BINDER NO. WBNEQ-CABL-049 PLANT WBN UNIT(S) 1 SHEET 1 OF 29

BINDER TITLE ROCKBESTOS KXL-780 COMPUTED LAQ DATE 8/29/86 R R

FIREWALL III INS/TVA TYPE MS & PXMJ CHECKED MWL DATE 8-29-86

A. DOCUMENTATION

Equipment Description Electrical Cable

Vendor/Manufacturer The Rockbestos Company

Equipment Model No.(s) Flame Retardant XLPE Type MS* and PXMJ*, Firewall III - Chemically Cross-linked Polyethylene, TVA Mark WVA,** WHB-1,*** and WHH-1****

QUALIFICATION REPORTS (TAB D)

(1) Title/Number/Revision Accident testing of Rockbestos Cable for Tennessee Valley Authority Report No. A -706-86-02 (Revision 2) TAB D, pp D-1 through D-117 RIMS B71 860615 101 DATE 02/10/86

(2) Title/Number/Revision Thermogravimetric Analysis Test Report, TAB D, Pages D-118 thru D-128 RIMS B43 860219 002 DATE 01/07/86

(3) Title/Number/Revision Voltage Withstand Testing of Rockbestos Cable for Tennessee Valley Authority, Report No. A-709-86, TAB D, Pages D-126 thru D-133 RIMS B43 860326 512 DATE 02/27/86

OTHER (ANALYSIS, VENDOR DATA, ETC.)

*MS - Multiconductor signal cable with shield and overall jacket.

PXMJ - Multiconductor cable with a core of specified number of Type PX single conductor covered with a chlorosulfonated polyethylene outer jacket.

BINDER NO. WBNEQ-CABL-049 PLANT WBN UNIT(S) 1 SHEET 1A OF 29

BINDER TITLE ROCKBESTOS KXL-780 COMPUTED YAC DATE 8/29/86 R ___ R ___

FIREWALL III INS/TVA TYPE MS & PXMJ CHECKED NWC DATE 8-29-86

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

1. TAB C - Section A, Sample Selection, Environmental Profile and Application

2. TAB C - Section B, Normal Service Related Stresses and Seismic Testing

3. TAB C - Section C, System 1000 Calculation of Qualified Life

4. TAB C - Section D, Submergence

5. TAB C - Section E, Location of the Qualified Cable

6. TAB E - 1, Rockbestos Letter to TVA - Insulated Conductor Material Verification dated 3-7-86 RIMS No. B43 860310 018

7. TAB E - 2, TVA Letter to Corporate Consulting and Development Company - Regarding the Three Anomalies Pertaining to the Test Report A-709-86-02 dated 6-30-86 RIMS No. B48 860702 903

8. TAB E - 3, Rockbestos Letter to TVA - Insulation Material Verification dated 12-17-85 RIMS No. B70 851217 001

9. TAB E - 4, TVA Letter to Rockbestos for Insulation Material Verification dated 11-27-85 RIMS No. B70 851127 001

10. TAB E - 5, TVA Letter to Corporate Consulting and Development Company- Regarding the Acceptance of Test Report A-709-86 dated 3-28-86 RIMS No. B43 860331 910

11. TAB E - 6, Rockbestos Flame Test on #16 AWG XLPE

12. TAB E - 7, TVA Letter to Corporate Consulting dated 7-7-86 RIMS No. B43 860708 902

13. TAB E - 8, TVA Letter to Corporate Consulting dated 2-26-86 RIMS No. B43 860227 920

**WVA - 2/c, twisted, standard, No. 16 AWG, cross-linked polyethylene insulation, color coded, shielded, and 90°C conductor temperature, minimum black light stabilized chlorosulfonated polyethylene jacket.

*** WHB-1 - No. 14 AWG copper cable, 2/c, 600V, PXMJ.

**** WHH-1 - No. 14 AWG copper cable, 9/c, 600V, PXMJ.

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BINDER TITLE ROCKBESTOS KXL-780 COMPUTED [illegible] DATE 9/21/86 R R

FIREWALL III INS/TVA TYPE MS & PXMJ CHECKED [illegible] DATE 9-21-86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified (Pending Resolution of Open Items)

____ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

____ Equipment Qualification Not Established by Documentation

____ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

1. Rerouting of cables subject to submergence in the steam valve vaults.

2. Ensure that agreement between design and installation records is established and documented.

3. The measured values documented in this binder must be evaluated to ensure acceptable performance (applies to MS cables only).

4. Rerouting of cables as a result of non-EQ design changes.

5. Heat rise studies and calculations must be performed to ensure that the qualification temperature is not exceeded (applies to PXMJ only).

COMMENTS/RECOMMENDATIONS See TAB C, Section A.2.

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BINDER TITLE ROCKBESTOS KXL-780 COMPUTED YAQ DATE 8/29/86 R ___ R ___

FIREWALL III INS/TVA TYPE MS & PXMJ CHECKED [illegible] DATE 8-29-86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

___ Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

X Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE Standard 383-1974.

BINDER NO. WBNEQ-CABL-049 PLANT WBN UNIT(S) 1 SHEET 4 OF 29

BINDER TITLE ROCKBESTOS KXL-780 COMPUTED YAQ DATE 8/29/84 R ___ R ___

FIREWALL III INS/TVA TYPE MS & PXMJ CHECKED MWL DATE 8-29-86

D. QUALIFICATION METHODOLOGY (Check only one block)

X Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

___ Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS Tested representative sample in accordance with IEEE 383-1974. Specimen was a sample of installed cable. (See also TAB C, Section A.1)

EQP195.62

TVA 19537 (OE-3-86)

BINDER NO. WBNEQ-CABL-049 PLANT WBN UNIT(S) 1 SHEET 5 OF 29

BINDER TITLE ROCKBESTOS KXL-780 COMPUTED PAU DATE 8/29/86 R ___ R ___

FIREWALL III INS/TVA TYPE MS & PXMJ CHECKED [illegible] DATE 8-29-86

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? Yes

	Plant Device	Qualification Document	Reference Report No. A-706-86-02
(1) Equipment Type	Cable	Same	App. A, p. 1, Sect. 2
(2) Manufacturer	Rockbestos	Same	App. A, p. 1, Sect. 2
(3) Model Number(s)	Firewall III	Same	App. A, p. 1, Sect. 2
	KXL-780	Same	App. A, p. 1, Sect. 2
(4) Serial Number(s)	NA	CCL Sample No. 1963-003-000-001	App. A, p. 1, Sect. 2

(5) Identify Component-Unique checksheet attached: Tab B, Supplement 2

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-CABL-049 PLANT WBN UNIT(S) 1 SHEET 6 OF 29

BINDER TITLE ROCKBESTOS KXL-780 COMPUTED LAQ DATE 8/29/86 R ___ R ___

FIREWALL III INS/TVA TYPE MS & PXMJ CHECKED [illegible] DATE 8-29-86

F. INSTALLATION INTERFACES

Does the qualification program address all relevant interfaces of the equipment so that the installed design and configuration is similar or identical to the test configuration (yes/no/NA)? (note below)

Interface	Identify Interface Requirement	Acceptable? (Yes/No/NA)	Reference Test Report
Mounting Bolts	NA		
External Process Connections	NA		
Electrical Connections	NA		
Conduit Seals	NA		
Connector Seals	NA		
Orientation	NA		
Physical Configuration	NA		
Other	NA		

JUSTIFICATION/COMMENTS Not applicable to cable qualification.

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TVA 19537 (OE-3-86)

G. TEST SEQUENCE

*(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Report 1 Reference
(a) Equipment inspected for damage	No	Baseline only, See TAB B, Sect. G(1)(b)
(b) Baseline performance measurements taken	Yes	App. B, p. 5
(c) Equipment aged:		
**Thermal	Yes	App. D, pp. 4 and 8-10
**Radiation	Yes	App. C pp. 3, 5, & 6
Wear	No	See Tab C, Section B
(d) Vibration/seismic testing conducted	No	****
(e) Design basis event (DBE) exposure	Yes	App. E, p. 5 Sect 4.3 & pp. 14-15
(f) Post-DBE exposure	Yes	App. E, p. 5 Sect 4.3 & pp. 14-15
(g) Post-DBE funtion and inspection	Yes	App. E, Sect 4.2•10, pp. 4&5 and Report 3

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes
(Reference ***).

JUSTIFICATION/COMMENTS *Test sequence described in Report 1, Appendix A, p. 1. **Radiation aging performed prior to thermal aging. ***Report 1, Appendix C, pp. 5, 8, & 9; Appendix D, p. 8; Appendix F, p. 1; Report 3, pp. 132 & 133. ****Vibration/seismic testing not applicable to environmental qualification of cable.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference See Tab B, Sect G(1)(c)).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	See Tab B, Sect G(1)(c)
Radiation exposure	Yes	See Tab B, Sect G(1)(c)
Vibration (non-seismic) aging	No	See Tab C, Sect B
Operational (electrical/mechanical/process) stress aging	No	See Tab C, Sect B

JUSTIFICATION/COMMENTS

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference).

JUSTIFICATION/COMMENTS NUREG-0588 Category II Evaluation

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference See Tab B, Sect. G(1)(c)).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: Report 1, Appendix D, p. 4 and Report 2).

JUSTIFICATION/COMMENTS

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference Report 1, Appendix D p. 1, Section 3.1.1 and 3.1.2).

JUSTIFICATION/COMMENTS See Tab B, Section I.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes* (Reference Report 1, App. D, pp. 4 & 10).

Parameter	Conductor Maximum Normal	Test	Equivalent
Temperature	54.4°C	** 252.2°F	60°C
Time	40 years	168 hrs	40 years

JUSTIFICATION/COMMENTS *See Tab B, Section I. **Average temperature.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference).

JUSTIFICATION/COMMENTS See Tab B, Section I. See also Report 1, App. D, p. 1, Para 3.1.2).

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference Report 2).

JUSTIFICATION/COMMENTS See Tab B, Section I. (See also Report 1, Appendix D, p. 1, Para 3.1.2).

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? NA (Reference ___).

JUSTIFICATION/COMMENTS Activation energy used. See TAB B, Section H(e) and (f).

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference ___).

JUSTIFICATION/COMMENTS Accelerated aging temperature more than accounts for expected energized heat rise.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference See Tab B, Sect G(1)(c)).

JUSTIFICATION/COMMENTS ___

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference Report 1 App. C, p. 4).

JUSTIFICATION/COMMENTS The cable insulation materials are considered susceptible to radiation aging.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference Report 1, App. C, p. 1, Sect. 2.1.1).

JUSTIFICATION/COMMENTS ___

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference 47E235-78 R2).

Plant normal ambient radiation dose (rd) 1.8E + 03

Test exposure dose (rd) 2E + 08

Test exposure dose rate (rd/hr) .566E + 06

Test exposure source type (e.g., Co-60 gamma) Co-60 gamma

JUSTIFICATION/COMMENTS Dose rate is acceptable per IEEE 383-1974 requirements and total dose exceeds WBN requirements with margin.

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No (Reference ___).

JUSTIFICATION/COMMENTS See Tab C, Section B.

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? NA (Reference ___).

JUSTIFICATION/COMMENTS See Tab C, Section B.

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No (Reference ___).

JUSTIFICATION/COMMENTS See Tab C, Section B.

H. AGING (Continued)

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? NA (Reference _____).

JUSTIFICATION/COMMENTS See Tab C, Section B.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes
(Reference Report 1, p. 1, Para. 3.1.1).

Qualified life (Document in QMDS) 40 years

JUSTIFICATION/COMMENTS See Tab C, Section A.2.

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? No
(Reference _____).

Replacement Intervals (Document in QMDS) NA

JUSTIFICATION/COMMENTS The qualified life established in Tab C, Section A.2 is 40 years

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BINDER TITLE ROCKBESTOS KXL-780 COMPUTED YAC DATE 8/29/86 R ___ R ___

FIREWALL III INS/TVA TYPE MS & PXMJ CHECKED [illegible] DATE 8-29-86

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Chemically Cross-linked Polyethylene KXL-780	NA	NA	1.39	Report 2
(b)					
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS The insulation material was identified by the Rockbestos Co. (B43 860310 018 and B70 851217 001, TAB E) for the two contracts 77K5-822173-1, 77K5-823265) covered by this binder to be chemically cross-linked polyethylene KXL-780 compound. The letter B43 860310 018 doesn't cover the cable used in this binder under contract 77K5-823265 since it only references compound KXL-760-D. Also compound KXL-760-D is qualified in cable Binder WBNEQ-CABL-037. The letter B70 851217 001 covers the cable qualified in this binder under contract 77K5-823265. The activation energy was determined for this material in Report No. 2 in TAB D.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? No (Reference).

Identify Acceptance Criteria: Test was performed to determine the subject cable's characteristics. Specific performance measurements were taken per TAB B, Sections J(3) and J(5) and evaluated in TAB C, Section A.3.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference Report 1, Appendix E, Sect. 4.2.5, p 3; Sects. 4.2.8; 4.2.10, p 4. **Report 3, See 1.4.3, test data sheet).

Identify baseline and functional testing: Insulation Resistance (IR) measurements before and after radiation and thermal aging. IR measurements were also taken once during transient period and once every hour for the first 24 hours and then every 24 hours thereafter for duration of test. Leakage currents to the shield were monitored continuously during the initial transient and after completion of test. Loading per TAB B, Section J(3) monitored at eight hour intervals. **80V/mil (2000VAC) - 5 minute hi-pot test after recoiled around 40x mandrel and immersed in water.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes
(Reference Report 1, Appendix E, p. 1, Section 4.1.3; p. 3, Section 4.2.5; p. 4, Sections 4.2.8 and p. 8).

JUSTIFICATION/COMMENTS 264 VAC between conductors with 3 amp load on each and 132 VAC potential between each conductor and shield. Voltage applied continuously for duration of test. Loading removed during first 100 minutes to facilitate leakage current measurements. 3 amp load applied after 100 minutes and remained for duration of test (except for leakage current and IR measurements).

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? No (Reference _____).

JUSTIFICATION/COMMENTS Initial check was for IR and continuity only. Qualification for normal operation established through manufacturing and testing per IPCEA S-66-524.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	75VDC/120VAC	*
Load	1/2 amps	*
Frequency	NA	
Accuracy	NA	
Other(s)		

JUSTIFICATION/COMMENTS *See TAB C, Section A.2 for more discussions on qualified life.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(b)

Parameter	Demonstrated Conditions	Reference
Voltage	132/264VAC	Report 1, App. E, p. 1, Para. 4.1.3
Load	3 amps	Report 1, App. E, p. 1, Para. 4.1.3
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-76R2 & 47E235-78 R2
OE Calc TI-RPS-194 represent the limiting parameters.

(1) Normal Max

(a) Temperature (°F) 130
(b) Pressure 14.4psia
(c) Humidity (%) 80
(d) Radiation (rd) 1.8×10^3 (See Comments next page).

(2) Abnormal Max

(a) Temperature (°F) 140
(b) Pressure 14.4psia
(c) Humidity (%) 100
(d) Radiation (rd) NA

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: Abnormal service condition duration is less than 8 hours per occurrence and total time does not exceed 1 percent of plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	325*	Accident type	HELB
(b) Pressure	25.18psia	Accident type	HELB
(c) Humidity (%)	100	Accident type	HELB
(d) Radiation (rd)	1.1×10^8	Accident type	LOCA
(e) Spray Type	NA	Accident type	

*The cable peak temperature was calculated for the cable inside conduits in the valve vault (WBNNAL6-001) after a postulated MSLB. With TSI fireproof insulation of the conduit carrying the electrical cable, the peak temperature was calculated to be 220.2°F at 5500 seconds. Control cables (PXMJ) are connected to devices which perform their function before the temperature reach the qualification value (see WBNOSG4-003 for detail analysis).

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

Refer to environmental data drawings 47E235-76R2 and -78R2 for bounding accident parameters. This accident dose is the worst for the location of the cables qualified in this binder. The 40 year total integrated dose is the worst combination the cables covered by this binder will encounter. The 1.1E + 08 rads dose is the accident dose in the EGTS. This value represents the accident dose 2 feet from the filter. This leads to the conclusion that 1.1E + 08 rads is the total worst dose the cables will encounter even after considering the annulus beta radiation. The cables located in the annulus (47E235-44R0) are exposed to a beta dose of 6.0×10^5 during a LOCA accident. The total radiation the cables located in the annulus will be exposed to is 1.0E + 06 (40 yr) + 1.2E + 07 (gamma accident) + 6.0E + 05 (beta accident) = 1.36E + 07 rads which is less than the worst case considered above.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? No (Reference IEEE 383-1974 & MFR testing)

(7) Subject to submergence (yes/no/NA)? No
(Reference See TAB C, Section D).

Identify initiation time and duration of submergence: _____

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
Radiation (GENNAL3-001)	B45 851117 235
Radiation (WBNNAL3-004)	B45 860205 235
Radiation (TI-RPS-48)	B45 851105 235
Radiation (WBNNAL3-025)	B45 860401 235
Temperature (WBNNAL6-001)	B45 850912 235
Superheat Steam (WBNOSG4-003)	B45 851112 218

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Required	Demonstrated	Report 1 Reference
Operating Time	100days	10 days (100 days equiv)	(See TAB C, Sect C) App. E, p. 1, Sect 4.1.1, & p. 5, Sect 4.3
Temperature (°F)	325	360	App. E, pp. 12 & 14
Pressure	25.18psia	48.1 psia (33.4 psig)	App. E, pp. 12 & 14
Relative Humidity (%)	100	Yes Saturated Steam	App. E, p. 3, Sect 4.2.6 & p. 5, Sect 4.3
*Chemical Spray	NA	NA	
**Radiation (rd)	1.1E + 08 ***	2E+08 gamma	App. C, pp. 5 & 6
Submergence	NA	NA	See TAB C, Section D

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

***See TAB C, Section A.3.C.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelops Specified (Yes/No/NA)	Report 1 Reference
Temperature	Yes	(See TAB C, Section A.2.a)
Pressure	Yes	App. E, p. 12 & 14
Relative Humidity	Yes (Saturated Steam)	App. E, p. 3, Sect 4.2.6 & p. 5, Sect 4.3
Chemical Spray	NA	
Submergence	NA	See TAB C, Section D

JUSTIFICATION/COMMENTS Cables from the two contracts covered by this binder are not subjected to any chemical spray even though they are qualified for that.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	>15°F	Yes
Pressure: +10%	>10%	Yes
Radiation: +10% of accident dose	>10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	None	*
Voltage: +10%	>10%	Yes**
Frequency: ±5% of rated value	NA	Not Applicable to low voltage instr. cable
Environmental Transient: the initial transient and the peak temperature applied twice	1 transient	Yes***
Vibration: +10% added to acceleration	NA	See TAB C, Section B

JUSTIFICATION/COMMENTS: Test condition margins applied to postulated profile and plant conditions.

*Test time acceptable as equivalent degradation received is much greater than required (See TAB C Section A). **Test voltage is greater than 10% of application voltages (See TAB C Section A.2.a).

*** Two transients are not required for cables, for justification refer to IEEE 383-1974.

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BINDER TITLE ROCKBESTOS KXL-780 COMPUTED [illegible] DATE 8/29/86 R ___ R ___

FIREWALL III INS/TVA TYPE MS & PXMJ CHECKED [illegible] DATE 8-29-86

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference See TAB A).

JUSTIFICATION/COMMENTS To maintain continuity and integrity of voltage and current to Class 1E equipment.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? YES
(Reference Report 1, App. E, Sect. 4.3, p. 5, and Data sheets on pp. 21-25).

JUSTIFICATION/COMMENTS See also TAB C, Sections A.2 & A.3.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? YES
(Reference See TAB B, Section M(2)).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? YES (Reference **).

JUSTIFICATION/COMMENTS **See TAB C Section A.2.b

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? YES
(Reference Report 1, App. G).

JUSTIFICATION/COMMENTS Anomalies were reviewed and the dispositions did not significantly impact the qualification program. Completion of test is valid and the results acceptable.

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BINDER NO. WBNEQ-CABL-049 PLANT WBN UNIT(S) 1 SHEET 23 OF 29

BINDER TITLE ROCKBESTOS KXL-780 COMPUTED [illegible] DATE 8/29/86 R ___ R ___

FIREWALL III INS/TVA TYPE MS & PXMJ CHECKED [illegible] DATE 8-29-86

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? YES (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See TAB G. There are no surveillance on maintenance requirements identified from the vendor or test documentation; however, TVA does have a maintenance and surveillance program at the plant.

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TVA 19537 (OE-3-86)

BINDER NO. WBNEQ-CABL-049 PLANT WBN UNIT(S) 1 SHEET 24 OF 29

BINDER TITLE ROCKBESTOS KXL-780 COMPUTED YAQ DATE 8/29/86 R R

FIREWALL III INS/TVA TYPE MS & PXMJ CHECKED [illegible] DATE 8-29-86

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	YES
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NONE TAKEN
(3) Choice of qualification methodology adequately justified?	YES
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	YES
(6) Aging degradation evaluated adequately?	YES
(a) Mechanical and/or cycle aging addressed?	NO SEE TAB C SECTION B
(b) Equipment aged to end of life condition prior to application of DBE conditions?	YES
(c) Absence of preaging in test/analysis justified?	NA - AGING PERFORMED
(d) Materials susceptible to thermal/radiation aging identified?	YES

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TVA 19537 (OE-3-86)

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	YES
(7) Qualified life or replacement schedule established?	YES
(8) Criteria regarding temperature/pressure exposure satisfied?	YES
(a) Peak temperature adequate	YES
(b) Peak pressure adequate	YES
(c) Duration adequate	YES
(d) Required profile enveloped adequately	YES
(e) Steam exposure adequate	YES
(9) Criteria regarding test sequence satisfied?	YES
(10) Criteria regarding spray satisfied?	NA*
(a) Was the spray testing done while under the extremes of pressure and temperature?	NA
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA
(11) Criteria regarding submergence satisfied?	YES
(12) Criteria regarding radiation satisfied?	YES
(a) Was dose rate considered?	YES
(b) Was beta radiation considered?	YES
(13) Criteria regarding operability status/mode satisfied?	YES
(14) Criteria regarding test failures or anomalies satisfied?	YES

*Cables are located in the annulus and in the auxiliary building and therefore not subject to chemical spray during a DBA.

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	YES
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	YES
(b) Was an initial base line test done to establish required performance characteristics?	YES
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	YES
(16) Criteria regarding instrument accuracy satisfied?	NA FOR CABLE
(17) Test duration margin (1 hour + function time) satisfied?	YES, See TAB C, Sect. C
(a) Is the minimum specified operating time at least 1 hour?	YES
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	YES
(19) Criteria regarding margins satisfied?	YES
(20) Maintenance and surveillance requirements adequately identified?	YES

P. DISCUSSION

EQP195.62

SUPPLEMENT 2
COMPONENT-UNIQUE CHECKLIST
CABLES/SPLICES

EQUIPMENT IDENTIFICATION

(1) Are the cables (splices) identified in the qualification program identical to the plant cables (splices) which require qualification (yes/no/NA)? No

Item	Plant	Report	Acceptable Yes/No/NA	Report 1 Reference
(a) Conductor				
Insulation material	CXLPE	Same	Yes	Sect 2
Size	#16 & #14 AWG	#16 AWG	Yes	App A, p. 1 Sect 2
Stranding	7 Strand	Same	Yes	App A, p. 1 Sect 2
Coating	Tinned	Same	Yes	App A, p. 1 Sect 2
Insulation Thickness	20 mil (#16) & 30 mil (#14)	20 mil	Yes	App A, p. 1 Sect 2
Number of conductors	2 & 9	2	Yes	App A, p. 1 Sect 2
Arrangement of conductors	Twisted	Same	Yes	App A, p. 1 Sect 2
(b) Shielding	AL/ Mylar Applies to Type MS Cable only	Same	Yes	App A, p. 1 Sect 2
(c) Insulation jacket				
Material	NA			
Thickness	NA			
(d) Outer jacket				
Material	Hypalon	Same	Yes	App A, p. 1 Sect 2
Thickness	45 mil	Same	Yes	App A, p. 1 Sect 2

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EQUIPMENT IDENTIFICATION (Continued)

Item	Plant	Report	Acceptable Yes/No/NA	Report Section
(e) Rated voltage	75Vdc 120Vac	132/ 264Vac	Yes	App. E, p. 1 Para. 4.1.3 & p. 8, Fig. 2
(f) Rated current	NA	3 Amps	Yes	App. E, p. 1 Para. 4.1.3
(g) Operating temperature rating				per contract referenced in TAB D, App. A, p. 1, Sect. 2
Normal	54.4°C	90°C	Yes	
Emergency	NA	NA	NA	NA
Short circuit	NA	NA	NA	NA
(h) Insulation resistance	NA		Yes	*App. B, p. 12 & App. E, p. 12
(i) Splice				
Material	NA	NA	NA	NA
Thickness	NA	NA	NA	NA
Identification	NA	NA	NA	NA

Comments: *IR value measured was 8M ohm (minimum) conductor to conductor for 10 foot specimen at 500VDC and approximately 346°F.

(2) Does the qualification program adequately address temperature and moisture resistance (yes/no/NA)? Yes (Reference Contract Reqmts).

Comments: Cable is manufactured to IPCEA-NEMA STD S-66-524.

(3) Was the cable energized during test (yes/no/NA)? Yes (Reference _____).

Comments: 132/264VAC and 3 amps. See TAB B, Section J (3).

EQUIPMENT IDENTIFICATION (Continued) Page 3 of 3

(4) Was the cable subjected to a voltage withstand test (yes/no/NA)? Yes (Reference Report 3).

Comments: 40 x mandrel bend and 5 minute - 80V/mil (2000 VAC) hi-pot while immersed in water.

(5) Was the cable subjected to an insulation resistance test (yes/no/NA)? Yes (Reference Report 1, App. B, & App. E, p. 4, Sect 4.2.8 & 4.2.10).

Comments:

(6) Was the cable subjected to a mandrel bend and voltage withstand test (yes/no/NA)? Yes (Reference Report 3).

Comments: 40x mandrel bend and 5 minute - 80V/mil (2000VAC) hi-pot while immersed in water.

(7) Was the cable subjected to a flame test to demonstrate flame retardant characteristics (yes/no/NA)? Yes (Reference See Comments).

Identify flame test standard: IEEE 383-1974, Section 2.5.6.

Comments: Typical IEEE 383-1974 vertical tray flame test on completed cables and UL44FR-1 vertical flame test on the individual conductors are shown in TAB E as attachments to QEB 771027 172.

PRINT DATE: 09/21/86

BINDER NO. : WBNEQ-CABL-061
MANUFACTURER : ROCKBESTOS

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NO.	UNIT DEV ID NO.	DESCR.	MODEL NO.	LOCATION COL/AZ.	LOCATION ELEV.	LOCATION *PM	**CONTRACT	C A I.	OPER TIME	MITIGATING ACCIDENT	SAFETY FUNCTION
1-@RM-090-0420-A	1RM 420-A	COAX	WTK	VARIOUS	VARIOUS	O	79K13-826045-0	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-@RM-090-0440-A	1RM 440-A	COAX	WTK	VARIOUS	VARIOUS	O	79K13-826045-0	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-@RM-090-0442-A	1RM 442-A	COAX	WTK	VARIOUS	VARIOUS	O	79K13-826045-0	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-@RM-090-0444-A	1RM 444-A	COAX	WTK	VARIOUS	VARIOUS	O	79K13-826045-0	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-@RM-090-0448-B	1RM 448-B	COAX	WTK	VARIOUS	VARIOUS	O	79K13-826045-0	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-@RM-090-0449-B	1RM 449-B	COAX	WTK	VARIOUS	VARIOUS	I	79K13-826045-0	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-@RM-090-0450-B	1RM 450-B	COAX	WTK	VARIOUS	VARIOUS	O	79K13-826045-0	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-@RM-090-0451-B	1RM 451-B	COAX	WTK	VARIOUS	VARIOUS	I	79K13-826045-0	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-@RM-090-0452-B	1RM 452-B	COAX	WTK	VARIOUS	VARIOUS	O	79K13-826045-0	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-@RM-090-0453-B	1RM 453-B	COAX	WTK	VARIOUS	VARIOUS	I	79K13-826045-0	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-@RM-090-0455-B	1RM 455-B	COAX	WTK	VARIOUS	VARIOUS	I	79K13-826045-0	A	100 D	LOCA/HELB	CARRY VLTG/CURR

* I=INSIDE, O=OUTSIDE PRIMARY CONTAINMENT
** CONTRACTS PREFIXED WITH "N" INDICATE UNVERIFIED CONTRACT AND CABLE DATA

PREPARER/DATE 9/21/86 R____ R____ R____
CHECKED/DATE 9/21/86 _____ _____ _____

BINDER NO. WBNEQ-CABL-061 PLANT WBN UNIT(S) 1 SHEET 1 OF 30

BINDER TITLE ROCKBESTOS/COAX-XLPE COMPUTED LAQ DATE 9/21/86 R ___ R ___

INS./TVA TYPE COAX CHECKED FW DATE 9/21/86

A. DOCUMENTATION

Equipment Description: Coaxial Cable

Vendor/Manufacturer: Rockbestos Co.

Equipment Model No.(s): RSS-6-103-1081

TVA Contract No. 79K13-826045

QUALIFICATION REPORTS

(1) Title/Number/Revision: Report #QR-6802 Report on Qualification Tests for Rockbestos Adverse Service Coaxial, Twinaxial, and Triaxial Cable Generic Nuclear Incident for Class IE Service in Nuclear Generating Stations — RIMS B43 860319 001 — DATE 3-12-1986

(2) Title/Number/Revision: _____ RIMS _____ DATE _____

(3) Title/Number/Revision: _____ RIMS _____ DATE _____

OTHER (ANALYSIS, VENDOR DATA, ETC.)

1. TAB E - 1. Rockbestos letter to TVA regarding questions and comments on the test report and jacket material activation energy dated 6-27-86 (B70 860630 001).
2. TAB E - 2. TVA's letter to Rockbestos regarding comments on Test Report QR-6802 dated 6-19-86 (B70 860619 002)
3. TAB E - 3. Rockbestos letter to TVA regarding the transmittal of the Supplemental Qualification Test dated 2-21-86 (B43 860224 012)
4. TAB E - 4. Rockbestos Similarity Analysis of Coaxial Insulation Types Polymer LO and Polymer LE dated 7-21-86 (B70 860725 001)
5. TAB E - 5. Rockbestos Test Report "Report on Simulated Steam Line Break Testing of Second Generation Solid Dielectric Coaxial Construction" dated July 22, 1983 Report QR 2812 (B43 860424 909). dated July 22, 1983 Report QR 2812 (B43 860424 909).
6. TAB E - 6. Rockbestos letter to TVA regarding contracts vs. insulating compound type and number dated 3-7-86
7. TAB E - 7. TVA letter to Rockbestos regarding comments on the qualification test Report QR-6802.
8. TAB E - 8. Rockbestos letter to TVA regarding leakage current dated 8-29-86 (B71 860909 001).

BINDER NO. WBNEQ-CABL-061 PLANT WBN UNIT(S) 1 SHEET 2 OF 30

BINDER TITLE ROCKBESTOS/COAX-XLPE COMPUTED [illegible] DATE 9/21/86 R ___ R ___

INS./TVA TYPE COAX CHECKED [illegible] DATE 9/21/86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified (pending resolution of open items)

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

1. Calculation of beta radiation attenuation for cables routed through flexible conduits inside containment.

2. The measured values documented in this binder must be evaluated to ensure acceptable performance.

COMMENTS/RECOMMENDATIONS Cables as covered by this binder are qualified subject to the following restrictions: Cables may not be installed in areas subject to submergence, within 2 feet of the ABGTS or EGTS filter housing, or in any lower compartment areas of containment with normal radiation doses above 2.0E08 rads.

BINDER NO. WBNEQ-CABL-061 PLANT WBN UNIT(S) 1 SHEET 3 OF 30

BINDER TITLE ROCKBESTOS/COAX-XLPE COMPUTED LAQ DATE 9/21/86 R ___ R ___

INS./TVA TYPE COAX CHECKED FW DATE 9/21/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 323-1974

IEEE 383-1974

NUREG-0588

IPCEA-S-66-524

IPCEA-S-19-81

Reg. Guide 1.131-1977

10CFR50.49 App. B

BINDER NO. WBNEQ-CABL-061 PLANT WBN UNIT(S) 1 SHEET 4 OF 30

BINDER TITLE ROCKBESTOS/COAX-XLPE COMPUTED LAQ DATE 9/21/86 R R

INS./TVA TYPE COAX CHECKED fcW DATE 9/21/86

D. QUALIFICATION METHODOLOGY (Check only one block)

_____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

__X__ Test of Similar Items with Supporting Analysis

_____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

_____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS See TAB C, Section A.

BINDER NO. WBNEQ-CABL-061 PLANT WBN UNIT(S) 1 SHEET 5 OF 30

BINDER TITLE ROCKBESTOS/COAX-XLPE COMPUTED DAO DATE 9/21/86 R ___ R ___

INS./TVA TYPE COAX CHECKED FWW DATE 9/21/86

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? _____

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Coaxial Cable	Coaxial Cable	QR-6802
(2) Manufacturer	Rockbestos Co.	Rockbestos Co.	QR-6802
(3) Model Number(s)	RSS-6-103-1081	RSS-6-104	QR-6802 p. 3
(4) Serial Number(s)	Product Code H44-3003	Product Code H44-0104	QR-6802, p.3, & Contract No. 79K13-826045

(5) Identify Component-Unique checksheet attached: Supplement 2 Component-Unique Checklist Cables/Splices

JUSTIFICATION/COMMENTS

TVA 19537 (OE-3-86)

EQP235.02

BINDER NO. WBNEQ-CABL-061 PLANT WBN UNIT(S) 1 SHEET 6 OF 30

BINDER TITLE ROCKBESTOS/COAX-XLPE COMPUTED LAQ DATE 9/21/86 R R

INS./TVA TYPE COAX CHECKED FWS DATE 9/21/86

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface Requirements	Acceptable? (Yes/No/NA)	Reference Test Report
Mounting Bolts	NA	NA	NA
External Process Connections	NA	NA	NA
Electrical Connections	Amphenol 82-816-1000 HN Connector at detector-cable interface	Yes	See Binder No. WBNEQ-IRE-001
Conduit Seals	NA	NA	NA
Connector Seals	Raychem Kit NPKX-CCKN-06-01	Yes	See Binder No. WBNEQ-IRE-001
Orientation	NA	NA	NA
Physical Configuration	NA	NA	NA
Other	-	-	-

JUSTIFICATION/COMMENTS Electrical connections and connector seals are both addressed in the referenced binder above.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	QR-6802 P. 7
(b) Baseline performance measurements taken	Yes	QR-6802 P. 39
(c) Equipment aged:		
Thermal	Yes	QR-6802 P. 7 & 47
Radiation	Yes	QR-6802 P. 8 & 48-50
Wear	NA	*
(d) Vibration/seismic testing conducted	NA	*
(e) Design basis event (DBE) exposure	Yes	QR-6802 P. 10, 51-55 & 66
(f) Post-DBE exposure	Yes	QR-6802 P. 11 & 66
(g) Final inspection and disassembly	Yes	QR-6802 P. 13

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes (Reference QR-6802, P. 111).

JUSTIFICATION/COMMENTS *Seismic events are natural phenomena which are outside the scope of 10CFR50.49; however, upon completion of the LOCA simulation, the cable samples were subjected to a mandrel rebend test and an in-water hi pot test. IEEE 383-1974, paragraph 2.4.4 regards that the performance of this test demonstrates that the cables have retained considerable mechanical durability and would be more severe even than the application of two cycles of the environment. The retention of a high degree of flexibility at the end of life (plus accident) demonstrates the cables ability to withstand significant mechanical stresses.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference QR-6802, P. 7).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	QR-6802 P. 7 & 47
Radiation exposure	Yes	QR-6802 P. 8 & 48-50
Vibration (non-seismic) aging	NA	*
Operational (electrical/mechanical/process) stress aging	Yes	QR-6802* P. 26 & 27

JUSTIFICATION/COMMENTS *Normal Service Related Stresses - In accordance with paragraph 1.3.4.1 of IEEE 383-1974, "The cable, as installed, should be suitable for operation at maximum ambient temperature, radiation, and atmospheric conditions and normal electrical and physical stresses for its installed life as specified. Evidence of this suitability may be based on compliance with appropriate published industry standards . . . . " Paragraph 2.3.1 of that same document further states, "Evidence of qualification for normal operation may be demonstrated by providing certified evidence that the provisions of one or more of the following industry standards or criteria." Included in the list that follows the above quote are standards which Rockbestos uses in the manufacture of coaxial cables (See Test Report QR-6802).

1. IPCEA S-19-81 Rubber-Insulated Cable
2. IPCEA S-66-524 Cross-Linked-Polyethylene-Insulated Cable.

Based on the above, we conclude that the cables, having been tested in accordance with the appropriate standard, are qualified for normal duty including vibration commensurate with such service.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? Yes (Reference QR-6802, P. 8).

JUSTIFICATION/COMMENTS See TAB C, Section E.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference QR-6802, P. 7).

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference QR-6802, Sect. 3 sample conditioning P. 44 considers insulation only).

JUSTIFICATION/COMMENTS Use of IEEE 383-1974 guidelines implicitly considers cable insulation/jackets material susceptible to thermal degradation. See TAB C, Sect. B for jacket material degradation.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference QR-6802, PP. 44, 45, 46).

JUSTIFICATION/COMMENTS Also see TAB C, Section B.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference QR-6802, P. 7 & TAB C, Sect. B).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	48.9°F	100°C	68°C
Time	40 yrs.	120 hrs	40 yrs.

JUSTIFICATION/COMMENTS There will be no temperature rise above ambient. See TAB C, Section B.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference QR-6802, Arrhenius plot).

JUSTIFICATION/COMMENTS See also TAB C, Section B.

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference QR-6802, p 44 & Rockbestos letter B70 860630 001, TAB E).

JUSTIFICATION/COMMENTS The above response is applicable to the cable's jacket degradation evaluation performed as part of the TAB C, Section B analysis.

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes (Reference QR-6802, Arrhenius plot).

JUSTIFICATION/COMMENTS Also see TAB C, Section B.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference ___).

JUSTIFICATION/COMMENTS Not required. There is no additional heat rise associated with operation of this coaxial cable.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference QR-6802, P. 8 & PP. 48-50).

JUSTIFICATION/COMMENTS ___

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference QR-6802, P. 8).

JUSTIFICATION/COMMENTS Testing to IEEE-383 presumes that all organic material degrades with radiation.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference QR-6802, P. 8).

JUSTIFICATION/COMMENTS ___

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference QR-6802, P. 48-50 Drawing 47E235-41 R0).

Plant normal ambient radiation dose (rd) 1.0×10^8 rads (gamma)

Test exposure dose (rd) 2×10^8 rads

Test exposure dose rate (rd/hr) 0.49M rads/hr.

Test exposure source type (e.g., Co-60 gamma) Co-60 gamma.

JUSTIFICATION/COMMENTS See also TAB C, Section G.

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? NA (Reference _____

JUSTIFICATION/COMMENTS See comments in TAB B, H(2).

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? NA (Reference _____).

JUSTIFICATION/COMMENTS See comments in TAB B, H(2).

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference ___).

JUSTIFICATION/COMMENTS See comments in TAB B, Section H(2).

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference ___).

JUSTIFICATION/COMMENTS See comments in TAB B, Section H(2).

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes
(Reference QR-6802, Arrhenius plot and TAB C, Section B).

Qualified life (Document in QMDS) 40 years

JUSTIFICATION/COMMENTS The cable is qualified for 40 years inside containment, the Annulus and ABGTS rooms.

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? No
(Reference _____).

Replacement Intervals (Document in QMDS) None.

JUSTIFICATION/COMMENTS The cable is qualified for 40 years. See TAB G for recommended maintenance and surveillance.

BINDER NO. WBNEQ-CABL-061 PLANT WBN UNIT(S) 1 SHEET 14 OF 30

BINDER TITLE ROCKBESTOS/COAX-XLPE COMPUTED [illegible] DATE 9/21/86 R ___ R ___

INS./TVA TYPE COAX CHECKED [illegible] DATE 9/21/86

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Radiation Cross-Linked Polyethylene (KXL-100)		Insulation	2.74	QR-6802, p. 44
(b)	Radiation Cross-Linked, Flame Retardant Polyethylene (KXL-200)		Jacket	1.315	See letter B70 860630 001, TAB E
(c)					
(d)					

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference QR-6802, P. 13).

Identify Acceptance Criteria: Cables were to remain energized with rated potential during steam/chemical spray exposure and pass the final bend and high potential-withstand tests, with total leakage current/charging current less than 1 ma. [See letter from Rockbestos in TAB E (B71 860909 001)].

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference QR-6802, P. 7, 9, 11-13).

Identify baseline and functional testing: Insulation resistance measurements were used for baseline and functional testing. IR measurements were made pre- and post-thermal and irradiation aging and during LOCA. Cables were also energized during the steam/spray exposure.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference QR-6802, Section 7).

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? No (Reference QR-6802, P. 39).

JUSTIFICATION/COMMENTS Baseline tests consisted of insulation resistance measurement at 500 VDC. The cable is qualified for its normal service on the basis of its fabrication in accordance with various national standards (see TAB B, Sheet 8).

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	See Justification/Comments Below	Contract 79K13-826045
Load	*	NA
Frequency	*	NA
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS The contract did not specify any voltage or current values. Test voltage through the accident cycle was 600 VAC followed by a 2000 VAC hipot test after the mandrel rebend.

*The current load on the coaxial signal cable is in the 10^{-11} A induced by a dc mullivolt signal where the frequency is not an applicable parameter.

BINDER NO. WBNEQ-CABL-061 PLANT WBN UNIT(S) 1 SHEET 17 OF 30

BINDER TITLE ROCKBESTOS/COAX-XLPE COMPUTED SMC DATE 9/21/86 R ___ R ___

INS./TVA TYPE COAX CHECKED KW DATE 9/21/86

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(b)

Parameter	Demonstrated Conditions	Reference
Voltage	600 VAC	QR-6802 Sect. 7
Load	NA	NA
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-CABL-061 PLANT WBN UNIT(S) 1 SHEET 18 OF 30

BINDER TITLE ROCKBESTOS/COAX-XLPE COMPUTED SMQ DATE 9/21/86 R R

INS./TVA TYPE COAX CHECKED FEW DATE 9/21/86

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-42R2

(1) Normal Max

(a) Temperature (°F) 120°F

(b) Pressure (psig) 14.7 psia

(c) Humidity (%) 80%

(d) Radiation (rd) 1.0E+08

(2) Abnormal Max

(a) Temperature (°F) 130°F

(b) Pressure (psig) 14.7 psia

(c) Humidity (%) 100%

(d) Radiation (rd) NA

(3) Process Interfaces: NA

(4) State anticipated occurrence frequency and duration of abnormal conditions: Eight hours per excursion and will occur less than 1% of the life of the plant.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	327°F	Accident type LOCA
(b) Pressure (psig)	25.6 psia	Accident type LOCA
(c) Humidity (%)	100%	Accident type LOCA
*(d) Radiation (rd)	4.0E+07 Gamma 5.0E+08 Beta	Accident type LOCA
(e) Spray Type	Chemical	Accident type LOCA

* See TAB C, Section G.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

Spray composition: 2,000 PPM Boron .19 Molar H_3BO_3, 0.033 Molar Na OH resulting in a pH of 8.3 at 25°C.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? No (Reference Manufacturer's std test to IPCEA-66-524).

(7) Subject to submergence (yes/no/NA)? No
(Reference See K(8) #2 below).

Identify initiation time and duration of submergence: _____

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
1. Beta Radiation WBNAPS3-036	B45 860909 001
2. Submergence WBN-OSG4-048	B45 860602 218

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 days	108 days	QR-6802 P. 9 & 66
Temperature (°F)	327°F	345°F	P. 66
Pressure (psig)	28.7 psia	122.1 psig	P. 66
Relative Humidity (%)	100	100	P. 66 Saturated Steam
*Chemical Spray	See Comments Below	24 hrs.	P. 9
**Radiation (rd)	1.4E+08 Gamma & 5.0E+08 Beta	2×10^8	P. 50
Submergence	NA	NA	

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	QR-6802 P. 66
Pressure	Yes	P. 66
Relative Humidity	Yes	P. 66
Chemical Spray	Yes	P. 9
Submergence	NA	NA

JUSTIFICATION/COMMENTS All cables inside containment are routed in conduit and are therefore not subject to direct impingement of the chemical spray solution. Because the spray flowrate and direct impingement are of no concern, the tested condition demonstrates that the cables are conservatively qualified for their installed environment. See also TAB B, Section K(5)(e).

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	> 15°F	Yes
Pressure: +10% but no more than 10 psig	> 10 psig	Yes
Radiation: +10% of accident dose	> 10%*	See TAB C, Section G
Time: +10% (or 1 hour + operating time per NUREG-0588)	None	See TAB C, Section B
Voltage: ±10% of rated value	> 10%	> 10%
Frequency: ±5% of rated value	NA	NA
Environmental Transient: the initial transient and the peak temperature applied twice	Two Transients	Yes
Vibration: +10% added to acceleration	NA	NA

JUSTIFICATION/COMMENTS *Pending resolution of open item on Beta Radiation.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference See TAB A).

JUSTIFICATION/COMMENTS Safety function of cable is to maintain electrical integrity and load throughout testing. See TAB C, Section D.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference QR-6802, PP. 13 & 22).

JUSTIFICATION/COMMENTS See performance writeup, TAB C, Section D.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference QR-6802, PP. 13 & 22).

JUSTIFICATION/COMMENTS See performance writeup, TAB C, Section D.

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference QR-6802, P. 22).

JUSTIFICATION/COMMENTS See also TAB C, Section B.

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference QR-6802, PP. 15-20).

JUSTIFICATION/COMMENTS We have reviewed test anomalies and concur that there is no significant impact on cables installed at the plant.

BINDER NO. WBNEQ-CABL-061 PLANT WBN UNIT(S) 1 SHEET 24 OF 30

BINDER TITLE ROCKBESTOS/COAX-XLPE COMPUTED MAQ DATE 9/21/86 R ___ R ___

INS./TVA TYPE COAX CHECKED FWV DATE 9/21/86

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS There were no surveillance or maintenance requirements identified from the review and evaluation of vendor and test documentation; however, TVA does have a maintenance and surveillance program at the plant. See TAB G.

BINDER NO. WBNEQ-CABL-061 PLANT WBN UNIT(S) 1 SHEET 25 OF 30

BINDER TITLE ROCKBESTOS/COAX-XLPE COMPUTED [illegible] DATE 9/21/86 R ___ R ___

INS./TVA TYPE COAX CHECKED [illegible] DATE 9/21/86

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	NA
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	Yes

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes
(11) Criteria regarding submergence satisfied?	NA
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	See TAB C Section B
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

SUPPLEMENT 2
COMPONENT-UNIQUE CHECKLIST
CABLES/SPLICES

EQUIPMENT IDENTIFICATION

(1) Are the cables (splices) identified in the qualification program identical to the plant cables (splices) which require qualification (yes/no/NA)? No (See TAB C, Section A).

Item	Plant	Report	Acceptable Yes/No/NA	Report Section
(a) Conductor				
Insulation material	XLPE	XLPE	Yes	QR-6802 P. 3
Size	22 AWG	22 AWG	Yes	QR-6802 P. 3
Stranding	19	19	Yes	QR-6802 P. 3
Coating	Tin Coated Copper	Tin Coated Copper	Yes	QR-6802 P. 3
Insulation Thickness	.049"	.049"	Yes	QR-6802 P. 3
Number of conductors	1	1	Yes	QR-6802 P. 3
Arrangement of conductors	NA	NA	NA	NA
(b) Shielding	TC	TC	Yes	QR-6802 P. 3
(c) Insulation jacket				
Material	NA	NA	NA	NA
Thickness	NA	NA	NA	NA
(d) Outer jacket				
Material	KXL-200	KXL-200	Yes	QR-6802 P. 3
Thickness	.035"	.035"	Yes	QR-6802 P. 3

EQUIPMENT IDENTIFICATION (Continued)

Item	Plant	Report	Acceptable Yes/No/NA	Report Section
(e) Rated voltage	*	600 VAC	Yes	QR-6802
(f) Rated current	NA	NA	NA	NA
(g) Operating temperature rating				
Normal	48.9°C	65°C	Yes	QR-6802 P. 44
Emergency	NA	NA	NA	NA
Short circuit	NA	NA	NA	NA
(h) Insulation resistance	NA	$1x10^6$ Mohm -1000'	Yes	QR-6802 P. 83
(i) Splice				
Material	NA	NA	NA	NA
Thickness	NA	NA	NA	NA
Identification	NA	NA	NA	NA

Comments: *The operating voltage is specified in Binder WBNEQ-IRE-001 for the coaxial signal cable and is in the millivolt range.

(2) Does the qualification program adequately address temperature and moisture resistance (yes/no/NA)? Yes (Reference IEEE 383-1974 & QR-6802, PP. 39 & 59).

Comments:

(3) Was the cable energized during test (yes/no/NA)? Yes (Reference QR-6802, Section 6 & 7).

Comments:

BINDER NO. WBNEQ-CABL-061 PLANT WBN UNIT(S) 1 SHEET 30 OF 30

BINDER TITLE ROCKBESTOS/COAX-XLPE COMPUTED LAQ DATE 9/21/86 R R

INS./TVA TYPE COAX CHECKED FW DATE 9/21/86

EQUIPMENT IDENTIFICATION (Continued) Page 3 of 3

(4) Was the cable subjected to a voltage withstand test (yes/no/NA)? Yes (Reference QR-6802, P. 59).

Comments: Withstand voltage was 80 volts per mil for 1 minute.

(5) Was the cable subjected to an insulation resistance test (yes/no/NA)? Yes (Reference QR-6802, P. 59).

Comments:

(6) Was the cable subjected to a mandrel bend and voltage withstand test (yes/no/NA)? Yes (Reference QR-6802, P. 8).

Comments:

(7) Was the cable subjected to a flame test to demonstrate flame retardant characteristics (yes/no/NA)? Yes (Reference QR-6802, P. 14).

Identify flame test standard: IEEE 383-1974

Comments:

PRINT DATE: 09/21/86

BINDER NO. : WBNEQ-CABL-063
MANUFACTURER : OKONITE

W A T T S B A R N U C L E A R P L A N T
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NO.	UNIT DEV ID NO.	DESCR.	MODEL NO.	LOCATION COL/AZ.	LOCATION ELEV.	LOCATION ±RM	**CONTRACT	C A I.	OPER TIME	MITIGATING ACCIDENT	SAFETY FUNCTION
1-APL-031-4520-A	1PL4520-A	PXJ	WDO	VARIOUS	VARIOUS	0	N78K5-824443-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-APL-215-4982A-B	1PL4982-B	PXJ	WDO	VARIOUS	VARIOUS	0	78K5-824443-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-APL-215-4985-B	1PL4985-B	PXJ	WDO	VARIOUS	VARIOUS	0	78K5-824443-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-APL-215-4986-B	1PL4986-B	PXJ	WDO	VARIOUS	VARIOUS	0	78K5-824443-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
2-APL-031-4520-A	2PL4520-A	PXJ	WDO	VARIOUS	VARIOUS	0	78K5-824443-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
2-APL-215-4975-A	2PL4975-A	PXJ	WDO	VARIOUS	VARIOUS	0	78K5-824443-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
2-APL-215-4976-A	2PL4976-A	PXJ	WDO	VARIOUS	VARIOUS	0	78K5-824443-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
2-APL-215-4978-A	2PL4978-A	PXJ	WDO	VARIOUS	VARIOUS	0	N78K5-824443-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
2-APL-215-4979-A	2PL4979-A	PXJ	WDO	VARIOUS	VARIOUS	0	N78K5-824443-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
2-APL-215-4982-B	2PL4982-B	PXJ	WDO	VARIOUS	VARIOUS	0	78K5-824443-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
2-APL-215-4983-B	2PL4983-B	PXJ	WDO	VARIOUS	VARIOUS	0	78K5-824443-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR

* I=INSIDE, O=OUTSIDE PRIMARY CONTAINMENT
** CONTRACTS PREFIXED WITH "N" INDICATE UNVERIFIED CONTRACT AND CABLE DATA

		R____	R____	R____
PREPARER/DATE	Qw 9-21-86	_____	_____	_____
CHECKED/DATE	P.R. White 9/22/86	_____	_____	_____

PRINT DATE: 09/21/86

BINDER NO. : WBNEQ-CABL-063
MANUFACTURER : OKONITE

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NO.	UNIT DEV ID NO.	DESCR.	MODEL NO.	LOCATION COL/AZ.	LOCATION ELEV.	LOCATION ±RM	**CONTRACT	C A I	OPER TIME	MITIGATING ACCIDENT	SAFETY FUNCTION
1-BPL-070-4733-A	1PL4733-A	PXJ	WDN-1	VARIOUS	VARIOUS	0	79K5-825342-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-BPL-070-4734-A	1PL4734-A	PXJ	WDN-1	VARIOUS	VARIOUS	0	79K5-825342-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-BPL-215-49826-B	1PL4982-B	PXJ	WDO-1	VARIOUS	VARIOUS	0	N79K5-825342-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
2-BPL-031-44408-B	2PL4440-B	PXJ	WDO-1	VARIOUS	VARIOUS	0	N79K5-825342-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
2-BPL-070-4733-B	2PL4733-B	PXJ	WDN-1	VARIOUS	VARIOUS	0	79K5-825342-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
2-BPL-070-4734-B	2PL4734-B	PXJ	WDN-1	VARIOUS	VARIOUS	0	79K5-825342-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
2-BPL-215-4985-B	2PL4985-B	PXJ	WDO-1	VARIOUS	VARIOUS	0	N79K5-825342-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR
2-BPL-215-4986-B	2PL4986-B	PXJ	WDO-1	VARIOUS	VARIOUS	0	N79K5-825342-1	A	100 D	LOCA/HELB	CARRY VLTG/CURR

* I=INSIDE, O=OUTSIDE PRIMARY CONTAINMENT
** CONTRACTS PREFIXED WITH "N" INDICATE UNVERIFIED CONTRACT AND CABLE DATA

R____ R____ R____

PREPARER/DATE Dm 9.21.86 _____ _____ _____

CHECKED/DATE R.K. White 9/22/86 _____ _____ _____

BINDER NO. WBNEQ-CABL-063 PLANT WBN UNIT(S) 1 SHEET 1 OF 32

BINDER TITLE OKONITE/LOW VOLTAGE COMPUTED Qm DATE 9.9.86 R R

POWER & CONTROL-EPR INS/TVA TYPE PXJ CHECKED RKW DATE 9/10/86

A. DOCUMENTATION

Equipment Description 600V Power and Control Cables

Vendor/Manufacturer The Okonite Company

Equipment Model No.(s) TVA Type PXJ

TVA Contract Nos. 78K5-824443-01 &

79K5-825342-01

QUALIFICATION REPORTS

(1) Title/Number/Revision Nuclear Environmental Qualification Report for Okonite Insulated Cables, Report No. NQRN-1A, Revision 3 RIMS B71 860806 001 DATE Feb. 16, 1984

(2) Title/Number/Revision Not used; for future RIMS DATE

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(3) The Okonite Company letters dated January 4, 1985 and February 20, 1985 (RIMS EEB 850117 010 and EEB 850222 011 respectively) indicating applicable qualification reports for Okonite cables supplied under Contract # 78K5-824443-01 and 79K5-825342-01 (TAB E).

(4) The Okonite Company letter dated January 21, 1986 (RIMS B70 860127 004) indicating the test anomalies in Report NQRN-1A applicable to the subject cables (TAB E).

(5) TVA Calculation WAC-178 titled "Material Aging Calculation Report Transmittal", dated August 21, 1986 (TAB C).

(6) Analysis and calculations for qualification of cables of Binder WBNEQ-CABL-063 (TAB C).

Note: The above references are referred to throughout TAB B by their reference numbers, for example, Reference 3.

BINDER NO. WBNEQ-CABL-063 PLANT WBN UNIT(S) 1 SHEET 2 OF 32

BINDER TITLE OKONITE/LOW VOLTAGE COMPUTED [illegible] DATE 9.21.86 R ___ R ___

POWER & CONTROL-EPR INS/TVA TYPE PXJ CHECKED RKW DATE 9/22/86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES (1) Resolution of existing discrepancies between design and installation records for cables that are identified by an "N" prefixed contract number in TAB A. (2) Qualification confirmation for cables with ID Nos. 2PL4985-B and 2PL4986-B in view of their routing after being repulled. (3) Replace 1PL4982-B (825342-1) and 2PL4440-B per ECN 6625.

COMMENTS/RECOMMENDATIONS The subject cable is qualified for low voltage power and control circuits and for service conditions outside the containment. It has a qualified life of 40 years at 90°C conductor temperature and 100 days post-accident operating time. The detailed service conditions are listed in Section K of this tab.

BINDER NO. WBNEQ-CABL-063 PLANT WBN UNIT(S) 1 SHEET 3 OF 32

BINDER TITLE OKONITE/LOW VOLTAGE COMPUTED Ay DATE 9.9.86 R ___ R ___

POWER & CONTROL-EPR INS/TVA TYPE PXJ CHECKED RKW DATE 9/10/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

_____ Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

__X__ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS The subject cables were ordered under Contract numbers 78K5-824443-01, dated September 7, 1978, and 79K5-825342-01, dated July 27, 1979. These contract dates are before the cut-off date of May 23, 1980, for equipment to be qualfied by NUREG-0588 Category I.

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE: 383-1974

IEEE: 323-1974

D. QUALIFICATION METHODOLOGY (Check only one block)

____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS A 1/c, #12 AWG test sample with EPR insulation (brand name Okonite insulation) was tested for qualification (Reference 1, Section 1.4.1.1, Constructions A, and Reference 4, Section I(1)). It is considered a representative sample for qualifying low voltage, single conductor power and multiconductor control cables which have identical insulation material as that of the test sample (Reference 3; also see D in Section P). This is in compliance with IEEE 383-1974, Table 1 and therefore acceptable.

The subject cables being qualified are 1/c-400 MCM and 1/c-300 MCM (mark numbers WDO and WDN-1 respectively) with Okonite insulation and Okolon (hypalon) jacket materials (the insulation and jacket materials are identified in the certified test reports found with contract documents but not enclosed in this binder).

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No(1)

	Plant Device	Qualification Document	Reference
(1) Equipment Type	600V Cable	600V Cable	1, p3
(2) Manufacturer	Okonite	Okonite	1, p1
(3) Model Number(s)	(3) TVA Type PXJ	(2) Not stated	NA
(4) Serial Number(s)	NA	NA	
(5) Identify Component-Unique checksheet attached:	See Supplement 2		

JUSTIFICATION/COMMENTS (1) The subject cables are of sizes different than the test specimens, however the insulation material used in their manufacturing is chemically identical. See Supplement 2, page 30 for comparison between the supplied and the tested cables, and justification/comment in Section D.

(2) Test cables are not assigned with any specific model numbers by the manufacturer.

(3) TVA Type PXJ cable is a single conductor cable with flame retardant ethylene propylene rubber insulation and chlorosulfonated polyethylene or chlorinated-polyethylene jacket materials.

BINDER NO. WBNEQ-CABL-063 PLANT WBN UNIT(S) 1 SHEET 6 OF 32

BINDER TITLE OKONITE/LOW VOLTAGE COMPUTED Qu DATE 9.9.86 R ___ R ___

POWER & CONTROL-EPR INS/TVA TYPE PXJ CHECKED RKW DATE 9/10/86

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA		
External Process Connections	NA		
Electrical Connections	NA		
Conduit Seals	NA		
Connector Seals	NA		
Orientation	NA		
Physical Configuration	NA		
Other			

JUSTIFICATION/COMMENTS The cable interfaces are not considered for cable qualification.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	1, Sect 1.4.1.5
(b) Baseline performance measurements taken	Yes	1, Sect 1.4.1.5
(c) Equipment aged:		
Thermal	Yes	1, Sect 1.4.1.5
Radiation	Yes	1, Sect 1.4.1.5
Wear	NA	See p 14
(d) Vibration/seismic testing conducted	NA	See p 14
(e) Design basis event (DBE) exposure	Yes	1, Sect 1.4.1.5
(f) Post-DBE exposure	Yes	1, Sect 1.4.1.5
(g) Final inspection and disassembly	Yes	1, Sect 1.4.1.5

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes
(Reference 1, Appendix 5

JUSTIFICATION/COMMENTS The reference 1, Appendix 5 lists only the test equipment used during qualification testing. Per Okonite, the test equipment calibrations are certified on a yearly basis and it is done to a tolerance and accuracy requirement set forth by Okonite. The complete data is available at Okonite for audit.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference 1, Section 1.4.1.3).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	1, Sect 1.4.1.3
Radiation exposure	Yes	1, Sect 1.4.1.3
Vibration (non-seismic) aging	NA	See Comment on p 14
Operational (electrical/mechanical/process) stress aging	NA	See Comment on p 14

JUSTIFICATION/COMMENTS

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? No (Reference

JUSTIFICATION/COMMENTS Cable being qualified to NUREG-0588

Category II (see Justification/Comment in Section C).

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference 1, Sect 1.4.1.3

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: 1, Section 1.4.1.1, Construction A).

JUSTIFICATION/COMMENTS The cable insulation material is considered susceptible to thermal degradation which may affect the cable performance. The cable tested was with ethylene propylene rubber (brand name Okonite) insulation.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference 1, Appendix 2, p 3).

JUSTIFICATION/COMMENTS The cable insulation was thermally aged for a time to 40% retention of elongation property.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference 1, Sect 1.4.1.3).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	40°C (104°F)	150°C	90°C
Time	40 years	504 hrs	40 years

JUSTIFICATION/COMMENTS See Reference 6, Paragraph 1.2.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference 1, Appendix 2 , p 3).

JUSTIFICATION/COMMENTS See Reference 6, Paragraph 1.2.

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? NA (Reference ____

JUSTIFICATION/COMMENTS Regression time methodology was employed.

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes (Reference 1, Appendix 2, p 6).

JUSTIFICATION/COMMENTS The accelerated aging parameters determined for developing the regression line for the insulation material were based on 40% retention of insulation elongation property.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference

JUSTIFICATION/COMMENTS The qualified life for the cable is calculated considering the expected conductor temperature at its rated current or at operating load current. Therefore, energization of the test sample during accelerated thermal aging is not required.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference 1, Sect 1.4.1.3)

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference 1, Sect 1.4.1.1, "Construction A"

JUSTIFICATION/COMMENTS Test program was based on IEEE: 383-1974 which implicitly considers insulation material as susceptible to radiation.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? No (Reference

JUSTIFICATION/COMMENTS The test specimen was tested for electrical characteristics before and after the irradiation test. (Reference 1, Sect 1.4.1.5). This is considered as an acceptable basis for ascertaining the retention of cable insulation property on radiation aging.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference 1, Appendix 3 - "Construction A").

Plant normal ambient radiation dose (rd) 19×10^6

Test exposure dose (rd) 200×10^6

Test exposure dose rate (rd/hr) $0.67 - 0.75 \times 10^6$

Test exposure source type (e.g., Co-60 gamma) Co - 60 gamma

JUSTIFICATION/COMMENTS The worst case 40 years plant normal maximum ambient dose for the subject cables is postulated in the spent resin storage tank valve gallery A16 at elevation 692' (Reference 6, Paragraph 2.1).

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? NA (Reference).

JUSTIFICATION/COMMENTS See p 14

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? NA (Reference).

JUSTIFICATION/COMMENTS See p 14

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? NA
(Reference _____).

JUSTIFICATION/COMMENTS See p 14

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? NA (Reference _____).

JUSTIFICATION/COMMENTS See p 14

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes
(Reference _____).

Qualified life (Document in QMDS) 40 years at 90°C conductor temperature.

JUSTIFICATION/COMMENTS See Reference 6, Paragraph 1.2.

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? NA
(Reference _____
_____).

Replacement Intervals (Document in QMDS) _____

JUSTIFICATION/COMMENTS The subject cables are qualified for the design life of the plant and therefore no replacement interval is established or recommended.

GENERIC COMMENT FOR VIBRATION, WEAR AND OPERATIONAL STRESS AGING IN SECTIONS G(1)(c), G(1)(d), H(2), H(6) and H(7)

Normal Service Related Stresses- In accordance with paragraph 1.3.4.1 of IEEE 383-1974, "The cable, as installed, should be suitable for operation at maximum ambient temperature, radiation, and atmospheric conditions and normal electrical and physical stresses for its installed life as specified. Evidence of this suitability may be based on compliance with appropriate published industry standards..." Paragraph 2.3.1 of that same document further states, "Evidence of qualification for normal operation may be demonstrated by providing certified evidence that the cable has been manufactured and tested and passed in accordance with the provisions of one or more of the following industry standards or criteria." Included in the list that follows the above quote is the standard to which TVA purchased the cables addressed in this binder: IPCEA S-68-516, Interim Standards for Ethylene-Propylene-Rubber-Insulated Wire and Cable. Number 1, Cables Rated 0-35000V. Number 2, Cables Rated 2000V, Integral Insulation and Jacket.

As part of the contract specifications, TVA includes this standard as a requirement for manufacturing and testing the cable supplied. Based on the above, it is concluded that the cables are qualified for normal duty vibration, wear and operational stresses.

GENERIC COMMENT FOR SEISMIC SECTION G(1)(d)

Seismic events are natural phenomena which are not considered in 10CFR50.49. Specific seismic testing on the cables was not performed; however, upon completion of the LOCA simulation, the cable samples were subjected to a mandrel rebend test and an in-water hipot test. IEEE 383-1974, Paragraph 2.4.4, regards that the performance of this test demonstrates that the cables have retained considerable mechanical durability and would be more severe even than the application of two cycles of the environment. The retention of a high degree of flexibility at the end of life (plus an accident) demonstrates the cables ability to withstand significant mechanical stresses.

BINDER NO. WBNEQ-CABL-063 PLANT WBN UNIT(S) 1 SHEET 15 OF 32

BINDER TITLE OKONITE/LOW VOLTAGE COMPUTED Qy DATE 9.9.86 R ___ R ___

POWER & CONTROL-EPR INS/TVA TYPE PXJ CHECKED RKW DATE 9/10/86

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Ethylene Propylene Rubber (brand name Okonite insulation)	NA	NA	1.07	5&6, Para 1.1
(b)					
(c)					
(d)					

JUSTIFICATION/COMMENTS

TVA 19537 (OE-3-86)

EQP224.21

BINDER NO. WBNEQ-CABL-063 PLANT WBN UNIT(S) 1 SHEET 16 OF 32

BINDER TITLE OKONITE/LOW VOLTAGE COMPUTED Qu DATE 9.9.86 R ___ R ___

POWER & CONTROL-EPR INS/TVA CHECKED Rcw DATE 9/10/86
TYPE PXJ

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference 1, Sect 1.4.1.4 and 1.4.2.4)

Identify Acceptance Criteria: No specific limiting values of performance characteristics were identified. The test sample was monitored to maintain 600V, 18A load during LOCA testing and was required to withstand bend test and high-pot test post-LOCA testing.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference 1, Sect 1.4.1.4 & 1.4.1.5 (a), (e) & (j), through (o)).

Identify baseline and functional testing: As a baseline and functional testing the test sample was tested for capacitance, %PF & IR values.

JUSTIFICATION/COMMENTS See J(1) above for cable performance characteristics tested during LOCA and post-LOCA.

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference 1, Sect 1.4.2.4 "Construction A").

JUSTIFICATION/COMMENTS The test sample was connected to 600VAC, 18 amp load all throughout the LOCA testing.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? Yes (Reference 1, Section 1.4.1.6).

JUSTIFICATION/COMMENTS

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	480V	See Comment 1
Load	45A	See Comment 2
Frequency	NA	-
Accuracy	NA	-
Other(s)		

JUSTIFICATION/COMMENTS (1) The subject cables are for low voltage power and control circuits. At Watts Bar, a nominal system low-voltage is 480VAC or less (A.C. or D.C. in case of the control circuits) with a 600V grade insulation.

(2) As a worst case 1/c, #12 AWG EPR cable is considered to be loaded to its rated ampacity of 45A in free air based on ambient air temperature of 40°C and conductor temperature of 90°C. The above cable ampacity is per NEC-1984.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5) (b)

Parameter	Demonstrated Conditions	Reference
Voltage	600V	1, Sect 1.4.2.4
Load	18A	"Construction A"
Frequency	NA	
Accuracy	NA	
Other(s)		

JUSTIFICATION/COMMENTS Although the test cable was loaded to 18A during DBE testing as against 45A indicated in Section J(a) above, the test cable insulation was shown to withstand 100°C temperature for 126 days of post-DBE testing and this is well above the 90°C rated design value for cable and 100 days post-DBE operating time requirement. Also, see Reference 6, Paragraph 4.2.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. For K(1) & (2) Dwg No. 47E235-40 and for radiation Reference 6, Paragraph 2.1. For K(5) Dwg No. 47E235-74 and for Radiation Reference 6, Paragraph 2.2.

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psia) 14.4

(c) Humidity (%) 80

(d) Radiation (rd) 19×10^6

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psia) 14.4

(c) Humidity (%) 90

(d) Radiation (rd) --

(3) Process Interfaces: Not applicable in case of cable qualification.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Up to eight hours per excursion and will occur less than 1% of the life of the plant.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	218	Accident type	HELB
(b) Pressure (psia)	15.90	Accident type	HELB (RHR)
(c) Humidity (%)	100%	Accident type	HELB
(d) Radiation (rd)	10×10^6 gamma	Accident type	LOCA
(e) Spray Type	NA	Accident type	See Comment

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

Since all subject cables are routed outside containment, an environment with a chemical spray is not postulated.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? No (Reference See K(6) in Sect P).

(7) Subject to submergence (yes/no/NA)? No
(Reference QIR WBNEEB86037

Identify initiation time and duration of submergence: NA; all the subject cables are routed in those areas of the auxiliary building where they are not subject to submergence

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
NA	

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 days	126 days	1, Appx 1, Fig 1
Temperature (°F)	216	345	1, Appx 1, Fig 1
Pressure (psia)	15.9	128.7	1, Appx 1, Fig 1
Relative Humidity (%)	100	100	1, Sect 1.4.2.3
*Chemical Spray	NA(1)	Chemical	1, Sect 1.4.2.3
**Radiation (rd)	19×10^6 (2) (gamma)	200×10^6	1, Sect 1.4.2.3
Submergence	NA	NA	See Sect K(7)

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	6, Para 4.1
Pressure	Yes	1, Appx 1, Fig 1
Relative Humidity	Yes	1, Sect 1.4.2.3
Chemical Spray	NA	See Comment for Sect K(5)
Submergence	NA	See Sect K(7)

JUSTIFICATION/COMMENTS (1) See comment for Section K(5)

(2) See Reference 6, Paragraph 2.1.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	> +15	Yes
Pressure: +10% but no more than 10 psig	> +10%	Yes
Radiation: +10% of accident dose	> 10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	> 10%	Yes
Voltage: ±10% of rated value	>+10%(1)	Yes
Frequency: ±5% of rated value	NA	NA
Environmental Transient: the initial transient and the peak temperature applied twice	Yes	Yes
Vibration: +10% added to acceleration	NA	NA

JUSTIFICATION/COMMENTS: (1) The test cable was connected to 600VAC that corresponds to the cable insulation rating. These cables are used up to a nominal system voltage of 480 VAC. Thus the test was performed at voltage 25% above nominal.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference _____).

JUSTIFICATION/COMMENTS Electrical connections for the Class 1E power and control circuits rated for 480V or less. Cables must maintain circuit integrity during and after a LOCA/HELB condition.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference 1, Sect 1.4.1.6, Construction A and 1.4.2.4).

JUSTIFICATION/COMMENTS The test cable remained energized at 600VAC and 18A load current.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes

(Reference 1, Sect 1.4.1.6 and Appendix A, Figure 1).

JUSTIFICATION/COMMENTS The test cable passed 30 days and 130 days post-LOCA bend test and high-pot test.

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference 1, Section 1.4.3.2 and Appendix 1, Figure 1).

JUSTIFICATION/COMMENTS The test cable was tested for 126 days post-LOCA/HELB operating time. See also Reference 6, Paragraph 4.2.

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference 4, Section I(2)).

JUSTIFICATION/COMMENTS There are two test anomalies which are addressed in Reference 4, Section I(2). Therein, the first anomaly referred to in Report NQRN-1A, Section 1.4.3.1 (Reference 1) is about the rate of temperature rise at the start of a transient condition. This anomaly is not applicable for the subject cables since the postulated profile for the subject cables is shown to have been enveloped by the test porfile all along its duration (See Reference 6, Paragraph 4.1).
The second anomaly is in fact an additional conservatism in the simulated accident testing.

BINDER NO. WBNEQ-CABL-063 PLANT WBN UNIT(S) 1 SHEET 25 OF 32

BINDER TITLE OKONITE/LOW VOLTAGE COMPUTED Qy. DATE 9.9.86 R ___ R ___

POWER & CONTROL-EPR INS/TVA CHECKED RKW DATE 9/10/86

TYPE PXJ

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? NA (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS No surveillance or maintenance requirements have been identified by the vendor or on review of the qualification document. However, TVA has an in-house maintenance and surveillance program for cables; See TAB G.

BINDER NO. WBNEQ-CABL-063 PLANT WBN UNIT(S) 1 SHEET 26 OF 32

BINDER TITLE OKONITE/LOW VOLTAGE COMPUTED [illegible] DATE 9.9.86 R ___ R ___

POWER & CONTROL-EPR INS/TVA TYPE PXJ CHECKED RZW DATE 9/10/86

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	NA
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	Yes

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	NA; See Comment for Sect K(5)
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA
(11) Criteria regarding submergence satisfied?	NA; See Comment for Sect K(7)
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	NA, See O(12)(b) in Sect P
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	NA; See Comment for Sect H(3)
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	NA; See Comment for Sect N

P. DISCUSSION

D: There is a typo error in the contract number typed on page 2 of Okonite letter dated February 20, 1986, in reference 3. The contract number 79K5-825342-4 shall be 79K5-825342-1, as typed under "Reference" on page 1 of the same letter. Further there is no TVA contract numbered 79K5-825342-4.

P. DISCUSSION (continued)

K(6): The IEEE:383-1974 Section 2.3.4 indicates that cables is shown to comply with IPCEA S-68-516 requirements are considered to have met with moisture resistance requirement during normal operation. Since TVA specification requires the supplied cables to be manufactured to the above referred industry standard, they are considered to have resistance to moisture intrusion.

In addition to the above justification, test sample was tested to withstand 600 volts, 18A load under the simulated accident condition of 100% relative humidity, elevated temperature and pressure and chemical spray.

O(12)(b): All the subject cables are routed outside containment where beta radiation is not postulated.

SUPPLEMENT 2
COMPONENT-UNIQUE CHECKLIST
CABLES/SPLICES

EQUIPMENT IDENTIFICATION

(1) Are the cables (splices) identified in the qualification program identical to the plant cables (splices) which require qualification (yes/no/NA)? No

Item	Plant(1)	Report	Acceptable Yes/No/NA	Report Section
(a) Conductor				
Insulation material	EPR	EPR	Yes	1, Sect 1.4.1.1
Size	300 & 400 MCM	#12	Yes	1, Sect 1.4.1.1
Stranding	Class B	7 strands	Yes	1, Sect 1.4.1.1
Coating	-	-	NA	-
Insulation Thickness	0.065"	0.030"	Yes	1, Sect 1.4.1.1, Const A
Number of conductors	1/c	1/c	Yes	4, Sect I(1)
Arrangement of conductors	NA	NA	NA	-
(b) Shielding	NA	NA	NA	-
(c) Insulation jacket				
Material	None	None	NA	-
Thickness	NA	NA	NA	-
(d) Outer jacket				
Material	Okolon (Hypalon)	None	Yes	1, Sect 1.4.1.1 Const A
Thickness	0.08"	NA	Yes	-

EQUIPMENT IDENTIFICATION (Continued)

Item	Plant	Report	Acceptable Yes/No/NA	Report Section
(e) Rated voltage	600V	600V	Yes	1, Sect 1.4.1.4 Const A
(f) Rated current	NA	18A	Yes	1, Sect 1.4.2.4 Const A
(g) Operating temperature rating				
Normal	90°C	90°C	Yes	1, Appx 2
Emergency	NA	NA	NA	-
Short circuit	NA	NA	NA	-
(h) Insulation resistance	NA	NA	NA	-
(i) Splice				
Material	NA	NA	NA	-
Thickness	NA	NA	NA	-
Identification	NA	NA	NA	-

Comments: (1) The information listed under "plant" is taken from the contracts and from routine test reports for the cables.

(2) Does the qualification program adequately address temperature and moisture resistance (yes/no/NA)? Yes (Reference 1, Sect 1.4.2.3).

Comments: The test cable was subjected to peak temperature, pressure and 100% RH during LOCA exposure. In addition to this, by a separate test, as given in Appendix 6, Table 1, a 1/c, #14 AWG EPR insulated (brand name Okonite insulation) test sample was shown to have long term moisture stability. Also, see K(6) in Section P.

(3) Was the cable energized during test (yes/no/NA)? Yes (Reference 1, Sect 1.4.1.6, Construction A).

EQUIPMENT IDENTIFICATION (Continued)

(4) Was the cable subjected to a voltage withstand test (yes/no/NA)? Yes (Reference 1, Sect 1.4.1.6, Construction A, (b)).

Comments: In addition to voltage withstand test at 80V/mil insulation thickness, the test cable was tested for AC dielectric breakdown test that was found to be greater than 16 times rated voltage (Reference 1, Section 1.4.1.6, (c), (4) and Section 1.4.4.1).

(5) Was the cable subjected to an insulation resistance test (yes/no/NA)? Yes (Reference 1, Sect 1.4.1.5 (j) and (l) and Appendix 1, Figure 1)).

Comments: The check marks (x) on the test profile in Reference 1, Appendix 1, indicate when IR measurements were taken.

(6) Was the cable subjected to a mandrel bend and voltage withstand test (yes/no/NA)? Yes (Reference 1, Sect 1.4.1.6, Construction A).

Comments: Also refer comment to Section 4 above).

(7) Was the cable subjected to a flame test to demonstrate flame retardant characteristics (yes/no/NA)? Yes (Reference 1, Appx 7).

Identify flame test standard: _____

Comments: IEEE: 383-1974

PRINT DATE: 09/21/86

BINDER NO. : WBNEQ-CABL-064
MANUFACTURER : COLLYER

WATTS BAR NUCLEAR PLANT
TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NO.	UNIT DEV ID NO.	DESCR.	MODEL NO.	LOCATION COL/AZ.	LOCATION ELEV.	LOCATION *RM	**CONTRACT	C A I.	OPER TIME	MITIGATING ACCIDENT	SAFETY FUNCTION
1-APP-067-0700-B	1PP 700-B	EPSJ	WNB-1	VARIOUS	VARIOUS	O	N77K5-822173-3	A	100 D	LOCA/HELB	CARRY VLTG/CURR
1-APP-067-0712-B	1PP 712-B	EPSJ	WNB-1	VARIOUS	VARIOUS	O	N77K5-822173-3	A	100 D	LOCA/HELB	CARRY VLTG/CURR

* I=INSIDE, O=OUTSIDE PRIMARY CONTAINMENT
** CONTRACTS PREFIXED WITH "N" INDICATE UNVERIFIED CONTRACT AND CABLE DATA

	R____	R____	R____
PREPARER/DATE Qm 9.21.86	_____	_____	_____
CHECKED/DATE R.K. White 9/22/86	_____	_____	_____

BINDER NO. WBNEQ-CABL-064 PLANT WBN UNIT(S) 1 SHEET 1 OF 32

BINDER TITLE COLLYER/MEDIUM COMPUTED Qm DATE 9.19.86 R R

VOLTAGE POWER - EPR INS/TVA TYPE EPSJ CHECKED RW DATE 9/22/86

A. DOCUMENTATION

Equipment Description 8kV Power Cables

Vendor/Manufacturer Collyer Insulated Wire Company (Collyer)

Equipment Model No.(s) TVA Type EPSJ

TVA Contract No. 77K5-822173-3

QUALIFICATION REPORTS

(1) Title/Number/Revision Nuclear Environmental Qualification Test Program on Various Cables Used Outside Containment (Profile 3) for TVA for Use in Sequoyah and Watts Bar Nuclear Generating Station; Report No. 17732-1, Revision C RIMS B70 860228 100 DATE February 24, 1986

(2) Title/Number/Revision Not Used; for future RIMS DATE

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(3) TVA Calculation WAC-208 titled "Material Aging Calculation Report Transmittal," dated September 17, 1986, (TAB C).

(4) Analysis & Calculations for Qualification of Cables of Binder WBNEQ-CABL-064 (TAB C)

(5) IEEE 383 Flame Test (TAB E)

NOTE: The above references are referred to throughout this TAB by their reference numbers; for example, Reference 3.

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

_____ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

_____ Equipment Qualification Not Established by Documentation

_____ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES (1) On issuance of the official CACTAT, it shall be confirmed that the conductor temperature for all subject cables is less than 60°C qualified value. (2) Resolution of existing discrepancies between design and installation records for cables denoted by and "N" prefixed contract number in TAB A.

COMMENTS/RECOMMENDATIONS The subject cable is qualified for 6900V power circuit and for service conditions outside the containment. It has a qualified life of 40 years at 60°C conductor temperature and 100 days post-accident operating time. Referring to the CACTAT, it is determined that the worst-case conductor temperature for the cable is 50.9°C and thus below the qualified limit (see reference 4, paragraph 3.0). The detailed service conditions are listed in Section K of this tab.

BINDER NO. WBNEQ-CABL-064 PLANT WBN UNIT(S) 1 SHEET 3 OF 32

BINDER TITLE COLLYER/MEDIUM COMPUTED Qm DATE 9.19.86 R ___ R ___

VOLTAGE POWER - EPR INS/TVA TYPE EPSJ CHECKED RKW DATE 9/22/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

___ Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

X Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS The subject cables were ordered under Contract number 77K5-822173-3, dated August 1, 1977. This contract date is before the cut-off date of May 23, 1980, for equipment to be qualified by NUREG-0588 Category I.

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE: 323-1974

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R R

BINDER TITLE COLLYER/MEDIUM COMPUTED Dy DATE 9.19.86

VOLTAGE POWER - EPR INS/TVA CHECKED RKW DATE 9/22/86

TYPE EPSJ

D. QUALIFICATION METHODOLOGY (Check only one block)

_____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

_____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

_____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS An 8kV, 1/c-500 MCM (mark No. WNF-1), EPR insulated (Type EPSJ) cable was tested for qualification (Reference 1, page No. xii, Specimen No. 34). This cable is considered as a representative sample for qualifying the 8kV, 1/c-2/0 AWG (mark No. WNB-1), EPR insulated (Type EPSJ) cables listed in the Tab A of this binder. The test cable and the subject cables were both manufactured by Collyer and purchased under the TVA contract 77K5-822173-3 Reference 1, page I-3, Specimen No. 34 and reference 4, paragraph 1.0). This is in compliance with IEEE: 383-1974, Table 1 and therefore acceptable.

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No(1)

	Plant Device	Qualification Document	Reference
(1) Equipment Type	6900V Cable	6900V Cable	1, p I-3
(2) Manufacturer	Collyer	Collyer	1, p I-3
(3) Model Number(s)	(2) TVA Type EPSJ	(2) TVA Type EPSJ	1, p 1-3
(4) Serial Number(s)	NA	NA	
(5) Identify Component-Unique checksheet attached:	See Supplement 2		

JUSTIFICATION/COMMENTS (1) The subject cable is of size different than the test specimen; however, both cables were purchased under the same TVA contract and the insulation material used in their manufacturing is chemically identical. See Supplement 2, page 30 for comparison between the supplied and the tested cables, and justification/comment in Section D.

(2) TVA Type EPSJ cable is a single-conductor, high voltage cable with extruded strand shield, ethylene-propylene rubber insulation or flame-retardant, nonchlorinated, mineral filled, cross-linked polyethylene insulation, with extruded insulation shield, with metallic electrostatic shielding and a chlorosulfonated polyethylene or chlorinated-polyethylene jacket materials.

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F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA		
External Process Connections	NA		
Electrical Connections	NA		
Conduit Seals	NA		
Connector Seals	NA		
Orientation	NA		
Physical Configuration	NA		
Other			

JUSTIFICATION/COMMENTS The cable interfaces are not considered for cable qualification.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	1, p I-1, Sect 2.1
(b) Baseline performance measurements taken	Yes	1, p I-5, Sect 2.3
(c) Equipment aged:		
Thermal	Yes	1, p IV-1 Sect 1.1 & 1.2
Radiation	Yes	1, p II-1, Sect 2.0
Wear	NA	See p 14
(d) Vibration/seismic testing conducted	NA	See p 14
(e) Design basis event (DBE) exposure	Yes	1, p V-3, Sect 2.4 & 2.5
(f) Post-DBE exposure	Yes	1, p V-3, Sect 2.4 & 2.5
(g) Final inspection and disassembly	Yes	1, p VIII-1 Sect 2.0

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes
(Reference 1, p xiii, Section 8.0).

JUSTIFICATION/COMMENTS

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference 1, pp. II-1 & IV-1).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	1, p IV-1, Sect 1.1 & 1.2
Radiation exposure	Yes	1, p II-1, Sect 2.0
Vibration (non-seismic) aging	NA	See Comment on p 14
Operational (electrical/mechanical/process) stress aging	NA	See Comment on p 14

JUSTIFICATION/COMMENTS

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? No (Reference).

JUSTIFICATION/COMMENTS Cable being qualified to NUREG-0588

Category II (see Justification/Comment in Section C).

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference 1, p IV-1, Section 1.1 & 1.2).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference 1, p VII-17, Sect. 3.3.2 & 3.3.3).

JUSTIFICATION/COMMENTS The cable insulation material is considered susceptible to thermal degradation which may affect the cable performance. The cable tested was with ethylene propylene rubber insulation.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference 1, p VII-16, Sect 3.3.1).

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference 1, pp IV-1 & 2, Sect 1.1 & 1.2; p VII-17, Sect 3.3.4).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	40°C (104°F)	90, 100 & 120°C	60°C
Time	40 years	100, 114 & 928 hrs	40 years

JUSTIFICATION/COMMENTS The specimen 34B was thermally aged at the above test temperatures and durations (in the given order) for an equivalent life of 40 years at 60°C conductor temperature. (See also references 3 and 4, paragraph 3.0).

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference 1, p VII-36).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference 1, p VII-17, Sect. 3.3.2; p VII-25, Table 1 & p VII-31, Table 2).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA) NA (Reference _____).

JUSTIFICATION/COMMENTS The activation energy and the Arrhenius methodology was employed.

(h) Was the equipment operated during the thermal aging (yes/no/NA) No (Reference 1, VII-17, Sect. 3.3.4).

JUSTIFICATION/COMMENTS Since the accelerated aging time for the specimen was based on the conductor temperature (ambient plus heat-rise), the energization of the test sample during accelerated thermal aging was not required.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA) Yes (Reference 1, p II-1, Sect 2.0).

JUSTIFICATION/COMMENTS _____

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA) Yes (Reference 1, p VII-29).

JUSTIFICATION/COMMENTS Test program was based on IEEE: 383-1974 which implicitly considers insulation material as susceptible to radiation.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA) Yes (Reference 1, p VII-15, Sect. 3.2).

JUSTIFICATION/COMMENTS The insulation material was irradiated to a dose which was greater than its threshold value. Retention of the cable insulation property on radiation aging was ascertained by testing the specimens for insulation resistance before and after the irradiation aging (Reference 1, pp VII-9, I-5, and III-1).

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference 1, p II-2, Sect 2.0).

Plant normal ambient radiation dose (rd) 19×10^6

Test exposure dose (rd) 75×10^6

Test exposure dose rate (rd/hr) 0.234×10^6

Test exposure source type (e.g., Co-60 gamma) Co - 60 gamma

JUSTIFICATION/COMMENTS The worst case 40 years plant normal maximum ambient dose for the subject cables is postulated in the spent resin storage tank valve gallery A16 at elevation 692' (Reference 4, Paragraph 2.0).

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? NA (Reference).

JUSTIFICATION/COMMENTS See p 14

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? NA (Reference).

JUSTIFICATION/COMMENTS See p 14

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? NA
(Reference _____).

JUSTIFICATION/COMMENTS See p 14

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? NA (Reference _____).

JUSTIFICATION/COMMENTS See p 14

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes
(Reference 1, VII-16, Sect 3.3).

Qualified life (Document in QMDS) 40 years at 60°C conductor temperature.

JUSTIFICATION/COMMENTS The qualified life of 40 years at 60°C conductor temperature is considered acceptable based on the fact that per CACTAT the worst-case conductor temperature calculated for the subject cables is found to be 50.9°C (reference 4, paragraph 3.0).

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? NA
(Reference _____
_____).

Replacement Intervals (Document in QMDS) _____

JUSTIFICATION/COMMENTS The subject cables are qualified for the design life of the plant and therefore no replacement interval is established or recommended.

GENERIC COMMENT FOR VIBRATION, WEAR AND OPERATIONAL STRESS AGING IN SECTIONS G(1)(c), G(1)(d), H(2), H(6) and H(7)

Normal Service Related Stresses- In accordance with paragraph 1.3.4.1 of IEEE 383-1974, "The cable, as installed, should be suitable for operation at maximum ambient temperature, radiation, and atmospheric conditions and normal electrical and physical stresses for its installed life as specified. Evidence of this suitability may be based on compliance with appropriate published industry standards..." Paragraph 2.3.1 of that same document further states, "Evidence of qualification for normal operation may be demonstrated by providing certified evidence that the cable has been manufactured and tested and passed in accordance with the provisions of one or more of the following industry standards or criteria." Included in the list that follows the above quote is the standard to which TVA purchased the cables addressed in this binder: IPCEA S-68-516, Interim Standards for Ethylene-Propylene-Rubber-Insulated Wire and Cable. Number 1, Cables Rated 0-35000V. Number 2, Cables Rated 2000V, Integral Insulation and Jacket.

As part of the contract specifications, TVA includes this standard as a requirement for manufacturing and testing the cable supplied. Based on the above, it is concluded that the cables are qualified for normal duty vibration, wear and operational stresses.

GENERIC COMMENT FOR SEISMIC SECTION G(1)(d)

Seismic events are natural phenomena which are not considered in 10CFR50.49. Specific seismic testing on the cables was not performed; however, upon completion of the LOCA simulation, the cable samples were subjected to a mandrel rebend test and an in-water hipot test. IEEE 383-1974, Paragraph 2.4.4, regards that the performance of this test demonstrates that the cables have retained considerable mechanical durability and would be more severe even than the application of two cycles of the environment. The retention of a high degree of flexibility at the end of life (plus an accident) demonstrates the cables ability to withstand significant mechanical stresses.

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I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Ethylene Propylene Rubber	1×10^6	1, p VII -29	1.11	1, p VII -29
(b)					
(c)					
(d)					

JUSTIFICATION/COMMENTS

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference 1, pp VII-11, Sect 2.2.2; V-3, Sect 2.5 and V-4, Sect 2.5.3).

Identify Acceptance Criteria: No specific limiting values of performance characteristics were identified. The specimen was monitored to maintain 7590V, 18A load for the initial 26.4 hours of the LOCA test and thereafter periodically during the post-LOCA test.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference 1, pp VII-9, Sect 1.4; V-3, Sect 2.5 and V-36).

Identify baseline and functional testing: The insulation resistance as a baseline test and monitoring of leakage current when the specimen was energized to the specified voltage and load current during the LOCA & post-LOCA test.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference 1, pp V-3, Sect 2.5 and V-4, Sect 2.5.3).

JUSTIFICATION/COMMENTS The test sample was connected to 7590VAC, 18 amp load for the initial 26.4 hours of the LOCA test and thereafter periodically during the post-LOCA test.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? No (Reference 1, pp I-1, Sect 1.3; VII-9, Sect 1.4).

JUSTIFICATION/COMMENTS The specimen's insulation resistance was tested as a baseline test. The IR test was also repeated after radiation aging, thermal aging and the accident simulation.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	6900V	See Comment 1
Load	NA	-
Frequency	NA	-
Accuracy	NA	-
Other(s)		

JUSTIFICATION/COMMENTS (1) The subject cables are for medium voltage power circuits. At Watts Bar, a nominal system medium-voltage is 6900VAC with an 8kV grade insulation.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5) (b)

Parameter	Demonstrated Conditions	Reference
Voltage	7590V	1, pp V-3, Sect 2.5 & V-4, Sect 2.53
Load	18A	
Frequency	NA	
Accuracy	NA	
Other(s)		

JUSTIFICATION/COMMENTS The specimen was energized for initial 26.4 hours of accident simulation. During post-DBE testing, the specimen was subjected to 80°C temperature for 295 hours, which is equivalent to 60°C conductor temperature and 100 days of post-DBE operating time; a limiting value set for this cable qualification (see reference 4, paragraph 4.0).

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. For K(1) & (2) Dwg No. 47E235-40 and for Radiation Reference 4, Paragraph 2.1. For K(5) Dwg No. 47E235-74 and for Radiation Reference 4, Paragraph 2.2.

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psia) 14.4

(c) Humidity (%) 80

(d) Radiation (rd) 19×10^6

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psia) 14.4

(c) Humidity (%) 90

(d) Radiation (rd) --

(3) Process Interfaces: Not applicable in case of cable qualification.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Up to eight hours per excursion and will occur less than 1% of the life of the plant.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	218	Accident type	HELB
(b) Pressure (psia)	15.90	Accident type	HELB (RHR)
(c) Humidity (%)	100	Accident type	HELB
(d) Radiation (rd)	10×10^6 gamma	Accident type	LOCA
(e) Spray Type	NA	Accident type	See Comment

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

Since all subject cables are routed outside containment, an environment with a chemical spray is not postulated.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? No (Reference See K(6) in Sect P).

(7) Subject to submergence (yes/no/NA)? No
(Reference QIR WBNEEB86037).

Identify initiation time and duration of submergence: NA; all the subject cables are routed in those areas of the auxiliary building where they are not subject to submergence.

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
NA	

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 days	110 days	4, paragraph 4.2
Temperature (^{o}F)	218	240	1, p V-46
Pressure (psia)	15.9	16.6	1, p V-46
Relative Humidity (%)	100	100	1, p V-46
*Chemical Spray	NA(1)	NA(1)	-
**Radiation (rd)	$19x10^6$ (2) (gamma)	$75x10^6$	1, p II-1, Sect 2.0
Submergence	NA	NA	See Sect K(7)

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	1, p V-46
Pressure	Yes	1, p V-46
Relative Humidity	Yes	1, p V-46
Chemical Spray	NA	See Comment for Sect K(5)
Submergence	NA	See Sect K(7)

JUSTIFICATION/COMMENTS (1) See comment for Section K(5)

(2) See Reference 4, Paragraph 2.1.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	+15	Yes
Pressure: +10% but no more than 10 psig	4.4%	Yes(1)
Radiation: +10% of accident dose	10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	+10%	Yes
Voltage: ±10% of rated value	+10%(2)	Yes
Frequency: ±5% of rated value	NA	NA
Environmental Transient: the initial transient and the peak temperature applied twice	No	NA
Vibration: +10% added to acceleration	NA	NA

JUSTIFICATION/COMMENTS: (1) The environment pressure is not considered to have any impact on cable performance characteristics. However, per reference 1, p V-46, for a short duration (10 seconds) the specimen was subjected to a pressure up to 21.7 psia.

(2) The test cable was connected to 7590VAC. These cables are used up to a nominal system voltage of 6900VAC. Thus the test was performed at voltage 10% above nominal.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference _____).

JUSTIFICATION/COMMENTS Electrical connections for the Class 1E power circuit rated for 6900V or less. Cables must maintain circuit integrity during and after a LOCA/HELB condition.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference 1, pp V-9, Sect 3.5; V-36).

JUSTIFICATION/COMMENTS The test cable remained energized at 7590VAC and 18A load current for 26.4 hours of LOCA test. Also the IR values as given in reference 1, ppV-99 and V-105, were acceptable.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes

(Reference 1, pp V-9, Sect 3.5; V-36 and VI-1, Sect 1.0).

JUSTIFICATION/COMMENTS The specimen withstood the test voltage and load current when periodically energized during the post-LOCA test. Also it passed the dielectric withstand test at 6900VAC for 1 minute and 11,200VAC for 5 minutes under a submerged condition subsequent to post-LOCA test.

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference 1, pp VII-22, Sect 3.4.9 and V-46).

JUSTIFICATION/COMMENTS The specimen was tested at 80°C for 295 hours post-LOCA/HELB. This is equivalent to 110 days operating time at 60°C conductor temperature.

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference 1, pp ii; iii; iv; IV-2, Sect 1.2 and V-5, Sect 3.2 for anomalies No. 4 & 8).

JUSTIFICATION/COMMENTS There are two test anomalies for specimen 34 and both of the anomalies were resolved satisfactorily in the report as referenced above.

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TYPE EPSJ

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? NA (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS No surveillance or maintenance requirements have been identified by the vendor or on review of the qualification document. However, TVA has an in-house maintenance and surveillance program for cables; See TAB G.

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VOLTAGE POWER - EPR INS/TVA TYPE EPSJ CHECKED [illegible] DATE 9/22/86

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	Yes-See O(2) in Sect P
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	NA
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	Yes

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	NA; See Comment for Sect K(5)
(a) Was the spray testing done while under the extremes of pressure and temperature?	NA
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA
(11) Criteria regarding submergence satisfied?	NA; See Comment for Sect K(7)
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	NA, See O(12)(b) in Sect P
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed	Yes
(b) Was an initial base line test done to establish required performance characteristics	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured	Yes
(16) Criteria regarding instrument accuracy satisfied	NA
(17) Test duration margin (1 hour + function time) satisfied	Yes
(a) Is the minimum specified operating time at least 1 hour	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided	NA
(18) Criteria regarding synergistic effects satisfied	NA; See Comment for Sect H(3)
(19) Criteria regarding margins satisfied	Yes
(20) Maintenance and surveillance requirements adequately identified	NA; See Comment for Sect N

P. DISCUSSION

K(6): The IEEE:383-1974 Section 2.3.4 indicates that cables shown to comply with IPCEA S-68-516 requirements are considered to have met with moisture resistance requirement during normal operation. Since TVA specification requires the supplied cables to be manufactured to the above referred industry standard, they are considered to have resistance to moisture intrusion.

P. DISCUSSION (continued)

In addition to the above justification, test sample was tested to withstand 7590 volts, 18A load for 26.4 hours under the simulated accident condition of 100% relative humidity, elevated temperature and pressure.

O(2): The maximum conductor temperature for the subject cable was downrated to 60°C, as contrary to the 90°C design value. See reference 4, paragraph 3.0 for acceptability.

O(12)(b): All the subject cables are routed outside containment where beta radiation is not postulated.

SUPPLEMENT 2
COMPONENT-UNIQUE CHECKLIST
CABLES/SPLICES

EQUIPMENT IDENTIFICATION

(1) Are the cables (splices) identified in the qualification program identical to the plant cables (splices) which require qualification (yes/no/NA)? _____

Item	Plant(1)	Report(1)	Acceptable Yes/No/NA	Report Section
(a) Conductor				
Insulation material	EPR	EPR	Yes	Comment (1)
Size	2/0 AWG	500 MCM	Yes	Comment (1)
Stranding	19 strands	37 strands	Yes	Comment (1)
Coating	NA	NA	NA	—
Insulation Thickness	0.15"	0.14"	Yes	Comment (1)
Number of conductors	1/c	1/c	Yes	Comment (1)
Arrangement of conductors	NA	NA	NA	-
(b) Shielding	50% lap	50% lap	Yes	Comment (1)
(c) Insulation jacket				
Material	NA	NA	NA	--
Thickness	NA	NA	NA	—
(d) Outer jacket				
Material	Hypalon	Hypalon	Yes	Comment (1)
Thickness	0.08"	0.08"	Yes	Comment (1)

BINDER NO. WBNEQ-CABL-064 PLANT WBN UNIT(S) 1 SHEET 31 OF 32

R ___ R ___

BINDER TITLE COLLYER/MEDIUM COMPUTED [illegible] DATE 9.19.86

VOLTAGE POWER -EPR INS/TVA CHECKED [illegible] DATE 9/22/86

TYPE EPSJ

EQUIPMENT IDENTIFICATION (Continued) Page 2 of 3

Item	Plant	Report	Acceptable Yes/No/NA	Report Section
(e) Rated voltage	8kV	8kV	Yes	Comment (1)
(f) Rated current	NA	NA	NA	-
(g) Operating temperature rating				
Normal	60°C(2)	60°C(2)	Yes	Comment (2)
Emergency	NA	NA	NA	-
Short circuit	NA	NA	NA	-
(h) Insulation resistance	-	-	-	-
(i) Splice				
Material	NA	NA	NA	-
Thickness	NA	NA	NA	-
Identification	NA	NA	NA	-

Comments: (1) All the information listed under "Plant" and under "Report" are taken from routine test reports for the cables and they are in the contract files (the reports are enclosed in this binder). (2) The cable was tested and qualified for 60°C service temperature for the 40 years life and 100 days post-HELB operating time. Referring to the CACTAT, it was found that the worst-case conductor temperature for the subject cables was 50.9°C.

(2) Does the qualification program adequately address temperature and moisture resistance (yes/no/NA)? Yes (Reference 1, p VII-18, Sect 3.3.5).

Comments: _____

(3) Was the cable energized during test (yes/no/NA)? Yes (Reference 1, p V-3, Sect 2.5 & 2.5.3).

Comments: The specimen was energized at 7590V, 18A load for 26.4 hours of LOCA testing. Thereafter the specimen was periodically energized at the 72-, 144-, 216-, and 319-hour point of the test.

EQUIPMENT IDENTIFICATION (Continued)

(4) Was the cable subjected to a voltage withstand test (yes/no/NA)? Yes (Reference 1, p VI-1, Sect 1.0 & p VI-13).

Comments: The specimen was subjected to 6900VAC for 1 minute and 11,200VAC for 5 minutes under a submerged condition.

(5) Was the cable subjected to an insulation resistance test (yes/no/NA)? Yes (Reference 1, p V-10, Sect 3.5 & p V-99).

Comments: The insulation resistance was found to be 1.3×10^{11} ohms at 74°F temperature.

(6) Was the cable subjected to a mandrel bend and voltage withstand test (yes/no/NA)? Yes (Reference 1, p VI-1, Sect 1.0 & p VI-13).

Comments: The specimen was subjected to 11,200 VAC for 5 minutes under a submerged condition.

(7) Was the cable subjected to a flame test to demonstrate flame retardant characteristics (yes/no/NA)? Yes (Reference 5).

Identify flame test standard: IEEE: 383-1974

Comments:

BINDER NO. WBNEQ-TB-001 PLANT WBN UNIT(S) 1 SHEET 1 OF 1

R R

BINDER TITLE GENERAL ELECTRIC COMPUTED [illegible] DATE 7/16/86

TERMINAL BLOCKS CHECKED [illegible] DATE 7/18/86

DISCUSSION FOR TAB A

This binder addresses the qualification of General Electric CR151B, CR151A, EB-5, EB-25, and EB-27 terminal blocks although only GE CR151B terminal blocks have been installed in category A/B Class 1E harsh environment junction boxes at WBN. Field verification for the terminal blocks is provided in TAB F. The qualification of any General Electric terminal blocks supplied by a manufacturer with his equipment package is addressed in the binder(s) for that equipment.

Since the terminal blocks are in many safety-related circuits, some of which are required to operate for 100 days following an accident, the category and operating times for the terminal blocks are designated as "a" and "100 days", respectively, for all accidents.

The terminal block EQIS and unit device identification nos. are synonymous with the junction box EQIS and unit device identification nos. except for the component function code (TB). There are multiple terminal blocks in some junction boxes; however, each individual terminal block within a junction box is not identified.

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WCNEO-TB -001
MANUFACTURER: GENERAL ELECTRIC
PAGE: 1 OF 71

EQIS NO.		UNIT DEVICE ID NO.		DESCRIPTION	MODEL	LOCATION COLUMN	AZ	ELEV*	RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WCN-0-TB -292-0228	-A	0-TB -292-0228	-A	TERMINAL BLOCK	CR151B	1A5		729	A06	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WCN-0-TB -292-0229	-B	0-TB -292-0229	-B	TERMINAL BLOCK	CR151B	1A8		729	A06	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WCN-0-TB 292-1163	-B	0-TB -292-1163	B	TERMINAL BLOCK	CR151B	VA12		757	A16	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WCN-0-TB -292-1164	-A	0-TB -292-1164	-A	TERMINAL BLOCK	CR151B	VA12		757	A16	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WCN-0-TB -292-1547	-A	0-TB -292-1547	A	TERMINAL BLOCK	CR151B	WA7		737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WCN-0-TB -292-1548	-B	0-TB -292-1548	-B	TERMINAL BLOCK	CR151B	WA9		737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WCN-0-TB -292-1706	-A	0-TB -292-1706	A	TERMINAL BLOCK	CR151B	RA3		737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WCN-0-TB -292-1708	-B	0-TB -292-1708	-B	TERMINAL BLOCK	CR151B	RA13		737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WCN-0-TB -292-1942	-A	0-TB -292-1942	-A	TERMINAL BLOCK	CR151B	VA11		757	A16	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WCN-0-TB -292-1943	-B	0-TB -292-1943	-B	TERMINAL BLOCK	CR151B	VA11		757	A16	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WCN-0-TB -292-2034	-A	0-TB -292-2034	A	TERMINAL BLOCK	CR151B	BA1		713	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WCN-0-TB -292-2035	-B	0-TB -292-2035	-B	TERMINAL BLOCK	CR151B	BA1		713	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE J.L. Hollis 7/26/88
CHECKER/DATE R.T. Dunlap 7/26/88

PAGE A-2

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WPNED-1B -001
MANUFACTURER: GENERAL ELECTRIC
PAGE: 2 OF 21

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AT ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBM-0-1B -292-2765 -A	0-1B -292-2765 -A	TERMINAL BLOCK	CR151B	TA1	692'	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBM-0-1B -292-2766 -B	0-1B -292-2766 -B	TERMINAL BLOCK	CR151B	TA14	692	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBM-0-1B -292-2856 -A	0-1B -292-2856 -A	TERMINAL BLOCK	CR151B	RA4	737'	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBM-0-1B -292-2894 -B	0-1B -292-2894 B	TERMINAL BLOCK	CR151B	TA12	737'	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBM-0-1B -292-3213 -B	0-1B -292-3213 -B	TERMINAL BLOCK	CR151B	VA11	692	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBM-0-1B -292-3215 -A	0-1B -292-3215 -A	TERMINAL BLOCK	CR151B	UA9	737'	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBM-0-1B 292-3341 -B	0-1B -292-3341 -B	TERMINAL BLOCK	CR151B	RA13	737'	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBM-0-1B -292-3342 -A	0-1B -292-3342 -A	TERMINAL BLOCK	CR151B	SA3	737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBM-1-1B -292-0004 -A	1-1B -292-0004 -A	TERMINAL BLOCK	CR151B	TA8	737'	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBM-1-1B -292-0358 -B	1-1B -292-0358 -B	TERMINAL BLOCK	CR151B	UA6	692'	A12	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBM-1-1B -292-0359 -B	1-1B -292-0359 -B	TERMINAL BLOCK	CR151B	VA5	692'	A13	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBM-1-1B -292-0530 -B	1-1B -292-0530 B	TERMINAL BLOCK	CR151B	SVR	729'	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE J.L. Hollis 7/26/86
CHECKER/DATE [illegible] 7/26/86

PAGE A-3

EDIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RR/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WDN-1-TB -292-0540 -A	1-TB -292-0540 -A	TERMINAL BLOCK	CR151B	SVB		729	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDN-1-TB -292-0567 -A	1-TB -292-0567 -A	TERMINAL BLOCK	CR151B	VA5		676	A16	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDN-1-TB -292-0569 -B	1-TB -292-0569 B	TERMINAL BLOCK	CR151B	UA5		676	A16	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDN-1-TB -292-0593 -A	1-TB -292-0593 -A	TERMINAL BLOCK	CR151B	VA3		737	A05	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDN-1-TB -292 0748 -B	1-TB -292-0748 -B	TERMINAL BLOCK	CR151B	WA5		715	A20	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDN-1-TB -292-0772 -B	1-TB -292-0772 -B	TERMINAL BLOCK	CR151B	TA5		676	A16	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDN-1-TB -292-0773 -A	1-TB -292-0773 -A	TERMINAL BLOCK	CR151B	UA5		676	A16	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDN-1-TB -292-0846 -B	1-TB -292-0846 -B	TERMINAL BLOCK	CR151B	TA1		692	A06	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDN-1-TB -292-0847 -A	1-TB -292-0847 -A	TERMINAL BLOCK	CR151B	TA1		692	A06	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDN-1-TB -292-1005 -A	1-TB -292-1005 -A	TERMINAL BLOCK	CR151B	WA5		737	A05	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDN-1-TB -292-1006 -B	1-TB -292-1006 B	TERMINAL BLOCK	CR151B	WA5		737	A05	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDN-1-TB -292-1182 -B	1-TB -292-1182 -B	TERMINAL BLOCK	CR151B	SA3		737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

A A A

PREPARER/DATE D.L. Hollin 7/26/86

CHECKER/DATE E.T. Dunlap 7/26/86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. NBNEQ-TB -001
MANUFACTURER: GENERAL ELECTRIC

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
NBN-1-TB -292-1189 -A	1-TB -292-1189 -A	TERMINAL BLOCK	CR151B	TA3		692	A09	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-TB -292-1190 -B	1-TB -292-1190 -B	TERMINAL BLOCK	CR151B	UA5		692	A10	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-TB -292-1195 -A	1-TB -292-1195 -A	TERMINAL BLOCK	CR151B	VA6		692	A13	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-TB -292-1196 -B	1-TB -292-1196 -B	TERMINAL BLOCK	CR151B	UA6		692	A12	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-TB -292-1231 -A	1-TB -292-1231 -A	TERMINAL BLOCK	CR151B	TA6		713	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-TB -292-1232 -B	1-TB -292-1232 -B	TERMINAL BLOCK	CR151B	TA6		713	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-TB -292-1235 -A	1-TB -292-1235 -A	TERMINAL BLOCK	CR151B	WA5		713	A13	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-TB -292-1246 -A	1-TB -292-1246 -A	TERMINAL BLOCK	CR151B	WA8		713	A13	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-TB -292-1352 -A	1-TB -292-1352 -A	TERMINAL BLOCK	CR151B	WA5		713	A28	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-TB -292-1353 -A	1-TB -292-1353 -A	TERMINAL BLOCK	CR151B	VA5		713	A28	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-TB -292-1354 -B	1-TB -292-1354 -B	TERMINAL BLOCK	CR151B	WA5		713	A28	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-TB -292-1355 -B	1-TB -292-1355 -B	TERMINAL BLOCK	CR151B	VA5		713	A28	VARIOUS	ALL	A	100D	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE J.L. Hollis 7/26/86
CHECKER/DATE F.T. Dunlap 7/26/86

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EDIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-TB -292-1356 -A	1-TB -292-1356 -A	TERMINAL BLOCK	CR151B	WA5		713	A28	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1357 -A	1-TB -292-1357 -A	TERMINAL BLOCK	CR151B	WA5		713	A28	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1358 -B	1-TB -292-1358 -B	TERMINAL BLOCK	CR151B	WA5		713	A28	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1367 -A	1-TB -292-1367 -A	TERMINAL BLOCK	CR151B	WA5		713	A28	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1368 -B	1-TB -292-1368 B	TERMINAL BLOCK	CR151B	WA5		713	A28	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1369 -A	1-TB -292-1369 -A	TERMINAL BLOCK	CR151B	WA5		713	A28	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1370 -A	1-TB -292-1370 A	TERMINAL BLOCK	CR151B	WA5		713	A28	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1371 -B	1-TB -292-1371 B	TERMINAL BLOCK	CR151B	WA5		713	A28	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1391 -B	1-TB -292-1391 -B	TERMINAL BLOCK	CR151B	WA7		692	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1407 -A	1-TB -292-1407 -A	TERMINAL BLOCK	CR151B	SA3		713	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1408 -B	1-TB -292-1408 B	TERMINAL BLOCK	CR151B	SA4		713	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1421 -A	1-TB -292-1421 -A	TERMINAL BLOCK	CR151B	WA7		713	A12	VARIOUS	ALL	A	100D	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE J S Hollis 7/26/86
CHECKER/DATE R T Dunlap 7/26/86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-TB -292-1422	-B 1-TB -292-1422 -B	TERMINAL BLOCK	CR151B	VA7		713	A11	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1425	-A 1-TB -292-1425 -A	TERMINAL BLOCK	CR151B	VA4		713	A07	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1426	-B 1-TB -292-1426 -B	TERMINAL BLOCK	CR151B	VA4		713	A07	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1446	-B 1-TB -292-1446 -B	TERMINAL BLOCK	CR151B	VA4		713	A06	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1447	-A 1-TB -292-1447 -A	TERMINAL BLOCK	CR151B	VA4		713	A06	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1502	-A 1-TB -292-1502 -A	TERMINAL BLOCK	CR151B	UA2		713	A06	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1504	-B 1-TB -292-1504 -B	TERMINAL BLOCK	CR151B	VA2		713	A06	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1506	-A 1-TB -292-1506 -A	TERMINAL BLOCK	CR151B	SA3		713	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1507	-B 1-TB -292-1507 -B	TERMINAL BLOCK	CR151B	UA3		713	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1512	-A 1-TB -292-1512 -A	TERMINAL BLOCK	CR151B	SVR		729	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1514	-A 1-TB -292-1514 -A	TERMINAL BLOCK	CR151B	NVR		729	A02	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-1516	-B 1-TB -292-1516 -B	TERMINAL BLOCK	CR151B	SVR		729	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER

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PREPARER/DATE J. L. Hollis 9/10/86

CHECKER/DATE E. T. Dunlap 9-10-86

FDIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WDM-1-1B -292-1518 -B	1-1B -292-1518 B	TERMINAL BLOCK	CR1518	WVR		729	A02	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDM-1-1B -292-1543 -A	1-1B -292-1543 A	TERMINAL BLOCK	CR1518	UA4		692	A07	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDM-1-1B -292-1544 -B	1-1B -292-1544 B	TERMINAL BLOCK	CR1518	VA5		692	A07	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDM-1-1B -292-1549 -A	1-1B -292-1549 -A	TERMINAL BLOCK	CR1518	VA4		737	A05	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDM-1-1B -292-1551 -B	1-1B -292-1551 -B	TERMINAL BLOCK	CR1518	VA5		737	A05	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDM-1-1B -292-1564 -A	1-1B -292-1564 -A	TERMINAL BLOCK	CR1518	UA5		692	A08	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDM-1-1B -292-1565 -B	1-1B -292-1565 -B	TERMINAL BLOCK	CR1518	VA5		692	A08	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDM-1-1B -292-1566 -B	1-1B -292-1566 -B	TERMINAL BLOCK	CR1518	UA5		692	A08	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDM-1-1B 292-1567 -A	1-1B -292-1567 -A	TERMINAL BLOCK	CR1518	VA5		692	A08	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDM-1-1B -292-1598 -A	1-1B -292-1598 -A	TERMINAL BLOCK	CR1518	UA5		713	A28	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDM-1-1B -292-1599 -B	1-1B -292-1599 -B	TERMINAL BLOCK	CR1518	UA5		713	A28	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WDM-1-1B -292-1933 -S	1-1B -292-1933 -S	TERMINAL BLOCK	CR1518	UA2		692	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

A ... A ... A ...

PREPARER/DATE D.J. Wolfe 7/26/86

CHECKER/DATE E.T. Dunlap 7/26/86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WPNEB-1B -001
MANUFACTURER: GENERAL ELECTRIC
PAGE: 8 OF 21

EDIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RB/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-1B -292-1964 -B	1-1B -292-1964 B	TERMINAL BLOCK	CR151B	SA3		737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-1B -292-1966 -A	1-1B -292-1966 -A	TERMINAL BLOCK	CR151B	TA3		737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-1B -292-1968 -A	1-1B -292-1968 -A	TERMINAL BLOCK	CR151B	UA3		737	A06	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-1B -292-1970 -B	1-1B -292-1970 -B	TERMINAL BLOCK	CR151B	UA3		737	A06	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-1B -292-1972 -B	1-1B -292-1972 -B	TERMINAL BLOCK	CR151B	SVR		729	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-1B -292-1974 -A	1-1B -292-1974 -A	TERMINAL BLOCK	CR151B	SVR		729	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-1B -292-1985 -A	1-1B -292-1985 -A	TERMINAL BLOCK	CR151B	SVR		729	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-1B -292-1986 -B	1-1B -292-1986 -B	TERMINAL BLOCK	CR151B	SVRO		729	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-1B -292-1987 -B	1-1B -292-1987 -B	TERMINAL BLOCK	CR151B	NVR		729	A02	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-1B -292-1989 -A	1-1B -292-1989 -A	TERMINAL BLOCK	CR151B	BVR		729	A12	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-1B -292-2007 -B	1-1B -292-2007 -B	TERMINAL BLOCK	CR151B	UA2		692	A07	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-1B -292-2008 -A	1-1B -292-2008 -A	TERMINAL BLOCK	CR151B	UA2		692	A07	VARIOUS	ALL	A	1000	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE J.S. Hollin 7/26/86
LIC'CLER/DATE R.T. Dunn 7/26/86

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EDIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-TB -292-2012 -B	1-TB -292-2012 B	TERMINAL BLOCK	CR151B	WAR		713	A13	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-2013 -A	1-TB -292-2013 -A	TERMINAL BLOCK	CR151B	WAS		713	A13	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-2049 -B	1-TB -292-2049 B	TERMINAL BLOCK	CR151B	SA[illegible]		713	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-2063 -A	1-TB -292-2063 -A	TERMINAL BLOCK	CR151B	WA4		692	A07	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-2064 -B	1-TB -292-2064 -B	TERMINAL BLOCK	CR151B	VA3		692	A07	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-2065 -A	1-TB -292-2065 -A	TERMINAL BLOCK	CR151B	UA3		692	A07	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-2066 -B	1-TB -292-2066 -B	TERMINAL BLOCK	CR151B	UA3		692	A07	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-2071 -A	1-TB -292-2071 -A	TERMINAL BLOCK	CR151B	TA4		737	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-2122 -A	1-TB -292-2122 A	TERMINAL BLOCK	CR151B	VA1		713	A06	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-2140 -A	1-TB -292-2140 -A	TERMINAL BLOCK	CR151B	SVR		729	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-2141 -B	1-TB -292-2141 -B	TERMINAL BLOCK	CR151B	SVR		729	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -292-2202 -A	1-TB -292-2202 -A	TERMINAL BLOCK	CR151B	UA3		737	A05	VARIOUS	ALL	A	100D	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

A ..... B ..... B .....

PREPARER/DATE D.S. Hollis 7/26/86

CHECKER/DATE R.T. Dunlap 7/26/86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. NDMEO-10 -001
MANUFACTURER: GENERAL ELECTRIC
PAGE:10 OF 21

EQUIP NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
NBN-1-TB -292-2203 -A	1-TB -292-2203 A	TERMINAL BLOCK	CR151B	TA5		729	A08	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-TB -292-2204 -A	1-TB -292-2204 A	TERMINAL BLOCK	CR151B	TA5		737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-TB -292-2205 -A	1-TB -292-2205 A	TERMINAL BLOCK	CR151B	TA10		737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-TB 292-2206 -A	1-TB -292-2206 A	TERMINAL BLOCK	CR151B	TA5		737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-TB -292-2207 -A	1-TB -292-2207 A	TERMINAL BLOCK	CR151B	VA3		692	A07	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-TB -292-2208 -B	1-TB -292-2208 B	TERMINAL BLOCK	CR151B	TA5		737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-TB -292-2209 -B	1-TB -292-2209 B	TERMINAL BLOCK	CR151B	UA3		737	A05	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-TB -292-2210 -B	1-TB -292-2210 B	TERMINAL BLOCK	CR151B	TA5		729	A08	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-TB -292-2211 -B	1-TB -292-2211 B	TERMINAL BLOCK	CR151B	VA3		692	A07	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-TB -292-2212 -B	1-TB -292-2212 B	TERMINAL BLOCK	CR151B	TA11		737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-TB -292-2234 -S	1-TB -292-2234 S	TERMINAL BLOCK	CR151B	UA2		692	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-TB -292-2236 -S	1-TB -292-2236 S	TERMINAL BLOCK	CR151B	UA2		692	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R____ R____ R____

PREPARER/DATE D.L. Hollis 7/26/86
CHECKER/DATE E.T. Lum Jr 7/26/86

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EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RB/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
MBH-1 1B -292-2230 -S	1-1B -292-2230 -S	TERMINAL BLOCK	CR151B	UA2		692'	A06	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
MBH-1-1B -292-2242 -S	1-1B -292-2242 S	TERMINAL BLOCK	CR151D	TA2		692	A06	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
MBH-1 1B -292-2252 -A	1-1B -292-2252 A	TERMINAL BLOCK	CR151D	VA11		757'	A16	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
MBH-1-1B -292-2257 -A	1-1B -292-2257 -A	TERMINAL BLOCK	CR151D	UA2		713'	A06	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
MBH-1-1B -292-2260 -B	1-1B -292-2260 B	TERMINAL BLOCK	CR151B	UA2		713'	A06	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
MBH-1-1B -292-2262 -B	1-1B -292-2262 -B	TERMINAL BLOCK	CR151B	VA11		757'	A16	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
MBH-1-1B -292-2265 -B	1-1B -292-2265 -B	TERMINAL BLOCK	CR151D	TA5		737'	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
MBH-1-1B -292-2386 -B	1-1B -292-2386 -B	TERMINAL BLOCK	CR151D	TA4		737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
MBH-1-1B -292-2387 -A	1-1B -292-2387 -A	TERMINAL BLOCK	CR151D	TA3		737'	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
MBH-1-1B -292-2389 -A	1-1B -292-2389 A	TERMINAL BLOCK	CR151D	SA6		737'	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
MBH-1-1B -292-2503 -B	1-1B -292-2503 B	TERMINAL BLOCK	CR151B	UA6		676'	A09	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
MBH-1-1B -292-2504 -A	1-1B -292-2504 -A	TERMINAL BLOCK	CR151D	UA6		676'	A09	VARIOUS	ALL	A	1000	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE D.J. Hollins 7/26/86
CHECKER/DATE R.T. Dunlap 7/26/86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WCNEO-1B -001
MANUFACTURER: GENERAL ELECTRIC

EUIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-TB -292-2507 -B	1-TB -292-2507 -B	TERMINAL BLOCK	CR151B	VA6		676'	A10	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-TB -292-2508 -A	1-TB -292-2508 -A	TERMINAL BLOCK	CR151B	WA6		676'	A11	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-TB -292-3032 -B	1-TB -292-3032 B	TERMINAL BLOCK	CR151B	WA5		713'	A28	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-TB -292-3033 -A	1-TB -292-3033 -A	TERMINAL BLOCK	CR151B	WA5		713'	A28	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-TB -292-3208 A	1-TB -292-3208 A	TERMINAL BLOCK	CR151B	WA4		692	A07	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-TB -292-3214 -B	1-TB -292-3214 -B	TERMINAL BLOCK	CR151B	WA9		737'	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-TB -292-3422 -A	1-TB -292-3422 -A	TERMINAL BLOCK	CR151B	VA5		713	A28	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-TB -292-3423 -B	1-TB -292-3423 -B	TERMINAL BLOCK	CR151B	VA5		713'	A28	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-TB -292-3870 -A	1-TB -292-3870 A	TERMINAL BLOCK	CR151B	WA5		737'	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-TB -292-4011 -A	1-TB -292-4011 -A	TERMINAL BLOCK	CR151B	SVB		729'	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-TB -292-4013 -A	1-TB -292-4013 -A	TERMINAL BLOCK	CR151B	WA4		737'	A05	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
WBN-1-TB -292-4015 -B	1-TB -292-4015 -B	TERMINAL BLOCK	CR151B	VA4		737'	A05	VARIOUS	ALL	A	1000	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

A..... A..... A.....

PREPARER/DATE J.E. Hollin 7/26/86 ....

CHECKER/DATE R.T. Dunlap 7/26/86 ....

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EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
NBN-1-1B -292-4026 -B	1-1B -292-4026 B	TERMINAL BLOCK	CR151B	UA3		737	A05	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -292-4027 -A	1-1B -292-4027 A	TERMINAL BLOCK	CR151B	UA3		737	A05	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN 1-1B -292-4166 -A	1-1B -292-4166 -A	TERMINAL BLOCK	CR151B	YA11		729	A04	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -292-4167 -B	1-1B -292-4167 -B	TERMINAL BLOCK	CR151B	YA11		729	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -292-4261 -B	1-1B -292-4261 B	TERMINAL BLOCK	CR151B	VA7		713	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -292-4275 -A	1-1B -292-4275 A	TERMINAL BLOCK	CR151B	RA3		737	A01	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -292-4984 -A	1-1B -292-4984 -A	TERMINAL BLOCK	CR151B	VA11		757	A16	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -292 4985 -B	1-1B -292-4985 -B	TERMINAL BLOCK	CR151B	VA13		757	A16	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1 1B -293-0159 -B	1-1B -293-0159 B	TERMINAL BLOCK	CR151B		341	756	U	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -293-0368 -B	1-1B -293-0368 -B	TERMINAL BLOCK	CR151B		163	756	U	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -293-0394 -A	1-1B -293-0394 A	TERMINAL BLOCK	CR151B		041	703	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -293-0542 -A	1-1B -293-0542 A	TERMINAL BLOCK	CR151B		235	716	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R ... R ... R ...

PREPARER/DATE D.S. Hodin 7/26/86

CHECKER/DATE E.T. Dunlap 7/26/86

EGIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION BN/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
NBN-1-IB -293-0544 -A	1-IB -293-0544 -A	TERMINAL BLOCK	CR151B		248	744'	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-IB -293-0546 -B	1-IB -293-0546 -B	TERMINAL BLOCK	CR151B		298	716'	AHN	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-IB 293-0548 -B	1-IB -293-0548 -B	TERMINAL BLOCK	CR151B		250	756'	AHN	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-IB -293-0550 -A	1-IB -293-0550 -A	TERMINAL BLOCK	CR151B		287	793'	AHN	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-IB -293-0553 -A	1-IB -293-0553 -A	TERMINAL BLOCK	CR151B		295	748'	AHN	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-IB -293-0574 -A	1-IB -293-0574 -A	TERMINAL BLOCK	CR151B		009	716'	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-IB -293-0578 -B	1-IB -293-0578 -B	TERMINAL BLOCK	CR151B		350	716'	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-IB -293-0596 -B	1-IB -293-0596 -B	TERMINAL BLOCK	CR151B		345	703'	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-IB -293-0656 -A	1-IB -293-0656 -A	TERMINAL BLOCK	CR151B		127	716'	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-IB -293-0691 -A	1-IB -293-0691 -A	TERMINAL BLOCK	CR151B		213	703'	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-IB -293-0724 -B	1-IB -293-0724 -B	TERMINAL BLOCK	CR151B		059	749'	AHN	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-IB -293-0745 -A	1-IB -293-0745 -A	TERMINAL BLOCK	CR151B		199	756'	U	VARIOUS	ALL	A	1000	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE J.L. Heller 7/26/86
CHECKER/DATE R.T. Dunlap 7/26/86

EDIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
NBH-1-TB -293-0760 -B	1-TB -293-0760 -B	TERMINAL BLOCK	CR151B		108	716	11R	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBH-1-TB -293-0762 -A	1-TB -293-0762 -A	TERMINAL BLOCK	CR151B		105	749	AUX	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBH-1-TB -293-0764 -A	1-TB -293-0764 -A	TERMINAL BLOCK	CR151B		060	716	11R	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBH-1-TB -293-0766 -B	1-TB -293-0766 -B	TERMINAL BLOCK	CR151B		303	744	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBH-1-TB -293-0768 -A	1-TB -293-0768 -A	TERMINAL BLOCK	CR151B		276	725	AUX	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBH-1-TB -293-0775 -A	1-TB -293-0775 -A	TERMINAL BLOCK	CR151B		034	716	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBH-1-TB -293-0783 -A	1-TB -293-0783 -A	TERMINAL BLOCK	CR151B		289	730	AUX	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBH-1-TB -293-0792 -B	1-TB -293-0792 -B	TERMINAL BLOCK	CR151B		285	716	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBH-1-TB -293-0795 -A	1-TB -293-0795 -A	TERMINAL BLOCK	CR151B		285	730	AUX	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBH-1-TB -293-1034 -A	1-TB -293-1034 -A	TERMINAL BLOCK	CR151B		004	837	AUX	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBH-1-TB -293-1036 -B	1-TB -293-1036 -B	TERMINAL BLOCK	CR151B		358	837	AUX	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBH-1-TB -293-1255 -A	1-TB -293-1255 -A	TERMINAL BLOCK	CR151B		035	729	AUX	VARIOUS	ALL	A	1000	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R ..... R ..... R .....

PREPARER/DATE J.F. Holler 7/26/86

CHECKER/DATE R.T. Dunlap 7/26/86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	AZ	ELEV*	RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-TB -293-1277 -A	1-TB -293-1277 -A	TERMINAL BLOCK	CR151B		311	806'	ANN	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-1283 -B	1-TB -293-1283 -B	TERMINAL BLOCK	CR151B		317	806'	ANN	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-1285 -B	1-TB -293-1285 -B	TERMINAL BLOCK	CR151B		315	806'	ANN	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-1287 -A	1-TB -293-1287 -A	TERMINAL BLOCK	CR151B		313	806	ANN	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-1575 -B	1-TB -293-1575 -B	TERMINAL BLOCK	CR151B		099	756'	U	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-1576 -A	1-TB -293-1576 -A	TERMINAL BLOCK	CR151B		095	756	U	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-1736 -B	1-TB -293-1736 -B	TERMINAL BLOCK	CR151B		305	716'	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-1738 -B	1-TB -293-1738 -B	TERMINAL BLOCK	CR151B		286	716'	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-1750 -A	1-TB -293-1750 -A	TERMINAL BLOCK	CR151B		304	716'	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-1758 -B	1-TB -293-1758 -B	TERMINAL BLOCK	CR151B		285	716'	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-1764 -B	1-TB -293-1764 -B	TERMINAL BLOCK	CR151B		282	716'	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-1883 -B	1-TB -293-1883 -B	TERMINAL BLOCK	CR151B		165	729'	ANN	VARIOUS	ALL	A	100D	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.J. Hollin 9/16/86

CHECKER/DATE R.T. Dunlap 9-16-86

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RR/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
NBN-1-1B -293-1885 -A	1-1B -293-1885 -A	TERMINAL BLOCK	CR151B		191	729'	ARM	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -293-1887 -A	1-1B -293-1887 -A	TERMINAL BLOCK	CR151B		004	729'	ARM	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -293-1889 -B	1-1B -293-1889 -B	TERMINAL BLOCK	CR151B		348	729'	ARM	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -293-1921 -A	1-1B -293-1921 -A	TERMINAL BLOCK	CR151B		291	716'	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -293-2649 -A	1-1B -293-2649 -A	TERMINAL BLOCK	CR151B		023	756'	U	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -293-3193 -B	1-1B -293-3193 -B	TERMINAL BLOCK	CR151B		303	756	U	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -293-3201 -B	1-1B -293-3201 -B	TERMINAL BLOCK	CR151B		289	716	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -293-3203 -A	1-1B -293-3203 -A	TERMINAL BLOCK	CR151B		234	716	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -293-3317 -B	1-1B -293-3317 -B	TERMINAL BLOCK	CR151B		285	716	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -293-4326 -B	1-1B -293-4326 -B	TERMINAL BLOCK	CR151B		028	716	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -293-4328 -B	1-1B -293-4328 -B	TERMINAL BLOCK	CR151B		049	716	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
NBN-1-1B -293-4330 -E	1-1B -293-4330 -E	TERMINAL BLOCK	CR151B		152	716'	L	VARIOUS	ALL	A	1000	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R ... R ... R ...

PREPARER/DATE D.E. Hollis 7/26/86

CHECKER/DATE K.T. Dunlap 7/26/86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-TB -293-4332 -E	1-TB -293-4332 -E	TERMINAL BLOCK	CR151B		133	716'	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-4334 -F	1-TB -293-4334 -F	TERMINAL BLOCK	CR151B		203	716'	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-4336 -F	1-TB -293-4336 -F	TERMINAL BLOCK	CR151B		226	716'	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-4338 -G	1-TB -293-4338 -G	TERMINAL BLOCK	CR151B		345	716'	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-1-TB -293-4340 -G	1-TB -293-4340 -G	TERMINAL BLOCK	CR151B		317	716'	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-0006 -B	2-TB -292-0006 -B	TERMINAL BLOCK	CR151B	SA6		737	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-1008 -B	2-TB -292-1008 -B	TERMINAL BLOCK	CR151B	WA12		737'	A09	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-1183 -B	2-TB -292-1183 -B	TERMINAL BLOCK	CR151B	SA14		737'	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-1448 -B	2-TB -292-1448 -B	TERMINAL BLOCK	CR151B	VA12		713'	A19	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-1449 -A	2-TB -292-1449 -A	TERMINAL BLOCK	CR151B	VA12		713'	A19	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-1503 -A	2-TB -292-1503 -A	TERMINAL BLOCK	CR151B	VA14		713'	A19	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-1505 -B	2-TB -292-1505 -B	TERMINAL BLOCK	CR151B	VA14		713'	A19	VARIOUS	ALL	A	100D	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE J.L. Hollis 9/16/86
CHECKER/DATE R.T. Dunlap 9.16.86

R_____ R_____ R_____

TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	AZ	ELEV*	RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-2-TB -292-1508 -A	2-TB -292-1508 -A	TERMINAL BLOCK	CR151B	TA14		713	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-1509 -B	2-TB -292-1509 -B	TERMINAL BLOCK	CR151B	TA14		713	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-1550 -A	2-TB -292-1550 -A	TERMINAL BLOCK	CR151B	VA12		737	A09	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-1552 -B	2-TB -292-1552 -B	TERMINAL BLOCK	CR151B	VA13		737	A09	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-1553 -A	2-TB -292-1553 -A	TERMINAL BLOCK	CR151B	UA12		692	A25	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-1554 -B	2-TB -292-1554 -B	TERMINAL BLOCK	CR151B	VA11		692	A25	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-1555 -A	2-TB -292-1555 -A	TERMINAL BLOCK	CR151B	UA15		692	A25	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-1556 -B	2-TB -292-1556 -B	TERMINAL BLOCK	CR151B	WA14		692	A25	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-2050 -B	2-TB -292-2050 -B	TERMINAL BLOCK	CR151B	SA13		713	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-2389 -A	2-TB -292-2389 -A	TERMINAL BLOCK	CR151B	SA12		737	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-2390 -B	2-TB -292-2390 -B	TERMINAL BLOCK	CR151B	TA13		737	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
WBN-2-TB -292-2391 -A	2-TB -292-2391 -A	TERMINAL BLOCK	CR151B	TA11		737	A01	VARIOUS	ALL	A	100D	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE J. L. Holtz 9/16/86
CHECKER/DATE K. T. Dan 9.16.86

R_____ R_____ R_____

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
NBN-2-1B -292-2761 -B	2-1B -292-2761 -B	TERMINAL BLOCK	CR151B	VA11		757	A16	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-2-1B -292-2762 -A	2-1B -292-2762 -A	TERMINAL BLOCK	CR151B	VA11		757	A16	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-1B -276-L177 -F	1-1B -276-L177 -F	TERMINAL BLOCK	CR151B		306	716	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-1B -276-L182A -B	1-1B -276-L182A -B	TERMINAL BLOCK	CR151B		183	716	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-1B -276-L182B -D	1-1B -276-L182B -D	TERMINAL BLOCK	CR151B		181	716	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-1B -276-L183A -E	1-1B -276-L183A -E	TERMINAL BLOCK	CR151B		005	716	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-1B -276-L183B -E	1-1B -276-L183B -E	TERMINAL BLOCK	CR151B		002	716	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-1B -276-L183C -B	1-1B -276-L183C -B	TERMINAL BLOCK	CR151B		359	716	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-1B -276-L184A -F	1-1B -276-L184A -F	TERMINAL BLOCK	CR151B		240	716	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-1B -276-L184B -A	1-1B -276-L184B -A	TERMINAL BLOCK	CR151B		242	716	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-1B -276-L185A -G	1-1B -276-L185A -G	TERMINAL BLOCK	CR151B		296	716	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER
NBN-1-1B -276-L185B -G	1-1B -276-L185B -G	TERMINAL BLOCK	CR151B		296	716	L	VARIOUS	ALL	A	100D	DISTRIBUTE POWER

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

A R R

PREPARER/DATE J.L. Hollin 7/26/86

CHECKER/DATE R.T. Dunlap 7/26/86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. HBNEQ-TB -001
MANUFACTURER: GENERAL ELECTRIC

EDIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
HBN-1-TB -276-L196 -D	1-TB -276-L196 -D	TERMINAL BLOCK	CR151B	UA2		713	A06	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
HBN-1-TB -276-L197 -E	1-TB -276-L197 -E	TERMINAL BLOCK	CR151B	UA2		713	A06	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
HBN-1-TB -276-L216 -A	1-TB -276-L216 -A	TERMINAL BLOCK	CR151B	UA3		713	A06	VARIOUS	ALL	A	1000	DISTRIBUTE POWER
HBN-1-TB -276-L217 -A	1-TB -276-L217 -A	TERMINAL BLOCK	CR151B	VA4		737	A05	VARIOUS	ALL	A	1000	DISTRIBUTE POWER

PAGE A-22

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE J.S. Holler 7/26
CHECKER/DATE K.T. Dunlap 7/26

BINDER NO. WBNEQ-TB-001 PLANT WBN UNIT(S) 1 SHEET B1 OF B39

BINDER TITLE GENERAL ELECTRIC TERMINAL BLOCKS COMPUTED J.M. DATE 7/30/86 R R

CHECKED E.T.D. DATE 7/30/86

A. DOCUMENTATION

Equipment Description Terminal Blocks

Vendor/Manufacturer General Electric Company

Equipment Model No.(s) CR151B, CR151A, EB-5, EB-25, EB-27

*QUALIFICATION REPORTS

*(1) Title/Number/Revision "Nuclear Environmental Qualification Test Program on Terminal Blocks and Cables for Tennessee Valley Authority," Wyle Test Report No. 17733-1, Revision B RIMS B43 860514 501 DATE 3/19/86

(2) Title/Number/Revision "Nuclear Environmental Qualification Test for Control Equipment and Cables," Wyle Test Report No. 17503-1 RIMS EEB 840123 300 DATE 1/6/84

(3) Title/Number/Revision "High Energy Line Break (HELB) Test Program on Two (2) Control Equipment/Cable Assembly Test Sets," Wyle Test Report No. 17508-1 RIMS EEB 830117 306 DATE 11/22/82

OTHER (ANALYSIS, VENDOR DATA, ETC.) Test report summary on Patel Engineers Conformal Coating (PECC) excerpted from technical report No. PEI-TR-850400-2 (RIMS B71 860429 100) (See TAB C, Section C11).

*All references herein are to Wyle Report No. 17733-1 unless otherwise stated. The report addressed the qualification of terminal blocks (coated and uncoated) and certain cables. Only the data on the terminal blocks (specimens 1 through 20) is used in this binder.

QUALIFICATION BIBLIOGRAPHY

1. Wyle Test Report No. 17733-1, Rev. B, 3-19-86 (RIMS No. B43 860528 919).

2. Wyle Test Report No. 17503-1, 1-6-84 (RIMS No. EEB 840123 300).

3. Wyle Test Report No. 17508-1, 11-22-82 (RIMS No. EEB 830117 306).

4. DNE Calculation GENNAL6-002 R1 (RIMS No. B45 851017 235).

5. DNE Calculation WBN-OSG4-44 R0 (RIMS No. B45 860110 218).

6. Material Aging Calculation No. WAC-93 from Digital Engineering System 1000.

7. DNE Calculation WBNNAL3-031 R0 (RIMS No. B45 860529 237).

8. DNE Calculation "Maximum Containment Water Level" R2 (RIMS No. NEB 840120 220).

9. DNE Calculation WBN-OSG4-048 R0 (RIMS No. B45 860210 218).

10. DNE Calculation WBNNAL3-004 R0 (RIMS No. B45 860205 235).

11. DNE Calculation TI-RPS-48 R2 (RIMS No. B45 851105 235).

12. Technical report from Central Laboratories -PSC- Chattanooga with attachment (RIMS No. E13 851113 251).

13. Memo, to R. A. Sessoms from John A. Raulston, November 20, 1985, with attachments (RIMS No. B45 851120 263).

14. Test report summary on Patel Engineers Conformal Coating (PECC) excerpted from Technical Report No. PEI-TR-850400-2 (RIMS No. B71 860429 100).

BINDER NO. WBNEQ-TB-001 PLANT WBN UNIT(S) 1 SHEET B2 OF B39

R R

BINDER TITLE GENERAL ELECTRIC COMPUTED [illegible] DATE 7/16/86

TERMINAL BLOCKS CHECKED [illegible] DATE 7/18/86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified *

____ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

____ Equipment Qualification Not Established by Documentation

____ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES *The conclusion of equipment qualified is conditional depending upon resolution of the technical issues listed (see front of binder). See sheet B2A for an abbreviated description of each technical issue and open item.

COMMENTS/RECOMMENDATIONS The General Electric terminal blocks are qualified for inside and outside containment service for 40 years. The blocks are qualified for power, control, and RTD instrumentation applications in any area of the plant. For transmitter circuits, the blocks are qualified for use in areas that are not susceptible to moisture intrusion. TVA supplied and installed terminal blocks in local junction boxes inside containment and the main steam valve vault rooms are coated with Dow Corning RTV 3140 coating.

TVA 19537 (OE-3-86) EQP127.31

BINDER NO. WBNEQ-TB-001 PLANT WBN UNIT(S) 1 SHEET B2A OF B39

BINDER TITLE GENERAL ELECTRIC COMPUTED JH DATE 9/15/86 R ___ R ___

TERMINAL BLOCKS CHECKED ETW DATE 9.15.86

TECHNICAL ISSUES AND OPEN ITEMS

1. Technical Issue - Justification for the utilization of both cellulose filled and mineral filled phenolic must be entered into binder.

2. Open Item - Verify that all terminal blocks requiring coating have been coated.

3. Open Item - Nametag discrepancies on field verification data sheets must be corrected.

4. Open Item - All unqualified terminal blocks must be replaced and coating applied where required.

BINDER NO. WBNEQ-TB-001 PLANT WBN UNIT(S) 1 SHEET B3 OF B39
R R

BINDER TITLE GENERAL ELECTRIC COMPUTED [illegible] DATE 7/26/86

TERMINAL BLOCKS CHECKED [illegible] DATE 7/26/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS NA

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE Standard 344-1975

10CFR50/Appendix B

ANSI N45.2

NEMA ICS4

UL 1059

BINDER NO. WBNEQ-TB-001 PLANT WBN UNIT(S) 1 SHEET B4 C99
R R

BINDER TITLE GENERAL ELECTRIC COMPUTED [illegible] DATE 7/16/86

TERMINAL BLOCKS CHECKED [illegible] DATE 7/18/86

D. QUALIFICATION METHODOLOGY (Check only one block)

____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS See Section E for similarity discussion.

BINDER NO. WBNEQ-TB-001 PLANT WBN UNIT(S) 1 SHEET B5 OF B39
R R
BINDER TITLE GENERAL ELECTRIC COMPUTED [illegible] DATE 7/26/86
TERMINAL BLOCKS CHECKED [illegible] DATE 7/26/86

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? Yes*

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Terminal Block	Terminal Block	Page I-2, Par. 2.1
(2) Manufacturer	General Electric	General Electric	Page I-2, Par. 2.1
(3) Model Number(s)	CR151B Series	CR151B6	Page I-2, Par. 2.1
(4) Serial Number(s)	NA	NA	NA
(5) Identify Component-Unique checksheet attached:	NA		

JUSTIFICATION/COMMENTS *This binder also presents qualification documentation for GE models CR151A, EB-5, EB-25, and EB-27 although only GE model CR151B terminal blocks have been used in the WBN category A/B Class 1E harsh environment applications (as evidenced by TAB F field verification).

SIMILARITY JUSTIFICATION

A comparison of the CR151B, CR151A, EB-5, EB-25, and EB-27 terminal blocks is presented below (compiled from data in TAB E):

TB	Material	Construction	Electrical Rating
CR151B	Cellulose-Filled Phenolic	Molded	30A,600V
CR151A	Phenolic	Fabricated	30A,600V
EB-5	Cellulose-Filled Phenolic	Fabricated	30A,600V
EB-25	Cellulose-Filled Phenolic	Molded	30A,600V
EB-27	Cellulose-Filled Phenolic	Molded	30A,600V

Dimensions for typical 12-point terminal blocks of each type are given below:

TB	Length	Width	Depth	Spacing Between Adjacent Terminals
CR151B	6.88"	1.62"	1.16"	.56"
CR151A	8.81"	1.75"	1.45"	.62"
EB-5	8.25"	2.00"	1.31"	(2) .62"
EB-25	8.25"	2.00"	1.25"	(1) .62"
EB-27	8.25"	2.00"	1.25"	(2) .62"

Suffixes to the above model numbers reflect the type of terminals (i.e., screw, saddle clamp, etc.) and number of terminals. Field verification has indicated that all of the TB screws are either binding head or washer head type screws.

As shown above, each of the terminal blocks is composed of a phenolic material. Although the exact phenolic material of the CR151A is not known, it is reasonable to expect that it is cellulose-filled, since the other General Electric blocks are. The chemical compositions of the metallic materials for the above terminal blocks are given in TAB C, page C10. The EB-27 metallic chemical composition is assumed to be similar to the EB-25 since General Electric, in their technical data sheet No. 7173, dated October 15, 1984 (see TAB E), states that the EB-27 is the same as the EB-25, except that short circuit strips are supplied in lieu of a marking strip. The CR151-series blocks have zinc- or cadmium-plated screws and brass terminal plates (strips), while the EB series have nickel-plated brass screws and terminal plates.

Numerous tests and reports, specifically Sandia Laboratories report No. NUREG/CR3691, dated September 1984, "An Assessment of Terminal Blocks in the Nuclear Power Industry," have concluded that the terminal block phenolic material is not a significant factor to terminal block failures, but rather leakage currents caused by conductive film formation on the terminal block insulating surfaces. Several sources exist which contribute to the film formation: contaminants (dust, manufacturing residues, body salts from handling, etc.) in the block crevices and on its surfaces; corrosion of the block metallics (conductive strips, screws) and condensation formed from both normal and accident conditions.

The conclusion from the chemical analysis of the metallic materials of the blocks is that the CR151-series metallics will corrode more easily than the EB-series, and the CR151B is more apt to corrode due to its zinc plating than the CR151A.

Geometrically, although the terminals for all the blocks are located approximately 1/2" from the bottom of the block base (and thus to ground), the CR151B block is more likely to experience problems with leakage currents because of closer terminal spacing and shorter barrier height. These characteristics provide a shorter path for leakage currents, thus increasing chances of terminal block failure. Although overall physical appearances of the blocks differ somewhat, the relative surface areas and distances between terminals are the central concerns in surface film formation and potential leakage current paths.

Based on the similarity of the block material, and the fact that the CR151B is more prone to failure, this block was chosen for the test program, and its qualification qualifies the other GE models.

(1) Dimension obtained from measurement of actual terminal block sample.
(2) Approximate dimension based on similarity to the EB-25 block.

BINDER NO. WBNEQ-TB-001 PLANT WBN UNIT(S) 1 SHEET B8 OF B39

BINDER TITLE GENERAL ELECTRIC TERMINAL BLOCKS COMPUTED [illegible] DATE 7/16/86 CHECKED [illegible] DATE 7/18/86

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	Terminal Block Mounting Screws	(3) Yes	Page X-11, Par. 3.2.1
External Process Connections	None	NA	NA
Electrical Connections	Terminal Lugs (1) See Comment	(3) Yes	Page I-2, Par. 2.2.1
Conduit Seals	None	NA	NA
Connector Seals	None	NA	NA
Orientation	Horizontal or Vertical	(2)(3) No	Page X-10, Par. 3.2.1
Physical Configuration	Mounted Inside Enclosures	(3) Yes	Page VIII-3, Par. 2.1.1
Other	Junction Boxes and Jumper Wiring	(3)(4) Yes	Page I-2, Par. 2.2.1; Page VIII-3, Par. 2.1.1

JUSTIFICATION/COMMENTS (1) All terminations on terminal blocks at Watts Bar are made using prescribed materials and procedures per TVA General Construction Specification G-38. Included in G-38 are crimp type insulated and uninsulated terminals (tin coated for oxidation/corrosion inhibition and compatibility with terminal block materials) which are installed by using the appropriate terminal manufacturer's calibrated crimping tools. Sources for these terminals are the AMP Products Corp., Burndy Corp., and Thomas and Betts Company.

F. INSTALLATION INTERFACES (Continued)

The performance of the terminals in the test confirms the suitability of these materials. Terminal blocks screws are tightened to provide a snug connection with terminals, unless otherwise instructed by terminal block or terminal vendors. These procedures are required by TVA General Construction Specification G-38, "Installing Insulated Cables Rated Up to 15,000 Volts," and Watts Bar Nuclear Plant Modifications and Additions Instruction M&AI-4, "Installation and Inspection of Cable Terminations."

(2) Terminal block orientation in test was vertical with open conduit entering top of box. This allowed the chemical spray entering junction box to flow or drip down terminal block across adjacent circuits, thus increasing chances of leakage currents and subsequent failure of the safety-related circuits. Although the blocks were not located directly under the conduit entry in the test, the possibility exists that some blocks may be located directly under top entry conduits at Watts Bar. But in the high accident pressure areas where steam/chemical spray might be forced into the boxes (i.e., containment and the main steam valve vault rooms), the conduit systems are closed to minimize this possibility and the terminal blocks are coated inside containment and the main steam valve vault rooms to help protect them. Also see note (3).

F. INSTALLATION INTERFACES (Continued)

(3) The standard physical configuration is to install terminal blocks in enclosures per the National Electrical Code Article 110-17 and the NEMA Standard Publication 250. The attachment of the terminal blocks to the enclosure internal panels by mounting screws, the attachment of wiring to the terminal blocks by terminal lugs, and the orientation of the terminal blocks within the enclosures are all standard considerations in all terminal block applications/installations and do not require any special considerations for QMDS. Terminal blocks in WBN safety-related circuits are installed in gasketed and ungasketed sheet steel enclosures (see Binder WBNEQ-JBOX-001). The enclosures provide a degree of physical protection but are not relied upon for environmental qualification other than for direct spray impingement. The Wyle test program, 17733-1, qualified terminal blocks installed in NEMA 12 (gasketed) enclosures. However, since the enclosures had weepholes drilled in them and they had open conduits entering them, the test essentially applied to ungasketed enclosures, also.

BINDER NO. WBNEQ-TB-001 PLANT WBN UNIT(S) 1 SHEET B11 OF B39
R R

BINDER TITLE GENERAL ELECTRIC COMPUTED JBH DATE 7/16/86
TERMINAL BLOCKS CHECKED EJD DATE 7/18/86

F. INSTALLATION INTERFACES (Continued)

(4) The environmental qualification of junction boxes and jumper wire interfaces of the terminal blocks is addressed in the following binders:

Binder No.	Interface
WBNEQ-JBOX-001	Junction Box
WBNEQ-CABL-044	Rockbestos XLPE Jumper Wire

EQP127.31

TVA 19537 (OE-3-86)

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	Page I-1, Par. 2.1
(b) Baseline performance measurements taken	Yes	Page I-3, Par. 2.3
(c) Equipment aged:		
Thermal	Yes*	Page IV-1, Par. 2.0
Radiation	Yes	Page II-1, Par. 2.0
Wear	NA	See Sht. B13
(d) Vibration/seismic testing conducted	Yes	Page VI-2, Par. 2.0
(e) Design basis event (DBE) exposure	Yes	Page VIII-4, Par. 2.4
(f) Post-DBE exposure	Yes	Page VIII-4, Par. 2.4
(g) Final inspection and disassembly	Yes	Page IX-1, Par. 3.0

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes
(Reference Page vii, paragraph 8.0).

JUSTIFICATION/COMMENTS *Only coated terminal blocks were thermally aged, since the Dow Corning RTV 3140 was considered to be sensitive to thermal aging. The uncoated blocks in the test were not thermally aged, since the terminal block materials were deemed not age-sensitive to time-temperature effects (see 17733-1, page K-19, paragraph 3.6.5).

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R R

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G.(1)(c) Wear - The terminal blocks contain no moving parts and thus, wear aging is not appropriate for this equipment. The blocks are passive electrical devices that are energized at levels below the manufacturer's ratings (30A,600V). Thus there are no electrical, mechanical, or process stresses induced in them.

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H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference Page IV-1, par. 2.0 and Page II-1, par. 2.0).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	Page IV-1, Par. 2.0
Radiation exposure	Yes	Page II-1, Par. 2.0
Vibration (non-seismic) aging	No	See TAB C
Operational (electrical/mechanical/process) stress aging	No	See Sht. B1

JUSTIFICATION/COMMENTS

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS See sheet B15.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference Page IV-1, par. 2.0).

JUSTIFICATION/COMMENTS

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TEST SEQUENCE AND SYNERGISTIC EFFECTS, SECTIONS G AND H(3)

A review of NUREG/CR-2157 and 2932 determined that there are no known synergistic effects on the RTV coating material that would cause unsatisfactory performance of the terminal blocks. The terminal block materials were assumed to be insensitive to thermal aging effects, and the test program proved that they are not sensitive to radiation effects of the levels exposed. As shown in Sections I, III, and V of Wyle Test Report 17733-1 (See TAB D), the result of sequential radiation and thermal aging on the terminal block coating material was increased insulation resistance after each exposure from initial baseline measurements. No visible damage or degradation to the terminal blocks or coating had occurred. Because each exposure (thermal aging and radiation exposure) on its own increased the insulation resistance of the blocks, it is reasonable to conclude that the reverse sequence of exposure or simultaneous exposure to these parameters would have the same effect. It is concluded that sequence has no effect on these materials.

No dose rate synergisms are known to apply to the RTV or terminal block materials. Moisture is the only other environmental parameter that could have a potential synergistic effect on the terminal blocks. EPRI Report No. NP-2129, "Radiation Effects on Organic Materials in Nuclear Plants," states that cellulose-filled phenolics become more susceptible to moisture damage after irradiation. However, this phenomenon was not observed in Wyle Test Report 17733-1. Also, any moisture induced cracking of the phenolic insulating material would be minimized as the entire block is held intact and rigid by the mounting screws. In addition, changes in relative humidity could cause condensation to form on the terminals, thus increasing the chances of corrosion; however, terminal blocks in areas that experience periods of 100 percent relative humidity during non-accident conditions (i.e., containment and the main steam valve vault rooms) are coated with Dow Corning RTV 3140 coating. Periodic surveillance and preventive maintenance, as recommended in TAB G, will detect and correct any potential corrosion problems.

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H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes
(Reference: Section X, paragraph 3.6 through 3.6.4.1; Tables I and II; Appendix IV).

JUSTIFICATION/COMMENTS Phenolics were shown not to be age-sensitive. (Refer to Justification/Comments, Section G).

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference Page X-15, paragraph 3.6).

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference Page X-16, paragraph 3.6.4.1; Page X-19, paragraph 3.6.5).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	120°F (48.9°C)	90°C	120°F (48.9°C)
Time	40-years	498 hrs	40-years

JUSTIFICATION/COMMENTS

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference Page X-49, Appendix IV).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes
(Reference Page X-16, paragraph 3.6.4.1).

JUSTIFICATION/COMMENTS The RTV activation energy was used as the basis for the aging program because phenolics are not age-sensitive. Resultant age-conditioning was comparable to 37 years on terminal blocks that had RTV coating; the coating was aged to 40 years.

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? NA (Reference See below).

JUSTIFICATION/COMMENTS Regression line not used.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference Page X-19, paragraph 3.6.5).

JUSTIFICATION/COMMENTS See sheet B18.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference Page II-1, paragraph 2.0).

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference Page X-30, Items 1.1 & 1.2; Page X-14, paragraph 3.4.1).

JUSTIFICATION/COMMENTS

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference Page X-15, paragraph 3.4.3).

JUSTIFICATION/COMMENTS

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H.(4)(b) JUSTIFICATION/COMMENTS - The terminal blocks were not energized during thermal aging sequence of Wyle test program 17733-1 for the following reasons:

1. The terminal blocks are passive devices. Thus, there is no need to monitor their performance during thermal aging.
2. Any temperature rise in the blocks' enclosures due to energization is negligible due to the following:
   a. The results of the 17733-1 test program revealed that there is little difference, if any, on terminal block performance during an accident whether or not they are coated. Thus, the effect of temperature on the coating material is irrelevant. Wyle had concluded that the terminal block materials were not sensitive to time-temperature effects over a 40-year lifetime (page X-19, paragraph 3.6.5).
   b. There is minimal thermal contribution from terminal blocks inside enclosures because: (1) instrumentation circuits operate with low current, thus there is no heat rise and (2) safety-related control circuits are operated only periodically.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference Page II-1, paragraph 2.0).

Plant normal ambient radiation dose (rd) 2.0×10^7 Gamma

Test exposure dose (rd) 2.534×10^8 Gamma

Test exposure dose rate (rd/hr) $< 1.0 \times 10^6$

Test exposure source type (e.g., Co-60 gamma) Co-60 Gamma

JUSTIFICATION/COMMENTS

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Equipment installed in enclosures which are rigidly mounted. See TAB C (page C1).

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS See (6)(a).

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS See sheet B13.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS See sheet B13.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference Page v, paragraph 4.0).

Qualified life (Document in QMDS) 40-years

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? No
(Reference See below).

Replacement Intervals (Document in QMDS)

JUSTIFICATION/COMMENTS No replacement intervals; terminal blocks qualified for 40 years.

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I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Phenolic	3.4×10^5	Page X-30	1.59	Page X-30
(b)	Dow Corning RTV 3140 Coating	unknown	Page X-30	1.61	Page X-30
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS The phenolic material forms the base of the terminal block and is used as the insulating material between circuits on the block. The RTV coating is used to help protect the terminal block conducting materials (terminal screws and connector plates) from corrosion and potential leakage currents if the block is exposed to moisture. The RTV activation energy was used as the basis for the thermal aging program because phenolics are not age-sensitive. The resultant age-conditioning was equivalent to 37 years (activation energy 1.59) on the terminal blocks that had the coating; the coating was aged to the equivalent of 40 years (activation energy 1.61). A detailed analysis for the phenolic and coating is presented in Wyle Test Report No. 17733-1, Section X, paragraphs 3.4 and 3.6.

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference Page VIII-2, paragraph 1.5).

Identify Acceptance Criteria: The terminal blocks shall distribute sufficient power for proper operability of end devices during the LOCA test. Proper operability of (see sheet B24).

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference Page VIII-2, paragraph 1.5).

Identify baseline and functional testing: Insulation resistance measurements after thermal aging, radiation exposure, seismic testing, load current monitoring during accident simulation, and periodic leakage current measurements during accident simulation.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference Page VIII-2, paragraph 1.5.1).

JUSTIFICATION/COMMENTS

J.(1)(Continued): end devices is defined as follows:

1. RTD End Devices - The output resistance shall be within ± 20 percent of the values recorded during the pre-LOCA operability checks.

2. Transmitter End Devices - The output currents shall be within ± 20 percent of the values recorded during the pre-LOCA operability checks.

3. Solenoid Valve End Devices - The solenoid valves shall remain energized during the LOCA test and not change state.

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS See sheet B27.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a) Parameter	(1) Specified Accident Conditions	(1) Reference
Voltage	120VAC, 125VDC	
Load	NA	
Frequency	NA	
Accuracy	(2)	
Other(s)		

JUSTIFICATION/COMMENTS J(5)(a)(1) Electrical parameters for terminal blocks, under specified accident conditions, are the same as under plant normal conditions. The Watts Bar terminal blocks are used in control applications where control circuit loads range up to 1 amp (typically these loads are less than 1 amp).

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(b)	Parameter	Demonstrated Conditions	Reference
(3)	Voltage	120VAC, 125VDC	p VIII-20
	Load	432 ma, 108 ma	p VIII-20
	Frequency	NA	NA
	Accuracy	(2)	(2)
	Other(s)		
	NA	NA	NA

JUSTIFICATION/COMMENTS J(5)(a)(2) The test program was designed to determine the ability of the terminal blocks to provide sufficient power for proper operability of end devices during an accident at loads typical of those at Watts Bar. There are no 10CFR50.49 instrumentation transmitter and RTD circuits terminated on terminal blocks at Watts Bar. Therefore, accuracy is not a consideration. The demonstrated values of voltage and load throughout the test compared closely to values which were predetermined by pre-LOCA operability checks of the end devices.

J(5)(b)(3) See TAB C, sheet C9, for discussion of qualification of terminal blocks for 480VAC applications.

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J.(4) JUSTIFICATION/COMMENTS

Only insulation resistance measurements were performed for baseline testing. Testing for operability with test loads was considered unnecessary because terminal blocks are not complex equipment, and insulation resistance measurements and visual inspection did not provide indication to the contrary that the terminal blocks would not carry the load. Pre-accident simulation load conditions were established. See J.(5).

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K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. See sheet B29A for a list of references.

(1) Normal Max

(a) Temperature (°F) 120

(b) Pressure (psig) 0.3

(c) Humidity (%) 80

(d) Radiation (rd) 2×10^7 TID Gamma

(2) Abnormal Max

(a) Temperature (°F) 130

(b) Pressure (psig) 0.3

(c) Humidity (%) 100

(d) Radiation (rd) NA

Comments: (1)(a) and (2)(a) - Main steam valve vault rooms have normal and abnormal maximum temperatures of 130°F and 140°F, respectively.

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: Up to 8 hours per excursion and will occur less than 1% of the plant life. The 10°F difference for the abnormal time is negligible for a 40-year life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 327 Accident type LOCA/HELB

(b) Pressure (psig) 11.2 Accident type LOCA/HELB

(c) Humidity (%) 100 Accident type LOCA/HELB

(d) Radiation (rd) (4.0×10^7 Gamma, 4.7×10^6 Beta), 2.116×10^8 Gamma* equivalent Accident type LOCA/HELB

(e) Spray Type Chemical Accident type LOCA/HELB

*See TAB C, page C7, for explanation of beta dose reduction. Gamma radiation value in DNE calculation (later) is greater than 2.316×10^8 rads. However, document WBNNAL3-031 (TAB C, page C5) indicates that no 10CFR50.49 junction boxes with terminal blocks in the EGTS room will experience an accident dose greater than 8.3×10^6 rads.

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K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

Spray duration is 30 days and flow rate is 0.92 gpm/ft^2. Spray composition is an alkaline borate solution (pH 8.3) produced by mixing boric acid with sodium tetraborate.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? Yes (Reference TAB C, page C2; Section P, Discussion).

(7) Subject to submergence (yes/no/NA)? No (Reference TAB F, TAB C (pages C3 and C6).

Identify initiation time and duration of submergence: _____

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
(a) Moisture intrusion (TAB C, page C2)	B45 851017 235
(b) Thermal life (TAB C, page C4	NA
(c) Submergence in auxiliary building (TAB C, page C3)	B45 860110 218
(d) Maximum containment water level (TAB C, page C6)	NEB 840120 220
(e) Radiation (TAB C, page C7)	B45 860205 235
(f) Post-accident operating time (TAB C, page C8)	NA

Comment K.(8)(e) See Sheet B29A for radiation documentation references.

DOCUMENTATION REFERENCES FOR ENVIRONMENTAL CONDITIONS, SECTION K

See the referenced documents for the environmental radiation conditions, both normal and accident, in the listed areas. See the WBN 47E235-42 drawing for the maximum values for temperature, pressure, and spray.

AREA	REFERENCES	
	40-Year Normal	Accident
Primary Cntmt	GENNAL3-001	TI-RPS-48 WBNNAL3-004
Annulus	GENNAL3-001	WBNNAL3-004
Aux. Bldg. General Areas	WBNNAL3-025	WBNNAL3-026
*EGTS (El 757/Rm A16)	WBNNAL3-025	WBNNAL3-031
*ABGTS (El 737/Rms A5,A9)	WBNNAL3-025	WBNNAL3-007
**Volume Control Tank Rooms (El 713/Rms A7,A20)	WBNNAL3-025	WBNNAL3-021

*Location specific radiation doses for equipment in these areas are documented in TAB C, Section C5.

**These rooms are listed for reference purposes as the room's interiors have extremely high normal doses. However, field verification has determined that no junction boxes, terminal blocks, handswitches, etc., are located in the interiors of these rooms.

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L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 days	83 hours	PP VIII-28,29,30 P X-26, Par. 3.10.7
Temperature (°F)	327	350	P VIII-28
Pressure (psig)	11.2	21.2	P VIII-28
Relative Humidity (%)	100	100	P X-25, Par. 3.10.7 P VIII-28
*Chemical Spray	2000ppm boron pH 8.3	2000ppm boron pH 8.3 ± 1	P VIII-4, Par. 2.4
Radiation (rd)*	2.316×10^8 gamma and beta	2.5337×10^8 gamma	p II-1, Par. 2.0
Submergence	NA	NA	NA

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

***See TAB C, page C7, for Beta Radiation Dose Reduction Calculation.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	P VIII-28
Pressure	Yes	P VIII-28
Relative Humidity	Yes	P VIII-28
Chemical Spray	Yes	P VIII-4
Submergence	NA	NA

JUSTIFICATION/COMMENTS See TAB C, page C8, for extension of post-accident operating time to 100 days.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)		Margin Applied	Yes/No/NA
Temperature: +15 degrees F		+23°F	Yes
Pressure: +10% but no more than 10 psig		8.6 psig	Yes
Radiation: +10% of accident dose		+10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)		None	Yes (4)
Voltage: ±10% of rated value	(1)	None	NA
Frequency: ±5% of rated value	(1)	None	NA
Environmental Transient: the initial transient and the peak temperature applied twice	(2)	NA	NA
Vibration: +10% added to acceleration	(3)	NA	NA

JUSTIFICATION/COMMENTS: (1) Only the necessary levels of voltage and frequency to operate the end devices were applied.

(2) Although required by IEEE-323(74), the twice applied environmental transient is generally recognized to not be needed if sufficient margin is added to the temperature and pressure parameters. This is consistent with the option provided in IEEE-323(83).

(3) The terminal blocks were qualified seismically as devices in the test program, which is more stringent than qualification as assemblies, which they are, as actually installed (mounted inside enclosures which are affixed to some rigid structure).

(4) See TAB C, page C8, for calculation of extension of operating to 100 days.

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M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference Page X-9, par. 2.2).

JUSTIFICATION/COMMENTS The terminal blocks distribute sufficient power for proper operability of safety-related devices before, during, and after design basis accidents.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference Page VIII-5, par. 3.0).

JUSTIFICATION/COMMENTS

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference Page VIII-5, par. 3.0).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference Page VIII-5, par. 3.0; TAB C, page C8).

JUSTIFICATION/COMMENTS

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference Pages ii, iii, iv, v; par. 4.0).

JUSTIFICATION/COMMENTS Only Anomalies 1 and 2 are applicable to the terminal blocks being addressed in this binder. Anomalies 3-5 apply to cables which are addressed in other binders. See Section P for discussion of anomalies.

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N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS

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0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	Yes
(d) Materials susceptible to thermal/radiation aging identified?	Yes

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O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes
(11) Criteria regarding submergence satisfied?	NA
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

See sheet B37.

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P. DISCUSSION (Continued)

1. The terminal blocks are used to terminate circuits of safety-related equipment inside and outside containment and applications are in the 120VAC and 125VDC range. All 10CFR50.49 instrumentation transmitter and RTD circuits have been spliced out at Watts Bar. This action was taken to relieve uncertainties due to leakage currents which are inherent in low voltage instrumentation circuit/terminal block applications under accident conditions and which degrade instrumentation signal levels/loop accuracies. Wyle test program 17733-1 showed that leakage currents are a potential problem for terminal blocks in accident conditions, and corrosion is a contributing factor to the leakage current. The test program also showed that coating of terminations can reduce the levels of leakage currents. Coating will also reduce corrosion effects during normal, non-accident conditions. TVA-supplied and installed terminal blocks used in local junction boxes in the harsh environment at Watts Bar in safety-related circuits are coated with two different coatings - Dow Corning RTV 3140 and Patel Engineers Conformal Coating (PECC). The DC 3140 is used throughout the harsh environment areas whereas the use of PECC is limited to use in areas in which the 40-year normal plus accident radiation dose does not exceed 2×10^7 rads. See TAB C, Section C11 for the PECC qualification justification and a list of junction boxes (and locations) containing PECC coated terminal blocks.

P. DISCUSSION (Continued)

The blocks are constructed of a phenolic material and are rated for 30 amps and 600 volts. They utilize screw terminals for circuit wire connections. The terminal blocks are mounted in enclosures to provide a degree of protection from the environment. All 10CFR50.49 terminal blocks are located above the maximum postulated flood levels. Terminal block enclosures in areas susceptible to high accident pressures (containment and the main steam vault rooms) and areas subject to moisture instrusion (see TAB C) have weep holes drilled in them.

Wyle Laboratories test program 17733-1, along with complementary data from Wyle programs 17503-1 and 17508-1, proved that the terminal blocks are qualified for 40 years and will perform adequately before, during, and after design basis accidents.

2. Anomalies that occurred during the Wyle Laboratories 17733-1 test program that could affect the terminal blocks' ability to perform their safety functions are addressed below:

A. Anomaly No. 1: Terminal barriers on terminal block specimens 2, 4, and 15 were broken during shipment from the radiation facility. Since the functional operability of the terminal blocks was demonstrated in subsequent functional tests and accident testing, the damage does not affect the qualification of the terminal blocks.

P. DISCUSSION (Continued)

B. Anomaly No. 2: The output of the RTD end device for terminal block specimens 4 and 9 was less than the required 1.04 mA (approximately 0.9 mA) after 15 hours into the LOCA test. Measurements taken on the blocks revealed that specimen 4 was the problem. Testing was continued successfully with specimen 9 only in the circuit. A post-LOCA inspection of specimen 4 revealed a loose terminal screw. The screw was tightened and the voltage was applied to specimen 4 only with the RTD end device. The output was normal, indicating that the cause of the anomaly was probably the loose screw, and the terminal block would have performed adequately in the test with the tightened screw.

BINDER NO. WBNEQ-JBOX-001 PLANT WBN UNIT(S) 1 SHEET 1 OF 1

BINDER TITLE JUNCTION BOXES COMPUTED JLH DATE 6/16/86 R ___ R ___

CHECKED ETL DATE 6/16/86

TAB A COMPILATION METHODOLOGY

The Watts Bar Environmental Qualification binder WBNEQ-JBOX-001 equipment list (TAB A) was compiled by utilizing the DNE calculation WBPEVAR 8601003 as a baseline reference document. This calculation listed all of the Class 1E junction boxes and local instrumentation panels in the harsh environment. All end devices (devices whose circuits terminate in the junction box) were listed for each JB. A crosscheck of the end devices in each JB was made to the category and operating times calculations (see TAB E for the memo which tabulates the systems for which category and operating times calculations have been issued) and, if any device was determined to be category A or B for any event, the JB was entered into the binder TAB A.

This process was performed for each revision and QIR to the WBPEVAR 8601003 calculation to ensure a comprehensive assessment of all Class 1E harsh environment JBs. To maintain the TAB A through the life of the plant, this process will be repeated each time a modification adds, changes, or in any way affects Class 1E harsh environment JBs/end devices/circuits.

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-0-JB -292-0228 -A	0-JB -292-0228 -A	JUNCTION BOX	JBE	XA5		729'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-0229 -B	0-JB -292-0229 -B	JUNCTION BOX	JBE	XA8		729'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-1163 -B	0-JB -292-1163 -B	JUNCTION BOX	JSE	VA12		757'	A16	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-1164 -A	0-JB -292-1164 -A	JUNCTION BOX	JSE	VA12		757'	A16	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-1547 -A	0-JB -292-1547 -A	JUNCTION BOX	JXA	WA7		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-1548 -B	0-JB -292-1548 -B	JUNCTION BOX	JXA	WA9		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-1706 -A	0-JB -292-1706 -A	JUNCTION BOX	JVE	RA3		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-1708 -B	0-JB -292-1708 -B	JUNCTION BOX	JVE	QA13		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-1942 -A	0-JB -292-1942 -A	JUNCTION BOX	JXA	UA11		757'	A16	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-1943 -B	0-JB -292-1943 -B	JUNCTION BOX	JXA	VA11		757'	A16	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-2034 -A	0-JB -292-2034 -A	JUNCTION BOX	JQD	QA1		713'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-2035 -B	0-JB -292-2035 -B	JUNCTION BOX	JQD	QA1		713'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.L. Hollis 9/8/86

CHECKER/DATE E.T. Dunlap 9-10-86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS
PAGE: 2 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-0-JB -292-2765 -A	0-JB -292-2765 -A	JUNCTION BOX	JQE	TA1		692'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-2766 -B	0-JB -292-2766 -B	JUNCTION BOX	JQE	TA14		692'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-2856 -A	0-JB -292-2856 -A	JUNCTION BOX	JXA	RA4		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-2894 -B	0-JB -292-2894 -B	JUNCTION BOX	JXA	TA12		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-3213 -B	0-JB -292-3213 -B	JUNCTION BOX	JXA	VA11		692'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-3215 -A	0-JB -292-3215 -A	JUNCTION BOX	JXA	UA9		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-3341 -B	0-JB -292-3341 -B	JUNCTION BOX	JXA	RA13		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-3342 -A	0-JB -292-3342 -A	JUNCTION BOX	JXA	SA3		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-3788 -A	0-JB -292-3788 -A	JUNCTION BOX	JPF	VA4		737'	A05	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-0-JB -292-3993 -B	0-JB -292-3993 -B	JUNCTION BOX	JPF	VA12		737'	A09	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-0004 -A	1-JB -292-0004 -A	JUNCTION BOX	JXA	TA8		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-0358 -B	1-JB -292-0358 -B	JUNCTION BOX	JXA	UA6		692'	A12	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.J. Hollis 9/8/86

CHECKER/DATE E.T. Dunlap 9.10.86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -292-0359 -B	1-JB -292-0359 -B	JUNCTION BOX	JXA	VA5		692'	A13	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-0530 -B	1-JB -292-0530 -B	JUNCTION BOX	JVF	SVR		729'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-0540 -A	1-JB -292-0540 -A	JUNCTION BOX	JVE	SVR		729'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-0567 -A	1-JB -292-0567 -A	JUNCTION BOX	JFD	VA5		676'	A16	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-0569 -B	1-JB -292-0569 -B	JUNCTION BOX	JFD	UA5		676'	A16	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-0593 -A	1-JB -292-0593 -A	JUNCTION BOX	JQE	VA3		737'	A05	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-0748 -B	1-JB -292-0748 -B	JUNCTION BOX	JXA	WA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-0772 -B	1-JB -292-0772 -B	JUNCTION BOX	JFD	TA5		676'	A16	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-0773 -A	1-JB -292-0773 -A	JUNCTION BOX	JXA	UA5		676'	A16	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-0846 -B	1-JB -292-0846 -B	JUNCTION BOX	JVC	TA1		692'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-0847 -A	1-JB -292-0847 -A	JUNCTION BOX	JVC	TA1		692'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1005 -A	1-JB -292-1005 -A	JUNCTION BOX	JXA	WA5		737'	A05	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.L. Hollis 9/8/86 _____ _____ _____

CHECKER/DATE E.T. Dunlap 9.10.86 _____ _____ _____

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -292-1006 -B	1-JB -292-1006 -B	JUNCTION BOX	JXA	WA5		737'	A05	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1182 -B	1-JB -292-1182 -B	JUNCTION BOX	JQE	SA3		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1189 -A	1-JB -292-1189 -A	JUNCTION BOX	JYJ	TA3		692'	A09	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1190 -B	1-JB -292-1190 -B	JUNCTION BOX	JYJ	UA5		692'	A10	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1195 -A	1-JB -292-1195 -A	JUNCTION BOX	JYJ	VA6		692'	A13	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1196 -B	1-JB -292-1196 -B	JUNCTION BOX	JYJ	UA6		692'	A12	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1231 -A	1-JB -292-1231 -A	JUNCTION BOX	JQD	TA6		713'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1232 -B	1-JB -292-1232 -B	JUNCTION BOX	JQD	TA6		713'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1235 -A	1-JB -292-1235 -A	JUNCTION BOX	JXA	WA5		713'	A13	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1246 -A	1-JB -292-1246 -A	JUNCTION BOX	JXB	WA8		713'	A13	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1352 -A	1-JB -292-1352 -A	JUNCTION BOX	JXD	WA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1353 -A	1-JB -292-1353 -A	JUNCTION BOX	JXA	VA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

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* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.L. Hollis 9/8/86 _____ _____ _____

CHECKER/DATE E.T. Dunlap 9-10-86 _____ _____ _____

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS
PAGE: 5 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -292-1354 -B	1-JB -292-1354 -B	JUNCTION BOX	JXD	WA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1355 -B	1-JB -292-1355 -B	JUNCTION BOX	JXA	VA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1356 -A	1-JB -292-1356 -A	JUNCTION BOX	JXA	WA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1357 -A	1-JB -292-1357 -A	JUNCTION BOX	JXA	WA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1358 -B	1-JB -292-1358 -B	JUNCTION BOX	JXD	WA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1367 -A	1-JB -292-1367 -A	JUNCTION BOX	JQG	WA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1368 -B	1-JB -292-1368 -B	JUNCTION BOX	JQH	WA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1369 -A	1-JB -292-1369 -A	JUNCTION BOX	JQG	WA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1370 -A	1-JB -292-1370 -A	JUNCTION BOX	JQE	WA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1371 -B	1-JB -292-1371 -B	JUNCTION BOX	JQE	WA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1391 -S	1-JB -292-1391 -S	JUNCTION BOX	JVC	UA2		692'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1407 -A	1-JB -292-1407 -A	JUNCTION BOX	JXA	SA3		713'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.L. Hollis 9/8/86 _____ _____ _____

CHECKER/DATE E.T. Dunlap 9.10.86 _____ _____ _____

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS
PAGE: 6 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -292-1408 -B	1-JB -292-1408 -B	JUNCTION BOX	JXA	SA4		713'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1421 -A	1-JB -292-1421 -A	JUNCTION BOX	JXA	WA7		713'	A12	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1422 -B	1-JB -292-1422 -B	JUNCTION BOX	JXA	VA7		713'	A11	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1425 -A	1-JB -292-1425 -A	JUNCTION BOX	JXA	VA4		713'	A07	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1426 -B	1-JB -292-1426 -B	JUNCTION BOX	JXA	VA4		713'	A07	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1446 -B	1-JB -292-1446 -B	JUNCTION BOX	JXA	VA4		713'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1447 -A	1-JB -292-1447 -A	JUNCTION BOX	JXA	VA4		713'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1502 -A	1-JB -292-1502 -A	JUNCTION BOX	JXA	UA2		713'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1504 -B	1-JB -292-1504 -B	JUNCTION BOX	JXA	VA2		713'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1506 -A	1-JB -292-1506 -A	JUNCTION BOX	JXA	SA3		713'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1507 -B	1-JB -292-1507 -B	JUNCTION BOX	JXA	UA3		713'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1512 -A	1-JB -292-1512 -A	JUNCTION BOX	JVE	SVR		729'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE D.J. Hollis 9/8/86 _____ _____ _____

CHECKER/DATE R.T. Dunlap 9.10.86 _____ _____ _____

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS
PAGE: 7 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -292-1514 -A	1-JB -292-1514 -A	JUNCTION BOX	JVE	NVR		729'	A02	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1516 -B	1-JB -292-1516 -B	JUNCTION BOX	JVE	SVR		729'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1518 -B	1-JB -292-1518 -B	JUNCTION BOX	JVC	NVR		729'	A02	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1543 -A	1-JB -292-1543 -A	JUNCTION BOX	JFD	UA4		692'	A07	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1544 -B	1-JB -292-1544 -B	JUNCTION BOX	JFD	VA5		692'	A07	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1549 -A	1-JB -292-1549 -A	JUNCTION BOX	JXA	VA4		737'	A05	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1551 -B	1-JB -292-1551 -B	JUNCTION BOX	JXA	VA3		737'	A05	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1564 -A	1-JB -292-1564 -A	JUNCTION BOX	JXA	UA5		692'	A08	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1565 -B	1-JB -292-1565 -B	JUNCTION BOX	JXA	VA5		692'	A08	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1566 -B	1-JB -292-1566 -B	JUNCTION BOX	JXA	UA5		692'	A08	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1567 -A	1-JB -292-1567 -A	JUNCTION BOX	JXA	VA5		692'	A08	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1598 -A	1-JB -292-1598 -A	JUNCTION BOX	JXA	UA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.J. Hollis 9/8/86 _____ _____ _____

CHECKER/DATE R.T. Dunlap 9.10.86 _____ _____ _____

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION A2	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -292-1599 -B	1-JB -292-1599 -B	JUNCTION BOX	JXA	UA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1933 -S	1-JB -292-1933 -S	JUNCTION BOX	JVH	UA2		692'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1964 -B	1-JB -292-1964 -B	JUNCTION BOX	JWB	SA3		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1966 -A	1-JB -292-1966 -A	JUNCTION BOX	JWB	TA3		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1968 -A	1-JB -292-1968 -A	JUNCTION BOX	JWH	UA3		737'	A05	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1970 -B	1-JB -292-1970 -B	JUNCTION BOX	JWH	UA3		737'	A05	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1972 -B	1-JB -292-1972 -B	JUNCTION BOX	JWH	SVR		729'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1974 -A	1-JB -292-1974 -A	JUNCTION BOX	JWH	SVR		729'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1985 -A	1-JB -292-1985 -A	JUNCTION BOX	JVC	SVR		729'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1986 -B	1-JB -292-1986 -B	JUNCTION BOX	JVC	SVR		729'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1987 -B	1-JB -292-1987 -B	JUNCTION BOX	JVE	NVR		729'	A02	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-1988 -A	1-JB -292-1988 -A	JUNCTION BOX	JVE	NVR		729'	A02	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

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* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J. L. Hollis 9/8/86 _____ _____ _____

CHECKER/DATE E. T. Dunlap 9.10.86 _____ _____ _____

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS
PAGE: 9 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -292-2007 -B	1-JB -292-2007 -B	JUNCTION BOX	JYJ	UA2		692'	A07	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2008 -A	1-JB -292-2008 -A	JUNCTION BOX	JYJ	UA2		692'	A07	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2012 -B	1-JB -292-2012 -B	JUNCTION BOX	JXD	WA8		713'	A13	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2013 -A	1-JB -292-2013 -A	JUNCTION BOX	JXD	WA5		713'	A13	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2049 -B	1-JB -292-2049 -B	JUNCTION BOX	JFC	SA2		713'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2063 -A	1-JB -292-2063 -A	JUNCTION BOX	JXA	WA4		692'	A07	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2064 -B	1-JB -292-2064 -B	JUNCTION BOX	JXA	VA3		692'	A07	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2065 -A	1-JB -292-2065 -A	JUNCTION BOX	JFE	UA3		692'	A07	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2066 -B	1-JB -292-2066 -B	JUNCTION BOX	JFE	UA3		692'	A07	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2071 -A	1-JB -292-2071 -A	JUNCTION BOX	JXA	TA4		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2122 -A	1-JB -292-2122 -A	JUNCTION BOX	JQE	VA1		713'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2140 -A	1-JB -292-2140 -A	JUNCTION BOX	JVC	SVR		729'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.L. Hollis 9/8/86

CHECKER/DATE E.T. Dunlap 9.10.86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -292-2141 -B	1-JB -292-2141 -B	JUNCTION BOX	JVC	SVR		729'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2202 -A	1-JB -292-2202 -A	JUNCTION BOX	JXB	UA3		737'	A05	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2203 -A	1-JB -292-2203 -A	JUNCTION BOX	JXD	XA5		729'	A08	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2204 -A	1-JB -292-2204 -A	JUNCTION BOX	JXD	TA5		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2205 -A	1-JB -292-2205 -A	JUNCTION BOX	JXD	TA10		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2206 -A	1-JB -292-2206 -A	JUNCTION BOX	JXD	TA5		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2207 -A	1-JB -292-2207 -A	JUNCTION BOX	JQD	VA3		692'	A07	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2208 -B	1-JB -292-2208 -B	JUNCTION BOX	JXD	TA5		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2209 -B	1-JB -292-2209 -B	JUNCTION BOX	JXB	UA3		737'	A05	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2210 -B	1-JB -292-2210 -B	JUNCTION BOX	JXD	XA5		729'	A08	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2211 -B	1-JB -292-2211 -B	JUNCTION BOX	JQD	VA3		692'	A07	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2212 -B	1-JB -292-2212 -B	JUNCTION BOX	JXD	TA11		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.L. Hollis 9/8/86

CHECKER/DATE E.T. Dunlap 9.10.86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS
PAGE:11 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -292-2234 -S	1-JB -292-2234 -S	JUNCTION BOX	JVE	UA2		692'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2236 -S	1-JB -292-2236 -S	JUNCTION BOX	JXD	UA2		692'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2238 -S	1-JB -292-2238 -S	JUNCTION BOX	JVC	UA2		692'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2240 -A	1-JB -292-2240 -A	JUNCTION BOX	JVA	TA1		692'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2242 -S	1-JB -292-2242 -S	JUNCTION BOX	JVB	TA2		692'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2244 -A	1-JB -292-2244 -A	JUNCTION BOX	JVA	UA1		692'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2248 -B	1-JB -292-2248 -B	JUNCTION BOX	JVA	UA1		692'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2249 -B	1-JB -292-2249 -B	JUNCTION BOX	JVA	UA2		692'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2252 -A	1-JB -292-2252 -A	JUNCTION BOX	JXA	VA11		757'	A16	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2257 -A	1-JB -292-2257 -A	JUNCTION BOX	JGE	UA2		713'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2260 -B	1-JB -292-2260 -B	JUNCTION BOX	JGE	UA2		713'	A06	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2262 -B	1-JB -292-2262 -B	JUNCTION BOX	JXA	VA11		757'	A16	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.L. Holler 9/8/86 _____ _____ _____

CHECKER/DATE E.T. Dunlap 9.10.86 _____ _____ _____

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -292-2265 -B	1-JB -292-2265 -B	JUNCTION BOX	JXD	TA5		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2386 -B	1-JB -292-2386 -B	JUNCTION BOX	JXA	TA4		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2387 -A	1-JB -292-2387 -A	JUNCTION BOX	JXA	TA3		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2388 -A	1-JB -292-2388 -A	JUNCTION BOX	JXA	SA6		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2503 -B	1-JB -292-2503 -B	JUNCTION BOX	JFG	UA6		676'	A08	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2504 -A	1-JB -292-2504 -A	JUNCTION BOX	JFG	UA6		676'	A09	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2507 -B	1-JB -292-2507 -B	JUNCTION BOX	JFG	VA6		676'	A10	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-2508 -A	1-JB -292-2508 -A	JUNCTION BOX	JQE	WA6		676'	A11	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-3032 -B	1-JB -292-3032 -B	JUNCTION BOX	JXA	WA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-3033 -A	1-JB -292-3033 -A	JUNCTION BOX	JXB	WA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-3208 -A	1-JB -292-3208 -A	JUNCTION BOX	JXA	WA4		692'	A07	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-3214 -B	1-JB -292-3214 -B	JUNCTION BOX	JXA	UA9		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

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* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.L. Hollin 9/8/86

CHECKER/DATE E.T. Dunlap 9.10.86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -292-3422 -A	1-JB -292-3422 -A	JUNCTION BOX	JQQ	VA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-3423 -B	1-JB -292-3423 -B	JUNCTION BOX	JQQ	VA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-3424 -A	1-JB -292-3424 -A	JUNCTION BOX	JVB	VA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-3425 -A	1-JB -292-3425 -A	JUNCTION BOX	JVB	VA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-3426 -B	1-JB -292-3426 -B	JUNCTION BOX	JVB	VA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-3427 -B	1-JB -292-3427 -B	JUNCTION BOX	JVB	VA5		713'	A28	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-3870 -A	1-JB -292-3870 -A	JUNCTION BOX	JWH	UA5		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-4011 -A	1-JB -292-4011 -A	JUNCTION BOX	JXA	SVR		729'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-4013 -A	1-JB -292-4013 -A	JUNCTION BOX	JXA	WA4		737'	A05	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-4015 -B	1-JB -292-4015 -B	JUNCTION BOX	JXA	VA4		737'	A05	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-4026 -B	1-JB -292-4026 -B	JUNCTION BOX	JVE	UA3		737'	A05	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-4027 -A	1-JB -292-4027 -A	JUNCTION BOX	JVE	UA3		737'	A05	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

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* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.L. Hollis 9/8/86

CHECKER/DATE R.T. Dunlap 9.10.86

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -292-4166 -A	1-JB -292-4166 -A	JUNCTION BOX	JVE	YA11		729'	A04	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-4167 -B	1-JB -292-4167 -B	JUNCTION BOX	JVE	YA11		729'	A04	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-4261 -B	1-JB -292-4261 -B	JUNCTION BOX	JXA	VA7		713'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-4275 -A	1-JB -292-4275 -A	JUNCTION BOX	JQQ	RA3		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-4455 -A	1-JB -292-4455 -A	JUNCTION BOX	JQE	SA11		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-4984 -A	1-JB -292-4984 -A	JUNCTION BOX	JQB	VA11		757'	A16	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-4985 -B	1-JB -292-4985 -B	JUNCTION BOX	JQB	VA13		757'	A16	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -292-5058 -B	1-JB -292-5058 -B	JUNCTION BOX	JTF	TA2		713'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0159 -B	1-JB -293-0159 -B	JUNCTION BOX	JVC		341	756'	U	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0368 -B	1-JB -293-0368 -B	JUNCTION BOX	JVC		163	756'	U	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0369 -A	1-JB -293-0369 -A	JUNCTION BOX	JVC		354	703'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0394 -A	1-JB -293-0394 -A	JUNCTION BOX	JVD		041	703'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.S. Hollin 9/8/86

CHECKER/DATE R.T. Dunlap 9.10.86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS
PAGE:15 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -293-0542 -A	1-JB -293-0542 -A	JUNCTION BOX	JVB		235	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0544 -A	1-JB -293-0544 -A	JUNCTION BOX	JVC		248	744'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0546 -B	1-JB -293-0546 -B	JUNCTION BOX	JXA		298	716'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0548 -B	1-JB -293-0548 -B	JUNCTION BOX	JQE		250	756'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0550 -A	1-JB -293-0550 -A	JUNCTION BOX	JQB		287	793'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0553 -A	1-JB -293-0553 -A	JUNCTION BOX	JSE		295	748'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0574 -A	1-JB -293-0574 -A	JUNCTION BOX	JVB		009	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0578 -B	1-JB -293-0578 -B	JUNCTION BOX	JVB		350	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0596 -B	1-JB -293-0596 -B	JUNCTION BOX	JVC		345	703'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0656 -A	1-JB -293-0656 -A	JUNCTION BOX	JVC		127	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0691 -A	1-JB -293-0691 -A	JUNCTION BOX	JVB		213	703'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0724 -B	1-JB -293-0724 -B	JUNCTION BOX	JQE		059	749'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.S. Hollis 9/8/86 _____ _____ _____

CHECKER/DATE E.T. Dunlap 9.10.86 _____ _____ _____

PAGE A-15

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -293-0745 -A	1-JB -293-0745 -A	JUNCTION BOX	JVC		199	756'	U	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0760 -B	1-JB -293-0760 -B	JUNCTION BOX	JVC		108	716'	IIR	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0762 -A	1-JB -293-0762 -A	JUNCTION BOX	JQE		105	749'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0764 -A	1-JB -293-0764 -A	JUNCTION BOX	JVC		060	716'	IIR	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0766 -B	1-JB -293-0766 -B	JUNCTION BOX	JVJ		303	744'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0768 -A	1-JB -293-0768 -A	JUNCTION BOX	JQG		296	725'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0775 -A	1-JB -293-0775 -A	JUNCTION BOX	JVB		034	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0788 -A	1-JB -293-0788 -A	JUNCTION BOX	JQG		289	730'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0792 -B	1-JB -293-0792 -B	JUNCTION BOX	JVD		285	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-0795 -A	1-JB -293-0795 -A	JUNCTION BOX	JXA		285	730'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1034 -A	1-JB -293-1034 -A	JUNCTION BOX	JQD		004	837'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1036 -B	1-JB -293-1036 -B	JUNCTION BOX	JQD		358	837'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.F. Hollis 9/8/86

CHECKER/DATE E.T. Dunlap 9.10.86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS
PAGE:17 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -293-1255 -A	1-JB -293-1255 -A	JUNCTION BOX	JQE		035	729'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1277 -A	1-JB -293-1277 -A	JUNCTION BOX	JXA		311	806'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1283 -B	1-JB -293-1283 -B	JUNCTION BOX	JXA		317	806'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1285 -B	1-JB -293-1285 -B	JUNCTION BOX	JXA		319	806'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1287 -A	1-JB -293-1287 -A	JUNCTION BOX	JXA		313	806'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1575 -B	1-JB -293-1575 -B	JUNCTION BOX	JVC		099	756'	U	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1576 -A	1-JB -293-1576 -A	JUNCTION BOX	JVC		095	756'	U	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1736 -B	1-JB -293-1736 -B	JUNCTION BOX	JVB		305	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1738 -B	1-JB -293-1738 -B	JUNCTION BOX	JVC		286	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1750 -A	1-JB -293-1750 -A	JUNCTION BOX	JVC		304	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1758 -B	1-JB -293-1758 -B	JUNCTION BOX	FIELD		285	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1764 -B	1-JB -293-1764 -B	JUNCTION BOX	JVC		282	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN THE F.

R_____ R_____ R_____

PREPARER/DATE J.L. Hollis 9/8/86

CHECKER/DATE E.T. Dunlap 9.10.86

PAGE A-17

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -293-1883 -B	1-JB -293-1883 -B	JUNCTION BOX	JXA		165	729'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1885 -A	1-JB -293-1885 -A	JUNCTION BOX	JXA		191	729'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1887 -A	1-JB -293-1887 -A	JUNCTION BOX	JXA		004	729'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1889 -B	1-JB -293-1889 -B	JUNCTION BOX	JXA		348	729'	ANN	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-1921 -A	1-JB -293-1921 -A	JUNCTION BOX	JVB		291	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-2649 -A	1-JB -293-2649 -A	JUNCTION BOX	JVC		023	756'	U	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-2705 -D	1-JB -293-2705 -D	JUNCTION BOX	JVB		173	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-3193 -B	1-JB -293-3193 -B	JUNCTION BOX	JVD		303	756'	U	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-3201 -B	1-JB -293-3201 -B	JUNCTION BOX	JVB		289	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-3203 -A	1-JB -293-3203 -A	JUNCTION BOX	JVB		234	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-3317 -B	1-JB -293-3317 -B	JUNCTION BOX	JVB		285	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-3319 -F	1-JB -293-3319 -F	JUNCTION BOX	JVC		232	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.J. Hollis 9/8/86

CHECKER/DATE E.T. Dunlap 9.10.86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS
PAGE:19 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -293-3321 -G	1-JB -293-3321 -G	JUNCTION BOX	JVB		068	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4326 -D	1-JB -293-4326 -D	JUNCTION BOX	JVB		028	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4328 -D	1-JB -293-4328 -D	JUNCTION BOX	JVB		049	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4330 -E	1-JB -293-4330 -E	JUNCTION BOX	JVB		152	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4332 -E	1-JB -293-4332 -E	JUNCTION BOX	JVB		133	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4334 -F	1-JB -293-4334 -F	JUNCTION BOX	JVB		203	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4336 -F	1-JB -293-4336 -F	JUNCTION BOX	JVB		226	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4338 -G	1-JB -293-4338 -G	JUNCTION BOX	JVB		345	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4340 -G	1-JB -293-4340 -G	JUNCTION BOX	JVB		317	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4342 -D	1-JB -293-4342 -D	JUNCTION BOX	JVA		024	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4344 -D	1-JB -293-4344 -D	JUNCTION BOX	JVA		057	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4346 -D	1-JB -293-4346 -D	JUNCTION BOX	JVA		155	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.L. Hollis 9/8/86 _____ _____ _____

CHECKER/DATE E.T. Dunlap 9.10.86 _____ _____ _____

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -293-4348 -D	1-JB -293-4348 -D	JUNCTION BOX	JVA		125	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4350 -E	1-JB -293-4350 -E	JUNCTION BOX	JVA		200	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4352 -E	1-JB -293-4352 -E	JUNCTION BOX	JVA		234	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4354 -E	1-JB -293-4354 -E	JUNCTION BOX	JVA		340	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4356 -E	1-JB -293-4356 -E	JUNCTION BOX	JVA		306	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4360 -E	1-JB -293-4360 -E	JUNCTION BOX	JVB		358	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4555 -A	1-JB -293-4555 -A	JUNCTION BOX	JVC		065	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -293-4557 -B	1-JB -293-4557 -B	JUNCTION BOX	JVC		067	716'	L	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-0006 -B	2-JB -292-0006 -B	JUNCTION BOX	JXA	SA6		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-1008 -B	2-JB -292-1008 -B	JUNCTION BOX	JXA	WA12		737'	A09	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-1183 -B	2-JB -292-1183 -B	JUNCTION BOX	JDE	SA14		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-1448 -B	2-JB -292-1448 -B	JUNCTION BOX	JXA	VA12		713'	A19	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE D.S. Hollis 9/8/86

CHECKER/DATE E.T. Dunlap 9.10.86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-2-JB -292-1449 -A	2-JB -292-1449 -A	JUNCTION BOX	JXA	VA12		713'	A19	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-1503 -A	2-JB -292-1503 -A	JUNCTION BOX	JXA	VA14		713'	A19	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-1505 -B	2-JB -292-1505 -B	JUNCTION BOX	JXA	VA14		713'	A19	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-1508 -A	2-JB -292-1508 -A	JUNCTION BOX	JXA	TA14		713'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-1509 -B	2-JB -292-1509 -B	JUNCTION BOX	JXA	TA14		713'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-1550 -A	2-JB -292-1550 -A	JUNCTION BOX	JXA	VA12		737'	A09	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-1552 -B	2-JB -292-1552 -B	JUNCTION BOX	JXA	VA13		737'	A09	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-1553 -A	2-JB -292-1553 -A	JUNCTION BOX	JFD	UA12		692'	A25	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-1554 -B	2-JB -292-1554 -B	JUNCTION BOX	JFD	VA11		692'	A25	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-1555 -A	2-JB -292-1555 -A	JUNCTION BOX	JYJ	UA15		692'	A25	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-1556 -B	2-JB -292-1556 -B	JUNCTION BOX	JYJ	UA14		692'	A25	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-2050 -B	2-JB -292-2050 -B	JUNCTION BOX	JFC	SA13		713'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.S. Hollis 9/8/86 _____ _____ _____

CHECKER/DATE R.T. Dunlap 9.10.86 _____ _____ _____

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBGX-001
MANUFACTURER: VARIOUS

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-2-JB -292-2389 -A	2-JB -292-2389 -A	JUNCTION BOX	JWB	SA12		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-2390 -B	2-JB -292-2390 -B	JUNCTION BOX	JWB	TA13		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-2391 -A	2-JB -292-2391 -A	JUNCTION BOX	JWB	TA11		737'	A01	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-2761 -B	2-JB -292-2761 -B	JUNCTION BOX	JXA	VA11		757'	A16	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-2-JB -292-2762 -A	2-JB -292-2762 -A	JUNCTION BOX	JXA	VA11		757'	A16	VARIOUS	ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -276-L177 -F	1-JB -276-L177 -F	LOC PNL JUNCTION BOX	BY PNL MFR			716'	L		ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -276-L182A -D	1-JB -276-L182A -D	LOC PNL JUNCTION BOX	BY PNL MFR			716'	L		ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -276-L182B -D	1-JB -276-L182B -D	LOC PNL JUNCTION BOX	BY PNL MFR			716'	L		ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -276-L183A -E	1-JB -276-L183A -E	LOC PNL JUNCTION BOX	BY PNL MFR			716'	L		ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -276-L183B -E	1-JB -276-L183B -E	LOC PNL JUNCTION BOX	BY PNL MFR			716'	L		ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -276-L183C -B	1-JB -276-L183C -B	LOC PNL JUNCTION BOX	BY PNL MFR			716'	L		ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -276-L184A -F	1-JB -276-L184A -F	LOC PNL JUNCTION BOX	BY PNL MFR			716'	L		ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.L. Hollis 9/8/86 _____ _____ _____

CHECKER/DATE E.T. Dunlap 9.10.86 _____ _____ _____

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-JBOX-001
MANUFACTURER: VARIOUS
PAGE:23 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-JB -276-L184B -A	1-JB -276-L184B -A	LOC PNL JUNCTION BOX	BY PNL MFR			716'	L		ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -276-L185A -G	1-JB -276-L185A -G	LOC PNL JUNCTION BOX	BY PNL MFR			716'	L		ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -276-L185B -G	1-JB -276-L185B -G	LOC PNL JUNCTION BOX	BY PNL MFR			716'	L		ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -276-L196 -D	1-JB -276-L196 -D	LOC PNL JUNCTION BOX	BY PNL MFR			713'	A06		ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -276-L197 -E	1-JB -276-L197 -E	LOC PNL JUNCTION BOX	BY PNL MFR			713'	A06		ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -276-L216 -A	1-JB -276-L216 -A	LOC PNL JUNCTION BOX	BY PNL MFR			713'	A06		ALL	B	100D	COMPONENT PROTECTION
WBN-1-JB -276-L217 -A	1-JB -276-L217 -A	LOC PNL JUNCTION BOX	BY PNL MFR			737'	A05		ALL	B	100D	COMPONENT PROTECTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE J.L. Hollis 9/8/86 _____ _____ _____

CHECKER/DATE E.T. Dunlap 9.10.86 _____ _____ _____

BINDER NO. WBNEQ-JBOX-001 PLANT WBN UNIT(S) 1 SHEET B1 OF B11

BINDER TITLE JUNCTION BOXES COMPUTED JJH DATE 9/10/86 R R

CHECKED ETD DATE 9.15.86

A. DOCUMENTATION

Equipment Description Junction Boxes

Vendor/Manufacturer Various*

Equipment Model No.(s) See Binder TAB E for a List of Mark Numbers Used at WBN

QUALIFICATION REPORTS

(1) Title/Number/Revision WYLE Test Report No. 17733-1, Revision B, "Nuclear Environmental Qualification Test Program on Terminal Blocks and Cables for TVA" RIMS B43 860514 501 DATE 3/19/86

(2) Title/Number/Revision ** RIMS DATE

(3) Title/Number/Revision RIMS DATE

OTHER (ANALYSIS, VENDOR DATA, ETC.) *Comment - The junction boxes were purchased on various contracts from several sources/manufacturers over a long period of time. They are static, passive devices which serve only to provide a mounting location and a certain degree of protection for other components and devices. Therefore, contractural documentation indicating the various manufacturers is not required.

**See Sheet B1A, this Tab, for a qualification bibliography listing all test reports, calculations, etc., concerning the qualification process.

QUALIFICATION BIBLIOGRAPHY

1. Wyle Test Report No. 17733-1 Rev. B, 3-19-86 (RIMS No. B43 860514 501)

2. DNE Calculation EQP-01 (RIMS No. B71 860310 200)

3. DNE Calculation WBNOSG4-44 (RIMS No. B45 860110 218)

4. DNE Calculation WBNNAL6-004 (RIMS No. B45 860116 235)

5. DNE Calculation "Maximum Containment Water Level" (RIMS No. NEB 840120 220)

6. DNE Calculation WBNOSG4-048 (RIMS No. B45 860210 218)

7. DNE Calculation GENNAL6-002 (RIMS No. B45 851017 235)

8. Memorandum. J. A. Raulston to J. C. Standifer and D. L. Kitchel, May 1, 1986; Watts Bar Nuclear Plant - 10CFR50.49 Electrical Equipment Environmental Qualification - Component Category and Operating Time Calculations (RIMS No. B45 860501 251)

BINDER NO. WBNEQ-JBOX-001 PLANT WBN UNIT(S) 1 SHEET B2 OF B11

BINDER TITLE JUNCTION BOXES COMPUTED [illegible] DATE 6/13/86 R ___ R ___

CHECKED [illegible] DATE 6/13/86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified *

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES *The conclusion of equipment qualified is conditional depending upon resolution of the technical issues listed (see front of binder). See Sheet B2A for an abbreviated description of each technical issue and open item.

COMMENTS/RECOMMENDATIONS

BINDER NO. WBNEQ-JBOX-001 PLANT WBN UNIT(S) 1 SHEET B2A OF B11

BINDER TITLE JUNCTION BOXES COMPUTED JH DATE 9/15/86 R R

CHECKED RD DATE 9.15.86

TECHNICAL ISSUES AND OPEN ITEMS

1. Technical Issue - Complete identification, categorization, and evaluation of all internal components/devices is required.

2. Open Item - Field verification is required to verify that all handswitches have been disconnected and removed from PRI containment.

3. Open Item - Verify that submerged JBs inside primary containment have been relocated.

4. Open Item - Verify that weepholes have been drilled in JBs located inside primary containment and the MSVRs.

5. Open Item - Verify that weepholes have been drilled in JBs which are located in areas subject to condensation.

6. Open Item - Nametag discrepancies on field verification data sheets must be corrected.

7. Open Item - Verify that MSVR exterior doors have been modified to reduce flooding and that JBs have been relocated.

8. Open Item - Verify that all unqualified terminal blocks have been replaced and that primary containment and MSVR TBs have been coated.

9. Open Item - Verify that junction boxes have been rewired with qualified wiring.

10. Arc suppression networks for certain solenoid valves must be relocated to a mild environment.

BINDER NO. WBNEQ-JBOX-001 PLANT WBN UNIT(S) 1 SHEET B3 OF B11

BINDER TITLE JUNCTION BOXES COMPUTED JHH DATE 9/10/86 R ___ R ___

CHECKED E.T.D. DATE 9-11-86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS Criteria and requirements as set forth in 10CFR50.49 and 10CFR50 App. A have been met through the box manufacturer's adherence to recognized industry standards and this binder's utilization of qualification methods as outlined in IEEE 323-1974.

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

NEMA STD 250

ANSI/UL 50

JIC EMP-1/EGP-1-1967

BINDER NO. WBNEQ-JBOX-001 PLANT WBN UNIT(S) 1 SHEET B4 OF B11

BINDER TITLE JUNCTION BOXES COMPUTED JLH DATE 5/15/86 R R

CHECKED ERD DATE 5/15/86

D. QUALIFICATION METHODOLOGY (Check only one block)

_____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

_____ Test of Similar Items with Supporting Analysis

X Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

_____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS IEEE 323-1974 states that: "Qualification May Be Accomplished in Several Ways; Type Testing, Operating Experience, or Analysis." The method used for qualifying junction boxes at WBN relies heavily on analysis with some supporting type test data from qualification testing of other equipment housed in junction boxes during testing. See WYLE Laboratories Test Report 17733-1 in TAB D, portions of which support the analysis presented in TAB C. TAB C presents a quantitative analysis (where pertinent) in addition to a qualitative analysis of the junction boxes which affirms that the performance/functional requirements of the junction boxes (based on applicable industry standards - NEMA 250, ANSI/UL 50, etc.) are met when the boxes are subjected to the WBN normal/accident service conditions and accident environments. Full consideration of the time dependent effects of environmental influences was taken in establishing the qualified life of the WBN junction boxes.

BINDER NO. WBNEQ-JBOX-001 PLANT WBN UNIT(S) 1 SHEET B5 OF 11

BINDER TITLE JUNCTION BOXES COMPUTED JLH DATE 5/15/86 R R

CHECKED [illegible] DATE 5/15/86

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Junction Boxes (Various Types, Sizes)	NEMA 12 Junction Box (12-1/2" x 10"x8")	17733-1 Section X Para 3.2.1
(2) Manufacturer	Various	Unknown	
(3) Model Number(s)	See TAB E	N/A	N/A
(4) Serial Number(s)	N/A	N/A	N/A
(5) Identify Component-Unique checksheet attached:	N/A		

JUSTIFICATION/COMMENTS The basic structure and function of junction boxes are similar regardless of variations in size and NEMA types/features. The type box used in the WYLE Laboratories Test is representative of those boxes used at WBN.

BINDER NO. WBNEQ-JBOX-001 PLANT WBN UNIT(S) 1 SHEET B6 OF B11

BINDER TITLE JUNCTION BOXES COMPUTED JLH DATE 5/15/86 R R

CHECKED ETD DATE 5/15/86

F. INSTALLATION INTERFACES

Does the qualification program address all relevant interfaces of the equipment so that the installed design and configuration is similar or identical to the test configuration (yes/no/NA)? (note below)

Interface	Identify Interface Requirement	Acceptable? (Yes/No/NA)	Reference Test Report
Mounting Bolts	N/A		
External Process Connections	N/A		
Electrical Connections	N/A		
Conduit Seals	N/A		
Connector Seals	N/A		
Orientation	N/A		
Physical Configuration	N/A		
Other	Internal Components See Comments		

JUSTIFICATION/COMMENTS Mounting of internal components is addressed in the qualification of terminal blocks, handswitches, etc. Where placement orientation, etc. is important to qualification, it is addressed for those particular components being qualified.

BINDER NO. WBNEQ-JBOX-001 PLANT WBN UNIT(S) 1 SHEET B7 OF B11

BINDER TITLE JUNCTION BOXES COMPUTED JCH DATE 5/15/86 R R

CHECKED ETA DATE 5/15/86

Sections G through M are omitted as not being applicable to this equipment.

TVA EQP065.25

BINDER NO. WBNEQ-JBOX-001 PLANT WBN UNIT(S) 1 SHEET B8 OF B11

BINDER TITLE JUNCTION BOXES COMPUTED JCH DATE 5/15/86 R R

CHECKED ETD DATE 5/15/86

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS Recommended surveillance and maintenance parameters are addressed in TAB G.

BINDER NO. WBNEQ-JBOX-001 PLANT WBN UNIT(S) 1 SHEET B9 OF B11

BINDER TITLE JUNCTION BOXES COMPUTED JLH DATE 5/15/86 R ___ R ___

CHECKED [illegible] DATE 5/15/86

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	N/A
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	Yes
(b) Were specific features and failure modes and effects analyzed?	N/A
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	N/A
(d) Were environmental parameters which affect equipment performance identified?	Yes
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	N/A
(b) Equipment aged to end of life condition prior to application of DBE conditions?	N/A
(c) Absence of preaging in test/analysis justified?	N/A
(d) Materials susceptible to thermal/radiation aging identified?	Yes

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	N/A
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	N/A
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	N/A
(9) Criteria regarding test sequence satisfied?	N/A
(10) Criteria regarding spray satisfied?	N/A
(a) Was the spray testing done while under the extremes of pressure and temperature?	N/A
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	N/A
(11) Criteria regarding submergence satisfied?	N/A
(12) Criteria regarding radiation satisfied?	N/A
(a) Was dose rate considered?	N/A
(b) Was beta radiation considered?	N/A
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	N/A

BINDER NO. WBNEQ-JBOX-001 PLANT WBN UNIT(S) 1 SHEET B11 OF B11

BINDER TITLE JUNCTION BOXES COMPUTED JLH DATE 5/15/86 R ___ R ___

CHECKED ETD DATE 5/15/86

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	N/A
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	N/A
(b) Was an initial base line test done to establish required performance characteristics?	N/A
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	N/A
(16) Criteria regarding instrument accuracy satisfied?	N/A
(17) Test duration margin (1 hour + function time) satisfied?	N/A
(a) Is the minimum specified operating time at least 1 hour?	N/A
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	N/A
(18) Criteria regarding synergistic effects satisfied?	N/A
(19) Criteria regarding margins satisfied?	N/A
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-CSC -001
MANUFACTURER: CONAX
PAGE: 1 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RR/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -001-0005A -A	1-PCV -001-0005/ZS1CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07			757'	SVR	84K5-836071	FW	A	100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0005B -A	1-PCV -001-0005/ZS2CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07			757'	SVR	84K5-836071	FW	A	100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0006B -A	1-PSV -001-0006B CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11089-27			729'	SVR	84K5-836071	FW/V	A	100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0007 -B	1-FCV -001-0007 CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11005-11		350	729'	SVR	84K5-836071	MS/V FW/V	A/B A/B	5MIN/100D 5MIN/100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0012A -B	1-PCV -001-0012/ZS1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07			729'	NVR	84K5-836071	FW	A	100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0012B -B	1-PCV -001-0012/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07			729'	NVR	84K5-836071	FW	A	100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0013B -B	1-PSV -001-0013B CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11089-27		174	729'	NVR	84K5-836071	FW/V	A	100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0014 -A	1-FCV -001-0014 CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11005-11		350	729'	SVR	84K5-836071	MS/V FW/V	A/B A/B	5MIN/100D 5MIN/100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0023A -A	1-PCV -001-0023/ZS1CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07			729'	NVR	84K5-836071	FW	A	100D	PREVENT MOISTURE INTRUSION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE [signature] 9/9/86

CHECKER/DATE [signature] 9.9.86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-CSC -001
MANUFACTURER: CONAX
PAGE: 2 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -001-0023B -A	1-PCV -001-0023/ZS2CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07			729'	SVR	B4K5-836071	FW	A	100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0024B -A	1-PSV -001-0024B CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11089-27		185	729'	AVR	B4K5-836071	FW/V	A	100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0025 -B	1-FCV -001-0025 CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		350	729'	SVR	B4K5-836071	MS/V FW/V	A/B A/B	5MIN/100D 5MIN/100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0030A -B	1-PCV -001-0030/ZS1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07			729'	SVR	B4K5-836071	FW	A	100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0030B -B	1-PCV -001-0030/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07			729'	SVR	B4K5-836071	FW	A	100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0031B -B	1-PSV -001-0031B CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11089-27			729'	SVR	B4K5-836071	FW/V	A	100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0032 -A	1-FCV -001-0032 CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		350	729'	SVR	B4K5-836071	MS/V FW/V	A/B A/B	5MIN/100D 5MIN/100D	PREVENT MOISTURE INTRUSION
WBN-1-CSC -001-0181 -A	1-FCV -001-0181 CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		350	716'	CR1	B4K5-836071	MS/C FW/C RM/C CV/C L	A/B A/B A/B A/B A/B	5MIN/100D 5MIN/100D 15MIN/1MO 1HR/1MO 5MIN/100D	PREVENT MOISTURE INTRUSION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE HOR 9/9/86
CHECKER/DATE Dun 9.9.86

R_____ R_____ R_____

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-CSC -001
MANUFACTURER: CONAX
PAGE: 3 OF 23

EQIS NO.		UNIT DEVICE ID NO.		DESCRIPTION	MODEL	LOCATION COLUMN	AZ	ELEV*	RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -001-0182	-B	1-FCV -001-0182	CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		009	716'	CR1	B4K5-836071	MS/C	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
											FW/C	A/B	5MIN/100D	
											RH/C	A/B	15MIN/1MO	
											CV/C	A/B	1HR/1MO	
											L	A/B	5MIN/100D	
WBN-1-CSC -001-0183	-A	1-FCV -001-0183	CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07		009	716'	CR1	B4K5-836071	MS/C	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
											FW/C	A/B	5MIN/100D	
											RH/C	A/B	15MIN/1MO	
											CV/C	A/B	1HR/1MO	
											L	A/B	5MIN/100D	
WBN-1-CSC -001-0184	-B	1-FCV -001-0184	CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		350	716'	CR1	B4K5-836071	MS/C	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
											FW/C	A/B	5MIN/100D	
											RH/C	A/B	5MIN/100D	
											CV/C	A/B	15MIN/1MO	
											L	A/B	1HR/1MO	
WBN-1-CSC -003-0148	-B	1-LT -003-0148	CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		000	716'	FR1	B4K5-836071	L	A	5D	PREVENT MOISTURE INTRUSION
											MS/C	A	5D	
											FW/C	A	5D	
											RH/C	A	5D	
											CV/C	A	5D	
WBN-1-CSC -003-0156	-A	1-LT -003-0156	CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07			716'	ACC 3	B4K5-836071	L	A	5D	PREVENT MOISTURE INTRUSION
											MS/C	A	5D	
											FW/C	A	5D	
											RH/C	A	5D	
											CV/C	A	5D	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDR 9/9/86

CHECKER/DATE Dm 9.9.86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WRNED-CSC -001
MANUFACTURER: CONAX
PAGE: 4 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	AZ	ELEV*	RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -003-0164 -A	1-LT -003-0164 CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		243	716'	ACC 3	84K5-836071	L	A	5D	PREVENT MOISTURE INTRUSION
									MS/C	A	5D	
									FW/C	A	5D	
									RH/C	A	5D	
									CV/C	A	5D	
WBN-1-CSC -003-0171 -B	1-LT -003-0171 CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		000	716'	FR1	84K5-836071	L	A	5D	PREVENT MOISTURE INTRUSION
									MS/C	A	5D	
									FW/C	A	5D	
									RH/C	A	5D	
									CV/C	A	5D	
WBN-1-CSC -003-0172 -A	1-LT -003-0172 CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		242	716'	ACC 3	84K5-836071	L	A	5D	PREVENT MOISTURE INTRUSION
									FW/C	A	5D	
									MS/C	A	5D	
WBN-1-CSC -003-0173 -B	1-LT -003-0173 CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		295	716'	ACC 4	84K5-836071	L	A	5D	PREVENT MOISTURE INTRUSION
									MS/C	A	5D	
									FW/C	A	5D	
WBN-1-CSC -003-0174 -B	1-LT -003-0174 CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		296	716	ACC 4	84K5-836071	L	A	5D	PREVENT MOISTURE INTRUSION
									FW/C	A	5D	
									MS/C	A	5D	
WBN-1-CSC -003-0175 -A	1-LT -003-0175 CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		242	716'	ACC 3	84K5-836071	L	A	5D	PREVENT MOISTURE INTRUSION
									FW/C	A	5D	
									MS/C	A	5D	
WBN-1-CSC -030-0008A -B	1-FCV -030-0008/Z51CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		300	806'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDR 9/8/86

CHECKER/DATE Dmy 9.9.86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-ESC -001
MANUFACTURER: CONAX
PAGE: 5 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-ESC -030-0008B -B	1-FCV -030-0008/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		300	806'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-ESC -030-0010A -A	1-FCV -030-0010/ZS1CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY			263	757'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-ESC -030-0010B -A	1-FCV -030-0010/ZS2CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY			263	757'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-ESC -030-0015A -B	1-FCV -030-0015/ZS1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07		297	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-ESC -030-0015B -B	1-FCV -030-0015/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07		297	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	

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* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDC 9/9/86

CHECKER/DATE Dm 9.9.86

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -030-0017A -A	1-FCV -030-0017/ZS1CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		237	716'	ACC 3	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -030-0017B -A	1-FCV -030-0017/ZS2CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		237	716'	ACC 3	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -030-0020A -A	1-FCV -030-0020/ZS1CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		059	716		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	/AB	1HR/1MO	
WBN-1-CSC -030-0020B -A	1-FCV -030-0020/ZS2CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		059	716'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -030-0040A -A	1-FCV -030 0040/ZS1CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		286	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HOR 9/9/86

CHECKER/DATE Ow 9.9.86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-CSC -001
MANUFACTURER: CONAX
PAGE: 7 OF 23

ERIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -030-0040B -A	1-FCV -030-0040/ZS2CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		287	716'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -030-0050A -B	1-FCV -030-0050/ZS1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		290	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -030-0050B -B	1-FCV -030-0050/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		290	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -030-0052A -A	1-FCV -030-0052/ZS1CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		252	744'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -030-0052B -A	1-FCV -030-0052/ZS2CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11094-07		252	744		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDR 9/8/86

CHECKER/DATE Ow 9.9.86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WRNED-CSC -001
MANUFACTURER: CONAX
PAGE: 8 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WRN-1-CSC -030-0056A -A	1-FCV -030-0056/ZS1CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	M-11085-11		038	716'	ACC 2	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WRN-1-CSC -030-0056B -A	1-FCV -030-0056/ZS2CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	M-11085-11		038	716'	ACC 2	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WRN-1-CSC -030-0058A -B	1-FCV -030-0058/ZS1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	M-11084-07		116	731'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WRN-1-CSC -030-0058B -B	1-FCV -030-0058/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	M-11084-07		116	731'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WRN-1-CSC -030-0134 -B	1-FSV -030-0134 CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY			291	740'	ACC 3	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE [illegible] 9/9/86

CHECKER/DATE [illegible] 9.9.86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-CSC -001
MANUFACTURER: CONAX
PAGE: 9 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -030-0134A -B	1-FCV -030-0134/ZS1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		291	740'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -031-0306A -A	1-FCV -031-0306/ZS1CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		061	716'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -031-0306B -A	1-FCV -031-0306/ZS2CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		061	716'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -031-0308A -A	1-FCV -031-0308/ZS1CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		061	716'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -031-0308B -A	1-FCV -031-0308/ZS2CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		061	716'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDR 9/9/86

CHECKER/DATE Dm 9.9.86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-CSC -001
MANUFACTURER: CONAX
PAGE:10 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -031-0327A -B	1-FCV -031-0327/ZS1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		103	716'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -031-0327B -B	1-FCV -031-0327/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		103	716'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -031-0329A -B	1-FCV -031-0329/ZS1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		103	716'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -031-0329B -B	1-FCV -031-0329/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		103	716'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -043-0201 -A	1-FSV -043-0201 CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11087-27		236	716'	ACC 3	84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

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R_____ R_____ R_____

PREPARER/DATE HDR 9/9/86

CHECKER/DATE Qm 9.9.86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-CSC -001
MANUFACTURER: CONAX

EDIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -043-0202 -A	1-FSV -043-0202 CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11089-27		236	716'	ACC 3	84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -043-0207 -B	1-FSV -043-0207 CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11089-27		290	716'	ACC 4	84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -043-0208 -B	1-FSV -043-0208 CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11089-27		290	716'	ACC 4	84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -043-0251 -A	1-FSV -043-0251 CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		290	716'	ACC 4	84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -043-0268 -A	1-FSV -043-0268 CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07	VA5		726'	A28	84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									CV/A	B	1MO	
									AF/A	B	1MO	
									AB/A	B	1MO	
									RH/A	B	1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDR 9/8/86

CHECKER/DATE Dm 9.9.86

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EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -043-0288 -A	1-FSV -043-0288 CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		305	716'	ACC 2	84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -043-0310 -B	1-FSV -043-0310 CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		236	716'	ACC 2	84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -043-0312 -B	1-FSV -043-0312 CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07	VA5		713'	A28	84K5-836071	L	A	1000D	PREVENT MOISTURE INTRUSION
									CV/A	A	1MO	
									AF/A	A	1MO	
									AB/A	A	1MO	
									RH/A	A	1MO	
WBN-1-CSC -043-0319 -B	1-FSV -043-0319 CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		292	716'	ACC 2	84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -061-0097A -B	1-FCV -061-0097/ZS1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		303	757'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDR 9/9/86

CHECKER/DATE Qy 9.9.86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WANEO-CSC -001
MANUFACTURER: CONAX
PAGE: 13 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -061-0097B -B	1-FCV -061-0097/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		303	757'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -061-0122A -B	1-FCV -061-0122/ZS1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		303	757'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -061-0122B -B	1-FCV -061-0122/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		303	757'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -061-0192A -B	1-FCV -061-0192/ZS1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		294	806'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -061-0192B -B	1-FCV -061-0192/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		294	806'		84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE HDR 9/8/86

CHECKER/DATE Ovy 9.9.86

R_____ R_____ R_____

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-CSC -001
MANUFACTURER: CONAX
PAGE:14 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -061-0194A -B	1-FCV -061-0194/ZS1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		299	806'		B4K5-836071	L MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	5MIN/100D 5MIN/100D 5MIN/100D 15MIN/1MO 1HR/1MO	PREVENT MOISTURE INTRUSION
WBN-1-CSC -061-0194B -B	1-FCV -061-0194/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		299	806'		B4K5-836071	L MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	5MIN/100D 5MIN/100D 5MIN/100D 15MIN/1MO 1HR/1MO	PREVENT MOISTURE INTRUSION
WBN-1-CSC -062-0069A -A	1-FCV -062-0069/ZS1CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		132	708'		B4K5-836071	CV/C	A/B	1HR/1MO	PREVENT MOISTURE INTRUSION
WBN-1-CSC -062-0069B -A	1-FCV -062-0069/ZS2CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		132	708'		B4K5-836071	CV/C	A/B	1HR/1MO	PREVENT MOISTURE INTRUSION
WBN-1-CSC -062-0070A -A	1-FCV -062-0070/ZS1CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11065-11		130	716'	ACC 2	B4K5-836071	CV/C	A/B	1HR/1MO	PREVENT MOISTURE INTRUSION
WBN-1-CSC -062-0070B -A	1-FCV -062-0070/ZS2CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		130	716'	ACC 2	B4K5-836071	CV/C	A/B	1HR/1MO	PREVENT MOISTURE INTRUSION
WBN-1-CSC -063-0071A -A	1-FCV -063-0071/ZS1CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		291	716'	ACC 4	B4K5-836071	L MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	5MIN/100D 5MIN/100D 5MIN/100D 15MIN/1MO 1HR/1MO	PREVENT MOISTURE INTRUSION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE HDR 9/2/86
CHECKER/DATE Dm 9.9.86

R____ R____ R____

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-CSC -001
MANUFACTURER: CONAX
PAGE:15 OF 23

EQIG NO.		UNIT DEVICE ID NO.		DESCRIPTION	MODEL	LOCATION COLUMN	AZ	ELEV*	RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -063-0071B	-A	1-TCV -063-0071/ZS2C9-A		ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		291	716'	ACC 4	B4K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
											MS/C	A/B	5MIN/100D	
											FW/C	A/B	5MIN/100D	
											RH/C	A/B	15MIN/1MO	
											CV/C	A/B	1HR/1MO	
WBN-1-CSC -068-0001	-D	1-TE -068-0001	CS-D	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11111-05		024	702'		B4K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
											MS	A	100D	
											FW	A	100D	
											RH/C	A	1MO	
											CV/C	A	1MO	
WBN-1-CSC -068-0018	-D	1-TE -068-0018	CS-D	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11111-05		155	702'		B4K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
											MS	A	100D	
											FW	A	100D	
											RH/C	A	1MO	
											CV/C	A	1MO	
WBN-1-CSC -068-0024	-D	1-TE -068-0024	CS-D	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11111-05		155	702'		B4K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
											MS	A	100D	
											FW	A	100D	
											RH/C	A	1MO	
											CV/C	A	1MO	
WBN-1-CSC -068-0041	-D	1-TE -068-0041	CS-D	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11111-05		125	716'		B4K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
											MS	A	100D	
											FW	A	100D	
											RH/C	A	1MO	
											CV/C	A	1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HOR 9/9/86

CHECKER/DATE Dm 9.9.86

PAGE A-15

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WPNEQ-CSC -001
MANUFACTURER: CONAX
PAGE: 16 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -068-0043 -E	1-TE -068-0043 CS-E	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11111-05		200	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS	A	100D	
									FW	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0060 -E	1-TE -068-0060 CS-E	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11111-05		234	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS	A	100D	
									FW	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0065 -E	1-TE -068-0065 CS-E	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11111-05		340	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS	A	100D	
									FW	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0083 -E	1-TE -068-0083 CS-E	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11111-05		306	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS	A	100D	
									FW	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0308A -B	1-FCV -068-0308/ISICS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-1		305	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE HOR 9/9/86

CHECKER/DATE Qm 9.9.86

R_____ R_____ R_____

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EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -068-0308B -B	1-PCV -068-0308/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		305	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -068-0319 -F	1-TE -068-0319 CS-F	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		107	716'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS	A	100D	
									FW	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0324 -G	1-TE -068-0324 CS-G	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07		107	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS	A	100D	
									FW	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0334 -B	1-PCV -068-0334 CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		104	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0340 -A	1-PCV -068-0340 CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		104	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	

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R_____ R_____ R_____

PREPARER/DATE HOR 9/9/86

CHECKER/DATE Qm 9.9.86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-CSC -001
MANUFACTURER: CONAX
PAGE:18 ,OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -068-0373 -D	1-TE -068-0373 CS-D	ELECTRICAL CONDUIT SEAL ASSEMBLY			025	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0376 -D	1-TE -068-0376 CS-D	ELECTRICAL CONDUIT SEAL ASSEMBLY			095	675'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0377 -D	1-TE -068-0377 CS-D	ELECTRICAL CONDUIT SEAL ASSEMBLY			070	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0378 -D	1-TE -068-0378 CS-D	ELECTRICAL CONDUIT SEAL ASSEMBLY			000	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0379 -D	1-TE -068-0379 CS-D	ELECTRICAL CONDUIT SEAL ASSEMBLY			025	716'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	

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R_____ R_____ R_____

PREPARER/DATE [signature] 9/8/86

CHECKER/DATE [signature] 9.9.86

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EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -068-0380 -E	1-TE -068-0380 CS-E	ELECTRICAL CONDUIT SEAL ASSEMBLY			205	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0383 -E	1-TE -068-0383 CS-E	ELECTRICAL CONDUIT SEAL ASSEMBLY			085	675'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0384 -E	1-TE -068-0384 CS-E	ELECTRICAL CONDUIT SEAL ASSEMBLY			115	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0385 -E	1-TE -068-0385 CS-E	ELECTRICAL CONDUIT SEAL ASSEMBLY			008	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-CSC -068-0386 -E	1-TE -068-0386 CS-E	ELECTRICAL CONDUIT SEAL ASSEMBLY			080	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	

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R_____ R_____ R_____

PREPARER/DATE HDR 9/9/86

CHECKER/DATE Dm 9.9.86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBMED-CSC -001
MANUFACTURER: CONAX

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBM-1-CSC -074-0014 -G	1-TE -074-0014 CS-G	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07	VA5		713'	A12	84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
WBM-1-CSC -074-0025 -F	1-TE -074-0025 CS-F	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11084-07	VA5		713'	A12	84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
WBM-1-CSC -077-0009A -B	1-FCV -077-0009/1S1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07		280	716'	ACC 4	84K5-836071	L MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	5MIN/100D 5MIN/100D 5MIN/100D 15MIN/1MO 1HR/1MO	PREVENT MOISTURE INTRUSION
WBM-1-CSC -077-0009B -B	1-FCV -077-0009/1S2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07		280	716'	ACC 4	84K5-836071	L MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	5MIN/100D 5MIN/100D 5MIN/100D 15MIN/1MO 1HR/1MO	PREVENT MOISTURE INTRUSION
WBM-1-CSC -077-0016A -B	1-FCV -077-0016/1S1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		287	716'	ACC 4	84K5-836071	L MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	5MIN/100D 5MIN/100D 5MIN/100D 15MIN/1MO 1HR/1MO	PREVENT MOISTURE INTRUSION
WBM-1-CSC -077-0016B -B	1-FCV -077-0016/1S2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		287	716'	ACC 4	84K5-836071	L MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	5MIN/100D 5MIN/100D 5MIN/100D 15MIN/1MO 1HR/1MO	PREVENT MOISTURE INTRUSION

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* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE HOR 9/9/86.
CHECKER/DATE Dm 9.9.86.

R_____ R_____ R_____

EQIS NO.		UNIT DEVICE ID NO.		DESCRIPTION	MODEL	LOCATION COLUMN	AZ	ELEV*	RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -068-0393	-E	1-TE -068-0393	CS-E	ELECTRICAL CONDUIT SEAL ASSEMBLY			215	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
											MS/C	A	100D	
											FW/C	A	100D	
											RH/C	A	1MO	
											CV/C	A	1MO	
WBN-1 CSC -068-0394	-A	1-FSV -068-0394	CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		045	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
											MS/C	A	100D	
											FW/C	A	100D	
											RH/C	A	1MO	
											CV/C	A	1MO	
WBN-1-CSC -068-0395	-B	1-FSV -068-0395	CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		045	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
											MS/C	A	100D	
											FW/C	A	100D	
											RH/C	A	1MO	
											CV/C	A	1MO	
WBN-1-CSC -068-0396	-B	1-FSV -068-0396	CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-1185-11		050	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
											MS/C	A	100D	
											FW/C	A	100D	
											RH/C	A	1MO	
											CV/C	A	1MO	
WBN-1-CSC -068-0397	-A	1-FSV -068-0397	CS-A	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		050	702'		84K5-836071	L	A	100D	PREVENT MOISTURE INTRUSION
											MS/C	A	100D	
											FW/C	A	100D	
											RH/C	A	1MO	
											CV/C	A	1MO	

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* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HOR 9/9/86

CHECKER/DATE Ow 9.9.86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-CSC -001
MANUFACTURER: CONAX
PAGE:22 OF 23

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -077-0018A -B	1-FCV -077-0018/ZS1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07		282	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -077-0018B -B	1-FCV -077-0018/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07		282	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -077-0127A -B	1-FCV -077-0127/ZS1CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		294	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -077-0127B -B	1-FCV -077-0127/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		294	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -090-0108 -B	1-FCV -090-0108/ZS2CS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07		293	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE HOK 9/9/86

CHECKER/DATE Dm 9.9.86

R_____ R_____ R_____

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-CSC -001
MANUFACTURER: CONAX

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-CSC -090-0109 -B	1-FCV -090-0109/ISZCS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07		293	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -090-0110 -B	1-FCV -090-0110/ISZCS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07		293	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -090-0114 -B	1-FCV -090-0114/ISZCS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		299	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -090-0115 -B	1-FCV -090-0115/ISZCS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-11		294	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	
WBN-1-CSC -090-0116 -B	1-FCV -090-0116/ISZCS-B	ELECTRICAL CONDUIT SEAL ASSEMBLY	N-11085-07		294	716'	ACC 4	84K5-836071	L	A/B	5MIN/100D	PREVENT MOISTURE INTRUSION
									MS/C	A/B	5MIN/100D	
									FW/C	A/B	5MIN/100D	
									RH/C	A/B	15MIN/1MO	
									CV/C	A/B	1HR/1MO	

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PREPARER/DATE HOR 9/9/86

CHECKER/DATE Dm 9.9.86

R_____ R_____ R_____

BINDER NO. WBNEQ-CSC-001 PLANT WBN UNIT(S) 1 SHEET B1 OF B34

BINDER TITLE CONAX ELECTRICAL CONDUCTOR SEAL ASSEMBLIES (ECSA) COMPUTED [illegible] DATE 6/11/86 R ___ R ___

CHECKED [illegible] DATE 6/16/86

A. DOCUMENTATION

Equipment Description Electrical Conductor Seal Assembly

Vendor/Manufacturer Conax

Equipment Model No.(s) Type ECSA

QUALIFICATION REPORTS

(1) Title/Number/Revision Design Qualification Test Report for Electrical Conductor Seal Assembly (ECSA) IPS-1079, Revision D RIMS EEB 840824 366 DATE 5/21/84

(2) Title/Number/Revision Design Qualification Test Plan for Electrical Conductor Seal Assembly (ECSA) IPS-1080, Revision A RIMS B70 851209 100 DATE 8/15/83

(3) Title/Number/Revision Design Qualification Material Test Report IPS-325, Revision E RIMS EEB 841029 302 DATE 8/16/84

OTHER (ANALYSIS, VENDOR DATA, ETC.) Installation Manual for Electrical Conductor Seal Assemblies With Long Body for Pipe Thread Equipment Interface IPS-725, Revision G, DATED 2/15/85 (RIMS B70 851209 101).

BINDER NO. WBNEQ-CSC-001 PLANT WBN UNIT(S) 1 SHEET B2 OF B34

BINDER TITLE CONAX ELECTRICAL CONDUCTOR SEAL ASSEMBLIES (ECSA) COMPUTED HDR DATE 9-13-86 R ___ R ___

CHECKED [illegible] DATE 9.15.86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

1. Devices requiring qualified conduit seal but do not have one installed.

COMMENTS/RECOMMENDATIONS The electrical conductor seal assemblies (ECSA) are qualified for 40 years at 121.9°C with one DBA and 100-day post-accident operation for the areas defined in TAB B, Section K, page B17. The seals are also qualified for 40 years at 130°C if they are not required to perform their safety function during or after a DBA.

NOTE: The conclusion that equipment is qualified is conditional, depending upon resolution of all open items listed (see front of binder).

BINDER NO. WBNEQ-CSC-001 PLANT WBN UNIT(S) 1 SHEET B3 OF B34

BINDER TITLE CONAX ELECTRICAL COMPUTED [illegible] DATE 6/4/86 R ___ R ___

CONDUCTOR SEAL ASSEMBLIES (ECSA) CHECKED [illegible] DATE 6/16/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS Conax ECSAs were purchased after February 22, 1983 (contract No. 84K5-836071).

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

BINDER NO. WBNEQ-CSC-001 PLANT WBN UNIT(S) 1 SHEET B4 OF B34

BINDER TITLE CONAX ELECTRICAL CONDUCTOR SEAL ASSEMBLIES (ECSA) COMPUTED HOR DATE 6/11/86 R ___ R ___

CHECKED Gm DATE 6/16/86

D. QUALIFICATION METHODOLOGY (Check only one block)

___ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS The qualification test was a type test done on Conax model N-11006-10. The only differences between the device tested and devices used at Watts Bar are the number of conductors through the ECSA and the diameter of ECSA. The ECSAs used in the test were manufactured by Conax Corporation using materials, processes, and quality assurance standards identical with those employed on actual production assemblies. All assemblies procured have been certified as the same type and design as documented in design qualification test report IPS-1079, revision D (See TAB E, page E4 for Conax certification).

BINDER NO. WBNEQ-CSC-001 PLANT WBN UNIT(S) 1 SHEET B5 OF B34

BINDER TITLE CONAX ELECTRICAL CONDUCTOR SEAL ASSEMBLIES (ECSA) COMPUTED [illegible] DATE 6/11/86 CHECKED [illegible] DATE 6/16/86 R ___ R ___

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No (see TAB B, Section D, page B4).

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Type ECSA	Type ECSA	IPS-1079 Page ii
(2) Manufacturer	Conax	Conax	IPS-1079 Page ii
(3) Model Number(s)	See TAB A	N-11006-10	IPS-1079 Page ii
(4) Serial Number(s)	N/A	N/A	N/A
(5) Identify Component-Unique checksheet attached:	N/A		

JUSTIFICATION/COMMENTS The qualification test was a type test done on the ECSAs to verify the design concept and suitability of the materials used in the construction of the ECSAs. Conax qualified equipment is designated with the prefix "N-" in their model numbers. All qualified ECSAs are designed and manufactured using materials, processes, and quality assurance standards identical with those employed on the qualification test. ECSAs do not have unique serial numbers. No component-unique checksheet required.

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if no, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	N/A	N/A	N/A
External Process Connections	N/A	N/A	N/A
Electrical Connections	See Comments	Yes	See TAB H, Page H3 IPS-725 Sec. 6.0 & 7.0
Conduit Seals	N/A	N/A	N/A
Connector Seals	N/A	N/A	N/A
Orientation	N/A	N/A	N/A
Physical Configuration	N/A	N/A	N/A
Other	See Comments	Yes	IPS-1079, Sec. 4.5, Page 3

JUSTIFICATION/COMMENTS The ECSAs must be installed per Conax installation manual IPS-725 (TAB H, Section 6.0 & 7.0, page H3). "Grafoil" tape must be used on all threaded connections per installation instructions in IPS-725, appendix D. Torque values to be as specified in IPS-725. Where the Conax torque values exceed the device value, the device torque has precedent. Conductor terminations on inboard pigtails of the ECSA to be as specified by device manufacturer. Outboard pigtails and inboard pigtails connected to pigtails from device are to be connected using a nuclear qualified Raychem splice. Raychem splice qualification is found in binder WBNEQ-SPLC-001. The maximum temperature interface that the ECSAs may be subjected to is

F. INSTALLATION INTERFACES (continued)

JUSTIFICATION/COMMENTS 121.9°C (40 years) when they are required to perform their safety function during a DBA and 100 days post-DBA operation. When they are not required to perform their safety function during or after a DBA, they may be subjected to 130°C (40 years). If these temperatures are exceeded, then the seals must be placed away from the device at a distance which would reduce the temperature to the above limits.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	IPS-1079 Sec. 4.1.1
(b) Baseline performance measurements taken	Yes	IPS-1079 Sec. 6.1
(c) Equipment aged:		
Thermal	Yes	IPS-1079 Sec. 6.3
Radiation	Yes	IPS-1079 Sec. 6.5
Wear	N/A	N/A
(d) Vibration/seismic testing conducted	Yes	IPS-1079 Sec. 6.7
(e) Design basis event (DBE) exposure	Yes	IPS-1079 Sec. 6.9
(f) Post-DBE exposure	Yes	IPS-1079 Sec. 6.9, and Add. A
(g) Final inspection and disassembly	Yes	IPS-1079 Sec. 6.10, and Add. A 2.8 & A 2.9

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes (Reference IPS-1079, Section 5.6).

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes (Reference IPS-1079, Page 22 and Appendix A, Section A3.0).

JUSTIFICATION/COMMENTS _____

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference IPS-1079, Sections 6.3 and 6.5).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	IPS-1079, Sec. 6.3
Radiation exposure	Yes	IPS-1079, Sec. 6.5
Vibration (non-seismic) aging	No	See TAB B, Sec. P, p B27
Operational (electrical/mechanical/process) stress aging	N/A	N/A

JUSTIFICATION/COMMENTS No operational stress during normal plant operation that would cause undue mechanical or electrical stress aging.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? N/A (Reference IPS-325, Section 6.0).

JUSTIFICATION/COMMENTS No known synergistic effects known for materials used in ECSA. Conax has done substantial testing (IPS-325, Section 6.0) to show the compatability of all ECSA material during simulated environments. Also, the values of temperature and radiation exposure experienced during testing were higher than the ECSAs would experience during their normal operation and accident conditions and would compensate for any synergistic effects.

H. AGING (Continued)

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference IPS-1079, Section 6.3).

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: IPS-325, Section 3.3).

JUSTIFICATION/COMMENTS

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference IPS-325, Appendix A, Section 1.0).

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference IPS-325, Appendix A and IPS-1079, Section 6.3).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	130°F (54.5°C)	150°C	121.9°C
Time	40 Years	168.33 Hrs	40 Years

JUSTIFICATION/COMMENTS See TAB C, page 3, and TAB B, Section P, page B30.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference IPS-325, Appendix A, p A21).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? N/A (Reference N/A).

JUSTIFICATION/COMMENTS Device specific regression curve data was developed and utilized for age-conditioning of the qualification test specimens.

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes (Reference IPS-325, Appendix A, pp A11, A15, A19 and A21).

JUSTIFICATION/COMMENTS

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference N/A).

JUSTIFICATION/COMMENTS Energizing during thermal aging was not required because the age-conditioning and evaluation was based on consideration of temperature rises associated with energized conductors and attached equipment. See TAB C, page 1.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference IPS-1079, Sec. 6.5).

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference IPS-325, Sec. 3.3 and Table 3.3).

JUSTIFICATION/COMMENTS

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference IPS-325, Section 4.0 and 5.0).

JUSTIFICATION/COMMENTS The literature search data was used as the basis for radiation aging exposure.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference IPS-1079, Sec. 6.5).

Plant normal ambient radiation dose (rd) 2.0×10^7

Test exposure dose (rd) 2.25×10^8

Test exposure dose rate (rd/hr) 4.87×10^5 to 1.09×10^6

Test exposure source type (e.g., Co-60 gamma) Co-60 Gamma

JUSTIFICATION/COMMENTS

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No (Reference N/A).

JUSTIFICATION/COMMENTS See TAB B, Section P, page B27, for discussion.

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? N/A (Reference N/A).

JUSTIFICATION/COMMENTS See TAB B, Section P, page B27, for discussion.

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No (Reference N/A).

JUSTIFICATION/COMMENTS Based on the device applications, no significant operational stresses are anticipated during operation.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? N/A (Reference N/A).

JUSTIFICATION/COMMENTS

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference IPS-1079, Sec. 6.3.1).

Qualified life (Document in QMDS) 40 years

JUSTIFICATION/COMMENTS For qualified life calculations, see TAB C, page C2.

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? N/A
(Reference N/A).

Replacement Intervals (Document in QMDS) None required.

JUSTIFICATION/COMMENTS The Conax ECSAs are qualified for 40 years normal life plus 100 days post-accident operation without any maintenance/replacement requirements.

BINDER NO. WBNEQ-CSC-001 PLANT WBN UNIT(S) 1 SHEET B14 OF B34

BINDER TITLE CONAX ELECTRICAL CONDUCTOR SEAL ASSEMBLIES (ECSA) COMPUTED HSR DATE 6/11/86 CHECKED Dm DATE 6/16/86 R ___ R ___

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	N/A				
(b)					
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS The ECSAs were thermal aged to 168.3 hours at 150°C and radiation aged to 2.25×10^8 rads with no significant degradation noted (Table 1.0, pages iii and iv of IPS-1079).

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference IPS-1080, Sec. 4.12).

Identify Acceptance Criteria: Dielectric strength (no dielectric breakdown), insulation resistance (greater than 1×10^6 OHMS), continuity check (verify), and gas leak rate (less than 1×10^{-6} SCC/sec at 77 PSIG dry Nitrogen).

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference IPS-1079, Sec. 6.0).

Identify baseline and functional testing: Dielectric strength, insulation resistance, continuity check, and gas leak rate check to verify the ECSAs will maintain electrical integrity and prevent moisture intrusion through the assembly.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? N/A (Reference IPS-1079, Sec. 6.9 and Diagrams 6.9.3.4A and 6.9.3.4B).

JUSTIFICATION/COMMENTS See TAB B, Section P, page B31, for discussion on loads.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? No (Reference N/A).

JUSTIFICATION/COMMENTS No loading during baseline testing. Baseline testing was to ensure devices being tested would maintain electrical and mechanical integrity.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	140 VDC and 127.5 VAC Max.	TAB E, p3
Load	2.5 Amps Max. (1)(2)	TAB B, pB31
Frequency	N/A	N/A
Accuracy	N/A	N/A
Other(s)		

JUSTIFICATION/COMMENTS (1) The maximum load current of 2.5 Amps is not considered to have an adverse effect on the device performance. (OE Calculation EEB 841022 952).

(2) No leakage current was detected during qualification testing (lowest detectable limit of instruments utilized was 0.2 mA AC). A leakage current of 0.2 mA or less would be within the limits of the accuracy requirements of the end devices (see QIR EQP 86105).

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CONDUCTOR SEAL ASSEMBLIES (ECSA) CHECKED [illegible] DATE 9.15.86

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. Worst case 47E235-42 R2 and 47E235-76 R3.

(1) Normal Max

(a) Temperature (°F) 130°

(b) Pressure (psig) .3

(c) Humidity (%) 80

(d) Radiation (rd) 2.0×10^7

(2) Abnormal Max

(a) Temperature (°F) 140°

(b) Pressure (psig) .3

(c) Humidity (%) 100

(d) Radiation (rd) NA

(3) Process Interfaces: No significant effects due to cable interfaces. If operating temperature of device requiring ECSA is greater than the qualified service temperature of 251°F (121.9°C) for ECSA, then the ECSA shall be installed at a distance from the device where it sees temperature not greater than 251.4°F.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Up to 8 hours per excursion and will occur less than 1 percent of the plant life. (TVA Environmental Drawing 47E235-76).

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 327° (3) Accident type LOCA/HELB

(b) Pressure (psig) 11.2 Accident type LOCA/HELB

(c) Humidity (%) 100% Accident type LOCA/HELB

(d) Radiation (rd) 4.7×10^8 beta (1)
4.0×10^7 gamma Accident type LOCA/HELB

(e) Spray Type Chemical (2) Accident type LOCA/HELB

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K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

(1) See radiation TAB B, page B33 discussion.

(2) Spray composition: 0.1847 Molar H_3BO_3 (2000 PPM Boron), 0.033 Molar NaOH resulting in a pH of 8.35 at 25°C. Devices are located throughout the plant with the worst case environmental conditions listed above. (TVA drawing 47E235-42)

(3) See temperature TAB B, page B33.1, Discussion.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? No (Reference N/A).

(7) Subject to submergence (yes/no/NA)? Yes
(Reference Location - TAB F, Area-TAB C). Location of submerged devices found in TAB F and areas subjected to flooding found in TAB C.

Identify initiation time and duration of submergence: Submergence initiated at time of DBE and has a maximum duration of 100 days. See TAB B, Section P, page B28.

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
OE Calculation "Flooding in Aux. Building Due to Postulated Pipe Breaks"	B45 860110 218
OE Calculation "Maximum Containment Water Level"	NEB 840120 220
QIRNEB85061 "Water Level Inside the Containment Following a Critical Crack in the RHR System"	B45 850917 268
QIRNEB85069 "Water Level in Primary Containment Following the CVCS HELB"	B45 851030 255

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 Days	15 Days	IPS-1079 Sec. 6.9
Temperature (°F)	327	375	IPS-1079 Fig. 6.9.3
Pressure (psig)	11.2	75	IPS-1079 Fig. 6.9.3
Relative Humidity (%)	100	100 (steam)	IPS-1079 Sec. 6.9
*Chemical Spray	See TAB B Sec. K(5)	See TAB B p B20A	IPS-1079 Sec. 6.9
**Radiation (rd)	***4.7×10^8 Beta 6.0×10^7 Gamma	2.25×10^8 Gamma	IPS-1079 Sec. 6.5
Submergence	Yes	Yes, See TAB B, Sec. P, p B28	IPS-1079 Addendum A

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

***See radiation TAB B, page B33 for discussion.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	IPS-1079 Fig. 6.9.3
Pressure	Yes	IPS-1079 Fig. 6.9.3
Relative Humidity	Yes	IPS-1079 Sec. 6.9
Chemical Spray	Yes	IPS-1079 Sec. 6.9
Submergence	Yes	IPS-1079 Addendum A

JUSTIFICATION/COMMENTS See TAB C, page C7 for calculation for post-accident operating time extension to 100 days post-accident.

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CONDUCTOR SEAL ASSEMBLIES (ECSA) CHECKED [illegible] DATE 6/16/86

CHEMICAL SPRAY USED IN TEST REPORT IPS-1079 FOR CONAX SEALS.
(Reference: IPS-1079, Section 6.9.3.2, page 16).

Spray consisting of 6200 ppm of boron, 220 ppm hydrazine and sufficient sodium hydroxide to obtain an initial pH of 10.9 was maintained at a spray rate of 0.15 gpm/ft^2.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 Days	15 Days	IPS-1079 Sec. 6.9
Temperature (°F)	327	375	IPS-1079 Fig. 6.9.3
Pressure (psig)	13.7	75	IPS-1079 Fig. 6.9.3
Relative Humidity (%)	100	100 (steam)	IPS-1079 Sec. 6.9
*Chemical Spray	See TAB B Sec. K(5)	See TAB B p B20A	IPS-1079 Sec. 6.9
**Radiation (rd)	***4.7×10^8 Beta 6.0×10^7 Gamma	2.25×10^8 Gamma	IPS-1079 Sec. 6.5
Submergence	Yes	Yes, See TAB B, Sec. P, p B28	IPS-1079 Addendum A

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

***See radiation TAB B, page B33 for discussion.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	IPS-1079 Fig. 6.9.3
Pressure	Yes	IPS-1079 Fig. 6.9.3
Relative Humidity	Yes	IPS-1079 Sec. 6.9
Chemical Spray	Yes	IPS-1079 Sec. 6.9
Submergence	Yes	IPS-1079 Addendum A

JUSTIFICATION/COMMENTS See TAB C, page C7 for calculation for post-accident operating time extension to 100 days post-accident.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	48°F	Yes
Pressure: +10% but no more than 10 psig	61.3psig	Yes
Radiation: +10% of accident dose	38.7%	Yes (4)
Time: +10% (or 1 hour + operating time per NUREG-0588)	No	Yes (1)
Voltage: ±10% of rated value	10%	Yes (2)
Frequency: ±5% of rated value	N/A	N/A
Environmental Transient: the initial transient and the peak temperature applied twice	Per IEEE-323, 1974	Yes (3)
Vibration: +10% added to acceleration	N/A	N/A

JUSTIFICATION/COMMENTS: (1) See TAB C, page C7 for calculation of extension of operating time to 100-day post-accident.

(2) Cable used in seal assembly rated at 600 volts; test was done with cable energized at 155 volts A.C.; maximum voltage cables will experience at Watts Bar is 140 volts D.C. See TAB B, Section P, page B29, for discussion on voltage.

(3) Figure 6.9.3 on page 16A of IPS-1079.

(4) See TAB B, Section P, page B33, for discussion on radiation.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference IPS-1079, Section 8.0).

JUSTIFICATION/COMMENTS No loss of mechanical seal or electrical integrity to ensure there is no moisture intrusion to the device.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference IPS-1079, Section 6.9.4, p 19).

JUSTIFICATION/COMMENTS

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference IPS-1079, Section 6.9.4, p 19).

JUSTIFICATION/COMMENTS No moisture was found in test fixture and ECSA passed pressure and electrical acceptance criteria.

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference N/A).

JUSTIFICATION/COMMENTS By functional for 15 days and analysis for extrapolation of the test profile. See TAB C, page C3 for extension of operating time calculation.

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference IPS-1079, Section 6.9.3.7 and Section 6.10.2.2).

JUSTIFICATION/COMMENTS See TAB B, Section P, page B34.

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? N/A (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS Equipment was shown to perform for 40 years (heat aging, radiation aging), withstand one DBA test and 100-day post-accident and still perform its required function. No maintenance or surveillance required.

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CONDUCTOR SEAL ASSEMBLIES (ECSA) CHECKED [illegible] DATE 6/16/86

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	Yes
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	N/A
(b) Were specific features and failure modes and effects analyzed?	N/A
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	N/A
(d) Were environmental parameters which affect equipment performance identified?	N/A
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	N/A
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	N/A
(d) Materials susceptible to thermal/radiation aging identified?	Yes

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes
(11) Criteria regarding submergence satisfied?	Yes
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	Yes
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	N/A
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

See following pages.

P. DISCUSSION (Continued)

Reference: TAB B, paragraph H(2) and H(6)

NON-SEISMIC VIBRATION

Non-seismic vibration, although mentioned in IEEE 323-1974, is not defined in relation to either intensity or frequency. Equipment requiring the use of Conax seals at Watts Bar is located in areas of the power plant where vibration would be of either low intensity or of momentarily nature. These vibrations would not be of sufficient intensity to cause the ECSAs to fail or malfunction. The only effect low intensity system vibration has on equipment is to produce a tendency for threaded connections which were not properly tightened to become loose. Due to installation instructions requiring torquing of the threaded connections and Conax's long power plant experience, the low intensity system vibration can be discounted as a potential problem area and, therefore, vibration is not addressed in environmental qualifications.

P. DISCUSSION (Continued)

Reference: TAB B, paragraphs K(7) and L(1)

SUBMERGENCE

The submergence test (IPS-1079, Revision D, Addendum A) demonstrated the leak tightness of the ECSA for 100-day post-accident submergence, provided a closed (threaded connections) system up to and above the submergence level exists. As required on all threaded connections between the Conax ECSA and the device (IPS-725) being protected, the threaded connections below the submergence level must use "Grafoil" tape on the threads and be torqued to the values specified for the ECSA, except the torque values at the device connection must not exceed the torque value recommended for the device.

P. DISCUSSION (Continued)

Reference: TAB B, paragraphs J(5) and L(3)

OPERATING VOLTAGE LEVELS

The voltage level specified in test plan IPS-1080 indicated a voltage level of 660 volts AC. The test was run at 660 volts AC for only 18.4 hours. After the failure of specimen 66-1, Conax concluded that the voltage level was producing undo stress on the ECSAs. During actual plant operation, the ECSAs are used in control circuits at Watts Bar and would have a maximum voltage level of 127.5 volts AC and 140 volts DC (normal operating voltages are 120 volts AC and 125 volts DC; maximum voltages may occur during line variations and battery equalization). The test voltage was then lowered to 155 volts AC.

The operating voltages at Sequoyah are 127.5 volts AC and 140 volts DC and the test voltage was 155 volts AC only. The failure mode of the ECSA where the voltage level would be a factor is in the dielectric breakdown strength. A greater DC voltage level would be required for a dielectric breakdown to occur than for a given AC voltage level. Therefore, the 155 volt AC voltage applied during the test represents as severe a test as would a 155 volts DC voltage level.

The 155 volts AC level applied during the test demonstrated the ECSAs are qualified for the Watts Bar voltage operating conditions.

P. DISCUSSION (Continued)

Reference: TAB B, paragraph H(4)(d)

AGING

The Conax ECSAs were determined by Conax to have an operational life greater than 40 years (IPS-325, Section 8.3, page 28 located in TAB D). The activation energy was determined to be 3.918 eV for the total ECSA assembly. This activation energy was found using a failure mode of dielectric breakdown strength withstand capabilities, insulation resistance values (1×10^8 OHMS), loss of continuity, and gas leak rate testing.

A low insulation resistance reading on one of the ECSAs after completion of the DBE (after being removed from test chamber and handled) indicates that the ECSAs may be subject to failure or damage from mechanical stresses after aging and DBE exposure; however, since the ECSAs are installed as new devices and heat shrink tubing (Raychem WCSF-N) is installed to protect the cable during installation, this is not a significant impact on environmental qualification. Once the devices are installed, they are not subjected to any significant mechanical stresses. Therefore, Conax's predicted qualified life based on the dielectric breakdown strength, insulation resistance values, loss of continuity, and gas leak rate testing parameters are justifiable to determine the activation energy for the complete assembly.

The tested ECSAs were aged at 168.3 hours at 150°C. This aging will give the ECSAs a qualified life of 40 at 121.9°C (TAB C, page C3). Therefore, the ECSAs are qualified for 40 years plus one DBA at 121.9°C. Also, Conax has concluded via a long-term thermal aging program and statistical analysis (IPS-325 Revision E, TAB D, page D4) that the ECSAs will operate continuously for 40 years at 130°C without failure. The calculated usable line is shown on page A21 of IPS-325. No qualification testisng was done on ECSAs aged to 40 years with operation at 130°C. Therefore, the ECSAs <u>are not</u> qualified for operation after a DBA when maximum service temperature exceeds 121.9°C. If operation after a DBA is not required, the ECSAs may have a maximum service temperature of 130°C.

P. DISCUSSION (Continued)

Reference: TAB B, paragraphs J(3) and J(5)

CURRENT LOADING

The ECSA was connected to 155 volts AC with no current load for monitoring the performance characteristic during the DBE test. The actual load currents that the ECSAs are subject to at Watts Bar are relatively small (see OE Calculation EEB 841022 952 - TAB C, page C5). As the ECSA maintained its electrical integrity during the test (no leakage current), the DBE test adequately demonstrates the functional capability.

The small current loads the ECSAs would experience during normal operation would create an increase in operating temperature of only 0.67°C (see OE Calculation EEB 841022 952-TAB C, page C5). This increase would not cause the conductor temperature to change enough to affect the DBE qualification test.

Therefore, it is concluded that the lack of current loading during the DBE had no adverse effects on the qualification of the ECSA.

P. DISCUSSION (Continued)

Reference: TAB B, paragraph M(5)

INSTALLATION

The installation drawing (TVA drawing 45W883-3 R15) for the ECSAs at Watts Bar requires drain holes located in the conduit nipple just before the ECSA to allow drainage of any condensate that may have formed in the conduit system. The failure of test specimen 66-1 was due to the direct spray impingement on the outboard end of the ECSA. The position of the test specimen to the spray head in the test chamber was such that a break in the conduit system allowed the spray to hit directly onto the outboard end of the seal. In actual intallation at Watts Bar, the large area of the rooms and the distance from the source of any spray would not cause direct impingement on the installed ECSAs. Also, the drain holes are not located at the very end of the ECSA and the installed ECSAs are protected by Raychem WCSF-N heat shrink tubing (see Note 1) to protect the cable ends of the ECSA from mechanical damage during installation. This would further ensure that spray impingement would not occur. The installation of the ECSAs at Watts Bar is adequately protected to ensure that the ECSAs do not receive a direct spray impingement on the inside ends of the ECSA. Therefore, the qualification test qualifies the ECSAs for the Watts Bar installation.

Note 1

Heat shrink polyolefin tubing was not applied over the outboard pigtails as specified in the Conax qualification test plan IPS-1080 and suggested in their installation manual IPS-725. Photograph 13.0, Appendix D, page D7 of IPS-1079 shows the outboard end with no heat shrink. This was confirmed in a telecon with Conax (Ron Mikander) that no heat shrink polyolefin was used on the outboard pigtails to protect them during installation and during the test program.

P. DISCUSSION (Continued)

Reference: TAB B, paragraphs K(5), L(1), and L(3)

In their worst-case installed environment (inside containment), the total radiation exposure to the Conax electric conductor seal assemblies (ECSA's) is 6×10^7 rads gamma (including 40-year dose of 2×10^7 rads) and a beta dose of 4.7×10^8 rads. The ECSA is constructed from and completely covered by a stainless steel sheath, therefore the inside is not exposed to beta radiation. The polyimide insulated conductor leads of the assembly are enclosed in steel conduit and terminated in a minimum of 16-gauge steel enclosures which effectively blocks most of the Beta. The ECSA's were tested with a radiation dose of 2.25×10^8 rads which is much higher than the 6×10^7 rads gamma the ECSA's will experience (40-year dose and accident) at WBN and more than compensated for any Beta that would not be blocked by the steel conduit or the termination enclosures. Other areas of WBN have radiation doses higher than the 2.25×10^8 rads for which the ECSA's are qualified but these areas do not contain equipment which requires the ECSA; therefore, no ECSA's are installed in these areas.

Reference: TAB B, paragraph K(5)

TEMPERATURE

TVA Environmental Drawing 47E235-76 R5 shows a maximum temperature of 535°F during a MSLB. The following devices, which require a ECSA, are located in this area:

Solenoid Valves	Limit Switches
1-PSV-001-006B	1-PCV-001-0005/ZS1
1-FCV-001-007	1-PCV-001-0005/ZS2
1-PSV-001-013B	1-PCV-001-0023/ZS1
1-FCV-001-014	1-PCV-001-0023/ZS2
1-PSV-001-024B	1-PCV-001-0030/ZS1
1-FCV-001-025	1-PCV-001-0030/ZS2
1-PSV-001-031B	
1-FCV-001-032	

The limit switches are not required to perform any safety function during a MSLB and therefore their failures will have no effect on this type of accident.

The solenoid valves are required to operate as follows for a MSLB. (Reference: OE Calculation WBNOSG4-003, RIMS No. B45 851112 218).

a). Valves close no later than 10 seconds after received SI signal to close.

b). For large break the SI signal is generated 2.7 seconds after beginning of the break.

c). For small break the SI signal is generated 185.9 seconds after beginning of break.

d). Superheat conditions for MSLB begin 56.5 seconds after start of large break and 309.5 seconds after start of small break.

By using the above parameters, these valves will perform the MSLB function 43.8 seconds before superheat condition during a large break and 113.6 seconds before superheat condition during a small break. After performing their function, the valves are de-energized and remain de-energized; therefore, the ECSAs will perform the function before the superheat temperatures could cause them to fail.

P. DISCUSSION (Continued)

Reference: TAB B, paragraph M(5)

ANOMALIES

1) Specimen 66-1 leakage current exceeds 250 mA causing fuse F1 (diagram 6.9.3.4A) to blow between time = 5 hours and time = 15 hours. The fuse was replaced and the circuit re-energized to approximately 150 volts before the fuse F1 blew again. At time = 18.4 hours, the DBA test was stopped to remove test specimen 66-1 for examination. It was noted that a 1/4 to 3/8-inch opening was positioned on the top of the device at the junction of flexible and rigid conduit. The position of this opening relative to the point of chamber steam and chemical spray ingress would allow possible direct impingement on the ECSA proper. Moisture was applied to the end of the ECSA and voltage applied. Arcing was observed between the conductors and ground. The shorting of these conductors is believed to be caused by the pressure from the chemical and steam spray.

Since specimen 66-1 was not installed in a manner representative of an actual field installation(see page B32) (direct spray on end of ECSA) causing deterioration at this point and test specimen 66-2 successfully completed the test maintaining full electrical and mechanical integrity, the qualification test demonstrates that the ECSAs will maintain their mechanical and electrical integrity during a DBA.

2) At the conclusion of the DBE test, specimen 66-2 was removed from the test chamber. A dielectric strength test was run with no evidence of a dielectric breakdown. An insulation resistance test was then done and a reading of less than 2.0×10^3 OHMS was observed between two conductors and ground. This condition would indicate insulation damage. As the specimen passed the dielectric breakdown test and there was no measurable leakage current during the DBE test, the damage most likely was incurred during handling of the specimen after the DBE. Handling or movement of the ECSAs during actual plant activities after installation would not occur; therefore, this low resistance reading can be disregarded. The test specimen was then submerged in water and energized at 155 volts AC for 100 days with no appreciable leakage currents (maximum of 8.6 mA). This further verifies the electrical capabilities of the ECSA design and substantiates the qualification of these devices.

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-001
MANUFACTURER: CONAX CORPORATION
PAGE: 1 OF 1

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/BLD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0001	1-PENT-293-0001	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10000-01		056-30	706'	57' 6"	76K61-87064	LOCA HELB	B B	100D 100D	MAINTAIN PRESSURE BOUNDARY
WBN-1-PENT-293-0002	1-PENT-293-0002	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10000-01		120-30	706'	57' 6"	76K61-87064	LOCA HELB	B B	100D 100D	MAINTAIN PRESSURE BOUNDARY
WBN-1-PENT-293-0003	1-PENT-293-0003	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10000-01		243-30	706'	57' 6"	76K61-87064	LOCA HELB	B B	100D 100D	MAINTAIN PRESSURE BOUNDARY
WBN-1-PENT-293-0004	1-PENT-293-0004	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10000-01		291-30	706' 6"	57' 6"	76K61-87064	LOCA HELB	B B	100D 100D	MAINTAIN PRESSURE BOUNDARY

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PENT-001

R_____ R_____ R_____

PREPARER/DATE AWT / 9-8-86

CHECKER/DATE 9/12/86

BINDER NO. WBNEQ-PENT-001 PLANT WBN UNIT(S) 1 SHEET 1 OF 31

BINDER TITLE CONAX ELECTRICAL PENETRATIONS - MV POWER

COMPUTED AWT DATE 9-5-86 R ___ R ___

CHECKED [illegible] DATE 9/12/86

A. DOCUMENTATION

Equipment Description Electrical Penetrations (MVP)

Vendor/Manufacturer Conax Corporation

Equipment Model No.(s) 7429-10000-01

QUALIFICATION REPORTS

(1) Title/Number/Revision "Design Qualification Rpt For Electric Penetration Assemblies for Watts Bar Nuclear Plant Units 1 and 2"/IPS-752/ Revision A. RIMS EEB 820115 315 DATE December 9, 1981

(2) Title/Number/Revision "Design Qualification Material Test Report for Materials Used in Conax Electric Penetration Assemblies and Electric Conductor Seal Assemblies." IPS-325/ Revision D. RIMS EEB 811110 300 DATE May 14, 1981

(3) Title/Number/Revision "Test Report Qualification of Medium Voltage Power Service Classification Electric Penetration (BF-11) For Class 1E Service In BWR and PWR Containment Structures IPS-585.1/Revision A RIMS EEB 820115 316 DATE October 16, 1981

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(1) TVA Drawing No. 45N860-3 R7 - "Conduit and Grounding Floor El 702.78 Details - Sheet 1." (See TAB E).

(2) Conax Corporation Drawing Nos. 7429-10000-01, Rev. D. shts. 1 and 2 and PL7429-10000-01, Rev. C, shts. 1 and 2. (See TAB I).

(3) Watts Bar Nuclear Plant Environmental Drawings 47E235-42R1, 47E235-44R0, and 47E235-45R0.

(4) EQP-02: "Average Temperature for Rooms Inside Lower Containment." (B71 860402 200) (See TAB E).

(5) GENNAL3-001: "Forty Year Normal Doses for Equipment Qualification for All Shield Building Spaces." (B45 851117 235) (See TAB E).

(6) TI-RPS-48 R2: "Integrated Accident Dose Inside Primary Containment." (B45 851105 235) (See TAB E).

(7) WBNNAL3-004: "Accident Dose Inside Reactor Building." (B45 860205 235) (See TAB E).

(8) GENNAL3-002: "Reduction of Beta Dose by Sheet Steel." (B45 860423 235) (See TAB E).

(9) GENNAL3-013: "Beta Dose Reduction from Finite Volume." (B45 860624 235) (See TAB E).

(10) Conax Factory Test Report Data Sheets (EEB 770801 909) (See TAB E).

BINDER NO. WBNEQ-PENT-001 PLANT WBN UNIT(S) 1 SHEET 2 OF 3

R ___ R ___

BINDER TITLE CONAX ELECTRICAL COMPUTED AWT DATE 9-13-86

PENETRATIONS - MV POWER CHECKED B DATE 9/15/86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

Open Items -1) Field verification incomplete; NCR W-353-P R1 not resolved.

2) Updated Penetration Overcurrent Protection Analysis not yet issued.

3) Qualification for submergence not yet established.

COMMENTS/RECOMMENDATIONS These penetrations are used to feed the Reactor Coolant Pump Motor circuits through the steel primary containment vessel wall. These circuits are category C and are not required to perform any electrical safety function before, during, or after any accident. The penetrations are Category B in that they are required to maintain primary containment pressure boundary at all times.

The penetration pressure boundary consists of high-alumina ceramic terminal bushings brazed to a threaded steel bushing that uses a Viton O-ring for a seal to the stainless steel header plate which is welded to the inboard end of the steel containment nozzle. Another

COMMENTS/RECOMMENDATIONS (Continued)

threaded steel bushing, inside the penetration header plate, is welded to a stainless steel conduit tube which acts as a support and provides phase isolation for Kerite insulated solid conductors throughout the entire length of the penetration. This threaded steel bushing also uses a Viton O-ring seal to the header plate. This double-seal barrier provides a means of monitoring pressure in each module. The seal between the solid conductor and the ceramic bushing is a metal-to-metal seal provided by a midlock ferrule assembly that is squeezed by torquing the midlock cap. The Watts Bar penetrations also contain a No. 2/0 AWG conductor feedthru which is utilized as a "ground" connection and must maintain containment seal integrity throughout the design life of the plant. Test Data Base Two does not contain the 2/0 AWG feedthru. Conax IPS-585.3 qualifies this design to the requirements of IEEE 317-1976. IPS-752 Test Data Base One is the assembly tested in IPS-585.3. The qualification of this feedthru design is documented in Watts Bar EQ Binder WBNEQ-PENT-002.

The penetrations are qualified to maintain pressure boundary integrity within prescribed limits before, during, and after a LOCA or steam line break occurring anytime within the 40-year plant design life.

Several penetration identification numbers are used interchangeably by TVA. The matrix on Sheet 2B is provided as a correlation between numbers used in several separate documents.

PENETRATION IDENTIFICATION MATRIX

Conax Serial No.*	EQIS NO.	Unit Device I.D. No.	Electrical Penetration Nameplate No.	PEN. No.**	Sleeve Mark No.
416	WBN-1-PENT-293-0001	1-PENT-293-0001	8391	1	X-121E
417	WBN-1-PENT-293-0002	1-PENT-293-0002	8392	2	X-122E
418	WBN-1-PENT-293-0003	1-PENT-293-0003	8393	3	X-123E
419	WBN-1-PENT-293-0004	1-PENT-293-0004	8394	4	X-124E

*Taken from Conax Factory Test Report Data Sheets (See TAB E).

**A -1 or -2 is normally added to these numbers to indicate a unit designation, as applicable.

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS Contract date: November 14, 1975

For purpose of this evaluation to determine compliance with 10CFR50.49 criteria, the required operating and performance conditions are as defined within TAB B of this binder. The TVA Design Specification WBNP-DS-1805-2697-00 is included in TAB E for information only.

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

NRC Reg. Guide 1.63, Rev. 2.

IEEE Std. 317-1976 (including applicable sections of ASME Codes referenced therein).

D. QUALIFICATION METHODOLOGY (Check only one block)

_____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

__X__ Test of Similar Items with Supporting Analysis

_____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

_____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS IPS-752, section 1.2 states "the method of qualification is by analysis and comparison to Conax Electric Penetration Assemblies previously qualified by type tests conducted at levels equal to or more severe than the specified requirements."

IPS-752 is the primary qualification document with the primary test specimen being Data Base Two.

IPS-585.1, also in TAB D, documents the type testing on Test Data Base Two (BF-11) of IPS-752 and is referenced herein for clarity where necessary. Installation weld, short time overload current, and rated continuous current testing was performed on separate data bases containing identical possible leakage paths, leak mechanisms, insulation systems, and seals as the Data Base Two, in order to accommodate the logistics of the overall testing program.

During specific type tests, the Test Data Bases were pressurized with nitrogen to provide a means of determining the amount of leakage during the test. It is to be noted that nitrogen was merely used as the indicating medium. Pressurization of the penetrations is not required for operation but only as a means to verify sealing. In accordance with Tech Spec requirements, conforming with 10CFR50, Appendix J, the penetrations are leak tested at least once every 24 months to assure that the containment leak rate is within acceptable limits.

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R R

BINDER TITLE CONAX ELECTRICAL COMPUTED AWT DATE 8-5-86

PENETRATIONS - MV POWER CHECKED B DATE 9/12/86

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? NO

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Electrical Penetration	Electrical Penetration	IPS-752, Sec. 1.1
(2) Manufacturer	Conax Corporation	Conax Corporation	IPS-752, Sec. 3.1
(3) Model Number(s)	7429-10000	7508-10004	IPS-752, Sec. 4.1, IPS-585.1, Sec. 4.2
		7508-10005	IPS-752, Sec. 4.1, IPS-585.1, Sec. 3.1.1
		7508-10000	IPS-752, Secs. 4.1, 5.7.8, 5.9.3, IPS-585.1, Secs. 6.7.3 & 6.15
(4) Serial Number(s)	416	BF-11	IPS-752, Sec. 4.1, IPS-585.1, Sec. 4.1
	417	PV-12	IPS-752, Sec. 4.1, IPS-585.1, App. E, para. 1
	418		
	419		

(5) Identify Component-Unique checksheet attached: See supplement 3 of TAB B.

JUSTIFICATION/COMMENTS See Sheet 5 A.

Conax states in IPS-752, para. 4.3, that "the design and construction of the subject penetrations of Para. 3.1 contains the identical leakage paths, leak mechanisms, feedthru concepts, seals, insulation systems, and materials as Test Data Bases One, Two, Three and Four and no differences exist between the Test Data Bases and the Watts Bar design which would affect qualification." Test Data Base Two is a medium voltage power penetration assembly and is the primary test specimen used in Conax's qualification testing program for the subject Watts Bar penetrations. This assembly (designated BF-11) is detailed in Conax drawing 7508-10004 (see TAB E) and was utilized in all portions of the test sequence of IPS-585.1, Figure 3.5 except the Installation Weld, Short Time Overload Current and Rated Continuous Current Tests. These three tests were performed on a prototype data base unit detailed in Conax drawing 7508-10000 (see TAB E), which Conax states contains "...identical possible leakage paths, leak mechanisms, feedthrough concepts, seals, insulation systems, and materials as the BF-11 test unit."

During the course of the test program anaomalies occurred in Short Circuit Current tests which required further testing on a separate data base unit. This assembly (designated PV-12), detailed in Conax drawing 7508-10005 (see TAB E), also contained "...identical leakage paths, leak mechanisms, insulation systems, seals, and materials as the subject test unit, S/N BF-11."

By comparison of the aforementioned drawings (TAB E) and the subject penetration drawing 7429-10000 (see TAB I), it is seen that, even though the tested assemblies are of the cannister-type design and the subject assemblies are modular type, their basic materials and construction are identical. The pressure retaining boundary materials of all assemblies consist of the header plate (welded), ceramic bushings, bushing extension tubes (conductor sub-assemblies), Viton "O" rings, and midlock ferrule assemblies. Inasmuch as these penetrations are built to ASME Code, the physical differences such as penetration length and diameter, number and size of conductors, header plate thickness, etc. are not of consequence when considering the penetration's ability to maintain the containment pressure boundary.

Conax also used test data from yet another assembly, 7658-10000 (a 15 kV assembly), to supplement the Corona and Basic Impulse Level testing done on the BF-11 assembly (a 5 kV assembly) and to substantiate the design of the subject 8 kV penetrations. Again, Conax certified that this assembly had a design and construction that contained the identical leakage paths, leak mechanisms, seals, insulation system and materials as the other assemblies. This data is documented in Conax report IPS-481 which is also found in TAB E along with the applicable assembly drawings.

From the data and drawings provided by Conax, it is seen that the items used in the qualification test program as described in IPS-752 and IPS-585.1 are representative of the items furnished to the Watts Bar Nuclear Plant. Design qualification is established based on testing of these items in accordance with IEEE 317-1976, Section 6.1.

BINDER NO. WBNEQ-PENT-001 PLANT WBN UNIT(S) 1 SHEET 6 OF 31

BINDER TITLE CONAX ELECTRICAL PENETRATIONS - MV POWER COMPUTED AWJ DATE 8-5-86 CHECKED B DATE 8/12/86 R ___ R ___

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	NA
External Process Connections	NA	NA	NA
Electrical Connections	See comments	No	NA
Conduit Seals	NA	NA	NA
Connector Seals	NA	NA	NA
Orientation	NA	NA	NA
Physical Configuration	NA	NA	NA
Other	NA	NA	NA

JUSTIFICATION/COMMENTS Penetration wiring is non-safety related, therefore qualification of the electrical connections is not addressed. The connections are enclosed in junction boxes on both ends of the penetrations.

Penetrations are welded in place with the header plate inside containment.

Penetration pressure gage, valve, and associated tubing are extended from the header plate to the outboard end of the penetration.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	IPS-585.1, Sec. 6.5.3
(b) Baseline performance measurements taken	Yes	IPS-752, Sec. 5.0, IPS-585.1, Secs. 6.1-6.6
(c) Equipment aged:		
Thermal	Yes	IPS-752, Sec. 5.7.9.1
Radiation	Yes	IPS-752, Sec. 5.7.10.1
Wear	No	See below
(d) Vibration/seismic testing conducted	Yes	IPS-752, Sec. 5.12.1
(e) Design basis event (DBE) exposure	Yes	IPS-752, Sec. 5.14.7
(f) Post-DBE exposure	Yes	IPS-752, Sec. 5.14.10.1.D
(g) Final inspection and disassembly	Yes	IPS-585.1, Sec. 6.18.5

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes (Reference IPS-585.1, sec. 7.0).

JUSTIFICATION/COMMENTS G(1)(c) - Penetrations are passive devices and are not subject to wear as an aging mechanism. The penetrations, however, were subjected to simulated operational stresses which included thermal cycling (IPS-752, sec. 5.7.11) and short time overload and fault current tests (IPS-752, secs. 5.10.2 and 5.11.2) as recommended by IEEE 317-1976. See sheet 7A for complete discussion of test sequence.

G(1) Test Sequence: The same medium voltage power test assembly (7508-10004) was utilized in all segments of the test sequence as described in Figure 3.5 of IPS-585.1, except the Installation Weld, Short Time Overload Current, and Rated Continuous Current Tests. These specific tests were performed on a Conax prototype test specimen (7508-10000) which, as discussed in Section E of this tab, was materially and functionally identical to the aforementioned assembly. The test sequence presented in IEEE 317-1976 is the basis for the Conax test program.

IEEE 317-1976 requires a rated Continuous Current Test prior to Cycling and Aging Tests. The Rated Continuous Current Test on the Conax 7508-10000 prototype assembly was performed after Cycling and Aging. This sequence modification is considered justified and acceptable since an aged and irradiated sample would make the continuous current test more severe. The 7508-10004 (BF-11) assembly was subjected to Rated Continuous Current Tests during both seismic and DBE test simulation for seismic and DBE evaluation only. All assemblies contain solid insulated conductors with no splices internal to the penetrations.

IEEE 317-1976 specifies simulation of normal service environment radiation exposure prior to seismic testing. Conax performed seismic testing on the BF-11 assembly prior to any radiation exposure. Following seismic testing, the assembly was subjected to a normal plus accident radiation dose of 1.19E+08 rads which is six times the required normal dose of 2E+07 rads. Evaluation tests showed that neither seismic nor irradiation was detrimental to the test unit. This sequence modification is also acceptable since indications are that irradiation to normal levels would not be detrimental to seismic testing. Qualification goals are not compromised by this modification. The combination of normal service environment radiation exposure and maximum postulated accident service environment integrated radiation exposure is allowed by IEEE 317-1976.

The BF-11 assembly was subjected to a Thermal Cycling Test subsequent to Seismic-Irradiation Testing instead of prior to age conditioning as set forth by 317-1976. The purpose of the Thermal Cycling Test is to simulate a plant's operating cycles. This sequence modification is considered more severe due to the fact that Thermal Cycling Testing was done on an equivalent 40-year thermally aged, seismically tested, 40-year irradiated data base unit. This modification does not affect qualification in any way.

To accomodate the logistics of the overall testing program the Gas Leak Rate Test to be done following age-conditioning was deferred to post-seismic/irradiation evaluation. This represented a more severe test sequence and demonstrated penetration sealant integrity was also maintained at the earlier post-aging/pre-seismic evaluation.

Based on justifications provided by Conax and the discussion above, the sequential program modifications implemented by Conax in no way adversely affects the qualification goals of IEEE 317-1976.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference IPS-752, sec. 5.7.9.1 and 5.7.24.2).

JUSTIFICATION/COMMENTS Materials tests and analyses done in IPS-325 by Conax.

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	IPS-752, Sec. 5.7.9
Radiation exposure	Yes	IPS-752, Sec. 5.7.10
Vibration (non-seismic) aging	No	NA
Operational (electrical/mechanical/process) stress aging	Yes	IPS-752, Secs. 5.7.11, 5.9.3, 5.10.2, 5.11.2

JUSTIFICATION/COMMENTS Penetrations are passive devices. Vibration aging is not a significant degradation mechanism.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS No synergistic effects known for electrical penetrations, based on literature review of applicable materials of construction.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference IPS-752, sec. 5.7.9).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: IPS-752, sec. 5.7.24.2).

JUSTIFICATION/COMMENTS Viton "O" Ring Seal is the only organic material performing a safety function.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, sec. 5.7.24.2).

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, sec. 5.7.24.2 and App. A).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	120°F (105°F avg.)	121°C	129.36°F
Time	40 yrs.	168 hrs.	40 yrs.

JUSTIFICATION/COMMENTS See sheet 9a.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference IPS-752, sec. 5.7.24.2).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference IPS-325, sec. 5.5.2.3).

JUSTIFICATION/COMMENTS

H(4)(d) Aging:

The age conditioning curve for Viton for Test Data Base Two shown on IPS-752, Figure 5.7.2 shows a 40-year qualified life at a service temperature of approximately 130°F. This is greater than the plant average normal temperature inside the lower compartment of containment (105°F per calculation EQP-02; see TAB E). An aged/conditioned test unit containing identical possible leakage paths, leak mechanisms, seals, insulation systems, and materials as Test Data Base Two was subjected to a continuous current test. The unit was placed in a 12-inch test nozzle which was insulated with cork to simulate a concrete/nozzle interface. Heating chambers were attached to the inboard and outboard ends of the penetration. The inboard end was heated to 135°F while the outboard end was stabilized to 125°F. Current of 418 amps was applied to all three bus conductors until the cork/nozzle interface stabilized at approximately 150°F (65.5°C). The conductor temperature was calculated from conductor resistance measurements. The maximum calculated conductor temperature shown was 140.4°F (60.2°C) and the conductor temperature stabilized at about 134.5°F (57°C). The Watts Bar penetrations are installed in nozzles in a free standing steel containment vessel where the average ambient temperature around the penetrations is 105°F. Therefore, the maximum continuous current conductor temperature would be approximately 115°F (46.1°C). It is seen from this data that heat rise due to electrical operation is not significant and is encompassed by Conax's age conditioning program. Therefore, a greater than 40-year thermal life is conservatively established for the subject electrical penetration assemblies.

H. AGING (Continued)

(4) (g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes (Reference IPS-752, Appendix A).

JUSTIFICATION/COMMENTS

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Heat rise due to electrical operation is insignificant. (see Sheet 9A).

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference IPS-752, sec. 5.7.10).

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference IPS-325, Table 3.1).

JUSTIFICATION/COMMENTS All materials were irradiated to the same level.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Dose applied exceeded Watts Bar 40 year plus accident dose to penetrations.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference IPS-752, sec. 5.7.10.1).

Plant normal ambient radiation dose (rd) 2.0E + 07

Test exposure dose (rd) 1.19E + 08

Test exposure dose rate (rd/hr) 8.8E + 05

Test exposure source type (e.g., Co-60 gamma) Co-60 gamma

JUSTIFICATION/COMMENTS

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Not required by IEEE 317-1976 (penetrations are passive devices and vibrational stress is not a significant aging degradation mechanism).

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS See H(6)(a).

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference IPS-752, secs. 5.7.11, 5.9.3, 5.10.2, 5.11.2 and 5.8).

JUSTIFICATION/COMMENTS Thermal cycle test, continuous current test, rated short time overload test, short circuit current test, impulse test.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, secs. 5.7.11, 5.9.3, 5.10.2, 5.11.2, 5.8).

JUSTIFICATION/COMMENTS

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference IPS-752, secs. 1.4 and 8.0).

Qualified life (Document in QMDS) 40 years

JUSTIFICATION/COMMENTS See comments in H(9).

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? No (Reference NA).

Replacement Intervals (Document in QMDS) None required; penetrations qualified for expected life of plant.

JUSTIFICATION/COMMENTS Penetrations are qualified for full 40-year life of the plant. IPS-752, sec. 8.0 states that "materials as used in Conax electric penetrations are not susceptible to any significant degradation due to thermal or radiation effects."

BINDER NO. WBNEQ-PENT-001 PLANT WBN UNIT(S) 1 SHEET 14 OF 31

BINDER TITLE CONAX ELECTRICAL PENETRATIONS - MV POWER COMPUTED AWJ DATE 9-15-86 CHECKED B DATE 9/15/86 R R

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Viton/Mechanical/O-Ring Seal	NA	NA	1.27 eV	IPS-325, Sec. 5.5.2.3
(b)	Kerite/Electrical/Cable Insulation	NA	NA	NA	NA
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS (a) Viton O-rings are enclosed within a metal groove and protected from exposure to significant amounts of radiation by metal bushings screwed into the header plate ports.

(b) Kerite cable insulation does not perform any safety function in this application and thermal and/or radiation degradation and aging is not a safety concern.

Penetration sealant and conductor insulation materials are considered susceptible to thermal and radiation degradation implicitly when test programs are developed based on IEEE 317-1976 guidelines. Testing was done in accordance with IEEE 317-1976 and test program included tests on insulation and sealant materials. No materials analysis by TVA is required. Refer to TAB D, IPS-325 for Conax's discussion of materials susceptible to thermal and radiation degradation and aging.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference IPS-752, secs. 5.1.2, 5.7.12.1, and 5.14.8.1).

Identify Acceptance Criteria: Leak rate less than 1.0E-06 scc/sec (pre-DBE) and less than 1.0E-02 scc/sec (post-DBE exposure), per IEEE 317-1976.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference IPS-752, secs. 5.1 through 5.6, 5.8, 5.10, 5.11 and 5.15).

Identify baseline and functional testing: gas leak rate, pneumatic pressure, conductor continuity, dielectric strength, insulation resistance, partial discharge (corona), basic impulse level, short-time overload, short-circuit current and duration, I^2t thermal, max. duration of short circuit.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference IPS-752, sec. 5.14.7.1).

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Baseline testing and subsequent functional tests consisted of gas leak rate, pneumatic pressure, and conductor continuity testing and dielectric strength and insulation resistance measurements which provide an indication of penetration insulated conductor condition, but are not the actual voltage and load carried by the penetration conductors in service in the plant. The demonstration of the penetration to perform its intended mechanical integrity safety function was accomplished during the accident test. Testing was in accordance with IEEE 317-1976.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	NA	NA
Load	NA	NA
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS Penetrations are not required to function electrically during an accident; therefore, accident voltage and load conditions are not specified. Subject conductors are not frequency sensitive. Conductors have no accuracy requirements.

(b)

Parameter	Demonstrated Conditions	Reference
Voltage	3.2 kVac	IPS-752, Sec. 5.14.7.1
Load	385 amps/conductor	IPS-752, Sec. 5.14.7.1
Frequency	60Hz	IPS-585.1, Sec. 3.2
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS Less than 8kV voltage is of no concern in relation to the pressure boundary integrity consideration. See TAB C for maximum continuous current calculation.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-42 R1, -44 R0, -45 R0. (See sheet 19A).

(1) Normal Max

(a) Temperature (°F) 120

(b) Pressure (psig) 0.3

(c) Humidity (%) 80

(d) Radiation (rd) 2.0E + 07*

(2) Abnormal Max

(a) Temperature (°F) 130

(b) Pressure (psig) 0.3

(c) Humidity (%) 100

(d) Radiation (rd) NA

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: Up to eight hours per excursion and occurring less than 1% of plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 327 Accident type LOCA/HELB

(b) Pressure (psig) 12.3 Accident type LOCA/HELB

(c) Humidity (%) 100 Accident type LOCA/HELB

(d) Radiation (rd) 1.0E + 07 gamma** 4.7E + 08 beta** Accident type LOCA

(e) Spray Type Chemical Accident type LOCA/HELB

*GENNAL3-001: See sheets 19A and 20A.
**TI-RPS-48: See sheets 19A and 20A.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

See sheet 19A. Spray composition - 0.1844 molar H_3BO_3 (2000 ppm Boron), 0.033 molar NaOH, pH of 8.35 at 25°C.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? No (Reference IPS-752, sec. 5.14.10.3).

(7) Subject to submergence (yes/no/NA)? Yes
(Reference TVA Environmental Dwg. No. 47E235-42 R1, TAB F, and TAB A).

Identify initiation time and duration of submergence: See TAB C.

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See sheet 19A	

The following is a listing of documents from which data was taken in order to determine the environmental parameters to which the subject medium-voltage electrical penetrations are required to be qualified:

1) TVA (WBN) Environmental Drawing Nos. 47E235-42 R1, -44 R0, -45 R0.

2) EQP-02 - "Average Temperature for Rooms Inside Lower Containment" (B71 860402 200)

3) GENNAL3-001 - "Forty Year Normal Doses for Equipment Qualification for All Shield Building Spaces" (B45 851117 235).

4) TI-RPS-48 - "Integrated Accident Dose Inside Primary Containment" (B45 851105 235).

5) WBNNAL3-004 - "Accident Dose Inside Reactor Building" (B45 860205 235).

6) GENNAL3-002 - "Reduction of Beta Dose by Sheet Steel" (B45 860423 235).

7) GENNAL3-013 - "Beta Dose Reduction from Finite Volume" (B45 860624 235).

One end of each penetration is exposed to conditions in the annulus (Dwg. No. 47E235-44 R0), while the other end is exposed to conditions in the lower compartment of the reactor building. Penetrations 1 and 2 are exposed to lower compartment conditions in the instrument room (Dwg. No. 47E235-45 R0) on their inboard ends. Penetrations 3 and 4 are exposed to lower compartment conditions in accumulator rooms 3 and 4, respectively (Dwg. No. 47E235-42 R1). Conditions from 47E235-42 R1 represent the overall worst-case for the subject penetrations and are used as the qualification requirement along with supplemental information from items 2 through 5 above.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 days	13 days	IPS-752, Fig. 5.14.4
Temperature (°F)	327	400	IPS-752, Fig. 5.14.4
Pressure (psig)	12.3	72	IPS-752, Fig. 5.14.4
Relative Humidity (%)	100	100	IPS-752, Fig. 5.14.4
*Chemical Spray	0.1844 molar H_3BO_3 0.033 molar NaOH pH = 8.35	None	IPS-752, Sec. 5.14.10.3
**Radiation (rd)	3.86E + 07 rads gamma + beta	1.19E + 08 rads gamma	IPS-752, Sec. 5.7.10.1
Submergence	Yes	None	See TAB C

*Includes spray concentration, flowrate, density, duration, and pH.
**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	IPS-752, Fig. 5.14.4
Pressure	Yes	IPS-752, Fig. 5.14.4
Relative Humidity	Yes	IPS-752, Fig. 5.14.4
Chemical Spray	No	See Below
Submergence	No	See TAB C

JUSTIFICATION/COMMENTS L(2) - Chemical Spray - Specified containment spray is 30 days, and the flow rate is 0.92 gpm/ft^2. Conax Test Data Base Two was not subjected to a chemical spray. Conax considered the effects of chemical spray on the pressure seal and electrical integrity of the (Continued on sheet 20A).

L(2) JUSTIFICATION/COMMENTS (Continued)

Data Base and the subject penetrations as negligible. The outboard ends of the subject penetrations are not exposed to chemical spray. The inboard ends of penetrations 1-1 and 2-1 are within the instrument room and are not directly affected by chemical spray. The inboard ends of penetrations 3-1 and 4-1 are inside accumulator rooms 3 and 4, respectively. Spray flood water from the upper compartment enters these rooms via the air return fan openings at a flow rate of 185 gpm in accumulator room 3 and 18.5 gpm in accumulator room 4. The subject penetrations are not located directly below the fan openings and are therefore not subject to direct spray water flow. These flow rates and a resultant pH of 8.3 is determined insignificant for the subject penetration materials. The Viton O-rings on both sides of the inboard header plate forming a double seal pressure boundary, are enclosed by the steel bushings which are threaded into the stainless steel header plate. The conductors are terminated in ceramic insulators and the terminations are wrapped with ethylene propylene rubber tape. The protection afforded by this configuration and by the ends of the assemblies being enclosed in junction boxes demonstrates that the subject penetrations are impervious to chemical spray.

L(1) Radiation - From GENNAL3-001, the penetrations are exposed to a 40-year total integrated gamma dose of 2.0E+07 rads. From TI-RPS-48, sheet 7.21, they are exposed to an accident gamma dose of 1.0E+07 rads for a total gamma dose of 3.0E+07 rads. The accident beta dose is 4.7E+08 rads from TI-RPS-48. Of the penetration materials susceptible to radiation degradation effects, which are integral to the pressure boundary, the Viton O-ring seals are encased in steel and protected on the ends with 12 gauge (minimum) sheet steel boxes. The ceramic insulators and terminations are inside the boxes also. The beta dose reduction afforded by the 12 gauge boxes is 1.75E-02 in accordance with calculation GENNAL3-002. This yields a beta radiation dose to the penetrations of 1.75E-02 x 4.7E+08 = 8.23E+06 rads. The beta dose reduction afforded by the boxes (42"H x 30"W x 24"D) as a finite volume (4.96E+05 cm^3) is 7.17E-04 in accordance with calculation GENNAL3-013. This yields a beta radiation dose of 7.17E-04 x 4.7E+08 = 3.37E + 05 rads. The total dose to the penetrations is then (3.0E+07) + (8.23E+06) + (3.37E+05) = 3.86E+07 rads.

L(2) Relative Humidity - The relative humidity was not maintained at 100% throughout the entire test conducted by Conax, but did occur at various times. Because the test profile was a combination of both the LOCA and HELB conditions, saturated steam, obviously, could not be the test medium throughout. However, portions of the test were performed under saturated steam, while the HELB conditions were simulated by low humidity superheated steam.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	> +15°F	Yes
Pressure: +10% but no more than 10 psig	> +10%	Yes
Radiation: +10% of accident dose	> +10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	See TAB C, Section A	Yes
Voltage: ±10% of rated value	NA	NA
Frequency: ±5% of rated value	NA	NA
Environmental Transient: the initial transient and the peak temperature applied twice	transient applied twice	Yes
Vibration: +10% added to acceleration	NA	NA

JUSTIFICATION/COMMENTS: Penetrations perform no electrical safety function and no electrical margins are required.

Sheet 3 of Material Aging Calculation Report WAC-220 (see TAB C, Section A) shows the test post-accident operating time equivalent is considerably more than 10% over the Watts Bar required operating time.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment: (Reference IPS-752, Abstract and sec. 1.5).

JUSTIFICATION/COMMENTS These penetrations have no electrical function during an accident and are required only to maintain mechanical integrity in order to maintain the containment pressure boundary.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes (Reference IPS-752, sec 5.14.8.1).

JUSTIFICATION/COMMENTS Data base was not nitrogen pressurized during test, mechanical integrity verified by post-DBE evaluation (leak rate test). This method is considered acceptable because there is no mechanism that could be postulated that would result in unacceptable leakage during the test but would recover afterwards.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes (Reference IPS-752, sec. 5.14.8.1).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference IPS-752, secs. 5.14.10.1.B and 5.14.10.1.D).

JUSTIFICATION/COMMENTS

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes (Reference IPS-585.1, secs. 6.16.4, 6.16.4.1, 6.20.4, 6.20.4.1, and Appendices D and E).

JUSTIFICATION/COMMENTS Anomalies and resolutions reviewed and determined acceptable. Conax reported in the sections referenced above that, during short-circuit testing, the penetration assembly conductors that were shorted had lost sealant integrity at the conductor/bushing nut interface upon return of the test unit to Conax. Torque values on the bushing nuts had relaxed to unacceptable values and allowed leakage. Conax retorqued the bushing nuts and leak rate tested the assembly. Acceptable leak rate results were observed. Conax attributed this abnormality to overtest conditions during short circuit and maximum duration short circuit testing. Loads applied during these tests were 63 kA and 62 kA (actual currents 60.3 kA and 59.8 kA) respectively, yielding I^2t values of 8.19E+09 amp^2-sec. and 8.01E+09 amp^2-sec., respectively. It should be pointed out that IEEE 317-1983 lists preferred values of rated short-circuit current and rated short-circuit thermal capacity (I^2t) for 1000 MCM conductors of 50 kA and 5.18E+09 amp^2-sec. Comparison of test values with these preferred values does yield an apparent overtest condition which could cause excessive leakage. Appendices D and E of IPS-585.1 documents subsequent testing on a Data Base Unit (PV-12) containing identical possible leakage paths, leak mechanisms, insulation systems, seals and materials as the original test specimen. This Data Base Unit was not an aged/irradiated unit and had not gone through a pre-test conditioning sequence. The original failure was attributed to excessive mechanical stresses causing a break in the metal-to-metal seal formed by the ceramic bushing midlock ferrule assembly and the copper conductor. The fact that the assembly passed the leak rate test after the nuts were retorqued is evidence that the failure was not age related. The age-sensitive materials, Viton and Kerite, were aged to an equivalent 40-year service life and completed the short-circuit testing without failure even at the elevated loads. The subsequent test on the PV-12 unit was done for engineering information and assurance that the metal-to-metal conductor seal would not be purged at realistic conditions. Pre-aging was not required in order to provide that assurance since the subject seal was not age sensitive. This testing was done at realistic short-circuit conditions, and the Data Base Unit functioned as required indicating no loss of mechanical integrity.

Appendix E of IPS-585.1 lists values of short circuit current and thermal density (I^2t) for the 750 MCM conductors of the subject Watts Bar penetrations as calculated from the test values taken from the 1500 MCM conductors of the tested Data Base Unit.

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BINDER TITLE CONAX ELECTRICAL COMPUTED AWT DATE 9-5-86 R ___ R ___

PENETRATIONS - MV POWER CHECKED B DATE 9/12/86

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See TAB G - QMDS

BINDER NO. WBNEQ-PENT-001 PLANT WBN UNIT(S) 1 SHEET 25 OF 31

BINDER TITLE CONAX ELECTRICAL PENETRATIONS - MV POWER COMPUTED AWT DATE 9-5-86 CHECKED B DATE 9/12/86 R ___ R ___

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA None taken
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	NA (See Sec. L(2))
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA (See Sec. L(2))
(11) Criteria regarding submergence satisfied?	Yes (See TAB C)
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	Yes
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

P. DISCUSSION (Continued)

P. DISCUSSION (Continued)

SUPPLEMENT 3
COMPONENT-UNIQUE CHECKLIST
ELECTRICAL PENETRATIONS

EQUIPMENT IDENTIFICATION

(1) Are the penetrations identified in the qualification program identical to the plant penetrations which require qualification (yes/no/NA)? No

Item	Plant	Report	Acceptable Yes/No/NA	IPS-752 Report Section
(a) Penetration type	MVP Modular	MVP Cannister	Yes	Table 3.1, Table 4.2
(b) Mounting	Welded Header	Welded Header	Yes	Table 3.1, Table 4.2
(c) External connections	NA	NA	NA	NA

Comments: Penetration wiring is non-safety related; therefore, qualification of the electrical connections is not a concern.

(2) Does the qualification report identify the following performance characteristics:

Performance Characteristics	Acceptable (Yes/No/NA)	IPS-752 Report Section
(a) Temperature rating	Yes	4.5.2.3 (a)(i)
(b) Voltage rating	Yes	5.6.3
(c) Continuous current rating	Yes	5.9.3
(d) Short-time overload current rating & duration	Yes	5.10.2 & 5.10.5(1)
(e) Rated short circuit current & duration	Yes	5.11.2 & 5.15.4
(f) Pressure rating	Yes	5.2

EQUIPMENT IDENTIFICATION (Continued)

Performance Characteristics	Acceptable (Yes/No/NA)	IPS-752 Report Section
(g) Maximum gas leakage rate	Yes	5.1.2.1

Comments: _____

(3) Does the qualification program address the following tests:

Item	Acceptable Yes/No/NA	IPS-752 Report Section
(a) Continuous current rating	Yes	5.9.3, 5.9.6(B)
(b) Short-time overload current rating and duration	Yes	5.10.2, 5.10.5(1)
(c) Short circuit current rating and duration	Yes	5.11.2, 5.15.4
(d) Rated maximum duration of rated short circuit current	Yes	5.11.2, 5.15.4
(e) Pneumatic pressure rating	Yes	5.2
(f) Maximum gas leakage rate	Yes	5.1.2.1, 5.14.8.1
(g) Conductor continuity	Yes	5.3, 5.14.8.2
(h) Dielectric strength	Yes	5.4.2, 5.14.8.3
(i) Impulse	Yes	5.8
(j) Insulation resistance	Yes	5.5.2, 5.14.8.4
* (k) Flame	Yes	6.3

Comments: *The insulated conductors in the subject penetrations are completely enclosed by the penetration assembly when installed, and are not subject to flame.

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-002
MANUFACTURER: CONAX CORPORATION

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0005	1-PENT-293-0005	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-03		256-30	779' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0006 -A	1-PENT-293-0006 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-02		015	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0007 -B	1-PENT-293-0007 -B	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-02		165	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0008 -A	1-PENT-293-0008 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-02		199	728' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0009 -B	1-PENT-293-0009 -B	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-02		333	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	

* SEE DRAWING 45W860-3 IN TAB E.

PREPARER/DATE DDD 7/26/86
CHECKER/DATE WBK 7/27/86

R_____ R_____ R_____

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PENT-002

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-002
MANUFACTURER: CONAX CORPORATION

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0010	1-PENT-293-0010	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-05		290	735' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0011	1-PENT-293-0011	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-01		248-30	779' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0012	1-PENT-293-0012	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-06		243-30	739' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0013	1-PENT-293-0013	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-06		240	739' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0014 -A	1-PENT-293-0014 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-04		097	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	

* SEE DRAWING 45W860-3 IN TAB E.

PREPARER/DATE DDD 7/26/86
CHECKER/DATE WWK 7/27/86

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PENT-002

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-002
MANUFACTURER: CONAX CORPORATION
PAGE: 3 OF 6

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0015 -A	1-PENT-293-0015 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-03		101	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0016 -B	1-PENT-293-0016 -B	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-03		114	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0017 -B	1-PENT-293-0017 -B	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-04		118-30	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0021 -A	1-PENT-293-0021 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-02		236-30	720'	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0024	1-PENT-293-0024	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-02		238-45	730'	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	

* SEE DRAWING 45W860-3 IN TAB E.

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PREPARER/DATE DDD 7/26/86

CHECKER/DATE WEK 7/26/86

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PENT-002

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-002
MANUFACTURER: CONAX CORPORATION
PAGE: 4 OF 6

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0026	1-PENT-293-0026	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-06		248-30	771' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0027 -A	1-PENT-293-0027 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-05		019	728' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0032	1-PENT-293-0032	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-02		029	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0035	1-PENT-293-0035	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-02		161	726' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0036 -B	1-PENT-293-0036 -B	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-05		150	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	

* SEE DRAWING 45W860-3 IN TAB E.

PREPARER/DATE DDD 7/26/86
CHECKER/DATE WBK 7/29/86

R_____ R_____ R_____

PAGE A-4

PENT-002

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-002
MANUFACTURER: CONAX CORPORATION
PAGE: 5 OF 6

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0041	1-PENT-293-0041	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-01		211	737' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0044 -A	1-PENT-293-0044 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-05		209	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0046	1-PENT-293-0046	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-05		163	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0047	1-PENT-293-0047	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-02		343	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0048	1-PENT-293-0048	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-05		331	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	

* SEE DRAWING 45W860-3 IN TAB E.

PREPARER/DATE DDD 7/26/86
CHECKER/DATE WMK 7/27/86

R_____ R_____ R_____

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PENT-002

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-002
MANUFACTURER: CONAX CORPORATION
PAGE: 6 OF 6

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0051	1-PENT-293-0051	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-04		056-30	733' 9"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0052 -B	1-PENT-293-0052 -B	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-05		345	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0053	1-PENT-293-0053	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-05		243-30	720'	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	

* SEE DRAWING 45W860-3 IN TAB E.

PREPARER/DATE DOD 7/26/86
CHECKER/DATE WBK 7/27/86

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PENT-002

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 1 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL

COMPUTED DDD DATE 7/26/86 R ___ R ___

CHECKED WBK DATE 8/6/86

A. DOCUMENTATION

Equipment Description Electrical Penetration, Low Voltage Pwr & Control

Vendor/Manufacturer Conax Corporation

Equipment Model No.(s) 7429-10001 and 7429-10002

QUALIFICATION REPORTS

(1) Title/Number/Revision "Design Qualification Report for Electrical Penetration Assemblies for Watts Bar Nuclear Plant Units 1&2"/IPS-752/Rev. A. RIMS EEB 820115 315 DATE December 09, 1981

(2) Title/Number/Revision "Design Qualification Mtl Test Report for Materials Used in Conax Electrical Penetration Assemblies and Electric Conductor Seal Assemblies"/IPS-325/Rev. D. RIMS EEB 811110 300 DATE May 14, 1981

(3) Title/Number/Revision "Design Qualification Test Report of a Low Volt. Pwr & Control Service Classification (BF-LVP/C) Electrical Penetration Assembly"/IPS-585.3/Rev. A. RIMS EEB 811110 304 DATE February 11, 1981

(4) Title/Number/Revision "Design Qualification Rpt For a 42 Conductor #18 AWG Conax Low Volt. Service Classification Feedthrough Assembly Consistent with the Requirements of IEEE Standard 317-1976 & NRC Regulatory Guide 1.63, 7/78"/IPS-353.10/Rev. B. RIMS B26 860801 048 DATE June 23, 1983

OTHER (ANALYSIS, VENDOR DATA, ETC.)

Design Qualification Material Test Report for Materials Used in Conax Electrical Penetration Assemblies and Electric Conductor Seal Assemblies, IPS-325, Rev. E.
45N860-3, R7 - Conduit and Grounding, Floor El 702.78, Details - Sheet 1
45W860-10, R8 - Conduit and Grounding, Electrical Penetration Details
7429-10001, Sheet 1, Rev. D - LVP Electric Penetrations for Watts Bar Units 1 & 2
7429-10001, Sheet 2, Rev. D - LVP Electric Penetrations for Watts Bar Units 1 & 2
7429-10002, Sheet 1, Rev. D - LVP Electric Penetrations for Watts Bar Units 1 & 2
7429-10002, Sheet 2, Rev. D - LVP Electric Penetrations for Watts Bar Units 1 & 2
7429-24001, Sheet 1, - Enclosure Sub-Assy
7429-24002, Sheet 1, Rev. A - Enclosure Sub-Assy

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 1A OF 29

R ___ R ___

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL

COMPUTED DDD DATE 7/26/86

CHECKED WBK DATE 7/27/86

PL7429-10001-01, Sheet 1, Rev C - Parts List

PL7429-10001-01, Sheet 2, Rev C - Parts List

PL7429-10001-01, Sheet 3, Rev C - Parts List

PL7429-10001-02, Sheet 1, Rev C - Parts List

PL7429-10001-02, Sheet 2, Rev C - Parts List

PL7429-10001-02, Sheet 3, Rev C - Parts List

PL7429-10001-03, Sheet 1, Rev C - Parts List

PL7429-10001-03, Sheet 2, Rev C - Parts List

PL7429-10001-03, Sheet 3, Rev C - Parts List

PL7429-10001-04, Sheet 1, Rev C - Parts List

PL7429-10001-04, Sheet 2, Rev C - Parts List

PL7429-10001-04, Sheet 3, Rev C - Parts List

PL7429-10001-05, Sheet 1, Rev C - Parts List

PL7429-10001-05, Sheet 2, Rev C - Parts List

PL7429-10001-05, Sheet 3, Rev C - Parts List

PL7429-10001-06, Sheet 1, Rev C - Parts List

PL7429-10001-06, Sheet 2, Rev C - Parts List

PL7429-10001-06, Sheet 3, Rev C - Parts List

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 1B OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED DDD DATE 7/26/86 R ___ R ___

CHECKED [illegible] DATE 7/26/86

PL7429-10002-01, Sheet 1, Rev D - Parts List

PL7429-10002-01, Sheet 2, Rev D - Parts List

PL7429-10002-01, Sheet 3, Rev D - Parts List

PL7429-10002-02, Sheet 1, Rev D - Parts List

PL7429-10002-02, Sheet 2, Rev D - Parts List

PL7429-10002-02, Sheet 3, Rev D - Parts List

PL7429-10002-03, Sheet 1, Rev D - Parts List

PL7429-10002-03, Sheet 2, Rev D - Parts List

PL7429-10002-03, Sheet 3, Rev D - Parts List

PL7429-10002-04, Sheet 1, Rev D - Parts List

PL7429-10002-04, Sheet 2, Rev D - Parts List

PL7429-10002-04, Sheet 3, Rev D - Parts List

PL7429-10002-05, Sheet 1, Rev D - Parts List

PL7429-10002-05, Sheet 2, Rev D - Parts List

PL7429-10002-05, Sheet 3, Rev D - Parts List

PL7429-10002-06, Sheet 1, Rev D - Parts List

PL7429-10002-06, Sheet 2, Rev D - Parts List

PL7429-10002-06, Sheet 3, Rev D - Parts List

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 1C OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED DDD DATE 7/24/86 R ___ R ___

CHECKED UVK DATE 8/8/86

WBNNAL3-004 - Accident Dose Inside Reactor Building (B45 860205 235)

TI-RPS-48 (R2) - Integrated Accident Dose Inside Primary Containment (B45 851105 235)

GENNAL3-001 - Normal Radiation Dose (B45 851117 235)

GENNAL4-001 - SQN and WBN Annulus Temperature Analysis (B45 860317 237)

Maximum Containment Water Level (NEB 840120 220)

GENNAL3-002 - Reduction of Beta Dose by Sheet Steel (B45 860423 235)

EQP-02 - Average Temperature for Rooms Inside Lower Containment (B71 860402 200)

GENNAL3-013 - Beta Dose Reduction from Finite Volume (B45 860624 235)

47E235-41 R0 - Environmental Data, Upper Compartment

47E235-42 R1 - Environmental Data, Lower Compartment

47E235-44 R0 - Environmental Data, Annulus Area

47E235-45 R0 - Environmental Data Instrument Room

WBNEQ-GEN-001 - Environmental Qualification Generic Binder

WBNEQ-SPLC-001 - Environmental Qualification Binder for Raychem Heat Shrink Splices

IPS-752 is the document submitted by Conax Corporation as the key qualification report for the Watts Bar Penetrations. It is a very comprehensive summary report and documents qualification by analysis and comparison to similar modular-type low voltage power and control penetration assemblies of a universal design previously qualified by type tests conducted in accordance with IEEE 317-1976 at levels equal to or more severe than TVA specified requirements for Watts Bar. Most references in this binder are to IPS-752.

IPS-325 documents qualification of Conax Electric Penetration Assemblies from the standpoint of material tests, as a minimum satisfying requirements of Section 6.3 of IEEE 317-1976. Appendix A of IPS-325 includes Conax's thermal evaluation program. IPS-325 is referenced in this binder for identification of materials susceptible to aging degradation and to support Arrhenius Aging Calculations.

IPS-585.3 documents tests on the low voltage power and control penetration assembly referred to as test data base one in IPS-752. It is a more detailed test report than IPS-752 that includes raw data and therefore it is referenced in a few places in this binder.

IPS-353.10 documents qualification tests of a low voltage penetration module consistent with the requirements of IEEE 317-1976. For this binder it provides environmental qualification documentation for chemical spray, supporting IPS-752 in the same way that IPS-325 and IPS-585.3 do.

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 2 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED ODD DATE 9/16/86 R ___ R ___

CHECKED Dm for W.B.K. DATE 9.23.86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

(See Sheet 2A).

COMMENTS/RECOMMENDATIONS These modular-type electrical penetrations are used to convey both safety-related and non-safety related low voltage power and control circuits (480V nominal or less) into primary containment. These penetrations are qualified to maintain pressure integrity and electrical integrity within prescribed limits before, during, and after a LOCA, steam line, CVCS, RHR, or FW break occurring any time within the 40-year plant design life, contingent on satisfactory resolution of open items and qualification deficiencies noted above.

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 2A OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL

COMPUTED DDP DATE 9/23/86 R ___ R ___

CHECKED Qm for WBK DATE 9.23.86

1. Field verification must be corrected and completed and NCRs W-353-P and 6224 must be resolved.

2. Penetration protection analyses covered by scope of work documents WBN SWD86019 and WBN SWD86025 must be completed.

3. Adequate electrical protection must be provided for penetration circuits covered by SCR WBNEEB8616, NCR WBNEEB8507, SCR WBNEEB8630, and NCR WBNEEB8111.

4. Determine maximum nominal system voltage. See QIR WBNEQP86102.

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS Contract Date: 11/14/75. Although procured, delivered, and installed prior to 2/22/83, these electrical penetrations meet NUREG-0588, Category I requirements.

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 317-1976 - Standard for Electrical Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations.

ASME Boiler and Pressure Vessel Code Section III, Subsection NE, for Class MC Components, 1974 Edition & Addenda Through Winter 1974.

IEEE 344-1975 - Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations.

U. S. Nuclear Regulatory Commission Regulatory Guide 1.63, Revision 2, July 1978 - Electric Penetration Assemblies in Containment Structures for Light-Water-Cooled Nuclear Power Plants.

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 4 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED [illegible] DATE 8/19/86 R ___ R ___

CHECKED [illegible] DATE 8/20/86

D. QUALIFICATION METHODOLOGY (Check only one block)

___ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS Conax Qualification Report IPS-752, Section 1.2. See binder TAB D, Section D-1 for copy of IPS-752. IPS-752, Section 4.3 states "The design and construction of the subject penetrations of Para. 3.1 contains the identical leakage paths, leak mechanisms, feedthrough concepts, seals, insulation systems, and materials as test data bases one, two, three, and four and no differences exist between the test data bases and the Watts Bar design which would affect qualification."

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Elec. Pen. LVP & C	Same	IPS-752, Sect. 4.1
(2) Manufacturer	Conax Corporation	Same	IPS-752, Sect. 4.1
(3) Model Number(s)	See TAB A	7508-10003	IPS-585.3, Sect. 4.2
(4) Serial Number(s)	See TAB F	NA	IPS-585.3 Appx. A

(5) Identify Component-Unique checksheet attached: See TAB B, Supplement 3.

JUSTIFICATION/COMMENTS Conax Summary Qualification Report IPS-752 documented qualification by analysis and comparison to similar modular-type low voltage power and control penetration assemblies previously qualified by type tests conducted at levels equal to or more severe than TVA specified requirements for Watts Bar. Test data base one is the applicable test specimen for low voltage power and

JUSTIFICATION/COMMENTS (Continued)

control classification penetrations. See IPS-752, Table 4.1, for a detailed description of the tested penetration (test data base one). IPS-585.3 is the type test report for test data base one described in IPS-752. IPS-585.3 is much more detailed and therefore it is referenced at some points in this binder. Some Watts Bar penetrations include spliced-on outboard pigtail extensions for size 8 AWG and larger which were not part of test data base one. However, the annulus does not experience any steam accident environment. The splice insulations are Raychem WCSF-N as shown in instruction manual IPS-214 (binder TAB H, Section H-1) and are qualified in accordance with binder WBNEQ-SPLC-001. See Sheets 5B and 5C for correlation of plant devices EQIS No.'s, Model No.'s, Serial No.'s, and Types.

All WBN Primary Containment Electrical Penetrations are tabulated on TVA Drawing 45N860-3 in binder TAB E, Section E-2. Penetrations covered in this binder are low voltage power and control types and are listed on 45N860-3 as being for node voltage levels 3, 3A, 3B, 4, 4A, and 4B.

(Penetrations for node voltage level 5 are covered in binder WBNEQ-PENT-001 and those for node voltage levels 1, 2, 2A, 2B, 2D, 2E, 2F, and 2G are covered in binder WBNEQ-PENT-003).

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 5B OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED DDD DATE 7/26/86 R ___ R ___

CHECKED WBK DATE 7/27/86

EQIS NO.		MODEL NO.	SERIAL NO.	TYPE
WBN-1-PENT-293-0005		7429-10001-03	384	L.V. Power
WBN-1-PENT-293-0006	-A	7429-10001-02	374	L.V. Power
WBN-1-PENT-293-0007	-B	7429-10001-02	375	L.V. Power
WBN-1-PENT-293-0008	-A	7429-10001-02	376	L.V. Power
WBN-1-PENT-293-0009	-B	7429-10001-02	383	L.V. Power
WBN-1-PENT-293-0010		7429-10002-05	357	L.V. Control
WBN-1-PENT-293-0011		7429-10001-01	373	L.V. Power
WBN-1-PENT-293-0012		7429-10001-06	381	L.V. Power
WBN-1-PENT-293-0013		7429-10001-06	382	L.V. Power
WBN-1-PENT-293-0014	-A	7429-10002-04	363	L.V. Power
WBN-1-PENT-293-0015	-A	7429-10002-03	370	L.V. Power
WBN-1-PENT-293-0016	-B	7429-10002-03	371	L.V. Power
WBN-1-PENT-293-0017	-B	7429-10002-04	364	L.V. Power
WBN-1-PENT-293-0021	-A	7429-10002-02	365	L. V. Power

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 5C OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED DDD DATE 7/26/86 R ___ R ___

CHECKED WBK DATE 7/24/86

EQIS NO.		MODEL NO.	SERIAL NO.	TYPE
WBN-1-PENT-293-0024		7429-10002-02	366	L.V. Power
WBN-1-PENT-293-0026		7429-10002-06	355	L.V. Power
WBN-1-PENT-293-0027	-A	7429-10002-05	358	L.V. Control
WBN-1-PENT-293-0032		7429-10002-02	367	L.V. Power
WBN-1-PENT-293-0035		7429-10002-02	368	L.V. Power
WBN-1-PENT-293-0036	-B	7429-10002-05	359	L.V. Control
WBN-1-PENT-293-0041		7429-10002-01	356	L.V. Power
WBN-1-PENT-293-0044	-A	7429-10002-05	360	L.V. Control
WBN-1-PENT-293-0046		7429-10002-05	361	L.V. Control
WBN-1-PENT-293-0047		7429-10002-02	369	L.V. Power
WBN-1-PENT-293-0048		7429-10002-05	362	L.V. Control
WBN-1-PENT-293-0051		7429-10001-04	372	L.V. Control
WBN-1-PENT-293-0052	-B	7429-10001-05	379	L.V. Control
WBN-1-PENT-293-0053		7429-10001-05	380	L.V. Control

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	NA
External Process Connections	NA	NA	NA
Electrical Connections	NA-See Note 1 below	NA	NA
Conduit Seals	NA	NA	NA
Connector Seals	NA	NA	NA
Orientation	NA	NA	NA
Physical Configuration	NA-See Note 2 below	Yes	IPS-752, Table 4.1
Other	NA	NA	NA

JUSTIFICATION/COMMENTS Note 1: In-line splice insulations for connection of field cable to penetration conductor pigtails were provided by TVA and are not part of the penetration assembly qualification. See binder WBNEQ-SPLC-001 for splice qualification.

Note 2: Header plate, feedthrough tube material, feedthrough seal, conductor sealants, conductor insulation, copper conductors, installation weld. There are no required external process requirements, no conduit seals (penetrations are seals), and orientation is not a consideration for penetrations.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	IPS-752 Reference
(a) Equipment inspected for damage	No	NA
(b) Baseline performance measurements taken	Yes	Sect. 5.0
(c) Equipment aged:		
Thermal	Yes	Sect. 5.7.4
Radiation	Yes	Sect. 5.7.5
Wear	No	NA
(d) Vibration/seismic testing conducted	Yes	Sect. 5.12
(e) Design basis event (DBE) exposure	Yes	Sect. 5.14.1
(f) Post-DBE exposure	Yes	Sect. 5.14.1
(g) Final inspection and disassembly	No	NA

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes (Reference IPS-585.3, p. 32).

JUSTIFICATION/COMMENTS G(1)(a)-Although Conax does not state that an initial visual inspection was done, they have completed numerous successful test programs and there is no reason to believe a visual inspection was not done. However, an initial visual inspection is not required by IEEE 317-1976.
G(1)(c)-Electrical penetrations are passive devices and are not subject to wear as an aging mechanism. Wear aging is not required by IEEE 317-1976. The penetrations, however, were subjected to simulated operational stresses which included thermal cycling (Section 5.7.3) and short-term overload and fault current tests (Sections 5.10.1 and 5.11.1) as recommended by IEEE 317-1976.

JUSTIFICATION/COMMENTS G(1)(g)-Conax does not state that a final inspection and disassembly was done, but extensive final evaluation testing was performed (IPS-752, Section 5.14.2) in accordance with IEEE 317-1976, fully proving the post-accident integrity and operability of the assembly. It is reasonable to assume that a manufacturer of Conax's experience did make a visual inspection. However, a final visual inspection and disassembly are not required by IEEE 317-1976.

G(1)(e) and G(2) - Test data base 1 was exposed to the sequence as listed above. However, the DBE exposure did not include any chemical spray. Spray compatibility of Conax penetrations was established in report IPS-353.10 as stated in IPS-752, Section 5.14.10.2. IPS-353.10 documents environmental qualification tests on another (not test data base 1) penetration assembly. This assembly received sequential thermal aging, thermal cycling, radiation exposure, and DBA accident profile at levels approximately equal to test data base 1 and in excess of WBN requirements. Thermal aging was somewhat less and radiation exposure somewhat more than test data base 1. The materials and design of this penetration assembly are the same as test data base 1. See Conax Justification/Comparison in IPS-752, Section 5.14.10.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference IPS-752, Section 5.7).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	IPS-752 Reference
Thermal aging	Yes	Sect. 5.7.4
Radiation exposure	Yes	Sect. 5.7.5
Vibration (non-seismic) aging	No	NA
Operational (electrical/mechanical/process) stress aging	Yes	Sect. 5.7.3, 5.9.2, 5.10.1, 5.11.1, 5.12.1, 5.13.1 & 5.15.1

JUSTIFICATION/COMMENTS Vibration aging not required by IEEE 317-1976 (Penetrations are passive devices and vibrational stress is not a significant aging degradation mechanism).

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS No synergistic effects known for these penetrations, based on a literature review of applicable materials data for materials used in Conax L. V. Power and Control Penetrations.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Section 5.7.4).

PAGE B-17 JUSTIFICATION/COMMENTS Aging based on materials tests and analysis done in IPS-325 (binder TAB D, Section D-2) by Conax.

H. AGING (Continued)

(4) (b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: IPS-325, Table 3.1 and IPS-752, Tables 3.2 and 3.3).

JUSTIFICATION/COMMENTS

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Section 5.7.24.2).

JUSTIFICATION/COMMENTS Thermal aging based on conductor feed-through life. See analysis of feedthroughs in IPS-325, Appx. A.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Section 5.7.24.2).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	120°F	150°C	120°C
Time	40 yrs.	100 hrs.	40 yrs.

JUSTIFICATION/COMMENTS See Sheet 9A.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference IPS-752, Section 5.7.24.2).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference IPS-325, Rev. E, Section 6.4.1 (Footnote at bottom of page) in binder TAB E, Section E-4).

JUSTIFICATION/COMMENTS

H(4)(d) Aging:

The thermal age conditioning curve shown in IPS-752, Figure 5.7.1, shows a 40-year life at 120°C. Note in IPS-752, Table 5.9.4, that the full load current test ambient temperature (TIA) is greater than the normal ambient at Watts Bar, the test total operating temperature (TIF) is less than 90°C in every case, and the test current is greater than the Watts Bar required current (See contract 76K61-87064, Section E4g.(1) in binder TAB E, Section E-1) in every case. Therefore, a greater than 40-year thermal life is conserva-tively established for the subject penetration assemblies. Conax document IPS-325 covers an ongoing test program. A newer revision of IPS-325/Rev. E shows the latest Conax calculation of activation energy for their feed-throughs is 3.916, which agrees closely with the regression line presented in IPS-325, Figure 5.7.1. See in binder TAB E, Section E-4, IPS-325, Rev. E, page 26. See Material Aging Calculation Report WAC-62, page 2 in binder, TAB C, Section C-1 for calculation of qualified life at 90°C.

H. AGING (Continued)

(4) (g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes (Reference IPS-325, Rev. E, Appendix A in binder TAB E, Section E-4).

JUSTIFICATION/COMMENTS Also, see IPS-752, Figure 5.7.1 and binder sheet 9A.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Not required by IEEE 317-1976. Aging time and temperature was sufficient to account for penetration operating temperature which is ambient, plus temperature rise due to electrical loading.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.7.5).

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference IPS-325, Table 3.1 and IPS-752, Tables 3.2 and 3.3).

JUSTIFICATION/COMMENTS All materials were irradiated to the same level.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Dose applied exceeded Watts Bar 40-year plus accident dose to penetrations.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference IPS-752, Section 5.7.5).

Plant normal ambient radiation dose (rd) $2x10^7$

Test exposure dose (rd) $1.285x10^8(H_2O)$ or $1.156x10^8$(air)

Test exposure dose rate (rd/hr) $1.09x10^6(H_2O)$ or $0.98x10^6$(air)

Test exposure source type (e.g., Co-60 gamma) Co-60 gamma

JUSTIFICATION/COMMENTS
Test exposure dose is the sum of 40-year normal dose plus accident dose. See Sheet 11A for dose conversion from water to air equivalent.

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Not required by IEEE 317-1976.

(Penetrations are passive devices and vibrating stress is not a significant aging degradation mechanism).

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS See H(6)(a).

Dose conversion from rads water to rads air for the incident Co-60 gamma ray flux used in the irradiation portion of the test program is proportional to the ratio of the mass absorption coefficient ($\mu a/\rho$) for gamma rays in air and water, assuming an average Co-60 gamma energy of 1.25 meV. The air equivalent dose is 1.285×10^8 rads ($\mu a/\rho$) air/($\mu a/\rho$) water or 1.156×10^8 rads. Mass absorption coefficient values of 0.0268 cm^2/6m for air and 0.0298 cm^2/6m for water were used. (Reference: ANL-5800, reactor physics constants)

In the same manner the test exposure dose rate of 1.09×10^6 rad/hr (water) converts to 0.98×10^6 rad/hr (air).

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.7.3, 5.9.2, 5.10.1, 5.11.1, 5.13.1, and 5.15.1).

JUSTIFICATION/COMMENTS Thermal cycle test, continuous current test, short time overload test, short circuit test, repeat continuous current test, and maximum duration of short circuit tests.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.7.3, 5.9.2, 5.10.1, 5.11.1, 5.12.1, 5.13.1, & 5.15.1).

JUSTIFICATION/COMMENTS Stresses induced were in accordance with IEEE 317-1976.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sect 1.4).

Qualified life (Document in QMDS) 40 years

JUSTIFICATION/COMMENTS See Justification/Comments in H(9).

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? NA
(Reference NA).

Replacement Intervals (Document in QMDS) None required per IPS-214, "Installation and Maintenance Manual." See binder TABS G (QMDS) and H, Section H-1 (Instruction Manual).

JUSTIFICATION/COMMENTS IPS-752, Section 1.4 states "...materials as used in Conax electric penetrations are not susceptible to any significant degradation due to thermal aging and radiation and that no age or service related common failure modes exist that would preclude a qualified life of 40 years."

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Polysulfone/Sealant	NA	NA	NA	NA
(b)	Kapton Polyimide Film/ Conductor Insulation	NA	NA	NA	NA
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS Penetration feedthrough sealant and conductor insulation materials are considered susceptible to thermal and radiation degradation implicitly when test programs are developed based on IEEE 317-1976 guidelines. Testing was done in accordance with IEEE Standard 317-1976. Test program included tests on insulation and sealant materials. No materials analysis by TVA is required.

Refer to TAB D, Section D-2, IPS-325, for Conax's discussion of materials susceptible to thermal and radiation degradation and aging.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference IPS-752, Sect. 1.5, 5.1.1.1, 5.4.1, 5.5.1 & 5.14.2).

Identify Acceptance Criteria: Baseline acceptance criteria includes leak rate less than 1E-06 SCC/SEC helium, dielectric strength test at 2.7 kV for 5 seconds with no failures, and insulation resistance greater than 1E+08 ohms. During DBA, function and operate at specified service levels without loss of mechanical or electrical integrity. After DBA, gas leak rate less than 1E-02 scc/sec nitrogen, dielectric strength test with no failures, insulation resistance greater than 1E+08 ohms.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.0, 5.14.1, 5.14.2, and 5.15.3.1).

Identify baseline and functional testing: Baseline testing included gas leak rate, pneumatic pressure, dielectric strength, insulation resistance, and conductor continuity. During DBA test, penetration was energized and carrying load except for 10 intervals when insulation resistance was taken. Post-DBA tests included gas leak rate, dielectric strength, insulation resistance, and conductor continuity.

JUSTIFICATION/COMMENTS Tests were in accordance with IEEE 317-1976.

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.14.1.1 and 5.14.1.2).

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JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? No (Reference IPS-752, Sects. 5.1 - 5.5).

JUSTIFICATION/COMMENTS Baseline testing consisted of insulation resistance, conductor continuity, and hipot tests which provide an indication of the electrical condition of the penetration, but are not the actual voltage and load carried by the penetrations in service in the plant. Tests were in accordance with IEEE 317-1976.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	480 VAC max nom system volt.	Open Item, See QIR WBNEQP86102
Load	Various	Spec. 2697, Sect. E.4.G
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		
	NA	NA
	NA	NA

JUSTIFICATION/COMMENTS Specification 2697 is part of purchase contract 76K61-87064 in binder TAB E, Section E-1. Electrical penetrations are not frequency sensitive and have no accuracy requirements.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(b)

Parameter	Demonstrated Conditions	Reference
Voltage	528 VAC	IPS-752 Sect. 5.14.1.2
Load	Various	IPS-752 Sect. 5.14.1.1
Frequency	60Hz	IPS-585.3 Sect. 3.2
Accuracy	NA	NA
Other(s)		
Insulation Resistance	1E+06 minimum	IPS-752 Sect. 5.14.1.3
Leakage Current	0.12 milliamps maximum	IPS-752 Sect. 5.14.1.4

JUSTIFICATION/COMMENTS The penetration maintained required loads throughout the DBA test. For low voltage power and control penetrations, a minimum insulation resistance of 1×10^6 ohms and a maximum leakage current of 0.12 milliamps at the maximum application voltage is also sufficient to support the electrical operability and circuit integrity for category A and B devices served. See generic binder WBNEQ-GEN-001, Section III.C.4.5.2. for discussion of low voltage power and control cable applications.

For nondivisional and other devices served that may not be qualified and could fail in an accident, electrical circuit protection has been provided to ensure penetration containment boundary integrity. All divisional circuits are also similarly protected. See TAB B, Section K(8) for listing of penetration protection analyses.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. See Sheet 19A

(1) Normal Max

(a) Temperature (F°) 110

(b) Pressure (psig) 0.3

(c) Humidity (%) 80

(d) Radiation (rd) $2x10^7$ gamma

(2) Abnormal Max

(a) Temperature (°F) 130

(b) Pressure (psig) 0.3

(c) Humidity (%) 100

(d) Radiation (rd) NA

(3) Process Interfaces: None.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Up to eight hours per excursion and occurring less than 1% of plant life. 20°F difference in maximum temperature for this time period is negligible.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 327 Accident type LOCA/HELB

(b) Pressure (psig) 12.3 Accident type LOCA/HELB

(c) Humidity (%) 100 Accident type LOCA/HELB

(d) Radiation (rd) $1.4x10^7$ gamma, $7.441x10^7$ beta Accident type LOCA

(e) Spray Type Chemical* Accident type LOCA/HELB

*Chemical Spray 0.1844 molar H_3BO_3, 0.033 molar NaOH, pH 8.35

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

One end of each penetration is exposed to annulus environment. Containment ends are in lower compartment (outermost small rooms), lower compartment instrument room, or upper compartment. Parameters shown are worst case; see Sheet 19A.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? No (Reference IPS-752, Sect. 5.14.1).

(7) Subject to submergence (yes/no/NA)? No (Reference Calculation (NEB 840120 220) Maximum Containment Water Level for Flood Elevation (EL 717.7 outside crane wall where penetrations are located), and binder TAB A for penetration elevation. Also see Dwg. 45N860-3 in binder TAB E, Section E-2 and field verification in binder TAB F for location).

Identify initiation time and duration of submergence: NA

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See Sheet 19B	

AREA/ENVIRONMENTAL DWG

	UPPER COMPARTMENT (47E235-41)	LOWER* COMPARTMENT (47E235-42)	ANNULUS (47E235-44)	INSTRUMENT ROOM (47E235-45)
Max Normal Temperature, °F	110	105 (1)	95 (2)	75
Max Abnormal Temperature, °F	120	130	120	120
Max Normal Pressure, PSIA (PSIG)	14.7 (0.3)	14.7 (0.3)	ATM	14.7 (0.3)
Max Abnormal Pressure, PSIA (PSIG)	14.7 (0.3)	14.7 (0.3)	ATM	14.7 (0.3)
Max Normal R.H. %	80	80	80	60
Max Abnormal R.H. %	90	100	90	90
40-Yr Normal Radiation, Rads	$1x10^6$ gamma(4)	$2x10^7$ gamma	$1x10^6$ gamma(4)	$3.5x10^5$ gamma(4)
Peak Accident Temperature, °F	160	327	134	327
Peak Accident Pressure, PSIG	12.3	12.3	ATM	12.3
Accident Radiation, Rads	$1.4x10^7$ gamma(6) $7.441x10^7$ beta (3)	$1x10^7$ gamma(7) $7.441x10^7$ beta (3)	$1.2x10^7$ gamma plus beta(5)	$1x10^7$ gamma $7.441x10^7$ beta (3)
Total 40-Year Plus Accident Radiation, Rads	$8.941x10^7$ gamma plus beta	$1.0441x10^8$ gamma plus beta	$1.3x10^7$ gamma plus beta	$8.476x10^7$ gamma plus beta

*Fan rooms and accumulator rooms (outermost small rooms).

(1) Documented average temperature. See calculation EQP-02.
(2) Documented average temperature. See calculation GENNAL4-001.
(3) See Sheet 19C.
(4) See Calculation GENNAL3-001.
(5) See Calculation WBNNAL3-004, Sheet 3, Conclusion 5.
(6) See Calculation TI-RPS-48, Sheet 7.19.
(7) See Calculation TI-RPS-48, Sheet 7.21.

Special Environmental Calculations

WBNNAL3-004 - Accident Dose Inside Reactor Building (B45 860205 235).

TI-RPS-48(R2) - Integrated Accident Dose Inside Primary Containment (B45 851105 235).

GENNAL3-001 - Normal Radiation Dose (B45 851117 235).

GENNAL4-001 - SQN and WBN Annulus Temperature Analysis (B45 860317 237).

Maximum Containment Water Level (NEB 840120 220).

GENNAL3-002 - Reduction of Beta Dose by Sheet Steel (B45 860423 235).

EQP-02 - Average Temperature for Rooms Inside Lower Containment (B71 860402 200).

GENNAL3-013 - Beta Dose Reduction from Finite Volume (B45 860624 235).

Penetration Electrical Protection Analyses issuance is an open item.

The accident beta radiation dose to the penetrations is determined as follows:

The maximum containment accident beta dose is 4.7×10^{8} rads in accordance with calculation TI-RPS-48 R2 in TAB E, Section E-6.

The penetration terminal boxes, which enclose all radiation sensitive materials, are constructed of 18 gauge minimum sheet steel as shown on drawings 7429-24001 and 7429-24002 in TAB I. In accordance with calculation GENNAL3-002, Reduction of Beta Dose by Sheet Steel, in TAB E, Section E-10 the boxes reduce the beta dose $4.7 \times 10^{8} \times 1.58 \times 10^{-1}$ or 7.426×10^{7} rads inside the box. This dose is designated as beta radiation in TAB B, but it also includes bremsstrahlung.

Additionally, the boxes are not effectively sealed against LOCA pressure and contaminants can enter. The dose to the penetrations from contamination in the boxes varies directly with the size of the box. For these penetrations the largest box is 24" x 24" x 24" as shown on drawing 7429-24001 in TAB I. The volume is 13824 in^3 or $2.265 \times 10^{5} cm^3$. In accordance with calculation GENNAL3-013, Beta Dose Reduction from Finite Voume in binder TAB E, Section E-12, the beta dose reduction factor is $2.265 \times 10^{5} / 6.921 \times 10^{8}$ or 0.327×10^{-3}. The resultant beta dose is therefore $4.7 \times 10^{8} \times 0.327 \times 10^{-3}$ or 1.537×10^{5} rads.

The total beta dose inside the box from these sources is $7.426 \times 10^{7} + 1.537 \times 10^{5}$ or 7.441×10^{7} rads.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	IPS-752 Reference
Operating Time	100 days	13.54 days	Fig. 5.14.1
Temperature (°F)	327	370	Fig. 5.14.1
Pressure (psig)	12.3	75	Fig. 5.14.1
Relative Humidity (%)	100	100	Fig. 5.14.1
*Chemical Spray	0.1844 molar H_3BO_3 0.033 molar NaOH pH 8.35	6200ppm H_3BO_3 50ppm Hydrazine & Trisodium Phosphate, pH 9.23	Sect. 5.14.10.2
**Radiation (rd)	1.0441×10^8 gamma plus beta	1.156×10^8(air) or 1.285×10^8 G(H_2O)	Sect. 5.7.5
Submergence	None	None	NA

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	IPS-752 Reference
Temperature	Yes	Fig. 5.14.1
Pressure	Yes	Fig. 5.14.1
Relative Humidity	Yes	Fig. 5.14.1
Chemical Spray	NA	Sect. 5.14.10.2
Submergence	NA	NA

JUSTIFICATION/COMMENTS Specified containment spray is 30 days, and the flow rate is 0.92gpm/ft^2. Spray chemistry varies with time.

JUSTIFICATION/COMMENTS (Continued)

Parameters shown are a composite resultant concentration. All of these penetrations are enclosed in junction boxes and are not subject to direct chemical spray impingement. All penetrations, except no.'s 5, 11, and 26 (which are all nondivisional), are additionally protected from chemical spray by the concrete floor slab above them. These physical barriers negate the effects of spray flow rate and difference in spray chemistry. Also see TAB B, sheet 7A, Justification/Comments for G(1)(e) and G(2). As is seen in TAB C, Section C-1, Report WAC-62, the test profile does not envelop the WBN accident profile for approximately the first 100 seconds. This exists due to starting at a lower temperature and the difficulty in getting the temperature to rise in the steam chamber as fast as the WBN accident profile does, a common problem in steam tests. Report WAC-62 does not include the first test temperature transient. This extra transient and the significantly higher test temperatures compensate for the slightly slower transient rise time. Also, as noted in IPS-752, Section 5.14.10.1, testing without a terminal box is more severe than with the box due to thermal lag and dew point effects associated with the box. Thus, this small deviation in the profile for the first few seconds is not significant.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	43°F	Yes
Pressure: +10% but no more than 10 psig	62.7 psig	Yes
Radiation: +10% of accident dose	13.26%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	See TAB C, Section C-1	Yes
Voltage: ±10% of rated value	10% of maximum nom. system voltage	Yes
Frequency: ±5% of rated value	0	No
Environmental Transient: the initial transient and the peak temperature applied twice	transient applied twice	Yes
Vibration: +10% added to acceleration	NA	NA

JUSTIFICATION/COMMENTS: Margins applied per IEEE 317-1976. Frequency margin not required by IEEE 317-1976. Electrical penetrations function electrically as insulated conductors, and they are not frequency sensitive in the low frequency range of power and control applications. Sheet 1 of Material Aging Calculation Report WAC-62 (see TAB C, Section C-1) shows the test post-accident operating time equivalent is considerably more than 10% over the Watts Bar required operating time.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment: (Reference IPS-752, Sect. 1.5).

JUSTIFICATION/COMMENTS Maintain pressure boundary and electrical integrity.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.14.1).

JUSTIFICATION/COMMENTS

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.14.1).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.14.1 & 5.14.2).

JUSTIFICATION/COMMENTS Test was for 13 1/2 days. See analysis extending time to 100 days in IPS-752, Sect. 5.14.10.1C.

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes (Reference IPS-585.3, Sect. 6.18.1.1, 6.21.1.1, and 6.24).

JUSTIFICATION/COMMENTS

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See TAB G - QMDS.

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) adequately justified?	NA (No exceptions taken)
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA (preaging performed)
(d) Materials susceptible to thermal/radiation aging identified?	Yes

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA (See TAB B, Sect. L(2))
(11) Criteria regarding submergence satisfied?	NA(penetrations not submerged)
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA(penetrations qualified for 100 days)
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

Conax Report IPS-752 is the qualification document for these penetrations. The penetrations contain the identical possible leakage paths, leak mechanisms, feedthrough concepts, seals, insulation system, and materials as the test data base penetration No. 1 described in IPS-752. Detailed raw test data for the tested assemblies is contained in IPS-585.3. IPS-752 is a summary document of the reports on the tested assemblies. It is a very thorough summary and is the document submitted by Conax Corporation as the key qualification report for the subject low voltage power and control penetration assemblies.

SUPPLEMENT 3
COMPONENT-UNIQUE CHECKLIST
ELECTRICAL PENETRATIONS

EQUIPMENT IDENTIFICATION

(1) Are the penetrations identified in the qualification program identical to the plant penetrations which require qualification (yes/no/NA)? No

Item	Plant	Report	Acceptable Yes/No/NA	IPS-752 Report Section
(a) Penetration type	LVP & C	LVP & C	Yes	Table 4.1
(b) Mounting	See p 29A	See p 29A	Yes	NA
(c) External connections	in-line splices	NA	NA	NA

Comments: TVA provided in-line splices. Conax test was of similar items with supporting analysis, per IPS-752, Sect. 1.0.

(2) Does the qualification report identify the following performance characteristics:

Performance Characteristics	Acceptable (Yes/No/NA)	IPS-752 Report Section
(a) Temperature rating	Yes	5.7.24.2
(b) Voltage rating	Yes	See Sheet 29A
(c) Continuous current rating	Yes	5.9.5
(d) Short-time overload current rating & duration	Yes	5.10.4
(e) Rated short circuit current & duration	Yes	5.11.2
(f) Pressure rating	Yes	5.1 & 5.2

EQUIPMENT IDENTIFICATION (Continued)

Performance Characteristics	Acceptable (Yes/No/NA)	IPS-752 Report Section
(g) Maximum gas leakage rate	Yes	5.1.1.1

Comments: See page 29A

(3) Does the qualification program address the following tests:

Item	Acceptable Yes/No/NA	IPS-752 Report Section
(a) Continuous current rating	Yes	5.9.2
(b) Short-time overload current rating and duration	Yes	5.10.1
(c) Short circuit current rating and duration	Yes	5.11.1
(d) Rated maximum duration of rated short circuit current	Yes	5.15.1
(e) Pneumatic pressure rating	Yes	5.2.1
(f) Maximum gas leakage rate	Yes	5.1.1
(g) Conductor continuity	Yes	5.3.1
(h) Dielectric strength	Yes	5.4.1
(i) Impulse	NA	NA
(j) Insulation resistance	Yes	5.5.1
(k) Flame	Yes	6.3

Comments: Impulse tests not required for low voltage penetrations per IEEE 317-1976.

Additional Comments for Supplement 3

(1)(b) Watts Bar L. V. Power and Control Penetrations are mounted by welding the penetration assembly header plate to the annulus (outside containment) end of the containment nozzle. The containment nozzles are horizontal. The inboard ends are supported by a support plate resting in the inboard end of the nozzle and located by support rods attached to the header plate. Inside containment junction boxes for connection of penetration conductor pigtails to field cables are bolted to slip-on flanges welded to the inboard end of the containment nozzle. Outside containment junction boxes, where used, are bolted to the penetration header plate in the annulus.

The test penetration assembly was inserted horizontally into the environmental test chamber as shown in IPS-585.3, Appendix D, photographs 5.0 through 8.0. Whether it was bolted in or welded in or whether it incorporated an inboard support plate is not stated, but this is in no way material to the results of the DBA test. No junction boxes were used as stated in IPS-752, Section 5.14.1, which is conservative as discussed in IPS-752, Section 5.14.10.1A.

(2)(b) The voltage rating of the penetrations is implied but not specifically stated in the qualification report. The voltage rating was specified to be 600 volts in contract 76K61-87064. Dielectric strength tests before the DBA test at 2.7 kV and after the DBA tests at 660 volts are consistent with a voltage rating of 600 volts in accordance with IEEE 317-1976, Sections 4.2.1, 7.3.2, and 6.4.13. See IPS-752, Sections 5.4.1 and 5.14.2.2.

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. NMP2-PENT-Qu2
MANUFACTURER: CROMAJ CORPORATION

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/ROOM	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
NMP-1-PENT-293-0005	1-PENT-293-0005	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-03		256-30	779' 6"	57' 6"	76K61-07064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
									HS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	1000/1000	
									RH/C	A/B	1H0/1H0	
									CV/C	A/B	1H0/1H0	
NMP-1-PENT-293-0006 -A	1-PENT-293-0006 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-02		015	738' 6"	57' 6"	76K61-07064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
									HS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	1000/1000	
									RH/C	A/B	1H0/1H0	
									CV/C	A/B	1H0/1H0	
NMP-1-PENT-293-0007 -B	1-PENT-293-0007 -B	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-02		165	738' 6"	57' 6"	76K61-07064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
									HS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	1000/1000	
									RH/C	A/B	1H0/1H0	
									CV/C	A/B	1H0/1H0	
NMP-1-PENT-293-0008 -A	1-PENT-293-0008 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-02		199	738' 6"	57' 6"	76K61-07064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
									HS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	1000/1000	
									RH/C	A/B	1H0/1H0	
									CV/C	A/B	1H0/1H0	
NMP-1-PENT-293-0009 -B	1-PENT-293-0009 -B	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-02		333	738' 6"	57' 6"	76K61-07064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
									HS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	1000/1000	
									RH/C	A/B	1H0/1H0	
									CV/C	A/B	1H0/1H0	

* SEE DRAWING 45H864-3 IN TAB E.

PREPARER/DATE DDD 7/24/86
CHECKER/DATE WMK 7/29/86

A_____ A_____ A_____

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PENT-002

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBRES-PENT-002
MANUFACTURER: CONAX CORPORATION
PAGE: 2 OF 6

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/ROW	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WSM-1-PENT-293-0010	1-PENT-293-0010	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-05		290	735' 6"	57' 6"	76K61-07064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	1000/1000	
									RM/C	A/B	IND/IND	
									CV/C	A/B	IND/IND	
WSM-1-PENT-293-0011	1-PENT-293-0011	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-01		248-30	779' 6"	57' 6"	76K61-07064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	1000/1000	
									RM/C	A/B	IND/IND	
									CV/C	A/B	IND/IND	
WSM-1-PENT-293-0012	1-PENT-293-0012	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-06		293-30	739' 6"	57' 6"	76K61-07064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	1000/1000	
									RM/C	A/B	IND/IND	
									CV/C	A/B	IND/IND	
WSM-1-PENT-293-0013	1-PENT-293-0013	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-06		290	739' 6"	57' 6"	76K61-07064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	1000/1000	
									RM/C	A/B	IND/IND	
									CV/C	A/B	IND/IND	
WSM-1-PENT-293-0014 -A	1-PENT-293-0014 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-04		097	739' 6"	57' 6"	76K61-07064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	1000/1000	
									RM/C	A/B	IND/IND	
									CV/C	A/B	IND/IND	

* SEE DRAWING 439860-3 IN TAB E.

A_____ A_____ A_____

PREPARER/DATE DRD 7/26/86 _____ _____ _____

CHECKER/DATE WMK 7/27/86 _____ _____ _____

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PENT-002

TAB A - EQUIPMENT IDENTIFICATION MATRIX

DIBBER NO. WOMED-PENT-002
MANUFACTURER: CONAX CORPORATION

EQIG NO.		UNIT DEVICE ID NO.		DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RO/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0015	-A	1-PENT-293-0015	-A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-03		101	738' 6"	57' 6"	76K61-87064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
											MS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
											FW/C	A/B	1000/1000	
											RH/C	A/B	IND/IND	
											CV/C	A/B	IND/IND	
WBN-1-PENT-293-0016	-B	1-PENT-293-0016	-B	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-03		114	738' 6"	57' 6"	76K61-87064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
											MS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
											FW/C	A/B	1000/1000	
											RH/C	A/B	IND/IND	
											CV/C	A/B	IND/IND	
WBN-1-PENT-293-0017	-B	1-PENT-293-0017	-B	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-04		110-30	738' 6"	57' 6"	76K61-87064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
											MS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
											FW/C	A/B	1000/1000	
											RH/C	A/B	IND/IND	
											CV/C	A/B	IND/IND	
WBN-1-PENT-293-0021	-A	1-PENT-293-0021	-A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-02		236-30	720'	57' 6"	76K61-87064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
											MS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
											FW/C	A/B	1000/1000	
											RH/C	A/B	IND/IND	
											CV/C	A/B	IND/IND	
WBN-1-PENT-293-0024		1-PENT-293-0024		PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-02		230-45	730'	57' 6"	76K61-87064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
											MS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
											FW/C	A/B	1000/1000	
											RH/C	A/B	IND/IND	
											CV/C	A/B	IND/IND	

* SEE DRAWING 45N860-3 IN TAB E.

A_____ B_____ A_____

PREPARER/DATE DDD 7/26/86 _____ _____ _____

CHECKER/DATE WMK 7/26/86 _____ _____ _____

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PENT-002

TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIB NO.		EQUIP DEVICE ID NO.		DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/ROOM	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WSH-1-PENT-293-0026		1-PENT-293-0026		PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-06		240-30	771' 6"	57' 6"	76K61-07064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	1000/1000 1000/1000 1000/1000 1HO/1HO 1HO/1HO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WSH-1-PENT-293-0027	-A	1-PENT-293-0027	-A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-05		019	720' 6"	57' 6"	76K61-07064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	1000/1000 1000/1000 1000/1000 1HO/1HO 1HO/1HO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WSH-1-PENT-293-0032		1-PENT-293-0032		PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-02		029	734' 6"	57' 6"	76K61-07064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	1000/1000 1000/1000 1000/1000 1HO/1HO 1HO/1HO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WSH-1-PENT-293-0035		1-PENT-293-0035		PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-02		161	726' 6"	57' 6"	76K61-07064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	1000/1000 1000/1000 1000/1000 1HO/1HO 1HO/1HO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WSH-1-PENT-293-0036	-B	1-PENT-293-0036	-B	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-05		150	730' 6"	57' 6"	76K61-07064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	1000/1000 1000/1000 1000/1000 1HO/1HO 1HO/1HO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)

* SEE DRAWING 45U060-3 IN TAB E.

PREPARER/DATE DDB 7/26/86
CHECKER/DATE [illegible] 7/29/86

A____ A____ A____

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. NONED-PENT-002
MANUFACTURER: CONAX CORPORATION
PAGE: 5 OF 6

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	COLUMN	LOCATION AZ°	LOCATION ELEV°	LOCATION RM/BLDG	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
NSB-1-PENT-293-0041	1-PENT-293-0041	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-01		211	737' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	1000/1000 1000/1000 1000/1000 1HR/1HR 1HR/1HR	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
NSB-1-PENT-293-0044 -A	1-PENT-293-0044 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-08		269	734' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	1000/1000 1000/1000 1000/1000 1HR/1HR 1HR/1HR	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
NSB-1-PENT-293-0046	1-PENT-293-0046	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-05		163	734' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	1000/1000 1000/1000 1000/1000 1HR/1HR 1HR/1HR	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
NSB-1-PENT-293-0047	1-PENT-293-0047	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-02		343	734' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	1000/1000 1000/1000 1000/1000 1HR/1HR 1HR/1HR	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
NSB-1-PENT-293-0048	1-PENT-293-0048	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10002-05		331	734' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	1000/1000 1000/1000 1000/1000 1HR/1HR 1HR/1HR	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)

* SEE DRAWING 4SM840-3 IN TAB E.

PREPARER/DATE DDD 7/24/86 R_____ R_____ R_____
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PENT-002

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBRED-PENT-002
MANUFACTURER: COMAI CORPORATION
PAGE: 6 OF 6

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/ROW	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0051	1-PENT-293-0051	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-04		056-30	733' 9"	57' 6"	76X61-07064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	1000/1000	
									RW/C	A/B	1000/1000	
									CV/C	A/B	1000/1000	
WBN-1-PENT-293-0052 -B	1-PENT-293-0052 -B	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-05		345	738' 6"	57' 6"	76X61-07064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	1000/1000	
									RW/C	A/B	1000/1000	
									CV/C	A/B	1000/1000	
WBN-1-PENT-293-0053	1-PENT-293-0053	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10001-05		243-30	720'	57' 6"	76X61-07064	LOCA	A/B	1000/1000	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	1000/1000	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	1000/1000	
									RW/C	A/B	1000/1000	
									CV/C	A/B	1000/1000	

* SEE DRAWING 450040-3 IN TAB E.

A_____ B_____ A_____

PREPARER/DATE DDD 7/24/86

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PENT-002

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 1 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED DDD DATE 7/26/86 R ___ R ___

CHECKED WBK DATE 8/6/86

A. DOCUMENTATION

Equipment Description Electrical Penetration, Low Voltage Pwr & Control

Vendor/Manufacturer Conax Corporation

Equipment Model No.(s) 7429-10001 and 7429-10002

QUALIFICATION REPORTS

(1) Title/Number/Revision "Design Qualification Report for Electrical Penetration Assemblies for Watts Bar Nuclear Plant Units 1&2"/IPS-752/Rev. A. RIMS EEB 820115 315 DATE December 09, 1981

(2) Title/Number/Revision "Design Qualification Mtl Test Report for Materials Used in Conax Electrical Penetration Assemblies and Electric Conductor Seal Assemblies"/IPS-325/Rev. D. RIMS EEB 811110 300 DATE May 14, 1981

(3) Title/Number/Revision "Design Qualification Test Report of a Low Volt. Pwr & Control Service Classification (BF-LVP/C) Electrical Penetration Assembly"/IPS-585.3/Rev. A. RIMS EEB 811110 304 DATE February 11, 1981

(4) Title/Number/Revision "Design Qualification Rpt For a 42 Conductor #18 AWG Conax Low Volt. Service Classification Feedthrough Assembly Consistent with the Requirements of IEEE Standard 317-1976 & NRC Regulatory Guide 1.63, 7/78"/IPS-353.10/Rev. B. RIMS B26 860801 048 DATE June 23, 1983

OTHER (ANALYSIS, VENDOR DATA, ETC.)

Design Qualification Material Test Report for Materials Used in Conax Electrical Penetration Assemblies and Electric Conductor Seal Assemblies, IPS-325, Rev. E.
45N860-3, R7 - Conduit and Grounding, Floor El 702.78, Details - Sheet 1
45W860-10, R8 - Conduit and Grounding, Electrical Penetration Details
7429-10001, Sheet 1, Rev. D - LVP Electric Penetrations for Watts Bar Units 1 & 2
7429-10001, Sheet 2, Rev. D - LVP Electric Penetrations for Watts Bar Units 1 & 2
7429-10002, Sheet 1, Rev. D - LVP Electric Penetrations for Watts Bar Units 1 & 2
7429-10002, Sheet 2, Rev. D - LVP Electric Penetrations for Watts Bar Units 1 & 2
7429-24001, Sheet 1, - Enclosure Sub-Assy
7429-24002, Sheet 1, Rev. A - Enclosure Sub-Assy

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 1A OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED [illegible] DATE 7/26/86 R ___ R ___

CHECKED [illegible] DATE 7/29/86

PL7429-10001-01, Sheet 1, Rev C - Parts List

PL7429-10001-01, Sheet 2, Rev C - Parts List

PL7429-10001-01, Sheet 3, Rev C - Parts List

PL7429-10001-02, Sheet 1, Rev C - Parts List

PL7429-10001-02, Sheet 2, Rev C - Parts List

PL7429-10001-02, Sheet 3, Rev C - Parts List

PL7429-10001-03, Sheet 1, Rev C - Parts List

PL7429-10001-03, Sheet 2, Rev C - Parts List

PL7429-10001-03, Sheet 3, Rev C - Parts List

PL7429-10001-04, Sheet 1, Rev C - Parts List

PL7429-10001-04, Sheet 2, Rev C - Parts List

PL7429-10001-04, Sheet 3, Rev C - Parts List

PL7429-10001-05, Sheet 1, Rev C - Parts List

PL7429-10001-05, Sheet 2, Rev C - Parts List

PL7429-10001-05, Sheet 3, Rev C - Parts List

PL7429-10001-06, Sheet 1, Rev C - Parts List

PL7429-10001-06, Sheet 2, Rev C - Parts List

PL7429-10001-06, Sheet 3, Rev C - Parts List

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 1B OF 29

BINDER TITLE COAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED DDD DATE 7/26/86 R R

CHECKED [illegible] DATE 7/26/86

PL7429-10002-01, Sheet 1, Rev D - Parts List

PL7429-10002-01, Sheet 2, Rev D - Parts List

PL7429-10002-01, Sheet 3, Rev D - Parts List

PL7429-10002-02, Sheet 1, Rev D - Parts List

PL7429-10002-02, Sheet 2, Rev D - Parts List

PL7429-10002-02, Sheet 3, Rev D - Parts List

PL7429-10002-03, Sheet 1, Rev D - Parts List

PL7429-10002-03, Sheet 2, Rev D - Parts List

PL7429-10002-03, Sheet 3, Rev D - Parts List

PL7429-10002-04, Sheet 1, Rev D - Parts List

PL7429-10002-04, Sheet 2, Rev D - Parts List

PL7429-10002-04, Sheet 3, Rev D - Parts List

PL7429-10002-05, Sheet 1, Rev D - Parts List

PL7429-10002-05, Sheet 2, Rev D - Parts List

PL7429-10002-05, Sheet 3, Rev D - Parts List

PL7429-10002-06, Sheet 1, Rev D - Parts List

PL7429-10002-06, Sheet 2, Rev D - Parts List

PL7429-10002-06, Sheet 3, Rev D - Parts List

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 1C OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL

COMPUTED DCD DATE 7/24/86 R ___ R ___

CHECKED UHK DATE 8/8/86

WBNNAL3-004 - Accident Dose Inside Reactor Building (B45 860205 235)

TI-RPS-48 (R2) - Integrated Accident Dose Inside Primary Containment (B45 851105 235)

GENNAL3-001 - Normal Radiation Dose (B45 851117 235)

GENNAL4-001 - SQN and WBN Annulus Temperature Analysis (B45 860317 237)

Maximum Containment Water Level (NEB 840120 220)

GENNAL3-002 - Reduction of Beta Dose by Sheet Steel (B45 860423 235)

EQP-02 - Average Temperature for Rooms Inside Lower Containment (B71 860402 200)

GENNAL3-013 - Beta Dose Reduction from Finite Volume (B45 860624 235)

47E235-41 R0 - Environmental Data, Upper Compartment

47E235-42 R1 - Environmental Data, Lower Compartment

47E235-44 R0 - Environmental Data, Annulus Area

47E235-45 R0 - Environmental Data Instrument Room

WBNEQ-GEN-001 - Environmental Qualification Generic Binder

WBNEQ-SPLC-001 - Environmental Qualification Binder for Raychem Heat Shrink Splices

IPS-752 is the document submitted by Conax Corporation as the key qualification report for the Watts Bar Penetrations. It is a very comprehensive summary report and documents qualification by analysis and comparison to similar modular-type low voltage power and control penetration assemblies of a universal design previously qualified by type tests conducted in accordance with IEEE 317-1976 at levels equal to or more severe than TVA specified requirements for Watts Bar. Most references in this binder are to IPS-752.

IPS-325 documents qualification of Conax Electric Penetration Assemblies from the standpoint of material tests, as a minimum satisfying requirements of Section 6.3 of IEEE 317-1976. Appendix A of IPS-325 includes Conax's thermal evaluation program. IPS-325 is referenced in this binder for identification of materials susceptible to aging degradation and to support Arrhenius Aging Calculations.

IPS-585.3 documents tests on the low voltage power and control penetration assembly referred to as test data base one in IPS-752. It is a more detailed test report than IPS-752 that includes raw data and therefore it is referenced in a few places in this binder.

IPS-353.10 documents qualification tests of a low voltage penetration module consistent with the requirements of IEEE 317-1976. For this binder it provides environmental qualification documentation for chemical spray, supporting IPS-752 in the same way that IPS-325 and IPS-585.3 do.

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 2 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED DOB DATE 7/26/86 R ___ R ___

CHECKED WBK DATE 7/27/86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

Binder WBNEQ-SPLC-001 needs to be issued. (Continued Sheet 2A).

COMMENTS/RECOMMENDATIONS These modular-type electrical penetrations are used to convey both safety-related and non-safety related low voltage power and control circuits (480V nominal or less) into primary containment. These penetrations are qualified to maintain pressure integrity and electrical integrity within prescribed limits before, during, and after a LOCA, steam line, CVCS, RHR, or FW break occurring any time within the 40-year plant design life, contingent on satisfactory resolution of open items and qualification deficiencies noted above.

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 2A OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED DDD DATE 8/19/86 R R

CHECKED WWK DATE 8/20/86

Generic binder WBNEQ-GEN-001 needs to be issued. Conax report IPS-353.10 needs to be revised to include Figure F and correct units for insulation resistance in data sheet L. Need documentation that 480 volts is the highest system voltage in these penetrations. Penetration protection analysis covered by scope-of-work document WBNSWD86019 must be completed. Penetration protection analysis covered by scope-of-work document WBNSWD86025 must be completed. SCR WBNEEB8616 concerning redundant tripping must be closed. NCR WBNEEB8507 concerning redundant tripping must be closed. SCR WBNEEB8630 concerning redundant tripping must be closed. NCR WBNEEB8111 concerning penetration circuit protection must be closed. NCR W-353-P concerning splices must be closed. NCR 6204 concerning interface connections must be closed. Field verification must be corrected and completed. Reverify field identification of model number for WBN-1-PENT-293-005. Reverify field identification of model number and serial number for WBN-1-PENT-293-0032. Document accident gamma radiation in fan rooms, accumulator rooms, and instrument rooms is 1×10^7 rads. Determine and document accident gamma radiation dose to the 3 penetrations in the reactor building upper compartment.

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS Contract Date: 11/14/75. Although procured, delivered, and installed prior to 2/22/83, these electrical penetrations meet NUREG-0588, Category I requirements.

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 317-1976 - Standard for Electrical Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations.

ASME Boiler and Pressure Vessel Code Section III, Subsection NE, for Class MC Components, 1974 Edition & Addenda Through Winter 1974.

IEEE 344-1975 - Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations.

U. S. Nuclear Regulatory Commission Regulatory Guide 1.63, Revision 2, July 1978 - Electric Penetration Assemblies in Containment Structures for Light-Water-Cooled Nuclear Power Plants.

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 4 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL

COMPUTED [illegible] DATE 8/19/86 R ___ R ___

CHECKED [illegible] DATE 8/20/86

D. QUALIFICATION METHODOLOGY (Check only one block)

___ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS Conax Qualification Report IPS-752, Section 1.2. See binder TAB D, Section D-1 for copy of IPS-752. IPS-752, Section 4.3 states "The design and construction of the subject penetrations of Para. 3.1 contains the identical leakage paths, leak mechanisms, feedthrough concepts, seals, insulation systems, and materials as test data bases one, two, three, and four and no differences exist between the test data bases and the Watts Bar design which would affect qualification."

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Elec. Pen. LVP & C	Same	IPS-752, Sect. 4.1
(2) Manufacturer	Conax Corporation	Same	IPS-752, Sect. 4.1
(3) Model Number(s)	See TAB A	7508-10003	IPS-585.3, Sect. 4.2
(4) Serial Number(s)	See TAB F	NA	IPS-585.3 Appx. A

(5) Identify Component-Unique checksheet attached: See TAB B, Supplement 3.

JUSTIFICATION/COMMENTS Conax Summary Qualification Report IPS-752 documented qualification by analysis and comparison to similar modular-type low voltage power and control penetration assemblies previously qualified by type tests conducted at levels equal to or more severe than TVA specified requirements for Watts Bar. Test data base one is the applicable test specimen for low voltage power and

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 5A OF 29

BINDER TITLE COAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED DDB DATE 8/19/86 R R

CHECKED WJK DATE 8/20/86

JUSTIFICATION/COMMENTS (Continued)

control classification penetrations. See IPS-752, Table 4.1, for a detailed description of the tested penetration (test data base one). IPS-585.3 is the type test report for test data base one described in IPS-752. IPS-585.3 is much more detailed and therefore it is referenced at some points in this binder. Some Watts Bar penetrations include spliced-on outboard pigtail extensions for size 8 AWG and larger which were not part of test data base one. However, the annulus does not experience any steam accident environment. The splice insulations are Raychem WCSF-N as shown in instruction manual IPS-214 (binder TAB H, Section H-1) and are qualified in accordance with binder WBNEQ-SPLC-001. See Sheets 5B and 5C for correlation of plant devices EQIS No.'s, Model No.'s, Serial No.'s, and Types.

All WBN Primary Containment Electrical Penetrations are tabulated on TVA Drawing 45N860-3 in binder TAB E, Section E-2. Penetrations covered in this binder are low voltage power and control types and are listed on 45N860-3 as being for node voltage levels 3, 3A, 3B, 4, 4A, and 4B.

(Penetrations for node voltage level 5 are covered in binder WBNEQ-PENT-001 and those for node voltage levels 1, 2, 2A, 2B, 2D, 2E, 2F, and 2G are covered in binder WBNEQ-PENT-003).

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 5B OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED DDA DATE 7/26/86 R ___ R ___

CHECKED WWK DATE 7/27/86

EQIS NO.		MODEL NO.	SERIAL NO.	TYPE
WBN-1-PENT-293-0005		7429-10001-03	384	L.V. Power
WBN-1-PENT-293-0006	-A	7429-10001-02	374	L.V. Power
WBN-1-PENT-293-0007	-B	7429-10001-02	375	L.V. Power
WBN-1-PENT-293-0008	-A	7429-10001-02	376	L.V. Power
WBN-1-PENT-293-0009	-B	7429-10001-02	383	L.V. Power
WBN-1-PENT-293-0010		7429-10002-05	357	L.V. Control
WBN-1-PENT-293-0011		7429-10001-01	373	L.V. Power
WBN-1-PENT-293-0012		7429-10001-06	381	L.V. Power
WBN-1-PENT-293-0013		7429-10001-06	382	L.V. Power
WBN-1-PENT-293-0014	-A	7429-10002-04	363	L.V. Power
WBN-1-PENT-293-0015	-A	7429-10002-03	370	L.V. Power
WBN-1-PENT-293-0016	-B	7429-10002-03	371	L.V. Power
WBN-1-PENT-293-0017	-B	7429-10002-04	364	L.V. Power
WBN-1-PENT-293-0021	-A	7429-10002-02	365	L. V. Power

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 5C OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL

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EQIS NO.		MODEL NO.	SERIAL NO.	TYPE
WBN-1-PENT-293-0024		7429-10002-02	366	L.V. Power
WBN-1-PENT-293-0026		7429-10002-06	355	L.V. Power
WBN-1-PENT-293-0027	-A	7429-10002-05	358	L.V. Control
WBN-1-PENT-293-0032		7429-10002-02	367	L.V. Power
WBN-1-PENT-293-0035		7429-10002-02	368	L.V. Power
WBN-1-PENT-293-0036	-B	7429-10002-05	359	L.V. Control
WBN-1-PENT-293-0041		7429-10002-01	356	L.V. Power
WBN-1-PENT-293-0044	-A	7429-10002-05	360	L.V. Control
WBN-1-PENT-293-0046		7429-10002-05	361	L.V. Control
WBN-1-PENT-293-0047		7429-10002-02	369	L.V. Power
WBN-1-PENT-293-0048		7429-10002-05	362	L.V. Control
WBN-1-PENT-293-0051		7429-10001-04	372	L.V. Control
WBN-1-PENT-293-0052	-B	7429-10001-05	379	L.V. Control
WBN-1-PENT-293-0053		7429-10001-05	380	L.V. Control

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 6 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL COMPUTED DDD DATE 7/24/86 R ___ R ___

CHECKED [illegible] DATE 7/27/86

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	NA
External Process Connections	NA	NA	NA
Electrical Connections	NA-See Note 1 below	NA	NA
Conduit Seals	NA	NA	NA
Connector Seals	NA	NA	NA
Orientation	NA	NA	NA
Physical Configuration	NA-See Note 2 below	Yes	IPS-752, Table 4.1
Other	NA	NA	NA

JUSTIFICATION/COMMENTS Note 1: In-line splice insulations for connection of field cable to penetration conductor pigtails were provided by TVA and are not part of the penetration assembly qualification. See binder WBNEQ-SPLC-001 for splice qualification.

Note 2: Header plate, feedthrough tube material, feedthrough seal, conductor sealants, conductor insulation, copper conductors, installation weld. There are no required external process requirements, no conduit seals (penetrations are seals), and orientation is not a consideration for penetrations.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	IPS-752 Reference
(a) Equipment inspected for damage	No	NA
(b) Baseline performance measurements taken	Yes	Sect. 5.0
(c) Equipment aged:		
Thermal	Yes	Sect. 5.7.4
Radiation	Yes	Sect. 5.7.5
Wear	No	NA
(d) Vibration/seismic testing conducted	Yes	Sect. 5.12
(e) Design basis event (DBE) exposure	Yes	Sect. 5.14.1
(f) Post-DBE exposure	Yes	Sect. 5.14.1
(g) Final inspection and disassembly	No	NA

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes (Reference IPS-585.3, p. 32).

JUSTIFICATION/COMMENTS G(1)(a)-Although Conax does not state that an initial visual inspection was done, they have completed numerous successful test programs and there is no reason to believe a visual inspection was not done. However, an initial visual inspection is not required by IEEE 317-1976.
G(1)(c)-Electrical penetrations are passive devices and are not subject to wear as an aging mechanism. Wear aging is not required by IEEE 317-1976. The penetrations, however, were subjected to simulated operational stresses which included thermal cycling (Section 5.7.3) and short-term overload and fault current tests (Sections 5.10.1 and 5.11.1) as recommended by IEEE 317-1976.

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JUSTIFICATION/COMMENTS G(1)(g)-Conax does not state that a final inspection and disassembly was done, but extensive final evaluation testing was performed (IPS-752, Section 5.14.2) in accordance with IEEE 317-1976, fully proving the post-accident integrity and operability of the assembly. It is reasonable to assume that a manufacturer of Conax's experience did make a visual inspection. However, a final visual inspection and disassembly are not required by IEEE 317-1976.

G(1)(e) and G(2) - Test data base 1 was exposed to the sequence as listed above. However, the DBE exposure did not include any chemical spray. Spray compatibility of Conax penetrations was established in report IPS-353.10 as stated in IPS-752, Section 5.14.10.2. IPS-353.10 documents environmental qualification tests on another (not test data base 1) penetration assembly. This assembly received sequential thermal aging, thermal cycling, radiation exposure, and DBA accident profile at levels approximately equal to test data base 1 and in excess of WBN requirements. Thermal aging was somewhat less and radiation exposure somewhat more than test data base 1. The materials and design of this penetration assembly are the same as test data base 1. See Conax Justification/Comparison in IPS-752, Section 5.14.10.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference IPS-752, Section 5.7).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	IPS-752 Reference
Thermal aging	Yes	Sect. 5.7.4
Radiation exposure	Yes	Sect. 5.7.5
Vibration (non-seismic) aging	No	NA
Operational (electrical/mechanical/process) stress aging	Yes	Sect. 5.7.3, 5.9.2, 5.10.1, 5.11.1, 5.12.1, 5.13.1 & 5.15.1

JUSTIFICATION/COMMENTS Vibration aging not required by IEEE 317-1976 (Penetrations are passive devices and vibrational stress is not a significant aging degradation mechanism).

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS No synergistic effects known for these penetrations, based on a literature review of applicable materials data for materials used in Conax L. V. Power and Control Penetrations.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Section 5.7.4).

PAGE B-17 JUSTIFICATION/COMMENTS Aging based on materials tests and analysis done in IPS-325 (binder TAB D, Section D-2) by Conax.

H. AGING (Continued)

(4) (b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: IPS-325, Table 3.1 and IPS-752, Tables 3.2 and 3.3).

JUSTIFICATION/COMMENTS

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Section 5.7.24.2).

JUSTIFICATION/COMMENTS Thermal aging based on conductor feed-through life. See analysis of feedthroughs in IPS-325, Appx. A.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Section 5.7.24.2).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	120°F	150°C	120°C
Time	40 yrs.	100 hrs.	40 yrs.

JUSTIFICATION/COMMENTS See Sheet 9A.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference IPS-752, Section 5.7.24.2).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference IPS-325, Rev. E, Section 6.4.1 (Footnote at bottom of page) in binder TAB E, Section E-4).

JUSTIFICATION/COMMENTS

H(4)(d) Aging:

The thermal age conditioning curve shown in IPS-752, Figure 5.7.1, shows a 40-year life at 120°C. Note in IPS-752, Table 5.9.4, that the full load current test ambient temperature (TIA) is greater than the normal ambient at Watts Bar, the test total operating temperature (TIF) is less than 90°C in every case, and the test current is greater than the Watts Bar required current (See contract 76K61-87064, Section E4g.(1) in binder TAB E, Section E-1) in every case. Therefore, a greater than 40-year thermal life is conserva-tively established for the subject penetration assemblies. Conax document IPS-325 covers an ongoing test program. A newer revision of IPS-325/Rev. E shows the latest Conax calculation of activation energy for their feed-throughs is 3.916, which agrees closely with the regression line presented in IPS-325, Figure 5.7.1. See in binder TAB E, Section E-4, IPS-325, Rev. E, page 26. See Material Aging Calculation Report WAC-62, page 2 in binder, TAB C, Section C-1 for calculation of qualified life at 90°C.

H. AGING (Continued)

(4) (g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes (Reference IPS-325, Rev. E, Appendix A in binder TAB E, Section E-4).

JUSTIFICATION/COMMENTS Also, see IPS-752, Figure 5.7.1 and binder sheet 9A.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Not required by IEEE 317-1976. Aging time and temperature was sufficient to account for penetration operating temperature which is ambient, plus temperature rise due to electrical loading.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.7.5).

JUSTIFICATION/COMMENTS ___

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference IPS-325, Table 3.1 and IPS-752, Tables 3.2 and 3.3).

JUSTIFICATION/COMMENTS All materials were irradiated to the same level.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Dose applied exceeded Watts Bar 40-year plus accident dose to penetrations.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference IPS-752, Section 5.7.5).

Plant normal ambient radiation dose (rd) $2x10^7$

Test exposure dose (rd) $1.285x10^8(H_2O)$ or $1.156x10^8$(air)

Test exposure dose rate (rd/hr) $1.09x10^6(H_2O)$ or $0.98x10^6$(air)

Test exposure source type (e.g., Co-60 gamma) Co-60 gamma

JUSTIFICATION/COMMENTS
Test exposure dose is the sum of 40-year normal dose plus accident dose. See Sheet 11A for dose conversion from water to air equivalent.

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Not required by IEEE 317-1976.

(Penetrations are passive devices and vibrating stress is not a significant aging degradation mechanism).

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS See H(6)(a).

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Dose conversion from rads water to rads air for the incident Co-60 gamma ray flux used in the irradiation portion of the test program is proportional to the ratio of the mass absorption coefficient (μ_a/ρ) for gamma rays in air and water, assuming an average Co-60 gamma energy of 1.25 meV. The air equivalent dose is 1.285×10^8 rads (μ_a/ρ) air/(μ_a/ρ) water or 1.156×10^8 rads. Mass absorption coefficient values of 0.0268 cm^2/6m for air and 0.0298 cm^2/6m for water were used. (Reference: ANL-5800, reactor physics constants)

In the same manner the test exposure dose rate of 1.09×10^6 rad/hr (water) converts to 0.98×10^6 rad/hr (air).

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.7.3, 5.9.2, 5.10.1, 5.11.1, 5.13.1, and 5.15.1).

JUSTIFICATION/COMMENTS Thermal cycle test, continuous current test, short time overload test, short circuit test, repeat continuous current test, and maximum duration of short circuit tests.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.7.3, 5.9.2, 5.10.1, 5.11.1, 5.12.1, 5.13.1, & 5.15.1).

JUSTIFICATION/COMMENTS Stresses induced were in accordance with IEEE 317-1976.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sect 1.4).

Qualified life (Document in QMDS) 40 years

JUSTIFICATION/COMMENTS See Justification/Comments in H(9).

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? NA
(Reference NA).

Replacement Intervals (Document in QMDS) None required per IPS-214, "Installation and Maintenance Manual." See binder TABS G (QMDS) and H, Section H-1 (Instruction Manual).

JUSTIFICATION/COMMENTS IPS-752, Section 1.4 states "...materials as used in Conax electric penetrations are not susceptible to any significant degradation due to thermal aging and radiation and that no age or service related common failure modes exist that would preclude a qualified life of 40 years."

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I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Polysulfone/Sealant	NA	NA	NA	NA
(b)	Kapton Polyimide Film/ Conductor Insulation	NA	NA	NA	NA
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS Penetration feedthrough sealant and conductor insulation materials are considered susceptible to thermal and radiation degradation implicitly when test programs are developed based on IEEE 317-1976 guidelines. Testing was done in accordance with IEEE Standard 317-1976. Test program included tests on insulation and sealant materials. No materials analysis by TVA is required.

Refer to TAB D, Section D-2, IPS-325, for Conax's discussion of materials susceptible to thermal and radiation degradation and aging.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference IPS-752, Sect. 1.5, 5.1.1.1, 5.4.1, 5.5.1 & 5.14.2).

Identify Acceptance Criteria: Baseline acceptance criteria includes leak rate less than 1E-06 SCC/SEC helium, dielectric strength test at 2.7 kV for 5 seconds with no failures, and insulation resistance greater than 1E+08 ohms. During DBA, function and operate at specified service levels without loss of mechanical or electrical integrity. After DBA, gas leak rate less than 1E-02 scc/sec nitrogen, dielectric strength test with no failures, insulation resistance greater than 1E+08 ohms.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.0, 5.14.1, 5.14.2, and 5.15.3.1).

Identify baseline and functional testing: Baseline testing included gas leak rate, pneumatic pressure, dielectric strength, insulation resistance, and conductor continuity. During DBA test, penetration was energized and carrying load except for 10 intervals when insulation resistance was taken. Post-DBA tests included gas leak rate, dielectric strength, insulation resistance, and conductor continuity.

JUSTIFICATION/COMMENTS Tests were in accordance with IEEE 317-1976.

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.14.1.1 and 5.14.1.2).

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JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? No (Reference IPS-752, Sects. 5.1 - 5.5).

JUSTIFICATION/COMMENTS Baseline testing consisted of insulation resistance, conductor continuity, and hipot tests which provide an indication of the electrical condition of the penetration, but are not the actual voltage and load carried by the penetrations in service in the plant. Tests were in accordance with IEEE 317-1976.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	480 VAC max nom system volt.	Open item
Load	Various	Spec. 2697, Sect. E.4.G
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		
Insulation Resistance	1E+05 minimum	Binder WBNEQ-GEN-001, Sect. III C
Leakage Current	40 milliamps maximum	Binder WBNEQ-GEN-001, Sect. III C

JUSTIFICATION/COMMENTS Specification 2697 is part of purchase contract 76K61-87064 in binder TAB E. Electrical penetrations are not frequency sensitive and have no accuracy requirements.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(b)

Parameter	Demonstrated Conditions	Reference
Voltage	528 VAC	IPS-752 Sect. 5.14.1.2
Load	Various	IPS-752 Sect. 5.14.1.1
Frequency	60Hz	IPS-585.3 Sect. 3.2
Accuracy	NA	NA
Other(s)		
Insulation Resistance	1E+06 minimum	IPS-752 Sect. 5.14.1.3
Leakage Current	0.12 milliamps maximum	IPS-752 Sect. 5.14.1.4

JUSTIFICATION/COMMENTS

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. See Sheet 19A

(1) Normal Max

(a) Temperature (F°) 110

(b) Pressure (psig) 0.3

(c) Humidity (%) 80

(d) Radiation (rd) $2x10^7$ gamma

(2) Abnormal Max

(a) Temperature (°F) 130

(b) Pressure (psig) 0.3

(c) Humidity (%) 100

(d) Radiation (rd) NA

(3) Process Interfaces: None.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Up to eight hours per excursion and occurring less than 1% of plant life. 20°F difference in maximum temperature for this time period is negligible.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 327 Accident type LOCA/HELB

(b) Pressure (psig) 12.3 Accident type LOCA/HELB

(c) Humidity (%) 100 Accident type LOCA/HELB

(d) Radiation (rd) $1.4x10^7$ gamma, $7.441x10^7$ beta Accident type LOCA

(e) Spray Type Chemical* Accident type LOCA/HELB

*Chemical Spray 0.1844 molar H_3BO_3, 0.033 molar NaOH, pH 8.35

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

One end of each penetration is exposed to annulus environment. Containment ends are in lower compartment (outermost small rooms), lower compartment instrument room, or upper compartment. Parameters shown are worst case; see Sheet 19A.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? No (Reference IPS-752, Sect. 5.14.1).

(7) Subject to submergence (yes/no/NA)? No (Reference Calculation (NEB 840120 220) Maximum Containment Water Level for Flood Elevation (EL 717.7 outside crane wall where penetrations are located), and binder TAB A for penetration elevation. Also see Dwg. 45N860-3 in binder TAB E, Section E-2 and field verification in binder TAB F for location).

Identify initiation time and duration of submergence: NA

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See Sheet 19B	

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AREA/ENVIRONMENTAL DWG

	UPPER COMPARTMENT (47E235-41)	LOWER* COMPARTMENT (47E235-42)	ANNULUS (47E235-44)	INSTRUMENT ROOM (47E235-45)
Max Normal Temperature, °F	110	105 (1)	95 (2)	75
Max Abnormal Temperature, °F	120	130	120	120
Max Normal Pressure, PSIA (PSIG)	14.7 (0.3)	14.7 (0.3)	ATM	14.7 (0.3)
Max Abnormal Pressure, PSIA (PSIG)	14.7 (0.3)	14.7 (0.3)	ATM	14.7 (0.3)
Max Normal R.H. %	80	80	80	60
Max Abnormal R.H. %	90	100	90	90
40-Yr Normal Radiation, Rads	$1x10^6$ gamma(4)	$2x10^7$ gamma	$1x10^6$ gamma(4)	$3.5x10^5$ gamma(4)
Peak Accident Temperature, °F	160	327	134	327
Peak Accident Pressure, PSIG	12.3	12.3	ATM	12.3
Accident Radiation, Rads	$1.4x10^7$ gamma(6) $7.441x10^7$ beta (3)	$1x10^7$ gamma(7) $7.441x10^7$ beta (3)	$1.2x10^7$ gamma plus beta(5)	$1x10^7$ gamma $7.441x10^7$ beta (3)
Total 40-Year Plus Accident Radiation, Rads	$8.941x10^7$ gamma plus beta	$1.0441x10^8$ gamma plus beta	$1.3x10^7$ gamma plus beta	$8.476x10^7$ gamma plus beta

*Fan rooms and accumulator rooms (outermost small rooms).

(1) Documented average temperature. See calculation EQP-02.
(2) Documented average temperature. See calculation GENNAL4-001.
(3) See Sheet 19C.
(4) See Calculation GENNAL3-001.
(5) See Calculation WBNNAL3-004, Sheet 3, Conclusion 5.
(6) See Calculation TI-RPS-48, Sheet 7.19.
(7) Open Item Issue Drawings 47E235-42 R2 and -45 R1.

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Special Environmental Calculations

WBNNAL3-004 - Accident Dose Inside Reactor Building (B45 860205 235).

TI-RPS-48(R2) - Integrated Accident Dose Inside Primary Containment (B45 851105 235).

GENNAL3-001 - Normal Radiation Dose (B45 851117 235).

GENNAL4-001 - SQN and WBN Annulus Temperature Analysis (B45 860317 237).

Maximum Containment Water Level (NEB 840120 220).

GENNAL3-002 - Reduction of Beta Dose by Sheet Steel (B45 860423 235).

EQP-02 - Average Temperature for Rooms Inside Lower Containment (B71 860402 200).

GENNAL3-013 - Beta Dose Reduction from Finite Volume (B45 860624 235).

The accident beta radiation dose to the penetrations is determined as follows: The maximum containment accident beta dose is 4.7×10^8 rads in accordance with calculation TI-RPS-48 R2 in TAB E, Section E-6.

The penetration terminal boxes, which enclose all radiation sensitive materials, are constructed of 18 gauge minimum sheet steel as shown on drawings 7429-24001 and 7429-24002 in TAB I. In accordance with calculation GENNAL3-002, Reduction of Beta Dose by Sheet Steel, in TAB E, Section E-10 the boxes reduce the beta dose $4.7 \times 10^8 \times 1.58 \times 10^{-1}$ or 7.426×10^7 rads inside the box. This dose is designated as beta radiation in TAB B, but it also includes bremsstrahlung.

Additionally, the boxes are not effectively sealed against LOCA pressure and contaminants can enter. The dose to the penetrations from contamination in the boxes varies directly with the size of the box. For these penetrations the largest box is 24" x 24" x 24" as shown on drawing 7429-24001 in TAB I. The volume is 13824 in^3 or $2.265 \times 10^5 cm^3$. In accordance with calculation GENNAL3-013, Beta Dose Reduction from Finite Voume in binder TAB E, Section E-12, the beta dose reduction factor is $2.265 \times 10^5 / 6.921 \times 10^8$ or 0.327×10^{-3}. The resultant beta dose is therefore $4.7 \times 10^8 \times 0.327 \times 10^{-3}$ or 1.537×10^5 rads.

The total beta dose inside the box from these sources is $7.426 \times 10^7 + 1.537 \times 10^5$ or 7.441×10^7 rads.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	IPS-752 Reference
Operating Time	100 days	13.54 days	Fig. 5.14.1
Temperature (°F)	327	370	Fig. 5.14.1
Pressure (psig)	12.3	75	Fig. 5.14.1
Relative Humidity (%)	100	100	Fig. 5.14.1
*Chemical Spray	0.1844 molar H_3BO_3 0.033 molar NaOH pH 8.35	6200ppm H_3BO_3 50ppm Hydrazine & Trisodium Phosphate, pH 9.23	Sect. 5.14.10.2
**Radiation (rd)	1.0441×10^8 gamma plus beta	1.156×10^8 (air) or 1.285×10^8 G(H_2O)	Sect. 5.7.5
Submergence	None	None	NA

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	IPS-752 Reference
Temperature	Yes	Fig. 5.14.1
Pressure	Yes	Fig. 5.14.1
Relative Humidity	Yes	Fig. 5.14.1
Chemical Spray	NA	Sect. 5.14.10.2
Submergence	NA	NA

JUSTIFICATION/COMMENTS Specified containment spray is 30 days, and the flow rate is 0.92gpm/ft^2. Spray chemistry varies with time.

JUSTIFICATION/COMMENTS (Continued)

Parameters shown are a composite resultant concentration. All of these penetrations are enclosed in junction boxes and are not subject to direct chemical spray impingement. All penetrations, except no.'s 5, 11, and 26 (which are all nondivisional), are additionally protected from chemical spray by the concrete floor slab above them. These physical barriers negate the effects of spray flow rate and difference in spray chemistry. Also see TAB B, sheet 7A, Justification/Comments for G(1)(e) and G(2). As is seen in TAB C, Section C-1, Report WAC-62, the test profile does not envelop the WBN accident profile for approximately the first 100 seconds. This exists due to starting at a lower temperature and the difficulty in getting the temperature to rise in the steam chamber as fast as the WBN accident profile does, a common problem in steam tests. Report WAC-62 does not include the first test temperature transient. This extra transient and the significantly higher test temperatures compensate for the slightly slower transient rise time. Also, as noted in IPS-752, Section 5.14.10.1, testing without a terminal box is more severe than with the box due to thermal lag and dew point effects associated with the box. Thus, this small deviation in the profile for the first few seconds is not significant.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assume that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	43°F	Yes
Pressure: +10% but no more than 10 psig	62.7 psig	Yes
Radiation: +10% of accident dose	13.26%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	See TAB C, Section C-1	Yes
Voltage: ±10% of rated value	10% of maximum nom. system voltage	Yes
Frequency: ±5% of rated value	0	No
Environmental Transient: the initial transient and the peak temperature applied twice	transient applied twice	Yes
Vibration: +10% added to acceleration	NA	NA

JUSTIFICATION/COMMENTS: Margins applied per IEEE 317-1976. Frequency margin not required by IEEE 317-1976. Electrical penetrations function electrically as insulated conductors, and they are not frequency sensitive in the low frequency range of power and control applications. Sheet 1 of Material Aging Calculation Report WAC-62 (see TAB C, Section C-1) shows the test post-accident operating time equivalent is considerably more than 10% over the Watts Bar required operating time.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment: (Reference IPS-752, Sect. 1.5).

JUSTIFICATION/COMMENTS Maintain pressure boundary and electrical integrity.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.14.1).

JUSTIFICATION/COMMENTS

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.14.1).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference IPS-752, Sect. 5.14.1 & 5.14.2).

JUSTIFICATION/COMMENTS Test was for 13 1/2 days. See analysis extending time to 100 days in IPS-752, Sect. 5.14.10.1C.

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes (Reference IPS-585.3, Sect. 6.18.1.1, 6.21.1.1, and 6.24).

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 24 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL

COMPUTED [illegible] DATE 7/26/86 R ___ R ___

CHECKED [illegible] DATE 7/27/86

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See TAB G - QMDS.

TVA 19537 (OE-3-86)

EQP189.24

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) adequately justified?	NA (No exceptions taken)
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA (preaging performed)
(d) Materials susceptible to thermal/radiation aging identified?	Yes

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA (See TAB B, Sect. L(2))
(11) Criteria regarding submergence satisfied?	NA(penetrations not submerged)
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA(penetrations qualified for 100 days)
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

BINDER NO. WBNEQ-PENT-002 PLANT WBN UNIT(S) 1 SHEET 27A OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, LV POWER & CONTROL

COMPUTED [illegible] DATE 7/26/86 R ___ R ___

CHECKED [illegible] DATE 7/27/86

P. DISCUSSION

Conax Report IPS-752 is the qualification document for these penetrations. The penetrations contain the identical possible leakage paths, leak mechanisms, feedthrough concepts, seals, insulation system, and materials as the test data base penetration No. 1 described in IPS-752. Detailed raw test data for the tested assemblies is contained in IPS-585.3. IPS-752 is a summary document of the reports on the tested assemblies. It is a very thorough summary and is the document submitted by Conax Corporation as the key qualification report for the subject low voltage power and control penetration assemblies.

SUPPLEMENT 3
COMPONENT-UNIQUE CHECKLIST
ELECTRICAL PENETRATIONS

EQUIPMENT IDENTIFICATION

(1) Are the penetrations identified in the qualification program identical to the plant penetrations which require qualification (yes/no/NA)? No

Item	Plant	Report	Acceptable Yes/No/NA	IPS-752 Report Section
(a) Penetration type	LVP & C	LVP & C	Yes	Table 4.1
(b) Mounting	See p 29A	See p 29A	Yes	NA
(c) External connections	in-line splices	NA	NA	NA

Comments: TVA provided in-line splices. Conax test was of similar items with supporting analysis, per IPS-752, Sect. 1.0.

(2) Does the qualification report identify the following performance characteristics:

Performance Characteristics	Acceptable (Yes/No/NA)	IPS-752 Report Section
(a) Temperature rating	Yes	5.7.24.2
(b) Voltage rating	Yes	See Sheet 29A
(c) Continuous current rating	Yes	5.9.5
(d) Short-time overload current rating & duration	Yes	5.10.4
(e) Rated short circuit current & duration	Yes	5.11.2
(f) Pressure rating	Yes	5.1 & 5.2

EQUIPMENT IDENTIFICATION (Continued)

Performance Characteristics	Acceptable (Yes/No/NA)	IPS-752 Report Section
(g) Maximum gas leakage rate	Yes	5.1.1.1

Comments: See page 29A

(3) Does the qualification program address the following tests:

Item	Acceptable Yes/No/NA	IPS-752 Report Section
(a) Continuous current rating	Yes	5.9.2
(b) Short-time overload current rating and duration	Yes	5.10.1
(c) Short circuit current rating and duration	Yes	5.11.1
(d) Rated maximum duration of rated short circuit current	Yes	5.15.1
(e) Pneumatic pressure rating	Yes	5.2.1
(f) Maximum gas leakage rate	Yes	5.1.1
(g) Conductor continuity	Yes	5.3.1
(h) Dielectric strength	Yes	5.4.1
(i) Impulse	NA	NA
(j) Insulation resistance	Yes	5.5.1
(k) Flame	Yes	6.3

Comments: Impulse tests not required for low voltage penetrations per IEEE 317-1976.

Additional Comments for Supplement 3

(1)(b) Watts Bar L. V. Power and Control Penetrations are mounted by welding the penetration assembly header plate to the annulus (outside containment) end of the containment nozzle. The containment nozzles are horizontal. The inboard ends are supported by a support plate resting in the inboard end of the nozzle and located by support rods attached to the header plate. Inside containment junction boxes for connection of penetration conductor pigtails to field cables are bolted to slip-on flanges welded to the inboard end of the containment nozzle. Outside containment junction boxes, where used, are bolted to the penetration header plate in the annulus.

The test penetration assembly was inserted horizontally into the environmental test chamber as shown in IPS-585.3, Appendix D, photographs 5.0 through 8.0. Whether it was bolted in or welded in or whether it incorporated an inboard support plate is not stated, but this is in no way material to the results of the DBA test. No junction boxes were used as stated in IPS-752, Section 5.14.1, which is conservative as discussed in IPS-752, Section 5.14.10.1A.

(2)(b) The voltage rating of the penetrations is implied but not specifically stated in the qualification report. The voltage rating was specified to be 600 volts in contract 76K61-87064. Dielectric strength tests before the DBA test at 2.7 kV and after the DBA tests at 660 volts are consistent with a voltage rating of 600 volts in accordance with IEEE 317-1976, Sections 4.2.1, 7.3.2, and 6.4.13. See IPS-752, Sections 5.4.1 and 5.14.2.2.

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-003
MANUFACTURER: CONAX CORPORATION
PAGE: 1 OF 5

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0018	1-PENT-293-0018	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-05		093-00	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0019 -E	1-PENT-293-0019 -E	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-03		017-00	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0020	1-PENT-293-0020	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-10		116-30	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0022	1-PENT-293-0022	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-10		078-30	720'	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0023 -F	1-PENT-293-0023 -F	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-06		241-45	733'	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	

* SEE DRAWING 45W860-3 IN TAB E.

R____ R____ R____

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNED-PENT-003
MANUFACTURER: CONAX CORPORATION
PAGE: 2 OF 5

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0025	1-PENT-293-0025	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-01		254-30	771' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0028	1-PENT-293-0028	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-02		027-00	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0029	1-PENT-293-0029	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-04		030-00	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0030 -B	1-PENT-293-0030 -B	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-09		021-00	726' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0031 -G	1-PENT-293-0031 -G	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-06		025-00	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	

* SEE DRAWING 45W860-3 IN TAB E.

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEB-PENT-003
MANUFACTURER: CONAX CORPORATION
PAGE: 3 OF 5

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0033	1-PENT-293-0033	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-04		153-00	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0034	1-PENT-293-0034	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-02		151-00	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0037 -A	1-PENT-293-0037 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-07		155-00	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0038 -D	1-PENT-293-0038 -D	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-03		159-00	720' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0039	1-PENT-293-0039	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-02		195-00	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	

* SEE DRAWING 45N860-3 IN TAB E.

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-003
MANUFACTURER: CONAX CORPORATION

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0040 -A	1-PENT-293-0040 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-08		207-00	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0043 -D	1-PENT-293-0043 -D	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-06		205-00	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0045 -F	1-PENT-293-0045 -F	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-03		197-00	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0049 -G	1-PENT-293-0049 -G	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-03		335-00	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0050	1-PENT-293-0050	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-02		339-00	728' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	

* SEE DRAWING 45W860-3 IN TAB E.

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-003
MANUFACTURER: CONAX CORPORATION
PAGE: 5 OF 5

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0054 -E	1-PENT-293-0054 -E	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-06		306-30	719'	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	

* SEE DRAWING 45W860-3 IN TAB E.

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-003
MANUFACTURER: CONAX CORPORATION

EDIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0018	1-PENT-293-0018	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-05		093-00	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0019 -E	1-PENT-293-0019 -E	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-03		017-00	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0020	1-PENT-293-0020	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-10		116-30	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0022	1-PENT-293-0022	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-10		078-30	720'	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0023 -F	1-PENT-293-0023 -F	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-06		241-45	733'	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	

* SEE DRAWING 45N860-3 IN TAB E.

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-003
MANUFACTURER: CONAX CORPORATION
PAGE: 2 OF 5

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/ROOM	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0025	1-PENT-293-0025	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-01		254-30	771' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	100D/100D 100D/100D 100D/100D 1MO/1MO 1MO/1MO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WBN-1-PENT-293-0028	1-PENT-293-0028	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-02		027-00	738' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	100D/100D 100D/100D 100D/100D 1MO/1MO 1MO/1MO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WBN-1-PENT-293-0029	1-PENT-293-0029	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-04		030-00	738' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	100D/100D 100D/100D 100D/100D 1MO/1MO 1MO/1MO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WBN-1-PENT-293-0030 -B	1-PENT-293-0030 -B	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-09		021-00	726' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	100D/100D 100D/100D 100D/100D 1MO/1MO 1MO/1MO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WBN-1-PENT-293-0031 -G	1-PENT-293-0031 -G	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-06		025-00	734' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	100D/100D 100D/100D 100D/100D 1MO/1MO 1MO/1MO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)

* SEE DRAWING 45W860-3 IN TAB E.

PREPARER/DATE [signature] 9/15/86
CHECKER/DATE [signature] 9.18.86

R____ R____ R____

PAGE A-2

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-003
MANUFACTURER: CONAX CORPORATION
PAGE: 3 OF 5

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0033	1-PENT-293-0033	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-04		153-00	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0034	1-PENT-293-0034	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-02		151-00	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0037 -A	1-PENT-293-0037 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-07		153-00	734' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0038 -D	1-PENT-293-0038 -D	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-03		159-00	728' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	
WBN-1-PENT-293-0039	1-PENT-293-0039	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-02		195-00	738' 6"	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	

* SEE DRAWING 45W860-3 IN TAB E.

R____ R____ R____

PREPARER/DATE DDD 9/15/86

CHECKER/DATE 9-18-86

PAGE A-3

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-003
MANUFACTURER: CONAX CORPORATION
PAGE: 4 OF 5

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0040 -A	1-PENT-293-0040 -A	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-08		207-00	738' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	100D/100D 100D/100D 100D/100D 1MO/1MO 1MO/1MO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WBN-1-PENT-293-0043 -D	1-PENT-293-0043 -D	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-06		205-00	734' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	100D/100D 100D/100D 100D/100D 1MO/1MO 1MO/1MO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WBN-1-PENT-293-0045 -F	1-PENT-293-0045 -F	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-03		197-00	734' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	100D/100D 100D/100D 100D/100D 1MO/1MO 1MO/1MO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WBN-1-PENT-293-0049 -G	1-PENT-293-0049 -G	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-03		335-00	734' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	100D/100D 100D/100D 100D/100D 1MO/1MO 1MO/1MO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)
WBN-1-PENT-293-0050	1-PENT-293-0050	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-02		339-00	728' 6"	57' 6"	76K61-87064	LOCA MS/C FW/C RH/C CV/C	A/B A/B A/B A/B A/B	100D/100D 100D/100D 100D/100D 1MO/1MO 1MO/1MO	MAINTAIN PRESSURE BOUNDARY (CAT B) AND ELECTRICAL INTEGRITY (CAT A)

* SEE DRAWING 45W860-3 IN TAB E.

PREPARER/DATE DDD 9/15/86
CHECKER/DATE [illegible] 9.18.86

R____ R____ R____

PAGE A-4

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-PENT-003
MANUFACTURER: CONAX CORPORATION
PAGE: 5 OF 5

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ*	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0054 -E	1-PENT-293-0054 -E	PRIMARY CONTAINMENT ELEC PENETRATION	7429-10003-06		306-30	719'	57' 6"	76K61-87064	LOCA	A/B	100D/100D	MAINTAIN PRESSURE BOUNDARY (CAT B)
									MS/C	A/B	100D/100D	AND ELECTRICAL INTEGRITY (CAT A)
									FW/C	A/B	100D/100D	
									RH/C	A/B	1MO/1MO	
									CV/C	A/B	1MO/1MO	

* SEE DRAWING 45W860-3 IN TAB E.

		R____	R____	R____
PREPARER/DATE	DCD 9/15/86			
CHECKER/DATE	Jm 9.18.86			

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BINDER NO. WBNEQ-PENT-003 PLANT WBN UNIT(S) 1 SHEET 1 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, INSTRUMENTATION & INDICATION

COMPUTED DDD DATE 9/15/86 R ___ R ___

CHECKED [illegible] DATE 9.18.86

A. DOCUMENTATION

Equipment Description: Electrical Penetrations, Instrumentation & Indication

Vendor/Manufacturer: Conax Corporation

Equipment Model No.(s): 7429-10003-01 through 7429-10003-10

QUALIFICATION REPORTS

(1) Title/Number/Revision- Design Qualification Report for Electrical Penetration Assemblies for Watts Bar Nuclear Plant Units 1&2/IPS-752/Rev. A. RIMS EEB 820115 315 DATE 12/9/81

(2) Title/Number/Revision- Design Qualification Material Test Report for materials used in Conax Electrical Penetration Assemblies and Electric Conductor Seal Assemblies/IPS-325/Rev. D. RIMS EEB 811110 300 DATE 5/14/81

(3) Title/Number/Revision- Test Report Qualification of Instrumentation Service Classification Electric Penetration/IPS-585.2 RIMS EEB 811110 306 DATE 1-18-81

(4) Title/Number/Revision- Test Report Qualification of Conax Instrumentation Classification Coaxial Feedthrough Subassemblies/IPS-585.4 RIMS EEB 811110 303 DATE 1/16/81

(5) Title/Number/Revision- "Design Qualification Rpt For a 42 Conductor #18 AWG Conax Low Volt. Service Classification Feedthrough Assembly Consistent with the Requirements of IEEE Standard 317-1976 & NRC Regulatory Guide 1.63, 7/78"/IPS-353.10/Rev. B. RIMS B26 860801 048 DATE June 23, 1983

OTHER (ANALYSIS, VENDOR DATA, ETC.) Design Qualification Material Test Report for Materials Used in Conax Electrical Penetration Assemblies and Electric Conductor Seal Assemblies, IPS-325, Rev. E.

BINDER NO. WBNEQ-PENT-003 PLANT WBN UNIT(S) 1 SHEET 1A OF 29

BINDER TITLE CONAX ELECTRICAL COMPUTED DDB DATE 9/15/86 R R

PENETRATION, INSTRUMENTATION & INDICATION CHECKED Dy DATE 9-18-86

45N860-3 R7 - Conduit and Grounding - Floor El702.78, Details - Sheet 1

45W860-10, R8 - Conduit and Grounding - Electrical Penetration Details

7429-10003, Sheet 1, Rev. E - Electrical Penetrations for Watts Bar

7429-10003, Sheet 2, Rev. E - Electrical Penetrations for Watts Bar

7429-24002, Sheet, Rev A - Enclosure SUB-ASSY

PL7429-10003-01, Sheet 1, Rev. E - Parts List

PL7429-10003-01, Sheet 2, Rev. E - Parts List

PL7429-10003-02, Sheet 1, Rev. E - Parts List

PL7429-10003-02, Sheet 2, Rev. E - Parts List

PL7429-10003-03, Sheet 1, Rev. E - Parts List

PL7429-10003-03, Sheet 2, Rev. E - Parts List

PL7429-10003-04, Sheet 1, Rev. E - Parts List

PL7429-10003-04, Sheet 2, Rev. E - Parts List

PL7429-10003-05, Sheet 1, Rev. E - Parts List

PL7429-10003-05, Sheet 2, Rev. E - Parts List

PL7429-10003-06, Sheet 1, Rev. E - Parts List

PL7429-10003-06, Sheet 2, Rev. E - Parts List

PL7429-10003-07, Sheet 1, Rev. E - Parts List

PL7429-10003-07, Sheet 2, Rev. E - Parts List

PL7429-10003-08, Sheet 1, Rev. E - Parts List

PL7429-10003-08, Sheet 2, Rev. E - Parts List

BINDER NO. WBNEQ-PENT-003 PLANT WBN UNIT(S) 1 SHEET 1B OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, INSTRUMENTATION & INDICATION

COMPUTED [illegible] DATE 9/18/86 R ___ R ___

CHECKED [illegible] DATE 9.18.86

PL7429-10003-09, Sheet 1, Rev. E - Parts List

PL7429-10003-09, Sheet 2, Rev. E - Parts List

PL7429-10003-10, Sheet 1, Rev. E - Parts List

PL7429-10003-10, Sheet 2, Rev. E - Parts List

WBNNAL3-004 - Accident Dose Inside Reactor Building (B45 860205 235)

TI-RPS-48 (R2) - Integrated Accident Dose Inside Primary Containment (B45 851105 235)

GENNAL3-001 - Normal Radiation Dose (B45 851117 235)

GENNAL4-001 - SQN and WBN Annulus Temperature Analysis (B45 860317 237)

Maximum Containment Water Level (NEB 840120 220)

GENNAL3-002 - Reduction of Beta Dose by Sheet Steel (B45 860423 235)

EQP-02 - Average Temperature for Rooms Inside Lower Containment (B71 860402 200)

GENNAL3-013 - Beta Dose Reduction from Finite Volume (B45 860624 235)

47E235-41 R0 - Environmental Data, Upper Compartment

47E235-42 R1 - Environmental Data, Lower Compartment

47E235-44 R0 - Environmental Data, Annulus Area

47E235-45 R0 - Environmental Data, Annulus Area

WBNEQ-IXT-001 - Environmental Qualification Binder for Acoustic Monitors

WBNEQ-SPLC-001 - Environmental Qualification Binder for Raychem Heat Shrink Splices

45A860-1 to -54 - Electrical Penetration Connection Drawings. (not included in binder)

TVA 19537 (OE-3-86)

EQP162.63

IPS-752 is the document submitted by Conax Corporation as the key qualification report for the Watts Bar Penetrations. It is a very comprehensive summary report and documents qualification by analysis and comparison to similar modular-type low voltage power and control penetration assemblies of a universal design previously qualified by type tests conducted in accordance with IEEE 317-1976 at levels equal to or more severe than TVA specified requirements for Watts Bar. Most references in this binder are to IPS-752.

IPS-325 documents qualification of Conax Electric Penetration Assemblies from the standpoint of material tests, as a minimum satisfying requirements of Section 6.3 of IEEE 317-1976. Appendix A of IPS-325 includes Conax's thermal evaluation program. IPS-325 is referenced in this binder for identification of materials susceptible to aging degradation and to support Arrhenius Aging Calculations. IPS-325 documents an ongoing test program. Revision D of IPS-325 is referenced in IPS-752 and is included in Binder TAB D, Section D-2. A later revision of IPS-325, Rev. E is included in in Binder TAB E, Section E-4, and is referenced in several places in this binder.

IPS-585.4 documents tests on a coax penetration assembly referred to as test data base 3 in IPS-752. It is a more detailed test report than IPS-752 that includes raw data and therefore requires reference in a f[illegible] places in this binder. Only the RG-59 coax is applicable to Watts Bar as indicated in IPS-752, Table 4.3.

BINDER NO. WBNEQ-PENT-003 PLANT WBN UNIT(S) 1 SHEET 1D OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, INSTRUMENTATION ~~& INDICATION~~ COMPUTED DDD DATE 9/16/86 CHECKED Qu DATE 9.18.86 R R

IPS-585.2 documents tests on an instrumentation penetration assembly referred to as test data base 4 in IPS-752. It also is more detailed than IPS-752, contains raw data, and requires reference in a few places in this binder. IPS-752, Table 4.4 indicates which portions of test data base 4 are applicable to Watts Bar.

IPS-353.10 documents qualification tests of a low voltage penetration module consistent with the requirements of IEEE 317-1976. For this binder it provides environmental qualification documentation for chemical spray, supporting IPS-752 in the same way that IPS-325, IPS-585.2, and IPS-585.4 do.

BINDER NO. WBNEQ-PENT-003 PLANT WBN UNIT(S) 1 SHEET 2 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, INSTRUMENTATION & INDICATION

COMPUTED [illegible] DATE 9/16/86 R ___ R ___

CHECKED [illegible] DATE 9.18.86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES See Sheet 2A.

COMMENTS/RECOMMENDATIONS These modular-type electrical penetrations are used to convey both safety related and non-safety related low voltage indication, communications, annunciation, and instrumentation circuits into primary containment. These penetrations are qualified to maintain pressure integrity and electrical integrity for the worst case postulated environmental conditions at their location before, during, and after a LOCA or steam line break occurring any time within the 40 year plant design life, pending satisfactory resolution of the above open items.

TVA 19537 (OE-3-86)

EQP162.63

BINDER NO. WBNEQ-PENT-003 PLANT WBN UNIT(S) 1 SHEET 2A OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATION, INSTRUMENTATION & INDICATION

COMPUTED [illegible] DATE 9/16/86 R ___ R ___

CHECKED [illegible] DATE 9.18.86

1. Field Verification must be corrected and completed and NCRs W-353-P, R1 and 6224 must be resolved.

2. Documentation of penetration voltage level must be provided. See QIR EQP86102.

3. Penetration DBA insulation integrity must be documented to be adequate to support required instrument accuracy for several instruments. See QIR EQP86094.

4. Document accident beta radiation dose inside penetration. See QIR EQP86089.

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS Contract Date: Nov. 14, 1975. Although procured, delivered, and installed prior to February 22, 1983, these electrical penetrations meet NUREG-0588, Category I Requirements.

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 317-1976 - Standard for Electrical Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations.

BINDER NO. WBNEQ-PENT-003 PLANT WBN UNIT(S) 1 SHEET 4 OF 29

BINDER TITLE CONAX ELECTRICAL COMPUTED [illegible] DATE 9/15/86 R ___ R ___

PENETRATION, INSTRUMENTATION & INDICATION CHECKED [illegible] DATE 9.18.86

D. QUALIFICATION METHODOLOGY (Check only one block)

___ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS Conax Qualification Report IPS-752, Section 1.2. See binder TAB D, Section D-1 for copy of IPS-752.

IPS-752, Section 4.3 states "The design and construction of the subject penetrations of para. 3.1 contains the identical leakage paths, leak mechanisms, feedthru concepts, seals, insulation systems, and materials as test data bases one, two, three, and four and no differences exist between the test data bases and the Watts Bar Design which would affect qualification." Test data bases 3 and 4 are the applicable test items for this binder. See IPS-752, Table 3.3 for a general description of the WBN LVI type penetration and Tables 4.3 and 4.4 for a description of the test data bases.

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Elec. Pene. Instr.& Ind.	Elec. Pene. Assemblies	IPS-752 Sec. 4.1
(2) Manufacturer	Conax Corporation	Conax Corporation	IPS-752 Sec. 4.1
(3) Model Number(s)	See TAB A	Data Base Three	IPS-752 Table 4.3
		Data Base Four	IPS-752 Table 4.4
(4) Serial Number(s)	See TAB F	Not stated	NA
(5) Identify Component-Unique checksheet attached:	See TAB B, Supplement 3		

JUSTIFICATION/COMMENTS

IPS-752, Section 4.3 states "The design and construction of the subject penetrations of para. 3.1 contains the identical leakage paths, leak mechanisms, feedthru concepts, seals, insulation systems, and materials as test data bases one, two, three, and four and no differences exist between the test data bases and the Watts Bar Design which would affect qualification." Test data bases 3 and 4 are the applicable test items for this binder. See IPS-752, Table 3.3 for a general description of the WBN LVI type penetration and Tables 4.3 and 4.4 for a description of the test data bases.

IPS-585.2 and IPS-585.4 are the type test reports for test data bases three and four described in IPS-752. IPS-585.2 and IPS-585.4 are much more detailed and therefore require reference at some points in this binder. Test data base 3 is the test item for RG-59 coax. Test data base 4 is the test item for RG-11 triax, 14 AWG, 16 AWG, and thermocouple types. Other conductor types in the test items (RG-114 for example) are not used at Watts Bar. See Contract 76K61-87064 in TAB E, Section E-1, for description of WBN penetrations. Although Conax does state a type for test data bases 3 or 4, they include the conductor types TVA used for instrumentation, indication, communication, and annunciation circuits in the electrical penetrations at WBN.

See sheet 5B for correlation of WBN plant device EQIS numbers, model numbers serial numbers, and types. Test data bases do not have model or serial numbers. This is not significant since the test data bases include the same conductor types as the WBN penetrations and Conax states there are no significant differences that would affect qualification.

All WBN primary containment electrical penetrations are tabulated on TVA Drawing 45N860-3 in binder TAB E, Section E-2. Penetrations covered in this binder are instrumentation and indication types and are listed on 45N860-3 as being for node voltage levels 1, 2, 2A, 2B, 2D, 2E, 2F, and 2G. (Penetrations for node voltage level 5 are covered in Binder WBNEQ-PENT-001 and those for node voltage levels 3, 3A, 3B, 4, 4A, and 4B are covered in Binder WBNEQ-PENT-002).

BINDER NO. WBNEQ-PENT-003 PLANT WBN UNIT(S) 1 SHEET 5B OF 29

R ___ R ___

BINDER TITLE CONAX ELECTRICAL PENETRATION, INSTRUMENTATION & INDICATION

COMPUTED [illegible] DATE 9/16/86

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EQIS NO.	MODEL NO.	SERIAL NO.	TYPE
WBN-1-PENT-293-0018	7429-10003-05	400	Instrumentation
WBN-1-PENT-293-0019-E	7429-10003-03	391	Instrumentation
WBN-1-PENT-293-0020	7429-10003-10	404	Instr. & Indic.
WBN-1-PENT-293-0022	7429-10003-10	405	Instr. & Indic.
WBN-1-PENT-293-0023-F	7429-10003-06	393	Instrumentation
WBN-1-PENT-293-0025	7429-10003-01	397	Instrumentation
WBN-1-PENT-293-0028	7429-10003-02	385	Instrumentation
WBN-1-PENT-293-0029	7429-10003-04	398	Instrumentation
WBN-1-PENT-293-0030-B	7429-10003-09	402	Instr. & Post-Acc. Rad. Monit.
WBN-1-PENT-293-0031-G	7429-10003-06	394	Instrumentation
WBN-1-PENT-293-0033	7429-10003-04	399	Instrumentation
WBN-1-PENT-293-0034	7429-10003-02	386	Instrumentation
WBN-1-PENT-293-0037-A	7429-10003-07	401	Instr. & Indic. & Post-Acc. Rad. Monit.
WBN-1-PENT-293-0038-D	7429-10003-03	392	Instrumentation
WBN-1-PENT-293-0039	7429-10003-02	387	Instrumentation
WBN-1-PENT-293-0040-A	7429-10003-08	403	Instr. & Indic.
WBN-1-PENT-293-0043-D	7429-10003-06	395	Instrumentation
WBN-1-PENT-293-0045-F	7429-10003-03	389	Instrumentation
WBN-1-PENT-293-0049-G	7429-10003-03	390	Instrumentation
WBN-1-PENT-293-0050	7429-10003-02	388	Instrumentation
WBN-1-PENT-293-0054-E	7429-10003-06	396	Instrumentation

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	NA
External Process Connections	NA	NA	NA
Electrical Connections	See Note 1	Yes*	IPS-752, Table 4.3 & 4.4
Conduit Seals	NA	NA	NA
Connector Seals	NA	NA	NA
Orientation	NA	NA	NA
Physical Configuration	NA	NA	NA
Other	NA	NA	NA

JUSTIFICATION/COMMENTS There are no required external process requirements, no conduit seals (penetrations are seals), and orientation is not a consideration for penetrations. The Watts Bar penetrations are welded into their nozzles. (Continued on sheet 6A)

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Note 1: Raychem WCSF-N in-line splice insulations for connection of field cables, other than coax and triax, to penetration conductor pigtails were provided by TVA and are not part of the penetration assembly qualification. See binder WBNEQ-SPLC-001 for splice insulation qualification. For coax and triax connectors Conax furnished jacks and plugs with Raychem WCSF-N sleeves. See TVA drawing 45W860-10, detail J10 in binder TAB E, Section E-3, and Conax manual IPS-214, sections 5.4.4 and 5.4.5 in binder TAB H Section H-1 for installation instructions and details. See binder WBNEQ-SPLC-001 for Raychem WCSF-N qualification.

*Interface is an installation requirement but needs no maintenance and is not listed on QMDS.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	IPS-752 Reference
(a) Equipment inspected for damage	No	NA
(b) Baseline performance measurements taken	Yes	5.0
(c) Equipment aged:		
Thermal	Yes	5.7.15, 5.7.21
Radiation	Yes	5.7.16, 5.7.22
Wear	No	NA
(d) Vibration/seismic testing conducted	Yes	5.12
(e) Design basis event (DBE) exposure	Yes	5.14.3, 5.14.5
(f) Post-DBE exposure	Yes	5.14.3, 5.14.5
(g) Final inspection and disassembly	No	NA

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes
(Reference IPS-585.2, page 32 and IPS-585.4, page 27).

JUSTIFICATION/COMMENTS G(1)(a) Although Conax does not state that an initial visual inspection was done, they have completed numerous successful test programs and there is no reason to

believe a visual inspection was not done. However, an initial visual inspection is not required by IEEE 317-1976.

G(1)(c) Electrical penetrations are passive devices and are not subject to wear as an aging mechanism. Wear aging is not required by IEEE 317-1976.

G(1)(g) Conax does not state that a final inspection and disassembly was done, but extensive evaluation testing was performed (IPS-752, Sect 5.14.4 and 5.14.6) in accordance with IEEE 317-1976, fully proving post-accident integrity and operability of the assembly. It is reasonable to assume that a manufacturer of Conax's experience did make a visual inspection. However, a final visual inspection and disassembly are not required by IEEE 317-1976.

G(1)(e) and G(2) Test data bases 3 and 4 were exposed to the sequence as listed above. However the DBA test for test data base 3 did not include any chemical spray and the DBA test for test data base 4 included only a short period of spray. Spray compatibility of Conax penetrations was established in report IPS-353.10 as stated in IPS-752, Section 5.14.10.2. Report IPS-353.10 documents environmental qualification tests on another (not test data base 3 or 4) penetration assembly. This assembly received sequential thermal aging, thermal cycling, radiation exposure, and DBA accident profile at levels approximately equal to test data bases 3 and 4 and in excess of WBN requirements. Thermal aging was somewhat less and radiation exposure somewhat more than test data bases 3 and 4. See Conax Justification/Comparison in IPS-752, Section 5.14.10.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	IPS-752 Reference
Thermal aging	Yes	5.7.15, 5.7.21
Radiation exposure	Yes	5.7.16, 5.7.22
Vibration (non-seismic) aging	No	NA
Operational (electrical/mechanical/process) stress aging	Yes	5.7.14, 5.7.20

JUSTIFICATION/COMMENTS Vibration aging not required by IEEE 317-1976 (penetrations are passive devices and vibrational stress is not a significant aging degradation mechanism).

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS No synergistic effects known for these penetrations, based on a literature review of applicable materials data for materials used in Conax instrumentation and indication penetrations.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.15 and 5.7.21).

JUSTIFICATION/COMMENTS Aging based on materials tests and analysis done in IPS-325 (binder TAB D, Section D-2) by Conax.

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: IPS-325, Table 3.1 and IPS-752, Table, 3.3.).

JUSTIFICATION/COMMENTS See IPS-325, Rev. D, in binder TAB D, Section D-2.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.24.2).

JUSTIFICATION/COMMENTS Thermal aging based on conductor feedthru life. See analysis of feedthrus in IPS-325, Appendix A.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.24.2).

Parameter	Plant Maximum Normal	Test(1)	Equivalent
Temperature	110°F(2)	150°C	120°C
Time	40 years	100 hrs	40 years

JUSTIFICATION/COMMENTS (1)Test data base three was aged at 151.6°C for 102 hours. (2)Worst case, see sheet 19A. See sheet 9A for discussion of aging.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.24.2).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference IPS-325, Rev. E, Sect 6.4.1 (Footnote at bottom of page) in Binder TAB E, Section E-4.

JUSTIFICATION/COMMENTS

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The thermal age conditioning curve shown in IPS-752, Figure 5.7.1 shows a 40 year life at 120°C. This is far greater than the plant maximum normal and abnormal temperature For penetrations (110°F and 130°F max, respectively), and therefore a far greater than 40 year qualified life is established for the subject penetrations. There is little or no temperature rise associated with the low power indication, communication, annunciation, and instrumentation circuits passing through these penetrations.

Conax document IPS-325 covers an ongoing test program. A newer revision of IPS-325 (Rev. E) shows the latest Conax calculation of activation energy is 3.916, which agrees closely with the regression line presented in IPS-752, Figure 5.7.1. See in binder TAB E, Section E-4, IPS-325, Rev. E, page 26.

See Material Aging Calculation Report WAC-70, page 2, in binder TAB C, Secton C-1, for calculation of qualified life at 130°F (54.44°C). Worst case maximum normal ambient temperature is 110°F, however the qualified life is calculated at 130°F for conservatism.

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes (Reference IPS-325, Rev. E, in Appendix A, binder TAB E, Section E-4).
JUSTIFICATION/COMMENTS Also see IPS-752, figure 5.7.1. and binder Sheet 9A.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference NA).
JUSTIFICATION/COMMENTS Not required by IEEE 317-1976. Aging times and temperatures were based on typical penetration operating temperature, which is ambient plus temperature rise due to loading. However, there is little or no temperature rise for these penetrations which are used for low power instrumentation, communication, annunciation, and indication circuits.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.16 and 5.7.22).

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference IPS-325, Table 3.1 and IPS-752, Table 3.3).
JUSTIFICATION/COMMENTS All materials were irradiated to the same level.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? No (Reference NA).
JUSTIFICATION/COMMENTS Dose applied exceeded Watts Bar 40 year plus accident dose to penetrations.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.16 and 5.7.22).

Plant normal ambient radiation dose (rd)	2×10^7 gamma Data Base Three	2×10^7 gamma Data Base Four
Test exposure dose (rd)	$1.1 \times 10^8 (H_2O)$	$1.9 \times 10^8 (H_2O)$
Test exposure dose rate (rd/hr)	$5.4 \times 10^5 (H_2O)$	$7.7 \times 10^5 (H_2O)$
Test exposure source type (e.g., Co-60 gamma)	Co-60 Gamma	Co-60 Gamma

JUSTIFICATION/COMMENTS Test exposure dose is the sum of 40 year normal dose plus accident dose. See Sheet 11A for dose conversion from water to air equivalent.

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Not required by IEEE 317-1976 (penetrations are passive devices and vibrational stress is not a significant aging degradation mechanism).

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS See H(6)(a).

Dose conversion from rads water to rads air for the incident Co-60 gamma ray flux used in the irradiation portion of the test program is proportional to the ratio of the mass absorption coefficient (Na/p) for gamma rays in air and water, assuming an average Co-60 gamma energy of 1.25 meV. The air equivalent dose for test data base 3 is 1.1×10^8 rads water x $\frac{(\mu a/\rho)\text{air}}{(\mu a/\rho)\text{water}}$ = 0.989×10^8 rads air. Mass absorption coefficient values of 0.0268 cm^2/gm for air and 0.0298 cm^2/gm for water were used. (Reference: ANL-5800, Reactor Physics Constants). In the same manner the test exposure dose rate of 5.4×10^5 rad/hr (water) for test data base 3 converts to 4.856×10^5 rad/hr (air).

For test data base four the test exposure of 1.9×10^8 rads (water) converts to 1.709×10^8 rads (air) and the dose rate of 7.7×10^5 rads/hr (water) converts to 6.925×10^5 rads (air).

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.13, 5.7.14, 5.7.18, and 5.7.20).

JUSTIFICATION/COMMENTS Shipping and storage tests and thermal cycle test.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.7.13, 5.7.14, , 5.7.18, and 5.7.20).

JUSTIFICATION/COMMENTS Stresses induced were in accordance with IEEE 317-1976.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference IPS-752, Sec. 1.4).

Qualified life (Document in QMDS) 40 years

JUSTIFICATION/COMMENTS See Justification/Comments in H(9).

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? No
(Reference NA).

Replacement Intervals (Document in QMDS) None required per IPS-214, "Installation and Maintenance Manual". See binder TABS G (QMDS) and H (Instruction Manual).

JUSTIFICATION/COMMENTS IPS-752, Sec. 1.4 states "...Materials as used in Conax electric penetrations are not susceptible to any significant degradation due to thermal aging and radiation and that no age or service related common failure modes exist that would preclude a qualified life of 40 years."

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Polysulfone/sealant	NA	NA	NA	NA
(b)	Kapton Polyimide film/ Conductor Insulation	NA	NA	NA	NA
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS Penetration feedthru sealant and conductor insulation materials are considered susceptible to thermal and radiation degradation implicitly when test programs are developed based on IEEE 317-1976 guidelines. Testing was done in accordance with IEEE 317-1976 and test program included tests on insulation and sealant materials. No materials analysis by TVA is required.

Refer to TAB D, Section D-2, IPS-325 for Conax's discussion of materials susceptible to thermal and radiation degradation and aging.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference IPS-752, Sections 1.5, 5.1.3, 5.1.4, 5.5.3, 5.5.4, 5.14.4, and 5.14.6).

Identify Acceptance Criteria: Baseline gas leak rate less than 1E-06 SCC/SEC helium (1E-08 for test data base three). Insulation resistance greater than 1E+08 ohms for 16 AWG, 1E+12 ohms for coax and triax. During DBA, function and operate at specified service levels without loss of mechanical or electrical integrity. After DBA, gas leak rate less than 1E-02 SCC/SEC nitrogen, continuity and dielectric strength test with no failures.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference IPS-752, Sections 5.1.3, 5.1.4, 5.2.1, 5.3.1, 5.4.3, 5.4.4, 5.5.3, 5.5.4, 5.14.3, 5.14.4, 5.14.5, and 5.14.6).

Identify baseline and functional testing: Baseline testing included gas leak rate, pneumatic pressure, dielectric strength, insulation resistance, and conductor continuity. During DBA test, penetrations were energized and leakage current monitored except for 11 intervals when insulation resistance was measured on triax. Post-DBA tests included leak rate, conductor continuity, dielectric strength, and an insulation resistance on the 16 AWG size conductors.

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.14.3.1 and 5.14.5.1).

JUSTIFICATION/COMMENTS

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? No (Reference IPS-752, Sections 5.1 through 5.5).

JUSTIFICATION/COMMENTS Electrical baseline testing consisted of insulation resistance and hipot tests which provide an indication of the electrical condition of the penetrations but are not the actual voltage and load carried by the penetrations in service in the plant. Tests were in accordance with IEEE 317-1976.

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	Various	Open Item
Load	NA	NA
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS For instrumentation/indication penetrations the required electrical characteristics depend on the end device served. Category A and B divisional devices served by these penetrations can be categorized into 6 groups.

Group	Device Served
1	Switches
2	Transmitters
3	RTDs
4	Incore Thermocouples
5	Acoustic Monitors
6	GA Post-Accident Radiation Monitors (PAM)

Refer to TVA Drawing 45N860-3 in binder TAB E, Section E-2, for a general description of each penetration's use. For a complete tabulation of devices and/or cables connected to each penetration, see TVA drawing series 45A860.

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Except for PAM circuits, category A divisional devices served by these penetrations operate at a maximum nominal system voltage of 120 VAC or 125 VDC. The PAM monitors are served by RG11 A/U triax modules added to penetrations 30 and 37. See notes 6 and 7 on TVA Drawing 45W 860-10 binder TAB E, Section E-3) and penetration circuit tabulation Drawing 45A860-3 and 45A860-37. The GA radiation monitor operates at 875 VDC bias voltage and requires a minimum insulation resistance of 1×10^9 ohms.

These instrumentation and indication penetrations are not assigned any rated current. Loads served carry 1 ampere or less, with most in the milliamp range. These small currents cause essentially no heat rise or other stress in the penetrations.

Electrical penetrations are not frequency sensitive and have no accuracy requirements themselves. Loop accuracy for the end devices served is addressed in the individual device binder.

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J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(b)

Parameter	Demonstrated Conditions	Reference
Voltage	300 VDC	IPS-752, Sec. 5.14.3.1 and 5.14.5.1
Load	50 mA for 16 AWG	IPS-752 Sec. 5.14.5.1
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		
Insulation Resistance for TRIAX	1×10^{10} ohms minimum	IPS-585.2, App. A, Sheet 1
Insulation Resistance for 16 AWG	1.8×10^{5} ohms minimum	IPS-585.2, App. A, Sheet 3

JUSTIFICATION/COMMENTS Devices in Groups 1 through 5 (switches, transmitters, RTDs, thermocouples and acoustic monitors - See Sheet 16) operate at 125 volts or less. The 300 volt DBA test voltage represents a 140 percent margin.

The Group 6 PAM monitors are the only divisional devices served by these penetrations Triax circuits that must operate after a DBA. Conax performed a baseline dielectric stength test on the Triax module at 5.0kVAC for 1 minute (IPS-752, Sec. 5.4.4) and a post-DBA test at 3.0 KVAC for 5 minutes (IPS-752, sec. 5.14.6.3) with no breakdown. This shows the basic insulation rating is well over 1000 volts and remains that good after 40 years thermal and radiation aging and a DBA much more severe than the maximum postulated at Watts Bar. During the DBA test, the insulation resistance was measured at 500 VAC on 11 occasions

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with values ranging from 1E+10 to 4E+11 ohms (IPS-752, sec. 5.14.5.2), which exceeds the requirement of 1E+09 ohms. The first measurement was made at 5 hours with the temperature over 330°F and the pressure over 50 psig, in excess of the peak Watts Bar values. During the DBA test, Conax energized the triax with 300 VDC with maximum measured leakage current of 0.13 milliamps (IPS-752, sec. 5.14.5.1). Assuming leakage current is proportional to voltage in this small range indicates a leakage current maximum of 0.38 milliamps at 875 VCD, which is acceptable. Since the triax module passed the post-DBA tests at 3.0 KVAC center conductor to shield with no signs of insulation failure and the insulation resistance values and leakage currents measured during the DBA indicate no problem would be experienced at 875 volts, the triax module is qualified for this service. This is additionally proven by other tests Conax has performed on the same triax modules using 1000 volts during DBA testing. These tests are documented in Conax Qualification Report IPS-1334 and Test Report IPS-1054, which Conax furnished TVA to qualify triax penetrations for identical GA radiation monitors at Sequoyah Nuclear Plant. Those triax modules were originally furnished on Watts Bar Contract 76K61-87064 along with the rest of the penetrations covered in this binder and were transferred to Sequoyah as discussed in Sequoyah Binder SQNEQ-PENE-005.

Devices in Groups 1 through 5 are all served by 16 AWG copper conductors in these penetrations. Group 6 devices are served by RG 11A/U Triax.

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Group 1 switches are very similar to low voltage power and control devices due to their applications, such as 120 volts at 1 amp. A minimum insulation resistance of 1.8×10^5 ohms is acceptable for these applications. Group 5 acoustic monitors do not have accuracy requirements that would be adversely affected by a penetration insulation resistance of 1.8×10^5 ohms minimum. See Binder WBNEQ-IXT001.

For Groups 2, 3, 4, and 6, adequacy of penetration DBA insulation resistance is an open item.

Penetration coax conductors, thermocouple conductors, and 14 AWG conductors do not serve any Category A or B divisional devices and therefore they have no DBA electrical requirements.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. See sheet 19A.

(1) Normal Max

(a) Temperature (°F) 110

(b) Pressure (psig) 0.3

(c) Humidity (%) 80

(d) Radiation (rd) 2×10^7

(2) Abnormal Max

(a) Temperature (°F) 130

(b) Pressure (psig) 0.3

(c) Humidity (%) 100

(d) Radiation (rd) NA

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: Up to 8 hours per excursion and occurring less than 1% of plant life. 20°F difference in maximum temperature for this time period is negligible.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 327 Accident type LOCA/HELB

(b) Pressure (psig) 12.3 Accident type LOCA/HELB

(c) Humidity (%) 100 Accident type LOCA/HELB

(d) Radiation (rd) 1.5×10^7 gamma, 3.8×10^7 beta Accident type LOCA

(e) Spray Type Chemical* Accident type LOCA/HELB

*0.1844 molar H_3BO_3, 0.033 molar NaOH, pH 8.35.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

One end of each penetration is exposed to annulus environment. Containment ends are in lower compartment (outermost small rooms), lower compartment instrument room, or upper compartment. Parameters shown are worst case. See sheet 19A.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? No (Reference IPS-752, sections 5.14.3 and 5.14.5).

(7) Subject to submergence (yes/no/NA)? No
(Reference Calculation (NEB 840120 220), maximum Containment Water Level for Flood Elevation (el 717.7 outside crane wall where penetrations are located), and binder TAB A for penetration elevation Also see drawing 45N860-3 in binder TAB E, Section E-2, field verification binder TAB F for location).

Identify initiation time and duration of submergence: NA

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See Sheet 19B	

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AREA/ENVIRONMENTAL DWG

	UPPER COMPARTMENT (47E235-41)	LOWER* COMPARTMENT (47E235-42)	ANNULUS (47E235-44)	INSTRUMENT ROOM (47E235-45)
Max Normal Temperature, °F	110	105 (1)	95 (2)	75
Max Abnormal Temperature, °F	120	130	120	120
Max Normal Pressure, PSIA (PSIG)	14.7 (0.3)	14.7 (0.3)	ATM	14.7 (0.3)
Max Abnormal Pressure, PSIA (PSIG)	14.7 (0.3	14.7 (0.3)	ATM	14.7 (0.3)
Max Normal R.H. %	80	80	80	60
Max Abnormal R.H. %	90	100	90	90
40-Yr Normal Radiation, Rads	1×10^6 gamma(4)	2×10^7 gamma	1×10^6 gamma(4)	3.5×10^5 gamma(4)
Peak Accident Temperature, °F	160	327	134	327
Peak Accident Pressure, PSIG	12.3	12.3	ATM	12.3
Accident Radiation, Rads	1.5×10^7 gamma(6) 3.8×10^7 beta (3)	1×10^7 gamma(7) 3.8×10^7 beta (3)	$1.2 \cdot 10^7$ gamma plus beta (5)	1×10^7 gamma 3.8×10^7 beta (3)
Total 40-Year Plus Accident Radiation, Rads	5.4×10^7 gamma plus beta	6.8×10^7 gamma plus beta	1.3×10^7 gamma plus beta	4.8356×10^7 gamma plus beta

*Fan rooms and accumulator rooms (outermost small rooms).

(1) Documented average temperature. See calculation EQP-02.
(2) Documented average temperature. See calculation GENNAL4-001.
(3) Open Item. See QIR request EQP86089
(4) See Calculation GENNAL3-001.
(5) See Calculation GENNAL3-004.
(6) See Calculation TI-RPS-48, Sheet 7.19.
(7) See Calculation TI-RPS-48, Sheet 7.21.

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Special Environmental Calculations

WBNNAL3-004 - Accident Dose Inside Reactor Building (B45 860205 235).

TI-RPS-48(R2) - Integrated Accident Dose Inside Primary Containment (B45 851105 235).

GENNAL3-001 - Normal Radiation Dose (B45 851117 235).

GENNAL4-001 - SQN and WBN Annulus Temperature Analysis (B45 860317 237).

Maximum Containment Water Level (NEB 840120 220).

GENNAL3-002 - Reduction of Beta Dose by Sheet Steel (B45 860423 235).

EQP-02 - Average Temperature for Rooms Inside Lower Containment (B71 860402 200).

GENNAL3-013 - Beta Dose Reduction from Finite Volume (B45 860624 235).

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	IPS-752 Reference
Operating Time	100 days	13 days,15 days	Fig. 5.14.2 & 5.14.3
Temperature (°F)	327	400,395	Fig. 5.14.2 & 5.14.3
Pressure (psig)	12.3	70,80	Fig. 5.14.2 & 5.14.3
Relative Humidity (%)	100	100,100	Fig. 5.14.2 & 5.14.3
*Chemical Spray	2000 ppm boron and NaOH, pH 8.2	6200 ppm boron 50 ppm Hydrazine & Trisodium Phosphate, pH 9.23	Section 5.14.10.2
**Radiation (rd)	6.8×10^7 gamma plus beta	0.989×10^8 gamma (air) 1.709×10^8 gamma (air)	5.7.16 & 5.7.22
Submergence	None	None	NA

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	IPS-752 Reference
Temperature	Yes	Fig. 5.14.2 & 5.14.3
Pressure	Yes	Fig. 5.14.2 & 5.14.3
Relative Humidity	Yes, See Sheet 20.B	Fig. 5.14.2 & 5.14.3
Chemical Spray	NA	Section 5.14.10.2
Submergence	NA	NA

JUSTIFICATION/COMMENTS

L(1) Chemical Spray - Specified containment spray is 30 days and the flow rate is 0.92 gpm/ft^2. Spray chemistry varies with

JUSTIFICATION/COMMENTS (Continued)

time. Parameters shown are a composite resultant concentration. All of these penetrations are enclosed in junction boxes and are not subject to direct chemical spray impingement. All penetrations except No. 25 (which is nondivisional) are additionally protected from chemical spray by the concrete floor slab above them. These physical barriers negate the effect of spray flow rate and difference in spray chemistry. Also see TAB B, sheet 7A, Justification/Comments for G(1)(e) and G(2).

L(1) Radiation - Worst case total radiation is in lower compartment. See Sheet 19A.

L(2) Temperature - As is seen in TAB C, Section C-1, Report WAC-70, the test profiles do not envelop the WBN accident profile for approximately the first 100 seconds. This exists due to starting at a lower temperature and the difficulty in getting the temperature to rise in the steam chamber as fast as the WBN accident profile does, a common problem in steam tests. Report WAC-70 does not include the first test temperature transients. This extra transient and the significantly higher test temperatures compensate for the slightly slower transient rise times. Also, as noted in IPS-752, Section 5.14.10.1, testing without a terminal box is more severe than with the box due to thermal lag and dew point effects, associated with the box. Thus, this small deviation in the profiles for the the first few seconds is not significant.

BINDER NO. WBNEQ-PENT-003 PLANT WBN UNIT(S) 1 SHEET 20B OF 29

BINDER TITLE CONAX ELECTRICAL COMPUTED DDJ DATE 9/15/86 R ___ R ___

PENETRATION, INSTRUMENTATION & INDICATION CHECKED [illegible] DATE 9.18.86

L(2) Relative Humidtiy - Conax test reports do not state the humidity in the environmental chamber during DBE testing. The relative humidity was not maintained at 100% throughout the entire tests conducted by Conax, but did occur at various times. Because the test profiles were a combination of both the LOCA and HELB conditions, saturated steam, obviously, could not be the test medium throughout. However, portions of the tests were performed under saturated steam, while the HELB conditions were simulated by low humidity superheated steam. Both the temperatures and pressures used throughout the tests were well in excess of maximum Watts Bar values which is conservative for electrical penetrations.

TVA 19537 (OE-3-86)

EQP162.63

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	73°F, 68°F	Yes
Pressure: +10% but no more than 10 psig	57.7, 67.7 psig	Yes
Radiation: +10% of accident dose	>10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	See Note 1	Yes
Voltage: ±10% of rated value	See Note 2	Yes
Frequency: ±5% of rated value	0	No
Environmental Transient: the initial transient and the peak temperature applied twice	Transient applied twice	Yes
(Seismic) Vibration: +10% added to acceleration	+10%	Yes

JUSTIFICATION/COMMENTS: Electrical penetrations are not frequency sensitive in this range and frequency margin is not required by IEEE 317-1976.

Note 1: Material Aging Calculation Report WAC-70 in binder TAB C shows the time margin (conservatism factor) far exceeds 10%.

Note 2: Voltage margin was 150% of maximum plant voltage for size 16 AWG and 14 AWG conductors used for instrumentation and indication service. Margin was 0 for coax and triax conductors. See discussion on sheet 17A.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference IEEE 317-1976).

JUSTIFICATION/COMMENTS Maintain pressure boundary and electrical integrity.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference IPS-752, Sec. 5.14.3, 5.14.4, 5.14.5, and 5.14.6).

JUSTIFICATION/COMMENTS

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference IPS-752, Sec. 5.14.3, 5.14.4, 5.14.5, 5.14.6).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference IPS-752, Sec. 5.14.10.1.C).

JUSTIFICATION/COMMENTS Tests were for 13 and 15 days. See analysis extending time to 100 days in IPS-752, Sec. 5.14.10.1.C.

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference).

JUSTIFICATION/COMMENTS No anomalies were reported in IPS-752 for test data bases three and four. IPS-585.2, Sec. 5.2.6.6.1 does report shipping damage that was the probable cause of eventual problems with the 14 AWG feedthru in test data base four; see IPS-752, Sec. 5.3.3.1. This is reasonable since no problems were experienced with the 16 AWG feedthru of the same design and construction. Also 14 AWG feedthru was included in test data base one and was fully qualified as documented in IPS-752. At Watts Bar 14 AWG conductors do not serve any Category A or B divisional or Devices. See Sheets 17 through 17B. The minimum measured insulation resistance for 16 AWG during DBE was 1.8×10^5 ohm. Adequacy of this value for WBN applications is an open item. RG-59 coax and thermocouple conductor types do not serve any Category A or B divisional devices and their DBA electrical characteristics do not need to be addressed.

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See TAB G - QMDS.

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA (No exceptions taken)
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA (Preaging performed)
(d) Materials susceptible to thermal/radiation aging identified?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA (See TAB B Sec. L(2))
(11) Criteria regarding submergence satisfied?	NA (Penet. not submerged)
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA (Penet. qualified for 100 days)
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

Conax Report IPS-752 is the qualification document for these penetrations. The penetrations contain the identical possible leakage paths, leak mechanisms, feedthru concepts, seals, insulation systems, and materials as the test data base penetrations number three and four described in IPS-752. Detailed raw test data for the tested assemblies is contained in IPS-585.2 and IPS-585.4. IPS-752 is a

P. DISCUSSION (Continued)

summary document of the reports on the tested assemblies. It is a very thorough summary and is the document submitted by Conax Corporation as the key qualification report for the subject penetration assemblies.

SUPPLEMENT 3
COMPONENT-UNIQUE CHECKLIST
ELECTRICAL PENETRATIONS

EQUIPMENT IDENTIFICATION

(1) Are the penetrations identified in the qualification program identical to the plant penetrations which require qualification (yes/no/NA)? No

Item	Plant	Report	Acceptable Yes/No/NA	IPS-752 Report Section
(a) Penetration type	Instrm.& Indication	Instrm.& Indication	Yes	Tables 4.3&4.4
(b) Mounting	Welded	Welded & Bolted	Yes	Tables 4.3&4.4
(c) External connections	Connectors or Splices	Connectors or Splices	Yes	Tables 4.3&4.4

Comments: Conax test was of similar items with supporting analysis per IPS-752, Sec. 1.0. TVA provides the in-line splices.

(2) Does the qualification report identify the following performance characteristics:

Performance Characteristics	Acceptable (Yes/No/NA)	IPS-752 Report Section
(a) Temperature rating	Yes	5.7.24.2
(b) Voltage rating	Yes	5.4.3 & 5.4.4
(c) Continuous current rating	NA	5.9.4
(d) Short-time overload current rating & duration	NA	5.10.3
(e) Rated short circuit current & duration	NA	5.11.3
(f) Pressure rating	Yes	5.1 & 5.2

EQUIPMENT IDENTIFICATION (Continued)

Performance Characteristics	Acceptable (Yes/No/NA)	IPS-752 Report Section
(g) Maximum gas leakage rate	Yes	5.1.3 & 5.1.4

Comments: ____

(3) Does the Qualification program address the following tests:

Item	Acceptable Yes/No/NA	IPS-752 Report Section
(a) Continuous current rating	NA	5.9.4
(b) Short-time overload current rating and duration	NA	5.10.3
(c) Short circuit current rating and duration	NA	5.11.3
(d) Rated maximum duration of rated short circuit current	NA	5.15.6
(e) Pneumatic pressure rating	Yes	5.2
(f) Maximum gas leakage rate	Yes	5.1.3 & 5.1.4
(g) Conductor continuity	Yes	5.3.1
(h) Dielectric strength	Yes	5.4.3 & 5.4.4
(i) Impulse	NA	NA
(j) Insulation resistance	Yes	5.5.3 & 5.4.4
(k) Flame	Yes	6.3

Comments: Impulse tests not require for low voltage penetrations per IEEE 317-1976.

TAB A-EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WORK: PENT-004
MANUFACTURER: (MAI CORPORATION
PAGE: 1

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/BAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PENT-293-0055	1-55-1	PERSONNEL AIRLOCK ELEC PENETRATION	7205-10000-01		062-00	713'00"	A09	81K69-828971	LOCA MELB	B B	1000 1000	MAINTAIN PRESSURE BOUNDARY
WBN-1-PENT-293-0056	1-56-1	PERSONNEL AIRLOCK ELEC PENETRATION	7205-10000-01		255-00	757'00"	A12	81K69-828971	LOCA MELB	B B	1000 1000	MAINTAIN PRESSURE BOUNDARY

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R_____ ____ R_____

PREPARER/DATE CWThomas 5-20-86 _____ ____ _____

CHECKER/DATE WBKirk 5/28/86 _____ ____ _____

BINDER NO. WBNEQ-PENT-004 PLANT WBN UNIT(S) 1 SHEET 1 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATIONS - AIRLOCK COMPUTED AWT DATE 5/20/86 CHECKED WBK DATE 5/28/86 R R

A. DOCUMENTATION

Equipment Description Electrical Penetrations - Airlock

Vendor/Manufacturer Conax Corporation

Equipment Model No.(s) 7205-10000-01

QUALIFICATION REPORTS (Continued on sheet 1A)

(1) Title/Number/Revision "Design Qualification Report for Electric Penetration Assemblies-Airlock for Watts Bar Nuclear Plant Units 1 and 2"/IPS-757/Original RIMS EEB 811223 308 DATE November 25, 1981

(2) Title/Number/Revision "Design Qualification Material Test Report for Materials Used in Conax Electric Penetration Assemblies and Electric Conductor Seal Assemblies"/IPS-325/Rev. D RIMS EEB 811221 303 DATE May 14, 1981

(3) Title/Number/Revision "Design Qualification Test Report For a Conax Instrumentation Service Classification Conductor Module to the Requirements of IEEE Standard 317-1976 and NRC Reg. Guides 1.63 and 1.100"/ IPS-353.1/Rev. B. RIMS EEB 811221 309 DATE March 10, 1981

(4) Title/Number/Revision "Design Qualification Test Report For a Conax Low Voltage Control Service Classification Conductor Module to the Requirements of IEEE Standard 317-1976 and NRC Reg. Guides 1.63 and 1.100"/IPS-353.2/Rev. A. RIMS EEB 811221 305 DATE March 10, 1981

(5) Title/Number/Revision "Design Qualification Test Report of a Low Voltage Power and Control Service Classification Electric Penetration Assembly for Class 1E Service in BWR and PWR Containment Structures"/IPS-585.3/Rev. A. RIMS EEB 811221 307 DATE February 10, 1981

BINDER NO. WBNEQ-PENT-004 PLANT WBN UNIT(S) 1 SHEET 1A OF 29
R R

BINDER TITLE CONAX ELECTRICAL COMPUTED AWT DATE 9/4/86

PENETRATIONS - AIRLOCK CHECKED WBK/DAK DATE 9/4/86

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(1) Title/Number/Revision "Design Qualification Material Test Report For Materials Used In Conax Nuclear Products For Service In Nuclear Power Generating Stations"/IPS-325/Rev. E (See TAB E). RIMS EEB 841029 302 DATE August 16, 1984

(2) GENNAL3-001: "Doses for Equipment Qualification for all Shield Building Spaces." (B45 851117 235) (See TAB E).

(3) TI-RPS-48 R2: "Integrated Accident Dose Inside Primary Containment." (B45 851105 235) (See TAB E).

(4) WBNOSG4-44: "Flooding in Auxiliary Building Due to Postulated Pipe Breaks." (B45 860110 218) (See TAB E).

(5) "Maximum Containment Water Level" Calculation (NEB 840120 220) (See TAB E).

(6) Watts Bar Nuclear Plant Environmental Drawings 47E235-06R1, 47E235-41R0, 47E235-42R1, and 47E235-00R0.

(7) TVA Drawing No. 44N240R4 - "Personnel Access Lock Arrangement and Details" (See TAB E).

(8) TVA Drawing Nos. 45A824-1R0 and 45A828-1R0 - Wire Termination Lists (See TAB E).

(9) Conax Drawing Nos. 7205-10000, Rev. A, and PL7205-10000, Rev. 0.

(10) Conax Corporation Certificates of Conformance (EEB 820114 312 and EEB 820114 310) (See TAB E).

(11) INPO Operating Experience Review 85-004: Solvent Damage to Containment Electrical Penetration Seals (L33 850729 802) (See TAB E).

(12) WBNNAL3-004: "Accident Dose Inside Reactor Building." (B45 860205 235) (See TAB E).

(13) QIR NEB86106: "Location-Specific Accident Dose-Electrical Penetrations." (B45 860807 253) (See TAB E).

BINDER NO. WBNEQ-PENT-004 PLANT WBN UNIT(S) 1 SHEET 2 OF 29

R ___ R ___

BINDER TITLE CONAX ELECTRICAL COMPUTED AWT DATE 9/4/86

PENETRATIONS - AIRLOCK CHECKED WBK/BRK DATE 9/4/86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

1. Field verification is not complete.

2. Electrical Penetration Protection Analysis is not complete.

COMMENTS/RECOMMENDATIONS See Tab C for extension of post-accident operating time qualification from 30 days to 100 days.

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS Contract date: July 28, 1981

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 317-1976; "Standard for Electrical Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations."

IEEE 323-1974; "Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations."

NRC Reg. Guide 1.63, Rev. 2, July 1978; "Electrical Penetration Assemblies in Containment Structures for Light-Water-Cooled Nuclear Power Plants."

BINDER NO. WBNEQ-PENT-004 PLANT WBN UNIT(S) 1 SHEET 4 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATIONS - AIRLOCK COMPUTED AWT DATE 6/11/86 R R

CHECKED WBK DATE 6/12/86

D. QUALIFICATION METHODOLOGY (Check only one block)

____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS Conax Qualification Report IPS-757 is the principal qualification document for these airlock penetrations. It is a summary document of tests done on data base penetrations as described in Conax reports IPS-353.2, IPS-353.1 and IPS-585.3. Test Data Base One, a low-voltage control penetration described in IPS-353.2, is the primary data base used for qualification, with supplemental data on a low-voltage instrumentation assembly provided in IPS-353.1. IPS-585.3 was primarily used by Conax to document installation weld testing for the airlock penetrations which are a welded header design. The subject airlock penetrations are considered low-voltage power penetrations which contain the identical possible leakage paths, leak mechanisms, feed-thru concepts, seals, insulation system, and materials as the data base penetrations described in IPS-757. See Tab B, section P for further discussion.

BINDER NO. WBNEQ-PENT-004 PLANT WBN UNIT(S) 1 SHEET 5 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATIONS - AIRLOCK COMPUTED AWT DATE 5/20/86 R ___ R ___

CHECKED WBK DATE 5/28/86

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Electrical Penetration	Same	IPS-757, Sec. 1.1
(2) Manufacturer	Conax Corporation	Same	IPS-757, Sec. 1.0
(3) Model Number(s)	7205-10000-01 (LVP)	7641-10000-01 (LVI)	IPS-757, Sec. 4.1
		7508-10003-01 (LVC)	IPS-757, Sec. 5.6.2.4
		7508-10003-01 (LVP/C)	IPS-757, Sec. 5.6.2.6
(4) Serial Number(s)	1922	-	Certificate of Conformance Tab E
	1920		Certificate of Conformance Tab E

(5) Identify Component-Unique checksheet attached: See Supplement 3 of Tab B.

JUSTIFICATION/COMMENTS Qualification report IPS-757 documented qualification by analysis and comparison to similar penetration assemblies previously qualified by type tests conducted at levels equal to or more severe than TVA specified requirements.

BINDER NO. WBNEQ-PENT-004 PLANT WBN UNIT(S) 1 SHEET 6 OF 29

BINDER TITLE CONAX ELECTRICAL COMPUTED AWT DATE 5/20/86 R R

PENETRATIONS - AIRLOCK CHECKED [illegible] DATE 5/28/86

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS; if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	NA
External Process Connections	NA	NA	NA
Electrical Connections	In-line splices	NA	NA
Conduit Seals	NA	NA	NA
Connector Seals	NA	NA	NA
Orientation	NA	NA	NA
Physical Configuration	NA	NA	NA
Other	NA	NA	NA

JUSTIFICATION/COMMENTS Penetration wiring is non-safety related, therefore qualification of the in-line splices is not a concern. Splices were furnished by TVA.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	No	See Below
(b) Baseline performance measurements taken	Yes	IPS-757, Secs. 5.1-5.5
(c) Equipment aged:		
Thermal	Yes	IPS-757, Sec. 5.6.1(4)
Radiation	Yes	IPS-757, Sec. 5.6.1(5)
Wear	No	See Below
(d) Vibration/seismic testing conducted	Yes	IPS-757, Sec. 5.10
(e) Design basis event (DBE) exposure	Yes	IPS-757, Sec. 5.12
(f) Post-DBE exposure	Yes	IPS-757, Sec. 5.12
(g) Final inspection and disassembly	Yes	IPS-757 Sec. 5.12.2

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes

(Reference IPS-353.2, p. 37; IPS-353.1, p. 30; IPS-585.3, p. 32).

JUSTIFICATION/COMMENTS G(1)(a)-Conax does not implicitly state that an initial visual inspection for damage was done. However, Conax has completed numerous successful test programs and there is no reason to believe visual inspection was not done. G(1)(c)-Penetrations are passive devices and are not subject to wear as an aging mechanism. The penetrations, however, were subjected to simulated operational

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G. TEST SEQUENCE (Cont'd)

stresses which included thermal cycling (IPS-757, Sec. 5.6) and short time overload and fault current tests (IPS-757, Secs. 5.8 and 5.9), as recommended by IEEE 317-1976.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference IPS-757, Sec. 5.6).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	IPS-757, Sec. 5.6.1(4)
Radiation exposure	Yes	IPS-757, Sec. 5.6.1(5)
Vibration (non-seismic) aging	No	See Below
Operational (electrical/mechanical/process) stress aging	Yes	IPS-757, Sec. 5.6.1(3)

JUSTIFICATION/COMMENTS H(2)-Vibration aging not required by IEEE 317-1976. See sheet 9a.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS A literature review of applicable materials data for the materials of construction for the airlock electrical penetrations revealed no known synergistic effects.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference IPS-757, Sec. 5.6.2.3).

JUSTIFICATION/COMMENTS Aging based on materials tests and analyses done in IPS-325 by Conax.

H(2) Vibration (non-seismic) Aging:

Conax states in IPS-757, Sec. 5.6.1(1.A) that "Test Data Base One was shipped via motor express from Conax to Isomedix in New Jersey and returned to Conax, a round trip of approximately 1000 miles. A mechanical recording accelerometer which records shocks and impacts in three mutually perpendicular axes measured impact forces of the Test Data Base ranging from 7.7 to 29.5 g's." These forces far exceed installed vibration forces.

H. AGING (Continued)

(4)(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: IPS-325, Table 3.1 and IPS-757, Table 3.2.).

JUSTIFICATION/COMMENTS

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference IPS-757, Sec. 5.6.2.3).

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference IPS-757, Sec. 5.6.2.3).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	120°F	255°F	210.4°F
Time	40 yrs.	169 hrs.	>40 yrs.

JUSTIFICATION/COMMENTS See Sheet 9A.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference IPS-757, Sec. 5.6.2.3).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference IPS-325, Sec. 2.0 and Appendix A).

JUSTIFICATION/COMMENTS

H(4)(d) Aging:

The age conditioning curve at 70°C shown on IPS-757, Figure 5.6.1 shows a 40-year qualified life at 70°C (158°F). This is far greater than the plant maximum normal temperature inside the personnel access airlocks (120°F max.) and therefore a greater than 40-year qualified life is established for the subject Watts Bar personnel access airlock electrical penetrations. Accounting for possible internal heat rise due to electrical operation of the penetrations, Conax Test Data Base One was age-conditioned for 169 hours at 124°C (255°F) which was equivalent to a 40-year service temperature of 99.13°C (210.4°F) as shown by figure 5.6.1.

Conax document IPS-325 covers an ongoing test program. A newer revision of IPS-325 (Rev. E) shows the latest Conax calculation of activation energy for their feed-thrus is 3.916 eV, which agrees closely with the regression lines presented in IPS-757, figure 5.6.1. Refer to Binder Tab E, IPS-325, Rev. E, page 26.

H. AGING (Continued)

(4)(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes

(Reference IPS-325, Appendix A, Sec. 2.0).

JUSTIFICATION/COMMENTS

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Aging time/temperature conditions were sufficient to account for any internal heat build-up due to electrical operation of the penetrations.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes

(Reference IPS-757, Sec. 5.6.1(5)).

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes
(Reference IPS-325, Table 3.1 and IPS-757, Table 3.2.

JUSTIFICATION/COMMENTS

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes
(Reference IPS-757, Sec. 5.6.1(5)).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference IPS-757, Sec. 5.6.1(5)).

Plant normal ambient radiation dose (rd) 1.0E + 06

Test exposure dose (rd) 2.238E + 08

Test exposure dose rate (rd/hr) 2.04E + 06

Test exposure source type (e.g., Co-60 gamma) Co-60 gamma

JUSTIFICATION/COMMENTS

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No (Reference See Sheet 8a).

JUSTIFICATION/COMMENTS

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS No vibration aging done.

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference IPS-757, Secs. 5.6.1(3), 5.7, 5.8, and 5.9).

JUSTIFICATION/COMMENTS Thermal cycle test, continuous current test, short circuit current test, and short time overload test.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference IPS-757, Sec. 5.6.1(3)).

JUSTIFICATION/COMMENTS

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference IPS-757, Sec. 8.0).

Qualified life (Document in QMDS) 40 years

JUSTIFICATION/COMMENTS See comments in H(9), Sheet 13.

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? No (Reference NA).

Replacement Intervals (Document in QMDS) None required.

Penetrations qualified for expected life of plant.

JUSTIFICATION/COMMENTS IPS-757, Sec. 8.0 states that "materials as used in Conax electric penetrations are not susceptible to any significant degradation due to thermal or radiation effects and that no age or service-related common failure modes exist that would preclude a qualified life of 40 years."

BINDER NO. WBNEQ-PENT-004 PLANT WBN UNIT(S) 1 SHEET 14 OF 29

BINDER TITLE CONAX ELECTRICAL PENETRATIONS - AIRLOCK COMPUTED AWT DATE 5/20/86 R R

CHECKED [illegible] DATE 5/28/86

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Polysulfone/Mechanical/ Feed-thru Sealant	NA	NA	NA	NA
(b)	Kapton Polyimide Film/ Electrical/Conductor Insulation	NA	NA	NA	NA
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS

Penetration feed-thru sealant and conductor insulation materials are considered susceptible to thermal and radiation degradation implicitly when test programs are developed based on IEEE 317-1976 guidelines. Testing was done in accordance with IEEE 317-1976 and test program included tests on insulation and sealant materials. No materials analysis required.

TVA 19537 (OE-3-86)

EQP069.23

BINDER NO. WBNEQ-PENT-004 PLANT WBN UNIT(S) 1 SHEET 15 OF 29

BINDER TITLE CONAX ELECTRICAL COMPUTED AWT DATE 5/20/86 R R

PENETRATIONS - AIRLOCK CHECKED WBR DATE 5/28/86

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? No (Reference NA).

Identify Acceptance Criteria: Gas leak rate less than 1.0E-06 scc/sec excluding aperture seal(s) (pre-DBE exposure), and less than 1.0E-02 scc/sec including aperture seal(s) (post-DBE exposure), per IEEE 317-1976, Sections 5.1.4, 5.1.5, 6.4.13, and 8.3

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference IPS-757, Secs. 5.1-5.5, and and 7.1-7.5).

Identify baseline and functional testing: gas leak rate, dielectric strength, insulation resistance, conductor continuity

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference IPS-757, Sec. 5.12.1.1).

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Baseline testing and subsequent functional tests consisted of dielectric strength and insulation resistance measurements which provide an indication of penetration insulated conductor condition but are not the actual voltage and load carried by the penetration conductors in service in the plant. The tests were in accordance with IEEE 317-1976. The demonstration of the penetrations to perform its intended mechanical integrity safety function was accomplished during the accident test.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	NA	NA
Load	NA	NA
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS Frequency: Cables are not frequency sensitive. Accuracy: Cables have no accuracy requirements. Penetrations are not required to function electrically during an accident; therefore, accident voltage and load conditions are not specified.

(b)

Parameter	Demonstrated Conditions	Reference
Voltage	600 Vac	IPS-757, Sec. 5.12.1.1
Load	6 amps	IPS-757, Sec. 5.12.1.1
Frequency	60Hz	IPS-353.1, Sec. 5.1
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS See comments in J(5)(a) concerning frequency and accuracy.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. See Sheet 19A

(1) Normal Max

(a) Temperature (°F) 120

(b) Pressure (psig) 0.3

(c) Humidity (%) 80

(d) Radiation (rd) 1.0E + 06

(2) Abnormal Max

(a) Temperature (°F) 130

(b) Pressure (psig) 0.3

(c) Humidity (%) 100

(d) Radiation (rd) NA

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions:

Up to eight hours per excursion and occurring less than 1% of plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 327 Accident type LOCA/HELB

(b) Pressure (psig) 12 Accident type LOCA/HELB

(c) Humidity (%) 100 Accident type LOCA/HELB

(d) Radiation (rd) 1.8E+06 gamma 5.6E+06 beta Accident type LOCA

(e) Spray Type Chemical Accident type LOCA/HELB

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

See Sheet 19A.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? No (Reference IPS-757, Secs. 5.12.1.2 and 5.12.4).

(7) Subject to submergence (yes/no/NA)? No (Reference Tab A, Calculation WBNOSG4-44 (B45 860110 218), and "Maximum Containment Water Level" Calculation (NEB 840120 220)).

Identify initiation time and duration of submergence: NA

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
See Sheet 19A	

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Environmental parameters are taken from the following sources:

1. GENNAL3-001 — Normal radiation dose (B45 851117 235).
2. 47E235-42 R1 — All temperatures, pressures, humidities, and chemical spray.
3. QIR NEB86106 — Location-specific accident dose-electrical penetrations (B45 860807 253)
4. WBNOSG4-44 — Flooding in auxiliary building due to postulated pipe breaks (B45 860110 218).
5. Maximum containment water level calculation (NEB 840120 220).

The references listed above provide the worst case environmental conditions for the subject airlock penetrations. The penetration located in the upper compartment containment airlock is bound by the conditions in the upper compartment (TVA dwg. 47E235-41 R0) on the inboard end and by the conditions in the reactor building access room 757-A12 (TVA dwg. 47E235-06 R1) on the outboard end. The penetration located in the lower compartment airlock is bound by the conditions in the lower compartment (TVA dwg. 47E235-42 R1) on its inboard end and by the conditions in the reactor building access room 713-A08 (mild environment per TVA dwg. 47E235-00 R0) on its outboard end.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 days	30 days	IPS-757, Fig. 5.12.1 & Fig. 5.12.2
Temperature (°F)	327	342	IPS-757, Fig. 5.12.1
Pressure (psig)	12	128	IPS-757, Fig. 5.12.2
Relative Humidity (%)	100	100	IPS-757, Sec. 5.12.1.3
*Chemical Spray	2000 ppm H_3BO_3 w/NaOH, pH 8.35	3000 ppm Borated H_2O w/ NaOH, pH=10.5, 24 hrs., 0.17gpm/ft^2	IPS-757, Sec. 5.12.1.2
**Radiation (rd)	8.4E+06 gamma + beta	2.238E + 08 gamma	IPS-757, Sec. 5.6.1(5)
Submergence	None	None	NA

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	IPS-757, Fig. 5.12.1
Pressure	Yes	IPS-757, Fig. 5.12.2
Relative Humidity	Yes	IPS-757, Sec. 5.12.1.3
Chemical Spray	Yes	IPS-757 Sec. 5.12.1.2
Submergence	NA	NA

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

JUSTIFICATION/COMMENTS See Tab C for operating time calculation. These penetrations are inside the airlocks at the auxiliary building wall and are not subject to direct chemical spray. The spray chemistry varies with time; values shown are total concentration considering all sources.

Conax spray testing was done concurrently with DBE exposure and was in accordance with requirements of IEEE 323-1974. This demonstrated spray testing and the protection afforded by being inside the airlocks near their ceiling demonstrates that the penetrations are impervious to chemical spray.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	+15°F	Yes
Pressure: +10% but no more than 10 psig	>+10%	Yes
Radiation: +10% of accident dose	>+10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	0	No
Voltage: ±10% of rated value	> 10%	See below
Frequency: ±5% of rated value	NA	NA
Environmental Transient: the initial transient and the peak temperature applied twice	same	Yes
Vibration: +10% added to acceleration	NA	NA

JUSTIFICATION/COMMENTS: Margins applied per IEEE 317-1976.

Frequency margin not applicable to low voltage power circuits.

See Tab C for dicussion concerning post-accident operating time.

Voltage: Test voltage of 600Vac is 125% of maximum nominal (480Vac) system operating voltage.

Vibration: Not required by IEEE 317-1976.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference See Section P of Tab B).

JUSTIFICATION/COMMENTS These penetrations have no electrical function during an accident and are required only to maintain containment pressure boundary integrity.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference IPS-757, Secs. 5.12.2 and 5.12.4).

JUSTIFICATION/COMMENTS

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference IPS-757, Secs. 5.12.2 and 5.12.4).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Functioned for 30 days. See Tab C for extension to 100 days operability.

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference IPS-353.2, Sec. 5.20 and IPS-585.3, Sec. 6.24).

JUSTIFICATION/COMMENTS Anomalies reviewed and determined acceptable.

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See Tab G for recommended surveillance and preventative maintenance procedures.

BINDER NO. WBNEQ-PENT-004 PLANT WBN UNIT(S) 1 SHEET 24 OF 29

BINDER TITLE CONAX ELECTRICAL COMPUTED AWT DATE 5/20/86 R R

PENETRATIONS - AIRLOCK CHECKED WBK DATE 5/28/86

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes
(11) Criteria regarding submergence satisfied?	NA (Not Submerged)
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

Conax report IPS-757 is the principal qualification document for these airlock penetrations. It is a summary document of tests done on data base penetrations as described in Conax reports IPS-353.2,

P. DISCUSSION (Continued)

IPS-353.1 and IPS-585.3. These penetrations are considered low-voltage power penetrations which contain the identical possible leakage paths, leak mechanisms, feed-thru concepts, seals, insulation system, and materials as the data base penetrations described in IPS-757. Airlock penetrations are located in the upper and lower compartment airlocks which provide personnel access to the primary containment from the auxiliary building. They are located in the airlock wall on the auxiliary building end of the airlocks and pass lighting, telephone, and indicating light circuits into the airlock from the auxiliary building. The penetrations' only safety function is to provide a containment pressure boundary in the event that the inner airlock (containment) door seal is compromised during an accident inside containment, at which time the penetrations would see containment accident conditions.

SUPPLEMENT 3
COMPONENT-UNIQUE CHECKLIST
ELECTRICAL PENETRATIONS

EQUIPMENT IDENTIFICATION

(1) Are the penetrations identified in the qualification program identical to the plant penetrations which require qualification (yes/no/NA)? No

Item	Plant	Report	Acceptable Yes/No/NA	IPS-757 Report Section
(a) Penetration type	LVP	LVP & C & thermo-couple	Yes	4.3
(b) Mounting	Welded	Welded	Yes	5.6.2.6
(c) External connections	in-line splices	NA	NA	NA

Comments: TVA provided in-line splices. Conax test was of similar items with supporting analysis, per IPS-757, Sec. 1.0.

(2) Does the qualification report identify the following performance characteristics:

Performance Characteristics	Acceptable (Yes/No/NA)	IPS-757 Report Section
(a) Temperature rating	Yes	5.7.4
(b) Voltage rating	Yes	3.1
(c) Continuous current rating	Yes	5.7 & 5.11
(d) Short-time overload current rating & duration	Yes	5.8
(e) Rated short circuit current & duration	Yes	5.9 & 5.13
(f) Pressure rating	Yes	5.1 & 5.2

EQUIPMENT IDENTIFICATION (Continued)

Performance Characteristics	Acceptable (Yes/No/NA)	IPS-757 Report Section
(g) Maximum gas leakage rate	Yes	5.1

Comments:

(3) Does the qualification program address the following tests:

Item	Acceptable Yes/No/NA	IPS-757 Report Section
(a) Continuous current rating	Yes	5.7 & 5.11
(b) Short-time overload current rating and duration	Yes	5.8
(c) Short circuit current rating and duration	Yes	5.9
(d) Rated maximum duration of rated short circuit current	Yes	5.13
(e) Pneumatic pressure rating	Yes	5.2
(f) Maximum gas leakage rate	Yes	5.1
(g) Conductor continuity	Yes	5.3
(h) Dielectric strength	Yes	5.4
(i) Impulse	NA	See Below
(j) Insulation resistance	Yes	5.5
(k) Flame	Yes	6.3

Comments: Impulse testing required only for medium voltage penetrations.

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WSAEQ-HS -001
MANUFACTURER: SQUARE D

EDIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAB	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -003-0116A/B -A	1-HS -003-0116A/B -A	HANDSWITCH	CLASS 9001	SA3		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -003-0116B/B -A	1-HS -003-0116B/B -A	HANDSWITCH	CLASS 9001	SA3		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -003-0126A/B -B	1-HS -003-0126A/B -B	HANDSWITCH	CLASS 9001	SA4		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -003-0126B/B -B	1-HS -003-0126B/B -B	HANDSWITCH	CLASS 9001	SA4		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -003-0136A/B -A	1-HS -003-0136A/B -A	HANDSWITCH	CLASS 9001	TA1		692'	A06	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -003-0136B/B -A	1-HS -003-0136B/B -A	HANDSWITCH	CLASS 9001	TA1		692'	A06	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -003-0179A/B -B	1-HS -003-0179A/B -B	HANDSWITCH	CLASS 9001	TA1		692'	A06	86922	L	B	100D	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDR 7/10/86 _____ _____ _____

CHECKER/DATE WEK 8/12/86 _____ _____ _____

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D
PAGE: 2 OF 27

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	AZ	ELEV*	RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -003-0179B/B -B	1-HS -003-0179B/B -B	HANDSWITCH	CLASS 9001	TA1		692'	A06	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -026-0240B -A	1-HS -026-0240B -A	HANDSWITCH	CLASS 9001	WA5		692'	A07	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -026-0241 -B	1-HS -026-0241 -B	HANDSWITCH	CLASS 9001	WA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -026-0242 -A	1-HS -026-0242 -A	HANDSWITCH	CLASS 9001	WA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -026-0243 -A	1-HS -026-0243 -A	HANDSWITCH	CLASS 9001	WA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -026-0244 -B	1-HS -026-0244 -B	HANDSWITCH	CLASS 9001	WA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -026-0245 -A	1-HS -026-0245 -A	HANDSWITCH	CLASS 9001	WA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0003 -A	1-HS -030-0003 -A	HANDSWITCH	CLASS 9001	VA3		692'	A07	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0006 -B	1-HS -030-0006 -B	HANDSWITCH	CLASS 9001	VA3		692'	A07	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0013 -A	1-HS -030-0013 -A	HANDSWITCH	CLASS 9001	UA1		713'	A06	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0018 -B	1-HS -030-0018 -B	HANDSWITCH	CLASS 9001	UA1		713'	A06	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0028 -A	1-HS -030-0028 -A	HANDSWITCH	CLASS 9001	UA3		737'	A05	B6922	L	B	100D	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARED/DATE HOR 7/10/86

CHECKED/DATE ARK 8/12/86

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HS-001

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBHEQ-HS -001
MANUFACTURER: SQUARE D
PAGE: 3 OF 27

EDIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -030-0029 -B	1-HS -030-0029 -B	HANDSWITCH	CLASS 9001	UA3		737'	A05	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0032 -A	1-HS -030-0032 -A	HANDSWITCH	CLASS 9001	XA5		729'	A08	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0033 -B	1-HS -030-0033 -B	HANDSWITCH	CLASS 9001	XA5		729'	A08	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0060 -A	1-HS -030-0060 -A	HANDSWITCH	CLASS 9001	VA11		757'	A16	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0069 -B	1-HS -030-0069 -B	HANDSWITCH	CLASS 9001	VA11		757'	A16	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0076 -A	1-HS -030-0076 -A	HANDSWITCH	CLASS 9001	TA11		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0079 -B	1-HS -030-0079 -B	HANDSWITCH	CLASS 9001	TA11		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0091 -A	1-HS -030-0091 -A	HANDSWITCH	CLASS 9001	UA11		737'	A01	832120	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0115 -A	1-HS -030-0115 -A	HANDSWITCH	CLASS 9001	TA5		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0116 -B	1-HS -030-0116 -B	HANDSWITCH	CLASS 9001	TA5		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0117 -A	1-HS -030-0117 -A	HANDSWITCH	CLASS 9001	TA5		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0118 -B	1-HS -030-0118 -B	HANDSWITCH	CLASS 9001	TA5		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D
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EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -030-0119 -A	1-HS -030-0119 -A	HANDSWITCH	CLASS 9001	IA5		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0120 -B	1-HS -030-0120 -B	HANDSWITCH	CLASS 9001	IA5		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0121 -A	1-HS -030-0121 -A	HANDSWITCH	CLASS 9001	IA5		729'	A08	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0124 -B	1-HS -030 0124 -B	HANDSWITCH	CLASS 9001	IA5		729'	A08	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0125 -A	1-HS -030-0125 -A	HANDSWITCH	CLASS 9001	IA5		729'	A08	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0128 -B	1-HS -030-0128 -B	HANDSWITCH	CLASS 9001	IA5		729'	A08	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0131 -A	1-HS -030-0131 -A	HANDSWITCH	CLASS 9001	IA5		729'	A08	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0132 -B	1-HS -030-0132 -B	HANDSWITCH	CLASS 9001	IA5		729'	A08	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0146B -A	1-HS -030-0146B -A	HANDSWITCH	CLASS 9001	VA5		737'	A05	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-2-HS -030-0157B -B	2-HS -030-0157B -B	HANDSWITCH	CLASS 9001	VA11		737'	A09	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0175 -A	1-HS -030-0175 -A	HANDSWITCH	CLASS 9001	WA6		676'	A11	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0176 -B	1-HS -030-0176 -B	HANDSWITCH	CLASS 9001	VA6		676'	A10	86922	L	B	100D	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

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PREPARER/DATE HOR 7/10/86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D
PAGE: 5 OF 27

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -030-0177 -A	1-HS -030-0177 -A	HANDSWITCH	CLASS 9001	UA6		676'	A09	86922	L	B	300	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0178 -B	1-HS -030-0178 -B	HANDSWITCH	CLASS 9001	TA6		676'	A08	86922	L	B	300	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0179 -B	1-HS -030-0179 -B	HANDSWITCH	CLASS 9001	VA7		692'	A12	86922	L	B	1000	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0180 -A	1-HS -030-0180 -A	HANDSWITCH	CLASS 9001	VA7		692'	A13	86922	L	B	1000	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0182 -B	1-HS -030-0182	HANDSWITCH	CLASS 9001	UA5		692'	A10	86922	L	B	1000	NO CHANGE IN CONTACT STATE
									RH/A	B	100	
									CV/A	B	100	
									AF	B	100	
									AB	B	100	
WBN-1-HS -030-0183 -A	1-HS -030-0183 -A	HANDSWITCH	CLASS 9001	UA4		692'	A09	86922	L	B	1000	NO CHANGE IN CONTACT STATE
									RH/A	B	100	
									CV/A	B	100	
									AF	B	100	
									AB	B	100	
WBN-1-HS -030-0186 -A	1-HS -030-0186 -A	HANDSWITCH	CLASS 9001	UA4		692'	A07	86922	L	B	1000	NO CHANGE IN CONTACT STATE
									RH/A	B	100	
									CV/A	B	100	
									AF	B	100	
									AB	B	100	
WBN-2-HS -030-0186 -A	2-HS -030-0186 -A	HANDSWITCH	CLASS 9001	UA12		692'	A25	86922	L	B	1000	NO CHANGE IN CONTACT STATE
									RH/A	B	100	
									CV/A	B	100	
									AF	B	100	
									AB	B	100	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D
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EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAB	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -030-0187 -B	1-HS -030-0187 -B	HANDSWITCH	CLASS 9001	VA4		692'	A07	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-2-HS -030-0187 -B	2-HS -030-0187 -B	HANDSWITCH	CLASS 9001	UA12		692'	A25	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -030-0190 -A	1-HS -030-0190 -A	HANDSWITCH	CLASS 9001	SA3		713'	A01	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -030-0191 -B	1-HS -030-0191 -B	HANDSWITCH	CLASS 9001	UA2		713'	A01	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-0-HS -030-0192 -A	0-HS -030-0192 -A	HANDSWITCH	CLASS 9001	WA7		737'	A01	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBREQ-HS -001
MANUFACTURER: SQUARE D

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	AZ	ELEV*	RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-0-HS -030-0193 -B	0-HS -030-0193 -B	HANDSWITCH	CLASS 9001	WA9		737'	A01	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -030-0194 -A	1-HS -030-0194 -A	HANDSWITCH	CLASS 9001	VA4		737'	A05	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-2-HS -030-0194 -A	2-HS -030-0194 -A	HANDSWITCH	CLASS 9001	VA12		737'	A09	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0195 -B	1-HS -030-0195 -B	HANDSWITCH	CLASS 9001	VA4		737'	A05	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-2-HS -030-0195 -B	2-HS -030-0195 -B	HANDSWITCH	CLASS 9001	VA13		737'	A09	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -030-0196 -A	1-HS -030-0196 -A	HANDSWITCH	CLASS 9001	VA2		713'	A06	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-2-HS -030-0196 -A	2-HS -030-0196 -A	HANDSWITCH	CLASS 9001	UA14		713'	A19	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D
PAGE: 8 OF 27

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RH/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -030-0197 -B	1-HS -030-0197 -B	HANDSWITCH	CLASS 9001	VA2		713'	A06	86922	L	D	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-2-HS -030-0197 -B	2-HS -030-0197 -B	HANDSWITCH	CLASS 9001	UA14		713'	A19	86922	L	D	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-2-HS -030-0200 -A	2-HS -030-0200 -A	HANDSWITCH	CLASS 9001	VA11		757'	A16	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0201 -A	1-HS -030-0201 -A	HANDSWITCH	CLASS 9001	UA2		692'	A07	86922	L	D	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-2-HS -030-0201 -A	2-HS -030-0201 -A	HANDSWITCH	CLASS 9001	UA15		692'	A25	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -030-0202 -B	1-HS -030-0202 -B	HANDSWITCH	CLASS 9001	UA2		692'	A07	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

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PREPARER/DATE 7/10/86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D
PAGE: 9 OF 27

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-2-HS -030-0202 -B	2-HS -030-0202 -B	HANDSWITCH	CLASS 9001	UA15		692'	A25	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-2-HS -030-0207 -B	2-HS -030-0207 -B	HANDSWITCH	CLASS 9001	WA11		757'	A16	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0214 -S	1-HS -030-0214 -S	HANDSWITCH	CLASS 9001	TA2		692'	A25	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0296 -A	1-HS -030-0296 -A	HANDSWITCH	CLASS 9001	YA11		729'	A04	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0297 -B	1-HS -030-0297 -B	HANDSWITCH	CLASS 9001	YA11		729'	A04	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0298 -B	1-HS -030-0298 -B	HANDSWITCH	CLASS 9001	YA11		729'	A04	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -030-0299 -A	1-HS -030-0299 -A	HANDSWITCH	CLASS 9001	YA11		729'	A04	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-0-HS -031-0049B -B	0-HS -031-0049B -B	HANDSWITCH	CLASS 9001	RA13		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-0-HS -031-0080 -A	0-HS -031-0080 -A	HANDSWITCH	CLASS 9001	RA4		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

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EQIS ID.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-0-HS -031-0096 -B	0-HS -031-0096 -B	HANDSWITCH	CLASS 9001	TA12		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AD	B	1MO	
WBN-0-HS -031-0400B -A	0-HS -031-0400B -A	HANDSWITCH	CLASS 9001	SA3		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AD	B	1MO	
WBN-1-HS -043-0002 -B	1-HS -043-0002 -B	HANDSWITCH	CLASS 9001	WA8		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AD	B	1MO	
WBN-1-HS -043-0002A -B	1-HS -043-0002A -B	HANDSWITCH	CLASS 9001	XA5		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AD	B	1MO	
WBN-1-HS -043-0003 -A	1-HS -043-0003 -A	HANDSWITCH	CLASS 9001	WA8		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AD	B	1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDR 7/10/86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D
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EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -043-0011 -B	1-HS -043-0011 -B	HANDSWITCH	CLASS 9001	WA8		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -043-0012 -A	1-HS -043-0012 -A	HANDSWITCH	CLASS 9001	WA8		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -043-0022 -B	1-HS -043-0022 -B	HANDSWITCH	CLASS 9001	WA8		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -043-0023 -A	1-HS -043-0023 -A	HANDSWITCH	CLASS 9001	WA8		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -043-0034 -B	1-HS -043-0034 -B	HANDSWITCH	CLASS 9001	WA8		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -043-0035 -A	1-HS -043-0035 -A	HANDSWITCH	CLASS 9001	WA8		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -043-0054D -B	1-HS -043-0054D -B	HANDSWITCH	CLASS 9001	VA7		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D
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EBIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAB	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -043-0055 -A	1-HS -043-0055 -A	HANDSWITCH	CLASS 9001	WA8		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -043-0056D -B	1-HS -043-0056D -B	HANDSWITCH	CLASS 9001	VA7		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -043-0058 -A	1-HS -043-0058 -A	HANDSWITCH	CLASS 9001	WA8		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -043-0059D -B	1-HS -043-0059D -B	HANDSWITCH	CLASS 9001	VA7		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -043-0061 -A	1-HS -043-0061 -A	HANDSWITCH	CLASS 9001	WA8		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -043-0063D -B	1-HS -043-0063D -B	HANDSWITCH	CLASS 9001	VA7		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -043-0064 -A	1-HS -043-0064 -A	HANDSWITCH	CLASS 9001	WA8		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -043-0075 -B	1-HS -043-0075 -B	HANDSWITCH	CLASS 9001	WA8		713'	A13	86922	L RH/A CV/A AF AB	B B B B B	100D 1MO 1MO 1MO 1MO	NO CHANGE IN CONTACT STATE
WBN-1-HS -043-0077 -A	1-HS -043-0077 -A	HANDSWITCH	CLASS 9001	WA8		713'	A13	86922	L RH/A CV/A AF AB	B B B B B	100D 1MO 1MO 1MO 1MO	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDR 7/10/86

CHECKER/DATE WRK 8/12/86

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WBNEQ-HS-001

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D
PAGE:13 OF 27

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	AZ	ELEV*	RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -062-0063B -A	1-HS -062-0063B -A	HANDSWITCH	CLASS 9001	WA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									AF	B	1MO	
WBN-1-HS -062-0090B -A	1-HS -062-0090B -A	HANDSWITCH	CLASS 9001	WA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -062-0091B -B	1-HS -062-0091B -B	HANDSWITCH	CLASS 9001	WA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -062-0098B -A	1-HS -062-0098B -A	HANDSWITCH	CLASS 9001	UA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -062-0099B -B	1-HS -062-0099B -B	HANDSWITCH	CLASS 9001	UA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -062-0108B -A	1-HS -062-0108B -A	HANDSWITCH	CLASS 9001	UA4		692'	A09	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDR 7/10/86 _____ _____ _____

CHECKER/DATE WRK 8/12/86 _____ _____ _____

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HS-001

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D
PAGE:14 OF 27

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -062-0132B -A	1-HS -062-0132B -A	HANDSWITCH	CLASS 9001	VA4		713'	A07	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -062-0133B -B	1-HS -062-0133B -B	HANDSWITCH	CLASS 9001	VA4		713'	A07	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -062-0135B -A	1-HS -062-0135B -A	HANDSWITCH	CLASS 9001	UA3		692'	A07	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -062-0136B -B	1-HS -062-0136B -B	HANDSWITCH	CLASS 9001	UA3		692'	A07	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -063-0001B -A	1-HS -063-0001B -A	HANDSWITCH	CLASS 9001	UA5		692'	A08	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
WBN-1-HS -063-0003B -A	1-HS -063-0003B -A	HANDSWITCH	CLASS 9001	UA5		692'	A08	B6922	L	B	100D	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE [illegible] 7/10/86

CHECKER/DATE [illegible] 8/12/86

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HS-001

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	AZ	ELEV*	RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -063-0004B -B	1-HS -063-0004B -B	HANDSWITCH	CLASS 9001	VA7		692'	A13	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0005B -B	1-HS -063-0005B -B	HANDSWITCH	CLASS 9001	UA5		692'	A08	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0006B -B	1-HS -063-0006B -B	HANDSWITCH	CLASS 9001	VA5		692'	A08	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0007B -A	1-HS -063-0007B -A	HANDSWITCH	CLASS 9001	VA5		692'	A08	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0008B -A	1-HS -063-0008B -A	HANDSWITCH	CLASS 9001	VA5		713'	A28	B6922	L RH/A	B B	100D 1MO	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0010B -A	1-HS -063-0010B -A	HANDSWITCH	CLASS 9001	VA7		692'	A13	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0011B -B	1-HS -063-0011B -B	HANDSWITCH	CLASS 9001	VA5		713'	A28	B6922	L RH/A	B B	100D 100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0015B -B	1-HS -063-0015B -B	HANDSWITCH	CLASS 9001	UA6		692'	A12	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0022B -B	1-HS -063-0022B -B	HANDSWITCH	CLASS 9001	WA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0025B -B	1-HS -063-0025B -B	HANDSWITCH	CLASS 9001	WA5		713'	A28	B6922	L RH/A CV/A AF AB	B B B B B	100D 1MO 1MO 1MO 1MO	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

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PREPARER/DATE 3/OR 7/14/86 _____ _____ _____

CHECKER/DATE WBK 8/12/86 _____ _____ _____

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D
PAGE:16 OF 27

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RH/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -063-0026B -A	1-HS -063-0026B -A	HANDSWITCH	CLASS 9001	WA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MD	
									CV/A	B	1MD	
									AF	B	1MD	
									AB	B	1MD	
WBN-1-HS -063-0047B -A	1-HS -063-0047B -A	HANDSWITCH	CLASS 9001	VA7		692'	A13	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0048B -B	1-HS -063-0048B -B	HANDSWITCH	CLASS 9001	UA6		692'	A12	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0072B -A	1-HS -063-0072B -A	HANDSWITCH	CLASS 9001	VA4		692'	A07	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MD	
									CV/A	B	1MD	
									AF	B	1MD	
									AB	B	1MD	
WBN-1-HS -063-0073B -B	1-HS -063-0073B -B	HANDSWITCH	CLASS 9001	VA4		692'	A07	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MD	
									CV/A	B	1MD	
									AF	B	1MD	
									AB	B	1MD	
WBN-1-HS -063-0093B -A	1-HS -063-0093B -A	HANDSWITCH	CLASS 9001	WA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0094B -B	1-HS -063-0094B -B	HANDSWITCH	CLASS 9001	WA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0152B -A	1-HS -063-0152B -A	HANDSWITCH	CLASS 9001	WA5		713'	A28	B6922	L	B	100D	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE [illegible] 7/10/86

CHECKER/DATE CWK 8/12/86

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D
PAGE:17 OF 27

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	AZ	ELEV*	RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -063-0153B -B	1-HS -063-0153B -B	HANDSWITCH	CLASS 9001	WA5		713'	A28	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0156B -A	1-HS -063-0156B -A	HANDSWITCH	CLASS 9001	WA5		713'	A28	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0157B -B	1-HS -063-0157B -B	HANDSWITCH	CLASS 9001	WA5		713'	A28	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0172B -B	1-HS -063-0172B -B	HANDSWITCH	CLASS 9001	WA5		713'	A28	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0175B -B	1-HS -063-0175B -B	HANDSWITCH	CLASS 9001	UA5		692'	A12	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -063-0177B -A	1-HS -063-0177B -A	HANDSWITCH	CLASS 9001	VA5		692'	A08	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-0-HS -065-0023B -A	0-HS -065-0023B -A	HANDSWITCH	CLASS 9001	VA11		757'	A16	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-0-HS -065-0042B -B	0-HS -065-0042B -B	HANDSWITCH	CLASS 9001	VA12		757'	A16	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -065-0080 -A	1-HS -065-0080 -A	HANDSWITCH	CLASS 9001	WA5		737'	A05	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -065-0082 -B	1-HS -065-0082 -B	HANDSWITCH	CLASS 9001	WA4		737'	A05	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -065-0090 -A	1-HS -065-0090 -A	HANDSWITCH	CLASS 9001	WA5		737'	A05	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -065-0097 -B	1-HS -065-0097 -B	HANDSWITCH	CLASS 9001	WA4		737'	A05	86922	L	B	100D	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HOR 2/10/86

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HS-001

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -067-0083B -A	1-HS -067-0083B -A	HANDSWITCH	CLASS 9001		006	725'	ANN	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									MS/C	B	100D	
									FW/C	B	100D	
									RH/C	B	1MO	
									CV/C	B	1MO	
WBN-1-HS -067-0088B -B	1-HS -067-0088B -B	HANDSWITCH	CLASS 9001		350	729'	ANN	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									MS/C	B	100D	
									FW/C	B	100D	
									RH/C	B	1MO	
									CV/C	B	1MO	
WBN-1-HS -067-0091B -A	1-HS -067-0091B -A	HANDSWITCH	CLASS 9001		190	728'	ANN	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									MS/C	B	100D	
									FW/C	B	100D	
									RH/C	B	1MO	
									CV/C	B	1MO	
WBN-1-HS -067-0096B -B	1-HS -067-0096B -B	HANDSWITCH	CLASS 9001		170	728'	ANN	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									MS/C	B	100D	
									FW/C	B	100D	
									RH/C	B	1MO	
									CV/C	B	1MO	
WBN-1-HS -067-0099 -B	1-HS -067-0099 -B	HANDSWITCH	CLASS 9001		170	728'	ANN	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									MS/C	B	100D	
									FW/C	B	100D	
									RH/C	B	1MO	
									CV/C	B	1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE DOR 7/10/86

CHECKER/DATE WJK 8/12/86

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EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBM-1-HS -067-0104B -A	1-HS -067-0104B -A	HANDSWITCH	CLASS 9001		190	729'	ANN	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									MS/C	B	100D	
									FW/C	B	100D	
									RH/C	B	1MO	
									CV/C	B	1MO	
WBM-1-HS -067-0107B -B	1-HS -067-0107B -B	HANDSWITCH	CLASS 9001		350	729'	ANN	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									MS/C	B	100D	
									FW/C	B	100D	
									RH/C	B	1MO	
									CV/C	B	1MO	
WBM-1-HS -067-0112B -A	1-HS -067-0112B -A	HANDSWITCH	CLASS 9001		006	725'	ANN	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									MS/C	B	100D	
									FW/C	B	100D	
									RH/C	B	1MO	
									CV/C	B	1MO	
WBM-1-HS -067-0123B -B	1-HS -067-0123B -B	HANDSWITCH	CLASS 9001	TA4		737'	A01	86922	L	B	1MO	NO CHANGE IN CONTACT STATE
WBM-2-HS -067-0123B -B	2-HS -067-0123B -B	HANDSWITCH	CLASS 9001	TA13		737'	A01	86922	L	B	1MO	NO CHANGE IN CONTACT STATE
WBM-1-HS -067-0124B -B	1-HS -067-0124B -B	HANDSWITCH	CLASS 9001	VA4		713'	A06	86922	L	B	1MO	NO CHANGE IN CONTACT STATE
WBM-2-HS -067-0124B -B	2-HS -067-0124B -B	HANDSWITCH	CLASS 9001	VA12		713'	A19	86922	L	B	1MO	NO CHANGE IN CONTACT STATE
WBM-1-HS -067-0125B -A	1-HS -067-0125B -A	HANDSWITCH	CLASS 9001	TA3		737'	A01	86922	L	B	1MO	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HOR 7/10/86 _____ _____ _____

CHECKER/DATE WMK 8/12/86 _____ _____ _____

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HS-001

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: ASCO

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-2-HS -067-0125B -A	2-HS -067-0125B -A	HANDSWITCH	CLASS 9001	TA11		737'	A01	B6922	L	B	1MO	NO CHANGE IN CONTACT STATE
WBN-1-HS -067-0126B -A	1-HS -067-0126B -A	HANDSWITCH	CLASS 9001	VA7		713'	A06	B6922	L	B	1MO	NO CHANGE IN CONTACT STATE
WBN-2-HS -067-0126B -A	2-HS -067-0126B -A	HANDSWITCH	CLASS 9001	TA12		713'	A19	B6922	L	B	1MO	NO CHANGE IN CONTACT STATE
WBN-1-HS -067-0130B -A	1-HS -067-0130B -A	HANDSWITCH	CLASS 9001		313	806'	ANM	B6922	L MS/C FW/C RH/C CV/C	B B B B B	100D 100D 100D 1MO 1MO	NO CHANGE IN CONTACT STATE
WBN-1-HS -067-0131B -B	1-HS -067-0131B -B	HANDSWITCH	CLASS 9001		316	806'	ANM	B6922	L MS/C FW/C RH/C CV/C	B B B B B	100D 100D 100D 1MO 1MO	NO CHANGE IN CONTACT STATE
WBN-1-HS -067-0133B -A	1-HS -067-0133B -A	HANDSWITCH	CLASS 9001		310	806'	ANM	B6922	L MS/C FW/C RH/C CV/C	B B B B B	100D 100D 100D 1MO 1MO	NO CHANGE IN CONTACT STATE
WBN-1-HS -067-0134B -B	1-HS -067-0134B -B	HANDSWITCH	CLASS 9001		320	806'	ANM	B6922	L MS/C FW/C RH/C CV/C	B B B B B	100D 100D 100D 1MO 1MO	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDR 7/10/86

CHECKER/DATE [illegible] 8/12/86

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HS-001

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -067-0138B -B	1-HS -067-0138B -B	HANDSWITCH	CLASS 9001		316	806'	ANN	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									MS/C	B	100D	
									FW/C	B	100D	
									RH/C	B	1MO	
									CV/C	B	1MO	
WBN-1-HS -067-0139B -A	1-HS -067-0139B -A	HANDSWITCH	CLASS 9001		310	806'	ANN	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									MS/C	B	100D	
									FW/C	B	100D	
									RH/C	B	1MO	
									CV/C	B	1MO	
WBN-1-HS -067-0141B -B	1-HS -067-0141B -B	HANDSWITCH	CLASS 9001		320	806'	ANN	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									MS/C	B	100D	
									FW/C	B	100D	
									RH/C	B	1MO	
									CV/C	B	1MO	
WBN-1-HS -067-0142B -A	1-HS -067-0142B -A	HANDSWITCH	CLASS 9001		310	806'	ANN	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									MS/C	B	100D	
									FW/C	B	100D	
									RH/C	B	1MO	
									CV/C	B	1MO	
WBN-0-HS -067-0152B -B	0-HS -067-0152B -B	HANDSWITCH	CLASS 9001	FA13		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

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PREPARER/DATE [illegible] 7/10/86

CHECKER/DATE [illegible] 8/12/86

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EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RH/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-0-HS -067-0205B -A	0-HS -067-0205B -A	HANDSWITCH	CLASS 9001	QA2		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-0-HS -067-0208B -B	0-HS -067-0208B -B	HANDSWITCH	CLASS 9001	QA1		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -067-0223B -A	1-HS -067-0223B -A	HANDSWITCH	CLASS 9001	SA6		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-2-HS -067-0223B -A	2-HS -067-0223B -A	HANDSWITCH	CLASS 9001	SA6		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -067-0458B -A	1-HS -067-0458B -A	HANDSWITCH	CLASS 9001	TA4		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDR 7/10/86

CHECKER/DATE WBK 8/12/86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D
PAGE:23 OF 27

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	AZ	ELEV*	RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -067-0478B -B	1-HS -067-0478B -B	HANDSWITCH	CLASS 9001	TA5		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -070-0038B -B	1-HS -070-0038B -B	HANDSWITCH	CLASS 9001	TA2		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -070-0046B -A	1-HS -070-0046B -A	HANDSWITCH	CLASS 9001	TA3		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1 HS -070-0051B -A	1-HS -070-0051B -A	HANDSWITCH	CLASS 9001	TA2		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-2-HS -070-0051B -I	2-HS -070-0051B -I	HANDSWITCH	CLASS 9001	TA2		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDK 7/10/86 _____ _____ _____

CHECKER/DATE WBK 8/12/86 _____ _____ _____

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EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -070-0090B -A	1-HS -070-0090B -A	HANDSWITCH	CLASS 9001	WA5		713'	A28	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -070-0092B -A	1-HS -070-0092B -A	HANDSWITCH	CLASS 9001	WA5		713'	A28	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -070-0134B -B	1-HS -070-0134B -B	HANDSWITCH	CLASS 9001	WA5		737'	A05	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -070-0140B -B	1-HS -070-0140B -B	HANDSWITCH	CLASS 9001	WA5		713'	A28	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -070-0143B -A	1-HS -070-0143B -A	HANDSWITCH	CLASS 9001	WA5		713'	A28	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -070-0153B -B	1-HS -070-0153B -B	HANDSWITCH	CLASS 9001	TA6		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -070-0156B -A	1-HS -070-0156B -A	HANDSWITCH	CLASS 9001	TA6		713'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -070-0183B -A	1-HS -070-0183B -A	HANDSWITCH	CLASS 9001	WA50		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-0-HS -070-0194B -B	0-HS -070-0194B -B	HANDSWITCH	CLASS 9001	SA6		737'	A01	86922	L RH/A CV/A AF AB	B D D D D	100D IND IND IND IND	NO CHANGE IN CONTACT STATE
WBN-0-HS -070-0197B -A	0-HS -070-0197B -A	HANDSWITCH	CLASS 9001	TAB		737'	A01	86922	L RH/A CV/A AF AB	B D D D D	100D IND IND IND IND	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDR 7/10/86 _____ _____ _____

CHECKER/DATE WDK 8/12/86 _____ _____ _____

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-HS -001
MANUFACTURER: SQUARE D
PAGE:25 OF 27

EDIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-0-HS -070-0206B -B	0-HS -070-0206B -B	HANDSWITCH	CLASS 9001	WA11		692'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -070-0207B -B	1-HS -070-0207B -B	HANDSWITCH	CLASS 9001	UA9		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-2-HS -070-0207B -B	2-HS -070-0207B -B	HANDSWITCH	CLASS 9001	UA9		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-0-HS -070-0208B -A	0-HS -070-0208B -A	HANDSWITCH	CLASS 9001	UA9		737'	A01	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -070-0215 -A	1-HS -070-0215 -A	HANDSWITCH	CLASS 9001	WA5		713'	A13	86922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -072-0002B -B	1-HS -072-0002B -B	HANDSWITCH	CLASS 9001	WA5		737'	A05	86922	L	B	1MO	NO CHANGE IN CONTACT STATE
WBN-1-HS -072-0010B -B	1-HS -072-0010B -B	HANDSWITCH	CLASS 9001	TA6		676'	A08	86922	L	B	1MO	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

PREPARER/DATE [illegible] 7/10/86
CHECKER/DATE [illegible] 8/12/86

R_____ R_____ R_____

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HS-001

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -072-0013B -B	1-HS -072-0013B -B	HANDSWITCH	CLASS 9001	VA5		692'	A08	B6922	L	D	1MO	NO CHANGE IN CONTACT STATE
WBN-1-HS -072-0021B -B	1-HS -072-0021B -B	HANDSWITCH	CLASS 9001	TA5		676'	A16	B6922	L	D	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -072-0022B -A	1-HS -072-0022B -A	HANDSWITCH	CLASS 9001	UA5		676'	A16	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -072-0027B -A	1-HS -072-0027B -A	HANDSWITCH	CLASS 9001	UA6		676'	A09	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	
WBN-1-HS -072-0034B -A	1-HS -072-0034B -A	HANDSWITCH	CLASS 9001	VA5		692'	A08	B6922	L	D	30D	NO CHANGE IN CONTACT STATE
WBN-1-HS -072-0039B -A	1-HS -072-0039B -A	HANDSWITCH	CLASS 9001	UA4		737'	A05	B6922	L	D	30D	NO CHANGE IN CONTACT STATE
WBN-1-HS -072-0044B -A	1-HS -072-0044B -A	HANDSWITCH	CLASS 9001	VA4		692'	A07	B6922	L	D	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MO	
									CV/A	B	1MO	
									AF	B	1MO	
									AB	B	1MO	

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HDR 7/10/86

CHECKER/DATE WMK 8/14/86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BIDDER NO. WDNED-HS -001
MANUFACTURER: SQUARE D

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-HS -072-0045B -B	1-HS -072-0045B -B	HANDSWITCH	CLASS 9001	VA4		692'	A07	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
									RH/A	B	1MD	
									CV/A	B	1MD	
									AF	B	1MD	
									AB	B	1MD	
WBN-1-HS -074-0003B -A	1-HS -074-0003B -A	HANDSWITCH	CLASS 9001	VA6		676'	A11	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -074-0012B -A	1-HS -074-0012B -A	HANDSWITCH	CLASS 9001	VA5		676'	A16	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -074-0021B -B	1-HS -074-0021B -B	HANDSWITCH	CLASS 9001	VA6		676'	A10	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -074-0024 -B	1-HS -074-0024 -B	HANDSWITCH	CLASS 9001	VA5		676'	A16	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -074-0033B -A	1-HS -074-0033B -A	HANDSWITCH	CLASS 9001	VA7		713'	A12	B6922	L	B	100D	NO CHANGE IN CONTACT STATE
WBN-1-HS -074-0035B -B	1-HS -074-0035B -B	HANDSWITCH	CLASS 9001	VA7		713'	A11	B6922	L	B	100D	NO CHANGE IN CONTACT STATE

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE HOR 7/10/86

CHECKER/DATE WBK 8/12/86

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HS-001

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 1 OF 31

BINDER TITLE SQUARE-D COMPUTED [illegible] DATE 8-11-86 R ___ R ___

HANDSWITCHES CHECKED [illegible] DATE 8/14/86

A. DOCUMENTATION

Equipment Description Control Switches

Vendor/Manufacturer Square-D

Equipment Model No.(s) Class 9001 Type K Pushbutton Station and Class 9001 Type KS Selector Station

QUALIFICATION REPORTS

(1) Title/Number/Revision Nuclear Environmental Qualification Test For Control Equipment And Cables-Wyle Test Report No. 17503-1 RIMS EEB 840123 300 DATE January 6, 1984

(2) Title/Number/Revision ___ RIMS ___ DATE ___

(3) Title/Number/Revision ___ RIMS ___ DATE ___

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(1) REIC Report No. 21 (applicable pages). RIMS B70 851209 116

(2) Post-Accident Operating Time Calculation - WAC-51

(3) Flooding Calculation - RIMS B45 860110 218

(4) Operational Voltage Levels - WBPEVAR 8602005

(5) Dynamit Noble Chemicals letter RIMS B71 860806 101

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 2 OF 31

BINDER TITLE SQUARE-D COMPUTED [illegible] DATE 9/17/86 R ___ R ___

HANDSWITCHES CHECKED WBK/[illegible] DATE 9/17/86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES No qualification deficiencies.

OPEN ITEMS 1. Location specific radiation doses.

COMMENTS/RECOMMENDATIONS

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 3 OF 31

BINDER TITLE SQUARE-D COMPUTED [illegible] DATE 8-11-86 R ___ R ___

HANDSWITCHES CHECKED [illegible] DATE 8/12/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS NA

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE Standard 323-1974

IEEE Standard 344-1975

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 4 OF 31

BINDER TITLE SQUARE-D COMPUTED [illegible] DATE 8-11-86 R ___ R ___

HANDSWITCHES CHECKED [illegible] DATE 8/12/86

D. QUALIFICATION METHODOLOGY (Check only one block)

X Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

___ Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS The Qualification Test Report No. 17503-1 covers junction boxes, terminal blocks, pushbutton operators, selector switch operators, contact blocks for the switch and pushbutton operators and cable. This EQ binder covers the Square-D Class 9001 pushbutton and selector switch assemblies. The safety function requirement is that the contact blocks must not change state during the mitigating accidents listed in Tab A.

The Square-D handswitches are qualified to the environmental conditions for which they must retain their safety function as substantiated by the Wyle Test Report No. 17503-1 and information in Tab B and C of this binder.

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 5 OF 31

BINDER TITLE SQUARE-D COMPUTED HDR DATE 8-11-86 R ___ R ___

HANDSWITCHES CHECKED WMR DATE 8/12/86

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? Yes

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Control Station	Control Station	Summary 6.1.1
(2) Manufacturer	Square-D	Square-D	Summary 6.1.1
(3) Model Number(s)	Class 9001 Type K and Type KS	Class 9001 Type K and Type KS	Summary 6.1.1
(4) Serial Number(s)	NA	NA	NA
(5) Identify Component-Unique checksheet attached:	None		

JUSTIFICATION/COMMENTS Test item number 4.14 was a Square-D push-button station Class 9001 Type K.

Test item 4.15 was a Square-D selector switch Class 9001 Type KS.

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 6 OF 31

BINDER TITLE SQUARE-D HANDSWITCHES COMPUTED HOR DATE 8-11-86 R ___ R ___

CHECKED WBK DATE 8/12/86

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	NA
External Process Connections	NA	NA	NA
Electrical Connections	NA	NA	NA
Conduit Seals	NA	NA	NA
Connector Seals	NA	NA	NA
Orientation	NA	NA	NA
Physical Configuration	NA	NA	NA
Other	NA	NA	NA

JUSTIFICATION/COMMENTS The control stations were mounted on a NEMA 4 junction box. The junction box had weep holes drilled in the bottom of the box and the conduit feeding the box was open to the HELB environment. The box offered no additional protection and is used for a mounting surface and as mechanical protection for the wiring. This is typical of mounting at Watts Bar Nuclear. Wiring and terminal blocks are covered in binder WBNEQ-JBOX-001 and the binders referenced therein.

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 7 OF 31

BINDER TITLE SQUARE-D HANDSWITCHES COMPUTED [illegible] DATE 8-11-86 R ___ R ___

CHECKED WBK DATE 8/16/86

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	Section I Par. 1.2.6.1 and 1.2.7.1
(b) Baseline performance measurements taken	Yes	Section I Par. 2.6 and 2.7
(c) Equipment aged:		
Thermal	Yes	Section IV Par. 1.3
Radiation	Yes	Section II Par. 2.0
Wear	Yes	Section VI Par. 1.0
(d) Vibration/seismic testing conducted	Yes	Section VIII Par. 1.0
(e) Design basis event (DBE) exposure	Yes	Section X Par. 1.2 and page X-23
(f) Post-DBE exposure	Yes	Section X Par. 1.2 page X-23, and Tab C page 4 of binder
(g) Final inspection and disassembly	Yes	Section XI Par. 3.0

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes (Note 1)

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes (Note 1) (Reference Summary, Par. 6.2).

JUSTIFICATION/COMMENTS Note 1. See Anomaly No. 4, TAB B, Section 2C, page 29.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference Section II, Par. 3.0, Section IV, Par. 1.3, and Section VI, Par. 1.0).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	Section IV Par. 1.3
Radiation exposure	Yes	Section II Par. 3.0
Vibration (non-seismic) aging (1)	No	NA
Operational (electrical/mechanical/process) stress aging	Yes	Section VI Par. 1.0

JUSTIFICATION/COMMENTS (1) Switches installed in and/or on enclosures which are rigidly mounted. See Tab C, page 5.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS No known synergistic effects are present, for the materials required for the switches to perform their safety function, at the levels of temperature and radiation the handswitches are subjected to.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference Section IV, Par. 1.3).

JUSTIFICATION/COMMENTS This binder is for items 4.14 and 4.15 of the test report (Square-D Class 9001 Handswitches).

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: Section XII, Table I, pages XII-70 through XII-78).

JUSTIFICATION/COMMENTS

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference Section XII, Par. 3.4.2.2).

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference Section XII, Par. 3.4.1 and 3.4.2, and Tab C page 3).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	110°F	95°C	110°F
Time	40 years	2893 hours	27 years

JUSTIFICATION/COMMENTS

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference Section XII, Par. 3.4.1).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference Section XII, Par. 3.4.2.2 and Table 1).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS Arrhenius Methodology was used.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS The control stations were thermally aged to provide a qualified life at a temperature they would experience if they were energized. The control stations are not operated during normal plant operation; they are used for maintenance purposes.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference Section II, Par. 1 through 3).

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference Section XII, Table I, pages XII-70 through XII-78).

JUSTIFICATION/COMMENTS

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference Section XII, Par. 3.3).

JUSTIFICATION/COMMENTS See Tab B, Section P, page 29 for additional justification.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference Section II, Par. 1.0 and 1.3).

Plant normal ambient radiation dose (rd) SEE OPEN ITEM IN FRONT OF BINDER

Test exposure dose (rd) 2.75×10^5 [illegible] 9/17/86

Test exposure dose rate (rd/hr) 1.0×10^4 DDK 9/17/86

Test exposure source type (e.g., Co-60 gamma) Co-60 gamma

JUSTIFICATION/COMMENTS See Tab B, Section P, page 29 for additional information.

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS Equipment installed in and/or on enclosures which are rigidly mounted. See Tab C, page 5.

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference Section VI, Par. 1.0).

JUSTIFICATION/COMMENTS

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference Section XII, Par. 3.4.3).

JUSTIFICATION/COMMENTS

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference Summary, Par. 4.0 and Tab B, Section P, page 29).

Qualified life (Document in QMDS) 20 years

JUSTIFICATION/COMMENTS Tab B, Section P, page 29.

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? Yes
(Reference See Tab B, Section P, page 29).

Replacement Intervals (Document in QMDS) Complete switch every 20 years.

JUSTIFICATION/COMMENTS Qualified for 20 years operation only.

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 14 OF 31

BINDER TITLE SQUARE-D COMPUTED [illegible] DATE 8-11-86 R ___ R ___

HANDSWITCHES CHECKED [illegible] DATE 8/12/86

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis) NA (Reference Section XII, page XII-70 through XII-78.

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)					
(b)					
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS See Section P of Tab B for discussion of materials.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference Section XII, Par. 2.2.2.3).

Identify Acceptance Criteria: Circuit current shall not increase or decrease by more than 10%, assuming load is held constant, IR $\geq 1 \times 10^5$ ohms, contact resistance of closed contact not $\leq$ 0.2 ohms, contact resistance of open contact not $> 1 \times 10^5$ ohms, and contact continuity with interruption $\leq$ 1 millisecond.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference Section I, Par. 2.6 and 2.7).

Identify baseline and functional testing: Visual, contact resistance/operability, insulation resistance, and continuity. The testing was done after every phase of the qualification test. (Baseline, radiation, heat aging, cycling, and DBA). Voltage and current measurements were recorded periodically during the DBA phase.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference Section X, Fig. X-6 and X-7, and data sheets, pages X-58 through X-62).

JUSTIFICATION/COMMENTS See Tab C, page 6.

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BINDER TITLE SQUARE-D COMPUTED HDR DATE 8-11-86 R R

HANDSWITCHES CHECKED WBK DATE 8/12/86

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS Under normal operation the switches are not under load. Switches are used during maintenance activities only.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

JUSTIFICATION/COMMENTS Handswitches are not required to perform. Their safety function is not to change state during a DBA.

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BINDER TITLE SQUARE-D HANDSWITCHES COMPUTED HDR DATE 8-11-86 R ___ R ___

CHECKED WAK DATE 8/12/86

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	NA 140 VDC, 135 VAC	OE Calculation WBPEVAR8602005
Load	NA 9 amp	OE Calculation WBPEVAR8602005
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS Handswitches are not required to perform under accident conditions.

(b)

Parameter	Demonstrated Conditions	Reference
Voltage	528 VAC (item 4.15) 132 VAC (item 4.14)	Section X, Par. 3.0, Figs. X-6 and X-7
Load	9 AMP	Section X, Par. 3.0, Figs. X-6 and X-7
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS Maximum voltage levels required for handswitches covered by this binder are 140 VDC and 135 VAC. See discussion on voltage, Tab C, page 6. PAGE B-17

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 18 OF 31

BINDER TITLE SQUARE-D COMPUTED [illegible] DATE 8-11-86 R ___ R ___

HANDSWITCHES CHECKED [illegible] DATE 8/12/86

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. See page 18A.

(1) Normal Max

(a) Temperature (°F) 110

(b) Pressure (psig) ATM(-)

(c) Humidity (%) 80

(d) Radiation (rd) SEE OPEN ITEM IN FRONT OF BINDER [illegible] 9/17/86 [illegible] 9/17/86

(2) Abnormal Max

(a) Temperature (°F) 120

(b) Pressure (psig) ATM(-)

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: Up to 8 hours per excursion and will occur less than 1% of the plant life. The 10°F difference over this time frame is negligible.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 216 Accident type HELB

(b) Pressure (psig) 1.6 Accident type HELB

(c) Humidity (%) 100 Accident type HELB

(d) Radiation (rd) ___ Accident type LOCA

(e) Spray Type None Accident type NA

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 18A OF 31

BINDER TITLE SQUARE-D COMPUTED [illegible] DATE 8-11-86 R ___ R ___

HANDSWITCHES CHECKED [illegible] DATE 8/14/86

REFERENCE ENVIRONMENTAL DATA

Composite of worst case operating environmental conditions for areas containing handswitches outside containment excluding the north and south steam valve vault rooms.

RADIATION

REFERENCES:	GENNAL3-001	Doses for Equipment Qualification for All Shield Building Spaces (B45 851117 235)
	TI-RPS-48 R2	Integrated Accident Dose Inside Primary Containment (B45 851105 235)
	WBNNAL3-004	Accident Dose Inside Reactor Building (B45 860205 235)
	WBNNAL3-025	Normal Operation Dose for Equipment Qualification Outside the Shield Building (B45 860401 235)
	TI-RPS-32	Shield Design Review and Equipment Qualification (B45 860407 237)
	WBNNAL3-026	Comparison of SQN and WBN Auxiliary Building for Application of TI-RPS-32 (B45 860328 237)

TEMPERATURE, PRESSURE, AND HUMIDITY

Worst case Watts Bar Environmental Drawing 47E235-51 for areas with installed handswitches.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

Radiation values shown for many areas are greater than 3 x 10^6 rads. See Tab C, page 2 for location specific doses for these areas which shows these values are less than the 3 x 10^6. See Section P for discussion on radiation dose values.

All equipment is located outside of reactor building and not subject to chemical spray.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? No (Reference Equipment mounted in junction boxes which when subjected to moisture have weep holes drilled in bottom).

(7) Subject to submergence (yes/no/NA)? No (Reference Tab A for location and Tab C for areas subject to flooding).

Identify initiation time and duration of submergence: NA

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
1. Post-Accident Operating Time WAC-51	NA
2. Flooding Calculation	B45 860110 218
3. Calculations listed on page 18A of Tab B	See page 18A of Tab B

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 20 OF 31

BINDER TITLE SQUARE-D COMPUTED [illegible] DATE 8-11-86 R R

HANDSWITCHES CHECKED [illegible] DATE 8/14/86

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 days	54 min (Note 1)	Section X, Fig. X-10
Temperature (°F)	216	240	Section X, Fig. X-10
Pressure (psig)	1.6	3	Section X, Fig. X-10
Relative Humidity (%)	100	100 (steam)	Section X, Par. 1.2.1
*Chemical Spray	NA	NA	NA
**Radiation (rd) [illegible] 9/14/86	SEE OPEN ITEM IN FRONT OF BINDER	2.75×10^5 (Note 2)	Section X, Par. 2.0
Submergence [illegible] 9/17/86	NA	NA	NA

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	Section X, Fig. X-10
Pressure	Yes	Section X, Fig. X-10
Relative Humidity	Yes	Section X, Par. 1.2.1
Chemical Spray	NA	NA
Submergence	NA	NA

JUSTIFICATION/COMMENTS Note 1 - See Tab C, page 4 for calculation to justify post-accident profile. Note 2 - See Tab B, pages 29 and 30 for radiation discussion.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	+15	Yes
Pressure: +10% but no more than 10 psig	+10%	Yes
Radiation: +10% of accident dose	No	No (See Tab B, Sec. P, page 29)
Time: +10% (or 1 hour + operating time per NUREG-0588)	No	No (See Tab C, page 4)
Voltage: ±10% of rated value	+10%	Yes
Frequency: ±5% of rated value	NA (1)	NA
Environmental Transient: the initial transient and the peak temperature applied twice	NA (2)	NA
Vibration: +10% added to acceleration	NA (3)	NA

JUSTIFICATION/COMMENTS: (1) Frequency: Control stations designed to operate on AC and/or DC voltage; therefore, frequency is not a critical parameter. (2) Environmental transient: Handswitches see only HELB (no LOCA); therefore, two transients are not required. (3) Vibration: Control stations were seismically qualified as devices, which is more stringent than qualification as an assembly, which they are in their actual installed conditions.

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 22 OF 31

BINDER TITLE SQUARE-D HANDSWITCHES COMPUTED [illegible] DATE 8-11-86 R ___ R ___

CHECKED [illegible] DATE 8/12/86

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment: (Reference Section XII, Par. 2.2.2.3).

JUSTIFICATION/COMMENTS No change of state of the contacts during required accident duration. Switches are not required to operate.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes (Reference Section X, Par. 3.0).

JUSTIFICATION/COMMENTS

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes (Reference Section X, Par. 3.0).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS See Tab C, page 4.

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference Summary).

JUSTIFICATION/COMMENTS Appropriate test report sections and Tab B, Section P.

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 24 OF 31

BINDER TITLE SQUARE-D HANDSWITCHES COMPUTED [illegible] DATE 8-11-86 R ___ R ___

CHECKED [illegible] DATE 8/12/86

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? NA (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS Required operation of the control stations during normal plant operation (control stations only operated during equipment maintenance) would detect problems and repair or replacement would be initiated accordingly.

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 25 OF 31

BINDER TITLE SQUARE-D COMPUTED HDR DATE 8-11-86 R ___ R ___

HANDSWITCHES CHECKED WBK DATE 8/12/86

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	No
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	Yes
(b) Were specific features and failure modes and effects analyzed?	Yes
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	Yes
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	Yes

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BINDER TITLE SQUARE-D HANDSWITCHES COMPUTED [illegible] DATE 8-11-86 R ___ R ___

CHECKED WBK DATE 8/12/86

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	NA
(a) Was the spray testing done while under the extremes of pressure and temperature?	NA
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA
(11) Criteria regarding submergence satisfied?	NA
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	NA
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

BINDER NO. WBNEQ-HS-001 PLANT WBN UNIT(S) 1 SHEET 27 OF 31

BINDER TITLE SQUARE-D COMPUTED [illegible] DATE 8-11-86 R ___ R ___

HANDSWITCHES CHECKED [illegible] DATE 8/12/86

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	NA
(17) Test duration margin (1 hour + function time) satisfied?	No
(a) Is the minimum specified operating time at least 1 hour?	No
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	Yes
(18) Criteria regarding synergistic effects satisfied?	NA
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

See attached sheets.

P. DISCUSSION (Continued)

1.0 The control stations perform local control functions outside containment. They are used when maintenance functions are performed on various devices. Although they are not required to operate during a design basis event, the failure (change of contact state) of those in Class 1E circuits could prevent safety-related equipment from performing accident mitigation functions.

The control station components are oiltight, dusttight, and moisture resistant. They are mounted in or on gasketed enclosures that provide a degree of protection from humidity and steam exposure. All Category B control stations are located above the maximum expected flood levels. Samples of the control stations passed environmental qualification test by Wyle Laboratories[1] in the sequence given below:

a. Radiation aging to 2.75×10^5 rads gamma at a maximum dose rate of 1.0×10^4 rads per hour.

b. Thermal aging at 95°C for 2893 hours to simulate a 20 year life.[2]

c. Operational cycling (11,000 cycles).

d. Seismic qualification.

e. Accident qualification at the following maximum conditions: 240°F, 3 psig, and 100% relative humidity.

2.0 Anomalies that occurred during the test program that could affect the control stations' ability to perform their safety functions during accident conditions are listed below along with their resolutions.

a. Anomaly Nos. 1, 2, 5, 6, 7, 8, 9, 10, 12, 13, 18, 19, and 20: Not applicable to this binder.

b. Anomaly Nos. 3, 11, 16, and 17: Contact resistance measurements above acceptance criteria during testing. Each time the switches were cycled to remove a suspected oxide film. After cycling, all readings were within the acceptance criteria. This condition would not adversely affect the safety function of the device (change contact state).

Wyle recommends that the contact blocks KA-2 and KA-3 not be used with the Square-D spring-return-to-center selector switch (anomaly No. 17) as the contact blocks would not allow the selector switch to return to center from either the right or left position. This condition would only occur during manual operation of the switch during maintenance operations and would be replaced at this time if a problem was found. The condition did not adversely affect the safety function of the device (No contacts changed state).

P. DISCUSSION (Continued)

c. Anomaly No. 4: During post-thermal aging functional test, the selector switch handle fell apart. Probable cause was a splitting apart of the cam carrier ring. None of the contacts changed state; therefore, this condition would not adversely affect the safety function of the device. A new selector switch handle assembly was installed to allow testing of the contact blocks to be continued.

d. Anomaly No. 14: Multiplier on instrument may have been in wrong position while taking insulation resistance readings after thermal aging. If was in wrong position, readings would be off by a factor of 10 (low). This would mean that readings taken were conservative by a factor of 10 and therefore would have no effect on qualification.

e. Anomaly No. 15: Specimen identifiers list in Table I did not agree with identifiers in paragraph 1.3. Identifiers were corrected. There is no effect on qualification.

3.0 The Wyle test states that the Square-D control stations are qualified for 10 years for the environmental conditions the handswitches will be exposed to at Watts Bar Nuclear Plant; the handswitches are qualified for more than 20 years.

RADIATION DISCUSSION FOR SQUARE-D HANDSWITCHES

a. Radiation - From an analysis of the operation of the type 9001 Square-D handswitch, it is concluded that the contact block is the only component whose failure could affect the required safety function of the handswitch (handswitch must not change state). The material composition of these components is Trogamid T Nylon (a Polyamide). This material either has a radiation threshold or retains a minimum of 75% of its physical properties (tensile strength, elongation, elastic modulus, shear strength and impact strength) at radiation levels of 4×10^6 rads (4×10^8 ERGS)[3] or higher. The supplier of Trogamid T has exposed Trogamid T to radiation levels of 3×10^6 rads[4] with no measurable effect on mechanical and physical properties other than a slight drop-off in light transmission (not a concern) values. The radiation caused a light blue discoloration of the material that was reversible by heating to 100°C for 1.5 hours. The above data, complemented by the Wyle Test results[1], justifies the conclusion that the handswitches are qualified for radiation levels to 3×10^6 rads and will perform their intended safety function after being subjected to this level.

P. DISCUSSION (Continued)

b. Heat Aging - the handswitches were aged at 95°C for 2893 hours. The activation energy used for the Arrhenius methodology was .86.(1) Fifty hours of the 2893 were removed to be used for post-accident operating time justification (see d). The aging at 95°C for 2843 hours gave a qualified life for the handswitches of 27 years.

c. Operational Cycling - the handswitches are only used during maintenance operations and are not required to operate during or after a DBE. Any problems with operation will be noted and corrected during the maintenance activities. Loss of operation will not affect the safety function of the handswitch.

d. DBE and Post-Accident Operation - the DBE test was run for a duration of 54 minutes with a maximum temperature of 240°F.(1) The required maximum temperature is 216°F. Since the accident requirements are not significantly different from normal/abnormal operating conditions, some of the aging time and temperature can be used to fulfill the plant enveloping requirement including margin. Fifty hours at 95°C were removed from the heat aging time and added to the DBE and post-accident time (radiation aging was done before the heat aging). The required temperature profile and the simulated profile are shown in calculation WAC-51.(2) It should be noted that at TIME equals 840 to 3600 seconds the required profile is slightly higher than the simulated profile. This condition is more than accounted for in the higher temperature peak shown on the simulated profile. The calculation summary (calculation WAC-51)(2) shows that the heat aging applied to the handswitches during the simulation (with a conservatism factor of more than 114%)(2) matches or exceeds the aging that would result from the DBE and post-accident operating time of 100-days.

The above data a through d, complemented by the Wyle test results, justifies the conclusion that the control stations are qualified for their service environment for at least 20 years plus one DBE with 100 day post-accident.

P. DISCUSSION (Continued)

REFERENCES: (1) Wyle Laboratories Test Report No. 17503-1 dated January 6, 1984, "Nuclear Environmental Qualification Test Program on Sequoyah Nuclear Power Station Control Equipment and Cables."

(2) Calculation No. WAC-51, Tab C, page 4.

Note: Copies of 1 above can be found in Tab D, a copy of 2 can be found in Tab C, and a copy of 3 and 4 found in Tab E.

(3) Radiation Effects Information Center (REIC) Report No. 21 "The effect of nuclear radiation on elastomeric and plastic components and materials".

(4) Letter from Dynamit Nobel Chemicals. RIMS (B71 860806 101).

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MANUFACTURER RAYCHEM
PAGE 1 OF 1

TAB A - EQUIPMENT IDENTIFICATION MATRIX

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL NO.	LOCATION COL/AZ	LOCATION ELEV*	LOCATION ROOM	PURCHASE CONTRACT NO./RD	CAT	OPERATING TIME	MITIGATING ACCIDENT	SAFETY FUNCTION
SPLC	SPLC	CABLE CONNECTIONS HEAT SHRINK SPLICES	RAYCHEM TYPES WCSF-N, N-MCK, NPKV, NPK, NESK, AND NCBK.		VARIOUS	I.O.	VARIOUS	a	100D	LOCA/HELB	PROVIDE ELECTRICAL INSULATING PROPERTIES FOR TERMINATIONS

*Room designation "I.O." represents Inside and Outside Containment

		R	R	R
Preparer/Date	9/23/86			
Checked/Date	9/23/86			

HQP232.02

A. DOCUMENTATION

Equipment Description: Heat Shrink Cable Sleeve (for applications of 600 VAC or less)

Vendor/Manufacturer: Raychem Corporation

Equipment Model No.(s): Raychem's complete line of nuclear grade cable connection heat shrink splices and terminations (600 volts or less) (Raychem material Type-52 and/or WCSF).

QUALIFICATION REPORTS

Report No. 1 Title/Number/Revision See title below/ RIMS B70 851119 101
Wyle Labs Report 58722-2/Revision 0 DATE Nov. 18, 1982

Report No. 2 Title/Number/Revision See title below/ RIMS B70 851112 102
Raychem Report EDR 5046 DATE March 4, 1982

Report No. 3 Title/Number/Revision See title below/ RIMS B70 851112 101
Raychem Report EDR 5040 DATE Oct. 15, 1981

OTHER (ANALYSIS, VENDOR DATA, ETC.) Report Titles:

1. "Environmental Qualification Test Report of Raychem WCSF-N In-Line Bolted Splice Assemblies."
2. Analysis of Heat Aging Data on WCSF Material to Determine Pre-Aging Conditions for Nuclear Qualification Testing."
3. Analysis of Heat Aging Data on -52 Molding Material to Determine Pre-Aging Conditions for Nuclear Qualification Testing.

See TAB E for additional qualification documentation. (Listed on pages 2 and 3).

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R ___ R ___

BINDER TITLE ENVIRONMENTAL QUALIFICATION OF RAYCHEM HEAT SHRINK CABLE SPLICES

COMPUTED [illegible] DATE 9/22/86

CHECKED [illegible] DATE 9/22/86

ADDITIONAL DOCUMENTATION

1. Environmental Qualification Test Report of Raychem NPKV Nuclear Plant Stub Connection Kit for Raychem Corporation Report 58722-1 Rev. 0. — RIMS EEB 830228 035 — DATE August 24, 1982

2. Environmental Qualification Test Report of Raychem Nuclear Cable Breakout and End Sealing Kits Report 58442-2 Rev. 0. — RIMS B70 851119 102 — DATE April 3, 1981

3. Qualification Report Supplement for Raychem Nuclear Grade Adhesive S119 Report EDR 5021 Rev. 0. — RIMS B70 851119 104 — DATE April 23, 1980

4. Wyle Laboratories Report "Environmental Qualification Test Report on Raychem Nuclear Plant Kit (NPK) Report 58722-6 Rev. 0. — RIMS B70 851112 105 — DATE Dec. 21, 1982

5. Raychem Palo Verde I Test Report EDR 5019 — RIMS B70 851015 102 — DATE March 4, 1980

6. Environmental Qualification Test Report of Raychem N-MCK Nuclear Motor Connection Kits Report 58442-3 Rev. 0 — RIMS B70 851112 104 — DATE July 28, 1980

The reports on page 2 will help substantiate the qualification of the different configurations of heat shrink cable connections used at Watts Bar (see TAB B).

Report 1 Covers NPKV Kits (Stub Connection Kit)

Report 2 Covers the nuclear cable break-out (-52 material) and end caps.

Report 3 Qualification report for new adhesive (S1119) which replaced S1024. This report demonstrates that the new adhesive is equivalent or superior to the S1024.

Report 4 Covers NPK kits nuclear cable break-out (-52 material)

Report 5 Covers in-line splices using both the S1119 and S1024 adhesives.

Report 6 Covers N-MCK Kits Motor connection kits.

The DBE profiles for these tests encompass the Watts Bar profile and are qualified for 40 years at 90°C, one DBE and 100 days post-accident time. Some of the test items failed to hold the 1000 volts AC test voltage during the test. In all cases the failures were shown to be caused by overaging of the test cable that the splices were used on. All splices passed the voltage withstand test and had acceptable IR measurements in a water bath when tested with the damaged portion of the leads out of the water during the test. The remainder of the test item held the test voltage (1000 AC) during the complete DBE test.

The above reports (located in TAB E) along with the binder test report 58722-2 qualifies all raychem splices 600 volts and below at Watts Bar Nuclear Plant.

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R ___ R ___

BINDER TITLE ENVIRONMENTAL QUALIFI- COMPUTED HOR DATE 9/20/86

CATION OF RAYCHEM HEAT SHRINK CABLE SPLICES CHECKED B DATE 9/21/86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

COMMENTS/RECOMMENDATIONS The nuclear grade Raychem cable connection heat shrink splices are environmentally qualified for 40 years at 90°C including a DBA and 100 day post-accident operation for the accident and normal conditions at the Watts Bar Nuclear Plant.

Note: Qualification contingent on resolution of all open items.

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 383-1974

D. QUALIFICATION METHODOLOGY (Check only one block)

_____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

__X__ Test of Similar Items with Supporting Analysis

_____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

_____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS This binder qualifies the different configurations of the Raychem cable connection heat shrink splices using WCSF and/or -52 type nuclear grade heat shrink materials. The test reports used in TAB B for qualification are for the WCSF-N sleeve configuration. Additional test reports have been included in TAB E detailing other configurations that have been tested. All the profiles encompass the Watts Bar environmental accident conditions and all tested samples were aged (heat and radiation) to levels well above those required for Watts Bar. All anomalies were addressed in each test report and no failures of the Raychem materials were noted in any of the test. All apparent failures were not Raychem failures but were attributed to excessive heat aging (causing cracks in cable insulation) of the cable used in the tests.

All cable connections must be made using TVA Standard Construction Specification G-38 which requires nuclear grade Raychem heat shrink be used on all safety-related equipment located in a harsh environment that are spliced. This specification details the sizes of heat shrink sleeves and breakouts to use for each cable size and configu-

ration. This specification is used in conjunction with the installation instructions supplied with the heat shrink material (See TAB H).

This binder covers all nuclear grade Raychem splices 600 volts or less. No safety-related equipment, located in a harsh environment, requiring a nuclear-grade Raychem splice is rated more than 600 volts. The splice load rating is consistent with the cable rating, per manufacturer and is demonstrated by the qualification type-tests described herein. The IR measurements taken during the DBE test of the test specimens (Raychem splice and connecting cable) were much greater than comparable readings taken during the qualification testing for TVA Type MS cable (signal cable) used in instrumentation circuits. The splices are required to maintain mechanical and electrical integrity and insulation characteristics during and following a DBE to allow the cable to which the splice is attached to maintain its required performance during all postulated service conditions. Thus, assurance is provided that the presence of splices in these cables will not result in degraded signal levels caused by current leakage resulting from the use of the Raychem splices.

All Raychem splice material and applications covered in this binder are consistent with Watts Bar applications.

The above information gives reasonable assurance that the nuclear grade Raychem heat shrink splices and terminations at Watts Bar Nuclear Plant are environmentally qualified for 40 years at 90°C and one DBA with 100 days post-accident operation.

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? Yes

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Cable Sleeve	Cable Sleeve	Report 1 Sec. 2.1.1
(2) Manufacturer	Raychem	Raychem	Report 1 Sec. 2.1.1
(3) Model Number(s)	See Comments	See Comments	NA
(4) Serial Number(s)	NA	NA	NA
(5) Identify Component-Unique checksheet attached:	None		

JUSTIFICATION/COMMENTS This binder qualifies the complete line of LOCA-qualified Raychem nuclear grade products consisting of -52 molding material and/or WCSF sleeves. The following products are covered: WCSF-N, NPKC, NPKS (in line splices); NPK (transition splice); NPKV (stub connection); NMCK (motor connection); NCBK (cable breakout kit); NESK (end sealing kit); and NEIS (nuclear environmental interface seal).

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA		
External Process Connections	NA		
Electrical Connections	NA		
Conduit Seals	NA		
Connector Seals	NA		
Orientation	NA		
Physical Configuration	NA		
Other	See below	Yes	No

JUSTIFICATION/COMMENTS 1) Raychem nuclear grade splices are designed to provide an environmental seal to smooth non-woven surfaces including polyolefin, most synthetic cable jackets and to many metals (TAB H Product Features). The qualification status of the Raychem splice is conditional upon the capability of the substrate materials maintaining physical integrity under the same conditions under which the Raychem materials are qualified. All safety related cables at WBN are qualified and are expected to maintain their physical integrity under the normal and DBE conditions at WBN (Ref. all cable qualification binders).

F. INSTALLATION INTERFACES (Continued)

JUSTIFICATION/COMMENTS (1)

The test reports included in this binder do not include all sizes of Raychem splices used at WBN or all cable jacket/insulation material to which the splices must seal. As stated above, the Raychem will seal most cable material. Also during qualification testing of safety related cables used at WBN, Raychem splices were required to connect the cable being tested to the test leads. These splices used during qualification of the cable show that the cable sizes and material types at WBN are compatable with and provide a qualified seal on the cable installations at WBN.

2) Splice installation is to be done in accordance with the latest revision of TVA Standard Drawings (SD)-E12.5.6, E12.5.7-1, E12.5.7-2, and E12.5.8 and Raychem installation instructions taking into account the two-inch minimum seal length after shrinking for in-containment applications. The test set-up utilized Raychem's installation instructions which also require a two-inch minimum seal length. (See TAB H for vendor installation/inspection guides and TAB G installation).

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	(1) See Comments	See Comments
(b) Baseline performance measurements taken	Yes	58722-2, Sec. 3.2
(c) Equipment aged:		
Thermal	Yes	58722-2, Sec. 3.3.1
Radiation	Yes	58722-2, Sec. 3.3.2
Wear	(2) NA*	--
(d) Vibration/seismic testing conducted	(2) NA*	--
(e) Design basis event (DBE) exposure	Yes	58722-2, Sec. 3.4
(f) Post-DBE exposure	Yes (Total of 30 days)	58722-2, Sec. 3.4
(g) Final inspection and disassembly	Yes	58722-2, Sec. 4.3

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes (Reference 58722-2, Appendix B).

JUSTIFICATION/COMMENTS 1) The report did not describe test specimen inspection; however Raychem has conducted many test programs and we have no reason to believe that inspection was not done.

2) See TAB B, Section P.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference 58722-2, Sec. 3.3).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	58722-2, Sec. 3.3.1
Radiation exposure	Yes	58722-2, Sec. 3.3.2
Vibration (non-seismic) aging	No*	
Operational (electrical/mechanical/process) stress aging	Yes*	

JUSTIFICATION/COMMENTS See TAB B, Section P.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? Yes (Reference None

JUSTIFICATION/COMMENTS See TAB B, Section P.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference 58722-2, Sec. 3.3.1).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes
(Reference: IEEE 383-1974 & Raychem Reports EDR 5046 and EDR 5040).

JUSTIFICATION/COMMENTS All insulation materials are considered susceptible to aging degradation.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference 58722-2, Sec. 3.3.1).

JUSTIFICATION/COMMENTS Analysis of heat aging data found in Raychem Reports EDR 5046 and EDR 5040 (see TAB D).

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference 58722-2, Section 3.3.1)

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	130°F	150°C	90°C
Time	40 years	916.75 hrs	>40 years

JUSTIFICATION/COMMENTS For analysis see Raychem Reports EDR 5046 (TAB D) and EDR 5040 (TAB D). Also see TAB C.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference 58722-2, Sec. 3.3.1).

JUSTIFICATION/COMMENTS Also see Raychem Reports EDR 5046 and 5040.

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? No
(Reference NA).

JUSTIFICATION/COMMENTS See H(4)(g).

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes (Reference See below).

JUSTIFICATION/COMMENTS Raychem Reports EDR 5046 and EDR 5040. A failure mode of retaining 30% of initial elongation was used, since this resulted in the lowest activation energy and is considered the most conservative case.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Thermal aging calculation based on 90°C maximum conductor temperature.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference 58722-2, Sec. 3.3.2).

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Splices were subjected to a total dose of 2.2×10^8 rads and passed all functional tests. This dose exceeds the worst case dose at WBN.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference 58722-2, Sec. 3.3.2).

JUSTIFICATION/COMMENTS Aging and accident dose done at the same time at 5.7E+5 rads/hour for 386 hours yielding TID of 2.2E+8 rads.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference 58722-2, Section 3.3.2 and Table I).

Plant normal ambient radiation dose (rd) $8x10^7$ (See Section K)

Test exposure dose (rd) 2.2E+8 (accident included)

Test exposure dose rate (rd/hr) 5.7E+5

Test exposure source type (e.g., Co-60 gamma) Co-60 gamma

JUSTIFICATION/COMMENTS Radiation dose and rate are acceptable in accordance with IEEE 383-1974.

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS See TAB B, Section P.

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? NA
(Reference ___).

JUSTIFICATION/COMMENTS See TAB B, Section P.

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference).

JUSTIFICATION/COMMENTS See TAB B, Section P.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference).

JUSTIFICATION/COMMENTS See TAB B, Section P.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference 58722-2, Sec. 3.3.1).

Qualified life (Document in QMDS) 40 years at 90°C

JUSTIFICATION/COMMENTS Also see Raychem Reports EDR 5046 and EDR 5040. See TAB C for qualified life calculation.

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? NA
(Reference _____).

Replacement Intervals (Document in QMDS) Qualified life is 40 years (See TAB G).

JUSTIFICATION/COMMENTS See TAB C for aging equivalent.

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Raychem-52 Molding Material			1.31	EDR 5040 and TAB C
(b)	Raychem WCSF-N Sleeving	NA	NA	1.33	EDR 5046 and TAB C
(c)					
(d)					

JUSTIFICATION/COMMENTS The insulation material (polyolefin) and sealant are considered susceptible to thermal and radiation degradation. The test was done in accordance with IEEE 383-1974 and IEEE 323-1974 and the test values exceeded those values expected during a DBE. The test program included tests on all materials used in the splices, therefore no material analysis is required.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference 58722-2, Sec. 1.0).

Identify Acceptance Criteria: IEEE 383-1974 criteria - Function continuously during test then pass high-voltage withstand test after conclusion of DBE simulation.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference See page 18.1).

Identify baseline and functional testing: Immersed in water for 16 hours then IR measurements at 500 VDC and voltage withstand test with 3600 VAC hi-pot while still immersed in water.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference 58722-2, Sec. 3.4).

JUSTIFICATION/COMMENTS 1000 Volts AC at a current of 90A.

PERFORMANCE CHARACTERISTICS

1) Functional Test Baseline (Ref. 58722-2 Section 3.1 and 3.2)

- Immersed in water for 16 hours
- Insulation resistance in water at 500 VDC
- 3600 VAC voltage withstand test in water

2) Post Thermal and Radiation Aging (Ref. 58722-2 Section 3.3.3) - Same as above (1)

3) DBE Exposure (Ref. 58722-2 Section 3.4; Fig. 4 and Table 3)

- Energized at 1000 volts AC at 90 amps (nominal)

4) Post DBE (Ref. 58722-2 Section 4.3) - Same as above (1)

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? Yes (Reference 58722-2, Sec. 3.4)

JUSTIFICATION/COMMENTS Baseline testing consisted of insulation resistance at 500 VDC voltage withstand at 3600 volts AC. The connection splices are qualified to the relevant industry standards and IEEE 383-1974.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	Mfg. Std. (600 volts or less)	See Comments
Load	See Comments	See Comments
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS Splice rating is consistent with cable rating, per manufacturer, and as demonstrated by the qualification type-tests described herein.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(b) Parameter	Demonstrated Conditions	Reference
Voltage	1000 VAC	58722-2, Sec. 3.4
Load	90 amperes	58722-2, Sec. 3.4
Frequency	NA	NA
Accuracy	NA	NA
Other(s)		

JUSTIFICATION/COMMENTS

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. Worst case 47E235-42 R2 and 47E235-76 R3

(1) Normal Max

(a) Temperature (°F) 130

(b) Pressure (psia) 14.4

(c) Humidity (%) 80

(d) Radiation (rd) 8×10^7

(2) Abnormal Max

(a) Temperature (°F) 140

(b) Pressure (psig) 14.4

(c) Humidity (%) 100

(d) Radiation (rd) NA

(3) Process Interfaces: None.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Abnormal service conditions duration is less than eight hours per occurrence and total time is less than 1 percent of plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 327 Accident type LOCA/HELB

(b) Pressure (psia) 25.6 Accident type LOCA/HELB

(c) Humidity (%) 100 Accident type LOCA/HELB

(d) Radiation (rd) 4×10^7 gamma, 4.7×10^8 beta Accident type LOCA/HELB

(e) Spray Type Yes (See L(2)) Accident type LOCA/HELB

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

Refer to Watts Bar Environmental Data Drawing Series 47E235 and discussions in TAB B on Radiation and Temperature.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? No (Reference NA).

(7) Subject to submergence (yes/no/NA)? Yes
(Reference See TAB B, Discussion page).

Identify initiation time and duration of submergence: NA

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time (days)	100	31.3 days (See TAB C)	58722-2, Sec. 4.2 (c), Fig. 6
Temperature (°F)	327	442	58722-2, Fig.6, (p 10)
Pressure	25.6 psia	132 psig	58722-2, Fig. 6 (p 10)
Relative Humidity (%)	100	100	58722-2, Sec. 5.0
*Chemical Spray	Yes	IEEE 323-1974 (See L(2) for Justification)	58722-2, Sec. 3.4
**Radiation (rd)	1.2×10^8 gamma 4.7×10^8 beta	2.2E+8 gamma	58722-2, Table 1, p 17
Submergence	No	No	TAB B, Sec. P, "Submergence"

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type. See discussion TAB B, Section P "Radiation".

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	58722-2, Fig. 6, (p 10)
Pressure	Yes	58722-2, Fig. 6, (p 10)
Relative Humidity	Yes (saturated steam)	58722-2, Sec. 5.0
Chemical Spray	Yes (see below)	58722-2, Sec. 3.4
Submergence	NA	TAB B, Sec. P, "Submergence"

JUSTIFICATION/COMMENTS All cables in containment at WBN are enclosed in conduit; therefore, the splices are not subject to direct impingement of chemical spray. Test chemical spray encompasses requirements for WBN composition. (See TAB B Discussion).

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	15°F	Yes
Pressure: +10% but no more than 10 psig	10%	Yes
Radiation: +10% of accident dose	10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	10% (equivalent)	Yes*
Voltage: ±10% of rated value	10%	Yes
Frequency: ±5% of rated value	NA	NA
Environmental Transient: the initial transient and the peak temperature applied twice	2 Transients	Yes
Vibration: +10% added to acceleration	NA	NA

JUSTIFICATION/COMMENTS: Note: Margins noted are the difference between the required WBN values and the values of the test.

*Refer to TAB C for operating time evaluation.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment: (Reference None).

JUSTIFICATION/COMMENTS To maintain mechanical and electrical integrity and insulation characteristics during and following a DBE to allow the cable to which the splice is attached to maintain its required performance during all postulated service conditions.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes (Reference 58722-2, Section 5.0).

JUSTIFICATION/COMMENTS Ten of twelve test assemblies maintained rated current and voltage during test. All sleeves passed voltage withstand test and had high IR measurements. (See TAB B, Section P).

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes (Reference 58722-2, Section 5.0).

JUSTIFICATION/COMMENTS See M(2) above.

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Time required is 100 days. Test included 31.3-day LOCA test only (See TAB C).

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference 58722-2, Section 5.0).

JUSTIFICATION/COMMENTS See TAB B, Discussion.

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS See TAB G. There were no surveillance or maintenance requirements identified from the vendor or test documentation; however, TVA does have a maintenance and surveillance program at the plant.

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	None taken
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA (type test)
(b) Were specific features and failure modes and effects analyzed?	NA (type test)
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA (type test)
(d) Were environmental parameters which affect equipment performance identified?	NA (Type test)
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	NA
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA (aging)
(d) Materials susceptible to thermal/radiation aging identified?	Yes

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes
(11) Criteria regarding submergence satisfied?	Yes
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	Yes
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

See continuation page.

P. DISCUSSION (Continued)

A. Qualification Methodology

1. Test Report Applicability - Wyle Report 58722-2 documents the test performed in accordance with a Raychem Test Plan. The plan and program were performed to also satisfy the intent of IEEE 323-1974 and IEEE 383-1974. Report Nos. 2 & 3 (Raychem EDR 5046 and EDR 5040) document the aging study done to predict service life of the material and this information was used to establish accelerated aging criteria for Report 58722-2. These reports provide the basis for qualification and are used in the evaluation of the Raychem splices. Additional qualification reports for different variations of Raychem splice kits are located in TAB E. The test parameters for these additional tests meet or exceed the parameters required at Watts Bar. No anomalies were noted that would have an adverse affect on the test results of these tests (see discussion on anomalies and refer to discussion on page 3 of 36, TAB B). These additional reports, along with the reports used to establish qualification, will substantiate that all nuclear grade Raychem splices are qualified.

P. DISCUSSION (Continued)

B. Test Sequence and Synergistic Effects

References: 1. Wyle Test Report No. 58722-2 (See TAB D).

2. NUREG CR3588 (SAND83-2406) dated April 1984

The test sequence was in accordance with IEEE 323-1974 as follows:

Test Activity	Report Section (Ref. 1)
Initial Functional Test (Baseline)	I
Aging Simulation	II
Post-Aging Functional Test	III
Radiation Exposure (normal plus accident)	IV
Post-Radiation Functional Test	V
Accident Simulation (LOCA and MSLB)	VI
Post-Accident Functional Test	VII
Post-Test Inspection	VIII

This sequence is considered to constitute the most severe order of tests for the heat shrink cable sleeves. There are no known synergistic effects for the Raychem heat shrink material (polyolefin). The values of the temperature and radiation experienced during the test were much higher than the material would experience during accident conditions and therefore would compensate for any synergistic effects that may be present.

P. DISCUSSION (Continued)

C. Radiation

The splices in the Wyle Test Report 58722-2 were irradiated with a Cobalt-60 gamma field to yield a total dose of 2.04 x 10^8 rads. The maximum radiation dose expected is 5.9 x 10^8 rads (1.2 x 10^8 gamma plus 4.7 x 10^8 beta) inside containment. In addition, certain other areas of the plant will experience radiation doses above the 2.04 x 10^8 rads the splices were qualified for. The maximum radiation level that all cables installed at Watts Bar are qualified to is less than 2 x 10^8 rads. Therefore all cable is either installed in areas less than 2 x 10^8 rads or the cable is being moved out of the area. As no cable can be installed in areas greater than 2 x 10^8 rads, the tested total dose for Raychem heat shrink splices of 2.04 x 10^8 rads qualifies them for all areas where they are used. The following cable binders will confirm the above: WBNEQ-CABL-002, -003, -006, -008, -009, -010, -012, -013, -015, -017, -019, -022, -032, -036, -040, -042, -043, -044, -047, -048, -049, -061, and -063.

The above discussion along with the test report shows that the Raychem splices are qualified for the radiation dose they will be exposed to and will perform their safety function.

P. DISCUSSION (Continued)

D. Submergence

The only safety related cables which have cable splices that are subjected to submergence are connected to the following devices:

1-FSV-62-72	1-FSV-1-147
1-FSV-62-73	1-FSV-3-185
1-FSV-62-74	1-FSV-3-186
1-FSV-62-76	1-FSV-3-187
1-FSV-87-7	
1-FSV-87-8	

The required operating time for the above devices is one hour or less. The cables become de-energized and failure of the splice after this time would not be a safety concern (see EQ Binders WBNEQ-SOL-006 and WBNEQ-SOL-003 for operating time justification). No splices are required for submergence longer than the 1 hour given above.

The splices are located in conduit and/or steel junction boxes and therefore not exposed to the direct chemical spray solution. When the conduit or junction box becomes submerged, the solution may submerge the splice. The splices were subjected to the direct chemical spray at a much higher pressure and temperature (than plant accident conditions) for 31.3 days. Also the splices were subjected to a 16 hour water bath prior to the performance of each functional test cycle. The 31.3 day exposure to direct chemical spray and the 42 hour water bath (3 at 16 hours) ensure that the splices will not fail during the required 1 hour of submergence.

P. DISCUSSION (Continued)

E. Temperature

The maximum room temperature the splices will be subjected to is 535°F (Valve Vault Rooms). All safety related cables are in conduit and any cables required to operate for the MSLB are in insulated conduit. The maximum temperature the cables will be subjected to is 220.2°F. This temperature is within the qualified temperature of the Raychem splices (OE Calculation WBNNAL6-001, RIMS B45 850912 235 located in TAB C). Therefore, the worst case temperature the splices are subjected to is the 327°F inside containment and this temperature profile is enveloped by the test profile.

P. DISCUSSION (Continued)

F. Normal Service Related Stresses

In accordance with paragraph 1.3.4.1 of IEEE 383-1974, the cable terminations and splices, as installed, should be suitable for operation at maximum ambient temperature, radiation, and atmospheric conditions and normal electrical and physical stresses for its installed life. Maximum ambient temperature, radiation, and atmospheric conditions are covered under the test program. Electrical and physical stresses are not specifically specified as a part of the test program. A voltage withstand test of 3600 volts AC was applied to the cable connections after each phase of the test program (3 times) and the specimens were energized at 1000 volts AC during the DBE. These conditions ensure that the cable will endure voltage stresses during normal operation. Seismic concerns are not applicable to cable or splicing systems which have inherently high damping and for which vibration is not a principal failure mode. As the values of elongation for the connection kits and splices (500% in unaged state and 154% after thermal aging to simulate a 40 year life) would ensure that normal physical stresses during operation would not cause a failure. Also after the test was completed, the specimens were removed from the test chamber and additional testing was performed. This physical handling of the specimens would cause a greater physical stress than would occur during normal plant operation. From the above it may be concluded that the specimens meet the intent of paragraph 1.3.4.1 of IEEE 383-1974. Reference TAB E for letter from Raychem dated June 4, 1985 with additional information.

P. DISCUSSION (Continued)

G. Aging

The Qualification Report 58722-2 was for Raychem Type WCSF-N splicing materials. The splices were aged for 916.75 hours at 150°C to give a life equivalent of more than 40 years. The justification for the above parameters is found in Raychem Report EDR 5046 (TAB D).

This binder also covers Raychem -52 molding material used as breakouts in splicing kits (NPK Kit Report 58722-6, TAB E). The activation energy for the -52 molding material (1.3) is lower than the activation energy for the WCSF material (1.33). The justification for the above parameters is found in Raychem Report EDR 5040. The calculations located in TAB C for aging are done using both sets of parameters for the two types of material to show that both types meet the 40 year life at 90°C.

P. DISCUSSION (Continued)

H. Test Anomaly Evaluation

1) At 9 minutes and at 5 hours into the test, the test was interrupted because of problems with the vessel pressure seal and the test extension leads. Replacement of the vessel penetration seal and the test specimen extension leads was required. The test specimens themselves were not modified or changed in any way. This anomaly had no effect on the test results.

2) Two of the twelve specimens did not hold rated voltage throughout the environmental exposure nor did they pass the voltage withstand test while immersed inside the test vessel. At the conclusion of the test, the two specimens passed a 3600 VAC withstand test in a water bath and also measured acceptable insulation resistance values with the connecting extension leads excluded from the test. Visual inspection of all specimens (including two that did not hold voltage) showed no cracking or splitting of the sleeving material. Failure of the two splices to hold rated voltage throughout the environmental exposure and pass the voltage withstand test while still in vessel was due to damaged extension leads. Testing of the two specimens after removal of the test leads demonstrated their electrical integrity and visual examination substantiated their physical integrity. This anomaly does not affect the test results.

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-BKRA-002

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION	MANUF.
WBN-0-BD -228-0003	0-BD -228-0003	CIRCUIT BREAKER	JA	TA2		692'	A01	73C02-84112	L	B	100D	BREAKER PANELS MUST PROTECT ASSOCIATED NON-1E CABLES DURING FAULT OR OVERLOAD.	WESTINGHOUSE
									AF	B	1MO		
									AB	B	1MO		
									RH/A	B	1MO		
									CV/A	B	1MO		
WBN-0-BD -228-0004	0-BD -228-0004	CIRCUIT BREAKER	JA	TA15		692'	A01	73C02-84112	L	B	100D	BREAKER PANELS MUST PROTECT ASSOCIATED NON-1E CABLES DURING FAULT OR OVERLOAD.	WESTINGHOUSE
									AF	B	1MO		
									AB	B	1MO		
									RH/A	B	1MO		
									CV/A	B	1MO		
WBN-0-DPL -234-0001/WDS	0-DPL -234-0001/WDS	CIRCUIT BREAKER	QOB	VA11		692'	A01	77K6-821608	L	B	100D	BREAKER PANELS MUST PROTECT ASSOCIATED NON-1E CABLES DURING FAULT OR OVERLOAD.	SQUARE D
									AF	B	1MO		
									AB	B	1MO		
									RH/A	B	1MO		
									CV/A	B	1MO		
WBN-0-DPL -234-0002/WDS	0-DPL -234-0002/WDS	CIRCUIT BREAKER	QOB	UA7		692'	A01	77K6-821608	L	B	100D	BREAKER PANELS MUST PROTECT ASSOCIATED NON-1E CABLES DURING FAULT OR OVERLOAD.	SQUARE D
									AF	B	1MO		
									AB	B	1MO		
									RH/A	B	1MO		
									CV/A	B	1MO		

NOTES:
1. 0-BD -228-0003 CONTAINS 8 WESTINGHOUSE JA CIRCUIT BREAKERS.
2. 0-BD -228-0004 CONTAINS 5 WESTINGHOUSE JA CIRCUIT BREAKERS.
3. 0-DPL -234-0001/WDS CONTAINS 1 SQUARE D QOB CIRCUIT BREAKER.
4. 0-DPL -234-0002/WDS CONTAINS 3 SQUARE D QOB CIRCUIT BREAKERS.

		R_____	R_____	R_____
PREPARER/DATE	H.W. Hampton 9/14/84			
CHECKER/DATE	R.W. Pitts 9/17/84			

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-BKRA-002

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION	MANUF.
WBN-0-DPL -234-00A3/CVC	0-DPL -234-00A3CVC	CIRCUIT BREAKER	QOB	TA14		692'	A01	77K6-821608	L	B	100D	BREAKER PANELS MUST PROTECT ASSOCIATED NON-1E CABLES DURING FAULT OR OVERLOAD.	SQUARE D
									AF	B	1MO		
									AB	B	1MO		
									RH/A	B	1MO		
									CV/A	B	1MO		
WBN-0-DPL -234-00A4/CVC	0-DPL -234-00A4CVC	CIRCUIT BREAKER	QOB	SA15		692'	A01	77K6-821608	L	B	100D	BREAKER PANELS MUST PROTECT ASSOCIATED NON-1E CABLES DURING FAULT OR OVERLOAD.	SQUARE D
									AF	B	1MO		
									AB	B	1MO		
									RH/A	B	1MO		
									CV/A	B	1MO		
WBN-0-DPL -234-00B3/CVC	0-DPL -234-00B3CVC	CIRCUIT BREAKER	QOB	TA14		692'	A01	77K6-821608	L	B	100D	BREAKER PANELS MUST PROTECT ASSOCIATED NON-1E CABLES DURING FAULT OR OVERLOAD.	SQUARE D
									AF	B	1MO		
									AB	B	1MO		
									RH/A	B	1MO		
									CV/A	B	1MO		
WBN-0-DPL -234-00B4/CVC	0-DPL -234-00B4CVC	CIRCUIT BREAKER	QOB	SA15		692'	A01	77K6-821608	L	B	100D	BREAKER PANELS MUST PROTECT ASSOCIATED NON-1E CABLES DURING FAULT OR OVERLOAD.	SQUARE D
									AF	B	1MO		
									AB	B	1MO		
									RH/A	B	1MO		
									CV/A	B	1MO		

NOTES:
1. 0-DPL -234-00A3/CVC CONTAINS 35 QOB CIRCUIT BREAKERS.
2. 0-DPL -234-00A4/CVC CONTAINS 24 QOB CIRCUIT BREAKERS.
3. 0-DPL -234-00B3/CVC CONTAINS 34 QOB CIRCUIT BREAKERS.
4. 0-DPL -234-00B4/CVC CONTAINS 23 QOB CIRCUIT BREAKERS.

		R_____	R_____	R_____
PREPARER/DATE	H.W. Hampton 9/16/86	_____	_____	_____
CHECKER/DATE	R.K. White 9/17/86	_____	_____	_____

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-BKRA-002

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION	MANUF.
WBN-0-MCC -217-000A	0-MCC -217-000A	CIRCUIT BREAKER	EF3-	TA6		692'	A01	74C5-84646	L	B	100D	BREAKER PANELS MUST	ITE
									AF	B	1MO	PROTECT ASSOCIATED NON-1E	
									AB	B	1MO	CABLES DURING FAULT OR	
									RH/A	B	1MO	OVERLOAD.	
									CV/A	B	1MO		
WBN-0-MCC -217-000B	0-MCC -217-000B	CIRCUIT BREAKER	EF3-	TA10		692'	A01	74C5-84646	L	B	100D	BREAKER PANELS MUST	ITE
									AF	B	1MO	PROTECT ASSOCIATED NON-1E	
									AB	B	1MO	CABLES DURING FAULT OR	
									RH/A	B	1MO	OVERLOAD.	
									CV/A	B	1MO		
WBN-0-DPL -234-00A1/SIS	0-DPL -234-00A1/SIS	CIRCUIT BREAKER	QOB	VA3		713'	A06	77K6-821608	L	B	100D	BREAKER PANELS MUST	SQUARE D
									AF	B	1MO	PROTECT ASSOCIATED NON-1E	
									AB	B	1MO	CABLES DURING FAULT OR	
									RH/A	B	1MO	OVERLOAD.	
									CV/A	B	1MO		
WBN-0-DPL -234-00A2/SIS	0-DPL -234-00A2/SIS	CIRCUIT BREAKER	QOB	VA12		713'	A19	77K6-821608	L	B	100D	BREAKER PANELS MUST	SQUARE D
									AF	B	1MO	PROTECT ASSOCIATED NON-1E	
									AB	B	1MO	CABLES DURING FAULT OR	
									RH/A	B	1MO	OVERLOAD.	
									CV/A	B	1MO		

NOTES:
1. 0-MCC -217-000A CONTAINS 15 ITE EF3- CIRCUIT BREAKERS.
2. 0-MCC -217-000B CONTAINS 12 ITE EF3- CIRCUIT BREAKERS.
3. 0-DPL -234-00A1/SIS CONTAINS 8 QOB SQUARE D CIRCUIT BREAKERS.
4. 0-DPL -234-00A2/SIS CONTAINS 21 QOB SQUARE D CIRCUIT BREAKERS.

R_____ R_____ R_____

PREPARER/DATE H.W. Hampton 9/16/86 _____ _____ _____

CHECKER/DATE R.K. Wolcott 9/17/86 _____ _____ _____

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-BKRA-002

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION	MANUF.
WBN-0-DPL -234-00B1/SIS	0-DPL -234-00B1/SIS	CIRCUIT BREAKER	QOB	VA4		713'	A06	77K6-821608	L	B	100D	BREAKER PANELS MUST PROTECT ASSOCIATED NON-1E CABLES DURING FAULT OR OVERLOAD.	SQUARE D
									AF	B	1MO		
									AB	B	1MO		
									RH/A	B	1MO		
									CV/A	B	1MO		
WBN-0-DPL -234-00B2/SIS	0-DPL -234-00B2/SIS	CIRCUIT BREAKER	QOB	VA13		713'	A19	77K6-821608	L	B	100D	BREAKER PANELS MUST PROTECT ASSOCIATED NON-1E CABLES DURING FAULT OR OVERLOAD.	SQUARE D
									AF	B	1MO		
									AB	B	1MO		
									RH/A	B	1MO		
									CV/A	B	1MO		

NOTES:
1. 0-DPL -234-00B1/SIS CONTAINS 9 SQUARE D QOB CIRCUIT BREAKERS.
2. 0-DPL -234-00B2/SIS CONTAINS 20 SQUARE D QOB CIRCUIT BREAKERS.

		R_____	R_____	R_____
PREPARER/DATE	H.W. Hamptn 9/16/86	_____	_____	_____
CHECKER/DATE	R.K. White 9/17/86	_____	_____	_____

BINDER NO. WBNEQ-BKRA-002 PLANT WBN UNIT(S) COMMON SHEET 1 OF 27

BINDER TITLE MOLDED CASE CIRCUIT BREAKERS COMPUTED HWH DATE 9/17/86 R ___ R ___

CHECKED [illegible] DATE 9/17/86

A. DOCUMENTATION

Equipment Description Molded Case Circuit Breakers

Vendor/Manufacturer ITE Siemens Allis, Westinghouse, and Square-D

Equipment Model No.(s) EF3-, JA, and QOB breakers

QUALIFICATION REPORTS

(1) Title/Number/Revision Test Report/17737-02 R0 RIMS B71 860911 100

Thermal Test on Circuit Breakers DATE Oct. 29, 1985

(2) Title/Number/Revision ___ RIMS ___

___ DATE ___

(3) Title/Number/Revision ___ RIMS ___

___ DATE ___

OTHER (ANALYSIS, VENDOR DATA, ETC.)

UL Standard 489/Sixth Edition. October 19, 1984.

Calculation No. WAA-8 (See TAB C) System 1000.

Calculation WBNNAL3-029 (B45 860506 236) See TAB C.

BINDER NO. WBNEQ-BKRA-002 PLANT WBN UNIT(S) COMMON SHEET 2 OF 27

BINDER TITLE MOLDED CASE CIRCUIT BREAKERS COMPUTED HWH/BY BDM DATE 9-22-86 R R

CHECKED RLW DATE 9/22/86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified

____ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

____ Equipment Qualification Not Established by Documentation

____ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES See 3 open items for verification of manufacture to UL Standard 489, and lists of organic materials. Install qualified breakers equipped with overload and fault protection (SCR WBNEQP8633).

COMMENTS/RECOMMENDATIONS These associated circuits breakers are qualified to the requirements for an associated circuits as described in IEEE 384-1981, paragraph 5.5.3.

BINDER NO. WBNEQ-BKRA-002 PLANT WBN UNIT(S) COMMON SHEET 3 OF 27

BINDER TITLE MOLDED CASE CIRCUIT BREAKERS COMPUTED HWH DATE 9/16/86 R ___ R ___

CHECKED RKW DATE 9/16/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

_____ Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

__X__ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of 1E Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS Breakers were purchased on TVA Contracts 74C5-84646, 77K6-821608, and 73C02-84112 and as such are Category II components. All breakers were purchased and delivered prior to May 23, 1980.

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

These breakers meet UL Standard 484 titled "Molded Case Circuit Breakers and Circuit Breaker Enclosures."

BINDER NO. WBNEQ-BKRA-002 PLANT WBN UNIT(S) COMMON SHEET 4 OF 27

BINDER TITLE MOLDED CASE CIRCUIT BREAKERS COMPUTED HWH DATE 9/16/86 R ___ R ___

CHECKED RKN DATE 9/16/86

D. QUALIFICATION METHODOLOGY (Check only one block)

_____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

__X__ Test of Similar Items with Supporting Analysis

_____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

_____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS Non 1E Cables that the molded case circuit breakers protect are routed in the same cable trays with 1E cables. cables. As a result of this commonality, the molded case circuit breakers must protect their associated cables such that no damage can occur to the 1E cables.

DELETE

TVA drawing 47E235-63 indicates that these breakers can be exposed to a temperature greater than 130°F for a period of 150 seconds.

Test Report 17737-01/02 R0, the fact that these breakers meet UL Standard 489, and materials analysis give a measure of assurance that these breakers will protect their associated circuits.

BINDER NO. WBNEQ-BKRA-002 PLANT WBN UNIT(S) COMMON SHEET 5 OF 27

BINDER TITLE MOLDED CASE CIRCUIT BREAKERS COMPUTED HWH DATE 9/16/86 R ___ R ___

CHECKED RKN DATE 9/16/86

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? No

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Circuit Breaker	Circuit Breaker	Test Report 17737-02 R0, PAR. 6.0 P. iii
(2) Manufacturer	*	*	"
(3) Model Number(s)	**	**	"
(4) Serial Number(s)	NA	NA	NA
(5) Identify Component-Unique checksheet attached:	None		

JUSTIFICATION/COMMENTS *ITE, Westinghouse, and Square-D.

**EF3-, JA, and QOB breakers.

Similar items were tested with supporting analysis to show equivalence and qualification. Breakers are equivalent except for breaker rating and trip element. Breakers are tested on a family basis. The trip coil will change with rating but other elements (including organic materials) do not change.

BINDER NO. WBNEQ-BKRA-002 PLANT WBN UNIT(S) COMMON SHEET 6 OF 27

BINDER TITLE MOLDED CASE CIRCUIT BREAKERS COMPUTED HWH DATE 8/18/86 R ___ R ___

CHECKED WMK DATE 8/18/86

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA	NA	NA
External Process Connections	NA	NA	NA
Electrical Connections	NA	NA	NA
Conduit Seals	NA	NA	NA
Connector Seals	NA	NA	NA
Orientation	NA	NA	NA
Physical Configuration	NA	NA	NA
Other	NA	NA	NA

JUSTIFICATION/COMMENTS No interfaces were identified in the test report which are pertinent to EQ.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	Test Report 17737-02, Sec. 2.1, Page I-1
(b) Baseline performance measurements taken	Yes	"
(c) Equipment aged:		
Thermal	No	No
Radiation	No (1)	No (1)
Wear	Yes	UL Standard 489, Part 19, p E-14
(d) Vibration/seismic testing conducted	No	No
(e) Design basis event (DBE) exposure	Yes	Test Report 17737-02, p iii
(f) Post-DBE exposure	No	No
(g) Final inspection and disassembly	Yes	Test Report 17737-02 R0, Para. 3.0, p I-3

(1) See Calculation WBNNAL3-029. (TAB C)

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes
(Reference Test Report 17737-02 R0, Appendix III).

JUSTIFICATION/COMMENTS Radiation, vibration/seismic testing, and post-DBE exposure are not test parameters for these devices. Thermal lifetime is established through analysis. Qualification for design basis event was established through testing. Breakers are allowed to fail open during a seismic or other event.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? No (Reference See Calculation WBNNAL3-029 (TAB C)).

JUSTIFICATION/COMMENTS See TAB C (Analysis) Calculation No. WAA-8.

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	No	Calculation WAA-8
Radiation exposure	No	Calculation WBNNAL3-029
Vibration (non-seismic) aging	No	NA
Operational (electrical/mechanical/process) stress aging	No	NA

JUSTIFICATION/COMMENTS See TAB C. Breakers may fail open during any event.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference).

JUSTIFICATION/COMMENTS No synergistic effects known for this equipment.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? NA (Reference).

JUSTIFICATION/COMMENTS A materials analysis of organic materials provides a large margin for expected lifetime. (See TAB C - Analysis) Calculation No. WAA-8.

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? NA (Reference: _____).

JUSTIFICATION/COMMENTS Thermal aging was not considered in the qualification program. A list of materials was supplied by Westinghouse. Qualification is determined by materials analysis by System 1000.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? NA (Reference _____).

JUSTIFICATION/COMMENTS See TAB C (Analysis) TVA Calculation WAA-8, WAC-170

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? NA (Reference See TAB C - Analysis), TVA Calculation WAA-8

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	104°F	NA	104°F
Time	40 Yrs.		40 Yrs.

JUSTIFICATION/COMMENTS See TAB C (Analysis) TVA Calculation WAA-8.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference See TAB C - Analysis).

JUSTIFICATION/COMMENTS TVA Calculation WAA-8.

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference _____).

JUSTIFICATION/COMMENTS See TAB C (Analysis) TVA Calculation WAA-8.

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? NA (Reference ___).

JUSTIFICATION/COMMENTS Regression line not used.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? NA (Reference See Comments).

JUSTIFICATION/COMMENTS Thermal aging was not considered in Qualification Program; therefore, operation of the devices was not required.

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? No (Reference ___).

JUSTIFICATION/COMMENTS Radiation aging was not considered in Qualification Program. TAB C analysis (Calc WAA-8) identifies those materials subject to degradation and their radiation thresholds. These values are significantly greater than that seen for the devices installed environment.

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? NA (Reference ___).

JUSTIFICATION/COMMENTS Those materials subject to radiation degradation are identified in TAB C (Calc WAA-8).

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? NA (Reference ___

JUSTIFICATION/COMMENTS None

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? NA (Reference No radiation aging performed.)

Plant normal ambient radiation dose (rd) 1.4E4

*Test exposure dose (rd) N/A

*Test exposure dose rate (rd/hr) N/A

*Test exposure source type (e.g., Co-60 gamma) N/A

JUSTIFICATION/COMMENTS Radiation levels are low enough that no breaker components are affected.

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS Equipment installed in enclosures which are rigidly mounted.

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? NA (Reference NA).

JUSTIFICATION/COMMENTS Equipment installed in enclosures which are rigidly mounted.

*Radiation aging was not considered for those breakers identified in TAB A.

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No
(Reference See Part 19 of UL Standard 489).

JUSTIFICATION/COMMENTS UL Standard 489 requires testing to meet operational stresses. These breakers are manufactured to UL Standard 489 requirements.

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? No

JUSTIFICATION/COMMENTS Part 19 of UL Standard 489 provides endurance testing.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? No

Qualified life (Document in QMDS) 40 years.

JUSTIFICATION/COMMENTS See TAB C - Analysis Materials analysis puts the lowest expected life at 3008 years. Since 40 years is only 1.3% of the expected life, this gives a reasonable assurance that the breakers have a 40 year life.

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? No
(Reference See TAB G - QMDS).

Replacement Intervals (Document in QMDS) NA

JUSTIFICATION/COMMENTS See construction specification G-84 for periodic breaker maintenance requirements.

BINDER NO. WBNEQ-BKRA-002 PLANT WBN UNIT(S) COMMON SHEET 14 OF 27

BINDER TITLE MOLDED CASE COMPUTED HWH DATE 9/16/86 R ___ R ___

CIRCUIT BREAKERS CHECKED RKW DATE 9/16/86

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation* Energy	Reference
(a)	Glass Reinforced Polyester Resin/Base, Case and Cover	-	-	.81-2.07	TAB C
(b)	Valox, Thermoplastic/ Handle	-	-	.87-1.83	TAB C
(c)	Molded Fibre/ Arc Wrapper	-	-	1.31	TAB C
(d)	Molded Phenolic - Wood Fill/Trip Bar	-	-	1.02 -1.82	TAB C

JUSTIFICATION/COMMENTS *Electron volts.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference Test Report 17737-02 R0, Para. 1.1).

Identify Acceptance Criteria: Breakers must protect (during elevated temperatures) associated non 1E cables so that associated cables will not convey any damage to IE Cables.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference Test Report 17737-02 R0, Para. 1.1).

Identify baseline and functional testing: Breakers correctly operated during elevated temperature testing. Breakers were manufactured to the requirements of UL Standard 489.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference Test Report 17737-02 R0, Para. 2.2).

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? Yes (Reference Test Report 17737-02, Para. 2.2).

JUSTIFICATION/COMMENTS The breaker loads during testing are typical of loads carried during normal operation.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	480 Volts AC	Test Procedure 17737-01, Para. 3.2, p 3.
Load	10, 30, 50, and 70 amperes	Test Procedure 17737-01, Para. 3.2, p 4.
Frequency	60 Hz	Test Procedure 17737-01, Para. 3.2, p 3.
Accuracy	300% ±5% of rated current (trip current)	Test Procedure 17737-01, Para. 3.2, p 4.
Other(s)		

Trip times - See 17737-01, Para. 2.2, p 2.

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(a)

Parameter	Demonstrated Conditions	Reference
Voltage	480 Volts AC	Test Report 17737-02 R0, Para. 2.2
Load	10, 30, 50, and 70 amperes	Test Report 17737-02 R0, Para. 2.2.2
Frequency	60 Hz	Test Report 17737-02 R0, Para. 2.2
Accuracy	300% ±5% of rated current (Trip Current)	Test Report 17737-02 R0, Para. 2.2.4
Other(s)		

Trip times - See 17737-02, Para. 1.1

JUSTIFICATION/COMMENTS All breakers tripped within acceptable time limits. See Test Report 17737-02 R0, Para. 3.0.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-56 R1, 47E235-62 R1

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) ATM-

(c) Humidity (%) 80

(d) Radiation (rd) 1.4E4[1]

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) ATM-

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: None

(4) State anticipated occurrence frequency and duration of abnormal conditions: Less than 1% of plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 197 Accident type HELB* (RHR)

(b) Pressure (psig) ATM- Accident type HELB

(c) Humidity (%) 100 Accident type HELB

(d) Radiation (rd) 3.7E4[1] Accident type HELB

(e) Spray Type None Accident type NA

*HELB means high energy line break.

[1] TVA Calculation WBNNAL3-029.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

See TVA Environmental Drawings 47E235-62 R1 and 47E235-56 R1 for duration, peak, and profile.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? Yes (Reference See 47E235-62 R1, HELB (steam). See TAB C - Analysis).

(7) Subject to submergence (yes/no/NA)? No
(Reference See 47E235-62 R1, 47E235-56 R1).

Identify initiation time and duration of submergence: NA

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
WBNNAL3-029	B45 860506 236

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 days	14 days	WAC-170
Temperature (°F)	197°F[1], 153°F[1]	197°F[1]+, 153°F[1]	See 17737-1. Sect 2.2 Sect III. 1.1 Sect. III
Pressure (psig)	ATM (-)	NA	NA
Relative Humidity (%)	100	100	See TAB C
*Chemical Spray	NA	NA	NA
**Radiation (rd)	3.7E4	NA	NA
Submergence	NA	NA	NA

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

[1]CALC. WAC-170 (TAB C)

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	Tab C. WAC-170
Pressure	NA	NA
Relative Humidity	Yes	See TAB C
Chemical Spray	NA	NA
Submergence	NA	NA

JUSTIFICATION/COMMENTS Pressure, chemical spray, radiation, and submergence are not areas for which these breakers must be qualified.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	NA	Yes*
Pressure: +10% but no more than 10 psig	NA	NA
Radiation: +10% of accident dose	NA	NA
Time: +10% (or 1 hour + operating time per NUREG-0588)	NA	NA
Voltage: ±10% of rated value	NA	NA
Frequency: ±5% of rated value	NA	NA
Environmental Transient: the initial transient and the peak temperature applied twice	NA	NA
Vibration: +10% added to acceleration	NA	NA

JUSTIFICATION/COMMENTS: *+9°F is less than the suggested margin of IEEE-323 (74), but is more than sufficient for our test. Pressure, radiation, voltage, frequency, and vibration are not test variables. See TAB C for equivalency calculation. Per IEEE 323 (1974) margin is not required for Category II qualification.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference These breakers protect associated cables, and prevent associated cables from damaging IE cables.).

JUSTIFICATION/COMMENTS The associated cables and IE cables share a common cable tray. See QIR EEB86027.

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference See Test Report 17737-01/02 R0, Para. 3.0).

JUSTIFICATION/COMMENTS Breakers operated under elevated temperatures.

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference See Test Report 17737-01/02 R0, Para. 3).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? No (Reference).

JUSTIFICATION/COMMENTS See TAB C for accident equivalency calculation.

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference See Test Report 17737-01/02 R0, Appendix 1).

JUSTIFICATION/COMMENTS Anomalies were reviewed and approved.

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS

These breakers were tested to elevated temperatures to assure that they will operate and not cause damage to associated IE cables. For maintenance and surveillance see Section G.

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	Yes
(b) Were specific features and failure modes and effects analyzed?	Yes
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	Yes
(d) Were environmental parameters which affect equipment performance identified?	Yes
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	NA
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	NA
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	NA
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	NA
(a) Was the spray testing done while under the extremes of pressure and temperature?	NA
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA
(11) Criteria regarding submergence satisfied?	NA
(12) Criteria regarding radiation satisfied?	NA
(a) Was dose rate considered?	NA
(b) Was beta radiation considered?	NA
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	Yes
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	NA
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

They were tested at elevated temperatures to ensure that their associated cables would have no adverse effect on IE cables during a design basis event. See Test Report 17737-02. These are associated circuits and are not subjected to a full qualification program.

Associated circuits are circuits which do not mitigate any accident or perform any safety related function. Associated circuits share space with safety related circuits. The only requirement of associated circuits is that they not degrade nearby 1E cirucits.

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 1 OF 1

R ___ R ___

BINDER TITLE BARTON 764 COMPUTED [illegible] DATE 5/22/86

LOT 7 AND 4 CHECKED [illegible] DATE 5/22/86

TAB A - Identification of Equipment

Comprising the Equipment Type

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-XMTR-001
MANUFACTURER: BARTON

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-FT -001-0003A -D	1-FT -001-0003A -D	SG1 MAIN STEAM HDR FLOW CHAN 1	764 LOT 7				*	71C62-54114-1	MS/C FW/C	A A	5MIN 5MIN	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW
WBN-1-FT -001-0003B -E	1-FT -001-0003B -E	SG1 MAIN STEAM HDR FLOW CHAN 2	764 LOT 7				*	71C62-54114-1	MS/C FW/C	A A	5MIN 5MIN	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW
WBN-1-FT -001-0010A -D	1-FT -001-0010A -D	SG2 MAIN STEAM HDR FLOW CHAN 1	764 LOT 7				*	71C62-54114-1	MS/C FW/C	A A	5MIN 5MIN	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW
WBN-1-FT -001-0010B -E	1-FT -001-0010B -E	SG2 MAIN STEAM HDR FLOW CHAN 2	764 LOT 7				*	71C62-54114-1	MS/C FW/C	A A	5MIN 5MIN	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW
WBN-1-FT -001-0021A -D	1-FT -001-0021A -D	SG 3 MAIN STEAM HDR FLOW CHAN 1	764 LOT 7				*	71C62-54114-1	MS/C FW/C	A A	5MIN 5MIN	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW
WBN-1-FT -001-0021B -E	1-FT -001-0021B -E	SG 3 MAIN STEAM HDR FLOW CHAN 2	764 LOT 7				*	71C62-54114-1	MS/C FW/C	A A	5MIN 5MIN	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW
WBN-1-FT -001-0028A -D	1-FT -001-0028A -D	SG 4 MAIN STEAM HDR FLOW CHAN 1	764 LOT 7				*	71C62-54114-1	MS/C FW/C	A A	5MIN 5MIN	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW

* ECN 5974 IS RELOCATING THESE TRANSMITTERS, SEE OPEN ITEM SHEET 1.

R_____ R_____ R_____

PREPARER/DATE A. W. Lewis 9/23/86 _____ _____ _____

CHECKER/DATE Bryan D. Myers / 9-23-86 _____ _____ _____

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-XMTR-001
MANUFACTURER: BARTON
PAGE: 2 OF 7

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-FT -001-0028B -E	1-FT -001-0028B -E	SG 4 MAIN STEAM HDR FLOW CHAN 1	764 LOT 7				*	71C62-54114-1	MS/C FW/C	A A	5MIN 5MIN	INITIATE SI & MS ISOLATION ON HIGH STM FLOW, INITIATE REAC TRIP ON LOW FW FLOW
WBN-1-LT -003-0038 -E	1-LT -003-0038 -E	STM GEN 1 LEVEL	764 LOT 7				*	71C62-54114-1	L MS/C FW/C RH/C CV/C	A A A A A	100D 100D 100D 1MO 1MO	MEASURES SG WATER LEVEL, PAM
WBN-1-LT -003-0039 -F	1-LT -003-0039 -F	STM GEN 1 LEVEL	764 LOT 7				*	71C62-54114-1	L MS/C FW/C RH/C CV/C	A A A A A	100D 100D 100D 1MO 1MO	MEASURES SG WATER LEVEL, PAM
WBN-1-LT -003-0042 -G	1-LT -003-0042 -G	STM GEN 1 LEVEL	764 LOT 7				*	71C62-54114-1	L FW/C MS/C RH/C CV/C	A A A A A	100D 100D 100D 1MO 1MO	TRIPS REACTOR WHEN SG WATER LEVEL IS LOW, PAM
WBN-1-LT -003-0043 -F	1-LT -003-0043 -F	STM GEN 1 LEVEL	764 LOT 7				*	71C62-54114-1	L FW/C MS/C RH/C CV/C	A A A A A	100D 100D 100D 1MO 1MO	MEASURES SG WATER LEVEL, PAM
WBN-1-LT -003-0051 -D	1-LT -003-0051 -D	STM GEN 2 LEVEL	764 LOT 7				*	71C62-54114-1	L MS/C FW/C RH/C CV/C	A A A A A	100D 100D 100D 1MO 1MO	MEASURES SG WATER LEVEL, PAM

* ECN 5974 IS RELOCATING THESE TRANSMITTERS, SEE OPEN ITEM SHEET 1.

R_____ R_____ R_____

PREPARER/DATE A.N. Lawler 8/-4/86

CHECKER/DATE B.D. Mayn /9-23-86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-XMTR-001
MANUFACTURER: BARTON

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-LT -003-0052 -F	1-LT -003-0052 -F	STM GEN 2 LEVEL	764 LOT 7				*	71C62-54114-1	L	A	100D	MEASURES SG WATER LEVEL, PAM
									FW/C	A	100D	
									MS/C	A	100D	
									CV/C	A	1MO	
									RH/C	A	1MO	
WBN-1-LT -003-0055 -G	1-LT -003-0055 -G	STM GEN 2 LEVEL	764 LOT 7				*	71C62-54114-1	L	A	100D	MEASURES SG WATER LEVEL, PAM
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-LT -003-0056 -G	1-LT -003-0056 -G	STM GEN 2 LEVEL	764 LOT 7				*	71C62-54114-1	L	A	100D	MEASURES SG WATER LEVEL, PAM
									FW/C	A	100D	
									MS/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-LT -003-0093 -D	1-LT -003-0093 -D	STM GEN 3 LEVEL	764 LOT 7				*	71C62-54114-1	L	A	100D	MEASURES SG WATER LEVEL, PAM
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-LT -003-0094 -F	1-LT -003-0094 -F	STM GEN 3 LEVEL	764 LOT 7				*	71C62-54114-1	L	A	100D	MEASURES SG WATER LEVEL, PAM
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	

* ECN 5974 IS RELOCATING THESE TRANSMITTERS, SEE OPEN ITEM SHEET 1.

R_____ R_____ R_____

PREPARER/DATE A.W. Lewis 9/24/86

CHECKER/DATE B.D. Meyer 9-23-86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-XMTR-001
MANUFACTURER: BARTON

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-LT -003-0097 -G	1-LT -003-0097 -G	STM GEN 3 LEVEL	764 LOT 7				*	71C62-54114-1	L	A	100D	MEASURES SG WATER LEVEL, PAM
									MS/C	A	100D	
									FW/C	A	100D	
									CV/C	A	1MO	
									RH/C	A	1MO	
WBN-1-LT -003-0098 -G	1-LT -003-0098 -G	STM GEN 3 LEVEL	764 LOT 7				*	71C62-54114-1	L	A	100D	MEASURES SG WATER LEVEL, PAM
									FW/C	A	100D	
									MS/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-LT -003-0106 -E	1-LT -003-0106 -E	STM GEN 4 LEVEL	764 LOT 7				*	71C62-54114-1	L	A	100D	MEASURES SG WATER LEVEL, PAM
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-LT -003-0107 -F	1-LT -003-0107 -F	STM GEN 4 LEVEL	764 LOT 7				*	71C62-54114-1	L	A	100D	MEASURES SG WATER LEVEL, PAM
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-LT -003-0110 -G	1-LT -003-0110 -G	STM GEN 4 LEVEL	764 LOT 7				*	71C62-54114-1	L	A	100D	MEASURES SG WATER LEVEL, PAM
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	

* ECN 5574 IS RELOCATING THESE TRANSMITTERS, SEE OPEN ITEM SHEET 1.

R_____ R_____ R_____

PREPARER/DATE R.W. Lawler 9/23/86 _____ _____ _____

CHECKER/DATE B.D. Moya 9-23-86 _____ _____ _____

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-XMTR-001
MANUFACTURER: BARTON

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-LT -003-0111 -F	1-LT -003-0111 -F	STM GEN 4 LEVEL	764 LOT 4				*	71C62-54114-1	L	A	100D	MEASURES SG WATER LEVEL, PAM
									FW/C	A	100D	
									MS/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-PDT -030-0042 -G	1-PDT -030-0042 -G	CNTMT PRESS DIFF XMTR	764 LOT 7		301	728' 7"	ANN	71C62-54114-1	L	A	100D	PROVIDES A SIGNAL FOR PHASE B ISOLATION, PAM
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-PDT -030-0043 -F	1-PDT -030-0043 -F	CNTMT PRESS DIFF XMTR	764 LOT 7		296	729' 1"	ANN	71C62-54114-1	L	A	100D	PROVIDES A SIGNAL FOR PHASE B ISOLATION, PAM
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-PDT -030-0044 -E	1-PDT -030-0044 -E	CNTMT PRESS DIFF XMTR	764 LOT 7		285	746' 1"	ANN	71C62-54114-1	L	A	100D	PROVIDES A SIGNAL FOR PHASE B ISOLATION, PAM
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	
WBN-1-PDT -030-0045 -D	1-PDT -030-0045 -D	CNTMT PRESS DIFF XMTR	764 LOT 7		307	728' 7"	ANN	71C62-54114-1	L	A	100D	PROVIDES A SIGNAL FOR PHASE B ISOLATION, PAM
									MS/C	A	100D	
									FW/C	A	100D	
									RH/C	A	1MO	
									CV/C	A	1MO	

* ECN 5974 IS RELOCATING THIS TRANSMITTER, SEE OPEN ITEM SHEET 1.

PREPARER/DATE M. W. Leufer 9/23/86
CHECKER/DATE B. A. Myn 9-23-86

R_____ R_____ R_____

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-XMTR-001
MANUFACTURER: BARTON
PAGE: 6 OF 7

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-LT -063-0180 -D	1-LT -063-0180 -D	CNTMT LEVEL MIN LEVEL RHR RECIR	764 LOT 7		169	720' 3/4"	FAN 2 BPM 9-23-86 AWL 9/23/86	71C62-54114-1	L MS/C FW/C RH/C CV/C	A A A A A	100D 100D 100D 1MO 1MO	DETECT HIGH SUMP WATER LVL INITIATE SWITCHOVER ON LOW RWST, PAM
WBN-1-LT -063-0181 -E	1-LT -063-0181 -E	CNTMT LEVEL MIN LEVEL RHR RECIR	764 LOT 7		359	720' 3/4"	2 BPM 9-23-86 AWL 9/23/86 FAN 1	71C62-54114-1	L MS/C FW/C RH/C CV/C	A A A A A	100D 100D 100D 1MO 1MO	DETECT HIGH SUMP WATER LVL INITIATE SWITCHOVER ON LOW RWST, PAM
WBN-1-LT -063-0182 -F	1-LT -063-0182 -F	CNTMT LEVEL MIN LEVEL RHR RECIR	764 LOT 7		277	720' 3/4" 2	BPM 9-23-86 ACC 4	71C62-54114-1	L MS/C FW/C RH/C CV/C	A A A A A	1WK 1WK 1WK 1WK 1WK	DETECT HIGH SUMP WATER LVL INITIATE SWITCHOVER ON LOW RWST
WBN-1-LT -063-0183 -G	1-LT -063-0183 -G	CNTMT LEVEL MIN LEVEL RHR RECIR	764 LOT 7		072	720' 2"	IIR	71C62-54114-1	L MS/C FW/C RH/C CV/C	A A A A A	1WK 1WK 1WK 1WK 1WK	DETECT HIGH SUMP WATER LVL INITIATE SWITCHOVER ON LOW RWST
WBN-1-LT -068-0320 -F	1-LT -068-0320 -F	RCS PRZR LEVEL	764 LOT 7		120	730' 10"	IIR	71C62-54114-1	L MS/C FW/C CV/C RH/C	A A A A A	100D 100D 100D 1MO 1MO	ISOLATE RCS LETDOWN, CONT RCP SEAL WATER INJECTION, PAM AND REACTOR TRIP

R_____ R_____ R_____

PREPARER/DATE A.W. Lawson 9/23/86

CHECKER/DATE B.D. Meyer 9-23-86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-XMTR-001
MANUFACTURER: BARTON

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-LT -068-0335 -E	1-LT -068-0335 -E	RCS PRZR LEVEL	764 LOT 7		085	732' 4"	IIR	71C62-54114-1	L	A	100D	ISOLATE RCS LETDOWN, CONT
									MS/C	A	100D	RCP SEAL WATER INJECTION,
									FW/C	A	100D	PAM AND REACTOR TRIP
									CV/C	A	1MO	
									RH/C	A	1MO	
WBN-1-LT -068-0339 -D	1-LT -068-0339 -D	RCS PRZR LEVEL	764 LOT 7		103	732' 8"	IIR	71C62-54114-1	L	A	100D	ISOLATE RCS LETDOWN, CONT
									MS/C	A	100D	RCP SEAL WATER INJECTION,
									FW/C	A	100D	PAM AND REACTOR TRIP
									CV/C	A	1MO	
									RH/C	A	1MO	

R_____ R_____ R_____

PREPARER/DATE A. W. Leifer 9/23/86 _____ _____ _____

CHECKER/DATE B. D. Meyer 9-23-86 _____ _____ _____

BINDER NO. WBNEQ-XMTR-001	PLANT WBN	UNIT(S) 1	SHEET 1 OF 1		
BINDER TITLE BARTON 764	COMPUTED AWL	DATE 5-22-86	R	R	
LOT 7 AND 4	CHECKED [illegible]	DATE 5/22/86			

TAB B - CHECKLIST FOR EVALUATION OF

ENVIRONMENTAL QUALIFICATION

INCLUDING SUMMARY AND CONCLUSION

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 1 OF 24

BINDER TITLE BARTON 764 COMPUTED AWL DATE 9/23/86 R ___ R ___

LOT 7 AND 4 CHECKED BDM DATE 1-23-86

A. DOCUMENTATION

Equipment Description Refer to Tab A

Vendor/Manufacturer Westinghouse/Barton

Equipment Model No.(s) 764 Lot 7

764 Lot 4

QUALIFICATION REPORTS

(1) Title/Number/Revision WCAP-8687, Supp. 2-EQTR-E03A, Revision 2* RIMS R2-NEB 840807 362 DATE 3/83

(2) Title/Number/Revision WCAP-8587, Supp. 1-EQDP-ESE-3A, Revision 4 RIMS R4-NEB 840807 361 DATE 11/83

(3) Title/Number/Revision WCAP-8587 - Methodology Rev. 6 RIMS NEB 840724 354 NEB 840724 353 DATE 3/83

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(4) QRN 67142

(5) QRN 68859

(6) QRN 68872

(7) QRN 68188

(8) QRN 68284

(9) QRN 68873

*All references in Tab B are to this test report unless otherwise noted.

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 1A OF 24

BINDER TITLE BARTON 764 COMPUTED AWR DATE 9/23/86 R ___ R ___

LOT 7 AND 4 CHECKED BDM DATE 9-23-86

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(10) QRN 67149

(11) QRN 74904

(12) QRN 67151

(13) QRN 67150

(14) QRN 68857

(15) QRN 56177

(16) Auditable Link Document (B45 860521 351)

(17) Calculation EQP-02 (B71 860402 200)

(18) WBNNAL3-004 (B45 860205 235)

(19) GENNAL3-001 (B45 851117 235)

(20) TI-RPS-48 (B45 851105 235)

(21) Cat. and Oper Time - System 1 (B45 860722 219)

(22) Cat. and Oper Time - System 3 (B45 860411 219)

(23) Cat. and Oper Time - System 30 (B45 860320 224)

(24) Cat. and Oper Time - System 63 (B45 860314 219)

(25) Cat. and Oper Time - System 68 (B45 860722 218)

(26) WBPE0038603018 (B43 860625 901)**

(27) WBPE0038603020 (B43 860402 904)**

(28) WBPE0638603024 (B43 860502 901)**

(29) Setpoint Methodology (B45 851211 600)**

(30) PAM Functional Requirement (B45 860127 351)**

(31) WAC-17

**See open item 4.

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 1B OF 24

BINDER TITLE BARTON 764 COMPUTED AWL DATE 9/23/86 R ___ R ___

LOT 7 AND 4 CHECKED BDM DATE 9-23-86

OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

(32) WAC-15

(33) WAC-16

(34) WAC-21

(35) WBPE0308603017 (B43 860326 934)**

(36) WAC-23

(37) WAC-28

(38) WAC-26

(39) WAC-29

(40) WAC-27

(41) WAC-95

(42) WAC-72

(43) Spec Sheets 01410 - (NEB 840302 352 and NEB 840302 353)

(44) Spec. 955270 - (B45 850423 359)

(45) Spec. 953328 - (B45 850508 351)

(46) TVA-85-176 - (B70 850925 006)

(47) WAT-D-6354 (NEB 850201 609)

(48) WAT-EQ-001 (B71 860225 001)

(49) WAT-EQ-010 (B71 860516 003)

(50) Manual No. 82F2 (B45 850426 351)

(51) Dwg. 8765D45, R7***

(52) WCAP-8687, Supp. 2-E03A Addendum 1 (B45 851105 356)

**See open item sheet 4
***See open item sheet 3

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 2 OF 24

BINDER TITLE BARTON 764 COMPUTED ANR DATE 9/23/86 R ___ R ___

LOT 7 AND 4 CHECKED BDM DATE 9-23-86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified - Pending Resolution of Open Items

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

1. Relocate Transmitter (SCR WBNEEB6172 R1)
2. SCR WBNEEB8575 R1
3. Drawing 8765D45
4. Demonstrated and Required Accuracy
5. NCR 6224

COMMENTS/RECOMMENDATIONS

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 3 OF 24

BINDER TITLE BARTON 764 COMPUTED AWL DATE 5/22/86 R ___ R ___

LOT 7 AND 4 CHECKED [illegible] DATE 5/22/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate All Documents Which are Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

___ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 323-1974

IEEE 344-1975

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 4 OF 24

BINDER TITLE BARTON 764 COMPUTED [illegible] DATE 5/22/86 R ___ R ___

LOT 7 AND 4 CHECKED [illegible] DATE 5/22/86

D. QUALIFICATION METHODOLOGY (Check only one block)

X Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

___ Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS

EQP085.41

TVA 19537 (OE-3-86)

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 5 OF 24

R ___ R ___

BINDER TITLE BARTON 764 COMPUTED [illegible] DATE 5/22/86

LOT 7 AND 4 CHECKED [illegible] DATE 5/22/86

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? Yes

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Transmitter	Transmitter	
(2) Manufacturer	Barton	Barton	See Comments
(3) Model Number(s)	764	764	
	Lot 7	Lot 7	
	Lot 4	Lot 4	
(4) Serial Number(s)	See	550	Table 1
	Tab C	853	Page 22
	Section A	854	
(5) Identify Component-Unique checksheet attached:	NA		

JUSTIFICATION/COMMENTS Section 2, page 2 of the test report (Tab D) identifies the tested units and to what baseline configuration they were built. Table 9, page 33 of the test report identifies that the Auditable Link Document formally compares the plant specific purchased units and their baseline configuration to the qualification test units. The Auditable Link Document is contained in Tab C, Section A (Traceability) along with Table 1, which shows the link from the equipment in the field to the test report. Other supporting documents are also included in this section.

F. INSTALLATION INTERFACES

Does the qualification program address all relevant interfaces of the equipment so that the installed design and configuration is similar or identical to the test configuration (yes/no/NA)? (note below)

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	4-5/16"Bolt/225-245IN/LB	Yes	Dwg 8765D45 Tab I 4.2.3, p7
External Process Connections	1/2" NPT/Female	Yes	Spec. 953328 Sec. 4.3.3, Tab E, Sec C
Electrical Connections	Per Dwg. 8765D45 R7***	Yes	Tab I
Conduit Seals	Per Dwg. 8765D45 R7***	NA	Note 2 of Dwg Tab I - See Comments**
Connector Seals	Per Dwg. 8765D45 R7***	NA	See Comments**
Orientation	Horizontal	Yes	Instrument Man., p. 3-1
Physical Configuration	Per Dwg. 8765D45 R7***	Yes	Tab I
Other	See Comments*		

JUSTIFICATION/COMMENTS *Raychem splices are being qualified in binder WBNEQ-SPLC-001. **The Barton transmitters are supplied with a manufacturer seal (potting compound) which was tested and exposed to total HELB environment as described in the test report. This information is contained in Westinghouse letter WAT-EQ-010 (WAT-D-6985) (B71 860516 003) which is in Tab E, Section H. ***See open item sheet 3.

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 7 OF 24

R R

BINDER TITLE BARTON 764 COMPUTED ARL DATE 5/29/86

LOT 7 AND 4 CHECKED WBK DATE 5/29/86

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	3.2 p.4
(b) Baseline performance measurements taken	Yes	3.2 p.4
(c) Equipment aged:		
Thermal	Yes	3.1.1 p.3
Radiation	Yes	3.1.2 & .3.p.3
Wear	Yes	3.1.1.p.3
(d) Vibration/seismic testing conducted	Yes	4.2.3.p.7
(e) Design basis event (DBE) exposure	Yes	5.4.p.14
(f) Post-DBE exposure	Yes	5.4.p.14
(g) Final inspection and disassembly	Yes	3.2. p.4

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes*

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes**
(Reference Table 2, 3, 4, and pages 23, 24, 25, and 26).

JUSTIFICATION/COMMENTS *O-rings and fill oil were replaced; see Sections 5.1 and 7.1.

**Calibration data and test equipment accuracies available for audit at Westinghouse.

TVA 19537 (OE-3-86) EQP085.41

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference 3.1.1, p. 3).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	3.1.1,p.3
Radiation exposure	Yes	3.1.2&3,p.3
Vibration (non-seismic) aging	Yes	5.3.5,p.14*
Operational (electrical/mechanical/process) stress aging	Yes	5.1, p.9

JUSTIFICATION/COMMENTS *See WCAP-8587, Appendix B, Item 17 P.B-7 in Tab E, Section D for further justification.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS This is addressed in Appendix B of WCAP-8587 (#21,P.B-8), Tab E, Section D.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference 3.1.1, p. 3).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: See Comments*).

JUSTIFICATION/COMMENTS *See Appendix D, Section 3, page D-5 of WCAP-8587 in Tab E, Sect. D. This is not for transmitters only - applies to all Westinghouse NSSS.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS See App. B, Section 7, p. B-2 and App. D, Sect. 3, p. D-5 of WCAP-8587 in Tab E, Section D.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference 5.1, p. 9).

Parameter	Plant Maximum Normal	Test	Equivalent
	Fan RM 1 - 101°F		
	Fan RM 2 - 100°F		
	Acc RM 3 - 92°F		
	Acc RM 4 - 95°F		
Temperature	IIR = 75°F, Ann. = 110°F	125° C	104°F
Time	40 Years	1673 Hrs	10 Years

JUSTIFICATION/COMMENTS *See Tab C, Section B for plant temperature calculation (EQP-02) supporting these temperatures.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference 5.1, p. 9).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes* (Reference 5.1, p. 9).

JUSTIFICATION/COMMENTS *Test report used a conservative activation energy of .5eV; see Appendix D, Sect. 3, p. D-5 of WCAP-8587 in Tab E, Section D.

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? NA (Reference _____).

JUSTIFICATION/COMMENTS _____

(h) Was the equipment operated during the thermal aging (yes/no/NA)? Yes (Reference 7.1, p. 17).

JUSTIFICATION/COMMENTS _____

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference 5.2, p. 10).

JUSTIFICATION/COMMENTS _____

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? No (Reference See Comments).

JUSTIFICATION/COMMENTS App. C of WCAP-8587 in Tab E, Sec. D

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes* (Reference 3.1.2, p. 3 and 5.2, p. 10).

JUSTIFICATION/COMMENTS *The basis was further identified in Section 6.7.1 (p. 6-3) and 6.7.4 (pages 6-6 through 6-9) of WCAP-8587 in Tab E, Section D.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference 5.2, p.10 and 3.1.3, p.3).

Plant normal ambient radiation dose (rd) $2x10^7$ (40 years - Gamma)

Test exposure dose (rd) 6.8×10^7

Test exposure dose rate (rd/hr) 2.0 to 3.0 M Rd/hr

Test exposure source type (e.g., Co-60 gamma) Co-60 Gamma

JUSTIFICATION/COMMENTS

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes* (Reference See Comments).

JUSTIFICATION/COMMENTS *See App. B Item 17, p. B-7 of WCAP-8587 in Tab E, Section D.

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS *See App. B Item 20, p. B8 of WCAP-8587 in Tab E, Section D.

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS Section 5.0 - Test procedure addresses the fact that operational stresses were induced in the qualification program, page 9.

H. AGING (Continued)

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS See App. B - Subprogram A, Section 13-15, page B-6 of WCAP-8587 in Tab E, Section D.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference 7.5, page 20).

Qualified life (Document in QMDS) IIR=26.4 yrs.; Ann.=8.2 yrs.; Fan Rm. 1=10.9 yrs.; Fan Rm. 2=11.2 yrs. Acc Rm. 3=14.6 yrs.; Acc Rm. 4=12.8 yrs.

JUSTIFICATION/COMMENTS See Tab C, Section B for Qualified Life Calculations.

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? Yes (Reference 7.5, page 20).

Replacement Intervals (Document in QMDS) See Tab G.

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 13 OF 24

BINDER TITLE BARTON 764 COMPUTED [illegible] DATE 5/22/86 R R

LOT 7 AND 4 CHECKED [illegible] DATE 5/22/86

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of EQC Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	EPT/O-rings			.92eV	5.1, p.10
(b)	Silicone 550/Fill Oil			.92eV	5.1, p.10
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS At the conclusion of the aging testing, it was determined that the internal O-rings failed because the aging temperature selected was too high for the internal O-rings material to survive the aging time. The O-rings and fill oil were replaced and aged for 350 hours at 125°C based on an activation energy of .92eV based on the O-ring manufacturer. The aging calculation is in Tab C, Section B.

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 14 OF 24

BINDER TITLE BARTON 764 COMPUTED AWR DATE 9/23/86 R ___ R ___

LOT 7 AND 4 CHECKED BDM DATE 9-23-86

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference 3.2, page 4).

Identify Acceptance Criteria: Refer to Section 3.2 of the report, pages 4 and 5.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference 3.2, p. 4, Tbls. 5,6,7,8,&11).

Identify baseline and functional testing: See Section 6.0, page 6-1 and Section 6.8, page 6-9 on WCAP-8587 in Tab E, Section D.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference 5.0, pages 10-14).

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? Yes (Reference _____).

JUSTIFICATION/COMMENTS See Comments on 5b

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	See Comments	
Load	See Comments	
Frequency	NA	
Accuracy	Open Item sheet 4	
Other(s)		

JUSTIFICATION/COMMENTS Voltage and load are accounted for in the design process and will not vary during accident conditions since they are powered from regulated power.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(b)

Parameter	Demonstrated Conditions	Reference
Voltage	15-52V DC ± 1V	1.1.1 of ESE-3A
Load	10-50 MA	1.1.3 of ESE-3A
Frequency	NA	1.1.2 of ESE-3A
Accuracy	Open Item Sheet 4	
Other(s)		

JUSTIFICATION/COMMENTS Electrical characteristics are contained in EQDP-ESE-3A and Specification 953328. Vendor submits to Westinghouse for approval the verification of electrical characteristics to Spec. 953328. Verification of electrical characteristics on file at Westinghouse to be audited. Spec. 953328 contained in Tab E, Section C; EQDP-ESE-3A is contained in TAB D, Section D.

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 16 OF 24

BINDER TITLE BARTON 764 COMPUTED [illegible] DATE 5/22/86 R ___ R ___

LOT 7 AND 4 CHECKED [illegible] DATE 5/22/86

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. See Sheet 16A for Transmitters Operating Environment - Normal & Abnormal

(1) Normal Max

(a) Temperature (°F) Sheet 16A

(b) Pressure (psig) Sheet 16A

(c) Humidity (%) Sheet 16A

(d) Radiation (rd) Sheet 16A

(2) Abnormal Max

(a) Temperature (°F) Sheet 16A

(b) Pressure (psig) Sheet 16A

(c) Humidity (%) Sheet 16A

(d) Radiation (rd) Sheet 16A

(3) Process Interfaces: The transmitters are connected by impulse lines to the process systems which they are monitoring and are located in instrument racks away from the process system so that they should not see any significant effect due to the process.

(4) State anticipated occurrence frequency and duration of abnormal conditions: These conditions could exist for up to eight hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	327	Accident type	L, HELB
(b) Pressure (psiA)	26.4	Accident type	L
(c) Humidity (%)	100	Accident type	L, HELB
(d) Radiation (rd)	4.7×10^8 (beta)** 3.3×10^7 (gamma)*	Accident type	L
(e) Spray Type	2000 ppm Boron pH 8.35	Accident type	L, HELB

*Radiation level based on OE Calculation WBNNAL3-004 (B45 860205 235) contained in Tab C, Section C, Subsection A. Page 3 of Calculation.

**Radiation level based on OE Calculation TI-RPS-48 (B45 851105 235) contained in Tab C, Section C, Subsection C. Page 2 of Calculation.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-42 R2, Lower Containment

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	105	(a) Temperature (°F)	130
(b) Pressure (psia)	14.7	(b) Pressure (psia)	14.7
(c) Humidity (%)	80	(c) Humidity (%)	100
(d) Radiation (rd)	2×10^7	(d) Radiation (rd)	NA

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-45 R1, IIR-Incore Instrument Room

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	75	(a) Temperature (°F)	120
(b) Pressure (psia)	14.7	(b) Pressure (psia)	14.7
(c) Humidity (%)	60	(c) Humidity (%)	90
(d) Radiation (rd)	3.5×10^5*	(d) Radiation (rd)	NA

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-44 R1, Annulus

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	110	(a) Temperature (°F)	120
(b) Pressure (psia)	ATM(-)	(b) Pressure (psia)	ATM(-)
(c) Humidity (%)	80	(c) Humidity (%)	90
(d) Radiation (rd)	1×10^6*	(d) Radiation (rd)	NA

*Radiation level based on OE Calculation GENNAL3-001, contained in Tab C, Section C, Subsection B. Page 2 of calculation.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

See pages 17A, B, C, and D.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? Yes (Reference * Moisture Intrusion TAB C, Section I).

(7) Subject to submergence (yes/no/NA)? No
(Comments See Tab A for elevation and sheet 17A1).
*See Open Item Sheet 1
Identify initiation time and duration of submergence: NA

(8) Special environmental calculations (temp., rad., etc.)

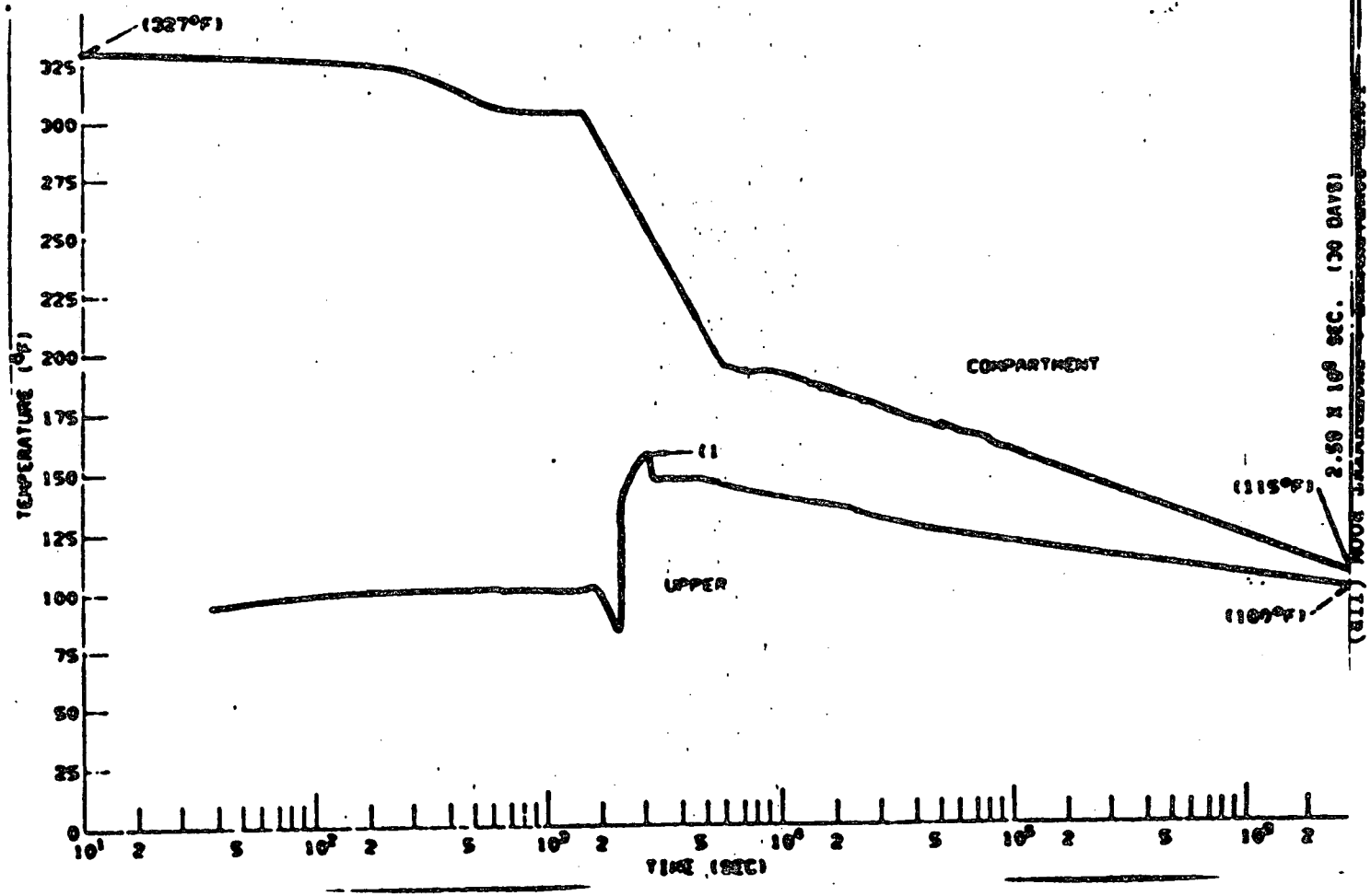
Type	RIMS No.
Radiation	B45 860205 235
Radiation	B45 851117 235
Temperature	B71 860402 200
Radiation	B45 851105 235
Moisture Intrusion	B45 860812 236

BINDER NO. WBNEQ-XNTR-001 PLANT WBN UNIT(S) 1 SHEET 17A OF 24

BINDER TITLE BARTON 764 COMPUTED DATE R R

LOT 7 AND 4 CHECKED DATE

CONTAINMENT TEMPERATURE, DOUBLE ENDED PUMP SUCTION BREAK (LOCA)
AND
MOST SEVERE STEAMLINE BREAK (HELB) COMBINED
(FIGURE 1)



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K. REQUIRED OPERATING ENVIRONMENT (Continued)

(7) Comments: Tab A contains the exact elevation of the transmitters (from the field verification sheets contained in Tab F) which can then be compared to the following flood level:

1. IIR - elevation 717.7 ft. (47E235-45 R1)
2. FAN ROOM 1 - 717.7 ft. (47E235-42 R2)
3. FAN ROOM 2 - 717.7 ft. (47E235-42 R2)
4. ACC. ROOM 3 - 717.7 ft. (47E235-42 R2)
5. ACC. ROOM 4 - 717.7 ft. (47E235-42 R2)
6. ANNULUS - NA

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R R

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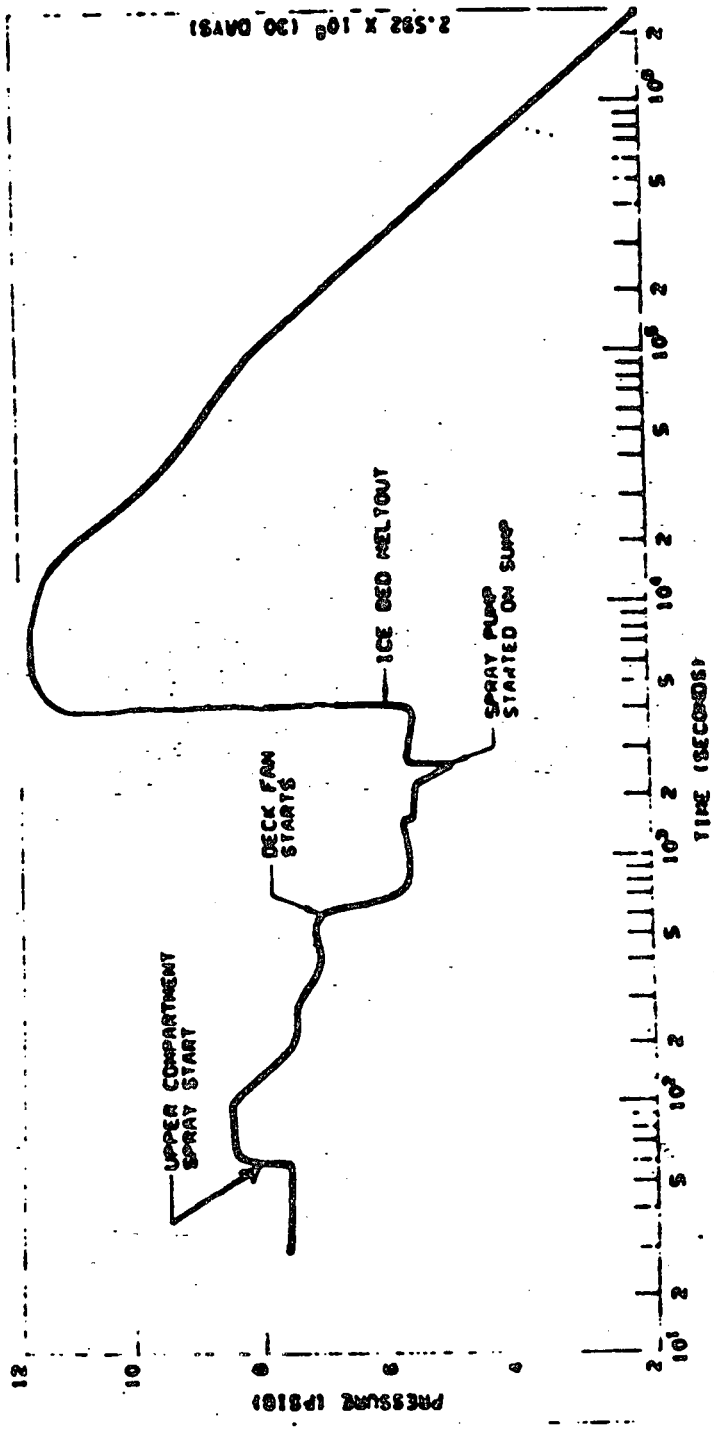
LOT 7 AND 4 CHECKED [illegible] DATE 5/22/86

LOWER CONTAINMENT & INSTRUMENT ROOM (IIR)

CONTAINMENT PRESSURE - DOUBLE ENDED PUMP SUCTION BREAK (LOCA)



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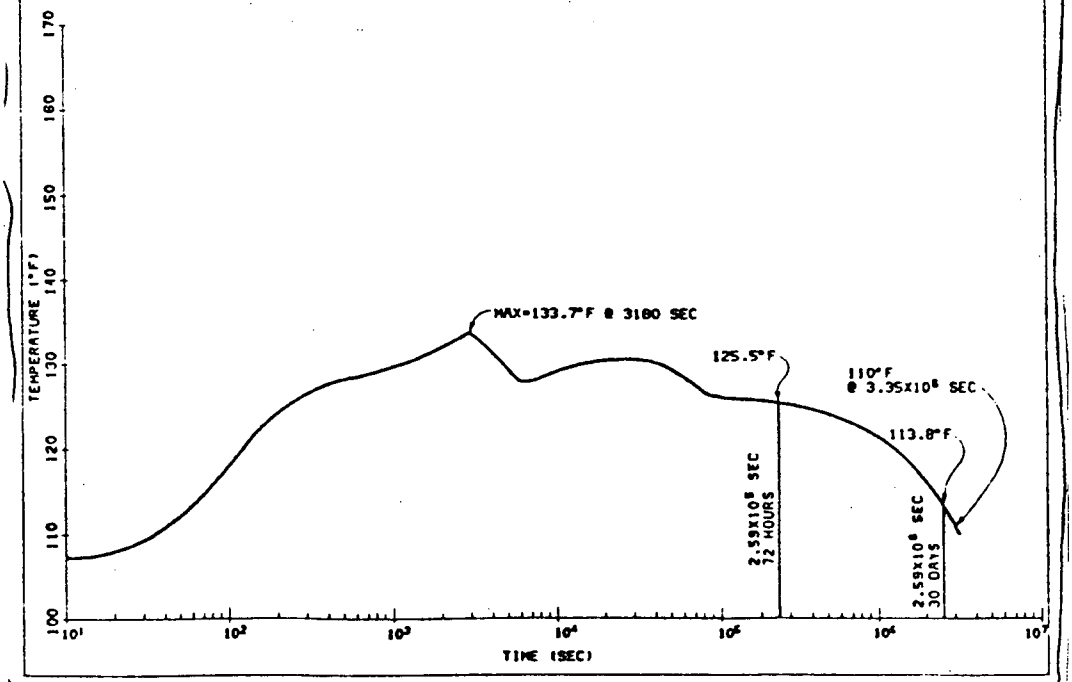
LOT 7 AND 4 CHECKED BAM DATE 9-27-86

ANNULUS

ANNULUS TEMPERATURE RESPONSE TO A DOUBLE ENDED PUMP SUCTION BREAK (LOCA) AND MOST SEVERE STEAMLINE BREAK (HELB) COMBINED OCCURING INSIDE PRIMARY CONTAINMENT

(FIGURE 2)



LOWER CONTAINMENT AND INSTRUMENT ROOM (IIR)

Chemical Spray: The chemical composition of the containment spray was based on the following solutions which result in the most severe conditions:

1. Ice Condenser - Quantity of Ice - 2.7195×10^6 Pounds - Boron Concentration 1800 PPM B added as $Na_2B_4O_7$ ~~10 H_2O~~ $10H_2O$ BDM/9-23-86 BDM 9-23-86 AWL 9/23/86
2. Boron Injection Tank - Volume - 900 GAL - Boron Concentration ~~20,000~~ ~~22,500~~ 2100 PPM B in the form of H_3BO_3. 2100 AWL 9/23/86 BDM/9-23-86 BDM 9-23-86 AWL 9/23/86
3. Cold Leg Injection Accumulators (4 Tanks) - Volume - 10,098 FT^3 - Boron Concentration: 2000 PPM B in the form of H_3BO_3.
4. Upper Head Injection - Volume - 1800 FT^3 - Boron Concentration: 2100 PPM B in the form of H_3BO_3.
5. Refueling Water Storage Tank - Volume - 375,000 GAL - Boron Concentration: 2100 PPM B in the form of H_3BO_3.
6. Reactor Coolant System - Volume - 12,145 FT^3 - Maximum Boron Concentration: 2100 PPM B in the form of H_3BO_3.

Results: The solutions stated above yield a resulting concentration of .19 Molar ~~NaOH~~ H_3BO_3 BDM/9-23-86 resulting in a pH of 8.3 at 25°C.

AWL 9/23/86

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LOT 7 AND 4 CHECKED [illegible] DATE 5/22/86

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 Days	15 Days	Fig. 2, p. 38 See Tab C, Sect. H for Comparison
Temperature (°F)	327	420	Figure 2, p. 38
Pressure (psia)	26.4	72	Figure 2, p. 38 Table 1 of EQDP-3A
Relative Humidity (%)	100	100	Figure 2, p. 38 Table 1 of EQDP-3A
*Chemical Spray	See Sheet 17C	See Table 1 of EQDP-ESE-3A, p. 15, Tab D	
**Radiation (rd)	5.3×10^7(gamma)*** 4.7×10^8(beta)****	6.8×10^7(gamma) 9×10^8(beta)	6.2 p. 15 Spec. 955270, p.6
Submergence	NA	NA	See Section K(7), page 17 and 17A1

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

***See Section K - 2×10^7(normal), 3.3×10^7(accident).

****See Section K(5)

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	See Tab C Section H
Pressure	Yes	Figure 2, page 38
Relative Humidity	Yes	Tab D, Table 1 EQDP-ESE-3A,p.15
Chemical Spray	Yes	Tab C, Section H
Submergence	NA	

JUSTIFICATION/COMMENTS

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L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	+ 15°F	Yes
Pressure: +10% but no more than 10 psig	+ 10%	Yes
Radiation: +10% of accident dose	+ 10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	+ 10%	Yes
Voltage: +10% of rated value		No
Frequency: +5% of rated value		NA
Environmental Transient: the initial transient and the peak temperature applied twice	Same	Yes
Seismic Vibration: +10% added to acceleration	NA	NA

JUSTIFICATION/COMMENTS: Voltage must not exceed 52VDC ± 1VDC - See Note 4 of drawing 8765D45 in Tab I. See Seismic Section 5.3.5.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment: (Reference Refer to Tab A).

JUSTIFICATION/COMMENTS

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes (Reference 7.4, p.18, Table 8, p. 32).

JUSTIFICATION/COMMENTS

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes (Reference 7.4, p. 18).

JUSTIFICATION/COMMENTS

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS See Tab C, Section B which demonstrates that the transmitter operates for the required time interval.

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS See Sheet 20A.

M. OPERABILITY TEST RESULT (Continued)

(5) JUSTIFICATION/COMMENTS See Appendix A and Sections 7.1 thru 7.4 on pages 17 thru 21 of test report (Tab D) for a discussion of the anomalies and their resolution. We concur with the resolution for the O-rings and erratic behavior during HELB because:

1. The cover O-rings are being replaced per Westinghouse recommendation as noted in the QMDS in Tab G.

2. The erratic behavior observed during HELB testing has been corrected in the Lot 7 and 4 model by a manufacturing change to build the transmitters with the soldered connection.

3. The Lot 2 transmitters are being upgraded to the equivalent of the Lot 7 by making the solder modification and exercising the potentiometer as discussed in Tab C, Section G. This will remain an open item until field verification is received that the solder modification is complete.

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LOT 7 AND 4 CHECKED [illegible] DATE 5/22/86

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-XMTR-001 PLANT WBN UNIT(S) 1 SHEET 22 OF 24

BINDER TITLE BARTON 764 COMPUTED [illegible] DATE 5/22/86 R R

LOT 7 AND 4 CHECKED [illegible] DATE 5/22/86

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	No
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	No*

*See Section H (5b)

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes**
(11) Criteria regarding submergence satisfied?	NA
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

**See Tab C, Section H.

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	Open Item Sheet 4
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes*
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA**
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

*A few of the transmitters have a minimum specified operating time of five minutes.

**See Section 7.1.6 of WCAP-8587 in Tab E, Section D for justification.

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R ___ R ___

BINDER TITLE ROSEMOUNT 1153 SERIES B COMPUTED [illegible] DATE 9/18/86

PRESSURE TRANSMITTERS CHECKED [illegible] DATE 9/18/86

TAB A - Identification of Equipment Comprising the Equipment Type

TAB A - EQUIPMENT IDENTIFICATION MATRIX

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MANUFACTURER: ROSEMOUNT
PAGE: 1 OF 1

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-FT -070-0215A -A	1-FT -070-0215A -A	SAMPLE HTX HDR INLET FLOW	1153DB3PB	WA6		713'	A13	83KJ9-830570	L AB AF CV/A RH/A	A A A A A	100D 1MO 1MO 1MO 1MO	ISOLATION OF NON-QUALIFIED PIPING IN THE EVENT OF CCS LINE BREAK
WBN-1-FT -070-0215B -A	1-FT -070-0215B -A	SAMPLE HTX HDR OUTLET FLOW	1153DB3PB	WA6		713'	A13	83KJ9-830570	L AB AF CV/A RH/A	A A A A A	100D 1MO 1MO 1MO 1MO	ISOLATION OF NON-QUALIFIED PIPING IN THE EVENT OF CCS LINE BREAK
WBN-0-LT -077-0134 -A	0-LT -077-0134 -A	PASSIVE SUMP AUX BLDG LVL TRANSMITTER	1153DB4PAN0014	UA5		676'	A09	82K62-828967-2	L RH/A CV/A	A A A	100D 1MO 1MO	RHR OR CVCS LINE BREAK INDICATION. ALSO, RHR PUMP LEAK INDICATION AFTER LOCA
WBN-0-LT -077-0135 -B	0-LT -077-0135 -B	PASSIVE SUMP AUX BLDG LVL TRANSMITTER	1153DB4PAN0014	UA11		676'	A14	82K62-828967-2	L RH/A CV/A	A A A	100D 1MO 1MO	RHR OR CVCS LINE BREAK INDICATION. ALSO, RHR PUMP LEAK INDICATION AFTER LOCA

PAGE A-2

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

		R	R	R
PREPARER/DATE	ANP / AVB 9/18/86			
CHECKER/DATE	B 9/18/86			

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BINDER TITLE ROSEMOUNT 1153 SERIES B COMPUTED DMC/ekB DATE 9/18/86 R ___ R ___

PRESSURE TRANSMITTERS CHECKED B DATE 9/18/86

TAB B - Checklist for Evaluation of Environmental Qualification including summary and conclusion.

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BINDER TITLE ROSEMOUNT 1153 SERIES B PRESSURE TRANSMITTERS COMPUTED [illegible] DATE 9/18/86 R R

CHECKED [illegible] DATE 9/18/86

A. DOCUMENTATION

Equipment Description Pressure Transmitter

Vendor/Manufacturer Rosemount

Equipment Model No.(s) 1153DB3PB

1153DB4PAN0014[1]

QUALIFICATION REPORTS

(1) Title/Number/Revision Rosemount Report 108025, Rev. B, * Qualification Report for Pressure Transmitters, Rosemount Model 1153 Series B RIMS B70 851106 101 DATE 2/22/83

(2) Title/Number/Revision Rosemount Report 108026, Rev. A, Type Test Report for Pressure Transmitters Rosemount Model 1153 Series B Vol. 1 RIMS EEB 840329 500 DATE 2/24/84

(3) Title/Number/Revision Rosemount Report 108026, Vol. 2, Type Test Report for Pressure Transmitters Rosemount Model 1153 Series B RIMS B70 851108 108 DATE 2/24/84

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(4) Rosemount Procedure 1802, Rev. A

(5) Rosemount Report 57820, Rev. D

(6) Wyle Report 45353-1

(7) Rosemount Report 37824D, Rev. D

*Per Rosemount letter dated May 8, 1986 (B70 860606 005) several changes (i.e., revision levels) have been made to the original qualification report (108025). All of the changes involve some enhancement of the original report and thus the later revisions all apply to the devices qualified under the original report. This binder incorporates Rev. B of Report 108025 (revision levels of supplementary reports identified on sheet 1 of 24 this TAB) but Rev. D (latest revision level of 108025 to date) and corresponding revision level(s) of supplementary reports may be incorporated at a later date.

[1] See open item concerning remote seal's qualification.

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BINDER TITLE ROSEMOUNT 1153 SERIES B PRESSURE TRANSMITTERS COMPUTED [illegible] DATE 9/18/86 R ___ R ___

CHECKED [illegible] DATE 9/18/86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified(Pending Resolution of open items)

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

1. Required accuracy calculations
2. Raychem splices
3. Qualified storage temperature limits
4. Demonstrated accuracy calculations
5. Qualification of Remote Seal System
6. Response Time Testing
7. Anomalies
8. Moisture Intrusion

COMMENTS/RECOMMENDATIONS

For details of the above open items, refer to the open items sheets in the front of this binder.

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R R

BINDER TITLE ROSEMOUNT 1153 SERIES B COMPUTED [illegible] DATE 9/15/86

PRESSURE TRANSMITTERS CHECKED [illegible] DATE 9/15/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS None

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 323-1974

D. QUALIFICATION METHODOLOGY (Check only one block)

____ Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X Test of Similar Items with Supporting Analysis

____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS The only difference between the models 1153DB3PB and 1153DB3PA is the flange option. Code A is a welded 3/8" Swagelok compression fitting process connection. Code B is a 1/4"-NPT process connection. Code B is qualified per Rosemount report 108025, Section 5, page 15, except for the process connection interface, which is the responsibility of the user.

Model 1153DB4PA is qualified by similarity to models 1153DB3PA and 1153DB5PA as documented in Rosemount report 57820. The conclusions of their similarity analysis are documented in Table 20, page 96 of 57820.

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R R

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CHECKED [illegible] DATE 9/18/86

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? Yes

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Pressure Transmitter	Pressure Transmitter	108025, Sect. 5 Page 15
(2) Manufacturer	Rosemount	Rosemount	108025, Sect. 5 Page 15
(3) Model Number(s)	1153DB3PB	1153DB3PA	108025, Table 1, Pg 16
	*1153DB4PAN0014	1153DB4PA	108025, Table 1, Pg 16
(4) Serial Number(s)	404980 404979	235617	108026, Vol. 1 Table 1, Pg 8
	405512 405514	235615	108026, Vol. 1 Table 1, Pg 8

(5) Identify Component-Unique checksheet attached:

JUSTIFICATION/COMMENTS Only the differential (D) pressure models tested are listed above. Gage(G), absolute(A), and high-line (H) pressure models were also tested. In addition, 3 different vintages of transmitters were tested, designated as groups A, B, and C. Failure of group A transmitters resulted in design changes tested in groups B and C. Group C testing was abandoned when it was determined that the accelerated aging test temperature was too high and

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PRESSURE TRANSMITTERS CHECKED [illegible] DATE 9/18/86

E. EQUIPMENT DESCRIPTION (Continued)

JUSTIFICATION/COMMENTS resulted in failures. Therefore, qualification is based on Group B testing. Note that all design changes are incorporated in all production transmitters (108026, Volume 1, page 101).

*See open item concerning remote seal.

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BINDER TITLE ROSEMOUNT 1153 SERIES B PRESSURE TRANSMITTERS COMPUTED RWB DATE 8/12/86 R R

CHECKED B DATE 8/14/86

F. INSTALLATION INTERFACES

Does the qualification program address all relevant interfaces of the equipment so that the installed design and configuration is similar or identical to the test configuration (yes/no/NA)? (note below)

Interface	Identify Interface Requirement	Acceptable? (Yes/No/NA)	Reference Test Report
Mounting Bolts	4 5/16" ASTM A-193, Class 2, Grade B8, torqued to 200 in-lb	See Comment #3 No	Wyle Report 45353-1, Pg 5; Inst. Manual 4302, Pg 3
External Process Connections	3/8" Tubing Using Swagelok Compression Fitting	See Sect. D, Pg 4 of TAB B	108025, Pg 19, Sect. 6.2.4
Electrical Connections	1/2-14 NPT	See Comment #3 No	1802, Pg 10, Sect. 4.2.1; Inst. Manual 4302, Pg 5
Conduit Seals	All conduit connections, as well as the pipe plugs used to seal off the unused conduit hub, must be sealed with a qualified thread sealant.	NA	108025, Pg 19, Sect. 6.2.2
Connector Seals	Install with qualified conduit entrance seal	See Comment #4 p. 6A NA	108025, Pg 19, Sect. 6.2.2
Orientation	See Comment #1	See Comment #3 No	1802, Pg 71, Sect. 10.8
Physical Configuration		N/A	
Other	See Comment #2	See Comment #3 No	108025, Pg 20, Sect. 6.3

JUSTIFICATION/COMMENTS 1. Units could exhibit a maximum zero effect of 1.5 in H_2O (or $\pm$.15% of span, whichever is greater) depending on mounting position. See Figure 3 of instruction manual 4302 for typical mounting.

2. Installation and checkout must be performed in strict compliance with instruction manual.

3. A "No" in the acceptable column above signifies an unknown plant configuration rather than an unacceptable condition. The above requirements will be ensured by the WBN maintenance program (See TAB G).

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CHECKED B DATE 8/14/86

4. The transmitters listed in TAB A are located in areas which are not subject to moisture intrusion in their conduit systems per OE Calculation GENNAL6-002 (refer to TAB C, section D).

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	108026, Vol. 1 Sect. 6.5, Pg 15
(b) Baseline performance measurements taken	Yes	108026, Section 6, Page 13
(c) Equipment aged:		
Thermal	Yes	108026, Vol. 1 Sect. 9, pg 35
Radiation	Yes	108026, Vol. 1 Sect. 13, pg 54
Wear	Yes	108026, Vol. 1 Sect. 10, pgs 40 through 45
(d) Vibration/seismic testing conducted	Yes	108026, Vol. 1 Sect. 18, pg 99 Sect. 14, pg 69
(e) Design basis event (DBE) exposure	Yes	108026, Vol. 1 Sect. 15, pg 76
(f) Post-DBE exposure	Yes	108026, Vol. 1 Sect. 16, pg 97
(g) Final inspection and disassembly	No	See Comments (2)

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes (1)

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes
(Reference 1802, Table 6, pages 43 and 44 .)

JUSTIFICATION/COMMENTS (1) As part of the functional aging the amplifier, compensation, and calibration boards were replaced to simulate wear due to board replacement.
(2) Although final inspection and disassembly were not performed, the relevant test specimens successfully completed the qualification testing. The lack of this step in the sequence has no impact on the qualification of the transmitters.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference 108026, Vol. 1, pp 17-50).

JUSTIFICATION/COMMENTS None

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	108026, Vol. 1 Sect. 9, pg 35
Radiation exposure	Yes	108026, Vol. 1 Sect. 13, pg 54
Vibration (non-seismic) aging	Yes*	108026, Vol. 1 Sect. 10.1, pg 40
Operational (electrical/mechanical/process) stress aging	Yes	108026, Vol. 1 Pages 40-50

JUSTIFICATION/COMMENTS *See also Section 18, pg 99 of 108026, Vol 1

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? Yes (Reference 57820, Sections 5.4 and 6.0, Pages 51-59, 108025, Sect. 8.4, pages 37, 38).

JUSTIFICATION/COMMENTS These transmitters are not exposed to levels of temperature or radiation at which known synergistic effects occur.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference 108026, Vol. 1, Section 9, pg 35).

JUSTIFICATION/COMMENTS None

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: 57820, Sect 6.17, pp 78-92 & 108025, Sect 8.2, pp 33-37).
JUSTIFICATION/COMMENTS None

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference 57820, Sect. 6.17.7 pp 91&92 & 108025, Section 8.2, pp 33-37).

JUSTIFICATION/COMMENTS None

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference 108026, Sect. 9, p 35, 108025, Sect. 8)

Parameter	Plant Maximum Normal	Test	Section 8 Equivalent
Temperature	104°F	203°F	104°F
Time	40 years	47D	9.5 years

JUSTIFICATION/COMMENTS

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference 57820, Sect. 6.17, pg 78 & 108025 Section 8.2, pp. 33-37).

JUSTIFICATION/COMMENTS None

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes (Reference 57820, Sect. 6.17.1-6.17.7, pp 83-91 & 108025, Sect 8.2, pp. 33-37).

JUSTIFICATION/COMMENTS None

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? N/A (Reference _____).

JUSTIFICATION/COMMENTS None

(h) Was the equipment operated during the thermal aging (yes/no/NA)? Yes (Reference 108026, Vol. 1 Sect. 9.2 Page 36).

JUSTIFICATION/COMMENTS None

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference 108026, Vol. 1 Sect. 13, Page 54).

JUSTIFICATION/COMMENTS None

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? NA (Reference 1802, Sect. 5.4.5.3, Page 34).

JUSTIFICATION/COMMENTS Radiation qualification based on irradiation of an assembled transmitter.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference 1802, Sect. 5.4.5.3, Page 34).

JUSTIFICATION/COMMENTS None

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference 108026, Vol. 1 Figure 1, Page 61).

Plant normal ambient radiation dose (rd) *3.5×10^4, 1.8×10^7

Test exposure dose (rd) 2.62×10^7

Test exposure dose rate (rd/hr) 2.0 Mrads at 2.0 MR/HR, 6.0 Mrads at 1.5 MR/HR, & 18.2 MR at 1.0 MR/HR

Test exposure source type (e.g., Co-60 gamma) Cobalt 60 Gamma

JUSTIFICATION/COMMENTS *See sheets 16 and 16A

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference 108026, Sect. 10.1 Page 40, Sect. 18, p. 99).

JUSTIFICATION/COMMENTS None

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference 57820, Sect. 6.5, pp. 66-68 1802, Sect. 13.1, p. 77).

JUSTIFICATION/COMMENTS

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference 108026, Vol. 1, pp 40-50).

JUSTIFICATION/COMMENTS See memo in TAB E for functional cycles testing.

H. AGING (Continued)

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference 57820, Pages 69-78).

JUSTIFICATION/COMMENTS Refer to TAB E for Rosemount letter which supersedes above reference.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference 108025, Sect. 8, pp 32-42 and TAB C, Section B).

Qualified life (Document in QMDS) 9.5 years (See Tab G)

JUSTIFICATION/COMMENTS None

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? Yes (Reference TAB C, Section B).

Replacement Intervals (Document in QMDS) See Tab G

JUSTIFICATION/COMMENTS None

BINDER NO. WBNEQ-XMTR-003 PLANT WBN UNIT(S) 1 AND 2 SHEET 13 OF 24

BINDER TITLE ROSEMOUNT 1153 SERIES B PRESSURE TRANSMITTERS COMPUTED RJB DATE 8/12/86 CHECKED RB DATE 8/15/86

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of EQC Binder for Detailed Materials Analysis)

Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a) LM308 Integrated Circuit	N/A	N/A	0.78eV	108025, Sect. 8.2
(b) ESTRASOL 180 Transformer Magnet Wire Insulation	N/A	N/A	1.5 eV	57820, pg 85 Sect. 6.17.2
(c) Cross-linked Polyethylene Wire	N/A	N/A	1.3 eV	57820, pg 87 Sect. 6.17.3
(d) Ethylene Propoylene O-Ring	N/A	N/A	1.2 eV	57820, pg 87 Sect. 6.17.4
(e) Solder Joints	N/A	N/A	2 eV	57820, pg 88 Sect. 6.17.5
(f) Resistors	N/A	N/A	0.98 eV	57820, pg 91 Sect. 6.17.6
(g) Capacitors	N/A	N/A	1.68 eV	57820, pg 91 Sect. 6.17.6

JUSTIFICATION/COMMENTS As stated on page 34, Section 5.4.5.3 of 1802, these materials are not susceptible to significant degradation due to radiation aging.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference 108026, Sect. 6, pages 13-16).

Identify Acceptance Criteria: See Section 6, pages 13 thru 16.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference 1802, Sections 10 & 11, pages 56 thru 74

Identify baseline and functional testing:

JUSTIFICATION/COMMENTS None

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference 1802, Section 20, pages 116&117.).

JUSTIFICATION/COMMENTS None

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? Yes (Reference).

JUSTIFICATION/COMMENTS See comment sheet 15A.

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	13.5 - 40VDC	57820 page 77
Load	0-1325 OHMS	57820 page 77
Frequency	NA	
Accuracy	Open Item	
Other(s)		

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-XMTR-003 PLANT WBN UNIT(S) 1 SHEET 15A OF 24

BINDER TITLE ROSEMOUNT 1153 SERIES B PRESSURE TRANSMITTERS COMPUTED [illegible] DATE 9/18/86 R R

CHECKED [illegible] DATE 9/18/86

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(b)

Parameter	Demonstrated Conditions	Reference
Voltage	See Comment	
Load	See Comment	
Frequency	NA	
Accuracy	Open Item	
Other(s)		

JUSTIFICATION/COMMENTS Voltage, load and frequency are accounted for in the design process and will not vary during accident conditions since they are powered from regulated power supplies with fixed loads, and connected with qualified cable. The voltage and load will be verified due to requirement placed in QMDS.

TVA 19537 (OE-3-86)

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-52 R0,-53 R1: RM A13, EL 713' See Sheet 16A

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psig) ATM(-)

(c) Humidity (%) 80

(d) Radiation (rd) 1.8×10^7*

*See Tab C, Section G

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psig) ATM(-)

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: The transmitters are connected by impulse lines to the process systems which they are monitoring and are located in instrument racks away from the process system so that they will not see any significant effect due to process temperature.

(4) State anticipated occurrence frequency and duration of abnormal conditions: These conditions could exist for up to 8 hours and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 125 Accident type RH/A

(b) Pressure (psia) 14.4 Accident type ALL HELB

(c) Humidity (%) 100 Accident type ALL HELB

(d) Radiation (rd) $< 1 \times 10^4$ * Accident type LOCA

(e) Spray Type N/A Accident type N/A

*See Tab C, Section G

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-81 R0: RMS A9 & A14, EL 676'

(1) Normal Max

(a) Temperature (°F) 104

(b) Pressure (psia) ATM(-)

(c) Humidity (%) 80

(d) Radiation (rd) 3.5×10^4*

*See Tab C, Section G

(2) Abnormal Max

(a) Temperature (°F) 110

(b) Pressure (psia) ATM(-)

(c) Humidity (%) 90

(d) Radiation (rd) NA

(3) Process Interfaces: See sheet 16

(4) State anticipated occurrence frequency and duration of abnormal conditions: These conditions could exist for up to 8 hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	110	Accident type	LOCA
(b) Pressure (psia)	NA	Accident type	NA
(c) Humidity (%)	NA	Accident type	NA
(d) Radiation (rd)	$<1 \times 10^7$	Accident type	LOCA
(e) Spray Type	NA	Accident type	NA

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? No (Reference See TAB C, Sect. E).

(7) Subject to submergence (yes/no/NA)? No
(Reference See Sheet 17A .)

Identify initiation time and duration of submergence: NA

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
Condensate Formation	B45 851017 235
Flooding	B45 860110 218
Normal Radiation Dose	B45 860328 236
Accident Radiation Dose	B45 860328 237

K(7) The following table shows the device ID number, actual elevation from the field verification (TAB F), and the submergence level based on flooding calculation (TAB C, Section F).

ID #	Actual Elevation	Submergence Level
1-FT-70-215A	717'7"	713'3"
1-FT-70-215B	717'7"	713'3"
0-LT-77-134	681'5"	676'6"
0-LT-77-135	681'5"	676'6"

L. SUMMARY COMPARISON OF TEST CONDITION TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 days	968 Hrs ***	108026, Vol. 1, Sect. 16, pp 97-98 & Table 34, p 82
Temperature (°F)	125°F	318°F	108026, Vol. 1, Table 34, p 82
Pressure (psig)	14.4 psia	72 psig	108026, Vol. 1, Table 34, p 82
Relative Humidity (%)	100%	100%	108026, Vol. 1, p 76, Sect. 15.2
*Chemical Spray	NA	NA	NA
**Radiation (rd)	1.8×10^7	2.62×10^7	108026, Vol. 1, Fig. 1, p 61
Submergence	NA	NA	NA

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

***Demonstrated operating time includes an 80 hour DBE and 37 days of post-DBE testing.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	108026, Vol. 1, Fig. 10 p 86; Sect. 16, p 97
Pressure	Yes	108026, Vol. 1, Fig. 10 p 86; Sect. 16, p 97
Relative Humidity	Yes	108026, Vol. 1, p 76, Section 15.2
Chemical Spray	NA	NA
Submergence	NA	NA

JUSTIFICATION/COMMENTS None

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	+15°F	Yes
Pressure: +10% but no more than 10 psig	+10%	Yes
Radiation: +10% of accident dose	+10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	+10% (Comment (1))	Yes
Voltage: ±10% of rated value	NA	NA
Frequency: ±5% of rated value	NA	NA
Environmental Transient: the initial transient and the peak temperature applied twice	Yes	Yes
Seismic Vibration: +10% added to acceleration	10% Comment 2	Yes

JUSTIFICATION/COMMENTS: (1)Accident degradation equivalency in TAB C, Section E demonstrates that the test conditions envelope plant accident conditions for 100 days.

(2) Per TVA standard specification SS-E18.12.01, this equipment should be tested to 3g's horizontal and 2g's vertical. The testing up to 9.8g's was more than adequate.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference Refer to Tab A).

JUSTIFICATION/COMMENTS None

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference Sect. 15.3, p 77 of 108026).

JUSTIFICATION/COMMENTS None

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference Sect. 16, p 97 and Sect. 17, p 98 of 108026).

JUSTIFICATION/COMMENTS None

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference TAB C, Section E).

JUSTIFICATION/COMMENTS None

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference See Comment).

JUSTIFICATION/COMMENTS Rosemount has provided detailed descriptions and analyses of test anomalies which occurred in several of the test phases. We have reviewed these anomalies with respect to plant specific requirements and concur with Rosemount's disposition. See open item.

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS None

BINDER NO. WBNEQ-XMTR-003 PLANT WBN UNIT(S) 1 SHEET 22 OF 24

R ___ R ___

BINDER TITLE ROSEMOUNT 1153 SERIES B COMPUTED [illegible] DATE 9/18/86

PRESSURE TRANSMITTERS CHECKED [illegible] DATE 9/18/86

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Open Item
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	Yes

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	NA
(a) Was the spray testing done while under the extremes of pressure and temperature?	NA
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	NA
(11) Criteria regarding submergence satisfied?	NA
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	NA
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

(15) Criteria regarding functional testing satisfied? Yes

(a) Does the test plan/report specify an acceptance criteria for equipment performed? Yes

(b) Was an initial base line test done to establish required performance characteristics? Yes

(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured? Open Item No. 5

(16) Criteria regarding instrument accuracy satisfied? Open Item No. 5

(17) Test duration margin (1 hour + function time) satisfied? Yes

(a) Is the minimum specified operating time at least 1 hour? Yes

(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided? NA

(18) Criteria regarding synergistic effects satisfied? Yes

(19) Criteria regarding margins satisfied? Yes

(20) Maintenance and surveillance requirements adequately identified? Yes

P. DISCUSSION

None

BINDER NO. WBNEQ-XMTR-004 PLANT WBN UNIT(S) 1 SHEET 1 OF 1

BINDER TITLE BARTON 763 COMPUTED AHL DATE 4/23/86 R ___ R ___

LOT 7 CHECKED CJB DATE 4/24/86

Tab A - Identification of Equipment

Comprising the Equipment Type

EQP055.27

TVA

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-XMTR-004
MANUFACTURER: BARTON
PAGE: 1 OF 2

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/RAD	CONTRACT*	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PT -001-0009A -D	1-PT -001-0009A -D	S62 MAIN STEAM HDR PRESS	763 LOT 7			731' 2"	A02	71C62-54114-1	MS/V FW/V	A A	100D 100D	INITIATES FEEDWATER ISOL AND SAFETY INJECTION; PAM
WBN-1-PT -001-0009B -E	1-PT -001-0009B -E	S62 MAIN STEAM HDR PRESS	763 LOT 7			733' 5"	A02	71C62-54114-1	MS/V FW/C	A A	100D 100D	INITIATES FEEDWATER ISOL AND SAFETY INJECTION; PAM
WBN-1-PT -001-0020A -D	1-PT -001-0020A -D	S63 MAIN STEAM HDR PRESS	763 LOT 7			731' 4"	A02	71C62-54114-1	MS/V FW/C	A A	100D 100D	INITIATES FEEDWATER ISOL AND SAFETY INJECTION; PAM
WBN-1-PT -001-0020B -E	1-PT -001-0020B -E	S63 MAIN STEAM HDR PRESS	763 LOT 7			733' 5"	A02	71C62-54114-1	MS/V FW/C	A A	100D 100D	INITIATES FEEDWATER ISOL AND SAFETY INJECTION; PAM
WBN-1-PT -068-0063 -D	1-PT -068-0063 -D	LOOP 1 HOT LEG PRESS	763 LOT 7			717' 6"	A06	71C62-54114-1	L AF AB RH/A CV/A	A A A A A	100D 1MO 1MO 1MO 1MO	PAM
WBN-1-PT -068-0322 -G	1-PT -068-0322 -G	RCS PRIR PRESS	763 LOT 7		076	731' 8"	I1R	71C62-54114-1	L MS/C FW/C CV/C RH/C	A A A A C	5MIN 5MIN 5MIN 5MIN 5MIN	TRIP FUNCTION FOR BOTH HIGH AND LOW PRESSURIZER PRESSURE
WBN-1-PT -068-0323 -F	1-PT -068-0323 -F	RCS PRIR PRESS	763 LOT 7		BOM 8-24-86 ~~126~~ 120° AWL 9/24/86	732'	I1R	71C62-54114-1	L MS/C FW/C CV/C RH/C	A A A A C	5MIN 5MIN 5MIN 5MIN 5MIN	TRIP FUNCTION FOR BOTH HIGH AND LOW PRESSURIZER PRESSURE

* CONTRACT NUMBERS SHOWN IN THIS TAB WERE OBTAINED BY TRACING THE SERIAL NUMBER ON EACH TRANSMITTER THROUGH TVA PROCUREMENT RECORDS AND DID NOT DEPEND ON FIELD VERIFICATION DATA FOR CONTRACT NUMBERS.

R_____ R_____ R_____

PREPARER/DATE A.W. Lafo 9/23/86

CHECKER/DATE Bryan D. Meyer 9-24-86

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-XMTR-004
MANUFACTURER: BARTON
PAGE: 2 OF 2

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV	LOCATION RM/RAD	CONTRACT*	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-PT -068-0334 -E	1-PT -068-0334 -E	RCS PRZR PRESS	763 LOT 7		091	734'10"	IIR	71C62-54114-1	L	A	5MIN	TRIP FUNCTION FOR BOTH HIGH AND LOW PRESSURIZER PRESSURE
									MS/C	A	5MIN	
									FW/C	A	5MIN	
									CV/C	A	5MIN	
									RH/C	C	5MIN	
WBN-1-PT -068-0340 -D	1-PT -068-0340 -D	RCS PRZR PRESS	763 LOT 7		096	735'	IIR	71C62-54114-1	L ~~S~~	A	5MIN	TRIP FUNCTION FOR BOTH HIGH AND LOW PRESSURIZER PRESSURE
									~~MS~~/C	A	5MIN	
									FW/C	A	5MIN	
									CV/C	A	5MIN	
									RH/C	C	5MIN	

bnr 9-24-86
AWL 9/24/86

* CONTRACT NUMBERS SHOWN IN THIS TAB WERE OBTAINED BY TRACING THE SERIAL NUMBER ON EACH TRANSMITTER THROUGH TVA PROCUREMENT RECORDS AND DID NOT DEPEND ON FIELD VERIFICATION DATA FOR CONTRACT NUMBERS.

PREPARER/DATE AWR 9/23/86

CHECKER/DATE Bryan D. Meyer / 9-24-86

R_____ R_____ R_____

BINDER NO. WBNEQ-XMTR-004 PLANT WBN UNIT(S) 1 SHEET 1 OF 1

BINDER TITLE BARTON 763 COMPUTED AHL DATE 4/23/86 R ___ R ___

LOT 7 CHECKED SR DATE 4/23/86

Tab B - Checklist for Evaluation of

Environmental Qualification

Including Summary and Conclusion

EQP055.27

TVA

BINDER NO. WBNEQ-XMTR-004 PLANT WBN UNIT(S) 1 SHEET 1 OF 24

BINDER TITLE BARTON 763 COMPUTED AWL DATE 9/23/86 R ___ R ___

LOT 7 CHECKED BCM DATE 9-24-86

A. DOCUMENTATION

Equipment Description Pressure Transmitter

Vendor/Manufacturer Westinghouse/Barton

Equipment Model No.(s) 763 Lot 7

763 Lot 2 Upgrade

QUALIFICATION REPORTS

(1) Title/Number/Revision WCAP-8687, Supp. RIMS NEB 840807 359

2-EQTR-E01A, Revision 2 * DATE March 1983

(2) Title/Number/Revision WCAP-8587, Supp. RIMS NEB 840807 355

1-EQDP-ESE-1A, Revision 4 DATE March 1983

NEB 840724 353

(3) Title/Number/Revision WCAP-8587 Revision 6 RIMS NEB 840724 354

"Methodology" DATE March 1983

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(4) QRN 74911

(5) QRN 74962

(6) QRN 68872

(7) QRN 43423

(8) Auditable Link Document (B45 860521 351)

(9) WAC-33

* All references referred to in Tab B are to this test report (TAB D) unless otherwise noted.

EQP055.27

BINDER NO. WBNEQ-XMTR-004 PLANT WBN UNIT(S) 1 SHEET 1A OF 24

BINDER TITLE BARTON 763 COMPUTED AVR DATE 9/23/86 R R

LOT 7 CHECKED BDM DATE 9-24-86

(10) WAC-32

(11) WAC-34

(12) WBNNAL3-025 (B45 860328 236)

(13) GENNAL3-001 (B45 851117 235)

(14) WBNNAL3-004 (B45 860205 235)

(15) TI-RPS-48 (B45 851105 235)

(16) Cat. & Oper. Time-System 68 R8 (B45 860722 218)

(17) Cat. & Oper. Time-System 1 R9 (B45 860722 219)

(18) WBPE0018603012 (B43 860402 901)**

(19) OE Calculation (1-PT-68-63) - (B43 860318 901)**

(20) PAM Functional Requirement Document (B45 860127 351) **

(21) Setpoint Methodology Study (B45 851211 600)**

(22) Barton Upgrade Package (B70 851024 001)

(23) WAC-20

(24) WAC-18

(25) WAC-35

(26) TI-ANL-198 (B45 851001 236)

(27) WBNAPS2-001 (B45 860711 236)

(28) WBNOSG4-44 (B45 860110 218)

(29) Spec. Sheet No. 01010

(30) Spec. 955270 (B45 850423 359)

(31) Spec. 953328 (B45 850508 351)

** See Open Item Sheet

(32) WAT-D-6467 (B45 850321 600)

(33) WAT (EQ)-001 (B71 860225 001)

(34) TVA-86-620 (B45 860804 612)

(35) Manual No. 82F1 (B45 850426 352)

(36) Dwg. 8765D46 Rev. 5***

(37) Moisture Intrusion (B45 860812 236)

(38) WAT (EQ)-010 (B71 860516 003)

*** See Open Item Sheet

BINDER NO. WBNEQ-XMTR-004 PLANT WBN UNIT(S) 1 SHEET 2 OF 24

BINDER TITLE BARTON 763 COMPUTED AWR DATE 9/23/86 R ___ R ___

LOT 7 CHECKED BDM DATE 9-24-86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified (Pending Resolution of Open Items)

___ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

___ Equipment Qualification Not Established by Documentation

___ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

1. SCR WBNEEB 8575 & ECN 6119

2. SCR 6224 - Unqualified Splices

3. Lot 2 Solder Modification

4. Drawing 8765 P46 R5

5. Valve Vault Flooding (SCR WBNEEB 8584)

6. Demonstrated and required loop accuracy (SCR EQP8621 R1)

COMMENTS/RECOMMENDATIONS

EQP055.27

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 323-1974

IEEE 344-1975

BINDER NO. WBNEQ-XMTR-004 PLANT WBN UNIT(S) 1 SHEET 4 OF24

BINDER TITLE BARTON 763 COMPUTED AWL DATE 5/15/86 R ___ R ___

LOT 7 CHECKED SP DATE 5/15/86

D. QUALIFICATION METHODOLOGY (Check only one block)

X Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

X** Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS **The lot 2 baseline configuration has been compared with the lot 4 and lot 7 baseline configuration and differences noted. The baseline comparison showed only revision level differences (not affecting qualification) of some piece parts and a solder modification. The Barton upgrade package is contained in TAB C, Section G.

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? Yes

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Transmitter	Transmitter	
(2) Manufacturer	Barton	Barton	2.0 pg. 2
(3) Model Number(s)	763 Lot 7	763 Lot 7	See Tab C
	763 Lot 2		See Tab C
	Upgrade		Sect. G
(4) Serial Number(s)	See Tab C	001	Table 1
	Section A	485	Page 23
		471	
(5) Identify Component-Unique checksheet attached:			

JUSTIFICATION/COMMENTS Lot 2 and Lot 7 transmitters can be differentiated by the Baseline Design Document to which they were built as shown in Tab C, Section G.

BINDER NO. WBNEQ-XMTR-004 PLANT WBN UNIT(S) 1 SHEET 6 OF 24

BINDER TITLE BARTON 763 COMPUTED ASVL DATE 9/23/86 R R

LOT 7 CHECKED BDA DATE 9-24-86

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	4-5/16"-225 to 245 in/lb	Yes	DWG 8765D46R5 4.2.3 pg. 7
External Process Connections	1/2" NPT FEMALE	Yes	SPEC 953328 Sect. 4.3.3 -TAB E
Electrical Connections	PER DWG 8765 D46 R5***	Yes	TAB I Note 2 of DWG** 8765 D46 - TAB I
Conduit Seals	PER DWG 8765 D46 R5***	NA	See Comments
Connector Seals	PER DWG 8765 D46 R5***	NA	See Comments**
Orientation	Horizontal	Yes	Instr. Manual Sect. 3 TAB H
Physical Configuration	DWG 8765 B46 R5***	Yes	TAB I
Other	See Comments*		

JUSTIFICATION/COMMENTS *The panels each transmitter is installed in are tabulated in Tab C, Section D. Raychem splices will be qualified by binder WBNEQ-SPLC-001. **The Barton transmitters are supplied with a manufacturer seal (potting compound) which was tested and exposed to total HELB environment as described in test report. This information is contained in Westinghouse letter WAT-EQ-010 (WAT-D-6985) (B71 86051~~603~~ 003) which is in TAB E, Section H. ***See Open Item Sheet 4. BDA 9-24-86 ASVL 9/24/86

EQP055.27

TVA 19537 (OE-3-86)

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	3.2 Pg. 4
(b) Baseline performance measurements taken	Yes	3.2 Pg. 4
(c) Equipment aged:		
Thermal	Yes	3.1.1 Pg.3
Radiation	Yes	3.1.2 and 3.1.3 Pg. 3
Wear	Yes	3.1.1 Pg. 3
(d) Vibration/seismic testing conducted	Yes	3.1.4 Pg. 4
(e) Design basis event (DBE) exposure	Yes	3.1.5 Pg. 4
(f) Post-DBE exposure	Yes	3.1.5 Pg. 4
(g) Final inspection and disassembly	Yes	2.8 & 2.9 Pg.11 of *** EQDP-ESE-1A (Tab D)

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes*

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes**
(Reference Tables 2, 3, and 4).

JUSTIFICATION/COMMENTS *O-rings were replaced, see Sections 5.1 and 7.1 Page 10 and 18. **Calibration data and test equipment accuracies available for audit at Westinghouse. *** This section identifies the test sequences which the transmitters were subjected to. Test sequences are as specified in IEEE 323-1974. Since no exceptions were taken it is assumed that final inspection and disassembly were performed.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference 3.1.1 Page 3).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	3.1.1 Pg.3
Radiation exposure	Yes	3.1.2 & 3 Pg.3 Pg. 3
Vibration (non-seismic) aging	Yes*	5.3.5 Pg.14
Operational (electrical/mechanical/process) stress aging	Yes	3.1.1 Pg. 3

JUSTIFICATION/COMMENTS *See WCAP-8587 - App. B Item 17 P. B-7 in Tab E, Section D for further justification.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS Section 21 (P. B8) - Appendix B of WCAP-8587 in Tab E Section D

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference 5.1 Page 9).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes* (Reference: 5.1, page 9*).

JUSTIFICATION/COMMENTS *See Appendix D, Section 3, pg D-5 of WCAP-8587 in Tab E, Section D. This is for generic Westinghouse NSSS equipment.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference).

JUSTIFICATION/COMMENTS See WCAP-8587, Appendix B, Section 7, page B-2 in Tab E, Section D.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference 5.1, page 9).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	IIR=75°F, PENT. RM (A6)= 104°F NSVVR(A2)=130°F	125°C	104°F
Time	40 years	1673hrs	10 yrs

JUSTIFICATION/COMMENTS See Tab C, Section B.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference 5.1, page 9).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? Yes * (Reference 5.1, page 9).

JUSTIFICATION/COMMENTS * Test report used a conservative activation energy of .5eV (see Appendix D, Section 3, page D-5 of WCAP-8587 in Tab E, Section D).

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? NA (Reference ___).

JUSTIFICATION/COMMENTS Regression lines were not used.

(h) Was the equipment operated during the thermal aging (yes/no/NA)? Yes (Reference 5.1, page 9).

JUSTIFICATION/COMMENTS

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference 5.2, page 11).

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? No (Reference NA).

JUSTIFICATION/COMMENTS Not required. Assembled device irradiated to required dose.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference 5.2, page 11).

JUSTIFICATION/COMMENTS See WCAP-8587 for further basis (Sections 6.7.1, pg 6-3, and 6.7.4, pg 6-4) in Tab E, Section D.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference 5.2, pg 11/3.1.3, pg 3).

Plant normal ambient radiation dose (rd) 2×10^7 (40 years)

Test exposure dose (rd) 6.8×10^7

Test exposure dose rate (rd/hr) 2.0 to 3.0 M

Test exposure source type (e.g., Co-60 gamma) Co-60 gamma

JUSTIFICATION/COMMENTS

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS See Appendix B, item 17, pg B-7 of WCAP-8587, Tab E. Also see 5.3.5, pg 14.

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? Yes* (Reference 5.3.5, pg 14).

JUSTIFICATION/COMMENTS *See Appendix B, items 17 and 20, pgs B-7 and B-8 of WCAP-8587, Tab E, Section D.

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS Section 5.1, pg 9. Test Procedure addresses the fact that operational stresses were induced in the qualification program.

H. AGING (Continued)

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference See Comments).

JUSTIFICATION/COMMENTS See Appendix B, Subprogram A, Section 13-15, pg B-6 of WCAP-8587, Tab E, Section D.

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference 7.5, pg 21).

Qualified life (Document in QMDS) IIR-26.4 yrs, PENT. RM(A6)=9.9 yrs. NSVVR(A2) = 4.4 yrs.

JUSTIFICATION/COMMENTS See Tab C, Section B, and Tab G.

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? Yes (Reference 7.5, pg 22).

Replacement Intervals (Document in QMDS) See Tab G for replacement interval for cover O-rings.

JUSTIFICATION/COMMENTS Although not a replacement part, the potentiometer (Lot 2) is recommended to be exercised at all calibration cycles. - See QMDS in TAB G.

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BINDER TITLE BARTON 763 COMPUTED ANR DATE 5/9/86 R ___ R ___

LOT 7 CHECKED SH DATE 5/15/86

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of EQC Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	EPT/O-rings			.92eV	5.1, p 10
(b)					
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS At the conclusion of the aging testing, it was determined that the O-rings failed due to high aging temperature. The O-rings were replaced and aged for 14 hours at 125°C based on an activation energy of .92eV. This 14 hours simulated 2 years of service for the O-rings. See Section 7.1 on page 18 of test report in Tab D, Section A. All other components were conservatively assigned an activation energy of .5eV.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference 3.2, pg 4).

Identify Acceptance Criteria: Refer to Section 3.2 of the test report.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference 3.2, pg 4/Table 5, 6, 7, 8, and 11).

Identify baseline and functional testing: See Section 6.0, pg 6-1 and Section 6.8, pg 6.9 on WCAP-8587 in Tab E, Section D.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? Yes (Reference Section 5.0, pgs 9-15).

JUSTIFICATION/COMMENTS

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? Yes (Reference).

JUSTIFICATION/COMMENTS See comment under section 5(a).

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

JUSTIFICATION/COMMENTS See comments on sheet 15A.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5) (a)

Parameter	Specific Accident Conditions	Reference
Voltage	NA	See Comment
Load	NA	
Frequency	NA	
Accuracy	See TAB C, Section F See Open Item 6	
Other(s)		

JUSTIFICATION/COMMENTS Voltage, load, and frequency are accounted for in the design process and will not vary during accident conditions since these transmitters are powered from regulated power supplies with fixed loads, and connected with qualified cable. The only electrical characteristics on which qualification is based is accuracy. Variations in the power supply are accounted for in the loop accuracy calculations.

(5) (b)

Parameter	Demonstrated Conditions	Reference
Voltage	15-52 VDC	Sect. 1.1.1 of ESE-1A
Load	10-50 MA	Sect. 1.1.3 of ESE-1A
Frequency	NA	Sect. 1.1.2 of ESE-1A
Accuracy	See TAB C, Section F See Open Item 6	
Other(s)		

JUSTIFICATION/COMMENTS

Electrical characteristics are contained in EQDP-ESE-1A and specification 953328. Vendor submits to Westinghouse for approval the verification of electrical characteristics to specification 953328. Verification of electrical characteristics is on file at Westinghouse and can be audited. Specification 953328 is contained in TAB E, Section C, and EQDP-ESE-1A is contained in TAB D, Section B.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. Normal and abnormal: See Sheet 16A
Accident: 47E235-45 RO Instrument Room

(1) Normal Max

(a) Temperature (°F) See Sheet 16A
(b) Pressure (psig) See Sheet 16A
(c) Humidity (%) See Sheet 16A
(d) Radiation (rd) See Sheet 16A

(2) Abnormal Max

(a) Temperature (°F) See Sheet 16A
(b) Pressure (psig) See Sheet 16A
(c) Humidity (%) See Sheet 16A
(d) Radiation (rd) See Sheet 16A

(3) Process Interfaces: The transmitters are connected by impulse lines to the process systems which they are monitoring and are located in instrument racks away from the process system so that they should not see any significant effect due to process temperature.

(4) State anticipated occurrence frequency and duration of abnormal conditions: 1% of the plant life and could exist up to 8 hours per excursion.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	327	Accident type	L
(b) Pressure (psia)	26.7	Accident type	L
(c) Humidity (%)	100	Accident type	L
(d) Radiation (rd)	3.3×10^7 (Gamma)* 4.7×10^8 (Beta)**	Accident type	L
(e) Spray Type	2000 ppm Boron pH 8.2	Accident type	L

*Radiation level contained in OE Calculation WBNNAL3-004 (B45 860205 235) contained in Tab C, Section C.

**Radiation level contained in OE Calculation TI-RPS-48 (B45 851105 235) contained in Tab C, Section C.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-56 R1, 713-RM-A6-Penetration Room

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	104	(a) Temperature (°F)	110
(b) Pressure (psia)	ATM(-)	(b) Pressure (psia)	ATM(-)
(c) Humidity (%)	80	(c) Humidity (%)	90
(d) Radiation (rd)	2.2×10^6*	(d) Radiation (rd)	NA

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-45 R1 Instrument Room

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	75	(a) Temperature (°F)	120
(b) Pressure (psia)	14.7	(b) Pressure (psia)	14.7
(c) Humidity (%)	60	(c) Humidity (%)	90
(d) Radiation (rd)	3.5×10^5**	(d) Radiation (rd)	NA

**Radiation level based on OE Calculation GENNAL3-001. Contained in Tab C, Sect. C.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-76 R3, 729-RM A2-NSVVR

(1) Normal Max		(2) Abnormal Max	
(a) Temperature (°F)	130	(a) Temperature (°F)	140
(b) Pressure (psia)	ATM(-)	(b) Pressure (psia)	ATM(-)
(c) Humidity (%)	50	(c) Humidity (%)	100
(d) Radiation (rd)	1.8×10^3*	(d) Radiation (rd)	NA

*Radiation level based on OE Calculation WBNNAL3-025, contained in Tab C, Sect. C.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.)

See pages 17A, B, C, D, E, F, and G

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? Yes (Reference See Moisture Intrusion).

(7) Subject to submergence (yes/no/NA)? Yes*

Identify initiation time and duration of submergence: NA

*Comments: See sheet 17A1 and open item sheet 5.

(8) Special environmental calculations (temp., rad., etc.)

Radiation*	B45 860328 236
Radiation*	B45 851117 235
Radiation*	B45 860205 235
Radiation*	B45 851105 235
Temperature**	B45 851001 236
Flooding***	B45 860116 235
Flooding***	B45 860711 236
Moisture Intrusion ****	B45 860812 236

*Radiation calculation contained in Tab C, Section C.
**Temperature analysis contained in Tab C, Section I.
***Flooding calculation contained in Tab C, Section J.
****Moisture Intrusion contained in Tab C, Section L.

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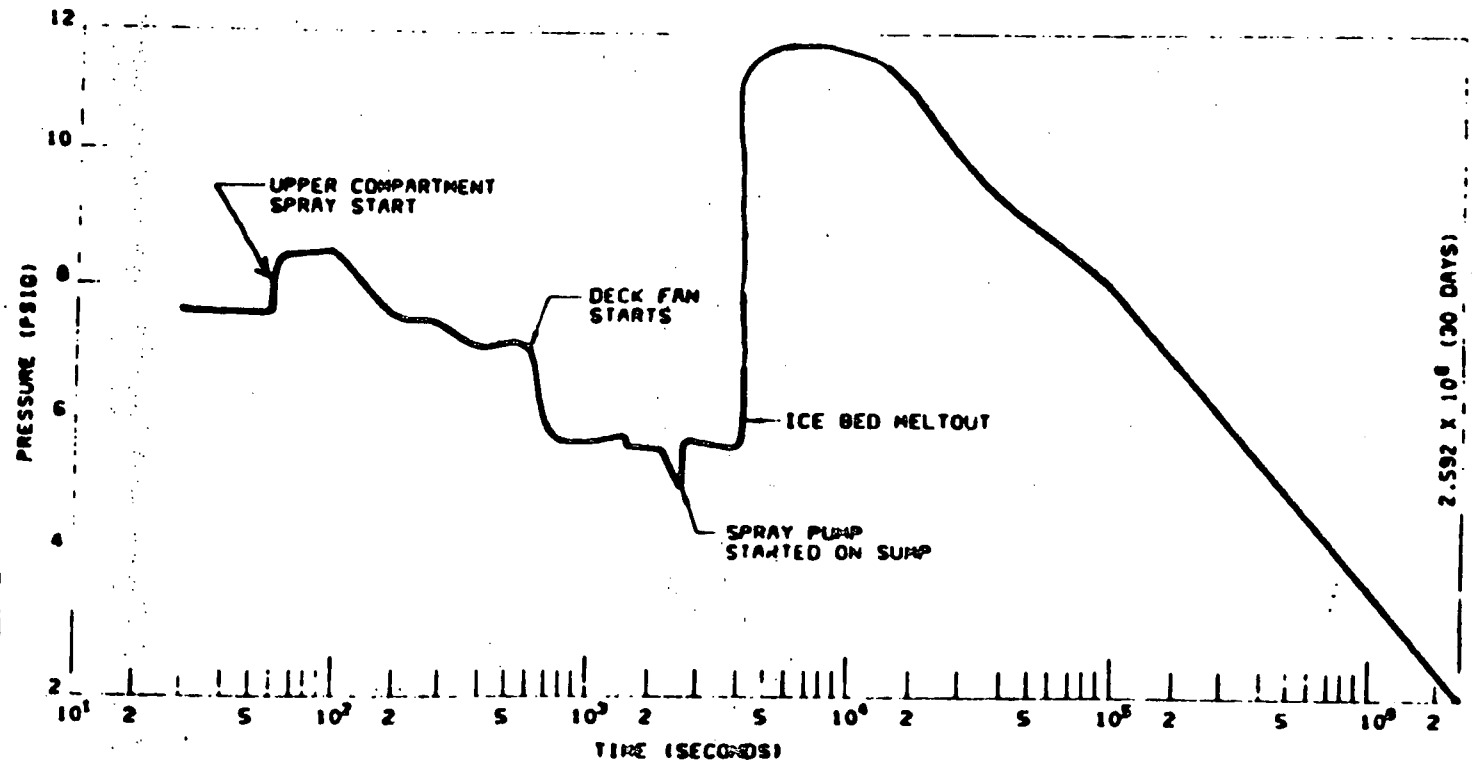
BINDER TITLE BARTON 763 LOT 7 COMPUTED [illegible] DATE 4/23/86 R ___ R ___

CHECKED [illegible] DATE [illegible]

INSTRUMENT ROOM (IIR)

CONTAINMENT PRESSURE - DOUBLE ENDED PUMP SUCTION BREAK (LOCA)



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TVA

K. REQUIRED OPERATING ENVIRONMENT (Continued)

(7) Comments: Tab A contains the exact elevation of the transmitters (field verification) which can then be compared to the following flood level:

1. IIR - elevation - 717.7 ft. (47E235-45 R0)
2. North Steam Valve Vault Room (A2) - 731.6 ft. (Calculation WBNAPS2-001)
3. Penetration Room (A6) - 713 ft. 7 inch (Calculation WBNOSG4-44)

Transmitter 1-PT-1-20A presently will be flooded, but Calculation WBNNA6-004 is being revised and should lower the flood level below the transmitter elevation (see open items).

ID#	ACTUAL ELEV	FLOOD ELEV
1-PT-1-9A	731'2"	731.6' *
1-PT-1-9B	733'5"	731.6'
1-PT-1-20A	731'4"	731.6' *
1-PT-1-20B	733'5"	731.6'
1-PT-68-63	717'6"	713'~~7~~ 1" BDM 9-24-86 AWL 9/24/86
1-PT-68-322	731'	717.7'
1-PT-68-323	732'	717.7'
1-PT-68-334	734'10"	717.7'
1-PT-68-340	735'	717.7'

* See open item sheet 5

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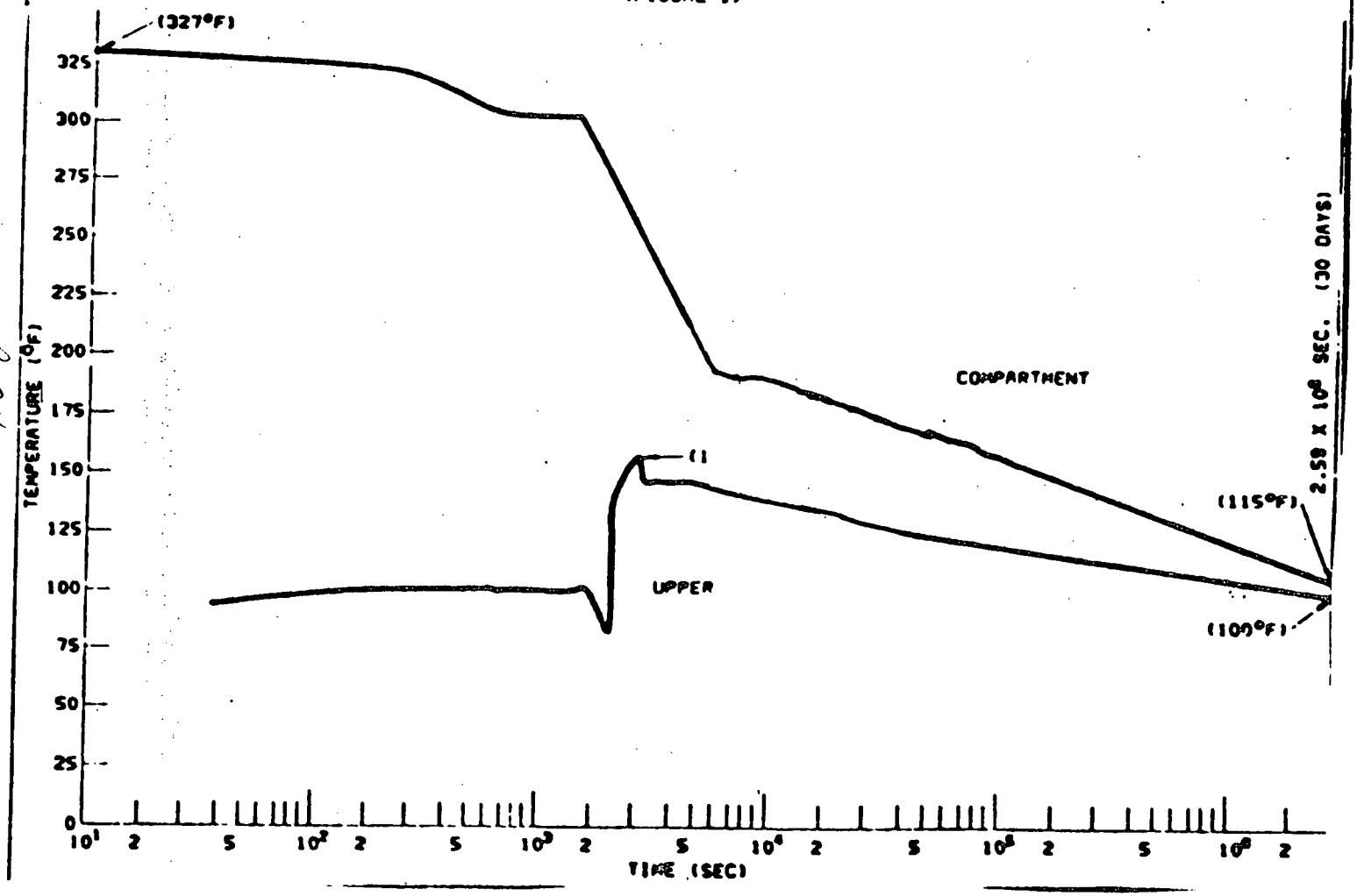
BINDER TITLE BARTON 763 LOT 7 COMPUTED [illegible] DATE 4/23/86 R ___ R ___

CHECKED [illegible] DATE [illegible]

INSTRUMENT ROOM (IIR)

CONTAINMENT TEMPERATURE, DOUBLE ENDED PUMP SUCTION BREAK (LOCA)
AND
MOST SEVERE STEAMLINE BREAK (HELB) COMBINED
(FIGURE 1)

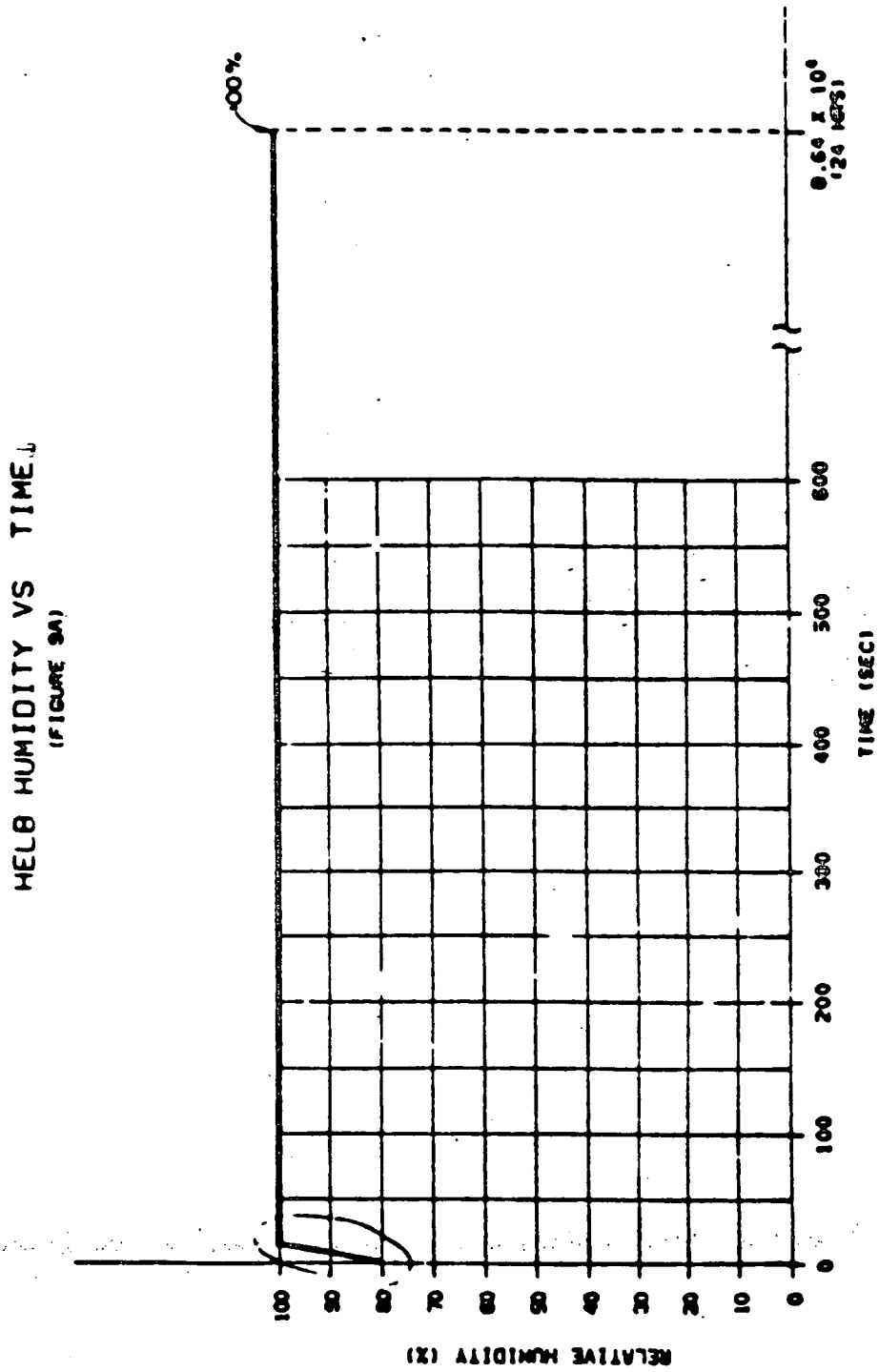


BINDER NO. WBNEQ-XMTR-004 PLANT WBN UNIT(S) 1 SHEET 17C OF 24

BINDER TITLE BARTON 763 LOT 7 COMPUTED [illegible] DATE 4/23/86 R ___ R ___

CHECKED [illegible] DATE [illegible] ___ ___

PENETRATION ROOM (A6)



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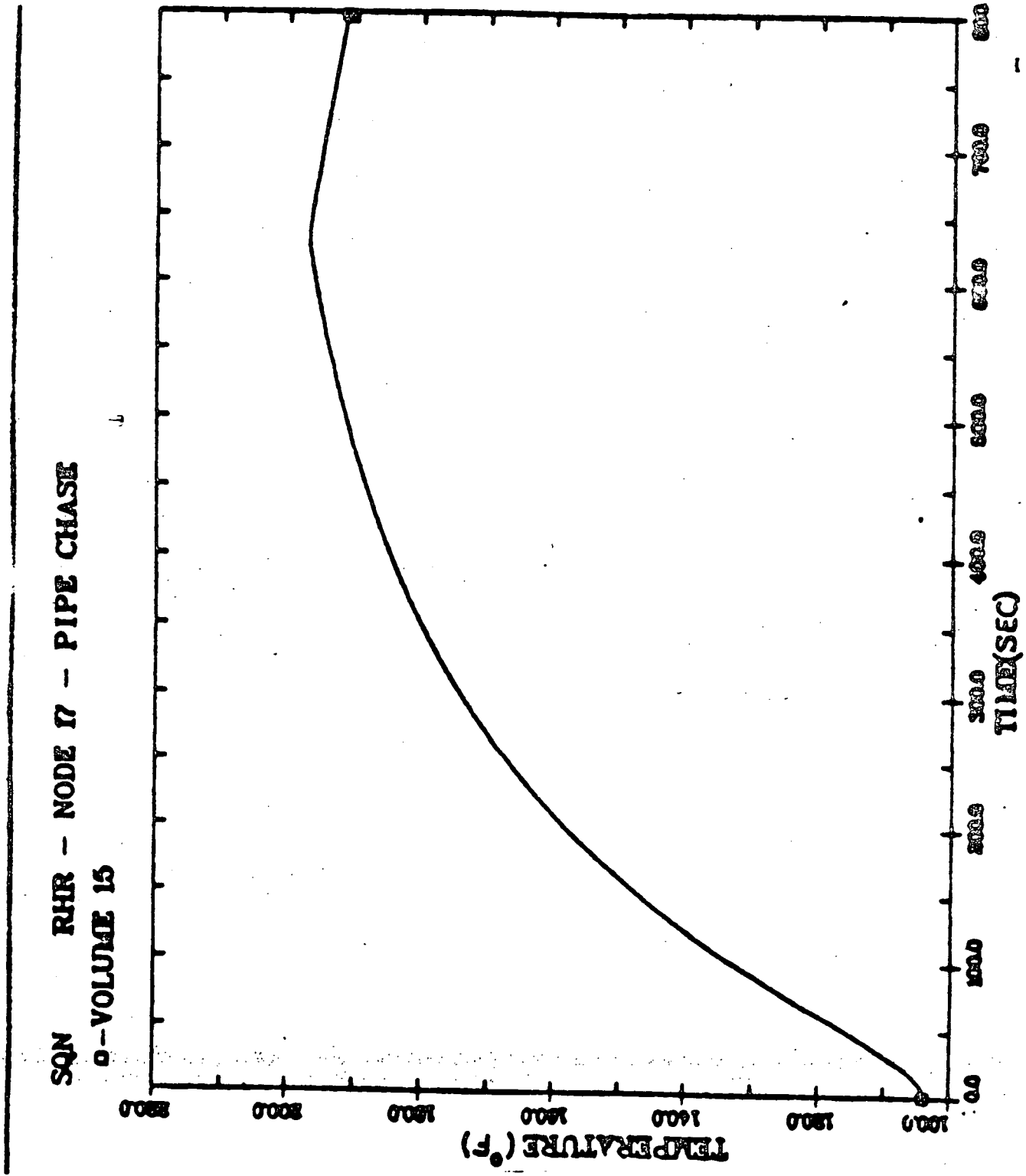
TVA

BINDER NO. WBNEQ-XMTR-004 PLANT WBN UNIT(S) 1 SHEET 17D OF 24

BINDER TITLE BARTON 763 LOT 7 COMPUTED AWL DATE 4/23/86 R ___ R ___

CHECKED ___ DATE 5/9/86

PENETRATION ROOM (A6)



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TVA

BINDER NO. WBNEQ-XMTR-004 PLANT WBN UNIT(S) 1 SHEET 17E OF 1

BINDER TITLE BARTON 763 LOT 7 COMPUTED AWL DATE 9/23/86 R R

CHECKED BDM DATE 9-24-86

AWL 9/23/86 BDM/9-24-86

LOWER CONTAINMENT AND INSTRUMENT ROOM (IIR)

Chemical Spray: The chemical composition of the containment spray was based on the following solutions which result in the most severe conditions:

1. Ice Condenser - Quantity of Ice - 2.7195×10^6 Pounds - Boron Concentration 1800 PPM B added as $Na_2B_4O_7 10 H_2O$

2. Boron Injection Tank - Volume - 900 GAL - Boron Concentration ~~20,000~~ ~~22,500~~ 2100 PPM B in the form of H_3BO_3. AWL 9/23/86 BDM/9-24-86

3. Cold Leg Injection Accumulators (4 Tanks) - Volume - 10,098 FT^3 - Boron Concentration: 2000 PPM B in the form of H_3BO_3.

4. Upper Head Injection - Volume - 1800 FT^3 - Boron Concentration: 2100 PPM B in the form of H_3BO_3.

5. Refueling Water Storage Tank - Volume - 375,000 GAL - Boron Concentration: 2100 PPM B in the form of H_3BO_3.

6. Reactor Coolant System - Volume - 12,145 FT^3 - Maximum Boron Concentration: 2100 PPM B in the form of H_3BO_3.

Results: The solutions stated above yield a resulting concentration of .19 Molar ~~NaOH~~ H_3BO_3 resulting in a pH of 8.3 at 25°C.

AWL 9/23/86 BDM/9-24-86

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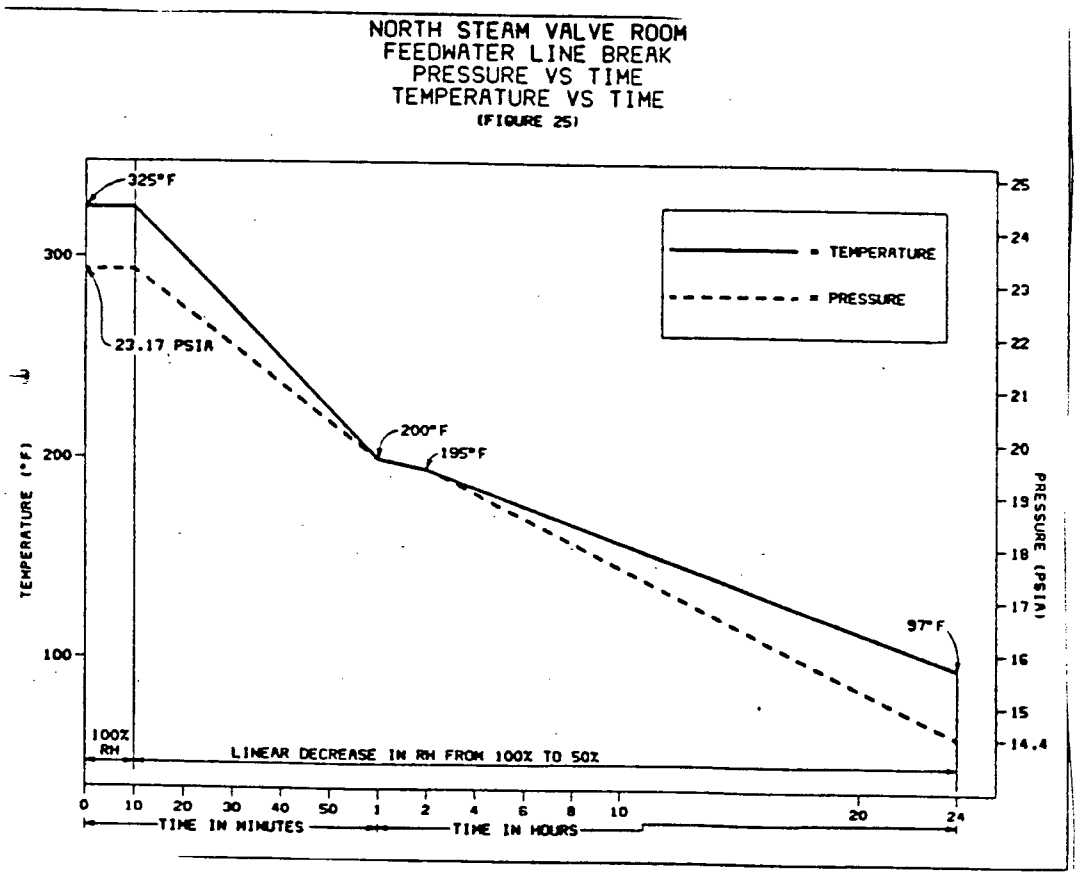
BINDER TITLE BARTON 763 LOT 7 COMPUTED AJR DATE 9/23/86 R ___ R ___

CHECKED BDM DATE 9-24-86

NORTH STEAM VALVE VAULT ROOM (A2) - FEEDWATER BREAK

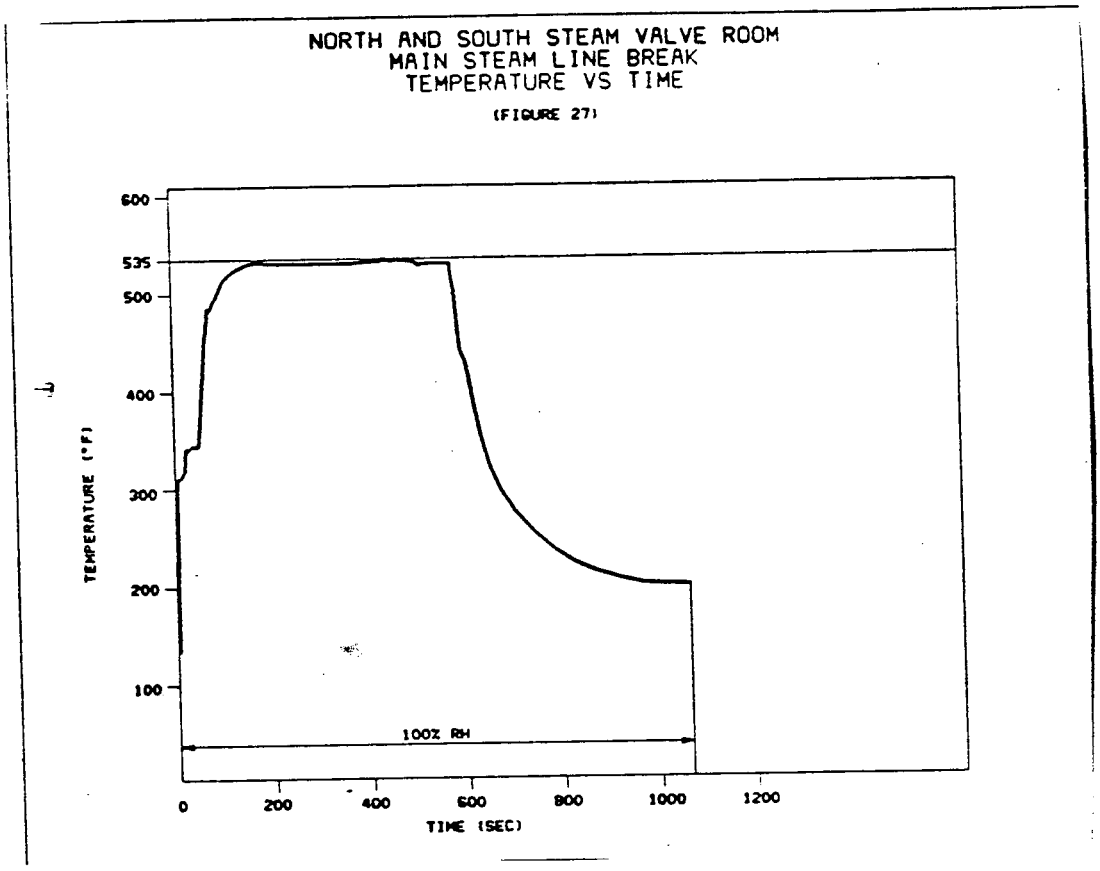


BINDER NO. WBNEQ-XMTR-004PLANT WBN UNIT(S) 1 SHEET 17 OF 24

BINDER TITLE BARTON 763 LOT 7 COMPUTED AMP DATE 9/23/86

CHECKED BDM DATE 9-24-86

NORTH STEAM VALVE VAULT ROOM (A2) - MAIN STEAM LINE BREAK



L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDTIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 Days	15 Days	See Tab C Sect. H for Comp
Temperature (°F)	327, 535 ****	420	3.1.5 Pg. 4
Pressure (psia)	26.7	72	Figure 2 Page 38
Relative Humidity (%)	100	100	Tbl 1, Pg. 16 EQDP-Tab D Sect. B
*Chemical Spray	2000 ppm pH 8.2	2500 ppm pH 10.7	Tbl 1, Pg. 16 EQDP-Tab D Sect. B
**Radiation (rd)	3.335×10^{7}*** 4.7×10^{8}(BETA)***	6.8×10^{7} 9×10^{8}	6.1, Pg. 16 TAB C, Sect. C
Submergence	See Sheet 17A1	See Sheet 17A1	

*Includes spray concentration, flowrate, density, duration, and pH.
**Enter 40-year integrated normal dose plus integrated accident dose and specify type.
***Based on information contained in section K; accident - 3.3×10^{7}, normal - 3.5×10^{5}
****The temperature for the North Steam Valve Vault Room is 535°F.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes[1]	Fig. 2 Pg. 38
Pressure	Yes	Fig. 2 Pg. 38
Relative Humidity	Yes	Tbl 1, Pg. 2 EQDP-ESE-1A
Chemical Spray	Yes	TAB C Section K
Submergence	See Sheet 17A1	

JUSTIFICATION/COMMENTS [1]OE Calculation TI-ANL-198 (TAB C, Section I) establishes that the peak temperature the transmitter will see is 258.6°F.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	> +15 °F	Yes
Pressure: +10% but no more than 10 psig	> +10%	Yes
Radiation: +10% of accident dose	> +10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	> +10%	Yes
Voltage: +10% of rated value		No*
Frequency: +5% of rated value	NA	NA
Environmental Transient: the initial transient and the peak temperature applied twice	Same	Yes
Seismic Vibration: +10% added to acceleration	> +10%	Yes*

JUSTIFICATION/COMMENTS: *Voltage must not exceed 52VDC + 1VDC -

See Note 4 on Dwg. 8765 D46 in Tab I.

*See Section 5.3.5 on page 14.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference See Tab A).

JUSTIFICATION/COMMENTS NA

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference Section 7.4 Page 20).

JUSTIFICATION/COMMENTS NA

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference Section 7.4 Page 20).

JUSTIFICATION/COMMENTS NA

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference 7.4 Page 20).

JUSTIFICATION/COMMENTS See Tab C Section H

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference See Comments).

JUSTIFICATION/COMMENTS See Sheet 20A.

M. OPERABILITY TEST RESULT (Continued)

(5) JUSTIFICATION/COMMENTS See Appendix A and Sections 7.1 thru 7.4 on pages 18 thru 21 of test report (TAB D) for a discussion of the anomalies and their resolution. We concur with the resolution for the O-rings and erratic behavior during HELB because:

1. The cover O-rings are being replaced per Westinghouse recommendation as noted in the QMDS in TAB G.

2. The erratic behavior has been corrected in the Lot 7 model by a manufacturing change to build the transmitters with the soldered connection.

3. The Lot 2 transmitters are being upgraded to the equivalent of the Lot 7 by making the solder modification and exercising the potentiometer as discussed in TAB C, Section G. This will remain an open item until field verification is received that the solder modification is complete.

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	No
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	No*

*See Section H (5b)

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes**
(11) Criteria regarding submergence satisfied?	Open Item Sheet 5
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes*
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

*See specification 955270 (Tab E, Section B) section 6.0 page 6 and Westinghouse letter WAT(EQ)-001 (Tab E, Section F). See Also TAB C, Section C.
**Due to the test chamber configuration being small, the flow rate is considered adequate in regard to the plant's requirements.

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	Open Item Sheet 6
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	No
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	Yes*
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

*See Section 7.1.6 of WCAP-8587 contained in Tab E, Section D.

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. NBMED-ITE -002
MANUFACTURER: ROSEMOUNT
PAGE: 1 OF 2

EGIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
NBM-1-TE -068-0002A -D	1-TE -068-0002A -D	RCS LOOP 1 HOT LEG RTD MAIN TEMP	176KF		016	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION
NBM-1-TE -068-0002B -D	1-TE -068-0002B -D	RCS LOOP 1 HOT LEG RTD MAIN TEMP	176KF		016	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION
NBM-1-TE -068-0014A -D	1-TE -068-0014A -D	RCS LOOP 1 COLD LEG RTD MAIN TEMP	176KF		040	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION
NBM-1-TE -068-0014B -D	1-TE -068-0014B -D	RCS LOOP 1 COLD LEG RTD MAIN TEMP	176KF		040	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION
NBM-1-TE -068-0025A -E	1-TE -068-0025A -E	RCS LOOP 2 HOT LEG RTD MAIN TEMP	176KF		158	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION
NBM-1-TE -068-0025B -E	1-TE -068-0025B -E	RCS LOOP 2 HOT LEG RTD MAIN TEMP	176KF		158	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION
NBM-1-TE -068-0037A -E	1-TE -068-0037A -E	RCS LOOP 2 COLD LEG RTD MAIN TEMP	176KF		132	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION
NBM-1-TE -068-0037B -E	1-TE -068-0037B -E	RCS LOOP 2 COLD LEG RTD MAIN TEMP	176KF		132	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION
NBM-1-TE -068-0044A -F	1-TE -068-0044A -F	RCS LOOP 3 HOT LEG RTD MAIN TEMP	176KF		205	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE N.C. Rito 7/30/86

CHECKER/DATE W. B. [illegible] 7/30/86

PAGE A-1

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-ITE -002
MANUFACTURER: ROSEMOUNT
PAGE: 2 OF 2

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-TE -068-0044B -F	1-TE ~~-068-0044B~~ -F	RCS LOOP 3 HOT LEG RTD MAIN TEMP	176KF		205	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION
WBN-1-TE -068-0056A -F	1-TE ~~-068-0056A~~ -F	RCS LOOP 3 COLD LEG RTD MAIN TEMP	176KF		221	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION
WBN-1-TE -068-0056B -F	1-TE ~~-068-0056B~~ -F	RCS LOOP 3 COLD LEG RTD MAIN TEMP	176KF		225	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION
WBN-1-TE -068-0067A -G	1-TE ~~-068-0067A~~ -G	RCS LOOP 4 HOT LEG RTD MAIN TEMP	176KF		335	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION
WBN-1-TE -068-0067B -G	1-TE ~~-068-0067B~~ -G	RCS LOOP 4 HOT LEG RTD MAIN TEMP	176KF		335	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION
WBN-1-TE -068-0079A -G	1-TE ~~-068-0079A~~ -G	RCS LOOP 4 COLD LEG RTD MAIN TEMP	176KF		315	702'	LC	54114-1	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION
WBN-1-TE -068-0079B -G	1-TE ~~-068-0079B~~ -G	RCS LOOP 4 COLD LEG RTD MAIN TEMP	176KF		315	702'	LC	282326	MS/C	A	5MIN	OVER TEMPERATURE DELTA T TRIP FUNCTION

* FLOOR/ACTUAL ELEVATION - ACTUAL ELEVATIONS ARE DOCUMENTED ON FIELD VERIFICATION SHEETS AND FOUND IN TAB F.

R_____ R_____ R_____

PREPARER/DATE N.A. Pike 7/30/86

CHECKER/DATE W.B. [illegible] 7/30/86

PAGE A-2

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B1 OF B30

BINDER TITLE ROSEMOUNT RTD'S COMPUTED Nap DATE 6/4/86 R ___ R ___

CHECKED WJK DATE 6/16/86

A. DOCUMENTATION

Equipment Description RTDs - See Tab A.

Vendor/Manufacturer Rosemount

Equipment Model No.(s) 176KF

QUALIFICATION REPORTS

(1) Title/Number/Revision Westinghouse WCAP-9157 RIMS NEB801218300

(See Tab D) DATE Sept. 1977

(2) Title/Number/Revision Westinghouse WCAP-9745 RIMS NEB810331343

(See Tab D) DATE June 1980

(3) Title/Number/Revision ___ RIMS ___

___ DATE ___

OTHER (ANALYSIS, VENDOR DATA, ETC.)

1. Category and Operating Times WBNOSG4-017 (Tab C-4)

2. 40 Year Normal Dose Calc GENNAL3-001 (Tab C-7)

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B2 OF B3(R R

BINDER TITLE ROSEMOUNT RTD'S COMPUTED nap DATE 9/12/86

CHECKED WBK/RK DATE 9/12/86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified (Pending resolution of open items)

____ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

____ Equipment Qualification Not Established by Documentation

____ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES

1. Westinghouse Setpoint Methodology Document

2. Terminal Block Replacement

Delete #3

PAGE B-2

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B3 OF B30

BINDER TITLE ROSEMOUNT RTD'S COMPUTED nap DATE 5/27/86 R ___ R ___

CHECKED WMK DATE 6/4/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate All Documents Which are Applicable):

___ Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

X Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 323-1971

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B4 OF B30

BINDER TITLE ROSEMOUNT RTD'S COMPUTED [illegible] DATE 6/3/86 R ___ R ___

CHECKED WBK DATE 6/4/86

D. QUALIFICATION METHODOLOGY (Check only one block)

X Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

___ Test of Similar Items with Supporting Analysis

___ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

___ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS The qualification of these devices was based on three things: 1) material aging data presented by Westinghouse and Digital (see TABs C-2 and C-3), 2) the operating experience TVA has with these devices, and 3) the operating time margin being significantly longer than required (see TAB C-8). The test reports, found in TAB D, were used to establish 3 above. For a more detailed qualification analysis see TAB B and TAB C-1.

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B5 OF B30

BINDER TITLE ROSEMOUNT RTD'S COMPUTED [illegible] DATE 6/12/86 R ___ R ___

CHECKED [illegible] DATE 6/16/86

E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? Yes

	Plant Device	Qualification Document	Reference
(1) Equipment Type	RTD	RTD	*
(2) Manufacturer	Rosemount	Rosemount	*
(3) Model Number(s)	176KF	176KF	*
(4) Serial Number(s)	See ***	6561	**
		6888	**
		6889	**
(5) Identify Component-Unique checksheet attached:	None		

JUSTIFICATION/COMMENTS

*WCAP-9157, page 3-4 and WCAP-9745, page 2-8, Table 1.

**WCAP-9157, page 6-3 and Tab C-6.

***8749	8745	8750	8777	8773	30097
8747	8755	8753	8762	8774	
8744	8754	8781	8760	8767	

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B6 OF B30

BINDER TITLE ROSEMOUNT RTD'S COMPUTED NAP DATE 5/23/86 R ___ R ___

CHECKED WBK DATE 6/4/86

F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	None	NA	NA
External Process Connections	None	NA	NA
Electrical Connections	See comments below		
Conduit Seals	None	NA	NA
Connector Seals	None	NA	NA
Orientation	None	NA	NA
Physical Configuration	None	NA	NA
Other	None	NA	NA

JUSTIFICATION/COMMENTS The termination qualification is addressed in binder WBNEQ-TB-001.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 - 1974, paragraph 6.3.2 (yes/no/NA)? (note below)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	Note 1
(b) Baseline performance measurements taken	Yes	Note 1
(c) Equipment aged:		
Thermal	No	Note 1
Radiation	Yes	Note 1
Wear	No	Note 1
(d) Vibration/seismic testing conducted	No	Note 1
(e) Design basis event (DBE) exposure	Yes	Note 1
(f) Post-DBE exposure	No	Note 1
(g) Final inspection and disassembly	No	Note 1

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes (See WCAP-9745, page 3-15 and WCAP-9157, Table 6-1, page 6-3).

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? No (Reference Note 2).

JUSTIFICATION/COMMENTS Note 1 - The test sequence scenario outlined above (i.e., G(1) (a) through (g)) is from IEEE 323-1974. The qualification criteria for this equipment is NUREG-0588, Category II (IEEE 323-1971). Table 1-1, page 1-2, of WCAP-9157 outlines the RTD test

sequence and WCAP-9745 provides justification for the adequacy of the test sequence per NUREG-0588, Category II (pages 3-15 and 3-16 of WCAP-9745). Also, the sequence employed satisfies the requirements of Section 5.2(3) of the DOR Guidelines.

Note 2 - Although test equipment data was not included in the test report (WCAP-9157), the discussions regarding radiation and environmental test facility, radiation and environmental test plans, and the data acquisition system warrant the conclusion that the test data was correctly and accurately compiled (see WCAP-9157, pages 4-1, 4-2, 4-7, 5-1, and 5-3).

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? No (Reference *).

JUSTIFICATION/COMMENTS *Tab C-1 Materials Analysis

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	No	* WCAP-9157 Sect. 4-4 page 4-5
Radiation exposure	Yes	
Vibration (non-seismic) aging	No	**
Operational (electrical/mechanical/process) stress aging	No	**

JUSTIFICATION/COMMENTS *Tab C-1 Materials Analysis

**Operational and vibration aging are not significant concerns

Continued on sheet B10

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? No (Reference See Tab C-1 Materials Analysis).

JUSTIFICATION/COMMENTS

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? No (Reference *).

JUSTIFICATION/COMMENTS *Tab C-1 Materials Analysis

for these devices. These devices are of simple construction and are rigidly pipe mounted; the vendor drawing (Tab I, drawing 176KF, note 2.3) specifies a vibration performance specification which, in TVA's engineering judgement, adequately demonstrates that vibration is not a concern.

Also, with regard to operational stress aging, these devices operate passively (i.e., no mechanical movement) and are designed for extended service; therefore, operational stress aging is not a concern for this type of equipment.

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: WCAP-9157, page 2-7).

JUSTIFICATION/COMMENTS See also Tab C-1 Materials Analysis.

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? No (Reference *).

JUSTIFICATION/COMMENTS *See Tab C-1 Materials Analysis.

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? No (Reference *).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	*	*	*
Time	*	*	*

JUSTIFICATION/COMMENTS *See Tab C-1 Materials Analysis.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? No (Reference *).

JUSTIFICATION/COMMENTS *See Tab C-1 Materials Analysis.

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? No (Reference *).

JUSTIFICATION/COMMENTS *See Tab C-1 Materials Analysis and Tab C-3 Westinghouse's Materials Analysis and Process Interface Evaluation.

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? Yes (Reference _____).

JUSTIFICATION/COMMENTS See comment on H(4)(f).

(h) Was the equipment operated during the thermal aging (yes/no/NA)? NA (Reference _____).

JUSTIFICATION/COMMENTS Aging was addressed by analysis (see Tab C-1 Materials Analysis).

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference WCAP-9157, Sect. 2-2, p. 2-1).

JUSTIFICATION/COMMENTS Refer also to Tab C-1 Materials Analysis.

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference WCAP-9157, Section 2, page 2-7).

JUSTIFICATION/COMMENTS See Tab C-1 Materials Analysis, Tab C-2, Digital Engineering Analysis, and Tab C-3 Westinghouse Materials and Process Interface Evaluation.

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference WCAP-9157, Section 2-2, page 2-1).

JUSTIFICATION/COMMENTS _____

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference WCAP-9157, Sect. 4, page 4-5, and Appendix A, page A-3).

Plant normal ambient radiation dose (rd) 1.08×10^7, gamma

Test exposure dose (rd) 1.027×10^8, gamma

Test exposure dose rate (rd/hr) 8.046×10^6 (Note: WCAP-9157 incorrectly identifies the normal dose rate as 8.046 rad/hr rather than Mrd/hr)

Test exposure source type (e.g., Co-60 gamma) Co-60, gamma

JUSTIFICATION/COMMENTS The 1.08×10^7 rd, gamma normal dose is for 5.4 years and was calculated from the 40 year normal dose of 8×10^7 rads (see GENNAL3-001 in Tab C-7).

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No (Reference *).

JUSTIFICATION/COMMENTS *Vibration, although mentioned in IEEE 323-1974, is not defined in relation to either intensity or frequency. Generally, in power plant applications, this vibration would be of low intensity (low acceleration less than 1G) which exists whenever the plant is generating power. These devices are rigidly pipe mounted and are of simple

H. AGING (Continued)

construction, having no parts susceptible to vibration degradation. Additionally, TVA has operating experience for one 5.4 year qualified life cycle for these RTDs and has experienced no detrimental performance due to the environment, including low level vibration. Therefore, in TVA's engineering judgement, the accelerations experienced during normal plant operation are not sufficiently intense to cause equipment malfunction or failure. See also note 2.3 of drawing 176KF (Tab I).

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? NA
(Reference *).

JUSTIFICATION/COMMENTS *See (6)(a) above.

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? No
(Reference).

JUSTIFICATION/COMMENTS See Section H (2).

H. AGING (Continued)

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? NA (Reference).

JUSTIFICATION/COMMENTS See Section H (2).

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? No
(Reference *).

Qualified life (Document in QMDS) 5.4 years

JUSTIFICATION/COMMENTS *See Tab G and Tab C-1 Materials Analysis.

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? No
(Reference Tab G).

Replacement Intervals (Document in QMDS) Replace RTDs every 5.4 years or sooner.

JUSTIFICATION/COMMENTS See also Tab C-1 Materials Analysis.

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B16 OF B30
R R

BINDER TITLE ROSEMOUNT RTD'S COMPUTED NAP DATE 5/29/86

CHECKED WMK DATE 6/4/86

I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Section C of EQC Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)					
(b)					
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS See Tab C-1 Materials Analysis and Tab C-3 Westinghouse Materials and Process Interface Evaluation.

EQPI13.22

TVA 19537 (OE 3-86)

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(Note - All references in Section J are to WCAP-9157 unless otherwise noted.)

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference Sect. 2, especially pgs 2-1, 2-2, and 2-8).

Identify Acceptance Criteria: Westinghouse's stated test acceptance criteria is provided in WCAP-9157, Section 2, Table 2-1 (especially see pgs 2-1, 2-2, and 2-8 for supplemental discussion). However, for our application, the demonstrated operability as evidenced by the RTD pretest and post-test calibration data (WCAP-9157, Table 6-1, pg 6-3) and the loop accuracy data provided by Westinghouse (Tab C-5 TVA Watts Bar Nuclear Plant Units 1 and 2 Statistical Setpoint Study, dated 12/10/85, RIMS B45 851211 600) demonstrate acceptable performance during harsh post-accident conditions for these devices. Specifically, the Westinghouse demonstrated loop accuracies include inaccuracy contribution due to harsh post-DBA conditions. The required and demonstrated loop accuracies for these RTD's specified by Westinghouse are summarized in Tab C with the Westinghouse report.

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B18 OF B30

BINDER TITLE ROSEMOUNT RTD'S COMPUTED Naf DATE 5/22/86 R R

CHECKED WMK DATE 6/4/86

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference Sect. 6, pg 6-1 and Table 6-1, pg 6-3).

Identify baseline and functional testing: Each RTD tested received an initial, post-radiation test, and post-environment test calibration.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? NA (Reference _____).

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B19 OF B30

BINDER TITLE ROSEMOUNT RTD'S COMPUTED NAP DATE 9/10/86 R ___ R ___

CHECKED WBK/RK DATE 9-10-86

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ~~E~~ SURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? NA (Reference _____).

JUSTIFICATION/COMMENTS _____

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	NA	NA
Load	NA	NA
Frequency	NA	NA
Accuracy	6.9% of span-channels 7 thru 11 4.9% of span-channels 12 thru 14 None-channel 36	*
Other(s)		

JUSTIFICATION/COMMENTS *See Westinghouse Statistical Setpoint Study - Table 3-19 (Tab C-5). This study documents the demonstrated loop accuracy and the required accuracy requirements for these RTD's in % of span. These figures include inaccuracy contributions due to a harsh post-DBE environment.

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B20 OF B30

BINDER TITLE ROSEMOUNT RTD'S COMPUTED nap DATE 9/10/86 R ___ R ___

CHECKED GAK/DLK DATE 9-10-86

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(b)

Parameter	Demonstrated Conditions	Reference
Voltage	NA	NA
Load	NA	NA
Frequency	NA	NA
Accuracy	6.3% of span-channels 7 thru 11 4.8% of span-channels 12 thru 14 3.2% of span-channel 36	*
Other(s)		

JUSTIFICATION/COMMENTS *See reference for Section J(5)(a).

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B21 OF B30

BINDER TITLE ROSEMOUNT RTD'S COMPUTED nap DATE 8/5/86 R R

CHECKED WJR DATE 8/19/86

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-42, R1

(1) Normal Max

(a) Temperature (°F) 120

(b) Pressure (psig) 14.7

(c) Humidity (%) 80

(d) Radiation (rd) 1.08×10^{7} (1)

(2) Abnormal Max

(a) Temperature (°F) 130

(b) Pressure (psig) 14.7

(c) Humidity (%) 100

(d) Radiation (rd) NA

(3) Process Interfaces: These RTD's function to detect primary loop temperatures. A discussion of the thermal effects due to the process interface is provided in the Materials Analysis (Tab C-1) and Westinghouse's Materials and Process Interface Evaluation (Tab C-3).

(4) State anticipated occurrence frequency and duration of abnormal conditions: Abnormal conditions of temp. and humidity could exist for up to 8 hours per excursion and will occur less than 1% of the plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F) 327 Accident type HELB-IPC

(b) Pressure (psig) 12.0 Accident type HELB-IPC

(c) Humidity (%) 100 Accident type HELB-IPC

(d) Radiation (rd) NA (2) Accident type NA

(e) Spray Type Chemical Spray Accident type HELB-IPC

(1) 5.4 year normal dose - Since these devices have only a 5.4 year qualified life, the normal 40 year dose is reduced accordingly.

(2) These devices are only required to operate for a main steam line break. Therefore, there is no accident dose. Also, beta radiation is not a concern since fuel damage will not occur during this accident.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

See page B22A - Chemical Spray.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? No (Reference WCAP-9157, Sect. 5-8, Fig. 5-11).

Comments These devices were tested without a conduit seal, therefore, exposure to 100% RH during accident conditions is not a concern.

(7) Subject to submergence (yes/no/NA)? No
(Reference See page B22A).

Identify initiation time and duration of submergence: NA

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
40 Year Normal Dose Calculation	B45 851117 235
GENNAL3-001 (See TAB C-7)	
Flooding Calc WBNOSG4-048	B45 860602 218

SUBMERGENCE

The lowest elevation for any of these devices or their lead cables is 715' 10". These devices are only required to operate for 5 minutes following a main steam line break. This accident will not cause flooding to 715' 10" during the 5 minute required operating time (See TAB C-9). Therefore, flooding is not a concern.

CHEMICAL SPRAY

These RTD's will be subject to containment spray in the event of a main steam line break inside primary containment. The composition of the solution is 0.1844 molar H_3BO_3 and 0.033 molar NaOH, resulting in a pH of 8.35 at 25°C. The condition will exist for less than 30 days at a flowrate of 0.92 GPM. (Reference 47E235-42 R1, Notes 5 and 22.)

Per the Test Report WCAP-9157, Section 5-2, page 5-1, the RTD's were subjected to a chemical spray during the DBE simulation. The composition of the spray was 1.14% weight H_3BO_3 and 0.17% NaOH dissolved in water. The spray was administered for 24 hours at a flowrate of 6 gallons per hour. Per WCAP-9745, page 3-5, this solution has a pH of 8.5.

The test spray was slightly more harsh (more basic) than the containment spray as shown by the pH values. Although the test flowrate does not match the flowrate of containment spray, it is considered acceptable based on two things: 1) the RTD's are only required to operate for 5 minutes following an accident, thus there is no prolonged exposure; and 2) the RTD lead wires are covered with a stainless steel armor braid, thus providing some protective covering to the wire insulation and delaying the onset of any harmful effects to the cables until sometime after the devices have performed their safety function.

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B23 OF B30

R R

BINDER TITLE ROSEMOUNT RTD'S COMPUTED Mip DATE 6-3-86

CHECKED MK DATE 6/4/86

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	5 minutes	6 days	WCAP-9157, Sect. 5, pgs 5-5, 5-14; Sect. 6, pg 6-3, Fig. 6-3, pg 6-6
Temperature (°F)	327	340	WCAP-9157, Sect. 5, pgs 5-5, 5-14; Sect. 6, pg 6-3, Fig. 6-3, pg 6-6
Pressure (psig)	12	66	WCAP-9745, Table 1, pg 2-8 WCAP-9157, pgs 5-1, 5-3
Relative Humidity(%)	100	100	WCAP-9745, Table 1, pg 2-8 WCAP-9157, pgs 5-1, 5-3
*Chemical Spray	Yes	Yes	WCAP-9745, Table 1, pg 2-8; Sect 2.2.8, pgs 3-13, 3-5. WCAP-9157, Sect. 5-2, pg 5-1
**Radiation (rd)	1.08×10^7 gamma	1×10^8 gamma	WCAP-9157, Appendix A, Table A-1, pg A-3
Submergence	No	NA	See K(7)

*Includes spray concentration, flowrate, density, duration, and pH. (See K(5) comments)

**5.4 year integrated normal dose.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	WCAP-9157, Sect. 5, pgs 5-5, 5-14; Sect. 6, pg 6-3, Fig. 6-3, pg 6-6
Pressure	Yes	WCAP-9745, Table 1, pg 2-8 WCAP-9157, pgs 5-1, 5-3
Relative Humidity	Yes	WCAP-9745, Table 1, pg 2-8 WCAP-9157, pgs 5-1, 5-3
Chemical Spray	Yes	WCAP-9745, Table 1, pg 2-8; Sect 2.2.8, pgs 3-13, 3-5. WCAP-9157, Sect. 5-2, pg 5-1.
Submergence	NA	See K(7)

PAGE B24 JUSTIFICATION/COMMENTS

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L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

* Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	13°F	Yes
Pressure: +10% but no more than 10 psig	+54 psig	Yes
Radiation: +10% of accident dose	greater than +10%	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	6 days	Yes
Voltage: ± 10% of rated value	None	NA
Frequency: +5% of rated value	None	NA
Environmental Transient: the initial transient and the peak temperature applied twice	None	NA
Vibration: +10% added to acceleration	None	NA-See H(2) & H(6)

JUSTIFICATION/COMMENTS: *The qualification criteria for these devices is NUREG-0588, Category II (IEEE 323-1971). No formal requirements for margin as outlined in IEEE 323-1974 are included in the 1971 standard; however, NUREG-0588, Category II, Section 2.2.2 states that "Test results should demonstrate that the equipment can perform its required function for all service conditions postulated (with margin) during its installed life."

(continued on next page)

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B25 OF B30

R R

BINDER TITLE ROSEMOUNT RTD'S COMPUTED NAP DATE 6/12/86

CHECKED WBK DATE 6/12/86

JUSTIFICATION/COMMENTS (Continued).....

The margins applied to the more important qualification parameters (i.e., temperature, pressure, radiation, and time) more than adequately demonstrate qualification in accordance with NUREG-0588, Category II.

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BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B26 OF B30

R ___ R ___

BINDER TITLE ROSEMOUNT RTD'S COMPUTED [illegible] DATE 6/12/8[illegible]

CHECKED [illegible] DATE [illegible]

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment: (Reference *).

JUSTIFICATION/COMMENTS *See Tab A - Reactor over temperature delta temperature trip, over power delta temperature trip, and Tave Low - Low trip (See also Tab C-5).

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes (Reference *).

JUSTIFICATION/COMMENTS *WCAP-9157, Section 6-3, pg 6-1; See also J(1).

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes (Reference *).

JUSTIFICATION/COMMENTS *WCAP-9157, Section 6-3, pg 6-1; See also J(1).

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference *).

JUSTIFICATION/COMMENTS *WCAP-9157, Section 6, Table 6-1, pg 6-3; Section 7-1, pg 7-1; See also J(1).

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes (Reference *).

JUSTIFICATION/COMMENTS *WCAP-9157, Section 6, pg 6-1; Section 7, pg 7-1. The anomaly explanation with regard to RTD temperature deviation, attributed to the instability of the oil bath medium, was evaluated and concurred with.

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B27 OF B30

BINDER TITLE ROSEMOUNT RTD'S COMPUTED [illegible] DATE 6/12/86 R ___ R ___

CHECKED [illegible] DATE 6/16/86

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the EQC Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS All requirements entered in QMDSs (TAB G).

EQP113.21

TVA 19537 (OE-3-86)

BINDER NO. WBNEQ-ITE-002 PLANT WBN UNIT(S) 1 SHEET B28 OF B30

BINDER TITLE ROSEMOUNT RTD'S COMPUTED [illegible] DATE 5/23/86 R ___ R ___

CHECKED [illegible] DATE 6/4/86

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	Yes
(b) Were specific features and failure modes and effects analyzed?	Yes
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	Yes
(d) Were environmental parameters which affect equipment performance identified?	Yes
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	NA
* (b) Equipment aged to end of life condition prior to application of DBE conditions?	No
(c) Absence of preaging in test/analysis justified?	Yes
(d) Materials susceptible to thermal/radiation aging identified?	Yes

* Refer to Section H.

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	Yes
(11) Criteria regarding submergence satisfied?	Yes
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	Yes
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	(See Sect P) Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	(See Sect P) Yes
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

An operating time of one hour was demonstrated; however, the specified operating time is 5 minutes and failure after 5 minutes in any mode will not affect plant safety. The qualification assessment documented in Tab B took credit for the 5 minutes required operating time only for submergence qualification - See Section K(7), and Tab C-1.

TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-ITE -003
MANUFACTURER: RdF

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD**	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-TE -068-0001 -D	1-TE -068-0001 -D	RCS LOOP 1 HOT LEG TEMP	21205		030	718' 6"	L	71C62-54114-1	L	A	100D	MONITORS RCS LOOP 1 HOT LEG TEMP, PAM
									MS	A	100D	
									FW	A	100D	
									CV/C	A	1MO	
									RH/C	A	1MO	
WBN-1-TE -068-0018 -B	1-TE -068-0018 -D	RCS LOOP 1 COLD LEG TEMP	21205		057	718' 4"	L	71C62-54114-1	L	A	100D	MONITORS RCS LOOP 1 COLD LEG TEMP, PAM
									MS	A	100D	
									FW	A	100D	
									CV/C	A	1MO	
									RH/C	A	1MO	
WBN-1-TE -068-0024 -D	1-TE -068-0024 -D	RCS LOOP 2 HOT LEG TEMP	21205		153	718'	L	71C62-54114-1	L	A	100D	MONITORS RCS LOOP 2 HOT LEG TEMP, PAM
									MS	A	100D	
									FW	A	100D	
									CV/C	A	1MO	
									RH/C	A	1MO	
WBN-1-TE -068-0041 -B	1-TE -068-0041 -D	RCS LOOP 2 COLD LEG TEMP	21205		119	718' 6"	L	71C62-54114-1	L	A	100D	MONITORS RCS LOOP 2 COLD LEG TEMP, PAM
									MS	A	100D	
									FW	A	100D	
									CV/C	A	1MO	
									RH/C	A	1MO	
WBN-1-TE -068-0043 -E	1-TE -068-0043 -E	RCS LOOP 3 HOT LEG TEMP	21205		208	718' 5"	L	71C62-54114-1	L	A	100D	MONITORS RCS LOOP 3 HOT LEG TEMP, PAM
									MS	A	100D	
									FW	A	100D	
									CV/C	A	1MO	
									RH/C	A	1MO	

* ELEVATIONS SHOWN IN THIS TAB ARE ACTUAL ELEVATIONS

** L - LOWER CONTAINMENT

R_____ R_____ R_____

PREPARER/DATE [signature] 8-11-86 _____ _____ _____

CHECKER/DATE W.C. Graham 8-12-86 _____ _____ _____

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TAB A - EQUIPMENT IDENTIFICATION MATRIX

BINDER NO. WBNEQ-ITE -003
MANUFACTURER: RdF
PAGE: 2 OF 2

EQIS NO.	UNIT DEVICE ID NO.	DESCRIPTION	MODEL	LOCATION COLUMN	LOCATION AZ	LOCATION ELEV*	LOCATION RM/RAD**	CONTRACT	EVENT	CAT	OPER TIME	SAFETY FUNCTION
WBN-1-TE -068-0060 -E	1-TE -068-0060 -E	RCS LOOP 3 COLD LEG TEMP	21205		232	718' 6"	L	71C62-54114-1	L MS FW CV/C RH/C	A A A A A	100D 100D 100D 1MO 1MO	MONITORS RCS LOOP 3 COLD LEG TEMP, PAM
WBN-1-TE -068-0065 -E	1-TE -068-0065 -E	RCS LOOP 4 HOT LEG TEMP	21205		330	718' 6"	L	71C62-54114-1	L MS FW CV/C RH/C	A A A A A	100D 100D 100D 1MO 1MO	MONITORS RCS LOOP 4 HOT LEG TEMP, PAM
WBN-1-TE -068-0083 -E	1-TE -068-0083 -E	RCS LOOP 4 COLD LEG TEMP	21205		308	718' 6"	L	71C62-54114-1	L MS FW CV/C RH/C	A A A A A	100D 100D 100D 1MO 1MO	MONITORS RCS LOOP 4 COLD LEG TEMP, PAM

PAGE A-2

* ELEVATIONS SHOWN IN THIS TAB ARE ACTUAL ELEVATIONS

** L - LOWER CONTAINMENT

		R	R	R
PREPARER/DATE	H. Fenton 9-11-86			
CHECKER/DATE	W.C. Graham 9-12-86			

BINDER NO. WBNEQ-ITE-003 PLANT WBN UNIT(S) 1 SHEET 1 OF 37

R ___ R ___

BINDER TITLE INSTRUMENT COMPUTED [illegible] DATE 9-11-86

TEMPERATURE ELEMENT CHECKED WCN DATE 9-12-86

A. DOCUMENTATION

Equipment Description Resistance Temperature Detector (RCS Well-Mounted)

Vendor/Manufacturer RdF

Equipment Model No.(s) 21205

QUALIFICATION REPORTS

(1) Title/Number/Revision Equipment Qualification Test Report WCAP-8687 Supp. 2-E06A R3 RIMS B45 860512 365 DATE March, 1983

(2) Title/Number/Revision ___ RIMS ___ DATE ___

(3) Title/Number/Revision ___ RIMS ___ DATE ___

OTHER (ANALYSIS, VENDOR DATA, ETC.)

(1) The following documentation required to support qualification is included in TAB C - Analyses and Justification.

a) OE Calculation WBNOSG4-017 Reactor Coolant System (68) NUREG-0588 Category and Operating Times (B45 860722 218).

b) OE Calculation GENNAL6-002, Identification of Harsh Environmental Areas with High Potential for Condensate Formation (B45 860812 236).

A. DOCUMENTATION - OTHER (ANALYSIS, VENDOR DATA, ETC.), (Continued)

c) Justification for HELB/LOCA Chemical Spray Qualification Deficiency.

d) Initiation Time and Duration of Submergence Including Analysis Supporting Operation of Submerged RTDs.

e) Material Aging Calculation Reports WAC-104 DTD 5-20-86, and WAC-195 DTD 9-3-86. Calculations Determine Qualified Lifetimes and Post-DBE Qualified Lifetimes.

f) Instrument Accuracy Calculations, WBPE0688605005 (B43 860722 901).

g) Justification for Applied 10% Margin of Accident Radiation Dose.

(2) In addition to qualification reports listed on Sheet 1, this section, the following documentation required to support qualification is included in TAB D - Qualification Documents.

a) Equipment Qualification Data Package WCAP-8587, EQDP-ESE-6 R5, DTD 3/83 (B45 860512 366).

(3) The following documentation required to support qualification is included in TAB E - Miscellaneous Documents and Correspondence.

a) Design Specification 955322 R3, DTD 8/10/82 (B45 851210 351).

A. DOCUMENTATION - OTHER (ANALYSIS, VENDOR DATA, ETC.) (Continued)

b) Design Specification 955270 R2, dated 6/4/84 (B45 850423 359).

c) Specification for Reactor Coolant RTD's Drawing No. WATS-325-04210 R1, dated 10/5/84, page 1 (B45 850425 352).

d) Traceability of Installed RTD to Its Qualification Documentation (Section includes Auditable Link Document EQAL-WAT R3, dated March 1986, RIMS NO. B45 860521 351 and Quality Release 74284).

e) Letter from Westinghouse to D. L. Kitchel dated 8-22-86 (B71 860826 003) - States that Cal-Note SEC-OSA-1242-CO which provides justification for use of a max normal ambient temperature of 200°F is on file at Westinghouse.

f) Letter from Westinghouse to D. Wilson dated 3-27-86 (B71 860404 002) - States type, manufacturer and activation energy of the epoxy used in RTD assembly. Also denotes epoxy location in RTD assembly.

g) EN DES Calculations Maximum Containment Water Level Rise (NEB 811125 267)

h) TVA Drawings

a) Conduit and Grounding Penetration Sealing and Fire Stop Details, DWG 45W883-3 R15.

b) Conduit and Grounding Floor EL 716.0 Details, Sheet 17, DWG 45W862-19 R22.

i) Traceability of Installed Thermowell.

(4) Westinghouse's Drawings 2650C31 R3, 271C315 R3 and 206C740 R5; All incorporated in TAB I.

BINDER NO. WBNEQ-ITE-003 PLANT WBN UNIT(S) 1 SHEET 4 OF 37

R R

BINDER TITLE INSTRUMENT COMPUTED [illegible] DATE 6-27-86

TEMPERATURE ELEMENT CHECKED WBK DATE 7/3/86

B. CONCLUSION OF REVIEW (Check only one block)

X Equipment Qualified (Pending Resolution of Open Items)

____ Equipment Satisfies All Requirements Except Qualified Life or Justification of Replacement Schedule

____ Equipment Qualification Not Established by Documentation

____ Equipment Not Qualified Based on Test Failures

OPEN ITEMS AND QUALIFICATION DEFICIENCIES Refer to Sheet 5, this section, for open items and qualification deficiencies.

COMMENTS/RECOMMENDATIONS

BINDER NO. WBNEQ-ITE-003 PLANT WBN UNIT(S) 1 SHEET 5 OF 37

BINDER TITLE INSTRUMENT COMPUTED [illegible] DATE 9-11-86 R ___ R ___

TEMPERATURE ELEMENT CHECKED WCJ DATE 9-12-86

B. CONCLUSION OF REVIEW - Open Items and Qualification Deficiencies

(1) Relocation of junction boxes for 1-TE-68-1, -18, -24, -41, -43, -60, and -83 above postulated flood level. Reference SCR WBNEEB8559/ECN5993.

(2) Binder Open Item WBNEQP8621 R1, (B45 860717 851) which requires review of Westinghouse's PAM Functional Requirements Document (B45 860122 351) to determine its adequacy for use in demonstrating qualification of the RCS wide range RTDs.

BINDER NO. WBNEQ-ITE-003 PLANT WBN UNIT(S) 1 SHEET 6 CF 37

R R

BINDER TITLE INSTRUMENT COMPUTED Kw DATE 5-28-86

TEMPERATURE ELEMENT CHECKED WBK DATE 6/12/86

C. QUALIFICATION CRITERIA

Criteria Used to Demonstrate Qualification is in Accordance with the Following (Indicate Which Criteria is Applicable):

X Components are Qualified to the Criteria of 10CFR50.49 and/or NUREG-0588 Category I (IEEE323-1974)

____ Components are Qualified to the Criteria of NUREG-0588 Category II or the DOR Guidelines of IE Bulletin No. 79-01B (IEEE323-1971) (DOR Guidelines Applicable to only BFN)

JUSTIFICATION/COMMENTS

INDICATE OTHER REGULATORY DOCUMENTS AND/OR INDUSTRY STANDARDS MET

IEEE 344-1975

EQP127.23

TVA 19537 (OE-3-86)

D. QUALIFICATION METHODOLOGY (Check only one block)

X Test of Identical Item Under Identical Conditions or Under Similar Conditions with Supporting Analysis

____ Test of Similar Items with Supporting Analysis

____ Analysis in Combination with Partial Type Test Data that Supports the Analytical Assumptions and Conclusions

____ Experience with Identical or Similar Equipment Under Similar Conditions with Supporting Analysis

JUSTIFICATION/COMMENTS The installed RTDs are identical to those tested. Refer to TAB E, Section 4, for traceability.

During HELB simulation tests, RTDs were subjected to chemical spray from start of test to 24 hours. Flow rate was not specified. RTDs are required to operate for 100 days following a LOCA or line breaks in either MS or FW lines. Refer to TAB C, Section 5, for acceptability.

RTDs are subject to submergence following a DBE. During HELB simulation tests, RTDs were not tested to demonstrate qualification for submergence. For analysis supporting operation of submerged RTDs, refer to TAB C, Section 6.

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E. EQUIPMENT DESCRIPTION

Is the equipment identified in the qualification report identical to the plant equipment which requires qualification (yes/no/NA)? Yes

	Plant Device	Qualification Document	Reference
(1) Equipment Type	Resistance Temperature Detector	Same	(1)
(2) Manufacturer	RdF	Same	(1)
(3) Model Number(s)	21205	21205	Tbl 1, p 20(1)
(4) Serial Number(s)	417, 418,	103, 114,	Tbl 1, p 20(1)
	419, 420,	115	
	421, 422,		
	423, 424		

(5) Identify Component-Unique checksheet attached:

JUSTIFICATION/COMMENTS(1) Qualification Report WCAP-8687, Supp. 2 - E06A R3

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F. INSTALLATION INTERFACES

List all interfaces pertinent to EQ identified in the test report and/or evaluation and reference the source. Is the interface a requirement for our application (Yes/No)? (Note below.) If yes, enter requirement in QMDS, if No, provide justification.

Interface	Identify Interface	Plant Requirement? (Yes/No)	Reference Test Report
Mounting Bolts	NA		
External Process Connections	NA		
Electrical Connections	NA(1)		
Conduit Seals	(1)	Yes	(2)
Connector Seals	NA		
Orientation	NA		
Physical Configuration	NA		
Other	(3)(4)	Yes	(5)

JUSTIFICATION/COMMENTS (1) RTD cable assembly interfaces with a Conax seal and electrical connections are made within the Conax seal (Refer to TAB E, Section 8, TVA drawings 45W883-3 R15, Detail F3 and 45W862-19 R22, Detail F19). Environmental qualification of Conax seal is documented in EQ Binder WBNEQ-CSC-001.

(2) Qualification Report WCAP-8687, Supp 2-EQ6A R3, Para 7.1, pp 17 and 18.

(3) The RTD cable must be seismically supported to maintain seismic qualification. For seismic installation requirements, refer to TAB I, DWG 2650C31 R3, Note 1.

(JUSTIFICATIONS/COMMENTS continued on Sheet 9A)

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JUSTIFICATION/COMMENTS (Continued) (4) Installation requirements are per Westinghouse drawing RCS Cold Leg RTD Installation Details (Well Type), drawing no. 2650C31 R3 (Refer to TAB I, Section 1). RTD to be used with thermowell as specified on Westinghouse drawing Installation Details Thermowell with Boss, drawing no. 271C315 R3 (Refer to TAB I, Section 2). (5) Equipment Qualification Data Package EQDP-ESE-6 R5, Paragraph 1.2, page 2.

G. TEST SEQUENCE

(1) Test Sequence: Was the test sequence established to simulate the accident environment in accordance with IEEE-323 (74), paragraph 6.3.2 (yes/no/NA)? (note below) Refer to Para 2.9, p 9 (1)

	Yes/No/NA	Reference
(a) Equipment inspected for damage	Yes	Para 2.9, p 9 (1)
(b) Baseline performance measurements taken	Yes	Appx C, pp 58, 59, 60 (2)
(c) Equipment aged: (4)		
Thermal	Yes	Para 5.1, p 10 (2)
Radiation	Yes	Paras 5.3, 5.4 pp 10, 11 (2)
Wear	Yes	Para 3.2, p 5 (2)
(d) Vibration/seismic testing conducted	Yes	Paras 5.5, 5.6 pp 11 thru 14 (2)
(e) Design basis event (DBE) exposure	Yes	Para 5.7, p 14 (2)
(f) Post-DBE exposure	Yes	Para 5.7, p 14 (2)
(g) Final inspection and disassembly	(3)	(3)

(2) Was the same piece of equipment used throughout the test sequence described in item (1) above (yes/no/NA)? Yes

(3) Have the test equipment, test equipment accuracies and calibration data been appropriately documented (yes/no/NA)? Yes (5)
(Reference Tbl II, pp 21 thru 24 (2)).

JUSTIFICATION/COMMENTS

(1) Equipment Qualification Data Package EQDP-ESE-6 R5.

G. TEST SEQUENCE - Justification/Comments (Continued)

(2) Qualification Report WCAP-8687, Supp 2-E06A R3.

(3) RTDs were subjected to final inspection (Refer to Equipment Qualification Data Package EQDP-ESE-6 R5, Para 2.9, pp 9 & 10) and were subjected to post-qualification performance tests (Refer to Qualification Report WCAP-8687, Supp 2-E06A R3, Appx C)

(4) RTDs were subjected to thermal cycling (Refer to Qualification Report WCAP-8687, Supp 2-E06A, R3, Para 5.2, p 10).

(5) Calibration Data and Test Equipment Accuracies are available for audit at Westinghouse.

H. AGING

(1) Was aging considered in the qualification program (Yes/no/NA)? Yes (Reference Qualification Report WCAP-8687, Supp 2-E06A R3, Para 3.1, p 3).

JUSTIFICATION/COMMENTS

(2) Were the following effects considered in the aging program:

Aging Effect	Yes/No/NA	Reference
Thermal aging	Yes	Para 3.1.1, p 3 (1)
Radiation exposure	Yes	Para 3.1.3, 3.1.4, p 4 (1)
Vibration (non-seismic) aging	Yes	Para 3.1.5, p 4 (1)
Operational (electrical/mechanical/process) stress aging	Yes	Para 3.1.2, p 3 (1) Para 3.1.5, p 4 (1)

JUSTIFICATION/COMMENTS (1) Qualification Report WCAP-8687, Supp 2-E06A R3.

(3) Were all known synergistic effects which are believed to have a significant effect on equipment performance considered in the aging program (yes/no/NA)? NA (Reference).

JUSTIFICATION/COMMENTS Based upon review of materials of construction, no known synergistic effects apply to this equipment.

(4) Thermal Aging:

(a) Was thermal aging considered in the qualification program (yes/no/NA)? Yes (Reference Qualification Report WCAP, Supp 2-E06A R3, Para 3.1.1, p 3 and Para 5.1, p 10).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(b) Were the materials susceptible to thermal aging degradation identified in the qualification program (yes/no/NA)? Yes (Reference: Qualification Report WCAP-8687, Supp 2-E06A R3, Para 3.1.1, p 3).

JUSTIFICATION/COMMENTS

(c) Was the basis for thermal aging identified in the qualification program (yes/no/NA)? Yes (Reference Equipment Qualification Data Package EQDP-ESE-6 R5, Para 1.9, p 4; Qualification Report WCAP-8687, Supp 2-E06A R3, Para 5.1, p 10).

JUSTIFICATION/COMMENTS

(d) Was the aging acceleration rate justified and the parameters of time and temperature identified in the qualification program (yes/no/NA)? Yes (Reference Qualification Report WCAP-8687, Supp 2-E06A R3, Para 5.1, p 10).

Parameter	Plant Maximum Normal	Test	Equivalent
Temperature	200°F(1)	400°F(2)	200°F(3)
Time	40 years	11 days	>40 years

JUSTIFICATION/COMMENTS (1)(2)(3) Refer to Sheet 14, this tab.

(e) Was the Arrhenius methodology used for accelerated aging (yes/no/NA)? Yes (Reference Equipment Qualification Data Package EQDP-ESE-6 R5, Para 1.9, p 4).

JUSTIFICATION/COMMENTS

(f) If activation energies were used for determining accelerated aging parameters, are they properly referenced to the source of the technical data (yes/no/NA)? No (Reference (4) Refer to Sheet 14, this tab.).

JUSTIFICATION/COMMENTS

H. AGING

(4) Thermal Aging (Continued)

(d)(1) The plant maximum normal for RTDs 1-TE-68-1,-18,-24,-41,-43,-60,-65,-83 is 200°F. Westinghouse has performed an analysis which shows that the air velocity and ambient temperature of the area in which the RTDs are located are sufficient to limit the temperature of the RTDs head to approximately 200°F. Analysis, Cal-Note SEC-OSA-1242-CO, is on file at Westinghouse - Refer to TAB E, Section 5.

(2) Qualification Report WCAP-8687, Supp 2-E06A R3, Para 5.1, p 10.

(3) Material Aging Calculation WAC-104, Refer to TAB C, Section 7.

(f)(4) The activation energy used is denoted in Para 3.1.1, p 3 of Qualification Report WCAP-8687, Supp 2-E06A R3. Also refer to TAB E, Sect 6 - Letter from Westinghouse to D. Wilson dated March 27, 1986 (B71 860404 002).

H. AGING (Continued)

(g) If a regression line was used for determining accelerated aging parameters, are test points or failure modes identified on the line (yes/no/NA)? NA (Reference).

JUSTIFICATION/COMMENTS

(h) Was the equipment operated during the thermal aging (yes/no/NA)? Yes (Reference Qualification Report WCAP-8687, Supp 2-E06A R3, Para 3.2, p 5).

JUSTIFICATION/COMMENTS

(5) Radiation Aging Exposure:

(a) Was radiaton aging exposure considered in the qualification program (yes/no/NA)? Yes (Reference Qualification Report WCAP-8687, Supp 2-E06A R3, Para 3.1.3, 3.1.4, p 4 and Para 5.3, 5.4, pp 10, 11).

JUSTIFICATION/COMMENTS

(b) Were the materials susceptible to radiation degradation identified in the qualification program (yes/no/NA)? Yes (Reference Qualification Report WCAP-8687, Supp 2-E06A R 3 Para 3.1.1, p 3).

JUSTIFICATION/COMMENTS

(c) Was the basis for radiation aging exposure identified in the qualification program (yes/no/NA)? Yes (Reference See comments).

JUSTIFICATION/COMMENTS Design Specification 955270 R2, Para 6.2, p 6. Refer to TAB E, Sect 2; Qualification Report WCAP-8687, Supp 2-E06A R3, Para 3.1.3, 3.1.4, p 4.

H. AGING (Continued)

(d) Is the radiation test exposure dose and dose rate acceptable (yes/no/NA)? Yes (Reference Qualification Report WCAP-8687, Supp 2-E06A R3, Para 5.3, pp 10, 11).

Plant normal ambient radiation dose (rd) 8×10^7

Test exposure dose (rd) Tip of RTD 2.47×10^8 (1) Cable 1.22×10^8 (2)

Test exposure dose rate (rd/hr) Between 2×10^6 and 3×10^6

Test exposure source type (e.g., Co-60 gamma) Co-60 Gamma (2)

JUSTIFICATION/COMMENTS (1) Qualification Report WCAP-8687, Supp 2-E06A R3, Para 5.3, pp 10, 11. (2) Design Specification 955270 R2, Para 6.2, p 6 (refer to TAB E, Sect 2).

(6) Vibration (non-seismic) Aging:

(a) Were the effects of non-seismic vibration induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference Qualification Report WCAP-8687, Supp 2-E06A R3, Para 3.1.5, p 4 and Para 5.5, pp 11 thru 13).

JUSTIFICATION/COMMENTS

(b) Was the basis for vibration aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference Qualification Report WCAP-8687, Supp 2-E06A R3, Para 3.1.5, p 4 and Para 5.5, pp 11 thru 13.).

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(7) Operational Stress Aging:

(a) Were the effects of electrical, mechanical, and process operational stresses induced during normal and abnormal operation addressed in the qualification program (yes/no/NA)? Yes (Reference Qualification Report WCAP-8687, Supp. 2-E06A Rev. 3, Para 3.1.2, p 3, and Para 5.2, p 10).

JUSTIFICATION/COMMENTS

(b) Was the basis for stresses induced during operational aging identified and justified in the qualification program (yes/no/NA)? Yes (Reference Qualification Report WCAP-8687, Supp. 2-E06A, Rev. 3, Para 3.1.2, p 3).

JUSTIFICATION/COMMENTS

(8) Was the qualified life of the equipment and its basis defined in the qualification program (yes/no/NA)? Yes (Reference Qualification Report WCAP-8687, Supp 2-E06A R3, Para 3.1.1, p 3, and Para 5.1, p 10, Equipment Qualification Data Package EQDP-ESE-6 Rev. 5, Para 1.9, p 4).

Qualified life (Document in QMDS) >40 yrs

JUSTIFICATION/COMMENTS

H. AGING (Continued)

(9) Were replacement intervals for the equipment or its components defined in the qualification program (yes/no/NA)? Yes
(Reference See comments).

Replacement Intervals (Document in QMDS) Qualified life of RTD is >40 years (refer to Material Aging Calculation WAC-104, TAB C, Sect. 7).

JUSTIFICATION/COMMENTS Qualified life of test specimen is 10 years (refer to Equipment Qualification Data Package EQDP-ESE-6, Rev. 5, Tbl 1, p 18).

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I. MATERIALS ANALYSIS

Identification of Materials Susceptible to Significant Thermal and/or Radiation Degradation and Aging (Use Sect. C of Binder for Detailed Materials Analysis)

	Material/Property/Function	Radiation Threshold	Reference	Activation Energy	Reference
(a)	Silicon Varnish (Cable Coating)	NA (1)	(1)	Not Specified (2)	Para 3.1.1, p 3 (3)
(b)	Epoxy (Potting Matl)	NA (1)	(1)	.98eV	Para 3.1.1, p 3 (3)
(c)					
(d)					
(e)					

JUSTIFICATION/COMMENTS (1) Materials were irradiated to 1.22×10^8 rads gamma and 9.23×10^8 rads beta during radiation exposure test (refer to Qualification Report WCAP-8687, Supp 2-E06A R3, Paras 5.3, 5.4, pp 10, 11).

(2) The silicon varnish is only used as a manufacturing process to prevent the fiberglass insulation of the cable from fraying during manufacturing and is not required for operation of the RTD.

(3) Qualification Report WCAP-8687, Supp 2-E06A R3.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(1) Acceptance Criteria: Does the report/analysis identify the limiting values of performance characteristics which would constitute failure if not met (yes/no/NA)? Yes (Reference Equipment Qualification Data Package EQDP-ESE-6 R5, Sect. 1.7, p 3; Qualification Report WCAP-8687, Supp 2-E06A R3, Para 3.2, p 5, and Para 6.3, p 16).

Identify Acceptance Criteria: ± 0.2°F repeatability, ±1.0°F drift allowance; insulation resistance > 1 Megohm.

(2) Performance Characteristics: Does the report/analysis provide the performance characteristics for the equipment which should be verified before, after, and periodically during the test to judge equipment performance (yes/no/NA)? Yes (Reference Qualification Report WCAP-8687, Supp. 2-E07A R3, Para 3.2, p 5).

Identify baseline and functional testing: Refer to Sheet 21, this tab.

JUSTIFICATION/COMMENTS

(3) Does the qualification report/analysis describe loads (or load combinations) applied during DBE test (yes/no/NA)? NA (Reference Equipment Qualification Data Package EQDP-ESE-6 R5, Para 1.1, p 2).

JUSTIFICATION/COMMENTS For electric connections, refer to Sheet 21, this tab.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(2) Performance Characteristics (Continued)

Baseline Functional Tests (Operation - Normal Condition) are described in the Equipment Qualification Data Package EQDP-ESE-6 R5, Para 2.9, p 9. For baseline functional test results and functional test (static calibration) results performed after each of the test phases, refer to Qualification Report WCAP-8687, Supp 2-E06A R3, Appx C, pp 57 thru 61.

(3) During static calibration checks, the RTDs were excited by a constant current (approximately 1 mA; refer to Equipment Qualification Data Package EQDP-ESE-6 R5, Para 1.1, p 2) applied to the two leads while the voltage drop was measured across the other two leads. A digital voltmeter was used to measure resistance. Refer to Qualification Report WCAP-8687, Supp 2-E06A R3, Para 4.2.1, p 7, and Fig. 4, p 32.

During each of the test phases, the RTD outputs were monitored via Westinghouse 300 series amplifiers. The 0-10-Volt analog outputs of the amplifiers were monitored and recorded on a digital data logger. Refer to Qualification Report WCAP-8687, Supp 2-E06A R3, Para 3.2, p 5, and Paras 4.2.2, 4.2.3, 4.2.4, 4.2.5, and 4.2.6, pp 7 thru 9.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(4) Do the applied loads during baseline testing reflect normal operating conditions (yes/no/NA)? NA (Reference Refer to J.(3), Sheet 21, this tab).

JUSTIFICATION/COMMENTS

(5) Identify electrical characteristics necessary to ensure the equipment performance specifications can be satisfied.

(a)

Parameter	Specific Accident Conditions	Reference
Voltage	R/I Converter with 1-milliamp current	(1)(2)
Load	NA	(1)
Frequency	NA	(1)
Accuracy	±21 °F (3)	(4)
Other(s)		

JUSTIFICATION/COMMENTS (1) Equipment Qualification Data Package EQDP-ESE-6 R5, Para 1.1, p 2, (2) Electric Control Drawing 47W610-68-1, -2, -3, and -4. (3) Open item pending resolution of SCR WBNEQP8621. (4) Instrument Accuracy Calculations WBPEQ688605005, P36 (Refer to TAB C, Section 8).

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS (Continued)

(5)(b)

Parameter	Demonstrated Conditions	Reference
Voltage	R/E Converter with 1-milliamp current	(1)
Load	NA	(1)
Frequency	NA	(1)
Accuracy	±26.2°F	(2)
Other(s)		

JUSTIFICATION/COMMENTS (1) Equipment Qualification Data Package EQDP-ESE-6 R5, Para 1.1, p 2.

(2) Refer to Sheet 24, this tab.

J. EQUIPMENT ELECTRICAL CHARACTERISTICS NECESSARY TO ENSURE THE PERFORMANCE SPECIFICATIONS CAN BE SATISFIED UNDER ACCIDENT CONDITIONS

(5)(b) Demonstrated Conditions

Accuracy - There are no changes in the RTD due to severe environments. The calibration accuracy is ±0.2,F and the drift allowance is ±1.0,F (refer to Equipment Qualification Data Package EQDP-ESE-6 R5, Tbl 1, p 18, and to Qualification Report WCAP-8687, Supp 2-E06A R3, Para. 7.2, p 18). For demonstrated loop accuracy of ±26.2,F, refer to Instrument Accuracy Calculations, TAB C, Section 8.

K. REQUIRED OPERATING ENVIRONMENT

Reference Environmental Drawing No. 47E235-42 R2

(1) Normal Max

(a) Temperature (°F) 120(1)

(b) Pressure (psig) .3

(c) Humidity (%) 80

(d) Radiation (rd) 8×10^7

(2) Abnormal Max

(a) Temperature (°F) 130(1)

(b) Pressure (psig) .3

(c) Humidity (%) 100

(d) Radiation (rd) NA

(3) Process Interfaces: NA; RTDs are installed in thermowells. For effects of process temperatures, refer to sheet 26, this TAB.

(4) State anticipated occurrence frequency and duration of abnormal conditions: Maximum abnormal temperature, pressure, and humidity could exist for up to eight hours per excursion and will occur less than 1% of plant life.

(5) Accident (worst case for any combination of specified accident parameter including peak, duration, and profile):

(a) Temperature (°F)	327(1)	Accident type	HELB
(b) Pressure (psig)	11.2	Accident type	LOCA
(c) Humidity (%)	100	Accident type	LOCA/HELB
(d) Radiation (rd)	4.7×10^8 beta 4×10^7 gamma	Accident type	LOCA
(e) Spray Type	Boron(2)	Accident type	LOCA/HELB

(1)(2) Refer to Sheet 26, this tab.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

(1) Due to effects of process temperatures, the temperature of the RTD head, during normal operation, will be approximately 200,F (refer to H(4)(d), Comment (1), Sheet 14, this tab) and during DBE/Post-DBE environments, the RTD will be subjected to a conservative 50,C temperature rise above ambient (refer to Qualification Report WCAP-8687, Supp 2-E06A R3, Para 5.1, p 10).

(2) Refer to Sheet 30, this tab, for composition.

K. REQUIRED OPERATING ENVIRONMENT (Continued)

Comments (duration/peak/profile/spray composition and pH, margin, etc.):

Refer to Sheet 30, this tab.

(6) Is the equipment subject to moisture or liquid intrusion which can affect the performance of the equipment under design basis accident conditions (yes/no/NA)? Yes (Reference Refer to Sheet 28, this tab).

(7) Subject to submergence (yes/no/NA)? Yes
(Reference Refer to TAB A).

Identify initiation time and duration of submergence: Refer to Section 6, TAB C.

(8) Special environmental calculations (temp., rad., etc.)

Type	RIMS No.
Condensate Formation	B45 860812 236
Radiation	B45 851117 235

K. REQUIRED OPERATING ENVIRONMENT (Continued)

(6) Reference - OE Calculation, Identification of Harsh Environmental Areas with High Potential for Condensate Formation (B45 860812 236). Refer to TAB C, Sect. 2.

To prevent moisture intrusion into the RTD/cable assembly, the RTD cable assembly interfaces with a Conax seal assembly. The RTD cable leads are enclosed in a flexible, pressure-tight hose. The flexible, pressure-tight hose is helium leak tested to assure no degradation under HELB/LOCA environmental conditions (refer to Qualification Report WCAP-8687, Supp. 2-E06A R3, Para. 7.1, p 17). Therefore, the RTD/cable assembly is not subject to moisture intrusion and will function as required under design basis conditions.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS

(1) Comparison of worst-case maximum parameters:

Parameter	Specified	Demonstrated	Reference
Operating Time	100 days	15 days	Fig 7, p 35 (1) Fig 7, p 35 (1)
Temperature (°F)	327	420	Tbl 1, p 18 (2) Fig 8.9, pp 36, 37 (1)
Pressure (psig)	11.2	75	Tbl 1, p 18 (2)
Relative Humidity (%)	100	100	Tbl 1, p 18 (2) Para 3.1.7, pp 4, 5 (1)
*Chemical Spray	Sheet 30, this tab	Sheet 30, this tab	Tbl 1, p 18 (2) Paras 5.3, 5.4, pp 10, 11 (1)
**Radiation (rd)	1.2×10^8 gamma 4.7×10^8 beta	(3)	Tbl 1, p 18 (2) Refer to TAB C, Sect 6, for Analysis
Submergence	Yes	No	

*Includes spray concentration, flowrate, density, duration, and pH.

**Enter 40-year integrated normal dose plus integrated accident dose and specify type.

(2) Comparison of worst-case profiles and margin assessment:

Parameter	Test Profile Envelopes Specified (Yes/No/NA)	Reference
Temperature	Yes	Fig 7, p 35 (1) Tbl 1, p 18 (2) Figs 8, 9 pp 36, 37 (1)
Pressure	Yes	Tbl 1, p 18 (2)
Relative Humidity	Yes	Tbl 1, p 18 (2)
Chemical Spray	Yes	Sheet 30, this tab
Submergence	No	Refer to TAB C, Sect 6, for Analysis

JUSTIFICATION/COMMENTS Qualification for submergence has been established by analysis.

(1)(2)(3) Refer to Sheet 30, this tab.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(1) Qualification Report WCAP-8687, Supp 2-E06A R3.

(2) Equipment Qualification Data Package EQDP-ESE-6 R5.

(3) RTD TIP - 2.47×10^8 rads gamma

Cable - 1.22×10^8 rads gamma

RTD and Cable - 9.23×10^8 rads beta

Chemical Spray

Specified - The chemical spray composition is 0.19 Molar H_3BO_3 (2000 ppm Boron), 0.033 Molar NaOH resulting in a pH of 8.3 at 25°C. The flowrate is equal to 0.92 gal/min per square foot of containment cross section. Refer to Environmental Data Drawing 47E235-42 R2, notes 5 and 22.

Demonstrated - The chemical spray composition consisted of 2750 ppm Boron buffered with 0.9 percent dissolved NaOH to a pH of 10.7 at 25°C and was applied from the start of HELB simulation to 24 hours. The flowrate was not specified. Refer to TAB C, Sect 5 for acceptability.

L. SUMMARY COMPARISON OF TEST CONDITIONS TO SPECIFIED CONDITIONS (Continued)

(3) Were margins applied to the test parameters or otherwise addressed in the test program to assure that normal variation and uncertainties are accounted for? (Note margin applied, yes/no/NA)

Suggested Margins per IEEE-323(74)	Margin Applied	Yes/No/NA
Temperature: +15 degrees F	> 15°F	Yes
Pressure: +10% but no more than 10 psig	> 10%	Yes
Radiation: +10% of accident dose	> 10%(4)	Yes
Time: +10% (or 1 hour + operating time per NUREG-0588)	None	(1)
Voltage: ±10% of rated value	NA	
Frequency: ±5% of rated value	NA	
Environmental Transient: the initial transient and the peak temperature applied twice	(2)	Yes
Vibration: +10% added to acceleration	(3)	Yes

JUSTIFICATION/COMMENTS: (1) Refer to TAB C, sect 7 for plant specific margin.

(2) Qualification Report WCAP-8687, Supp 2-E06A R3, Fig. 7, p 35.

(3) Equipment Qualification Data Package EQDP-ESE-6 R5, Para 2.10.3.3, p 11.

(4) Refer to TAB C, Sect 9 for justification.

M. OPERABILITY TEST RESULTS

(1) Identify the safety function(s) of this equipment:
(Reference Refer to TAB A).

JUSTIFICATION/COMMENTS _____

(2) Did the equipment perform its intended function during the simulated design basis accident exposure (yes/no/NA)? Yes
(Reference Qualification Report WCAP-8687, Supp 2-E06A R3, Para 3.2, p 5, Para 6.2, p 15, and Para 7.2, p 18).

JUSTIFICATION/COMMENTS _____

(3) Did the equipment perform its intended function during the simulated post-design basis accident exposure (yes/no/NA)? Yes
(Reference Qualification Report WCAP-8687, Supp 2-E06A R3, Para 3.2, p 5, Para 6.2, p 15, and Para 7.2, p 18).

JUSTIFICATION/COMMENTS _____

(4) Did the test demonstrate the operability requirements for the required time interval for which the equipment is required to operate (yes/no/NA)? Yes (Reference Refer to TAB C, Sect. 7).

JUSTIFICATION/COMMENTS _____

M. OPERABILITY TEST RESULTS (Continued)

(5) Abnormal Conditions: Were abnormal conditions or anomalies properly addressed and resolved (yes/no/NA)? Yes
(Reference Qualification Report WCAP-8687, Supp. 2-E06A

Rev. 3, Para 6.2, p 15, and Para 7.3, p 19).

JUSTIFICATION/COMMENTS The qualification report denotes that during beta irradiation testing, an apparent transient effect on the amplified RTD output occurred.

Tests were performed to investigate the apparent response to beta radiation, and in none of the tests were the original effects repeated. Westinghouse concluded that the responses observed in the initial tests were the result of conditions unique to the qualification test set-up and not a response to conditions reflecting accident doses.

The above anomaly was properly addressed in the qualification report and the conclusion concurred with.

N. MAINTENANCE AND SURVEILLANCE

Has the qualification program identified those surveillance, maintenance, and inspection parameters which are essential to maintain qualification and which aid in detecting degrading materials or equipment performance (yes/no/NA)? Yes (Enter all requirements in Section G of the Binder - Qualification Maintenance Data Sheets).

JUSTIFICATION/COMMENTS

BINDER NO. WBNEQ-ITE-003 PLANT WBN UNIT(S) 1 SHEET 35 OF 37
R R

BINDER TITLE INSTRUMENT COMPUTED [illegible] DATE 5-20-86

TEMPERATURE ELEMENT CHECKED [illegible] DATE 6/12/86

0. SUMMARY OF REVIEW

	Yes/No/NA
(1) Documented evidence of qualification adequate (Have all assumptions, mathematical models, and all extrapolations of test data used in an analysis been justified and documented)?	Yes
(2) Any exceptions (i.e., sound reasons to the contrary) taken to the specified qualification level adequately justified?	NA
(3) Choice of qualification methodology adequately justified?	Yes
(4) If analysis was performed, complete the following:	
(a) Were equipment performance requirements identified?	NA
(b) Were specific features and failure modes and effects analyzed?	NA
(c) Were assumptions and mathematical models used together with appropriate justification for their use?	NA
(d) Were environmental parameters which affect equipment performance identified?	NA
(5) Adequate similarity between equipment and test specimen established?	Yes
(6) Aging degradation evaluated adequately?	Yes
(a) Mechanical and/or cycle aging addressed?	Yes
(b) Equipment aged to end of life condition prior to application of DBE conditions?	Yes
(c) Absence of preaging in test/analysis justified?	NA
(d) Materials susceptible to thermal/radiation aging identified?	Yes

0. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(e) Normally operating state of device (e.g., normally energized) considered?	Yes
(7) Qualified life or replacement schedule established?	Yes
(8) Criteria regarding temperature/pressure exposure satisfied?	Yes
(a) Peak temperature adequate	Yes
(b) Peak pressure adequate	Yes
(c) Duration adequate	Yes
(d) Required profile enveloped adequately	Yes
(e) Steam exposure adequate	Yes
(9) Criteria regarding test sequence satisfied?	Yes
(10) Criteria regarding spray satisfied?	Yes
(a) Was the spray testing done while under the extremes of pressure and temperature?	Yes
(b) Does the spray concentration, flow rate, density, duration, and pH used in tests meet or exceed those to be used for the plant?	No; Refer to TAB C, Sect 5 for Acceptability
(11) Criteria regarding submergence satisfied?	Yes
(12) Criteria regarding radiation satisfied?	Yes
(a) Was dose rate considered?	Yes
(b) Was beta radiation considered?	Yes
(13) Criteria regarding operability status/mode satisfied?	Yes
(14) Criteria regarding test failures or anomalies satisfied?	Yes

O. SUMMARY OF REVIEW (Continued)

	Yes/No/NA
(15) Criteria regarding functional testing satisfied?	Yes
(a) Does the test plan/report specify an acceptance criteria for equipment performed?	Yes
(b) Was an initial base line test done to establish required performance characteristics?	Yes
(c) Has the test/analysis demonstrated that performance performance specifications and characteristics (e.g., voltage, load frequency, and other electrical characteristics) can be ensured?	Yes
(16) Criteria regarding instrument accuracy satisfied?	No pending resolution of open item
(17) Test duration margin (1 hour + function time) satisfied?	Yes
(a) Is the minimum specified operating time at least 1 hour?	Yes
(b) If exception to the 1-hour minimum operating time was taken, was adequate justification provided?	NA
(18) Criteria regarding synergistic effects satisfied?	Yes
(19) Criteria regarding margins satisfied?	Yes
(20) Maintenance and surveillance requirements adequately identified?	Yes

P. DISCUSSION

MILD ENVIRONMENT DRAWING SERIES INDEX

AUXILIARY BUILDING

ELEVATION	ROOM DESCRIPTION(S)	ROOM NUMBER(S)	DRAWING NUMBER
772.0	480 VOLT TRANSFORMER ROOMS	A5,A6,A11,A12	47E235-01
786.0	MECHANICAL EQPT ROOMS	A3,A4	47E235-02
772.0	480 VOLT BOARD ROOMS, 125 VOLT BATTERY ROOMS	A1,A2,A3,A4, A16,A13,A14,A15	47E235-03
772.0	MECHANICAL EQPT ROOMS	A7,A10	47E235-04
782.0	CONTROL ROD DRIVE EQPT ROOMS, PRESSURIZER HEATER TRANSFORMER ROOMS	A1,A2,A3,A4	47E235-05
757.0	STEAM GENERATOR BLOWDOWN ROOM, REACTOR BLDG EQPT HATCH	A10,A11,A15	47E235-06
757.0	AUX CONTROL ROOM, AUX CONTROL INST ROOMS, BATT BD ROOMS, 6.9 KV SHUTDOWN BD ROOMS, 480V SHUTDOWN BD ROOMS	A1,A2,A3,A4,A5, A21,A22,A23, A24,A25,A26,A27,A29	47E235-07
737.0	HOT INST SHOP	A2	47E235-08
737.0	HEATING AND VENTILATION EQPT ROOMS AIR LOCKS	A3,A12,A4,A11	47E235-09
729.0	UHI EQPT ROOMS	A14,A15	47E235-10
763.5	UHI EQPT ROOM, ICE BIN EQPT ROOM	A1,A2	47E235-11
775.25	ICE MACHINE EQUIPMENT ROOM	A1	47E235-12
786.5	PACKAGE CHILLER EQPT	A1	47E235-13
713.0	TITRATION ROOM, RADIO CHEMLAB, COUNTING ROOM	A3,A4,A5	47E235-14
772.0	15TH VITAL BATTERY ROOM, HEPA FILTER PLENUM ROOM	A8,A9	47E235-15
	AUX BLDG ROOF, HYDROGEN CABINET NEAR AUX BLDG DISCHARGE STRUCTURE, REFUELING WATER STORAGE TANKS	-	47E235-36
757.0	REFUELING FLOOR	A13	47E235-37
757.0	PERSONNEL & EQPT ACCESS ROOM	A9,A17	47E235-38
729.0	NORTH STEAM VALVE & INSTRUMENT ROOMS	A12,A13	47E235-87
729.0	POST ACCIDENT SAMPLING ROOMS	A8,A9	47E235-88

CONTROL BUILDING

ELEVATION	ROOM DESCRIPTION(S)	ROOM NUMBER(S)	DRAWING NUMBER
755.0	MAIN CONTROL ROOM, RELAY ROOM	C12,C13	47E235-16
708.0	AUX INSTR ROOMS, COMPUTER ROOM	C1,C3,C4	47E235-17
755.0	LOCKER ROOM, CORRIDOR	C6,C15	47E235-18
692.0	250V BATT ROOMS, 250V BATT BOARD ROOMS, 24V & 48V BATT ROOMS, 24V & 48V BATT BD & CHARGER ROOM, COMMUNICATIONS ROOM	C3,C4,C5,C6,C7, C8,C9	47E235-19
692.0	MECHANICAL EQPT ROOMS	C1,C2,C10	47E235-23
755.0	MECHANICAL EQPT ROOM	C1	47E235-24
729.0	SPREADING ROOM	C1	47E235-25

TURBINE BUILDING

ELEVATION	ROOM DESCRIPTION(S)	ROOM NUMBER(S)	DRAWING NUMBER
729.0	TURBINE ROOM	T1	47E235-20
755.0	TURBINE ROOM	T1	47E235-21
708.0	TURBINE ROOM	T1	47E235-22

DIESEL GENERATOR BUILDING

ELEVATION	ROOM DESCRIPTION(S)	ROOM NUMBER(S)	DRAWING NUMBER
760.5	ELECTRICAL BOARD ROOMS	760.5-4,-7,-10,-13	47E235-26
742.0	DIESEL GENERATOR ROOMS	742.0-4,-5,-6,-7	47E235-29
760.5	AIR INTAKE ROOMS, AIR EXHAUST ROOMS	760.5-3,-5,-6,-8,-9, -11,-12,-14	47E235-31

ADDITIONAL DIESEL GENERATOR BUILDING

ELEVATION	ROOM DESCRIPTION(S)	ROOM NUMBER(S)	DRAWING NUMBER
760.5	TRANSFORMER ROOM, ELECTRICAL BOARD ROOM	760.5-2,-4	47E235-27
742.0	6.9KV BOARD ROOM	742.0-4	47E235-28
742.0	DIESEL GENERATOR ROOM	742.0-1	47E235-30
742.0	CORRIDOR	742.0-5	47E235-32
760.5	AIR INTAKE ROOM, AIR EXHAUST ROOM, FIRE PROTECTION ROOM, CORRIDOR	760.5-1,-3,-5,-7	47E235-33

ERCW PUMPING STATION

ELEVATION	ROOM DESCRIPTION(S)	ROOM NUMBER(S)	DRAWING NUMBER
741.0	PUMP AREAS	-	47E235-34
711.0, 722.0	ELECTRICAL & MECHANICAL EQPT ROOMS	-	47E235-35

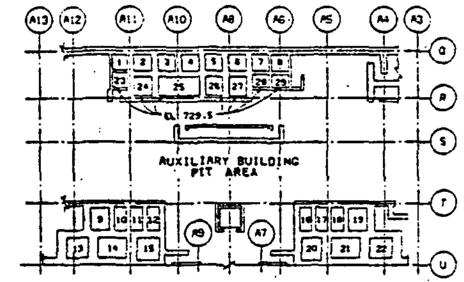
HARSH ENVIRONMENT DRAWING SERIES INDEX

AUXILIARY BUILDING

ELEVATION	ROOM DESCRIPTION(S)	ROOM NUMBER(S)	DRAWING NUMBER
729.0	H_2 STORAGE AREA	A6	47E235-39
692.0	CASK DECON TANK ROOM, VALVE GALLERY	A14,A16	47E235-40
737.0	GENERAL FLOOR AREA	A1	47E235-46
737.0	HARSH HELB PROFILES	-	47E235-47
737.0	PENETRATION (ABGTS) ROOMS	A5, A9	47E235-48
737.0	HARSH HELB PROFILES	-	47E235-49
713.0	RHR HEAT EXCHANGERS, CONTAINMENT SPRAY HEAT EXCHANGERS	A11,A12,A15,A16	47E235-50
713.0	HARSH HELB PROFILES	-	47E235-51
713.0	GENERAL FLOOR AREA, SAMPLE ROOMS, WASTE GAS COMP RMS A&B, VALVE GALLERY, WASTE GAS ANALYZER ROOM	A1,A13,A14,A24,A25, A26,A31	47E235-52
713.0	HARSH HELB PROFILES	-	47E235-53
713.0	HARSH HELB PROFILES	-	47E235-54
713.0	HARSH HELB PROFILES	-	47E235-55
713.0	PENETRATION RMS, VOLUME CONTROL TANK RM, VOLUME CONTROL TANK RM LABYRINTHS	A6,A19,A7,A20,A7',A20'	47E235-56
713.0	HARSH HELB PROFILES	-	47E235-57
676.0	PIPE CHASE	A16,A17	47E235-58
676.0	HARSH HELB PROFILES	-	47E235-59
692.0	PIPE CHASE	A8,A24	47E235-60
713.0	PIPE CHASE	A28,A29	47E235-61
692.0	GENERAL FLOOR AREA, VALVE GALLERY, GAS DECAY TANK RMS, CONCENTRATE FILTER ROOM, CHEMICAL DRAIN TANK ROOM	A1,A2,A3,A4,A5,A27	47E235-62
692.0	HARSH HELB PROFILES	-	47E235-63
692.0	HARSH HELB PROFILES	-	47E235-64
692.0	HARSH HELB PROFILES	-	47E235-65
692.0	PENETRATION ROOMS	A7,A25	47E235-66
~~692.0~~	~~HARSH HELB PROFILES~~		~~47E235-67~~ DWG DELETED
692.0	TURBINE DRIVEN AUX FEEDWATER PUMP ROOMS	A6,A25	47E235-68
692.0	HARSH HELB PROFILES	-	47E235-69
676.0	CORRIDOR, GAS STRIPPER FEED PUMP ROOM, SUMP PUMP ROOM, SUMP TANK ROOM	A1,A5,A6,A7	47E235-70
676.0	HARSH HELB PROFILES	-	47E235-71
676.0	HARSH HELB PROFILES	-	47E235-72
676.0	WASTE HOLDUP TANK ROOM, WASTE EVAP FEED PUMP ROOM	A1,A2	47E235-73
676.0	RHR PUMP ROOMS	A10,A11,A12,A13	47E235-74
676.0	HARSH HELB PROFILES	-	47E235-75
729.0	NORTH & SOUTH STEAM VALVE ROOMS	A1,A2,A10,A11	47E235-76
685.0	RHR VALVE ROOMS	A7',A25'	47E235-77
757.0	EMERGENCY GAS TREATMENT ROOM REACTOR BUILDING ACCESS ROOMS	A12,A14,A16	47E235-78
692.0	SAFETY INJECTION PUMP ROOMS, CENTRIFICAL CHARGING PUMP ROOMS, RECIPRICAL CHARGING PUMP ROOMS, WASTE EVAPORATOR PACKAGE ROOM (FUTURE HYPERFILTRATION DEMIN ROOM)	A9,A10,A11,A12 A13,A17,A19,A20 A21,A22,A23	47E235-79
737.0	AIR LOCKS	A6,A10	47E235-80
676.0	CONTAINMENT SPRAY PUMP ROOMS	A8,A9,A14,A15	47E235-81
737.0	LETDOWN HEAT EXCHANGER ROOMS	A7,A8	47E235-82
737.0	HARSH HELB PROFILES	-	47E235-83
	HARSH ENVIRONMENTAL HELB NODE FIGURES	-	47E235-84
692.0	BORIC ACID EVAP. PACKAGE ROOMS	A29,A30	47E235-85
692.0	HARSH HELB PROFILES	-	47E235-86
729.0	PASF ROOMS (BEHIND SAMPLE PANELS) WASTE PACKAGING AREA	A8',A9',A3,A4	47E235-89
713.0	VALVE GALLERY, REACTOR COOLANT FILTER PITS 9 & 15	A9,A18,PITS 9,15	47E235-90

REACTOR BUILDING

ELEVATION	ROOM DESCRIPTION(S)	ROOM NUMBER(S)	DRAWING NUMBER
	REACTOR BLDG CONTAINMENT UPPER COMPARTMENT	-	47E235-41
	REACTOR BLDG CONTAINMENT LOWER COMPARTMENT	-	47E235-42
	REACTOR BLDG ICE BED CONDENSER	-	47E235-43
	REACTOR BLDG CONTAINMENT ANNULUS AREA	-	47E235-44
716.0	REACTOR BLDG CONTAINMENT, LOWER COMPARTMENT INSTR ROOM	-	47E235-45



PLAN EL 713.0
KEY PLAN

NOTES:

1. THE FOLLOWING ROOMS, NOT INCLUDED IN THIS DRAWING SERIES, ARE SUBJECTED TO HELB TEMPERATURE AND PRESSURE TRANSIENTS WHICH EXCEED THE ABNORMAL MAXIMUM VALUES AND, THEREFORE ARE HARSH ENVIRONMENT AREAS:

    - *692.0-A15 SPENT RESIN TANK ROOM
    - *692.0-A31 SPARE (FUTURE HYPERFILTRATION EQPT RM A)
    - *713.0-A10 SEAL WATER HEAT EXCHANGER ROOM 1A
    - *713.0-A17 SEAL WATER HEAT EXCHANGER ROOM 2A
    - *713.0-A22 VALVE GALLERY
    - *713.0-A30 AIR LOCK
    - *713.0- PITS 10 THROUGH 12 AND 16 THROUGH 18
    - 737.0-A15 GROSS FAILED FUEL DETECTOR ROOM
    - 737.0-A16 GROSS FAILED FUEL DETECTOR ROOM
    - *692.0-A28 (FUTURE HYPERFILTRATION EQPT RM B)

    DETAILED ENVIRONMENTAL CONDITIONS FOR THESE AREAS WILL BE DEVELOPED ON A CASE BY CASE BASIS AS NECESSARY.

2. THE FOLLOWING ROOMS ALSO NOT CURRENTLY IN THIS DRAWING SERIES, ARE OUTSIDE OF THE HELB BOUNDARY AND SHOULD BE CONSIDERED AS HARSH ENVIRONMENT AREAS PENDING RADIATION DOSE CALCULATIONS:

    - *676.0-A2 HOLD-UP TANK ROOM A
    - *676.0-A3 HOLD-UP TANK ROOM B
    - *676.0-A4 FLOOR DRAIN COLLECTION PUMP FILTER ROOM
    - *676.0-A4A FLOOR DRAIN COLLECTION TANK ROOM
    - *713.0- PITS 1 THRU 8, 13 THRU 15, AND 20 THRU 29
    - *713.0-A27 DECONTAMINATION ROOM
    - 729.0-A7 CASK DECONTAMINATION ROOM
    - *713.0-A23 CVCS VALVE GALLERY
    - *692.0-A18 AUXILIARY WASTE EVAPORATOR PACKAGE ROOM (FUTURE CRT STORAGE ROOM)
    - 709.25-A1 SPENT FUEL PIT
    - *713.0-A2 AIR LOCK
    - 729.0-A5 CASK LOADING AREA
    - 737.0-A13 AIR LOCK
    - 737.0-A14 AIR LOCK
    - 729.5-A16 SHIELD BUILDING VENT RADIATION MONITORING ROOM
    - 729.5-A17 SHIELD BUILDING VENT RADIATION MONITORING ROOM
    - 776.1-A1 ELEVATOR MACHINE ROOM
    - 786.0-A2 ROOF ACCESS AIR LOCK
    - CDWE BUILDING

    *THESE ROOMS ARE ALSO SUBJECTED TO FLOODING FROM AN HELB.

    THE MAXIMUM TOTAL DOSE, 40 YEAR NORMAL PLUS ACCIDENT, FOR ALL AREAS LISTED ABOVE, CAN BE CONSIDERED TO NOT EXCEED 6.75 X 10^7 RADS.

    ALL AREAS LISTED IN NOTES 1 AND 2 ARE OUTLINED ON SHEET 004 OR IN THE KEY PLAN ABOVE.

3. THE FOLLOWING MILD ENVIRONMENT AREAS ARE NOT INCLUDED IN THIS DRAWING SERIES.

    AUXILIARY BUILDING

    - 713.0-A8 REACTOR BUILDING ACCESS ROOM
    - 713.0-A21 REACTOR BUILDING ACCESS ROOM
    - 786.0-A1 EXHAUST FAN ROOM

    CONTROL BUILDING

    - 692.0-C11 CORRIDOR
    - 692.0-C12 SECONDARY ALARM STATION
    - C1 STAIR
    - C2 STAIR
    - 708.0-C2 CORRIDOR
    - 755.0-C2 WOMEN'S TOILET
    - 755.0-C3 CORRIDOR
    - 755.0-C4 KITCHEN
    - 755.0-C5 TOILET
    - 755.0-C7 SHOWER
    - 755.0-C8 SHOWER
    - 755.0-C9 CONF ROOM
    - 755.0-C10 SHIFT ENGR OFFICE
    - 755.0-C14 TECHNICAL SUPPORT
    - 755.0-C16 CONFERENCE
    - 755.0-C17 TELEPHONE
    - 755.0-C18 NRC OFFICE
    - 755.0-C19 CORRIDOR
    - 755.0-C20 OPSC SHOP
    - C3 STAIR
    - C4 STAIR

    DIESEL GENERATOR BUILDING

    - 742.0-1 CO_2 STORAGE
    - 742.0-2 LUBE OIL STORAGE
    - 742.0-3 TOILET
    - 742.0-8 FUEL OIL TRANSFER ROOM
    - 742.0-9 PIPE GALLERY & CORRIDOR
    - 742.0-10 CONDUIT INTERFACE RM
    - D1 STAIR
    - 760.5-1 CORRIDOR
    - 760.5-2 RADIATION SHELTER

    ADDITIONAL DIESEL GENERATOR BUILDING

    - 742.0-2 FUEL OIL TRANSFER RM
    - 742.0-3 PIPE GALLERY
    - 742.0-6 CLOSET
    - D3 STAIR
    - 760.5-6 JANITORS' CLOSET
    - 760.5-8 CLOSET

4. ALL AUXILIARY BUILDING, CONTROL BUILDING, DIESEL GENERATOR BUILDING, AND ADDITIONAL DIESEL GENERATOR BUILDING ROOM NUMBERS WERE OBTAINED FROM ARCHITECTURAL DRAWINGS 46W401-4 THROUGH 8, 46W402-1, 2, 16W410-2, AND 16W420-2.

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TI APERTURE CARD

Also Available On Aperture Card

REV NO	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD

SCALE: NTS EXCEPT AS NOTED

UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD & HARSH
DRAWING SERIES INDEX

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN	CHECKED	1	2	
DESIGNED	REVIEWED	3	4	

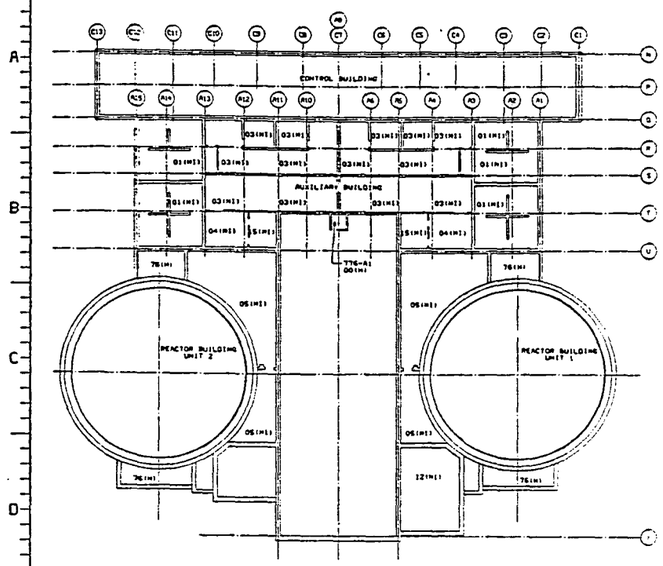
KNOXVILLE | DATE 9-9-86 | 85 | N | 47E235-00 | R0

ECN-6178

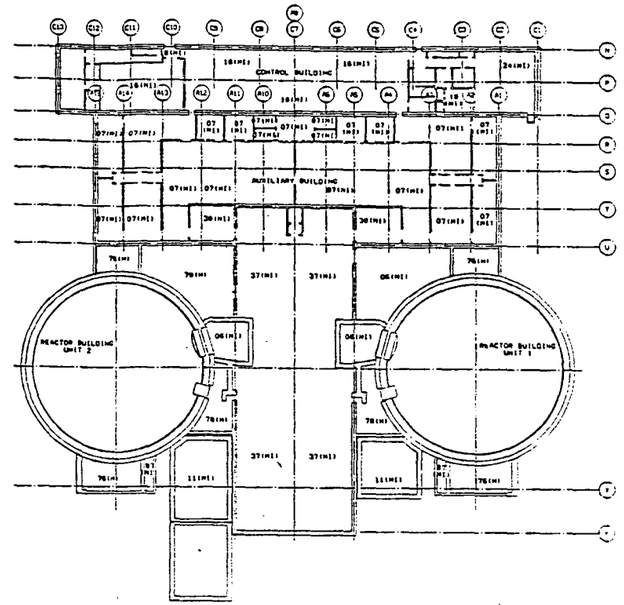
ISSUED BY:

WBN074

85 N 47E235-00



PLAN EL 772.0 & 782



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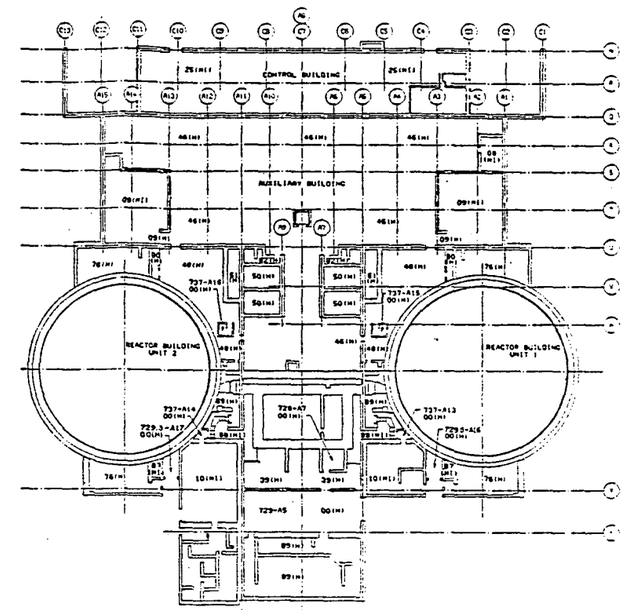
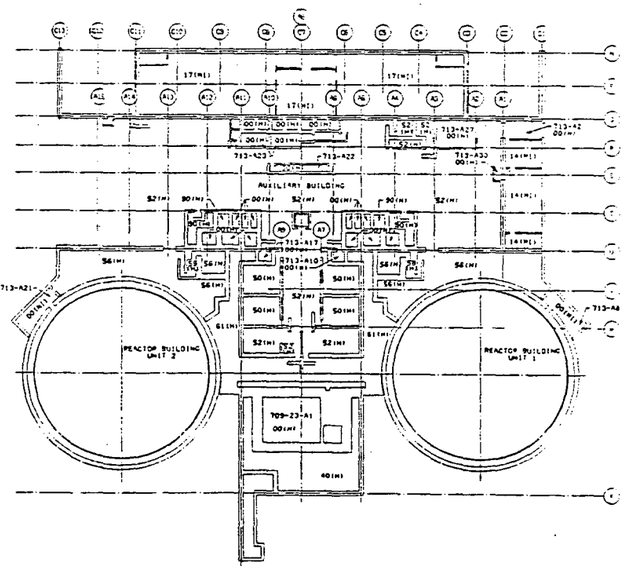
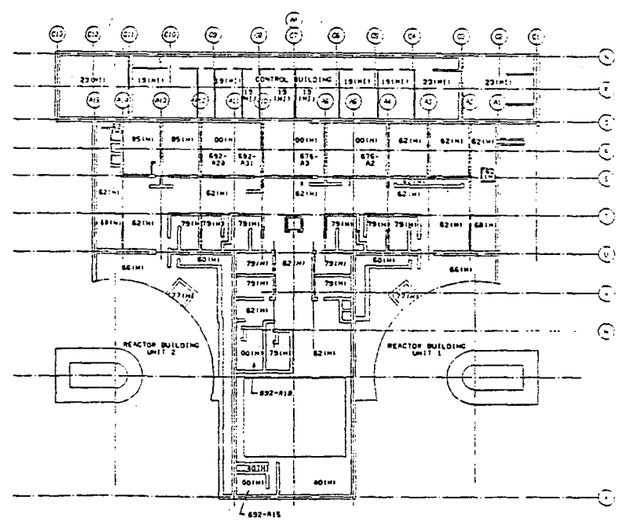


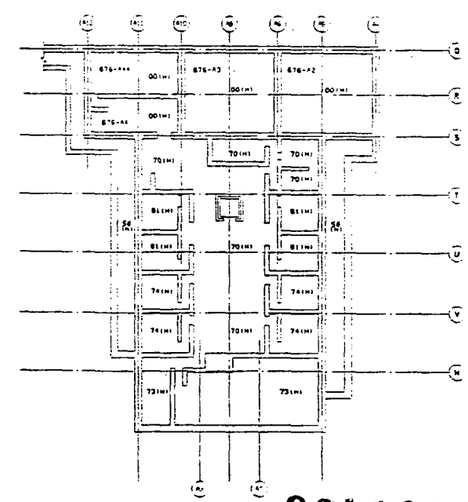
PLAN - EL 729.0 & 737.0



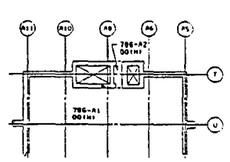
PLAN - EL 709.0 & 713.0



PLAN - EL 685.0 & 692.0



PLAN - EL 676.0



PLAN - EL 786.0

TI APERTURE CARD

Also Available On Aperture Card

NOTES:

1. NUMBERS INDICATED IN KEY PLANS REFER TO THE DRAWING SERIES SHEET NUMBERS.
2. HARSH AND MILD ENVIRONMENT AREAS ARE DENOTED BY 1H1 AND 1M1 RESPECTIVELY.
3. ROOM NUMBERS INDICATED IN KEY PLANS DESIGNATE AREAS LISTED IN NOTES 1 & 2 ON SHEET 00. THESE AUXILIARY BUILDING ROOMS DO NOT APPEAR IN THE DRAWING SERIES.

ECH-6178

ISSUED BY:

	ECN/FCR	DATE	DSGN	DRWN	CHKD	REVWD	APPD	ISSD

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD & HARSH
DRAWING SERIES INDEX

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

0

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN	CHECKED	1	2	
DESIGNED	REVIEWED	3	4	

KNOXVILLE | DATE 9-9-86 | 85 | M | 47E235-00A | R0

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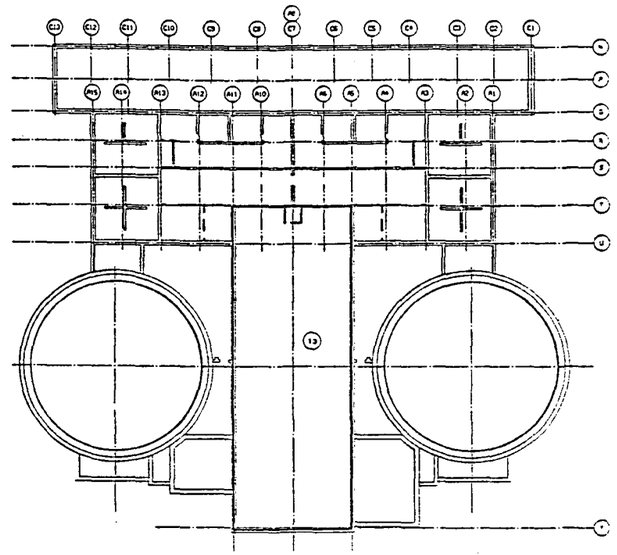

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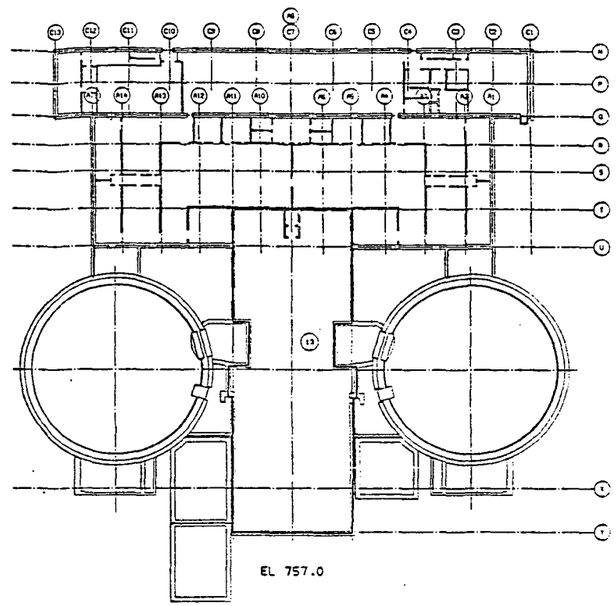

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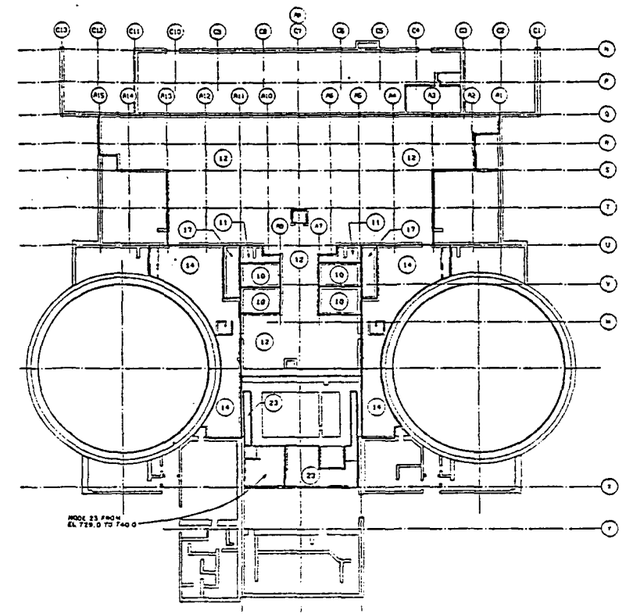
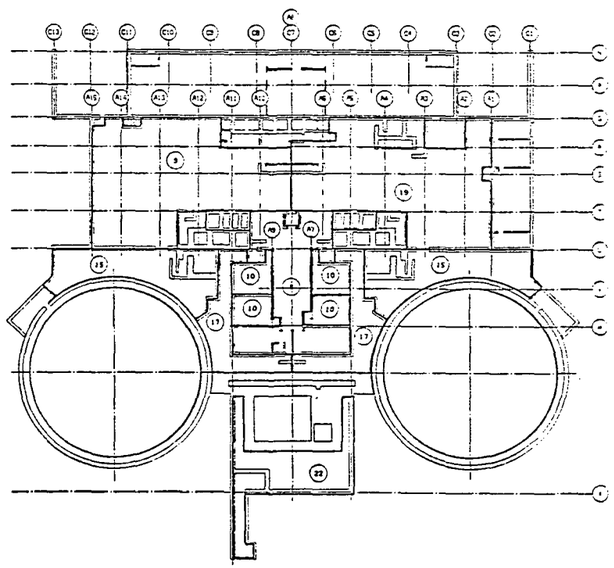
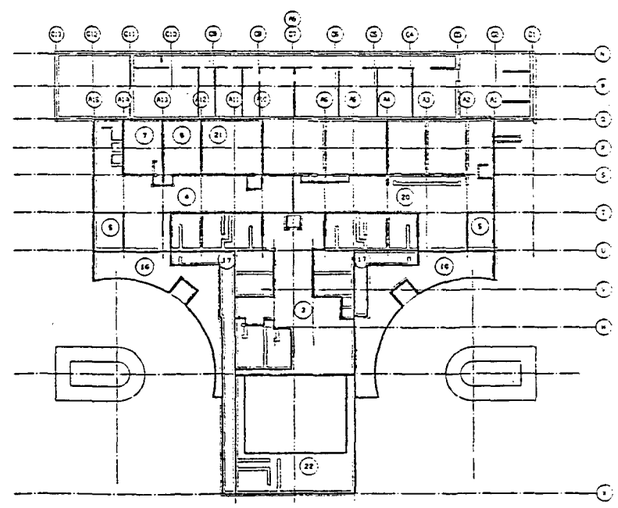


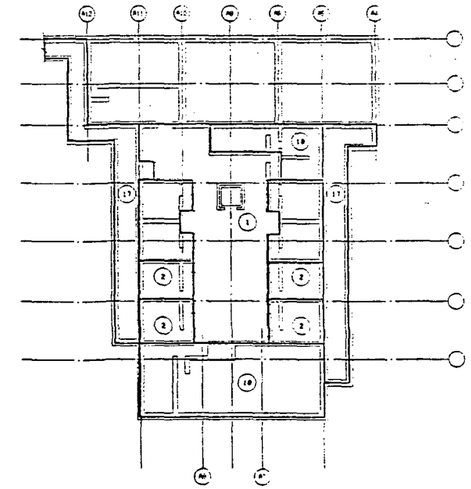
EL 737.0



EL 713.0



EL 692.0



EL 676.0

8610090051-03

BREAKS ANALYZED

DESCRIPTION	BREAK NODE
1-AUX FW PUMP TURBINE STEAM SUPPLY	6
2-CVCS LETDOWN LINE	11, 17
3-AUX BOILER SYS	3, 4, 6, 7, 13, 22
4-RHR SYS	2, 10, 17

VOLUME DESCRIPTION

1. CORRIDOR EL 676.0
2. RHR PUMP RM EL 676.0
3. CORRIDOR EL 692.0
4. CORRIDOR EL 692.0
5. AFW TURBINE PUMP RM EL 692.0
6. BORIC ACID GAS STRIPPER RM EL 692.0
7. BORIC ACID GAS STRIPPER RM EL 692.0
8. CORRIDOR EL 713.0
9. CORRIDOR EL 713.0
10. RHR HX RM EL 713.0
11. LETDOWN HX RM EL 737.0
12. GENERAL SPACE EL 737.0
13. REFUELING AREA EL 757.0
14. ABGTS RM EL 737.0
15. PIPE GALLERY EL 713.0
16. PIPE GALLERY EL 692.0
17. PIPE CHASE EL 676.0, EL 692.0, EL 713.0, EL 737.0
18. MISC SPACES EL 676.0
19. CORRIDOR EL 713.0
20. CORRIDOR EL 692.0
21. SPARE RM EL 692.0
22. CRDM DECON RM EL 692.0
23. HZ STORAGE AREA EL 737.0

TI APERTURE CARD

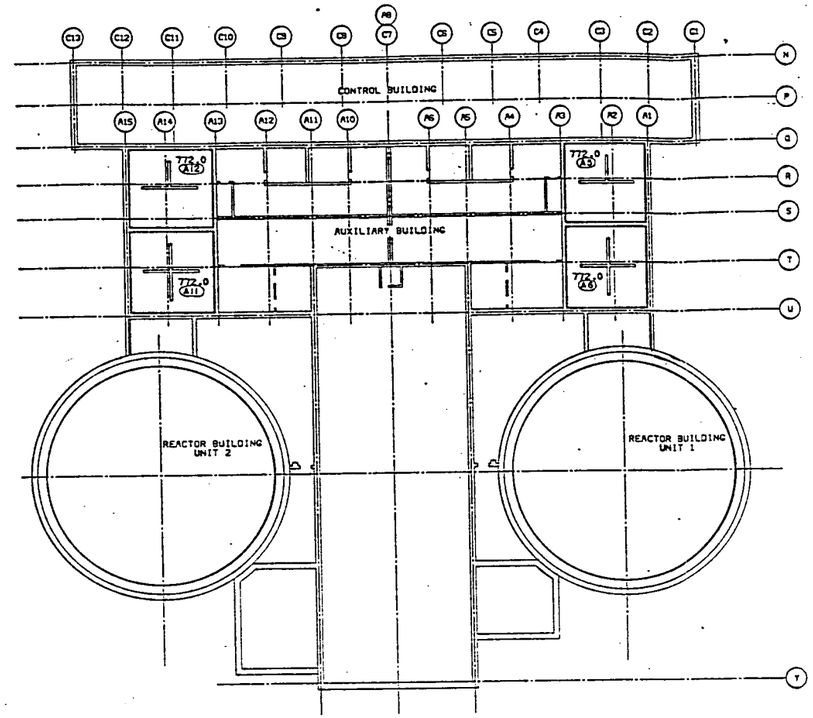
Also Available On Aperture Card

WBN079

RO ISSUE FOR ECN 6178

ISSUED BY:

SCALE:	EXCEPT AS NOTED
AUXILIARY BUILDING UNITS 1 & 2	
ENVIRONMENTAL DATA ENVIRONMENT - HARSH HELB NODE FIGURES	
WATTS BAR NUCLEAR PLANT TENNESSEE VALLEY AUTHORITY OFFICE OF ENGINEERING	Q
DESIGN / DISCIPLINE INTERFACE / ENGINEERING APPROVAL	
DRAWN / CHECKED / REVIEWED / DESIGNED	
KNOXVILLE / DATE / 95 / M / 47E235-008	RO



PLAN EL 772.0

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRM IS APPROXIMATELY 14.6 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 24 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 90°F. FOR TEMPERATURES ABOVE 90°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

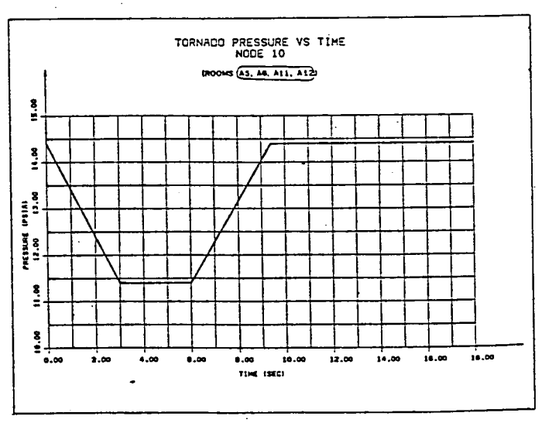
X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (90% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR.

X THIS AREA HAS NO ENVIRONMENTAL CONTROL

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTES B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING 480-VOLT TRANS-FORMER ROOMS 16-26-18-29 (A3, A6, A11, A12) EL 772.0	1 AVG	80	55	ATM	NA	NA	A	NOTE I
	1 MAX	104	80	ATM	15	NA		
	1 MIN	60	30	ATM	NA	NA		
	2 MAX	110 (NOTE D)	80	ATM	NA	< 1 X 10⁴		
	2 MIN	30	10	ATM	NA	NA		
	3	NA	NA	MODE 10	NA	NA		



REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB-81-1119-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-811213-217).

8610090051-04

TI APERTURE CARD

Also Available On Aperture Card

REV	ECN/FCN	DATE	DRAWN	CHECKED	CHKD	APPD
0	6178.A	3-Apr				
1	REVISED NOTES A.1-A.3, DELETED SAMA NUMBERS AND NO YEAR. DOSE ADDED REF 1, AND A DESIGNATION PER SPECIFICATION.					

DRAWN
DESIGN
CHKD
SUPV
SHOP
DESIGNED BY

SCALE: EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 772.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

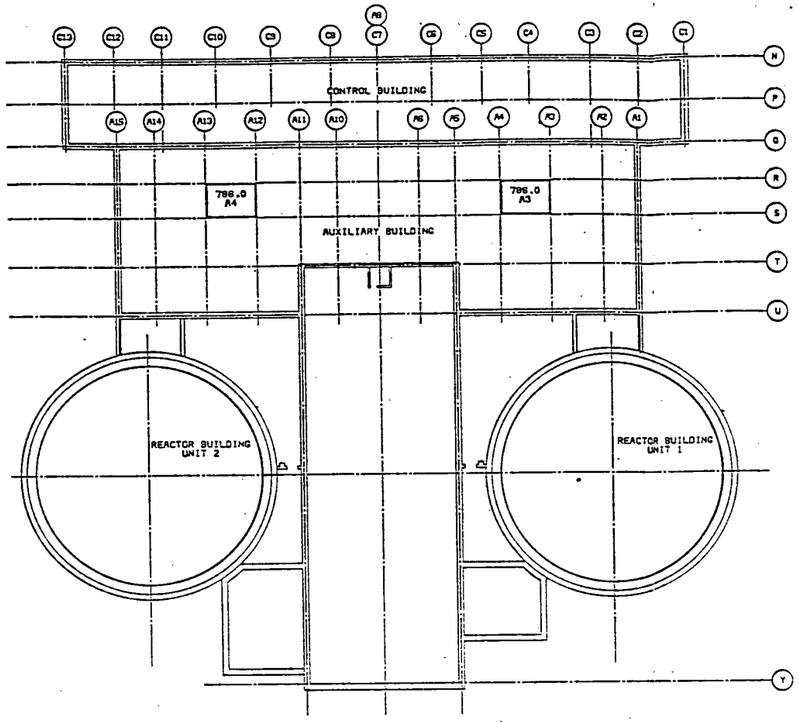
SUBMITTED | RECOMMENDED | APPROVED

INSPECTED AND APPROVED FOR ISSUE

KNOXVILLE | 3-26-83 | 0S | M | 47E235-01 | R1

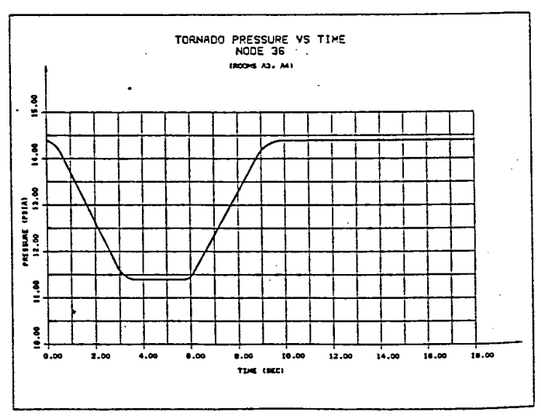
RECORD DRAWING AS CONSTRUCTED

ECN-3806



PLAN - EL 786.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE B)	PRESSURE (PSIA) (NOTES B & M)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING MECHANICAL EQUIPMENT ROOMS 18 & 29 A3,A4 EL 786.0	1 AVG MAX MIN	90 104 80	55 80 30	ATM ATM ATM	NA 1.2 X 10^3 NA	NA NA NA	A	NOTE I
	2 MAX MIN	110 40 NOTE D	80 10	ATM ATM	NA NA	< 1 X 10^4 NA		
	3	NA	NA	NODE 36	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL.
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRN IS APPROXIMATELY 14.6 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA, I.E. GREATER THAN NORMAL HEAT LOADS.

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 80% RH IS 90°F. FOR TEMPERATURES ABOVE 90°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

M. THE MODEL(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-25 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-25 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR.

X THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB-81-1113-2751).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-421 (ESB-831213-214).

8610090051-05

TI APERTURE CARD

Also Available On Aperture Card

NO.	ECN/FCN	DATE	DRAWN/CHK	DWG/CHK	APPD	ISSD
1	6179.A	9-9-86				

REVISED NOTES C.2, D.3, E, AND 40 YEAR DOSE. ADDED KEY A, AND B DESIGNATION FOR EXCEPTION A

SCALE: EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 786.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED | RECOMMENDED | APPROVED

KNOXVILLE | 1-26-83 | 05 | M | 47E235-02 | R1

RECORD DRAWING AS CONSTRUCTED

FURTHER REVIEWED

INSPECTED AND APPROVED FOR ISSUE

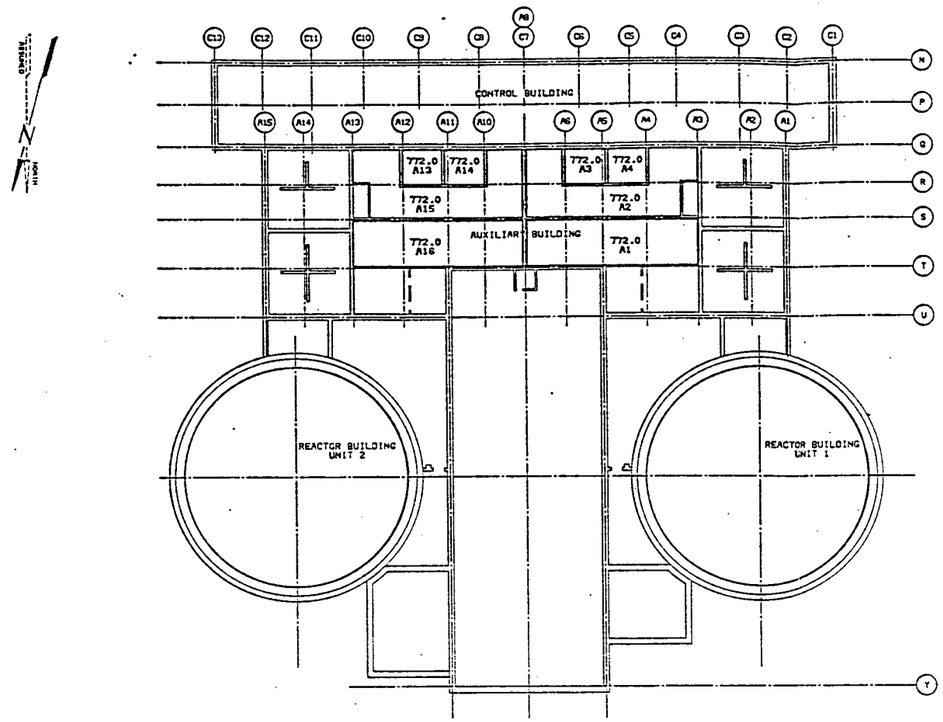
ECN-3604

7413 R0

M8N028

47E235-02

7419 R0



PLAN - EL 772.0

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRN IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM ** INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

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G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-23 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

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B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-23 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

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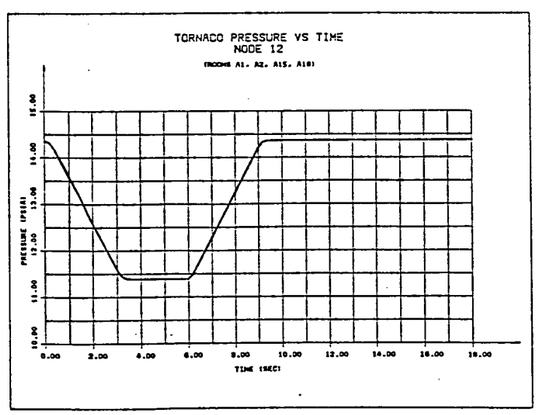
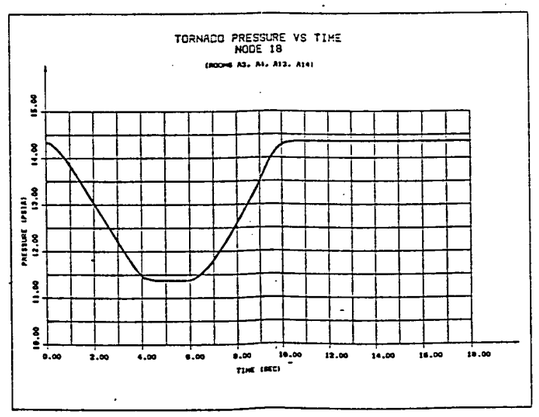
BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTES B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING 125 VOLT BATTERY ROOMS 1,2,3 AND 4	1 AVG / MAX / MIN	75 / 80 / 80	50 / 80 / 40	ATM / ATM / ATM	NA / 1.0E-3 / NA	NA / NA / NA	A	NOTE I
480 VOLT BOARD ROOMS 1A,1B,2A AND 2B A4,A3,A14,A13,A1, A16,A2,A15 EL 772.0	2 MAX / MIN	104 / 40 NOTE D	90 / 10	ATM / ATM	10 / NA	1.0E-3 / NA		
	3	NA	NA	NODES 12 & 18	NA	NA		





REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB-81-1119-2251).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-43) (EDB-831213-27).

8610090051-06

TI APERTURE CARD

Also Available On Aperture Card

6178.A	12-9-86		
1	REVISED BASED SUBMITTED BY TERA AND NRC REVIEWED AND ADDED DIV 2 AND A SIGNATURE. NEW REFERENCE 2.		
REV	ECN/FCR	DATE	

DRAWN | CHECKED | DESIGN | DESIGN | SUPV | MANAGER

SCALE: EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 772.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED | RECOMMENDED | APPROVED

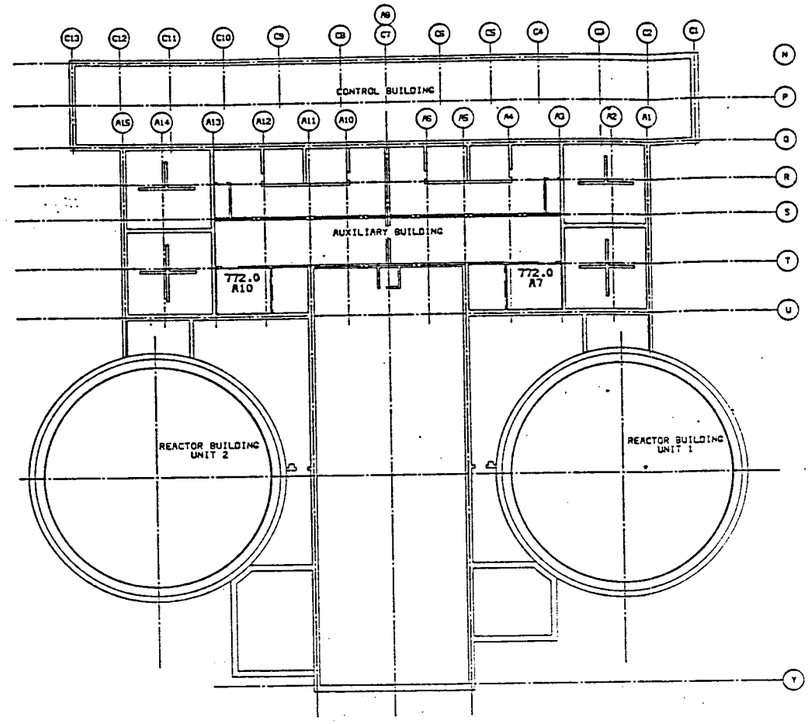
FURTHER REVIEWED | ECN-3696

INSPECTED AND APPROVED FOR ISSUE

KNOXVILLE | 12-9-85 | BS | M | 47E235-03 | R1

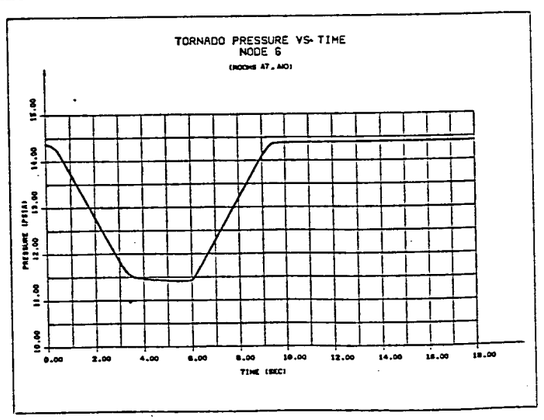
PLANT DRAWING AS CONSTRUCTED

MBN029



PLAN - EL 772.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTES B & H)	TOTAL 40-YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	APE* TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING MECHANICAL EQUIPMENT ROOMS 1A & 2A A7, A10 EL 772.0	1 AVG / MAX / MIN	75 / 80 / 80	50 / 60 / 40	ATM / ATM / ATM	NA / 1.5 X 10^3 / NA	NA / NA / NA	A	NOTE I
	2 MAX / MIN	104 / 40 NOTE D	80 / 10	ATM / ATM	NA / NA	< 1 X 10^6 / NA		
	3	NA	NA	NOTE E	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT NOM IS APPROXIMATELY 14.6 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 130°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCESSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F FOR TEMPERATURES ABOVE 80°F. THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (DEG RELATIVE HUMIDITY WILL EXIST UP TO 95 OF THE YEAR.

X THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB2-81-1119-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (E38-83-123-2-4).

8610090051-07

TI APERTURE CARD

Also Available On Aperture Card

REV	SCH/PCN	DATE	DESIGNED	DRAWN	CHECKED	APPD	ISSUED
0	6178.A	9-9-86	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	REVISED NOTES A.H.J.K.L.M AND 40 YEAR DOSE. ADDED KEY E, AND G. DESIGNATION PER ELECTRICAL A.						

SCALE: EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 772.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED / RECOMMENDED / APPROVED

KNOXVILLE 8-21-83 | 85 | M | 47E235-04 | R1

PRINTED EXPLODED

INSPECTED AND APPROVED FOR ISSUE

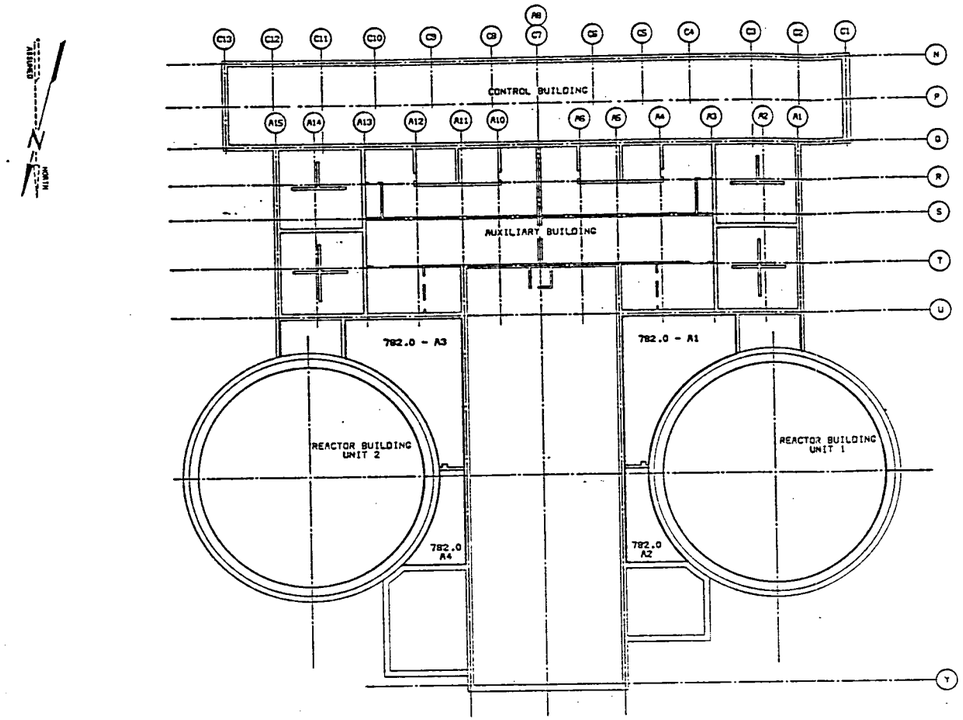
EDH-3800

85 | M | 47E235-04

7419 R0

NBN030

7419 R0



PLAN - EL 782.0

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT HRM IS APPROXIMATELY 14.6 PSIA. "+ATM" INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM "-" INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

(X) THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO (TWO) CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

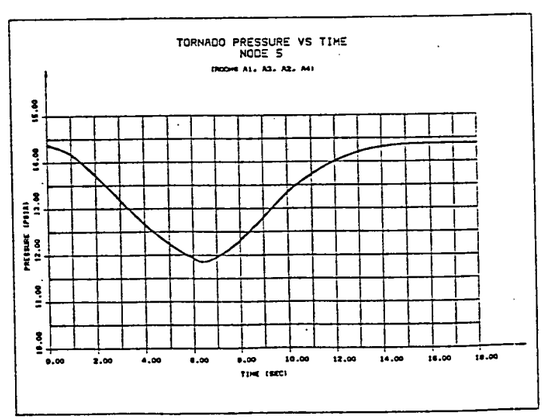
(X) THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS". (AND WILL BE FLOODED). ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD, SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

(X) THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 52 OF THE YEAR.

(X) THIS AREA HAS NO ENVIRONMENTAL CONTROL

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTES B & H)	TOTAL 40-YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING CONTROL ROD DRIVE EQUIP RMS A1,A3 PRESSURIZER HEATER TRANSF. RM A2,A4 EL 782.0	1 AVG MAX MIN	73 90 50	50 80 40	ATM ATM ATM	NA (1.9 X 10⁵) NA	NA NA NA	B	NOTE I
	2 MAX MIN	100 40 (NOTE D)	90 10	ATM ATM	NA NA	< 1 X 10⁴ NA		
	3	NA	NA	MODE 5	NA	NA		



REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB-81-1119-2291).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (SS-81212-214).

8610090051-08

REV	ECN/FCR	DATE	DESCRIPTION OF REVISION
2	6178,A		
REVISION NUMBER N/A DESCRIPTION N/A			
1	ECN/FCR	DATE	DESCRIPTION OF REVISION
1	ECN 6666	12-21-82	
CHANGED AREA TYPE DESIGNATION			
NO.	ECN NO	DATE	DESCRIPTION OF REVISION

DRAWN / DESIGN / CHECK / SUPV — DESIGN

SCALE: EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 782.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED

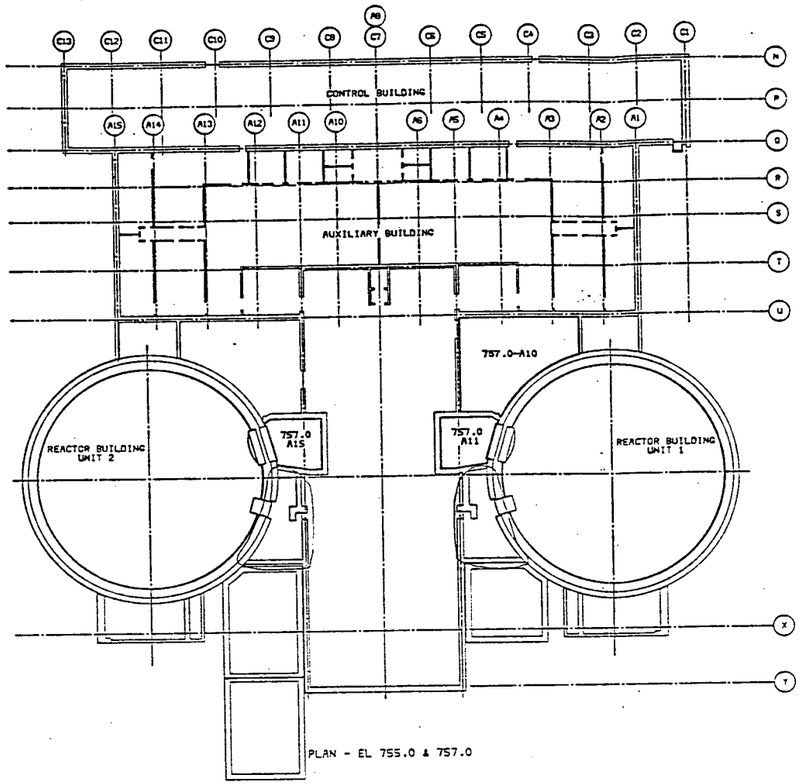
KNOXVILLE | 9-26-83 | BS | N | 47E235-05 | R2

RECORD DRAWING AS CONSTRUCTED

PROJECT REVIEWED
ECN-3606
INSPECTED AND APPROVED FOR ISSUE

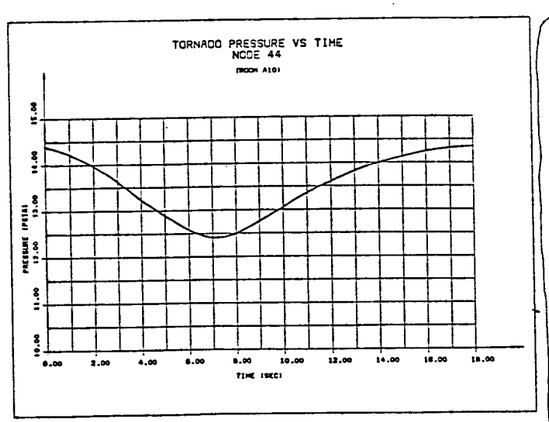
TI APERTURE CARD

Also Available On Aperture Card



PLAN - EL 755.0 & 757.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING STEAM GENERATOR BLOWDOWN ROOM A10 REACTOR BUILDING EQUIPMENT HATCH A11, A15 EL 757.0	1 AVG	80	55	ATM	NA	NA	B	NOTE I
	1 MAX	104	80	ATM	1.8 X 10⁵	NA		
	1 MIN	80	30	ATM	NA	NA		
	2 MAX MIN	120 40 NOTE D	80 10	ATM ATM	NA NA	<1 X 10⁴ NA		
	3	NA	NA	NODE 44	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MBW IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS. TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS PER EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE TEAR.

X. THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB-B-81-1119-2751.
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (E16-870213-216.

8610090051-09

REV	EC NO	DATE	DRWN	DSGN	CHKD	PROJ	ENGR	SUPV	PROJ ENGR	APPD
7	6176.A MOVED ROOMS A12 AND A14 TO AREA SHT.79. REVISED NOTES C,H,I,J,L. KEY PLAN AND 40 YEAR DOSE. DELETED NODE FIGURES 47 AND 48. ADDED REF 2, AND G DESIGNATION PER EXCEPTION A.									
6	4542 CHANGED NODE 44 CURVE	12-5-84								
REV	ECN NO	DATE	DRWN	DSGN	CHKD	PROJ	ENGR	SUPV	PROJ ENGR	APPD

SCALE: EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA.
ENVIRONMENT - MILD
EL 757.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED / RECOMMENDED / APPROVED

KNOXVILLE 8-26-13 95 M 47E235-06 R2

RECORD DRAWING AS CONSTRUCTED

TI APERTURE CARD

Also Available On Aperture Card

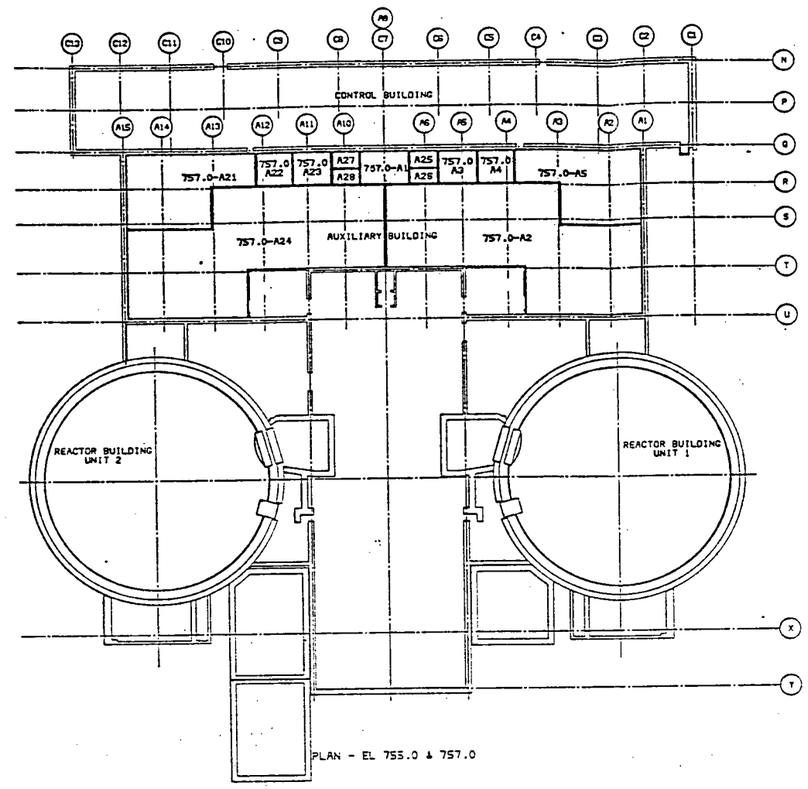
INSPECTED AND APPROVED FOR ISSUE

7419 R0

47E235-06 M 95

MENG32

7419R0



PLAN - EL 755.0 & 757.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE D)	PRESSURE (PSIA) (NOTE B)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	APCS TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING AUX CONTROL ROOM, AUX CONT INST RMS 1A-1B-2A-2B BATTERY BD ROOMS 1-I-II-III-IV 6.9 KV SWITCHGR BD ROOMS A & B 480V SWITCHGR BD ROOMS/SA & 1B ROOM NUMBERS A1,A2,A3,A4,A21, A22,A23,A24,A25, A5,A26,A27,A28 EL 757.0	1 AVG / MAX / MIN	75 75 75	50 50 40	ATM (+) ATM (+) ATM (+)	NA NA	NA NA NA	A	NOTE I
	2 MAX / MIN	104 / 50 NOTE O	90 10	ATM (+) ATM (+)	NA NA	NA NA		
	3	NA	NA	ATM	NA	NA		

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MBN IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

(X) THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

(X) THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA MB-DC-40-23 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO (TWO) CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

(X) THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

(X) THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA MB-DC-40-23 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

(X) THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 35 OF THE YEAR.

(X) THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (MEB-81-1119-2251).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (MB-DC-40-42) (ESB-4312-3-214).

86100900051-10

REV	DESCRIPTION	DATE	APPROVED	CHK	DWN	DSN
2	6178.A	3-8-85				
	REVISED NOTES C,H,J(A), SEE PLAN, 40 YEAR DOSE, AND ACCIDENT DOSE. ADDED REFERENCE 2. CORRECTED ROOM NUMBERS IN TABLE. ADDED Q DESIGNATION PER CLARIFICATION A.					
1	4542	3-3-84				
	DELETED TORNADO CURVE					

DRAWN
DESIGN
CHKD
APPR

SCALE: EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 757.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED | RECOMMENDED | APPROVED

INSPECTED AND APPROVED FOR ISSUE

KNOXVILLE 7-26-83 | 85 | M | 47E235-07 | R2

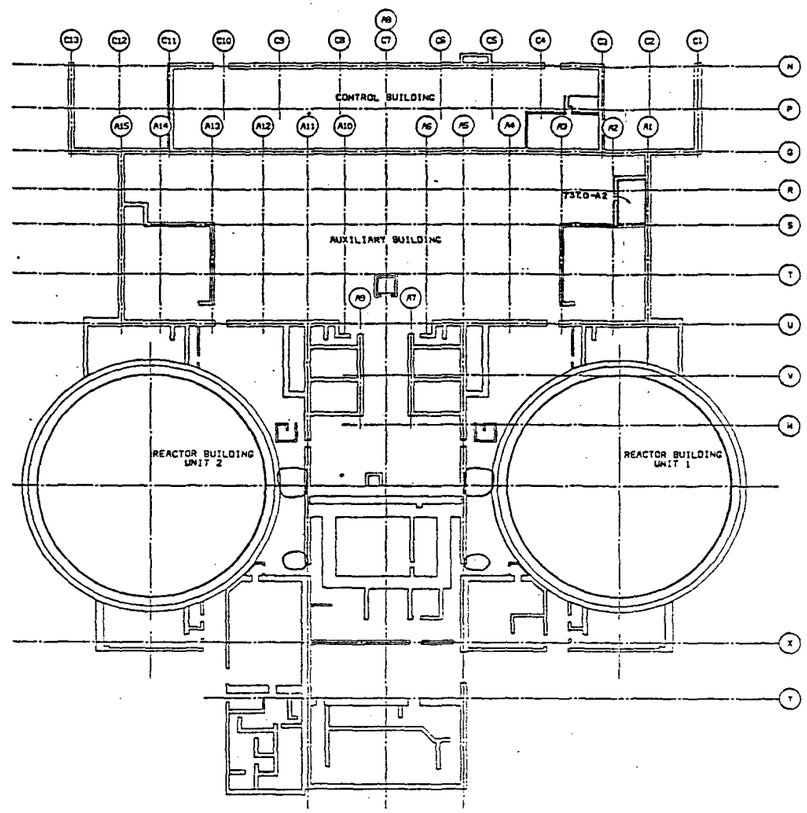
RECORD DRAWING AS CONSTRUCTED

TI APERTURE CARD

Also Available On Aperture Card

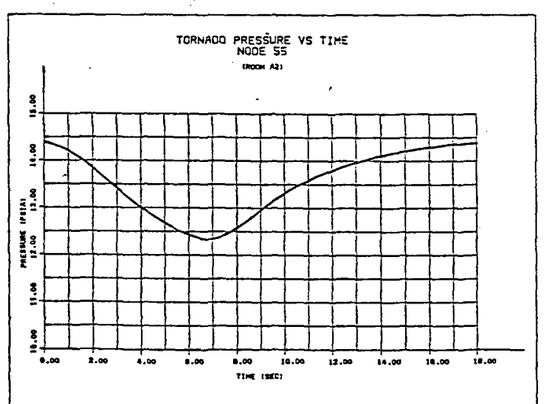
ECN-3606

M8N033



PLAN - EL 729.0 & 737.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE B)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING HOT INSTRUMENT SHOP A2 EL 737.0	1 AVG	75	50	ATM	NA	NA	B	NOTE L
	1 MAX	90	50	ATM	2.2×10^{5}	NA		
	1 MIN	50	40	ATM	NA	NA		
	2 MAX	104 NOTE D	90	ATM	NA	$< 1 \times 10^{4}$		
	2 MIN	40	10	ATM	NA	NA		
	3	NA	NA	NODE 55	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MSL IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

X THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 70°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR.

X THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB-DC-81-1113-2751).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-62) (ESB-81)(213-214).

8610090051-11

TI APERTURE CARD

Also Available On Aperture Card

REV	ECN/FCR	DATE	DESCRIPTION	CHK	APP
1	6174.A	3-9-86	[illegible]		

SCALE: EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 737.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

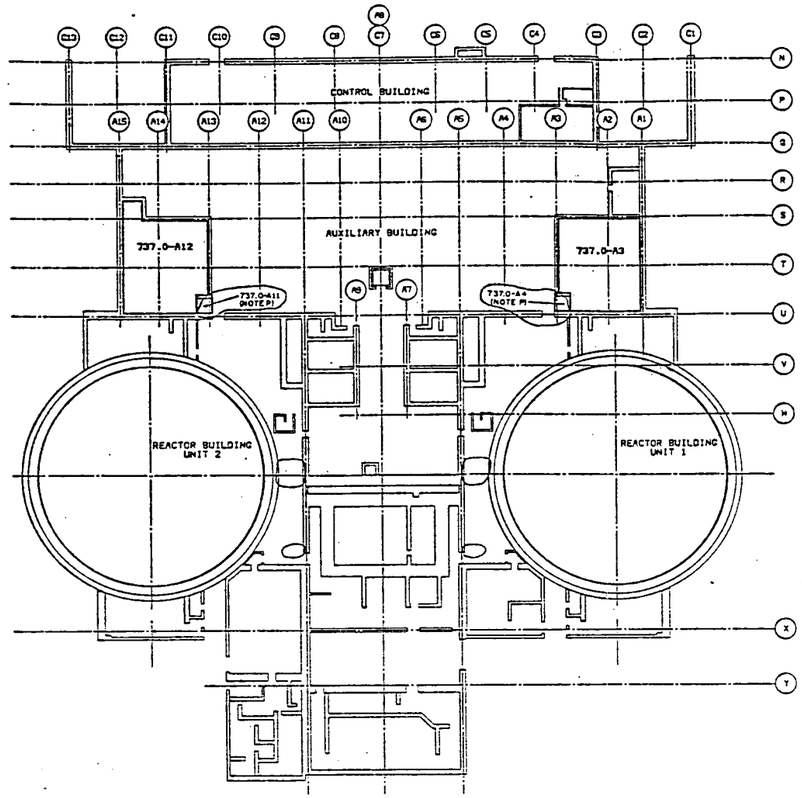
SUBMITTED	RECOMMENDED	APPROVED
[illegible]	[illegible]	[illegible]

KNOXVILLE | 1-26-13 | BS | M | 47E235-08 | R1

RECORD DRAWING AS CONSTRUCTED

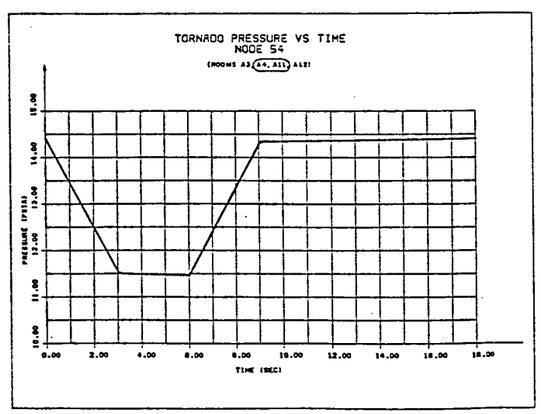
INSPECTED AND APPROVED FOR ISSUE

MBN004



PLAN - EL 729.0 & 737.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)		TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE B)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING HEATING AND VENTILATION EQUIPMENT ROOMS A3-A12 (AIR LOCKS A4, A11 EL 737.0)	1	AVG	80	55	ATM	NA	NA	B	NOTE L
		MAX	85	50	ATM	1.8×10^{5}	NA		
		MIN	40	30	ATM		NA		
	2	MAX	104 (NOTE D)	95	ATM	NA	$<1 \times 10^{4}$		
		MIN	10 (NOTE E)	10	ATM	NA	NA		
	3		NA	NA	NODE S4	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS:
1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MSL IS APPROXIMATELY 14.4 PSIA. ATM^{+} INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM^{-} INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

(X) THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 90°F. FOR TEMPERATURES ABOVE 90°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 146 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

(X) THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-25 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO (TWO) CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

K. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-25 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

(X) THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR.

(X) THIS AREA HAS NO ENVIRONMENTAL CONTROL.

P. THE SPACE ABOVE AIR LOCKS A4 AND A11 (EL 747.33 AND ABOVE) IS ENVIRONMENTALLY PART OF ROOM 737.0-A1. SEE SHEET 46 FOR THE ENVIRONMENTAL CONDITIONS IN THIS AREA.

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB-81-1119-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-40) (E18-131213-214).

8610090051-12

TI APERTURE CARD

Also Available On Aperture Card

1	6178.A			

ADDED AIR LOCKS A4 AND A11 TO SEE PLAN AND TABLE. REVISED NOTE C. REVISED PLAN AND AD PLAN DETS. ADDED REFERENCE 2 AND NOTE P. ADDED Q DRAWING TYPE. REVISION 1.

NO	REVISION	DATE	DRAWN	DESIGN	CHECKED	APPROVED	DATE

DRAWN R.E. Lollis
DESIGN R.E. Lollis
CHECK Robert Blundell
SUPV Michael Jones

DRAFT
DESIGN
DATE

SCALE: EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 737.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

(Q)

SUBMITTED	RECOMMENDED	APPROVED

INSPECTED AND APPROVED FOR ISSUE

KNOXVILLE | 7-26-83 | BS | M | 47E235-09 | R1

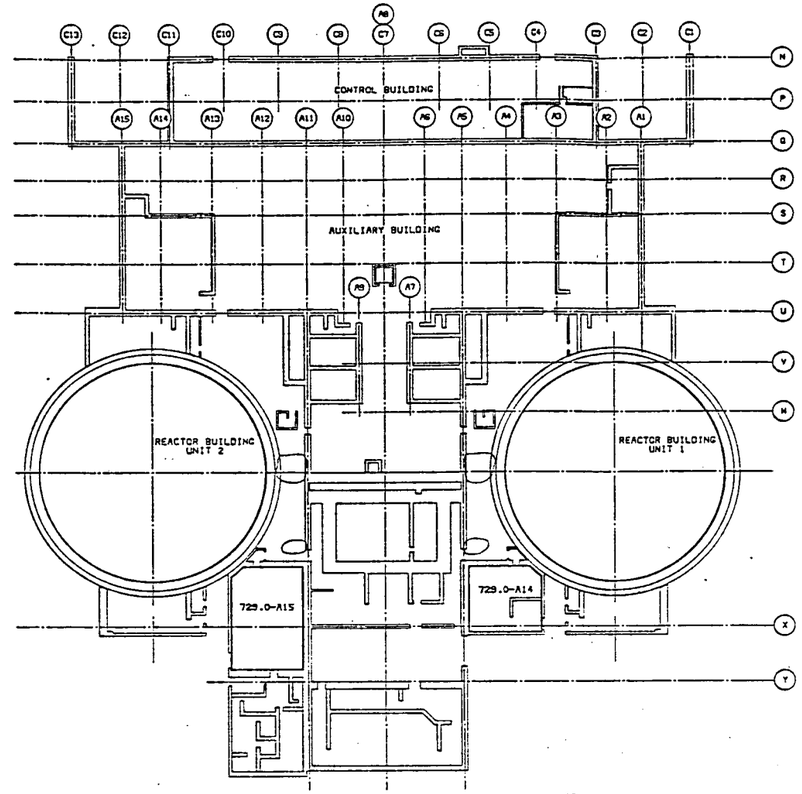
RECORD DRAWING AS CONSTRUCTED

ECN-3806

7419R0

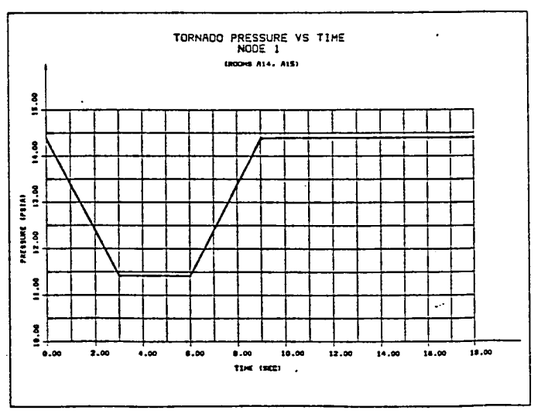
M8M035

47E235-09 M BS



PLAN - EL 729.0 & 737.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE B)	PRESSURE (PSIA) (NOTE E & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING UNIT EQUIPMENT ROOMS A14,A15 EL 729.0	1 AVG	90	50	ATM	NA	NA	B	NOTE L
	1 MAX	82	80	ATM	4.3×10^5	NA		
	1 MIN	70	40	ATM	NA	NA		
	2 MAX	110 NOTE D	90	ATM	NA	$<1.2 \times 10^4$		
	2 MIN	40	10	ATM	NA	NA		
	3	NA	NA	NOTE I	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRM IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOADS OR DECREASED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION CAN ONLY EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODELS LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

X THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (90% RELATIVE HUMIDITY WILL EXIST UP TO 52 OF THE YEAR.

X THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB-B1-1119-2251.
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-21 (E16-83121)-2).

8610090051-13

TI APERTURE CARD

Also Available On Aperture Card

1	8/18/8			
REV	ECN/FCR	DATE	DESIGNER	CHK'D

SCALE: EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 729.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED | RECOMMENDED | APPROVED

INSPECTED AND APPROVED FOR ISSUE

KNOXVILLE | 8-26-83 | BS | M | 47E235-10 | R1

RECORD DRAWING AS CONSTRUCTED

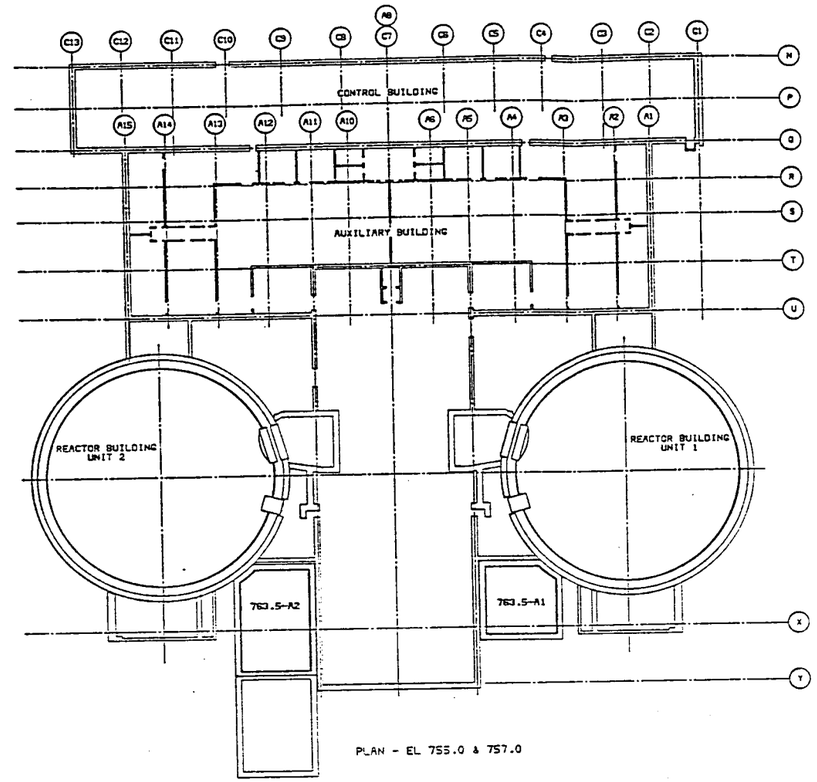
PRINTERS REVIEWED

ECN-3606

M8N036

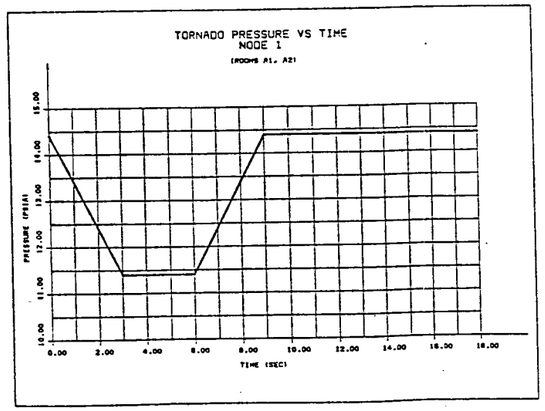
47E235-10 M BS

7560R0



PLAN - EL 755.0 & 757.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE C)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING (SEE BIN EQUIPMENT ROOM: A1) (UNI EQUIPMENT ROOM: A2 EL 763.5	1 AVG MAX MIN	80 120 70	50 80 40	ATM ATM ATM	NA 1.8×10^{5} NA	NA NA NA	B	NOTE I
	2 MAX MIN	110 40 NOTE D	80 10	ATM ATM	NA NA	$<1 \times 10^{4}$ NA		
	3	NA	NA	MODE 1	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRN IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS. TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN ARE OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS PER EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 80% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (100% RELATIVE HUMIDITY) WHICH EXIST UP TO 5% OF THE YEAR.

X THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB-81-1119-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-21 (E36-831213-214).

8610090051-14

REV	DESCRIPTION	DATE	DRAWN	CHKD	SUPV
1	8178.A				

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 763.5

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

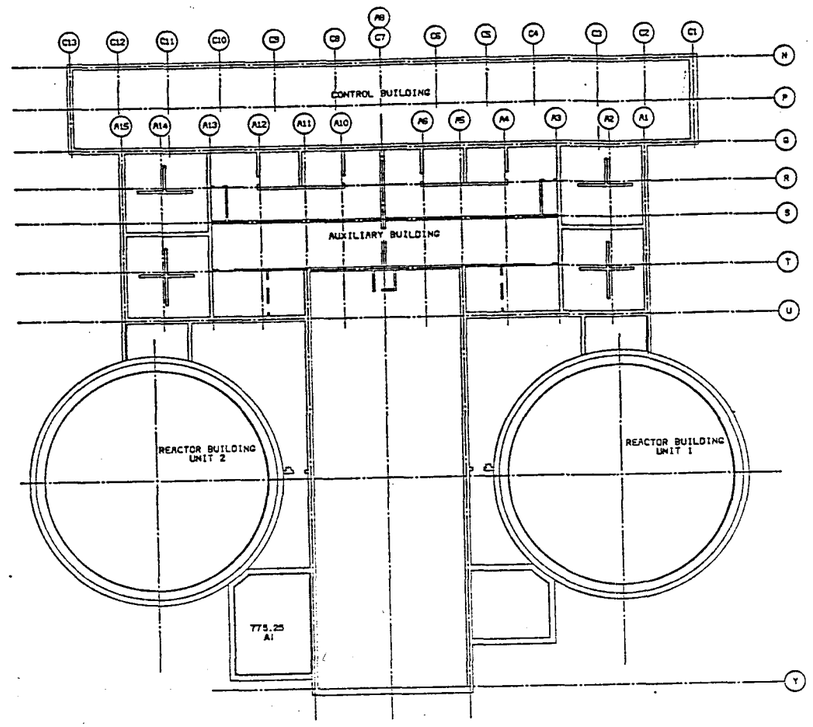
KNOXVILLE | 7-26-83 | 85 | N | 47E235-11 | R1

INSPECTED AND APPROVED FOR ISSUE

TI APERTURE CARD

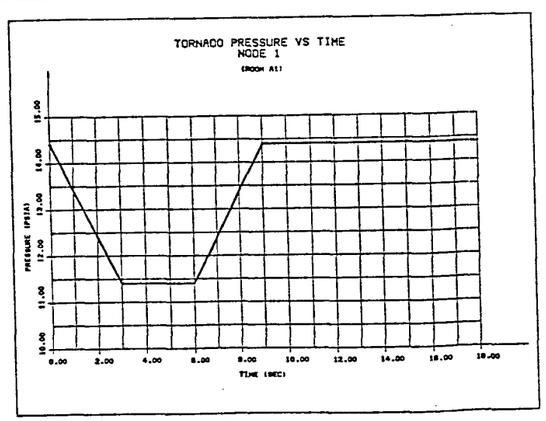
Also Available On Aperture Card

MBN037



PLAN - EL 772.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTES B)	PRESSURE (PSIA) (NOTES B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING ICE MACHINE EQUIPMENT ROOM A1	1 AVG MAX MIN	80 95 70	50 80 40	ATM ATM ATM	NA NA	NA NA NA	B	NOTE I
(ADDITIONAL EQUIPMENT BUILDING) (EL 775.25)	2 MAX MIN	110 NOTE D 40	90 10	ATM ATM	NA NA	$< 1 \times 10^{6}$ NA		
	3	NA	NA	MODE 1	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MSL IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOAD OF DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 24 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR.

X THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB-81-1119-2351.
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (E34-837212-214

86100900051-15

TI APERTURE CARD

Also Available On Aperture Card

SCALE: NTS	EXCEPT AS NOTED
AUXILIARY BUILDING UNITS 1 & 2	
ENVIRONMENTAL DATA ENVIRONMENT - MILD EL 775.25	
WATTS BAR NUCLEAR PLANT TENNESSEE VALLEY AUTHORITY DIVISION OF ENGINEERING DESIGN	
SUBMITTED / RECOMMENDED / APPROVED	
KNOXVILLE	85 M 47E235-12 R1

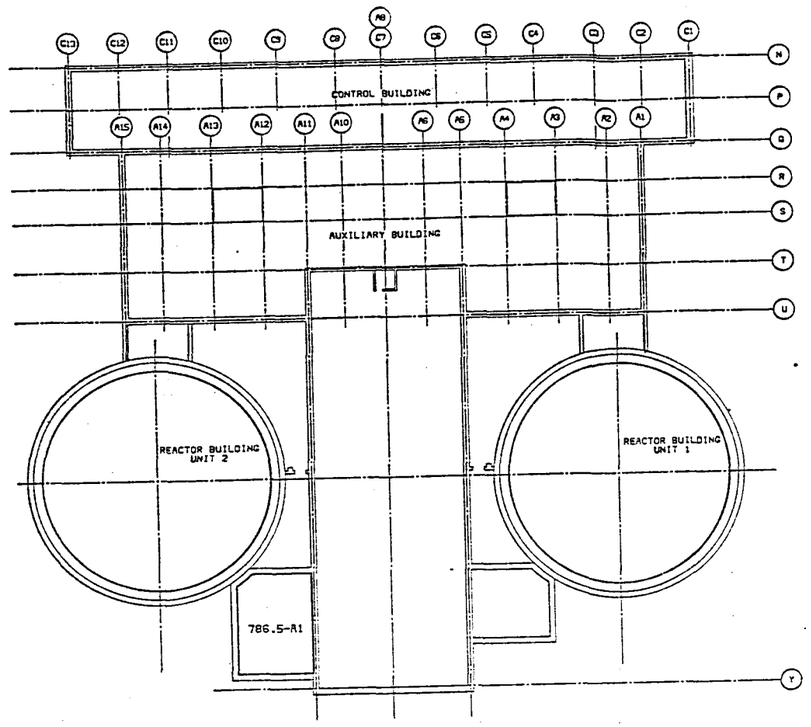
INSPECTED AND APPROVED FOR ISSUE

RECORD DRAWING AS CONSTRUCTED

ECN-3608

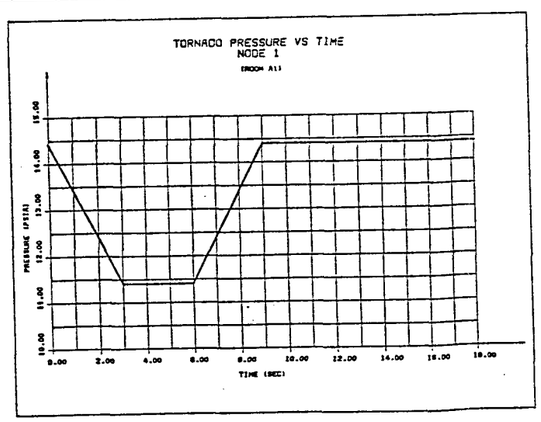
75600

M5N0038



PLAN - EL 786.5

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)		TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTES B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING PACKAGE CHILLER EQUIPMENT A1 (ADDITIONAL EQUIPMENT BUILDING) EL 786.5	1	AVE	80	50	ATM	NA to 5×10^4	NA	B	NOTE I
		MAX	92	80	ATM		NA		
		MIN	70	40	ATM	NA	NA		
	2	MAX	110	90	ATM	NA	$< 1 \times 10^4$		
		MIN	40 NOTE D	10	ATM	NA	NA		
	3		NA	NA	NODE 1	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRN IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL. WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 130°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 92°F. FOR TEMPERATURES ABOVE 90°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 30% OF THE YEAR.

X THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB-81-1119-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-121 (E58-831213-214).

8610090051-16

TI APERTURE CARD

Also Available On Aperture Card

1	3/17/86		REVISED NOTES AND TO PEAK SCALE, ADDED REF 2, AND J DESIGNATION MK 3
REV	SCALE/DR	DATE	DESCRIPTION (CHANGES INCLUDED)

DRAWN R. E. Lathbury
DRFTM
ENGR
SUPV

DESIGNED
DRFTM

SCALE: NTS EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 786.5

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

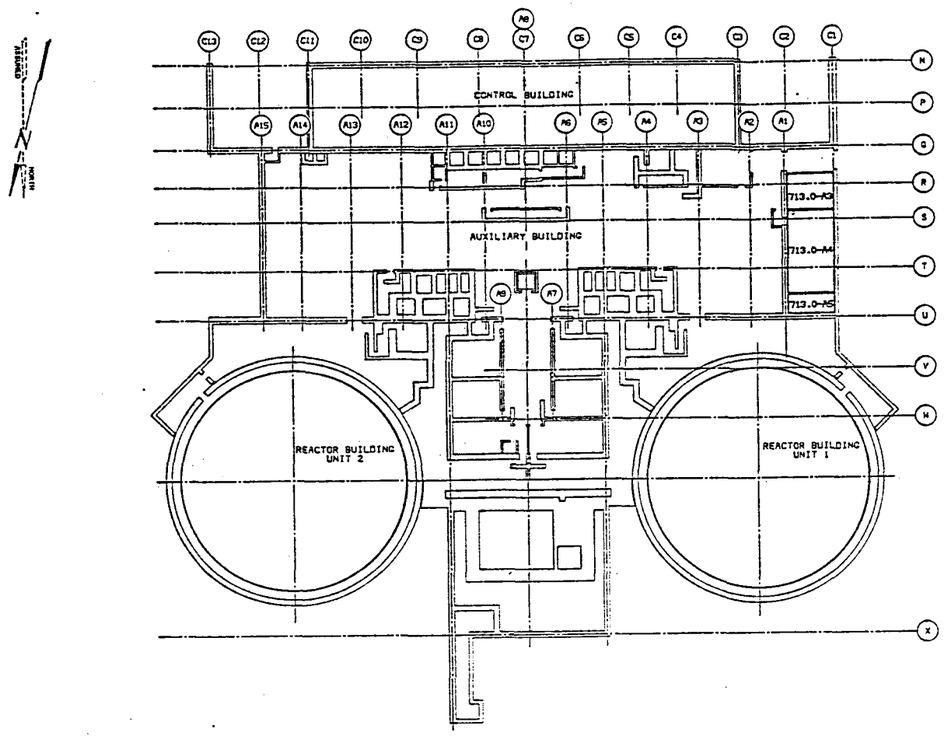
SUBMITTED | RECOMMENDED | APPROVED

KNOXVILLE | V 2613 | BS | M | 47E235-13 | R1

FURTHER REVIEWED
BES
CES
MES
ECN-3608

INSPECTED AND APPROVED FOR ISSUE

MGN039



PLAN - EL 708.0 & 713.0

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WHICH IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA, (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

(X) THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

X. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

(X) THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

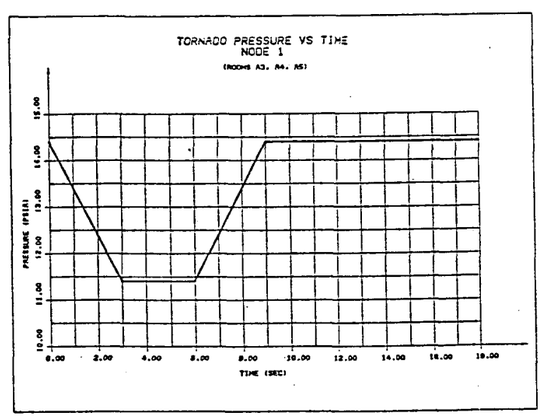
L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND 30 TO 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

(X) THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (DOCE RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR).

(X) THIS AREA HAS NO ENVIRONMENTAL CONTROL

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING TITRATION ROOM A3 / RADIO CHEM LAB A4 / COUNTING ROOM A5 EL 713.0	1 AVG / MAX / MIN	75 / 79 / 68	50 / 60 / 40	ATM / ATM / ATM	NA / TABLE 2 / NA	NA / NA / NA	B	NOTE L
	2 MAX / MIN	104 / 80 } NOTE D	90 / 10	ATM / ATM	NA / NA	<1 X 10⁻⁴ / NA		
	3	NA	NA	MODE 1	NA	NA		

TABLE 2	
ROOM NO.	DOSE (RADS)
A3,A5	1.8 X 10⁻³
A4	3.3 X 10⁻⁴



REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB8-81-1119-2291).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (E18-831213-314).

8610090051-17

TH APERTURE CARD

Also Available On Aperture Card

131673.A	H.R.NW				
REVISED NOTES A.1, A.2 AND A.3 ADDED REV. 1 AND 2 DESCRIPTION PER REPORTING A					
CH	EGN/FOR	DATE			

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 713.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED / RECOMMENDED / APPROVED

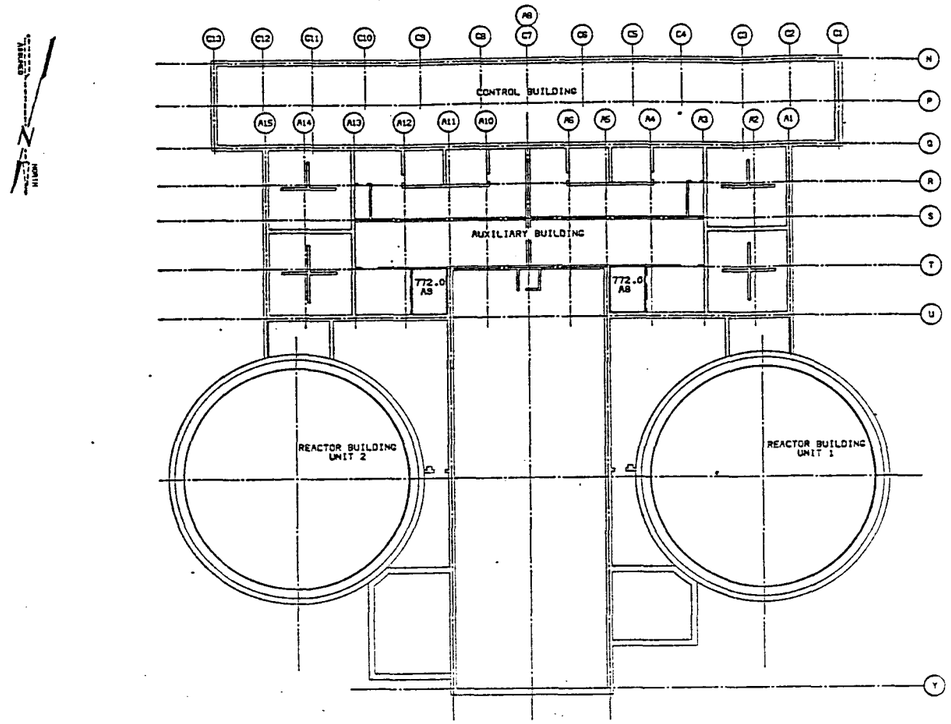
KNOXVILLE 1-26-83 | BS | M | 47E235-14 | R1

FURTHER REVIEWED

INSPECTED AND APPROVED FOR ISSUE

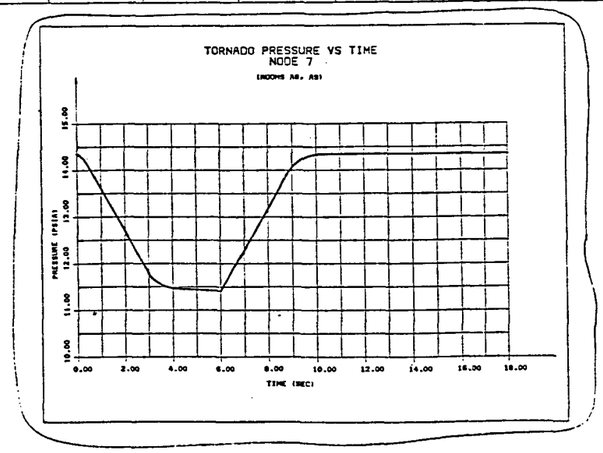
47E235-14 | M | BS

7560R0



PLAN - EL 772.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE D)	PRESSURE (PSIA) (NOTES B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES X & C)	AREA TYPE (NOTE J)	FLOODING
HEPA FILTER PLENUM ROOM ROOM NO.A9 5TH VITAL BATTERY ROOM ROOM NO.A8 EL 772.0	1 AVG MAX MIN	80 104 80	55 80 30	ATM ATM ATM	NA $1.2 \times 10^{[illegible]}$ NA	NA NA NA	B	NOTE I
	2 MAX MIN MIN	110 40 (RM.A9) NOTE G 80 (RM.A8)	90 10	ATM ATM	NA NA	$< 1 \times 10^{4}$ NA		
	3	NA	NA	NODE 7	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT NBN IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM - INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS. TEMPORARY, GREATER THAN DESIGN, TEMPERATURE EXCURSIONS IN DESIGNED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA, I.E., GREATER THAN NORMAL HEAT LOADS.

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS PER EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 50% OF THE YEAR.

X. THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB-81-1119-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-12) (EB-831215121).

8610090051-18

REV	ECN/PER	DATE	DESCRIPTION	CHK	APPD	ISSUED
2	5178-A		REVISED NOTE C, D, G, H, AND SA TABLE. ADDED REF. 2, AND D			
1	4542	12-3-87	CHANGED NODE 7 CURVE AND ADDED THE 5th VITAL BATTERY ROOM			
0	ECN NO	DATE	DESCRIPTION			

DRAWN: [illegible] DATE:
CHKD: R.R. Campbell
SUPV: [illegible] SUPERVISOR: [illegible]

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 772.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED: [illegible] RECOMMENDED: [illegible] APPROVED: [illegible]

KNOXVILLE | 12-2-83 | BS | H | 47E235-15 | R2

RECORD DRAWING AS CONSTRUCTED

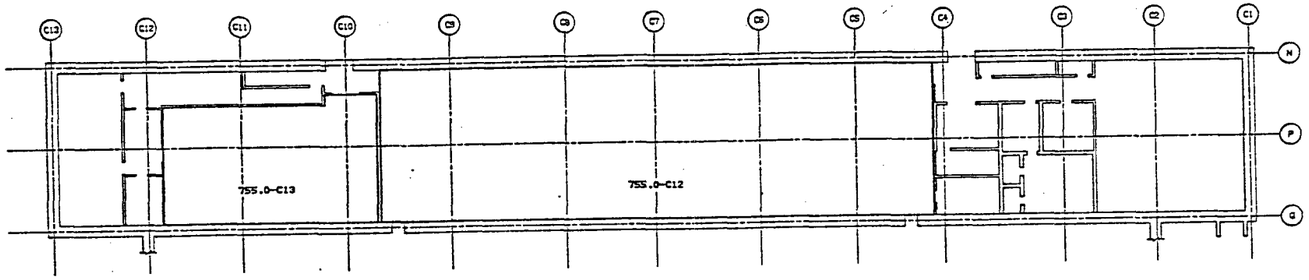
PRINTS REVISED
INSPECTED AND APPROVED FOR ISSUE

ECN-3608

TI APERTURE CARD

Also Available On Aperture Card

MBN041



PLAN - EL 755.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE B)	PRESSURE (PSIA) (NOTE B)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
CONTROL BUILDING MAIN CONTROL ROOM, RELAY ROOM C12,C13 EL 755.0	1 (AVG, MAX, MIN)	75 75 75	50 50 50	ATM (+) ATM (+) ATM (+)	NA (1.5×10^5) NA	NA NA NA	A	NOTE I
	2 (MAX, MIN)	104 80 } NOTE D	80 10	ATM (+) ATM (+)	NA NA	(1×10^5) NA		
	3	NA	NA	ATM	NA	NA		

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRN IS APPROXIMATELY 14.4 PSIA. ATM(+) INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM(-) INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 24 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

(X) THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 80% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIED 80% RH HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

(X) THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DEBHA BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO (TWO) CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

(X) THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

(X) THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

(X) THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (DOES NOT INCLUDE HUMIDITY WILL EXIST UP TO 50% OF THE YEAR).

(X) THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB-B-1115-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (SQN-DC-V-21.2).

86100900051-19

TI APERTURE CARD

Also Available On Aperture Card

REV	EDITOR	DATE	DESCRIPTION (CHG/REV/ADD/DEL)	ISSUE
1	BATR.A	2-6-86	REVISED NOTES C,H,I,J,L; 40 YEAR DOSE AND ACCIDENT DOSE ADDED; ELT D AND A DESIGNATION ADD DESCRIPTION	

SCALE: NTS — EXCEPT AS NOTED

CONTROL BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 755.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

KNOXVILLE | 7-26-83 | 85 | M | 47E235-16 | R1

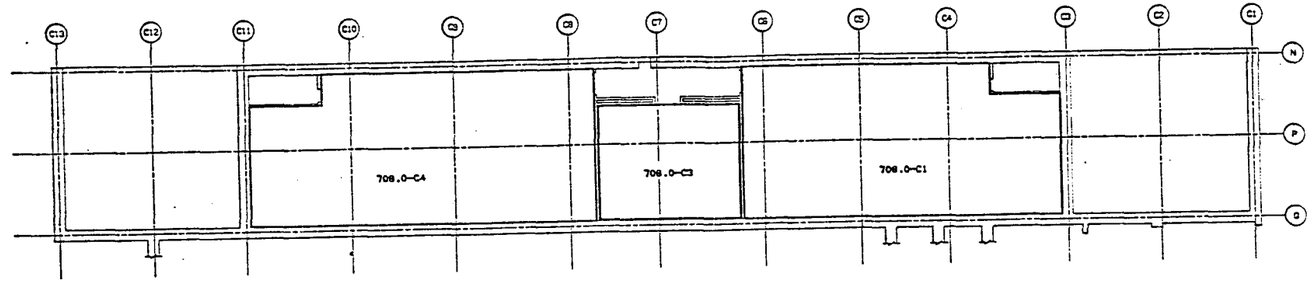
PROJECT REVIEWED

INSPECTED AND APPROVED FOR ISSUE

FCM-3896

MEN042

7560R0



PLAN - EL 708.0

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRH IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. (THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS PER EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

X. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

X. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR).

X. THIS AREA HAS NO ENVIRONMENTAL CONTROL

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTE B)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
CONTROL BUILDING AUX INSTRUMENT RMS C1, C4 EL 708.0	1 AVG / MAX / MIN	72 / 77 / 75	50 / 50 / 50	ATM (+) / ATM (+) / ATM (+)	3.5×10^7 / NA	NA / NA / NA	A	NOTE L
	2 MAX / MIN	104 / 80 NOTE D	90 / 10	ATM (+) / ATM (+)	NA / NA	$<1 \times 10^4$ / NA		
	3	NA	NA	ATM	NA	NA		

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTE B)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
CONTROL BUILDING COMPUTER RM C1 EL 708.0	1 AVG / MAX / MIN	70 / 70 / 70	50 / 50 / 50	ATM (+) / ATM (+) / ATM (+)	NA / 3.5×10^7 / NA	NA / NA / NA	A	NOTE L
	2 MAX / MIN	104 / 80 NOTE D	90 / 10	ATM (+) / ATM (+)	NA / NA	$<1 \times 10^4$ / NA		
	3	NA	NA	ATM	NA	NA		

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB-81-1119-223).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (E18-831213-214).

8610090051-2D

TI APERTURE CARD

Also Available On Aperture Card

NO	EDN/PCN	DATE	DRWN	DSGN	ENGD	REVIEW	APPD	ISSD
1	44OB	5-5-84						
2	41718.A	5-9-86						

CHANGED COMPUTER ROOM NOMINAL TEMPERATURE

SCALE: NTS — EXCEPT AS NOTED

CONTROL BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 708.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED | RECOMMENDED | APPROVED

KNOXVILLE | BS | H | 47E235-17 | R2

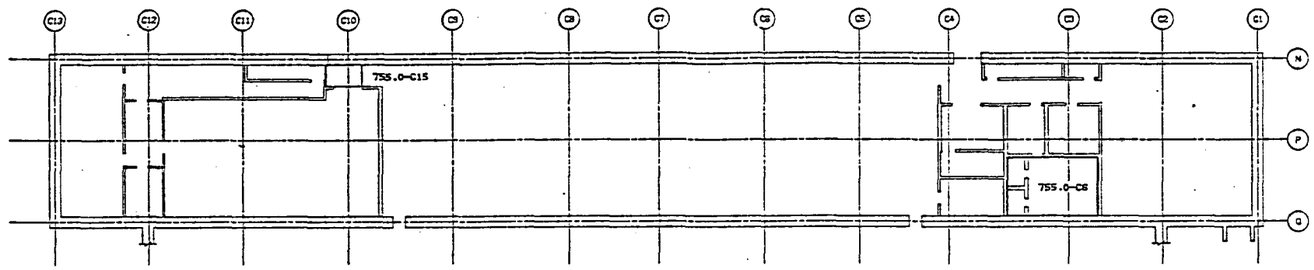
RECORD DRAWING AS CONSTRUCTED

PRINTS RETAINED

INSPECTED AND APPROVED FOR ISSUE

ECN-3608

WBN043



PLAN - EL 755.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)		TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSI) (NOTE B)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
CONTROL BUILDING: LOCKER ROOM, CORRIDOR CIRCLE EL 755.0	1	MAX	75	50	ATM (+)	NA	NA	A	NOTE I
		MAX	75	50	ATM (+)	3.6×10^{5}	NA		
		MIN	75	50	ATM (+)	NA	NA		
	2	MAX	104 } NOTE D	80	ATM (+)	NA	NA		
		MIN	60	10	ATM (+)	NA	4.1×10^{4}		
	3		NA	NA	ATM	NA	NA		

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT WBN IS APPROXIMATELY 14.4 PSIA. ATM(+) INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM(-) INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 80% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

X. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 60°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND IS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (80% RELATIVE HUMIDITY WILL EXIST UP TO 50 OF THE YEAR.

X. THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB3-81-1113-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-421 (ESB-81-213-214).

8610090051-21

TI APERTURE CARD

Also Available On Aperture Card

REV	DATE	DESCRIPTION
1	8-13-86	REVISED NOTES G, H, I, J, W/ 40 YEAR DOSE AND ACCIDENT DOSE. ADDED REF 1 AND 2 ASSUMPTION FOR SECTION A

SCALE: NTS — EXCEPT AS NOTED

CONTROL BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 755.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

INSPECTED AND APPROVED FOR ISSUE

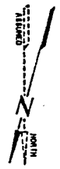
XNOXVILLE | 9-20-83 | BS | M | 47E235-18 | R1

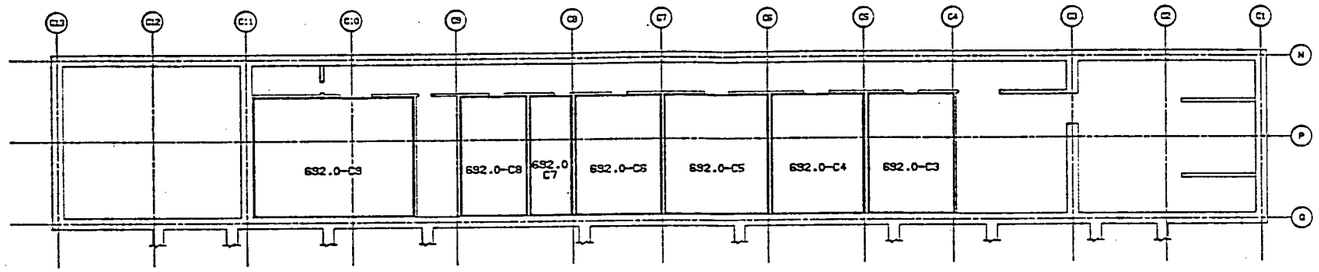
PRINTED REVISED

ECN-3606

MBN044

7560R0





PLAN - EL 692.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTE B)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
CONTROL BUILDING 250V BATT RMS 1,2 C2-C8	1 AVG / MAX / MIN	72 75 75	50 50 50	ATM (+) ATM (+) ATM (+)	NA 4.5 X 10^5 NA	NA NA NA	A	NOTE L
250V BATT (50) RMS L 2,C4,C5 24V & 48V BATT RM C7	2 MAX / MIN	104 80 } NOTE D	90 10	ATM (+) ATM (+)	NA NA	4.1 X 10^5 NA		
24V & 48V BATT RM 80 & CHARGER RM C9	2	NA	NA	ATM	NA	NA		
COMMUNICATIONS RM C3 EL 692.0								

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRW IS APPROXIMATELY 14.4 PSIA. ATM(+) INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM(-) INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR REDUCED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

X THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

Y THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO (TWO) CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR).

X THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTS, CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBN-B(-)1(-)2-C-20).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-43) (SSB-83)213-214.

8610090051-22

TI APERTURE CARD

Also Available On Aperture Card

1	REV A			
	REVISED NOTES, CHANGED 40 YEAR DOSE AND ACCIDENT DOSE ADDED REF 2, AND A DESIGNATION PER SECTION A.			
NO.	DESCRIPTION	DATE	DRAWN	CHECKED	ENGINEERING	APPROVED	CONSTRUCTION

SCALE: NTS — EXCEPT AS NOTED

CONTROL BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 692.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED | RECOMMENDED | APPROVED

INSPECTED AND APPROVED FOR ISSUE

KNOXVILLE | 12-93 | 85 | M | 47E235-19 | R1

MBN045

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL.
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO.

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MSM IS APPROXIMATELY 14.6 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCAL (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS PER EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

X. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. SPACES LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

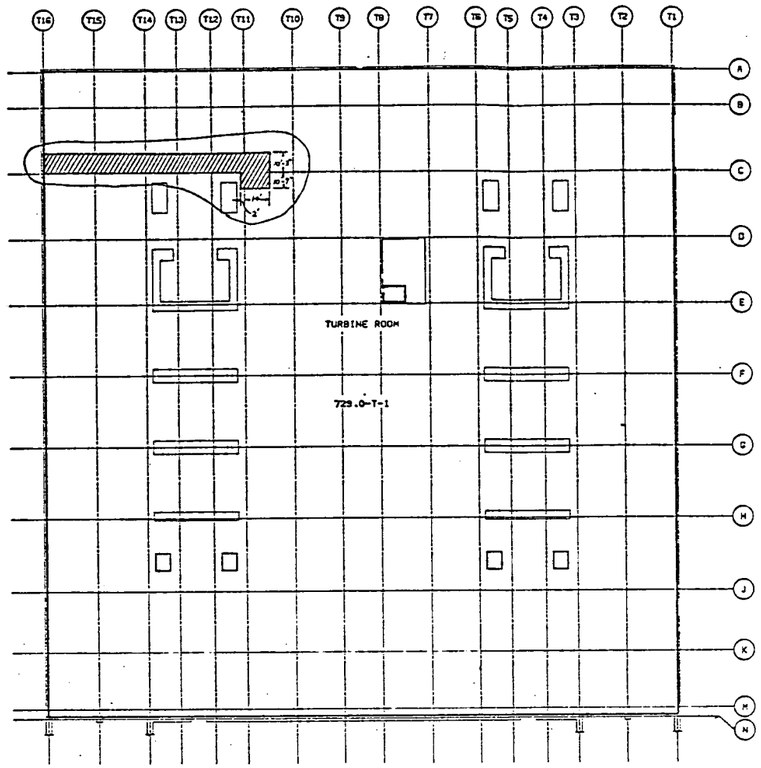
B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

K. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND MUST BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS. 100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR.

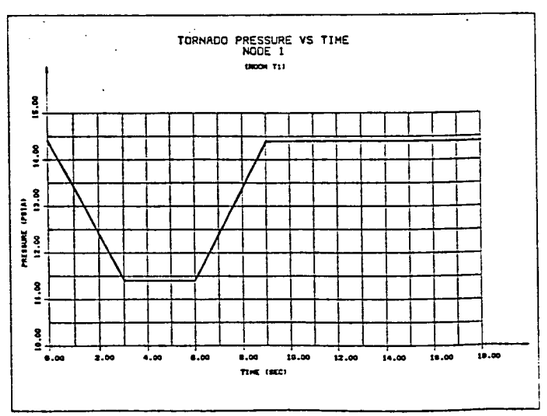
X. THIS AREA HAS NO ENVIRONMENTAL CONTROL.



PLAN - EL 729.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
TURBINE BUILDING TURBINE ROOM T-1 EL 729.0	1 AVG MAX MIN	85 110 50	55 90 30	ATM ATM (+) ATM	NA TABLE 2 NA	NA NA NA	B	* NOTE L
	2 MAX MIN	120 40 } NOTE D	90 10	ATM (+) ATM	NA NA	41×10^4 NA		
	3	NA	NA	MODE 1	NA	NA		

TABLE 2	
ROOM NO	DOSE (RADS)
T-1 (SHADED AREA)	DOSE LATER
T-1 (UNSHADED AREA)	3.5×10^2



REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB9-81-1119-225).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-40) (SSB-831213-214).

8610090051-23

TH APERTURE CARD

Also Available On Aperture Card

REV	DESCRIPTION	DATE	DRAWN	CHECKED	ENGINEER	PROJECT ENGINEER	SUPERVISOR
1	REVISED NOTES, ADDED NOTE L, ADD PLANT 40 YEAR DOSE AND ACCIDENT DOSE, ADDED NOTE J, TABLE 1 AND 2, SEGREGATION PER SSB	8/13/86					

SCALE: NTS — EXCEPT AS NOTED

TURBINE BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 729.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

INSPECTED AND APPROVED FOR ISSUE

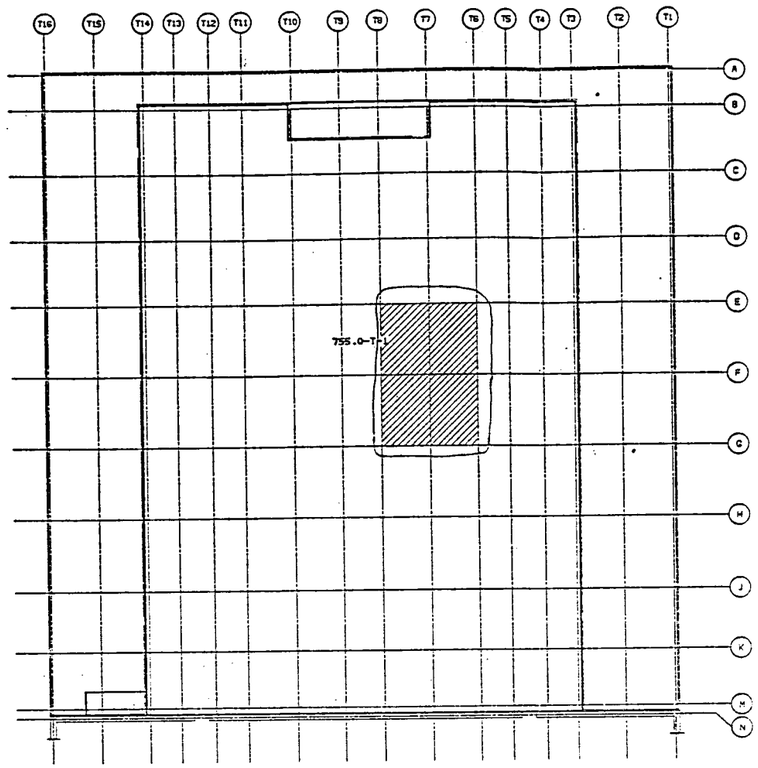
KNOXVILLE | 85 | M | 47E235-20 | R1

FURTHER REVIEWED: SCS, CEA, NEA, TEA

ECN-3408

MEN046

47E235-20 | 85 | M

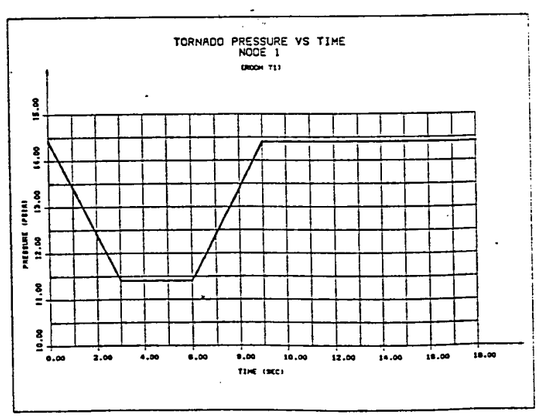


PLAN - EL 755.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
TURBINE BUILDING TURBINE ROOM T-1 EL 755.0	1 AVG MAX MIN	95 110 30	55 80 30	ATM ATM (+) ATM	NA (TABLE 2) NA	NA NA NA	B	NOTE I
	2 MAX MIN	120 40 NOTE D	90 10	ATM (+) ATM	NA NA	(<1 X 10⁻⁴) NA		
	3	NA	NA	NOTE I	NA	NA		

TABLE 2

ROOM NO.	DOSE (RADS)
T-1 (SHADED AREA)	3.5×10^{4}
T-1 (UNSHADED AREA)	1.8×10^{3}



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL.
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRN IS APPROXIMATELY 14.4 PSIA. ATM(+) INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL. WHILE ATM(-) INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 90°F. FOR TEMPERATURES ABOVE 90°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

K. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 50°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (LOW RELATIVE HUMIDITY) WILL EXIST UP TO 8% OF THE YEAR.

X. THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB3-81-1119-2331).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESS-831213-27).

86100900051-24

TI APERTURE CARD

Also Available On Aperture Card

REV	DESCRIPTION	DATE	DRAWN	CHKD	APPD
1	REVISED NOTES A, J, K, PLUS REF. ITEM 2, TO REFLECT LOCA AND ACCIDENT DOSE, ADDED REF 2, TABLE 2, AND Q DESIGNATION PER EXCEPTION A.	6-9-86			

SCALE: NTS — EXCEPT AS NOTED

TURBINE BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 755.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

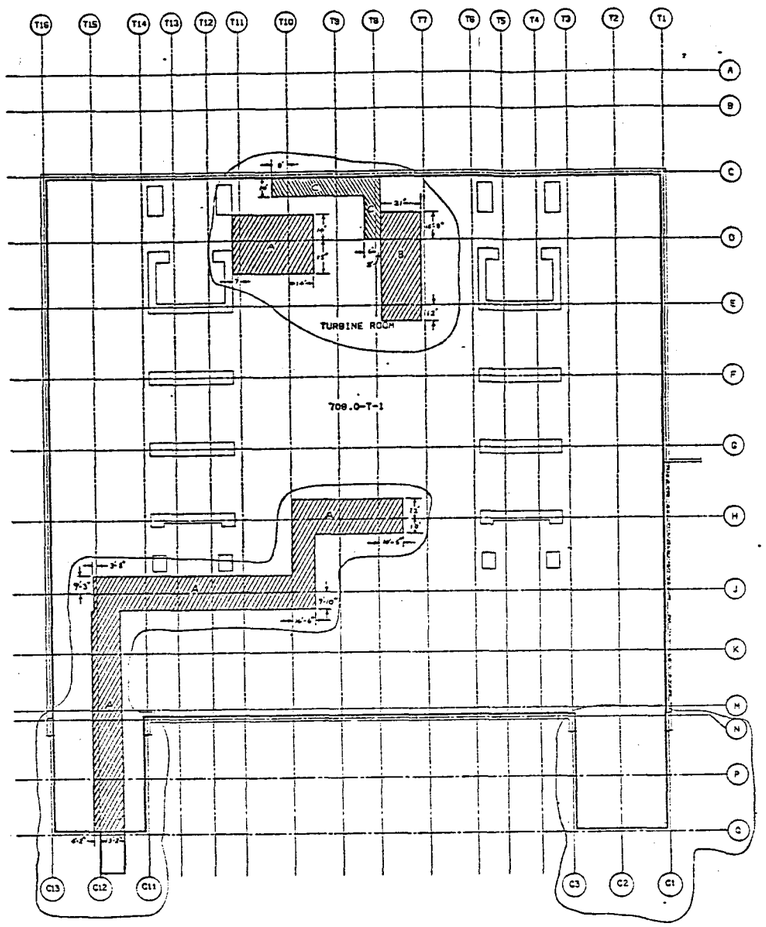
SUBMITTED | RECOMMENDED | APPROVED

KNOXVILLE | 3-26-83 | 85 | M | 47E235-21 | R1

INSPECTED AND APPROVED FOR ISSUE

FORM 3806

MBN047



PLAN-EL 708.0

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRN IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL. WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS)

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 90°F. FOR TEMPERATURES ABOVE 90°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

X. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS."

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD; AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT, ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR.

X. THIS AREA HAS NO ENVIRONMENTAL CONTROL.

TABLE 2	
ROOM NO.	DOSE (RADS)
T-1 (SHADED AREA A)	DOSE LATER
T-1 (SHADED AREA B)	DOSE LATER
T-1 (SHADED AREA C)	DOSE LATER
T-1 (UNSHADED AREA)	2.5×10^5

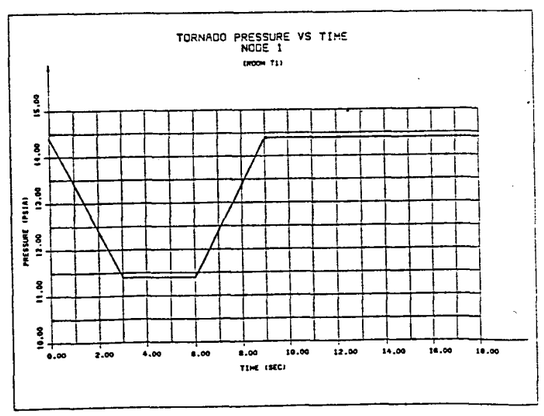
TI APERTURE CARD

Also Available On Aperture Card

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB-81-1119-2251).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-A21 (ESB-931213-214).

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
TURBINE BUILDING TURBINE ROOM T-1 EL 708.0	1 AVG	85	55	ATM	NA	NA	B	NOTE L
	MAX	110	90	ATM (+)	TABLE 2	NA		
	MIN	50	30	ATM	NA	NA		
	2 MAX	120	90	ATM (+)	NA	NA		
	MIN	40 NOTE D	10	ATM	NA	(1×10^5) NA		
	3	NA	NA	MODE 1	NA	NA		



8610090051-25

1	6178.A	2-2-86				
0	REVISED PER DCN 6178.A. ADDED Q DESIGNATION PER EXCEPTION A.					
REV	DEN/PER	DATE	DRWN	DSGN	CHKD	APPD

SCALE: NTS — EXCEPT AS NOTED

TURBINE BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 708.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED | RECOMMENDED | APPROVED

INSPECTED AND APPROVED FOR ISSUE

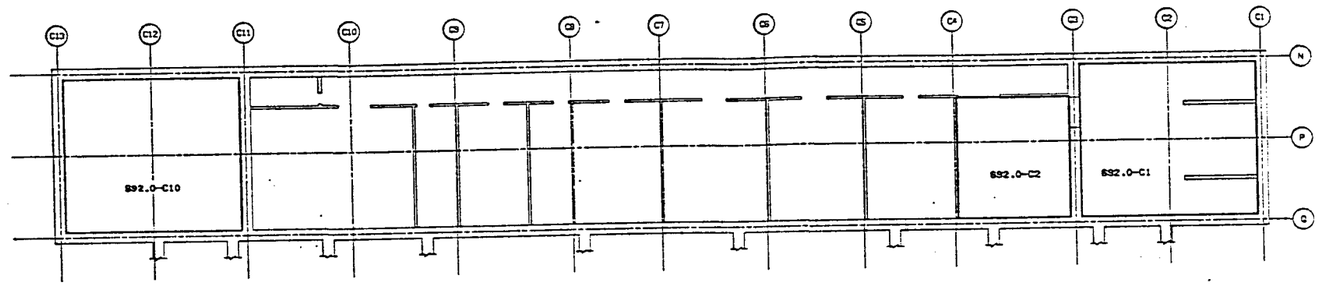
KNOXVILLE | 85 | M | 47W235-22 | R1

FURTHER REVIEWED

DCN-3608

MBN048

7553RG



PLAN - EL 692.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (SEE NOTE B)	PRESSURE (PSIA) (NOTE B)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
CONTROL BUILDING MECHANICAL EQUIPMENT ROOMS C1, C2 & C10 EL 692.0	1 AVG MAX MIN	72 75 70	50 50 50	ATM (-) ATM (-) ATM (-)	NA [illegible]	NA NA NA	A	NOTE L
	2 MAX MIN	104 60 } NOTE D	80 10	ATM (+) ATM (+)	NA NA	[illegible]		
	3	NA	NA	ATM	NA	NA		

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MSL IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC MOISTURE WILL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

X THE MODES(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

X THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 70°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 50 OF THE YEAR.

X THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB-81-1113-2251).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ES8-831213-214).

TI APERTURE CARD

Also Available On Aperture Card

8610090051-26

1	8/18/8 A	REVISED NOTES G, H & J, 40 YEAR DOSE AND ACCIDENT DOSE. ADDED REF 2. AND DESIGN CRITERIA FOR SPECIFICATION A	
NO.	ECN/PCN	DATE	DESCRIPTION (CHG BY/PKG APPR)

DRAWN [illegible] | CHKD [illegible] | DSIGN [illegible] | ENGINEER [illegible] | MGR [illegible]

SCALE: NTS — EXCEPT AS NOTED

CONTROL BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 692.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED [illegible] | RECOMMENDED [illegible] | APPROVED [illegible]

KNOXVILLE | 3-26-73 | 65 | H | 47E235-23 | R1

REVISED DRAWING AS CONSTRUCTED

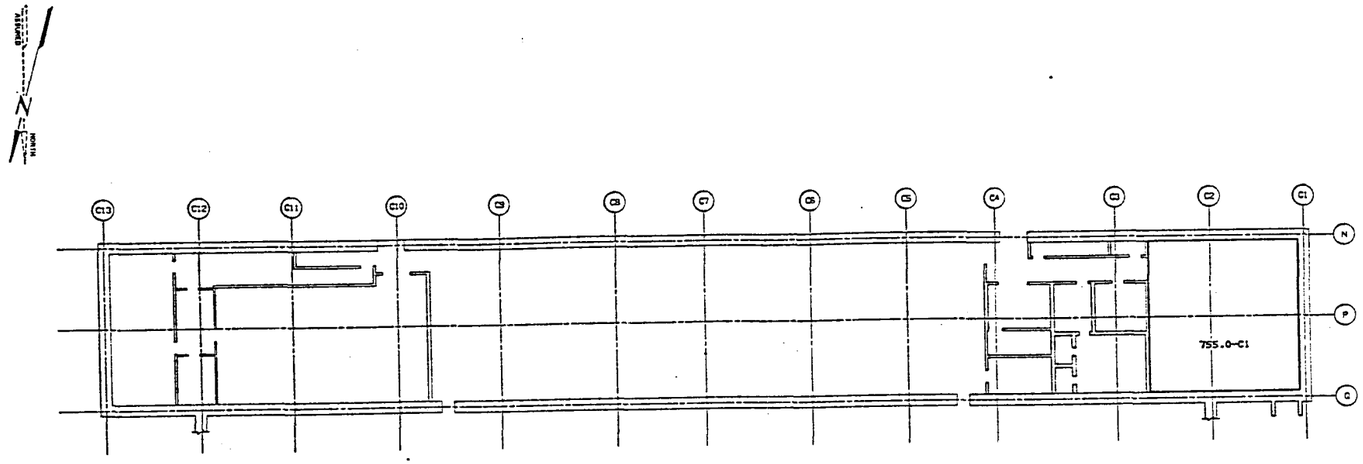
PRINTER REVIEWED

INSPECTED AND APPROVED FOR ISSUE [illegible]

ECN-3658

HBN049

755980



PLAN - EL 755.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE B)	PRESSURE (PSIA) (NOTE B)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
CONTROL BUILDING MECHANICAL EQUIPMENT ROOM C1 EL 755.0	1 AVG	72	50	ATM (+)	NA	NA	A	NOTE I
	1 MAX	75	50	ATM (+)	5.5×10^5	NA		
	1 MIN	72	50	ATM (+)	NA	NA		
	2 MAX	104 NOTE D	30	ATM (+)	NA	1.1×10^7		
	2 MIN	50	10	ATM (+)	NA	NA		
	3	NA	NA	ATM	NA	NA		

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT HRN IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL EXPOSURE DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS PER EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

X. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (DOT RELATIVE HUMIDITY WILL EXIST UP TO 90% OF THE TIME).

X. THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB2-81-1119-2391).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42)(CS8-831213-21).

8610090051-27

TI APERTURE CARD

Also Available On Aperture Card

1	6176.A	9-9-86			
	REVISED NOTES [illegible] TO REFLECT DOSE AND ACCIDENT DATA. ADDED NOTE [illegible] AND A [illegible]				
REV	ECN/FCN	DATE	DRAWN	CHECKED	APPROVED

SCALE: NTS EXCEPT AS NOTED

CONTROL BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 755.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED	RECOMMENDED	APPROVED

KNOXVILLE 9-26-83 85 M 47E235-24 R1

RECORD DRAWING AS CONSTRUCTED

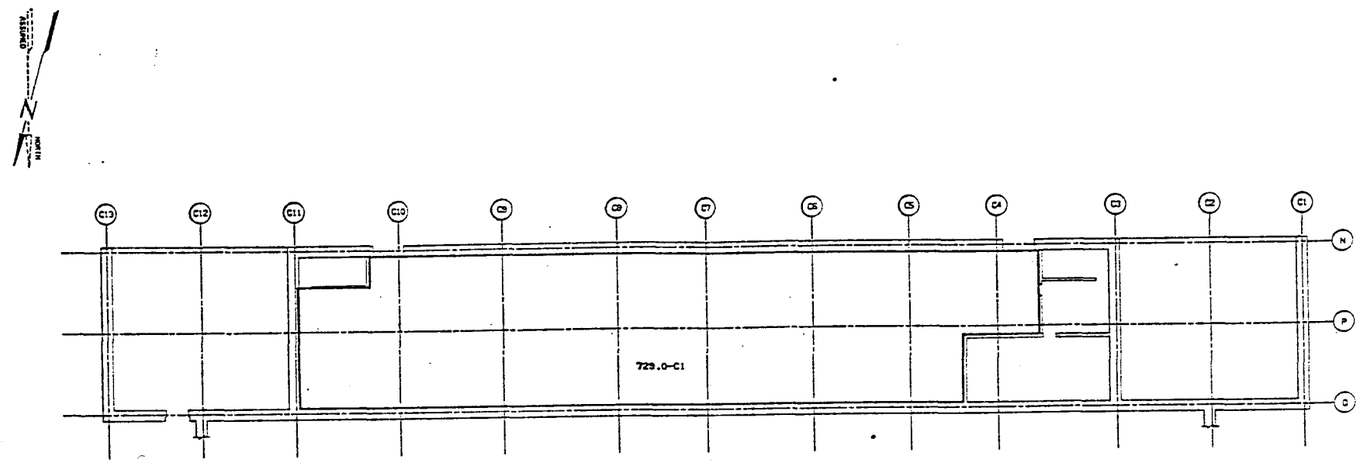
FORMER REVIEWED

INSPECTED AND APPROVED FOR ISSUE

ECN-3608

MBN050

7559R0



PLAN - EL 729.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE B)	PRESSURE (PSIA) (NOTE B)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
CONTROL BUILDING SPREADING ROOM C1 EL 729.0	1 AVG.	70	55	ATM (-)	NA	NA	8	NOTE L
	1 MAX.	95	90	ATM (-)	1.5×10^5	NA		
	1 MIN.	60	30	ATM (-)	NA	NA		
	2 MAX	104 } NOTE D	90	ATM (-)	NA	NA		
	2 MIN	50 } NOTE D	10	ATM (-)	NA	4.1×10^4 NA		
	3	NA	NA	ATM	NA	NA		

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT TVA IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE ABNORMAL TEMPERATURE ASSOCIATED WITH BOTH RH IS 90°F. FOR TEMPERATURES ABOVE 90°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

X. THE NOCK(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

X. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-23 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 70°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO A GENERAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-23 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (90% RELATIVE HUMIDITY WILL EXIST UP TO 90 OF THE TEM).

X. THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (NEB-81-1119-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-421 (ESB-5121212).

8610090051-28

TI APERTURE CARD

Also Available On Aperture Card

6179.A	9-9-86				
REVISED NOTES G, H, I, J, L, NO TORN DOSE, ADDED SAF & AMB & DESIGNATION MEB ESGS SYSTEM 4					
REV	ECN/FCR	DATE	DRWN	DSGN	ENGR	SPVR	APPD	TVA

DRWN
DSGN
ENGR
SUPV

SCALE: NTS — EXCEPT AS NOTED

CONTROL BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 729.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

INSPECTED AND APPROVED FOR ISSUE

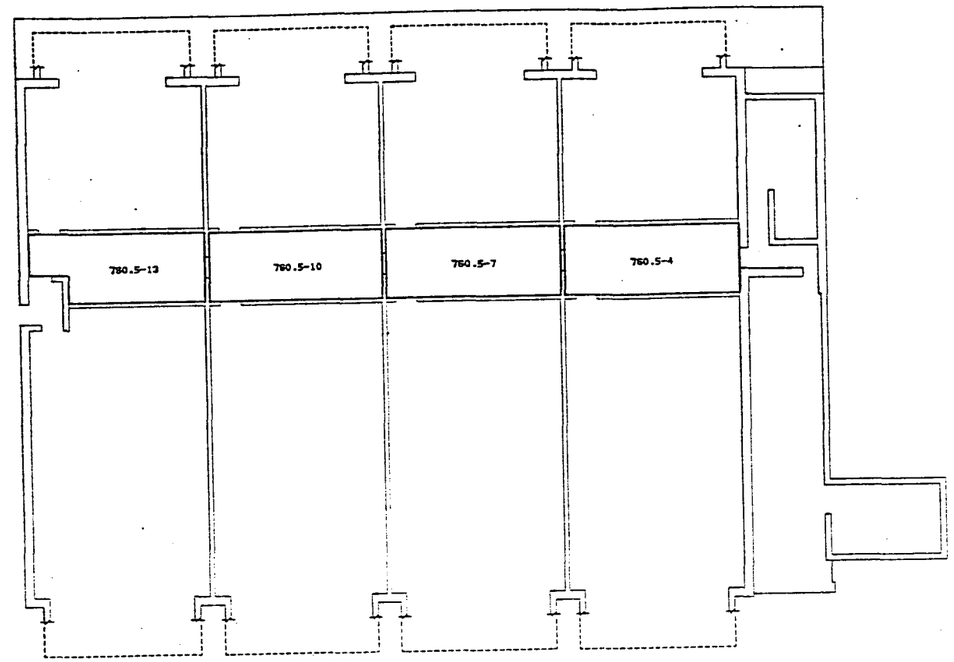
KNOXVILLE | 3 26 73 | 05 | M | 47E235-25 | R1

RETURN DRAWING AS CONSTRUCTED

FORMS REVISED

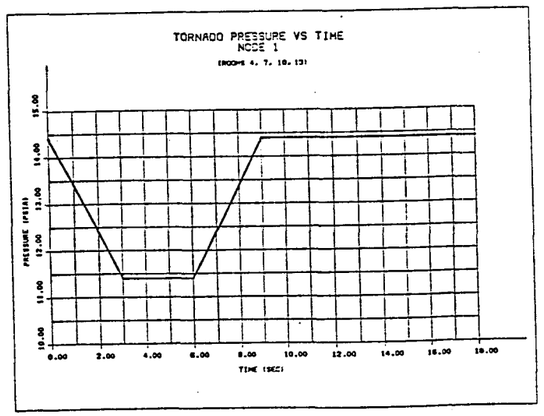
ECN-3608

MBN058



PLAN - EL 760.5

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE D)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE A & C)	AREA TYPE (NOTE J)	FLOODING
DIESEL GENERATOR BUILDING ELECTRICAL BOARD ROOMS 760.5-4 760.5-7 760.5-10 760.5-13	1 AVG MAX MIN	85 104 50	55 90 30	ATM ATM ATM	NA 5.5×10^5 NA	NA NA NA	A	NOTE I
	2 MAX MIN	120 40 NOTE D	90 10	ATM ATM	NA NA	NA 4.1×10^5 NA		
	3	NA	NA	MODE 1	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MSL IS APPROXIMATELY 14.7 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR.

X. THIS AREA HAS NO ENVIRONMENTAL CONTROL.

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB-81-1119-2251).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-421 (EB-831213-214).

8610090051-29

TI APERTURE CARD

Also Available On Aperture Card

NO.	ENV/PER	DATE	DRAWN/CHKD/PROJ ENG/APPD (ESB)
1	WATTS A REVISED NOTES TO REFLECT AS TERA DATA AND ACCIDENT DOSE. ADDED NLR 5 AND DESIGNATION NLR 1 EXCEPTION A	9-9-86	

DRAWN R.G. Fletcher
CHKD
PROJ ENG
APPD

SCALE: NTS EXCEPT AS NOTED

DIESEL GENERATOR BUILDING

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 760.5

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED R.E. Bowman
RECOMMENDED
APPROVED

KNOXVILLE 9-26-83 | BS | N | 47E235-26 | R1

RECORD DRAWING AS CONSTRUCTED

PARTIES REVISED

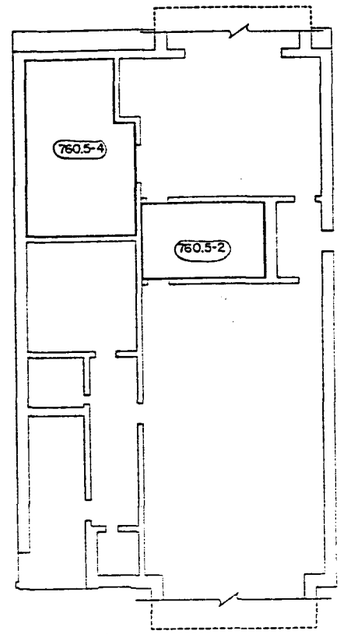
INSPECTED AND APPROVED FOR ISSUE

ECN-3204

47E235-26 | N | 50

75S3R0

MBN053



PLAN - EL 760.5

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. VERANDA

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT ~MN IS APPROXIMATELY 14.6 PSIA. ATM** INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM ** INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA, I.E. GREATER THAN NORMAL HEAT LOADS.

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURES ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES >80°F, THE SPECIFIED HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

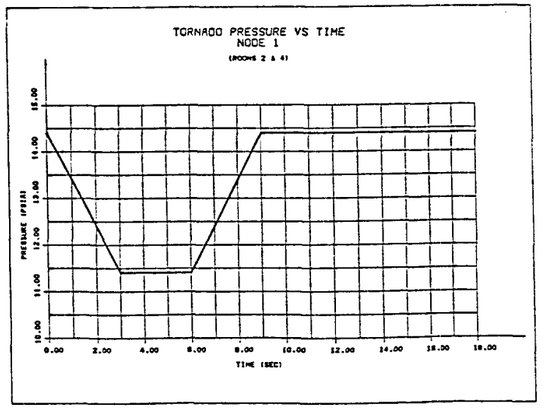
X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (DUE: RELATIVE HUMIDITY WILL EXIST ~ 100 % OF THE YEAR).

X THIS AREA HAS NO ENVIRONMENTAL CONTROL

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)(NOTE G)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS)(NOTE C)	INTEGRATED ACCIDENT DOSE (RADS)(NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
ADDITIONAL DIESEL GENERATOR BUILDING	1 AVG / MAX / MIN	85 / 104 / 40	55 / 80 / 30	ATM / ATM / ATM	NA / 3.5 X 10^5 / NA	NA / NA / NA	A	NOTE I
TRANSFORMER RM (EL 760.5-5) ELECTRICAL BOARD RM (EL 760.5-2)	2 MAX / MIN	120 / 40 NOTE D	90 / 10	ATM / ATM	NA / NA	6.1 X 10^4 / NA		
	3	NA	NA	NODE 1	NA	NA		



REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH WATTS BAR NUCLEAR PLANTS (WEB-81-1119-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-421 (ESB-821213-214).

8610090051-30

TI APERTURE CARD

Also Available On Aperture Card

REV	DATE	DRAWN	CHECKED	APPD	ISSUED
1	11-9-84	[illegible]	[illegible]	[illegible]	[illegible]

REVISED PER DCN [illegible] AND REVISED ELEVATION FROM 762.5 TO 760.5 ADDED D DESIGNATION PER DESCRIPTION

DSN: [illegible]
DWN: [illegible]
CHK: [illegible]
SUP: [illegible]
DSGN: [illegible]

SCALE: NTS — EXCEPT AS NOTED

ADDITIONAL DIESEL GENERATOR BLDG

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 760.5

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

0

SUBMITTED / RECOMMENDED / APPROVED

KNOXVILLE | 8-20-83 | 05 | M | 47E235-27 | R1

NEW DRAWING AS CONSTRUCTED

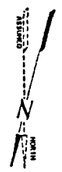
PERTINENT REVIEWED
DES
CHK
REC
MES

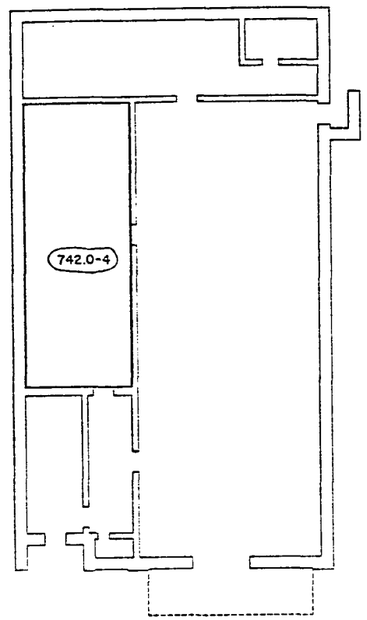
INSPECTED AND APPROVED FOR ISSUE

ECN-3606

MSN060

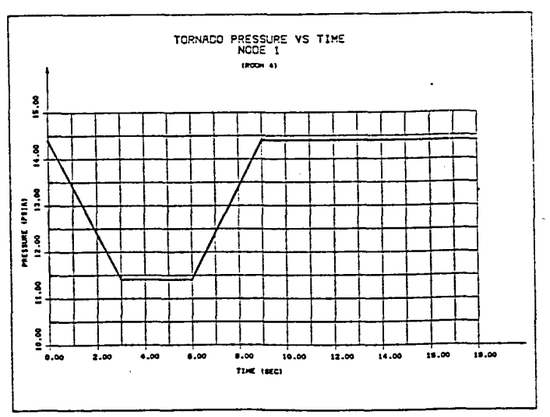
755990





PLAN - EL 742.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
ADDITIONAL DIESEL GENERATOR BUILDING 6.9 KV BOARD ROOM (EL 742.0-4)	1 AVG	85	55	ATM	NA	NA	A	NOTE I
	1 MAX	104	90	ATM	1.5E+05	NA		
	1 MIN	40	30	ATM	NA	NA		
	2 MAX	120 (NOTE D)	90	ATM	NA	6.1E+05		
	2 MIN	40	10	ATM	NA	NA		
	3	NA	NA	MODE 1	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL.
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRF IS APPROXIMATELY 14.6 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS; TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 9 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOAD).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 9 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEPTHE TIME PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-31-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 32°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-31-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS". AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (100% RELATIVE HUMIDITY WILL EXIST UP TO 50% OF THE YEAR).

X THIS AREA HAS NO ENVIRONMENTAL CONTROL.

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB-B1-1119-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-421 (ESA-931213-214).

8610090051-31

TI APERTURE CARD

Also Available On Aperture Card

4178,A							
1	REVISED TO REFLECT CHANGES IN DESIGN CRITERIA.						
0	ISSUED FOR CONSTRUCTION						
REV	ECN/FCR	DATE	DRAWN	CHKD	ENGR	PROJ	APPD

SCALE: NTS — EXCEPT AS NOTED

ADDITIONAL DIESEL GENERATOR BLDG

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 742.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

KNOXVILLE | 1/26/87 | 95 | M | 47E235-28 | R1

RECORD DRAWING AS CONSTRUCTED

PARTIES REVIEWED

INSPECTED AND APPROVED FOR ISSUE

ECN-3604

MEMOS1

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT WBN IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCESSIVES, TEMPORARY, GREATER THAN DESIGN MEAN LOADS, DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

F. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

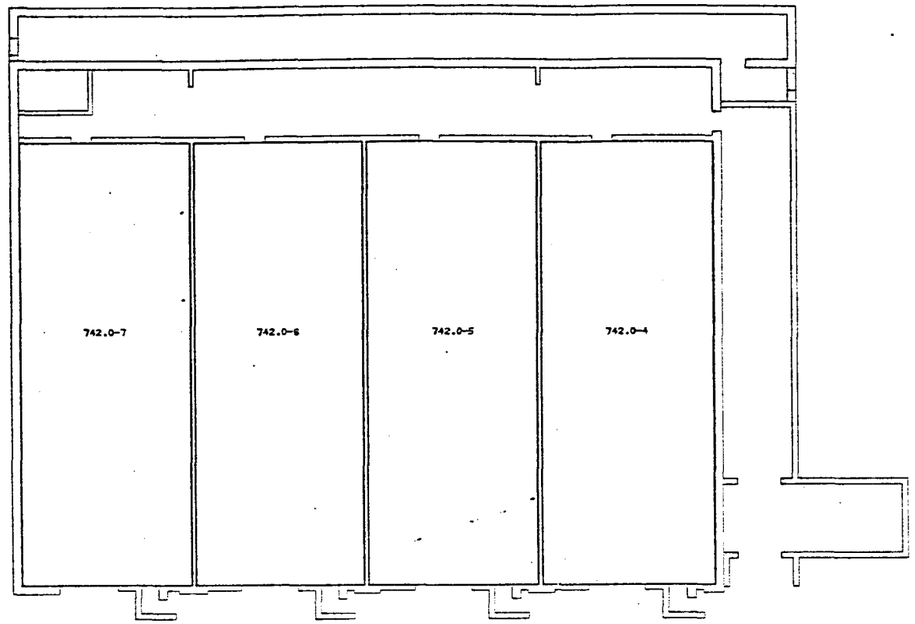
B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHALL BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

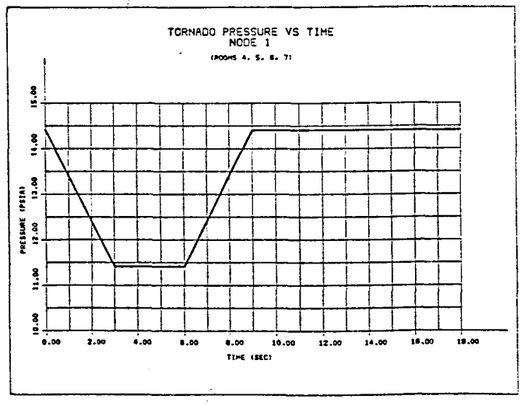
X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE TIME.

X. THIS AREA HAS NO ENVIRONMENTAL CONTROL



PLAN - EL 742.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)		TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTES B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS)(NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
DIESEL GENERATOR BUILDING DIESEL GENERATOR ROOMS 4,5,6,7 EL 742.0	1	AVG MAX MIN	75 100 50	55 80 30	ATM ATM ATM	NA [illegible] NA	NA NA NA	A	NOTE I
	2	MAX MIN	120 (NOTE F) 40 (NOTE D)	90 10	ATM ATM	NA NA	[illegible] NA		
	3		NA	NA	NOTE 1	NA	NA		



REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBS-81-1113-B-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ES8-921213-2 [illegible])

8610090051-32

TI APERTURE CARD

Also Available On Aperture Card

REV	DESCRIPTION	DATE	DRAWN	CHECKED	DESIGN VERIFIED	APPD	ISSUED
1	REVISED NOTES C, D, I, J; 40 YEAR DOSE AND ACCIDENT DOSE, ADDED REFERENCE 2 AND G DESCRIPTION PER EXCEPTION A.	10-4-86	[illegible]	[illegible]	[illegible]	[illegible]	

DRAWN [illegible] DATE [illegible]
DESIGN [illegible] DATE [illegible]
CHKD [illegible] DATE [illegible]
APPD [illegible] DATE [illegible]

SCALE: NTS EXCEPT AS NOTED

DIESEL GENERATOR BUILDING

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 742.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED [illegible] RECOMMENDED [illegible] APPROVED [illegible]

KNOXVILLE 8-26-75 BS H 47E235-29 R1

PRIMARY DRAWING ACCEPTANCE

PERTINENT REVIEWED
EES
CES
MES
SES
INSPECTED AND APPROVED FOR ISSUE

ECN-3016

SHEET
SIZE

7559R0

MBN062

47E235-29 | H | BS

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRF IS APPROXIMATELY 14.4 PSIA. ATM** INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM** INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOAD, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E., GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

F. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

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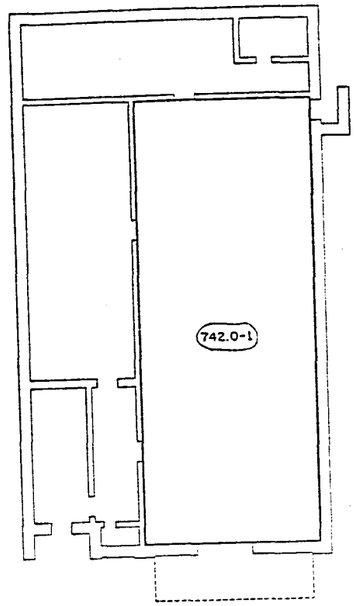
(X) THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 32°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

(X) THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHALL BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

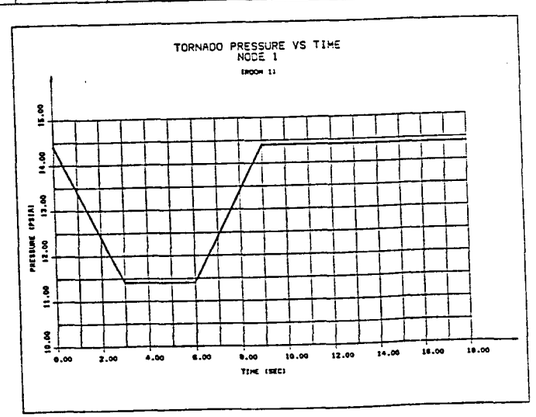
(X) THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (DOES NOT INCLUDE HUMIDITY) THAT EXIST UP TO 5% OF THE YEAR.

(X) THIS AREA HAS NO ENVIRONMENTAL CONTROL



PLAN - EL 742.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
ADDITIONAL DIESEL GENERATOR BUILDING DIESEL GENERATOR RM EL 742.0-1	1 AVG / MAX / MIN	75 104 50	55 80 30	ATM ATM ATM	NA 3.5 x 10^5 NA	NA NA NA	A	NOTE I
	2 MAX / MIN	120 (NOTE F) 40 (NOTE D)	90 10	ATM ATM	NA NA	NA 6.5 x 10^5 NA		
	3	NA	NA	NODE 1	NA	NA		



REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB-B-81-1119-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42).

8610090051-33

TI APERTURE CARD

Also Available On Aperture Card

REV	DESCRIPTION	DATE	PROPOSED	CHECKED	APPROVED	ISSUED
1	REVISED NOTES, ADDED A DESCRIPTION FOR EQ. 2.3.4, ADDED A DESCRIPTION PER EQ. A.					

SCALE: NTS — EXCEPT AS NOTED

ADDITIONAL DIESEL GENERATOR BLDG

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 742.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

KNOXVILLE | 12-13 | 85 M | 47E235-30 | R1

RELEASE DRAWING AS CONSTRUCTED

FURTHER REVIEWED — ECN 3606

INSPECTED AND APPROVED FOR ISSUE

85 M 47E235-30

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

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D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION WILL EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

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G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO two CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

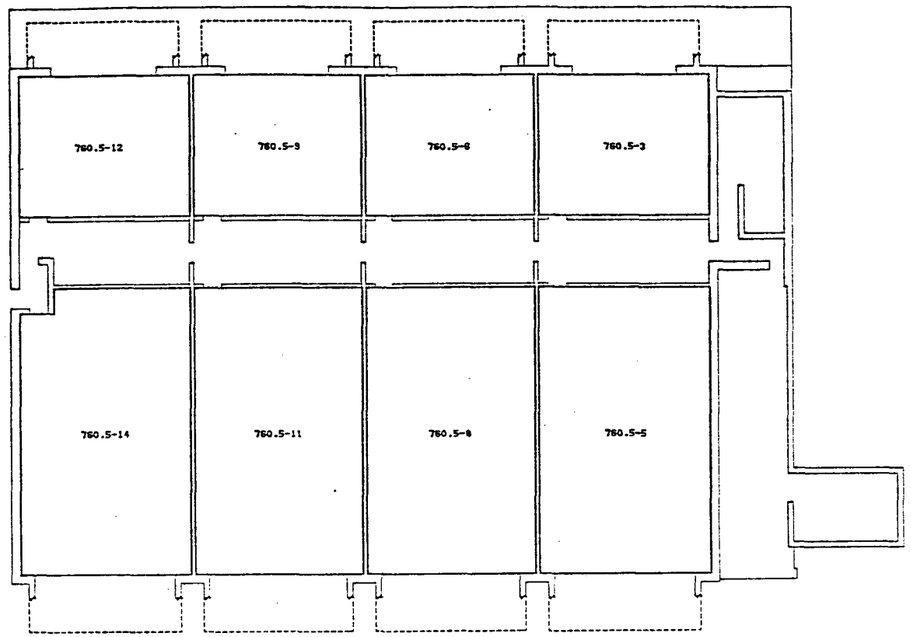
B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

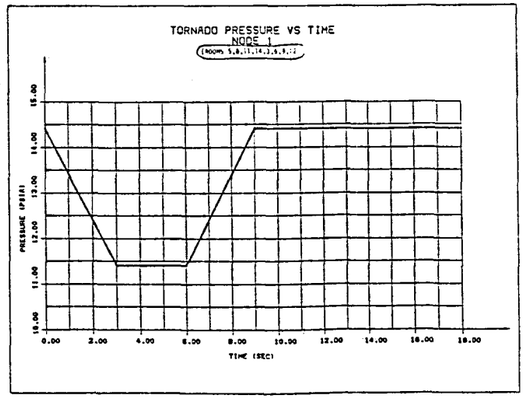
X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (100% RELATIVE HUMIDITY WILL EXIST UP TO 50% OF THE YEAR).

X THIS AREA HAS NO ENVIRONMENTAL CONTROL.



PLAN - EL 760.5

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)		TEMPERATURE (°F)	RELATIVE HUMIDITY (% UNSATURATED)	PRESSURE (PSIA) (NOTE B)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE C)	AREA TYPE (NOTE J)	FLOODING
DIESEL GENERATOR BUILDING AIR INTAKE ROOMS 760.5-2 760.5-8 760.5-11 760.5-14 AIR EXHAUST ROOMS 760.5-3 760.5-6 760.5-9 760.5-12	1	AVG MAX MIN	85 104 50	55 90 30	ATM ATM ATM	NA [illegible]	NA NA NA	A	NOTE I
	2	MAX MIN	120 50 } NOTE D	90 10	ATM ATM	NA NA	<[illegible] NA		
	3		NA	NA	MODE 1	NA	NA		



REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB-DC-[illegible]).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-421 [illegible])

8610090051-34

TI APERTURE CARD

Also Available On Aperture Card

NO	ECN/PCN	DATE	DESCRIPTION
1	6179-A	2-4-86	ADDED "Q" DESIGNATION PER EXCEPTION A.

SCALE: EXCEPT AS NOTED

DIESEL GENERATOR BUILDING

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 760.5

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED | RECOMMENDED | APPROVED

KNOXVILLE | 8-26-83 | BS | M | 47E235-31

REGIONAL DRAWING AS CONSTRUCTED

FURTHER REVIEWED

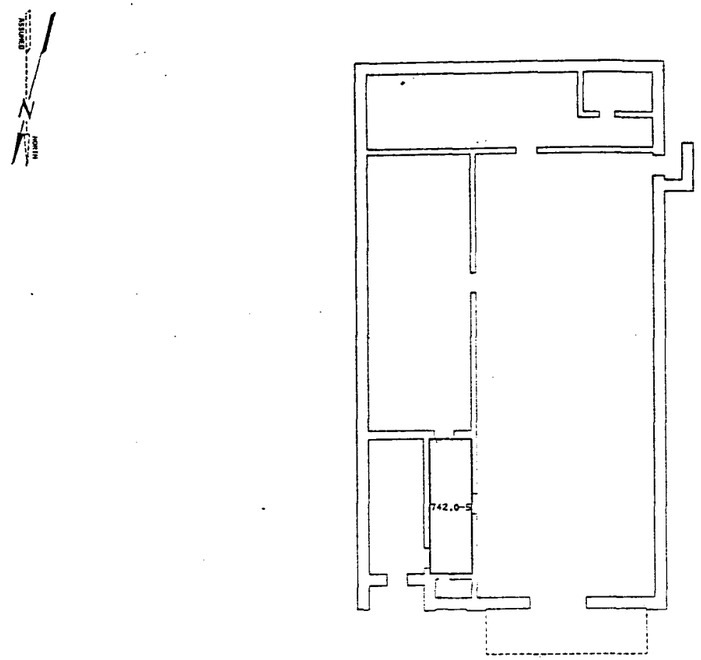
INSPECTED AND APPROVED FOR ISSUE

ECN-9606

47E235-31

MBN054

3191R0



PLAN - EL 742.0

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT WBN IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F. THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

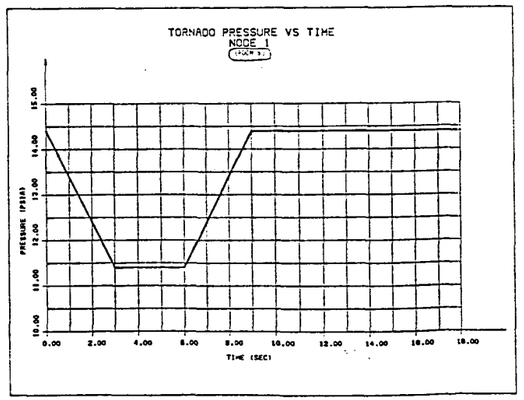
X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR.

X THIS AREA HAS NO ENVIRONMENTAL CONTROL

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
ADDITIONAL DIESEL GENERATOR BUILDING CORRIDOR 742.0-S	1 AVG MAX MIN	85 104 40	53 90 30	ATM ATM ATM	NA 4.5×10^{5} NA	NA NA NA	A	NOTE I
	2 MAX MIN	120 40 NOTE D	90 10	ATM ATM	NA NA	4.2×10^{5} NA		
	3	NA	NA	NODE 1	NA	NA		
	4							
	5							



REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (NEB-81-1119-2251).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (TVA-31)(3-2).

8610090051-35

TI APERTURE CARD

Also Available On Aperture Card

1	6/18/8			REVISED NOTES C.H, I, J.k, NOTES D.G&E, AND DESIGN DATA. INDEX REFERENCE 1 AND D DESIGNATION AND EXCEPTION A.
REV	ECN/FCR	DATE	DRAWN/DESIGN	CHKD/PVRD/APPD/ISSD

SCALE: NTS — EXCEPT AS NOTED

ADDITIONAL DIESEL GENERATOR BLDG

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 742.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

KNOXVILLE 6 20 83 — 85 M 47E235-32 — R1

RECORD DRAWING AS CONSTRUCTED

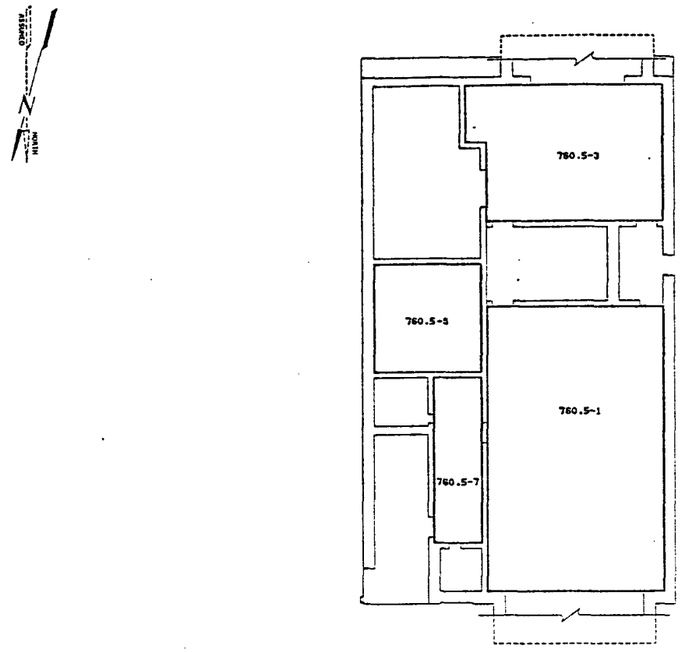
PORTIONS REVIEWED: ES CS EC MS SS

ECN-3006

INSPECTED AND APPROVED FOR ISSUE

WBN065

9131R0



PLAN - EL 760.5

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRF IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 90°F. FOR TEMPERATURES ABOVE 90°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

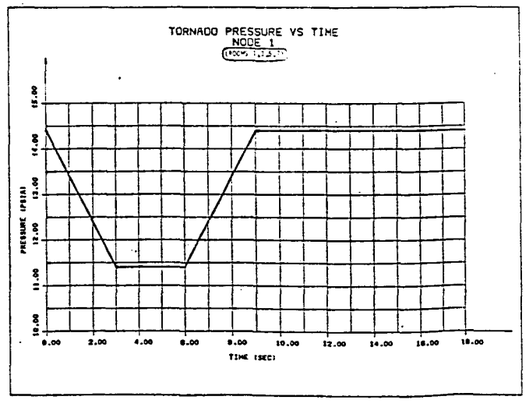
X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 50% OF THE TIME.

X THIS AREA HAS NO ENVIRONMENTAL CONTROL

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
ADDITIONAL DIESEL GENERATOR BUILDING AIR INTAKE ROOM EL 760.5-1	1 AVG MAX MIN	85 104 40	55 80 30	ATM ATM ATM	NA 1.3 E 10^2	NA NA NA	A	NOTE I
AIR EXHAUST ROOM EL 760.5-3	2 MAX MIN	120 40 NOTE D	90 10	ATM ATM	NA NA	NA 41 E 10^5		
FIRE PROTECTION RM EL 760.5-5 CORRIDOR EL 760.5-7	3	NA	NA	MODE 1	NA	NA		



REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB-81-1119-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (626-312-274).

8610090051-36

TI APERTURE CARD

Also Available On Aperture Card

REV	ECN/FCR	DATE	DRAWN	DESIGN	CHECKED	APPROVED	CHIEF
1	6179 A	9-9-86					
0	REVISED NOTES C, H, I, L, G; 40 YEAR DOSE AND ACCIDENT DOSE; ADDED REFERENCE 1; ADD 2 DESIGNATORS PER RECOMMENDAT.						

SCALE: NTS EXCEPT AS NOTED

ADDITIONAL DIESEL GENERATOR BLDG

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 760.5

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED | RECOMMENDED | APPROVED

KNOXVILLE 6-20-73 | 85 | H | 47E235-33 | R1

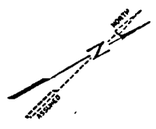
RECORD DRAWING AS CONSTRUCTED

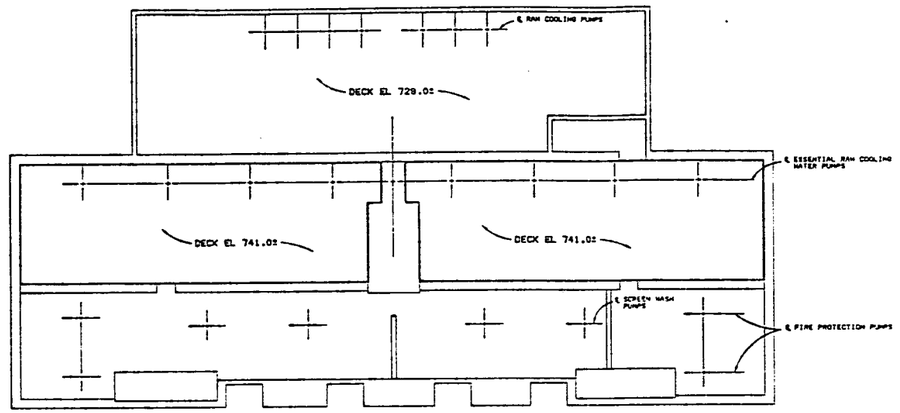
FURTHER REVIEWED

ECN-3006

INSPECTED AND APPROVED FOR ISSUE

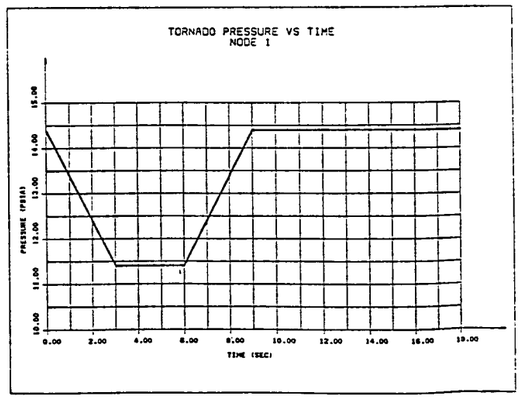
MBN068





PLAN @ EL 728.0 & 741.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE E)	PRESSURE (PSIA) (NOTES B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RAD) (NOTE C)	INTEGRATED ACCIDENT DOSE (RAD) (NOTES B & C)	AREA TYPE (NOTE J)	FLOODING
EACH INTAKE PUMPING STATION PUMP AREA EL 741.0	1 AVG / MAX / MIN	80 / 120 / 10	55 / 100 (NOTE M) / 10	ATM / ATM / ATM	[illegible]	NA / NA / NA	B	(NOTE I)
	2 MAX / MIN	130 / 10 (NOTE D)	100 (NOTE M) / 10	ATM / ATM	NA / NA	[illegible]		
	3	NA	NA	MODE 1	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRW IS APPROXIMATELY 14.6 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 130°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS PER EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 10°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

M. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS. 100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR.

X THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB3-81-1119-205).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-23) (SS-81-213-2).

8610090051-37

TH APERTURE CARD

Also Available On Aperture Card

REV	DESCRIPTION	DATE	DRAWN	CHKD	APPR
1	REVISED NOTES C, D, F, G, AS TO 1% DOSE AND ACCIDENT DOSE, ADDED REFERENCE 2, AND Q DESIGNATION AS NOT EXCEPTIONAL				

SCALE: NTS — EXCEPT AS NOTED

INTAKE PUMPING STATION
WATER SUPPLY UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 728.0 & 741.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

KNOXVILLE | 1-26-83 | BS | M | 47E235-34 | R1

RECORD DRAWING AS CONSTRUCTED

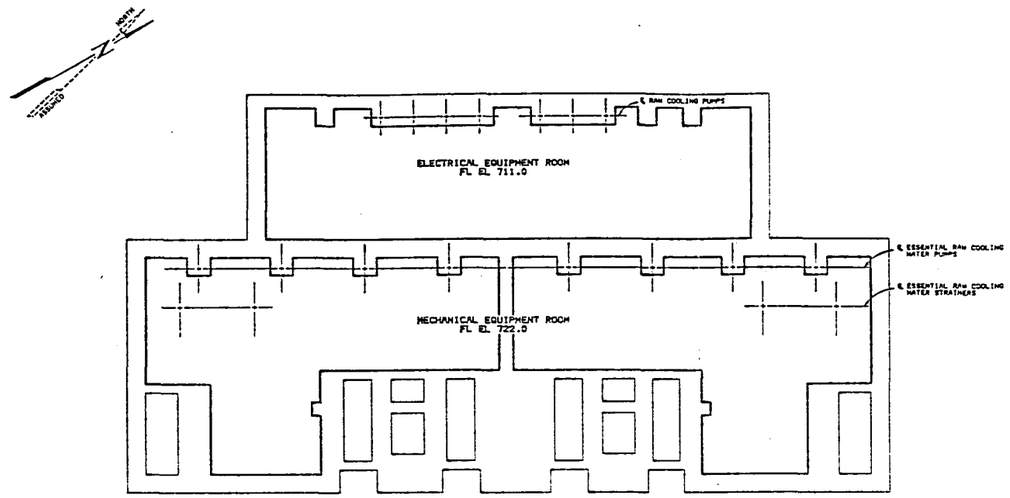
PRINTING REVIEWED

INSPECTED AND APPROVED FOR ISSUE

ECN-3606

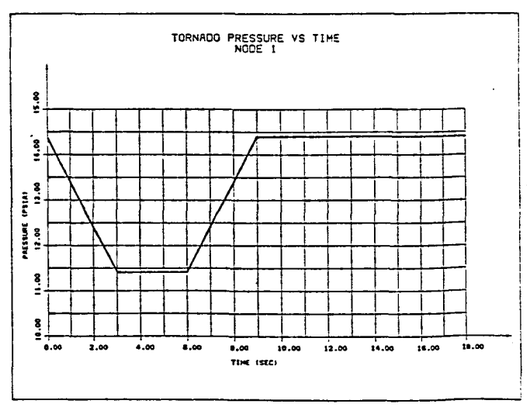
91191R0

M8N051



PLAN BELOW EL 726.0 & 739.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTES B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS)(NOTES A & G)	AREA TYPE (NOTE J)	FLOODING
EPCW INTAKE PUMPING STATION ELECTRICAL EQUIP ROOMS FL EL 711.0 MECHANICAL EQUIP ROOMS FL EL 722.0	1 AVG 1 MAX 1 MIN	75 103 65	55 90 30	ATM ATM ATM	NA 5.5 × 10^12 NA	NA NA NA	A	NOTE L
	2 MAX 2 MIN	110 40 } NOTE D	90 10	ATM ATM	NA NA	0.0 × 10^0 NA		
	3	NA	NA	NODE I	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT WBN IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

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D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEPICT THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

X. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X. THIS PARAMETER MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OR 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD, SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 55 OF THE YEAR.

X. THIS AREA HAS NO ENVIRONMENTAL CONTROL

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBN-81-1119-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (E38-831213-214).

8610090051-38

THE APERTURE CARD

Also Available On Aperture Card

REV	REVISED NOTES 1, 2, 11, 12, 40 YEAR DOSE AND ACCIDENT DOSE. ADDED REFERENCE 2. AND D DESIGNATION PER EXCEPTION A.					
1						

SCALE: NTS — EXCEPT AS NOTED

INTAKE PUMPING STATION
WATER SUPPLY UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 711.0 & 722.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

INSPECTED AND APPROVED FOR ISSUE

KNOXVILLE 3-26-83 BS N 47E235-35 R1

RECORD DRAWING AS CONSTRUCTED

ECN-3606

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT HBM IS APPROXIMATELY 14.6 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM M- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER OCCURRENCE AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. (THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA, I.E., GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X THESE SPACES WILL REACH 130°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 90°F. FOR TEMPERATURES ABOVE 90°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-25 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 30°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

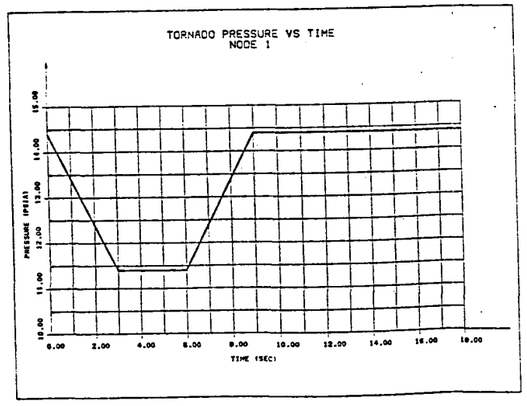
L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-25 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR).

X THIS AREA HAS NO ENVIRONMENTAL CONTROL.

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE G)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING ROOF HYDROGEN CABINET NEAR AUX BLDG DISCHARGE STRUCTURE REFUELING WATER STORAGE TANKS	1 AVG / MAX / MIN	60 92 19	50 100 20	ATM ATM ATM	NA (TABLE 2) NA	NA NA NA	NA	NOTE (I).
	2 MAX / MIN	102 8 } NOTE D	100 10	ATM ATM	NA NA	NA (TABLE 2) NA		
	3	NA	NA	MODE 1	NA	NA		

TABLE 2	
LOCATION	DOSE (RADS)
AUX BLDG ROOF	1.8×10^3
H_2 CABINET	3.5×10^2
RWST	1.8×10^4



REFERENCES:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB-81-1119-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (25-53123-3).

8610090051-39

TI APERTURE CARD

Also Available On Aperture Card

REV	ECN/TCP	DATE	DESCRIPTION	DRWN	DSGN	APPD	CHKD
1	6176 A	9-4-86	ADDED 'X' DESIGNATION PER EXCEPTION A.				

SCALE: NTS — EXCEPT AS NOTED

OUTSIDE ATMOSPHERE

ENVIRONMENTAL DATA
ENVIRONMENT - MILD

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

KNOXVILLE 3-26-85 | 85 | M | 47E235-36 | R1

RECORD DRAWING AS CONSTRUCTED

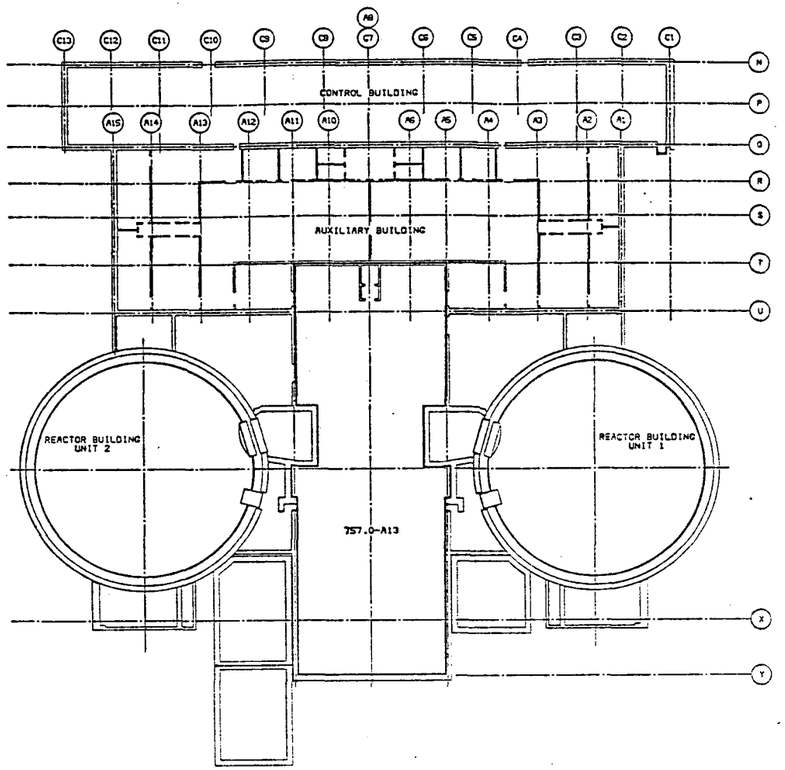
INSPECTED AND APPROVED FOR ISSUE

PREVIOUS REVIEWED

ECN: 3606

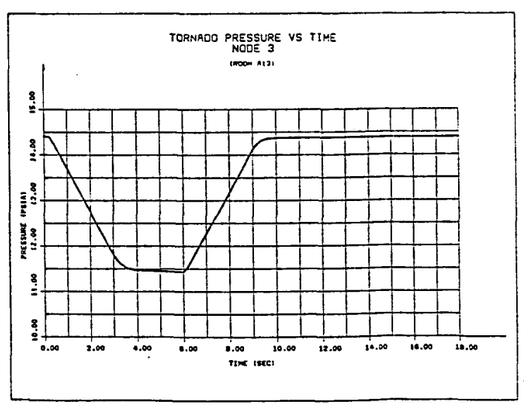
47E235-36 | M | 85

9133R0



PLAN - EL 755.0 & 757.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE D)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING REFUELING FLOOR A13 EL 757.0	1 AVG	80	53	ATM (-)	NA	NA	B	NOTE I
	1 MAX	104	85	ATM (-)	[illegible]	NA		
	1 MIN	60	30	ATM (-)	NA	NA		
	2 MAX	115 NOTE G	90	ATM (-)	NA	NA		
	2 MIN	40	10	ATM (-)	NA	<1 X 10^7 NOTE R		
	3	NA	NA	NODE 3	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT WBN IS APPROXIMATELY 14.4 PSIA. ATM(+) INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM(-) INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E., GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-23 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

X. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-23 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD, SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS. 100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR.

X. THIS AREA HAS NO ENVIRONMENTAL CONTROL

R. A FUEL HANDLING ACCIDENT WILL RESULT IN A DOSE LESS THAN 1 X 10^7 RADS.

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB-DC-40-2301).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-A21 (ES9-931213-21).

8610090051-40

TI APERTURE CARD

Also Available On Aperture Card

1	6/18/8	REVISED NOTES C, D, E, I, J AND R. ADDED NOTE R AND REFERENCE 2. ADDED Q DESIGNATION PER EXCEPTION A.
CH	DATE	DESCRIPTION

SCALE: EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 757.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED | RECOMMENDED | APPROVED

KNOXVILLE 3-26-83 | BS | M | 47E235-37 | R1

PRIMARY DRAWING AS CONSTRUCTED

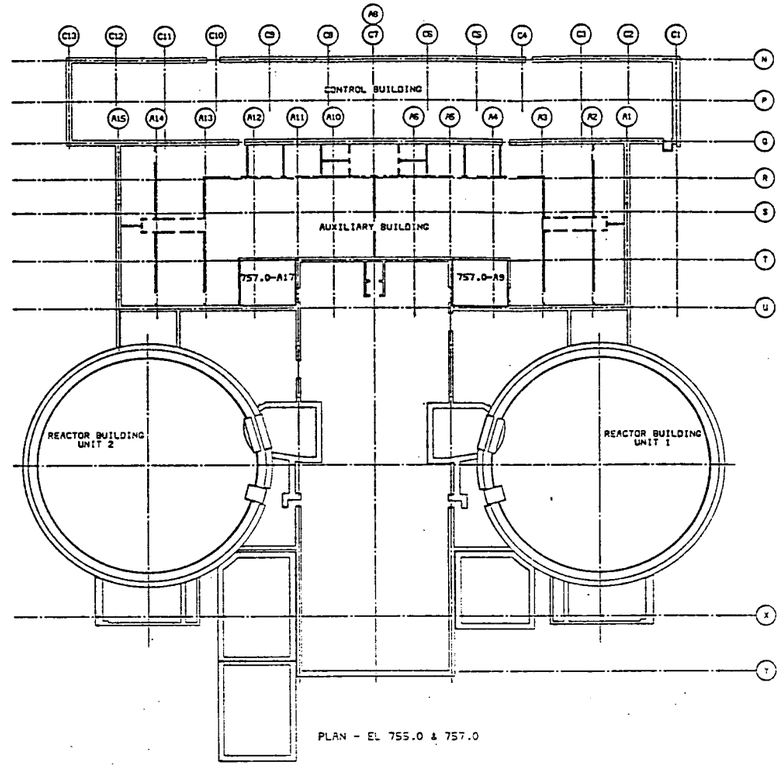
FURTHER REVIEWED

DEO
CCE
MEE
NEE

INSPECTED AND APPROVED FOR ISSUE

FORM 3600

MBN057



PLAN - EL 755.0 & 757.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE B)	PRESSURE (PSIA) (NOTE D)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING PERSONNEL & EQPT ACCESS ROOMS A9-A17 EL 757.0	1 AVG	78	50	ATM (-)	NA	NA	A	NOTE I
	1 MAX	80	65	ATM (-)	NA	NA		
	1 MIN	80	40	ATM (-)	NA	NA		
	2 MAX	104	90	ATM (-)	NA	NA		
	2 MIN	80 NOTE G	10	ATM (-)	NA	<1 X 10⁻⁶		
	3	NA	NA	ATM	NA	NA		

X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRN IS APPROXIMATELY 14.6 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

F. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH BOTH RELATIVE HUMIDITIES FOR TEMPERATURES LESS THAN THE SPECIFIED HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE MODELS LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

I. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

K. THIS ABNORMAL HIGH TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT MIDDAY TIME. THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE MIDDAY HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM 8 HOUR TIMEFRAME. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD, AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

M. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS (COLD, RELATIVE HUMIDITY WILL EXIST UP TO 8% OF THE TIME).

N. THIS AREA HAS NO ENVIRONMENTAL CONTROL.

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBS-81-5119-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-402) (ESM-STT-73-21).

8610090051-41

REV	DESCRIPTION	DATE	APPROVED
2	6174.4 REVISED NOTES C.2, E, L AND M; NEW DATE, ADDED REF 2 AND D DESIGNATION PER DCN A		
Q1	ECN-6170	DATE	
1	4542 DELETED TORNADO CURVE AND REMARKED SHEET FROM 757.0 TO 755.0		
Q1	ECN-4542	DATE	

DRAWN / DATE / CHKD / DATE / APPD / DATE

REF

SCALE: EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 757.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED / RECOMMENDED / APPROVED

KNOXVILLE 8-26-83 | 85 | M | 47E235-38 | R2

BEING DRAWN AS CONSTRUCTED

FURTHER REVIEWED

INSPECTED AND APPROVED FOR ISSUE

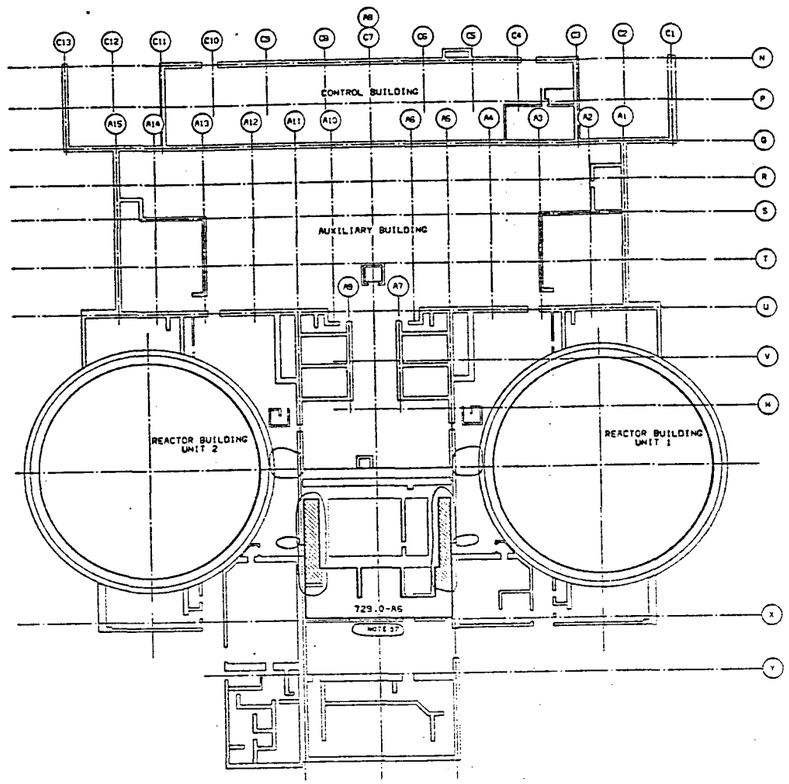
ECN-3606

THE APERTURE CARD
Also Available On Aperture Card

47E235-38 | M | 85

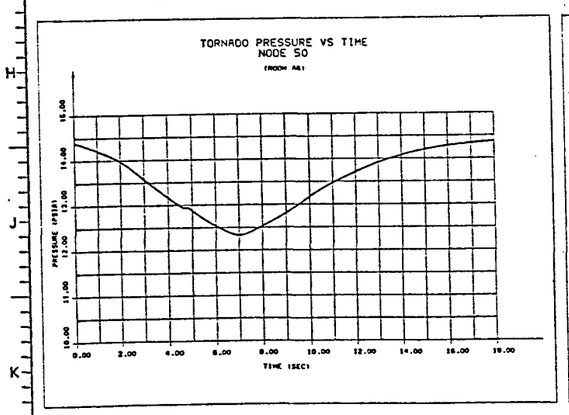
9193R0

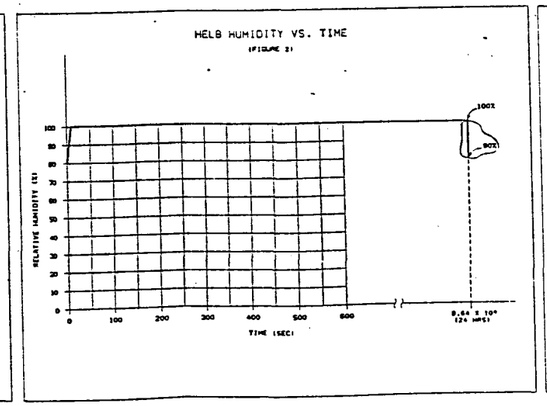
MBN068

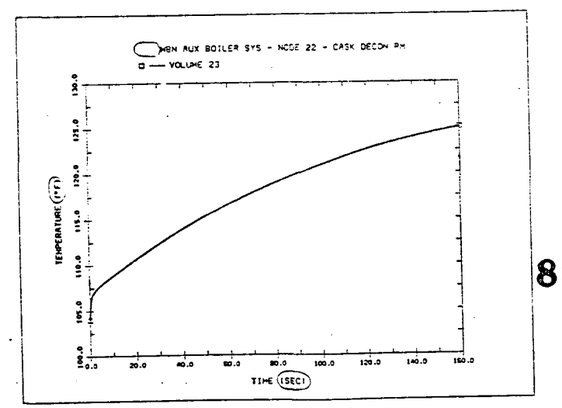


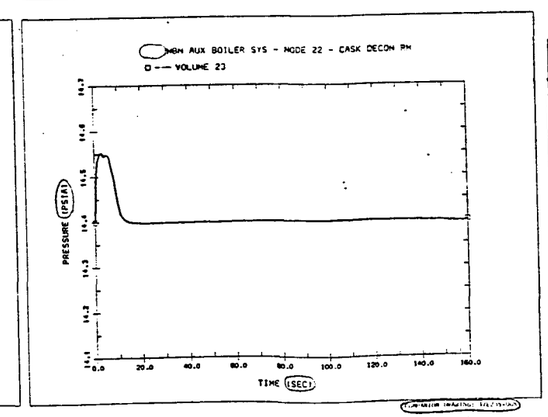
PLAN - EL 729.0 & 737.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS)(NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS)(NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING NITROGEN ENV. STORAGE AREA A6 EL 729.0	1 AVG / MAX / MIN	80 / 104 / 60	55 / 80 / 30	ATM (-) / ATM (-) / ATM (-)	NA / 1.8×10^{-5} / NA	NA / NA / NA	B	NOTE 16
	2 MAX / MIN	110 / 40 } NOTE 8	30 / 10 } NOTE 10	ATM (+) / ATM (+)	NA / NA	NA / NA		
	3	NA	NA	NA	NA	1.5×10^{6} NOTE 32		
	4	NOTE 52	100 } NOTE 52 FIGURE 2	NOTE 52	NA	NA		NOTE 28
	5	NA	NA	NOTE 6 NODE 50	NA	NA		









NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:

   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION

2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MRM IS APPROXIMATELY 14.4 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -3.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE ICES ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

4. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

8. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY OPERATION WITH DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE EITHER (A) FROM "LOCA" TOTAL RADIATION DOSE (GAMMA) OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES OR (B) THE HEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION-SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:

   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

28. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

32. THE LOCA DOSE GIVEN IS THE LARGEST DOSE EXPECTED IN THE ROOM. IF EQUIPMENT CANNOT BE QUALIFIED TO THIS DOSE, REFINED LOCATION SPECIFIC VALUES SHOULD BE OBTAINED FROM THE HEB RADIOLOGICAL PROTECTION SECTION (RPS-S). ON AN AS NECESSARY BASIS.

38. THE HELB'S DESCRIBED IN NOTE 52 WILL NOT CAUSE FLOODING IN THIS AREA.

52. THIS SPACE IS ONLY AFFECTED BY A BREAK IN THE AUXILIARY BOILER SYSTEM. TEMPERATURE, PRESSURE, AND RELATIVE HUMIDITY PROFILES FOR THIS BREAK ARE ALL INCLUDED ON THIS SHEET. THE VOLUME NUMBER CORRESPONDS TO THE AREA HIGHLIGHTED ON THE KEY PLAN, WHILE THE NODE NUMBER IDENTIFIES WHERE THE BREAK IS POSTULATED TO OCCUR. NODE NUMBER LOCATIONS ARE IDENTIFIED ON SHEET 8A. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DECREASE LINEARLY TO THE NORMAL MAXIMUM VALUE GIVEN IN THE ENVIRONMENTAL TABLE THE END OF 24 HOURS IF IT HAS NOT REACHED THAT VALUE WITHIN THE TIME SCALE OF THE FIGURE.

57. THE SHADED AREA ABOVE EL 737.0 (UNIT 1 SIDE), EL 736.0 (UNIT 2 SIDE) IS ENVIRONMENTALLY HARSH. SEE DRAWING 47E235-40. THE SHADED AREA BELOW 737.0 (UNIT 1 SIDE), EL 736.0 (UNIT 2 SIDE) IS PART OF THE PARSE SAMPLE AREA WHICH IS SHOWN ON DRAWING 47E235-41.

TI APERTURE CARD

Also Available On Aperture Card

8610090051-42

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (NED 82-0726-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-421 (ESB-831213-2114)

REV NO.	ECN/FCN	DATE	DSGN	DRWN	CHKD	RVWD	APPD	TSSD
4	6176-A	0996	RAS	JCS	VHE	MAD	RAF	

REVISED 40 YEAR DOSE, KEY PLAN, HELB FIGURES, NOTES 1,4,11,16,38,FIG 5 AND REF 2. ADDED NOTES 28,32 AND 57. DELETED NOTE 13 AND RENUMBERED FIGURE 4 AS FIGURE 2. DELETED SGN APPLICABILITY FROM PROFILES. ADDED COMMON DRAWING NUMBER AND Q DESIGNATION PER EXCEPTION A.

REV NO.	ECN/FCN	DATE	DSGN	DRWN	CHKD	RVWD	APPD	TSSD
3	5594	3-27-85	SAB	RAD	RAS	GEC	JAR	JCS

CHANGED INTEGRATED ACCIDENT DOSE. ADDED NOTE 32.

REV NO.	ECN/FCN	DATE	DSGN	DRWN	CHKD	RVWD	APPD	TSSD
2	4900	6-20-84	RAS	JHC	WCE	GEC	JAR	JCS

CORRECTED ENV. DATA IN OPERATING CONDITIONS 2,3, & 5

REV NO.	ECN/FCN	DATE	DSGN	DRWN	CHKD	RVWD	APPD	TSSD
1	4542	3-8-84	RAS	RAD	SAB	GEC	JAR	JCS

AREA REDEFINED AS HARSH ENVIRONMENT AND SHEET RENUMBERED

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 729.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

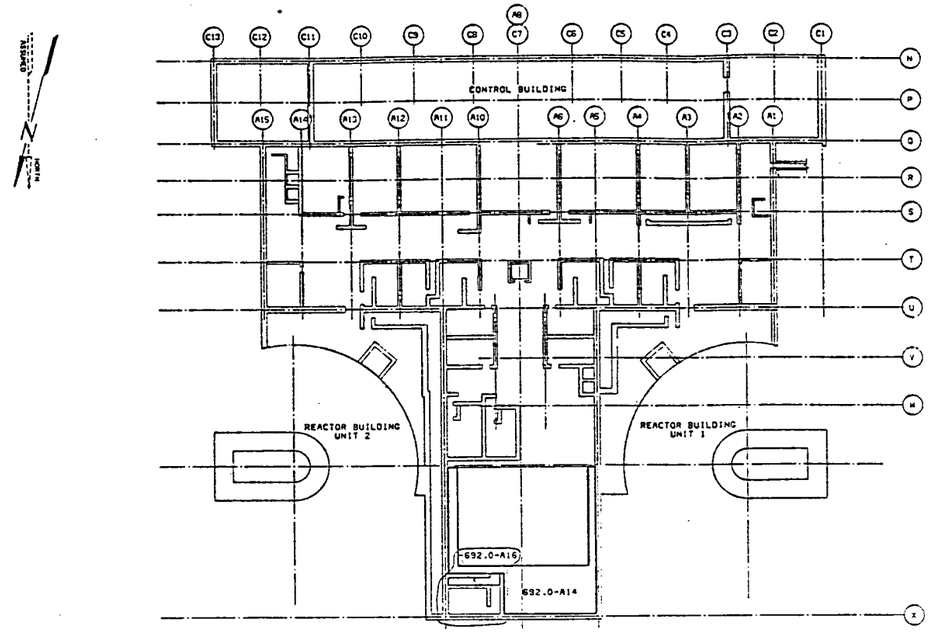
Q

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R. A. RUTLEDGE	CHECKED R. D. CRAWFORD	1	2	
DESIGNED R. A. RUTLEDGE	SUBMITTED R. D. CRAWFORD	3	4	

KNOXVILLE — DATE — 05 — M — 47E235-39 — R4

ISSUED BY:

WBN057

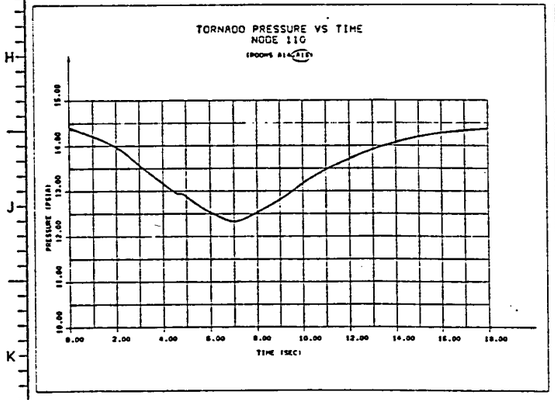


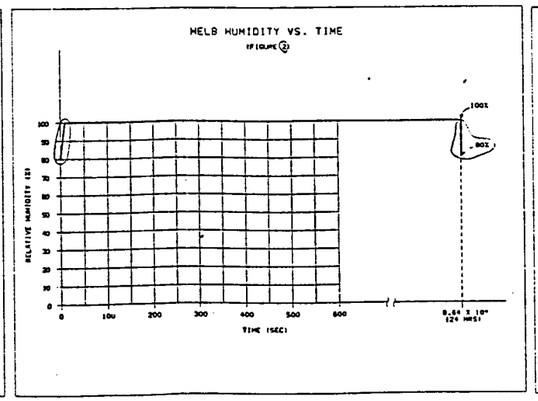
PLAN - EL 692.0

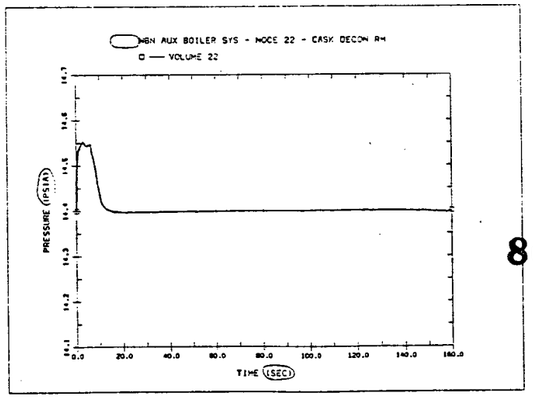
TABLE 1					
ROOM NO.	HELB				
	PRESSURE (PSI)	MAX	MIN	RH	
A14 A16	2"	1"	1"	1"	

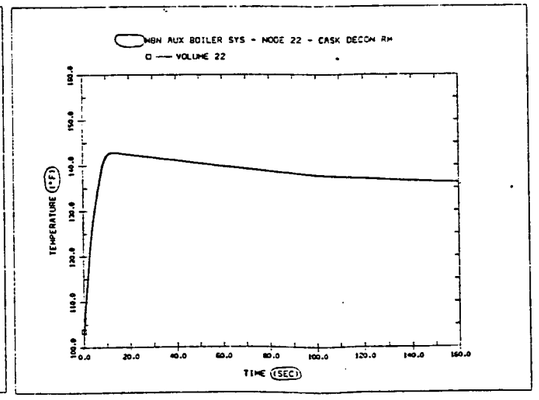
TABLE 2	
ROOM NO.	DOSE (RADS)
A14	$<3.5 \times 10^{6}$
A16	1.9×10^{7}

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIG) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS)(NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS)(NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING CASK DECONTAMINATION ROOM A14 VALVE GALLERY A16 EL 692.0	1 AVG	80	55	ATM (+)	NOTE 7 TABLE 2	NA	B	NOTE 16
	MAX	104	80	ATM (+)		NA		
	MIN	60	30	ATM (+)		NA		
	2 MAX	110	90 NOTE 10	ATM (+)	NA	NA		
	MIN	40 NOTE 8	10	ATM (+)	NA	NA		
	3	NA	NA	NA	NA	<1X10⁶		NOTE 33 TABLE 1
	4	NOTE 33	100 (NOTE 33 FIGURE 6)	NOTE 33	NA	NA		
	5	NA	NA	NOTE 5 NODE 110	NA	NA		









NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:

   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (NOPSF, CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION

2. ATM (-) INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MSL IS APPROXIMATELY 14.6 PSIA.

   ATM (+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

3. ATM (-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE ECTS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

4. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 12 OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 12 OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. FOR INTEGRATED ACCIDENT DOSE GIVEN FOR A 30-DAY EXCURSION, THE TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE NEW RADIATION PROTECTION SECTION MUST BE CONSULTED FOR LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:

   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-25 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

33. THE ONLY HELB WHICH AFFECTS THE TEMPERATURE, PRESSURE, AND RELATIVE HUMIDITY IN THIS AREA IS AN AUXILIARY BOILER LINE BREAK. TEMPERATURE, PRESSURE, AND RELATIVE HUMIDITY PROFILES FOR THIS BREAK ARE ALL INCLUDED ON THIS SHEET. THE VOLUME NUMBER CORRESPONDS TO THE AREA HIGHLIGHTED ON THE KEY PLAN WHILE THE NODE NUMBER IDENTIFIES WHERE THE BREAK IS POSTULATED TO OCCUR. NODE NUMBER LOCATIONS ARE IDENTIFIED ON SHEET 84. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DECREASE LINEARLY TO THE NORMAL MAXIMUM VALUE GIVEN IN THE ENVIRONMENTAL TABLE AT THE END OF 24 HOURS IF IT HAS NOT REACHED THAT VALUE WITHIN THE TIME SCALE OF THE FIGURE. TABLE 1 SPECIFIES THE FLOOD LEVELS RESULTING FROM BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW), STEAM SUPPLY, AUXILIARY BOILER (ABB), RESIDUAL HEAT REMOVAL (RHR), AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS).

TI APERTURE CARD

Also Available On Aperture Card

8610090051-43

REFERENCES:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBP 82-0726-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-831213-214).

NO.	ECN/FCN	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD	
3	6179 A	7-9-86	MC	VAZ	WEP	SAB	JAM	[illegible]	
2	4900	6-20-84	RAS	JHC	HCC	GEG	JAM	JCS	
1	4542	3-8-84	RHS	RAO	SAB	GEG	JAM	JCS	

REVISED 40 YEAR DOSE, KEY PLAN, HELB FIGURES, NOTES 1,6,11,16, FIGURE 2 AND REF 2, ADDED NOTE 33, TABLES 1 & 2 AND ROOM A16, DELETED NOTE 13 AND RENUMBERED FIGURE 6 AS FIGURE 2, DELETED SGN APPLICABILITY FROM PROFILES, ADDED COMPANION DRAWING NUMBER AND Q DESIGNATION PER ECN A.

CORRECTED ENV. DATA IN OPERATING CONDITIONS 2,3, & 5

AREA REDEFINED AS HARSH ENVIRONMENT.

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 692.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A. DOTSON	CHECKED R.H. CAMPBELL	1	2	J.R. RAULSTON
DESIGNED R.A. SULFRIDGE	SUBMITTED G.E. GERMAN	3	4	

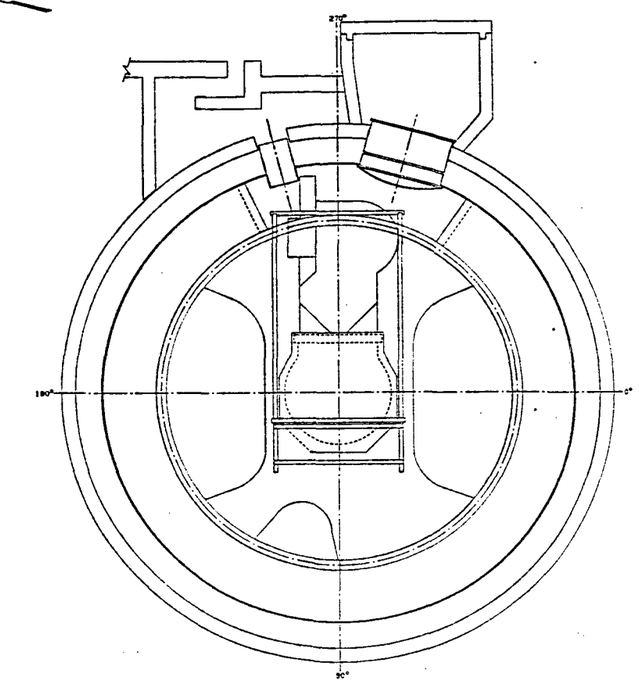
KNOXVILLE | DATE 8-26-83 | 85 | N | 47E235-40 | R3

COMPANION DRAWING: 47E235-00B

ECN-3806

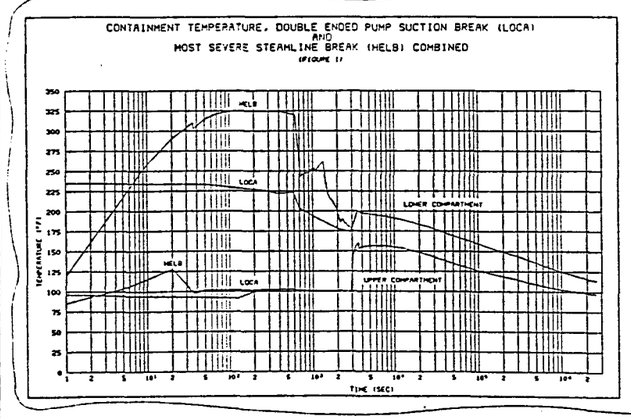
ISSUED BY: J.C. STANDIFER

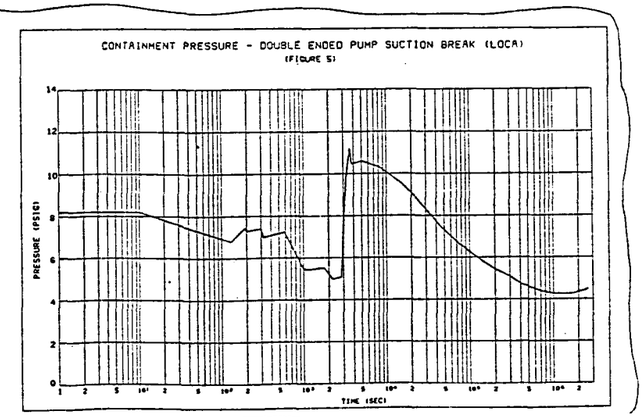
WBN069



PLAN-UPPER COMPARTMENT

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
REACTOR BUILDING CONTAINMENT UPPER COMPARTMENT	1 AVG MAX MIN	100 113 60	40 80 30	ATM ± 14.7 } NOTE 3 14.3	NA 1.0×10^8 NA	NA NA NA	A	NA
	2 MAX MIN	120 50 } NOTE 9	30 10 } NOTE 10	14.7 14.3 } NOTE 3	NA NA	NA NA		NA
	3	281 NOTE 7	100 NOTE 7, 46	25.0 NOTE 7	NA	4.7×10^8 BETA 3.8×10^7 GAMMA NOTE 60		NOTE 5.22
	6	NA	100 NOTE 19	12.4 NOTE 19	NA	NA		NOTE 5.22





NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE, LARGE BREAK FOR PRESSURE) (NO FUEL HANDLING ACCIDENT)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUCTION PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION - SEE NOTE 19

2. ATM. -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MRN IS APPROXIMATELY 14.6 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE ICETS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

3. THE NORMAL PRESSURE RANGE INSIDE PRIMARY CONTAINMENT AND THE INSTRUMENT ROOM IS -0.1 TO +0.3 PSIG. PRESSURES DUE TO ABNORMAL CONDITIONS WILL NOT EXCEED THIS RANGE. ANY PRESSURES OUTSIDE THIS RANGE ARE THE RESULT OF AN ACCIDENT CONDITION. SEE OPERATIONAL CONDITION 3.

5. FOLLOWING A LOCA THE CONTAINMENT SPRAY SYSTEM WILL BE ACTIVATED AND FLOODING WILL OCCUR. THE SURGE FLOOD LEVEL INSIDE THE CRANE WALL IS 722.0 FT WHILE STEADY STATE LEVEL BOTH INSIDE AND OUTSIDE THE CRANE WALL IS 713.7 FT. INSTRUMENT ROOMS WILL FLOOD TO STEADY STATE ELEVATIONS. CONTAINMENT SPRAY DURATION IS LESS THAN OR EQUAL TO 30 DAYS. CONTAINMENT SPRAY FLOW RATE IS EQUAL TO 9100 GPM OR 0.92 GPM PER SQUARE FOOT OF CONTAINMENT CROSS SECTION. ALL EQUIPMENT REQUIRED FOR PLANT SAFETY MUST BE LOCATED ABOVE APPLICABLE FLOOD ELEVATIONS OR OTHERWISE HAVE FLOOD PROTECTION.

   ALL ACCESSES AND PENETRATIONS BELOW THE OUTSIDE MAXIMUM POSSIBLE FLOOD LEVEL IN THE SHIELD BUILDING ARE DESIGNED TO BE WATERTIGHT. THEREFORE, THE ANNULUS AND PRIMARY CONTAINMENT ARE NOT AFFECTED BY THIS DBE. OUTSIDE FLOOD LEVELS ARE DEFINED IN DESIGN CRITERIA WB-DC-40-23.

7. FIGURE 1 SHOWS WORST CASE TEMPERATURE VS TIME PROFILES FOR BOTH UPPER AND LOWER COMPARTMENTS. THESE CURVES TAKE INTO ACCOUNT THE EFFECTS OF BOTH A DOUBLE ENDED PUMP SUCTION BREAK (LOCA) AND MOST SEVERE STEAM LINE BREAK (HELB). IN ADDITION, SEPARATE TEMPERATURE PROFILES ARE SHOWN FOR BOTH LOCA AND HELB CONDITIONS. RELATIVE HUMIDITY IN BOTH COMPARTMENTS WILL INCREASE TO 100% DURING THE FIRST FEW SECONDS AND WILL REMAIN AT THAT VALUE UNTIL 10 SECONDS, AFTER WHICH TIME IT WILL DECREASE LINEARLY TO THE NORMAL MAXIMUM VALUE OF 80% AT 30 DAYS. THE PRESSURE CURVE (FIGURE 5) FOR A LOCA AND COMPLETELY ENVELOPES THE HELB PRESSURE PROFILE.

8. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS; TEMPORARY GREATER THAN DESIGN HEAT LOADS; OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN IS FOR A LOCA, OR FUEL HANDLING ACCIDENT. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE WEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

19. ADVERSE CONDITIONS RESULTING FROM INADVERTENT CONTAINMENT SPRAY (CONDITION 6) WILL EXIST FOR UP TO ONE HOUR THEN RETURN TO NORMAL LINEARLY WITHIN 8 HOURS. THIS EVENT SHOULD BE CONTROLLED TO OCCUR NO MORE THAN 8 TIMES DURING PLANT LIFE.

22. CHEMICAL SPRAY: THE CHEMICAL COMPOSITION OF THE CONTAINMENT SPRAY WAS BASED ON THE FOLLOWING SOLUTIONS WHICH RESULT IN THE MOST SEVERE SERVICE CONDITIONS:
   1. ICE CONDENSER - QUANTITY OF ICE - 2.7195×10^6 POUNDS - BORON CONCENTRATION - 1800 PPM B ADDED AS $Na_2B_4O_7 \cdot 10H_2O$.
   2. BORON INJECTION TANK - VOLUME - 900 GAL - BORON CONCENTRATION (2100) PPM B IN THE FORM OF H_3BO_3.
   3. COLD LEG INJECTION ACCUMULATORS (4 TANKS) - VOLUME (10,096 FT³) - BORON CONCENTRATION: (2000) PPM B IN THE FORM OF H_3BO_3.
   4. UPPER HEAD INJECTION - VOLUME - (1800) FT³ - BORON CONCENTRATION: (2100) PPM B IN THE FORM OF H_3BO_3.
   5. REFUELING WATER STORAGE TANK - VOLUME - (375,000) GAL - BORON CONCENTRATION (2100) PPM B IN THE FORM OF H_3BO_3.
   6. REACTOR COOLANT SYSTEM - VOLUME - (7116) FT³ - MAXIMUM BORON CONCENTRATION: (2100) PPM B IN THE FORM OF H_3BO_3.

   RESULTS: THE SOLUTIONS STATED ABOVE YIELD A RESULTING CONCENTRATION OF (0.115 MOLAR H_3BO_3, (1000 PPM BORON), 0.033 MOLAR $NaOH$ RESULTING IN A PH OF (9.5) AT 25°C.

   NOTE: THIS CHEMICAL COMPOSITION IS ENVELOPED BY THE REQUIREMENTS IN IEEE-323 1974.

29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

46. UNSEALED CONDUITS AND COMPONENTS LOCATED INSIDE PRIMARY CONTAINMENT ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF A LOCA OR HELB. AN EVALUATION SHOULD BE PERFORMED TO DETERMINE IF SEALING IS NECESSARY TO PREVENT THE SHORT TERM EFFECTS OF PRESSURE INDUCED MOISTURE INTRUSION AND THE LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.

60. A FUEL HANDLING ACCIDENT CAN RESULT IN A MAXIMUM DOSE OF 2.0×10^4 RADS IN THE UPPER COMPARTMENT.

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB 82-0726-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESA-831213-214).

TI APERTURE CARD

Also Available On Aperture Card

8610090051-44

REV NO	ECN/FCN	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD
1	6178-A	9-9-86						

REVISED PER PLAN. NOTES 1-5, 7, 11, 22; NORMAL DOSE-ACCIDENT DOSE-PEAK PRESSURE-FLOOD-MIN ATM PRESSURE. DELETED FIGURE 4, AND NOTES 5 AND 24. ADDED NOTES 46, 60. AND REF 2. ADDED Q DESIGNATION PER REQUIREMENTS.

SCALE: NTS — EXCEPT AS NOTED

REACTOR BUILDING
UNIT 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
UPPER COMPARTMENT

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.DOTSON	CHECKED R.R.CAMPBELL	1	2	J.A.RAULSTON
DESIGNED R.A.SULFRIDGE	SUBMITTED G.E.GERMAN	3	4	

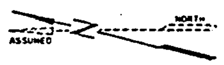
KNOXVILLE — DATE 8-26-83 — 85 M 47E235-41 R1

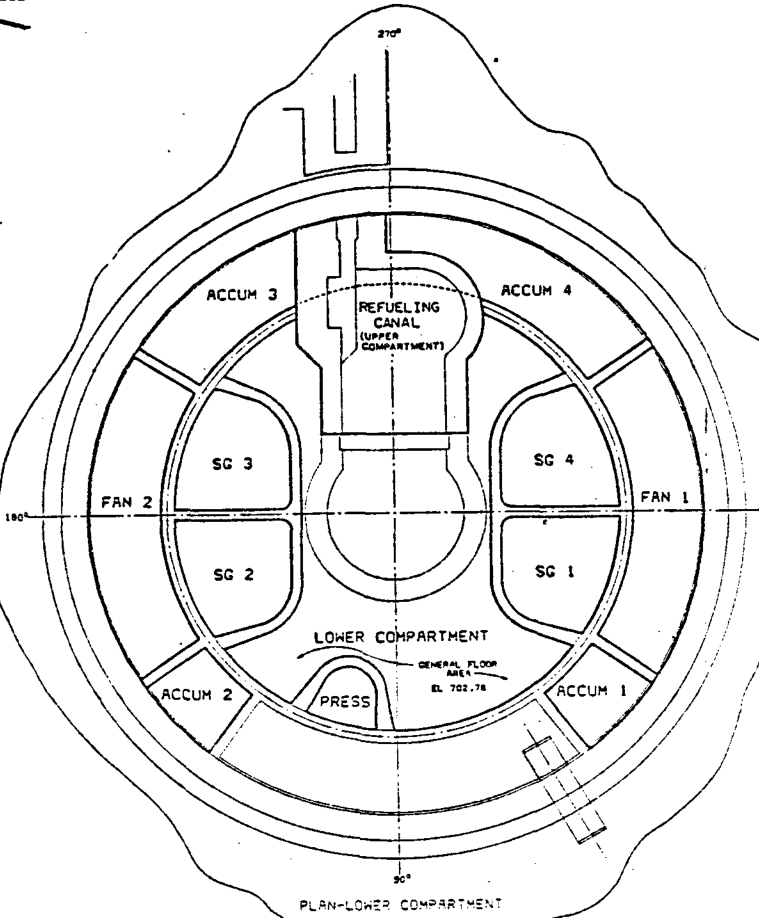
ISSUED BY: J.C.STAMOIFER

ECN-3606

MBN001

47E235-42 | M | 85





PLAN-LOWER COMPARTMENT

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION - SEE NOTE 19.

2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT WBN IS APPOXIMATELY 14.4 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE EGTS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

3. THE NORMAL PRESSURE RANGE INSIDE PRIMARY CONTAINMENT AND THE INSTRUMENT ROOM IS -0.1 TO +0.3 PSIG. PRESSURES DUE TO ABNORMAL CONDITIONS WILL NOT EXCEED THIS RANGE. ANY PRESSURES OUTSIDE THIS RANGE ARE THE RESULT OF AN ACCIDENT CONDITION. SEE OPERATIONAL CONDITION 3.

5. FOLLOWING A LOCA THE CONTAINMENT SPRAY SYSTEM WILL BE ACTIVATED AND FLOODING WILL OCCUR. THE SURGE FLOOD LEVEL INSIDE THE CRANE WALL IS 722.0 FT WHILE STEADY STATE LEVEL BOTH INSIDE AND OUTSIDE THE CRANE WALL IS 717.7 FT. INSTRUMENT ROOMS WILL FLOOD TO STEADY STATE ELEVATIONS. CONTAINMENT SPRAY DURATION IS LESS THAN OR EQUAL TO 30 DAYS. CONTAINMENT SPRAY FLOW RATE IS EQUAL TO 9500 GPM OR 0.92 GPM PER SQUARE FOOT OF CONTAINMENT CROSS SECTION. ALL EQUIPMENT REQUIRED FOR PLANT SAFETY MUST BE LOCATED ABOVE THE APPLICABLE FLOOD ELEVATION OR OTHERWISE HAVE FLOOD PROTECTION.

   ALL ACCESSES AND PENETRATIONS BELOW THE OUTSIDE MAXIMUM POSSIBLE FLOOD LEVEL IN THE SHIELD BUILDING ARE DESIGNED TO BE WATERTIGHT; THEREFORE, THE ANNULUS AND PRIMARY CONTAINMENT ARE NOT AFFECTED BY THIS DBE. OUTSIDE FLOOD LEVELS ARE DEFINED IN DESIGN CRITERIA WB-DC-40-29.

7. FIGURE 1 SHOWS WORST CASE TEMPERATURE VS TIME PROFILES FOR BOTH UPPER AND LOWER COMPARTMENTS. THESE CURVES TAKE INTO ACCOUNT THE EFFECTS OF BOTH A DOUBLE ENDED PUMP SUCTION BREAK (LOCA) AND MOST SEVERE STEAM LINE BREAK (HELB). IN ADDITION, SEPERATE TEMPERATURE PROFILES ARE SHOWN FOR BOTH LOCA AND HELB CONDITIONS. RELATIVE HUMIDITY IN BOTH COMPARTMENTS WILL INCREASE TO 100% DURING THE FIRST FEW SECONDS AND WILL REMAIN AT THAT VALUE UNTIL 10^6 SECONDS AT WHICH TIME IT WILL DECREASE LINEARLY TO THE NORMAL MAXIMUM VALUE OF 80% AT 30 DAYS. THE PRESSURE CURVE (FIGURE 5) IS FOR A LOCA AND COMPLETELY ENVELOPES THE HELB PRESSURE PROFILE. FIGURE 4 SHOWS THE WORST CASE TEMPERATURE VS TIME PROFILE FOR THE MOST SEVERE STEAMLINE BREAK (HELB) IN ALL DEAD-ENDED COMPARTMENT OUTSIDE THE CRANE WALL. THESE INCLUDE FAN ROOMS 1 AND 2, ACCUMULATOR ROOMS 1 THROUGH 4, AND THE INSTRUMENT ROOM.

8. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN IS FOR A LOCA. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE NEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

19. ADVERSE CONDITIONS RESULTING FROM INADVERTENT CONTAINMENT SPRAY (CONDITION 6) WILL EXIST FOR UP TO ONE HOUR THEN RETURN TO NORMAL LINEARLY WITHIN 8 HOURS. THIS EVENT SHOULD BE CONSIDERED TO OCCUR NO MORE THAN 5 TIMES DURING PLANT LIFE.

22. CHEMICAL SPRAY: THE CHEMICAL COMPOSITION OF THE CONTAINMENT SPRAY WAS BASED ON THE FOLLOWING SOLUTIONS WHICH RESULT IN THE MOST SEVERE SERVICE CONDITIONS:
   1. ICE CONDENCER - QUANTITY OF ICE - 2.7195×10^6 POUNDS - BORON CONCENTRATION - 1900 PPM B ADDED AS $Na_2B_4O_7 \cdot 10H_2O$.
   2. BORON INJECTION TANK - VOLUME - 900 GAL - BORON CONCENTRATION 2100 PPM B IN THE FORM OF H_3BO_3.
   3. COLD LEG INJECTION ACCUMULATORS(4 TANKS) - VOLUME 10,098 FT3 - BORON CONCENTRATION: 2000 PPM B IN THE FORM OF H_3BO_3.
   4. UPPER HEAD INJECTION - VOLUME - 1800 FT3 - BORON CONCENTRATION: 2100 PPM B IN THE FORM OF H_3BO_3.
   5. REFUELING WATER STORAGE TANK - VOLUME - 375,000 GAL - BORON CONCENTRATION 2100 PPM B IN THE FORM OF H_3BO_3.
   6. REACTOR COOLANT SYSTEM - VOLUME - 12145 FT3 - MAXIMUM BORON CONCENTRATION: 2100 PPM B IN THE FORM OF H_3BO_3.

   RESULTS: THE SOLUTIONS STATED ABOVE YIELD A RESULTING CONCENTRATION OF 0.19 MOLAR H_3BO_3 (2000 PPM BORON), 0.033 MOLAR NaOH RESULTING IN A PH OF 9.3 AT 25 C.

   NOTE: THIS CHEMICAL COMPOSITION IS ENVELOPED BY THE REQUIREMENT IN IEEE-323 1974.

29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

34. AVERAGE TEMPERATURES LISTED IN TABLE 1 ARE BASED ON ACTUAL PLANT DATA FROM THE FIRST FOUR AND ONE HALF YEARS OF OPERATION AT SEQUOYAH. THE 120°F LOWER COMPARTMENT MAXIMUM TEMPERATURE IS THE DESIGN BASIS FOR COOLER SIZING. DUE TO THE EXTREME HEAT LOAD IN SUCH A RESTRICTED VOLUME, TEMPERATURES INSIDE THE STEAM GENERATOR COMPARTMENTS EXCEED THE DESIGN TEMPERATURE. SINCE THERE ARE NO SAFETY-RELATED ELECTRICAL COMPONENTS REQUIRING QUALIFICATION IN THESE COMPARTMENTS, THEY ARE CONSIDERED ACCEPTABLE "HOT SPOTS".

35. THE GAMMA DOSE FOR THE ACCUMULATOR TANK ROOMS AND FAN ROOMS IS 1×10^7 RADS. THE GAMMA DOSE SHOWN IS A MAXIMUM VALUE FOR ALL OTHER AREAS THAT INCLUDES THE DOSE FROM BOTH AIRBORNE ACTIVITY AND ACTIVITY IN PIPING AND COMPONENTS. THE NEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUE LOWER THAN THAT SHOWN.

36. AN RHR LINE BREAK INSIDE PRIMARY CONTAINMENT CAN RESULT IN A WATER LEVEL OUTSIDE THE CRANE WALL UP TO EL 703.78 FT 15 MINUTES AFTER THE ACCIDENT. ICE MELT WILL RESULT IN FLOODING INSIDE THE CRANE WALL. THE FLOOD LEVELS FOR THIS BREAK ARE LESS THAN ONE FOOT.

    A CVCS LINE BREAK INSIDE PRIMARY CONTAINMENT CAN RESULT IN A WATER LEVEL OUTSIDE THE CRANE WALL UP TO EL 710.78 FT 46 MINUTES AFTER THE ACCIDENT IF NOT ISOLATED. ICE MELT WILL CAUSE SOME FLOODING INSIDE THE CRANE WALL. IF NEEDED, THIS INFORMATION CAN BE CALCULATED BY THE NEB NUCLEAR SAFETY ANALYSIS SECTION.

44. ACCUMULATOR ROOMS 1 AND 2, FAN ROOMS 1 AND 2, AND THE FOLLOWING PORTIONS OF ACCUMULATOR ROOMS 3 AND 4 ARE NOT DIRECTLY AFFECTED BY CONTAINMENT SPRAY: ACCUMULATOR ROOM 3 BETWEEN AZIMUTHS 215° AND 242°, ACCUMULATOR ROOM 4 BETWEEN AZIMUTHS 293° AND 299°, AND BETWEEN AZIMUTHS 305° AND 325°. IN ADDITION, ALL AREAS ABOVE ELEVATION 733 FT IN ACCUMULATOR ROOM 3 AND ABOVE ELEVATION 739.5 FT IN ACCUMULATOR ROOM 4 ARE UNAFFECTED BY SPRAY. SPRAY FLOOD WATER FROM THE UPPER COMPARTMENT ENTERS THESE ROOMS VIA THE AIR RETURN FAN OPENINGS AT A FLOW RATE OF 185 GPM IN ACCUMULATOR ROOM 3 (AZ 250) AND 18.5 GPM IN ACCUMULATOR ROOM 4 (AZ 297).

46. UNSEALED CONDUITS AND COMPONENTS LOCATED INSIDE PRIMARY CONTAINMENT ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF A LOCA OR HELB. AN EVALUATION SHOULD BE PERFORMED TO DETERMINE IF SEALING IS NECESSARY TO PREVENT THE SHORT TERM EFFECTS OF PRESSURE INDUCED MOISTURE INTRUSION AND THE LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.

TI APERTURE CARD

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BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
REACTOR BUILDING CONTAINMENT LOWER COMPARTMENT	1 AVG MAX MIN	TABLE 1 NOTE 34 120 60	40 80 30	ATM 14.7 14.3 } NOTE 3	NA TABLE 2 NA	NA NA NA	A	NA
	2 MAX MIN	130 50 } NOTE 8	100 10 } NOTE 10	14.7 14.3 } NOTE 3	NA NA	NA NA		NA
	3	327 NOTE 7	100 NOTES 7,46	25.6 NOTE 7	NA	4.7×10^8 BETA 4×10^7 GAMMA NOTE 35		NOTES 5,22,36,44
	6	NA	100 NOTE 19	12.4 NOTE 19	NA	NA		NOTES 5,22,44

TABLE 1 (NOTE 34)

ROOM	AVG TEMP (°F)
ACCUM 1 ACCUM 2 ACCUM 3 ACCUM 4 FAN 1 FAN 2	105
SG 1 SG 2 SG 3 SG 4	135
PRESS	115
LOWER COMPARTMENT	115

TABLE 2

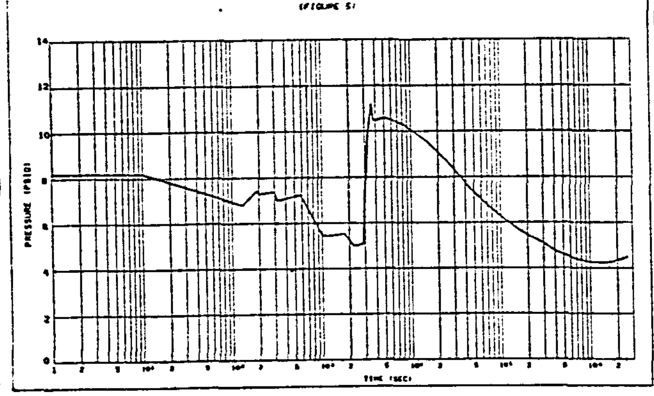
SPACE	DOSE (RADS)
REGION INSIDE THE PRIMARY SHIELD WALL FROM THE REACTOR VESSEL FLANGE (EL 725.15) TO THE CONTROL ROD DRIVE MISSLE SHIELD (EL 756.63).	8.0×10^7
CYLINDRICAL SPACE OF RADIUS 8'-6" IN THE REACTOR CAVITY DIRECTLY BENEATH THE REACTOR PRESSURE VESSEL.	3.0×10^8
IN THE VICINITY OF PRIMARY REACTOR COOLANT SYSTEM PIPING	8.0×10^7
ANNULUS REGION OF REACTOR CAVITY BETWEEN REACTOR VESSEL AND ADJACENT CONCRETE WALL FROM BOTTM OF REACTOR VESSEL TO REACTOR VESSEL FLANGE.	THIS VALUE SHOULD BE OBTAINED FROM THE NEB RADIATION PROTECTION SECTION ON A CASE BY CASE BASIS.
ALL OTHER AREAS HIGHLIGHTED IN KEY PLAN.	2.0×10^7

REFERENCE:

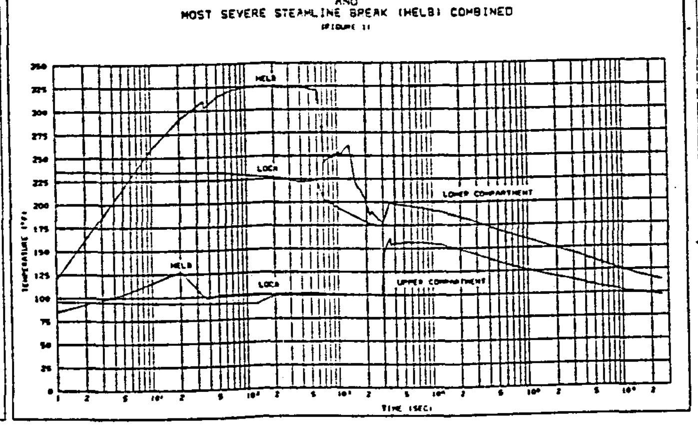
1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (NEB 82-0726-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-831213-214).

8610090051-45

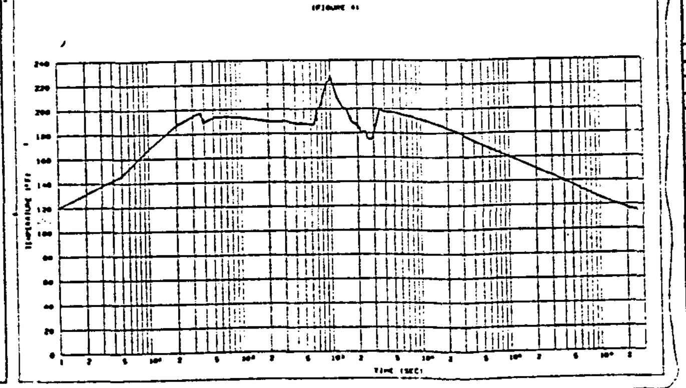
CONTAINMENT PRESSURE - DOUBLE ENDED PUMP SUCTION BREAK (LOCA)
(FIGURE 5)



CONTAINMENT TEMPERATURE, DOUBLE ENDED PUMP SUCTION BREAK (LOCA) AND MOST SEVERE STEAMLINE BREAK (HELB) COMBINED
(FIGURE 1)



DEAD-ENDED COMPARTMENT TEMPERATURE MOST SEVERE STEAM LINE BREAK
(FIGURE 4)



ECN-3606

ISSUED BY: J.C.STANDIFER

REV	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD
2	6178, A	9 9 86			WCR			
REVISED KEY PLAN, NOTES 1,5,7,11,22 NORMAL DOSE, PEAK PRESSURE, ACCIDENT DOSE, FIGURES 1 AND 5. DELETED FIGURE A, AND NOTES 4,24, AND 30. ADDED NOTES 34,35,36,44,46, REFERENCE 2, TABLES 1 AND 2 AND FIGURE 4. ADDED Q DESIGNATION PER EXCEPTION A.								
1	4542	3-8-84	RAS	RAD	SAB	CEC	JAR	JCS
CORRECTED TITLE BLOCK.								

SCALE: NTS EXCEPT AS NOTED

REACTOR BUILDING
UNITS 1 & 2

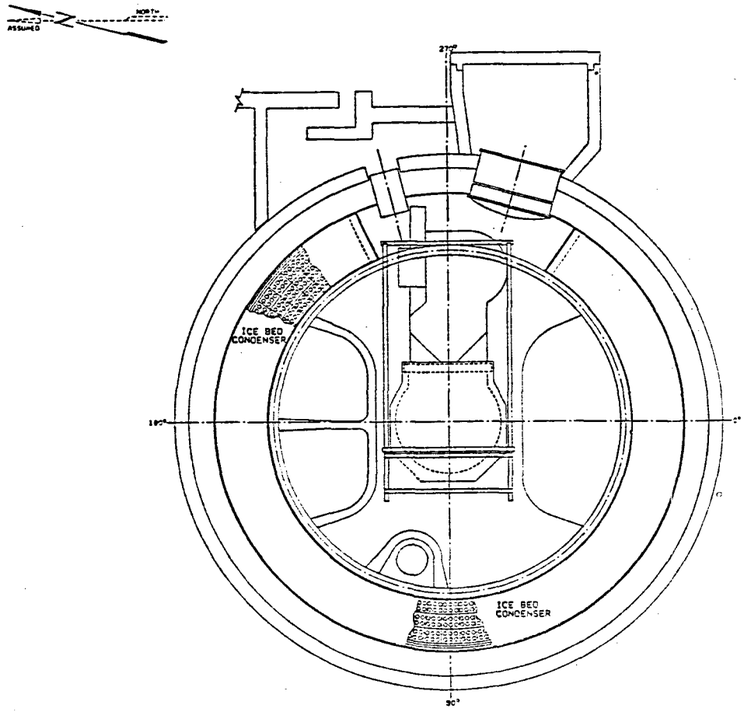
ENVIRONMENTAL DATA ENVIRONMENT - HARSH LOWER COMPARTMENT

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING
(Q)

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.DOTSON	CHECKED R.R.CAMPBELL	1	2	J.A.RAULSTON
DESIGNED R.A.SULFRIDGE	SUBMITTED G.E.GERMAN	3	4	

KNOXVILLE | DATE 8-26-83 | 85 | M | 47E235-42 | R2

WBN002



PLAN-UPPER COMPARTMENT

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:

   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (MOST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TOP-END (SUDDEN) PRESSURE DROP OF 3 PSIG.
   6. INADVERTENT CONTAINMENT SPRAY INITIATION - SEE NOTE 19.

2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT WBN IS APPROXIMATELY 14.4 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE ECCS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

3. THE NORMAL PRESSURE RANGE INSIDE PRIMARY CONTAINMENT AND THE INSTRUMENT ROOM IS -0.1 TO +0.3 PSIG. PRESSURES DUE TO ABNORMAL CONDITIONS WILL NOT EXCEED THIS RANGE. ANY PRESSURES OUTSIDE THIS RANGE ARE THE RESULT OF AN ACCIDENT CONDITION. SEE OPERATIONAL CONDITION 3.

5. FOLLOWING A LOCA THE CONTAINMENT SPRAY SYSTEM WILL BE ACTIVATED AND FLOODING WILL OCCUR. THE SURGE FLOOD LEVEL INSIDE THE CRANE WALL IS 721.0 FT WHILE STEADY STATE LEVEL IS BOTH INSIDE AND OUTSIDE THE CRANE WALL IS 717.7 FT. INSTRUMENT ROOMS WILL FLOOD TO STEADY STATE ELEVATION. CONTAINMENT SPRAY DURATION IS LESS THAN OR EQUAL TO 30 DAYS. CONTAINMENT SPRAY FLOW RATE IS EQUAL TO 2000 GPM OR 0.32 GPM PER SQUARE FOOT OF CONTAINMENT CROSS SECTION. ALL EQUIPMENT REQUIRED FOR PLANT SAFETY MUST BE LOCATED ABOVE THE APPLICABLE FLOOD ELEVATION OR OTHERWISE HAVE FLOOD PROTECTION.

   ALL ACCESSES AND PENETRATIONS BELOW THE OUTSIDE MAXIMUM POSSIBLE FLOOD LEVEL IN THE SHIELD BUILDING ARE DESIGNED TO BE WATERTIGHT. THEREFORE, THE ANNULUS AND PRIMARY CONTAINMENT ARE NOT AFFECTED BY THIS ORE. OUTSIDE FLOOD LEVELS ARE DEFINED IN DESIGN CRITERIA WB-DC-40-25.

7. FIGURE 1 SHOWS WORST CASE TEMPERATURE VS TIME PROFILES FOR BOTH UPPER AND LOWER COMPARTMENTS. THESE CURVES TAKE INTO ACCOUNT THE EFFECTS OF BOTH A DOUBLE ENDED PUMP SUCTION BREAK (LOCA) AND WORST SEVERE STEAM LINE BREAK (HELB). IN ADDITION, SEPARATE TEMPERATURE PROFILES ARE SHOWN FOR BOTH LOCA AND HELB CONDITIONS. RELATIVE HUMIDITY IN BOTH COMPARTMENTS WILL INCREASE TO 100% DURING THE FIRST FEW SECONDS AND WILL REMAIN AT THAT VALUE UNTIL 109 SECONDS AT WHICH TIME IT WILL DECREASE LINEARLY TO THE NORMAL MAXIMUM VALUE OF 80% AT 30 DAYS. THE PRESSURE CURVE (FIGURE 5) IS FOR A LOCA AND COMPLETELY ENVELOPES THE HELB PRESSURE PROFILE.

9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE SHOWN IS FOR A LOCA. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE HEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:

   A. SPACES THAT ARE SERVED BY SAFETY-RELATED MEDIUMRANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   B. SPACES NOT MAINTAINED BY MEDIUMRANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND MEDIUMRANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

19. ADVERSE CONDITIONS RESULTING FROM INADVERTENT CONTAINMENT SPRAY (CONDITION 6) WILL EXIST FOR UP TO ONE HOUR THEN RETURN TO NORMAL LINEARLY WITHIN 8 HOURS. THIS EVENT SHOULD BE CONSIDERED TO OCCUR NO MORE THAN 5 TIMES DURING PLANT LIFE.

22. CHEMICAL SPRAY: THE CHEMICAL COMPOSITION OF THE CONTAINMENT SPRAY WAS BASED ON THE FOLLOWING SOLUTIONS WHICH RESULT IN THE MOST SEVERE SERVICE CONDITIONS:

   1. ICE CONDENSER - QUANTITY OF ICE - (3.719X10⁶) POUNDS - BORON CONCENTRATION - 1800 PPM B ADDED AS ($Na_2B_4O_7 \cdot 10H_2O$)

   2. BORON INJECTION TANK - VOLUME - 900 GAL - BORON CONCENTRATION (2100 PPM B IN THE FORM OF H_3BO_3).

   3. COLD LEG INJECTION ACCUMULATORS (TWO) - VOLUME - (10,000 CU.FT.) - BORON CONCENTRATION (2100 PPM B IN THE FORM OF H_3BO_3).

   4. UPPER HEAD INJECTION - VOLUME - (1920) FT³ - BORON CONCENTRATION (2100 PPM B IN THE FORM OF H_3BO_3).

   5. REFUELING WATER STORAGE TANK - VOLUME - (375,000 GAL) - BORON CONCENTRATION (2100 PPM B IN THE FORM OF H_3BO_3).

   6. REACTOR COOLANT SYSTEM - VOLUME - (12,140) FT³ - (0.0233 MOLE) BORON CONCENTRATION (2100 PPM B IN THE FORM OF H_3BO_3).

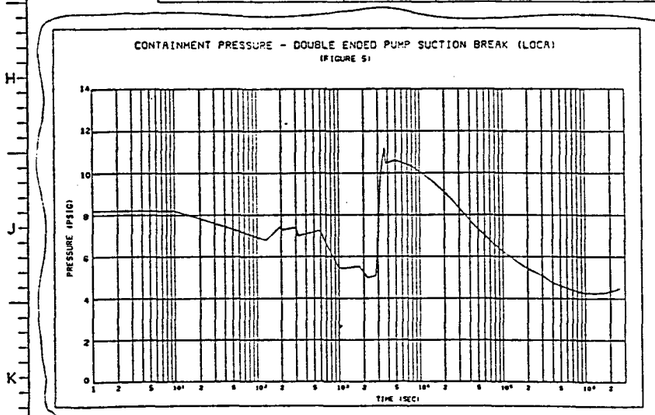
   RESULTS: THE SOLUTIONS STATED ABOVE YIELD A RESULTING CONCENTRATION OF (0.18 MOLAR H_3BO_3 (2000 PPM BORON) - 0.033 MOLAR H_2O) RESULTING IN A PH OF (8.2) AT 25°C.

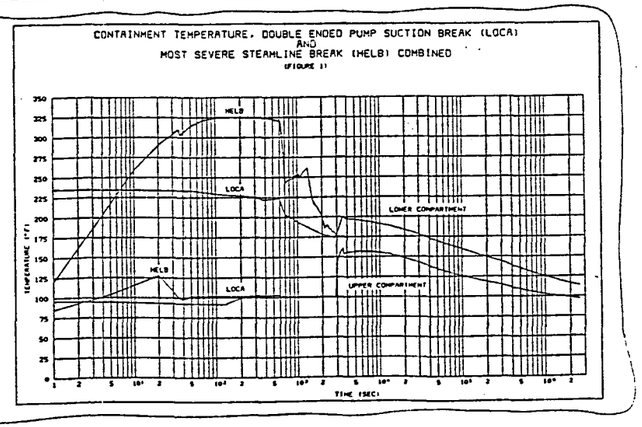
   NOTE: THIS CHEMICAL COMPOSITION IS ENVELOPED BY THE REQUIREMENTS IN IEEE-323 1974.

29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

48. UNSEALED CONDUITS AND COMPONENTS LOCATED INSIDE PRIMARY CONTAINMENT ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF A LOCA OR HELB. AN EVALUATION SHOULD BE PERFORMED TO DETERMINE IF SEALING IS NECESSARY TO PREVENT THE SHORT TERM EFFECTS OF PRESSURE INDUCED MOISTURE INTRUSION AND THE LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
REACTOR BUILDING ICE BED CONDENSER	1 AVG MAX MIN	15 20 10	100 100 60	ATM 14.7 14.3 } NOTE 3	NA 1.0×10^7 NA	NA NA NA	A	NA
	2 MAX MIN	27 } NOTE 8 10 }	100 60 } NOTE 10	14.7 14.3 } NOTE 3	NA NA	NA NA		NA
	3	270 NOTE 7	100 NOTE 7	(25.8) NOTE 7	NA	4.7×10^7 BETA 1.5×10^7 GAMMA		NOTE 5, 22
	6	NA	NA	12.4 NOTE 19	NA	NA		NOTE 5, 22





REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WCB 82-0726-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-831213-214).

TI APERTURE CARD

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1	6178.A	4-9-86	RS	JND	WCP	JAS	AHL	KCM

REVISED NOTES 1-5,7,11,22, NORMAL DOSE, ACCIDENT DOSE, PEAK PRESSURE, FIGURES 1 AND 5. DELETED FIGURE 6. AND NOTES 8 AND 24. ADDED NOTE 48 AND REFERENCE 2, ABOVE @ DESIGNATION PER EXCEPTION A.

REV NO.	ECN/FCN	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD

SCALE: NTS EXCEPT AS NOTED

REACTOR BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
ICE CONDENSER

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

(0)

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A. DOTSON	CHECKED R.W. CAMPBELL	1	2	J.A.R. RAULSTON
DESIGNED R.A. BAERTRUDE	SUBMITTED D.C. GERMAN	3	4	

KNOXVILLE | DATE 8-26-82 | BS | M | 47E235-43 | R1

ECN-3608

ISSUED BY: J.C. STANDIFER

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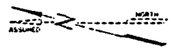
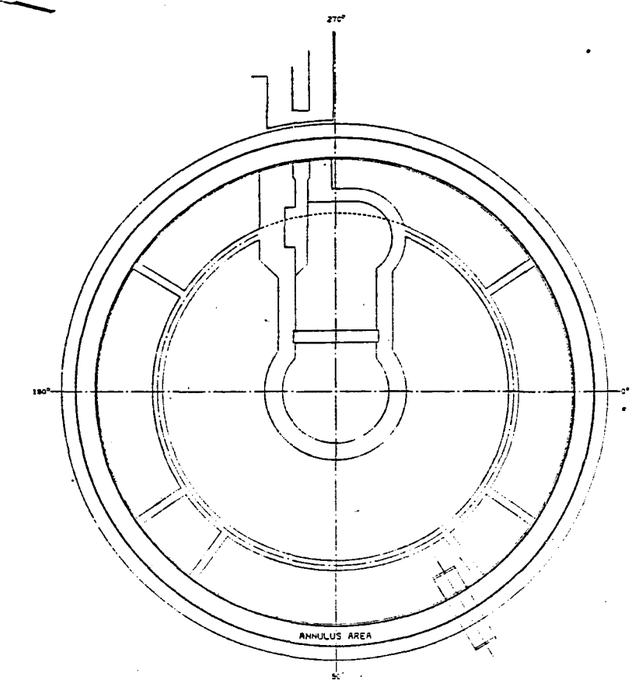
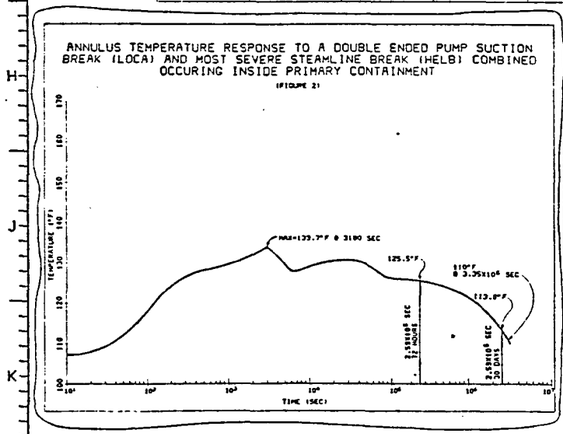
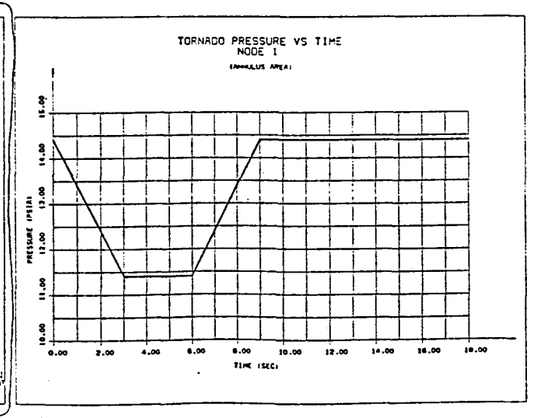




PLAN-LOWER COMPARTMENT

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING (NOTE 37)
REACTOR BUILDING CONTAINMENT ANNULUS AREA	1 AVG MAX MIN	105 110 80	55 80 30	ATM (-) ATM (-) ATM (-)	NA 1.0×10^4 NA	NA NA NA	C	NA
	2 MAX MIN	120 40 NOTE 8	90 10 NOTE 10	ATM (-) ATM (-)	NA NA	NA NA		NA
	3	122.7 FIGURE 2	81	ATM (-)	NA	1.2×10^7 NOTE 37		NA
	5	NA	NA	NOTE 4 NODE 1	NA	NA		NA
	6	NA	NA	ATM(-) NOTE 19	NA	NA		NA





NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:

   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB (INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION - SEE NOTE 19

2. ATM (-) =INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MSL IS APPROXIMATELY 14.6 PSIA.

   ATM(+) =INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) =INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE EDTS; ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

4. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS; TEMPORARY GREATER THAN DESIGN HEAT LOADS; OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE SAMPLE DAILY DOSE CONTRIBUTIONS UNLESS OTHERWISE INDICATED. (WITH INTEGRATED ACCIDENT DOSE DEFINED AS THE 40-YR INTEGRATED RADIATION DOSE IS ADDITIVE TO ADDING THE 1 HOUR INTEGRATED AND INTEGRATED ACCIDENT DOSES). FOR HEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:

   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

19. ADVERSE CONDITIONS RESULTING FROM INADVERTENT CONTAINMENT SPRAY (CONDITION 6) WILL EXIST FOR UP TO ONE HOUR THEN RETURN TO NORMAL LINEARLY WITHIN 8 HOURS. THIS EVENT SHOULD BE CONSIDERED TO OCCUR NO MORE THAN 5 TIMES DURING PLANT LIFE.

25. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

31. HIGH ENERGY LINES PASSING THROUGH THE ANNULUS ARE SLEEVED. THEREFORE, THIS SPACE IS NOT AFFECTED BY HELB'S. ALL ACCESSES AND PENETRATIONS BELOW THE OUTSIDE MAXIMUM POSSIBLE FLOOD LEVEL IN THE SHIELD BUILDING ARE DESIGNED TO BE WATERTIGHT; THEREFORE, THE ANNULUS AND PRIMARY CONTAINMENT ARE NOT AFFECTED BY THIS DBE.

37. THE ACCIDENT DOSE SHOWN IS FOR ANNULUS AREAS IN THE VICINITY OF PIPING AND PENETRATIONS CONTAINING ACCIDENT SOURCES. FOR ANNULUS AREAS NOT IN THE VICINITY OF PIPING AND PENETRATIONS THE ACCIDENT DOSE IS 1.0×10^7 RADS. THESE DOSES INCLUDE A BETA CONTRIBUTION OF 6×10^3 RADS.

TI APERTURE CARD

Also Available On Aperture Card

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBN 82-0726-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-421 (ESB-831213-214).

8610090051-47

1	6178.A	7-9-86	MS	JHR	VER	AND	JHR	ECN	

REVISED NOTES 1,4,11, ACCIDENT DOSE, 40 YEAR DOSE, FIGURE 2, LOCA HUMIDITY AND REF 2. ADDED NOTES 31 AND 37. DELETED NOTES 5,26 AND FIGURE A. ADDED Q DESIGNATION PER EXCEPTION A.

NO.	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD

SCALE: NTS — EXCEPT AS NOTED

REACTOR BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
ANNULUS AREA

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

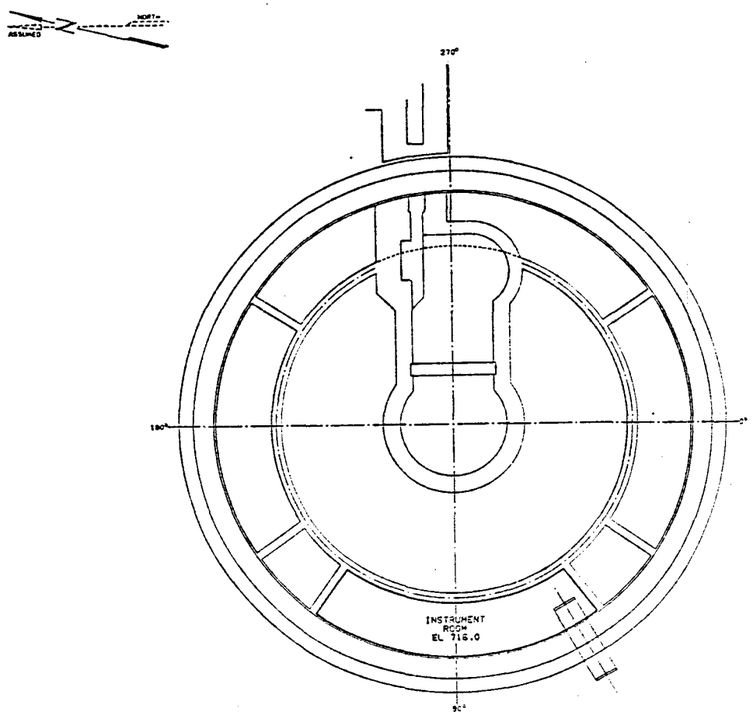
DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.COTSON	CHECKED R.R.CAMPBELL	1	2	J.A.RAULSTON
DESIGNED R.A.BULFRIDGE	SUBMITTED G.E.DERMAN	3	4	

KNOXVILLE	DATE 8-26-83	85	M	47E235-44	R1

ISSUED BY: J.E.STANDIFER

ECN-3636

MBN004



PLAN-LOWER COMPARTMENT

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
REACTOR BUILDING CONTAINMENT LOWER COMPARTMENT INSTRUMENT ROOM EL 716.0	AVG MAX MIN	70 75 60	50 60 40	ATM 14.3 14.3 } NOTE 3	NA (25) NA	NA NA NA	B	NA
	MAX MIN	120 50 35 NOTE 27	90 20 } NOTE 10	14.3 14.3 } NOTE 3	NA NA	NA NA		NA
	3	227 NOTE 6,7	100 NOTE 6,7 (46)	(25.6) NOTE 7	NA	(6.7 X 10⁶ BETA 1 X 10⁷ GAMMA)		NOTE 5,22 (45)

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:

   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION

2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT WBN IS APPROXIMATELY 14.4 PSIA.
   ATM+14 -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.
   ATM-14 -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE EGTS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

3. THE NORMAL PRESSURE RANGE INSIDE PRIMARY CONTAINMENT AND THE INSTRUMENT ROOM IS -0.3 TO +0.3 PSIG. PRESSURES DUE TO ABNORMAL CONDITIONS WILL NOT EXCEED THIS RANGE. ANY PRESSURES OUTSIDE THIS RANGE ARE THE RESULT OF AN ACCIDENT CONDITION. SEE OPERATIONAL CONDITION 3.

5. FOLLOWING A LOCA THE CONTAINMENT SPRAY SYSTEM WILL BE ACTIVATED AND FLOODING WILL OCCUR. THE SURGE FLOOD LEVEL INSIDE THE CRANE WALL IS 722.0 FT WHILE STEAM STATE LEVEL BOTH INSIDE AND OUTSIDE THE CRANE WALL IS 717.7 FT. INSTRUMENT ROOMS WILL FLOOD TO STEADY STATE EL 716.0.
   10+5. CONTAINMENT SPRAY DURATION IS LESS THAN OR EQUAL TO 30 DAYS.
   10+6. CONTAINMENT SPRAY FLOW RATE IS EQUAL TO 3000 GPM OR 0.32 GPM PER SQUARE FOOT OF CONTAINMENT CROSS SECTION. ALL EQUIPMENT REQUIRED FOR PLANT SAFETY MUST BE LOCATED ABOVE THE APPLICABLE FLOOD ELEVATION OR OTHERWISE HAVE FLOOD PROTECTION.

   ALL ACCESSES AND PENETRATIONS BELOW THE OUTSIDE MAXIMUM POSSIBLE FLOOD LEVEL IN THE SHIELD BUILDING ARE DESIGNED TO BE WATERTIGHT. THEREFORE, THE ANNULUS AND PRIMARY CONTAINMENT ARE NOT AFFECTED BY THIS DBE. OUTSIDE FLOOD LEVELS ARE DEFINED IN DESIGN CRITERIA WB-DC-40-23.

6. THE WALLS OF THE INSTRUMENT ROOM HAVE PRESSURE RELIEF PANELS DESIGNED TO OPEN AT 1.0 PSI DIFFERENTIAL PRESSURE. THE ENVIRONMENT INSIDE THE INSTRUMENT ROOM WILL BE THE SAME AS CONTAINMENT FOLLOWING A LOCA/HELB. THE INSTRUMENT ROOM ENVIRONMENT WILL NOT BE AFFECTED BY AN INADVERTENT CONTAINMENT SPRAY.

7. FIGURE 1 SHOWS WORST CASE TEMPERATURE VS TIME PROFILES FOR BOTH UPPER AND LOWER COMPARTMENTS. THESE CURVES TAKE INTO ACCOUNT THE EFFECTS OF BOTH A DOUBLE ENDED PUMP SUCTION BREAK (LOCA) AND THE MOST SEVERE STEAM LINE BREAK (HELB). IN ADDITION, DEAD-END TEMPERATURE PROFILES ARE SHOWN FOR BOTH LOCA AND HELB CONDITIONS. RELATIVE HUMIDITY IN BOTH COMPARTMENTS WILL INCREASE TO 100% DURING THE FIRST FEW SECONDS AND WILL REMAIN AT THAT VALUE UNTIL 10^5 SECONDS AT WHICH TIME IT WILL DECREASE LINEARLY TO THE NORMAL MAXIMUM VALUE OF 90% AT 30 DAYS. THE PRESSURE CURVE (FIGURE 5) IS FOR A LOCA AND COMPLETELY ENVELOPES THE HELB PRESSURE PROFILE. FIGURE 6 SHOWS THE WORST CASE TEMPERATURE VS TIME PROFILE FOR THE MOST SEVERE STEAM LINE BREAK (HELB) IN ALL DEAD-ENDED COMPARTMENTS OUTSIDE THE CRANE WALL. THESE INCLUDE FAN ROOMS 1 AND 2, ACCUMULATOR ROOMS 1 THROUGH 4, AND THE INSTRUMENT ROOM.

8. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS. TEMPERATURE GREATER THAN DESIGN HEAT LOADS OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE SHOWN IS FOR A LOCA. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE WBN RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:

   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

22. CHEMICAL SPRAY: THE CHEMICAL COMPOSITION OF THE CONTAINMENT SPRAY WAS BASED ON THE FOLLOWING SOLUTIONS WHICH RESULT IN THE MOST SEVERE SERVICE CONDITIONS:

   1. ICE CONDENSER - QUANTITY OF ICE - 2.7195×10^6 POUNDS - BORON CONCENTRATION - 1800 PPM B ADDED AS $(Na_2B_8O_{13} \cdot 10H_2O)$.
   2. BORON INJECTION TANK - VOLUME - 900 GAL - BORON CONCENTRATION (2100) PPM B IN THE FORM OF H_3BO_3.
   3. COLD LEG INJECTION ACCUMULATORS (4 TANKS) - VOLUME (10,398 FT³) - BORON CONCENTRATION: (2000) PPM B IN THE FORM OF H_3BO_3.
   4. UPPER HEAD INJECTION - VOLUME - (1800) FT³ - BORON CONCENTRATION: (2100) PPM B IN THE FORM OF H_3BO_3.
   5. REFUELING WATER STORAGE TANK - VOLUME - ([illegible]) GAL - BORON CONCENTRATION (2100) PPM B IN THE FORM OF H_3BO_3.
   6. REACTOR COOLANT SYSTEM - VOLUME - (12145 FT³) - MAXIMUM BORON CONCENTRATION: (2100) PPM B IN THE FORM OF H_3BO_3.

   RESULTS: THE SOLUTIONS STATED ABOVE YIELD A RESULTING CONCENTRATION OF (0.139) MOLAR H_3BO_3 (2000 PPM BORON). 0.033 MOLAR NaOH RESULTING IN A PH OF 9.7 (9.5).
   NOTE: THIS CHEMICAL COMPOSITION IS ENVELOPED BY THE REQUIREMENTS IN IEEE-323 1974.

27. UPON FAILURE OF THE AUXILIARY BUILDING AIR INTAKE HEATING COILS DURING PUMPING OPERATIONS, SPACE TEMPERATURES WILL DROP LINEARLY TO 70°F WITHIN A 10 MIN PERIOD. THE PUMPS FAN WILL THEN BE SHUTDOWN AND TEMPERATURES WILL INCREASE LINEARLY TO THE ABNORMAL MAXIMUM OF 50°F OVER A ONE HOUR PERIOD. THIS CONDITION SHOULD BE CONSIDERED TO OCCUR TWICE DURING THE 40 YEAR LIFE OF THE PLANT.

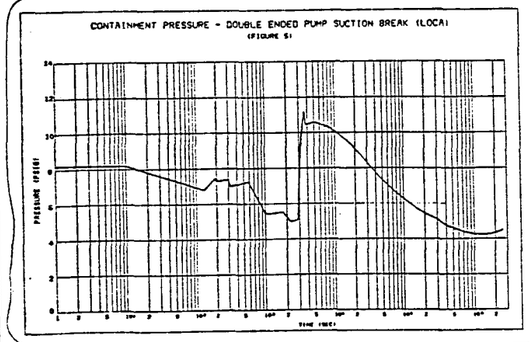
29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

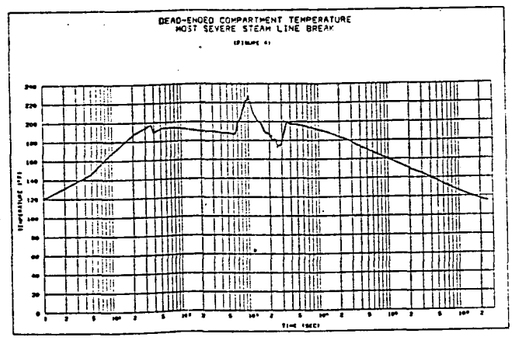
45. THE INSTRUMENT ROOM IS NOT DIRECTLY AFFECTED BY CONTAINMENT SPRAY BUT WILL FLOOD TO THE STEADY STATE LEVELS GIVEN IN NOTE 5 DUE TO WATER RISE DURING A LOCA.

46. UNSEALED CONDUITS AND COMPONENTS LOCATED INSIDE PRIMARY CONTAINMENT ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF A LOCA OR HSLB. AN EVALUATION SHOULD BE PERFORMED TO DETERMINE IF SEALING IS NECESSARY TO PREVENT THE SHORT TERM EFFECTS OF PRESSURE INDUCED MOISTURE INTRUSION AND THE LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.

REFERENCES:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB 82-0726-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-421 (ESB-831213-214).





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TI APERTURE CARD

Also Available On Aperture Card

8610090051-48

REV NO	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD
1	6178,A	6-9-86						

REVISED NOTES 1,5,7,11,22, NORMAL DOSE, ACCIDENT DOSE, PEAK PRESSURE. FIGURES 1 AND 5. DELETED FIGURES 2,4, AND NOTES 4 AND 24. ADDED NOTES 45, 46, AND REFERENCE 2. ADDED Q DESIGNATION PER EXCEPTION A.

SCALE: NTS — EXCEPT AS NOTED

REACTOR BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
INSTRUMENT ROOM

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

0

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.R.DOTSON	CHECKED R.R.CAMPBELL	1	2	J.A.RAULSTON
DESIGNED R.A.DUFFRIDGE	SUBMITTED G.E.DEWEES	3	4	

KNOXVILLE — DATE 8-26-83 — 85 M 47E235-45 R1

ISSUED BY: J.C.STANOIFER

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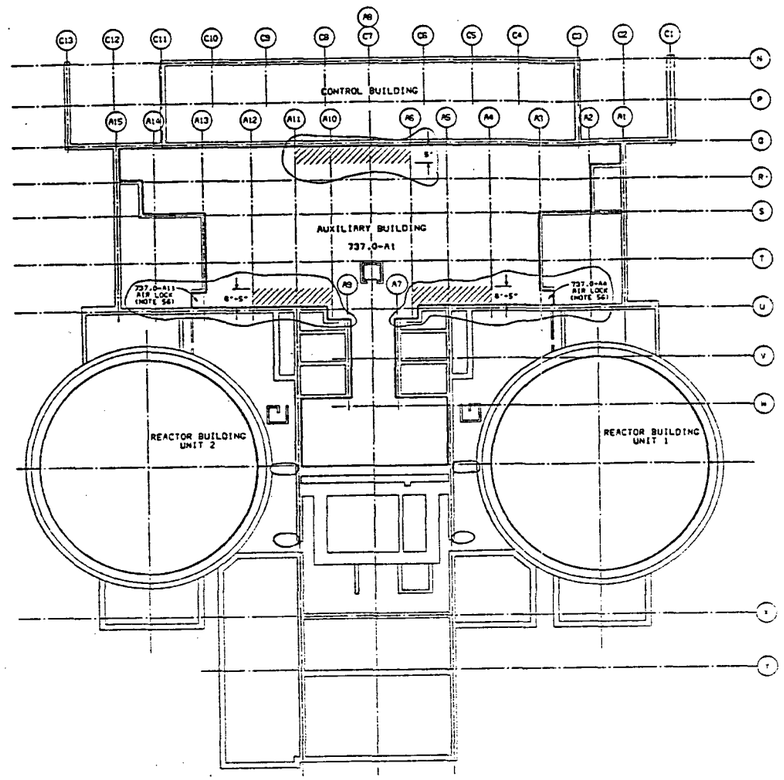


PLAN - EL 729.0 & 737.0

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA/MELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. MELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF .3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION

2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT WBN IS APPROXIMATELY 14.4 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE ECCS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

4. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

8. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY OPERATION THAN DESIGN HEAT LOADS OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN IS FOR A LOCA. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE WBN RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT/SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS). LETDOWN LINE. COMPANION DRAWINGS REFERENCED CONTAIN TEMPERATURE AND PRESSURE VS TIME PROFILES FOR ALL THE WORST CASE BREAKS INVOLVING THESE SYSTEMS. PROFILES TYPICAL EXPLAIN WHICH BREAKS EXPERIENCE SYSTEM EFFECT VS BEING DEPICTED. THE FOLLOWING COMPARISONS TO AREAS OR PORTIONS OF THE AREA HIGHLIGHTED ON THE KEY PLAN. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DECREASE LINEARLY TO ITS NORMAL SYSTEM VALUE GIVEN IN THE ENVIRONMENTAL TABLE IN THE END OF 24 HOURS IF IT HAS NOT REACHED THAT VALUE WITHIN THE SCALE OF THE FIGURE. FOR QUALIFICATION PURPOSES, THE MELB PROFILES REPRESENTING THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.

16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

38. THE MELB'S DESCRIBED IN NOTE 13 WILL NOT CAUSE FLOODING IN THIS AREA.

41. TABLE 3 EXPLAINS WHICH RELATIVE HUMIDITY FIGURE TO USE FOR A PARTICULAR MELB.

56. THE ENTIRE ABOVE AIR LOCKS A6 AND A11 (EL 747.33 AND ABOVE) IS ENVIRONMENTALLY PART OF ROOM 737.0-A1.

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)		TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING GENERAL FLOOR PER ROOM A1 EL 737.0	1	AVG	80	55	ATM (-)	NA (TABLE 2)	NA	B	NOTE 16
		MAX	104	80	ATM (-)		NA		
		MIN	60	30	ATM (-)		NA		
	2	MAX	110	90	ATM (-)		NA		
		MIN	50 (NOTE 8)	10 (NOTE 10)	ATM (-)		NA		
	3		NA	NA	NA	NA	<1 X 10⁴		NOTE 38
	4		NOTE 12	100 (NOTE 41 TABLE 3)	NOTE 13	NA	NA		
	5		NA	NA	NOTE 4 NODE 56	NA	NA		

TABLE 2

ROOM NO.	DOSE (RADS)
A1 (SHADED AREA)	2.1 X 10⁵
A1 (UNSHADED AREA)	3.8 X 10⁵

TABLE 3

ROOM NO.	MELB			
	BHR	CVCS	AFW	AB
A1	FIG 2	FIG 2	FIG 1	FIG 1

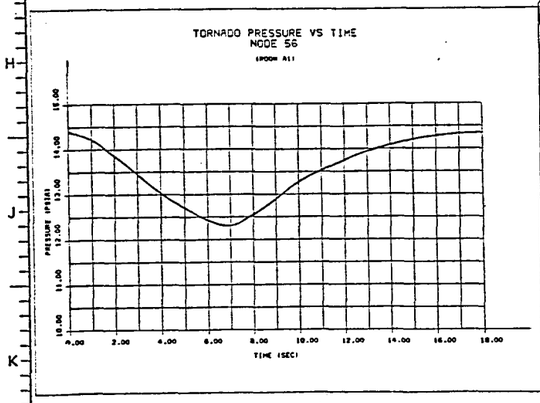
TI APERTURE CARD

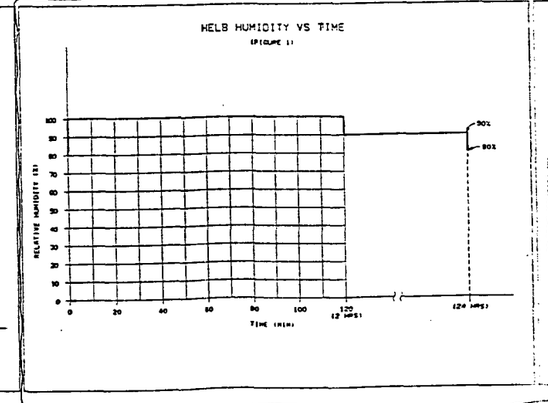
Also Available On Aperture Card

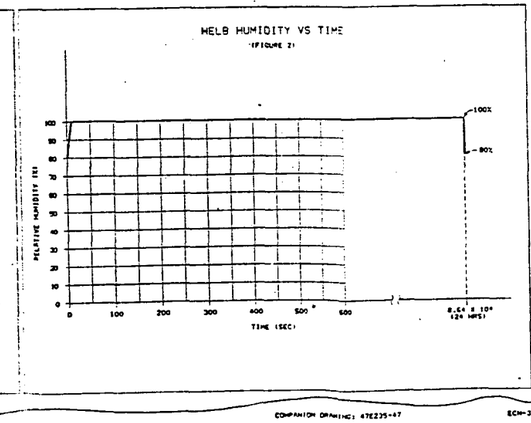
8610090051-49

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBN 82-0726-3251).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-831213-2141).







COMPANION DRAWING: 47E235-47 ECN-2606

REV	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD
1	8178,A	4-9-86	EMS	RAE	WLF	JAB	[illegible]	[illegible]

REVISED NOTES 1,4,11,13,16, KEY PLAN, NO 40 YEAR DOSE, ADDED NOTES 38,41,56, TABLES 2, 3, AND FIGURES 1 AND 2. DELETED FIGURE 6. ADDED Q DESIGNATION PER EXCEPTION A.

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 737.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

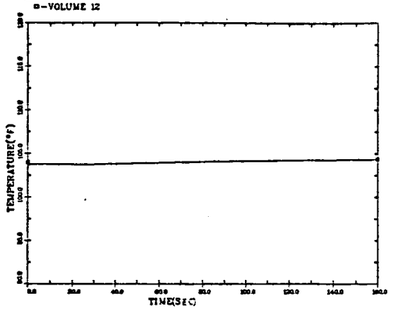
DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.DOTSON	CHECKED R.R.CAMPBELL	1	2	J.R.RAULSTON
DESIGNED R.A.BRIDGE	SUBMITTED R.E.DERMAN	3	4	

KNOXVILLE | DATE 8-26-83 | 05 | M | 47E235-46 | R1

ISSUED BY: J.C.STANOIFER

MBN006

WBN AFW PUMP TURBINE RM ND5
⊗-VOLUME 12



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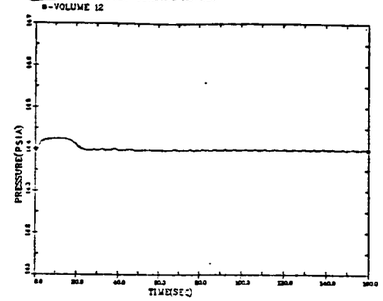
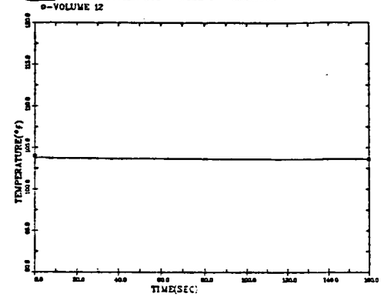
⊗-VOLUME 12



WBN AUX BOILER SYS - NODE 9 - CORRIDOR
⊗-VOLUME 12



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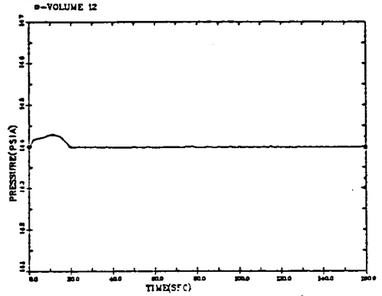
⊗-VOLUME 12



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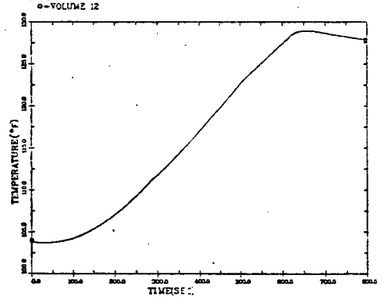
⊗-VOLUME 12



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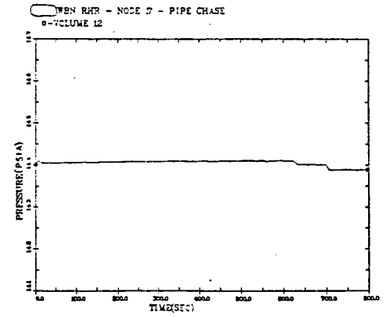
⊗-VOLUME 12



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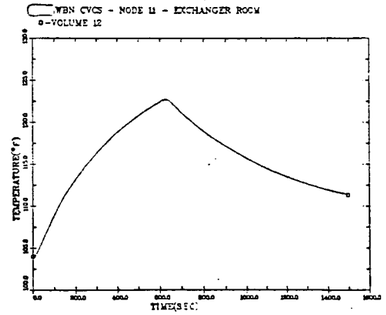
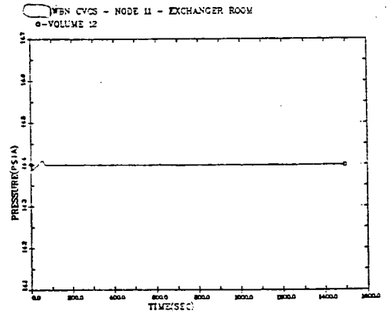
⊗-VOLUME 12



WBN CVCS - NODE 11 - EXCHANGER ROOM
⊗-VOLUME 12



8610090051-5D

TI APERTURE CARD

Also Available On Aperture Card

1	5175/A	9 9 86	DELETED SQN APPLICABILITY. REVISED COMP DWG TO DCN ADDED D DESIGNATION FOR REV 1
REV	ECN/CR	DATE	
1	4542	3 3 87	REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED PRELIM STATUS
REV	ECN NO	DATE	

DRN Pickett
DSN NAC
CHK R. A. Gillespie
APP R. E. Fortenberry
REVIEWED J. K. Lee

SCALE: NTS EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED | RECOMMENDED | APPROVED

INSPECTED AND APPROVED FOR ISSUE

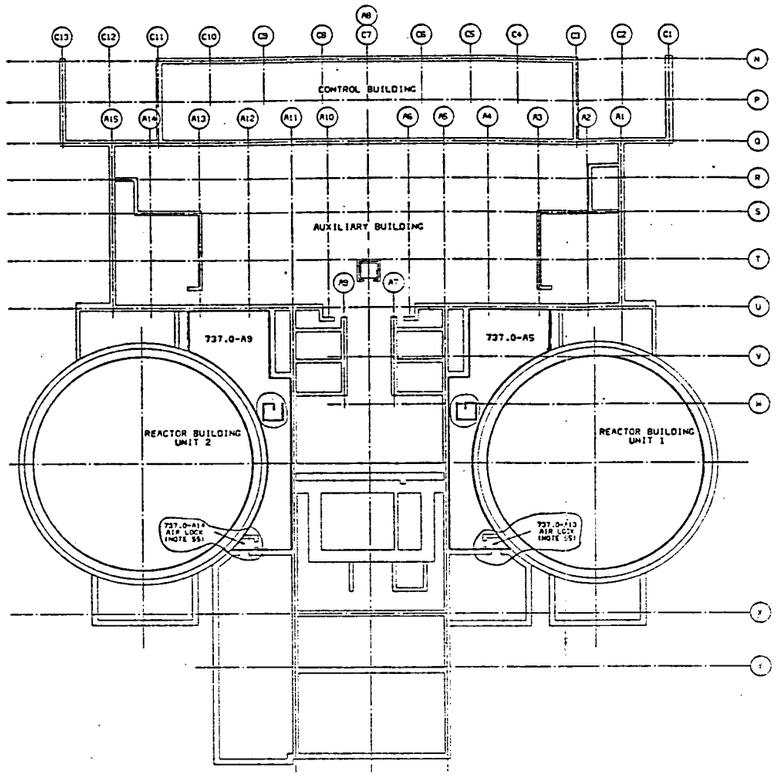
KNOXVILLE | 85 | M | 47E235-47 | R2

AS CONSTRUCTED

PERTINENT REVISIONED
DES
CHK
REV
APP

ECN - 3606

COMPANION DRAWING : 47E235-606

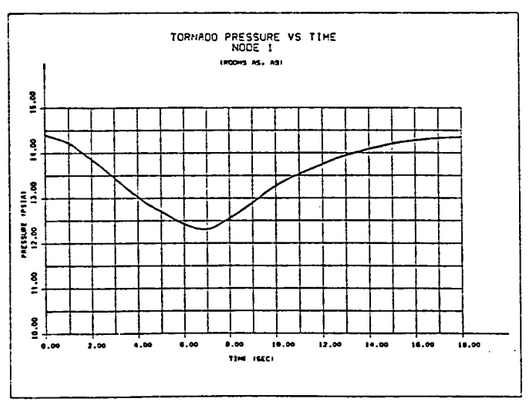


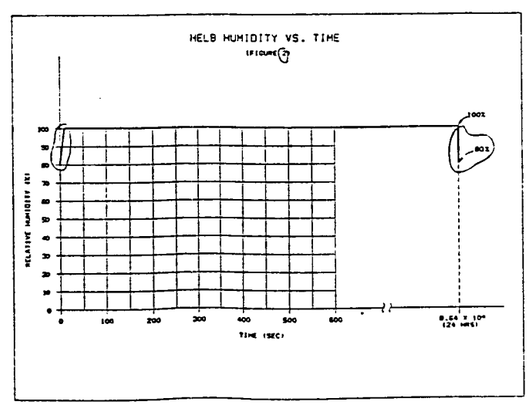
PLAN - EL 729.0 & 737.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING PENETRATION ROOMS AUX BLDG GAS TREATMENT SYSTEM (ABGTS) ROOMS A5-A9 EL 737.0	1 AVG MAX MIN	80 104 60	55 80 30	ATM (-) ATM (-) ATM (-)	8.3 X 10⁶ NA	NA NA NA	C	NOTE 18
	2 MAX MIN	110 50 NOTE 8	90 10 NOTE 10	ATM (-) ATM (-)	NA NA	NA NA		
	3	110 NOTE 25	NA	NA	NA	1 X 10⁶ (NOTE 32) 1.2 X 10⁶ (NOTE 33) (TABLE 2 NOTE 5S)		
	4	NOTE 13	100 (NOTES 13/14 FIGURE 7)	NOTE 13	NA	NA		NOTE 30
	5	NA	NA	NOTE 4 NOTE 1	NA	NA		

TABLE 2

FUEL HANDLING ACCIDENT DOSE (RADS)
4.0X10⁶ (NOTE 5S)





NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:

   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION

2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MRM IS APPROXIMATELY 14.4 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS, DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE EGTS. ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

4. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE DAILY AND BASIS CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE EITHER IS FOR A LOCA OR THE FUEL HANDLING ACCIDENT. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE HPS RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:

   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THE COMPANION DRAWINGS REFERENCED CONTAIN TEMPERATURE AND PRESSURE VS TIME PROFILES FOR ALL THE WORST CASE BREAK SCENARIOS INVOLVING THESE SYSTEMS. PROFILE TITLES EXPLAIN WHICH HIGH ENERGY SYSTEM EFFECT IS BEING DEPICTED. THE VOLUME NUMBER CORRESPONDS TO AREAS OR PORTIONS OF THE AREAS HIGHLIGHTED ON THE KEY PLAN. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DECREASE LINEARLY TO THE NORMAL OPERATING STATE GIVEN IN THE ENVIRONMENTAL TABLE AT THE END OF 24 HOURS. THE ENVIRONMENT MUST BE REDUCED THAT WITHIN THE LIMITS SHOWN FOR THE PROFILE FIGURES. THE SAME PROFILE VS TIME FIGURES ARE USED FOR BOTH CASE FOR QUALIFICATION PURPOSES. THE PROFILES REPRESENTING THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.

18. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

25. THE DURATION OF THIS CONDITION SHOULD BE CONSIDERED TO EXIST FOR UP TO 30 DAYS.

29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

32. THE LOCA DOSE GIVEN IS THE LARGEST DOSE EXPECTED IN THE ROOM. IF EQUIPMENT CANNOT BE QUALIFIED TO THIS DOSE, REFINED LOCATION SPECIFIC VALUES SHOULD BE OBTAINED FROM THE HPS RADIOLOGICAL PROTECTION SECTION (RAPS-3) ON AN AS NECESSARY BASIS.

33. THIS IS THE MAXIMUM LOCA DOSE INSIDE THE AIR CLEANUP UNIT HOUSING. ACTUAL DOSE WILL VARY DEPENDING UPON EQUIPMENT LOCATION. IF EQUIPMENT CANNOT BE QUALIFIED TO THIS DOSE, REFINED LOCATION SPECIFIC VALUES SHOULD BE OBTAINED FROM THE RADIOLOGICAL PROTECTION SECTION (RAPS-3) ON AN AS NECESSARY BASIS.

38. THE HELB'S DESCRIBED IN NOTE 13 WILL NOT CAUSE FLOODING IN THIS AREA.

47. UNSEALED CONDUITS AND COMPONENTS LOCATED WITHIN THIS AREA ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF AN RHR LINE BREAK. AN EVALUATION SHOULD BE PERFORMED TO DETERMINE IF SEALING IS NECESSARY TO PREVENT THE LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.

55. THE SPACE ABOVE AIR LOCKS A13 AND A14 (EL 746.0 AND ABOVE) IS ENVIRONMENTALLY PART OF ROOMS A5 AND A9 RESPECTIVELY.

59. THE DOSE GIVEN IS THE LARGEST DOSE EXPECTED IN THE ROOM FOR A FUEL HANDLING ACCIDENT. THE DOSE IS REDUCED TO <1X10⁶ RADS AT A DISTANCE OF 3.25 FEET FROM THE ABGTS CHARCOAL FILTER. ADDITIONAL EVALUATION IS REQUIRED IF EQUIPMENT IS LOCATED WITHIN 3.25 FEET OF THE CHARCOAL FILTER.

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBN 82-0726-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-21) (ESB-831213-2211).

8610090051-51

3	6178.A	1-9-86	RD	[illegible]	HER	MJ	[illegible]	[illegible]	

REVISED NOTES 1,6,11,13,16,32,33, KEY PLAN, 40-YEAR DOSE, AND FIGURE 2. ADDED TABLE 2, REFERENCE 2, AND NOTES 28,47,55, AND 59. DELETED NOTE 15, RENUMBERED FIGURE 6 AS FIGURE 2, ADDED Q DESIGNATION PER DISCRETION A.

2	5408	1-22-85	RAS	RAD	HER	GEC	JAR	JCS	

REVISED INT ACC DOSE. ADDED NOTE 32 & 33.

1	4542	3-8-84	RAS	RAD	SAB	GEC	JAR	JCS	

CORRECTED TITLE BLOCK ELEVATION AND REVISED KEYPLAN.

MAT'L NO.	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 737.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A. DOTSON	CHECKED R.P. CAMPBELL	1	2	J.A. RAULSTON
DESIGNED R.A. SULFRIDGE	SUBMITTED C.E. GERMAN	3	4	

KNOXVILLE | DATE 9-26-83 | 05 | M | 47E235-48 | R3

ISSUED BY: J.C. STANDIFER

COMPANION DRAWING: 47E235-49

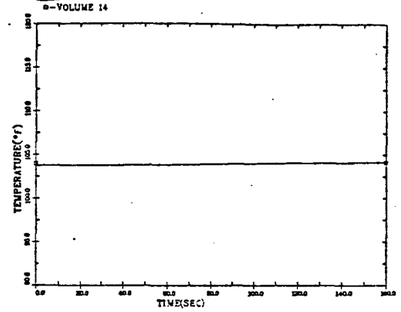
ECN-3606

MS-H007

TI APERTURE CARD

Also Available On Aperture Card

WBN AFW PUMP TURBINE RM ND5
a-VOLUME 14



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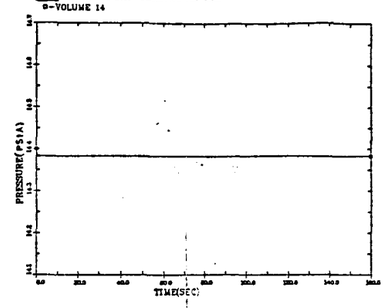
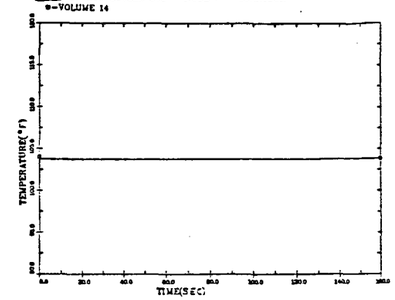
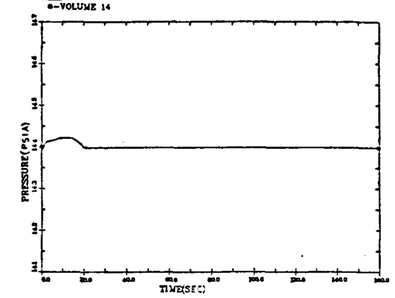
a-VOLUME 14



WBN AUX BOILER SYS - NODE 9 - CORRIDOR
a-VOLUME 14



WBN AUX BOILER SYS - NODE 9 - CORRIDOR
a-VOLUME 14



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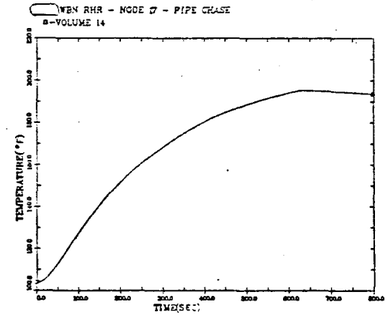
a-VOLUME 14



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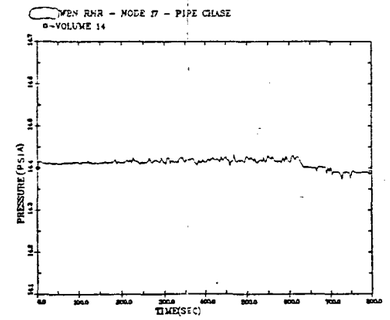

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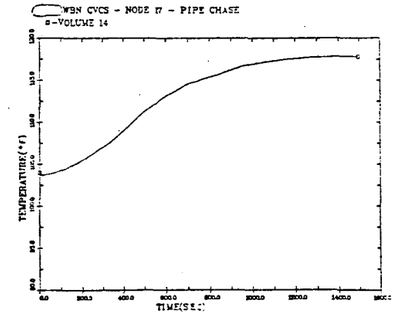
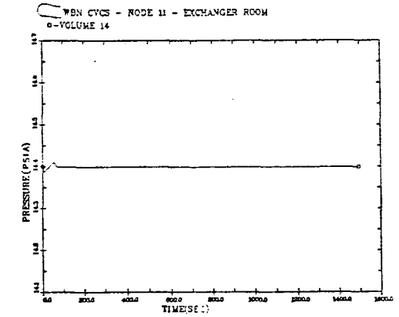
a-VOLUME 14



WBN CVCS - NODE 11 - EXCHANGER ROOM
a-VOLUME 14



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TI APERTURE CARD

Also Available On Aperture Card

2	ALTR. A		DELETED SOM APPLICABILITY. REVISED COMP DWG TO DOB. ADDED 3 PRESSURIZATION PER ECN A
1	4542		REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED PRELIM STATUS

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

KNOXVILLE — 85 — N — 47E235-49 — R2

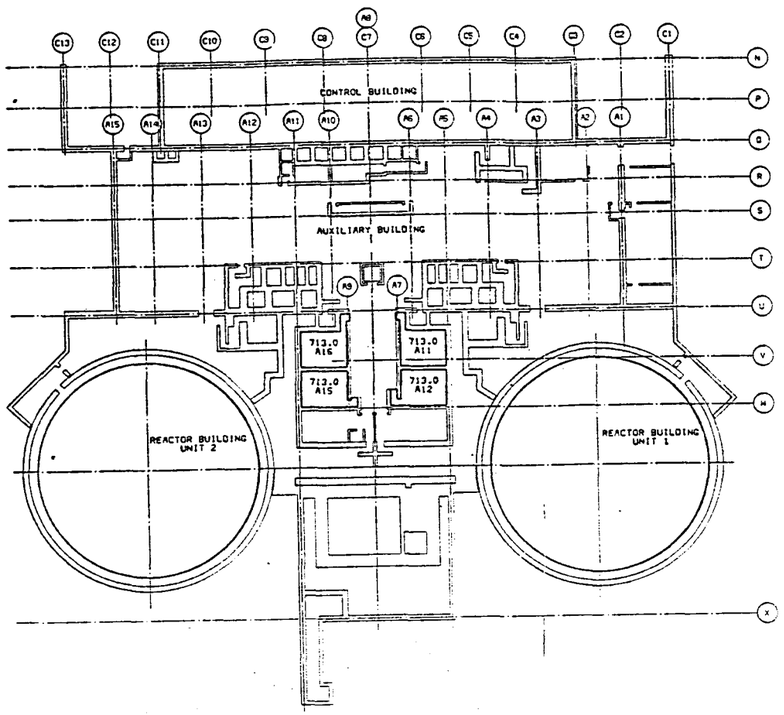
RECORD DRAWING AS CONSTRUCTED

PRIMER REVIEWED

INSPECTED AND APPROVED FOR ISSUE

COMPANION DRAWING: 47E235-[illegible]

ECN-3606



PLAN - EL 708.0 & 713.0

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:

   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION

2. ATM =INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MSM IS APPROXIMATELY 14.4 PSIA.

   ATM(+) =INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) =INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE EGTS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

4. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE SEVEN DOSE CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED DOSE DOCUMENT IS FOR A LOCAL TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE NER RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREA, LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:

   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THE COMPANION DRAWINGS REFERENCED CONTAIN TEMPERATURE AND PRESSURE VS TIME PROFILES FOR ALL THE WORST CASE BREAK SCENARIOS INVOLVING THESE SYSTEMS. PROFILE TITLES EXPLAIN WHICH BREAK CORRESPONDS. SYSTEM EFFECT IS BEING DEPICTED. THE VOLUME OF THE REFERENCED CORRESPONDS TO AREAS OR PORTIONS OF THE AREAS WHICH ARE ON THE REFERENCED PROFILE. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DECREASE LINEARLY TO THE NORMAL ATMOSPHERIC VALUE IF IT HAS NOT REACHED ENVIRONMENTAL TRUE AT THE END OF 30 HOURS. IF IT HAS NOT REACHED THAT VALUE WITHIN THE TIME IN EACH CASE, FOR JUSTIFICATION PURPOSES, THE PROFILES REPRESENTING THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.

19. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-31.2. DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS, AND SAFETY RELATED EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD (WHICH IS EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED).

25. THE DURATION OF THIS CONDITION SHOULD BE CONSIDERED TO EXIST FOR UP TO 30 DAYS.

29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

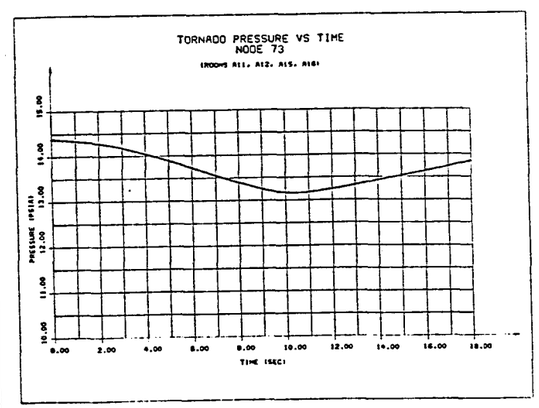
40. THE HELB'S DESCRIBED IN NOTE 13 WILL RESULT IN THE FLOOD LEVEL SPECIFIED IN TABLE 1. 2'-1" IS FOR A BREAK IN THE WEST EXCHANGER ROOM. THE FLOOD LEVEL IS ONLY 1'-1" IN EACH ROOM FOR A BREAK IN THE OPPOSITE WEST EXCHANGER ROOM.

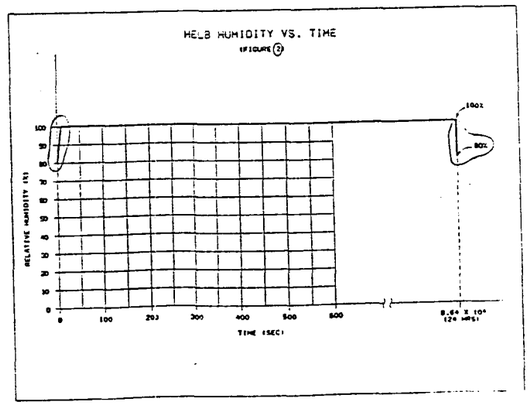
49. UNSEALED CONDUITS AND COMPONENTS LOCATED WITHIN THIS AREA ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF A SEAL LINE BREAK. AN EVALUATION SHOULD BE PERFORMED TO DETERMINE IF SEALING IS NECESSARY TO PREVENT THE SHORT TERM EFFECTS OF PRESSURE INDUCED MOISTURE INTRUSION AND LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.

TABLE I

ROOM NO.	HELB			
	DWG	CHES	ANN	AB
A11, A1213'-1" A15, A16				

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40-YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING RESIDUAL HEAT REMOVAL (RHR) HEAT EXCHANGERS 1A,1B 2A,2B CONTAINMENT SPRAY HEAT EXCHANGERS 1A,1B,2A,2B A11,A12,A15,A16 EL 713.0	1 AVG / MAX / MIN	80 / 104 / 60	55 / 80 / 30	ATM (-) / ATM (-) / ATM (-)	3.[illegible] x 10^6 / NA	NA / NA / NA	B	NOTE 16
	2 MAX / MIN	110 / 50 NOTE 8	90 / 10 NOTE 10	ATM (-) / ATM (-)	NA / NA	NA / NA		
	3	NA	NA	NA	NA	1 x 10^7		
	4	NOTE 13	100 NOTE 13,40 FIGURE 2	NOTE 13	NA	NA		NOTE 40 TABLE 1
	5	NA	NA	NOTE 4 MODE 73	NA	NA		





REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS TNEB 82-0726-235..
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN TNB-DC-40-42 (ESB-831213-21)..

8610090051-53

TI APERTURE CARD

Also Available On Aperture Card

REV NO.	ECN/FCP	DATE	DSGN	DRWN	CHKD	DRWD	APPD	ISSD
1	8178,A	9-9-86	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

REVISED 40 YEAR DOSE REF 2, FIGURE 2, AND NOTES 1,4,11,13, AND 16; ADDED TABLE I AND NOTES 40 AND 49, RENUMBERED FIGURE 6 AS FIGURE 2. DELETED NOTE 15. ADDED Q DESIGNATION PER EXCEPTION A.

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 713.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

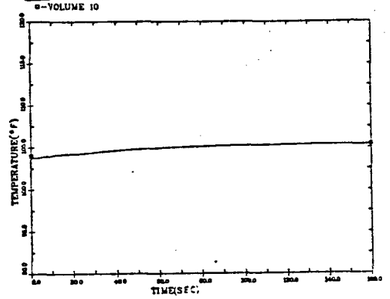
DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.DOTSON	CHECKED R.R.CAMPBELL	1	2	J.A.PAULSTON
DESIGNED R.A.SULFRIDGE	SUBMITTED G.E.DEMANN	3	4	

KNOXVILLE | DATE 8-26-83 | 85 | M | 47E235-50 | R1

ECN-3606 — ISSUED BY: J.C.STANGIFER

MBN008

WBN AFW PUMP TURBINE RM ND5
0-VOLUME 10



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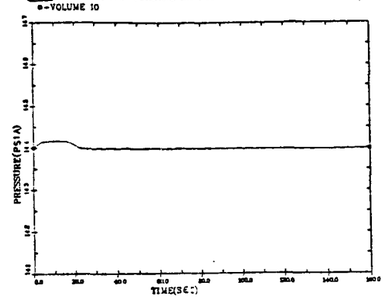

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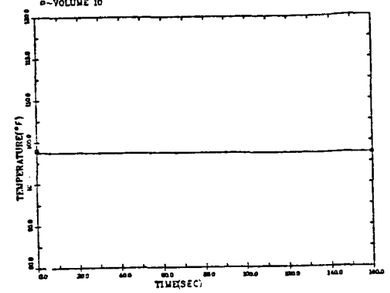
0-VOLUME 10



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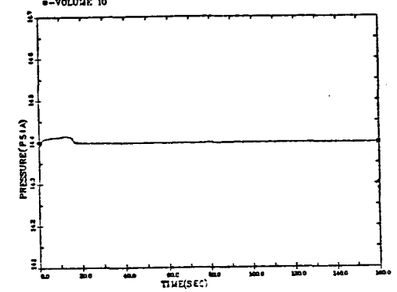
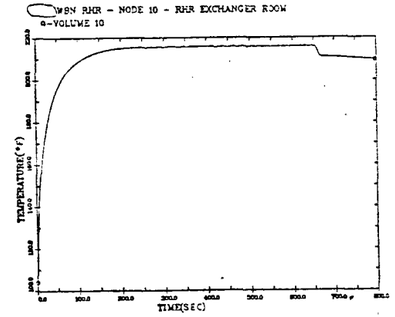


WBN RHR - NODE 10 - RHR EXCHANGER ROOM
0-VOLUME 10



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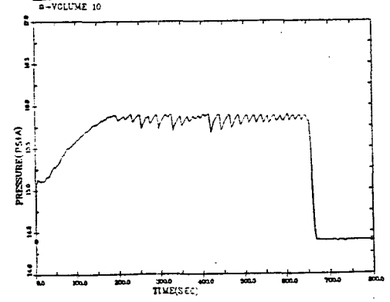
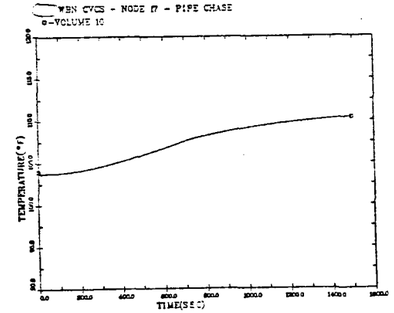
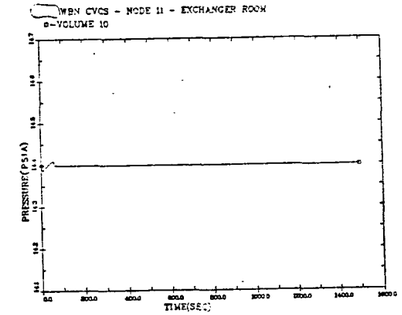
0-VOLUME 10



WBN CVCS - NODE 17 - PIPE CHASE
0-VOLUME 10



WBN CVCS - NODE 11 - EXCHANGER ROOM
0-VOLUME 10



8610090051-54

TI APERTURE CARD

Also Available On Aperture Card

2	6171,A		
	DELETED SGN APPLICABILITY, REVISED COMP DWG TO GOB, ADDED @ DRWG PER ECN A.		
1	ECN/FCR	DATE	
1	4542		
	REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED PREUM STATUS		
REV	ECN NO	DATE	

SCALE:NTS EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

(Q)

SUBMITTED | RECOMMENDED | APPROVED

KNOXVILLE | 9-29-83 | BS | N | 47E235-51 | R2

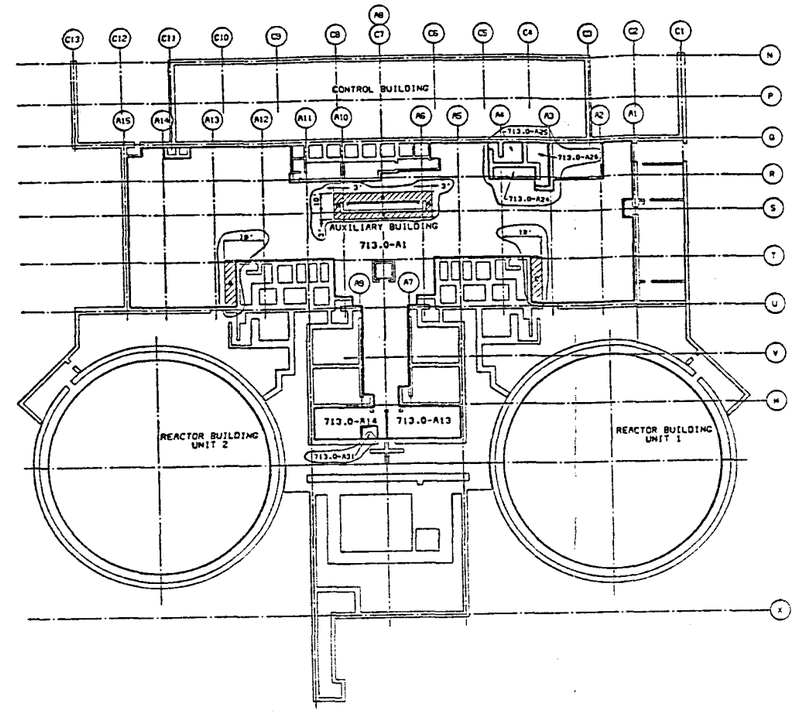
RECORD DRAWING AS CONSTRUCTED

FURTHER REVIEWED

ECN - 3606

INSPECTED AND APPROVED FOR ISSUE

COMPANION DRAWING : 47E235-



PLAN - EL 709.0 & 713.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 3)	TEMPERATURE (F°)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING GENERAL FLOOR AREA, SAMPLE ROOMS 1,12, WASTE GAS COMPRESSOR ROOMS A & B, WASTE GAS COMPRESSOR VALVE GALLERY ROOMS WASTE GAS ANALYZER ROOM A1,A13,A14,A24, A25,A26,A31 EL 713.0	1 AVG MAX MIN	80 104 60	55 80 30	ATM(-) ATM(-) ATM(-)	TABLE 2	NA NA NA	B	NOTE 18
	2 MAX MIN	MAX 110 50 NOTE 8	90 10 NOTE 10	ATM(-) ATM(-)	NA	NA NA		
	3	NA	NA	NA	NA	< 1 x 10⁴		
	4	NOTE 13	100 NOTES 13, 41 TABLE 3	NOTE 13	NA	NA		NOTE 29 TABLE 1
	5	NA	NA	NOTE 4 MODE 69	NA	NA		

TABLE 1

ROOM NO.	HELB			
	RHR	CVCS	RFW	AB
A1,A24, A25,A26	1*	1*	NA	1*
A13	3*(U1)1* 3*(U2)1*	1*	NA	1*
A14,A31	3*(U1)1* 3*(U2)1*	1*	NA	1*

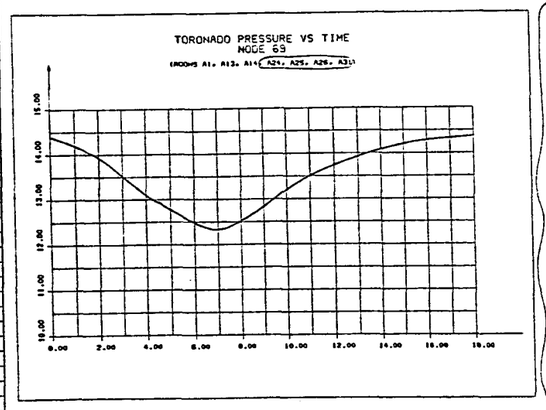
*INDICATES WHICH UNIT THE BREAK OCCURS IN.

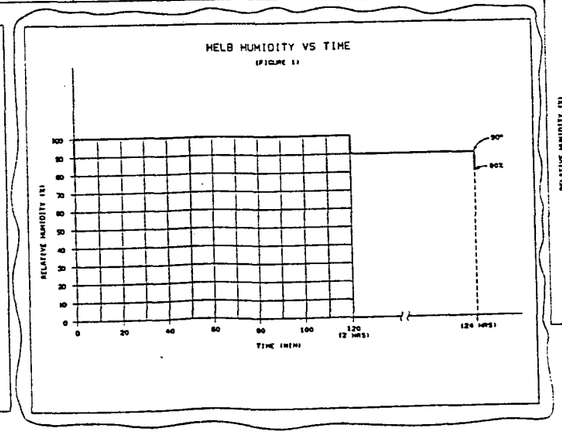
TABLE 2

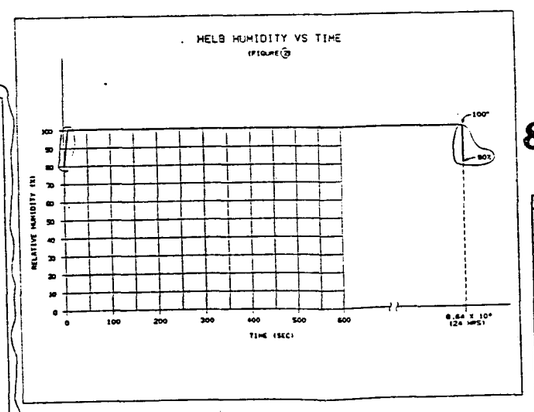
ROOM NO.	DOSE (RADS)
A1 (SHADED AREA A1	7.2 X 10⁵
A1 (SHADED AREAS B & C)	4.6 X 10⁵
A1 (UNSHADED AREA)	4.0 X 10⁴
A13,A14	1.8 X 10⁷
A24	4.4 X 10⁶
A25,A26	8.9 X 10⁶
A31	DOSE ON REQUEST

TABLE 3

ROOM NO.	HELB			
	RHR	CVCS	RFW	AB
A1,A24, A25,A26	FIG 2	FIG 2	FIG 1	FIG 1
A13,A14 ,A31	FIG 2	FIG 2	FIG 1	FIG 1







NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCALIZED INSIDE PRIMARY CONTAINMENT (HOPE? CASE SHALL BE USED FOR TEMPERATURE + LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SEQUOYAH PRESSURE DROP OF 3 PSI).
   6. INADVERTENT CONTAINMENT SPRAY INITIATION.
2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT NOW IS APPROXIMATELY 14.4 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE ECTS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.
4. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).
9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN IS FOR A 30-DAY TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE HEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.
12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
    A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.
13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THE COMPANION DRAWINGS REFERENCED CONTAIN TEMPERATURE AND PRESSURE VS TIME PROFILES FOR ALL THE WORST CASE BREAK SCENERIOS INVOLVING THESE SYSTEMS. PROFILE TITLES EXPLAIN WHICH HIGH ENERGY SYSTEM EFFECT IS BEING DEPICTED. THE VOLUME NUMBER CORRESPONDS TO AREAS OR PORTIONS OF THE AREAS HIGHLIGHTED ON THE KEY PLAN. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DECREASE LINEARLY TO THE NORMAL MAXIMUM VALUE GIVEN IN THE ENVIRONMENTAL TABLE AT THE END OF 24 HOURS IF IT HAS NOT REACHED THAT VALUE WITHIN THE TIME SCALE OF THE FIGURE.

    FOR QUALITIFICATION PURPOSES, THE HELB PROFILES REPRESENTING THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.
18. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.
29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.
39. THE HELB'S DESCRIBED IN NOTE 13 WILL RESULT IN THE FLOOD LEVELS SPECIFIED IN TABLE 1.
41. TABLE 3 EXPLAINS WHICH RELATIVE HUMIDITY FIGURE TO USE FOR A PARTICULAR HELB.

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBN 82-0728-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESR-831213-2141).

TI APERTURE CARD

Also Available On Aperture Card

8610090051-55

REV	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD
1	8178,A	9 7 86						

REVISED NOTES 1,4-11,13,16; KEY PLAN; 40 YEAR DOSE AND FIGURE 2. ADDED ROOMS A24, A25, AND A26 TO THE KEY PLAN AND TABLE. ALSO ADDED TABLES 1,2,3. FIGURE 1. AND NOTES 39, AND 41. RENUMBERED FIGURE 6 AS FIGURE 2. ALSO ADDED ROOM A31 AND D DESIGNATION PER EXCEPTION A.

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 713.0

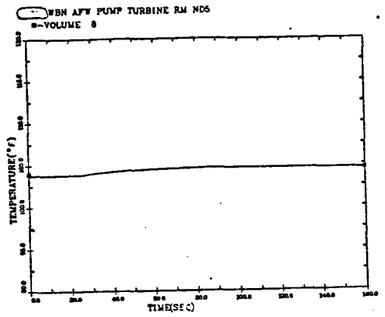
WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

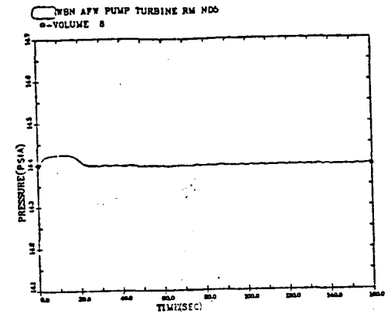
DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.OTTSON	CHECKED R.P.CAMPBELL	1	2	J.R.BRALSTON
DESIGNED R.A.SLEFRIDGE	SUBMITTED G.E.GERMAN	3	4	

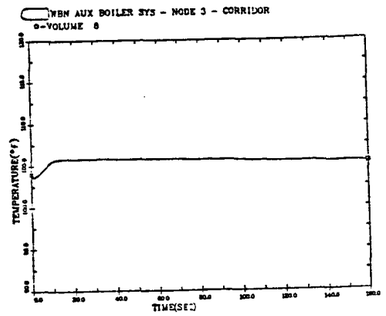
KNOXVILLE — DATE 8-26-83 — 85 M 47E235-52 R1

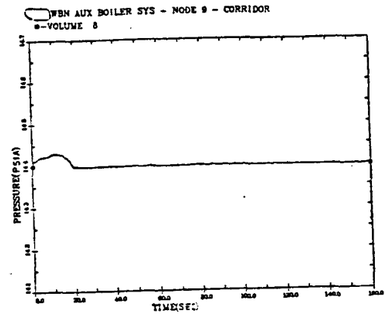
COMPANION DRAWINGS: 47E235-53,54,55 — ECN-3606 — ISSUED BY: J.C.STANSIFER

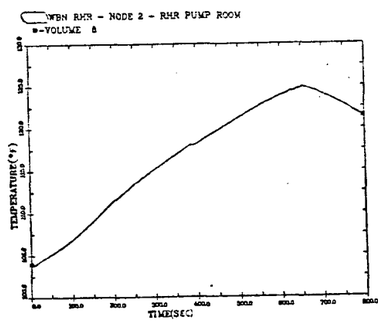
MEN003

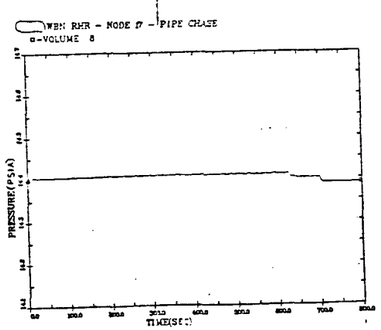


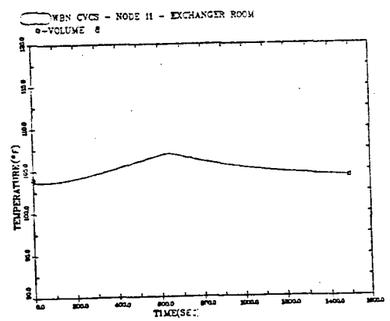


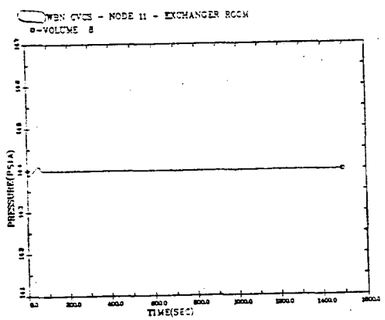












8610090051-56

TI APERTURE CARD

Also Available On Aperture Card

REV	DESCRIPTION	DATE	DRAWN	CHKD	APPD
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1	45-92	12-3-84			
0	REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED PRELIM STATUS				

REV	ECN NO	DATE	DESCRIPTION OF REVISION

DRAWN
CHKD
CHKD
SUPV

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED — RECOMMENDED — APPROVED

INSPECTED AND APPROVED FOR ISSUE

KNOXVILLE 12-6-83 BS M 47E235-53 R2

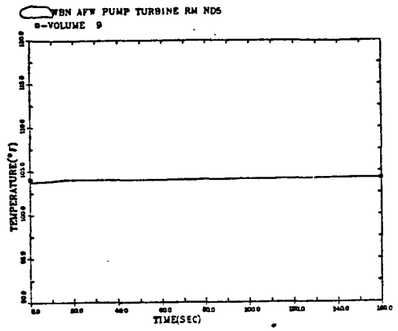
RECORD DRAWING AS CONSTRUCTED

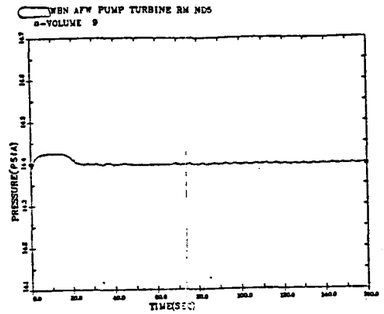
PERTINENT REVIEWED

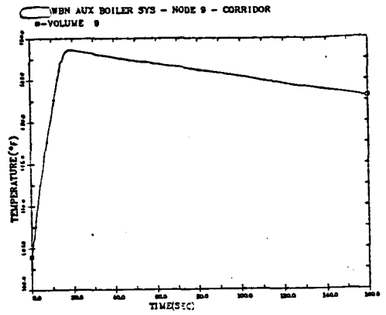
ECN - 3608

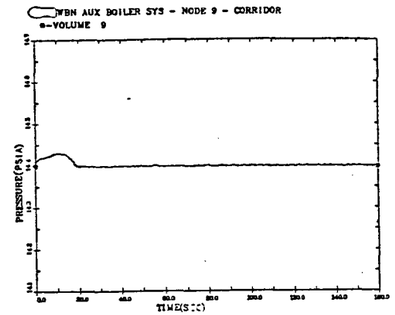
COMPANION DRAWING : 47E235-

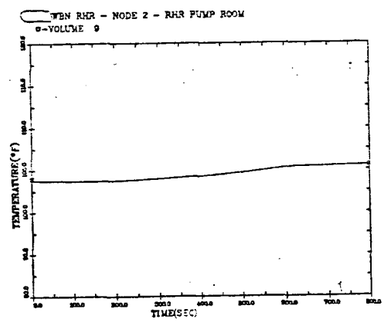
47E235-53 M BS

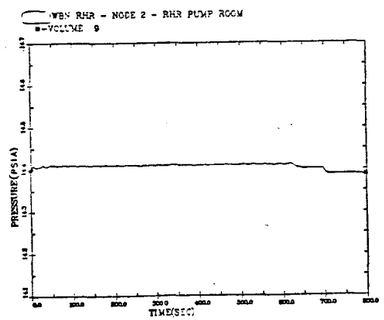


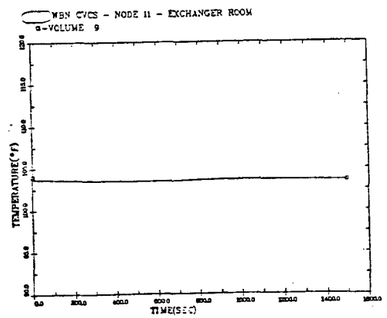


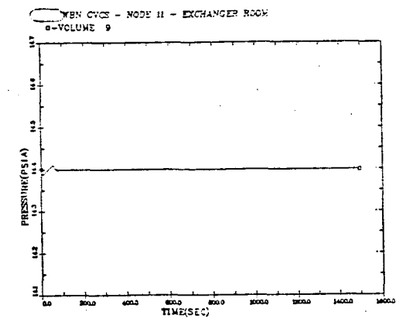












8610090051-57

TI APERTURE CARD

Also Available On Aperture Card

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SYM	ECN/FCN	DATE	DESCRIPTION
1	4542		
REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED PRELIM STATUS			
SYM	ECN NO	DATE	DESCRIPTION

DRAWN
DESIGN
CHKD
DATE

DESIGNED

SCALE: NTS EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

(Q)

SUBMITTED | RECOMMENDED | APPROVED

INSPECTED AND APPROVED FOR ISSUE

KNOXVILLE | 12 13 | 85 | M | 47E235-54 | R2

RECORD DRAWING AS CONSTRUCTED

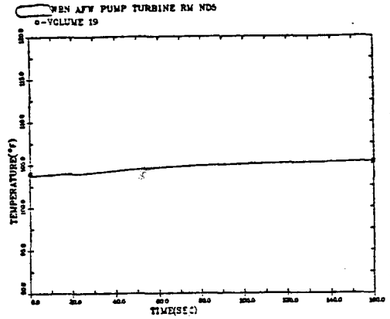
FURTHER REVIEWED
EES
CES
NES
TCA

ECN - 3606

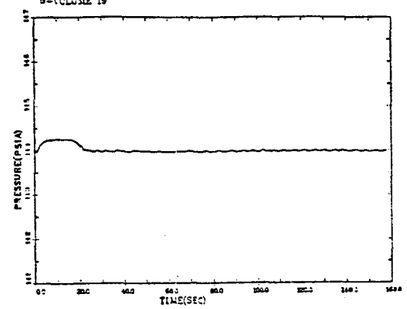
COMPANION DRAWING : 47E235-53

47E235-54 | M | 85

WBN AFW PUMP TURBINE RM ND5
a-VOLUME 19



WBN AFW PUMP TURBINE RM ND5
a-VOLUME 19



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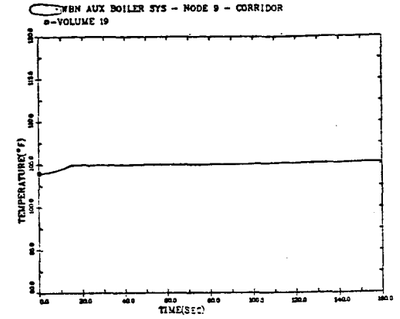
a-VOLUME 19



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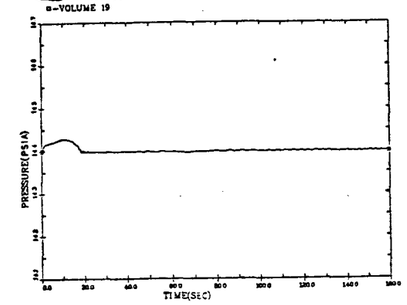
a-VOLUME 19



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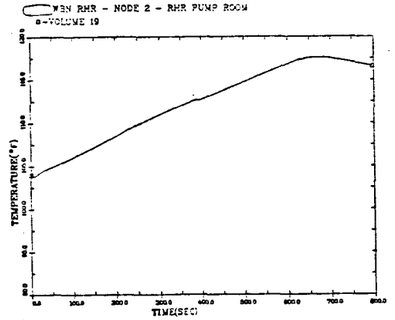
a-VOLUME 19



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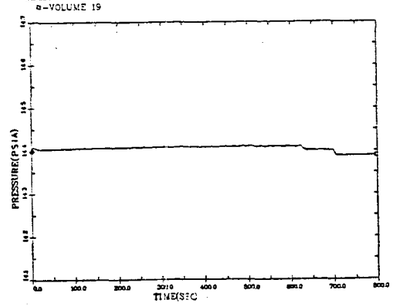

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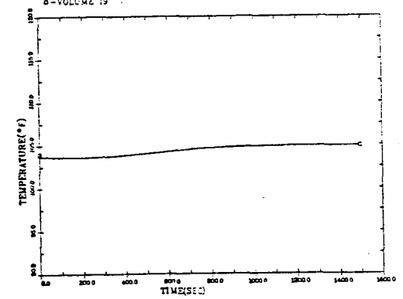
a-VOLUME 19



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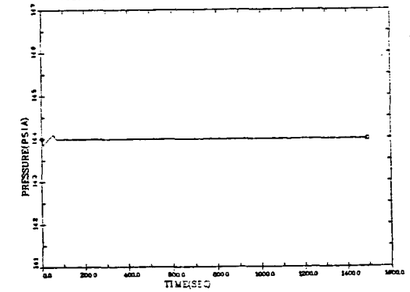
a-VOLUME 19



8610090051-58

TI APERTURE CARD

Also Available On Aperture Card

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1	12-15-83		REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED PRELIM STATUS
REV	ECN NO	DATE	DESCRIPTION

DRAWN R.A. Hess
DESIGN M.C. Crum
CHKD R.A. Hess
DATE 4-2-86
MGR J. Johnson
SCALE: NTS EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED | RECOMMENDED | APPROVED

KNOXVILLE | 8-26-83 | BS | M | 47E235-55 | R2

RECORD DRAWING AS CONSTRUCTED

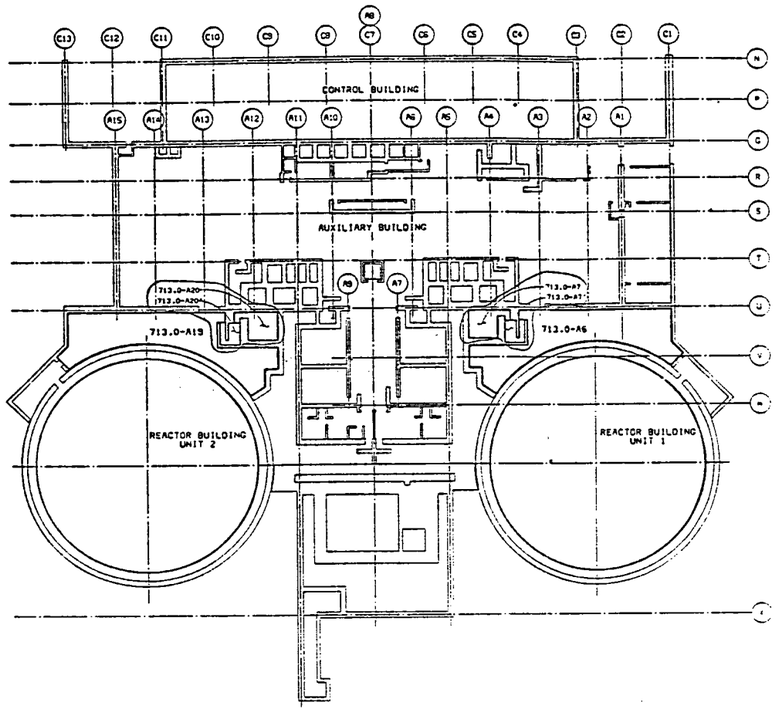
PEER REVIEW

INSPECTED AND APPROVED FOR ISSUE

COMPANION DRAWING : 47E235-[illegible]

ECN - 3608

47E235-55 M BS



PLAN - EL 708.0 & 713.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (F)(4)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING PENETRATION ROOMS A6, A19 VOLUME CONTROL TANK ROOMS A7,A20 VOLUME CONTROL TANK ROOM LABYRINTHS A7',A20' EL 713.0	1 AVG MAX MIN	80 104 60	55 90 30	ATM(+) ATM(+) ATM(+)	TABLE 2	NA NA	C	NOTE 16
	2 MAX MIN	110 50 } NOTE 8	90 10 } NOTE 10	ATM(+) ATM(+)	NA NA	NA NA		
	3	110 NOTE 25	NA	NA	NA	TABLE 2		
	4	NOTE 13	100 } NOTES 13,47 FIGURE 2	NOTE 13	NA	NA		NOTE 39 TABLE 1
	5	NA	NA	NOTE 4 NODE 68	NA	NA		

TABLE 1				
ROOM NO.	HELB			
	RWD	CHGS	AFW	RB
A6, A7, A19, A20, A7',A20'	1"	1"	NA	1"

TABLE 2		
ROOM NO.	40 YEAR DOSE (RADS)	ACCIDENT DOSE (RADS)
A6, A19	2.2×10^6	2×10^6
A7, A20	5.8×10^6	3×10^6
A7',A20'	5.8×10^6 (NOTE 61)	5×10^6

NOTES:

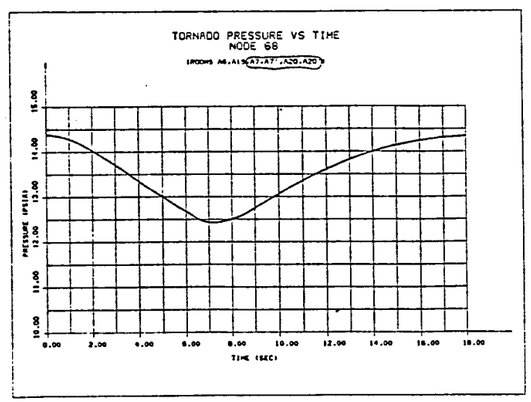
1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA(HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION
2. ATM =INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MBN IS APPROXIMATELY 14.6 PSIA.

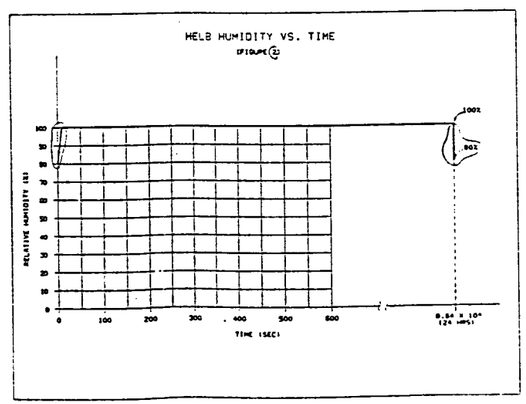
   ATM(+) =INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) =INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -9.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE ESF'S, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.
4. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).
8. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN IS FOR A LOCA. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE MBN RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.
12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.
13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY SYSTEM AND AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) QUESTIONS AND PRESSURE COMPANION DRAWINGS REFERENCED CONTAIN CASE BREAK SCENARIOS INVOLVING THE PROFILES FOR ALL THE MORE EXPLAIN HIGH ENERGY SYSTEM DESCRIBED. THE VOLUME NUMBER CORRESPONDS TO AREAS OF INTEREST IN THE AREAS HIGHLIGHTED ON THE KEY PLAN. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DECREASE EXPONENTIALLY TO THE NORMAL MAXIMUM VALUE GIVEN IN THE ENVIRONMENTAL TABLE AT THE END OF 24 HOURS IF IT HAS NOT REACHED THAT VALUE WITHIN THE TIME SCALE OF THE FIGURE. THE SAME HUMIDITY VS TIME FIGURE APPLIES IN EACH CASE. FOR QUALIFICATION PURPOSES, (PROFILES) PROFILES REPRESENTING THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.
16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA MB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.
25. THE DURATION OF THIS CONDITION SHOULD BE CONSIDERED TO EXIST FOR UP TO 30 DAYS.
29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.
39. THE HELB'S DESCRIBED IN NOTE 13 WILL RESULT IN THE FLOOD LEVELS SPECIFIED IN TABLE 1.
47. UNSEALED CONDUITS AND COMPONENTS LOCATED WITHIN THIS AREA ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF AN HVAC LINE BREAK. AN EVALUATION SHOULD BE PERFORMED TO DETERMINE IF SEALING IS NECESSARY TO PREVENT THE LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.
61. THE DOSE GIVEN IS THE 40 YEAR DOSE FOR THE HOLDUP CONTROL TANK ROOM WHICH IS CONSERVATIVE FOR THE VCT LABYRINTH. IF NEEDED, AN ACTUAL LABYRINTH ROOM DOSE CAN BE DETERMINED BY THE MBN RADIATION PROTECTION SECTION (RPS-3).

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (MEB 82-0726-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (MB-DC-40-42) (ESB-831213-2141).





8610090051-59

TI APERTURE CARD

Also Available On Aperture Card

REV	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD		
1	8178, A	9 9 86								

REVISED NOTES 1,4,11,13,16. KEY PLAN, 40 YEAR DOSE, AND FIGURE 2. ADDED ROOMS A7,A7',A20,A20' TO THE KEY PLAN AND TABLE. ALSO ADDED TABLES 1,2 AND NOTES 39,47 AND 61. REVISED FIGURE 6 AS FIGURE 2. ADDED Q DESIGNATION PER EXCEPTION A.

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 713.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN P.A.DOTSON	CHECKED R.R.CAMPBELL	1	2	J.A.RAULSTON
DESIGNED P.A.SULFRIDGE	SUBMITTED D.E.DEPMAN	3	4	

KNOXVILLE | DATE 8-26-83 | 95 | M | 47E235-56 | R1

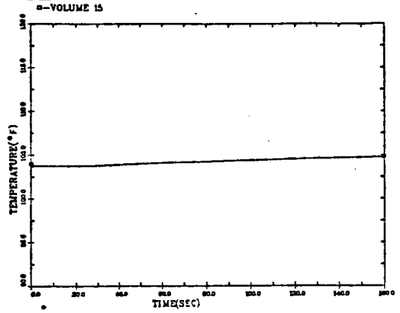
COMPANION DRAWING: 47E235-57

ECN-3606

ISSUED BY: J.C.STANDIFER

MBN010

WBN AFW PUMP TURBINE RM ND5
a-VOLUME 15



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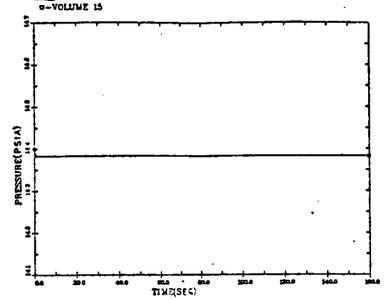
a-VOLUME 15



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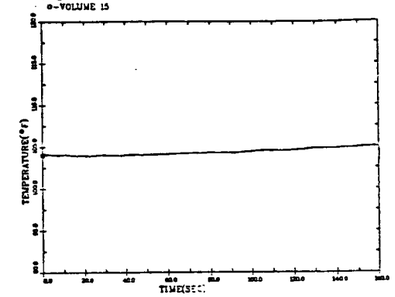

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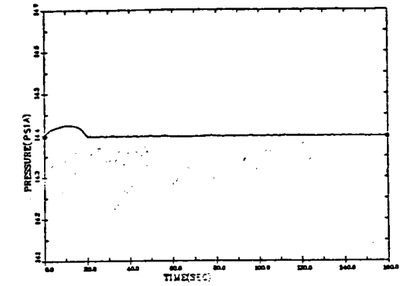

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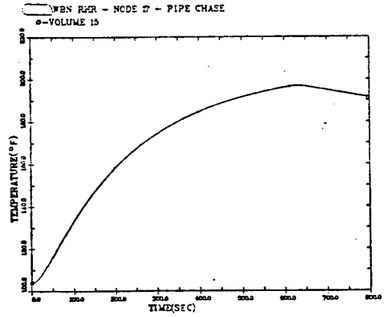

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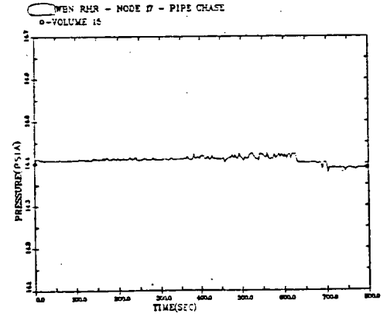

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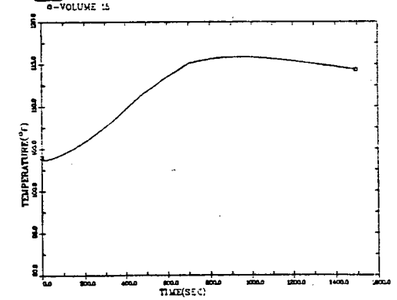

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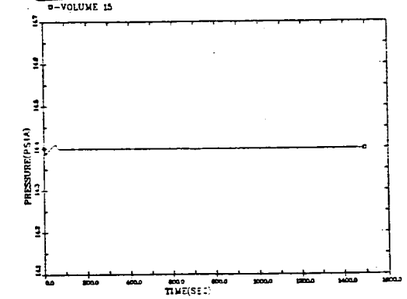
a-VOLUME 15



8610090051-60

TI APERTURE CARD

Also Available On Aperture Card

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0			
11	4542	1-26-83	REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED HELIUM STATUS
REV	ECN NO	DATE	DESCRIPTION

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

KNOXVILLE | 1-26-83 | BS | M | 47E235-57 | R2

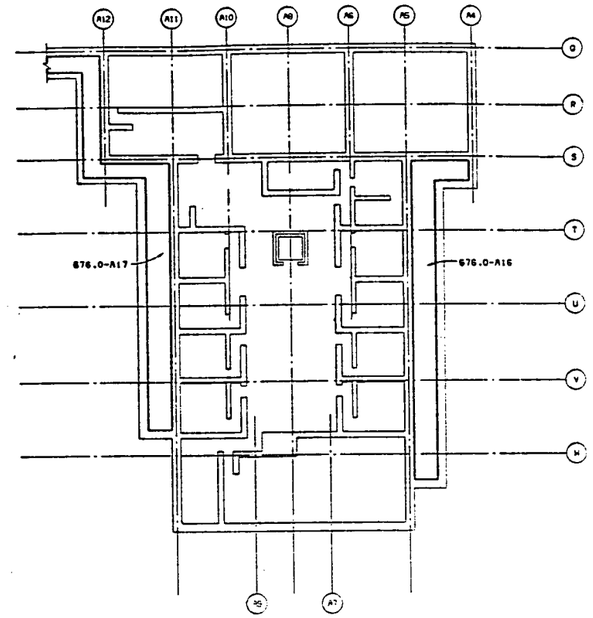
RECORD DRAWING AS CONSTRUCTED

FURTHER REVIEWED
EES
CES
MES
RES

INSPECTED AND APPROVED FOR ISSUE

ECN - 3608

COMPANION DRAWING : 47E235-54

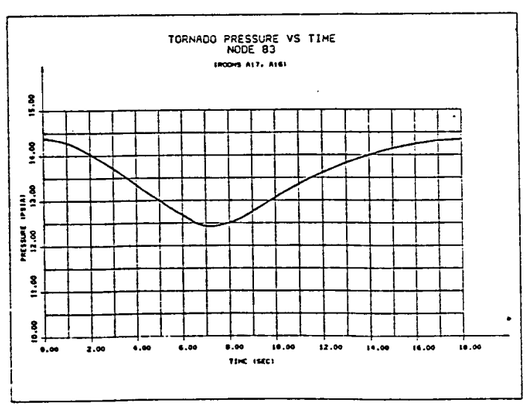


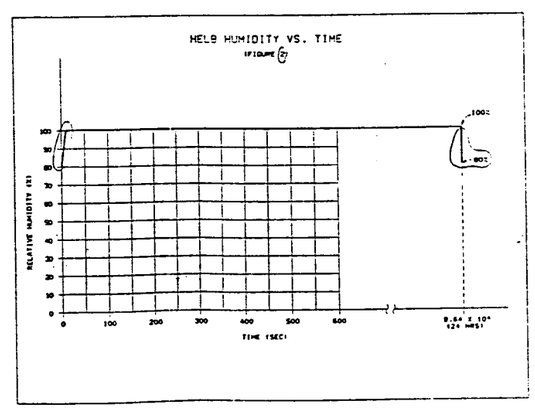
PLAN - EL 676.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING PIPE CHASE A16,A17 EL 676.0	1 AVG MAX MIN	80 104 60	55 80 30	ATM (-) ATM (-) ATM (+)	NA 7.4 x 10⁶ NA	NA NA NA	C	NOTE 16
	2 MAX MIN	110 50 } NOTE 8	90 10 } NOTE 10	ATM (-) ATM (-)	NA NA	NA NA		
	3	110 NOTE 25	NA	NA	NA	5 x 10⁴		
	4	NOTE 13	100 (NOTES 13-27 FIGURE 2)	NOTE 13	NA	NA		NOTE 39 TABLE 1
	5	NA	NA	NOTE 4 NODE 83	NA	NA		

TABLE 1

ROOM NO.	HELB			
	SWB	DVCS	AFW	AB
A16,A17	7"	7"	1"	1"





NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION

2. ATM (-) INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT ANR IS APPROXIMATELY 14.4 PSIA.

   ATM(+) =INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) =INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE ECTS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

4. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

8. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED RESIDENT DOSE EITHER IS FOR A LOCAL TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE HEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM (ABS), RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THE COMPANION DRAWINGS REFERENCED CONTAIN TEMPERATURE AND PRESSURE VS TIME PROFILES FOR THE WORST CASE BREAK SCENARIOS INVOLVING THESE SYSTEMS. PROFILE TITLES EXPLAIN WHICH HIGH ENERGY SYSTEM IS BEING DEPICTED. THE VOLUME NUMBER CORRESPONDS TO AREAS OR PORTIONS OF THE AREAS HIGHLIGHTED ON THE HEB PLAN. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DECREASE LINEARLY TO THE NORMAL MAXIMUM VALUE GIVEN IN THE ENVIRONMENTAL TABLE AT THE END OF 24 HOURS IF IT HAS NOT REACHED THAT VALUE WITHIN THE TIME SCALE OF THE FIGURE. THE SAME HUMIDITY VS TIME FIGURE APPLIES IN EACH CASE. FOR QUALIFICATION PURPOSES, THE HEB PROFILES REPRESENTING THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.

16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

25. THE DURATION OF THIS CONDITION SHOULD BE CONSIDERED TO EXIST FOR UP TO 30 DAYS.

29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

39. THE HELB'S DESCRIBED IN NOTE 13 WILL RESULT IN THE FLOOD LEVELS SPECIFIED IN TABLE 1.

47. UNSEALED CONDUITS AND COMPONENTS LOCATED WITHIN THIS AREA ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF AN SWBL LINE BREAK. EVALUATION SHOULD BE PERFORMED TO DETERMINE IF SEALING IS NECESSARY TO PREVENT THE LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB 82-0726-2251.
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-421 (ESB-831213-2141).

8610090051-61

TI APERTURE CARD

Also Available On Aperture Card

1	6178.A	07 86	BD	SW	WLZ	WH	RWM	RWM	

REVISED NOTES 1, 4, 11, 13, 16, REF 2, 40 YEAR DOSE, ACCIDENT DOSE, AND FIGURE 2, ADDED TABLE 1, NOTES 27 AND 39, RENUMBERED FIGURE 5 AS FIGURE 2, DELETED NOTE 15, ADDED Q DESIGNATION PER EXCEPTION A1.

REV	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 676.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

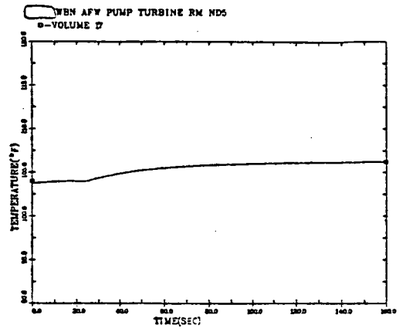
Q

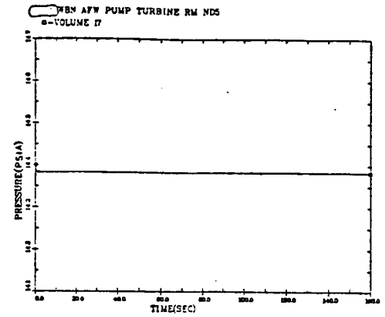
DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.DODTSON	CHECKED R.K.CHAMBELL	1	2	J.A.RAULSTON
DESIGNED R.A.BARRIDGE	SUBMITTED G.E.GERMAN	3	4	

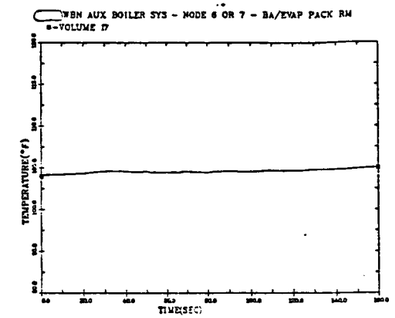
KNOXVILLE — DATE 8-26-83 — 85 M 47E235-58 R1

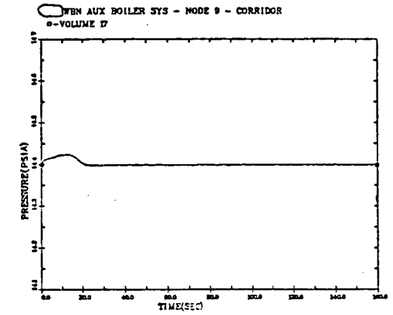
COMPANION DRAWINGS: 47E235-58 — ECN-3606 — ISSUED BY: J.C.STANDIFER

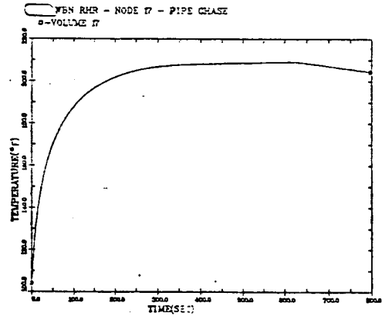
MBN011

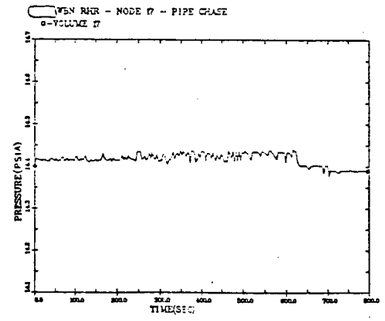


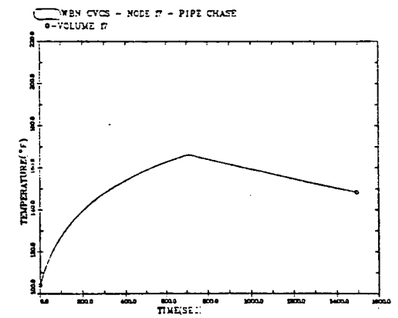


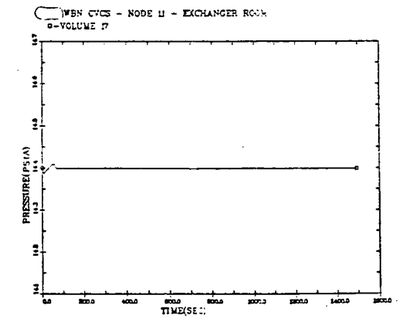












8610090051-62

TI APERTURE CARD

Also Available On Aperture Card

1	6-17-86	DELETED SCH APPLICABILITY REVISED COMP DWG TO ONE. ADDED D DWGS PER ECN	
0	11-4-85	REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED PRELIM STATUS	

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED — RECOMMENDED — APPROVED

INSPECTED AND APPROVED FOR ISSUE

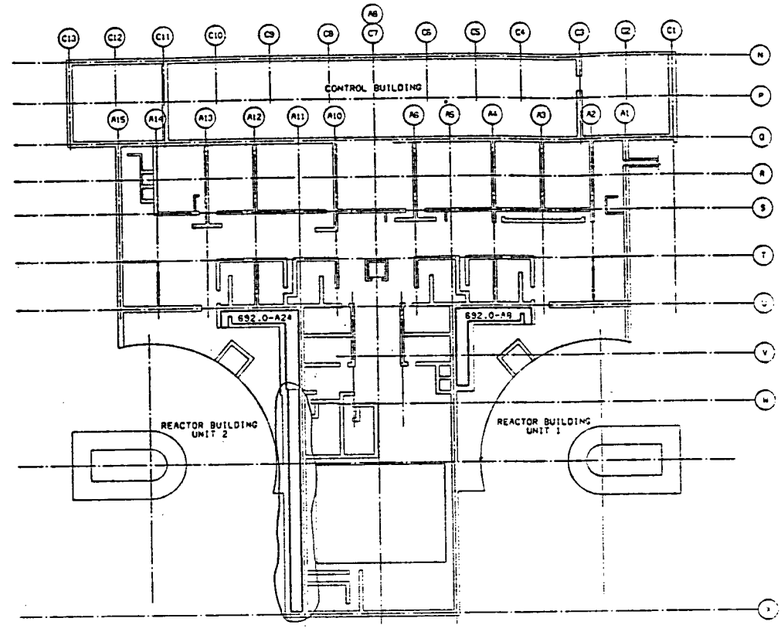
KNOXVILLE | 7-30-85 | 85 | M | 47E235-59 | R2

RECORD DRAWING AS CONSTRUCTED

COMPANION DRAWING : 47E235-70

FOOTNOTES REVIEWED

ECN - 3606



PLAN - EL 685.0 & 692.0

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA(WELD INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. WELD OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF .3 PSI)
   6. IMPROVEMENT CONTAINMENT SPRAY INITIATION
2. ATM =INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MSN IS APPROXIMATELY 14.4 PSIA.

   ATM(+) =INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) =INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OCCUPATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE EDTS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.
4. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).
9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS. TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED DOSES SHOWN ARE THE TOP-A-LOCA TOTAL RADIATION DOSE IS DERIVED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE WBN RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.
12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
    A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.
13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. COMPANION DRAWINGS REFERENCED CONTAIN TEMPERATURE AND PRESSURE VS TIME PROFILES FOR ALL THE WORST CASE BREAK SCENARIOS INVOLVING THESE SYSTEMS. PROFILE TITLES EXPLAIN WHICH HIGH ENERGY SYSTEM EFFECT IS BEING DEPICTED. THE VOLUME NUMBER CORRESPONDS TO AREAS OR PORTIONS OF THE AREAS HIGHLIGHTED ON LINE TO FLOW. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE PLOTTED TO DECREASE LINEARLY TO THE NORMAL UNIFORM VALUE GIVEN IN THE ENVIRONMENTAL TABLE AT THE END OF 24 HOURS (FIGURE). THE SAME HUMIDITY VS TIME FIGURE APPLIES IN THE ABOVE FOR QUALIFICATION PURPOSES. THE PROFILES REPRESENT THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.
18. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-31 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER (1) CAPABLE TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.
25. THE DURATION OF THIS CONDITION SHOULD BE CONSIDERED TO EXIST FOR UP TO 30 DAYS.
29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.
39. THE HELB'S DESCRIBED IN NOTE 13 WILL RESULT IN THE FLOOD LEVELS SPECIFIED IN TABLE 1.
47. UNSEALED CONDUITS AND COMPONENTS LOCATED WITHIN THIS AREA ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF AN RHR LINE BREAK. AN EVALUATION SHOULD BE PERFORMED TO DETERMINE IF REPAIR IS NECESSARY TO PREVENT THE LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.

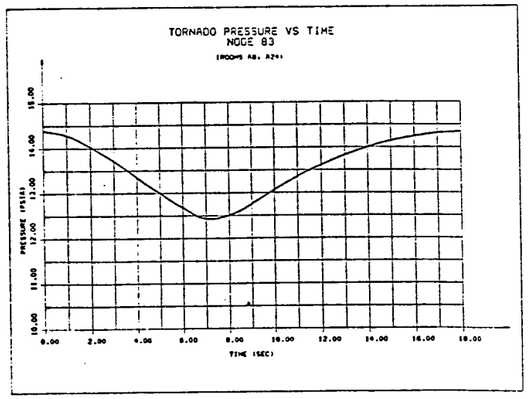
BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING PIPE CHASE A8-A24 EL 692.0	1 AVG / MAX / MIN	80 / 104 / 50	55 / 90 / 30	ATM (+) / ATM (+) / ATM (+)	NA / 2.1×10^{8}	NA / NA / NA	C	NOTE 18
	2 MAX / MIN	110 / 50 NOTE 8	90 / 10 NOTE 10	ATM (+) / ATM (+)	NA / NA	NA / NA		
	3	110 NOTE 25	NA	NA	NA	5×10^{8}		
	4	NOTE 13	100 (MOTEN FIGURE 6) (47)	NOTE 13	NA	NA		NOTE 39 TABLE 1
	5	NA	NA	NOTE 4 MODE 83	NA	NA		

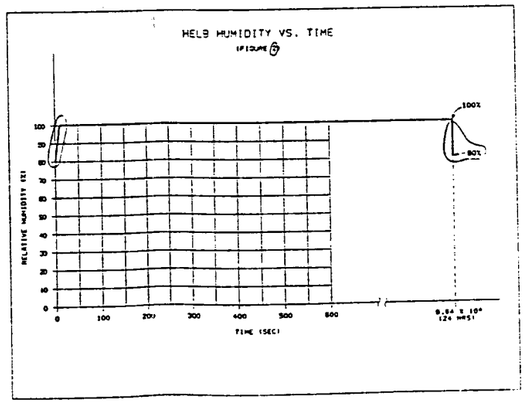
TABLE 1

ROOM NO.	HELB			
	RHR	CVCS	AFW	AB
A8-A24	2"	1"	1"	1

REFERENCE:

1. SUMMARY OF WARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBS 82-0726-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-831213-214).





86100900051-63

TI APERTURE CARD

Also Available On Aperture Card

REV	ECN/FCN	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD
1	617-A							

REVISED NOTES 1, 11, 13, 18, AND 2. 40 YEAR DOSE, ACCIDENT DOSE, AND FIGURE 2. ADDED NOTES 39, 47 AND TABLE 1. RENUMBERED FIGURE 6 AS FIGURE 2. DELETED NOTE 15. ADDED Q DESIGNATION PER EXCEPTION A.

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 692.0

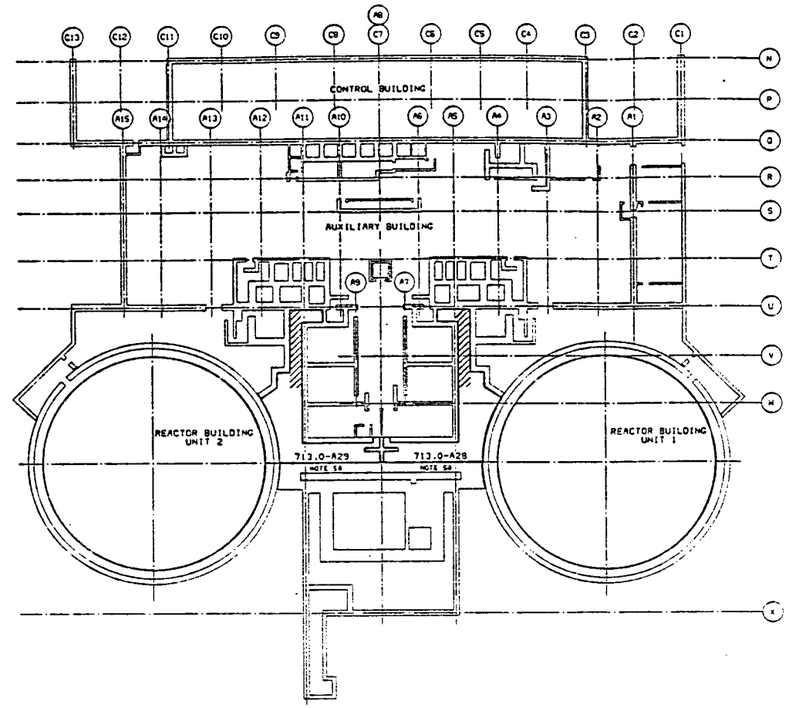
WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.DOTSON	CHECKED R.R.CAMPBELL	1	2	J.A.PAULSTON
DESIGNED R.A.SULFRIDGE	SUBMITTED C.E.CERMAK	3	4	

KNOXVILLE — DATE 8-26-83 — 85 — M — 47E235-60 — R1

COMPANION DRAWING: 47E235-53 — ECN-3606 — ISSUED BY: J.C.STANDIFER

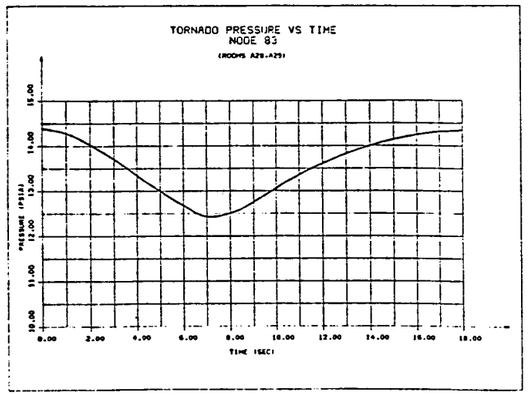
MBN012

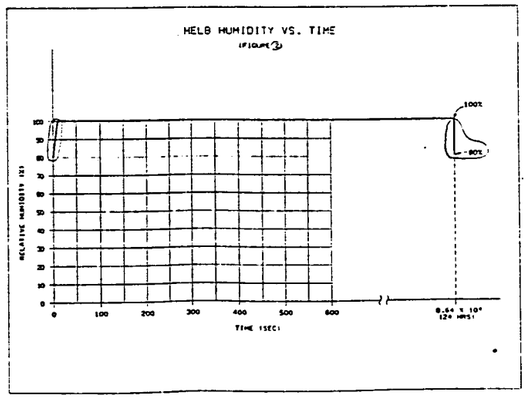


PLAN - EL 708.0 & 713.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING PIPE CHASE A29,A29 EL 713.0	1 AVG MAX MIN	80 104 60	55 80 30	ATM (+) ATM (+) ATM (+)	NA 7.5×10^4 NA	NA NA NA	C	NOTE 16
	2 MAX MIN	110 50 NOTE 8	90 10 NOTE 10	ATM (+) ATM (+)	NA NA	NA NA		
	3	110 NOTE 25	NA	NA	NA	5×10^5		
	4	NOTE 13	100 NOTES 13-17 1-FIGURE 2	NOTE 13	NA	NA		NOTE 39 TABLE 1
	5	NA	NA	NOTE 4 MODE 83	NA	NA		

TABLE 1				
ROOM NO.	HELB RHR	LEVEL (EL)	AFW	AB
A29	3-1U1 1 1-1U2 1	1'	NA	1'
A29	1-1U1 1 3-1U2 1	1'	NA	1'
1 INDICATES WHICH UNIT THE BREAK OCCURS IN.				





NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:

   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION

2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MSL IS APPROXIMATELY 14.6 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING NORMAL OPERATIONAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING TESTING OF THE ICE CONDENSER, THE ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

4. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN IS FOR A LOCAL TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE MRB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:

   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THE COMPANION DRAWINGS REFERENCED CONTAIN TEMPERATURE AND PRESSURE VS TIME PROFILES FOR ALL THE WORST CASE BREAK SCENARIOS INVOLVING THESE SYSTEMS. PROFILES LISTED BELOW WHICH HAVE NO SYSTEM EFFECT IS BEING DEPICTED. THE HOLDS ARE ASSIGNED TO AREAS OR PORTIONS OF THE AREAS AS INDICATED ON THE CITED PLAN. EACH TEMPERATURE VS PRESSURE SCENARIO SHOULD BE ASSUMED TO DECREASE LINEARLY FROM THE MAXIMUM VALUE GIVEN IN THE EXCEEDANCE TIME TO A VALUE OF 0 PSIA AT TIME OF 24 HOURS IF IT HAS NOT REACHED 0 PSIA WITHIN THE TIME SCALE OF THE FIGURE. THE SAME HUMIDITY VS TIME PROFILE IS IN EACH CASE. FOR QUALIFICATION PURPOSES, 4-FIGURE PROFILES REPRESENTING THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.

16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-22 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

25. THE DURATION OF THIS CONDITION SHOULD BE CONSIDERED TO EXIST FOR UP TO 30 DAYS.

29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

39. THE HELB'S DESCRIBED IN NOTE 17 WILL RESULT IN THE FLOOD LEVELS SPECIFIED IN TABLE 1.

47. UNSEALED CONDUITS AND COMPONENTS LOCATED WITHIN THIS AREA ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF AN RHR LINE BREAK. AN EVALUATION SHOULD BE PERFORMED TO DETERMINE IF SEALING IS NECESSARY TO PREVENT THE LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.

58. THE SHADED PORTION OF ROOMS A28 AND A29 EXTENDS THROUGH THE GRATING AT EL 737.0 UP TO THE FLOOR SLAB AT EL 757.0.

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBP 82-0328-2251).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-831213-2141).

8610090051-64

TI APERTURE CARD

Also Available On Aperture Card

REV NO.	ECN/FCR	DATE	DSGN	DRWN	CHKD	DVND	APPD	ISSD
1	6170,A	7-19-93						

REVISED NOTES 1,4,11,12,16. KEY PLAN: REF 2. 40 YEAR DOSE, ACCIDENT DOSE, AND FIGURE 2. ADDED NOTES 39,47,58, AND TABLE 1. RENUMBERED FIGURE 6 AS FIGURE 2. DELETED NOTE 15, ADDED 0 DESIGNATION PER BLEFSTON A.

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 713.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

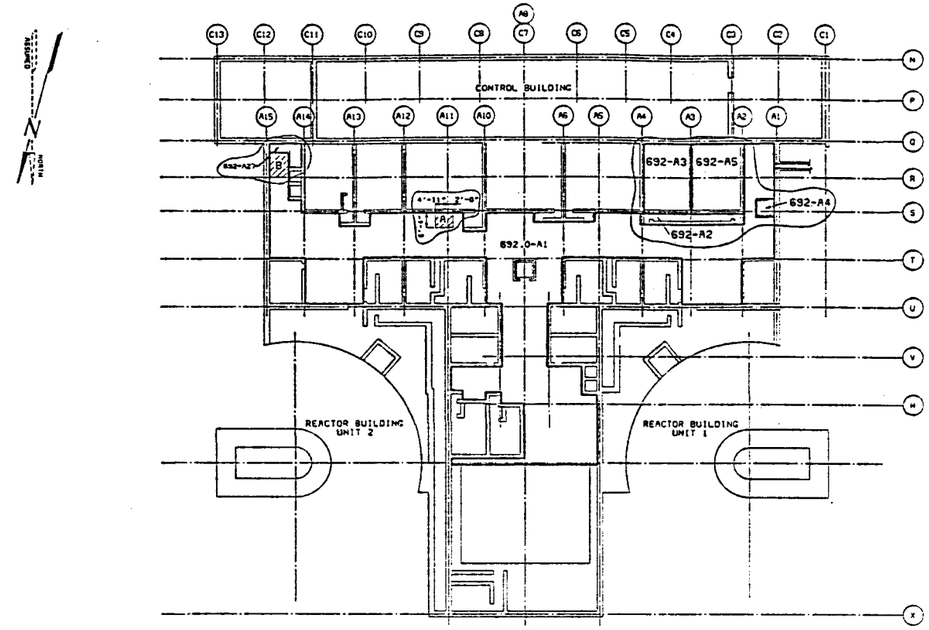
DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.DOTSON	CHECKED R.R.CAMPBELL	1	2	J.A.RAULSTON
DESIGNED R.A.SULFRIDGE	SUBMITTED G.E.GERMAN	3	4	

KNOXVILLE — DATE 8-26-83 — 95 — M — 47E235-61 — R1

COMPANION DRAWING: 47E235-59 — ECN-3606 — ISSUED BY: J.C.SCHNOIFER

MBN013

47E235-61 | 95 | M



PLAN - EL 685.0 & 692.0

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO SUDDEN PRESSURE DROP OF 3 PSI.
   6. INADVERTENT CONTAINMENT SPRAY INITIATION.
2. ATM (-) INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT WBN IS APPROXIMATELY 14.4 PSIA.

   ATM (+) INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM (-) INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE EGTS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

A. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSION(S), TEMPORARY GREATER THAN DESIGN HEAT LOADS OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE SHIELDING SEA CONTAINS CONTAINS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN IS FOR A LOCA. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE WBN RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THE COMPANION DRAWINGS REFERENCED CONTAIN TEMPERATURE AND PRESSURE VS TIME PROFILES FOR ALL THE WORST CASE BREAK SCENARIOS INVOLVING THESE SYSTEMS. PROFILE TABLES EXPLAIN WHICH HIGH ENERGY SYSTEM (S) EFFECTS THE ROOM DEPICTED. THE VOLUME OF THE ROOMS TO ARRIVE AT THE PRESSURE AREAS HIGHLIGHTED ON THE FIGURES. THE TEMPERATURE AND PRESSURE CURVE COULD BE ASSUMED TO DECREASE LINEARLY TO THE NORMAL MAXIMUM VALUE GIVEN IN THE ENVIRONMENTAL TABLE AT THE END OF 24 HOURS IF IT HAS NOT REACHED THAT VALUE WITHIN THE TIME SCALE OF THE FIGURE FOR QUALIFICATION PURPOSES. THE HELB PROFILES REPRESENTING THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.

16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

39. THE HELB'S DESCRIBED IN NOTE 13 WILL RESULT IN THE FLOOD LEVELS SPECIFIED IN TABLE 1.

41. TABLE 3 EXPLAINS WHICH RELATIVE HUMIDITY FIGURE TO USE FOR A PARTICULAR HELB.

TI APERTURE CARD

Also Available On Aperture Card

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING GENERAL FLOOR AREA VALVE GALLERY A2 BAT DECAY TANK ROOM A3 SPENT RESIN CONCENTRATE FILTER ROOM A27 CHEMICAL DRAIN TANK ROOM A4 EL 692.0	1 MAX MIN	80 104 60	55 80 30	ATM (+) ATM (+) ATM (+)	NA (TABLE 2) NA	NA NA NA	B	NOTE 16
	2 MAX MIN	110 90 } NOTE 8	90 10 } NOTE 10	ATM (+) ATM (-)	NA NA	NA NA		
	3	NA	NA	NA	NA	<1X10⁷		
	4	NOTE 13	100 (NOTES 13, 41 TABLE 2)	NOTE 13	NA	NA		NOTE 39 TABLE 1
	5	NA	NA	NOTE 4 MODE 99	NA	NA		

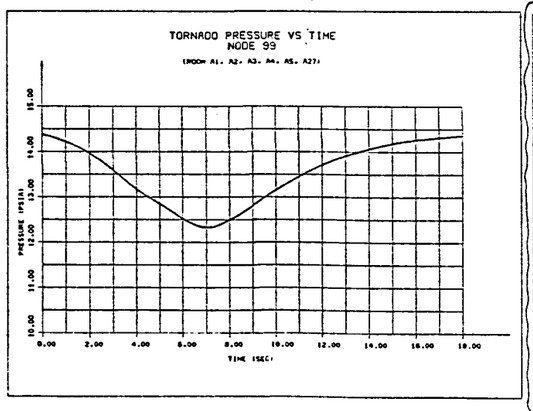
TABLE 1				
ROOM NO.	HELB			
	RHR	CVCS	AFW	AB
A1, A2, A3, A4, A5, A27	2"	1"	1"	1"

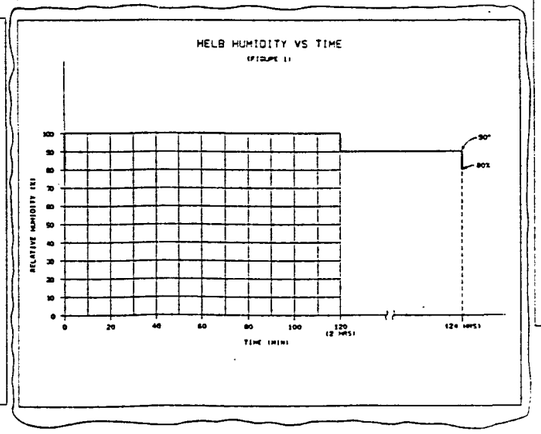
TABLE 2	
ROOM NO.	DOSE (RADS)
A1 (SHADED AREA A)	3.7 x 10⁵
A1 (SHADED AREA B)	5.6 x 10⁵
A1 (UNSHADED AREA C)	3.2 x 10⁴
A2	3.5 x 10⁴
A3, A5	2.3 x 10⁵
A27	1.7 x 10⁵
A4	1.9 x 10⁵

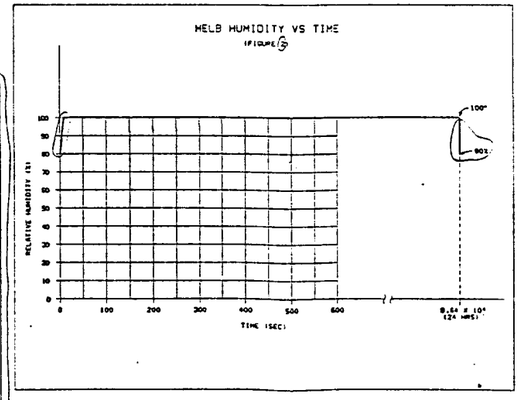
TABLE 3				
ROOM NO.	HELB			
	RHR	CVCS	AFW	AB
A1, A2, A3, A4, A5, A27	FIG 2	FIG 2	FIG 1	FIG 1

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WCB 82-0726-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-47) (ESB-831213-214).







8610090051-65

1	WTS.A	9 9 86	RSM	JWC	DTE	DFA	
REVISED NOTES 1,4,11,13,16. KEY PLAN. REF 2. 40 YEAR DOSE. AND FIGURE 2. ADDED NOTES 29, 41. TABLES 1, 2, 3. AND FIGURE 1. RENUMBERED FIGURE 5 AS FIGURE 2. ALSO ADDED ROOMS A2,A3,A4,A5, AND A27. ADDED Q DESIGNATION PER DESCRIPTION A.							
REV	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD ISSD

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 692.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN W.A.DOTSON	CHECKED W.R.CAMPBELL	1	2	J.A.RAULSTON
DESIGNED W.A.SULFRIDGE	SUBMITTED G.E.CEMAN	3	4	

KNOXVILLE | DATE 8-26-83 | 85 | M | 47E235-62 | R1

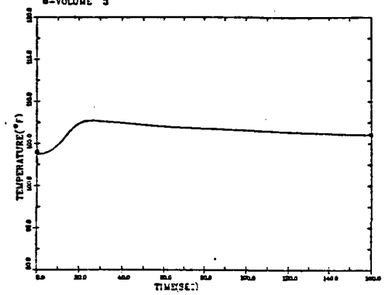
COMPANION DRAWINGS: 47E235-63,-64,-65

ECN-3606

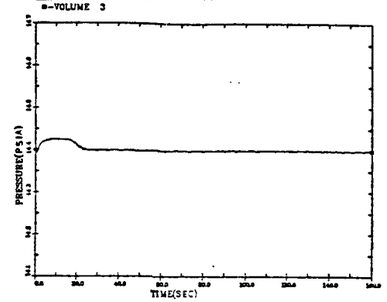
ISSUED BY: J.C.STANDIFER

WBN014

WBN AFW PUMP TURBINE RM ND6
o-VOLUME 3



WBN AFW PUMP TURBINE RM ND6
o-VOLUME 3



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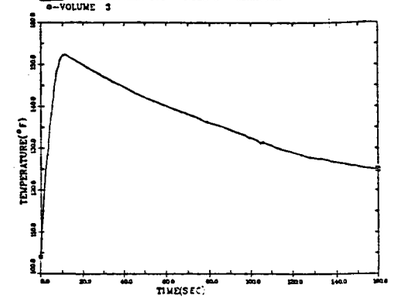
o-VOLUME 3



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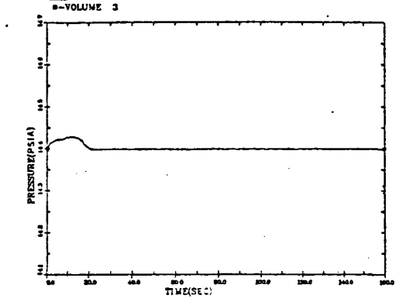
o-VOLUME 3



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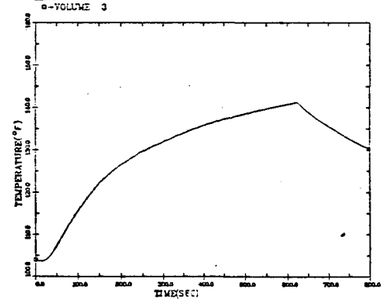
o-VOLUME 3



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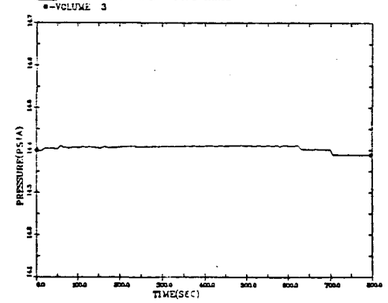
o-VOLUME 3



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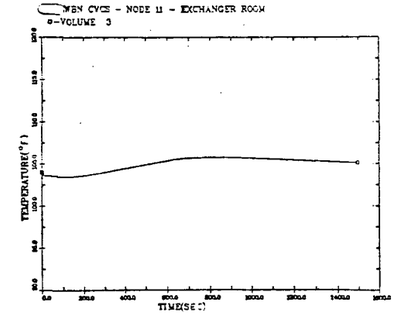
o-VOLUME 3



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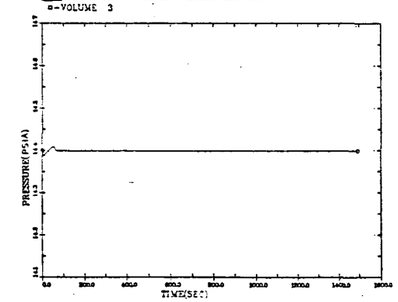
o-VOLUME 3



8610090051-66

TI APERTURE CARD

Also Available On Aperture Card

2	6179-A	2-9-86	DELETED SOM APPLICABILITY, REVISED COMP DWG TO INCL. ADDED Q DESIG. PER REC A.
1	4542	1-14-83	REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED PRELIM STATUS

SCALE: NTS EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED / RECOMMENDED / APPROVED

INSPECTED AND APPROVED FOR ISSUE

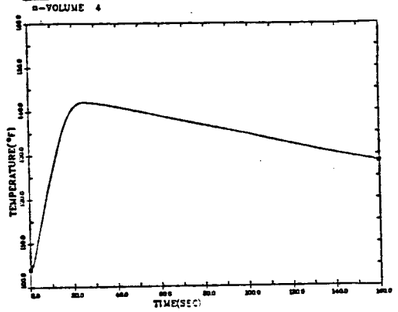
KNOXVILLE 8-26-83 BS M 47E235-63 R2

RECORD DRAWING AS CONSTRUCTED

COMPANION DRAWING : 47E235-[illegible]

47E235-63 M BS

WBN AFW PUMP TURBINE RM ND5
a-VOLUME 4



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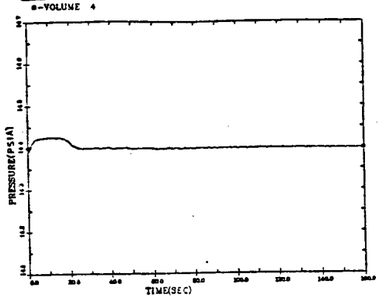
a-VOLUME 4



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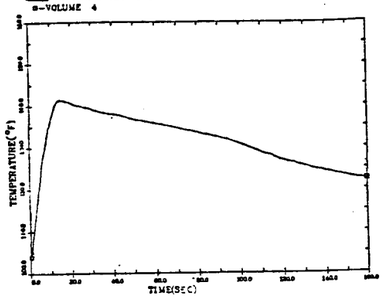
a-VOLUME 4



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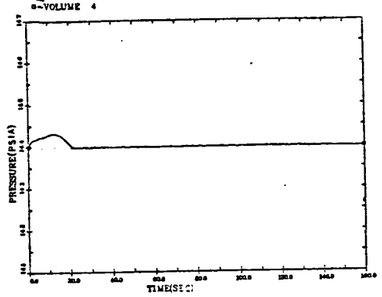

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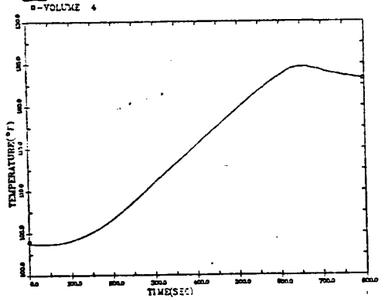

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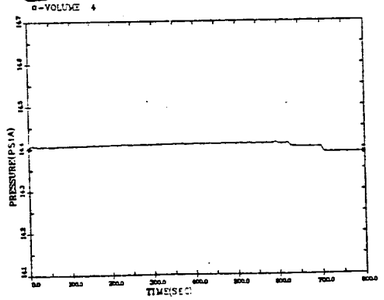

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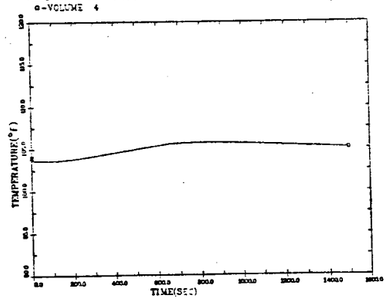

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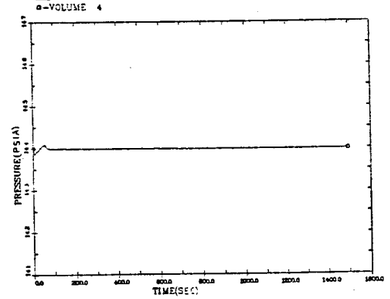

8610090051-67

TI APERTURE CARD

Also Available On Aperture Card

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4	ECN/TCD	DATE	
1	4542		
	REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED PROCM STATUS		
	ECN NO	DATE	

DRAWN
DESIGN
CHKD
SUPV
MGR
PROJ ENGR

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED — RECOMMENDED — APPROVED

INSPECTED AND APPROVED FOR ISSUE

KNOXVILLE | 7 26 83 | as | W | 47E235-64 | R2

FURTHER REVIEWED

ECN - 3608

COMPANION DRAWING : 47E235-

47E235-64 | W | 85

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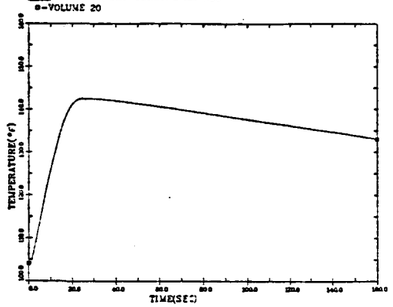

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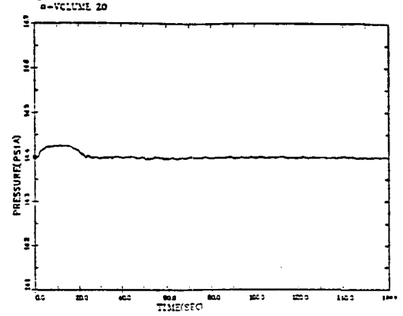

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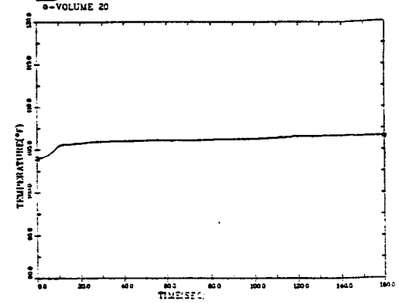

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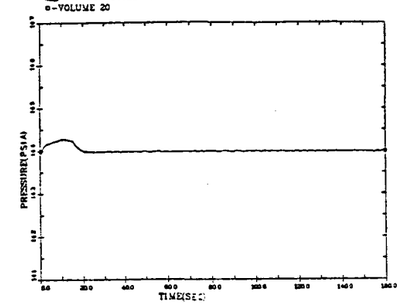
o-VOLUME 20



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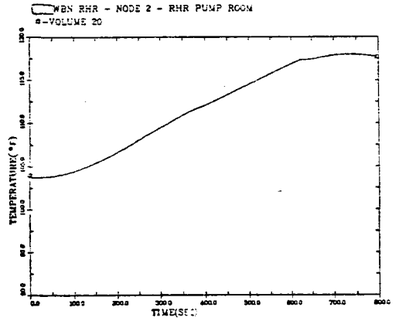

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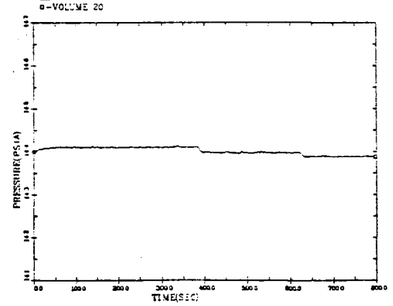

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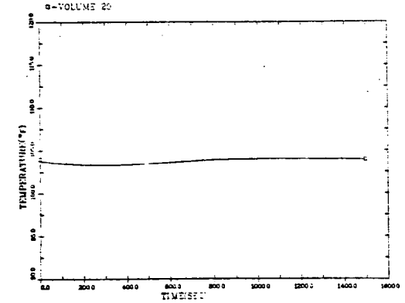

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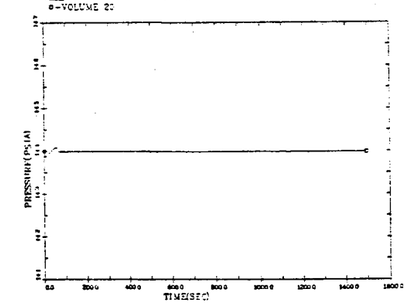
o-VOLUME 20



8610090051-68

TI APERTURE CARD

Also Available On Aperture Card

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4542			REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED PREL W STATUS

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED — RECOMMENDED — APPROVED

INSPECTED AND APPROVED FOR ISSUE

KNOXVILLE | 7-26-75 | 05 | M | 47E235-65 | R2

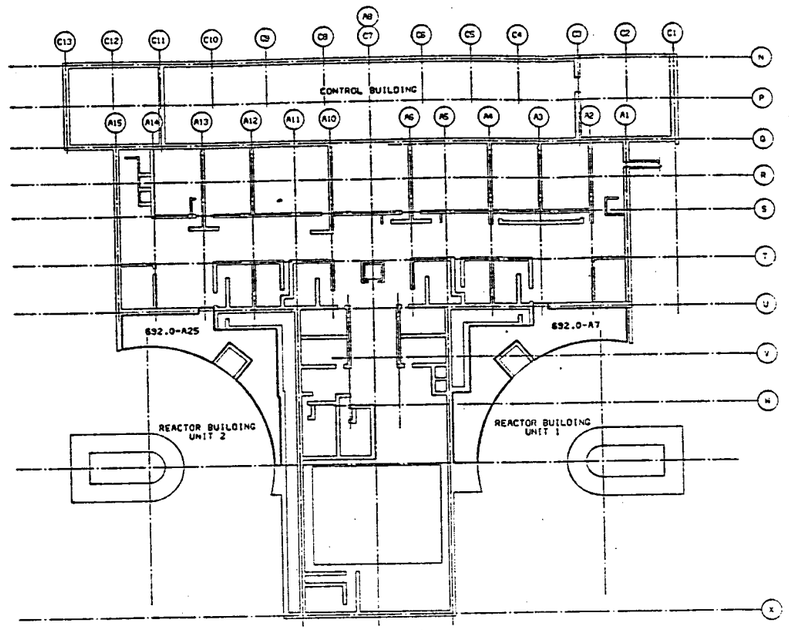
RECORD DRAWING AS CONSTRUCTED

COMPANION DRAWING : 47E235-

FURTHER REVIEWED

ECN - 3606

05 M 47E235-65



PLAN - EL 692.0

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:

   1. NORMAL
   2. ABNORMAL
   3. LOCA/MELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. MELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION

2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT 2GW IS APPROXIMATELY 14.4 PSIA.
   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.
   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.
   ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -6.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS, DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE ECTS: ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

4. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

8. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPERATURE GREATER THAN DESIGN HEAT LOADS; OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA COMPONENTS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN IS FOR A LOCA. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE WBN RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:

   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

18. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 30 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

25. THE DURATION OF THIS CONDITION SHOULD BE CONSIDERED TO EXIST FOR UP TO 30 DAYS.

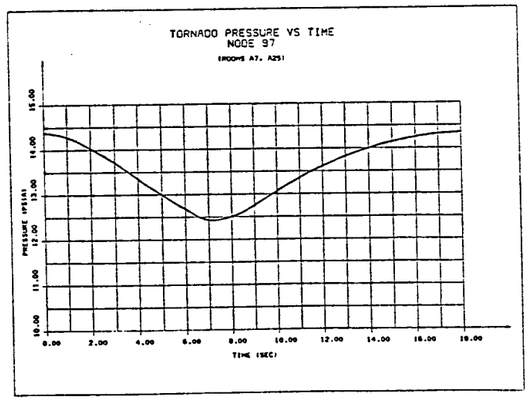
29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

43. THE TEMPERATURE, PRESSURE AND RELATIVE HUMIDITY IN THESE SPACES IS UNAFFECTED BY FLOODING IN ANY OF THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY BOILER, AUXILIARY STEAM SUPPLY, AUXILIARY BOILER SYSTEM, CONDENSATE, HEAT REMOVAL (RHR) SYSTEM, AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THESE SPACES, HOWEVER, WILL EXPERIENCE FLOOD LEVELS SPECIFIED IN TABLE 1 DUE TO WATER LEAKAGE UNDER DOORS FROM THE ADJACENT GENERAL FLOOR AREA.

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING PENETRATION ROOMS A7, A25 EL 692.0	1 AVG MAX MIN	80 104 80	55 80 30	ATM (-) ATM (-) ATM (-)	NA 3.5×10^6 NA	NA NA NA	C	NOTE 16
	2 MAX MIN	110 50 NOTE 8	80 10 NOTE 10	ATM (-) ATM (-)	NA NA	NA NA		
	3	110 NOTE 25	NA	NA	NA	$<1 \times 10^4$		
	4	NOTE 43	NOTE 43	NOTE 43	NA	NA		NOTE 43 TABLE 1
	5	NA	NA	NOTE 4 NODE 97	NA	NA		

TABLE 1

ROOM NO.	MELB (RHR)	(CVCS)	(AFW)	(SG)
A7, A25	2"	1"	1"	1"



REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBB 82-0726-225).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-831213-214).

8610090051-69

TI APERTURE CARD

Also Available On Aperture Card

REV	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD
1	6178-A	9 9 86						

REVISED NOTES 1, 4, 11, 18, 40 YEAR DOSE, AND REF 2. ADDED TABLE 1 AND NOTE 43. DELETED NOTES 13-15. FIGURE 6 AND COMPANION DWG REF. ADDED Q DESIGNATION PER EXCEPTION A.

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENTAL - HARSH
EL 692.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

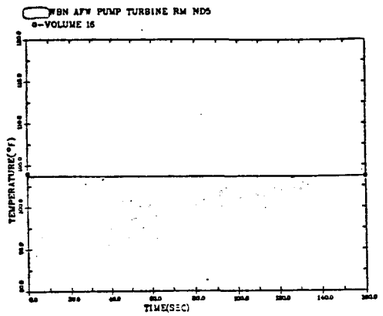
DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.R.DOTSON	CHECKED R.R.CAMPBELL	1	2	J.R.RAULSTON
DESIGNED R.R.SAFRIDGE	SUBMITTED G.E.DERMAN	3	4	

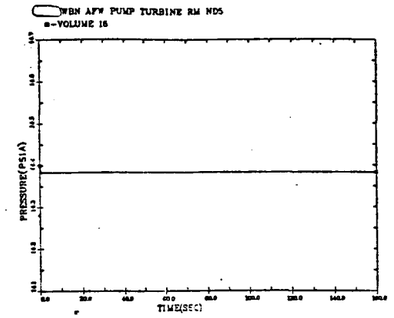
KNOXVILLE | DATE 8-26-83 | 85 | M | 47E235-66 | R1

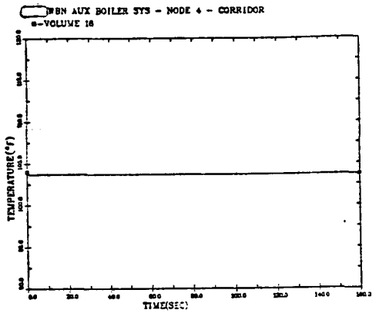
ECN-3608

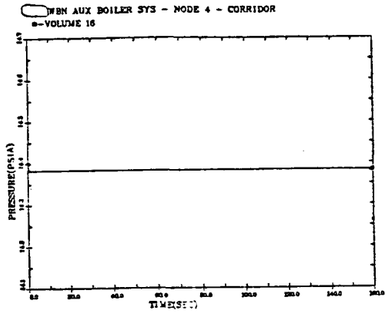
ISSUED BY: J.C.STANDIFER

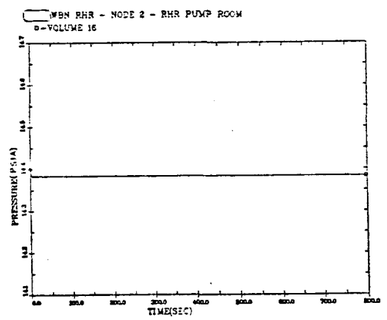
MBN015

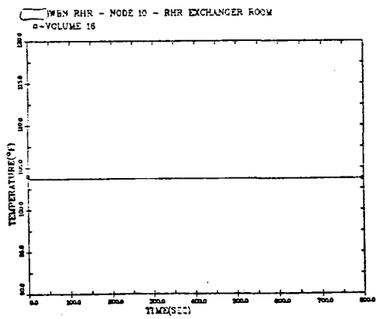


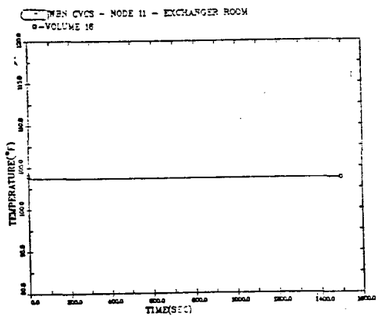


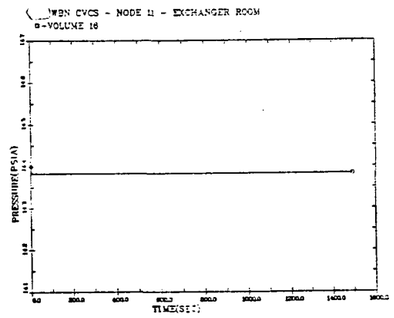












8610090051-70

TI APERTURE CARD

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INSPECTED AND APPROVED FOR ISSUE

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

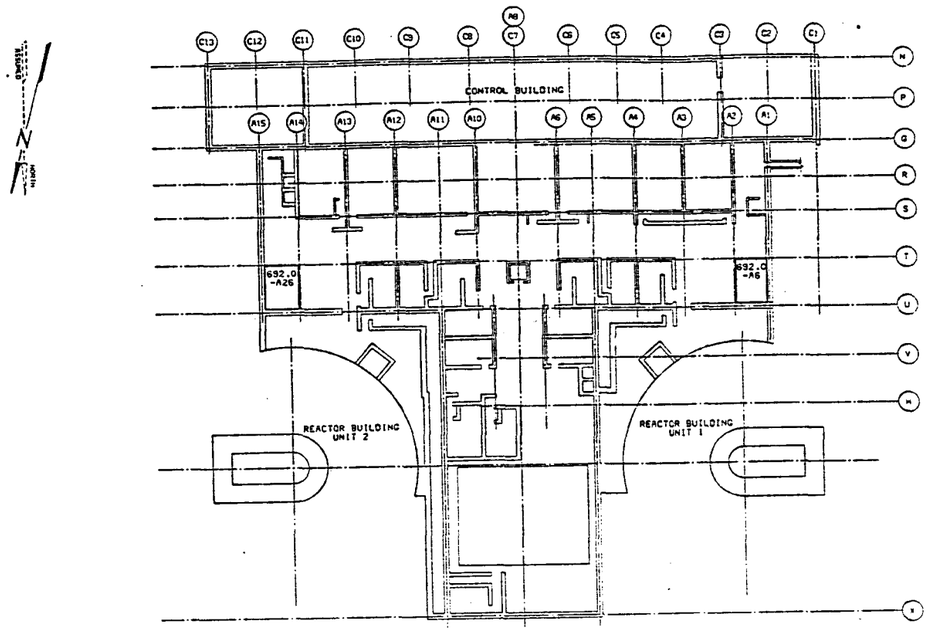
ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

KNOXVILLE 7-26-83 BS M 47E235-67 R2

RECORD DRAWING AS CONSTRUCTED



PLAN - EL 685.0 & 692.0

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION
2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MSL IS APPROXIMATELY 14.6 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE ECTS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.
4. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).
9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN IS FOR A LOCATION SPECIFIC RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE NSR RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.
12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
    A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.
13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS)[illegible] THE COMPANION DRAWINGS REFERENCED CONTAIN TEMPERATURE AND PRESSURE VS TIME PROFILES FOR ALL THE WORST CASE BREAK SCENARIOS INVOLVING THESE SYSTEMS. PROFILE TITLES EXPLAIN [illegible] WHICH CORRESPONDS TO AREAS OR PORTIONS OF THE AREAS HIGHLIGHTED ON THE PER PLAN. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DECREASE LINEARLY TO THE NORMAL [illegible] GIVEN IN THE ENVIRONMENTAL TABLE AT THE END OF 24 HOURS IF IT HAS NOT REACHED THAT VALUE WITHIN THE TIME SCALE OF THE FIGURE.
    PORTIONS OF THE WORST CASE [illegible] FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.
16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-31.9 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD PHASE FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.
25. THE DURATION OF THIS CONDITION SHOULD BE CONSIDERED TO EXIST FOR UP TO 30 DAYS.
29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.
39. THE HELB'S DESCRIBED IN NOTE 13 WILL RESULT IN THE FLOOD LEVELS SPECIFIED IN TABLE 1.
41. TABLE 3 EXPLAINS WHICH RELATIVE HUMIDITY FIGURE TO USE FOR A PARTICULAR HELB.
49. UNSEALED CONDUITS AND COMPONENTS LOCATED WITHIN THIS AREA ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF AN AFW PUMP TURBINE LINE BREAK. AN EVALUATION SHOULD BE PERFORMED TO DETERMINE IF SEALING IS NECESSARY TO PREVENT THE SHORT TERM EFFECTS OF PRESSURE INDUCED MOISTURE INTRUSION AND THE LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.

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Also Available On Aperture Card

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING TURBINE DRIVEN AUXILIARY FEEDWATER PUMP ROOMS A6, A26 EL 692.0	1 AVG / MAX / MIN	80 / 104 / 60	55 / 80 / 30	ATM (-) / ATM (-) / ATM (-)	NA / 1.8×10^{7}	NA / NA / NA	C	NOTE 16
	2 MAX / MIN	110 / 50 NOTE 8	90 / 10 NOTE 10	ATM (-) / ATM (-)	NA / NA	NA / NA		
	3	110 NOTE 25	NA	NA	NA	$<1 \times 10^{4}$		
	4	NOTE 13	100 NOTES 12, 41, 42 TABLE 3	NOTE 13	NA	NA		NOTE 39 TABLE 1
	5	NA	NA	NOTE 4 NODE 98	NA	NA		

TABLE 1

ROOM NO.	HELB				
	DWG	CVCS	AFW	RS	
A6	2"	1"	1"(U1)* 2"(U2)*	1"	
A26	2"	1"	1"(U1)* 2"(U2)*	1"	

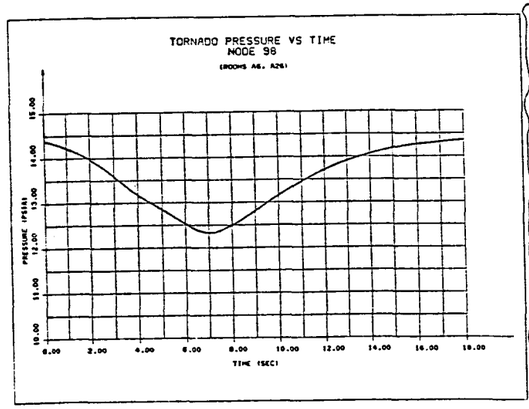
* INDICATES WHICH UNIT THE BREAK OCCURS IN

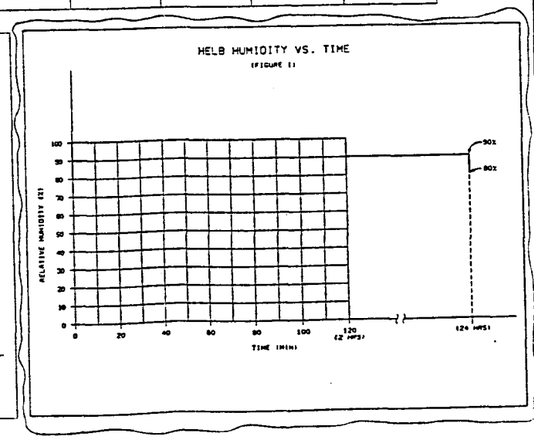
TABLE 3

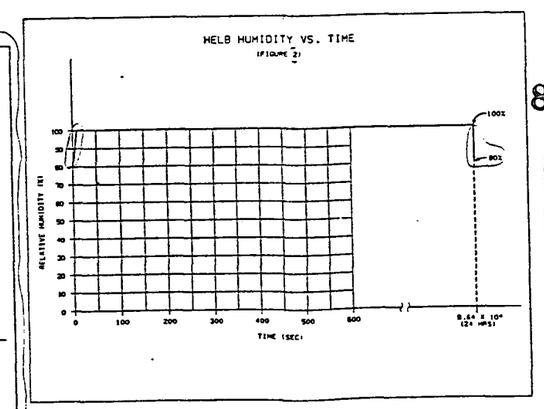
ROOM NO.	HELB				
A6,A26	FIG 3	FIG 3	FIG 2	FIG 3	

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBN 82-0726-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42; IESS-931213-21**).







8610090051-71

REV NO.	ECN/FCR	DATE	DSGN	DRWN	CHKD	IRVWD	APPD	ISSD
1	6170,A							

REVISED NOTES 1, 4, 11, 13, 16, REF 2, 40 YEAR DOSE, AND FIGURE 2. ADDED NOTES 39, 41, 49. TABLES 1, 2, AND FIGURE 1. RENUMBERED FIGURE 6 AS FIGURE 2. DELETED NOTE 26. ADDED Q DESIGNATION PER EXCEPTION A

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 692.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.OOTSON	CHECKED H.B.CAMPBELL	1	2	J.A.RAULSTON
DESIGNED R.A.SULFRIDGE	SUBMITTED G.E.GERMAN	3	4	

KNOXVILLE | DATE 9-26-83 | 85 | M | 47E235-68 | R1

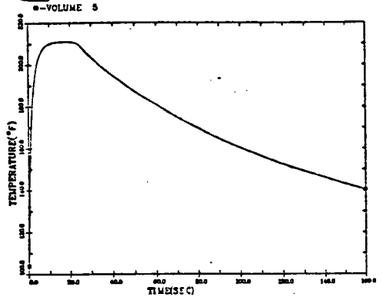
COMPANION DRAWING: 47E235-63

ECH-3606

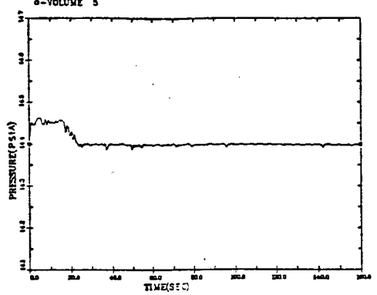
ISSUED BY: J.C.STMOIFER

WBN016

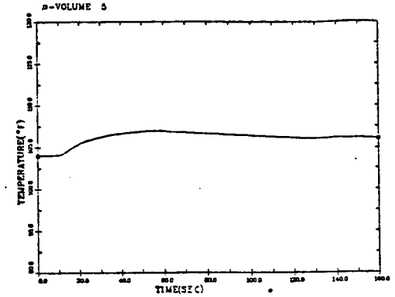
WBN AFW PUMP TURBINE RM ND5
o-VOLUME 5



WBN AFW PUMP TURBINE RM ND5
o-VOLUME 5



WBN AUX BOILER SYS - NODE 6 OR 7 - BA/EVAP PACK RM
o-VOLUME 5



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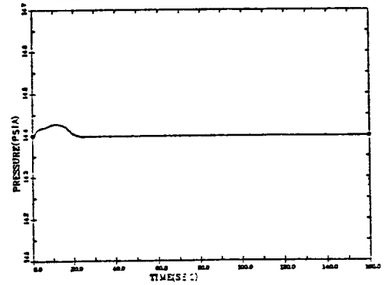
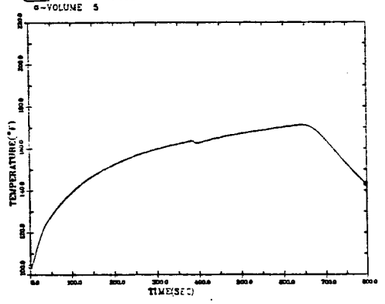
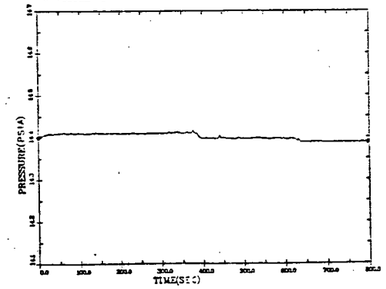
o-VOLUME 5



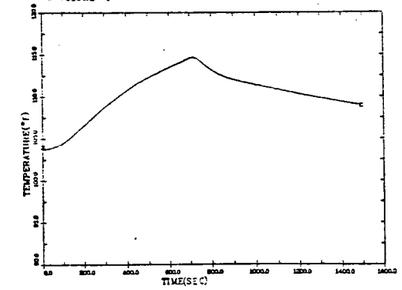
WBN RHR - NODE 2 - RHR PUMP ROOM
o-VOLUME 5



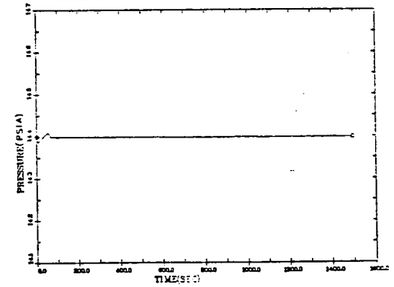
WBN RHR - NODE 2 - RHR PUMP ROOM
o-VOLUME 5



WBN CVCS - NODE 17 - PIPE CHASE
o-VOLUME 5



WBN CVCS - NODE 11 - EXCHANGER ROOM
o-VOLUME 5



8610090051-72

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1	INITIAL		
2	UPDATED FROM REVISED SYSTEM DATA FROM TEST PROG. REVISED COMPANION DWG. NO. 72-9054-A, REVISED A, DATA HANDLING FOR REVISED DWG.		
ECN	ECN/FCR	DATE	
1	4542		
REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED PRELIM STATUS			
ECN NO	1	DATE	

DRAWN
APPR
CHKD
APPR

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED — RECOMMENDED — APPROVED

FURTHER REVIEWED
ECS
ECS
NES
NES

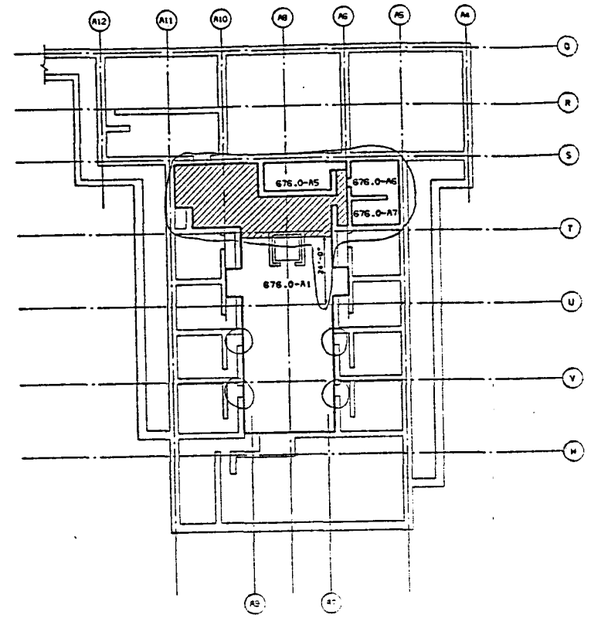
INSPECTED AND APPROVED FOR ISSUE

KNOXVILLE | 7-24-83 | 85 | M | 47E235-69 | R2

RECORD DRAWING AS CONSTRUCTED

COMPANION DRAWING : 47E235-72

ECN - 3486



PLAN - EL 676.0

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION

2. ATM (-) INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT WBN IS APPROXIMATELY 14.4 PSIA.

   ATM(+) INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE EGTS ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

4. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE DURATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE EFFECTS DEMANDED BY DCRT. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE HEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THE COMPANION DRAWINGS REFERENCED CONTAIN TEMPERATURE AND PRESSURE VS TIME PROFILES FOR ALL THE WORST CASE BREAK SCENARIOS INVOLVING THESE SYSTEMS. PROFILES EXPLAIN WHICH ROOMS CORRESPONDS TO AREAS OR PORTIONS OF THE AREAS PROJECTED ON THE KEY PLAN. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DECREASE LINEARLY TO THE NORMAL OPERATING VALUE GIVEN IN THE ENVIRONMENTAL TABLE AT THE END OF 24 HOURS IF IT HAS NOT REACHED THAT VALUE WITHIN THE TIME SCALE OF THE FIGURE.

   PURPOSES: THE HELB PROFILES REPRESENTING THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.

16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

29. THE HELB'S DESCRIBED IN NOTE 13 WILL RESULT IN THE FLOOD LEVELS SPECIFIED IN TABLE 1.

41. TABLE 3 EXPLAINS WHICH RELATIVE HUMIDITY FIGURE TO USE FOR A PARTICULAR HELB.

TI APERTURE CARD

Also Available on Aperture Card

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 3)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING CORRIDOR GAS STRIPPER FEED PUMP ROOM SUMP PUMP ROOM SUMP TANK ROOM A1,A5,A6,A7 EL 676.0	1 AVG MAX MIN	80 104 60	55 80 30	ATM (-) ATM (-) ATM (-)	NA TABLE 2 NA	NA NA NA	B	NOTE 16
	2 MAX MIN	110 50 } NOTE 9	90 10 } NOTE 10	ATM (-) ATM (-)	NA NA	NA NA		
	3	NA	NA	NA	NA	9×10^5		
	4	NOTE 13	100 } NOTES TABLE 2,3,41	NOTE 13	NA	NA		NOTE 29 TABLE 1
	5	NA	NA	NOTE 4 NODE 49	NA	NA		

TABLE 1

ROOM NO.	HELS RHR	CVCS	AFW	AB
A1,A5, A6	6"	1"	1"	1"
A7	6"	NA	1"	1"

TABLE 2

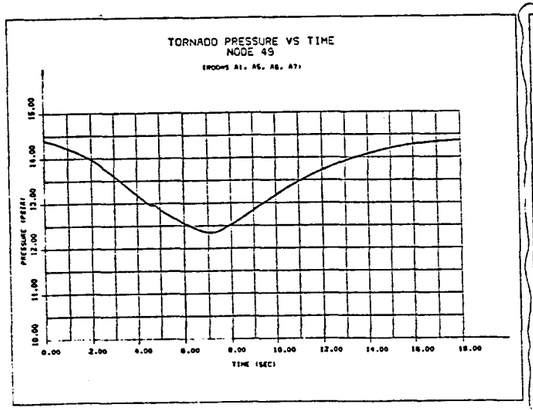
ROOM NO.	DOSE (RADS)
A1(SHADED AREA)	1.4×10^8
A1(UNSHADED AREA)	2.4×10^8
A5	3.9×10^8
A6	1.6×10^8
A7	8.2×10^7

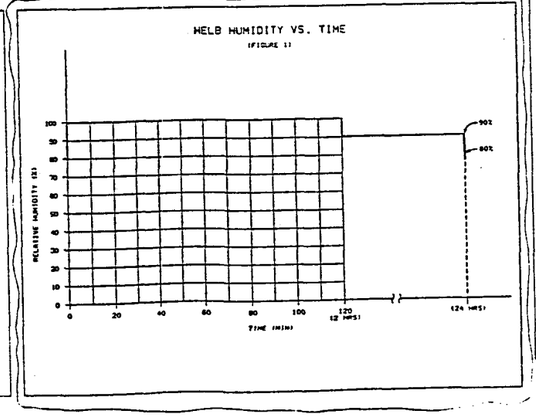
TABLE 3

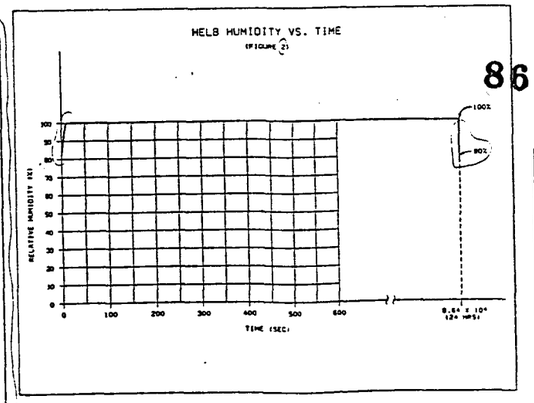
ROOM NO.	HELB RHR	CVCS	AFW	AB
A1,A5,A6,A7	FIG 2	FIG 2	FIG 1	FIG 1

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB 82-0726-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-831213-2141).







8610090051-73

COMPANION DRAWINGS: 47E235-71-72

ECN-3606

REV NO.	ECN/FCR	DATE	DSGN	DRWN	CHKD	AFWRD	APPD	ISSD
1	4174.A	6-9-86	BS	LJ	WEB			

REVISED NOTES 1, 4, 11, 13, 16, KEY PLAN, 40 YEAR DOSE, AND FIGURE 2. ADDED NOTES 29, 41, TABLES 1, 2, 3, AND FIGURE 1. RENUMBERED FIGURE 6 AS FIGURE 2. CHANGED Q DESIGNATION FROM A TO SECTION A.

SCALE: NTS EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 676.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

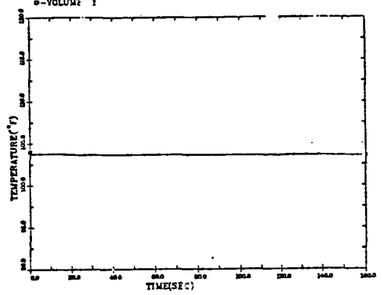
DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN W.R.DOTSON	CHECKED R.R.CAMPBELL	1	2	J.A.BAULSTON
DESIGNED W.R.SULFRIDGE	SUBMITTED G.E.GERMAN	3	4	

KNOXVILLE | DATE 8-28-83 | 85 | M | 47E235-70 | R1

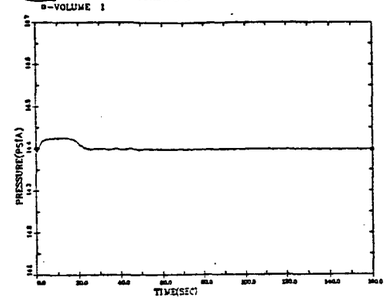
ISSUED BY: J.C.STANDIFER

MBN017

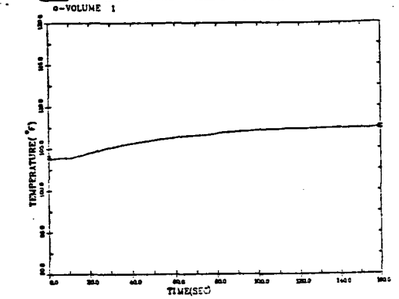
WBN AFW PUMP TURBINE RM ND5
G-VOLUME 1



WBN AFW PUMP TURBINE RM ND5
G-VOLUME 1



WBN AUX BOILER SYS - NODE 3 - CORRIDOR
G-VOLUME 1



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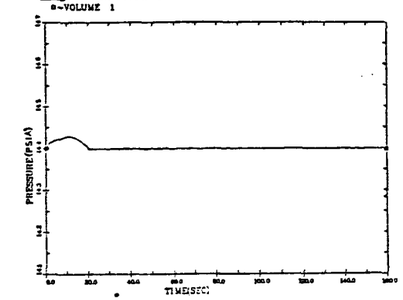
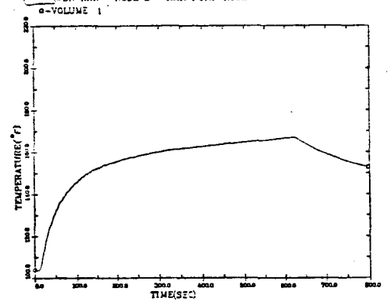
G-VOLUME 1



WBN RHR - NODE 2 - RHR PUMP ROOM
G-VOLUME 1



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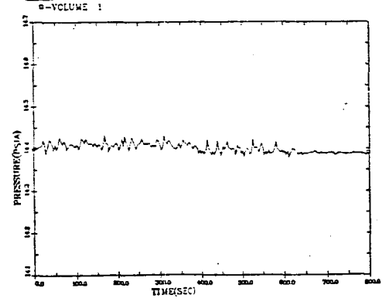
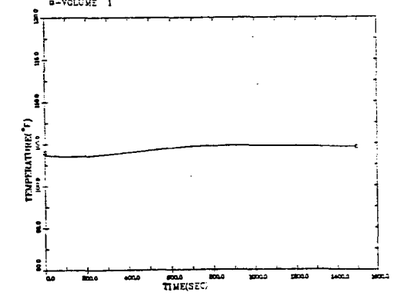
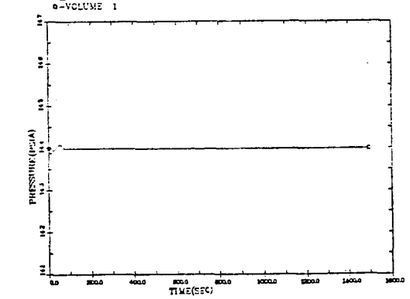


WBN CVCS - NODE 11 - EXCHANGER ROOM
G-VOLUME 1



WBN CVCS - NODE 11 - EXCHANGER ROOM
G-VOLUME 1



8610090051-74

TI APERTURE CARD

Also Available On Aperture Card

1	4/25/86		
1	4542	5-5-86	REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED PRELIM STATUS

SCALE: NTS EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED | RECOMMENDED | APPROVED

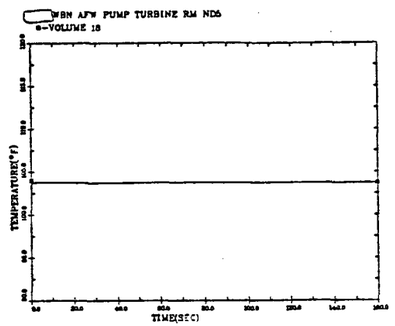
INSPECTED AND APPROVED FOR ISSUE

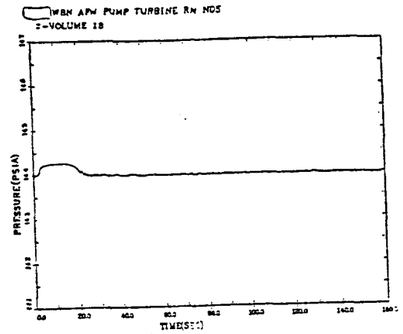
KNOXVILLE | 85 | M | 47E235-71 | R2

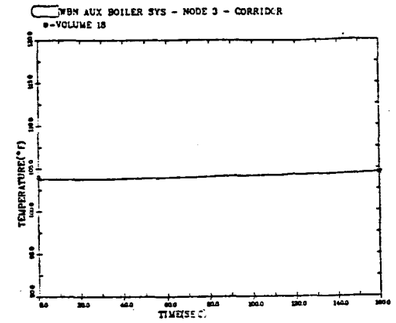
RECORD DRAWING AS CONSTRUCTED

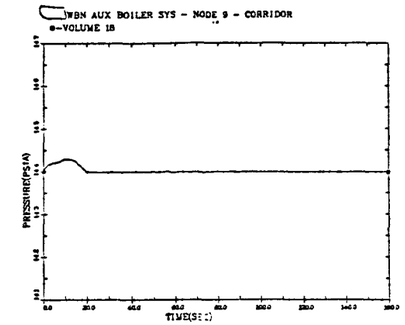
COMPANION DRAWING : 47E235-

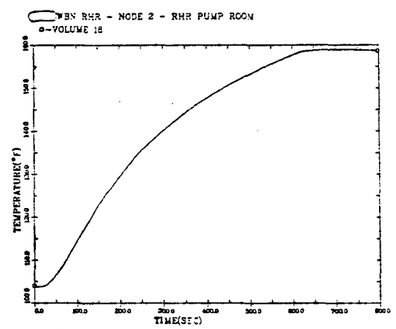
ECN - 3598

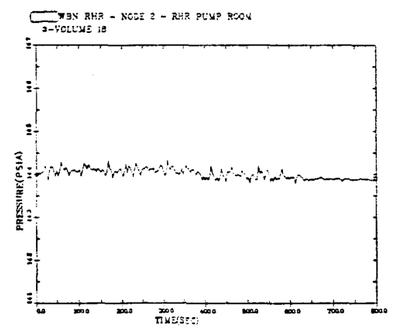


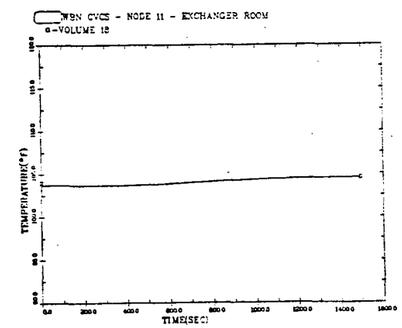


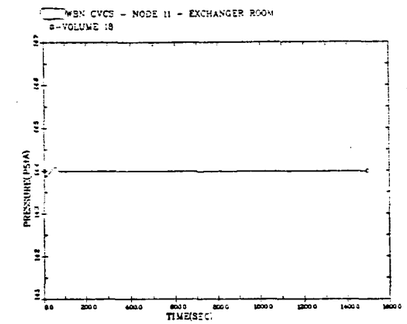












8610090051-75

TI APERTURE CARD

Also Available On Aperture Card

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4			
3			
2			
1			
REV	ECN NO	DATE	DESCRIPTION

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

KNOXVILLE | 12-16-83 | BS | M | 47E235-72 | R2

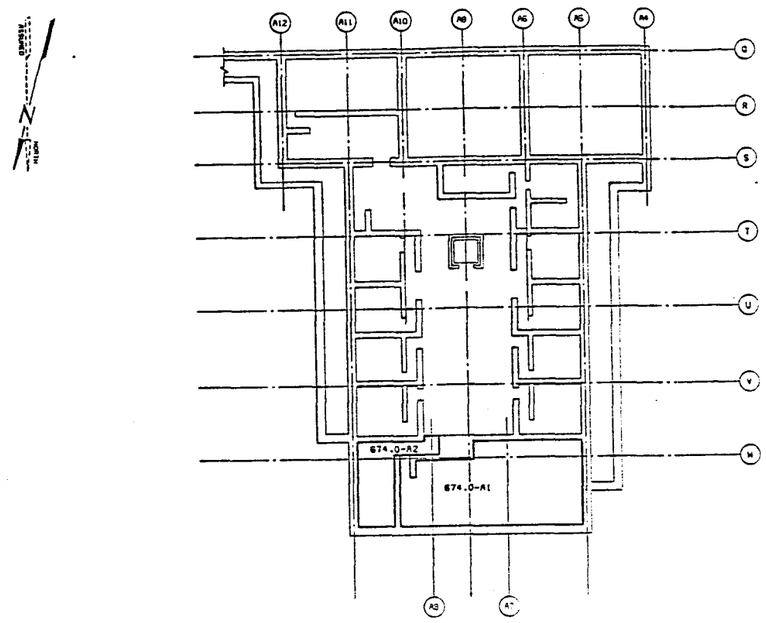
RECORD DRAWING AS CONSTRUCTED

COMPANION DRAWING : 47E235-1/2A

FURTHER REVIEWED

UNINSPECTED AND APPROVED FOR ISSUE

ECN - 3606



PLAN - EL 675.0

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA/MELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. MELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION
2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MSL IS APPOXIMATELY 14.6 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS (NOTE 3A ACCIDENT CONDITION (OPERATIONAL CONDITION 3)) AND DURING PERIODS OF TESTING THE ECTS. ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

   A. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).
3. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE-STATIC IS PRACTICALLY TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40 YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE NUCLEAR RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.
12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
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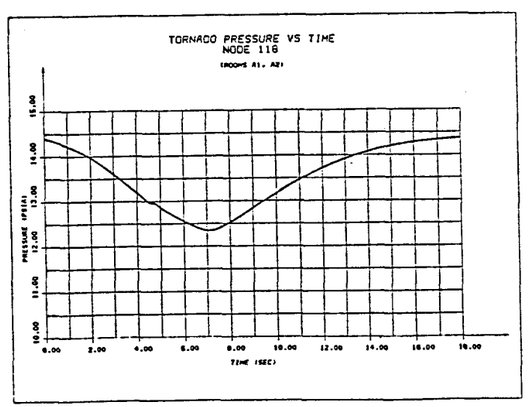
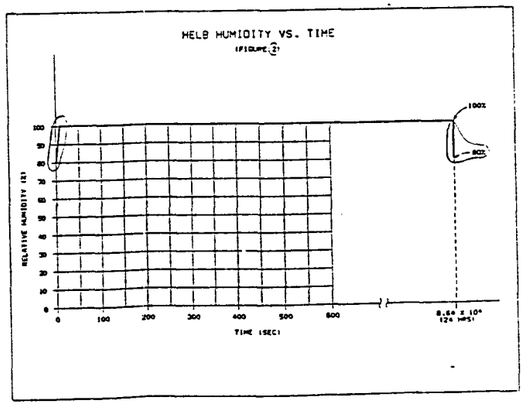
    B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.
13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THE COMPANION DRAWINGS REFERENCED CONTAIN TEMPERATURE AND PRESSURE VS TIME PROFILES FOR ALL THE WORST CASE BREAK SCENARIOS EXISTING THESE SYSTEMS. PROFILE TITLES EXPLAIN WHICH SYSTEM EFFECT SYSTEM EFFECT IS BEING DEPICTED. THE VOLUME NUMBER CORRESPONDS TO AREAS OR PORTIONS OF THE AREAS HIGHLIGHTED ON THE KEY PLAN. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DIVERGE LINEARLY TO THE NORMAL PRESSURE VALUE GIVEN IN THE ENVIRONMENTAL TABLE AT THE END OF THE FIGURE. IF AREA NOT REACHED THAT VALUE WITHIN THE TIME SHOWN ON THE FIGURE, THE SAME HUMIDITY VS TIME FIGURE PROFILES REPRESENTING THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.
    18. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD FOR UP TO 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.
23. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.
    39. THE MELB'S DESCRIBED IN NOTE 13 WILL RESULT IN THE FLOOD LEVELS SPECIFIED IN TABLE 1.

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING WASTE HOLD UP TANK ROOM (TRITIATED DRAIN TANK) WASTE EVAP FEED PUMP ROOM A1,A2 EL 674.0	1 MAX MAX MIN	90 104 50	95 80 30	ATM (+) ATM (+) ATM (+)	TABLE 2	NA NA NA	B	NOTE 18
	2 MAX MIN	110 50 NOTE 8	90 10 NOTE 10	ATM (+) ATM (+)	NA NA	NA NA		
	3	NA	NA	NA	NA	<1X10⁻⁶		
	4	NOTE 13	100 NOTE 13 FIGURE 2	NOTE 13	NA	NA		NOTE 39 TABLE 1
	5	NA	NA	NOTE 4 NODE 11G	NA	NA		

TABLE 1				
ROOM NO.	MELB			
	B+R	CVCS	AFW	A6
A1,A2	2'-6"	2'-11"	2"	2"

TABLE 2	
ROOM NO.	DOSE (RADS)
A1	3.2×10^{5}
A2	1.5×10^{6}





REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB 82-0726-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESS-832253-2141).

8610090051-76

TI APERTURE CARD

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COMPANION DRAWING: 47E235-72

ECN-3606

ISSUED BY: J.C.STANOLFER

REV	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD
2	8178.A	4-9-86	MS	DHR	DLR	JAR	JAR	JCS

REVISED NOTES 1, 4, 11, 13, 16, 40 YEAR DOSE; REF 2, AND FIGURE 2. ADDED TABLES 1, 2, AND NOTE 39. RENUMBERED FIGURE 6 AS FIGURE 2. ADDED 5 DESIGNATION REQ EXCEPTION.

REV	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD
1	4542	3/2/84	RAS	RAD	SAB	GEC	JAR	JCS

CORRECTED KEY PLAN ELEVATION

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 674.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.GOTSON	CHECKED R.W.CAMPBELL	1	2	J.A.RAULSTON
DESIGNED R.A.SULFRIDGE	SUBMITTED G.E.GERMAN	3	4	

KNOXVILLE — DATE 10-26-82 — 85 — M — 47E235-73 — R2

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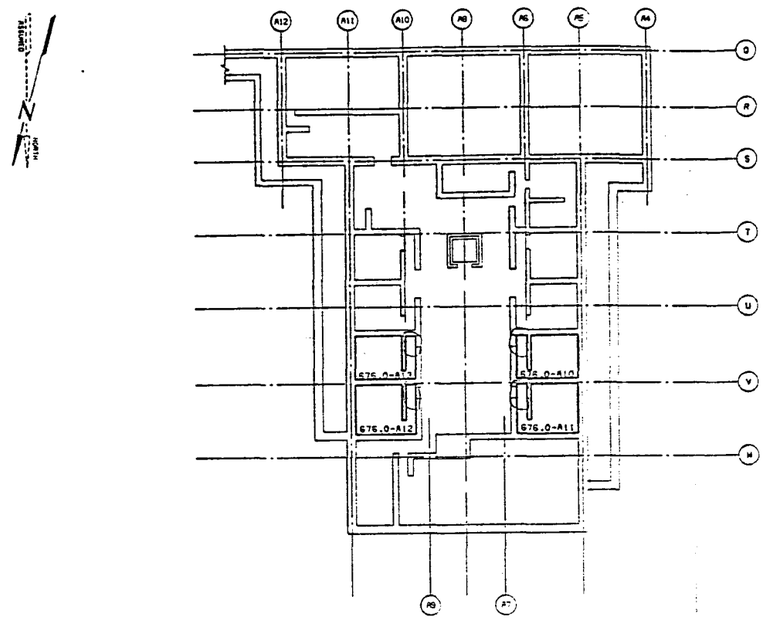
SIZE

PRINTS REV- 2



PLAN-EL 676.0

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:

   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB (INSIDE PRIMARY CONTAINMENT, WORST CASE SHALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 2 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION

2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT NOW IS APPROXIMATELY 14.4 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NORMAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF RESTING THE EDTS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

4. THE HIGHEST LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

8. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN IS FOR A LOCA. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE NORM INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE NSR RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:

   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITION.

13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AWA) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND AUXILIARY AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THE COMPANION DRAWINGS REFERENCED CONTAIN TEMPERATURE AND PRESSURE VS TIME PROFILES FOR ALL THE WORST CASE BREAK SCENARIOS INVOLVING THESE SYSTEMS. PROFILE TITLES EXPLAIN WHICH HIGH ENERGY SYSTEM EFFECT IS BEING DEPICTED. THE VOLUME NUMBER CORRESPONDS TO AREAS OR PORTIONS OF THE AREAS HIGHLIGHTED ON THE KEY PLAN. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DECREASE LINEARLY TO THE NORMAL MAXIMUM VALUE GIVEN IN THE ENVIRONMENTAL TABLE AT THE END OF 24 HOURS IF IT WAS NOT REACHED THAT VALUE WITHIN THE TIME SCALE OF THE FIGURE. THE SAME HUMIDITY VS TIME FIGURE APPLIES IN EACH CASE. FOR QUALIFICATION PURPOSES, HELB PROFILES REPRESENTING THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.

16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

25. THE DURATION OF THIS CONDITION SHOULD BE CONSIDERED TO EXIST FOR UP TO 30 DAYS.

29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

33. THE HELB'S DESCRIBED IN NOTE 13 WILL RESULT IN THE FLOOD LEVELS SPECIFIED IN TABLE 1.

48. UNSEALED CONDUITS AND COMPONENTS LOCATED WITHIN THIS AREA ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF AN RHR LINE BREAK. AN EVALUATION SHOULD BE PERFORMED TO DETERMINE IF SEALING IS NECESSARY TO PREVENT THE SHORT TERM EFFECTS OF PRESSURE INDUCED MOISTURE INTRUSION AND LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.

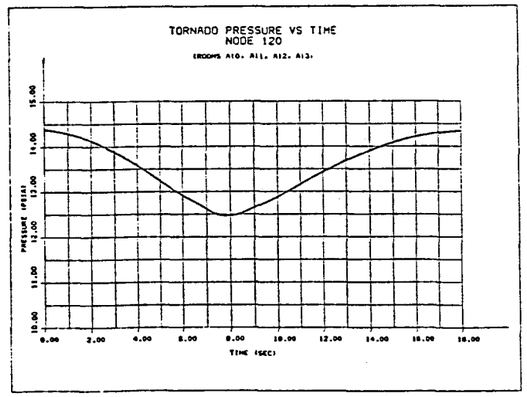
BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING RHR PMP ROOMS 1A-A, 1B-B, 2A-A, 2B-B ROOM NOS. A10, A11, A12, A13 EL 676.0	1 AVG / MAX / MIN	80 / 104 / 60	55 / 80 / 30	ATM (-) / ATM (-) / ATM (-)	5 / 1 / 0.5	NA / NA / NA	C	NOTE 16
	2 MAX / MIN	110 / 50 NOTE 8	90 / 10 NOTE 10	ATM (-) / ATM (-)	NA / NA	NA / NA		
	3	110 NOTE 25	NA	NA	NA	1810[7]		
	4	NOTE 13	100 (NOTES 13 & 33, FIGURE 2)	NOTE 13	NA	NA		NOTE 29 TABLE 1
	5	NA	NA	NOTE 4, NODE 120	NA	NA		

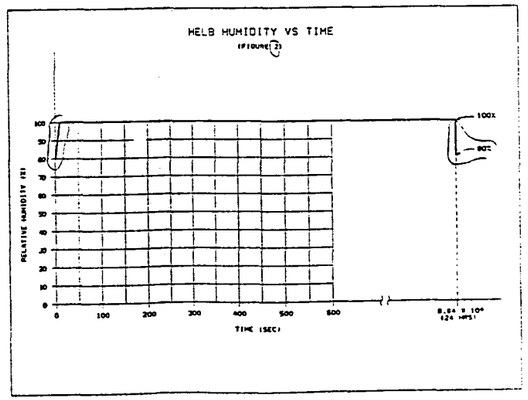
TABLE 1

ROOM NO.	HELB			
	RHR	CVCS	MFW	MS
A10, A11, A12, A13	3"	NA	1"	1"

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBN 82-0126-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-831213-2141).





8610090051-77

TI APERTURE CARD

Also Available On Aperture Card

COMPANION DRAWING: 47E235-77

ECN-3606

ISSUED BY: J.C. SEMMOLFER

REV	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD
1	6/18/86						

REVISED NOTES 1, 4, 11, 13, 16, KEY PLAN, 40 YEAR DOSE, FIGURE 2, AND REF 2. ADDED NOTES 29, 48, AND TABLE 1. DELETED NOTES 19 AND 28. RENUMBERED FIGURE 6 AS FIGURE 2. ADDED Q DESIGNATION PER EXCEPTION A.

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 676.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

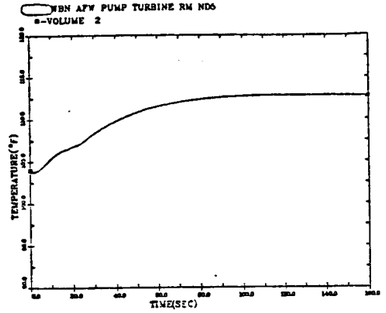
Q

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN M.A. DODSON	CHECKED M.A. CAMPBELL	1	2	J.A. PAULSTON
DESIGNED M.A. SHERRIDE	SUBMITTED D.E. GERMAN	3	4	

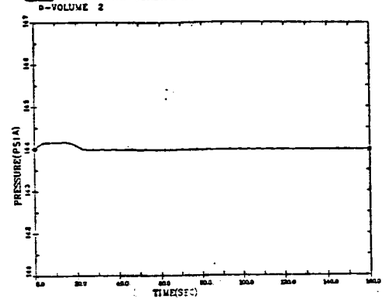
KNOXVILLE | DATE 8-26-83 | 85 | M | 47E235-74 | R1

MBN019

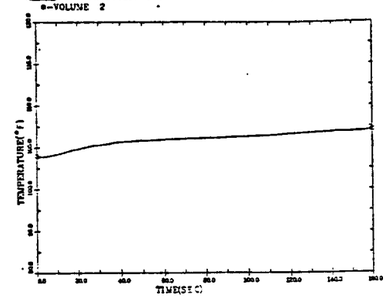
WBN AFW PUMP TURBINE RM ND6
G-VOLUME 2



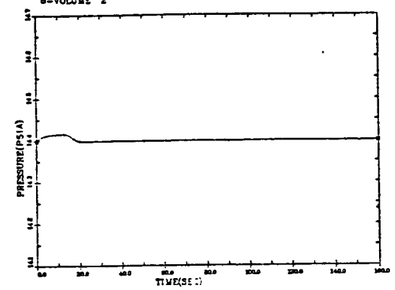
WBN AFW PUMP TURBINE RM ND5
G-VOLUME 2



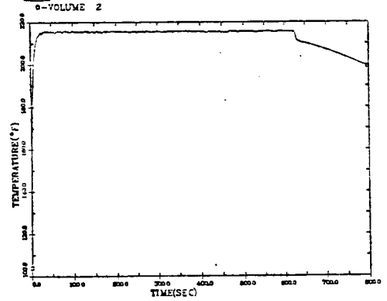
WBN AUX BOILER SYS - NODE 6 OR 7 - BA/EVAP PACK RM
G-VOLUME 2



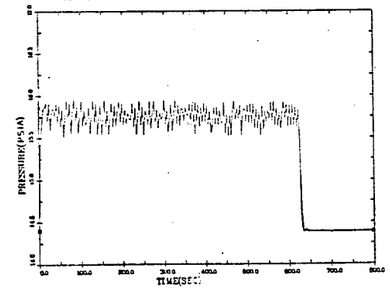
WBN AUX BOILER SYS - NODE 9 - CORRIDOR
G-VOLUME 2



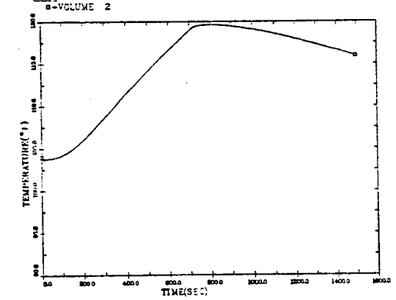
WBN RHR - NODE 2 - RHR PUMP ROOM
G-VOLUME 2



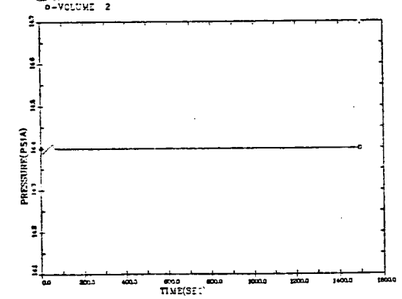
WBN RHR - NODE 2 - RHR PUMP ROOM
G-VOLUME 2



WBN CVCS - NODE 17 - PIPE CHASE
G-VOLUME 2



WBN CVCS - NODE 11 - EXCHANGER ROOM
G-VOLUME 2



8610090051-78

TI APERTURE CARD

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REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED PRELIM STATUS

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED — RECOMMENDED — APPROVED

KNOXVILLE | 7-26-83 | 85 | M | 47E235-75 | R2

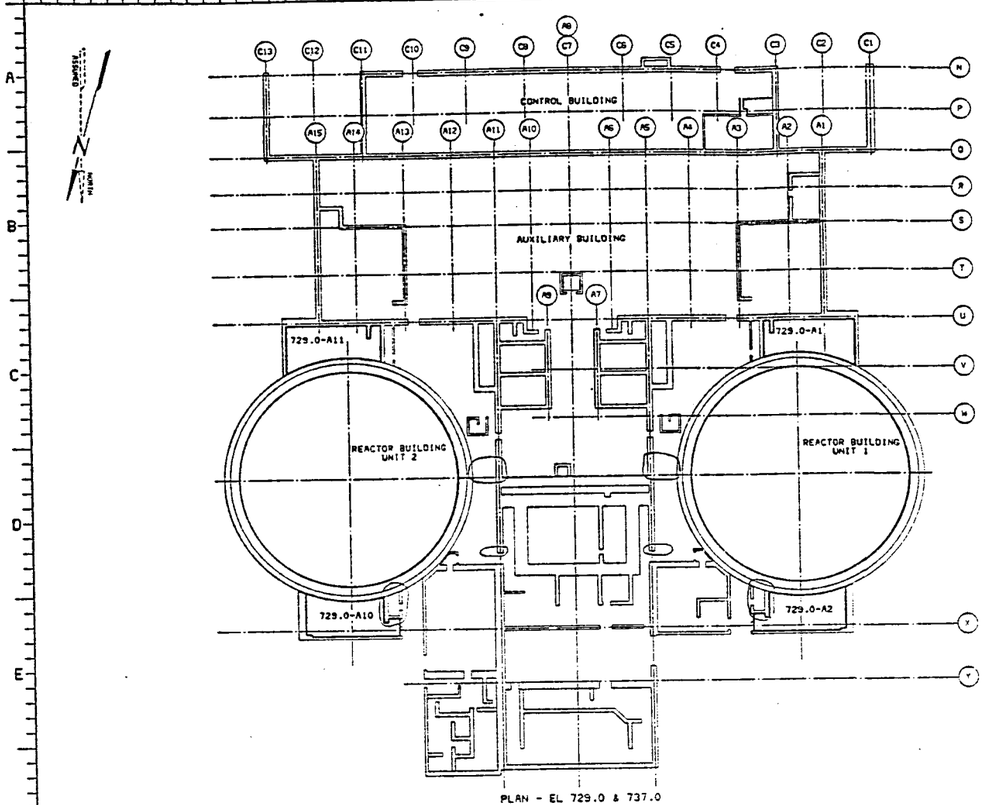
RECORD DRAWING AS CONSTRUCTED

INSPECTED AND APPROVED FOR ISSUE

COMPANION DRAWING : 47E235-76

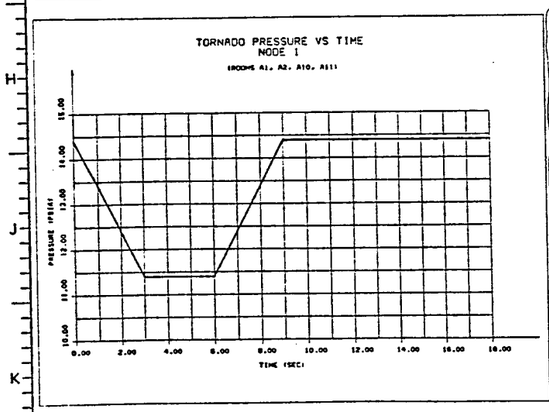
PARTNER REVIEWED

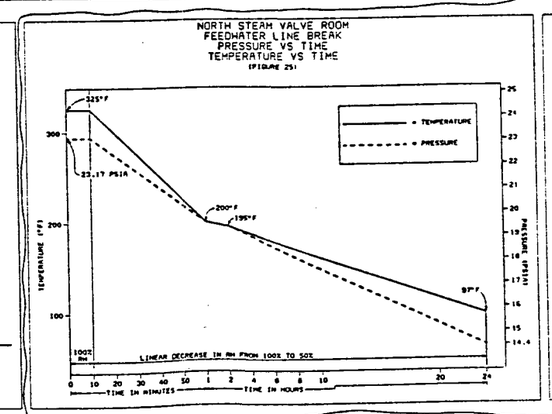
EDN - 3606

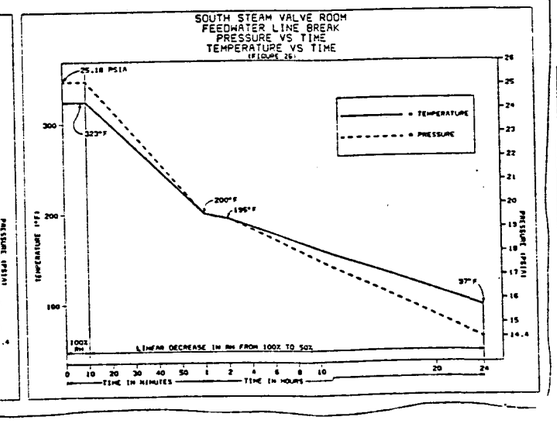


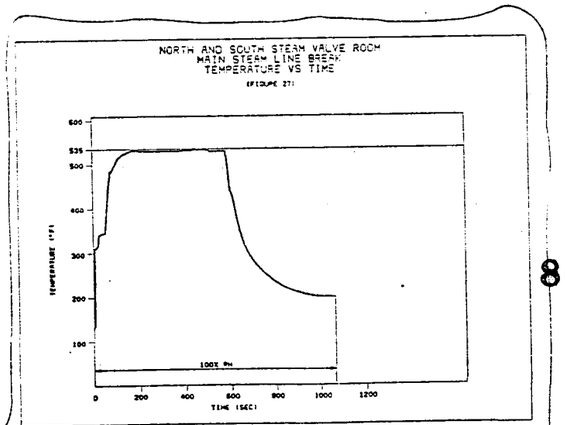
PLAN - EL 729.0 & 737.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BLDG NORTH AND SOUTH STEAM VALVE ROOMS A1,A2,A10,A11 EL 729.0	1	AVG 120 MAX 130 MIN 80	25 50 20	ATM (-) ATM (+) ATM (-)	NA 1.8×10^7 NA	NA NA NA	B	NOTE 16
	2	MAX 140 MIN 40 } NOTE 8, NOTE 20	100 10 } NOTE 18	ATM ATM (-)	NA NA	NA NA		
	3	NA	NA	NA	NA	$<1 \times 10^4$		
	4	325 323 325 } SEE FIGURES 25, 26, 27	100 { SEE FIGURES 25, 26, 27 NOTE 51	23.17 25.18 25.26 } SEE FIGURES 25, 26	NA	NA		NOTE 62
	5	NA	NA	NOTE 4 MODE 1	NA	NA		









NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION
2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MSL IS APPROXIMATELY 14.6 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -1.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS, EXCEPT DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE EGTS. ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.
4. THE MODE(S) LISTED DEFINE THE PRESSURE-VS-TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).
8. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS; TEMPORARY GREATER THAN DESIGN, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. FOR INTEGRATED ACCIDENT DOSE SITES FOR A LOCA, TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE HEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING NA VALUES LOWER THAN THOSE SHOWN.
12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.
16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-25 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THIS CONDITION AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.
18. THE ABNORMAL MINIMUM RELATIVE HUMIDITY OF 10% WILL OCCUR SIMULTANEOUSLY WITH THE ABNORMAL MAXIMUM TEMPERATURE OF 140°F. 25% WILL OCCUR SIMULTANEOUSLY WITH THE NORMAL MAXIMUM TEMPERATURE OF 130°F. A STEAM LEAK COULD RAISE THE HUMIDITY TO 100%. THIS CONDITION COULD EXIST FOR UP TO 8 HRS AND WILL RETURN TO THE NORMAL MAXIMUM OF 50% RH IN NO 8 HOUR PERIOD LINEARLY. THIS CONDITION SHOULD BE CONSIDERED TO OCCUR NO MORE THAN THICE DURING THE PLANT LIFE.
20. DURING UNIT SHUTDOWN AND MALFUNCTION OF THE VENTILATION SYSTEM (FAN CONTINUES TO OPERATE), TEMPERATURE COULD DROP TO 50°F. THIS CONDITION WILL EXIST FOR NOT MORE THAN 8 HOURS BY WHICH TIME THE SPACE WILL WARM UP LINEARLY TO THE ABNORMAL MINIMUM OF 40°F OVER A 24 HOUR PERIOD. THIS FAILURE SHOULD BE CONSIDERED TO OCCUR NO MORE THAN THICE DURING THE PLANT LIFE.
29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.
51. UNPEALED CONDUITS AND COMPONENTS LOCATED WITHIN THE VALVE ROOMS ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF A HELB. AN EVALUATION SHOULD BE PERFORMED TO DETERMINE IF THIS IS NECESSARY TO PREVENT THE SHORT TERM EFFECTS OF PRESSURE INDUCED MOISTURE INTRUSION AND THE LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.
62. A MAIN FEEDWATER LINE BREAK WILL RESULT IN FLOODING UP TO ELEVATION 730.58 FT (1.58 FT) IN THE SOUTH VALVE VAULT, 730.83 FT (1.83 FT) IN THE NORTH VALVE VAULT AND SIGNIFICANT WETTING UP TO ELEVATION 731.3 FT (2.3 FT) IN BOTH VALVE VAULTS. FLOODING FROM A MAIN STEAM LINE BREAK IS NEGLIGIBLE.

APERTURE CARD
Also Available On Aperture Card

8610090051-79

REFERENCE:
1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB 82-0726-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-831213-214)

3	8178.A	9-9-86	RD	RAD	WEB	JCS	JAR	JCS
REVISED 40 YEAR DOSE. NOTES 1.4.11. AND 16. FIGURES 25.26. KEY PLAN AND REF. 2. DELETED NOTES 30.31. AND ROOMS A12 AND A13. ADDED NOTES 49.51. AND FIGURE 27. ADDED Q DESIGNATION PER EXCELSION A.								
2	5691	4-22-85	SAB	RAD	RAS	CCC	JAR	JCS
REVISED RADIATION DOSES								
1	5403	2-4-85	SAB	RAD	MCC	RFC	JAR	JCS
ADDED NOTES 10.30 & 34. REVISED KEY PLAN. ADDED TABLE								
REV NO	ECN/FCN	DATE	DSCN	DRWN	CHKD	SUPVD	APPD	ISSD

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 729.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

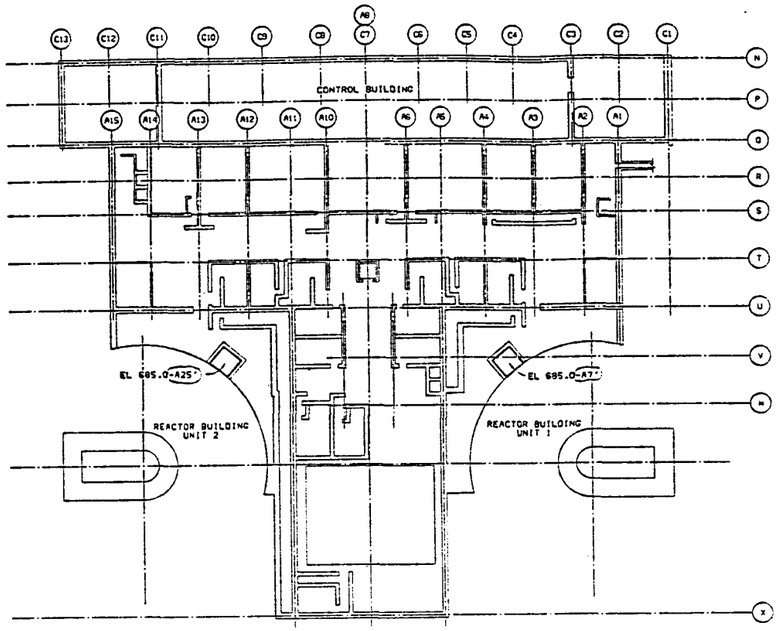
DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DR.Name R.A. JUSTICE	CHECKED R.S. CARNAL	1	2	
DESIGNED R.A. JUSTICE	SUBMITTED R.C. GRAHAM	3	4	

KNOXVILLE | DATE 4-26-81 | BS | M | 47E235-76 | R3

ECN-3606

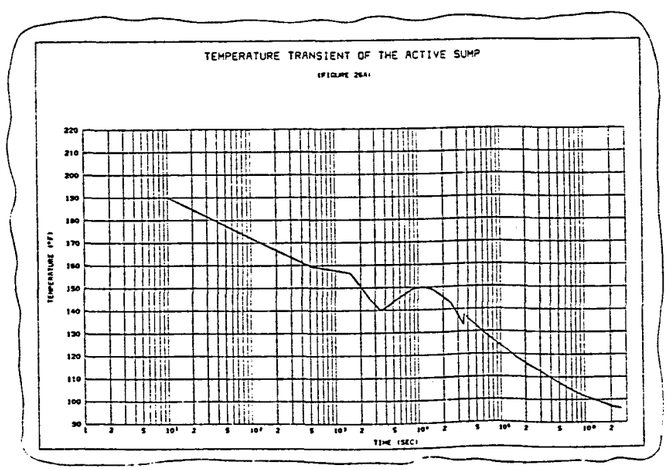
MBN020

ISSUED BY: J.E. STANBURY



PLAN - EL 685.0 & 692.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING RESIDUAL HEAT REMOVAL (RHR) VALVE ROOMS A7+, A25 EL 685.0	1 AVG / MAX / MIN	80 / 104 / 60	55 / 90 / 30	ATM / ATM / ATM	NA / 1.5E+05 / NA	NA / NA / NA	NA	NOTE 14
	2 MAX / MIN	110 / 80 - NOTE 8	90 / 10 - NOTE 10	ATM / ATM	NA / NA	NA / NA		
	3	190 - NOTE 21 FIGURE 26A	NOTE 21	NOTE 21	NA	1810?		
	4	NOTE 42	NOTE 42	NOTE 42	NA	NA		NOTE 42



NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION
2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MSL IS APPROXIMATELY 14.4 PSIA.

   ATM+: -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM-: -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE ECTS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.
9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS TEMPORARY GREATER THAN DESIGN HEAT LOADS; OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN IS FOR A LOCA. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE NEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.
12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
    A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.
14. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".
21. DURING POST-LOCA CONDITIONS, THE TEMPERATURE INSIDE THIS SPACE WILL VARY ACCORDING TO THE ACTIVE SUMP CURVE SHOWN IN FIGURE 26A. RELATIVE HUMIDITY WILL REMAIN WITHIN THE ABNORMAL RANGE WHILE PRESSURE CHANGE IS NEGLIGIBLE.
29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.
42. THESE SPACES ARE NOT AFFECTED BY BREAKS IN ANY OF THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE.

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBN 82-0726-2251).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (BSR-831213-2141).

TI APERTURE CARD

Also Available On Aperture Card

8610090051-80

NO	ECN/FCR	DATE	DSGN	DRWN	CHKD	SVWD	APPD	ISSD
1	8170-A	9-9-86						

REVISED NOTES 1, 11(TEXT), 12(TEXT), NORMAL DOSE, FIGURE 26A, AND REF 2. DELETED NOTE 13. ADDED NOTE 42 AND ROOM NUMBERS. ADDED Q DESIGNATION PER EXCEPTION A.

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 685.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

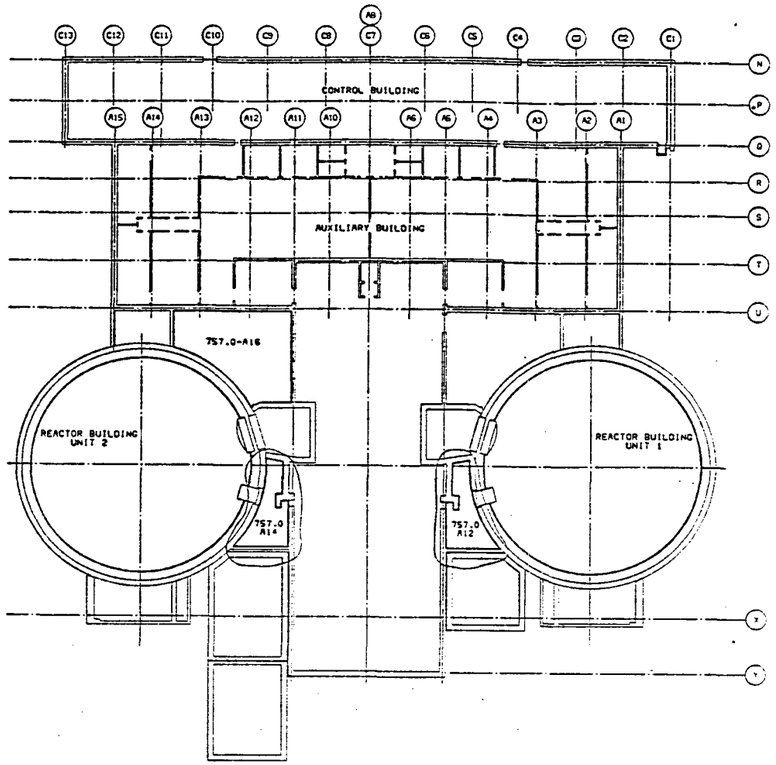
DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A. DOTSON	CHECKED R.P. CAMPBELL	1	2	R.A. RALSTON
DESIGNED R.A. BLEFRIDGE	SUBMITTED G.E. GERMAN	3	4	

KNOXVILLE | DATE 8-26-83 | 85 | M | 47E235-77 | R1

ECN-3636

ISSUED BY: J.C. STANDIFER

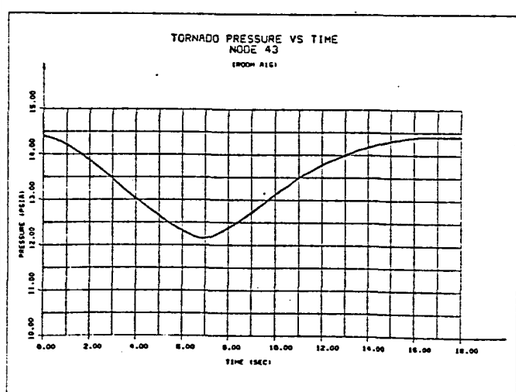
WBN021

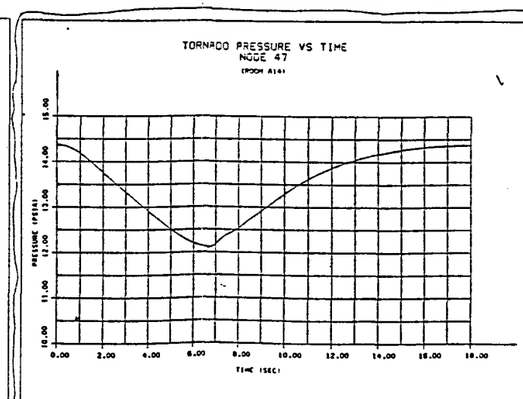


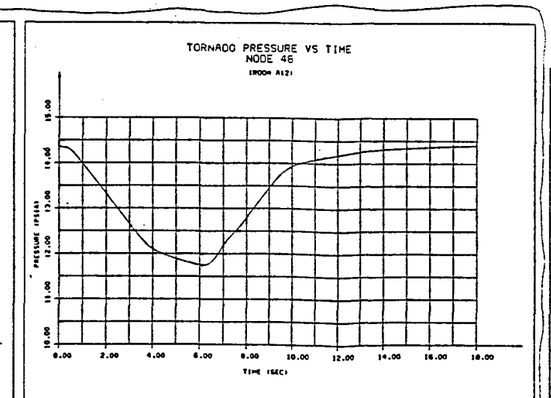
PLAN - EL 755.0 & 757.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 13)	INTERMITTENT ACCIDENT DOSE (RADS) (NOTE 33)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING EMERGENCY GAS TREATMENT SYSTEM (EGTS) A16, REACTOR BUILDING ACCESS ROOMS A12,A14 EL 757.0	1 AVG / MAX / MIN	80 / 104 / 60	55 / 80 / 30	ATM / ATM / ATM	NA / 2.8×10^{-3} / NA	NA / NA / NA	A	NOTE 14
	2 MAX / MIN	110 (NOTE 23) / 50 (NOTE 9)	80 / 10 (NOTE 10)	ATM / ATM	NA / NA	NA / NA		
	3	110 NOTE 25	NA	NA	NA	TABLE 2		
	4	NOTE 42	NOTE 42	NOTE 42	NA	NA		NOTE 42
	5	NA	NA	NOTE 4, NODES 43,47,46	NA	NA		

TABLE 2		
ROOM NO.	ACCIDENT DOSE (RADS)	
A16	5.5×10^{5} (NOTE 32) / 3.0×10^{5} (NOTE 33)	
A12, A14	2.5×10^{4}	







NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE + LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INSTALLATION
2. ATM (INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MRH IS APPROXIMATELY 14.4 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE EGTS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.
4. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).
9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN IS FOR A LOCA. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE NEW RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.
12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
    A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.
14. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".
23. THE EGTS UNITS WILL BE OPERATED 10 HRS PER MONTH CONTINUOUSLY FOR TESTING AND MAINTENANCE. FOUR MONTHS EACH YEAR FOOD AMBIENT TEMPERATURES COULD REACH 110°F DURING THIS TESTING (40 HOURS TOTAL).
25. THE DURATION OF THIS CONDITION SHOULD BE CONSIDERED TO EXIST FOR UP TO 30 DAYS.
29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.
32. THE LOCA DOSE GIVEN IS THE LARGEST DOSE EXPECTED IN THE ROOM. IF EQUIPMENT CANNOT BE QUALIFIED TO THIS DOSE, REFINED LOCATION SPECIFIC VALUES SHOULD BE OBTAINED FROM THE NEW RADIOLOGICAL PROTECTION SECTION (NAL-31 ON AN AS NECESSARY BASIS.
33. THIS IS THE MAXIMUM LOCA DOSE INSIDE THE AIR CLEANUP UNIT HOUSING. ACTUAL DOSE WILL VARY DEPENDING UPON EQUIPMENT LOCATION. IF EQUIPMENT CANNOT BE QUALIFIED TO THIS DOSE, REFINED LOCATION SPECIFIC VALUES SHOULD BE OBTAINED FROM THE RADIOLOGICAL PROTECTION SECTION (NAL-31 ON AN AS NECESSARY BASIS.
42. THESE SPACES ARE NOT AFFECTED BY BREAKS IN ANY OF THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM, AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE.

TI APERTURE CARD

Also Available On Aperture Card

8610090051-81

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBN 82-0726-2251).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-831213-2141).

3	B178,A	9-9-86	MD	RWD	WCC	GEC	JAR	JCS	

REVISED NOTES 1,4,11,14. KEY PLAN. 40 YEAR DOSE. ACCIDENT DOSE. ADDED NOTES 10,42. ROOMS A12, A14. TABLE 2. NOTE FIGURES #7, #8. OPERATIONAL CONDITION 4. AND REF 2. DELETED NOTE 13. ADDED G DESIGNATION PER EXCEPTION A.

2	SAOR	1-22-85	PAS	RWD	WCC	GEC	JAR	JCS	

REVISED INT ACC DOSE. ADDED NOTE 32 & 33.

1	ASAZ	3-8-84	PAS	RWD	SAB	GEC	JAR	JCS	

CHANGED TORNADO CURVE.

REV	ECN/FCR	DATE	DSGN	DRWN	CHKD	REVWD	APPD	ISSD

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 757.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

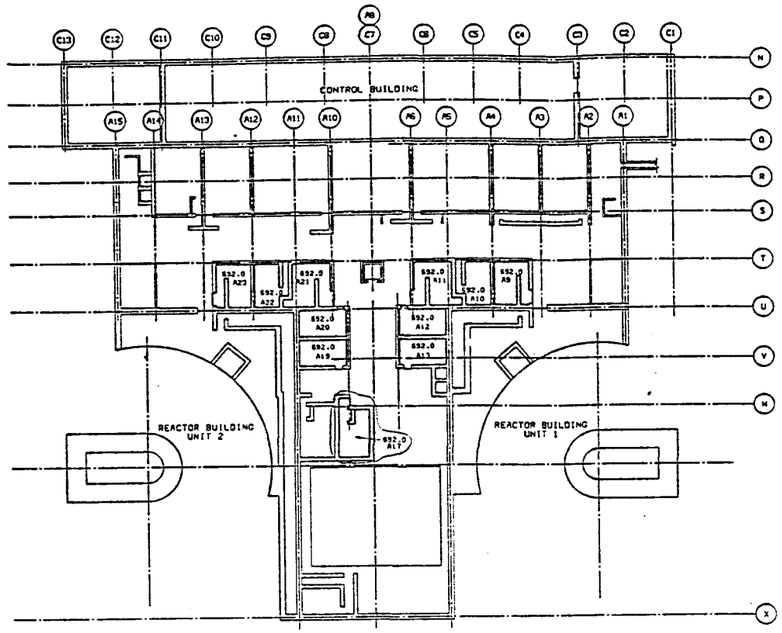
DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.DOTSON	CHECKED R.R.CAMPBELL	1	2	J.A.PAULSTON
DESIGNED R.A.SULFRIDGE	SUBMITTED G.E.GERMAN	3	4	

KNOXVILLE | DATE 8-26-83 | 85 | M | 47E235-78 | R3

ISSUED BY: J.E.STANDIFER

ECN-3606

MBN022



PLAN - EL 685.0 & 692.0

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION
2. ATM =INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT NOW IS APPROXIMATELY 14.4 PSIA.

   ATM+1 =INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM-1 =INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE EGTS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.
3. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).
9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE DURATION OF THE SAME AREA CONTAMINATION ANALYSIS. OTHERWISE INDICATED, THE INTEGRATED ACCIDENT DOSE SHOWN IS THE 30-DAY INTEGRATED DOSE. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE NEW RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.
12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
    A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.
18. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.
25. THE DURATION OF THIS CONDITION SHOULD BE CONSIDERED TO EXIST FOR UP TO 30 DAYS.
29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.
43. THE TEMPERATURE, PRESSURE, AND RELATIVE HUMIDITY IN THESE SPACES IS UNAFFECTED BY BREAKS IN ANY OF THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM, AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THESE SPACES, HOWEVER, WILL EXPERIENCE FLOOD LEVELS SPECIFIED IN TABLE 1 DUE TO WATER LEAKAGE UNDER DOORS FROM THE ADJACENT GENERAL FLOOR AREA.

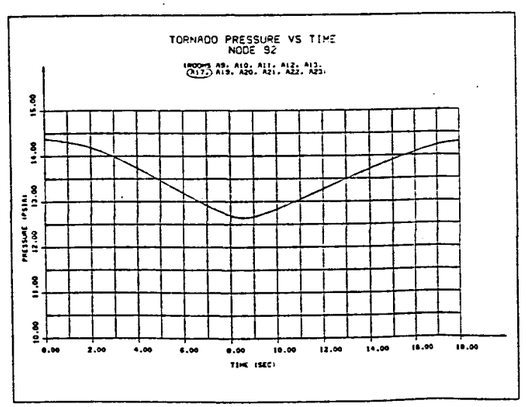
BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING SAFETY INJECTION PUMP ROOMS CENTRIFUGAL CHARGING PUMP ROOMS RECIPROCAL CHARGING PUMP ROOMS	1 MAX MAX MIN	80 104 60	55 80 30	ATM ATM ATM	NA (TABLE 2)	NA NA NA	C	NOTE 16
	2 MAX MIN	MAX 110 MIN 50 } NOTE 8	90 10 } NOTE 10	ATM ATM	NA NA	NA NA		
WASTE EVAPORATOR PACKAGE ROOM (FUTURE HYPERFILTRATION DEMIN ROOM)	3	110 NOTE 25 (NOTE 43)	NA	NA	NA	(TABLE 2)		
A9,A10,A11,A12,A13 A17,A19,A20,A21,A22,A23 EL 692.0	4	NOTE 43	NOTE 43	NOTE 43	NA	NA		NOTE 43 (TABLE 1)
	5	NA	NA	NOTE 4 NODE 92	NA	NA		

TABLE 1

ROOM NO.	HELB RHR	CVCS	AFW	FB
A9,A10, A11,A12, A13,A19, A20,A21, A22,A23	2"	NA	1"	1"
A17	2"	1"	1"	1"

TABLE 2

ROOM NO.	40 YEAR DOSE (RADS)	ACCIDENT DOSE (RADS)
A9,A10,A11 A21,A22,A23	3.6×10^6	1×10^7
A17	5.4×10^6	$<1 \times 10^6$
A12,A13, A19,A20	3.5×10^6	1×10^7



REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB 82-2726-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-421 (ESB-831213-2141).

8610090051-82

TI APERTURE CARD

Also Available On Aperture Card

REV NO.	ECN/FCR	DATE	DSGN	DRWN	CHKD	REVWD	APPD	ISSD
1	6178.A	2-13-86	RS	JAC	WER	TP	AM	KL

REVISED NOTES 1, 4, 11, 16, AND 40 YEAR DOSE. ADDED NOTE 43. TABLES 1, 2. OPERATIONAL CONDITION 4, REF 2, AND ROOM A17. DELETED NOTE 15. ADDED Ⓐ DESIGNATION PER EXCEPTION A.

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 692.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Ⓐ

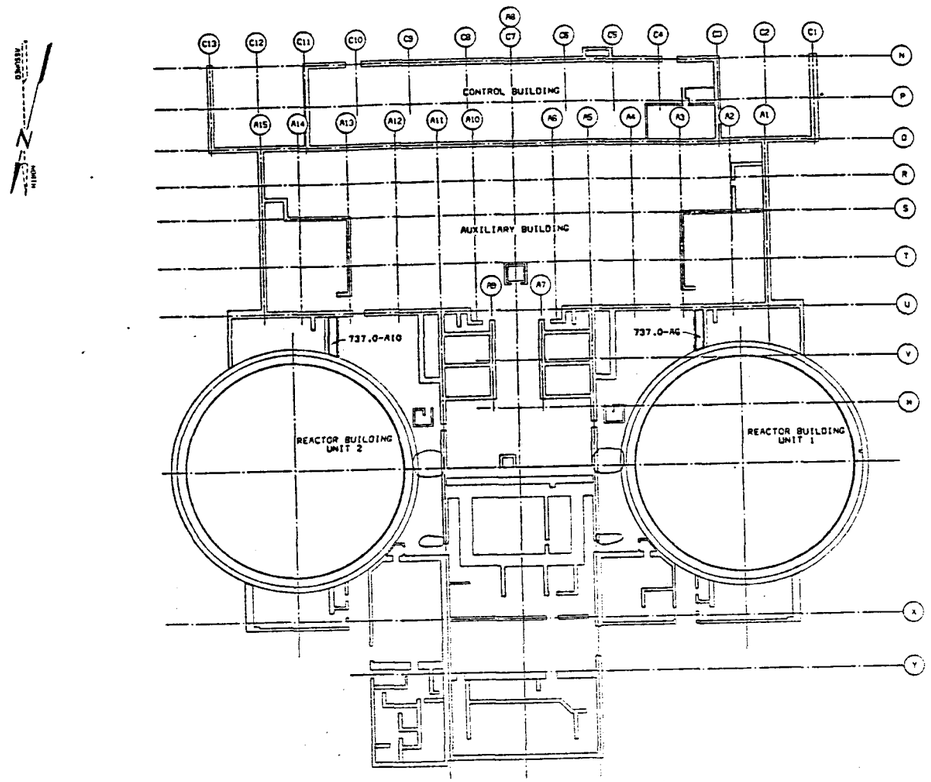
DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A. DOTSON	CHECKED P.R. CAMPBELL	1	2	J.A. RANSTON
DESIGNED R.A. SACKRIDGE	SUBMITTED D.E. DEBRUHN	3	4	

KNOXVILLE — DATE 8-26-83 — 85 — H — 47E235-79 — R1

ECN-3606

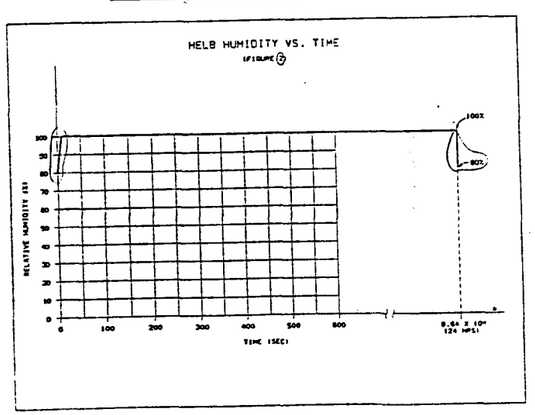
ISSUED BY: J.C. STANDIFER

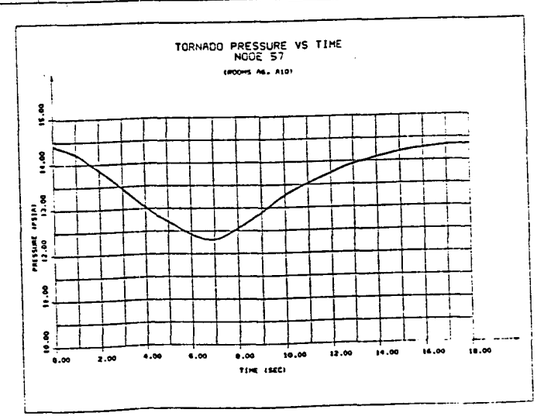
WBN023



PLAN - EL 729.0 & 737.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BLDG AIR LOCKS A6,A10 EL 737.0	1 AVG MAX MIN	80 104 60	50 80 30	ATM (=) ATM (=) ATM (=)	NA 1.3×10^3 NA	NA NA NA	B	NOTE 16
	2 MAX MIN	110 50 } NOTE 8	90 10 } NOTE 10	ATM (+) ATM (=)	NA NA	NA NA		
	3	NA	NA	NA	NA	$<1 \times 10^3$		
	4	NOTE 13	100 (NOTES 13&47) FIGURE 6	NOTE 13	NA	NA		NOTE 18
	5	NA	NA	NOTE 4 MODE 57	NA	NA		





NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB (INSIDE PRIMARY CONTAINMENT (WORST CASE SHALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 2 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION.
2. ATM (=) INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT HSM IS APPROXIMATELY 14.6 PSIA.

   ATM(+) =INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) =INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS; DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE ECTS. ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.
4. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).
8. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 CONSECUTIVE HOURS PER EXCURSION AND WILL OCCUR LESS THAN 12 OF THE PLANT LIFE.
10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 12 OF THE PLANT LIFE.
11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. FOR INTEGRATED ACCIDENT DOSE EVALUATION IS OTHERWISE INDICATED, THE TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE MEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.
12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.
13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY SYSTEM AND AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THE COMPANION DRAWINGS REFERENCED CONTAIN CVCS TEMPERATURE AND PRESSURE VS TIME PROFILES FOR ALL THE WORST CASE BREAK SCENARIOS INVOLVING THESE SYSTEMS. PROFILE 1 ... EXPLAIN WHICH HIGH ENERGY SYSTEM EFFECT IS BEING REPORTED. THE VOLUME NUMBER CORRESPONDS TO AREAS OR PORTIONS OF AREAS VIOLATED ON THE KEY PLAN. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DECREASE LINEARLY TO THE NORMAL MAXIMUM VALUE GIVEN IN THE ENVIRONMENTAL TABLE AT THE END OF 24 HOURS IF IT HAS NOT REACHED THAT VALUE WITHIN THE TIME SCALE OF THE FIGURE. THE SAME HUMIDITY VS TIME FIGURE APPLIES IN EACH CASE. FOR QUALIFICATION PURPOSES, THE PROFILES REPRESENTING THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.
18. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-31. DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS AND ALSO REFERENCE THE FLOOD AND FOR REQUIRED TO MAINTAIN PLANT SAFE SHUTDOWN. THE FLOOD SHOULD BE EITHER 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED OR LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.
29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.
38. THE HELB'S DESCRIBED IN NOTE 13 WILL NOT CAUSE FLOODING IN THIS AREA.
47. UNSEALED CONDUITS AND COMPONENTS LOCATED WITHIN THIS AREA ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF AN RHR LINE BREAK. AN EVALUATION SHOULD BE PERFORMED TO DETERMINE IF SEALING IS NECESSARY TO PREVENT THE LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBN 82-0724-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-831213-2141).

8610090051-83

TI APERTURE CARD

Also Available On Aperture Card

2	6178 A	4780								
REVISED NEW PLAN; NOTES 1,4,11,12,18, 40 YEAR DOSE, FIGURE 7, MODE 57, ADDED NOTE 38 AND 47. RENUMBERED FIGURE 6 AS FIGURE 7. ADDED AUX BLDG DESCRIPTION A.										
1	4542	3-8-84	RAS	RAD	SAB	GEC	JAR	JCS		
CHANGED COMPANION DRAWING NUMBER.										
NO.	ECN/ECP	DATE	DSGN	DRWN	CHKD	REVWD	APPD	ISSD		
SCALE: NTS								EXCEPT AS NOTED		

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 737.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.DOTSON	CHECKED R.R.CAMPBELL	1	2	J.A.RAULSTON
DESIGNED R.A.SALFRIDGE	SUBMITTED G.E.GERMAN	3	4	

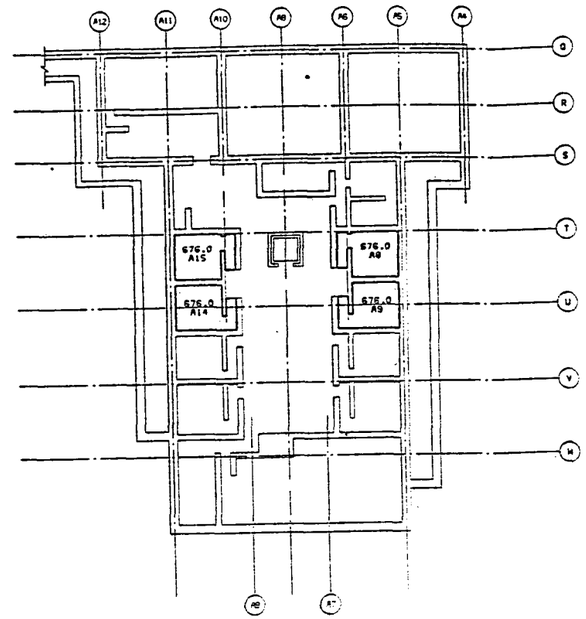
KNOXVILLE | DATE 8-26-83 | 85 | M | 47E235-80 | R2

COMPANION DRAWING: 47E235-45

ECN-3606

ISSUED BY: J.C.STANDIFER

MBN024



PLAN - EL 676.0

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:

   1. NORMAL
   2. ABNORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION

3. THE NORMAL PRESSURE RANGE INSIDE PRIMARY CONTAINMENT AND THE INSTRUMENT ROOM IS -0.1 TO +0.3 PSIG; PRESSURES DUE TO ABNORMAL CONDITIONS WILL NOT EXCEED THIS RANGE. ANY PRESSURES OUTSIDE THIS RANGE ARE THE RESULT OF AN ACCIDENT CONDITION. SEE OPERATIONAL CONDITION 3.

4. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

8. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS; TEMPORARY GREATER THAN DESIGN HEAT LOADS; OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA COMPONENTS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN IS FOR A LOCA. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE HEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:

   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

25. THE DURATION OF THIS CONDITION SHOULD BE CONSIDERED TO EXIST FOR UP TO 30 DAYS.

29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

43. THE TEMPERATURE, PRESSURE AND RELATIVE HUMIDITY IN THESE SPACES IS UNAFFECTED BY BREAKS IN ANY OF THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW); STEAM SUPPLY; AUXILIARY BOILER SYSTEM; RESIDUAL HEAT REMOVAL (RHR) SYSTEM; AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THESE SPACES; HOWEVER, WILL EXPERIENCE FLOOD LEVELS SPECIFIED IN TABLE 1 DUE TO WATER LEAKAGE UNDER DOORS FROM THE ADJACENT GENERAL FLOOR AREA.

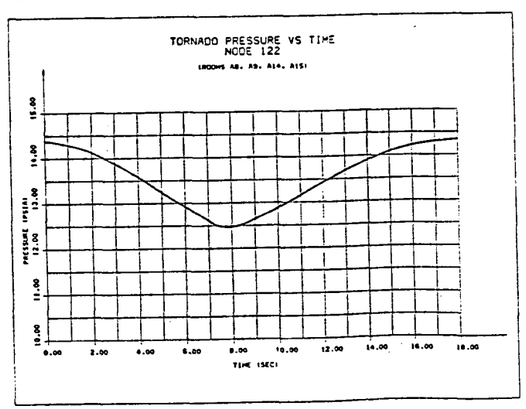
BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIG) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING CONTAINMENT SPRAY PUMP ROOMS 1A-A, 2A-A, 1B-B & 2B-B ROOM NOS. A8, A9, A14, A15 EL 676.0	1 MAX MAX MIN	80 104 60	55 80 30	ATM (-) ATM (-) ATM (-)	NA 3.5 x 10^5 NA	NA NA NA	C	NOTE 16
	2 MAX MIN	110 50 NOTE 8	30 10 NOTE 10	ATM (-) ATM (-)	NA NA	NA NA		
	3	110 NOTE 25	NA	NA	NA	1310^7		
	4	NOTE 43	NOTE 43	NOTE 43	NA	NA		TABLE 43 TABLE 1
	5	NA	NA	NOTE 4 MODE 122	NA	NA		

TABLE 1

ROOM NO.	HELB			
	BWR	CVCS	ARM	AB
A8, A9, A14, A15	8"	NA	1"	1"

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBN 82-0726-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (BSB-831213-2161).



8610090051-84

TI APERTURE CARD

Also Available On Aperture Card

1	8179.A	J.A. Rio	ARM	JAC	VLR	JA	[illegible]	[illegible]

REVISED NOTE 1, 4, 11, 16; NO YEAR DOSE, AND REF 2; ADDED NOTE 43, AND TABLE 1; DELETED NOTE 15; ADDED Q DESIGNATION PER EXCEPTION A.

NO.	ECN/FCR	DATE	DSCN	DRWN	CHKD	RVWD	APPD	ISSD

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 676.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.R. DOTSON	CHECKED P.R. CAMPBELL	1	2	J.R. RAULSTON
DESIGNED R.A. SULFRIDGE	SUBMITTED C.E. GERMAN	3	4	

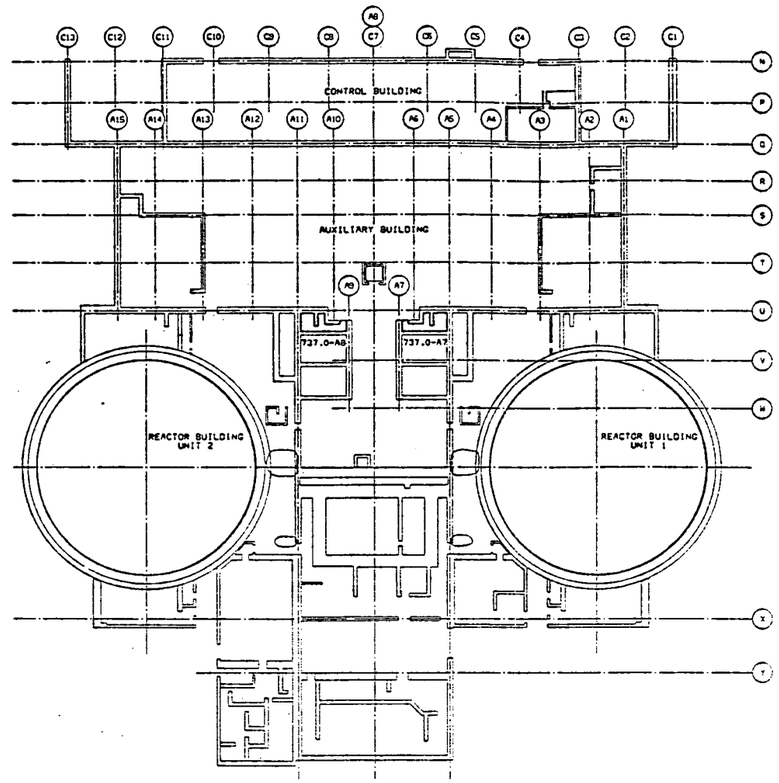
KNOXVILLE | DATE 8-29-83 | 85 | M | 47E235-81 | R1

ECN-3606

ISSUED BY: J.C. STANDIFER

WBN025

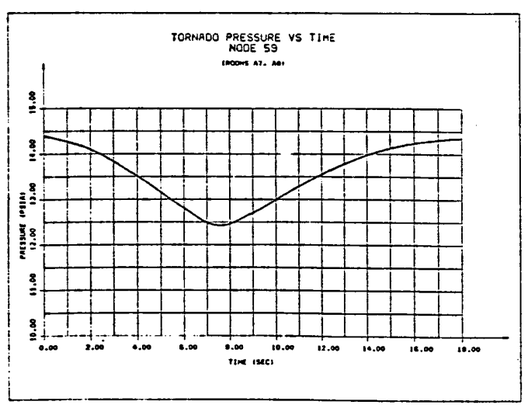
PRINT
SIZE

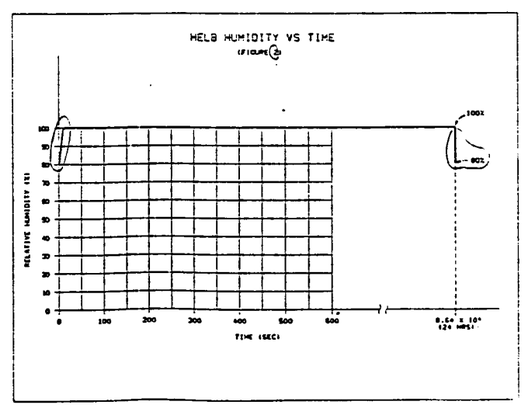


PLAN - EL 729.0 & 737.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BLDG LET DOWN HEAT EXCHANGER ROOMS A7, A8 EL 737.0	1 AVG MAX MIN	80 104 60	55 80 30	ATM (-) ATM (-) ATM (-)	80 9.E 10⁵ NA	NA NA NA	B	NOTE 16
	2 MAX MIN	110 50 } NOTE 8	80 10 } NOTE 10	ATM (-) ATM (-)	NA NA	NA NA		
	3	NA	NA	NA	NA	5.E 10⁵		
	4	NOTE 13	100 (NOTE 13 FIGURE 5B)	NOTE 13	NA	NA		NOTE 29 TABLE 1
	5	NA	NA	NOTE 4 NODE 59	NA	NA		

TABLE 1					
ROOM NO.	HELB				
	BWR	EVCS	AFW	AB	
A7	NA	3'-8"(U1)* NA(U2)*	NA	NA	
A8	NA	NA(U1)* 3'-8"(U2)*	NA	NA	
* INDICATES WHICH UNIT THE BREAK OCCURS IN.					





NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. NORMAL
   3. LOCA/HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. LOCA/HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (WORST PRESSURE DROP IS 8PSI)
   6. INADVERTENT CONTAINMENT SPRAY (INITIATION
2. ATM (-) -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MSM IS APPROXIMATELY 14.4 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -8.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE ECTS: ANNULUS PRESSURE WILL BE MAINTAINED AT -8.0 INCHES OF WATER.
4. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).
9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. FOR INTEGRATED ACCIDENT DOSE GIVE 30 FOR THE LOW-ENERGY RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE NRC RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO ASSUMING DOSES LOWER THAN THOSE SHOWN.
12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
    A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.
13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THE OPERATIONAL CONDITIONS DEVELOPED CONTAIN TEMPERATURE AND PRESSURE VS TIME CURVES FOR THE WORST CASE BREAK SCENARIOS INVOLVING THESE SYSTEMS. PROFILE TIMES EXTRAPOLATION WHICH EXHIBIT SIMILAR EFFECT IN BEING DEFICIENT, SUFFICIENT OR CORRECT RELATIVE TO AREAS OR POSITIONS OF THE AREAS HIGHLIGHTED ON THE PLAN. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DECREASE LINEARLY TO THE NORMAL MAXIMUM VALUE GIVEN IN THE ENVIRONMENTAL TABLE AT THE END OF 24 HOURS IF IT WAS NOT REACHED THAT VALUE WITHIN THE TIME SCALE OF THE FIGURE. THE SAME HUMIDITY VS TIME CURVE APPLIES IN EACH CASE. FOR QUALIFICATION PURPOSES, (TWO) HELB PROFILES REPRESENTING THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.
16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-31 "DESIGN CRITERIA FOR FLOOD PROTECTION" PROVISIONS AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO BE IN THE PLANT DURING THE FLOOD AND FOR 100 DAYS THEREAFTER (BEYOND THE FLOOD) SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.
29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.
33. THE HELB'S DESCRIBED IN NOTE 13 WILL RESULT IN THE FLOOD LEVELS SPECIFIED IN TABLE 1.
50. UNSEALED CONDUITS AND COMPONENTS LOCATED WITHIN THIS AREA ARE SUBJECT TO MOISTURE INTRUSION AS THE RESULT OF A CVCS LINE BREAK. AN EVALUATION SHOULD BE PERFORMED TO DETERMINE IF SEALING IS NECESSARY TO PREVENT THE LONG TERM EFFECTS OF MOISTURE INTRUSION BY DIFFUSION.

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WBN BZ-0726-235).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-831213-214).

8610090051-85

TI APERTURE CARD

Also Available On Aperture Card

REV	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD
1	8178-A	9-9-86						

REVISED KEY PLAN, NOTES 1,8,11,13,16,40 YEAR DOSE, ADDITIONAL DOSE, FIGURE 2, WBN REF 2, ADDED NOTES 29,33, WBN TABLE 2, RENUMBERED FIGURE 5 AS FIGURE 2, MODIFIED DESIGNATION MAP EXCEPTION 4

SCALE: NTS EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 737.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.DOTSON	CHECKED R.R.CAMPBELL	1	2	J.A.RAULSTON
DESIGNED R.A.SULFRIDGE	SUBMITTED G.E.CEPHUS	3	4	

KNOXVILLE DATE 8-26-83 85 M 47E235-82 R1

COMPANION DRAWING: 47E235-83

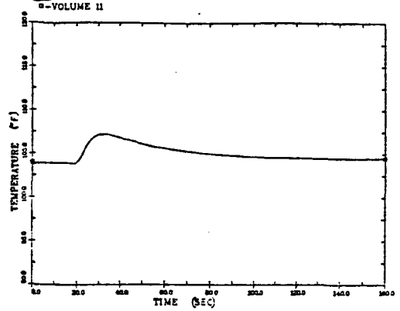
ECN-3606

ISSUED BY: J.C.SPANDIFER

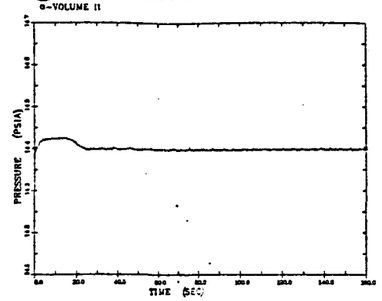
MBN026

85 M 47E235-82

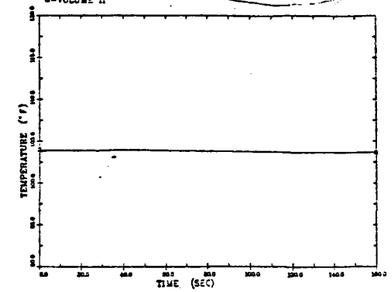
WBN AFW PUMP TURBINE RM ND5
G-VOLUME 11



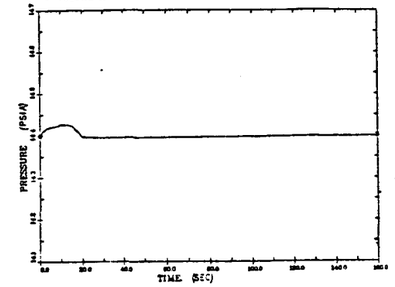
WBN AFW PUMP TURBINE RM ND5
G-VOLUME 11



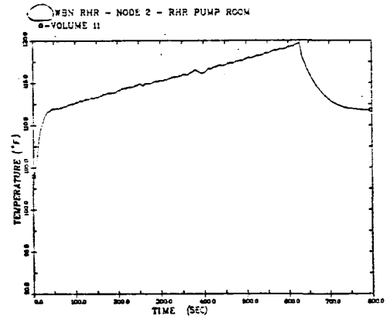
WBN AUX BOILER SYS - NODE 9 - CORRIDOR
G-VOLUME 11



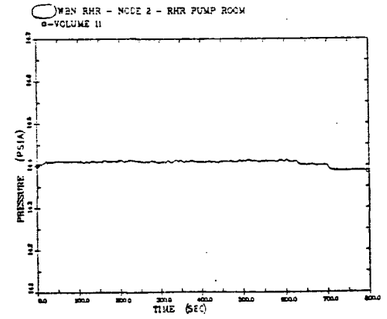
WBN AUX BOILER SYS - NODE 9 - CORRIDOR
G-VOLUME 11



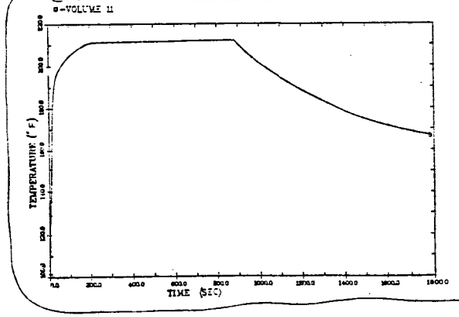
WBN RHR - NODE 2 - RHR PUMP ROOM
G-VOLUME 11



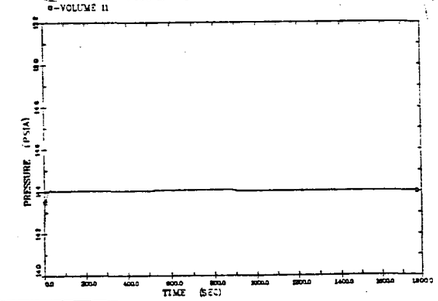
WBN RHR - NODE 2 - RHR PUMP ROOM
G-VOLUME 11



WBN CVCS - NODE 11 - EXCHANGER ROOM
G-VOLUME 11



WBN CVCS - NODE 11 - EXCHANGER ROOM
G-VOLUME 11



8610090051-86

TI APERTURE CARD

Also Available On Aperture Card

REVISED AUXILIARY BOILER SYSTEM PROFILES DELETED PRELIM STATUS

SCALE: NTS EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

SUBMITTED | RECOMMENDED | APPROVED

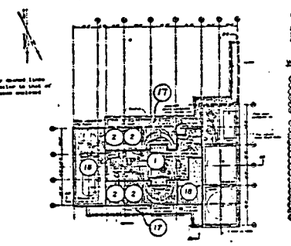
KNOXVILLE | 85 | M | 47E235-83 | R2

RECORD DRAWING AS CONSTRUCTED

INSPECTED AND APPROVED FOR ISSUE

COMPANION DRAWING: 47E235-[illegible]

ECN - 3606

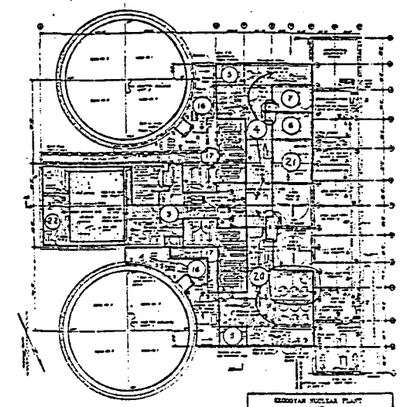


PLAN EL 653.0

This drawing is of the Sequoyah Nuclear Plant. To obtain the proper elevation and direction for Watts Bar, add 23.0 ft. to all elevations and rotate "assumed north" 90. degrees clockwise.

SEQUOYAH NUCLEAR PLANT
AND
WATTS BAR NUCLEAR PLANT

HELB NODE DEFINITION

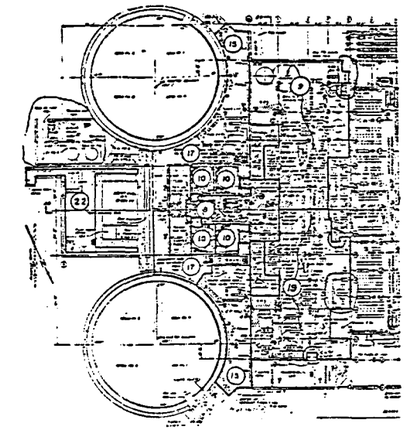


EL 669.0

This drawing is of the Sequoyah Nuclear Plant. To obtain the proper elevation and direction for Watts Bar, add 23.0 ft. to all elevations and rotate "assumed north" 90. degrees clockwise.

SEQUOYAH NUCLEAR PLANT
AND
WATTS BAR NUCLEAR PLANT

HELB NODE DEFINITION

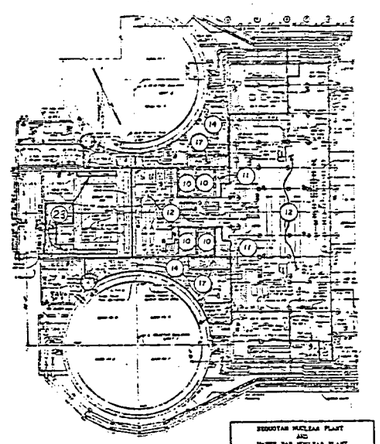


EL 690.0

This drawing is of the Sequoyah Nuclear Plant. To obtain the proper elevation and direction for Watts Bar, add 23.0 ft. to all elevations and rotate "assumed north" 90. degrees clockwise.

SEQUOYAH NUCLEAR PLANT
AND
WATTS BAR NUCLEAR PLANT

HELB NODE DEFINITION

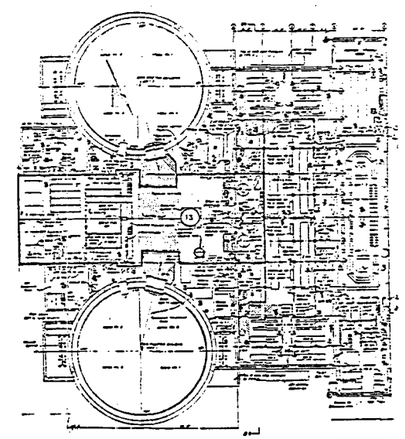


EL 714.0

This drawing is of the Sequoyah Nuclear Plant. To obtain the proper elevation and direction for Watts Bar, add 23.0 ft. to all elevations and rotate "assumed north" 90. degrees clockwise.

SEQUOYAH NUCLEAR PLANT
AND
WATTS BAR NUCLEAR PLANT

HELB NODE DEFINITION

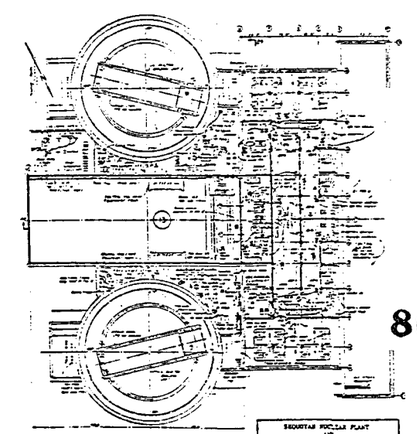


EL 734.0

This drawing is of the Sequoyah Nuclear Plant. To obtain the proper elevation and direction for Watts Bar, add 23.0 ft. to all elevations and rotate "assumed north" 90. degrees clockwise.

SEQUOYAH NUCLEAR PLANT
AND
WATTS BAR NUCLEAR PLANT

HELB NODE DEFINITION



EL 749.0

This drawing is of the Sequoyah Nuclear Plant. To obtain the proper elevation and direction for Watts Bar, add 23.0 ft. to all elevations and rotate "assumed north" 90. degrees clockwise.

SEQUOYAH NUCLEAR PLANT
AND
WATTS BAR NUCLEAR PLANT

HELB NODE DEFINITION

8610090051-87

TI APERTURE CARD

Also Available On Aperture Card

2	6178.A						
THIS SHEET REPLACED BY SHEET 47E235-00B.							
1	14542						
ADDED NODES 22 AND 23							
REV	ECN NO	DATE					

DRAWN
DESIGN
LAYOUT
SUPV

SCALE: EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB NODE FIGURES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED | RECOMMENDED | APPROVED

KNOXVILLE | 8 24 87 | 85 | M | 47E235-84 | R2

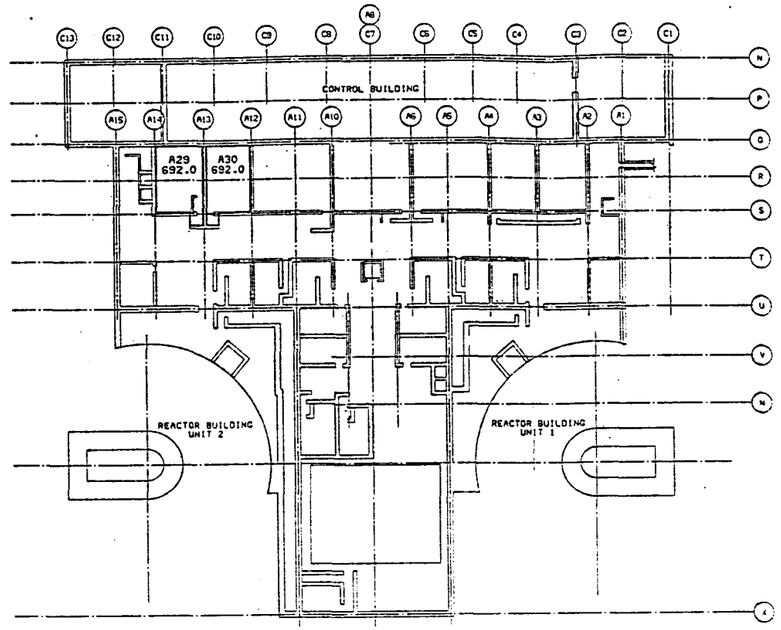
RECORD DRAWING AS CONSTRUCTED

FURTHER REVIEWED
GES
CES
MES
MEA
MEB

ECN - 3606

INSPECTED AND APPROVED FOR ISSUE

PROJ
DATE



PLAN - EL 685.0 & 692.0

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:

   1. NORMAL
   2. ABNORMAL
   3. LOCA/MELB INSIDE PRIMARY CONTAINMENT (WORST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. MELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION

2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT MSM IS APPROXIMATELY 14.4 PSIA.

   ATM(+) -INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) -INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -6.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE EGTS, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.5 INCHES OF WATER.

4. THE NODE(S) LISTED DEFINE THE PRESSURE-VS-TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE SAME ENTRIES. COMBINATIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE (INA) IS FOR A LOCA. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE WEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:

   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

13. THESE SPACES ARE AFFECTED BY BREAKS IN THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THE COMPANION DRAWINGS REFERENCED CONTAIN TEMPERATURE AND PRESSURE VS TIME PROFILES FOR ALL THE WORST CASE BREAK SCENARIOS INVOLVING THESE SYSTEMS. PROFILE TITLES EXPLAIN WHICH HIGH ENERGY SYSTEM EFFECT IS BEING DEPICTED. THE VOLUME NUMBER CORRESPONDS TO AREAS OR PORTIONS OF THE AREAS HIGHLIGHTED ON THE KEY DRAW. EACH TEMPERATURE AND PRESSURE CURVE SHOULD BE ASSUMED TO DECREASE LINEARLY TO THE NORMAL MAXIMUM VALUE GIVEN IN THE ENVIRONMENTAL TABLE AT THE END OF 24 HOURS IF IT HAS NOT REACHED THAT VALUE WITHIN THE TIME SCALE OF THE FIGURE. THE SAME MAXIMUM VS TIME CURVE APPLIES IN EACH CASE FOR QUALIFICATION PURPOSES. THE HELB PROFILES REPRESENTING THE EVENTS FOR WHICH THE EQUIPMENT IN QUESTION IS REQUIRED TO FUNCTION SHOULD BE USED.

16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29. FOR DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS SEE WB-DC-40-29. FLOODED EQUIPMENT REQUIRED TO MAINTAIN THE SAFE SHUTDOWN FUNCTIONS (NOTE 13) MUST BE SUITABLE TO MAINTAIN THE INTEGRITY OF THE PLANT DURING AND AFTER SEISMIC EVENTS (EQUIPMENT SUBMERGED). LOCATED ABOVE THE MAXIMUM FLOOD LEVEL OR OTHERWISE PROTECTED.

29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

39. THE HELB'S DESCRIBED IN NOTE 13 WILL RESULT IN THE FLOOD LEVELS SPECIFIED IN TABLE 1.

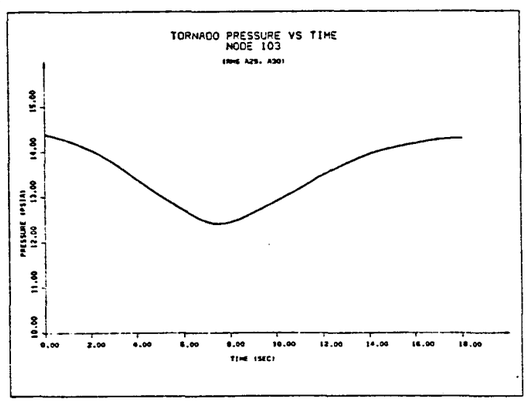
BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING EL 692.0 BORIC ACID EVAP PACKAGE ROOM A RM NO. A30 BORIC ACID EVAP PACKAGE ROOM B RM NO. A29	1 (AVG, MAX, MIN)	87 111 87	44 83 25	ATM(-) ATM(-) ATM(-)	TABLE 2 NA	NA NA NA	B	NOTE 16
	2 (MAX, MIN)	117 97 } NOTE 9	70 8 } NOTE 10	ATM(-) ATM(-)	NA NA	NA NA		
	3	NA	NA	NA	NA	$\leq 1 \times 10^{4}$		
	4	NOTE 13	NOTE 13, FIGURE 2	NOTE 13	NA	NA		NOTE 39, TABLE 1
	5	NA	NA	NOTE 4, NODE 103	NA	NA		

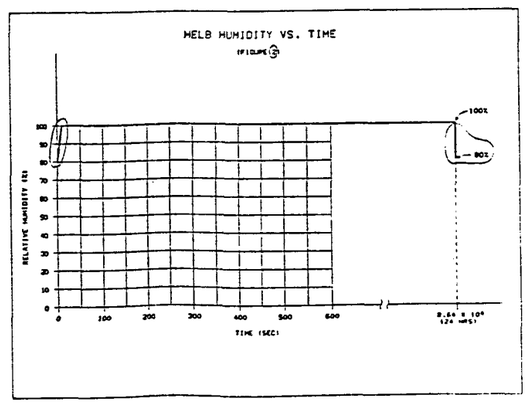
TABLE 1

ROOM NO.	HELB			
	RHR	CVCS	AFW	AB
A29,A30	2"	1"	1"	2"

TABLE 2

ROOM NO.	40 YEAR DOSE (RADS)
A29	1.7×10^{6}
A30	2.0×10^{6}





REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB 82-0726-2351).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-9211(SB-83-1213-2141).

8610090051-88

TI APERTURE CARD

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COMPANION DRAWINGS: 47E235-86

ECN-3626

ISSUED BY: J.C.STANOIFER

REV	ECN/FCN	DATE	DSCN	DRWN	CHKD	RVWD	APPD	ISSD
1	4179,	9-9-92	MK	JAC	DLR	JCS		

REVISED NOTES 1, 11, 12, 40 YEAR DOSE, FIGURE 2, AND REF 2. ADDED TABLES 1 AND 2. AND NOTE 39. RENUMBERED FIGURE 6 AS FIGURE 2.

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 692.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

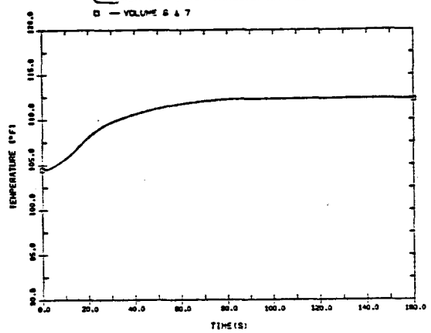
0

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN R.A.DOTSON	CHECKED H.C.CARMON	1	2	J.A.RAWLSON
DESIGNED R.R.SULEFRIDGE	SUBMITTED G.C.GERMAN	3	4	

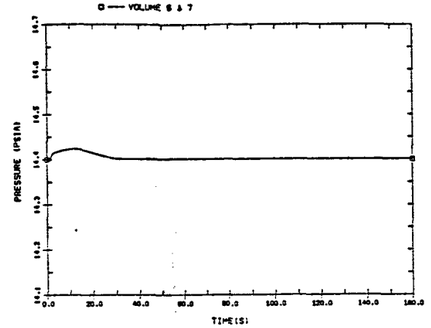
KNOXVILLE — DATE 8-26-83 — 85 M 47E235-85 — R1

MBN070

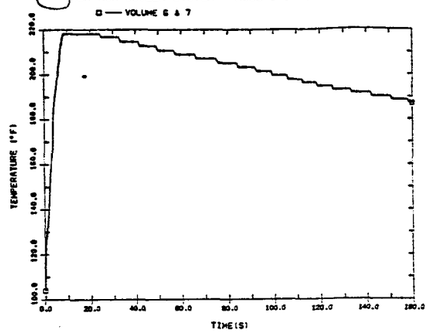
WBN AFW PUMP TURBINE RM NOS



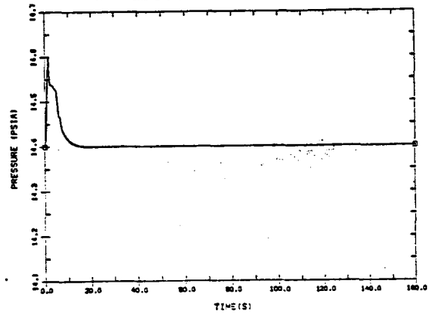
WBN AFW PUMP TURBINE RM NOS



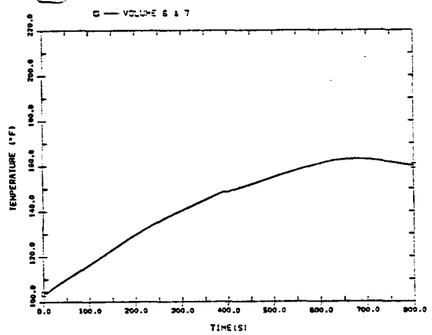
WBN AUX BOILER SYSTEM - NODE 6 OR 7 - BA/EVAP PACK RM



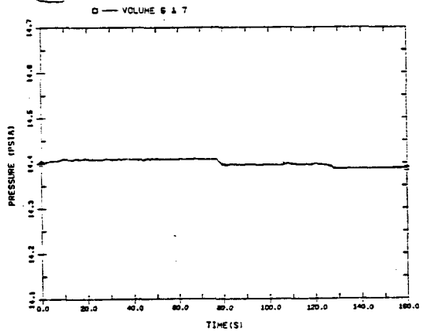
WBN AUX BOILER SYSTEM - NODE 6 OR 7 - BA/EVAP PACK RM



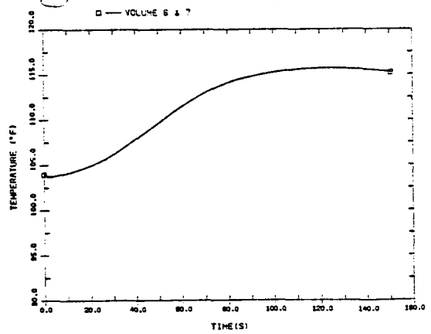
WBN RHR - NODE 2 - RHR PUMP ROOM



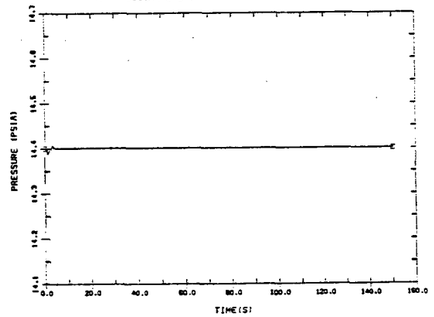
WBN RHR - NODE 2 - RHR PUMP ROOM



WBN CVCS - NODE 17 - PIPE CHASE



WBN CVCS - NODE 17 - PIPE CHASE



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0	ECN 5474		

SCALE NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
HELB PROFILES

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

Q

SUBMITTED — RECOMMENDED — APPROVED

NO ISSUE FOR ECN-5474
INSPECTED AND APPROVED FOR ISSUE

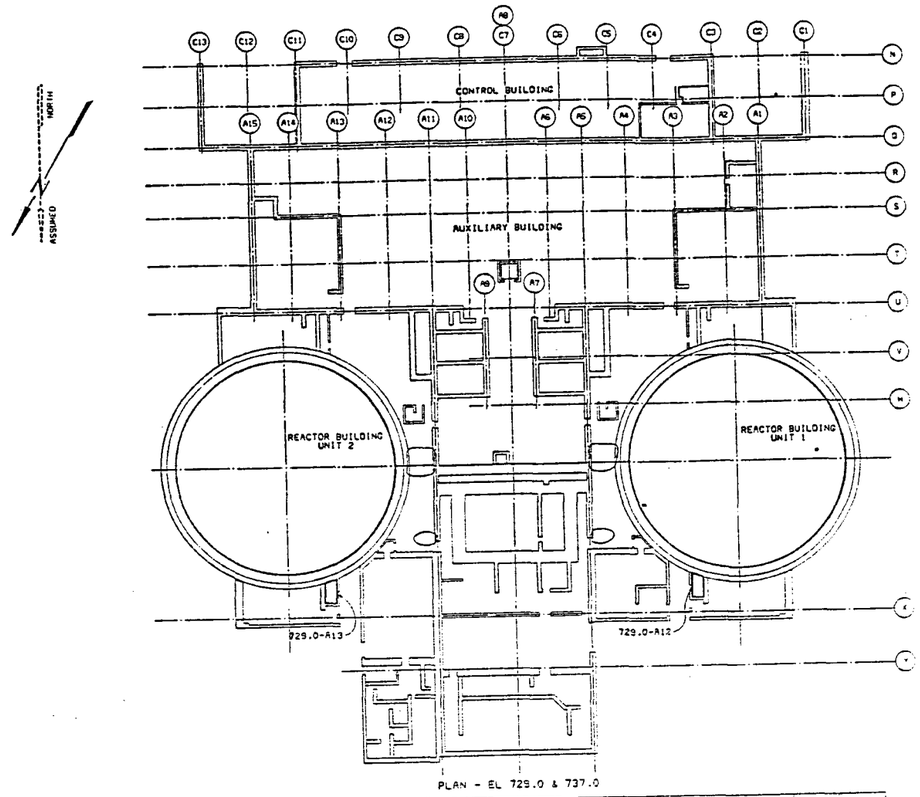
KNOXVILLE 2-24-86 | BS | M | 47E235-86 | R1

RECORD DRAWING AS CONSTRUCTED

COMPANION DRAWING: 47E235-[illegible]

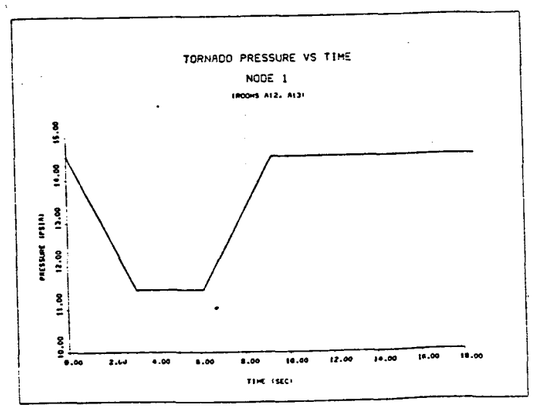
WBN071

47E235-86 | M | BS



PLAN - EL 729.0 & 737.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)		TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE E)	PRESSURE (PSIA) (NOTES B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS)(NOTES A & C)	AREA TYPE	FLOOD(NO
NORTHSTEAM VALVE INSTRUMENT RMS A12,A13 EL 729.0	1	AVG MAX MIN	104 110 70	55 80 30	ATM ATM ATM	1.8×10^3	NA NA NA	NOTE M	NOTE L
	2	MAX MIN	120 40 / NOTE D	90 10	ATM ATM	NA NA	$< 1 \times 10^4$ NA		
	3		NA	NA	NODE 1	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MRM IS APPROXIMATELY 14.6 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL. WHILE ATM-- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY, GREATER THAN DESIGN LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 5% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

X. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

X. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR.

M. THIS AREA HAS NO ENVIRONMENTAL CONTROL.

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WB-81-1119-2361).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-42) (ESB-831213-2141).

8610090051-90

TI APERTURE CARD

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NO ISSUE FOR ECN-6178

REV NO.	ECN/FCR	DATE	DSGN	DRWN	CHKD	SVWD	APPD	ISSD

SCALE: NONE — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 729.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

Q

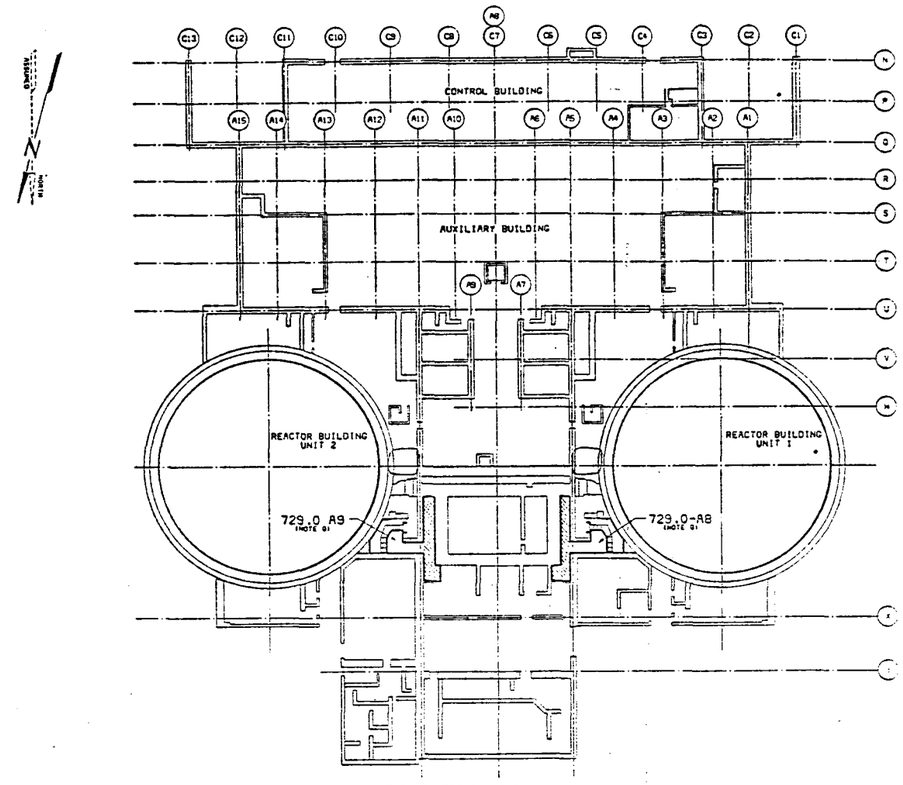
DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN	CHECKED	1	2	
DESIGNED	REVIEWED	3	4	

KNOXVILLE | DATE | 45 | M | 47E235-87 | RO

ISSUED BY:

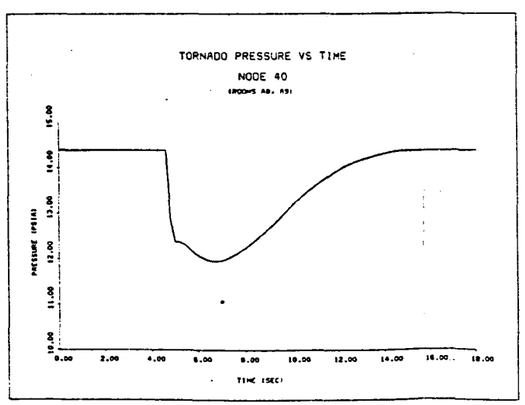
WBN076

47E235-87



PLAN EL 729.0 & 737.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE A)		TEMPERATURE (°F)	RELATIVE HUMIDITY (%) (NOTE D)	PRESSURE (PSIA) (NOTE B & H)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE C)	INTEGRATED ACCIDENT DOSE (RADS) (NOTES A & C)	AREA TYPE (NOTE J)	FLOODING
AUXILIARY BUILDING PASS ROOMS (SAMPLE AREA) A8,A9 EL 729.0	1	AVG MAX MIN	80 104 60	55 80 30	ATM ATM ATM	NA 1.8×10^{5} NA	NA NA NA	B	NOTE L
	2	MAX MIN	110 } NOTE D 40 }	30 10	ATM ATM	NA NA	$< 1 \times 10^{4}$ NA		
	3		NA	NA	NODE 40	NA	NA		



X'D OUT NOTES DO NOT APPLY TO THIS SHEET

NOTES:

A. OPERATIONAL CONDITION DEFINITIONS

1. NORMAL
2. ABNORMAL (THIS ALSO INCLUDES ACCIDENT RADIATION LEVELS FOR LOCA CONDITIONS.)
3. TORNADO

B. ATM INDICATES A PRESSURE EQUAL TO ATMOSPHERIC PRESSURE WILL BE PRESENT. NORMAL ATMOSPHERIC PRESSURE AT MBN IS APPROXIMATELY 14.4 PSIA. ATM+ INDICATES A PRESSURE SLIGHTLY ABOVE NORMAL, WHILE ATM- INDICATES A PRESSURE SLIGHTLY BELOW.

C. ALL 40 YEAR INTEGRATED RADIATION DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSES GIVEN ARE FOR A LOCA CONDITION. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES.

D. THESE ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS (TEMPORARY, GREATER THAN DESIGN), HEAT LOAD OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO 8 HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE. THESE TEMPERATURES INCLUDE THE EFFECTS OF A LOCA. (I.E. GREATER THAN NORMAL HEAT LOADS).

E. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

X. THESE SPACES WILL REACH 120°F ONCE EACH MONTH FOR 1 HOUR PLUS ONCE EVERY 18 MONTHS FOR 24 HOURS (CONTINUOUS) DURING PERIODIC TESTING OF THE DIESELS.

G. THE MAXIMUM AND MINIMUM ABNORMAL RELATIVE HUMIDITIES GIVEN WILL OCCUR LESS THAN 1% OF THE TIME WITH A DURATION OF 8 HRS FOR EACH EXCURSION. THE MAXIMUM TEMPERATURE ASSOCIATED WITH 90% RH IS 80°F. FOR TEMPERATURES ABOVE 80°F, THE SPECIFIC HUMIDITY SHALL BE ASSUMED TO BE CONSTANT AT 140 GRAINS OF MOISTURE PER POUND OF DRY AIR.

H. THE NODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

X. THIS AREA IS ABOVE THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA MB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS".

J. AREAS LISTED ARE DIVIDED INTO TWO CATEGORIES DEFINED AS FOLLOWS:

A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

X. THIS ABNORMAL MINIMUM TEMPERATURE WILL OCCUR FOR A DURATION OF UP TO 1 HOUR AT WHICH TIME THE SPACE TEMPERATURE WILL INCREASE TO 20°F FOR THE NEXT 8 HOURS. TEMPERATURES WILL RETURN TO THE NORMAL MINIMUM OF 40°F THEREAFTER. THESE CONDITIONS WILL EXIST LESS THAN 1% OF THE PLANT LIFE.

L. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA MB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

X. THESE SPACES ARE OPEN TO THE OUTSIDE ATMOSPHERE AND AS A RESULT ARE SUBJECT TO EXTREME ENVIRONMENTAL CONDITIONS 100% RELATIVE HUMIDITY WILL EXIST UP TO 5% OF THE YEAR.

M. THIS AREA HAS NO ENVIRONMENTAL CONTROL.

O. THE SHADED PORTION OF THE KEY PLAN BELOW EL 737.0 (UNIT 1 SIDE), EL 729.0 (UNIT 2 SIDE) IS ENVIRONMENTALLY PART OF THE PASS SAMPLE AREA. THE SHADED PORTION ABOVE EL 737.0 (UNIT 1 SIDE), EL 736.0 (UNIT 2 SIDE) IS PART OF THE REACTOR STORAGE AREA (729 Q-M) AND IS SHOWN ON DRAWING 47E235-[illegible]

REFERENCE:

1. SUMMARY OF MILD ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (MB2-81-1119-2251).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (MB-DC-40-42) (B58-831213-2141).

8610090051-91

TI APERTURE CARD

Also Available On Aperture Card

RO ISSUE FOR ECN 6178

REV	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD

SCALE: NONE — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - MILD
EL 729.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

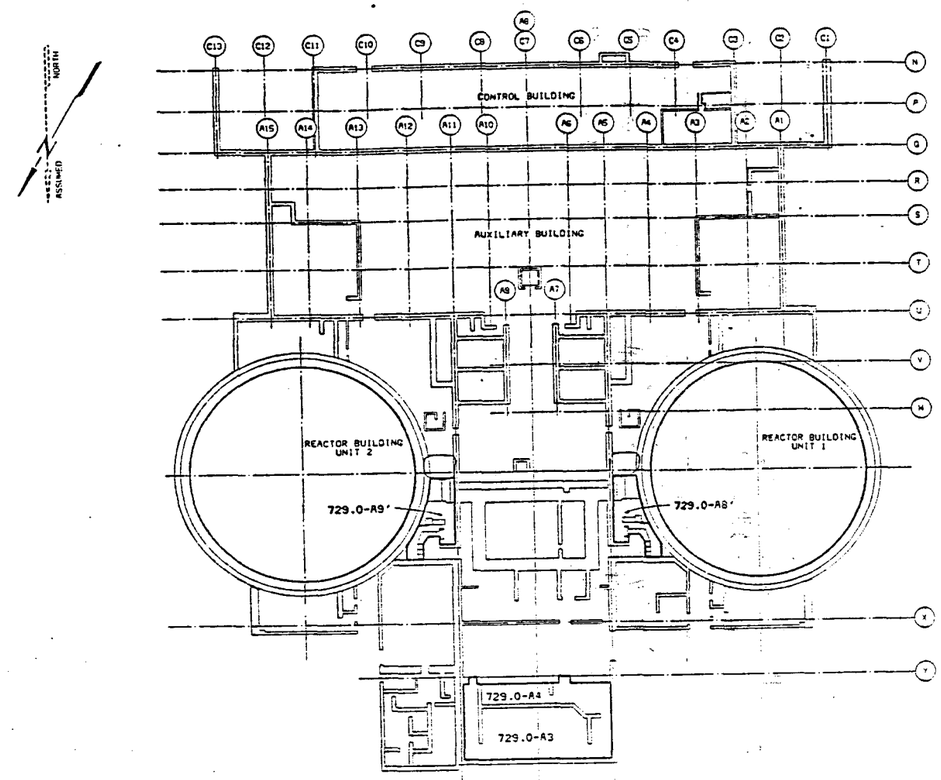
Q

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DR/Date	CHECKED	1	2	
DESIGNED	REVIEWED	3	4	

KNOXVILLE | DATE 9 9 86 | 45 | M | 47E235-88 | RO

ISSUED BY:

MBN077



PLAN EL 729.0 & 737.0

BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING PAST ROOMS (BEHIND SAMPLE PANELS) A9',A9' WASTE PACKAGING AREA A3,A4 EL 729.0	1	NOC 80 MAX 104 MIN 60	55 80 30	ATM ATM ATM	NA TABLE 2 NA	NA NA NA	B	NOTE 16
	2	MAX 110 MIN 50	90 10 NOTE 10	ATM ATM	NA NA	NA NA		
	3	NA	NA	NA	NA	TABLE 2		NA
	4	NOTE 42	NOTE 42	NOTE 42	NA	NA		
	5	NA	NA	NOTE 4 NODE 40, 45	NA	NA		

TABLE 2

ROOM NO.	40 YEAR DOSE (RADS)	ACCIDENT DOSE (RADS)
A8',A9'	3.5×10^{5}	5×10^{5}
A3,A4	2.5×10^{5}	$<1\times10^{4}$

NOTES:

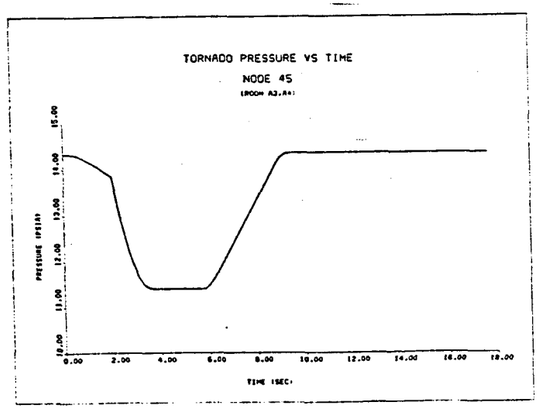
1. OPERATIONAL CONDITION DEFINITIONS:
   1. NORMAL
   2. ABNORMAL
   3. LOCA/MSLB (INSIDE PRIMARY CONTAINMENT (NOPST CASE SMALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. MSLB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION
2. ATM -INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT SQN IS APPROXIMATELY 14.6 PSIA.

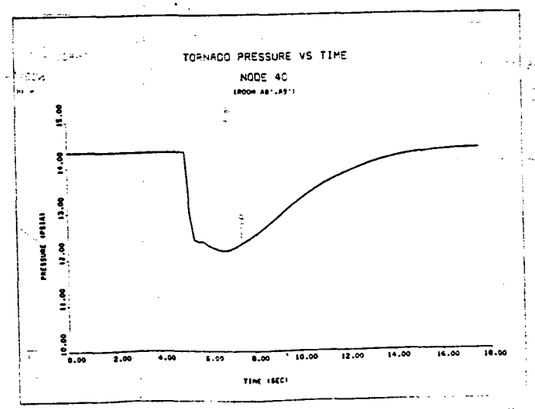
   ATM^{+} INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM^{-} INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NORMAL PRESSURE OF -5.0 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE ESF'S, ANNULUS PRESSURE WILL BE MAINTAINED AT -0.8 INCHES OF WATER.
4. THE NODE(S) LISTED DEFINE THE PRESSURE-VS-TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).
9. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.
11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE GIVEN IS FOR A LOCA. TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE WEB RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.
12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:
    A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.
    C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.
16. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-28 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THIS EVENT MUST DO FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.
29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.
42. THESE SPACES ARE NOT AFFECTED BY BREAKS IN ANY OF THE FOLLOWING HIGH ENERGY SYSTEMS: AUXILIARY FEEDWATER (AFW) STEAM SUPPLY, AUXILIARY BOILER SYSTEM, RESIDUAL HEAT REMOVAL (RHR) SYSTEM, AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE.

REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (WEB 82-0726-2[illegible]).
2. SEQUOYAH NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (SQN-DC-V-21.0)(ESB-83-12[illegible]).





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TI APERTURE CARD

Also Available On Aperture Card

RO ISSUE FOR ECN-6178

ISSUED BY:

REV	ECN/FCR	DATE	DSGN	DRWN	CHKD	[illegible]	ISSD

SCALE: NONE — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

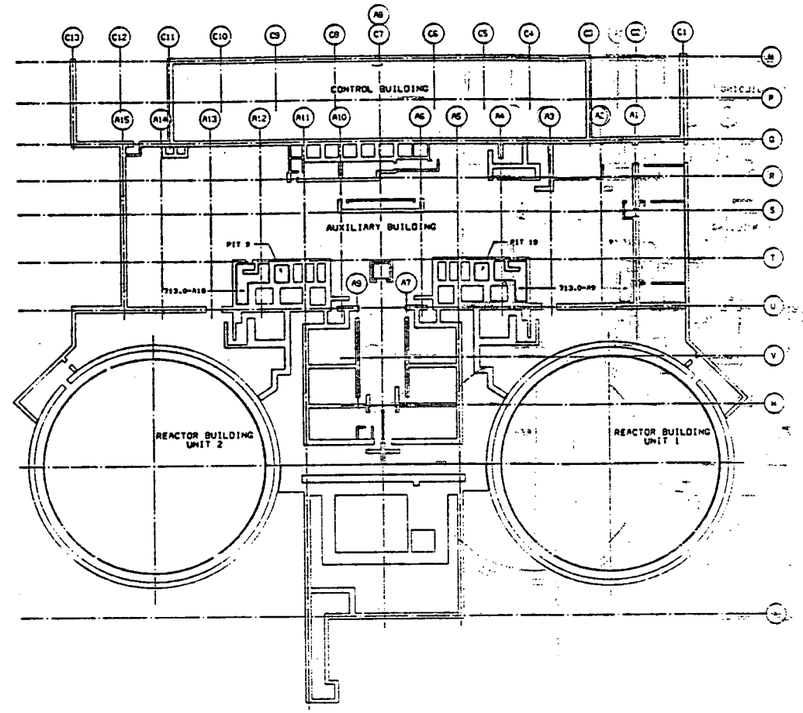
ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 729.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING — Q

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN	CHECKED	1	2	
DESIGNED	REVIEWED, TVA	3	4	

KNOXVILLE | DATE 7-9-86 | 45 | N | 47E235-89 | RO

MBN075



PLAN - EL 706.0 & 713.0

NOTES:

1. OPERATIONAL CONDITION DEFINITIONS:

   1. NORMAL
   2. ABNORMAL
   3. LOCA(HELB INSIDE PRIMARY CONTAINMENT (WORST CASE SHALL BREAK FOR TEMPERATURE - LARGE BREAK FOR PRESSURE)
   4. HELB OUTSIDE PRIMARY CONTAINMENT
   5. TORNADO (SUDDEN PRESSURE DROP OF 3 PSI)
   6. INADVERTENT CONTAINMENT SPRAY INITIATION

2. ATM =INDICATES ATMOSPHERIC PRESSURE EXISTS. NORMAL ATMOSPHERIC PRESSURE AT NOM IS APPROXIMATELY 14.4 PSIA.

   ATM(+) =INDICATES A POSITIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE.

   ATM(-) =INDICATES A NEGATIVE PRESSURE WITH RESPECT TO THE ATMOSPHERE. THE ANNULUS IS MAINTAINED AT A NOMINAL PRESSURE OF -0.5 INCHES OF WATER DURING ALL NORMAL AND ABNORMAL CONDITIONS. DURING AN ACCIDENT CONDITION (OPERATIONAL CONDITION 3) AND DURING PERIODS OF TESTING THE EGTS, ANNULUS PRESSURE WILL BE MAINTAINED AT +0.5 INCHES OF WATER.

4. THE MODE(S) LISTED DEFINE THE PRESSURE VS TIME RELATIONSHIP DURING A DESIGN BASIS TORNADO FOR THE SUBJECT ROOM(S).

8. THESE MAXIMUM AND MINIMUM ABNORMAL TEMPERATURES COULD OCCUR AS A RESULT OF OUTSIDE TEMPERATURE EXCURSIONS, TEMPORARY GREATER THAN DESIGN HEAT LOADS, OR DEGRADED ENVIRONMENTAL CONTROL SYSTEM OPERATION. THIS CONDITION COULD EXIST FOR UP TO EIGHT HOURS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

10. THESE MAXIMUM AND MINIMUM ABNORMAL HUMIDITIES COULD EXIST FOR UP TO 8 HRS PER EXCURSION AND WILL OCCUR LESS THAN 1% OF THE PLANT LIFE.

11. ALL 40 YEAR INTEGRATED DOSES SHOWN ARE UPPER LIMITS FOR THE SUMMATION OF THE GAMMA AND BETA CONTRIBUTIONS UNLESS OTHERWISE INDICATED. THE INTEGRATED ACCIDENT DOSE EITHER IS FOR A LOCAL TOTAL RADIATION DOSE IS OBTAINED BY ADDING THE 40-YR INTEGRATED AND INTEGRATED ACCIDENT DOSES. THE NER RADIATION PROTECTION SECTION MUST BE CONSULTED FOR A LOCATION SPECIFIC ANALYSIS PRIOR TO USING ANY VALUES LOWER THAN THOSE SHOWN.

12. AREAS LISTED ARE DIVIDED INTO THREE CATEGORIES DEFINED AS FOLLOWS:

   A. SPACES THAT ARE SERVED BY SAFETY-RELATED REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   B. SPACES NOT MAINTAINED BY REDUNDANT ENVIRONMENTAL CONTROL SYSTEMS BACKED BY ONSITE EMERGENCY ELECTRICAL POWER.

   C. SPACES SERVED BY NON SAFETY-RELATED ENVIRONMENTAL CONTROL SYSTEMS DURING NORMAL CONDITIONS AND REDUNDANT SAFETY-RELATED SYSTEMS DURING ACCIDENT CONDITIONS.

18. THIS AREA IS BELOW THE MAXIMUM POSSIBLE FLOOD LEVEL SPECIFIED IN DESIGN CRITERIA WB-DC-40-29 "DESIGN CRITERIA FOR FLOOD PROTECTION PROVISIONS" AND WILL BE FLOODED. ALL EQUIPMENT REQUIRED TO MAINTAIN PLANT SAFETY DURING THE FLOOD AND FOR 100 DAYS AFTER THE BEGINNING OF THE FLOOD SHOULD BE EITHER DESIGNED TO OPERATE SUBMERGED, LOCATED ABOVE THE MAXIMUM FLOOD LEVEL, OR OTHERWISE PROTECTED.

29. NA INDICATES NOT APPLICABLE FOR THIS OPERATIONAL CONDITION.

43. THE TEMPERATURE, PRESSURE AND RELATIVE HUMIDITY IN THESE SPACES IS UNAFFECTED BY FAILURE OF THE FOLLOWING NON-SAFETY SYSTEMS: AUXILIARY AIR (EGTS); WATER (AFW) STEAM SUPPLY (AFW); BOILER SYSTEM; CHILLED WATER REMOVAL (AFW) SYSTEM; AND CHEMICAL AND VOLUME CONTROL SYSTEM (CVCS) LETDOWN LINE. THESE SPACES WILL EXPERIENCE FLOOD LEVELS SPECIFIED IN TABLE 1 DUE TO WATER LEAKAGE UNDER DOORS FROM THE ADJACENT GENERAL FLOOD AREA.

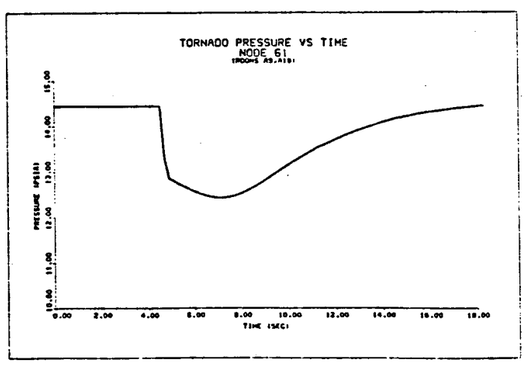
BUILDING LOCATION AND ROOM NUMBER	OPERATIONAL CONDITION (NOTE 1)	TEMPERATURE (°F)	RELATIVE HUMIDITY (%)	PRESSURE (PSIA) (NOTE 2)	TOTAL 40 YEAR INTEGRATED DOSE (RADS) (NOTE 11)	INTEGRATED ACCIDENT DOSE (RADS) (NOTE 11)	AREA TYPE (NOTE 12)	FLOODING
AUXILIARY BUILDING PITS 9 & 19 VALVE GALLERIES A9,A18 EL 713.0	1 AVG MAX MIN	80 104 60	55 90 30	ATM(-) ATM(-) ATM(-)	NA TABLE 2 NA	NA NA NA	B	NOTE 18
	2 MAX MIN	110 50 } NOTE 8	90 10 } NOTE 10	ATM(-) ATM(-)	NA NA	NA NA		
	3	NA	NA	NA	NA	TABLE 2		
	4	NOTE 43	NOTE 43	NOTE 43	NA	NA		NOTE 43
	5	NA	NA	NOTE 6 PITS 9 & 19 NA ROOMS A9 & A18 NODE 61	NA	NA		

TABLE 1

ROOM NO.	HELB			
	SHP	IGCCS	AFW	AB
A9,A18 PITS 9 & 19	1*	1*	2NA 3	1*

TABLE 2

ROOM NO.	40 YEAR DOSE (RADS)	ACCIDENT DOSE (RADS)
A9,A18	2.1×10^{6}	$<1.3 \times 10^{6}$
PITS 9 & 19	2.2×10^{6}	1.3×10^{6}



REFERENCE:

1. SUMMARY OF HARSH ENVIRONMENTAL CONDITIONS FOR SEQUOYAH AND WATTS BAR NUCLEAR PLANTS (NEB 82-0728-2251).
2. WATTS BAR NUCLEAR PLANT GENERAL DESIGN CRITERIA FOR ENVIRONMENTAL DESIGN (WB-DC-40-421 (ESB-831213-2141).

8610090051-93

TI APERTURE CARD

Also Available On Aperture Card

REV NO.	ECN/FCR	DATE	DSGN	DRWN	CHKD	RVWD	APPD	ISSD

SCALE: NTS — EXCEPT AS NOTED

AUXILIARY BUILDING
UNITS 1 & 2

ENVIRONMENTAL DATA
ENVIRONMENT - HARSH
EL 713.0

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
OFFICE OF ENGINEERING

0

DESIGN		DISCIPLINE INTERFACE		ENGINEERING APPROVAL
DRAWN	CHECKED	1	2	
DESIGNED	REVIEWED (1)	3	4	

KNOXVILLE — DATE 9.9.86 — BS — M — 47E235-90 — RO

RO ISSUE FOR ECN-6174

ISSUED BY:

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SIZE

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