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SUBJECT: Forwards executive summary of investigation, results of
 investigation & conclusions re integrity of containment
 operating deck hatches.

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219 425 2111



AEP:NRC:1043

Donald C. Cook Nuclear Plant Units 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74
INVESTIGATION OF INTEGRITY OF CONTAINMENT OPERATING DECK
HATCHES EXECUTIVE SUMMARY

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Attn: T. E. Murley

November 13, 1987

Dear Dr. Murley:

On August 24, 1987, Unit 1 was in the last stages of a refueling outage, when a bolt supporting a reactor pump hatch cover (#12) broke while being torqued. Because of this, other bolts in that hatch were examined. Some of the other bolts appeared to have been cut off and rewelded to the seal channel. The bolts in the other containment operating deck hatches in both Units 1 and 2 were then examined. Hatches in both units were found to have suspect bolts. Unit 2 was immediately shut down and an investigation of the containment hatch cover anchorages was initiated.

The attachments to this letter provide a detailed summary of our investigation, the results of the investigation, and our conclusions concerning the integrity of the D. C. Cook Units 1 and 2 containment operating deck hatches.

As discussed in the attached summary, we have concluded that both the Unit 1 and Unit 2 containment operating deck hatches would not have failed during an accident and/or design basis earthquake. In addition, the as-found conditions met the design basis as described in the D. C. Cook FSAR, Section 5.2.2.4. We have, however, made or plan to make certain enhancement(s) to the anchorage of some of the hatch covers as described in our report.

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Dr. T. E. Murley

-2-

AEP:NRC:1043

This document has been prepared following Corporate procedures which incorporate a reasonable set of controls to ensure its accuracy and completeness prior to signature by the undersigned.

Sincerely,



M. P. Alexich
Vice President

cm

cc: John E. Dolan
W. G. Smith, Jr. - Bridgman
R. C. Callen
G. Bruchmann
G. Charnoff
NRC Resident Inspector - Bridgman
D. H. Danielson, NRC - Region III
A. B. Davis - Region III

D. C. COOK NUCLEAR PLANT - UNIT #1
CONTAINMENT INVESTIGATION - REACTOR COOLANT PUMP & CRDM HATCHES
EXECUTIVE SUMMARY

I. Hatch Design

A. Location

The four (4), Unit #1 Reactor Coolant Pump (RCP) hatches are located on the Containment operating deck, elevation 652'-7 1/2". They are identified by numbers 11, 12, 13 and 14 which designate the unit and the quadrant in the unit where the hatch is located (i.e., RCP hatch #11 is in quadrant #1 in Unit #1). The operating deck has one (1) other similar hatch on the operating deck at elevation 652'-7 1/2". This is the CRDM hatch which allows access to the Control Rod Drive Mechanism (CRDM) exhaust fans. (Figure No. 1)

B. RCP and CRDM Hatch Design

The RCP hatches are approximately rectangular in shape and measure 7 feet 6 inches by about 11 feet. (Figures No. 2 & 3) The CRDM hatch is rectangular in shape and measures 3 feet by 6 feet. (Figure No. 23)

Each of the four (4) RCP hatches and the CRDM hatch has a steel tray which holds lead bricks. This steel tray is situated below but is independent of the hatch cover which is a welded plate frame filled with concrete. The lead tray and the hatch cover rest on ledges formed in the concrete deck by an angle frame embedment. (Figure No. 4)

Each RCP hatch cover is anchored to the operating deck by either 18 or 19 - 3/4" or 7/8" diameter ASTM A193, grade B7 high strength anchor bolts which fit into pockets in the cover. The CRDM hatch is anchored to the operating deck by 12 - 3/4" diameter ASTM A193 high strength anchor bolts which fit into pockets in the hatch cover. (Figures No. 6 & 24)

A seal rod welded to the bottom of the hatch cover fits into a seal channel welded atop the angle that forms the upper ledge which supports the hatch cover. The seal channel which runs around the periphery of the hatch has a continuous notch cut into it, into which an elastomeric seal material is fitted. The seal rod on the bottom of the hatch cover seats into the elastomeric material in the notch in the seal channel to seal the hatch. (Figure No. 24)

The operating deck is a reinforced concrete slab, thirty-four and one-half inches (34 1/2") thick. The anchor bolts are embedded twenty-one and three quarter inches (21 3/4") into the concrete. Each bolt is anchored by a 5 inch square by 1 inch thick steel plate embedded in the concrete.

II. As Found Condition of Unit #1 Hatches

A. Background

On August 24, 1987, Unit #1 was in the last stages of a refueling outage and Unit #2 was operating. While reinstalling the cover on RCP hatch #12 in Unit #1, bolt #10 broke while being torqued. Because of this, the other bolts in that hatch were examined and several were found with the appearance of having been cut off and rewelded to the seal channel. The remaining bolts in the nine (9) other RCP and CRDM hatches in both units were then examined by plant QC personnel and hatches in both units were found to have suspect bolts. Unit #2 was immediately shut down. This and subsequent NDE and visual inspections identified eight (8) bolts which had discontinuities at the level of the seal channel and three (3) bolts which were missing in Unit #1. A summary of the results of the NDE and visual examinations follows.

B. Description of As Found Unit #1 Configuration

Hatch #11

All bolts were found to be sound.

Hatch #12

4 bolts cut off and rewelded - bolt #10, #11, #12, and #13. Note that bolt #10 broke in the weld while being torqued.

Hatch #13

2 bolts missing - bolts #9 and #15. This had been documented and analyzed previously.

Hatch #14

1 bolt missing - bolt #7. This had been documented and analyzed previously.

CRDM Hatch

4 bolts cut off and rewelded - bolts #1, #6, #7 and #12.

The bolt layout and the locations of the suspect bolts are shown in Figure No. 25.

III. Analysis - Unit #1 RCP and CRDM Hatches

All of the hatches were analyzed for:

- o The operation of Unit #1 in the as-found condition.
- o The operation of Unit #1 after modification of the anchorage.
- o The original anchorage design.

In the analyses, an equivalent pressure load of 18 psi was applied to each hatch cover and its anchorages. The equivalent pressure load included the effects of dead load, earthquake and accident in accordance with the load factor equations of the D. C. Cook Plant updated FSAR.

The Structural Design Section of AEPSC analyzed all of the hatches in both units. The hatch covers and their anchorage were evaluated using the computer program GTSTRUDL and manual computations.

RCP Hatches #12, #13 and #14 and the CRDM hatch were analyzed assuming that the cut and rewelded bolts and the missing bolts did not exist, although as noted in the Unit #2 Hatch Investigation Executive Summary, the in-situ, plant pull tests made on the RCP hatch #23 bolts in Unit #2 established that the cut off and rewelded bolts were capable of carrying a considerable amount of load.

- o The analysis of RCP hatch #12 was made assuming that bolts #10, #11, #12 and #13 did not exist. Without these bolts, the hatch was found to be structurally adequate under the design loads and would not have unseated in an accident and/or earthquake.
- o The analysis of RCP hatch #13 was made assuming that the two missing bolts #9 and #15 did not exist. This was a known condition that had been analyzed previously. The hatch was found to be structurally adequate under the design loads and would not have unseated in an accident and/or earthquake.
- o The analysis of RCP hatch #14 was made assuming that the missing bolt, #7 did not exist. This case was enveloped by the RCP hatch #13 analysis. This was a known condition that had been analyzed previously. The hatch was found to be structurally adequate and would not have unseated in an accident and/or earthquake.

- o The analysis of the CRDM hatch was made assuming that the four (4) cut and rewelded bolts did not exist. The hatch was found to be structurally adequate and would not have unseated in an accident and/or earthquake.

The analysis of the Unit #1 RCP and CRDM hatches is contained in Calc./Anal. No. DC-D-3195-165-SC. A copy of the analysis of RCP hatch #12 was given to the NRC Region III personnel who attended the September 10, 1987 presentation on the Unit #1 hatches at D.C. Cook Plant.

IV. Restoration of Unit #1 RCP and CRDM Hatches

Based on the results of the analyses of the as-found condition of the Unit #1 operating deck hatches and because the bolts which were cut off and rewelded to the seal channel are required to carry small tensile loads, it was decided to enhance the anchorage of only RCP Hatch #12 at present.

To enhance the anchorage along the crane wall side of RCP hatch #12, three hold down plates were designed and bolted to existing embedded plates in the crane wall above the hatch opening. The remaining cut and rewelded bolts can be used to tighten down on the hatch cover. The hold down plates sit atop the hatch cover and hold the hatch cover seal rod in place along the crane wall during an accident and/or earthquake. These hold down plates aid in holding down the hatch cover, but they are not required to maintain the integrity of the hatch because the remaining effective anchor bolts are capable of doing that without help. (Figures No. 26 & 27).

Based on the experience gained in restoring the bolts cut off and rewelded in Unit #2, AEP has decided to restore all the Unit #1 bolts that were cut off and rewelded or missing in a way similar to that which was done on Unit #2. This work is planned for the next scheduled Unit #1 outage in 1989. (Figures No. 12 through 15, 17, 19 and 21 show the type of restoration planned for the Unit #1 bolts.)

V. Documentation of As-found Hatch Bolt Configurations

As part of the investigation, we made extensive searches and conducted pertinent personnel interviews in attempting to locate records that would address the as-found bolt configurations. Both construction and operation records were reviewed and pursued. Personnel involved with the construction history and personnel involved with the operations history of the D. C. Cook Plant were interviewed.

Based on our searches and interviews, we believe that the applicable bolts were probably cut and rewelded prior to the unit going operational. Certain construction meeting minutes indicate that work activities, related to the alignment of the hatches, continued for an extensive period of time. Though not conclusive, the possibility exists that the applicable bolts were cut and rewelded during the extensive hatch alignment period. No other records were found which address the bolts which were cut and rewelded.

VI. Conclusions

We believe, based on the analyses that have been performed on the Unit #1 RCP and CRDM hatches, that the hatch covers would not have failed during an accident and/or earthquake and that in the as found condition, these hatches met the design basis in section 5.2.2.4 of the FSAR. The plant was operated with a secure divider barrier between the upper and lower containments. The modifications made to the anchorage of RCP hatch #12 enhance the structural integrity of the hatch.

D. C. COOK NUCLEAR PLANT - UNIT #2
CONTAINMENT INVESTIGATION REACTOR COOLANT PUMP HATCHES
EXECUTIVE SUMMARY

I. Hatch Design

A. Location

The four (4), Unit #2 Reactor Coolant Pump (RCP) hatches are located on the Containment operating deck, elevation 652'-7 1/2". They are identified by numbers 21, 22, 23 and 24 which designate the unit and the quadrant in the unit where the hatch is located (i.e., RCP hatch #21 is in quadrant #1 in Unit #2). The operating deck has one (1) other similar hatch on the operating deck at elevation 652'-7 1/2". This is the CRDM hatch which allows access to the Control Rod Drive Mechanism (CRDM) exhaust fans. (Figure No. 1)

B. RCP Hatch Design

The RCP hatches are approximately rectangular in shape and measure 7 feet 6 inches by about 11 feet. (Figures No. 2 & 3)

Each of the four (4) RCP hatches has a steel tray which holds lead bricks. This steel tray is situated below but is independent of the hatch cover which is a welded plate frame filled with concrete. The lead tray and the hatch cover rest on ledges formed in the concrete deck by an angle frame embedment. (Figure No. 4)

Each RCP hatch cover is anchored to the operating deck by either 18 or 19 - 3/4" or 7/8" diameter ASTM A193, grade B7 high strength anchor bolts which fit into pockets in the cover. (Figures No. 5 & 6)

A seal bar welded to the bottom of the hatch cover fits into a seal channel welded atop the angle that forms the upper ledge which supports the hatch cover. The seal channel which runs around the periphery of the hatch has a continuous notch cut into it, into which an elastomeric seal material is fitted. The seal bar on the bottom of the hatch cover seats into the elastomeric material in the notch in the seal channel to seal the hatch. (Figure No. 5)

The operating deck is a reinforced concrete slab, thirty-four and one-half inches (34 1/2") thick. The anchor bolts are embedded twenty-one and three quarter inches (21 3/4") into the concrete. Each bolt is anchored by a 5 inch square by 1 inch thick steel plate embedded in the concrete.

II. As Found Condition of Unit #2 Hatches

A. Background

On August 24, 1987, Unit #1 was in the last stages of a refueling outage and Unit #2 was operating. While reinstalling the cover on RCP hatch #12 in Unit #1, bolt #10 broke while being torqued. Because of this, the other bolts in that hatch were examined and several were found with the appearance of having been cut off and rewelded to the seal channel. The remaining bolts in the nine (9) other RCP and CRDM hatches in both units were then examined by plant QC personnel and hatches in both units were found to have suspect bolts. Unit #2 was immediately shut down. This and subsequent NDE inspections identified twenty (20) bolts in Unit #2 which had discontinuities at the level of the seal channel. A summary of the results of the NDE examinations follows.

B. Description of As Found Unit #2 Configuration

Hatch #21

3 bolts cut off and rewelded - bolts #3, #4 & #5.

1 stud with no embedded anchor bolt in concrete below - bolt #17.

Hatch #22

1 bolt cut off and rewelded - bolt #1.

1 stud with no embedded anchor bolt in concrete below - bolt #3.

Hatch #23

12 bolts cut off and rewelded - bolts #1, #2, #8 thru #16, and #19.

1 stud with no embedded anchor bolt in concrete below #18.

Hatch #24

1 bolt cut off and rewelded - bolt #1.

CRDM Hatch

All bolts were found to be sound.

The bolt layout and the locations of the suspect bolts are shown in Figure No. 7.

III. Test Program - Hatch #23

Bolt #9 in hatch #23 and a section of the seal channel it was attached to were cut out and a lengthwise slice was made through the specimen to examine the weld. This bolt was selected because from previous analyses we knew that bolt #9 was one of the lesser loaded bolts in the hatch. Cutting out this bolt posed less risk in the restoration of the hatch. The slice was sent to Westinghouse Electric Corporation's General Technology Systems Division (metallurgical laboratory) for testing to establish an analytical baseline. The results of the metallurgical analysis showed that:

The Stud was a 0.25% carbon steel. *(Specimen Tensile Strength = 85 ksi)

The embed bolt was AISI 4140 steel *(Specimen Tensile Strength = 150 ksi).

The seal channel was a carbon steel similar to ASTM A36 steel *(Specimen Tensile Strength = 70 ksi).

The weld was a low carbon steel probably made by an E7018 electrode. *(Specimen Tensile Strength = 95 ksi).

* Approximate specimen tensile strengths were obtained from hardness test conversions.

The welds were mapped. Weld Sizes, location and descriptions were indicated on as-found sketches. Bolt stamps identifying bolt material were noted where found. This information was documented by plant QC and site design personnel.

The As-found bolt locations were documented.

All bolts were photographed and videotaped.

A series of samples/mockups were fabricated and tested to approximate the as-found conditions and to establish an analytical baseline. These tests were proposed and implemented by Stevenson and Associates of Cleveland. AEPSC reviewed and approved the test program.

Most of the mockups were fabricated at D.C. Cook Nuclear Plant. The single exception was the embedded angle/seal channel mockups. The tests were made at Heron Labs and Case Western Reserve University in Cleveland under the direction of Stevenson and Associates personnel.

The cut off and rewelded bolts were pull tested in place.

All cut and rewelded bolts were pull tested to at least 20^k except bolt #9 which had been cut out with a portion of the seal channel and bolt #18 where no embedded bolt was found in the concrete below the seal channel. Bolts #8 and #10 were pulled against the seal channel. All other bolts were pulled against beams which rested on the operating deck level. All bolts reached a tension of 20^k without breaking except bolt #10 which broke at a tension of 16.5^k. This bolt broke in the weld.

Bolts #8, #13, #14, #15 and #16 were retested. Bolt #8 was pulled against the seal channel. The bolt was tensioned to 30^k without apparent distress and did not break. Bolt #13 broke at 41.25^k, 1/2" above the seal channel in the heat effected zone of the shank of the bolt. Bolt #14 broke in threads at a load of 24.2^k. Bolt #15 broke at a load of 24.45^k in the threads and at the weld simultaneously. Bolt #16 was pulled to a tension of 35.43^k, when the test was stopped.

Many of these pull tests were videotaped and photographed.

The pull tests were conducted by Wiss, Janney and Elsnor Associates, Chicago, who used their own equipment. The pull tests were witnessed by personnel from the Plant QC department, AEPSC Civil Engineering Division, Stevenson and Associates, and Wiss Janney and Elsnor.

IV. Analysis - RCP Hatches #21, #22, #23 and #24

All of the hatches were analyzed for:

- o The operation of Unit #2 in the as-found condition.
- o The operation of Unit #2 after modification of the anchorage.
- o The original anchorage design.

In the analyses, an equivalent pressure load of 18 psi was applied to each hatch cover and its anchorages. The equivalent pressure load included the effects of dead load, earthquake and accident in accordance with the load factor equations of the D. C. Cook Plant updated FSAR.

The Structural Design Section of AEPSC analyzed all of the hatches in both units. The hatch covers and their anchorage were evaluated using the computer program GTSTRU DL.

Hatches #21, #22 and #24 were analyzed assuming that the cut and rewelded bolts did not exist, although as noted above, the in-situ, plant pull tests made on the hatch #23 bolts established that the cut off and rewelded bolts were capable of carrying a considerable amount of load.

- o The analysis of hatch #21 was made assuming that bolts #3, #4, #5 and #17 did not exist. Without these bolts, the hatch was found to be structurally adequate under the design loads and would not have unseated in an accident and/or earthquake.
- o The analysis of hatch #22 was made assuming that two bolts #1 and #3 did not exist. This case was enveloped by hatch #21. The hatch was found to be structurally adequate under the design loads and would not have unseated in an accident and/or earthquake.
- o The analysis of hatch #24 was made assuming that one bolt, #1 did not exist. This case was enveloped by hatches #21 and #22. The hatch was found to be structurally adequate and would not have unseated in an accident and/or earthquake.

The analysis of the Unit #2 RCP hatches is contained in Calc./Anal. No. DC-D-3195-167-SC. A copy of the analysis was given to the NRC Region III personnel who attended the September 30, 1987 presentation on the Unit #2 hatches at D.C. Cook Plant.

V. Analysis of Hatch #23 - Past Operations in the As-Found Condition.

Hatch #23 was analyzed independently by the Structural Design Section of AEPSC and by Stevenson and Associates, who acted as consultants to AEPSC in the matter of the as-found condition of the RCP Hatches.

The test results (discussed above) were used to establish the ultimate tensile strengths of the cut off and rewelded bolts. Hatch #23 was analyzed for the equivalent pressure load described in part IV on page 4. The analysis made by the Structural Design Section of AEPSC found that Hatch #23 was structurally adequate and would not have become unseated during an accident or earthquake.

The draft report on the analyses made by Stevenson and Associates dated October 20, 1987 on Hatch #23 concludes as follows: "Hatch 23 in its "as-found" condition is capable of sustaining a differential pressure of at least 20.6 psi without failure of any bolts and with deformations well within the capacity of the sealing mechanism".

VI. Restoration of Unit #2 RCP Hatches

AEP modified the as-found configuration of every suspect Unit #2 anchor bolt to a configuration as close to the original design as was possible. With the exception of bolt #17 on Hatch #21, bolt #3 on Hatch #22 and bolt #18 on Hatch #23, all of the Unit #2 RCP hatch anchor bolts that were cut and rewelded have been modified in accordance with Figures No. 8 thru 22. The rewelded studs have been removed. The embedded anchor bolts have been freed of any connection to the seal channel. The top of the embedded anchor bolts have been threaded and extension nuts have been installed on those threads. ASTM A193 studs have been installed in the other end of the extension nuts to fit into the hatch cover bolt pockets. These bolt pockets were modified to accept the location of the modified anchor bolts.

At bolt #17 on hatch #21, bolt #3 on hatch #22 and bolt #18 on hatch #23, no embedded bolt was found to exist. All of these bolts are situated in a corner of the hatch adjacent to the crane wall. The analyses made by both AEPSC and Stevenson and Associates show that these corner bolts carry very little tensile load during an accident and/or earthquake because of the way the hatch cover framing was designed. Therefore, holes were drilled and tapped in the seal channel and ASTM A36 studs were installed in those corners to ensure a tight seal.

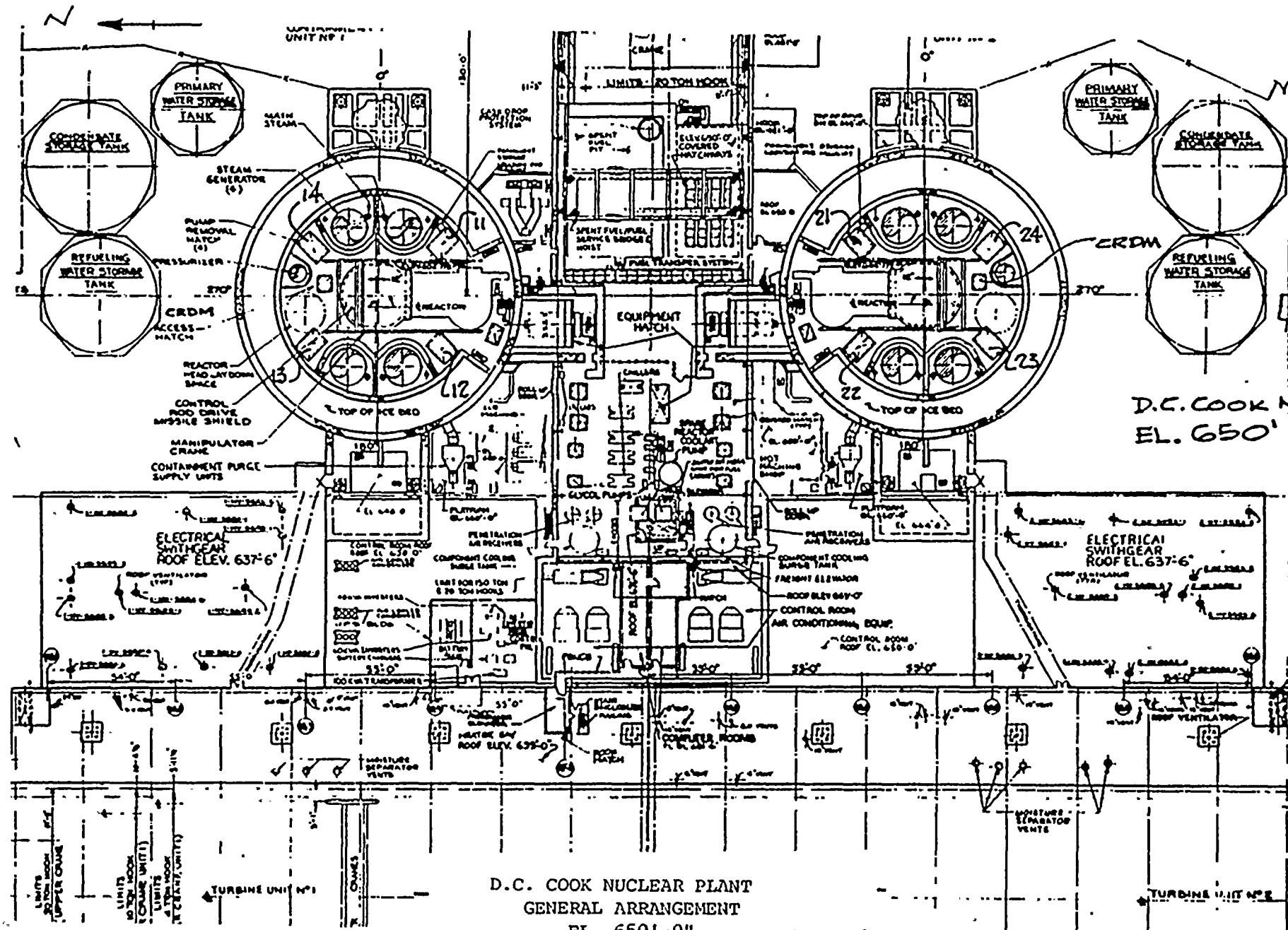
VII. Documentation of As-found Hatch Bolt Configurations

As part of the investigation, we made extensive searches and conducted pertinent personnel interviews in attempting to locate records that would address the as-found bolt configurations. Both construction and operation records were reviewed and pursued. Personnel involved with the construction history and personnel involved with the operations history of the D. C. Cook Plant were interviewed.

Based on our searches and interviews, we believe that the applicable bolts were probably cut and rewelded prior to the unit going operational. Certain construction meeting minutes indicate that work activities, related to the alignment of the hatches, continued for an extensive period of time. Though not conclusive, the possibility exists that the applicable bolts were cut and rewelded during the extensive hatch alignment period. No other records were found which address the bolts which were cut and rewelded.

VIII. Conclusions

We believe, based on the testing program that was done and on the analyses that have been performed by both AEPSC and by Stevenson and Associates on the Unit #2 RCP Hatches, that the hatch covers would not have failed during an accident and/or earthquake and that in the as found condition, these hatches met the design basis in section 5.2.2.4 of the FSAR. The plant was operated with a secure divider barrier between the upper and lower containments. The modifications made to the anchorage of the hatches and to the hatch cover bolt pockets enhance the structural integrity of the hatches.



D.C. COOK NUCLEAR PLANT
GENERAL ARRANGEMENT
EL. 650'-0"
FIGURE NO. 1

15-3/4" A.B. MK-HTB 25
T.B. EL. 652'-6"

15" HOLES IN L'S OL.

RCP HATCHES #11 and #12

RCP HATCHES #21 and #22

TYPICAL - PLAN

- FIGURE NO. 3

SEAL CHANNEL

2-1/2" HOLES
(FOR GROUTING
IN L'S OL. & SEAL
CHANNEL)

SEAL CHANNEL

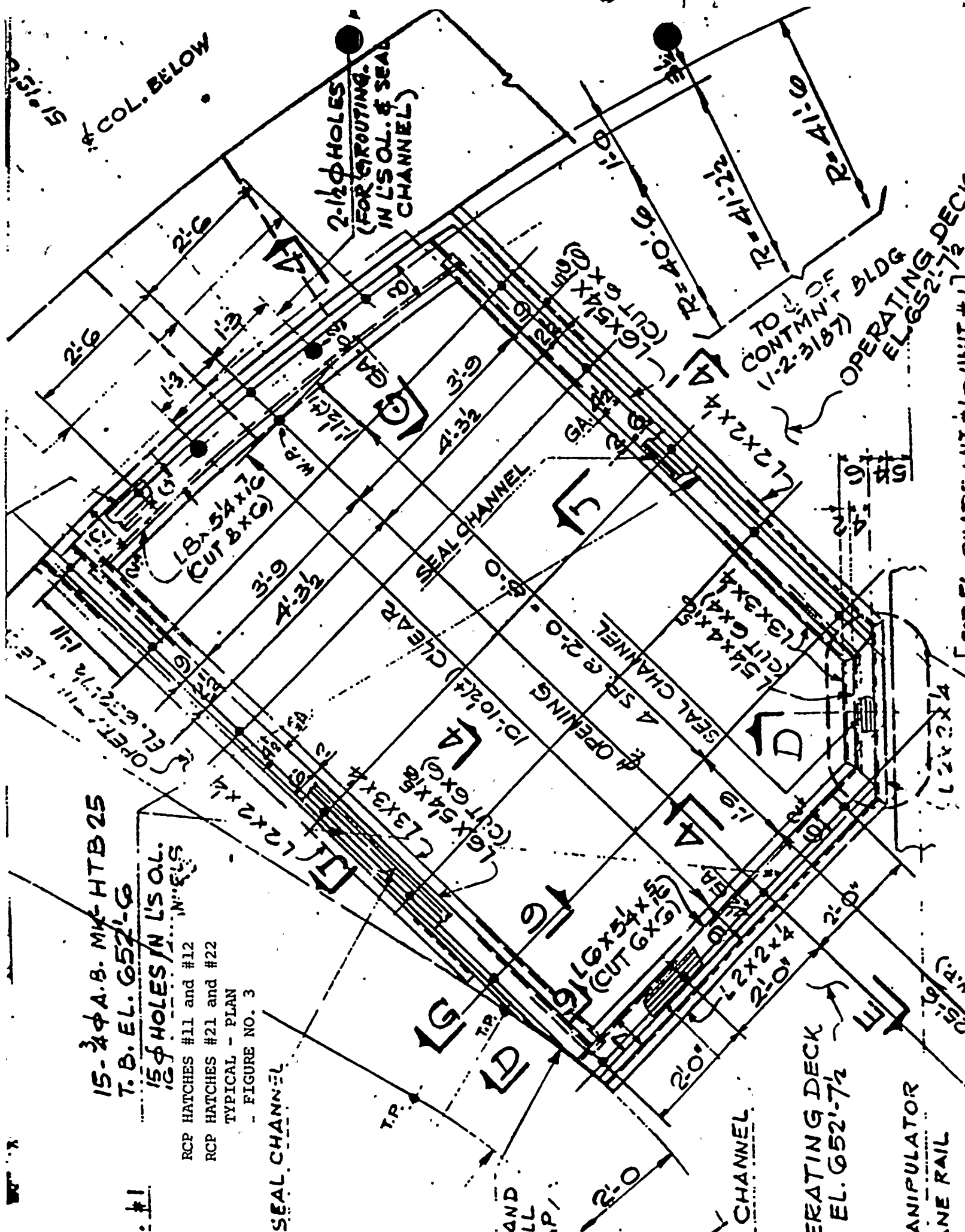
SEAL CHANNEL

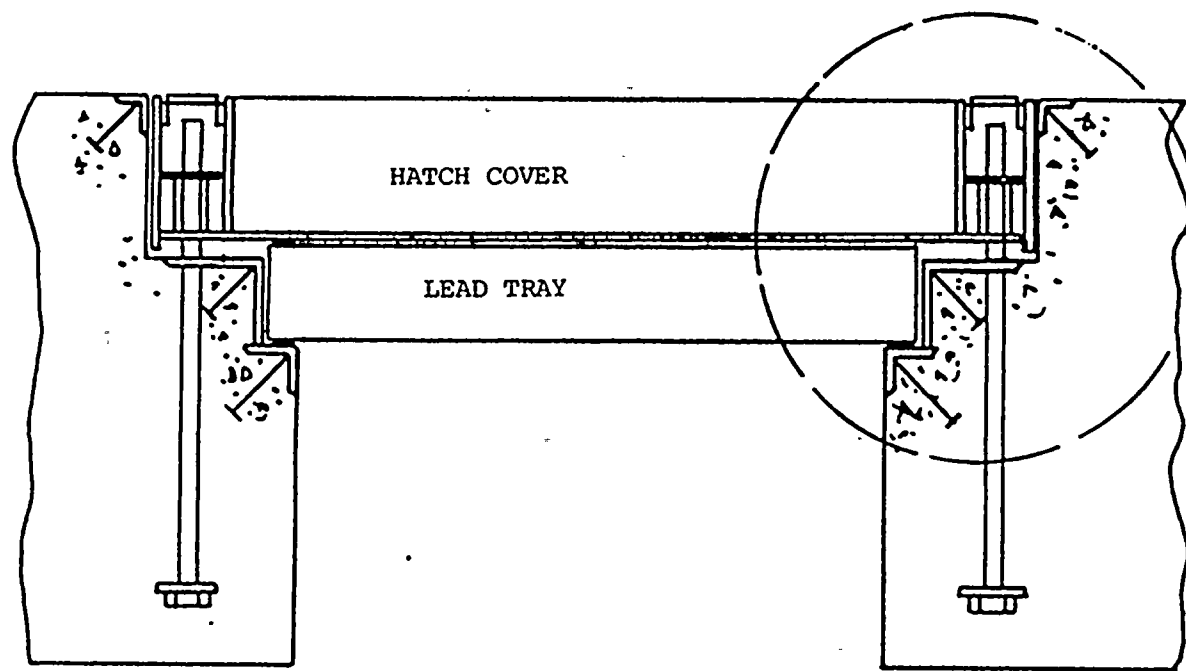
CHANNEL

OPERATING DECK
EL. 652'-7 1/2"

MANIPULATOR
ANE RAIL

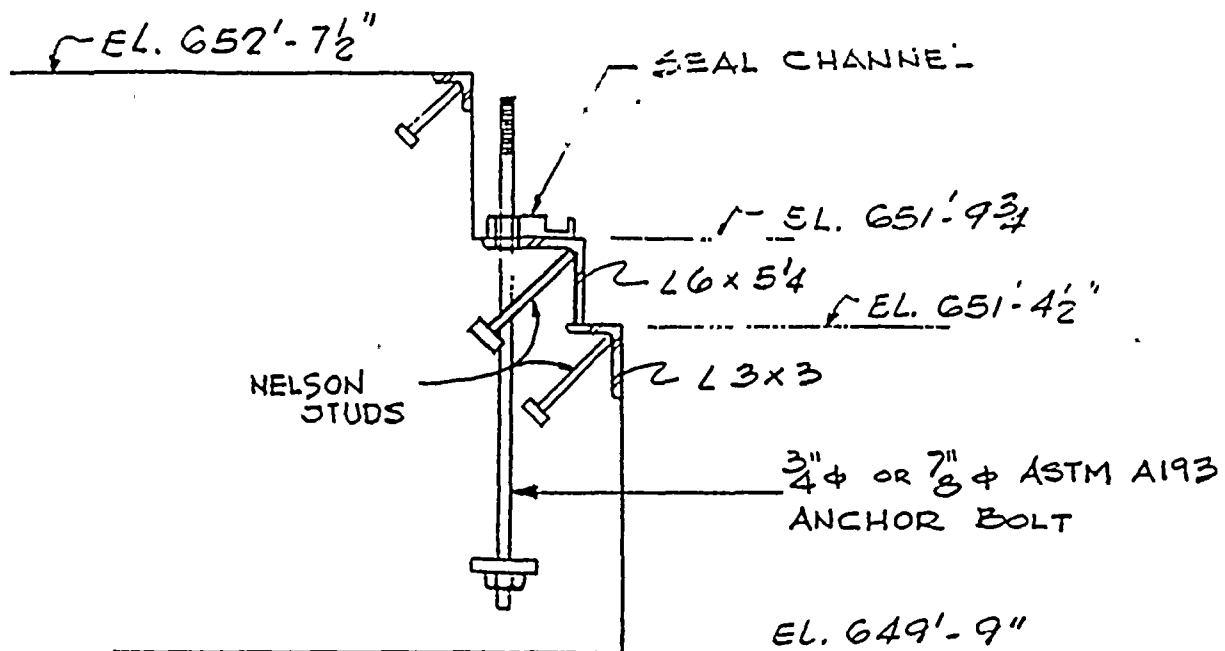
TO CONTIN. OF BLDG
(1-2-3187) OPERATING DECK
EL. 652'-7 1/2"



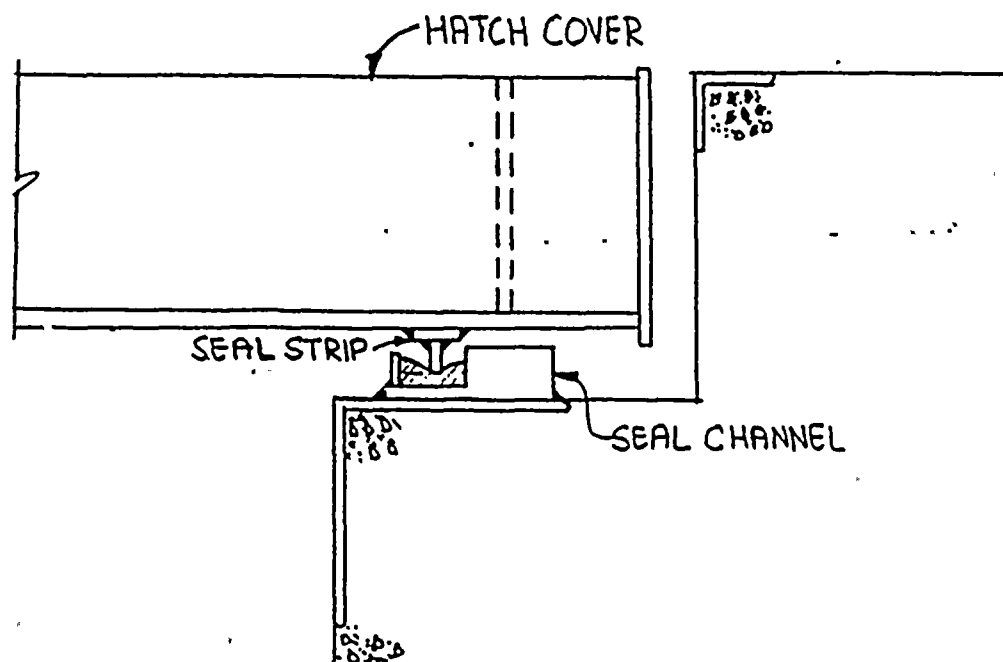


SECTION "A-A"
TYP. SECTION THRU HATCH
(Seal Channel not Shown)

FIGURE NO. 4

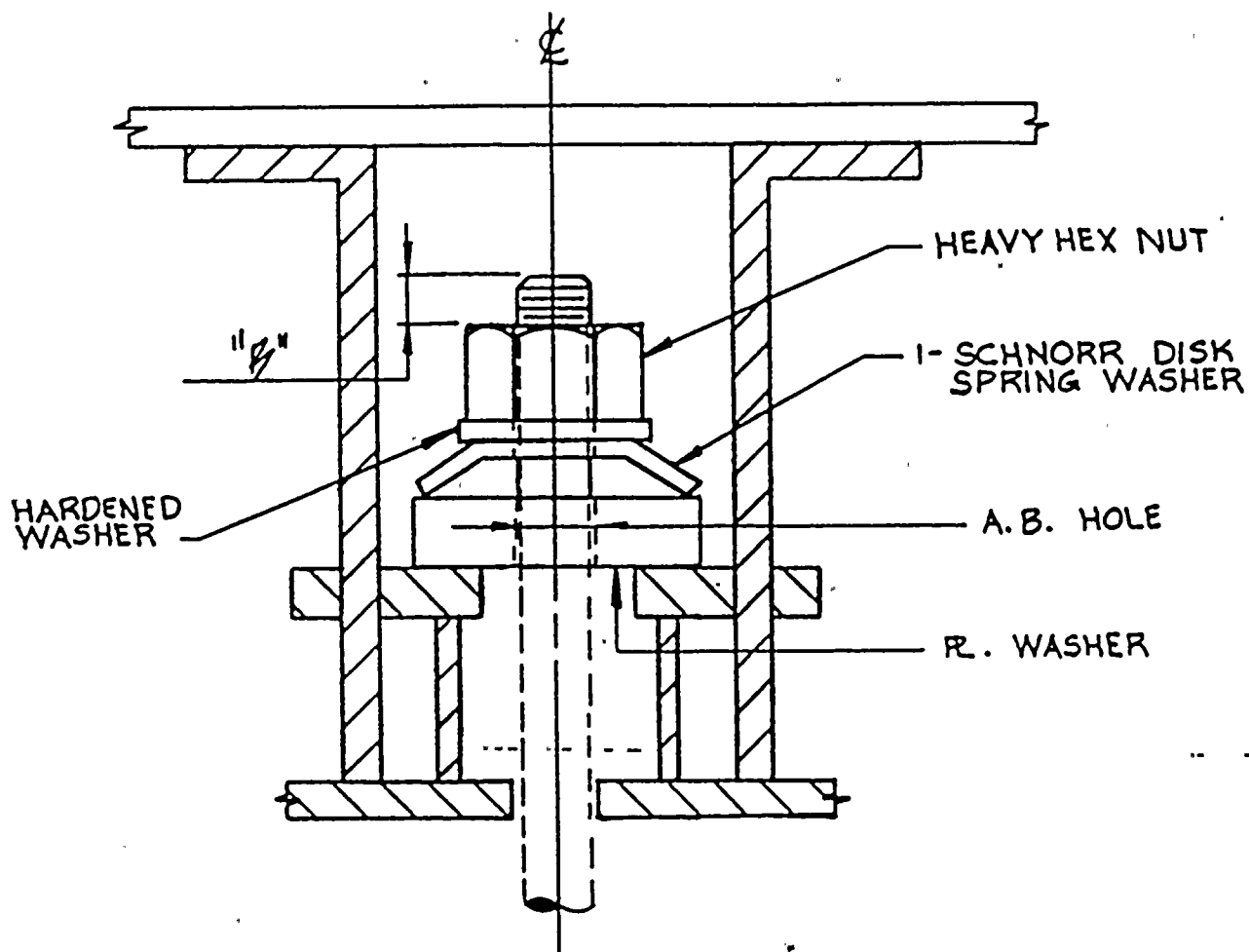


TYPICAL SECTION AT ANCHOR BOLT



SECTION SHOWING SEAL STRIP - UNIT #2

FIGURE NO. 5

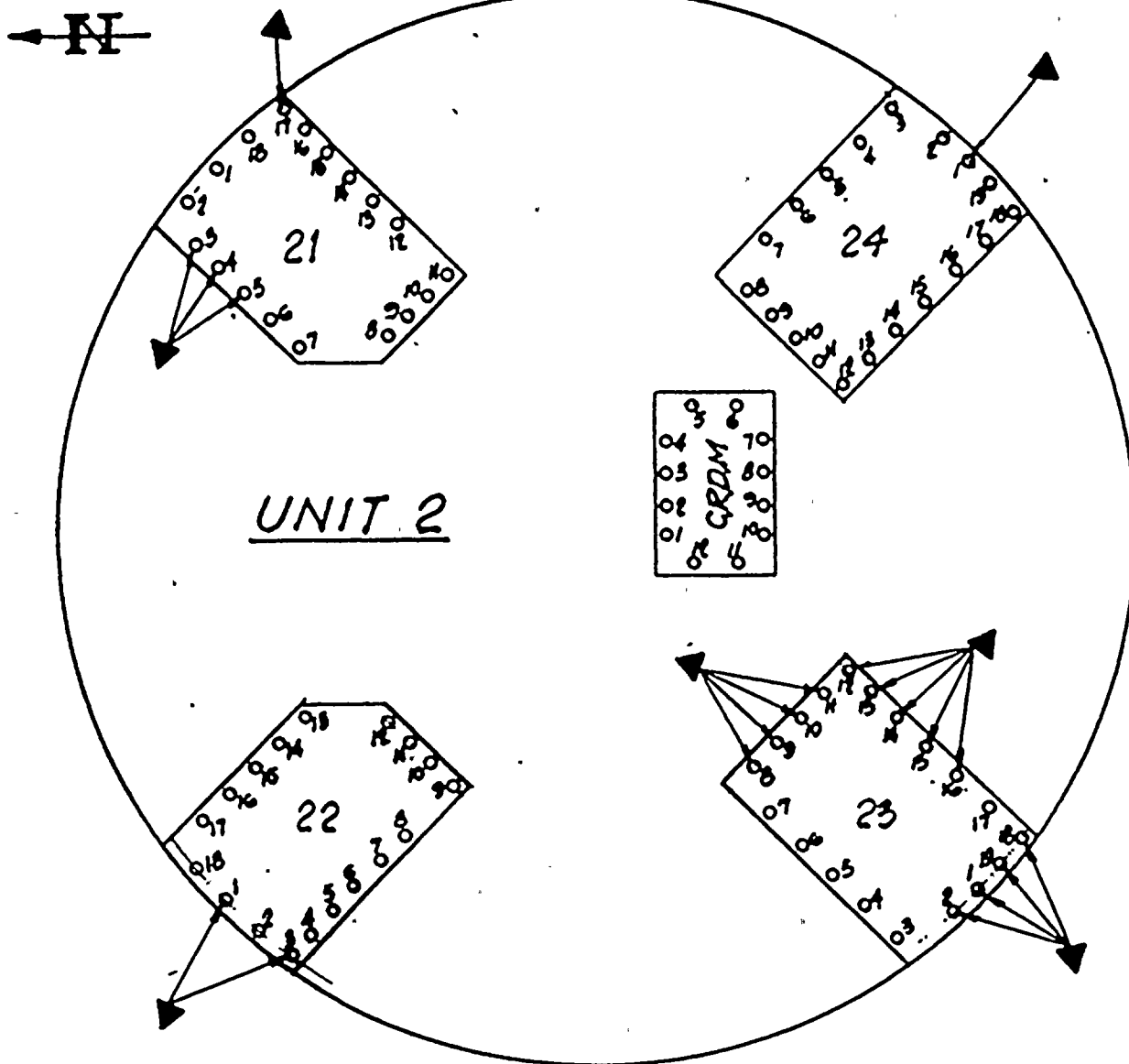


HATCH COVER

TYP. ANCHORING ASSEMBLY

REP ≠ CRDM HATCHES

FIGURE NO. 6



~ PLAN ~

UNIT #2 AS-FOUND CONDITION

RCP & CRDM HATCH

ANCHOR BOLTS

▲ - BOLT REJECTED - U.T.

FIGURE NO. 7

ORIGINAL ISSUE	REVISION	2 MK, JAR, ... - R.P.H. 2/1
9-18-87	DATE	

REDRAWN FOR REVISION 2

UNIT TWO

R.C.P. HATCH

HATCH BOLT NO. (TYP)

FOR REFERENCE ONLY
UNCONTROLLED COPY

PLAN VIEW (NTS)

INSTRUCTION TO THE PLANT CONSTRUCTION DEPARTMENT

1. Modify Hatch Bolts #3, #4, and #5 (▲ on Plan View) in accordance with Sketch SSK-HBR-1 Shts 1 to 5 and their corresponding bolt pockets in accordance with either Sketch SSK-HCP-1 or Sketch SSK-HPR-1, Shts 1 & 2.
2. Modify Hatch Bolt #17 (● on Plan View) in accordance with Sketch SSK-HCS-1.
3. The hatch bolt tightening requirements of Detail G-8 on Drawing 1-2-3186L Rev.4 apply to all hatch bolts.

DESIGN DIVISION: <u>W.B. Bore</u>	CIVIL ENGINEERING: <u>B.H. Bore</u> by <u>Paul Riva</u>
DONALD C. COOK NUCLEAR PLANT — BRIDGEMAN MI	
DR. <u>M. Riva</u>	AMERICAN ELEC. POWER SERVICE CORP.
CH. <u>JAR</u>	UNIT #2 - R.C.P. HATCH COVER #21
DATE: <u>9-18-87</u>	HATCH COVER ANCHORAGE ENHANCEMENT
APP'VD COO. ENGR. <u>H.P. Modry</u>	9-29-87 RFC-DC-12-2925
APP'VD DES. SECT. MGR. <u>H.P. Modry</u>	9-29-87 SSK-AE-21

ORIGINAL ISSUE	REVISION	A. ML IN 1'S TAIL 3' 5'
9-22-87	DATE	9-29-87

REDRAWN FOR REVISION 2

UNIT TWO

PLAN VIEW (N.T.S.)

R.C.P. HATCH #22

HATCH BOLT = No. (TYP)

FOR REFERENCE ONLY

UNCONTROLLED COPY

INSTRUCTION TO THE PLANT CONSTRUCTION DEPARTMENT

1. Modify Hatch Bolt #1 (▲ on Plan View) in accordance with Sketch SSK-HBR-1 Shts 1 to 5. Modify the corresponding bolt pocket in accordance with either Sketch SSK-HCP-1 or Sketch SSK-HPR-1, Shts 1 & 2, if the existing design drawing details do not fit the restored bolt.
2. Modify Hatch Bolt #3 (● on Plan View) in accordance with Sketch SSK-HCS-1.
3. The hatch bolt tightening requirements of Detail G-8 on Drawing 1-2-3186L Rev.4 apply to all hatch bolts.

DESIGN DIVISION: <i>McLellan</i>	CIVIL ENGINEERING: <i>B. K. Bunt & J. L. Davis</i>	
DONALD C. COOK NUCLEAR PLANT — BRIDGEMAN ML		
DR. <i>McLellan</i>	AMERICAN ELEC. POWER SERVICE CORP.	
CH. <i>I. Huang</i>	UNIT #2 - R.C.P. HATCH COVER #22	
DATE 9-22-87	HATCH COVER ANCHORAGE ENHANCEMENT	
APP'VD COB. ENGR. <i>J. P. Modrey</i>	9-29-87	RFC-DC-12-2925
APP'VD DES. SECT. MGR. <i>J. P. Modrey</i>	9-29-87	SSK-AE-22

ORIGINAL ISSUE	REVISION
9-29-87	DATE



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UNIT TWO

PLAN VIEW (N.T.S.)

R.C.P. HATCH
#23

HATCH BOLT No. (TYP)

INSTRUCTION TO THE PLANT CONSTRUCTION DEPARTMENT

1. Modify Hatch Bolts #1, #2, #8, #9, #10, #11, #12, #13, #14, #15, #16 and #19 (▲ on Plan View) in accordance with Sketch SSK-HBR-1 Shts 1 to 5. Modify the corresponding bolt pockets in accordance with either Sketch SSK-HCP-1 or Sketch SSK-HPR-1, Shts 1 & 2, if the existing design drawing details do not fit the restored bolts.
2. Modify Hatch Bolt #18 (● on Plan View) in accordance with Sketch SSK-HCS-1.
3. Restore the seal channel at Hatch Bolt #9 in accordance with Sketch SSK-SCR-1.
4. Visually inspect seal channel to angle weld for distress from bolt testing and replace as necessary.
5. The hatch bolt tightening requirements of Detail G-8 on Drawing 1-2-3186L Rev.4 apply to all hatch bolts.

DESIGN DIVISION: *V.C. LeDon*

CIVIL ENGINEERING: *B.H. Bunn Atty. Paul Luv*

DONALD C. COOK NUCLEAR PLANT - BRIDGEMAN MI

DR. *M. Kucera*
CH. *J. Dwyer*
DATE *9-29-87*

AMERICAN ELEC. POWER SERVICE CORP.
UNIT #2 - R.C.P. HATCH COVER #23
HATCH COVER ANCHORAGE ENHANCEMENT

APP'VD COB. ENGR. *H.P. Modry* *9-29-87*
APP'VD DES. SECT. MGR. *[Signature]* *9-29-87*

RFC-DC-12-2925
SSK-AE-23

1/1

ORIGINAL ISSUE	REVISION	1. MC 14 88 7/11/87
7-22-87	DATE	9-29-87

REDRAWN FOR REVISION 1

UNIT TWO

PLAN VIEW (N.T.S.)

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INSTRUCTION TO THE PLANT CONSTRUCTION DEPARTMENT

1. Modify Hatch Bolt #1 (▲ on Plan View) in accordance with Sketch SSK-HBR-1 Shts 1 to 5. Modify the corresponding bolt pocket in accordance with either Sketch SSK-HCP-1 or Sketch SSK-HPR-1, Shts 1 & 2, if the existing design drawing details do not fit the restored bolt. ▲
2. The hatch bolt tightening requirements of Detail G-8 on Drawing 1-2-3186L Rev.4 apply to all hatch bolts.

DESIGN DIVISION: <u>RCR/PSD</u>	CIVIL ENGINEERING: <u>B.H. Bunt to by Fred Lane</u>	
DONALD C. COOK NUCLEAR PLANT — BRIDGEMAN MI		
DR. <u>M. Kucera</u>	AMERICAN ELEC POWER SERVICE CORP.	
CH. <u>L. Huey</u>	UNIT #2 - R.C.P. HATCH COVER #24	
DATE <u>9-22-87</u>	HATCH COVER ANCHORAGE ENHANCEMENT	
APP'VD COS. ENGR. <u>H.P. Modry</u>	9-29-87	RFC-DC-12-2925
APP'VD DES. SECT. MGR. <u>[Signature]</u>	9-29-87	SSK-AE-24

SIGNATURES	
ORIGINAL ISSUE	REVISION
9-18-87	DATE
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>3" BORE (± 1/4")</p> <p>28" DEEP (± 1/4")</p> <p>1 1/2" (± 1/4") MILL BORE</p> <p>1 1/2" (± 1/4") MILL BORE</p> <p>3/4" HATCH BOLT</p> <p>DO NOT CUT ANY REBAR. IF REBAR IS ENCOUNTERED, STOP CUTTING AND INFORM COLUMBUS AEPSC STRUCTURAL DESIGN OFFICE.</p> </div> <div style="width: 45%;"> <p>REMOVE PLUGS</p> <p>SEAL CHANNEL</p> <p>L 6x5 1/4</p> <p>#11 REBAR</p> <p>#65</p> </div> </div>	

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STEP #2

MILL BORE TO EXPOSE BOLT FOR THREADING.

DESIGN DIVISION: <u>YD & POE</u>		CIVIL ENGINEERING: <u>B. H. Bennett</u>	
DONALD C. COOK NUCLEAR PLANT — BRIDGEMAN MI			
DR. <u>D.S.</u>	AMERICAN ELEC. POWER SERVICE CORP.		
CH. <u>ML/JPB</u>	UNIT #2 RCP HATCH COVERS #21, 22, 23 & 24		
DATE <u>9-18-87</u>	HATCH BOLT RESTORATION		
APP'VD COS. ENGR. <u>H. P. Hodge</u>	9-18-87	RFC-DC-12-2925	
APP'VD DES. SECT. MGR. <u>[Signature]</u>	9-18-87	SSK-HBR-1	

SIGNATURES	
ORIGINAL ISSUE 9-18-87	REVISION DATE 9-29-87

SAWCUT AND/OR GRIND OFF
HATCH BOLT & PREPARE END
FOR THDS. THDS TO BE
1/4" - 10 UNF - 2A PER ANSI B.1.1

STEP #3
BOLT PREPARATION &
CUTTING OF THREAD

FOR REFERENCE ON
UNCONTROLLED
COPY

DESIGN DIVISION: <u>10-300</u>		CIVIL ENGINEERING: <u>B. H. R. R.</u>	
DONALD C. COOK NUCLEAR PLANT — BRIDGEMAN MI			
DR. <u>D. G.</u>	AMERICAN ELEC. POWER SERVICE CORP.		
CH. <u>M. J. JAR</u>	UNIT #2 RCP HATCH COVERS <u>1122324</u>		
DATE <u>9-18-87</u>	HATCH BOLT RESTORATION <u>VA</u>		
APP'VD COG. ENGR. <u>H. R. Hody</u>	<u>9-18-87</u>	RFC-DC-12-2925	
APP'VD DES. SECT. MGR. <u>[Signature]</u>	<u>9-18-87</u>	SSK-HBR-1	

Figure No. 14

SIGNATURES	
ORIGINAL ISSUE	REVISION
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	9-29-87

3/4" ASTM A193 GRADE B7 THD'D STUD - 9' LG AT SKETCH SSK-HBR-1
 & 19 1/4' LG AT SKETCH SSK-HCP-1

3/4" COUPLING 2' LG
 CONFORMING TO THE
 REQUIREMENTS OF ASTM A194
 GRADE 7 NUTS - COUPLING MAY BE
 MACHINED FROM 1 1/2" SQ.
 BAR STOCK.

CLEAN SEAL CHANNEL OF
 RESIDUES FROM STUD WELD,
 FROM BURNOUT SPLATTER &
 FROM GROUTING SPLATTER

2.0 x 3/4"

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FILL POCKET
 WITH NON SHRINK GROUT
 PER PROCEDURES &
 SHAPE TO MATCH SEAL
 CHANNEL

NET-USE 3/4" STUDS
 & COUPLINGS & 3/4"
 BOLTS WHERE
 APPLICABLE.

STEP #4

INSTALLATION OF COUPLING & STUD
 GROUTING OF POCKET

DESIGN DIVISION: <i>D. S. P.</i>	CIVIL ENGINEERING: <i>B. J. Bonnell</i>
DONALD C. COOK NUCLEAR PLANT - BRIDGEMAN MI.	
DR. <i>D. S.</i>	AMERICAN ELEC. POWER SERVICE CORP.
CH. <i>M. J. JAR</i>	UNIT #2 RCP HATCH COVERS #21, 22, 23 & 24
DATE <i>9-18-87</i>	HATCH BOLT RESTORATION
APP'D COB. ENGR. <i>A. P. Mody</i>	9/18/87
APP'D DES. SECT. MGR. <i>A. P. Mody</i>	9/18/87
	RFC-DC-12-2925 SSK-HBR-1

ORIGINAL ISSUE		REVISION		SIGNATURES	
9-18-87		DATE		9/29/87	
				X.H. Hm <i>[Signature]</i> M. JAR, V.V. Hm <i>[Signature]</i>	

HATCH BOLT RESTORATION PROCEDURE

Prior to Starting the Work

1. Determine if the stud of the restored bolt will fit in the existing hatch cover bolt pocket and select the appropriate sketch, either SSK-HBR-1 or SSK-HCP-1, which show the hatch cover bolt pocket modification schemes.
2. If the restored bolt does not fit either pocket modification scheme, as detailed, advise the Columbus AEPSC Structural Design office of the details of the mismatch.
3. If the restored bolt fits the bolt pocket modification schemes proceed with Steps 1 through 4 below.
4. Fabricate and/or purchase new nuts and studs as shown on this sketch.

Step 1 (Refer to Sketch SSK-HBR-1 Sht 1 of 5)

1. Remove the seal material and protect the seal channel seal groove against damage during the bolt restoration work.
2. Remove the existing stud welded to the seal channel as shown on the referenced sketch.
3. If the embedded portion of the anchor bolt is welded to the seal channel free the bolt by removing the weld.

Step 2 (Refer to Sketch SSK-HBR-1 Sht 2 of 5)

1. Using a mill bore for the steel portion and a hole saw for the concrete portion, core bore a 3" diameter hole, centered on the embedded bolt, as shown on the sketch. The depth of the bore has been selected to avoid cutting rebars. No rebar is to be cut. If rebar is encountered stop cutting and inform Columbus AEPSC Structural Design Office.
2. Remove steel and concrete plugs. Bottom of pocket need not be smooth.

Step 3 (Refer to Sketch SSK-HBR-1 Sht 3 of 5)

1. Cut the bolt as shown to prepare the bolt for cutting the thread.
2. Cut 3/4 - 10 UNC Class 2A thread at the exposed end of the bolt.

Step 4 (Refer to Sketch SSK-HBR-1 Sht 4 of 5)

1. Install the coupling nut and stud as shown on the referenced sketch.
2. Fill bore pocket with non-shrink grout in accordance with plant procedures and as shown.
3. Hatch cover shall not be installed until 24 hours after grouting and once installed, shall not be removed until 7 days after grouting.

Step 5

1. As-built drawings of the restoration work made in these hatches shall be forwarded to AEPSC Structural Design Section after completion of the work.

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DESIGN DIVISION: <i>10.500 - 2</i>		CIVIL ENGINEERING: <i>[Signature]</i>	
DONALD C. COOK NUCLEAR PLANT - BRIDGEMAN ML			
DR. <i>M. K. [Signature]</i>		AMERICAN ELEC. POWER SERVICE CORP.	
CH. <i>JAR</i>		UNIT # 2 - R.C.P. HATCH COVERS #21, 22, 23, 24	
DATE <i>9-18-87</i>		HATCH BOLT RESTORATION <i>[Signature]</i>	
APP'VD CON. ENGR. <i>[Signature]</i>		9-18-87	
APP'VD DES. SECT. MGR. <i>[Signature]</i>		9-18-87	
		RFC-DC-12-2925	
		SSK-HBR-1	

ORIGINAL DATE		REVISION		SIGNATURES	
9-18-87		DATE		9-29-87	

PROCEDURE FOR THE RELOCATION OF BOLT POCKETS IN R.C.P. HATCH COVERS #21, TO FIT THE RESTORED HATCH BOLTS

#22, #24, #23 A

1. Bolt pockets of new design will replace the existing pockets for the hatch bolts that will be restored in accordance with Sketch SSK-HPR-1. If the stud of the restored bolt fits within the existing pocket, the existing hatch bolt pocket and Sketch SSK-HCP-1 may be used in lieu of this sketch.
2. The new pockets are to be located to match the restored bolts. Prior to commencing the work, the Plant Construction Department shall verify that these replacement pockets, as detailed on SSK-HPR-1 Sht 1, will fit the geometry of the restored bolts, the hatch cover and the hatch opening. If they do not fit, the Plant Construction Department shall inform Columbus AEPSC Structural Design of the details of the mismatch.
3. Fabricate the new bolt pockets as shown on the sketch taking into account the existing dimensions and clearances of the areas where they will be installed.
4. Remove the existing pockets from the hatch cover, including the 1/2" stiffener plates, the seat plates, the angle iron pieces, and the 2" diameter pipe pieces without damaging the 3/8" thick plates that enclose them.
5. The checkered plate covers and any concrete below them that are in the way of the bolt seat relocation must be removed. The checkered plate covers are to be restored after the pocket relocation is completed.
6. Grind all surfaces smooth in the areas that are to receive the relocated pockets.
7. Drill new 1-1/4" diameter holes in the hatch cover bottom plate centered on the restored studs. Old holes need not be plugged unless they fall in areas of new weld.
8. Drill holes in 2" replacement pocket seat plates centered on the restored studs and install pockets as shown. Weld replacement pockets to the hatch cover with a weld sequence selected to prevent warping of the frame.
9. Modify the bolt pocket cover plates as required.
10. As-built drawings of restoration work made in these hatches shall be forwarded to AEPSC Structural Design Section after completion of the work.

DESIGN DIVISION: U.S. 2012 CIVIL ENGINEERING: B. A. Bennett

DONALD C. COOK NUCLEAR PLANT - BRIDGEMAN MI

DR. <u>MR. 2</u>	AMERICAN ELEC. POWER SERVICE CORP.
CH. <u>JAR</u>	UNIT #2 - R.C.P. HATCH COVERS #21, 22, 23, 24
DATE <u>9-18-87</u>	DETAIL OF RELOCATED HATCH BOLT POCKET
APP'VD COR. ENGR. <u>J. P. Heddy</u>	RFC-DC-12-2925
APP'VD DES. SECT. MGR. <u>J. P. Heddy</u>	SSK-HPR-1

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9-18-87

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DATE

9/21/87

9/23/87

FOR

UNCLAS

0

CO

3/16" (4 PLACES)

2 1/4"

3 3/4"

4" MAX

1/4" HOLE

BY FIELD

1/2" TYP

PLAN

NOTES:

1. ALL MATL ASTM A36 SFL UAL

2. SEE SPEC. DGC-CE-149 QCN - BY FIELD

FOR FABR. OF

STRUCTURAL STEEL.

COVER 1/2" THK

BY FIELD

SECT. B-B

(AT COVER BOLT ONLY)

RESTORED STUD

3/4" NYI HEX NUT

HARDENED WASHER

SCHNORR DISC SPRING

1/2" THK 1 1/4" SQ WSHR

1/4" HOLE

(SEE DET. 8

DWG. 1-2-5186 L REV. 4)

REMOVE

AS REQ'D

COUPLER

2 EXISTING 3/4" HATCH ANCHOR BOLT

SEAL CHAM.

1/4"

EXIST HATCH COVER

SECT. A-A

(REF. SECT. F-2 IN DWG. 1-2-5186 L REV. 4)

DONALD C. COOK NUCLEAR PLANT — BRIDGEMAN MI

DR. D.S.

CH. M/JAR

DATE 9-18-87

AMERICAN ELEC. POWER SERVICE CORP.

UNIT #2 RCP HATCH COVERS

DETAIL OF HATCH BOLT COVER PLATE

APPROV'D COR. ENGR. H.P. WADSWORTH

APPROV'D DES. SECT. MGR. J. J. BARKER

DESIGN DIVISION

CIVIL ENGINEERING

9-18-87

9-18-87

RFC-DC-12-2925

SSK-HCP-1

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9-18-87		9-22-87	9-29-87

R.C.P. HATCH COVERS #21, #22, #24 & #23 ^Δ

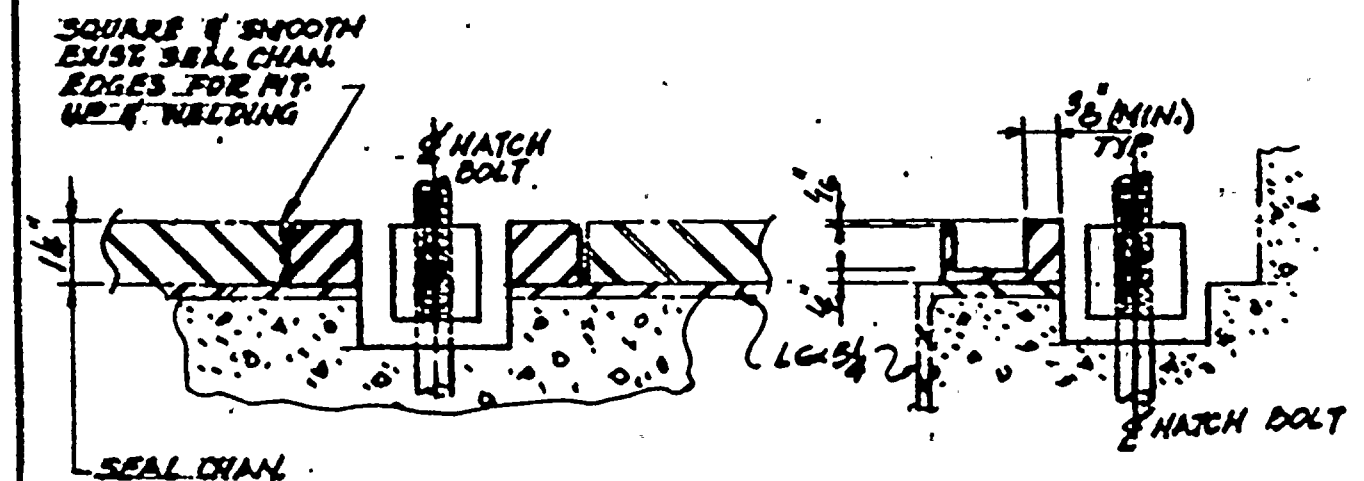
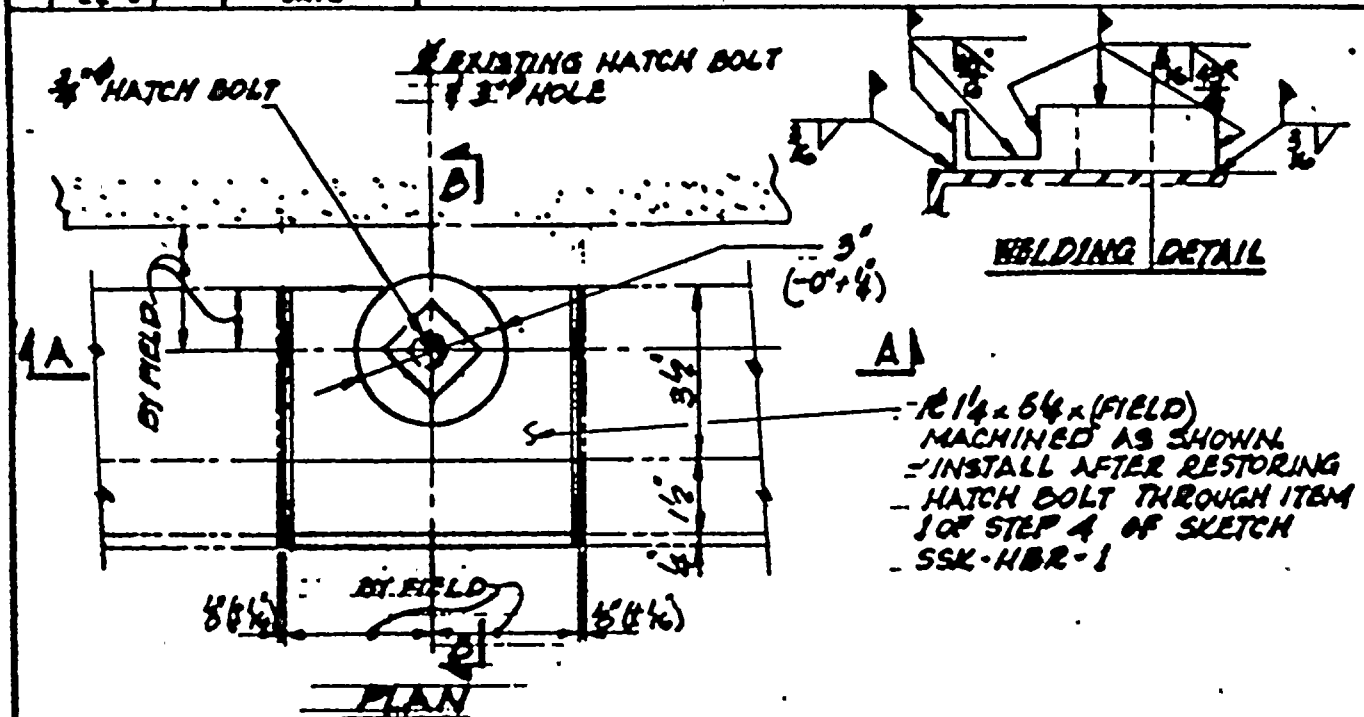
PROCEDURE FOR THE INSTALLATION OF COVER PLATES OVER THE EXISTING BOLT POCKETS TO ACCOMODATE THE RESTORED HATCH BOLTS

1. For those hatch cover bolt pockets where the stud of the restored hatch bolt fits within the existing bolt pockets the cover plates of this sketch may be used in lieu of Sketch SSK-HPR-1.
2. Custom fabricate each 2" thick cover plate to fit the existing top of hatch pocket dimensions as shown on the sketch.
3. Grind all surfaces smooth in the areas that are to receive the cover plates.
4. Remove only those portions of the existing pockets that interfere with the studs of the restored hatch bolts. Bolt pocket vertical stiffener plates and angle iron pieces must not be disturbed.
5. Drill 1-1/4" diameter holes in the 3/8" hatch cover bottom plate to accomodate the studs of the restored hatch bolts. Old holes need not be fixed.
6. Drill 1-1/4" diameter holes in the cover plates to match the studs and install the cover plates on the pockets. Weld as shown.
7. Paint per plant procedures.
8. As built drawings of restoration work in these hatches shall be forwarded to AEPSC Structural Design after completion of the work.

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DESIGN DIVISION: <u>30</u>		CIVIL ENGINEERING: <u>P. H. Bennett</u>	
DONALD C. COOK NUCLEAR PLANT — BRIDGEMAN MI			
DR. <u>MR. Ruelle</u>		AMERICAN ELEC. POWER SERVICE CORP. ^Δ	
CH. <u>JAR</u>		UNIT #2 - R.C.P. HATCH COVER #21, 22, 23 & 24	
DATE <u>9-18-87</u>		DETAIL OF HATCH BOLT POCKET COVER PLATE	
APP'VD COR. ENGR. <u>H. P. Hoadley</u>		9-18-87	
APP'VD DES. SECT. MGR. <u>H. P. Hoadley</u>		9-18-87	
		RFC-DC-12-2925	
		SSK-HCP-1	

ORIGINAL ISSUE	REVISION	DATE
9-22-87		



NOTES:

1. ALL MAT'L ASTM A36 STEEL UN.
2. SEE SPECIFICATION DGC-CE-M9 DCN FOR FABRICATION OF STRUCTURAL STEEL.

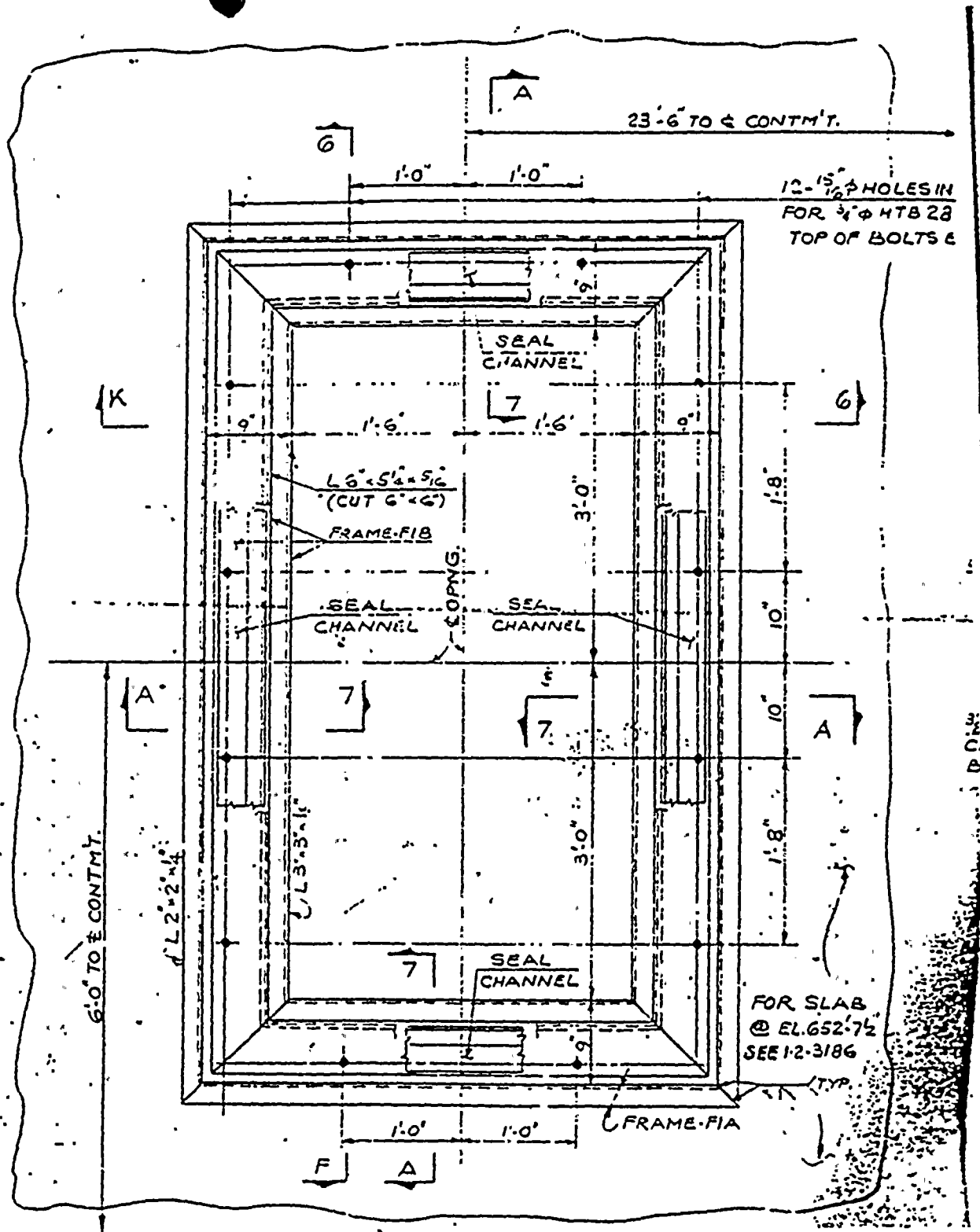
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DESIGN DIVISION: *D. Cook* CIVIL ENGINEERING: *B. H. Smith & F. J. Smith*

DONALD C. COOK NUCLEAR PLANT — BRIDGEMAN MI

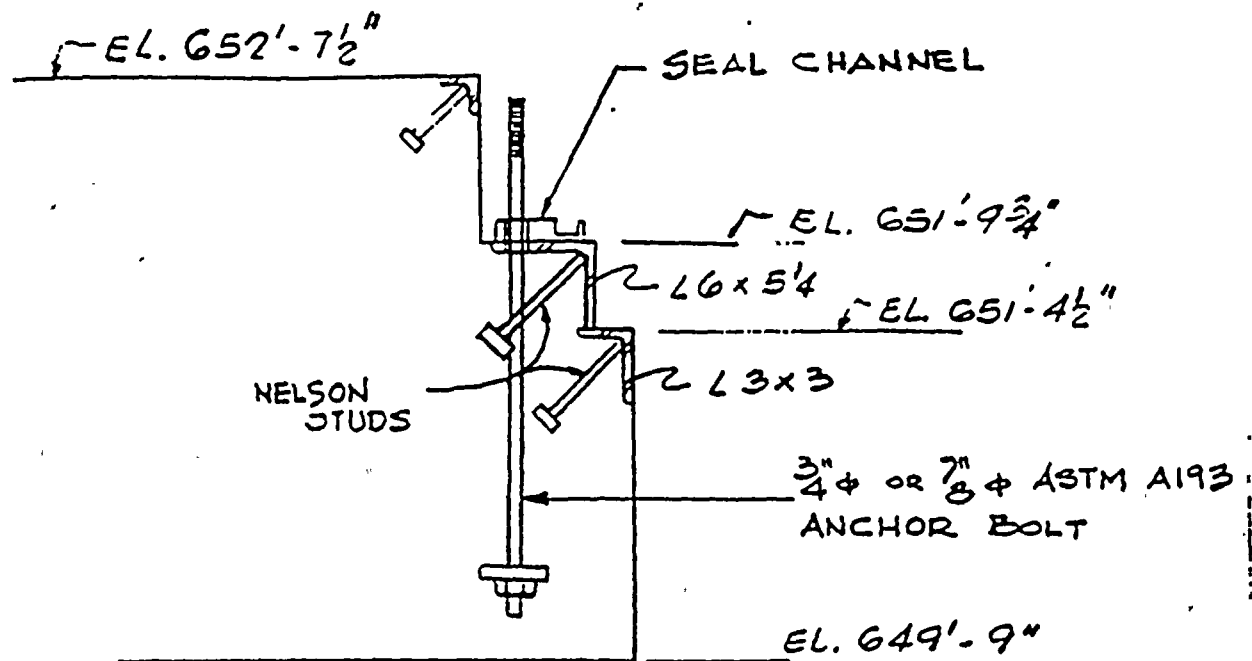
DR. *D.S.* AMERICAN ELEC. POWER SERVICE CORP.
CH. *ML/JAR* *gh* UNIT #2 RCP HATCH COVER #23
DATE 9-22-87 SEAL CHANNEL RESTORATION @ BOLT #9

APP'VD COS. ENGR. *J.P. Huday* 9-22-87 RFC-DC-12-2925
APP'VD DES. SECT. MGR. *Ed Smith* 9-22-87 SSK-SCR-1

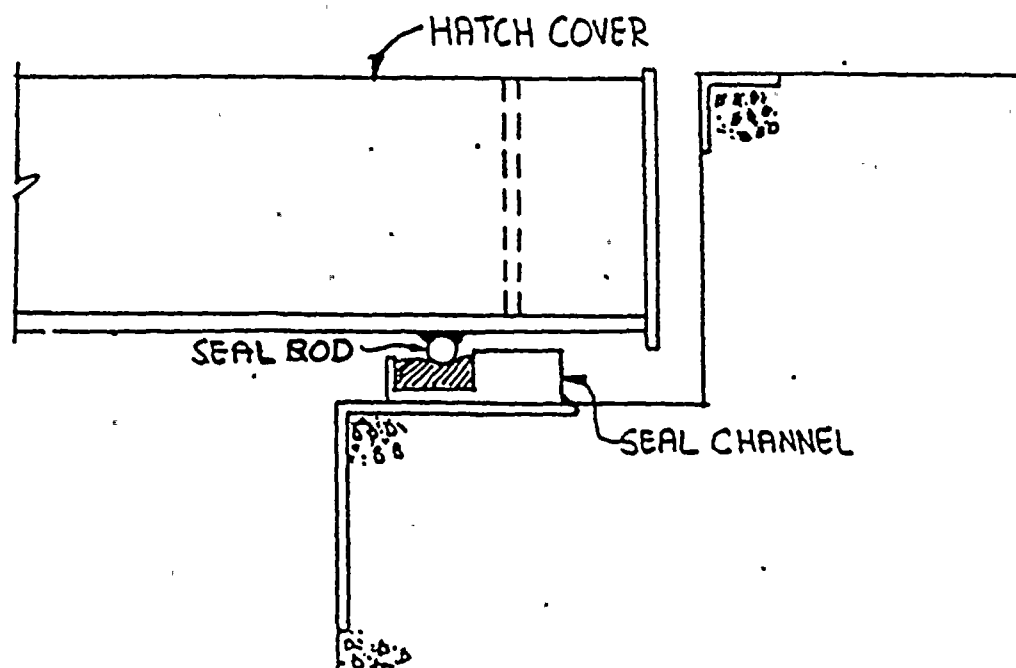


PLAN - CRDM HATCH - TYPICAL

Figure No. 23

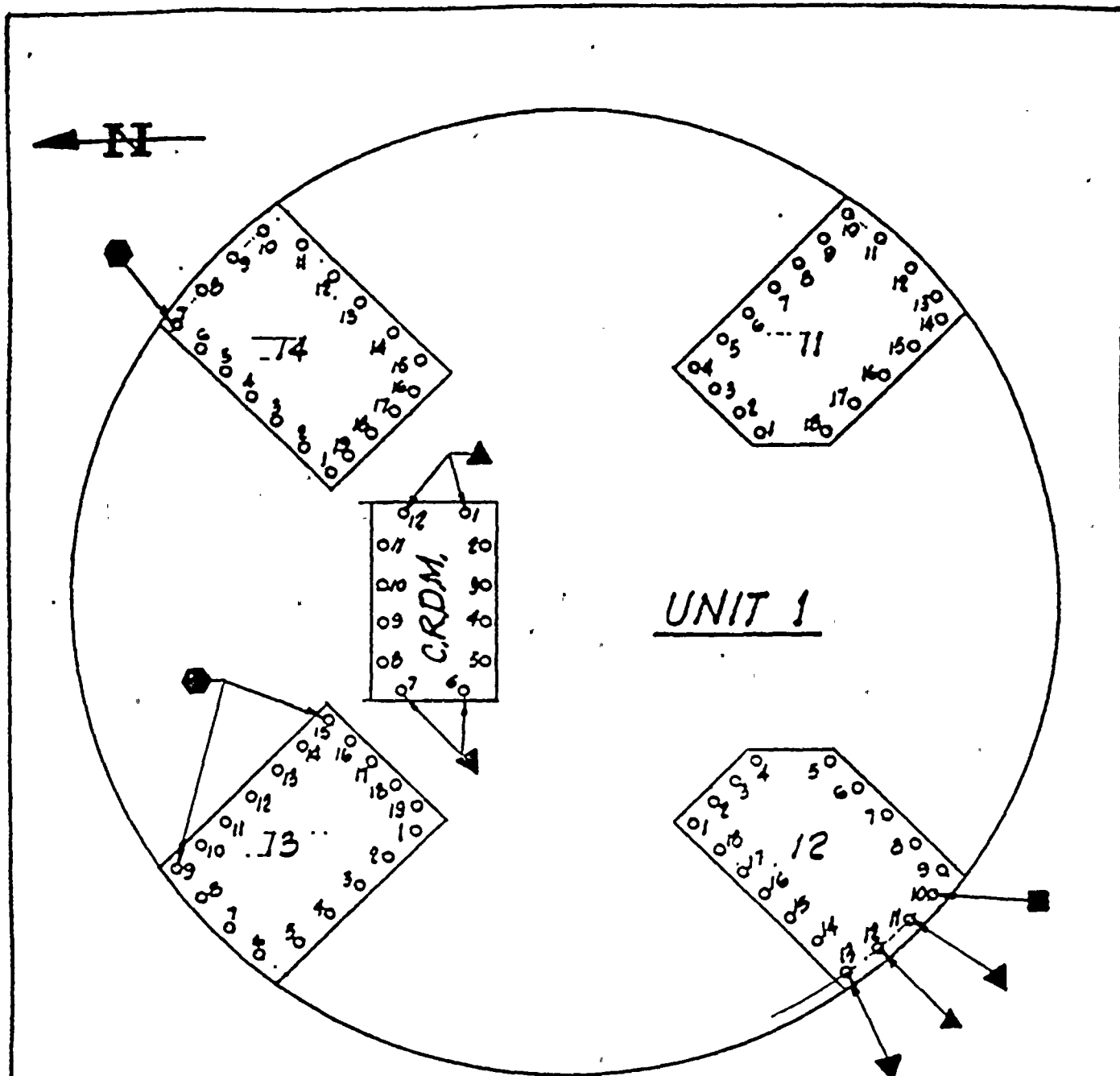


TYPICAL SECTION AT ANCHOR BOLT



SECTION SHOWING SEAL STRIP - UNIT #1

FIGURE NO. 24



- PLAN -

UNIT #1 AS-FOUND CONDITION
- RCP & CRDM HATCH
ANCHOR BOLTS

● - BOLT MISSING

▲ - BOLT REJECTED - U.T.

■ - BOLT BROKE AT WELD TO SEAL
CHANNEL UPON TORQUE

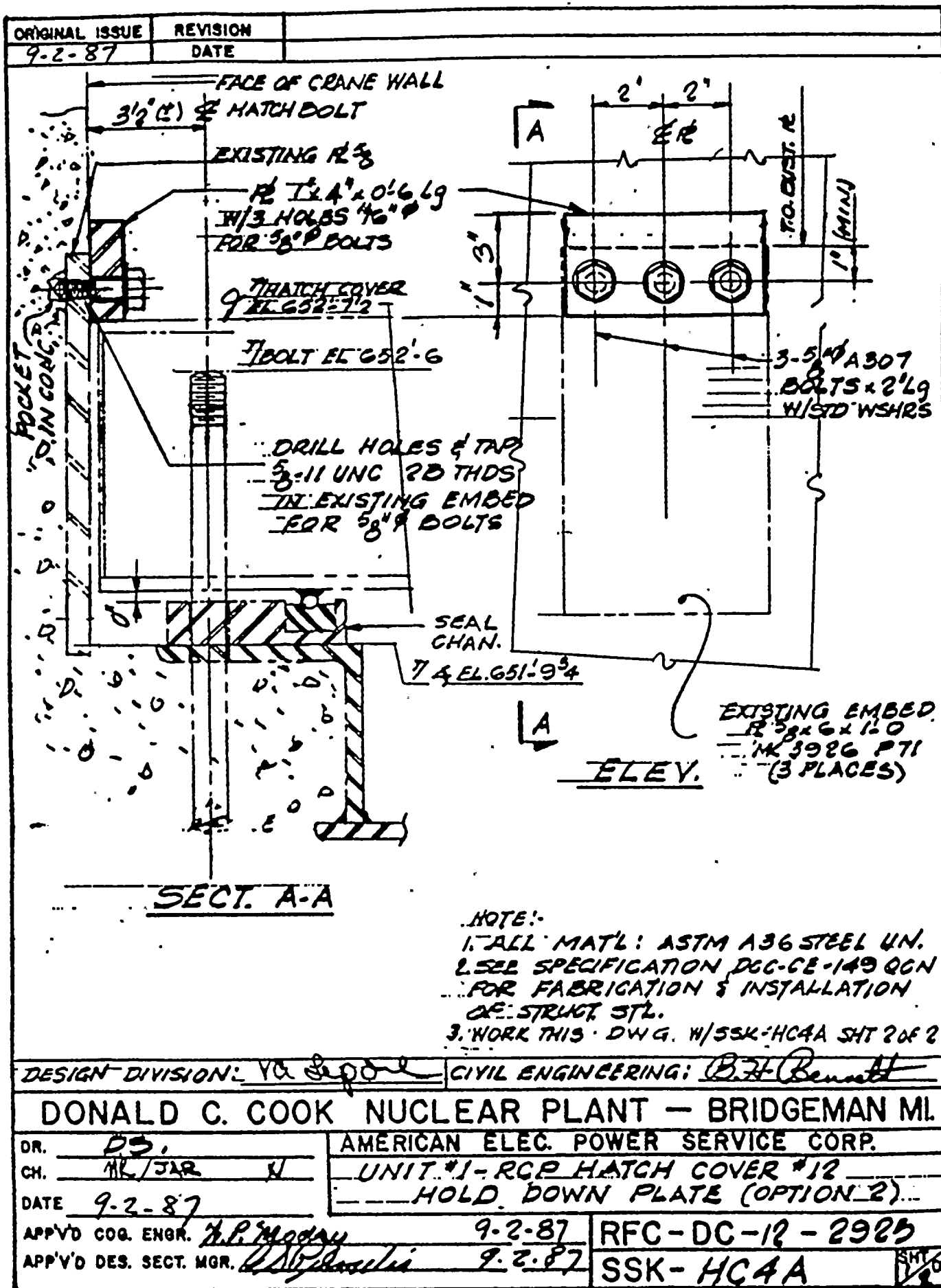


Figure No. 26

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PROCEDURE FOR THE INSTALLATION OF HOLD DOWN PLATES
(OPTION 2) FOR UNIT #1 R.C.P. HATCH #12

1. Work this procedure with DRAWING SSK-HC4A Sht 1 of 2.
2. One 1" x 4" x 6" long hold down plate shall be installed on each MK 3926-P71 plate embedded in the crane wall if the 2" minimum dimension of item #3 can be met.
3. The Option 2 hold down plates may be used where the existing MK 3926-P71 embedded plates extend a minimum of 2 inches above the top of the hatch cover. The 2" measurement may take place with the hatch cover fully seated against the seal channel.
4. Grind smooth those areas of the existing embedded plates, the concrete wall and the top of the hatch cover that will receive the hold down plates.
5. Fully seat the hatch cover by tightening each of the hatch cover hold down bolts in accordance with plant procedures.
6. With the hatch cover in the fully seated position, use the hold down plates, positioned as shown on DRAWING HC4A, as templates to drill and tap the holes in the existing embed plates. The actual drilling and tapping may be performed with the hatch cover off or in place.
7. At the back of the drilled and tapped holes in the embedded plates pockets shall be drilled in the concrete to a depth of 1/2" to accommodate bolt projection. The pockets shall be cleaned of loose material. No reinforcing steel shall be cut or exposed during this operation. Contact the Columbus Structural Design Office if reinforcing is encountered.
8. With the hatch covers fully seated, install the hold down plates and tighten the 5/8 inch diameter A 307 bolts to a torque of 35 FT-LBS. Each time the hatch cover is reinstalled the bolts must be torqued to 35 FT-LBS.
9. Shims may be used between the hold down plate and the top of the hatch cover to insure that the hold down plates bear uniformly on the hatch cover.

DESIGN DIVISION: <i>J. W. Smith</i>	CIVIL ENGINEERING: <i>K. H. Bennett</i>
DONALD C. COOK NUCLEAR PLANT — BRIDGEMAN MI	
DR. JAR	AMERICAN ELEC. POWER SERVICE CORP.
CH. <i>MR</i>	UNIT #1 - RCP HATCH COVER #12
DATE 9-2-87	HOLD DOWN PLATE (OPTION 2)
APP'VD COB. ENGR. <i>J. P. [Signature]</i> 9-2-87	RFC-DC-12-2925
APP'VD DES. SECT. MGR. <i>[Signature]</i> 9-2-87	SSK-HC4A

