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RENBERGER,D.L. Washington Public Power Supply System
RECIP.NAME RECIPIENT AFFILIATION
YOUNGBLOOD,B.J. Licensing Branch 1

SUBJECT: Forwards addl info required for NRC to complete review of partial penetration weld substitution for sacrificial shield wall. Includes documents re shielding correction for shim gaps at elevation 541 inches to 5 ft & detailed drawings.

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Washington Public Power Supply System
A JOINT OPERATING AGENCY

P. O. Box 968 3000 Geo. Washington Way Richland, Washington 99352 Phone (509) 375-5000

mA)4

June 20, 1980
G02-80-131

Docket No. 50-397

Director, Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington D. C. 20555

Attention: Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing

Subject: WPPSS NUCLEAR PROJECT NO. 2
NRR APPROVAL OF WNP-2
SACRIFICIAL SHIELD WALL
WELD PREPARATION

Reference: WPPSS to NRR letter, G02-80-95, D. L. Renberger to H.R. Denton, subject, "Sacrificial Shield Wall Weld Preparation", April 25, 1980

Dear Mr. Youngblood:

Based on conversations with Mr. M. D. Lynch of your staff, it is our understanding that additional information is required in order for NRR to complete their review of the partial penetration weld substitution for the WNP-2 sacrificial shield wall. Details of this subject were provided in the reference. The purpose of this letter is to transmit to you additional information on two (2) items:

- o A detailed drawing illustrating the existing configuration at the proposed weld joint, showing existing welds which will be affected by the new weld, and
- o Detailed documents which demonstrate how the shielding correction will be accomplished for the shim gaps at El. 541'-5".

Enclosed are documents which address the above, including the draft response to Concern No. 2, associated with NRC Region V itemized concerns for the sacrificial shield wall.

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In addition, Mr. Lynch stated that questions on the reference should be received by the Supply System on or about June 26, 1980. Responses to these questions will be supplied to you as prepared. Mr. Lynch also mentioned a tentative date of July 22, 1980, for a meeting in your offices to discuss this subject. This date is satisfactory for us and thus, we request confirmation of this date from your part. We anxiously await the opportunity to meet with you.

Very truly yours,

D L Renberger

D. L. RENBERGER
Assistant Director
Technology

DLR/DCT/rmm

Attachments: Draft Response to Concern No. 2
Burns and Roe letter BRWP-F-80-456
Burns and Roe PED Nos. 215-M-2746, 215-M-3320, 215-M-3604
Sketch -1

cc: V. Stello - Director, NRC, Washington, D.C.
M.D. Lynch - NRC, Washington, D.C.
B. Wood - NUS
N.D. Lewis - EFSEC, Olympia, Washington
J.R. Lewis - BPA
R.E. Snaith - B&R, New York
J.J. Verderber - B&R, New York
J.M. Blas - B&R, New York
R.C. Root - B&R, Site
WNP-2 Files

STATE OF WASHINGTON)
) ss
COUNTY OF BENTON)

NRR APPROVAL OF WNP-2 SACRIFICIAL SHIELD WALL WELD PREPARATION

D. L. RENBERGER, Being first duly sworn, deposes and says: That he is the Assistant Director, Technology, for the WASHINGTON PUBLIC POWER SUPPLY SYSTEM, the applicant herein; that he is authorized to submit the foregoing on behalf of said applicant; that he has read the foregoing and knows the contents thereof; and believes the same to be true to the best of his knowledge.

DATED June 20, 1980

D L Renberger
D. L. RENBERGER

On this day personally appeared before me D. L. RENBERGER to me known to be the individual who executed the foregoing instrument and acknowledged that he signed the same as his free act and deed for the uses and purposes therein mentioned.

GIVEN under my hand and seal this 20 day of June, 1980

Barbara F. Gotham
Notary Public in and for the State of Washington
Residing at Richland, WA

CONCERN NO. 2

Voids in the concrete have been identified in the SSW. The voids recently identified may affect the previously accepted corrective action plan, due to the potential increase in magnitude of the void problem. This plan may involve use of the operating plant to confirm adequate shielding and/or detect additional voids. Shim gap voids also exist between rings 3 and 4 of the SSW (refer to Concern No. 1).

BACKGROUND

I. A 100% inspection survey reveals the existence of forty (40) gaps between shims at elevation 541'-5". This concern is documented by this survey and on NCR-215-5688.

II. A concrete void was discovered in an upper SSW compartment (315^{o}) while chasing a linear indication on the outside of the wall. This void was documented via NCR-215-3698. Two more concrete voids were discovered at the upper corners of a compartment located above elevation 541'-5" ($\emptyset = 0^{o} - 15^{o}$) after removal of a skin plate to inspect for plug welds. This concern is documented on NCR-215-4884. Discovery of these voids makes locations of similar geometry and fill procedure suspect.

III. Shielding Design Aspects of the Sacrificial Shield Wall

A. Function

The sacrificial shield wall (SSW) is designed to shield electrical and mechanical components, some of which are safety-related, from excess operational radiation which may impair their design functions. In addition, it shields personnel in the drywell during shutdown. These shielding functions are independent of any structural considerations.

B. Design Concept

The SSW design concept is based on General Electric criteria and consists of two feet of ordinary concrete between steel skin plates in addition to an outer two inches of steel shielding plate in the active core region.

C. Method of Shielding Analysis

The analytical method consisted of using the NRN one-dimensional removal- diffusion computer code to calculate the neutron flux distribution from the core through the vessel, sacrificial shield and biological walls. Calculated thermal neutron flux distributions were used to generate capture sources, in addition to prompt fission and fission product gamma rays, were calculated with the QAD point-kernal computer code.

Confirmation of the SSW shield design was done with the ANISN one-dimensional discrete-ordinates computer code, in a P_8 S_8 mode, using the CASK coupled neutron-gamma ray cross section data set. This analytical approach is the current standard design tool for transport calculations of this problem type. This design method is currently being benchmarked by various organizations, including ANS, EPRI and the NRC.

The ANISN results confirm the shielding adequacy of the SSW; and, indeed, show that the original NRN results were conservative.

D. Comparisons With Other Results

Calculated dose rates in the drywell are similar to those experienced at other operating BWR plants and to calculated results reported by SAI/EPRI, S&W, and GE. Thus, the SSW shield design is adequate to shield the safety-related components from radiation during the design plant life.

CONCERN RESOLUTION

The following outline presents the resolution, implementation and verification program to be implemented to resolve the two (2) aforementioned concerns.

I. Gaps Between Shims at the 541'-5" Elevation of the SSW.

A. Examination

1. Survey at the 541'-5" elevation was performed on December 14, 1979 through December 18, 1979.

2. Location of all gaps, outline dimensions, depth of gaps, and adjacent shim penetration were all documented during this survey.

3. 100% inspection from 0^{o} to 360^{o} was performed.

B. Concerns

1. Forty (40) gaps between shims have been located and documented.

2. The gaps vary in area and radial penetration. Twenty-five (25) gaps extend the full radial thickness of the SSW. The largest gap area is 5/8" x 2-1/2".

3. The 541'-5" elevation is 2-1/2" above the bottom of the active core zone.

4. The gaps represent potential radiation windows.

C. Resolution

1. Back dam all gaps where required.

2. Apply BISCO NS-1 product (high density) into gap.

3. Allow to cure.

4. Examine gap for proper fill.

5. Insert thin sheet of insulatory material.

6. Insert backing ring (for weld).(a)

7. Make 2" circumferential weld.(a)

8. Back-up verification with Startup radiation scan program.

D. Prototype Testing and Verification of Methodology

1. Construct channels which simulate detected gaps.

2. Perform steps C.1 through C.4 above.

3. Develop procedure until fill is consistently verified.

4. Prototype testing was successfully completed at the WNP-2 site on May 29, 1980.

5. Construct mock-up (with four gaps) that simulate wall configuration for 2" circumferential weld.

(a) Refer to Concern No. 1 PEDs

6. Fill gaps with BISCO NS-1 (high density).

7. Install insulatory and backing ring materials.

8. Perform 2" circumferential weld.

9. Cut cross sections of mock-up.

10. Qualify shield material for heat input.

11. Mockup testing was successfully completed at the WNP-2 site on May 29, 1980.

E. Implementation

1. All work shall be performed after the 541'-5" elevation is arc-gouged and prepared for the 2" circumferential weld(a)

2. The 215 Contractor shall perform the following:

   a. Vacuum clean all gaps.

   b. Position man at nearest porthole to gap to observe inner gap.

   c. Back dam gaps where required.

   d. Apply BISCO NS-1 (high density) into gap as per approved final procedure based on prototype methodology.

   e. Insert insulatory material (for larger-type gaps).

   f. Cut out and insert backing ring (A36-steel) to fit outline of the gap.(a)

(a) Refer to Concern No. 1 PEDs.

3. Make 2" circumferential weld.(a)

4. Back-up verification with startup radiation scan program.

F. Back-Up Verification: Startup Radiation Scan Program

1. Purpose

a. Insure adequacy of fix program

b. Insure dose at location of safety-related components does not exceed design criteria.

2. Primary Detector Locations

a. Shim gap (Elevation 541'-5")

b. Locations of detected voids.

c. Random sampling in drywell (especially active core region) in areas of sensitive equipment.

3. Program (primary emphasis)

a. Measure total dose rate (neutron-gamma ray).

II. Concrete Voids in SSW

A. Concerns

1. "Suspect" void location is based on compartment geometry and concrete fill procedure (see Figures 4, 5 and 6 for illustration of the three Categories (I, II and III).

(a) Refer to Concern No. 1 PEDs.

2. Skin plate removed at 541'-5" elevation (0^{o} - 15^{o}) resulted in the discovery of concrete voids in the upper corners of this compartment (Category I). Another void was discovered at elevation 567' and azimuth 315^{o} which is in a Category III type compartment.

3. Possible existence of concrete voids in SSW compartments based on numbers 1 and 2 above.

4. The active core region from 539' to 552' is of primary concern because of the flux reduction beyond this region.

5. Voids in the active core zone (539' - 552') represent radiation windows.

B. Examination

1. One hundred percent (100%) inspection of "suspect" void locations for the 24 compartments (Category I) above 541'-5" elevation shall be performed. The reason for this is that these compartments were filled from the sides (rather than from the top), and because the existence of concrete voids at this location (elevation 544'-5") produces the most severe (mid-active core region) consequence.

2. One hundred percent (100%) inspection of Category III type compartments in the active core region shall be performed.

3. Random sampling inspection of other Category II and III type compartments shall be made. Sampling shall be expanded as required to achieve statistical level of confidence.

C. Resolution

1. Determine if concrete void exists at suspect location by either drilling 3/4" Ø hole and boroscoping or by using the pulse echo method developed by Portland Cement Association.

2. Based on number one (1) above, voids shall be filled by either pumping the shield material through a 1/2" Ø fill hole with a minimum 1/4" Ø vent at the top of the void location or by flowing (by gravity) the shield material through a 3/4" Ø hole at the top of the void location.

3. 1/4", 1/2", or 3/4" Ø holes shall either be plug welded or threaded and capped closed.

4. Above methodology shall be developed and verified through prototype testing.

5. Shield material shall be BISCO NS1 (high density) or Owner approved equivalent.

D. Prototype Testing

1. Identify six (6) compartments at the 541'-5" elevation (high suspect - Category I) that are accessible and where the skin plates can readily be removed.

2. Choose two (2) of the six (6) skin plate/compartments.

   a. Utilize pulse echo method (microseismic technique) to look for voids at upper corners of the compartment (high suspect).

b. Drill 3/4" Ø holes and boroscope to look for voids at upper corners of the compartment.

c. Based on b above, drill 1/2" Ø hole at most extreme distance from first hole that will still hit the void.

d. Remove skin plates.

e. Verify pulse echo technique and interpretation, drill technique and boroscopic interpretation, and location of 1/2" Ø hole with respect to actual void location.

f. Develop procedure until exploration and drill technique is consistently verified.

3. For the remaining four (4) skin plate/compartments perform alternate 'fill' techniques as follows.

a. Perform steps 2.a and 2.b above.

b. For half the voids discovered, flow (by gravity) the shield material through the 3/4" Ø hole at the top of the void location.

c. Perform step 2.c above for the remaining void locations.

d. Pump shield material through 1/2" Ø fill hole and vent air out through 3/4" top hole for the remaining void locations.

e. Allow shield material to cure.

f. Remove skin plates.

g. Develop procedure until 'fill" is consistently acceptable.

4. Note that if the six (6) compartments chosen do not provide enough voids as a data base for acceptance, then a mock-up compartment will be constructed off-site that will depict the Category I type compartment voids discovered and documented via NCR-215-4884. Prototype testing will then continue using this mock-up.

E. Implementation

1. The 215 Contractor shall perform the following work.

   a. Contractor shall explore for voids all suspect void locations commited to in II.B. This exploration shall be by an owner approved procedure based on prototype testing.

   b. The exploration program shall document thoroughly all major voids found in the SSW. (b)

   c. For all voids discovered, the contractor shall fill all voids per an owner approved procedure based on the prototype testing.

2. Back-up verification with startup radiation scan program.

F. Startup Radiation Scan Program

The scan program previsouly described will be used to provide confirmatory data.

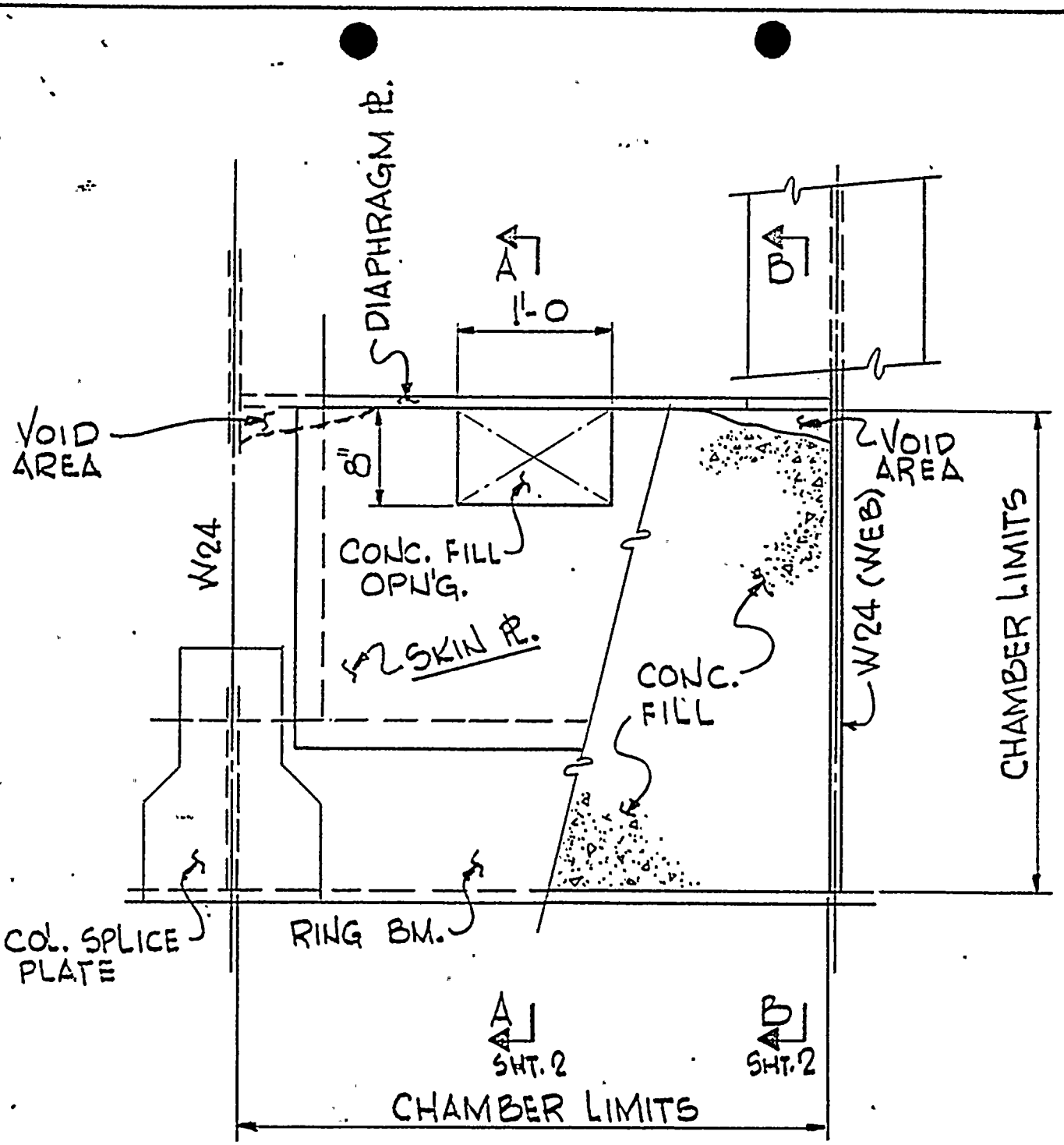
(b) Number of locations to be explored shall be expanded if numerous, large voids are found as a result of this exploratory drilling.

DISCUSSION

The resolution to the shim gap concern provides for 100% inspection and shielding repair of all gaps found at the 541'-5" elevation. The shielding material used shall be BISCO NS-1 (high density) which has the proper shielding, cohesion, adhesion, expansion, consistency and thermal properties which will insure a proper fill and has been confirmed by prototype testing. The prototype testing insures verification of methodology and of repair. The radiation scan program supplements that verification and provides confirmatory evidence of shielding adequacy. Prototype testing was successfully completed on May 29, 1980.

The resolution of the concrete void concern provides for 100% inspection and shielding repair of all highly "suspect" voids based on geometry and fill procedure (Category III in active core region and all Category I). All other locations will be random sampled and repaired as necessary. Sampling will be expanded if a statistical level of acceptance cannot be obtained. Exploration technique (drilling or pulse echo) and fill procedure (pressure grouting) will be verified through prototype testing. The radiation scan program supplements this verification while insuring shielding adequacy.

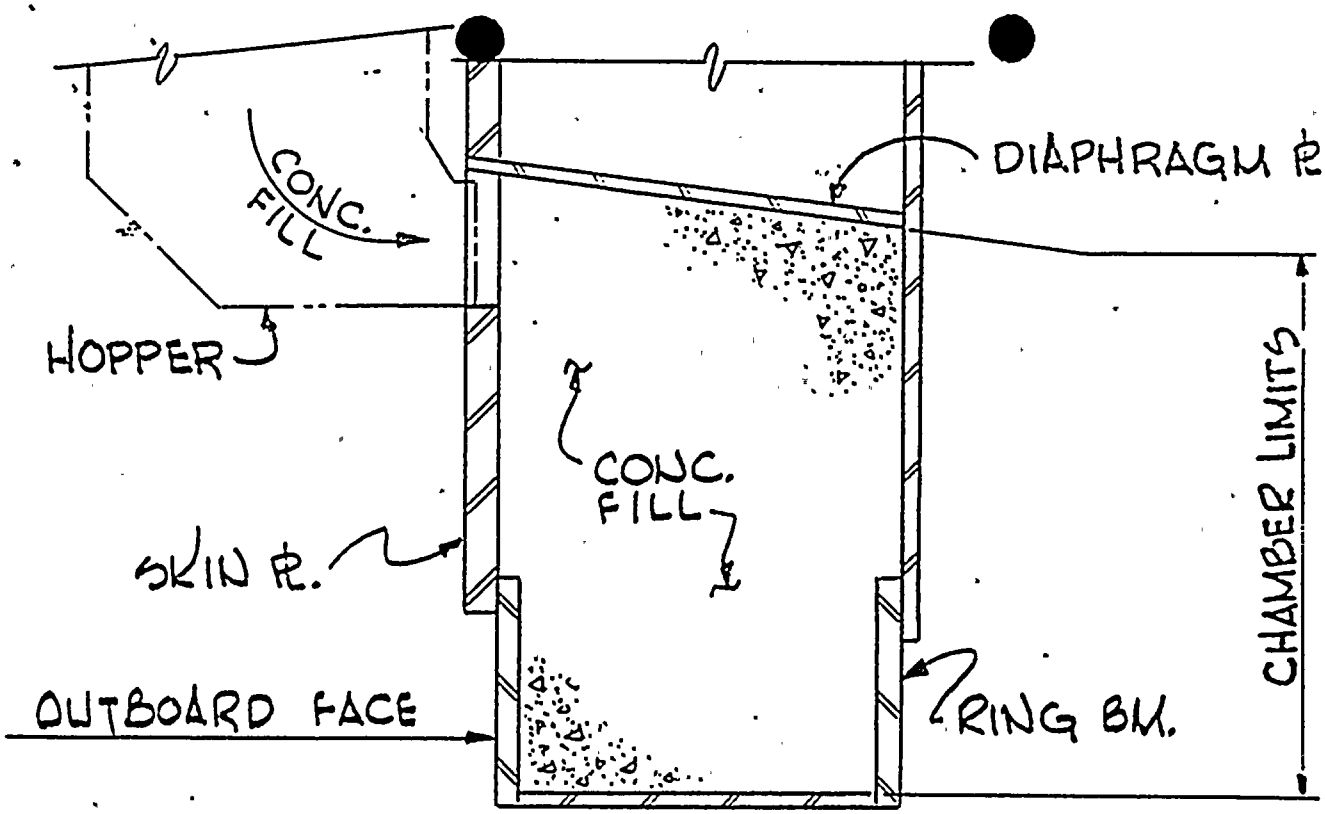
It should be noted that all work will be performed to approved procedures and shall be thoroughly documented. Full restoration of gaps and voids with material of greater shielding effectiveness than the original shield material (concrete) insures the shielding adequacy of the SSW.



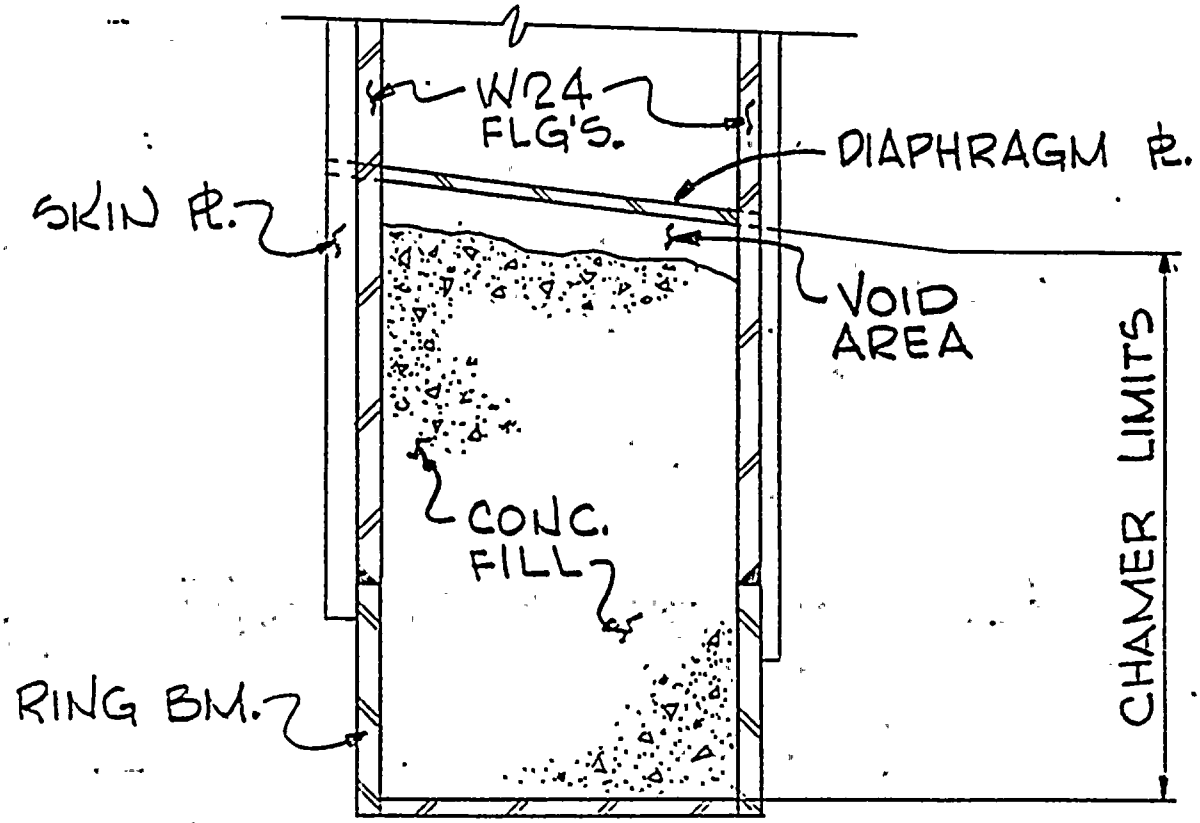
ELEVATION LOOKING @ OUTBOARD FACE OF SAC-SHIELD WALL

CATEGORY I

Figure 4-1

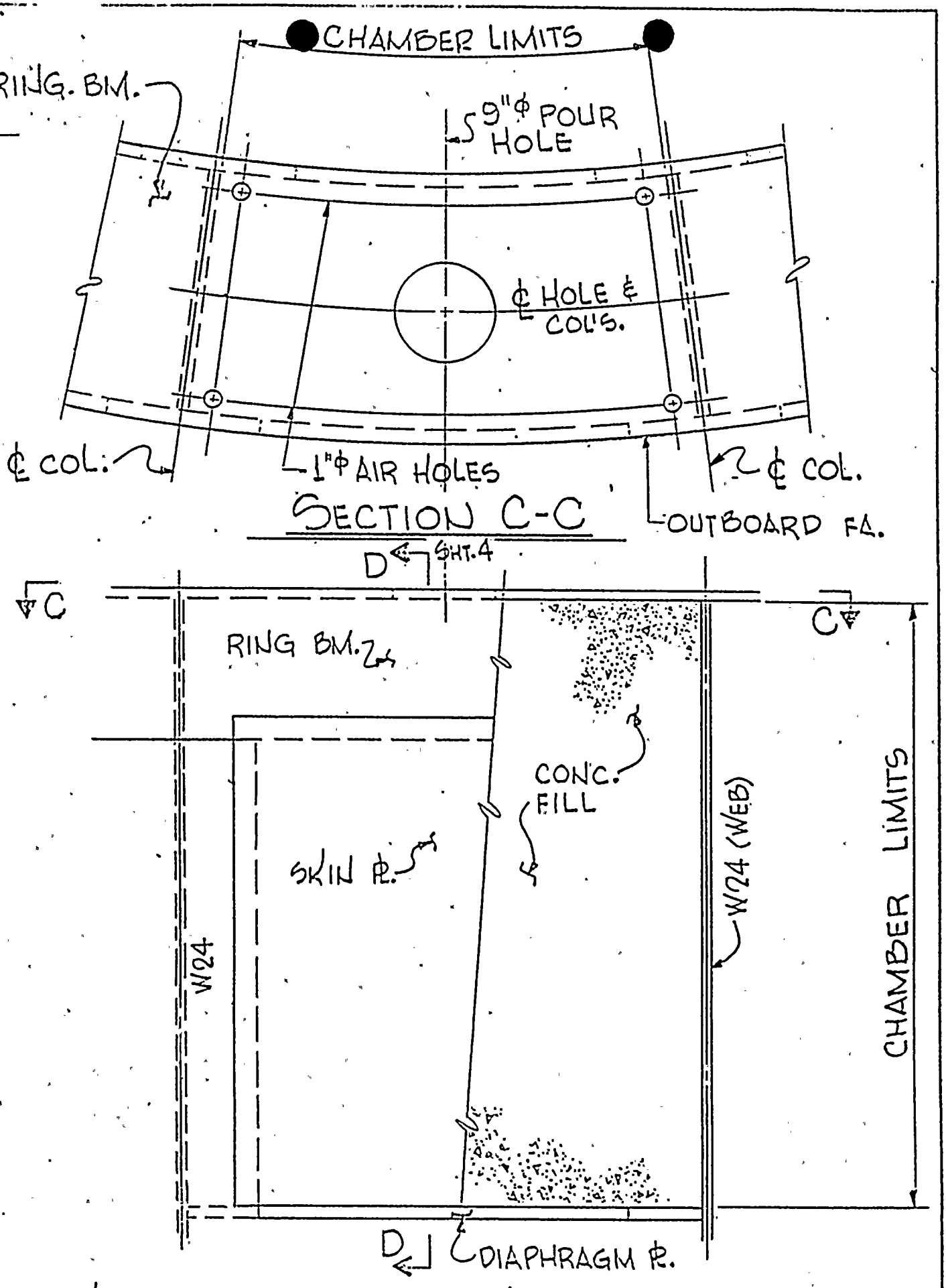


SECTION A-A



SECTION B-B

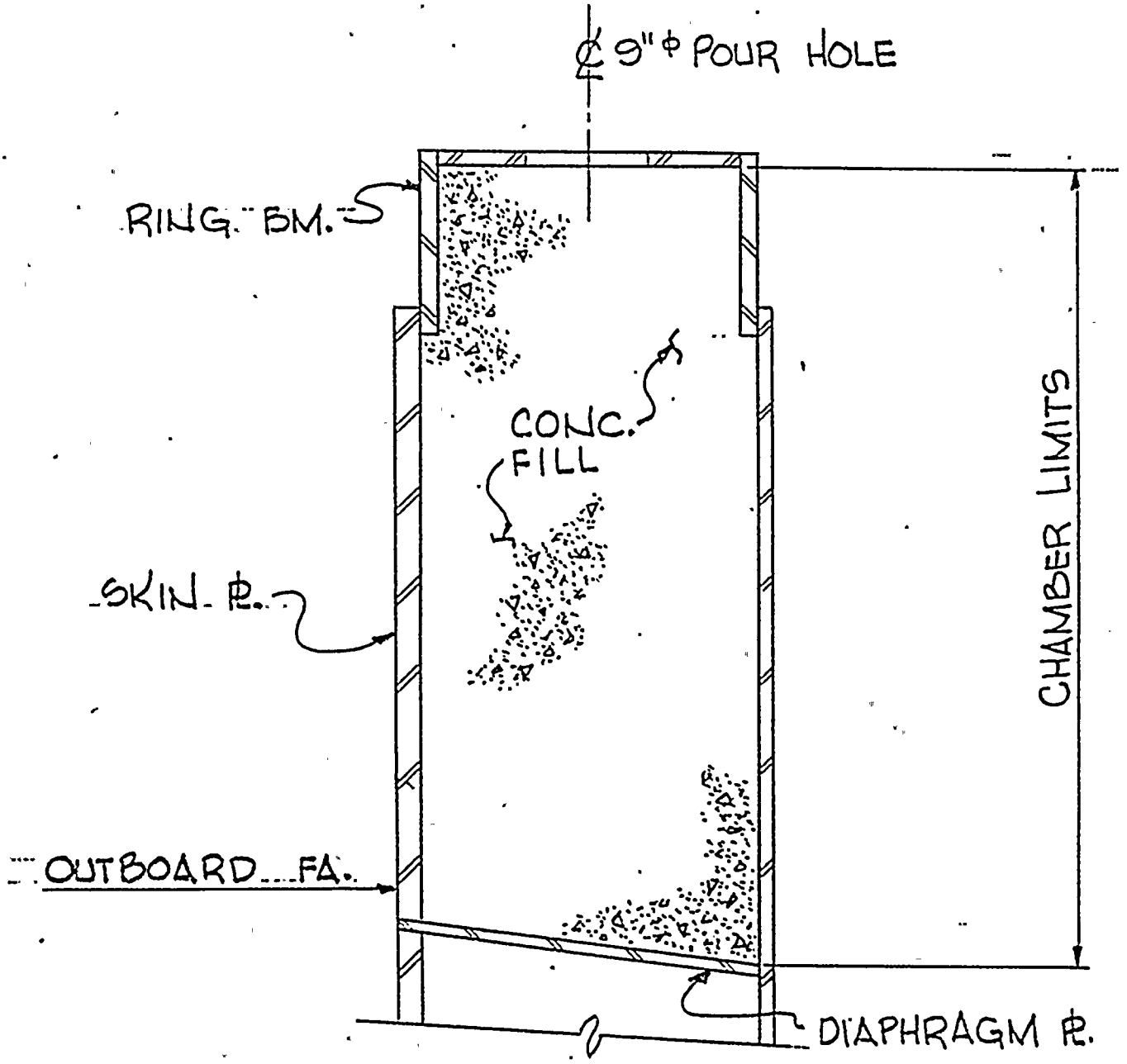
Figure 4-2



ELEV. LOOKING @ OUTBOARD FA. / SAC - SHIELD WALL

CATEGORY II

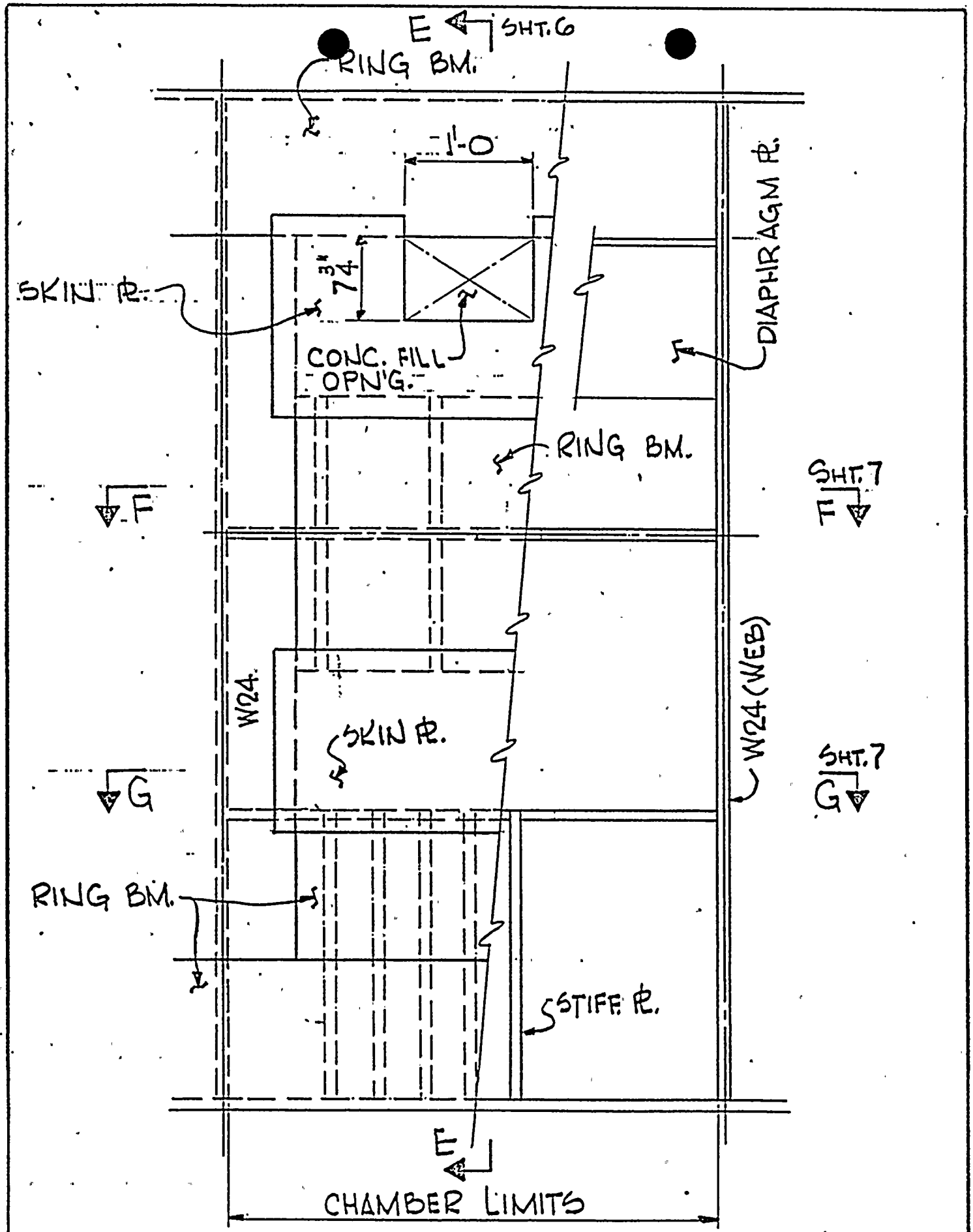
Figure 5-1



SECTION D-D

Figure 5-2

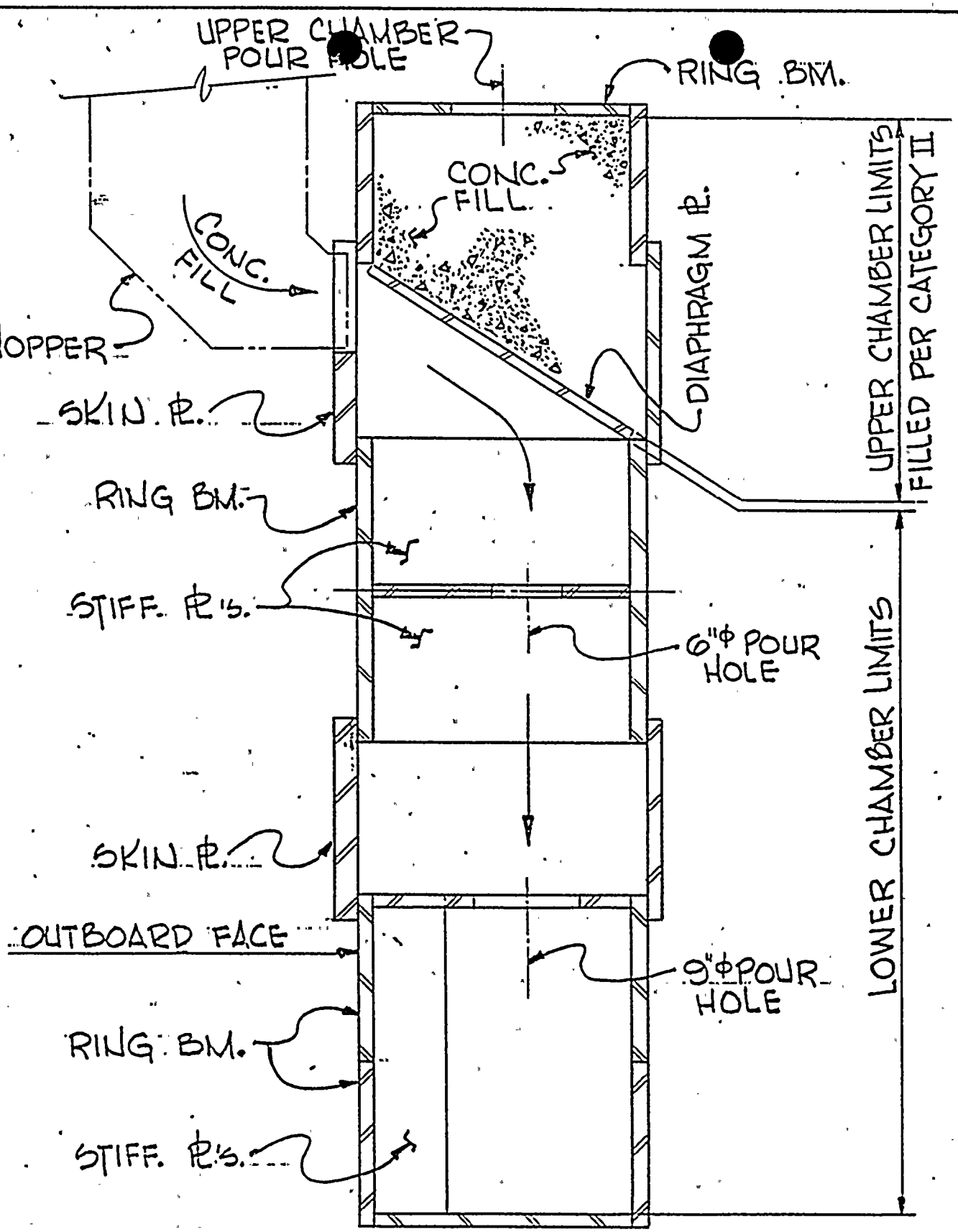
CATEGORY II



ELEV. LOOKING @ OUTBOARD FA./SAC.- SHIELD WALL

CATEGORY III

Figure 6-1



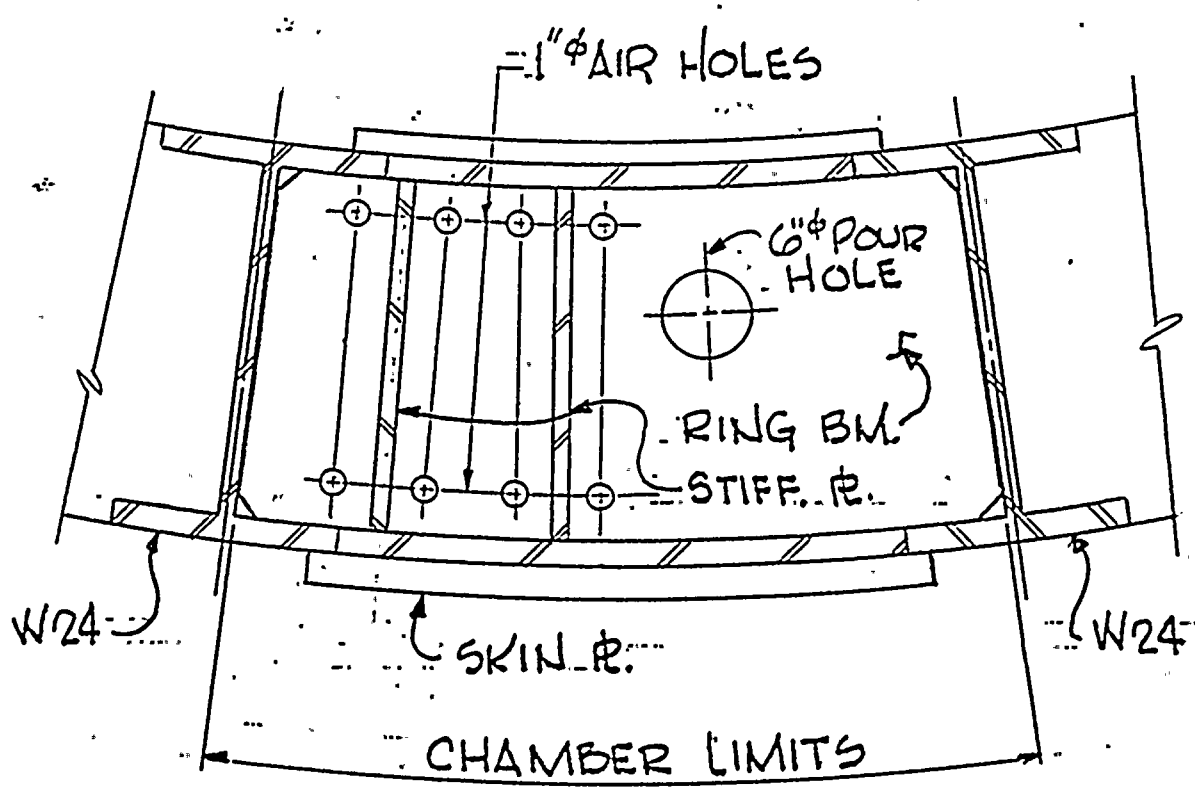
SECTION E-E

NOTE:

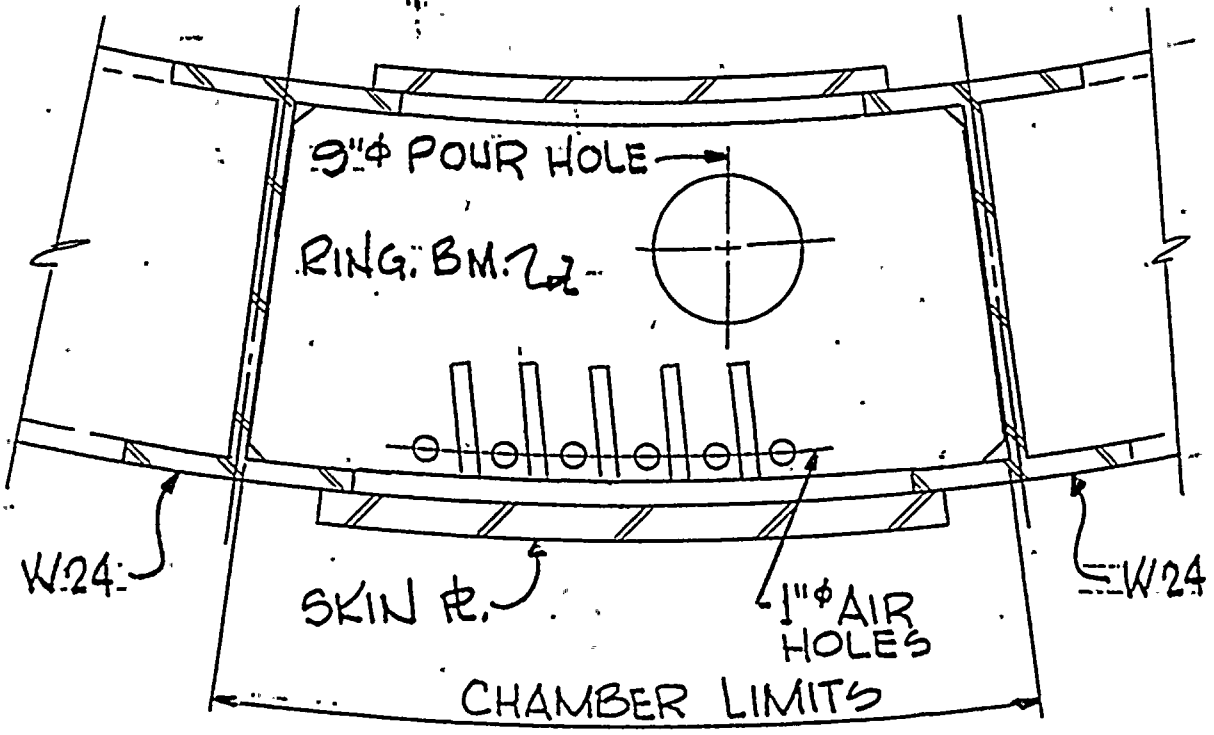
VOIDS SUSPECTED THROUGHOUT LOWER CHAMBER

CATEGORY III

Figure 6-2



SECTION F-F



SECTION G-G

Figure 6-3

CATEGORY III

Burns and Roe, Inc.

Nuclear Project No. 2 – WPPSS ■ P.O. Box 200 ■ Richland, Washington 99352 ■ Tele. 509–377-2301 Tele. 509–946-7621

SUBJECT: W.O. 2808
WPPSS Nuclear Project #2
SSW Shielding Evaluation Status Report

June 5, 1980
BRWP-F-80-456

Washington Public Power Supply System
P.O. Box 968
Richland, Wa. 99352

Attention: Mr. R.M. Foley

References: G02-80-28, dated 2/1/80
Docket Number 50-397, CPPR-93
SSW, Pipe Whip Restraints and Related Structures

Gentlemen:

This letter is in response to your verbal request for a status update concerning the SSW shim.gap concern and the SSW concrete void concern. The conceptual approach to resolving both these concerns is presented as concern number two (2) in the above referenced document. Since we are following very closely the commitments made in the original problem resolution, I will only present to you those deviations which have been or will be implemented. A current status of engineering work is also included for your convenience.

There are only four (4) deviations being implemented with respect to the original problem resolution:

a) We have elected not to use steel wool as a dam when shielding gaps. Prototype testing has shown that the cohesion and adhesion properties of the shield material are sufficient to fill small gaps (3/16" or less) without back damming. Larger gaps shall be back dammed with Babcock and Wilcox Roll Board or BISCO SE-Form (pre-fabricated) as was successfully demonstrated during prototype testing.

b) In all cases where we have previously specified Chemtree 120-26T or Owner approved equivalent for the shielding material, we have elected to use BISCO product NS-1 (high density). This product was extremely successful in our shim gap prototype testing. Furthermore, all the required certification and documentation can be provided with this material.

c) Examination for concrete voids in the SSW shall either be by drilling 3/4" Ø holes at "suspect" void locations (and boroscoping) or by utilizing an NDE microseismic technique (pulse echo method) developed by Portland Cement Association. Both possibilities shall be developed and verified during prototype testing as was originally committed to the NRC in the referenced report.

d) The filling of any voids found in the SSW shall be made by either pumping the shield material through a 1/2" Ø fill hole with a 1/4" Ø vent at the top of the void location or by flowing (by gravity) the shield material through a 3/4" Ø hole at the top of a particular void location. Again, final methodology will be developed and verified during prototype testing as was originally committed to the NRC in the referenced report.

The current status for these programs is as follows:

a) The SSW shim gap prototype testing was completed on May 29, 1980. The testing was a complete success and was thoroughly documented. We are currently awaiting finalized formal procedures from Contract 215 which are based on these test results. Project Engineering Directives (PED's) for the SSW Shim Gap Repair are as follows:

PED 215-M-2746
PED 215-M-3320
PED 215-M-3452
PED 215-M-3604

b) The details for the SSW concrete void repair are currently being prepared within the context of PED 215-M-3452. This PED is approximately 25% complete at this time. This PED shall incorporate all the commitments made in concern number two (2) of the referenced document and all deviations previously mentioned in this memo.

If you have any questions concerning this matter, or would like to look over specimens from the completed prototype testing, please do not hesitate to contact Fred S. Weingard in the RPE office.

Very truly yours

Mr. G.T. Harper, Jr.
Technical Support Manager

cc: WNP2 Files
WC Bibb
RM Foley
JR Lewis, BPA

GTH/FSW/lrg

BURNS AND ROE, INC.
WPPSS
NUCLEAR PROJECT
NO. 2

PROJECT ENGINEERING DIRECTIVE

CODE	PROJECT ENGINEERING DIRECTIVE
21	215 - M - 27 46
DATE	04/04/80
PRIORITY	I

REASON FOR P. E. D.:

To direct contract 215 to repair the forty (40) gaps between shims located at the 541'-5" elevation on the sacrificial shield wall (SSW). This repair is necessary to restore the shielding adequacey of the SSW at this elevation.

INFORMATION COPIES CS, W

SHEET 1 OF 6

REFERENCES	
SUBJECT	SSW Shim Gap Repair
LOCATION	541'-5" SSW: Containment
ENG. SYSTEM	N/A
S/U SYSTEM	N/A
QUALITY CLASS	I
ORIGINATING DOCUMENTS	SSW Task Force Action Plan Concern No. 2

DESCRIPTION OF WORK:

-Refer to sheets 2 through 6 of this PED-

NOTES

1. THIS PED REVISES DIRECTION PREVIOUSLY PROVIDED BY N/A THE FOLLOWING PED(s): ____

2. THIS PED VOIDS DIRECTION PREVIOUSLY PROVIDED BY N/A THE FOLLOWING PED(s): ____

3. THIS PED WORK SHOULD BE COORDINATED WITH KNOWN OTHER WORK UNDER THE FOLLOWING PED'S: PED-215-W-2749, PED-215-W-1604

4. THIS PED DEPENDS ON THE PRIOR INSTALLATION OF THE FOLLOWING PED'S: PED-215-W-2742

REVISE:

NONE X

DRAWINGS ____

SPECIFICATION ____

APPROVALS:

DISCIPLINE ENGINEER	DATE 4/4/80
LEAD DISCIPLINE ENGINEER	DATE 4/4/80
SUPERVISION ENGINEER	DATE 4.11.80
RESIDENT PROJECT ENGINEER	DATE 4-11-80

GENERAL DESCRIPTION

This PED directs contract 215 to repair the forty (40) gaps between shims that were identified and documented during the month of December, 1979. The survey that was performed at that time was documented and this documentation package (because of its bulk) will be provided to you by the owner (Fred S. Weingard, Ext. 2876) under separate cover. The survey identifies each gap numerically (# 1-40) and gives the azimuth for the centerline of each gap and all measured parameters of the gap. Each gap shall be repaired by filling with an Owner approved shielding material (to be specified later in this PED). Due to the nature of this repair, and as the result of commitments to the NRC, prototype testing shall be implemented to develop a verified procedure for repair.

The scheduling of all repairs shall be controlled by Construction Management. This work shall be implemented after PED-215-W-2742 is implemented for the area of concern and before PED-215-W-1604 is implemented in the area of concern. Technical direction for this repair shall be controlled by B&R Engineering (Fred S. Weingard, Ext. 2876). All work to be done by contract 215, as directed by this PED, shall be done to Owner approved, Quality Class I, procedures and shall be implemented only with a B&R Engineering representative present at all times.

It should be noted that throughout the context of this PED, contract 215 is directed to procure the products and/or services of Brand Industrial Services, Inc. (BISCO). It is highly recommended that contract 215 work these requests through their BISCO sub-contractor on site. To assist in this effort, the following contacts are provided:

1. Mr. Mike Marsh, BISCO site contact.
2. Mr. Jim Sherwood, Director of Marketing, BISCO.
3. Mr. James Anderson, Technical Support, BISCO.
4. Mr. Clayton W. Brown, Vice President, BISCO.

DETAILED DESCRIPTION

I. Material Specification.

Contract 215 shall procure enough shielding material to fill all the gaps in the SSW and to perform prototype testing. The total amount of shielding material required is (with conservatism) approximately that amount of shielding material capable of filling 2.5 cubic feet of volume. All shielding material brought on site shall be stored in strict accordance with manufacturer's recommendations.

The shielding material to be used shall be BISCO product NS-1 (high density). NO SUBSTITUTE shall be acceptable! NS-1 (high density) is a combination of BISCO's NS-1 binder and lead filler

REF DOC PCN -NA-	RFI -NA-	WPPSS NUCLEAR PROJECT NO. 2	
REF SPEC SECTION -NA- PAGE -NA- PARA -NA-		BURNS AND ROE, INC.	
REF DWG -NA-	DWG ZONE -NA-	PED 215-M-2746	SHT 2 OF 6
SCALE NONE	DRAWN DATE 4.4.80	TITLE. SSW Shim Gap Repair	
	CHKD DATE 4/10/80 APPVD DATE 4.4.80		

(11% by volume). A silicon based compound may be added to the mixture to cause foaming in a controlled manner. Expansion due to foaming may not exceed 1%-2% by volume. The total density of the final "as-installed" product (after curing and foaming) must be greater than or equal to that density of ordinary concrete which is 2.4 grams/cc or 150 lbs/ft^3. Certification must be provided that the "as-installed" mixture meets the above criteria.

The radiation shielding properties of the "as-installed" material must meet or exceed the shielding properties of ordinary concrete. The above criteria shall be documented via experimental data or by analytical modeling and computer programming such as with the ANISN program or others. This documentation shall also be transmitted to the Owner for approval prior to procurement of the material. The "as-installed" product shall be capable of withstanding an integrated dose of 2.0×10^{10} rads over the 40 year life of the plant. All radiation test reports for the material shall be transmitted to the Owner with a list of the following properties provided giving data before exposure and after exposure (if available):

1. Density
2. Composition (chemicals by % weight)
3. % Lead fill (by volume)
4. Composite flame spread:
   (a) ASTM E-84
   (b) ASTM E-162
   (c) ASTM E-119
5. Tensile strength
6. Elongation
7. Durometer (hardness)
8. Halogen content

The aforementioned test reports and property data shall be transmitted to the Owner for approval prior to procurement of the shielding material.

The thermal stability of the "as-installed" material must also be certified for the following concerns:

1. Continuous ambient temperature of 270^0 F for 40 years
   and
2. Short term heat input due to welding that might bring the temperature close to 600^0 F.

Note that certification for concern # 1 (above) may be extrapolated from shorter term data.

The construction features of this shielding material shall be such that it may be injected into a shim gap as small as 1/16 inch by 1/16 inch by 24 inches and after foaming and curing, fill this gap completely. The flow characteristics, cohesion, adhesion, and

REF DOC PCN -NA-	RFI -NA-	WPPSS NUCLEAR PROJECT NO. 2
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REF DWG -NA-	DWG ZONE -NA-	REF 215-M-2246 SH 3 REV 6
SUPPL NONE	DRAWN DATE 4-4-80	TITLE SSW · Shim Gap Repair
	CHKD DATE 4/11/80 APPVD DATE 4-4-80	

'pot life' properties of this material shall be such that the aforementioned gap size (1/16 x 1/16 x 24) will be filled completely at an ambient temperature of no greater than 100° F. The expected temperature range during filling (or injection) and curing shall be between 50° F. and 100° F.

The construction features and concern number two (2) of the thermal features shall be verified during prototype testing. It is imperative that the shield material be procured and delivered to the site as soon as possible.

II. Prototype Testing

A. The Owner shall provide a test fixture for prototype testing of the construction features of the shielding material. This test fixture consists of two (2) 1/2" x 18" x 2'0 3/4" plates for which varying shim stock may be inserted between the plates to simulate gaps between shims at the 541' 5" elevation of the SSW. The plates are held together by heavy duty "C" type clamps. The simulated gap sizes shall vary between:

1. Height: 1/16" to 5/8"
2. Circumferential length: 1/16" to 9"
3. Radial depths = shim depth on either side of gap shall either be 2' 0 3/4" or 1'0".

Note that the 2' 0 3/4" radial depth shim prototype represents straight-thru gaps as depicted in the survey data. The 1'0" radial depth shim prototype represents gaps where the shims on either side of the gaps do not extend the full radial depth of the SSW wall as indicated by the hooked probes during the shim gap survey. In both cases it shall be assumed that there is no backing for the flow of the shielding material into the gap. The backing and methodology for inserting backing shall be determined during prototype testing. It is recommended that oil free, steel wool be used for backing the gap, however, other methods suggested by contract 215 or BISCO may be tried to determine feasibility. Any material inserted as a backing (or a dam) for the shielding must be approved by the Owner. The chemical analysis of the backing (or dam) shall be submitted to the Owner for approval.

Prototype testing shall be implemented in the following stages:

1. Write a 'prototype procedure' delineating steps and controls.
2. The procedure should closely follow these steps:
   a. insert backing
   b. apply (pour or pressurize or inject) shield material - method of application shall be determined by BISCO
   c. let cure (and/or foam) - foam control and cure time established by BISCO
   d. remove "C" clamps and disassemble test fixture
   e. observe gap for complete fill (Owner must be present)

REF DOC PCN -NA-	RFI -NA-		WPPSS NUCLEAR PROJECT NO. 2
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SCALE NONE	DRAWN DATE 4-4-80	APPVD DATE 4-4-80	TITLE SSW Shim Gap Repair
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3. The Owner's representative will then decide if the 'fill' is acceptable. If the 'fill' is not acceptable, the 'prototype procedure' shall be modified to correct deficiencies and the contractor shall proceed back to step #1 above. If the 'fill' is deemed acceptable by the Owner's representative the 'prototype procedure' shall be implemented several more times for varying gap sizes and parameters (as directed by the Owner's representative). In any case, where the Owner's representative deems the results unacceptable, the 'prototype procedure' shall be modified to correct deficiencies and the entire test program shall be reinstated from the start.
4. Upon final acceptance of the 'prototype procedure' by the Owner's representative, the prototype testing shall be deemed complete and acceptable and a final formalized procedure shall be submitted to the Owner for approval.

B. The test fixture for the weld qualification delineated in PED-215-W-2749 shall contain a gap. This gap shall be filled by contract 215 per the finalized approved procedure written in accordance with #4 above. Welding shall be performed per the direction given in PED-215-W-2749, however, after welding the test fixture shall be (destructively) cut to qualify the weld and the shield material with respect to heat input concerns during welding. If the shield material is not acceptable to Owner after welding, a new test fixture (with a gap) shall be constructed in accordance with the requirements of PED-215-W-2749. The shield material shall again be injected per the approved finalized procedure, however, space shall be left for installation of an Owner-approved thermal insulator. BISCO has recommended Babcock and Wilcox ceramic fiber product Roll Board which can be inserted between the installed shielding and the backing ring for the weld. The appropriate weld shall then be made and the test fixture shall be cut to qualify the weld and shielding material again. If the heat input from the weld results in damage to the shield material that is deemed unacceptable by the Owner's representative, then the shield material shall be deemed unacceptable and a new material shall be located by the Owner. If this situation arises, new direction will be issued to contract 215 at that time. If the shield material passes either the first or second weld qualification test, then the shielding material shall be deemed "Owner approved" with the final installation procedure being modified to include the addition of a thermal insulator, if required.

Prototype testing shall be implemented as soon as the shield material is delivered to the site.

III. Repair of Shim Gaps.

A. After PED-215-W-2742 is implemented in a particular area of concern (work zone) and at the direction of contract management (CM), contract 215 shall 'clean out' all gaps in the work zone specified by CM. In no case shall cleaning involve blowing air (or liquid) into the gap. All cleaning of gaps shall be accomplished by vacuum technique. It is recommended that BISCO direct the cleaning of the gaps so as to insure the proper cleanliness for the injection of the Bisco shield product into the gap.

As was noted previously, all gaps and their locations are identified in the survey documentation package to be provided to you under separate cover.

B. For the gaps (in the work zone) identified to be repaired, contract 215 shall post a man in the nearest SSW door opening so that he can observe with a flashlight the inner openings of the gaps (if they are 'straight thru' or 'point thru'). Leakage out of these inner openings during filling shall be reported to the Owner's representative immediately.

C. The gaps shall be filled with the shielding material per the approved, finalized procedure which was determined during prototype testing. The safety precautions, as recommended by the manufacturer, shall be strictly adhered to during the mixing and curing process.

D. The repair crew shall go on to a new work zone at the direction of CM and shall proceed with the repair of those gaps in the work zone.

E. A procedure incorporating steps A through D above shall be submitted to the Owner.

IV. Scheduling.

It is anticipated that the shield repairing of the gaps will start in early May 1980. Prototype testing may be started as soon as the shielding material arrives on site. The prototype testing must be completed and approved by Owner prior to implementing the actual repairs on the SSW.

REF DOC PCN -NA-	RFI -NA-		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECTION -NA- PAGE -NA- PARA -NA-			BURNS AND ROE, INC.
REF DWG -NA-	DWG ZONE -NA-		REF 215-M-2746 SH 6 OF 6
SCALE	DRAWN RJN DATE 4-4-80		TITLE SSW Shim Gap Repair
	CHKD DATE 4/10/80	APPVD RJN DATE 4-4-80	

BURNS AND ROE, INC.
WPPSS
NUCLEAR PROJECT
NO. 2

PROJECT
ENGINEERING
DIRECTIVE

CODE	PROJECT ENGINEERING DIRECTIVE
? 1	2 1 5 - M - 3 3 2 0
1 2	3 4 5 6 7 8 9 10 11 12 13 14 15
DATE	0 5 / 0 5 / 8 0
X	16 17 X 18 19 X 20 21

PRIORITY
I - (Rush)

REASON FOR P. E. D.:

1. To expedite the initiation of prototypotesting as delineated on sheets 4 and 5 of PED-215-M-2746.
2. To delineate a different prototype test fixture as prescribed on sheet 4 of PED 215-M-2746. This new fixture will allow for several (4) gaps to be tested at one time and therefore decrease the overall prototype testing time which is dependent on the shield material cure time (10 hrs.)

INFORMATION COPIES

SHEET 1 OF 3

REFERENCES
SUBJECT SSW shim gap prototype testing
LOCATION off site
ENG. SYSTEM N/A
S/U SYSTEM I Procedures
QUALITY CLASS

ORIGINATING DOCUMENTS: Verbal with Mike Brewer on 5/2/80

DESCRIPTION OF WORK:

1.(a) Sheet 3 of 6 of PED 215-M-2746 requires (in two places) the transmittal of documentation to the owner for approval prior to procurement of the shielding material. This requirement shall be implemented for the shielding material to be installed in the SSW and does not apply to shielding material required on site for prototype testing. The purpose of this PED is to clarify the intent of those statements so as to expedite the initiation of prototype testing.

(b) In line with the above, Contract 215 is authorized to have the prototype testing shield material air-freighted to the site to reduce the delivery time.

2 (a) Revise sheet 4 of 6 of PED 215-M-2746 as per sheet 2 of 3 of this PED.

(b) Refer to figure 1 on sheet 3 of 3 of this PED. This figure delineates the test fixture required to perform prototype testing as called out in Sheet 2 of 3 of this PED.

*** Note that two (2) test fixtures are required by this PED. ***

NOTES

1. THIS PED REVISES DIRECTION PREVIOUSLY PROVIDED BY _____ THE FOLLOWING PED(s): Sht 4 of 215-M-2746
2. THIS PED VOIDS DIRECTION PREVIOUSLY PROVIDED BY _____ THE FOLLOWING PED(s): _____
3. THIS PED WORK SHOULD BE COORDINATED WITH KNOWN 215-M-2746 OTHER 215 WORK UNDER THE FOLLOWING PED'S: _____
4. THIS PED DEPENDS ON THE PRIOR INSTALLATION OF THE FOLLOWING PED'S: _____

REVISE:
NONE X
DRAWINGS _____
SPECIFICATION _____

APPROVALS:

Fred Wengard — 5.6.80
DISCIPLINE ENGINEER — DATE

Fred Wengard — 5-6-80
LEAD DISCIPLINE ENGINEER — DATE

R. Schlosser — 5-6-80
S/U LIAISON ENGINEER — DATE

R. Schlosser — 5-6-80
RESIDENT PROJECT ENGINEER — DATE

REV 1 BR 803-2

mentioned gap size (1/16 x 1/16 x 24) will be filled completely at an ambient temperature of no greater than 100° F. The expected temperature range during filling (or injection) and curing shall be between 80° F. and 100° F.

The construction features and concern number two (2) of the thermal features shall be verified during prototype testing. It is imperative that the shield material be procured and delivered to the site as soon as possible.

II. Prototype Testing

A. The Owner shall provide two identical test fixtures for PED 215-M-3320 prototype testing of the construction features of the shielding material. Each test fixture shall be capable of simulating four (4) owner prescribed gaps.. The test fixture shall consist of two (2) plates for which varying shim stock may be inserted between the plates to simulate gaps between the shims at the 541'5" elevation of the SSW. The plates are held together by heavy duty "C" type clamps. The test fixture and all dimensions are delineated in figure 1 on sheet 3 of 3 of PED 215-M-3320. The gaps prescribed in this figure are indicative of those found per the survey. Each fixture (set of four gaps) shall fulfill the requirement for varying gap sizes as called out in step 3 on sheet 5 of 6.

In all cases it shall be assumed that there is no backing for the flow of the shielding material into the gap. The backing and methodology for inserting backing shall be determined during prototype testing. It is recommended that oil free, steel wool be used for backing the gap, however, other methods suggested by contract 215 or BISCO may be tried to determine feasibility. Any material inserted as a backing (or a dam) for the shielding must be approved by the Owner. The chemical analysis of the backing (or dam) shall be submitted to the Owner for approval.

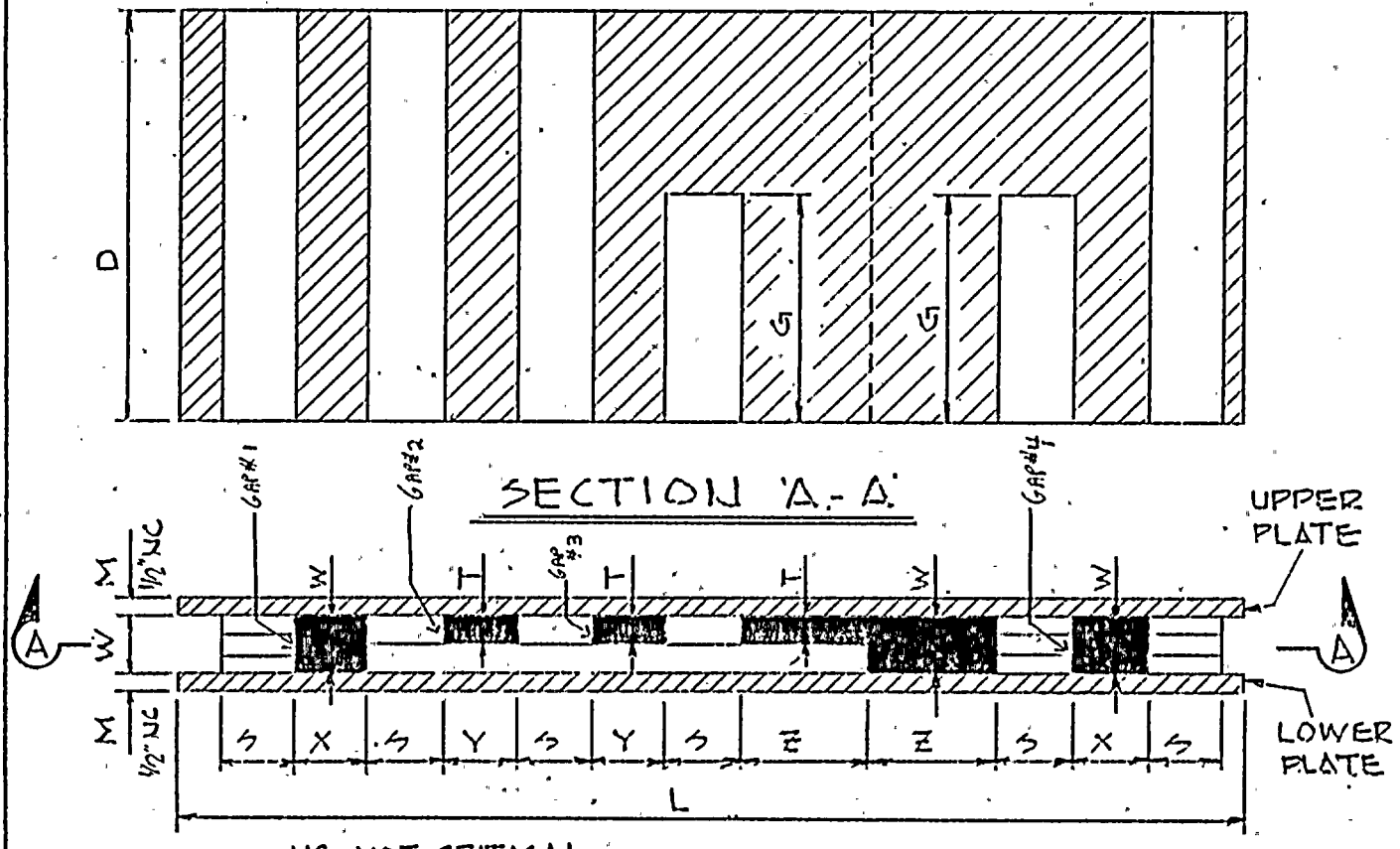
Prototype testing shall be implemented in the following stages:

1. Write a 'prototype procedure' delineating steps and controls.
2. The procedure should closely follow these steps:
   a. insert backing
   b. apply (pour or pressurize or inject) shield material - method of application shall be determined by BISCO
   c. let cure (and/or foam) - foam control and cure time established by BISCO
   d. remove "C" clamps and disassemble test fixture
   e. observe gap for complete fill (Owner must be present)

REF DOC PCN -NA-	RFI -NA-	WPPSS NUCLEAR PROJECT NO. 2
REF SPEC SECT NO -NA-	PAGE -NA-	PARA -NA-	BURNS AND ROE, INC.
REF DWG -NA-	DWG ZONE	PED 215-M-3320
SCALE: NONE	DRAWN BY JSW DATE 5-6-80	-NA-	TITLE SSW Shim Gap Repair
	CHKD BY JSW DATE 5-6-80	APPVD JSW DATE 5-6-80	

REF. DOC PCN	RFI	WPPSS NUCLEAR PROJECT NO. 2
REF SPEC. SECTION:	PAGE. PARA	BURNS AND ROE, INC.
REF DWG.	DWG. ZONE	PED 215-M-3320 SHT 2 OF 3
SCALE: None	DRAWN BY JSW DATE 5-6-80	TITLE: Revise SSW Shim Gap Repair PED
	CHKD BY JSW DATE 5-6-80 APPVD JSW DATE 5-6-80	

DIM.	DESCRIP.	DIM.	TOL.
D	SAC WALL RADIAL DEPTH	2'-0 3/4"	±1"
G	SIMULATE TRANSVERSE FLOW	1'-0"	±1"
L	LENGTH OF FIXTURE	3'-0"	NC
W	MAX. HEIGHT OF GAP	5/8"	±1/32"
S	SHIM SEPARATION LENGTH	3"	NC
T	MIN. HEIGHT OF GAP	1/16"	+1/32" -0
X	MAX WIDTH OF GAP	2 1/2"	±1/8"
Y	MIN. WIDTH OF GAP	1/16"	+1/32" -0
Z	NON-INTERFERING TRANSVERSE FLOW ZONE	3"	±1"



PROTOTYPE TEST FIXTURE
(PLATES TO BE HELD TOGETHER BY "C" TYPE CLAMPS)
FIGURE I (NOT TO SCALE)

REF. DOC.: PCN	RFI		WPPSS NUCLEAR PROJECT NO. 2
REF SPEC. SECTION:	PAGE:	PARA:	BURNS AND ROE, INC.
REF DWG.	DWG. ZONE		PED 215-M-3320 SHT. 3 OF 3
SCALE: NONE	DRAWN BY LKN DATE 5/11/80		TITLE: SSW SHIM GAP PROTOTYPE FIXTURE
	CHKD BY JSW DATE 5-6-80	APPVD JSW DATE 5-6-80	

REV 1

215 - M - 3604

BURNS AND ROE, INC.
WPPSS
NUCLEAR PROJECT
NO. 2

PROJECT
ENGINEERING
DIRECTIVE

CODE	PROJECT ENGINEERING DIRECTIVE
21	15 - M - 3604
DATE	05/29/80
	PRIORITY I

REASON FOR P. E. D.:

1. The mock-up fixture per section IIB of PED-215-M-2746 is used soley for the qualification of the shield material with respect to expected heat input during welding.
2. The mock-up fixture will be destructively cut for the purpose of observing shield cross sections after welding to evaluate if any detrimental affects have occurred.
3. The "fill procedure" has been qualified per section IIA of PED-215-M-2746.

INFORMATION COPIES W

SHEET 1 OF 2

REFERENCES
SUBJECT SSW Shim Gap Mock-up Testing
LOCATION Offsite
ENG. SYSTEM N/A
S/U SYSTEM N/A
QUALITY CLASS I

ORIGINATING DOCUMENTS NONE

DESCRIPTION OF WORK:

Per reasons 1, 2, and 3 above, it is not necessary to the fill the weld mock-up fixture using the finalized SSW shim gap fill procedure as originally called out in section IIB of PED-215-M-2746. It is only required that the gap in the mock-up be completely filled with the shield material and cured before preheat and welding commence.

Note that this direction does not constitute new work since the mock-up fixture has already been constructed by C215 and is approved by the owner.
Replace in its entirety, section IIB on sheet 5 of 6 of PED-215-M-2746 by the following:

B. Contract 215 shall construct a test mock-up fixture with configuration similiar to the fixture constructed to qualify welders per PED-215-M-2749. Construction of this mock-up shall be at the direction of the B&R welding engineer. This mock-up shall contain four (4) gaps. Two (2) gaps shall be 1/16 x 1/16 x depth of mock-up. The other two (2) gaps shall be 5/8 x 2 1/2 x depth of mock-up. The depth of the mock-up shall be a minimum of one (1) foot. Mock-up is subject to final approval by owner.
All four (4) gaps shall be filled completely with the approved shield material per Section I of this PED. The shield material shall be allowed to cure.

NOTES

1. THIS PED REVISES DIRECTION IIB on sheet 5 of 6 of PREVIOUSLY PROVIDED BY 215-M-2746 THE FOLLOWING PED(s): —
2. THIS PED VOIDS DIRECTION PREVIOUSLY PROVIDED BY N/A THE FOLLOWING PED(s): —
3. THIS PED WORK SHOULD BE COORDINATED WITH KNOWN OTHER WORK UNDER THE FOLLOWING PED'S: 215-W-1604, 215-W-2749
4. THIS PED DEPENDS ON THE PRIOR INSTALLATION OF 215-W-2749 THE FOLLOWING PED'S: —

REVISE:
NONE X
DRAWINGS —
SPECIFICATION —

APPROVALS:

DISCIPLINE ENGINEER	6-03-80 DATE
LEAD DISCIPLINE ENGINEER	6-03-80 DATE
S/U LIAISON ENGINEER	6-3-80 DATE
RESIDENT PROJECT ENGINEER	6-3-80 DATE

REV 1 BR 803-2

The mock-up shall then be prepared for welding by cleaning and then inserting at owner's direction insulatory material and/or backing rings into the gaps. The recommended thermal insulatory material shall be Babcock and Wilcox ceramic fiber product Roll Board which can be inserted in between the installed shielding and the backing ring for the weld.

Welding shall then be performed at the direction of the owner. The weld shall be made in accordance with the weld requirements of PED-215-W-1604 and the welder shall be qualified per PED-215-W-2749. Preheat shall be applied as required. It is intended to perform the entire 2 inch circumferential weld, however, the owner may stop the welding process at his discretion.

After welding and after the mock-up fixture is brought back down to ambient temperature, the fixture shall be cut in order to observe the cross sections of the four (4) gaps. This cutting shall be at the direction of the owner who must be present at this time. It is recommended that the gaps be cut near their edges at first and then delicately ground from the side until a suitable cross section of the material is observed. The owner will evaluate the cross sections for acceptability.

If a thermal insulator is deemed necessary from the results of this mock-up test, then this requirement shall be incorporated in the final filling procedure developed in section IIA of this PED.

Prototype and mock-up testing shall be implemented as soon as the shield material is delivered to the site.

REF. DOC.: PCN		RFI		WPPSS NUCLEAR PROJECT NO. 2	
RFF SPEC. SECTION:	PAGE:	PARA:		BURNS AND ROE, INC.	
REF. DWG.:		DWG. ZONE:		PED 215-M-3604	SHT. 2 OF 2
SCALE: None	DRAWN BY JSW DATE: 5-29-80			TITLE: SSW Shim Gap Mock-up Testing.	
	CHKD BY JSW DATE 5-29-80	APPVD: JSW	DATE 5-29-80		

REV 1

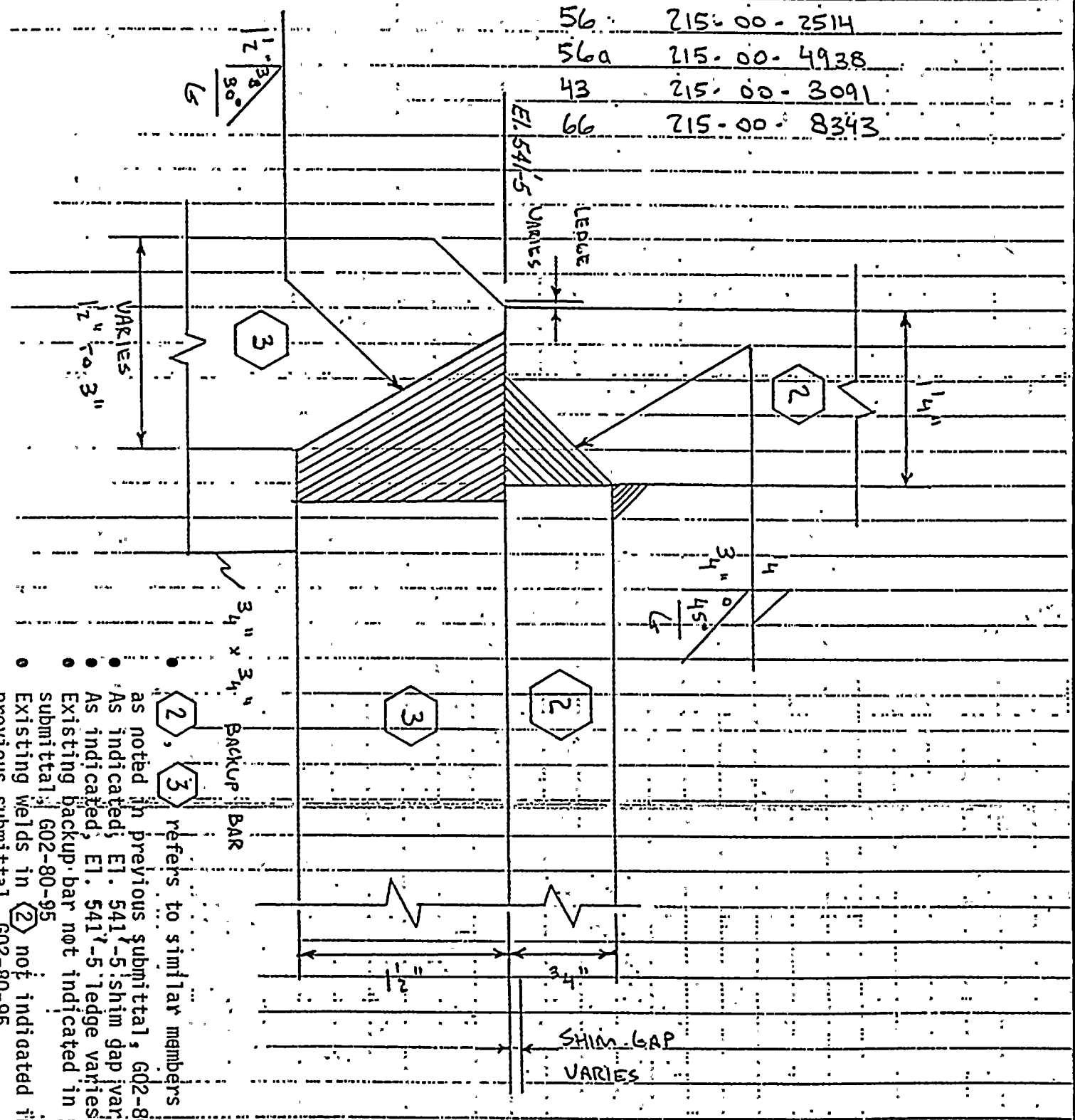
BURNS AND ROE, INC.
Headquarters Office—Oradell, N.J.

SKETCH-1

W.O. No. _____ Date 6/17/80 Book No. _____ Page No. _____
Drawing No. 5783 Calc. No. _____ Sheet _____ Cont. on Sheet _____
By MEAD Checked _____ Approved _____
Title WPPSS HANFORD 2 (LNP2) SAC SHIELD WALL

REFER TO LECKENBY SHOP DRAWINGS

56	215-00-2514
56a	215-00-4938
43	215-00-3091
66	215-00-8343



- refers to similar members as noted in previous submittal, G02-80-95
- As indicated, El. 541'-5" shim gap varies
- Existing backup bar not indicated in previous submittal, G02-80-95
- Existing welds in (2) not indicated in previous submittal, G02-80-95

ORIGINAL CONFIGURATION AT PROPOSED PERIPHERAL WELD