SUMMARY REPORT
FOR PACIFIC AIR PRODUCTS COMPANY
SOLENOID MOUNTING PLATES

GRAND GULF NUCLEAR POWER STATION
UNITS 1 & 2

SUMMARY REPORT FOR PACIFIC AIR PRODUCTS COMPANY

SOLENOID MOUNTING PLATES

GRAND GULF NUCLEAR POWER STATION-UNITS #1 AND #2

Prepared by : [signature] Date: 3/10/82

Independent Review by: Stephen A. Descoteaux Date: 3/10/82

Approved by : Richard E. Green Date: 3/10/82

INTERNATIONAL ENERGY ENGINEERING, INC.
77 North Washington Street
Boston, Massachusetts 02114

Revision 0
March 10, 1982

SUMMARY REPORT FOR PACIFIC AIR PRODUCTS COMPANY

SOLENOID MOUNTING PLATES

TABLE OF CONTENTS

Revision 0
March 10, 1982

1.0 CERTIFICATION

This report was prepared for Bechtel Power Corporation by International Energy Engineering in accordance with Specification 9645-M-617.1. The report is part of the seismic qualification of the Pacific Air Products Company automatic damper solenoid mounting plates for the Grand Gulf Nuclear Power Station, Units 1 and 2.

Certified by:

Richard E. Green

Richard E. Green, Professional Engineer
Maine No. 4104

Revision 0
March 10, 1982

2.0 INTRODUCTION

This report is in response to NRC inquiries concerning the solenoid valve mounting plates supplied by Pacific Air Products Company under Bechtel's Grand Gulf Specification 9645-M-617.1. These plates are associated with the automatic dampers having the following MPL numbers:

Q1Z77F001A	Q2Z77F001A
Q1Z77F001B	Q2Z77F001B
Q1Z77F002A	Q2Z77F002A
Q1Z77F002B	Q2Z77F002B
Q1Z77F003A	Q2Z77F003A
Q1Z77F003B	Q2Z77F003B
Q1Z77F035A	Q2Z77F035A
Q1Z77F035B	Q2Z77F035B

During its Seismic Qualification Review Team (SQRT) walkdown, the NRC indicated that, "An unacceptable mounting of the solenoid valve was noted during the field inspection. The valve was mounted on a rather flexible mounting plate such that impacting could occur between the plate and a heavy air cylinder behind it . . . Impact loading could result in seismic loads well in excess of that for which the equipment is qualified."

Bechtel agreed to eliminate the impacting situation by modifying the mounting plate. International Energy Engineering (IEE) was retained to design and analyze the modifications, thereby eliminating the potential impacting.

3.0 DESCRIPTION

There are sixteen mounting plates, supplied by Pacific Air Products Company, located at Elevation 111'-0" and Elevation 133'-0" of the Grand Gulf Control Building.

The plates are 15" x 20.5" x 10 gage sheet steel, weighing approximately 12.0 pounds. Supported on this plate are a solenoid valve weighing approximately 3.0 pounds, supplied by ASCO; two limit switches weighing approximately 4.5 pounds each, supplied by NAMCO, and a Sun junction box weighing approximately 9.5 pounds. The valve, limit switches, and junction box are attached to the mounting plate through use of metal fasteners.

The mounting plate is bolted directly into the hub of the heavy air cylinder which is located behind the plate. In addition, restraint has been provided in the vicinity of the junction box through use of structural members.

Although the mounting and support arrangements vary from plate to plate, the general configuration of the units is illustrated by Figure 1.

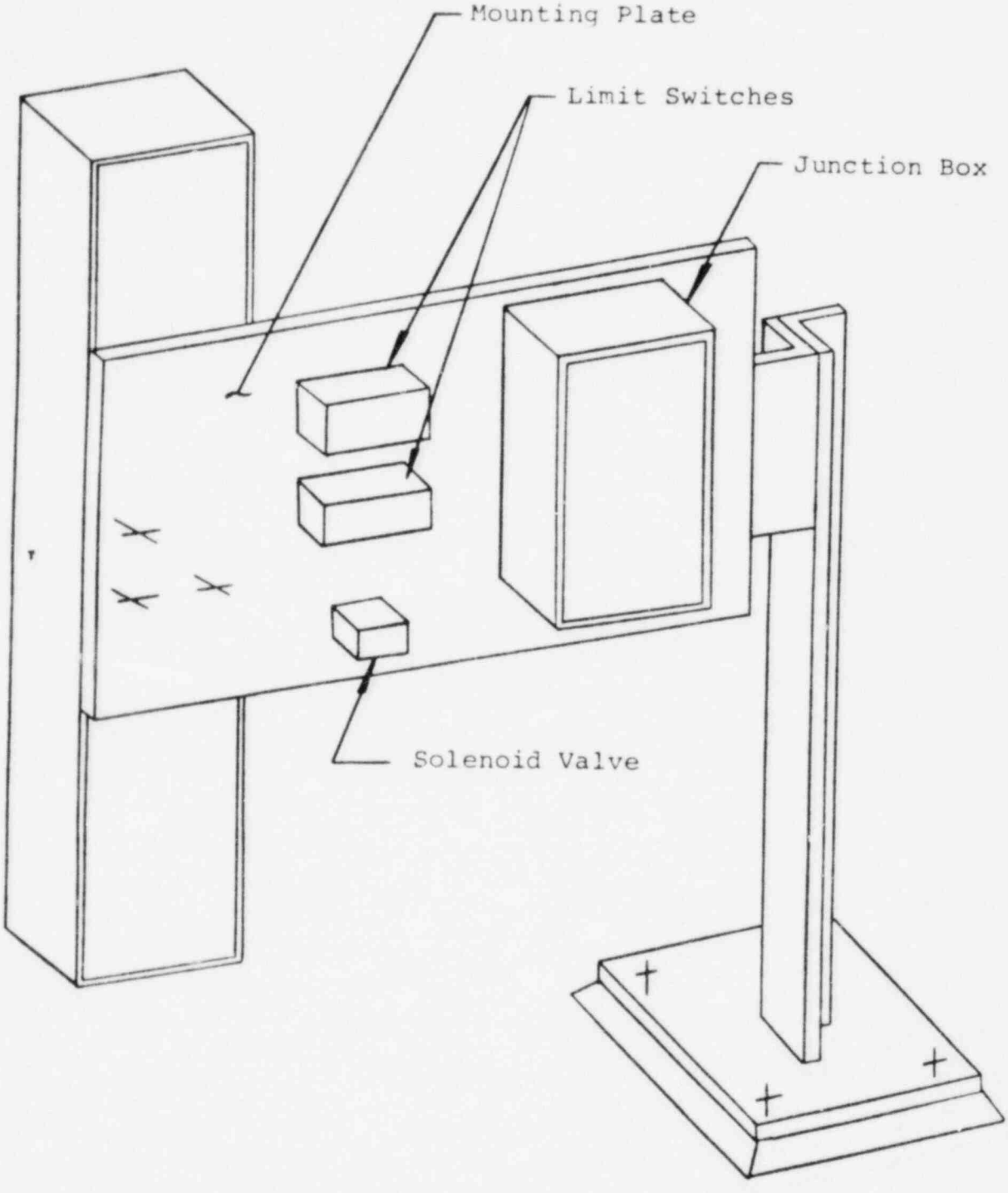

Figure 1 - General Configuration, Solenoid Valve Mounting Plate

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4.0 DESIGN CRITERIA

4.1 Deflection

For this analysis, deflection was limited to 0.0625 inches (1/16"). Field inspections indicated that 1/16" of clearance would be necessary to ensure that no impacting could occur between the mounting plate and the heavy air cylinder behind it.

4.2 Stress

Evaluation of structural steel members and plates was in accordance with the AISC Specification, Seventh Edition. However, no increase in allowable stresses was used for earthquake loading. A value of 36 ksi was used as the yield stress for all structural steel.

Allowable weld stress for fillet welds was taken as 0.30 times the yield stress of the base metal. Bolts equal to or greater than 1/2 inch in diameter were evaluated in accordance with the AISC Specification, Seventh Edition. Smaller bolts utilize the same procedure except that allowable stresses were taken from Marks Handbook, Eight Edition. Bechtel Specification 9645-C-103.1, Rev. 8 was used for the design of Hilti anchor bolts.

4.3 Seismic

Seismic criteria was dictated by Section 6.10.2 of Bechtel Specification 9645-M-617.1, which notes that seismic qualification may be in accordance

with Appendix S (Bechtel Specification 9645-C-196.0). Seismic qualification conformed to Sections 4.1.1,2 of Specification 9645-C-196.0.

For rigid equipment (natural frequency > 33 cps), the equipment was analyzed statically, and the seismic forces on equipment components were obtained by multiplying the mass and the appropriate acceleration.

For flexible equipment (natural frequency < 33 cps), the equipment was analyzed dynamically by using the response spectra modal analysis technique.

5.0 LOADING CONDITIONS

For the analysis, the mounting plates were simultaneously subjected to two types of loads:

1.) Deadweight

2.) Maximum seismic loads in three directions were taken from the Safe Shutdown Earthquake (SSE) response spectra curves for the Control Building at Elevation 133'-0".

For rigid plates, the loads were based upon acceleration values corresponding to Zero Period Acceleration. For flexible plates, the loads were based upon acceleration values determined in accordance with the response spectra modal analysis tehcnique.

Maximum stresses and deflections for the worst loading cases were determined by combining deadweight and seismic loads.

6.0 MATHEMATICAL MODEL

The typical actuator damper solenoid configuration consists of a 15" x 20.5" x 10 gage sheet steel plate upon which is mounted a solenoid valve, two limit switches, and a junction box. The mounting plate is attached to a support structure which generally is located at the junction box end of the plate, and then extends to an existing HVAC duct support or to the floor. Since the support structures must be removable, a two-bolt (1/2" diameter A307 bolts) connection is provided at adjoining plate sections and/or angle sections for each structure. In addition, the solenoid plate is bolted to a heavy air cylinder with (3) 1/2" diameter bolts.

The solenoid plate is represented by quadrilateral plate finite elements. The node and element numbers are consistent for all (16) problems. The node points corresponding to the locations of the three anchor bolts connecting the solenoid plate to the heavy air cylinder are considered fixed restraints (three translations and three rotations are fixed); this reflects the clamping action of the bolts.

The internal components of the solenoid valve, limit switches, and junction box are not included in this analysis. The mass and mass moments of inertia for each of these items are lumped at their centers of gravity and are connected to the solenoid plate by rigid elements at their bolted locations.

In general, the bracing supports for the solenoid plates are characterized by a structural element which is 1) welded to the junction box edge of the plates, and 2) bolted to adjoining plate sections. The structural element is either a plate or an angle section. The bolted

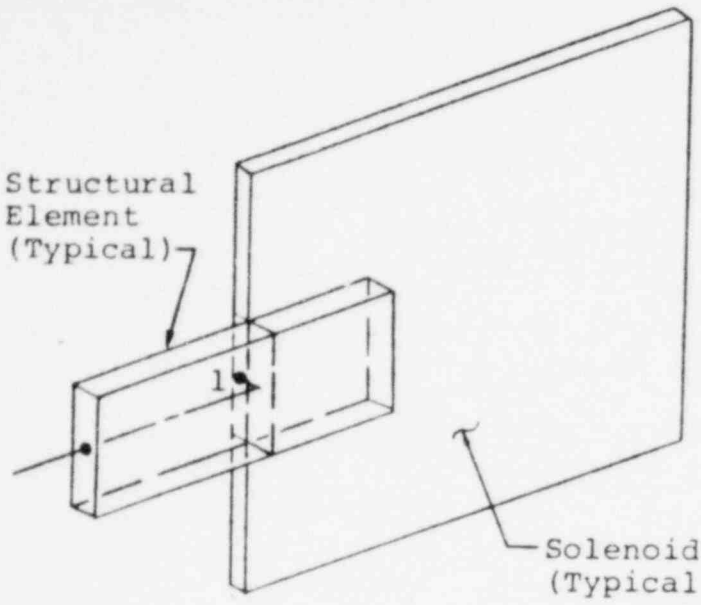
connection is through the outstanding legs of back to back angles or through a plate section and the outstanding leg of an angle section. Since the typical bolted connection consists of (2) bolts, the moment about the axis described by the line of bolts was considered free between the interconnecting elements. Therefore, three forces and two moments were transferred between interconnecting elements at the bolted locations.

The point of connection of the bracing support structure to the HVAC duct support member or to the floor was considered a fixed anchor point for analysis purposes. However, stiffener bars have been inserted on the HVAC duct support members at the point of connection with the solenoid plate support.

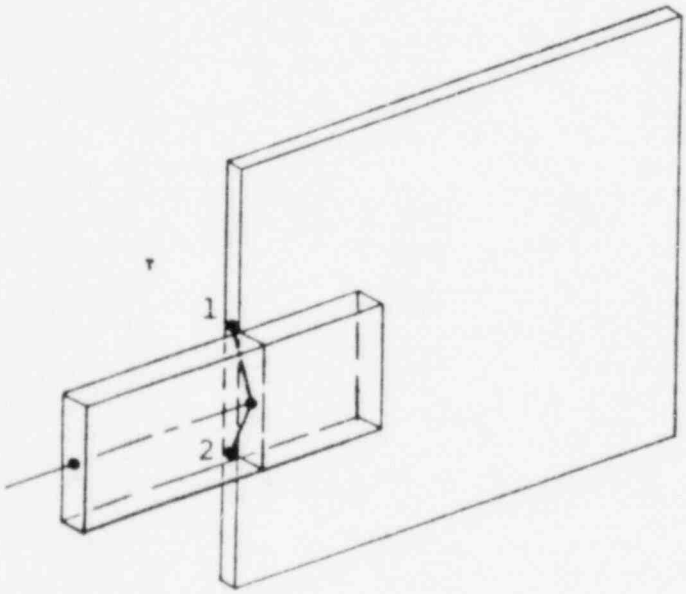
Three methods were used to model the stiffening effects of the structural elements welded to the solenoid plate. These methods are shown in Figure 2 as Case A, Case B, and Case C. The elements are schematically shown as plate sections but are meant to encompass both plate sections and/or legs of angles.

Most of the analyses employed the structural model shown in Case A of Figure 2. For this method, the stiffness properties of the structural element are transferred to one location on the solenoid plate (Point 1) through an offset member at the edge of the plate. The effects of the structural element overlapping the solenoid plate are accounted for by increasing the thickness of the existing quadrilateral plate elements located at the overlapped area.

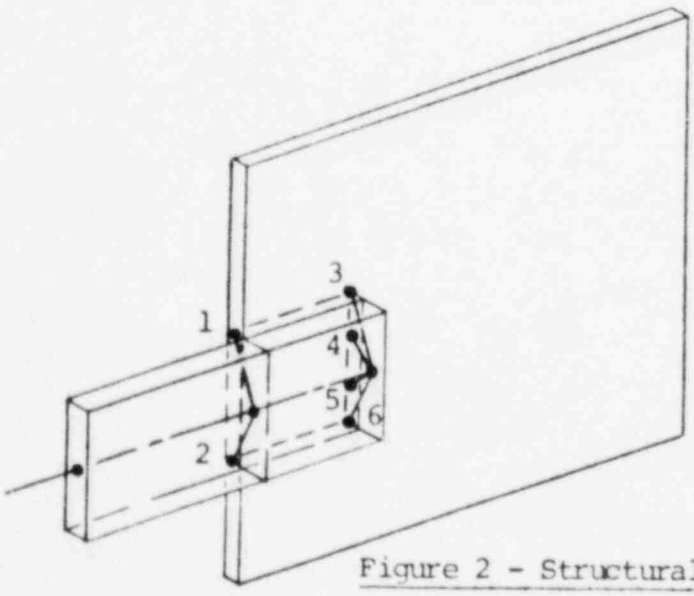
Cases B and C of Figure 2 are progressively more refined modeling techniques that would produce a more accurate



Case A - Computer Generated
Rigid Element Offset



Case B - TS 4 x 4 x ¼ Offset



Case C - TS 4 x 4 x ¼ Offset

Figure 2 - Structural Element To Solenoid Plate Connections

representation of the structural element connected to the plate. Case B was used for the analysis of FCN-1137. Case C was used for the analyses of FCN-1143 and FCN-1148.

For Case B, the stiffness properties of the structural element are transferred to two points on the solenoid plates by means of offset members. These offset members extend from the centerline of the structural plate to the top and bottom node points on the solenoid plate. Again, the effects of the overlapping portion of the structural plate on the solenoid plate are accounted for by increasing the thickness of the existing quadrilateral plate elements.

For Case C, the entire structural plate is modeled onto the solenoid plate. Two sets of offset members are used, at the connection between the structural plate and the solenoid plate. Multiple offset members from the centerline of the structural plate to the node points on the solenoid plate are used to represent a full line of weld. In this case, the thickness of quadrilateral plate elements is not increased.

The offset member shown in Case A is generated by the computer as a rigid element. The offset members shown in Cases B and C are modeled as TS 4 x 4 x 1/4 members. This causes the offset to be semi-rigid such that increased bending effects become negligible.

The remaining structural members of the support structure are modeled as beam elements.

7.0 COMPUTER PROGRAMS

The STARDYNE computer program (1977 update of Version 3) was used for natural frequency determination, static analysis, and response spectra modal analysis. STARDYNE is a public domain program which is readily available through Control Data Corporation (CDC).

STARDYNE was the only computer program used in this analysis.

Computer output for the analysis is enclosed as Appendix B.

8.0 ANALYSIS TECHNIQUES/RESULTS

This section describes the procedures used to analyze the mathematical models of the solenoid plate structures. Critical assumptions for this analysis have also been provided. The calculations for the analysis are enclosed with the report as Appendix A.

8.1 Procedure

The intent of this analysis was to demonstrate that during a seismic event, the solenoid mounting plates would not impact against the nearby air actuators and be subjected to unanticipated dynamic loads. To accomplish this, it was necessary to show that the maximum seismic deflection of the solenoid plate would be less than 1/16".

Before beginning the analysis, four sets of Control Building response spectra were reviewed: SSE at Elevation 133'-0" with 3% damping, SSE at Elevation 111'-0" with 3% damping, 1/2 SSE at Elevation 133'-0" with 2% damping, and 1/2 SSE at Elevation 111'-0" with 2% damping. The curves for Elevation 133'-0" with 3% damping conservatively were used because these curves provide the largest accelerations. Seismic loads were applied to the solenoid plate structures by imparting appropriate acceleration values in three directions.

The Zero Period Acceleration (ZPA) for all curves is assumed as 33 cps. By ensuring that the lowest system natural frequency is above the ZPA of the SSE response spectra, a static analysis is justified for structural evaluation. For this analysis, 0.223 g vertical and 0.323 g horizontal can be applied to the structure if the lowest system natural frequency exceeds 33 cycles per second. The 0.323 g value is an envelope of N-S and E-W ZPA accelerations. Fifteen of the sixteen solenoid plate problems are included in the category of static analysis.

The Lanczos modal extraction program indicated that for solenoid plate problem FCN-M-1143, the lowest system natural frequency was less than 33 cycles per second. In this case, the structural model is considered flexible and is analyzed by the response spectra modal analysis technique. Since the lowest system natural frequency of 24.7 cycles per second is the only natural frequency below the ZPA, the structure is relatively rigid with little variation in acceleration values over the range of natural frequencies. Accordingly, the first (6) natural frequencies of the structural model were used in the modal anlaysis program (DYNRE 4). These cover a frequency range of 24.7 to 172.9 cycles per second and are considered a sufficient number of significant modes. The response of interest, i.e., deflection, accelerations, loads, and stresses, are determined by taking the square root of the sum of the squares (SRSS) of each modal response. The SRSS also is used in combining the effects of the two

horizontal and vertical directions. Provisions are made in this analysis for including the effects of closely spaced modes for which consecutive frequencies differ by 10% or less. This is in accordance with the ten-percent method of analysis outlined in the NRC Regulatory Guide 1.92.

The static analysis for each of the (15) solenoid plate problems with a natural frequency greater than 33 cps includes the effects of dead load and seismic loading. For the FCN-M-1143 analysis, the results of a separate static dead load analysis are combined with the DYNRE 4 analysis by absolute sum to generate values used in the calculations.

In the calculations section, the following items are checked: member stresses, quadrilateral plate stresses, bolt and screw loads, weld profiles, and maximum deflections.

8.2 Assumptions

- The electrical components that comprise the junction box, solenoid valve, and limit switches are not included in this analysis. Qualification of these components, considering no impact between the solenoid plates and air actuator, is by others.

- A minimum of (3) bolts is considered to connect each solenoid plate to its corresponding air actuator. The nodes representing these bolts are treated as fixed restraint points at their locations in the structural model.

- The point of attachment between the structural support and the solenoid plate was approximated as closely as possible to existing node points on the solenoid plate element grid.

- All offset elements between centerlines of members were modeled in two ways: as rigid elements generated by the computer, and as members with a finite stiffness provided by section properties.

- The limit switches, solenoid valve, and junction box were treated as lumped masses with rotational inertias located at their centers of gravity, and were connected by rigid elements to the solenoid plate.

- The structural elements welded to the solenoid plates are analyzed as solid rectangular beam sections; the legs of the angle sections welded to the solenoid plate are treated as solid rectangular beams.

- The bolted connection between back to back structural elements was considered to transmit (3) forces and (2) moments; the moment about the axis describing the bolt line was considered free.

- The points of attachment of the bracing structures that frame into existing HVAC duct support members were considered fully fixed.

- Loadings to floor mounted base plates for the two applicable solenoid plate problems are assumed negligible.

- Weight density of structural elements = 0.2833 lb/in^3

- Weight density of solenoid plate = 0.2904 lb/in^3

- E = Young's Modulus = 29,000 ksi

- g = 386.4 in/sec^2

9.0 SUMMARY OF THE ANALYSIS

The natural frequency for 15 of the 16 mounting plates was computed as greater than 33 cps, and static analysis, as described in Section 4.3, was used for qualification. For the sixteenth plate, Q2Z77F003B, the natural frequency was computed as less than 33 cps, and the response spectra modal analysis technique was used for qualification.

As previously noted, deadweight and seismic loads were applied simultaneously for the analysis. With the supplementary structural support, the maximum plate deflection was determined to be less than 0.0625 inches. Therefore, the potential for impact between the heavy air cylinders and solenoid mounting plates has been eliminated. Also, the resulting stresses in the mounting plates, structural support members, and connecting components were found to be within allowable limits.

10.0 SOURCES OF FORMULAE AND REFERENCE

10.1 AISC Manual - 7th Edition

10.2 Bechtel Specification Nos. 9645-M-617.1, Rev. 7 (including Appendix T)
9645-C-196.0, Rev. 1
9645-J-820.0, Rev. 1

10.3 Beer & Johnson, Statics & Dynamics

10.4 Biggs, Structural Dynamics

10.5 Blodgett, Design of Welded Structures

10.6 IEEE Standard 344-1975

10.7 Marks' Standard Handbook for Mechanical Engineers - Eighth Edition

10.8 STARDYNE Manual

10.9 Correspondence

- Bechtel letter to Mr. T. H. Cloninger, dated November 30, 1981

- Bechtel letter to Mr. R. E. Green, dated December 24, 1981

- IEE letter to Mr. R. S. Trickovic, dated December 31, 1981

- Bechtel letter to Mr. R. E. Green, dated February 11, 1982

10.10 Pacific Air Products Co. Drawings:

- Document No. 9645-M-617.1-QS-1.1-3-3
- Document No. 9645-M-617.1-QS-1.1-6-4

10.11 NRC Regulatory Guides

- R. G. 1.61, "Damping Values for Seismic Design of Nuclear Power Plants"
- R. G. 1.92, "Combining Modal Response and Spatial Components in Seismic Response Analysis"

APPENDIX A

CALCULATIONS FOR
SOLENOID MOUNTING
PLATES

GRAND GULF NUCLEAR POWER STATION

IEE

QUALITY ASSURANCE PROGRAM
CALCULATION COVER SHEET

Calc. No. Q1277, Q2277

Job No. 9645

DISCIPLINE: MECHANICAL ENGINEERING

No. of sheets 95

TITLE

MISSISSIPPI POWER & LIGHT COMPANY
GRAND GULF NUCLEAR STATION UNITS 1 AND 2

SUBJECT

PACIFIC AIR PRODUCTS COMPANY SOLENOID MOUNTING PLATES

Q.A. APPROVAL
3/10/82
(DATE)
I. E. E.

STATEMENT OF PROBLEM

SEISMIC QUALIFICATION OF THE SOLENOID MOUNTING PLATES FOR THE CONTROL ROOM STANDBY FRESH AIR SYSTEM UNITS AT ELEVATION 133'-0" AND ELEVATION 111'-0"

Q

SAR CHECKED [X] SAR CHANGE REQ'D [ ] SAR CHANGE NOTICE INITIATED [ ]

SOURCES OF DATA

[X] Computer Program Data - STARDYNE Version # 3

ATTACHMENTS: A1-2, B1-2, C1-2, D1-2, E1-2, F1-2, G1-3, H1-2, I1-2, J1-2, K1-2, L1-2, M1-3, N1-2, O1-2, P1-2 (INCLUDED FOR INFO. ONLY)

SOURCES OF FORMULAE & REFERENCES

[X] Design Specification Bechtel 9645-M-617.1 Revision 7
[X] AISC Manual - 7th Edition
[X] IEEE Standard 344-1975
[X] For Additional Sources - See Section 10.0 of Summary Report

PRELIMINARY CALC [ ] FINAL CALC [X] SUPERSEDED CALC NO. _____

REV. NO.	DATE	DESCRIPTION	CALC. BY	CHECKED BY	DATE	APPROVED BY	DATE
A	3/10/82	TO DETERMINE SEISMIC INTEGRITY	[signature]	[signature]	3/10/82	[signature]	3/10/82

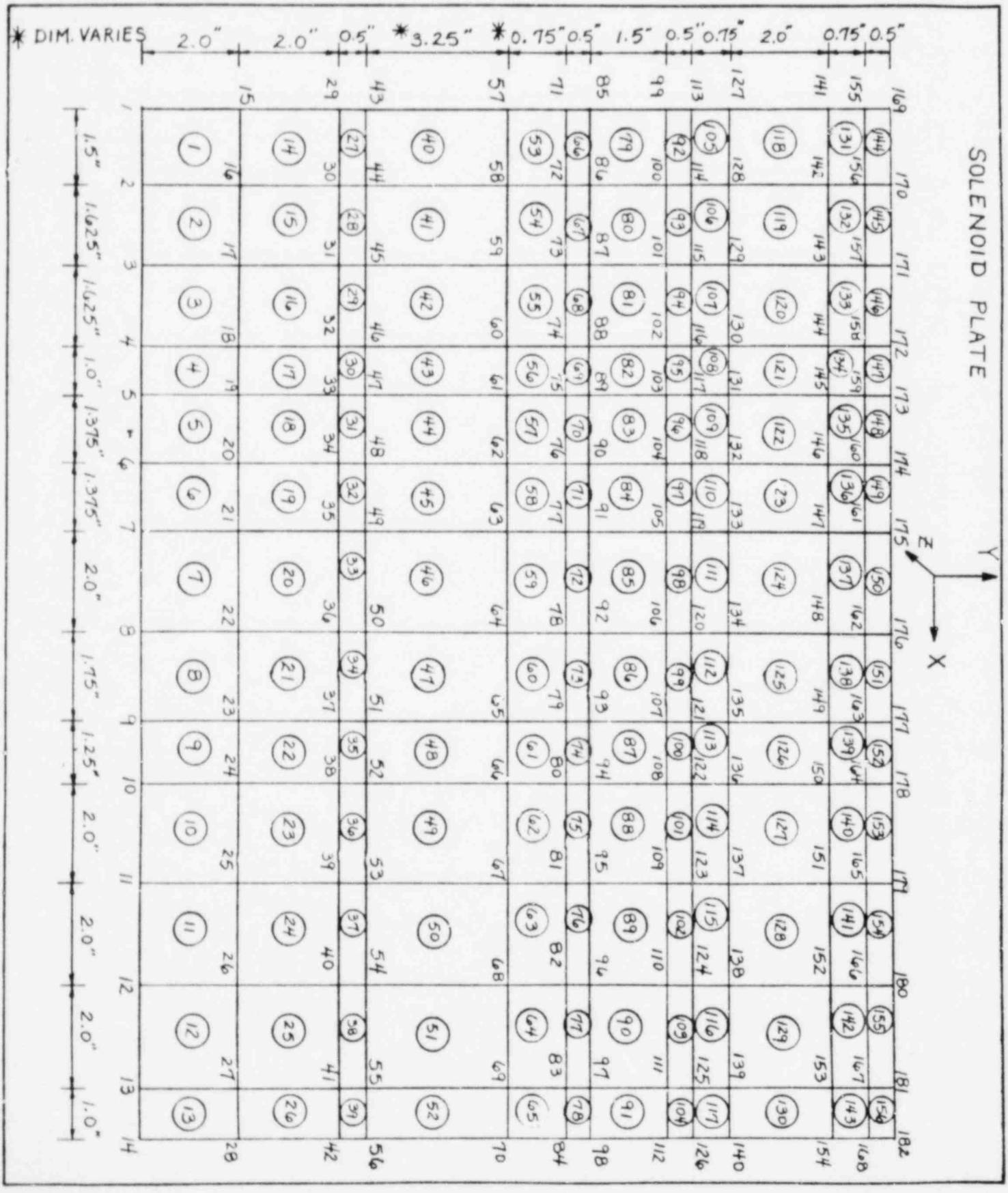
CALCULATION SHEET

JOB NO 9645 CALC NO. G1277, G2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Stephen A. Descoteaux DATE 2/18/82

SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 3/8/82

SOLENOID MOUNTING PLATE SHEET NO 1 OF 95



BECHTEL MPL # N/A

CHANGE REQUEST/NOTICE Q ☒ NQ ☐

JOB NO. 9645

CR/N# BXN-M-1137

PAGE 1 OF 2

REF. DWG. OR SPEC. NO. 9645-M6[illegible] REV. 5 TITLE Safety Related Attachments

REASON FOR CHANGE/EXISTING CONDITION Control Damper

Add support to stiffen Safeguard mounting plate on actuator Q1E77G001A.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See page 2

ATTACHMENT: A, 1 OF 2

FOR INFORMATION ONLY Date: 3/10/82

Q

WP&R # Q1E77G001-C

Dwn 1/29/82

PREPARED BY: [signature] DATE 1/29/82

PFE APPROVED PCR - SUBMIT TO PROJECT ENG. ☐

PFE APPROVED PCN - PROCEED WITH WORK ☒

PFE DISAPPROVED ☐

PFE: [signature] DATE 1/29/82

ACTION BY ENGINEERING – DESCRIPTION OF CHANGE –

THIS IS: DCN # _____

TO DWG # _____ REV. _____

SCN # _____

TO SPEC. # _____ REV. _____

DEVIATION # D _____

DATE _____

PAGE ___ OF ___

REMARKS _____

RESP. ENGR: _____ DATE _____ CHKD: _____

GROUP SUPV. _____ DATE _____

CHIEF ENGINEER _____ DATE _____

PROJECT ENGR. APPROVAL YES ☐ NO ☐

_____ DATE _____

SAR CHANGES YES ☐ NO ☐

CDT – _____ DATE _____

TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reaves File: 0080/

GPO - 13272 Rev. 3/81 (Form No. 9645-8-Q)

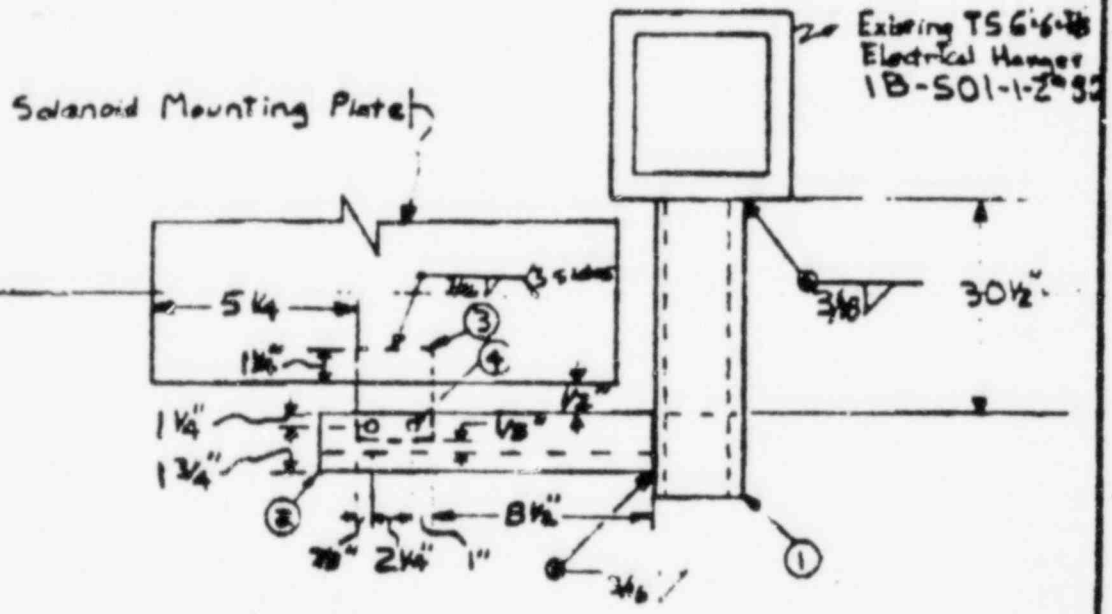
SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

FCN or CRAN No. M-1137

PAGE 2 OF 2

ATTACHMENT A, 2 OF 2

FOR INFORMATION ONLY Date: 3/10/82



Bill of Materials

Item No.	Description
1	TS 4"x4"x 1/4" x 35" long
2	∠ 3"x 3"x 1/4" x 13 1/8" long
3	PL 3/8" x 4 1/8" x 4 1/2"
4	2- 9/16" ϕ holes for 1/2" ϕ A307 Bolts W/ Nuts

Q

OPO-13222-A 1/78

CALCULATION SHEET

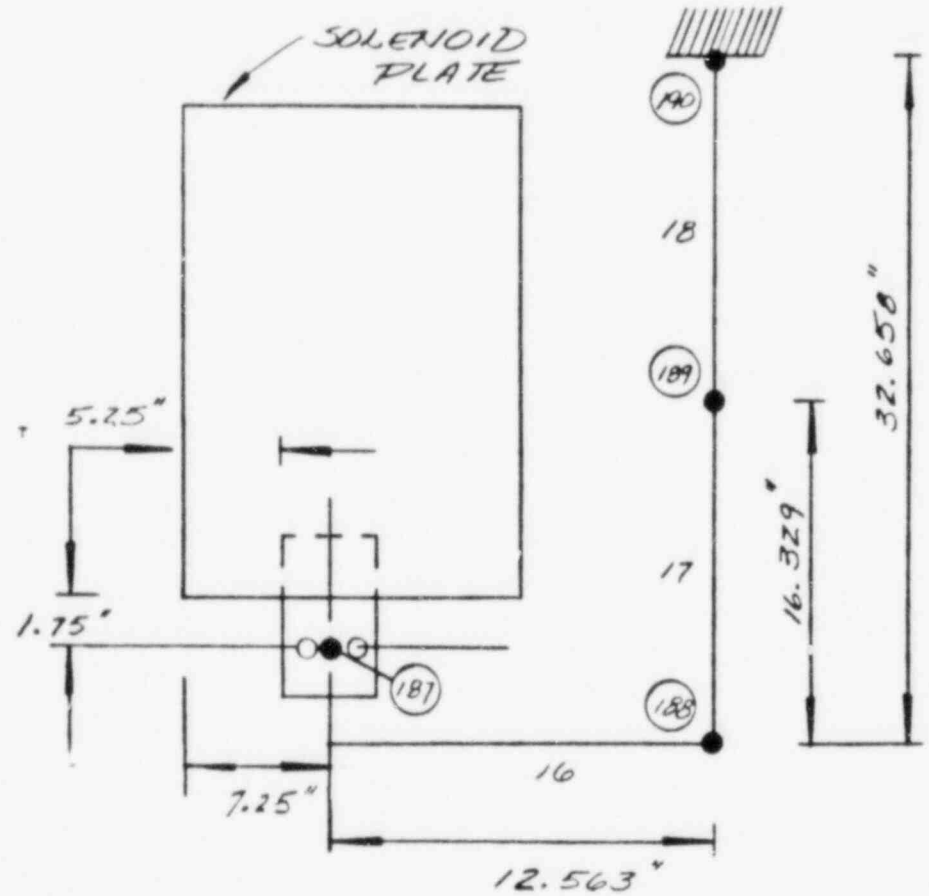
JOB NO. 9645 CALC NO. G1277, Q2277 REV NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 3/8/82

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Descoteaux DATE 3/9/82

SOLENOID MOUNTING PLATE SHEET NO. 2 OF 95

FCN-A1-1137



MEM	SHAPE
16	∠ 3"x 3"x 1/4"
17	TS 4"x 4"x 1/4"
18	TS 4"x 4"x 1/4"

CALCULATION SHEET

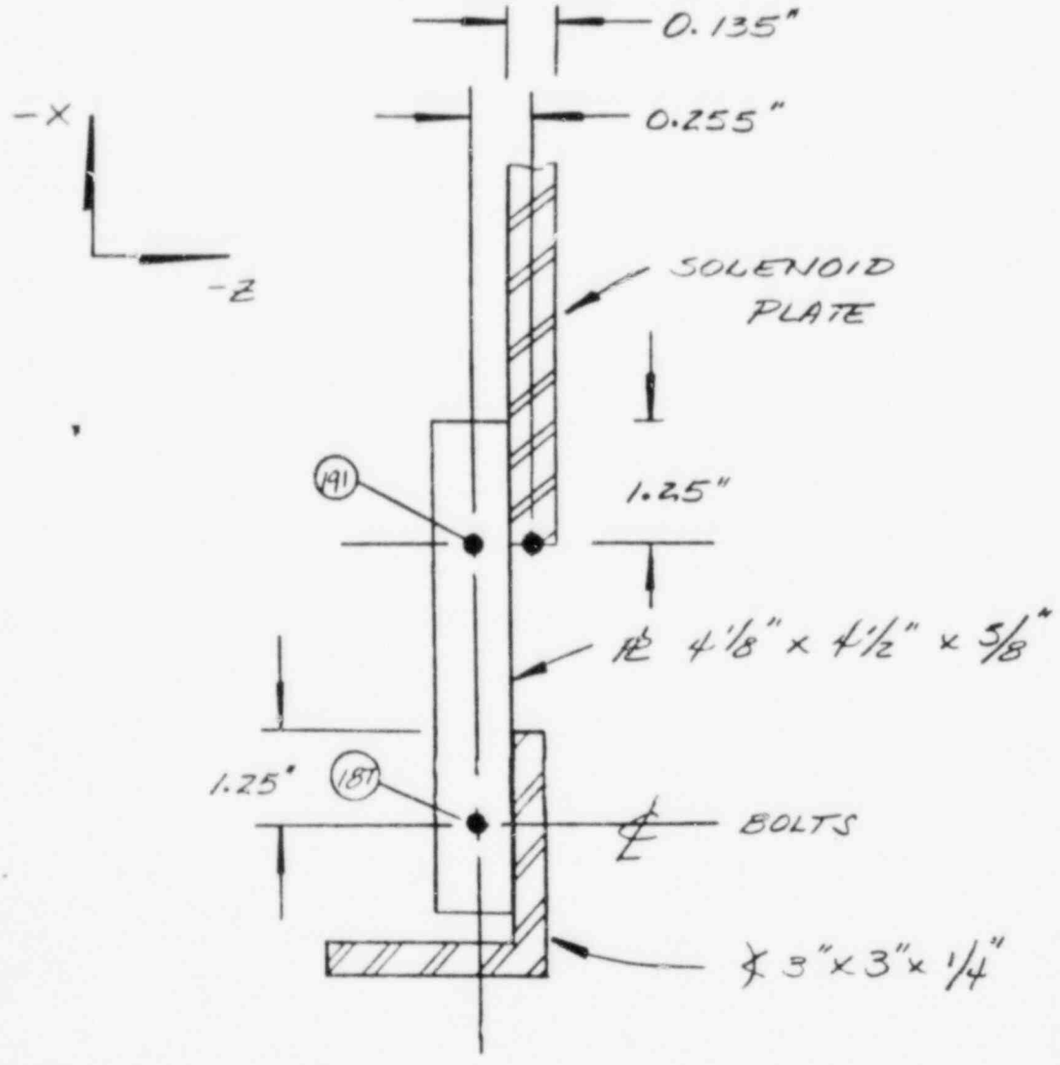
JOB NO. 9645 CALC NO. QIZTT, QZZTT REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [redacted] DATE 3/8/82

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Descoteaux DATE 3/9/82

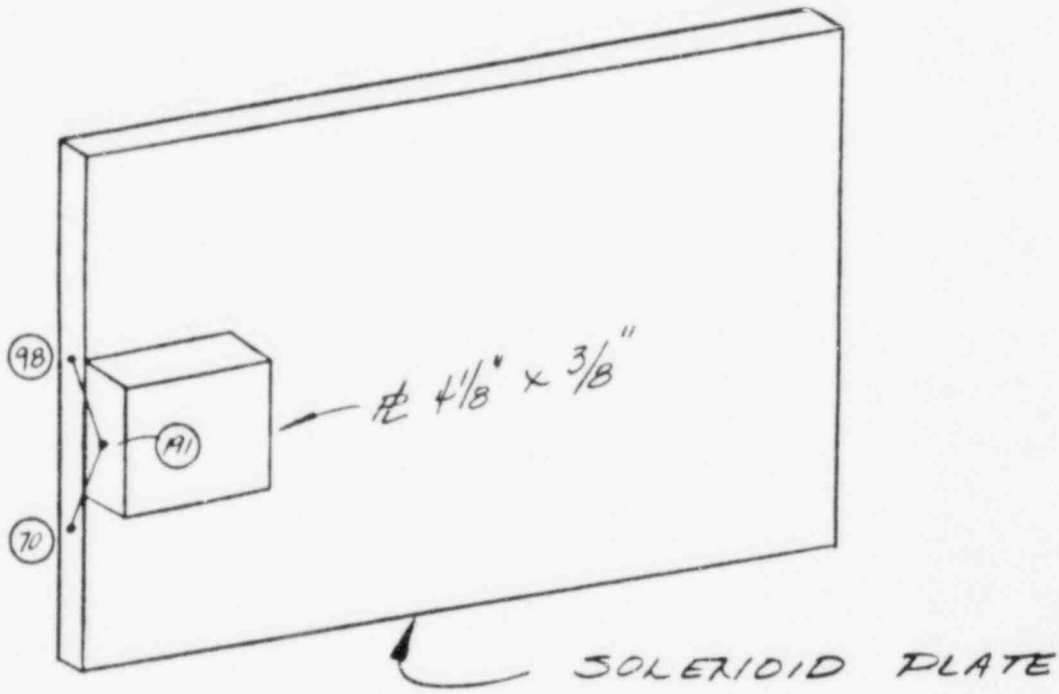
SOLENOID MOUNTING PLATE SHEET NO 3 OF 95

FCN-M-1137 (CONT.)



FCN-A1-1137 (CONT.)

OFFSET BEAMS



NOTE: OFFSET BEAMS 19, 20 - NODES 70-191 & 191-98 ARE CODED AS TS 4 x 4 x 1/4 TO BE SEMI-RIGID AND TO DISTRIBUTE THE EFFECTS OF THE ℄ 4 1/8" x 3/8" OVER THE OVERLAPPING SECTION.

BECHTEL N/A

CHANGE REQUEST/NOTICE YES ☐ NO ☐

JOB NO. 9645

CR/N PCN-M-1138

PAGE 1 OF 2

REF. DWG. OR SPEC. NO. 9645-M-M07.1-GS-1.1-6-5 REV. 5 TITLE Safety Related

REASON FOR CHANGE/EXISTING CONDITION Automatic Control Damper

Add support to strengthen solenoid mounting plate on actuator QB27750018.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See Page 2

ATTACHMENT; B, 1 OF 2

FOR INFORMATION ONLY Date: 3/10/82

Q

WPLR# QB27750002-C

PREPARED BY: [signature] DATE 1/15/82

PFE APPROVED FCR - SUBMIT TO PROJECT ENG. ☐
PFE APPROVED FCN - PROCEED WITH WORK ☒
PFE DISAPPROVED ☐
PFE: [signature] DATE 1/25/82

ACTION BY ENGINEERING – DESCRIPTION OF CHANGE

THIS AS: DCN #
TO DWG # REV.
SCN #
TO SPEC. # REV.
DEVIATION # D
DATE
PAGE OF

REMARKS

RESP. ENGR. DATE CHKD:

GROUP SUPV. DATE

CHIEF ENGINEER DATE

PROJECT ENGR. APPROVAL YES ☐ NO ☐

DATE

SAR CHANGES YES ☐ NO ☐

CDT – DATE

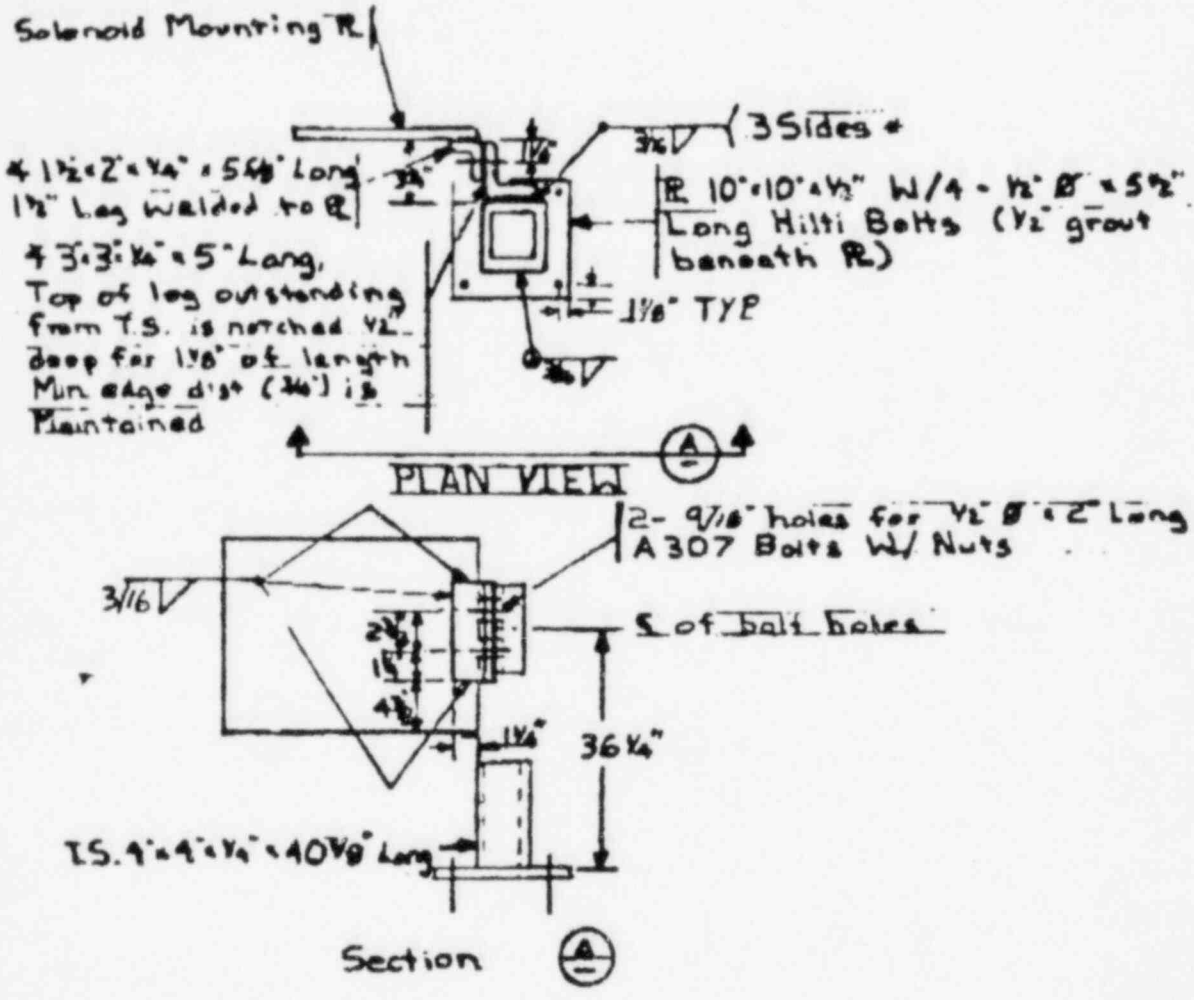
TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reaves File: 0060

GPO-12222 Rev. 3/81 (Form No. 9645-9-C)

Second page

SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

CR/N No. FCN-M-1138
PAGE 2 OF 2



FOR INFORMATION ONLY Date: 3/10/82

* Omit for side weld

ATTACHMENT; B, 2 OF 2

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OPO-13222-A 1/78

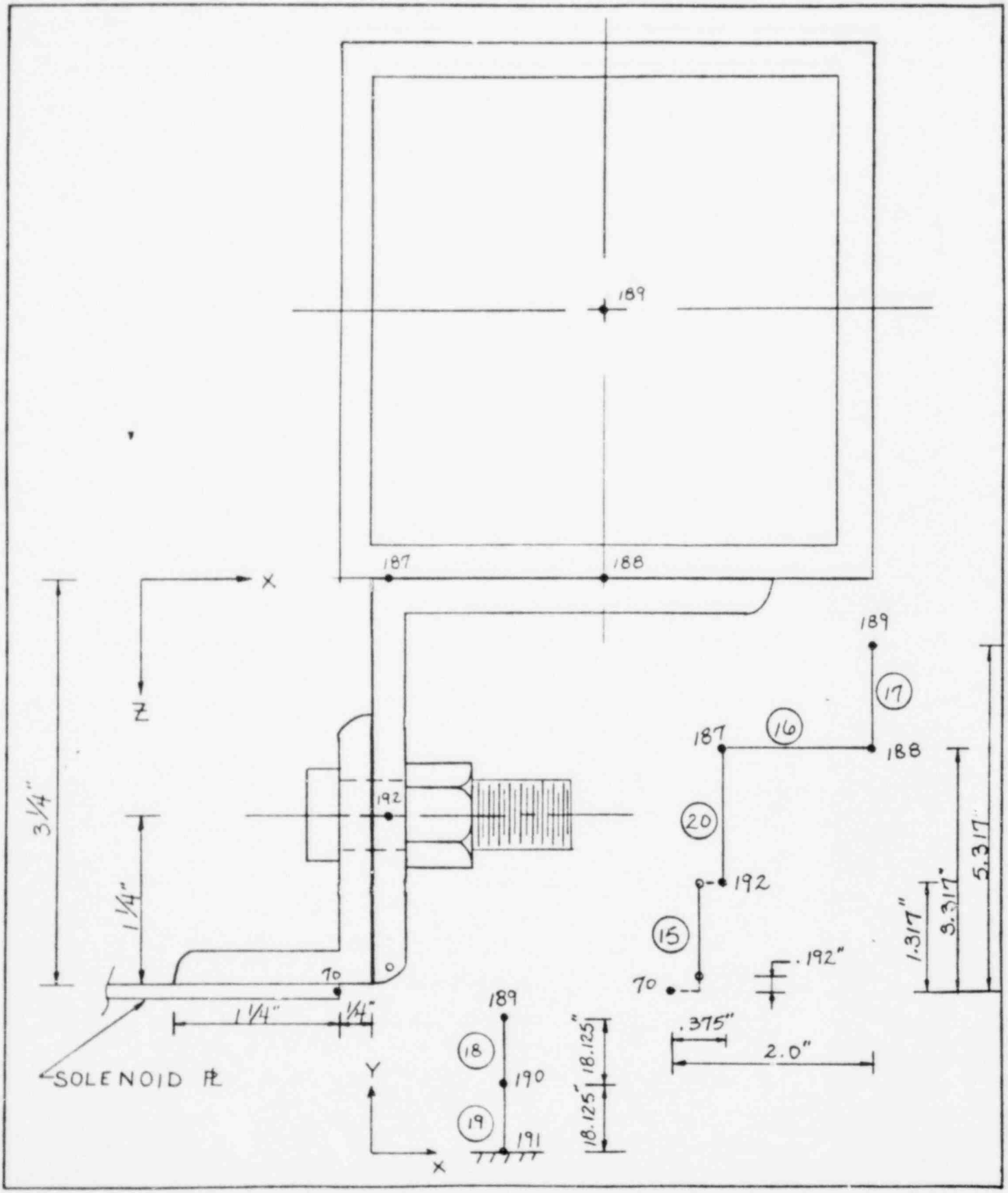
CALCULATION SHEET

JOB NO. 9645 CALC NO. Q1277, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Stephen A. Descoteaux DATE 2/2/82

SUBJECT GRAND GULF NUCLEAR STATION CKD Circ. Dwg. Y DATE MAR 2. 82

SOLENOID MOUNTING PLATE SHEET NO. 5 OF 95



BECHTEL

MPL # N/A

CHANGE REQUEST/NOTICE Q ☒ NO ☐

JOB NO. 9545

SHEET RN-M-1139

PAGE 1 OF 2

REF. DWG. OR SPEC. NO. 9545M-601-QA-11-45 REV. 5 TITLE Safety Related - Automatic Control Damper

REASON FOR CHANGE/EXISTING CONDITION

Add supports to stiffen solenoid mount plate on actuator QP2377F001B.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See page 2

ATTACHMENT; C, 1 OF 2

FOR INFORMATION ONLY Date: 3/10/82

Q

WP&R # QP2377Q002-C

PREPARED BY: [signature] DATE 1/15/82

PFE APPROVED PCR - SUBMIT TO PROJECT ENG. ☐

PFE APPROVED PCN - PROCEED WITH WORK ☒

PFE DISAPPROVED ☐

PFE: [signature] DATE 1/27/82

ACTION BY ENGINEERING – DESCRIPTION OF CHANGE - -

THIS IS: DCN #

TO DWG # REV.

SCN #

TO SPEC # REV.

DEVIATION # D

DATE

PAGE OF

REMARKS

RESP. ENGR: DATE CHKD:

GROUP SUPV. DATE

CHIEF ENGINEER DATE

PROJECT ENGR. APPROVAL YES ☐ NO ☐

DATE

CDT – DATE

BAR CHANGES YES ☐ NO ☐

TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reeves File: 0080/

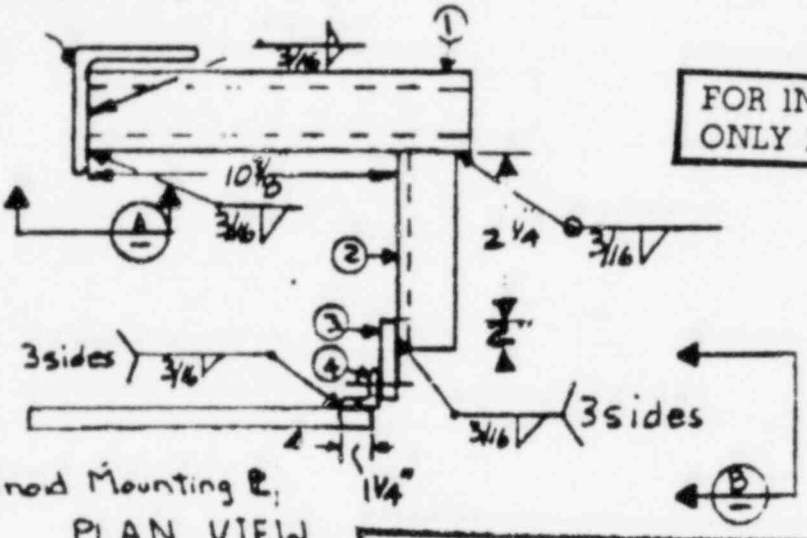
GPO-12222 Rev. 3/81 (Form No. 9545-9-C)

SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

FCN GRAN No. M-1139

PAGE 2 OF 2

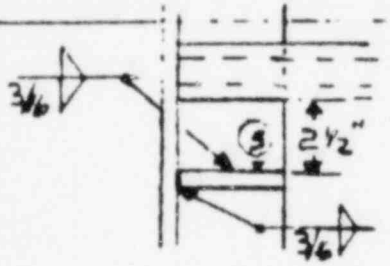
Existing 4 3"x3"x¼" HVAC Hanger Q2Z77G002 HG4



PLAN VIEW

FOR INFORMATION ONLY Date: 3/10/82

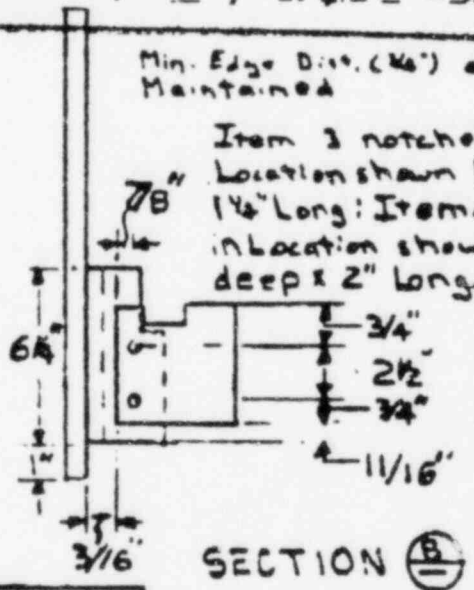
ATTACHMENT; 1 OF 2



SECTION A

Min. Edge Dist. (¼") are Maintained

Item 3 notched in Location shown ½" deep x 1¼" Long: Item 4 notched in Location shown ¼" deep x 2" long



SECTION B

BILL OF MATERIALS

Item	Description
1	TS 2"x2"x¼"x13" long
2	∠ 1½"x1½"x¼"x4¼" long
3	PL 4"x4"x⅜"
4	∠ 2"x1½"x¼"x6¼" long
5	PL 2¾"x2¾"x⅜"
6	2-9/16" Ø holes for 2-½" [illegible]

GPC-13222-A 1/78

CALCULATION SHEET

JOB NO. 9645 CALC. NO. Q1277, Q2277 REV. NO. A

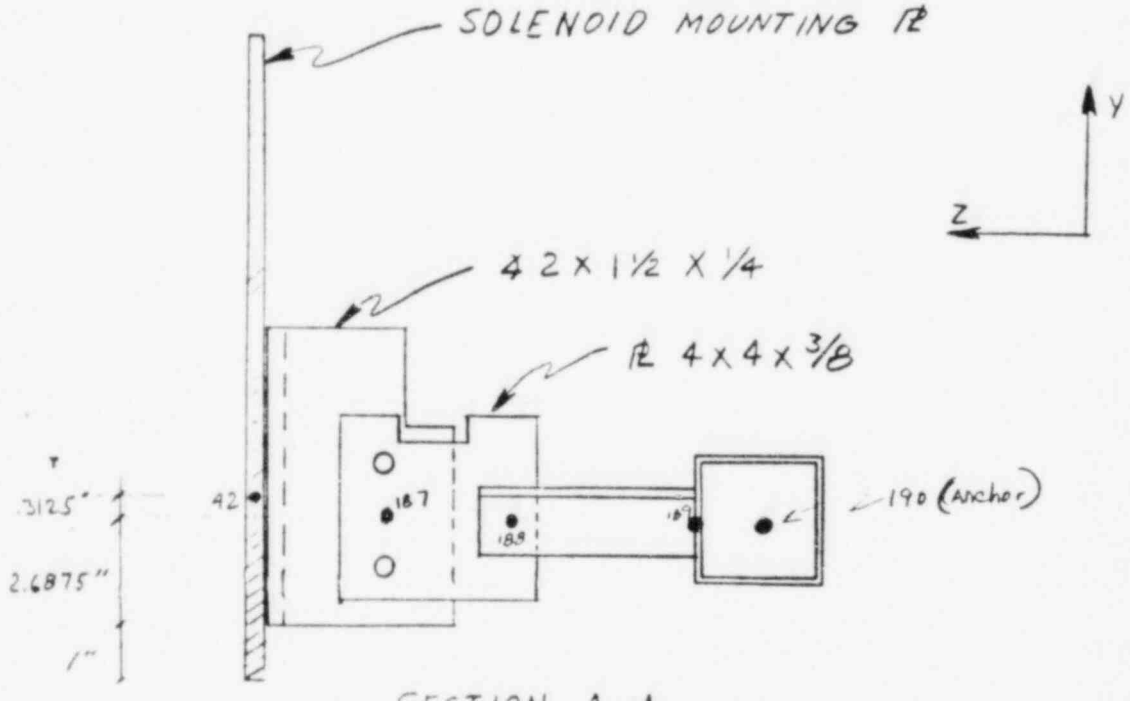
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Raj D. Mattu DATE 2-16-82

SUBJECT GRAND GULF NUCLEAR STATION CKD Virgil Sharp DATE 2.26.82

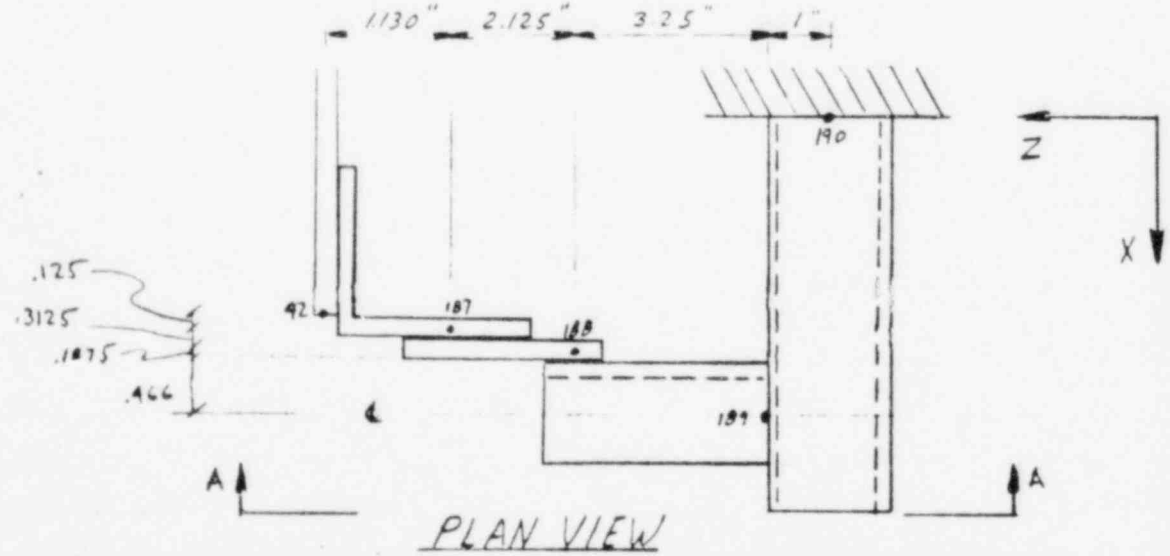
SOLENOID MOUNTING PLATE SHEET NO. 6 OF 95

ASSUME THAT NEUTRAL AXES OF ALL MEMBERS ARE AT THE SAME ELEV. ON SECTION A-A

FCN-M-1139



SECTION A-A



PLAN VIEW

FROM NODE	TO NODE	SECTION
42	187	SOLID RECTANGULAR 6½ x ¼
187	188	SOLID RECTANGULAR 3½ x ⅜
188	189	∠ 1½ x 1½ x ¼
189	190	TS 2 x 2 x ¼

MPL # N/A

CHANGE REQUEST/NOTICE Q ☒ NQ ☐

JOB NO. 9645

DRN# BSN-M-1151

PAGE 1 OF +2 "Engr."

REF. DWG. OR SPEC. NO. 9645-M-SKD-1-01-1-11-1 REV. TITLE Safety Related Automatic Control Dampers

REASON FOR CHANGE/EXISTING CONDITION

Add support to clutton solenoid mounting plate on actuator QIE11F035A

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

SEE PAGE 2

ATTACHMENT; D, 1 OF 2

FOR INFORMATION ONLY Date: 3/2/82

Q

WP&R# QIE11G004-L

PREPARED BY: [signature] DATE 1/15/82

PFE APPROVED PCR - SUBMIT TO PROJECT ENGR. ☐

PFE APPROVED PCN - PROCEED WITH WORK ☒

PFE DISAPPROVED ☐

PFE: [signature] DATE 1/21/82

ACTION BY ENGINEERING – DESCRIPTION OF CHANGE --

THIS IS: DCN #

TO DWG # REV.

SCN #

TO SPEC # REV.

DEVIATION # D

DATE

PAGE OF

REMARKS

RESP. ENGR: DATE CHKD:

GROUP SUPV. DATE

CHIEF ENGINEER DATE

PROJECT ENGR. APPROVAL YES ☐ NO ☐

DATE

BAR CHANGES YES ☐ NO ☐

CDT – DATE

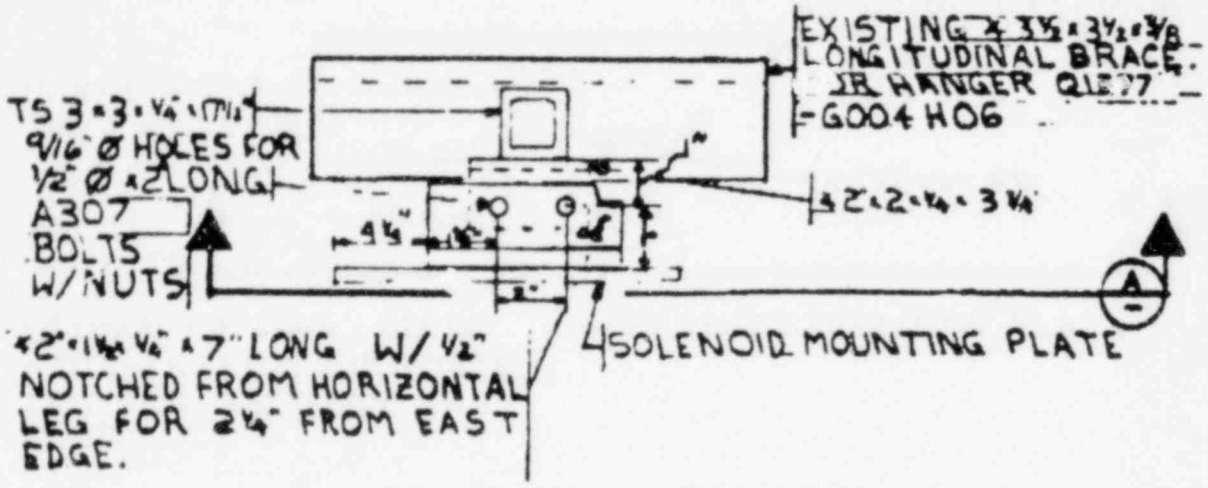
DATE

TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reeves File: 0060/

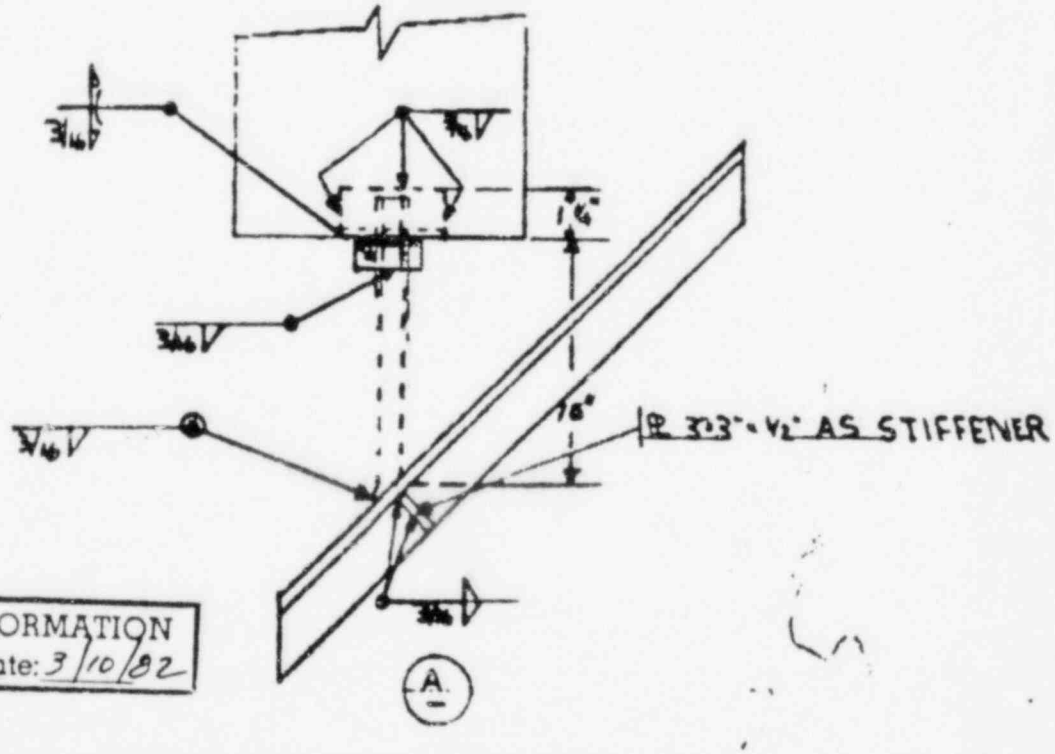
SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

CR/N No. ECN-M-1151

PAGE 2 OF 2



PLAN VIEW



FOR INFORMATION ONLY Date: 3/10/82

ATTACHMENT; D, 2 OF 2

CALCULATION SHEET

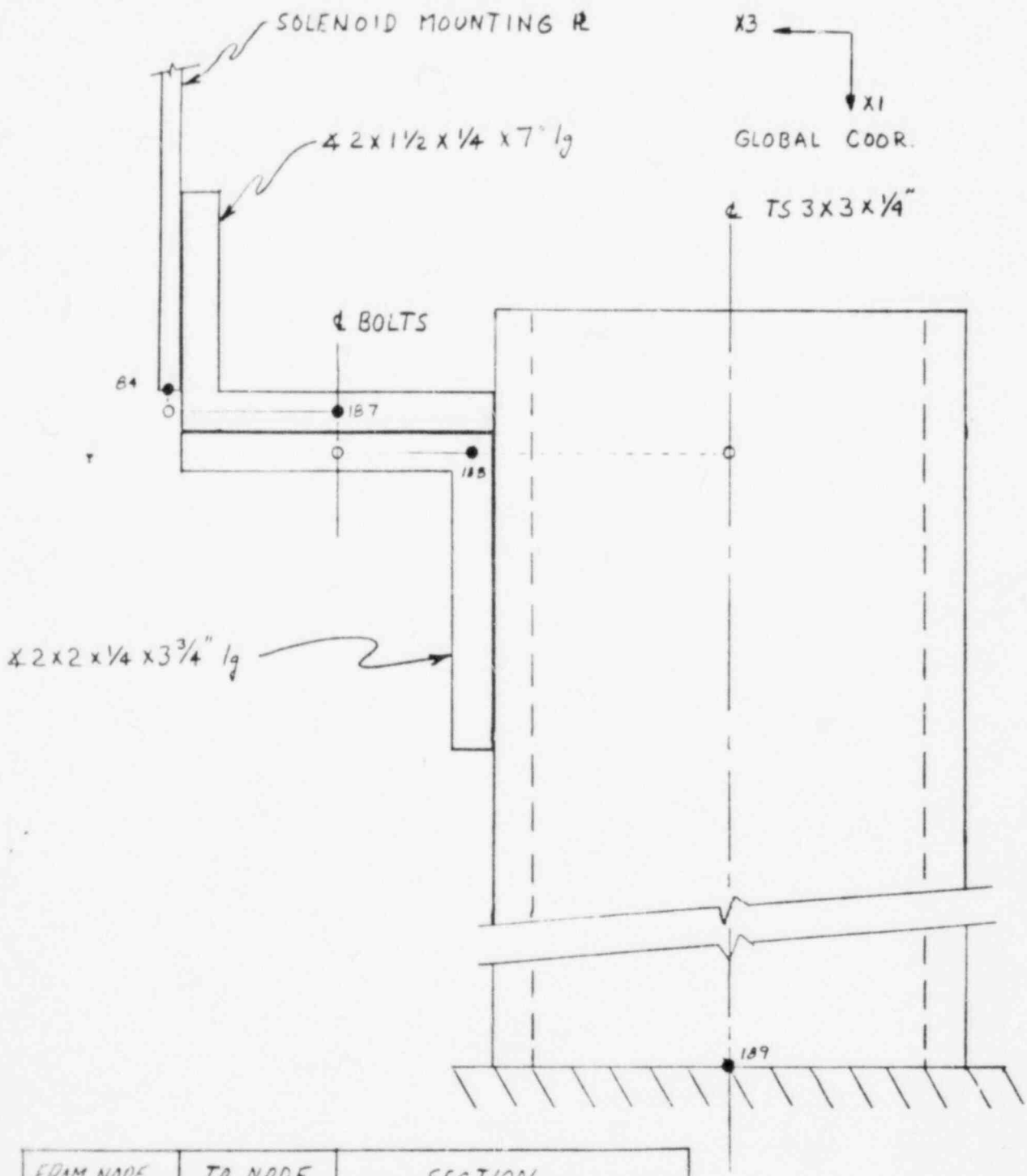
JOB NO. 9645 CALC. NO. Q1277, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 2-15-82

SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 2-17-82

SOLENOID MOUNTING PLATE SHEET NO. 7 OF 95

FCN-M-1151



FROM NODE	TO NODE	SECTION
84	187	SOLID RECTANGLE 7" x ¼
187	188	SOLID RECTANGLE 3¾ x ¼
188	189	TS 3 x 3 x ¼

BECHTEL

WPAR # N/A

CHANGE REQUEST/NOTICE NO ☐

CRN # FCN-M-1150

JOB NO. 9645

PAGE 1 OF 2

REF. DWG. OR SPEC. NO. 9645-M-617.1-85-1.1-6-5 REV. 5 TITLE Safety Related

REASON FOR CHANGE/EXISTING CONDITION Auto. Control Dampers

Add support to fasten solenoid mounting plate on actuator Q2E77F007A.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See Page 2

ATTACHMENT; E, 1 OF 2

FOR INFORMATION ONLY Date: 3/10/82

WPAR # Q2E77G007A-C

PREPARED BY: [signature] DATE 1/15/82

PFE APPROVED FOR - SUBMIT TO PROJECT ENG. ☐
PFE APPROVED FOR - PROCEED WITH WORK ☒
PFE DISAPPROVED ☐
PFE: [signature] DATE 2/2/82

ACTION BY ENGINEERING - DESCRIPTION OF CHANGE --

THIS IS: DCN #
TO DWG # REV.
SCN #
TO SPEC. # REV.
DEVIATION # D
DATE
PAGE OF

REMARKS

RESP. ENGR: DATE CHKD:

GROUP SUPV. DATE

CHIEF ENGINEER DATE

PROJECT ENGR. APPROVAL YES ☐ NO ☐

DATE

CDT - DATE

SAR CHANGES YES ☐ NO ☐

TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reeves File: 0080

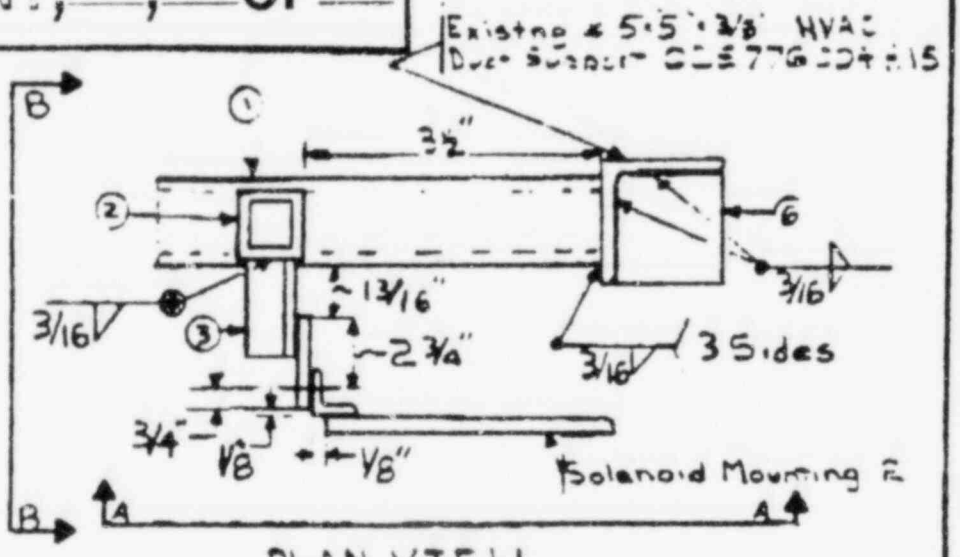
GPO 13222 Rev. 3781 (Form No. 9643-8-C)

FOR INFORMATION ONLY Date: 3/10/82

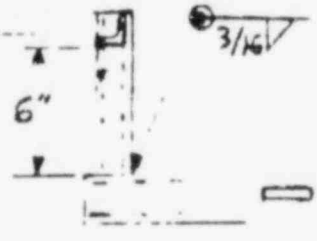
SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

ECN-
~~DRAWING NO.~~ M-1150

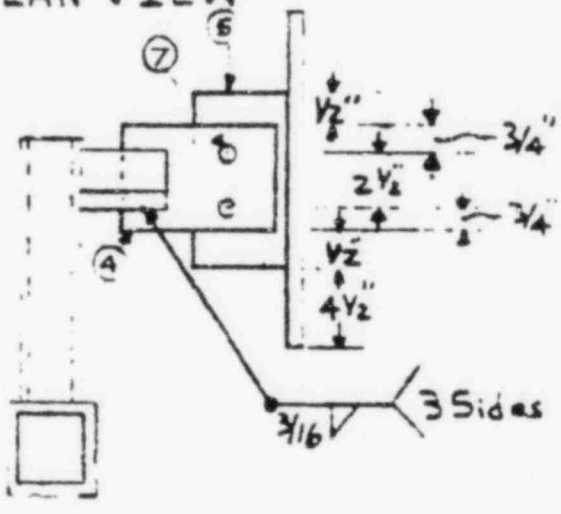
ATTACHMENT; E, 2 OF 2



PLAN VIEW



Section A-A
Parts Omitted for Clarity



BILL OF MATERIALS

ITEM	DESCRIPTION
1	TS 4 x 4 x ¼ x 6 7/8 Long
2	TS 3 x 3 x ¼ x 9 ½ Long
3	∠ 2 x 2 x ¼ x 2½ Long
4	⊏ 4 x 3½ x 3/8
5	∠ 1½ x 1½ x ¼ x 5" Long
6	⊏ 4½ x 4½ x 3/8
7	2 - 9/16" Ø Holes for 2 - A-307 Bolts W/ Nuts

(1)

(2)

CALCULATION SHEET

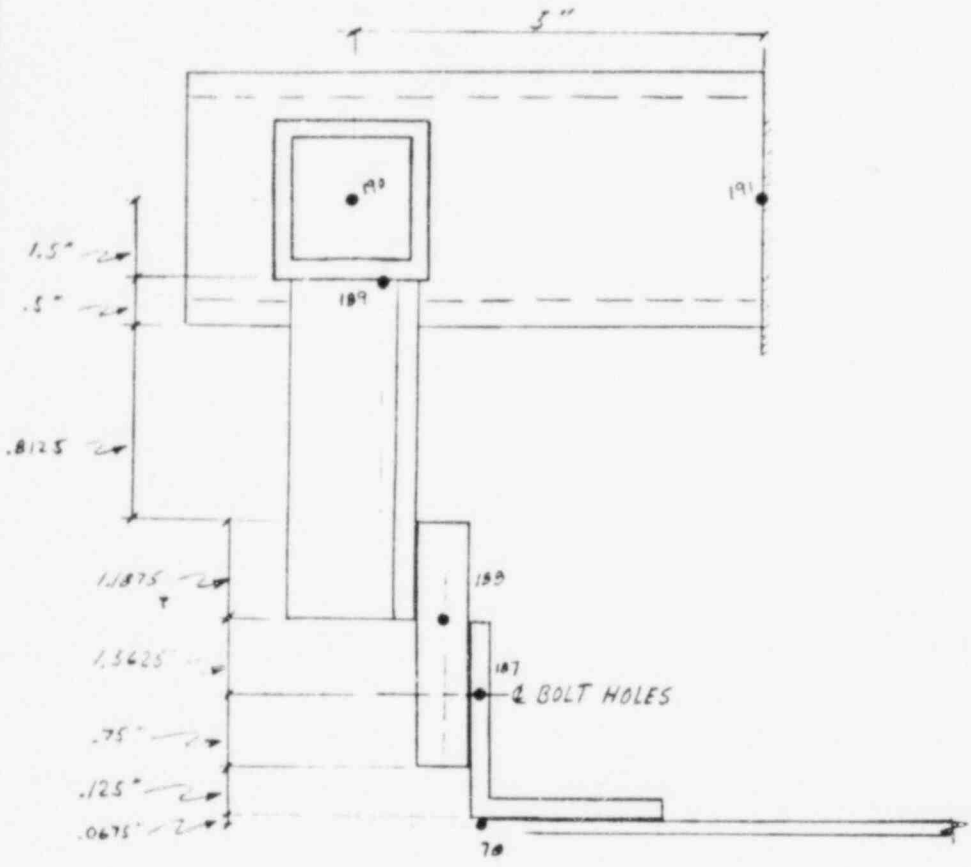
JOB NO. 9645 CALC. NO. Q1277, Q2277 REV. NO. A

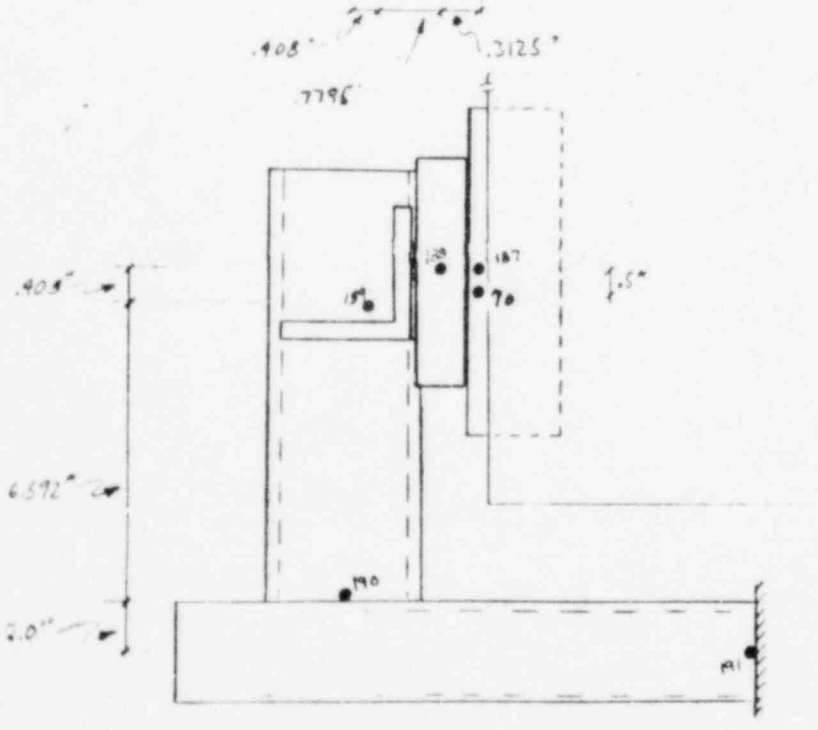
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Lisa Matthis DATE 2-17-82

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Descoteaux DATE 3/1/82

Solenoid Mounting Plate Q2377E002A SHEET NO. 8 OF 95

FCN-M-1150





CALCULATION SHEET

JOB NO. 9645 CALC NO. Q1277, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 2-17-82

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Descoteaux DATE 3/1/82

Solenoid Mounting Plate Q2277F003A SHEET NO 9 OF 95

FROM NODE	TO NODE	SECTION
84	187	SOLID RECTANGLE 5 x 1/4
137	138	SOLID RECTANGLE 4 x 3/8
188	189	∠ 2 x 2 x 1/4
189	190	TS 3 x 3 x 1/4
190	191	TS 4 x 4 x 1/4

BECHTEL

MPL # N/A

CHANGE REQUEST/NOTICE YES ☒ NO ☐

JOB NO. 9648

CR/N# SCN-M-1152

PAGE 1 OF 2

REF. DWG. OR SPEC. NO. 2-AS-M-MA1-SR-1-1-M-1 REV. 1 TITLE Safety Related

REASON FOR CHANGE/EXISTING CONDITION Hydraulic Control Damper

Add support to stiffen solenoid mounting plate on actuator Q2377603SA.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See Page 2

ATTACHMENT; F, 1 OF 2

FOR INFORMATION ONLY Date: 3/10/82

Q

WP&R # Q2377600-4C

PREPARED BY: Darryl Nelson DATE 1/15/82

PFE APPROVED FCR - SUBMIT TO PROJECT ENG. ☐
PFE APPROVED FCN - PROCEED WITH WORK ☒
PFE DISAPPROVED ☐
PFE: [signature] DATE 2/3/82

ACTION BY ENGINEERING – DESCRIPTION OF CHANGE

THIS IS: DCN # _____
TO DWG # _____ REV. _____
BCN # _____
TO SPEC # _____ REV. _____
DEVIATION # D _____
DATE _____
PAGE ___ OF ___

REMARKS _____

RESP. ENGR: _____ DATE _____ CHKD: _____

GROUP SUPV. _____ DATE _____

CHIEF ENGINEER _____ DATE _____

PROJECT ENGR. APPROVAL YES ☐ NO ☐

SAR CHANGES YES ☐ NO ☐

DOT – _____ DATE _____

_____ DATE _____

TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reeves Fbs: 0080

(3)

CRD-12737 Rev. 3/81 Form No. 9648-A-C

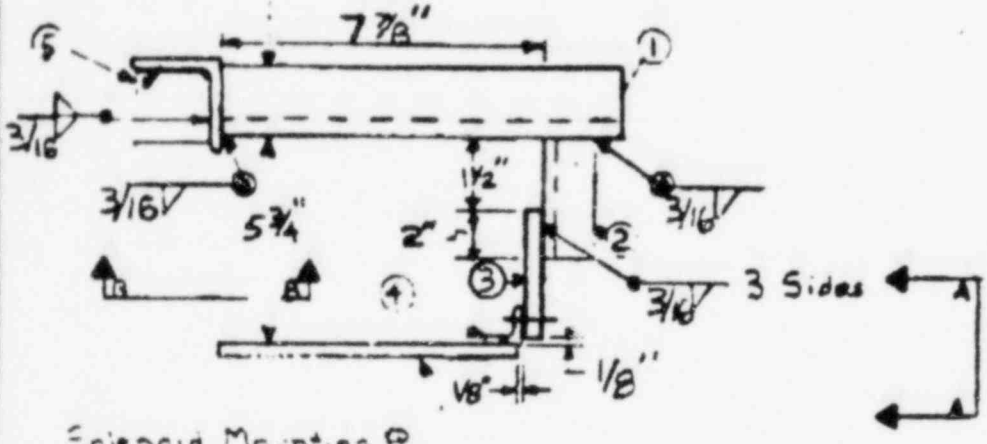
FCN-
DRAN No M-1152

PAGE 2 OF 2

SUPPLEMENTAL SHEET

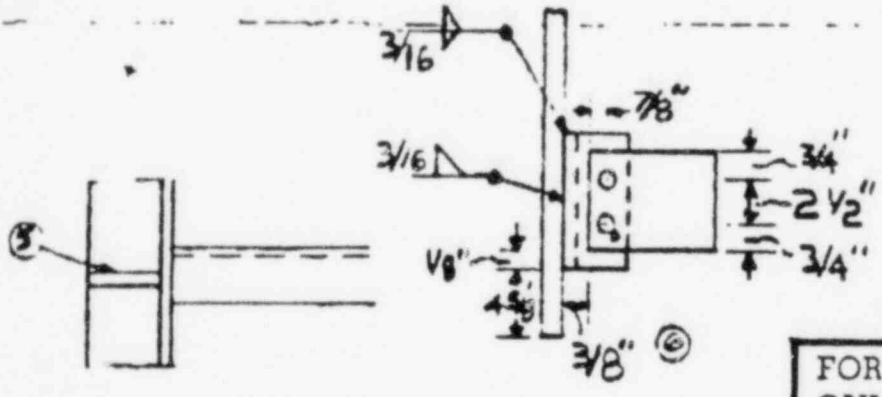
CHANGE REQUEST NOTICE

Existing 3½ x 3½ x ½ : HVAC
Duct Support - G2377GC04 H12



Solenoid Mounting Pl.

PLAN VIEW



Section B-B

Section A-A

FOR INFORMATION ONLY Date: 3/10/82

Bill of Materials

ATTACHMENT; F, 2 OF 2

Item	Description
1	∠ 2 x 2 x ¼ x 10½" Long
2	∠ 1½" x 1½" x ¼" x 3½" Long
3	PL 4" x 4" x ⅜"
4	∠ 2" x 1½" x ¼" x 7" Long
5	PL 3" x 3" x ⅜"
6	2 - 9/16" ⌀ holes for A307 Bolts w/ Nuts

(Q)

(4)

GPD-13222-A 1-78

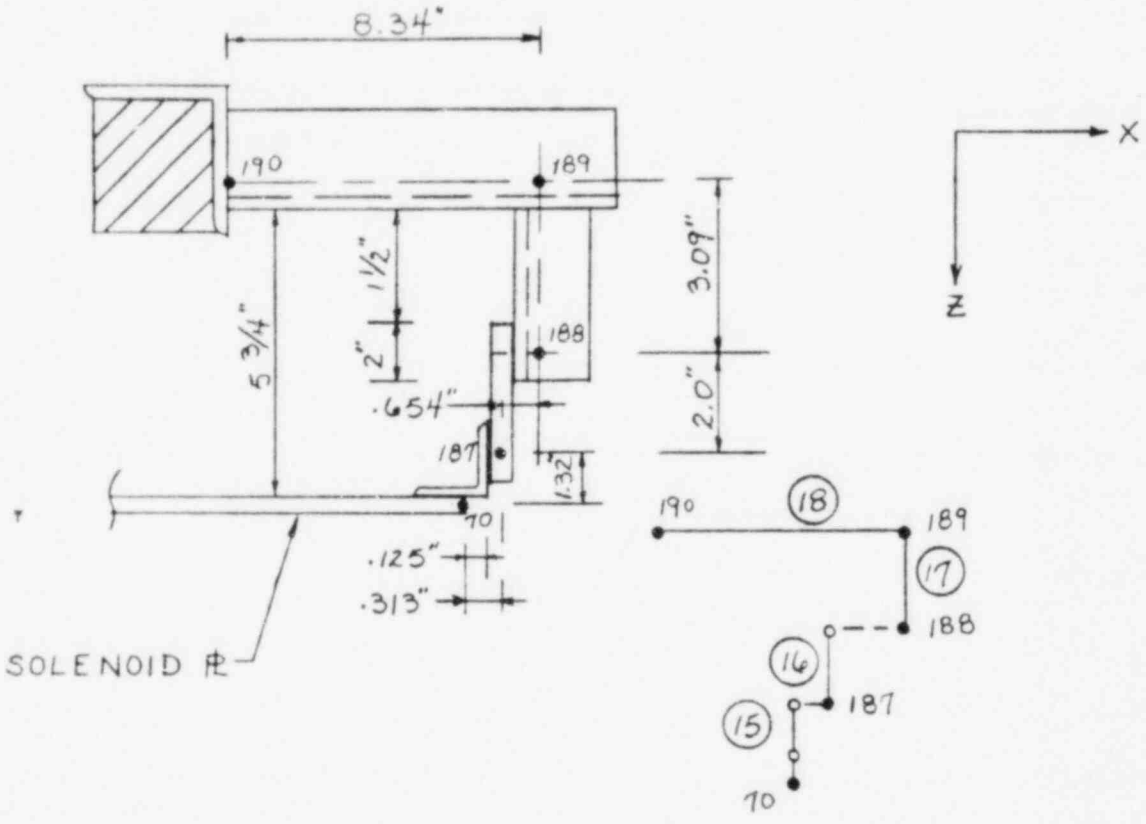
CALCULATION SHEET

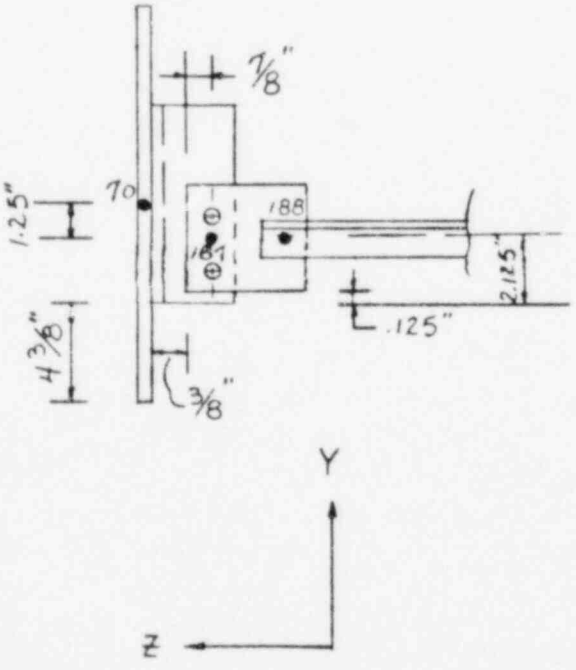
JOB NO. 9645 CALC NO. QIZ77, QZZ77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Stephen A. Descoteaux DATE 2/8/82

SUBJECT GRAND GULF NUCLEAR STATION CKD O.C.H. Gray P.V. DATE MAR 0.82

SOLENOID MOUNTING PLATE SHEET NO. 10 OF 95





BECHTEL MPL # N/A

JOB NO. 9645

CHANGE REQUEST/NOTICE Q ☒ NQ ☐

FCN-m-1149

PAGE 1 OF 3

REF. DWG. OR SPEC. NO. 4/9645-M-101-QL-W-6.5 REV. 5 TITLE Safety Related

REASON FOR CHANGE/EXISTING CONDITION Auto Control Dampers

Add support to stiffen solenoid mounting plate on actuator Q1E77F003A.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See pages 2 & 3

ATTACHMENT; G, 1 OF 3

FOR INFORMATION ONLY Date: 3/10/82

WP&R # Q1E77G004-C

PREPARED BY: [signature] DATE 1/15/82

PFE APPROVED FCR - SUBMIT TO PROJECT ENG. ☐
PFE APPROVED FCN - PROCEED WITH WORK ☒
PFE DISAPPROVED ☐
PFE: [signature] DATE 2/2/82

ACTION BY ENGINEERING — DESCRIPTION OF CHANGE - -

THIS IS: DCN #
TO DWG # ______ REV. ______
SCN #
TO SPEC. # ______ REV. ______
DEVIATION # D
DATE ______
PAGE ___ OF ___

REMARKS ______

RESP. ENGR: ______ DATE ______ CHKD: ______

GROUP SUPV. ______ DATE ______

CHIEF ENGINEER ______ DATE ______

PROJECT ENGR. APPROVAL YES ☐ NO ☐

DATE ______

SAR CHANGES YES ☐ NO ☐

CDT - ______ DATE ______

TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reaves File: 0080

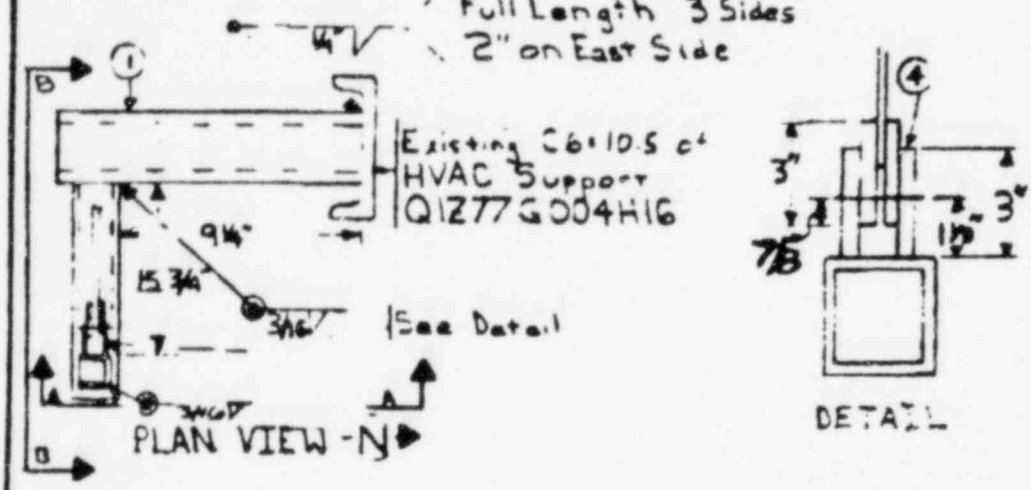
(5)

FCN-
DRAWING No. M-1149

PAGE 2 OF 3

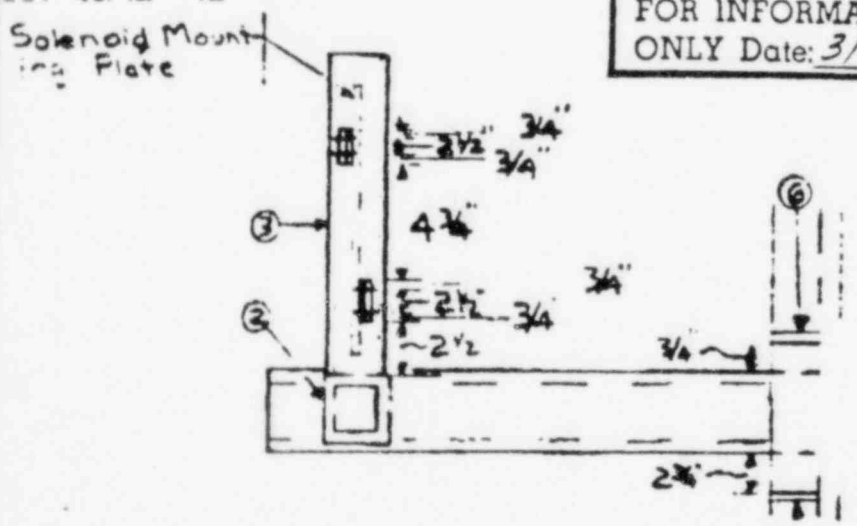
SUPPLEMENTAL SHEET

CHANGE REQUEST/NOTICE



ATTACHMENT; 6 , 2 OF 3

FOR INFORMATION
ONLY Date: 3/10/82



TYP 3 Sides
EQ Spaces

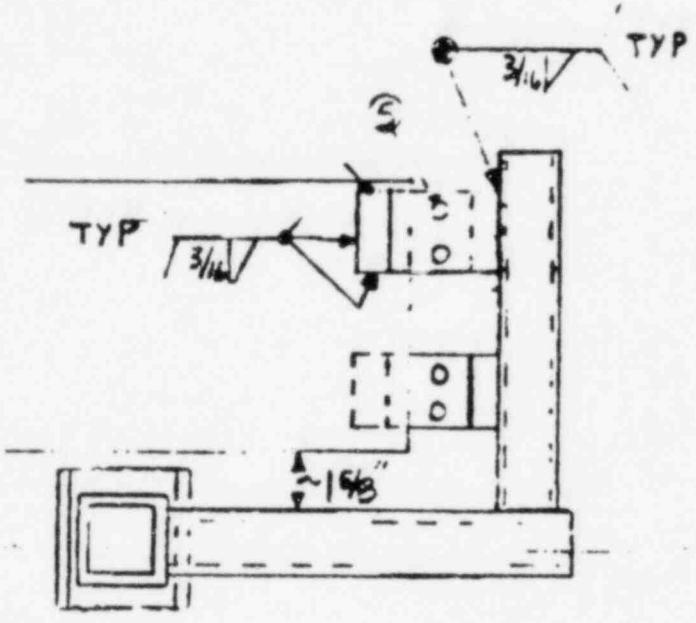
(1)

(6)

SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

FCN-
ORVN No. M-149

PAGE 3 OF 3



Section B-B

B.11 of Materials

Item	Description
1	~~TS4×4×~~ x 13" long
2	TS3×3×¼ x 19½" long
3	TS2½×2½×¼" × 16½" long
4	PL 4" × 3" × 3/8" (4 total)
5	9/16 ø holes for ½ A307 Bolts w/Nuts (4 sets)
6	PL 2" × 5½" × 3/8 (2 total)

ATTACHMENT; 6, 3 OF 3

FOR INFORMATION
ONLY Date: 3/10/82

Q 7

CALCULATION SHEET

JOB NO 9645 CALC NO Q1277, Q2277 REV NO A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY

GRAND GULF NUCLEAR STATION

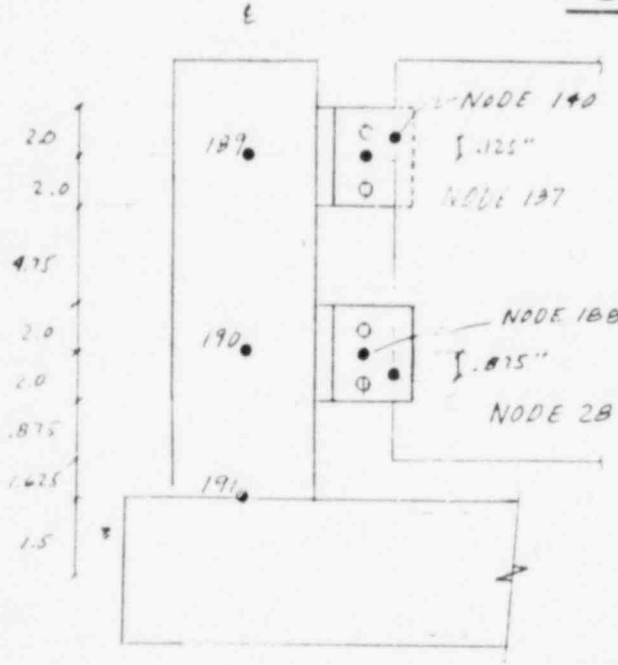
BY [signature] DATE 2/16/82

SUBJECT Solenoid Mounting Plate 012777003A

CKD [signature] DATE FEB 26, 82

SHEET NO 11 OF 95

FCN-A1-1149



SECTION A-A

FROM NODE	TO NODE	SECTION
140	137	SOLID RECTANGLE 4 x 3/8
28	188	SOLID RECTANGLE 4 x 3/8
137	189	SOLID RECTANGLE 4 x 3/8
188	190	SOLID RECTANGLE 4 x 3/8
189	190	TS 2 1/2 x 2 1/2 x 1/4
190	191	TS 2 1/2 x 2 1/2 x 1/4
191	192	TS 3 x 3 x 1/4
192	193	TS 4 x 4 x 1/4

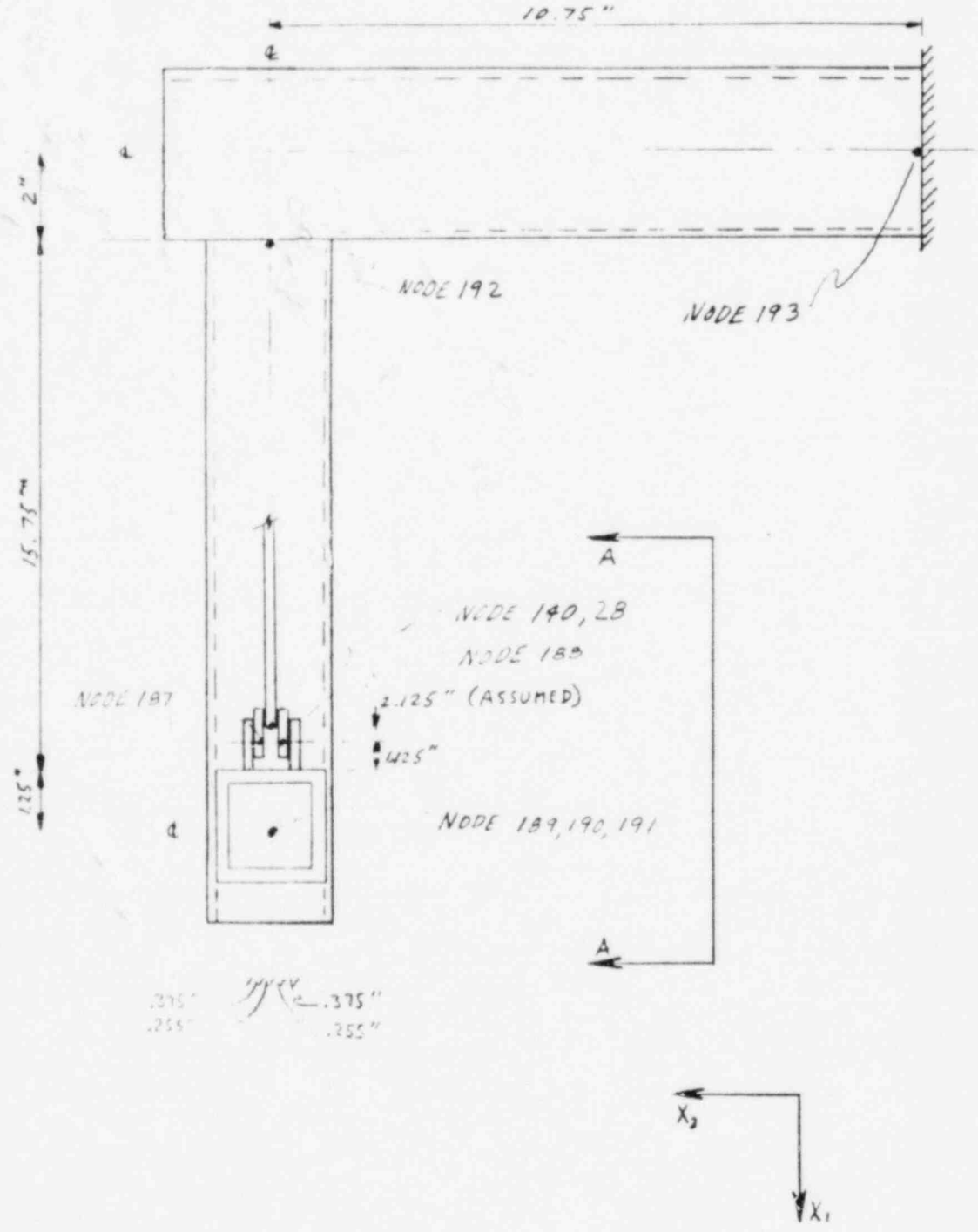
CALCULATION SHEET

JOB NO 9645 CALC NO. Q1Z77, Q2Z77 REV. NO A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Roger Mette DATE 2/18/82

SUBJECT GRAND GULF NUCLEAR STATION CKD Virgil Dairy. DATE FEB 26 82

Solenoid Mounting Plate Q1Z77F003A SHEET NO 12 OF 95



GLOBAL COOR.

FCN-M-1149

BECHTEL N/A

CHANGE REQUEST/NOTICE YES ☒ NO ☐

JOB NO. 9545

DRN# BCR-M-141

PAGE 1 OF 2

REF. DSG. OR SPEC. NO. 9545-M-6172-95-1/1-1101 REV. 1 TITLE Safety Related Automatic Control Dampers

REASON FOR CHANGE/EXISTING CONDITION

Add support to fasten solenoid mounting plate on actuator Q2377G013B.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See page 2

ATTACHMENT; 1, 1 OF 2

FOR INFORMATION ONLY Date: 3/10/92

WP&R # Q2377G003C

PREPARED BY: [signature] DATE 1/15/92

PFE APPROVED FCR - SUBMIT TO PROJECT ENGR ☐
PFE APPROVED FCN - PROCEED WITH WORK ☒
PFE DISAPPROVED ☐
PFE: [signature] DATE 2/3/92

ACTION BY ENGINEERING – DESCRIPTION OF CHANGE

THIS IS: DCN #
TO DWG # REV.
SCN #
TO SPEC. # REV.
DEVIATION # D
DATE
PAGE OF

REMARKS

RESP. ENGR: DATE CHKD:

GROUP SUPV. DATE

CHIEF ENGINEER DATE

PROJECT ENGR. APPROVAL YES ☐ NO ☐

DATE

SAR CHANGES YES ☐ NO ☐

CDT – DATE

TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reaves File: 0080

GPD-13222 Rev. 3/81 (Form No. 9545-8-C)

FOR INFORMATION ONLY Date: 3/10/82

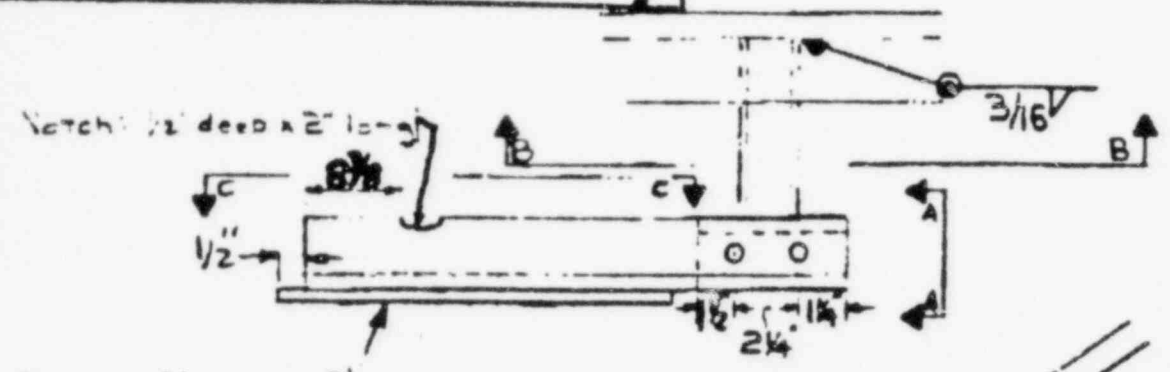
SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

ECN-CHTN No. M-1141

PAGE 2 OF 2

ATTACHMENT; 4, 2 OF 2

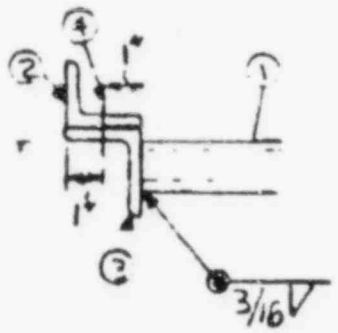
Existing 4"x4"x3/8" HVAC Duct Supports 02 Z7 [illegible] H01



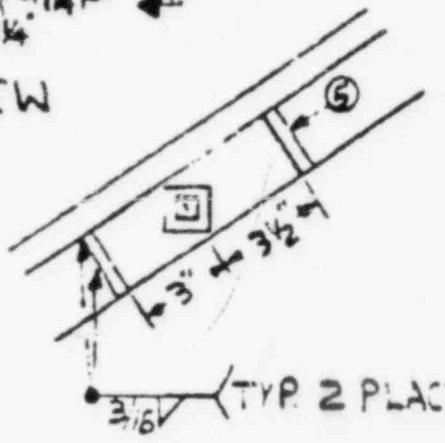
Notch 1/2" deep x 2" long

Solenoid Mounting Ft

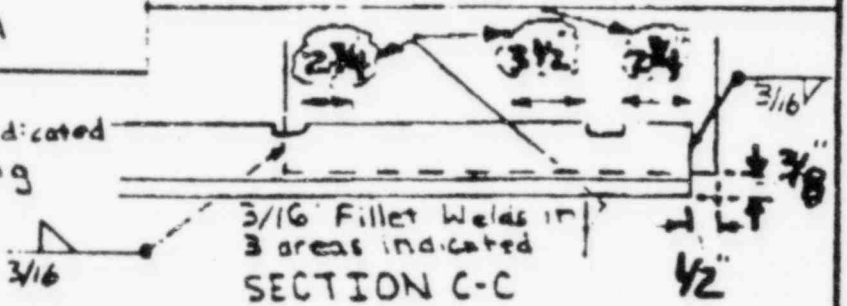
PLAN VIEW



SECTION A-A



SECTION B-B



2 Notches as indicated ½" deep x 3/4" Long

3/16 Fillet Welds in 3 areas indicated

SECTION C-C

BILL OF MATERIALS

ITEM	DESCRIPTION
1	TS 2x2x¼ - 6 3/8" long
2	∠ 1½x2x¼ x 19 7/8" long
3	∠ 2x3 x ¼ x 5" long
4	2- 9/16 Ø holes for 2- ½ Ø 2" Long A-307 Bolts
5	□ 3½ x 3½ x ½ (2 total)

GPO-13222-A 1/78

CALCULATION SHEET

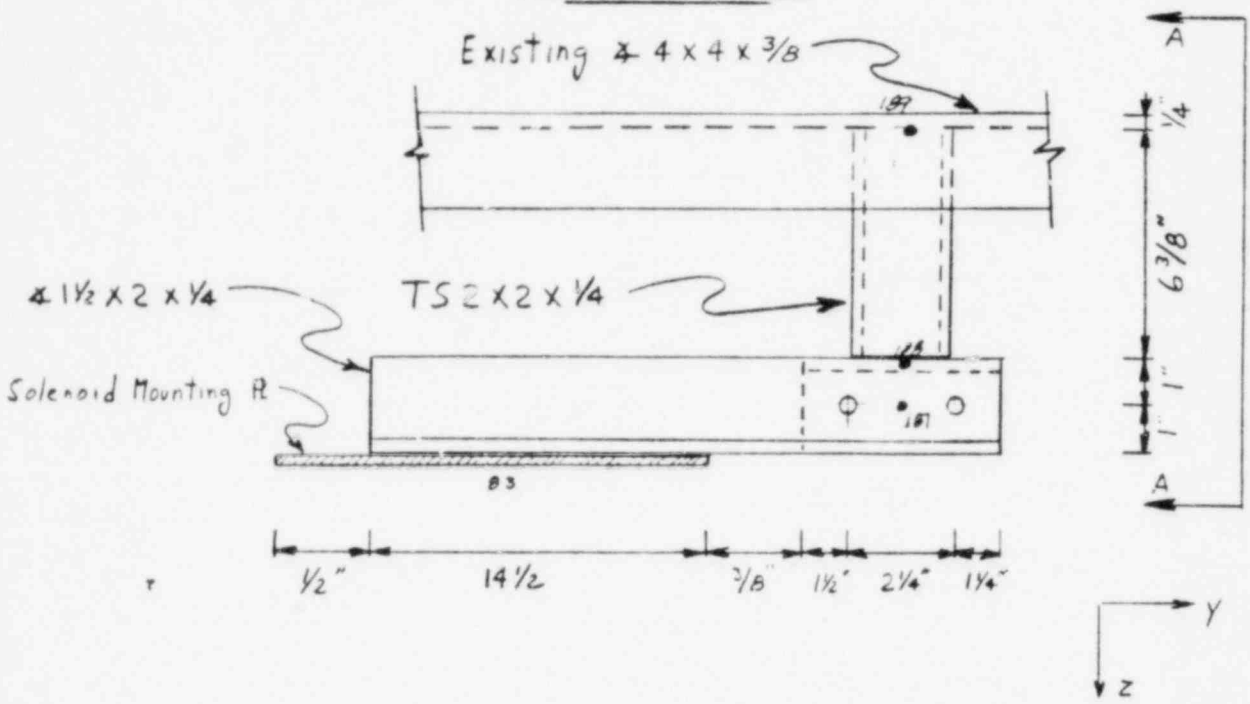
JOB NO. 9645 CALC NO. Q1Z77, Q2Z77 REV. NO. A

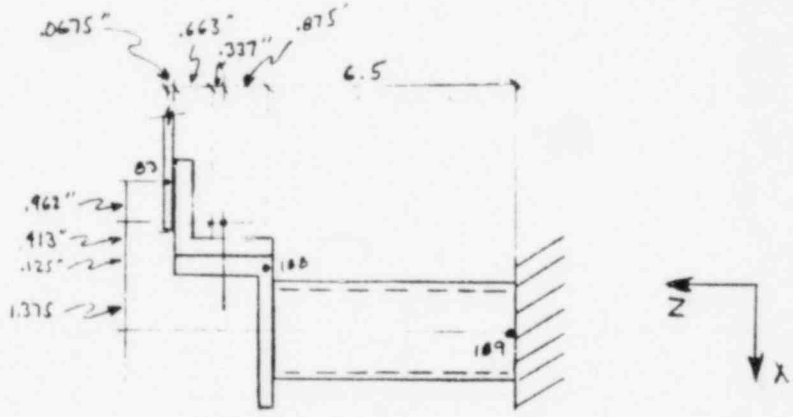
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Roger Mitts DATE 2-17-82

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Descoteaux DATE 2/26/82

SOLENOID MOUNTING PLATE SHEET NO. 13 OF 95

FCN-M-1141





SECTION A-A

FROM DP	TO DP	SECTION
183	187	∠ 1½ x 2 x ¼
187	188	SOLID RECTANGLE 5 x ¼
188	189	TS 2 x 2 x ¼

MPL # N/A

CHANGE REQUEST/NOTICE 08 10

JOB NO. 9645

CR No. ECN-M-1140

PAGE 1 OF 2

REF. DWG. OR SPEC. NO. 2NS-M-6171-98-1.1-6-5 REV. 5 TITLE Safety Related Automatic Control Dampers.

REASON FOR CHANGE/EXISTING CONDITION

All supports to station solenoid mounting plate on actuator Q2E71F001A.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See page 2

ATTACHMENT; I, 1 OF 2

FOR INFORMATION ONLY Date: 3/10/82

Q

WPMR # Q2E71G003-C

PREPARED BY: [signature] DATE 1/15/82

PFE APPROVED FOR - SUBMIT TO PROJECT ENG. ☐
PFE APPROVED FOR - PROCEED WITH WORK ☒
PFE DISAPPROVED ☐
PFE: [signature] DATE 2/5/82

ACTION BY ENGINEERING – DESCRIPTION OF CHANGE --

THIS IS: DCN #
TO DWG # REV.
SCN #
TO SPEC. # REV.
DEVIATION # ①
DATE
PAGE OF

REMARKS

RESP. ENGR: DATE CHKD:

GROUP SUPV. DATE

CHIEF ENGINEER DATE

PROJECT ENGR. APPROVAL YES ☐ NO ☐

DATE

SAR CHANGES YES ☐ NO ☐

CDT – DATE

TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reaves File: 0080V

GPD-13272 Rev. 3-81 (Form No. 9645-9-C)

3

FOR INFORMATION ONLY Date: 3/10/82

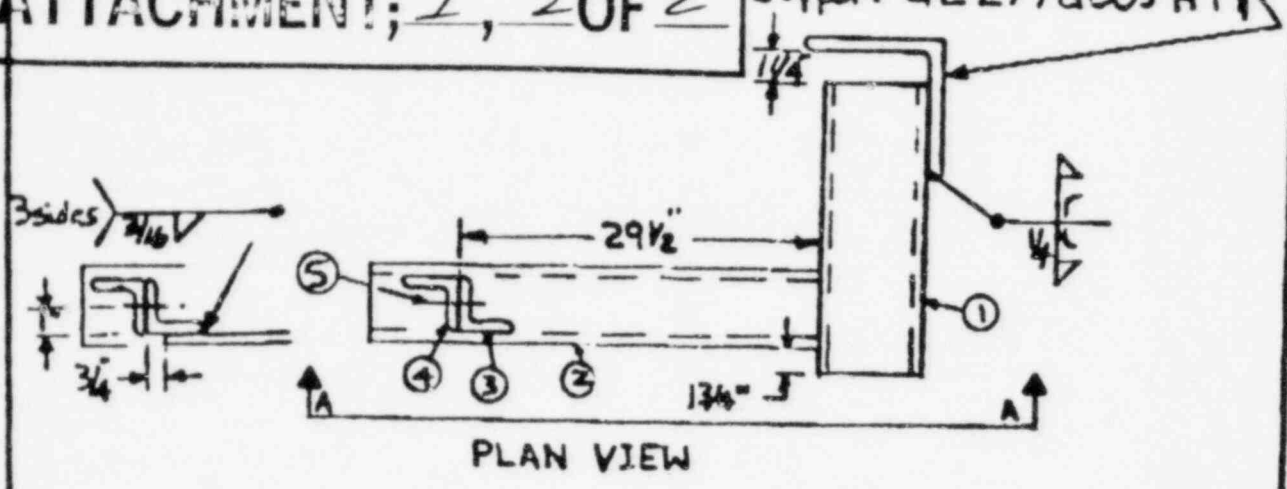
SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

FCN/CR No. M-1140

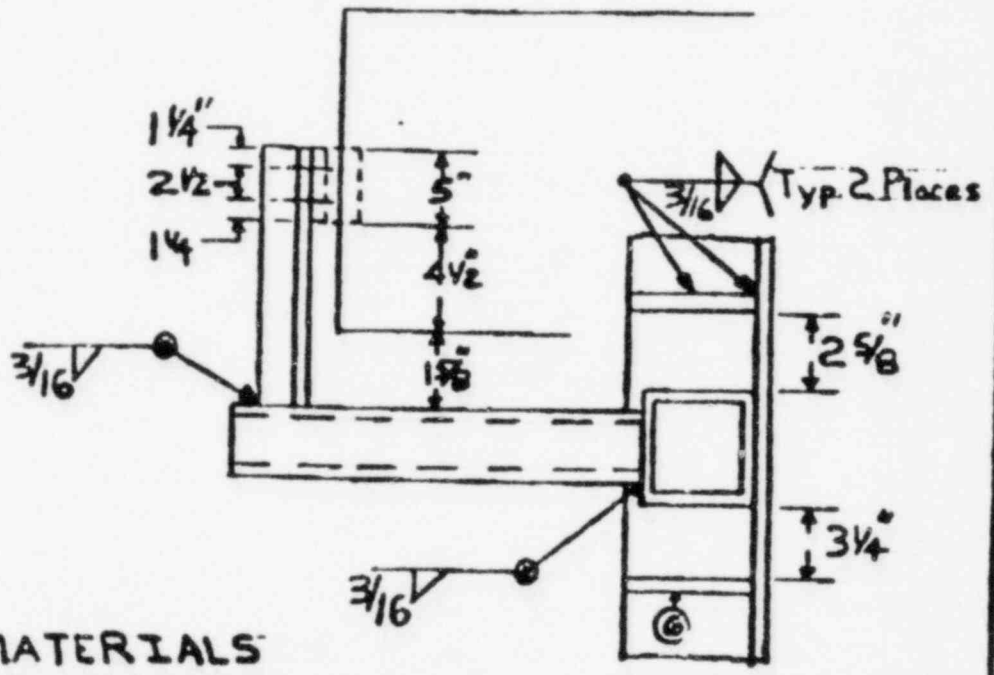
PAGE 2 OF 2

ATTACHMENT; 1, 2 OF 2

Existing 4"x6"x3/8" : HVAC Support Q2Z77G003 H19



PLAN VIEW



BILL OF MATERIALS

ITEM #	DESCRIPTION
1	TS 4" x 4" x 1/4" x 9" Long
2	TS 3" x 3" x 1/4" x 29 3/4" Long
3	∠ 2" x 2" x 1/4" x 5" Long
4	∠ 2" x 2" x 1/4" x 11 1/4" Long
5	2-9/16" Ø holes for 1/2" Ø A307 Bolts W/Nuts
6	PL 5 1/2" x 5 1/2" x 1/2" (2 total)

Q

GPD-12222-A 1/78

CALCULATION SHEET

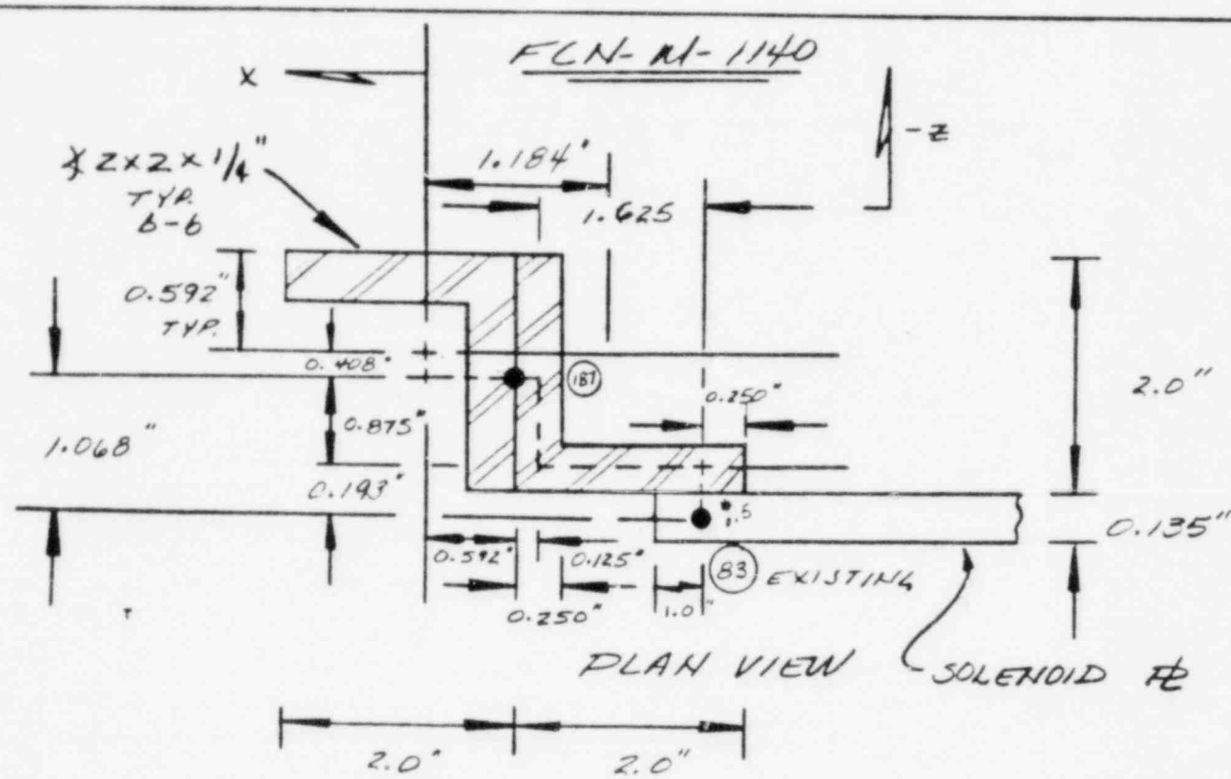
JOB NO. 9645 CALC NO. Q1777, Q2777 REV. NO. A

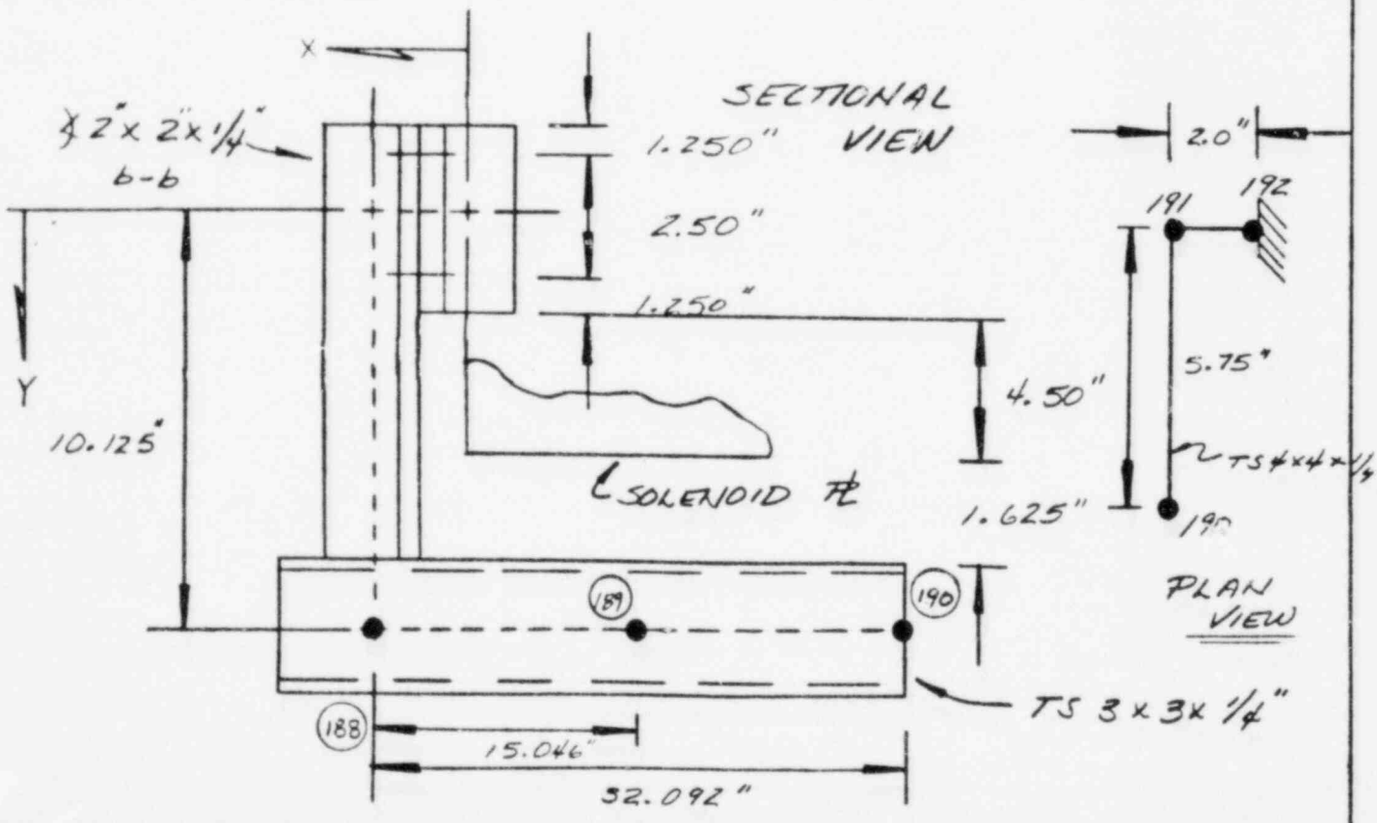
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 3/9/82

SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 3/9/82

SOLENOID MOUNTING PLATES SHEET NO. 14 OF 95

FCN-M-1140





NPL: N/A

CHANGE REQUEST/NOTICE 03 NO ☐

JOB NO. 9645

CR No. FCN-M-1143

PAGE 1 OF 2

REF. DWG. OR SPEC. NO. 46A6M-4174-03-1.1-6-5 REV. 5 TITLE Safety Related Automatic Coaxial Dampers

REASON FOR CHANGE/EXISTING CONDITION

Add support to stiffen solenoid mounting plate on actuator Q2377500B.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See page 2

ATTACHMENT; I, 1 OF 2

FOR INFORMATION ONLY Date: 3/10/82

Q

WP&IR # Q2.2776003-C

PREPARED BY [signature] DATE 1/5/82 & 2/5/82

PFE APPROVED FCR - SUBMIT TO PROJECT ENG. ☐
PFE APPROVED FCN - PROCEED WITH WORK ☒
PFE DISAPPROVED ☐
PFE: RJ Alexander DATE 2/5/82

ACTION BY ENGINEERING – DESCRIPTION OF CHANGE --

THIS IS: DCN #
TO DWG # REV.
SCN #
TO SPEC # REV.
DEVIATION # D
DATE
PAGE OF

REMARKS

RESP. ENGR: DATE CHKD:

GROUP SUPV. DATE

CHIEF ENGINEER DATE

PROJECT ENGR. APPROVAL YES ☐ NO ☐

SAR CHANGES YES ☐ NO ☐

CDT – DATE

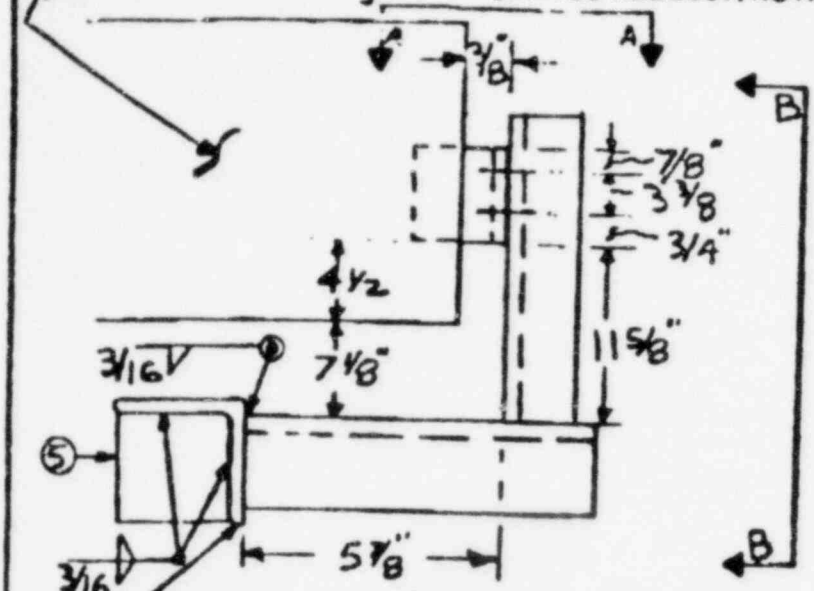
TO: C. D. Wood cc: L. F. Dale; C. K. McCo T. E. Rivers File: 0080V DATE

GPO-13722 Rev. 3'81 (Form No. 9645-9-C)

FCN-CR/N No. M-1143

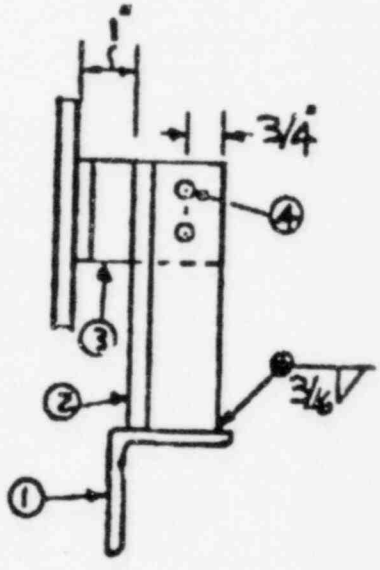
SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

Solenoid Mounting Bracket



Existing ∠ 4"x4"x1/4" : HVAC Duct Support Q2Z77G003H24

SECTION A-A



SECTION B-B

ATTACHMENT; 1, 2 OF 2

FOR INFORMATION ONLY Date: 3/10/82

BILL OF MATERIALS

ITEM #	DESCRIPTION
1	∠ 3"x3"x1/4"x9" Long
2	∠ 2"x2"x1/4"x16 3/4" Long
3	∠ 1 1/2"x3"x1/4"x5" Long
4	2-9/16" Ø holes for 1/2" Ø A307 Bolts W/ Nuts
5	R 3 3/4"x3 3/4"x3/8"

CALCULATION SHEET

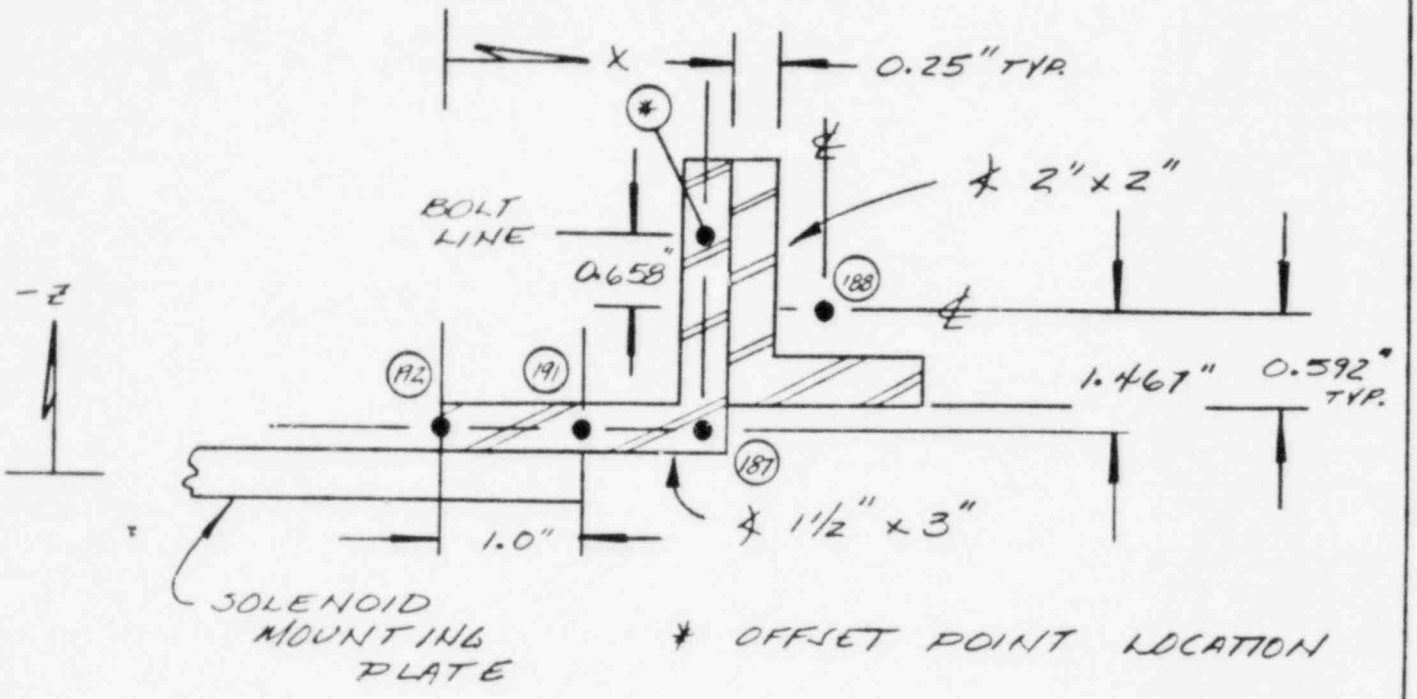
JOB. NO. 9645 CALC. NO. Q1277, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [illegible] DATE 3/8/82

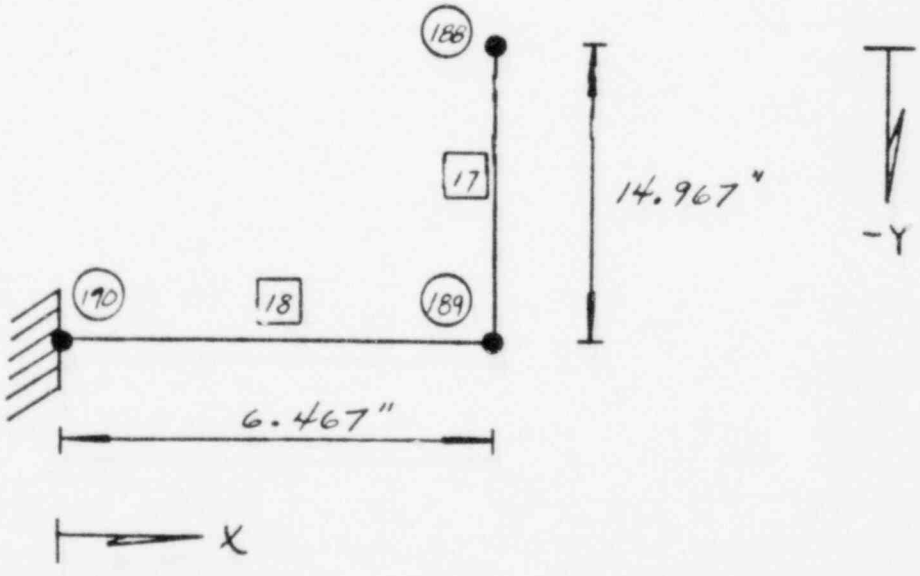
SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Discoteaux DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO 15 OF 95

FCN-M-1143



PLAN VIEW



CALCULATION SHEET

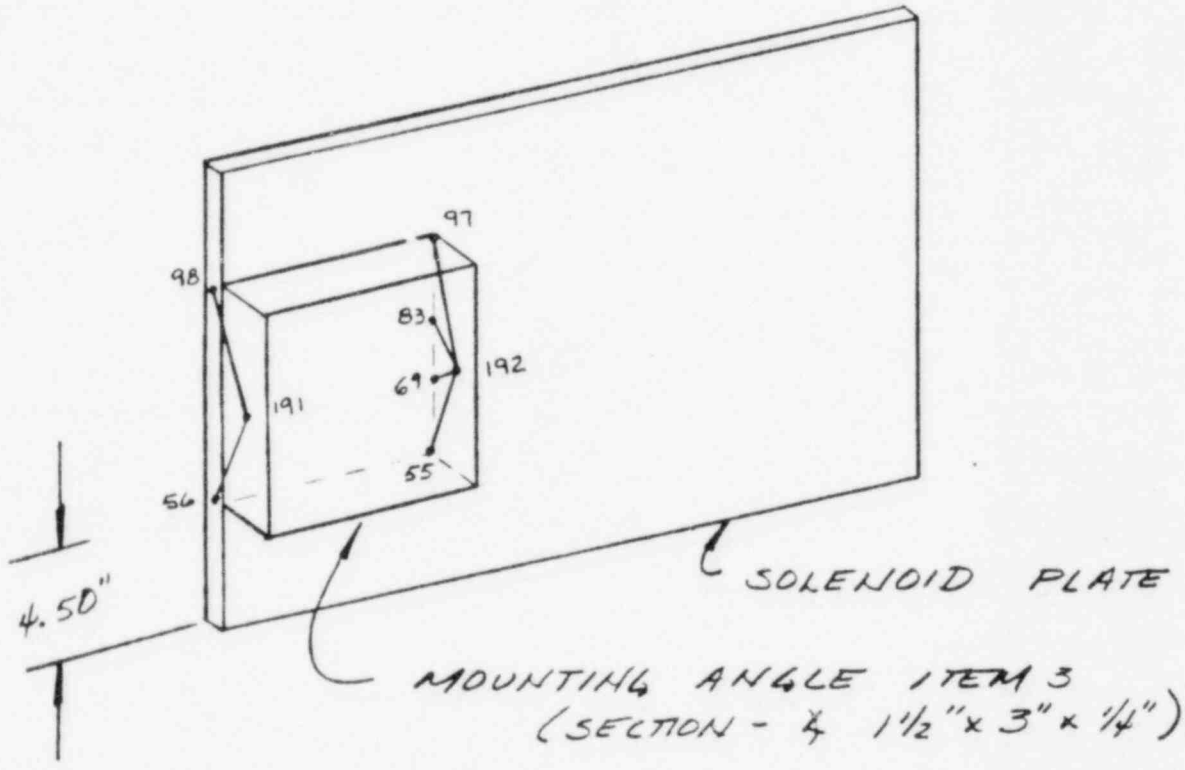
JOB NO. 9645 CALC NO. Q1277, Q2277 REV NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 3/10/82

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Descoteaux DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO 16 OF 95

FCN-M-1143 (CONT.)



NODAL POINT CONFIGURATION

CALCULATION SHEET

JOB NO. 9645 CALC NO. Q1Z77, Q2Z77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGH COMPANY BY Stephen A. Descoteaux DATE 3/10/82

SUBJECT GRAND GULF NUCLEAR STATION CKD James H Ellyson DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 17 OF 95

REACTIONS AT CONNECTION OF SUPPORT STRUCTURE TO HVAC DUCT EXISTING MEMBER FOR FCN-M-1143

ANCHOR POINT IS AT NODE 190, END OF MEMBER 18; DEAD LOAD AND SEISMIC LOAD EFFECTS MUST BE ADDED:

DEAD LOAD (SEE EQUILIBRIUM CHECK OF STATIC RUN)

F_{x1}	F_{x2}	F_{x3}	M_{x1}	M_{x2}	M_{x3}
0.9#	1.8#	0.3#	6.4"#	0.5"#	19.1"#

DYNRE 4 (SEE BEAM END LOADS AT NODE 190, BEAM ELEMENT NO. 18)

F_{x1}	F_{x2}	F_{x3}	M_{x1}	M_{x2}	M_{x3}
4.3#	38.9#	5.3#	22.5"#	27.8"#	166.9"#

TOTAL

F_{x1}	F_{x2}	F_{x3}	M_{x1}	M_{x2}	M_{x3}
5#	41#	6#	29"#	28"#	186"#

CALCULATION SHEET

JOB NO. 9645 CALC NO. G1277, Q2777 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Stephen A. Descoteaux DATE 3/10/82

SUBJECT GRAND GULF NUCLEAR STATION CKD James W Calloway DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 18 OF 95

MAXIMUM QUADRILATERAL PLATE STRESSES FOR FCN-M-1143

DEAD LOAD AND SEISMIC LOAD EFFECTS MUST BE COMBINED:

DEAD LOAD (SEE MAXIMUM SURFACE STRESS SUMMARY FOR QUADRILATERAL STRESSES IN STATIC RUN)

MAXIMUM QUAD. # STRESS = 1225.5 PSI @ QUAD. # NO. 69

SEISMIC LOAD (SEE MAXIMUM RESPONSES SECTION OF QUAD.-PLATE STRESSES ON DYNRE4 RUN)

THE FOLLOWING MAXIMUM SURFACE STRESSES ARE LISTED:

+Z FACE: $S_X = 1794.9$ PSI, $S_Y = 1900.0$ PSI, $S_{XY} = 722.7$ PSI

-Z FACE: $S_X = 1280.1$ PSI, $S_Y = 1169.4$ PSI, $S_{XY} = 444.7$ PSI

(ALL VALUES @ QUAD. # NO. 69 EXCEPT 444.7 PSI)

PRINCIPAL STRESSES: MAX. $= \frac{S_X+S_Y}{2} + \sqrt{\left(\frac{S_X-S_Y}{2}\right)^2 + (S_{XY})^2}$

MIN. $= \frac{S_X+S_Y}{2} - \sqrt{\left(\frac{S_X-S_Y}{2}\right)^2 + (S_{XY})^2}$

TAKE ABSOLUTE MAX. PRINCIPAL STRESS AT BOTH FACES:

+Z FACE $\Rightarrow$ MAX. PRIN. STRESS $= \frac{1794.9+1900.0}{2} + \sqrt{\left(\frac{1794.9+1900.0}{2}\right)^2 + (722.7)^2}$

-Z FACE $\Rightarrow$ MAX. PRIN. STRESS $= \frac{1280.1+1169.4}{2} + \sqrt{\left(\frac{1280.1+1169.4}{2}\right)^2 + (444.7)^2}$

+Z FACE IS WORST CASE: MAX. PRINCIPAL STRESS = 3831.2 PSI

TOTAL MAXIMUM QUADRILATERAL PLATE STRESS = 1225.5 + 3831.2 = 5057 PSI

CALCULATION SHEET

JOB NO. 9645 CALC NO. G1Z77; Q2Z77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Stephen A. Descoteaux DATE 3/10/82

SUBJECT GRAND GULF NUCLEAR STATION CKD James H. Allyn DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 19 OF 95

MAXIMUM BEAM STRESS FOR FCN-M-1143

DEAD LOAD AND SEISMIC LOAD EFFECTS MUST BE COMBINED:

DEAD LOAD (SEE STATIC RUN BEAM STRESS SUMMARY)

MAX. COMBINED AXIAL AND BENDING STRESS = 91.63 PSI
AT MEMBER 17

MAX. COMBINED SHEAR STRESS ($f_{v2}+f_{v3}+T$) = 185.66 PSI
MAX. SUM OF
ALL MEMBERS

SEISMIC LOAD (TAKE MAXIMUM VALUES FROM DYNRE4 RUN)

MAX. COMBINED AXIAL AND BENDING STRESS = 605.36 PSI (MEM. 17)

MAX. COMBINED SHEAR STRESS = 264.122 PSI (MEM. 18)

TOTAL: MAX. COMBINED AXIAL AND BENDING STRESS = 696.99 PSI *

MAX. COMBINED SHEAR STRESS = 452.16 PSI

* WORST BEAM STRESS

MAXIMUM BEAM LOADS FOR FCN-M-1143

DEAD LOAD AND SEISMIC LOAD EFFECTS MUST BE COMBINED:

DEAD LOAD (SEE STATIC RUN BEAM ELEMENT LOADS SUMMARY)

	P	V_2	V_3	M_T	M_2	M_3
MAXIMUM BEAM LOADS	5.2#	11.0#	3.6#	17.7"#	15.3"#	19.1"#

SEISMIC LOAD (SEE MAXIMUM BEAM END LOADS ON DYNREH RUN)

	P	V_2	V_3	M_T	M_2	M_3
MAXIMUM BEAM LOADS	38.9#	39.1#	9.6#	22.5"#	82.8"#	165.9"#

TOTAL MAXIMUM BEAM LOADS:

P	V_2	V_3	M_T	M_2	M_3
44#	50#	13#	40"#	98"#	185"#

UPL # N/A

CHANGE REQUEST/NOTICE 0 ☒ 10 ☐

JOB NO. 9648

~~ORIG~~ FCN-M-1145

PAGE 1 OF 2

REF DWG OR SPEC. NO. 9645-M-DM-GS-1.1-6-5 REV. 5 TITLE Safety Related Auxiliary Control Compressor

REASON FOR CHANGE/EXISTING CONDITION

Add support to stiffen solenoid mounting plate on Q2377F002A.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See page 2

ATTACHMENT; K, 1 OF 2

FOR INFORMATION ONLY Date: 3/10/92

Q

WP&R # Q2377F002-C

PREPARED BY: [signature] DATE 1/15/92

PFE APPROVED FCR - SUBMIT TO PROJECT ENG. ☐
PFE APPROVED FCN - PROCEED WITH WORK ☒
PFE DISAPPROVED ☐
PFE: [signature] DATE 2/5/92

ACTION BY ENGINEERING – DESCRIPTION OF CHANGE --

THIS IS: DCN #
TO DWG # REV.
SCN #
TO SPEC # REV.
DEVIATION # D
DATE
PAGE OF

REMARKS

RESP. ENGR. DATE CHKD:

GROUP SUPV. DATE

CHIEF ENGINEER DATE

PROJECT ENGR. APPROVAL YES ☐ NO ☐

SAR CHANGES YES ☐ NO ☐

CDT – DATE

CDT – DATE

TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reaves File: 0080/

GPC 1222 Rev. 3 81 (Form No. 9645-8-C)

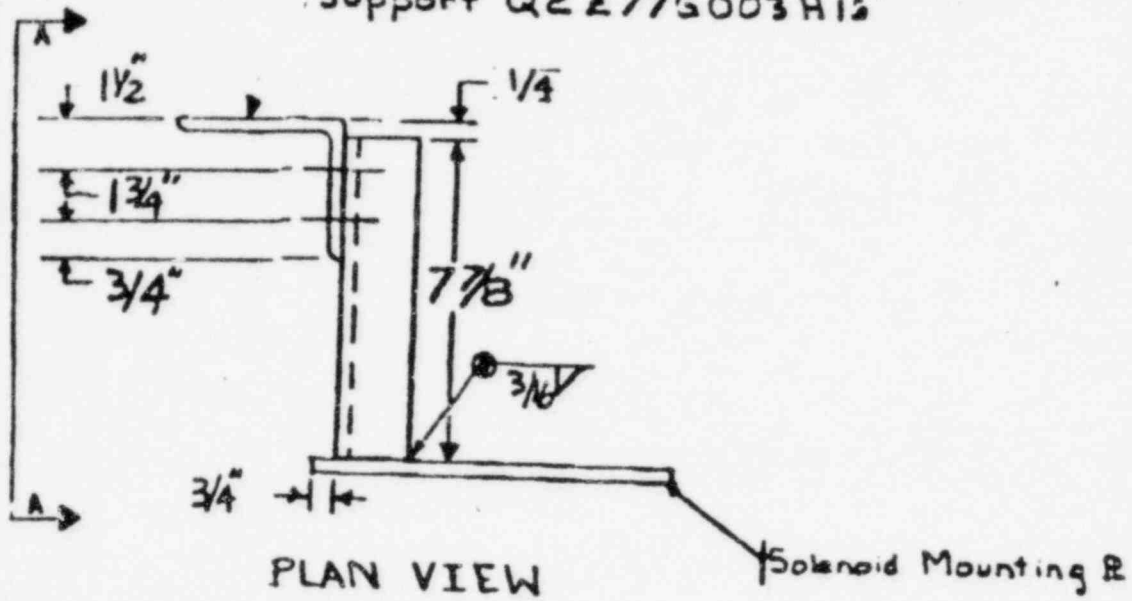
See next page (5)

SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

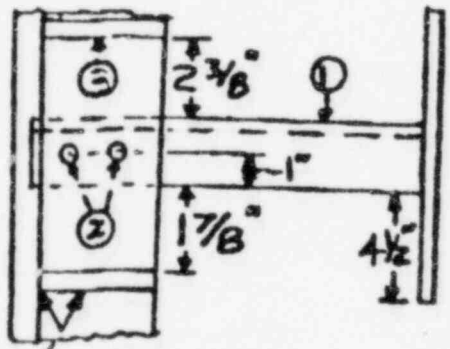
FCV-CR/N No. M-1145

PAGE 2 OF 2

Existing 4 4"x4"x 3/8" HVAC Duct Support Q2Z77S003 H15



PLAN VIEW



TYP 3/16

SECTION A-A

FOR INFORMATION ONLY Date: 3/10/82

ATTACHMENT; K, 2 OF 2

BILL OF MATERIALS

ITEM No.	DESCRIPTION
1	4 2"x2"x¼" x 7 7/8" Long
2	2- 9/16" Ø holes for ½" Ø A307 Bolts
3	PL 5½"x3 1/8"x 3/8" (2 total)

Q

GPO-12222-A 1/78

6

CALCULATION SHEET

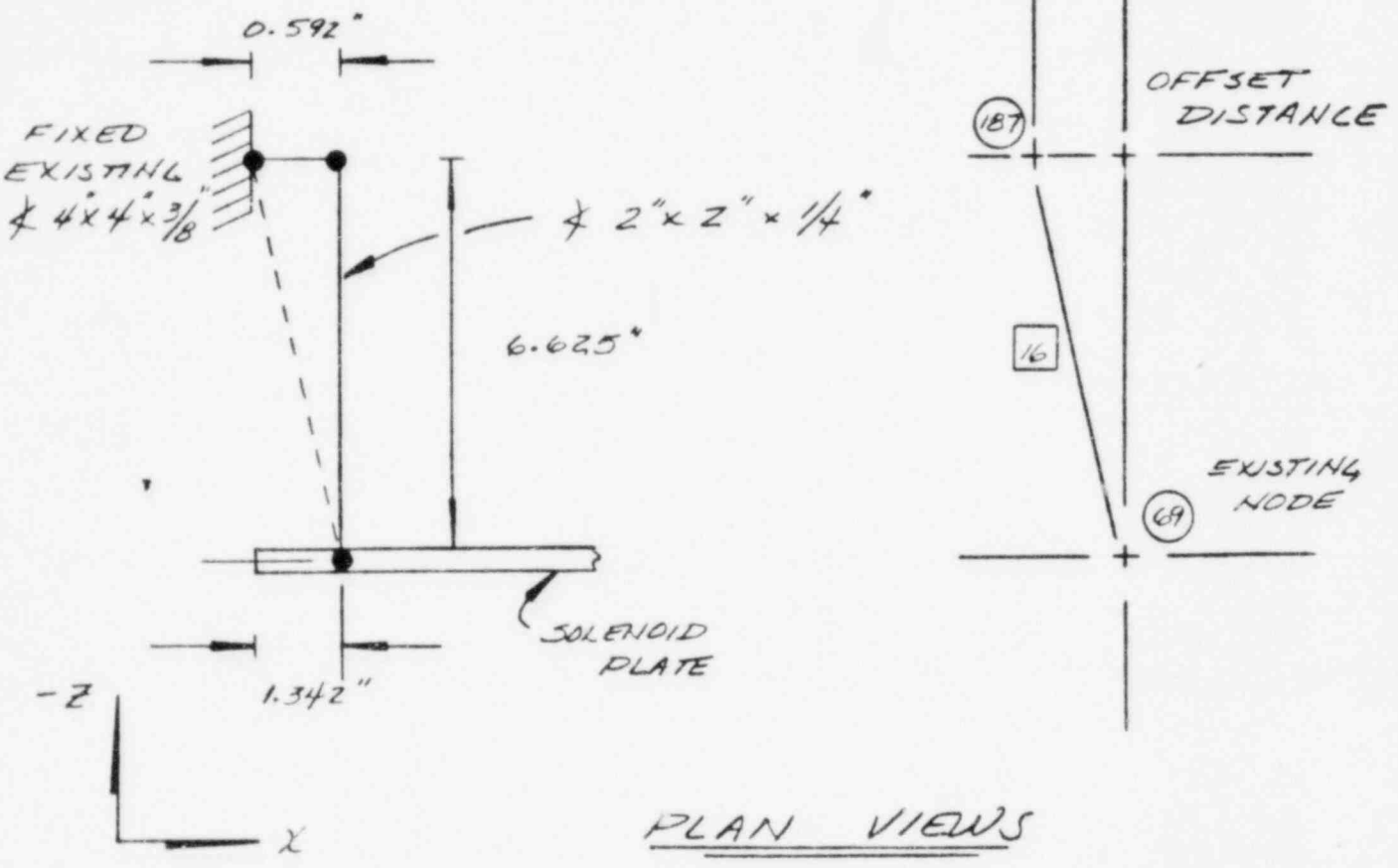
JOB NO. 9645 CALC NO. Q1277, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 3/8/82

SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 3/9/82

SOLENOID MOUNTING PLATE SHEET NO 21 OF 95

FCN-M-1145



PLAN VIEWS

NOTE: RIGID BEAM ELEMENTS CODED BETWEEN NODES 68-69, AND 55-69 TO ACCOUNT FOR THE SHAPE OF THE ∠ 2"x2"x1/4" ANGLE WELDED TO THE SOLENOID PLATE.

BECHTEL MPL # N/A

CHANGE REQUEST/NOTICE NO. 0 ☐ NO ☐

JOB NO. 9645

ORIG: ECN-M-1142

PAGE 1 OF 2

REF. DWG. OR SPEC. NO. 9645-M-5N,T-05-11-11-1 REV. | TITLE Safety Related

REASON FOR CHANGE/EXISTING CONDITION Interferes Control Damper

Add support to clutch solenoid mounting plate on actuator QR1Z75035B.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See page 2.

ATTACHMENT; 1, 1 OF 2

FOR INFORMATION ONLY Date: 3/10/92

WP&R # Q1Z776003-C

PREPARED BY: [signature] DATE 3/5/92

PFE APPROVED FOR - SUBMIT TO PROJECT ENG. ☐
PFE APPROVED FCN - PROCEED WITH WORK ☐
PFE DISAPPROVED ☐
PFE: [signature] DATE 3/10/92

ACTION BY ENGINEERING – DESCRIPTION OF CHANGE

THIS IS: DCN # _____
TO DWG # _____ REV. _____
SCN # _____
TO SPEC. # _____ REV. _____
DEVIATION # D 1
DATE _____
PAGE ___ OF ___

REMARKS _____

RESP. ENGR: _____ DATE _____ CHKD: _____

GROUP SUPV. _____ DATE _____

CHIEF ENGINEER _____ DATE _____

PROJECT ENGR. APPROVAL YES ☐ NO ☐

DATE _____

CDT – _____ DATE _____

BAR CHANGES YES ☐ NO ☐

TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reames File 0080/

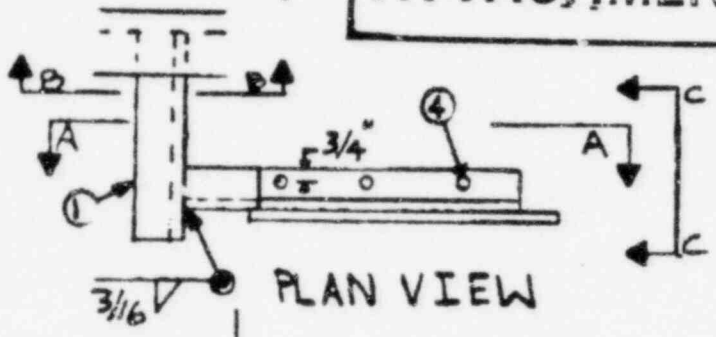
SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

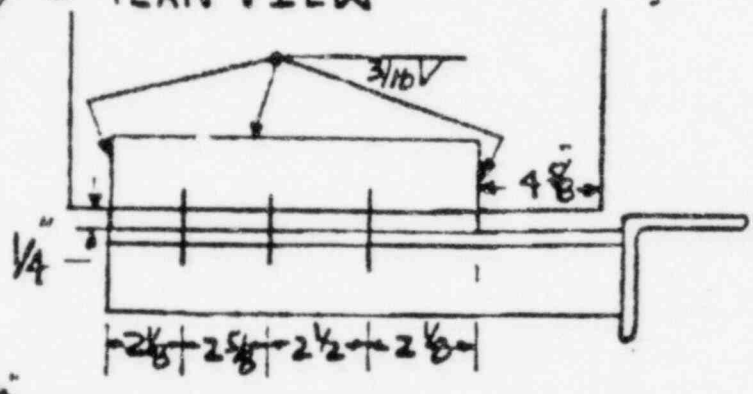
FCN-CRAN No. M-1142

PAGE 2 OF 2

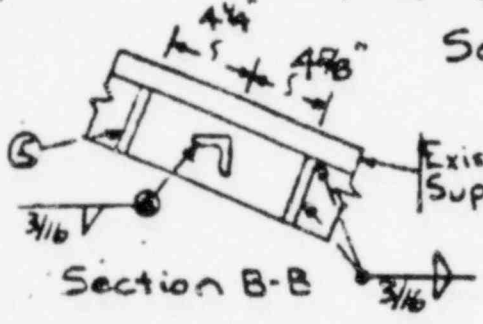
ATTACHMENT; 1, 2 OF 2

FOR INFORMATION ONLY Date: 3/10/82



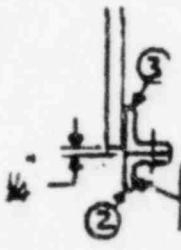


Section A-A



Existing 4 3"x 3"x 1/4" HVAC Support Q1277G003H10

Section B-B



Section C-C

BILL OF MATERIALS

ITEM No.	DESCRIPTION
1	4 2"x2"x 1/4" x 6" Long
2	4 1 1/2"x 1 3/8" x 1/4" x 14 3/4" Long
3	4 1 1/2"x 1 1/2" x 1/4" x 9 3/8" Long
4	3- 9/16" Ø Bolt holes for 3- 1/2" Ø A 307 Bolts
5	2- L 2 1/2" x 2 1/2" x 3/8"

Q

CALCULATION SHEET

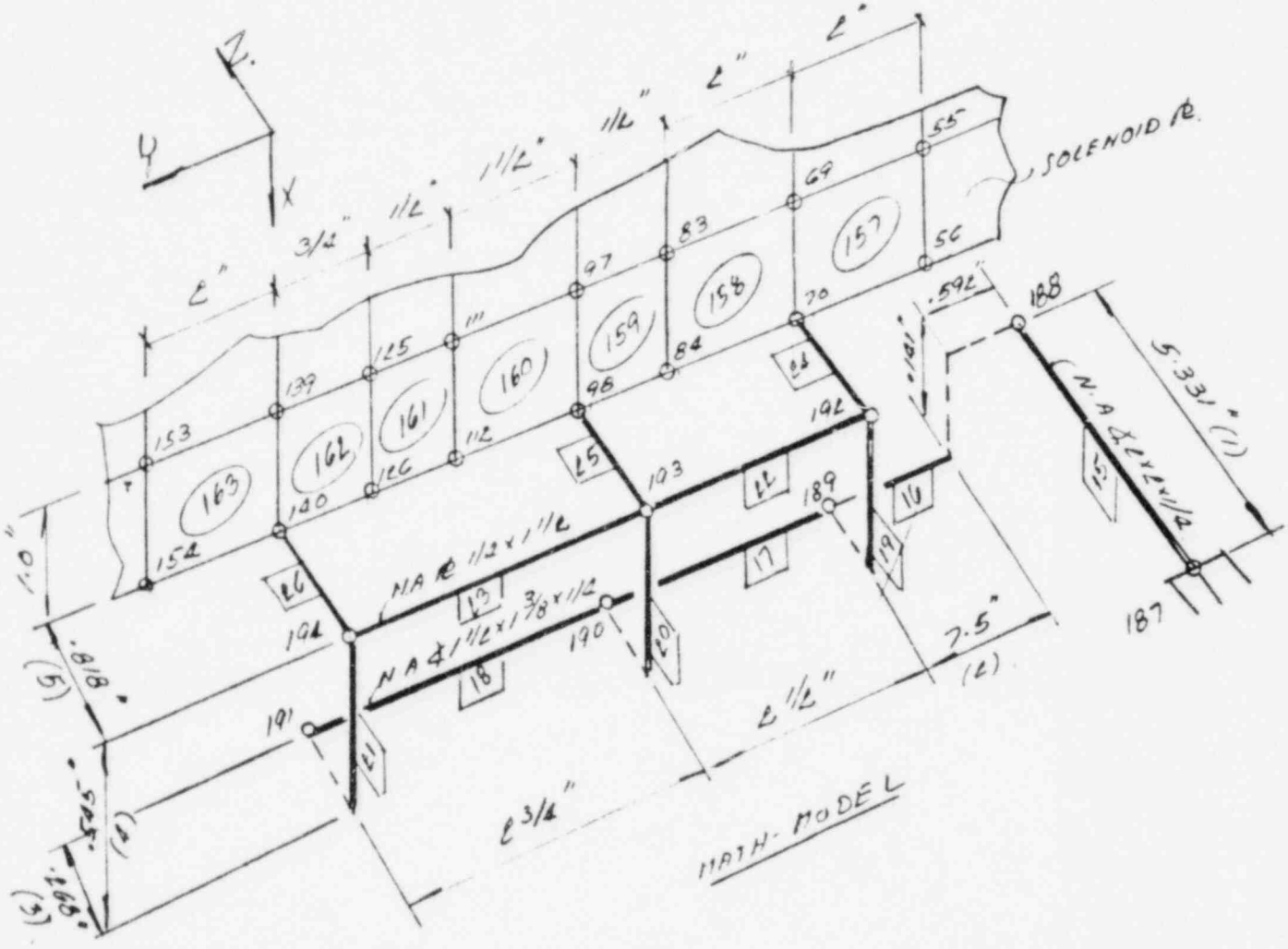
JOB NO. 9605 CALC NO. Q1Z77, Q2Z77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Vird. Vaupot DATE FEB 23,82

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Descoteaux DATE 2/24/82

SOLENOID MOUNTING RL SHEET NO. 22 OF 95

FCN-M1-1142



(1) = LENGTH OF L − SIZE OF WELD − $\bar{x}$ OF ITEM 2
= 6 − 3/16 − .482 = 5.331"

(2) = LENGTH OF ITEM 2 − DIST. FROM NODE 154 TO 70
= 10.75 − 2 − 2.75 − 2.5 = 7.5"

(3) = 3/8 − m (SEE M, N IN SECTION PROP)

(4) = N4 · .45/d

(5) = 3/8 × .135/Z

CALCULATION SHEET

JOB. NO. 9645 CALC. NO. QIZ77, Q2Z77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Virl. Gramp. DATE FEB 23, 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Descoteaux DATE 2/24/82

SOLENOID MOUNTING R. SHEET NO. 23 OF 95

ASSUMPTION:

1) ASSUME THAT BOLTS ARE AT NODES 192, 193, 194 WHICH JOIN SOLENOID MOUNTING R. @ NODE 70, 98, 100 RESPECTIVELY IN Z DIR. AND ARE CODED @ BOLTED NODES

2.) ADD EXTRA R W/ 1/10" THICK TO SOLENOID MOUNTING R. i.e., R NO'S 157 - 163

3.) TREAT MEM'S 22, 23 AS BEAMS W/ 1/2 x 1 1/2 SECTION.

4.) ASSUME THAT Q OF ANGLE LEGS OF ITEM 1 & OF ITEM 2 INTERSECT EACHOTHER ON SECTION A-A OF DESIGN SKETCH.

5) TREAT MEM'S 19, 20, 21 AS ∠ 1 1/2 x 1 3/8 x 1/2

6.) TREAT MEM'S 24, 25, 26 AS R 1/2 x 2

MPL # N/A

JOB NO. 9645

CHANGE REQUEST/NOTICE Q ☒ NQ ☐

ECN-M-1144

PAGE 1 OF 3

REF. DWG. OR SPEC. NO. 9645-M601-05-1.1-6-5 REV. 5 TITLE Safety Related Automatic Control Dampers

REASON FOR CHANGE/EXISTING CONDITION

Add support to stiffen solenoid mounting plate on actuator Q1Z77F003B.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See Pages 2 & 3

ATTACHMENT; M, 1 OF 3

FOR INFORMATION ONLY Date: 3/10/82

Q

WP&R # Q1Z77G003-C

PFE APPROVED FCR - SUBMIT TO PROJECT ENG. ☐
PFE APPROVED FCN - PROCEED WITH WORK ☒
PFE DISAPPROVED ☐

PREPARED BY: [signature] DATE 3/5/82

PFE: [signature] DATE 3/10/82

ACTION BY ENGINEERING - DESCRIPTION OF CHANGE - -

THIS IS: DCN #
TO DWG # ______ REV. ______
SCN #
TO SPEC. # ______ REV. ______
DEVIATION # D
DATE
PAGE ___ OF ___

REMARKS

RESP. ENGR.: ______ DATE ______ CHKD: ______

GROUP SUPV. ______ DATE ______

CHIEF ENGINEER ______ DATE ______

PROJECT ENGR. APPROVAL YES ☐ NO ☐

DATE ______

SAR CHANGES YES ☐ NO ☐

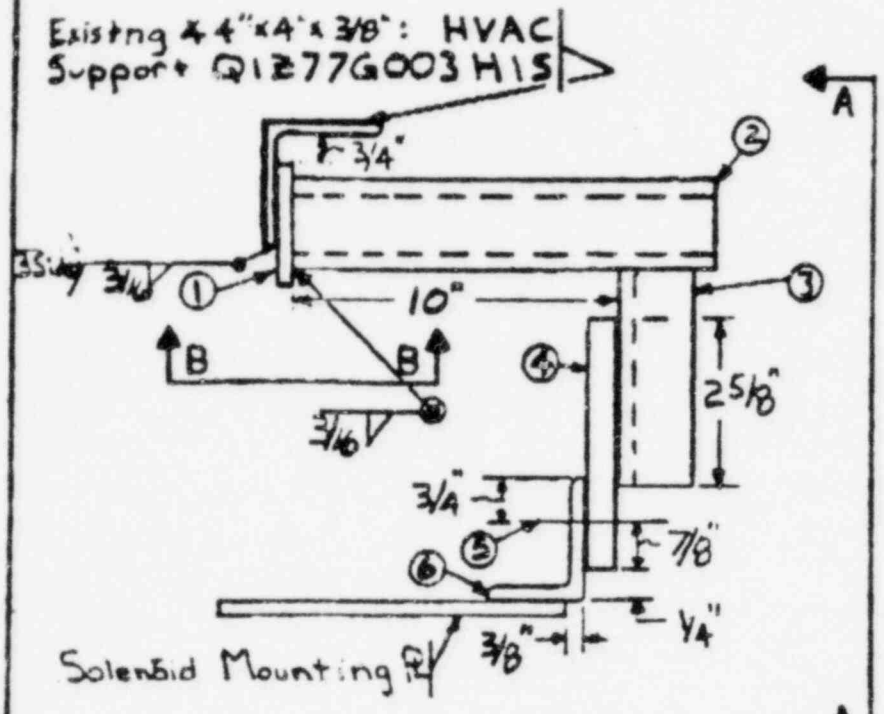
CDT - ______ DATE ______

TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reeves File: 0080/

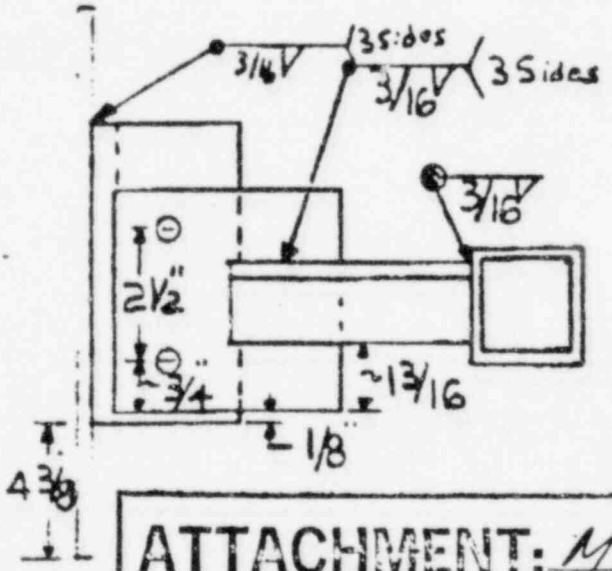
GPO-13222 Rev. 3/81 (Form No. 9645-Q-C)

FCN-
~~DRN~~ NO. M-1144

SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE



PLAN VIEW



Section A-A

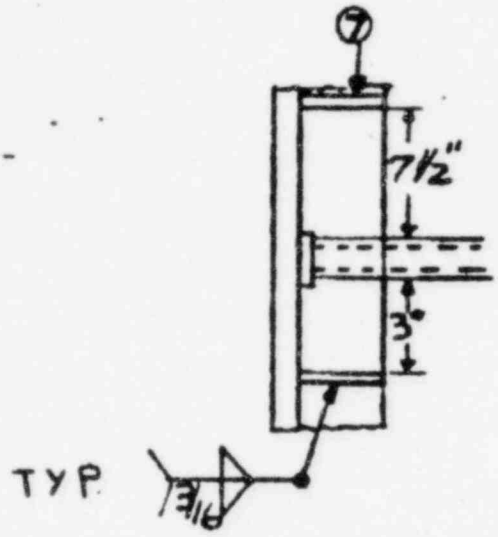
ATTACHMENT; M, 2 OF 3

FOR INFORMATION ONLY Date: 3/10/82

SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

ECN No. M-1194

PAGE 3 OF 3



Section B-B

FOR INFORMATION ONLY Date: 3/10/82

ATTACHMENT; M, 3 OF 3

BILL OF MATERIALS

ITEM No.	DESCRIPTION
1	R 3½" x 3½" x ½"
2	TS 2" x 2" x ¼" x 14" Long
3	∠ 1½" x 1½" x ¼" x 3½" Long
4	⊙ 43/16" x 4" x 3/8
5	2 - 9/16" Ø holes for 2 - ½" Ø A307 Bolts
6	∠ 2" x 1½" x ¼" x 5" Long
7	R 3½" x 3½" x ½" (2 Total)

Q

CALCULATION SHEET

JOB NO. 9665 CALC. NO. Q1Z77, Q2Z77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Vicd Nguyen DATE FEB 19, 82

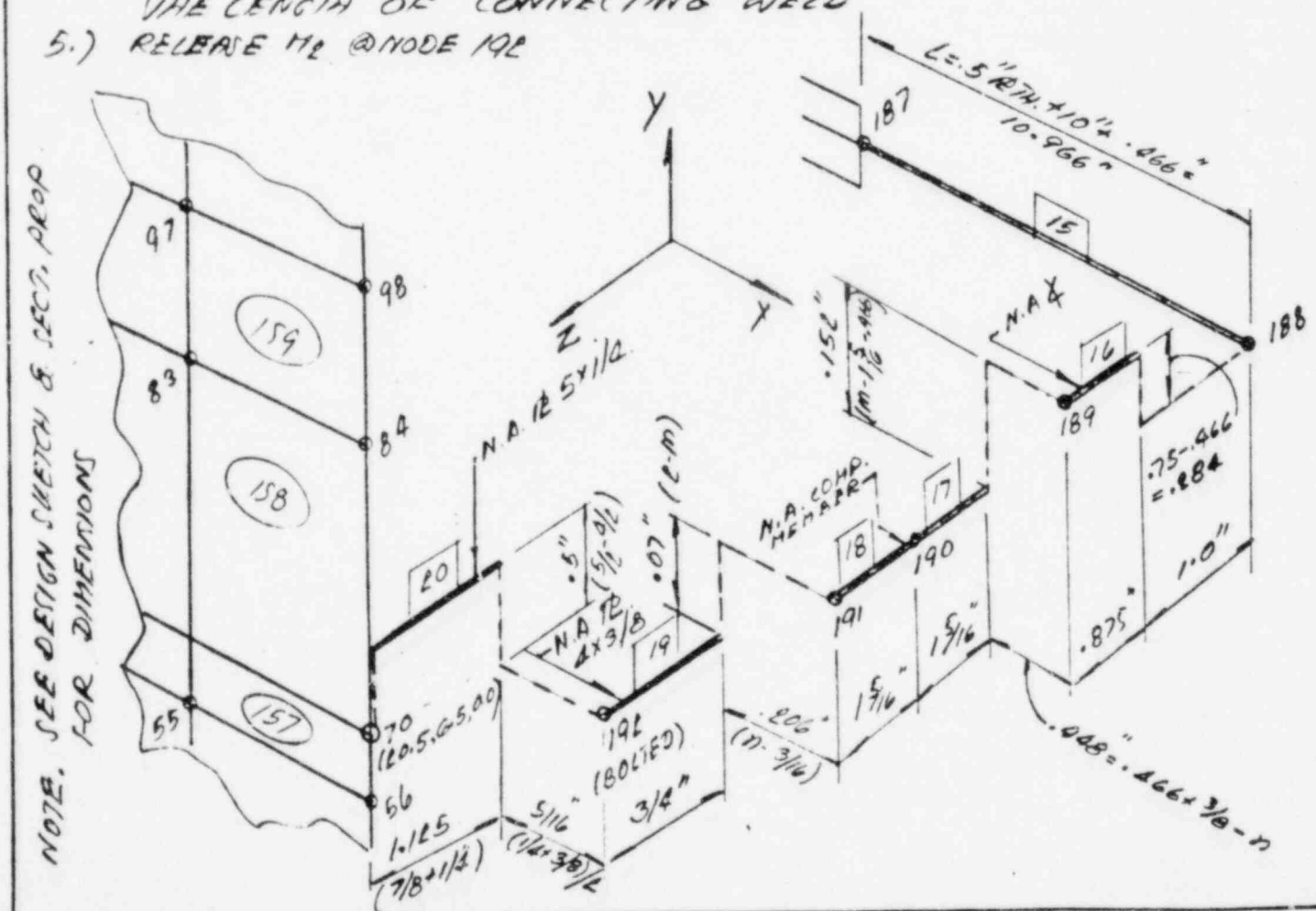
SUBJECT GRAND GULF NUCLEAR STATION CKD [illegible] DATE 2/24/82

SOLENOID MOUNTING BR SHEET NO. 24 OF 95

ACTUATOR Q1Z77F0033; FCN-M-1144.

ASSUMPTIONS = (SEE MATH. MODEL & DESIGN SKETCH FOR REF.)

1.) TREAT NODE 187 AS A FIXED JOINT
2.) ASSUME ℄ OF VERT. LEG ALONG THE MEMBER OF ITEM 3 INTERSECTS ℄ OF ITEM 2
3.) USE BEAM OFFSET FOR MEMBER 20 TO CONNECT NODE 70 ON SOLENOID MOUNTING BR.
4.) TREAT ITEM 3 & ITEM 2 AS A UNIT MEMBER THROUGHOUT THE LENGTH OF CONNECTING WELD
5.) RELEASE M_z @ NODE 190



BECHTEL

JOB NO. 9645

CR/N FCN-M-1146
PAGE 1 OF 2

REF. DWG. OR SPEC. NO. 9645-M-601-Q-4.1.4-5 REV. 5 TITLE Safety Related

REASON FOR CHANGE/EXISTING CONDITION Automatic Control Dampers

Add support to stiffen solenoid mounting plate on actuator Q1277G002A.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See page 2

ATTACHMENT; H, 1 OF 2

FOR INFORMATION ONLY Date: 3/10/82

Q

WPAR # Q1277G003-C

PREPARED BY: George Malone DATE 1/15/82

PFE APPROVED PCR - SUBMIT TO PROJECT ENG. ☐
PFE APPROVED PCN - PROCEED WITH WORK ☒
PFE DISAPPROVED ☐
PFE: R. J. Alexander DATE 2/9/82

ACTION BY ENGINEERING - DESCRIPTION OF CHANGE - -

THIS IS: DCN # ____
TO DWG # ____ REV. ____
SCN # ____
TO SPEC. # ____ REV. ____
DEVIATION # D ____
DATE ____
PAGE ____ OF ____

REMARKS ____

RESP. ENGR: ____ DATE ____ CHKD: ____

GROUP SUPV. ____ DATE ____

PROJECT ENGR. APPROVAL YES ☐ NO ☐

DATE ____

CHIEF ENGINEER ____ DATE ____

CGT - ____ DATE ____

SAR CHANGES YES ☐ NO ☐

TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reeves File: 0080/

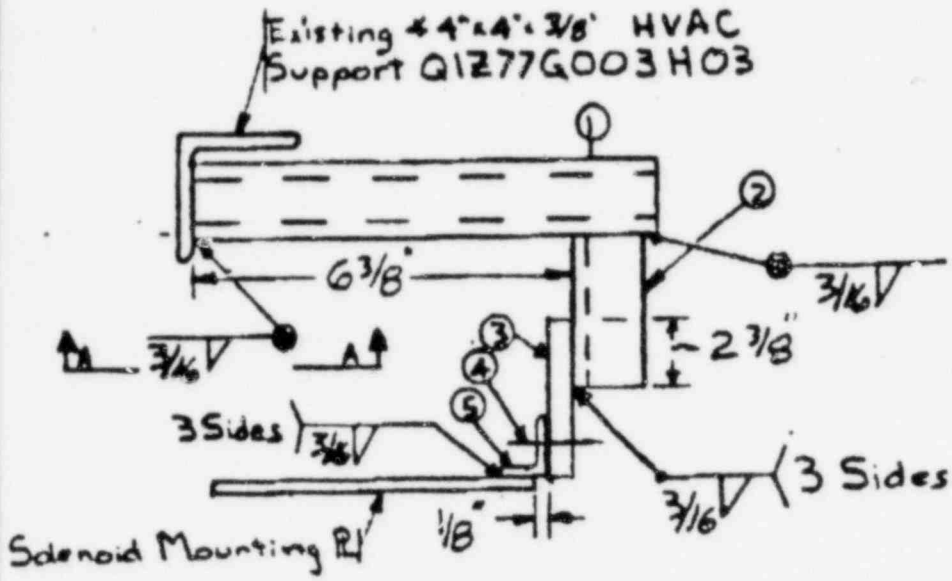
ECN-DRAN NO. M-1146

PAGE 2 OF 2

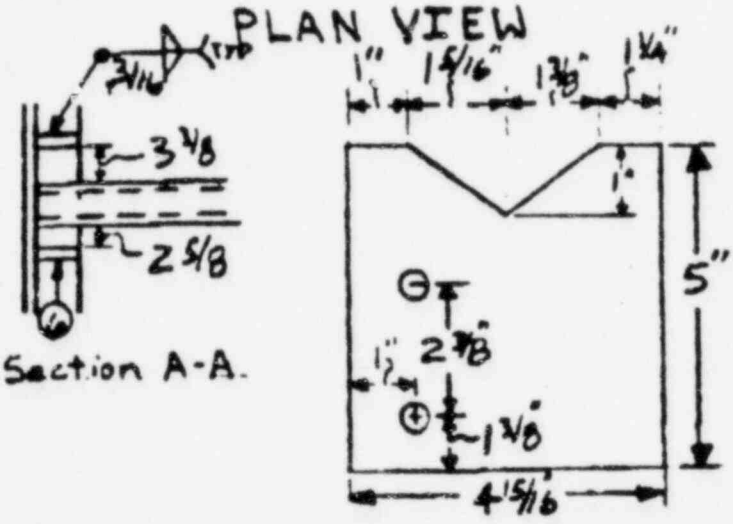
SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

FOR INFORMATION ONLY Date: 3/10/82

ATTACHMENT: N, 2 OF 2



PLAN VIEW



Section A-A.

Section View from right of PL

4 2"x1 1/4"x1/4" Plates to back of plate as shown in Plan View w/2" Long notches to match Plate. Bottom of PL (Item #3) & 2"x1 1/4"x1/4" (Item #5) is 4 3/8" above bottom of Solenoid PL.

BILL OF MATERIALS

ITEM#	DESCRIPTION
1	TS 3"x3"x1/4"x9 7/8" Long
2	4 2"x2"x1/4"x3 1/4" Long
3	PL 4 15/16" x 5" x
4	2-9/16" Ø holes for 2-1/2" Ø A307 Bolts
5	4 2"x1 1/4"x1/4"x5" Long
6	PL 3 1/2"x3 1/2"x1/2" (2 total)

GPO-12222-A 1/78

CALCULATION SHEET

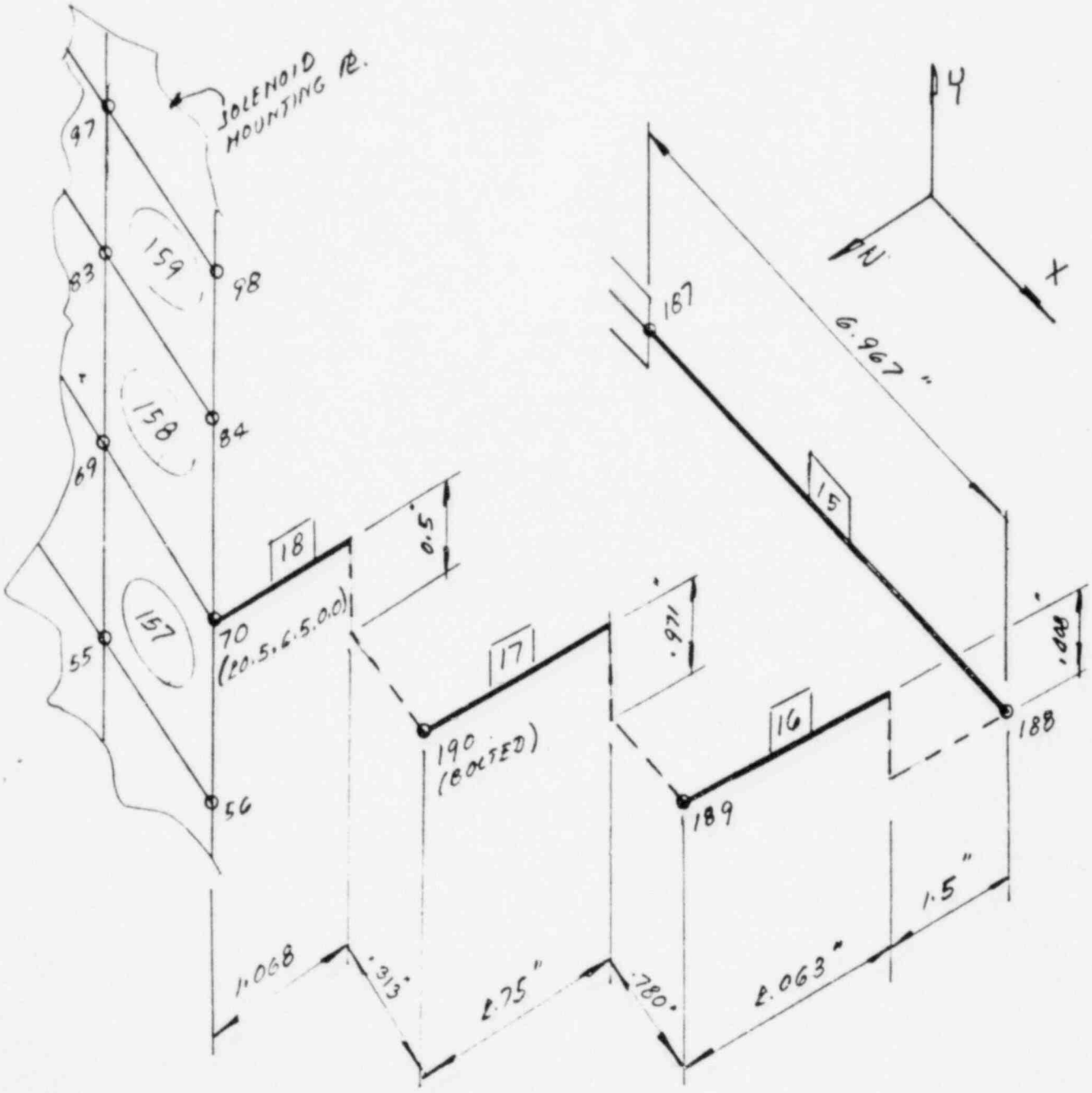
JOB. NO. 9645 CALC. NO. Q1Z77, Q2Z77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Dick A. Dayer DATE FEB 22, 82.

SUBJECT GRAND GULF NUCLEAR STATION CKD Roger Matthews DATE 2/24/82

SOLENOID MOUNTING PL SHEET NO. 25 OF 95

ACTUATOR Q1Z77 G 002A, FCN-M-1146



MATH - MODEL

CALCULATION SHEET

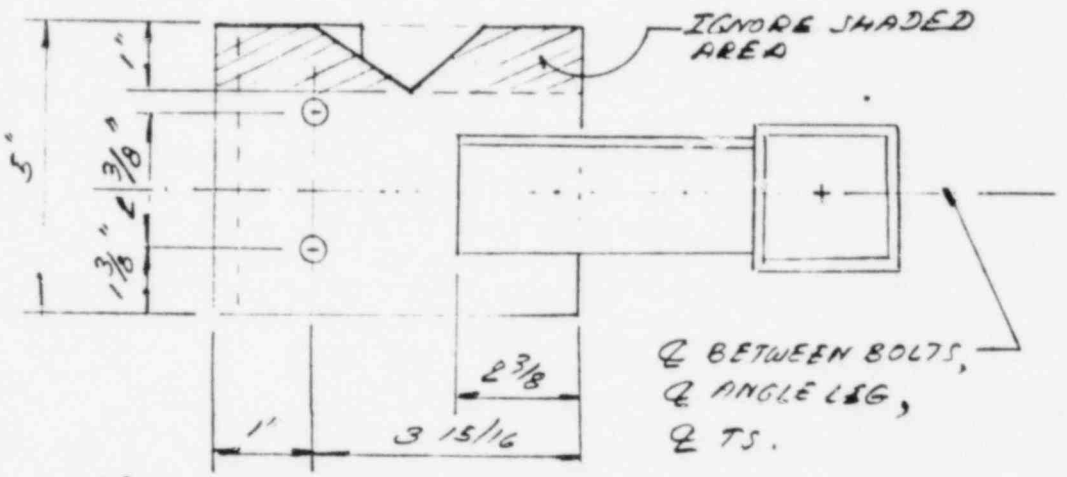
JOB NO. 9625 CALC NO. Q1277, Q2277 REV NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Vick. Nowpy DATE FEB 22, 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Roger Matt DATE 2/24/82

SOLENOID MOUNTING R SHEET NO 26 OF 95

ASSUMPTIONS: REFER TO DESIGN SKETCH, MATH-MODEL & FIGURE BELOW.



SECTION VIEW FROM RIGHT OF ℝ.

1.) ASSUMING THAT ℄ BETWEEN BOLTS, ℄ ANGLE LEG, & TS ARE AT THE SAME LEVEL

2.) IGNORE SHADED AREA OF THE ℝ.

3.) ANGLE IS MODED AS A BEAM. FROM EDGE OF TS. TO THE MID POINT OF OVERLAP OF ANGLE & THE ℝ.

4.) NODE 190 IN MAIN-MODEL IS PINNED. i.e., RELEASE M_z

5.) FIXED PT IS MODED @ NODE 187.

6.) ASSUME THE MID PT. OF THE ANGLE LENGTH (ITEM 5) LOCATED @ NODE 70 OF SOLENOID MOUNTING ℝ.

BECHTEL

MPL # N/A

JOB NO. 9645

CHANGE REQUEST/NOTICE Q ☒ NQ ☐

DRWG FCAHR-1149

PAGE 1 OF 2

REF. DWG. OR SPEC. NO. [illegible] REV. 5 TITLE Safety Related Auto Control Dampers

REASON FOR CHANGE/EXISTING CONDITION

Add support to stiffen solenoid mounting plate on actuator Q1277G002B.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See page 2

ATTACHMENT; 0, 1 OF 2

FOR INFORMATION ONLY Date: 3/10/82

Q

WPLR# Q1277G004-C

PFE APPROVED FCR - SUBMIT TO PROJECT ENG. ☐
PFE APPROVED FCN - PROCEED WITH WORK ☒
PFE DISAPPROVED ☐

PREPARED BY: [signature] DATE 2/15/82 PFE: [signature] DATE 2/9/82

ACTION BY ENGINEERING – DESCRIPTION OF CHANGE . .

THIS IS: DCN # ____
TO DWG # ____ REV. ____
SCN # ____
TO SPEC. # ____ REV. ____
DEVIATION # D ____
DATE ____
PAGE ___ OF ___

REMARKS ____

RESP. ENGR: ____ DATE ____ CHKD: ____

GROUP SUPV. ____ DATE ____

PROJECT ENGR. APPROVAL YES ☐ NO ☐

CHIEF ENGINEER ____ DATE ____

DATE ____

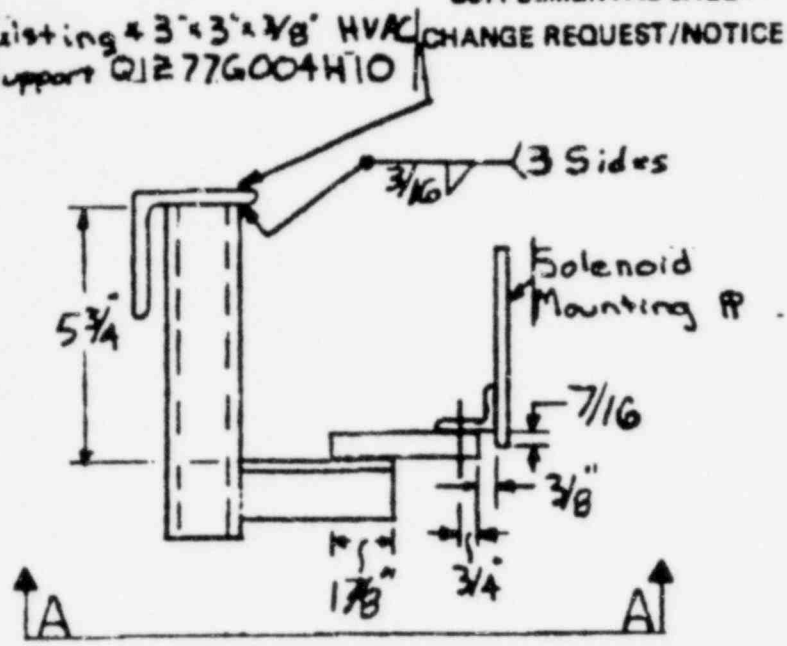
SAR CHANGES YES ☐ NO ☐

CDT – ____ DATE ____

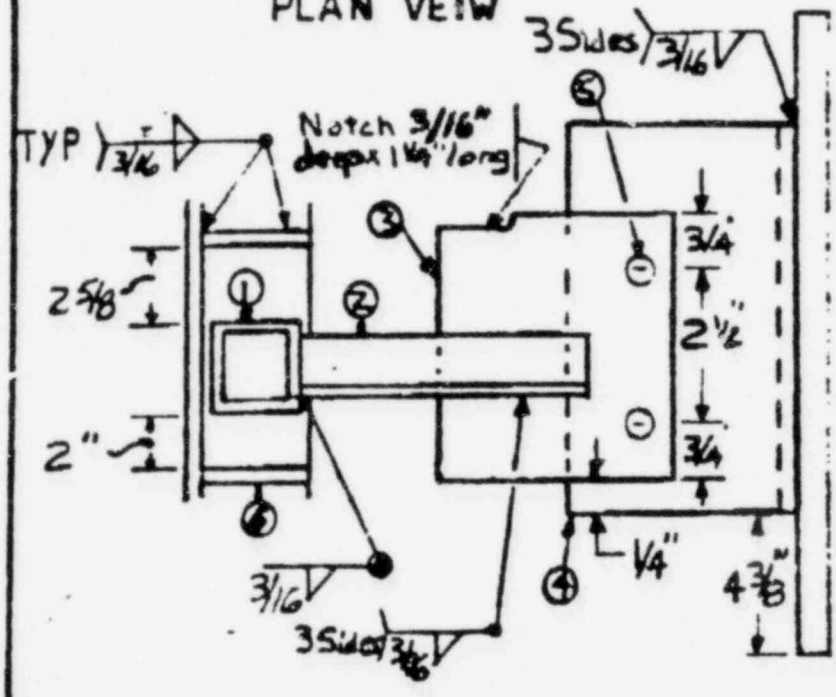
TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reeves File: 0080/

SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

FCN DRAFT NO. M-1147



PLAN VEIW



Section A-A

Bill of Materials

Item #	Description
1	TS 2"x2"x1/4"x7 3/4"
2	∠ 1 1/2"x1 1/2"x1/8"x4 1/2"
3	PL 4"x3"x3/8"
4	∠ 2"x1 1/2"x1/4"x5 1/2"
5	2-9/16" Ø holes for 2-1/2" Ø A307 Bolts W/ Nuts
6	PL 2 1/2"x2 1/2"x3/8" (2 total)

FOR INFORMATION ONLY Date: 3/10/82

Q

ATTACHMENT; 0, 2 OF 2

CALCULATION SHEET

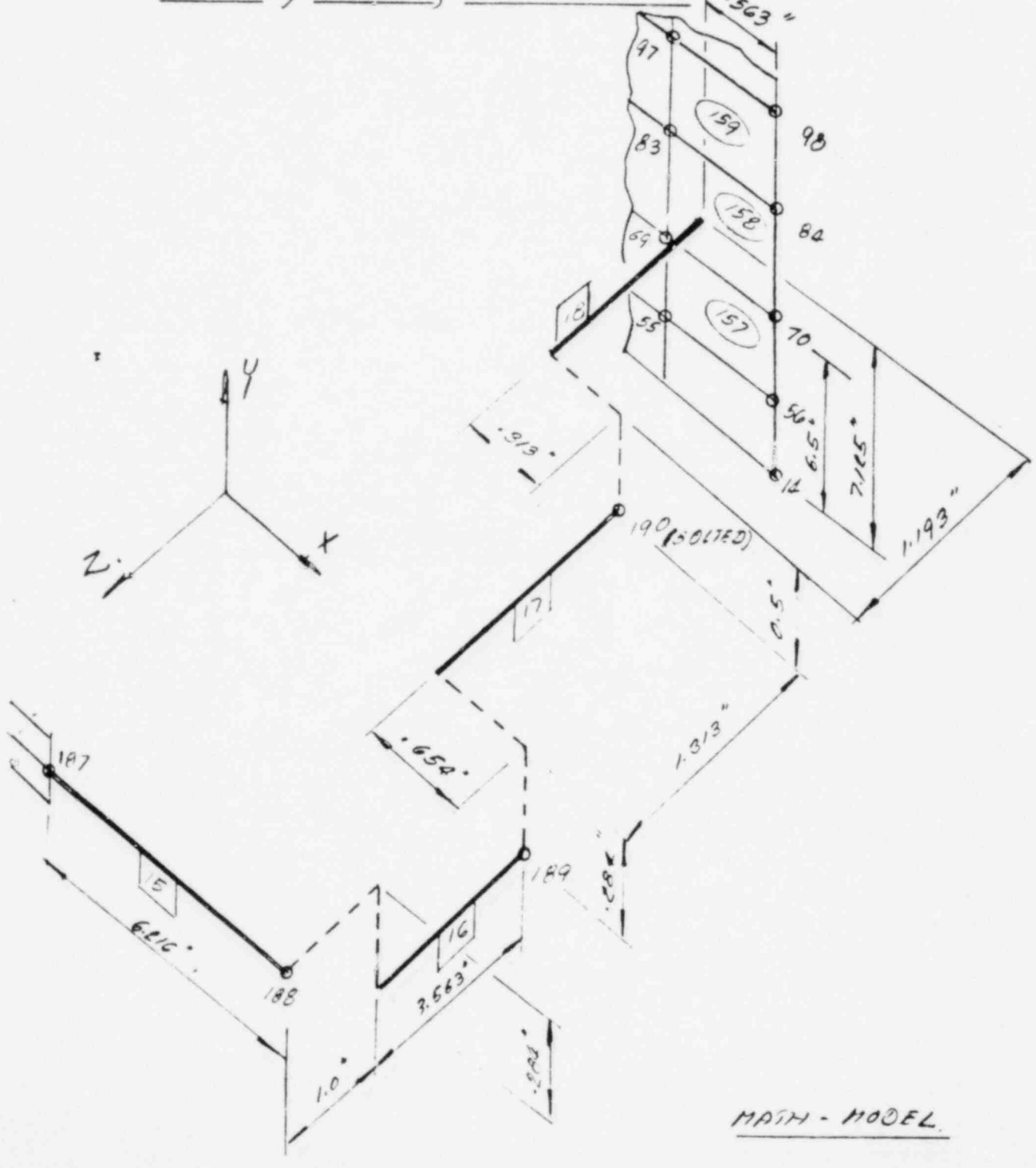
JOB NO. 9645 CALC. NO. Q1Z77, Q2Z77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Vicd Nayp V. DATE FEB. 22, 82.

SUBJECT GRAND GULF NUCLEAR STATION CKD [illegible] DATE 3/1/82

SOLENOID MOUNTING #2 SHEET NO. 27 OF 95

Q1Z77f00LB ; FCN-M-1147



MATH - MODEL

CALCULATION SHEET

JOB. NO. 9625 CALC. NO. Q1277, QZZ11 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Vicki Knapp DATE FEB 22, 82

SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 3/1/82

SOLENOID MOUNTING RR SHEET NO. 28 OF 95

ASSUMPTIONS: REFER TO DESIGN SKETCH & MATH MODEL.

1.) ON SECT A-A OF DESIGN SKETCH, ASSUMING THAT ℄ OF ITEM 1, ℄ OF VERT. LEG OF ITEM 2, ℄ OF ITEM 3 ARE AT THE SAME ELEVATION

2.) IGNORE THE NOTCH OF ITEM 3

3.) ITEM 2 IS CODED AS A BEAM (# 16) w/ ∠ 1 1/2" x 1 1/2" x 1/8" SECTION FROM EDGE OF ITEM 1 TO THE MID POINT OF OVERLAP OF ITEM 2 & ITEM 3 (1 7/8")

4.) NODE 190 ON MATH-MODEL IS PINCODED i.e. RELEASE M2.

5.) FIXED PT. IS CODED @ NODE 187

BECHTEL

MPL # N/A

CHANGE REQUEST/NOTICE Q ☒ NQ ☐

JOB NO. 9645

CR No. ECN-M-1190

PAGE 1 OF 2

REF. DWG. OR SPEC. NO. 9645-M-612.5-R1-1-6-5 REV. 5 TITLE Safety Related

REASON FOR CHANGE/EXISTING CONDITION Auto. Control Dampers

Add support to stiffen solenoid mounting plate on actuator Q2377602B.

CHANGE REQUEST/SKETCH (IF NECESSARY)

As-Built

See page 2

ATTACHMENT; P, 1 OF 2

FOR INFORMATION ONLY Date: 3/10/82

Q

WP&R # Q2E77G004-C

PREPARED BY: [signature] DATE 1/15/82

PFE APPROVED FCR - SUBMIT TO PROJECT ENG. ☐
PFE APPROVED FCN - PROCEED WITH WORK ☒
PFE DISAPPROVED ☐
PFE: [signature] DATE 2/10/82

ACTION BY ENGINEERING – DESCRIPTION OF CHANGE --

THIS IS: DCN #
TO DWG # REV.
SCN #
TO SPEC. # REV.
DEVIATION # D
DATE
PAGE OF

REMARKS

RESP. ENGR: DATE CHKD:

GROUP SUP'V. DATE

CHIEF ENGINEER DATE

PROJECT ENGR. APPROVAL YES ☐ NO ☐

DATE

CDT – DATE

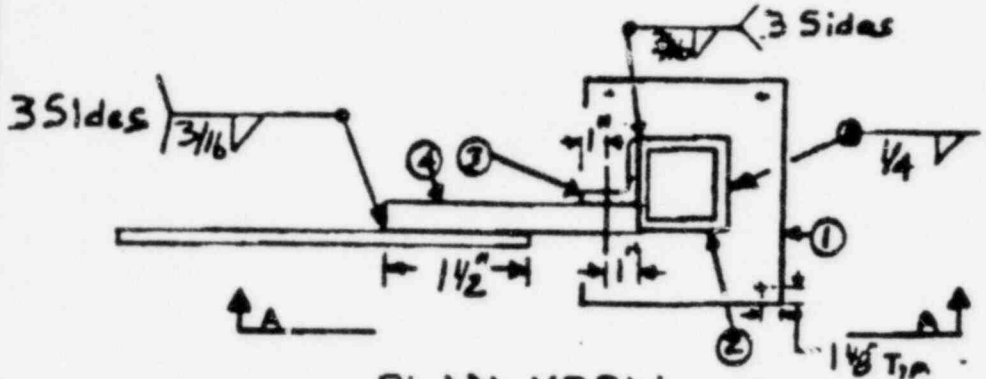
SAR CHANGES YES ☐ NO ☐

TO: C. D. Wood cc: L. F. Dale; C. K. McCoy; T. E. Reeves File: 0080/

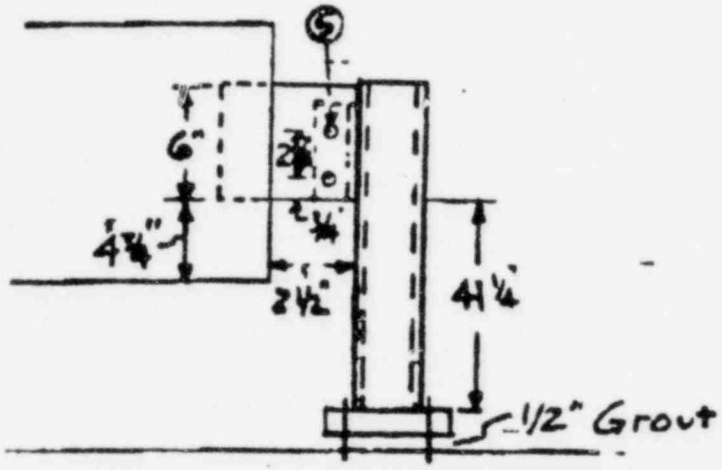
SUPPLEMENTAL SHEET
CHANGE REQUEST/NOTICE

SCN-Bldg No. M-1148

PAGE 2 OF 2



PLAN VIEW



Section A-A

FOR INFORMATION ONLY Date. 3/10/82

ATTACHMENT; P, 2 OF 2

BILL OF MATERIALS

ITEM	DESCRIPTION
1	PL 8"x8"x½" W/ 4- ½"Ø hilti bolts 5½" Long
2	TS 3"x3"x¼"x 4⅛" Long
3	L 2"x2"x¼" x 4" ong
4	PL 4"x6"x 3/8"
5	2- 9/16" Ø holes for 2-½" Ø A307 Bolts

CALCULATION SHEET

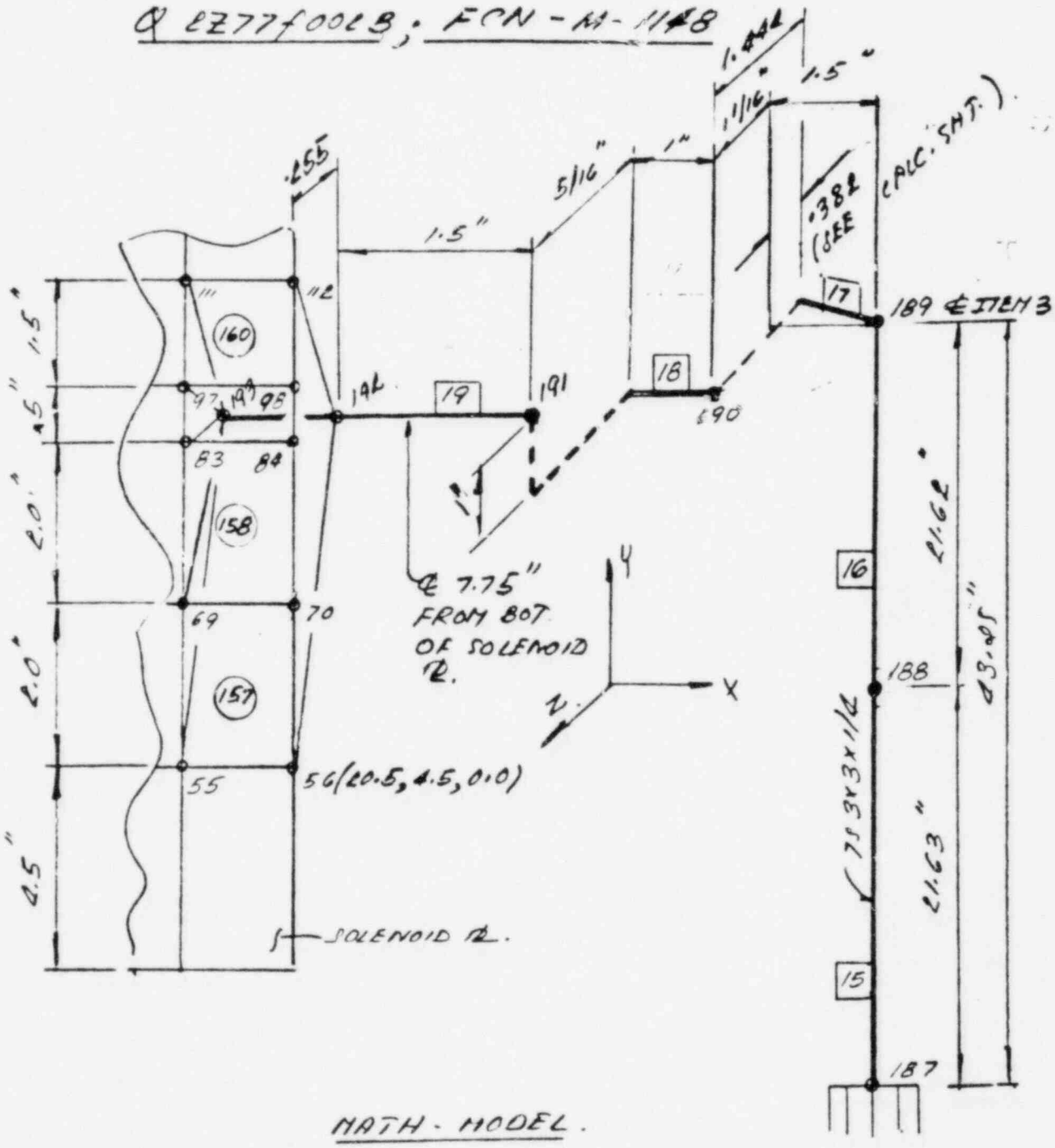
JOB. NO. 9625 CALC. NO. Q1277, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Vicd. Vaup. DATE FEB 18 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Descoteaux DATE 2/19/82

SOLENOID MOUNTING PLATE SHEET NO. 29 OF 95

Q E2777001B; ECN-M-1148



MATH-MODEL.

CALCULATION SHEET

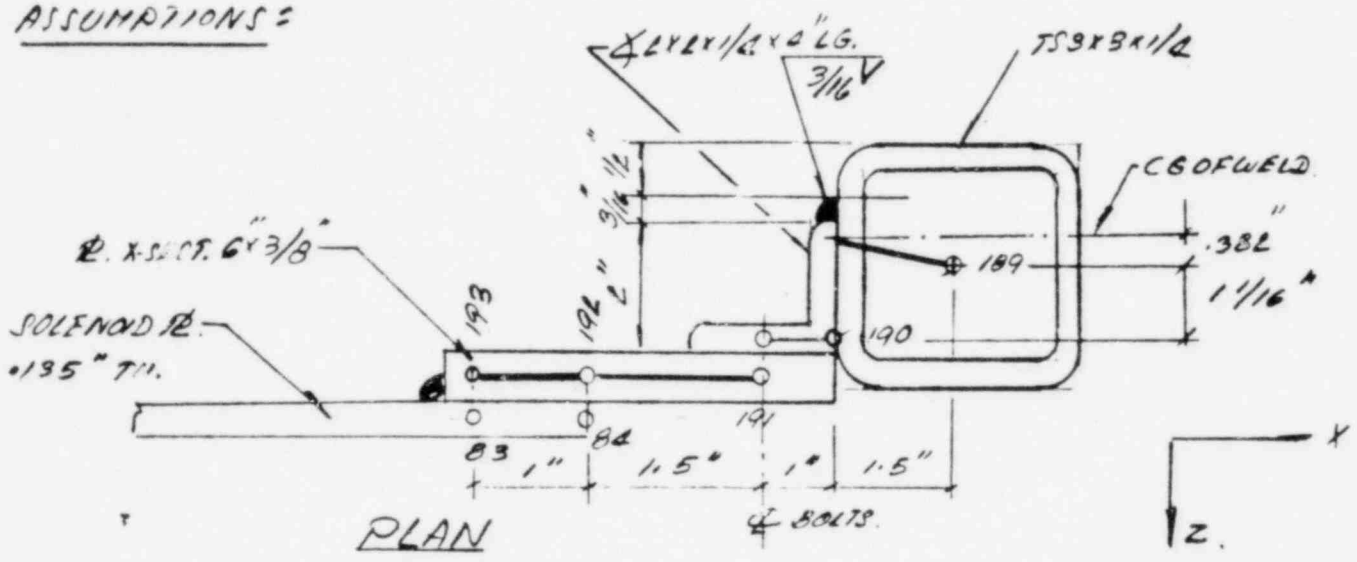
JOB. NO. 9605 CALC. NO. Q1277, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY V.C.S. - Nayak DATE FEB 19. 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Descoteaux DATE 2/19/82

SOLENOID MOUNTING PLATE SHEET NO. 30 OF 95

ASSUMPTIONS:



REFER TO MATH-MODEL & PLAN VIEW ON THIS PAGE.

1.) TREAT MEM's 19, 20 AS BEAM W/ X-SEC OF 6 x 3/8

2.) TREAT MEM 18 AS BEAM W/ X-SEC OF 4 x 1/2

3) DISTRIBUTE FORCES FROM SOLENOID MOUNTING R. TO THE ATTACHED R 6 x 3/8 BY MEM's 22-28 (USING TS 8 x 4 x 1/4)

4.) TREAT MEM 17 AS BEAM W/ X-SEC OF TS 4 x 8 x 1/4

5) RELEASE MOMENT @ WEAK AXIS OF MEM 19 @ NODE 191

CALCULATION SHEET

JOB NO. 9645 CALC. NO. Q1E77, Q2E77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Civil Engr. DATE MAR 3, 82.

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Descoteaux DATE 3/4/82

SOLENOID MOUNTING BR. SHEET NO. 31 OF 95

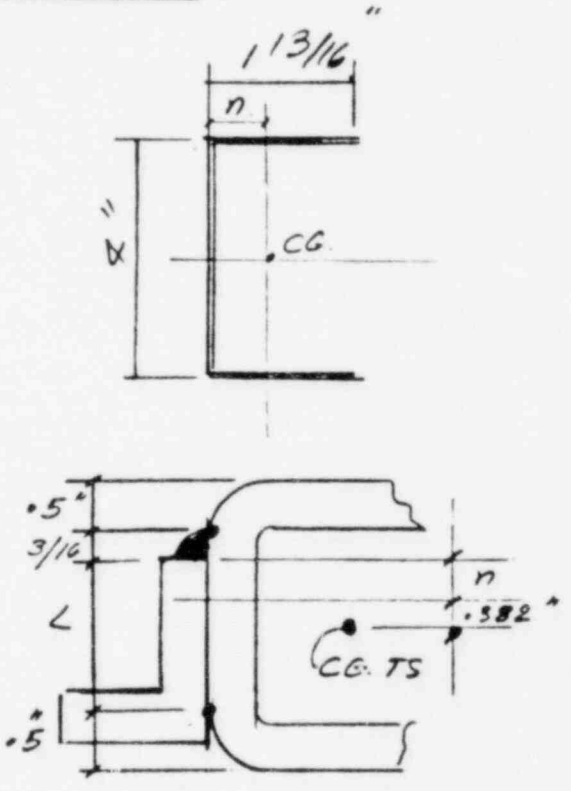
WELD 7 L2x2x1/4 TO TS 3x3x1/4.

ASSUME THAT WELD CAN NOT BE DONE AT CORNER OF TS.

i.e. L OF WELD = 3 - .5 - 3/16 - .5 = $1\frac{13}{16}$ "

CG. OF WELD; n

$$n = \frac{\ell\left(1\frac{13}{16}\right)^2 \times \frac{1}{2}}{2\left(1\frac{13}{16}\right) + 4} = .431 \text{ IN}$$



CALCULATION SHEET

JOB NO. 9645 CALC. NO. Q1277 & Q2277 REV. NO. A

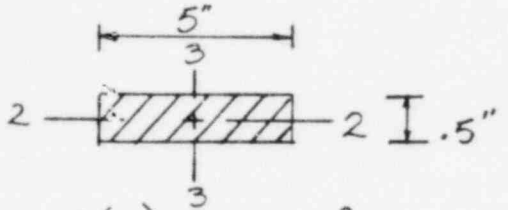
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Stephen A. Descoteaux DATE 1/29/82

SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 2/16/82

SOLENOID MOUNTING PLATE SHEET NO. 32 OF 95

1

PL 1/2" x 5"



$A = 5(.5) = 2.5 \text{ IN}^2$

$J = R = \beta bd^3 = .313(5)(.5)^3 = .196 \text{ IN}^4$

$I_{2-2} = \frac{5(.5)^3}{12} = .052 \text{ IN}^4$

$I_{3-3} = \frac{.5(5)^3}{12} = 5.208 \text{ IN}^4$

$SF2 = SF3 = 0.85$

$H_2 = 5.0 \text{ IN}$

$H_3 = .5 \text{ IN}$

$C_T = 0.5 \text{ IN}$

$SSF2 = SSF3 = 1.5$

CALCULATION SHEET

JOB NO 9645 CALC NO. Q1Z77 , Q2Z77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Stephen A. Descoteaux DATE 2/11/82

SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 2/16/82

SOLENOID MOUNTING PLATE SHEET NO 33 OF 95

2

TS 4x4x 1/4

$A = 3.54\ IN^2$

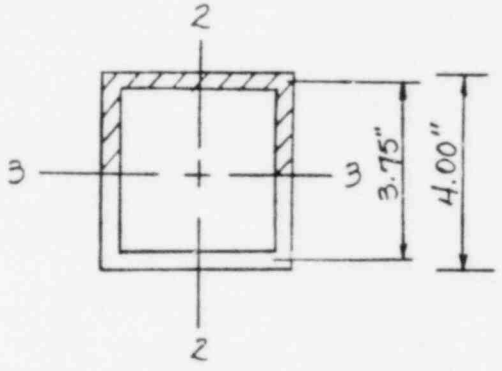
$$J = \frac{2(.25)(3.75)^2(3.75)^2}{3.75 + 3.75} = 13.184\ IN^4$$

$I_2 = I_3 = 8.00\ IN^2$

$$SF2 = SF3 = \frac{2(4.0-.25).25}{3.54} = 0.53$$

$H_2 = H_3 = 4.0\ IN$

$$C_T = \frac{3.75(3.75)}{3.75+3.75} = 1.875\ IN.$$



$Q_2 = Q_3$ = STATICAL MOMENT OF CROSS-HATCHED AREA ABOUT NEUTRAL AXIS

$$Q_2 = Q_3 = 4.0(.25)(1.875) + \frac{2(1.75)^2(.25)}{2} = 2.641\ IN^3$$

$$SSF2 = SSF3 = \frac{QA}{It} = \frac{2.641(3.54)}{8.00(2x.25)} = 2.337$$

CALCULATION SHEET

JOB. NO. 9645 CALC. NO. Q1277 ; Q2277 REV. NO. A

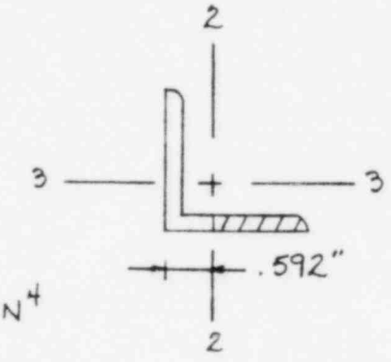
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Stephen A. Descoteaux DATE 2/5/82

SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 2/16/82

SOLENOID MOUNTING PLATE SHEET NO. 34 OF 95

3

L 2 x 2 x 1/4



$A = .938\ IN^2$

$b/d = 2/.25 = 8.0 \therefore B = .307$

$R = 2Bbd^3 = 2(.307)(2.0)(.25)^3 = .019\ IN^4$

$I_{2-2} = I_{3-3} = .348\ IN^4$

$SF2 = SF3 = \frac{2(.25)}{.938} = .533$

$H_2 = 2.816\ IN.$

$H_3 = 2.816\ IN.$

$C_T = 0.25\ IN.$

$Q_2 = Q_3 = \frac{.25(1.408)^2}{2} = .2478\ IN^3$

$SSF2 = SSF3 = \frac{QA}{It} = \frac{.2478(.938)}{.348\ (.25)} = 2.672$

CALCULATION SHEET

JOB NO. 9645 CALC. NO. Q1277, Q2277 REV. NO. A

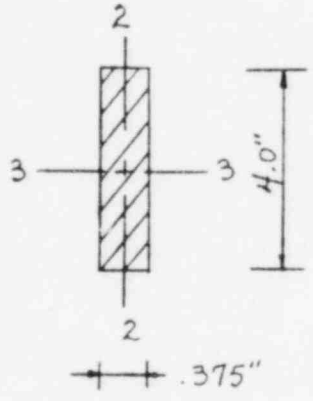
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Stephen A. Descoteaux DATE 2/5/82

SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 2/16/82

SOLENOID MOUNTING PLATE SHEET NO. 35 OF 95

4

PL 3/8" x 4"



$A = 4.0(.375) = 1.5\ IN^2$

$J = R = \beta b d^3 = .314(4.0)(.375)^3 = .066\ IN^4$

$I_{2-2} = \frac{4.0(.375)^3}{12} = .018\ IN^4$

$I_{3-3} = \frac{.375(4.0)^3}{12} = 2.0\ IN^4$

$SF2 = SF3 = 0.85$

$H_2 = 4.0\ IN.$

$H_3 = 0.375\ IN.$

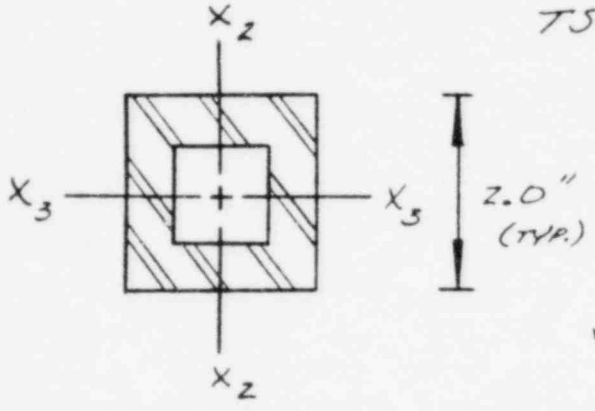
$C_T = 0.375\ IN.$

$SSF2 = SSF3 = 1.5$

5

SECTION PROPERTIES

TS 2"x 2"x 1/4"



$A = 1.59\ in^2$

$I_2 = I_3 = 0.766\ in^4$

$$J = \frac{2(0.25)(1.75)^2(1.75)^2}{1.75+1.75}$$

$J = 1.3398\ in^4$

$$SF_2 = SF_3 = \frac{2(b-t)(t)}{A} = \frac{2(2.0-0.25)(0.25)}{2.59}$$

$SF_2 = SF_3 = 0.5503$

$$C_T = \frac{[A]}{b+d} = \frac{(1.75)^2}{1.75+1.75} = 0.875$$

$$Q_2 = Q_3 = [0.875(0.25)(2.0) + 2(0.25)(0.75)(0.375)]$$

$Q_2 = Q_3 = 0.5781\ in^3$

$$SSF_2 = SSF_3 = \frac{0.5781\ in^3(1.59)}{0.766\ (2)(0.25)} = 2.40$$

$H_2 = H_3 = 2.0\ in$

CALCULATION SHEET

JOB NO. 9645 CALC. NO. Q1277, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 2-8-82

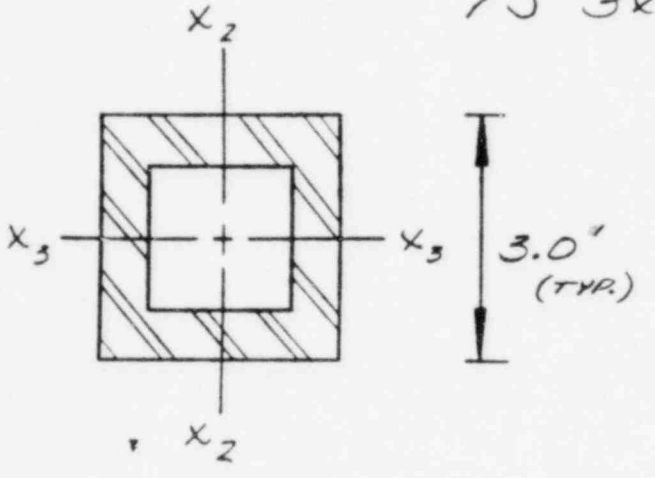
SUBJECT GRAND GULF NUCLEAR STATION CKD V.d. Dayport DATE 2.16.82

SOLENOID MOUNTING PLATE SHEET NO. 37 OF 95

6

SECTION PROPERTIES

TS 3"x3"x 1/4"



$A = 2.59\ in^2$

$I_2 = I_3 = 3.16\ in^4$

$$J = \frac{2(0.25)(2.75)^2(2.75)^2}{2.75 + 2.75}$$

$J = 5.199\ in^4$

$$SF_2 = SF_3 = \frac{2(b-t)t}{A} = \frac{2(3.0-0.25)(0.25)}{2.59} = 0.531$$

$$C_T = \frac{[A]}{b+d} = \frac{2.75(2.75)}{2.75+2.75} = 1.375$$

$$Q_2 = Q_3 = [1.375(0.25)(3.0) + 2(0.25)(1.25)(0.625)]$$

$Q_2 = Q_3 = 1.422$

$$SSF_2 = SSF_3 = \frac{1.422(2.59)}{3.16(2)(0.25)} = 2.331$$

$H_2 = H_3 = 3.0\ in$

CALCULATION SHEET

JOB. NO. 9645 CALC. NO. Q1217, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 2-10-82

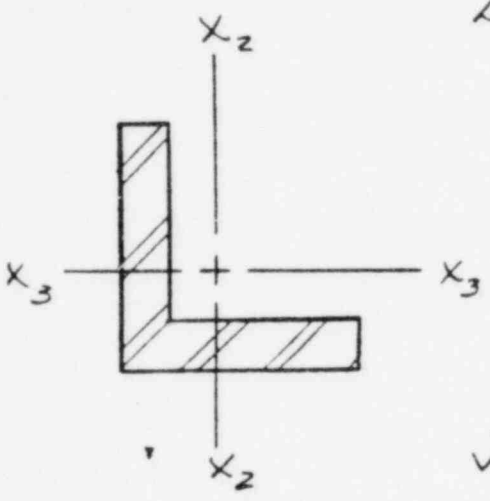
SUBJECT GRAND GULF NUCLEAR STATION CKD Vicd. Dayport DATE 4.16.82

SOLENOID MOUNTING PLATE SHEET NO. 38 OF 95

7

SECTION PROPERTIES

L 1½" x 1½" x ¼"



$A = 0.688\ IN^2$

$b/d = 1.50/0.25 = 6.0$

$B = 0.299$

$J = R = Bbd^3 = 2(0.299)(1.5)(0.25)^3$

$J = 0.014\ IN^4$

$I_2 = I_3 = 0.139\ IN^4$

$SF_2 = SF_3 = \frac{1.5\,(0.25)}{0.688} = 0.545$

$H_2 = H_3 = 2.068\ IN$

$C_T = 0.25$

$Q_2 = Q_3 = \frac{0.25\,(1.034)^2}{2} = 0.1336\ IN^3$

$SSF_2 = SSF_3 = \frac{QA}{It} = \frac{0.1336\,(0.688)}{0.139\,(0.25)} = 2.645$

CALCULATION SHEET

JOB NO. 9645 CALC NO. Q1277, Q2377 REV NO. A

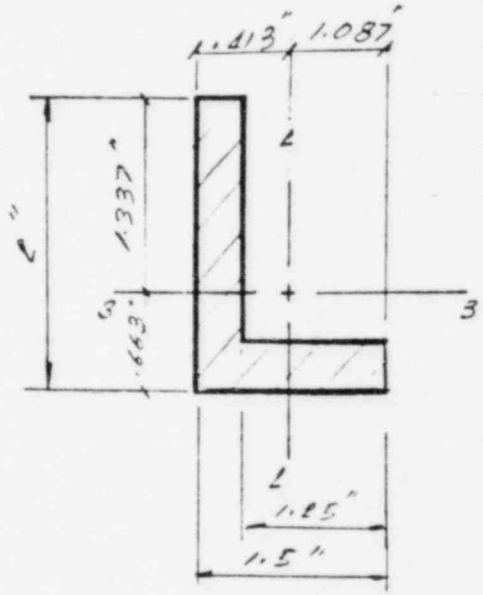
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Virgil Draughn DATE FEB. 11. 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Roger Mutti DATE 2-16-82

SOLENOID HOUNNING PLATE SHEET NO. 39 OF 95

8

ANGLE 2" x 1 1/2" x 1/4"



$A = .813 \quad in^2$

$I_2 = .151 \quad in^4$

$I_3 = .316 \quad in^4$

$J = \Sigma \beta_0 d^3$

$= .307(2)(.25)^3 + .290(1.25)(.25)^3$

$= .01526 \quad in^4$

$C_{TOP} = .25 \quad IN$

$H_2 = 2.670 \quad IN.$

$H_3 = 2.174 \quad IN.$

$SF_3 = \frac{2 \times .25}{.813} = .61501$

$SF_2 = \frac{1.5 \times .25}{.813} = .46185$

$Q_2 = (.25 \times 1.087)(\frac{1.087}{2}) = .10770 \quad IN^3$

$Q_3 = (.25 \times 1.337)(\frac{1.337}{2}) = .12305 \quad in^3$

$SSF_2 = \frac{.10770 \times .813}{.151 \times .25} = 3.18093$

$SSF_3 = \frac{.12305 \times .813}{.316 \times .25} = 2.29956$

CALCULATION SHEET

JOB. NO. 9645 CALC. NO. Q1277, Q2277 REV. NO. A

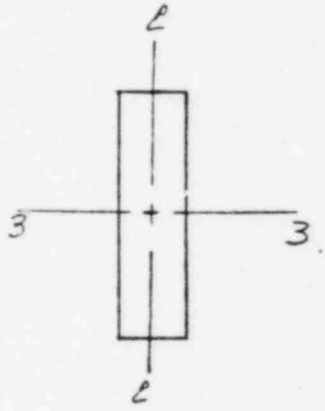
PROJECT MISSISSIPPI POWER & IGH COMPANY BY Vicd. Gray p.e. DATE FEB. 11. 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Roger Matthis DATE 2/16/82

SOLENOID MOUNTING PLATE SHEET NO. 40 OF 95

9

PLATE 3 1/2" x 1/2"



$A = 3.5 \times 0.5 = 1.75 \text{ IN}^2$

$I_\ell = \frac{1}{12} \times 3.5 \times (.5)^3 = .03646 \text{ IN}^4$

$I_3 = \frac{1}{12} \times 0.5 \times (3.5)^3 = 1.78646 \text{ IN}^4$

$J = \beta b d^3$ (BLODGETT P. E. 10-2)

$= .303 \times 3.5 \times (.5)^3$

$= .1325 \text{ IN}^4$

$SF_\ell = SF_3 = 0.85$

$H_\ell = 3.5 \text{ IN}$

$H_3 = 0.5 \text{ IN}$

$SSF_\ell = SSF_3 = 1.5$

$C_T = 0.5 \text{ IN}$

CALCULATION SHEET

JOB. NO. 9645 CALC. NO. Q1277, Q2277 REV. NO. A

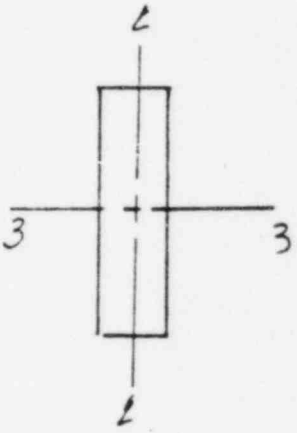
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Vicul. Gramp.o/ DATE FEB. 12. 82.

SUBJECT GRAND GULF NUCLEAR STATION CKD Rajo Mittle DATE 2/16/82

SOLENOID MOUNTING PLATE SHEET NO. 41 OF 95

10

PLATE 4 1/2 X 3/8



$A = 4.5 \times .375 = 1.6875 \text{ IN}^2$

$I_2 = \frac{1}{12}(0.5)(.375)^3 = .01978 \text{ IN}^4$

$I_3 = 1/12(.375)(0.5)^3 = 2.80766 \text{ IN}^2$

$J = .333(.5)(.375)^3 = .07902 \text{ IN}^2$

$C_{TOR} = .375 \text{ IN}$

$H_2 = 0.5 \text{ IN}$

$H_3 = .375 \text{ IN}$

$SF_2 = SF_3 = 0.85$

$SSF_3 = SSF_2 = 1.50$

CALCULATION SHEET

JOB NO. 9645 CALC. NO. Q1277, QZ277 REV. NO. A

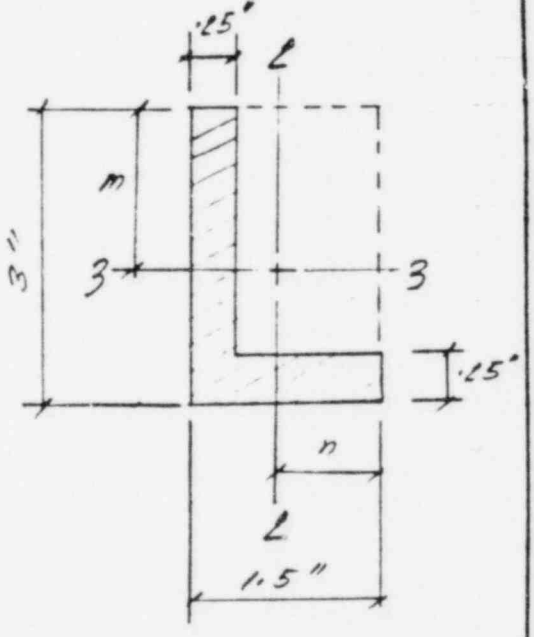
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Vic J. Kraft DATE FEB. 12. 82.

SUBJECT GRAND GULF NUCLEAR STATION CKD Roger Mutti DATE 2-16-82

SOLENOID MOUNTING PLATE SHEET NO. 42 OF 95

11

ANGLE 3 X 1 1/2 X 1/4



$A = (3 \times 1.5) - (2.75 \times 1.25) = 1.0625 \text{ in}^2$

NEUTRAL AXES (m, n)

$$m = \frac{(3 \times 1.5) 1.5 - (2.75 \times 1.25) \times \frac{2.75}{2}}{1.0625} = 1.904 \text{ in.}$$

$$n = \frac{(3 \times 1.5) \frac{1.5}{2} - (2.75 \times 1.25) \times \frac{1.25}{2}}{1.0625} = 1.154 \text{ in}$$

$$I_3 = \left[\left(\frac{1}{12} \times 1.5 \times 3^3\right) + (3 \times 1.5)\left(1.904 - \frac{3}{2}\right)^2\right] - \left[\left(\frac{1}{12} \times 1.25 \times 2.75^3\right) + (1.25 \times 2.75)\left(1.904 - \frac{2.75}{2}\right)^2\right]$$

$= .98118 \text{ in}^4$

$$I_2 = \left[\left(\frac{1}{12} \times 3 \times 1.5^3\right) + (3 \times 1.5)\left(1.154 - \frac{1.5}{2}\right)^2\right] - \left[\left(\frac{1}{12} \times 2.75 \times 1.25^3\right) + (2.75 \times 1.25)\left(1.154 - \frac{1.25}{2}\right)^2\right]$$

$= .16868 \text{ in}^4$

$J = \Sigma \beta b d^3 = .313 (2.75)(.25)^3 + .299 (1.5)(.25)^3 = .02046 \text{ in}^4$

COR = .25 in

$H_2 = 3.808$ in

$H_3 = 2.308$ in

$SF_3 = \frac{3 \times .25}{1.0625} = .70588$

$SF_2 = \frac{1.5 \times .25}{1.0625} = .35294$

$SSF_2 = \frac{Q_2 A}{I_3 t} = \frac{(1.154 \times .25)\frac{1.154}{2} \times 1.0625}{.16868 \times .25} = 2.1902$

$SSF_3 = \frac{Q_3 A}{I_3 t} = \frac{(1.904 \times .25)\frac{1.904}{2} \times 1.0625}{.98118 \times .25} = 1.9629$

CALCULATION SHEET

JOB. NO. 9645 CALC. NO. Q1277, Q2277 REV. NO. A

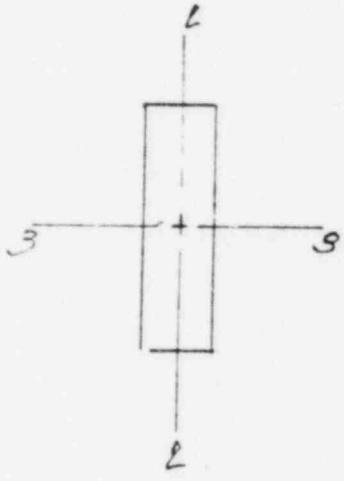
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Vird. Sampo. DATE FEB. 12. 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Roger Matthe DATE 2/16/82

SOLENOID MOUNTING PLATE SHEET NO. 43 OF 95

12

PLATE 4 1/8 X 3/8



$A = 4.125 \times .375 = 1.5469 \text{ in}^2$

$I_2 = \frac{1}{12}(4.125)(.375)^3 = .01813 \text{ in}^4$

$I_3 = \frac{1}{12}(.375)(4.125)^3 = 2.1930 \text{ in}^4$

$J = \beta b d^3$

$= .313(4.125)(.375)^3 = .06809 \text{ in}^4$

$C_{TOR} = .375 \text{ in}$

$H_2 = 4.125 \text{ in}$

$H_3 = .375 \text{ in}$

$SF_2 = SF_3 = .85$

$SSF_2 = SSF_3 = 1.50$

CALCULATION SHEET

JOB NO. 9645 CALC NO. Q1277, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 2-12-82

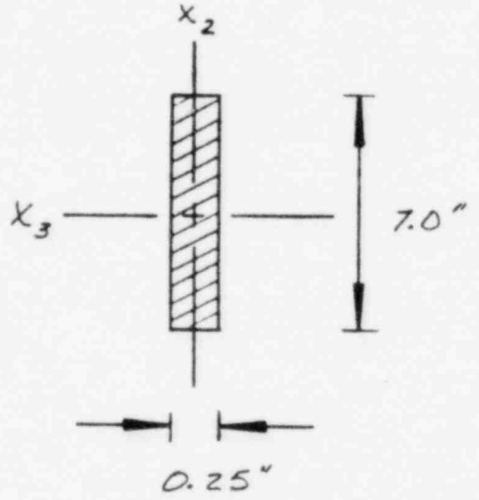
SUBJECT GRAND GULF NUCLEAR STATION CKD Vicl. Gaypol. DATE 2.16.82

SOLENOID MOUNTING PLATE SHEET NO. 44 OF 95

13

SECTION PROPERTIES

PLATE 7" x 1/4"



$A = 7.0(0.25) = 1.75\ IN^2$

$J = R = \beta b d^3 \cong 0.327(7.0)(0.25)^3 = 0.036\ IN^4$

$I_{2-2} = \frac{7.0(0.25)^3}{12} = 0.0091\ IN^4$

$I_{3-3} = \frac{0.25(7.0)^3}{12} = 7.146\ IN^4$

$SF_2 = SF_3 = 0.85$

$H_2 = 7.0\ IN \qquad H_3 = 0.25\ IN$

$C_T = 0.25$

$SSF_2 = SSF_3 = 1.50\ IN$

CALCULATION SHEET

JOB NO. 9645 CALC NO. Q1277 ; Q2277 REV. NO. A

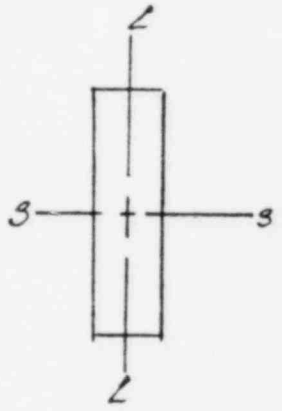
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY W.C.L. Traylor DATE FEB. 16, 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Roger Mutt DATE 2/16/82

SOLENOID MOUNTING PLATE SHEET NO. 45 OF 95

14

PLATE 5" x 1/2"



$A = 5 \times .25 = 1.25\ IN^2$

$J = R = \beta b d^3 = .333(5)(.25)^3 = .026\ IN^4$

$I_L = \frac{5(.25)^3}{12} = .0065\ IN^4$

$I_3 = \frac{.25(5)^3}{12} = 2.604$

$SF_L = SF_3 = 0.85$

$M_3 = 5.0\ IN$

$M_3 = .25\ IN$

$C_T = 0.25\ IN$

$SSF_3 = SSF_3 = 1.5$

CALCULATION SHEET

JOB. NO. 9645 CALC. NO. Q1E77, Q2E77 REV. NO. A

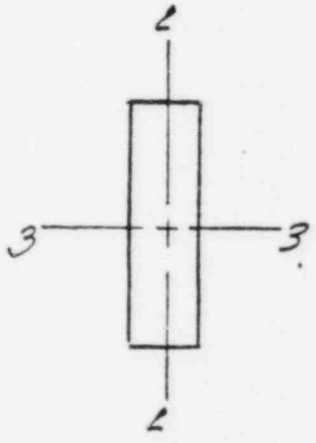
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Vicki Graypool DATE FEB. 16 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Roger Matthe DATE 2/16/82

SOLENOID MOUNTING PLATE. SHEET NO. 46 OF 95

15

PLATE 4 1/2 x 3/8



$A = 4.25 \times .375 = 1.594\ in^2$

$I_2 = \frac{1}{12} \times 4.25 \times .375^3 = .01868\ in^4$

$I_3 = \frac{1}{12} \times .375 \times 4.25^3 = 2.39893\ in^4$

$J = \beta b d^3 = .313(4.25)(.375)^3 = .07015\ in^4$

$SF_2 = SF_3 = 0.85$

$H_2 = 4.25\ in$

$H_3 = .375\ in$

$SSF_2 = SSF_3 = 1.5$

$C_1 = 0.375\ in.$

CALCULATION SHEET

JOB. NO. 9645 CALC. NO. Q1277, Q2277 REV. NO. A

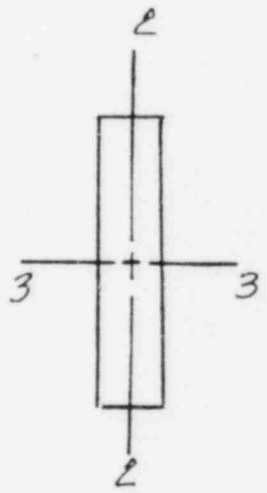
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Bird. Dalpe DATE FEB 16, 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Roger Nutter DATE 2/16/82

SOLENOID MOUNTING PLATE SHEET NO. 47 OF 95

16

PLATE 3 1/2 X 3/8.



$A = 3.5 \times .375 = 1.3125 \text{ IN}^2$

$I_2 = \frac{1}{12} \times 3.5 \times .375^3 = .01538 \text{ IN}^4$

$I_3 = \frac{1}{12} \times .375 \times 3.5^3 = 1.3398 \text{ IN}^4$

$J = \beta b d^3 = .311 \times 3.5 \times .375^3 = .0574 \text{ IN}^4$

CTOR = .375 IN

$H_2 = 3.5 \text{ IN}$

$H_3 = .375 \text{ IN}$

$SF_2 = SF_3 = 0.85$

$SSF_2 = SSF_3 = 1.5$

CALCULATION SHEET

JOB NO 9645 CALC NO Q1277, Q2277 REV NO A

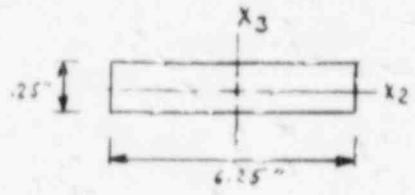
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY C Mettle DATE 2/16/82

SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 2/16/82

SOLENOID MOUNTING PLATE SHEET NO 43 OF 95

17

PLATE 6¼ X ¼



$A = (.25\,in)(6.25\,in) = 1.563\,in^2$

$J = (.333)(6.25\,in)(.25in)^3 = .033\,in^4$ (R from DESIGN OF WELDED STRUCTURES)

$I_3 = (.25in)(6.25in)^3/12 = 5.086\,in^4$

$I_2 = (6.25in)(.25in)^3/12 = .008\,in^4$

$SF_2 = SF_3 = 0.85$ (Recommended Value from manual)

$H_3 = 0.25\,in$ $H_2 = 6.25\,in$

CTORS = 0.25

$SSF_2 = SSF_3 = 1.50$ (Recommended Value from manual)

CALCULATION SHEET

JOB NO 9645 CALC NO Q1277 & Q2277 REV. NO A

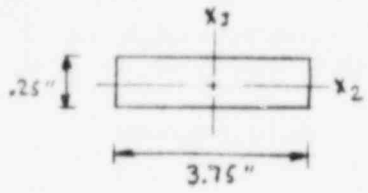
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY D Mettle DATE 2/16/82

SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 2/16/82

SOLENOID MOUNTING PLATE SHEET NO 49 OF 95

18

PLATE 3¾ x ¼



$A = (.25\ in)(3.75\ in) = 0.938"$

$J = (.333)(3.75\ in)(.25\ in)^3 = 0.020\ in^4$

$I_3 = (.25)(3.75\ in)^3/12 = 1.099\ in^4$

$I_2 = (3.75\ in)(.25\ in)^3/12 = 0.005\ in^4$

$SF_2 = SF_3 = 0.85$ (Recommended value from manual)

$H_3 = 0.25\ in$ $H_2 = 3.75\ in$

CTORS = .25

$SFF_2 = SFF_3 = 1.50$ (Recommended value from manual)

CALCULATION SHEET

JOB NO. 9605 CALC NO. Q1377, Q2377 REV NO. A

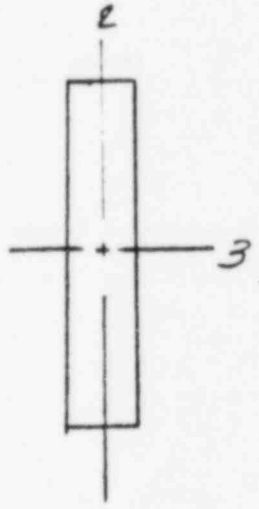
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Vic. Hayes DATE FEB 18 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen R. Descoteaux DATE 2/19/82

SOLENOID MOUNTING PL. SHEET NO. 50 OF 95

19

PL 6" X 3/8"



$A = 6 \times .375 = 2.25 \text{ in}^2$

$J = \beta bd^3 \cong .333(6)(.375)^3 = .1050 \text{ in}^4$

$I_2 = \frac{1}{12}(6)(.375)^3 = .0264 \text{ in}^4$

$I_3 = \frac{1}{12}(.375)(6)^3 = 6.75 \text{ in}^4$

$SF_2 = SF_3 = 8.5$

$H_2 = 6"$

$H_3 = .375"$

$SSF_2 = SSF_3 = 1.5$

$C_{TOP} = .375"$

CALCULATION SHEET

JOB NO. 9645 CALC NO. Q1277, Q2777 REV. NO. A

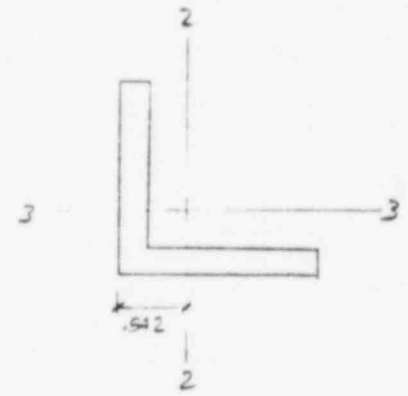
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Roger Mettle DATE 2/22/82

SUBJECT GRAND GULF NUCLEAR STATION CKD Vicki - Gayle DATE FEB 22, 82

SOLENOID MOUNTING PLATE SHEET NO. 51 OF 95

20

4 3 X 3 X 1/4



$A = 1.44\ in^2$

$J = 2\beta bd^3 = (2)(.333)(3)(.25)^3 = .031\ in^4$

$I_{22} = I_{3-3} = 1.24\ in^4$

$SF_2 = SF_3 = \frac{(2)(25)}{1.44} = .521$

$H_2 = H_3 = 9.316\ in$

CTORS = .25 in

$Q_2 = Q_3 = \frac{(.25)(.168)^2}{2} = .582$

$SSF_2 = SSF_3 = \frac{(.582)(1.44)}{(1.24)(.25)} = 2.704$

CALCULATION SHEET

JOB NO. 9645 CALC. NO. Q1277-Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Circ-Ray P.Y. DATE FEB. 18. 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Lyle Matthe DATE 2/24/82

SOLENOID MOUNTING PL. SHEET NO. 52 OF 95

L1	L2

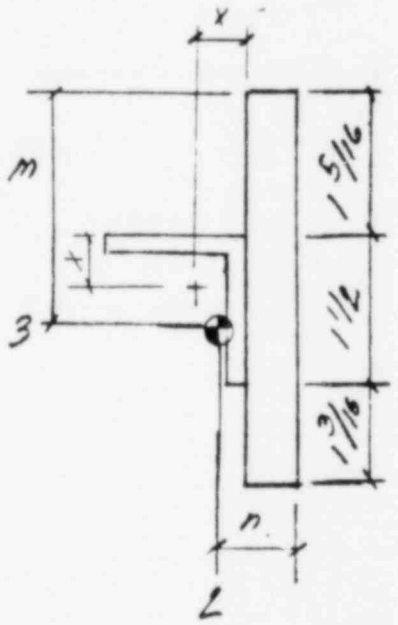
SECTION PROP.

COMPOSITE MEMBER OF PL 4x3/8 & ∠ 1 1/2 x 1 1/2 x 1/8

CG OF ∠ 1 1/2 x 1 1/2 x 1/8 ; X = .466 "

$A_{\angle} = .688\ in^2$, $A_{PL} = 1.5\ in^2$

$A_{TOT} = 2.188\ in^2$



CG OF COMBINATION, M & n

$$M = \frac{.688(1\frac{5}{16} + .466) + 1.5(2.0)}{2.188} = 1.930\ in$$

$$n = \frac{.688(\frac{3}{8} + .466) + 1.5(\frac{3}{16})}{2.188} = .393\ in$$

$$J = \Sigma \beta b d^3$$
$$\simeq 2(.299 \times 1.5 \times .25^3) + (.313 \times 0 \times .375^3)$$
$$= .080\ in^4$$

$$I_2 = \frac{1}{12}(4 \times .375)^3 + 1.5(.393 - \tfrac{3}{16})^2 + .139 + .688(.466 + \tfrac{3}{8} - .393)^2$$
$$= .358\ in^4$$

$$I_3 = \frac{1}{12}(.375 \times 4)^3 + 1.5(2.0 - 1.930)^2 + .139 + .688(1.930 - 1\tfrac{5}{16} - .466)^2$$
$$= 2.162\ in^4$$

$C_{TOR} = .375 + .25 = .625\ in$

$H_2 = 2(0 - M) = 4.14\ in$

$H_3 = 2(1.5 + .375 - n) = 2.934\ in$

$$SF_2 = \frac{(1.5 \times .375) \cdot 25}{2.188} = .214$$

$$SF_3 = \frac{(1.5 \times .25) + (0 \times .375)}{2.188} = .857$$

CALCULATION SHEET

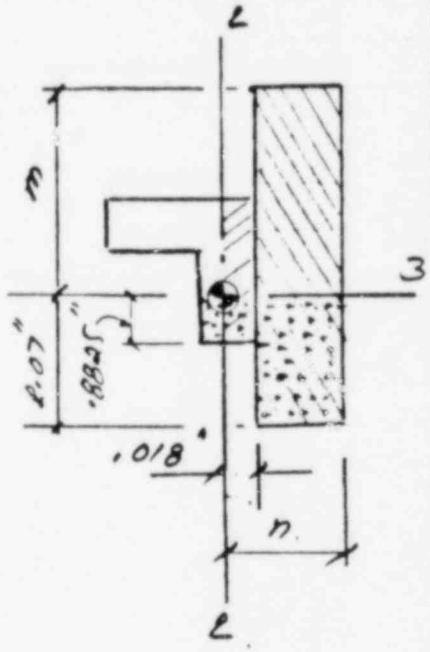
JOB NO. 9645.
CALC. NO. Q1277, Q2777 REV. NO. A
PROJECT MISSISSIPPI POWER & LIGHT COMPANY
BY Cicd-Laypol. DATE 8/18/82
SUBJECT GRAND GULF NUCLEAR STATION
CKD Roger Mattis DATE 2/24/82
SOLENOID MOUNTING PL
SHEET NO. 53 OF 95

$$Q_2 = 1.5(.393 - 3/16) + 1.5(.018)^2/2 = .3085 \text{ in}^3$$

$$Q_3 = .375(2.07)^2/2 - .25(.8825)^2/2 = .9008 \text{ in}^3$$

$$SSF_2 = \frac{.3085 \times 2.188}{.318 \times .25} = 7.502$$

$$SSF_3 = \frac{.9008 \times 2.198}{2.162 \times (.254 .375)} = 1.459$$



CALCULATION SHEET

JOB NO. 9645 CALC NO. G1277, Q2277 REV. NO. A

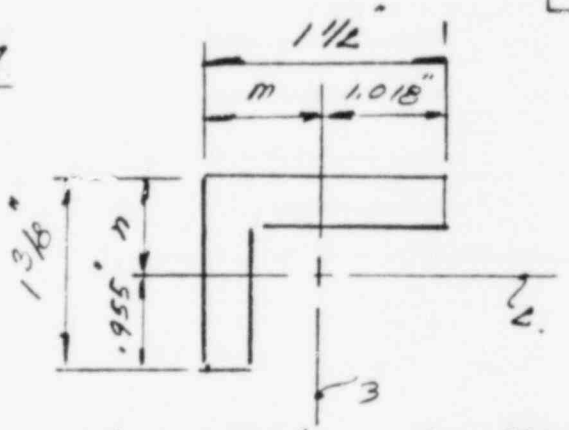
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Vic A. Kaypy. DATE FEB 22 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Descoteaux DATE 2/24/82

SOLENOID MOUNTING R. SHEET NO. 54 OF 95

23

∠ 1 1/2 × 1 3/8 × 1/4



$A = .25[1.375 + (1.5 - .25)] = .6563 \text{ in}^2$

$J = \Sigma \beta b d^3 = .2405(1.375)(.25)^3 + .290(1.25)(.25)^3$

$= .0120 \text{ in}^3$

b/d = 1.375/.25 ; β = .2405

t/d = 1.25/.25 ; β = .290

N.A.

$$m = \frac{1.375\left(\frac{.25}{2}\right) + (.25)(1.25)(.875)}{.6563}$$

$= .482 \text{ in}$

$$n = \frac{.25\left(\frac{1.375}{2}\right)^2 + 1.25\left(\frac{.25}{2}\right)^2}{.6563}$$

$= .420 \text{ in}$

$$I_2 = \frac{1}{12}(.25)(1.375)^3 + (1.375)(.25)\left(\frac{1.375}{2} - .030\right)^2 + 1/12(1.25)(.25)^3 + 1.25(.25)\left(.420 - \frac{.25}{2}\right)^2$$

$= .1076 \text{ in}^4$

$$I_3 = \frac{1}{12}(1.375)(.25)^3 + (1.375)(.25)\left(.482 - \frac{.25}{2}\right)^2 + \frac{1}{12}(.25)(1.25)^3 + (1.25)(.25)\left(1.018 - \frac{.25}{2}\right)^2$$

$= .1346 \text{ in}^4$

$C_{TOR} = .25 \text{ in}$

$N_2 = 2 \times 1.018 = 2.036 \text{ in}$

$N_3 = 2 \times .955 = 1.910 \text{ in}$

$SF_2 = 1.375 \times .25 / .6563 = .524$

$SF_3 = 1.5 \times .25 / .6563 = .571$

CALCULATION SHEET

JOB NO 9645
CALC NO Q1277, Q2277 REV NO A
PROJECT MISSISSIPPI POWER & LIGHT COMPANY
BY Vicd. Nayar DATE FEB 22, 82
SUBJECT GRAND GULF NUCLEAR STATION
CKD Stephen A. Descoteaux DATE 2/24/82
SOLENOID MOUNTING TC
SHEET NO 55 OF 95

$$SSF_2 = \frac{[.25(.955)^2 \times 1/2] \times .6563}{.1076 \times .25} = 2.781$$

$$SSF_3 = \frac{[.25(1.018)^2 \times 1/2] \times .6563}{.1346 \times .25} = 2.527$$

CALCULATION SHEET

JOB. NO. 9605 CALC. NO. Q1277, Q2277 REV. NO. A

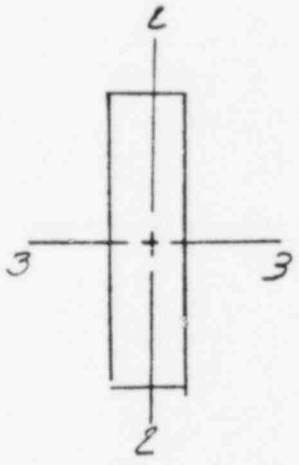
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Chird. Gayed DATE FEB 22, 82

SUBJECT GRAND GULF NUCLEAR STATION CHKD [illegible] DATE 6/25/82

SOLENOID MOUNTING RL SHEET NO. 56 OF 95

24

RL 1/4" x 5 1/2".



$A = .25 \times 5.5 = 1.375 \text{ in}^2$

$J = .333(5.5)(.25)^3 = .0286 \text{ in}^4$

$I_2 = \frac{1}{12}(5.5)(.25)^3 = .0072 \text{ in}^4$

$I_3 = 1/12\,(.25)(5.5)^3 = 3.066 \text{ in}^4$

$C_{TOR} = .25"$

$Y_2 = 5.5"$

$Y_3 = .25"$

$SF_2 = SF_3 = .85$

$SSF_2 = SSF_3 = 1.5$

CALCULATION SHEET

JOB NO. 9685 CALC. NO. Q1277, Q2377 REV. NO. A

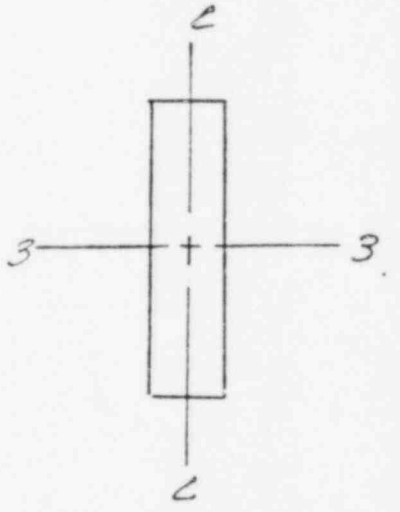
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Virgil Dalpe DATE FEB 23, 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Descoteaux DATE 2/24/82

SOLENOID MOUNTING R SHEET NO. 57 OF 95

25

R 1/4 x 1 1/2



$A = .25 \times 1.5 = .375 \text{ in}^2$

$J = .249(1.5)(.25)^3 = .007 \text{ in}^4$

$I_2 = \frac{1}{12}(1.5)(.25)^3 = .002 \text{ in}^4$

$I_3 = \frac{1}{12}(.25)(1.5)^3 = .070 \text{ in}^4$

$SF_2 = SF_3 = .85$

$H_2 = 1.5"$

$H_3 = .25"$

$C_{TOR} = .25"$

$SF_2 = SSF_3 = 1.5$

CALCULATION SHEET

JOB NO. 9625 CALC NO. Q1277, Q2277 REV NO. A

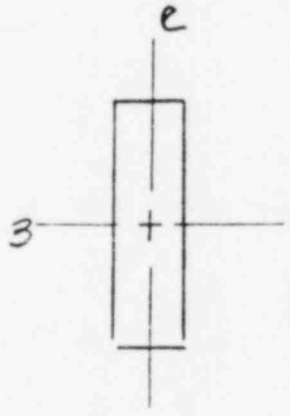
PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY V.S. Dayal DATE FEB 19 82

SUBJECT GRAND GULF NUCLEAR STATION CKD Stephen A. Descoteaux DATE 2/19/82

SOLENOID MOUNTING R. SHEET NO. 58 OF 95

26.

R 4x1/4



$A = 4 \times .25 = 1.0 \text{ in}^2$

$J = .333(4)(.25)^3 = .0208 \text{ in}^4$

$I_2 = \frac{1}{12}(2)(.25)^3 = .0052 \text{ in}^4$

$I_3 = \frac{1}{12}(.25)(4)^3 = 1.333 \text{ in}^4$

$C_{TOR} = .25 \text{ in}$

$H_2 = 4 \text{ in}$

$H_3 = .25 \text{ in}$

$SF_2 = SF_3 = .85$

$SSF_2 = SSF_3 = 1.5$

CALCULATION SHEET

JOB NO. 9645 CALC NO. Q1E77, Q2E77 REV. NO. A

PROJECT GRAND GULF STATION BY [signature] DATE 3/8/82

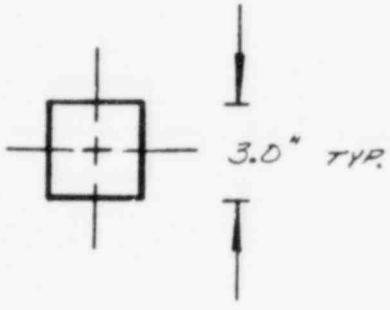
SUBJECT Q1E77F002A CKD James M Callahan DATE 3/10/82

FCN - M - 1146 SHEET NO. 59 OF 95

1

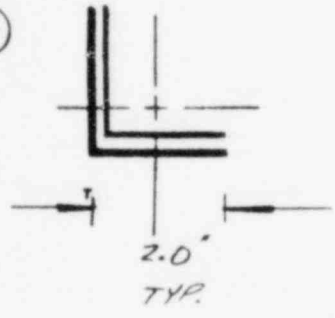
WELD PROFILES

(A)



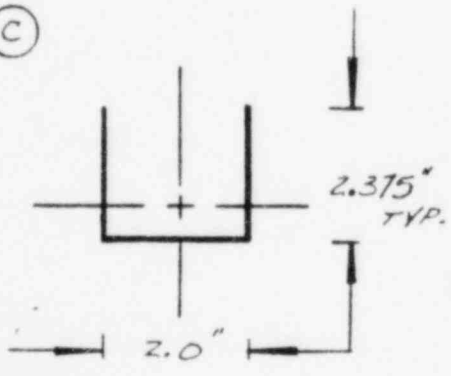
* AT SUPPORT POINT - ITEM 1
* 3/16" FILLET - ALL AROUND

(B)



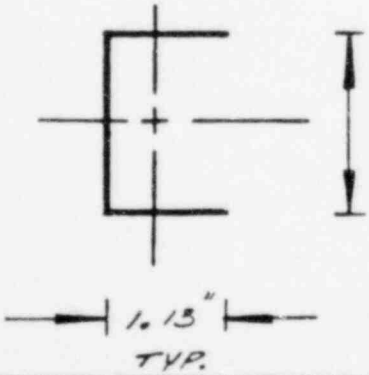
* ITEM 2 - ITEM 1
* 3/16" FILLET - ALL AROUND

(C)



* ITEM 3 - ITEM 2
* 3/16" FILLET - 3 SIDES

(D)



* ITEM 5 - SOLENOID PL
* 3/16" FILLET - 3 SIDES

CALCULATION SHEET

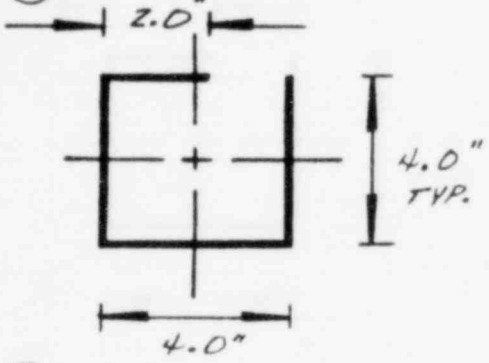
JOB. NO. 9645 CALC NO. Q1277, Q2277 REV. NO. A

PROJECT GRAND GULF STATION BY [signature] DATE 3/3/82

SUBJECT Q1277F003A CKD James H Gallagher DATE 3/10/82

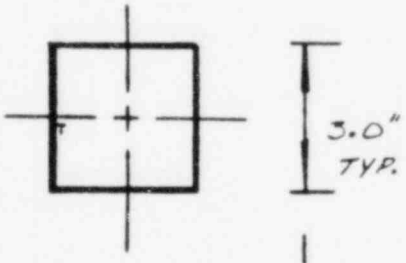
ECN-M-1149 SHEET NO. 60 OF 95

(A)



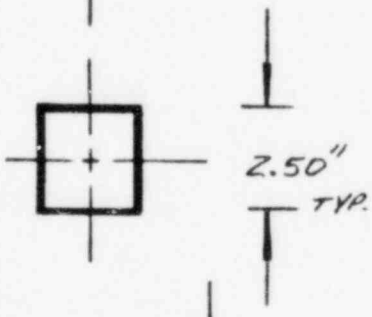
* ITEM 1 - EXISTING SUPPORT
* 3/16" FILLET - ALL AROUND LESS 2".

(B)



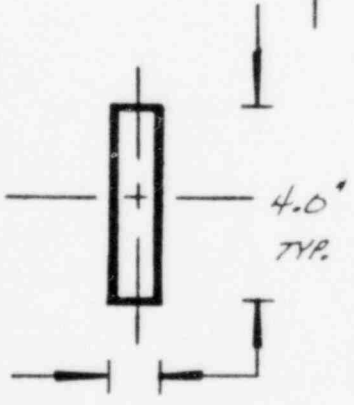
* ITEM 1 - ITEM 2
* 3/16" FILLET - ALL AROUND

(C)



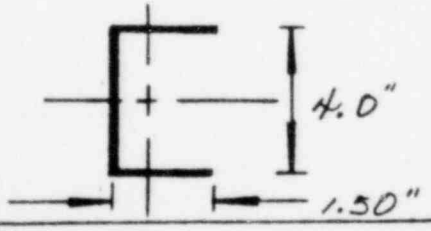
* ITEM 2 - ITEM 3
* 3/16" FILLET - ALL AROUND

(D)



* ITEM 4 - ITEM 3
* 3/16" FILLET - ALL AROUND

(E)



* ITEM 4 - SOLENOID PL
* 3/16" FILLET - 3 SIDES
* 1.50" ASSUMED - DUE TO INFORMATION SUPPLIED

CALCULATION SHEET

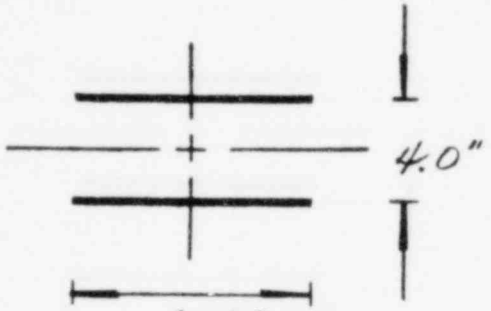
JOB NO. 9645 CALC NO. QI277, QZ277 REV. NO. A

PROJECT GRAND GULF STATION BY [signature] DATE 3/8/82

SUBJECT QZ277F001A CKD James H Gallyon DATE 3/10/82

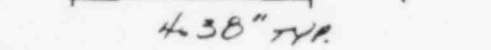
FCN-M-1140 SHEET NO. 61 OF 95

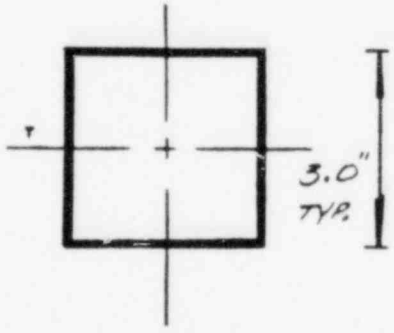
(A)



* ITEM 1 - EXISTING SUPPT.
* 1/4" FILLET + FLARE BEVEL

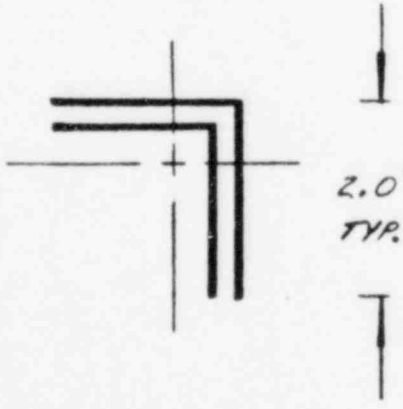
(B)





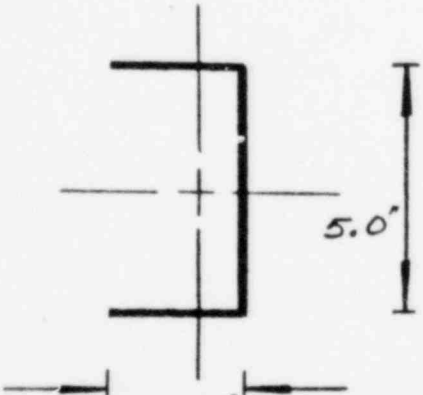
* ITEM 1 - ITEM 2
* 3/16" FILLET - ALL AROUND

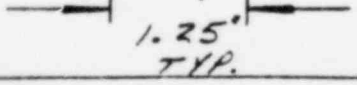
(C)



* ITEM 2 - ITEM 4
* 3/16" FILLET - ALL AROUND

(D)





* ITEM 3 - SOLENOID PL
* 3/16" FILLET - 3 SIDES

CALCULATION SHEET

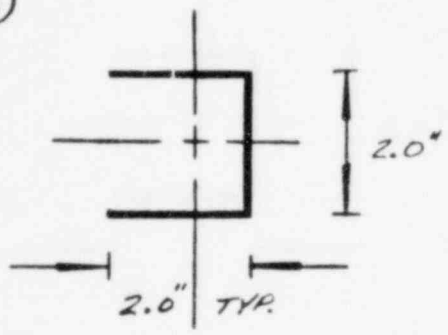
JOB NO 9645 CALC NO Q1277, Q2277 REV NO A

PROJECT GRAND GULF STATION BY [signature] DATE 3/8/82

SUBJECT Q1277F002B CKD James H Gallyon DATE 3/10/82

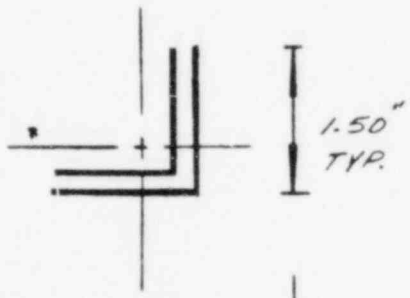
FCN-M-1147 SHEET NO 62 OF 95

(A)



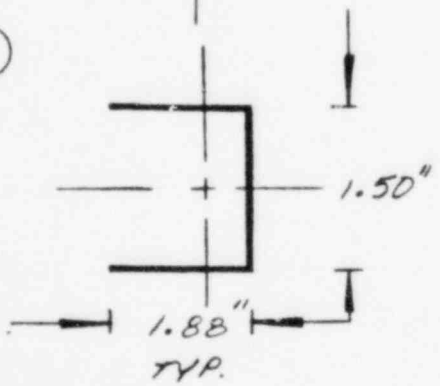
* ITEM 1 - EXISTING SUPPORT
* 3/16" FILLET - 3 SIDES

(B)



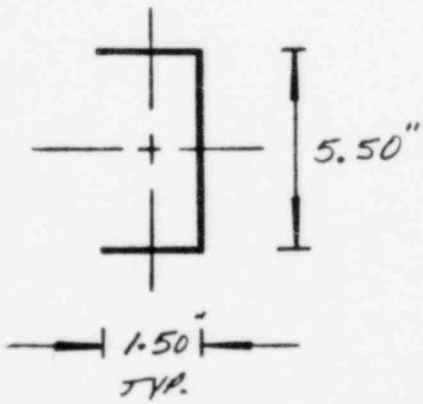
* ITEM 1 - ITEM 2
* 3/16" FILLET - ALL AROUND

(C)



* ITEM 2 - ITEM 3
* 3/16" FILLET - 3 SIDES

(D)



* ITEM 4 - SOLENOID PL
* 3/16" FILLET - 3 SIDES

CALCULATION SHEET

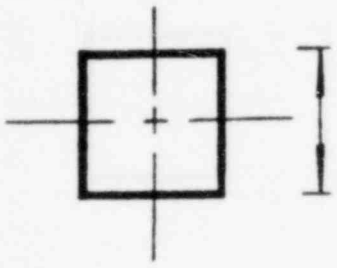
JOB NO. 9645 CALC NO. Q1277, Q2277 REV NO. A

PROJECT GRAND GULF STATION BY [signature] DATE 3/8/82

SUBJECT Q1277F035A CKD James W Gallagher DATE 3/10/82

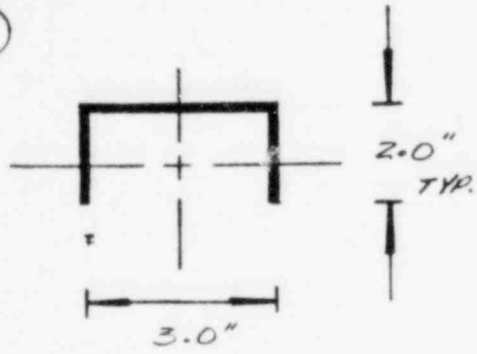
FCH-M-1151 SHEET NO. 63 OF 95

(A)



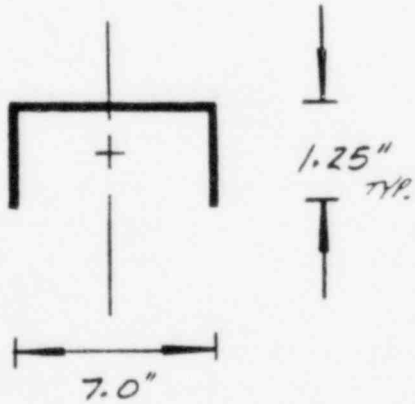
* TUBING STEEL - EXISTING SUPPORT
* 3/16" FILLET - ALL AROUND

(B)



* ℄ 2"x2"x 1/4" - TS 3"x3"x1/4
* 3/16" FILLET + FLARE BEVEL 3-SIDES - 2 SIDES

(C)



* ℄ 2" x 1 1/2" x 1/4" - SOLENOID PL
* 3/16" FILLET - 3 SIDES

CALCULATION SHEET

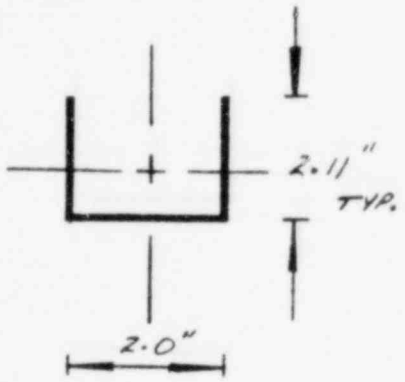
JOB. NO. 945 CALC. NO. Q1277, Q2277 REV. NO. A

PROJECT GRAND GULF STATION BY [signature] DATE 3/8/82

SUBJECT Q1277F0030 CKD James W Allyn DATE 3/10/82

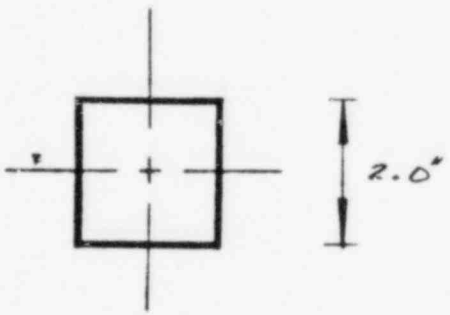
FCN - M - 1144 SHEET NO. 64 OF 95

(A)



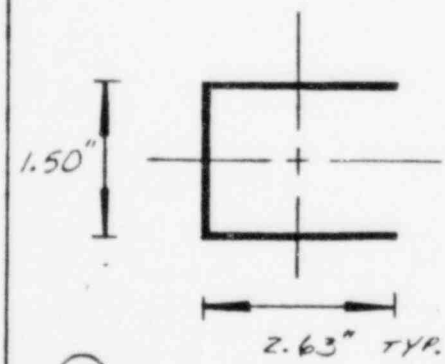
* ITEM 1 - EXISTING ANGLE
* 3/16" FILLET - 3 SIDES (CONSERV. PROFILE SHOWN)

(B)



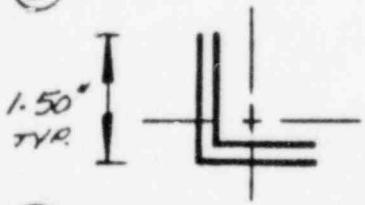
* ITEM 1 - ITEM 2
* 3/16" FILLET - ALL AROUND

(C)



* ITEM 3 - ITEM 4
* 3/16" FILLET - 3 SIDES

(D)



* ITEM 2 - ITEM 5
* 3/16" FILLET - ALL AROUND

(E)

* ITEM 6 - SOLENOID PLATE
* 3/16" FILLET - 3 SIDES

CALCULATION SHEET

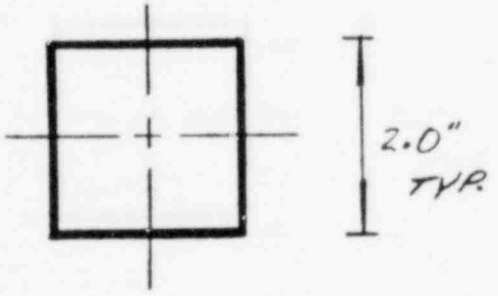
JOB NO. 9645 CALC NO. Q1277, Q2277 REV. NO. A

PROJECT GRAND GULF STATION BY [signature] DATE 3/8/82

SUBJECT Q2777F035B CKD James H Gallagher DATE 3/10/82

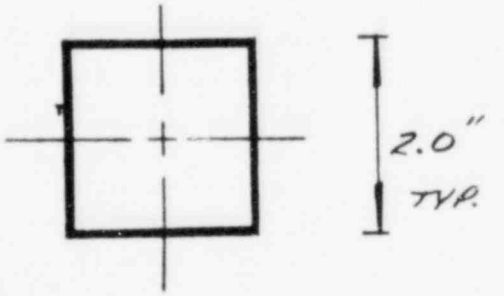
FCN-M-1141 SHEET NO. 65 OF 95

(A)



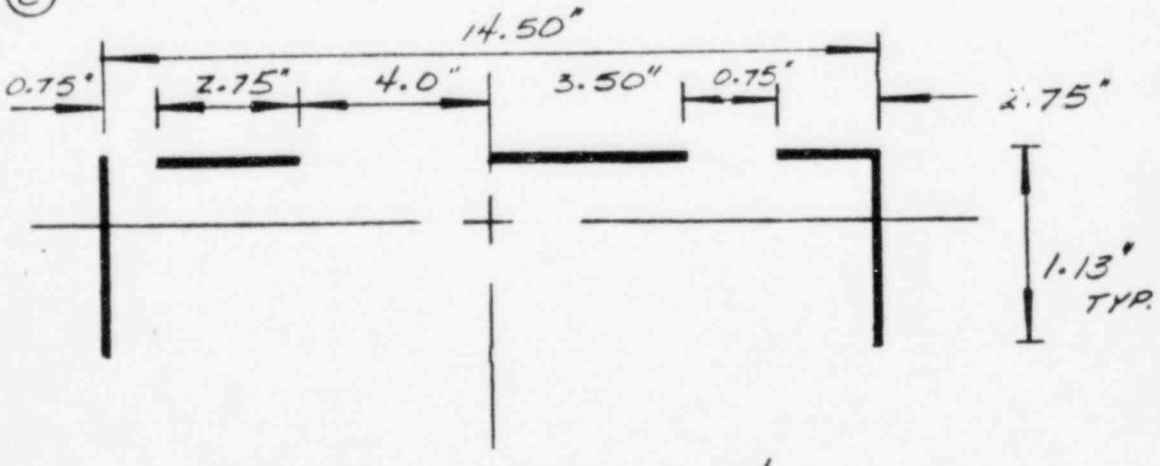
* ITEM 1 - EXISTING SUPPORT
* 3/16" FILLET - ALL AROUND

(B)



* ITEM 1 - ITEM 3
* 3/16" FILLET - ALL AROUND

(C)



* ITEM 2 - SOLENOID
* 3/16" FILLET - AS SHOWN

CALCULATION SHEET

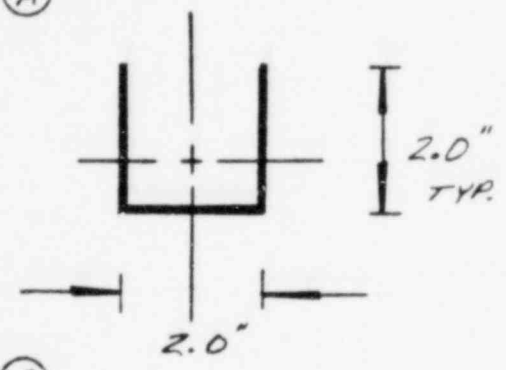
JOB NO. 9645 CALC NO. QIZ77, QZZ77 REV. NO. A

PROJECT GRAND GULF STATION BY [signature] DATE 3/8/82

SUBJECT QZZ77F001B CKD James H Gilly DATE 3/10/82

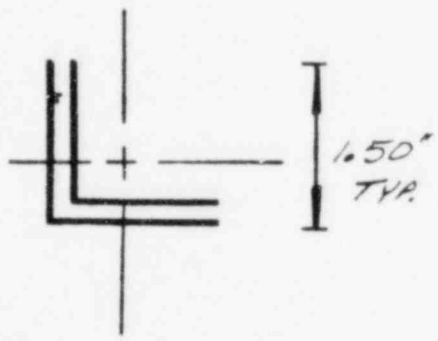
FCN-M-1139 SHEET NO. 66 OF 95

(A)



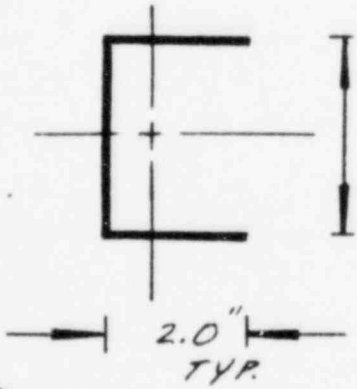
* ITEM 1 - EXISTING SUPPORT
* 3/16" FILLET - 3 SIDES

(B)



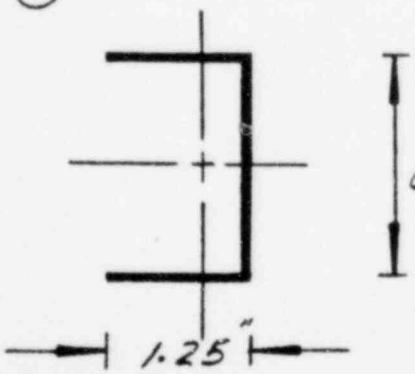
* ITEM 1 - ITEM 2
* 3/16" FILLET - ALL AROUND

(C)



* ITEM 3 - ITEM 4
* 3/16" FILLET - 3 SIDES

(D)



* ITEM 4 - SOLENOID ℄
* 3/16" FILLET - 3 SIDES

CALCULATION SHEET

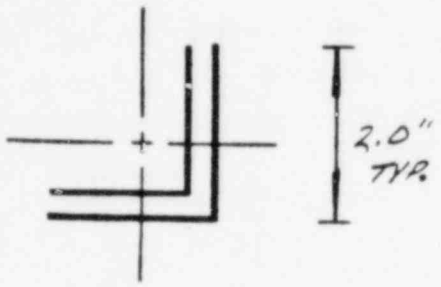
JOB NO. 9645 CALC NO. Q1277, Q2277 REV. NO. A

PROJECT GRAND GULF STATION BY [signature] DATE 3/8/82

SUBJECT Q2277F035A CKD James H Gallagher DATE 3/10/82

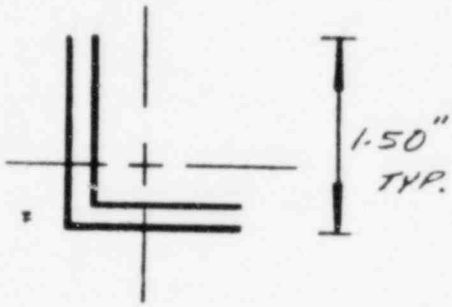
FCN-M-1152 SHEET NO. 67 OF 95

(A)



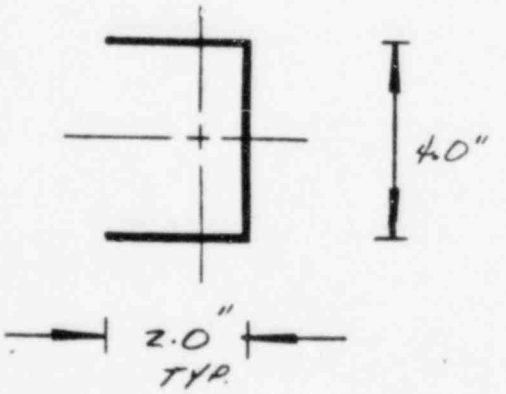
* ITEM 1 - EXISTING SUPPORT
* 3/16" FILLET - ALL AROUND

(B)



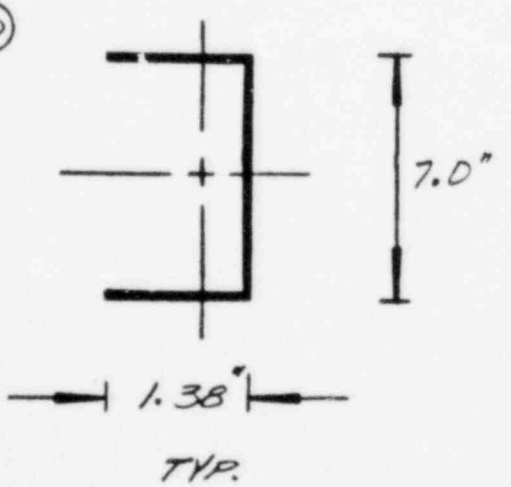
* ITEM 1 - ITEM 2
* 3/16" FILLET - ALL AROUND

(C)



* ITEM 2 - ITEM 3
* 3/16" FILLET - 3 SIDES

(D)



* ITEM 4 - SOLENOID PL
* 3/16" FILLET - 3 SIDES

CALCULATION SHEET

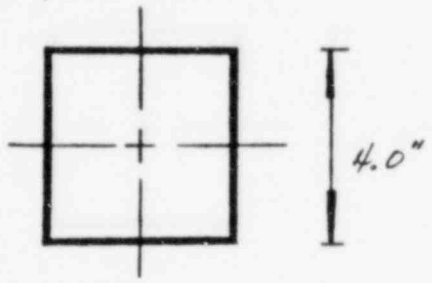
JOB NO. 9645 CALC NO. Q1Z77 ; Q2Z77 REV. NO. A

PROJECT GRAND GULF STATION BY [signature] DATE 3/8/82

SUBJECT Q1Z77F001B CKD James H Calligh DATE 3/10/82

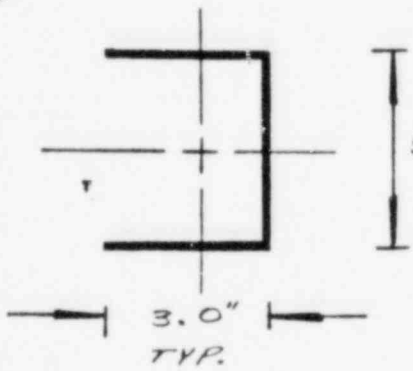
FCN-M-1138 SHEET NO. 68 OF 95

(A)



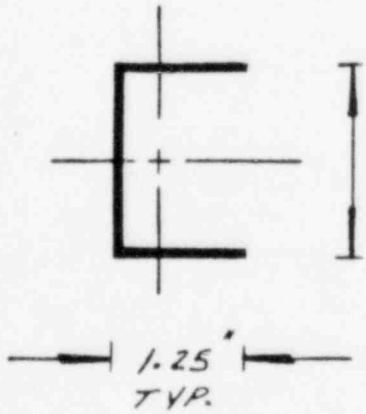
* TS 4"x4"x1/4" - BASE PL
* 3/16" FILLET - ALL AROUND

(B)



* ∠ 3"x3"x1/4" - ∠ 1½"x2"x1/4
* 3/16" FILLET - 3 SIDES

(C)



* ∠ 1½"x2"x1/4" - SOLENOID PL
* 3/16" FILLET - 3 SIDES

CALCULATION SHEET

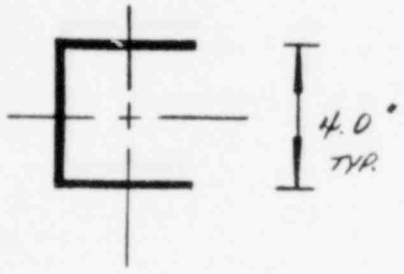
JOB. NO. 9645 CALC NO. QZ77, QZZ77 REV. NO. A

PROJECT COPANO GULF STATION BY [signature] DATE 3/8/82

SUBJECT QZZ77F003A CKD James H Callyhan DATE 3/10/82

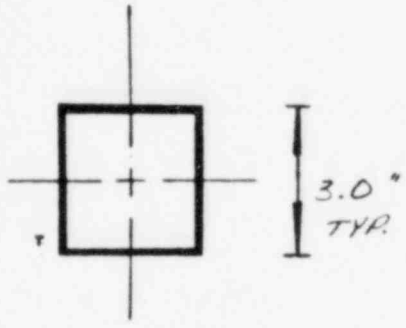
FCN-M-1150 SHEET NO. 69 OF 95

(A)



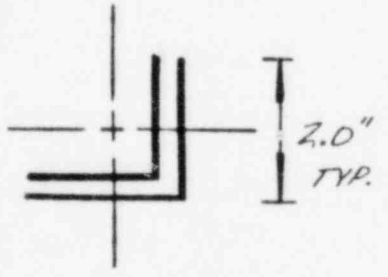
* ITEM 1 - EXISTING SUPPORT
* 3/16" FILLET - 3 SIDES

(B)



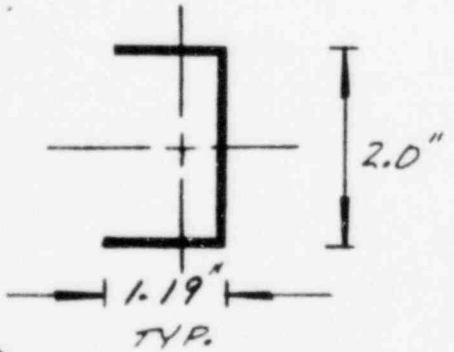
* ITEM 2 - ITEM 1
* 3/16" FILLET - ALL AROUND

(C)



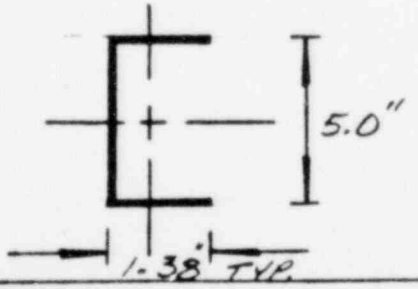
* ITEM 3 - ITEM 2
* 3/16" FILLET - ALL AROUND

(D)



* ITEM 3 - ITEM 4
* 3/16" FILLET - 3 SIDES

(E)



* ITEM 5 - SOLENOID PL
* 3/16" FILLET - 3 SIDES

CALCULATION SHEET

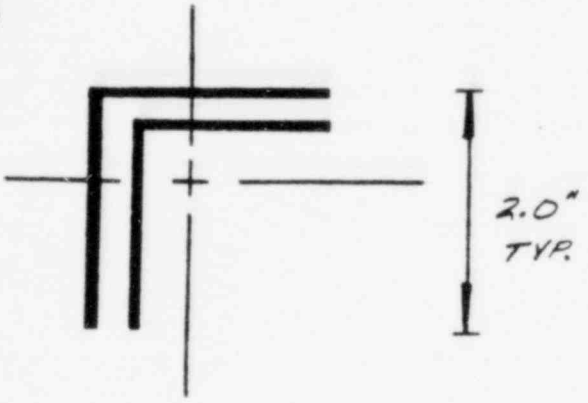
JOB. NO. 9645 CALC. NO. Q1Z77, Q2Z77 REV. NO. A

PROJECT GRAND GULF STATION BY [signature] DATE 3/8/82

SUBJECT Q2Z77F002A CKD James H Callyhan DATE 3/10/82

FCN-M-1145 SHEET NO. 70 OF 95

(A)



* ITEM 1 - SOLENOID ☈
* 3/16" FILLET - ALL AROUND

CALCULATION SHEET

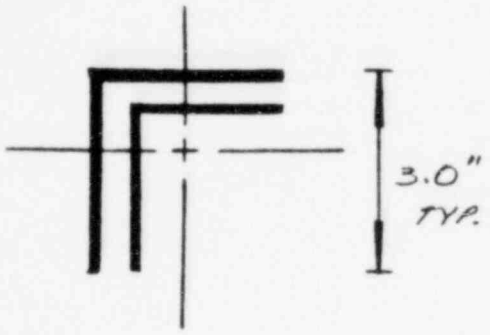
JOB NO. 9645 CALC NO. Q1277; Q2277 REV. NO. A

PROJECT GRAND GULF STATION BY [signature] DATE 3/8/82

SUBJECT Q2277F0035 CKD James H Callyn DATE 3/10/82

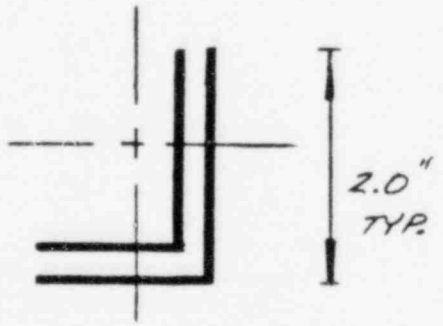
FCN-M-1143 SHEET NO. 71 OF 95

(A)



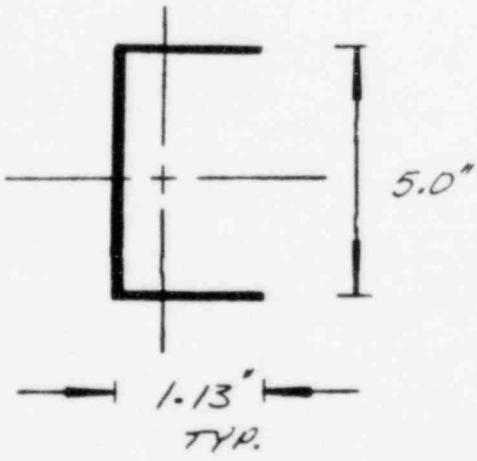
* ITEM 1 - EXISTING SUPPORT
* 3/16" FILLET - ALL AROUND

(B)



* ITEM 2 - ITEM 1
* 3/16" FILLET - ALL AROUND

(C)



* ITEM 3 - SOLENOID PL
* 3/16" FILLET - 3 SIDES

CALCULATION SHEET

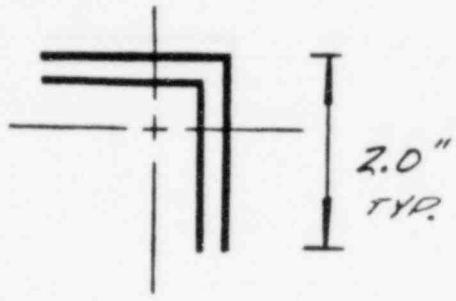
JOB NO. 9645 CALC NO. Q1277, QR277 REV. NO. A

PROJECT GRAND GULF STATION BY [signature] DATE 3/8/82

SUBJECT Q1277F055B CKD James H Gallagher DATE 3/10/82

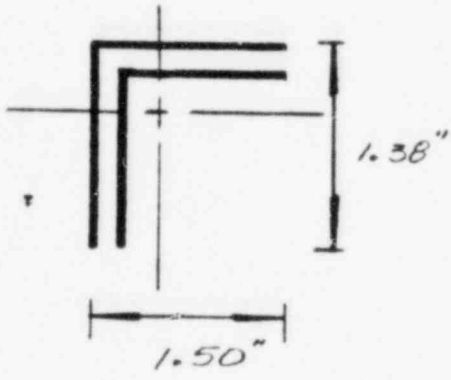
FCN-M-1142 SHEET NO. 72 OF 95

(A)



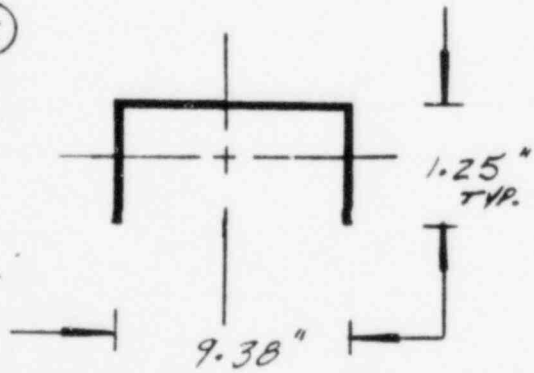
* ITEM 1 - EXISTING SUPPORT
* 3/16" FILLET - ALL AROUND

(B)



* ITEM 1 - ITEM 2.
* 3/16" FILLET - ALL AROUND

(C)



* ITEM 3 - SOLENOID PL
* 3/16" FILLET - 3 SIDES

CALCULATION SHEET

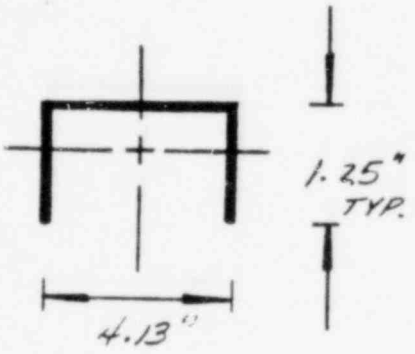
JOB NO. 9645 CALC NO. Q1Z77, Q2Z77 REV NO. A

PROJECT GRAND GULF STATION BY [signature] DATE 3/8/82

SUBJECT Q1Z77F001A (KD James D Callaghan DATE 3/14/82

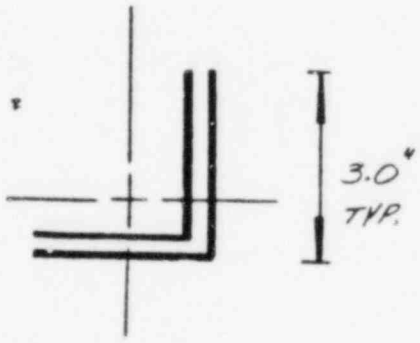
ECN-M-1137 SHEET NO. 73 OF 95

(A)



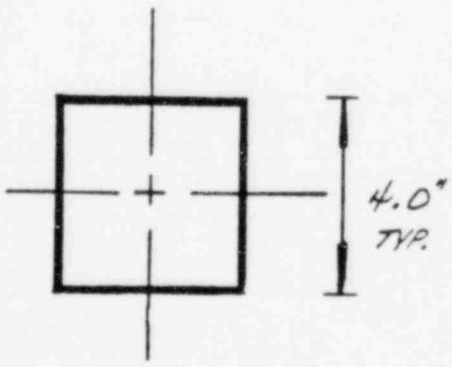
* ITEM 3 - ITEM 2
* 3/16" - FILLET - 3 SIDES

(B)



* ITEM 2 - ITEM 1
* 3/16" FILLET - ALL AROUND

(C)



* ITEM 1 - EXISTING SUPPORT
* 3/16" FILLET - ALL AROUND

CALCULATION SHEET

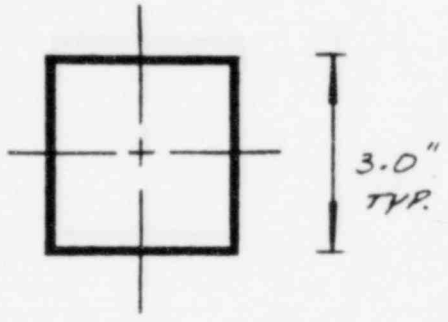
JOB NO. 9645 CALC NO. Q1277, Q2277 REV NO. A

PROJECT GRAND GULF STATION BY [signature] DATE 3/8/82

SUBJECT Q2277F0028 CKD James H Gallyon DATE 3/10/82

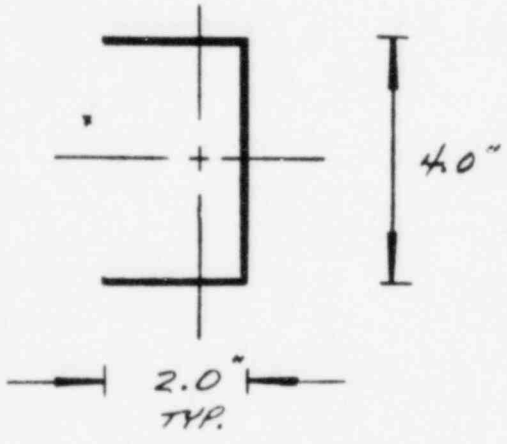
FCN-M-1148 SHEET NO. 74 OF 95

(A)



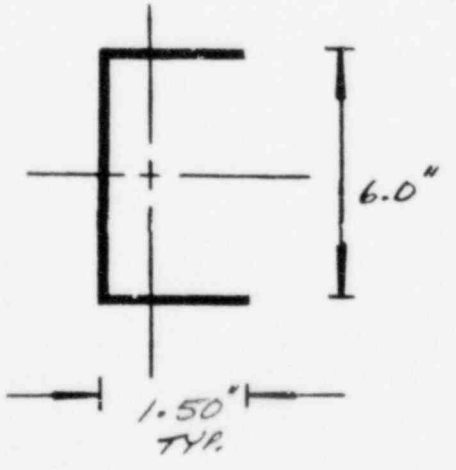
* ITEM 2 - BOLTED ℄
* 1/4" FILLET - ALL AROUND

(B)



* ITEM 3 - ITEM 2
* 3/16" FILLET - 3 SIDES

(C)



* ITEM 4 - SOLENOID ℄
* 3/16" FILLET - 3 SIDES

CALCULATION SHEET

JOB NO. 9645 CALC NO. Q1277, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 3/5/82

GRAND GULF NUCLEAR STATION

SUBJECT SOLENOID MOUNTING PLATES CKD James H Callaghan DATE 3/14/82

SHEET NO. 75 OF 95

(2)

FINAL WELDING REQUIREMENTS

LOADING CONDITION	ATTACHING DESIGN	LETTER	PROFILE (SHAPE)	VALUE GENERATED
PULLOUT	FCN-M-1150	D	CHANNEL	4.38 IN
SHEAR X_2	FCN-M-1149	D	PLATE	0.75 IN
SHEAR X_3	FCN-M-1149	D	PLATE	0.75 IN
TORSION	FCN-M-1142	B	ANGLE	C - 1.11 IN PMI = 1.95
BENDING X_2	FCN-M-1150	D	CHANNEL	0.77
BENDING X_3	FCN-M-1150	D	CHANNEL	0.77

NOTES: 1) ABOVE GENERATED WELD PROPERTIES REFLECT THE CRITICAL VALUES FOR EACH ONE OF THE LOADING CONDITIONS, TAKEN FROM ALL POSSIBLE ATTACHING MEMBERS.

2) THE APPLIED LOADS ARE THE RESULT OF THE CRITICAL F_{X_1}, F_{X_2}, OR F_{X_3} FOR ANY GIVEN STRUCTURE, COMBINED WITH THE CRITICAL M_{X_1}, M_{X_2} OR M_{X_3} VALUE, FOR ANY GIVEN STRUCTURE.

FINAL WELDING REQUIREMENT (CONT.)

$F_{X_1} - F_{X_2} - F_{X_3}$ - MAX. VALUE - 0.050^{K} (FCN-1143)

$M_{X_1} - M_{X_2} - M_{X_3}$ - MAX. VALUE - $0.413^{K\text{-}IN}$ (FCN-1138)

$\therefore$ WELD SIZE

$$f_1 = \frac{0.05^{K}}{0.75\,IN} + \frac{0.413^{K\text{-}IN}(1.11)}{1.95} = 0.30\ K/IN$$

$$f_2 = \frac{0.05^{K}}{0.75\,IN} + \frac{0.413^{K\text{-}IN}(1.11)}{1.95} = 0.30\ K/IN$$

$$f_3 = \frac{0.05^{K}}{4.38\,IN} + \frac{0.413^{K\text{-}IN}}{0.77} + \frac{0.413^{K\text{-}IN}}{0.77} = 1.08\ K/IN$$

$$f_R = \sqrt{(0.30)^2 + (0.30)^2 + (1.08)^2} = 1.16\ K/IN$$

$$W_R = \frac{1.16\ K/IN}{10.8\ KSI} = 0.11\ IN \text{ (REQUIRED)}$$

$\therefore$ 0.11 IN (REQ'D) $<$ 0.1875 IN (MINIMUM WELD SUPPLIED)

$\therefore$ ALL WELDS ON ALL ATTACHED STEEL ARE SATISFACTORY.

CALCULATION SHEET

JOB NO. 9645 CALC NO. Q1277, Q2777 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 3/9/82

SUBJECT GRAND GULF NUCLEAR STATION CKD James H Calloway Jr DATE 3/16/82

SOLENOID MOUNTING PLATE SHEET NO. 77 OF 95

FCN-M	NODE 38			NODE 41		
	Fx (lbs)	Fy (lbs)	Fz (lbs)	Fx (lbs)	Fy (lbs)	Fz (lbs
1137	-4.84	1.27	-2.69	-2.16	0.72	0.09
1138	1.84	8.32	0.05	0.26	-0.14	0.56
1139	6.79	5.31	0.66	-2.55	0.32	2.67
1140	-7.97	-8.63	-1.95	-0.04	2.80	-2.88
1141	-5.62	2.08	-2.14	-1.25	2.38	1.02
1142	-3.92	2.43	-2.43	-0.78	-1.67	-0.19
1143	5.32	7.35	7.006	1.545	2.86	8.96
1144	1.15	5.27	0.17	2.37	0.07	0.24
1145	-1.92	-2.87	-0.71	0.25	-5.22	-3.39
1146	0.74	7.64	0.15	0.78	0.79	0.25
1147	0.49	2.70	0.64	-1.79	4.56	-0.20
1148	-3.47	9.38	-1.51	7.27	-2.18	2.33
1149	-1.91	13.30	-0.97	9.20	-12.47	1.78
1150	-1.05	7.17	0.22	1.69	2.31	0.20
1151	-4.77	1.87	-2.66	-1.01	-0.47	-0.01
1152	3.35	9.24	-0.30	-0.28	-1.34	1.11

CALCULATION SHEET

JOB NO. 9645 CALC. NO. Q1277, Q2777 REV. NO. A

PROJECT MISSISSIPPI POWER & IGH COMPANY BY [signature] DATE 3/9/82

SUBJECT GRAND GULF NUCLEAR STATION CKD James W Calley Jr DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 78 OF 95

FCN-M	NODE 164			NODE 167		
	F_X (lbs)	F_Y (lbs)	F_Z (lbs)	F_X (lbs)	F_Y (lbs)	F_Z (lbs)
1137	-3.48	-4.88	-1.24	-1.14	-0.17	0.77
1138	-4.46	3.87	-1.38	-0.72	-0.43	-0.23
1139	-1.65	5.24	0.65	0.48	0.76	-0.91
1140	5.20	-8.51	0.39	-0.26	2.72	1.37
1141	-3.14	-2.41	-1.69	-1.60	1.02	-0.26
1142	-5.30	-2.02	-1.40	-1.62	-1.50	0.95
1143	4.33	5.86	7.31	0.83	1.00	8.50
1144	-4.25	3.74	-1.50	-0.82	-0.46	-1.98
1145	-0.95	-3.16	0.06	-0.46	-0.37	0.97
1146	-3.80	3.52	-1.49	-0.79	-0.33	-1.98
1147	-1.50	3.52	-1.86	-0.27	0.84	-1.65
1148	-4.70	5.75	-0.77	-2.16	-1.33	-3.12
1149	-7.33	7.95	-0.62	-3.04	2.83	-3.26
1150	-2.82	2.45	-1.45	-0.89	-0.31	-2.04
1151	-4.42	-3.36	-1.18	-1.42	-1.11	0.76
1152	-5.56	4.64	-0.99	-0.58	-0.92	-2.90

CALCULATION SHEET

JOB NO 9695 CALC. NO. Q1277, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 3/9/82

SUBJECT GRAND GULF NUCLEAR STATION CKD James H Gallagher DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 79 OF 95

FCN-M	NODE 49			NODE 50		
	Fx (lbs)	Fy (lbs)	Fz (lbs)	Fx (lbs)	Fy (lbs)	Fz (lbs
1137	-4.26	-0.48	-1.83	0.59	-0.48	0.86
1138	0.84	1.83	-1.30	-1.81	1.83	0.33
1139	3.88	1.83	0.93	-2.91	1.83	0.04
1140	-5.54	-1.83	-0.86	4.57	-1.83	-0.11
1141	-4.72	0.48	-1.95	1.05	0.48	0.98
1142	-3.97	-0.48	-1.85	0.30	-0.48	0.88
1143	2.90	1.79	2.30	2.90	1.79	2.30
1144	0.50	1.83	-1.22	-1.47	1.83	0.25
1145	-2.15	-1.83	-0.82	1.18	-1.83	-0.15
1146	0.37	1.83	-1.22	-1.34	1.83	0.25
1147	0.68	1.83	-1.26	-1.85	1.83	0.29
1148	-0.06	1.83	-1.14	-0.91	1.83	0.17
1149	-0.12	1.83	-1.27	-0.85	1.83	0.30
1150	-0.53	1.83	-1.21	-0.44	1.83	-0.24
1151	-4.61	-0.48	-1.79	0.94	-0.48	0.82
1152	1.67	1.83	-1.29	-2.64	1.83	0.32

CALCULATION SHEET

JOB NO. 9645 CALC. NO. Q1277, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Boyd Mott DATE 3/9/82

SUBJECT GRAND GULF NUCLEAR STATION CKD James H Callaghan DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 80 OF 95

FCN-M	NODE 89			NODE 93		
	Fx (lbs)	Fy (lbs)	Fz (lbs)	Fx (lbs)	Fy (lbs)	Fz (lbs)
1137	-24.16	-6.05	-5.64	7.17	2.79	3.05
1138	15.18	18.63	1.99	5.31	-1.79	-1.54
1139	25.68	18.60	5.38	-0.23	-2.78	-1.63
1140	-36.85	-27.10	-7.93	-0.25	5.02	3.89
1141	-16.52	-1.11	-3.02	6.37	2.21	1.63
1142	-15.83	-1.65	-4.94	5.92	1.15	2.46
1143	21.15	18.38	5.61	2.11	3.03	4.06
1144	14.04	17.90	2.20	5.63	-1.64	-1.81
1145	-17.44	-12.69	-4.42	0.01	1.30	0.91
1146	13.17	16.93	2.18	5.28	-1.45	-1.79
1147	13.45	12.64	3.16	0.48	-1.01	-2.71
1148	15.58	18.70	-1.09	6.10	-2.16	1.26
1149	17.23	22.06	0.89	8.52	-2.78	-0.55
1150	8.94	14.50	2.38	6.06	-0.75	-1.95
1151	-19.85	-3.83	-5.21	6.52	1.91	2.77
1152	18.94	21.43	1.25	5.06	-2.45	-0.72

CALCULATION SHEET

JOB. NO. 9645 CALC. NO. Q1277, Q2777 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY

GRAND GULF NUCLEAR STATION

BY Roger Wetth DATE 2/9/82

SUBJECT SOLENOID MUNTING PLATE

CKD James H Calleyh DATE 3/10/82

SHEET NO. 81 OF 95

FCN-M	NODE 117			NODE 121		
	FX (lbs)	FY (lbs)	FZ (lbs)	FX (lbs)	FY (lbs)	FZ (lbs
1137	2.51	0.94	3.16	8.98	0.86	-2.02
1138	-13.85	-9.35	-4.06	-8.09	-1.99	2.15
1139	-12.56	-8.24	-3.75	-11.44	-2.07	1.46
1140	19.31	13.16	6.19	16.34	3.42	-3.60
1141	-0.36	-0.44	0.50	5.01	0.80	-0.56
1142	-0.84	-1.28	2.59	5.25	-0.32	-1.56
1143	13.23	9.17	5.94	10.03	2.55	4.39
1144	-13.40	-8.59	-4.31	-7.72	-1.88	2.47
1145	7.95	4.80	3.24	8.02	1.09	-1.19
1146	-12.57	-8.28	-4.29	-7.34	-1.70	2.44
1147	-8.27	-5.38	-5.25	-7.13	-0.75	3.34
1148	-14.14	-9.06	-1.09	-9.00	-1.98	-0.55
1149	-17.22	-11.16	-2.94	-9.98	-2.61	1.15
1150	-10.82	-6.91	-4.43	-5.64	-1.33	2.55
1151	0.75	-0.15	2.97	7.07	0.62	-1.99
1152	-15.89	-11.07	-3.25	-9.56	-2.40	1.26

CALCULATION SHEET

JOB NO. 9695 CALC NO. Q1Z77, Q2Z77 REV. NO. A

PROJECT MISSISSIPPI POWER & IGHT COMPANY BY Roger Mutt DATE 3/9/82

SUBJECT GRAND GULF NUCLEAR STATION CKD James H Gallagh DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 82 OF 95

FCN-M	NODE 131			NODE 135		
	Fx (lbs)	Fy (lbs)	Fz (lbs)	Fx (lbs)	Fy (lbs)	Fz (lbs
1137	-7.14	-3.67	-2.75	-3.29	-0.26	1.13
1138	-4.21	11.53	1.80	12.49	0.94	-1.15
1139	0.12	11.58	3.01	12.01	0.69	-0.15
1140	2.07	-16.79	-4.33	-18.67	-0.62	1.61
1141	-5.46	-0.58	-1.18	-1.49	-0.62	-0.45
1142	-7.15	-0.98	-2.45	-0.41	-0.09	-0.80
1143	2.61	11.60	5.03	12.47	1.10	3.63
1144	-4.04	11.15	1.92	12.02	0.94	-1.28
1145	-1.67	-7.92	-2.83	-7.32	-0.76	0.09
1146	-3.63	10.55	1.90	11.16	0.94	-1.26
1147	-0.60	7.93	1.43	6.57	0.89	-1.83
1148	-3.09	11.56	0.17	12.09	0.87	0.62
1149	-4.74	13.59	0.96	15.12	1.05	0.03
1150	-3.23	9.04	1.98	9.39	0.96	-1.34
1151	-7.18	-2.30	-2.67	-1.81	0.18	1.02
1152	-4.99	13.14	1.26	14.54	0.94	-0.51

CALCULATION SHEET

JOB NO. 9695 CALC. NO. Q1Z77, Q2Z77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY

GRAND GULF NUCLEAR STATION

BY Roger Mettt DATE 2/9/82

SUBJECT SOLENOID MOUNTING PLATE

CKD James D Callaghan DATE 3/10/82

SHEET NO. 88 OF 95

FCN-M	NODE 145			NODE 149		
	F_X (lbs)	F_Y (lbs)	F_Z (lbs)	F_X (lbs)	F_Y (lbs)	F_Z (lbs)
1137	2.93	0.59	-0.22	1.99	1.37	0.38
1138	-19.10	-6.01	-2.89	9.37	-0.96	0.79
1139	-17.65	-5.32	-0.74	6.98	-1.44	-0.67
1140	29.07	9.15	1.60	-13.92	2.75	-0.33
1141	0.56	0.02	-1.40	0.88	1.40	0.67
1142	-2.44	-1.23	-0.35	4.50	0.66	0.55
1143	19.12	6.31	4.71	9.25	1.89	3.31
1144	-18.22	-5.72	-2.99	8.79	-0.87	0.90
1145	9.49	2.62	1.05	-1.95	0.55	0.21
1146	-16.85	-5.26	-2.99	7.87	-0.73	-0.90
1147	-10.56	-3.11	-3.32	3.14	-0.20	1.26
1148	-18.26	-5.82	-1.99	7.80	-1.11	-0.25
1149	-22.88	-7.42	-2.53	11.04	-1.72	0.09
1150	-13.53	-4.17	-2.97	5.91	-0.33	0.88
1151	0.19	-0.34	-0.09	3.26	1.01	0.28
1152	-22.74	-7.23	-2.54	11.73	-1.36	0.33

CALCULATION SHEET

JOB NO. 9695 CALC. NO. Q1Z77, Q2Z77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [illegible] DATE 3/9/82

SUBJECT GRAND GULF NUCLEAR STATION CKD James H Calleigh DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 84 OF 95

FCN-M	NODE 72			NODE 74		
	Fx (lbs)	Fy (lbs)	Fz (lbs)	Fx (lbs)	Fy (lbs)	Fz (lbs
1137	18.52	-13.81	-0.90	40.07	35.52	10.94
1138	-20.10	35.54	-3.60	-19.81	-107.21	4.81
1139	-2A.03	37.88	-0.43	-38.78	-107.90	-8.53
1140	41.71	-60.43	0.69	55.29	162.21	11.36
1141	12.86	-8.19	-1.87	28.32	9.62	9.22
1142	10.72	-2.47	-0.73	26.31	7.51	9.98
1143	27.82	41.72	31.82	33.61	109.62	30.32
1144	-19.21	33.47	-3.55	-18.41	-102.97	4.70
1145	17.47	-21.09	1.07	25.44	70.29	6.20
1146	-17.85	30.91	-3.52	-17.10	-96.88	4.68
1147	-14.82	21.19	-3.77	-18.47	-70.91	3.80
1148	-19.43	33.47	-3.00	-18.98	-107.80	8.03
1149	-22.70	41.19	-3.44	-20.48	-128.82	6.41
1150	-12.94	23.73	-3.43	-10.24	-51.13	4.26
1151	14.88	-8.30	-0.34	32.36	21.45	9.68
1152	-23.59	43.09	-3.18	-24.93	-124.58	5.09

CALCULATION SHEET

JOB NO. 9695 CALC. NO. Q1277, Q2777 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Roger Mott DATE 3/9/82

SUBJECT GRAND GULF NUCLEAR STATION CKD James H Gallagher DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 85 OF 95

FCN-M	NODE 100					
	Fx (lbs)	Fy (lbs)	Fz (lbs)	Fx (lbs)	Fy (lbs)	Fz (lbs
1137	-6.33	-8.25	-0.58			
1138	57.53	27.76	5.41			
1139	51.19	27.96	1.92			
1140	-8192	-45.26	-4.27			
1141	4.04	-4.28	1.80			
1142	9.13	0.26	-0.21			
1143	57.58	32.56	32.42			
1144	56.07	26.15	5.50			
1145	-29.86	-15.29	-1.79			
1146	52.33	24.15	5.50			
1147	34.00	16.03	6.35			
1148	57.38	26.28	2.70			
1149	70.79	32.58	4.39			
1150	43.38	18.82	5.58			
1151	2.13	-4.08	-0.62			
1152	65.54	33.98	4.83			

CALCULATION SHEET

JOB NO. 9645 | CALC. NO. Q1277, Q2277 | REV. NO. A

PROJECT: MISSISSIPPI POWER & LIGHT COMPANY — GRAND GULF NUCLEAR STATION

BY Roger Matt DATE 3/10/92

SUBJECT: SOLENOID MOUNTING PLATE

CKD James D Gallagher DATE 3/10/92

SHEET NO. 06 OF 95

Max Accel. in x direction = .07258
Max Accel. in y direction = .09719
Max Accel in z direction = .72893

} FROM DYNRE 4 ANALYSIS

Force due to Acceleration = Accel x mass

For Junction Box. (NODES 38, 41, 164, 167)

$F_X = 9.5 \times .07258 = .690$
$F_Y = 9.5 \times .09719 = .923$
$F_Z = 9.5 \times .72893 = 6.925$

For Solenoid (NODES 49, 50)

$F_X = 3.0 \times .07258 = .218$
$F_Y = 3.0 \times .09719 = .292$
$F_Z = 3.0 \times .72893 = 2.187$

For Limit Switches (NODES 89, 93, 117, 121, 131, 135, 145, 149)

$F_X = 4.5 \times .07258 = .327$
$F_Y = 4.5 \times .09719 = .437$
$F_Z = 4.5 \times .72893 = 3.280$

For Solenoid Plate (NODES 72, 79, 100)

$F_X = 41.14 \times .07258 = 2.986$
$F_Y = 41.14 \times .09719 = 3.998$
$F_Z = 41.14 \times .72893 = 29.988$

NOTES: For FCN-M-1193 the forces calculated above shall be added to forces from the equilibrium check taken from the static run.

Forces for all other FCN's taken from equilibrium check from the static analysis

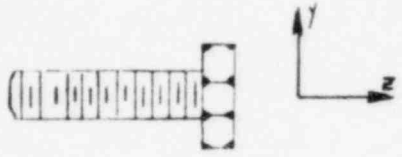
CALCULATION SHEET

JOB NO. 9145 CALC NO. Q1277, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 3/9/82

SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 87 OF 95



1/4" Hex Head Bolts for Junction Box. (NODES 38, 41, 164, 167)

$F_{z\,max}$ = 8.96 lbs < 270 lbs*

$\sqrt{F_{x\,max}^2 + F_{y\,max}^2} = \sqrt{(9.2)^2 + (13.3)^2}$ = 16.17 lbs < 380 lbs*

* Allowable Loads from MARK'S HANDBOOK P. 8-30, TABLE 32

1/2" Bolts Connecting Solenoid to Actuator (NODES 72, 74, 100)

$F_{z\,max}$ = 32.42 lbs < 1,260 lbs*

$\sqrt{F_{x\,max}^2 + F_{y\,max}^2} = \sqrt{(70.79)^2 + (162.21)^2}$ = 176.98 lbs < 1,470 lbs*

* Allowable Loads from MARK'S HANDBOOK P. 8-30, TABLE 32

CALCULATION SHEET

JOB NO. 9645 CALC NO. Q1277, Q2777 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 3/9/82

SUBJECT GRAND GULF NUCLEAR STATION CKD James H Callaghan DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 88 OF 95

1/8" MACHINE SCREWS, for Limit Switches & Solenoid (NODES 89, 93, 117, 121, 131, 135, 145, 149, 49, 50)

Max Tensile Stress:

$\sigma_T = F_{x\,max.} / \text{Stress Area}$ *

$\sigma_T = 7.93\ \text{lbs} / .0079\ \text{in}^2 = 1,004\ \text{PSI} = 1.004\ \text{KSI} < 7.5\ \text{KSI}$ **

Max. Shear Stress:

$\sigma_v = \sqrt{F_{x\,max}^2 + F_{y\,max}^2} / \text{Basic min minor dia.}$ *

$\sigma_v = \sqrt{(36.85)^2 + (27.10)^2} / .0067\ \text{in}^2 = 6,827\ \text{PSI} = 6.827\ \text{KSI} < 7.5\ \text{KSI}$ **

* Stress Area & Basic Min. minor dia. From MARKS HANDBOOK P.8-10, Table 1.

** Allowable Stress Taken from MARK'S HANDBOOK P 8-30, TABLE 32

CALCULATION SHEET

JOB NO. 9645 CALC. NO. Q1277, Q2777 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Stephen A. Descoteaux DATE 3/10/82

SUBJECT GRAND GULF NUCLEAR STATION CKD James H Colley DATE 3/11/82

SOLENOID MOUNTING PLATE SHEET NO. 89 OF 95

CHECK A307 1/2" ϕ STRUCTURAL BOLTS

THE MAXIMUM FORCE IN ANY DIRECTION FOR ALL BEAM ELEMENTS WAS FOUND TO BE 50#; THIS ENCOMPASSES THE LOADING AT THE BOLTED CONNECTIONS FOR ALL (16) SOLENOID PLATE PROBLEMS

ASSUME 50# IN (3) DIRECTIONS AND APPLY THE SUM TO (1) BOLT

∴ TOTAL BOLT LOAD = 150#

ASSUMING THIS LOAD IS A SHEAR FORCE OVER THE FULL NOMINAL AREA,

$$f_{v,\,BOLT} = \frac{150}{\frac{\pi (.5)^2}{4}} = 764 \text{ PSI}$$

F_v FOR A307 BOLTS = 10.0 KSI (REF. SEC. 1.5.2.1 OF AISC MANUAL)

SINCE .764 KSI < 10.0 KSI, A307 BOLTS ARE O.K.

CHECK BASE PLATES AND BOLTS

ANCHOR REACTIONS ARE NEGLIGIBLE AT THE BASE PLATES OF THE (2) SOLENOID PLATE STRUCTURES THAT CONTAIN CONNECTIONS TO FLOOR

CALCULATION SHEET

JOB NO. 9645 CALC. NO. Q1Z77, Q2Z77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 3/9/82

SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 90 OF 95

FCN-M-	ACTUATOR	MAX. Δ (in)	FREQ.	MAX. BEAM* STRESS (PSI)	MAX. QUAD. R** STRESS (PSI)
1137	Q1Z77F001A	±0.0042	34.60	100.33	946.22
1138	Q1Z77F001B	±0.0076	35.20	267.16	2,264.63
1139	Q2Z77F001B	±0.0040	35.65	245.55	676.19
1140	Q2Z77F001A	±0.0067	34.25	206.97	917.22
1141	Q2Z77F035B	±0.0047	34.21	150.55	1,262.11
1142	Q1Z77F035B	±0.0037	41.38	170.31	913.55
1143	Q2Z77F003B	±0.0160	29.70	696.99	5,056.70
1144	Q1Z77F003B	±0.0077	34.68	365.32	2,312.77
1145	Q2Z77F002A	±0.0033	38.40	297.77	594.39
1146	Q1Z77F002A	±0.0076	35.19	253.65	2,276.38
1147	Q1Z77F002B	±0.0081	33.62	654.70	2,357.63
1148	Q2Z77F002B	±0.0070	33.09	382.76	1,991.48
1149	Q1Z77F002A	±0.0077	35.07	210.69	2,331.97
1150	Q2Z77F003A	±0.0074	35.37	318.83	2,181.18
1151	Q1Z77F035A	±0.0039	42.28	144.51	824.88
1152	Q2Z77F035A	±0.0066	38.36	371.86	2,108.14

* Beam stresses negligible

** Max Quad R stress 5.057 KSI < 10 KSI = .4 Fy

CALCULATION SHEET

JOB NO. 9645 CALC. NO. Q1Z77, Q2Z77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Stephen A. Descoteaux DATE 3/10/82

SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 91 OF 95

ANALYSIS RESULTS

1) MAXIMUM DISPLACEMENT : .016"

2) MAXIMUM BEAM STRESS : 697 PSI
(COMBINED AXIAL AND BENDING OR COMBINED SHEAR)

3) MAXIMUM QUADRILATERAL PLATE STRESS : 5057 PSI
(CONSERVATIVE)

4) LOWEST NATURAL FREQUENCY OF (15) STATIC EQUIVALENT ANALYSES: 33.09 CPS

5) MINIMUM REQUIRED WELD = .11" THICK

6) ALL BOLT AND SCREW CONNECTIONS ARE ADEQUATE

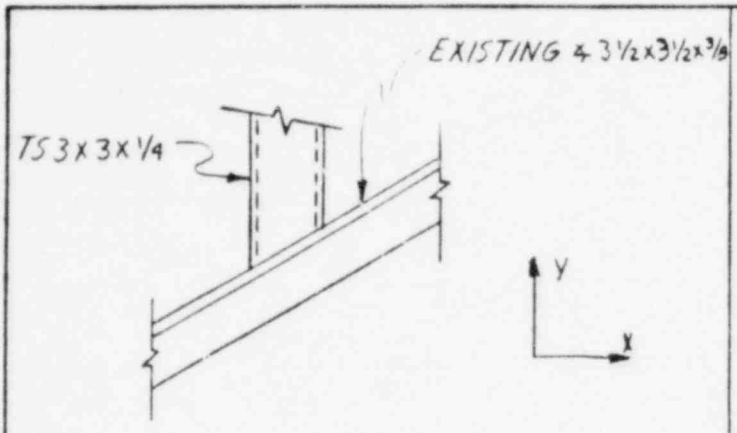
CALCULATION SHEET

JOB. NO. 9645 CALC. NO. Q1277, Q2277 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY Roger Mettle DATE 3/9/82

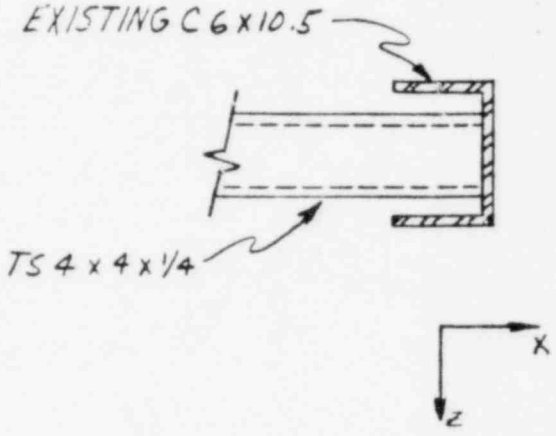
SUBJECT GRAND GULF NUCLEAR STATION CKD James H Calloway DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 92 OF 95



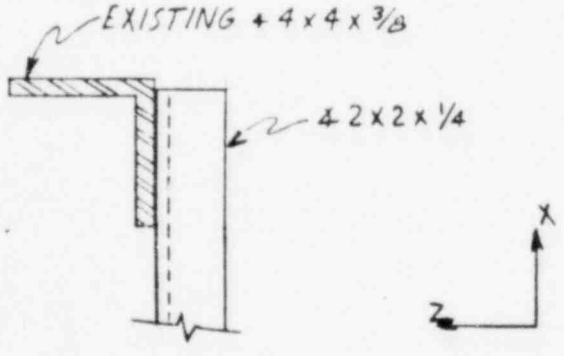
Q1777F035A (FCN-M-1151)

$F_x = \pm$ 4.66 lbs	$M_x = \pm$ 53.72 in-lbs
$F_y = \pm$ 0.17 lbs	$M_y = \pm$ 10.11 in-lbs
$F_z = \pm$ 3.66 lbs	$M_z = \pm$ 61.76 in-lbs



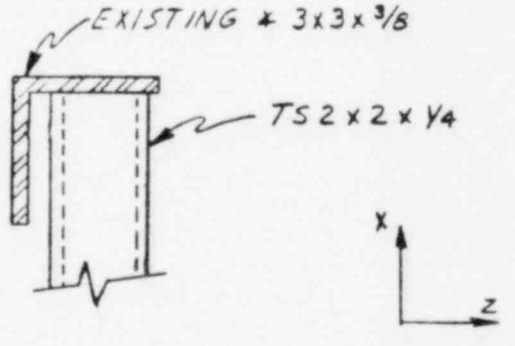
Q1777F003A (FCN-M-1149)

$F_x = \pm$ 12.67 lbs	$M_x = \pm$ 169.62 in-lbs
$F_y = \pm$ 21.90 lbs	$M_y = \pm$ 174.41 in-lbs
$F_z = \pm$ 3.34 lbs	$M_z = \pm$ 358.37 in-lbs



Q2277F002A (FCN-M-1145)

$F_x = \pm$ 2.41 lbs	$M_x = \pm$ 7.02 in-lbs
$F_y = \pm$ 8.08 lbs	$M_y = \pm$ 1.93 in-lbs
$F_z = \pm$ 5.64 lbs	$M_z = \pm$ 0.22 in-lbs



Q1277F002B (FCN-M-1147)

$F_x = \pm$ 11.27 lbs	$M_x = \pm$ 44.52 in-lbs
$F_y = \pm$ 11.67 lbs	$M_y = \pm$ 98.98 in-lbs
$F_z = \pm$ 5.60 lbs	$M_z = \pm$ 67.47 in-lbs

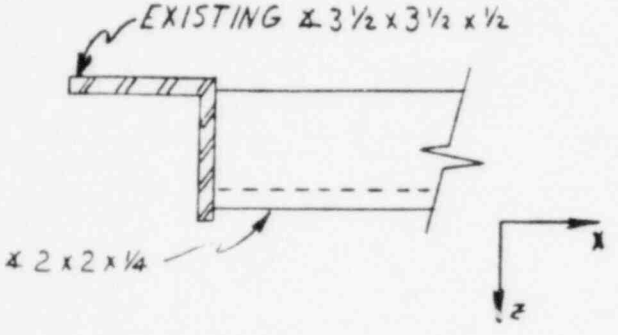
CALCULATION SHEET

JOB NO. 9645 CALC NO. Q1Z77, Q2Z77 REV NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 3/9/82

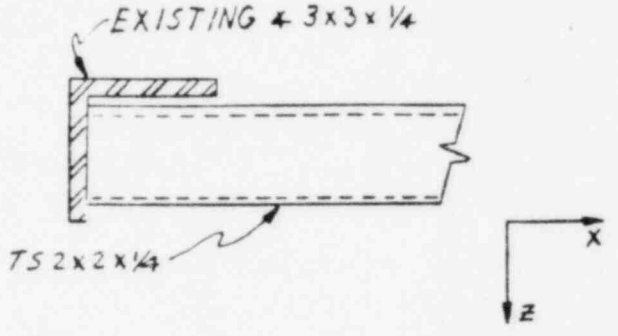
SUBJECT GRAND GULF NUCLEAR STATION CKD [signature] DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 93 OF 95



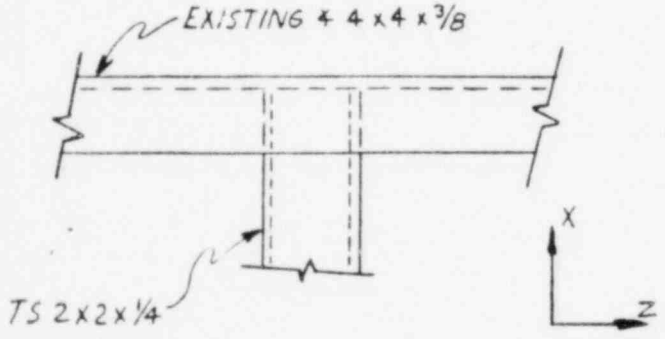
Q2Z77F035A (FCN-M-1152)

$F_x = \pm 5.02$ lbs	$M_x = \pm 0.77$ in-lbs
$F_y = \pm 2.08$ lbs	$M_y = \pm 70.58$ in-lbs
$F_z = \pm 5.25$ lbs	$M_z = \pm 20.00$ in-lbs



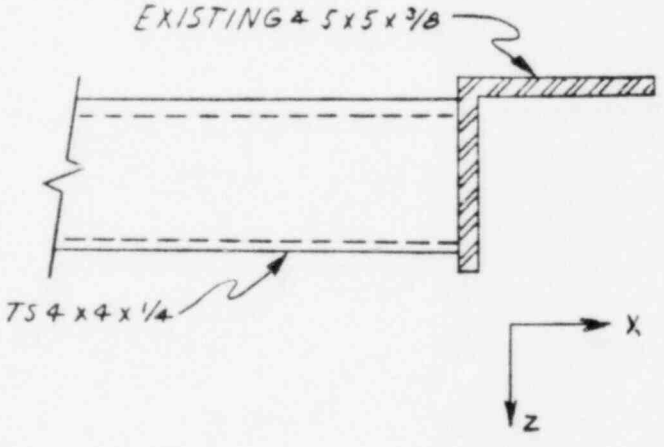
Q2Z77F001B (FCN-M-1139)

$F_x = \pm 3.27$ lbs	$M_x = \pm 17.81$ in-lbs
$F_y = \pm 5.21$ lbs	$M_y = \pm 74.06$ in-lbs
$F_z = \pm 4.81$ lbs	$M_z = \pm 59.13$ in-lbs



Q2Z77F035B (FCN-M-1141)

$F_x = \pm 2.97$ lbs	$M_x = \pm 1.65$ in-lbs
$F_y = \pm 9.27$ lbs	$M_y = \pm 1.72$ in-lbs
$F_z = \pm 0.62$ lbs	$M_z = \pm 63.15$ in-lbs



Q2Z77F003A (FCN-M-1150)

$F_x = \pm 6.85$ lbs	$M_x = \pm 109.21$ in-lbs
$F_y = \pm 13.86$ lbs	$M_y = \pm 80.35$ in-lbs
$F_z = \pm 7.44$ lbs	$M_z = \pm 6.78$ in-lbs

CALCULATION SHEET

JOB NO. 9645 CALC NO. Q1Z77, Q2Z77 REV NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY

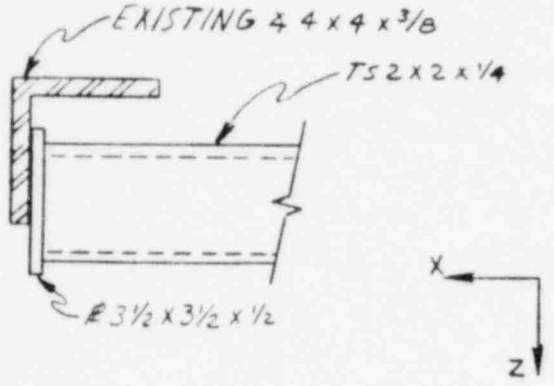
SUBJECT GRAND GULF NUCLEAR STATION

BY [signature] DATE 3/9/82

CKD [signature] DATE 3/10/82

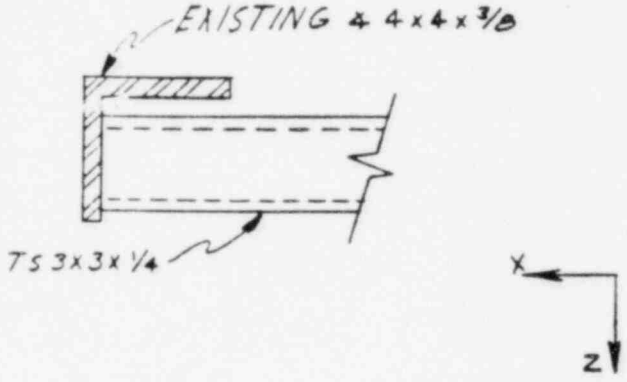
SOLENOID MOUNTING PLATE

SHEET NO. 94 OF 95



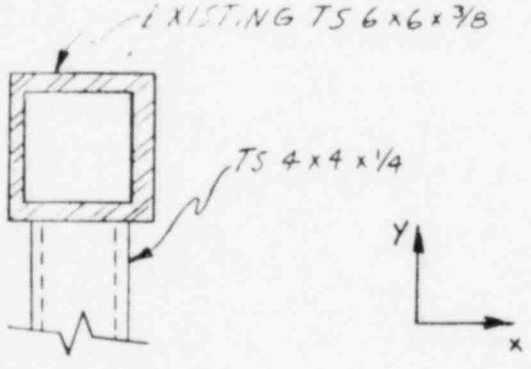
Q1Z77F003B (FCN-M-1144)

$F_x = \pm 5.90$ lbs		$M_x = \pm 22.46$ in-lbs	
$F_y = \pm 4.16$ lbs		$M_y = \pm 98.65$ in-lbs	
$F_z = \pm 5.91$ lbs		$M_z = \pm 45.91$ in-lbs	



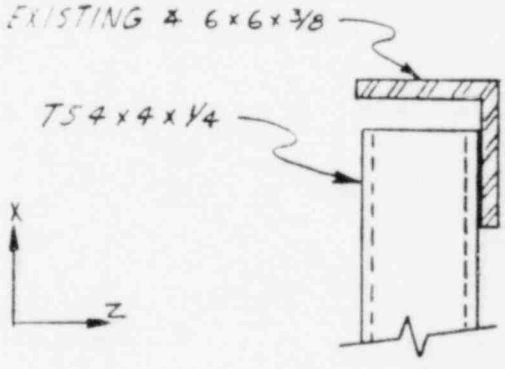
Q1Z77F002A (FCN-M-1146)

$F_x = \pm 4.94$ lbs		$M_x = \pm 41.38$ in-lbs	
$F_y = \pm 5.31$ lbs		$M_y = \pm 73.83$ in-lbs	
$F_z = \pm 5.78$ lbs		$M_z = \pm 24.87$ in-lbs	



Q1Z77F001A (FCN-M-1137)

$F_x = \pm 7.08$ lbs		$M_x = \pm 277.69$ in-lbs	
$F_y = \pm 25.54$ lbs		$M_y = \pm 30.91$ in-lbs	
$F_z = \pm 11.09$ lbs		$M_z = \pm 94.76$ in-lbs	



Q2Z77F001A (FCN-M-1140)

$F_x = \pm 14.00$ lbs		$M_x = \pm 156.39$ in-lbs	
$F_y = \pm 25.94$ lbs		$M_y = \pm 254.44$ in-lbs	
$F_z = \pm 6.70$ lbs		$M_z = \pm 154.10$ in-lbs	

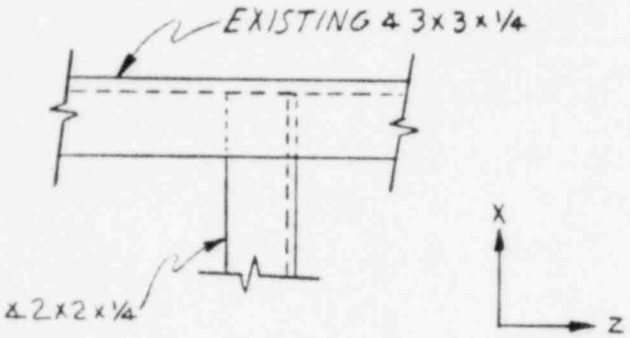
CALCULATION SHEET

JOB. NO. 9645 CALC. NO. Q1E77, Q2E77 REV. NO. A

PROJECT MISSISSIPPI POWER & LIGHT COMPANY BY [signature] DATE 3/9/82

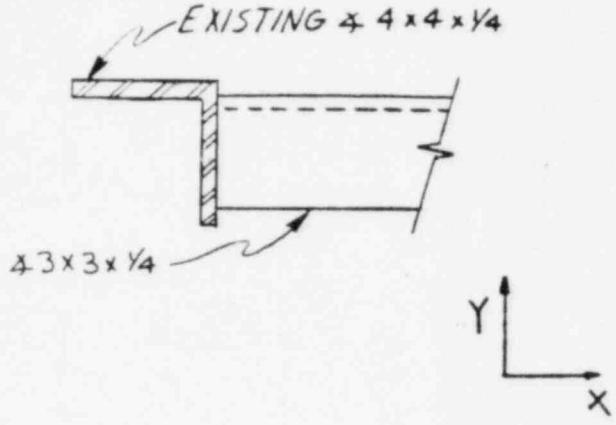
SUBJECT GRAND GULF NUCLEAR STATION CKD James N Callejo DATE 3/10/82

SOLENOID MOUNTING PLATE SHEET NO. 95 OF 95



Q1E77F035B (FCN-M-1142)

$F_x = \pm$ 3.18 lbs	$M_x = \pm$ 1.10	in-lbs
$F_y = \pm$ 6.92 lbs	$M_y = \pm$ 2.55	in-lbs
$F_z = \pm$ 0.13 lbs	$M_z = \pm$ 17.83	in-lbs



Q2E77F003B (FCN-M-1143)

$F_x = \pm$ 5. lbs	$M_x = \pm$ 29.	IN-lbs.
$F_y = \pm$ 41. lbs.	$M_y = \pm$ 28.	IN-lbs.
$F_z = \pm$ 6. lbs.	$M_z = \pm$ 186	IN-lbs