TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
1630 Chestnut Street Tower II

June 5, 1985

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

In the Matter of the Application of) Docket Nos. 50-390
Tennessee Valley Authority) 50-391

This letter is in response to your letter to TVA dated May 16, 1985 requesting numerous documents related to our Watts Bar Nuclear Plant. With the exception of your item 23 (83-10-31-L), all documents requested are enclosed. Please note that your item 24 duplicates item 4 and item 22 duplicates item 19.

If you have any questions concerning this matter, please get in touch with R. H. Shell at FTS 858-2688.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. W. Hufham, Manager
Licensing and Regulations

Sworn to and subscribed before me
this 5th day of June 1985

Paulette D. White
Notary Public
My Commission Expires 8-24-88

Enclosures
cc: U.S. Nuclear Regulatory Commission (Enclosures)
Region II
Attn: Dr. J. Nelson Grace, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

B001
1/1

Enclosure

LIST OF DOCUMENTS ON WATTS BAR CONCERNS

Please provide the following documents:

1. CEB 820413008; CEB 821020003; NCRWBNCEB8203
2. Documents related to closing Black & Veatch finding F710
3. CEB 821110017
4. WBN 831019009 - Memo from Wadewitz to Standiffer (?) dated 10/19/83
5. ESB 831213209
6. 840518A0369 - Memo from Costner to Cantrell dated 4/25/84
7. CEB 840523008
8. OQA 840604 - Memo from Castner to Cantrell dated 6/4/84
9. CEB 840625006 - Memo from Cantrell to Anderson dated 6/25/84
10. Memo from Beasley to Standiffer (?) dated 10/3/84
11. 841004 T0407 (QMS 84100320A (or 4))
12. EFB 831213209 - Rev. 2 to GCS N3C-928
13. Rev. 1 to GCS N3C-928
14. NEB 84022420 (840229K0056)
15. CEB 84013004
16. OQA 840215601
17. Memo from Cantrell to Anderson dated 3/19/84 and related to deviation report C03-S-84-0055-D01
18. NEB 840321225
19. C03-S-84-0055-D01
20. CEB 841015021

TVA 64 (OS-9-65)

UNITED STATES GOVERNMENT

Memorandum

TENNESSEE VALLEY AUTHORITY

TO : Those listed

FROM : R. O. Barnett, Chief, Civil Engineering Branch, W9D224 C-K

DATE : APR 13 1982

(2)

SUBJECT: WATTS BAR NUCLEAR PLANT UNITS 1 AND 2 - POTENTIALLY OVERSTRESSED EMBEDDED PLATES - NCR WBNCEB8203

Attached is the subject nonconformance which has been considered a significant condition and is to be processed in accordance with EN DES-EP 2.02.

For R. O. Barnett

R. A. Costner, W11C126 C-K
John A. Raulston, W10C126 C-K
J. C. Standifer, 204 GB-K

ROB:JRR:DEC
Attachment
cc (Attachment):
E. G. Beasley, W12B26 C-K
H. N. Culver, 249A HBB-K
MEDS, 100 UB-K
R. M. Pierce, W4D224 C-K
M. N. Sprouse, W11A9 C-K
J. E. Wilkins, Watts Bar Nuclear CONST (3)

052098.02

Principally Prepared By: J. R. Rowan, extension 6722

DIVISION OF ENGINEERING DESIGN

CEB '82 0331 004 NONCONFORMANCE REPORT [1] REPORT NO. WBNCEB8203

[2] PROJECT SWP [3] PLANT WBN [4] UNIT 1 & 2

[5] PREPARER/ORGANIZATION/DATE B. M. McAlister/CEB/3-24-82

[6] DESCRIPTION OF CONDITION

Multiple supports have been attached to embedded plates without a design review of the embedded plate capacity. This could result in the embedded plate anchors being over loaded and could effect any system utilizing imbedded plates.

[7] DATE OF OCCURRENCE EST ( ), ACT. ( )

[8] METHOD OF DISCOVERY NCR 3842R

[9] UNID CODE (EN DES-EP 8.01)

[10] SCHEDULE IMPACT ☐ P ☐ A ☐ N

[11] ECN REQUIRED ☐ YES ☐ NO

[12] SIGNIFICANT CONDITION ADVERSE TO QUALITY YES ☒ NO ☐

[13] *BRANCH CHIEF/DATE [signature] 3/30/82

[14] CORRECTIVE ACTION:

[15] ASSIGNABLE CAUSE: (REQUIRED IF SIGNIFICANT)

[16] ACTION REQUIRED TO PREVENT RECURRENCE: (REQUIRED IF SIGNIFICANT)

[17] *QA ENGINEER REVIEW AND CONCURRENCE:

[18] LABOR EST. ( ), ACT. ( ) MH [19] SCHEDULE EST. ( ), ACT. ( ) DA

[20] ACTIVITY NO. [21] TASK DESCRIPTION [22] DATE INITIATED

[23] REMARKS: Refer to SWP for completion of all remaining action.

[26] DISTRIBUTION:

[27] QEB QA GROUP-ENGINEERING SECTION
OEDC QA
NEB-NLS (For Significant NCR's)**
MEDS
NSAS (For Significant NCR's)

*DISTRIBUTE AFTER THIS SIGNATURE

**HANDCARRY COPY TO NEB NLS ALSO

[24] ALL ACTION COMPLETE:

BRANCH CHIEF/ORG. DATE

[25] *NCR CLOSED:

CHIEF, QUALITY ENGINEERING BRANCH DATE

QEB USE

TVA 64 (OS-9-65)

UNITED STATES GOVERNMENT

Memorandum

TENNESSEE VALLEY AUTHORITY

CEB '82 102 003

TO : John A. Raulston, Chief, Nuclear Engineering Support Branch, W10C125 C-K

FROM : R. O. Barnett, Chief, Civil Engineering Support Branch, W9D224 C-K

DATE : OCT 3 0 1982

8210250132

(2)

SUBJECT: WATTS BAR NUCLEAR PLANT AND BELLEFONTE NUCLEAR PLANT - POTENTIALLY OVERSTRESSED EMBEDDED PLATES - NONCONFORMANCE REPORTS (NCRS) WBNCEB8203 AND GENCEB8203 - REPORT NO. 3 - INTERIM

Attached is our approved interim report on the subject nonconformances for your forwarding to NRC-OIE Region II. We expect to provide you with additional information by December 1, 1982.

L. O. Barnett

R. O. Barnett

ROB:BMM:CFM
Attachment
cc (Attachment):
E. G. Beasley, W12B26 C-K
W. R. Brown, 102 ESTA-K
P. L. Duncan, 5100 MIB-K
R. M. Hodges, 1117 IBM-K
MEDS, W5B63 C-K
R. M. Pierce, 104 ESTA-K
J. C. Standifer, 204 GB-K

Principally Prepared By: B. M. McAlister, extension 3443

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
POTENTIALLY OVERSTRESSED EMBEDDED PLATES
10CFR50.55(e) - REPORT NO. 3 - INTERIM
NCRS WBNCEB8203 AND GENCEB8208

Description of Deficiency

After reviewing Watts Bar Nuclear Plant NCR 3842R, which is being separately reported and concerns positioning of expansion anchors near embedded plates with attachments, TVA recognized that one aspect of this nonconformance report should be reported separately. This separate concern is that multiple supports have been attached to embedded plates' without design review of the embedded plates' capacity. The apparent cause of this potential deficiency is the lack of control procedures and documentation requirements concerning the loading limits of embedded plates.

Interim Progress

NCR WBNCEB8203

TVA has completed an evaluation of the sample of 69 embedded plates that were selected to determine if a support failure could occur. The result of the sample was that 1 embedded plate out of the 69 evaluated had an anchor load that exceeded TVA's design allowables. However, this would not have resulted in an anchor failure or a support failure. The selection of the plate sample was restricted to the more highly congested areas of the plant and in general to the heavier loaded plates. Two embedded plates were selected in the intake pumping station due to the heavy loading expected from large diameter piping. An additional 9 plates were evaluated above the original 60 required for the sample. The 9 plates were identified while evaluating embedded plates for NCR 3842R, item 7.

A failure rate of 0 in a sample of 60 provides a 95 percent confidence that less than 5 percent of the embedded plates in category I structures have an ultimate capacity less than the maximum design loads.

Since the inspection resulted in 0 failures in 69, no further inspection work will be required for supports attached to embedded plates prior to March 27, 1982. TVA is presently reviewing the alternatives for control or acceptance of attachments to embedded plates after March 27, 1982.

NCR GENCEB8208

TVA is presently reviewing the alternatives for control of attachments to embedded plates for Bellefonte Nuclear Plant.

Prepared Billie M. McMaster 10/7/82
Date

Reviewed J. Lawrence Coves 10/7/82
Date

Approved R. H. Anderson 10-8-82
Date

DIVISION OF ENGINEERING DESIGN

CEB 82 0331 004 NONCONFORMANCE REPORT [1] REPORT NO. WBNCEB8203

[2] PROJECT SWP | [3] PLANT WBN | [4] UNIT 1 & 2

[5] PREPARER/ORGANIZATION/DATE B. M. McAlister/CEB/3-24-82

[6] DESCRIPTION OF CONDITION

Multiple supports have been attached to embedded plates without a design review of the embedded plate capacity. This could result in the embedded plate anchors being over loaded and could effect any system utilizing imbedded plates.

820405F0076

[7] DATE OF OCCURRENCE EST( ), ACT. ( )

[8] METHOD OF DISCOVERY NCR 3842R

[9] UNID CODE (EN DES-EP 8.01)

[10] SCHEDULE IMPACT ☐P ☐A ☐N

[11] ECN REQUIRED ☐ YES ☐ NO

[12] SIGNIFICANT CONDITION ADVERSE TO QUALITY YES ☒ NO ☐

[13] *BRANCH CHIEF/DATE [signature] 3/29/82

[14] CORRECTIVE ACTION:

[15] ASSIGNABLE CAUSE: (REQUIRED IF SIGNIFICANT)

[16] ACTION REQUIRED TO PREVENT RECURRENCE: (REQUIRED IF SIGNIFICANT)

[17] *QA ENGINEER REVIEW AND CONCURRENCE:

[18] LABOR EST. ( ), ACT. ( ) MH | [19] SCHEDULE EST. ( ), ACT. ( ) DAYS

[20] ACTIVITY NO. | [21] TASK DESCRIPTION | [22] DATE INITIATED

[23] REMARKS: Refer to SWP for completion of all remaining action.

[26] DISTRIBUTION:

[27] QEB QA GROUP-ENGINEERING SECTION
OEDC QA
NEB-NLS (For Significant NCR's)**
EDS
RS (For Significant NCR's)

*DISTRIBUTE AFTER THIS SIGNATURE
**HANDCARRY COPY TO NEB-NLS ALSO

[24] ALL ACTION COMPLETE:
BRANCH CHIEF/ORG. DATE

[25] *NCR CLOSED:
CHIEF, QUALITY ENGINEERING BRANCH DATE

QEB USE

TENNESSEE VALLEY AUTHORITY
KNOXVILLE, TENNESSEE 37902
400 West Summit Hill Drive, W10C126

NEB 821222 264

DEC 22 1982

(87)

Black and Veatch
1500 Meadow Lake Parkway
Post Office Box 8405
Kansas City, Missouri 64114

8212280025

Attention: Mr. W. J. Zidziunas

Gentlemen:

PERSONAL SERVICES CONTRACT NO. TV-60052A

We have received the finding reports for Finding Nos. F120; F121; F333; F373; F504; F710; F711; F712; F731, Rev. 1; and F800. The chairman of the OEDC Policy Committee has reviewed the findings, and the results of this review are enclosed for your consideration.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

John A. Raulston
Chief, Nuclear Engineering Support Branch

Enclosures

HLJ:MLL
cc (Enclosures):
H. N. Culver, 249A HBB-K
MEDS, W5B63 C-K
R. M. Pierce, 104 ESTA-K
R. A. Painter, E5C80 C-K
J. C. Standifer, 204 GB-K

E82355.02

FORM 2

WATTS BAR NUCLEAR PLANT
INDEPENDENT REVIEW

FINDING RESPONSE

Finding number IF-I-12-01

Date finding received from Black & Veatch 12/8/82
Date

Comments pertinent to finding:

TVA agrees there is a nomenclature error in the value identification.

This finding is identical to F800 and should be combined with F800 for level 3 and report considerations.

NCR SWPWBN8267 has been issued to cover the nomenclature error.

E Grey Beasley
Chairman, OEDC Policy Committee

12-20-82
Date

JCS 12
OEDC Program Manager

12/21/82
Date

Date finding response transmitted to Black & Veatch 12/22/82
Date

FORM 2

WATTS BAR NUCLEAR PLANT
INDEPENDENT REVIEW

FINDING RESPONSE

Finding number IF1 12/1 1

Date finding received from Black & Veatch 12/8/82
Date

Comments pertinent to finding:

TVA agrees that the design does not agree with an exact, literal interpretation of position c(1b) of Reg Guide 1.106. However, TVA feels that the position and bases outlined in the level 1 response is the best solution. That position will be discussed with NRC to assure that NRC agrees.

E Gray Beasley
Chairman, OEDC Policy Committee

12-20-82
Date

Wm L. Lyon
OEDC Program Manager

12/21/82
Date

Date finding response transmitted to Black & Veatch 12/22/82
Date

FORM 2

WATTS BAR NUCLEAR PLANT
INDEPENDENT REVIEW

FINDING RESPONSE

Finding number IF131381

Date finding received from Black & Veatch 11/4/82
Date

Comments pertinent to finding:

The attached summarizes the basis for TVA's position that it is acceptable for the auxiliary feedwater pump motors to exceed the name plate rating for event postulated in the finding.

E Gray Beasley
Chairman, OEDC Policy Committee

12-20-82
Date

Wm L Gunn
OEDC Program Manager

12/21/82
Date

Date finding response transmitted to Black & Veatch 12/22/82
Date

F333 Finding Response

The design of the AEW system is such that it can tolerate any single active failure in combination with the event it must mitigate and still perform its safety function. A failure of the pump runout protection for one of the motor driven pumps would be considered a single failure which removed that motor driven pump from service. Specifically for the feedwater rupture event, the FSAR chapter 15 accident analysis for the event (15.4.2.2) specifies that the assumed single failure is the failure of the (motor driven) pump feeding the unfaulted SG's. The analysis concludes that the results are satisfactory.

The original response had taken a value of 620 hp. from the motor performance curve and did a rule of thumb estimate on the temperature rise. In this response we have extended the performance curve out to a maximum of 640 hp.

The total temperature of a 600 hp motor operating at 640 hp, which is peak motor horsepower required, approximately a 7 percent overload, may be conservatively approximated by assuming that the total temperature is proportional $(hp)^{1.5}$, (Electrical Apparatus, February 1980 "How to Interpret Motor Temperature Tests, by R.L. Nailen.). If we consider a total temperature of 106.8°C (equal to the 49.4°C ambient due to an HELB and the tested motor full load temperature rise of 57.4°C), this very conservative approximation would yield the following total temperature at 640 hp.:

$$\left(\frac{640}{600}\right)^{1.5} = 1.10$$

$$106.8\,^{\circ}C \times 1.10 = 117.7\,^{\circ}C$$

F333 (cont'd)

The inherent temperature limit of class "B" insulation is 80° rise + 40°C ambient = 120°C total temperature. Thus, an overload of 7 percent should not drive this machine into temperatures which would result in loss of life greater than expected.

FORM 2

WATTS BAR NUCLEAR PLANT
INDEPENDENT REVIEW

FINDING RESPONSE

Finding number IFB17131

Date finding received from Black & Veatch 12/8/82
Date

Comments pertinent to finding:

The condition identified in the finding was previously identified in NCR WBNCEB8215 prepared on April 5, 1982, and still is open. While the condition does exist it was properly identified prior to the Black and Veatch review. While closure of NCR WBNCEB8215 is a potential punch list item the resolution of the NCR, in TVA's opinion, will bring the design and construction into conformance with the license application..

E Gray Beasley
Chairman, OEDC Policy Committee

12-20-82
Date

Wm L Lawson
OEDC Program Manager

12/21/82
Date

Date finding response transmitted to Black & Veatch 12/22/82
Date

FORM 2

WATTS BAR NUCLEAR PLANT
INDEPENDENT REVIEW

FINDING RESPONSE

Finding number IE1510141

Date finding received from Black & Veatch 11/5/82
Date

Comments pertinent to finding:

Agree that this finding identifies a failure to meet a direct FSAR commitment.

Bellefonte containment analyses used 5% eccentricity. Review of the Bellefonte analyses has shown the effect of not using 5% eccentricity on Watts Bar to be small. The attached provides additional information on why the effect is small.

The deficiency has been identified as an NCR.

E Gray Beasley
Chairman, OEDC Policy Committee

12-20-82
Date

DCD 12/20/82

Henry L. Green
OEDC Program Manager

12/21/82
Date

Date finding response transmitted to Black & Veatch 12/22/82
Date

An Expended Discussion
of Black & Veatch Finding F504

The Commitment Defined

Section 3.7.2.1.1 of the Watts Bar Final Safety Analysis Report (FSAR) makes the following statement: "For axisymmetric structures, an eccentricity of 5 percent of the diameter was assumed." An explanation follows.

Consider a cylindrical containment vessel with a spherical dome, as shown in figure 1. It is nominally symmetric about its central vertical axis. To meet the commitment, the analyst would assume an arbitrary offset (equal to 1/20th of the diameter of the structure) of the center of mass, M, from the center of the structure, C. Since the mass is then eccentric to the center of twisting (known as the shear center), base ground motion (such as an earthquake) along the + and - y axes in figure 1 will induce both lateral shear forces and torsion in the structure. The eccentric mass will also result in the formation of vibration modes involving simultaneous (or coupled) translational and rotational motion.

The intent of this commitment was to account for asymmetry due to: (1) construction tolerances and (2) eccentric mass distribution of supported systems (such as piping, hatches, ladders, etc.). The historical source of the 5-percent figure (e.g., why not 1 percent or 2 percent?) is the uniform building code (UBC). In commercial buildings designed by the UBC, the potential for eccentricities in mass center due to asymmetric floor loadings and shifts in shear center due to the effects of interior walls is much greater than for nuclear containment structures.

The Watts Bar Steel Containment Vessel Seismic Analysis

Rather than apply the arbitrary 5-percent eccentricity, the analyst calculated actual eccentricies at various levels of the structure. The most significant of these were due to hatches, although, at most, the eccentricities are equal to approximately 1 percent of the diameter. Thus, part 2 of the intent of the commitment was met. TVA has considerable data supplied by the designer and constructor of the vessel (Chicago Bridge and Iron Company) to show that the structure has insignificant additional eccentricity due to construction tolerances.

The Effect of Not Meeting the Commitment

In those instances where TVA has used 5-percent eccentricity on cylindrical structures, the effect has been shown to be small. One way of expressing the effect of including the 5-percent eccentricity is to compare the motion of a point on the shell (shown as "+R" in section A-A, figure 1) to the motion of the center of the cylinder, C. If the torsional effects are significant, the motion of these two points will be signicantly different. Figure 2 is a response spectrum plot of these two points for the seismic

analysis of the Bellefonte Nuclear Plant secondary containment structure. (It is a plot of the peak acceleration of subsystems of various frequencies attached to the structure.) Since the two points have almost identical response spectra, the effect of considering the 5-percent eccentricity is seen to be small.

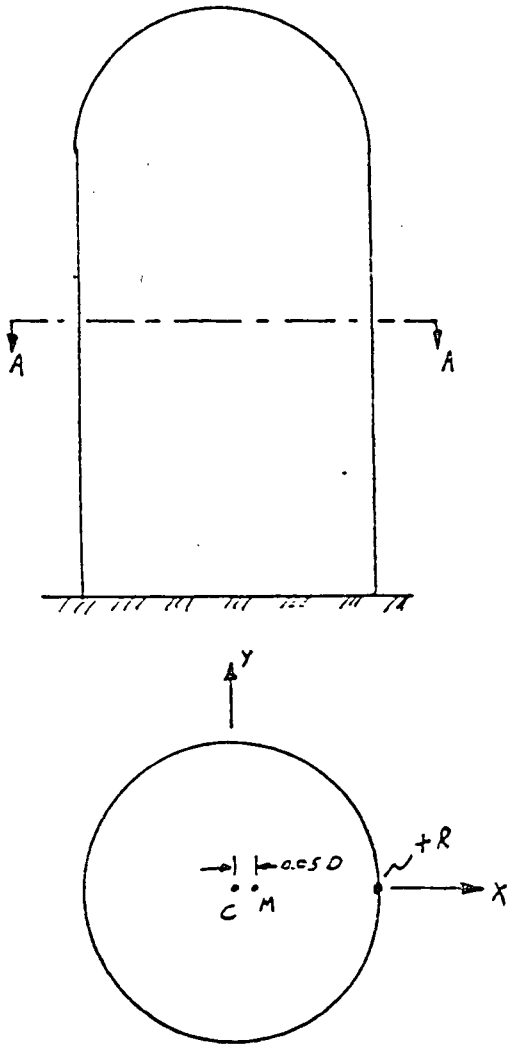
This effect should be even less for the Watts Bar Nuclear Plant containment vessel, since its first torsional vibration mode is at approximately 15 hertz (cycles per second), compared to the 10 hertz coupled torsional-translational mode for the Bellefonte secondary containment and since there is considerably less seismic ground motion input at 15 hertz than at 10 hertz.

Summary

1. The FSAR commitment was not met.

2. The original intent of the FSAR commitment was met.

3. The effect of not meeting the FSAR commitment is minimal.



Section A-A

Figure 1

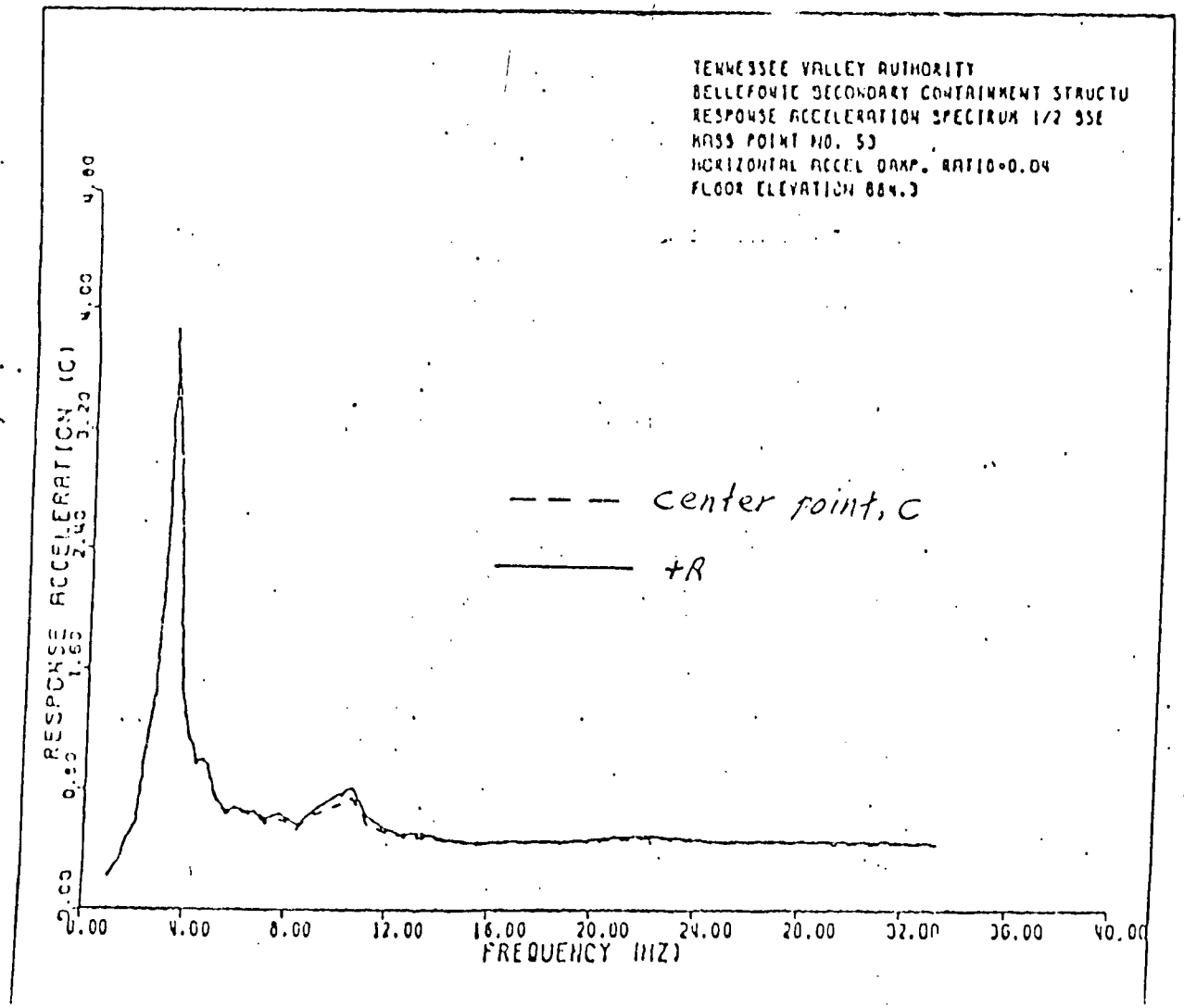

TENNESSEE VALLEY AUTHORITY
BELLEFONTE SECONDARY CONTAINMENT STRUCTU
RESPONSE ACCELERATION SPECTRUM 1/2 SSE
MASS POINT NO. 53
HORIZONTAL ACCEL DAMP. RATIO=0.04
FLOOR ELEVATION 884.3
RESPONSE ACCELERATION (G)
2.00
3.20
4.00
0.00
4.00
8.00
12.00
16.00
20.00
24.00
28.00
32.00
36.00
40.00
FREQUENCY (HZ)
center point, C
+R

Figure 2.

FORM 2

WATTS BAR NUCLEAR PLANT
INDEPENDENT REVIEW

FINDING RESPONSE

Finding number IF 1711 101

Date finding received from Black & Veatch 11/24/82
Date

Comments pertinent to finding:

Attached are the design calculations for the embedded plate MK 40W. These calculations confirm adequacy of the embedded plate. These calculations would have been performed later if necessary to address NCR WBNCEB 8203, issued March 1982, but were accelerated to address this finding. The calculations are adequate to close the NCR in so far as the embedded plate is concerned; however, NCR WBNCEB 8203 must remain open because it is generic to a large number of embedded plates and thus closure of NCR WBNCEB 8203 should be added to your punch list.

Please recycle on level 2 if the attached calculations are not sufficient hard evidence to show the plates in question are acceptable.

E Gray Beasley
Chairman, OEDC Policy Committee

12-20-82
Date

Henry L. Green
OEDC Program Manager

12/21/82
Date

Date finding response transmitted to Black & Veatch 12/22/82
Date

S&V Finding F7.10

SHEET 1 OF 1

LOAD SUMMARY

COMPUTED WWW DATE 11/1/82

CHECKED CS DATE 11-5-82

F-7.10

(1) $F_T = .020^K$, $F_S = .042^K$, $m = .22^{K\text{-}IN}$

(2) $F_T = .70^K$

(3) DELETED PER ECN 2576 & 3210 DTD 9/17/82 R 903

(4) $F_T = .12^K$ $m = 9.64^{K\text{-}IN}$ (CONSERVATIVE)

5) $F_T = .038^K$, $F_S = .046^K$, $m = 1.63^{K\text{-}IN}$

$F_{T_{TOTAL}} = 0.878^K$ $m_{T_{TOTAL}} = 10.49^{K\text{-}IN}$

$$\frac{F_{T_{ACT}}}{F_{T_{ALL}}} + \frac{m_{T_{ACT}}}{m_{T_{ALL}}} \leq 1$$

$$\frac{0.878^K}{10.2^K} + \frac{10.49^{K\text{-}IN}}{67.00^{K\text{-}IN}} = 0.24 < 1.0$$

ASSUMING ALL LOAD ACTS AT SAME PT. VERY CONSERVATIVE

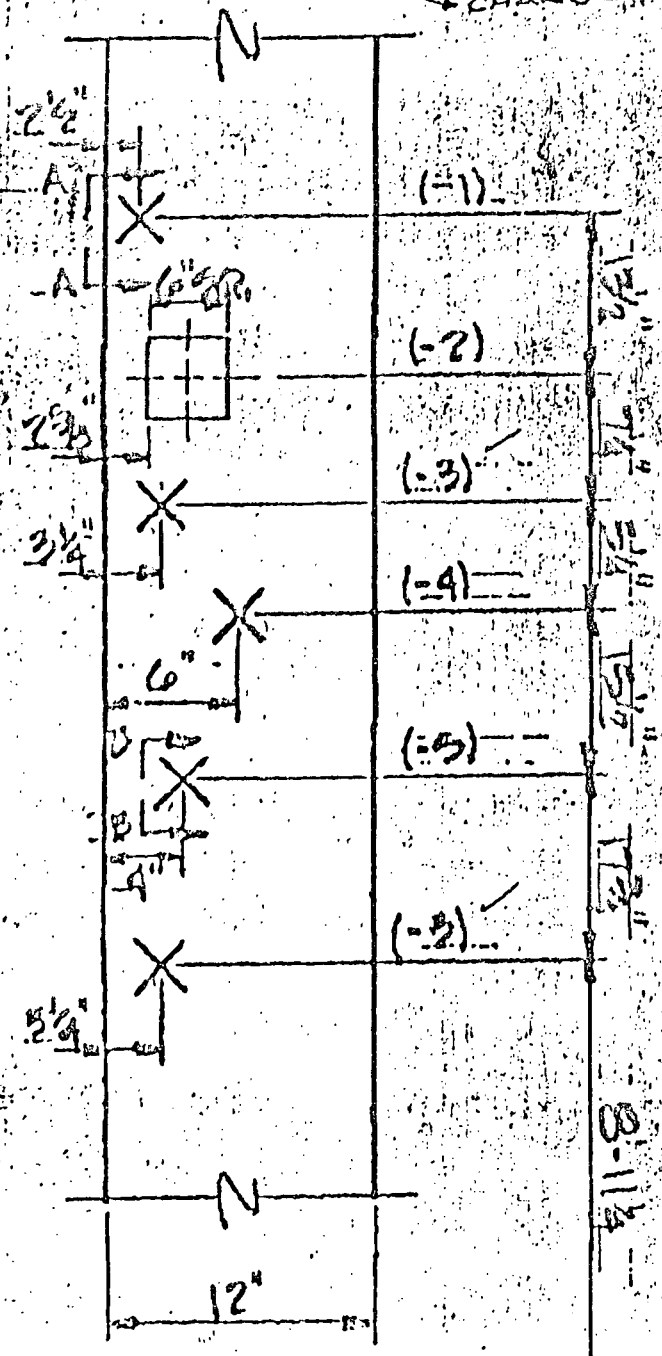
F_T = TENSION $F_{T_{ALL}} = 10.2^K$

F_S = SHEAR

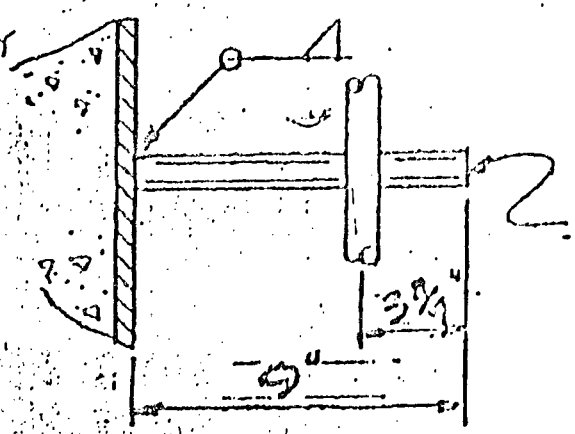
$m_T = m_Y$ OR m_Z $M_{Y\text{ OR }Z_{ALL}} = 67.0^{K\text{-}IN}$

FINDING # F710

HGP #2 - 03B - 1AFW - R1[illegible] (83015)
#3 - 03B - 1AFN - R14
#4 - 03B - 1AFN - R10B (83015)
→ CHANGE B TO R106
PER BOB McKAY
11/1/82

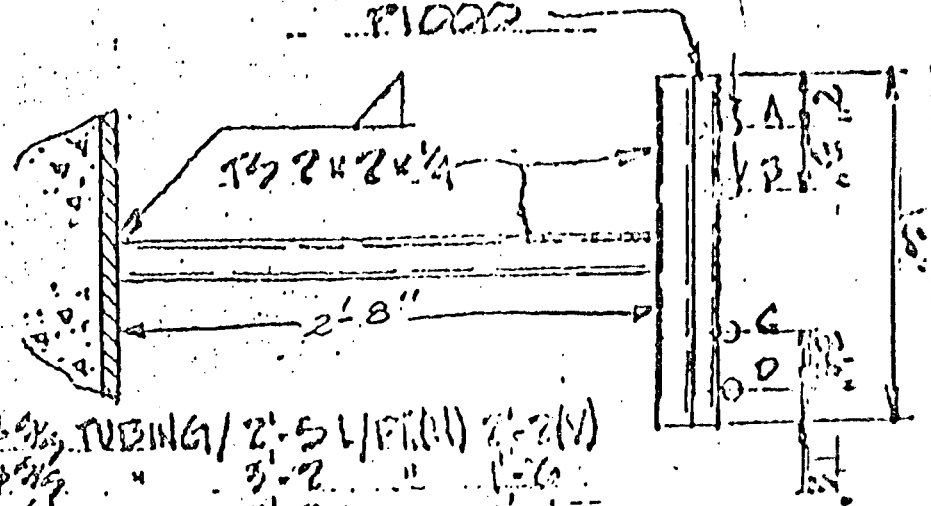


SECTION A-A



¾" ϕ CONDUIT/SUPPORTS 2'-4 LIN/FT. (V)
2'-1" " (H)

SECTION B-B



A - ½" ϕ SS TUBING / 2'-5 L/FT (H) 2'-2 (V)
B - ½" ϕ SS " 3'-2 " 1'-6"
C - ½" ϕ SS " 2'-3 " 1'-4"

SHEET 1 OF 3

F-7.0

SEC B-B

HORIZ. COMPUTED WNW DATE 10-20-?

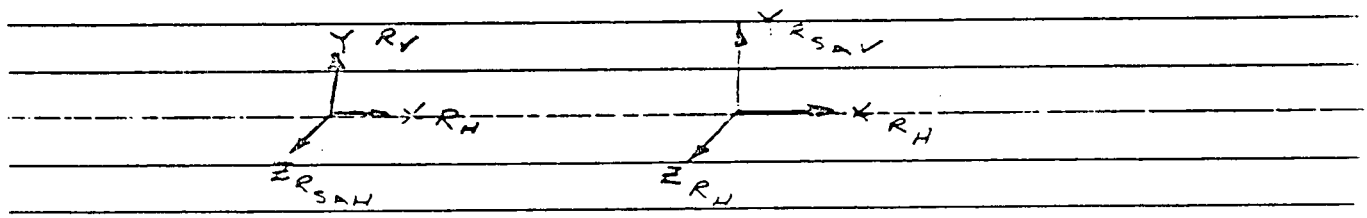
VERT. CHECKED LS DATE 11-4-?

A ○ 2'-5" (.48) | 2'-2" (.43)

B ○ 3'-2" (.63) | 1'-6" (.30)

C ○ 2'-3" (.45) | 2'-4" (.47)

D ○ 2'-8" (.53) | 1'-2" (.23)



SPAN = 5'-0" 1/2" ϕ SS TUBING

$R_V = 9.648$ #

$R_H = 10.643$ #

$R_{SAH} = 0.601$ #/FT

$R_{SAV} = 0.507$ #/FT

$Y_A = R_V(.48) + R_{SAV}(2.17)$

$= 9.648(.48) + 0.507(2.17)$

$Y_A = 5.73$ #

$X_A = R_H(.48) + R_H(.43)$

$= 10.643(.48) + 10.643(.43)$

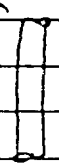
$X_A = 9.69$ #

$Z_A = R_{SAH}(2.42) + R_H(.43)$

$= 0.601(2.42) + 10.643(.43)$

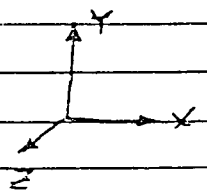
$Z_A = 6.03$ #

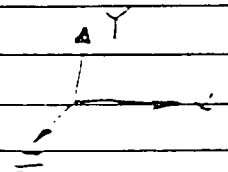
SEC A-A



ACTUAL 2'-4" (.47) ○ ACTUAL 2'-1" (.42)

SPAN = 5'-0" 3/4" ϕ CONDUIT





$R_Y = 11.0$ #

$R_X = 10.0$ #

$R_Z = 10.0$ #

$R_Y = 11.0$ #

$R_X = 10.0$ #

$R_Z = 0.6$ #

F-710

COMPUTED WWW DATE 10-30-82

CHECKED LS DATE 11-4-82

(SEC B-B) CON'T

$Y_B = R_V(.63) + R_{SAV}(1.5)$
$= 9.648(.63) + 0.507(1.5)$
$Y_B = 6.84^{\#}$

$X_B = R_H(.63) + R_H(.30)$
$= 10.643(.63) + 10.643(.30)$
$X_B = 9.90^{\#}$

$Z_B = R_{SAH}(3.17) + R_H(.30)$
$= .601(3.17) + 10.643(.30)$
$Z_B = 5.10^{\#}$

$Y_C = R_V(.45) + R_{SAV}(2.33)$
$= 9.648(.45) + .507(2.33)$
$Y_C = 5.52^{\#}$

$X_C = R_H(.45) + R_H(.47)$
$= 10.643(.45) + 10.643(.47)$
$X_C = 9.79^{\#}$

$Z_C = R_{SAH}(2.25) + R_H(.47)$
$= .601(2.25) + 10.643(.47)$
$Z_C = 6.35^{\#}$

$Y_D = R_V(.53) + R_{SAV}(1.17)$
$= 9.648(.53) + .507(1.17)$
$Y_D = 5.71^{\#}$

$X_D = R_H(.53) + R_H(.23)$
$= 10.643(.53) + 10.643(.23)$
$X_D = 8.09^{\#}$

$Z_D = R_{SAH}(2.67) + R_H(.23)$
$= .601(2.67) + 10.643(.23)$
$Z_D = 4.05^{\#}$

3/4" ϕ CONDUIT (SEC A-A)

$Y = R_Y(.47) + R_Y(.42)$
$= 11(.47) + 11(.42)$
$Y = 9.80^{\#}$

$X = R_X(.47) + R_X(.42)$
$= 10(.47) + 10(.42)$
$X = 8.9^{\#}$

$Z = R_Z(.47) + R_Z(.42)$
$= 10(.47) + 9.6(.42)$
$Z = 8.73^{\#}$

F-710

COMPUTED N.N.W DATE 10-30-82

CHECKED LS DATE 11-4-82

SEC A-A

$F_c = 20.0^{\#}$

$F_s = 41.6^{\#}$

$m = 41.6^{\#}(5\frac{1}{4}") = 218.4^{"\#}$

SEC B-B

$F_f = 9.69 + 9.90 + 9.79 + 8.09$

$F_f = 37.47^{\#}$

$F_s = 5.73 + 6.03 + 6.84 + 5.10 + 5.52 + 6.35 + 5.71 + 4.05$

$F_s = 45.33^{\#}$

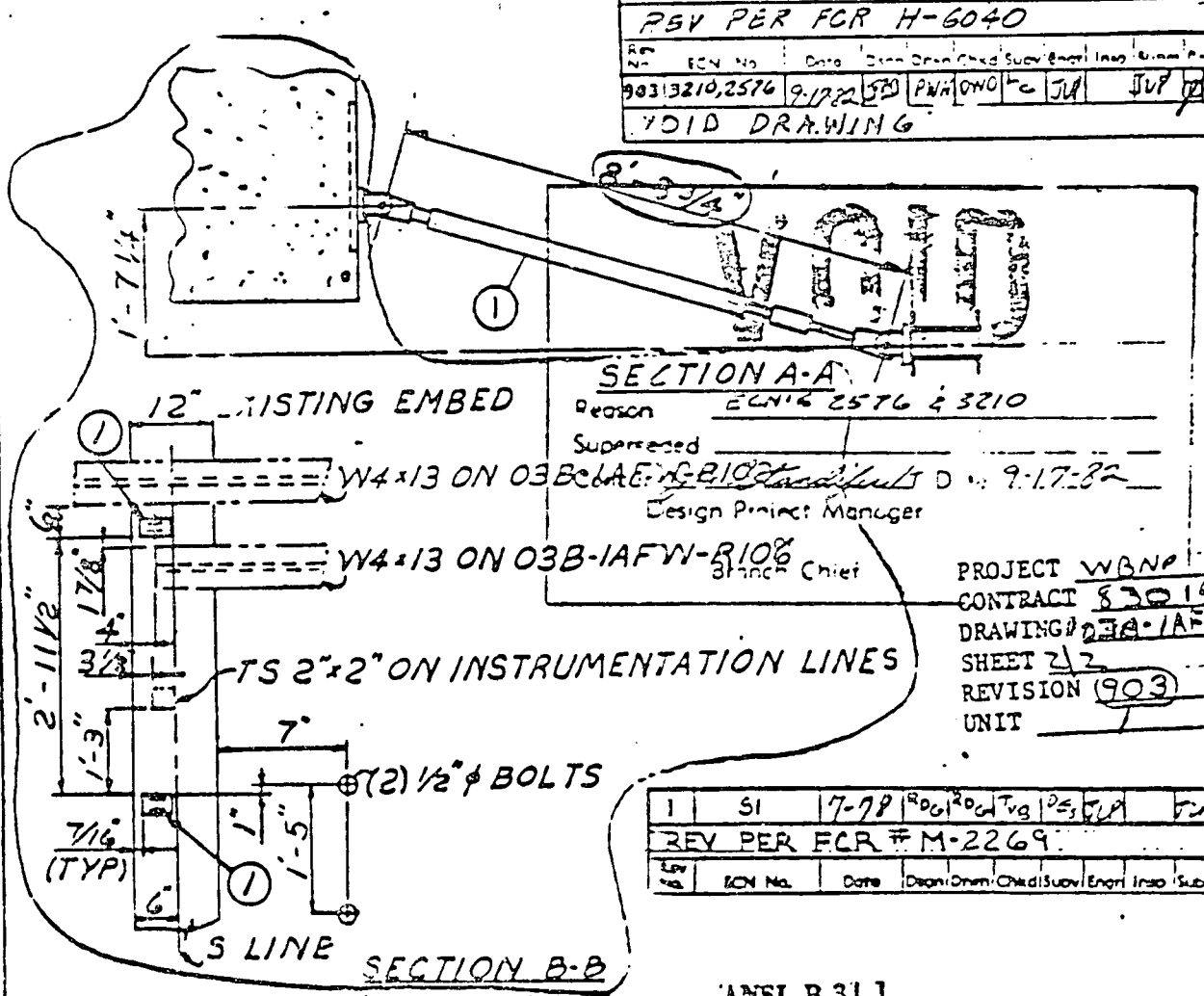
$m = F_s(36")$

$= 45.33(36)$

$m = 1.63^{IN-K}$

ITEM NO.	NO. REQ'D	PART NO.	SIZE	DESCRIPTION	WGT.

REV NO.	ECN NO.	DATE	DESIGN	DRAWN	CHK'D	SUPV	ENGR	INSP	SUBM	RECM	APP
2	SI	12-4-82	MMS	PWH	DWO	TC	JM	JHP			
PSV PER FCR H-6040											
1	903 3210, 2576	9-17-82	SD	PWH	DWO	TC	JM	JHP			
VOID DRAWING											



SECTION A-A

Reason ECN's 2576 & 3210

Superseded

Design Project Manager

Branch Chief

D 9-17-82

PROJECT WBNP

CONTRACT 83015

DRAWING 03A-1AFW-R0

SHEET 2 2

REVISION (903)

UNIT

REV NO.	ECN No.	DATE	DESIGN	DRAWN	CHK'D	SUPV	ENGR	INSP	SUBM	RECM	APP
1	SI	7-78	RDG	RDG	TVG	DES					
REV PER FCR # M-2269.											

TVA 900 - VENDOR RO

DRAVO ISO #E-2880-IC-208-1

ANSI B 31.1

T. V. A. CLASS G

LOAD:

DRAVO CORPORATION P.O. # E-2879-

CUSTOMER T. V. A. CONTRACT # 74C33-83015

ENGR WATTS BAR NUCLEAR PLANT - UNIT # 1

CONSUMER

PIPING SYSTEM AUX. FEEDWATER

REFERENCE DWG 47W427-2-0 (Pipe)
48W1221-2-3 (Str.)

MARK NO 03BHAFW-R14 NO. REQ'D. 1

BERGEN-PATERSON PIPESUPPORT CORP.

BOSTON, MASS. WOOD-RIDGE, N.J. SAN FRANCISCO, CALIF.
PITTSBURGH, PA. HOUSTON, TEX. CHICAGO, ILL.

DRAWN	CHK'D.	APPVD.	DATE
LR	RR	HJT	5-17-83

JOB NO. 3604 REV-903

DWG. NO. 03B-1AFW-R14 (2 of 2)

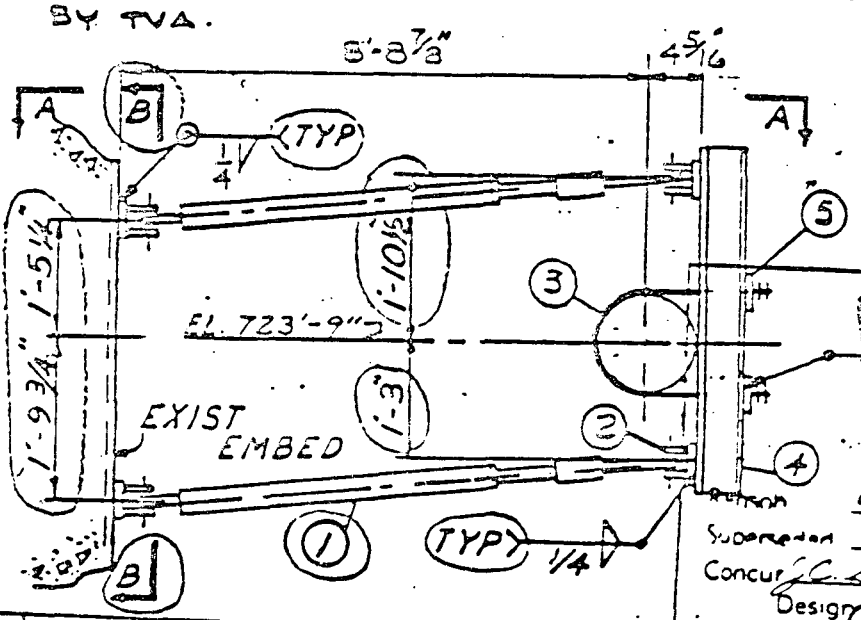
ITEM	NO REQ'D	PART NO.	SIZE	DESCRIPTION	DOT.
1	2	RSSA	10	O.A. STRUT LGTH = 3'-8 3/4"	110
				EA-3 FOR 8" PIPE SIZE	
2	2	2003	10	END ATTACHMENT FOR ITEM # 1	
3	1	233	8"	LONG TANGENT U-BOLT D = 7'-0 9/16"	
	2	—	GLX.B.2	x 3'-2" LG. bb = 1 1/2"	
5	2	260	5	WASHER PLATE	
	1	SDE	(2) HBS		
	1	SDD			
1	1	SB	210-3	FOR ITEM 1 (PIN TO PIN ONLY)	
	1	EZP			
	1	BLT			

PROJECT WBNP
CONTRACT 85015
DRAWING# DE0-[illegible]-R[illegible]
SHEET 1/2
REVISION 903
UNIT

PAINT CARBOZINC 11 BY BP EXCEPT REAR BRKT. & PIPE CLAMP TO BE CARBOWELD 11 PRIMER BY TVA.

SHIP BARE METAL. PAINT CARBOWELD 11 PRIMER BY TVA.

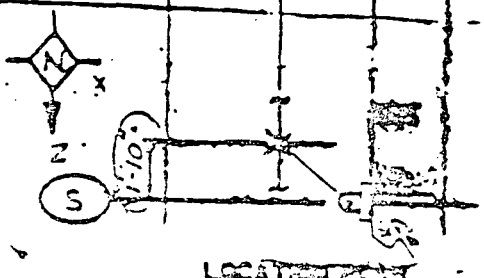
ISO 47W427-206-R0
JOINT: 401
DIRECTION: X
TYPE: SR
+ 6000
DESIGN LOAD:
— 4000



VOID

ECN'S 2576, 3210

Supervisor
Concur
Design Engineer or Manager
Branch Chief



ECN No.	Date	Desgn	Drwn	Chkd	Supv	Engrg	Insp	Subm	Recm	Appr
903	3210, 2576	9/12/12	[illegible]	PNM	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
VOLD DRAWING										
1	SI	11-78	[illegible]	[illegible]	TVB	PES	[illegible]	[illegible]	[illegible]	[illegible]
REV PER FCR M-2269										

8" ø PIPE SIZE

ELEV. LOOKING NORTH

TVA-900 = VENDOR RO

DRAVO ISO #E-2880-IC-203-1

T.V.A. CLASS G

DRAVO CORPORATION P.O. # E-2879-

T.V.A. CONTRACT # 74C33-83015

WATTS BAR NUCLEAR PLANT - UNIT #1

PIPING SYSTEM ALT. FEEDWATER

REFERENCE DWG 47W427-2-0
48N1221-2-3

LINE NO. CCP-1A1-R1-4 SH. 1

DESIGN PATERSON PIPESUPPORT CORP.

DRAWN	CHKD	APPR'D	DATE
LR	JR	HJT	5-12-7

SCALE

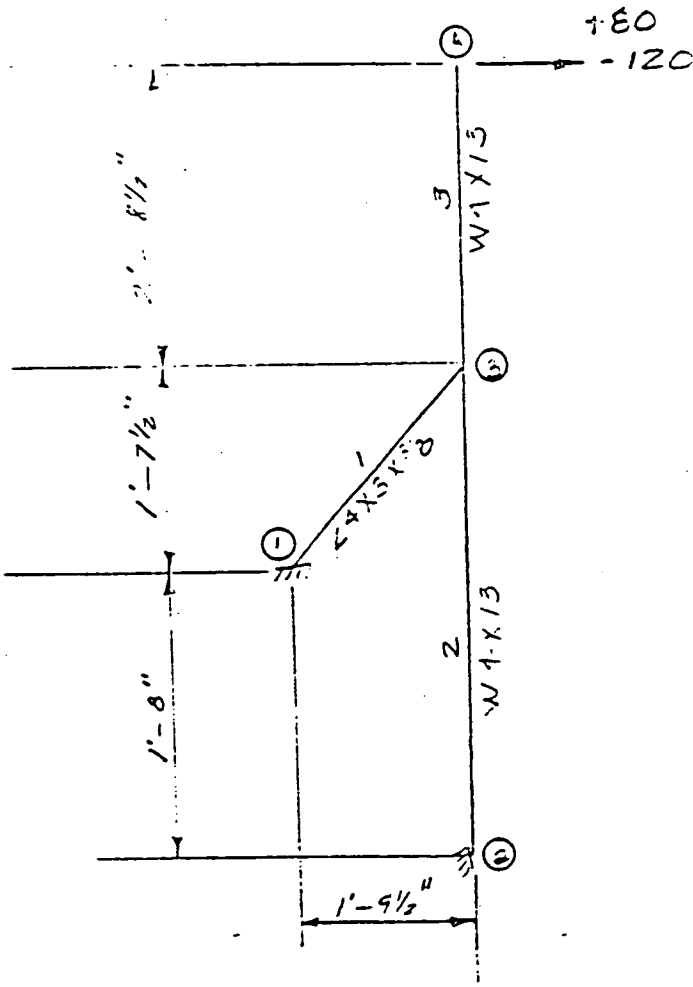
REV PER FCR H-6040 SI

ISSUED FOR CONSTRUCTION

```
OLD,P106
READY.
LIST

 82/11/01.  14.46.32.
  PROGRAM    P106

00100 SUPPORT :038-1AFW-P106
00110 ANALYSIS
00120 1,1
00130 MTABLE
00140 1,29.0E6,.1156,,,.284
00150 SFTABLE
00160 1,-10,L4X3X6
00170 2,-10,W4X13
00180 JOINTS
00190 1,0,0,0
00200 2,21.5,-20,0
00210 3,21.5,19.5,0
00220 4,21.5,52,0
00230 RESTRAINTS
00240 1,7
00250 2
00260 SPANS
00270 1,1,2,1,1
00280 2,2,3,1,2
00290 3,3,4,1,2
00300 LOADING :X=80
00310 ACCELS
00320 0,-1,0
00321 FORCES
00330 4,1,80
00340 LOADING X=-120
00350 ACCELS
00360 0,-1,0
00370 FORCES
00380 4,1,-120
READY.
```



SAGS MODEL

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BEGIN,,MDL,SAGS
 PROCEDURE FILE FOR ACCESSING

 SDRC MECHANICAL DESIGN LIBRARY

(

ENTER DATA FILE NAME

? P106

 PRINT INPUT DATA?
? Y
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S A S I

STATIC ANALYSIS OF GENERAL STRUCTURES

STRUCTURAL DYNAMICS RESEARCH CORPORATION

SUPPORT #03B-1AFW-R106

◆◆◆ SPACE FRAME ANALYSIS ◆◆◆

SPAN	LENGTH	FORE END JOINT	AFT END JOINT	MATERIAL CODE	SECTION CODE	ROTATION ANGLE	TEMP.
1	39.34	1	2	1	1	29.0	
2	39.50	2	3	1	2		
3	32.50	3	4	1	2		

STRUCTURE WEIGHT/MASS = 9.879E+01

JOINT COORDINATES

JOINT	X	Y	Z
1	0.000	0.000	0.000
2	21.500	-20.000	0.000
3	21.500	19.500	0.000
4	21.500	52.000	0.000

MATERIAL PROPERTIES

CODE	E	POISSON'S	DENSITY	THERMAL COEFFICIENT	YIELD
1	29.0E+06	.318	2.840E-01	0.	3.600E+04

SPECIAL CROSS SECTIONS

CODE	TYPE	P1	P2	P3	P4	P5	P6
1	STEEL SECT.	L4X3X6	AISC69				
2	STEEL SECT.	W4X13	AISC69				

CROSS-SECTION PROPERTIES

CODE	AREA	MOMENTS OF INERTIA Z	Y	SHEAR RATIO Y	Z	TORSION CONSTANT	WARPING CONSTANT	DEG. FIX.
1	2.48E+00	4.85E+00	1.03E+00	2.10	2.30	1.25E-01		
2	3.82E+00	1.13E+01	3.76E+00	3.75	1.50	1.54E-01	1.37E+01	.60

ECCENTRICITY

CODE	Z	Y
	1.050	.670

STATIC ANALYSIS OF GENERAL STRUCTURES
SUPPORT #03B-1AFW-#106

STRESS RECOVERY VALUES

CODE	COMBINED STRESS	POINT 1/3 C(Y)	POINT 1/3 C(Z)	POINT 1/3 R(EFF)	POINT 2/4 C(Y)	POINT 2/4 C(Z)	POINT 2/4 R(EFF)
1	2	2.760	.686	0.000	-2.190	1.320	0.000
		-.746	-1.300	.668			
3	432	2.080	2.030	0.000	2.080	0.000	.648
		-2.080	0.000	.648			

SPECIFIED RESTRAINTS

JOINT	DIRECTION	VALUE
1	123456	
2	123456	

LOADING NO. 1: :X=80

ACCELERATION LOADING
A(X) = 0. A(Y) = -1.000E+00 A(Z) = 0.

JOINT	DIR	APPLIED FORCES TYPE	VALUE	FINAL JOINT	INC.
4	X	FORCE	8.000E+01		

TOTAL APPLIED FORCES
F(X) = 8.000E+01 F(Y) = -9.879E+01 F(Z) = 0.

LOADING NO. 2: X=-120

ACCELERATION LOADING
A(X) = 0. A(Y) = -1.000E+00 A(Z) = 0.

JOINT	DIR	APPLIED FORCES TYPE	VALUE	FINAL JOINT	INC.
4	X	FORCE	-1.200E+02		

TOTAL APPLIED FORCES
F(X) = -1.200E+02 F(Y) = -9.879E+01 F(Z) = 0.

S A S S

STATIC ANALYSIS OF GENERAL STRUCTURES

STRUCTURAL DYNAMICS RESEARCH CORPORATION

SUPPORT #038-1AFW-R106

◆◆◆ LOADING NO. 1: :X=80

JOINT DISPLACEMENTS

JOINT	X	Y	Z	THETA(X)	THETA(Y)	THETA(Z)
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	1.149E-02	-2.021E-05	0.	0.	0.	-5.038E-04
4	3.089E-02	-2.538E-05	0.	0.	0.	-6.328E-04

MAXIMUM DISPLACEMENTS

JOINT	4	4	1	1	1	4
VALUE	3.089E-02	-2.538E-05	0.	0.	0.	-6.328E-04

JOINT REACTIONS

JOINT	F(X)	F(Y)	F(Z)	M(X)	M(Y)	M(Z)
1	0.	1.034E+01	0.	0.	0.	3.705E+01
2	-8.000E+01	8.845E+01	0.	0.	0.	5.723E+03
OTAL	-8.000E+01	9.879E+01	0.	0.	0.	5.760E+03

STATIC ANALYSIS OF GENERAL STRUCTURES
SUPPORT =03B-1AFW-P106

••• LOADING NO. 2: X=-120

JOINT DISPLACEMENTS

JOINT	X	Y	Z	THETA(X)	THETA(Y)	THETA(Z)
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	-1.733E-02	-2.021E-05	0.	0.	0.	7.558E-04
4	-4.633E-02	-2.538E-05	0.	0.	0.	9.492E-04

MAXIMUM DISPLACEMENTS

JOINT	4	4	1	1	1	4
VALUE	-4.633E-02	-2.538E-05	0.	0.	0.	9.492E-04

JOINT REACTIONS

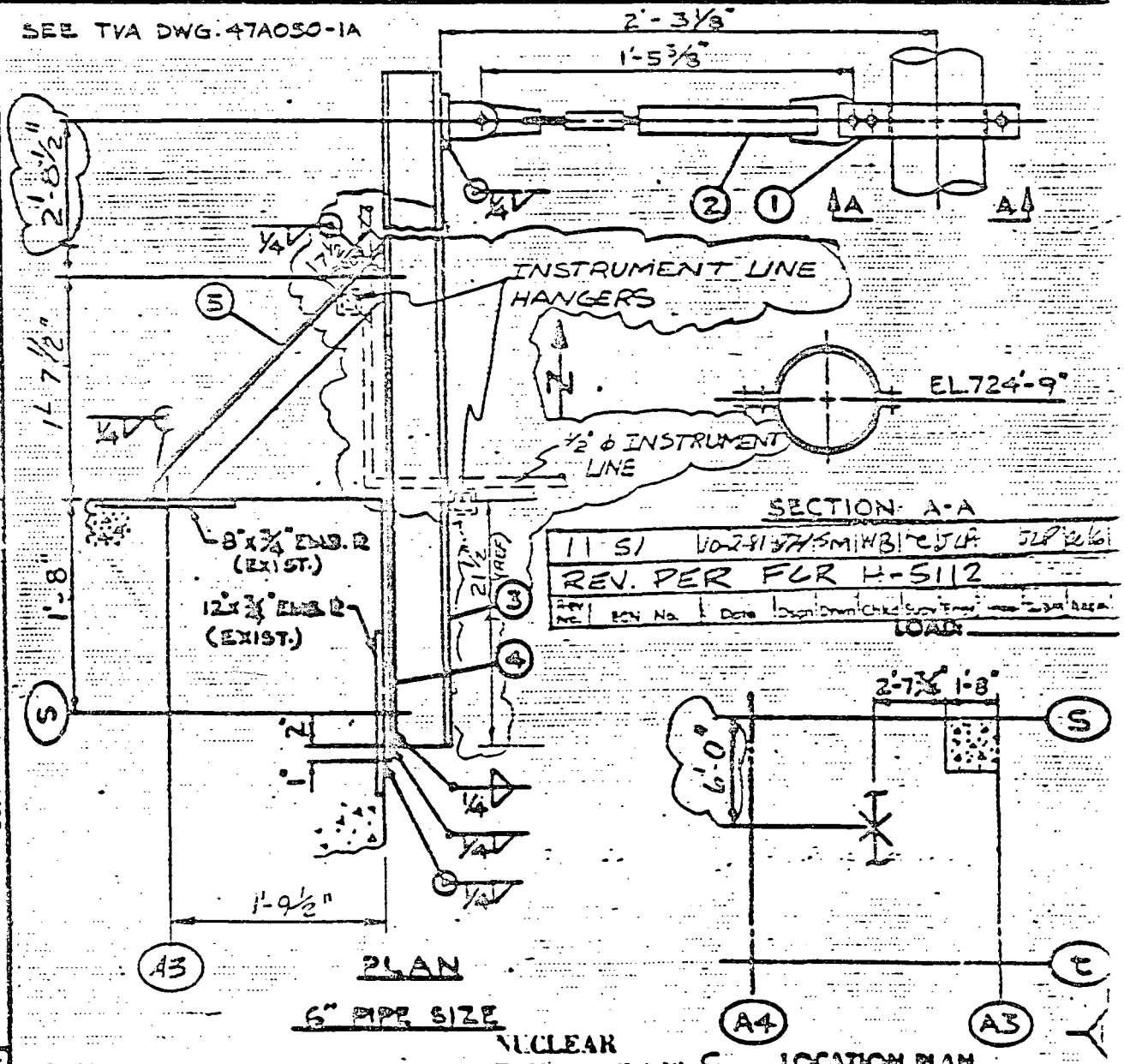
JOINT	F(X)	F(Y)	F(Z)	M(X)	M(Y)	M(Z)
1	0.	1.034E+01	0.	0.	0.	3.705E+01
2	1.200E+02	8.845E+01	0.	0.	0.	-8.677E+03
TOTAL	1.200E+02	9.879E+01	0.	0.	0.	-8.640E+03

FORM BA-3. 10/75

ITEM	QUAN.	PART NO.	SIZE	DESCRIPTION	WGT.
1	1	2600-5	6" PIPE CLAMP		
2	1	2200	R/1 - 1.5 - 1'-5 3/8"		18
3	1	-	W4 X 13 X 6'-4" LG.		BY TVA
4	1	-	6" x 1/2" PL x 6" LG.		BY TVA
5	1	-	4" x 3" x 3/8" ANGLE x AS REQ'D. (CUT AS SHOWN)		BY TVA
-	1	SDE	(3) HRS.		
-	1	SDD			
-	1	SB)	210-3 FOR ITEM 2 (PIN TO PIN)		
-	1	EZP)			
-	1	B&T.			

PROJECT WBNP
CONTRACT 74C33-33015
DRAWING 33-1AFW-R106
SHEET 1 OF 2
REVISION 402

SEE TVA DWG. 47A050-1A



DRAVO ISO #E-2873-IC-8

DRAVO CORPORATION P.O. # E-2873-

T.V.A. CONTRACT # 74C33-33015

WATTS BAR NUCLEAR PLANT - UNIT #1

BERGEN-PATERSON PIPESUPPORT CO

PIPING SYSTEM: AUX. FEEDWATER

DWG. PIPING: 47W427-2-0 STRUCTURAL: 48N1221-2-9

JOB NO. 3604 FAB NO. 09

DRAWING NO. 033-1AFW-R106 SHEET 1 OF 2

REV					DATE
	LR	LR	ASL	WT	9-20-76

INVOICE CODE

DESCRIPTION

REV	DESCRIPTION	DATE	BY	CHK	APP
1	REVISED PER FCR H-5112	10-26-76	ZR		

C2m BP-3. 10/73

ITEM	QUAN.	PART NO.	SIZE	DESCRIPTION	WGT.			

ISO. 47W427-203-R4
JOINT: 106
DIRECTION: X
TYPE: SR
80 #
DESIGN LOAD: 120 #

LOAD TABLE 47B427-508 R0
PROB. NO:- N3-3-10A

INVOICE CODE

DESCRIPTION

REV NO.	ECN No.	DESCRIPTION	DATE
002	S1/ECN 5-21-87	REV PER ECN 5156, 3210 & FCR H-6550 (INACTIVE CONTRACT)	
1	S1	REV. PER FCR H-5112	10-29-87

PROJECT WBN
CONTRACT 83015
DRAWING # 033-1AFW-R106
SHEET 2 OF 2
REVISION 002
UNIT

NUCLEAR
T. V. A. CLASS C

DRAVO ISO #E-2878-IC-6

DRAVO CORPORATION P.O. # E-2879-
T.V.A. CONTRACT # 74C38-83015
WATTS BAR NUCLEAR PLANT - UNIT # 1

BERGEN-PATERSON PIPESUPPORT COR

PIPING SYSTEM	AUX. FEEDWATER		
REF. DWGS	PIPING 47W427-2-0	STRUCTURAL 48N1221-2-9	
JOB NO. 3604	FAB NO. 09	NO. ERECTD 1	
MARK & DWG NO.	033-1AFW-R106	SHEET 2 of 2	

CHK'D BY | DATE

DRAWN BY ASL | CHK'D BY HT | DATE 9-30-76

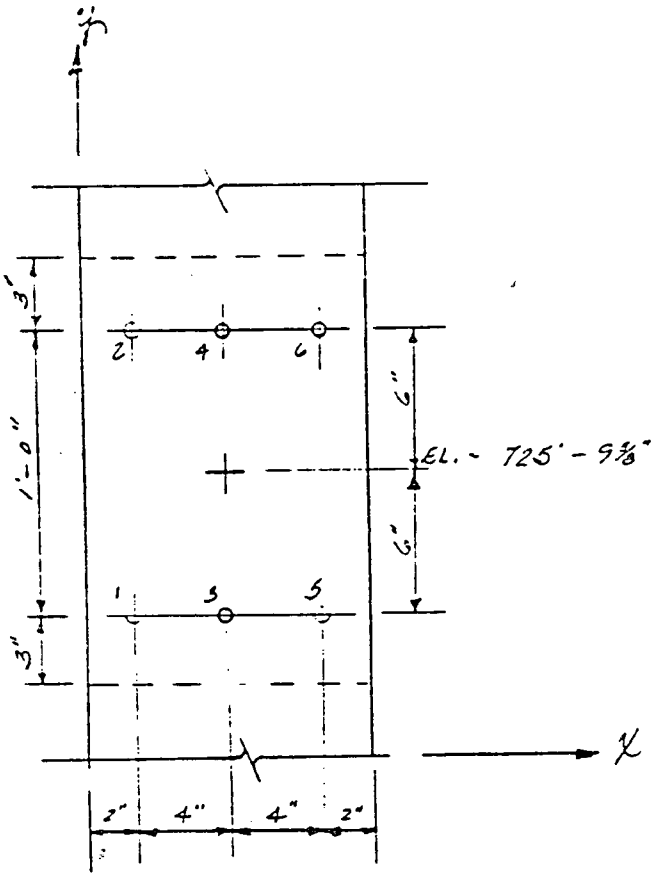
SHEET _____ OF _____

WIENP

Embedded Plate

MK 40 W 48N1221-2-4 COMPUTED WNW DATE 10-29-

SUPPORTS # 03B-1AFW-R105 & 03G-1AFW-R102 CHECKED AS DATE 10-30-



MK 40W EL. 717'-0"
℄ 17'-6" x 12" x ¾"
w/ ⅝" ϕ x 6½" CONC. ANCHOR

SUPPORTS # 03B-1AFW-R105 & 0313-1AF ARE ATTACHED TO EXISTING EMBEDDED PLATES LOCATED ON NORTH, EAST AND SOUTH SIDES of COLUMN @ 48N1221-2 A3 & S. AS SHOWN ON ATTACHED DWGS.. TOTAL LOADS APPLIED ON SUPPORTS ARE: $F_Z = +700^{\#}$ $F_X = +670^{\#}$
$-630^{\#}$ $= -736^{\#}$

FOR A CONSERVATIVE ANALYSIS ASSUME TOTAL LOAD IS CARRIED by MK 40 W. ON EAST SIDE of COLUMN.

ANCHOR Capacity:

TOTAL TENSION = $700^{\#} \rightarrow .7^{K}$

TENSILE CAPACITY of ONE ⅝" ϕ STUD = $A_{st}\, \phi\, f_y$ (DS 6.1.
$= .307(.55)(44)$
$= 7.43^{K} > 7.7^{K}$ ∴ O

SHEET ____ OF ____

WIND

ENG. R.

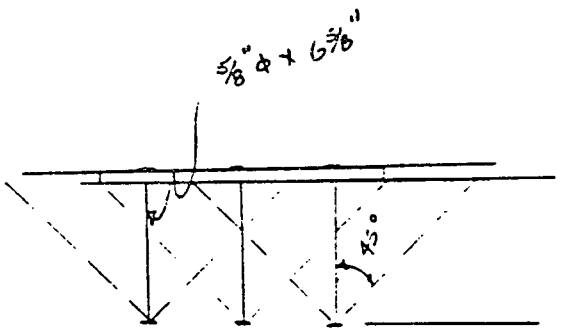
D 1.1K 40W FSK 1231-2-4 COMPUTED W WIN DATE 10-27-

SUPPORTS # 03B-1AFN-2105 & 03B-1AFN-2102 CHECKED LS DATE 10-30

CONCRETE PULL-OUT CAPACITY

TOTAL TENSION CARRIED by EMB. PLATE = .7^K

$$P_c' = \frac{3.4\sqrt{f'c}\ A_{proj.}}{4}$$

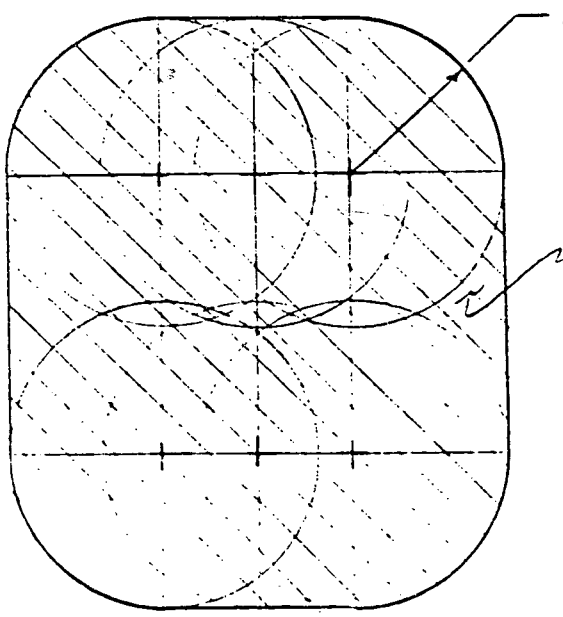


where: P_c' = CONCRETE PULLOUT CAPACI

A_{proj} = PROJECTED AREA from EMB. LENGTH of ST

$f'c$ = COMPRESSIVE STRENGTH CONCRETE,

4 - SAFETY FACTOR from (LS-CC.CC.1.11)



A_{proj} FOR 1-5/8"ø X 6 5/8" STUD

$= \pi R^2$

$= \pi (6\frac{5}{8}")^2$

$= 137.9\ in^2$

FOR 1-5/8"ø STUD

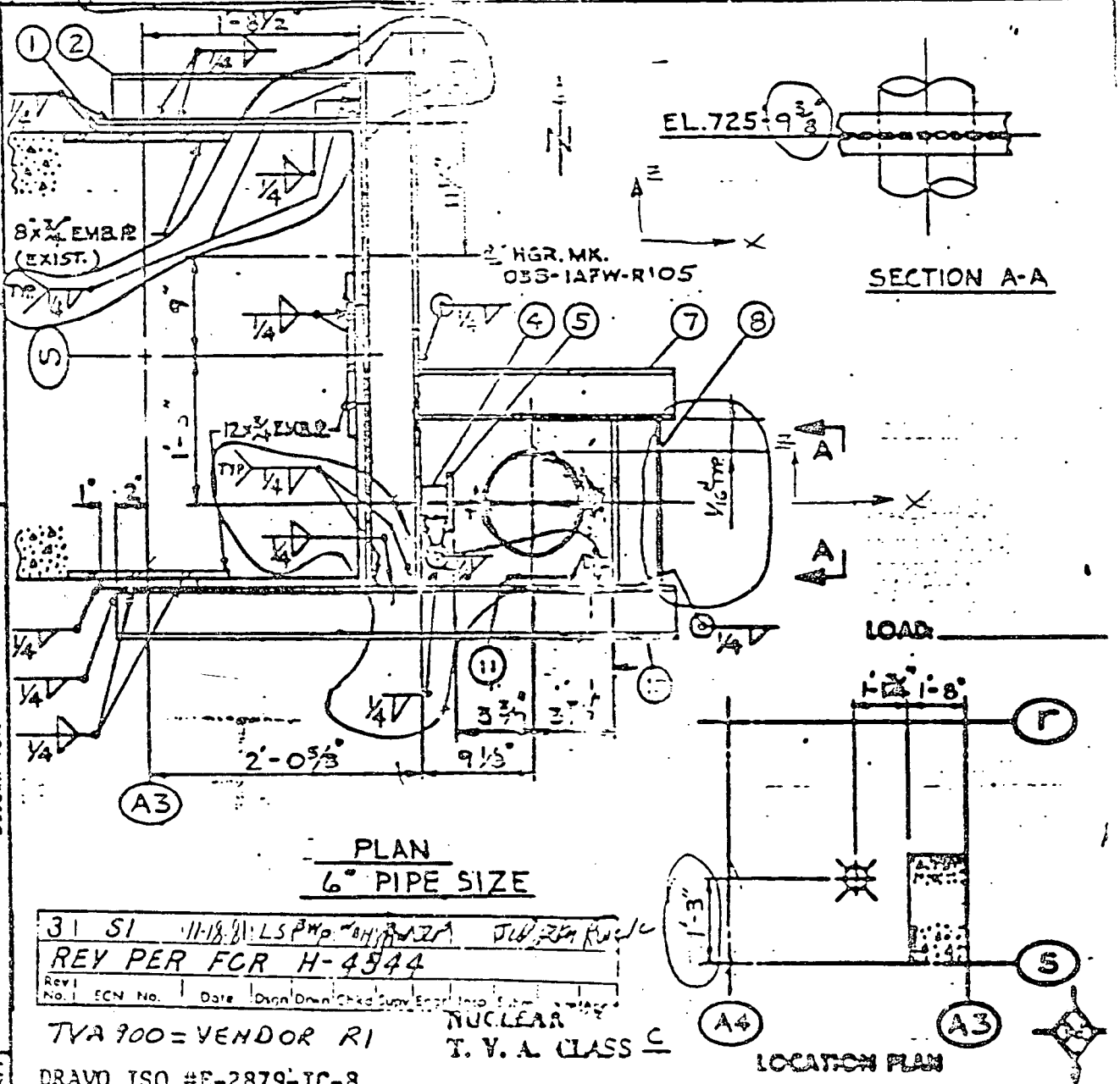
$$P_c' = \frac{3.4\ (\sqrt{3000})(137.9)}{4}$$

$= 6419.5^{\#} = 6.42^K > .7^K$

∴ CONCRETE PULL OUT CAPA: IS FULLY ADEQUATE

VA 11030 (VIA-7-75)

		–	6" x ½" R x 6" LG.	BY TVA			
	1	–	W4 x 13 x 1'-10½" LG	BY TVA			
	1	–	W4 x 13 x LG AS REQD	BY TVA			
4	1	–	4"x3"x3.3" ANGLE x LG (LLBB OUT 0 UNIT)	BY TVA			
5	1	–	5" x 3/8" R x 5" LG.	BY TVA			
6	–	–	NOT USED				
7	1	–	4 x 13 x 1'-6" LG.	BY TVA			
8	1	–	W4 x 13 x LG AS REQD.	BY TVA			
9	–	–	NOT USED				
10	1	–	4 x 13 x 3'-9" LG	BY TVA			
11	1	–	6 C 13 x 8" LG	BY TVA			
		–					



REV.	DESCRIPTION	BY	CHK	APP	DATE
1	REV PER FCR H-4544				2-1-77

3 SI ... REV PER FCR H-4544

Rev No.	ECN No.	Date	Dsgn	Drwn	Chkd	Surv	Engr	Insp
1	3210	11-6-73	RC	RC	AL	KAZ		

REVISED PER ECN 2576 ADDED 8" & 11" SCHEDULE 40 PIPE

INVOICE CODE: TVA'TVA 6 MICB 1903 DT 8/5/74 DELIVERED 2/5/75 DISCHARGE HOLL

TVA 900 = VENDOR R1

DRAVO ISO #E-2879-IC-8

NUCLEAR T. V. A. CLASS C

DRAVO CORPORATION P.O. # E-2879-

T.V.A. CONTRACT # 74C38-83015

WATTS BAR NUCLEAR PLANT - UNIT #1

PIPING-PATERSON PRESUPPORT

AUX. FEEDWATER

DRAWING: 47W427-2-0 REV: 9 | 48W221-3-9 REV: 9

SYSTEM: 3004 | PAGE NO. 09

LR LR LR ASLIGHT 2-30-76

033-1AFW-R102

SHEET 1 of 2 REV 0

ITEM	QUAN	PART NO	SIZE	DESCRIPTION	MAT.
-	1	SEE	(+) HRS		
-	1	SDD			
				SEE TVA DWG. 47A050-1A	

ISO. 47W427-203-(R4)
JOINT: 263
DIRECTION: X
TYPE: RR
+ 420 #
DESIGN LOAD:
- 380 #

ISO. 47W427-203-(R4)
JOINT: 263
DIRECTION: Z
TYPE: RR
+ 370 #
DESIGN LOAD:
- 346 #

REF: LOAD TABLE 47B 427-509/R0
PROB:- N3-3-12A

INVOICE CODE

FOR REV 1 SEE SHT 1 OF 2

REV NO.	DESCRIPTION
904	SI ECN 5726 RC RC AL
	REV. PER FCR'S H-7208, H-6983 & ECNS 2576, 3210 (INACTIVE cont.)
3	SI 11-13-81 REV PER FCR H-4544
2	SI REV PER FCR # M-1361

PROJECT WBNP
CONTRACT 8303
DRAWING # 03B-1AFW-R102
SHEET 3 of 3
REVISION 904
UNIT

NUCLEAR
T. V. A. CLASS C

DRAVO ISO #E-2879-IC-8

DRAVO CORPORATION P.O. # E-2879-
T.V.A. CONTRACT # 74C38-83015
WATTS BAR NUCLEAR PLANT - UNIT # 1

BERGEN-PATERSON PIPESUPPORT CORP.

PIPING SYSTEM: AUX. FEEDWATER
REF. DWGS. PIPING: 47W427-2-0 STRUCTURAL: 48N1221-2-9
JOB NO. 3604 PAS NO. 09 NO. ISOS 1
DRAWING NO. 03B-1AFW-R102 SHEET 2 of 2 REV 904

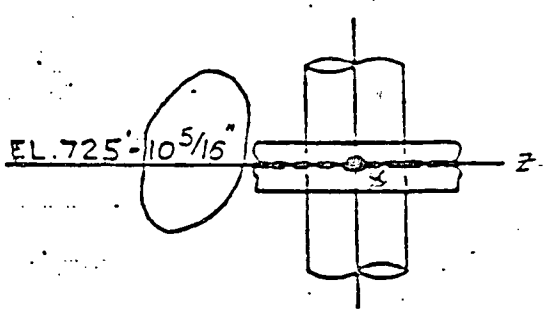
REV	DATE	BY	CHK	APP
1	2-1-77	ASL		SM
	DES LR	DR LR	CHK ASL	APP HT	DATE 9-30-76

TVA 2500 - VENDOR R1

ITEM	QUAN.	PART NO.	SIZE	DESCRIPTION	MAT.
1 ⊙	2	-	W4 X 13 x 1'-6" LG.		BY TVA
2 ⊙	1	-	W4 x 13 x 6 3/4" LG.		BY TVA
3	-	-	NOT USED		
4	-	-	NOT USED		BY TVA
5 ⊙	1	-	5" x 7/8" R x 5" LG.		BY TVA
6 ⊙	1	-	4" x 3" x 3/8" ANGLE x 6" LG (FIELD TO CUT TO SUIT)		BY TVA
-	1	SDE	(3) HRS		
-	1	SDD			

PROJECT 1910
CONTRACT 82N1
DRAWING 6-1A
SHEET 1 of 1
REVISION 901
UNIT 1

SEE TVA DWG. 47A050-1A

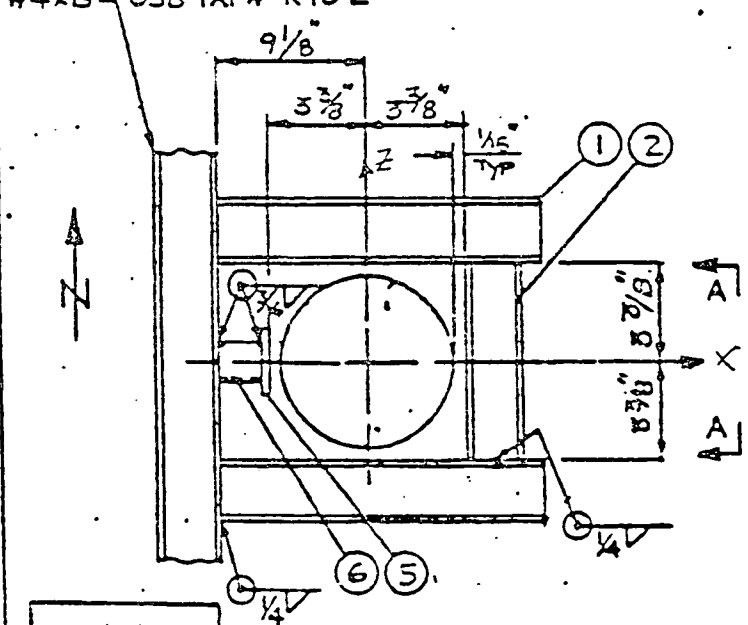


SECTION A-A

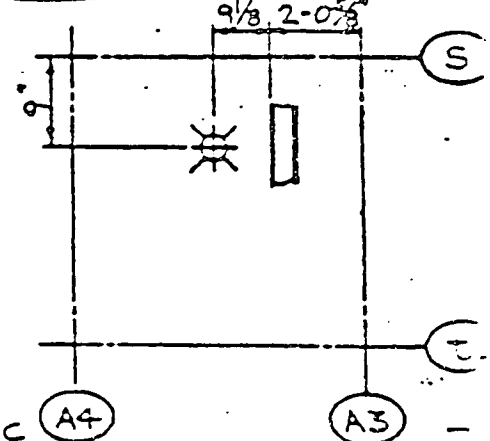
ISO. 47W427-203-R4
JOINT: 102
DIRECTION: X
TYPE: RR
+ 280 =
DESIGN LOAD:
- 250 =

ISO. 47W427-203-R4
JOINT: 102
DIRECTION: Z
TYPE: RR
+ 1300 =
DESIGN LOAD:
- 390 =

SUPPL'D. W/ HGR. MK.
W4x13 — 038-1AFW-R102



LOAD TABLE: 47B427-508 R
PROB. NO. N3-3-10A



LOCATION PLAN

AS VERIFIED AS APPROVED

PLAN

6" PIPE SIZE NUCLEAR T.V.A. CLASS C

DRAVO ISO #E-2879-IC-5 (TVA900 = VENDOR R1)

REV	DESCRIPTION	INVOICE CODE
10	REV PER ECN'S 2576 & 3210	TVA L'TR # MEB 1003 DT 11/3 (78)

DRAVO CORPORATION P.O. = E-2879-
T.V.A. CONTRACT = 74C38-83015
WATTS BAR NUCLEAR PLANT - UNIT # 1

BERGEN-PATERSON PIPESUPPORT C

PIPING SYSTEM: AUX. FEEDWATER

REF. DWGS	PIPING	STRUCTURAL
	47W427-2-0	48N1221-2-5

JOB NO. 3604 | FAC NO. 09

MARK & DWG NO. 03B-1AFW-R105

REV	BY	CHK	APP	DATE
10	LR	LR	ASL	8-30-76

FORM 2

WATTS BAR NUCLEAR PLANT
INDEPENDENT REVIEW

FINDING RESPONSE

Finding number IEI7: 1111

Date finding received from Black & Veatch 11/24/82
Date

Comments pertinent to finding:

Attached are the design calculations for the embedded plate MK 38W. These calculations confirm adequacy of the embedded plate. These calculations would have been performed later if necessary to address NCR WBNCEB 8203, issued March 1982, but were accelerated to address this finding. The calculations are adequate to close the NCR in so far as the embedded plate is concerned; however, NCR WBNCEB 8203 must remain open because it is generic to a large number of embedded plates and thus closure of NCR WBNCEB 8203 should be added to your punch list.

Please recycle on level 2 if the attached calculations are not sufficient hard evidence to show the plates in question are acceptable.

E Gray Beasley
Chairman, OEDC Policy Committee

12-20-82
Date

Henry L Green
OEDC Program Manager

12/21/82
Date

Date finding response transmitted to Black & Veatch 12/22/82
Date

TVA 496 (12-81)

SHEET _____ OF _____

B&V Finding F711

LOAD SUMMARY

COMPUTED WWW DATE 11/1/82

CHECKED L. SAIGIA DATE 11-5-82

F-711

		HGR NO.
1)	$F_t = 0$, $F_s = 0.35^K$ (SEE F-710)	(1)
2)	$F_t = 4.31^K$, $F_s = 0.78^K$, $m_z = 5.64^{K-IN}$	(2)
3)	$F_t = 5.73^K$, $F_s = 0.71^K$, $m_z = 5.86^{K-IN}$	(2)
4)	$F_t = 0.26^K$, $F_s = 0.15^K$, $m_t = 1.9^{K-IN}$	(3)
5)	$F_t = 0.26^K$, $F_s = 0.15^K$, $m_t = 1.9^{K-IN}$	(4)
6)	$F_t = 3.03^K$, $F_s = 3.62^K$, $m_z = 3.09^{K-IN}$	(2)
7)	$F_t = 0$, $F_s = 0.66^K$	(5)

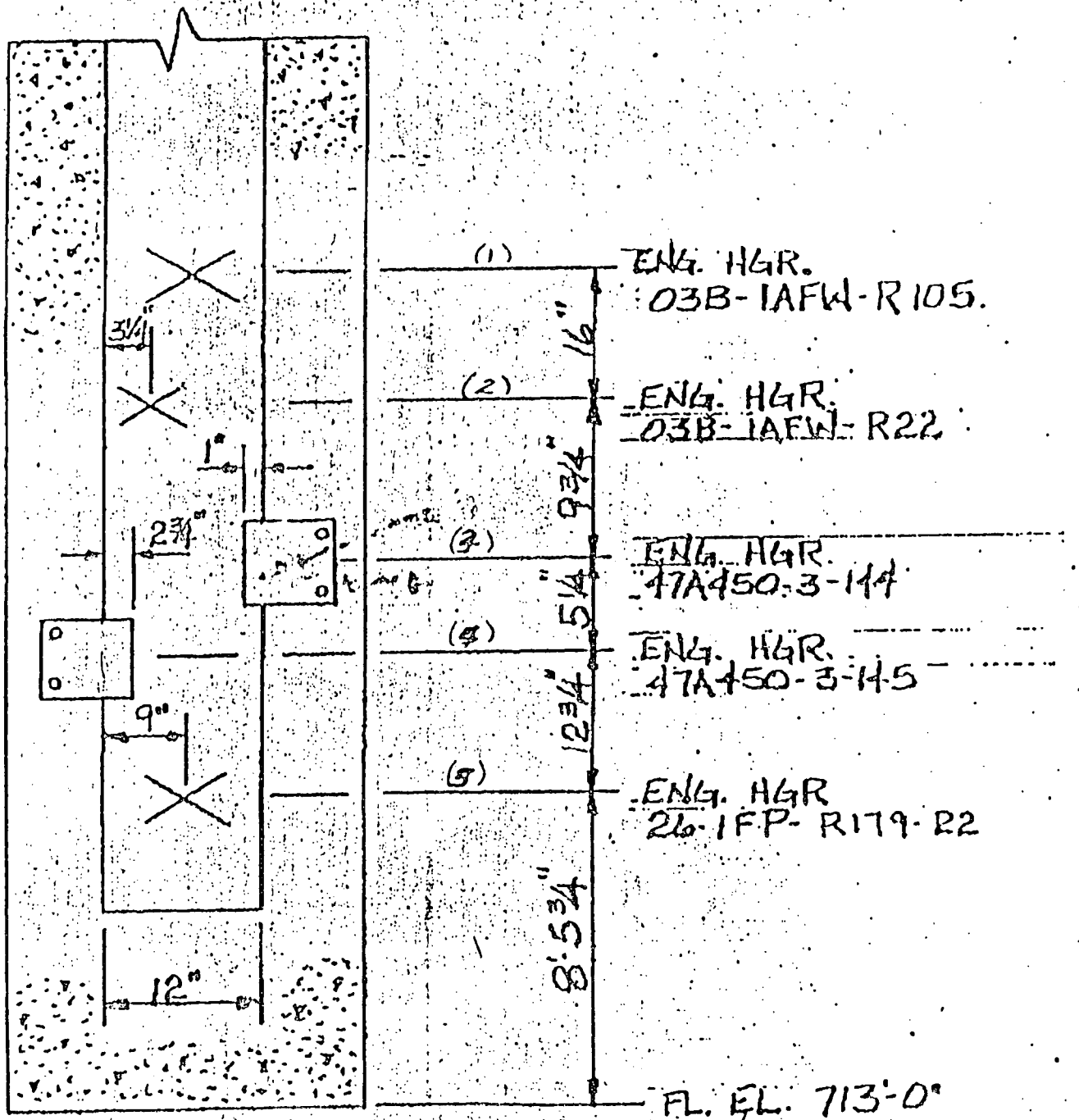
F_t = TENSION

F_s = SHEAR

$m_t = m_{Y \text{ OR } Z}$

FINDING # F711

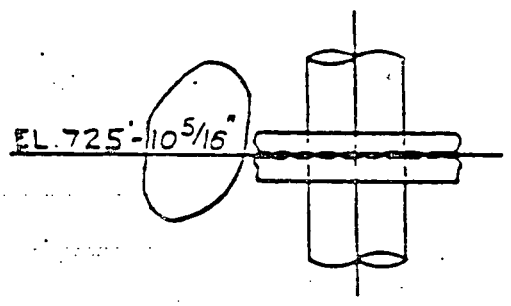
SOUTH SIDE A3 & S LI



FORM BP-8 REV 73

ITEM	QUAN.	PART NO.	SIZE	DESCRIPTION	WGT.
1	2	-	W4 X 13 X 1'-6" LG.		BY TVA
2	1	-	W4 x 13 x 6 3/4" LG.		BY TVA
3	-	-	NOT USED		
4	-	-	NOT USED		BY TVA
5	1	-	5" X 3/8" PL X 5" LG.		BY TVA
6	1	-	4" x 3" X 3/8" ANGLE X 6" LG (FIELD TO CUT TO SUIT)		BY TVA
-	-	SDE	(3) HRS		
-	-	SDD			

PROJECT WBN
CONTRACT 82N1
DRAWING 47B1A-1-2
SHEET 1 of 1
REVISION 901
UNIT 1

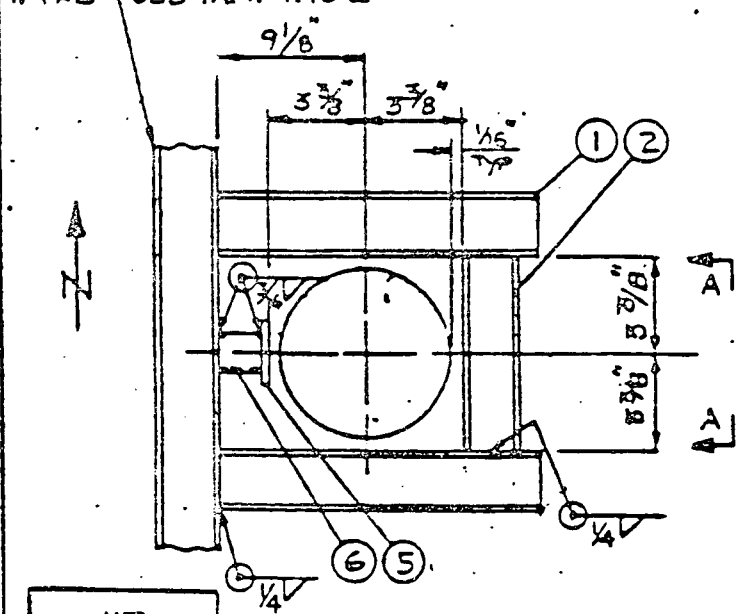


SECTION A-A

ISO. 47W427-203-R4
JOINT: 102
DIRECTION: X
TYPE: RR
+ 280 #
DESIGN LOAD:
- 250 #

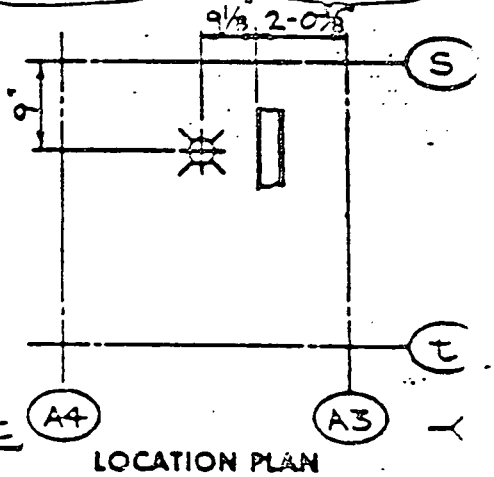
ISO. 47W427-203-R4
JOINT: 102
DIRECTION: Z
TYPE: RR
+ 300 #
DESIGN LOAD:
- 390 #

SUPPL'D. W/ HGR. MK.
W4X13 - 038-1AFW-R102



PLAN

LOAD TABLE: 47B427-508-R
PROB. NO. N3-3-10A



LOCATION PLAN

AS VERIFIED AS APPROVED

6" PIPE SIZE NUCLEAR 1 V 1 CLASS C

DRAVO ISO #E-2878-IC-6 (TVA900 = VENDOR RI)

REV	DES	DRN	CHK	APP	DATE
901	LR	LR	ASL	HT	9-30-76

DRAVO CORPORATION P.O. # E-2879-

T.V.A. CONTRACT # 74C38-63015

WATTS BAR NUCLEAR PLANT - UNIT # 1

BERGEN-PATERSON PIPESUPPORT C:

PIPING SYSTEM: AUX. FEEDWATER

REF. DWGS. PIPING: 47W427-2-0 STRUCTURAL: 48N1221-2-9

JOB NO. 3604 PAB NO. 09 NO. REQ'D

MARK & DWG NO. 038-1AFW-R105 SHEET 1 of 1

INVOICE CODE

ITEM	QUAN.	PART NO.	DESCRIPTION
1	1	1/2	TVA L'YR #MEB 1903 DT 11/30/76
2	1	321	
3	1		
4	X		

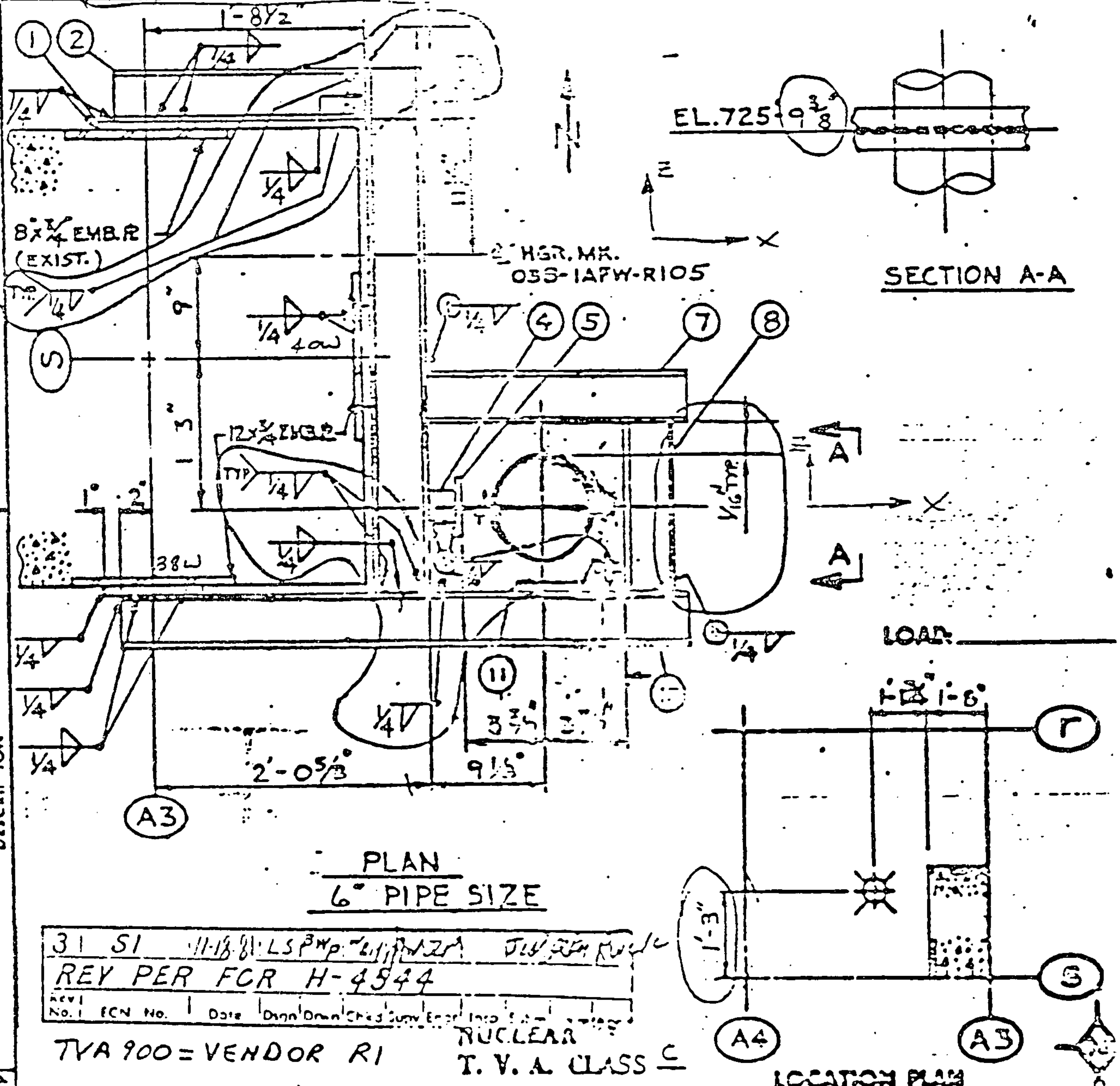
REV PER ECN'S 2576 & 3210 - INSPECTION CONTAINED

ECN No. | Date | Engr | Imp | Sched | Item

901 | 12-1-76 | MPL | ASL | HT

REV | DES | DRN | CHK | APP | DATE | BY

ITEM	QTY		SIZE / DESCRIPTION	MAT'L
1	3	–	6" x ½" R x 6" LG.	BY TVA
2	1	–	W4 X 13 X 1'-10½" LG.	BY TVA
3	1	–	W4 X 13 X LG AS REQD.	BY TVA
4	1	–	4" x 3" x 3/8" ANGLE X 7' LG (FIELD TO CUT TO SUIT)	BY TVA
5	1	–	5" x 3/8" R x 5" LG.	BY TVA
6	–	–	NOT USED	
7	1	–	4 X 13 x 1'-6" LG.	BY TVA
8	1	–	W4 x 13 X LG AS REQD.	BY TVA
9	–	–	NOT USED	
10	1	–	4 X 13 X 3'-9" LG	BY TVA
11	1	–	6C 13 X 6" LG	BY TVA



PLAN
6" PIPE SIZE

3	SI	11-18-81	LS					
REV PER FCR H-4544								
Rev No.	ECN No.	Date	Dsgn	Drwn	Chkd	Supv	Engr	Insp

TVA 900 = VENDOR R1

NUCLEAR
T. V. A. CLASS C

DRAVO ISO #E-2879-IC-8

DRAVO CORPORATION P.O. # E-2879-
T.V.A. CONTRACT # 74C38-83015
WATTS BAR NUCLEAR PLANT - UNIT #1

[illegible]-PATERSON PIPE SUPPLY CO.
AUX. FEEDWATER
97M27-2-0
[illegible]
03S-1AFW-R102
1 of 2

INVOICE CODE
TVA LTR WHCB1903 JC #19494 [illegible] 3/21
H-6983, ECN 2576, 3210 (TVA CONT)
REV'D [illegible] AS SHOWN, DELETED [illegible] ADDED [illegible] APPROVED AS-BUILT
DESCRIPTION
REV. PER H-72081
LR LR ASL HT 8-30-76

			DESCRIPTION	MAT.			
2	1	SEE	(4) HRS				
1	1	SBD					
			SEE TVA DWG 47A050-1A				

ISO. 47W427-203-(R4)
JOINT: 263
DIRECTION: X
TYPE: RR
+ 420 #
DESIGN LOAD:
— 380 #

ISO. 47W427-203-(R4)
JOINT: 263
DIRECTION: Z
TYPE: RR
+ 370 #
DESIGN LOAD:
— 346 #

REF: LOAD TABLE 47B 427-509/R0
PROB:- N3-3-12A

INVOICE CODE

FOR REV 1 SEE SHT 1 OF 2

DESCRIPTION

REV NO	ECN No.	Date	Dsgn	Drwn	Chkd	Supv	Engr	Insp	Systm	Room	Appr
904	SI	ECN 5218	RC	RC	AL						

REV. PER FCR'S H-7208, H-6983 & ECNS 2576, 3210 (INACTIVE CONT.)

REV NO	ECN No.	Date	Dsgn	Drwn	Chkd	Supv	Engr	Insp	Systm	Room	Appr
3	SI	11-18-81	LSI								

REV PER FCR H-4544

REV NO	ECN No.	Date	Dsgn	Drwn	Chkd	Supv	Engr	Insp	Systm	Room	Appr
2	SI	4-28-78	RC	RC	AB	DS	FHR				

REV PER FCR # M-1361

PROJECT WBNP
CONTRACT 83013
DRAWING # 03B-1AFW-R102
SHEET 2 of 2
REVISION 904
UNIT 1

NUCLEAR
T. V. A. CLASS C

DRAVO ISO #E-2879-IC-8

DRAVO CORPORATION P.O. # E-2879-

T.V.A. CONTRACT # 74C38 83015

WATTS BAR NUCLEAR PLANT - UNIT # 1

BERGEN-PATERSON PIPESUPPORT CORP.

PIPING SYSTEM: AUX. FEEDWATER

DSN. DWGS.	PIPING	STRUCTURAL
	47W427-2-0	48N1221-2-3

JOB NO. 3604 | TAB NO. 09 | NO. ASSD 1

DRAWING NO. 03B-1AFW-R102 | SHEET 2 of 2 | REV 904

REV	DATE	BY	CHK	APP
1	2-1-77	ASL		SM

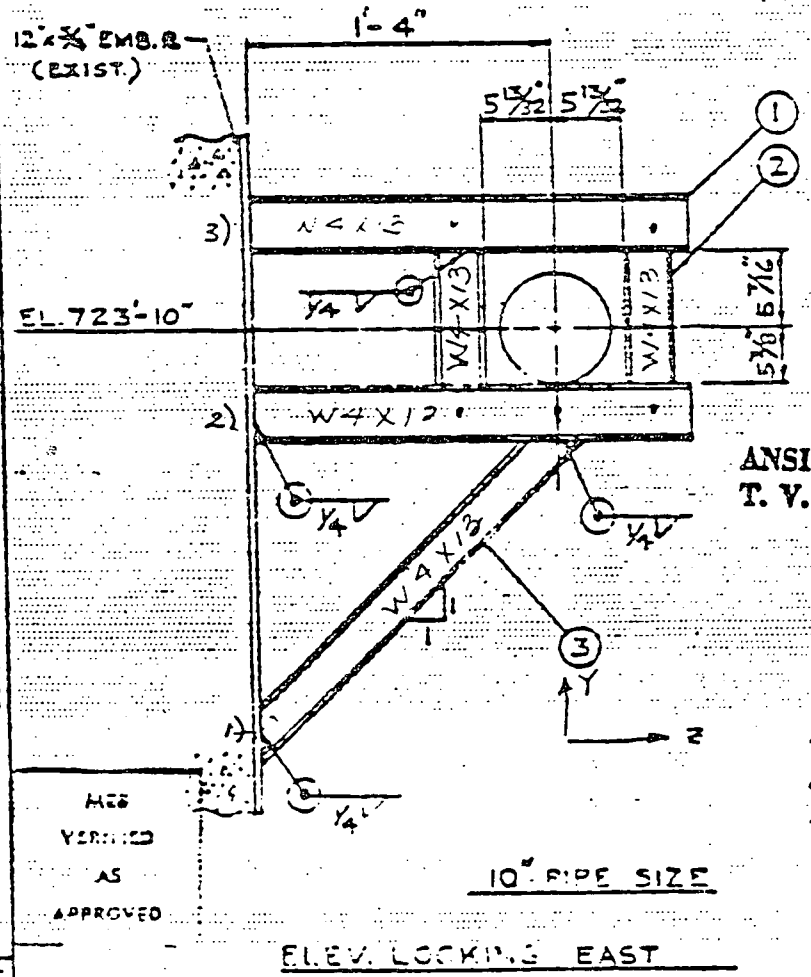
REV DES	LR	DR	LR	CHK	ASL	APP	HT	DATE 9-30-76

ITEM	QUAN	PART NO.	SIZE	DESCRIPTION	WGT.
1	2	STR	W 4 X 13 X 2'-3" LG.		50
2	2	STR	W 4 X 13 X 10 15/16" LG.		24
3	1	CS	W 4 X 13 X 2'-2 3/4" LG. (CUT AS SHOWN)		29
			SHIP BARE METAL. PAINT CARBOWELD II		
			BY TVA.		
-	1	SDE	(3) HRS		
-	1	SDD			
-	1	B&T			

PROJECT WBN
CONTRACT 83015
DRAWING # 47B-1AFW-R22
SHEET 1 OF 1
REVISION 0
UNIT 1

ISO. 47W427-206-RO
JOINT: 115
DIRECTION: Y
TYPE: SR
+ 2000 #
DESIGN LOAD:
— 5000 (1)(2) #

ISO. 47W427-206-RO
JOINT: 115
DIRECTION: Z
TYPE: SR
+ 7000 (2) #
DESIGN LOAD:
— 8000 (1) #

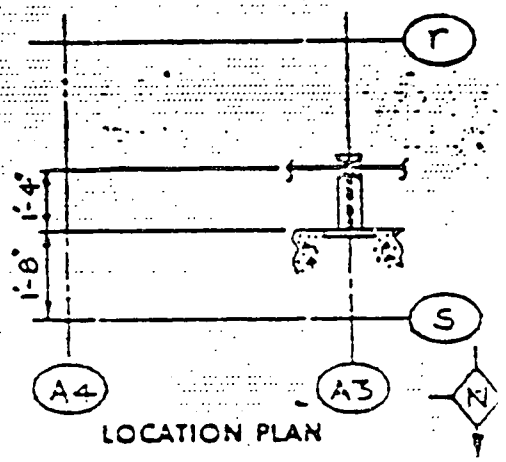


10" PIPE SIZE

ELEV. LOOKING EAST

ANSI B 31.1
T. V. A. CLASS G

LOAD



LOCATION PLAN

DRAVO ISO #E-2880-IC-208-1

DRAVO CORPORATION P.O. # E-2879-

T.V.A. CONTRACT # 74C38-83015

WATTS BAR NUCLEAR PLANT - UNIT #1

BERGEN-PATERSON PIPESUPPORT COR

PIPING SYSTEM AUX. FEEDWATER

REF.	PIPING	STRUCTURAL
DWGS.	47W427-2-0	48N1221-2-8

JOB NO. 3608+ | FAB NO. 09 | NO REQ'D

BLOCK & DWG NO. 47B-1AFW-R22

REV DES LR DRN LR CHK RR APP HLT DATE 5-17-76

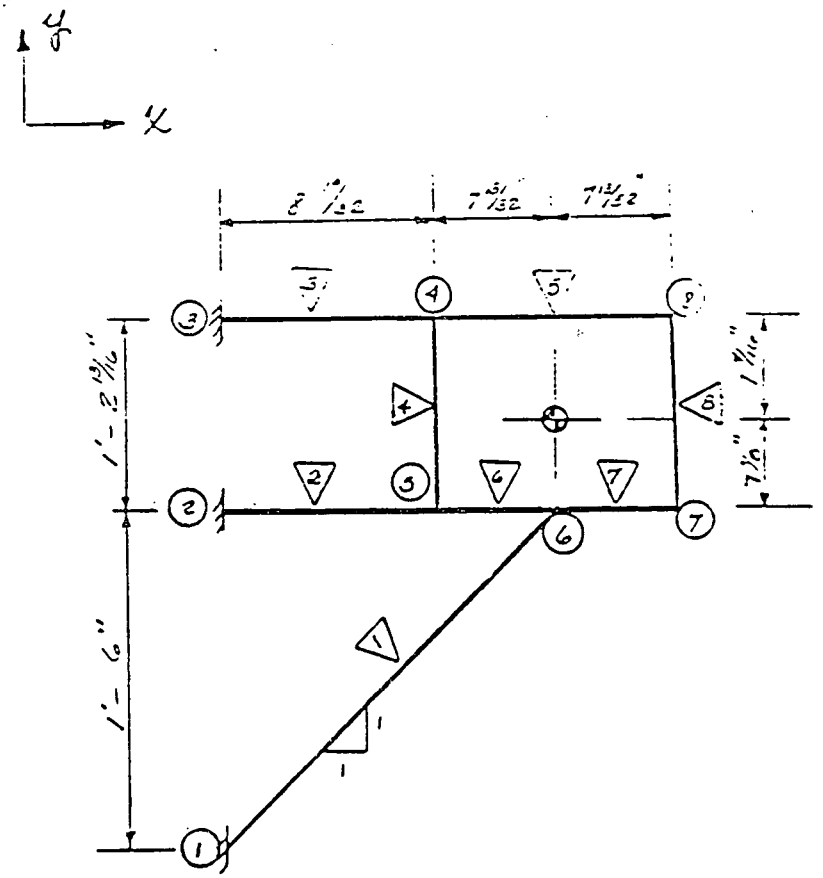
INVOICE CODE | DESCRIPTION | CHK APP | BY | DATE

SHEET _____ OF _____

COMPUTED WWW DATE 11-2-

CHECKED LS DATE 11-2-

Support # 03B - 1AFW - R22



○ Jt. No.

▽ Member.

All Memb. W4-X13

FORCES.

$F_y = -5000^{\#}$ @ Jt. 6

$F_x = 7000^{\#}$ Memb. 8

or $F_x = -8000^{\#}$ Memb. 4

REACTIONS : By SAGS Program (R22)

LOADING #11 - GOVERNS

VA 11030 (WM 7-75)

32.

B-1AFW-R22

E6,,.284

0

1,0

0 Y=-5000

75

0 Y=-5000

75

```
OLD,R22
READY.
LIST

 82/11/03. 10.59.32.
PROGRAM   R22

00100 SUPPORT #03B-1AFW-R22
00110 ANALYSIS
00120 1,1
00130 MTABLE
00140 1,29.0E6,11E6,,.284
00150 SPTABLE
00160 1,-10,W4X13
00170 JOINTS
00180 1,0,0,0
00190 2,0,18,0
00200 3,0,32.81,0
00210 4,8.6,32.81,0
00220 5,8.6,18,0
00230 6,16,18,0
00240 7,23.41,18,0
00250 8,23.41,32.81,0
00260 RESTRAINTS
00270 1,7
00280 2
00290 3
00300 SPANS
00310 1,1,6,1,1
00320 2,2,5,1,1
00330 3,3,4,1,1
00340 4,4,5,1,1
00350 5,4,3,1,1
00360 6,5,6,1,1
00370 7,6,7,1,1
00380 8,7,8,1,1
00390 LOADING: X=7000  Y=-5000
00400 ACCELS
00410 0,-1,0
00420 MIDSPAN
00430 8,1,1,7000,7.375
00460 FORCES
00470 6,2,-5000
00480 LOADING* X=-8000  Y=-5000
00490 ACCELS
00500 0,-1,0
00510 MIDSPAN
00520 4,1,1,-8000,7.375
00550 FORCES
00560 6,2,-5000
READY.
```

S A G S

STATIC ANALYSIS OF GENERAL STRUCTURES

STRUCTURAL DYNAMICS RESEARCH CORPORATION

7URT #03B-1AFW-R22

*** SPACE FRAME ANALYSIS ***

SPAN	LENGTH	FORE END JOINT	AFT END JOINT	MATERIAL CODE	SECTION CODE	ROTATION ANGLE	TEMP.
1	24.08	1	6	1	1		
2	8.60	2	5	1	1		
3	8.60	3	4	1	1		
4	1..81	4	5	1	1		
5	14.81	4	8	1	1		
6	7.40	5	6	1	1		
7	7.41	6	7	1	1		
8	14.81	7	8	1	1		

STRUCTURE WEIGHT/MASS = 1.091E+02

JOINT COORDINATES

JOINT	X	Y	Z
1	0.000	0.000	0.000
2	0.000	18.000	0.000
3	0.000	32.810	0.000
4	8.600	32.810	0.000
5	8.600	18.000	0.000
6	16.000	18.000	0.000
7	23.410	18.000	0.000
8	23.410	32.810	0.000

MATERIAL PROPERTIES

CODE	E	POISSON'S	DENSITY	THERMAL COEFFICIENT	YIELD
1	29.0E+06	.318	2.840E-01	0.	3.600E+04

SPECIAL CROSS SECTIONS

CODE	TYPE	P1	P2	P3	P4	P5	P6
1	STEEL SECT.	W4X13	AISC69				

CROSS-SECTION PROPERTIES

CODE	AREA	MOMENTS OF INERTIA Z	MOMENTS OF INERTIA Y	SHEAR RATIO Y	SHEAR RATIO Z	TORSION CONSTANT	WARPING CONSTANT	DEG. FIX.
1	3.82E+00	1.13E+01	3.76E+00	3.75	1.50	1.54E-01	1.37E+01	.60

STATIC ANALYSIS OF GENERAL STRUCTURES
SUPPORT #038-1AFW-R22

STRESS RECOVERY VALUES

CODE	COMBINED STRESS	POINT 1/3 C(Y)	POINT 1/3 C(Z)	POINT 1/3 R(EFF)	POINT 2/4 C(Y)	POINT 2/4 C(Z)	POINT 2/4 R(EFF)
1	422	2.080	2.030	0.000	2.080	0.000	.648
		-2.080	0.000	.648			

SPECIFIED RESTRAINTS

JOINT	DIRECTION	VALUE
1	123456	
2	123456	
3	123456	

LOADING NO. 1: X=7000 Y=-5000

ACCELERATION LOADING
A(X) = 0 A(Y) = -1.000E+00 A(Z) = 0.

MID-SPAN FORCES

SPAN	DIR	COORDINATE	VALUE	DISTANCE	VALUE	DISTANCE
8	X	ABSOLUTE	7.00E+03	7.38E+00		

JOINT	APPLIED FORCES DIR	TYPE	VALUE	FINAL JOINT	INC.
6	Y	FORCE	-5.000E+03		

TOTAL APPLIED FORCES
F(X) = 7.000E+03 F(Y) = -5.109E+03 F(Z) = 0.

LOADING NO. 2: X=-8000 Y=-5000

ACCELERATION LOADING
A(X) = 0. A(Y) = -1.000E+00 A(Z) = 0.

MID-SPAN FORCES

SPAN	DIR	COORDINATE	VALUE	DISTANCE	VALUE	DISTANCE
4	X	ABSOLUTE	-8.00E+03	7.38E+00		

STATIC ANALYSIS OF GENERAL STRUCTURES
SUPPORT #03B-1AFW-R22

JOINT	APPLIED FORCES DIR	TYPE	VALUE	FINAL JOINT	INC.
6	Y	FORCE	-5.000E+03		

TOTAL APPLIED FORCES
F(X) = -8.000E+03 F(Y) = -5.109E+03 F(Z) = 0.

S A G S

STATIC ANALYSIS OF GENERAL STRUCTURES

STRUCTURAL DYNAMICS RESEARCH CORPORATION

SUPPORT #03B-1AFW-R22

*** LOADING NO. 1: X=7000 Y=-5000

JOINT DISPLACEMENTS

JOINT	X	Y	Z	THETA(X)	THETA(Y)	THETA(Z)
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	3.342E-04	-9.798E-04	0.	0.	0.	-6.021E-05
5	4.446E-04	-9.725E-04	0.	0.	0.	-7.415E-05
6	8.616E-04	-2.136E-03	0.	0.	0.	-1.099E-04
7	1.076E-03	-2.529E-03	0.	0.	0.	-1.575E-04
8	8.410E-04	-2.423E-03	0.	0.	0.	1.000E-04

MAXIMUM DISPLACEMENTS

JOINT	7	7	1	1	1	7
VALUE	1.076E-03	-2.529E-03	0.	0.	0.	-1.575E-04

JOINT REACTIONS

JOINT	F(X)	F(Y)	F(Z)	M(X)	M(Y)	M(Z)
1	3.033E+03	3.621E+03	0.	0.	0.	3.093E+03
2	-5.728E+03	7.081E+02	0.	0.	0.	5.857E+03
3	-4.305E+03	7.804E+02	0.	0.	0.	5.637E+03
TOTAL	-7.000E+03	5.109E+03	0.	0.	0.	1.459E+04

STATIC ANALYSIS OF GENERAL STRUCTURES
SUPPORT #03B-1AFW-R22

*** LOADING NO. 2: X=-8000 Y=-5000

JOINT DISPLACEMENTS

JOINT	X	Y	Z	THETA(X)	THETA(Y)	THETA(Z)
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	-2.591E-04	-7.259E-04	0.	0.	0.	-1.412E-04
5	-1.001E-04	-7.456E-04	0.	0.	0.	4.210E-05
6	1.073E-04	-1.608E-03	0.	0.	0.	-4.248E-05
7	8.958E-05	-1.857E-03	0.	0.	0.	-1.049E-05
8	-2.237E-04	-1.864E-03	0.	0.	0.	-2.422E-05

MAXIMUM DISPLACEMENTS

JOINT	4	8	1	1	1	4
VALUE	-2.591E-04	-1.864E-03	0.	0.	0.	-1.412E-04

JOINT REACTIONS

JOINT	F(X)	F(Y)	F(Z)	M(X)	M(Y)	M(Z)
1	3.372E+03	3.975E+03	0.	0.	0.	1.959E+03
2	1.290E+03	1.002E+03	0.	0.	0.	2.691E+03
3	3.338E+03	1.327E+02	0.	0.	0.	5.936E+03
TOTAL	8.000E+03	5.109E+03	0.	0.	0.	1.059E+04

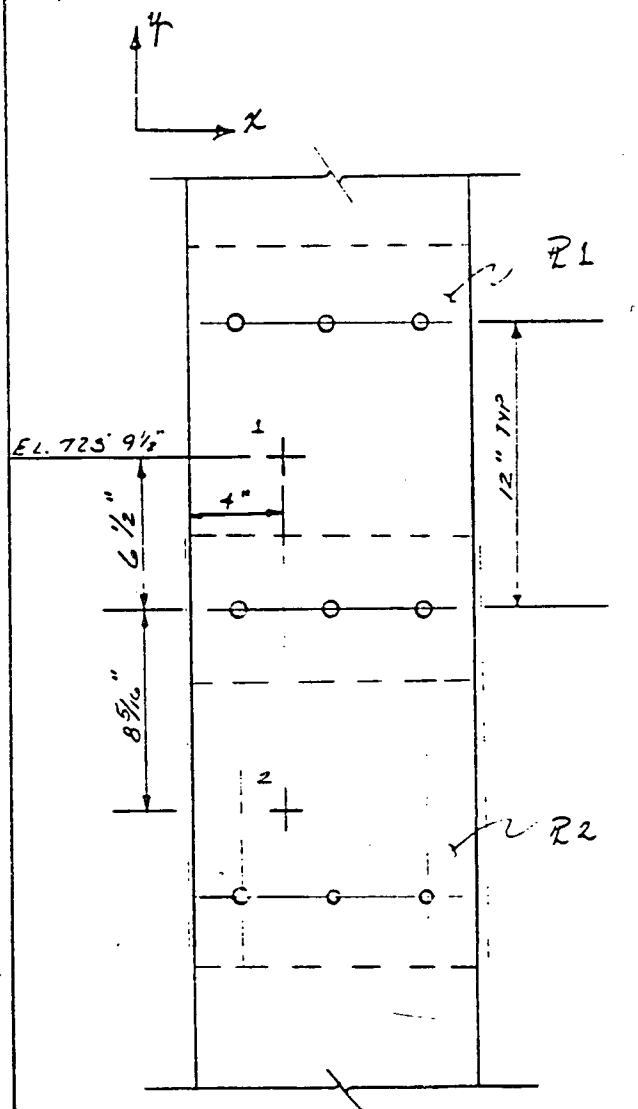
SHEET _____ OF _____

E-711

EMBEDDED PLATE MK38W 48N1221-2

COMPUTED WWW DATE 11-2-92

SUPPORT # 03B-1AFW-222 CHECKED LS DATE 11-4-92



Σ 17'-6" X 1' X 3/4"
EL. 717' 0"

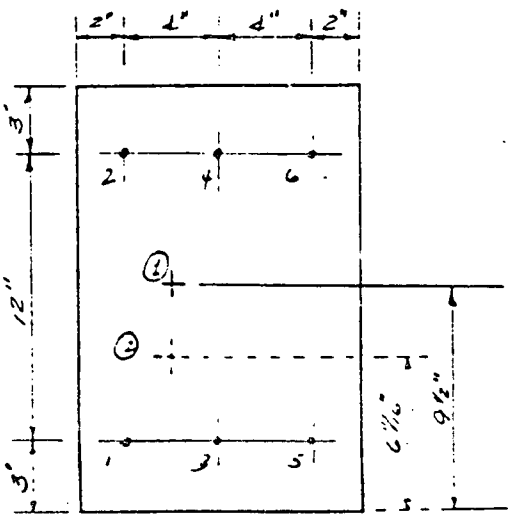
LOAD 1 (JOINT #3 at 03B-1AFW-222 from SAGS OUTPUT for 222 COND. 1

F_y = 0.78 K M_x = -5.64 IN-K
F_z = 4.31 K = -.47 FT-K

LOAD 2 (JOINT #2 at 03B-1AFW-222 from SAGS for 222 COND. 1)

F_y = 0.71 K M_x = -5.86 IN-K
F_z = 5.73 K = -0.49 FT-K

SINCE R1 & 2 ARE ALIKE MODEL ON-1 PLATE WITH 2 LOADING CONDITIO.



-13AP222
"No Compression", 9
R1 or 2 12, 18, 6
.307, 2, 3
.307, 2, 15
.307, 6, 3
.307, 6, 15
.307, 10, 3
.307, 10, 15
3
4.31, 4, 9.5, 0, -.47
0.0, 4, 6.69, 0, -.49
5.73, 4, 6.69, 0, 0

EVA 11030 (Wilk-7-75)

```
LIST

 82/11/04. 15.15.17.
PROGRAM   F711

00100 "NO COMPRESSION";9
00110 12,18,6
00120 .307,3,3
00130 .307,3,15
00140 .307,6,3
00150 .307,6,15
00160 .307,10,3
00170 .307,10,15
00180 3
00190 4.31,4,9.5,0,-.47
00200 0.0,4,6.69,0,-.49
00210 5.73,4,6.69,0,0
READY.
```

PROGRAM OUT222

PLATE NUMBER= 1 ANCHOR TYPE=NO COMPRESSION
WIDTH OF PLATE = 12 INCHES
LENGTH OF PLATE= 18 INCHES
MODULAR RATIO= 9

ANCHOR NUMBER	AREA SQ IN	X ORDINATE IN	Y ORDINATE IN
1	.307	2	3
2	.307	2	15
3	.307	6	3
4	.307	6	15
5	.307	10	3
6	.307	10	15

LOAD CONDITION NUMBER= 1
VERT. LOAD= 4.31 KIPS LOCATION X= 4 INCHES Y= 9.5 INCHES
APPLIED MOMENT ABOUT Y AXIS= 0 KIP FEET
APPLIED MOMENT ABOUT X AXIS=-.47 KIP FEET
TRANSLATED MOMENT CENTERLINE ABOUT Y AXIS= .718333 KIP FEET
TRANSLATED MOMENT CENTERLINE ABOUT X AXIS=-.649583 KIP FEET

PARTIAL PRESSURE CASE

CONCRETE PRESSURE (KSI)
C2=-.08

CONCRETE PRESSURE FORCE,CF=-.19 KIPS
LOCATION IN X-DIRECTION= 11.52 INCHES
LOCATION IN Y-DIRECTION= 1.89 INCHES

FRICTION SHEAR CAPACITY,SF= .1 KIPS

PRESSURE BULB GEOMETRY
Z3= 1.9
Z6= 7.55

ANCHOR NUMBER	STRESS GROSS AREA (KSI)	LOAD KIPS
1	3.4	1.04
2	4.56	1.4
3	1.86	.57
4	3.03	.93
5	.33	.1

LOAD CONDITION NUMBER= 2
VERT LOAD= 0 KIPS LOCATION X= 4 INCHES Y= 6.69 INCHES
APPLIED MOMENT ABOUT Y AXIS= 0 KIP FEET
APPLIED MOMENT ABOUT X AXIS=-.49 KIP FEET
TRANSLATED MOMENT CENTERLINE ABOUT Y AXIS= 0 KIP FEET
TRANSLATED MOMENT CENTERLINE ABOUT X AXIS=-.49 KIP FEET

PARTIAL PRESSURE CASE

CONCRETE PRESSURE (KSI)
C1=-.02
C3=-.02

CONCRETE PRESSURE FORCE,CF=-.43 KIPS
LOCATION IN X-DIRECTION= 6 INCHES
LOCATION IN Y-DIRECTION= 1.3 INCHES

FRICTION SHEAR CAPACITY,SF= .21 KIPS

PRESSURE BULB GEOMETRY
Z3= 12
Z6= 3.91
Z8= 3.91

ANCHOR NUMBER	STRESS GROSS AREA (KSI)	LOAD KIPS
2	.47	.14
4	.47	.14
6	.47	.14

LOAD CONDITION NUMBER= 3
VERT LOAD= 5.73 KIPS LOCATION X= 4 INCHES Y= 6.69 INCHES
APPLIED MOMENT ABOUT Y AXIS= 0 KIP FEET
APPLIED MOMENT ABOUT X AXIS= 0 KIP FEET
TRANSLATED MOMENT CENTERLINE ABOUT Y AXIS= .955 KIP FEET
TRANSLATED MOMENT CENTERLINE ABOUT X AXIS= 1.10302 KIP FEET

PARTIAL PRESSURE CASE

CONCRETE PRESSURE (KSI)
C4=-.13

CONCRETE PRESSURE FORCE,CF=-.33 KIPS
LOCATION IN X-DIRECTION= 11.43 INCHES
LOCATION IN Y-DIRECTION= 16.27 INCHES

FRICTION SHEAR CAPACITY,SF= .17 KIPS

PRESSURE BULB GEOMETRY
Z1= 2.3
Z2= 6.91

ANCHOR NUMBER	STRESS GROSS AREA (KSI)	LOAD KIPS
1	6.24	1.91
2	4.28	1.31
3	4.27	1.31
4	2.31	.71
5	2.3	.71
6	.34	.11

SHEET _____ OF _____

E-711

EMBEDDED PLATE MK38W 48N1221-2

SUPPORT # 03B-1AFW-R22

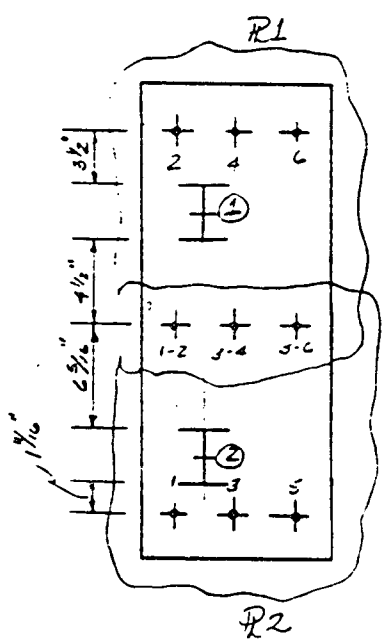
COMPUTED WWW DATE 11-2-82

CHECKED LS DATE 11-4-82

THE MK38W ANCHORS 1, 3 & 5 FROM R1 ARE THE SAME AS ANCHORS 2, 4 & 6 FROM R#2. THEREFORE COMBINE REBUTING TENSION FROM EACH PLATE TO OBTAIN THE ACTUAL TENSION

BY SUPERIMPOSING THE LOADS FROM CONDITION 1 WITH 2 & 3:

ANCHOR	LOAD 1		LOAD 2		LOAD 3	TOTAL
1-2	1.04^K	+	.14^K	+	1.31^K	2.49^K
3-4	1.40^K	+	.14^K	+	.71^K	2.25^K
5-6	0.57^K	+	.14^K	+	.11^K	0.82^K



ANCHOR #	LOAD
1	1.91^K
1-2	2.49^K
2	1.40^K
3	1.31^K
3-4	2.25^K
4	0.93^K
5	0.71^K
5-6	0.82^K
6	0.46^K
	Σ = 12.28^K

CHECK ADEQUACY OF ANCHORS

FOR 5/8" ϕ STUD $T_{ALL} = \phi F_y A_{sr}$ (DS-C6.1)

$= .55(44)(.307)$

$= 7.43^K$

MAX TENSION OCCURS AT ANCH # 1-2 $T = 2.49^K$

$2.49^K < 7.43^K = T_{all}$ ∴ ANCHOR FULLY ADEQ.

TVA 11030 (WM-7-75)

SHEET _____ OF _____

F-711

COMPUTED WWW DATE 11-2-95

CHECKED [illegible] DATE 11-6-95

SUPPORT #03B-1AFW-R22

TOTAL SHEAR FOR all 9 ANCHOR from LOADS 1 & 2 = 1.49^k
$\therefore$ .17^k PER ANCHOR $\therefore$ Negligible.

R BENDING.

FOR A CONSERVATIVE ANALYSIS, CHECK PLATE BENDING CONSIDERING EACH PLATE TO BE INDEPENDENT FROM EACH OTHER.

From preceeding pg.

R 1

$$M_{AX} - M_{X-X} = 2.49(4.5) + 2.25(4.5) + 0.82(4.5)$$
$$= 25.02$$

$$f_{bx} = \frac{M}{S_x} = \frac{25.02}{\frac{18(.75)^2}{6}} = \frac{25.02}{1.69} = \underline{14.83 \text{ ksi}}$$

$$M_{AX} - M_{Y-Y} = 0.46(4) + .82(4) = 5.12^{k-in}$$

$$f_{by} = \frac{M}{S_x} = \frac{5.12^{k-in}}{1.125 \text{ in}^3} = \underline{4.55 \text{ ksi}}$$

$$\frac{f_{bx}}{F_{bx}} + \frac{f_{by}}{F_{by}} \leq 1$$

$$\frac{14.83}{.75 F_y} + \frac{4.55}{.75 F_y} \leq 1$$

$$\frac{14.83}{27} + \frac{4.55}{27} \leq 1$$

$$0.71 < 1 \quad \therefore \text{ R BENDING O.K.}$$

VA 11030 (WM-7-75)

SHEET _____ OF _____

F-711

COMPUTED WWW DATE 11-2-92

Support #03B-1AFW-R22 CHECKED LS DATE 11-5-92

R2.

MAX $M_{x-x} = 2.49(6\ 5/16) + 2.25(5\ 5/16) + 0.82(5\ 5/16)$

$= 35.1$ K-IN

$f_{bx} = \frac{35.1}{1.69} = 20.77$ KSI

MAX $M_{y-y} = .82(4) + .71(4) = 6.12$ K-IN

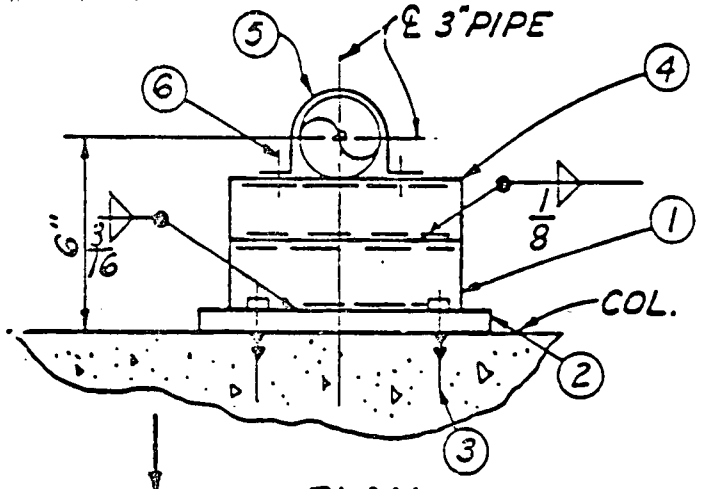
$f_{by} = \frac{6.12}{1.125} = 5.44$ KSI

COMBINED STRESSES.

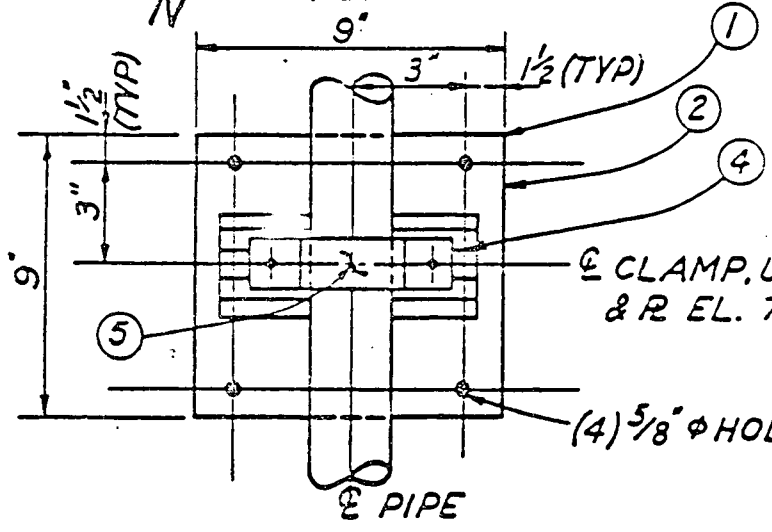
$$\frac{f_{bx}}{F_{bx}} + \frac{f_{by}}{F_{by}} \leq 1$$

$$\frac{20.77}{27} + \frac{5.44}{27} \leq 1$$

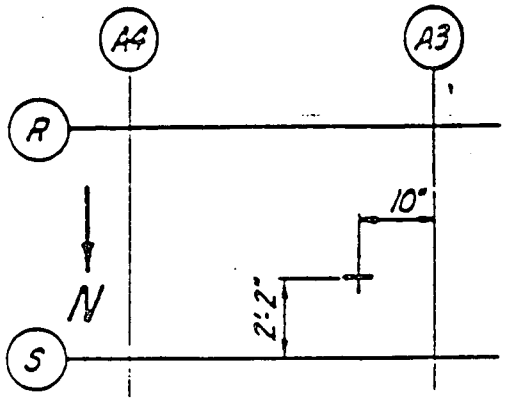
$.97 < 1$ ∴ R BENDING O.K.



PLAN



ELEVATION LOOKING NORTH



LOCATION PLAN
FL EL 713'-0"

NOTES:
1. FOR GENERAL NOTES SEE 47A450
2. S.S.E. DESIGN LOADS (PER PIPE)
   A. Rv = 335 #
   B. RL = 164 #
3. TVA PIPE CLASS 3

NOT TO SCALE

ITEM	QTY	MATERIAL DESCRIPTION FOR ONE SUPPORT	NO. SUPP. ONE
6	2	3/8" ⌀ BOLTS W/UNISTRUT NUT P1008, WASHER	
5	1	3" STD. PIPE STRAP - UNISTRUT P-2558-30	
4	1	P-1000 UNISTRUT x 0'-8"	
3	4	½" ⌀ BOLT ANCHOR ASSEMBLY	
2	1	R 5/8" x 9" x 0'-9"	
1	1	TS 2 x 2 x .25 x 0'-8"	

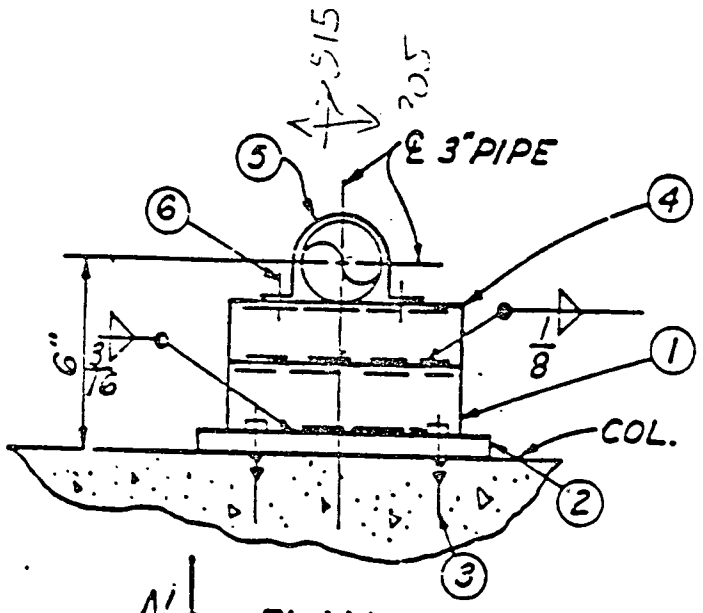
SEISMIC CATEGORY I STRUCTURES

MECHANICAL SEISMIC SUPPORT FOR ERCW SUPPORT DETAIL 3-144

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

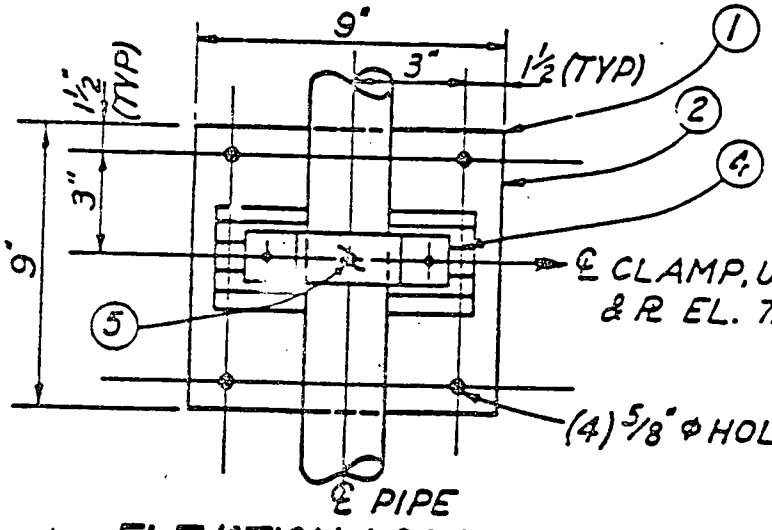
DRAWING NO. E 47A450-3-144 R0

DES. M. OGLE
DRWN T. G. EAGLE
CHKD C. MARLER
SUPV L. M. CHACON
ENGINEER

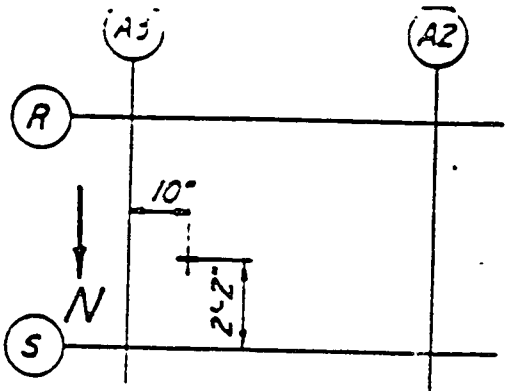


N

PLAN



ELEVATION LOOKING NORTH



LOCATION PLAN
FL EL 713'-0"

NOTES:
1. FOR GENERAL NOTES SEE 47A450
2. S.S.E. DESIGN LOADS (PER PIPE)
   A. Rv = (335 #) → ↑515
   B. RL = (164 #) → ↑305
3. TVA PIPE CLASS 3

NOT TO SCALE

ITEM	QTY	MATERIAL DESCRIPTION FOR ONE SUPPORT	NO. SUPP. ONE
6	2	3/8" ⌀ BOLTS W/UNISTRUT NUT P1008, WASHER	
5	1	3" STD. PIPE STRAP - UNISTRUT P-2558-30	
4	1	P-1000 UNISTRUT x 0'-8"	
3	4	½" ⌀ BOLT ANCHOR ASSEMBLY	
2	1	PL 3/8" x 9" x 0'-9"	
1	1	TS 2 x 2 x .25 x 0'-8"	

SEISMIC CATEGORY I STRUCTURES

MECHANICAL SEISMIC SUPPORT FOR ERCW SUPPORT DETAIL 3-145

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

KEY	ECN NO.	DATE	ORIGINATOR	CHECKER	APPROVER	UNIT	LOAD	CONSTRUCTION	ASME
			M. DALE	D.E. THOMPSON	C. MASTERS	G.M. GHAGEN			

DRAWN: G.M. GHAGEN
ORIGINATOR: M. DALE
CHECKED: D.E. THOMPSON
APPROVED: C. MASTERS

DRAWING	UNIT	CLASS	DRAWING NO.
	1	E	47A450-3-145

RO

M-
RO

ITEM	QUAN	PART NO	SIZE	DESCRIPTION	MAT			
1	1	2000	1.5	—0'-15 3/4" — RRS				
2	1	2600-5	6"	PIPE CLAMP				
3	1	—		WF 6 X 25 X 2'-11 7/8" LG. (A36)	BY TVA			
4	2	—		4 X 4 X 1/2" ANCHOR 0 14 1/2" 10 (A36)	BY TVA			
5	1	—		5/8 X 10" CS PL 0'10" LG. (A36)	BY TVA			
6	4	—		1/2" BOLT ANCHOR ASS'Y.	BY TVA			
					BY TVA			
—	—	SDE		(3) HRS				
—	—	SDD						
—	—	SB)		210-3 FOR ITEM 1 (PIN TO PIN)				
—	—	EZP)						
—	—	B&T						

ANALYSIS PROBLEM N3-J6-3A SEE T.V.A. DWG. 47A050-1 & 1A

LOAD TABLE: 478491-379

ECN 2575

ISO 47W491-204-R5

JOINT: 17Z

DIRECTION: X

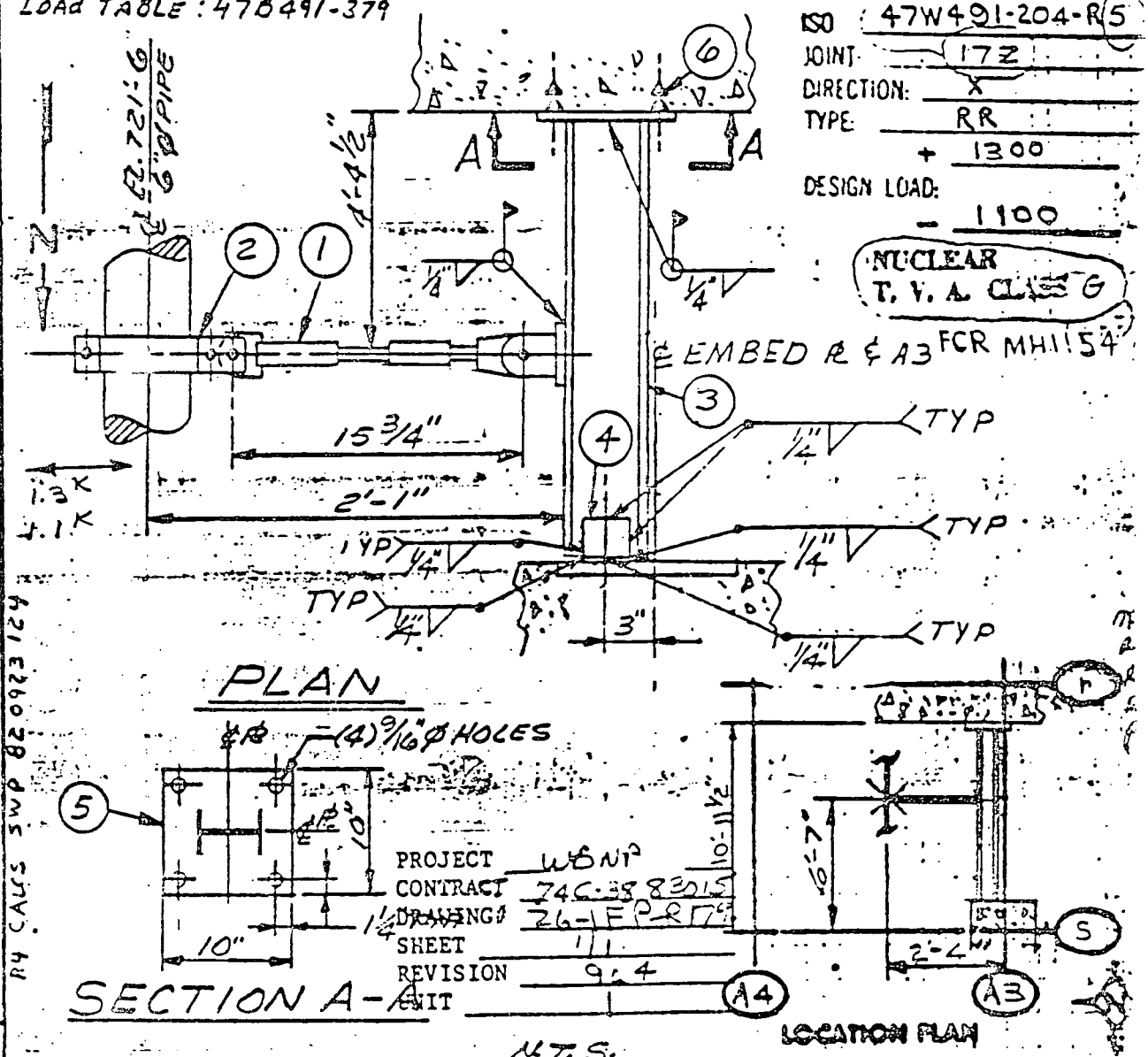
TYPE: RR

+ 1300

DESIGN LOAD:

- 1100

NUCLEAR
T. V. A. CLASS G



PROJECT WBNP
CONTRACT 74C-38 83015
DRAWING 26-1FP-R17
SHEET 1
REVISION 9
UNIT 1

W WELDED SYMBOLS PER FCR 11-127

REV. WELD SYMBOLS PER FCR 11-127

REVISED DIM. AT LOC. PLAN PER REV'D. ANSI. ECN-1581

RY CALCS SWP 82 0923 124

ECN DWG PER ECN AND FCR MH 1154 "E" 9/6/83

DRAVO CORPORATION P. O. # E-2879

T. V. A. CONTRACT # 74 C-38 83015

WATTS BAR NUCLEAR PLANT - UNIT # 1

BERGEN-PATTERSON PIPESUPPORT CO.

H.P. FIRE PROTECTION

DRAWING 47W491-8-7 41N318-1-2

JOB NO. 3604 PAGE NO. 029

SHEET 1 DRAWING NO. 26-1FP-8179

FORM 2

WATTS BAR NUCLEAR PLANT
INDEPENDENT REVIEW

FINDING RESPONSE

Finding number IE1711121

Date finding received from Black & Veatch 11/24/82
Date

Comments pertinent to finding:

Attached are the design calculations for the embedded plate MK 38W. These calculations confirm adequacy of the embedded plate. These calculations would have been performed later if necessary to address NCR WBNCEB 8203, issued March 1982, but were accelerated to address this finding. The calculations are adequate to close the NCR in so far as the embedded plate is concerned; however, NCR WBNCEB 8203 must remain open because it is generic to a large number of embedded plates and thus closure of NCR WBNCEB 8203 should be added to your punch list.

Please recycle on level 2 if the attached calculations are not sufficient hard evidence to show the plates in question are acceptable.

E Gray Beasley
Chairman, OEDC Policy Committee

12-20-82
Date

OEDC Program Manager

12/21/82
Date

Date finding response transmitted to Black & Veatch 12/22/82
Date

TVA 488 · DES-5-00

SHEET 1 OF 4

B&V Finding F712

F-712

COMPUTED WWW DATE 11-3-82

CHECKED LS DATE 11-5-82

3" ϕ CONDUIT 10' SPAN $R_{AXIAL} = 176.5^{\#}$

$R_{LATERAL} = 205.0^{\#}$

SECTION A-A $R_{VERTICAL} = 199.0^{\#}$

	HORIZ.	VERT
A	—	6'-8" (.67)
B	1'-1" (.11)	3'-8" (.37)

SECTION B-B

A	2'-0" (.20)	2'-1½" (.21)
B	3'-0" (.30)	2'-7" (.26)

1" ϕ CONDUIT 5' SPAN $R_{AXIAL} = 14.95^{\#}$

SECTION A-A $R_{LATERAL} = 14.0^{\#}$

C 6'-6" (1.3) $R_{VERTICAL} = 17.0^{\#}$

SECTION A-A

$F_{YA} = R_V(0) + R_A(.67)$

$= 176.5(.67)$

$F_{YA} = 118.26^{\#}$

$F_{XA} = R_L(0) + R_L(.67)$

$= 205.0(.67)$

$F_{XA} = 137.35^{\#}$

$F_{ZA} = R_L(0) + R_L(.67)$

$= 205.0(.67)$

$F_{ZA} = 137.35^{\#}$

$F_{YB} = R_V(.11) + R_A(.37)$

$= 199.0(.11) + 176.5(.37)$

$F_{YB} = 87.2^{\#}$

$F_{XB} = R_L(.11) + R_L(.37)$

$= 205.0(.11) + 205.0(.37)$

$F_{XB} = 98.4^{\#}$

$F_{ZB} = R_L(.11) + R_L(.37)$

$= 205.0(.11) + 205.0(.37)$

$F_{ZB} = 98.4^{\#}$

F-712

COMPUTED WWW DATE 11-3-82

CHECKED LS DATE 11-5-82

$F_{Y_C} = R_V(0) + R_A(1.3)$

$= 14.95(1.3)$

$F_{Y_C} = 19.44^{\#}$

$F_{X_C} = R_L(0) - R_L(1.3)$

$= 14.0(1.3)$

$F_{X_C} = 18.2^{\#}$

$F_{Z_C} = R_L(0) + R_L(1.3)$

$= 14.0(1.3)$

$F_{Z_C} = 18.2^{\#}$

SECTION B-B

$F_{Y_A} = R_V(.20) + R_A(.21)$

$= 199.0(.20) + 176.5(.21)$

$F_{Y_A} = 76.87^{\#}$

$F_{X_A} = R_L(.20) + R_L(.21)$

$= 205.0(.20) + 205.0(.21)$

$F_{X_A} = 84.05^{\#}$

$F_{Z_A} = R_L(.20) + R_L(.21)$

$= 205.0(.20) + 205.0(.21)$

$F_{Z_A} = 84.05^{\#}$

$F_{Y_B} = R_V(.30) + R_A(.26)$

$= 199.0(.30) + 176.5(.26)$

$F_{Y_B} = 105.59^{\#}$

$F_{X_B} = R_L(.30) + R_L(.21)$

$= 205.0(.30) + 205.0(.26)$

$F_{X_B} = 114.8^{\#}$

$F_{Z_B} = R_L(.30) + R_L(.26)$

$= 205.0(.30) + 205.0(.26)$

$F_{Z_B} = 114.8^{\#}$

SHEET 2 OF

F-7:2

COMPUTED W.W.W DATE 11-3-82

CHECKED LS DATE 11-5-82

SEC A-A

$F_f = 254^{\#}$

$F_s = 479^{\#}$

$m = \frac{PL}{8}$

$= \frac{254^{\#}(21^{"})}{8}$

$m = 666.75$ IN-LBS

SEC B-B

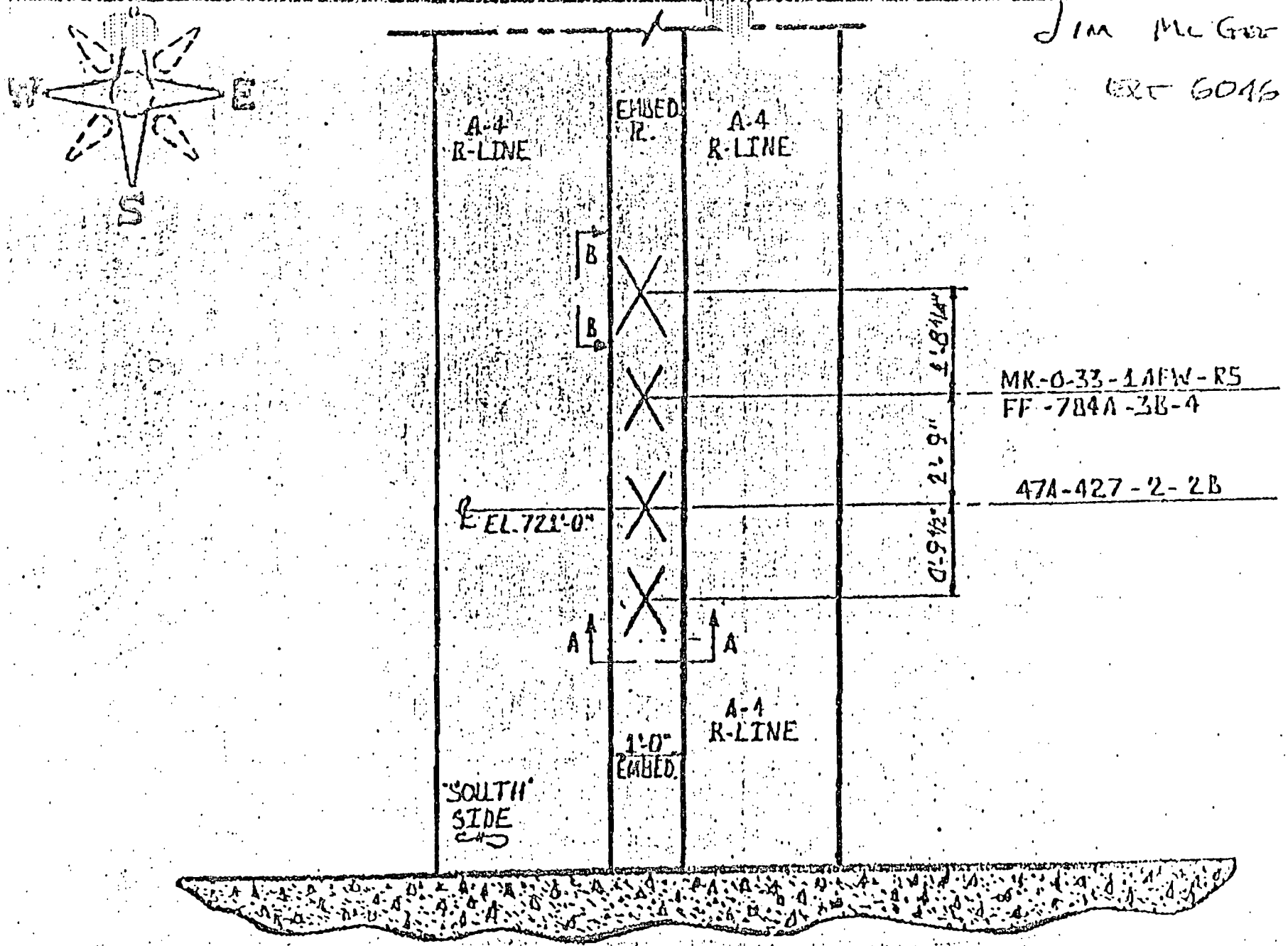
$F_f = 199^{\#}$

$F_s = 381^{\#}$

$m = PL$

$m = 381^{\#}(36^{"}) = 13.7^{K-IN}$

Jim McGee
ext 6016



ELEVATION-VIEW

F-712

COMPUTED WWW DATE 11-4-82

CHECKED LS DATE 11-5-82

47A427-2-28

F_T = 198.5 #
F_S = 115 #
m = 1.15 K-IN

} FROM WAYNE SMATHERS GROUP ON 11-3-82 BY BILL WILSON

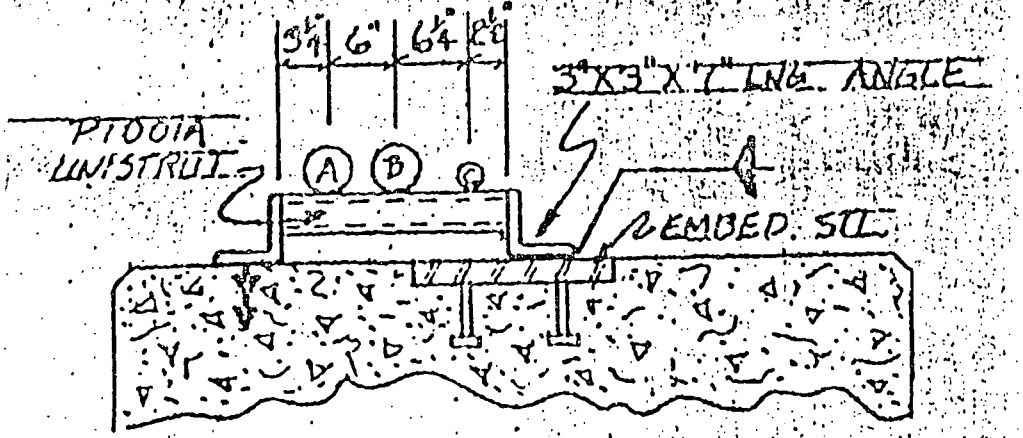
038-1AFW-R005

	F_T	F_S
JT. 1	-1.92 K	2.65 K
2	+3.23 K	2.55 K
3	+2.19 K	2.61 K

F_T = TENSION

F_S = SHEAR

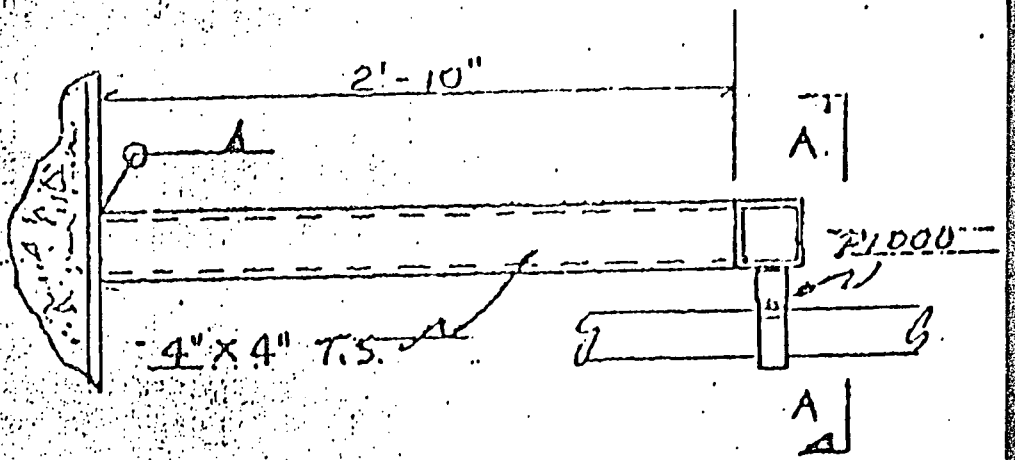
$m = m_{Y \text{ OR } Z}$



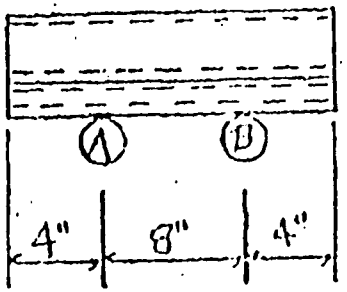
A - 3" Φ COND. 6'-8" VERTICAL L.F.
B - 3" Φ COND. 3'-8" V. 1'-1" H. L.F.
C - 1" Φ COND. 6'-6" VERTICAL L.F.

SECTION A-A

EXT 6045/0



DET. 1A



A - 3" Φ COND. 2'-1½" V. 2'-0" H. L.F.
B - 3" Φ COND. 2'-1" V. 3'-0" H. L.F.

SECTION B-B

SDE (3) HRS

SDD

ST

SHIP SAND METAL PAINT CARBOWELD II BY TVA

47W427-206R4

F-712

99

X

TYPE SR

3800

DESIGN LOAD 4600

ISO. 47W427-206-R.

JOINT: 99

DIRECTION: Y

TYPE: SR

+ 0

DESIGN LOAD:

3100

ISO. 47W427-206-R4

JOINT: 99

DIRECTION: Z

TYPE: SR

+ 3500

DESIGN LOAD:

3600

90M32102-1 (DUBLAS) REVISED PER ECN "INACTIVE CONTRACT"

INVOICE CODE

DESCRIPTION

12"x 3/4" EMB.C (EXIST.)

1'-4"

12" PIPE SIZE

TYP.

A

6 13/32

6 13/32

EL. 72[illegible]-9"

6 3/8

6 7/16

1/4

TYP B.E.

ANSI B 31.1

T. V. A. CLASS G

LOAD:

1/16" TYP.

MEB VERIFIED AS APPROVED

SECTION A-A

BEVEL TO OBTAIN 60°(MIN) INCLUDED ANGLE (TYP.)

ELEV. LOOKING EAST

1'-4"

1'-8"

A5

A4

LOCATION PLAN

DRAWD ISO #E-2880-IC-207-2

DRAVO CORPORATION P.O. # E-2879-

T.V.A. CONTRACT #74C38-83015

WATTS BAR NUCLEAR PLANT - UNIT #1

TVA 900 = VENDOR RC

BY CHK APP

DATE

REV CODE 5 5 5 RELEASED DATE 5-12-7[illegible]

BERGEN-PATERSON PIPESUPPORT C

PIPING SYSTEM AUX. FEEDWATER

DEP. DWGS PIPING 47W427-2-0 STRUCTURAL 48N1221-2-8

JOB NO. [illegible] PAD NO. 09

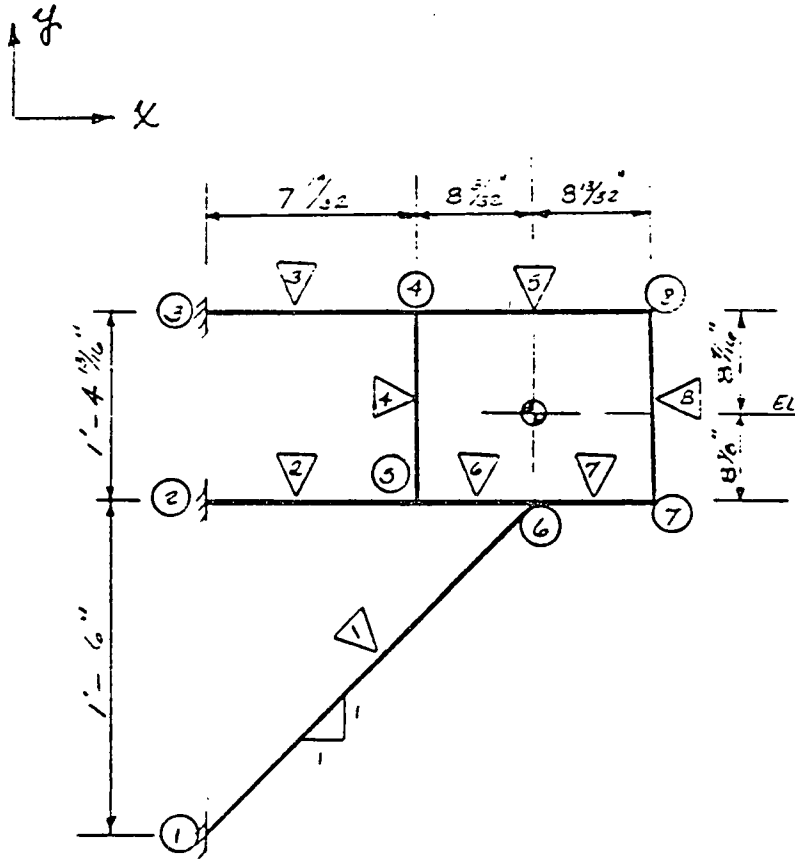
MARK # 038-1AFW-R005

SHEET 10

SHEET _____ OF _____

COMPUTED WWW DATE 11-3-05

Support # 03B-1AFW-R005 CHECKED JS DATE 11-4-05



○ J. No.

⌐ MEMBER.

ALL MEMB. W4 x 13

FORCES.

$F_y = -3100^{\#}$ (4) J. 6

$F_x = 3500^{\#}$ MEMB. 8

OR $F_x = -3600^{\#}$ MEMB. 4.

$F_z = 1900^{\#}$ MEMB. 4 & 8

OR $F_z = -2300^{\#}$ MEMB. 4 & 8

REACTIONS: BY SAGS PROGRAM (2005)

LOADING # 4 GOVERNS

```
00100 SUPPORT #03B-1AFW-R005
00110 ANALYSIS
00120 1,1
00130 MTABLE
00140 1,29.0E6,11E6,,.284
00150 SPTABLE
00160 1,-10,W4X13
00170 JOINTS
00180 1,0,0,0
00190 2,0,18,0
00200 3,0,34.81,0
00210 4,8.6,34.81,0
00220 5,8.6,18,0
00230 6,16,18,0
00240 7,23.41,18,0
00250 8,23.41,34.81,0
00260 RESTRAINTS
00270 1,7
00280 2
00290 3
00300 SPANS
00310 1,1,6,1,1
00320 2,2,5,1,1
00330 3,3,4,1,1
00340 4,4,5,1,1
00350 5,4,8,1,1
00360 6,5,6,1,1
00370 7,6,7,1,1
00380 8,7,8,1,1
00500 LOADING: Y=-3100  X=3500  Z=1900
00590 ACCELS
00700 0,-1,0
00710 FORCES
00720 6,2,-3100
00730 MIDSPAN
00740 8,1,1,3500,8.375
00750 4,1,3,1900,8.438
00760 8,1,3,1900,8.375
00770 LOADING: Y=-3100  X=-3600  Z=1900
00780 ACCELS
00790 0,-1,0
00800 FORCES
00810 6,2,-3100
00820 MIDSPAN
00830 4,1,1,-3600,8.438
00840 4,1,3,1900,8.438
00850 8,1,3,1900,8.375
00860 LOADING: Y=-3100  X=-3600  Z=-2300
00870 ACCELS
00880 0,-1,0
00890 FORCES
00900 6,2,-3100
00910 MIDSPAN
00920 4,1,1,-3600,8.438
00930 4,1,3,-2300,8.438
00940 8,1,3,-2300,8.375
00950 LOADING: Y=-3100  X=3500  Z=-2300
00960 ACCELS
00970 0,-1,0
00980 FORCES
00990 6,2,-3100
01000 MIDSPAN
01010 8,1,1,3500,8.375
01020 4,1,3,-2300,8.438
01030 8,1,3,-2300,8.375
```

S A G S

STATIC ANALYSIS OF GENERAL STRUCTURES

STRUCTURAL DYNAMICS RESEARCH CORPORATION

SUPPORT #03B-1AFW-R005

*** SPACE FRAME ANALYSIS ***

SPAN	LENGTH	FORE END JOINT	AFT END JOINT	MATERIAL CODE	SECTION CODE	ROTATION ANGLE	TEMP.
1	24.08	1	6	1	1		
2	8.60	2	5	1	1		
3	8.60	3	4	1	1		
4	16.81	4	5	1	1		
5	14.81	4	8	1	1		
6	7.40	5	6	1	1		
7	7.41	6	7	1	1		
8	16.81	7	8	1	1		

STRUCTURE WEIGHT/MASS = 1.134E+02

JOINT COORDINATES

JOINT	X	Y	Z
1	0.000	0.000	0.000
2	0.000	18.000	0.000
3	0.000	34.810	0.000
4	7[illegible].600	34.810	0.000
5	7[illegible].600	18.000	0.000
6	16.000	18.000	0.000
7	23.410	18.000	0.000
8	23.410	34.810	0.000

MATERIAL PROPERTIES

CODE	E	POISSON'S	DENSITY	THERMAL COEFFICIENT	YIELD
1	29.0E+06	.318	2.840E-01	0.	3.600E+04

SPECIAL CROSS SECTIONS

CODE	TYPE	P1	P2	P3	P4	P5	P6
1	STEEL SECT.	W4X13	AISC69				

CROSS-SECTION PROPERTIES

CODE	AREA	MOMENTS OF INERTIA Z	MOMENTS OF INERTIA Y	SHEAR RATIO Y	SHEAR RATIO Z	TORSION CONSTANT	WARPING CONSTANT	DEG. FIX.
1	3.82E+00	1.13E+01	3.76E+00	3.75	1.50	1.54E-01	1.37E+01	.60

STATIC ANALYSIS OF GENERAL STRUCTURES
SUPPORT #03B-1AFW-R005

STRESS RECOVERY VALUES

CODE	COMBINED STRESS	POINT 1/3 C(Y)	POINT 1/3 C(Z)	POINT 1/3 R(EFF)	POINT 2/4 C(Y)	POINT 2/4 C(Z)	POINT 2/4 R(EFF)
1	422	2.080	2.080	0.000	2.080	0.000	.648
		-2.080	0.000	.648			

SPECIFIED RESTRAINTS

JOINT	DIRECTION	VALUE
1	123456	
2	123456	
3	123456	

LOADING NO. 1: Y=-3100 X=3500 Z=1900

ACCELERATION LOADING
A(X) = 0. A(Y) = -1.000E+00 A(Z) = 0.

JOINT	APPLIED FORCES DIR	TYPE	VALUE	FINAL JOINT	INC.
6	Y	FORCE	-3.100E+03		

MID-SPAN FORCES

SPAN	DIR	COORDINATE	VALUE	DISTANCE	VALUE	DISTANCE
8	X	ABSOLUTE	3.50E+03	8.38E+00		
4	Z	ABSOLUTE	1.90E+03	8.44E+00		
8	Z	ABSOLUTE	1.90E+03	8.38E+00		

TOTAL APPLIED FORCES
F(X) = 3.500E+03 F(Y) = -3.213E+03 F(Z) = 3.800E+03

STATIC ANALYSIS OF GENERAL STRUCTURES
SUPPORT #03B-1AFW-R005

LOADING NO. 2: Y=-3100 X=-3600 Z=1900

ACCELERATION LOADING
A(X) = 0. A(Y) = -1.000E+00 A(Z) = 0.

JOINT	APPLIED FORCES DIR	TYPE	VALUE	FINAL JOINT	INC.
6	Y	FORCE	-3.100E+03		

SPAN	DIR	MID-SPAN FORCES COORDINATE	VALUE	DISTANCE	VALUE	DISTANCE
4	X	ABSOLUTE	-3.60E+03	8.44E+00		
4	Z	ABSOLUTE	1.90E+03	8.44E+00		
8	Z	ABSOLUTE	1.90E+03	8.38E+00		

TOTAL APPLIED FORCES
F(X) = -3.600E+03 F(Y) = -3.213E+03 F(Z) = 3.800E+03

LOADING NO. 3: Y=-3100 X=-3600 Z=-2300

ACCELERATION LOADING
A(X) = 0. A(Y) = -1.000E+00 A(Z) = 0.

JOINT	APPLIED FORCES DIR	TYPE	VALUE	FINAL JOINT	INC.
6	Y	FORCE	-3.100E+03		

SPAN	DIR	MID-SPAN FORCES COORDINATE	VALUE	DISTANCE	VALUE	DISTANCE
4	X	ABSOLUTE	-3.60E+03	8.44E+00		
4	Z	ABSOLUTE	-2.30E+03	8.44E+00		
8	Z	ABSOLUTE	-2.30E+03	8.38E+00		

TOTAL APPLIED FORCES
F(X) = -3.600E+03 F(Y) = -3.213E+03 F(Z) = -4.600E+03

STATIC ANALYSIS OF GENERAL STRUCTURES
SUPPORT #03B-1AFW-R005

LOADING NO. 4: Y=-3100 X=3500 Z=-2300

ACCELERATION LOADING
A(X) = 0. A(Y) = -1.000E+00 A(Z) = 0.

JOINT	APPLIED FORCES DIR	TYPE	VALUE	FINAL JOINT	INC.
6	Y	FORCE	-3.100E+03		

MID-SPAN FORCES

SPAN	DIR	COORDINATE	VALUE	DISTANCE	VALUE	DISTANCE
8	X	ABSOLUTE	3.50E+03	8.38E+00		
4	Z	ABSOLUTE	-2.30E+03	8.44E+00		
8	Z	ABSOLUTE	-2.30E+03	8.38E+00		

TOTAL APPLIED FORCES
F(X) = 3.500E+03 F(Y) = -3.213E+03 F(Z) = -4.600E+03

S A G S

STATIC ANALYSIS OF GENERAL STRUCTURES

STRUCTURAL DYNAMICS RESEARCH CORPORATION

SUPPORT #03B-1AFW-R005

*** LOADING NO. 1: Y=-3100 X=3500 Z=1900

JOINT DISPLACEMENTS

JOINT	X	Y	Z	THETA(X)	THETA(Y)	THETA(Z)
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	1.700E-04	-6.002E-04	8.175E-03	-1.911E-04	-1.577E-03	-3.603E-05
5	2.511E-04	-5.954E-04	7.716E-03	2.284E-04	-1.472E-03	-4.472E-05
6	4.858E-04	-1.299E-03	2.113E-02	1.606E-04	-2.035E-03	-6.606E-05
7	5.922E-04	-1.542E-03	3.781E-02	3.755E-04	-2.305E-03	-9.423E-05
8	4.252E-04	-1.470E-03	4.033E-02	-1.245E-04	-2.420E-03	6.032E-05

MAXIMUM DISPLACEMENTS

JOINT	7	7	8	7	8	7
VALUE	5.922E-04	-1.542E-03	4.033E-02	3.755E-04	-2.420E-03	-9.423E-05

JOINT REACTIONS

JOINT	F(X)	F(Y)	F(Z)	M(X)	M(Y)	M(Z)
1	1.924E+03	2.291E+03	-2.948E+02	-7.369E+03	7.086E+03	1.843E+03
2	-3.234E+03	4.385E+02	-1.745E+03	-1.078E+03	2.617E+04	3.576E+03
3	-2.190E+03	4.838E+02	-1.760E+03	9.014E+02	2.756E+04	3.440E+03
TOTAL	-3.500E+03	3.213E+03	-3.800E+03	-7.545E+03	6.082E+04	8.859E+03

STATIC ANALYSIS OF GENERAL STRUCTURES
SUPPORT #03B-1AFW-R005

*** LOADING NO. 2: Y=-3100 X=-3600 Z=1900

JOINT DISPLACEMENTS

JOINT	X	Y	Z	THETA(X)	THETA(Y)	THETA(Z)
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	-1.093E-04	-4.657E-04	8.175E-03	-1.911E-04	-1.577E-03	-7.927E-05
5	-7.847E-06	-4.811E-04	7.716E-03	2.284E-04	-1.472E-03	1.601E-05
6	1.218E-04	-1.048E-03	2.113E-02	1.606E-04	-2.035E-03	-2.988E-05
7	1.119E-04	-1.200E-03	3.781E-02	3.755E-04	-2.305E-03	-7.260E-06
8	-8.938E-05	-1.201E-03	4.033E-02	-1.245E-04	-2.420E-03	-1.689E-05

MAXIMUM DISPLACEMENTS

JOINT	6	8	8	7	8	4
VALUE	1.218E-04	-1.201E-03	4.033E-02	3.755E-04	-2.420E-03	-7.927E-05

JOINT REACTIONS

JOINT	F(X)	F(Y)	F(Z)	M(X)	M(Y)	M(Z)
1	2.091E+03	2.478E+03	-2.948E+02	-7.369E+03	7.086E+03	1.345E+03
2	1.011E+02	5.965E+02	-1.745E+03	-1.078E+03	2.617E+04	1.941E+03
3	1.408E+03	1.390E+02	-1.760E+03	9.014E+02	2.756E+04	3.605E+03
TOTAL	3.600E+03	3.213E+03	-3.800E+03	-7.545E+03	6.082E+04	6.891E+03

STATIC ANALYSIS OF GENERAL STRUCTURES
SUPPORT #03B-1AFW-R005

*** LOADING NO. 3: Y=-3100 X=-3600 Z=-2300

JOINT DISPLACEMENTS

JOINT	X	Y	Z	THETA(X)	THETA(Y)	THETA(Z)
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	-1.093E-04	-4.657E-04	-9.897E-03	2.313E-04	1.909E-03	-7.927E-05
5	-7.847E-06	-4.811E-04	-9.340E-03	-2.765E-04	1.782E-03	1.601E-05
6	1.218E-04	-1.048E-03	-2.558E-02	-1.944E-04	2.464E-03	-2.988E-05
7	1.119E-04	-1.200E-03	-4.578E-02	-4.545E-04	2.791E-03	-7.260E-06
8	-8.938E-05	-1.201E-03	-4.882E-02	1.507E-04	2.929E-03	-1.689E-05

MAXIMUM DISPLACEMENTS

JOINT	6	8	8	7	8	4
VALUE	1.218E-04	-1.201E-03	-4.882E-02	-4.545E-04	2.929E-03	-7.927E-05

JOINT REACTIONS

JOINT	F(X)	F(Y)	F(Z)	M(X)	M(Y)	M(Z)
1	2.091E+03	2.478E+03	3.569E+02	8.920E+03	-8.578E+03	1.345E+03
2	1.011E+02	5.965E+02	2.113E+03	1.305E+03	-3.169E+04	1.941E+03
3	1.408E+03	1.390E+02	2.130E+03	-1.091E+03	-3.336E+04	3.605E+03
TOTAL	3.600E+03	3.213E+03	4.600E+03	9.134E+03	-7.362E+04	6.891E+03

STATIC ANALYSIS OF GENERAL STRUCTURES
SUPPORT #03B-1AFW-ROCE

*** LOADING NO. 4: Y=-3100 X=3500 Z=-2300

JOINT DISPLACEMENTS

JOINT	X	Y	Z	THETA(X)	THETA(Y)	THETA(Z)
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	1.700E-04	-6.002E-04	-9.897E-03	2.313E-04	1.909E-03	-3.603E-05
5	2.511E-04	-5.954E-04	-9.340E-03	-2.765E-04	1.782E-03	-4.472E-05
6	4.858E-04	-1.299E-03	-2.558E-02	-1.944E-04	2.464E-03	-6.606E-05
7	5.922E-04	-1.542E-03	-4.578E-02	-4.545E-04	2.791E-03	-9.423E-05
8	4.252E-04	-1.470E-03	-4.882E-02	1.507E-04	2.929E-03	6.032E-05

MAXIMUM DISPLACEMENTS

JOINT	7	7	8	7	8	7
VALUE	5.922E-04	-1.542E-03	-4.882E-02	-4.545E-04	2.929E-03	-9.423E-05

JOINT REACTIONS

JOINT	F(X)	F(Y)	F(Z)	M(X)	M(Y)	M(Z)
[illegible]						
[illegible]						
[illegible]						
TOTAL	-3.500E+03	3.213E+03	4.600E+03	9.134E+03	-7.362E+04	8.859E+03

This condition governs: therefore use this loading condition to analyse embedded #NR38W.

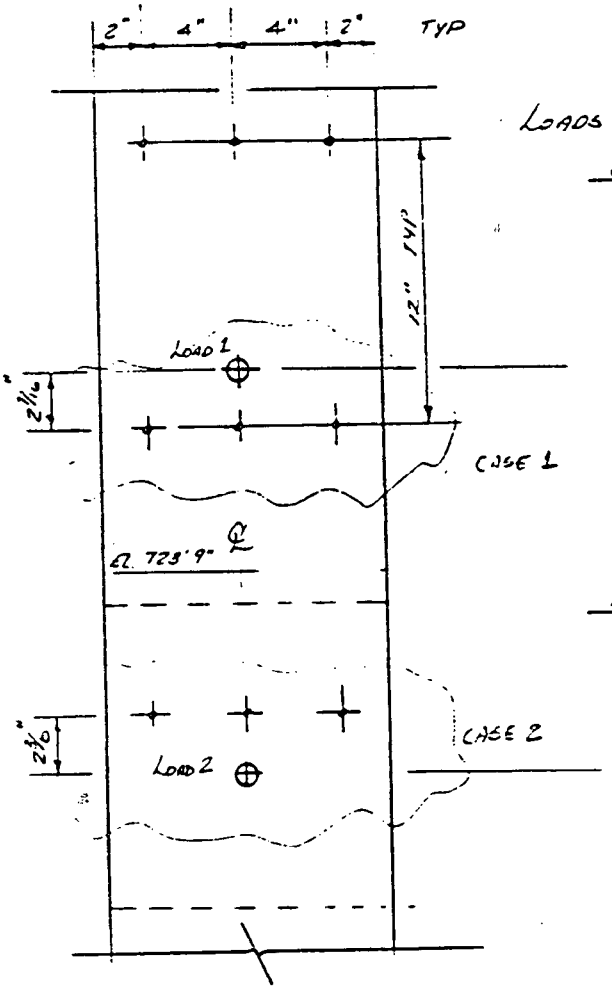
SHEET _____ OF _____

EMB PL MK 38W EL. 717'-0"

COMPUTED WWW DATE 11-3-82

SUPPORT # 038-1AFW-25 CHECKED LS DATE 11-4-82

MK38W ℄ 17'-6" X 1' X 3/4"
w/ 5/8" ϕ x 6 3/8" CONC. ANCHORS



LOADS TAKEN from SAG6 Program.

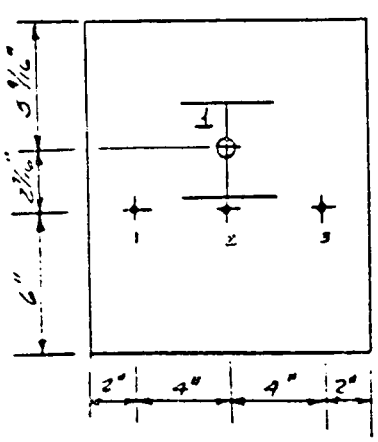
LOAD 1 (Jt. 3 from 038-1AFW-25)

$F_z = 2.2^K$ $M_x = -.29$ K-ft
$F_y = -.48^K$ $M_y = 2.78$ K-ft
$F_x = -2.13$ $M_z = 0.1$ K-ft

LOAD 2 Jt 2

$F_z = 3.23^K$ $M_x = -0.30$ K-ft
$F_y = -.44^K$ $M_y = 2.64$ K-ft
$F_x = -2.11^K$ $M_z = 0.11$ K-ft

RL



R1
- BAP222
"No Compression", 9
12, 14, 2
.307, 2, 6
.307, 6, 6
.307, 10, 6
1
2.2, 6, 3.44, 3.78, -.29

VA 11030 (WM-7-75)

```
LIST

 82/11/04. 15.11.35.
PROGRAM   MK38WB - ES

00100 "NU COMPRESSION".4
00110 12.14.3
00120 .307.2.8
00130 .307.6.8
00140 .307.10.8
00150 1
00160 3.23.6.5.625.2.64.-.3
READY.
```

```
15.12.29.
PROGRAM   OUT222

PLATE NUMBER= 1                          ANCHOR TYPE=NU COMPRESSION
WIDTH OF PLATE = 12 INCHES
LENGTH OF PLATE= 14 INCHES
MODULAR RATIO= 9

ANCHOR      AREA        X ORDINATE     Y ORDINATE
NUMBER      SQ IN       IN             IN
 1           .307        2              8
 2           .307        6              8
 3           .307        10             8

LOAD CONDITION NUMBER= 1
VERT LOAD= 3.23 KIPS     LOCATION  X= 6 INCHES     Y= 5.625 INCHES
APPLIED MOMENT ABOUT Y AXIS= 2.64 KIP FEET
APPLIED MOMENT ABOUT X AXIS=-.3 KIP FEET
TRANSLATED MOMENT  CENTERLINE ABOUT Y AXIS= 2.64 KIP FEET
TRANSLATED MOMENT  CENTERLINE ABOUT X AXIS= 7.01042E-2 KIP FEET

PARTIAL PRESSURE CASE

CONCRETE PRESSURE (KSI)
C2=-.12
C4=-.4

CONCRETE PRESSURE FORCE,CF=-3.03 KIPS
LOCATION IN X-DIRECTION= 11.4 INCHES
LOCATION IN Y-DIRECTION= 9.34 INCHES

FRICTION SHEAR CAPACITY,SF= 1.52 KIPS

PRESSURE BULB GEOMETRY
Z1= 2.34
Z2= 14
Z3= .68

ANCHOR      STRESS GROSS    LOAD
NUMBER      AREA (KSI)      KIPS
 1           13.02           4
 2           6.8             2.09
 3           .58             .18
```

6.27 K

$T_{max} = 4^K$ @ ANCH # 1

$T_{all} = \phi F_y A_{br} = .55(44)(.307)(2$
$= 7.43^K$

$T_{max} = 4^K < T_{all} = 7.43^K$ ∴ OK ANCH

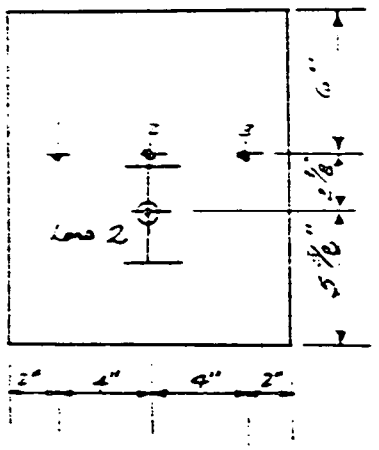
SHEET _____ OF _____

SUBJ. 7 WK 38W EL 717'-0"

COMPUTED WWW DATE 11-3-82

SUPPORT # GSB-1AFW-25 CHECKED WS DATE 11-4-82

EL



BAP222
"No Compression", 9
12, 14, 2
.307, 2, 8
.307, 6, 8
.307, 10, 8
1
3.23, 6, 5.625, 2.64, -.3

T_{MAX} @ ANCHOR # 1 $T_1 = 3.75^K$ $< T_{all} = 7.43^K$

∴ O.K

(DS-CL.1) $T_{all} = \phi f_y A_{sr} = .55(44)(.307)$
$= 7.43^K$

FOR Rs 1 & 2 TENSILE LOADS ARE SMALL ∴ # BENDING
O.K by INSPECTION

VA 11010 (WIA-1-75)

SHEET _____ OF _____

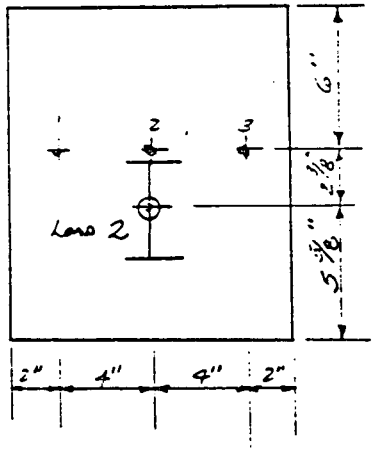
EMB. ₱ MK38W EL. 717'-0"

COMPUTED WWW DATE 11-3-

Supports # 03B-1AFW-R5

CHECKED LS DATE 11-4-

#2



BAP222
"No Compression", 9
12, 4, 2
.307, 2, 8
.307, 6, 8
.307, 10, 8
1
3.23, 6, 5.625, 2.64, -.3

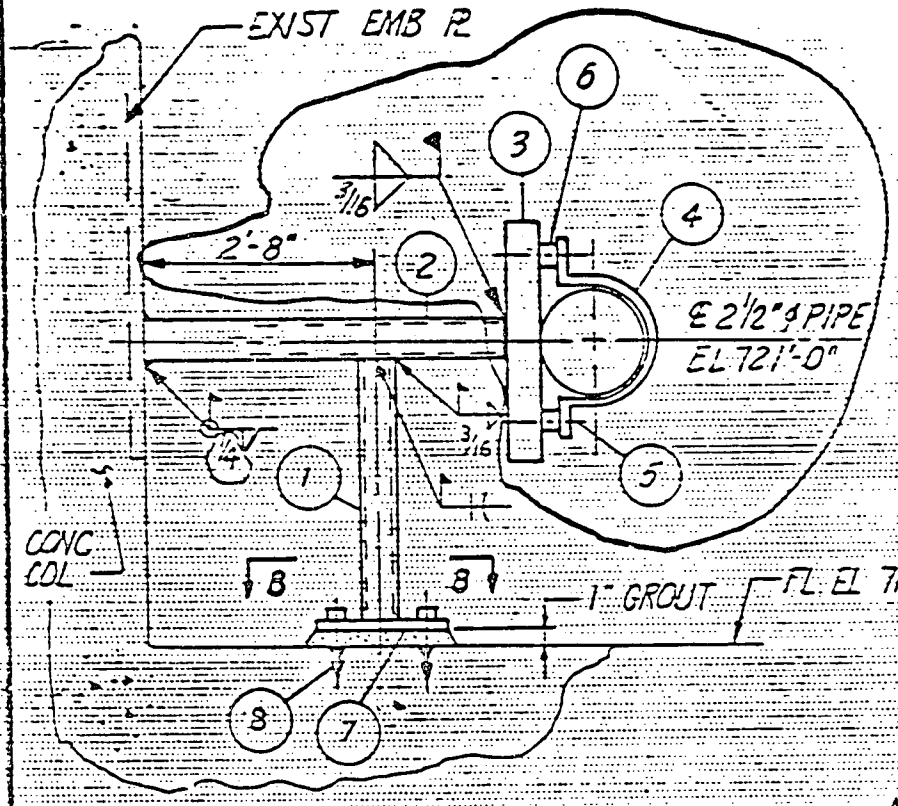
T_{MAX} @ ANCHOR # 1 $T_t = 3.75^K$ $< T_{all} = 7.43^K$

∴ O.K

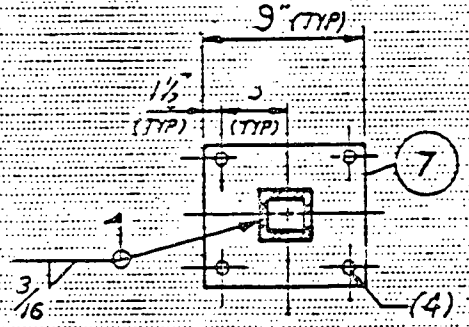
(DS-CL.1) $T_{ALL} = \phi f_y A_{sr} = .55(44)(.307)$
$= 7.43^K$

FOR ₱s 1 & 2 TENSILE LOADS ARE SMALL ∴ ₱ BENDING O.K by INSPECTION

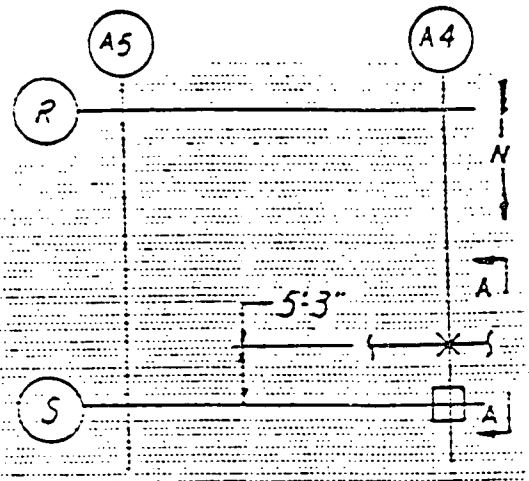
EVA 11030 (WM-7-75)



A-A



B-B



LOCATION PLAN
UNIT 1

F-712

NOTES:
1- FOR GENERAL NOTES SEE 47A427-1
2. S.S.E. DESIGN LOADS (ALT. ANAL)
R_H = 181 #
R_V = 366 #
F_c = 198.5 #
F_s = 115 #
m = 1.15 K-in

ITEM	QTY.	MAT'L DISCRIPTION FOR ONE SUPPORT
8	4	½" ϕ BOLT ANCHOR ASSEMBLY
7	1	PL ½" x 9" x 0'-9"
6	2	AMERICAN STANDARD WASHER
5	2	3/8" ϕ BOLTS W/NUTS
4	1	UNISTRUT P2558-25 PIPE STRAP
3	1	PL ½" x 4" x 0'-7" LG.
2	1	TS 3 x 3 x ¼ x LG AS REQ
1	1	TS 3 x 3 x ⅛ x LG AS REQ

SEISMIC CATEGORY I STRUCTURES

MECHANICAL
SEISMIC SUPPORT FOR AUX FEEDWATER PIPING
SUPPORT DETAIL 2-28

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

PLOTTED | RECOMMENDED | APPROVED

KNOXVILLE | 10-21-91 | RS M 47A427-2-28

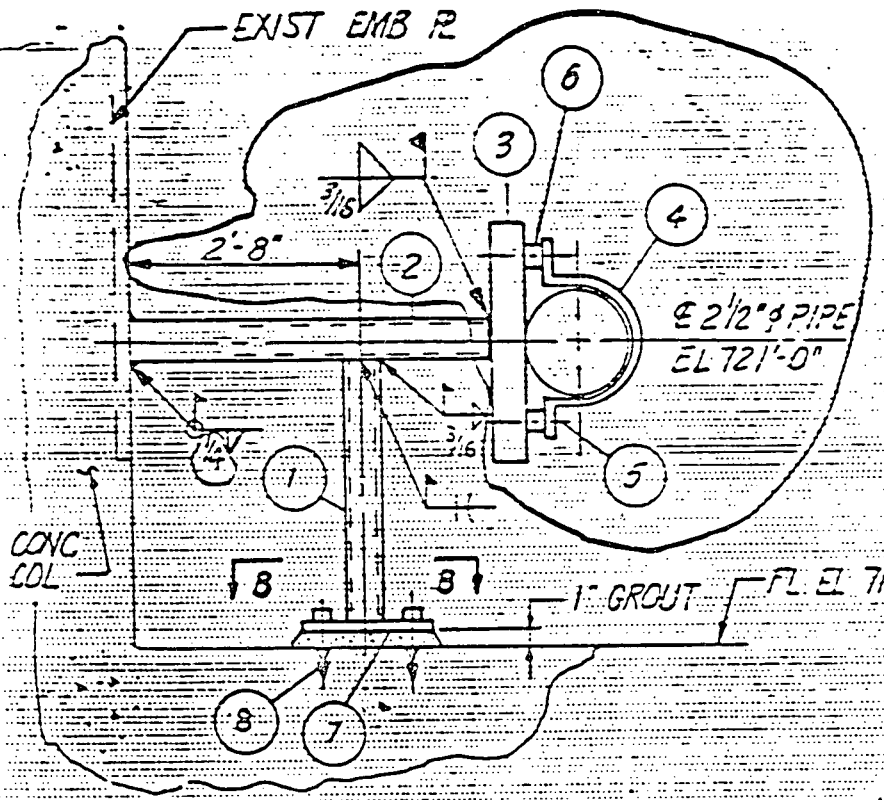
RECORD DRAWING AS CONSTRUCTED

REV NO	ECN NO.	DATE	DSGN	DRWN	CHKD	SUPV	ENGR	MGR	SUBM	RECM	APPD
1	S1		CKS	HWD	FCY	FCY	MS				

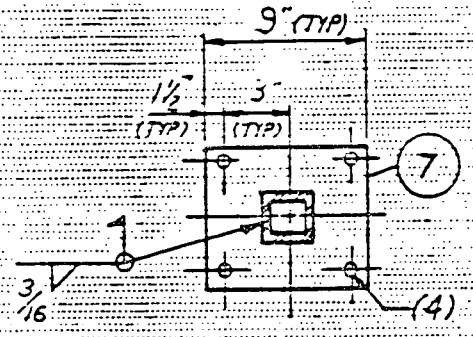
REV PER FCR H-8268.

DSGN M. Dale
DRWN L.A. HAMBY
CHKD D.K. ENDSLEY
SUPV L.M. CHAGEN
INSP
ENGINEER J. Kinsey

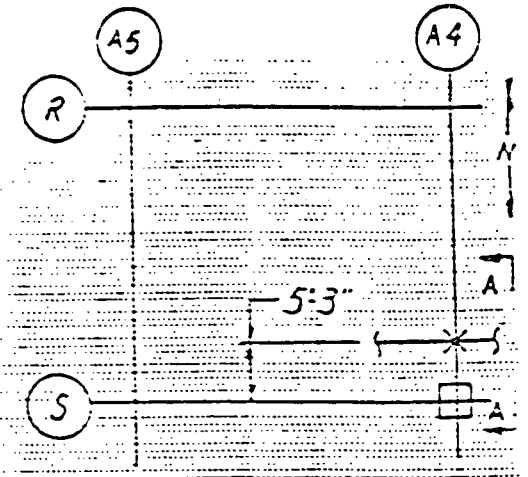
7100



A-A



B-B



LOCATION PLAN
UNIT 1

F-712

NOTES:
1- FOR GENERAL NOTES SEE 47A427-1
2. S.S.E. DESIGN LOADS (ALT. ANAL)
R_H = 181 #
R_V = 366 #
F_T = 198.5 #
F_S = 115 #
m = 1.15 K-IN

ITEM	QTY	MAT'L DISCRIPTION FOR ONE SUPPORT
8	4	½" ϕ BOLT ANCHOR ASSEMBLY
7	1	PL ½" x 9" x 0'-9"
6	2	AMERICAN STANDARD WASHER
5	2	3/8" ϕ BOLTS W/NUTS
4	1	UNISTRUT P2558-25 PIPE STRAP
3	1	PL ½" x 4" x 0'-7" LG.
2	1	TS 3 x 3 x ¼ x LG AS REQ
1	1	TS 3 x 3 x ¼ x LG AS REQ

REV NO.	ECN NO.	DATE	DSGN	DRWN	CHKD	QUPV	ENGR	MGR	SUPV	REC'D	APPD
1	S1		FXB	HWO	FCY	FCY	FHS				

REV PER FCR H-8268.

DSGN M. Dale
DRWN L. A. HAMEED
CHKD R. D. Freeman
SUPV L. M. CROSEN
INSP
ENGINEER J. Rusby

SEISMIC CATEGORY I STRUCTURES

MECHANICAL
SEISMIC SUPPORT FOR AUX FEEDWATER PIPING
SUPPORT DETAIL 2-28

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

APPROVED | RECOMMENDED | APPROVED

KNOXVILLE | 10-31-91 | RS M47A427-2-2

RECORD DRAWING AS CONSTRUCTED

SHEET 1 OF

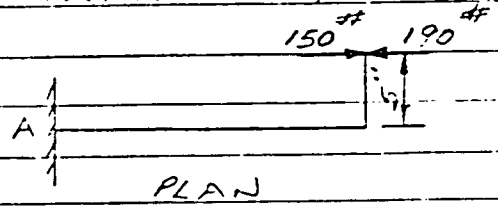
B&V Finding F 731R1

F 731R1

COMPUTED [illegible] DATE 11-30-82

CHECKED [illegible] DATE 12-1-82

I. 03B-1AFW-R127



PLAN

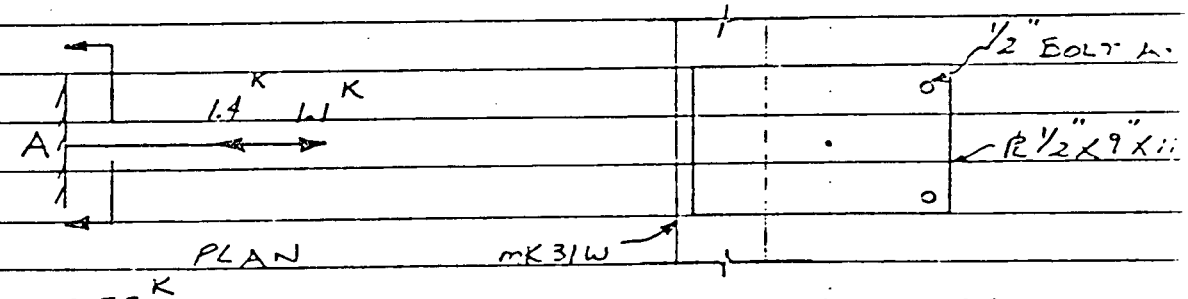
(1) $\Sigma m_A = 150^{\#}(5) = 0.75^{K\text{-}IN}$

$F_T = 0.15^{K}$

(2) $\Sigma m_A = 190^{\#}(5) = 0.95^{K\text{-}IN}$

$F_T = 0$

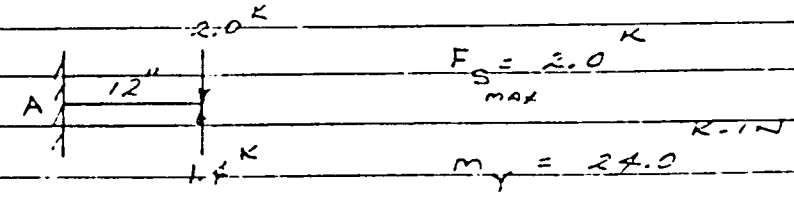
II. 03B-1AFW-R175



$F_T = 0.55^{K}$

$m = 0$

III. 03B-1AFW-R202



$F_{S_{MAX}} = 2.0^{K}$

$m_Y = 24.0^{K\text{-}IN}$

TVA 638 (MAR-0-1980)

SHEET 1 OF

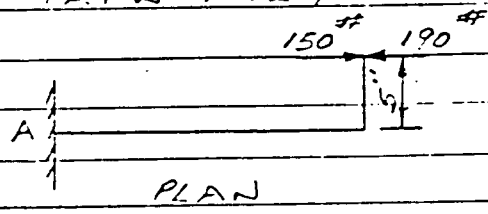
BFV Fdtn. F731N1

F 731R1

COMPUTED WWW DATE 11-30-82

CHECKED AC DATE 12-1-82

I. 03B-1AFW-R127



PLAN

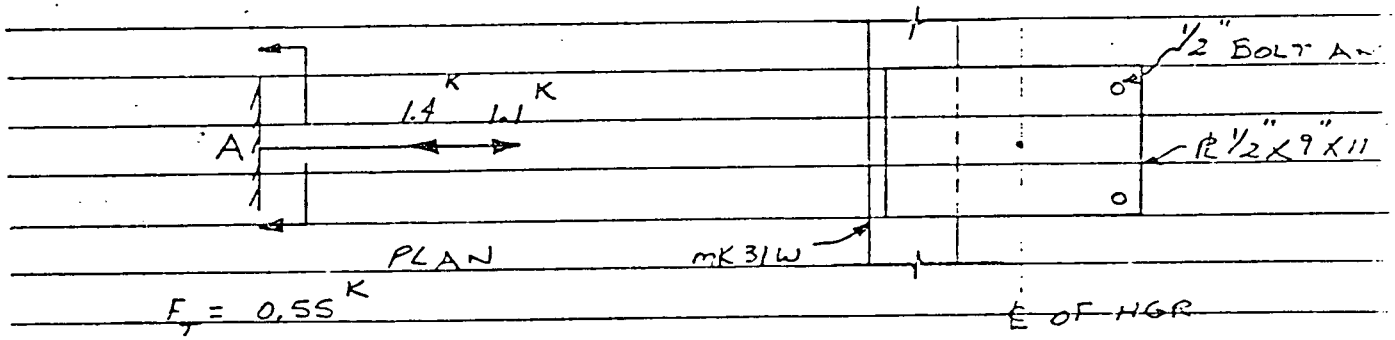
(1) $\Sigma m_A = 150^{\#}(5) = 0.75^{K\text{-}IN}$

$F_T = 0.15^{K}$

(2) $\Sigma m_A = 190^{\#}(5) = 0.95^{K\text{-}IN}$

$F_T = 0$

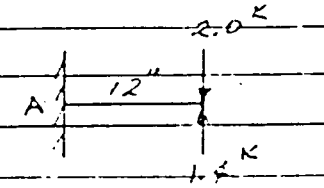
II. 03B-1AFW-R175



$F_y = 0.55^{K}$

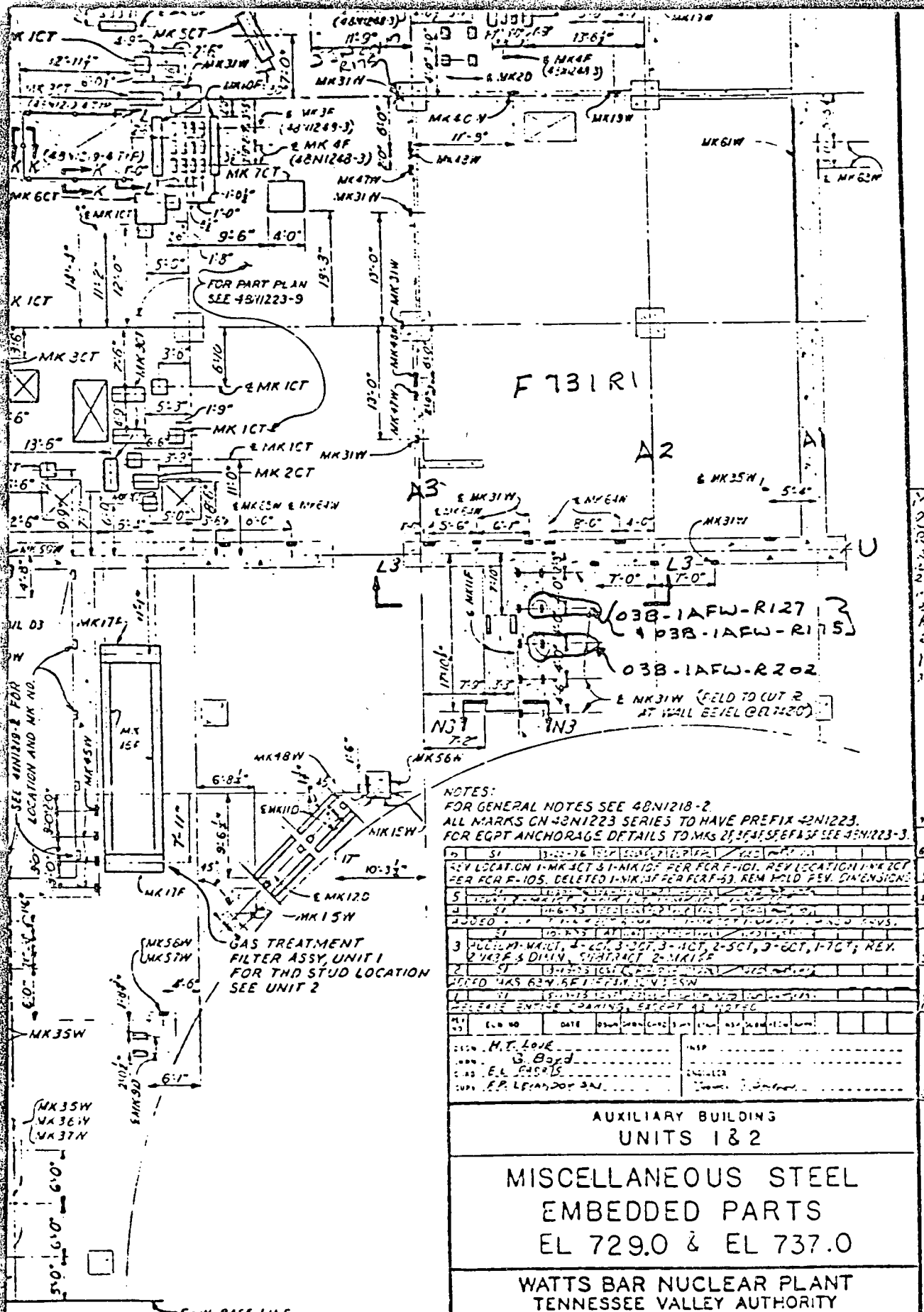
$m = 0$

III. 03B-1AFW-R202



$F_{S_{max}} = 2.0^{K}$

$m_y = 24.0^{K\text{-}IN}$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F 731 R1
A2
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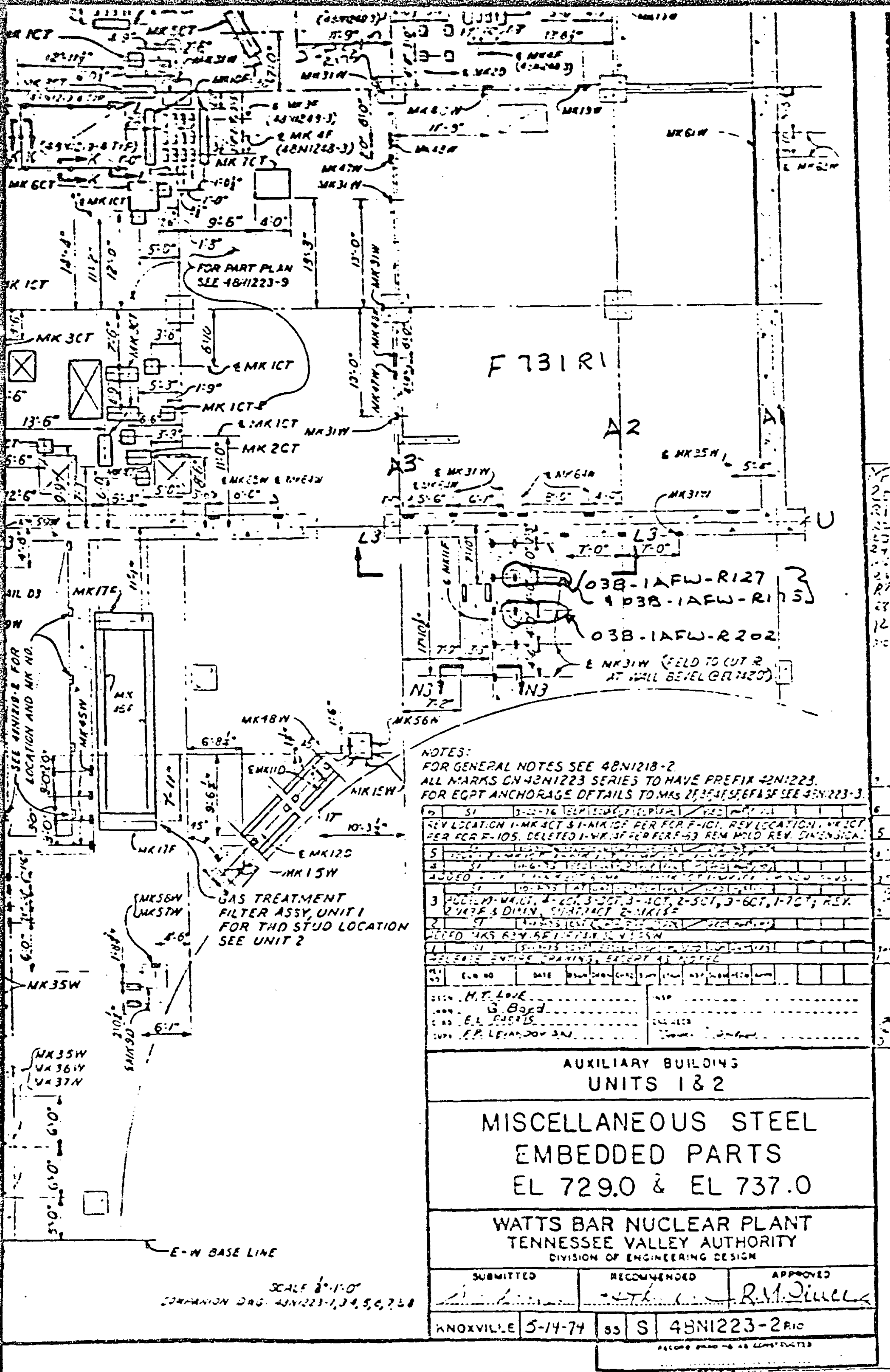
L3
N3
FOR PART PLAN SEE 48N1223-9
038-1AFW-R127
038-1AFW-R115
038-1AFW-R202
GAS TREATMENT FILTER ASSY, UNIT 1 FOR THD STUD LOCATION SEE UNIT 2
E-W BASE LINE
NOTES:
FOR GENERAL NOTES SEE 48N1218-2
ALL MARKS ON 48N1223 SERIES TO HAVE PREFIX 48N1223.
FOR EQPT ANCHORAGE DETAILS TO MKs 2F, 3F, 4F, 5F, 6F, & 3F SEE 48N1223-3.
AUXILIARY BUILDING
UNITS 1 & 2
MISCELLANEOUS STEEL
EMBEDDED PARTS
EL 729.0 & EL 737.0
WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN
SUBMITTED
RECOMMENDED
APPROVED
KNOXVILLE
5-14-74
65
S
48N1223-2 R10



F 731 R1
FOR PART PLAN SEE 48N1223-9
038-1AFW-R127
038-1AFW-R135
038-1AFW-R202
GAS TREATMENT FILTER ASSY, UNIT 1 FOR THD STUD LOCATION SEE UNIT 2
E-W BASE LINE
NOTES:
FOR GENERAL NOTES SEE 48N1218-2.
ALL MARKS ON 48N1223 SERIES TO HAVE PREFIX 48N1223.
FOR EQPT ANCHORAGE DETAILS TO MKS 2F,3F,4F,5F,6F & 8F SEE 48N1223-3.
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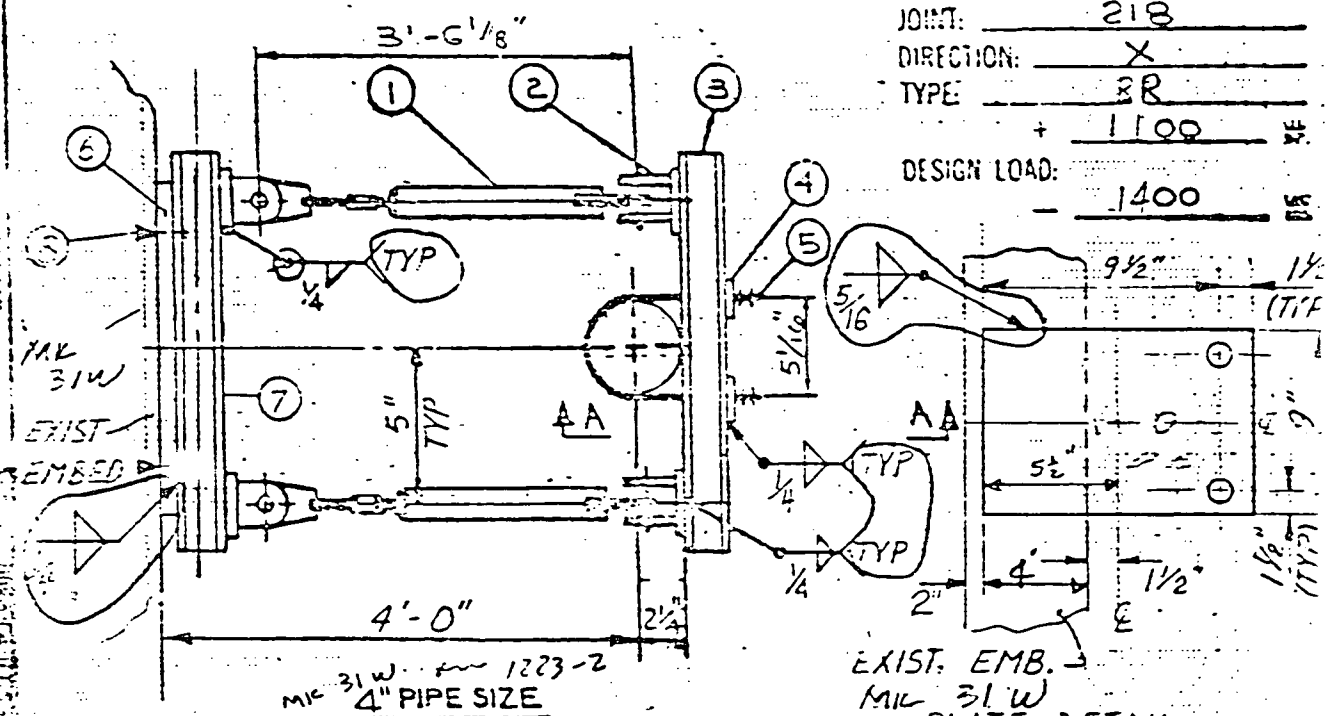
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN
SUBMITTED
RECOMMENDED
APPROVED
KNOXVILLE 5-14-74 35 S 48N1223-2 R10

ITEM	QTY	PART NO	SIZE	MATL			
1	2	[illegible]200	1.5 - 3'-6 1/8" - RSSA				
2		[illegible]1.5	END ATTACHMENT				
3	[illegible]	—	4 C5.4 X 1'-4" LG. 6-6.0 1 1/2" (A36)	SYTVA			
		[illegible]D	4 WASHER PLATE				
5	1	283A	4" ϕ PIPE SIZE U-BOLT D=9"				
6	1	—	9" x 1/2" PL x 11" LG. W/(2) 5/8" HOLES	SYTVA			
7	1	—	W4 x 13 x 1'-3 3/8" LG. (A36)	SYTVA			
SO	2	—	1/2" ϕ BOLT ANCHOR ASSEMBLY				
—	1	SDD					
—	1	[illegible]5	B 210-3 FOR STRUT ITEM #1 (PIN TO PIN)				
—	1	[illegible]ZDD					
—	[illegible]	[illegible]ST					

SEE TVA DWG NO 47A050-121A

ISO. 47W472-202-R4
JOINT: 218
DIRECTION: X
TYPE: 3R
+ 1100 LBS
DESIGN LOAD:
- 1400 LBS



MK 31W 4EN1223-2

4" PIPE SIZE

EL 737'-6"

PLAN

Bott of PL EL 754'-0"

Top of PL EL 754'-0"

NUCLEAR
T. V. A. CLASS B

EL. 747'-6"

SECT. A-A

F23: P1

REV PER ICR 11-1111

REV [illegible] PER ECN

BRAVO ISO E-2879-1C-10

BRAVO CORPORATION P.O. =E-2879-

T V A CONTRACT =74 C 38-83015

WATTS BAR NUCLEAR PLANT UNIT =1

BERGEN-PATERSON PIPESUPPORT CO.

PIPING SYSTEM: AUXILIARY FEEDWATER

REF. DWGS: PIPING 47W427-3-10 STRUCTURAL 48N1223-2-1[illegible]

JOB NO. 3605 MARK NO. 066

FILE NO. 038-1AFW-R175

DWG NO.

SHEET 1 of 1

[illegible] DRAWN [illegible] CHKD [illegible] DATE 10-31-77

ITEM	QUANTITY	SIZE	MATL
1	2200	1.5 - 3'-6 1/8" - RSSA	
2	2815	END ATTACHMENT	
3	—	4 C5.4 X1'-4" LG. 6-6 1/2" (A36)	BY TVA
4	9	4 WASHER PLATE	
5	1	283A 4" ϕ PIPE SIZE U-BOLT D=9"	
6	1	— 9" x 1/2" PL x 11" LG. W/(2) 5/8" HOLES	BY TVA
7	1	— W4 x 13 x 1'-3 3/8" LG. (A36)	BY TVA
8	2	— 1/2" ϕ BOLT ANCHOR ASSEMBLY	
—	1	SDD	
—	1	SB 3210-3 FOR STRUT ITEM #1 (PIN TO PIN)	
—	1	ZDD	
—	1	ST	

SEE TVA DWG NO 47A050-121A

ISO. 47W472-202-R-

JOINT: 218

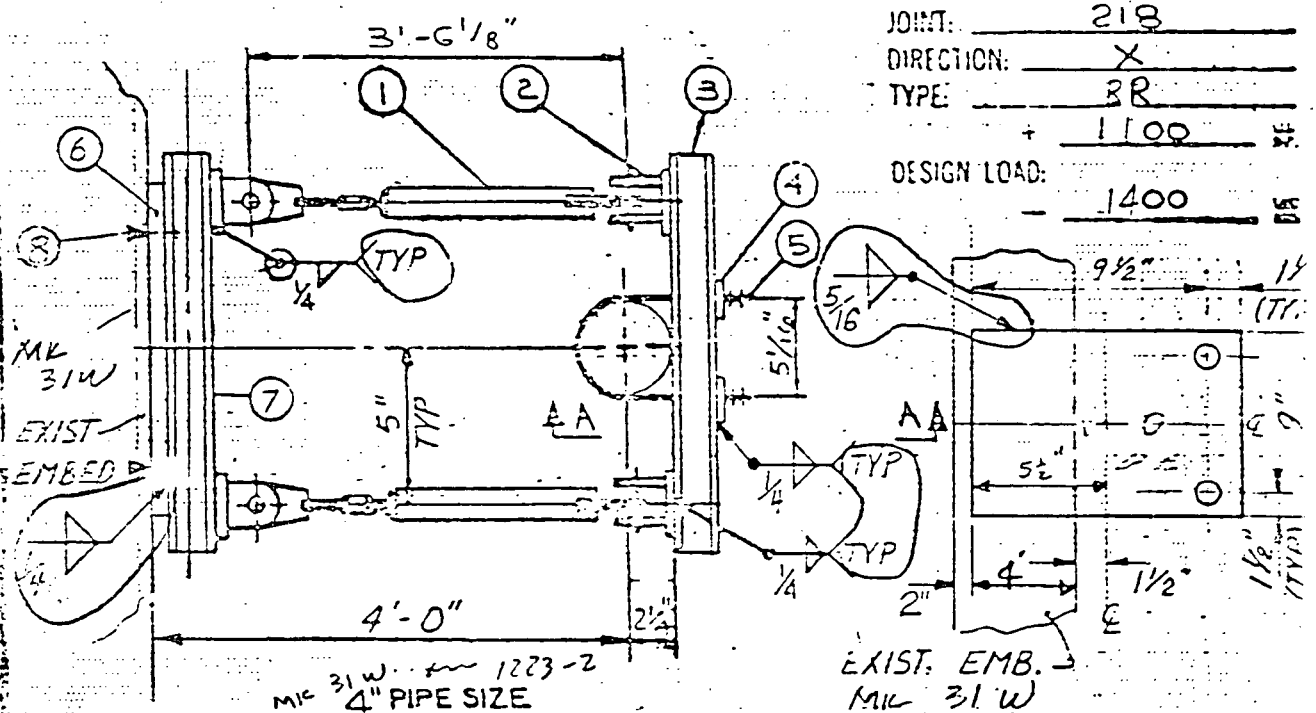
DIRECTION: X

TYPE: 3R

+ 1100 LBS.

DESIGN LOAD:

- 1400 LBS



MK 31W 4SN1223-2

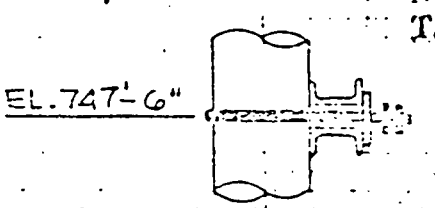
4" PIPE SIZE

PLAN

Bottom of PL EL 737'-0"

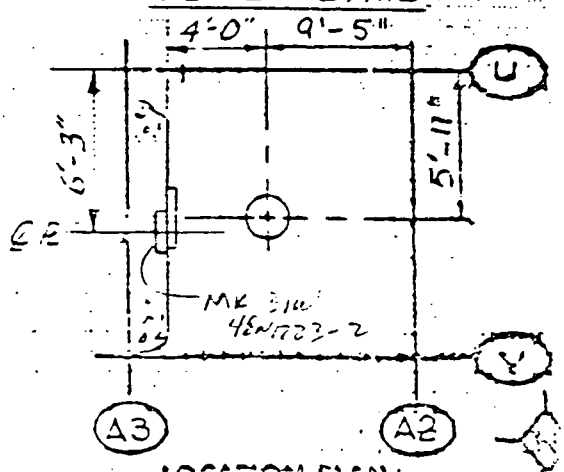
Top of PL EL 754'-0"

NUCLEAR
T. V. A. CLASS B



SECT. A-A

PLATE DETAIL



LOCATION PLAN

BRAVO ISO E-2879-1C-10

BRAVO CORPORATION P.O. =E-2879-

T V A CONTRACT =74 C 38-83015

WATTS BAR NUCLEAR PLANT UNIT =1

BERGEN-PATTERSON PIPESUPPORT CO.

PIPING SYSTEM AUXILIARY FEEDWATER

REF. DWGS. STRUCTURAL 47W427-3-10 48N1223-2-1

JOB NO. 3605 BERGEN-PATTERSON NO. 6GC

DESIGNED BY DSB-1AFW-R175 SHEET 1 OF 1

CHECKED BY

REVISED SUBMITTED DATE APPROVED

REV PER FCR 11-414

REV PER ECN

PEP ECN

FORM 2

WATTS BAR NUCLEAR PLANT
INDEPENDENT REVIEW

FINDING RESPONSE

Finding number IF1810101

Date finding received from Black & Veatch 12/8/82
Date

Comments pertinent to finding:

TVA agrees there is a nomenclature error. The finding is identical to F120 and should be combined with F120 for level 3 review and report considerations.

NCR SWPWBN8267 has been issued to cover the nomenclature error.

E Gray Beasley
Chairman, OEDC Policy Committee

12-20-82
Date

Henry L. Green
OEDC Program Manager

12/21/82
Date

Date finding response transmitted to Black & Veatch 12/22/82
Date

FORM 2

WATTS BAR NUCLEAR PLANT
INDEPENDENT REVIEW

FINDING RESPONSE

Finding number IF1810101

Date finding received from Black & Veatch 12/8/82
Date

Comments pertinent to finding:

TVA agrees there is a nomenclature error. The finding is identical to F120 and should be combined with F120 for level 3 review and report considerations.

NCR SWPWBN8267 has been issued to cover the nomenclature error.

E Gray Beasley
Chairman, OEDC Policy Committee

12-20-82
Date

Henry L. Green
OEDC Program Manager

12/21/82
Date

JES/L

Date finding response transmitted to Black & Veatch 12/22/82
Date

TVA 64 (09-9-65)

UNITED STATES GOVERNMENT

Memorandum

8211180160 (3)

TENNESSEE VALLEY AUTHORITY

CEB '82 1110 017

TO : Guenter Wadewitz, Project Manager, Watts Bar Nuclear Plant, CONST (3)

FROM : J. C. Standifer, Project Manager, Sequoyah/Watts Bar Design Projects, 204 GR-K

DATE : NOV 1 0 1982

SUBJECT: WATTS BAR NUCLEAR PLANT - INTERIM REQUIREMENTS FOR LOCATING ATTACHMENTS ON EMBEDDED PLATES - QUALITY INFORMATION

Scope

This memorandum gives interim requirements for locating attachments on embedded plates. The requirements are necessary to prevent recurrence of the problem identified in NCR WBNCEB8203. A project construction specification will be issued within 90 days.

Location of Attachments

The minimum edge distances given below shall be applied to the location of an attachment to an embedded plate unless a Division of Engineering Design (EN DES) approved drawing, which shows both the attachment and the plate edge, specifically calls for a closer edge distance. The minimum spacing given below shall be applied to the spacing between attachments on an embedded plate unless an EN DES drawing which shows both attachments specifically calls for a closer spacing. The minimum spacing between expansion anchors and attachments to embedded plates shall be in accordance with G-32. Attachment location tolerances shall not be used to reduce the minimum edge distances or spacing.

If conformance to the requirements for edge distance or the requirements for spacing between attachments on the embedded plate is impractical, a written request shall be submitted to EN DES. The request shall include the following:

1. The unique identification number for the embedded plate. For the initial request, the identification number shall be obtained from EN DES and shall be permanently affixed to the plate. (The written requests required by G-32 for expansion anchors spaced closer than the minimum to attachments on embedded plates do not require unique plate identification numbers).

2. A sketch showing the location on the embedded plate of new attachments which do not meet the edge distance requirements and of existing attachments which are spaced closer than the minimum to the new attachment. The sketch shall also show expansion anchors which are spaced closer to the new attachment than the minimum spacing given in G-32. The sketch shall include enough information for EN DES to determine the location and loading on each attachment.

Guenter Wadewitz

NOV [illegible] 1992

WATTS BAR NUCLEAR PLANT - INTERIM REQUIREMENTS FOR LOCATING ATTACHMENTS ON EMBEDDED PLATES - QUALITY INFORMATION

Some specific sizes and types of attachments may be exempted by EN DES from the requirements of this memorandum. Those attachments do not require review of location by EN DES and need not be shown on sketches submitted to EN DES.

Edge Distance

In general, the minimum clear distance between an attachment and the long edge of a rectangular plate or the edge of a square plate shall be 2 inches. The minimum clear distance between an attachment and the short edge of a rectangular plate shall be 6 inches. For a specific plate, the minimum clear distance may be reduced to the distance from the plate edge to the centerline of the row of studs parallel to the edge (see figure 1).

Spacing

In general, the clear distance between attachments to embedded plates shall be deter[illegible]ed from two measurements. Each measurement shall be taken parallel to a plate edge as shown in figure 1.

The minimum clear distance in at least one direction parallel to a plate edge shall be 24 inches. For a specific plate, the minimum clear distance may be reduced to two times the spacing of the stud rows which are perpendicular to the direction of measurement (see figure 1).

Prepared By: Mavis A. Cones

Independent Review By: Larry D. Ketchem

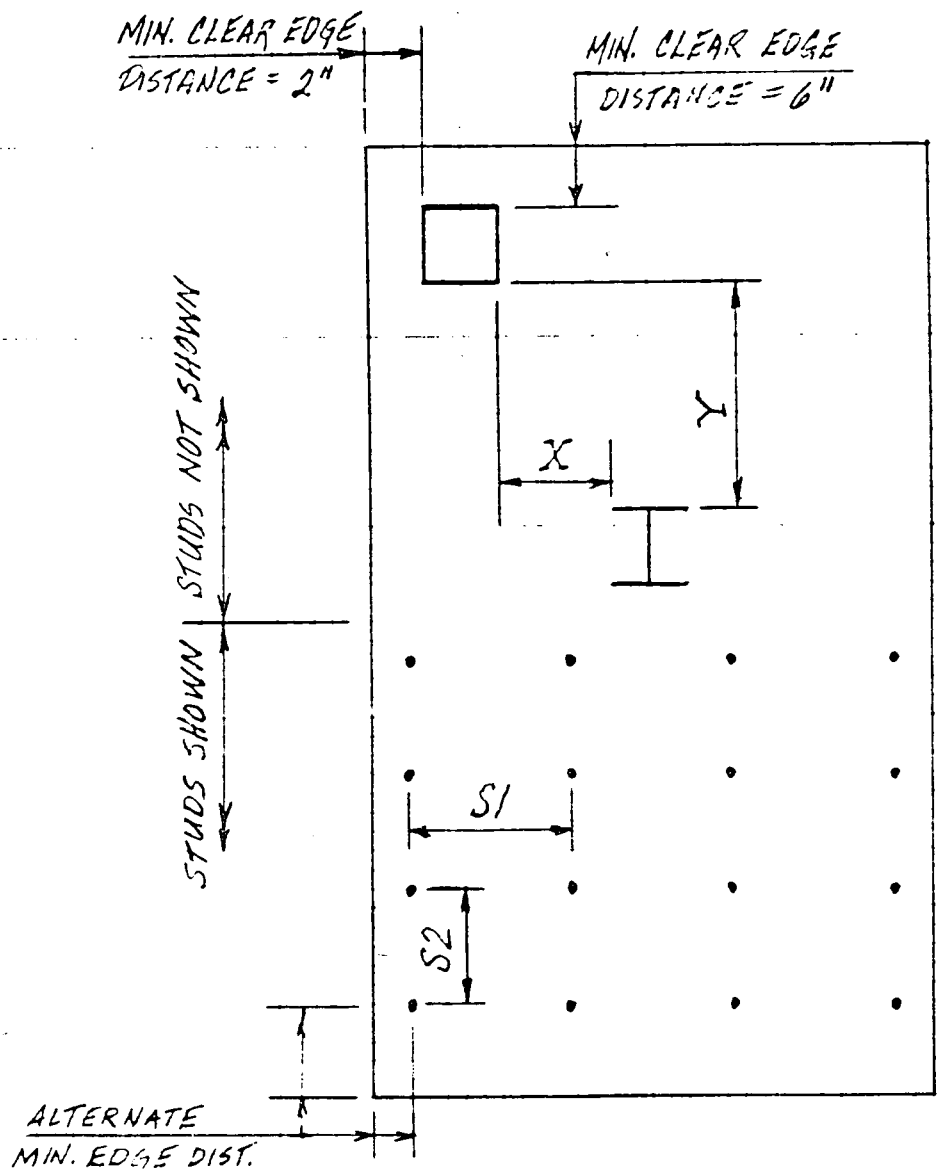
J. C. Standifer

EHC JWR RHA AJ

ROB:MAC:CFM
Attachment
cc (Attachment):
R. O. Barnett, W9D224 C-K (2)
R. A. Costner, W11C126 C-K
MEDS, W5B63 C-K
R. M. Pierce, 104 ESTA-K
L. J. Cooney, W6D224 C-K*
H. H. Mull, E7B24 C-K
M. N. Sprouse, W11A9 C-K

042306.01

*The information in this memorandum will be incorporated in Watts Bar Construction Specification N3C-928.



GENERAL REQUIREMENTS FOR SPACING

SPACING BETWEEN ATTACHMENTS IS ACCEPTABLE IF EITHER X OR Y IS GREATER THAN OR EQUAL TO 24".

ALTERNATE REQUIREMENTS FOR SPACING

SPACING BETWEEN ATTACHMENTS IS ACCEPTABLE IF EITHER X OR Y IS GREATER THAN 2 TIMES S1 OR 2 TIMES S2, RESPECTIVELY.

FIGURE 1

TVA 84 (08-8-83) 83 1021 20020

UNITED STATES GOVERNMENT

Memorandum

WBN '83 1019 009

TENNESSEE VALLEY AUTHORITY

L 54831020 232

TO : J. C. Standifer, Project Manager, Watts Bar Design Project, 204 GB-K (3)

FROM : Guenter Wadewitz, Project Manager, Watts Bar Nuclear Plant CONST

DATE : OCT 19 1983

SUBJECT: WATTS BAR NUCLEAR PLANT - CONSTRUCTION SPECIFICATION N3C-928 FOR LOCATING ATTACHMENTS ON EMBEDDED PLATES

Power Plt Supt
Watts Bar Nuclear Plant
OCT 2 '83

The subject construction specification was issued to implement part of the corrective action for nonconformance report (NCR) WBNCEB8265. It is constructions contention that 100 percent implementation of this construction specification was untimely and an over commitment by TVA. Its application to unit 1 has been a costly and [illegible] endeavor but its application to unit 2, at this time, is a gross misdirection of quality intent.

The appropriateness of the application of this specification has been a topic of continual discussion between EN DES and [illegible]. At the inception of N3C-928 in late 1982, CONST identified to EN DES that this number of supports installed in unit 2 was vastly lower than the number installed in unit 1. The likelihood of plate overloads was, therefore, radically reduced for unit 2. In a meeting between EN DES and CONST held in Knoxville on July 28, 1983, CONST again requested EN DES to re-evaluate their needs for the applicability of this specification (reference [illegible] 453). EN DES agreed to research the feasibility of this approach at that time but, as yet, no results.

Since July 28, 1983, CONST has conducted several discipline work studies concerned with productivity. These studies have all identified the implementation of the requirements of N3C-928 as being extremely engineering intensive and, as a result, a barrier to higher productivity. In addition, these studies have researched the contribution that this work effort is making to assuring the quality and maintenance of support integrity. To date, October 14, 1983, EN DES has evaluated 165 CONST field change requests (FCRs) generated as the implementing devices of N3C-928. Of these 165 FCRs, 130 have been approved, 31 have been rejected due to drawing errors, and 4 have been rejected due to structural inadequacies. The 4 rejections due to structural deficiencies represent a 2.4 percent failure rate. This rate is well below the acceptable failure rate of 5 percent for bolt anchors as documented by the field investigation to resolve IEB 79-02. The rejections due to drawing discrepancies on field submitted sketches are understandable when considering many of these sketches take 4 or more hours to complete under adverse field conditions.

CONST recommends the voiding of N3C-928 with the use of the data presently gathered as a sample to substantiate a confidence level that overloaded embedded plates do not constitute a safety related risk for units 1 and 2.

J. C. Standifer, Project Manager, Watts Bar Design Project, 204 GB-K (3)

OCT 19 1983

WATTS BAR NUCLEAR PLANT - CONSTRUCTION SPECIFICATION N3C-928 FOR LOCATING ATTACHMENTS ON EMBEDDED PLATES

If EN DES does not concur with this recommendation, an alternative would be cessation of the application of N3C-928 at this time with the substitution of another sample at a later date.

The adoption of either suggestion would not compromise the quality of support installations but will greatly enhance productivity while reducing both CONST and EN DES engineering costs. Your immediate attention and response to this matter are required if productivity and schedule achievement are to be enhanced in the field of support installation.

Guenter Wadewitz

TRB:GLT

cc: C. Bonine, Jr., E7B24 C-K
W. T. Cottle, NUC PR-WBN
H. J. Fischer, CEO-WBN CONST
R. M. Pierce, 104 ESTA-K
MEDS, W5B63 C-K

Principally prepared by: Tom R. Brown, extension 433.