TOLEDO EDISON

RICHARD P. CROUSE
Vice President
Nuclear
(419) 259-5221

Docket No. 50-346

License No. NPF-3

Serial No. 936

April 29, 1983

Director of Nuclear Reactor Regulation
Attention: Mr. John F. Stolz
Operating Reactor Branch No. 4
Division of Operating Reactors
United States Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Stolz:

This letter is in response to your letter dated March 25, 1983 (Log No. 1256) concerning Saftey-Related Electrical Equipment for the Davis-Besse Nuclear Power Station Unit No. 1.

A review of all existing Justification for Continued Operation (JCO) statements has been performed and JCOs exist for all equipment which may not be qualified. All JCOs are reaffirmed. The previous response submitted on March 10, 1983 has been reviewed and there are no changes or proprietary information.

Regarding items in Technical Evaluation Report (TER) Category IV, only TER item 46 is in this category. These components are felt to be qualified and all applicable documentation associated with these components is enclosed as Attachment I. Item 84 is incorrectly labeled in as Category IV, it is in reality Category IIIB.

Very truly yours,

RPC:LCS:TKR

bt e/3

Attachment

cc:
DB-1 NRC Resident Inspector

A045

TABLE 3 - TER CATEGORY IV

TER Number	SCEW Number	Replacement	Analysis/ Test	Modification	Justification	Discussion Requested
46	218H-019	N	--	--	Note 1	--
	218H-020	N	--	--		--
	218H-021	N	--	--		--
	219H-022	N	--	--		--

Note 1: This item is felt to be qualified. All qualification references applicable to this item are attached.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 46

EQUIPMENT ITEM NO. 46
RTD LOCATED IN THE CONTAINMENT, ELEV. 5'0"
ROSEMOUNT MODEL 177HW2
REQUIRED OPERATING TIME: 1 HOUR
TER CHECKSHEET NO. 46
LICENSEE REFERENCE(S): 3789, 60
FUNCTION (PLANT ID): SENSES TEMPERATURE(TERC3B4)
SERVICE: R.C. LOOP 2 HOT LEG NARROW RANGE TEMP. FOR RPS CHANNEL 3
LICENSEE SUBMITTAL: SCEW(S): 218H-022
FUNCTION (PLANT ID): SENSES TEMPERATURE(TERC3B2)
SERVICE: R.C. LOOP 1 HOT LEG NARROW RANGE TEMP. FOR RPS CHANNEL 1
LICENSEE SUBMITTAL: SCEW(S): 218H-021, 021A, B
FUNCTION (PLANT ID): SENSES TEMPERATURE(TERC3A4)
SERVICE: R.C. LOOP 2 HOT LEG NARROW RANGE TEMP. FOR RPS CHANNEL 2
LICENSEE SUBMITTAL: SCEW(S): 218H-020, 020A, B
FUNCTION (PLANT ID): SENSES TEMPERATURE(TERC3A2)
SERVICE: R.C. LOOP 2 HOT LEG NARROW RANGE TEMP. FOR RPS CHANNEL 4
LICENSEE SUBMITTAL: SCEW(S): 218H-019, 019A, B

DESIGNATION FOR DEFICIENCY IDENTIFIED BY THE NRC SER - CIRCLED ITEM(S) ONLY:
(See Section 3 of this TER for Legend)

R, T, (QT) RT, P, H, (CS) (A) S, (R), M, I, QM, RPN, EXN, SEN, QI, RPS, None,

Not stated, Not applicable

LISTING OF APPLICABLE CHECKSHEETS:

Contents	Checksheet Page No.
Equipment Item	1a
Summary of Licensee Responses to the NRC SER	1b
Equipment Environmental Qualification Summary Forms	2
Licensee Response to NRC SER	3a, ~~3b, 3c, 3d~~
System Consideration Review	~~4a, 4b, 4c, 4d, 4e, 4f~~
Equipment Environmental Qualification Review	~~5a, 5b, 5c, 5d, 5e,~~ 5f, ~~5g, 5h, 5i, 5j~~
Installed TMI Lessons Learned Implementation Equipment Summary	~~6a, 6b~~
Maintenance and Replacement Schedule Summary	~~7a, 7b, 7c~~

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 46

SUMMARY OF LICENSEE RESPONSES TO THE NRC SER - ONLY CHECKED ITEMS ARE APPLICABLE:

X Tne Licensee (has/~~has not~~) provided a response to the SER concerns.

___ The Licensee (has/has not) specifically stated that the equipment is qualified and/or will function when exposed to the applicable DBE environmental service conditions.

X The Licensee has presented information which shows there are no outstanding qualification deficiencies.

___ The Licensee (has/has not) proposed a corrective action for this equipment item whose qualification has not been fully established.

___ Justification for interim operation (has/has not) been provided by the Licensee for this equipment item.

___ Corrective action specified by the Licensee:

___ Equipment replacement with qualified equipment
___ Equipment modification
___ Equipment relocation above submergence level
___ Relocate or shield equipment from radiation source
___ Verify qualification by additional (testing/analysis)
___ Equipment relocation to a mild environment
___ Qualification testing of equipment in progress
___ Other (_____)

___ The Licensee has provided other information for this equipment item that can be construed as a basis for justification for interim operation.

___ The Licensee (nas/has not) provided a schedule for the proposed corrective action. (Schedule for accomplishing the corrective action _____.)

___ The Licensee states that the equipment item does not require qualification and/or should be exempted from environmental qualification.

DESIGNATION OF RESULTANT NRC QUALIFICATION EVALUATION CATEGORY BASED ON REVIEW - CIRCLED ITEM ONLY: (See Section 3 of this TER for Legend)

I.a Qualified
I.b Modification
II.a Qualification Not Established
II.b Not Qualified
II.c Qualified Life Deficiency
III.a Exempt
III.b Not in Scope
(IV) Documentation Not Available

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 46

EQUIPMENT ENVIRONMENTAL QUALIFICATION SUMMARY FORM

NRC REQUIREMENTS	DESIGNATION: X = DEFICIENCY
Documented Evidence of Qualification Adequate	___
Adequate Similarity Between Equipment and Test Specimen Established	___
Aging Degradation Evaluated Adequately	___
Qualified Life or Replacement Schedule Established (If Required)	___
Program Established to Identify Aging Degradation	___
Criteria Regarding Aging Simulation Satisfied (If Required)	___
Criteria Regarding Temperature/Pressure Exposure:	
o Peak Temperature Adequate	___
o Peak Pressure Adequate	___
o Duration Adequate	___
o Required Profile Enveloped Adequately	___
o Steam Exposure (If Required) Adequate	___
Criteria Regarding Spray Satisfied	___
Criteria Regarding Submergence Satisfied	___
Criteria Regarding Radiation Satisfied	___
Criteria Regarding Test Sequence Satisfied	___
Criteria Regarding Test Failures or Severe Anomalies (If Any) Satisfied	___
Criteria Regarding Functional Testing Satisfied	___
Criteria Regarding Instrument Accuracy Satisfied	___
Test Duration Margin (1 hour + Function Time) Satisfied	___
Criteria Regarding Margins Satisfied (NUREG-0588, Cat. I)	___

NRC QUALIFICATION CATEGORY		DESIGNATION: X = CATEGORY
I.a	Equipment Qualified	___
I.b	Equipment Qualification Pending Modification	___
II.a	Equipment Qualification Not Established	___
II.b	Equipment Not Qualified	___
II.c	Equipment Satisfies All Requirements Except Qualified Life or Replacement Schedule Justified	___
III.a	Equipment Exempt From Qualification	___
III.b	Equipment Not in the Scope of the Qualification Review	___
IV	Documentation Not Made Available	X

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 46

NOTES:

1. The following reference was not available for review:

Babcock & Wilcox Owners Group Environmental Qualification Matrix, Rev. 1, 3/80 (Ref. # AG)
The document was referenced as qualification for temperature, pressure and relative humidity parameters.

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW OF EQUIPMENT ITEM NO. 46

LICENSEE RESPONSE TO NRC SER

One hour operating time is used as a conservative specification for the initiation of the reactor protection system following a loss of coolant accident.

eds nuclear

FILE: 0370-025

RECORD OF CONVERSATION

COPY: J. V. Moran

☒ Telephone ☐ Meeting ☐ Other _____

TO: F. Levandoski FROM: J. E. Thompson DATE July 30, 1980

COMPANY: Babcock & Wilcox PHONE NO.: (804) 384-5111

SUBJECT: TMI-1 Environmental Qualification of Class 1E Electrical Equipment

Summary of Conversation:

Mr. Levandoski stated that the standard test time for the tests, whose results are provided in his letter to L. McBee dated February 11, 1980, subject: Environmental Qualification Sub-committee, is 24 hours.

JET/cek

REF. 3-3

ROSEMOUNT INC. POST OFFICE BOX 35129 / MINNEAPOLIS MINNESOTA 55435 / TEL (612) 541-3323
TWX 810 576 3123 TELEX 29-0123

INVESTIGATION
RADIATION REQUIREMENT
MODEL 177HW

Rosemount Report 87414

BABCOCK & WILCOX
DOCUMENT NUMBER
620-0017-18-21-22

57 0000 00

Prepared by Walter Brett
10 August 1974

INVESTIGATION
RADIATION REQUIREMENT
MODEL 177HW

RMT Report 87414

SUMMARY

Specification requirements for the 177HW sensor are that the unit must be capable of surviving a total radiation doseage of 3.0×10^8 rads. This requirement was evaluated and test results show the design can withstand this amount of exposure without any noticeable effects. In addition, a unit was exposed to 3.8×10^8 rads. This unit also yielded successful results.

BACKGROUND

Prior to this test, the radiation exposure requirement of 3.0×10^8 rads for the 177HW model had not been environmentally tested. There had been some question if this level of exposure was too high, consequently it was decided to subject two sensors to radiation, one at the specification level of 3.0×10^8 rads and the other at a slightly higher level of 3.8×10^8 rads. Performance tests were made prior to and after radiation which would show any damaging effects caused by the radiation exposure. Greater damage or deterioration caused by the longer exposure would be indicated by a larger shift in the results for the sensor having the longer exposure time.

INVESTIGATION

The two 177HW sensors subjected to a radiation testing were S/N 3370 at a level of 3×10^8 rads and S/N 3371 at the maximum level of 3.8×10^8 rads. Evaluations prior to and after the radiation exposure were - calibrations at Ro, 212°F and 600°F, - IR Check at 600°F and room temperature - and time response in water at 175°F flowing at 3 fps. The actual radiation exposure was conducted at Isomedix, Inc., Parsippany, New Jersey and the testing procedure followed was as outlined in a memo from Isomedix. The memo is an attachment to this report. After completion of the radiation testing, the two units were returned to Rosemount for final calibration and testing. These calibration and testing results together with the previous data are given in Table I. The shifts are shown in Table II. All variations or shifts were considered insignificant and were within the following limits:

R_0	.002 ohms
R_{212}	.004 ohms
R_{600}	.024 ohms
Alpha	1 ppm
Time Response	0.6 sec.

The IR readings with 100 VDC applied were all found to be greater than 100 megs when measured at room temperature and greater than 10 megs when measured at 600°F. In addition the sensors were thoroughly inspected for visible indications of damage or deterioration and nothing was found.

These test results show the 177HW design can withstand the radiation requirement of 3.8×10^8 rads.

TABLE I

Calibration, IR and Time Response Data

Calibration & Tests Before Exposure	S/N 3370		S/N 3371	
	Element #1	Element #2	Element #1	Element #2
Ro	99.784Ω	100.470Ω	100.155Ω	100.166Ω
212	138.992Ω	139.947Ω	139.518Ω	139.559Ω
600	219.612Ω	221.088Ω	220.439Ω	220.545Ω
ALPHA	.003929Ω/Ω/°C	.003929Ω/Ω/°C	.003930Ω/Ω/°C	.003933Ω/Ω/°C
IR_{600}	30 Megs	40 Megs	350 Megs	255 Megs
Time Response (Aver 3)	7.2 sec	6.9 sec	8.3 sec	8.0 sec
Exposure	3×10^8 rads		3.8×10^8 rads	
Calibration & Tests After Exposure	Element #1	Element #2	Element #1	Element #2
Ro	99.783Ω	100.470Ω	100.153Ω	100.168Ω
212	138.994Ω	139.948Ω	139.522Ω	139.560Ω
600	219.623Ω	221.112Ω	220.444Ω	220.547Ω
ALPHA	.003930Ω/Ω/°C	.003929Ω/Ω/°C	Ω/Ω/°C	.003933Ω/Ω/°C
IR_{600}	10 Megs	20 Megs	350 Megs	300 Megs
IR_{Room}	700 Megs	700 Megs	200,000 Megs	300,000 Megs
Time Response (Aver 3)	6.6 sec	6.7 sec	8.5 sec	8.1 sec

TABLE II

	Calibration, IR and Time Response Shifts			
	S/N 3370		S/N 3371	
	Element #1	Element #2	Element #1	Element #2
ΔR_o	-.001	.000	-.002	+.002
Δ212	+.002	+.001	+.004	+.002
Δ600	+.011	+.024	+.005	+.002
Δ ALPHA	+ 1 ppm	0	+ 1 ppm	0
Time Response Variation	-.6 sec	-.2 sec	+.2 sec	+.1 sec

NOTE: Both units used Never Seez NS-165 as a "thermal grease" in the silver bushing to thermowell I.D. interface.

ISOMEDIX

July 19, 1974

Mr. Don Mattachuck
Rosemount, Inc.
12001 W. 78th Street
Eden Prairie, Minnesota 95435

Dear Mr. Mattachuck:

The following will summarize the radiation sequence pertinent to the testing of two sensors with connection heads submitted by Rosemount and received by us at Isomedix on June 7, 1974. The irradiation was performed following the sequence in Instructions as outlined in your "Special Instructions".

Irradiation was begun on June 7, 1974 using cobalt-60, at a dose rate of $1x10^6$ rad per hour. A total dose of 300 Mrads was administered to one unit, and 380 Mrad to the other, as marked on each unit. Units were rotated and turned during exposure to achieve a more uniform dose distribution. The overdose factor to edges of the units was 1.15.

Irradiation was performed in air at ambient temperature (70°F) and a slight negative pressure (1/4"water). The maximum temperature of the sample during irradiation did not exceed 100°F, as confirmed by readings in an oil solution in the vacinity of the test samples.

Dosimetry was performed using a victoreen Model 555 Integrating Dose Rate Motor and Probe. The unit was calibrated on January 15, 1974 by the Victoreen Instrument Company, using Cobalt-60 and Cesium-137 sources whose calibrations are traceable to the U.S. National Bureau of Standards. A copy of the calibration certificate is available. Confirming dosimetry utilizing a Red Perspex system was also completed.

Irradiation was completed on July 19, 1974 and units returned to you under separate cover.

Very truly yours.

George R. Dietz

GRD:cp

ROSEMOUNT INC., 12001 WEST 78th STREET / EDEN PRAIRIE, MINNESOTA 55343 / TEL (612) 941-5500
TWX 910-576-3183 TELEX 29-0163

28 August 1975

Bailey Meter Co.
P. O. Box 400
Wickliffe, OH 44092

Attention: Mr. Lee Perossa
Mail Station 3KL

Subject: Investigation Radiation Requirement Model 177HW

Reference: Rosemount Report 87414

Gentlemen:

Attached please find the referenced report which outlines 177HW radiation capabilities. If you have any further questions, please contact me.

Very truly yours,

Steven R. McNattin

Steven R. McNattin
Applications Engineer

SRM:gel

Attachment: Rosemount Report 87414

THE BABCOCK & WILCOX COMPANY
POWER GENERATION GROUP

REF. AG

F.J. Levandoski, Product Manager

From

L. McBee, Protection Equipment Unit

BDS 663-5

Cust.

B&W Owners Group

File No. or Ref.

Subj.

Environmental Qualification Subcommittee

Date

March 19, 1980

This letter to cover one customer and one subject only.

Reference: Your note of 3/14/80 requesting test dates be included on matrix.

The attached Rev 01 of Owners Group Environmental Qualification matrix is the response to your request. One additional item was added in the matrix for the documentation for the NI Preamplifier - a report addendum was added (58-0087-00).

LM/whm

cc: w/attach.

NM Burstein 3-19-80

E.F. Dowling, Manager

177 B&W OWNERS GROUP
ENVIRONMEN — QUALIFICATION

OWNER	IPMENT	FUNCTION	MANUFACTURE AND MODEL NO	EQUIPMENT SPECIFICATION	ACCID ENVIRONMENT REQUIREMENT	EQUIPMENT QUALIFICATION DATA	DOCUMENTATION	REMARKS
(3-4-9) (5-6) (7) (8) (11) (14)	Reactor Coolant Flow	Input to Reactor Protection System	Bailey BY3X41X-AX	CS-3-17 NSS-9/1070 (3-4-9) NNI 1048 (5-6)-(7)-(8) (11)-(14)	$2X10^4$ Roentgen Press. 58 PSIG Temp. 285°F Steam/air atmosphere Max inaccuracy ±12% P/T vs Time Plot attached	$4X10^7$ with 4.5% shift $5X10^4$ Roentgen no effect Press. 59 PSIG Temp. 286°F Autoclave P/T vs Time attached Max inaccuracy ±0% ± 5.6% Seismic Vibration 3 Axis 3G Reached at 12-15Hz below 12Hz Displacement Limited to .375 D.A. Max Inaccuracy 2% Humidity - 100%	B&W 58-0081-00 (Mar. 12, 1973)	See Figure 1
(3-4-9) (5-6) (7) (8) (11) (14)	Pressurizer Level Transmitter	Indication and Control	Bailey BY3B40-AX					
(3-4-9) (5-6) (7) (8) (11) (14)	Steam Generator Level Start-up and Operate	Indication and Control	Bailey BY84B1X-A					
(3-4-9) (5-6) (7) (8) (11) (14)	CT Tank Level	Indication and Control	Bailey BY8X31X-A	CS-3-17/NSS-9/1070 (3-4-9) NNI 1048 (5-6)-(7)-(8) (11)-(14)	Not Required Design Range Only			
(3-4-9)	Reactor Coolant Pressure	Input to Reactor Protection System	Motorola (Westinghouse) 56PH	CS-3-17/NSS-9/1070	$2X10^4$ Roentgen Press. 58 PSIG Temp. 285°F P/T vs Time See Attached Max Inaccuracy ±10%	$2.2X10^6$ Roentgen Press. 59 PSIG Temp. 286°F Autoclave P/T vs Time Plots Attached. Max. Inaccuracy ± 0.6% Seismic (vibration) 3G sinusoidal 1-50HZ 3 Axis. Max Inaccuracy ± 2% Humidity - 100%	Certificate of Conformance Report for P/T 58-0093-00 (Sept. 1969)	See Figure 2 Copies of Test Reports Supplie B&W LOCA, Radiation Vibration, Design Range

OWNER	EQUIPMENT	FUNCTION	MANUFACTURE AND MODEL NO	EQUIPMENT SPECIFICATION	ACCIDENT ENVIRONMENT REQUIREMENT	EQUIPMENT QUALIFICATION DATA	DOCUMENTATION	REMARKS
(3-4-9)	Reactor Coolant Pressure	Input to Engineer Safety Protection System (SFAS)	Motorola 56PH	CS-3-17/NSS-911070 (3-4-9)	$2X10^4$ Roentgen Press 58 PSIG P/T vs time see attached max. inacc'y ± 10%	$2.2X10^6$ Roentgen Press 59 PSIG Temp. 286°F Autoclave P/T vs time plots attached max inacc'y 8.6%. Seismic (Vibration) 3G sinusoidal 1-50 HZ 3 Axis max. inacc'y .25%	Certificate of Conformance 58-0093-00 For P/T (Sept. 1969)	See Fig. 2 Copies of test reports supplied to B&W LOCA Radiation Vibration Design Range
(5-6) (7) (8) (11) (14)	Reactor Coolant Pressure	Input to SFAS and Indication	Foxboro E11GH	NNI1048	$2X10^4$ Roentgent Press. 58 PSIG Temp. 285°F Steam/air max inacc'y ±10% Seismic (Vibration) 1-25HZ 3G (Vertical & Horizontal) max. inacc'y ± 5%	$4.6X10^4$ Rad; press 90 PSIA Temp 318°F RH 100% max inacc'y 5%; Vibration 3G; 3 Axis ≥ 3.0% 1 to 50 HZ Max. inacc'y ≥ 3.0%	58-0079-00 (Dec. 22, 1971)	See Fig. 3A73B Copies of test reports supplied to B&W LOCA Radiation Vibration Design Range
(5-6) (7) (8) (11) (14)	Main Steam Pressure	Indication and Control	Foxboro E11GH	NNI1048		$4.6X10^4$ Rad Press 90 PSIA Temp. 318°F R.H. 100% Max. inacc'y 5% Vibration 3G 3 Axis ≥ 3.0%; 1 to 50HZ		
(3-4-9) (5-6) (7) (8) (11) (14)	Reactor Coolant Temperature Detector	Input to Reactor Protection System	Rosemount 177GY (3-4-9) (11) Rosemount 177HW (5-6) (7) (8) (14)	CS-3-17/NSS 9/1070 NNI1048 (5-6) (7) (8) (14)	Not required Design Range Requirements Only	$3.8X10^8$ Rad Temp. 325°F Press. 60 PSIG RH 100% 177 GY - Vibration by Analysis 177 HW - 1-33HZ, bi-axia 3G ZPA	Certificate of Conformance (177GY) 58-0372-00 (177HW) (Jan. 19, 1978)	The 177HW has been qualified for accident conditions by similarity to the 104AFP and is the replacement part for the 177GY
(5-6) (7) (8) (14)	Reactor Coolant Pressure Transmitter	Input to Reactor Protection System	Rosemount 1152GP 9A92	NNI-1048 & 08-1001108-00	$7X10^4$ Rad Temp. 286°F Press. 58 PSIG 100% RH chemical spray steam/air; max inacc'y 10% Seismic 1-35HZ; 3G ZPA Biaxial, max. inacc'y 5%	$5X10^6$ Rad 70 PSIG 316°F Saturated Steam/Chemical Spray; max inacc'y 5% Seismic 1-34HZ .3 D.A. 14-100 HZ 3G,ZPA Max inacc'y ± 1%	58-0261-00 (2/17/77) 58-0220-00 (9/19/75)	See Figure 4

177 B&W OWNERS GROUP
ENVIRONMENTAL QUALIFICATION

00-2/80
01-3/80

OWNER	EQUIPMENT	FUNCTION	MANUFACTURE AND MODEL NO.	EQUIPMENT SPECIFICATION	ACCIDENT ENVIRONMENT REQUIREMENT	EQUIPMENT QUALIFICATION DATA	DOCUMENTATION	REMARKS
(3-4-9) (5-6) (7) (8) (11) (14)	NI Pre-amplifier	Input to Reactor Protection system	Bailey PT No. 6623140A1	NI/RPS-CS-2-18 Design Range Rad. 2.0×10^4 Temp. 40-150 Humidity 0-90% Cont. NI/RPS-1018 (14 only)	Accident Requirement Design Range Only	Design Range (1) Rad 2.4×10^4 (2) Temp 40° to 160° (3) Humidity 94% RH at 140°F Tested 1G 7 to 40 HZ 3 Axis	58-1017404-01 For T&H (6/22/70) Seismic 58-0087-00 (2/5/70) 58-0098-00 (10-19-70)	Seismic (Vibration) below 7 HZ Limited by Shaker Table to ± 0.375 · opy of Rad. eport avail.
(3-4-9) (5-6) (7) (8) (11) (14)	Source Range NI Detector	Input to Reactor Protection System	Westinghouse WL-23682	NI/RPS CS-2-18 NI/RPS 1018 (14 only)	(1) Rad. 30-60 CPS/NV (2) Press. 150 PSIG (3) Temp. 212°F (4) 90% RH No accident requirement Design Range Only	(1) Rad. 49.4 CPS/NV (2) Press. 150 PSIG (3) Temp. 212°F (4) 100% RH Seismic (Vibration) 1G Vertical & Horizontal	58-0528-00 (11/17/70)	
(3-4-9)	Intermediate Range Detector	Input to Reactor Protection System	Westinghouse WL-23635		(1) Rad $4-8 \times 10^{-14}$ A/NV (2) Press. 150 PSIG (3) Temp. 212°F (4) 90% RH No accident requirement Design Range Only	(1) Rad 6.6×10^{-14} A/NV (2) Press. 150 PSIG (3) Temp. 212°F (4) 100% RH Seismic (Vibration) 1G Vertical & Horizontal	58-0529-00 (6-24-70)	
(3-4-9) (5-6) (7) (8) (11) (14)	Power Range Detector	Input to Reactor Protection System	Westinghouse WL-23636		(1) Rad $1.2-2.3 \times 10^{-13}$ A/NV (2) Press. 150 PSIG (3) Temp. 212°F (4) 90% RH No accident requirement Design Range Only	(1) *Rad 1.62×10^{-13} A/NV (2) Press. 150 PSIG (3) Temp. 212°F (4) Humidity 100% RH *At 750 volts Seismic (Vibration) 1G Vertical & Horizontal	58-0089-01 (6/22/70) Connector Test Rad Gamma 20R/Hr Neutron Flux 10^6 NV Temp. 200°F Press. 180 PSI	

OWNER CODE
(3-4-9) Oconee 1,2,3
(5-6) TMI
(7) Florida
(8) Arkansas
(11) ANO
(14) Davis

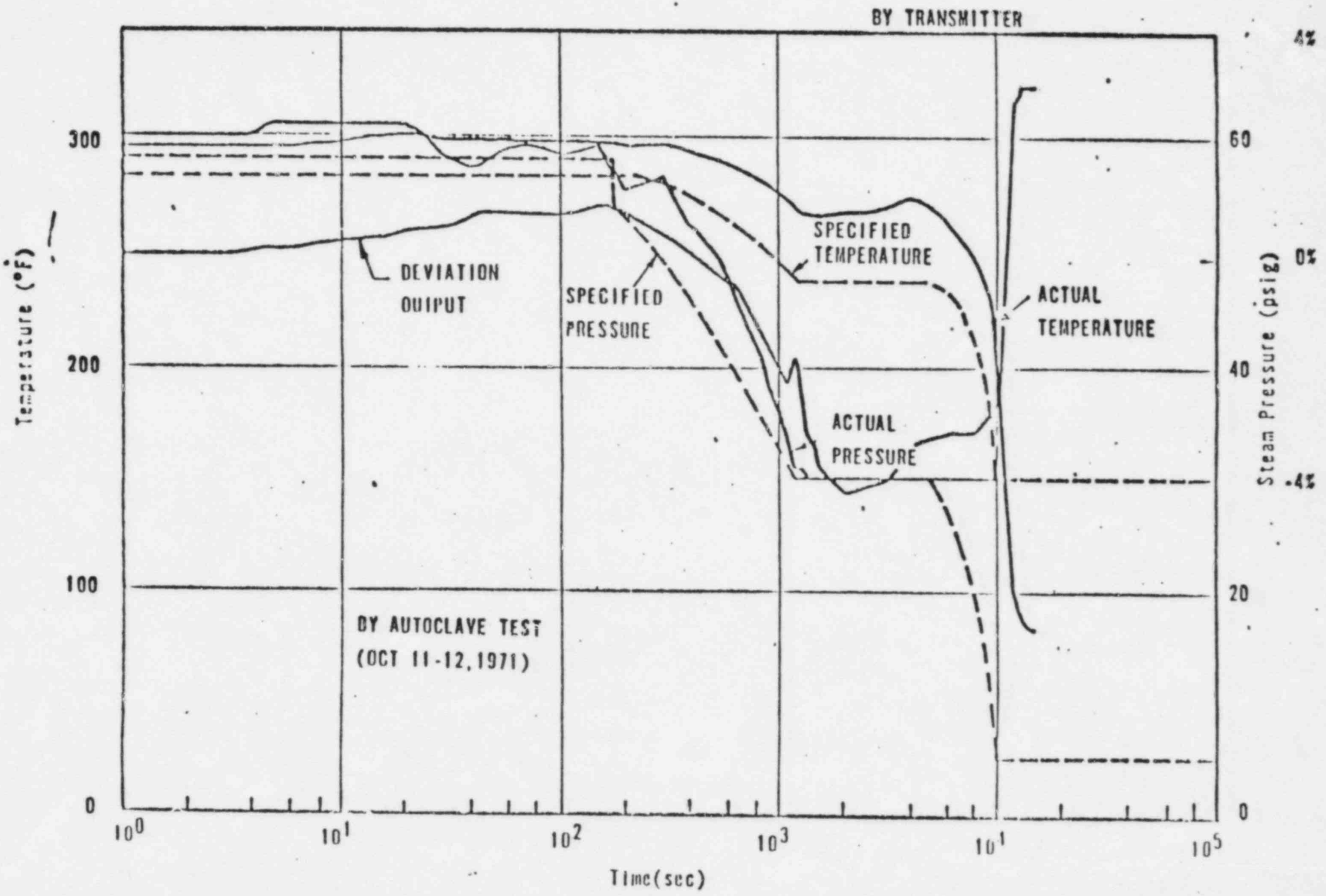
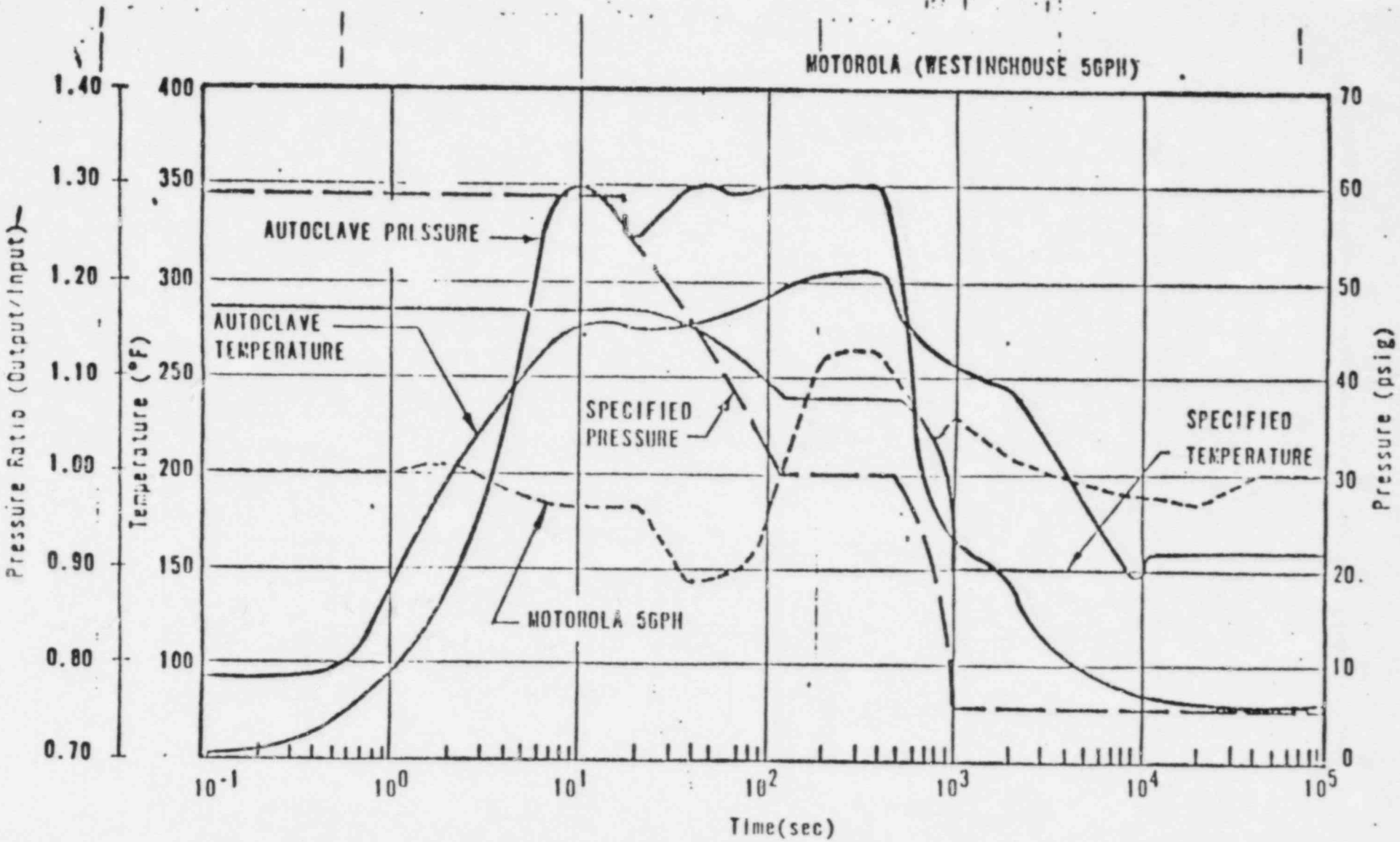

BY TRANSMITTER
Temperature (°F)
Steam Pressure (psig)
300
200
100
0
60
40
20
0
4%
0%
-4%
DEVIATION OUTPUT
SPECIFIED PRESSURE
SPECIFIED TEMPERATURE
ACTUAL TEMPERATURE
ACTUAL PRESSURE
BY AUTOCLAVE TEST
(OCT 11-12, 1971)
10^0
10^1
10^2
10^3
10^4
10^5
Time(sec)

FIGURE 1



VARIATION OF THE RATIO $\frac{\text{INDICATED PRESSURE}}{\text{ACTUAL PRESSURE}}$ FOR MOTOROLA 5GPH PRESSURE TRANSMITTER DURING ENVIRONMENTAL VARIATIONS OF THE LOCA TEST F-C2574-01

FIGURE 2

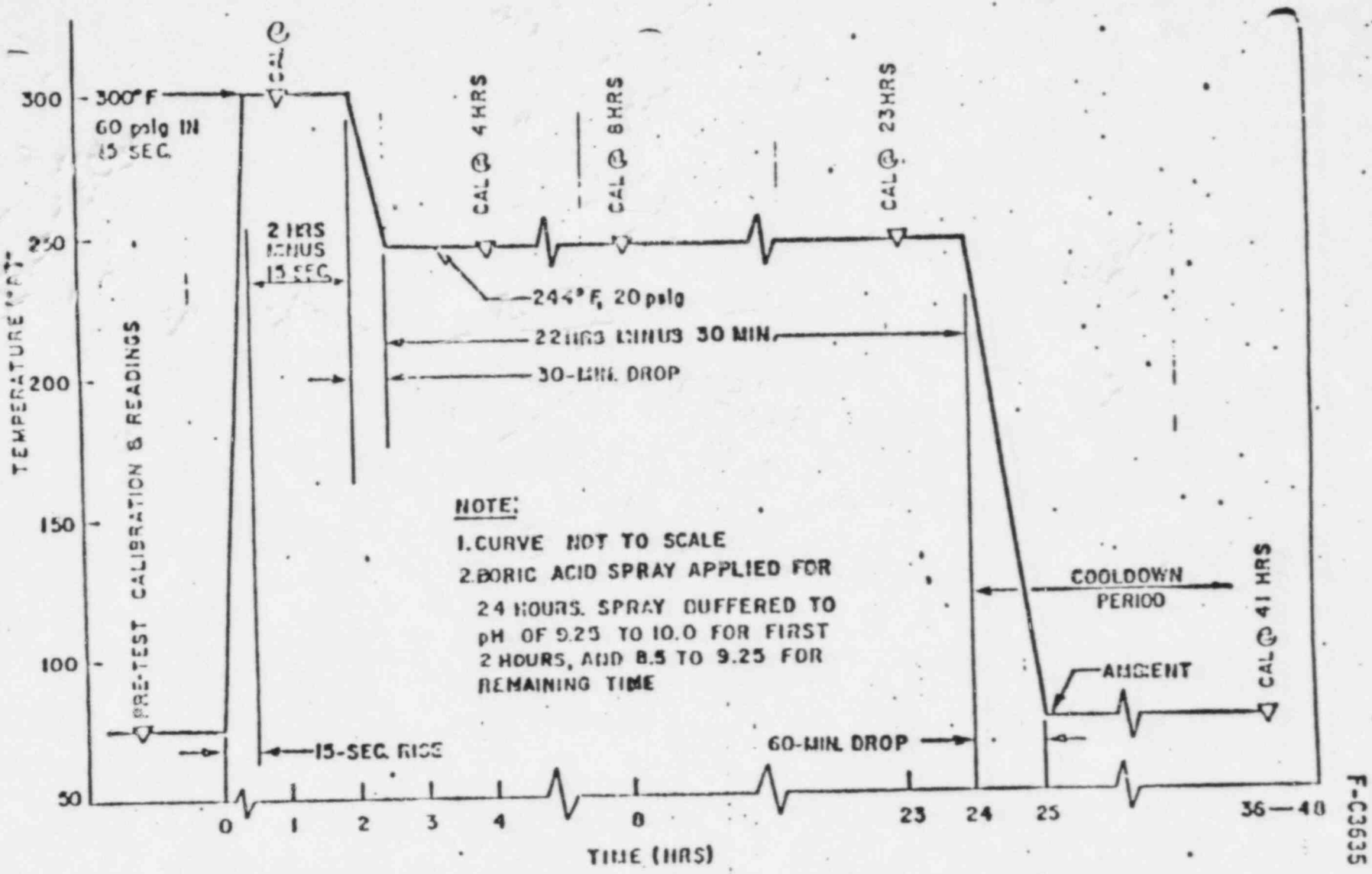


Figure 4. Specified Temperature/Pressure Profile of Steam/Chemical-Spray Exposure

FIGURE 3A

CALCULATION/PROBLEM COVER SHEET

Calculation/Problem No: 1040-001-042

Title: Chemical Spray Analysis of Safety-Related Components

Client: Toledo Edison **Project:** Davis-Besse, Unit No. 1 Equipment Qualification

Job No: 1040-001-671

Design Input/References:

Refer to Table of Contents on Page 2 of 8.

Assumptions:

Refer to Table of Contents on Page 2 of 8.

Method:

Refer to Table of Contents on Page 2 of 8.

Remarks:

The purpose of this calculation is to analyze the effects of a Boric Acid Spray on certain safety-related components installed at the Davis-Besse Nuclear Power Station, Unit No. 1.

REV. NO.	REVISION	PERFORMED BY	CHECKED	APPROVED	DATE
0	Original				8-10-81
1	pp. 1-7				1-8-82
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JOB NO 1040-001-671

CALC NO 1040-001-042

1.0 PURPOSE

To analyze the effects of a Boric Acid Spray (3000 ppm Boric Acid, pH = 5) on Rosemount 177HW-2 Resistance Temperature Detectors (RTD's) and Bailey Meter BY transmitters. This calculation is in support of Davis-Besse, Unit No. 1, 79-01B Qualification Data Worksheets.

2.0 SCOPE

This calculation applies to all Rosemount 177-HW-2 RTD's and all Bailey BY8B41X-A, BY3B40X, and BY3X41X-A transmitters installed at the Davis-Besse Nuclear Power Station, Unit No. 1. This analysis will cover the effects that the Davis-Besse chemical spray will have on these components under the conditions of a postulated Loss of Coolant Accident (LOCA).

3.0 REFERENCES

1. Letter from Rosemount to EDS Nuclear, Dated 12/31/81, containing a drawing of the 177HW RTD (79-01B Response Peference V-34A).

2. Telephone conversation of 5/15/81, between J. Graham (Rosemount) and J. Abbate (EDS), regarding the material used in the 177HW-2 RTD Connection Head (79-01B Response Reference ROC 34C).

3. Telephone conversation of 7/9/81, between Dan Dutoit (Rosemount) and J. Abbate (EDS), regarding the Rosemount 177-HW-2 RTD. (79-01B Response Reference ROC 34E)

4. Evaluation of Aging of Class 1E controls and instrumentation in B&W 177FA Scope of Supply (79-01B Response Reference AA).

5. Telephone conversation of 6/30/81, between Bob Rand (Bailey Meter) and Bill Bellando (EDS), regarding Bailey BY transmitters (79-01B Response Reference ROC-5A).

6. B&W Report No. 58-0881-00 (Bailey Transmitters) (79-01B Reference J-1).

7. "Corrosion Resistant Materials Handbook" by Ibert Mellan. Published by Noyes Data Corporation, 1966.

8. Davis-Besse Nuclear Power Station, Unit 1 FSAR.

4.0 METHOD OF ANALYSIS

The exposed materials were identified by examining test reports, drawings, and parts lists of the units involved. Knowing the exposed materials, their resistance to Boric Acid (ph=5) was determined by a document search of published materials in the field of corrosion resistance.

5.0 BASIC DATA AND ASSUMPTIONS

5.1 Basic Data

High-high containment vessel pressure, together with either high containment vessel pressure or low reactor coolant pressure (conditions present during LOCA's), will cause the safety features actuating system to open the containment spray isolation valves and start two containment spray pumps. The pumps take suction intially from the borated water storage tank. The containment spray system shares the borated water storage tank supply with high and low pressure injection systems.

After the water in the borated water storage tank reaches a low level, the spray pump suction is transferred to the containment vessel emergency sump. The sump water is then recirculated for use by the containment spray, high pressure injection, and low pressure injections systems. Baskets of Trisodium Phosphate (Na_3PO_4) are available in the sump so that when sump flooding occurs, neutralization will result. The spray pH upon recirculation is then 7.0 or greater (FSAR 6.2.2.2.2).

5.0 BASIC DATA AND ASSUMPTIONS

5.1 Basic Data (Con't)

The chemical properties of the borated water storage tank (BWST) supply are 1800 ppm Boron at a pH value of approximately 5.0 (FSAR 6.2.3.1). This supply can last a maximum of approximately 7 hours when minimum safeguards are operating (one containment spray pump):

BWST Maximum Capacity (FSAR Table 9-14) — 550,000 Gal.

Containment Spray Pump Capacity (FSAR Table 6-6) — 1300 Gal./Min.

BWST Maximum Depletion Time (One Containment Spray Pump)

$$= \frac{\text{BWST Maximum Capacity}}{\text{Containment Spray Pump Capacity}}$$

$$= \frac{550{,}000 \text{ Gal.}}{1300 \text{ Gal./Min.}}$$

= 423 Minutes
= 7 Hours 3 Minutes

During normal plant operations, the borated water storage tank contains a minimum capacity of 360,000 gallons (FSAR 6.3.2.6). At this capacity, the tanks's depletion time (with minimum safeguards operating) will be 4.6 hours:

BWST Depletion Time (One Containment Spray Pump)

$$= \frac{360{,}000 \text{ Gal}}{1300 \text{ Gal./Min}}$$

= 276 Minutes
= 4 Hours 36 Minutes

5.0 BASIC DATA AND ASSUMPTIONS

5.1 Basic Data (Con't)

There is only a remote chance that merely a single containment spray pump will be in operation following a Loss of Coolant Accident. This occurrence would only result from deliberate operator action or multiple failures of redundant safety systems. The Safety Features Actuation System is designed so that both trains of the high pressure injection, low pressure injection, and containment spray system will operate following a Loss of Coolant Accident. With these normal safeguards operating, the borated water storage tank supply (BWST) will last only 40 minutes. (15.4.6.4)

5.2 Assumptions

1. The "wash-off" and dilution effects that the primary coolant (which flashes to steam) would have on the chemical spray is not considered. This assumption makes the analysis more conservative.

2. The analysis of each material is made assuming that the material is not painted. This assumption is conservative as some components are painted and would provide additional corrosion resistance. Only identified corrosion resistance coverings are accounted for.

3. For the purpose of this calculation, all O-Rings and Gaskets are considered as exposed materials. In most cases, these materials are under large compressive forces that limit their chemical spray exposure to little or none at all. This assumption further adds conservatism to the calculation.

6.0 SUMMARY RESULTS

The Rosemount 177HW-2 RTD's and Bailey BY8841X-A, BY3R40X, and BY3X41X-A units are qualified by analysis for chemical spray exposure at Davis-Besse Unit 1. The exposed materials are all rated good or above for corrosion resistance to Boric Acid (ph=5).

7.0 BODY OF CALCULATION

7.1 Rosemount 177-HW-2 RTD

These units are completely sealed, therefore, only its external casings and seals are exposed. In addition, these units are covered with a chemical resistant paint.

The exposed materials are as follows:

COMPONENT	MATERIAL
Header	Stainless Steel
Flexitallic Gasket	304 Stainless Steel
Housing	Aluminum Alloy 214

Materials and Parts References: References 1, 2, 3, 4,

7.2 Bailey BY Type Transmitters

These units are completely sealed, and therefore, only the external casings and seals are exposed. In addition, these units are covered with a chemical resistant paint.

The exposed materials are as follows:

COMPONENT	MATERIAL
Amplifier Housing	Aluminum
Gaskets	SBR (Styrene Butadiene Rubber)

Materials and Parts References: Ref 5,6

7.3 MATERIALS ANALYSIS

MATERIAL	CORROSION RESISTANCE TO BO_3(ph=5)	REF
Stainless Steel	Up to concentrated boiling, fully resistant	7
Aluminum	Corrosion so slight as to be negligible	7
SBR	Good Resistance	7

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