Thomas D. Gatlin
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SCE&G®
A SCANA COMPANY

September 13, 2012
RC-12-0136

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Dear Sir/Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS) UNIT 1
DOCKET NO. 50-395
OPERATING LICENSE NO. NPF-12
RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION (TAC NO. ME8966) REQUEST FOR WELD RECATEGORIZATION AND USE OF ALTERNATIVES TO ASME CODE INSPECTION INTERVAL FOR VCSNS THIRD TEN YEAR INSERVICE INSPECTION (RR-III-08)

Reference:
1. Letter from T. D. Gatlin, SCE&G, REQUEST FOR WELD RECATEGORIZATION FOR VCSNS STEAM GENERATOR NOZZLE TO SAFE END WELDS [PRELIMINARY SUBMITTAL – RR-III-08], dated June 21, 2012, ADAMS Accession No. ML12177A381

2. Letter from T. D. Gatlin, SCE&G, REQUEST FOR WELD RECATEGORIZATION AND USE OF ALTERNATIVES TO ASME CODE INSPECTION INTERVAL FOR VCSNS THIRD TEN YEAR INSERVICE INSPECTION (RR-III-08), dated July 27, 2012, ADAMS Accession No. ML12212A287

This letter provides South Carolina Electric & Gas Company's (SCE&G) response to the Request for Additional Information (RAI) documented by Nuclear Regulatory Commission (NRC) email from Robert Martin dated August 31, 2011 at 7:22 am regarding the Request For Weld Recategorization And Use Of Alternatives To ASME Code Inspection Interval For VCSNS Third Ten Year Inservice Inspection (RR-III-08) pursuant to 10CFR50.55a(g)(6)(ii)(F)(2) and 10CFR50.55a(a)(3)(ii). The proposed request would allow an alternative categorization of the primary steam generator (SG) nozzle to safe end welds as required by inspection Item G of ASME Boiler & Pressure Vessel Code (BPVC) Code Case N-770-1 with conditions as specified in 10CFR50.55a(g)(6)(ii)(F). Additionally, the request would allow the station to defer the requirements of a baseline inspection from being performed in the first outage following January 20, 2012, by declaring hardship or unusual difficulty without a compensating increase in the level of quality and safety. Responses to the requested information are provided in the Enclosure.

A047
NRR

Should you have questions, please contact Mr. Bruce L. Thompson at (803) 931-5042.

Very truly yours,

Thomas D. Gatlin

JG/TDG/bj

Enclosure: Request For Additional Information
Attachment I: ALARA Projected Dose Study

c: K. B. Marsh
S. A. Byrne
J. B. Archie
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File (810.19-2)
PRSF (RC-12-0136)

Enclosure

VIRGIL C. SUMMER NUCLEAR STATION UNIT NO.1
REQUEST FOR ADDITIONAL INFORMATION (TAC NO. ME8966)
Request For Weld Recategorization And Use Of Alternatives To ASME Code Inspection Interval For VCSNS Third Ten Year Inservice Inspection (RR-III-08)

By letter dated June 21, 2012 (Agencywide Documents Access and Management System, Accession No. ML12177A381) and supplemented by letter dated July 27, 2012 (ADAMS Accession No. ML12212A287), South Carolina Electric and Gas Company submitted a request for weld recategorization and use of alternatives to ASME code inspection interval for VCSNS third ten year inservice inspection. The changes would allow an alternative categorization of the primary steam generator (SG) nozzle to safe end welds and provide relief from the baseline inspection requirements to be performed during the first outage following January 20, 2012.

VCSNS is requesting an alternative categorization to inspection items specific to the six replacement Steam Generator Nozzle (Hot and Cold Leg) to Safe End Welds which are Alloy 82/182 with an Alloy 152 inlay that was originally applied during fabrication. The replacement steam generators were manufactured in 1993 and installed during VCSNS outage RF8 in the fall of 1994. Based on the manufacturing process of the replacement steam generators and guidance from Code Case N-770-1, the VCSNS Steam Generator Nozzles' (Hot and Cold Leg) Safe End Welds should be categorized as Inspection Item G, "Uncracked Butt Weld Mitigated With An Inlay."

VCSNS also proposes to delay the volumetric and inside surface inspection beyond the third 10-year inservice inspection (ISI) interval. The delay of the inspection would allow the development of inspection strategies and methodologies. Code Case N-770-1 requires a surface examination to be performed from the inside surface and a volumetric examination performed from either the inside or outside surface. Each steam generator nozzle has its own unique geometry due to the final field machining processes used to mate the nozzles to the pipes. The six unique geometries would require multiple mockups to demonstrate proficiency from the outside diameter. VCSNS does not own a mockup of these nozzles and does not have a qualified technique in-house to perform outside diameter or inside diameter exams on this configuration. The delay would allow the development of an inside examination strategy. VCSNS has also determined that performing an ultrasonic and eddy current or penetrant test manually would subject personnel to a hazardous work environment and high radiation exposure. SCE&G proposes to conduct the baseline inspection with a qualified process during the following outage RF-21 scheduled for Spring 2014.

The following questions were developed as a result of the U.S. Nuclear Regulatory Commission (NRC) Staff's review of the Request For Weld Recategorization And Use Of Alternatives To ASME Code Inspection Interval For VCSNS Third Ten Year Inservice Inspection (RR-III-08).

1. ***Based on your statement "Currently there are no qualified vendors performing automated encoded ultrasonic or eddy current testing from the inside diameter of a steam generator nozzle," what are the unqualified aspects of performing an ultrasonic examination from the ID at this time? How have you verified no qualification can be completed prior to the fall outage?***

[VCSNS Response]
The unqualified aspects of this exam are:

1) There are no VCSNS Electric Power Research Institute (EPRI) Performance Demonstration Initiative (PDI) ultrasonic qualified technicians for performing automated encoded eddy current testing.
2) There are no VCSNS qualified procedures for performing automated encoded eddy current testing.
3) There is no VCSNS qualified ultrasonic process equipment (scopes, transducers, scanners, etc.) for performing automated encoded eddy current testing.

Therefore, the only possible options available at this time would be to use VCSNS personnel to perform an unqualified manual ultrasonic examination. The station does not have an eddy current process that could be used to detect the location of the inlay. Therefore, light acid etching of the inside diameter of each Alloy 152 inlay weld and a liquid penetrant surface exam would be required. The radiological impacts of this exam are discussed in the answer to RAI #2.

VCSNS contacted EPRI Nondestructive evaluation (NDE) department to identify qualified vendors and qualification requirements per the Performance Demonstration Initiative (PDI). At the time of the initial relief request submittal (Reference 1 and 2) there were no qualified processes or personnel. As of August 2012, there is only one vendor that has an EPRI Performance Demonstration Initiative (PDI) qualified process using the inside diameter dry contact ultrasonic examination of a Phased Array method with qualified procedures, equipment and personnel (1 individual). The resources and equipment required for this inspection are extremely limited due to the emergent nature of the new requirements and there are only enough resources and equipment for inspection of one plant. That inspection is scheduled to occur November 2012 and the vendor believes they will be available later that month (not accounting for delays) and are currently open for contract in 2014. VCSNS

is scheduled to begin fuel movement on October 20, 2012 and conclude refuel movement on October 29, 2012. Therefore, the safest opportunity for the station to be configured at half pipe would be during the Defueled Work Window scheduled for October 22, 2012 through October 27, 2012. Taking the station to half pipe would add a minimum of seven days to the outage duration.

VCSNS has sought out the possibilities of having another automated ultrasonic testing system manufactured and the availability of qualified personnel to support this exam. However, based on prior commitments to industry peers, vendor support and a very heavy outage season, resources are limited. The EPRI PDI qualification process requires plant specific procedures, mock ups, laser profiling of the inside diameter and scan coverage calculations be established to have a code acceptable process. The one qualified vendor has identified the following list of items that should be considered to prepare for the examinations at VCSNS:

- Steam generator primary nozzle drawings review.
- Tooling design engineer and NDE Level III will verify conditions of diameter, thickness, weld location, weld and surface conditions/geometry, steam dam ring configuration, and manway parameters note any differences and determine the effect on existing tooling or NDE procedure.
- Validate NDE procedure and exam area conditions are consistent with the EPRI Performance Demonstration Initiative (PDI) qualified procedure.
- Make any required adjustments or modifications to tooling (if required)
- Determine if any additional fit and function type mockup is required (if tooling modifications are required they should be tested)
- Scan Plan Development
- Station general examination planning (i.e. determine equipment setup locations, submit procedures, personnel certifications, equipment certifications for review and approval, planning and scheduling meetings, etc.)

VCSNS is requesting approval for alternative inspection requirements in accordance with paragraph 10CFR50.55a(a)(3)(ii) of this section by declaring hardship or unusual difficulty without a compensating increase in the level of quality and safety. Implementation of the alternative inspection requires a relief pursuant to 10CFR50.55a(a)(3)(ii) for the baseline performance for six primary Steam Generator (nozzle to safe-end) welds during the next scheduled refueling outage. VCSNS is requesting to delay the inspection to provide additional time to plan, qualify and implement the examinations from the inside surface. Based on vendor input and scheduling conflicts the opportunities to qualify and complete these exams during RF-20 are not achievable.

2. ***Based on your statement, "Performing an ultrasonic and eddy current or penetrant test manually would result in personnel performing a difficult test from the inside of the steam generator," what is the estimated radiological dose expected in performing this examination in the Fall 2012 outage rather than the automated examinations in the Spring 2014 outage?***

[VCSNS Response]
The dose impacts from performing a manual volumetric examination and visual surface examination on the steam generator nozzle welds (hot leg and cold leg) internally during the Fall 2012 outage is estimated to be between 43 to 77 Rem. There are no qualified techniques or outlined procedures available for the performance of an internal inspection of the steam generator nozzle welds at this time. The times used to calculate the estimated dose are based on historical similarities and input from a VCSNS qualified ultrasonic inspector. The nominal dose rates applied for this study are 1.000 Rem/hr for the hot leg and 2.000 Rem/hr for the cold leg. These rates are based on historical measurements located at the center of the bowl and at the bottom of the bowl. The manual volumetric examination by ultrasonic testing from inside the steam generator would most likely take 75 minutes per weld and result in a dose of 3.750 Rem/generator or 11.250 Rem total. The visual surface examination by dye penetrant testing from inside the steam generator is projected at 120 minutes per weld and would have an exposure of 6 Rem/generator or 18 Rem total.

The robotic methodology would be the best alternative for conducting the volumetric examination and surface examination on the steam generator nozzle safe end welds (hot leg and cold leg) from the inside diameter. In comparison of the two activities (manual vs robotic) the difference is the examination activity itself and administrative coverage where manual would result in approximately 29.250 Rem of dose in comparison to the estimated 0.378 Rem for the robotic methodology. The remainder of the 43 to 77 Rem is attributed to steam generator manway removal, surface preparation, acid etching, radiological barrier controls and administrative operations at half pipe. Therefore, the robotic examination would provide a total of 28.872 Rem savings in personnel exposure for just the inspection activity alone. If the examination was conducted during the scheduled eddy current testing of the steam generator tubes that is expected to be completed during RF21 (Spring 2014), the administrative dose would be shared with the two activities minimizing exposure even further.

The details of the study and supporting surveys are attached.

VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)
DOCKET NO. 50-395
OPERATING LICENSE NO. NPF-12

Attachment I

ALARA Projected Dose Study

The dose impact from performing an internal, manual volumetric examination and visual surface examination on the steam generator nozzle welds (hot leg and cold leg) could be on the order of 43 to 77 Rem. To better manage and control worker doses, a well outlined process, qualified workers, and station plan needs to be developed that should include benchmarking of other facilities and mockup training. There are no qualified techniques or outlined procedures available for the performance of an internal inspection of the steam generator nozzle welds at this time. The closest guidance available for comparison purposes would be the following station Quality Services Procedures:

- QSP-501 "Solvent Removable Liquid Penetrant Examination,"
- QSP-505 "Visual Examination,"
- QSP-513 "Manual Ultrasonic Examination for Piping Systems," and
- QSP-518 "Acid Etching."

The steps (breakdown of the manual process) and man-hours used in the dose estimations that follow are a projection based on jobs with historical similarities and input from a qualified inspector.

Manual Inspection Method:

The code inspections of the steam generator primary side (hot and cold legs) would require the plant to drain down to half pipe. This activity has not been scheduled for RF20 and there is no current additional work requiring station alignment to half pipe. The half pipe condition would add a minimum of seven days to the outage duration with an increased dose to the outage scope of approximately 0.700 Rem/day (or 4.9 Rem total).

The set up and removal of the necessary radiological barriers and controls (0.900 Rem) and radiation protection job coverage (0.825 Rem) would result in an additional 1.725 Rem.

The steam generator manway covers would have to be removed to access the inspection points inside the steam generator. Historically, workers receive 0.450 Rem for conducting the manway removal.

The dose rates utilized to evaluate the work inside the steam generator are an effective dose rate established from historical radiation and contamination surveys during eddy current testing. The nominal dose rates applied for this study are 1.000 Rem/hr for the hot leg and 2.000 Rem/hr for the cold leg. These dose rates are based on historical

measurements located at the center of the bowl and at the bottom of the bowl. The surveys from 2005 (RF15) and 2009 (RF18) are attached.

The steam generator nozzle would need to be prepped and potentially buffed for volumetric examination. The projected time it would take to buff a 31-inch diameter pipe is estimated at approximately 40 minutes per weld. The estimated dose for the hot leg is 0.667 Rem and for the cold leg 1.333 Rem, therefore, the expected exposure is 2.000 Rem per generator or 6.000 Rem total for the weld preparation.

The time to conduct a manual volumetric examination from the inside the steam generator is estimated to take 75 minutes per weld. The estimated dose for the hot leg is 1.250 Rem and for the cold leg 2.500 Rem, therefore, the expected exposure is 3.750 Rem per generator or 11.250 Rem total for the volumetric examination.

The time needed for the visual surface examination by dye penetrant testing (PT) from the inside the steam generator estimated to take 120 minutes per weld. The estimated dose for the hot leg is 2.000 Rem and for the cold leg is 4.000 Rem. Therefore, the expected exposure is 6.000 Rem per generator or 18.000 Rem total for the visual surface examination.

There is a potential of not knowing where the edge of the weld is located. The common practice of acid etching will need to be used to locate the edges of the weld. The etching process on a 31-inch diameter pipe is estimated to take 120 minutes. The estimated dose for the hot leg is 2.000 Rem and for the cold leg 4.000 Rem, therefore, the expected exposure is 6.000 Rem per generator or 18.000 Rem total if weld etching is required.

The total collective dose estimate for the manual volumetric examination and visual surface examination is 37.425 Rem with an additional 4.900 Rem for establishing and maintaining half pipe conditions. The overall impact to the refueling outage combined would be 42.325 Rem, but if acid etching is required, the dose could be as high as 60.325 Rem.

There are many variables that could easily increase personnel exposure in this evolution. The amount of time needed for weld surface preparation may vary due to the level of surface imperfections should they exist. Additionally, the installation of foreign material exclusion (FME) covers or bladders should be considered and installed to protect the system and personnel. There could be a variation to the time based on the use of delta suits utilized for personnel protection. The physical configuration of the piping, the lack of lighting and first time evolution of performing the inspection could impact the stay time.

A radiation work permit estimate is considered to be successfully planned when it is within plus or minus 25 percent of the estimate. (This methodology is consistent with INPO 05-008, "Guidelines for Radiological Protection at Nuclear Power Stations," Revision 1, January 2011.) Therefore, the estimated total collective dose could result in 43 Rem or as high as 77 Rem.

The amount of resources that would be required for this method also poses a genuine concern. Given the maximum collective dose estimated and authorizing an administrative exposure limit extension to 1.500 Rem per worker, the total number of workers needed to support and accomplish a manual inspection could be as high as 45. The total number of workers takes into account an administrative buffer of 90% (1.350 Rem per worker) to ensure no worker exceeds his/her limit. The availability of this many qualified workers on short notice would be a challenge.

Robotic/Remote Inspection Method:

The best solution is to have this inspection performed remotely via robotics. Historically, robotics has saved time and dose. Additionally, the collective dose received would be minimal if performed in conjunction with a scheduled steam generator eddy current inspection. All of the set-up and man-way work would need to be performed to support the eddy current inspection. Some of the steps involved with the manual inspection would also be part of the robotic inspection. For instance:

- Establishing half pipe conditions for an estimated dose of 4.900 Rem.
- Removal of steam generator manway covers for an estimated dose of 0.450 Rem.
- Set up and removal of radiological barriers and controls (0.900 Rem)
- Radiation protection job coverage is reduced from 0.825 Rem to 0.175 Rem due to the limited activity required within the generator.

The robotic inspection would also require installing and removing the robot, which is estimated at the duration of 2.5 minutes per weld. At the expected dose rates, the estimated dose for the hot leg is 0.042 Rem and for the cold leg 0.084 Rem, therefore, the expected exposure is 0.126 Rem/generator or 0.378 Rem total for robotic examination.

Additional exposure savings could be obtained based on the weld preparation requirements. However, since these requirements are not fully understood a dose estimate of 6.000 Rem will be applied. VCSNS also postulated that weld etching will

not be required for the automated process therefore the projected dose was reduced to zero.

Summary:

The robotic methodology would clearly be the best alternative for conducting the internal volumetric examination and surface examination on the steam generator nozzle welds (hot leg and cold leg). Comparison of the two examination methods would result in significant exposure savings of 29.522 Rem.

Manual examination method dose estimate of 42.325 Rem

Robotic examination method dose estimate of 12.803 Rem

If the examination was conducted during the scheduled eddy current testing of the steam generator tubes, that is expected to be completed during RF21 (Spring 2014), the administrative dose would be shared and minimized even further.

Step	Manual Examination	Robotic Examination
Half Pipe Dose (Administrative)	4.900 Rem	4.900 Rem
Setup & Demobilize	0.900 Rem	0.900 Rem
Full HP Coverage	0.825 Rem	0.175 Rem
Remove Manways	0.450 Rem	0.450 Rem
Weld Preparation	6.000 Rem	6.000 Rem
Volumetric Examination	11.250 Rem	0.000 Rem
Surface Examination	18.000 Rem	0.000 Rem
Robotic Equipment Setup	0.000 Rem	0.378 Rem
Total Estimated Dose	**42.325 Rem**	**12.803 Rem**
Weld Etching (contingent)	18.000 Rem	0.000 Rem
Gross Estimated Dose	**60.325 Rem**	**12.803 Rem**
Personnel Required (1.35 Limit)	45	10
Planning Error (125%) Max Dose	76.250 Rem	16.000 Rem

Attachments:

1. **RF15 Steam Generator Survey Spring 2005**

   RF15 (Spring 2005) – "B" Steam Generator Primary Channel Head Survey
   RF15 (Spring 2005) – "C" Steam Generator Primary Channel Head Survey
   RF15 (Spring 2005) – "C" Steam Generator Primary Channel Head Survey
   RF15 (Spring 2005) – "A" Steam Generator Primary Channel Head Survey
   RF15 (Spring 2005) – "A" Steam Generator Primary Channel Head Survey

2. **RF18 Steam Generator Survey Fall 2009**

   RF18 (Fall 2009) – "C" Steam Generator Primary Channel Head Survey
   RF18 (Fall 2009) – "C" Steam Generator Primary Channel Head Survey
   RF18 (Fall 2009) – "B" Steam Generator Primary Channel Head Survey
   RF18 (Fall 2009) – "B" Steam Generator Primary Channel Head Survey
   RF18 (Fall 2009) – "A" Steam Generator Primary Channel Head Survey
   RF18 (Fall 2009) – "A" Steam Generator Primary Channel Head Survey

3. **RF15 Steam Generator Access Point Spring 2005**

   RF15 (Spring 2005) – "C" Steam Generator Primary Manways RB-428' EL
   RF15 (Spring 2005) – "B" Steam Generator Primary Manways RB-428' EL
   RF15 (Spring 2005) – "A" Steam Generator Primary Manways RB-428' EL
   RF15 (Spring 2005) – "C" Steam Generator Primary Manways RB-428' EL

Attachment 1
RF15 (Spring 2005)

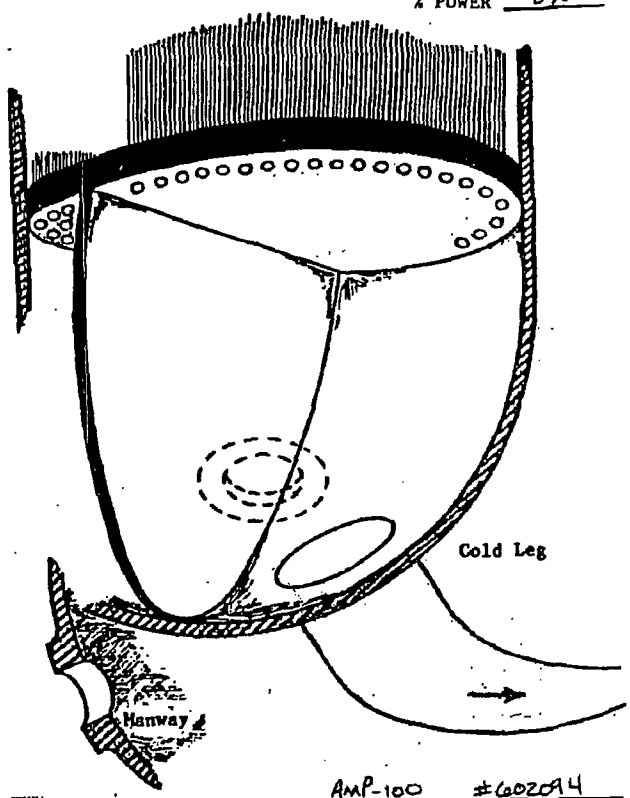
SURVEY # 1VA

SWP/RWP # 05-0005

% POWER 0%

"B" Steam Generator Primary Channel Head Survey

LOCATION	GAMMA	BETA
CENTER BOWL AMP	1500	N/A
CENTER DIVIDER PLATE AMP	1600	↓
CENTER TUBE SHEET AMP	3600	↓
CENTER NOZZLE AMP	2200	↓
BOTTOM OF BOWL AMP	1500	↓
12" INSIDE MANWAY RO-2A	1500	NO BETA
PLANE OF MANWAY RO-2A	1000	600
1' FROM MANWAY RO-2A	350	1350
3' FROM MANWAY RO-2A	120	240
CONTACT DIAPHRAGM INSTALLED RO-2A	800	N/A
12" DIAPHRAGM INSTALLED RO-2A	200	N/A
CONTACT BACKSIDE OF DIAPHRAGM REMOVED RO-2A	1500	13,500
12" BACKSIDE OF DIAPHRAGM REMOVED RO-2A	450	4650



AMP-100 #600294

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2		9		16		23		30					
3		10		17	N	24		31					
4		11		18	A	25		32					
5		12		19		26		33					
6		13		20		27		34					
7		14		21		28		35					

COUNTER: — SER.# —

COUNTER: — SER.# —

COMMENTS:

INITIAL SURVEY OF PRIMARY CHANNEL HEAD

INST. TYPE: RO-2A SER.# 1926

INST. TYPE: RO-20 SER.# 3160

SURVEYED BY: RHENNAU - P.Lt

TIME: 1635 DATE: 5/3/05

REVIEWED BY:

TIME: 1745 DATE: 5/4/05

Tommy Anderson

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)

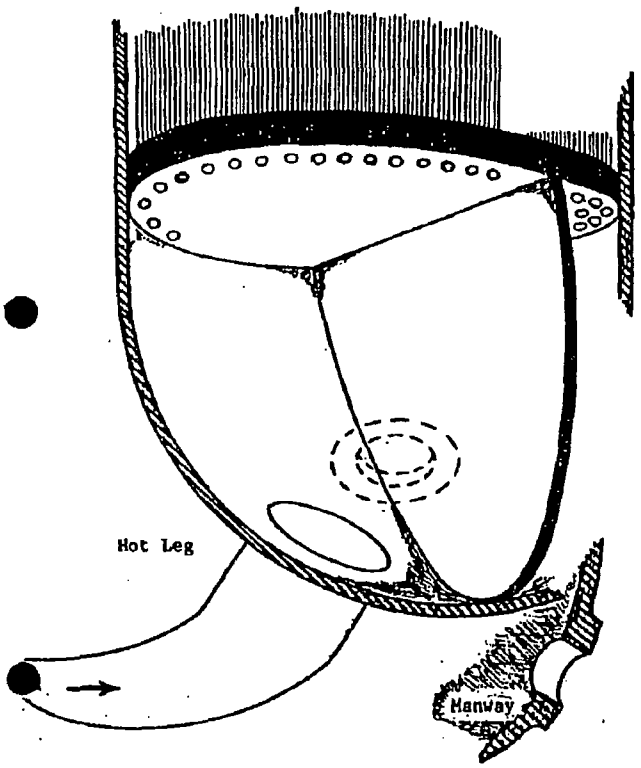
Attachment 1
RF15 (Spring 2005)

SURVEY # NA

"C" Steam Generator Primary Channel Head Survey

SWP/RWP# 05-0085

% POWER 0%



LOCATION	GAMMA	BETA
CENTER BOWL AMP	850	N/A
CENTER DIVIDER PLATE AMP	7600	↓
CENTER TUBE SHEET AMP	2200	
CENTER NOZZLE AMP	950	
BOTTOM OF BOWL AMP	850	↓
12" INSIDE MANWAY RO-2A	800	NO BETA
PLANE OF MANWAY RO-2A	300	900
1' FROM MANWAY RO-2A	150	450
3' FROM MANWAY RO-2A	50	30
CONTACT DIAPHRAGM INSTALLED RO-2A	300	N/A
12" DIAPHRAGM INSTALLED RO-2A	110	N/A
CONTACT BACKSIDE OF DIAPHRAGM REMOVED RO-2A	300	5100
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AMP-100 # 602094

CONTAMINATION IN DPM/100 CM2:

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4		11		18		25		32						
5		12		19	A	26		33						
6		13		20		27		34						
7		14		21		28		35						

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)

COUNTER: — SER.# —

COUNTER: — SER.# —

COMMENTS: INITIAL PRIMARY CHANNEL HEAD SURVEY

INST. TYPE: RO-2A SER.# 1926

INST. TYPE: RO-2 SER.# 2620

SURVEYED BY: RINEHART R-Lt

TIME: 1550 DATE: 5/3/05

REVIEWED BY: [signature]

TIME: 1745 DATE: 5/4/05

Tommy Anderson

Attachment 1
RF15 (Spring 2005)

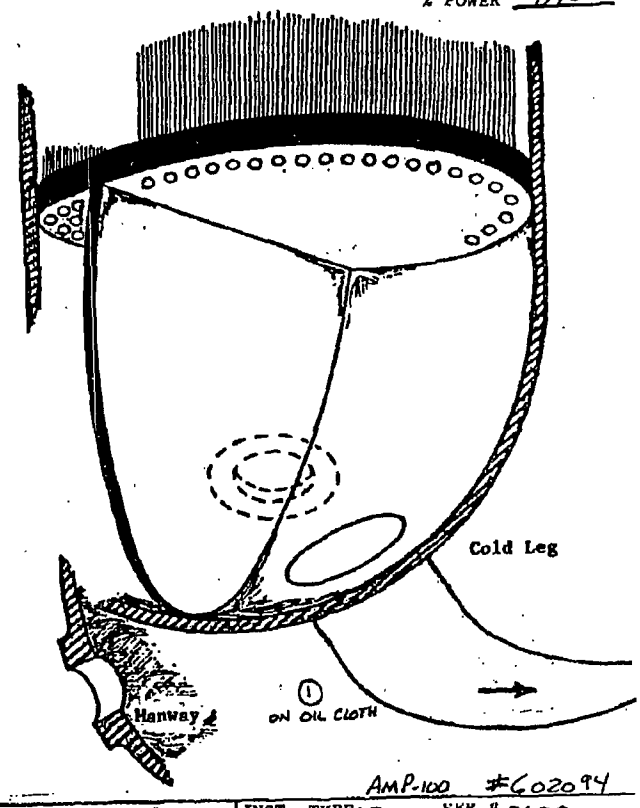
SURVEY # ____

SWP/RWP # 05-0085

% POWER 0%

"C" Steam Generator Primary Channel Head Survey

LOCATION	GAMMA	BETA
CENTER BOWL AMP	1500	N/A
CENTER DIVIDER PLATE AMP	1400	↓
CENTER TUBE SHEET AMP	4000	
CENTER NOZZLE AMP	2300	
BOTTOM OF BOWL AMP	1300	
12" INSIDE MANWAY RO-2A	2000	↓
PLANE OF MANWAY RO-2A	1000	1200
1' FROM MANWAY RO-2A	400	1200
3' FROM MANWAY RO-2A	100	360
CONTACT DIAPHRAGM INSTALLED RO-2A	1000	N/A
12" DIAPHRAGM INSTALLED RO-2A	400	N/A
CONTACT BACKSIDE OF DIAPHRAGM REMOVED RO-2A	1500	10,500
12" BACKSIDE OF DIAPHRAGM REMOVED RO-2A	600	4200



AMP-100 #C02094

CONTAMINATION IN DPM/100 CM²:

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4		11		18	A	25	32
5		12		19		26	33
6		13		20		27	34
7	↓	14		21		28	35

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)

COUNTER: — SER.# —

COUNTER: — SER.# —

COMMENTS:

INITIAL PRIMARY CHANNEL HEAD SURVEY

INST. TYPE: RO-2 SER.# 2620

INST. TYPE: RO-2A SER.# 1926

SURVEYED BY: R.WEHART R.L.T

TIME: 1600 DATE: 5/3/05

REVIEWED BY: [signature]

TIME: 1745 DATE: 5/4/05

Tommy Anderson

Attachment 1
RF15 (Spring 2005)

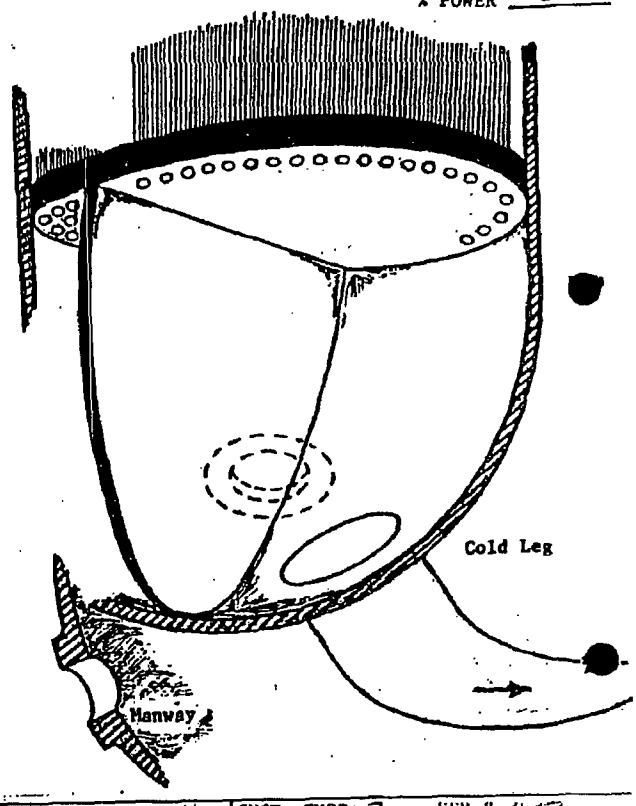
SURVEY # NA 1253

SWP/RWP # 05-0547 53

% POWER 0

"A" Steam Generator Primary Channel Head Survey

LOCATION	GAMMA	BETA
CENTER BOWL	1400	N/A
CENTER DIVIDER PLATE	1900	↓
CENTER TUBE SHEET	4000	
CENTER NOZZLE	1900	
BOTTOM OF BOWL	1500	↓
12" INSIDE MANWAY	1200	1500
PLANE OF MANWAY	700	1200
1' FROM MANWAY	260	500
3' FROM MANWAY	80	150
CONTACT DIAPHRAGM INSTALLED	400	N/A
12" DIAPHRAGM INSTALLED	260	↓
CONTACT BACKSIDE OF DIAPHRAGM REMOVED	1500	7000
12" BACKSIDE OF DIAPHRAGM REMOVED	700	3000



CONTAMINATION IN DPM/100 CM²:

1	8	15	22	29	
2	9	16	23	30	
3	10	17	24	31	
4	11	18	25	32	
5	12	19	26	33	
6	13	20	27	34	
7	14	21	28	35	

COUNTER: N/ SER.# N/

COUNTER: N/A SER.# N/A

COMMENTS:

INST. TYPE: RO20 SER.# 4653

INST. TYPE: HP-210 SER.# 602084

SURVEYED BY: J. Thacker

TIME: 0420 DATE: 5/4/05

REVIEWED BY: Frank Flaucher

TIME 2215 DATE: 5-4-05

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)

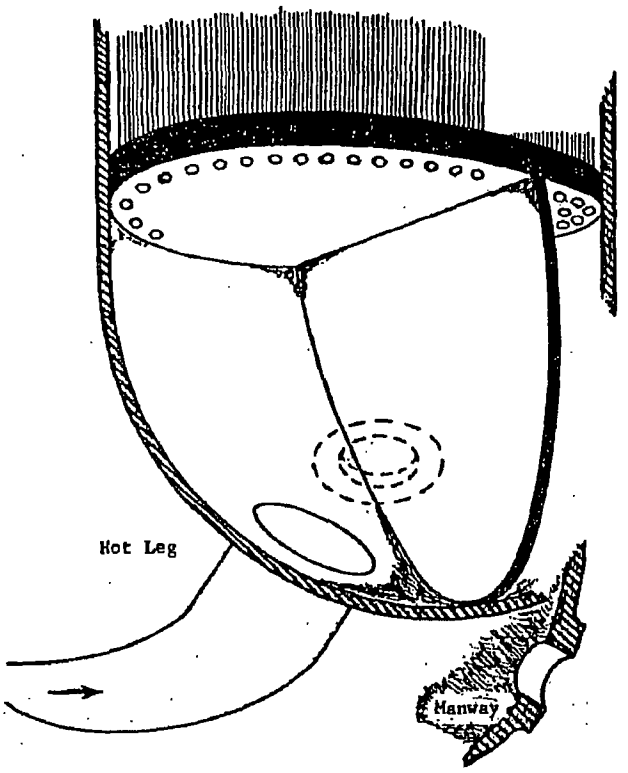
Attachment 1
RF15 (Spring 2005)

SURVEY # N/A

"A" Steam Generator Primary Channel Head Survey

SWP/RWP# 05-0744 80 SN100

% POWER 0



(uncorrected)

LOCATION	GAMMA	BETA
CENTER BOWL	860	N/A
CENTER DIVIDER PLATE	860	↓
CENTER TUBE SHEET	2500	
CENTER NOZZLE	1000	
BOTTOM OF BOWL	1000	
12" INSIDE MANWAY	800	1200
PLANE OF MANWAY	600	400
1' FROM MANWAY	150	500
3' FROM MANWAY	90	150
CONTACT DIAPHRAGM INSTALLED	300	90 5/4/05 400
12" DIAPHRAGM INSTALLED	100	N/A
CONTACT BACKSIDE OF DIAPHRAGM REMOVED	500	5000
12" BACKSIDE OF DIAPHRAGM REMOVED	220	1000

CONTAMINATION IN DPM/100 CM2:

1	20K	8		15		22	29
2	10K	9		16		23	30
3	<1K	10		17		24	31
4	15K	11		18		25	32
5	15K	12		19		26	33
6		13		20		27	34
7		14		21		28	35

COUNTER: Rm-145 SER.# 445 | INST. TYPE: RO20 SER.# 4653

COUNTER: —— SER.# —— | INST. TYPE: AMP-80 SER.# 202094

COMMENTS: Bkgd @ 120

SURVEYED BY: J. Thompson

TIME: 0615 DATE: 5/04/05

REVIEWED BY: RWC

TIME: 2200 DATE: 5-4-04

Spots taken at Platform

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)

SURVEY # _____

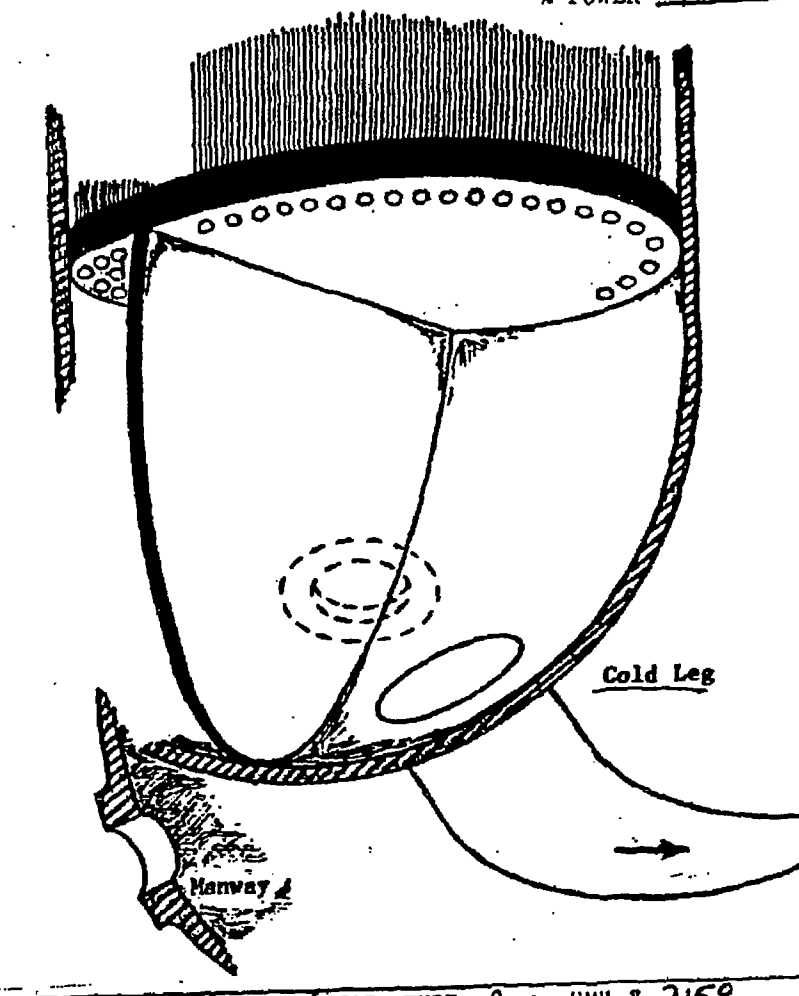
SWP/RWP# 4901

% POWER 8

"C" Steam Generator Primary Channel Head Survey

LOCATION	GAMMA	BETA
CENTER BOWL	1185	
CENTER DIVIDER PLATE	1250	
CENTER TUBE SHEET	3253	
CENTER NOZZLE	1392	
BOTTOM OF BOWL	1489	
12" INSIDE MANWAY	1151	
PLANE OF MANWAY	400	
1' FROM MANWAY	180	
3' FROM MANWAY	100	
CONTACT DIAPHRAGM INSTALLED	500	
12" DIAPHRAGM INSTALLED	220	
CONTACT BACKSIDE OF DIAPHRAGM REMOVED	800	14.4 R
12" BACKSIDE OF DIAPHRAGM REMOVED	200	
3Ft BACKSIDE OF DIAPHRAGM REMOVED	100	

CLOSED SHIELD DOOR CONTACT 250 / 90 @ 30cm



CONTAMINATION IN DPM/100 CM²:

1	8	15	22	29
2	9	16	23	30
3	10	17	24	31
4	11	18	25	32
5	12	19	26	33
6	13	20	27	34
7	14	21	28	35

COUNTER: SER.# _____

COUNTER: SER.# _____

COMMENTS:

INST. TYPE: RO20 SER.# 3158

INST. TYPE: AMP200 SER.# 602100

SURVEYED BY: W. BOSTON

TIME: 2200 DATE: 10-31-09

REVIEWED BY: W SMITH

TIME: 0315 DATE: 11/1/09

Test

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)

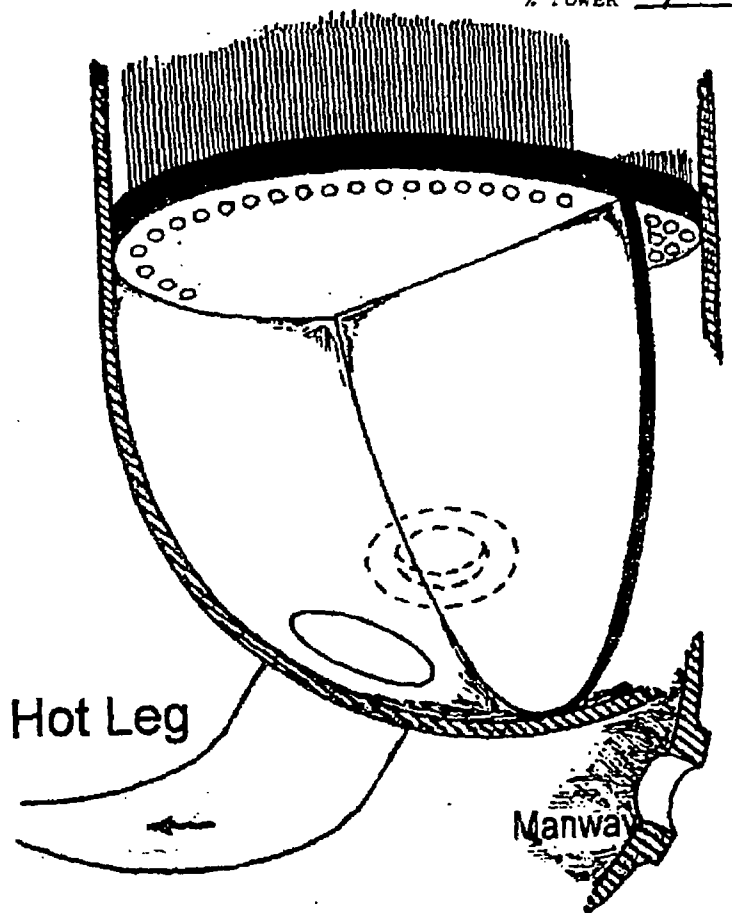
SURVEY # _____

SWP/RWP# 4901

% POWER 0

"C" Steam Generator Primary Channel Head Survey

LOCATION	GAMMA	BETA
CENTER BOWL	530	
CENTER DIVIDER PLATE	632	
CENTER TUBE SHEET	1687	
CENTER NOZZLE	668	
BOTTOM OF BOWL	645	
12" INSIDE MANWAY	485	
PLANE OF MANWAY	150	
1' FROM MANWAY	100	
3' FROM MANWAY	45	
CONTACT DIAPHRAGM INSTALLED	100	
12" DIAPHRAGM INSTALLED	40	
CONTACT BACKSIDE OF DIAPHRAGM REMOVED	300	3.4R
12" BACKSIDE OF DIAPHRAGM REMOVED	100	
3 FT BACKSIDE of DIAPHRAM REMOVED	30	
SHIELD DOOR CLOSED 130 CONTACT / 35 @ 30 CM		



CONTAMINATION IN DPM/100 CM²:

1	8	15	22	29
2	9	16	23	30
3	10	17	24	31
4	11	18	25	32
5	12	19	26	33
6	13	20	27	34
7	14	21	28	35

COUNTER: SER.#

COUNTER: SER.#

COMMENTS:

INST. TYPE: R020 SER.# 3158

INST. TYPE: AMP 100 SER.# 602100

SURVEYED BY: W. BOSTON

TIME: 2235 DATE: 10-31-09

REVIEWED BY: W. SMITH

TIME: 0315 DATE: 11/1/09 EST

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)

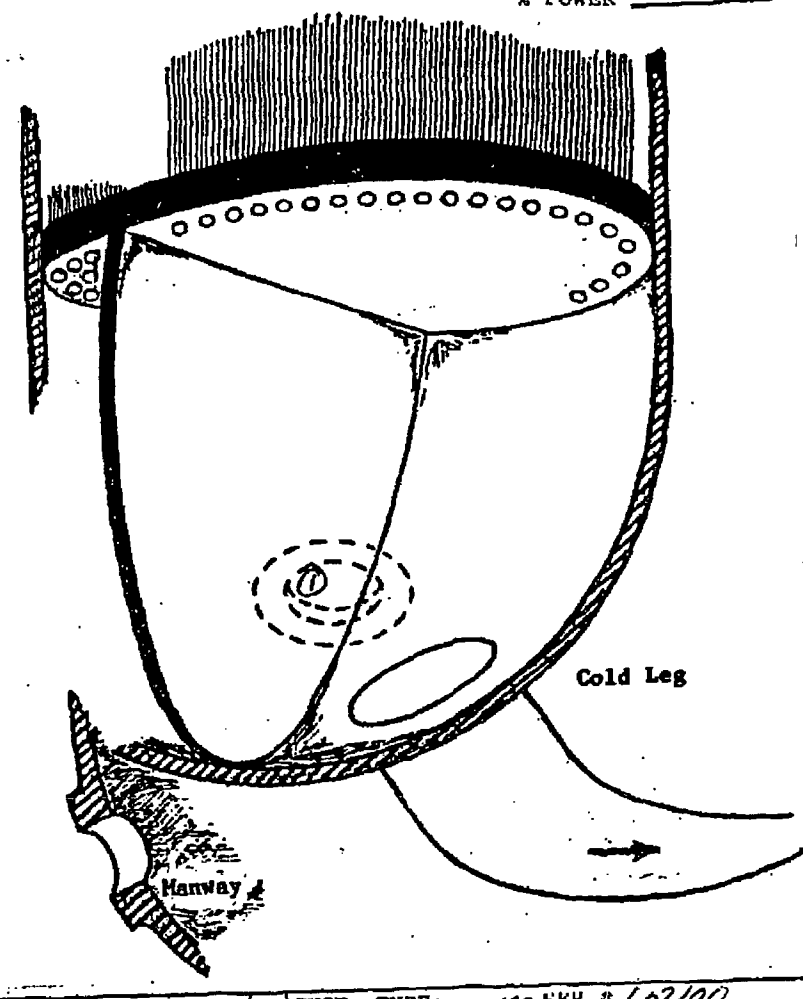
SURVEY # ____

SWP/RWP # 09-4901

% POWER 0

"B" Steam Generator Primary Channel Head Survey

LOCATION	GAMMA	BETA
CENTER BOWL	1296	
CENTER DIVIDER PLATE	1295	
CENTER TUBE SHEET	1247	
CENTER NOZZLE	3409	
BOTTOM OF BOWL	1857	
12" INSIDE MANWAY	1.3R	
PLANE OF MANWAY	1.2R	
1' FROM MANWAY	800	
3' FROM MANWAY	700	
CONTACT DIAPHRAGM INSTALLED	400	
12" DIAPHRAGM INSTALLED	250	
CONTACT BACKSIDE OF DIAPHRAGM REMOVED	350	2R
12" BACKSIDE OF DIAPHRAGM REMOVED	150	



Smear # 1 (diaphragm) → Chemistry # 2349

CONTAMINATION IN DPM/100 CM²:

1	80 mRad		8			15			22			29	
2			9			16			23			30	
3			10			17			24			31	
4	N		11	N		18	N		25	N		32	N
5		A	12		A	19		A	26		A	33	A
6			13			20			27			34	
7			14			21			28			35	

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)

COUNTER: N / SER.# N /

COUNTER: / A SER.# / A

COMMENTS:

INST. TYPE: Any 100 SER.# 602100

INST. TYPE: 1020 SER.# 357

SURVEYED BY: Grantham / Glasgow

TIME: 1700 DATE: 10-31-09

REVIEWED BY: W SMITH

TIME: 2020 DATE: 10/31/09

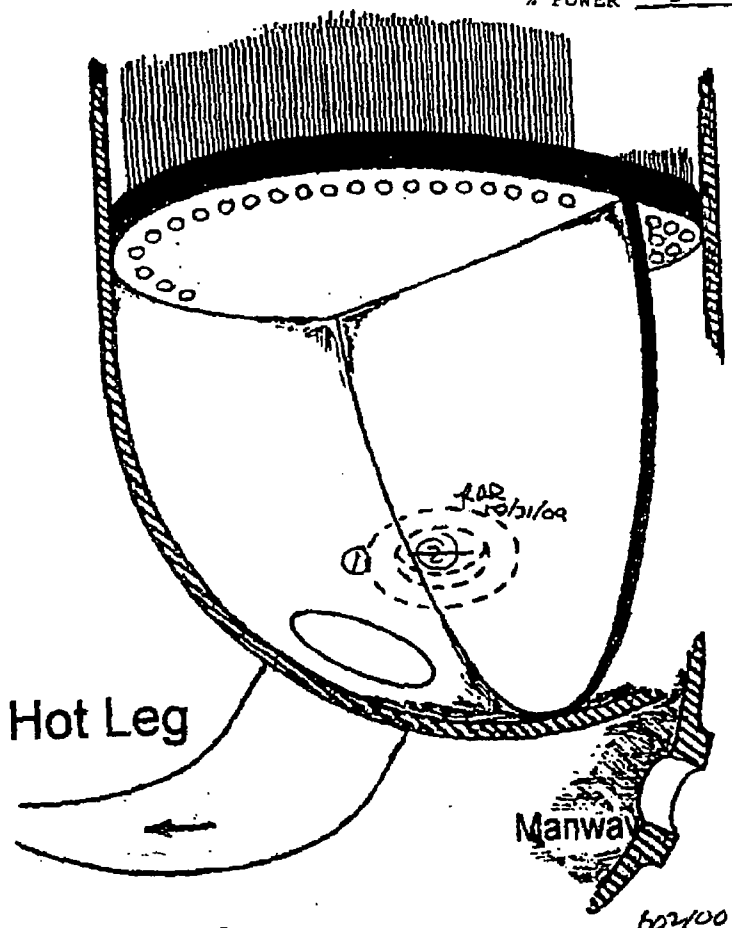
SURVEY # ~~

"B" Steam Generator Primary Channel Head Survey

SWP/RWP # 094901

% POWER 0

LOCATION	GAMMA	BETA
CENTER BOWL	901	
CENTER DIVIDER PLATE	783	
CENTER TUBE SHEET	1106	
CENTER NOZZLE	723	
BOTTOM OF BOWL	810	
12" INSIDE MANWAY	800	
PLANE OF MANWAY	300	
1' FROM MANWAY	150	
3' FROM MANWAY	~~200~~ 100	
CONTACT DIAPHRAGM INSTALLED	200	
12" DIAPHRAGM INSTALLED	80	
CONTACT BACKSIDE OF DIAPHRAGM REMOVED	300	IR
12" BACKSIDE OF DIAPHRAGM REMOVED	100	—



smear # 1 (diaphragm) → chemistry # 2350

602/100

CONTAMINATION IN DPM/100 CM²:

1	40 mRad		8			15			22			29		
2			9			16			23			30		
3			10	N	A	17	N	A	24	N	A	31	N	A
4	N	A	11			18			25			32		
5			12			19			26			33		
6			13			20			27			34		
7			14			21			28			35		

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)

COUNTER: SER.#

COUNTER: SER.#

COMMENTS:

INST. TYPE: Rmp/10 SER.# 620

INST. TYPE: RO 20 SER.# 3187

SURVEYED BY: Grantham / Robinson

TIME: 1700 DATE: 10-31-09

REVIEWED BY: W. Smith for S. Smith

TIME: 2020 DATE: 10/31/09

R. Smith / W

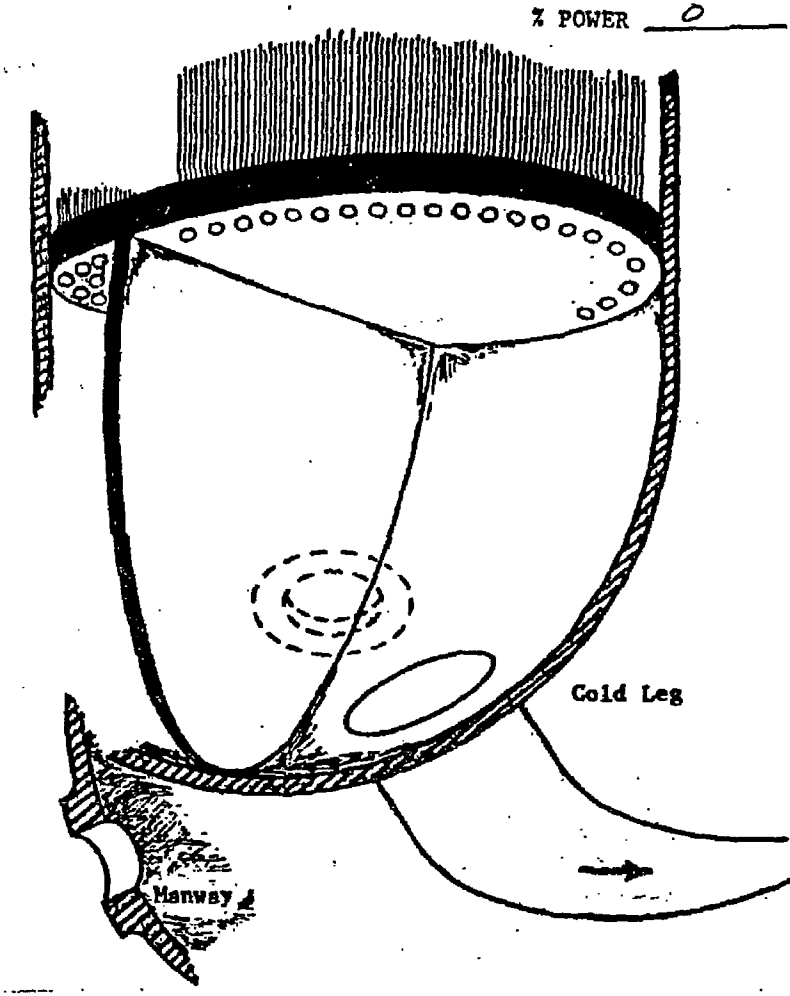
SURVEY # _____

"A" Steam Generator Primary Channel Head Survey

SWP/RWP # 09-4901

% POWER 0

LOCATION	GAMMA	BETA
CENTER BOWL	1338	N/A
CENTER DIVIDER PLATE	1238	
CENTER TUBE SHEET	3458	
CENTER NOZZLE	1804	
BOTTOM OF BOWL	1957	
12" INSIDE MANWAY	1200	
PLANE OF MANWAY	660	
1' FROM MANWAY	200	
3' FROM MANWAY	100	
CONTACT DIAPHRAGM INSTALLED	700	
12" DIAPHRAGM INSTALLED	250	N/A
CONTACT BACKSIDE OF DIAPHRAGM REMOVED	900	2R
12" BACKSIDE OF DIAPHRAGM REMOVED	200	N/A



CONTAMINATION IN DPM/100 CM²:

1	6-8 mrad	8		15		22		29						
2		9		16		23		30						
3		10		17		24		31						
4		11	N/A	18	N/A	25	N/A	32	N/A					
5	N/A	12		19		26		33						
6	N	13		20		27		34						
7		14		21		28		35						

COUNTER: N/A SER.# N/A

COUNTER: SER.#

COMMENTS: Smear #1 Taken on I/S of Diaphragm Smear #2 ~~#3~~ #1 Taken to Chemistry, Sample # 2347

INST. TYPE: AM-100 SER.# 602100

INST. TYPE: Ro-2 SER.# 3137

SURVEYED BY: [illegible] / Gleason

TIME: 1700 DATE: 10-31-09

REVIEWED BY: W. Smith

TIME: 2020 DATE: 10/31/09

T. Anderson / [illegible]

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)

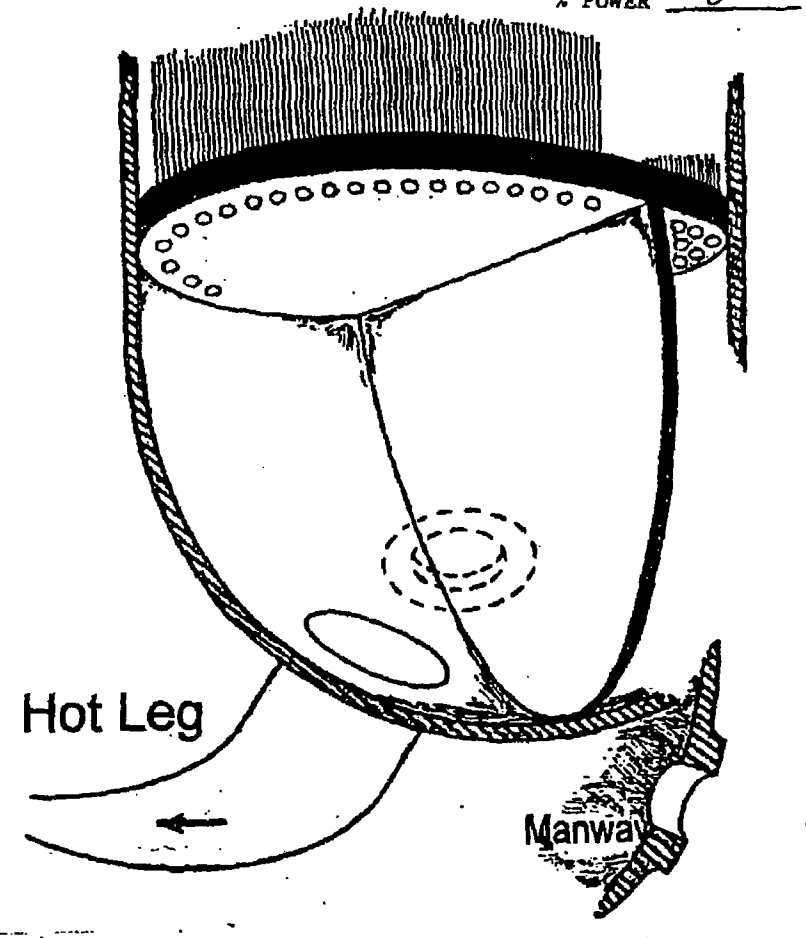
"A" Steam Generator Primary Channel Head Survey

SURVEY # _____

SWP/RWP# 09-4901

% POWER 0

LOCATION	GAMMA	BETA
CENTER BOWL	183	N/A
CENTER DIVIDER PLATE	746	
CENTER TUBE SHEET	727	
CENTER NOZZLE	944 Gamma Worms	
BOTTOM OF BOWL	870	
12" INSIDE MANWAY	608	
PLANE OF MANWAY	not 100 300	
1' FROM MANWAY	150	
3' FROM MANWAY	45	
CONTACT DIAPHRAGM INSTALLED	250	
12" DIAPHRAGM INSTALLED	120	
CONTACT BACKSIDE OF DIAPHRAGM REMOVED	250	2R
12" BACKSIDE OF DIAPHRAGM REMOVED	150	N/A



CONTAMINATION IN DPM/100 CM²:

1	20 MRAD	8		15		22		29					
2		9		16		23		30					
3		10		17		24		31					
4		11	N/A	18	N/A	25	N/A	32	N/A				
5	N/A	12	N/A	19	N/A	26	N/A	33	N/A				
6		13		20		27		34					
7		14		21		28		35					

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)

COUNTER: N/A SER.# N/A
INST. TYPE: Rad100 SER.# 602100

COUNTER: N/A SER.# N/A
INST. TYPE: RO-2 SER.# 2137

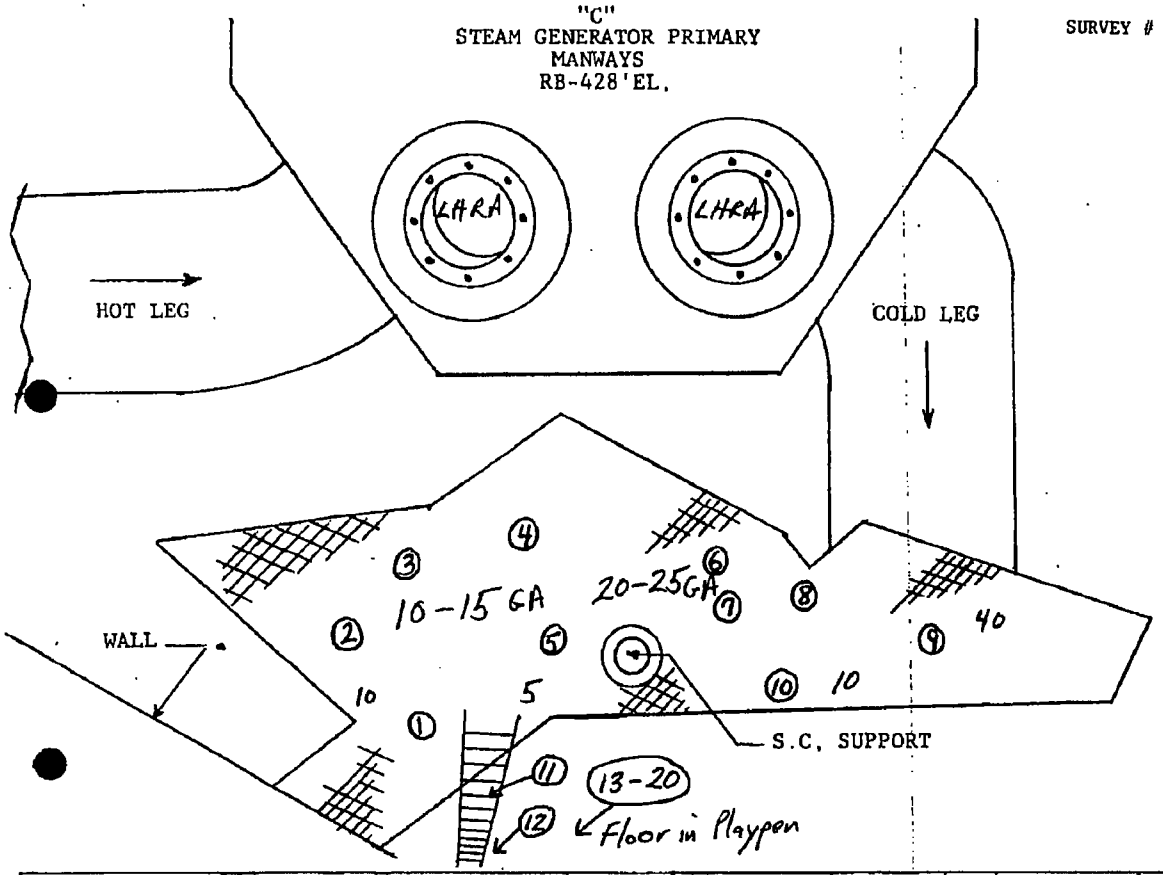
COMMENTS: SMEAR #1
TAKEN ON ITS OF DIAPHRAGM
SMEAR TAKEN TO CHEMISTRY
SAMPLE # 2346

SURVEYED BY: [illegible] / G Hayes
TIME: 1700 DATE: 10-31-09
REVIEWED BY: L.W. SMITH L.W. Smith
TIME: 2015 DATE: 10/31/09
T. ANDERSON / T. Anderson

Attachment 3
RF15 (Spring 2005)

"C"
STEAM GENERATOR PRIMARY
MANWAYS
RB-428'EL.

SURVEY # N/A
SWP/RWP# 05-084
% POWER 100%



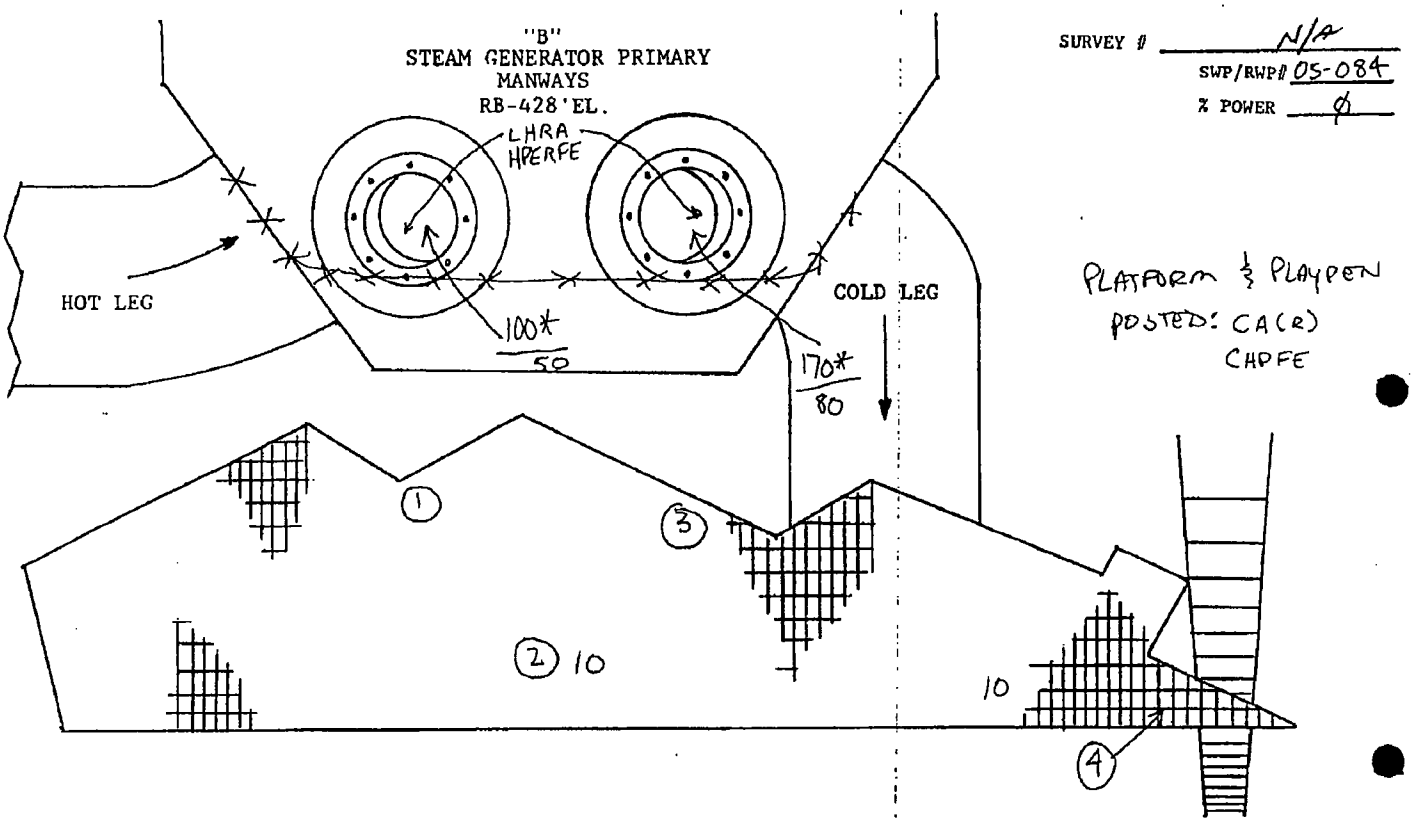
CONTAMINATION IN DPM/100 CM²:										COUNTER: RM-14 SER.# 4562	INST. TYPE: RO-2A SER.# 1140
1	20K	8	10K	15	25K	22	N/A	29	N/A	COUNTER: N/A SER.# N/A	INST. TYPE: N/A SER.# N/A
2	10K	9	40K	16	20K	23		30		COMMENTS: Post decon	SURVEYED BY: Todd Ellison RHRK
3	35K	10	15K	17	20K	24		31		Survey. Bowl posted	TIME: 1630 DATE: ~~05/03/05~~ MR 05/04/05
4	50K	11	30K	18	10K	25		32		LHRA. Loops posted	REVIEWED BY: [signature] 05/04/05
5	20K	12	10K	19	10K	26		33		HRA	TIME: 1829 DATE: 05/4/05
6	200K	13	20K	20	10K	27		34		RM-14 Bkgd = 140 cpm	
7	100K	14	50K	21	N/A	28		35			

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)

Attachment 3
RF15 (Spring 2005)

"B"
STEAM GENERATOR PRIMARY
MANWAYS
RB-428'EL.

SURVEY # N/A
SWP/RWP # 05-084
% POWER Ø



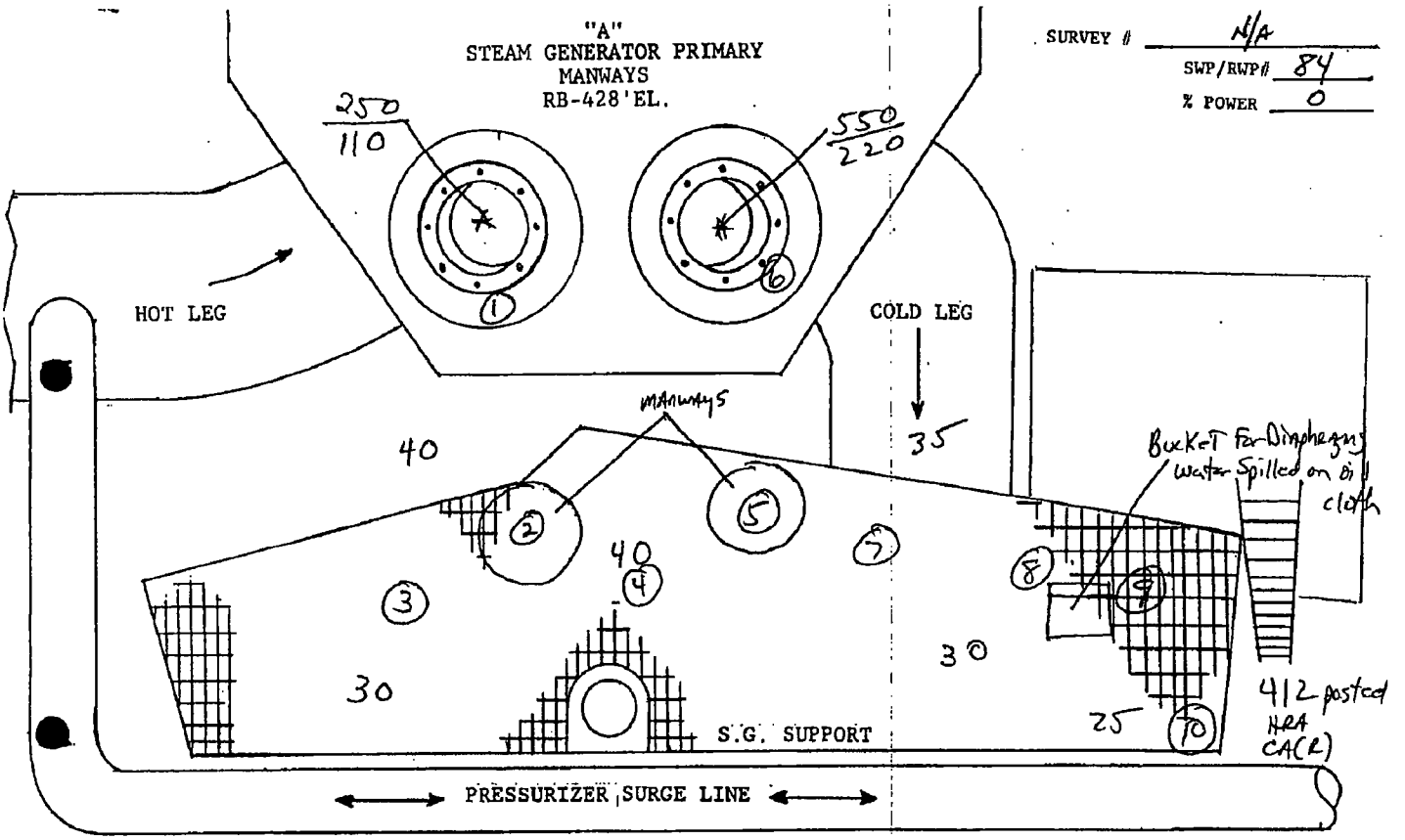
CONTAMINATION IN DPM/100 CM²:										COUNTER: RM-14 SER.# 4451	INST. TYPE: RO-20 SER.# 4653
1	2K	8	N/A	15	N/A	22	N/A	29	N/A	COUNTER: N/A SER.# N/A	INST. TYPE: N/A SER.# N/A
2	4K	9		16		23		30		COMMENTS: Post Decon	SURVEYED BY: T. Anderson / [illegible]
3	2K	10		17		24		31		Survey. Bag of	TIME: 1600 DATE: 5/5/05
4	12K	11		18		25		32		Old oil cloth 100*/60 Dmg Hc	REVIEWED BY: R. Everett - RP
5	N/A	12		19		26		33			TIME: 1815 DATE: 5/5/05
6	↓	13		20		27		34			
7	↓	14	↓	21	↓	28	↓	35	↓		

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)

Attachment 3
RF15 (Spring 2005)

"A"
STEAM GENERATOR PRIMARY
MANWAYS
RB-428'EL.

SURVEY # N/A
SWP/RWP# 84
% POWER 0

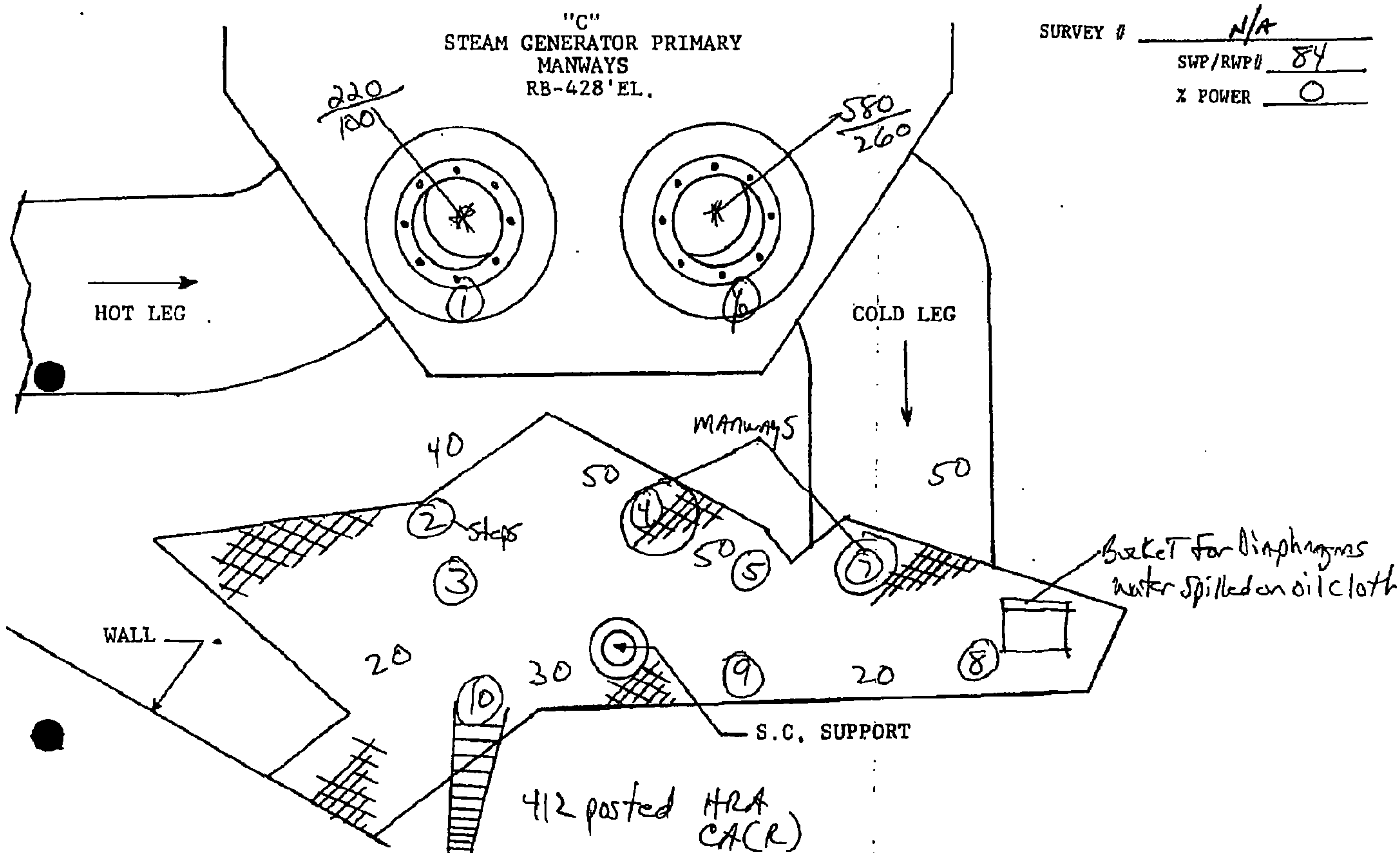


CONTAMINATION IN DPM/100 CM2:														
1	4 MAD	8	200 K	15		22		29	COUNTER: Rm 14	SER.# 4451	INST. TYPE: 2020	SER.# 4744
2	10	9	400 K	16		23		30	COUNTER: —	SER.# —	INST. TYPE: —	SER.# —
3	4	10	100 K	17		24		31	COMMENTS: RKG 250-300cpm		SURVEYED BY: Amerson/Kennedy	
4	8	11		18		25		32	Survey After diaphragm installation. Deposited Lifted		TIME: 1555 DATE: 5-9-05	
5	4	12		19		26		33	AT BOTH MANWAYS		REVIEWED BY: R. Elliott R-Ls	
6	8	13		20		27		34			TIME: 1730 DATE: 5/9/05	
7	10 √	14		21		28		35				

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)

Attachment 3
RF15 (Spring 2005)

SURVEY # N/A
SWP/RWP# 84
% POWER 0



CONTAMINATION IN DPM/100 CM2:										COUNTER: Rm14 SER.# 4451	INST. TYPE: RO20 SER.# 4744
1	10 mrad	8	80 mrad	15		22		29		COUNTER: — SER.# —	INST. TYPE: — SER.#
2	20	9	10	16		23		30		COMMENTS: BKG-250-300cpm	SURVEYED BY: A Martyn / [illegible]
3	10	10	10	17		24		31		Survey After installation of	TIME: 1645 DATE: 5/9/05
4	20	11		18		25		32		diaphragms.	REVIEWED BY: [illegible]
5	40	12		19		26		33		Deposted LHRA at both	TIME: 1730 DATE: 5/9/05
6	30	13		20		27		34		Manways	
7	40	14		21		28		35			

* DENOTES CONTACT READINGS, ALL OTHERS IN mR/hr UNLESS OTHERWISE NOTED (Beta/Gamma)