VEPCO

SURRY POWER STATION
UNITS 1 AND 2

RESPONSE
TO
SAFETY EVALUATION REPORT

BY

OFFICE OF NUCLEAR REACTOR REGULATION

VIRGINIA ELECTRIC AND POWER COMPANY

SAFETY EVALUATION REPORT BY
OFFICE OF NUCLEAR REACTOR REGULATION
FOR VIRGINIA ELECTRIC AND POWER COMPANY
SURRY UNITS 1 AND 2
DOCKET NO. 50-280/281

NRC Request

"ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED ELECTRICAL EQUIPMENT

1 INTRODUCTION

General Design Criteria 1 and 4 specify that safety-related electrical equipment in nuclear facilities must be capable of performing its safety-related function under environmental conditions associated with all normal, abnormal, and accident plant operation. In order to ensure compliance with the criteria, the NRC staff required all licensees of operating reactors to submit a reevaluation of the qualification of safety-related electrical equipment which may be exposed to a harsh environment."

Vepco Response

No comment

NRC Request

"2 BACKGROUND

On February 8, 1979, the NRC Office of Inspection and Enforcement (IE) issued to all licensees of operating plants (except those included in the systematic evaluation program (SEP)) IE Bulletin IEB 79-01, "Environmental Qualification of Class IE Equipment." This bulletin, together with IE Circular 78-08 (issued on May 31, 1978), required the licensees to perform reviews to assess the adequacy of their environmental qualification programs.

Subsequently, Commission Memorandum and Order CLI-80-21 (issued on May 23, 1980) states that the DOR guidelines and portions of NUREG-0588 (which were issued on January 14, 1980, as enclosures 4 and 5 to IEB-79-01B) form the requirements that licensees must meet regarding environmental qualification of safety-related electrical equipment in order to satisfy those aspects of 10 CFR 50, Appendix A, General Design Criterion (GDC)-4. This order also requires the staff to complete safety evaluation reports (SERs) for all operating plants by February 1, 1981. In addition, this order requires that the licensees have qualified safety-related equipment installed in their plants by June 30, 1982.

Supplements to IEB 79-01B were issued for further clarification and definition of the staff's needs. These supplements were issued on February 29, September 30, and October 24, 1980.

In addition, the staff issued orders dated August 29, 1980 (amended in September, 1980) and October 24, 1980 to all licensees. The August order required that the licensees provide a report, by November 1, 1980, documenting the qualification of safety-related electrical equipment. The October order required the establishment of a central file location for the maintenance of all equipment-qualification records. The central file was mandated to be established by December 1, 1980. The order also required that all safety-related electrical equipment be qualified by June 30, 1982. In response, the licensee submitted information through letters dated October 1 and 31, and December 1, 1980."

Vepco Response

Revision 3 to the I.E. Bulletin 79-01B 90 Day Review was submitted on January 30, 1981. It is assumed that this revision was not incorporated into the staff's SER review.

NRC Request

"2.1 Purpose

The purpose of this SER is to identify equipment whose qualification program does not provide sufficient assurance that the equipment is capable of performing the design function in hostile environments. The staff position relating to any identified deficiencies is provided in this report."

Vepco Response

No comment

NRC Request

"2.2 Scope

The scope of this report is limited to an evaluation of the equipment which must function in order to mitigate the consequences of a loss-of-coolant accident (LOCA) or a high-energy-line-break (HELB) accident, inside or outside containment, while subjected to the hostile environments associated with these accidents."

Vepco Response

No comment

NRC Request

"3 STAFF EVALUATION

The staff evaluation of the licensee's response included an onsite inspection of selected Class IE equipment and an examination of the licensee's report for completeness and acceptability. The criteria described in the DOR guidelines and in NUREG-0588, in part, were used as a basis for the staff evaluation of the adequacy of the licensee's qualification program.

The NRC Office of Inspection and Enforcement performed (1) a preliminary evaluation of the licensee's response, documented in technical evaluation reports (TERs) and (2) onsite verification inspections (reports dated May 2, 1980) of selected safety-related electrical equipment. Some components of the inside recirculation spray and the feedwater systems were inspected at both Units 1 and 2. The inspections at both units verified proper installation of equipment, overall interface integrity, and manufacturers' nameplate data. The manufacturer's name and model number from the nameplate data were compared to information given in the Component Evaluation Work Sheets (CES) of the licensee's report. The site inspections are documented for Units 1 and 2 in reports IE 50-280/80-14 and 281/80-15, respectively. Prior to the inspection, the licensee had not determined the model numbers of several components listed on the CES. Consequently, licensee and inspector model numbers could not be compared. The licensee agreed to provide the model numbers during the present outage of the Surry steam generator. For this review, the documents referenced above have been factored into the overall staff evaluation."

Vepco Response

Vepco has completed a field verification program (Special Test 104) to verify manufacturer and model number of all class 1E equipment listed on the master list. The information obtained by the program is being reviewed. The component evaluation worksheets (CES) have been revised to correct any known discrepancies in the manufacturer or model numbers previously provided. Revision 4 to the I.E. Bulletin 79-01B 90 Day Review is included with this submittal and includes the revised CES.

Vepco will complete the Special Test review by June 1982 and maintain the results in the equipment qualification central file.

NRC Request

"3.1 Completeness of Safety-Related Equipment

In accordance with IEB 79-01B, the licensee was directed to (1) establish a list of systems and equipment that are required to mitigate the consequences of a LOCA and an HELB and (2) identify components needed to perform the function of safety-related display information, post-accident sampling and monitoring, and radiation monitoring.

The staff developed a generic master list based upon a review of plant safety analyses and emergency procedures. The instrumentation selected includes parameters to monitor overall plant performance as well as to monitor the performance of the systems on the list. The systems list was established on the basis of the functions that must be performed for accident mitigation (without regard to location of equipment relative to hostile environments).

The list of safety-related systems provided by the licensee was reviewed against the staff-developed master list.

Based upon information in the licensee's submittal, the equipment location references, and in some cases subsequent conversations with the licensee, the staff has determined and verified that the systems included in the licensee's submittal are those required to achieve or support: (1) emergency reactor shutdown, (2) containment isolation, (3) reactor core cooling, (4) containment heat removal, (5) core residual heat removal, and (6) prevention of significant release of radioactive material to the environment. The staff therefore concludes that the systems identified by the licensee (listed in Appendix D) are acceptable, with the exception of those items discussed in Section 5 of this report.

Display instrumentation which provides information for the reactor operators to aid them in the safe handling of the plant was not specifically identified by the licensee. A complete list of all display instrumentation mentioned in the LOCA and HELB emergency procedures must be provided. Equipment qualification information in the form of summary sheets should be provided for all components of the display instrumentation exposed to harsh environments. Instrumentation which is not considered to be safety related but which is mentioned in the emergency procedure should appear on the list. For these instruments, (1) justification should be provided for not considering the instrument safety related and (2) assurance should be provided that its subsequent failure will not mislead the operator or adversely affect the mitigation of the consequences of the accident. The environmental qualification of post-accident sampling and monitoring and radiation monitoring equipment is closely related to the review of the TMI Lessons-Learned modifications and will be performed in conjunction with that review.

The licensee identified 553 items of equipment which were assessed by the staff. Because Units 1 and 2 are nearly identical, the review can be performed as one. Where necessary, differences in the units will be noted for clarity."

Vepco Response

A list of display instrumentation referenced in the Emergency Procedures is provided in Table 1. The equipment in Table 1 has been divided into three categories.

Category A - Display instrumentation which has been previously included on the master list of the I.E. Bulletin 79-01B 90 Day Review, Revision 3. The appropriate worksheet page number for each item in this category can be found in Table 1.

Category B - Display instrumentation which is in a harsh environment but not previously listed on the master list of I.E. Bulletin 79-01B 90 Day Review, Revision 3. Equipment in this category has been added to the master list of I.E. Bulletin 79-01B 90 Day Review, Revision 4, as a result of our review of the Emergency Procedures. The appropriate worksheet page number for the equipment in this category can be found in Table 1.

The qualification status and proposed corrective action of equipment in Category B is as follows:

LT-RS251A, B — Containment Sump Level

This equipment is being replaced as part of the TMI Lessons-Learned modifications. The transmitters were included on the master list for the TMI Review Supplement 3 response submitted February 1, 1981.

PT-2402 — RCS Wide Range Pressure

PT-RC2401-1 — RCS Wide Range Pressure

LT-2477, 87, 97 — Steam Generator Wide Range Pressure

PT-RS256A, B — Outside Recirculation Spray Pump Discharge Pressure

FT-2961, 62, 63 — Cold Leg. SI Flow

FT-2945, 46 — Low Head Injection Header Flow

The sensor, cable and terminations of the indication listed above will be reviewed for qualification. Those portions of the instrumentation loop that are exposed to a harsh environment will be upgraded with qualified equipment. This will ensure that the operator will not be provided with erroneous indication due to the effects of a harsh environment on this equipment in the event of a LOCA or MSLB.

The majority of the display instrumentation in the Surry control room is supplied directly from protection channels. However, to ensure the integrity of the trip function, an isolation device is provided to supply the indicator so that faults at the indicator will not be reflected into the safety trip portion of the circuit. Therefore, the cables that run from the safety trip circuit to the indicator are not treated as Class 1E cables with respect to cable separation. This approach allows for redundant indicators to be positioned side-by-side for comparison of readings.

Qualification of Post Accident Monitoring equipment referenced in the Emergency Procedures is a new requirement. Vepco will review the qualification status of this equipment and advise the NRC of the schedule for implementation of any required corrective action by June 30, 1982.

Category C - Display instrumentation which is not exposed to a harsh environment. These components will be included on the master list for equipment which is in a mild environment and will be reviewed as such. At present there is no requirement to provide Component Evaluation sheets for equipment in a mild environment.

TABLE 1

CATEGORY A

MARK NUMBER	DESCRIPTION	EXPOSED TO A HARSH ENVIRONMENT	PREVIOUSLY LISTED ON MASTER LIST	WORKSHEET	COMMENT
TE-2413	RCS Temperature Element (Wide Range)	X	X	191	--
TE-2423	RCS Temperature Element (Wide Range)	X	X	195	--
TE-2433	RCS Temperature Element (Wide Range)	X	X	199	--
PT-LM200A	Containment Pressure (Narrow Range)	X	X	128	--
PT-LM200B	Containment Pressure (Narrow Range)	X	X	129	--
PT-LM200C	Containment Pressure (Narrow Range)	X	X	130	--
PT-LM200D	Containment Pressure (Narrow Range)	X	X	131	--
LT-2459	Pressurizer Level Protection	X	X	182	--
LT-2460	Pressurizer Level Protection	X	X	183	--
LT-2461	Pressurizer Level Protection	X	X	184	--
LT-2474	Steam Generator Narrow Range Protection	X	X	90	--
LT-2484	Steam Generator Narrow Range Protection	X	X	93	--

NOTE: Surry Unit Two mark numbers are provided. Table 1 also applies to Surry Unit 1 equipment.

TABLE 1

CATEGORY A - (Continued)

MARK NUMBER	DESCRIPTION	EXPOSED TO A HARSH ENVIRONMENT	PREVIOUSLY LISTED ON MASTER LIST	WORKSHEET	COMMENT
LT-2494	Steam Generator Narrow Range Protection	X	X	96	--
LT-2475	Steam Generator Narrow Range Protection	X	X	91	--
LT-2485	Steam Generator Narrow Range Protection	X	X	94	--
LT-2495	Steam Generator Narrow Range Protection	X	X	97	--
LT-2476	Steam Generator Narrow Range Protection	X	X	92	--
LT-2486	Steam Generator Narrow Range Protection	X	X	95	--
LT-2496	Steam Generator Narrow Range Protection	X	X	98	--
PT-2474	Steam Generator 1 Pressure	X	X	151	--
PT-2475	Steam Generator 1 Pressure	X	X	152	--
PT-2476	Steam Generator 1 Pressure	X	X	153	--
PT-2484	Steam Generator 2 Pressure	X	X	154	--
PT-2485	Steam Generator 2 Pressure	X	X	155	--

TABLE 1

CATEGORY A - (Continued)

MARK NUMBER	DESCRIPTION	EXPOSED TO A HARSH ENVIRONMENT	PREVIOUSLY LISTED ON MASTER LIST	WORKSHEET	COMMENT
PT-2486	Steam Generator 2 Pressure	X	X	156	--
PT-2494	Steam Generator 3 Pressure	X	X	157	--
PT-2495	Steam Generator 3 Pressure	X	X	158	--
PT-2496	Steam Generator 3 Pressure	X	X	159	--
FT-FW200A	Aux Steam Generator Feed Pump Flow	X	X	87	--
FT-FW200B	Aux Steam Generator Feed Pump Flow	X	X	88	--
FT-FW200C	Aux Steam Generator Feed Pump Flow	X	X	89	--

TABLE 1

CATEGORY B

MARK NUMBER	DESCRIPTION	EXPOSED TO A HARSH ENVIRONMENT	PREVIOUSLY LISTED ON MASTER LIST	WORKSHEET	COMMENT
LT-RS251A	Containment Sump Level	X		10.3-30	TMI Reveiw Supplement 3
LT-RS251B	Containment Sump Level	X		10.3-31	TMI Reveiw Supplement 3
PT-2402	RCS Wide Range Pressure	X		6-273	--
PT-RC2402-1	RCS Wide Range Pressure	X		6-274	--
LT-2477	Steam Generator Wide Range Level	X		6-275	--
LT-2487	Steam Generator Wide Range Level	X		6-276	--
LT-2497	Steam Generator Wide Range Level	X		6-277	--
PT-RS256A	Outside Recirculation Spray Pump Discharge Pressure	X		6-278	--
PT-RS256B	Outside Recirculation Spray Pump Discharge Pressure	X		6-279	--
FT-2961	Clod Leg Safety Injection Flow	X		6-280	--
FT-2962	Clod Leg Safety Injection Flow	X		6-281	--
FT-2963	Clod Leg Safety Injection Flow	X		6-282	--
FT-2945	Low Head Injection Header Flow	X		6-283	--
FT-2946	Low Head Injection Header Flow	X		6-284	--

TABLE 1

CATEGORY C

MARK NUMBER	DESCRIPTION	EXPOSED TO A HARSH ENVIRONMENT	PREVIOUSLY LISTED ON MASTER LIST	WORKSHEET	COMMENT
LT-CS200A	Refueling Water Storage Tank Level			NA	--
LT-CS200B	Refueling Water Storage Tank Level			NA	--
LT-CN200	Consensate Storage Tank Level			NA	--
LT-CS200C	Consensate Storage Tank Level			NA	--
LT-CS200D	Consensate Storage Tank Level			NA	--

NRC Request

"3.2 Service Conditions

Commission Memorandum and Order CLI-80-21 requires that the DOR guidelines and the "For Comment" NUREG-0588 are to be used as the criteria for establishing the adequacy of the safety-related electrical equipment environmental qualification program. These documents provide the option of establishing a bounding pressure and temperature condition based on plant-specific analysis identified in the licensee's Final Safety Analysis Report (FSAR) or based on generic profiles using the methods identified in these documents.

On this basis, the staff has assumed, unless otherwise noted, that the analysis for developing the environmental envelopes for Surry Units 1 and 2, relative to the temperature, pressure and the containment spray caustics, has been performed in accordance with the requirements stated above. The staff has reviewed the CES to ensure that the qualification data envelope the specifications established by the licensee. During this review, the staff assumed that for plants designed and equipped with an automatic containment spray system which satisfies the single-failure criterion, the main-steam-line-break (MSLB) environmental conditions are enveloped by the large-break-LOCA environmental conditions. The staff assumed, and requires the licensee to verify, that the containment spray system is not subjected to a disabling single-component failure and therefore satisfies the requirements of Section 4.2.1 of the DOR guidelines.

Equipment submergence has also been addressed where the possibility exists that flooding of equipment may result from HELBs."

Vepco Response

A description of the containment spray systems at Surry is provided in Section 6.3.1.4 of the Surry FSAR (Reference 1). This system contains redundant 100% capacity trains which are not subjected to a disabling single-component failure.

NRC Request

"3.3 Temperature, Pressure, and Humidity Conditions Inside Containment

The licensee has provided the results of accident analyses as follows:

	Max Temp (°F)	Max Press (psig)	Humidity (%)
LOCA	278	45	100
MSLB	not provided	not provided	not provided

The staff has concluded that the minimum temperature profile for equipment qualification purposes should include a margin to account for higher-than-average temperatures in the upper regions of the containment that can exist due to stratification, especially following a postulated MSLB. Use of the steam saturation temperature corresponding to the total building pressure (partial pressure of steam plus partial pressure of air) versus time will provide an acceptable margin for either a postulated LOCA or MSLB, whichever is controlling, as to potential adverse environmental effects on equipment.

The licensee's specified temperature (service condition) of 278°F does not satisfy the above requirement. A saturation temperature corresponding to the pressure profile (292°F peak temperature at 45 psig) should be used instead. The licensee should update his equipment summary tables to reflect this change. If there is any equipment that does not meet the staff position, the licensee must provide either justification that the equipment will perform its intended function under the specified conditions or propose corrective action.

Vepco Response

Stratification would only be present for a short time period (since the containment spray system becomes effective within 100 seconds) following a LOCA or MSLB. The spray delivery to the upper regions of the containment would quickly cool the stratified region.

No safety-related electrical equipment is located in the upper third of the containment volume. This precludes any equipment from being exposed to a higher-than-average temperature due to stratification in the upper regions of the containment following a LOCA or MSLB.

Even if safety related electrical equipment were located in the upper third of the containment volume, the computer codes and models used to calculate the maximum containment average temperature of 278°F for LOCA contain significant conservatisms such that the calculated temperature is an overprediction of the expected average temperature. These conservatisms include:

(1) the blowdown model, which maximizes release rates to the containment

(2) overprediction of the energy available for release to the containment

(3) underprediction of the containment heat sinks and containment volume

(4) assuming the most severe containment initial conditions

(5) minimizing containment spray heat removal

(6) the modeling of the behavior of the break effluent to maximize the containment pressure and temperature.

The combination of all these factors results in calculated containment pressure and temperature transients which are substantially greater than expected values. Therefore, there is sufficient margin in the calculated temperature to account for stratified regions of higher-than-average temperatures for an MSLB.

Stratification of steam in the upper regions of the containment is not expected to occur after a LOCA. The location of the break is below the operating floor in the lower portion of the containment. The high, subcooled liquid blowdown rates will result in a high degree of mixing which will prevent the accumulation of stratified steam.

A sample of the methodology used to determine the inside containment LOCA profiles can be found in the Environmental Zone Descriptions for Surry Power Station behind Reference Tab #2.[1]

[1] A copy of the Environmental Zone Descriptions (EZD) Surry Power Stations Units 1 and 2 are provided with the SER response.

NRC Request

"3.4 Temperature, Pressure, and Humidity Conditions Outside Containment

The licensee has provided the temperature, pressure, humidity and applicable environment associated with an HELB outside containment. The following areas outside containment have been addressed:

(1) Auxiliary building
(2) Auxiliary building charging pump cubicle

The staff has verified that the parameters identified by the licensee for the HELB are acceptable.

Vepco Response

No comment

NRC Request

"3.5 Submergence

The maximum submergence levels have been established and assessed by the licensee. Unless otherwise noted, the staff assumed for this review that the methodology employed by the licensee is in accordance with the appropriate criteria as established by Commission Memorandum and Order CLI-80-21.

The licensee's value for maximum submergence is at the 21 ft. 11 in. elevation. The licensee identified three safety-related electrical components for Unit 1 and three for Unit 2 as having the potential for becoming submerged after a postulated event.

The licensee stated that these components--6 motor-operated valves--will have completed their function before becoming submerged. In this regard, the licensee should provide an assessment of the failure modes associated with the submergence of the valves. The licensee should also provide assurance that the subsequent failure of these components will not adversely affect any other safety functions or mislead an operator. Additionally, the licensee should discuss operating time, across the spectrum of events, in relation to the time of submergence. If the results of the licensee's assessment are acceptable, then the valves may be exempt from the submergence parameter of qualification.

It is not clear from the information submitted that submergence of safety-related electrical equipment outside of containment was addressed. The licensee should address this area more specifically in the 90-day response and upgrade the CES as appropriate."

Vepco Response

1. Inside Reactor Containment Building

The methodology used to determine the submergence level inside containment is provided for your review in the Environmental Zone Descriptions for Surry Power Station behind Reference Tab #6. This methodology is in accordance with the requirements of I.E. Bulletin 79-01B.

The maximum fluid level in the calculation is elevation -21' 11" to which all components were reviewed. The 6 motor operated valves (MOV 1865 A, B, C and MOV 2865 A, B, C) are below the submergence level.

These motor operated valves have been removed from the master list. The valves serve to isolate the safety injection accumulater tanks during refueling. They are administratively locked open whenever the reactor is critical by locking out the breakers that supply power to the valves. The valves will then remain in their locked open position and available to mitigate the consequences of a LOCA or MSLB. No power is supplied to these motor operated valves during critical operation; therefore, there can be no adverse effects to the electrical bus which normally supplies power to the valves. There is no position indication on these valves, thus the operator cannot be mislead due to the submergence of the valves. Since the valves are locked open, the question of operating time across the spectrum of events in relation to submergence need not be addressed.

2. Outside Reactor Containment Building

Submergence outside of containment was not specifically addressed during the I.E. Bulletin 79-01B 90 Day Review. The effects of piping system breaks outside of containment was analyzed in Appendix D of the Surry FSAR. This review takes into account the effects of discharging fluids that may result in failure of equipment important to safety.

A detailed review of the effects of flooding on equipment important to safety is provided in the North Anna FSAR Appendix C, Effects of Piping System Breaks Outside Containment (Reference 2). The Auxiliary Building was the only area affected by the postulated high-energy line breaks with regard to submergence. The maximum water level in the Auxiliary Building is 1 inch above the floor. All equipment important to safety was found to be at least 15 inches above the floor.

A similar review of the effects of flooding was not done for Surry. We can determine for Surry, however, that no equipment outside of containment important to safety will become submerged due to the postulated pipe breaks because of the similarity in design of the piping systems, the Auxiliary Building layout, and equipment location for North Anna and Surry.

Since we have determined that there is no equipment outside containment that would be subjected to submergence due to a LOCA or HELB, the submergence column on the Component Evaluation Sheet has been marked Not Required (NR).

NRC Request

"3.6 Chemical Spray

The licensee's submittal and reference are not clear on the subject of chemical spray solution and concentration. Moreover, there seem to be inconsistencies between the pH of 8.5-11 specified in the reference and the qualification values on the CES in the submittal. Therefore, for the purpose of this review, the effects of chemical spray will be considered unresolved. The staff will review the licensee's response when it is submitted and discuss the resolution in a supplemental report."

Vepco Response

The component evaluation sheets have been revised to show consistent units for chemical spray concentration. Each component on the master list which is subjected to chemical sprays has been reviewed to ensure that the chemical spray environment in the test report envelops the specified chemical spray environment. The results of the review are indicated on the worksheets included in Revision 4 of the IE Bulletin 79-01B 90 Day Review. Specific chemical spray deficiencies which were identified in Appendix B have also been reviewed and resolutions to these deficiencies are indicated on the Revision 4 component evaluation worksheets.

Details of the qualification review for chemical spray can be found in the qualification review packages contained in the central file.

NRC Request

"3.7 Aging

Section 7 of the DOR Guidelines does not require a qualified life to be established for all safety-related electrical equipment. However, the following actions are required:

(1) Make a detailed comparison of existing equipment and the materials identified in Appendix C of the DOR Guidelines. The first supplement to IEB-79-01B requires licensees to utilize the table in Appendix C and identify any additional materials as the result of their effort.

(2) Establish an ongoing program to review surveillance and maintenance records to identify potential age-related degradations.

(3) Establish component maintenance and replacement schedules which include considerations of aging characteristics of the installed components.

The licensee stated that all Class 1E electrical equipment is assessed for operability at specified time intervals by systematic application of the plant periodic test program. The licensee also stated (1) that a preliminary program was developed by December 1, 1980 to determine whether equipment inoperability was caused by aging, and (2) that the use of the periodic test program, together with a detailed analysis of all Class 1E inoperable equipment and other sources of information, should satisfy the aging requirement and provide assurance that Class 1E equipment and components will perform when needed.

For this review, however, the staff requires that the licensee submit supplemental information to verify and identify the degree of conformance to the above requirements. The response should include all the equipment identified as required to maintain functional operability in harsh environments.

The staff will review the licensee's response when it is submitted and discuss its evaluation in a supplemental report.

Vepco Response

Vepco has not fully developed an aging evaluation program to meet the current requirements for addressing aging as outlined in the Safety Evaluation Report and as discussed in the meetings held in Bethesda on July 7-10, 1981. As indicated previously in I.E. Bulletin 79-01B 90 Day Review, Revision 3, a program to assess the failure mechanisms of all class 1E electrical equipment has been developed and implemented at Surry.

The Atomic Industrial Forum is currently drafting a position paper which Vepco feels has merit with regard to addressing the aging concerns. Implementation of this program is contingent, however, on review of the existing preventive maintenance program at the station. Vepco is currently reviewing the draft AIF position paper on aging evaluation methods in conjunction with the existing preventive maintenance program at Surry. An aging evaluation program which meets the requirements of the SER will be implemented by June 1982.

Below is the program being proposed by the AIF:

3.7.1 Discussion

The purpose of qualifying safety-related equipment in a harsh environment is to assure that when the equipment is subjected to severe environmental stresses from a design-basis event, common mode failures will not occur in redundant safety systems. The purpose of including aging as part of the qualification process is to assure that such equipment will perform its safety functions in its "end-of-useful-life" as well as in its "as-new" condition. Such a demonstration must consider the design, manufacture, testing, installation, operation, maintenance, and replacement of the equipment.

However, the evaluation of aging, as practiced in the nuclear power industry, embodies the concept of preconditioning a piece of equipment by putting it in a simulated advanced stage of life. This practice is extended to determine an expected (i.e., qualified) life for that piece of equipment if, following the preconditioning, the equipment can be demonstrated to perform its intended function successfully when exposed to a harsh environment.

The aging and qualified-life concept is sound and logical in principle. In practice, however, industry research and experience has demonstrated that aging is still at the leading edge of technology; this statement is based on the following:

(1) The most common method to achieve a preconditioning of equipment is to use some form of accelerated stressing. This requires the identification of the various environmental parameters (i.e., temperature, pressure, himidity, radiation, vibration, and chemical environment) that cause stress. An appropriate acceleration technique must be established for each type of stress that is identified. The simultaneous simulated acceleration of some or all of these parameters (e.g., radiation, temperature, humidity), as would occur in the plant, is not always practical or feasible. In addition, some of these parameters (e.g., humidity and chemical environment) do not lend themselves to acceleration.

(2) When acceleration is practical, the methods used (such as the Arhenius technique and the 10 degree C rule for thermal aging, and an increased dose rate for radiation) are approximate and subject to arbitrary assumptions. Electric Power Research Institute Report NP-1558, "A Review of Equipment Aging Theory and Technology," demonstrates this fact.

The DOR Guidelines recognize this state-of-the-art limitation, as demonstrated by the staff position in Section 7, "Aging," which states:

> Implicit in the staff position in Regulatory Guide 1.89 with regard to backfitting IEEE Std. 323-1974 is the staff's conclusion that the incremental improvement in safety from arbitrarily requiring that a specific qualified life be demonstrated for all Class 1E equipment is not sufficient to justify the expense for plants already constructed and operating.

Section 7 continues that:

> This position does not, however, exclude equipment using materials that have been identified as being susceptible to significant degradation due to thermal and radiation aging. Component maintenance or replacement schedules should include considerations of the specific aging characteristics of the component materials. Ongoing programs should exist at the plant to review surveillance and maintenance records to assure that equipment which is exhibiting age related degradation will be identified and replaced as necessary.

Section 3.7.2 outlines the proposed program. When implemented this program will satisfy the aging requirements in the DOR Guidelines and the Safety Evaluation Report.

3.7.2 Aging Evaluation Program

To address the aging evaluation program in a disciplined man- ner, each safety related Class 1E equipment located in potentially harsh environment areas and, identified in the component evaluation worksheet will be reviewed individually and classified into three categories as follows, based on their qualification methods:

Category A - Equipment tested under LOCA/HELB conditions with preaging included in the test program

Category B - Equipment tested under LOCA/HELB conditions without preaging in the test program

Category C - Equipment not tested under LOCA/HELB conditions

3.7.2.1 Category A

Category A includes the equipment which was qualified by type tests. These type tests include (1) simulated aging test including thermal, radiation aging, and mechanical and electrical cycling where applicable, and (2) design-basis-event tests to verify the equipment's functional capability following simulated aging. In these cases a qualified-life estimate, based on most limiting of the thermal and radiation aging tests, was established. For this equipment, an Ongoing Aging evaluation and replacement schedule will be factored into an existing surveillance program, which includes:

3.7.2.1.1 The performance of routine preventive maintenance in accordance with established procedures based on manufacturers' recommendations and plant operating experience.

3.7.2.1.2 Parts replacements on which the expected qualified-life is contingent. Based on the review of the qualification tests and the results thereof Vepco has identified the parts replacements such as gaskets and lubricants that are required. The existing preventive maintenance programs for each piece of equipment will be revised to include these.

3.7.2.1.3 The evaluation of equipment failures to identify any trends that indicate a potential for common mode failure so corrective actions can be initiated. The failure evaluation program will specifically address the following.

A record will be maintained of all failures of safety related Class 1E equipment. Periodically failure records will be reviewed to determine:

(a) Repetitive nature

(1) Is the same type failure occurring on the same equipment and at some definite intervals?

(2) Is the same type failure occurring at a definite interval on similar equipment?

(b) Timing of the failures with respect to any environmental condition changes

(c) Other causes indicative of equipment in-service aging degradation.

Vepco currently has an administrative procedure that addresses this requirement. This procedure when fully developed and implemented will provide the additional information required to detect impending age related failure and initiate corrective action.

3.7.2.1.4 Review of periodic operational test and calibration records to spot any clues for developing age related failure mechanism.

3.7.2.2 Category B

Category B includes the equipment for which the qualification has been based on LOCA/HELB tests that are coupled with engineering analyses to address aging. The engineering analyses might include (1) a material evaluation to identify weak links and (2) a comparison of test data on generic materials, or an extrapolation of conservatisms contained in the LOCA/HELB testing. In these cases, the establishment of an estimated qualified life or replacement schedule has been based on engineering analyses. For this equipment, Ongoing Aging evaluation will consist of:

3.7.2.2.1 The performance of routine preventive maintenance in accordance with established procedures based on manufacturers' recommendations and plant operating experience.

3.7.2.2.2 Parts replacements on which the expected qualified-life is contingent. Based on the review of the qualification tests and the results thereof VEPCO has identified the parts replacements such as gaskets, and lubricants that are required. The existing preventive maintenance programs for each equipment will be revised to include these.

3.7.2.2.3 The evaluation of equipment failures to identify any trends that indicate a potential for common mode failure so corrective actions can be initiated. The failure evaluation program will specifically address the following.

(a) Repetitive nature

(1) Is the same type failure occurring on the same equipment and at some definite intervals?

(2) Is the same type failure occurring at a definite interval on similar equipment?

(b) Timing of the failures with respect to any environmental condition changes

(c) Other causes indicative of equipment in-service aging degradation.

Vepco currently has an administrative procedure that addresses this requirement. This procedure when fully developed and implemented will provide the additional information required to detect impending age related failure and initiate corrective action.

3.7.2.2.4 Review of periodic operational test and calibration records to spot any clues for developing age related failure mechanism.

3.7.2.2.5 An equipment monitoring program to augment engineering analyses for aging.

An example of this monitoring program could be the periodic review of motor-winding temperatures, starting current or running currents to identify any trends that indicate performance degradation. The results of this review would form the basis for initiating corrective action.

3.7.2.3 Category C

Category C includes the few pieces of equipment for which qualification has been demonstrated by analysis only. This equipment is exposed to a limited number of harsh environment parameters, which are substantially lower than they would be for Category A or B. An example would be the equipment in the pump rooms, where the only harsh parameter is the radiation that results from recirculating fluid lines or a transient temperature spike from a HELB accident.

3.7.2.3.1 The performance of routine preventive maintenance in accordance with established procedures based on manufacturers' recommendations and plant operating experience.

3.7.2.3.2 Parts replacements on which the expected qualified-life is contingent. Based on the review of the qualification tests and the results thereof Vepco has identified the parts replacements such as gaskets, and lubricants that are required. The existing preventive maintenance programs for each equipment will be revised to include these.

3.7.2.3.3 The evaluation of equipment failures to identify any trends that indicate a potential for common mode failure so corrective actions can be initiated. The failure evaluation program will specifically address the following.

(a) Repetitive nature

(1) Is the same type failure occurring on the same equipment and at some definite intervals?

(2) Is the same type failure occurring at a definite interval on similar equipment?

(b) Timing of the failures with respect to any environmental condition changes

(c) Other causes indicative of equipment in-service aging degradation.

Vepco currently has an administrative procedure that addresses this requirement. This procedure when fully developed and implemented will provide the additional information required to detect impending age related failure and initiate corrective action.

3.7.2.3.4 Review of periodic operational test and calibration records to spot any clues for developing age related failure mechanism.

3.7.2.3.5 A specific maintenance test program designed to augment the engineering analysis for the specific area of concerns (e.g., replacement of gaskets, O-rings, etc.).

3.7.3 Conclusion

The program outlined above reflects a practical approach to aging evaluation, consistent with the requirements of the DOR Guidelines and the requirements as outlined in the Safety Evaluation Report. Vepco believes that the implementation of this program will provide an extra measure of confidence in safety-related equipment capabilities on a continuing basis.

NRC Request

"3.8 Radiation (Inside and Outside Containment)

The licensee has provided values for the radiation levels postulated to exist following a LOCA. The application and methodology employed to determine these values were presented to the licensee as part of the NRC staff criteria contained in the DOR Guidelines, in NUREG-0588, and in the guidance provided in IEB-79-01B, Supplement 2. Therefore, for this review, the staff has assumed that, unless otherwise noted, the values provided have been determined in accordance with the prescribed criteria. The staff review determined that the values to which equipment was qualified enveloped the requirements identified by the licensee.

The radiation values provided by the licensee for inside containment for total integrated dose range from 7.44×10^6 to 3.41×10^9. The radiation service condition provided by the licensee is lower than provided in the DOR Guidelines (4×10^7 rads) for gamma and beta radiation. The licensee is requested to either provide justification for using the lower service condition or use the service condition provided in the DOR guidelines for both gamma and beta radiation. If the former option is chosen, the analysis--including the basis, assumptions, and a sample calculation--should be provided.

A required value outside containment of 8×10^6 rads has been used by the licensee to specify limiting radiation levels within the charging pump cubicle. This value appears to consider the radiation levels influenced by the source term methodology associated with post-LOCA recirculation fluid lines and is therefore acceptable."

Vepco Response

The calculated total integrated gamma radiation doses inside containment range from 7.4×10^6 to 3.8×10^7 rads, depending on the location of the dose points. They are shown in Table 2. The radiation doses were calculated based on power level of 2546 MW thermal and containment free volume of 1.8×10^6 ft^3. The shielding credit of crane wall and operating floor was taken into consideration. A sample calculation is provided in the Environmental Zone Descriptions for Surry Power Station behind Reference Tab #3.

TABLE 2

40-year normal plus LOCA gamma dose inside containment

Location		Dose (rads)
el. 47'4"	- Inside crane wall	3.7×10^7
el. 47'4"	- Outside crane wall	7.4×10^6
el. 18'4"	- Outside crane wall	7.4×10^6
el. (-) 3'6"	- Inside crane wall	3.7×10^7
el. (-) 3'6"	- Outside crane wall	7.4×10^6
el. (-)27'7"	- Above sump water	3.5×10^7
el. (-)27'7"	- Submerged in sump water	3.8×10^7

NRC Request

"4 QUALIFICATION OF EQUIPMENT

The following subsections present the staff's assessment, based on the licensee's submittal, of the qualification status of safety-related electrical equipment.

The staff has separated the safety-related equipment into three categories: (1) equipment requiring immediate corrective action, (2) equipment requiring additional qualification information and/or corrective action, and (3) equipment considered acceptable if the staff's concern identified in Section 3.7 is satisfactorily resolved.

In its assessment of the licensee's submittal, the NRC staff did not review the methodology employed to determine the values established by the licensee. However, in reviewing the data sheets, the staff made a determination as to the stated conditions presented by the licensee. Additionally, the staff has not completed its review of supporting documentation referenced by the licensee (for example, test reports). It is expected that when the review of test reports is complete, the environmental qualification data bank established by the staff will provide the means to cross reference each supporting document to the referencing licensee.

If supporting documents are found to be unacceptable, the licensee will be required to take additional corrective actions to either establish qualification or replace the item(s) of concern. This effort will begin in early 1981.

An appendix for each subsection of this report provides a list of equipment for which additional information and/or corrective action is required. Where appropriate, a reference is provided in the appendices to identify deficiencies. It should be noted, as in the Commission Memorandum and Order, that the deficiencies identified do not necessarily mean that equipment is unqualified. However, they are cause for concern and may require further case-by-case evaluation."

Vepco Response

No comment

NRC Request

"4.1 Equipment Requiring Immediate Corrective Action

Appendix A identifies equipment (if any) in this category. The licensee was asked to review the facility's safety-related electrical equipment. The licensee's review of this equipment has not identified any equipment requiring immediate corrective action; therefore, no licensee event reports (LERs) were submitted. In addition, in this review, the staff has not identified any safety-related electrical equipment which is not able to perform its intended safety function during the time in which it must operate."

Vepco Response

No comment

NRC Request

"4.2 Equipment Requiring Additional Information and/or Corrective Action

Appendix B identifies equipment in this category, including a tabulation of deficiencies. The deficiencies are noted by a letter relating to the legend (identified below), indicating that the information provided is not sufficient for the qualification parameter or condition.

Legend

R - radiation
T - temperature
QT - qualification time
RT - required time
P - pressure
H - humidity
CS - chemical spray
A - material-aging evaluation; replacement schedule; ongoing equipment surveillance
S - submergence
M - margin
I - HELB evaluation outside containment not completed
QM - qualification method
RPN - equipment relocation or replacement; adequate schedule not provided
EXN - exempted equipment justification inadequate
SEN - separate-effects qualification justification inadequate
QI - qualification information being developed
RPS - equipment relocation or replacement schedule provided

As noted in Section 4, these deficiencies do not necessarily mean that the equipment is unqualified. However, the deficiencies are cause for concern and require further case-by-case evaluation. The staff has determined that an acceptable basis to exempt equipment from qualification, in whole or part, can be established provided the following can be established and verified by the licensee:

(1) Equipment does not perform essential safety functions in the harsh environment, and equipment failure in the harsh environment will not impact safety-related functions or mislead an operator.

(2a) Equipment performs its function before its exposure to the harsh environment, and the adequacy for the time margin provided is adequately justified, and

(2b) Subsequent failure of the equipment as a result of the harsh environment does not degrade other safety functions or mislead the operator.

(3) The safety-related function can be accomplished by some other designated equipment that has been adequately qualified and satisfies the single-failure criterion.

(4) Equipment will not be subjected to a harsh environment as a result of the postulated accident.

The licensee is, therefore, required to supplement the information presented by providing resolutions to the deficiencies identified; these resolutions should include a description of the corrective action, schedules for its completion (as applicable), and so forth. The staff will review the licensee's response, when it is submitted, and discuss the resolution in a supplemental report.

It should be noted that in cases where testing is being conducted, a condition may arise which results in a determination by the licensee that the equipment does not satisfy the qualification test requirements. For that equipment, the licensee will be required to provide the proposed corrective action, on a timely basis, to ensure that qualification can be established by June 30, 1982."

Vepco Response

The equipment listed in Appendix B has been re-evaluated with regard to the deficiencies identified for each component. In most cases re-evaluation of the available qualification documentation provided assurance that the equipment is qualified for the parameters listed as deficiencies. The Component Evaluation Sheets (CES) have been updated with the required additional information. The summary information presented on the CES in Revision 4 of I.E. Bulletin 79-01B 90 Day Review (provided with this SER response) should provide enough information to resolve the deficiencies of Appendix B for equipment that has been determined through our review to be qualified.

The present status of each component listed in Appendix B is indicated in the resolution column of Table 3. Each component has been placed into one of the following four categories:

(1) COMPONENTS DELETED FROM THE MASTER LIST

(2) COMPONENTS REQUIRING REPLACEMENT OR MODIFICATION

(3) COMPONENTS DETERMINED TO BE QUALIFIED

(4) COMPONENTS DETERMINED TO BE QUALIFIED EXCEPT FOR AGING

The criteria used to resolve the deficiencies and categorize the equipment listed in Appendix B are presented below:

(1) COMPONENTS DELETED FROM THE MASTER LIST

Components which have been deleted from the master list are listed in the conclusion of the I.E. Bulletin 79-01B 90 Day Review Revision 4 (Section 7.3). Justification for deleting this equipment is provided there.

(2) COMPONENTS REQUIRING REPLACEMENT OR MODIFICATION

Components which are being replaced with qualified equipment or are being modified to upgrade their qualification status are listed in the conclusion of the 79-01B 90 Day Review Revision 4. (Section 7.1 and 7.2.) Justification for continued operation and the schedules for proposed corrective action are provided in these sections.

(3) COMPONENTS DETERMINED TO BE QUALIFIED

Further review of the available qualification documentation has provided sufficient justification to substantiate qualification. Summary information is provided on the CES to resolve the deficiencies for each component. The criteria used for re-evaluation of each parameter are as follows:

R - Radiation

The qualification references were reviewed to ensure that the proper service radiation level was indicated on the CES. The radiation level in the test report was checked to see that it encompassed the specification level. The test method was reviewed for adequacy. Any deficiencies with regard to this parameter were identified on the CES along with the proposed resolution.

In each equipment review effects of Beta dose were addressed to assure that either total radiation test dose includes the gamma equivalent of the same, or that the shielding effects inherent in the construction of the equipment (i.e., jacket thickness, casings thickness) were sufficient to reduce the total Beta dose to the sensitive internals are less than 10% after total required gamma dose.

T - Temperature

The qualification references were reviewed to ensure that the proper service temperature was indicated on the CES. The temperature level in the test report was checked to see that it encompassed the specification level. The test method was reviewed for adequacy. Any deficiencies with regard to this parameter were identified on the CES along with the proposed resolution.

QT - Qualification Time

The qualification references were reviewed to ensure that the correct qualification time was indicated on the CES. The qualification time was checked to see that it encompassed the required time. The test method was reviewed for adequacy.

RT - Required Time

The operating time(s) indicated on the CES are based on two references. The 120-day operating time is based on Westinghouse letter #NS-SS-79287 (Reference #3) dated November 28, 1979 which provided the operating times for equipment supplied by Westinghouse. The 60 second operating time for containment isolation valves is based on Section 6.2.4.2 of the North Anna FSAR (Reference #4). This reference is applicable in this case because the same design criteria for containment isolation valves at North Anna was used for Surry.

P - Pressure

The qualification references were reviewed to ensure that the proper service pressure was indicated on the CES. The pressure in the test report was checked to see that it encompassed the specification level. The test method was reviewed for adequacy. Any deficiencies with regard to this parameter were identified on the CES along with the proposed resolution.

H - Humidity

The qualification references were reviewed to ensure that the proper service humidity was indicated on the CES. The percent humidity in the test report was checked to see that it encompassed the specification level. The test method was reviewed for adequacy. Any deficiencies with regard to this parameter were identified on the CES along with the proposed resolution.

CS - Chemical Spray

The qualification references were reviewed to ensure that the proper chemical spray concentration was indicated on the CES. The chemical spray valves in the test report were checked to see that they encompassed the specification level. The test method was reviewed for adequacy. Any deficiencies with regard to this parameter were identified on the CES along with the proposed resolution.

Chemical spray effects were addressed in the review and evaluation of the qualification of each equipment by establishing an overall envelope of parametric (i.e., concentration, rate of spray flow, duration, and other environmental conditions occurring simultaneously) conditions. During the review, effects of any deviation in the tests of these condi-

tions from those required were addressed. Any resulting deficiencies and the resolutions thereof are indicated on the component evaluation worksheets.

A - Aging

The test documentation was reviewed with regard to aging. If there was sufficient qualification data to substantiate a qualified life for the equipment, the equivalent preaged life was indicated on the CES.

S - Submergence

No equipment in Appendix B was determined by the NRC to have a deficiency with regard to submergence.

M - Margin

Each of the parameters for which margin is a concern were reviewed to ensure sufficient margin was included for the test parameter.

I - HELB EVALUATION outside containment not complete

No items in Appendix B were determined by the NRC to be deficient from the standpoint of HELB mitigation.

QM - Qualification Method

The qualification method used has been evaluated against each of the critical parameters (operating time, temperature, pressure, relative humidity, chemical spray, radiation and aging) to determine the adequacy of the qualification information provided. The qualification method is indicated on the CES.

RPN - Replacement schedule not provided

Replacement schedules for equipment being replaced or modified can be found in the conclusion of the 79-01B 90 Day Review Revision 4.

EXN - Exempted equipment justification inadequate

See Category 1

SEN - Separate - effects qualification inadequate

No components in Appendix B were determined by the NRC to have this deficiency.

QI - Qualification information being developed

During the continuing re-evaluation process, qualification information (identified in the 90 day submittal as "being developed") has been assembled and reviewed. Disposition thereof is reflected in Appendix B, CES, and the conclusion section.

RPS - Equipment relocation or replacement schedule provided.

The equipment relocation or replacement schedule is provided in the conclusion section of the I.E. Bulletin 79-01B 90 Day Review Revision 4.

(4) EQUIPMENT WHICH HAS BEEN DETERMINED TO BE QUALIFIED EXCEPT FOR AGING

This equipment was reviewed using the same criteria as listed in Category 3. There was insufficient test documentation to predict a qualified life for components in this category. Therefore, we will develop an aging evaluation program by June 1982 for these components. For the details of this program see Section 3.7 of the SER response.

Additional supporting data for the conclusion reached on the qualification of all components on the master list are available in the equipment qualification central file. It is our understanding that the NRC has not requested or required all test documentation or details of the test documentation review process be supplied to the NRC at this time.

TABLE 3

SURRY POWER STATION
UNITS 1 AND 2
SAFETY EVALUATION REPORT (SER)
APPENDIX B

VEPCO

SURRY UNIT 1
APPENDIX B TO NRC-SER
AUGUST 24, 1981

LEGEND

DESIGNATION FOR DEFICIENCY

R - Radiation
T - Temperature
QT - Qualification time
RT - Required time
P - Pressure
H - Humidity
CS - Chemical spray
A - Material aging evaluation, replacement schedule, ongoing equipment surveillance
S - Submergence
M - Margin
I - HELB evaluation outside containment not completed
QM - Qualification method
RPN - Equipment relocation or replacement, adequate schedule not provided
EXN - Exempted equipment justification inadequate
SEN - Separate effects qualification justification inadequate
QI - Qualification information being developed
RPS - Equipment relocation or replacement schedule provided

RESOLUTION OF DEFICIENCY

1. Components deleted from the master list

2. Components requiring replacement or modification

3. Components determine to be qualified

4. Components determined to be qualified except for aging

OK,

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
001	0401	SOLENOID VALVE	ASCO	SOV-SV-102A	R,QT,A	2	6-1	REF QDR-5437-SOV-01	
002	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1275A	QT,A	3	6-2	QDR-5437-MOV-1-01	
003	0548	MOTOR OPERATED VALVE	UNKNOWN	MOV-1275B	QT,A	3	6-3		
004	0548	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1275C	QT,A	3	6-4		
005	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1373	R,T,QT,P,H,A,QT	3	6-5	QDR-5437-MOV-1-01	
006	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1381	QT,A	3	6-6		
007	0351	PUMP MOTOR	WESTINGHOUSE	1-CH-P-1A	R,T,QT,P,H,A,RPN	3	6-7	REF QDR-5437-43-01	
008	0351	PUMP MOTOR	WESTINGHOUSE	1-CH-P-1B	R,T,QT,P,H,A,RPN	3	6-8	REF QDR-5437-43-01	
009	0351	PUMP MOTOR	WESTINGHOUSE	1-CH-P-1C	R,T,QT,P,H,A,RPN	3	6-9		
010	0600	FLOW CONTROL VALVE		FCV-1122	R,QT,A	1	6-10		
011	0121	FLOW TRANSMITTER	FISHER-GOVENOR	FT-1122	RQT,A,RPN	1	6-11		
012	0401	SOLENOID OPERATED VALVE	ASCO	SOV-1311	R,T,QT,P,H,A,CS, RPN	1	6-12	REF QDR-5437-SOV-01	
013	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1115B	QT,A	2	6-13	QDR-5437-MOV-1-01	
014	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1115C	QT,P,A,QI	3	6-14	QDR-5437-MOV-1-01	
015	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1115D	QT,P,A,QI	2	6-15	QDR-5437-MOV-1-01	
016	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1115E	QT,P,A,QI	3	6-16	QDR-5437-MOV-1-01	
017	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1289A	QT,A	3	6-17	QDR-5437-MOV-1-01	
018	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1289B	QT,A	3	6-18	QDR-5437-MOV-1-01	
019	0401	SOLENOID VALVE	ASCO	SOV-1204	R,QT,A,RPN	2	6-19	REF QDR-5437-SOV-01	
020	0401	SOLENOID OPERATED VALVE	ASCO	SOV-1200A	R,T,QT,P,H,A,CS	3	6-20	REF QDR-5437-SOV-01	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
021	0401	SOLENOID OPERATED VALVE	ASCO	SOV-1200B	R,T,QT,P,H,A,CS	3	6-21	REF QDR-5437-SOV-01	
022	0401	SOLENOID OPERATED VALVE	ASCO	SOV-1200C	R,T,QP,P,H,A,CS	3	6-22	REF QDR-5437-SOV-01	
023	0711	480V MOTOR CONTROL	CUTLER-HAMMER	1-H1-2 SOUTH	R,QT,A,QI	1	6-23		
024	0711	480V MOTOR CONTROL CENTER	CUTLER-HAMMER	1-H1-2 NORTH	R,QT,A,QI	1	6-24		
025	0711	480V MOTOR CONTROL CENTER	CUTLER-HAMMER	1-J1-2 WEST	R,QT,A,QI	1	6-25		
026	0711	480V MOTOR CONTROL CENTER	CUTLER-HAMMER	1-J1-2 EAST	R,QT,A,QI	1	6-26		
027	1012	POWER PENETRATION	CONAX	SPEC. NO. 21/ CONAX TYPE IC	CS,A	3	6-27	REF QDR-5437-49-01	
028	1012	POWER PENETRATION	CONAX	SPEC. NO. 21/ CONAX TYPE ID	CS,A	3	6-28	CS & A DEFICIENCES	
029	1012	POWER PENETRATION	CONAX	SPEC. NO. 21/ CONAX TYPE IIA	CS,A	3	6-29	REF QDR-5437-49-01	
030	1012	POWER PENETRATION	CONAX	SPEC. NO. 21/ CONAX TYPE IIB	CS,A	3	6-30	REF QDR-5437-49-01	
031	1012	POWER PENETRATION	CONAX	SPEC. NO. 21/ CONAX TYPE IIC	CS,A	3	6-31	REF QDR-5437-49-01	
032	0813	600V CONTROL CABLE	CERRO WIRE AND CABLE CO.	SPEC. NO. NAS-120	CS,A	3	6-32	QDR 5437-MOV-2-021	
033	0813	600V CONTROL CABLE	CERRO WIRE AND CABLE CO.	SPEC. NO. NAS-3187	QT,CS,A	3	6-33	REQDRD5437-MOV-2-02	
034	0806	300V INSTRUMENT CABLE	BOSTON INSULATED WIRE AND CABLE	SPEC. NO. 128	CS,A	3	6-34		
035	0813	300V INSTRUMENT CABLE	CERRO WIRE AND CABLE CO.	SPEC. NO. NAS-430	QT,CS,A	3	6-35	REQDRQ5437-MOV-2-02	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
036	0813	300V INSTRUMENT CABLE	RAYCHEM CORP.	SPEC. NO. NAS-3190	QT,CS,A,QI	3	6-36	REQDRQ5437-MOV-2-02	
037	0837	1000V CONTROL CABLE	CERRO WIRE AND CABLE CO.	SPEC. NO. NUS-325	R,T,QT,P,CS,A,QI	3	6-37		
038	0813	1000V CONTROL CABLE	CERRO WIRE AND CABLE CO.	SPEC. NO. NUS-381C	R,T,QT,P,CS,A,QI	3	6-38	QDR 5437-MOV-2-021	
039	0813	1000V CONTROL CABLE	CERRO WIRE AND CABLE CO.	SPEC. NO. NUS-381E	R,T,QT,P,CS,A,QI	3	6-39	QDR 5437-MOV-2-021	
040	0824	1000V CONTROL CABLE	GE WIRE AND CABLE	SPEC. NO. NUS-381	QT,CS,A,QI	1	6-40		
041	0814	1000V CONTROL CABLE	CONTINENTAL WIRE AND CABLE	SPEC. NO. NUS-420	QT,CS,A,QI	3	6-42	QDR.5437-MOV-2-02-02	
042	0813	1000V CONTROL CABLE	CERRO	SPEC. NO. NUS-362	R,T,QT,P,CS,A,QI	3	6-42A	QDR 5437-MOV-2-021	
043	0836	1000V CONTROL CABLE	OKONITE	SPEC. NO. NUS-381B	R,T,QT,P,H,CS,A,QI	3	6-42B	REF QDR-5437-57A-01	
044	1002	INSTRUMENT PENETRATION	AMPHENOL	SPEC. NO. 41/ AMPHENOL TYPE IA	R,T,QT,P,CS,A,QI	4	6-43	REF QDR-5437-59-01	
045	1002	INSTRUMENT PENETRATION	AMPHENOL	SPEC. NO. 41/ AMPHENOL TYPE IB	R,T,QT,P,H,CS,A,QI	4	6-44	REF QDR-5437-59-01	
046	1002	POWER PENETRATION	AMPHENOL	SPEC. NO. 41/ AMPHENOL TYPE IC	R,T,QT,P,H,CS,A,QI	4	6-45	REF QDR-5437-59-01	
047	1002	TRIAXIAL PENETRATION	AMPHENOL	SPEC. NO. 41/ AMPHENOL TYPE III	R,T,QT,P,H,CS,A,QI	4	6-46	REF QDR-5437-59-01	
048	0602	THERMOCOUPLES	AMPHENOL	SPEC. NO. 41/ AMPHENOL TYPE IV	R,T,QT,P,H,CS,AQI	4	6-47	REF QDR-5437-MOV-2-01	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
049	0829	600V POWER CABLE	KAISER ALUMINUM AND CHEMICAL SALES	SPEC. NO. NUS-225	QT,CS,A,QM,QI	1	6-48		
050	0829	600V POWER CABLE	KAISER ALUMINUM AND CHEMICAL SALES	SPEC. NO. NUS-365A	QT,CS,A,QM,QI	1	6-49		
051	0836	600V POWER CABLE	OKONITE	SPEC. NO. NUS-365B	QT,CS,A,QM,QI	3	6-50		
052	0836	600V POWER CABLE	OKONITE	SPEC. NO. NUS-365C	QT,CS,A,QM,QI	3	6-51	REF QDR-5437-56-01	
053	0836	TRIPLEX NOS. 2, 210, 410 AWG, 250 MCM, 350, 500 AND 750 MCM	OKONITE	SPEC. NO. NUS-374	QT,CS,A,QM,QI	3	6-53	REF QDR-5437-56-01 REF QDR-5437-56-01	
054	0815	600V POWER CABLE	COLLYER INSULATED WIRE CO.	SPEC. NO. NUS-365E	QT,CS,A,QM,QI	3	6-54	REF QDR-5437-56-02	
055	0814	600V INSTRUMENT CABLE	CONTINENTAL WIRE AND CABLE	SPEC. NO. NUS-341	R,QT,P,H,CS,A,QI	3	6-58		
056	0814	600V INSTRUMENT CABLE	CONTINENTAL WIRE AND CABLE	SPEC. NO. NUS-411	R,QT,P,H,CS,A,QI	3	6-59		
057	0814	600V INSTRUMENT CABLE	CONTINENTAL WIRE AND CABLE	SPEC. NO. NUS-341A	R,QT,P,H,CS,A,QI	3	6-59A		
058	0814	HIGH TEMPERATURE CABLE	CONTINENTAL WIRE AND CABLE	SPEC. NO. NUS-326	QT,CS,A,QM,QI	3	6-60		
059	0815	5000V POWER CABLE	COLLYER	SPEC. NO. NUS-364	R,T,QT,P,H,A,QI	3	6-60A	REF QDR-5437-62A-01	
060	0836	5000V POWER CABLE	OKONITE	SPEC. NO. NUS-364A	R,T,QT,P,H,A,QI	3	6-60B	REF QDR-5437-62C-01	
061	0829	5000V POWER CABLE	KAISER	SPEC. NO. NUS-217	R,T,QT,P,H,A,QI	1	6-60C		

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
062	0300	PUMP MOTOR		1-CC-P-2A	R,T,QT,P,H,A,RPN	2	6-61		
063	0325	PUMP MOTOR	GE	1-CC-P-2B	R,T,QT,P,H,A,RPN	2	6-62		
064	0401	SOLENOID VALVE	ASCO	SOV-CC-105A	R,QT,A,RPN	2	6-63	REF QDR-5437-SOV-01	
065	0401	SOLENOID VALVE	ASCO	SOV-CC-105B	R,QT,A,RPN	2	6-64	REF QDR-5437-SOV-01	
066	0401	SOLENOID VALVE	ASCO	SOV-CC-105C	R,QT,A,RPN	2	6-65	REF QDR-5437-SOV-01	
067	0401	SOLENOID VALVE	ASCO	SOV-CC-107	R,QT,A,RPN	2	6-66	REF QDR-5437-SOV-01	
068	0401	SOLENOID VALVE	ASCO	SOV-CC-109A	R,QT,A,RPN	2	6-67	REF QDR-5437-SOV-01	
069	0401	SOLENOID VALVE	ASCO	SOV-CC-109B	R,QT,A,RPN	2	6-68	REF QDR-5437-SOV-01	
070	0401	SOLENOID VALVE	ASCO	SOV-CC-110A	QT,A,RPN	2	6-69	REF QDR-5437-SOV-01	
071	0401	SOLENOID VALVE	ASCO	SOV-CC-110B	R,QT,A,RPN	2	6-70	REF QDR-5437-SOV-01	
072	0401	SOLENOID VALVE	ASCO	SOV-CC-110C	R,QT,A,RPN	2	6-71	REF QDR-5437-SOV-01	
073	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-CS-101A	QT,A	3	6-72	QDR-5437-MOV-1-01	
074	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-CS-101B	QT,A	3	6-73	QDR-5437-MOV-1-01	
075	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-CS-101C	QT,A	3	6-74	QDR-5437-MOV-1-01	
076	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-CS-101D	QT,A	3	6-75	QDR-5437-MOV-1-01	
077	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-CS-102A	QT,A	3	6-76	QDR-5437-MOV-1-01	
078	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-CS-102B	QT,A	3	6-77	QDR-5437-MOV-1-01	
079	0300	PUMP MOTOR		1-CV-P-1A	R,QT,	1	6-78		
080	0300	PUMP MOTOR		1-CV-P-1B	R,QT,A	1	6-79		
081	0401	SOLENOID VALVE	ASCO	SOV-CV-150A	R,QT,Q,RPN	2	6-80	REF QDR-5437-SOV-01	
082	0401	SOLENOID VALVE	ASCO	SOV-CV-150B	R,QT,A,RPN	2	6-81	REF QDR-5437-SOV-01	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
083	0401	SOLENOID VALVE	ASCO	SOV-CV-150C	R,QT,A,RPN	2	6-82	REF QDR-5437-SOV-01	
084	0401	SOLENOID VALVE	ASCO	SOV-CV-150D	R,QT,A,RPN	2	6-83	REF QDR-5437-SOV-01	
085	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-FW-100A	R,QT,RT,CS,A,RPN	2	6-84		
086	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-FW-100B	R,QT,RT,CS,A,RPN	2	6-85		
087	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-FW-100C	R,QT,RT,CS,A,RPN	2	6-86		
088	0138	LEVEL TRANSMITTER	ROSEMOUNT	LT-1474	QT,A,RPN	2	6-87		
089	0107	LEVEL TRANSMITTER	BARTON	LT-1475	P,CS,A,RPN	2	6-88		
090	0107	LEVEL TRANSMITTER	BARTON	LT-1476	P,CS,A,RPN	2	6-89		
091	0107	LEVEL TRANSMITTER	BARTON	LT-1484	P,CS,A,RPN	2	6-90		
092	0107	LEVEL TRANSMITTER	BARTON	LT-1485	P,CS,A,RPN	2	6-91		
093	0107	LEVEL TRANSMITTER	BARTON	LT-1486	P,CS,A,RPN	2	6-92		
094	0107	LEVEL TRANSMITTER	BARTON	LT-1494	P,CS,A,RPN	2	6-93		
095	0107	LEVEL TRANSMITTER	BARTON	LT-1495	P,CS,A,RPN	2	6-94		
096	0107	LEVEL TRANSMITTER	BARTON	LT-1496	P,CS,A,RPN	2	6-95		
097	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-FW-151A	R,T,QT,P,H,CS,A, QI	2	6-96	QDR-5437-MOV-1-02	
098	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-FW-151B	R,T,QT,P,H,CS,A QI	2	6-97	QDR-5437-MOV-1-02	
099	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-FW-151C	R,T,QT,P,H,CS,A QI	2	6-98	QDR-5437-MOV-1-02	
100	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-FW-151D	R,T,QT,P,H.CS,A, QI	2	6-99	QDR-5437-MOV-1-02	
101	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-FW-151E	R,T,QT,P,H,CS,A, QI	2	6-100	QDR-5437-MOV-1-02	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
102	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-FW-151F	R,T,QT,P,H,CS,A, QI	2	6-101	QDR-5437-MOV-1-02	
103	0300	AUX. FEED PUMP MOTOR		1-FW-P-3A	T,QT,P,H,A	3	6-101A	Qual by Backup	
104	0300	AUX. FEED PUMP MOTOR		1-FW-P-3B	T,QT,P,H,A	3	6-101B	Qual by Backup	
105	1600	HYDROGEN RECOMBINER	WEST	1-GW-HC-2A	R,T,QT,P,H,CS,A, QI	3	6-102		
106	1600	HYDROGEN RECOMBINER	WEST	1-GW-HC-2B	T,QT,P,H,CS,A,QI	3	6-103		
107	1600	HYDROGEN ANALYZER	BENDIX	1-GW-H2A-103	R,QT,A,RPS	2	6-104	MANUFACTURER IS BENDIX CORPORATION	
108	1500	POWER PANEL		POWER SUPPLY 1-GW-HC-2A	R,QT,A,QI	1	6-105		
109	1500	POWER PANEL		POWER SUPPLY 1-GW-HC-2B	R,QT,A,QI	1	6-106		
110	0303	FAN MOTOR	ALLIS CHALMERS	2-VS-F-8A	R,T,QT,P,H,A,RPN	1	6-107	REF QDR-5437-79-01	
111	0303	FAN MOTOR	ALLIS CHALMERS	2-VS-F-8B	R,T,QT,P,H,A,RPN	1	6-108	REF QDR-5437-79-01	
112	1200	DAMPER	RCS INC.	DAMPER 3A(2)	R,T,QT,H,A,RPN	1	6-109	MANUFACTURER IS BUFFALO	
113	1208	DAMPER	RCS INC.	DAMPER 3B(2)	R,T,QT,H,A,RPN	1	6-110	MANUFACTURER IS BUFFALO	
114	0325	PUMP MOTOR	G.E.	1-RS-P-1A	R,T,QT,P,H,CS,A	3	6-111	REF. QDR-5437-34-01	
115	0325	PUMP MOTOR	G.E.	1-RS-P-1B	R,T,QT,P,H,CS,A	3	6-112	REF. QDR-5437-34-01	
116	0401	SOLENOID VALVE	ASCO	SOV-IA-100	R,QT,A,RPN	2	6-113	REF QDR-5437-SOV-01	
117	0401	SOLENOID VALVE	ASCO	SOV-IA-101A	R,T,QT,P,H,CS,A	2	6-114	REF QDR-5437-SOV-01	
118	0401	SOLENOID VALVE	ASCO	SOV-IA-101B	R,QT,A,RPN	2	6-115	REF QDR-5437-SOV-01	
119	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-LM-100A	QT,A,RPN	2	6-116		

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
120	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-LM-100B	QT,A,RPN	2	6-117		
121	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-LM-100C	QT,A,RPN	2	6-118		
122	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-LM-100D	QT,A,RPN	2	6-119		
123	0401	SOLENOID VALVE	ASCO	SOV-LM-100A	R,QT,A,RPN	2	6-120	REF QDR-5437-SOV-01	
124	0401	SOLENOID VALVE	ASCO	SOV-LM-100B	R,QT,A,RPN	2	6-121	REF QDR-5437-SOV-01	
125	0401	SOLENOID VALVE	ASCO	SOV-LM-100C	R,QT,A,RPN	2	6-122	REF QDR-5437-SOV-01	
126	0401	SOLENOID VALVE	ASCO	SOV-LM-100D	R,QT,A,RPN	2	6-123	REF QDR-5437-SOV-01	
127	0401	SOLENOID VALVE	ASCO	SOV-LM-100E	R,QT,A,RPN	2	6-124	REF QDR-5437-SOV-01	
128	0401	SOLENOID VALVE	ASCO	SOV-LM-100F	R,QT,A,RPN	2	6-125	REF QDR-5437-SOV-01	
129	0401	SOLENOID VALVE	ASCO	SOV-LM-100G	R,QT,A,RPN	2	6-126	REF QDR-5437-SOV-01	
130	0401	SOLENOID OPERATED VALVE	ASCO	SOV-LM-100H	R,QT,A,RPN	2	6-127	REF QDR-5437-SOV-01	
131	0401	SOLENOID VALVE	ASCO	SOV-LM-101A	R,QT,A,RPN	2	6-128	REF QDR-5437-SOV-01	
132	0401	SOLENOID VALVE	ASCO	SOV-LM-101B	R,QT,A,RPN	2	6-129	REF QDR-5437-SOV-01	
133	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-1474	R,QT,RT,CS,A,RPN	2	6-130		
134	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-1475	R,QT,RT,CS,A,RPN	2	6-131		
135	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-1484	R,QT,RT,CS,A,RPN	2	6-132		
136	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-1485	R,QT,RT,CS,A,RPN	2	6-133		
137	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-1494	R,QT,RT,CS,A,RPN	2	6-134		
138	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-1495	R,QT,RT,CS,A,RPN	2	6-135		
139	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1464	QT,A,RPN	2	6-136		
140	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1466	QT,A,RPN	2	6-137		

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
141	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1468	QT,A,RPN	2	6-138		
142	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1474	QT,A,RPN	2	6-139		
143	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1475	QT,A,RPN	2	6-140		
144	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1476	QT,A,RPN	2	6-141		
145	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1484	QT,A,RPN	2	6-142		
146	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1485	QT,A,RPN	2	6-143		
147	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1486	QT,A,RPN	2	6-144		
148	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1494	QT,A,RPN	2	6-145		
149	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1495	QT,A,RPN	2	6-146		
150	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1496	QT,A,RPN	2	6-147		
151	0401	SOLENOID VALVE	ASCO	SOV-MS-101AA	R,QT,A,RPN	2	6-148	REF QDR-5437-SOV-01	
152	0401	SOLENOID VALVE	ASCO	SOV-MS-101AB	R,QT,A,RPN	2	6-149	REF QDR-5437-SOV-01	
153	0401	SOLENOID VALVE	ASCO	SOV-MS-101BA	R,QT,A,RPN	2	6-150	REF QDR-5437-SOV-01	
154	0401	SOLENOID VALVE	ASCO	SOV-MS-101BB	R,QT,A,RPN	2	6-151	REF QDR-5437-SOV-01	
155	0401	SOLENOID VALVE	ASCO	SOV-MS-101CA	R,QT,A,RPN	2	6-152	REF QDR-5437-SOV-01	
156	0401	SOLENOID VALVE	ASCO	SOV-MS-101CB	R,QT,A,RPN	2	6-153	REF QDR-5437-SOV-01	
157	0401	SOLENOID VALVE	ASCO	SOV-MS-109	R,QT,A,RPN	2	6-154	REF QDR-5437-SOV-01	
158	0401	SOLENOID VALVE	ASCO	SOV-MS-110	R,QT,A	2	6-155	REF QDR-5437-SOV-01	
159	0325	PUMP MOTOR	G.E.	1-RS-P-2A	R,QT,A,QI	3	6-156	REF. QDR-5437-42-01	
160	0325	PUMP MOTOR	G.E.	1-RS-P-2B	R,QT,A,QI	3	6-157	REF. QDR-5437-42-01	
161	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-RS-155A	QT,A,QI	3	6-158	QDR-5437-MOV-1-01	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
162	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-RS-155B	QT,A,QI	3	6-159	QDR-5437-MOV-1-01	
163	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-RS-156A	QT,A	3	6-160	QDR-5437-MOV-1-01	
164	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-RS-156B	QT,A	3	6-161	QDR-5437-MOV-1-01	
165	0401	SOLENOID VALVE	ASCO	SOV-DA-100A	R,T,QT,P,H,CS,A,	3	6-162	REF QDR-5437-SOV-01	
166	0401	SOLENOID VALVE	ASCO	SOV-DA-100B	R,QT,A,RPN	2	6-163	REF QDR-5437-SOV-01	
167	0401	SOLENOID VALVE	ASCO	SOV-DG-108A	R,T,QT,P,H,CS,P, RPN	2	6-164	REF QDR-5437-SOV-01	
168	0401	SOLENOID VALVE	ASCO	SOV-DG-108B	R,QT,A	2	6-165	REF QDR-5437-SOV-01	
169	0401	SOLENOID VALVE	ASCO	SOV-VG-109A	R,T,QT,P,H,CS,A	2	6-166	REF QDR-5437-SOV-01	
170	0401	SOLENOID VALVE	ASCO	SOV-VG-109B	R,QT,A	2	6-167	REF QDR-5437-SOV-01	
171	0401	SOLENOID VALVE	ASCO	SOV-RM-100B	R,QT,A	2	6-168	REF QDR-5437-SOV-01	
172	0401	SOLENOID VALVE	ASCO	SOV-RM-100C	R,T,QT,P,H,CS,A RPS	2	6-169	REF QDR-5437-SOV-01	
173	0401	SOLENOID OPERATED VALVE	ASCO	SOV-RM-100A	R,T,QT,P,H,A	2	6-170	REF QDR-5437-SOV-01	
174	0107	LEVEL TRANSMITTER	BARTON	LT-1459	P,CS,A,RPN	2	6-171		
175	0107	LEVEL TRANSMITTER	BARTON	LT-1460	P,CS,A,RPN	2	6-172		
176	0107	LEVEL TRANSMITTER	BARTON	LT-1461	P,CS,A,RPN	2	6-173		
177	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1455	R,QT,RT,CS,A,RPN	2	6-174		
178	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1456	R,QT,RT,CS,A,RPN	2	6-175		
179	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-1457	R,QT,RT,CS,A,RPN	2	6-176		
180	0600	TEMPERATURE ELEMENT		TE-1410	T,QT,P,H,CS,A	2	6-177		
181	0600	TEMPERATURE ELEMENT		TE-1412B	T,QT,P,H,CS,A	2	6-178		

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
182	0600	TEMPERATURE ELEMENT		TE-1412D	T,QT,P,H,CS,A	2	6-179		
183	0600	TEMPERATURE ELEMENT		TE-1413	T,QT,P,H,CS,A	2	6-180		
184	0600	TEMPERATURE ELEMENT		TE-1420	T,QT,P,H,CS,A	2	6-181	NRC-TYPCO-SHOULD BE TE-1420	
185	0600	TEMPERATURE ELEMENT		TE-1422B	T,QT,P,H,CS,A	2	6-182		
186	0600	TEMPERATURE ELEMENT		TE-1422D	T,QT,P,H,CS,A	2	6-183		
187	0600	TEMPERATURE ELEMENT		TE-1423	T,QT,P,H,CS,A	2	6-184		
188	0600	TEMPERATURE ELEMENT		TE-1430	T,QT,P,H,CS,A	2	6-185		
189	0600	TEMPERATURE ELEMENT		TE-1432B	T,QT,P,H,CS,A	2	6-186		
190	0600	TEMPERATURE ELEMENT		TE-1432D	T,QT,P,H,CS,A	2	6-187		
191	0600	TEMPERATURE ELEMENT		TE-1433	T,QT,P,H,CS,A	2	6-188		
192	0401	SOLENOID OPERATED VALVE	ASCO	SOV-1519A	QT,A	2	6-189	REF QDR-5437-SOV-01	
193	0401	SOLENOID OPERATED VALVE	ASCO	MOV-1535	R,T,QT,P,H,CS,A, QI	2	6-196		
194	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1536	R,T,QT,P,H,CS,A, QI	2	6-197	QDR-5437-MOV-1-02	
195	0401	SOLENOID OPERATED VALVE	ASCO	SOV-1455C-1	R,T,QT,P,H,CS,A	3	6-190	REF QDR-5437-SOV-01	
196	0401	SOLENOID OPERATED VALVE	ASCO	SOV-1455C-2	R,T,QT,P,H,CS,A	3	6-191	REF QDR-5437-SOV-01	
197	0401	SOLENOID OPERATED VALVE	ASCO	SOV-1455C-3	R,T,QT,P,H,CS,A	2	6-192	REF QDR-5437-SOV-01	
198	0401	SOLENOID OPERATED VAVLE	ASCO	SOV-1456-1	R,T,QT,P,H,CS,A	3	6-193	REF QDR-5437-SOV-01	
199	0401	SOLENOID OPERATED VALVE	ASCO	SOV-1456-2	R,T,QT,P,H,CS,A	3	6-194	REF QDR-5437-SOV-01	
200	0401	SOLENOID OPERATED VALVE	ASCO	SOV-1456-3	F,T,QT,P,H,CS,A	2	6-195	REF QDR-5437-SOV-01	
201	0351	PUMP MOTOR	WESTINGHOUSE	1-SI-P-1A	R,QT,A,RPN	3	6-198		

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
202	0351	PUMP MOTOR	WESTINGHOUSE	1-SI-P-1B	R,QT,A,RPN	3	6-199		
203	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1842	QT,A	3	6-200	QDR-5437-MOV-1-01	
204	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1860A	QT,A,QI	3	6-201	QDR-5437-MOV-1-01	
205	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1860B	QT,A,QI	3	6-202	QDR-5437-MOV-1-01	
206	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1862A	QT,A,QI	3	6-203	QDR-5437-MOV-1-011	
207	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1862B	QT,A,QI	3	6-204	QDR-5437-MOV-1-01	
208	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1863A	QT,A,QI	2	6-205	QDR-5437-MOV-1-01	
209	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1863B	QT,A,QI	2	6-206	QDR-5437-MOV-1-01	
210	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1865A	QT,P,CS,A,QI	1	6-207	QDR-5437-MOV-1-01	
211	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1865B	QT,P,CS,A,QI	1	6-208	QDR-5437-MOV-1-02	
212	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1865C	QT,P,CS,A,QI	1	6-209	QDR-5437-MOV-1-01	
213	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1867A	R,QT,A,QI	3	6-210	QDR-5437-MOV-1-1	
214	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1867B	QT,A	3	6-211	QDR-5437-MOV-1-01	
215	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1867C	QT,A	3	6-212	QDR-5437-MOV-1-01	
216	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1867D	QT,A	3	6-213	QDR-5437-MOV-1-01	
217	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1869A	QT,A	3	6-214	QDR-5437-MOV-1-01	
218	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1890A	QT,A,QI	2	6-215	QDR-5437-MOV-1-01	
219	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1890B	QT,A,QI	2	6-216	QDR-5437-MOV-1-01	
220	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1890C	QT,A,QI	2	6-217	QDR-5437-MOV-1-01	
221	0401	SOLENOID VALVE	ASCO	SOV-SI-100	R,QT,A,RPN	2	6-218	REF QDR-5437-SOV-01	
222	0401	SOLENOID VALVE	ASCO	SOV-SI-101A	QT,A	3	6-219	REF QDR-5437-SOV-01	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
223	0401	SOLENOID VALVE	ASCO	SOV-SI-101B	R,QT,A,RPN	2	6-220	REF QDR-5437-SOV-01	
224	0401	SOLENOID VALVE	ASCO	SOV-SI-102A1	R,QT,A	1	6-221	REF QDR-5437-SOV-01	
225	0401	SOLENOID VALVE	ASCO	SOV-SI-102A2	R,T,QT,P,H,A	1	6-222	REF QDR-5437-SOV-01	
226	0401	SOLENOID VALVE	ASCO	SOV-SI-102B1	R,QT,A	1	6-223	REF QDR-5437-SOV-01	
227	0401	SOLENOID VALVE	ASCO	SOV-SI-102B2	R,T,QT,P,H,A	1	6-224	REF QDR-5437-SOV-01	
228	0401	SOLENOID VALVE	ASCO	SOV-1884A	R,QT,A	2	6-225	REF QDR-5437-SOV-01	
229	0401	SOLENOID VALVE	ASCO	SOV-1884B	R,QT,A	2	6-226	REF QDR-5437-SOV-01	
230	0401	SOLENOID VALVE	ASCO	SOV-1884C	R,QT,A	2	6-227	REF QDR-5437-SOV-01	
231	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1864A	R,QT,A,QI	2	6-228	QDR-5437-MOV-1-01	
232	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1864B	R,QT,A,QI	2	6-229	QDR-5437-MOV-1-01	
233	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1869B	R,QT,A,QI	3	6-230	QDR-5437-MOV-1-01	
234	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1885A	R,QT,A,QI	3	6-230A	QDR-5437-MOV-1-01	
235	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1885B	R,QT,A,QI	3	6-230B	QDR-5437-MOV-1-01	
236	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1885C	R,QT,A,QI	3	6-230C	QDR-5437-MOV-1-01	
237	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-1885D	R,QT,A,QI	3	6-230D	QDR-5437-MOV-1-01	
238	0401	SOLENOID VALVE	ASCO	SOV-SS-100A1	R,T,QT,P,H,CS,A	2	6-231	REF QDR-5437-SOV-01	
239	0401	SOLENOID OPERATED VALVE	ASCO	SOV-SS-100B1	R,QT,A	2	6-232	REF QDR-5437-SOV-01	
240	0401	SOLENOID VALVE	ASCO	SOV-SS-101A1	R,T,QT,P,H,CS,A	2	6-233	REF QDR-5437-SOV-01	
241	0401	SOLENOID VALVE	ASCO	SOV-SS-101B1	R,QT,A	2	6-234	REF QDR-5437-SOV-01	
242	0401	SOLENOID VALVE	ASCO	SOV-SS-102A1	R,T,QT,P,H,CS,A	2	6-235	REF QDR-5437-SOV-01	
243	0401	SOLENOID VALVE	ASCO	SOV-SS-102B1	R,QT,A	2	6-236	REF QDR-5437-SOV-01	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
244	0401	SOLENOID VALVE	ASCO	SOV-SS-103	R,QT,A	2	6-237	REF QDR-5437-SOV-01	
245	0401	SOLENOID VALVE	ASCO	SOV-SS-104A	R,T,QT,P,H,CS,A RPN	2	6-238	REF QDR-5437-SOV-01	
246	0401	SOLENOID VALVE	ASCO	SOV-SS-104B	R,QT,A	2	6-239	REF QDR-5437-SOV-01	
247	0401	SOLENOID VALVE	ASCO	SOV-SS-106A	R,T,QT,P,H,CS,A, RPN	2	6-240	REF QDR-5437-SOV-01	
248	0401	SOLENOID VALVE	ASCO	SOV-SS-106B	R,QT,A	2	6-241	REF QDR-5437-SOV-01	
249	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-104A	QT,A	3	6-242	QDR-5437-MOV-1-01	
250	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-104B	QT,A	3	6-243	QDR-5437-MOV-1-01	
251	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-104C	QT,A	3	6-244	QDR-5437-MOV-1-01	
252	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-104D	QT,A	3	6-245	QDR-5437-MOV-1-01	
253	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-105A	QT,A	3	6-246	QDR-5437-MOV-1-01	
254	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-105B	QT,A	3	6-247	QDR-5437-MOV-1-01	
255	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-105C	QT,A	3	6-248	QDR-5437-MOV-1-01	
256	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-105D	QT,A	3	6-249	QDR-5437-MOV-1-01	
257	0300	PUMP MOTOR		1-SW-P-5A	R,QT,A,RPN	2	6-250		
258	0300	PUMP MOTOR		1-SW-P-5B	R,QT,A,RPN	2	6-251		
259	0300	PUMP MOTOR		1-SW-P-5C	R,QT,A,RPN	2	6-252		
260	0300	PUMP MOTOR		1-SW-P-5D	R,QT,A,RPN	2	6-253		
261	0401	SOLENOID VALVE	ASCO	SOV-BD-100A	R,T,QT,P,H,CS,A, RPN	3	6-254	REF QDR-5437-SOV-01	
262	0401	SOLENOID VALVE	ASCO	SOV-BD-100B	R,QT,A,RPN	2	6-255	REF QDR-5437-SOV-01	
263	0401	SOLENOID VALVE	ASCO	SOV-BD-100C	R,T,QT,P,CS,A, RPN	3	6-256	REF QDR-5437-SOV-01	
264	0401	SOLENOID VALVE	ASCO	SOV-BD-100D	R,QT,A,RPN	2	6-257	REF QDR-5437-SOV-01	
265	0401	SOLENOID VALVE	ASCO	SOV-BD-100E	R,T,QT,P,H,CS,A, RPN	3	6-258	REF QDR-5437-SOV-01	
266	0401	SOLENOID VALVE	ASCO	SOV-BD-100F	R,QT,A,RPN	2	6-259	REF QDR-5437-SOV-01	

VEPCO

SURRY UNIT 2
APPENDIX B TO NRC-SER
AUGUST 24, 1981

LEGEND

DESIGNATION FOR DEFICIENCY

R - Radiation
T - Temperature
QT - Qualification time
RT - Required time
P - Pressure
H - Humidity
CS - Chemical spray
A - Material aging evaluation, replacement schedule, ongoing equipment surveillance
S - Submergence
M - Margin
I - HELB evaluation outside containment not completed
QM - Qualification method
RPN - Equipment relocation or replacement, adequate schedule not provided
EXN - Exempted equipment justification inadequate
SEN - Separate effects qualification justification inadequate
QI - Qualification information being developed
RPS - Equipment relocation or replacement schedule provided

RESOLUTION OF DEFICIENCY

1. Components deleted from the master list

2. Components requiring replacement or modification

3. Components determine to be qualified

4. Components determined to be qualified except for aging

OK,

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
267	0401	SOLENOID VALVE	ASCO	SOV-SV-202A	R,QT,A,RPN	2	6-1	REF GDR-5437-SOV-02	
268	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2275A	QT,A	3	6-2	QDR-5437-MOV-1-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
269	0548	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2275B	R,T,QT,P,H,A,QI	3	6-3	REF QDR-5437-MOV-2-01	
270	0548	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2275C	R,T,QT,P,H,A,QI	3	6-4	REF QDR-5437-MOV-2-01	
271	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2373A	QT,A	3	6-5	QDR-5437-MOV-1-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
272	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2381	QT,A	3	6-6	QDR-5437-MOV-1-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
273	0351	PUMP MOTOR	WESTINGHOUSE	2-CH-P-1A	R,T,QT,P,H,A,RPN	3	6-7		
274	0351	PUMP MOTOR	WESTINGHOUSE	2-CH-P-1B	R,T,QT,P,H,A,RPN	3	6-8		
275	0351	PUMP MOTOR	WESTINGHOUSE	2-CH-P-1C	R,T,QT,P,H,A,RPN	3	6-9		
276	2521	FLOW CONTROL VALVE	FISHER-GOVENOR	FCV-2122	R,QT,A	1	6-10		
277	0121	FLOW TRANSMITTER	FISHER-GOVENOR	FT-2122	R,QT,A	1	6-11		
278	0401	SOLENOID OPERATED VALVE	ASCO	SOV-2311	R,T,QT,P,H,CS,A, RPN	1	6-12	REF QDR-5437-SOV-02	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
279	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2115B	QT,P,A	2	6-13	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
280	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2115C	QT,P,A,QI	3	6-14	QDR 5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
281	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2115D	QT,P,A	2	6-15	QDR 5437-MOV-2-01	
282	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2115E	QT,P,A,QI	3	6-16	QDR 5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
283	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2289A	QT,A	3	6-17	QDR 5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
284	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2289B	QT,A	3	6-18	QDR 5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE	
285	0401	SOLENOID VALVE	ASCO	SOV-2204	R,QT,A	3	6-19	REF QDR-5437-SOV-02	
286	0401	SOLENOID OPERATED VALVE	ASCO	SOV-2200A	R,T,QT,P,H,CS,A	3	6-20	REF QDR-5437-SOV-02	
287	0401	SOLENOID OPERATED VALVE	ASCO	SOV-2200B	R,T,QT,P,H,CS,A	3	6-21	REF QDR-5437-SOV-02	
288	0711	480V MOTOR CONTROL CENTER	CUTLER-HAMMER	2H1-2 SOUTH	R,QT,A,QI	1	6-23		
289	0711	480V MOTOR CONTROL CENTER	CUTLER-HAMMER	2H1-2 NORTH	R,QT,A,QI	1	6-24		
290	0711	480V MOTOR CONTROL CENTER	CUTLER-HAMMER	2J1-2 WEST	R,QT,A,QI	1	6-25		
291	0711	480V MOTOR CONTROL CENTER	CUTLER-HAMMER	2J1-2 EAST	R,QT,A,QI	1	6-26		
292	1012	POWER PENETRATION	CONAX	SPEC. NO. 21/ CONAX TYPE 1C	CS,A	3	6-27	REF QDR-5437-117-01	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
293	1012	POWER PENETRATION	CONAX	SPEC. NO. 21/ CONAX TYPE 1D	CS,A	3	6-28	REF QDR-5437-117-01	
294	1012	POWER PENETRATION	CONAX	SPEC. NO. 21/ CONAX TYPE IIA	CS,A	3	6-29	REF QDR-5437-117-01	
295	1012	POWER PENETRATION	CONAX	SPEC. NO. 21/ CONAX TYPE IIB	CS,A	3	6-30	REF QDR-5437-117-01	
296	1012	POWER PENETRATION	CONAX	SPEC. NO. 21/ CONAX TYPE IIC	CS,A	3	6-31	REF QDR-5437-117-01	
297	0813	600V CONTROL CABLE	CERRO WIRE AND CABLE CO.	SPEC. NO. 120	CS,A	3	6-32	QDR 5437-MOV-2-0201	
298	0813	600V CONTROL CABLE	CERRO WIRE AND CABLE CO.	SPEC. NO. NAS-3187	QT,CS,A	3	6-33	REQDRQ5437-MOV-2-021	
299	0806	300V INSTRUMENT CABLE	BOSTON INSU-LATED WIRE AND CABLE	SPEC. NO. 128	CS,A	1	6-34		
300	0813	300V INSTRUMENT CABLE	CERRO WIRE AND CABLE CO.	SPEC. NO. 430	QT,CS,A	3	6-35	REQDRQ5437-MOV-2-021	
301	0837	300V INSTRUMENT CABLE	RAYCHEM CORP	SPEC. NO. NUS-3190	Q,T,CS,A,QI	3	6-36	QDR-5437-54-01	
302	0813	1000V CONTROL CABLE	CERRO WIRE AND CABLE CO.	SPEC. NO. NUS-325	R,T,QT,P,CS,A,QI	3	6-37		
303	0813	1000V CONTROL CABLE	CERRO WIRE AND CABLE CO.	SPEC. NO. NUS-381C	R,T,QT,P,CS,A,QI	3	6-38	QDR.5437-MOV-2-02-02	
304	0813	1000V CONTROL CABLE	CERRO WIRE AND CABLE CO.	SPEC. NO. NUS-381E	R,T,QT,P,CS,A,QI	3	6-39	QDR.5437-MOV-2-02-02	
305	0824	1000V CONTROL CABLE	GE WIRE AND CABLE	SPEC. NO. NUS-381	QT,CS,A,QI	1	6-40		
306	0814	1000V CONTROL CABLE	CONTINENTAL WIRE AND CABLE	SPEC. NO. NUS-420	QT,CS,A,QI	3	6-42		
307	0813	1000V CONTROL CABLE	CERRO	SPEC. NO. NUS-362	R,T,QT,P,CS,A	3	6-42A	QDR.5437-MOV-2-02-02	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
308	0836	1000V CONTROL CABLE	OKONITE	SPEC. NO. NUS-381B	R,T,QT,P,H,CS,A,QI	3	6-42B	REF QDR-5437-125A-01	
309	1002	INSTRUMENT PENETRATION	AMPHENOL	SPEC. 41/ AMPHENOL TYPE IA	R,T,QT,P,CS,A,QI	4	6-43	REF QDR-5437-127-01	
310	1002	INSTRUMENT PENETRATION	AMPHENOL	SPEC. 41/ AMPHENOL TYPE 1B	R,T,QT,P,H,CS,A,QI	4	6-44	REF QDR-5437-127-01	
311	1002	POWER PENETRATION	AMPHENOL	SPEC. 41/ AMPHENOL TYPE 1C	R,T,QT,P,H,CS,A,QI	4	6-45	REF QDR-5437-127-01	
312	1002	TRIAXIAL PENETRATION	AMPHENOL	SPEC. 41/ AMPHENOL TYPE III	R,T,QT,P,H,CS,A,QI	4	6-46	REF QDR-5437-127-01	
313	0602	THERMOCOUPLES	AMPHENOL	SPEC. 41/ AMPHENOL TYPE IV	R,T,QT,RT,P,H,CS A,QI	4	6-47	QDR 5437-MOV-2-0201	
314	0829	600V POWER CABLE	KAISER ALUMINUM AND CHEMICAL SALES	SPEC. NO. NUS-225	QT,CS,A,QM,QI	1	6-48		
315	0829	600V POWER CABLE	KAISER ALUMINUM AND CHEMICAL SALES	SPEC. NO. NUS-365A	QT,CS,A,QM,QI	1	6-49		
316	0836	600V POWER CABLE	OKONITE	SPEC. NO. NUS-365B	QT,CS,A,QM,QI	3	6-50	REF QDR-5437-124-01	
317	0836	600V POWER CABLE	OKONITE	SPEC. NO. NUS-365C	QT,CS,A,QM,QI	3	6-51	REF QDR-5437-124-01	
318	0836	TRIPLEX NOS. 2, 210, 410 AWG, 250MCM, 350, 500 AND 700MCM	OKONITE	SPEC. NO. NUS-374	QT,CS,A,QM	3	6-53	REF QDR-5437-124-01	
319	0815	600V POWER CABLE	COLLYER INSULATED WIRE CO.	SPEC. NO. NUS-365E	QT,CS,A,QM,QI	3	6-54	REF QDR-5437-124-02	
320	0814	600V INSTRUMENT CABLE	CONTINENTAL WIRE AND CABLE	SPEC. NO. NUS-341	R,QT,P,H,CS,A,QI	3	6-58		

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
321	0814	600V INSTRUMENT CABLE	CONTINENTAL WIRE AND CABLE	SPEC. NO. NUS-411	R,QT,P,H,CS,A,QI	3	6-59		
322	0814	600V INSTRUMENT CABLE	CONTINENTAL WIRE AND CABLE	NUS-341A	R,QT,P,H,CS,A,QI	3	6-59A		
323	0814	HIGH TEMPERATURE CABLE	CONTINENTAL WIRE AND CABLE	NUS-326	QT,CS,A,QM,QI	3	6-60		
324	0815	5000V POWER CABLE	COLLYER	NUS-364	R,T,QT,P,H,A,QI	3	6-60A	REF QDR-5437-143-01	
325	0836	5000V POWER CABLE	OKONITE	NUS-364A	R,T,QT,P,H,A,QI	3	6-60B	REF QDR-5437-133-01	
326	0829	5000V POWER CABLE	KAISER	NUS-217	R,T,QT,P,H,A,QI	1	6-60C		
327	0325	PUMP MOTOR	GE	2-CC-P-2A	R,T,QT,P,H,A,RPN	2	6-61		
328	0325	PUMP MOTOR	GE	2-CC-P-2B	R,T,QT,P,H,A,RPN	2	6-62		
329	0401	SOLENOID VALVE	ASCO	SOV-CC-205A	R,QT,A,RPN	2	6-63	REF QDR-5437-SOV-02	
330	0401	SOLENOID VALVE	ASCO	SOV-CC-205B	R,QT,A,RPN	2	6-64	REF QDR-5437-SOV-02	
331	0401	SOLENOID VALVE	ASCO	SOV-CC-205C	R,QT,A,RPN	2	6-65	REF QDR-5437-SOV-02	
332	0401	SOLENOID VALVE	ASCO	SOV-CC-207	R,QT,A,RPN	2	6-66	REF QDR-5437-SOV-02	
333	0401	SOLENOID VALVE	ASCO	SOV-CC-209A	R,QT,A,RPN	2	6-67	REF QDR-5437-SOV-02	
334	0401	SOLENOID VALVE	ASCO	SOV-CC-209B	QT,A	2	6-68	REF QDR-5437-SOV-02	
335	0401	SOLENOID VALVE	ASCO	SOV-CC-210A	QT,A,RPN	2	6-69	REF QDR-5437-SOV-02	
336	0401	SOLENOID VALVE	ASCO	SOV-CC-210B	R,QT,A,RPN	2	6-70	REF QDR-5437-SOV-02	
337	0401	SOLENOID VALVE	ASCO	SOV-CC-210C	R,QT,A,RPN	2	6-71	REF QDR-5437-SOV-02	
338	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-CS-201A	QT,A	3	6-72	QDR 5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
339	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-CS-201B	QT,A	3	6-73	QDR 5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE	
340	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-CS-201C	QT,A	3	6-74	QDR 5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE	
341	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-CS-201D	QT,A	3	6-75	QDR 5437-MOV-2-01	
342	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-CS-202A	QT,A	3	6-76	QDR 5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE	
343	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-CS-202B	QT,A	3	6-77	QDR 5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE	
344	0300	PUMP MOTOR		2-CV-P-1A	R,QT,A	1	6-78		
345	0300	PUMP MOTOR		2-CV-P-1B	R,QT,A	1	6-79		
346	0401	SOLENOID VALVE	ASCO	SOV-CV-250A	R,QT,A,RPN	2	6-80	REF QDR-5437-SOV-02	
347	0401	SOLENOID VALVE	ASCO	SOV-CV-250B	R,QT,A,RPN	2	6-81	REF QDR-5437-SOV-02	
348	0401	SOLENOID VALVE	ASCO	SOV-CV-250C	R,QT,A,RPN	2	6-82	REF QDR-5437-SOV-02	
349	0401	SOLENOID VALVE	ASCO	SOV-CV-250D	R,QT,A,RPN	2	6-83	REF QDR-5437-SOV-02	
350	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-PG-107A	QT,RT,A	3	6-84	QDR 5437-MOV-2-01	
351	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-PG-107B	QT,RT,A	3	6-85	QDR 5437-MOV-2-01	
352	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-PG-107C	QT,RT,A	3	6-86	QDR 5437-MOV-2-01	
353	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-FW-200A	R,T,QT,P,CS,A, RPN	2	6-87	REPLACE	
354	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-FW-200B	R,T,QT,P,CS,A, RPN	2	6-88	REPLACE	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
355	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-FW-200C	R,T,QT,P,CS,A,	2	6-89	REPLACE	
356	0138	LEVEL TRANSMITTER	ROSEMOUNT	LT-2474	QT,A,RPN	2	6-90	REPLACE	
357	0138	LEVEL TRANSMITTER	ROSEMOUNT	LT-2475	QT,A,RPN	2	6-91		
358	0138	LEVEL TRANSMITTER	ROSEMOUNT	LT-2476	QT,A,RPN	2	6-92		
359	0138	LEVEL TRANSMITTER	ROSEMOUNT	LT-2484	QT,A,RPN	2	6-93	REPLACE	
360	0138	LEVEL TRANSMITTER	ROSEMOUNT	LT-2485	QT,A,RPN	2	6-94		
361	0138	LEVEL TRANSMITTER	ROSEMOUNT	LT-2486	QT,A,RPN	2	6-95		
362	0138	LEVEL TRANSMITTER	ROSEMOUNT	LT-2494	QT,A,RPN	2	6-96		
363	0138	LEVEL TRANSMITTER	ROSEMOUNT	LT-2495	QT,A,RPN	2	6-97		
364	0138	LEVEL TRANSMITTER	ROSEMOUNT	LT-2496	QT,A,RPN	2	6-98		
365	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-FW-251A	QT,P,CS,A,QI	2	6-99	QDR 5437-MOV-2-02	
366	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-FW-251B	QT,P,CS,A,QI	2	6-100	QDR 5437-MOV-2-02	
367	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-FW-251C	QT,P,CS,A,QI	2	6-101	QDR 5437-MOV-2-02	
368	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-FW-251D	QT,P,CS,A,QI	2	6-102	QDR 5437-MOV-2-02	
369	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-FW-251E	QT,P,CS,A,QI	2	6-103	QDR 5437-MOV-2-02	
370	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-FW-251F	QT,P,CS,A,QI	2	6-104	QDR 5437-MOV-2-02	
371	0300	AUX. FEED PUMP MOTOR		2-FW-P-3A	T-QT,P,H,A	3	6-104A	Back-Up Rev	
372	0300	AUX. FEED PUMP MOTOR		2-FW-P-3B	T,QT,P,H,A	3	6-104B	Back-Up Rev	
373	1651	HYDROGEN RECOMBINER	WESTINGHOUSE	2-GW-HC-2A	R,T,QT,P,A,QI	3	6-105		
374	1651	HYDROGEN RECOMBINER	WESTINGHOUSE	2-GW-HC-2B	T,QT,P,A,QI	3	6-106		
375	1633	HYDROGEN ANALYZER	BENDIX	2-GW-H2A-203	R,QT,A,RPS	2	6-107	MANUFACTURER IS BENDIX	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
376	1541	POWER PANEL	WESTINGHOUSE	POWER SUPPLY/ 2-GW-HC-2A	R,QT,A,QI	1	6-108		
377	1551	POWER PANEL	WESTINGHOUSE	POWER SUPPLY/ 2-GW-HC-2B	R,QT,A,QI	1	6-109		
378	0303	FAN MOTOR	ALLIS CHALMERS	1-VS-F-8A	R,T,QT,P,H,A,RPN	1	6-110	REF QDR-5437-18-01	
379	0303	FAN MOTOR	ALLIS CHALMERS	1-VS-F-8B	R,T,QT,P,H,A,RPN	1	6-111	REF QDR-5437-18-01	
380	1200	DAMPER	RCS INC.	DAMPER 3A(2)	R,T,QT,P,H,A,RPN	1	6-112	MANUFACTURER IS BUFFALO	
381	1200	DAMPER	RCS INC.	DAMPER 3B(2)	R,T,QT,P,H,A,RPN	1	6-113	MANUFACTURER IS BUFFALO	
3821	651	CHILLER	WESTINGHOUSE	1-VS-E-4A	T,QT,H,A	1	6-114		
383	1651	CHILLER	WESTINGHOUSE	1-VS-E-4B	T,QT,H,A	1	6-115		
384	1651	CHILLER	WESTINGHOUSE	1-VS-E-4C	T,QT,H,A	1	6-116		
385	0325	PUMP MOTOR	GE	1-VS-P-1A	T,QT,H,A	1	6-117		
386	0325	PUMP MOTOR	GE	1-VS-P-1B	T,QT,H,A	1	6-118		
387	0325	PUMP MOTOR	GE	1-VS-P-1C	T,QT,H,A	1	6-119		
388	0303	PUMP MOTOR	ALLIS CHALMERS	1-VS-P-2A	T,QT,H,A	1	6-120		
389	0303	PUMP MOTOR	ALLIS CHALMERS	1-VS-P-2B	T,QT,H,A	1	6-121		
390	0303	PUMP MOTOR	ALLIS CHALMERS	1-VS-P-2C	T,QT,H,A	1	6-122		
391	0325	PUMP MOTOR	GE	2-RS-P-1A	CS,A	3	6-123	REF. QDR-5437-96-01	
392	0325	PUMP MOTOR	GE	2-RS-P-1B	CS,A	3	6-124	REF. QDR-5437-96-01	
393	0401	SOLENOID VALVE	ASCO	SOV-IA-200	R,QT,A,RPN	2	6-125	REF QDR-5437-SOV-02	
394	0401	SOLENOID VALVE	ASCO	SOV-IA-201A	QT,A	2	6-126	REF QDR-5437-SOV-02	
395	0401	SOLENOID VALVE	ASCO	SOV-IA-201B	QT,A,RPN	2	6-127	REF QDR-5437-SOV-02	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
396	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-LM-200A	QT,A,RPN	2	6-128	REPLACE	
397	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-LM-200B	QT,A,RPN	2	6-129	REPLACE	
398	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-LM-200C	QT,A,RPN	2	6-130	REPLACE	
399	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-LM-200D	QT,A,RPN	2	6-131	REPLACE	
400	0401	SOLENOID VALVE	ASCO	SOV-LM-200A	R,QT,A,RPN	2	6-132	REF QDR-5437-SOV-02	
401	0401	SOLENOID VALVE	ASCO	SOV-LM-200B	R,QT,A,RPN	2	6-133	REF QDR-5437-SOV-02	
402	0401	SOLENOID VALVE	ASCO	SOV-LM-200C	R,QT,A,RPN	2	6-134	REF QDR-5437-SOV-02	
403	0401	SOLENOID VALVE	ASCO	SOV-LM-200D	R,QT,A,RPN	2	6-135	REF QDR-5437-SOV-02	
404	0401	SOLENOID VALVE	ASCO	SOV-LM-200E	R,QT,A,RPN	2	6-136	REF QDR-5437-SOV-02	
405	0401	SOLENOID VALVE	ASCO	SOV-LM-200F	R,QT,A,RPN	2	6-137	REF QDR-5437-SOV-02	
406	0401	SOLENOID VALVE	ASCO	SOV-LM-200G	R,QT,A,RPN	2	6-138	REF QDR-5437-SOV-02	
407	0401	SOLENOID OPERATED VALVE	ASCO	SOV-LM-200H	R,QT,A,RPN	2	6-139	REF QDR-5437-SOV-02	
408	0401	SOLENOID VALVE	ASCO	SOV-LM-201A	R,QT,A,RPN	2	6-140	REF QDR-5437-SOV-02	
409	0401	SOLENOID VALVE	ASCO	SOV-LM-201B	R,QT,A,RPN	2	6-141	REF QDR-5437-SOV-02	
410	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-2474	R,T,QT,P,CS,A, RPN	2	6-142		
411	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-2475	R,T,QT,P,CS,A, RPN	2	6-143		
412	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-2484	R,T,QT,P,CS,A, RPN	2	6-144		
413	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-2485	R,T,QT,P,CS,A, RPN	2	6-145		
414	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-2494	R,T,QT,P,CS,A, RPN	2	6-146		

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
415	0122	FLOW TRANSMITTER	FISCHER & PORTER	FT-2495	R,T,QT,P,CS,A RPN	2	6-147		
416	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-2464	QT,A,RPN	2	6-148		
417	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-2466	QT,A,RPN	2	6-149		
418	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-2468	QT,A,RPN	2	6-150		
419	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-2474	QT,A,RPN	2	6-151	REPLACE	
420	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-2475	QT,A,RPN	2	6-152	REPLACE	
421	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-2476	QT,A,RPN	2	6-153	REPLACE	
422	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-2484	QT,A,RPN	2	6-154	REPLACE	
423	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-2485	QT,A,RPN	2	6-155	REPLACE	
424	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-2486	QT,A,RPN	2	6-156	REPLACE	
425	0122	PRESSURE TRANSMITER	FISCHER & PORTER	PT-2494	QT,A,RPN	2	6-157		
426	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-2495	QT,A,RPN	2	6-158	REPLACE	
427	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-2496	QT,A,RPN	2	6-159	REPLACE	
428	0401	SOLENOID VALVE	ASCO	SOV-MS-201AA	R,QT,A,RPN	2	6-160	REF QDR-5437-SOV-02	
429	0401	SOLENOID VALVE	ASCO	SOV-MS-201AB	R,QT,A,RPN	2	6-161	REF QDR-5437-SOV-02	
430	0401	SOLENOID VALVE	ASCO	SOV-MS-201BA	R,QT,A,RPN	2	6-162	REF QDR-5437-SOV-02	
431	0401	SOLENOID VALVE	ASCO	SOV-MS-201BB	R,QT,A,RPN	2	6-163	REF QDR-5437-SOV-02	
432	0401	SOLENOID VALVE	ASCO	SOV-MS-201CA	QT,A	2	6-164	REF QDR-5437-SOV-02	
433	0401	SOLENOID VALVE	ASCO	SOV-MS-201CB	R,QT,A,RPN	2	6-165	REF QDR-5437-SOV-02	
434	0401	SOLENOID VALVE	ASCO	SOV-MS-209	R,QT,A,RPN	2	6-166	REF QDR-5437-SOV-02	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
435	0401	SOLENOID VALVE	ASCO	SOV-MS-210	R,QT,A	2	6-166A	REF QDR-5437-SOV-02	
436	0325	PUMP MOTOR	GE	2-RS-P-2A	R,QT,A,QI	3	6-167	REF. QDR-5437-104-01	
437	0325	PUMP MOTOR	GE	2-RS-P-2B	R,QT,A,QI	3	6-168	REF. QDR-5437-104-01	
438	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-RS-255A	QT,A	3	6-169	QDR 5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
439	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-RS-255B	QT,A	3	6-170	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
440	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-RS-256A	QT,A	3	6-171	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
441	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-RS-256B	QT,A	3	6-172	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
442	0401	SOLENOID VALVE	ASCO	SOV-DA-200A	QT,A	2	6-173	REF QDR-5437-SOV-02	
443	0401	SOLENOID VALVE	ASCO	SOV-DA-200B	R,QT,A,RPN	2	6-174	REF QDR-5437-SOV-02	
444	0401	SOLENOID VALVE	ASCO	SOV-DG-208A	R,T,QT,P,H,CS,A, RPN	2	6-175	REF QDR-5437-SOV-02	
445	0401	SOLENOID VALVE	ASCO	SOV-DG-208B	R,QT,A,RPN	2	6-176	REF QDR-5437-SOV-02	
446	0401	SOLENOID VALVE	ASCO	SOV-VG-209A	QT,CS,A	2	6-177	REF QDR-5437-SOV-02	
447	0401	SOLENOID VALVE	ASCO	SOV-VG-209B	R,QT,A,RPN	2	6-178	REF QDR-5437-SOV-02	
448	0401	SOLENOID VALVE	ASCO	SOV-RM-200B	R,QT,A,RPN	2	6-179	REF QDR-5437-SOV-02	
449	0401	SOLENOID VALVE	ASCO	SOV-RM-200C	QT,A	2	6-180	REF QDR-5437-SOV-02	
450	0401	SOLENOID OPERATED VALVE	ASCO	SOV-RM-200A	R,T,QT,P,H,A	2	6-181	REF QDR-5437-SOV-02	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
451	0107	LEVEL TRANSMITTER	BARTON	LT-2459	CS,A,RPN	2	6-182	REPLACE	
452	0107	LEVEL TRANSMITTER	BARTON	LT-2460	CS,A,RPN	2	6-183	REPLACE	
453	0107	LEVEL TRANSMITTER	BARTON	LT-2461	CS,A,RPN	2	6-184	REPLACE	
454	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-2455	R,T,QT,P,CS,A,M, RPN	2	6-185		
455	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-2456	R,T,QT,P,CS,A,M, RPN	2	6-186		
456	0122	PRESSURE TRANSMITTER	FISCHER & PORTER	PT-2457	R,T,QT,P,CS,A,M, RPN	2	6-187		
457	0638	TEMPERATURE ELEMENT	ROSEMOUNT	TE-2410	T,QT,P,CS,A	2	6-188		
458	0638	TEMPERATURE ELEMENT	ROSEMOUNT	TE-2412B	T,QT,P,CS,A	2	6-189		
459	0638	TEMPERATURE ELEMENT	ROSEMOUNT	TE-2414D	T,QT,P,CS,A	2	6-190		
460	0638	TEMPERATURE ELEMENT	ROSEMOUNT	TE-2413	T,QT,P,CS,A	2	6-191	REPLACE	
461	0638	TEMPERATURE ELEMENT	ROSEMOUNT	TE-2420	T,QT,P,CS,A	2	6-192		
462	0638	TEMPERATURE ELEMENT	ROSEMOUNT	TE-2422B	T,QT,P,CS,A	2	6-193		
463	0638	TEMPERATURE ELEMENT	ROSEMOUNT	TE-2422D	T,QT,P,CS,A	2	6-194		
464	0638	TEMPERATURE ELEMENT	ROSEMOUNT	TE-2423	T,QT,P,CS,A	2	6-195	REPLACE	
465	0638	TEMPERATURE ELEMENT	ROSEMOUNT	TE-2430	T,QT,P,CS,A	2	6-196		
466	0638	TEMPERATURE ELEMENT	ROSEMOUNT	TE-2432B	T,QT,P,CS,A	2	6-197		
467	0638	TEMPERATURE ELEMENT	ROSEMOUNT	TE-2432D	T,QT,P,CS,A	2	6-198		
468	0638	TEMPERATURE ELEMENT	ROSEMOUNT	TE-2433	T,QT,P,CS,A	2	6-199	REPLACE	
469	0401	SOLENOID OPERATED VALVE	ASCO	SOV-2519A	QT,A	2	6-200	REF QDR-5437-SOV-02	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
470	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2535	R,T,QT,P,H,CS,A	2	6-200A	QDR-5437-MOV-2-02	
471	0500	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2536	R,T,QT,P,H,CS,A	2	6-200B	QDR-5437-MOV-2-02	
472	0401	SOLENOID OPERATED VALVE	ASCO	SOV-2455C-1	R,T,QT,P,H,CS,A	2	6-200C	REF QDR-5437-SOV-02	
473	0401	SOLENOID OPERATED VALVE	ASCO	SOV-2455C-2	R,T,QT,P,H,CS,A	2	6-200D	REF QDR-5437-SOV-02	
474	0401	SOLENOID OPERATED VALVE	ASCO	SOV-2455C-3	R,T,QT,P,H,CS,A	2	6-200E	REF QDR-5437-SOV-02	
475	0401	SOLENOID OPERATED VALVE	ASCO	SOV-2456-1	R,T,QT,P,H,CS,A	2	6-200F	REF QDR-5437-SOV-02	
476	0401	SOLENOID OPERATED VALVE	ASCO	SOV-2456-2	R,T,QT,P,H,CS,A	2	6-200G		
477	0401	SOLENOID OPERATED VALVE	ASCO	SOV-2456-3	R,T,QT,P,H,CS,A	2	6-200H	REF QDR-5437-SOV-02	
478	0351	PUMP MOTOR	WESTINGHOUSE	2-SI-P-1A	R,QT,A,RPN	3	6-201	REF QDR-5437-105-01	
479	0351	PUMP MOTOR	WESTINGHOUSE	2-SI-P-1B	R,QT,A,RPN	3	6-202	REF QDR-5437-105-01	
480	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2842	QT,A	3	6-203	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
481	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2860A	QT,A	3	6-204	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
482	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2860B	QT,A	3	6-205	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
483	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2862A	QT,A,QI	3	6-206	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
484	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2862B	QT,A,QI	3	6-207	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
485	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2863A	QT,A	2	6-208	QDR-5437-MOV-2-01	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
486	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2863B	QT,A	2	6-209	QDR-5437-MOV-2-01	
487	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2867A	QT,A	3	6-213	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
488	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2867B	QT,A	3	6-214	QDR-5437-MOV-2-01	
489	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2867C	QT,A	3	6-215	QDR-5437-MOV-2-01	
490	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2867D	QT,A	3	6-216	QDR-5437-MOV-2-01	
491	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2869A	QT,A	3	6-217	QDR-5437-MOV-2-01	
492	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2890A	QT,A	2	6-218	QDR-5437-MOV-2-01	
493	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2890B	QT,A	2	6-219	QDR-5437-MOV-2-01	
494	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2890C	QT,A	2	6-220	QDR-5437-MOV-2-01	
495	0401	SOLENOID VALVE	ASCO	SOV-SI-200	R,QT,A,RPN	2	6-221	REF QDR-5437-SOV-02	
496	0401	SOLENOID VALVE	ASCO	SOV-SI-201A	QT,CS,A,M	2	6-222	REF QDR-5437-SOV-02	
497	0401	SOLENOID VALVE	ASCO	SOV-SI-201B	R,QT,A,RPN	2	6-223	REF QDR-5437-SOV-02	
498	0401	SOLENOID VALVE	ASCO	SOV-SI-202A1	R,QT,A	1	6-224	REF QDR-5437-SOV-02	
499	0401	SOLENOID OPERATED VALVE		SOV-SI-202A2	R,T,QT,P,H,A	1	6-225	REF QDR-5437-SOV-02	
500	0401	SOLENOID VALVE	ASCO	SOV-SI-202B1	R,QT,A	1	6-226	REF QDR-5437-SOV-02	
501	0401	SOLENOID OPERATED VALVE	ASCO	SOV-SI-202B2	R,T,QT,P,H,A	1	6-227	REF QDR-5437-SOV-02	
502	0401	SOLENOID OPERATED VALVE	ASCO	SOV-2884A	R,QT,A,RPN	3	6-228	REF QDR-5437-SOV-02	
503	0401	SOLENOID OPERATED VALVE	ASCO	SOV-2884B	R,QT,A,RPN	3	6-229	REF QDR-5437-SOV-02	
504	0401	SOLENOID VALVE	ASCO	SOV-2884C	QT,A	2	6-230	REF QDR-5437-SOV-02	
505	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2864A	QT,A,QI	2	6-231	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
506	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2864B	QT,A,QI	2	6-232	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
507	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2869B	QT,A	3	6-232A	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
508	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2885A	QT,A	3	6-232B	QDR-5437-MOV-2-01	
509	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2885B	QT,A	3	6-232C	QDR-5437-MOV-2-01	
510	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2885C	QT,A	3	6-232D	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
511	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-2885D	QT,A	3	6-232E	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
512	0401	SOLENOID VALVE	ASCO	SOV-SS-200A1	QT,CS,A,M	2	6-233	REF QDR-5437-SOV-02	
513	0401	SOLENOID OPERATED VALVE	ASCO	SOV-SS-200B1	R,QT,A	2	6-234	REF QDR-5437-SOV-02	
514	0401	SOLENOID VALVE	ASCO	SOV-SS-201A1	QT,CS,A,M	2	6-235	REF QDR-5437-SOV-02	
515	0401	SOLENOID OPERATED VALVE	ASCO	SOV-SS-201B1	R,QT,A	2	6-236	REF QDR-5437-SOV-02	
516	0401	SOLENOID VALVE	ASCO	SOV-SS-202A1	QT,CS,A,M	2	6-237	REF QDR-5437-SOV-02	
517	0401	SOLENOID VALVE	ASCO	SOV-SS-202B1	R,QT,A	2	6-238	REF QDR-5437-SOV-02	
518	0401	SOLENOID VALVE	ASCO	SOV-SS-203	R,QT,A	2	6-239	REF QDR-5437-SOV-02	
519	0401	SOLENOID VALVE	ASCO	SOV-SS-204A	QT,CS,A,M	2	6-240	REF QDR-5437-SOV-02	
520	0401	SOLENOID VALVE	ASCO	SOV-SS-204B	R,QT,A	2	6-241	REF QDR-5437-SOV-02	
521	0401	SOLENOID VALVE	ASCO	SOV-SS-206A	QT,CS,A,M	2	6-242	REF QDR-5437-SOV-02	
522	0401	SOLENOID VALVE	ASCO	SOV-SS-206B	R,QT,A	2	6-243	REF QDR-5437-SOV-02	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
523	0325	PUMP MOTOR	GE	2-SW-P-10A	T,QT,P,H,A	1	6-244		
524	0349	PUMP MOTOR	U.S. ELECTRIC	2-SW-P-10B	T,QT,P,H,CS,A	1	6-245		
525	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-204A	QT,A	3	6-246	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
526	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-204B	QT,A	3	6-247	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
527	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-204C	QT,A	3	6-248	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
528	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-204D	QT,A	3	6-249	QDR-5437-MOV-2-01 BASED ON SURRY 1 INSP. WILL BE VERIFIED DURING OUTAGE.	
529	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-205A	QT,A	3	6-250	QDR-5437-MOV-2-01	
530	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-205B	QT,A	3	6-251	QDR-5437-MOV-2-01	
531	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-205C	QT,A	3	6-252	QDR-5437-MOV-2-01	
532	0531	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-205D	QT,A	3	6-253	QDR-5437-MOV-2-01	
533	0548	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-107B	T,QT,P,H.,A	1	6-254	REF QDR-5437-MOV-2-01	
534	0548	MOTOR OPERATED VALVE	LIMITORQUE	MOV-SW-107C	T,QT,P,H,A	1	6-255	REF QDR-5437-MOV-2-01	
535	0325	PUMP MOTOR	GE	2-SW-P-5A	R,QT,A,RPN	2	6-256	Duplicated from Unit 2.	
536	0325	PUMP MOTOR	GE	2-SW-P-5B	R,QT,A,RPN	2	6-257		
537	0325	PUMP MOTOR	GE	2-SW-P-5C	R,QT,A,RPN	2	6-258		
538	0325	PUMP MOTOR	GE	2-SW-P-5D	R,QT,A,RPN	2	6-259		
539	0401	SOLENOID VALVE	ASCO	SOV-BD-200A	QT,CS,A,M	2	6-260	REF QDR-5437-SOV-02	

NUM	KEY#	EQUIPMENT	MANUFACTURER	COMPONENT NUMBER	DEFICIENCY	RES	REF	COMMENTS	STA
540	0401	SOLENOID VALVE	ASCO	SOV-BD-200B	QT,A	2	6-261	REF QDR-5437-SOV-02	
541	0401	SOLENOID VALVE	ASCO	SOV-BD-200C	QT,CS,A,M	2	6-262	REF QDR-5437-SOV-02	
542	0401	SOLENOID VALVE	ASCO	SOV-BD-200D	R,QT,A,RPN	2	6-263	REF QDR-5437-SOV-02	
543	0401	SOLENOID VALVE	ASCO	SOV-BD-200E	QT,CS,A,M	2	6-264	REF QDR-5437-SOV-02	
544	0401	SOLENOID VALVE	ASCO	SOV-BD-200F	R,QT,A,RPN	2	6-265	REF QDR-5437-SOV-02	

NRC Request

"4.3 Equipment Considered Acceptable or Conditionally Acceptable

Based on the staff review of the licensee's submittal, the staff identified the equipment in Appendix C as (1) acceptable on the basis that the qualification program adequately enveloped the specific environmental plant parameters, or (2) conditionally acceptable subject to the satisfactory resolution of the staff concern identified in Section 3.7.

For the equipment identified as conditionally acceptable, the staff determined that the licensee did not clearly:

(1) state that an equipment material evaluation was conducted to ensure that no known materials susceptible to degradation because of aging have been used;

(2) establish an ongoing program to review the plant surveillance and maintenance records in order to identify equipment degradation which may be age related; and/or

(3) propose a maintenance program and replacement schedule for equipment identified in item 1 or equipment that is qualified for less than the life of the plant.

The licensee is, therefore, required to supplement the information presented for equipment in this category before full acceptance of this equipment can be established. The staff will review the licensee's response when it is submitted and discuss the resolution in a supplemental report."

Vepco Response

The aging program for equipment identified in Appendix C is described in Section 3.7 above.

NRC Request

"5 DEFERRED REQUIREMENTS

IEB 79-01B, Supplement 3 has relaxed the time constraints for the submission of the information associated with cold shutdown equipment and TMI lessons-learned modifications. The staff has required that this information be provided by February 1, 1981. The staff will provide a supplemental safety evaluation addressing these concerns."

Vepco Response

No comment

NRC Request

"6 CONCLUSIONS

The staff has determined that the licensee's listing of safety-related systems and associated electrical equipment whose ability to function in a harsh environment following an accident is required to mitigate a LOCA or HELB is complete and acceptable, except as noted in Section 3 of this report. The staff has also determined that the environmental service conditions to be met by the electrical equipment in the harsh accident environment are appropriate, except as noted in Section 3 of this report. Outstanding information identified in Section 3 should be provided within 90 days of receipt of this SER.

The staff has reviewed the qualification of safety-related electrical equipment to the extent defined by this SER and has found no outstanding items which would require immediate corrective action to ensure the safety of plant operation. However, the staff has determined that many items of safety-related electrical equipment identified by the licensee for this review do not have adequate documentation to ensure that they are capable of withstanding the harsh environmental service conditions. This review was based on a comparison of the qualification values with the specified environmental values required by the design, which were provided in the licensee's summary sheets.

Subsection 4.2 identified deficiencies that must be resolved to establish the qualification of the equipment; the staff requires that the information lacking in this category be provided within 90 days of receipt of this SER. Within this period, the licensee should either provide documentation of the missing qualification information which demonstrates that such equipment meets the DOR guidelines or NUREG-0588 or commit to a corrective action (requalification, replacement, relocation, and so forth) consistent with the requirements to establish qualification by June 30, 1982. If the latter option is chosen, the licensee must provide justification for operation until such corrective action is complete.

Subsection 4.3 identified acceptance and conditional acceptance based on noted deficiencies. Where additional information is required, the licensee should respond within 90 days of receipt of this SER by providing assurance that these concerns will be satisfactorily resolved by June 30, 1982.

The staff issued to the licensee Sections 3 and 4 of this report and requested, under the provisions of 10 CFR 50.54(f), that the licensee review the deficiencies enumerated and the ramifications thereof to determine whether safe operation of the facility would be impacted in consideration of the deficiencies. The licensee has completed a preliminary review of the identified deficiencies and has determined that, after due consideration of the deficiencies and their ramifications, continued safe operation would not be adversely affected.

Based on these considerations, the staff concludes that conformance with the above requirements and satisfactory completion of the corrective actions by June 30, 1982 will ensure compliance with the Commission Memorandum and Order of May 23, 1980. The staff further concludes that there is reasonable assurance of continued safe operation of this facility pending completion of these corrective actions. This conclusion is based on the following:

(1) that there are no outstanding items which would require immediate corrective action to assure safety of plant operation

(2) some of the items found deficient have been or are being replaced or relocated, thus improving the facility's capability to function following a LOCA or HELB

(3) the harsh environmental conditions for which this equipment must be qualified result from low-probability events; events which might reasonably be anticipated during this very limited period would lead to less demanding service conditions for this equipment."

Vepco Response

Summary information which demonstrates that the equipment listed on the master list meets the DOR guidelines or NUREG-0588 is provided in Revision 4 of the IE Bulletin 79-01B 90 Day Review. The corrective actions for those items which are considered by Vepco to have insufficient documentation are included in the conclusion of the above report. Also provided in the conclusion is the justifi- cation for continued operation until the corrective action is complete.

SAFETY EVALUATION RESPONSE
SURRY POWER STATION UNITS 1 AND 2

References:

1. Surry FSAR, Section 6.3.1.4

2. North Anna FSAR, Appendix C, Section C.5.4.6.3

3. Westinghouse letter number NS-SS-79287 dated November 28, 1979

4. North Anna FSAR, Section 6.2.4.2

The recirculation spray water flows through recirculation spray coolers where it is cooled by service water flowing under gravity at 6,000 gpm, as discussed in Section 9.9. Since the recirculation spray water pressure in the coolers is greater than the service water, only outleakage can occur, and dilution of the borated water by service water in the containment is not possible. This ensures that the necessary cold shutdown margin by boron is maintained.

The service water from each cooler is monitored by means of radiation monitors to enable the defective subsystem to be shut down if outleakage occurs. Section 7.4.2 describes the monitoring devices and techniques used.

Two nozzle sizes are used in the Containment Spray Subsystem and three nozzle sizes are used in the Recirculation Spray Subsystem. The arrangement and sizes of the spray nozzles produce an average particle size of approximately 1250 microns. The nozzle arrangement was designed so that some of the nozzles cover a vertical annulus measuring 15 feet horizontally on either side of the spray headers and the remainder of the nozzles cover the containment volume outside of the annulus.

The entire Spray System is constructed of corrosion-resistant materials, primarily stainless steel. However, other materials are used where suitable, such as brass for the spray nozzles. The system design pressure is 150 psig.

6.3.1.4 Evaluation

The Spray System consists of two completely separate, 100 percent capacity Containment Spray Subsystems and four completely separate 50 percent capacity Recirculation Spray Subsystems. The elimination of interconnecting valving

in the subsystems provides redundancy and improves system reliability. The use of a separate spray header connected to the discharge of each pump results in a fixed flow rate and allows for optimized selection of spray nozzle sizes. This arrangement gives the optimum combination of small spray particles for maximum heat transfer and larger particles for better coverage toward the center and sides of the containment. In addition, this arrangement also ensures that a failure of a component in any one subsystem does not affect the operational capability of the other subsystems.

The methods of preventing the plugging of spray nozzles in the two systems vary. For each Containment Spray Subsystem, the materials of construction, as well as the pump suction filter, prevent nozzle plugging. A method of nozzle testing is provided in the refueling water storage tank to ensure that no particulates which could plug the containment spray nozzles collect in the tank. Despite this precaution and regardless of strainer perforation size, some type of particles could conceivably pass lengthwise through the strainer and cause clogging of a spray nozzle. However, since the strainer perforations are smaller than the smallest spray nozzle size, such an occurrence is considered to be highly improbable.

The screen assembly in the containment sump is arranged so that no single failure results in the clogging of all suction points to the Recirculation Spray Subsystems, as discussed in Section 6.3.1.3. A first stage screen failure, coupled with the plugging or failure of the second stage, i.e., suction point cylindrical screens, must occur for any one of the suction points to be lost. Sufficient area is provided to ensure that system operation during accident

conditions is not impaired and entrance flow velocities are low enough to prevent entrainment of most small particles. System overdesign allows for some plugging or loss of function, in addition to the foregoing.

A 25 percent margin in the number of spray nozzles on the recirculation spray headers has been provided. However, plugging of 25 percent of the spray nozzles would result in only a 10 to 15 percent reduction in flow. Since the redundant capacity of the Recirculation Spray Subsystems increases from 100 percent after a loss-of-coolant incident to 400 to 1,000 percent one day after an incident, plugging which could only occur on a long-term basis would have no significant effect on the capability of the subsystems.

Initially the heat exchangers of the Recirculation Spray Subsystems are clean and dry, with maximum heat transfer capability. For long-term operation, on the order of weeks or months, there may be some fouling of the tubes on the service water side, with resultant loss in heat transfer capability. This loss of heat transfer capability is more than offset by the decrease in heat load due to decreasing decay heat production. One day after a LOCA, the decrease in the residual heat production rate is such that each subsystem has sufficient heat removal capacity to hold the containment at subatmospheric pressure. With a maximum service water temperature of 95^{o} F, the Recirculation Spray Subsystem design is conservative. There is a minimum 100 percent reserve capacity in recirculation spray at the onset of an accident. Within one day after the LOCA, the reserve capacity exceeds 400 percent.

The recirculation spray heat exchangers are designed to Section III of the ASME Boiler and Pressure Vessel Code, and have welded construction at all points

where there could be a potential for leakage of radioactive recirculation spray water into the service water. The maximum pressure differential which can occur between the service water and the recirculation spray water is 100 psi; under those conditions, leakage flow from the Recirculation Spray Subsystem is into the Service Water System. The service water is monitored for leakage by radiation monitors to detect leakage (See Section 11.3.3) from the defective subsystem. If leakage above that allowable is detected, the defective subsystem is shut down by manual operation of remote motor operated valves which isolate the recirculation spray cooler. As a result of the above pressure difference, inleakage of nonborated water into the containment, causing dilution of the borated water in the containment, is not possible.

Recirculation through the outside recirculation spray pumps presents a possibility of leakage through valve packings and from leaks in the suction and discharge piping of the pump. Valve designs are selected to reduce this potential leakage to a negligible amount. Leaks in the suction and discharge piping are controlled as follows:

1. Large leaks in the discharge piping of the recirculation spray pumps are detected by variations in the recirculation spray pump discharge pressure readings in the Main Control Room. A decreased pressure reading indicates a pipe break which causes an alarm to sound, and the operator in the Main Control Room then remote-manually isolates the pump indicated by the alarm.

2. Large leaks in the suction piping in the valve pit are detected by liquid level measuring devices. The valve pit is provided with a

baffle, dividing the pit into two sections. Thus, leakage from one set of recirculation spray lines is detected by the increased liquid level on the affected side of the baffle. Upon detection, the operator in the Main Control Room remote-manually isolates the leaking subsystem leaving one recirculation spray loop operable. In the case of small leaks, specific detection of a leak is not possible; however, the ventilation air from the structure (See Figure 6.3.1-4) enclosing the piping outside the containment is discharged to the atmosphere through the ventilation vent, and is automatically diverted through charcoal filters on a high high containment pressure signal.

The containment spray pumps start and pick up full load in less than 15 sec after receiving the safeguards initiation signal. This fast start-up is accomplished by using solid wheel, single-stage steam turbines which have been used successfully for many years in industry. These turbines are not subject to damage by slugs of water in the steam or by temperature transients; however, the steam supply lines to these turbines are continually charged with steam in order to keep them warm, thereby preventing slugs of water from forming on turbine start-up. Steam traps are provided in the lines to ensure that any condensate formed as a result of warming steam flow is removed. If for any reason the steam turbines fail to operate, the pumps are driven by electric motors. The steam supply piping, as shown on Figure 10.3.2-1, is arranged so that no single pipe failure could result in the loss of steam to both turbines. At 100 percent of station load, each steam generator contains about 81,000 lb of water and 6,700 lb of steam, saturated at about 510 F. Each steam generator has adequate steam capacity to drive both containment spray pumps for at least

40 min. For the case of minimum safeguards, sufficient steam capacity is available to drive one containment spray pump, 100 percent capacity, for at least 80 min.

The recirculation spray pumps are capable of meeting NPSH requirements under LOCA conditions. Analyses have shown that the water on the containment floor is subcooled with respect to containment temperature. The water in the sumps provides a net static head, after allowance is made for the suction piping losses, of about 3.5 ft to 7.5 ft. A minimum of 21 ft of head is available when the minimum containment air partial pressure (9.0 psia) is added to the static head. The deep well pumps installed, both inside and outside, require between 12 and 15 ft of NPSH. Since there is about 24.5 to 28.5 ft of NPSH available in the design, adequate NPSH is available to ensure satisfactory operation of the recirculation spray pumps.

A periodic inspection will be made of all potential points of leakage. Table 6.3.1-2 summarizes the potential leakage from the recirculation spray subsystem. Leakage of pumped fluid from the recirculation spray pumps cannot occur due to the manner in which the pump shaft is sealed. Two mechanical seals are arranged in tandem, with a seal fluid between them. The seal fluid is supplied from a reservoir arranged in such a manner that the pressure of the seal fluid is slightly above (about 1 psi) the pumped fluid pressure at the inboard side of the inboard seal at all times. With this arrangement, assuming the inboard seal fails, seal fluid leaks through the failed seal while the other seal remains available to prevent escape of pumped fluid to the atmosphere. A level alarm on the reservoir provides indication of a seal failure.

A failure made analysis for the components of the Spray Systems is included in Table 6.3.1-1.

TABLE 6.3.1-1

CONSEQUENCE OF COMPONENT MALFUNCTIONS

	Components	Malfunction	Comments and Consequences
1.	Containment Spray Pumps	Pump casing ruptures	The casing is designed for 450°F temperature; standard test pressure is 250 psig and maximum test pressure is 375 psig. These conditions exceed those which could occur during any operating conditions. The casings are made from cast iron (ASTM A351-CF8); this metal has corrosion-erosion resistance and produces sound castings. The pumps conform to Class I design. Pumps are missile protected and may be inspected at any time. Rupture by missiles is not considered credible. Rupture of the pump casing is therefore not considered credible.
2.	Containment Spray Pumps	Pump fails to start	The containment spray system has 2 parallel 100 percent capacity pumps. Sufficient capacity is provided by one pump in case of failure of the other pump.
3.	Containment Spray Pumps	Pump driven motor fails to start or electric power is not available	Turbine portion of dual drive operates pump
4.	Containment Spray Pump	Pump turbine driver fails to start	Motor portion of dual drive operates pump
5.	Containment Spray Pump Discharge Valve	Valve fails to open	Redundant parallel valves are provided. Redundant valve carries the flow.

TABLE 6.3.1-1 (Cont'd)

	Components	Malfunction	Comments and Consequences
6.	Containment Spray Pump Discharge Valve	Rupture of valve body	Valve body is designed for 150 lb. The castings are made from stainless steel; this material has corrosion-erosion resistance and produces sound castings. The valves are designed to be missile protected. Rupture of valve body is not considered credible.
7.	Containment Spray Pumps	Weight loaded valve in pump discharge line sticks closed	Valve is checked periodically during normal operation. In addition, parallel 100 percent capacity containment spray subsystem is operable.
8.	Containment Spray Piping	Pipe rupture	Piping is designed for 100° F temperature and 375 psig pressure. These conditions exceed those which could occur during operation. The piping is fabricated of Type 304 stainless steel; this metal has corrosion-erosion resistance. Piping is designed for Class I and is missile protected. Pipe rupture is not considered credible.
9.	Recirculation Spray Pump	Pump fails to start	Four 50 percent capacity recirculation spray pumps are provided altogether.
10.	Recirculation Spray Cooler	Tube or shell rupture	Four 50 percent capacity recirculation spray coolers are provided altogether. The recirculation spray coolers are designed to the ASME Code Section III C and Class I. Rupture is considered unlikely. However, in the event of a rupture, motor operated valves are provided to isolate the cooler and prevent further leakage. Another 50 percent capacity recirculation subsystem is used.

TABLE 6.3.1-1 (Cont'd)

	Components	Malfunction	Comments and Consequences
11.	Outside Recirculation Spray Pump	Rupture of pump casing	The casing is fabricated of ASTM-A452 Type 304 stainless steel; this metal is very corrosion resistant. The casings are missile protected and set in concrete. Rupture of the pump casing is not considered credible.
12.	Recirculation Spray Piping	Rupture of piping	Piping is fabricated of Type 304 stainless steel and designed to Class I. Piping is also missile protected. Rupture of piping is not considered credible. However, in case of pipe rupture for pipe lines to and from outside recirculation spray pumps, isolation valves are provided.
13.	Motor Operated Valves	Loss of power to one valve due to failure of electric bus	Redundant valves are provided, electric power to valves is supplied from separate buses
14.	Automatic electric and control instrumentation trains to actuate consequence limiting safeguards equipment	Failure of one train	Redundant train will actuate redundant equipment

TABLE 6.3.1-1 (Cont'd)

	Components	Malfunction	Comments and Consequences
15.	Spray Nozzles	Spray nozzles plugged	Filters are provided in the suction of the containment spray pumps. Three layers of screening are provided in the suction of recirculation spray pumps. The filters and the screen mesh are small enough to prevent any material which could plug the spray nozzles from passing through. Sufficient margin is provided to accommodate plugging of 25 percent of the nozzles.

TABLE 6.3.1-2

RECIRCULATION SUBSYSTEM LEAKAGE*

Item	No. of Units	Type of Leakage Control and Unit Leakage Rate used in the Analysis	Uncollected Leakage, cc per hr	Leakage to Vent and Drain System, cc per hr
Recirculation spray pumps	2	No leakage of spray water due to tandem seal arrangement	0	0
Flanges:		Assumed at 10 drops per min per flange		
a. Pump	4		120	0
b. Valves - bonnet to body (larger than 2 in.)	4		115	0
Valves - Stem leakoffs	4	Backseated, double packing with leakoff - 1 cc per hr per in. stem diameter	0	4
Miscellaneous small valves	2	Flanged body, packed stem - 1 drop per min	6	0
		Total	241	4

*Based on two subsystems in operation under DBA conditions.

a. The addition of temperature sensors in various parts of the AB as previously described, and

b. The use of existing instrumentation and valving to detect and isolate the break.

C.5.4.6.3 Flooding Effects

Flooding within the auxiliary building has been investigated with the approach to demonstrate that essential equipment is not endangered by water from any postulated pipe break.

A system of floor drains within the Auxiliary Building will direct the water flow from a break to the Auxiliary Building sump, which is located within the floor of the 244 ft-6 in. elevation. High water level within the sump will initiate an alarm in the control room. For breaks that exceed the 900 gal capacity of the sump, the water will run out onto the 244 ft-6 in. level. The large floor area of the Auxiliary Building at this elevation requires approximately 8,800 gal of water to attain a water level of 1 in. above the floor. The minimum height above floor level of equipment which is essential to safety was found to be 15 in. Therefore, the water required to reach this height would be approximately 132,000 gal. 34

The sump alarm, combined with visual inspection, will excute detection and isolation of the water source in adequate time to assure safety, considering the large amount of water required to cause damage.

C.5.4.7 Structural Analysis

The overall structural stability of the Auxiliary Building is not impaired by any potential pipe breaks.

NS-SS-79287

From: Nuclear Technology Division
Safety Standards
WIN: 249-4856
Date: November 28, 1979
Subject: Qualification of Electrical Equipment for Near Term OL Plants

To: W. C. Gangloff, 5
M. A. Siano, 5
R. S. Howard, 5
J. L. Vota, 5
M. H. Judkis, 5

cc: D. H. Rawlins, 4
R. J. Sero, 4
G. Butterworth, 4

As a result of a meeting with the five (Salem 2, North Anna 2, McGuire 1, Sequoyah 1, Diablo Canyon) near term OL plants on October 31, 1979 commitments were made to provide information on Westinghouse supplied electrical equipment inside containment. The information required along with a sample transmittal letter is attached. Please transmit Attachment A and the appropriate valve table (Attachment B) to your customer. As indicated herein, an additional transmittal on valves operators will be required prior to December 11, 1979.

Since the enclosed information is vital to the near term OL plants, it is essential that you get an advanced copy of this information to your customer after project manager approval.

If you have any questions, please contact the undersigned.

Carlon E. Faust III

C. E. Faust, III
Safety Standards

JJM/keg

Attachment(s)

Discard Date:

Westinghouse Electric Corporation
Water Reactor Divisions
PWR Systems Division
Box 355
Pittsburgh Pennsylvania 15230

Qualification of Westinghouse
Supplied Electric Equipment Inside Containment

Dear Sir:

In response to your request at the October 31, 1979 meeting with Westinghouse, information is provided to further support your operating license review and the qualification of Westinghouse supplied electrical equipment inside containment. The enclosed information has been segregated into two attachments as follows:

Attachment A - The information in this Attachment identifies Westinghouse supplied electrical equipment (excluding valve operators) inside containment. This information is presented in the tabular format identified in draft NUREG-0588. This information is generic and, as such, must be reviewed by your staff to identify which equipment is applicable to your plant. Additionally, portions of the information required by draft NUREG-0588 is plant specific and must be completed by your staff.

Attachment B - This Attachment identifies valves and their electircal operators located inside containment required to mitigate the consequences of a postulated accident. The valves listed represent those valves inside containment in Westinghouse supplied systems. However, all the valves and/or the valve operators may not have been supplied by Westinghouse. Currently, the qualification documentation for the valve operators identified in this Attachment is being reviewed. This effort will be completed by December 11, 1979 and a table in the format of draft NUREG-0588 will be provided.

In regard to valve operators, there have been a number of NRC I&E Bulletins and Circulars over the past several years which may have necessitated field modifications to valve operators. Based on these NRC instructions and other circumstances it is recommended that you verify the information in Attachment B based upon as-installed conditions.

The post-accident radiation dose used in the calculation of the narrow range RTD qualified life sent to you in a previous letter ( ) dated ( ) was too large. The calculations of attachment C are a corrected version of those transmitted previously. [The revised calculation does not affect the qualified life.] (The sentence in brackets should be deleted for McGuire and Sequoyah.)

If you have any questions on the enclosed information, please contact Mr. G. Butterworth, (412-373-4761) or Mr. C. Faust,III, (412-373-4176).

PROJECT MANAGER

/keg

W PROPRIETARY CLASS 2

WESTINGHOUSE SUPPL[illegible]SAFETY-RELATED ELECTRICAL EQUIPMENT INSIDE CONTAINMENT

Equipment function	Location	Manufacturer	Model Number or Identification Number	Abnormal or Accident Environment: Peak Temperature Pressure Humidity	Abnormal or Accident Environment: Chemistry Condition	Abnormal or Accident Environment: Integrated Dose Radiation Type	Qualified Environment: Peak Temperature Pressure Humidity	Qualified Environment: Chemistry Condition	Qualified Environment: Integrated Dose Radiation Type	Operability Requirements	Operability Demonstrated	Accuracy Requirements (% of Span)	Accuracy Demonstrated (% of Span)	Qualification Reference and Method
Pressurizer Pressure Transmitter		Barton	763 (Lot 1				LOCA 280^0F 78 psia 100% RH Fig. 3-1 SLB 380^0F 75 psig 100% RH Fig. 3-19 thru 3-22	1.14 wt. % Boric Acid and 0.17 wt. % N_AOH dissolved in water	LOCA $5x10^7$ GAMMA SLB 1.13×10^5 GAMMA	4 months Post-DBE	4 months Post-DBE	±10% for ≤5 min. 5 min. to 4 mo. ±25%	≤5% for 5 min. Max. Error 5 min. to 4 mo. 17%	NS-TMA-1950 Anderson to Stolz NS-TMA-2120 Anderson to Stolz (Test)
		Barton	763 (Lot 2)				380^0F 75 psig 100% RH	1.14 wt. % Boric Acid and 0.17 wt. % N_AOH dissolved in water	$5x10^7$ GAMMA	4 months Post-DBE	4 months Post-DBE	±10% for ≤5 min. 5 min. to 4 mo. ±25%	(1)	(1)
		Foxboro	E11 GM (MCA) (4-20 ma)				>300 ^{0}F see App. B >60 psig 100% RH	1.5% Boric Acid by weight + N_4OH to adjust the pH to 9.25-10	2.2×10^8 GAMMA	30 min. Post-DBE	40 hr. Post-DBE	±10% for ≤5 min.	Max. Error 0 to 5 min. -7% >5 min. -9%	WCAP-8541 (Test)
		Foxboro	E11 GM (MCA) (10-50 ma)				>318 ^{0}F see App. A >90 psig 100% RH	None	2.2×10^8 GAMMA	30 min. Post-DBE	25 hr. Post-DBE	±10% for ≤5 min.	Max. Error -14%	WCAP-8541 (Test)

WESTINGHOUSE SUPPLIED SAFETY-RELATED ELECTRICAL EQUIPMENT INSIDE CONTAINMENT

Equipment function	Location	Manufacturer	Model Number or Identification Number	Abnormal or Accident Environment: Peak Temperature Pressure Humidity	Abnormal or Accident Environment: Chemistry Condition	Abnormal or Accident Environment: Integrated Dose Radiation Type	Qualified Environment: Peak Temperature Pressure Humidity	Qualified Environment: Chemistry Condition	Qualified Environment: Integrated Dose Radiation Type	Operability Requirements	Operability Demonstrated	Accuracy Requirements (% of Span)	Accuracy Demonstrated (% of Span)	Qualification Reference and Method
Pressurizer Level Transmitter		Barton	764 (Prototype)				>320 °F 75 psig 100% RH see Figure	1.14 wt. % Boric Acid and 0.17 wt. % N_AOH dissolve in water	1.8×10^7 GAMMA	4 months Post-DBE	4 months Post-DBE	+10% -∞ for ≤5 min.	0 to 5 min. <3% 5 min. to 4 mo. -19%	NS-CE-1384 Eicheldinger to Stolz (Test)
		Barton	764 (Lot 1)				LOCA 280°F 78 psia 100% RH Fig. 3-1 SLB 380°F 75 psig 100% RH Fig. 3-19 thru 3-22	1.14 wt. % Boric Acid and 0.17 wt. % N_AOH dissolve in water	LOCA 5×10^7 GAMMA SLB 1.13×10^5 GAMMA	4 months Post-DBE	4 months Post-DBE	+10% -∞ for ≤5 min.	0 to 5 min. <5% Max. Error 5 min. to 4 mo. 17%	NS-TMA-1950 Anderson to Stolz NS-TMA-2120 Anderson to Stolz (Test)
		Barton	764 (lot 2)				380°F 75 psig 100% RH	1.14 wt. % Boric Acid and 0.17 wt. % N_AOH dissolve in water	5×10^7 GAMMA	4 months Post-DBE	4 months Post-DBE	+10% -∞ for ≤5 min. 5 min. to 4 mo. +25%	(1)	(1)

WESTINGHOUSE SUPPLIED SAFETY-RELATED ELECTRICAL EQUIPMENT INSIDE CONTAINMENT

Equipment function	Location	Manufacturer	Model Number or Identification Number	Abnormal or Accident Environment: Peak Temperature Pressure Humidity	Abnormal or Accident Environment: Chemistry Condition	Abnormal or Accident Environment: Integrated Dose Radiation Type	Qualified Environment: Peak Temperature Pressure Humidity	Qualified Environment: Chemistry Condition	Qualified Environment: Integrated Dose Radiation Type	Operability Requirements	Operability Demonstrated	Accuracy Requirements (% of Span)	Accuracy Demonstrated (% of Span)	Qualification Reference and Method
RCS Wide Range Pressure		Barton	763 (Prototype)				>320 °F 75 psig 100% RH see Figure	1.14 wt. % Boric Acid and 0.17 wt. % N_AOH dissolved in water	1.8×10^7 GAMMA	4 months Post-DBE	4 months Post-DBE	±10%	≤±10%	NS-CE-1384 Eicheldinger to Stolz (Test)
		Barton	763 (Lot 1)				LOCA 280°F 78 psia 100% RH. Fig. 3-1 SLB 380°F 75 psig 100% RH Fig. 3-19 thru 3-22	1.14 wt. % Boric Acid and 0.17 wt. % N_AOH dissolved in water	LOCA 5×10^7 GAMMA SLB 1.13×10^5 GAMMA	4 months Post-DBE	4 months Post-DBE	±10%	≤±10%	NS-TMA-1950 Anderson to Stolz NS-TMA- Anderson to Stolz (Test)
		Barton	763 (Lot 2)				380°F 75 psig 100% RH	1.14 wt. % Boric Acid and 0.17 wt. % N_AOH dissolved in water	5×10^7 GAMMA	4 months Post-DBE	4 months Post-DBE	±10%	(1)	(1)
		Veritrak	59 PM				130°F Atmospheric N/A	None	None	N/A	N/A	0.5%	<0.5%	Instruction Manual (Test) (2)

WESTINGHOUSE SUPPLIED SAFETY-RELATED ELECTRICAL EQUIPMENT INSIDE CONTAINMENT

Equipment function	Location	Manufacturer	Model Number or Identification Number	Abnormal or Accident Environment: Peak Temperature Pressure Humidity	Abnormal or Accident Environment: Chemistry Condition	Abnormal or Accident Environment: Integrated Dose Radiation Type	Qualified Environment: Peak Temperature Pressure Humidity	Qualified Environment: Chemistry Condition	Qualified Environment: Integrated Dose Radiation Type	Operability Requirements	Operability Demonstrated	Accuracy Requirements (% of Span)	Accuracy Demonstrated (% of Span)	Qualification Reference and Method
Steam Generator Level Transmitter (Narrow Range)		Barton	764 (Lot 1)				LOCA 280°F 78 psia 100% RH Fig. 3-1 SLB 380°F 75 psig 100% RH Fig. 3-19 thru 3-22	1.14 wt. % Boric Acid and 0.17 wt. % N_AOH dissolved in water	LOCA $5x10^7$ GAMMA SLB 1.13×10^5 GAMMA	4 months Post-DBE	4 months Post-DBE	±10% -∞ ≤5 min.	0 to 5 min. <5% Max. Error 5 min. to 4 mo. 17%	NS-TMA-1950 Anderson to Stolz (Test)
		Barton	764 (Lot 2)				380°F 75 psig 100% RH	1.14 wt. % Boric Acid and 0.17 wt. % N_AOH dissolved in water	$5x10^7$ GAMMA	4 months Post-DBE	4 months Post-DBE	±10% -∞ ≤5 min.	(1)	(1)

WESTINGHOUSE SUPPLIED SAFETY-RELATED ELECTRICAL EQUIPMENT INSIDE CONTAINMENT

Equipment Function	Location	Manufacturer	Model Number or Identification Number	Abnormal or Accident Environment: Peak Temperature Pressure Humidity	Abnormal or Accident Environment: Chemistry Condition	Abnormal or Accident Environment: Integrated Dose Radiation Type	Qualified Environment: Peak Temperature Pressure Humidity	Qualified Environment: Chemistry Condition	Qualified Environment: Integrated Dose Radiation Type	Operability Requirements	Operability Demonstrated	Accuracy Requirements (% of Span)	Accuracy Demonstrated (% of Span)	Qualification Reference and Method
Steam Flow Transmitter		Fischer and Porter	10B2496				>350 °F see Fig. 5-2 to 6-4 66 psig 100% RH	1.14 wt. % Boric Acid and 0.17 wt. % N_AOH dissolved in H_2O	$4x10^4$ GAMMA	Initiate SI on steamline break	Failed at 6 min.	±10% until containment pressure initiates SI	Max. Error -2.1% +1.9%	WCAP-9157 Rev. -0 (Test)
		Barton	764 (Lot 2)				380°F 75 psig 100% RH	1.14 wt. % Boric Acid and 0.17 wt. % N_AOH dissolved in water	$5x10^7$ GAMMA	4 months Post-DBE	4 months Post-DBE	-10% +∞ for ≤5 min.	(1)	(1)
		Veritrak	590P				130°F Atmospheric N/A	None	None	N/A	N/A	0.5%	<0.5%	Instruction Manual (Test) (2)

WESTINGHOUSE SUBMITTED SAFETY-RELATED ELECTRICAL EQUIPMENT INSIDE CONTAINMENT

Equipment Function	Location	Manufacturer	Model Number or Identification Number	Abnormal or Accident Environment: Peak Temperature Pressure Humidity	Abnormal or Accident Environment: Chemistry Condition	Abnormal or Accident Environment: Integrated Dose Radiation Type	Qualified Environment: Peak Temperature Pressure Humidity	Qualified Environment: Chemistry Condition	Qualified Environment: Integrated Dose Radiation Type	Operability Requirements	Operability Demonstrated	Accuracy Requirements (% of Span)	Accuracy Demonstrated (% of Span)	Qualification Reference and Method
RCS Temperature Narrow Range RTDs		Rosemount	176KF				>320 °F see Fig. 5-3 and 6.3 66 psig 100% RH	1.146 wt. % Boric Acid and 0.17 wt. % N_AOH dissolved in H_2O	$1x10^8$ GAMMA	30 sec. Post-SLB	40 yr. Life over 30 sec. Post-SLB	±.2%	±.2%	WCAP-9157 (Test)
		Sostman	11834B-1				>320 °F see Fig. 5-3 and 6.3. 66 psig 100% RH	1.146 wt. % Boric Acid and 0.17 wt. % N_AOH dissolved in H_2O	$1x10^8$ GAMMA	30 sec. Post-SLB	40 yr. Life over 30 sec. Post-SLB	±.2%	±.2%	WCAP-9157 (Test)
RCS Temperature Wide Range RTDs		Rosemount	176KS				>320 °F see Fig. 5-3 and 6-3 66 psig 100% RH	1.146 wt. % Boric Acid and 0.17 wt. % N_AOH dissolved in H_2O	$1x10^8$ GAMMA	2 weeks Post-SLB	12 yr. Life 2 weeks Post-SLB	±.2%	±.2%	WCAP-9157 (by comparison)
		Sostman	11901B				>320 °F see Fig. 5-3 and 6-3 66 psig 100% RH	1.146 wt. % Boric Acid and 0.17 wt. % N_AOH dissolved in H_2O	$1x10^8$ GAMMA	2 weeks Post-SLB	12 yr. Life 2 weeks Post-SLB	±.2%	±.2%	WCAP-9157 (by comparison)
Excore Neutron Detectors (Power Range)		WIGTD	WL-23686				300°F Atmospheric N/A	N/A	(5)	8 hr. at 175°F	16 hr. at 300°F	N/A	Detector Functional	W Test I/69

WESTINGHOUSE SUPPLIED SAFETY-RELATED ELECTRICAL EQUIPMENT INSIDE CONTAINMENT

Equipment Function	Location	Manufacturer	Model Number or Identification Number	Abnormal or Accident Environment: Peak Temperature Pressure Humidity	Abnormal or Accident Environment: Chemistry Condition	Abnormal or Accident Environment: Integrated Dose Radiation Type	Qualified Environment: Peak Temperature Pressure Humidity	Qualified Environment: Chemistry Condition	Qualified Environment: Integrated Dose Radiation Type	Operability Requirements	Operability Demonstrated	Accuracy Requirements (% of Span)	Accuracy Demonstrated (% of Span)	Qualification Reference and Method
Electric Hydrogen Recombiner		W Sturtevant	A				380°F 77 psia 100% RH see Supp. 2 Sect. 3.4.3	2500 ppm Boron as Boric Acid with N_AOH to give a pH of 10	$2x10^8$ GAMMA	<1 yr. Post-DBE	1 yr. Post-DBE	N/A	N/A	WCAP-7820 and Supp. 1-4 WCAP-7709-L and Supp. 1-4 (Test)
Electric Hydrogen Recombiner		W Sturtevant	B				302°F (4) 69 psia 100% RH	2500 ppm Boron as Boric Acid with N_AOH to give a pH of 10	$2x10^8$ GAMMA $2x10^9$ BETA	<1 yr. Post-DBE	1 yr. Post-DBE	N/A	N/A	WCAP-7820 and Supp. 1-7 WCAP-7709-L and Supp. 1-7 (Test)

NOTES:

(1) The tests have been completed and the report is being developed for submittal to the NRC.

(2) The test is a calibration preformed on each instrument by the manufacturer per the instruction manual.

(3) The recombiners are qualified to 420°F per the NRC acceptance letter dated 6/22/78.

(4) Designed to 5 x 10" n/cm^2s thermal, 5 x 10" n/cm^2s fast and 5 x 10^5 R/Hr gamma up to 2 x 10^{18} n/cm^2 and/or 0.7 x 10^{10} R.

Description	System	Valve No.	Location	Function	Type	Valve Operator	Manufacturer	Model No. or ID No.
Pressurizer SV	RCS	551 ABC	IRC	AM/RCPB	Relief	N/A		
Letdown LCV	CVCS	+LCV-460A	IRC	RCPB/AM	AOV			
Letdown LCV	CVCS	+LCV-460B	IRC	RCPB/AM	AOV			
Letdown	CVCS	+200 ABC	IRC	CIS	AOV			
Ex Letdown	CVCS	201	IRC	RCPB	AOV	LS	NAMCO	D-2400X
						S	ASCO	LB-831654
RCP Seal Ret	CVCS	+380	IRC	CIS	MOV			
ACC. TO GAS SYST.	SIS	HCV-936	IRC	CIS	AOV	LS	NAMCO	D-2400X
						S	ASCO	LB-832654
ACC. TO TEST LINE	SIS	842	IRC	CIS	AOV	LS	NAMCO	D-2400X
						S	ASCO	LB-832654

+ Information on operator not available at Westinghouse. Please check as-installed records.

IRC - inside reactor containment

AM - accident mitigation

RCPB - reactor coolant pressure boundary

CIS - containment isolation

AOV - air operated valve

LS - limit switch

S - solenoid

ATTACHMENT C

Radiation Dose Calculations for RTD's

The object of the following calculations is to estimate the plant specific in-service life that, when taken in conjunction with assuming the RTD's operate for 100 days in a post-LOCA environment, yields a total dose equal to 1×10^8 Rads as employed by Westinghouse for the testing reported in WCAP-9157.

External Environment

WCAP-8587, Figure 6-4, indicates a containment atmosphere dose of 1×10^8 Rads for 100 days post-LOCA. This value is based on a TID calculation for a 4100 MW reactor and a containment volume of 1.1×10^6 ft^3. The Westinghouse calculated dose can be approximately scaled for your plant application by the formulae:

$$D = 1.0 \times 10^8 \quad \frac{P}{4100} \quad \frac{1.1 \times 10^6}{V} \quad \text{Rads}$$

Inserting a value of 2900 MW (P) and 2.4×10^6 (V) as applicable to your plant yields a post-LOCA 100 day integrated dose of 3.2×10^7 Rads for the RTD external connection. Since the narrow range RTD is only required for a short time after the event this calculation only applies to the wide range measurement. The external dose for the narrow range is on the order of 10^6 Rads and is insignificant compared to the test condition.

The remaining dose available to cover in-service effects is the difference between the total dose employed in the Westinghouse test reported in WCAP-9157 (i.e., 1×10^8 Rads) and the above calculated post-LOCA dose (i.e., 3.2×10^7 Rads), which is 6.8×10^7 Rads. The dose rate during normal operation appropriate to the external connection

is taken as 165 R/hr (Table 6-2, WCAP-8587). Thus, assuming an 80 percent load factor, the time required to attain this remaining dose is:

Wide Range $\frac{6.8 \times 10^7}{165 \times 24 \times 365 \times 0.8}$ = 59 years

Narrow Range $\frac{1.0 \times 10^8}{165 \times 24 \times 365 \times 0.8}$ = 86 years

The Westinghouse calculated dose post-LOCA employed for this calculation is conservative with respect to those recommended by the Staff in Appendix D in NUREG-0588.

Internal Environment

WCAP-8587, Figure 6-8, indicates a RCS internal pipe dose of 1.8×10^7 Rads for 100 days post-LOCA. Without considering any reduction in this value by scaling for your plant, the remaining dose available to cover in-service radiation effects on the RTD is 8.2×10^7 Rads. The dose rate during normal operation for wide range RTD's installed directly in the reactor coolant system is conservatively taken as 820 R/hr as defined for the RCL pipe center in Table 6-2, WCAP-8587. For the bypass line, narrow range RTD's, the dose rate is conservatively taken as 165 R/hr as defined for the RCL outside surface. Thus, assuming an 80 percent load factor the time required for the internal part of the RTD to attain the remaining dose is:

Narrow Range $\frac{8.2 \times 10^7}{165 \times 24 \times 365 \times 0.8}$ = 70.9 years

Wide Range $\frac{8.2 \times 10^7}{820 \times 24 \times 365 \times 0.8}$ = 14.3 years

Summary

Using Westinghouse dose estimates from WCAP-8587 scaled for your plant, the shortest demonstrated life for the wide range RTD is 14.3 years and greater than 40 years for the narrow range RTD.

requirements for quality Class B as required by Regulatory Position C.1 and Table 1 of Regulatory Guide 1.26.

The component cooling lines to the residual heat removal heat exchangers are designed and built to ANSI-B31.7-1969 Class III which corresponds to the requirements of quality Class C of Regulatory Guide 1.26. 65

All of the sealed systems used as isolation barriers in lieu of isolation valves meet the requirements of Regulatory Guide 1.29 for Class I seismic equipment.

6.2.4.2 System Design

Table 6.2-34 provides information concerning every penetration that is in service, as to the type of valves that are provided; their positions under various conditions; the fluids they contain, and the systems they connect. In addition, each containment is provided with spare piping penetrations. These serve no function but are available should design modifications require additional penetrations. The spare penetrations are welded closed to prevent leakage. 65

All Stone & Webster procured remotely operated valves associated with piping penetrations through the containment are listed in Table 6.2-62. The auto-trip valves listed are spring-opposed diaphragm or piston-operated which fail closed upon loss of air or electrical power. 65

Westinghouse procured remotely operated valves associated with piping penetrations are listed in Table 6.2-63. The valves listed as using air for motive force fail closed upon loss of air.

All motor-operated valves listed in the tables fail in an "as is" condition upon loss of electrical power. Motor-operated valves used for containment isolation are powered from the onsite emergency power system, and in addition, are equipped with a hand wheel which allows manual operation of the valves in the case of a power failure.

The status of the valves during normal, shutdown, and accident conditions is given in Table 6.2-34.

All containment isolation valves purchased by Stone & Webster are factory tested and inspected. A written specification defines the specific requirements for valve procurement, which include the following:

1. Welding and NDT Procedure Qualification
2. Welder and NDT Operator Qualifications
3. Mill Test Reports
4. Dye Penetrant Test (as required)
5. Magnetic Particle Test (as required)
6. Radiography (as required)
7. Body Hydrostatic Test
8. Seat and Valve Steam Leakage Test
9. Performance Test
10. Dimensional Check
11. Cleaning
12. Preparation for Shipment
13. Seismic Qualification

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The auto-trip containment isolation valves, with the exception of the main steam isolation valves which are discussed in response to Comment 10.2, are

air-operated, globe or butterfly valves. The piston or diaphragm operators are spring opposed, so that the valve fails closed upon loss of instrument air or loss of power to the solenoid pilot, or trips closed upon receipt of a safety signal. Factory tests of these valves include tests to ensure proper stroke action and operation of accessories.

The use of "Limitorque" operators has been specified for all motor-operated containment isolation valves. The specific requirements for motor-operated valves include a seismic analysis of the valve and operator as a combined unit. With the exception of the main steam isolation valves, which are required to close within 5 seconds, all containment isolation valves must be capable of closing within 60 seconds after receipt of a containment isolation Phase A signal.

The basis for the 60-second limit is that no fuel cladding is expected to melt or fail until after 60 seconds following a loss-of-coolant accident (LOCA). Thus, fission product release from the core, to the containment atmosphere, or to other portions of the RCS could not occur until at least one minute after the event. 65

This is verified for PWR's by the FLECHT experimental results[32] which indicate peak temperatures occur 60 seconds or more after the start of reflooding (30 seconds more after the accident) for low reflooding rates like those that might lead to clad melting.

All containment isolation valves purchased by Stone & Webster satisfy the bases described below.

The bases for the selection of containment isolation valves and valve operators purchased by Westinghouse are primarily systems requirements. For

those lines that penetrate the containment and are in part of a system that is not necessary following a LOCA and whose inadvertent closure is not detrimental to plant operation or equipment integrity, Westinghouse systems criteria specify the use of "fail-closed" valves with air operators. This is based upon the fact that the energy needed for closure of this type of valve/operator is stored in a spring. The failure of the solenoid valve, electric power, pneumatic device or the loss of air pressure does not prevent the valve from moving to the desired position. This design ensures a high degree of reliability of the valve function. For those lines that penetrate the containment and are a part of a system that is required following a LOCA, or in which an inadvertent valve closure would jeopardize safe plant operation or component integrity, Westinghouse criteria specify the use of valves with motor-type operators, assigned to "fail as-is." For these types of valves, the failure of the motor operator on loss of electrical power to the operator does not affect the valve movement and ensures that the valve remains in its desired position. This design ensures a high degree of reliability of the valve function. Finally, Westinghouse criteria specify the use of check valves as the inside isolation valve where applicable. Since the only motive force necessary to provide closure of this valve is a pressure difference, this design ensures a high degree of reliability in the valve function.

In addition to these design requirements, all the valves are subjected to functional tests and shell hydrostatic tests prior to installation. These design and testing requirements are specified within the equipment specifications. This combination of design and testing is carefully monitored by Westinghouse quality control personnel throughout the procurement process. In the procurement process, the vendor's capability to produce a quality product to the requirements of the specification is carefully evaluated and is

one of the major considerations in awarding a contract. Requirements for the vendor's quality control program are established by Westinghouse. Additionally, Westinghouse has approved rights on each vendor's quality control system and on the inspection program for each type of valve.

All containment isolation valves provided by Westinghouse which are not normally in the closed position are capable of closure within 10 seconds. This time for fast-acting valves of the Engineered Safety Features is based upon the accident analyses requirements.

All lines passing through the containment penetrations enter into the auxiliary building pipe tunnel, safeguards area, or main steam valve house. All of the external isolation valves for these pipes are located in one of the above areas. The temperature of the auxiliary building pipe tunnel and safeguards area is maintained at a minimum of 50 F, which precludes the freezing of the valves and piping in these areas. The main steam valve house is also maintained at a temperature greater than freezing, as described in the Response to Comment 9.67. 65

These areas are all within Seismic Class 1 structures and are provided with tornado missile protection as indicated in Table 3.2.1-1.

Figure 6.2-99 shows schematic representations of typical containment isolation valve arrangements. Although the station is designed to the General Design Criteria published in 1966, most isolation arrangements conform to Criteria 55, 56, or 57 of Appendix A, "General Design Criteria for Nuclear Power Plants" to 10CFR50 published in 1971. A discussion of these criteria can be found in Section 3.1. 65 65

General Design Criteria 55, 56, and 57 had not been promulgated when four penetrations, which use check valves outside the containment as isolation valves, were designed. As explained in 6.2.4.2.b, and Table 6.2-34, these penetrations constitute exceptions taken to G.D.C. 55, 56, and 57. This 65 situation occurs only where there is a sealed Seismic Class I system inside the containment serving as a second isolation barrier. These penetrations are considered to meet the requirements of General Design Criterion 53 (July 10, 1967) in effect at the time of design. Table 6.2-34 also indicates the isolation criterion to which the penetration conforms, or references one of the following sections which describe isolation arrangements which differ from those listed in the criteria:

1. Reactor containment leakage monitoring lines to open taps and containment vacuum pump suction lines.

   The leakage monitoring lines to the open taps have one manual, administratively controlled valve followed by two automatic trip valves in series outside the containment. There are four of these 26 lines utilizing four penetrations. The two automatic valves in each line shut on receipt of a Containment Isolation Phase A Signal.

   The containment vacuum pump suction lines have two normally closed automatic trip valves in series. The Containment Atmosphere Cleanup System takes its suction from these lines downstream of the two automatic trip valves. These valves receive a Containment Isolation Phase A Signal to close.

The arrangements of two trip valves in series outside the containment is necessary to provide accessibility to the valves in order to ensure operation of these sytems following an accident.

2. Component cooling water supply to the Residual Heat Removal System (RHRS), the excess letdown heat exchanger and the containment air recirculation cooling coils; feedwater lines and chemical feed lines.

The penetrations for these lines have two barriers between fluid inside the reactor coolant pressure boundary or between the containment atmosphere and the atmosphere outside the containment. These two barriers are the various heat exchangers served by the lines and the check valves outside the containment. These check valves shut under a differential pressure when the higher pressure is on the containment side of the check valve. The piping inside the containment from the penetration to the component is run so that it is protected from potential missiles generated as a result of an accident.

Each feedwater line has the following connections between the isolation valve outside the containment and the steam generator inside the containment. The isolation arrangement for each of these connections is described:

a. A three-inch auxiliary feed line, located outside the containment, with a check valve.

b. The chemical feed line connects to the main feedwater line inside the containment. In addition to the check valve in the

chemical feed line, there is a normally open manual isolation valve on each side of the containment in this line.

3. Main steam line

Each 32-inch main steam line is isolated by an automatically tripped, normally open swing-check valve installed in the direction to prevent flow out of the containment. Flow into the containment is prevented by a motor-operated nonreturn valve installed adjacent to the trip valve. These valves are located outside the containment with a sealed system inside; this arrangement conforms to General Design Criterion 57. The following lines join each main steam line between the steam generator inside the containment and the isolation valve outside the containment with the exception of the flow element loop which is completely within the containment. The isolation arrangement for each of these lines is described:

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a. Four 3/4-inch pressure instrument lines outside the containment, each with two manually-operated isolation valves.

b. A 4-inch steam line outside the containment to the turbine driven auxiliary feedwater pump, isolated by one manually-operated valve.

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c. A 32-inch connection outside the containment to the safety and relief valves. This line leads to five parallel safety valves and one automatically controlled power relief valve. There is a manually operated isolation valve in the line to the power relief valve, and the safety valves can be manually gagged shut.

d. A 3-inch decay heat relief line outside the containment contains a check valve. After the junction of the three decay heat relief lines from the three main steam lines, there is a remote, manually controlled isolation valve.

e. A 1-inch sample line outside the containment containing two normally closed isolation valves.

f. A 3-inch warmup bypass line around the main steam trip valve contains an automatic trip valve for isolation.

4. Residual heat removal sample lines

These 3/8-inch lines contain a remote manually-operated isolation valve inside the containment and an automatic trip valve outside the containment. These isolation valves are normally shut during station operation and normally opened only when the reactor is shut down and at reduced pressure and temperature. During power operation, the RHRS is isolated from the RCS by motor-operated valves.

5. Safety injection discharge lines to the RCS

The Safety Injection System (SIS) is operated following a LOCA to keep the reactor core covered with water (Section 6.3). The valves affecting containment isolation in the boron injection path to the RCS cold legs are therefore designed to open upon receipt of a Safety Injection Actuation Signal. All other valves (except in the low head safety injection (LHSI) header to the RCS cold legs) are normally closed and opened as necessary by the control room operator after an accident has occurred. 65

The high head safety injection line to the Reactor Coolant System cold legs (boron injection line) is provided with two normally closed, remotely controlled motor-operated isolation valves in parallel outside the containment and one check valve inside the containment. A separate post-accident high head recirculation header feeding the cold leg injection branch lines is provided with one normally closed, remotely controlled motor-operated isolation valve outside the containment and one check valve inside the containment. In addition, there is a 1-inch line connecting to the boron injection line between the penetration and the isolation valve outside the containment bypassing the boron injection tank. This line is supplied with a normally locked closed manually-operated isolation valve.

The high head safety injection lines to the RCS hot legs are each provided with one normally closed, remotely controlled motor-operated valve outside the containment and one check valve in each header inside the containment.

The LHSI lines consist of three headers outside the containment supplied by both low head safety injection pumps. One LHSI header to
68 the RCS cold legs is provided with two parallel normally open, remotely controlled motor-operated isolation valve outside the containment and one check valve in each branch line to the cold legs inside the containment. Two LHSI headers to the RCS hot legs are provided each with one normally closed remotely controlled motor-operated isolation valve outside the containment and one check valve in each header inside the containment.

d. A 3-inch decay heat relief line outside the containment contains a check valve. After the junction of the three decay heat relief lines from the three main steam lines, there is a remote, manually controlled isolation valve.

e. A 1-inch sample line outside the containment containing two normally closed isolation valves.

f. A 3-inch warmup bypass line around the main steam trip valve contains an automatic trip valve for isolation.

4. Residual heat removal sample lines

These 3/8-inch lines contain a remote manually-operated isolation valve inside the containment and an automatic trip valve outside the containment. These isolation valves are normally shut during station operation and normally opened only when the reactor is shut down and at reduced pressure and temperature. During power operation, the RHRS is isolated from the RCS by motor-operated valves.

5. Safety injection discharge lines to the RCS

The Safety Injection System (SIS) is operated following a LOCA to keep the reactor core covered with water (Section 6.3). The valves affecting containment isolation in the boron injection path to the RCS cold legs are therefore designed to open upon receipt of a Safety Injection Actuation Signal. All other valves (except in the low head safety injection (LHSI) header to the RCS cold legs) are normally closed and opened as necessary by the control room operator after an accident has occurred. 65

The high head safety injection line to the Reactor Coolant System cold legs (boron injection line) is provided with two normally closed, remotely controlled motor-operated isolation valves in parallel outside the containment and one check valve inside the containment. A separate post-accident high head recirculation header feeding the cold leg injection branch lines is provided with one normally closed, remotely controlled motor-operated isolation valve outside the containment and one check valve inside the containment. In addition, there is a 1-inch line connecting to the boron injection line between the penetration and the isolation valve outside the containment bypassing the boron injection tank. This line is supplied with a normally locked closed manually-operated isolation valve.

The high head safety injection lines to the RCS hot legs are each provided with one normally closed, remotely controlled motor-operated valve outside the containment and one check valve in each header inside the containment.

The LHSI lines consist of three headers outside the containment supplied by both low head safety injection pumps. One LHSI header to the RCS cold legs is provided with one normally open, remotely controlled motor-operated isolation valve outside the containment and one check valve in each branch line to the cold legs inside the containment. Two LHSI headers to the RCS hot legs are provided each with one normally closed remotely controlled motor-operated isolation valve outside the containment and one check valve in each header inside the containment.

These containment isolation arrangements conform with the single failure criteria specified in Section 6.2.4.1 and also allow the SIS to perform its design function.

6. Reactor coolant pump seal water supply

These lines are each provided with a check valve and a normally open manual isolation valve inside the containment and normally open manual isolation valve outside the containment. In addition, there is an additional check valve inside the containment which is not missile protected.

The two isolation barriers are the check valve inside the containment and the closed portion of the Chemical and Volume Control System on the discharge side of the charging pumps. The piping from the check valve inside the containment to the manual isolation valve outside the containment is designed to Class I of ANSI B31.7, and the piping from the manual valve to the charging pump discharge is designed to Class II of ANSI B31.7.

Water is pumped through these lines, through the reactor coolant pump seals and into the RCS during normal operation and safety injection. Thus these lines remain open after receipt of a safety injection signal and the flow contributes to the SIS flow to the RCS while protecting the reactor coolant pump seals.

These containment isolation arrangements conform with the single failure criteria specified in Section 6.2.4.1 and also allow the SIS to perform its design function.

6. Reactor coolant pump seal water supply

These lines are each provided with a check valve and a normally open manual isolation valve inside the containment and normally open manual isolation valve outside the containment. In addition, there is an additional check valve inside the containment which is not missile protected.

The two isolation barriers are the check valve inside the containment and the closed portion of the Chemical and Volume Control System on the discharge side of the charging pumps. The piping from the check valve inside the containment to the manual isolation valve outside the containment is designed to Class I of ANSI B31.7, and the piping from the manual valve to the charging pump discharge is designed to Class II of ANSI B31.7.

Water is pumped through these lines, through the reactor coolant pump seals and into the RCS during normal operation and safety injection. Thus these lines remain open after receipt of a safety injection signal and the flow contributes to the SIS flow to the RCS while protecting the reactor coolant pump seals.

65 7. Quench spray, recirculation spray, and casing cooling pump discharge lines

65 The Containment Depressurization System operates after an accident to depressurize the containment. The valves in the lines from the quench spray and outside recirculation spray pumps are therefore designed to be opened upon receipt of a containment depressurization (high-high containment pressure) signal if they are not already open.

The quench spray pump discharge lines are provided with a check valve inside the containment and one normally closed, remotely controlled 41 motor-operated valve outside the containment. This motor-operated valve opens upon receipt of a containment depressurization (high-high containment pressure) signal. The two isolation barriers are provided for these penetrations by the check valve and the motor-operated valve.

The outside recirculation spray pump discharge lines are provided with a check valve inside the containment and a normally open, remotely controlled motor-operated valve outside the containment. The two isolation barriers are provided by the check valve inside the containment and the closed system outside the containment. This closed system includes the recirculation spray pumps and their casings. The system piping conforms to Class II of ANSI B31.7, the 65 recirculation spray pumps conform to Class II of the Nuclear Pump and Valve Code, and the recirculation spray pump casings conform to ASME Section III B.

The casing cooling pump discharge lines terminate at the suction to the outside recirculation spray pumps. These lines are provided with a check valve, one normally open remotely controlled motor-operated valve, and one normally closed remotely controlled motor-operated valve outside the containment. The isolation barriers are the check valve, two motor-operated valves, and the closed outside recirculation spray pump suction piping as discussed in Section 6.2.4.2. 65

8. Low head safety injection pump and outside recirculation spray pump suction lines

Special consideration given to the low head and recirculation spray pump inlet lines which take suction from sumps inside the containment results in a conservative design and use of highly reliable components in a single valve arrangement which is enclosed in a special valve pit. The major portion of the piping is buried in the reinforced concrete base mat, and only a short length of piping exists between the mat and the isolation valve. The single valve is equipped with a highly reliable remote operator. If a failure occurs in this suction line, the valve pit becomes flooded. This provides a water seal between the containment and the outside atmosphere which prevents leakage into or out of the containment. The design of this portion of the installation is compatible with letters from the Advisory Committee on Reactor Safeguards [12,13]. Provisions for detecting leaks in these suction lines are described in Sections 6.2.2. and 6.3. 65 65 65

The isolation valve at the suction of the outside recirculation spray pumps is a normally open, remotely controlled, motor-operated valve. The isolation valve for each LHSI pump suction penetration is a normally closed, remotely controlled, motor-operated valve.

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9. Fuel transfer tube

65 A 20-inch OD fuel transfer tube in the fuel transfer penetration between the refueling canal inside the containment and the spent fuel pit is fitted with a blind flange inside the containment and a normally closed gate valve in the transfer canal outside the containment to prevent leakage through the transfer tube during accident conditions.

10. Dead weight pressure calibrator

The line to the pressurizer dead weight pressure calibrator is provided with two normally closed, administratively controlled, manual isolation valves outside the containment. This line is not normally used during station operation.

Branch lines intersecting between isolation barriers consist of leakage monitoring connections that are provided with normally closed valves and caps. Leakage monitoring connections are designed to the same criteria as their respective main lines.

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The reactor coolant letdown line has a branch with a normally closed relief valve (Figures 9.3.4-3, 6). A temperature element is provided to monitor leakage downstream of the relief valve, and the relief valve set pressure exceeds the test pressure of the containment. Therefore, no isolation barrier is required.

When internal closed loop systems represent a barrier for containment isolation, the containment penetrations, the piping inside the containment, and the piping up to and including the isolation valves outside the containment are designed in accordance with Seismic Class 1 criteria.

The definition of Seismic Class 1 criteria is in Section 3.2.1. Table 3.2.1-1 lists the seismic criteria for structures, systems, and components.

The containment isolation system valves are protected from the effects of pipe whip by separation, physical barrier, and by the application of pipe whip restraints.

Design basis breaks are postulated in the high energy piping in accordance with Section 3.6 and NRC Regulatory Guide 1.46 as explained in the response to Comment 3.19. For the main steam and feedwater lines, whip restraints are designed which eliminate any possibility of damage to an isolation valve from pipe whip. Additional restraints or barriers are supplied, as required, to prevent damage to the isolation valves and related piping from a break in any other high energy line. 65

The following containment penetrations are identified as open to the containment with a check valve inside and a single valve outside subject to active failure:

1. Quench spray
2. Outside recirculation spray discharge

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Note, however, that there is no penetration with a check valve inside and a single valve outside subject to single active failure which is connected to nonseismic Class I piping or components.

Leakage into the containment for those containment penetrations identified above is prevented as described below.

The suction lines to the outside recirculation spray pumps are sealed against inleakage by a head of water in the containment sump.

The Outside Recirculation Spray System is a closed loop outside the containment and is Seismic Class I throughout so that although it is open to
65 the containment on the inside, failure of an isolation valve does not result in inleakage to the containment.

68 Additional automatic valves are provided for the air ejector vent, instrument air return line, and the containment radiation monitoring return line. These valves appear in Table 6.2-34 which lists all containment isolation valves.

The check valves used in the Quench and Recirculation Spray Systems are of the same design. They are soft seated swing check valves. Closing force is provided by external weights of lever arms located on both sides of the valves. The weights are initially set at the factory to hold the discs closed with 2 psi differential pressure in the normal flow direction. Once open, reseating is expected to occur at about 0.5 psi.

The opening and reseating pressures are adjusted by moving the external weight along the weight arm. Opening and reseating pressures are not independently adjustable.