ENCLOSURE 8

DC-5766 Vol I Rev 0

System 2850-2 Duct String Analysis and Support Evaluation

PLUS 3782 ATTACHMENT SHEETS

DESIGN CALCULATION COVER SHEET

PART 1: DESIGN CALCULATION IDENTIFICATION

A) Design Calculation Number: DC-5766		B) Volume Number: I	
C) Revision: 0	D) PIS Number: T4102	E) QA Level: [ ] Non-Q [X] 1 [ ] 1M	
F) ASME Code Classification: [X] NA		G) Certification Required: [ ] Yes [X] No	
H) Lead Discipline: MECHANICAL / CIVIL		I) Incorporation Code: F	

J) Title: CC HVAC CONCERN RESOLUTION TASK – DUCT STRING ANALYSIS AND SUPPORT EVALUATION OF 2850 SYSTEM SERIES

K) Design Change Documents Incorporated (Number and Revision)

NONE

L) Design Calculations Superseded (Number and Revision)

NONE

M) Revision Summary

ORIGINAL ISSUE

STRING ANALYSIS AND STRUCTURAL ADEQUACY EVALUATION OF SUPPORTS AND THEIR ANCHORAGES OF DUCT/SUPPORT SYSTEMS IN STRINGS 2850-1, 2850-2 AND 2850-4 ARE PERFORMED. MODIFICATIONS TO 9 SUPPORTS ARE IDENTIFIED AND DESIGNED.

THIS CALCULATION IS PART OF THE BASIS FOR EDP-28147.

PART 2: PREPARATION, REVIEW, AND APPROVAL

A) Prepared By Sign: E. ATAY		Date: 6/6/96
B) Checked By Sign: R Sen		Date: 6/7/96
C) Verified By Sign: R. Sen		Date: 6/7/96
D) Approved By (Includes PE approval) * Sign: E. Odar Abdul-Ghaleb		Date: 6/7/96

* Approve attached PE. if applicable

Not Decommissioning Related

DTC: TPMMES DSN: MES15001 Rev. 0 P1/1 File: 1703.22 Date: 8-25-95 Recip: ____

DTC: TDPCAS ☒ TDPELE ☐ TDPINC ☐ TDPMEC ☐

DSN: DC-5766 Rev: 0 File: 1801 IP: 1

VOL I

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GENERAL COMPUTATION SHEET

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PROJECT: DECO FERMI 2

SUBJECT: CCHVAC DUCT & DUCT SUPPORTS STRUCTURAL QUALIFICATION

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ATTACHMENTS

ATTACHMENT A1: Computer Output for String Analysis System 2850-1

A.	D28501.O	61 Sheets
B.	FQ28501.O	161 Sheets
C.	O28501.O	38 Sheets
D.	S28501.O	38 Sheets
E.	PO28501.O	65 Sheets
F.	PS28501.O	65 Sheets

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ATTACHMENT A2: Computer Output for String Analysis
System 2850-1 Initial Modification

A.	D28501.MO	61	Sheets
B.	FQ28501.MO	161	Sheets
C.	O28501.MO	38	Sheets
D.	S28501.MO	38	Sheets
E.	PO28501.MO	65	Sheets
F.	PS28501.MO	65	Sheets

ATTACHMENT A3: Computer Output for String Analysis
System 2850-1 Final Modification

A.	D28501.FO	61	Sheets
B.	FQ28501.FO	198	Sheets
C.	O28501.FO	38	Sheets
D.	S28501.FO	38	Sheets
E.	PO28501.FO	65	Sheets
F.	PS28501.FO	65	Sheets

ATTACHMENT A4: Computer Output for Stiffness Analysis
Supports 6M-2850-H-74 & 6M-2850-H-77

A.	H74.O	33	Sheets
B.	H77.O	33	Sheets

ATTACHMENT A5: Computer Output for String Analysis
System 2850-2

A.	D28502.O	52	Sheets
B.	FQ28502.O	157	Sheets
C.	O28502.O	35	Sheets
D.	S28502.O	35	Sheets
E.	PO28502.O	53	Sheets
F.	PS28502.O	53	Sheets

ATTACHMENT A6: Computer Output for String Analysis
System 2850-2 Modified Configuration

A.	D28502.O	51	Sheets
B.	FQ28502S.O	58	Sheets
C.	O28502.O	35	Sheets
D.	S28502.O	35	Sheets
E.	PO28502.O	30	Sheets
F.	PS28502.O	30	Sheets

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GENERAL COMPUTATION SHEET

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ATTACHMENT A7: Computer Output for String Analysis System 2850-4

A.	D28504.O	42	Sheets
B.	FQ28504.O	76	Sheets
C.	O28504.O	26	Sheets
D.	S28504.O	26	Sheets
E.	PO28504.O	33	Sheets
F.	PS28504.O	33	Sheets

Attachment B1 : Computer Output for Support Analysis Support 6M-2850-H-76 — 93 Sheets

Attachment B2 : Computer Output for Support Analysis Support 6M-2850-H-77, 4/22/96 — 148 Sheets

Attachment B3 : Computer Output for Support Analysis Support 6M-2850-H-81 — 78 Sheets

Attachment B4 : Computer Output for Support Analysis Support 6M-2850-H-87 — 83 Sheets

Attachment B5 : Computer Output for Support Analysis Support 6M-2650-H-88 — 83 Sheets

Attachment B6 : Computer Output for Support Analysis Support 6M-2850-1-H-11 — 78 Sheets

Attachment B7 : Computer Output for Support Analysis Support 6M-2850-H-73 — 78 Sheets

Attachment B8 : Computer Output for Support Analysis Support 6M-2850-H-77, 5/20/96 — 95 Sheets

Attachment B9 : Computer Output for Support Analysis Support 6M-2850-H-49 — 121 Sheets

Attachment B10: Computer Output for Support Analysis Support 6M-2850-H-54 — 120 Sheets

Attachment B11: Computer Output for Support Analysis Support 6M-2850-H-59, 4/4/96 — 78 Sheets

Attachment B12: Computer Output for ~~Support~~ STIFFNESS Analysis Support 6M-2850-H59, 4/6/96 — 78 Sheets

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Attachment B13: Computer Output for Support Analysis Support 6M-2850-H-63 — 78 Sheets

Attachment B14: Computer Output for Support Analysis Support 6M-2850-H-50 — 120 Sheets

Attachment C1 : Computer Output for Anchor and Base Plate Analysis Support 6M-2850-H-72 — 25 Sheets

Attachment C2 : Computer Output for Anchor and Base Plate Analysis Support 6M-2850-H-50 — 39 Sheets

Attachment D1 : Pertinent Reference Sheets from RICO 2850-1, 2850-2 and 2850-4 — 24 Sheets

Attachment E1 : Duct properties System 2850-1 — 41 Sheets

Attachment E2 : Duct properties System 2850-2 — 50 Sheets

Attachment E3 : Duct properties System 2850-4 — 25 Sheets

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PURPOSE

Fermi 2 Control Center Heating, Ventilation and Air Conditioning, (CCHVAC), and Standby Gas Treatment System (SGTS) safety related seismic category I duct, duct supports and anchorages were revalidated to demonstrate their structural adequacy under the effects of applicable loads and their combinations in accordance with the requirements and acceptance criteria contained in Design Criteria No: Fermi-DC-76230-1, "CCHVAC Duct and Duct Support Qualification", (Ref. 1). This revalidation effort is a result of the commitments made by DECo to the USNRC staff, to provide resolution of all the issues on the CCHVAC structural aspects identified by the staff in their letter, dated December 7, 1995 (Ref. 2) and during subsequent meetings held on February 7, 1996 and March 1, 1996 in Bethesda, MD. The overall revalidation program, referred to as the "CCHVAC Concern Resolution Task" is an integrated effort which includes recalculation of system operating (P_O) and maximum (P_A) pressures for duct evaluations; determination of pertinent seismic response on duct, duct supports and anchorages; evaluation of duct and duct transition segment (Tees, Ys, elbows, etc.) structural adequacy; evaluation of support and anchorage structural adequacy; and documentation of the adequacy in calculations and/or identifying required hardware modifications which are issued for implementation in EDP-28147. Duct/support systems shown to require modification(s) are reevaluated with the modified configurations to demonstrate structural adequacy of the modified system.

Pressure calculations are contained in calculations DC-5744 and DC-5758, (Ref. 3 & 4). The results of structural evaluation of ducts, supports and anchorages are summarized in a series of calculations as listed below. Generally the results of ducts/support system evaluations are arranged based on the drawing series where they appear, to facilitate correlation.

NON RIGID DUCT/SUPPORT SYSTEMS:

STRING ANALYSES, SUPPORT AND ANCHORAGE EVALUATION

DC-5762 Generic Evaluation
DC-5763 2268 Series
DC-5764 2848 Series
DC-5765 2849 and 4126 Series
DC-5766 2850 Series
DC-5767 4316 Series

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PROJECT DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION

EFFECTIVE SECTION CALCULATIONS AND DUCT EVALUATIONS

DC-5768	Duct Skin Stress Evaluation Under Internal Pressure
DC-5770	2268 and 2848 Series
DC-5771	2849 and 4126 Series
DC-5772	2850 Series
DC-5773	4316 Series

RIGID DUCT/SUPPORT SYSTEM EVALUATIONS:

DC-5774 Rigid duct/supports (all)

EXTENT OF CONDITION EVALUATION OF OTHER SAFETY RELATED DUCT AND DUCT SUPPORTS:

DC-5769 2255, 4148 and 4355 Series

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PROJECT DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION

SCOPE

This calculation contains the structural evaluation of duct/support systems 2850-1,2850-2 and 2850-4 .

Included in this calculation is the duct string mathematical modeling, dynamic response analyses to develop seismic responses, static analyses to establish loads due to dead weight, and structural evaluation of supports and their anchorages. Due to the exceedance of allowable stresses identified in a few areas, this calculation also includes reevaluation of the above systems with the modified configurations to show structural adequacy of the modified systems, and the calculations to demonstrate conformance to the allowable stress limits of the modified components.

The string and support configuration data, as well as the data on the as installed anchorage configuration was obtained from the existing documents (Ref. 11 thru 17). Existing design change documents were also considered.

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CCHVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION

METHODOLOGY

These duct/support systems are three of the twenty two systems classified as Non Rigid. The following is performed and documented in this calculation:

1. Review configuration and types of support.
2. Calculate rectangular duct section properties.
3. Evaluate horizontal and vertical stiffenesses of a selected support to validate acceptability of support springs contained in calculation DC-2789 (Ref. 11).
4. Validate acceptability of the duct/support string 2850-1, 2850-2 and 2850-4 models for analysis.
5. Model strings and perform response spectra modal analysis for three directional simultaneous application of OBE and SSE effects utilizing STARDYNE. Enveloped response spectra in three directions for OBE (4% damping) and SSE (7% damping) identified as El 677' are used as earthquake input for these rectangular duct systems. Digitized spectra are printed in the dynamic analysis printouts. The basis for the digitized spectra is provided in calculation DC-5762.
6. Select and evaluate bounding supports based on the calculated response loads and show structural adequacy.
7. Evaluate structural adequacy of critical welds for the supports.
8. Evaluate base plates and anchor bolts utilizing support member offsets on base plate as determined by field data contained in calculation DC-2833 ,DC-2834 ,DC-2836 .
9. For identified overstress conditions, determine constructible modifications and reevaluate the modified configurations to demonstrate structural adequacy of the modified systems and supports.
10. Summarize results.

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CCHVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION

RESULTS AND CONCLUSIONS

1. Member and weld stresses for the bounding case supports of systems 2850-1 ,2850-2 and 2850-4 under the combined effects of dead load and seismic responses are within allowables with the exception of supports H-74 (2850-1),H-76 (2850-1),H-80 (2850-1) ,H-81 (2850-1) and H-60 (2850-2),H-61 (2850-2),H-63 (2850-2),H-64 (2850-2) which required modifications. Bracing members have been added to supports H-73,H-74,H-76,H-77,H-81, H-60,H-61,H-63,H-64 and the supports have been shown to be adequate.

2. Base plate and anchorage of systems 2850-1,2850-2 and 2850-4 are structurally adequate with the exception of supports H-73 (2850-1),H-75 (2850-1),H-76 (2850-1),H-77 (2850-1) and H-60 (2850-2),H-61 (2850-2),H-62 (2850-2),H-63 (2850-2), H-64 (2850-2) . After the above modifications (bracing members have been added) the base plates and anchorages have been shown to be adequate.

3. The bracing arrangements are included in EDP-28147 .

It is concluded that, with modifications (see (D) MODIFICATIONS), the duct/support systems 2850-1 ,2850-2 and 2850-4 are structurally adequate and meet the requirements and acceptance criteria of Design Criteria No. Fermi-DC-76230-1.

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PROJECT DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION

REFERENCES

1. CCHVAC Duct and Duct Support Qualification, Fermi Design Criteria No. FERMI-DC-76230-1, Revision 0, dated 3/15/96.
2. NRC Letter Dated December 7, 1995, "Fermi 2 Control Center Heating, Ventilation and Air Conditioning (CCHVAC) System, including Safety Evaluation on the Same Subject".
3. DECo Calculation DC-5744, Rev. 0.
4. DECo Calculation DC-5758, Rev. 0.
5. AISC Manual of Steel Construction 7th Edition and 8th Edition.
6. AISC Specification for Allowable Stress Design of Single-Angle Member, included in the 9th Edition of AISC Manual.
7. DECo Calculation DC-2935, Revision 0, Design Methods - QAI Ductwork Supports.
8. DECo Specification 3071-226, Revision J, Purchase and Installation of Concrete Anchors.
9. DECo Calculation DC-5762, Rev. 0, Generic Evaluations for String Analysis & Duct Supports.
10. Design of Welded Structures, Blodgett-1972.
11. DECo Calculation DC-2833 for System 2850-1 .
12. DECo Calculation DC-2834 for System 2850-2 .
13. DECo Calculation DC-2836 for System 2850-4 .
14. Report No. RICO-2850-1 .
15. Report No. RICO-2850-2 .
16. Report No. RICO-2850-4 .
17. Drawing RICO 2850, REV. 15 .

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COMPUTER DISCLOSURE SHEET (REF. FORM 5611)

Program used : STARDYNE - 4.0, MAY01/93

RE&C Prequalification : Yes

Analysis description : Static and dynamic analysis of duct/support system string no. 2850-2

Stiffness analysis of support H59

Run no.s :

D28502.O	Mar. 29, 1996 Static analysis
FQ28502.O	Mar. 29, 1996 Frequency analysis
O28502.O	Mar. 29, 1996 OBE dynamic analysis
S28502.O	Mar. 29, 1996 SSE dynamic analysis
PO28502.O	Mar. 29, 1996 Post processing for DL and OBE
PS28502.O	Mar. 29, 1996 Post processing for DL and SSE
H49.OUT	Static analysis of support H49
H54.OUT	Static analysis of support H54
H59.OUT	Static analysis of support H59
H59.OUT	Stiffness analysis of support H59
H63.OUT	Static analysis of support H63

Program used : STARDYNE - 4.4, AUG03/95

RE&C Prequalification : Yes

Analysis description : Static and dynamic analysis of duct/support system string no. 2850-2

D28502.O	Apr. 22, 1996 Modified Static analysis
FQ28502S.O	Apr. 22, 1996 Modified Frequency analysis
O28502.O	Apr. 22, 1996 Modified OBE dynamic analysis
S28502.O	Apr. 22, 1996 Modified SSE dynamic analysis
PO28502.O	Apr. 22, 1996 Modified Post processing for DL and OBE
PS28502.O	Apr. 22, 1996 Modified Post processing for DL and SSE

The computer outputs attached to this calculation have been reviewed, the input data checked, and the results approved for release. Input criteria for this analysis were established.

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COMPUTER DISCLOSURE SHEET (REF. FORM 5611)

Program used : STARDYNE - 4.4, AUG03/95

RE&C Prequalification : Yes

Analysis description : Static and dynamic analysis of duct/support system string no. 2850-1

Stiffness analysis of supports H74 & H77

Run no.s :

D28501.O	Static analysis
FQ28501.O	Frequency analysis
O28501.O	OBE dynamic analysis
S28501.O	SSE dynamic analysis
PO28501.O	Post processing for DL and OBE
PS28501.O	Post processing for DL and SSE
D28501.MO	Initial modification Static analysis
FQ28501.MO	Initial modification Frequency analysis
O28501.MO	Initial modification OBE dynamic analysis
S28501.MO	Initial modification SSE dynamic analysis
PO28501.MO	Initial modification Post processing for DL and OBE
PS28501.MO	Initial modification Post processing for DL and SSE
D28501.FO	Final modified Static analysis
FQ28501.FO	Final modified Frequency analysis
O28501.FO	Final modified OBE dynamic analysis
S28501.FO	Final modified SSE dynamic analysis
PO28501.FO	Final modified Post processing for DL and OBE
PS28501.FO	Final modified Post processing for DL and SSE
H74.O	Stiffness analysis of support H74
H77.O	Stiffness analysis of support H77
H76.OUT	Static analysis of support H76
H77.OUT	Static analysis of support H77
H87.OUT	Static analysis of support H87
H88.OUT	Static analysis of support H88
H73.OUT	Static analysis of support H73
H77.OUT	Static analysis of support H77

The computer outputs attached to this calculation have been reviewed, the input data checked, and the results approved for release. Input criteria for this analysis were established.

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Program used : STARDYNE - 4.0, MAY01/93

RE&C Prequalification : Yes

Analysis description : Static and dynamic analysis of duct/support system string no. 2850-4

Run no.s :

D28504.O	Static analysis
FQ28504.O	Frequency analysis
O28504.O	OBE dynamic analysis
S28504.O	SSE dynamic analysis
PO28504.O	Post processing for DL and OBE
PS28504.O	Post processing for DL and SSE
H50.OUT	Static analysis of support H50

The computer outputs attached to this calculation have been reviewed, the input data checked, and the results approved for release. Input criteria for this analysis were established.

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COMPUTER DISCLOSURE SHEET (REF. FORM 5611)

Program used : STARDYNE - 4.0, MAY01/93

RE&C Prequalification : Yes

Analysis description : Static analysis of support
System string no. 2850-1

H81.OUT Static analysis of support H81
H11.OUT Static analysis of support H11

The computer outputs attached to this calculation have been reviewed, the input data checked, and the results approved for release. Input criteria for this analysis were established.

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COMPUTER DISCLOSURE SHEET (REF. FORM 5611)

Program used : PHI-DELTA STRUDL, version 0894

RE&C Prequalification : Yes

Analysis description : Base plate analysis

Run no.s : Job 00000081
00000085

The computer outputs attached to this calculation have been reviewed, the input data checked, and the results approved for release. Input criteria for this analysis were established.

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PROJECT: DECO FERMI 2

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(A) MODEL AND DATA FOR STRING ANALYSIS

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PROJECT DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

SUBJECT ~~STRUCTURAL QUALIFICATION~~ SYSTEM 2850-1, 2, 4

STRING ANALYSIS

The string analysis STARDYNE computer runs consist of six individual runs as described below:

1. Frequency run is made using the STAR module. Frequencies up to 50 cps are extracted plus two missing mass correction modes, one for each of the two orthogonal horizontal directions. The mathematical model input data is echoed in the output.

2. Response spectra analysis runs are made using the DYNRE4 module. One run is performed using OBE response spectra and one run is performed using SSE spectra. Missing mass correction in two horizontal directions are included. Since the string is essentially rigid in the vertical direction, missing mass correction for the vertical direction is performed using a static procedure as described under dead load runs and post runs.

   DYNRE4 utilizes the working files saved by the frequency run, therefore, only response spectra and control cards are echoed in the output.

3. Dead load run is made using the STAR module. Dead load, static vertical response at ZPA for OBE and static vertical response at ZPA for SSE are calculated. The mathematical model input data which is identical to the frequency run, with the exception of the loading cases, is echoed in the output.

4. Post runs are made using the POST module. One run is performed for OBE and one run is performed for SSE. Design values for member forces/moments and support loads are obtained from the post outputs.

   Post utilizes the working files saved by the dead load run and the response spectra analysis runs, and output the following load cases:

   a) Dead load.
   b) Earthquake (OBE or SSE).
   c) Dead load + Earthquake, if requested.
   d) Dead load - Earthquake, if requested.

   Missing mass correction in the vertical direction is accomplished by combining, using the SRSS method, the static vertical responses at ZPA with the respective response spectra analysis results. The output of the final member forces/moment and support loads are printed.

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DC-5766					
PRELIM	FINAL	VOID	0	SA DATE 6/6/96	DATE 6/7/96
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PROJECT DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION System 2850-1, 2 & 4

The output contains the echo of the load cases selected and the combination method. The mathematical model input data which are echoed in the output of the "source" runs are not repeated .

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	✓				
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JO 76230.502					

PROJECT DECO FERMI 2

SUBJECT CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM 2850-1, 2 & 4

ANALYSIS MODEL

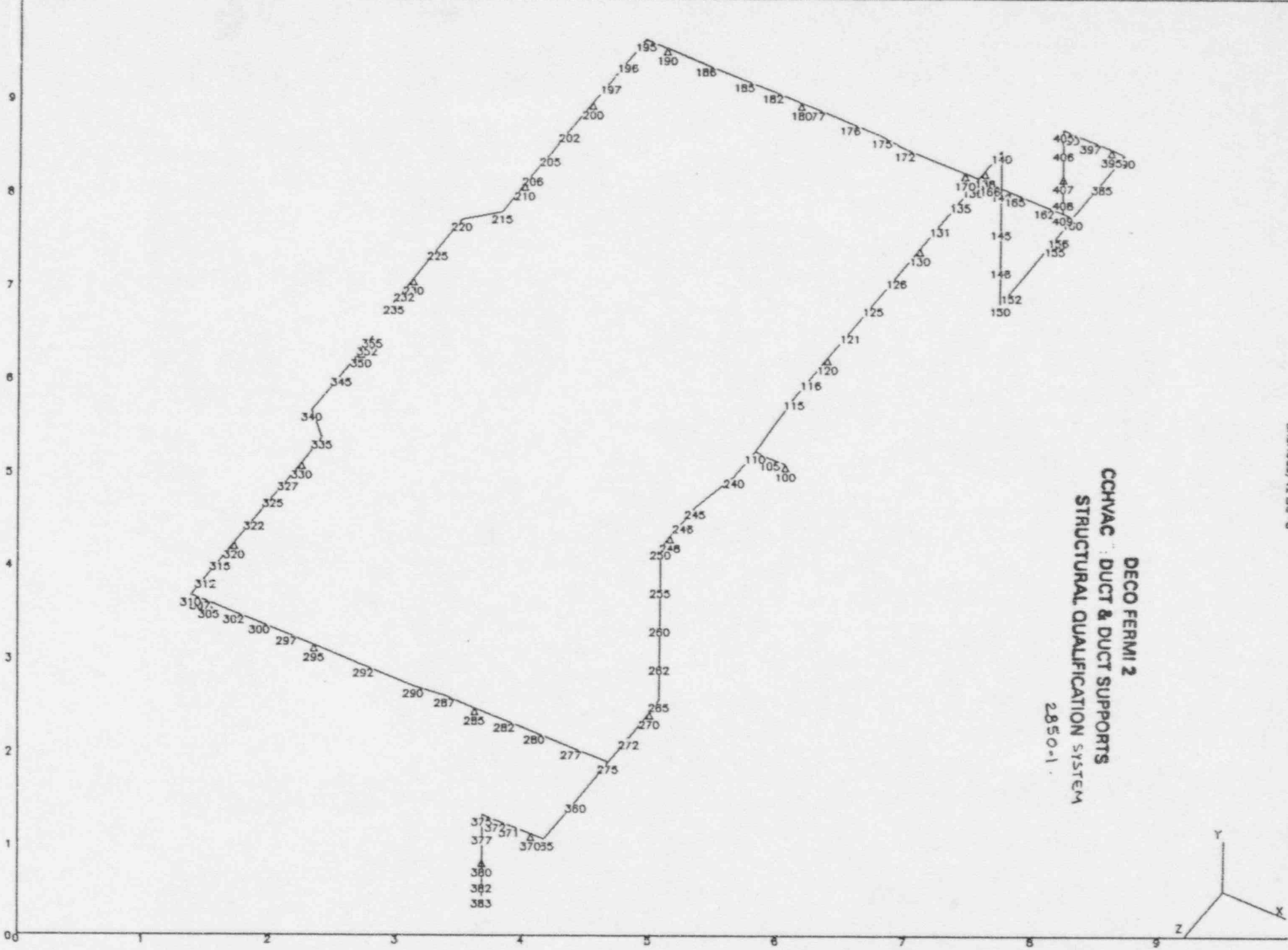
THE MODELS FOR STRING 2850-1, 2850-2 & 2850-4 ARE BASED ON THE RICO STRESS REPORTS (EXCERPTS FROM THE REPORT ARE INCLUDED IN ATTACHMENT "D1")

COMPUTER PLOT OF THE MODEL, PROPERTY, ADDITIONAL WEIGHT AND STIFFNESS CALCULATIONS ARE PRESENTED ON THE FOLLOWING SHEETS.

TH1 :

TH2 : 45.

EBASCO SERVICES , INC.	PREP. BY: R Lewis 5/24/96	CHCK. BY: E.ATAY 5/24/96
STRING 2850-1 DC-5766	J.O. 76230.502	Fri May 24 15:04:02 1996

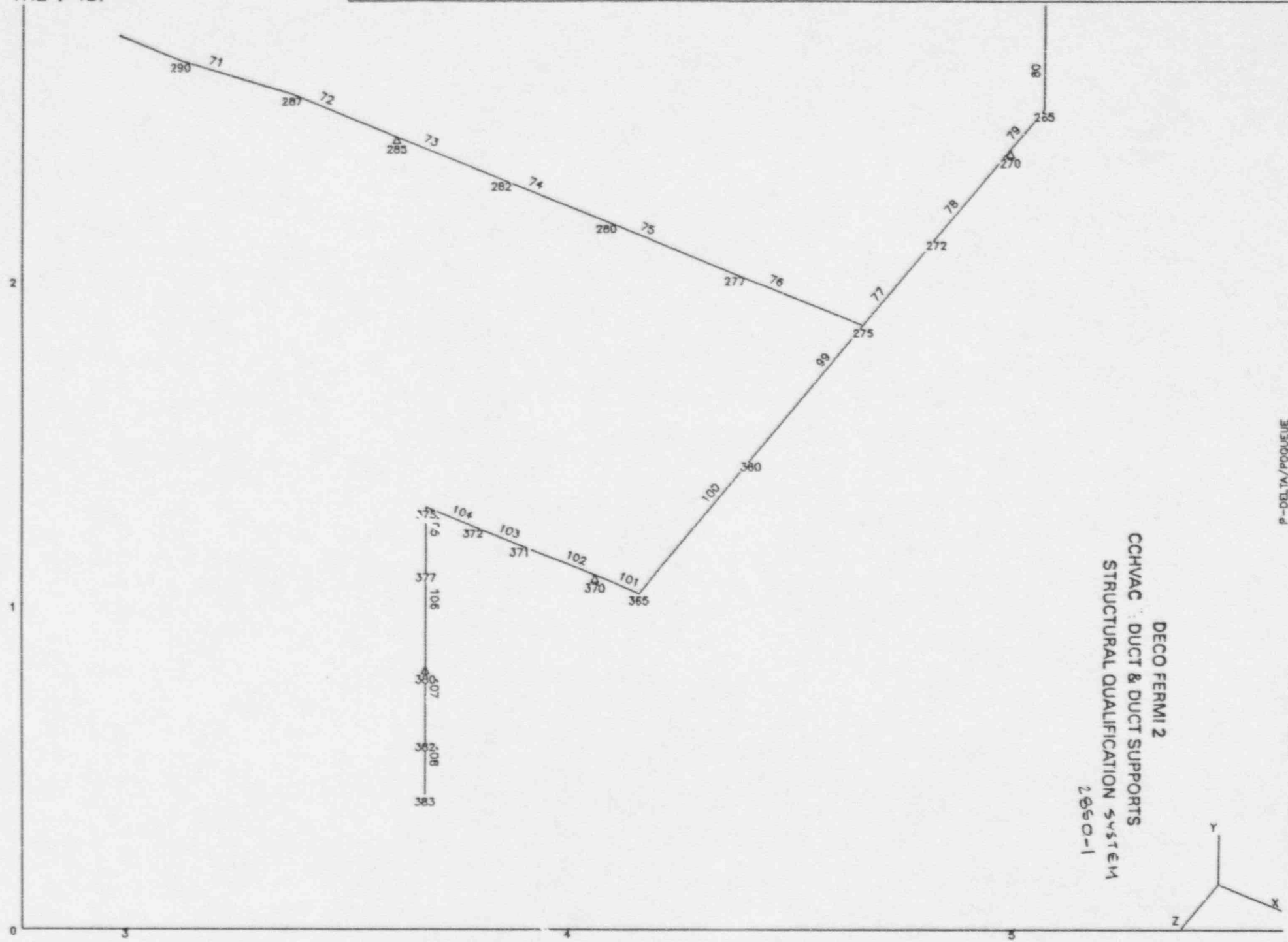


SHEET 21 OF 246

TH1 :

TH2 : 45.

EBASCO SERVICES , INC.	PREP. BY: R Cowan 5/24/96	CHCK. BY: E. ATAYSHAN
STRING 2850-1 DC-5766	J.O. 76230.502	Fri May 24 15:04:52 1996



DECO FERMI 2

CCHVAC : DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION SYSTEM

2850-1

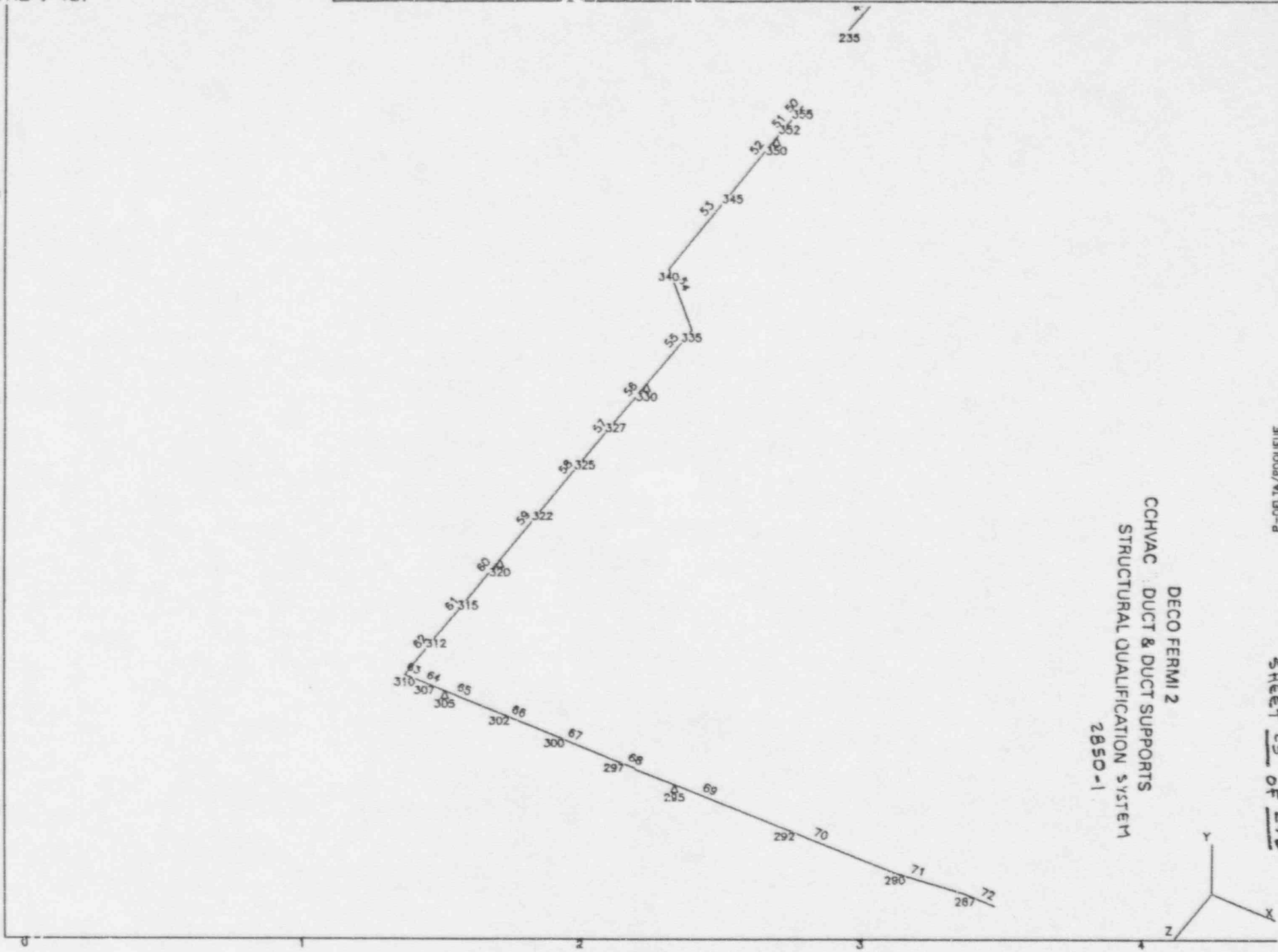
P-DELTA/PDOLUE

SHEET 22 OF 246

TH1 :

TH2 : 45.

EBASCO SERVICES , INC.	PREP. BY: R Cruz 5/24/96	CHCK. BY: E. ATAYS 5/24/96
STRING 2850-1 DC 5166	J.O. 76230.502	Fri May 24 15:10:56 1996



DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM
2850-1

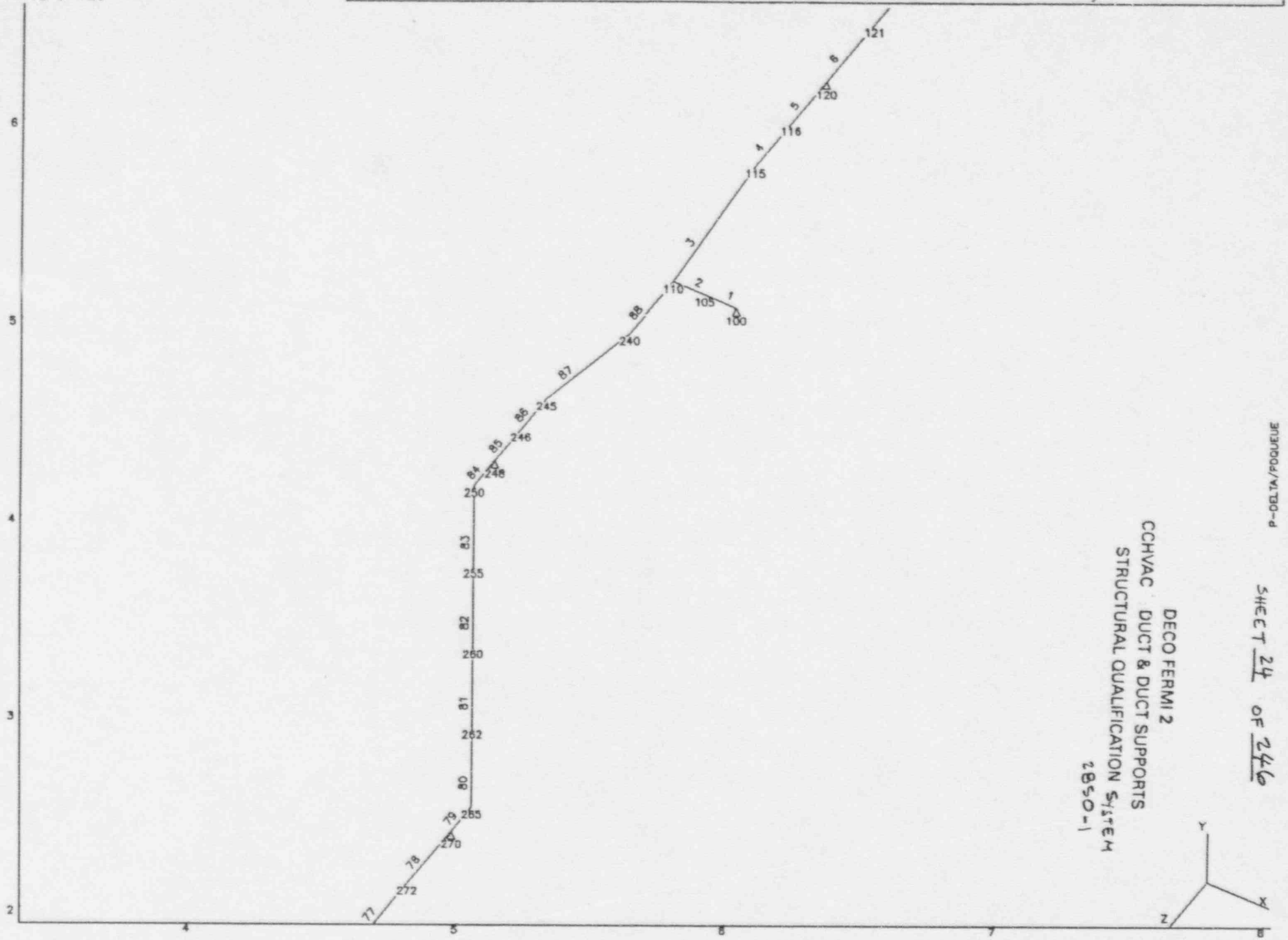
P-DELTA/PODUEUE

SHEET 23 OF 246

TH1 :

TH2 : 45.

EBASCO SERVICES , INC.	PREP. BY: C Cruz 5/24/96	CHCK. BY: EATAJ 5.24.96
STRING 2850-1 DC-5766	J.O. 76230.502	Fri May 24 15:11:38 1996



DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM
2850-1

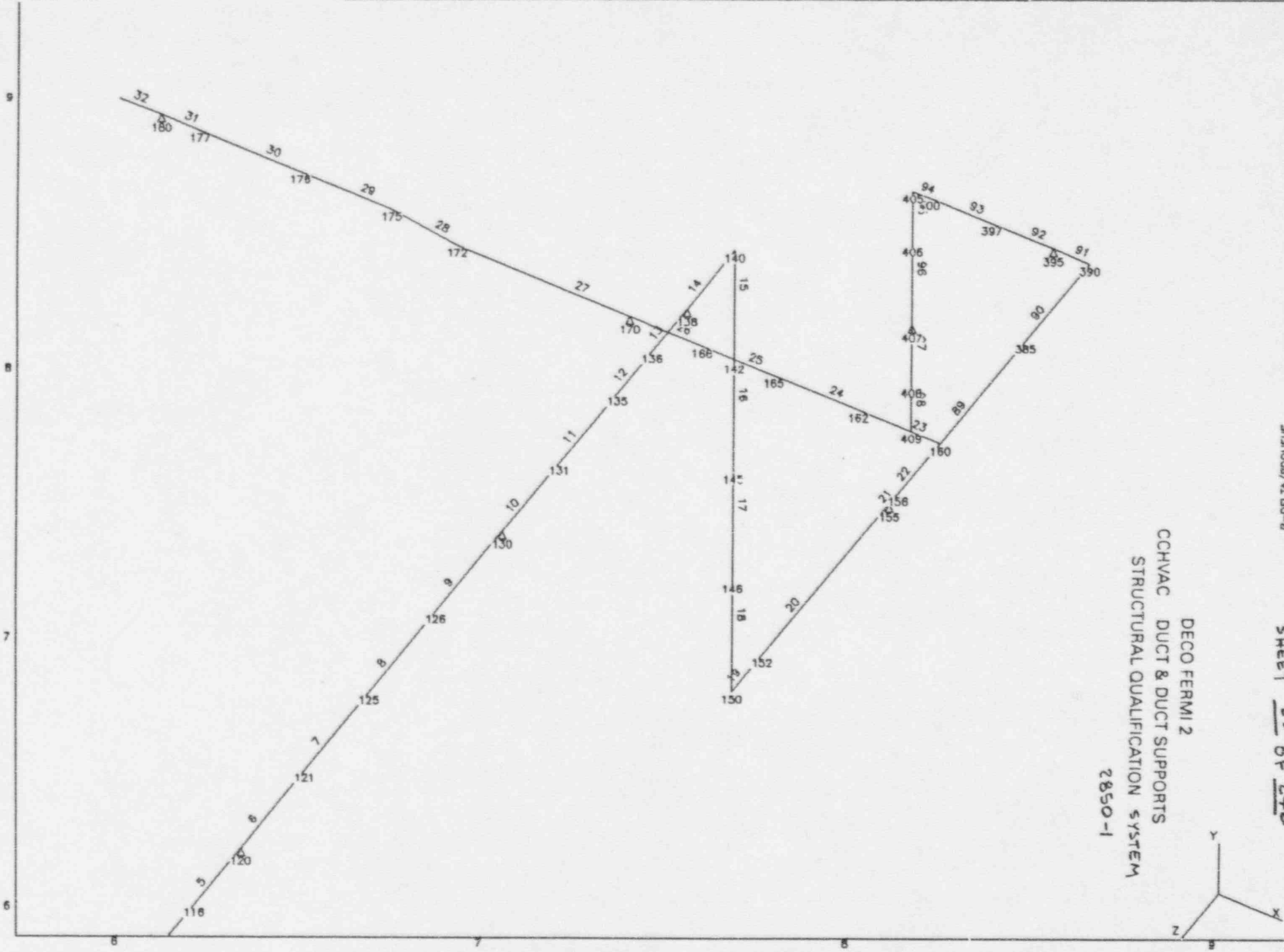
SHEET 24 OF 246

P-DELTA/PDQUEUE

TH1 :

TH2 : 45.

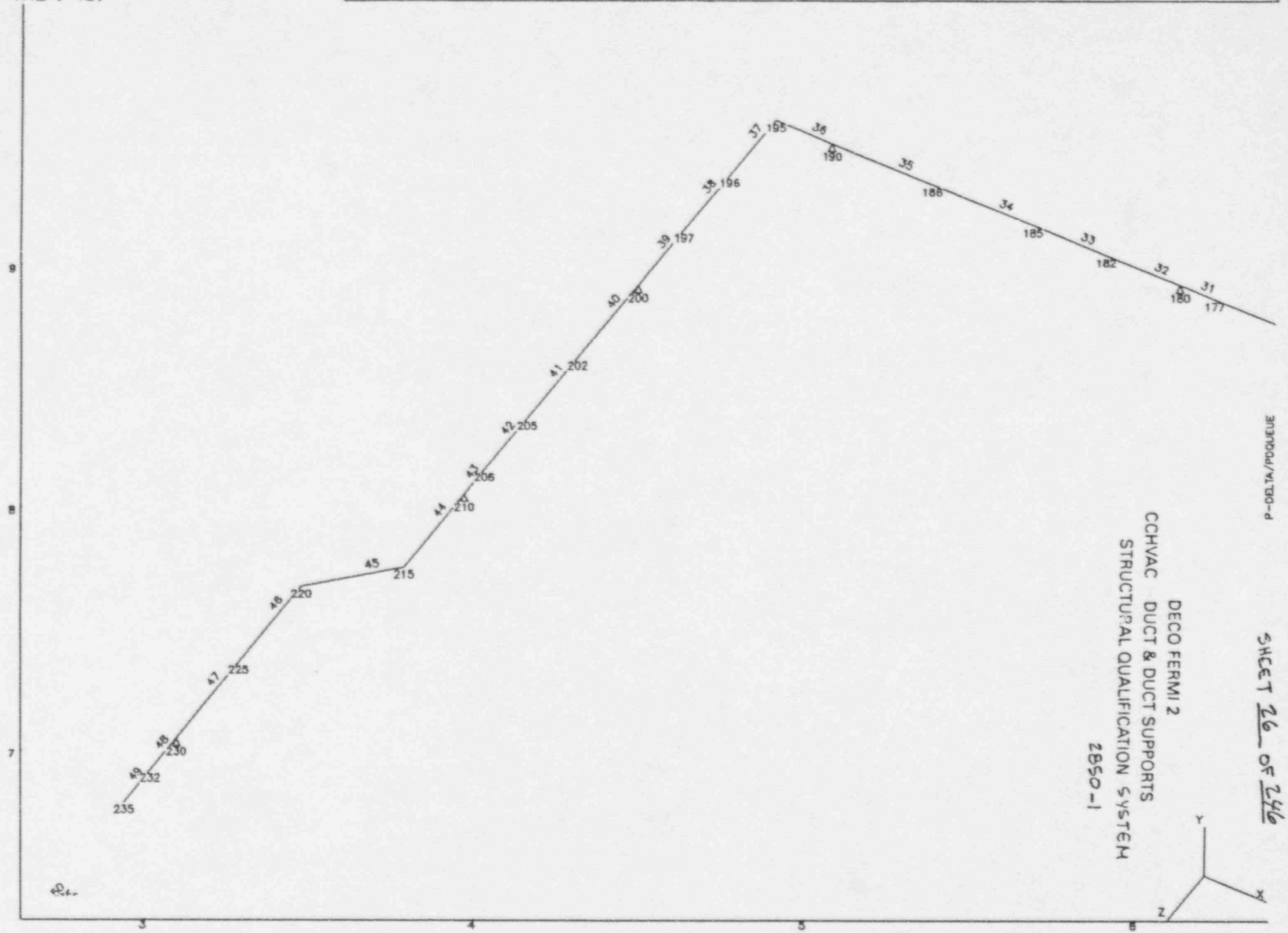
EBASCO SERVICES , INC.	PREP. BY: C Cour 5/24/96	CHCK. BY: E. ATAY 5/24/96
STRING 2850-1 DC-5766	J.O. 76230.502	Fri May 24 15:12:40 1996



TH1 :

TH2 : 45.

EBASCO SERVICES , INC.		PREP. BY: R Chan 5/24/96	CHCK. BY: E ATAY 5/24/96
STRING 2850-1 DC-5766	J.O. 76230.502		Fri May 24 13:52 1996



DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM
2850-1

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GENERAL COMPUTATION SHEET

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DC-5766				DA/[illegible]	[illegible]
PRELIM	FINAL	VOID	0	DATE 3/25/96	DATE 3/29/96
	✓				
SHEET 27 OF 246				DATE	DATE
JO 76230.502					

PROJECT: DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS

SUBJECT: STRUCTURAL QUALIFICATION SYSTEM 2850-1

MATLG

DUCT SIZE	#	(A) lb/ft DUCT + INSUL =	(B) ft² EFFECTIVE AREA	(A)/(B) DENSITY
34 x 20	1	19.44 + 6.75 = 26.19	0.02005	1306.234
28 x 14	2	15.12 + 5.25 = 20.37	0.01611	1264.432
24 x 18	3	15.12 + 5.25 = 20.37	0.01607	1267.579
24 x 14	4	13.68 + 4.75 = 18.43	0.01479	1246.112
20 x 18	5	13.68 + 4.75 = 18.43	0.01474	1250.339
20 x 14	6	12.24 + 4.25 = 16.49	0.01340	1230.597
16 x 20	7	12.96 + 4.50 = 17.46	0.01408	1240.057
16 x 14	8	10.80 + 3.75 = 14.55	0.01206	1206.472
15 x 15	9	10.80 + 3.75 = 14.55	0.01205	1207.468
15 x 8	10	8.28 + 2.88 = 11.16	0.00976	1143.443
12 x 12	11	8.64 + 3.00 = 11.64	0.01005	1158.209
10 x 8	12	6.48 + 2.25 = 8.73	0.00804	1085.821
8 x 14	13	7.92 + 2.75 = 10.67	0.00958	1113.779

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PROJECT DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
SUBJECT STRUCTURAL QUALIFICATION SYSTEM 2850-1

	DUCT SIZE	A(ft²)	A3 (ft²)	A2(ft²)	A3/A	A2/A
1	34×20	0.020050	0.01328	0.02257	0.662344	1.125686
2	28×14	0.016110	0.009294	0.01859	0.576909	1.153942
3	24×18	0.016070	0.01195	0.01593	0.743622	0.991288
4	24×14	0.014790	0.009294	0.01593	0.628398	1.077079
5	20×18	0.014740	0.01195	0.01328	0.810719	0.900950
6	20×14	0.013400	0.009294	0.01328	0.693582	0.991
7	16×20	0.014080	0.01328	0.01062	0.943182	0.754261
8	16×14	0.012060	0.009294	0.01062	0.770647	0.880597
9	15×15	0.012050	0.009958	0.009958	0.826390	0.826390
10	15×8	0.009766	0.005311	0.009958	0.543826	1.01966
11	12×12	0.010050	0.007967	0.007967	0.792736	0.792736
12	10×8	0.008036	0.005311	0.006639	0.660901	0.826157
13	8×14	0.009578	0.009294	0.005311	0.970349	0.554499

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GENERAL COMPUTATION SHEET

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DC-5766	0	DA DATE 3/25/96	DATE 3/29/96
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JO 76230.502			

PROJECT: DECO FERMI 2

SUBJECT: CCHVAC DUCT & DUCT SUPPORTS STRUCTURAL QUALIFICATION SYSTEM 2850-1

STIFFNESS (LB/FT)

HANGER	NODE	X (EW)	Y (VERT)	Z (NS)
6M-2849-H-57	130	91440	12 812 988	-
58	120	106 416	12 834 216	-
61	170	-	4 739 340	10 944
62	180	-	4 739 904	9 360
6M-2850-H-73	155	60 048	7 716 540	-
74	190	-	7 716 048	35472
75	200	35472	7 716 048	-
76	210	4572	3 740 184	-
77	270	95 076	7 704 648	-
78	370	5 844	1 190 712	11 078 796
79	285	-	7 703 664	52 884
80	295	-	3 744 960	6264
81	305	-	6 714 036	37 548
82	320	35 472	7716 048	-
83	330	4 572	3740 184	-
84	138	24 672	12 797 268	-
85	248	23 988	12 797 268	-
86	407	102 600	28 560	18 066 852
87	380	72 168	18 804	14 443 908
88	395	107 904	106 704	19 679 460
6M-2850-1-H-3	230	4 332	3 849 300	-
-11	350	12 947 772	19 272	-
6M-2850-H-57	100	4 712 904	28 011 204	408 960
ROTATION	100	5.5558×10^7	1.0966×10^7	1.5042×10^6

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JO 76230.502					

PROJECT: DECO FERMI 2

SUBJECT: CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM 2850-1

NODE	WT
110	72
115	35
135	92
145	75
150	30
160	86
175	50
185	59
195	30
205	42
215	38
240	61
250	65.5
260	50
265	32
275	92
280	27
290	85
300	53
310	30
325	42
335	37.4
345	37
360	36
365	25
385	36
390	25

NODE	WT
100	138
120	44
130	44
138	44
155	196
170	115
180	115
190	181
200	181
210	79
230	99
248	46
270	224
285	214
295	84
305	183
320	181
330	79
350	37
370	65
380	88
395	102
400	–
407	77

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GENERAL COMPUTATION SHEET

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DC-5766					
PRELIM	FINAL	VOID	0	JA DATE 3/21/96	DATE 3/29/96
	✓				
SHEET 31 OF 246				DATE	DATE
JO 76230.5					

PROJECT: DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS

SUBJECT: STRUCTURAL QUALIFICATION SYSTEM 2850-1

REF

HANGER 6M-2849-61 (NODE 170)

DWG 10-4221-000 6M-2849-61-A

$L\ 2\frac{1}{2} \times 2\frac{1}{2} \times \frac{1}{4} : \left[\frac{5.833}{2} + 2(14.77) + 2(2.11) + 2(2.69)\right] 4.1$

$\cong 173^{\#}$

@ NODE 170 : $\frac{2}{3} \times 173 = 115^{\#}$

HANGER 6M-2849-62 (NODE 180)

DWG 2849-62-A

SAME AS H-61

@ NODE 180 : $115^{\#}$

HANGER 6M-2850-73 (NODE 155)

DWG 2850-73-A

$L\ 4 \times 4 \times 1/4 : \left[2(14.88) + 3(3.33) + 2.69 + 2.02\right] 6.6$

$= 294^{\#}$

@ NODE 155 : $\frac{2}{3} \times 294 = 196^{\#}$

HANGER 6M-2850-74 (NODE 190)

DWG 2850-74-A

$L\ 4 \times 4 \times 1/4 : \left[2(14.88) + 2(2.02) + 3(2.42)\right] 6.6$

$= 271^{\#}$

@ NODE 190 : $\frac{2}{3} \times 271 = 181^{\#}$

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	✓				
SHEET 22 OF 246				DATE	DATE
JO 76230.502					

PROJECT: DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
SUBJECT: STRUCTURAL QUALIFICATION SYSTEM 2850-1

REF

HANGER 6M-2850-75 (NODE 200)

DWG 6M-2850-75

Same as H-74

@ NODE 200 : $\frac{2}{3} \times 271 = 181^{\#}$

HANGER 6M-2850-76 (NODE 210)

DWG 6M-2850-76

L 2x2x 1/4 : $\left[2(14.71) + 2(1.35) + 3(1.71)\right] 3.19$

$= 119^{\#}$

@ NODE 210 : $\frac{2}{3} \times 119 = 79^{\#}$

HANGER 6M-2850-77 (NODE 270)

DWG 6M-2850-77-B

L 4x 4x 1/4 : $\left[2(14.71) + 3(3.81) + 2(3.02) + 3 + 1\right] 6.6$

$= 336^{\#}$

@ NODE 270 : $\frac{2}{3} \times 336 = 224^{\#}$

HANGER 6M-2850-78 (NODE 370)

DWG 6M-285078

L 2 1/2 x 2 1/2 x 1/4 : $\left(2(6.46) + 2(1.10) + 7.83 + 1^{\text{CWS}}\right) 4.1$

$= 98^{\#}$

@ NODE 370 : $\frac{2}{3} \times 98 = 65^{\#}$

HANGER 6M-2850-79 (NODE 285)

DWG 6M-2850-79-B

L 4x4x 1/4 : $\left[2(14.88) + 3(2.71) + 2(4.36) + 2\right] 6.6$

$= 321^{\#}$

@ NODE 285 : $\frac{2}{3} \times 321 = 214^{\#}$

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J.O 76230.502					

PROJECT: DECO FERMI 2
SUBJECT: CCHVAC DUCT & DUCT SUPPORTS STRUCTURAL QUALIFICATION SYSTEM 2850-1

REF

HANGER 6M-2850-81 (NODE 305) — DWG 6M-2850-81-A

L 3×3×1/4 : [2(14.79) + 2(1.85) + 8.33 + 3(2.46) + 7] 4.9

= 274#

@NODE 305 : $\frac{2}{3}$ × 274 = 183#

HANGER 6M-2850-80 (NODE 295) — DWG 6M-2850-80

L 2×2×1/4 : [2(14.71) + 2(1.69) + 3(2.17)] 3.19

= 125#

@NODE 295 : $\frac{2}{3}$ × 125 = 84#

HANGER 6M-2850-82 (NODE 320) — DWG 6M-2950-82

L 4×4×1/4 : [2(14.88) + 2(2.02) + 3(2.42)] 6.6

= 271#

@NODE 320 : $\frac{2}{3}$ × 271 = 181#

HANGER 6M-2850-83 (NODE 330) — DWG 6M-2850-83

L 2×2×1/4 : [2(14.71) + 2(1.35) + 3(1.71)] 3.19

= 119#

@NODE 330 : $\frac{2}{3}$ × 119 = 79#

HANGER 6M-2850-84 (NODE 138) — DWG 6M-2850-84

L 2 1/2 × 2 1/2 × 1/4 : [2(5.58 + 2.44)] 4.1

= 66#

@NODE 138 : $\frac{2}{3}$ × 66 = 44#

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

PROJECT: DECO FERMI 2

SUBJECT: CCHVAC DUCT & DUCT SUPPORTS — STRUCTURAL QUALIFICATION SYSTEM 2850-1

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DC-5766				IA	RL
PRELIM	FINAL	VOID	0	DATE 3/21/96	DATE 3/25/96
	✓				
SHEET 34 OF 246				DATE	DATE
J.O 76230.502					

REF

HANGER 6M-2850-1-11 (NODE 350)

DWG 6M-2850-1-11-A

L 2½ x 2½ x ¼ : [2(5.44 + 1.27)] x 4.1

= 55#

@ NODE 350 : $\frac{2}{3}$ x 55 = 37#

HANGER 6M-2850-1-3 (NODE 230)

DWG 6M-2850-1-3

L 2½ x 2½ x ¼ : [4.08 + $\frac{4.54}{2}$ + 1.5 + 14.75 + 10.94 + 2(1.29)] 4.1

= 148#

@ NODE 230 : $\frac{2}{3}$ x 148 = 99#

HANGER 6M-2849-57-A (NODE 130)

DWG 6M-2849-57-A

L 2½ x 2½ x ¼ : 2[5.58 + 2.44] 4.1 = 66#

@ NODE 130 : $\frac{2}{3}$ x 66 = 44#

HANGER 6M-2850-57 (NODE 100)

DWG 6M-2850-57-B

L 3 x 3 x ¼ : [2(5.63) + 3.35 + 2.85 + 2(1) + 2(6) + 5.42 + 5.38] 4.9

= 207#

@ NODE 100 : $\frac{2}{3}$ x 207 = 138#

HANGER 6M-2849-58 (NODE 120)

DWG 6M-2849-58

L 2½ x 2½ x ¼ : [2(5.58) + 2(2.44)] 4.1

= 66#

@ NODE 120 : $\frac{2}{3}$ x 66 = 44#

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

PROJECT: DECO FERMI 2
SUBJECT: CCHVAC DUCT & DUCT SUPPORTS STRUCTURAL QUALIFICATION SYSTEM 2850-1

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DC-5766					
PRELIM	FINAL	VOID	0	IA	
	✓			DATE 3/21/96	DATE 3/29/96
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REF

HANGER 6M-2850-85 (NODE 248)

DWG 6M2850-85

L 2½ x 2½ x ¼ : [2(5.58) + 2(2.77)] 4.1
= 69#

@ NODE 248 : $\frac{2}{3}$ x 69 = 46#

HANGER 6M-2850-87 (NODE 380)

DWG 6M2850-87B

L 4x4x¼ : [2(6.58) + 2(1.94) + 1.96] 6.6 = 125
L 2x2x¼ : 2(1) x 3.19 = 7
132

@ NODE ____ : $\frac{2}{3}$ x 132 = 88#

HANGER 6M-2850-88 (NODE 395)

DWG 6M2850-88

L 4x4x¼ : [2(5.92) + 2(1.5) + 6.17 + 1] 6.6 = 145
L 2x2x¼ : [4(0.58)] x 3.19 = 8
153#

@ NODE ____ : $\frac{2}{3}$ x 153 = 102#

HANGER 6M-2850-86 (NODE 407)

DWG 6M-2850-86B

L 4x4x¼ : [2(5.98) + 2(1.69)] 6.6 = 102
L 3x3x¼ : (1.96) 4.9 = 10
L 2x2x¼ : (1) 3.19 = 3
115

@ NODE ____ : $\frac{2}{3}$ x 115 = 77#

HANGER 6M-2850-47 (NODE 400)

N/A

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DC-5766					
PRELIM	FINAL	VOID	0	R. [illegible] DATE 5/17/96	N. YUZEN DATE 6/4/96
	✓				
SHEET 36 OF 246				DATE	DATE
JO 76230.502					

PROJECT: DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS

SUBJECT: STRUCTURAL QUALIFICATION SYSTEM 2850-1

SYSTEM 2850-1 HANGER H-74 STIFFNESS

THE PURPOSE OF THIS EVALUATION IS TO DETERMINE THE PROPORTION OF THE LATERAL STIFFNESS TO THE VERTICAL STIFFNESS THAT CAN BE ASSUMED WHEN A LATERAL BRACE IS ADDED GLOBALLY TO THE HANGER. IN THIS CASE A GLOBAL BRACE IN THE LATERAL DIRECTION IS PROPOSED FOR HANGER H74.

LATERAL STIFFNESS

LATERAL LOAD @ NODE 7 & 8 $P_H = 500^{\#}$

LATERAL DISPL. @ NODE 7 $\delta_{X7} = 0.01087"$
LATERAL DISPL. @ NODE 8 $\delta_{X8} = 0.01123"$

AVERAGE LATERAL DISPL. $\delta_{XAVG} = \frac{\delta_{X7} + \delta_{X8}}{2}$

$= \frac{0.01087 + 0.01123}{2}$

$\delta_{XAVG} = 0.01106"$

LATERAL STIFFNESS $K_X = \frac{2P_H}{\delta_{XAVG}}$

$K_X = \frac{1000}{0.01106} = 90416^{\#/"} = 1084991.0^{\#/'}$

VERTICAL STIFFNESS

VERTICAL LOAD @ NODE 6 & 7 $P_V = 500^{\#}$

VERTICAL DISPL. @ NODE 6 $\delta_{Y6} = 0.001515"$
VERTICAL DISPL @ NODE 7 $\delta_{Y7} = 0.00159"$

AVG. VERTICAL DISPLACEMENT $\delta_{YAVG} = \frac{\delta_{Y6} + \delta_{Y7}}{2}$

$\delta_{YAVG} = \frac{0.001515 + 0.00159}{2} = 0.00155"$

VERTICAL STIFFNESS $k_Y = \frac{2P_V}{\delta_{YAVG}} = \frac{1000}{0.00155} = 645161.^{\#/'}$

$= 7741935.5^{\#/'}$

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DC-5766					
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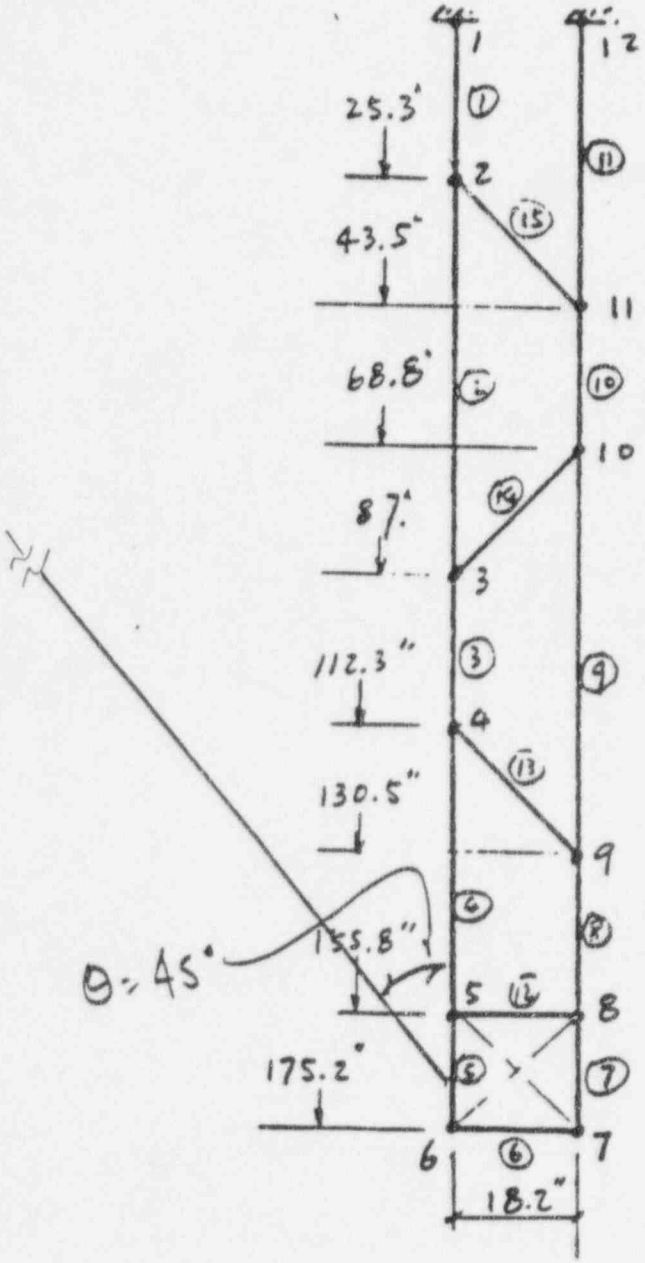
	✓				
SHEET 37 OF 246				DATE	DATE
J.O. T6230.502					

PROJECT DECO FERMI 2

SUBJECT CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM 2850-1

STRUCTL MODEL FOR GM-2850-H-74

REF. CALC.
DC-2833
VOL I REV B
PAGE 44 OF 100



ALL MEM: L4x4x¼

Form 5007 (Rev. 4/93)

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM.	FINAL	VOID	0	DATE 5/17/96	DATE 5/17/96
	✓				
SHEET 35 OF 246				DATE	DATE
J.O. 76230.502					

PROJECT DECO FERMI 2

SUBJECT CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM 2850-1

SYSTEM 2850-1 - HANGER H77 STIFFNESS

REF STARDYNE COMPUTER OUTPUT "H77.0" 5/17/96

LATERAL STIFFNESS

LATERAL LOAD APPLIED AT NODE 9 $P_1 = 500^{\#}$
LATERAL LOAD APPLIED AT NODE 11 $P_2 = 500^{\#}$

LATERAL DISPLACEMENT AT NODE 9 $\delta_{9x} = 0.09308588"$
LATERAL DISPLACEMENT AT NODE 11 $\delta_{11x} = 0.07783263"$

AVERAGE LATERAL DISPLACEMENT $\delta_{AVGx} = \frac{\delta_{9x} + \delta_{11x}}{2}$

$\delta_{AVGx} = \frac{0.09308588 + 0.07783263}{2}$

$\delta_{AVGx} = 0.0854592$

LATERAL STIFFNESS $K_x = \frac{P_1 + P_2}{\delta_{AVGx}} = \frac{1000}{0.0854592} = 11701.5^{\#}/_{in}$
$= 140417.9^{\#}/_{in}$

VERTICAL STIFFNESS

VERTICAL LOAD APPLIED AT NODE 7 $P_1 = 500^{\#}$
VERTICAL LOAD APPLIED AT NODE 9 $P_2 = 500^{\#}$

VERTICAL DISPLACEMENT AT NODE 7 $\delta_{7y} = 0.0015553"$
VERTICAL DISPLACEMENT AT NODE 9 $\delta_{9y} = 0.0015580$

AVERAGE VERTICAL DISPLACEMENT $\delta_{AVGy} = \frac{\delta_{7y} + \delta_{9y}}{2}$

$\delta_{AVGy} = \frac{0.0015553 + 0.0015580}{2}$

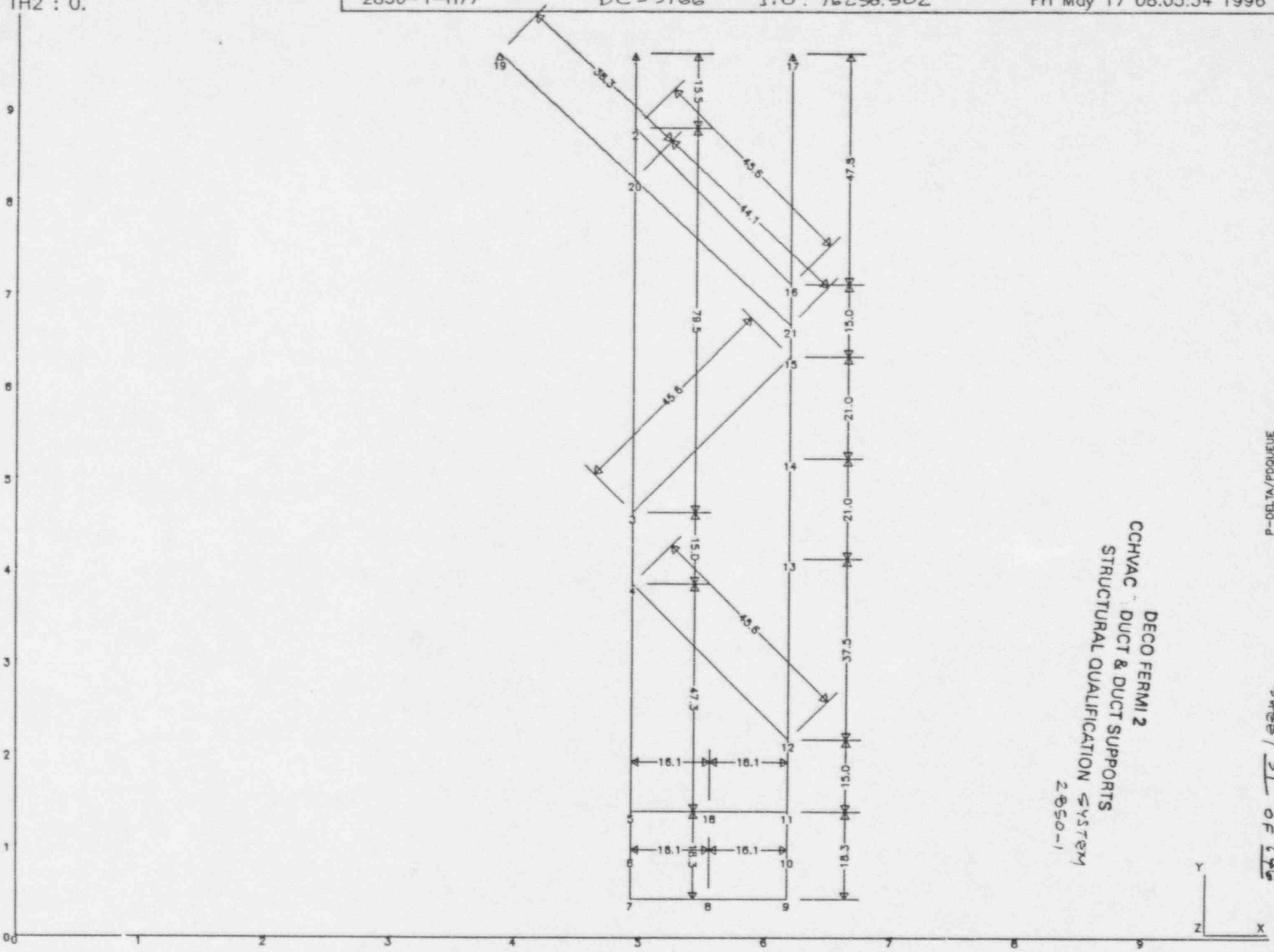
$\delta_{AVGy} = 0.0015567$

VERTICAL STIFFNESS: $k_y = \frac{P_1 + P_2}{\delta_{AVGy}} = \frac{1000}{0.0015567} = 642405^{\#}/_{in}$
$= 7708862^{\#}/_{in}$

TH1 : C

TH2 : 0.

EBASCO SERVICES , INC.		PREP. BY: R Qual 5/17/96	CHCK. BY: N.Y. ...TER/5-17-96
2850-1-H77	DC-5766	J.O. 76230.502	Fri May 17 08.05:34 1996



DECO FERMI 2
CCHVAC - DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM
2850-1

P-DELTA/PDELTA

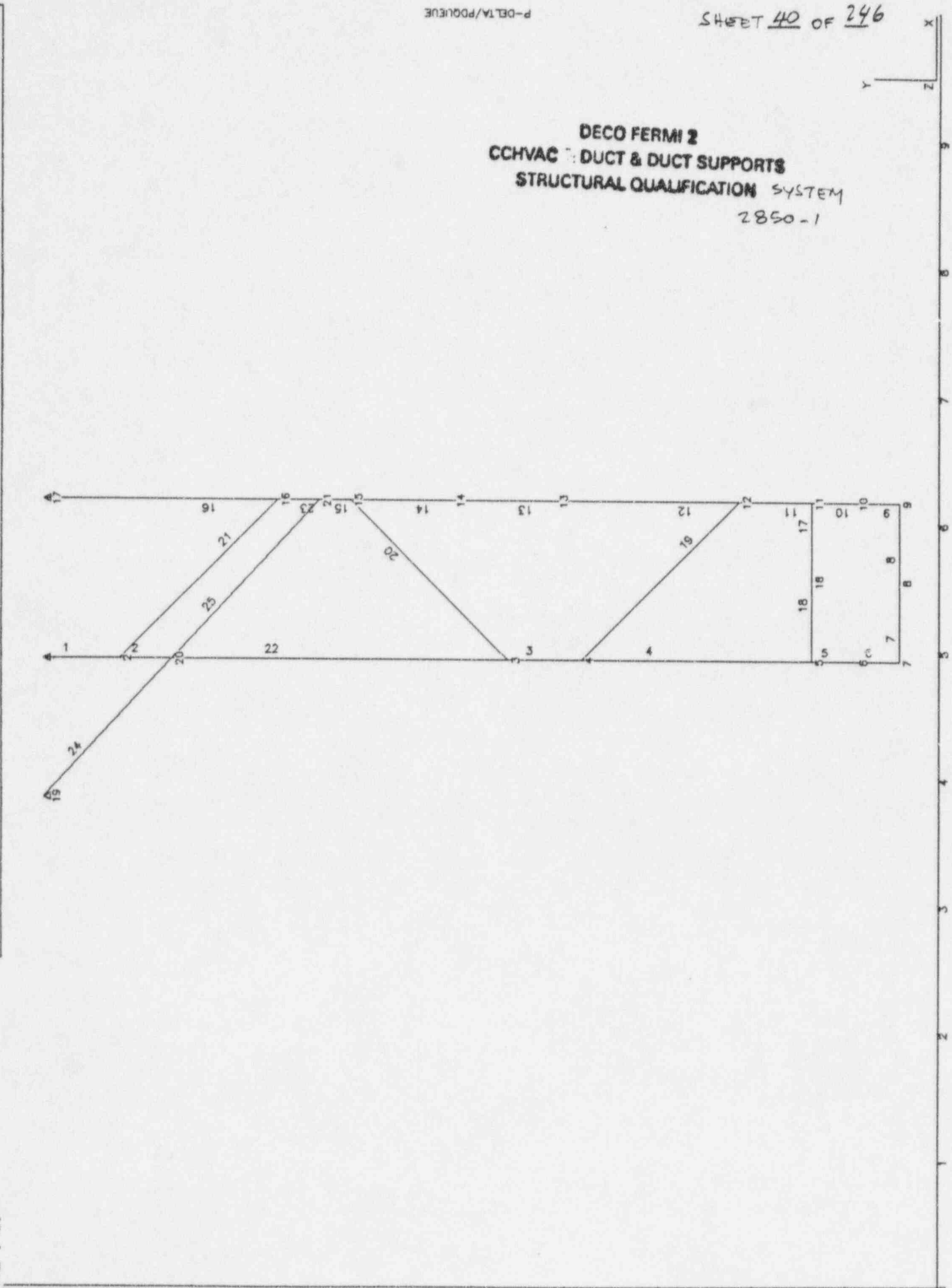
Sheet 39 of 146

SHEET 40 OF 246

EBASCO SERVICES , INC. | PREP. BY: R Cerv 5/17/96 | CHCK. BY: N. ... 5/17/96

2850-1-H77 DC-5766 3.0 76230.502 Fri May 17 08:04:26 1996

DECO FERMI 2
CCHVAC : DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM
2850-1



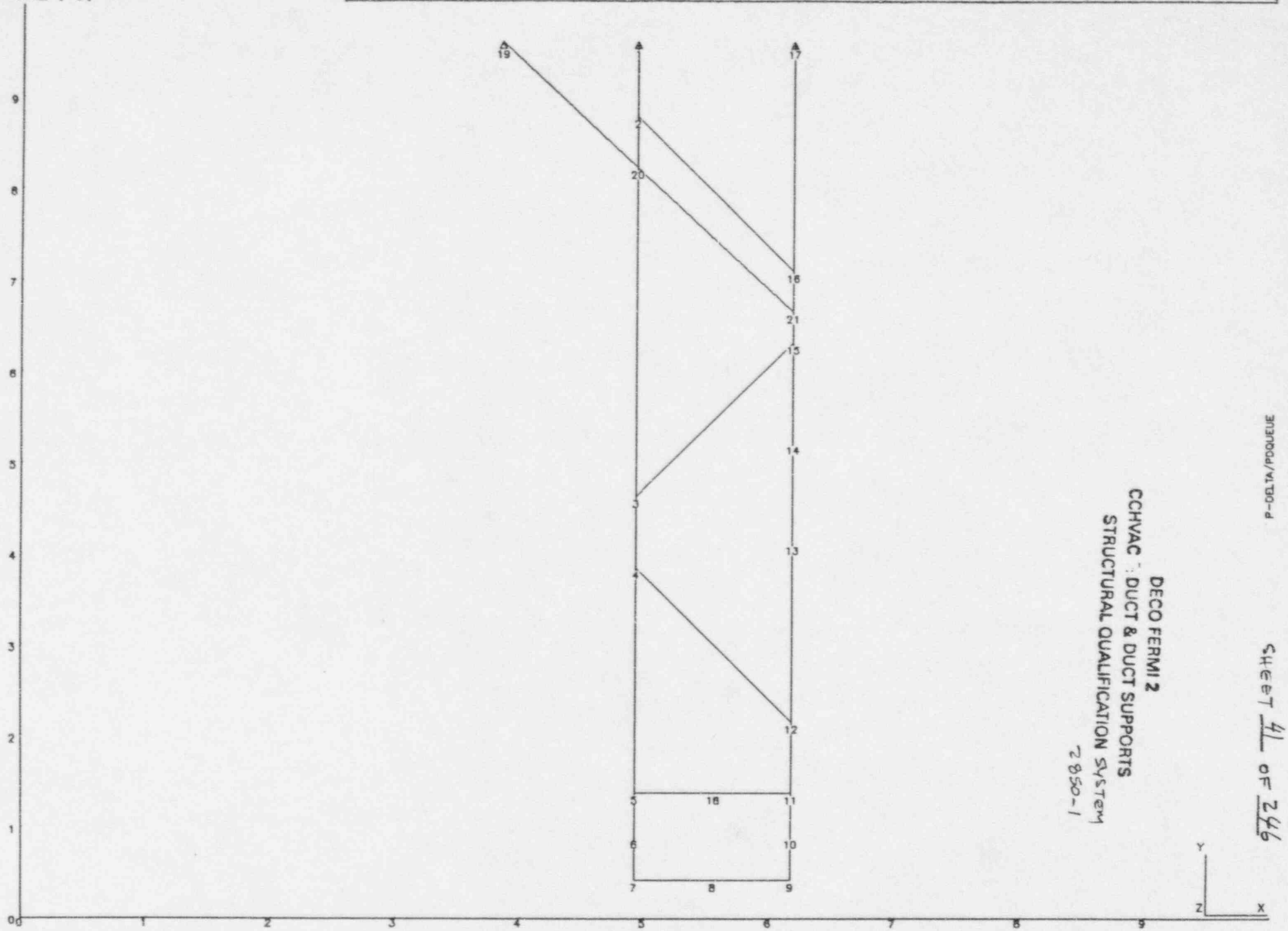
TH1 : ^

TH2 : 0.

TH1 : C

TH2 : 0.

EBASCO SERVICES , INC.	PREP. BY: R Cain 5/7/96	CHCK. BY: N.H. - R 5-17-96
2850-1-H77 DC-5766 J.O. 76230.502		Fri May 17 08:03:56 1996



P-DELTA/PODUELUE

DECO FERMI 2
CCHVAC : DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM
2850-1

SHEET 41 OF 246

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM.	FINAL	VOID	0	E. ATAY	RS
	✓			DATE 6/1/96	DATE 6.7.96
SHEET 42 OF 246				DATE	DATE
JO 76230.502					

PROJECT DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION SYSTEM 2850-2

IN ORDER TO QUALIFY OVER STRESSED ANCHORAGE, FIELD MODIFICATIONS ARE INTRODUCED.

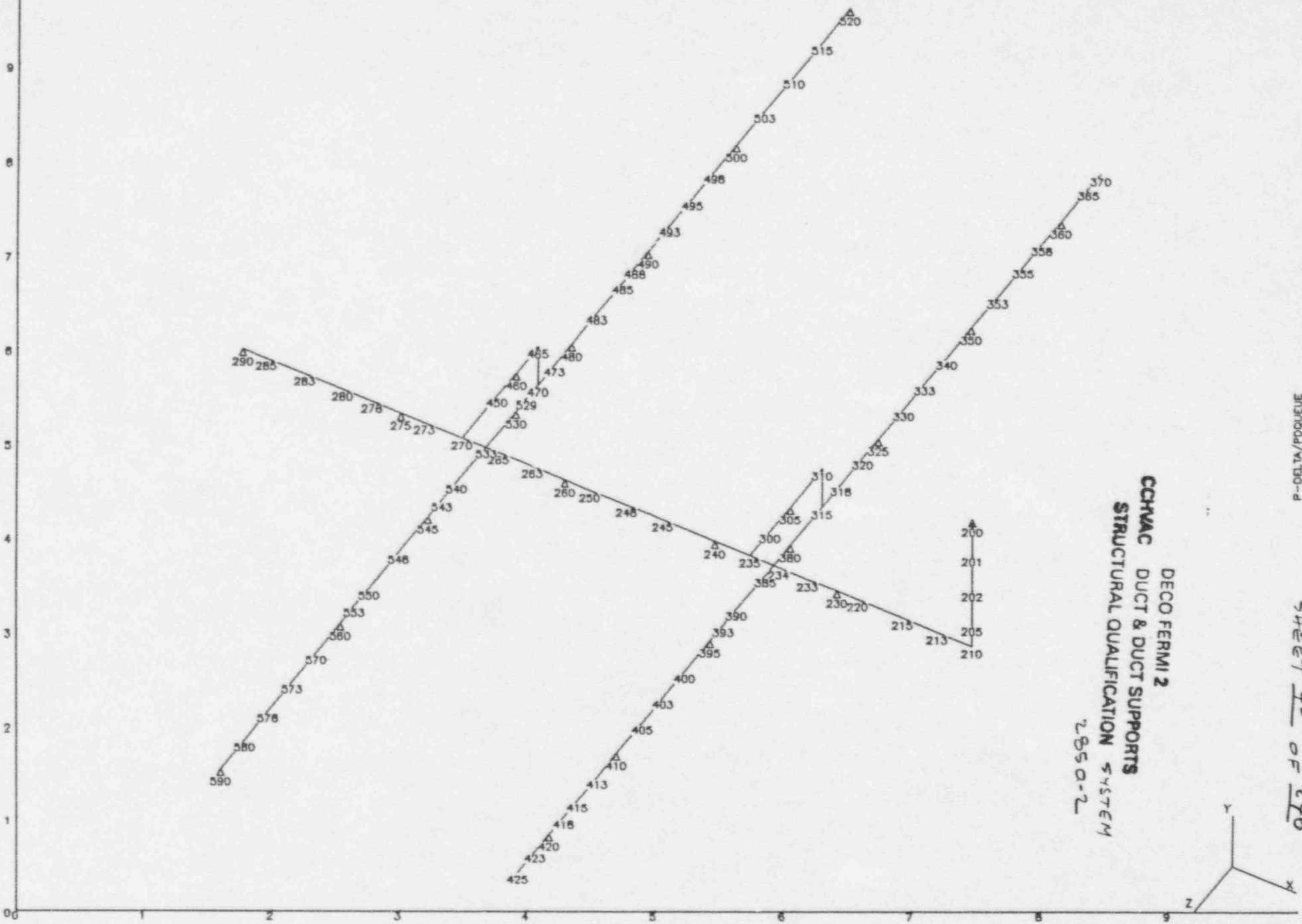
TO JUSTIFY THE proposed MOD'S FOR GM-2850-H-60, H-61, H-63 & H-64 A NEW STRING ANALYSIS/MOD ASSESSMENT RUN IS PERFORMED ON APRIL 22, 96.

CONSERVATIVELY ONLY SUPPORT H-61 (JOINT #300) & SUPPORT H-64 (JOINT #420) HORIZONTAL SPRING VALUES (X-DIRECTION) REVISED FROM 7308 #-ft TO 1,000,000 #-ft TO ACCOUNT FOR THE ADDED KICKERS.

TH1 : ""

TH2 : 45.

EBASCO SERVICES , INC.	PREP. BY: R Cour 5/24/96	CHCK. BY: E ATAY 6/1/96
STRING 2850-2 DC-5766	J.O.76230.502	Fri May 24 15:37:00 1996



DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM 2850-2

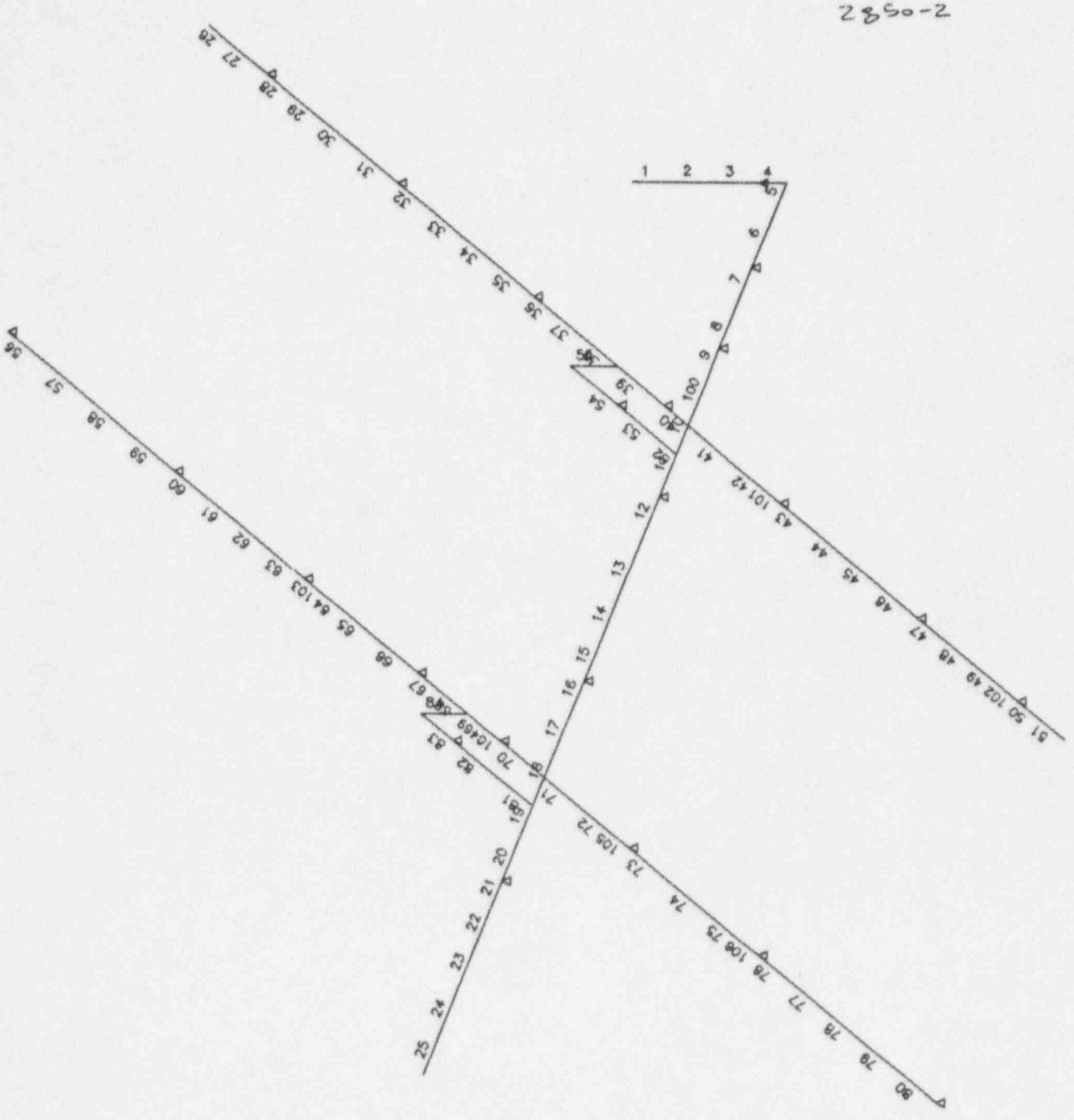
P-OLTV/PDDUEUE

SHEET 43 OF 246

P-DELTA/PDQUEUE

SHEET 44 sheet 246

DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION System
2850-2



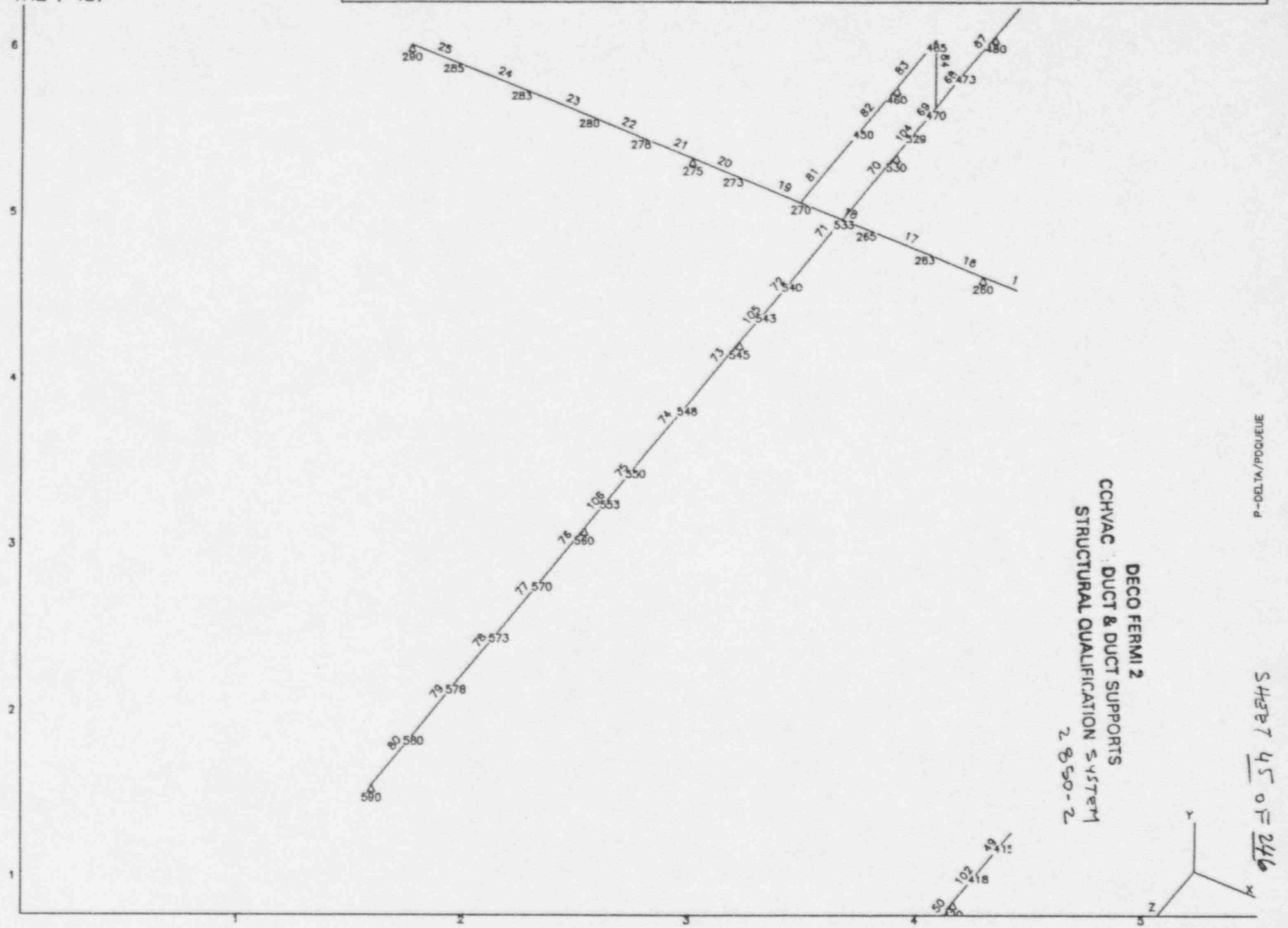
EBASCO SERVICES , INC.		PREP. BY:	CHCK. BY: E 'LA'
STRING 2850-2	DC-5766	J.O. 76230.502	Sat Mar 23 10:09:19 1996

TH1 : 70.
TH2 : 45.

TH1 : ""

TH2 : 45.

EBASCO SERVICES , INC.		PREP. BY: P Cenu 5/24/96	CHCK. BY: E Atay 6/1/96
STRING 2850-2	DC- 5766	J.O. 76230.502	Fri May 24 15:38:26 1996

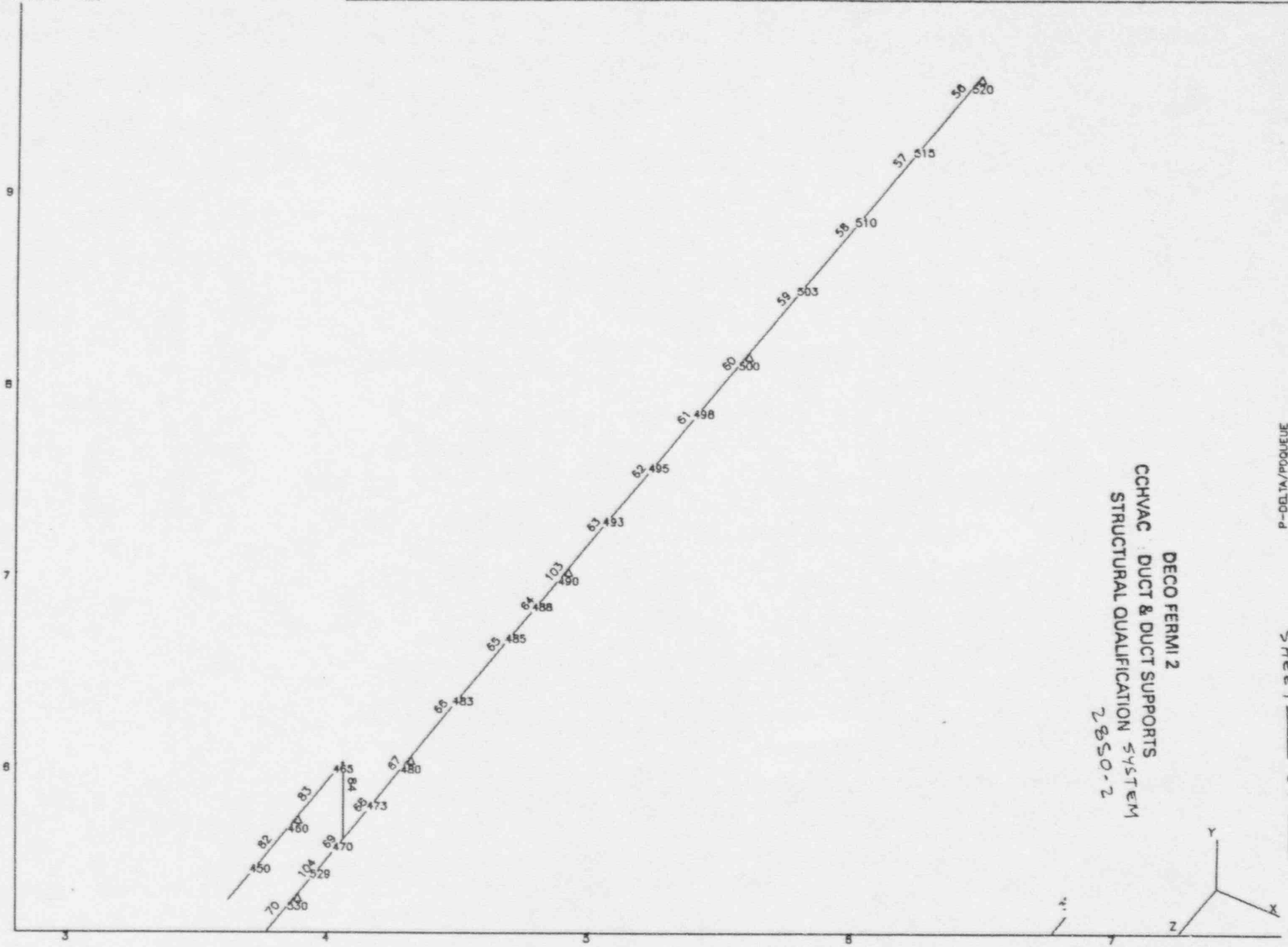


SHEET 45 OF 246

TH1 : ''

TH2 : 45.

EBASCO SERVICES , INC.		PREP. BY: RCarew 5/24/96	CHCK. BY: EATAY 6/1/96
STRING 2850-2 DC - 5766	T.O. 76230.502		Fri May 24 15:39:22 1996



DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM
2850-2

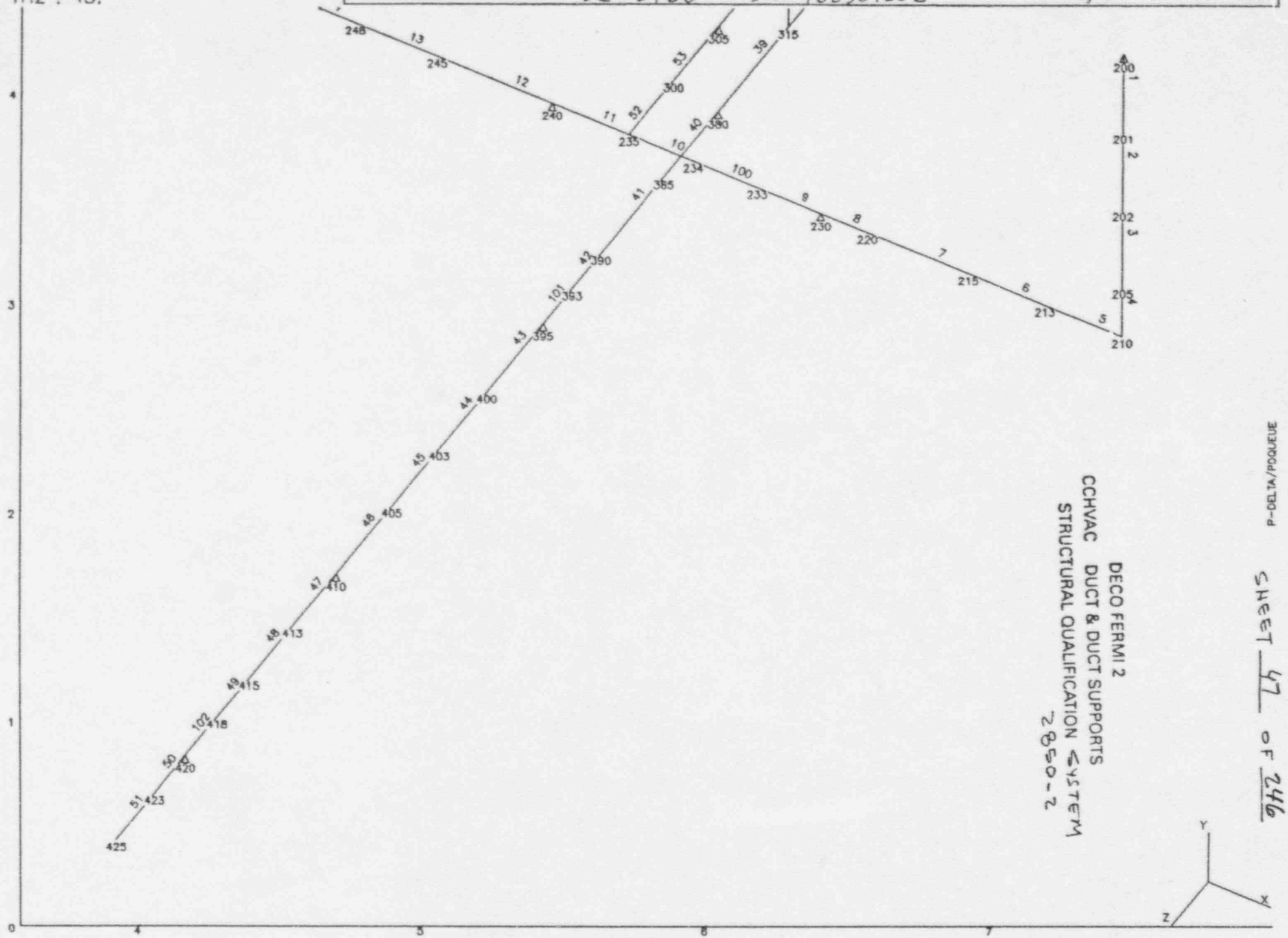
P-DELTA/PDQUELE

SHEET 46 OF 296

TH1 : [illegible].

TH2 : 45.

EBASCO SERVICES , INC.		PREP. BY: RCW 5/24/96	CHCK. BY: E.ATAY 6/11/96
STRING 2850-2	DC - 5766	J.O 76230.502	Fri May 24 15:40:06 1996



DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION <YSTEM
2850-2

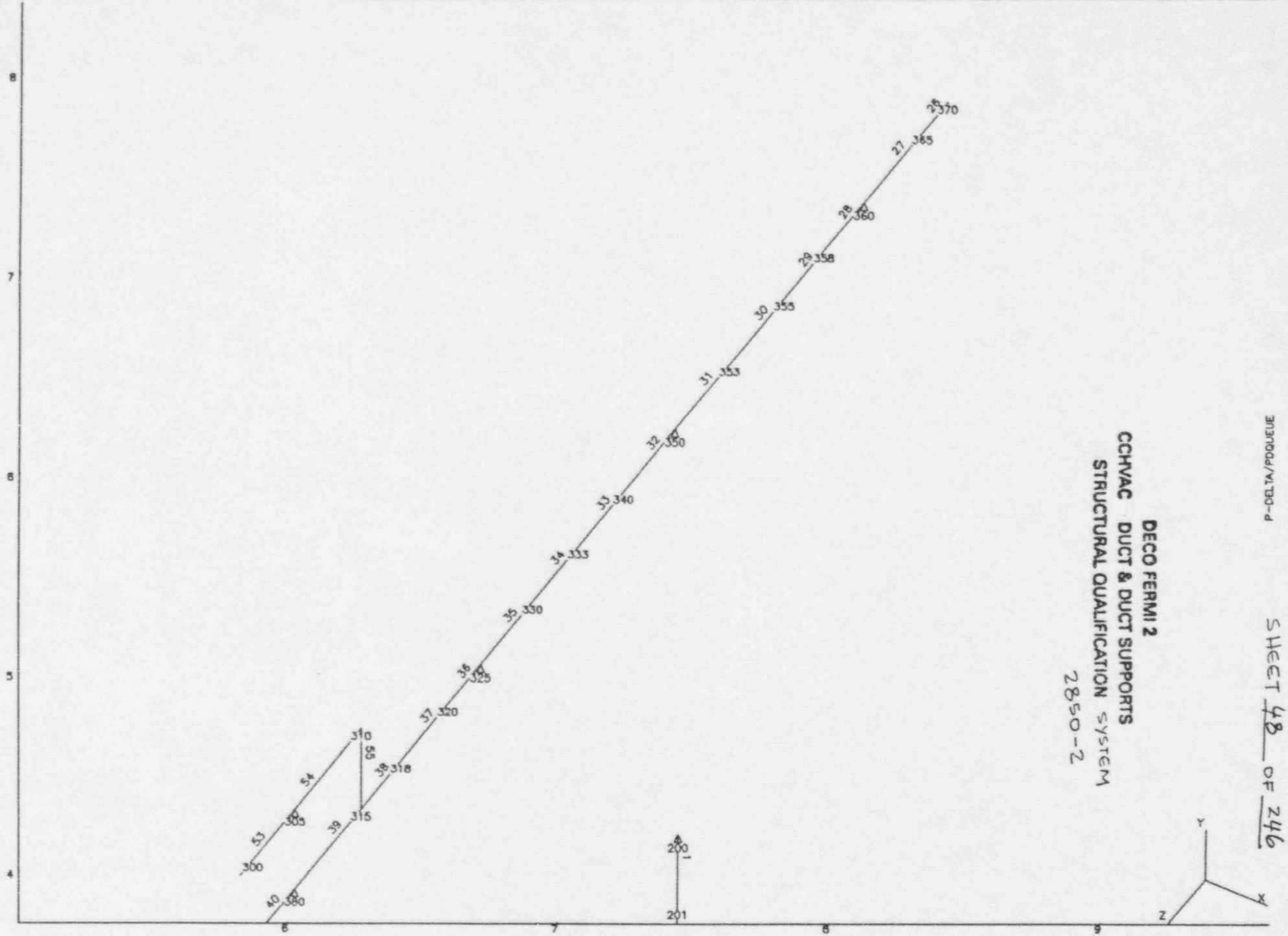
P-DELTA/PDQUEIE

SHEET 47 OF 246

TH1 :

TH2 : 45.

EBASCO SERVICES , INC.		PREP. BY: C Law 1/24/96	CHCK. BY: E. ATAY 6/11/96
STRING 2850-2	DC-5766	J.O. 76230.502	Fri May 24 15:40:43 1996



DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM
2850-2

P-DELTA/PODUELE

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Form 5007 (Rev. 4/93)

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

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DC-5766					
PRELIM	FINAL	VOID	0	IA	RLaw
	✓			DATE 3/12/96	DATE 3/13/96
SHEET 49 OF 246				DATE	DATE
J.O. 76230.502					

PROJECT DECO FERMI 2

SUBJECT CC HVAC - DUCT/SUPPORT SYSTEM 2850-2

	DUCT SIZE	(B) WT/FT DUCT + INSUL.	(A) AREA FOR ANALYSIS	(B/A) RELATIVE DENSITY
1)	40x32	25.92 + 9.00 = 34.92	0.026053	1340.345
2)	40x26	23.76 + 8.25 = 32.01	0.024048	1331.088
3)	34x26	21.60 + 7.50 = 29.10	0.022063	1318.950
4)	34x20	19.44 + 6.75 = 26.19	0.020060	1305.583
5)	24x26	18.00 + 6.25 = 24.25	0.018728	1294.853
6)	10x26	12.90 + 4.50 = 17.40	0.014049	1238.522
7)	16x26	15.12 + 5.25 = 20.37	0.016057	1268.606
8)	16x14	10.80 + 3.75 = 14.55	0.012061	1206.368
9)	10x16	9.36 + 3.25 = 12.61	0.010725	1175.758
10)	14x14	10.80 + 3.75 = 14.55	0.011392	1277.212
11)	10x14	8.64 + 3.00 = 11.64	0.010058	1157.288
12)	14x8	7.92 + 2.75 = 10.67	0.009420	1132.696
13)	8x10	6.48 + 2.25 = 8.73	0.008047	1084.876
14)	6x10	5.76 + 2.00 = 7.76	0.007362	1054.061
15)	8x8	5.76 + 2.00 = 7.76	0.007401	1048.507
16)	8x14	7.92 + 2.75 = 10.67	0.009392	1136.073

Form 5007 (Rev. 4/93)

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

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DC-5766	0	IA DATE 3/12/96	DATE 3/15/96
PRELIM / FINAL / VOID			
SHEET 50 OF 246		DATE	DATE
JO 76230.501			

PROJECT DECO FERMI 2

SUBJECT CC HVAC - DUCT/SUPPORT SYSTEM 2950-2

REF

HANGER 6M-2850-H-49 (NODE 230) — DCN02834 R/A ATT#2 PG 1

L 3x3x1/4 : [(85.4 + 27.3) x 2 + 24] ÷ 12 x 4.9 = 102#

L 2 1/2 x 2 1/2 x 1/4 : (11.58' + 5.44' + 1.81') x 4.10 = 78#

L 2x2x 1/4 : [7.46 + 3.81 + 1] x 3.19 = 40#

≤ 220#

CONSIDER $\frac{2}{3}$ OF $\left[\frac{2}{3} \times 220\right]$ →

@ NODE 230 98#

HANGER 6M-2850-H-54 (NODE 240) — ATT #2 PG 2

L 2 1/2 x 2 1/2 x 1/4 : (9.5 + 2 x 9.58 + 2 x 3.33) x 4.1 = 145#

@ NODE 240 $145 \times \frac{2}{3}$ = 97#

HANGER 6M-2850-H-55 (NODE 260) — ATT #2 PG 4

L 2 1/2 x 2 1/2 x 1/4 : (6.67 + 9.58 x 2 + 3.33 x 2) x 4.1 = 133#

@ NODE 260 $2 \times \frac{133}{3}$ = 89#

HANGER 6M-2850-H-56 (NODE 275) — ATT #2 PG 5

SAME AS NODE 260 →

@ NODE 275 89#

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GENERAL COMPUTATION SHEET

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DC-5766					
PRELIM	FINAL ✓	VOID	0	IA DATE 3/12/96	R DATE 3/15/96
SHEET 51 OF 246				DATE	DATE
JO 76230.502					

PROJECT DECO FERMI 2

SUBJECT CC HVAC - DUCT/SUPPORT SYSTEM 2850-2

REF

HANGER 6M-2850-H-58 (NODES 305 & 380)

DC No 2934 Rev A ATT 2 pg 7 & 6

L 3x3x1/4 : (11.67 + 8.83 + .58) 4.9 = 104#

L 2x2x1/4 : (1.38 x 3) 3.19 = 14

Σ 118#

@ 305 $\frac{118}{2} \times \frac{2}{3}$ = 39#

@ 380 $\frac{118}{2} \times \frac{2}{3}$ = 39#

HANGER 6M-2850-H-59 (NODE 325)

ATT #2 pg 8

L 2x2x1/4 : 2 x (11.56 + 1.25 + 1.5) x 3.19 = 92#

L 4x4x1/4 : 1' = 7#

@ NODE 325 $2 \times \frac{99}{3}$ = 66#

HANGER 6M-2850-H-60 (NODE 350)

ATT #2 pg 10

L 2x2x1/4 : 2 (11.56 + 1.25 + 1.08) 3.19 = 89#

@ NODE 350 : $2 \times \frac{89}{3}$ = 59#

HANGER 6M-2850-H-61 (NODE 360)

ATT #2 pg 11

SAME AS NODE 350

@ NODE 360 59#

HANGER 6M-2850-H-62 (NODE 395)

ATT #2 pg 12

L 2x2x1/4 : 2 (11.56 + 1.5 + 1.19) 3.19 = 91#

@ NODE 395 $91 \times \frac{2}{3}$ = 61#

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	IA DATE 3/12/96	R Reed DATE 3/15/96
	✓				
SHEET 52 OF 246				DATE	DATE
JO 76230.502					

PROJECT DECO FERMI 2

SUBJECT CC HVAC-DUCT/SUPPORT SYSTEM 2850-2

REF

HANGER 6M-2850-H-63 (NODE 410) — DC No 2834 Rev A ATT #2 pg 13

SAME AS NODE 350

@ NODE 410 59#

HANGER 6M-2850-H-64 (NODE 420) — ATT #2 pg 14,15

SAME AS NODE 350

@ NODE 420 59#

HANGER 6M-2850-H-65 (NODES 460 & 530) — ATT #2 pg 16,17

L 2½ x 2½ x ¼ : (6.88 x 2) 4.1 = 57#

L 2 x 2 x ¼ : (3 x 1.79) 3.19 = 17#

Σ 74#

@ NODE 460 $\frac{74}{2} \times \frac{2}{3} = 25^{\#}$

@ NODE 530 $\frac{74}{2} \times \frac{2}{3} = 25^{\#}$

HANGER 6M-2850-H-66 (NODE 480) — ATT #2 pg 18,19

L 2½ x 2½ x ¼ : (10.92 + 2.19 + 1.77) x 2 x 4.1 = 122#

@ NODE 480 $122 \times \frac{2}{3} = 81^{\#}$

HANGER 6M-2850-H-67 (NODE 490) — ATT #2 pg 20,21

L 2½ x 2½ x ¼ : (10.92 + 1.96 + 1.61) x 2 x 4.1 = 119#

@ NODE 490 $119 \times \frac{2}{3} = 79^{\#}$

HANGER 6M-2850-H-68 (NODE 500) — ATT #2 pg 22,23

SAME AS NODE 490

@ NODE 500 79#

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CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	IA DATE 3/12/96	DATE 3/12/96
	/				
SHEET 53 OF 246				DATE	DATE
JO 76230.502					

PROJECT DECO FERMI 2

SUBJECT CC HVAC - DUCT/SUPPORT SYSTEM 2850-2

REF

HANGER 6M-2850-H-69 (NODE 520)

DC No: 2834 Rev A ATT #2 pg 24,25

L 2x2x1/4 : 2 (10.92 + 1.25 + 1.03) 3.19 = 84#

@ NODE 520 $84 \times \frac{2}{3} = 56^{\#}$

HANGER 6M-2850-H-70 (NODE 545)

ATT #2 pg 26,27

L2x2x1/4 : 2 (10.92 + 1.96 + 1.52) 3.19 = 92#

@ NODE 545 $92 \times \frac{2}{3} = 61^{\#}$

HANGER 6M-2850-H-71 (NODE 560)

ATT #2 pg 28,29

L2x2x1/4 : 2 (10.92 + 1.96 + 1.61) 3.19 = 93#

@ NODE 560 $93 \times \frac{2}{3} = 62^{\#}$

HANGER 6M-2850-H-72 (NODE 590)

ATT #2 pg 30,31

L2x2x1/4 : 2 (10.92 + 1.25 + 1.19) 3.19 = 86#

@ NODE 590 $\frac{86 \times 2}{3} = 57^{\#}$

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Raytheon
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GENERAL COMPUTATION SHEET

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL ✓	VOID	0	IA DATE 3/12/96	P Lewis DATE 3/12/96
SHEET 54 OF 246				DATE	DATE
JO 76230.502					

PROJECT DECO FERMI 2

SUBJECT CC HVAC - DUCT SUPPORT SYSTEM 2850-2

	NODE	WT
WGHT	205	173
	215	77
	220	88
	235	154
	245	47
	250	59
	265	59
	270	72
	273	42
	280	53
	285	53
	300	8
	310	56
	315	39
	320	5
	330	39
	340	41
	355	36
	365	27
	385	24
	390	24
	400	36
	405	39
	415	27
	450	9
	465	33
	470	80
	485	58
	495	55
	510	39
	533	29
	540	29
	550	49
	570	22
	580	17

	NODE	WT
WGHT	230	98
	240	97
	260	89
	275	89
	305	39
	380	39
	325	66
	350	59
	360	59
	395	61
	410	59
	420	59
	460	25
	530	25
	480	81
	490	79
	500	79
	520	56
	545	61
	560	62
	590	57

Form 5007 (Rev. 4/93)

Raytheon
Engineers & Constructors

GENERAL COMPUTATION SHEET

PROJECT DECO FEEDL 2

SUBJECT CC HVAC - DUCT/SUPPORT SYSTEM 2850-2

DUCT SIZE	A	J	I2	I3	A3/A	A2/A
40 x 32	0.026053	0.104911	0.009491	0.015572	0.815415	1.019307
40 x 26	0.024048	0.075554	0.005927	0.015552	0.717773	1.104291
34 x 26	0.022063	0.060046	0.005922	0.010844	0.782351	1.023070
34 x 20	0.020060	0.039478	0.003221	0.010821	0.661914	1.125224
24 x 26	0.018728	0.035903	0.005907	0.004917	0.921668	0.850758
10 x 26	0.014049	0.008657	0.005839	0.000600	1.228628	0.472560
16 x 26	0.016057	0.018996	0.005883	0.001891	1.074983	0.661518
16 x 14	0.012061	0.007711	0.001362	0.001877	0.770583	0.880690
10 x 16	0.010725	0.004539	0.001864	0.000596	0.990396	0.619021
14 x 14	0.011392	0.006325	0.001359	0.001359	0.815836	0.815836
10 x 14	0.010058	0.003765	0.001349	0.000594	0.924041	0.660072
14 x 8	0.009420	0.002629	0.000342	0.001340	0.563800	0.986624
8 x 10	0.008047	0.001639	0.000585	0.000339	0.825028	0.659198
6 x 10	0.007362	0.001037	0.000578	0.000168	0.901793	0.538171
8 x 8	0.007401	0.001180	0.000336	0.000336	0.717606	0.717606
8 x 14	0.009392	0.002629	0.001340	0.000342	0.989566	0.565481

CALCULATION SET NO DC-5766

PRELIM | FINAL ✓ | VOID

SHEET 55 OF 246

JO 76230.502

REV	COMP. BY	CHK'D BY
0	TA DATE 3/27/96	P Lem DATE 3/27/96
	DATE	DATE

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Raytheon
Engineers & Constructors

GENERAL COMPUTATION SHEET

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DA DATE 3/12/96	R Lam DATE 3/13/96
SHEET 56 OF 246				DATE	DATE
JO 76230.502					

PROJECT DECO FERMI 2

SUBJECT CC HVAC-DUCT/SUPPORT SYSTEM 2850-2

DUCT SIZE

40x32	BPROP2	1	3.333	2.667
40x26		2	3.333	2.167
34x26		3	2.833	2.167
34x20		4	2.833	1.667
24x26		5	2.000	2.167
10x26		6	0.833	2.167
16x26		7	1.333	2.167
16x14		8	1.333	1.167
10x16		9	0.833	1.333
14x14		10	1.167	1.167
10x14		11	0.833	1.167
14x8		12	1.167	0.667
8x10		13	0.667	0.833
6x10		14	0.500	0.833
8x8		15	0.667	0.667
8x14		16	0.667	1.167

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CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	IA DATE 3/12/96	R Lur DATE 3/13/96
				DATE	DATE

PROJECT DECO FERMI 2

SHEET 57 OF 246

SUBJECT CC HVAC - DUCT/SUPPORT SYSTEM 2850-2

JO 76230.502

SPRING RATE (lb/ft)

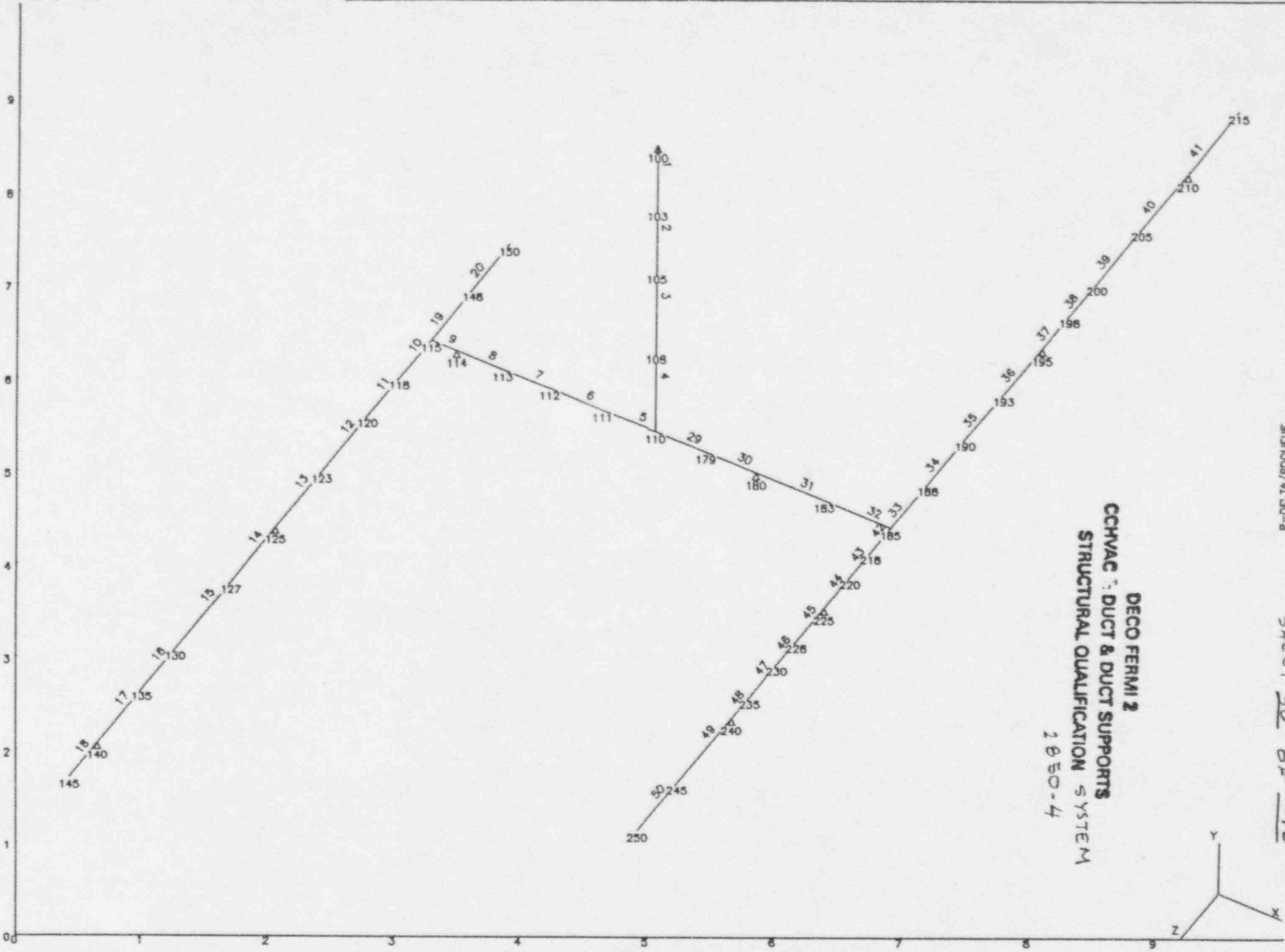
SUPPORT	NODE	KX	KY	KZ
H49	230	—	8 266 332	45 420
H54	240	—	7 818 648	185 916
H55	260	—	7 565 712	227 664
H56	275	—	7 565 712	227 664
H58 UPPER	305	21 120	11 083 116	—
H58 LOWER	380	16 608	8 753 352	—
H59	325	7 200	4 780 536	—
H60	350	7 308	4 780 536	—
H61	360	* 7 308	4 780 536	—
H62	395	7 068	4 780 500	—
H63	410	7 308	4 780 536	—
H64	420	* 7 308	4 780 536	—
H65 UPPER	460	40 812	14 633 208	—
H65 LOWER	530	24 672	10 275 924	—
H66	480	18 984	6 433 596	—
H67	490	18 108	6 433 500	—
H68	500	16 260	6 433 320	—
H69	520	7 536	5 078 004	—
H70	545	9 228	5 078 124	—
H71	560	16 260	6 433 320	—
H72	590	7 740	5 078 028	—

* REVISED TO 1,000,000 #-ft TO ACCOUNT FOR THE ADDED KICKERS. (APRIL 22, 96)

TH1 :

TH2 : 45.

EBASCO SERVICES , INC.		PREP. BY: R Cam 5/2+/96	CHCK. BY: E 5/24/96
STRING 2850-4	DC-5766	J.O. 76230.502	Fri May 24 15:48:14 1996



SHEET 58 OF 246

Raytheon
Engineers & Constructors

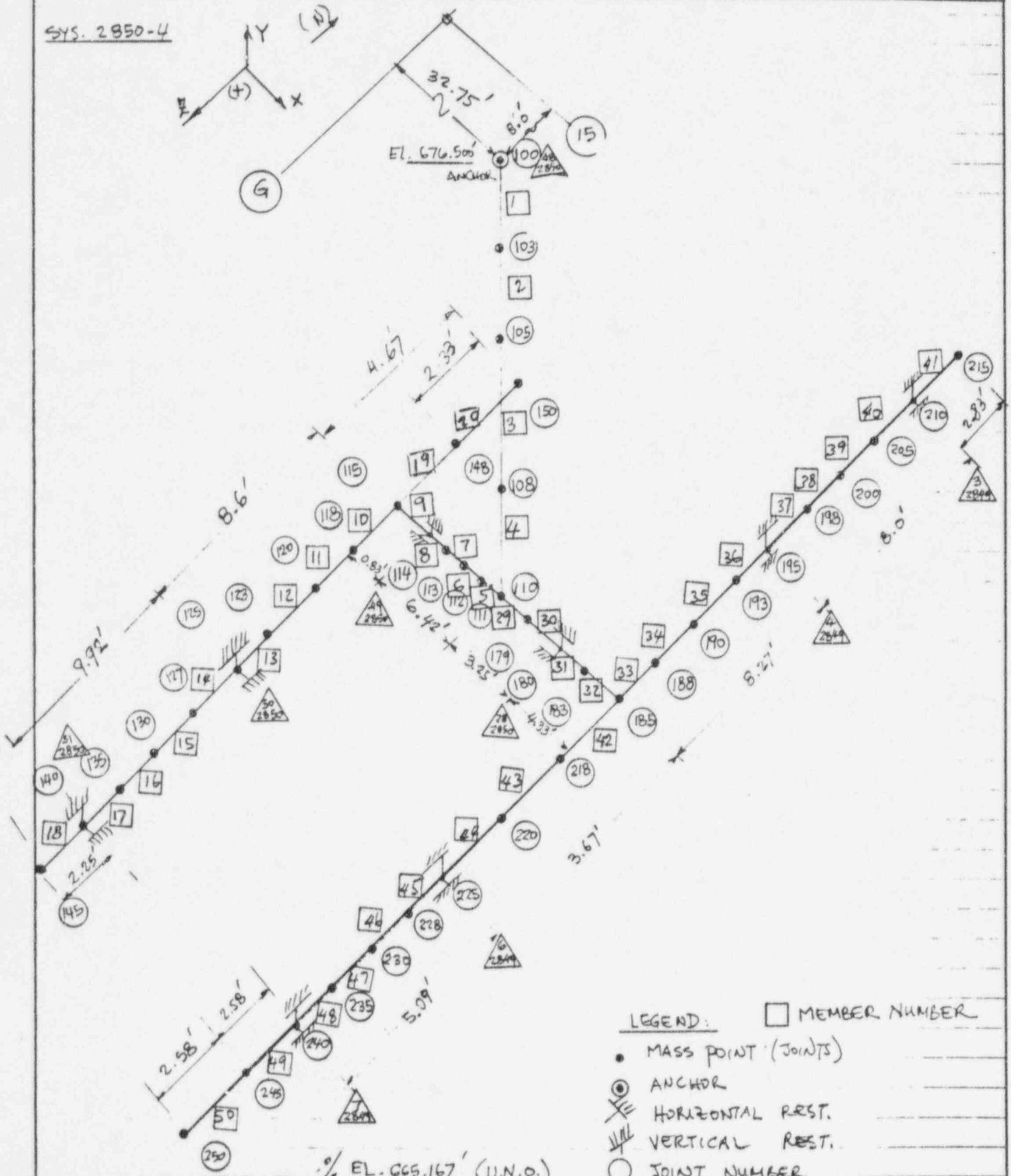
GENERAL COMPUTATION SHEET

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	E. ATAY DATE 2/22/96	R Rev DATE 5/24/96
				DATE	DATE
SHEET 59 OF 246					
J.O. 76230.501					

PROJECT DECO FERMI 2

SUBJECT CC HVAC - DUCT/SUPPORT SYSTEM 2850-4

SYS. 2850-4



LEGEND:

- MEMBER NUMBER
- MASS POINT (JOINTS)
- ANCHOR
- HORIZONTAL REST.
- VERTICAL REST.
- JOINT NUMBER
- SUPPORT MARK NO.

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Raytheon
Engineers & Constructors

GENERAL COMPUTATION SHEET

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC. 5766					
PRELIM	FINAL	VOID	0	E.A. DATE 2/22/96	DATE 5/24/96
	✓				
SHEET 60 OF 246				DATE	DATE
JO 76230.502					

PROJECT DECO FERMI 2

SUBJECT CCHVAC DUCT & DUCT SUPPORTS
~~STRUCTURAL QUALIFICATION~~ SYSTEM 2850-4

REF: DC No: 2836
STRESS REPORT
PAGE 9 OF 97
DATED 7/4/84

SYSTEM 2850-4
HANGER STIFFNESS FOR SYSTEM RUN.

JOINT#	HANGER #	X-DIRECTION OR Z-DIRECTION STIFFNESS LAT. (#/)	Y-DIRECTION STIFFNESS VER. (#/)
114	GM-2850-H-49	89412	6.627276
125	H-50	19020	7.835964
140	H-51	19020	7835964
180	H-28	74664	8919612
195	H-4	14880	269052
210	H-3	18480	265488
225	H-6	47760	1389420
240	H-7	6408	292524

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Raytheon
Engineers & Constructors

GENERAL COMPUTATION SHEET

PROJECT DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION SYSTEM 2850-4

CALCULATION SET NO	REV	COMP. BY	CHK'D BY
DC - 5766	0	DA	PP
PRELIM / FINAL / VOID		DATE 3/14/96	DATE 3/24/96
SHEET 61 OF 246		DATE	DATE
JO 76230 - 502			

DUCT SIZE	(IN) THICKNESS	(A) (WT/ft) DUCT + INSULATION ▲	(B) (ft²) AREA FOR ANALYSIS	(A)/(B) RELATIVE DENSITY
8×8	0.0516	5.76+2.00 = 7.76	0.007391	1049.926
10×6		5.76 +2.00 = 7.76	0.007412	1046.951
10×8		6.48+2.25 = 8.73	0.008068	1082.053
10×12		7.92 +2.75 = 10.67	0.009416	1136.8
12×12		8.64 +3.00 = 11.64	0.010080	1158.209
20×16		12.96+4.50 = 17.46	0.014070	1240.938
16×9		9.00 + 3.13 = 12.13	0.010400	1166.346
16×12		10.08 + 3.50 = 13.58	0.011400	1191.124

▲ - FOR REF SEE DC NO 2836 ATT 1 pg 15 & 16 of 18

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Raytheon
Engineers & Constructors

GENERAL COMPUTATION SHEET

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	IA DATE 3/14/96	R Rew DATE 5/24/96
	✓				
SHEET 62 OF 246				DATE	DATE
JO 76230.502					

PROJECT DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
SUBJECT STRUCTURAL QUALIFICATION SYSTEM 2850-4

24.0

DUCT SIZE	A	J	I2	I3	A3/A	A2/A
8x8	0.007391	0.001180	0.000336	0.000336	0.718577	0.718577
10x6	0.007412	0.001037	0.000168	0.000578	0.537373	0.895710
10x8	0.008068	0.001639	0.000339	0.000585	0.658280	0.822881
10x12	0.009416	0.003018	0.000925	0.000592	0.846113	0.705077
12x12	0.010080	0.003983	0.000929	0.000929	0.790377	0.790377
20x16	0.014110	0.013110	0.001886	0.003198	0.752657	0.941765
16x9	0.010400	0.003824	0.000459	0.001859	0.574519	1.021154
16x12	0.011400	0.006070	0.000934	0.001871	0.698860	0.931579

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GENERAL COMPUTATION SHEET

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC - 5766					
PRELIM	FINAL	VOID	0	DATE 2/22/96	DATE 2/24/96
	✓				
SHEET 63 OF 246				DATE	DATE
JO 76230.502					

PROJECT DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION SYSTEM 2850-4

EXTERNAL CONCENTRATED WEIGHT ON PIPING SYSTEM
REF. ATT#1 PAGE 14 OF 18
2850-4 DC N: 3836 REV A

JOINT	WEIGHT (LBS)
105	64.0
110	77.0
112	5.0
115	50.0
120	28.0
130	28.0
150	25.0
185	85.0
190	36.0
200	17.0
230	31.0
245	14.0

HANGER 1/2 WT IN X, Y, Z DIRECTIONS LUMPED @ JOINTS (LINE)

SEE FOLLOWING SH's.

Form 5007 (Rev. 4/93)

Raytheon Engineers & Constructors

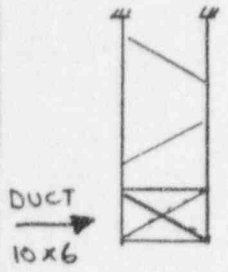
GENERAL COMPUTATION SHEET

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DA DATE 3/14/96	DATE 3/24/96
	✓				
SHEET 64 OF 246				DATE	DATE
JO 76230.502					

PROJECT DECO FERMI 2

SUBJECT CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM 2850-4

HANGER 6M-2850-H-50 & 51



L 2 1/2 x 2 1/2 x 1/4

$[(105 \times 2) + (11.5 \times 2)] \div 12 \times 4.1\#/ft = 81\#$

L 2x2 x 1/4

$(\sqrt{11.5^2 + 11.58^2} \times 2) \div 12 \times 3.19\#/ft = 9\#$

$\leq 90\#$

USING 2/3 OF HGR WT $\frac{90}{} \times \frac{2}{3} = \underline{\underline{60\#}}$ @ JTs 125 & 140

REF

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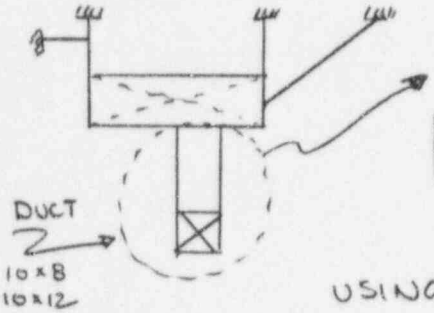
AISC 7th ed. pg 1-57

HANGER 6M-2849-H-3 & 4



L 2x2x1/4

$[(44.408 + 9.184) \times 2 + 10.184 \times 2] \div 12 \times 3.19$

$= 34\#$

USING 2/3 OF WT $34 \times \frac{2}{3} = \underline{\underline{23\#}}$ @ JTs 195 & 210

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DA DATE 3/14/96	R Lew DATE 5/24/96
	✓				
SHEET 65 OF 246				DATE	DATE
JO 76230-502					

PROJECT DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
SUBJECT STRUCTURAL QUALIFICATION SYSTEM 2850-4

REF

HANGER 6M-2850-H-49

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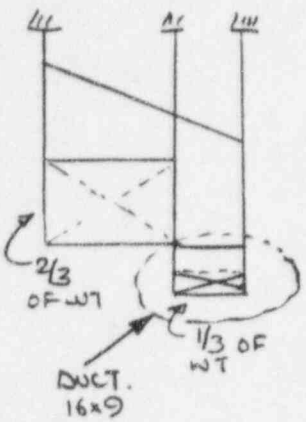

L 3x3x1/4
$(113.125 + 93.875 + 43.625) \div 12 \times 4.9 = 103^{\#}$

L 2x2x1/4
$(\sqrt{62.25^2 + 82.7^2} + 43) \div 12 \times 3.19 = 39^{\#}$

L 2 1/2 x 2 1/2 x 1/4
$(62.25 + 93.875 + 43.625 + 19.25) \div 12 \times 4.1 = 75^{\#}$

$\leq 217^{\#}$

USE $\frac{2}{3} \times \frac{1}{3}$ OF HGR WT $217 \times \frac{2}{9} = \underline{\underline{49^{\#}}}$

@ JT 114

HANGER 6M-2850-H-28

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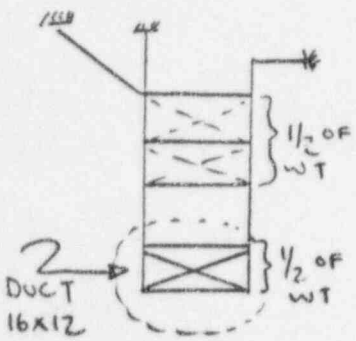

C4x7.25
$(85 + 12 + 10 + 17 + 13 + \sqrt{85^2 \times 2} + 19) \div 12 \times 7.25 = 167^{\#}$

L 2 1/2 x 2 1/2 x 1/4
$(19 + 43 + 12 + 10 + 17 + 13 + 19) \div 12 \times 4.1 = 46^{\#}$

L 2x2x1/4
$(19) \div 12 \times 3.19 = 5^{\#}$

TS 2x2x.25 (SAY 1') $= 5.4^{\#}$

$\leq 224^{\#}$

USING $\frac{1}{2} \times \frac{2}{3}$ OF HGR WT $\frac{224}{3} = \underline{\underline{75^{\#}}}$

@ JT 180

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Raytheon
Engineers & Constructors

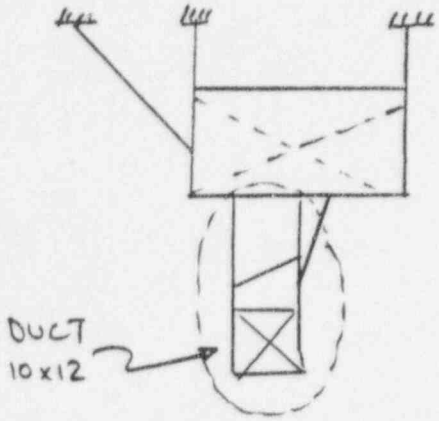
GENERAL COMPUTATION SHEET

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 3/14/96	DATE 3/24/96
	✓				
SHEET 66 OF 246				DATE	DATE
JO 76230.502					

PROJECT DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
SUBJECT STRUCTURAL QUALIFICATION SYSTEM 2850.4

REF

HANGER 6M-2849-H-6



L 3x3x1/4

$(98.5 \times 2 + 12.25 \times 2 + \sqrt{12.25^2 \times 2} + \sqrt{16.21^2 + 60.5^2}) \times 4.9 \div 12 = 123\#$

USING $\frac{2}{3}$ OF WT 123 = 82#

@ JT 225

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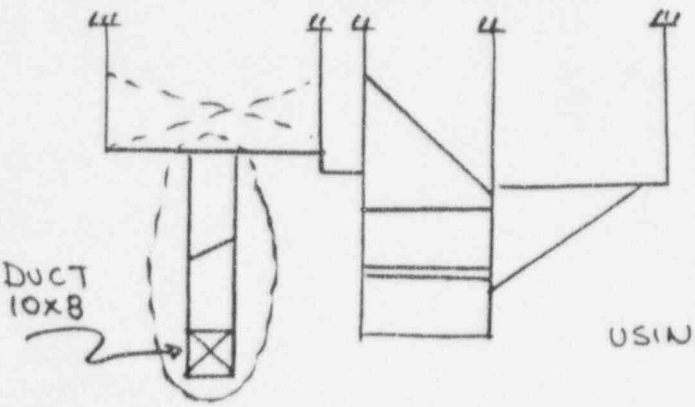
HANGER 6M-2849-H-7



L 2x2x1/4

$[(38.5 + 11.5 + 39.5 + 9.5) \times 2 + 11.5 \times 2 + \sqrt{11.5^2 \times 2}] \div 12 \times 3.19 = 63\#$

USING $\frac{2}{3}$ OF WT 63 = 43#

@ JT 240

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Raytheon
Engineers & Constructors

GENERAL
COMPUTATION
SHEET

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	EA	RS
	X			DATE 6/6/96	DATE 6.7.96
SHEET 67 OF 246				DATE	DATE
J.O. 76230.502					

PROJECT DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
SUBJECT STRUCTURAL QUALIFICATION

B. SUPPORT EVALUATION

Form 5007 (Rev. 4/93)

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N.YURTER DATE 4/11/96	K T W DATE 4/12/96
	✓				
SHEET 68 OF 246				DATE	DATE
JO 76230502					

REF.

SUPPORT LOADS FOR SYSTEM 2850-1

SUPPORT MARK NO. / NODE POINT	DIRECTION	DEAD LOAD [LBS]	OBE [LBS]	SSE [LBS]	SHARED WITH SYSTEM
6M-2849-H-57	VERT.	168	67	71	2849-3 (F)
130	LATERAL	0	212 (F_1)	272 (F_1)	
-H-58	VERT.	260	161	185	2849-3 (F)
120	LATERAL	0	92 (F_1)	109 (F_1)	
-H-61	VERT	329	192	219	2849-3 (F)
170	LATERAL	0	81 (F_3)	74 (F_3)	
-H-62	VERT.	273	69	60	2849-3 (F)
180	LATERAL	0	216 (F_3)	192 (F_3)	
6M-2850-H-84	VERT.	406	137	137	
138	LATERAL	~0	93 (F_1)	119 (F_1)	
H-73	VERT.	596	241	246	
155	LATERAL	12 (F_1)	431 (F_1)	517 (F_1)	
-H-74	VERT	353	87	73	
190	LATERAL	0	1367 (F_3)	1162 (F_3)	
-H-75	VERT.	242	60	51	
200	LATERAL	6	567 (F_1)	502 (F_1)	
-H-76	VERT.	237	57	47	
210	LATERAL	0	204 (F_1)	172 (F_1)	
-H-77	VERT.	540	274	314	
270	LATERAL	~0	749 (F_1)	823 (F_1)	
-H-78	VERT.	331	118	107	
370	LATERAL	13 (F_3)	245 (F_3)	298 (F_3)	
-H-79	VERT.	498	162	161	
285	LATERAL	~0	516 (F_3)	457 (F_3)	
-H-80	VERT.	191	64	52	
295	LATERAL	0	170 (F_3)	150 (F_3)	
-H-81	VERT	359	108	83	
305	LATERAL	0	1476 (F_3)	1303 (F_3)	
-H-82	VERT.	160	153	93	
320	LATERAL	6 (F_1)	320 (F_1)	366 (F_1)	
-H-83	VERT.	377	244	152	
330	LATERAL	0	31 (F_1)	36 (F_1)	

(F_1) AND (F_3): DIRECTION OF LOADS BASED ON SPRING DIRECTION

$F_1 \equiv E-W(X)$ $F_3 \equiv N-S(Z)$

OUTPUT FOR DYNAMIC ANALYSIS FOR SYSTEM 2850-1 4/12/96

Form 5007 (Rev. 4/93)

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N YLITER	K T W.
	✓			DATE 4/13/96	DATE 4/13/96
SHEET 69 OF 246				DATE	DATE
JO 76230502					

REF.

Support Loads for System 2850-1 (cont'd)

Support Mark No. / Node Point	Direction	Dead Load [LBS]	OBE [LBS]	SSE [LBS]	Shared with System
6M-2850-H-57 / 100	VERT.	371	222	252	
	LATERAL	18 (F3)	435 (F3)	618 (F3)	
	LATERAL	7 (F1)	270 (F1)	323 (F1)	
-H-85 / 298	VERT.	372	268	323	
	LATERAL	~ 0	100 (F1)	104 (F1)	
-H-86 / 407	VERT.	64	61	63	
	LATERAL	32 (F1)	126 (F1)	140 (F1)	
	LATERAL	46 (F3)	167 (F3)	193 (F3)	
-H-87 / 380	VERT.	29	93	95	
	LATERAL	18 (F1)	345 (F1)	358 (F1)	
	LATERAL	4 (F3)	73 (F3)	90 (F3)	
-H-88 / 395	VERT.	178	119	130	
	LATERAL	9 (F1)	350 (F1)	377 (F1)	
	LATERAL	49 (F3)	339 (F3)	373 (F3)	
6M-2850-1-H-3 / 230	VERT.	154	37	31	2850-3
	LATERAL	0	397 (F1)	336 (F1)	
-1-H-11 / 390	VERT.	64	86	51	
	LATERAL	0	161 (F1)	157 (F1)	

Supports 6M-2849-H-57, -H-58, -H-61, -H-62 and 6M-2850-1-H-3 will be addressed later because of other systems.

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Raytheon
Engineers & Constructors

GENERAL COMPUTATION SHEET

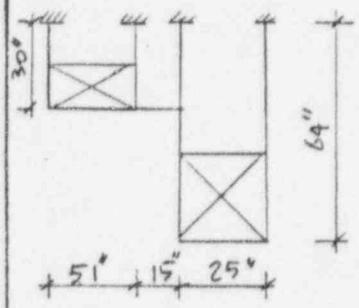
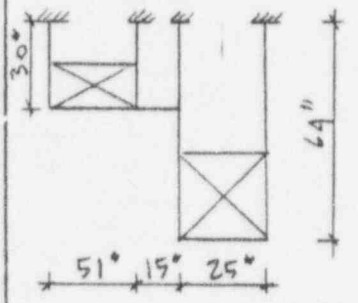
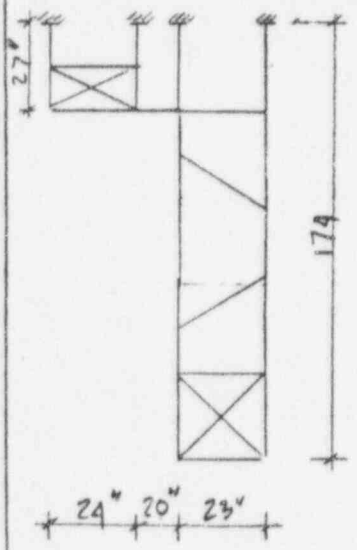
DECO FE&C MEZ

CCHVAC: DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YARTER DATE 9/12/96	ETK/L DATE 5/23/96
	✓				
SHEET 70 OF 246				DATE	DATE
JO 76230502					

SUPPORT MARK NO.	CONFIGURATION	VERT. MEMBER SIZE	HORIZONTAL MEMBER SIZE	REMARKS
GM-2849-H-57-A		L2 1/2 x 2 1/2 x 1/4	L2 1/2 x 2 1/2 x 1/4	SHARED WITH SYSTEM 2849-3 (F) SEE DLN No. 10881 A
GM-2849-H-58		L3 x 3 x 1/4 L2 1/2 x 2 1/2 x 1/4	L3 x 3 x 1/4 L2 1/2 x 2 1/2 x 1/4	SHARED WITH SYSTEM 2849-3 (F)
GM-2849-H-61-A		L2 1/2 x 2 1/2 x 1/4	L2 1/2 x 2 1/2 x 1/4	SHARED WITH SYSTEM 2849-3 (F)

Form 5007 (Rev. 4/93)

Raytheon
Engineers & Constructors

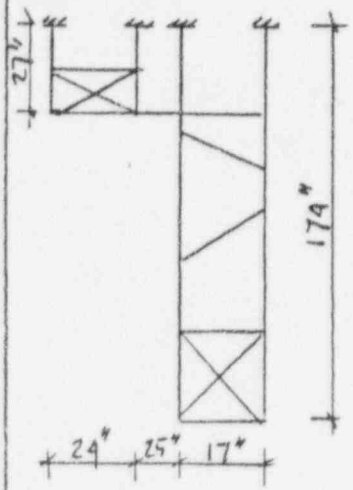
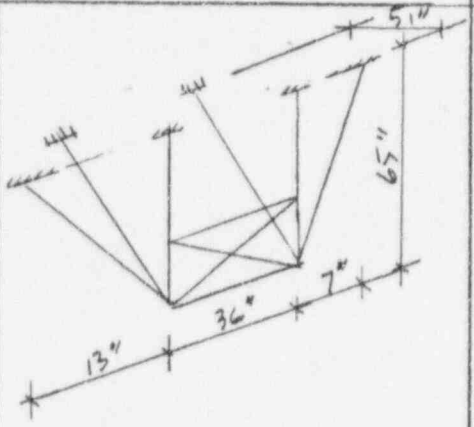
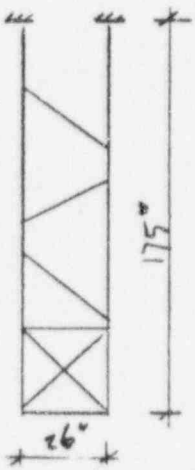
GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	M. YURTER DATE 4/12/96	ETW DATE 5/23/96
	✓				
SHEET 71 OF 246				DATE	DATE
JO 76230502					

SUPPORT MARK No.	CONFIGURATION	VERT. MEMBER SIZE	HORIZONTAL MEMBER SIZE	REMARKS
6M-2849-H-62-A		L2 1/2 x 2 1/2 x 1/4	L2 1/2 x 2 1/2 x 1/4	SHARED WITH SYSTEM 2849-3 (F)
6M-2850-H-57-B		L 3x3x1/4	L 3x3x1/4	
6M-2850-H-73-A		L4x4x1/4	L4x4x1/4	

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Raytheon
Engineers & Constructors

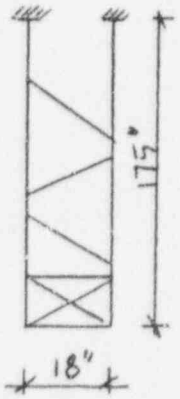
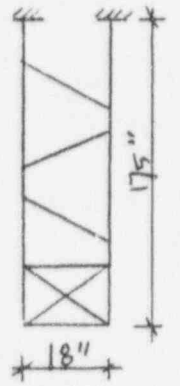
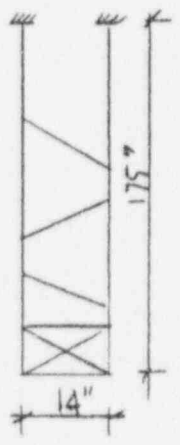
GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT ~~CCHVAC DUCT & DUCT SUPPORTS~~ STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YURTER DATE 4/12/96	KTW. DATE 5/23/96
	✓				
SHEET 72 OF 246				DATE	DATE
JO 76230502					

SUPPORT MARK NO.	CONFIGURATION	VERT. MEMBER SIZE	HORIZONTAL MEMBER SIZE	REMARKS
6M-2850-H-74-A		L4x4x1/4	L4x4x1/4	SEE DCN NO. 10938
6M-2850-H-75		L4x4x1/4	L4x4x1/4	
6M-2850-H-76		L2x2x1/4	L2x2x1/4	REPRESENTED BY SUPT. 6M-2850-H-63 (SYS. 2850-2) MEMBER FAILS.

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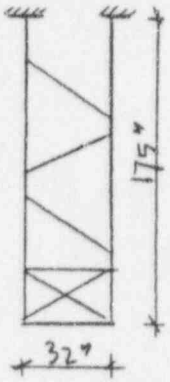
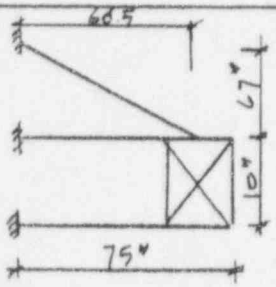
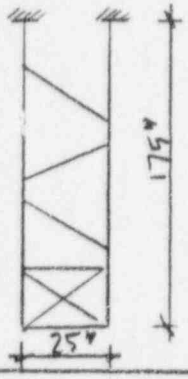
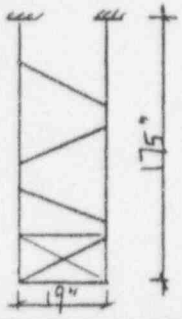
DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-576C					
PRELIM	FINAL	VOID	0	N. YURTER DATE 4/12/96	K TWu DATE 5/23/96
	✓				
SHEET 73 OF 246				DATE	DATE
J.O. 76230502					

SUPPORT MARK NO.	CONFIGURATION	VERT. MEMBER SIZE	HORIZONTAL MEMBER SIZE	REMARKS
6M-2850-H-77-B		L 4x4x1/4	L 4x4x1/4	
6M-2850-H-78		L 2½x2½x¼	L2½x2½x¼	
6M-2850-H-79-B		L 4x4x1/4	L 4x4x1/4	
6M-2850-H-80		L 2x2x1/4	L 2x2x1/4	REPRESENTED BY SUPT. 6M-2850-H-63 (SYS. 2850-2) MEMBER FAILS.

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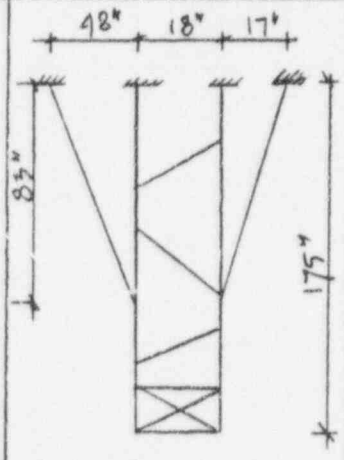
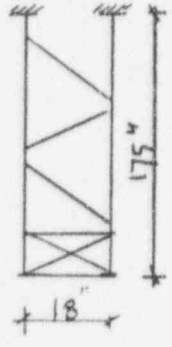
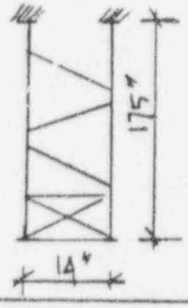
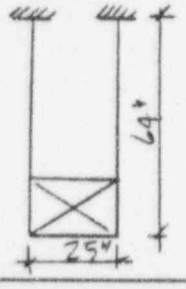
DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM.	FINAL	VOID	0	N. YUBER DATE 4/12/96	E T W. DATE 5/23/96
	✓				
SHEET 74 OF 246				DATE	DATE
J.O. 76230502					

SUPPORT MARK No.	CONFIGURATION	VERT. MEMBER SIZE	HORIZONTAL MEMBER SIZE	REMARKS
6M-2850-H-81-A		L 3x3x 1/4	L 3x3x 1/4	
6M-2850-H-82		L 4x4x 1/4	L 4x4x 1/4	
6M-2850-H-83		L 2x2x 1/4	L 2x2x 1/4	
6M-2850-H-84		L 2 1/2x2 1/2x 1/4	L 2 1/2x 2 1/2x 1/4	

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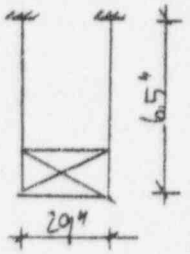
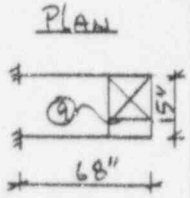
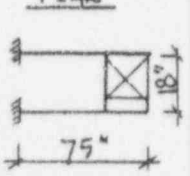
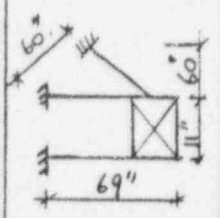
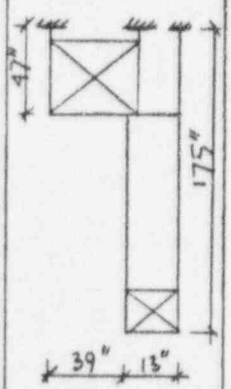
DECO FERMI 2

PROJECT ~~CCHVAC DUCT & DUCT SUPPORTS~~
STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	NYURER DATE 4/13/96	KTW DATE 5/23/96
	✓				
SHEET 75 OF 246				DATE	DATE
J.O. 76230502					

SUPPORT MARK No.	CONFIGURATION	VERT. MEMBER SIZE	HORIZONTAL MEMBER SIZE	REMARKS
6M-2850-H-85		L 2½ x 2½ x ¼	L 2½ x 2½ x ¼	
6M-2850-H-86B	PLAN 	L 4 x 4 x ¼	L 4 x 4 x ¼ EXCEPT MEM (9) L 3 x 3 x ¼	
6M-2850-H-87-B	PLAN 	L 4 x 4 x ¼	L 4 x 4 x ¼	SEE DCN No. 10939 A
6M-2850-H-88		L 4 x 4 x ¼	L 4 x 4 x ¼	
6M-2850-1-H-3		L 2½ x 2½ x ¼	L 2½ x 2½ x ¼	SHARED WITH SYSTEM 2850-3 (R)

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GENERAL COMPUTATION SHEET

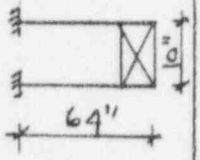
DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YARTER DATE 4/13/96	DATE 5/25/96
	✓				
SHEET 76 OF 246				DATE	DATE
JO 76 23 0502					

SUPPORT MARK NO.	CONFIGURATION	VERT. MEMBER SIZE	HORIZONTAL MEMBER SIZE	REMARKS
6M-2850-1-H-11-A		L 2 1/2 x 2 1/2 x 1/4	L 2 1/2 x 2 1/2 x 1/4	

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GENERAL COMPUTATION SHEET

DECO FERMI 2

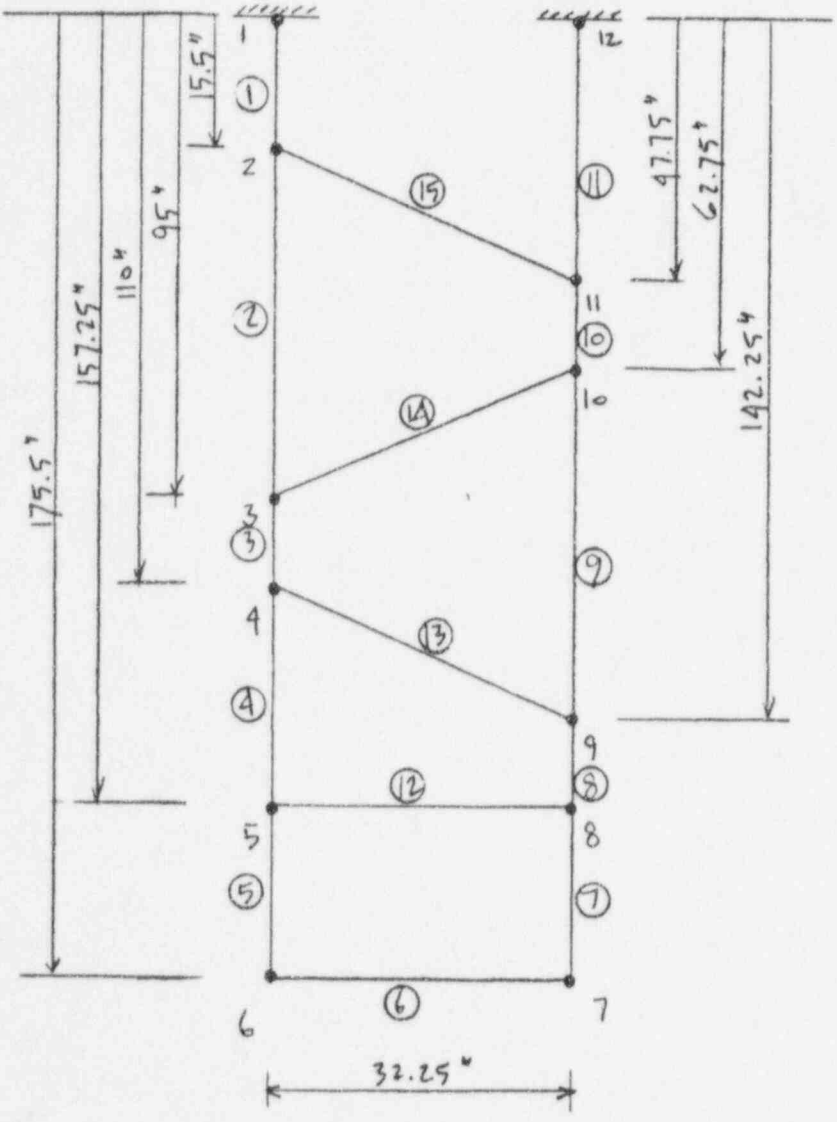
PROJECT CC:HVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION
SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YURTER	ETW
	/			DATE 4/15/96	DATE 5/23/96
SHEET 77 OF 246				DATE	DATE
J.O 76230502					

REF.

COMPUTER MODEL FOR SUPPORT 6M-2850-H-77



DWG
10-9221-000-
6M-2850-77-B

LAST JOINT NO. 12
LAST MEMBER NO. 15

ALL MEMBERS ARE L4x4x1/4

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DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION SYSTEM 2850-1

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YURTER DATE 4/15/96	KTW DATE 5/23/96
	✓				
SHEET 78 OF 246				DATE	DATE
JO 76230502					

RET.

CHECK MEMBER AND WELD STRESSES FOR SUPPORT 6M-2850-H-77

THIS SUPPORT IS REPRESENTATIVE CASE FOR FOLLOWING SUPPORTS BASED ON GREATER HORIZONTAL SEISMIC LOADS: SEE SUPPORT LOAD TABLE

6M-2850-H-73
-75
-79
-82

FOR STATIC RUN OF SUPPORT 6M-2850-H-77, TWO OUTPUT EXIST

1) DEAD LOAD = 540 # (ACTUAL LOAD)
2) DEAD LOAD = 160 # (HYPOTHETICAL LOAD FROM SUPPORT 6M-2850-H-82 IS USED TO CREATE MAX COMPRESSION FOR VERTICAL POST AND TO ENVELOPE REPRESENTED SUPPORTS) STARDYN OUTPUT 4/22/96

FROM OUTPUT WITH DL = 160 #, MAX. COMPRESSION LOAD FOR VERT. POST = 3829 # (LOAD COMBINATION-6 WITH BENDING MOMENT = 8810 #-in @ JT. 1)

SECTION PROPS FOR L 4 x 4 x 1/4: AISC, 7TH ED Pg. 1-56

A = 1.94 in^2
S = 1.05 in^3
r = 1.25 in (GEOMETRIC AXIS)

GOVERNING SSE-LOADS FOR VERTICAL POST, LOAD COMBINATION - 6:

AXIAL COMPRESSION LOAD = 3829 # @ JT. 1
BENDING MOMENT = 8810 #-in @ JT. 1

GOVERNING OBE-LOADS FOR VERTICAL POST LOAD COMBINATION - 2:

AXIAL LOAD (COMPRESSION) = 3453 # @ JT. 1
BENDING MOMENT = 8019 # @ JT. 1

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	H. YUNTER DATE 4/15/96	E.T.W. DATE 5/23/96
	✓				
SHEET 79 OF 246				DATE	DATE
JO 76230502					

REF.

SUPT. 6M-2850-H-77 (CONT'D)

FROM SUPPORT LOAD TABLE FOR SYSTEM 2850-1 :

$$\frac{\text{SSE-LATERAL}}{\text{OBE-LATERAL}} = \frac{823}{749} = 1.10 < 1.45$$

$$\frac{\text{SSE-VERT.}}{\text{OBE-VERT.}} = \frac{314}{274} = 1.15 < 1.45$$

$\therefore$ OBE GOVERNS

$$1.45 = \frac{0.58\,F_y(SSE)}{0.40\,F_y(OBE)}$$

DESIGN CRITERIA NO. FERMI-DC-76230-1 REV. 0, Pg. 19

$$\frac{KL}{r} = \frac{1.0 \times 175.25}{1.25} = 141 \quad \therefore F_A = 7510 \text{ psi}$$

$$f_a = \frac{3453}{1.94} = 1780 \text{ psi}$$

$$\frac{f_a}{F_A} = \frac{1780}{7510} = 0.23 > 0.15$$

$C_m = 0.85$

$$F_e' = \frac{12 \times \pi^2 \times E}{23\left(\frac{KL}{r}\right)^2}$$

HOWEVER, DIVIDE RADIUS OF GYRATION BY FACTOR 1.35 TO CHECK BENDING STRESS ABOUT GEOMETRIC AXES. MAX. BUCKLING LENGTH IN BENDING PLANE $L = 95 - 15.5 = 79.5"$ (SEE COMPUTER MODEL)

AISC, 9th ED Pg. 5-314

$$F_e' = \frac{12 \times \pi^2 \times 29 \times 10^6}{23\left(\frac{1.0 \times 795 \times 1.35}{1.25}\right)^2} = 20236 \text{ psi}$$

$F_b = 19660$ psi ALLOW. BENDING STRESS EVALUATED BASED ON LOCAL BUCKLING (GOVERNS) SEE EVALUATION OF HANGER 6M-2850-H-59.

$$f_b = \frac{M}{S} = \frac{8019}{1.05} = 7637 \text{ psi}$$

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV.	COMP BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YURTER DATE 4/15/96	ETW. DATE 5/23/96
	✓				
SHEET 80 OF 246				DATE	DATE
JO 76230502					

REF.

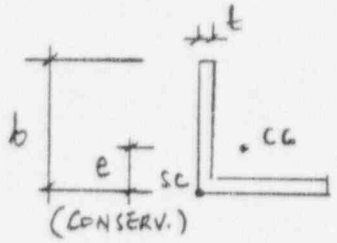
SUPT. 6M-2850-H-77 (CONT'D)

$$\frac{f_a}{F_A} + \frac{C_m f_b}{\left(1 - \frac{f_a}{F_e'}\right) F_b} = 0.23 + \frac{0.85 \times 7637}{\left(1 - \frac{1780}{20236}\right) 19660} = 0.60 < 1.0$$

∴ MEMBERS OK.

OTHER MEMBERS ARE OK BY COMPARISON OF MEMBER LOADS AND BUCKLING LENGTH.

CHECK SHEAR FOR L4×4×1/4



e = 1.09"

ANSC, 7th ED pg. 1-56

MAX. TORSIONAL MOMENT = (MAX. = LOAD COMB-6, JT. 1) HORIZONTAL LOAD × e

= 857 × 1.09

= 934 #-"

STARDYNE OUTPUT FOR H77.OUT 4/22/96 (ATT. B2)

MAX. SHEAR LOAD = 857 # (SEE ABOVE)

$$f_v = \frac{1.5\,V_b}{bt} + \frac{3\,M_T}{At} = \frac{1.5 \times 857}{4 \times 0.25} + \frac{3 \times 934}{1.94 \times 0.25}$$

f_v = 7063 psi < $0.4 \times F_y$ = 0.4 × 36000 = 14400 psi ∴ OK

ANSC, 9th ED pg. 5-315 & 5-316

WARPING STRESSES ARE NEGLIGIBLE.

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DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

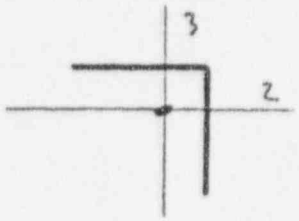
SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YURTER DATE 4/16/96	KTW/o DATE 5/23/96
	✓				
SHEET 81 OF 246				DATE	DATE
J.O. 76230502					

REF.

SHPT. 6M-2850-H-77 (CONT'D)

CHECK WELD AT SUPPORT POINT (JT. 1 OR JT. 12)



$A = 2 \times 4 = 8$ IN

$S_3 = \frac{4^2(4\times4+4)}{6(2\times4+4)} = 4$ IN^2 MIN

BLODGETT, 1972 pg. 7.4-7 (REF: 9)

WELD LOADS : CONSIDER CG OF WELD = CG OF L4x4x1/4

$F_1 = 780$ #
$F_2 = 4025$ #
$M_3 = 8025$ #-" } ENVELOPED LOADS, LOAD COMB-1 THRU 4 SINCE OBE GOVERNS (SEE PREVIOUS PAGES)

STARDYNE OUTPUT 4/22/96

$f_1 = \frac{4025}{8} + \frac{8025}{4} = 2509$ #/"

$f_3 = \frac{780}{8} = 98$ #/"

$f_R = \sqrt{2509^2 + 98^2} = 2509$ #/"

$W_{REQD} = \frac{2509}{14400} = 0.17"$ < ALL-AROUND WELD $2 \times 0.25 = 0.50"$

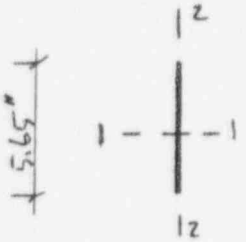
$IR = \frac{0.17}{0.50} = 0.35$

DWG 10-422J-000-CM-2850-77

CHECK WELD FOR DIAGONAL BRACES (MEM. 13, 14 & 15)

BRACES HAVE ANGLE WITH HORIZONTAL 45°
CONSIDER CONSERVATIVELY SINGLE LINE WELD.

WELD LENGTH $= \frac{4}{\cos 45^\circ} = 5.65"$



ENVELOPED LOADS (OBE GOVERNS)

$F_{x1} = 1352$ # (LC-4)
$F_{x2} = 196$ # (LC-4) } BEAM END LOADS
$M_{x_3} = 1627$ #-" (LC-4)

STARDYNE OUTPUT FOR #77 9/22/96 (ATT. B2)

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION SYSTEM 2850-1

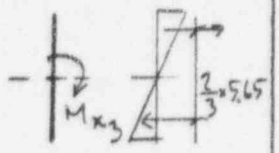
CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N.YURTER DATE 4/16/96	KTW. DATE 5/23/96
	/				
SHEET 82 OF 246				DATE	DATE
JO 76230502					

REF.

SUPT. 6M-2850-H-77 (CONT'D)

WELD FORCES:

$$f_1 = \frac{1352}{5.65} + \frac{4627}{\left(\frac{2}{3} \times 5.65\right)} = 1468\ \#/_{"}$$



$$f_2 = \frac{196}{5.65} = 35\ \#/_{"}$$

$$f_R = \sqrt{1468^2 + 35^2} = 1468\ \#/_{"}$$

$$W_{REQ'D} = \frac{1468}{14400} = 0.10 < 0.25 \quad \therefore \text{OK}$$

$$IR = \frac{0.10}{0.25} = 0.40 < 1.0$$

BY COMPARISON ALL OTHER WELDS ARE OK.

NOTE SUPT. H-77 PER FEM # 0289 AND SUPT. H-79 PER FEM # 0287 HAVE NOTCH IN VERTICAL POST. HOWEVER, THESE NOTCHES ARE REINFORCED WITH L4×4×1/4 ∴ NO IMPACT ON MEMBER STRESSES.

DWG. 10.4221-000-6M-2850-77-B AND -79-B

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

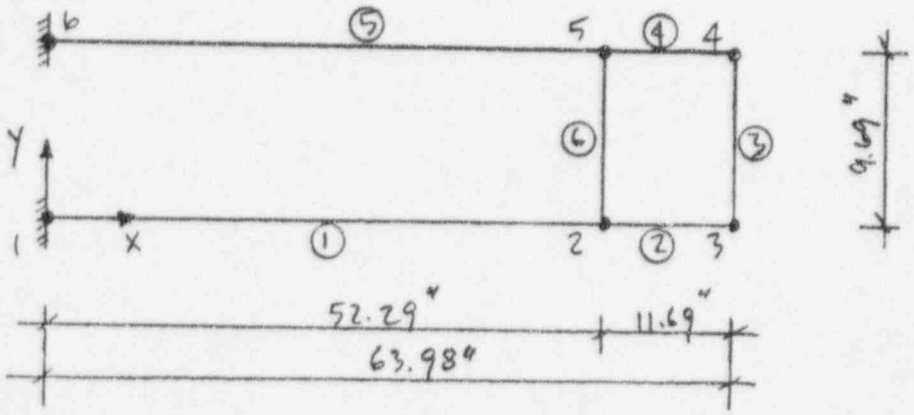
STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	H.YARTER DATE 4/16/96	KTW DATE 5/23/96
				DATE	DATE
SHEET 83 OF 246					
JO 76230502					

REF.

COMPUTER MODEL FOR SUPPORT GM-2850-1-H-11



LAST JOINT No. 6
LAST MEMBER No. 6
ALL MEMBERS ARE L 2 1/2 x 2 1/2 x 1/4

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GENERAL COMPUTATION SHEET

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PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	V.WURTER DATE 4/16/96	KTK/L DATE 5/23/96
	✓				
SHEET 84 OF 246				DATE	DATE
JO 76230502					

REF.

CHECK MEMBER AND WELD STRESSES FOR SUPPORT GM-2850-1-H-11

THIS SUPPORT IS REPRESENTATIVE HANGER FOR SUPT. GM-2850-H-84 AND GM-2850-H-85 BASED ON GREATER VERTICAL LOAD (DL + OBE) WHICH CREATES GREATER BENDING MOMENT FOR SUPPORT BASED ON MAGNITUDE OF VERTICAL LOADS ALTHOUGH MOMENT ARM IS SLIGHTLY SHORTER. ALSO, HORIZONTAL OBE-LOAD = 161# CREATES GREATER COMPRESSION IN MAIN MEMBER THAN IN THE CASE OF TWO OTHER SUPPORTS

SEE LOAD TABLE FOR SYS. 2850-1

MAX. AXIAL LOAD = 643# (@ JT. 1, LOAD COMB-4, EQUILIBRIUM)
MAX. BENDING MOM. = 2519#-in (@ JT. 1, LOAD COMB-4, EQUILIBRIUM)

STARDYNE OUTPUT FOR H11. (STT. 86)

AXIAL LOAD = 643# < 1062# (SUPT. GM-2850-H-59)

MOMENT = 2519#-in > 1700# (-11-)

HOWEVER, SECTION MODULUS FOR L2½ x 2½ x ¼ IS GREATER THAN SECTION MODULUS OF L2x2x¼. (0.394 in³ > 0.247 in³)

RATIO OF SECTION MODULUS:

$$\frac{S_{L2\frac{1}{2}\times 2\frac{1}{2}\times \frac{1}{4}}}{S_{L2\times 2\times \frac{1}{4}}} = \frac{0.394}{0.247} = 1.59$$

RATIO OF DESIGN MOMENTS:

$$\frac{M_{H-11}}{M_{H-59}} = \frac{2519}{1700} = 1.48 < 1.59 \quad \therefore \text{BENDING STRESS OK}$$

THEREFORE ALL MEMBERS FOR SUPT. H-11 ARE OK BY COMPARISON.
BY COMPARISON OF WELD LOADS AND WELD SECTION PROP'S OF SUPT. H-59 V.S. H-11, ALL WELDS FOR SUPT. H-11 ARE OK.

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PROJECT CCHVAC DUCT & DUCT SUPPORTS

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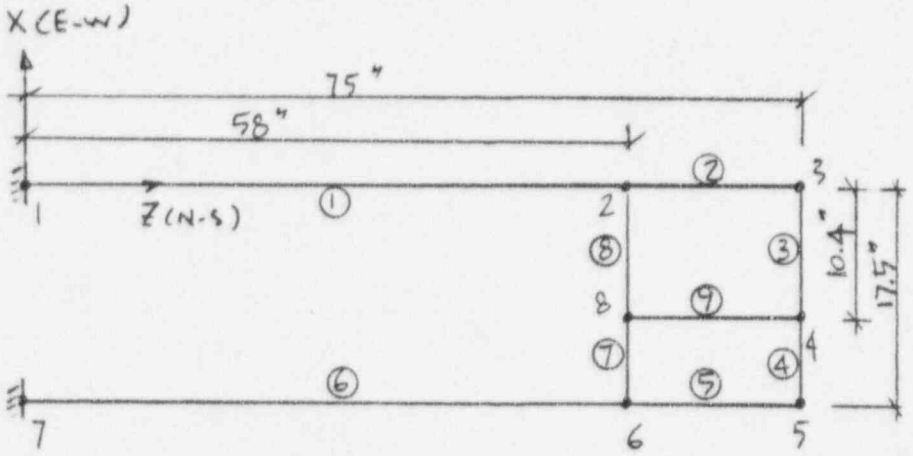
CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N.LYNTER DATE 4/17/96	K.T.W. DATE 5/23/96
	✓				
SHEET 85 OF 246				DATE	DATE
J.O 76230502					

REF.

COMPUTER MODEL FOR SUPPORT 6M-2850-H-87



DWG. 10-4221-000-6M-2850-H-87-B

LAST JOINT NO. 8
LAST MEMBER NO. 9
ALL MEMBERS ARE L4×4×1/4

THIS SUPPORT IS REPRESENTATIVE FOR SUPT. 6M-2850-H-86 BASED ON GREATER OBE LOADS. FOR ANALYSIS OBE LOADS GOVERN SINCE

$$\frac{SSE}{OBE} < 1.45 = \frac{0.58\ Fy}{0.40\ Fy}$$

SEE SUPPORT LOAD TABLE

DESIGN CRITERIA NO. FERMI-DC-76230-1, R/0 PG. 19

FOR COMPUTER ANALYSIS, ADD LATERAL LOADS, CREATED BY DEAD LOAD, TO LATERAL SEISMIC LOADS (CONSERV.)

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DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YUHTER DATE 4/17/96	KTW DATE 5/23/96
	✓				
SHEET 86 OF 246				DATE	DATE
JO 76230502					

REF.

SHPT. 6M-2850-H-87 (CONT'D)

CHECK MEMBER AND WELD STRESSES FOR SUPPORT 6M-2850-H-87

AXIAL + BENDING STRESS

MAX AXIAL LOAD = 795 # (COMPRESSION) (MEM. 1, @ JT. 1, LOAD COMB-4 EQILIBRIUM CHECK)

BENDING MOM. (X_1) = 7917 #-" (↓)

-"- (X_2) = 5587 #-"

$\Sigma M = 7917 + 5587 = 13504$ #-"

BY COMPANSON TO SHPT. 6M-2850-H-77 WITH M = 8019 #-" / AXIAL = 3453 # AND MAX. MEMBER IR = 0.60 AND WELD IR = 0.35, MEMBER AND WELD STRESSES WILL BE WITHIN THE ALLOWABLES.

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DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

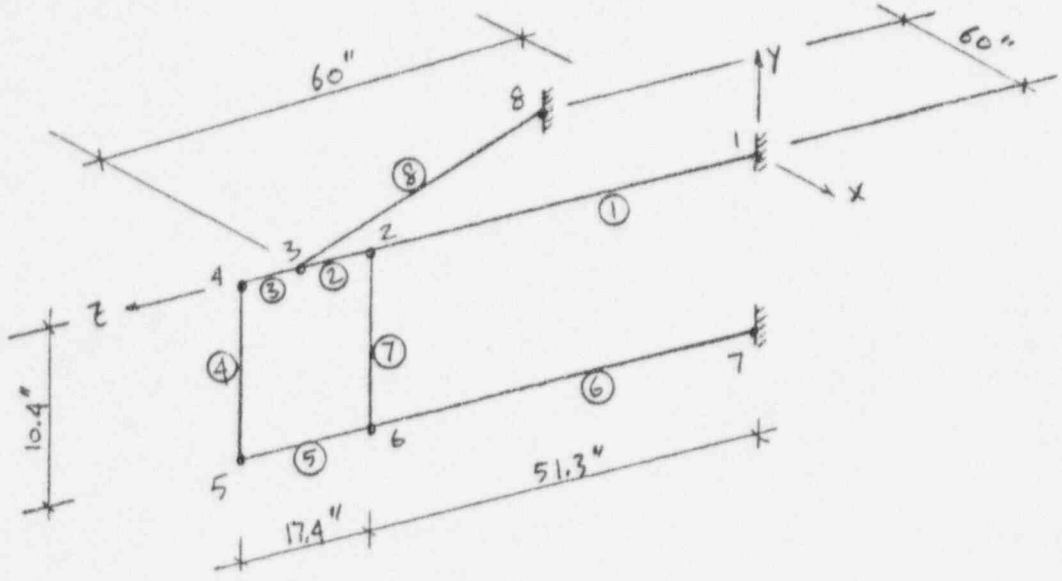
STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	NYHRTER DATE 4/17/96	ETW. DATE 5/23/96
	✓				
SHEET 87 OF 246				DATE	DATE
JO 76230502					

REF.

COMPUTER MODEL FOR SUPPORT 6M-2850-H-88



LAST JOINT NO. 8

LAST MEMBER NO. 8

ALL MEMBERS ARE L4×4×1/4

$$\frac{SSE_V}{OBE_V} = \frac{130}{119} = 1.09 < \frac{0.58\ F_y}{0.40\ F_y} = 1.45$$

$$\frac{\text{MAX. } SSE_H}{\text{MIN, } OBE_H} = \frac{377}{339} = 1.11 < 1.45$$

∴ OBE GOVERNS

CONSERVATIVELY ADD LATERAL LOADS CREATED BY DEAD LOADS TO SEISMIC LATERAL LOADS. FOR COMPUTER ANALYSIS.

$F_1 = F_{E-W} = 350 + 9 = 359$ #

$F_3 = F_{N-S} = 339 + 49 = 388$ #

DWG. 10-4221-000-6M-2850-H-88

SEE SUPPORT LOAD TABLE

DESIGN CRITERIA NO. FERMI-DC-76230-1, R/0, Pg. 19 (REF. 1)

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DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	NYNRTER DATE 4/18/96	ETW. DATE 5/23/96
	✓				
SHEET 88 OF 246				DATE	DATE
J.O. 76230502					

REF.

SUPT 6M-2850-H-88 (CONT'D)

CHECK MEMBER AND WELD STRESSES FOR SUPPORT 6M-2850-H-88

AXIAL + BENDING STRESS

MAX. AXIAL (COMPRESSION) (X_3) = 1522# (MEM. 1, @JT. 1 LOAD COMB-4 EQUILIBRIUM CHECK)

STARDYNE OUTPUT FOR H88.OUT 1/22/96 (ATT. B5)

BENDING MOMENT (X_1) = 5400 #-in (MEM. 1, @JT. 1, LOAD COMB-4)

-"- (X_2) = 118 #-in (MEM. 1, @JT. 1, LOAD COMB-4)

Σ BENDING MOMENT = 5400 + 118 = 5518 #-in

BY COMPARISON TO SUPT. 6M-2850-H-77 WITH AXIAL LOAD = 3453#, MOM = 8019 #-in AND MEM. IR = 0.60 AND WELD IR = 0.35, MEMBER AND WELD STRESSES ARE WITHIN ALLOWABLES.

CHECK SHEAR STRESS

MAX TORSIONAL MOMENT = 452 #-in (MEM. 3, LOAD COMB-2, BEAM ELEMENT LOADS)

MAX SHEAR (V_2) = 902# (MEM. 7, LOAD COMB-3, BEAM ELEMENT LOADS)

MAX. SHEAR (V_3) = 138# (MEM. 3, LOAD COMB-3, BEAM ELEMENT LOADS)

BY COMPARISON TO SUPT. 6M-2850-H-77, SHEAR STRESSES ARE WITHIN THE ALLOWABLES.

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PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

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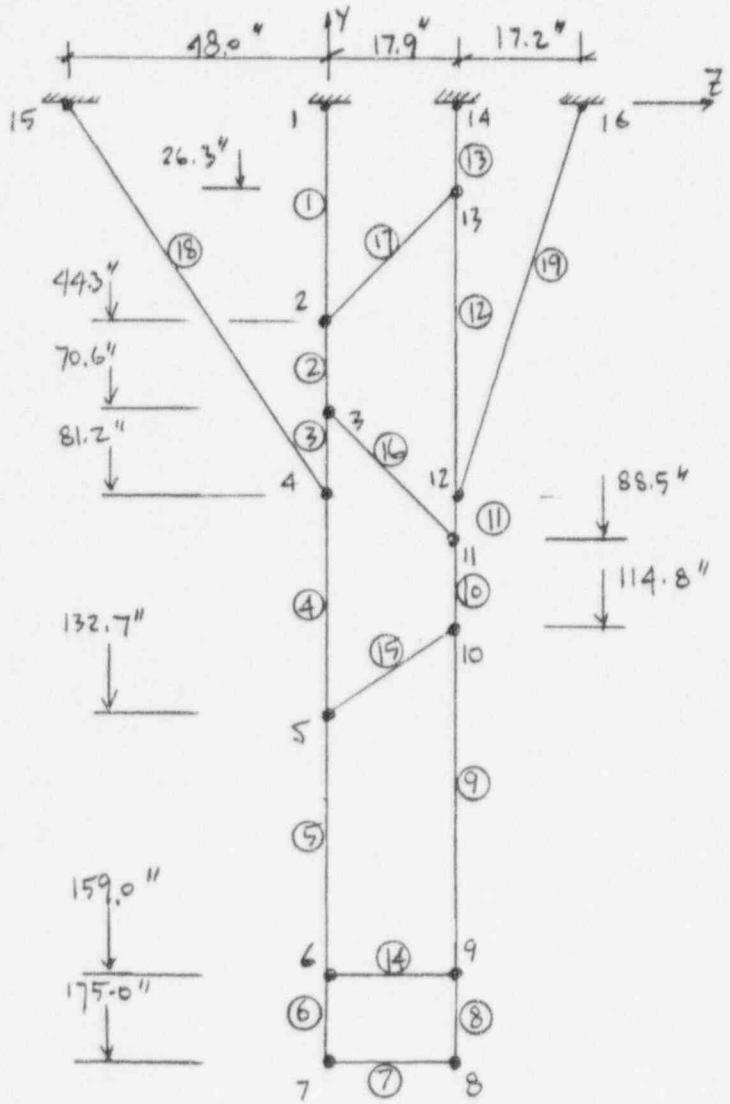
DC-5766					
PRELIM	FINAL	VOID	0	N. YURTER	ETW.
	✓			DATE 4/17/96	DATE 5/23/96
SHEET 39 OF 246				DATE	DATE
JO 76230502					

REF.

COMPUTER MODEL FOR SUPPORT 6M-2850-H-81



LAST JOINT NO. 16

LAST MEMBER NO. 19

ALL MEMBERS ARE L 3x3x 1/4

OBE-CASE GOVERNS SINCE OBE-SEISMIC LOADS ARE GREATER THAN SSE-SEISMIC LOADS.

DWG. 10-4221-000-6M-2850-81-A

SEE SUPPORT LOAD TABLE

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N.YHRER DATE 4/17/96	KTW/G DATE 5/23/96
	✓				
SHEET 90 OF 246				DATE	DATE
JO 76230502					

REF.

SHPT 6M-2850-H-81 (CONT'D)

CHECK MEMBER AND WELD STRESSES FOR SUPPORT 6M-2850-H-81

AXIAL (COMPRESSION) + BENDING

SECTION PROPS FOR L3x3x1/4 : — AISC-7TH ED PG. 1-57 (REF. 2)

$A = 1.44\ in^2$

$S = 0.577\ in^3$

$r_x = 0.930\ in$

MEMBER ① OR ⑬ (CRITICAL)

$\frac{KL}{r_x} = \frac{10 \times 175}{0.930} = 188 \rightsquigarrow F_A = 6480\ psi$

CRITICAL LOAD FOR MEM. ① : — STARDYNE OUTPUT FOR H-81 4/17/96 (ATT. 33)

COMPRESSION = 4189 # (LOAD COMB-2, EQUILIBRIUM CHECK) @ JT. 1

MOMENT = 495 #-in

CRITICAL LOADS FOR MEM. ⑬ :

COMPRESSION = 3323 # (LOAD COMB-1, EQUILIBRIUM CHECK) @ JT. 14

MOMENT = 1736 #-in

FOR MEM. ⑬ :

$f_a = \frac{3323}{1.44} = 2308\ psi \qquad \frac{f_a}{F_A} = \frac{2308}{6480} = 0.36 > 0.15$

AISC, 7TH ED PG. 5-22, 5-23 (REF. 2)

$\frac{f_a}{F_A} + \frac{C_m f_b}{(1 - \frac{f_a}{F_e'}) F_b} \leq 1.0$

$C_m = 0.85$

$f_b = \frac{M}{S} = \frac{1736}{0.577} = 3009\ psi$

$F_e' = \frac{12 \pi^2 E}{23 (\frac{KL}{r})^2}$ — HOWEVER, DIVIDE RADIUS OF GYRATION BY FACTOR 1.35 TO CHECK BENDING STRESS ABOUT GEOMETRIC AXES. — AISC, 9TH ED PG. 5-314 (REF. 3)

$L = 49.3"$ — MAX. BUCKLING LENGTH IN PLANE L=49.3" (USE L=49.3" FOR MEM. 1, CONSERV.)

SEE COMPUTER MODEL

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5765					
PRELIM	FINAL	VOID	0	NYLATER DATE 4/17/96	KTW DATE 5/3/96
	Y				
SHEET 91 OF 246				DATE	DATE
J.O. 76230502					

REF.

SUPT 6M-2850-H-81 (CONT'D)

$$Fe' = \frac{12 \times \pi^2 \times 29 \times 10^6}{23\left(\frac{1.0 \times 49.3 \times 1.35}{0.930}\right)^2} = 36074 \text{ psi}$$

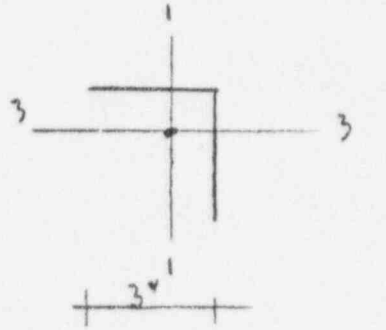
$$0.36 + \frac{0.85 \times 3009}{\left(1 - \frac{2308}{36074}\right) 21600} = 0.49 < 1.0 \quad \therefore \text{ OK}$$

BY COMPARISON ALL OTHER MEMBERS ARE OK.

CHECK WELD @ JT. 1, 14, 15 AND 16

$A = 2 \times 3 = 6$ IN

$S_{MIN} = \frac{3^2/(4 \times 3 + 3)}{6(2 \times 3 + 3)} = 2.5$ IN^2



ENVELOPED WELD LOADS (CONSERV.)

$F_2 = 4673\#$ (LOAD COMB-3, @ JT. 1)

$F_3 = 1129\#$ (LOAD COMB-3, @ JT. 15)

$M_1 = 1961$ #-" (LOAD COMB-1 @ JT. 16)

STARDYNE OUTPUT FOR H-81 4/17/96 (ATT. B3)

WELD FORCES:

$$f_2 = \frac{4673}{6} + \frac{1961}{2.5} = 1563 \text{ \#/"}$$

$$f_3 = \frac{1129}{6} = 188 \text{ \#/"}$$

$$f_R = \sqrt{1563^2 + 188^2} = 1574 \text{ \#/"}$$

$$W_{REQD} = \frac{1574}{14400} = 0.11" < 0.25" \quad \therefore \text{ OK}$$

$$IR = \frac{0.11}{0.25} = 0.44 < 1.0$$

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SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YUBTER DATE 4/18/96	ETW. DATE 5/23/96
	✓				
SHEET 92 OF				DATE	DATE
JO 76230502					

REF.

SUPT 6M-2850-H-81 (CONT'D)

CHECK AXIAL + BENDING STRESS FOR MEMBER (15)

BENDING MOMENT = 19766 #-in (@ JT. 5, BEAM ELEMENT LOADS, LOAD COMB-3 ↓)

COMPRESSION (AXIAL) = 2959 #-in ( )

$\frac{KL}{r_x} = \frac{1.0 \times 25}{0.930} = 26 \rightsquigarrow F_A = 20220$ psi

$f_a = \frac{2959}{1.44} = 2055$ psi $\rightsquigarrow \frac{f_a}{F_A} = \frac{2055}{20220} = 0.10 < 0.15$

$f_b = \frac{M}{S} = \frac{19766}{0.577} = 34256$ psi

INCREASE BENDING STRESS 25% TO CHECK AROUND GEOMETRIC AXIS. AISC, 9th ED pg. 5-312 SECT. 5.2.2.a (REF. 3)

$IR = \frac{f_a}{F_A} + \frac{1.25 f_b}{F_b} = 0.10 + \frac{1.25 \times 34256}{21600} = 2.08 > 1.0$

∴ N.G.

SIMILARLY MEMBER 5 @ JT. 6 WITH M = 17429 #-in MEMBER 10, @ JT. 11 WITH M = 16471 #-in, MEMBER 14 @ JT. 6 WITH M = 15184 #-in WILL HAVE OVERSTRESS CONDITIONS.

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DC-5766					
PRELIM	FINAL	VOID	0	N. WALTER	ETW
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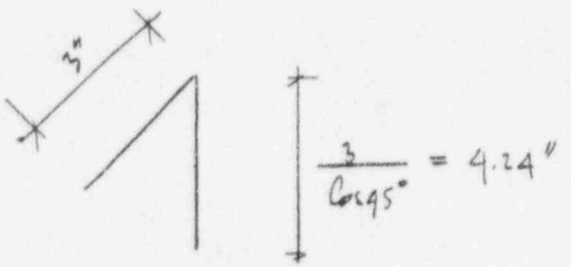
REF.

SUPT. GM-2850-H-81 (CONT'D)

CHECK WELD FOR MEM. 15 @ JT. 5



$J = \frac{4.24^3}{12} + \frac{3^3}{12} = 8.6\ in^3$ (CONSERV.)

$A = 7.24\ in$

WELD LOADS

$F_{AXIAL} = 2959\ \#$

$F_{WEAR} = 1543\ \#$

$M_T = 19766\ \#\text{-}"$

$f_1 = \frac{1543}{7.24} = 213\ \#/"$

$f_2 = \frac{2959}{7.24} + \frac{19766 \times (\sim 2.107")}{8.6} = 5251\ \#/"$

$f_R = \sqrt{213^2 + 5251^2} = 5255\ \#/"$

$W = \frac{5255}{14400} = 0.36 > 0.25 \therefore$ NG.

$IR = \frac{0.36}{0.25} = 1.44$

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DC-5766					
PRELIM	FINAL	VOID	0	N.YURTER DATE 4/18/96	K T W/ DATE 5/23/96
	V				
SHEET 94 OF 246				DATE	DATE
JO 76230502					

REF.

QUALIFICATION OF SUPPORT 6M-2850-H-83

OBE LOADS ARE GOVERNING SINCE MAX. LOAD RATIO $\frac{SSE}{OBE} < \frac{0.58\,F_y}{0.40\,F_y}$. — SEE SUPPORT LOAD TABLE

SUPPORT ATTACHED TO CEILING. SUPPORT CONFIGURATION IS SIMILAR TO THAT OF 6M-2850-H-59.

CRITICAL STRESSES ARE AXIAL + BENDING COMBINATION. (COMP.)

DEAD LOAD + OBE-VERTICAL (UPWARD) WILL NEVER CREATE COMPRESSION IN VERTICAL POST — SEE SUPPORT LOAD TABLE

SINCE DEAD LOAD = 377# > OBE-VERT. = 294#.

HORIZONTAL LOAD = 31# WHICH IS 3.7 TIMES LESS THAN HORIZONTAL LOAD FOR SUPT. 6M-2850-H-59. (115#)

$$\frac{115}{31} = 3.7$$

MAX. MOMENT ARM RATIO:

$$\frac{L_{H-83}}{L_{H-59}} = \frac{175}{136} = 1.29 < 3.7$$

$$\frac{KL}{r} = \frac{10 \times 175}{0.609} = 287 \rightsquigarrow F_A = \frac{12\times\pi^2\times E}{23\left(\frac{KL}{r}\right)^2}$$

$$F_A = \frac{12\times\pi^2\times 29\times 10^6}{23\,(287)^2}$$

$$F_A = 1811 \text{ psi}$$

$$\frac{F_{A(H-59)}}{F_{A(H-83)}} = \frac{2965}{1811} = 1.64 \rightsquigarrow 1.29 \times 1.64 = 2.1 < 3.7$$

THEREFORE SUPT. H-83 IS OK BY COMPARISON TO SUPT. H-59.

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CALCULATION SET NO. DC-5766			REV	COMP. BY	CHK'D BY
PRELIM	FINAL	VOID	0	HYURTER DATE 4/18/96	KTW DATE 5/23/96
	✓				
SHEET 95 OF 246				DATE	DATE
JO 76230502					

REF.

QUALIFICATION OF SUPPORT 6M-2850-H-57

MEMBERS ARE L3x3x1/4 WITH MAX. MAIN MEMBER LENGTH 65".

MAX RATIO: $\frac{SSE_{LATERAL}}{OBE_{LATERAL}} = \frac{618\ (F_3)}{435\ (F_3)} = 1.42$

$1.42 < \frac{0.58\ F_y}{0.40\ F_y}$ = MIN. ALLOW. RATIO ∴ OBE GOVERNS

THIS SUPPORT HAS FOUR KICKERS RESISTING ALL LATERAL LOADS. BY COMPARISON TO SUPPORT 6M-2850-H-54 (SYSTEM 2850-2) WITH L2½x2½x¼ AND MAIN MEMBER LENGTH 112.7" AND LATERAL LOAD = 534 #, MAX. IR = 0.82, SUPT. 6M-2850-H-57 WILL HAVE MEMBER AND WELD STRESSES WITHIN THE ALLOWABLES.

DWG. No. 0-4224-080-6M-2850-57

DESIGN CRITERIA NO. FERMI-DC-76230-1, REV. 0, Pg. 19

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PROJECT CCHVAC DUCT & DUCT SUPPORTS

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SUBJECT SYSTEM 2850-1

CALCULATION SET NO			REV	COMP. BY	CHK'D B
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PRELIM	FINAL	VOID	0	H.W. UTTER DATE 4/18/96	E.T.W. DATE 5/23/96
	✓				
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JO 76230502					

QUALIFICATION OF SUPT. 6M-2850-H-76 AND SUPT. 6M-2850-H-80

SIMILAR CONFIGURATION TO SUPT. 6M-2850-H-63, (SYSTEM 2850-2) WITH L_{POST} = 136.7" AND LATERAL LOAD = 204 # AND MEMBER IR = 1.15 > 1.0.

$F_{A\ H-63}$ = 2965 psi

$F_{A\ H-80\ OR\ H-76}$ = 1811 psi (SEE SIMILAR SUPT. 6M-2850-H-83)

MIN. LATERAL LOAD FOR SUPT H-80 OR H-76 IS 170 # (F_3). < 204 #. HOWEVER, BASED ON LONGER MOMENT ARM AND LESS COMPRESSION STRESS ALLOWABLE (F_A), SUPPORT H-76 AND H-80 WILL HAVE MEMBER STRESS FAILURE.

SEE SUPPORT LOAD TABLE

QUALFICATON OF SUPPORT 6M-2850-H-78

BY COMPARISON TO SUPT. H-54 (SYSTEM 2850-2), THIS SUPPORT IS ACCEPTABLE BASED ON SHORTER MOMENT ARM AND LESS LOADS.

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DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

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DC-5766					
PRELIM	FINAL	VOID	0	N. YURTER	K T W.
	/			DATE 4/18/96	DATE 5/23/96
SHEET 97 OF 246				DATE	DATE
JO 76230502					

REF.

RESULTS OF SUPPORT EVALUATIONS OF SYSTEM 2850-1

SUPT. MARK NO.	MEMBER STRESS	WELD STRESS	BASE R.	REPRESENTED BY SUPT.	REMARKS
6M-2849-H-57					SHARED WITH SYST. 2849-3 (F)
-H-58					↓
-H-61					
-H-62					
6M-2850-H-84	OK	OK		6M-2850-1-H-11	
-H-73	OK	OK		6M-2850-H-77	
-H-74	NG	NG		↓	FAILS BY COMPARISON TO H-77
-H-75	OK	OK			
-H-76	NG	NG		6M-2850-H-63	← SYSTEM 2850-2
-H-77	OK	OK		ITSELF	ANALYSIS SUPPORT
-H-78	OK	OK		6M-2850-H-54	← SYSTEM 2850-2
-H-79	OK	OK		6M-2850-H-77	
-H-80	NG	NG		6M-2850-H-63	← SYSTEM 2850-2
-H-81	NG	NG		ITSELF	ANALYSIS SUPPORT
-H-82	OK	OK		6M-2850-H-77	
-H-83	OK	OK		6M-2850-H-59	← SYSTEM 2850-2
-H-57	OK	OK		6M-2850-H-54	← SYSTEM 2850-2
-H-85	OK	OK		6M-2850-1-H-11	← SYSTEM 2850-1
-H-86	OK	OK		6M-2850-H-87	← SYSTEM 2850-1
-H-87	OK	OK		ITSELF	ANALYSIS SUPPORT
-H-88	OK	OK		ITSELF	ANALYSIS SUPPORT SHARED WITH SYST. 2850-3
6M-2850-1-H-3					
6M-2850-1-H-11	OK	OK		ITSELF	ANALYSIS SUPPORT

FAILING SUPPORTS WILL BE QUALIFIED IN THE NEXT PAGES DUE TO FIELD MODIFICATIONS.

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	JFS DATE 5-4-96	ETW DATE 5/9/96
	✓				
SHEET 98 OF 246				DATE	DATE
JO 76230502					

SUPPORT LOADS FOR SYSTEM 2850-1
BASED ON 1ST STRING ANALYSIS MODIFICATION:

REF

STRING ANALYSIS OUTPUT 4/25/96

SUPPORT MARK / NODE POINT	DIR.	SUPPORT REACTION DL (LBS)	OBE (LBS)	SSE (LBS)	SHARED WITH SYSTEM
6M-2849-H-57 / 130	VERT	168	62	69	2849-3 (F)
	LATERAL	0	196	247	
6M-2849-H-58 / 120	VERT	260	160	179	2849-3 (F)
	LAT.	0	77	95	
6M-2849-H-61 / 170	VERT	329	166	188	2849-3 (F)
	LAT	0	26	23	
6M-2849-H-62 / 180	VERT	273	68	59	2849-3 (F)
	LAT	0	46	40	
6M-2850-H-84 / 138	VERT	406	134	135	
	LAT	0	88	112	
H-73 / 155	VERT	596	205	210	
	LAT	F1=12	422	F1=516 F2=55	
H-74 / 190	VERT	353	86	73	
	LAT	0	320	382	
H-75 / 200	VERT	242	60	51	
	LAT	5	418	380	
H-76 / 210	VERT	236	57	47	
	LAT	0	145	119	
H-77 / 270	VERT	534	240	297	
	LAT.	0	714	F1=805 F2=58	
H-78 / 370	VERT	357	131	125	
	LAT.	F1=7	248	303	

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DECO FERMI 2 CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO			REV	COMP BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 5-4-96	DATE 5/9/96
	✓				
SHEET 99 OF 246				DATE	DATE
JO 76230502					

SUPPORT LOADS FOR SYSTEM 2850-1
BASED ON 1 ST STRING ANALYSIS MODIFICATION : CONT

REF

STRING ANALYSIS OUTPUT 4/25/96

SUPPORT MARK / NODE POINT	DIR.	SUPPORT REACTION DL (LBS)	OBE (LBS)	SSE (LBS)	SHARED WITH SYSTEM
6M-2850-H-79 / 285	VERT	503	154	140	
	LATERAL	0	115	134	
H-80 / 295	VERT	190	64	51	
	LAT.	0	8	10	
H-81 / 305	VERT	359	108	82	
	LAT.	F_2: 7	261	368	
H-82 / 320	VERT	160	153	92	
	LAT	F_1: 8	336	381	
H-83 / 330	VERT	377	244	152	
	LAT	0	31	36	
H-57 / 100	VERT	371	223	248	
	LAT	F_3: 19	F_1: 289 F_3: 410	F_1: 341 F_3: 577	
H-85 / 248	VERT	377	223	286	
	LAT	F_1: 5	85	97.	
H-86 / 407	VERT	64	54	60.	
	LAT	F_1: 32 F_2: 46	F_1: 112 F_3: 152	F_1: 132 F_3: 185	
H-87 / 380	VERT	0	0	0	
	LAT	F_1: 24	F_1: 266 F_3: 74	F_1: 299 F_3: 63	
H-88 / 395	VERT	178	119	132	
	LAT.	F_2: 50	F_1: 265 F_3: 260	F_1: 326 F_3: 315	
2850-1-H-3 / 230	VERT	154	37	31	2850-3
	LAT.	0	291	238	

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DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT ~~STRUCTURAL QUALIFICATION~~

SUBJECT SYSTEM 2850-1

CALCULATION SET NO			REV	COMP BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	QFS DATE 5-4-96	ETW DATE 5/9/96
	✓				
SHEET 100 OF 246				DATE	DATE
JO 76230502					

SUPPORT LOADS FOR SYSTEM 2850-1

BASED ON 1ST STRING ANALYSIS MODIFICATION : CONT.

REF

STRING ANALYSIS OUTPUT 4/25/96

SUPPORT MARK / NODE POINT	DIR.	SUPPORT REACTION DL (LBS)	OBE (LBS)	SSE (LBS)	SHARED WITH SYSTEM
GM-2850-H-11 / 350	VERT	64	86	51	
	LATERAL	0	74	92	
H-	VERT				
	LAT.				
H	VERT				
	LAT				
H	VERT				
	LAT				
H-	VERT				
	LAT				
H-	VERT				
	LAT				
H-	VERT				
	LAT				
H-	VERT				
	LAT				
H-	VERT				
	LAT				
H-	VERT				
	LAT				

QFS 5-4-96

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PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	NUMBER DATE 5/20/96	ET W/C DATE 5/23/96
	✓				
SHEET 101 OF 246				DATE	DATE
JO 76 230 502					

REF.

SUPPORT LOADS FOR SYSTEM 2850-1 AFTER FIELD MODIFICATIONS

SUPPORT MARK NO. / NODE POINT	DIRECTION	DEADLOAD [LBS]	OBE [LBS]	SSE [LBS]	SHARED WITH SYSTEM
6M-2849-H-57	VERT.	167	58	66	2849-3 (F)
130	LATERAL	0	227	282	
-H-58	VERT.	260	110	124	2849-3 (F)
120	LATERAL	0	72	93	
-H-61	VERT.	329	172	201	2849-3 (F)
170	LATERAL	0	13	19	
-H-62	VERT.	273	68	59	2849-3 (F)
180	LATERAL	0	19	26	
6M-2850-H-84	VERT.	406	133	137	
138	LATERAL	0	106	132	
-H-73	VERT.	596	208	226	
155	LATERAL	12	506	610	
-H-74	VERT.	353	86	73	
190	LATERAL	0	265	391	
-H-75	VERT.	242	60	51	
200	LATERAL	5	194	233	
-H-76	VERT.	236	57	47	
210	LATERAL	0	298	409	
-H-77	VERT.	534	239	297	
270	LATERAL	0	673	807	
-H-78	VERT.	357	123	120	
370	LATERAL	7	240	305	
-H-79	VERT.	503	136	120	
285	LATERAL	0	108	130	
-H-80	VERT.	189	81	97	
295	LATERAL	0	14	11	
-H-81	VERT.	359	107	82	
305	LATERAL	7	234	344	
-H-82	VERT.	160	153	92	
320	LATERAL	8	244	294	
-H-83	VERT.	377	244	152	
330	LATERAL	0	25	30	

STRING ANALYSIS 5/15/96

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Raytheon Engineers & Constructors

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DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	NYNTER DATE 5/20/96	KTW/L DATE 5/23/96
	✓				
SHEET 102 OF 246				DATE	DATE
JO76230502					

REF.

SUPPORT LOADS FOR SYSTEM 2850-1 AFTER FIELD MODIFICATIONS (CONT'D)

SUPPORT MARK NO. / NODE POINT	DIRECTION	DEAD LOAD [LBS]	OBE [LBS]	SSE [LBS]	SHARED WITH SYSTEM
6M-2850-H-57	VERT.	371	148	162	
100	LATERAL	0	141 (F1)	184 (F1)	
	LATERAL	19 (F3)	427 (F3)	591 (F3)	
-H-85	VERT.	377	229	295	
248	LATERAL	5	57	70	
-H-86	VERT.	64	57	63	
407	LATERAL	32 (F1)	126 (F1)	147 (F1)	
	LATERAL	46 (F3)	182 (F3)	218 (F3)	
-H-87	VERT.	0	0	0	
380	LATERAL	24 (F1)	207 (F1)	248 (F1)	
	LATERAL	0	77 (F1)	82 (F1)	
-H-88	VERT.	178	127	141	
395	LATERAL	0	316 (F1)	383 (F1)	
	LATERAL	50 (F3)	250 (F3)	340 (F3)	
6M-2850-1-H-3	VERT.	154	37	31	2850-3 (R)
230	LATERAL	0	74	93	
-1-H-11	VERT	64	86	51	
350	LATERAL	0	82	97	

STRING ANALYSIS 5/15/96

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DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N YURTER DATE 5/20/96	KTW DATE 5/23/96
	✓				
SHEET 103 OF 246				DATE	DATE
JO 76230502					

REF.

QUALIFICATION OF SUPPORTS (SYSTEM 2850-1) AFTER FIELD MODIFICATIONS

IN ORDER TO QUALIFY SOME OVERSTRESSED SUPPORTS AND BASE PLATES, SOME FIELD MODIFICATIONS ARE INTRODUCED. DUE TO NEW STIFFNESS VALUES OF MODIFIED SUPPORTS, A NEW STRING ANALYSIS HAS BEEN DONE AND NEW SUPPORT LOADS HAVE BEEN DETERMINED. ACCORDING THE NEW LOADS FOLLOWING SUPPORTS ARE STILL ACCEPTABLE BY SIMPLE LOAD COMPARISON SINCE NEW SUPPORT LOADS ARE EITHER SLIGHTLY GREATER THAN ORIGINAL SUPPORT LOADS OR THEY BECAME LESS THAN ORIGINAL LOADS;

Supt. H-57 (SHARED WITH SYSTEM 2849-3)
H-58 ( )
H-61 ( )
H-62 ( )
H-84
1-H-11
H-75
H-77
H-78
H-79
H-82
H-83
H-57
H-85
H-86
H-87
H-88
1-H-3

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YURTER	
	✓			DATE 5/20/96	DATE 5/23/96
SHEET 104 OF 246				DATE	DATE
JO 76230502					

QUALIFICATION OF SUPPORTS AFTER FIELD MOD. (CONT'D)

QUALIFICATION OF SUPPORT 6M-2850-H-74

A NEW HORIZONTAL BRACE (L4×4×¼) AT ALMOST UPPER DUCT ELEVATION HAS BEEN ADDED TO THE SUPPORT. THIS NEW MEMBER (L ≅ 8'-8") RESIST MAINLY HORIZONTAL LOAD AND BENDING MOMENT CREATED BY HORIZONTAL LOAD AND HELPS RELEASING CRITICAL STRESSES (COMPRESSION + BENDING) IN VERTICAL POSTS.

CHECK HORIZONTAL BRACE (L4×4×¼)

AXIAL LOAD = 265 # (TOTAL HORIZONTAL LOAD)

MOMENT = H×L = 265 × 15" = 3975 #-"

15" = DBE DUCT CENTER TO CG OF L4×4×¼

SECTION PROP'S OF L4×4×¼

$A = 1.94\ in^2$

$r = 1.25\ in$

$S = 1.05\ in^3$

$f_a = \frac{265}{1.94} = 137\ psi$

$\frac{KL}{r} = \frac{1.0 \times 104}{1.25} = 84 \rightarrow F_A = 14900\ psi$

$\frac{f_a}{F_A} = \frac{137}{14900} = 0.009$

$f_b = \frac{M}{S} = \frac{3975}{1.05} = 3786\ psi$

$IR = 0.009 + \frac{1.25^{*} \times 3786}{19660} = 0.25 < 1.0 \therefore$ L4×4×¼ OK

19660 = ALLOW. BENDING STRESS EVALUATED DUE TO LOCAL BUCKLING (SEE CALC. FOR SYSTEM 2851-2)

* FACTOR TO CONSIDER BENDING STRESS ABOUT GEOMETRIC AXIS.

(REF. 3 AISC, 9TH ED pg. 5-312 SECT. 5.2.2.a)

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N.YURTER DATE 5/20/96	K T W. DATE 5/23/96
	✓				
SHEET 105 OF 246				DATE	DATE
J0 76 230502					

REF.

QUALIFICATION OF SUPT. H-74 (CONT'D)

CHECK 1/2" ϕ BOLTS (A-325)

MIN DISTANCE BETWEEN TWO BOLT = 1.5" (CONSERV.)

CONSIDER ONLY TWO BOLTS RESISTING LOADS FROM COMPRESSION AND BENDING.

ALLOW BOLT SHEAR = $A \times 15000\ (psi) = (\pi \times 0.25^2) \cdot (15000) = 2944^{\#}$

MAX SHEAR = $\sqrt{265^2 + \left(\frac{3975}{15}\right)^2} = \underline{2663^{\#} < 2944^{\#}}$ ∴ 1/2 BOLT OK

ANSC, 7TH ED Pg. 5-195, Pg. 5-193 (REF. 2)

CHECK GUSSET PL (3/8" THICK)

MIN. HEIGHT = 4" (CONSERV.)

$A = 3/8 \times 4 = 1.5\ in^2$

$S = \frac{3/8 \times 4^2}{6} = 1.0\ in^3$ (FOR MOMENT CREATED BY HORIZONTAL LOAD)

$I_{MIN} = \frac{4 \times (3/8)^3}{12} = 0.0176\ in^4$

$r_{MIN} = \sqrt{\frac{I_{MIN}}{A}} = \sqrt{\frac{0.0176}{1.5}} = 0.108\ in$

$\frac{KL}{r_{MIN}} = \frac{1.0 \times (\sim 40)}{0.108} = 37 \rightsquigarrow F_A = 19420\ psi$ (FOR A-36)

$f_a = \frac{265}{1.5} = 177\ psi \rightsquigarrow \frac{f_a}{F_A} = \frac{177}{19420} = 0.009 < 0.15$

$f_b = \frac{M}{S} = \frac{3975}{1.0} = 3975\ psi$

$IR = 0.009 + \frac{3975}{21600} = \underline{0.19 < 1.0}$ ∴ OK

SUPT 6M-2850-H-74 (CONTD)

SINCE LATERAL LOAD MAINLY RESISTED BY HORIZONTAL BRACE, THE REST OF SUPPORT IS ABLE TO RESIST DEAD LOAD & VERTICAL SEISMIC AND ACCEPTABLE BY COMPARISON TO SUPT. H-77 (SYSTEM 2850-1).

QUALIFICATION OF SUPPORT 6M-2850-H-76

GOVERNING LOADS
DL = 236#
VERT (OBE) = 57#
HORIZONTAL (OBE) = 298#

MODIFICATION SIMILAR TO SUPT. H-74. LATERAL LOAD AND MOMENT CREATED BY IT MAINLY RESISTED BY HORIZONTAL BRACE. DEADLOAD AND VERTICAL SEISMIC LOADS ARE RESISTED MAINLY BY VERTICAL MEMBERS. THEREFORE, BY COMPARISON TO SUPT. H-74 (SYSTEM 2850-1) HORIZONTAL BRACE AND BY COMPARISON TO SUPT H-59 (SYSTEM 2850-2) THE REST OF SUPPORT IS ACCEPTABLE.

QUALIFICATION OF SUPPORT 6M-2850-H-80

ENVELOPED LOADS (OBE & SSE)
DL = 189#
VERT. (OBE) = 61#
LATERAL(SSE) = 11#

BY COMPARISON TO SUPT H-59 (SYSTEM 2850-2), THIS SUPPORT IS ACCEPTABLE BASED ON MUCH LESS LATERAL LOAD (11# << 115#).

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-7766					
PRELIM	FINAL	VOID	0	N. YURTER DATE 5/21/96	K T W. DATE 5/23/96
SHEET 107 OF 246				DATE	DATE
JO 76230502					

REF.

QUALIFICATION OF SUPPORT 6M-2850-H-81

SUPPORT LOADS AFTER FIELD MODIFICATIONS;
DL = 359 #
VERTICAL SEISMIC (OBE) = 107 #
HORIZONTAL SEISMIC (OBE) = 234 #
} OBE GOVERNS SINCE $\frac{SSE}{OBE} < 1.6$

BEFORE MODIFICATION SUPPORT HAD FOLLOWING GOVERNING LOADS;
DL = 359 #
VERTICAL SEISMIC (OBE) = 109 #
HORIZONTAL SEISMIC (OBE) = 1476 #
MAX. IR = 2.08 (COMPRESSION + BENDING FOR MEM. (15) SEE PREVIOUS PAGES)

MEMBER FAILURE MAINLY CAUSED BY HORIZONTAL LOAD. SINCE NEW HORIZONTAL LOAD MUCH LESS THAN ORIGINAL LOAD (234 # V.S. 1476 #), MEMBER AND WELD STRESSES ARE WITHIN THE ALLOWABLES BY COMPARISON.

QUALIFICATION OF SUPPORT 6M-2850-H-77

SUPPORT IS MODIFIED TO QUALIFY THE OVERSTRESSED BASE PL. MEMBER AND WELD STRESSES WERE WITHIN THE ACCEPTABLES, MODIFICATION HAS FAVORABLE EFFECT ON MEMBER AND WELD STRESSES. THEREFORE SUPPORT IS STILL ACCEPTABLE.

QUALIFICATION OF SUPPORT 6M-2850-H-73

SUPPORT IS MODIFIED TO QUALIFY OVERSTRESSED BASE PL. MODIFICATION HAS FAVORABLE EFFECT ON MEMBER AND WELD STRESSES DUE TO ADDITIONAL BRACE. THEREFORE SUPPORT IS STILL ACCEPTABLE.

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GENERAL COMPUTATION SHEET

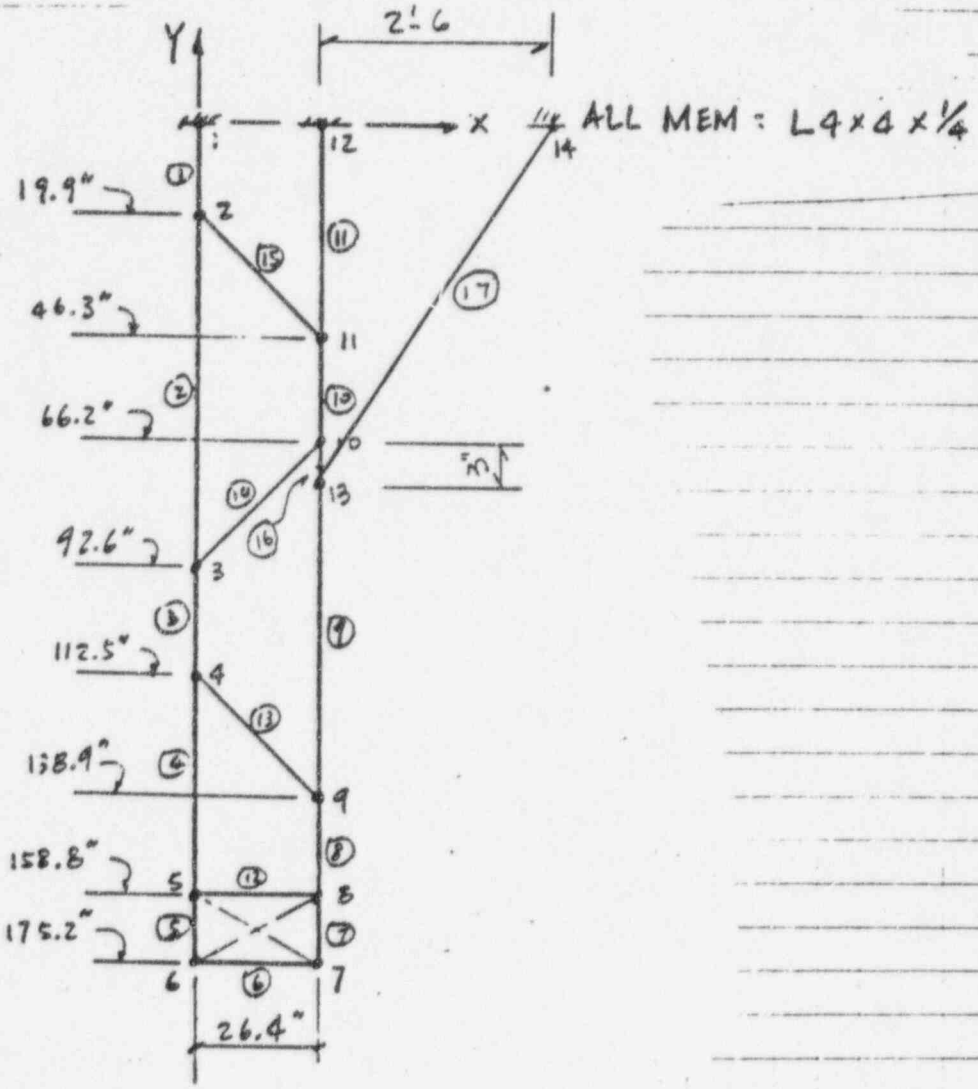
CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	R Bevan DATE 5/20/96	ETW DATE 5/20/96
	✓				
SHEET 108 OF 246				DATE	DATE
JO 76230, 502					

PROJECT DECO FERMI 2

SUBJECT

SYSTEM 2850-1 HANGER 2850-1-H73

STARDYNE MODEL WITH PROPOSED MODIFICATION (BRACE MEMBER 17) INCLUDED



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GENERAL COMPUTATION SHEET

DECO FERMI 2

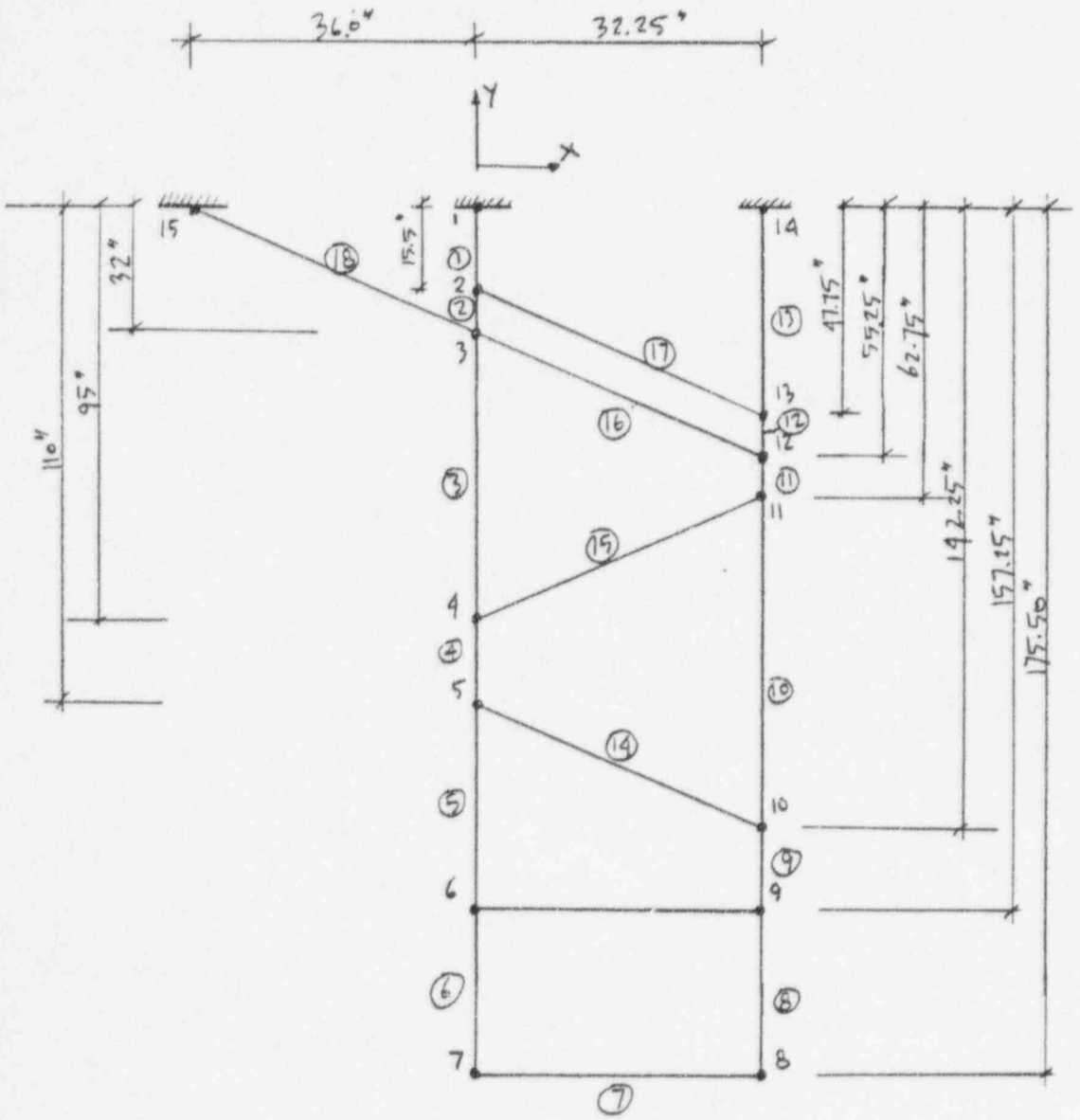
PROJECT CCHVAC : DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	NUMBER DATE 5/20/96	ETW DATE 5/20/96
	✓				
SHEET 109 OF 246				DATE	DATE
J.O. 76230502					

REF.

COMPUTER MODEL FOR SUPPORT CM-2850-H-77 AFTER FIELD MODIFICATION



LAST JOINT NO. 15
LAST MEMBER NO. 18

ALL MEMBERS ARE L4×4×1/4

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

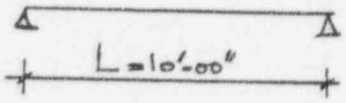
STRUCTURAL QUALIFICATION

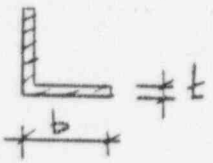
SUBJECT SYSTEM 2850-2

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM.	FINAL	VOID	0	HYURTER DATE 3/21/96	WC DATE 3/21/96
	✓				
SHEET 110 OF 246				DATE	DATE
JO 76230502					

REF.

ALLOWABLE BENDING STRESS FOR EQUAL LEG ANGLE BASED ON LATERAL-TORSIONAL BUCKLING





ANGLE SIZE	L [IN]	F_y [KSI]	$F_{ob}=\frac{85900}{(L/b)^2}C_b\left[\sqrt{1+0.78\left(\frac{Lt}{b^2}\right)^2}-1\right]$ [KSI]	C_b [-]	ALLOWABLE STRESS [KSI]
L2×2×1/4	120	36	$F_{bo}=135.98>3\times F_y=108$	1	$F_b=0.66F_y=23.76$
L2½×2½×¼			$F_{bo}=125.11>3\times F_y=108$		$F_b=23.76$
L3×3×¼			$F_{bo}=113.23>3\times F_y=108$		$F_b=23.76$
L3½×3½×¼			$F_{bo}=101.05<3\times F_y=108$		$F_b=23.45$ *
L4×4×¼	↓	↓	$F_{bo}=89.19<3\times F_y=108$	↓	$F_b=22.76$ *

AISC, 9th ED P6.5-312, 5-321

*) $F_b=\left[0.95-.050\sqrt{\frac{F_y}{F_{ob}}}\right]F_y$

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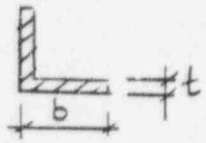
STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N.YARTER DATE 3/21/96	WC DATE 3/21/96
	✓				
SHEET 111 OF 246				DATE	DATE
JO 7k 230502					

REF.

ALLOWABLE BENDING STRESS FOR EQUAL LEG ANGLE BASED ON LOCAL BUCKLING



ANGLE SIZE	b/t	Q [REDUCTION FACTOR]	ALLOWABLE STRESS [KSI]
L 2×2×1/4	8	$b/t = 8 < \frac{65}{\sqrt{F_y}} = 10.8$ ⇝ Q = 1	$F_b = 0.66 F_y = \boxed{23.76}$ WITH $F_y = 36$
L 2½×2½×1/4	10	$10 < 10.8$ ⇝ Q = 1	$F_b = \boxed{23.76}$
L 3×3×1/4	12	$b/t = 12 > \frac{65}{\sqrt{F_y}}$ $< \frac{76}{\sqrt{F_y}}$ ⇝ Q = 1	$F_b = 0.60 F_y = \boxed{21.6}$
L 3½×3½×1/4	14	$b/t = 14 > \frac{76}{\sqrt{F_y}} = 12.67$ $< \frac{155}{\sqrt{F_y}} = 25.83$ ⇝ $Q = 1.34 - 0.00447(\frac{b}{t})\sqrt{F_y}$ Q = 0.96	$F_b = 0.60 F_y \times Q$ $= 0.60 \times 36 \times 0.96$ $F_b = \boxed{20.73}$
L 4×4×1/4	16	$b/t = 16 > \frac{76}{\sqrt{F_y}} = 12.67$ $< \frac{155}{\sqrt{F_y}} = 25.83$ ⇝ $Q = 1.34 - 0.00447(\frac{b}{t})\sqrt{F_y}$ Q = 0.91	$F_b = 0.60 F_y \times Q$ $= 0.60 \times 36 \times 0.91$ $F_b = \boxed{19.66}$

AISC, 9th ED PG. 5-311

☐ GOVERNING ALLOWABLES

Form 5007 (Rev. 4/93)

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	GPS DATE 3-30-96	ETulin DATE 5/21/96
	✓				
SHEET 112 OF 246				DATE	DATE
JO 76230.502					

SUPPORT LOADS FOR SYSTEM 2850-2

REF

SUPPORT MARK / NODE POINT	PREVIOUS * DIRECTION	DL (LBS)	OBE (LBS)	I.R. D+OBE	NEW ** DL (LBS)	OBE (LBS)	SSE (LBS)	I.R.
GM-2850-H-49 / 230	VERT	324	56		456	219	321	
	LATERAL	0	40		2	180	300	
H-54 / 240	VERT	319	86		422	411	666	
	LAT.	0	238		2.	534	894	
H-55 / 260	VERT	376	57		470	129	137	
	LAT.	0	330		0	390	628	
H-56 / 275	VERT	396	52		495	152	184	
	LAT	0	260		0	310	476	
H-58 / 305	VERT	309	83		286	420	687	
	LAT	0	17		0	47	46	
H-58 / 380	VERT	125	16		171	45	45	
	LAT	0	46		0	56	60	
H-59 / 325	VERT	150	148		240	156	247	
	LAT.	0	44		0	115	101	
H-60 / 350	VERT	140	22		199	53	56	
	LAT	0	90		0	247	205	
H-61 / 360	VERT	120	10		175	45	46	
	LAT	0	142		0	397	327	
H-62 / 395	VERT	161	22		215	55	53	
	LAT.	0	41		0	114	110	
H-63 / 410	VERT	122	7		180	43	36	
	LAT.	0	68		0	204	191	

* CALC. DC 2834

** STRING ANALYSIS OUTPUT 3/29/96

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 3-30-96	DATE 5/2/196
	✓				
SHEET 113 OF 246				DATE	DATE
JO T6230.502					

SUPPORT REACTION CONT.

REF

* CALC DC 2834

** STRING ANALYSIS OUTPUT 3/29/96

SUPPORT MARK / NODE POINT	PREVIOUS * DIRECTION	D.L. (LBS)	OBE (LBS)	I.R. D+OBE	NEW ** D.L. (LBS)	OBE (LBS)	SSE (LBS)	I.R.
GM-2850-H-64 / 420	VERT	56	3		115	28	23	
	LATERAL	0	78		0	220	210	
H-65 / 460	VERT	265	26		281	131	189	
	LAT.	0	14		0	31	48	
H-65 / 530	VERT	178	28		200	60	67	
	LAT.	0	15		0	28	42.	
H-66 / 480	VERT	133	136		196	178	267	
	LAT	0	16		0	40	58.	
H-67 / 490	VERT	149	8		251	63	55	
	LAT	0	26		0	83	106	
H-68 / 500	VERT	178	18		266	69	58	
	LAT	0	43		0	142	162	
H-69 / 520	VERT	44	7		105	28	24	
	LAT.	0	33		0	115.	135.	
H-70 / 545	VERT	153	17		209	53	47.	
	LAT	0	11		0	35	42.	
H-71 / 560	VERT	173	13		247	63	54.	
	LAT	0	43		0	145	166.	
H-72 / 590	VERT	48	6		113	30	26	
	LAT.	0	33		0	128.	147.	
H-	VERT							
	LAT.							

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N YURTER	R SONI
	✓			DATE 4/1/96	DATE 4.8.96
SHEET 114 OF 246				DATE	DATE
JO 76230502					

REF.

SUPPORT MARK No.	VERTICAL MEMBER SIZE	VERTICAL MEMBER LENGTH [IN]	HORIZONTAL MEMBER SIZE	HORIZONTAL MEMBER LENGTH [IN]	REMARKS
6M-2850-H-49	L3x3x1/4 L2½x2½x1/4	136.7	L2x2x1/4	60.3	
-H-54	L2½x2½x1/4	112.7	L2½x2½x1/4	35.5	WITH KICKER
-H-55	↓	↓	↓	↓	↓
-H-56	↓	↓	↓	↓	WITH KICKER MULTI DUCT BUT SAME SYSTEM 2850-2
-H-58	L3x3x1/4	≈ 186	L2x2x1/4	11.7	
-H-59	L2x2x1/4	136.6	↓	↓	
-H-60	↓	↓	↓	↓	
-H-61	↓	↓	↓	↓	
-H-62	↓	↓	↓	↓	
-H-63	↓	↓	↓	↓	
-H-64	↓	↓	↓	↓	
-H-65	L2½x2½x1/4	80.6	↓	≈ 20	MULTI DUCT BUT SAME SYSTEM 2850-2
-H-66	↓	128.8	L2½x2½x1/4	17.5	
-H-67	↓	128.8	L2½x2½x1/4	15.5	
-H-68	↓	128.8	L2½x2½x1/4	15.5	
-H-69	L2x2x1/4	128.8	L2x2x1/4	9.2	
-H-70	L2x2x1/4	128.6	L2x2x1/4	15.2	
-H-71	L2½x2½x1/4	128.8	L2½x2½x1/4	15.5	
-H-72	L2x2x1/4	128.6	L2x2x1/4	11.2	

STRESS REPORT 2850-2

DWG's 10-4221-000-6M-2850-H-49 TO -H-72

BY REVIEWING THE CONFIGURATION AND SUPPORT LOAD TABLE IT IS CONCLUDED THAT HANGER H-59 IS REPRESENTATIVE OF HANGERS H-58, H-62, H-65, H-66, H-67, H-68, H-69, H-70 H-71, H-72 AND

H-54 IS REPRESENTATIVE OF H-55 AND H-56

H-49 IS UNIQUE BY ITSELF.

SUPPORT H-63 AND BY COMPARISON TO H-64, H-60 & H-61 FAIL BASED ON GREATER HORIZONTAL LOAD. (SEE NEXT SHEETS)

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GENERAL COMPUTATION SHEET

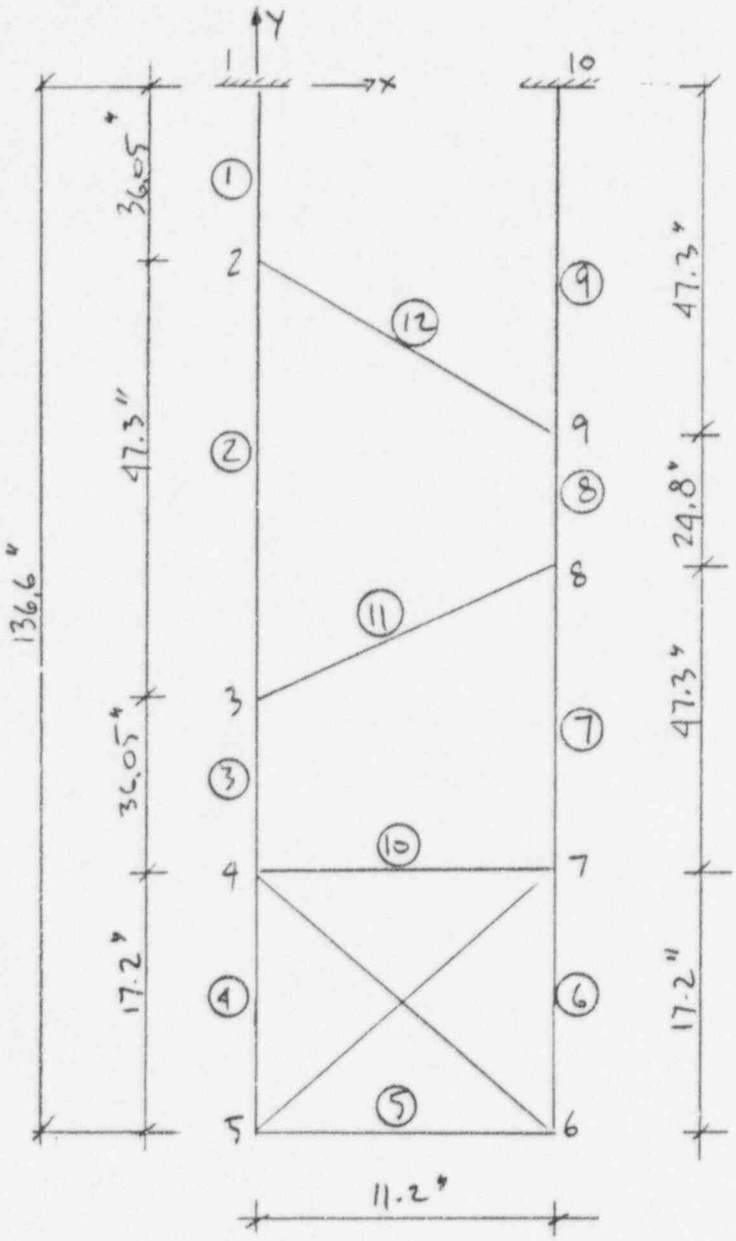
DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YARTER	R SONI
	✓			DATE 4/1/96	DATE 4.8.96
SHEET 115 OF 246				DATE	DATE
J.O 76230502					

STARDYNE - COMPUTER MODEL OF SUPT. 6M-2850-H-59



DWG.
10-4221-060-
6M-2850-H-59

MOMENT RELEASE FOR MEMBER (11) & (12) DUE TO SINGLE LINE WELD.

No. OF LAST MEMBER 12
No. OF LAST JOINT 10

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DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YUZTER DATE 4/6/96	R SONI DATE 4.8.96
	✓				
SHEET 116 OF 246				DATE	DATE
JO 76230502					

REF.

QUALIFICATION OF SUPPORT GM-2850-H-59

CHECK AXIAL + BENDING

ALL MEMBERS ARE L 2x 2x 1/4.

DWG. 10-4221-080-6M-2850-59

MAX. AXIAL (COMPRESSION) LOAD = 996 #

MAX. BENDING MOMENT = 1700 #-#

} (NODE 1, LOAD COMB 2) OUTPUT H59.OUT

PROPERTIES OF L 2x 2x 1/4 :

AISC, 7TH ED Pg. 1-57

$A = 0.938\ in^2$

$S = 0.247\ in^3$

$r_x = 0.609\ in$

$K = 1.0$ (DUCT RESIST THE BUCKLING IN OUT-OF-PLANE DIRECT.)

$L = 136.6''$ (FULL LENGTH OF VERTICAL POST MEMBER)

$\frac{kl}{r} = \frac{1.0 \times 136.6}{0.609} = 224.3 > 200$

AISC, 9TH ED Pg. 5-311

$b/t = 8 < \frac{76}{\sqrt{36}} = 12.67$ PREFERABLY SHOULD NOT BE GREATER THAN 200.

$\therefore Q = 1$

AISC, 7TH ED Pg. 5-16 & 5-17

$C_c = \sqrt{\frac{2\pi^2 E}{Q \times F_y}} = \sqrt{\frac{2 \times \pi^2 \times 29 \times 10^3}{1 \times 36}} = 126$

$\frac{KL}{r} > C_c \therefore F_a = \frac{12\pi^2 E}{23\left(\frac{KL}{r}\right)^2} = \frac{12 \times \pi^2 \times 29 \times 10^6}{23(224.3)^2}$

$F_A = 2965\ psi$

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N.YURTER DATE 4/6/96	R(illegible) DATE 4.8.96
	✓				
SHEET 117 OF 246				DATE	DATE
J.O 76230502					

REF.

6M-2850-H-59 (CONT'D)

$$f_a = \frac{996}{0.938} = 1062 \text{ psi}$$

$$\frac{f_a}{F_A} = \frac{1062}{2965} = 0.358 > 0.15$$

$$\frac{f_a}{F_A} + \frac{C_m f_b}{\left(1 - \frac{f_a}{F_e'}\right) F_b} \leq 1.0$$

AISC, 7th ED Pg. 5-22, 5-23

$C_m = 0.85$

$$f_b = \frac{M}{S} = \frac{1700}{0.247} = 6882 \text{ psi}$$

*) $F_b = 23760$ psi

$$F_e' = \frac{12\pi^2 E}{23\left(\frac{KL}{r}\right)^2}$$

HOWEVER, DIVIDE RADIUS OF GYRATION BY FACTOR 1.35 TO CHECK BENDING STRESS ABOUT GEOMETRIC AXES.
MAX. BUCKLING LENGTH IN BENDING PLANE $L = 47.3''$ (SEE COMPUTER MODEL)

AISC, 9th ED Pg. 5-314

$$F_e' = \frac{12 \times \pi^2 \times 29 \times 10^6}{23\left(\frac{1.0 \times 47.3 \times 1.35}{0.609}\right)^2}$$

$F_e' = 13580$ psi

*) F_b IS EVALUATED BASED ON BOTH LOCAL BUCKLING AND LATERAL-TORSIONAL BUCKLING. MEMBER SIZES FOR HANGERS IN STRESS REPORT 2850-2 FOR BOUNDING CASE (SUPT. H-59) ARE L2x2x1/4 WITH ALLOWABLE $F_b = 23760$ psi.

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJ. SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP'Y	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YURTER DATE 4/6/96	R SANI DATE 4.8.96
	✓				
SHEET 118 OF 246				DATE	DATE
JO 76230.502					

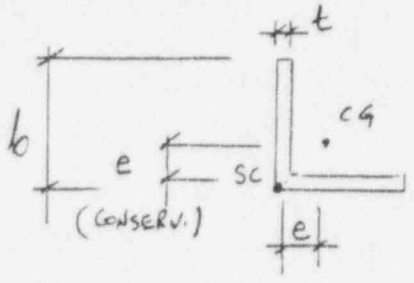
REF.

6M-2850-H-59 (CONT'D)

$$\frac{f_a}{F_A} + \frac{C_m f_b}{\left(1 - \frac{f_a}{F_e'}\right) F_b} = \frac{1062}{2965} + \frac{0.85 \times 6882}{\left(1 - \frac{1062}{13580}\right) 23760} = 0.63 < 1.0 \quad \therefore \text{OK}$$

OTHER MEMBERS ARE OK BY COMPARISON OF MEMBER LOADS & BUCKLING LENGTH.

CHECK SHEAR FOR L 2x2x1/4



e = 0.592"

AISC, 7TH ED pg. 1-57

MAX. TORSIONAL MOMENT = (LC-OBE HORIZONTAL LOAD) × e (@ VERTICAL POST)

= 84 × 0.592

M_T = 49.7 #-"

SEE OUTPUT H59.OUT

MAX SHEAR LOAD = 84 # (@ NODE 1, LC-2)

AISC, 9TH ED pg. 5-315 & 5-316

$$f_v = \frac{1.5 V_b}{bt} + \frac{3 M_T}{At}$$

$$= \frac{1.5 \times 84}{2 \times 0.25} + \frac{3 \times 49.7}{0.938 \times 0.25}$$

$$f_v = 887.8 \text{ psi} < \frac{0.4 F_y}{*} = 0.4 \times 36000 = 14400 \text{ psi} \quad \therefore \text{OK}$$

WARPING STRESSES ARE NEGLIGIBLE.

CHECK L 4x4x1/4 (ITEM NO. 9, DWG. 10-4221-000-6M-2850-59-1)

MEMBER STRESSES ARE WITHIN THE ALLOWABLES BY COMPARISON TO L 2x2x1/4 @ NODE NO. 1

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DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-2

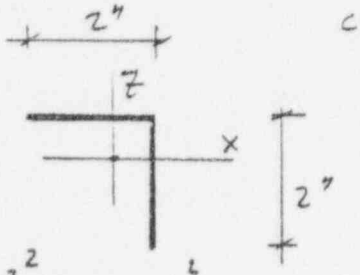
CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N.YURTER DATE 4/6/96	R SONI DATE 4.8.96
	✓				
SHEET 119 OF 246				DATE	DATE
J0762305O2					

REF.

6M-2850-H-59 (CONT'D)

CHECK WELD

AS MAX LOADS, USE LOADS FROM LC-2, @ NODE 1 AND CONSERVATIVELY CONSIDER FOLLOWING WELD CONFIGURATION.



CG OF WELD ≡ CG OF L2x2x1/4 (ASSUMED)

WELD PROP'S:

$$S_{z_{MAX}} = \frac{4\times2\times2+2^2}{6} = 3.33\ in^2$$

BLODGETT, 1966 PG. 7.4-7

$$S_{z_{MIN}} = \frac{2^2(4\times2+2)}{6(2\times2+2)} = 1.11\ in^2$$

$$A = 2\times2 = 4\ in$$

WELD LOADS:

OUTPUT H59.OUT

$F_x = 84\ \#$
$F_y = 1324\ \#$
$M_z = 1699\ \#\text{-}"$ } (LOAD COMB. 3 @ NODE 1)

$$f_x = \frac{F_x}{A} = \frac{84}{4} = 21\ \#/"$$

$$f_y = \frac{F_y}{A} + \frac{M_z}{S_{z_{MIN}}} = \frac{1329}{4} + \frac{1699}{1.11} = 1861\ \#/"$$

$$f_R = \sqrt{f_x^2 + f_y^2} = \sqrt{21^2 + 1861^2} = 1861\ \#/"$$

$$W_{REQ'D} = \frac{f_R}{0.4F_y} = \frac{1861}{0.4\times36000} = 0.13" < 2\times0.25 = 0.50" \therefore OK\ *)$$

AISC, 7TH ED PG. 5-16

BASE METAL - SHEAR

$$IR = \frac{0.13}{0.50} = 0.26$$

*) ALL-AROUND WELD

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STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-2

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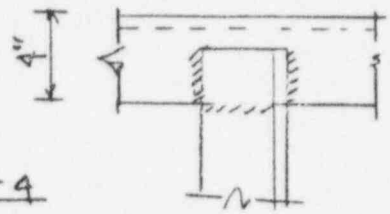
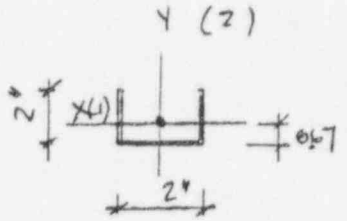
DC-5766					
PRELIM	FINAL	VOID	0	N.MARTER DATE 4/6/96	R SONI DATE 4.8.96
	✓				
SHEET 120 OF 246				DATE	DATE
JO 76230502					

REF.

SUPT. 6M-2850-4.59 (CONT'D)

CHECK WELD AT NODE 10





LOAD COMB.-4

$F_x = F_1 = 31\ \#$
$F_y = F_2 = 1323\ \#$
$M_z = M_3 = 928\ \#\text{-}"$

$A = 2 \times 3 = 6\ IN^2$

$I_x = \frac{2^3(2\times2+2)}{3(2+2\times2)} = 1.67\ IN^3$

$I_y = \frac{2^2(2+6\times2)}{12} = 4.67\ IN^3$

$I_p = 2.67 + 4.67 = 7.34\ IN^3$

$f_1 = \frac{31}{6} + \frac{928\times(2-0.67)}{7.34} = 174\ \#/"$

$f_2 = \frac{1323}{6} + \frac{928\,(2/2)}{7.34} = 347\ \#/"$

$f_R = \sqrt{174^2 + 347^2} = 388\ \#/"$

$w = \frac{f_R}{0.4 \times F_{y_1}} = \frac{388}{19400} = 0.03" < 0.25"$ ∴ OK

$0.4 \times F_{y_1}$ BASE METAL

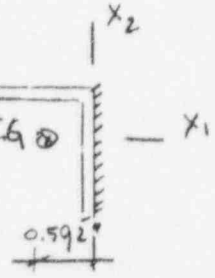
CHECK WELD AT DIAGONAL BRACING

ENVELOPED LOADS FROM LOADCOMB-1 THRU-4, BEAM END LOADS, MEM. (11) OR (12)

$F_{x_1} = 73\ \#$

$F_{x_2} = 398\ \#$

$M_{x_3} = 1930\ \#\text{-}"$



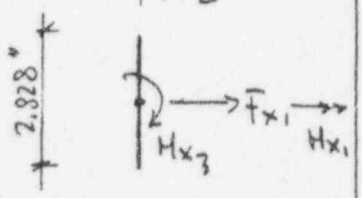
SUPT. 6M-2850-H-59 (CONT'D)

CHECK WELD AT DIAGONAL BRACING (CONT'D)

F_{x2} CREATES ADDITIONAL M_{x1} AT WELD.

$M_{x2} = 1930^{\#-"}$, $M_{x1} = 398 \times 0.592 = 235.6^{\#-"}$

WELD LENGTH $= \frac{2}{\cos 45^\circ} = 2.828"$



WELD FORCES

$f_1 = \frac{73}{2.828} + \frac{1930}{1.885} \times \frac{2.828}{2} = 1473.5\ \#/"$

$f_2 = \frac{398}{2.828} = 141\ \#/"$

$f_3 = \frac{398 \times 0.592}{1.33} = 171\ \#/"$

$f_R = \sqrt{1473.5^2 + 141^2 + 171^2} = 1490\ \#/"$

$A = 2.828\ IN$

$S_x = \frac{2.828^2}{6} = 1.33\ IN^2$

$J = \frac{2.828^3}{12} = 1.885\ IN^3$

$w_{Reqd} = \frac{f_R}{0.4 \times F_y} = \frac{1490}{0.4 \times 36000} = 0.103" < 0.25"$ ∴ OK

$IR = \frac{0.103}{0.25} = 0.41 < 1.0$

BY COMPARISON ALL OTHER WELDS FOR SUPT. H-59 ARE ACCEPTABLE.

EVALUATION OF MEMBER STRESSES FOR DIAGONAL BRACING (MEM. 11 AND 12)

AXIAL LOAD CREATES ADDITIONAL BENDING MOMENT BASED ON ECCENTRICITY BETWEEN SINGLE LINE WELD AND C.G. OF ANGLE L 2x2x1/4.
ENVELOPED LOADS FROM LOAD COMB-1 THRU -4

AXIAL = 332 # (LC-2)
BENDING MOMENT = $1922^{\#-"}$ (LC-2) } BEAM ELEMENT LOADS

OUTPUT H59.OUT

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	H. YURTER DATE 4/6/96	R SONI DATE 4.8.96
	✓				
SHEET 122 OF 246				DATE	DATE
JO 76230502					

REF.

SUPT. 6M-2850-H-59 (CONT'D)

EVALUATION OF MEMBER STRESSES FOR MEM. 11 AND 12 (CONT'D)

Σ BENDING MOMENT = $1922 + (332 \times 0.592) = 2119$ #-in

BY COMPARISON TO MEM. 1 WITH MAX. IR = 0.63 DIAGONAL BRACES ARE OK BASED ON SHORTER BUCKLING LENGTH.

CHECK AXIAL + BENDING FOR SUPT. 6M-2850-H-63

GEOMETRY IS THE SAME AS SUPT. 6M-2850-H-59.
FROM OUTPUT H63.OUT @ NODE 1, EQUILIBRIUM CHECK,
LOAD COMB.-2:
AXIAL LOAD = 1804 #
MOMENT = 2999 #-in

$f_a = \frac{1804}{0.938} = 1923$ psi , $F_A = 2965$ psi (SEE H-59)

$F_e' = 13580$ psi (")

$f_b = \frac{2999}{0.297} = 12142$ psi

$$\frac{f_a}{F_A} + \frac{C_m f_b}{\left(1 - \frac{f_a}{F_e'}\right) F_b}$$

$$\frac{1923}{2965} + \frac{0.85 \times 12142}{\left(1 - \frac{1923}{13580}\right) 23760} = 1.15 > 1.0 \therefore \text{NG}$$

BY COMPARISON SUPT. H-60, H-61 AND H-64 WILL FAIL TOO BASED ON GREATER HORIZONTAL LOAD AND SAME MEMBER SIZE AND CONFIGURATION.

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PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT ~~SYSTEM~~ 2850-2

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DC-5166					
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REF.

CHECK MEMBERS AND WELDS FOR SSE-CASE

FROM LOAD TABLE

$DL + V_{SSE} = 240 + 247 = 487$ #

$DL + V_{OBE} = 240 + 156 = 396$ #

$H_{SSE} = 101$ #

$H_{OBE} = 115$ #

$\frac{DL + V_{SSE}}{DL + V_{OBE}} = \frac{487}{396} = 1.22 < 1.6$

$\frac{H_{SSE}}{H_{OBE}} = \frac{101}{105} = 0.88 < 1.6$

∴ FOR MEMBER CHECK OBE GOVERNS.

DESIGN CRITERIA # FERMI-DC-76230-1 REV.1, PG.19

ALLOWABLE STRESS-RATIO FOR SHEAR

$\frac{0.58\ F_y}{0.40\ F_y} = 1.45 > 1.22$, > 0.88 ∴ OBE GOVERNS

CHECK MEMBER AND WELD STRESSES FOR SHPT. 6M-2850-H-68 AND 6M-2850-H-71

$\frac{DL + V_{SSE}}{DL + V_{OBE}} = \frac{266+58}{266+69} = 0.97 < 1.45$

$\frac{H_{SSE}}{H_{OBE}} = \frac{162}{142} = 1.14 < 1.45$

∴ FOR SHPT. H-68 OBE GOVERNS.

$\frac{DL + V_{SSE}}{DL + V_{OBE}} = \frac{247+54}{247+63} = 0.97 < 1.45$

$\frac{H_{SSE}}{H_{OBE}} = \frac{166}{145} = 1.14 < 1.45$

∴ FOR SHPT H-71 OBE GOVERNS.

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SUPT. 6M-2850-H-68 AND -H-71 (CONT'D)

VERTICAL AND HORIZONTAL MEMBER SIZES ARE L2½x2½x¼

$A_{L2½x2½x¼} = 1.19\ in^2$ $\quad A_{L2x2x¼} = 0.938\ in^2$

$S_{L2½x2½x¼} = 0.394\ in^3$ $\quad S_{L2x2x¼} = 0.247\ in^3$

AISC, 7TH ED PG. 1-57

RATIO OF SECTION PROP'S OF ANGLES

$$\frac{A_{L2½x2½x¼}}{A_{L2x2x¼}} = \frac{1.19}{0.938} = 1.27$$

$$\frac{S_{2½x2½x¼}}{S_{2x2x¼}} = \frac{0.394}{0.247} = 1.59$$

FOR REPRESENTATIVE SUPT. 6M-2850-H-59, CRITICAL STRESSES ARE CAUSED BY AXIAL (COMPRESSION) AND BENDING MOMENT WHICH ARE CREATED BY HORIZONTAL LOAD. THEREFORE RATIO OF HORIZONTAL LOADS OF REPRESENTATIVE SUPT. H-59 AND SUPT. H-68, H-71

$$\frac{H_{(SUPT\ H-68)}}{H_{(SUPT.\ H-59)}} = \frac{142\ \#}{115\ \#} = 1.23 < 1.27 < 1.59$$

$$\frac{H_{(SUPT\ H-71)}}{H_{(SUPT.\ H-59)}} = \frac{145\ \#}{115\ \#} = 1.26 < 1.27 < 1.59$$

} SEE ABOVE

SEE LOAD TABLE

ALSO, BASED ON COMPARISON OF KL/r - RATIOS OF CRITICAL MEMBERS (VERTICAL POST) FROM SUPT. H-59, H-68 AND H-71, SUPT. H-59 IS MORE CRITICAL DUE TO LONGER LENGTH AND SMALLER RADIUS OF GYRATION. HENCE, MEMBER STRESSES FOR SUPT. H-68 AND H-71 ARE GOING TO BE WITHIN ALLOWABLES BY COMPARISON TO H-59.

SEE GEOMETRY TABLE

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REF.

SUPT. 6M-2850-H-68 AND -H-71 (CONT'D)

SUPT. H-59 HAS WELD IR_{MAX} = 0.41 (DIAGONAL BRACING)

MAX. CRITICAL LOAD (HORIZONTAL) RATIO FOR SUPT. H-59 AND H-68 OR H-71 IS 1.26

SEE PREVIOUS PAGE

WELD SIZES FOR ALL THREE SUPT. AT CRITICAL LOCATION ARE THE SAME (1/4") AND CONFIGURATIONS ARE SIMILAR. HENCE MAX. ADJUSTED WELD IR FOR SUPT. H-68 AND H-71;

DWG. 10-4221-000-6M-2850-H-68 AND -H-71

ADJUSTED WELD IR = 0.41 × 1.26 = 0.52 < 1.0

∴ OK

CHECK MEMBER AND WELD STRESSES FOR SUPT. 6M-2850-H-72

H_{OBE} = 128# (SUPT. H-72)

SEE LOAD TABLE

H_{OBE} = 115# (SUPT. H-59)

CRITICAL MEMBERS, VERTICAL POST, HAVE THE SAME SIZE (L 2×2×1/4) AND CRITICAL WELDS WHICH ARE AT SUPPORT POINTS, HAVE THE SAME SIZE AND CONFIGURATION. HOWEVER, THE LENGTH OF VERTICAL POST OF SUPT. H-72 IS L = 128.6" WHICH IS LESS THAN L = 136.6" FOR REPRESENTATIVE SUPT. H-59.

SEE TABLE

SUPT. H-72:

$$\frac{KL}{r} = \frac{1.0 \times 128.6}{0.609} = 211$$

$$F_A = \frac{12\pi^2 E}{23\left(\frac{KL}{r}\right)^2} = \frac{12 \times \pi^2 \times 29 \times 10^6}{23(211)^2} = 3350 \text{ psi}$$

F_A = 2965 psi FOR SUPT. H-59.

COMPRESSION LOADS CREATED BY DEAD LOAD + UPWARD OBE-LOAD IN VERTICAL POST ALMOST THE SAME.

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SEE LOAD TABLE

SUPT. GM-2850-H-72 (CONT'D)

DL - OBE = 240 - 156 = 84 # (H-59)

DL - OBE = 113 - 30 = 83 # (H-72)

COMPRESSION LOAD CREATED BY HORIZONTAL LOAD THROUG BENDING MOMENT WILL MAKE THE DIFFERENCE.

COMPRESSION LOAD = $\frac{H \times L}{W} = \frac{128 \times 128.6}{11.2} = 1470$ # (H-72)

COMPRESSION LOAD = -"- = $\frac{115 \times 136.6}{11.2} = 1403$ # (H-59)

1470 # ≅ 1403 # ∴ COMPARE BENDING MOMENTS ONLY.

ΣBENDING MOMENT = 128 # × 128.6 " = 16461 #" (H-72)

ΣBENDING MOMENT = 115 # × 136.6 " = 15709 #" (H-59)

RATIO = $\frac{16461}{15709} = 1.05$

ADJUSTED MEMBER IR = $1.05 \times \overset{\text{H-59}}{0.63} = 0.66 < 1.0$ ∴ OK

ADJUSTED WELD IR = $1.05 \times 0.41 = 0.43 < 1.0$ ∴ OK

CHECK MEMBER AND WELD STRESSES FOR SUPPORT GM-2850-H-54, -H-55 AND -H-56

DWG. 10-4221-000-6M-2850-H-54, -H-55, -H-56

ALL THREE SUPPORTS HAVE SIMILAR CONFIGURATION AND SAME MEMBER SIZES.
BASED ON GOVERNING LOAD (HORIZONTAL LOAD) REGARDING AXIAL + BENDING STRESSES, SUPPORT H-54 IS MORE CRITICAL.

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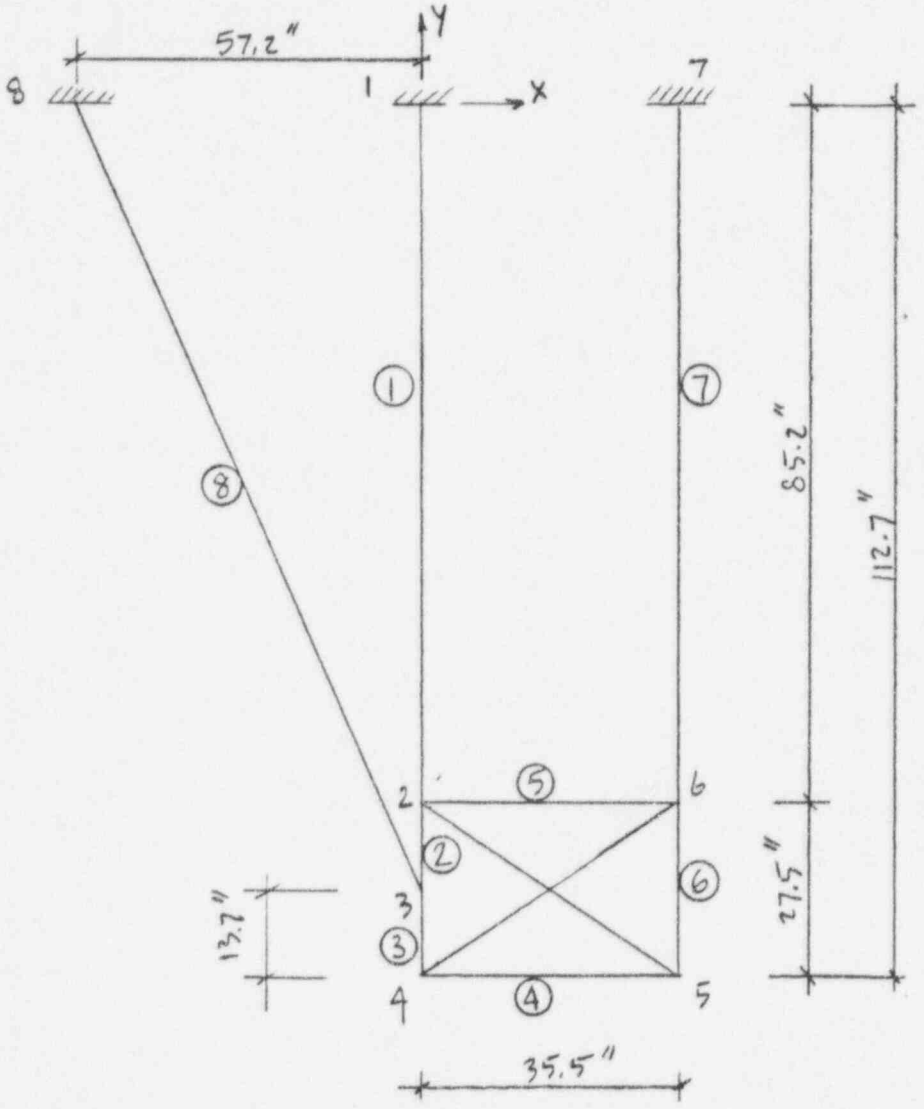
REF

COMPUTER MODEL FOR SUPPORT 6M-2850-H-54



DWG.
10-4221-080-6M-2850-54-A

No. OF LAST MEMBER 8
No. OF LAST JOINT 8

ALL MEMBERS ARE L 2 1/2 × 2 1/2 × 1/4

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REF.

SUPT. 6M-2850-H-54 (CONT'D)

FROM COMPUTER OUTPUT (H54.OUT), REACTIONS @ JT. 1, 7 & 8 (GOVERNING LOADS)

		MAX. AXIAL [#]	MAX. MOMENT [#-"]
SBO	LOAD COMB. 1	912	456
	2	936	465
	3	912	427
SWS	4	1345	495
	5	1513	776
	6	1474	767
	7	1514	729
	8	2054 (@ JT. 1)	814 (@ JT. 1)

WITH GOVERNING LOAD $V = 2054^{\#}$ & $M = 814^{\#}$
FOR MEMBER ① CHECK L 2 1/2 x 2 1/2 x 1/4.

REPRESENTATIVE SUPT. H-59 HAS LONGER MEMBER WITH SMALLER SECTION PROPERTIES. (L 2x2x1/4) HENCE LESS AXIAL (COMPRESSION) LOAD ALLOWABLE, HOWEVER, FOR COMPARISON PURPOSE, ADJUST THE MEMBER IR OF H-59 BASED ON AXIAL LOAD AND BENDING MOMENT RATIO. (CONSERVATIVE)

$$IR = \frac{f_A}{F_A} + \frac{C_M f_b}{\left(1 - \frac{f_a}{F_e'}\right) F_b}$$

$$= \frac{1062}{2965}\left(\frac{2054}{1062}\right) + \frac{0.85 \times 6882}{\left(1 - \frac{1062}{13580}\right) 23760}\left(\frac{814}{1700}\right)$$

H-59 LOAD RATIO — H-59 — MOM. RATIO

$IR = 0.82 < 1.0$ ∴ OK

MEMBER SHEAR STRESSES & WELD STRESSES ARE ACCEPTABLE BY COMPARISON TO SUPT. H-59.

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SHEET 129 OF 246				DATE	DATE
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REF.

CHECK MEMBER AND WELD STRESSES FOR SUPT. 6M-2850-H-58

MAX.

Σ HORIZONTAL LOAD ACTING @ SUPT = 46+60 = 106 #

SEE LOAD TABLE SEE pg. 2

HORIZONTAL LOADS @ SUPT. H-58 ARE LESS THAN HORIZONTAL LOAD FOR SUPT H-59 (115#) AND HAVE SHORTER MOMENTARM TO SUPPORT POINTS. HENCE BENDING MOMENTS FOR SUPT. H-58 WILL BE LESS.

ALSO, CRITICAL MEMBER (VERTICAL POST) FOR SUPT. H-58 HAS GREATER SECTION PROP'S THAN VERTICAL POST OF SUPT. H-59.

(L3x3x1/4 V.S. L2x2x1/4)

DWG. 10-4221-000-6M-2850-59A & -58

LENGTH AND WIDTH OF SUPPORTS ARE THE SAME. THEREFORE BY COMPARISON TO SUPT. H-59, MEMBER AND WELD STRESSES FOR SUPT. H-58 ARE WITHIN THE ALLOWABLES.

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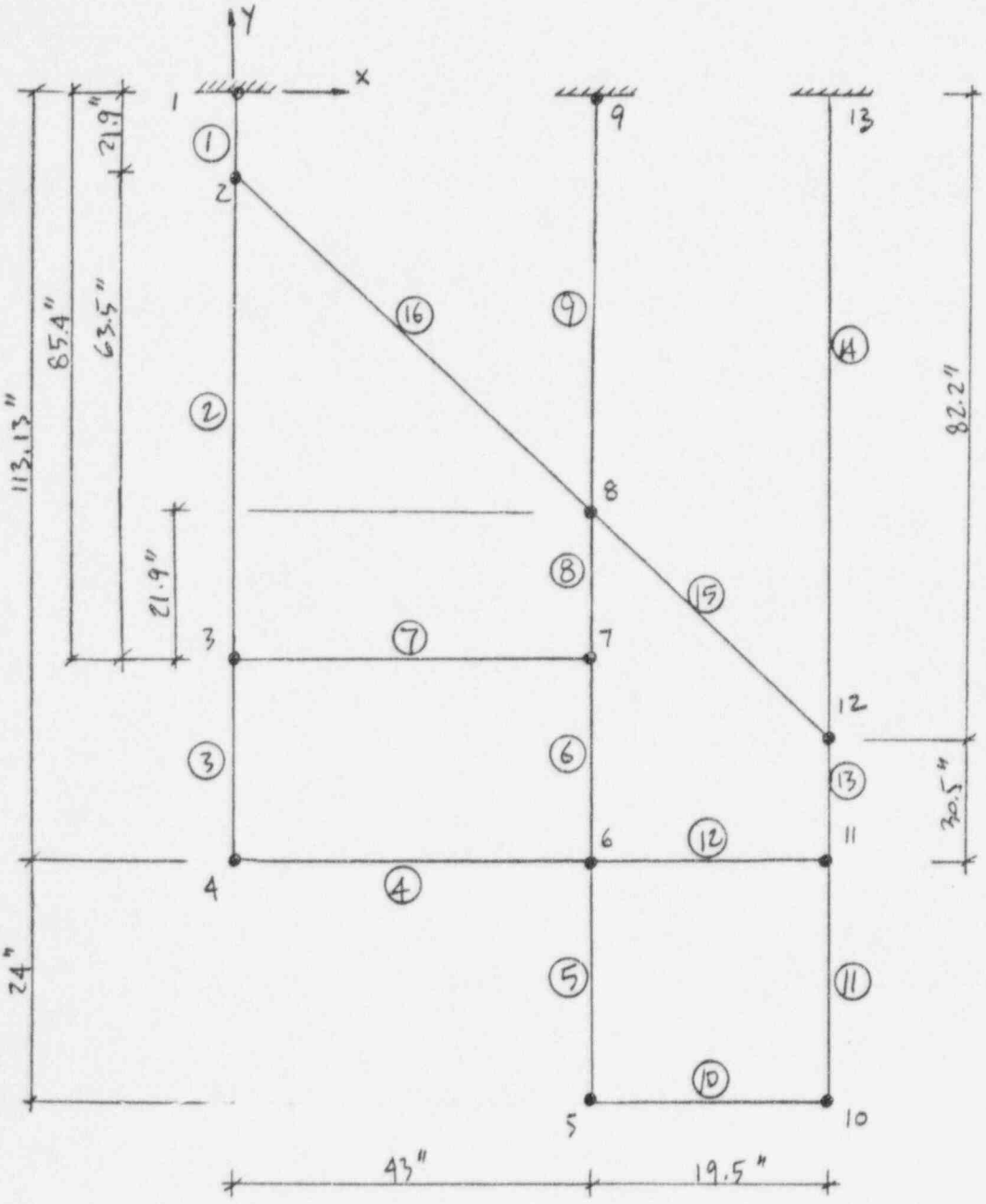
JO 76230562					

REF.

COMPUTER MODEL FOR SHPT. 6M-2850-H-49



LAST NODE NO. 13

LAST MEMBER NO. 16

DIMENSIONS FOR COMPUTER MODEL ENVELOPS THE VALUES USED IN STRESS REPORT 2850-2 AND 2850-4 SINCE THERE IS NO FIELD INFO. REGARDING DIMENSIONS.

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DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

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SHPT. 6M-2850-11-49 (CONT'D)

MEMBER NO. ①, ②, ③, ⑪, ⑬, ⑭ ARE L3×3×1/4
MEMBER NO. ④, ⑤, ⑥, ⑧, ⑨, ⑩, ⑫ ARE L2½×2½×1/4
MEMBER NO. ⑦, ⑮, ⑯ ARE L 2×2×1/4

DWG. 10-4221-000-6M-2850-49

AISC 7TH ED PG. 1-57 BLODGETT PG. 2.10-2

MEMBER PROP's FOR L3×3×1/4 :

$A = 1.44\ IN^2$
$I = 1.24\ IN^4$
$R = \beta b d^3$ (TORSIONAL RESISTANCE)

$\beta = 0.333$ FOR $b/d = 3/0.25 = 12$

$R = 2(0.333 \times 3 \times 0.25^3) = 0.031\ IN^4$

MEMBER PROP's FOR L 2½×2½×1/4 :

$A = 1.19\ IN^2$
$I = 0.703\ IN^4$
$R = 2(0.313 \times 2.5 \times 0.25^3) = 0.024\ IN^4$ FOR $b/d = 10$

MEMBER PROP's FOR L 2×2×1/4 :

$A = 0.938\ IN^2$
$I = 0.348\ IN^4$
$R = 2(0.307 \times 2 \times 0.25^3) = 0.019\ IN^4$

DEAD LOAD FOR NODE 230 (SYSTEM 2850-2) = 456 #
" " " 114 (" 2850-4) = 290 #

LOAD TABLE

OBE
VERT. = 219 #
HORIZ. = 180 #
} SYSTEM 2850-2 NODE 230

OBE
VERT. = 147 #
HORIZ. = 370 #
} SYSTEM 2850-4 NODE 114

SSE
VERT = 321 #
HORIZ = 300 #
} SYSTEM 2850-2 NODE 230

SSE
VERT = 136 #
HORIZ. = 430 #
} SYSTEM 2850-4 NODE 114

DL = 456 # (SYSTEM 2850-2, NODE 230)
DL = 290 # (" 2850-4, NODE 114)

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6M-2850-H-49 (CONT'D)

CHECK L 2x2x1/4 (MEM. (17), (15) AND (16)) (DESIGN FOR ENVELOPED LOADS)

MAX. AXIAL LOAD (SSE) = 1194# (LOAD COMB.-7, MEM. 16 BEAM ELEMENT LOADS) — OUTPUT H49.OUT

MAX. BENDING MOMENT (SSE) = 3647 #-4 (LOAD COMB.8 - MEM. 15 BEAM ELEMENT LOAD)

LENGTH OF MEM. (16) $= \sqrt{(63.5-21.9)^2 + 43^2} = 60''$

$r_x = 0.609''$
$S = 0.247''$
$A = 0.938\ IN^2$

AISC 7TH ED PG. 1-57 & 5-84

$\frac{KL}{r} = \frac{1.0 \times 60}{0.609} = 99 \rightsquigarrow F_A = 13100\ psi$

$f_a = \frac{1194}{0.938} = 1273\ psi$

$\frac{f_a}{F_A} = \frac{1273}{13100} = 0.097 < 0.28 = \frac{f_a}{F_A}$ SUPT. H-59

ALSO, MAX. BENDING MOMENT FOR SUPT H-59 IS 3985 #-4 > 3647 #-4 ∴ L 2x2x1/4 IS OK BY COMPARISON TO SUPT. H-59.

CHECK L 2 1/2 x 2 1/2 x 1/4 (MEM. (4), (5), (6), (8), (9), (10), (12))

MAX AXIAL LOAD = 877# (JT #9, LOAD COMB.-3)

MAX. BENDING MOM = 2820 #-4 (MEM. 5, LOAD COMB.-8)

BY COMPARISON TO L 2x2x1/4, L 2 1/2 x 2 1/2 x 1/4 IS OK DUE TO LESS LOADS AND GREATER SECTION PROP'S.

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6M-2850-H-49 (CONT'D)

CHECK L 3x3x 1/4 (MEM. ①, ②, ⑤, ⑪, ⑬ ⑭)

$A = 1.44\ IN^2$
$S = 0.577\ IN^3$
$r = 0.930\ IN$
CONSERVATIVE LOAD COMBINATION SINCE THEY ARE ENVELOPED.
MAX. AXIAL LOAD = 1518 # (EJT. 13, LOAD COMB-6) } SSE
MAX. BENDING MOM. = 11898 #-" (EJT. 1, LOAD COMB-7) }

MAX. AXIAL LOAD = 1374 # (EJT. 13, LOAD COMB-4) } OBE
MAX. BENDING MOM. = 8942 #-" (EJT. 1, LOAD COMB-3) }

$\frac{KL}{r} = \frac{10 \times 137.13}{0.930} = 147 \rightsquigarrow F_A = 6910\ psi$ — AISC-7TH ED pg 5-84

$f_a = \frac{1374}{1.44} = 954\ psi$

$\frac{f_a}{F_A} = \frac{954}{6910} = 0.138 < 0.15$

$f_b = \frac{M}{S} = \frac{8942}{0.577} = 15498\ psi$

$F_b = 21600\ psi$ (BASED ON LOCAL BUCKLING) — SEE TABLE

INCREASE f_b 25% TO CHECK BENDING STRESSES AROUND GEOMETRIC AXIS (CONSERVATIVE) — AISC, 9th ED pg. 5-312 SECT. 5.2.2.a

$IR = \frac{f_a}{F_A} + \frac{1.25\, f_b}{F_b} = 0.138 + \frac{1.25 \times 15498}{21600} \simeq 1.0$ ∴ OK.
NOTE: CONSERVATIVE ALLOW. USED

$\frac{M_{SSE}}{M_{OBE}} = \frac{11898}{8942} = 1.33 < \frac{\text{FACTOR TO ACCOUNT FOR SSE-ALLOW}}{1.6}$

$\frac{\text{AXIAL (SSE)}}{\text{AXIAL (OBE)}} = \frac{1518}{1374} = 1.1 < 1.6$ } ∴ OBE GOVERNS.

DESIGN CRITERIA No. FERMI-DC-76230-1 pg. 19 REV. 0

HENCE, L3x3x1/4 IS OK

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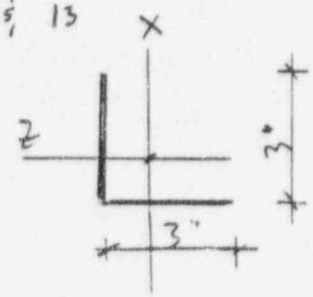
6M-2850-H-49 (CONT'D)

REF.

CHECK WELDS @ JT 1, 9 AND 13

WELD SECTION PROPS @ JT. 1, 9 & 13



$A = 2 \times 3 = 6$ IN

$S_{MAX} = \frac{4 \times 3 \times 3 + 3^2}{6} = 7.5\ IN^2$

$S_{MIN} = \frac{3^2(4 \times 3 + 3)}{6(2 \times 3 + 3)} = 2.5\ IN^2$

USE SSE-LOADS VS OBE ALLOWABLES (CONSERVATIVE)

FOR ENVELOPED AXIAL LOAD & BENDING MOMENT SEE PREVIOUS PAGE.

FOR MAX SHEAR LOAD @ JT. 1, 9 AND 13; SEE LOAD COMB. - 7, @ JT. 1;

OUTPUT H54.OUT

$F_{X_1} = 756\ \#$

WELD FORCES

$f_x = \frac{756}{6} = 126\ \#/"$

$f_y = \frac{1518}{6} + \frac{11898}{2.5} = 5013\ \#/"$

$f_R = \sqrt{126^2 + 5013^2} = 5013\ \#/"$

$w = \frac{5013}{\underbrace{0.4 \times F_y}_{OBE}} = \frac{5013}{14400} = 0.35" < 2 \times 0.25 = 0.50"$ *)

∴ OK

*) WELD IS ALL-AROUND ∴ DOUBLE THE WELD SIZE.

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT: CCHVAC DUCT & DUCT SUPPORTS

SUBJECT: STRUCTURAL QUALIFICATION — SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YUZTER DATE 4/7/96	R SONI DATE 4.8.96
	✓				
SHEET 135 OF 246				DATE	DATE
JO 76230502					

REF.

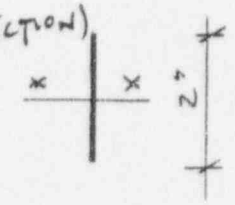
6M-2850-H-49

CHECK SINGLE LINE WELD (MEMBER ④, ⑦, ⑫, ⑩)

MIN WELD LENGTH = 2" (IN VERT. DIRECTION)

A = 2 IN

$S_x = \frac{2^2}{6} = 0.67\ in^2$



MAX. WELD LOADS FOR MEM. ④, ⑦, ⑩ AND ⑫ (SSE)

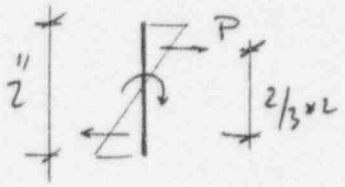
M = 2940 #-"
T

(JT. 6, MEM. 12, LOAD COMB-8)
BEAM END LOADS

OUTPUT H49.OUT

AXIAL = 291 #

SHEAR = 432 #



$f_x = \frac{291}{2} + \frac{2940}{2/3 \times 2} = 2351\ \#/"$

$f_y = \frac{432}{2} = 216\ \#/"$

$f_R = \sqrt{2351^2 + 216^2} = 2361\ \#/"$

$w = \frac{2361}{0.58 F_y} = \frac{2361}{0.58 \times 36000} = 0.113" < 0.25"$ ∴ OK

SSE

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

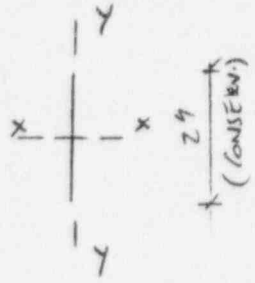
CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YURTER DATE 9/7/96	R CONJI DATE 4.8.96
SHEET 136 OF 246				DATE	DATE
JO 76230502					

BEF

6M-2850-H-49 (CONT'D)

CHECK WELD FOR MEMBER (15) & (16)

ANGLE BETWEEN MEMBERS & HORIZONTAL $\simeq 45°$



$$\text{WELD LENGTH} = \frac{2}{\cos 45°} = 2.828''$$

$A = 2.828$ IN

$$S = \frac{2.828^2}{6} = 1.33 \text{ IN}^2$$

FROM BEAM END LOADS, LOAD COMBINATION-8, MEM. 15, JT. 12 (GOVERNING LOAD COMB. FOR SSE);

$F_x = 433$ #
$F_y = 761$ #
$M_z = 3650$ #-"

WELD FORCES

$$f_x = \frac{F_x}{A} + \frac{M}{S} = \frac{433}{2.828} + \frac{3650}{\frac{2}{3} \times 2.828} = 2089 \text{ \#/"}$$

$$f_y = \frac{F_y}{A} = \frac{761}{2.828} = 269 \text{ \#/"}$$

$$f_R = \sqrt{2089^2 + 269^2} = 2106 \text{ \#/"}$$

USE SSE-LOADS VS OBE ALLOWABLES (CONSERV.)

$$U_{\text{WELD}} = \frac{f_R}{\frac{0.4 \times F_y}{\text{OBE}}} = \frac{2106}{0.4 \times 36000} = 0.15'' < 0.25'' \therefore \text{OK}$$

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION SYSTEM 2850-2

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N.YUKTER DATE 4/7/96	R LONI DATE 4.8.96
	✓				
SHEET 137 OF 246				DATE	DATE
JO 76230502					

REF.

CHECK STIFFNESS OF REPRESENTATIVE SUPPORT 6M-2850-H-59

STIFFNESS IN VERTICAL DIRECTION

FROM OUTPUT H59T.OUT DEFLECTIONS @ NODE 5 AND 6 LOAD CASE-1. (DEAD LOAD OF SUPPORT & DUCT)

$\Delta = 0.6023657 \times 10^{-3}$ (@ JT. 5)

$\Delta = 0.6023757 \times 10^{-3}$ (@ JT. 6)

AVERAGE $\Delta = \left(\frac{0.6023657 + 0.6023757}{2}\right) 10^{-3}$

$= 0.6023707 \times 10^{-3}$

APPLIED LOAD IN VERTICAL DIRECTION = 240#

$K_y = \frac{240}{0.6023707 \times 10^{-3}} = 398426$ #/"

$K_y = 398378$ #/" (FROM STRESS REPORT 2850-2 PG. 14 TO 16)

THEREFORE SUPPORT STIFFNESS IN VERTICAL DIRECTION IS ACCEPTABLE.

STIFFNESS IN HORIZONTAL DIRECTION

FROM OUTPUT H59T.OUT DEFLECTIONS @ NODE 4, 5, 6, 7 LOADCASE 3 (HORIZONTAL OBE +X DIRECTION)

$K_x = (2^*)\left(\underbrace{\frac{28.8}{0.15377}}_{@\ JT\ 4} + \underbrace{\frac{28.8}{0.167}}_{@\ JT\ 5}\right) = 720$ #/"

$K_x = 600$ #/" (FROM STRESS REPORT 2850-2 PG. 14 TO 16)

BY COMPARISON (720 #/" VS. 600 #/") STIFFNESS DIFFERENCE BETWEEN TWO RESULTS ACCEPTABLE.

*) DEFLECTIONS @ JT. 4 & 7, @ JT. 5 & 6 AND APPLIED @ ALL FOUR JOINTS ARE THE SAME.

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	H.YNRTER DATE 4/7/96	R SONI DATE 4.8.96
	✓				
SHEET 138 OF 246				DATE	DATE
JO 76230502					

REF.

RESULTS OF SUPPORT EVALUATIONS OF SYSTEM 2850-2

SUPT. MK. NO.	MEMBER STRESS	WELD STRESS	BASEPL.	REPRESENTED BY SUPT.	REMARKS
6M-2850-H-48					QUALIFY LATER. HAS DIFFERENT SYST.
-49	OK	OK		ITSELF	ANALYSIS SUPT.
-54	OK	OK		ITSELF	ANALYSIS SUPT.
-55	OK	OK		H-54	
-56	OK	OK		H-54	
-57					QUALIFY WITHIN 2850-1
-58	OK	OK		H-59	
-59	OK	OK		ITSELF	ANALYSIS SUPT.
-60	NG				FAILED BY COMPARISON TO H-63 ↓
-61	NG				
-62	OK	OK		H-59	
-63	NG			ITSELF	ANALYSIS SUPPORT
-64	NG				FAILS BY COMPARISON TO H-63.
-65	OK	OK		H-59	
-66	OK	OK		H-59	
-67	OK	OK		H-59	

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YUFER DATE 4/7/96	R (illegible) DATE 4.8.96
	✓				
SHEET 139 OF 246				DATE	DATE
JO76230.502					

RET.

RESULTS OF SUPPORT EVALUATIONS OF SYSTEM 2850-2

SUPT. MK. NO.	MEMBER STRESS	WELD STRESS	BASE PL.	REPRESENTED BY SUPT.	REMARKS
6M-2850-H-68	OK	OK		H-59	SEE EVALUATION FOR ADJUSTED IR.
-69	OK	OK		H-59	
-70	OK	OK		H-59	
-71	OK	OK		H-59	SEE EVALUATION FOR ADJUSTED IR.
-72	OK	OK		H-59	↓

FOR QUALIFICATION OF FAILING SUPPORTS SEE NEXT PAGES

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Engineers & Constructors

GENERAL COMPUTATION SHEET

DECOTERM / CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION

PROJECT

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO			REV	COMP BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 4-27-96	DATE 5/21/96
	✓				
SHEET 140 OF 246				DATE	DATE
JO 76230.502					

EVALUATION OF BASE PLATE USING NEW MOD ASSESSMENT STRING ANALYSIS RUN

REF

SUPPORT MARK / NODE POINT	DIR.	SUPPORT REACTION DL (LBS)	OBE (LBS)	SSE (LBS)	REMARKS
GM-2850-H-49 / 230	VERT	456	232	333	STRING ANALYSIS OUTPUT 4/22/96
	LATERAL	2	182	302	
H-54 / 240	VERT	422	410	667	
	LAT.	2	534	893	
H-55 / 260	VERT	470	130	138	
	LAT.	0	390	628	
H-56 / 275	VERT	495	154	185	
	LAT	0	312	478	
H-58 / 305	VERT	286	425	693	
	LAT	0	50	57	
H-58 / 380	VERT	171	45	45	
	LAT	0	83	95	
H-59 / 325	VERT	240	155	245	
	LAT.	0	77	85	
H-60 / 350	VERT	199	52	53	
	LAT	0	89	99	
H-61 / 360	VERT	175	43	39	
	LAT	0	67	97	
H-62 / 395	VERT	215	55	53	
	LAT.	0	103	116	
H-63 / 410	VERT	180	43	36	
	LAT.	0	104	117	

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RECO FERMI

GENERAL COMPUTATION SHEET

CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 4-27-96	DATE 5/21/96
	✓				
SHEET 141 OF 246				DATE	DATE
JO 76230.502					

PROJECT

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

EVALUATION OF BASE PLATE USING NEW MOD ASSESSMENT STRING ANALYSIS RUN

REF

SUPPORT MARK / NODE POINT	DIR.	SUPPORT REACTION DL (LBS)	OBE (LBS)	SSE (LBS)	REMARKS
6M-2850-H-64 / 420	VERT	115	28	23	STRING ANALYSIS OUTPUT 4/22/96
	LATERAL	0	73	83	
H-65 / 460	VERT	281	133	192	
	LAT.	0	31	48	
H-65 / 530	VERT	200	60	67	
	LAT.	0	28	42	
H-66 / 480	VERT	196	178	267	
	LAT	0	40	58	
H-67 / 490	VERT	251	63	55	
	LAT	0	85	109	
H-68 / 500	VERT	266	69	58	
	LAT	0	147	169	
H-69 / 520	VERT	105	28	24	
	LAT	0	120	140	
H-70 / 545	VERT	209	53	47	
	LAT	0	36	43	
H-71 / 560	VERT	247	63	54	
	LAT	0	151	173	
H-72 / 590	VERT	113	30	26	
	LAT.	0	133	153	
H-	VERT				
	LAT.				

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT: CCHVAC DUCT & DUCT SUPPORTS STRUCTURAL QUALIFICATION

SUBJECT: SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	N. YURTER DATE 5/20/96	K T W DATE 5/21/96
	✓				
SHEET 142 OF 246				DATE	DATE
JO 76230502					

QUALIFICATION OF SUPPORTS 6M-2850-H-60, 6M-2850-H-61, 6M-2850-H-63 AND 6M-2850-H-64

THESE SUPPORTS WERE FAILED (SEE PREVIOUS PAGES). AFTER ADDING KICKER TO SUPPORTS 6M-2850-H-61 AND 6M-2850-H-64, THE SUPPORT LOADS FOR ALL FAILING SUPPORTS (H-60, H-61, H-63 & H-64) BECAME LESS. WITH ENVELOPED LOADS FOR THE ABOVE MENTIONED SUPPORTS CONSIDERING COMPRESSION + BENDING AS CRITICAL;

MIN. DEAD LOAD = 115 # (SUPT. H-64)
MAX. UPWARD (OBE) = 52 # (SUPT. H-60)
MAX. LATERAL (OBE) = 104 # (SUPT. H-63)

} OBE GOVERNS SINCE $\frac{\text{SSE LOAD}}{\text{OBE LOAD}} < 1.6$

SEE STRING ANALYSIS OUT PUT 4/22/96

SEE SUPPORT LOAD SHEET AFTER MOD'S.

BY COMPARISON TO SUPT. H-59, ALL ABOVE SUPPORTS ARE ACCEPTABLE BASED ON LESS LOADS.

NOTE

FIELD MODIFICATIONS CONSIDER KICKER NOT ONLY FOR SUPPORTS H-61 AND H-64 BUT ALSO FOR SUPPORTS H-60 AND H-63. THIS WILL HAVE FAVORABLE EFFECT ON MEMBER AND WELD STRESSES OF FAILING SUPPORTS AFTER 1ST STRING ANALYSIS BY LESS LOADS. THEREFORE FIELD MODIFICATIONS ARE ACCEPTABLE.

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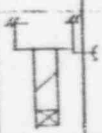
GENERAL COMPUTATION SHEET

DECO FERMI 2 CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION SUPPORT EVALUATION FOR SYSTEM 2850-4

SUBJECT

CALCULATION SET NO.	REV	COMP. BY	CHK'D BY
DC-5766	0	[signature] DATE 4/15/96	[signature] DATE 4-16-96
PRELIM / FINAL ✓ / VOID			
SHEET 143 OF 246		DATE	DATE
JO 76230.502			

SUPPORT NO.	SHARED WITH SYSTEM (S)	TYP	MEM SIZE L	L IN	W IN	DL lb VERT.	DL lb LAT.	OBE lb VERT.	OBE lb LAT.	SSE lb VERT.	SSE lb LAT.	REMARKS
6M-2850 -H-28	2850-5 (R) 2850-6 (R)		–	–	–	289	7	822	1291	813	1176	SEE RIGID SYSTEM EVALUATION
6M-2850 -H-48	2850-2 (F) 2850-5,6,7 & 9 (R)		PENETRATION SUPPORT			362	11	680	326	670	322	SEE RIGID SYSTEM EVALUATION
6M-2850 -H-49	2850-2 (F)		–	–	–	289	3	147	369	136	431	SEE SYS. 2850-2
6M-2850 -H-50	NONE		2½	106	12	172	0	51	168	44	185	Support QUALIFIED
6M-2850 -H-51	NONE	DITTO	2½	106	12	117	0	29	88	24	129	BOUNDED BY H-50 Support QUALIFIED
6M-2849 -H-3	2849-5 (F)		–	–	–	76	0	28	91	23	87	BOUNDED BY H-4
6M-2849 -H-4	2849-5 (F)		–	–	–	174	0	74	306	67	281	SEE 2849-5
6M-2849 -H-6	2849-5 (F) 2849-9 (F)		–	–	–	268	2	91	574	85	622	SEE 2849-9
6M-2849 -H-7	2850-7 (R) 2850-9 (R)		2	99	12	122	0	55	127	54	127	SUPPORT IS BOUNDED BY 6M-2850-H-59 AND IS QUALIFIED SEE RIGID SYSTEM EVAL. FOR OTHER MEMBERS
6M- -H-												

REF: DC 2836 & STRING ANALYSIS FOR SYSTEM 2850-4 3/29/96

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Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

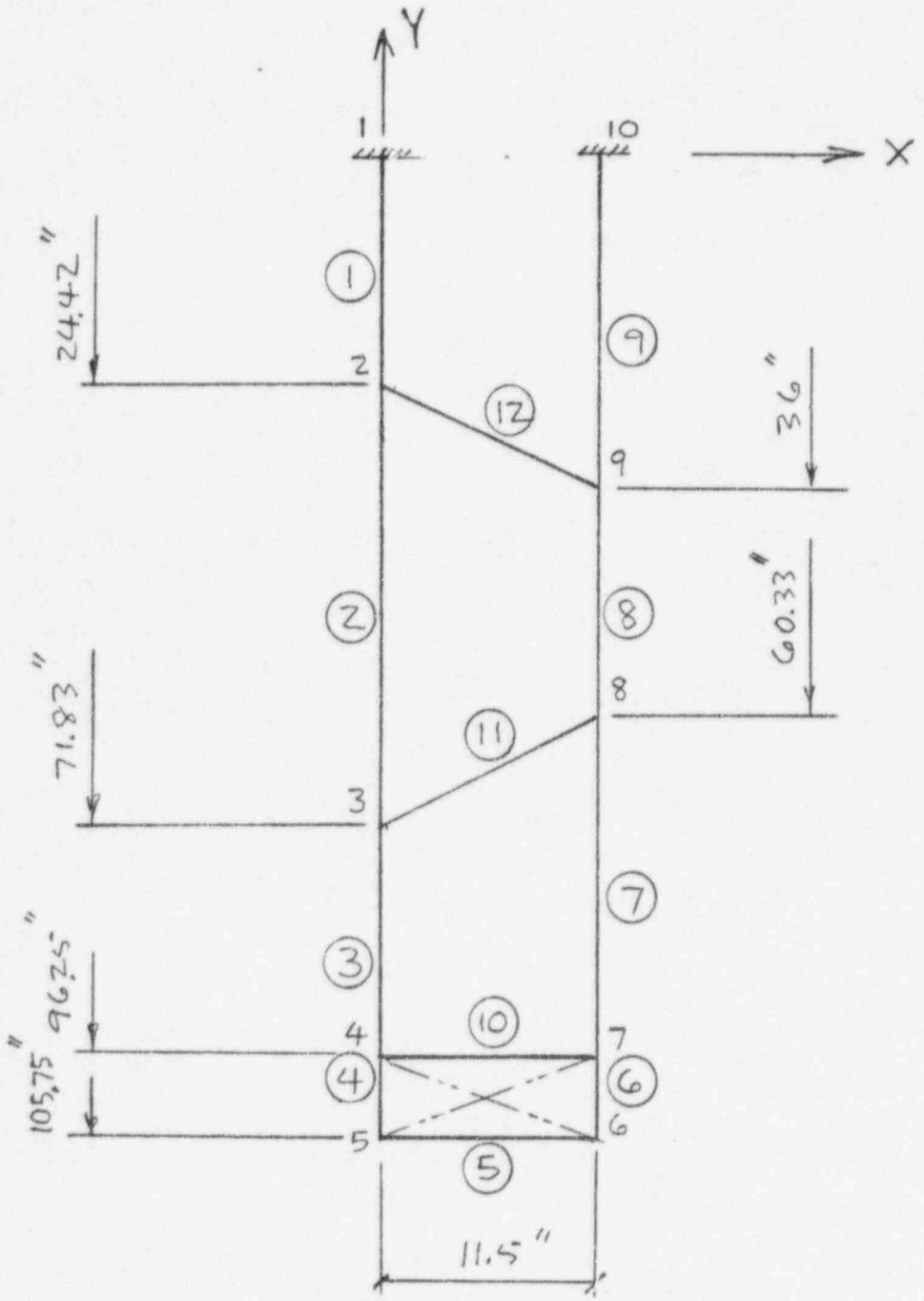
CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-4

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DFS DATE 4-8-96	KTW DATE 4/15/96
	✓				
SHEET 144 OF 246				DATE	DATE
JO 76230.502					

6M-2850-H-50



NOTE:

INFORMATION IS TAKEN FROM DWG. 10-4221-000-6M-2850-50 REV 0 & DC NO. 2836 PAGE 24.

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION SUPPORT EVALUATION FOR

SUBJECT SYSTEM 2850-4

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	GFS DATE 4-10-96	KTW DATE 4/15/96
	✓				
SHEET 145 OF 246				DATE	DATE
JO 76230.502					

REF

SUPPORT 2850-H-50

MEMBER CHECK

CONTROLLING MEMBER:

BEAM # 1, JOINT # 1

LOADS:

LOAD	LOAD COMB	AXIAL COMP (LBS)	MOMENT (IN-LBS)	SHEAR (LBS)	DL+SSE / DL+OBE
DL+OBE	2	1105	2277	147	AXIAL: 1.11
					M: 1.11
DL+SSE	6	1231	2521	163	SHEAR: 1.11

STARDYNE RUN, 4/10/96 H-50 (ATT. B12)

SINCE DL+SSE/DL+OBE < 1.6, THEREFORE OBE GOVERNS

MEMBER SIZE : L 2½ x 2½ x ¼

PROPERTIES : $A = 1.19\ IN^2$

$S = 0.394\ IN^3$

$r = 0.769"$

$L = 105.75"$, $K = 1$

$\frac{KL}{r} = \frac{105.75}{0.769} = 137.5$, USE 138. $F_a = 7.84$ KSI $= 7840$ PSI

AISC 7TH ED. PAGE 5-84 (REF. 2)

$f_a = \frac{1105}{1.19} = 929$ PSI

$\frac{f_a}{F_a} = \frac{929}{7840} = 0.12 < 0.15$

AISC 7TH ED PAGE 5-22 (REF. 2)

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-4

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DFS DATE 4-10-96	ETW DATE 4/16/96
	✓				
SHEET 146 OF 246				DATE	DATE
JO 76230.502					

REF.

SUPPORT 2850-H-50 : CONT

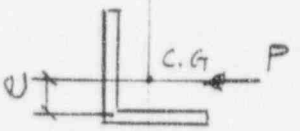
$$f_b = \frac{2277}{0.394} = 5779 \text{ PSI}$$

$$F_b = 21600 \text{ PSI}$$

$$\frac{f_a}{F_a} + \frac{f_b}{F_b} = 0.12 + \frac{5779}{21600} = 0.39 < 1.0 \quad \text{OK}$$

CHECK SHEAR

$$e = X - \frac{t}{2} = 0.717 - \frac{0.25}{2} = 0.592''$$



$\angle 2\frac{1}{2} \times 2\frac{1}{2} \times \frac{1}{4}$

$$P = 147 \#$$

$$M_T = P \cdot e = 147 \times 0.592 = 87 \text{ }''\# $$

$$f_V = \frac{1.5 V_b}{b \cdot t} + \frac{3 M_T}{A t} = \frac{1.5 \times 147}{2.5 \times 0.25} + \frac{3 \times 87}{1.19 \times 0.25} = 1230 \text{ PSI}$$

$$< 0.4 F_y = 14400 \text{ PSI} \quad \text{OK}$$

OTHER $\angle 2\frac{1}{2} \times 2\frac{1}{2} \times \frac{1}{4}$ MEMBERS ARE ~~ADEQUATE~~ BY COMPARISON OF MEMBER LOADS & LENGTHS.

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-4

CALCULATION SET NO.			REV	COMP BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	JFS DATE 4-10-96	KTW DATE 4/16/96
	✓				
SHEET 147 OF 246				DATE	DATE
JO 76230.502					

REF

H-50 : CONT

MEMBER CHECK : CONT

BRACING MEMBER # 11 & # 12

CONTROLLING MEMBER # 11

DL + OBE, LOAD COMB. # 1

AXIAL COMP = 417 #

MOMENT M_3 = 1958 "#

MOMENT M_1 = (AXIAL FORCE) x (ECCENTRICITY)

= 417 x 0.592 = 247 "#

MEMBER SIZE : L 2x2x 1/4

PROPERTIES : $A = 0.938\ in^2$

$S = 0.247\ in^3$

$r = 0.609"$

$L = 11.5 \times \sqrt{2} = 16.26"$

$\frac{KL}{r} = \frac{16.26}{0.609} = 27$, $F_a = 20.15\ KSI = 20150\ PSI$

$f_a = \frac{417}{0.938} = 445\ psi$

$\frac{f_a}{F_a} = \frac{445}{20150} = 0.02 < 0.15$

$f_{b3} = \frac{1958}{0.247} = 7927^{PSI}$; $f_{b1} = \frac{247}{0.247} = 1000^{PSI}$, $F_b = 21600^{PSI}$

$\frac{f_a}{F_a} + \frac{f_{b1} + f_{b3}}{F_b} = 0.02 + \frac{7927 + 1000}{21600} = 0.43 < 1.0$ OK

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION SUPPORT EVALUATION FOR

SUBJECT SYSTEM 2850 - 4

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	QFS DATE 4-10-96	ETW DATE 4/16/96
	✓				
SHEET 148 OF 246				DATE	DATE
JO 76230.502					

REF

H-50 : CONT

CHECK WELD

CONTROLLING JOINT : JOINT # 1, BEAM # 1

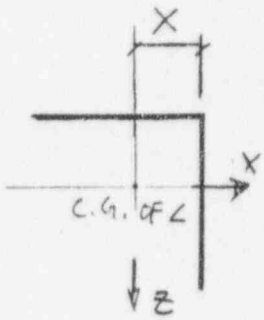
DL+OBE : LOAD COMB # 3

$F_X = 147$ #

$F_Y = 1362$ # TENSION

$M_Z = 2275$ "#

$M_T = 87$ "#



WELD PROPERTIES : 1/4" WELD ALL AROUND

DWG 6M-2850-50 R/0

$A_W = 2.5 \times 2 \times 2 = 10$" $\quad b = d = 2.5$"

$$S_{Z_1} = \left(\frac{4bd + d^2}{6}\right)x2 = \left\{\frac{4(2.5)(2.5) + (2.5)^2}{6}\right\}x2 = 10.42 \text{ IN}^2$$

BLODGETT PG 7.4-7 (REF. 9)

$$S_{Z_2} = \left\{\frac{d^2(4b+d)}{6(2b+d)}\right\}x2 = \frac{5}{18}b^2 \times 2 = 3.48 \text{ IN}^2$$

$$N_X = N_Y = \frac{d^2}{2(b+d)} = \frac{b}{4} = 0.625" \approx X = 0.717"$$

$$f_{a+b} = \frac{F_Y}{A_W} + \frac{M_Z}{S_{Z_2}} = \frac{1362}{10} + \frac{2275}{3.48} = 790 \text{ #/"}$$

$$f_v = \frac{F_X}{A_W} + \frac{M_T(2.5 - N_X)}{J_W} = \frac{147}{10} + \frac{87 \times 1.875}{13.02} = 27 \text{ #/"}$$

$$J_W = \left\{\frac{(b+d)^4 - 6b^2d^2}{12(b+d)}\right\}x2 = \frac{5x2}{12}b^3 = 13.02 \text{ IN}^3$$

$$f_r = (f_{a+b}^2 + f_v^2)^{1/2} = 790 \text{ #/"}$$

$$w_{REQ'D} = 790/14400 = 0.055" < 0.25" \quad OK$$

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-4

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766				GFS	KTW/L
PRELIM	FINAL	VOID	0	DATE 4-10-96	DATE 4/16/96
	✓				
SHEET 149 OF 246				DATE	DATE
J.O. 76230.502					

H-50 : CONT

WELD CHECK : CONT

BRACING MEMBERS #11 & #12 HAVE ONE LINE WELD OF 1/4"

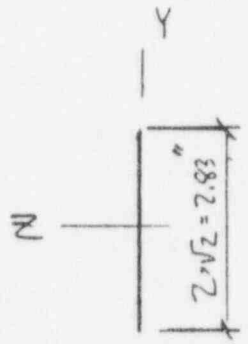
JOINT #8, BEAM #11

DL+OBE GOVERNS

$F_x = 133$ #

$F_y = 457$ #

$M_z = 1960$ "#



ELEVATION

WELD PROPERTIES :

$A_w = 2.83$ "

$S_w = d^2/6 = 2.83^2/6 = 1.33$ IN^2

$f_{w-b} = \frac{133}{2.83} + \frac{1960}{1.33} = 1521$ #/"

$f_v = \frac{457}{2.83} = 161$ #/"

$f_r = (1521^2 + 161^2)^{1/2} = 1530$ #/"

$w_{REQ'D} = \frac{f_r}{0.4 f_y} = \frac{1530}{14{,}400} = 0.106" < 0.25"$ OK

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DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-4

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 4-10-96	DATE 4/16/96
	✓				
SHEET 150 OF 246				DATE	DATE
JO 76230.502					

REF

SUPPORT STIFFNESS EVALUATION

SUPPORT 2850-H-50 :

LATERAL STIFFNESS :

$$K_X = \frac{42^{\#} \times 4}{0.8130183 \times 10^{-1}} = 2066^{\#/"}$$

STARDYNE RUN 4/10/96 (ATT. B12)

$$K_X = \frac{1000^{\#}}{0.6453} = 1550^{\#/"}$$

DC 2836 REV A PAGES 27 & 29

VERTICAL STIFFNESS :

$$K_Y = \frac{86.4 \times 2}{0.2647394 \times 10^{-3}} = 652,717^{\#/"}$$

STARDYNE RUN 4/10/96 (ATT. B12)

$$K_Y = \frac{1000}{0.0015314} = 652,997^{\#/"}$$

DC 2836 REV A PAGES 27 & 29

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

CALCULATION SET NO			REV	COMP BY	CHK'D BY
DC - 5766					
PRELIM	FINAL	VOID	0	EA DATE 6/6/96	RS DATE 6/7/96
	✓				
SHEET 151 OF 246				DATE	DATE
J.O. 76230.502					

PROJECT DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
SUBJECT STRUCTURAL QUALIFICATION

C. ANCHOR AND BASE PLATE EVALUATION

Form 5037 (Rev. 4/93)

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2 CCHVAC DUCT & DUCT SUPPORTS

PROJECT

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-1

CALCULATION SET NO DC-5766

PRELIM | FINAL ✓ | VOID

SHEET 152 OF 246

JO 76230502

REV	COMP. BY	CHK'D BY
0	DATE 5/10/96	DATE 5/22/96
	DATE	DATE

SUPPORT MARK	JOINT NO.	BASE PL. SIZE	ANCHOR BOLT	SUPPORT MEMBER	BASE PLATE LOADS TENSION (LBS)	MOMENT (FT-LBS)	SHEAR (LBS)	GOVERNING LOAD CASE	RESULT	REMARKS
6M-2850-H-57-B	9	8 x 5/8 x 8	4 - 1/2 ϕ	L 3 x 3 x 1/4	2054	68	23	FROM SUPP. 6M-2850 H-54-A	PASS	SEE CALC. FOR BASE PL QUALIFICATION DCN 10881A
	11									
	12									
	13									
	14									
	1		3 - 1/2 ϕ 1 - 5/8 ϕ WEDGE ANCH							
6M-2850-H-73-A		9 x 5/8 x 9	4 - 1/2 ϕ	L 4 x 4 x 1/4					PASS	MODIFIED SUPPORT
			"							
6M-2850-H-74-A			3 - 1/2 ϕ 1 - 5/8 ϕ WEDGE ANCH						PASS	MODIFIED SUPPORT DCN 10938A
			"							
6M-2850-H-75			4 - 1/2 ϕ						PASS	SEE CALC.
			"							
6M-2850-H-76		6 x 3/8 x 6	4 - 3/8 ϕ	L 2 x 2 x 1/4					PASS	MODIFIED SUPPORT
		"	"	"						

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-1

CALCULATION SET NO. DC-5766

PRELIM | FINAL: V | VOID

SHEET 153 OF 246

JO 76 230502

REV	COMP. BY	CHK'D BY
0	[signature] DATE 5/10/96	[signature] DATE 5/23/96
	DATE	DATE

SUPPORT MARK	JOINT NO.	BASE PL. SIZE	ANCHOR BOLT	SUPPORT MEMBER	BASE PLATE LOADS				RESULT	REMARKS
					TENSION (LBS)	MOMENT (FT-LBS)	SHEAR (LBS)	GOVERNING LOAD CASE		
6M-2850-H-77-B	1	9×5/8×9	4-1/2ϕ	L4×4×1/4					PASS	MODIFIED SUPPORT
	12	"	"	"						
6M-2850-H-78	1	8×1/2×8	4-3/8ϕ	L2½×2½×1/4					PASS	SEE CALC.
	7	↓	↓	↓						
	8									
6M-2850-H-79-B		9×5/8×9	4-1/2ϕ	L4×4×1/4					PASS	SEE CALC. FOR BASE PL QUALIFICATION
		"	"	"						
6M-2850-H-80		6×3/8×6	4-3/8ϕ	L2×2×1/4					PASS	SEE CALC
6M-2850-H-81-A		8×5/8×8	4-1/2ϕ	L3×3×1/4					PASS	MODIFIED SUPPORT
6M-2850-H-82		9×5/8×9	4-1/2ϕ	L4×4×1/4					PASS	SEE CALC. FOR BASE PL QUALIFICATION
		"	"	"						

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-1

CALCULATION SET NO DC-5766

PRELIM | FINAL | VOID

SHEET 154 OF 246

JO 76230502

SUPPORT MARK	JOINT NO.	BASE PL. SIZE	ANCHOR BOLT	SUPPORT MEMBER	BASE PLATE LOADS				RESULT	REMARKS
					TENSION (LBS)	MOMENT (FT-LBS)	SHEAR (LBS)	GOVERNING LOAD CASE		
6M-2850-H-83		6×3/8×6	4-3/8φ	L2×2×1/4					PASS	SEE CALC. FOR BASE PL QUALIFICATION
		"	"	"						
6M-2850-H-84		8×1/2×8	4-3/8φ	L2 1/2×2 1/2×1/4					PASS	BOUNDED BY 6M-2850-1-H-11-A
		"	"	"						
6M-2850-H-85		8×1/2×8	4-3/8φ	L2 1/2×2 1/2×1/4					PASS	BOUNDED BY 6M-2850-1-H-11-A
6M-2850-H-86-B		9×5/8×9	4-1/2φ	L4×4×1/4					PASS	SEE CALC. FOR BASE PL QUALIFICATION
6M-2850-H-87-B	1	A 9×5/8×9	4-1/2φ	L4×4×1/4	689	403	158	SSE	PASS	SEE CALC. DCN 10939A
	7	B "	3-1/2φ 1-5/8φ WEDGE ANCH	"	"	"	"	"		
6M-2850-H-88-	1	9×5/8×9	4-1/2φ	L4×4×1/4	1522	X1: 450 X2: 10	204	DTOBE L.C. #4	* PASS	BASE PLATE CHART C, ZONE I SSE ≅ OBE SHEAR IS NEGL.
	7	↓	↓	↓	COMP.					
	8				270	X1: 99 X2: 14	263	DTOBE L.C. #1		
6M-2850-1-H-11-A	1	8×1/2×8	4-3/8φ	L2 1/2×2 1/2×1/4	589	12	14	L.C. 1 DL+OBE	* PASS	BASE PLATE CHART C ZONE III. SSE < OBE SHEAR IS NEGL.
	6	"	"	"	642	210	100	L.C. 3 DL+OBE		

REV	COMP BY	CHK'D BY
0	[signature] DATE 5/10/96	[signature] DATE 5/23/96
	DATE	DATE
	DATE	DATE

* BASE PL LOADS ARE FROM STARDYNE OUTPUT FOR H-88 & H-11 (ATT. B5 & ATT. B6)

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION SUPPORT EVALUATION FOR

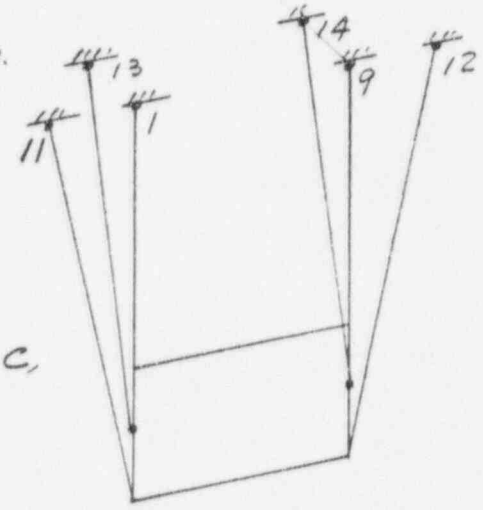
SUBJECT SYSTEM 2850-1

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	KTW DATE 4/25/96	DPS DATE 5-8-96
SHEET 155 OF 246				DATE	DATE
JO 76230502					

REF: DC 2833 REV. B

BASE PLATE CHECK FOR SUPPORT 6M-2850-H-57-B

SINCE THIS SUPPORT IS ENVELOPED BY SUPPORT 6M-2850-H-54-A, THE MOST CRITICAL BASE PLATE LOADS FOR 6M-2850-H-54-A ARE UTILIZED.



TENSION = 2054 lb
MOMENT = 68 FT-lb
SHEAR = 23 lb

BASE PLATES AT JOINTS 9, 11, 12, 13 & 14 ARE QUALIFIED BY BASE PLATE CHART C, ZONE II.

BASE PLATE @ JT. 1 (PLATE A)

ASSUME THAT THE $\frac{5}{8}\phi$ WEDGE ANCHOR WILL RESIST 100% TENSION.

2054 lb < *2858 lb/ANCHOR

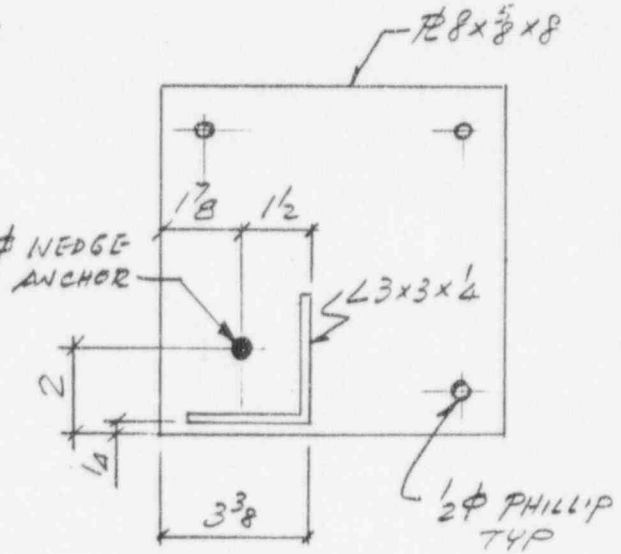
* REDUCED CAPACITY DUE TO SPACING VIOLATION SEE NEXT SHEET.

CHECK BASE PLATE STRESS

$$f_b = \frac{2054 \times 1.5}{8 \times \frac{0.625^2}{6}} = 5916 \text{ lb/in}^2$$

5916 lb/in² < 27,000 lb/in² (ALLOWABLE)

BASE PLATE & ANCHOR BOLTS ARE ADEQUATE.



BASE PLATE @ JT. 1

REF: DCN 10881 REV. A

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION SYSTEM 2850-1

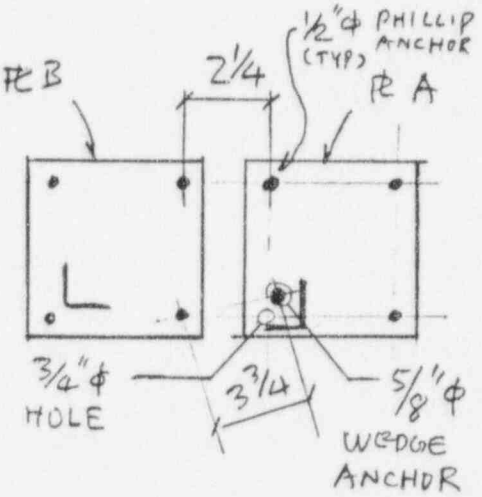
CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 5-8-96	DATE 5/23/96
	✓				
SHEET 156 OF 246				DATE	DATE
JO 76230.502					

REF

6M-2850-H-57 : CONT

ANCHOR BOLT SPACING VIOLATIONS WERE DOCUMENTED IN DCN # 10881 REV A

DCN # 10881 REV A



SPACING BETWEEN TWO ½"ϕ PHILLIPS ANCHOR IS DOCUMENTED AS 2¼" < 5" REQ'D.

SINCE THESE TWO BOLTS ARE AWAY FROM THE SUPPORTING MEMBERS AND SUBJECT TO LOW TENSION. THE REDUCED BOLT TENSILE CAPACITY IS STILL SUFFICIENT TO CARRY THE LOADS. IT IS OK.

RED HEAD ENG. BULLETIN # 111

SPACING VIOLATION BETWEEN ⅝"ϕ WEDGE ANCHOR & ½"ϕ PHILLIPS ANCHOR IS DOCUMENTED AS 3¾". WHICH IS < $\left(\frac{5}{2}" + \frac{4.375}{2}"\right) = 4.69"$ (REQ'D)

ALLOWABLE TENSION FOR ⅝"ϕ W.A. IS REDUCED

$3575^{\#} \times \frac{3.75}{4.69} = 2858^{\#} > 2054^{\#}$ (ACTUAL) OK

SINCE BASE PLATE STRESS (5,916 psi) IS LOW COMPARE WITH ALLOWABLE (27,000 psi), THEREFORE ONE OPEN HOLE OF ¾"ϕ IN THE PLATE DOES NOT ALTER THE PLATE'S STRUCTURAL ADEQUACY.

THESE VIOLATIONS ARE ACCEPTABLE

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM.	FINAL	VOID	0	KTW/c DATE 4/25/96	GFS DATE 5-8-96
	/				
SHEET 157 OF 246				DATE	DATE
J.O. 76230502					

REF

BASE PLATE CHECK FOR SUPPORT 6M-2850-H-73-A

RATIOS OF LOADS FOR SUPPORTS H-73 & H-77

$$\text{DEAD LOAD} = \frac{596}{540} = 1.104$$

$$\text{SSE VERTICAL} = \frac{246}{314} = 0.783$$

$$\text{SSE HORIZONTAL} = \frac{517}{823} = 0.628$$

PROPORTIONED BASE PLATE LOADS FOR SUPPORT H-73 ARE:

$$F_x = 857 \times 0.628 = 538 \text{ lb}$$

$$F_y = 271 \times 1.104 + 158 \times 0.783 + 3957 \times 0.628 = 2907 \text{ lb}$$

$$M_z = 25 \times 1.104 + 15 \times 0.783 + 8807 \times 0.628 = 5570 \text{ IN-lb} = 464 \text{ FT-lb}.$$

BASED ON THE AS BUILT SKETCH, THE BASE PLATE FAILS BY USING BASE PLATE CHART C, ZONE I

DC 2833
ABM-0507

Form 5007 (Rev. 4/93)

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DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	GFS DATE 5-21-96	KTW DATE 5/23/96
	✓				
SHEET 158 OF 246				DATE	DATE
JO 76230.502					

REF

6M-2850-H-73 (MODIFIED)

BASE PLATE LOADS : FROM STARDYNE 2850-H-73 (FIELD MOD) — ATT. B 7, ATT. D 1

DL+SSE

JOINT #1 OR #12

$F_x = 33^{\#}$

$F_y = 2921^{\#}$

$M_z = 313^{"\#} = 26^{'\#}$

] JOINT #1, L.C. #3

CHART C, ZONE I IS UTILIZED

$IR = \frac{2921}{3150} + \frac{26}{1023} = 0.95 < 1.0$ — DC 2833, ABM-0507

SHEAR IS NEGLIGIBLE

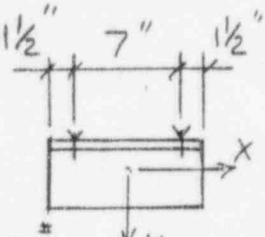
EVALUATION OF NEW ADDED BASE PLATE AS PER FIELD MOD.

JOINT #14 : DL+SSE, L.C. #4

$F_x = 648^{\#}$, $F_y = 1514^{\#}$, $M_z = 56^{"\#} = 5^{'\#}$ — ATT B 7, ATT D 1

BASE ANGLE : L 6x4x1/4

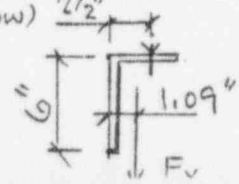
A.B. : 2-1/2" φ HKB II BOLTS



$\text{BOLT TEN} = \frac{1514 \times 3.5'' + 56}{7} = 765^{\#} < \frac{10500}{4} = 2625^{\#}$ (ALLOW) OK — DECO SPEC # 3071-226 REV J

CHECK L 6x4x1/4

$\text{STRESS} = \frac{1514 \times (2.5 - 1.09)}{10 \times 0.25^2/6} = 20{,}494^{PSI} < 27{,}000$ OK



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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 5-8-96	DATE 5/23/96
	✓				
SHEET 159 OF 246				DATE	DATE
J.O. 76230502					

REF

6M-2850-H-74

STRING ANALYSIS OUTPUT 4/25/96

BASED ON MODIFIED STRING ANALYSIS OUTPUT

BASE PLATE LOADS:

$F_x = 857 \times \left(\frac{382}{823}\right) = 398^{\#}$

$F_y = 271 \times \left(\frac{353}{540}\right) + 158 \times \left(\frac{73}{314}\right) + 3957 \times \left(\frac{382}{823}\right)$

$= 2051^{\#}$

$M_z = 8807 \times \left(\frac{382}{823}\right) = 4088^{"\#} = 341^{'\#}$

ONE 5/8"ϕ WEDGE ANCHOR IS USED AT THE NEAREST SUPP. MEMBER FOR EACH BASE PLATE. CONSERVATIVELY USE CHART 'C', ~~ZONE~~ I

$IR = \frac{2051}{3150} + \frac{341}{1023} = 0.984$

SHEAR IS NEGLIGIBLE

BOLT SPACING VIOLATIONS WERE DOCUMENTED IN DCN 10938A.

DCN # 10938A SH 2

ABM-0507 REV A SH. 11

MIN SPACING BETWEEN 5/8"ϕ W.A & 3/8"ϕ BOLT IN THE EXISTING CONDUIT SUPT IS 3 1/2".

REQ'D SPACING = $\frac{4.375}{2} + \frac{4}{2} = 4.19"$

REDUCED 5/8"ϕ W.B. TEN = $3575^{\#} \times \left(\frac{3.5}{4.19}\right) = 2986^{\#} > 2051^{\#}$

ALL BASE PL. TENSION IS TAKEN BY ONE W.A.

PLATE STRESS = $\frac{2051^{\#} \times (2 - 1.125)}{9 \times \frac{0.625^2}{6}} = 3063^{\#} < 27{,}000^{\#}$

SINCE PLATE STRESS IS LOW, ONE OPENHOLE IN PL B IS ACCEPTABLE.

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 5/21/96	DATE 5/23/96
	✓				
SHEET 160 OF 246				DATE	DATE
JO 76230 502					

GM-2850-H-74 (MODIFIED)

REF

EVALUATION OF NEW ADDED BASE PLATE BASED ON FIELD MODIFICATION.

ATT. D1

BASE PLATE : 10×10×3/4

A.B. : 4-1/2" ϕ HKB II HILTI BOLTS

FROM MODIFIED STRING ANALYSIS OUTPUT 5/15/96 LATERAL SUPPORT LOAD DUE TO DL+SSE IS 391#.

ATT. A STRING ANALYSIS OUTPUT 5/17/96

THE CAPACITY OF THIS BASE PLATE IS MUCH HIGHER THAN 391#, THEREFORE THIS BASE PLATE IS ADEQUATE.

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM.	FINAL	VOID	0	ETW DATE 4/25/96	JFS DATE 5-8-96
	/				
SHEET 161 OF 246				DATE	DATE
JO 76230502					

REF

BASE PLATE CHECK FOR SUPPORT 6M-2850-H-75

BASE PLATE LOADS FOR SUPPORT 6M-2850-H-77-B ARE UTILIZED AS BENCHMARK LOADS.

JOINT 1.OR12

DEAD LOAD (LC #1) 540 lb

$F_x = 0$
$F_y = 271$ lb
$M_z = 25$ IN-lb

STARDYNE OUTPUT FOR H-77 4/22/96 (ATT. B2)

SSE VERTICAL (LC #5) 314 lb

$F_x = 0$
$F_y = 158$ lb
$M_z = 15$ IN-lb

SSE HORIZONTAL (LC #6) 831 lb

$F_x = 857$ lb
$F_y = 3957$ lb
$M_z = 8807$ IN-lb

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	ETW DATE 4/25/96	DATE 5-8-96
	✓				
SHEET 162 OF 246				DATE	DATE
JO 76230502					

REF

BASE PLATE CHECK FOR SUPPORT GM-2850-H-75 (CONT'D)

RATIOS OF LOADS FOR SUPPORTS H-75 & H-77

$$\text{DEAD LOAD} = \frac{242}{540} = 0.448$$

STRING ANALYSIS OUTPUT 4/4/96

$$\text{SSE VERTICAL} = \frac{60^*}{314} = 0.191$$

$$\text{SSE HORIZONTAL} = \frac{567^*}{823} = 0.689$$

* USE OBE LOADS SINCE OBE > SSE

PROPORTIONED BASE PLATE LOADS FOR SUPPORT H-75 ARE:

$$F_x = 857 \times 0.689 = 590\ 16$$

$$F_y = 271 \times 0.448 + 158 \times 0.191 + 3957 \times 0.689 = 2878\ 16$$

$$M_z = 25 \times 0.448 + 15 \times 0.191 + 8807 \times 0.689 = 6082\ \text{IN-}16 = 506\ \text{FT-}16$$

BASED ON THE AS-BUILT SKETCH THE BASE PLATES FAIL BY USING BASE PLATE CHART C, ZONE I.

DC 2833 BBM-0507

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	KTW DATE 5/20/96	JFS DATE 5-21-96
	✓				
SHEET 163 OF 246				DATE	DATE
J.O. 76230.502					

BASE PLATE CHECK FOR SUPPORT 6M-2850-H-75 (CONT'D)

BASED ON MODIFIED STRING ANALYSIS OUTPUT 5/17/96 (ATT. A)

RATIO OF LOADS FOR SUPPORTS H-75 & H-77 ARE:

$$\text{DEAD LOAD} = \frac{242}{540} = 0.448$$

$$\text{SSE VERTICAL} = \frac{51}{314} = 0.162$$

$$\text{SSE HORIZONTAL} = \frac{233}{823} = 0.283$$

PROPORTIONED BASE PLATE LOADS FOR SUPPORT H-75 ARE:

$$F_x = 857 \times 0.283 = 243 \text{ lb}$$

$$F_y = 271 \times 0.448 + 158 \times 0.162 + 3957 \times 0.283 + 15 = 1282 \text{ lb}$$

$$M_z = 25 \times 0.448 + 15 \times 0.162 + 8807 \times 0.283 = 2506 \text{ IN-lb} = 209 \text{ FT-lb}$$

BASED ON THE AS BUILT SKETCH IN ADM-0507 (DC-2833), THE BASE PLATE CHART C, ZONE I IS USED FOR QUALIFICATION

$$IR = \frac{1282}{3150} + \frac{209}{1023} = 0.61 < 1.0 \quad \text{O.K.}$$

THE BASE PLATE & ANCH. BOLTS ARE ADEQUATE.

SHEAR IS NEGLIGIBLE

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GENERAL COMPUTATION SHEET

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PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
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	✓				
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BASE PLATE CHECK FOR SUPPORT 6M-2850-H-76

BASED ON MODIFIED STRUT ANALYSIS OUTPUT 5/17/96 (ATT. A)

THE SUPPORT LOADS ARE:

	DL	SSE
VERTICAL	236	47
LATERAL	0	409

MODIFIED SUPPORT

ASSUME THAT THE VERTICAL LOADS ARE TAKEN BY THE TWO VERTICAL MEMBERS AND LATERAL LOADS ARE TAKEN BY THE ADDED BRACING. THEREFORE.

BASE PLATE LOADS FOR PLATE A & B ARE

$\frac{236+47}{2} = 142$ lb (TENSION)

MOMENT = 0

PLATES A & B ARE QUALIFIED BY USING BASE PLATE CHART C, ZONE IV. $IR = \frac{142}{2110} = 0.07 < 1.0$

BASE PLATE LOADS FOR PLATE C ARE

TENSION = 409 lb

MOMENT = 0

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CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION
SUPPORT EVALUATION FOR

SUBJECT SYSTEM 2850-1

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
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	✓				
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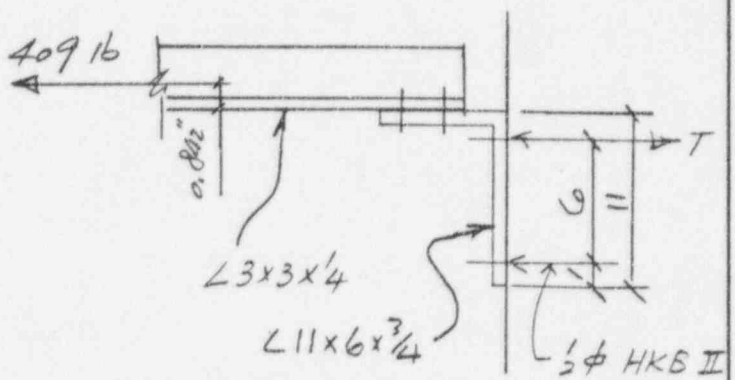
H76 (CONT'D)

PLATE C.



BOLT TENSION = $\frac{409 \times 10.842}{6} = 739\ lb < 2625\ lb$ O.K.

PLATE STRESS = $\frac{409 \times 4.842}{6 \times \frac{0.75^2}{6}} = 3521\ lb/in^2 < 27{,}000\ lb/in^2$ O.K.

IR FOR BOLT = $\frac{739}{2625} = 0.28 < 1.0$ OK

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PROJECT STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

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BASE PLATE CHECK FOR SUPPORT 6M-2850-H-77

BASE PLATE LOADS BASED ON MODIFIED SUPPORT ANALYSIS (ATT. B 8)

JT. 1 (L.C. #3)

$F_x = 115$ lb
$F_y = 2822$ lb
$M_z = 890$ IN-lb $= 74$ FT-lb

USE BASE PLATE CHART C, ZONE I

$$\frac{2822}{3150} + \frac{74}{1023} = 0.97 < 1.0 \quad \text{O.K.}$$

JT. 14 (L.C. #4)

$F_x = 14$ lb
$F_y = 3679$ lb
$M_z = 23$ IN-lb $= 2$ FT-lb

BASED ON AS BUILT SKETCH, AVERAGE VALUE OF BASE PLATE CHART B & C, ZONE I ARE USED ABM-0507 (DC-2833)

$$\frac{3679}{(5560+3150)/2} + \frac{2}{(1541+1023)/2} = 0.84 < 1.0 \quad \text{O.K.}$$

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PROJECT STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

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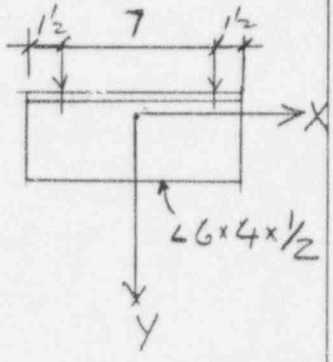
H-77 (CONT'D)

JT 15. (L.C. #3) (ATT. B 8)

$F_x = 939$ lb
$F_y = 859$ lb
$M_z = 368$ IN-lb = 31 FT-lb

BOLT TENSION:



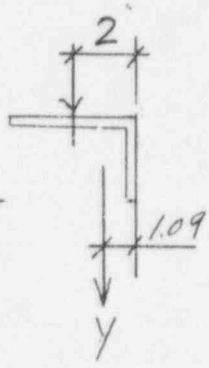
ATT. D 1

$$\frac{859 \times 3.5 + 368}{7} = 482 \text{ lb} < 2625 \text{ lb}$$

O.K.

$$IR = \frac{482}{2625} = 0.2$$

PLATE STRESS:



$$\frac{859 \times 0.91}{10 \times \frac{0.5^2}{6}} = 1876 \text{ psi} < 27{,}000 \text{ psi}$$

O.K.

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PROJECT CCHVAC DUCT & DUCT SUPPORTS

SUBJECT STRUCTURAL QUALIFICATION SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
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JO 76230502					

REF

6M-2850-H-78

BASED ON MODIFIED STRING RUN 4/25/96

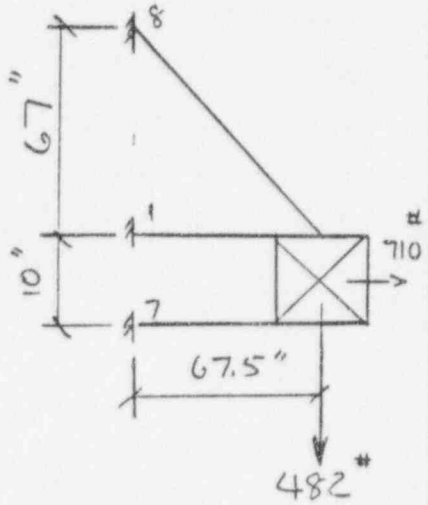
SUPPORT LOADS:

DL + SSE

VERT (MAX) = 357 + 125 = 482 #

VERT (MIN) = 357 - 125 = 232 #

LAT = 7 + 303 = 710 #



STRING ANALYSIS OUTPUT 4/25/96

$$\text{TEN @ JT. 8} = \frac{482 \times 67.5}{(67 + \frac{10}{2})} = 452^{\#}$$

BASE PL.: CHART 'C' ZONE III

ABM-0507 SH 15

$$IR = \frac{452}{2110} = 0.21 < 1.0 \quad OK$$

SHEAR & MOMENT ARE NEGLIGIBLE

JOINT 1 & 7:

$$\text{TENSION} = \frac{710 \times 72'' - 232 \times 67.5''}{72 \times 2} = 246^{\#}$$

CHART 'A', ZONE III

$$IR = \frac{246}{1400} = 0.18 < 1.0 \quad OK$$

SHEAR & MOMENT ARE NEGLIGIBLE

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PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-1

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DC-5766					
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STRING ANALYSIS OUTPUT 4/4/96

BASE PLATE CHECK FOR SUPPORT 6M-2850-79-B.

RATIOS OF LOADS FOR SUPPORTS H-79 & H-77

$$\text{DEAD LOAD} = \frac{498}{540} = 0.922$$

$$\text{SSE VERTICAL} = \frac{161}{314} = 0.512$$

$$\text{SSE HORIZONTAL} = \frac{457}{823} = 0.555$$

PROPORTIONED BASE PLATE LOADS FOR SUPPORT H-79 ARE:

$$F_x = 857 \times 0.555 = 476 \text{ lb}$$

$$F_y = 271 \times 0.922 + 158 \times 0.512 + 3957 \times 0.555 = 2560 \text{ lb}$$

$$M_z = 25 \times 0.922 + 15 \times 0.512 + 8807 \times 0.555 = 4919 \text{ in-lb} = 410 \text{ ft-lb}.$$

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PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-1

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DC 2833
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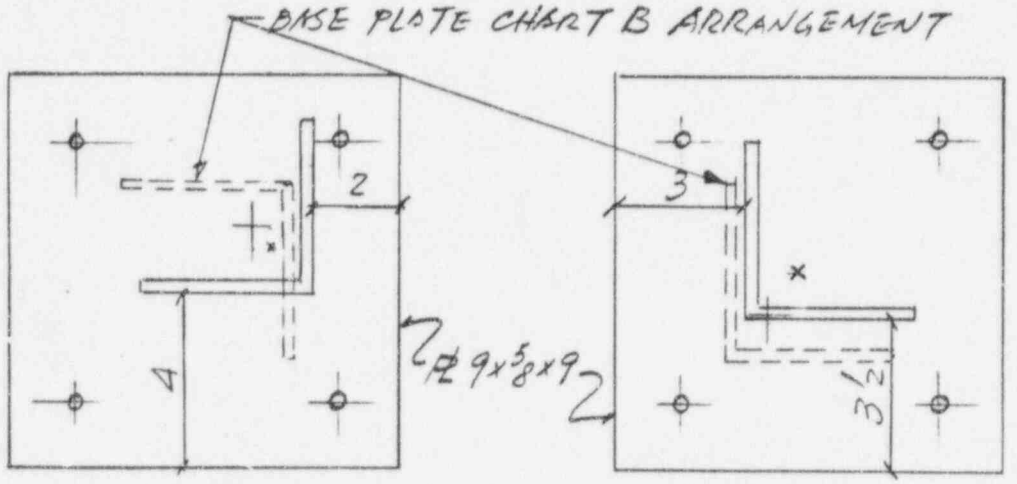
BASE PLATE CHECK FOR SUPPORT 6M-2850-H-79-B
(CONT'D)



ALL ATTACHED MEMBERS = L 4x4x1/4

PLATE B

PLATE A

BY OBSERVATION, PLATE B IS MORE CRITICAL.

USING BASE PLATE CHART B, ZONE I.

$$IR = \frac{2560}{5560} + \frac{410}{1541} = 0.726 < 1.0$$

THE BASE PLATES & ANCHORS ARE ADEQUATE

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PROJECT CCHVAC DUCT & DUCT SUPPORTS STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

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DC-5766					
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	✓				
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REF

6M-2850-H-80

THIS SUPPORT IS SIMILAR WITH 6M-2850-H-75

RATIO OF LOADS FOR H-80 & H-75

MODIFIED STRING ANALYSIS OUTPUT IS UTILIZED

STRING ANALYSIS OUTPUT 4/25/96

$$D.L. = \frac{190}{242} = 0.785$$

$$SSE\ VERT = \frac{51}{51} = 1.0$$

$$SSE\ HORIZ = \frac{10}{380} = 0.026$$

$$F_X = 435 \times 0.785 = 342\ \#$$

$$F_Y = 271 \times 0.448 \times 0.785 + 158 \times 0.191 \times 1.0 + 3957 \times 0.508 \times .026 + 15 = 193\ \#$$

$$M_Z = 25 \times 0.448 \times 0.785 + 15 \times 0.191 \times 1.0 + 8807 \times 0.508 \times 0.026 = 128''\ \# = 11'\ \#$$

CHART C, ZONE IV IS UTILIZED

$$IR = \frac{193}{2110} + \frac{11}{420} = 0.12 < 1.0 \quad OK$$

SHEAR IS NEGLIGIBLE

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PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
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	✓				
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STRING ANALYSIS OUTPUTS 4/25/96 (MOD.) & 4/4/96 (ORIGINAL)

STARDYNE H-81 RUN 4/17/96 (ATT. B3)

6M-2850-H-81

BASED ON MODIFIED STRING ANALYSIS OUTPUT

RATIO OF MOD OUTPUT & ORIGINAL OUTPUT

D.L = 1

$$\frac{SSE(MOD.)\ HORIZ}{OBE\ (ORIG.)\ HORIZ} = \frac{368}{1476} = 0.249$$

$$\frac{SSE(MOD.)\ VERT}{OBE\ (ORIG.)\ VERT} = \frac{82}{108} = 0.759$$

DL+SSE : L.C. 3

$F_z = 1129 \times 0.249 = 281^{\#}$

$F_y = (146+96) + 44 \times 0.759 + 4387 \times 0.249 = 1368^{\#}$

$M_x = 1992 \times 0.249 = 496''^{\#} = 41'^{\#}$

CHART C, ZONE II IS UTILIZED

$$IR = \frac{1368}{3150} + \frac{41}{920} = 0.48 < 1.0 \quad OK$$

SHEAR IS NEGLIGIBLE

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CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
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	✓				
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REF

GM-2850-H-81 : (MODIFIED)

ATT D1

PER THE MODIFICATION SCHEME, A BRACING IS ADDED TO THIS SUPPORT. THE IMPACT TO THE BASE PLATES IS INSIGNIFICANT. ALSO THE BASE PLATE IR OF 0.48 IS LOW, THEREFORE THESE BASE PLATES ARE ADEQUATE.

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CONTAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT Support Evaluation for System 2850-1

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM.	FINAL	VOID	0	KTWu DATE 4/27/96	GFS DATE 5-8-96
	✓				
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REF

BASE PLATE Check FOR Support 6M-2850-H-82

RATIOS OF LOADS FOR Supports H-82 & H-77

STRING ANALYSIS OUTPUT 4/25/96 (MOD)

$$\text{DEAD LOAD} = \frac{160}{540} = 0.296$$

$$\text{SSE VERTICAL} = \frac{93}{314} = 0.296$$

$$\text{SSE HORIZONTAL} = \frac{381}{823} = 0.463$$

PROPORTIONED BASE PLATE LOADS FOR Support H-82 ARE:

$$F_x = 857 \times 0.463 = 397\ lb$$

$$F_y = 271 \times 0.296 + 158 \times 0.296 + 3957 \times 0.463 = 1959\ lb$$

$$M_z = 25 \times 0.296 + 15 \times 0.296 + 8807 \times 0.463 = 4089\ in\text{-}lb = 341\ ft\text{-}lb$$

BASED ON THE ATTACHMENT LOCATION SHOWN ON AS BUILT SKETCH, THE BASE PLATES ARE QUALIFIED BY USING BASE PLATE CHART C, ZONE I.

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PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-1

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DC-5766					
PRELIM.	FINAL	VOID	0	KTW DATE 4/27/96	DFS DATE 5-8-96
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BASE PLATE CHECK FOR SUPPORT 6M-2850-H-83

BASE PLATE LOADS FOR SUPPORT 6M-2850-H-59-A

SYSTEM 2850-2

JOINT # 1

DEAD LOAD

$F_x = 0$
$F_y = 164$ lb
$M_z = 0$

OBE VERTICAL

$F_x = 0$
$F_y = 78$ lb
$M_z = 0$

OBE HORIZONTAL

$F_x = 140$ lb
$F_y = 874$ lb
$M_z = 3985$ in-lb

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PROJECT ~~STRUCTURAL QUALIFICATION~~ SUPPORT EVALUATION FOR

SUBJECT SYSTEM 2850-1

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	✓				
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BASE PLATE CHECK FOR SUPPORT GM-2850-H-83 (CONT'D)

RATIOS OF LOADS FOR SUPPORTS H-83 & H-59

DEAD LOAD = $\frac{377}{240} = 1.570$

* OBE VERTICAL = $\frac{240}{156} = 1.564$

* OBE HORIZONTAL = $\frac{31}{115} = 0.270$

STRING ANALYSIS OUTPUT 4/25/96

PROPORTIONED BASE PLATE LOADS FOR SUPPORT H-83 ARE:

$F_x = 140 \times 0.270 = 38$ lb

$F_y = 164 \times 1.570 + 78 \times 1.564 + 874 \times 0.270 = 615$ lb

$M_z = 3980 \times 0.270 = 1074.6$ in-lb = 90 ft-lb

BASED ON THE AS BUILT SKETCH OF THE BASE PLATES, THE BASE PLATES ARE QUALIFIED BY USING BASE PLATE CHART C, ZONE IV.

* OBE > SSE

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PROJECT CCHVAC DUCT & DUCT SUPPORTS

STRUCTURAL QUALIFICATION

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	✓			DATE 5/8/96	DATE 5-22-96
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REF

ATT. B4 STANDYNE OUTPUT FOR H-87 4/22/96

BASE PLATE CHECK FOR SUPPORT GM-2850-H-87-B

LOADS AT BASE PLATE

JOINT 1 OR 7

DEAD LOAD

$F_x = 0$
$F_y = 20$ lb
$F_z = 0$
$M_x = 1299$ IN-lb
$M_y = 0$
$M_z \cong 0$

OBE VERTICAL

$F_x = 0$
$F_y = 64$ lb
$F_z = 0$
$M_x = 4166$ IN-lb
$M_y \cong 0$
$M_z \cong 0$

OBE HORIZONTAL (X)

$F_x = 182$ lb
$F_y = 0$
$F_z = 741$ lb
$M_x = 0$
$M_y = 5584$ IN-lb
$M_z = 0$

HORIZONTAL (Z)

$F_x = 0$
$F_y = 0$
$F_z = 54$ lb
$M_x = 0$
$M_y \cong 0$
$M_z = 0$

DEAD LOAD OF MEMBER

$F_y = 56$ lb $\quad F_x = F_z = 0$
$M_x = 2552$ IN-lb $\quad M_y = M_z = 0$

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DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION
SUPPORT EVALUATION FOR

SUBJECT SYSTEM 2850-1

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
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PRELIM.	FINAL	VOID	0	KTW DATE 4/27/96	JFS DATE 5-22-96
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BASE PLATE CHECK FOR SUPPORT 6M-2850-H-87-B
(CONT'D)
BASED ON MODIFIED STRING ANALYSIS OUTPUT.
RATIOS OF SSE LOADS TO OBE LOADS

STRING ANALYSIS OUTPUT 4/25/96

$$\text{HORIZONTAL } X = \frac{299}{345} = 0.867$$

$$\text{HORIZONTAL } Z = \frac{63}{73} = 0.863$$

PROPORTIONED BASE PLATE LOADS FOR D+SSE ARE:

$F_x = 182 \times 0.867 = 158$ lb

F_y

$F_z = 741 \times 0.867 + 54 \times 0.863 = 689$ lb

$M_x = 2552 = 212$ FT-lb

$M_y = 5584 \times 0.867 = 4841$ IN-lb $= 403$ FT-lb

$M_z = 0$

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CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION
SUPPORT EVALUATION FOR

SUBJECT SYSTEM 2850-1

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DC-5766					
PRELIM	FINAL	VOID	0	ETW DATE 5/23/96	JPS DATE 5/23/96
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DC 2833
DCN 10939A
&
ABM-0507

BASE PLATE CHECK FOR SUPPORT EM-2850-H-87-B
(CONT'D)

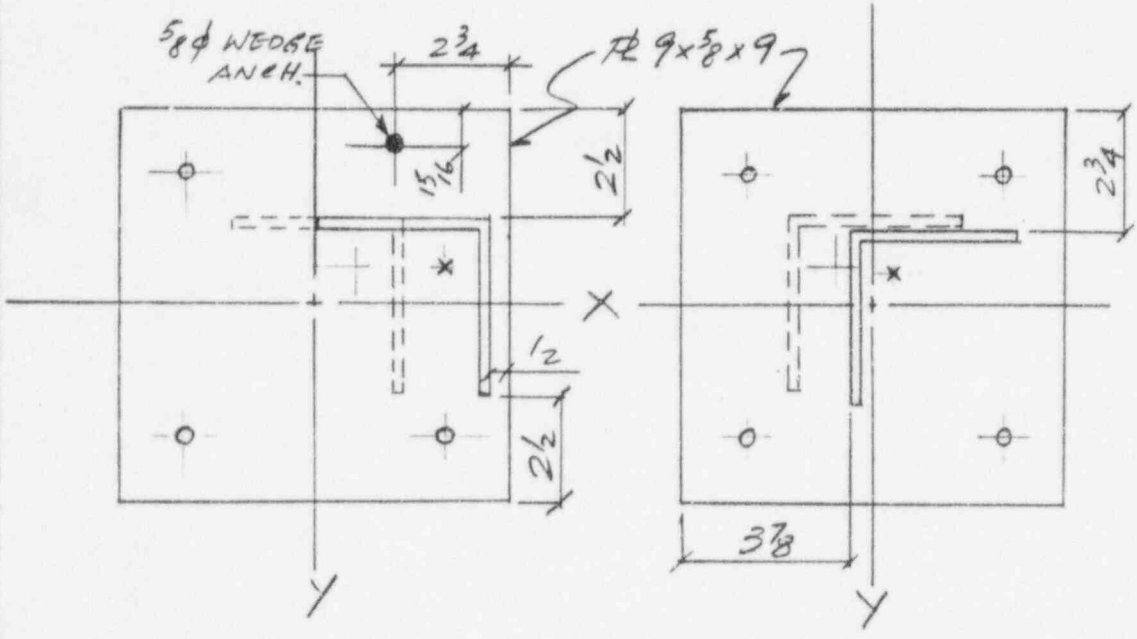

PLATE A IS QUALIFIED BY USING BASE PLATE CHART B, ZONE I.

FOR PLATE B, CHART A, ZONE I IS UTILIZED

$$IR = \frac{689}{2090} + \frac{403}{673} = 0.93 < 1.0 \quad \text{O.K.}$$

SHEAR IS NEGLIGIBLE

$$\text{PLATE STRESS} = \frac{3575 \times (2.5 - 0.9375)}{9 \times \frac{0.625^2}{6}} = 9533^{PSI} < 27,000 \text{ PSI}$$

SINCE PLATE STRESS IS LOW, AN OPEN HOLE IN BASE PLATE 'B' DOES NOT ALTER THE PLATE STRUCTURAL ADEQUACY, THEREFORE, IT IS ACCEPTABLE.

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-1

CALCULATION SET NO. DC-5766			REV	COMP. BY	CHK'D BY
PRELIM	FINAL	VOID	0	KTW DATE 4/27/96	GFS DATE 5-8-96
	✓				
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JO 76230502					

REF

BASE PLATE CHECK FOR SUPPORT 6M1-2850-H-86-B

RATIOS OF LOADS FOR SUPPORTS H-86 & H-87

STRING ANALYSIS OUTPUT 4/4/96

$$\text{DEAD LOAD} = \frac{64}{29} = 2.207$$

$$\text{SSE VERTICAL} = \frac{63}{93} = 0.677$$

$$\text{SSE HORIZONTAL (X)} = \frac{140}{345} = 0.406$$

$$\text{SSE HORIZONTAL (Z)} = \frac{193}{73} = 2.644$$

PROPORTIONED BASE PLATE LOADS FOR D+SSE ARE:

$F_x = 182 \times 0.406 = 74$ lb

$F_y = 20 \times 2.207 + 64 \times 0.677 + 56 = 165$ lb

$F_z = 741 \times 0.406 + 54 \times 2.644 = 444$ lb

$M_x = 1299 \times 2.207 + 4166 \times 0.677 + 2552$
$= 8239$ IN-lb $= 686$ FT-lb

$M_y = 5584 \times 0.406 = 2267$ IN-lb $= 189$ FT-lb

$M_z = 0$

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DI J FERMI 2

PROJECT CCHVAC DUCT & DUCT SUPPORTS

SUBJECT ~~SUPPORT STRUCTURAL CALCULATION~~ SYSTEM 2850-1

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM.	FINAL	VOID	0	KTW DATE 4/27/96	JFS DATE 5-8-96
	✓				
SHEET 181 OF 246				DATE	DATE
J.O. 76230502					

REF

BASE PLATE CHECK FOR SUPPORT 6M-2850-H-86-B (CONT'D)

DC 2833
ASM-0507

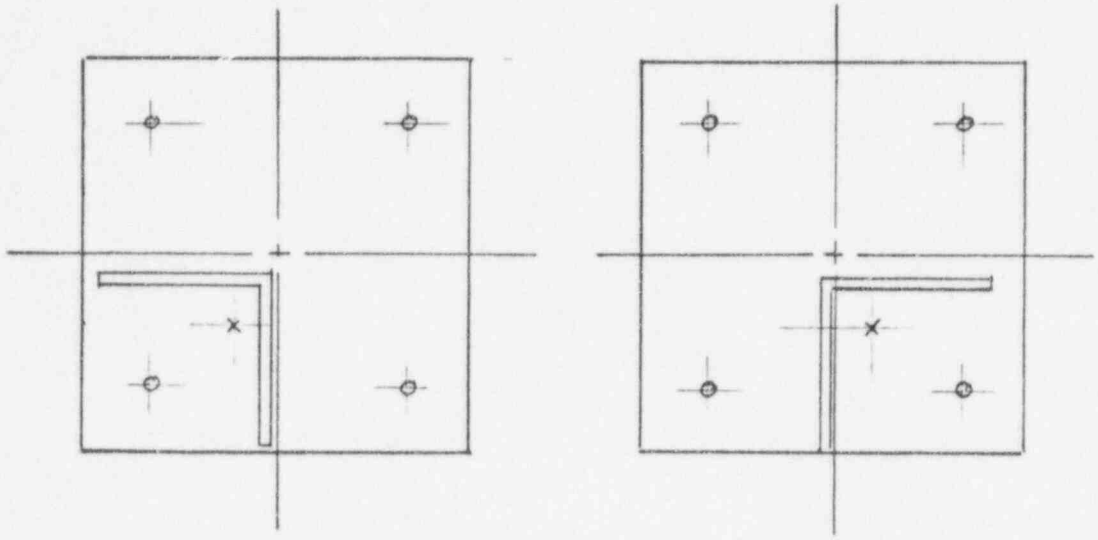

PLATE B PLATE A

BASED ON THE AS BUILT SKETCH FOR PLATES A & B, THE BASE PLATES ARE QUALIFIED BY USING BASE PLATE CHART C, ZONE I.

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO. DC-5766

PRELIM | FINAL ✓ | VOID

SHEET 182 OF 246

JO 76250.502

SUPPORT MARK	JOINT NO.	BASE PL. SIZE	ANCHOR BOLT (PHILLIPS ANCH UON)	SUPPORT MEMBER	* BASE PLATE LOADS TENSION (LBS)	MOMENT (FT-LBS)	SHEAR (LBS)	GOVERNING LOAD CASE	RESULT	REMARKS
GM-2850 H-49	1	8x8x5/8	4-1/2"Φ	L3x3x1/4	1511	991	755	D+SSE	PASS	SHARED WITH SYS. 2850-4
	9		4-3/8"Φ	L2½x2½x¼	969	49.	5.			
	13		4-1/2"Φ	L3x3x1/4	1670	16	26			
GM-2850 H-54	1	8x8x1/2	4-3/8"Φ	L2½x2½x¼	2054	68	23	D+SSE	PASS	
	7				647	32	8			
	8				1514	14	865			
GM-2850 H-55									PASS	BOUNDED BY H-54
GM-2850 H-56									PASS	BOUNDED BY H54
GM-2850 H-58	1	8x8x5/8	4-1/2"Φ	L3x3x1/4	1395	272	129	D+SSE	PASS	
	10	"	"	"	1395	65	22	"		

* SEE STRING ANALYSIS OUTPUT 3/29/96

REV	COMP. BY	CHK'D BY
0	GFS 4-9-96	ETW 5/21/96
	DATE	DATE
	DATE	DATE

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CC/HVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO: DC-5766

PRELIM | FINAL ✓ | VOID

SHEET 183 OF 246

JO 76230.502

REV: 0

COMP. BY: GFS DATE 4-9-96

CHK'D BY: KTW DATE 5/23/96

SUPPORT MARK	JOINT NO.	BASE PL. SIZE	ANCHOR BOLT PHILLIPS ANCHON	SUPPORT MEMBER	BASE PLATE LOADS TENSION (LBS)	MOMENT (FT-LBS)	SHEAR (LBS)	GOVERNING LOAD CASE	RESULT	REMARKS
GM-2850 H-59	1	L 4x4x1/4 x 1'-0 LG	4-3/8" Φ	L 2x2x1/4	1116	M_x=287 M_z=53	140	D+OBE	PASS	
	10	6x6x3/8	4-3/8" Φ		1116	81	25	"		
GM-2850 H-60	1								PASS	MODIFIED SUPPORT DCN10891A
	10									
GM-2850 H-61	1		3-3/8" Φ 1-1/2" Φ W.B.						PASS	MODIFIED SUPPORT DCN10890B
	10		4-3/8" Φ							
GM-2850 H-62	1				1051	335	141	D+SSE	PASS	
	10				1051	81	141			
GM-2850 H-63	1								PASS	MODIFIED SUPPORT DCN10893
	10									
GM-2850 H-64	1								PASS	MODIFIED SUPPORT DCN10895 DCN10883C
	10	↓	↓	↓						
GM-2850 H-65	1	8x8x1/2	4-3/8" Φ	L 2 1/2 x 2 1/2 x 1/4					PASS	BOUNDED BY H-59
	10	"	"	"						

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DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO: DC-5766

PRELIM | FINAL ✓ | VOID

SHEET 184 OF 246

JO 76230.502

REV	COMP. BY	CHK'D BY
0	DFS DATE 4-9-96	[illegible] DATE 5/21/96
	DATE	DATE

SUPPORT MARK	JOINT NO.	BASE PL. SIZE	ANCHOR BOLT PHILLIPS ANCHOR	SUPPORT MEMBER	BASE PLATE LOADS TENSION (LBS)	MOMENT (FT-LBS)	SHEAR (LBS)	GOVERNING LOAD CASE	RESULT	REMARKS
GM-2850 H-66	1	8x8x1/2	4-3/8"ϕ	L2½x2½x¼					PASS	BOUNDED BY H-59
	10									
GM-2850 H-67	1								PASS	BOUNDED BY H-59
	10									
GM-2850 H-68	1				1442	468	197	D+SSE	PASS	
	10	↓		↓	1442	114	35	"		
GM-2850 H-69	1	6x6x3/8		L2x2x¼					PASS	BOUNDED BY H-59
	10									
GM-2850 H-70	1								PASS	BOUNDED BY H-59
	10	↓		↓						
GM-2850 H-71	1	8x8x1/2		L2½x2½x¼					PASS	BOUNDED BY H-68
	10	"		"						
GM-2850 H-72	1	6x6x3/8		L2x2x¼	1142	400	180	D+SSE	PASS	SEE ATT. C1
	10	"	↓	"	1142	98	32	"	PASS	

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DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	JFS DATE 4-6-96	ETW DATE 5/21/96
	✓				
SHEET 185 OF 246				DATE	DATE
JO 76230.502					

GM-2850-H-49

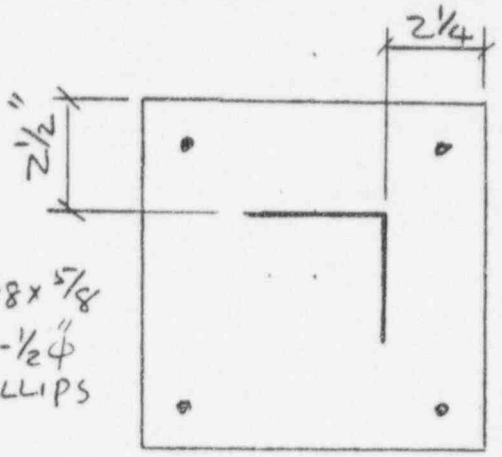
JOINT 1

DL+SSE

$F_x = 755$ #

$F_y = 1511$ #

$M_z = 991$ in-#



REF

DC 2836
ATT. 5

STARDYNE
OUTPUT
4/5/96
ATT. B 9

FROM TEN-MOMENT CAPACITY CHART 'B', ZONE II

$$\text{BOLT TEN IR} = \frac{1511}{5560} + \frac{991}{1388} = 0.986$$

$$\text{SHEAR IR} = \frac{755}{4 \times 1370} = 0.138$$

$$IR = (0.986)^{5/3} + (0.138)^{5/3} \cong 1.0 \quad \text{OK}$$

PLATE STRESS IS WITHIN THE TEN-MOMENT CAPACITY CHART IS OK

Form 5007 (Rev. 4/93)

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	GFS DATE 4-6-96	ETW DATE 5/2/96
	✓				
SHEET 186 OF 246				DATE	DATE
JO 76230.502					

H-49 : CONT

JOINT 9

DL±SSE

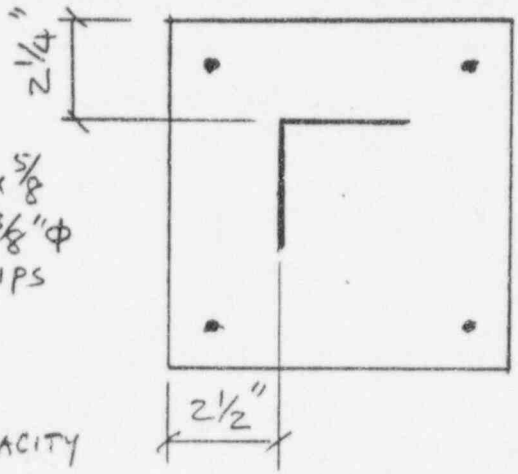
$F_x = 5$ #

$F_y = 969$ #

$M_z = 49'$ #

B.P. : 8×8×5/8

A.B. : 4-3/8"Φ PHILLIPS



FROM BASE PL. TEN-MOMENT CAPACITY CHART B ZONE III

BOLT TEN IR = $\frac{969}{3730} + \frac{49}{955} = 0.31$

SHEAR IS NEGLIGIBLE

PLATE STRESS IS WITHIN THE T-M CAPACITY CHART IS OK

* ENVELOPED FOR L.C. # 7 & 8

REF

DC 2836 ATT. 5

STARDYNE OUTPUT 4/5/96 ATT. B9

Form 5007 (Rev. 4/93)

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850 - 2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	QRS DATE 4-6-96	KTWo DATE 5/21/96
	V				
SHEET 187 OF 246				DATE	DATE
JO 76230.502					

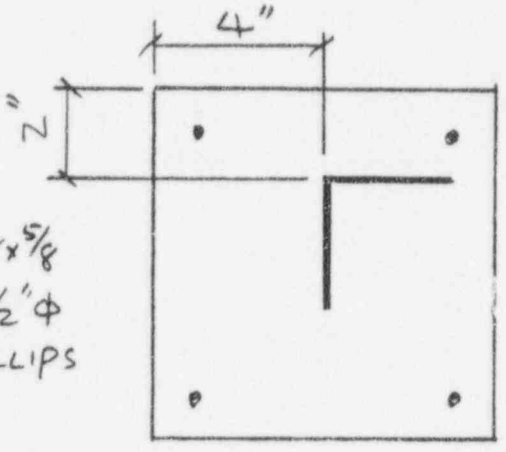
H-49 : CONT

JOINT 13

$F_x = 26$ #
$F_y = 1670$ #
$M_z = 16$ #

* DL±SSE

B.P. : 8×8×5/8
A.B. : 4-½"Φ
PHILLIPS



REF

DC 2836
ATT 5

STARDYNE
OUTPUT
4/5/96
ATT 39

FROM BASE PLATE-M CAPACITY CHART 'C', ZONE II
CONSERVATIVE

$$\text{BOLT IR} = \frac{1670}{3150} + \frac{16}{920} = 0.55 < 1.0$$

SHEAR IS NEGLIGIBLE

PLATE STRESS IS WITHIN THE T-M CAPACITY CHART
IS OK

* ENVELOPED FOR LC #7 & 8

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	JFS DATE 4-6-96	KTW DATE 5/21/96
	✓				
SHEET 188 OF 246				DATE	DATE
JO 76230.502					

EVALUATION OF BASE PLATE

GM-2850-H-54

DL+OBE (X+Y)

REF

STARDYNE OUTPUT ≡ 4/4/96 ATT. B10

JOINT 1 :

$F_X = 14.$ # COMB 4

$F_Y = 1345$ # COMB 4

$M_Z = 495$ "# COMB 4

JOINT 7 :

$F_X = 5$ # COMB 3

$F_Y = 498$ # COMB 4

$M_Z = 240$ "# COMB 4

JOINT 8 :

$F_X = 517$ # COMB 1

$F_Y = 912$ # COMB 1

$M_Z = 109$ "# COMB 4

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 4-6-96	DATE 5/2/96
				DATE	DATE
SHEET 189 OF 246					
JO 76230.502					

H-54 : CONT.

REF

ATT. B10 STARDYNE OUTPUT 4/4/96

DL + SSE (X+Y)

JOINT 1

F_x = 23 # COMB 8

F_y = 2054 # COMB 8

M_z = 814 "# COMB 8

JOINT 7

F_x = 8 # COMB 7

F_y = 647 # COMB 8

M_z = 389 "# COMB 8

JOINT 8

F_x = 865 # COMB 7

F_y = 1514 # COMB 7

M_z = 173 COMB 8

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5166					
PRELIM	FINAL	VOID	0	SFS DATE 4-6-96	KTV DATE 5/21/96
	✓				
SHEET 190 OF 246				DATE	DATE
JO 76230.502					

H-54 : CONT.

BASE PLATE : 8 x 8 x 1/2

A.B : 4 - 3/8" ϕ PHILLIPS ANCHOR

SUPPORT MEMBER : L 2 1/2 x 2 1/2 x 1/4

REF

DWG. 10-4221 000-GM-2850-54-A

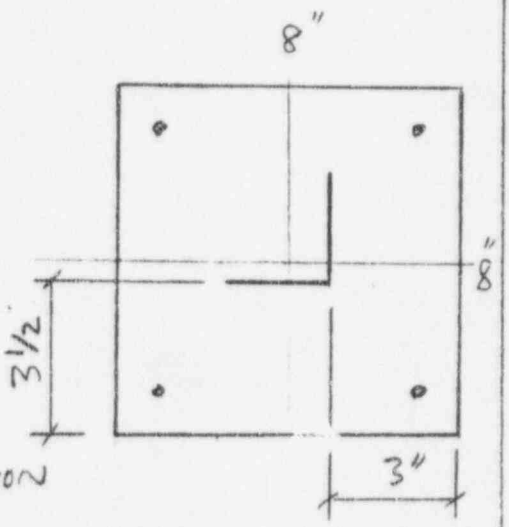
JOINT 1

DL + SSE (X+Y)

F_x = 23 #

F_y = 2054 #

M_z = 814 "# = 68 '#



ABM-0510 SH. 2 DETAIL A-A

CAPACITY OF BASE PLATE IS TAKEN BY LINEAR INTERPORATION OF CHARTS B & C, ZONE III

$$\text{TENSION, } T = 3730 - (3730 - 2110) \times \frac{(3.5 - 2.75)}{(2.75" - 1.55")} = 2718\ \#$$

$$\text{MOMENT, } M = 955 - (955 - 633) \times 0.625 = 754\ '\#$$

$$\text{BOLT TENSION } IR = \frac{2054}{2718} + \frac{68}{754} = 0.85 < 1.0 \quad \text{OK}$$

$$\text{BOLT SHEAR } IR = \frac{23}{4 \times 690} = 0.008 \quad \text{NEGLIGIBLE}$$

PLATE STRESS IS WITHIN THE T&M CHART IS OK

THIS BASE PLATE IS ADEQUATE

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT Support Evaluation for System 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 4-8-96	DATE 5/21/96
	✓				
SHEET 191 OF 246				DATE	DATE
JO 76230.502					

H-54 : CONT.

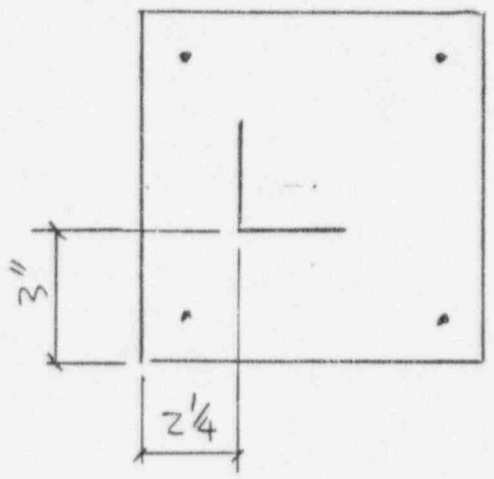
JOINT 7

DL + SSE (X+Y)

$F_X = 8^{\#}$

$F_Y = 647^{\#}$

$M_Z = 389^{"\#} = 32^{'\#}$



REF.

ABM-0510 SH 2

DET. B-B

T & M CAPACITIES :

USE CHART C, ZONE III

$T = 2110^{K}$; $M = 633^{'K}$

BOLT TENSION IR = $\frac{647}{2110} + \frac{32}{633} = 0.36$

BOLT SHEAR IR = $\frac{8}{4 \times 690} \doteq 0$

BOLT IR = 0.36 < 1.0 OK

PLATE STRESS IS WITHIN THE T-M CHART

IS WITHIN THE ALLOWABLE LIMIT

THIS BASE PLATE IS ADEQUATE

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 4-8-96	DATE 5/21/96
	✓				
SHEET 192 OF 246				DATE	DATE
JO 76250, 502					

REF

H-54 : CONT.

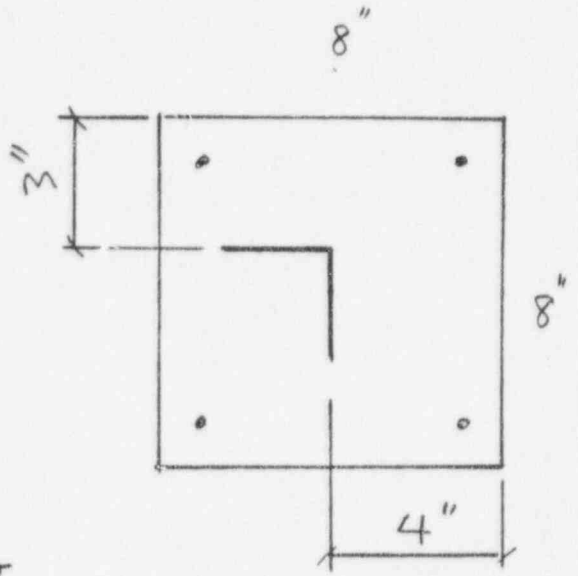
JOINT 8

DL + SSE (X+Y) :

$F_x = 865^{\#}$

$F_y = 1514^{\#}$

$M_z = 173^{"\#} = 14^{'\#}$



ABM-0510 SH 2 DET C-C

T & M CAPACITIES :

USE CHART C, ZONE III

$T = 2110^{K}$

$M = 633^{'K}$

BOLT TENSION IR = $\frac{1514}{2110} + \frac{14}{633} = 0.74$

BOLT SHEAR IR = $\frac{865}{4 \times 690} = 0.31$

BOLT IR = $(0.74)^{5/3} + (0.31)^{5/3} = 0.75 < 1.0$

OK

PLATE STRESS IS WITHIN THE T & M CHART

THEREFORE IS OK

THIS BASE PLATE IS ADEQUATE

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DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 4-8-96	DATE 5/21/96
	/				
SHEET 193 OF 246				DATE	DATE
JO 76230.502					

REF

6M-2850-H-58

DL+SSE : LINEAR ADJUSTMENT OF H-59 FORCE AND MOMENT

JOINT 1 -

$$F_x = 140 \times \left(\frac{46}{115}\right)^{\#} + 140 \times \left(\frac{60}{115}\right)^{\#} = 129^{\#}$$

DWG 6M-2850-58-A

$$F_y = 164 \times \left(\frac{286+171}{240}\right) + 78 \times \left(\frac{687^{\#}+45^{\#}}{156}\right) + 874 \times \left(\frac{60^{\#}}{115}\right) + 874 \times \left(\frac{46^{\#}}{115}\right)\left(\frac{102''}{136.6}\right)$$

STRING ANALYSIS OUTPUT 3/29/96

$$= 1395^{\#}$$

$$M_z = 3985^{''\#} \times \left(\frac{60}{115}\right) + 3985 \times \left(\frac{46}{115}\right)\left(\frac{102}{136.6}\right) = 3269^{''\#}$$

$$= 272^{'\#}$$

BASE PLATE : 8 x 8 x 5/8

A.B. : 4 - 1/2" ϕ PHILLIPS

SUPPORT MEMBER : L3x3x1/4

PER ABM-0510 SH 5 THIS BASE PLATE IS INSTALLED PER DESIGN

ABM-0510 SH. 5

FROM BASE PL TENSION-MOMENT CAPACITY CHART 'B'

ZONE II

TEN CAP $T = 5560^{\#}$

M CAP $M = 1388^{'\#}$

BOLT TEN I.R. $= \frac{1395}{5563} + \frac{272}{1388} = 0.45 < 1.0$ OK

SHEAR IS NEGLIGIBLE

BASE PLATE STRESS IS WITHIN THE CAPACITY CHART 'B' IS OK

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DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

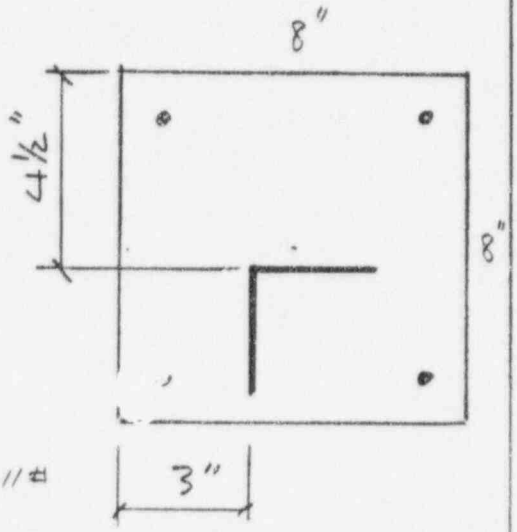
CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 4-8-96	DATE 5/21/96
	✓				
SHEET 194 OF 246				DATE	DATE
JO 76230.502					

H-58 : CONT

JOINT 10

REF

ABM-0510 SH. 5



DL + SSE

$F_X = 25^{\#} \times \left(\frac{46+60}{115}\right) = 23^{\#}$

$F_Y = 1395^{\#}$

$M_Z = 974 \times \left(\frac{46+60}{115}\right) = 898^{\#}$

$= 75'^{\#}$

BASE PL : 8 x 8 x 5/8

A.B. : 4 - ½" ϕ PHILLIPS

SUPPORT MEMBER : L 3x3x¼

FROM BASE PL TEN-MOMENT CAPACITY CHART C, ZONE II

BOLT TEN IR = $\frac{1395}{3150} + \frac{75}{920} = 0.52 < 1.0$ OK

SHEAR IS NEGLIGIBLE

PLATE STRESS IS WITHIN THE CAPACITY CHART IS OK

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 4-8-96	DATE 5/2/96
	✓				
SHEET 195 OF 296				DATE	DATE
JO 76230.502					

EVALUATION OF BASE PLATE

6M-2850-H-59

SUPPORT JOINT 1 :

D.L OF SUPPORT & DUCT PLUS DL OF MEMBER

$F_X = 0$

$F_Y = 120^{\#} + 43.6 = 163.6^{\#}$

$M_Z = 0$

OBE Y

$F_X = 0$

$F_Y = 78.0^{\#}$

$M_Z = 0$

OBE X

$F_X = 140.^{\#}$

$F_Y = 873.9^{\#}$

$M_Z = 3985^{11\#}$

COMB. LOAD : DL + OBE (X+Y)

$F_X = 140^{\#}$ COMB 3

$F_Y = 163.6 + 78. + 873.9 = 1115.5^{\#}$ COMB 3

$M_Z = 3985^{11\#}$ COMB 3

$= 3321^{\#}$

OBE GOVERNS

REF

ATT. B11 STARDYNE OUTPUT #4/4/96

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	JFS DATE 4-8-96	ETW. DATE 5/21/96
	✓				
SHEET 196 OF 246				DATE	DATE
JO 76230.502					

REF.

H-59 : CONT.

SUPPORT JOINT 1 : CONT.

DL + SSE (X+Y)

$F_x = 140 \times \left(\frac{101}{115}\right) = 123^{\#}$

$F_y = 163.6 + 78 \times \left(\frac{247}{156}\right) + 873.9 \times \left(\frac{101}{115}\right) = 1054.6^{\#}$

$M_z = 3985 \times \left(\frac{101}{115}\right) = 3500.^{''\#} = 292^{'\#}$

$F_z = M_x = M_y = 0$

JOINT 10 :

DL + OBE (X+Y) :

$F_x = 25^{\#}$ COMB 4

$F_y = 120 + 44 + 78 + 874 = 1116^{\#}$ COMB 4 | GOVERNS

$M_z = 974^{''\#} = 81^{'\#}$ COMB 4

ATT. B II STARDYNE OUTPUT * 4/4/96

DL + SSE (X+Y)

$F_x = 25 \left(\frac{101}{115}\right) = 22^{\#}$

$F_y = 1055^{\#}$

$M_z = 974 \left(\frac{101}{115}\right) = 855^{''\#}$

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

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DC-5766					
PRELIM	FINAL	VOID	0	JFS DATE 4-8-96	KTW DATE 5/21/96
	✓				
SHEET 197 OF 246				DATE	DATE
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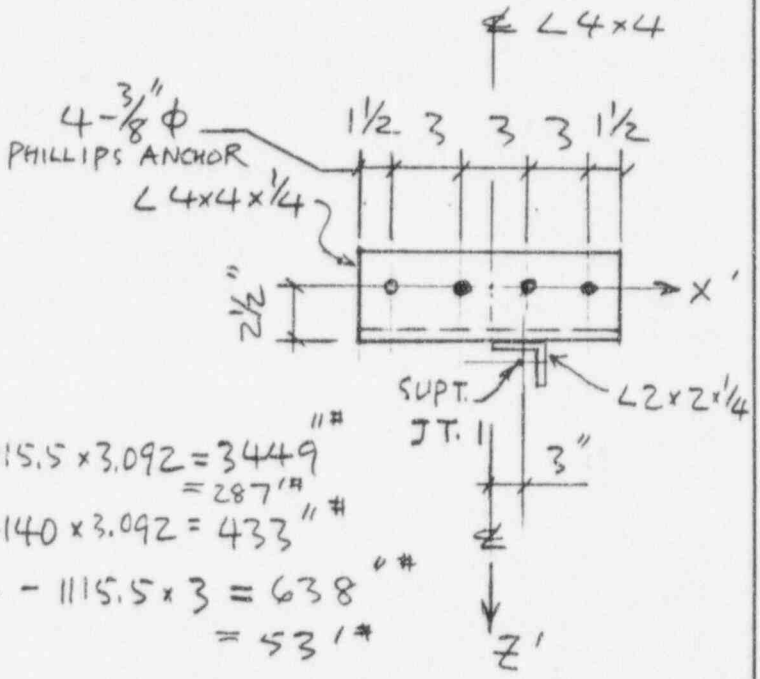
H 59 : CONT.

JOINT 1



DL + OBE (X+Y)
@ ℄ OF BOLTS

$F_{X'} = 140$

$F_{Y'} = 1115.5$ #

$F_{Z'} = 0$

$M_{X'} = F_Y \times (2.5 + 0.592) = 1115.5 \times 3.092 = 3449$ "#
$= 287$ '#

$M_{Y'} = F_X \times (2.5" + 0.592") = 140 \times 3.092 = 433$ "#

$M_{Z'} = M_Z - F_Y (3") = 3984 - 1115.5 \times 3 = 638$ "#
$= 53$ '#

BOLT TENSION : T

$$T = \frac{1116}{4} + \frac{638 \times 10.5}{(1.5^2 + 4.5^2 + 7.5^2 + 10.5^2)} + \frac{3449}{4 \times (4" - 2.5")}$$

$= 279 + 35.4 + 575 = 889$ # < 1240 # ALLOW OK

SHEAR : $V = \sqrt{\left(\frac{140}{4}\right)^2 + \left[\frac{433 \times 4.5}{2(1.5^2) + 2(4.5^2)}\right]^2} = 56$ # < 690 # ALLOW OK

$IR = \left(\frac{889}{1240}\right)^{5/3} + \left(\frac{56}{690}\right)^{5/3} = 0.573 + 0.015 = 0.59 < 1.0$ OK

CHECK ∠4×4×1/4
@ SECTION a-a

$M = F_{Y'} \times (2.5 - 0.25) = 1116 \times 2.25 = 2511$ "#

$f_b = \frac{2511}{12 \times 0.25^2/6} = 20,088$ PSI < 21,600 PSI OK

$f_v = 1116$ #$/(12 \times 0.25) = 372$ PSI < $0.4 \times 36000 = 14,400$ PSI OK

THIS BASE PLATE IS ADEQUATE

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SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

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DC-5766					
PRELIM	FINAL	VOID	0	QFS DATE 4-8-96	KTW. DATE 5/21/96
	✓				
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H59 : CONT.

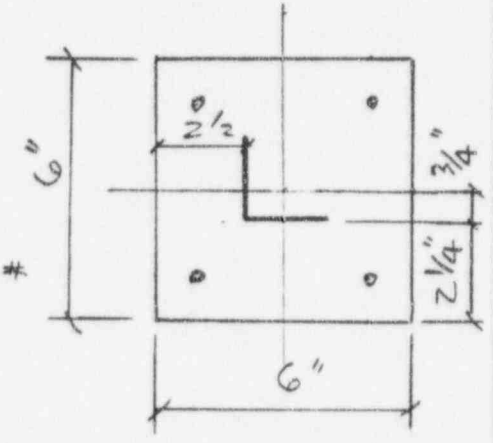
JOINT 10 :

$F_X = 25\ ^{\#}$

$F_Y = 1116\ ^{\#}$

$M_Z = 974\ ^{"\#} = 81\ ^{'\#}$

$F_Z = M_X = M_Y = 0$



REF

ABM-0510 SH. 6

BASE PL : 6 x 6 x 3/8

A.B. : 4 - 3/8" ϕ PHILLIPS ANCHOR

SUPPORT MEMBER : L 2 x 2 x 1/4

EVALUATION OF BASE PLATE BY USING BASE PLATE TENSION-MOMENT CHART C ZONE IV.

$$\text{BOLT TEN IR} = \frac{1116}{3660} + \frac{81}{630} = 0.43$$

$$\text{BOLT SHEAR IR} = 25/4 \times 650 = 0.009$$

$$IR = 0.44 < 1.0 \quad OK$$

PLATE STRESS IS WITHIN THE TENSION-MOMENT CHART IS OK

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PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
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	✓				
SHEET 199 OF 246				DATE	DATE
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6M-2850-H-60

BASE PLATE LOADS ARE LINEAR ADJUSTMENT OF H-59.

REF

STRING ANALYSIS OUTPUT 3/29/96

JOINT 1

DL + OBE (X+Y)

OBE RATIO OF $\left(\frac{H-60}{H-59}\right)$

$F_X = 140 \times 2.148 = 301^{\#}$

OBE X: $\frac{247}{115} = 2.148$

$F_Y = 160 \times .83 + 78 \times 0.34 + 874 \times 2.148$

$= 2043^{\#}$

OBE Y: $\frac{53}{156} = 0.340$

DL: $\frac{199}{240} = 0.83$

$M_Z = 3985 \times 2.148 = 8560^{''\#}$

$= 713^{'\#}$

SINCE THE LATERAL REACTION FOR SSE (205#) IS LESS THAN OBE (247#), THEREFORE THE OBE CASE GOVERNS

JOINT 10

DL + OBE (X+Y)

$F_X = 25 \times 2.148 = 54^{\#}$

$F_Y = 2043^{\#}$

$M_Z = 974 \times 2.148 = 2092^{''\#}$

$= 174^{'\#}$

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CC-HVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

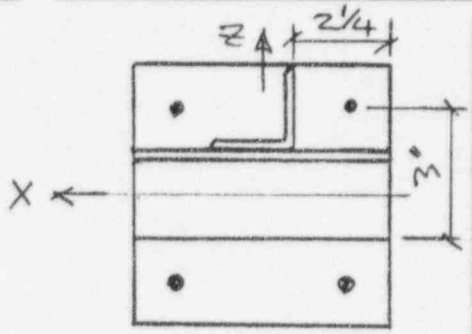
SUBJECT SUPPOR EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 4-9-96	DATE 5/21/96
	/				
SHEET 200 OF 246				DATE	DATE
JO 76230.502					

H-60 : CONT

JOINT 1

BASE PLATE 'B'



REF

DCN-10891
REV A
SH. 2

BASE PLATE : $6 \times 6 \times 3/8$
A.B. : $4 - 3/8''\phi$ PHILLIPS ANCHORS
SUPPORT MEMBER : $L\ 2 \times 2 \times 1/4$

DL+OBE (X+Y)
@ C.G. OF SUPPORT MEMBER

$F_x = 301\ \#$
$F_y = 2043\ \#$
$M_z = 8560\ ''\#$

REACTIONS @ ℓ OF BASE PLATE :

$F_x = 301\ \#$
$F_y = 2043\ \#$
$M_z = 8560 - 2043 \times (3.0 - 2.25 - 0.592) = 8237\ ''\#$
$M_y = 301 \times (1 + 0.592) = 479\ ''\#$
$M_x = 2068 \times 1.592 = 3292\ ''\#$

BOLT TENSION, $T = \frac{2043}{4} + \frac{8237}{2 \times 5} + \frac{3292}{2 \times 3} = 1883\ \# > 1240$

NG

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DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
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	✓				
SHEET 201 OF 246				DATE	DATE
JO 76230.502					

H-60 : CONT

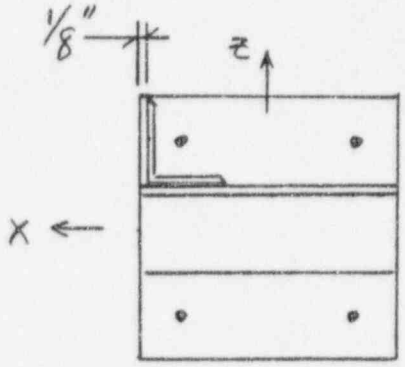
JOINT 10

BASE PL 'A'

BASE PL : 6x6x 3/8

A.B. : 4 - 3/8" ϕ PHILLIPS ANCHORS

SUPP. MEMBER : L2x2x1/4



REF.

DCN-10891
REV A
SH 2

DL+OBE (X+Y)

REACTIONS @ C.G. OF SUPP. MEMBER

$F_x = 54$ #

$F_y = 2043$ #

$M_z = 2092$ "#

REACTIONS @ ℄ OF BASE PLATE :

$F_x = 54$ #

$F_y = 2068$ #

$M_z = 2092 - 2043 \times (3 - 0.125 - 0.592) = -2572$ "#

$M_x = 2043 \times (1 + 0.592) = 3252$ "#

$M_y = 54 \times 1.592 = 86$ "#

BOLT TEN. $T = \frac{2043}{4} + \frac{2572}{2 \times 5} + \frac{3252}{2 \times 3} = 1310.7 > 1240$ # NG

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DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-Z

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
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	✓				
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J0762 30.502					

REF

EVALUATION OF BASE PLATES BASED ON MOD. STRING ANALY. OUTPUTS

6M-2850-H-60 (CONT'D)

SUPPORT LOADS

D.L : VERT (Y) = 199 #

LAT (X) = 0

STRING ANALYSIS OUTPUT 4/22/96

OBE : VERT (Y) = 52 #

LAT (X) = 84

SSE : VERT (Y) = 53 #

LAT (X) = 99 # | GOVERNS

BASE PLATE JOINT REACTIONS ARE CALCULATED BASED ON LINEAR ADJUSTMENT OF H-59 FORCES & MOMENTS

$$\text{DL RATIO} = \frac{199}{240} = 0.83$$

$$\text{SEISMIC VERT (Y) RATIO} = \frac{53}{156} = 0.340$$

$$\text{LAT (X) RATIO} = \frac{99}{115} = 0.861$$

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DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

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DC-5766					
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	✓				
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REF

GM-2850-H-60 : CONT.

JOINT #1 CONTROLLING JOINT

DL + SSE (X+Y)

$F_X = 140 \times 0.861 = 121$ #

$F_Y = 160 \times 0.83 + 78 \times 0.340 + 874 \times 0.861 = 912$ #

$M_Z = 3985 \times 0.861 = 3431$ "# $= 286$ '#

CHART 'A' ZONE IV

$IR = \frac{912}{1300} + \frac{286}{314} = 1.61 > 1.0$ NG

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DECO FERMI 2

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PROJECT STRUCTURAL QUALIFICATION SUPPORT EVALUATION FOR

SUBJECT SYSTEM 2850-2

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	ETW DATE 5/17/96	GPC DATE 5/22/96
	✓				
SHEET 204 OF 246				DATE	DATE
JO 76230.502					

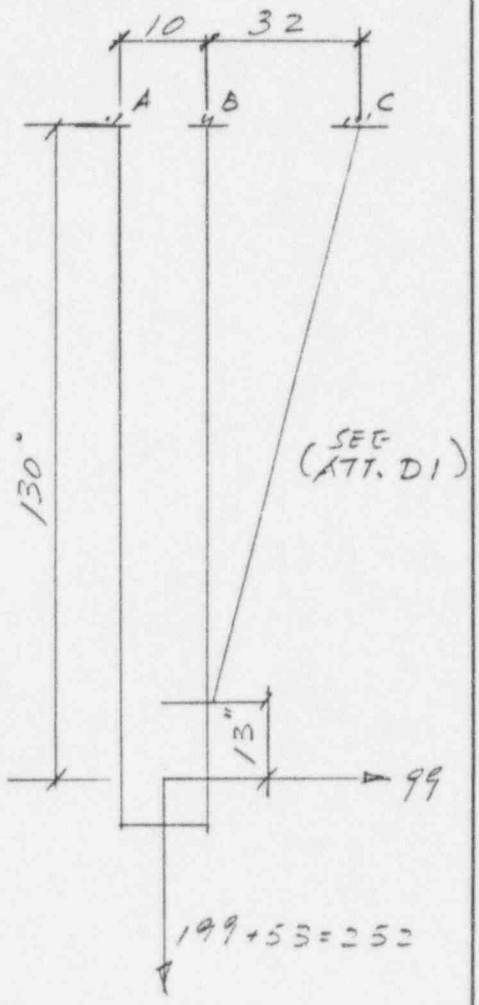
H-60 (MODIFIED)

TENSION ON VERTICAL MEMBER

$$\frac{99 \times 130 + 252 \times 37}{32} = 693 \text{ lb}$$

TENSION ON BRACING

$$\frac{99 \times 130 + 252 \times 5}{5 + 32} = 382 \text{ lb}$$



FOR BASE PLATES A & B SINCE THE TENSION ON BASE PLATE IS SMALLER THAN THE ALLOWABLE FOR A SINGLE $\frac{3}{8}$"ϕ PHILLIPS ANCHOR (1240 lb/INCH). THEREFORE, PLATES A & B ARE ADEQUATE SHEAR IS NEGLIGIBLE.

BASE PLATE AT C IS $10 \times 10 \times \frac{3}{4}$ WITH * 4 $\frac{1}{2}$"d HKB II HILTI BOLTS. THIS PLATE IS ADEQUATE SINCE THE TENSION AT BASE PLATE IS SMALLER THAN THE ALLOWABLE OF A SINGLE HILTI BOLT. (2625 lb/BOLT)

* FROM DECO SPEC 3071-226 REV J, APPENDIX C

* 2 GATEWAY INSERTS AND 2 $\frac{1}{2}$"ϕ HKB II IS USED IN LIEU OF 4 $\frac{1}{2}$"ϕ HKB II.

GATE WAY INSERT ALLOWABLE IS 3000#/LFT ∴ IS ACCEPTABLE CEA. 6/1/96

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DECO FERMI 2

CC-HVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

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	✓				
SHEET 205 OF 246				DATE	DATE
JO 76230.502					

6M-2850-H-61

REF

STRING ANALYSIS OUTPUT 3/29/96

BASE PLATE LOADS ARE CALCULATED BY LINEAR ADJUSTMENT OF H-59 !

JOINT 1

DL + OBE (X+Y)

OBE RATIO OF ($\frac{H\text{-}61}{H\text{-}59}$)

$F_x = 140^{\#} \times 3.452 = 483^{\#}$

OBE X : $\frac{397}{115} = 3.452$

$F_y = 164 \times .73 + 78 \times 0.288 + 874 \times 3.452$

$= 3159^{\#}$

OBE Y : $\frac{45^{\#}}{156} = 0.288$

DL : $\frac{175}{240} = 0.73$

$M_z = 3985 \times 3.452 = 13{,}756^{''\#}$

$= 1146^{'\#}$

DL + SSE (X+Y)

SINCE THE LATERAL REACTION FORCE FOR SSE ($327^{\#}$) IS LESS THAN OBE ($397^{\#}$), THEREFORE THE OBE CASE GOVERNS.

JOINT 10

DL + OBE (X+Y)

$F_x = 25 \times 3.452 = 86^{\#}$

$F_y = 3159^{\#}$

$M_z = 974 \times 3.452 = 3362^{''\#}$

SINCE THE LATERAL REACTION FOR SSE IS LESS THAN OBE THEREFORE THE OBE CASE GOVERNS

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DC-5766					
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	✓				
SHEET 206 OF 246				DATE	DATE
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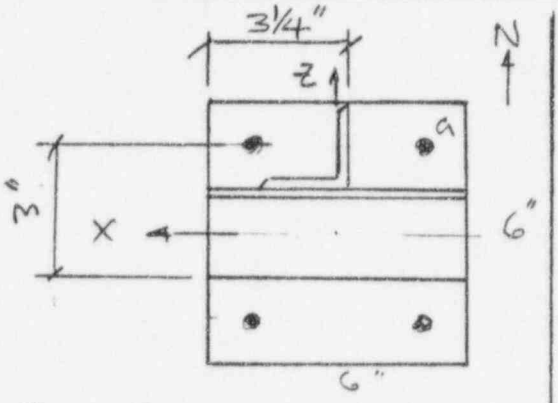
H-61 : CONT.

JOINT 1

PLATE 'B'



BASE PL : 6 × 6 × 3/8"

A.B. : 1-½" ϕ WEDGE BOLT & 3-⅜" ϕ PHILLIP ANCHORS

SUPPORT MEMBER : L 2×2×¼

REF

DCN-10890 REV 'B'

DL+OP (X+Y) :

$F_X = 483$ #

$F_Y = 3159$ #

$M_Z = 13756$ "#

$= 1146$ '#

REACTIONS @ C.G OF SUPPORT MEMBER

REACTIONS @ ℄ OF BASE PLATE :

$F_X = 483$ #

$F_Y = 3159$ #

$M_Z = 3159 \times (0.592" - 0.25) + 13756 = 14836$ "#

$M_X = 3159 \times (0.592 + 1.0) = 5029$ "#

$M_y = 483 \times (0.592 + 1.0) = 769$ "#

BOLT TENSION $T_a = \frac{3159}{4} + \frac{5029}{2 \times 3} + \frac{14836}{2 \times 5} = 3111$ #

> 1240 # NG

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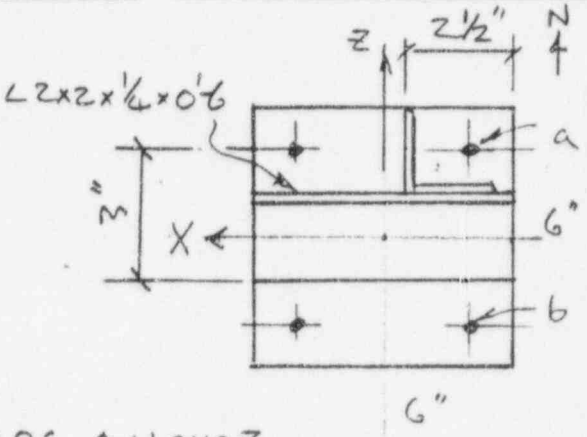
PRELIM.	FINAL	VOID	0	GPS DATE 4-9-96	KTW. DATE 5/21/96
	✓				
SHEET 207 OF 246				DATE	DATE
JO 76230.502					

H-61 : CONT.



REF

DCN-10890 REV "B"

JOINT 10

PLATE 'A' :

BASE PL : 6 x 6 x 3/8"

A.B. : 4 - 3/8" ϕ PHILLIPS ANCHOR

SUPPORT MEMBER : L2x2x¼

DL + OBE (X+Y)

$F_x = 86^{\#}$

$F_y = 3204^{\#}$

$M_z = 3362^{"\#} = 280^{'\#}$

REACTIONS @ C.G. OF SUPPORT MEMBER

REACTION @ ℄ OF BASE PLATE :

$F_x = 86$

$F_y = 3204^{\#}$

$M_x = 3204 \times (0.592" + 1") = 5101^{"\#}$

$M_z = 3204 \times (0.592 + 0.5) + 3362 = 6861^{"\#}$

$M_y = 86 \times 1.592 = 137^{"\#}$

BOLT TENSION, $T_a = \frac{3204}{4} + \frac{5101}{2 \times 3} + \frac{6861}{2 \times 5} = 2337^{\#}$

> 1240 NG

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CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 5-4-96	DATE 5/2/96
	✓				
SHEET 208 OF 246				DATE	DATE
JO 76230.502					

REF

GM-2850-H-61 : CONT.

BASE PLATE LOADS ARE BASED ON MODIFIED STRING ANALYSIS OUTPUT (4/22/96)

JOINT # 1 :

DCN-10891 REV A SH. 2

D L + SSE :

$F_X = 140^{\#} \times \left(\frac{97}{115}\right) = 118^{\#}$

$F_Y = 160 \times \left(\frac{175}{240}\right) + 78 \times \left(\frac{39}{156}\right) + 874 \times \left(\frac{97}{115}\right) = 873^{\#}$

$M_Z = 3985 \times \left(\frac{97}{115}\right) = 3361^{"\#} = 280^{'\#}$

STRING ANALYSIS OUTPUT 4/22/96

USE T-M CAPACITY CHART C ZONE IV

$IR = \frac{873}{2110} + \frac{280}{420} = 1.08 > 1.0$ NG

GM-2850-H-63 & H-64

BASE PLS. FAIL BY COMPARISON

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CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT Support Evaluation for System 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	KTW DATE 5/17/96	GFS DATE 5/22/96
	✓				
SHEET 209 OF 246				DATE	DATE
JO 76230.502					

H-61 (MODIFIED)

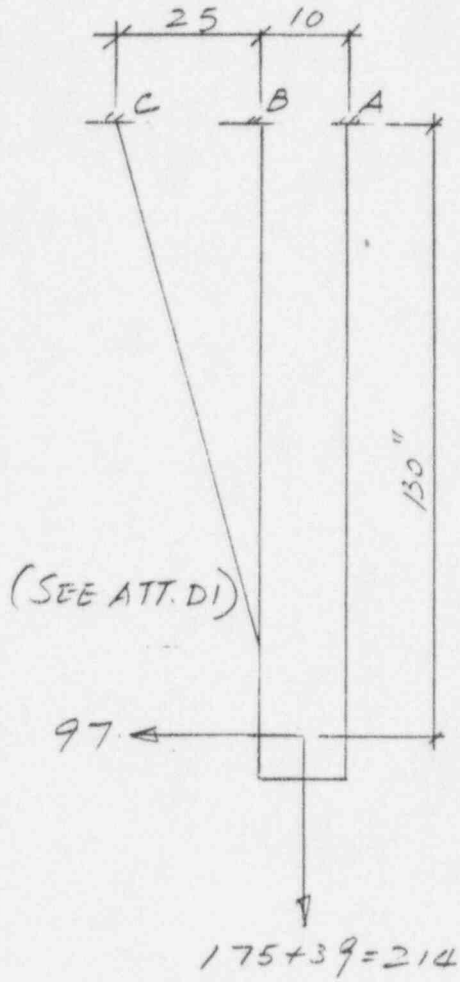
TENSION ON VERTICAL MEMBER

$$\frac{97 \times 130 + 214 \times 30}{25} = 760 \text{ lb}$$

TENSION ON BRACING

$$\frac{97 \times 130 + 214 \times 5}{30} = 456 \text{ lb}$$

THE BASE PLATES ARE ADEQUATE BY THE SAME JUSTIFICATION FOR H-60



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PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	KTW DATE 5/10/96	DFS DATE 5/10/96
	✓				
SHEET 210 OF 246				DATE	DATE
JO 76230.502					

6M-2850-H-62

DL+SSE (JT. 1. PLATE A AS PER ABM-0510)

$F_x = 140 \times \frac{116}{115} = 141\ ^{\#}$

$F_y = 160 \times \left(\frac{215}{240}\right) + 78 \times \left(\frac{53}{156}\right) + 874 \times \left(\frac{116}{115}\right) = 1051\ ^{\#}$

$M_z = 3985 \times \left(\frac{116}{115}\right) = 4020\ ^{''-\#} = 335\ ^{'-\#}$

THE AVERAGE VALUES OF BASE PLATE CHART B & C, ZONE IV ARE USED FOR EVALUATION

$$IR = \left(\frac{1051}{\frac{2110+3660}{2}}\right)^{4/3} + \left(\frac{335}{\frac{420+631}{2}}\right)^{4/3} = 0.81 < 1.0 \quad \text{O.K.}$$

SHEAR IS NEGLIGIBLE

JT. 10 PLATE B AS PER ABM-0510

$F_x = 141\ ^{\#}$

$F_y = 1051\ ^{\#}$

$M_z = 974 \times \left(\frac{116}{115}\right) = 982\ ^{''-\#} = 81\ ^{'-\#}$

PLATE B IS BOUNDED BY PLATE A. THEREFORE BOTH PLATES AND ANCHOR BOLTS ARE ADEQUATE.

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GENERAL COMPUTATION SHEET

DECO FERMI 2

PROJECT CCHVAC: DUCT & DUCT SUPPORTS STRUCTURAL QUALIFICATION

SUBJECT SYSTEM 2850-2

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	ETW DATE 5/10/96	JPS DATE 5/22/96
	✓				
SHEET 211 OF 246				DATE	DATE
JO 76230.502					

6M-2850-H-63 & 6M-2850-H-64

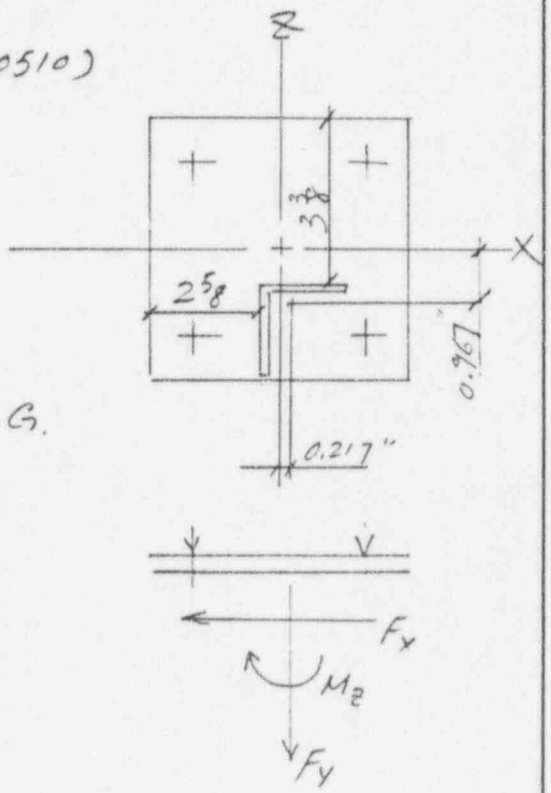
USE THE BASE PLATE LOADS FROM H-62 SINCE THE SUPPORT LOADS OF H-63 & H-64 ARE ENVELOPED BY THAT OF H-62

JT. 1 (PLATE B; H-63, SEE ABM-0510)

$F_x = 141$ #
$F_y = 1051$ #
$M_z = 4020$ "-# = 335'-#

USE BASE PLATE CHART C, ZONE III,

$IR = \frac{1051}{2110} + \frac{335}{420} = 1.30 > 1.0$ N.G.



Form 5007 (Rev. 4/93)

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO			REV	COMP BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	ETW DATE 5/17/96	DATE 5/22/96
	✓				
SHEET 212 OF 246				DATE	DATE
JO 76230.502					

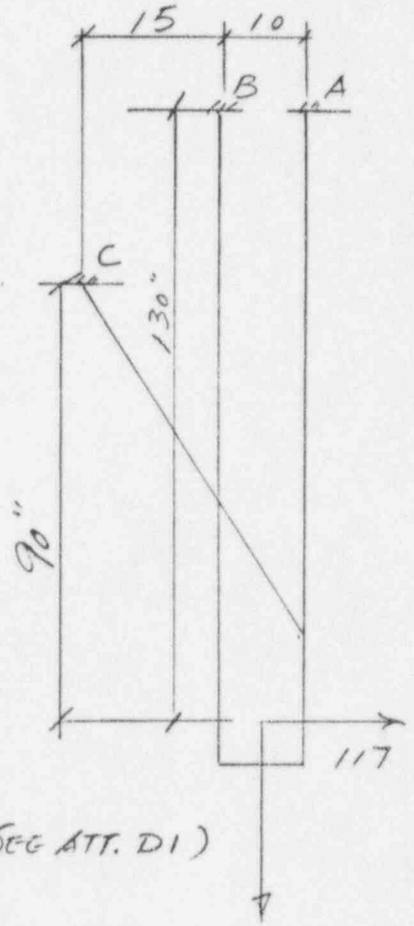
H-63 (MODIFIED)

TENSION ON VERTICAL MEMBER

$$\frac{117 \times 90 + 216 \times 20}{32} = 693 \text{ lb}$$

TENSION ON BRACING

$$\frac{117 \times 130 + 216 \times 5}{20} = 815 \text{ lb}$$



(SEE ATT. D1)

SINCE THE TENSION ON BASE PLATES A & B IS SMALLER THAN THE ALLOWABLE FOR A SINGLE $\frac{3}{8}$"Ø PHILLIPS ANCHOR (1240 lb/ANCH). THEREFORE, PLATES A & B ARE ADEQUATE SHEAR IS NEGLIGIBLE.

BASE PLATE AT C IS

8 × 5 × $\frac{3}{4}$ WITH 2 - $\frac{1}{2}$"Ø HKB II HILTI BOLTS

TOTAL TENSION = 815 lb < 2625 lb/BOLT O.K.

$$\text{PLATE STRESS} = \frac{815 \times 2.5}{5 \times \frac{0.75^2}{6}} = 4,347 \text{ psi} < 27,000 \text{ psi}$$ O.K.

SHEAR IS NEGLIGIBLE.
BASE PLATE AT C IS ADEQUATE.

BOLT SPACING VIOLATION IS NOTED FOR BASE PLATE AT C.

ACTUAL SPACING = $(3^2 + 2.5^2)^{1/2} = 3.91" < 6"$ (REQ'D)

REDUCED ALLOW. TEN = $2625 \times \left(\frac{3.91}{6}\right) = 1711^{\#}$ DECO SPEC 3071-226 REV J PAGE 8

$> 815^{\#}$

THIS SPACING VIOLATION IS ACCEPTABL

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	KTW DATE 5/17/96	QPS DATE 5/22/96
	✓				
SHEET 213 OF 246				DATE	DATE
J0762230.502					

H-64 (MODIFIED) SEE ATT. D1

H-64 SUPPORT HAS SIMILAR SUPPORT CONFIGURATION TO THAT OF H-63. THE LOADS ON H-64 IS SMALLER THAN THAT ON H-63. THE BASE PLAT FOR THE ADDED ANGLE ($10 \times 5 \times \frac{3}{4}$) IS SIMILAR TO THAT ON H-63. THEREFORE BASE PLATES FOR H-64 ARE ADEQUATE BY COMPARISON TO H-63

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DFS DATE 4-9-96	ETW DATE 5/2/96
	✓				
SHEET 214 OF 246				DATE	DATE
JO 76230.502					

6M-2850-H-68

REF

BASE PLATE LOADS ARE LINEAR ADJUSTMENT OF H-59

JOINT 1

DL RATIO: $\frac{266}{240} = 1.108$

DL + SSE

STRUT ANALYSIS OUTPUT 3/29/96

$F_x = 140 \times \frac{162}{115} = 197\ \#$

$F_y = 164 \times 1.108 + 78 \times \frac{58}{156} + 874 \times \frac{162}{115} = 1442\ \#$

$M_z = 3985 \times \frac{162}{115} = 5614\ "\# = 468'\#$

BASE PL: 8 x 8 x 1/2

A.B.: 4 - 3/8" ϕ PHILLIPS ANCHOR

TEN & MOMENT CAPACITIES

USE CHART B IN ZONE III

TEN. IR $= \frac{1442}{3730} + \frac{468}{955} = 0.88$

SHEAR IR $= \frac{197}{4 \times 690} = 0.07$

$IR = (0.87)^{5/3} + (0.07)^{5/3} = 0.80 < 1.0$ OK

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION SUPPORT EVALUATION FOR

SUBJECT SYSTEM 285D-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 4-9-96	DATE 5/21/96
	✓				
SHEET 215 OF 246				DATE	DATE
JO 76230.502					

REF

H-68 : CONT.

JOINT 10

DL + SSE

$F_x = 25 \times \left(\frac{162}{115}\right) = 35^{\#}$

$F_y = 1442^{\#}$

$M_z = 974 \times \left(\frac{162}{115}\right) = 1372^{"\#} = 114^{'\#}$

BASE PL : 8×8×½

A.B. : 4 – ⅜" Φ PHILLIPS

TEN & MOMENT CAPACITIES: ABM-0510 SH. 3

USE CHART C, ZONE III

BOLT TENSION :

$IR = \frac{1442}{2110} + \frac{114}{633} = 0.86 < 1.0$ OK

SHEAR IS NEGLIGIBLE

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GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DFS DATE 4-9-96	ETW. DATE 5/2/196
	✓				
SHEET 216 OF 246				DATE	DATE
JO 76230.502					

REF

6M-2850-H-72

STRING ANALYSIS OUTPUT 3/29/96

DL+SSE : LINEAR ADJUSTMENT OF H-59

JOINT 1

$F_x = 140 \times \left(\frac{147}{115}\right) = 180$ #

$F_y = 164 \times \left(\frac{113}{240}\right) + 78 \times \left(\frac{26}{156}\right) + 874 \times \left(\frac{147}{115}\right)\left(\frac{128.6''}{136.6}\right) = 1142$ #

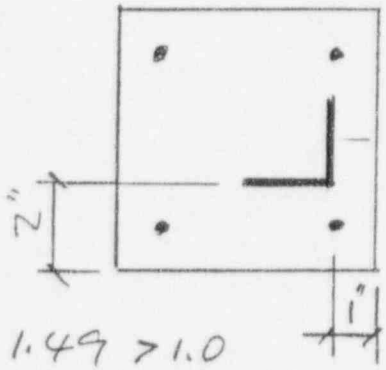
$M_z = 3985 \times \left(\frac{147}{115}\right)\left(\frac{128.6}{136.6}\right) = 4796''\text{-}\# = 400'\text{-}\#$

BASE PL 6×6×3/8

A.B. : 4-3/8" ϕ PHILLIPS

SUPPORT MEMBER : L2×2×1/4

ABM-0510 SH 19



FROM BASE PL TEN-M CAPACITY CHART C, ZONE IV

BOLT TEN IR = $\frac{1142}{2111} + \frac{400}{420} = 1.49 > 1.0$ NG

PER STRUDL RUN # 4/6/96, MAX. BOLT TENSION IS 846 # < 1240 # (ALLOWABLE), THEREFORE THIS BASE PLATE & ANCHOR BOLTS ARE OK

ATT. C1 STRUDL RUN OUTPUT # 4/6/96

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-2

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	DATE 4-9-96	DATE 5/21/96
	✓				
SHEET 217 OF 246				DATE	DATE
JO 76230.502					

H-72 CONT

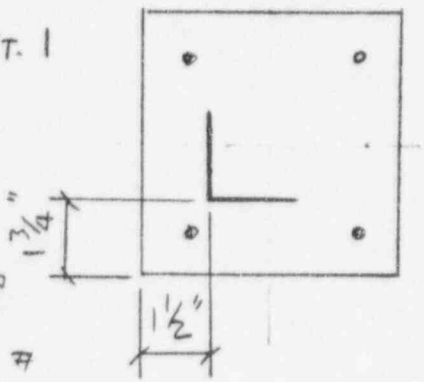
JOINT 10 B.P & A.B SAME AS JT. 1

$F_x = 25^{\#} \times \left(\frac{147}{115}\right) = 32^{\#}$

$F_y = 1142^{\#}$

$M_z = 974\left(\frac{147}{115}\right)\left(\frac{128.6}{136.6}\right) = 1172^{"\#}$

$= 98^{1\#}$



BASE PL TEN-M CAPACITY :

USE CHART C, ZONE IV

BOLT TEN IR = $\frac{1142}{2111} + \frac{98}{420} = 0.77 < 1.0$

SHEAR IS NEGLIGIBLE

PLATE STRESS IS WITHIN THE TEN-M CHART, OK

REF

ABM-0510 SH. 19

STRING ANALYSIS OUTPUT 3/29/96

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION

SUBJECT SUPPORT EVALUATION FOR SYSTEM 2850-4

CALCULATION SET NO: DC-5766 (PRELIM / FINAL ✓ / VOID)

SHEET 218 OF 246

JO 76230.502

REV	COMP BY	CHK'D BY
0	[illegible] DATE 4-12-96	[illegible] DATE 4/15/96
	DATE	DATE

SUPPORT MARK	JOINT NO.	BASE PL. SIZE	ANCHOR BOLT PHILLIPS	SUPPORT MEMBER	BASE PLATE LOADS TENSION (LBS)	MOMENT (FT-LBS)	SHEAR (LBS)	GOVERNING LOAD CASE	RESULT	REMARKS
GM-2850 H-50	1	C6×10.5	4-3/8" Φ	L2½×2½×¼	1443	210	163	DL+SSE	PASS	COMBINED BASE PLATE
	10	C6×10.5		L2½×2½×¼	-1227 (COMP)	76	23	DL+SSE		
GM-2850 H-51	1	C6×10.5	4-3/8" Φ	L2½×2½×¼					PASS	COMBINED BASE PLATE BOUNDED BY H-50
	10	C6×10.5		L2½×2½×¼						

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

DECO FERMI 2

CCHVAC DUCT & DUCT SUPPORTS

PROJECT STRUCTURAL QUALIFICATION SUPPORT EVALUATION FOR..

SUBJECT SYSTEM 2850-4

CALCULATION SET NO			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	AFS DATE 4-15-96	ETW DATE 4/16/96
	✓				
SHEET 219 OF 246				DATE	DATE
JO 76230.502					

REF

H-50

BASE PLATE EVALUATION

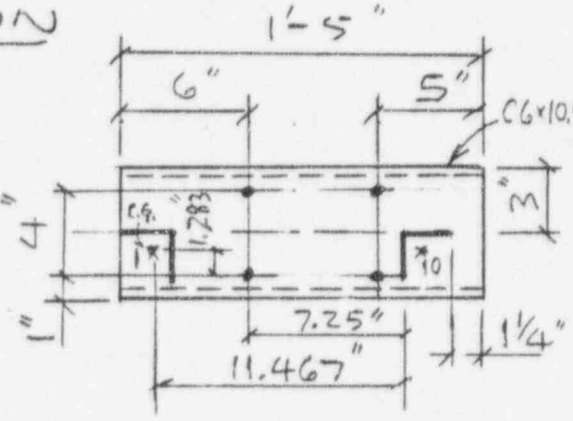
BASE PL : C 6x10.5

A.B. : 4 - 3/8" ϕ PHILLIPS

SUPPORT MEMBER : 2 - L2½x2½x¼

DL + SSE :

LOAD COMB #5



DC #2836 REV. A ATTACH 5 PAGE 10

DWG 6M-2850-50 R/0

STARDYNE RUN, 4/10/96 H-50 (ATT. B12)

JOINT #1 :

$F_x = 163^{\#}$

$F_y = 1443^{\#}$ TENSION

$M_z = 2520^{"\#} = 210^{'\#}$

JOINT #10 :

$F_x = 23^{\#}$

$F_y = 1227^{\#}$ COMPRESSION

$M_z = 910^{"\#} = 76^{'\#}$

$$\text{BOLT TENSION} = \left[1443 \times (11.467) + (2520 + 910)\right] / 2 \times 7.25" + \frac{1227 \times 0.717}{2 \times 7.25} + (1443 - 1227) \times (4 - 1.283) / 2 \times 4.0"$$

$$= 1378 + 60 + 73 = 1511^{\#} > 1240^{\#} \text{ NG}$$

USE STRUDL BASE PLATE COMPUTER PROGRAM

STRUDL RUN BASEPL 2850-H-50 BASE PLATE DATED 4/15/96 (ATT. C2)

BOLT I R = 0.97 < 1.0 OK

PLATE STRESS = 24.64 KSI < 27.0 KSI (ALLOW) OK

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Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC - 5766					
PRELIM	FINAL	VOID	0	ETW DATE 6/6/96	E.A DATE 6/6/96
	V				
SHEET 220 OF 246				DATE	DATE
JO 76230.502					

PROJECT DECO FERMI 2

SUBJECT CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION ~~SYSTEM~~ 2850-4

H-51

COMPARISON OF THE SUPPORT LOADS FOR H50 & H51 IS AS FOLLOWS:

	H50	H51	H51/H50
DL VERT	172	117	0.68
SSE VERT	44	24	0.58
SSE HORIZ.	185	129	0.70

USE RATIO 0.70 TO OBTAIN THE BOLT TENSION & SHEAR FOR H51

	H50	H51
TENSION	1209	846
SHEAR	44	31

MIN. SPACING BETWEEN $\frac{3}{8}$"ϕ PHILLIPS IS $3\frac{1}{2}$". MIN. SPACING FOR FULL CAPACITY OF THE ANCHOR IS 4". THEREFORE, THE ADJUSTED $\frac{3}{8}$"ϕ PHILLIP ANCHOR CAPACITIES ARE:

TENSION $1240 \times \frac{3.5}{4} = 1085$ lb

SHEAR $690 \times \frac{3.5}{4} = 604$ lb

IR FOR H51 ARE

TENSION $\frac{846}{1085} = 0.78$

SHEAR $\frac{31}{604} = 0.05$

$0.78 + 0.05 = 0.83 < 1.0$ O.K.

DETROIT EDISON

COMPUTATION SHEET

calculation number DC-5766 QA Catagory I

change document number EDP-28147 REV.0 Seismic Cat I

STRUCTURAL ATTACHMENT LOADING SCHEDULE

Support Number(s) GM-2850-H-73-A

Preparer J. SHIEH Date 5-22-96

Checker K.T.W. Date 5/23/96

JOINT NO.	SUPPORT REACTIONS X GLOBAL __LOCAL **						LOAD COND *
	Fx lbs	Fy lbs	Fz lbs	Mx ft-lbs	My ft-lbs	Mz ft-lbs	
14	648	1514	0	0	0	5	DL+SSE

* Load Condition

** Local Coordinate System

SEE NEXT SHEET FOR GLOBAL COORDINATION.

DC-5766

EDP CONTINUATION SHEET SHEET 222 OF 246

DWG TO BE REVISED
10-4221-000-GM-2850-73-A

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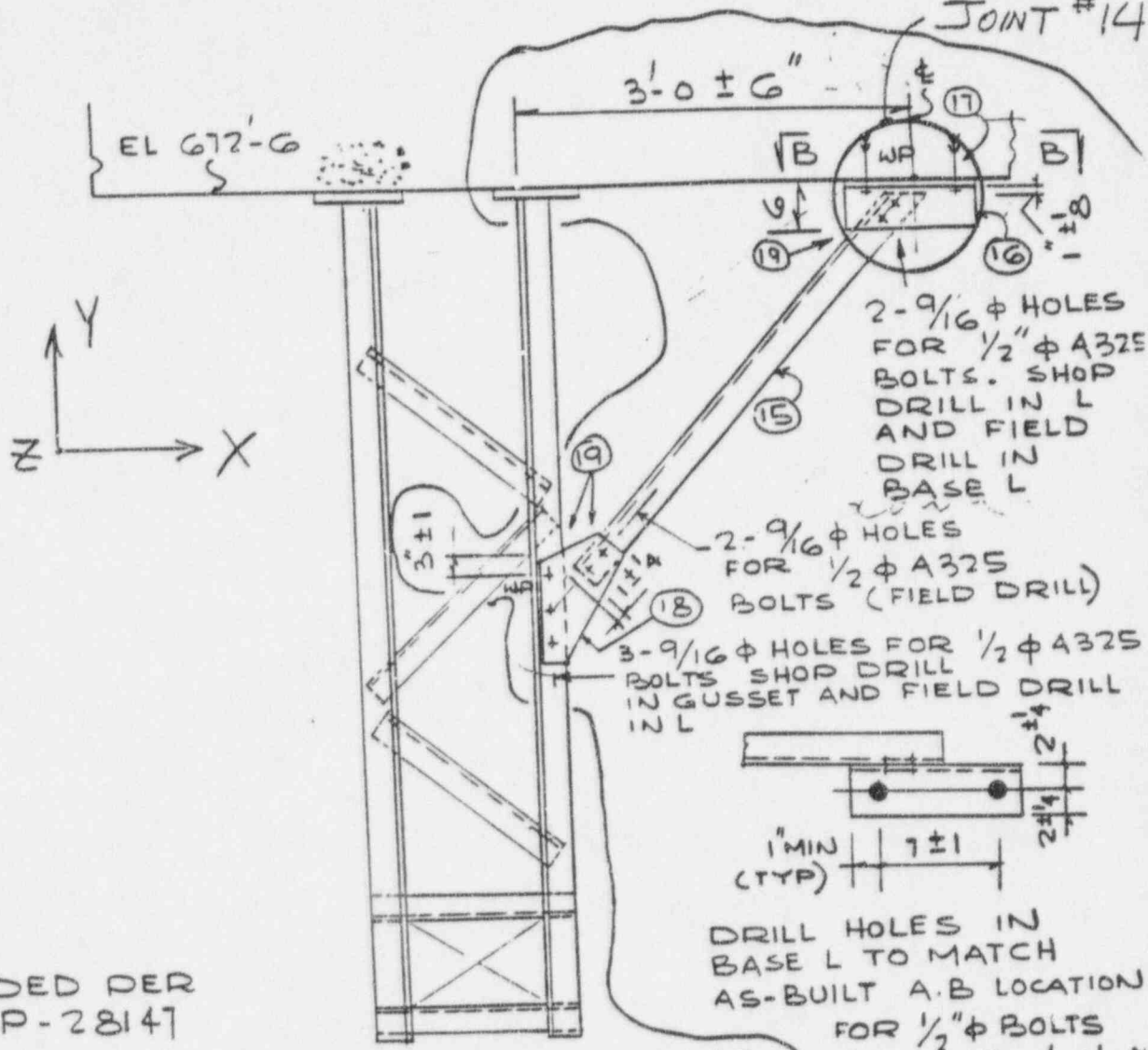
JOINT #14



PARTIAL ELEV LOOKING SOUTH
HGR. MK GM-2850-H-73

ADDED PER EDP-28147

PREPARED BY: K T W/a 5/23/96
CHECKED BY: E. MAY 5/24/96

DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION

TYPE OF SUPPORT RIGID HANGER & RESTRAINT (X)

BILL OF MATERIALS

QTY	ITEM	DESCRIPTION
1	15	L 4x4x1/4 x 5'-0 (CUT TO FIT)
1	16	L 6x4x1/2 x 0'-10" W/ 2-9/16 ϕ HOLES
2	17	1/2 ϕ HKB II HILTI BOLTS
1	18	3/8 GUSSET PL (CUT TO FIT)
7	19	1/2 ϕ A-325 HS BOLTS W/ NUT & WASHER

SIGNATURES

A) Prepared By	B) Checked By
Sign / Date	Sign / Date

DTC: TPMMES DSN: MES19004 Rev. 0 P1/1 File:1703.22 Date: - Recip:____
DTC: TCEDP DSN: _____ Rev:_____ File: 1801 IP: I Date:_____ Recip:____

DETROIT EDISON

COMPUTATION SHEET

calculation number DC-5766 QA Catagory I

change document number EDP-28147 REV 0 Seismic Cat I

STRUCTURAL ATTACHMENT LOADING SCHEDULE

Support Number(s) GM-2850H-77

Preparer J. SHIEH Date 5-22-96

Checker K.T. Wu Date 5/23/96

JOINT NO.	SUPPORT REACTIONS X GLOBAL __ LOCAL **						LOAD COND *
	Fx lbs	Fy lbs	Fz lbs	Mx ft-lbs	My ft-lbs	Mz ft-lbs	
15	939	859	0	0	0	31	DL+SSE

* Load Condition

** Local Coordinate System

SEE NEXT SHEET FOR GLOBAL COORDINATION.

DC-5766

EDP CONTINUATION SHEET SHEET 224 OF 246

DWG TO BE REVISED
10-4221-000-GM-2850-77

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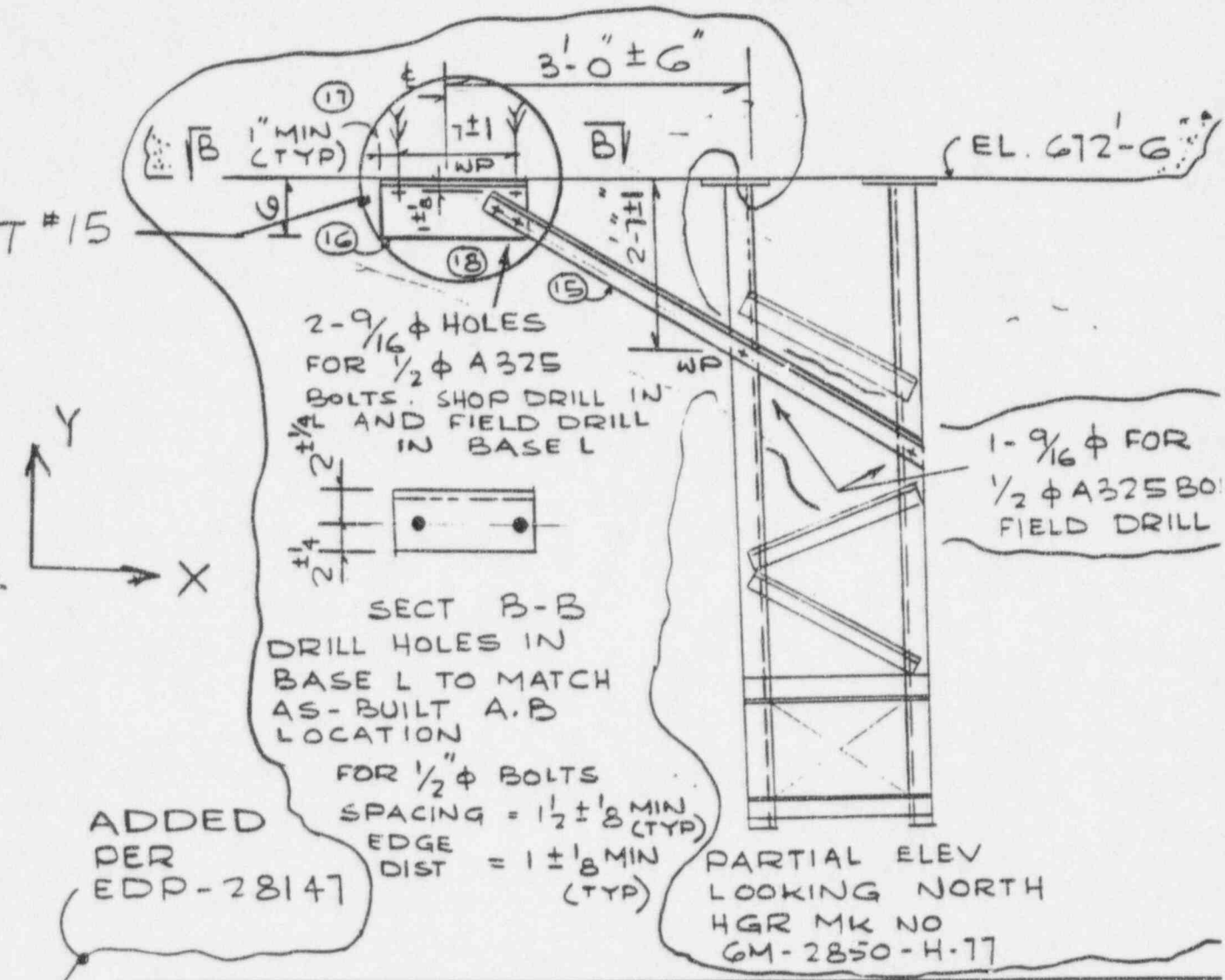

Prepared By: K T W/.. 5/23/96
Checked By: E. ATAY 5/24/96

DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION

TYPE OF SUPPORT: RIGID HANGER RESTRAINT (X)

BILL OF MATERIALS	QTY	ITEM	DESCRIPTION
	1	15	L 4x4x1/4 x 7'-8 (CUT TO FIT)
	1	16	L 6x4x1/2 x 10" W/2-9/16 ϕ HOLES
	2	17	1/2 ϕ HKB II HILTI BOLTS
	4	18	1/2 ϕ A325 BOLTS W/NUT & WASHER

SIGNATURES	
A) Prepared By Sign Date	B) Checked By Sign Date

DTC: TPMMES DSN: MES19004 Rev. 0 P1/1 File:1703.22 Date: - Recip:_____
DTC: TCEDP DSN: _____ Rev:_____ File: 1801 IP: I Date:_____ Recip:_____

DETROIT EDISON

COMPUTATION SHEET

calculation number DC-5766 QA Catagory I

change document number EDP-28147 REV 0 Seismic Cat I

STRUCTURAL ATTACHMENT LOADING SCHEDULE

Support Number(s) GM-2850-H-74-A

Preparer J. SHIEH Date 5-22-96

Checker K T Wu Date 5/23/96

JOINT NO.	SUPPORT REACTIONS X GLOBAL __ LOCAL **						LOAD COND *
	Fx lbs	Fy lbs	Fz lbs	Mx ft-lbs	My ft-lbs	Mz ft-lbs	
C	391	0	0	0	0	0	DL+SSE

* Load Condition

** Local Coordinate System

SEE NEXT SHEET FOR GLOBAL COORDINATION.

DC-5766

EDP CONTINUATION SHEET

DWG TO BE REVISED
10-4221-000-6M-2850-74 A

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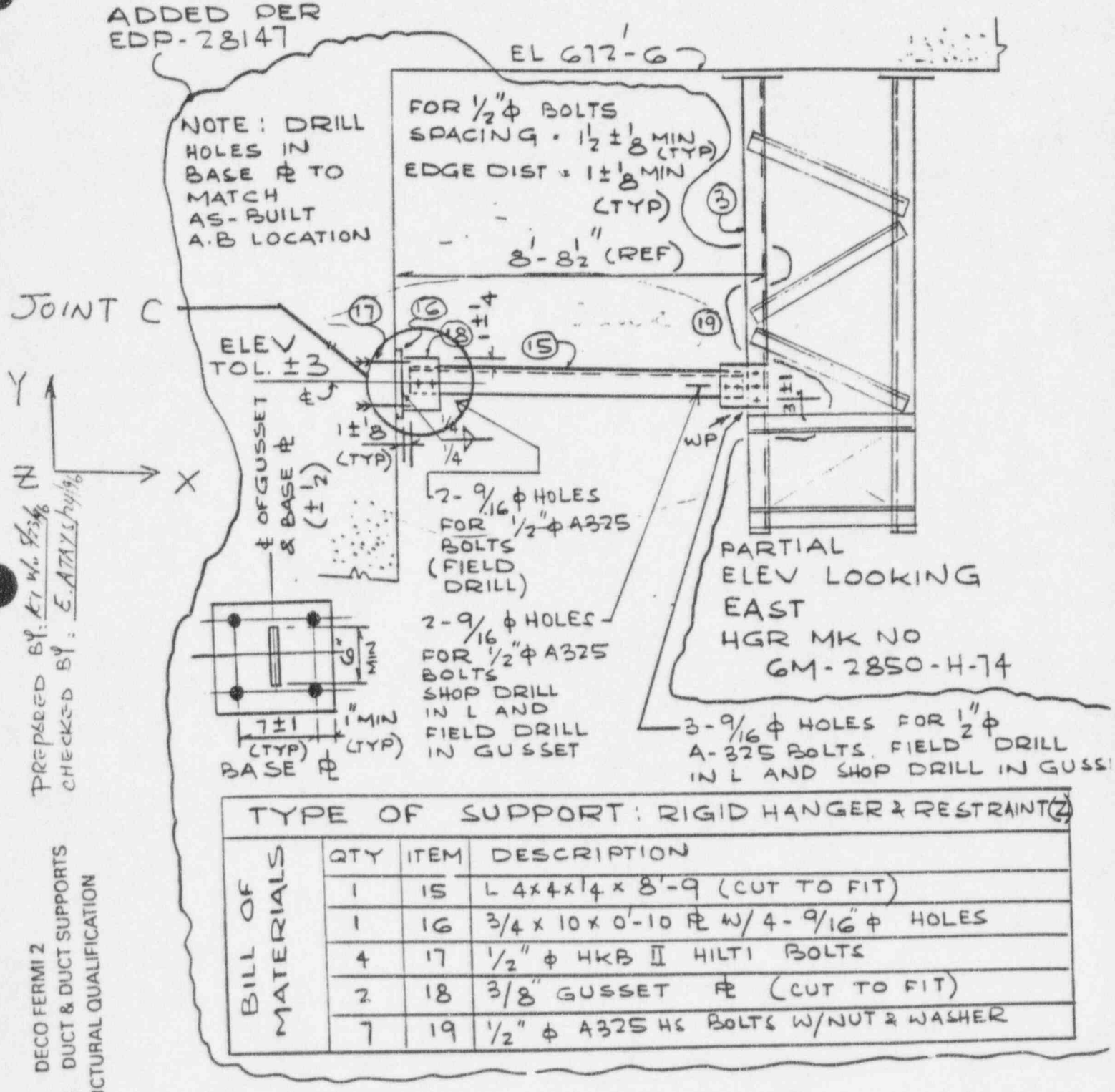
ADDED PER EDP-28147



TYPE OF SUPPORT: RIGID HANGER & RESTRAINT (2)

BILL OF MATERIALS

QTY	ITEM	DESCRIPTION
1	15	L 4x4x1/4 x 8'-9 (CUT TO FIT)
1	16	3/4 x 10 x 0'-10 PL W/ 4-9/16" ϕ HOLES
4	17	1/2" ϕ HKB II HILTI BOLTS
2	18	3/8" GUSSET PL (CUT TO FIT)
7	19	1/2" ϕ A325 HS BOLTS W/NUT & WASHER

PREPARED BY: K. W. Smith
CHECKED BY: E. ATALLAH

DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION

SIGNATURES	
A) Prepared By Sign Date	B) Checked By Sign Date

DTC: TPMMES DSN: MES19004 Rev. 0 P1/1 File:1703.22 Date: - Recip:_____
DTC: TCEDP DSN: _____ Rev:_____ File: 1801 IP: I Date:_____ Recip:_____

DETROIT EDISON

COMPUTATION SHEET

calculation number DC-5766 QA Catagory I

change document number EDP-28147, REV 0 Seismic Cat I

STRUCTURAL ATTACHMENT LOADING SCHEDULE

Support Number(s) 6M-2850-H-76

Preparer J. SHIEH Date 5-22-96

Checker K. T. WU Date 5/23/96

JOINT NO.	SUPPORT REACTIONS X GLOBAL __ LOCAL **						LOAD COND *
	Fx lbs	Fy lbs	Fz lbs	Mx ft-lbs	My ft-lbs	Mz ft-lbs	
C	409	0	0	0	0	0	DL+SSE

* Load Condition

** Local Coordinate System

SEE NEXT SHEET FOR GLOBAL COORDINATION.

DC-5766

EDP CONTINUATION SHEET SHEET 228 OF 246

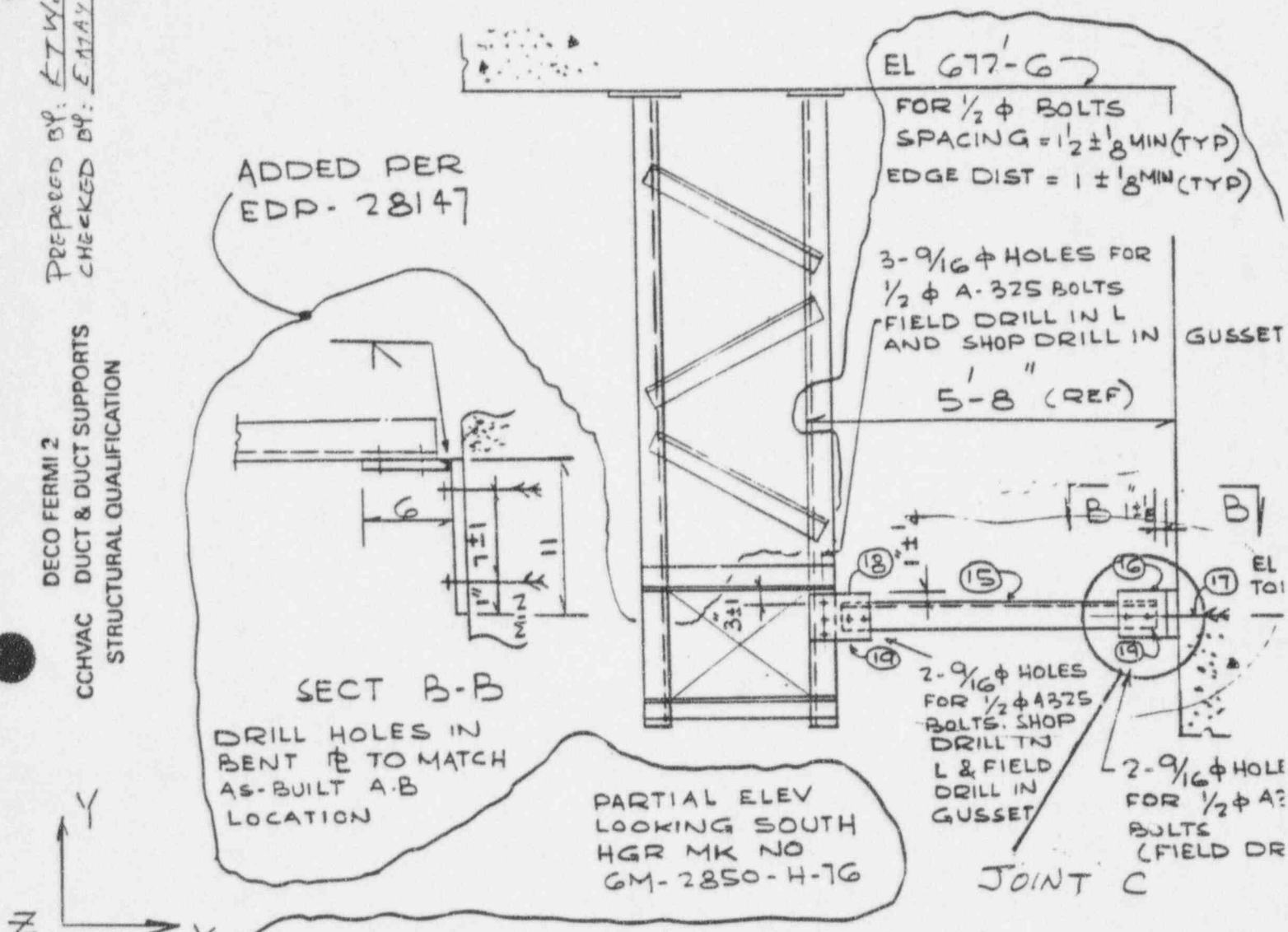
DWG TO BE REVISED

10-4221-000-6M-2850-76

EDP - 28147	Rev. 0
Index Item No. 17	Page

PREPARED BY: ETW 5/31/96
CHECKED BY: EMAY 5/10/96

DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION



TYPE OF SUPPORT: RIGID HANGER & RESTRAINT X

BILL OF MATERIALS

QTY	ITEM	DESCRIPTION
1	15	L 3x3x1/4 x 5'-10 (CUT TO FIT)
1	16	BUILT UP ANGLE 11x6x3/4 x 0'-5 LONG W/ 2-9/16 ϕ HOLES
2	17	1/2 ϕ HKB II HILTI BOLTS
1	18	3/8 THK GUSSET ℄
7	19	1/2" ϕ A325 HS BOLTS W/ NUT & WASHER

SIGNATURES	
A) Prepared By Sign Date	B) Checked By Sign Date

DTC: TPMMES DSN: MES19004 Rev. 0 P1/1 File:1703.22 Date:- Recip:_____
DTC: TCEDP DSN: _____ Rev:_____ File: 1801 IP: I Date:_____ Recip:_____

DETROIT EDISON

COMPUTATION SHEET

calculation number DC-5766 QA Catagory I

change document number EDP-28147 REV 0 Seismic Cat I

STRUCTURAL ATTACHMENT LOADING SCHEDULE

Support Number(s) 6M-2850-H-60

Preparer J. SHILZH Date 5-22-96

Checker K T Vu Date 5/24/96

JOINT NO.	SUPPORT REACTIONS X GLOBAL __LOCAL **						LOAD COND *
	Fx lbs	Fy lbs	Fz lbs	Mx ft-lbs	My ft-lbs	Mz ft-lbs	
C	99	382	0	0	0	0	DL+SSE

* Load Condition _____

** Local Coordinate System

SEE NEXT SHEET FOR GLOBAL COORDINATION.

DC-5766

DWG TO BE REVISED
10-4721-000-6M-2850-60

EDP CONTINUATION SHEET

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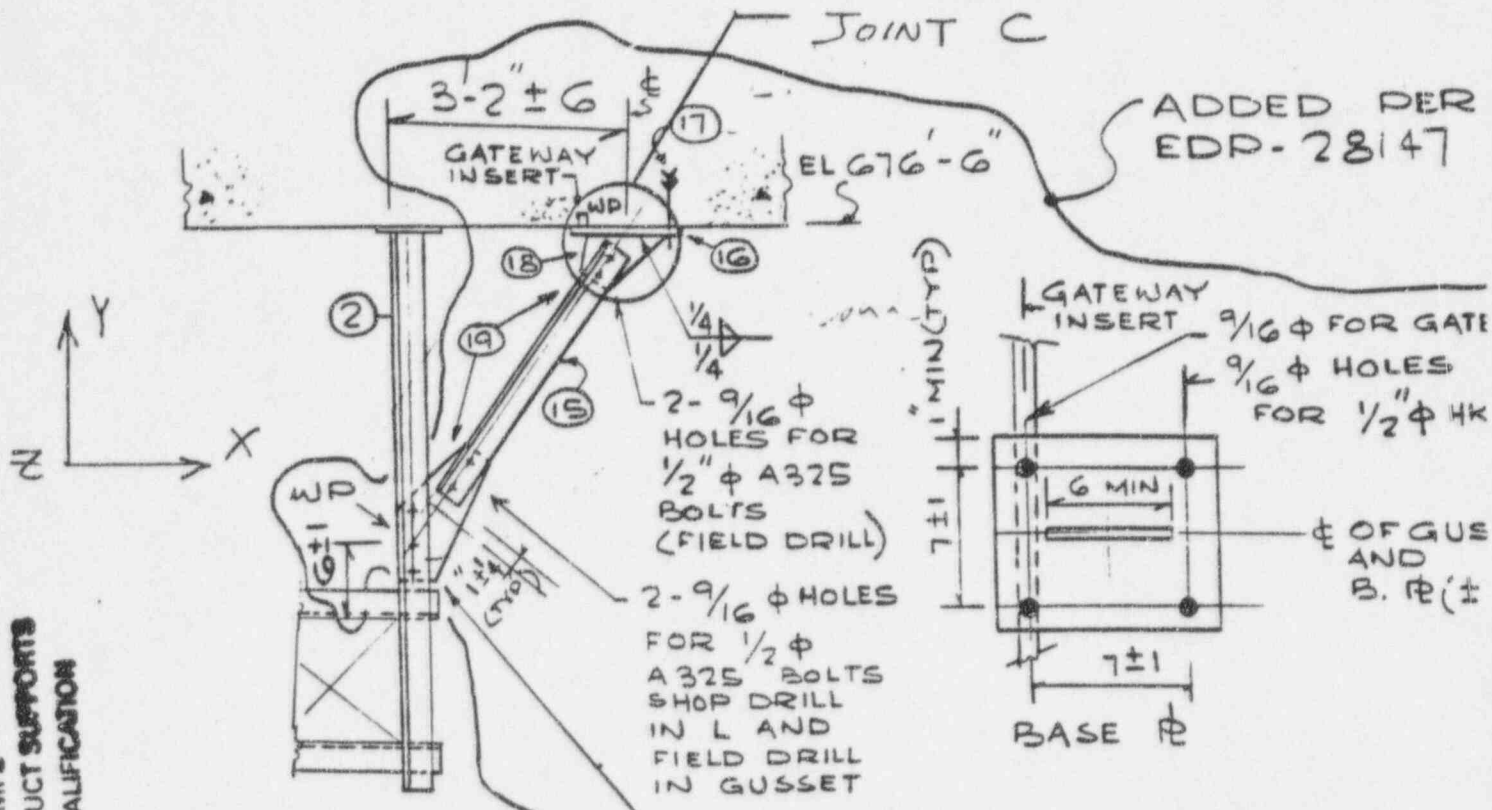

PARTIAL ELEV
LOOKING SOUTH
HGR MK NO
6M 2850-H-60

DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION

NOTE: DRILL HOLES IN BASE ℄ TO MATCH A.B AS-BUILT LOCATION.
BOLT SPACING FOR 1/2"ϕ BOLT = 1 1/2" ± 1/8" MIN (TYP)
EDGE DIST. FOR 1/2ϕ BOLT = 1"±1/8" MIN (TYP)

TYPE OF SUPPORT X · RESTRAINT & HANGER

BILL OF MATERIALS

QTY	ITEM	DESCRIPTION
1	15	L 4x4x1/4 x 10'-4 (CUT TO FIT)
1	16	3/4 x 10 x 0'-10" ℄ W/ 4 - 9/16 ϕ HOLES
2	17	1/2" ϕ HKB II HILTI BOLTS
2	18	3/8" THK GUSSET ℄ (CUT TO FIT)
7	19	1/2" ϕ A325 HS BOLTS W/ NUT & WASHER
2	20	1/2" ϕ BOLT ASSEMBLY FOR GATEWAY INSERT

Prepared by: K T W 5/30/96
Checked by: E. ATAY 5/24/96

SIGNATURES	
A) Prepared By Sign Date	B) Checked By Sign Date

DTC: TPMMES DSN: MES19004 Rev. 0 P1/1 File:1703.22 Date: - Recip:_____
DTC: TCEDP DSN: _____ Rev:_____ File: 1801 IP: I Date:_____ Recip:_____

DETROIT EDISON

COMPUTATION SHEET

calculation number DC-5766 QA Catagory I

change document number EDP-28147 REV 0 Seismic Cat I

STRUCTURAL ATTACHMENT LOADING SCHEDULE

Support Number(s) 6M-2850-H-61

Preparer J. SHIEH Date 5-22-96

Checker K T W/U Date 5/24/96

JOINT NO.	SUPPORT REACTIONS X GLOBAL __ LOCAL **						LOAD COND *
	Fx lbs	Fy lbs	Fz lbs	Mx ft-lbs	My ft-lbs	Mz ft-lbs	
C	97	456	0	0	0	0	DL+SSE

* Load Condition

** Local Coordinate System

SEE NEXT SHEET FOR GLOBAL COORDINATION.

DC-5766

EDP CONTINUATION SHEET

DWG TO BE REVISED
10-4221-000-GM-2850-G1

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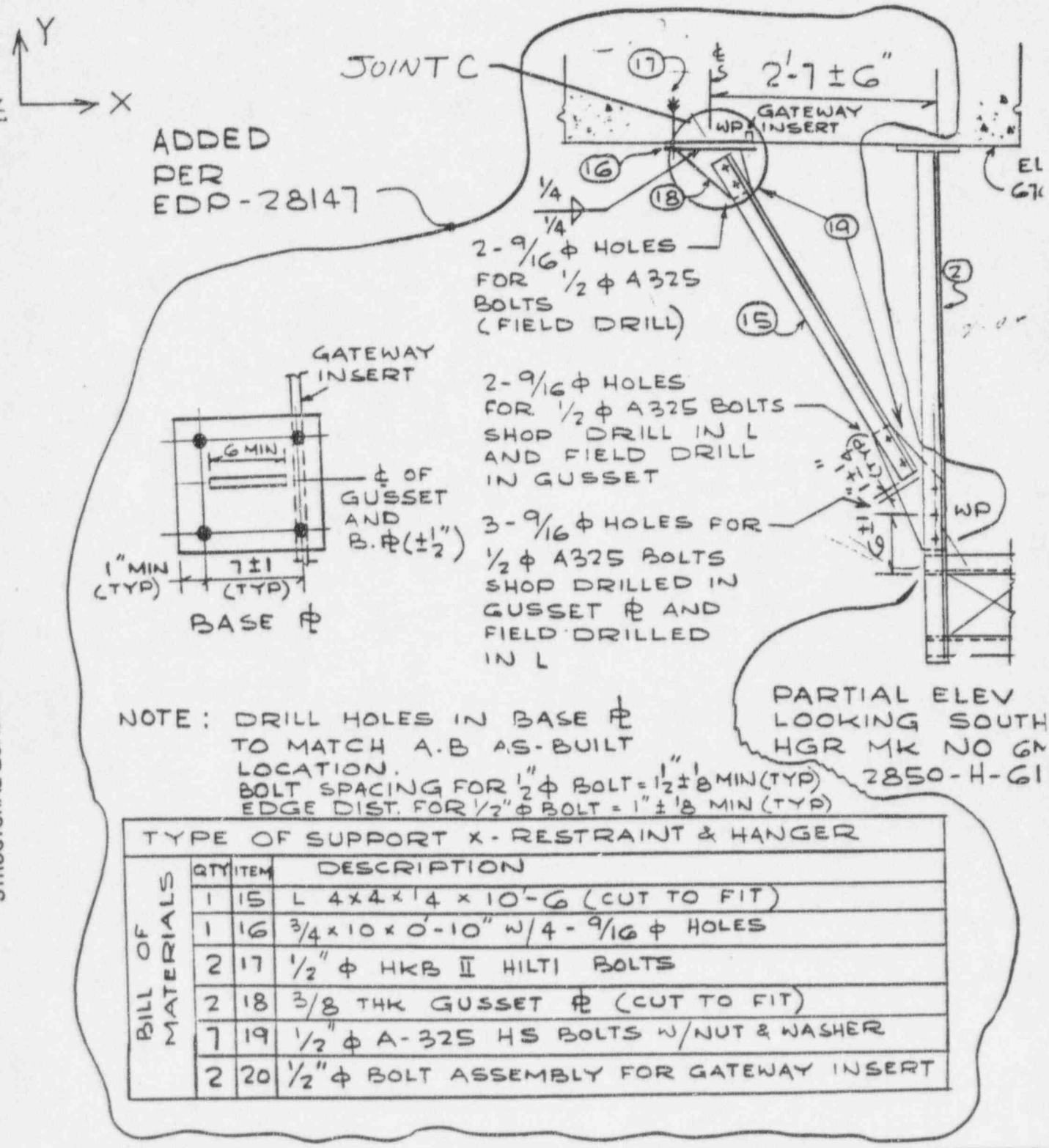
Index Item No. 12	Page

PREPARED BY: KT W.. 5/30/96
CHECKED BY: E. ATAY 5/24/96

DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION



NOTE: DRILL HOLES IN BASE ℄ TO MATCH A.B AS-BUILT LOCATION.
BOLT SPACING FOR 1/2" ϕ BOLT = 1 1/2" ± 1/8 MIN (TYP)
EDGE DIST. FOR 1/2" ϕ BOLT = 1" ± 1/8 MIN (TYP)

TYPE OF SUPPORT X - RESTRAINT & HANGER

BILL OF MATERIALS

QTY	ITEM	DESCRIPTION
1	15	L 4x4x1/4 x 10'-6 (CUT TO FIT)
1	16	3/4 x 10 x 0'-10" W/ 4 - 9/16 ϕ HOLES
2	17	1/2" ϕ HKB II HILTI BOLTS
2	18	3/8 THK GUSSET ℄ (CUT TO FIT)
7	19	1/2" ϕ A-325 HS BOLTS W/NUT & WASHER
2	20	1/2" ϕ BOLT ASSEMBLY FOR GATEWAY INSERT

SIGNATURES

A) Prepared By	B) Checked By
Sign Date	Sign Date

DTC: TPMMES DSN: MES19004 Rev. 0 P1/1 File:1703.22 Date: - Recip:_____
DTC: TCEDP DSN: _____ Rev:_____ File: 1801 IP: I Date:_____ Recip:_____

DETROIT EDISON **COMPUTATION SHEET**

calculation number DC-5766 QA Catagory I

change document number EDP-28147 REV 0 Seismic Cat I

STRUCTURAL ATTACHMENT LOADING SCHEDULE

Support Number(s) 6M-2850-H-63

Preparer J. SHIEH Date 5-22-96

Checker K T W/u Date 5/24/96

JOINT NO.	SUPPORT REACTIONS X GLOBAL __ LOCAL **						LOAD COND *
	Fx lbs	Fy lbs	Fz lbs	Mx ft-lbs	My ft-lbs	Mz ft-lbs	
C	117	815	0	0	0	0	DL+SSE

* Load Condition

** Local Coordinate System

SEE NEXT SHEET FOR GLOBAL COORDINATION.

DC-5766

EDP CONTINUATION SHEET

DWG TO BE REVISED
10-4221-000-GM-7850-63

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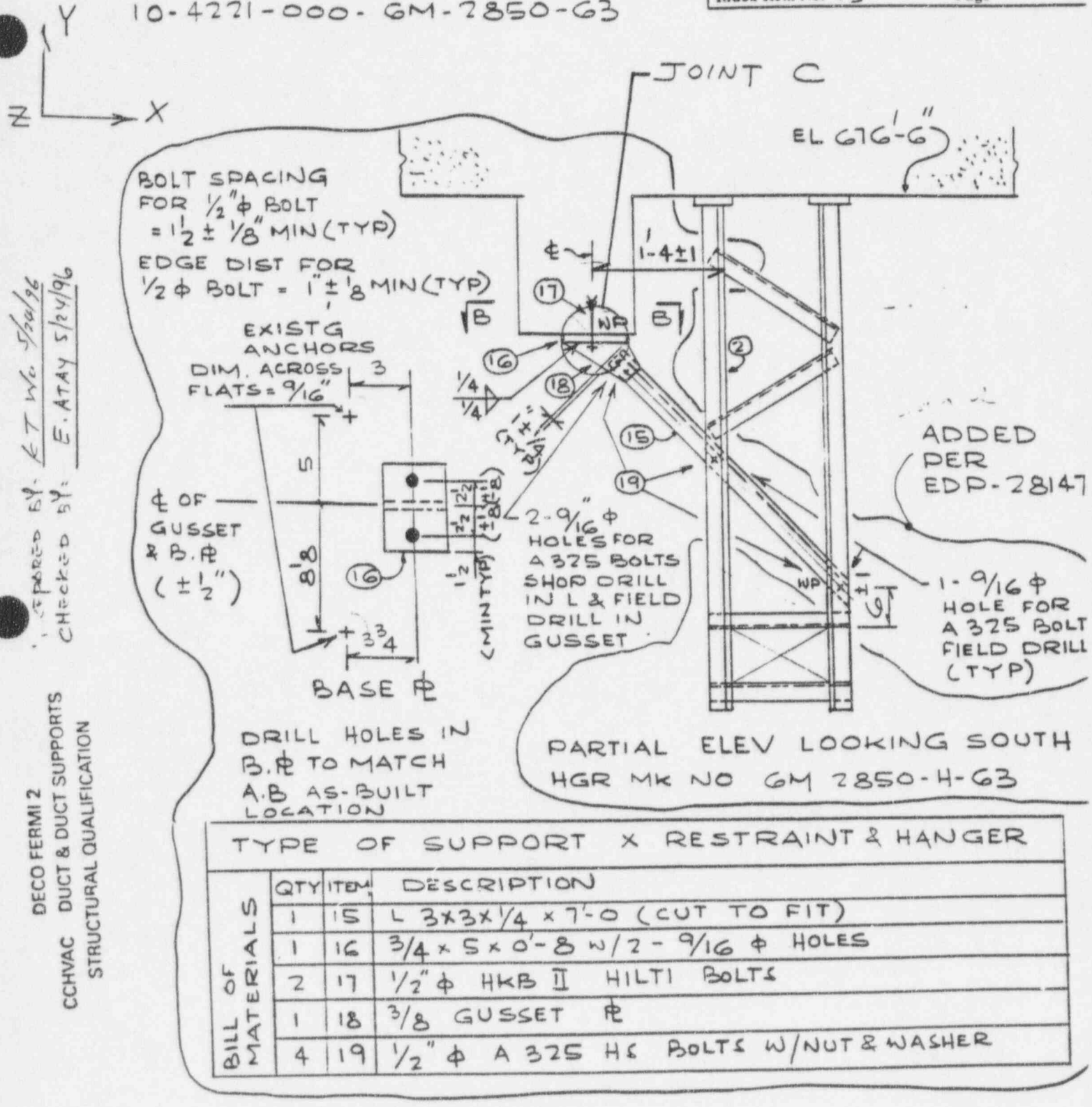

TYPE OF SUPPORT X RESTRAINT & HANGER

BILL OF MATERIALS

QTY	ITEM	DESCRIPTION
1	15	L 3x3x1/4 x 7'-0 (CUT TO FIT)
1	16	3/4 x 5 x 0'-8 W/2 - 9/16 ϕ HOLES
2	17	1/2" ϕ HKB II HILTI BOLTS
1	18	3/8 GUSSET ℗
4	19	1/2" ϕ A 325 HS BOLTS W/NUT & WASHER

PREPARED BY: ET W/O 5/24/96
CHECKED BY: E. ATAY 5/24/96

DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION

SIGNATURES	
A) Prepared By Sign Date	B) Checked By Sign Date

DTC: TPMMES DSN: MES19004 Rev. 0 P1/1 File:1703.22 Date: - Recip:____
DTC: TCEDP DSN: _____ Rev:_____ File: 1801 IP: I Date:_____ Recip:_____

DETROIT EDISON **COMPUTATION SHEET**

calculation number DC-5766 QA Catagory I

change document number EDP-28147 REV 0 Seismic Cat I

STRUCTURAL ATTACHMENT LOADING SCHEDULE

Support Number(s) 6M-2850-H-64

Preparer J. SHIEH Date 5-22-96

Checker K T W/u Date 5/24/96

JOINT NO.	SUPPORT REACTIONS X GLOBAL __LOCAL **						LOAD COND *
	Fx lbs	Fy lbs	Fz lbs	Mx ft-lbs	My ft-lbs	Mz ft-lbs	
C	117	815	0	0	0	0	DL+SSE

* Load Condition _____

** Local Coordinate System

SEE NEXT SHEET FOR GLOBAL COORDINATION.

DC-5766

EDP CONTINUATION SHEET SHEET 236 OF 246

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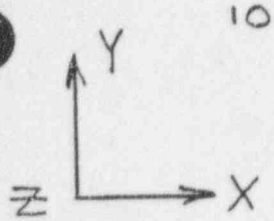
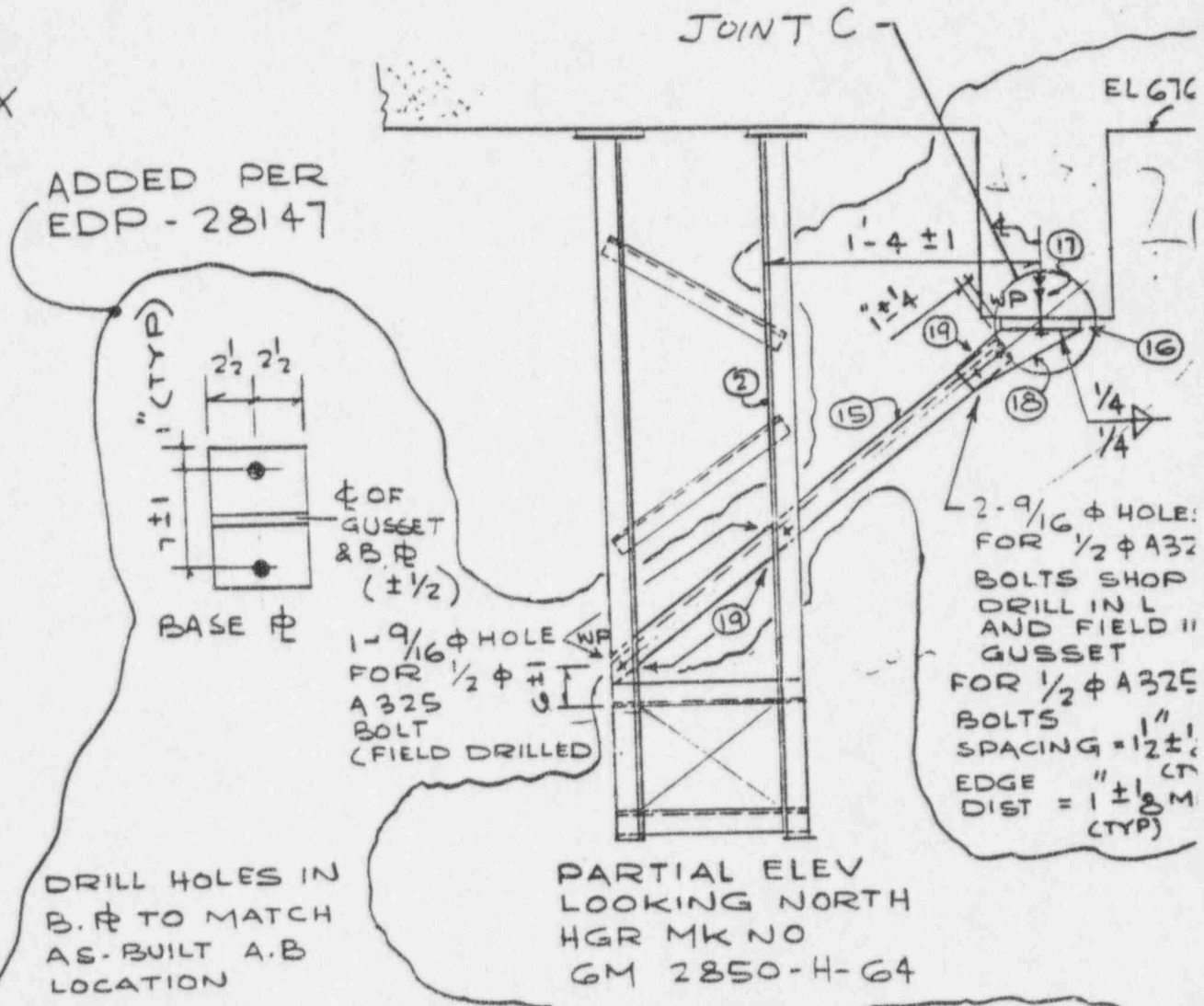
DWG TO BE REVISED
10-4221-000-GM-2850-64



PREPARED BY: K T W/a 5/24/96
CHECKED BY: E. ATAY 5/24/96

DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION



TYPE OF SUPPORT X-RESTRAINT & HANGER

BILL OF MATERIALS

QTY	ITEM	DESCRIPTION
1	15	L 2×2×3/8 × 7'-0 (CUT TO FIT)
1	16	3/4 × 5 × 0'-10" ℄ WITH 2-9/16 ϕ HOLES
2	17	1/2" ϕ HKB II HILTI BOLTS
1	18	3/8" THK GUSSET ℄ (CUT TO FIT)
4	19	1/2" ϕ A-325 HS BOLTS W/NUT & WASHER

SIGNATURES

A) Prepared By	B) Checked By
Sign Date	Sign Date

DTC: TPMMES DSN: MES19004 Rev. 0 P1/1 File:1703.22 Date: - Recip:_____
DTC: TCEDP DSN: _____ Rev:_____ File: 1801 IP: I Date:_____ Recip:_____

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

PROJECT: DECO FERMI 2

SUBJECT: CCHVAC DUCT & DUCT SUPPORTS STRUCTURAL QUALIFICATION

CALCULATION SET NO.			REV	COMP. BY	CHK'D BY
DC-5766					
PRELIM.	FINAL	VOID	0	DATE 6/7/96	DATE 6/7/96
	X				
SHEET 237 OF 246				DATE	DATE
J.O. 76230.502					

(D) Modifications

1. System 2850-1

The string analysis of system 2850-1 was performed with the result that member overstresses occurred in hangers 6M-2850-H-74, H-76, H-80 and H-81.

To relieve these overstresses, the first proposed modification was one where braces were added to hangers H-74 and H-81. The first system rerun was with the braces at the two hangers. The lateral stiffness at hangers H-74 and H-81 were taken to be approximately 20 percent of the stiffness in the vertical direction. This approximation was proven to be acceptable after performing a stiffness evaluation of hanger 6M-2850-H-74 with a bracing member added to it. The results of the initial system rerun indicated that three hangers, H-74, H-76 & H-81, would require a hanger member modification and four hangers, H-73, H-75, H-76 & H-77 would require anchorage modification.

Inspection in the field indicated that modification of hangers H-73, H-74, H-76, H-77 & H-81 were feasible with the addition of braces to strengthen the supports. (The bracing arrangements are included in EDP-28147). The system was reanalyzed a second time by increasing the stiffnesses at hangers H-74, H-76, H-77 & H-81 to reflect the addition of the bracing members. With the results of the string analysis, evaluation of the initial six problem hangers was performed. All six of the hangers, H-73, H-74, H-75, H-76, H-77 and H-81 were found to be structurally acceptable.

2. System 2850-2

The string analysis of system 2850-2 was performed with the result that member overstresses occurred in hangers 6M-2850-H-60, H-61, H-63 and H-64.

To relieve these overstresses, the system was rerun with a proposed modification wherein braces would be added to hangers H-61 and H64. Therefore the lateral stiffness at hangers H-61 and H-64 was increased to account for the addition of braces to the hangers. The lateral stiffness of the hangers were taken to be approximately 20 percent of the stiffness in the vertical direction. (This approximation was proven to be acceptable with the results of the stiffness evaluation of hanger 6M-2850-H-74, in system 2850-1, when a bracing member was added to it.) The results of the reanalysis of the system indicated that supports H-60 thru H-64 had anchorage overstresses. To relieve these overstresses braces were added to supports H-60, H-61, H-63 and H-64. Inspection in the field indicated that addition of bracing members to four hangers (H-60, H-61, H-63 and H-64) to strengthen the supports were feasible, and the bracing arrangements are included in EDP-28147. The system analysis was not rerun to account for the additional braces at supports H-60 and H-63 because it was expected that it would cause less amplification on the system seismic responses. With the addition of the braces on the four supports, all five supports and their anchorages were reanalyzed and were found to be structurally acceptable.

3. System 2850-4

The string analysis of system 2850-4 was performed with the result that the existing duct and supports are acceptable.

Form 5007 (Rev. 4/93)

Raytheon
Engineers & Constructors

GENERAL
COMPUTATION
SHEET

CALCULATION SET NO.			REV.	COMP. BY	CHK'D BY
DC-5766					
PRELIM	FINAL	VOID	0	E.A DATE 6/6/96	RS DATE 6.7.96
	✓				
SHEET 238 OF 246				DATE	DATE
JO 76230.502					

PROJECT ~~DECO FERMI 2~~

SUBJECT CCHVAC: DUCT & DUCT SUPPORTS
~~STRUCTURAL QUALIFICATION~~

(E) ANCHOR DESIGN CHECKLISTS

Form 5007 (Rev. 4/93)

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

CALCULATION SET NO.	REV	COMP. BY	CHK'D BY
DC-5766	0	E.A DATE 6/6/96	KTW DATE 6/6/96
PRELIM / FINAL / VOID: FINAL ✓			
SHEET 239 OF 246		DATE	DATE
JO 76230.502			

PROJECT DECO FERMI 2

SUBJECT CCHVAC : DUCT & DUCT SUPPORTS STRUCTURAL QUALIFICATION SYSTEM

(E) ANCHOR DESIGN CHECKLISTS 2850-4

C.4.1 Checklist for Anchor Design

1. Design Discipline: (X) Mechanical ( ) Controls ( ) Electrical (X) Structural

2. Anchors used for Support No. 6M-2850-H-50 Other Structure ( ) Specify _____

3. Classification: QA Level (X) 1 ( ) Non-Q
   Seismic Cat.: (X) I ( ) II/I ( ) None

4. Anchor Size 3/8" ϕ If different sizes, specify all

5. Anchor Type: ( ) Hilti Kwik Bolt II
   (X) Other, Specify RED HEAD SELF DRILLING (PHILLIPS)

6. Actual maximum tension 1209 (lb) SEE ATT C2 pp 31
   Allowable tension 1240 (lb)

7. Actual maximum shear 44 (lb)
   Allowable shear 690 (lb)

8. Shear-tension interaction less than 1.0: (X) Yes ( ) No
   with exponential power equal to ( ) 1.0 (X) 5/3

9. Actual minimum spacing between anchors 4 (in) is more than the minimum spacing required between anchors (X) Yes ( ) No (in the same attachment and between the adjacent attachments)

   If no, state the minimum spacing required: N/A (in), and fill out "Anchor spacing Violation, Acceptance Documentation."

10. Actual minimum edge distance from the edge of concrete NA (in) is more than the minimum edge distance required to obtain maximum loads. (X) Yes ( ) No If no, state the edge distance required and fill out "Edge Distance Violation, Acceptance Criteria."

Prepared by E. ATAY Date 6/6/96

Checked by E. T. W. Date 6/6/96

Form 5007 (Rev. 4/93)

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

CALCULATION SET NO.	REV.	COMP. BY	CHK'D BY
DC-5766	0	K T W. DATE 6/6/96	E.A DATE 6/6/96
PRELIM / FINAL / VOID			
SHEET 240 OF 246		DATE	DATE
J.O. 76230.502			

PROJECT DECO FERMI 2

SUBJECT CCHVAC : DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM

(E) ANCHOR DESIGN CHECKLIST 2850-4

C.4.1 Checklist for Anchor Design

1. Design Discipline: (X) Mechanical ( ) Controls
   ( ) Electrical (X) Structural

2. Anchors used for Support No. 6M-2850 H-51 Other Structure ( )
   Specify _____

3. Classification: QA Level (X) 1 ( ) Non-Q
   Seismic Cat.: (X) I ( ) II/I ( ) None

4. Anchor Size $\frac{3}{8}$" ϕ If different sizes, specify all

5. Anchor Type: ( ) Hilti Kwik Bolt II
   (X) Other, Specify RED HEAD SELF DRILLING

6. Actual maximum tension 846 (lb)
   Allowable tension 1085 (lb)

7. Actual maximum shear 31 (lb)
   Allowable shear 604 (lb)

   } SEE CALC. SH.

8. Shear-tension interaction less than 1.0: (X) Yes ( ) No
   with exponential power equal to (X) 1.0 ( ) 5/3

9. Actual minimum spacing between anchors 3½ (in) is more than the minimum spacing required between anchors ( ) Yes (X) No
   (in the same attachment and between the adjacent attachments)

   If no, state the minimum spacing required: 4 (in), and fill out "Anchor spacing Violation, Acceptance Documentation."

10. Actual minimum edge distance from the edge of concrete NA (in) is more than the minimum edge distance required to obtain maximum loads. (X) Yes ( ) No If no, state the edge distance required and fill out "Edge Distance Violation, Acceptance Criteria."

Prepared by K T W. Date 6/6/96

Checked by E. ATAY Date 6/6/96

DECO FERMI 2
CCHVAC DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION
SYSTEM 2850-4

Specification No. 3071-226
Revision J
Page C-14 of C-14

C.4.2 EXPANSION ANCHOR SPACING AND EDGE DISTANCE VIOLATION ACCEPTANCE DOCUMENTATION

Reporting Document: ( ) ABN _____ ( ) ECR _____
(X) ABM-0560

Description of Violation:

Bolt Dia. 3/8" ϕ
Min'm. spacing req'd. 4"
Min'm. edge dist. req'd. 3"
Actual Spacing 3 1/2"
Actual Edge Distance N/A

Affected Items and Corresponding Design Documents for the Interaction

( ) C: Controls _____ ( )I ( )II/I ( )N DC# _____
( ) E: Electrical _____ ( )I ( )II/I ( )N DC# _____
( ) M: Mechanical _____ ( )I ( )II/I ( )N DC# _____
(X) S: Structural _____ (X)I ( )II/I ( )N DC# _____

Acceptance (of violation):

( ) This Violation has been evaluated generically "severe case simulation" DC-3200 - Case No. _____

( ) Per attached Computations

(X) SEE CALC. SHEET

Results (of evaluation):

(X) This violation has no adverse effect on the load carrying capability of the anchors

( ) _____

Comments: _____

Prepared by K T Wu Date 6/6/96

Checked by E. ATAY Date 6/6/96

Form 5007 (Rev. 4/93)

Raytheon Engineers & Constructors

GENERAL COMPUTATION SHEET

CALCULATION SET NO.	REV	COMP. BY	CHK'D BY
DC-5766	0	KTW. DATE 6/7/96	EA DATE 6/7/96
PRELIM / FINAL / VOID			
SHEET 242 OF 246		DATE	DATE
J.O. 76230.502			

PROJECT DECO FERMI 2

SUBJECT CCHVAC : DUCT & DUCT SUPPORTS
STRUCTURAL QUALIFICATION SYSTEM 2850-1

C.4.1 Checklist for Anchor Design

1. Design Discipline: (X)Mechanical ( )Controls
( )Electrical (X)Structural

2. Anchors used for Support No. H-73-A Other Structure ( )
H-73A ENVELOPS H-77, H-74-A, H-76, H-60, H-61, H-63, H-64 Specify _____

3. Classification: QA Level (X) 1 ( ) Non-Q
Seismic Cat.: (X) I ( ) II/I ( ) None

4. Anchor Size ½"ϕ If different sizes, specify all

5. Anchor Type: (X) Hilti Kwik Bolt II
( ) Other, Specify _____

6. Actual maximum tension 765 (lb)
Allowable tension 2623 (lb)

7. Actual maximum shear 324 (lb)
Allowable shear 1500 (lb)

8. Shear-tension interaction less than 1.0: (X)Yes ( )No
with exponential power equal to (X)1.0 ( )5/3

9. Actual minimum spacing between anchors 6 (in) is more than the minimum spacing required between anchors (X)Yes ( )No
(in the same attachment and between the adjacent attachments)

If no, state the minimum spacing required: ____ (in), and fill out "Anchor spacing Violation, Acceptance Documentation."

10. Actual minimum edge distance from the edge of concrete N/A (in) is more than the minimum edge distance required to obtain maximum loads. (X)Yes ( )No If no, state the edge distance required and fill out "Edge Distance Violation, Acceptance Criteria."

Prepared by KTW. Date 6/7/96

Checked by E ATAY Date 6/7/96

Specification No. 3071-225
Revision J
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C.4.1 Checklist for Anchor Design

1. Design Discipline: (X) Mechanical ( ) Controls
( ) Electrical (X) Structural

2. Anchors used for Support No. 6M-2850-H-57 Other Structure ( )
PLATES 'A' & 'B' Specify _____

3. Classification: QA Level (X) 1 ( ) Non-Q
Seismic Cat.: (X) I ( ) II/I ( ) None

4. Anchor Size $\frac{1}{2}$" ϕ If different sizes, specify all

5. Anchor Type: ( ) Hilti Kwik Bolt II
(X) Other, Specify RED HEAD SELF DRILLING ANCHOR

6. Actual maximum tension _____ (lb)
Allowable tension _____ (lb)

7. Actual maximum shear _____ (lb)
Allowable shear _____ (lb)

SEE CALC. SHEET 156

8. Shear-tension interaction less than 1.0: (X) Yes ( ) No
with exponential power equal to (X) 1.0 ( ) 5/3

9. Actual minimum spacing between anchors 2¼ (in) is more than the minimum spacing required between anchors ( ) Yes (X) No (in the same attachment and between the adjacent attachments)

If no, state the minimum spacing required: 5 (in), and fill out "Anchor spacing Violation, Acceptance Documentation."

10. Actual minimum edge distance from the edge of concrete NA (in) is more than the minimum edge distance required to obtain maximum loads. (X) Yes ( ) No If no, state the edge distance required and fill out "Edge Distance Violation, Acceptance Criteria."

Prepared by E T W. Date 6/7/96

Checked by E. ATAY Date 6/7/96

Specification No. 3071-226
Revision J
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C.4.2 EXPANSION ANCHOR SPACING AND EDGE DISTANCE VIOLATION ACCEPTANCE DOCUMENTATION

Reporting Document: ( ) ABN _____ ( ) ECR _____
(X) DCN 10881 REV. A

Description of Violation:

Bolt Dia. 1/2" ϕ
Min'm. spacing req'd. 5"
Min'm. edge dist. req'd. 3 1/2"
Actual Spacing 2 1/4"
Actual Edge Distance NA

Affected Items and Corresponding Design Documents for the Interaction

( ) C: Controls _____ ( )I ( )II/I ( )N DC# _____
( ) E: Electrical _____ ( )I ( )II/I ( )N DC# _____
( ) M: Mechanical _____ ( )I ( )II/I ( )N DC# _____
(X) S: Structural _____ ( )I ( )II/I ( )N DC# _____

Acceptance (of violation):

( ) This Violation has been evaluated generically "severe case simulation" DC-3200 - Case No. _____

( ) Per attached Computations

(X) SEE CALCULATION SHEET 156

Results (of evaluation):

(X) This violation has no adverse effect on the load carrying capability of the anchors

( ) _____

Comments: _____

Prepared by E T w/u Date 6/7/96

Checked by E. ATAY Date 6/7/96

Specification No. 3071-226
Revision J
Page C-13 of C-14

C.4.1 Checklist for Anchor Design

1. Design Discipline: (X) Mechanical ( ) Controls
( ) Electrical (X) Structural

2. Anchors used for Support No. 6M-2850-H-57 Other Structure ( )
PLATE 'A' & 'B' Specify _____

3. Classification: QA Level (X) 1 ( ) Non-Q
Seismic Cat.: (X) I ( ) II/I ( ) None

4. Anchor Size 5/8" ϕ If different sizes, specify all

5. Anchor Type: ( ) Hilti Kwik Bolt II
(X) Other, Specify RED HEAD WEDGE ANCHOR

6. Actual maximum tension 2054 (lb)
Allowable tension 2858 (lb)

7. Actual maximum shear NEGLIGIBLE (lb)
Allowable shear 3078 (lb)

8. Shear-tension interaction less than 1.0: (X) Yes ( ) No
with exponential power equal to (X) 1.0 ( ) 5/3

9. Actual minimum spacing between anchors 3 3/4 (in) is more than the minimum spacing required between anchors ( ) Yes (X) No (in the same attachment and between the adjacent attachments)

If no, state the minimum spacing required: 4.69* (in), and fill out "Anchor spacing Violation, Acceptance Documentation."

10. Actual minimum edge distance from the edge of concrete NA (in) is more than the minimum edge distance required to obtain maximum loads. (X) Yes ( ) No If no, state the edge distance required and fill out "Edge Distance Violation, Acceptance Criteria."

Prepared by E T W/L Date 6/7/96

Checked by E. ATAY Date 6/7/96

* SEE CALCULATION SHEET 156

Specification No. 3071-226
Revision J
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C.4.2 EXPANSION ANCHOR SPACING AND EDGE DISTANCE VIOLATION ACCEPTANCE DOCUMENTATION

Reporting Document: ( ) ABN _____ ( ) ECR _____
(X) DCN 10881 REV. A

Description of Violation:

Bolt Dia. 5/8" ϕ WEDGE ANCHOR
Min'm. spacing req'd. 4.69" (SEE CALC. SHEET 156)
Min'm. edge dist. req'd. 3"
Actual Spacing 3 3/4"
Actual Edge Distance N/A

Affected Items and Corresponding Design Documents for the Interaction

( ) C: Controls _____ ( )I ( )II/I ( )N DC#_____
( ) E: Electrical _____ ( )I ( )II/I ( )N DC#_____
( ) M: Mechanical _____ ( )I)II/I ( )N DC#_____
(X) S: Structural _____ ( )I ( )II/I ( )N DC#_____

Acceptance (of violation):

( ) This Violation has been evaluated generically "severe case simulation" DC-3200 - Case No. _____

( ) Per attached Computations

(X) SEE CALC. SHEET 156

Results (of evaluation):

(X) This violation has no adverse effect on the load carrying capability of the anchors

( ) _____

Comments: _____

Prepared by E T W. Date 6/7/96

Checked by E. ATAY Date 6/7/96