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AUG 25 1994

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT № 141829

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
E. Biebesheimer/7C214	Equipment Stress Analysis/ 23480	N/A
5. Proj./Prog./Dept./Div.:	**6. Cog. Engr.:**	**7. Purchase Order No.:**
E18201	A. J. Kostelnik	N/A
8. Originator Remarks: This EDT transmits the attached supporting document.		**9. Equip./Component No.:** N/A
		10. System/Bldg./Facility: 241-U-701 Building
11. Receiver Remarks:		**12. Major Assm. Dwg. No.:** N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: N/A

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Impact Level	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-WM-DA-135	N/A	0	241-U-701 New Compressor Building and Instrument Air Piping Analyses	3S RF 8/23/94	1	1	1

16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 (see MRP 5.43)	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Impact Level for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature (M) MSIN	(L) Date	(J) Name	(K) Signature (M) MSIN	(L) Date	(G) Reason	(H) Disp.
1	1	Cog. Eng. ~~A. J. Kostelnik~~ R.D. FREEMAN	SD-09-52	6/9/94	R. B. Pan	H5-53	7/28/93	1	1
1	1	Cog. Mgr. E. Biebesheimer	S0-09		S. K. Kanjila	H5-57	7/20/93	1	1
1		QA J. J. Verderber	S1-57		W. J. Karwoski		7/20/93	1	1
1	1	Safety ~~K. L. Leggett~~ CHARLES JAEGER	R3-08	8/22/94	R. L. Jorissen	H5-53	7/11/94	1	1

18.	19.	20.	21. DOE APPROVAL (if required)
F. H. Huang 7-20-93 Signature of EDT Originator Date	7/11/94 Authorized Rep for Receiving Organization Date	E. Biebesheimer 7/11/94 Cognizant/Project Engineer's Manager Date	Ltr. No. [] Approved [] Approved w/comments [] Disapproved w/comments

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Document Number:	WHC-SD-WM-DA-135, REV 0
Document Title:	241-U-701 NEW COMPRESSOR BUILDING AND INSTRUMENT AIR PIPING ANALYSES
Release Date:	8/24/94

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This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

* * * * * * * * * * * * * *

WHC Information Release Administration Specialist:

Kara Broz — (Signature)

8/24/94 — (Date)

241-U-701 NEW COMPRESSOR BUILDING AND INSTRUMENT AIR PIPING ANALYSES

FOREWORD

This report contains engineering calculations to support three Engineering Change Notices (ECNs):

- ECN No. 198255, "241-U-701 New Compressor Building"
- ECN No. 196637, "241-U-701 Compressor Building"
- ECN No. 198245, "241-U-701 Compressed Air System."

ECN No. 196637 supersedes ECN No. 198255 in its entirety. Both ECN No. 198255 ECN No. 196637 are discussed in Section 1.0 and ECN No. 198245 is discussed in Section 2.0.

Kaiser Engineers Hanford performed engineering calculations to support ECN 198255. These calculations were checked and supplemented with calculations by Westinghouse Hanford Company (WHC). The WHC performed engineering calculations to support ECN No. 198245 and ECN No. 196637. All engineering calculations appear in the appendices to this report.

1.0 241-U-701 NEW COMPRESSOR BUILDING

1.1 INTRODUCTION

A new building, 241-U-701, will house an air compressor, dryer, and electric rack. The foundation dimensions and concrete slab design of the building are shown in Drawing No. H-2-36381, sheet 1, rev. 2 (ECN 196637). Changes in the foundation design are specified in ECN No. 198255 and ECN No. 196637 (WHC 1993). KEH has performed calculations to verify the structural adequacy of the foundation of the building and the anchorage for equipment anchorage (KEH 1993). To support an U.S. Department of Energy (DOE) milestone to install five compressors by September 30, 1993, Equipment Stress Analysis (ESA) has completed the independent review of ECN No. 198255 and the KEH calculations.

As shown in ECN No. 198255 (Appendix A), the foundation of the building was designed to have a footing burial depth of 2.5 ft below finished grade in accordance with the SDC 4.1 requirement. This depth is required to avoid damage to the slab caused by frost heave. However, radiological contamination was detected a few inches below the grade. The foundation of the compressor

building needs to be redesigned. Design for a slab on grade without footings extending below the frost line is in ECN No. 196637 (WHC 1993). The purpose of this work is to analyze the integrity of the concrete slab and to check the KEH calculations for equipment anchorage under seismic loading.

1.2 SCOPE

The following items are analyzed for seismic qualification:

- Stability of new slab
- Foundation slab thickness
- Anchor bolts for foundation
- Compressor anchorage under seismic loads
- Dryer anchorage under seismic loads
- Electric rack anchorage under seismic loads
- Unbalanced moments of compressor.

1.3 SUMMARY

Analysis of the anchorage for the building is to qualify the design of the foundation for the new compressor building given in "241-U-701 New Compressor Building" (ECN No. 198255 and ECN No. 196637). Recommendations for some changes in the ECN are made accordingly. The slab design incorporates drainage controls to eliminate percolation water. The stability of the slab without footings is evaluated. Calculations show that the new slab on grade can resist overturning and sliding due to wind or seismic loads. Analysis of the integrity of the concrete slab focuses on the capability of the slab to support the pipe supports and the proper selection of building anchor bolts. Calculations show that the 6-in. slab is capable of supporting the pipe supports. Calculations also show that the foundation, the compressor and dryer anchorage, and the electric rack are adequate structurally, on the basis of safety requirements established in SDC 4.2, UBC 1991, and AISC 1989. Seismic anchorage capacity for these components is assessed to assure that they will not fall or slide during earthquake motion.

1.4 RECOMMENDATIONS

ESA recommends the following:

- ECN No. 198255, page 1, item #7, change impact level from 3Q to 3S.
- ECN No. 198255, page 1, item #12, add "Calculations on slab design are given in Supporting Document WHC-SD-WM-DA-135."
- ECN No. 198255, page 3, add to note: "Place 3/8-in. hard rubber pads (commercial grade) under each air receiver leg of the compressor" to isolate any vibration. (This note will be added to the ECN for the compressor installation and pipe supports.)
- ECN No. 198255, page 4, add to general notes: "Backfill with native soil materials in 4- to 6-in. lifts. Use mechanical compaction to compact each lift to an in situ dry-weight density of 110 lb/ft^3."
- ECN No. 198255, page 4, delete the dimension 1'-0".

Changes are made in ECN #198255 according to these recommendations and the revised ECN is shown in Appendix A.

1.5 RESULTS AND DISCUSSION

1.5.1 Slab Thickness

The adequacy of the concrete slab is analyzed to the slab-thickness design quidelines given in "Slab Thickness Design for Industrial Concrete Floors on Grade" (Packard 1976). For a post spacing of 28 by 46 in. and a post load contact area of 100 in^2, as in the case of the U-701 Building foundation with pipe supports, the calculations show that the 6-in.-thick concrete slab can withstand each post load up to 3,000 lb with 28- and 46-in. spacing in the transverse and longitudinal direction, respectively. This capability is much higher than the weight (300 lb) of each pipe support on the slab of the compressor building. The concrete bearing and shear stresses for the pipe support with a load area of 100 in^2 are within the limits specified by ACI 322. In addition, the bending stress on the concrete slab caused by the bending moment of the pipe support is less than one-third of the concrete flexural strength. Calculations for the concrete slab are in Appendix B.

1.5.2 Building Anchorage

ASTM A307 1/2-in.-dia. bolts are used for the building anchorage because the bolt requires an edge distance shorter than 2 in. in the building

foundation. A sizing analysis of the 1/2-in.-dia. anchor bolts used is in Appendix B.

1.5.3 Component Anchorage Under Seismic Loads

Calculations (KEH 1993) performed to determine the adequacy of the building foundation, anchorage for the compressor and dryer, and electric rack under seismic loading were checked. Corrections for minor errors and changes found in the calculations have been made on the original calculation sheets. These corrections require no change on the safety items analyzed. The calculation sheets, signed by the originator and checker, are in Appendix C.

1.5.4 Unbalanced Moments of Compressor

The original calculations in KEH 1993 do not consider the unbalanced moments for the compressor. Because the rocking and torsional unbalanced moments can cause an unacceptable amount of displacement in the foundation, the compressor manufacturer was contacted for additional information. On June 16, 1993, C. Kroll of Pacific Fluid Systems Corporation stated that no special foundation is required for the 15-hp compressor and that vibrations caused by the subject compressor are negligible (Appendix D).

1.5.5 Concrete Slab Design

The foundation of the compressor building is redesigned because of the contamination exists several inches below ground surface. The new slab has thickened edges without footings extending below the frost line. Frost action is prevented by sealing asphalt apron to the concrete to eliminate percolation water. The analysis of the new slab considers overturning and sliding by wind or seismic loads. Calculations for the stability of the new concrete slab are in Appendix G.

1.6 CONCLUSION

The slab design incorporates drainage controls and the structural evaluations for the new concrete slab meet the minimum design loads requirements established by American Society of Civil Engineers (ASCE). The building anchorage, reinforcement bar, and bearing pressure of the soil satisfy design requirements. Analysis indicates that anchorage for the air compressor and dryer is adequate to withstand seismic loads.

Concrete anchors to be used in the construction of foundation are the ASTM A307 1/2-in.-dia. anchor bolts for the building anchorage, Hilti HVA anchor bolts for the compressor, and Hilti Kwik-bolt II for other equipment

anchorage. The work loads are smaller than the anchor values allowed for these bolts.

Structural evaluations also were performed on safety class 3 electric rack. Both component weights and seismic loads are considered in analyzing the bending of the top beam in the electric rack. Results show that the bending stress is about 14% of the allowable stress of the Unistrut P1000 beam. The vertical Unistrut is welded to a 6 by 6-in. plate that is bolted to the foundation. Calculations show that the 1/4-in. fillet weld is adequate and that the bending of the 3/8-in.-thick plate is within the AISC allowable stress allowed by the *Manual of Steel Construction* (AISC 1989). In addition, the pull-out force and shear on the 3/8-in.-dia. bolts are well below the values allowed.

1.7 REFERENCES

ACI 322 1972, "Building Code Requirements for Structural Plain Concrete," American Concrete Institute.

AISC 1989, Manual of Steel Construction, American Institute of Steel Construction (AISC), Ninth Edition.

ASCE 1990, "Minimum Design Loads for Buildings and Other Structures," ANSI A58.1, American Society of Civil Engineers.

KEH 1993, Calculations on "Building 241-U-701 Foundation Design, Compressor, and Dryer Anchorage," ER3100-S01, W. A. Adamek, Kaiser Engineers Hanford Company, Richland, Washington.

Packard, R. G., 1976, "Slab Thickness Design for Industrial Concrete Floor on Grade," Portland Cement Association.

SDC 1989, SDC 4.1, Design Loads for Facilities, Hanford Plant Standards.

SDC 1992, SDC 4.2, Design and Installation of Expansion Anchors, Hanford Plant Standards.

UBC 1991, Uniform Building Code (UBC).

WHC 1993, Engineering Change Notice(ECN) #198255 titled "241-U-701 New Compressor Building," Westinghouse Hanford Company, Richland, Washington; 1993, Engineering Change Notice(ECN) #196637 titled "241-U-701 Compressor Building," Westinghouse Hanford Company, Richland, Washington.

2.0 INSTRUMENT PIPING ANALYSES

2.1 INTRODUCTION

Pipe stress and pipe support analyses were performed to structurally qualify the instrument air pipeline 1"IA-M7 and supports for U-FARM compressed air system as described in ECN No. 198245 (WHC 1993) and Dwg. No. H-2-36381, sheet 1, Revision 2. The objective of this analysis is to confirm that the resulting operating and seismic stresses in the pipeline and pipe supports meet the applicable code requirements for a safety class 3 system.

2.2 DESIGN CRITERIA

The design analysis conforms to the following codes and standards:

- ASME B31.3, 1990 Edition, addenda ASME B31.3b-1991 (ASME 1990) to qualify the different levels of piping stresses
- UBC, 1991 Edition (ICBO 1991b) to develop the seismic criteria
- Hanford Plant Standard SDC 4.1, Rev. 11 (DOE 1989), used as a general design guideline for seismic loads
- AISC Steel Construction Manual, Ninth Edition (AISC 1989) for qualifying the support structures.

2.3 ASSUMPTIONS

The following assumptions governed the analysis.

- The heat pump for the Building 241-U-701 will maintain ambient air temperatures between 65 and 90°F. Ambient temperature is conservatively assumed as 65°F for the piping thermal analysis.
- Maximum operating pressure for the compressed air system is 100 lbf/in^2 (gauge); a design pressure of 125 lbf/in^2 (gauge) is used in the analysis. The latter pressure is the rated pressure for the safety relief valves.
- The floor concrete is cast with the instrument pipe placed in position. The pipe is assumed fixed and modelled as an anchor at this point.
- The connecting points at the top and the bottom of the dryer units are modelled as anchors because of the moment-carrying threaded connections at those points.
- For tees and valves, a stress intensification factor of 2.3 is used for the pipe stress analysis, in conformance with ASME B31.3,

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The following assumptions governed the analysis.

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- The floor concrete is cast with the instrument pipe placed in position. The pipe is assumed fixed and modelled as an anchor at this point.
- The connecting points at the top and the bottom of the dryer units are modelled as anchors because of the moment-carrying threaded connections at those points.
- For tees and valves, a stress intensification factor of 2.3 is used for the pipe stress analysis, in conformance with ASME B31.3,

(ASME 1990).

- The routing of the pipeline shall be in compliance with the isometric sketch supplied with the ECN (WHC 1993)
- Friction forces from thermal movements are small and therefore are neglected in the pipe support calculations.

2.4 DISCUSSION

The stress analysis for the instrument air piping is performed with the AUTOPIPE computer code, Version 4.42 (EDA 1992 and WHC 1990). The results of the analysis give the support reactions and the ASME B31.3a (1990) code compliance assessment for different load combinations as required by the code. The support reactions are picked for the worst load combinations and are used as the design loads for designing pipe supports. The AUTOPIPE code compliance assessment for the seismic load cases is made with load combinations sustained (deadweight plus pressure) plus seismic loading in only one of the orthogonal directions. The resultant seismic load is the square root of the sum of the squares of the three orthogonal directions; the stresses induced with the resultant seismic loads are not compared with the code allowables. However, a conservative absolute summation of three seismic components was checked and found to produce a stress level within that allowed by the code.

In general the piping and pipe support stresses are small, and the overall design is conservative.

2.5 CONCLUSION

The instrument air piping and pipe supports for the compressed air system meet the applicable code requirements and are acceptable.

2.6 REFERENCES AND BIBLIOGRAPHY

AISC 1989, *Manual of Steel Construction, Allowable Stress Design*, Ninth Edition, American Institute of Steel Construction, Inc., Chicago, Illinois.

ASME 1990, *Chemical Plant and Petroleum Refinery Piping*, ASME B31.3-1990 Edition, The American Society of Mechanical Engineers, New York, New York.

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Drawing No. *H-2-36381*, Sheet 1, Revision 2, Westinghouse Hanford Company, Richland, Washington.

EDA 1992, *Autopipe User Reference*, Version 4.42, Engineering Design Automation, Berkeley, California.

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ICBO 1991, *Hilti Kwik Bolt Allowable Tension and Shear Values*, Report No. 4627, International Conference of Building Officials, Whittier, California.

ICBO 1991, *Uniform Building Code*, 1991 Edition, International Conference of Building Officials, Whittier, California.

WHC 1993, *Engineering Change Notice*, ECN No. 198245, "241-U-701 Compressed Air System," Westinghouse Hanford Company, Richland, Washington.

WHC 1990, *Autopipe Software Verification*, WHC-SD-GN-CSWD-30003, Revision 0-B, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A

ENGINEERING CHANGE NOTICE No. 198255, No.196637, AND No. 198245

IPF #4

ENGINEERING CHANGE NOTICE

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.		4. Date
Supplemental [X] Direct Revision [] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	Wayne Adamek, KEH, S3-10, 373-4197		May 25, 1993
	5. Project Title/No./Work Order No. ER3100 / 241-U-701 New Compressor Building	6. Bldg./Sys./Fac. No. 241-U-701	7. Impact Level ~~3~~ 3SQ a/k 6-18-93
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.) H-2-36381, SH 1, REV 2	9. Related ECN No(s). N/A	10. Related PO No. N/A

11a. Modification Work	11b. Work Package No.	11c. Modification Work Complete	11d. Restored to Original Condition (Temp. or Standby ECN only)
[X] Yes (fill out Blk. 11b) [] No (NA Blks. 11b, 11c, 11d)	2W-92-1027-K	Cog. Engineer Signature & Date	N/A Cog. Engineer Signature & Date

12. Description of Change

Revise dwg. H-2-36381, sh 1, rev 2, as shown on attached pages 3 and 4 and 5.

Calculations on slab design are given in the Supporting Document WHC-SD-WM-DA-135. a/k 6-18-93

13a. Justification (mark one)							
Criteria Change	[X]	Design Improvement	[]	Environmental	[]		
As-Found	[]	Facilitate Const.	[]	Const. Error/Omission	[]	Design Error/Omission	[]

13b. Justification Details

New larger building is required to house a new compressor.

14. Distribution (include name, MSIN, and no. of copies)

Al Kostelnik	S0-09 (1)	John Verderbes	S1-57	(1)
JA Crawford	S0-09 (1)	Jon Wills	S3-10	(1)
Frank Huang	H5-67 (1)	STA. 1	S5-85	
Bob Parr	H5-53 (1)	STA. 2	S6-81	
Kari Leggett	R3-08 (1)	STA. 5	T4-30	
		STA. 20	T4-01	
		IPF #6	T7-11	

dtd. 1-6-20

RELEASE STAMP

OFFICIAL RELEASE BY WHC (5)
DATE JUN 22 1993
dtd 4

ECN 198255

APPENDIX A-3

15. Design Verification Required	16. Cost Impact					
	ENGINEERING		CONSTRUCTION			
[X] Yes	Additional	[] $	Additional	[] $		
[] No	Savings	[] $	Savings	[] $	Delay	[]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]		[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision

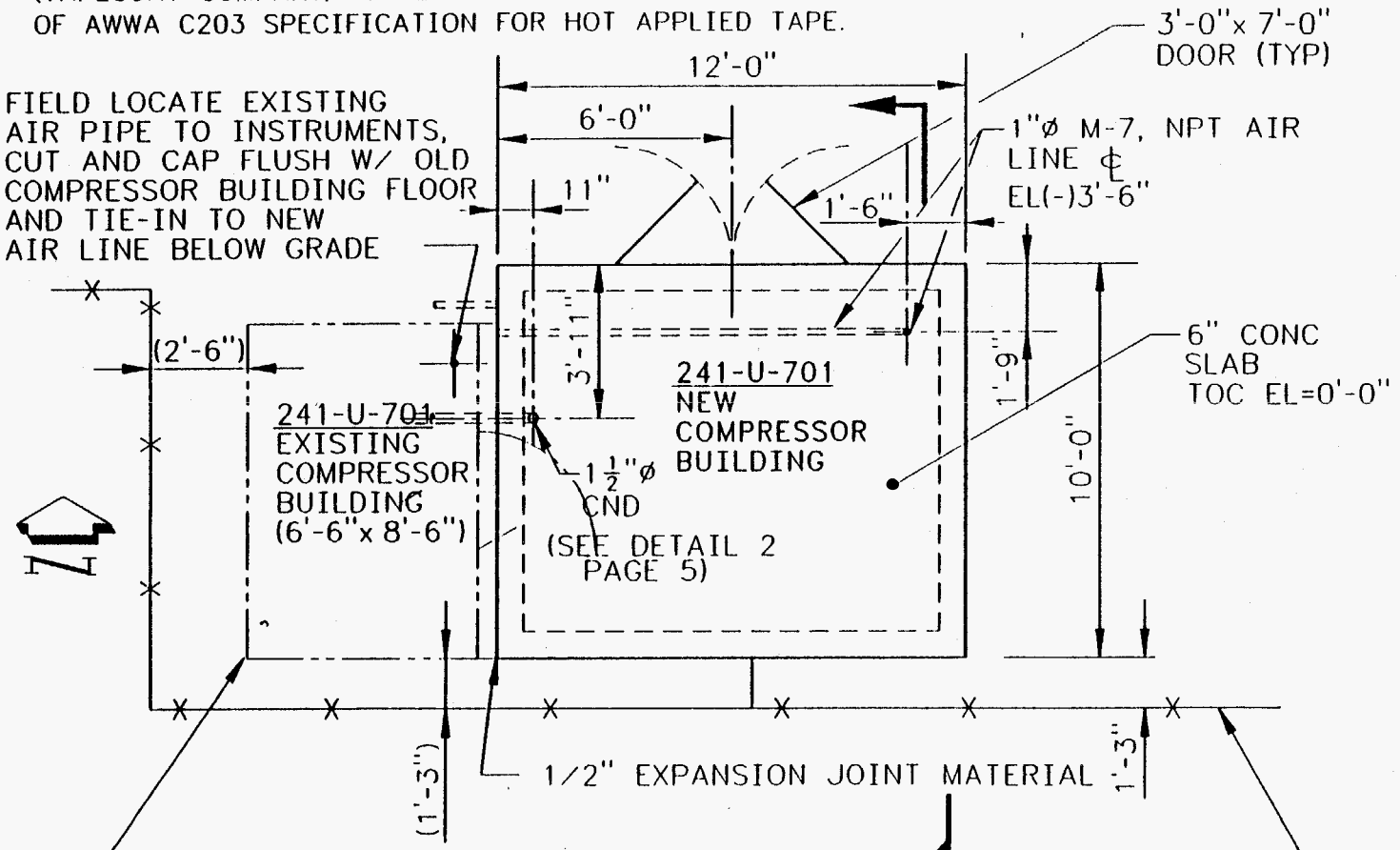
20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog Engineer AJ Kostelnik / AJ Kostelnik	6-18-93	PE	
Cog. Mgr. EBipesheimer	6-22-93	QA	
QA Mayaranda	6/22/93	Safety	
Safety J.E. Thomas	6-22-93	Design	
Security		Environ.	
Environ.		Other	
Projects/Programs			
Tank Waste Remediation System			
Facilities Operations		DEPARTMENT OF ENERGY	
Restoration & Remediation		Signature or Letter No.	
Operations & Support Services			
IRM		ADDITIONAL	
Other			
Informal Review L.D. Huang F.H. HUANG	6-18-93		

ADD:

NOTE:

COATING FOR BURIED CARBON STEEL FIELD JOINTS, FITTINGS, AND SHORT LENGTHS OF PIP: (TAPECOAT COMPANY) "TAPE COAT 203" AND PRIMER MEETING THE REQUIREMENTS OF AWWA C203 SPECIFICATION FOR HOT APPLIED TAPE.



PLAN

NOT TO SCALE

NOTE:

SEE PROCUREMENT SPECIFICATION ER3100-P1 FOR NEW BUILDING.
INSTALL NEW BUILDING PER MANUFACTURERS RECOMENDATIONS.
Relocate temporary laundry storage building 20' minimum from 241-U-701. Request location from 200 W operations. (ECN Only)

Ref. Dwg. H-2-36381 | Sh. 1 | Rev. 2 | Prepared By W. ADAMEK | Checked By | ECN No. 198255 | Page 3

ENGINEERING CHA

APPENDIX A-4

WHC-SD-WM-DA-135
REV 0

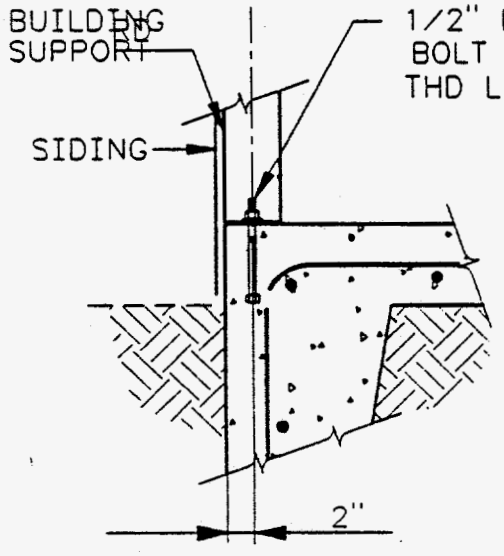
projects/er3100/sheet

KEH-0159.00 (1/88)

APPENDIX A-5
ENGINEERING CHANGE NOTICE SKETCH

Ref. Dwg.	Sh.	Rev.	Prepared By	Checked By	ECN No.	Page
H-2-36381	1	2	W. ADAMEK		198255	4

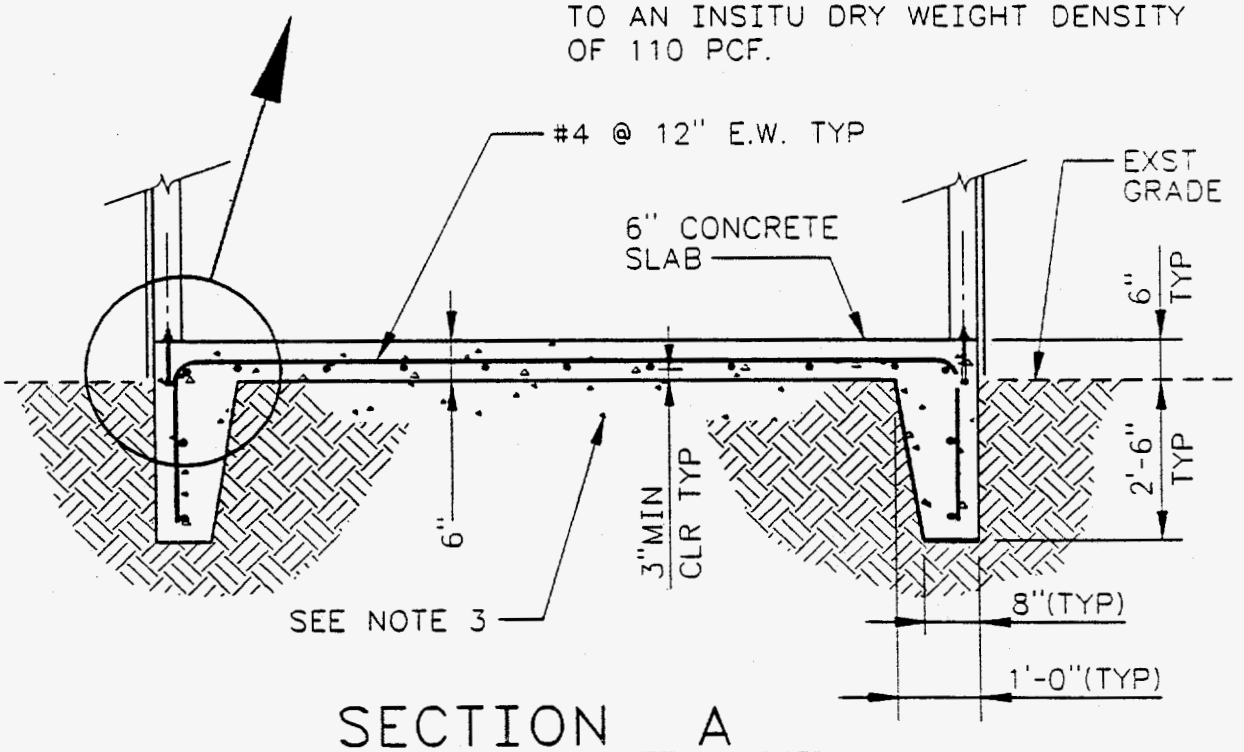
ADD:



1/2" DIA X 5-1/2" LONG ASTM A307 ANCHOR BOLT AT 4'-0" O.C. 4" MIN EMBED, 1-1/2" THD LENGTH.

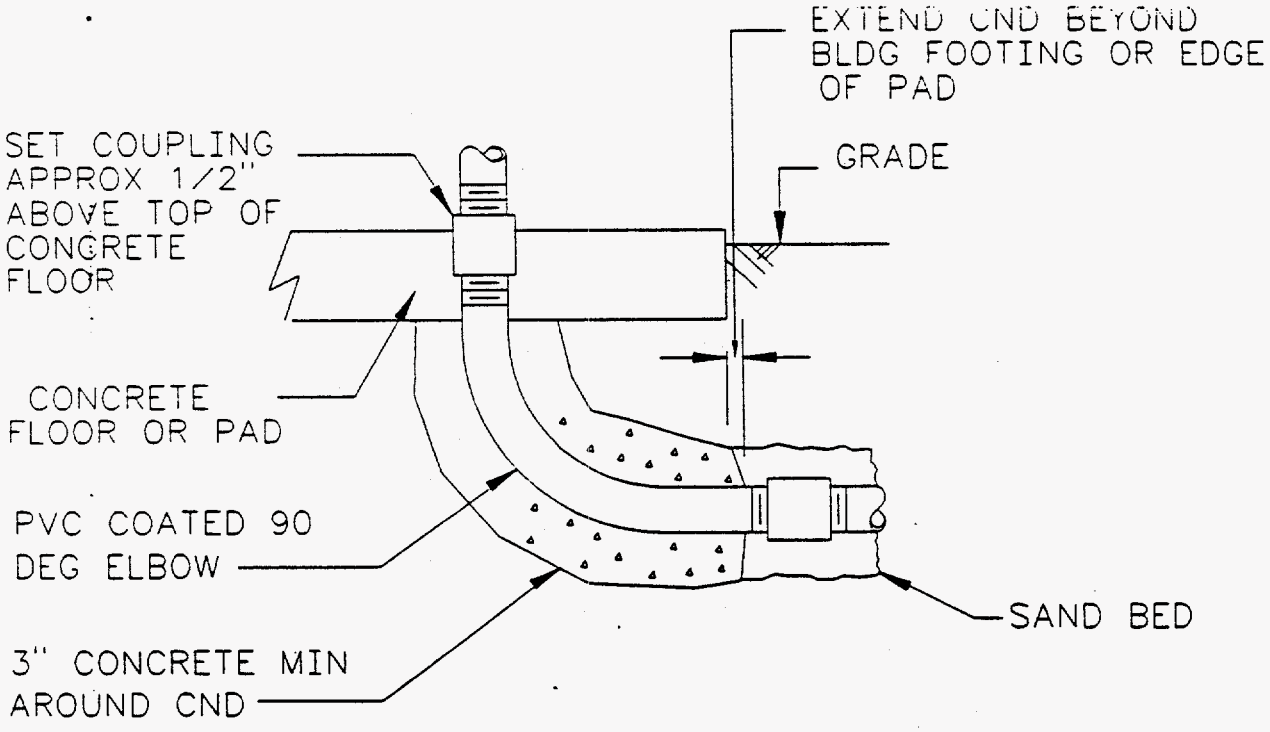
NOTES:

1. CONCRETE COMPRESSIVE STRENGTH f'c=3000psi AT 28 DAYS. TEST PER ACI 301.
2. REINFORCING STEEL SHALL CONFORM TO ASTM A615, GR.60, fy=60000psi.
3. BACKFILL WITH NATIVE SOIL MATERIALS IN 4" TO 6" LIFTS. USE MECHANICAL COMPACTION TO COMPACT EACH LIFT TO TO AN INSITU DRY WEIGHT DENSITY OF 110 PCF.



SECTION A
NOT TO SCALE

ADD:



DETAIL 2 OF CND THROUGH CONC FLOOR SLAB

IPF LO

WHC-SD-WM-DA-135
REV 0

ECN 196637

ENGINEERING CHANGE N

APPENDIX A-7

oj.
:N

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.		4. Date
Supplemental [ ] Direct Revision [ ] Change ECN [ ] Temporary [ ] Standby [ ] Supersedure [X] Cancel/Void [ ]	LT BUTLER, DESIGN SERVICES, S2-01, 373-3409		7/26/93
	5. Project Title/No./Work Order No. 241-U-701 COMPRESSOR BUILDING	6. Bldg./Sys./Fac. No. 241-U-701	7. Impact Level 3SQ
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.) H-2-36381, SH1, REV2	9. Related ECN No(s). 198255	10. Related PO No. N/A

11a. Modification Work	11b. Work Package No.	11c. Modification Work Complete	11d. Restored to Original Condition (Temp. or Standby ECN only)
[X] Yes (fill out Blk. 11b) [ ] No (NA Blks. 11b, 11c, 11d)	2W-92-1027-K	Cog. Engineer Signature & Date	N/A Cog. Engineer Signature & Date

12. Description of Change

THIS ECN SUPERCEDES ECN NO. 198255 IN IT'S ENTIRETY

SEE ATTACHED PAGES FOR COMPLETE CHANGES

13a. Justification (mark one)							
Criteria Change	[X]	Design Improvement	[ ]	Environmental	[ ]		
As-Found	[ ]	Facilitate Const.	[ ]	Const. Error/Omission	[ ]	Design Error/Omission	[ ]

13b. Justification Details

A LARGER BUILDING IS REQUIRED TO HOUSE A NEW COMPRESSOR.

SUPERCEDURE:
EXCAVATION DISCOVERED AN ASPHALT CAP OVER AN EXISTING HAZARDOUS SPILL. EXCAVATION MAY NOT PENETRATE CAP, REQUIRING FOUNDATION REDESIGN.

14. Distribution (include name, MSIN, and no. of copies)

AJ KOSTELNIK	S0-09	1	JJ VERDERBER	S1-57	1
JA CRAWFORD	S0-09	1	JE WILLS	S3-10	1
FF HUANG	H5-67	1	LT BUTLER	S2-01	1
RB PAN	H5-53	1	Mike Koch	R1-49	(1)
KL LEGGETT	R3-08	1	Warren Brown	R1-49	(1)
STA 1	S5-59		STA 5	T4-30	
STA 2	S6-81		~~STA 6~~ IPF 6	T7-11	
STA 20	T4-08				

RELEASE STAMP

OFFICIAL RELEASE BY WHC
DATE JUL 29 1993
STA 4

A-7900-013-2 (06/92) GEF095

A-7900-013-1 (06/92)

ENGINEERING CHANGE NOTICE

APPENDIX A-8

15. Design Verification Required	16. Cost Impact						
	ENGINEERING		CONSTRUCTION				
[X] Yes	Additional	[] $	Additional	[] $	Improvement	[]
[] No	Savings	[] $	Savings	[] $	Delay	[]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]		[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]	NONE	[X]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
	None	

20. Approvals

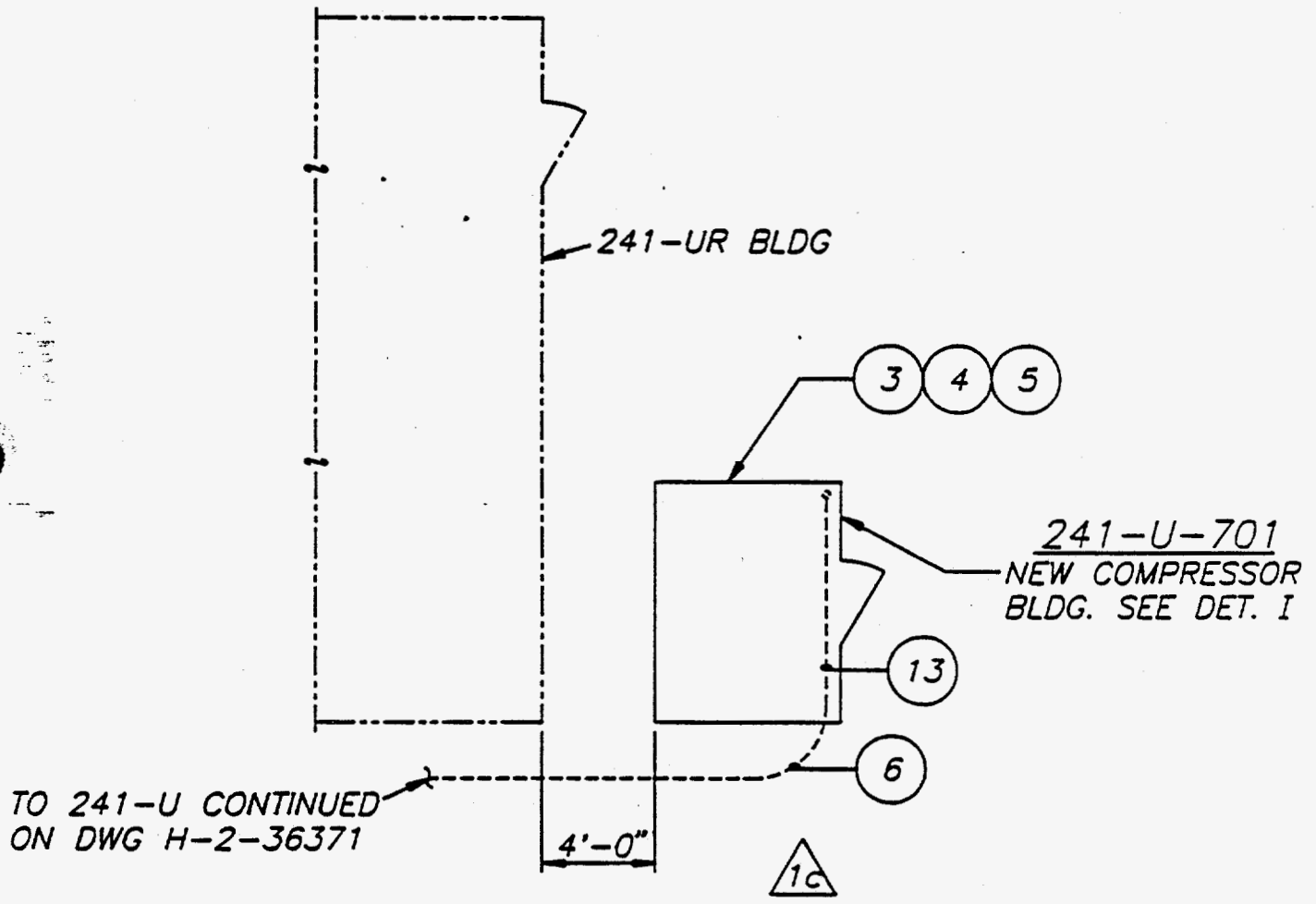
Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog Engineer AL KOSTELNIK *[signature]*	7-28-93	PE	
Cog. Mgr. ERIC BIEBESHEIMER *[signature]*	7/29/93	QA	
QA *for* JJ VERDERBER *[signature]*	7/29/93	Safety	
Safety LE THOMAS *[signature]*	7-29-93	Design	
Security		Environ.	
Environ.		Other	
Projects/Programs			
Tank Waste Remediation System			
Facilities Operations		DEPARTMENT OF ENERGY	
Restoration & Remediation		Signature or Letter No.	
Operations & Support Services			
IRM		ADDITIONAL	
Fac. Cog. Mike Koch *[signature]*	7-28-93		
Informal Review *Sandy Crisson per telecon a/k*	7-29-93		
Air Sys Cog. *[signature]*	7-28-93		

1. ECN 196637

WAS:
H-2-36381, SH1, REV2

WHC-SD-WM-DA-135
REV 0

APPENDIX A-9

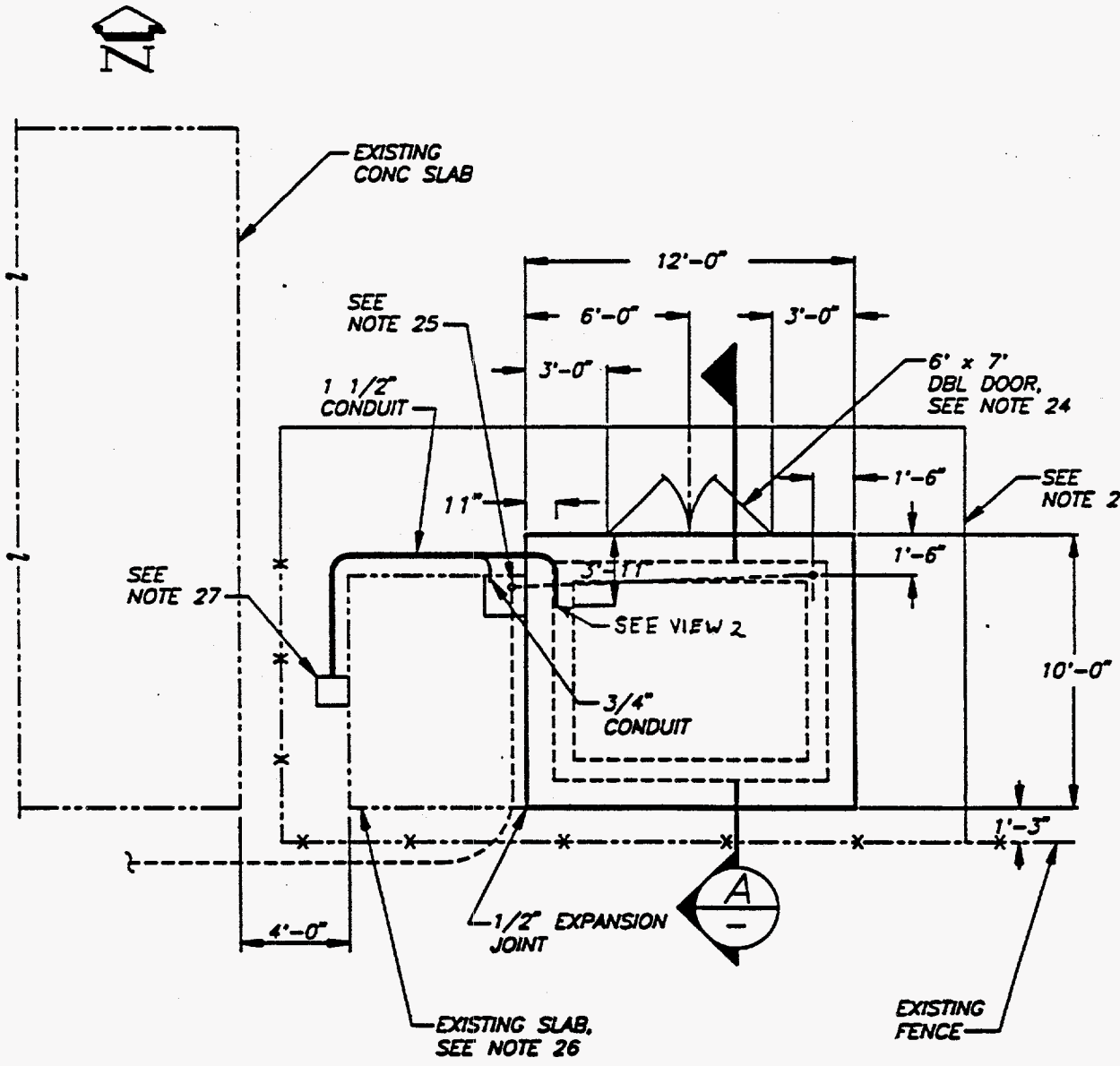


241-U

IS:
H-2-36381, SH1, REV2

WHC-SD-WM-DA-135
REV 0

APPENDIX A-10



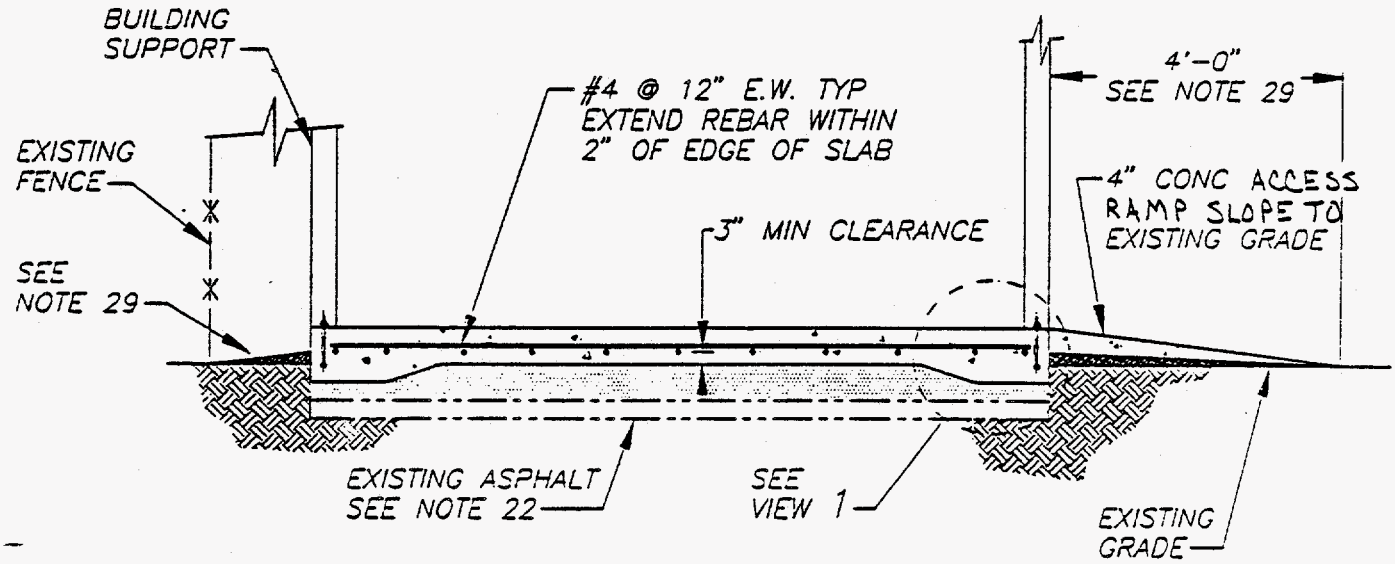
241-U-701 COMPRESSOR BUILDING

FILE NAME; 701U-A

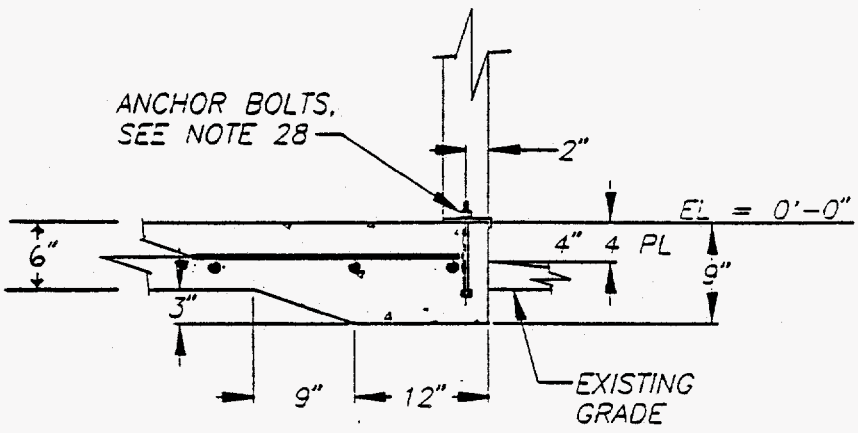
ADD:
H-2-36381, SH1, REV2

WHC-SD-WM-DA-135
REV 0

APPENDIX A-11



A SECTION
NOT TO SCALE



VIEW 1
NOT TO SCALE
TYPICAL

ADD:
H-2-36381, SH1, REV2

WHC-SD-WM-DA-135
REV 0

GENERAL NOTES:

APPENDIX A-12

20. CONCRETE COMPRESSIVE STRENGTH f'c = 4,000psi AT 28 DAYS. TEST PER ACI 301

21. REINFORCING STEEL SHALL CONFORM TO ASTM A615, GR 60 fy = 60,000psi.

22. REMOVE 3" SOIL FROM EXISTING ASPHALT SLAB AND FILL WITH A MINIMUM OF 3" OF COMPACTED FILL BETWEEN THE EXISTING ASPHALT AND EDGE OF THE NEW CONCRETE SLAB. BACKFILL WITH NATIVE SOIL MATERIALS IN 4" LIFTS. USE MECHANICAL COMPACTION TO COMPACT EACH LIFT TO DRY WEIGHT DENSITY OF 120 PCF. CLEAR CONSTRUCTION SITE OF FOREIGN MATERIAL AND DEBRIS.

23. COATING FOR BURIED CARBON STEEL FIELD JOINTS, FITTINGS AND SHORT LENGTHS OF PIPE TO BE TAPECOAT CO "TAPE COAT 203". PRIMER TO MEET ALL REQUIRMENTS OF AWWA C203 SPECIFICATIONS FOR HOT APPLIED TAPE.

24. SEE PROCUREMENT SPECIFICATION ER3100-P1 FOR NEW BUILDING. INSTALL NEW BUILDING PER MANUFACTURERS RECOMENDATIONS.

25. CUT ACCESS HOLE IN EXISTING CONCRETE SLAB AROUND EXISTING AIR PIPE TO EXPOSE SUBSTRATE. FIELD ROUTE AIR PIPE BELOW FLOOR OF 241-U-701 AS SHOWN AND TIE INTO EXISTING PIPE WITH TEE AND PLUG. FILL ACCESS HOLE WITH FIBERGLASS BATT INSULATION, COVER WITH 1/4" GALVANIZED PLATE AND SEAL.

26. REMOVE EXISTING BUILDING, COMPRESSOR AND EQUIPMENT. CONCRETE SLAB TO REMAIN.

27. ENCLOSURE SHALL BE QUAZITE PC1212BG12 WITH OPEN BASE. GREY IN COLOR AND MEASURING 14"x14"x12 3/4"D. ENCLOSURE AVAILABLE THROUGH STONEWAY ELECTRIC SUPPLY.

28. ANCHOR BOLTS TO BE 1/2" DIA x 5 1/2" L WITH 1 1/2" THREAD LENGTH. BOLTS TO BE EMBEDDED 4" MINIMUM AND LOCATED AT 4'-0" ON CENTER. MATERIAL TO BE ASTM A307. BOLTS TO HAVE A 2" MINIMUM EDGE DISTANCE.

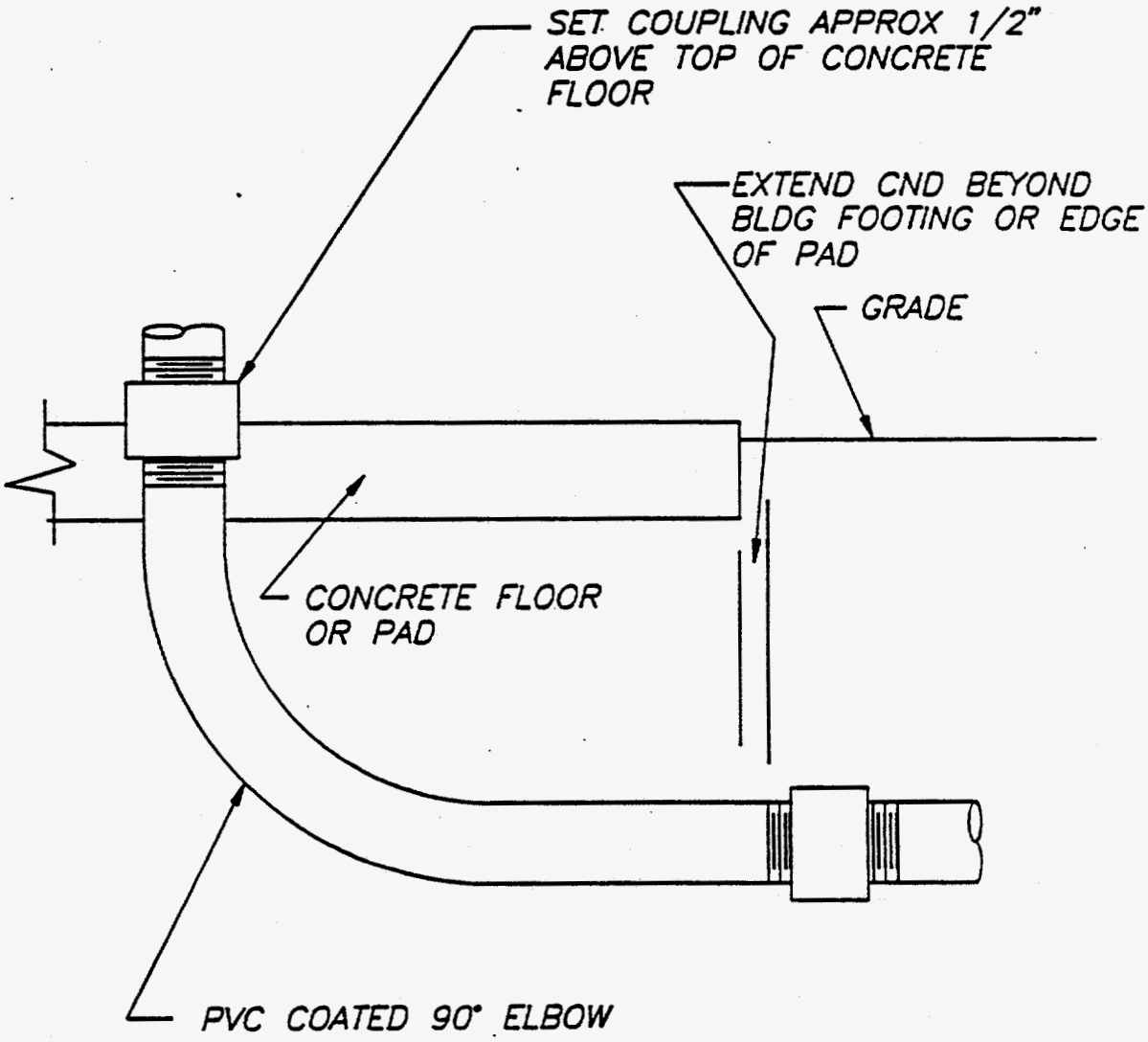
29. ASPHALT APRON WILL EXTEND TO THE EXISTING FENCE LINE ON THE WEST AND SOUTH SIDE OF THE SLAB. ON THE NORTH AND EAST SIDES THE APRON SHOULD EXTEND A MINIMUM OF 4' FROM THE EDGE OF SLAB. SLOPE APPROXIMATELY 1:10. SEAL ASPHALT TO CONCRETE.

30. THE DESIGN ANALYSIS FOR THE 241-U-701 COMPRESSOR BUILDING FOUNDATION, PIPING AND EQUIPMENT SUPPORTS IS CONTAINED IN WHC-SD-WM-DA-135.

1. ECN 196637

WHC-SD-WM-DA-135
REV 0

APPENDIX A-13



VIEW 2 OF CND
THROUGH CONC FLOOR SLAB

WHC-SD-WM-DA-135
REV 0

ENGINEERING CHANGE

APPENDIX A-14

1. ECN 198245

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.		4. Date
Supplemental [X] Direct Revision [] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	Al Kostelnik, WHC, SO-09, 3-4471		1/15/93
	5. Project Title/No./Work Order No. ER3100/241-U-701 Compressed Air System	6. Bldg./Sys./Fac. No. 241-U-701	7. Impact Level 3QS
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.) See Block 12	9. Related ECN No(s). 198255	10. Related PO No. NA

11a. Modification Work	11b. Work Package No.	11c. Modification Work Complete	11d. Restored to Original Condition (Temp. or Standby ECN only)
[X] Yes (fill out Blk. 11b) [] No (NA Blks. 11b, 11c, 11d)	2W-92-1027	Cog. Engineer Signature & Date	N/A Cog. Engineer Signature & Date

12. Description of Change

SC-3

Affected Documents:

H-2-36380, Sh 1, Rev. 2
H-2-36381, Sh. 1, Rev. 2
H-2-73682, Sh. 1, Rev. 6

Revise H-2-36381, Sh. 1, Rev. 2 as shown on pages 3 through ~~16~~ ~~17~~. 14
Revise H-2-73682, Sh. 1, Rev. 6 as shown on pages ~~18 through 33.~~ 18
Revise H-2-36380, Sh. 1, Rev. 2 as shown on pages 15-17.
1) Add new sheets to above drawings as required.

13a. Justification (mark one)	Criteria Change	[]	Design Improvement	[X]	Environmental	[]
As-Found []	Facilitate Const.	[]	Const. Error/Omission	[]	Design Error/Omission	[]

13b. Justification Details

Existing tank farm equipment is insufficient for current air delivery requirements and beyond repair.

14. Distribution (include name, MSIN, and no. of copies)

John Verderber 51-57 (1) Kari Leggett R3-08 (1)
Jim Tuck 52-24 (1) Jim Crawford SO-09 (1)
Rich Larson R1-30 (1) Gary Moe SO-09 (1)
Allen Alstad R1-49 (1) Rick Grantham SO-09 (1)
Al Kostelnik SO-09 (1) Rod Brown R2-88 (1)
Bob Pan H5-53 (1)
Sunil Kanjilal H5-57 (1)

STA. 1 55-59
STA. 2 56-81
STA. 5 T4-30
STA. 20 T4-01

RELEASE STAMP

OFFICIAL RELEASE BY WHC
DATE JUL 12 1993
Sta. 4

RECEIVED
JUL 22 1993
R.B. PAN

A-7900-013-2 (06/92) GEF095

A-7900-013-1 (06/92)

ENGINEERING CHANGE NOTICE

Pag

15. Design Verification Required
[X] Yes
[ ] No

16. Cost Impact

	ENGINEERING		CONSTRUCTION		
Additional	[X]	$	Additional	[X]	$
Savings	[ ]	$	Savings	[ ]	$

Improvement [X]
Delay [ ]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[ ]	Seismic/Stress Analysis	[ ]	Tank Calibration Manual	[ ]
Functional Design Criteria	[ ]	Stress/Design Report	[ ]	Health Physics Procedure	[ ]
Operating Specification	[ ]	Interface Control Drawing	[ ]	Spares Multiple Unit Listing	[ ]
Criticality Specification	[ ]	Calibration Procedure	[ ]	Test Procedures/Specification	[ ]
Conceptual Design Report	[ ]	Installation Procedure	[ ]	Component Index	[ ]
Equipment Spec.	[ ]	Maintenance Procedure	[X]	ASME Coded Item	[ ]
Const. Spec.	[ ]	Engineering Procedure	[ ]	Human Factor Consideration	[ ]
Procurement Spec.	[ ]	Operating Instruction	[ ]	Computer Software	[ ]
Vendor Information	[ ]	Operating Procedure	[X]	Electric Circuit Schedule	[ ]
OM Manual	[ ]	Operational Safety Requirement	[ ]	ICRS Procedure	[ ]
FSAR/SAR	[ ]	IEFD Drawing	[ ]	Process Control Manual/Plan	[ ]
Safety Equipment List	[ ]	Cell Arrangement Drawing	[ ]	Process Flow Chart	[ ]
Radiation Work Permit	[ ]	Essential Material Specification	[ ]	Purchase Requisition	[ ]
Environmental Impact Statement	[ ]	Fac. Proc. Samp. Schedule	[ ]		[ ]
Environmental Report	[ ]	Inspection Plan	[ ]		[ ]
Environmental Permit	[ ]	Inventory Adjustment Request	[ ]		[ ]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision | Document Number/Revision | Document Number Revision

New Operating Procedure

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog Engineer by E Bickelheimer	6-30-93	PE	
Cog. Mgr. E Bickelheimer	6-30-93	QA	
QA	7-12-93	Safety	
Safety L.E Harms	7-12-93	Design	
Security		Environ.	
Environ.		Other	
Projects/Programs			
Tank Waste Remediation System			
Facilities Operations		DEPARTMENT OF ENERGY	
Restoration & Remediation		Signature or Letter No.	
Operations & Support Services			
~~IRM~~ Structural Informal Review	Per Bob Parra Telecon 7-12-93	ADDITIONAL	
Other			
Electrical Informal Review	7/12/93		
Mechanical Informal Review	7-12-93		

for Jim Tuck

241-U-701 General Notes:

1) Only Note: (Reference Drawing H-2-36381 Sh.1 Rev.2. Incorporate this ECN with ECN 198255. Delete reference to Det.I, Zone F-7, from "241-U" site "Plan" view. Add the following general notes to drawing as required, renumber as necessary. All of the following notes apply directly to the new design if old drawing notes are not listed, they do not apply.)

3) 241-U-701 Instrument Air Piping and valves to be per code M-7 on drawing H-2-31750 Sh.7 Rev.3. Maximum operating pressure to be 100 PSIG. All components shall be rated for 125 psig minimum.

4) 241-U-701 Condensate piping and valves to be per code M-5 on drawing H-2-31750 Sh.5 Rev.5. All components shall be rated for 125 psig minimum.

5) Sealants for threaded piping joints: (Chesterton "goldend" No. 7298, Federal Process Co "JC-30", or Lake Chemical Co "Slic-Tite").

6) Labels - Label valves and instruments in accordance with HPS-I-2-7, Type C, 1/4" characters per P&ID nomenclature. Label size may be increased as necessary.

7) Installation of 241-U-701 piping shall be performed per ASME B31.3. Unions to be installed as necessary to facilitate servicing of components. Slope piping a minimum of 1/8" per ft. to drain locations.

8) Pneumatic testing of 241-U-701 air piping shall be performed with instrument quality air per ASME B31.3 para. 345.5. Test pressure 110 psig ± 5 psig.

9) Welder qualifications and welding to be performed in accordance with AWS D 1.1. Welder qualification is accordance with ASME Sec. IX may be used as a substitute.

10) Equipment Mounting - Mount air compressor with hard, rubber pads as supplied by vendor and dryer using 1/2" concrete anchors embedded $4^{1/4}$", Shim as required to level within +/-.060". Use additional lock nuts and "snugtight" per AISC steel construction manual. Hilti HVA, ASTM A36, 1/2" x $6^{1/2}$" (Hilti HVA Anchor Rod 686675 with Adhesive Cartridge 668046). Consult manufacturer's instructions for installation.

11) Pipe Support mounting - Locations may be adjusted to avoid rebar or other construction restraint. Piping to have minimum .030" gap on both sides and top through pipe supports (guides only). Use 1/2" x $4^{1/2}$" Hilti Kwik Bolt II to anchor supports. Minimum embedment $2^{1/4}$". Install per KEH procedure CV-9.

12) Anchor Bolts - Unless otherwise specified, field may relocate anchor bolts due to rebar interference as follows: 1/2" and smaller diameter bolts may be relocated up to 1" (minimum base plate edge distance 7/8").

13) Painting - Paint all exposed carbon steel surfaces with low VOC, lead free primer and top coats, one coat of primer followed by two top coats of paint per manufacturer's instruction, final color to be medium gray.

14) Tolerances - Piping and supports to be field fit approximately as shown. Piping and support dimensions are +/- 1'-0". Equipment location dimensions be held within +/- 1" unless otherwise specified.

15) Install the flow meter with a minimum of 1 foot. straight piping run into the inlet and 6 inch straight run from the outlet to verify fully developed flow.

New item Description list:

ECN Only Note: (Modify drawing H-2-35381 Sh.1 Rev.2 as required. The following items are to be added to the description list with the exception of those items referencing items to the existing drawing. All items listed below pertain to the new 241-U-701 Instrument Air design all existing drawing items which are not listed below do not apply).

1) 200 West Area - See Dwg. H-2-36381 Sh.1 Rev.2

8) Pressure gauge - See Dwg. H-2-36381 Sh.1 Rev.2

9) Gate Valve - See Dwg. H-2-36381 Sh.1 Rev.2

10) Misc. pipe fittings - See Dwg. H-2-36381 Sh.1 Rev.2

12) Pressure regulating valve - See Dwg. H-2-36381 Sh.1 Rev.2

14) Air Compressor - for 241-U-701 — Air cooled, packaged unit, reciprocating non-lubed compressor, 50 scfm @ 100 psig, 120 gal. receiver tank, safety valve, air pressure gauge, automatic drain, aftercooler, motor and drive system, low oil level switch, high temperature switch, dual controls, motor starter mounted and wired, (Ingersoll Rand model 10T3NLM-E15). 480 V 3-phase power single point connection motor to have a 1.15 min. service factor.

15) Air dryer - for 241-U-701 — Regenerative heatless pressure swing air dryer, inlet flow rate 45 scfm at 100 psig, 120°F., moisture content saturated, outlet flow rate dewpoint -40°F. @ 100 psig. Automatic purge saving system, maximum purge rate 8 scfm. Switching Failure alarm, active tower lights, NEMA Enclosures, and Humistat. (Hankinson model DH-45 with Sensatherm auto purge saving system, high dewpoint alarm).

16) Prefilters/Afterfilters - for 241-U-701 — 1 Micron Air line filter, 100 scfm @ 100 psig capacity, with manual drain. Air inlet/outlet connection is 1" NPTF Rated 125 psig @ 120°F Min. (Hankison Series 3100, T100-08F-48-A.)

17) Ball valves - 1", 1/2" NPT per general notes 3 and 4.

18) Coalescing Filter - for 241-U-701 — 0.025 micron ultra high efficiency oil removal filter, 100 scfm at 100 psig, with internally mounted automatic drain. Air inlet/outlet connection is 1" NPTF. Rated 125 psig @ 120°F Min. (Hankison model A100-08F-100-D.)

20) Automatic condensate drain valves - for 241-U-701 — Electrically operated solenoid valve controlled by a solid sate electronic timer, (Hankison model 532-04-150).

21) Air flow meter - for 241-U-701 — Differential pressure, direct reading flowmeter, horizontal flow to the right, bronze, 50 scfm, 1" IPS, calibrated for air at 100 psig and 100°F. Rated 125 psig and 120°F Min. (RCM model# 1-71-R-50-IE).

22) High Pressure Safety Relief Valve - for 241-U-701 — 1" x 1" 70 scfm @ 125 psig min. capacity, ASME Boiler and Pressure Vessel code section VIII certified. (Crosby 1" x 1" JRU-C-Type E, Set Pressure 125 psig).

Low Pressure Safety Relief Valve - 1" x 1" 70 scfm @ 125 psig min. capacity, ASME
for 241-U-701 Boiler and Pressure Vessel code section VIII certified. (Crosby 1" x 1" JRU-C-Type E, Set Pressure 25 psig).

24) Insulation for Compressor for 241-U-701 - Insulate 3/4" tubing from second stage cylinder to after cooler on compressor with 1" wall thickness, molded, sectional, rigid fiberglass pipe covering meeting requirements of FSHH-I-558, Form D, Type III, Class 12, complete with PVC jacket with pressure sensitive closure system. Tape: 3 inch wide pressure sensitive metallic foil Scrim Kraft (FSK) tape, Nashua FSK) or (Ideal No. 491 FSK). Insulating cement for forming insulation covering over fittings and valves shall be fiber cement meeting the requirements of ASTM C449, Cements that contain asbestos not acceptable.

ENGINEERING CHANGE NOTICE SKETCH						
Ref. Dwg. H-2-36381	Sh. 1	Rev. 2	Prepared By S.F.HARRIS	Checked By	ECN No. 198245	Page 6/18

Add

WHC-SD-WM-DA-135
REV 0

APPENDIX A-19

LEGEND

REDUCER

PRESSURE REGULATING VALVE

SOLENOID VALVE

GATE VALVE

BALL VALVE

CHECK VALVE

SAFETY RELIEF VALVE

NEEDLE VALVE

RESTRICTING ORIFICE

FLEXIBLE HOSE

PRESSURE INDICATOR

TEMPERATURE INDICATOR

FLOW INDICATOR

TRAP

FILTER

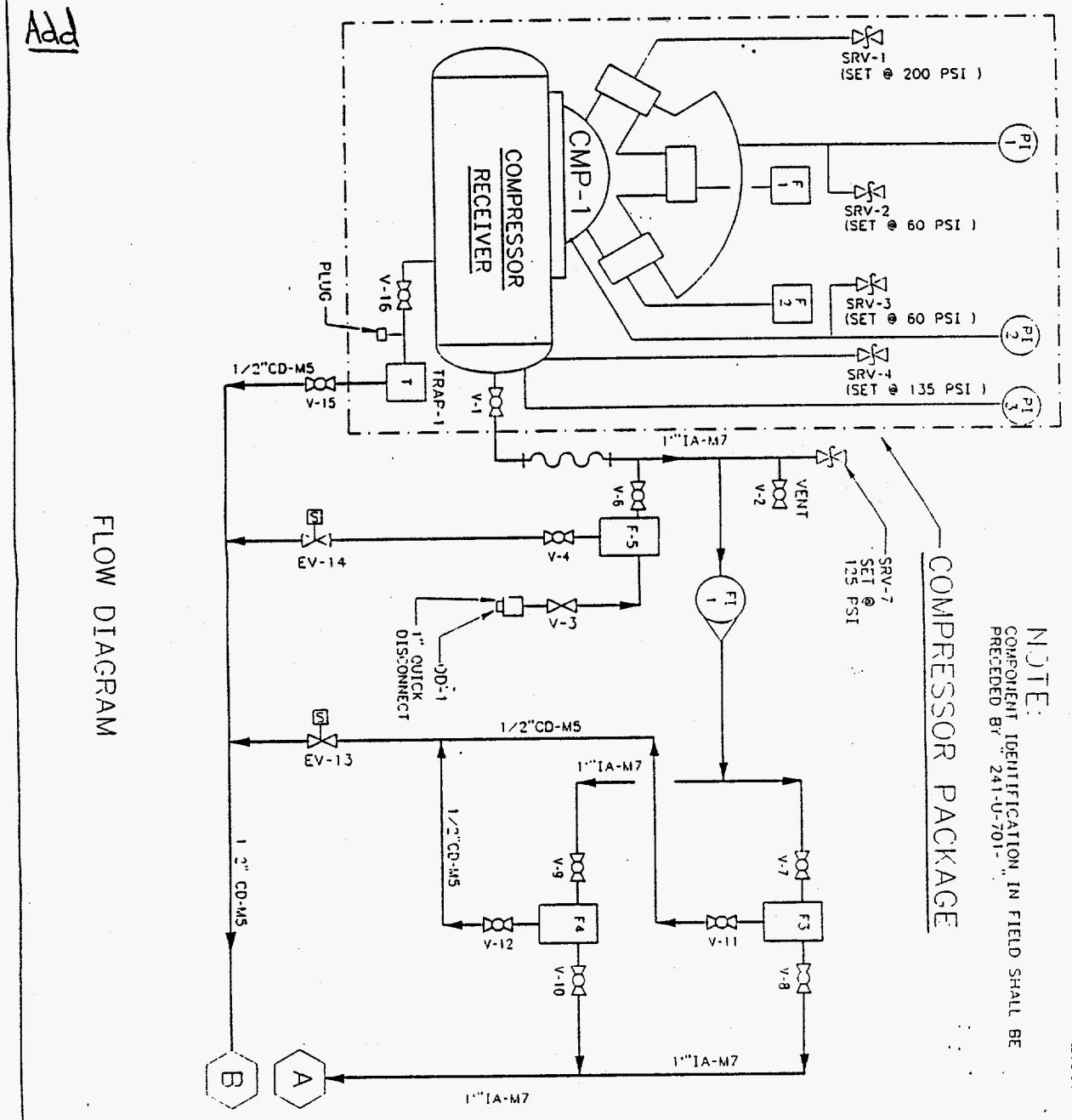
EXHAUST MUFFLER

SUPPORT LOCATION

ENGINEERING CHANGE NOTICE SKETCH

Ref. Dwg.	Sh.	Rev.	Prepared By	Checked By	ECN No.	Page
H-2-36381	1	2	S.F.HARRIS		198245	7/18

Add

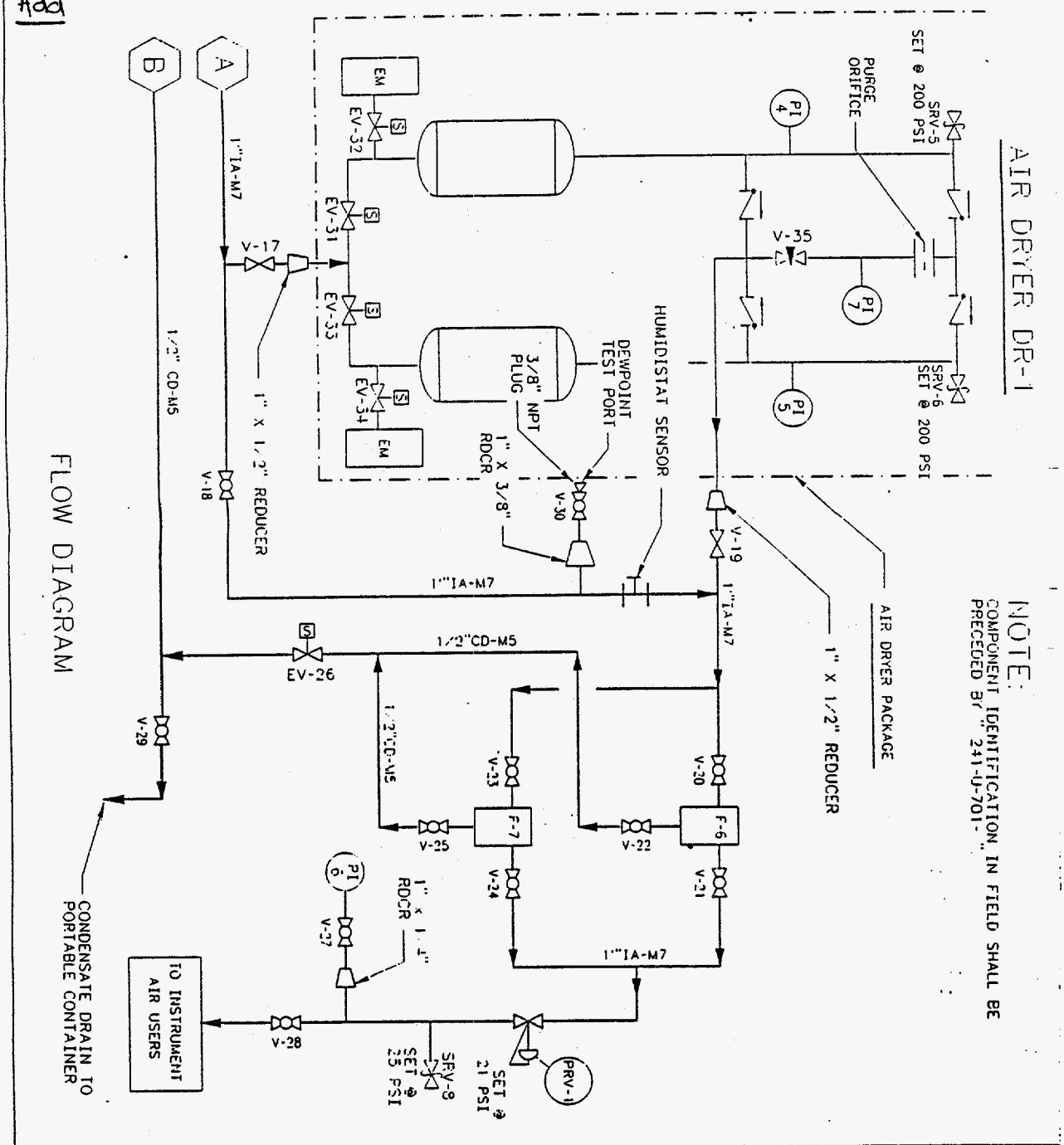


APPENDIX A-21

ENGINEERING CHANGE NOTICE SKETCH

Ref. Dwg.	Sh.	Rev.	Prepared By	Checked By	ECN No.	Page
H-2-36381	1	2	S.F.HARRIS		198245	8/18

Add

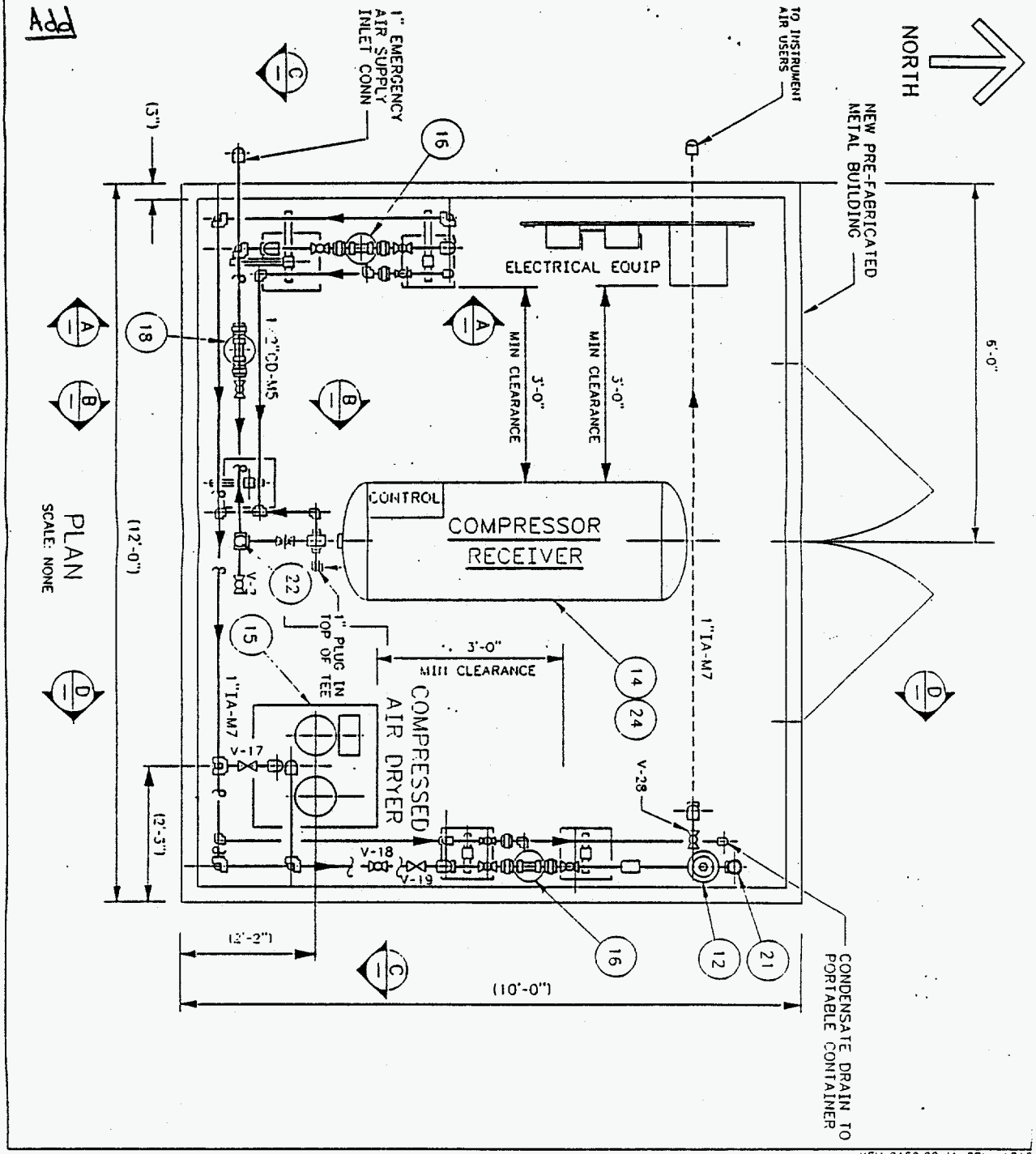


KEH-0159.00 (1/88) ACAD

ENGINEERING CHANGE NOTICE SKETCH

Ref. Dwg.	Sh.	Rev.	Prepared By	Checked By	ECN No.	Page
H-2-36381	1	2	S.F.HARRIS		198245	9/18

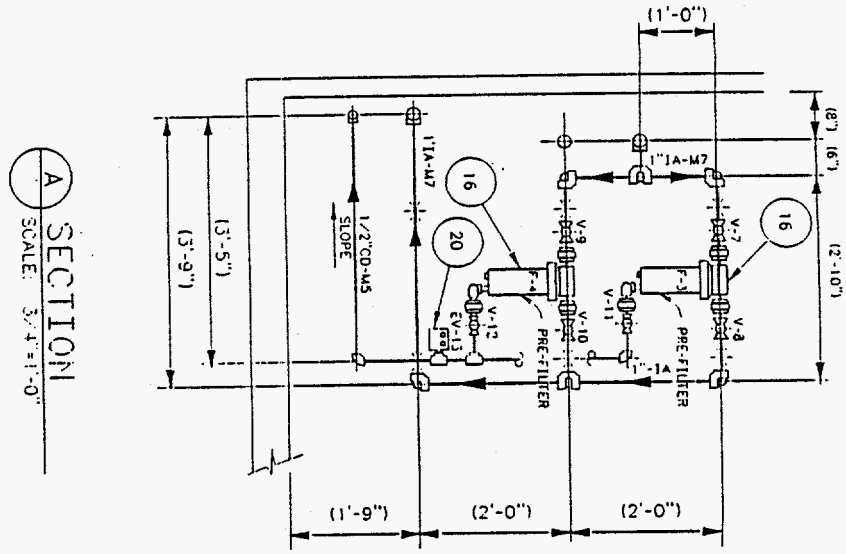
Add



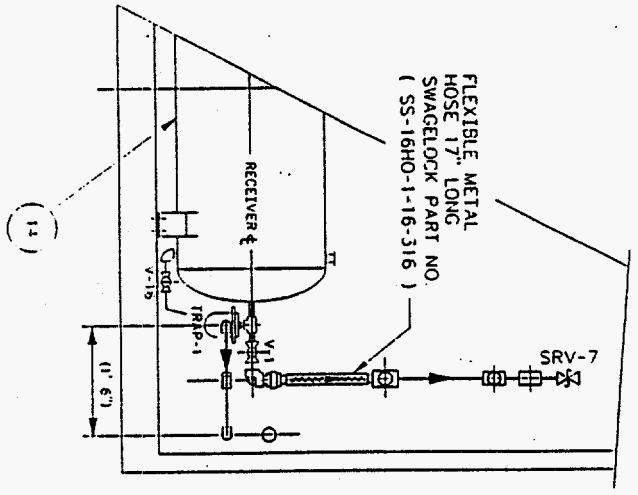
ENGINEERING CHANGE NOTICE SKETCH

Ref. Dwg.	Sh.	Rev.	Prepared By	Checked By	ECN No.	Page
H-2-36381	1	2	S.F.HARRIS		198245	10/18

Add



A SECTION
SCALE: 3/4"=1'-0"



B SECTION
SCALE: 3/4"=1'-0"

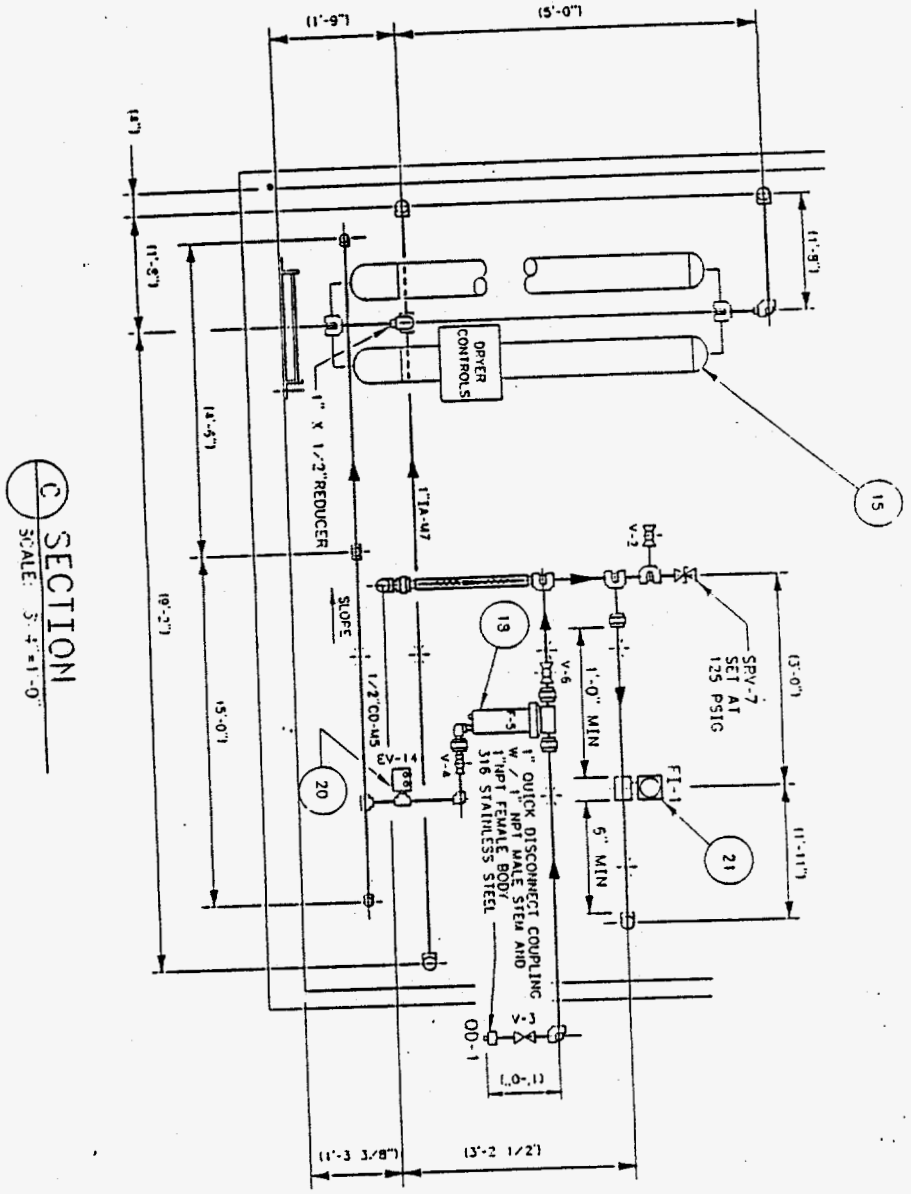
REH-0159.00 (1/88) ACAD

KEH-0159.00 (1/88) ACAD

ENGINEERING CHANGE NOTICE SKETCH

Ref. Dwg.	Sht.	Rev.	Prepared By	Checked By	ECN No.	Page
H-2-36381	1	2	S.F.HARRIS		198245	11/18

Add



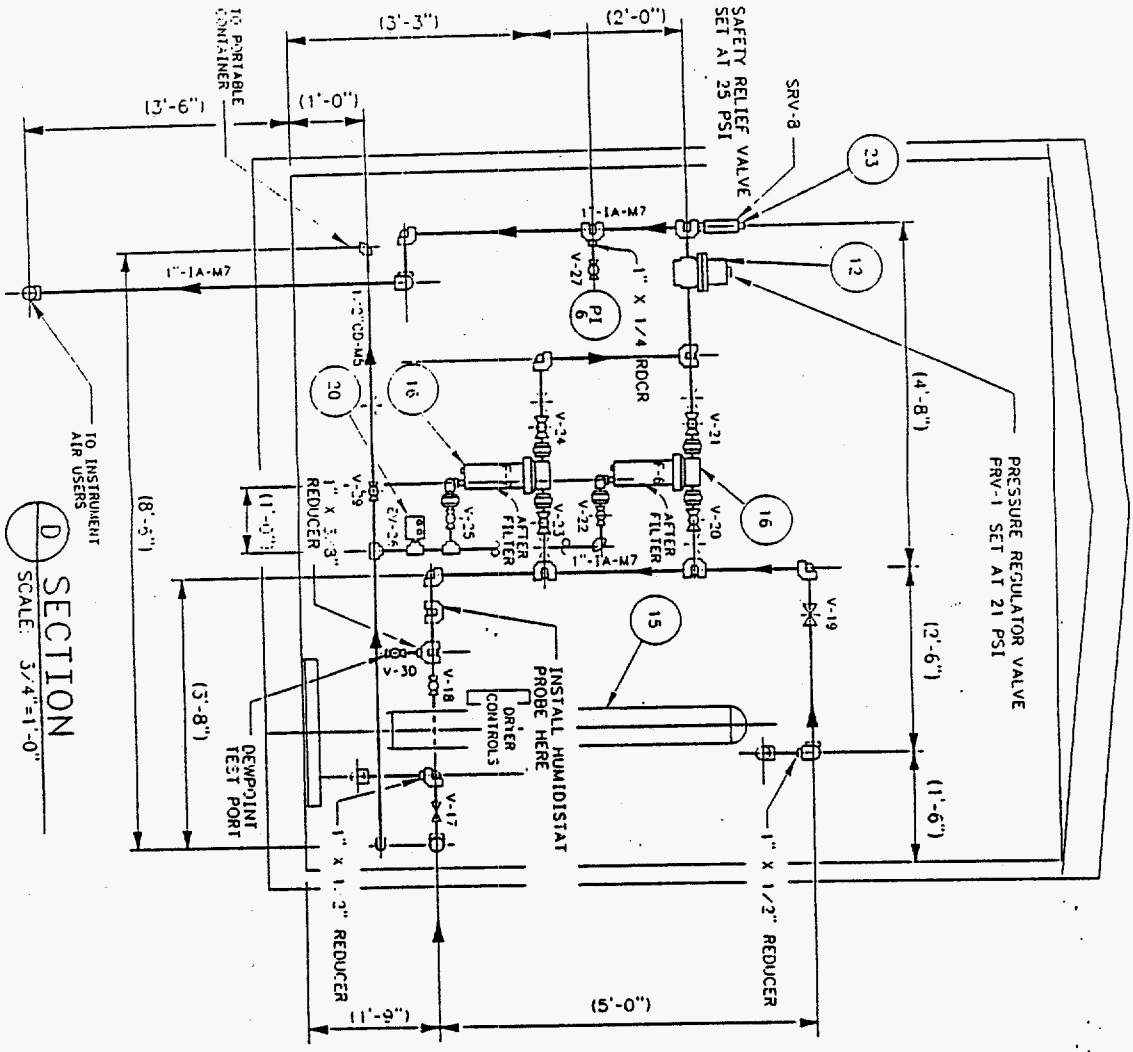
SECTION C
SCALE: 3/4"=1'-0"

KEH-0159.00 (1/88) ACAD

ENGINEERING CHANGE NOTICE SKETCH

Ref. Dwg.	Sh.	Rev.	Prepared By	Checked By	ECN No.	Page
H-2-36381	1	2	S.F.HARRIS		198245	17/18

Add



D SECTION
SCALE: 3/4"=1'-0"

KEH-0159.00 (1/88) ACAD

KEH-0159.00 (1/88) ACAD

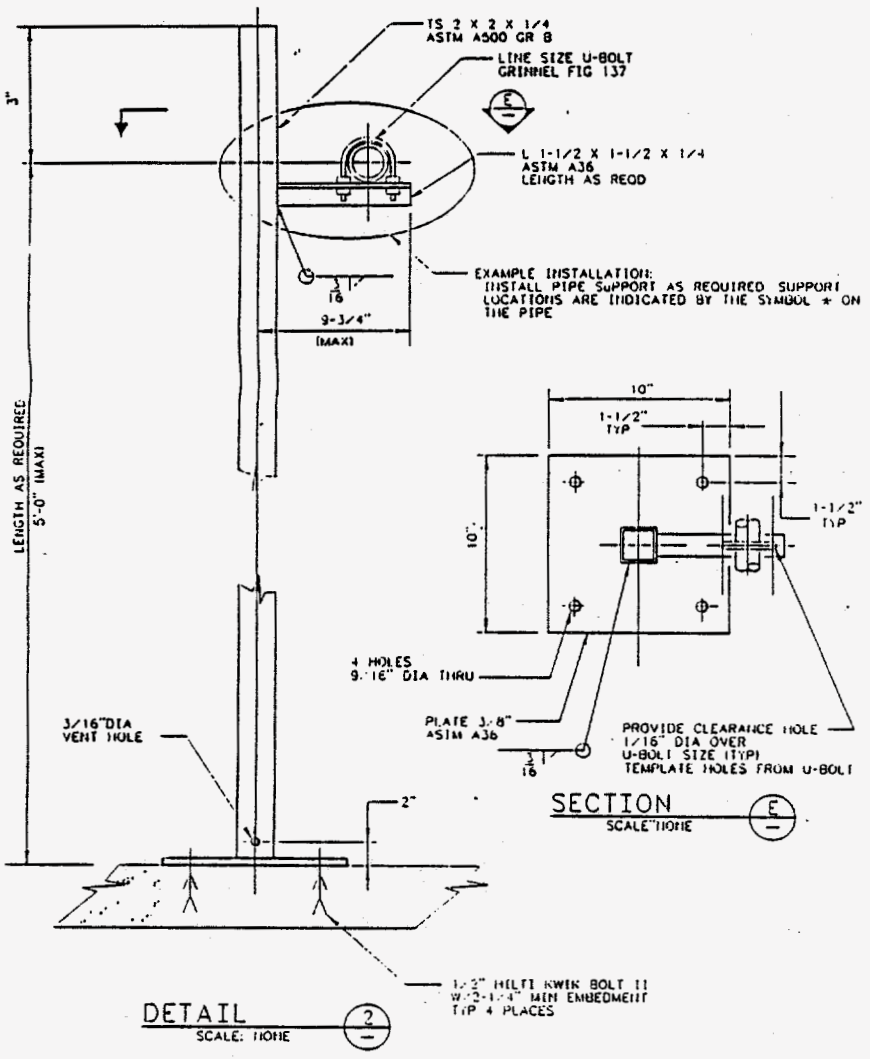
ENGINEERING CHANGE NOTICE SKETCH

Ref. Dwg.	Sh.	Rev.	Prepared By	Checked By	ECN No.	Page
H-2-36381	1	2	S.F.HARRIS		198245	13/18

Add NOTES: (CONTINUED FROM PAGE 3)

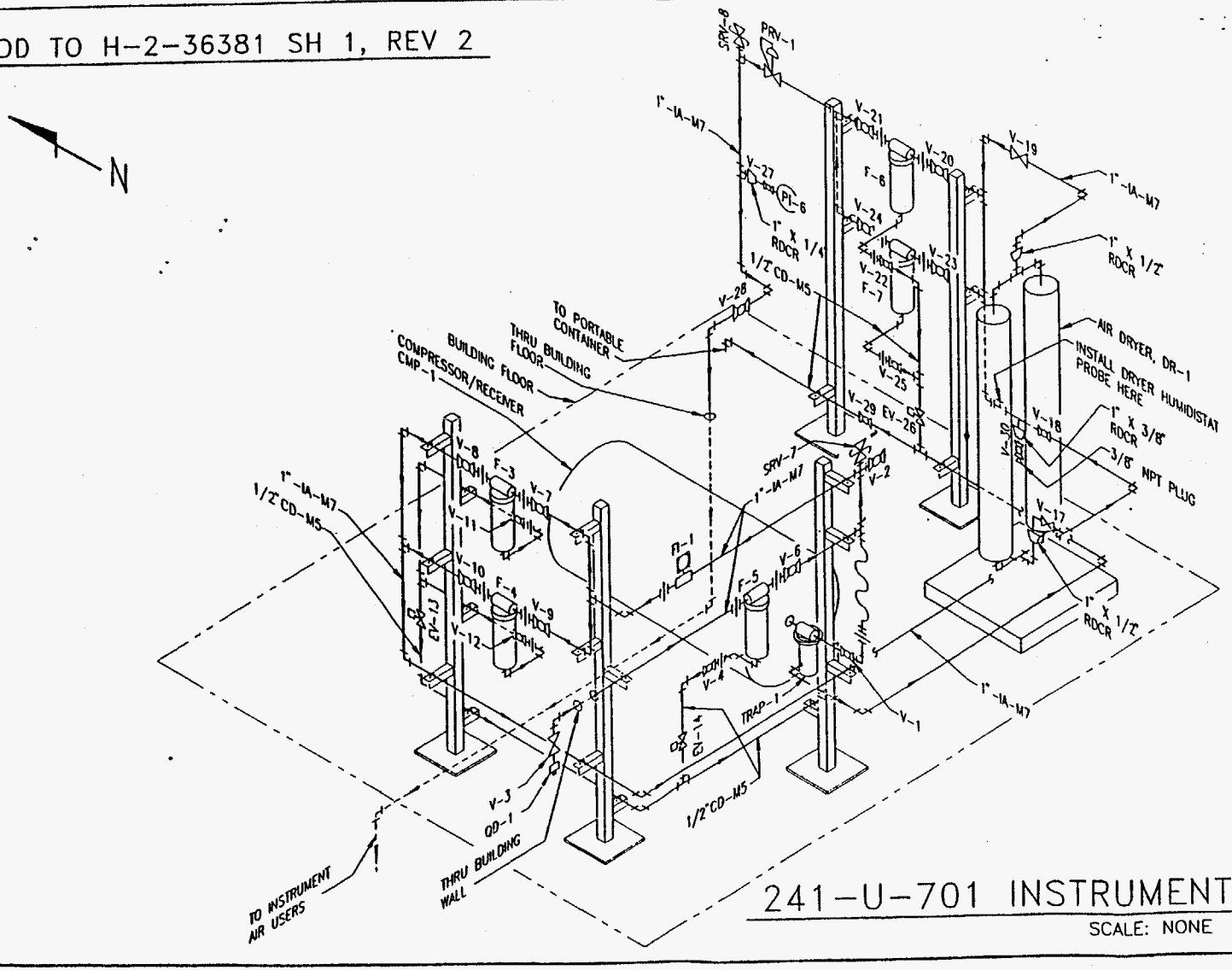
16. SEE SECTIONS A, B, C, & D PIPING DRAWING FOR LOCATION AND IDENTIFICATION OF PIPE SUPPORTS.
17. THIS IS A TYPICAL SUPPORT DRAWING. HOROZONTAL ARMS MAY BE ADDED TO SUPPORT THE PIPE LINE AT DIFFERENT ELEVATIONS AS SHOWN ON THE PIPING DRAWINGS
18. 1/2" DIA CONDENSATE PIPE LINE MAY BE SUPPORTED FROM THE VERTICAL STAND PIPE AS REQUIRED.

(NOTES CONTINUED ON PAGE 15)



KEH-0159.00 (1/88) ACAD

ADD TO H-2-36381 SH 1, REV 2



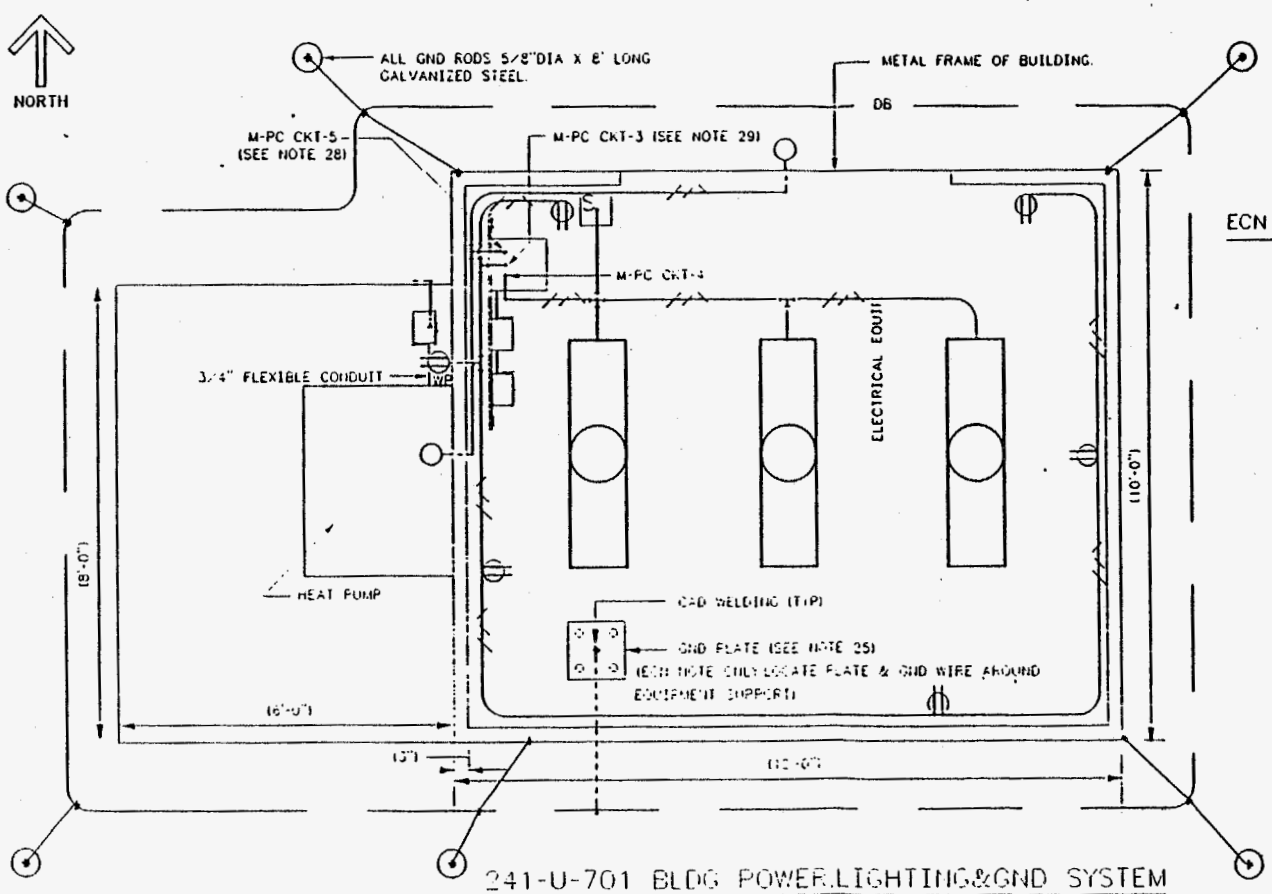
241-U-701 INSTRUMENT AIR SYSTEM

SCALE: NONE

PLOT = 1/1 ZRC80095 7/9/93

WESTINGHOUSE HANFORD	ENGINEERING CHANGE NOTICE SKETCH				
Ref Dwg	In.	Rev	Prepared By	Checked By	ECN No.	Page
H-2-36380	1	2	S.A.NAJJAR		198245	15/18

Add



241-U-701 BLDG POWER,LIGHTING&GND SYSTEM

SCALE NONE

LEGEND	
SYMBOL	DESCRIPTION
	FIXTURE,2TUBES,FLUORESCENT,100W,120VAC 4' LONG.
	FIXTURE,INCANDESCENT W/PHOTO CELL,150W 120VAC,OUTDOOR.
S	TOGGLE SWITCH.
	DUPLEX RCPT,20A,120VAC.
WP	DUPLEX RCPT,WEATHER PROOF,20A,120VAC.
	#12 AWG CONDUCTOR GND.
	#12 AWG CONDUCTOR,PHASE.
	#12 AWG CONDUCTOR NEUTRAL.
	CROUSE HINDS CAT. NO X28 OR EQUAL.
	CROUSE HINDS CAT. NO T28 OR EQUAL.
	CONNECTION BY CAD WELDING.

ECN NOTES:

19- APPREVIATIONS ARE PER ASME Y1.1 UNLESS OTHERWISE SPECIFIED.

20- ALL GND RODS SHALL BE 5/8"DIA X 8'LONG GALVANIZED GRADE STEEL. GROUNDING CABLE SHALL BE 4/0 MEDIUM HARD DRAWN COPPER.

21- ALL CABLE-TO-CABLE AND CABLE-TO-GRND ROD WELDS SHALL BE "ERICO PRODUCTS CADWELD" OR APPROVED EQUAL.

22- MINIMUM BURIAL DEPTH OF THE GND CABLE SYSTEM SHALL BE 2'-6".

23-GND CABLE SHALL BE 2 TO 4" FROM THE BUILDING.

24- GROUNDING CABLES SHALL BE PROTECTED AGAINST MECHANICAL DAMAGE BEFORE AND DURING BACKFILL. BACKFILL MATERIAL WITHIN ONE FOOT OF CABLES SHALL NOT CONTAIN ROCK LARGER THAN 2" IN DIAMETER.

26- FIELD ROUTE LIGHTING AND RECEPTACLE CONDUIT RUNS IN A GOOD CRAFTMAN LIKE MANNER IN ACCORDANCE WITH NFPA70 1993 EDITION(NEC).

27- LIGHTING CIRCUITS TYPICALLY TO BE 3-1 C #12 AWG IN 3/4" GALV RIGID CONDUIT UNLESS SHOWN OTHERWISE.

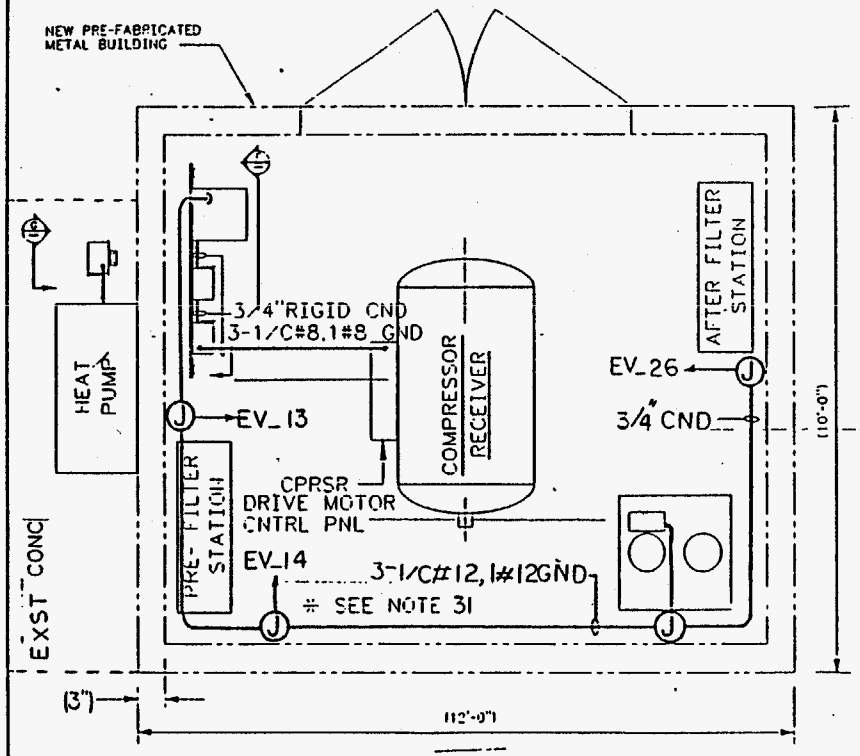
28- M-PC IS THE MINI-POWER CENTER IN 241-U-701 BLDG

29- CKT-3 BREAKER IS GFIC BREAKER.

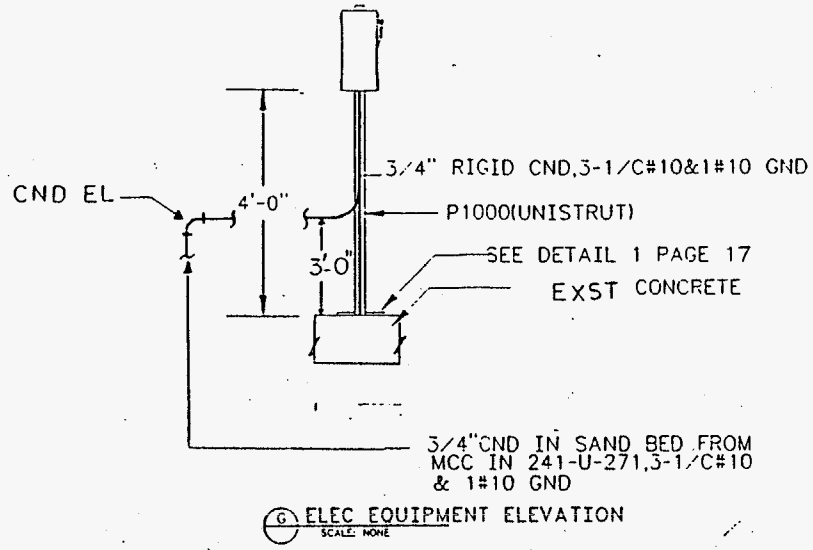
30- MOUNT RECEPTACLES APPROXIMATELY 36" ABOVE FLOOR SLAB. MOUNT LIGHT SWITCH 48" ABOVE FLOOR SLAB. FIELD TO COORDINATE EXACT RECEPTACLE LOCATIONS SO AS TO BE 6" ABOVE OR BELOW ALL PIPING.

WESTINGHOUSE HANFORD	ENGINEERING CHANGE NOTICE SKETCH					
Eng. Doc. H-2-36330	Ch. 1	Rev. 2	Prepared By S.A.NAJJAR	Checked By	ECN No. 198245	Page 16/18

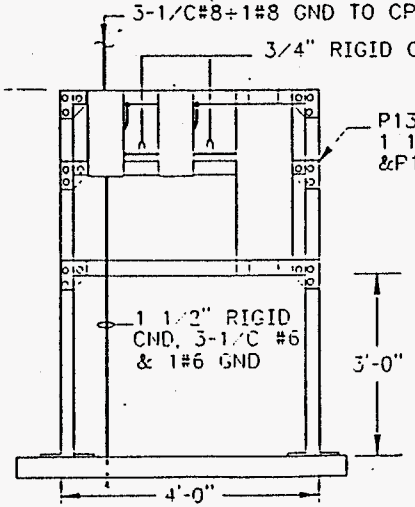
Modify Detail 6 as shown; Add elevations.



DET6
SCALE: NONE



G ELEC EQUIPMENT ELEVATION
SCALE: NONE



F ELEC EQUIPMENT ELEVATION
SCALE: NONE

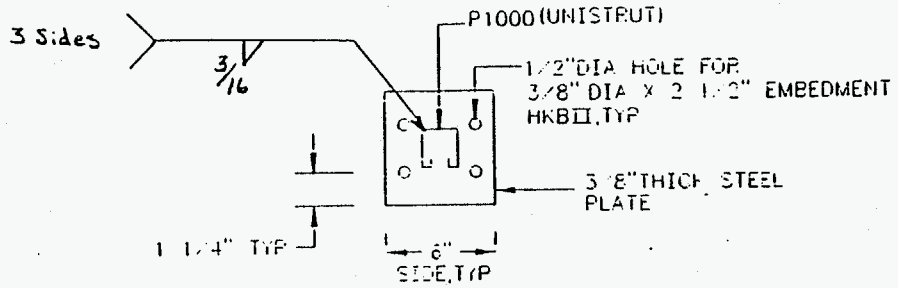
NOTE:
31-AIR DRYER AND TIMERS ARE TO BE HARDWIRED, AND CORRESPONDING CONDUITS ARE TO BE FIELD ROUTED TO M-PC CKT-1

32-All Power conductors to be Single Conductor Stranded Copper THWN Insulation 90°C Rated.

WESTINGHOUSE HANFORD	ENGINEERING CHANGE NOTICE SKETCH				
Ref Dwg. H-2-36380	In. 1	Rev. 2	Prepared By S.A. NAJJAR	Checked By	ECN No. 198245

Page 17/8

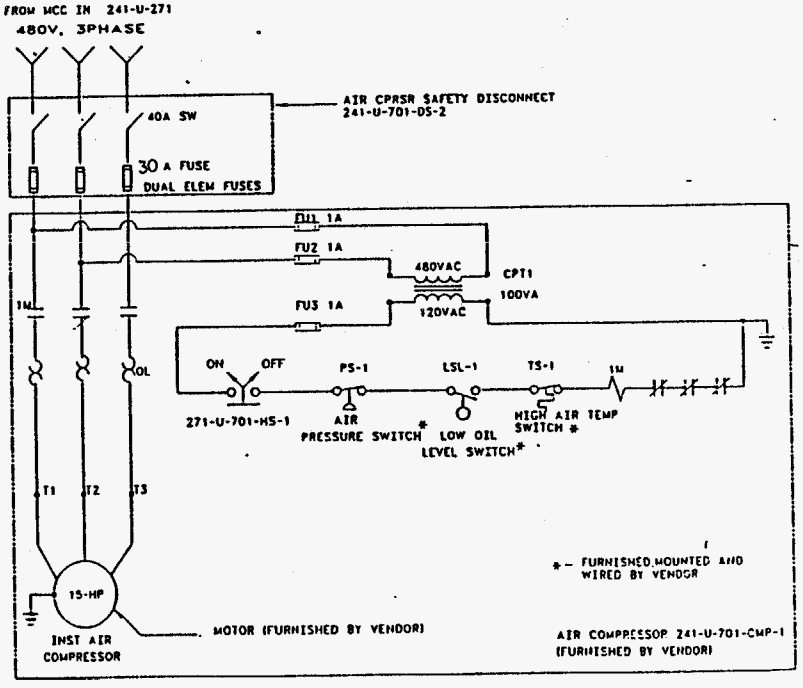
Add



DETAIL 1
OF BACK BASE

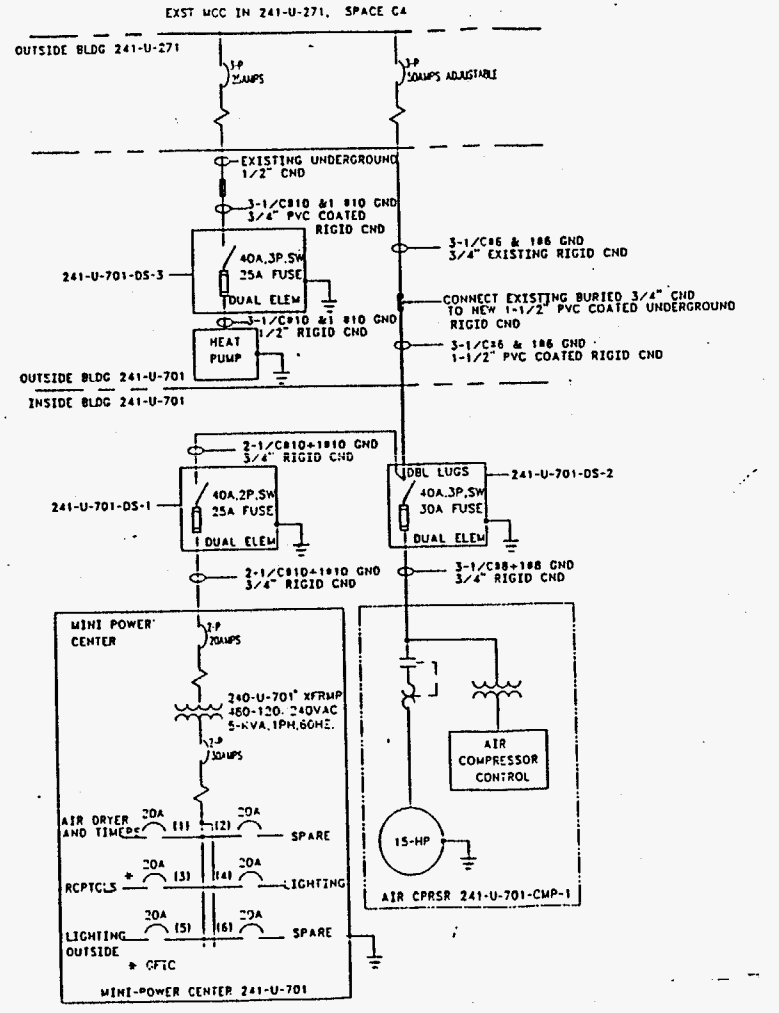
WESTINGHOUSE HANFORD	ENGINEERING CHANGE NOTICE SKETCH				
Ref. Dwg. H-2-73682	Sh. 1	Rev. 6	Prepared By S.A. NAJJAR	Checked By	ECN No. 198245

Add Elementary Diagram, Modify One-line Diagram as shown.



ELEMENTARY DIAGRAM, AIR COMPRESSOR

241-U-701-CMP-1



PARTIAL ONE-LINE DIAGRAM

APPENDIX B

ANALYSIS OF CONCRETE SLAB

DESIGN CALCULATION WHC-SD-WM-DA-135 REV 0

(1) Drawing H-2-36381 Rev 2 (2) Doc. No. _____

(4) Building 241-U-701 (5) Rev. 0 (6) Jot APPENDIX B-2

(7) Subject ANALYSIS OF CONCRETE SLAB

(8) Originator F.H. Huang F.K. Kuang Date 7-8-93

(9) Checker W.J. Kawoski (WJK) Date 7/19/93

(10) ANALYSIS OF POST LOADS ON THE 6" THICK SLAB OF THE 241-U-701 COMPRESSOR BUILDING

REFERENCES

1. PIPE SUPPORT CALCULATION FOR U-FARM COMPRESSOR AIR SYSTEM, A.R. ROMERO, KAISER ENG. HANFORD, 6-2-[illegible]
2. SLAB THICKNESS DESIGN FOR INDUSTRIAL CONCRETE FLOORS ON GRADE, R.E. PACKARD, PORTLAND CEMENT ASSO.

DEAD LOAD OF PIPE SUPPORT (REF.1)

HORIZONTAL MEMBER, $L_H = 116$ #

VERTICAL MEMBER, $L_V = 183$ #

TOTAL $L \simeq 300$ #

MOMENT OF PIPE SUPPORT (REF.1)

TOTAL MOMENT

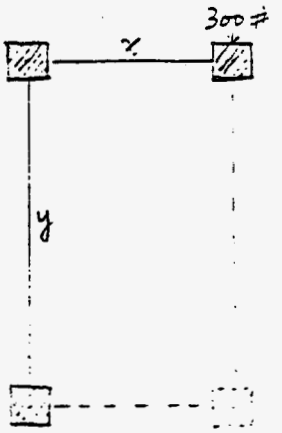
$M = 3877$ in-lb. SAY 4000 in-lb.

POST LOADS ON THE COMPRESSOR FOUNDATION

post spacings: Estimated

28" transverse(X),

46" longitudinal (Y)



post loads

300 #, each post

Load contact area

100 in.^{2} plate

Subgrade strength

50 #/in.^{2}

assuming soil of medium density (conservative)

(1) Drawing H-2-36321 Rev. 2 (2) Doc. No. _____
(4) Building 241-C-701 (5) Rev. 0 (6) Jo. APPENDIX B-3
(7) Subject ANALYSIS OF CONCRETE SLAB
(8) Originator E.D. Harvey Date 7-8-93
(9) Checker WJK Date 7/18/93

(10)

Concrete Data

f'_c = 3000 psi

flexural (tensile) strength, more critical than compressive strength in floor-slab design

flexural strength (modulus of rupture, MR) can be estimated by the formula

$MR = 9\sqrt{f'_c} = 493$ psi

SLAB THICKNESS DETERMINATION

1. Assume safety factor

SF = 3.0

2. Concrete working stress

$WS = \frac{MR}{SF} = \frac{493}{3} = 164$ psi

3 Slab stress per 1,000 # of post load (p.l.)

$= \frac{WS}{p.l.\ kips} = \frac{164}{0.3} = 548$ psi

4. Use Fig. 7a in REF. 2

548 psi/kip is out of range, implying a slab thinner than 5" is adequate.

LOAD CAPACITY OF 6" THICK SLAB

1. In Fig. 7a, locate X-post spacing of 28 in. on the 6" line for slab thickness; up to Y-post spacing of 46"; then left to 52 psi stress and 100 in^2 contact area.

(1) Drawing H-2-36321 Rev 2 (2) Doc. No. _____
(4) Building 241-U-701 (5) Rev. 0 (6) Job APPENDIX B-4
(7) Subject ANALYSIS OF CONCRETE SLABS
(8) Originator F.H. HUANG Date 7-8-93
(9) Checker WJK Date 7/19/93

(10)

2. Fig. 5 in REF. 2 shows the effective contact area and actual contact area of 100 in² is same.

3 slab stress 52 psi per 1,000 # gives

post Load capacity = $\frac{164}{52} \times 1000 = 3154$ #

4. Allowable bearing stress
for interior load = 4.2 MR = 2,071 psi
for edge/corner load = 2.1 MR = 1,035 psi
computed bearing stress
= $\frac{\text{post load}}{\text{load area}} = \frac{3154}{100} = 31.5$ psi OK

5. Allowable shear stress = 0.27 MR = 133 psi
computed shear stress
for interior load = $\frac{3154}{6(10\times4 + 6\times4)} = 8.2$ psi O.K.
for edge load = $\frac{3154}{6(0.75\times40 + 2\times6)} = 12.5$ psi O.K.
for corner load = $\frac{3154}{6(0.5\times40 + 6)} = 20.2$ psi O.K.

Therefore, the 6" thick slab of the compression building can withstand each post load up to 3000 lb with 28" and 46" in the x and y-spacing.

DESIGN CALCULATION WHC-SD-WM-DA-135
REV 0

(1) Drawing H-2-36321 Rev.2 (2) Doc. No. _____

(4) Building 241-U-701 (5) Rev. _____ (6) Jc APPENDIX B-5

(7) Subject ANALYSIS OF CONCRETE SLAB

(8) Originator E.H. Hwang E.H. Hwang Date 7-8-93

(9) Checker 7/19/93 GJF Date 7/19/93

(10)

SLAB BENDING DUE TO PIPE SUPPORT MOMENT

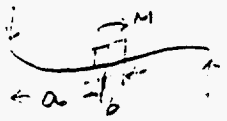
REF: R.J. ROARK + W.C. YOUNG, Table 24, Case 20, p. 332

• Central Couple on a Simply Supported plate

$M = 4000$ in-lb

$a = 1''$

$b = 12.5''$



• $a/b = 0.08$; $\beta = 10.768$. (REF Table 20, Case 20)

Max. Stress:

$$\sigma = \frac{\beta M}{at^2} = \frac{10.768 \times 4000}{12.5 \times 6^2} = 35.7 \text{ psi} < MR_{fc} = [illegible]$$

O.K.

(1) Drawing H-2-35321 REV 2 (2) Doc. No. _____

(4) Building 241-U-701 (5) Rev. 0 (6) Job APPENDIX B-6

(7) Subject ANALYSIS OF CONCRETE SLAB

(8) Originator E.H. Hueni Date 7-8-93

(9) Checker WJK Date 7/19/93

(10)

BUILDING ANCHORAGE

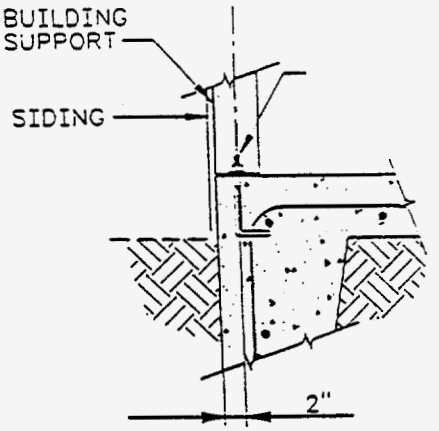
REFERENCES

1. SDC 4.2, DESIGN AND INSTALLATION OF EXPANSION ANCHORS
2. UNIFORM BUILDING CODE (UBC) Table 25-E.

• VERT. OR HORIZ. LOAD ON FOUNDATION IS 150 #/Lin. Ft.

CARBON STEEL HILTI KWIK BOLTS at 4' O.C.

½" DIA. 2 ¼ EMBD.



Allowable shear load (REF.)

V = 1,470 #/Bolt >
150 x 4 = 600 #/Bolt

Edge distance
= 6 3/4"

Min. Spacing = 6"

By Reducing the work load 50%,

V = 1,470 / 2 = 735 #/Bolt.

the minimum allowable edge distance
= 3 3/8" > 2". Not O.K.

AN ALTERNATIVE ANCHOR INSTALLATION MUST BE SELECTED.

(1) Drawing H-2-35227 Rev 2 (2) Doc. No. _____

(4) Building 241-U-701 (5) Rev. 0 (6) Job APPENDIX B-7

(7) Subject ANALYSIS OF CONCRETE SLAB

(8) Originator F.H. HUANG Date 7-8-93

(9) Checker WJK Date 7/19/93

(10)

ASTM A307 ANCHOR BOLT (REF 2)

½" DIA. 4" EMBD

Allowable shear load

$V = 2{,}000\ \#/\text{bolt} > 600\ \#/\text{bolt}$

Edge distance $= \frac{1}{2} \times 6 = 3"$

Bolt spacing $= \frac{1}{2} \times 12 = 6"$

Minimum allowable edge distance

$= 3/2 = 1\frac{1}{2}" < 2"$ O.K.

allowable shear load $= 2000/2 = 1{,}000\ \#/\text{bolt} > 600\ \#/\text{bolt}$

O.K.

Because flexure controls, the design factors are similar to those used for vehicle loads except that the use of a higher safety factor may be appropriate. The specific design factors are:

maximum post load
load contact area
spacing between posts
subgrade-subbase strength
flexural strength of concrete

Figs. 7a, 7b, and 7c are used to determine the slab thickness requirements for k values of 50, 100, and 200 pci. The charts* were developed to estimate slab stresses for the two equivalent post configurations and load conditions shown in Fig. 8, representing continuous racks. In Figs. 7a, 7b, and 7c, the post spacing, y, is in the longitudinal direction of a continuous rack and x is the transverse spacing.

When using the de
should be corrected to
from Fig. 5.

For special post load configurations that deviate substantially from those indicated in Fig. 8, slab stresses may be determined by computer program[10]** or by influence charts.[18]

It should be noted that the design procedure is based on load stresses only; it is not necessary to consider shrinkage stresses (see first footnote on page 4).

*For a structurally reinforced slab, bending moments computed from the flexural stress determined from Figs. 7a, 7b, and 7c may be used to compute the required tensile reinforcement.

**The computer program may be used with appropriate modifications in the shape of the contact area. For the range of contact areas involved, a circular or elliptical area may be used without significant error to approximate a square or rectangular area.

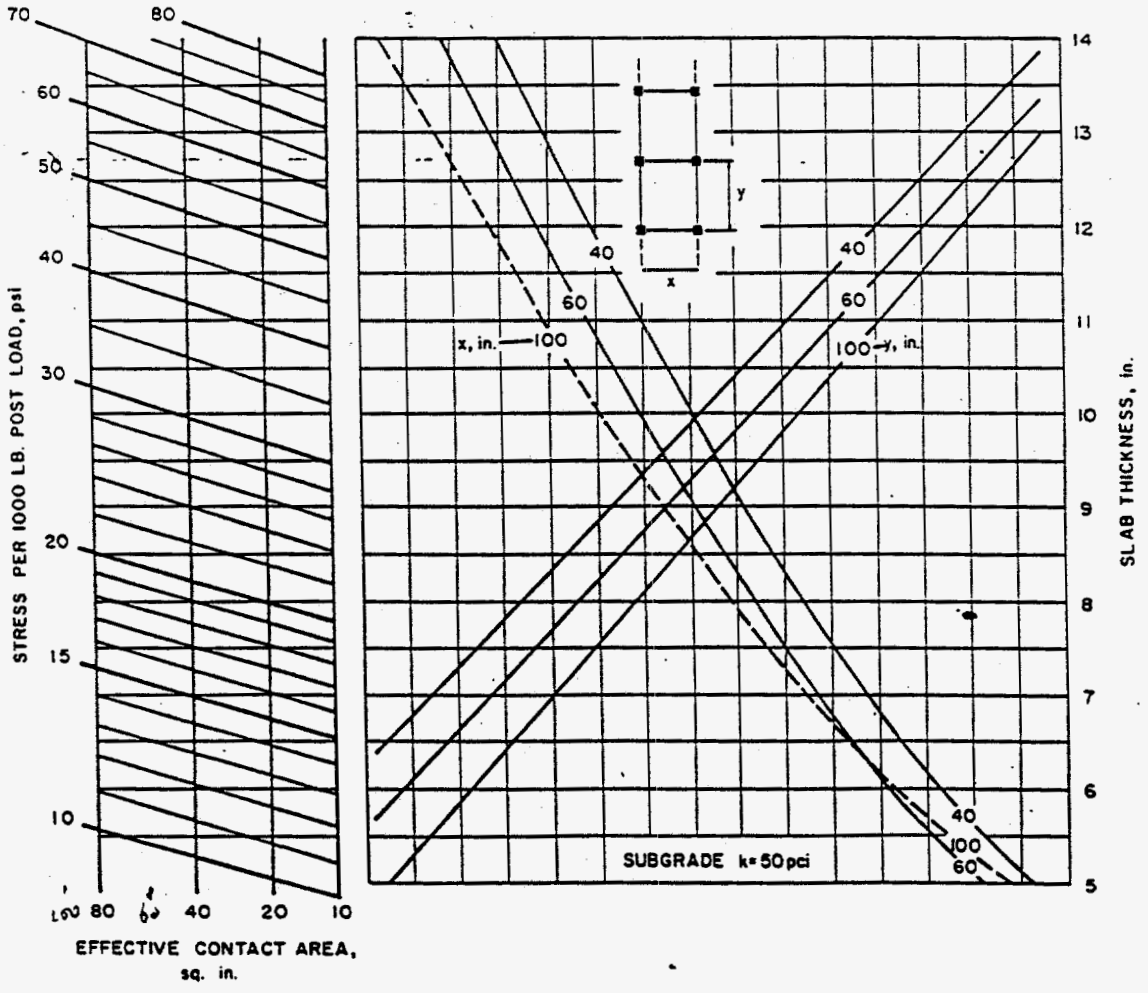


Fig. 7a. Design chart for post loads, subgrade k = 50 pci.

APPENDIX C

CALCULATIONS

CALC No ER3100-[illegible] | Of [illegible]

CALCULATION IDENTIFIC

WO/Job No. ER3100
Date 05/25/93

This sheet shows the status and description of the attached Design Analysis sheets.

Discipline 24 STRUCTURAL

Project No. & Name ER3100 BLDG 241-U-701 COMPRESSOR BLDG - NEW

Calculation Item FOUNDATION/SLAB DESIGN; AIR COMPRESSOR & DRYER LOADING, ELECTRICAL [illegible]

These calculations apply to:

Dwg. No. H-2-36381, SH 1 Rev. No. 2

Dwg. No. ____ Rev. No. ____

Other (Study, CDR) ____ Rev. No. ____

The status of these calculations is:

- ☐ Preliminary Calculations
- ☑ Final Calculations
- ☐ Check Calculations (On Calculation Dated ____)
- ☐ Void Calculation (Reason Voided ____)

Incorporated in Final Drawings? ☑ Yes ☐ No

This calculation verified by independent "check" calculations? ☐ Yes ☑ No

Original and Revised Calculation Approvals:

	Rev. 0 Signature/Date	Rev. 1 Signature/Date	Rev. 2 Signature/Date
Originator	[signature] 5/25/93		
Checked by	[signature] 6/17/93		
Approved by	[signature] 7/28/93		
Checked Against Approved Vendor Data			

INDEX

Design Analysis Page No.	Description
1	OBJECTIVE, CRITERIA, METHODS, REFERENCES, ASSUMPTIONS, CONCLUSIONS
2-9	BODY OF CALCULATION
ATTACH 1, A1-[illegible]	PREENGINEERED BLDG CUT SHTS
ATTACH 2, B1-[illegible]	AIR COMPRESSOR CUT SHTS
ATTACH 3, [illegible]	DRYER CUT SHTS
ATTACH 4, D1-[illegible]	ELECTRICAL CUT SHTS.

DESIGN VERIFICATION SCREENING CRITE

WHC-SD-WM-DA-135
REV 0

APPENDIX C-3

Project/Document No. [illegible]

When the design or design change affects hardware, formal design verification must be performed if one or more of the following questions must be answered affirmatively (YES).

YES	NO		
____	X	1.	Does the design or design change involved meet the established criteria to be considered Safety Class 1 or 2?
____	X	2.	Does this design or design change cause or permit changes to Safety Class 1 or 2 instrument or alarm setpoints outside of previously approved operational limits?
____	X	3.	Does this design or design change significantly affect the nuclear safety consequences of a malfunction or failure of the structure, system, or component?
____	X	4.	Does this design or design change involve or change design that has previously undergone formal design verification?

Assigned Lead Engineer — Date: 5/25/93

Responsible Discipline Manager — Date: 7/28/93

Original Design Package Distribution:

- Project Engineer
- Chief Design Engineer
- Engineering Document Control

Design Change Distribution:

- Attach to Engineering Change Notice

CALCULATION CROSS INDEX (Typical)

Subject Calculation No. 6R3100

Page 111 of 111

Subject Calculation Revision No.	Superceded by Calculation No.	These interfacing calculation/documents provide input to the subject calculation, and if revised may require revision of the subject calculation.		Results and conclusions of the subject calculation are used in these interfacing calculations and/or documents.		Does the output interface calculation/ documents require revision?		Has the output interface calculation/ documents been revised?		Discipline manager's signature and date indicating evaluation complete.
		Calculation/Document No.	Revision No.	Calculation/Document No.	Revision No	Yes	No	Yes	No	
0	—	—	—	H-2-36381, 411	2	X			X	

WHC-SD-WM-DA-135
REV 0

APPENDIX C-4

KFI

DESIGN ANALYSIS

APPENDIX C-5

WO/Job No. /EK3100

Subject BLDG 241-U-701 COMP. BLDG. FNDTN DESIGN AND COMPRESSOR AND DRYER ANCHORAGE

Date 05/25/93 By W.A. ADAMEK

Checked 6/17/93 By E.H. Hirano & D. Jones

Location 200 AREA

Revised _____ By _____

OBJECTIVE

DESIGN BUILDING FOUNDATION FOR A 10' BY 12' PREENGINEERED BUILDING AND SIZE ANCHORAGE FOR A NEW DRYER AND COMPRESSOR.

CRITERIA

* DOE ORDER 6430.1A, 4/6/89
* LOI No. 9258144, AND ADDENEDUM TO LOI 9258144, LOI NO. 9352974, Dated April 7, 1993, from ALOIS J. KOSTELNIK.

METHODS

HAND CALCULATIONS

REFERENCES

1. SDC 4.1, REV 11.
2. SDC 4.2, REV 0.
3. UNIFORM BUILDING CODE (UBC), 1991 EDITION
4. AISC STEEL CONSTRUCTION MANUAL, 9TH EDITION, ASD
5. ACI 318-89.
6. DWG. H-2-36381, SH. 1, REV. 2.
8. "DESIGN OF WELDED STRUCTURES", BLODGETT, 12TH PRINTING, 1982
7. UNISTRUT GENERAL ENGINEERING CATALOG NO.11, UNISTRUT CORPORATION. EXT.

ASSUMPTIONS

1. ALL WORK IS SAFETY CLASS 3.
2. CONCRETE STRENGTH f'c= 3000psi.
3. REINFORCING STEEL STRENTH fy= 60000psi.
4.

CONCLUSIONS

SEE BODY OF THE CALCULATION.

DESIGN ANALYSIS

APPENDIX C-6

Client

Subject BLDG 241-U-701 COMP. BLDG. FNDTN DESIGN AND COMPRESSOR AND DRYER ANCHORAGE

Location 200 AREA

WO/Job No. /ER3100

Date 05/25/93 By W.A. ADAMEK

Checked 6/17/93 By E.F. Hump [illegible]

Revised __/__/__ By _____

SIZE FOUNDATION BASED ON MANUFACTURER'S LOADING (ATTACH A

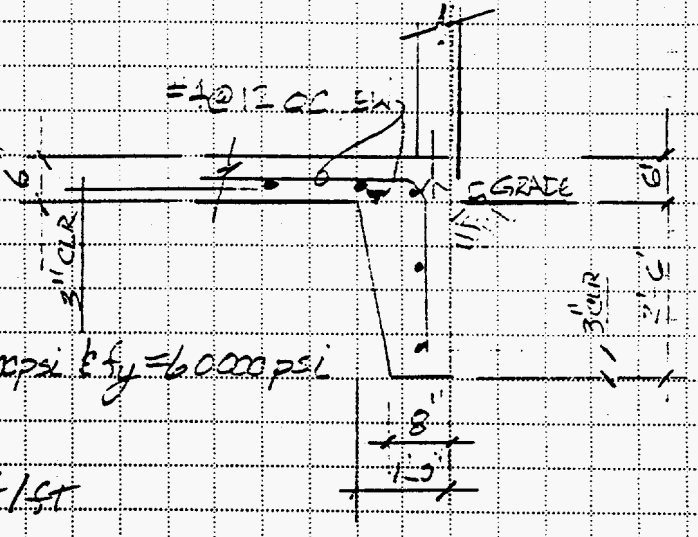
VERT LOAD TOTAL PER LINEAL FT = 150#/LF
HORIZ LOAD = 150#/LF
} ATTACH A pg.

FROM REF 3, TBL 29-B, f; USE ALLOW q_s = 1500psf

BEARING PRESSURE

$= \frac{150}{1'(.667')} = 225 psf < 1500 psf$

OK



MIN STEEL, ρ_{MIN} = 0.0018 W/ f'_c = 3000psi & f_y = 60,000 psi (REF 5, 7.12.2.1

$A_{S\,REQD} = 0.0018(6")(12") = 0.13 in^2/ft$

$\Sigma A_{S\,REQD} = 0.0019(8")(12") = 0.17 in^2/ft$

USE #5 @ 12" OC EW, A_S = 0.20 in^2/ft & f'_c = 3000 psi (28 DAY)

SIZE BLDG ANCHORAGE LAT LOAD @ FNDTN = 150#/LF (SEE ABOVE)

MIN. Allowable Edge Distance = 3 3/8" with V = 735# (REF 2) = 2.0"

TRY 1/2 ϕ X 2 1/4" EMBED HKB II @ 4' OC

CAPACITY = 1.4700# > 150#/LF(4') = 600# OK (REF 2)

USE 8 1/2 ϕ x 2 1/4 EMBED HKB II @ 4' OC AROUND PERIMETER

ALTERNATE: 1/2" ϕ [illegible] EMBED [illegible] > 600# OK (REF 2, TBL 6E)

DESIGN ANALYSIS

APPENDIX C-7

Client

Subject BLDG 241-U-701 COMP. BLDG. FNDTN DESIGN AND COMPRESSOR AND DRYER ANCHORAGE

Location 200 AREA

WO/Job No. /ER3100

Date 05/25/93 By W.A. ADAMEK

Checked 6/17/93 By

Revised __/__/__ By

SIZE ANCHORAGE FOR AIR COMPRESSOR ATTACH 2

CG NOT READILY AVAILABLE FROM ATTACH 2, HOWEVER, CONSERVATIVELY ASSUME CG LOCATED @ 54" UP FROM FLR.

$\therefore CG = 0.75(64") = \pm 48"$ $L = 70"$, $W = 30"$, $WT = 1450^{\#}$ $H = 64"$

CALC OTM DUE TO SEISMIC

$F_p = ZIC_p W_p$ WHERE F_p = LAT SEISMIC FORCE

$Z = 0.20$ (ZONE 2B, REF 3)

$I = 1.25$ (REF 1)

$C_p = 0.75$ (REF 3, III.2) RIGIDITY COEFF

W_p = WT OF COMPONENT

$F_p = 0.20(1.25)(0.75)(1450)$

$= 272^{\#}$

$OTM = 272^{\#}(48") = 13,056^{\#-"}$ SPA OF BOLTS, MIN = 23.75 (ATTACH 2, B-1)

$MAX\ T\ PER\ BOLT = \frac{M}{2_{BOLTS}(SPA)} = \frac{13,056}{2(23.75")} = 275^{\#}$

$V = \frac{272^{\#}}{4\ BOLTS} = 68^{\#}/BOLT$

CAPACITY OF ½" ϕ X 2¼" EMBED HILTI KWIK-BOLT II (HKB II)

$T_{CAP} = 1230^{\#}/BOLT$

$V_{CAP} = 1,170^{\#}/BOLT$ } REF 2

$COMBINED = \frac{275}{1230} + \frac{68}{1170} = 0.27 < 1.0$ OK

* ½" X 4¼" EMBED HILTI KWIK BOLT, ASTM A36

$T = 2,840^{\#}/BOLT$; $V = 2,090^{\#}/BOLT$

$COMBINED: \frac{275}{2840} + \frac{68}{2090} = 0.13$ < 1.0 O.K.

USE (4) ½" ϕ x 2¼ EMBED HKB II

DESIGN ANALYSIS

APPENDIX C-8

Client

Subject BLDG 241-U-701 COMP. BLDG. FNDTN DESIGN AND COMPRESSOR AND DRYER ANCHORAGE

Location 200 AREA

WO/Job No. /ER3100

Date 05/25/93 By W.A. ADAMEK

Checked 6/17/93 By [illegible]

Revised __/__/__ By _____

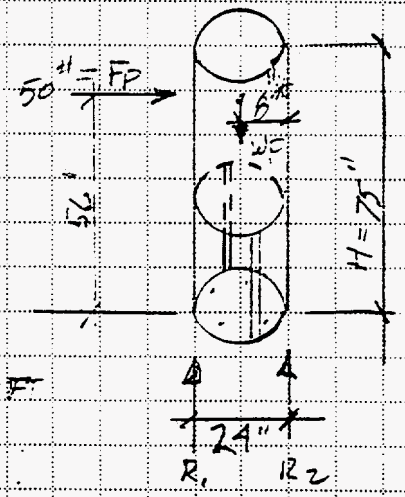
SIZE ANCHORAGE FOR DRYER (ATTACH 3, C-1)

WT = 265#

FROM PG 3, SEISMIC $F_p = ZIC_pW_p = 0.20(1.25)0.75W_p = 0.19W_p$

$F_p = 0.19(265) = 50^{\#}$

(USE CYLINDRICAL SHAPE, CONSERVATIVE)



ASSUME CG @ 3/4 H (CONSERV)

$CG = 0.75(75) = 56"$

NET UPLIFT = $\frac{\Sigma(265^{\#}) - 56"(50^{\#})}{24"} = 28^{\#}$ UPLIFT

$V = 50^{\#} \div 4 \text{ BOLTS} = 13^{\#}/\text{BOLT}$

$T = 28^{\#}/\text{BOLT}$

TRY 2- 3/8" ϕ x 2 1/2" EMBED HKBII's

$T_{CAP} = 1210^{\#}/\text{BOLT} > 28^{\#}/\text{BOLT}$ OK

$V_{CAP} = 880^{\#}/\text{BOLT} > 13^{\#}/\text{BOLT}$ OK

CHECK COMBINED: $\frac{28}{1210} + \frac{13}{880} = 0.04 < 1.0$ OK

USE: (2)- 3/8" ϕ x 2 1/2" EMBED HKBII's MIN

DESIGN ANALYSIS

APPENDIX C-9

Client

Subject BLDG 241-U-701 COMP. BLDG. FNDTN DESIGN AND COMPRESSOR AND DRYER ANCHORAGE

Location 200 AREA

WO/Job No. /ER3100
Date 05/25/93 By W.A. ADAMEK
Checked 6/17/93 By
Revised __/__/__ By

DESIGN ELECTRICAL RACK IN BUILDING

$P_1 = 25^{\#}$ SAY COULEN USE $50^{\#}$

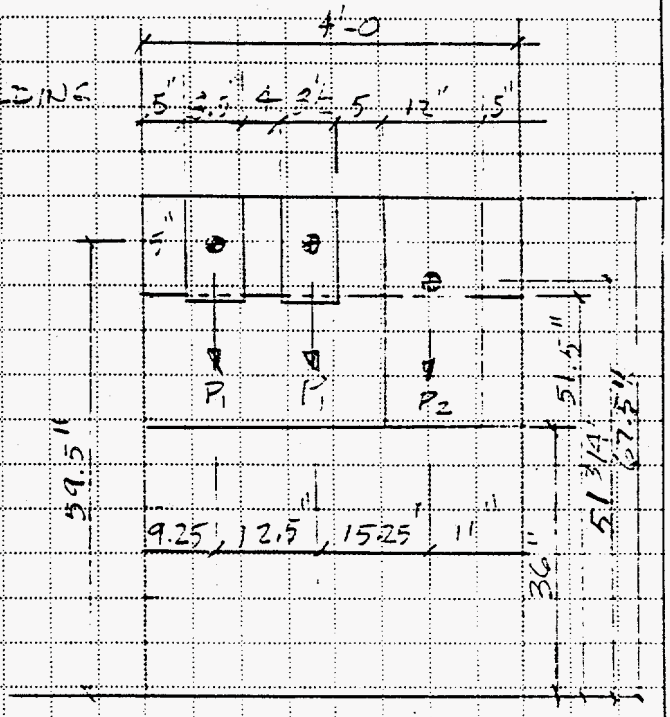
$P_2 = 150^{\#}$

SEISMIC LOADING, FROM PG 3

$F_p = .125(.75\ W_p) = .19 W_p$

$F_{1\ SEISMIC} = 0.19(50) = 7.5^{\#}$ SAY $10^{\#}$

$F_{2\ SEISMIC} = 0.19(150) = 28.5^{\#}$ SAY $29^{\#}$



FIRST, SIZE TOP BEAM (THIS HAS WORST CASE LOADING

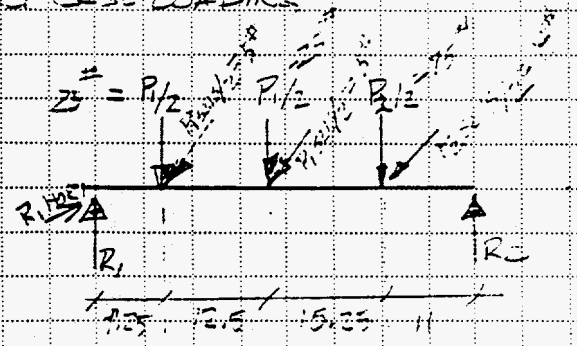
BM DL NEGLIGIBLE

$R_1 = \frac{75(14") + 25(23.25" + 33.75")}{48"} = 51^{\#}$

$R_{1\ FROM\ 2} = \frac{14(11") + 5(26.25" + 33.75")}{48"} = 10^{\#}$

$R_2 = 75 + 2(25) - 51 = 74^{\#}$

$R_{2\ FROM\ 2} = 14 + 2(5) - 10 = 14^{\#}$



EQ'D SHEAR LOAD'D 2 R_2

$M_{MAX} = 74^{\#}(11") = 814$

$M_{FROM\ 2} = 14^{\#}(\quad - .5") =$

DESIGN ANALYSIS

APPENDIX C-10

Client

Subject BLDG 241-U-701 COMP. BLDG. FNDTN DESIGN AND COMPRESSOR AND DRYER ANCHORAGE

Location 200 AREA

WO/Job No. /ER3100

Date 05/25/93 By W.A. ADAMEK

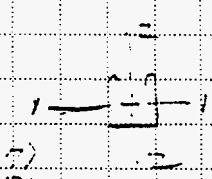
Checked 6/17/93 By [illegible]

Revised __/__/__ By ________

USING P1000 *

AXIS 1-1, I = .165, S = .202, r = .577, A = .556

AXIS 2-2, I = .236, S = .2[illegible], r = .651 (REF 7) [illegible]



$f_b = \frac{M}{S} = \frac{814}{0.290} = 2807$ psi

$f_{b_L} = \frac{M}{S} = \frac{15[illegible]}{0.202} = 762$ psi

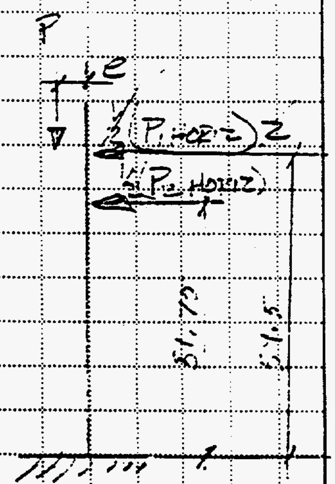
* UNISTRUT INFORMATION FROM UNISTRUT METAL FRAMING, "[illegible] ENGINEERING CATALOG", No. 11. (delete)

USE $F_b = 25$ KSI (REF 7) [illegible]

COMBINED STRESS $= \frac{2807 + 762}{25000} = 0.14 < 1.0$ OK

USE: P1000 BEAMS

SIZE VERTICALS



$P_{MAX} = [illegible] = 148^{\#}$

$e = 6 + 1\frac{1}{2} + \frac{3}{4} = 8.25''$

$M_{MAX} = 148(8.25'') + 9.5(59.5'') + 23(51.75)$

$= 3235''^{\#}$

$f_b = \frac{M}{S} = \frac{3235}{0.202} = 16,015$ psi

$f_a = \frac{P}{A} = \frac{148}{0.556} = 266$ psi

$l = [illegible]$ $K = 2.0$ $Kl = 13[illegible]$

@ $Kl = 120$, $P_{ALLOW} = 2200^{\#}$ (REF 7) [illegible]

DESIGN ANALYSIS

APPENDIX C-11

Client

Subject BLDG 241-U-701 COMP. BLDG. FNDTN DESIGN AND COMPRESSOR AND DRYER ANCHORAGE

Location 200 AREA

WO/Job No. /ER3100

Date 05/25/93 By W.A. ADAMEK

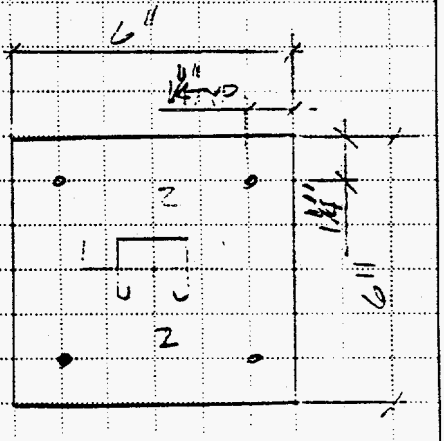
Checked 6/17/93 By [illegible]

Revised __/__/__ By _____

CHECK COMBINED LOADING

$\frac{P}{P_{allow}} + \frac{f_b}{F_{b\,allow}} \leq 1.0 = \frac{1.3^{k}}{2200\#} + \frac{16015\ psi}{[illegible]} = 0.71 < 1.0$ OK

USE [illegible] VERT.



SIZE BASE

SIZE WELD c=c = 1.5

$S_{1-1\ TOP} = \frac{2bd+d^2}{3} = \frac{2(1.5)1.5+1.5^2}{3} = 2.25\ in^2$ *

$S_{1-1\ BOT} = \frac{d^2(2b+d)}{12(b+d)} = \frac{(1.5)^2[2(1.5)+1.5]}{3(1.5+1.5)} = 1.125\ in^2$ *

$S_{2-2} = bd + \frac{d^2}{6} = 1.5(1.5) + \frac{1.5^2}{6} = 2.63\ in^2$ *

* SEE 7 8 SHR.

USE S = 1.125

WELD CAPACITY REQD = $\frac{M}{S} = \frac{3822.1^{\#}}{1.125} = 2357\ \#/in$

USING 1/4" FILLET CAPACITY = 1/4 (.707)(3)(7000) = 3712 #/in (E70XX) (LR=4)

3712 #/in > 2357 #/in OK

USE 1/4" FILLET, 3 SIDES

SIZE PL A36 $F_b = 0.75 F_y = 27.0$ KSI (REF 4, FZ.1)

$f_b = \frac{M}{S} = \frac{F_b}{[illegible]}$ $t_{REQD} = \sqrt{\frac{6M}{F_b}}$

$t_{REQD} = \left[\frac{6(3822.1^{\#})}{(27{,}000)}\right]^{\frac{1}{2}} = 0.35"$ USE: PL 3/8 x 6 x 2'-6

DESIGN ANALYSIS

Client

Subject BLDG 241-U-701 COMP. BLDG. FNDTN DESIGN AND COMPRESSOR AND DRYER ANCHORAGE

Location 200 AREA

WO/Job No. /ER3100

Date 05/25/93 By W.A. ADAMEK

Checked 6/17/93 By [signature]

Revised __/__/__ By _____

SIZE EXP AHR:

$M = 3235^{FT-\#}$ $d = 6" - 1.25" = 4.75"$

$T_{MAX} = \frac{M}{2\,\text{BOLTS}} = \frac{3235}{2\,(4.75)} = 341^{\#}/\text{BOLT}$

$V_{MAX} = [9.5^{\#} + 425^{\#}]/4\,\text{BOLTS} = 9.4\ \text{SAY}\ 10^{\#}/\text{BOLT}$

TR- 3/8" ϕ X 2 1/2" EMBED HKBII : (REF 2, f'_c = 2000 psi)

$T_{allP} = 1210^{\#}/\text{BOLT} > 341^{\#}/\text{BOLT}$ OK

$V_{allP} = 850^{\#}/\text{BOLT} > 10^{\#}/\text{BOLT}$ OK

CHECK COMBINED $\frac{341}{1210} + \frac{10}{850} = .29 < 1.0$ OK

USE: (4)- 3/8" ϕ X 2 1/2" HKBII's PER P

DESIGN ANALYSIS

APPENDIX C-13

Client

WO/Job No. /ER3100

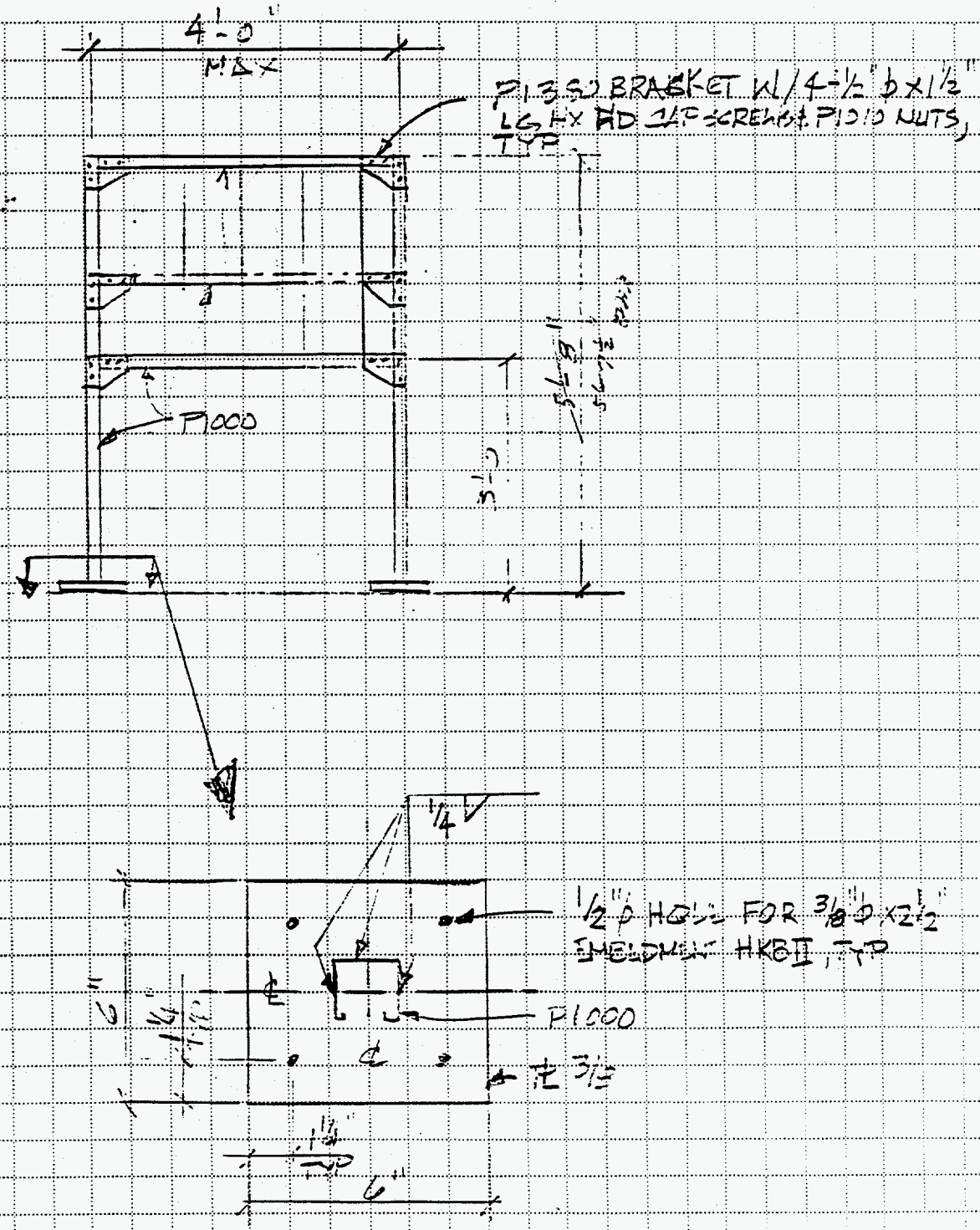
Subject BLDG 241-U-701 COMP. BLDG. FNDTN DESIGN AND COMPRESSOR AND DRYER ANCHORAGE

Date 05/25/93 By W.A. ADAMEK

Checked 6/17/93 By [illegible]

Location 200 AREA

Revised __/__/__ By _____



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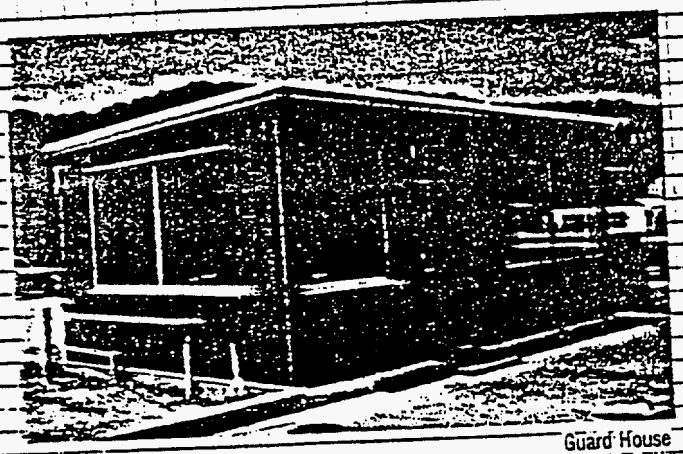
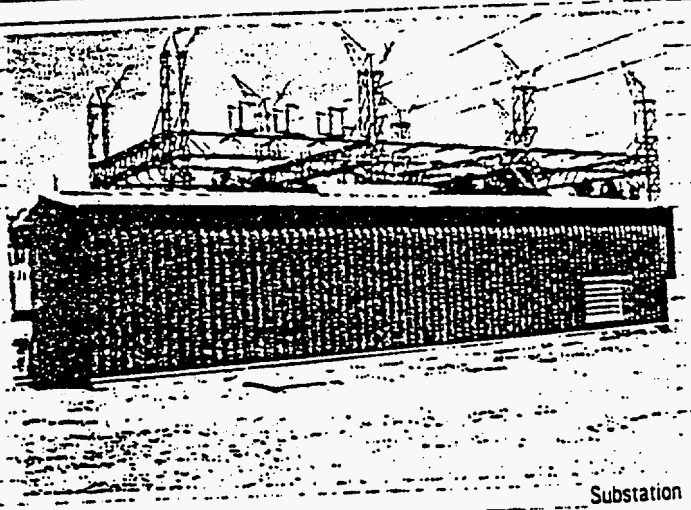
From simple storage space to complex computerized control stations, Parkline's wide selection of sizes, accessories and interior finishes allow you to tailor a Parkline building system to fit your specific needs at a reasonable cost.

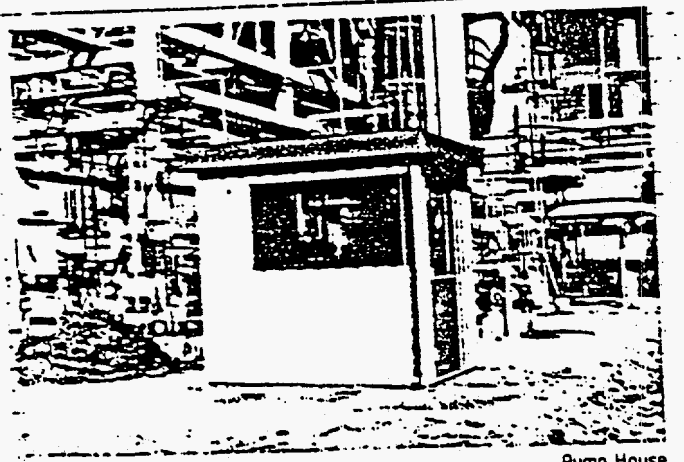


Guard House

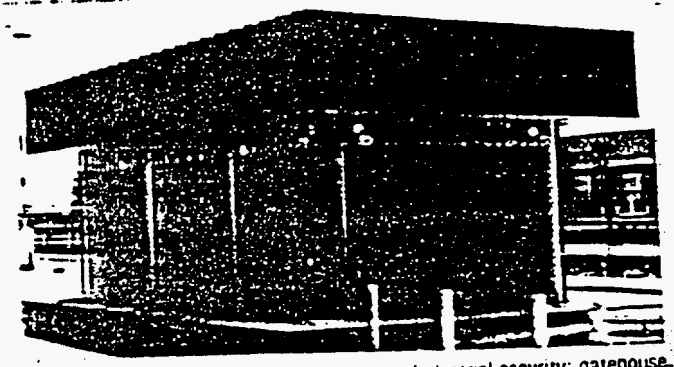
Penthouse



Substation



Pump House



Industrial security gatehouse

ATTACH 1, A-1

~~ATTACH A, PG L~~

H. SUGGESTED FOUNDATION DESIGNS

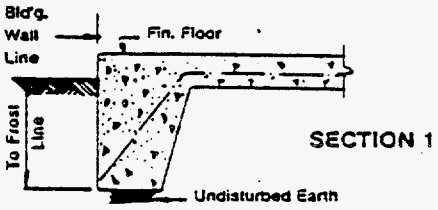
Due to the even distribution of loads developed by Parkline buildings, the foundation designs are usually quite simple when compared to other types of building construction.

The information below is offered only as general guidance regarding foundation designs commonly used for Parkline buildings. In order to achieve the proper foundation design for a specific building, an engineer should be retained who is familiar with the building codes, soil conditions, etc., in the area where the building is to be constructed.

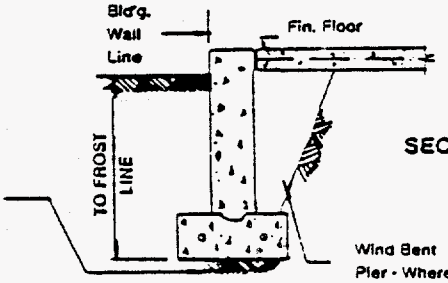
In many applications, a combined foundation-floor design can be used (see Section 1). However, in extreme frost conditions, poor soil, etc., it may be necessary to design a separate foundation and floor system (see Section 2). Separate pier and footings are required where a wind column assembly is used (see Section 2 and 3).

Wire mesh reinforcing is recommended in the floor slab under any condition. Additional reinforcing, such as rods, may be required to satisfy strength requirements and to prevent cracks due to uneven settlement of soil.

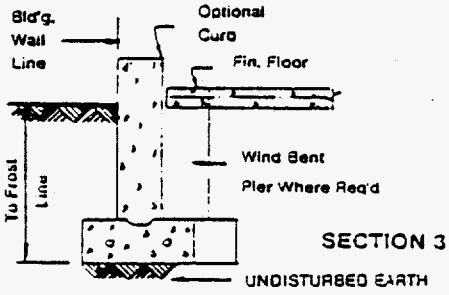
The tabulation below shows the nominal loads induced into the perimeter foundation wall.



SECTION 1



SECTION 2



SECTION 3

FOUNDATION LOAD REQUIREMENTS

BLDG. WIDTH			Vertical Load: #/Lin. Ft. Standard Design Load Combinations (LL/WL) 20/15	20/25	30/20	40/20	Horizontal Load
5'-4"	THRU	8'-0"	100	100	140	180	150# per lineal foot
10'-8"	&	12'-0"	150	150	210	270	
16'-0"	THRU	24'-0"	300	300	420	540	
28'-0"	THRU	32'-0"	415	415	575	735	

The values shown include dead load, live load and wind load. Any other loads supported by the building must be added and the foundation designed accordingly.

I. TOLERANCES

To assure proper erection and fit-up of all building components, the following tolerances should be maintained when finishing the perimeter walls and floor slab.

Width and/or Length
Less than 12': ± ⅛"
Over 12': ± ¼"

Diagonal: ± ½"

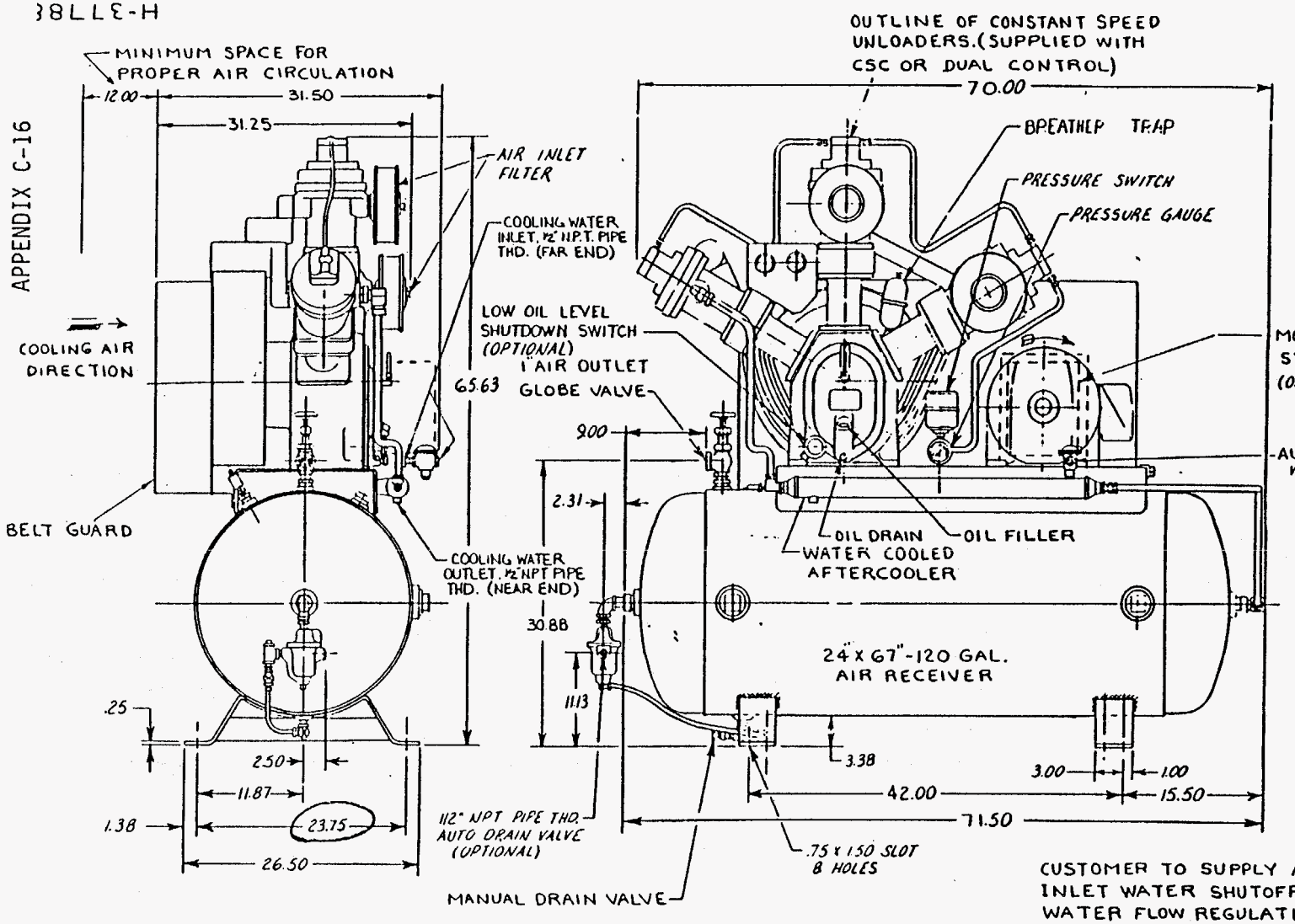
Level: ± ⅛" in 20'
± ¼" overall

ATTACH. C

B-1

ATTACHMENT 2

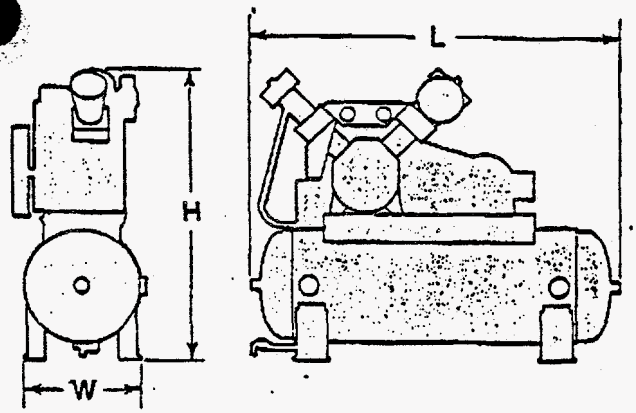
38LLE-H



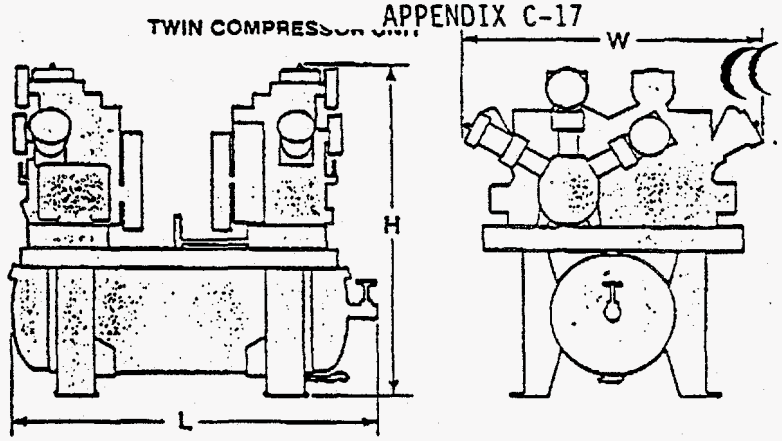
MOTOR HORSEPOWER	COMPRESSOR RPM:	APPROVED FOR	
MOTOR: VOLTS, PHASE, HZ	PISTON DISPLACEMENT: CFM	IR ORD Nº	
MOTOR ENCLOSURE:	DISCH. PR. RATING, PSI	CUSTOMER	GENERAL ARRANGEMENT
STARTER - TYPE:	ACT. DEL. CFM FREE AIR	CUSTOMER ORD Nº	TYPE 30 COMPRESSORS
	REGULATION | AS&S | CSC | DUAL	PER: DATE:	SCALE: 1/8 — MODELS 10T3NLE10/10T3NLE15
	RECOM. WATER FLOW - 2 GPM	B: SPECS:	DATE: 8-8-84 E DICKEY — INGERSOLL RAND COMPANY CAMPBELLSVILLE KY
		M: ARCH/ENGR:	CHKD:

Type 30 Compressors with NONLUBR

SINGLE COMPRESSOR UNIT



TWIN COMPRESSOR UNIT



DATA AND DIMENSIONS

Receiver Mounted Compressor Model No.	Motor Hp	Max. Pressure Psig	Max. Pressure bar	Actual Capacity cfm 75 Psig	Actual Capacity m³/min 5.17 bar	Actual Capacity cfm 100 Psig	Actual Capacity m³/min 6.90 bar	Actual Capacity cfm 125 Psig	Actual Capacity m³/min 8.62 bar	Dimensions Length in.	Dimensions Length cm	Dimensions Width in.	Dimensions Width cm	Dimensions Height in.	Dimensions Height cm	Net Weight* lb.	Net Weight* kg	Receiver Size gal.	Receiver Size liters
Single Compressor Units																			
23ANLF1	1	100	6.90	3.9	.11	3.5	.10	—	—	39	99	24	61	42	107	350	159	30	114
23ANLF4	1½	100	6.90	5.3	.15	4.7	.13	—	—	39	99	24	61	42	107	355	161	30	114
235HNLC2†	2	100	6.90	7.4	.21	6.9	.20	—	—	49	124	22	56	45	114	505	229	60	227
235HNLC3†	3	100	6.90	10.7	.30	9.4	.27	—	—	49	124	22	56	45	114	520	236	60	227
235HNLD3†	3	100	6.90	10.7	.30	9.4	.27	—	—	64	163	22	56	45	114	625	284	80	303
[illegible]2NLD5	5	125	8.62	19.0	.54	18.5	.52	18.0	.51	66	168	25	64	53	135	800	363	80	
[illegible]ILD7½	7½	125	8.62	28.2	.80	27.5	.78	26.9	.76	66	168	25	64	53	135	855	388	80	
[illegible]T3NLE10	10	125	8.62	35.9	1.02	35.2	.99	34.3	.97	70	178	30	76	64	163	1400	635	120	454
10T3NLE15	15	125	8.62	50.8	1.44	49.7	1.41	48.8	1.37	70	178	30	76	64	163	1450	655	120	454
Twin Compressor Units																			
2-23ANLC1	2	100	6.90	7.8	.22	7.0	.20	—	—	53	135	40	102	46	117	855	388	60	227
2-23ANLC4	3	100	6.90	10.8	.30	9.4	.26	—	—	53	135	40	102	46	117	870	395	60	227
2-235HNLD2†	4	100	6.90	14.8	.42	13.8	.40	—	—	67	170	42	107	46	117	1110	504	80	303
2-235HNLD3†	6	100	6.90	21.4	.60	18.8	.54	—	—	67	170	42	107	46	117	1140	518	80	303
2-5T2NLE5	10	125	8.62	38.0	1.08	37.0	1.04	36.0	1.02	74	188	55	140	61	155	2440	1108	120	454
2-5T2NLE7½	15	125	8.62	56.4	1.60	55.0	1.56	53.8	1.52	74	188	55	140	61	155	2480	1126	120	454
2-10T3NLE10	20	125	8.62	71.3	2.03	70.4	1.99	68.6	1.94	74	188	60	152	68	173	2795	1350	120	454
2-10T3NLE15	30	125	8.62	101.6	2.88	99.4	2.81	97.2	2.75	74	188	60	152	68	173	3025	1373	120	454

*Weights are for standard unit without aftercooler.
For air-cooled aftercooler, add approximately 50 lb. (22.68 kg)—double for twin compressor units.
For water-cooled aftercooler, add approximately 85 lb. (38.55 kg)—double for twin compressor units.
†Water-cooled cylinder units.

Product improvement is a continuing goal at Ingersoll-Rand. Designs and specifications are subject to change without notice or obligation.

STANDARD EQUIPMENT

Single Units

Nonlubricated compressor with:
NEMA Motor
Inlet Air Filter
Drive Belt
Automatic Start and Stop Control
Intercooler on Two-Stage Units
[illegible]SME Code Receiver
[illegible]ly Enclosed Belt Guard

Twin Units

Two nonlubricated compressors, each with standard equipment indicated at left.

Individual compressor isolation by safety-valve-protected discharge line shutoff valve.

Lifting pads for handling with fork truck on 5 horsepower units and larger.

OPTIONAL EQUIPMENT

Single Units

Air- or Water-Cooled Aftercooler
Automatic Condensate Drain Valve
Automatic Water Valve
Low Oil Level Switch
Constant Speed and/or Dual Control
Full Voltage Motor Starters (mounted or unmounted)

Twin Units

Constant Speed and/or Dual Control
Air- or Water-Cooled Aftercoolers (2)
Automatic Water Valves (2)
Automatic Condensate Traps
Full Voltage Motor Starters (mounted or unmounted)
Alternators (mounted or unmounted)

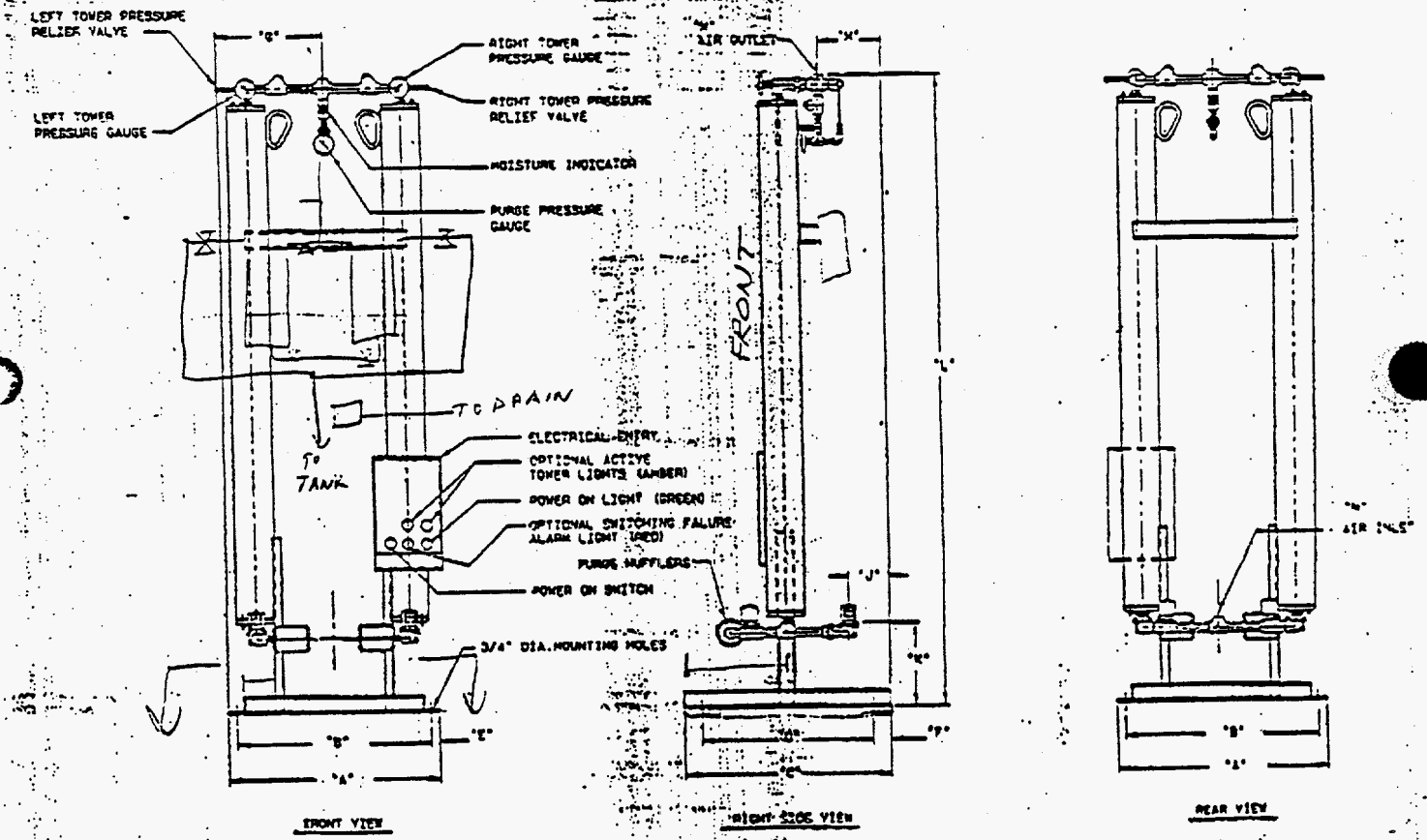
ATTACHMENT 2

B-2

APPENDIX C-18

DIMENSIONS IN INCHES													
MODEL NO	A	B	C	D	E	F	G	H	J	K	L	M	WT/KG
25	24 5/8	22.5/8	24	20	1	2	12.5/16	7.5/16	4.5/8	10.1/4	74.7/8	1/2 NPT	265
40	24.5/8	22.5/8	24	20	1	2	12.5/16	7.5/16	4.5/8	10.1/4	74 7/8	1/2 NPT	265
60	24.5/8	22.5/8	24	20	1	2	12.5/16	6.5/16	3.3/4	10.1/16	75.3/16	3/4 NPT	324
85	30	27	30	26	1.1/2	2	15	8.3/4	5.7/8	9.1/2	82	1 NPT	529

DIMENSIONS IN MILLIMETERS													
MODEL NO.	A	B	C	D	E	F	G	H	J	K	L	M	WT/KG
25	626	575	610	508	25	51	313	186	117	260	1902	13	265
40	626	575	610	508	25	51	313	186	117	260	1902	13	265
60	625	575	610	508	25	51	313	160	95	255	1910	19	324
85	762	686	762	660	38	51	381	222	149	241	2083	25	529

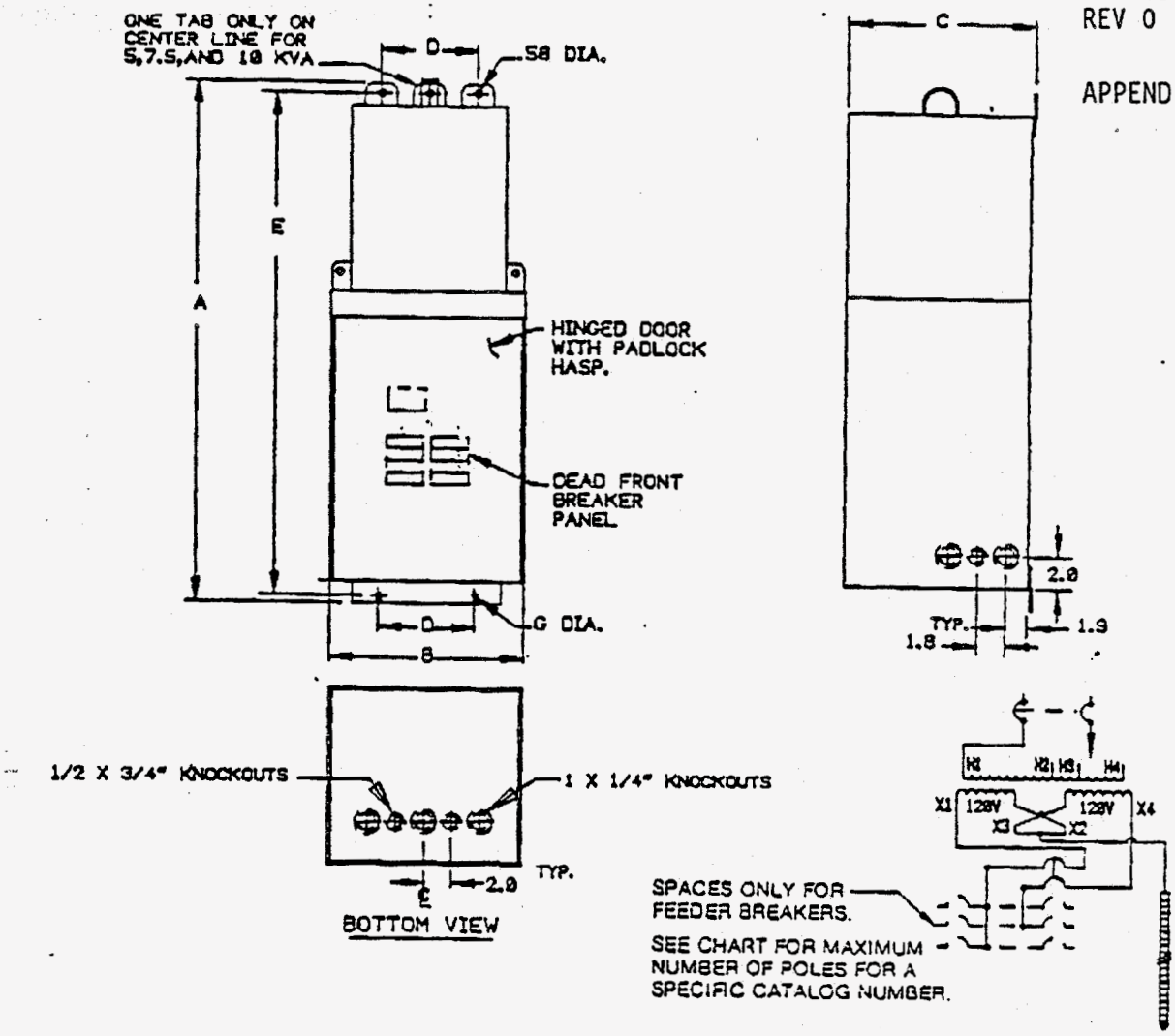


DRYER

Figure 3.

1) Diameter of tanks
2) Top of tanks
3) Support to edge of horizontal support

ATTACH 3, C-1



* FOR EACH KVA MAXIMUM SIZE OF SECONDARY BREAKER NOT TO EXCEED AMPERE RATING SHOWN IN TABLE. TOTAL CURRENT OF SECONDARY MAIN BUS NOT TO EXCEED BREAKER RATING. IF ALL SPACES ARE UTILIZED, MAXIMUM CURRENT THAT CAN BE DRAWN THROUGH EACH BRANCH BREAKER IS 10 AMPS.

KVA	CATALOG NUMBER	HIGH VOLT.	LOW VOLT.	TAPS	WT. LBS.	A	B	C	D	E	G	PRI. MAIN CRKT. BRKR.	SEC. MAIN CRKT. BRKR.	FEEDER * BREAKERS	
														MAX. NO. 1P OR 2P	MAX. AMPS
5	MPZ5S40F	480	240/120	2-5%FCBN	150	32.7	12.0	11.9	–	31.5	.312	FAL 24020 20A	QO-230 30A	6 OR 3	20
7.5	MPZ7S40F	480	240/120	2-5%FCBN	190	32.7	12.0	11.9	–	31.5	.312	FAL 24030 30A	QO-240 40A	8 OR 4	30
10	MPZ10S40F	480	240/120	2-5%FCBN	190	32.7	12.0	11.9	–	31.5	.312	FAL 24040 40A	QO-260 60A	10 OR 5	40
15	MPZ15S40F	480	240/120	2-5%FCBN	360	42.9	17.4	13.5	12.0	41.7	.562	FAL 24060 60A	QO-280 80A	16 OR 8	60
25	MPZ25S40F	480	240/120	2-5%FCBN	360	42.9	17.4	13.5	12.0	41.7	.562	FAL 24100 100A	Q1-2125 125A	24 OR 12	100

ATTACH 4, D-1

MINI POWER-ZONE® Dry-Type Transformer
Single Phase 60 HERTZ
5 to 25 KVA
UL Listed (UL)

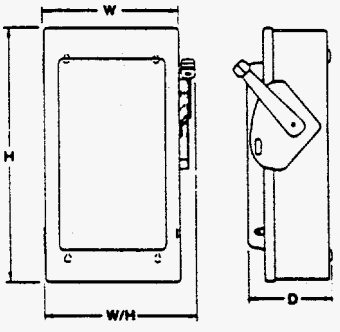
SORGEL TRANSFORMERS
SQUARE D COMPANY

DM19-R1 DATE: September, 1986

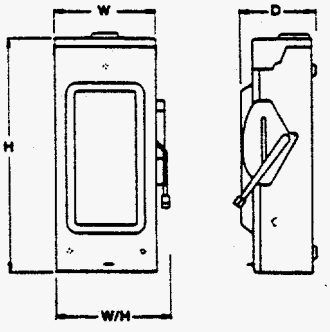
Terminal Lug Data▲

Ampere Rating	NEMA Type Enclosure	Conductors Per Phase	Wire Range Wire Bending Space Per NEC Table 373-6	Lug Wire Range	Optional VERSA-CRIMP Compression Lug Field Installable★
30	1, 3R 4X KRYDON	1	#12-6 AWG (Al) or #14-6 AWG (Cu)	#12-2 AWG (Al) or #14-2 AWG (Cu)	.....
60	1, 3R 4X KRYDON	1	#12-3 AWG (Al) or #14-3 AWG (Cu)	#12-2 AWG (Al) or #14-2 AWG (Cu)	.....
100	1, 3R 4X KRYDON	1	#12-1/0 AWG (Al) or #14-1/0 AWG (Cu)	#12-1/0 AWG (Al) or #14-1/0 AWG (Cu)	VCEL-021-14S1
200	1, 3R	1	#6 AWG - 250 kcmil (Al/Cu)	#6 AWG - 300 kcmil (Al/Cu)	VCEL-030-516H1
400	1, 3R	1 or 2	#3/0 AWG - 750 kcmil (Al/Cu) or #6 AWG - 300 kcmil (Al/Cu)	#3/0 AWG - 750 kcmil (Al/Cu) and #6 AWG - 300 kcmil (Al/Cu)	VCEL-075-12H1 or VCEL-030-516H1● and VCEL-050-12H1
600	1, 3R	2	#3/0 AWG - 500 kcmil (Al/Cu)	#3/0 AWG - 500 kcmil (Al/Cu)	VCEL-050-12H1
800	1, 3R	3	#3/0 AWG - 750 kcmil (Al/Cu)	#3/0 AWG - 750 kcmil (Al/Cu)	H8LKE2◇
1200	1, 3R	4	#3/0 AWG - 750 kcmil (Al/Cu)	#3/0 AWG - 750 kcmil (Al/Cu)	H12LKE2◇

▲ 30-100 amp. switches suitable for 60°C or 75°C conductors. 200-1200 amp. switches suitable for 75°C conductors.
★ Refer to Construction/Industrial Connector Products Catalog AEC-40.
● Order two PK516KN mounting kits ($4.20 each, Lexington Order Point) when installing VCEL-030-516H1 lugs. Only one kit is required on 2-pole switches.
◇ See Page 3-14, 750 kcmil Lug Kits, for additional information. Not UL Listed.



Typical NEMA Type 1



Typical NEMA Type 3R

Catalog Number	Approximate Dimensions Series	H	W	W/H	D	Catalog Number	Approximate Dimensions Series	H	W	W/H	D
H221N	E2	14¼	6½	7⅜	4⅜	H364	E1	27⅜	12⅞	14⅜	7½
H221NRB	E2	15¼	7	7½	4⅞	H364N	E1	27⅜	16¼	17⅜	7½
H222N	E1	16⅜	7⅞	8½	5⅞	H364NRB	E1	27½	16¼	18	7¾
H222NRB	E1	18¼	8⅜	8¾	6¼	H364RB	E1	27⅜	13½	14⅜	7¾
H223N	E1	21⅞	10¼	11½	6¼	H365, N	E2	50¼	27⅛	27⅛	10⅛
H223NRB	E1	22½	10¾	11⅝	6⅝	H365R, NR	E2	50¼	27⅞	27⅞	10⅛
H224N	E1	27⅜	12⅞	14⅜	7½	H366, N	E2	50¼	27⅛	27⅛	10⅛
H224NRB	E1	27⅜	13½	14¾	7¾	H366NR, R	E2	50¼	27⅞	27⅞	10⅛
H225, N	E1	50¼	27⅛	27⅛	10⅛	H367, N	E3	69	31	31	16
H225NR, R	E1	50¼	27⅞	27⅞	10⅛	H367NR, R	E3	69⅛	31	31	16
H226, N	E1	50¼	27¾	27¾	10⅛	H368, N	E3	69	31	31	16
H226NR, R	E1	50¼	27⅞	27⅞	10⅛	H368NR, R	E3	69⅛	31	31	16
H227, N	E3	69	31	31	16	H461-2	E1	16⅜	9¾	10¾	5⅞
H227NR, R	E3	69⅛	31	31	16	H462	E1	16⅜	9¾	10¾	5⅞
H228, N	E3	69	31	31	16	H463	E2	20⅜	17¼	18⅜	6½
H228NR, R	E3	69⅛	31	31	16	H464	E1	27⅜	16¼	17⅜	7½
H265	E2	50¼	27⅛	27⅛	10⅛	H465	E2	50¼	33⅞	33⅞	10⅛
H265R	E2	50¼	27⅞	27⅞	10⅛	H466	E2	50¼	33⅞	33⅞	10⅛
H266	E2	50¼	27⅛	27⅛	10⅛	HU265	E2	50¼	27⅛	27⅛	10⅛
H266R	E2	50¼	27⅞	27⅞	10⅛	HU265R	E2	50¼	27⅞	27⅞	10⅛
H267	E2	69	31	31	16	HU266	E2	50¼	27¾	27¾	10⅛
H267R	E2	69⅛	31	31	16	HU266R	E2	50¼	27⅞	27⅞	10⅛
H268	E2	69	31	31	16	HU267	E3	69	31	31	16
H268R	E2	69⅛	31	31	16	HU267R	E3	69⅛	31	31	16
H321N	E2	14¼	6½	7⅜	4⅜	HU268	E3	69	31	31	16
H321NRB	E2	15¼	7	7½	4⅞	HU268R	E3	69⅛	31	31	16
H322N	E1	16⅜	7⅞	8½	5⅞	HU361	E2	14¼	6½	7⅜	4⅜
H322NRB	E1	18¼	8⅜	8¾	6¼	HU361RB	E2	15¼	7	7½	4⅞
H323N	E1	21⅞	10¼	11½	6¼	HU362	E1	16⅜	7⅞	8½	5⅞
H323NRB	E1	22½	10¾	11⅝	6⅝	HU362RB	E1	18¼	8⅜	8¾	6¼
H324N	E1	27⅜	12⅞	14⅜	7½	HU362WH	E1	20⅜	7⅞	8½	5⅞
H324NRB	E1	27⅜	13½	14¾	7¾	HU363	E1	21⅞	10¼	11½	6¼
H325, N	E1	50¼	27⅛	27⅛	10⅛	HU363RB	E1	22½	10¾	11⅝	6⅝
H325R, NR	E1	50¼	27⅞	27⅞	10⅛	HU364	E1	27⅜	12⅞	14⅜	7½
H326, N	E1	50¼	27¾	27¾	10⅛	HU364RB	E1	27⅜	13½	14¾	7¾
H326R, NR	E1	50¼	27⅞	27⅞	10⅛	HU365	E2	50¼	27⅛	27⅛	10⅛
H327, N	E3	69	31	31	16	HU365R	E2	50¼	27⅞	27⅞	10⅛
H327R, NR	E3	69⅛	31	31	16	HU366	E2	50¼	27⅛	27⅛	10⅛
H328, N	E3	69	31	31	16	HU366R	E2	50¼	27⅞	27⅞	10⅛
H328R, NR	E3	69⅛	31	31	16	HU367	E3	69	31	31	16
H361, N	E1	14¼	6½	7⅜	4⅜	HU367R	E3	69⅛	31	31	16
H361-2	E1	16⅜	7⅞	8½	5⅞	HU368	E3	69	31	31	16
H361NRB, RB	E1	15¼	7	7½	4⅞	HU368R	E3	69⅛	31	31	16
H362, N	E1	16⅜	7⅞	8½	5⅞	HU461	E1	16⅜	9¾	10¾	5⅞
H362NRB, RB	E1	18¼	8⅜	8¾	6¼	HU462	E1	16⅜	9¾	10¾	5⅞
H362WH	E1	20⅜	7⅞	8½	5⅞	HU463	E1	20⅜	17¼	18⅜	6½
H363, N	E1	21⅞	10¼	11½	6¼	HU464	E1	27⅜	16¼	17⅜	7½
H363NRB, RB	E1	22½	10¾	11⅝	6⅝	HU465	E2	50¼	33⅞	33⅞	10⅛
						HU466	E2	50¼	33⅞	33⅞	10⅛

VERSA-CRIMP is a Registered Trademark of Square D Company.
KRYDON is a Registered Trademark of Crouse-Hinds Company.

ATTACH 1 D-2

Class J Fuse Provisions:

Provisions for installing Class J fuses are included in 30 through 400 ampere 600 volt, and 100 through 400 ampere 240 volt, fusible heavy duty safety switches. Conversion to Class J fuse spacing requires relocating the load side fuse base assembly from the standard Class H fuse location to an alternate position as marked in the enclosure. Switches rated 600 amperes, 240 or 600 volt, require the addition of an adapter kit, H600J at $231. One kit per 3-pole switch.

800A. and 1200A. Safety Switches use Class L bolt-in fuses and are rated for use on systems with up to 200,000 rms symmetrical amperes at 600Vac maximum.

Class R Fuse Provisions:

Fusible Square D 30 through 600 ampere heavy duty safety switches will accept Class R fuses as standard. A field installable rejection kit is available which, when installed, rejects all but Class R fuses. With the installation of the rejection kit and Class R fuses, the switch is UL listed for use on systems with up to 200,000 rms symmetrical amperes available fault current. See Class R Fuse Kits on Page 3-12.

600 Volts — Single Throw Fusible

System	Amps.	NEMA Type 1 Indoor		NEMA Type 3R Raintight (Bolt-on Hubs Page 3-12)		NEMA Type 4, 4X, 5 (Stainless Steel) Dusttight, Watertight, Corrosion Resistant All Cu Current Carrying Parts (Hubs-Page 3-12)		JIC-Mill & Foundry Type *All Cu Current* Carrying Parts (Hubs-Page 3-12)				Horsepower Ratings ▼□					
								NEMA Type 12K With Knockouts		NEMA Type 12, 3R† Without Knockouts		480Vac		600Vac		dc	
		Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Std.	Max.	Std.	Max.		
												3Ø	3Ø	3Ø	3Ø	250	600
2 Wire (2 Blades and Fuseholders) — 600VAC, 600VDC																	
	30	Use 3 Wire Devices For 2 Wire Applications										—	—	—	—	—	—
	60											—	—	—	—	—	—
	100											—	—	—	—	—	—
	200											—	—	—	—	—	—
	400	H265	$2127.	H265R	$2743.	H265DS	$7207.	—	—	H265AWK	$2419.	100◆	250◆	—	—	50	—
	600	H266	3365.	H266R	5406.	H266DS	10309.	—	—	H266AWK	3602.	150◆	400◆	—	—	—	—
	800	H267☆	5243.	H267R☆	8288.	—	—	—	—	H267AWK☆★	7359.	—	—	—	—	—	—
	1200	H268☆	7369.	H268R☆	9100.	—	—	—	—	H268AWK☆★	8692.	—	—	—	—	—	—
3 Wire (3 Blades and Fuseholders) — 600VAC, 500VDC●																	
	30	H361	$ 268.	H361RB	$ 454.	H361DS	$1213.	H361A	$ 481.	H361AWK	$ 457.	5	15	7½	20	10	15
	30	H361-2▲	312.	—	—	—	—	H361-2A▲	489.	H361-2AWK▲	466.	5	15	7½	20	10	15
	60	H362	322.	H362RB	532.	H362DS	1334.	H362A	495.	H362AWK	471.	15	30	15	50	—	30
	100	H363■	600.	H363RB■	831.	H363DS■	2647.	H363A■	769.	H363AWK■	734.	25	60	30	75	20	—
	200	H364	864.	H364RB	1143.	H364DS	3701.	H364A	1203.	H364AWK	1145.	50	125	60	150	—	50
	400	H365☆	2302.	H365R☆	2797.	H365DS☆	7380.	—	—	H365AWK☆	2631.	100	250	125	350	—	—
	600	H366☆	3869.	H366R☆	5513.	H366DS☆	10482.	—	—	H366AWK☆	4433.	150	400	200	500	—	—
	800	H367☆	6736.	H367R☆	8346.	—	—	—	—	H367AWK☆★	7876.	200	350	250	500	—	—
	1200	H368☆	8855.	H368R☆	10121.	—	—	—	—	H368AWK☆★	9492.	—	—	—	—	—	—
4 Wire (3 Blades and Fuseholders, 1 S/N) — 600VAC																	
	30	H361N	$ 312.	H361NRB	$ 498.	Use 3 Wire Devices - Field Installable Solid Neutral Assemblies, Order Separately-See Page 3-13						5	15	7½	20	—	—
	60	H362N	358.	H362NRB	573.							15	30	15	50	—	—
	100	H363N	647.	H363NRB	878.							25	60	30	75	—	—
	200	H364N	945.	H364NRB	1218.	H364NDS	$3791.	H364NA	$1283.	H364NAWK	$1221.	50	125	60	150	—	50
	400	H365N	2477.	H365NR	2916.	H365NDS	7548.	—	—	H365NAWK	2806.	100	250	125	350	—	—
	600	H366N	4056.	H366NR	5590.	H366NDS	10857.	—	—	H366NAWK	4625.	150	400	200	500	—	—
	800	H367N	7103.	H367NR	8702.	—	—	—	—	H367NAWK★	8310.	200	350	250	500	—	—
	1200	H368N	9162.	H368NR	10818.	—	—	—	—	H368NAWK★	10030.	—	—	—	—	—	—
4 Wire (4 Blades and Fuseholders) — 600VAC◇												2Ø	2Ø	2Ø	2Ø		
	30	H461-2▲	$ 440.	—	—	H461-2DS▲△	$1414.	—	—	H461-2AWK▲	$ 532.	7½	20	10	25	—	—
	60	H462	512.	—	—	H462DS△	1479.	—	—	H462AWK	600.	15	40	20	50	—	—
	100	H463	856.	—	—	H463DS△	4020.	—	—	H463AWK	923.	25	50	30	50	—	—
	200	H464	1424.	—	—	H464DS△	6068.	—	—	H464AWK	1538.	50	50	50	50	—	—
	400	H465	2991.	—	—	—	—	—	—	H465AWK	3279.	—	—	—	—	—	—
	600	H466	4868.	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6 Wire (6 Blades and Fuseholders) — 600VAC◇																	
	100	—	—	—	—	H663DS△	$12508.	—	—	H663RWK△	$2440.	For applications requiring motor disconnect capability, use electrical interlock EK1020-1 or -2. Refer to Page 3-12.					
	200	—	—	—	—	H664DS△	17049.	—	—	H664RWK△	5832.						

▼ Refer to page 5-22 for additional motor application data.
□ The starting current of motors of more than standard horsepower may require the use of fuses with appropriate time delay characteristics.
† Also suitable for NEMA Type 3R application by removing drain screw from bottom endwall.
■ 250Vdc maximum. Use two outside poles for switching DC.
◆ For grounded "B" phase systems only and with solid neutral assembly installed.
☆ AC only.
★ Not UL Listed.
● On 3-pole devices, use two outside poles for switching DC.
▲ 60 ampere switch with 30 ampere fuse spacing and clips. Must use 60A. enclosure accessories including electrical interlocks.
◇ Not suitable for use as service equipment.
△ Not UL Listed — 6 week shipment.

NOTE: One day shipment is available on DASH Program for non-stock 400 through 1200 ampere heavy duty switches.

Dimensions NEMA Type 1 & 3R ..... Page 3-15
NEMA Type 4, 4X & 5 Stainless and Type 12 ..... Page 3-16
Accessories ..... Pages 3-11 & 3-14

APPENDIX D

TELECON WITH CHUCK KROLL OF PACIFIC FLUID SYSTEMS CORPORATION

Pacific Fluid Systems Corporation
East 5629 Broadway, Spokane, Washington 99212
Phone (509) 535-4717
FAX (509) 534-3159

June 16, 1993

Westinghouse Hanford Co.

Attn: Bob Pan FAX 376-7382

Subject: Ingersoll-Rand Air Compressor, Model10T3NLME15

This will confirm our conversation yesterday that no special foundation is required for the 15HP T30 unit. Usually 4-6" concrete floor is adequate, and we recommend 3/8" hard rubber pads under each air receiver leg to isolate any vibration.

This unit sits on a air receiver and the only points in contact with the floor are the 4 legs, .

Feel free to call us at any time if we can assist further or if you have any additional questions.

Regards,

Chuck Kroll

800-234-8765

APPENDIX E

PIPE STRESS ANALYSIS
INSTRUMENT AIRLINE 1"IA-M7

U-FARM COMPRESSED AIR SYSTEM

KAISER ENGINEERS HANFORD

CALCULATION IDENTIFICATION AND INDEX

WO/Job No. ER3100
Date 6/[illegible]

This sheet shows the status and description of the attached Design Analysis sheets.

Discipline PIPING (27)

Project No. & Name ER3100, U-FARM COMPLEX [illegible]

Calculation Item AUTOPIPE ANALYSIS U-FARM COMPLEX [illegible]

These calculations apply to:

Dwg. No. H-2-36331 Rev. No. 2

Dwg. No. _____ Rev. No. _____

Other (Study, CDR) PRELIMINARY ECN No. 193245

PIPE STRESS CALC. No. ER3100-37-2, REV. 0 Rev. No. _____

The status of these calculations is:

- ☐ Preliminary Calculations
- ☒ Final Calculations
- ☐ Check Calculations (On Calculation Dated _____)
- ☐ Void Calculation (Reason Voided _____)

Incorporated in Final Drawings? ☒ Yes ☐ No

This calculation verified by independent "check" calculations? ☐ Yes ☒ No

Original and Revised Calculation Approvals:

	Rev. 0 Signature / Date	Rev. 1 Signature / Date	Rev. 2 Signature / Date
Originator	Angel K. Kumar 6/21/93		
Checked by	[signature] 6/24/93		
Approved by			
Checked Against Approved Vendor Data			

INDEX

Design Analysis Page No.	Description
1.	OBJECTIVE, DESIGN INPUT: CRITERIA GIVEN DATA, [illegible]
2	DESIGN INPUT [illegible]
3	DESIGN INPUT (CONT'D) [illegible] REFERENCES [illegible]
APPENDIX A	AUTOPIPE ANALYSIS [illegible] FILE ID, DATE 2
APPENDIX B	PRELIMINARY ECN No. 193245
APPENDIX C	WHC-LOE-93-2 [illegible]
APPENDIX D	[illegible]
APPENDIX E	AUTOPIPE MAT DATA
APPENDIX F	[illegible]

KAISER ENGINEERS HANFORD

DESIGN ANALYSIS

Calc. No. ER3100-7-1
Revision 0
Page No. 1 of 3

Client WHC	WO/Job No. ER3100		
Subject U-FARM COMPRESSED AIR SYSTEM	Date 6/14/93	By AR Romero	
	Checked	By [illegible] 6/24/93	
Location BLDG 241-U-701	Revised	By	

OBJECTIVE

THE OBJECTIVE OF THIS CALCULATION IS TO CONFIRM THAT THE RESULTING STRESS IN THE COMPRESSED AIR LINE IN BUILDING 241-U-701 MEETS ASME B31.3 CODE REQUIREMENTS.

THE OUTPUT LOADINGS ON THE MODELLED PIPE SUPPORTS WILL BE USED FOR INPUT TO A PIPE SUPPORT ANALYSIS.

DESIGN INPUTS:

CRITERIA:

1. WHC-LOI-935 2974, April 7, 1993. (Addendum to LOI # 92-BVH-4)
2. ASME B31.3, 1990 Edition, Addenda ASME B31.3b-1991.
3. HANFORD PLANT STANDARDS, DESIGN CRITERIA, STANDARD NUMBER CRITERIA 4-1, REV. 11.
4. UNIFORM BUILDING CODE, EARTHQUAKE REGULATIONS, 1991 EDITION

GIVEN DATA

1. DRAWING H-2-36381, SH. 1, REV. 2.
2. PRELIMINARY ECN No. 198245 IS ASSUMED TO BE GIVEN DATA UNTIL THE DATA IS VERIFIED VIA APPROVAL OF THIS CALCULATION.
3. PIPE IS 1" A106 GRADE B, SCHEDULE 80 PER PIPE CODE 1A-7 ON DRWG H-2-31730, SH 7. [REF. 1]
4. MAXIMUM LINE PRESSURE IS 120 PSIG [REF. 1]
5. SYSTEM IS SAFETY CLASS 3 [REF. 2]

ASSUMPTIONS

1. HEAT PUMPS FOR BUILDING 241-U-701 WILL [illegible] AMBIENT AIR TEMPERATURES BETWEEN 65°F AND 90°F. ASSUMING WORST CASE THERMAL LOADS, AMBIENT TEMP. = 65°F, MAX TEMP = [illegible]°F
2. TEES AND VALVES ARE THREADED AND [illegible] (WITH STRESS INTENSIFICATION FACTOR VALUES OF $i_i = 2.30$, $i_o = 2.30$. [REF. 5, TABLE D-1]
3. PIPE WILL BE FIELD ROUTED [REF. 1] THE SYSTEM WILL BE MODELLED TO PROVIDE A CONSERVATIVE ANALYSIS.

KAISER ENGINEERS HANFORD

DESIGN ANALYSIS

Calc. No. ER3100-27-1
Revision 1
Page No. 2 of 3

Client WHC	WO/Job No. ER3100		
Subject U-FARM COMPRESSED AIR SYSTEM	Date 6/14/93	By A.R. ROMERO	
	Checked	By [illegible] 6/24/93	
Location BLDG. 241-U-701	Revised	By	

METHODS:

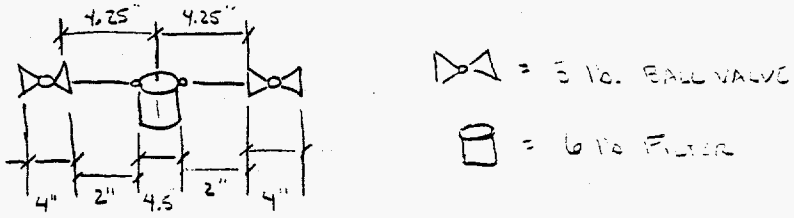
1. PIPING STRESS ANALYSIS PERFORMED USING AUTOPIPE 4.42 COMPUTER PROGRAM (APPENDIX A, THIS CALC)

   A. THE INLET AND OUTLET TO THE AIR DRYERS ARE MODELLED AS ANCHOR POINTS. (POINTS 104 AND 200 [illegible])

   B. THE POINT AT WHICH THE INSTRUMENT AIR LINE EXITS BUILDING 241-U-701 TO ACCOMMODATE AN EMERGENCY AIR QUICK CONNECT IS MODELLED AS A GUIDE WITH 0.021 GAPS ALL AROUND. (POINT 'WALL' ON SEGMENT G)

   C. THE PIPE IS ANCHORED AT THE POINT AT WHICH THE PIPE ENTERS THE FLOOR OF BUILDING 241-U-701. (POINT 400) THE INSTRUMENT AIR LINE WILL BE CAST IN THE CONCRETE FLOOR, PRIOR TO ATTACHMENT TO THE PIPING THAT IS BEING ANALYZED. THIS POINT IS MODELLED AS AN ANCHOR.

   D. THE TYPICAL FILTER AND VALVE CONFIGURATION USED IN THIS ANALYSIS IS SHOWN BELOW.



   E. FILTERS AND FLOW METERS ARE MODELLED AS [illegible] LOADS AT THEIR MIDPOINTS

   F. U-BOLT SUPPORTS ARE MODELLED AS GUIDE SUPPORTS WITH 0.0625 INCH GAPS ABOVE THE PIPE AND 0.0312 INCH GAPS LEFT AND RIGHT OF THE PIPE.

KAISER ENGINEERS HANFORD

DESIGN ANALYSIS

Calc. No. ER3100-ST-1
Revision 0
Page No. 3 of 3

Client	WHC	WO/Job No.	ER3100
Subject	U-FARM COMPRESSED AIR SYSTEM	Date 6/14/93	By A R ROMERO
		Checked	By [illegible] 6/24/93
Location	BLDG 241-U-701	Revised	By

METHODS (CONT'D)

2. SEISMIC ANALYSIS CRITERIA SAFETY CLASS 3 [REF. 3 AND REF 4]

$F_p = Z \cdot I \cdot C_p \cdot W_p$

$(M_p \cdot a) = Z \cdot I \cdot C_p (M_p \cdot g)$

$a = Z \cdot I \cdot C_p \cdot g$

a = SEISMIC Acceleration (Horizontally)
Z = Seismic Zone Coefficient
I = IMPORTANCE FACTOR
C_p = Horizontal Force Factor

: Z = 0.2 [REF 3, TABLE 23-I, ZONE 2B]
I = 1.25 [REF 3, TABLE 23-L, CATEGORY II]
C_p = 0.75 [REF 3, TABLE 23-P, ITEM II-4]

FOR CONSERVATIVE RESULTS, CONSIDER SYSTEM TO BE NON-RIGID
FOR NON-RIGID SYSTEM, C_p VALUE IS DOUBLED.

THEREFORE,

$a_{x,z} = Z \cdot I \cdot (2C_p) \cdot g$

$a_{x,z} = (0.2)(1.25)(2 \cdot 0.75)\, g$

$a_{x,z} = 0.375\, g$ (x- and z Directions)

$a_y = \frac{2}{3} a_{x,z} = \frac{2}{3}(0.375) = 0.25$

REFERENCES

1. PRELIMINARY ECN. No. 193245 (SEE APPENDIX B, THIS CALC)

2. WHC-WOI-93S2974, APRIL 7, 1993 (SEE APPENDIX C, THIS CALC)

3 UNIFORM BUILDING CODE, 1991 EDITION.

4. HANFORD PLANT STANDARDS, DESIGN CRITERIA, STANDARD DESIGN CRITERIA, REV. 11,

5. ASME B31.3, 1990 edition, Addenda ASME B31.3a-1991

CONCLUSION

THE U-FARM COMPRESSED AIR SYSTEM MEETS ASME B31.3 REQUIREMENTS.

WHC-SD-WM-DA-[illegible]
REV-0
APPENDIX E-6

DESIGN CALCULATION

(1) Drawing _____ (2) Doc. No. _____ (3) Page _____ of _____

(4) Building _____ (5) Rev. _____ (6) Job No. _____

(7) Subject U-FARM COMPRESSED AIR SYSTEM.

(8) Originator [signature] Date 6/24/93.

(9) Checker [signature] Date 6/23/93

(10)

Comments on AUTOPIPE Results.

Load combination Sustained + Earthquake is compared with code allowables.

In Autopipe output, earthquake produced stresses are considered for one direction only. Actual seismic stress should be the SRSS of three orthogonal directions.

Forom the stress summary, Max. occassional stress is at node G01, Sust+E3 = 6539 psi

Conservatively add $E_1 + E_2 + E_3$

Σ stress = 5493 + 6165 + 6539

= 18197 psi < 26,600 psi

Ok.

WHC-SD-WM-DA-
REV-0
APPENDIX E-7

****
**
** AUTOPIPE SYSTEM DATA LISTING **
**
****

SYSTEM NAME : U2

PROJECT ID : U-FARM COMPRESSED AIR SYSTEM

PREPARED BY : A.R. Romero
AR ROMERO

CHECKED BY : S Kanjilal
S. KANJILAL

PIPING CODE : B31.3

AMBIENT TEMP. (deg F) : 65.0

COMPONENT LIBRARY : AUTOPIPE

MATERIAL LIBRARY : AUTOB313

MODEL REVISION NUMBER : 7

WHC-SD-WM-DA-135
REV-0
APPENDIX E-8

POINT DATA LISTING

POINT NAME	TYPE	OFFSETS (ft) X	Y	Z	PIPE ID	DESCRIPTION
*** SEGMENT A						
A00	Run	0	0	0	CS 1	
A01	Bend	0	1.50	0		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
A02	Valv	0	0	-0.17		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30
A03	Run	0	0	-0.33		
A04	Bend	0	0	-0.17		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
A05	Bend	-0.67	0	0		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
A06	Tee	0	1.75	0		
SRV8	Bend	0	2.00	0		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
PRV1	Run	0.75	0	0		
SRV7	Run	0.75	0	0		
A10	Tee	0.25	0	0		
S1B	Run	0.33	0	0		
A11	Valv	0.44	0	0		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30
A12	Run	0.33	0	0		
A13	Run	0.35	0	0		
A14	Valv	0.35	0	0		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30
A15	Run	0.33	0	0		
S2B	Run	0.44	0	0		
A16	Tee	0.33	0	0		
*** SEGMENT B						
A06	Tee	-0.67	4.00	-0.67	CS 1	
B01	Valv	0.33	0	0		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30
B02	Run	0.33	0	0		
B03	Run	0.33	0	0		
*** SEGMENT C						
A10	Tee	1.08	5.25	-0.67	CS 1	

WHC-SD-WM-DA-135
REV-0
APPENDIX E-9

POINT DATA LISTING

POINT NAME	TYPE	OFFSETS (ft) X	Y	Z	PIPE ID	DESCRIPTION
C01	Bend	0	-2.00	0		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
S1A	Run	0.33	0	0		
C02	Valv	0.44	0	0		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30
C03	Run	0.33	0	0		
C04	Run	0.35	0	0		
C05	Valv	0.35	0	0		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30
C06	Run	0.33	0	0		
S2A	Run	0.44	0	0		
C07	Tee	0.33	0	0		
*** SEGMENT D						
D00	Run	6.49	6.08	1.00	CS 1	
D01	Bend	0	0.67	0		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
D02	Bend	0	0	-1.67		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
D03	Valv	-1.00	0	0		Rating = 150, Weight = 8 lb Surface factor = 0.00, SIF = 2.30
D04	Run	-0.29	0	0		
D05	Bend	-1.21	0	0		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
A16	Tee	0	-1.50	0		
C07	Tee	0	-2.00	0		
D08	Bend	0	-1.50	0		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
D09	Tee	1.00	0	0		
D10	Valv	1.33	0	0		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30
D11	Run	0.33	0	0		
D12	Bend	1.00	0	0		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00

WHC-SD-WM-DA-135
REV-0
APPENDIX E-10

POINT DATA LISTING

POINT NAME	TYPE	OFFSETS (ft) X	Y	Z	PIPE ID	DESCRIPTION
D13	Tee	0	0	1.67		
S3A	Run	0	0	5.98		
D14	Bend	0	0	3.19		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
S4A	Run	-1.25	0	0		
S5A	Run	-2.17	0	0		
D15	Bend	-0.33	0	0		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
D16	Bend	0	0	-0.50		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
D17	Tee	0	2.00	0		
D18	Bend	0	2.00	0		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
S5C	Run	0.33	0	0		
D19	Valv	0.40	0	0		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30
D20	Run	0.33	0	0		
D21	Run	0.35	0	0		
D22	Valv	0.35	0	0		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30
D23	Run	0.33	0	0		
S4C	Run	0.40	0	0		
D24	Bend	0.33	0	0		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
D25	Tee	0	-1.00	0		
*** SEGMENT E						
D17	Tee	3.90	3.75	9.67	CS 1	
S5B	Run	0.33	0	0		
E01	Valv	0.40	0	0		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30
E02	Run	0.33	0	0		
E03	Run	0.35	0	0		
E04	Valv	0.35	0	0		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30

WHC-SD-WM-DA-135
REV-0
APPENDIX E-11

POINT DATA LISTING

POINT NAME	TYPE	OFFSETS (ft) X	Y	Z	PIPE ID	DESCRIPTION
E05	Run	0.33	0	0		
S4B	Run	0.40	0	0		
E06	Bend	0.33	0	0		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
D25	Tee	0	1.00	0		
*** SEGMENT F						
D25	Tee	6.73	4.75	9.67	CS 1	
F01	Bend	0.50	0	0		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
F02	Run	0	0	-1.92		
S3C	Run	0	0	-0.77		
F03	Tee	0	0	-2.23		
F04	Junc	0	-1.00	0		
*** SEGMENT G						
F04	Junc	7.23	3.75	4.75	CS 1	
S3B	Run	0	0	2.23		
G01	Valv	0	0	0.33		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30
G02	Run	0	0	0.33		
G03	Run	0	0	0.35		
G04	Valv	0	0	0.35		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30
G05	Run	0	0	0.33		
WALL	Run	0	0	2.06		
G06	Bend	0	0	0.50		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
G07	Valv	0	-0.17	0		Rating = 150, Weight = 8 lb Surface factor = 0.00, SIF = 2.30
G10	Run	0	-0.29	0		
G11	Run	0	-0.21	0		
*** SEGMENT H						
F03	Tee	7.23	4.75	4.75	CS 1	
H01	Valv	0	0.17	0		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30
H02	Run	0	0.33	0		
H03	Run	0	0.17	0		

WHC-SD-WM-DA-151
REV-0
APPENDIX E-12

POINT DATA LISTING

POINT NAME	TYPE	-----OFFSETS (ft)----- X	Y	Z	PIPE ID	DESCRIPTION
*** SEGMENT I						
D13	Tee	7.65	1.75	1.00	CS 1	
I01	Valv	-0.33	0	0		Rating = 150, Weight = 8 lb Surface factor = 0.00, SIF = 2.30
I02	Run	-0.29	0	0		
I03	Bend	-0.38	0	0		Long Elbow, Radius = 1.50 inch Bend angle change = 90.00 deg SIF - In = 1.02, Out = 1.00
I04	Run	0	-1.00	0		
*** SEGMENT J						
D09	Tee	4.99	1.75	-0.67	CS 1	
J01	Valv	0	-0.17	0		Rating = 150, Weight = 4 lb Surface factor = 0.00, SIF = 2.30
J02	Run	0	-0.33	0		
J03	Run	0	-0.17	0		

Total weight of empty pipes : 148 lb

WHC-SD-WM-DA-151
REV-0
APPENDIX E-13

COMPONENT DATA LISTING

POINT NAME	---COORDINATE(ft)--- X	Y	Z	DATA TYPE	DESCRIPTION
*** SEGMENT A					
A00	0.00	0.00	0.00	ANCHOR	Rigid
					Thermal movements : None
A01 N	0.00	1.38	0.00		
A01	0.00	1.50	0.00	TI	
A01 F	0.00	1.50	-0.13		
A02	0.00	1.50	-0.17		
A03	0.00	1.50	-0.50		
A04 N	0.00	1.50	-0.54		
A04	0.00	1.50	-0.67	TI	
A04 F	-0.13	1.50	-0.67		
A05 N	-0.54	1.50	-0.67		
A05	-0.67	1.50	-0.67	TI	
A05 F	-0.67	1.63	-0.67		
A06	-0.67	3.25	-0.67	TEE	Other
					SIF - In = 2.30, Out = 2.30
SRV8N	-0.67	5.13	-0.67		
SRV8	-0.67	5.25	-0.67	TI	
SRV8M	-0.63	5.21	-0.67	WEIGHT	5 lb , No offsets
SRV8F	-0.54	5.25	-0.67		
PRV1	0.08	5.25	-0.67	WEIGHT	6 lb , No offsets
SRV7	0.83	5.25	-0.67	WEIGHT	5 lb , No offsets
A10	1.08	5.25	-0.67	TEE	Other
					SIF - In = 2.30, Out = 2.30
S1B	1.42	5.25	-0.67	GUIDE	ID : S1B 1, Connected to Ground
					Stiffness = RIGID
					Gap-down = 0.00, Above = 0.06 inch
					Gap-left = 0.03, Right = 0.03 inch
					Friction = 0.00
					Gaps set Weightless
A11	1.85	5.25	-0.67		
A12	2.18	5.25	-0.67		
A13	2.54	5.25	-0.67	WEIGHT	6 lb , No offsets
A14	2.89	5.25	-0.67		
A15	3.22	5.25	-0.67		
S2B	3.66	5.25	-0.67	GUIDE	ID : S2B 1, Connected to Ground
					Stiffness = RIGID
					Gap-down = 0.00, Above = 0.06 inch
					Gap-left = 0.03, Right = 0.03 inch
					Friction = 0.00
					Gaps set Weightless
A16	3.99	5.25	-0.67	TEE	Other
					SIF - In = 2.30, Out = 2.30
*** SEGMENT B					
A06	-0.67	4.00	-0.67	TEE	Other
					SIF - In = 2.30, Out = 2.30
B01	-0.33	4.00	-0.67		
B02	0.00	4.00	-0.67		

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COMPONENT DATA LISTING

APPENDIX E - 4

POINT NAME	COORDINATE(ft) X	Y	Z	DATA TYPE	DESCRIPTION
B03	0.33	4.00	-0.67		
*** SEGMENT C					
A10	1.08	5.25	-0.67	TEE	Other
					SIF - In = 2.30, Out = 2.30
C01 N	1.08	3.38	-0.67		
C01	1.08	3.25	-0.67	TI	
C01 F	1.21	3.25	-0.67		
S1A	1.42	3.25	-0.67	GUIDE	ID : S1A 1, Connected to Ground
					Stiffness = RIGID
					Gap-down = 0.00, Above = 0.06 inch
					Gap-left = 0.03, Right = 0.03 inch
					Friction = 0.00
					Gaps set Weightless
C02	1.85	3.25	-0.67		
C03	2.18	3.25	-0.67		
C04	2.54	3.25	-0.67	WEIGHT	6 lb , No offsets
C05	2.89	3.25	-0.67		
C06	3.22	3.25	-0.67		
S2A	3.66	3.25	-0.67	GUIDE	ID : S2A 1, Connected to Ground
					Stiffness = RIGID
					Gap-down = 0.00, Above = 0.06 inch
					Gap-left = 0.03, Right = 0.03 inch
					Friction = 0.00
					Gaps set Weightless
C07	3.99	3.25	-0.67	TEE	Other
					SIF - In = 2.30, Out = 2.30
*** SEGMENT D					
D00	6.49	6.08	1.00	ANCHOR	Rigid
					Thermal movements : None
D01 N	6.49	6.63	1.00		
D01	6.49	6.75	1.00	TI	
D01 F	6.49	6.75	0.87		
D02 N	6.49	6.75	-0.54		
D02	6.49	6.75	-0.67	TI	
D02 F	6.36	6.75	-0.67		
D03	5.49	6.75	-0.67		
D04	5.20	6.75	-0.67		
D05 N	4.11	6.75	-0.67		
D05	3.99	6.75	-0.67	TI	
D05 F	3.99	6.63	-0.67		
A16	3.99	5.25	-0.67	TEE	Other
					SIF - In = 2.30, Out = 2.30
C07	3.99	3.25	-0.67	TEE	Other
					SIF - In = 2.30, Out = 2.30
D08 N	3.99	1.88	-0.67		
D08	3.99	1.75	-0.67	TI	
D08 F	4.11	1.75	-0.67		

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APPENDIX E-15

COMPONENT DATA LISTING

POINT NAME	---COORDINATE(ft)--- X	Y	Z	DATA TYPE	DESCRIPTION
D09	4.99	1.75	-0.67	TEE	Other SIF - In = 2.30, Out = 2.30
D10	6.32	1.75	-0.67		
D11	6.65	1.75	-0.67		
D12 N	7.53	1.75	-0.67		
D12	7.65	1.75	-0.67	TI	
D12 F	7.65	1.75	-0.54		
D13	7.65	1.75	1.00	TEE	Other SIF - In = 2.30, Out = 2.30
S3A	7.65	1.75	6.98	GUIDE	ID : S3A 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.06 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.00 Gaps set Weightless
D14 N	7.65	1.75	10.04		
D14	7.65	1.75	10.17	TI	
D14 F	7.53	1.75	10.17		
S4A	6.40	1.75	10.17	GUIDE	ID : S5A 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.06 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.00 Gaps set Weightless
S5A	4.23	1.75	10.17	GUIDE	ID : S6A 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.06 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.00 Gaps set Weightless
D15 N	4.03	1.75	10.17		
D15	3.90	1.75	10.17	TI	
D15 F	3.90	1.75	10.04		
D16 N	3.90	1.75	9.79		
D16	3.90	1.75	9.67	TI	
D16 F	3.90	1.88	9.67		
D17	3.90	3.75	9.67	TEE	Other SIF - In = 2.30, Out = 2.30
D18 N	3.90	5.63	9.67		
D18	3.90	5.75	9.67	TI	
D18 F	4.03	5.75	9.67		
S5C	4.23	5.75	9.67	GUIDE	ID : S6C 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.06 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.00 Gaps set Weightless
D19	4.63	5.75	9.67		
D20	4.96	5.75	9.67		

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APPENDIX E-16

COMPONENT DATA LISTING

POINT NAME	X	Y	Z	DATA TYPE	DESCRIPTION
D21	5.32	5.75	9.67	WEIGHT	6 lb , No offsets
D22	5.67	5.75	9.67		
D23	6.00	5.75	9.67		
S4C	6.40	5.75	9.67	GUIDE	ID : S5C 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.06 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.00 Gaps set Weightless
D24 N	6.60	5.75	9.67		
D24	6.73	5.75	9.67	TI	
D24 F	6.73	5.63	9.67		
D25	6.73	4.75	9.67	TEE	Other SIF - In = 2.30, Out = 2.30
*** SEGMENT E					
D17	3.90	3.75	9.67	TEE	Other SIF - In = 2.30, Out = 2.30
S5B	4.23	3.75	9.67	GUIDE	ID : S6B 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.06 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.00 Gaps set Weightless
E01	4.63	3.75	9.67		
E02	4.96	3.75	9.67		
E03	5.32	3.75	9.67	WEIGHT	6 lb , No offsets
E04	5.67	3.75	9.67		
E05	6.00	3.75	9.67		
S4B	6.40	3.75	9.67	GUIDE	ID : S5B 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.06 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.00 Gaps set Weightless
E06 N	6.60	3.75	9.67		
E06	6.73	3.75	9.67	TI	
E06 F	6.73	3.88	9.67		
D25	6.73	4.75	9.67	TEE	Other SIF - In = 2.30, Out = 2.30
*** SEGMENT F					
D25	6.73	4.75	9.67	TEE	Other SIF - In = 2.30, Out = 2.30
F01 N	7.10	4.75	9.67		
F01	7.23	4.75	9.67	TI	
F01 F	7.23	4.75	9.54		
F02	7.23	4.75	7.75	WEIGHT	4 lb , No offsets
S3C	7.23	4.75	6.98	GUIDE	ID : S3B 1, Connected to Ground

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APPENDIX E-17

COMPONENT DATA LISTING

POINT NAME	COORDINATE(ft) X	Y	Z	DATA TYPE	DESCRIPTION
					Stiffness = RIGID
					Gap-down = 0.00, Above = 0.06 inch
					Gap-left = 0.03, Right = 0.03 inch
					Friction = 0.00
					Gaps set Weightless
F03	7.23	4.75	4.75	TEE	Other
					SIF - In = 2.30, Out = 2.30
F04	7.23	3.75	4.75	WEIGHT	15 lb , No offsets
*** SEGMENT G					
F04	7.23	3.75	4.75		
S3B	7.23	3.75	6.98	GUIDE	ID : G10 1, Connected to Ground
					Stiffness = RIGID
					Gap-down = 0.00, Above = 0.06 inch
					Gap-left = 0.03, Right = 0.03 inch
					Friction = 0.00
					Gaps set Weightless
G01	7.23	3.75	7.31		
G02	7.23	3.75	7.64		
G03	7.23	3.75	8.00	WEIGHT	6 lb , No offsets
G04	7.23	3.75	8.35		
G05	7.23	3.75	8.68		
WALL	7.23	3.75	10.74	GUIDE	ID : WALL 1, Connected to Ground
					Stiffness = RIGID
					Gap-down = 0.03, Above = 0.03 inch
					Gap-left = 0.03, Right = 0.03 inch
					Friction = 0.00
					Gaps set Weightless
G06 N	7.23	3.75	11.11		
G06	7.23	3.75	11.24	TI	
G06 F	7.23	3.63	11.24		
G07	7.23	3.58	11.24		
G10	7.23	3.29	11.24		
G11	7.23	3.09	11.24		
*** SEGMENT H					
F03	7.23	4.75	4.75	TEE	Other
					SIF - In = 2.30, Out = 2.30
H01	7.23	4.92	4.75		
H02	7.23	5.25	4.75		
H03	7.23	5.42	4.75		
*** SEGMENT I					
D13	7.65	1.75	1.00	TEE	Other
					SIF - In = 2.30, Out = 2.30
I01	7.32	1.75	1.00		
I02	7.03	1.75	1.00		
I03 N	6.78	1.75	1.00		
I03	6.65	1.75	1.00	TI	

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APPENDIX E-18

COMPONENT DATA LISTING

POINT NAME	---COORDINATE(ft)--- X	Y	Z	DATA TYPE	DESCRIPTION
I03 F	6.65	1.63	1.00		
I04	6.65	0.75	1.00	ANCHOR	Rigid Thermal movements : None
*** SEGMENT J					
D09	4.99	1.75	-0.67	TEE	Other SIF - In = 2.30, Out = 2.30
J01	4.99	1.58	-0.67		
J02	4.99	1.25	-0.67		
J03	4.99	1.08	-0.67		

Number of points in the system : 144

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APPENDIX E-19

PIPE DATA LISTING

Pipe ID/ Material	Nom/ Sch	O.D. inch	-----Thickness(inch)----- W.Th.	Corr	Mill	Insu	Ling	Spec Grav	Weight(lb/ft) Pipe	Other	Total
CS 1	1	1.315	0.179	0	0.02	0	0	0.00	2.17	0	2.17
A106-B	80										

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APPENDIX E-20

MATERIAL DATA LISTING

Material Name	Pipe ID	Density (lb/cu.ft)	Poisson ratio	Temperature (deg F)	Modulus (E6 psi)	Expansion (in/100ft)	Allowable (psi)
A106-B	CS 1	489.0	0.30	65.0	29.52		20000.0
				90.0		0.1861	20000.0

TEMPERATURE AND PRESSURE DATA

POINT NAME	CASE 1 PRESS. psi	CASE 1 TEMPER deg F	CASE 1 EXPAN. in/100ft	CASE 2 PRESS. psi	CASE 2 TEMPER deg F	CASE 2 EXPAN. in/100ft	CASE 3 PRESS. psi	CASE 3 TEMPER deg F	CASE 3 EXPAN. in/100ft
*** SEGMENT A									
A00	125	90.00	0.186						
A16	125	90.00	0.186						
*** SEGMENT B									
A06	125	90.00	0.186						
B03	125	90.00	0.186						
*** SEGMENT C									
A10	125	90.00	0.186						
C07	125	90.00	0.186						
*** SEGMENT D									
D00	125	90.00	0.186						
D25	125	90.00	0.186						
*** SEGMENT E									
D17	125	90.00	0.186						
D25	125	90.00	0.186						
*** SEGMENT F									
D25	125	90.00	0.186						
F04	125	90.00	0.186						
*** SEGMENT G									
F04	125	90.00	0.186						
G11	125	90.00	0.186						
*** SEGMENT H									
F03	125	90.00	0.186						
H03	125	90.00	0.186						
*** SEGMENT I									
D13	125	90.00	0.186						
I04	125	90.00	0.186						
*** SEGMENT J									
D09	125	90.00	0.186						
J03	125	90.00	0.186						

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APPENDIX E-22

ANALYSIS SUMMARY

Current model revision number : 7

Static - Date and Time of analysis ..... Apr 17, 1993 2:51 PM
Model Revision Number 7
Number of load cases 6
Load cases analyzed ..... GR T1 E1 E2 E3 P1
Gaps/Friction/Yielding considered ..... Yes
Tolerance - Force, Displacement ..... 100.00 lb 0.0162 in
Friction - Factor, tolerance 1.00 0.10
Hanger design run ..... No
Cut short included ..... No
Occasional load analysis type ..... Nonlinear
Non-linear analysis summary file U2.LOG
Base load cases for nonlinear analysis
GR = None
T1 = GR
E1 = GR
E2 = GR
E3 = GR
P1 = T1
Weight of contents included ..... Yes
Pressure stiffening case 0
Water elevation for buoyancy loads .... Not considered

CODE COMPLIANCE COMBINATIONS

Combination	Method	Load	Factor	Allowable
GR + Max P	Sum	Gravity	1.00	Automatic
		Max Pres	1.00	
Cold to T1	Sum	Thermal 1	1.00	Automatic
Sus. + E1	Abs sum	Earth 1	1.00	Automatic
		Max Sus	1.00	
Sus. + E2	Abs sum	Earth 2	1.00	Automatic
		Max Sus	1.00	
Sus. + E3	Abs sum	Earth 3	1.00	Automatic
		Max Sus	1.00	
Max P		Max Hoop	1.00	Automatic

OTHER USER COMBINATIONS

Combination	Method	Load	Factor
SEIS	SRSS	Earth 1	1.00
		Earth 2	1.00
		Earth 3	1.00
SUST	Sum	Gravity	1.00
		Press 1	1.00
OCC	Abs sum	SEIS	1.00
		SUST	1.00
TOTAL	Abs sum	OCC	1.00
		Thermal 1	1.00

CODE COMPLIANCE

Y - Factor 0.40
Weld efficiency factor 1.00
Range reduction factor 1.00
Design Pressure Factor 1.00
Include corrosion in stress calcs. .... Y
Include torsion in code stress ..... N
Include axial force in code stress .... N
Longitudinal pressure calculation PD/4t
Include rigorous pressure ..... Y

EARTHQUAKE LOAD CASES :

Number of load cases analysed : 3

Load case 1 - E1

X-Multiplier= 0.375 Y-Multiplier= 0.000 Z-Multiplier= 0.000

Load case 2 - E2

X-Multiplier= 0.000 Y-Multiplier= 0.250 Z-Multiplier= 0.000

Load case 3 - E3

X-Multiplier= 0.000 Y-Multiplier= 0.000 Z-Multiplier= 0.375

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
*** Segment A begin ***							
A00	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.000	0.000	0.000	0.000	0.000	0.000
	E1	0.000	0.000	0.000	0.000	0.000	0.000
	E2	0.000	0.000	0.000	0.000	0.000	0.000
	E3	0.000	0.000	0.000	0.000	0.000	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.000	0.000	0.000	0.000	0.000	0.000
	SUST	0.000	0.000	0.000	0.000	0.000	0.000
	OCC	0.000	0.000	0.000	0.000	0.000	0.000
	TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
A01 N	GR	-0.001	0.000	-0.004	-0.030	-0.009	0.007
	T1	-0.001	0.003	0.000	-0.003	0.003	0.007
	E1	0.003	0.000	0.003	0.020	-0.006	-0.018
	E2	0.000	0.000	0.001	0.008	0.002	-0.002
	E3	-0.001	0.000	0.006	0.037	0.020	0.008
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.004	0.000	0.007	0.043	0.021	0.020
	SUST	-0.001	0.000	-0.004	-0.030	-0.009	0.007
	OCC	0.004	0.000	0.011	0.073	0.030	0.027
	TOTAL	0.006	0.003	0.012	0.075	0.033	0.034
A01 F	GR	-0.001	-0.001	-0.005	-0.038	-0.010	0.010
	T1	-0.001	0.003	-0.001	-0.003	0.004	0.008
	E1	0.004	0.001	0.004	0.024	-0.007	-0.018
	E2	0.000	0.000	0.001	0.010	0.002	-0.003
	E3	-0.002	0.001	0.007	0.041	0.024	0.010
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.004	0.001	0.008	0.048	0.025	0.021
	SUST	-0.001	-0.001	-0.005	-0.038	-0.010	0.010
	OCC	0.005	0.002	0.014	0.086	0.035	0.032
	TOTAL	0.007	0.005	0.014	0.090	0.038	0.040
A02	GR	-0.001	-0.001	-0.005	-0.039	-0.010	0.011
	T1	-0.002	0.003	-0.001	-0.003	0.004	0.009
	E1	0.004	0.001	0.004	0.025	-0.007	-0.018
	E2	0.000	0.000	0.001	0.010	0.002	-0.003
	E3	-0.002	0.001	0.007	0.041	0.024	0.011
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.005	0.002	0.008	0.049	0.026	0.021
	SUST	-0.001	-0.001	-0.005	-0.039	-0.010	0.011
	OCC	0.005	0.003	0.014	0.088	0.035	0.032
	TOTAL	0.007	0.006	0.014	0.091	0.039	0.041

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS X	Y	Z
A03	GR	0.000	-0.004	-0.005	-0.039	-0.010	0.011
	T1	-0.002	0.002	-0.001	-0.003	0.004	0.009
	E1	0.005	0.002	0.004	0.025	-0.007	-0.018
	E2	0.000	0.001	0.001	0.010	0.002	-0.003
	E3	-0.004	0.004	0.007	0.041	0.025	0.011
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.006	0.005	0.008	0.049	0.026	0.021
	SUST	0.000	-0.004	-0.005	-0.039	-0.010	0.011
	OCC	0.006	0.009	0.013	0.088	0.035	0.032
	TOTAL	0.008	0.011	0.015	0.091	0.039	0.041
A04 N	GR	0.000	-0.004	-0.005	-0.039	-0.010	0.012
	T1	-0.002	0.002	-0.001	-0.003	0.004	0.009
	E1	0.005	0.003	0.004	0.025	-0.007	-0.018
	E2	0.000	0.001	0.001	0.010	0.002	-0.003
	E3	-0.004	0.005	0.007	0.042	0.025	0.011
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.006	0.005	0.008	0.050	0.026	0.022
	SUST	0.000	-0.004	-0.005	-0.039	-0.010	0.012
	OCC	0.006	0.010	0.013	0.089	0.036	0.033
	TOTAL	0.008	0.012	0.015	0.092	0.040	0.042
A04 F	GR	0.000	-0.006	-0.005	-0.038	-0.010	0.014
	T1	-0.002	0.002	-0.002	-0.004	0.004	0.010
	E1	0.005	0.004	0.004	0.031	-0.006	-0.020
	E2	0.000	0.001	0.001	0.009	0.003	-0.003
	E3	-0.005	0.005	0.008	0.048	0.029	0.012
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.007	0.007	0.009	0.057	0.030	0.023
	SUST	0.000	-0.006	-0.005	-0.038	-0.010	0.014
	OCC	0.007	0.013	0.014	0.095	0.040	0.037
	TOTAL	0.009	0.015	0.016	0.099	0.043	0.047
A05 N	GR	0.000	-0.007	-0.006	-0.034	-0.011	0.013
	T1	-0.003	0.001	-0.001	-0.004	0.003	0.010
	E1	0.005	0.006	0.003	0.040	-0.005	-0.022
	E2	0.000	0.002	0.002	0.009	0.003	-0.003
	E3	-0.005	0.004	0.011	0.058	0.031	0.012
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.007	0.007	0.011	0.071	0.032	0.025
	SUST	0.000	-0.007	-0.006	-0.034	-0.011	0.013
	OCC	0.007	0.014	0.018	0.105	0.042	0.038
	TOTAL	0.010	0.016	0.019	0.109	0.046	0.048

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
A05 F	GR	0.000	-0.007	-0.007	-0.032	-0.011	0.008
	T1	-0.003	0.001	-0.001	-0.004	0.003	0.011
	E1	0.005	0.006	0.004	0.045	-0.004	-0.025
	E2	0.000	0.002	0.002	0.008	0.003	-0.002
	E3	-0.005	0.004	0.013	0.064	0.032	0.010
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.007	0.008	0.014	0.079	0.033	0.027
	SUST	0.000	-0.007	-0.007	-0.032	-0.011	0.008
	OCC	0.008	0.015	0.021	0.111	0.044	0.035
	TOTAL	0.011	0.016	0.023	0.114	0.047	0.046
A06	GR	0.000	-0.007	-0.017	-0.024	-0.015	-0.006
	T1	-0.007	0.004	-0.002	-0.003	0.003	0.008
	E1	0.015	0.006	0.023	0.060	-0.006	-0.028
	E2	0.000	0.002	0.004	0.006	0.004	0.002
	E3	-0.007	0.004	0.038	0.074	0.033	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.017	0.008	0.044	0.095	0.034	0.028
	SUST	0.000	-0.007	-0.017	-0.024	-0.015	-0.006
	OCC	0.017	0.015	0.061	0.119	0.049	0.034
	TOTAL	0.024	0.019	0.064	0.123	0.051	0.042
SRV8N	GR	0.000	-0.007	-0.025	-0.020	-0.019	0.010
	T1	-0.007	0.008	-0.004	-0.002	0.002	-0.006
	E1	0.025	0.006	0.046	0.051	-0.008	-0.024
	E2	0.000	0.002	0.006	0.005	0.005	-0.002
	E3	-0.006	0.004	0.064	0.057	0.040	-0.010
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.025	0.008	0.079	0.077	0.041	0.026
	SUST	0.000	-0.007	-0.025	-0.020	-0.019	0.010
	OCC	0.026	0.015	0.104	0.097	0.060	0.036
	TOTAL	0.033	0.023	0.108	0.099	0.062	0.042
SRV8M	GR	0.000	-0.007	-0.025	-0.020	-0.020	0.013
	T1	-0.007	0.008	-0.004	-0.002	0.002	-0.008
	E1	0.025	0.006	0.047	0.049	-0.007	-0.024
	E2	0.000	0.002	0.006	0.005	0.005	-0.003
	E3	-0.005	0.004	0.065	0.055	0.040	-0.012
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.008	0.080	0.074	0.041	0.027
	SUST	0.000	-0.007	-0.026	-0.020	-0.020	0.013
	OCC	0.026	0.015	0.105	0.094	0.061	0.040
	TOTAL	0.033	0.022	0.109	0.096	0.063	0.048

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (X	Y	Z
SRV8F	GR	0.000	-0.007	-0.025	-0.020	-0.020	0.016
	T1	-0.007	0.008	-0.004	-0.002	0.002	-0.010
	E1	0.025	0.006	0.047	0.047	-0.007	-0.024
	E2	0.000	0.002	0.006	0.005	0.005	-0.004
	E3	-0.005	0.004	0.064	0.053	0.041	-0.013
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.007	0.080	0.071	0.042	0.027
	SUST	0.000	-0.007	-0.025	-0.020	-0.020	0.015
	OCC	0.026	0.014	0.105	0.091	0.062	0.043
	TOTAL	0.033	0.022	0.109	0.093	0.064	0.053
PRV1	GR	0.000	-0.004	-0.023	-0.020	-0.021	0.022
	T1	-0.006	0.006	-0.004	-0.001	0.002	-0.016
	E1	0.025	0.003	0.048	0.037	-0.006	-0.021
	E2	0.000	0.001	0.006	0.005	0.005	-0.005
	E3	-0.005	0.002	0.059	0.043	0.042	-0.013
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.003	0.076	0.056	0.043	0.026
	SUST	0.000	-0.004	-0.023	-0.020	-0.021	0.022
	OCC	0.026	0.008	0.099	0.076	0.063	0.047
	TOTAL	0.032	0.014	0.103	0.077	0.065	0.063
SRV7	GR	0.000	-0.001	-0.019	-0.019	-0.021	0.016
	T1	-0.004	0.003	-0.004	0.000	0.001	-0.022
	E1	0.025	0.000	0.048	0.024	0.001	-0.011
	E2	0.000	0.000	0.005	0.005	0.005	-0.004
	E3	-0.005	0.000	0.052	0.030	0.039	-0.006
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.000	0.071	0.039	0.040	0.013
	SUST	0.000	-0.001	-0.019	-0.019	-0.021	0.016
	OCC	0.026	0.002	0.091	0.058	0.060	0.029
	TOTAL	0.030	0.004	0.095	0.059	0.061	0.051
A10	GR	0.000	0.000	-0.018	-0.019	-0.020	0.009
	T1	-0.004	0.002	-0.004	0.000	0.001	-0.023
	E1	0.025	0.000	0.048	0.019	0.004	-0.006
	E2	0.000	0.000	0.005	0.005	0.005	-0.002
	E3	-0.005	0.000	0.050	0.026	0.037	-0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.000	0.070	0.033	0.037	0.007
	SUST	0.000	0.000	-0.018	-0.019	-0.020	0.009
	OCC	0.026	0.001	0.088	0.052	0.058	0.016
	TOTAL	0.030	0.003	0.093	0.052	0.059	0.039

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (X	Y	Z
S1B	GR	0.000	0.000	-0.017	-0.019	-0.020	0.003
	T1	-0.003	0.000	-0.004	0.000	0.001	-0.023
	E1	0.025	-0.001	0.048	0.015	0.008	-0.005
	E2	0.000	0.000	0.004	0.005	0.005	-0.001
	E3	-0.005	0.000	0.048	0.022	0.034	-0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.001	0.068	0.027	0.035	0.005
	SUST	0.000	0.000	-0.017	-0.019	-0.020	0.003
	OCC	0.026	0.001	0.085	0.046	0.055	0.008
	TOTAL	0.029	0.001	0.089	0.046	0.056	0.031
A11	GR	0.000	0.000	-0.015	-0.018	-0.020	-0.001
	T1	-0.003	-0.002	-0.004	0.000	0.001	-0.010
	E1	0.025	-0.001	0.047	0.009	0.013	-0.002
	E2	0.000	0.000	0.004	0.004	0.005	0.000
	E3	-0.005	0.000	0.045	0.017	0.030	-0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.001	0.065	0.020	0.033	0.002
	SUST	0.000	0.000	-0.015	-0.018	-0.020	-0.001
	OCC	0.026	0.001	0.080	0.038	0.053	0.003
	TOTAL	0.029	0.003	0.085	0.038	0.054	0.014
A12	GR	0.000	0.000	-0.014	-0.018	-0.020	-0.001
	T1	-0.002	-0.002	-0.004	0.000	0.001	-0.010
	E1	0.025	-0.001	0.046	0.009	0.013	-0.002
	E2	0.000	0.000	0.003	0.004	0.005	0.000
	E3	-0.005	0.000	0.043	0.017	0.030	-0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.001	0.063	0.020	0.033	0.002
	SUST	0.000	0.000	-0.014	-0.018	-0.020	-0.001
	OCC	0.026	0.001	0.077	0.038	0.053	0.003
	TOTAL	0.028	0.003	0.081	0.038	0.054	0.014
A13	GR	0.000	0.000	-0.012	-0.017	-0.020	0.000
	T1	-0.001	-0.003	-0.005	0.001	0.001	0.000
	E1	0.025	-0.001	0.045	0.005	0.019	0.002
	E2	0.000	0.000	0.003	0.004	0.005	0.000
	E3	-0.005	0.000	0.041	0.013	0.030	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.001	0.061	0.015	0.036	0.002
	SUST	0.000	0.000	-0.012	-0.017	-0.020	0.000
	OCC	0.026	0.001	0.073	0.031	0.056	0.002
	TOTAL	0.027	0.004	0.077	0.032	0.057	0.002

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS X	Y	Z
A14	GR	0.000	0.000	-0.011	-0.016	-0.019	0.001
	T1	-0.001	-0.002	-0.005	0.001	0.000	0.010
	E1	0.025	-0.001	0.043	0.000	0.025	0.005
	E2	0.000	0.000	0.003	0.004	0.005	0.000
	E3	-0.005	0.000	0.038	0.009	0.032	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.001	0.058	0.010	0.041	0.005
	SUST	0.000	0.000	-0.011	-0.016	-0.019	0.001
	OCC	0.026	0.001	0.069	0.026	0.060	0.006
	TOTAL	0.027	0.003	0.073	0.027	0.061	0.016
A15	GR	0.000	0.000	-0.009	-0.016	-0.019	0.001
	T1	0.000	-0.002	-0.005	0.001	0.000	0.010
	E1	0.025	-0.001	0.041	0.000	0.026	0.005
	E2	0.000	0.000	0.002	0.004	0.005	0.000
	E3	-0.005	0.000	0.036	0.009	0.032	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.001	0.055	0.010	0.041	0.005
	SUST	0.000	0.000	-0.009	-0.016	-0.019	0.001
	OCC	0.026	0.001	0.065	0.026	0.060	0.006
	TOTAL	0.026	0.002	0.069	0.027	0.061	0.016
S2B	GR	0.000	0.000	-0.008	-0.015	-0.019	-0.001
	T1	0.001	0.000	-0.005	0.001	0.000	0.023
	E1	0.025	0.000	0.039	-0.006	0.035	0.010
	E2	0.000	0.000	0.002	0.004	0.005	0.000
	E3	-0.005	0.000	0.033	0.004	0.034	0.003
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.000	0.051	0.008	0.049	0.010
	SUST	0.000	0.000	-0.008	-0.015	-0.019	-0.001
	OCC	0.026	0.000	0.059	0.023	0.068	0.011
	TOTAL	0.027	0.000	0.063	0.024	0.068	0.034
A16	GR	0.000	0.000	-0.006	-0.014	-0.018	-0.002
	T1	0.001	0.002	-0.005	0.001	0.000	0.023
	E1	0.025	0.001	0.036	-0.010	0.040	0.017
	E2	0.000	0.000	0.002	0.004	0.005	0.000
	E3	-0.005	0.000	0.031	0.000	0.035	0.005
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.001	0.047	0.011	0.053	0.018
	SUST	0.000	0.000	-0.006	-0.014	-0.018	-0.002
	OCC	0.026	0.001	0.054	0.025	0.072	0.019
	TOTAL	0.027	0.003	0.058	0.026	0.072	0.042

*** Segment A end ***

*** Segment B begin ***

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATI X	Y	Z
A06	GR	0.000	-0.007	-0.017	-0.024	-0.015	-0.006
	T1	-0.007	0.004	-0.002	-0.003	0.003	0.008
	E1	0.015	0.006	0.023	0.060	-0.006	-0.028
	E2	0.000	0.002	0.004	0.006	0.004	0.002
	E3	-0.007	0.004	0.038	0.074	0.033	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.017	0.008	0.044	0.095	0.034	0.028
	SUST	0.000	-0.007	-0.017	-0.024	-0.015	-0.006
	OCC	0.017	0.015	0.061	0.119	0.049	0.034
	TOTAL	0.024	0.019	0.064	0.123	0.051	0.042
B01	GR	0.000	-0.008	-0.016	-0.024	-0.015	-0.008
	T1	-0.006	0.005	-0.003	-0.003	0.003	0.008
	E1	0.015	0.004	0.023	0.060	-0.006	-0.028
	E2	0.000	0.002	0.004	0.006	0.004	0.002
	E3	-0.007	0.004	0.035	0.074	0.032	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.017	0.006	0.042	0.095	0.033	0.028
	SUST	0.000	-0.008	-0.016	-0.024	-0.015	-0.008
	OCC	0.017	0.014	0.058	0.119	0.048	0.036
	TOTAL	0.023	0.019	0.061	0.123	0.051	0.043
B02	GR	0.000	-0.008	-0.015	-0.024	-0.015	-0.008
	T1	-0.006	0.005	-0.003	-0.003	0.003	0.008
	E1	0.015	0.002	0.024	0.060	-0.006	-0.028
	E2	0.000	0.002	0.004	0.006	0.004	0.002
	E3	-0.007	0.004	0.033	0.074	0.032	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.017	0.005	0.041	0.095	0.033	0.028
	SUST	0.000	-0.008	-0.015	-0.024	-0.015	-0.008
	OCC	0.017	0.014	0.056	0.119	0.048	0.036
	TOTAL	0.022	0.019	0.058	0.123	0.051	0.043
B03	GR	0.000	-0.009	-0.014	-0.024	-0.015	-0.008
	T1	-0.005	0.006	-0.003	-0.003	0.003	0.008
	E1	0.015	0.001	0.024	0.060	-0.006	-0.028
	E2	0.000	0.002	0.003	0.006	0.004	0.002
	E3	-0.007	0.004	0.031	0.074	0.032	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.017	0.005	0.039	0.095	0.033	0.028
	SUST	0.000	-0.009	-0.014	-0.024	-0.015	-0.008
	OCC	0.017	0.014	0.053	0.119	0.048	0.036
	TOTAL	0.022	0.020	0.056	0.123	0.051	0.043

*** Segment B end ***

*** Segment C begin ***

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS X	Y	Z
A10	GR	0.000	0.000	-0.018	-0.019	-0.020	0.009
	T1	-0.004	0.002	-0.004	0.000	0.001	-0.023
	E1	0.025	0.000	0.048	0.019	0.004	-0.006
	E2	0.000	0.000	0.005	0.005	0.005	-0.002
	E3	-0.005	0.000	0.050	0.026	0.037	-0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.000	0.070	0.033	0.037	0.007
	SUST	0.000	0.000	-0.018	-0.019	-0.020	0.009
	OCC	0.026	0.001	0.088	0.052	0.058	0.016
	TOTAL	0.030	0.003	0.093	0.052	0.059	0.039
C01 N	GR	0.001	0.000	-0.011	-0.020	-0.018	0.004
	T1	-0.005	-0.002	-0.004	0.000	0.001	0.020
	E1	0.027	0.000	0.041	0.019	0.010	0.008
	E2	0.000	0.000	0.003	0.005	0.005	-0.001
	E3	-0.004	0.000	0.041	0.019	0.020	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.027	0.000	0.058	0.027	0.023	0.008
	SUST	0.001	0.000	-0.011	-0.020	-0.018	0.004
	OCC	0.029	0.001	0.069	0.047	0.041	0.012
	TOTAL	0.034	0.002	0.073	0.047	0.043	0.033
C01 F	GR	0.002	0.000	-0.010	-0.019	-0.018	0.006
	T1	-0.004	-0.001	-0.004	0.000	0.001	0.027
	E1	0.027	0.000	0.040	0.020	0.011	0.006
	E2	0.000	0.000	0.002	0.005	0.005	-0.001
	E3	-0.004	0.000	0.041	0.017	0.018	-0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.028	0.000	0.057	0.027	0.021	0.006
	SUST	0.002	0.000	-0.010	-0.019	-0.018	0.006
	OCC	0.029	0.001	0.067	0.046	0.039	0.012
	TOTAL	0.033	0.002	0.071	0.046	0.041	0.039
S1A	GR	0.002	0.000	-0.009	-0.019	-0.018	0.004
	T1	-0.003	0.000	-0.004	0.000	0.001	0.024
	E1	0.027	0.000	0.040	0.021	0.012	0.005
	E2	0.000	0.000	0.002	0.005	0.004	-0.001
	E3	-0.004	0.000	0.040	0.015	0.016	-0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.028	0.000	0.056	0.026	0.021	0.005
	SUST	0.002	0.000	-0.009	-0.019	-0.018	0.004
	OCC	0.029	0.000	0.065	0.045	0.038	0.009
	TOTAL	0.033	0.000	0.069	0.045	0.039	0.033

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
C02	GR	0.002	0.000	-0.007	-0.018	-0.017	-0.001
	T1	-0.003	0.002	-0.004	0.000	0.001	0.011
	E1	0.027	0.000	0.039	0.023	0.014	0.003
	E2	0.000	0.000	0.002	0.005	0.004	0.000
	E3	-0.004	0.000	0.038	0.012	0.014	-0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.028	0.000	0.054	0.026	0.020	0.003
	SUST	0.002	0.000	-0.007	-0.018	-0.017	-0.001
	OCC	0.029	0.000	0.062	0.044	0.037	0.004
	TOTAL	0.032	0.002	0.066	0.045	0.038	0.015
C03	GR	0.002	0.000	-0.006	-0.018	-0.017	-0.001
	T1	-0.002	0.002	-0.004	0.000	0.001	0.011
	E1	0.027	0.001	0.038	0.023	0.014	0.003
	E2	0.000	0.000	0.002	0.005	0.004	0.000
	E3	-0.004	0.000	0.037	0.012	0.014	-0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.028	0.001	0.053	0.026	0.020	0.003
	SUST	0.002	0.000	-0.006	-0.018	-0.017	-0.001
	OCC	0.029	0.001	0.059	0.044	0.037	0.004
	TOTAL	0.031	0.003	0.064	0.045	0.038	0.015
C04	GR	0.002	0.000	-0.005	-0.018	-0.016	0.000
	T1	-0.001	0.003	-0.005	0.000	0.001	0.000
	E1	0.027	0.001	0.037	0.024	0.016	0.001
	E2	0.000	0.000	0.001	0.004	0.004	0.000
	E3	-0.004	0.000	0.036	0.009	0.015	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.028	0.001	0.052	0.026	0.022	0.002
	SUST	0.002	0.000	-0.005	-0.018	-0.016	0.000
	OCC	0.029	0.001	0.056	0.044	0.038	0.002
	TOTAL	0.031	0.004	0.061	0.044	0.039	0.002
C05	GR	0.002	0.000	-0.004	-0.017	-0.015	0.001
	T1	-0.001	0.002	-0.005	0.000	0.001	-0.011
	E1	0.027	0.001	0.035	0.026	0.018	0.001
	E2	0.000	0.000	0.001	0.004	0.004	0.000
	E3	-0.004	0.000	0.035	0.007	0.017	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.028	0.001	0.050	0.027	0.025	0.001
	SUST	0.002	0.000	-0.004	-0.017	-0.015	0.001
	OCC	0.029	0.001	0.054	0.044	0.040	0.002
	TOTAL	0.030	0.003	0.058	0.044	0.041	0.013

D I S P L A C E M E N T S

APPENDIX E-34

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
C06	GR	0.002	0.000	-0.003	-0.017	-0.015	0.001
	T1	0.000	0.002	-0.005	0.000	0.001	-0.011
	E1	0.027	0.001	0.034	0.026	0.018	0.001
	E2	0.000	0.000	0.001	0.004	0.004	0.000
	E3	-0.004	0.000	0.034	0.006	0.017	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.028	0.001	0.048	0.027	0.025	0.001
	SUST	0.002	0.000	-0.003	-0.017	-0.015	0.001
	OCC	0.029	0.001	0.051	0.044	0.040	0.002
	TOTAL	0.029	0.002	0.055	0.044	0.041	0.013
S2A	GR	0.002	0.000	-0.001	-0.016	-0.013	-0.001
	T1	0.001	0.000	-0.005	-0.001	0.001	-0.024
	E1	0.027	0.001	0.032	0.027	0.022	0.001
	E2	0.000	0.000	0.000	0.004	0.003	0.000
	E3	-0.004	0.000	0.032	0.003	0.020	0.003
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.028	0.001	0.046	0.028	0.029	0.003
	SUST	0.002	0.000	-0.001	-0.016	-0.013	-0.001
	OCC	0.029	0.001	0.047	0.044	0.043	0.004
	TOTAL	0.030	0.001	0.052	0.045	0.043	0.028
C07	GR	0.002	0.000	0.000	-0.016	-0.012	-0.001
	T1	0.001	-0.002	-0.005	-0.001	0.000	-0.023
	E1	0.027	0.001	0.031	0.029	0.024	-0.002
	E2	0.000	0.000	0.000	0.004	0.003	0.000
	E3	-0.004	0.000	0.031	0.001	0.022	0.005
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.028	0.001	0.043	0.029	0.033	0.005
	SUST	0.002	0.000	0.000	-0.016	-0.012	-0.001
	OCC	0.029	0.001	0.044	0.045	0.045	0.007
	TOTAL	0.031	0.003	0.049	0.046	0.045	0.030
*** Segment C end ***							
*** Segment D begin ***							
D00	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.000	0.000	0.000	0.000	0.000	0.000
	E1	0.000	0.000	0.000	0.000	0.000	0.000
	E2	0.000	0.000	0.000	0.000	0.000	0.000
	E3	0.000	0.000	0.000	0.000	0.000	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.000	0.000	0.000	0.000	0.000	0.000
	SUST	0.000	0.000	0.000	0.000	0.000	0.000
	OCC	0.000	0.000	0.000	0.000	0.000	0.000
	TOTAL	0.000	0.000	0.000	0.000	0.000	0.000

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
D01 N	GR	0.000	0.000	-0.001	-0.013	-0.004	-0.002
	T1	0.000	0.001	0.000	0.003	-0.001	-0.001
	E1	0.001	0.000	0.001	0.010	-0.028	-0.013
	E2	0.000	0.000	0.000	0.003	0.001	0.000
	E3	0.000	0.000	0.000	0.005	0.008	-0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.001	0.000	0.001	0.012	0.029	0.013
	SUST	0.000	0.000	-0.001	-0.013	-0.004	-0.002
	OCC	0.001	0.000	0.002	0.025	0.033	0.015
	TOTAL	0.001	0.001	0.002	0.028	0.034	0.016
D01 F	GR	0.000	0.000	-0.001	-0.021	-0.005	-0.003
	T1	0.000	0.001	0.000	0.006	-0.002	-0.002
	E1	0.002	0.000	0.001	0.012	-0.040	-0.015
	E2	0.000	0.000	0.000	0.005	0.001	0.001
	E3	0.000	0.000	0.001	0.006	0.011	-0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.002	0.000	0.001	0.015	0.042	0.015
	SUST	0.000	0.000	-0.001	-0.021	-0.005	-0.003
	OCC	0.003	0.001	0.002	0.036	0.047	0.018
	TOTAL	0.003	0.002	0.002	0.042	0.049	0.020
D02 N	GR	0.003	-0.009	-0.001	-0.032	-0.013	-0.010
	T1	0.001	0.004	-0.003	0.009	-0.003	-0.004
	E1	0.014	0.004	0.001	0.007	-0.017	-0.008
	E2	-0.001	0.002	0.000	0.008	0.003	0.003
	E3	-0.007	0.002	0.001	0.004	0.037	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.016	0.005	0.001	0.011	0.041	0.009
	SUST	0.003	-0.009	-0.001	-0.032	-0.013	-0.010
	OCC	0.019	0.014	0.002	0.043	0.054	0.019
	TOTAL	0.020	0.018	0.005	0.052	0.057	0.023
D02 F	GR	0.003	-0.010	-0.002	-0.030	-0.016	-0.012
	T1	0.001	0.004	-0.003	0.009	-0.003	-0.004
	E1	0.014	0.004	0.001	0.003	0.010	-0.007
	E2	-0.001	0.002	0.000	0.008	0.004	0.003
	E3	-0.008	0.002	0.002	0.003	0.046	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.016	0.005	0.002	0.009	0.048	0.007
	SUST	0.003	-0.010	-0.002	-0.030	-0.016	-0.012
	OCC	0.020	0.015	0.004	0.039	0.063	0.019
	TOTAL	0.021	0.019	0.006	0.048	0.066	0.023

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
D03	GR	0.003	-0.007	-0.005	-0.025	-0.020	-0.020
	T1	-0.001	0.005	-0.003	0.007	-0.002	-0.003
	E1	0.014	0.005	0.008	-0.011	0.057	0.002
	E2	-0.001	0.002	0.001	0.006	0.005	0.005
	E3	-0.008	0.002	0.012	0.000	0.059	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.016	0.005	0.014	0.013	0.082	0.006
	SUST	0.003	-0.007	-0.005	-0.025	-0.020	-0.020
	OCC	0.020	0.012	0.019	0.038	0.102	0.025
	TOTAL	0.021	0.017	0.022	0.045	0.104	0.028
D04	GR	0.003	-0.006	-0.006	-0.025	-0.020	-0.020
	T1	-0.001	0.005	-0.003	0.007	-0.002	-0.003
	E1	0.014	0.004	0.011	-0.011	0.057	0.002
	E2	-0.001	0.001	0.002	0.006	0.005	0.005
	E3	-0.008	0.001	0.015	0.000	0.059	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.016	0.005	0.019	0.013	0.082	0.006
	SUST	0.003	-0.006	-0.006	-0.025	-0.020	-0.020
	OCC	0.020	0.011	0.025	0.038	0.102	0.025
	TOTAL	0.021	0.016	0.028	0.045	0.104	0.028
D05 N	GR	0.003	-0.001	-0.011	-0.019	-0.021	-0.022
	T1	-0.003	0.005	-0.004	0.004	-0.001	0.006
	E1	0.014	0.002	0.026	-0.029	0.067	0.026
	E2	-0.001	0.000	0.003	0.005	0.005	0.005
	E3	-0.008	0.000	0.028	-0.004	0.055	0.006
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.016	0.002	0.038	0.029	0.087	0.027
	SUST	0.003	-0.001	-0.011	-0.019	-0.021	-0.022
	OCC	0.020	0.002	0.049	0.048	0.108	0.049
	TOTAL	0.023	0.007	0.053	0.052	0.109	0.055
D05 F	GR	0.003	0.000	-0.011	-0.017	-0.021	-0.018
	T1	-0.003	0.004	-0.004	0.004	-0.001	0.010
	E1	0.015	0.001	0.028	-0.032	0.064	0.036
	E2	-0.001	0.000	0.003	0.004	0.005	0.004
	E3	-0.008	0.000	0.030	-0.004	0.052	0.008
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.017	0.001	0.041	0.032	0.083	0.037
	SUST	0.003	0.000	-0.011	-0.017	-0.021	-0.018
	OCC	0.020	0.001	0.052	0.049	0.103	0.055
	TOTAL	0.023	0.005	0.056	0.053	0.104	0.065

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
A16	GR	0.000	0.000	-0.006	-0.014	-0.018	-0.002
	T1	0.001	0.002	-0.005	0.001	0.000	0.023
	E1	0.025	0.001	0.036	-0.010	0.040	0.017
	E2	0.000	0.000	0.002	0.004	0.005	0.000
	E3	-0.005	0.000	0.031	0.000	0.035	0.005
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.026	0.001	0.047	0.011	0.053	0.018
	SUST	0.000	0.000	-0.006	-0.014	-0.018	-0.002
	OCC	0.026	0.001	0.054	0.025	0.072	0.019
	TOTAL	0.027	0.003	0.058	0.026	0.072	0.042
C07	GR	0.002	0.000	0.000	-0.016	-0.012	-0.001
	T1	0.001	-0.002	-0.005	-0.001	0.000	-0.023
	E1	0.027	0.001	0.031	0.029	0.024	-0.002
	E2	0.000	0.000	0.000	0.004	0.003	0.000
	E3	-0.004	0.000	0.031	0.001	0.022	0.005
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.028	0.001	0.043	0.029	0.033	0.005
	SUST	0.002	0.000	0.000	-0.016	-0.012	-0.001
	OCC	0.029	0.001	0.044	0.045	0.045	0.007
	TOTAL	0.031	0.003	0.049	0.046	0.045	0.030
D08 N	GR	-0.001	0.000	0.005	-0.020	0.001	-0.021
	T1	-0.003	-0.004	-0.004	-0.002	-0.001	-0.009
	E1	0.024	0.001	0.021	0.035	0.028	-0.012
	E2	0.000	0.000	-0.001	0.005	0.000	0.005
	E3	-0.001	0.000	0.031	-0.001	0.026	0.010
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.025	0.001	0.038	0.035	0.038	0.016
	SUST	-0.001	0.000	0.005	-0.020	0.001	-0.021
	OCC	0.026	0.001	0.042	0.056	0.039	0.037
	TOTAL	0.029	0.005	0.047	0.058	0.039	0.046
D08 F	GR	-0.002	-0.001	0.005	-0.021	0.003	-0.028
	T1	-0.003	-0.005	-0.004	-0.003	-0.001	-0.005
	E1	0.024	0.001	0.019	0.033	0.028	-0.008
	E2	0.000	0.000	-0.001	0.005	-0.001	0.007
	E3	-0.001	0.001	0.030	-0.001	0.027	0.010
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.024	0.001	0.036	0.034	0.039	0.014
	SUST	-0.002	-0.001	0.005	-0.021	0.003	-0.028
	OCC	0.026	0.002	0.041	0.055	0.041	0.042
	TOTAL	0.030	0.006	0.046	0.058	0.042	0.047

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
D09	GR	-0.002	-0.007	0.004	-0.026	0.008	-0.033
	T1	-0.002	-0.005	-0.004	-0.004	-0.001	0.003
	E1	0.024	0.000	0.014	0.027	0.024	-0.002
	E2	0.000	0.002	-0.001	0.006	-0.002	0.008
	E3	-0.001	0.002	0.025	0.001	0.030	0.008
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.024	0.003	0.029	0.028	0.038	0.011
	SUST	-0.002	-0.007	0.004	-0.026	0.008	-0.033
	OCC	0.026	0.009	0.033	0.054	0.046	0.045
	TOTAL	0.028	0.014	0.037	0.058	0.048	0.047
D10	GR	-0.002	-0.015	0.001	-0.033	0.015	-0.028
	T1	0.001	-0.003	-0.004	-0.006	-0.002	0.009
	E1	0.024	0.000	0.011	0.018	-0.001	0.000
	E2	0.000	0.004	0.000	0.008	-0.004	0.007
	E3	-0.001	0.004	0.017	0.006	0.031	0.006
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.024	0.005	0.020	0.021	0.031	0.009
	SUST	-0.002	-0.015	0.001	-0.033	0.015	-0.028
	OCC	0.026	0.021	0.021	0.054	0.046	0.037
	TOTAL	0.027	0.024	0.024	0.060	0.049	0.045
D11	GR	-0.002	-0.017	0.000	-0.033	0.015	-0.028
	T1	0.001	-0.002	-0.003	-0.006	-0.002	0.009
	E1	0.024	0.000	0.011	0.018	-0.001	0.000
	E2	0.000	0.004	0.000	0.008	-0.004	0.007
	E3	-0.001	0.004	0.014	0.006	0.031	0.006
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.024	0.006	0.018	0.021	0.031	0.009
	SUST	-0.002	-0.017	0.000	-0.033	0.015	-0.028
	OCC	0.026	0.023	0.018	0.054	0.046	0.037
	TOTAL	0.028	0.026	0.022	0.060	0.049	0.045
D12 N	GR	-0.002	-0.022	-0.003	-0.038	0.018	-0.030
	T1	0.003	-0.001	-0.003	-0.007	-0.003	0.008
	E1	0.024	-0.001	0.014	0.012	-0.031	-0.003
	E2	0.000	0.005	0.001	0.009	-0.004	0.007
	E3	-0.001	0.005	0.009	0.009	0.022	0.006
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.024	0.008	0.017	0.018	0.039	0.010
	SUST	-0.002	-0.022	-0.003	-0.038	0.018	-0.030
	OCC	0.026	0.030	0.020	0.056	0.056	0.040
	TOTAL	0.029	0.031	0.023	0.063	0.059	0.047

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (X	Y	Z
D12 F	GR	-0.002	-0.022	-0.004	-0.039	0.019	-0.033
	T1	0.003	-0.001	-0.003	-0.007	-0.003	0.007
	E1	0.023	-0.001	0.015	0.011	-0.047	-0.005
	E2	0.000	0.005	0.001	0.009	-0.004	0.008
	E3	0.000	0.005	0.009	0.010	0.016	0.006
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.023	0.008	0.017	0.018	0.050	0.011
	SUST	-0.002	-0.022	-0.004	-0.039	0.019	-0.033
	OCC	0.025	0.030	0.021	0.056	0.068	0.044
	TOTAL	0.028	0.030	0.023	0.064	0.072	0.051
D13	GR	0.004	-0.011	-0.004	-0.019	0.015	-0.054
	T1	0.002	0.002	0.000	-0.004	-0.003	-0.001
	E1	0.003	-0.004	0.015	0.008	-0.061	-0.017
	E2	-0.001	0.003	0.001	0.004	-0.003	0.014
	E3	-0.001	0.001	0.009	0.013	-0.021	0.007
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.003	0.005	0.017	0.016	0.065	0.022
	SUST	0.004	-0.011	-0.004	-0.019	0.015	-0.054
	OCC	0.008	0.016	0.021	0.035	0.079	0.077
	TOTAL	0.010	0.018	0.021	0.038	0.082	0.077
S3A	GR	0.015	0.000	-0.004	-0.005	0.001	-0.029
	T1	-0.002	0.000	0.011	0.000	-0.003	0.004
	E1	0.016	0.000	0.015	-0.004	0.094	-0.005
	E2	-0.005	0.000	0.001	0.002	-0.003	0.007
	E3	-0.014	0.000	0.009	-0.002	0.007	0.003
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.022	0.000	0.017	0.005	0.095	0.009
	SUST	0.015	0.000	-0.004	-0.005	0.001	-0.029
	OCC	0.037	0.000	0.021	0.010	0.096	0.038
	TOTAL	0.039	0.000	0.032	0.010	0.099	0.042
D14 N	GR	0.013	-0.003	-0.004	0.004	-0.010	-0.016
	T1	-0.003	0.002	0.017	-0.003	-0.003	0.006
	E1	0.093	0.001	0.015	0.002	0.117	0.001
	E2	-0.007	0.001	0.001	-0.002	-0.003	0.003
	E3	0.000	0.000	0.009	0.001	0.040	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.094	0.001	0.017	0.003	0.124	0.004
	SUST	0.013	-0.003	-0.004	0.004	-0.010	-0.016
	OCC	0.106	0.004	0.021	0.007	0.133	0.020
	TOTAL	0.110	0.006	0.038	0.010	0.136	0.026

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS X	Y	Z
D14 F	GR	0.012	-0.003	-0.004	0.004	-0.011	-0.015
	T1	-0.004	0.002	0.017	-0.003	-0.003	0.006
	E1	0.096	0.001	0.018	0.002	0.108	0.001
	E2	-0.007	0.001	0.001	-0.002	-0.003	0.003
	E3	0.001	0.000	0.010	0.001	0.045	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.097	0.001	0.020	0.003	0.117	0.004
	SUST	0.012	-0.003	-0.004	0.004	-0.011	-0.015
	OCC	0.109	0.004	0.024	0.007	0.128	0.019
	TOTAL	0.113	0.005	0.041	0.010	0.131	0.025
S4A	GR	0.012	0.000	-0.007	0.001	-0.013	-0.007
	T1	-0.006	0.000	0.017	-0.003	-0.003	0.007
	E1	0.096	0.000	0.038	0.004	0.058	0.003
	E2	-0.007	0.000	0.000	-0.003	-0.003	0.001
	E3	0.001	0.000	0.022	0.001	0.051	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.097	0.000	0.044	0.005	0.077	0.003
	SUST	0.012	0.000	-0.007	0.001	-0.013	-0.007
	OCC	0.109	0.000	0.050	0.006	0.090	0.010
	TOTAL	0.115	0.000	0.067	0.009	0.093	0.017
S5A	GR	0.012	0.000	-0.012	-0.003	-0.005	0.000
	T1	-0.010	-0.004	0.015	-0.001	-0.003	0.013
	E1	0.096	-0.001	0.043	0.007	-0.017	0.001
	E2	-0.007	0.000	-0.002	-0.004	-0.003	-0.001
	E3	0.001	0.000	0.043	0.003	0.035	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.097	0.001	0.060	0.009	0.039	0.002
	SUST	0.012	0.000	-0.011	-0.004	-0.005	0.000
	OCC	0.109	0.002	0.072	0.012	0.044	0.002
	TOTAL	0.119	0.006	0.087	0.014	0.047	0.015
D15 N	GR	0.012	0.000	-0.012	-0.004	-0.003	0.000
	T1	-0.010	-0.005	0.015	-0.001	-0.003	0.013
	E1	0.096	-0.001	0.042	0.008	-0.019	0.000
	E2	-0.007	0.000	-0.002	-0.004	-0.003	-0.001
	E3	0.001	0.000	0.044	0.003	0.033	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.097	0.001	0.061	0.009	0.038	0.002
	SUST	0.012	0.000	-0.012	-0.004	-0.003	0.000
	OCC	0.109	0.002	0.072	0.013	0.041	0.002
	TOTAL	0.119	0.007	0.087	0.014	0.044	0.016

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (X	Y	Z
D15 F	GR	0.013	0.000	-0.012	-0.004	0.000	0.000
	T1	-0.010	-0.005	0.015	-0.001	-0.003	0.015
	E1	0.097	-0.001	0.041	0.008	-0.022	-0.001
	E2	-0.007	0.000	-0.002	-0.004	-0.003	-0.001
	E3	0.000	0.000	0.045	0.003	0.027	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.097	0.001	0.061	0.010	0.035	0.002
	SUST	0.012	0.000	-0.012	-0.005	0.000	0.000
	OCC	0.110	0.001	0.073	0.014	0.035	0.002
	TOTAL	0.120	0.007	0.087	0.016	0.038	0.017
D16 N	GR	0.012	0.000	-0.012	-0.005	0.002	0.000
	T1	-0.010	-0.005	0.014	-0.001	-0.003	0.016
	E1	0.098	0.000	0.041	0.009	-0.023	-0.002
	E2	-0.007	0.000	-0.002	-0.005	-0.003	-0.001
	E3	-0.001	0.000	0.045	0.003	0.024	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.098	0.001	0.061	0.010	0.034	0.003
	SUST	0.012	0.000	-0.012	-0.005	0.002	0.000
	OCC	0.111	0.001	0.073	0.015	0.036	0.003
	TOTAL	0.121	0.006	0.087	0.016	0.039	0.019
D16 F	GR	0.012	0.000	-0.012	-0.006	0.005	0.001
	T1	-0.011	-0.005	0.014	-0.001	-0.003	0.017
	E1	0.099	0.000	0.041	0.009	-0.025	-0.003
	E2	-0.007	0.000	-0.002	-0.005	-0.003	-0.001
	E3	-0.001	0.000	0.045	0.003	0.019	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.099	0.000	0.061	0.011	0.032	0.003
	SUST	0.012	0.000	-0.012	-0.006	0.005	0.001
	OCC	0.111	0.000	0.073	0.017	0.037	0.004
	TOTAL	0.122	0.006	0.087	0.018	0.039	0.021
D17	GR	0.012	0.000	-0.015	-0.006	0.026	0.001
	T1	-0.019	-0.002	0.014	-0.001	-0.003	0.023
	E1	0.099	0.000	0.045	0.007	-0.036	0.003
	E2	-0.007	0.000	-0.004	-0.005	-0.003	0.000
	E3	-0.002	0.000	0.046	0.006	-0.016	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.100	0.000	0.065	0.010	0.039	0.004
	SUST	0.012	0.000	-0.015	-0.006	0.026	0.001
	OCC	0.112	0.000	0.079	0.017	0.065	0.005
	TOTAL	0.130	0.002	0.093	0.018	0.068	0.028

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (d X	Y	Z
D18 N	GR	0.011	0.000	-0.017	-0.004	0.027	0.002
	T1	-0.019	0.002	0.013	-0.001	-0.003	-0.021
	E1	0.098	0.000	0.047	0.004	-0.035	0.000
	E2	-0.006	0.000	-0.006	-0.005	-0.003	-0.001
	E3	-0.004	0.000	0.048	0.001	-0.021	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.098	0.000	0.067	0.006	0.041	0.002
	SUST	0.011	0.000	-0.017	-0.004	0.027	0.002
	OCC	0.109	0.000	0.084	0.010	0.068	0.005
	TOTAL	0.128	0.002	0.097	0.011	0.071	0.026
D18 F	GR	0.011	0.000	-0.017	-0.003	0.027	0.000
	T1	-0.018	0.001	0.013	-0.001	-0.003	-0.027
	E1	0.098	0.000	0.048	0.003	-0.035	-0.002
	E2	-0.006	0.000	-0.006	-0.005	-0.003	0.000
	E3	-0.004	0.000	0.049	-0.001	-0.022	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.098	0.000	0.069	0.006	0.041	0.002
	SUST	0.011	0.000	-0.017	-0.003	0.027	0.000
	OCC	0.109	0.000	0.086	0.010	0.068	0.003
	TOTAL	0.127	0.002	0.099	0.010	0.071	0.030
S5C	GR	0.011	0.000	-0.019	-0.003	0.027	-0.001
	T1	-0.018	0.000	0.014	-0.001	-0.003	-0.024
	E1	0.098	0.000	0.050	0.003	-0.035	-0.002
	E2	-0.006	0.000	-0.006	-0.005	-0.003	0.000
	E3	-0.004	0.000	0.050	-0.002	-0.022	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.098	0.000	0.070	0.006	0.041	0.002
	SUST	0.011	0.000	-0.019	-0.003	0.027	-0.001
	OCC	0.109	0.000	0.089	0.009	0.068	0.003
	TOTAL	0.127	0.000	0.102	0.010	0.071	0.027
D19	GR	0.011	0.000	-0.021	-0.002	0.027	-0.003
	T1	-0.017	-0.001	0.014	-0.001	-0.003	-0.011
	E1	0.098	0.000	0.052	0.002	-0.033	0.000
	E2	-0.006	0.000	-0.005	-0.005	-0.003	0.001
	E3	-0.004	0.000	0.051	-0.005	-0.023	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.098	0.000	0.074	0.007	0.041	0.001
	SUST	0.011	0.000	-0.021	-0.003	0.027	-0.003
	OCC	0.109	0.001	0.094	0.010	0.068	0.004
	TOTAL	0.126	0.002	0.108	0.011	0.071	0.015

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (d X	Y	Z
D20	GR	0.011	0.000	-0.023	-0.002	0.027	-0.003
	T1	-0.016	-0.002	0.014	-0.001	-0.003	-0.011
	E1	0.098	0.000	0.055	0.002	-0.033	0.000
	E2	-0.006	0.000	-0.005	-0.005	-0.003	0.001
	E3	-0.004	0.000	0.053	-0.005	-0.023	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.098	0.000	0.076	0.007	0.041	0.001
	SUST	0.011	0.000	-0.023	-0.003	0.027	-0.003
	OCC	0.109	0.001	0.099	0.010	0.068	0.004
	TOTAL	0.125	0.003	0.113	0.011	0.071	0.015
D21	GR	0.011	-0.001	-0.025	-0.002	0.027	0.000
	T1	-0.016	-0.003	0.014	-0.001	-0.003	0.000
	E1	0.098	0.000	0.057	0.001	-0.029	0.001
	E2	-0.006	0.000	-0.005	-0.005	-0.003	0.000
	E3	-0.004	0.000	0.055	-0.007	-0.026	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.098	0.000	0.079	0.009	0.039	0.001
	SUST	0.011	-0.001	-0.025	-0.002	0.027	0.000
	OCC	0.109	0.001	0.104	0.011	0.067	0.002
	TOTAL	0.125	0.004	0.118	0.012	0.069	0.002
D22	GR	0.011	-0.001	-0.027	-0.001	0.028	0.003
	T1	-0.015	-0.002	0.014	-0.001	-0.003	0.011
	E1	0.098	0.000	0.059	0.000	-0.023	0.002
	E2	-0.006	0.000	-0.005	-0.005	-0.003	-0.001
	E3	-0.004	0.000	0.057	-0.010	-0.031	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.098	0.000	0.082	0.011	0.038	0.002
	SUST	0.011	0.000	-0.027	-0.002	0.028	0.003
	OCC	0.109	0.001	0.109	0.012	0.066	0.005
	TOTAL	0.124	0.003	0.123	0.013	0.069	0.016
D23	GR	0.011	0.000	-0.029	-0.001	0.028	0.003
	T1	-0.015	-0.001	0.015	-0.001	-0.003	0.011
	E1	0.098	0.000	0.061	0.000	-0.023	0.002
	E2	-0.006	0.000	-0.005	-0.005	-0.003	-0.001
	E3	-0.004	0.000	0.059	-0.010	-0.031	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.098	0.000	0.085	0.011	0.038	0.002
	SUST	0.011	0.000	-0.029	-0.002	0.028	0.003
	OCC	0.109	0.000	0.113	0.012	0.066	0.005
	TOTAL	0.124	0.002	0.128	0.013	0.069	0.016

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (d) X	Y	Z
S4C	GR	0.011	0.000	-0.031	-0.001	0.028	0.004
	T1	-0.014	0.000	0.015	-0.001	-0.003	0.024
	E1	0.098	0.000	0.062	-0.001	-0.012	0.001
	E2	-0.006	0.000	-0.004	-0.005	-0.003	-0.001
	E3	-0.004	0.000	0.062	-0.012	-0.041	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.098	0.000	0.088	0.013	0.043	0.002
	SUST	0.011	0.000	-0.031	-0.001	0.028	0.004
	OCC	0.109	0.000	0.119	0.014	0.071	0.006
	TOTAL	0.123	0.000	0.134	0.015	0.074	0.029
D24 N	GR	0.011	0.000	-0.032	0.000	0.028	0.003
	T1	-0.013	0.001	0.015	-0.001	-0.003	0.027
	E1	0.098	0.000	0.062	-0.001	-0.006	0.001
	E2	-0.006	0.000	-0.004	-0.005	-0.003	-0.001
	E3	-0.004	0.000	0.064	-0.014	-0.046	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.098	0.000	0.089	0.015	0.047	0.002
	SUST	0.011	0.000	-0.032	-0.001	0.028	0.003
	OCC	0.109	0.000	0.122	0.015	0.075	0.005
	TOTAL	0.122	0.001	0.137	0.016	0.078	0.032
D24 F	GR	0.011	0.000	-0.033	0.000	0.029	0.003
	T1	-0.013	0.002	0.015	-0.001	-0.003	0.020
	E1	0.098	0.000	0.062	0.000	0.004	-0.001
	E2	-0.006	0.000	-0.004	-0.005	-0.003	-0.001
	E3	-0.004	0.000	0.066	-0.015	-0.052	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.098	0.000	0.091	0.016	0.053	0.002
	SUST	0.011	0.000	-0.033	0.000	0.029	0.003
	OCC	0.109	0.000	0.124	0.016	0.081	0.005
	TOTAL	0.122	0.002	0.139	0.017	0.084	0.026
D25	GR	0.011	0.000	-0.033	0.003	0.031	0.004
	T1	-0.011	0.000	0.015	-0.001	-0.003	0.000
	E1	0.098	0.000	0.063	-0.001	0.037	0.006
	E2	-0.006	0.000	-0.003	-0.005	-0.003	-0.001
	E3	-0.003	0.000	0.067	0.000	-0.071	0.004
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.099	0.000	0.092	0.006	0.080	0.007
	SUST	0.011	0.000	-0.033	0.003	0.031	0.004
	OCC	0.110	0.000	0.125	0.008	0.111	0.011
	TOTAL	0.121	0.000	0.140	0.009	0.114	0.012

*** Segment D end ***

*** Segment E begin ***

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
D17	GR	0.012	0.000	-0.015	-0.006	0.026	0.001
	T1	-0.019	-0.002	0.014	-0.001	-0.003	0.023
	E1	0.099	0.000	0.045	0.007	-0.036	0.003
	E2	-0.007	0.000	-0.004	-0.005	-0.003	0.000
	E3	-0.002	0.000	0.046	0.006	-0.016	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.100	0.000	0.065	0.010	0.039	0.004
	SUST	0.012	0.000	-0.015	-0.006	0.026	0.001
	OCC	0.112	0.000	0.079	0.017	0.065	0.005
	TOTAL	0.130	0.002	0.093	0.018	0.068	0.028
S5B	GR	0.012	0.000	-0.017	-0.005	0.028	-0.001
	T1	-0.018	0.000	0.014	-0.001	-0.003	0.023
	E1	0.099	0.000	0.048	0.006	-0.037	0.003
	E2	-0.007	0.000	-0.004	-0.005	-0.003	0.000
	E3	-0.002	0.000	0.048	0.007	-0.020	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.100	0.000	0.067	0.011	0.043	0.003
	SUST	0.012	0.000	-0.017	-0.005	0.028	-0.001
	OCC	0.112	0.000	0.084	0.016	0.071	0.004
	TOTAL	0.129	0.000	0.098	0.017	0.074	0.027
E01	GR	0.012	0.000	-0.019	-0.004	0.031	-0.003
	T1	-0.017	0.001	0.014	-0.001	-0.003	0.011
	E1	0.099	0.000	0.051	0.005	-0.038	0.000
	E2	-0.007	0.000	-0.003	-0.005	-0.003	0.001
	E3	-0.002	0.000	0.050	0.008	-0.026	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.100	0.000	0.071	0.011	0.046	0.001
	SUST	0.012	0.000	-0.019	-0.005	0.031	-0.003
	OCC	0.112	0.000	0.090	0.016	0.077	0.004
	TOTAL	0.129	0.002	0.104	0.016	0.080	0.015
E02	GR	0.012	0.000	-0.021	-0.004	0.031	-0.003
	T1	-0.017	0.002	0.014	-0.001	-0.003	0.011
	E1	0.099	0.000	0.053	0.005	-0.038	0.000
	E2	-0.007	0.000	-0.003	-0.005	-0.003	0.001
	E3	-0.002	0.000	0.051	0.008	-0.026	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.100	0.000	0.074	0.011	0.046	0.001
	SUST	0.012	0.000	-0.021	-0.005	0.031	-0.003
	OCC	0.112	0.001	0.095	0.016	0.077	0.004
	TOTAL	0.128	0.003	0.110	0.016	0.080	0.015

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS X	Y	Z
E03	GR	0.012	-0.001	-0.024	-0.003	0.032	0.000
	T1	-0.016	0.003	0.015	-0.001	-0.003	0.000
	E1	0.099	0.000	0.056	0.004	-0.034	0.000
	E2	-0.007	0.000	-0.003	-0.005	-0.003	0.000
	E3	-0.002	0.000	0.053	0.009	-0.031	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.100	0.000	0.077	0.012	0.046	0.001
	SUST	0.012	-0.001	-0.023	-0.004	0.032	0.000
	OCC	0.112	0.001	0.101	0.015	0.078	0.001
	TOTAL	0.127	0.003	0.115	0.016	0.081	0.001
E04	GR	0.012	-0.001	-0.026	-0.003	0.033	0.003
	T1	-0.015	0.002	0.015	-0.001	-0.003	-0.011
	E1	0.099	0.000	0.058	0.004	-0.028	-0.001
	E2	-0.007	0.000	-0.003	-0.005	-0.003	-0.001
	E3	-0.002	0.000	0.056	0.011	-0.037	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.100	0.000	0.081	0.012	0.046	0.001
	SUST	0.012	-0.001	-0.026	-0.003	0.033	0.003
	OCC	0.112	0.001	0.107	0.015	0.079	0.004
	TOTAL	0.127	0.003	0.121	0.016	0.082	0.015
E05	GR	0.012	0.000	-0.028	-0.003	0.033	0.003
	T1	-0.015	0.001	0.015	-0.001	-0.003	-0.011
	E1	0.099	0.000	0.060	0.004	-0.027	-0.001
	E2	-0.007	0.000	-0.002	-0.005	-0.003	-0.001
	E3	-0.002	0.000	0.059	0.011	-0.037	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.100	0.000	0.084	0.012	0.046	0.001
	SUST	0.012	0.000	-0.028	-0.003	0.033	0.003
	OCC	0.112	0.000	0.112	0.015	0.079	0.004
	TOTAL	0.126	0.002	0.127	0.016	0.082	0.015
S4B	GR	0.012	0.000	-0.031	-0.002	0.033	0.004
	T1	-0.014	0.000	0.015	-0.001	-0.003	-0.024
	E1	0.099	0.000	0.062	0.003	-0.016	0.000
	E2	-0.007	0.000	-0.002	-0.005	-0.003	-0.001
	E3	-0.002	0.000	0.062	0.012	-0.046	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.100	0.000	0.088	0.013	0.049	0.001
	SUST	0.012	0.000	-0.031	-0.002	0.033	0.004
	OCC	0.112	0.000	0.119	0.015	0.082	0.005
	TOTAL	0.125	0.000	0.134	0.016	0.085	0.029

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
E06 N	GR	0.012	0.000	-0.032	-0.001	0.033	0.003
	T1	-0.014	-0.001	0.015	-0.001	-0.003	-0.027
	E1	0.099	0.000	0.063	0.002	-0.009	0.001
	E2	-0.007	0.000	-0.002	-0.005	-0.003	-0.001
	E3	-0.002	0.000	0.064	0.013	-0.050	0.001
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.100	0.000	0.090	0.014	0.051	0.002
	SUST	0.012	0.000	-0.032	-0.001	0.033	0.003
	OCC	0.112	0.000	0.122	0.015	0.084	0.005
	TOTAL	0.125	0.001	0.137	0.016	0.087	0.032
E06 F	GR	0.012	0.000	-0.033	-0.001	0.033	0.003
	T1	-0.013	-0.002	0.015	-0.001	-0.003	-0.021
	E1	0.099	0.000	0.063	0.000	0.001	0.004
	E2	-0.007	0.000	-0.002	-0.005	-0.003	-0.001
	E3	-0.002	0.000	0.066	0.014	-0.055	0.002
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.100	0.000	0.091	0.015	0.055	0.005
	SUST	0.012	0.000	-0.033	-0.001	0.033	0.003
	OCC	0.111	0.000	0.124	0.016	0.088	0.008
	TOTAL	0.124	0.002	0.139	0.016	0.091	0.028
D25	GR	0.011	0.000	-0.033	0.003	0.031	0.004
	T1	-0.011	0.000	0.015	-0.001	-0.003	0.000
	E1	0.098	0.000	0.063	-0.001	0.037	0.006
	E2	-0.006	0.000	-0.003	-0.005	-0.003	-0.001
	E3	-0.003	0.000	0.067	0.000	-0.071	0.004
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.099	0.000	0.092	0.006	0.080	0.007
	SUST	0.011	0.000	-0.033	0.003	0.031	0.004
	OCC	0.110	0.000	0.125	0.008	0.111	0.011
	TOTAL	0.121	0.000	0.140	0.009	0.114	0.012

*** Segment E end ***

*** Segment F begin ***

D25	GR	0.011	0.000	-0.033	0.003	0.031	0.004
	T1	-0.011	0.000	0.015	-0.001	-0.003	0.000
	E1	0.098	0.000	0.063	-0.001	0.037	0.006
	E2	-0.006	0.000	-0.003	-0.005	-0.003	-0.001
	E3	-0.003	0.000	0.067	0.000	-0.071	0.004
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.099	0.000	0.092	0.006	0.080	0.007
	SUST	0.011	0.000	-0.033	0.003	0.031	0.004
	OCC	0.110	0.000	0.125	0.008	0.111	0.011
	TOTAL	0.121	0.000	0.140	0.009	0.114	0.012

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
F01 N	GR	0.011	0.001	-0.036	0.007	0.031	0.006
	T1	-0.010	0.000	0.015	-0.001	-0.003	0.000
	E1	0.098	0.001	0.059	-0.002	0.061	0.011
	E2	-0.006	0.000	-0.003	-0.006	-0.003	-0.002
	E3	-0.003	0.000	0.073	0.003	-0.077	0.006
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.099	0.001	0.094	0.007	0.098	0.012
	SUST	0.011	0.001	-0.036	0.007	0.031	0.006
	OCC	0.110	0.002	0.130	0.014	0.129	0.019
	TOTAL	0.120	0.002	0.145	0.015	0.132	0.019
F01 F	GR	0.011	0.001	-0.036	0.010	0.031	0.007
	T1	-0.010	0.000	0.015	-0.001	-0.003	0.000
	E1	0.096	0.001	0.057	-0.001	0.084	0.016
	E2	-0.006	0.000	-0.003	-0.006	-0.003	-0.002
	E3	-0.001	0.001	0.075	0.005	-0.077	0.006
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.096	0.001	0.095	0.008	0.114	0.017
	SUST	0.010	0.001	-0.036	0.010	0.031	0.007
	OCC	0.107	0.002	0.131	0.018	0.145	0.024
	TOTAL	0.117	0.002	0.146	0.019	0.148	0.024
F02	GR	-0.001	0.004	-0.036	-0.008	0.032	0.008
	T1	-0.009	0.000	0.012	0.001	-0.003	0.000
	E1	0.054	0.000	0.057	-0.002	0.116	0.050
	E2	-0.005	-0.001	-0.003	0.003	-0.003	-0.002
	E3	0.026	0.002	0.075	-0.005	-0.070	0.007
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.061	0.002	0.095	0.006	0.136	0.051
	SUST	-0.001	0.004	-0.036	-0.008	0.032	0.008
	OCC	0.062	0.006	0.131	0.014	0.168	0.058
	TOTAL	0.071	0.006	0.143	0.015	0.171	0.059
S3C	GR	-0.007	0.000	-0.036	-0.043	0.033	0.008
	T1	-0.008	0.000	0.010	0.002	-0.003	0.000
	E1	0.038	0.000	0.057	-0.002	0.085	0.065
	E2	-0.005	0.000	-0.003	0.014	-0.003	-0.002
	E3	0.038	0.000	0.076	-0.020	-0.068	0.008
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.053	0.000	0.095	0.025	0.109	0.065
	SUST	-0.007	0.000	-0.036	-0.043	0.033	0.008
	OCC	0.060	0.000	0.131	0.068	0.142	0.073
	TOTAL	0.068	0.000	0.141	0.070	0.145	0.074

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
F03	GR	-0.023	-0.041	-0.036	-0.112	0.036	0.009
	T1	-0.007	0.001	0.006	0.001	-0.003	0.000
	E1	0.021	-0.001	0.057	-0.001	0.005	0.108
	E2	-0.003	0.013	-0.003	0.034	-0.003	-0.002
	E3	0.069	-0.022	0.076	-0.074	-0.064	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.072	0.026	0.095	0.082	0.064	0.108
	SUST	-0.023	-0.041	-0.036	-0.112	0.036	0.009
	OCC	0.094	0.067	0.131	0.194	0.100	0.117
	TOTAL	0.101	0.068	0.137	0.195	0.103	0.117
F04	GR	-0.021	-0.041	-0.012	-0.117	0.038	0.009
	T1	-0.007	-0.001	0.006	-0.001	-0.003	0.000
	E1	0.045	-0.001	0.057	-0.001	-0.013	0.117
	E2	-0.004	0.013	-0.010	0.034	-0.003	-0.002
	E3	0.070	-0.022	0.092	-0.075	-0.061	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.083	0.026	0.109	0.082	0.062	0.117
	SUST	-0.021	-0.041	-0.012	-0.117	0.038	0.009
	OCC	0.104	0.067	0.121	0.199	0.100	0.126
	TOTAL	0.111	0.068	0.128	0.200	0.103	0.127

*** Segment F end ***

*** Segment G begin ***

F04	GR	-0.021	-0.041	-0.012	-0.117	0.038	0.009
	T1	-0.007	-0.001	0.006	-0.001	-0.003	0.000
	E1	0.045	-0.001	0.057	-0.001	-0.013	0.117
	E2	-0.004	0.013	-0.010	0.034	-0.003	-0.002
	E3	0.070	-0.022	0.092	-0.075	-0.061	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.083	0.026	0.109	0.082	0.062	0.117
	SUST	-0.021	-0.041	-0.012	-0.117	0.038	0.009
	OCC	0.104	0.067	0.121	0.199	0.100	0.126
	TOTAL	0.111	0.068	0.128	0.200	0.103	0.127
S3B	GR	-0.002	0.000	-0.012	-0.024	0.041	0.009
	T1	-0.008	0.000	0.010	-0.001	-0.003	0.000
	E1	0.033	0.000	0.057	-0.001	-0.032	0.125
	E2	-0.005	0.000	-0.010	0.013	-0.003	-0.002
	E3	0.043	0.000	0.092	-0.020	-0.056	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.055	0.000	0.109	0.024	0.065	0.125
	SUST	-0.002	0.000	-0.012	-0.024	0.041	0.009
	OCC	0.057	0.000	0.121	0.048	0.106	0.134
	TOTAL	0.065	0.000	0.132	0.049	0.109	0.135

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
G01	GR	0.001	0.001	-0.012	0.004	0.042	0.009
	T1	-0.009	0.000	0.011	-0.001	-0.003	0.000
	E1	0.031	0.000	0.057	0.000	-0.034	0.126
	E2	-0.005	-0.001	-0.010	0.007	-0.003	-0.002
	E3	0.039	0.001	0.092	-0.013	-0.056	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.050	0.001	0.109	0.014	0.065	0.127
	SUST	0.001	0.001	-0.012	0.004	0.042	0.009
	OCC	0.051	0.002	0.121	0.019	0.107	0.135
	TOTAL	0.059	0.002	0.132	0.020	0.110	0.136
G02	GR	0.004	0.000	-0.012	0.005	0.042	0.009
	T1	-0.009	0.000	0.012	-0.001	-0.003	0.000
	E1	0.028	0.000	0.057	0.000	-0.034	0.126
	E2	-0.005	-0.001	-0.010	0.007	-0.003	-0.002
	E3	0.035	0.002	0.092	-0.013	-0.056	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.046	0.002	0.109	0.014	0.065	0.127
	SUST	0.004	0.000	-0.012	0.005	0.042	0.009
	OCC	0.049	0.003	0.121	0.019	0.107	0.135
	TOTAL	0.058	0.003	0.133	0.020	0.110	0.136
G03	GR	0.007	-0.001	-0.012	0.023	0.042	0.009
	T1	-0.009	0.000	0.012	0.000	-0.003	0.000
	E1	0.026	0.000	0.057	0.000	-0.037	0.128
	E2	-0.006	-0.002	-0.010	0.003	-0.003	-0.002
	E3	0.031	0.003	0.092	-0.006	-0.055	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.041	0.003	0.109	0.007	0.067	0.128
	SUST	0.007	-0.001	-0.012	0.023	0.042	0.009
	OCC	0.048	0.004	0.121	0.030	0.109	0.137
	TOTAL	0.057	0.004	0.134	0.030	0.112	0.137
G04	GR	0.010	-0.003	-0.012	0.037	0.042	0.009
	T1	-0.009	0.000	0.013	0.000	-0.003	0.000
	E1	0.023	0.000	0.057	0.000	-0.041	0.129
	E2	-0.006	-0.002	-0.010	0.001	-0.003	-0.002
	E3	0.027	0.003	0.092	-0.001	-0.055	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.036	0.003	0.109	0.001	0.069	0.129
	SUST	0.010	-0.003	-0.012	0.037	0.042	0.009
	OCC	0.046	0.006	0.121	0.038	0.111	0.138
	TOTAL	0.055	0.007	0.134	0.038	0.114	0.138

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
G05	GR	0.013	-0.006	-0.012	0.037	0.042	0.009
	T1	-0.009	0.000	0.014	0.000	-0.003	0.000
	E1	0.020	0.000	0.057	0.000	-0.041	0.129
	E2	-0.006	-0.002	-0.010	0.000	-0.003	-0.002
	E3	0.023	0.003	0.092	-0.001	-0.055	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.032	0.003	0.109	0.001	0.069	0.129
	SUST	0.013	-0.006	-0.012	0.037	0.042	0.009
	OCC	0.044	0.009	0.121	0.038	0.111	0.138
	TOTAL	0.054	0.009	0.135	0.038	0.114	0.138
WALL	GR	0.031	-0.031	-0.012	0.076	0.043	0.009
	T1	-0.011	0.000	0.017	0.001	-0.003	0.000
	E1	0.000	0.000	0.057	0.000	-0.047	0.136
	E2	-0.008	0.000	-0.010	-0.008	-0.003	-0.002
	E3	0.000	0.000	0.092	0.009	-0.054	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.008	0.000	0.109	0.012	0.072	0.137
	SUST	0.031	-0.031	-0.012	0.076	0.043	0.009
	OCC	0.039	0.031	0.121	0.088	0.115	0.145
	TOTAL	0.049	0.031	0.139	0.089	0.118	0.146
G06 N	GR	0.035	-0.037	-0.012	0.079	0.043	0.009
	T1	-0.011	0.000	0.018	0.001	-0.003	0.000
	E1	-0.004	0.000	0.057	0.000	-0.046	0.138
	E2	-0.008	0.001	-0.010	-0.008	-0.003	-0.002
	E3	-0.004	-0.001	0.092	0.008	-0.054	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.010	0.001	0.109	0.012	0.071	0.138
	SUST	0.035	-0.037	-0.012	0.079	0.043	0.009
	OCC	0.044	0.038	0.121	0.090	0.114	0.147
	TOTAL	0.055	0.038	0.139	0.091	0.117	0.147
G06 F	GR	0.036	-0.039	-0.014	0.079	0.043	0.009
	T1	-0.011	0.000	0.018	0.001	-0.003	0.000
	E1	-0.001	0.000	0.057	0.000	-0.046	0.138
	E2	-0.008	0.001	-0.010	-0.008	-0.003	-0.002
	E3	-0.005	-0.001	0.092	0.007	-0.054	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.010	0.001	0.109	0.011	0.071	0.139
	SUST	0.036	-0.039	-0.014	0.079	0.043	0.009
	OCC	0.046	0.041	0.123	0.090	0.114	0.147
	TOTAL	0.056	0.041	0.141	0.091	0.117	0.148

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
G07	GR	0.036	-0.039	-0.015	0.079	0.043	0.009
	T1	-0.011	0.000	0.018	0.001	-0.003	0.000
	E1	0.000	0.000	0.057	0.000	-0.046	0.138
	E2	-0.008	0.001	-0.010	-0.008	-0.003	-0.002
	E3	-0.005	-0.001	0.092	0.007	-0.054	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.010	0.001	0.109	0.011	0.071	0.139
	SUST	0.036	-0.039	-0.015	0.079	0.043	0.009
	OCC	0.046	0.041	0.124	0.090	0.114	0.148
	TOTAL	0.056	0.041	0.142	0.091	0.117	0.148
G10	GR	0.037	-0.039	-0.020	0.079	0.043	0.009
	T1	-0.011	-0.001	0.018	0.001	-0.003	0.000
	E1	0.008	0.000	0.057	0.000	-0.046	0.138
	E2	-0.008	0.001	-0.009	-0.008	-0.003	-0.002
	E3	-0.005	-0.001	0.091	0.007	-0.054	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.013	0.001	0.108	0.011	0.071	0.139
	SUST	0.037	-0.039	-0.020	0.079	0.043	0.009
	OCC	0.049	0.041	0.128	0.090	0.114	0.148
	TOTAL	0.060	0.042	0.146	0.091	0.117	0.148
G11	GR	0.037	-0.039	-0.023	0.079	0.043	0.009
	T1	-0.011	-0.001	0.018	0.001	-0.003	0.000
	E1	0.014	0.000	0.057	0.000	-0.046	0.138
	E2	-0.008	0.001	-0.009	-0.008	-0.003	-0.002
	E3	-0.004	-0.001	0.091	0.007	-0.054	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.017	0.001	0.108	0.011	0.071	0.139
	SUST	0.037	-0.039	-0.023	0.079	0.043	0.009
	OCC	0.054	0.041	0.131	0.090	0.114	0.148
	TOTAL	0.065	0.042	0.150	0.091	0.117	0.148
*** Segment G end ***							
*** Segment H begin ***							
F03	GR	-0.023	-0.041	-0.036	-0.112	0.036	0.009
	T1	-0.007	0.001	0.006	0.001	-0.003	0.000
	E1	0.021	-0.001	0.057	-0.001	0.005	0.108
	E2	-0.003	0.013	-0.003	0.034	-0.003	-0.002
	E3	0.069	-0.022	0.076	-0.074	-0.064	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.072	0.026	0.095	0.082	0.064	0.108
	SUST	-0.023	-0.041	-0.036	-0.112	0.036	0.009
	OCC	0.094	0.067	0.131	0.194	0.100	0.117
	TOTAL	0.101	0.068	0.137	0.195	0.103	0.117

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
H01	GR	-0.023	-0.041	-0.040	-0.112	0.036	0.009
	T1	-0.007	0.001	0.006	0.001	-0.003	0.000
	E1	0.017	-0.001	0.057	-0.001	0.005	0.108
	E2	-0.003	0.013	-0.001	0.034	-0.003	-0.002
	E3	0.068	-0.022	0.073	-0.074	-0.064	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.070	0.026	0.093	0.082	0.064	0.108
	SUST	-0.023	-0.041	-0.040	-0.112	0.036	0.009
	OCC	0.093	0.067	0.133	0.194	0.100	0.117
	TOTAL	0.100	0.068	0.139	0.195	0.103	0.117
H02	GR	-0.023	-0.041	-0.048	-0.112	0.036	0.009
	T1	-0.007	0.002	0.006	0.001	-0.003	0.000
	E1	0.010	-0.001	0.057	-0.001	0.005	0.108
	E2	-0.003	0.013	0.001	0.034	-0.003	-0.002
	E3	0.068	-0.022	0.068	-0.074	-0.064	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.068	0.026	0.088	0.082	0.064	0.108
	SUST	-0.024	-0.041	-0.048	-0.112	0.036	0.009
	OCC	0.092	0.067	0.137	0.194	0.100	0.117
	TOTAL	0.099	0.069	0.143	0.195	0.103	0.117
H03	GR	-0.024	-0.041	-0.052	-0.112	0.036	0.009
	T1	-0.007	0.002	0.006	0.001	-0.003	0.000
	E1	0.006	-0.001	0.057	-0.001	0.005	0.108
	E2	-0.003	0.013	0.002	0.034	-0.003	-0.002
	E3	0.067	-0.022	0.065	-0.074	-0.064	0.009
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.068	0.026	0.086	0.082	0.064	0.108
	SUST	-0.024	-0.041	-0.052	-0.112	0.036	0.009
	OCC	0.091	0.067	0.139	0.194	0.100	0.117
	TOTAL	0.098	0.069	0.145	0.195	0.103	0.117
*** Segment H end ***							
*** Segment I begin ***							
D13	GR	0.004	-0.011	-0.004	-0.019	0.015	-0.054
	T1	0.002	0.002	0.000	-0.004	-0.003	-0.001
	E1	0.003	-0.004	0.015	0.008	-0.061	-0.017
	E2	-0.001	0.003	0.001	0.004	-0.003	0.014
	E3	-0.001	0.001	0.009	0.013	-0.021	0.007
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.003	0.005	0.017	0.016	0.065	0.022
	SUST	0.004	-0.011	-0.004	-0.019	0.015	-0.054
	OCC	0.008	0.016	0.021	0.035	0.079	0.077
	TOTAL	0.010	0.018	0.021	0.038	0.082	0.077

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
I01	GR	0.004	-0.007	-0.003	-0.015	0.013	-0.057
	T1	0.001	0.002	0.000	-0.003	-0.002	-0.002
	E1	0.003	-0.003	0.010	0.011	-0.060	-0.019
	E2	-0.001	0.002	0.001	0.003	-0.003	0.014
	E3	-0.001	0.001	0.007	0.017	-0.029	0.007
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.003	0.003	0.013	0.021	0.067	0.025
	SUST	0.004	-0.007	-0.003	-0.015	0.013	-0.057
	OCC	0.008	0.011	0.015	0.035	0.080	0.081
	TOTAL	0.009	0.013	0.015	0.038	0.082	0.083
I02	GR	0.004	-0.004	-0.002	-0.015	0.013	-0.057
	T1	0.001	0.002	0.000	-0.003	-0.002	-0.002
	E1	0.003	-0.002	0.007	0.011	-0.060	-0.019
	E2	-0.001	0.001	0.000	0.003	-0.003	0.014
	E3	-0.001	0.001	0.005	0.017	-0.029	0.007
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.003	0.002	0.008	0.021	0.067	0.025
	SUST	0.004	-0.004	-0.002	-0.015	0.013	-0.057
	OCC	0.008	0.006	0.010	0.035	0.080	0.081
	TOTAL	0.009	0.008	0.010	0.038	0.082	0.083
I03 N	GR	0.004	-0.001	-0.001	-0.012	0.011	-0.050
	T1	0.000	0.002	0.000	-0.002	-0.002	-0.002
	E1	0.003	-0.001	0.004	0.014	-0.054	-0.020
	E2	-0.001	0.000	0.000	0.003	-0.002	0.012
	E3	-0.001	0.000	0.004	0.020	-0.028	0.007
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.003	0.001	0.005	0.024	0.061	0.025
	SUST	0.004	-0.001	-0.001	-0.012	0.011	-0.050
	OCC	0.008	0.002	0.007	0.036	0.072	0.075
	TOTAL	0.008	0.004	0.007	0.038	0.074	0.077
I03 F	GR	0.003	0.000	-0.001	-0.009	0.008	-0.035
	T1	0.000	0.002	0.000	-0.002	-0.002	-0.001
	E1	0.003	0.000	0.002	0.014	-0.043	-0.022
	E2	-0.001	0.000	0.000	0.002	-0.002	0.009
	E3	-0.001	0.000	0.003	0.021	-0.023	0.006
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.003	0.000	0.003	0.025	0.048	0.024
	SUST	0.003	0.000	-0.001	-0.009	0.008	-0.035
	OCC	0.006	0.000	0.004	0.034	0.057	0.059
	TOTAL	0.006	0.002	0.004	0.035	0.058	0.060

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
I04	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.000	0.000	0.000	0.000	0.000	0.000
	E1	0.000	0.000	0.000	0.000	0.000	0.000
	E2	0.000	0.000	0.000	0.000	0.000	0.000
	E3	0.000	0.000	0.000	0.000	0.000	0.000
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.000	0.000	0.000	0.000	0.000	0.000
	SUST	0.000	0.000	0.000	0.000	0.000	0.000
	OCC	0.000	0.000	0.000	0.000	0.000	0.000
	TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
*** Segment I end ***							
*** Segment J begin ***							
D09	GR	-0.002	-0.007	0.004	-0.026	0.008	-0.033
	T1	-0.002	-0.005	-0.004	-0.004	-0.001	0.003
	E1	0.024	0.000	0.014	0.027	0.024	-0.002
	E2	0.000	0.002	-0.001	0.006	-0.002	0.008
	E3	-0.001	0.002	0.025	0.001	0.030	0.008
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.024	0.003	0.029	0.028	0.038	0.011
	SUST	-0.002	-0.007	0.004	-0.026	0.008	-0.033
	OCC	0.026	0.009	0.033	0.054	0.046	0.045
	TOTAL	0.028	0.014	0.037	0.058	0.048	0.047
J01	GR	-0.003	-0.007	0.005	-0.026	0.008	-0.033
	T1	-0.002	-0.005	-0.004	-0.004	-0.001	0.003
	E1	0.024	0.000	0.014	0.027	0.024	-0.002
	E2	0.001	0.002	-0.001	0.006	-0.002	0.008
	E3	-0.001	0.002	0.025	0.001	0.030	0.008
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.024	0.003	0.029	0.028	0.038	0.011
	SUST	-0.003	-0.007	0.005	-0.026	0.008	-0.033
	OCC	0.027	0.009	0.034	0.054	0.046	0.045
	TOTAL	0.029	0.015	0.038	0.058	0.048	0.047
J02	GR	-0.005	-0.007	0.007	-0.026	0.008	-0.033
	T1	-0.001	-0.006	-0.004	-0.004	-0.001	0.003
	E1	0.024	0.000	0.012	0.027	0.024	-0.002
	E2	0.001	0.002	-0.002	0.006	-0.002	0.008
	E3	0.000	0.002	0.025	0.001	0.030	0.008
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.024	0.003	0.028	0.028	0.038	0.011
	SUST	-0.005	-0.007	0.007	-0.026	0.008	-0.033
	OCC	0.029	0.009	0.035	0.054	0.046	0.045
	TOTAL	0.031	0.015	0.038	0.058	0.048	0.047

D I S P L A C E M E N T S

Point name	Load combination	TRANSLATIONS (in) X	Y	Z	ROTATIONS (deg) X	Y	Z
J03	GR	-0.007	-0.007	0.008	-0.026	0.008	-0.033
	T1	-0.001	-0.006	-0.004	-0.004	-0.001	0.003
	E1	0.024	0.000	0.011	0.027	0.024	-0.002
	E2	0.002	0.002	-0.002	0.006	-0.002	0.008
	E3	0.000	0.002	0.025	0.001	0.030	0.008
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	SEIS	0.024	0.003	0.027	0.028	0.038	0.011
	SUST	-0.007	-0.007	0.008	-0.026	0.008	-0.033
	OCC	0.031	0.009	0.035	0.054	0.046	0.045
	TOTAL	0.032	0.015	0.039	0.058	0.048	0.047

*** Segment J end ***

RESTRAINT REACTIONS

APPENDIX E-57

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
A00	Anchor								
	GR	2	-22	1	22	-8	-2	0	8
	T1	-1	-1	0	2	-1	1	3	3
	E1	7	-5	3	9	8	-1	-9	12
	E2	-1	6	0	6	2	0	0	2
	E3	0	-6	9	11	16	4	2	17
	P1	0	0	0	0	0	0	0	0
	SEIS	7	9	9	15	18	4	9	21
	SUST	2	-22	1	22	-8	-2	0	8
	OCC	9	31	10	34	26	6	10	28
	TOTAL	10	32	10	35	26	7	13	30
S1B	Guide								
	GR	0	-5	0	5	0	0	0	0
	T1	0	5	0	5	0	0	0	0
	E1	0	0	0	0	0	0	0	0
	E2	0	1	0	1	0	0	0	0
	E3	0	-8	13	15	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	8	13	15	0	0	0	0
	SUST	0	-5	0	5	0	0	0	0
	OCC	0	13	13	19	0	0	0	0
	TOTAL	0	18	13	22	0	0	0	0
S2B	Guide								
	GR	0	-21	0	21	0	0	0	0
	T1	0	21	0	21	0	0	0	0
	E1	0	-23	0	23	0	0	0	0
	E2	0	5	0	5	0	0	0	0
	E3	0	1	0	1	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	23	0	23	0	0	0	0
	SUST	0	-21	0	21	0	0	0	0
	OCC	0	44	0	44	0	0	0	0
	TOTAL	0	65	0	65	0	0	0	0
S1A	Guide								
	GR	0	-39	0	39	0	0	0	0
	T1	0	-63	0	63	0	0	0	0
	E1	0	-2	0	2	0	0	0	0
	E2	0	10	0	10	0	0	0	0
	E3	0	12	7	14	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	15	7	17	0	0	0	0
	SUST	0	-39	0	39	0	0	0	0
	OCC	0	55	7	55	0	0	0	0
	TOTAL	0	117	7	118	0	0	0	0

R E S T R A I N T R E A C T I O N S APPENDIX E-58

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
S2A	Guide								
	GR	0	-22	0	22	0	0	0	0
	T1	0	-69	0	69	0	0	0	0
	E1	0	22	0	22	0	0	0	0
	E2	0	6	0	6	0	0	0	0
	E3	0	-1	4	4	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	23	4	23	0	0	0	0
	SUST	0	-22	0	22	0	0	0	0
	OCC	0	45	4	45	0	0	0	0
	TOTAL	0	114	4	114	0	0	0	0
D00	Anchor								
	GR	0	-9	-1	9	-9	-2	-1	10
	T1	1	2	0	2	2	-1	-1	3
	E1	27	4	13	30	10	-15	-16	25
	E2	0	2	0	2	2	0	0	2
	E3	3	1	10	10	6	4	-2	8
	P1	0	0	0	0	0	0	0	0
	SEIS	27	5	16	32	12	16	17	26
	SUST	0	-9	-1	9	-9	-2	-1	10
	OCC	27	14	17	35	22	18	18	33
	TOTAL	28	16	17	36	24	18	19	36
S3A	Guide								
	GR	0	-12	0	12	0	0	0	0
	T1	0	1	0	1	0	0	0	0
	E1	12	-1	0	12	0	0	0	0
	E2	0	3	0	3	0	0	0	0
	E3	0	-1	0	1	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	12	3	0	12	0	0	0	0
	SUST	0	-12	0	12	0	0	0	0
	OCC	12	15	0	19	0	0	0	0
	TOTAL	12	16	0	20	0	0	0	0
S4A	Guide								
	GR	0	-8	0	8	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0
	E2	0	2	0	2	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	2	0	2	0	0	0	0
	SUST	0	-8	0	8	0	0	0	0
	OCC	0	11	0	11	0	0	0	0
	TOTAL	0	11	0	11	0	0	0	0

R E S T R A I N T R E A C T I O N S

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
S5A	Guide								
	GR	0	0	0	0	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	0	0	11	11	0	0	0	0
	E2	0	0	0	0	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	0	11	11	0	0	0	0
	SUST	0	0	0	0	0	0	0	0
	OCC	0	0	11	11	0	0	0	0
	TOTAL	0	0	11	11	0	0	0	0
S5C	Guide								
	GR	0	-15	0	15	0	0	0	0
	T1	0	15	0	15	0	0	0	0
	E1	0	0	5	5	0	0	0	0
	E2	0	4	0	4	0	0	0	0
	E3	0	-2	0	2	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	4	5	7	0	0	0	0
	SUST	0	-15	0	15	0	0	0	0
	OCC	0	20	5	20	0	0	0	0
	TOTAL	0	35	5	35	0	0	0	0
S4C	Guide								
	GR	0	-7	0	7	0	0	0	0
	T1	0	7	0	7	0	0	0	0
	E1	0	5	0	5	0	0	0	0
	E2	0	2	0	2	0	0	0	0
	E3	0	4	24	24	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	7	24	25	0	0	0	0
	SUST	0	-7	0	7	0	0	0	0
	OCC	0	14	24	28	0	0	0	0
	TOTAL	0	21	24	32	0	0	0	0
S5B	Guide								
	GR	0	-16	0	16	0	0	0	0
	T1	0	-64	0	64	0	0	0	0
	E1	0	-15	5	16	0	0	0	0
	E2	0	4	0	4	0	0	0	0
	E3	0	-1	5	5	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	16	7	17	0	0	0	0
	SUST	0	-16	0	16	0	0	0	0
	OCC	0	31	7	32	0	0	0	0
	TOTAL	0	96	7	96	0	0	0	0

RESTRAINT REACTIONS

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
S4B	Guide								
	GR	0	-7	0	7	0	0	0	0
	T1	0	-63	0	63	0	0	0	0
	E1	0	-5	0	5	0	0	0	0
	E2	0	2	0	2	0	0	0	0
	E3	0	3	17	18	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	6	17	18	0	0	0	0
	SUST	0	-7	0	7	0	0	0	0
	OCC	0	13	17	22	0	0	0	0
	TOTAL	0	76	17	78	0	0	0	0
S3C	Guide								
	GR	0	-28	0	28	0	0	0	0
	T1	0	1	0	1	0	0	0	0
	E1	28	0	0	28	0	0	0	0
	E2	0	8	0	8	0	0	0	0
	E3	1	-4	0	4	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	28	9	0	30	0	0	0	0
	SUST	0	-28	0	28	0	0	0	0
	OCC	28	37	0	46	0	0	0	0
	TOTAL	28	38	0	47	0	0	0	0
S3B	Guide								
	GR	0	-40	0	40	0	0	0	0
	T1	0	-1	0	1	0	0	0	0
	E1	7	0	0	7	0	0	0	0
	E2	0	9	0	9	0	0	0	0
	E3	0	-3	0	3	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	7	9	0	12	0	0	0	0
	SUST	0	-40	0	40	0	0	0	0
	OCC	7	49	0	49	0	0	0	0
	TOTAL	7	50	0	50	0	0	0	0
WALL	Guide								
	GR	0	-9	0	9	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	7	0	0	7	0	0	0	0
	E2	0	3	0	3	0	0	0	0
	E3	0	3	0	3	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	7	4	0	8	0	0	0	0
	SUST	0	-9	0	9	0	0	0	0
	OCC	7	13	0	14	0	0	0	0
	TOTAL	7	13	0	15	0	0	0	0

RESTRAINT REACTIONS

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
I04	Anchor								
	GR	-2	-28	-1	28	-4	3	-14	15
	T1	1	-2	0	2	-1	-1	-1	1
	E1	21	-1	16	26	13	-14	-18	27
	E2	1	7	0	7	1	-1	3	4
	E3	-4	1	22	22	18	-8	4	20
	P1	0	0	0	0	0	0	0	0
	SEIS	21	7	27	35	23	16	19	34
	SUST	-2	-28	-1	28	-4	3	-14	15
	OCC	23	35	28	51	27	19	33	47
	TOTAL	23	37	28	52	28	19	34	48

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-62

Point name	Load combination	In-Pl. Moment (Moments in ft-lb)	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	Code Stress (Stress in psi)	Code Allow.
*** Segment A begin ***										
A00	Max P						(3a)	HOOP	473	20000
	GR + Max P	8	0		1.00	1.00	(18)	SUST	780	20000
	Cold to T1	1	3	1	1.00	1.00	(17)	DISP	224	30000
	Sus. + E1	16	10		1.00	1.00	(18)	OCC	1674	26600
	Sus. + E2	10	1		1.00	1.00	(18)	OCC	926	26600
	Sus. + E3	24	3		1.00	1.00	(18)	OCC	1985	26600
A01 N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	9	4		1.00	1.00	(18)	SUST	903	20000
	Cold to T1	1	1	1	1.00	1.00	(17)	DISP	115	30000
	Sus. + E1	12	5		1.00	1.00	(18)	OCC	1176	26600
	Sus. + E2	11	5		1.00	1.00	(18)	OCC	1078	26600
	Sus. + E3	13	6		1.00	1.00	(18)	OCC	1267	26600
A01 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	9	4		1.02	1.00	(18)	SUST	913	20000
	Cold to T1	1	1	1	1.02	1.00	(17)	DISP	116	30000
	Sus. + E1	12	5		1.02	1.00	(18)	OCC	1191	26600
	Sus. + E2	11	5		1.02	1.00	(18)	OCC	1091	26600
	Sus. + E3	13	6		1.02	1.00	(18)	OCC	1282	26600
A01 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	6	2		1.02	1.00	(18)	SUST	728	20000
	Cold to T1	1	0	1	1.02	1.00	(17)	DISP	98	30000
	Sus. + E1	10	2		1.02	1.00	(18)	OCC	1019	26600
	Sus. + E2	8	2		1.02	1.00	(18)	OCC	854	26600
	Sus. + E3	11	6		1.02	1.00	(18)	OCC	1175	26600
A01 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	6	2		1.00	1.00	(18)	SUST	720	20000
	Cold to T1	1	0	1	1.00	1.00	(17)	DISP	98	30000
	Sus. + E1	10	2		1.00	1.00	(18)	OCC	1006	26600
	Sus. + E2	8	2		1.00	1.00	(18)	OCC	844	26600
	Sus. + E3	11	6		1.00	1.00	(18)	OCC	1163	26600
A02	Max P						(3a)	HOOP	473	20000
	GR + Max P	6	1		2.30	2.30	(18)	SUST	1226	20000
	Cold to T1	1	0	1	2.30	2.30	(17)	DISP	141	30000
	Sus. + E1	10	2		2.30	2.30	(18)	OCC	1912	26600
	Sus. + E2	7	2		2.30	2.30	(18)	OCC	1476	26600
	Sus. + E3	10	6		2.30	2.30	(18)	OCC	2272	26600

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Point name	Load combination	(Moments in ft-lb) In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	(Stress in psi) Code Stress	Code Allow.
A03	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	1		2.30	2.30	(18)	SUST	343	20000
	Cold to T1	0	0	1	2.30	2.30	(17)	DISP	85	30000
	Sus. + E1	6	2		2.30	2.30	(18)	OCC	1313	26600
	Sus. + E2	0	1		2.30	2.30	(18)	OCC	372	26600
	Sus. + E3	6	5		2.30	2.30	(18)	OCC	1631	26600
A04 N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	1		1.00	1.00	(18)	SUST	291	20000
	Cold to T1	0	0	1	1.00	1.00	(17)	DISP	81	30000
	Sus. + E1	6	2		1.00	1.00	(18)	OCC	731	26600
	Sus. + E2	1	1		1.00	1.00	(18)	OCC	306	26600
	Sus. + E3	7	5		1.00	1.00	(18)	OCC	867	26600
A04 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	1		1.02	1.00	(18)	SUST	291	20000
	Cold to T1	0	0	1	1.02	1.00	(17)	DISP	81	30000
	Sus. + E1	2	6		1.02	1.00	(18)	OCC	732	26600
	Sus. + E2	1	1		1.02	1.00	(18)	OCC	307	26600
	Sus. + E3	5	7		1.02	1.00	(18)	OCC	870	26600
A04 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	2		1.02	1.00	(18)	SUST	383	20000
	Cold to T1	0	1	0	1.02	1.00	(17)	DISP	71	30000
	Sus. + E1	2	3		1.02	1.00	(18)	OCC	503	26600
	Sus. + E2	0	3		1.02	1.00	(18)	OCC	422	26600
	Sus. + E3	4	3		1.02	1.00	(18)	OCC	653	26600
A04 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	0		1.00	1.00	(18)	SUST	383	20000
	Cold to T1	1	0	0	1.00	1.00	(17)	DISP	71	30000
	Sus. + E1	3	2		1.00	1.00	(18)	OCC	501	26600
	Sus. + E2	3	0		1.00	1.00	(18)	OCC	422	26600
	Sus. + E3	3	4		1.00	1.00	(18)	OCC	649	26600
A05 N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	4	1		1.00	1.00	(18)	SUST	515	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	38	30000
	Sus. + E1	7	1		1.00	1.00	(18)	OCC	725	26600
	Sus. + E2	5	1		1.00	1.00	(18)	OCC	588	26600
	Sus. + E3	5	1		1.00	1.00	(18)	OCC	614	26600
A05 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	4	1		1.02	1.00	(18)	SUST	520	20000
	Cold to T1	0	0	0	1.02	1.00	(17)	DISP	38	30000
	Sus. + E1	7	1		1.02	1.00	(18)	OCC	734	26600
	Sus. + E2	5	1		1.02	1.00	(18)	OCC	594	26600
	Sus. + E3	5	1		1.02	1.00	(18)	OCC	620	26600

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Point name	Load combination	(Moments in ft-lb) In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	(Stress in psi) Code Stress	Code Allow.
A05 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	5	2		1.02	1.00	(18)	SUST	644	20000
	Cold to T1	0	0	0	1.02	1.00	(17)	DISP	18	30000
	Sus. + E1	8	8		1.02	1.00	(18)	OCC	1146	26600
	Sus. + E2	7	3		1.02	1.00	(18)	OCC	753	26600
	Sus. + E3	7	9		1.02	1.00	(18)	OCC	1149	26600
A05 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	5		1.00	1.00	(18)	SUST	638	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	18	30000
	Sus. + E1	8	8		1.00	1.00	(18)	OCC	1138	26600
	Sus. + E2	3	7		1.00	1.00	(18)	OCC	745	26600
	Sus. + E3	9	7		1.00	1.00	(18)	OCC	1143	26600
A06 -	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	1		2.30	2.30	(18)	SUST	555	20000
	Cold to T1	2	0	0	2.30	2.30	(17)	DISP	290	30000
	Sus. + E1	3	2		2.30	2.30	(18)	OCC	832	26600
	Sus. + E2	2	2		2.30	2.30	(18)	OCC	640	26600
	Sus. + E3	4	3		2.30	2.30	(18)	OCC	1021	26600
A06 +	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	1		2.30	2.30	(18)	SUST	517	20000
	Cold to T1	2	0	0	2.30	2.30	(17)	DISP	290	30000
	Sus. + E1	2	2		2.30	2.30	(18)	OCC	793	26600
	Sus. + E2	1	2		2.30	2.30	(18)	OCC	591	26600
	Sus. + E3	3	3		2.30	2.30	(18)	OCC	983	26600
SRV8N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	5		1.00	1.00	(18)	SUST	632	20000
	Cold to T1	0	4	0	1.00	1.00	(17)	DISP	290	30000
	Sus. + E1	5	5		1.00	1.00	(18)	OCC	975	26600
	Sus. + E2	0	7		1.00	1.00	(18)	OCC	734	26600
	Sus. + E3	5	8		1.00	1.00	(18)	OCC	1040	26600
SRV8N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	5	0		1.02	1.00	(18)	SUST	639	20000
	Cold to T1	4	0	0	1.02	1.00	(17)	DISP	295	30000
	Sus. + E1	5	5		1.02	1.00	(18)	OCC	982	26600
	Sus. + E2	7	0		1.02	1.00	(18)	OCC	743	26600
	Sus. + E3	8	5		1.02	1.00	(18)	OCC	1049	26600
SRV8M	Max P						(3a)	HOOP	473	20000
	GR + Max P	6	1		1.02	1.00	(18)	SUST	667	20000
	Cold to T1	4	0	0	1.02	1.00	(17)	DISP	299	30000
	Sus. + E1	6	4		1.02	1.00	(18)	OCC	914	26600
	Sus. + E2	7	1		1.02	1.00	(18)	OCC	775	26600
	Sus. + E3	8	5		1.02	1.00	(18)	OCC	1032	26600

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Point name	Load combination	(Moments in ft-lb) In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	(Stress in psi) Code Stress	Code Allow.
SRV8F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	5	1		1.02	1.00	(18)	SUST	639	20000
	Cold to T1	4	0	0	1.02	1.00	(17)	DISP	295	30000
	Sus. + E1	6	1		1.02	1.00	(18)	OCC	659	26600
	Sus. + E2	7	1		1.02	1.00	(18)	OCC	741	26600
	Sus. + E3	7	2		1.02	1.00	(18)	OCC	809	26600
SRV8F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	5	1		1.00	1.00	(18)	SUST	632	20000
	Cold to T1	4	0	0	1.00	1.00	(17)	DISP	290	30000
	Sus. + E1	6	1		1.00	1.00	(18)	OCC	652	26600
	Sus. + E2	7	1		1.00	1.00	(18)	OCC	733	26600
	Sus. + E3	7	2		1.00	1.00	(18)	OCC	800	26600
PRV1	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	0		1.00	1.00	(18)	SUST	380	20000
	Cold to T1	3	0	0	1.00	1.00	(17)	DISP	240	30000
	Sus. + E1	5	2		1.00	1.00	(18)	OCC	663	26600
	Sus. + E2	2	0		1.00	1.00	(18)	OCC	417	26600
	Sus. + E3	3	0		1.00	1.00	(18)	OCC	493	26600
[illegible]	Max P						(3a)	HOOP	473	20000
	GR + Max P	8	0		1.00	1.00	(18)	SUST	809	20000
	Cold to T1	2	0	0	1.00	1.00	(17)	DISP	181	30000
	Sus. + E1	15	5		1.00	1.00	(18)	OCC	1408	26600
	Sus. + E2	10	0		1.00	1.00	(18)	OCC	952	26600
	Sus. + E3	13	3		1.00	1.00	(18)	OCC	1294	26600
A10 -	Max P						(3a)	HOOP	473	20000
	GR + Max P	12	0		2.30	2.30	(18)	SUST	2371	20000
	Cold to T1	2	0	0	2.30	2.30	(17)	DISP	367	30000
	Sus. + E1	20	5		2.30	2.30	(18)	OCC	3993	26600
	Sus. + E2	16	1		2.30	2.30	(18)	OCC	2905	26600
	Sus. + E3	20	5		2.30	2.30	(18)	OCC	3839	26600
A10 +	Max P						(3a)	HOOP	473	20000
	GR + Max P	8	0		2.30	2.30	(18)	SUST	1560	20000
	Cold to T1	10	0	0	2.30	2.30	(17)	DISP	1791	30000
	Sus. + E1	8	4		2.30	2.30	(18)	OCC	2256	26600
	Sus. + E2	10	0		2.30	2.30	(18)	OCC	1893	26600
	Sus. + E3	10	2		2.30	2.30	(18)	OCC	2068	26600
S1B	Max P						(3a)	HOOP	473	20000
	GR + Max P	6	0		1.00	1.00	(18)	SUST	694	20000
	Cold to T1	11	0	0	1.00	1.00	(17)	DISP	807	30000
	Sus. + E1	9	5		1.00	1.00	(18)	OCC	1088	26600
	Sus. + E2	8	0		1.00	1.00	(18)	OCC	809	26600
	Sus. + E3	6	5		1.00	1.00	(18)	OCC	1026	26600

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Point name	Load combination	(Moments in ft-lb) In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	(Stress in psi) Code Stress	Code Allow.
A11	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	0		2.30	2.30	(18)	SUST	605	20000
	Cold to T1	11	0	0	2.30	2.30	(17)	DISP	1869	30000
	Sus. + E1	5	6		2.30	2.30	(18)	OCC	1652	26600
	Sus. + E2	3	0		2.30	2.30	(18)	OCC	698	26600
	Sus. + E3	2	2		2.30	2.30	(18)	OCC	945	26600
A12	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		2.30	2.30	(18)	SUST	290	20000
	Cold to T1	11	0	0	2.30	2.30	(17)	DISP	1879	30000
	Sus. + E1	3	6		2.30	2.30	(18)	OCC	1443	26600
	Sus. + E2	0	0		2.30	2.30	(18)	OCC	301	26600
	Sus. + E3	1	1		2.30	2.30	(18)	OCC	410	26600
A13	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	0		1.00	1.00	(18)	SUST	376	20000
	Cold to T1	11	0	0	1.00	1.00	(17)	DISP	822	30000
	Sus. + E1	5	7		1.00	1.00	(18)	OCC	927	26600
	Sus. + E2	2	0		1.00	1.00	(18)	OCC	410	26600
	Sus. + E3	3	1		1.00	1.00	(18)	OCC	484	26600
A14	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	0		2.30	2.30	(18)	SUST	435	20000
	Cold to T1	11	0	0	2.30	2.30	(17)	DISP	1900	30000
	Sus. + E1	5	7		2.30	2.30	(18)	OCC	1814	26600
	Sus. + E2	1	0		2.30	2.30	(18)	OCC	486	26600
	Sus. + E3	2	2		2.30	2.30	(18)	OCC	791	26600
A15	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		2.30	2.30	(18)	SUST	327	20000
	Cold to T1	11	0	0	2.30	2.30	(17)	DISP	1910	30000
	Sus. + E1	4	8		2.30	2.30	(18)	OCC	1811	26600
	Sus. + E2	0	1		2.30	2.30	(18)	OCC	346	26600
	Sus. + E3	2	2		2.30	2.30	(18)	OCC	750	26600
S2B	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	0		1.00	1.00	(18)	SUST	475	20000
	Cold to T1	11	0	0	1.00	1.00	(17)	DISP	836	30000
	Sus. + E1	7	9		1.00	1.00	(18)	OCC	1181	26600
	Sus. + E2	4	1		1.00	1.00	(18)	OCC	531	26600
	Sus. + E3	5	2		1.00	1.00	(18)	OCC	680	26600
A16	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	1		2.30	2.30	(18)	SUST	461	20000
	Cold to T1	12	0	0	2.30	2.30	(17)	DISP	1811	30000
	Sus. + E1	14	3		2.30	2.30	(18)	OCC	2361	26600
	Sus. + E2	2	1		2.30	2.30	(18)	OCC	520	26600
	Sus. + E3	3	2		2.30	2.30	(18)	OCC	853	26600

*** Segment A end ***

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Point name	Load combination	(Moments in ft-lb) In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	(Stress in psi) Code Stress	Code Allow.
*** Segment B begin ***										
A06	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	0		2.30	2.30	(18)	SUST	603	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	0	30000
	Sus. + E1	2	0		2.30	2.30	(18)	OCC	603	26600
	Sus. + E2	3	0		2.30	2.30	(18)	OCC	697	26600
	Sus. + E3	2	1		2.30	2.30	(18)	OCC	744	26600
B01	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	0		2.30	2.30	(18)	SUST	390	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	0	30000
	Sus. + E1	1	0		2.30	2.30	(18)	OCC	390	26600
	Sus. + E2	1	0		2.30	2.30	(18)	OCC	430	26600
	Sus. + E3	1	0		2.30	2.30	(18)	OCC	450	26600
B02	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		2.30	2.30	(18)	SUST	250	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	0	30000
	Sus. + E1	0	0		2.30	2.30	(18)	OCC	250	26600
	Sus. + E2	0	0		2.30	2.30	(18)	OCC	255	26600
	Sus. + E3	0	0		2.30	2.30	(18)	OCC	257	26600
B03	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		1.00	1.00	(18)	SUST	230	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	0	30000
	Sus. + E1	0	0		1.00	1.00	(18)	OCC	230	26600
	Sus. + E2	0	0		1.00	1.00	(18)	OCC	230	26600
	Sus. + E3	0	0		1.00	1.00	(18)	OCC	230	26600
*** Segment B end ***										
*** Segment C begin ***										
A10	Max P						(3a)	HOOP	473	20000
	GR + Max P	5	1		2.30	2.30	(18)	SUST	918	20000
	Cold to T1	8	0	0	2.30	2.30	(17)	DISP	1263	30000
	Sus. + E1	12	2		2.30	2.30	(18)	OCC	2062	26600
	Sus. + E2	6	1		2.30	2.30	(18)	OCC	1097	26600
	Sus. + E3	10	2		2.30	2.30	(18)	OCC	1720	26600
C01 N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	3		1.00	1.00	(18)	SUST	384	20000
	Cold to T1	0	9	0	1.00	1.00	(17)	DISP	685	30000
	Sus. + E1	1	4		1.00	1.00	(18)	OCC	510	26600
	Sus. + E2	0	3		1.00	1.00	(18)	OCC	432	26600
	Sus. + E3	2	6		1.00	1.00	(18)	OCC	678	26600

ASME B31.3a (1990) CODE COMPLIANCE

Point name	Load combination	(Moments in ft-lb) In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	(Stress in psi) Code Stress	Code Allow.
C01 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	0		1.02	1.00	(18)	SUST	387	20000
	Cold to T1	9	0	0	1.02	1.00	(17)	DISP	697	30000
	Sus. + E1	4	1		1.02	1.00	(18)	OCC	514	26600
	Sus. + E2	3	0		1.02	1.00	(18)	OCC	436	26600
	Sus. + E3	6	2		1.02	1.00	(18)	OCC	685	26600
C01 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		1.02	1.00	(18)	SUST	269	20000
	Cold to T1	1	0	0	1.02	1.00	(17)	DISP	107	30000
	Sus. + E1	2	2		1.02	1.00	(18)	OCC	440	26600
	Sus. + E2	1	0		1.02	1.00	(18)	OCC	281	26600
	Sus. + E3	3	3		1.02	1.00	(18)	OCC	539	26600
C01 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		1.00	1.00	(18)	SUST	268	20000
	Cold to T1	1	0	0	1.00	1.00	(17)	DISP	106	30000
	Sus. + E1	2	2		1.00	1.00	(18)	OCC	437	26600
	Sus. + E2	1	0		1.00	1.00	(18)	OCC	281	26600
	Sus. + E3	3	3		1.00	1.00	(18)	OCC	536	26600
S1A	Max P						(3a)	HOOP	473	20000
	GR + Max P	7	0		1.00	1.00	(18)	SUST	713	20000
	Cold to T1	12	0	0	1.00	1.00	(17)	DISP	869	30000
	Sus. + E1	9	2		1.00	1.00	(18)	OCC	906	26600
	Sus. + E2	8	1		1.00	1.00	(18)	OCC	837	26600
	Sus. + E3	7	3		1.00	1.00	(18)	OCC	935	26600
C02	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	1		2.30	2.30	(18)	SUST	662	20000
	Cold to T1	12	0	0	2.30	2.30	(17)	DISP	1979	30000
	Sus. + E1	4	2		2.30	2.30	(18)	OCC	1083	26600
	Sus. + E2	3	1		2.30	2.30	(18)	OCC	773	26600
	Sus. + E3	3	1		2.30	2.30	(18)	OCC	822	26600
C03	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	1		2.30	2.30	(18)	SUST	372	20000
	Cold to T1	11	0	0	2.30	2.30	(17)	DISP	1965	30000
	Sus. + E1	2	3		2.30	2.30	(18)	OCC	792	26600
	Sus. + E2	0	1		2.30	2.30	(18)	OCC	408	26600
	Sus. + E3	1	2		2.30	2.30	(18)	OCC	553	26600
C04	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	1		1.00	1.00	(18)	SUST	368	20000
	Cold to T1	11	0	0	1.00	1.00	(17)	DISP	848	30000
	Sus. + E1	3	3		1.00	1.00	(18)	OCC	556	26600
	Sus. + E2	2	1		1.00	1.00	(18)	OCC	404	26600
	Sus. + E3	3	3		1.00	1.00	(18)	OCC	531	26600

ASME B31.3a (1990) CODE COMPLIANCE

Point name	Load combination	(Moments in ft-lb) In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	(Stress in psi) Code Stress	Code Allow.
C05	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	1		2.30	2.30	(18)	SUST	493	20000
	Cold to T1	11	0	0	2.30	2.30	(17)	DISP	1936	30000
	Sus. + E1	2	4		2.30	2.30	(18)	OCC	951	26600
	Sus. + E2	1	1		2.30	2.30	(18)	OCC	561	26600
	Sus. + E3	2	3		2.30	2.30	(18)	OCC	938	26600
C06	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	1		2.30	2.30	(18)	SUST	462	20000
	Cold to T1	11	0	0	2.30	2.30	(17)	DISP	1922	30000
	Sus. + E1	1	4		2.30	2.30	(18)	OCC	956	26600
	Sus. + E2	0	2		2.30	2.30	(18)	OCC	520	26600
	Sus. + E3	2	4		2.30	2.30	(18)	OCC	937	26600
S2A	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	2		1.00	1.00	(18)	SUST	475	20000
	Cold to T1	11	0	0	1.00	1.00	(17)	DISP	828	30000
	Sus. + E1	3	5		1.00	1.00	(18)	OCC	715	26600
	Sus. + E2	4	2		1.00	1.00	(18)	OCC	536	26600
	Sus. + E3	5	4		1.00	1.00	(18)	OCC	680	26600
[illegible]	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	2		2.30	2.30	(18)	SUST	628	20000
	Cold to T1	12	0	0	2.30	2.30	(17)	DISP	1844	30000
	Sus. + E1	9	5		2.30	2.30	(18)	OCC	1760	26600
	Sus. + E2	3	2		2.30	2.30	(18)	OCC	732	26600
	Sus. + E3	4	5		2.30	2.30	(18)	OCC	1188	26600
*** Segment C end ***										
*** Segment D begin ***										
D00	Max P						(3a)	HOOP	473	20000
	GR + Max P	9	1		1.00	1.00	(18)	SUST	913	20000
	Cold to T1	2	1	1	1.00	1.00	(17)	DISP	200	30000
	Sus. + E1	20	18		1.00	1.00	(18)	OCC	2368	26600
	Sus. + E2	12	2		1.00	1.00	(18)	OCC	1087	26600
	Sus. + E3	16	3		1.00	1.00	(18)	OCC	1409	26600
D01 N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	9	1		1.00	1.00	(18)	SUST	871	20000
	Cold to T1	2	1	1	1.00	1.00	(17)	DISP	192	30000
	Sus. + E1	12	3		1.00	1.00	(18)	OCC	1164	26600
	Sus. + E2	11	2		1.00	1.00	(18)	OCC	1035	26600
	Sus. + E3	10	2		1.00	1.00	(18)	OCC	960	26600

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-70
(Moments in ft-lb) (Stress in psi)

Point name	Load combination	In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	Code Stress	Code Allow.
D01 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	9	1		1.02	1.00	(18)	SUST	882	20000
	Cold to T1	2	1	1	1.02	1.00	(17)	DISP	195	30000
	Sus. + E1	12	3		1.02	1.00	(18)	OCC	1178	26600
	Sus. + E2	11	2		1.02	1.00	(18)	OCC	1048	26600
	Sus. + E3	10	2		1.02	1.00	(18)	OCC	973	26600
D01 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	8	2		1.02	1.00	(18)	SUST	822	20000
	Cold to T1	2	1	0	1.02	1.00	(17)	DISP	175	30000
	Sus. + E1	9	14		1.02	1.00	(18)	OCC	1717	26600
	Sus. + E2	9	2		1.02	1.00	(18)	OCC	969	26600
	Sus. + E3	8	6		1.02	1.00	(18)	OCC	1153	26600
D01 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	8	2		1.00	1.00	(18)	SUST	812	20000
	Cold to T1	2	1	0	1.00	1.00	(17)	DISP	173	30000
	Sus. + E1	9	14		1.00	1.00	(18)	OCC	1708	26600
	Sus. + E2	9	2		1.00	1.00	(18)	OCC	958	26600
	Sus. + E3	8	6		1.00	1.00	(18)	OCC	1144	26600
D0[illegible] N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	2		1.00	1.00	(18)	SUST	428	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	50	30000
	Sus. + E1	5	27		1.00	1.00	(18)	OCC	2272	26600
	Sus. + E2	1	3		1.00	1.00	(18)	OCC	476	26600
	Sus. + E3	2	12		1.00	1.00	(18)	OCC	1127	26600
D02 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	1		1.02	1.00	(18)	SUST	430	20000
	Cold to T1	0	0	0	1.02	1.00	(17)	DISP	50	30000
	Sus. + E1	27	5		1.02	1.00	(18)	OCC	2305	26600
	Sus. + E2	3	1		1.02	1.00	(18)	OCC	479	26600
	Sus. + E3	12	2		1.02	1.00	(18)	OCC	1141	26600
D02 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	2		1.02	1.00	(18)	SUST	454	20000
	Cold to T1	0	0	1	1.02	1.00	(17)	DISP	57	30000
	Sus. + E1	28	4		1.02	1.00	(18)	OCC	2421	26600
	Sus. + E2	3	2		1.02	1.00	(18)	OCC	509	26600
	Sus. + E3	11	2		1.02	1.00	(18)	OCC	1121	26600
D02 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	2		1.00	1.00	(18)	SUST	452	20000
	Cold to T1	0	0	1	1.00	1.00	(17)	DISP	57	30000
	Sus. + E1	4	28		1.00	1.00	(18)	OCC	2385	26600
	Sus. + E2	2	3		1.00	1.00	(18)	OCC	506	26600
	Sus. + E3	2	11		1.00	1.00	(18)	OCC	1107	26600

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-71
(Moments in ft-lb) (Stress ... psi)

Point name	Load combination	In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	Code Stress	Code Allow.
D03	Max P						(3a)	HOOP	473	20000
	GR + Max P	5	1		2.30	2.30	(18)	SUST	1079	20000
	Cold to T1	1	0	1	2.30	2.30	(17)	DISP	246	30000
	Sus. + E1	10	16		2.30	2.30	(18)	OCC	3715	26600
	Sus. + E2	6	2		2.30	2.30	(18)	OCC	1289	26600
	Sus. + E3	6	4		2.30	2.30	(18)	OCC	1503	26600
D04	Max P						(3a)	HOOP	473	20000
	GR + Max P	4	1		2.30	2.30	(18)	SUST	982	20000
	Cold to T1	2	0	1	2.30	2.30	(17)	DISP	335	30000
	Sus. + E1	11	12		2.30	2.30	(18)	OCC	3109	26600
	Sus. + E2	5	1		2.30	2.30	(18)	OCC	1168	26600
	Sus. + E3	5	2		2.30	2.30	(18)	OCC	1204	26600
D05 N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	0		1.00	1.00	(18)	SUST	469	20000
	Cold to T1	4	0	1	1.00	1.00	(17)	DISP	295	30000
	Sus. + E1	14	4		1.00	1.00	(18)	OCC	1293	26600
	Sus. + E2	4	0		1.00	1.00	(18)	OCC	530	26600
	Sus. + E3	5	4		1.00	1.00	(18)	OCC	744	26600
N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	0		1.02	1.00	(18)	SUST	473	20000
	Cold to T1	4	0	1	1.02	1.00	(17)	DISP	300	30000
	Sus. + E1	14	4		1.02	1.00	(18)	OCC	1310	26600
	Sus. + E2	4	0		1.02	1.00	(18)	OCC	535	26600
	Sus. + E3	5	4		1.02	1.00	(18)	OCC	749	26600
D05 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	4	2		1.02	1.00	(18)	SUST	560	20000
	Cold to T1	4	1	0	1.02	1.00	(17)	DISP	311	30000
	Sus. + E1	13	5		1.02	1.00	(18)	OCC	1242	26600
	Sus. + E2	5	2		1.02	1.00	(18)	OCC	647	26600
	Sus. + E3	6	2		1.02	1.00	(18)	OCC	680	26600
D05 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	4		1.00	1.00	(18)	SUST	555	20000
	Cold to T1	1	4	0	1.00	1.00	(17)	DISP	306	30000
	Sus. + E1	5	13		1.00	1.00	(18)	OCC	1226	26600
	Sus. + E2	2	5		1.00	1.00	(18)	OCC	641	26600
	Sus. + E3	2	6		1.00	1.00	(18)	OCC	673	26600
A16 -	Max P						(3a)	HOOP	473	20000
	GR + Max P	5	0		2.30	2.30	(18)	SUST	1012	20000
	Cold to T1	3	1	0	2.30	2.30	(17)	DISP	552	30000
	Sus. + E1	23	15		2.30	2.30	(18)	OCC	5088	26600
	Sus. + E2	6	0		2.30	2.30	(18)	OCC	1209	26600
	Sus. + E3	8	3		2.30	2.30	(18)	OCC	1746	26600

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Point name	Load combination	In-Pl. Moment (Moments in ft-lb)	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	Code Stress (Stress in psi)	Code Allow.
A16	+ Max P						(3a)	HOOP	473	20000
	GR + Max P	6	1		2.30	2.30	(18)	SUST	1273	20000
	Cold to T1	9	0	0	2.30	2.30	(17)	DISP	1506	30000
	Sus. + E1	12	12		2.30	2.30	(18)	OCC	3462	26600
	Sus. + E2	8	1		2.30	2.30	(18)	OCC	1534	26600
	Sus. + E3	7	1		2.30	2.30	(18)	OCC	1524	26600
C07	- Max P						(3a)	HOOP	473	20000
	GR + Max P	6	1		2.30	2.30	(18)	SUST	1268	20000
	Cold to T1	9	0	0	2.30	2.30	(17)	DISP	1487	30000
	Sus. + E1	6	5		2.30	2.30	(18)	OCC	1892	26600
	Sus. + E2	7	2		2.30	2.30	(18)	OCC	1528	26600
	Sus. + E3	7	2		2.30	2.30	(18)	OCC	1508	26600
C07	+ Max P						(3a)	HOOP	473	20000
	GR + Max P	4	1		2.30	2.30	(18)	SUST	936	20000
	Cold to T1	3	0	0	2.30	2.30	(17)	DISP	600	30000
	Sus. + E1	11	6		2.30	2.30	(18)	OCC	2437	26600
	Sus. + E2	5	1		2.30	2.30	(18)	OCC	1102	26600
	Sus. + E3	8	3		2.30	2.30	(18)	OCC	1648	26600
[illegible]	N- Max P						(3a)	HOOP	473	20000
	GR + Max P	2	7		1.00	1.00	(18)	SUST	758	20000
	Cold to T1	0	4	0	1.00	1.00	(17)	DISP	315	30000
	Sus. + E1	3	9		1.00	1.00	(18)	OCC	973	26600
	Sus. + E2	2	8		1.00	1.00	(18)	OCC	886	26600
	Sus. + E3	2	7		1.00	1.00	(18)	OCC	816	26600
D08	N+ Max P						(3a)	HOOP	473	20000
	GR + Max P	7	2		1.02	1.00	(18)	SUST	766	20000
	Cold to T1	4	0	0	1.02	1.00	(17)	DISP	320	30000
	Sus. + E1	9	3		1.02	1.00	(18)	OCC	984	26600
	Sus. + E2	8	2		1.02	1.00	(18)	OCC	897	26600
	Sus. + E3	7	2		1.02	1.00	(18)	OCC	825	26600
D08	F- Max P						(3a)	HOOP	473	20000
	GR + Max P	6	3		1.02	1.00	(18)	SUST	722	20000
	Cold to T1	4	0	0	1.02	1.00	(17)	DISP	311	30000
	Sus. + E1	9	3		1.02	1.00	(18)	OCC	972	26600
	Sus. + E2	7	3		1.02	1.00	(18)	OCC	843	26600
	Sus. + E3	7	4		1.02	1.00	(18)	OCC	828	26600
D08	F+ Max P						(3a)	HOOP	473	20000
	GR + Max P	6	3		1.00	1.00	(18)	SUST	715	20000
	Cold to T1	4	0	0	1.00	1.00	(17)	DISP	305	30000
	Sus. + E1	9	3		1.00	1.00	(18)	OCC	961	26600
	Sus. + E2	7	3		1.00	1.00	(18)	OCC	835	26600
	Sus. + E3	7	4		1.00	1.00	(18)	OCC	820	26600

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-73

Point name	Load combination	(Moments in ft-lb) In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	(Stress in psi) Code Stress	Code Allow.
D09	- Max P						(3a)	HOOP	473	20000
	GR + Max P	1	2		2.30	2.30	(18)	SUST	627	20000
	Cold to T1	3	0	0	2.30	2.30	(17)	DISP	470	30000
	Sus. + E1	3	6		2.30	2.30	(18)	OCC	1372	26600
	Sus. + E2	1	3		2.30	2.30	(18)	OCC	723	26600
	Sus. + E3	1	4		2.30	2.30	(18)	OCC	912	26600
D09	+ Max P						(3a)	HOOP	473	20000
	GR + Max P	1	2		2.30	2.30	(18)	SUST	627	20000
	Cold to T1	3	0	0	2.30	2.30	(17)	DISP	470	30000
	Sus. + E1	2	6		2.30	2.30	(18)	OCC	1333	26600
	Sus. + E2	1	3		2.30	2.30	(18)	OCC	723	26600
	Sus. + E3	1	4		2.30	2.30	(18)	OCC	912	26600
D10	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	2		2.30	2.30	(18)	SUST	646	20000
	Cold to T1	1	0	0	2.30	2.30	(17)	DISP	130	30000
	Sus. + E1	2	11		2.30	2.30	(18)	OCC	2334	26600
	Sus. + E2	2	2		2.30	2.30	(18)	OCC	748	26600
	Sus. + E3	2	3		2.30	2.30	(18)	OCC	832	26600
	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	1		2.30	2.30	(18)	SUST	533	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	68	30000
	Sus. + E1	2	13		2.30	2.30	(18)	OCC	2480	26600
	Sus. + E2	1	2		2.30	2.30	(18)	OCC	607	26600
	Sus. + E3	1	3		2.30	2.30	(18)	OCC	891	26600
D12 N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	1		1.00	1.00	(18)	SUST	488	20000
	Cold to T1	1	0	0	1.00	1.00	(17)	DISP	97	30000
	Sus. + E1	5	16		1.00	1.00	(18)	OCC	1637	26600
	Sus. + E2	4	1		1.00	1.00	(18)	OCC	552	26600
	Sus. + E3	3	7		1.00	1.00	(18)	OCC	913	26600
D12 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	3		1.02	1.00	(18)	SUST	489	20000
	Cold to T1	0	1	0	1.02	1.00	(17)	DISP	97	30000
	Sus. + E1	16	5		1.02	1.00	(18)	OCC	1657	26600
	Sus. + E2	1	4		1.02	1.00	(18)	OCC	553	26600
	Sus. + E3	7	3		1.02	1.00	(18)	OCC	920	26600
D12 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	1		1.02	1.00	(18)	SUST	305	20000
	Cold to T1	0	0	1	1.02	1.00	(17)	DISP	106	30000
	Sus. + E1	15	3		1.02	1.00	(18)	OCC	1388	26600
	Sus. + E2	1	1		1.02	1.00	(18)	OCC	323	26600
	Sus. + E3	7	2		1.02	1.00	(18)	OCC	816	26600

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-74

Point name	Load combination	In-Pl. Moment (Moments in ft-lb)	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	Code Stress (Stress in psi)	Code Allow.
D12 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	1		1.00	1.00	(18)	SUST	305	20000
	Cold to T1	0	0	1	1.00	1.00	(17)	DISP	106	30000
	Sus. + E1	3	15		1.00	1.00	(18)	OCC	1370	26600
	Sus. + E2	1	1		1.00	1.00	(18)	OCC	322	26600
	Sus. + E3	2	7		1.00	1.00	(18)	OCC	807	26600
D13 -	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	12		2.30	2.30	(18)	SUST	2271	20000
	Cold to T1	1	2	1	2.30	2.30	(17)	DISP	388	30000
	Sus. + E1	10	12		2.30	2.30	(18)	OCC	3566	26600
	Sus. + E2	3	15		2.30	2.30	(18)	OCC	2787	26600
	Sus. + E3	14	12		2.30	2.30	(18)	OCC	4256	26600
D13 +	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	8		2.30	2.30	(18)	SUST	1656	20000
	Cold to T1	0	1	0	2.30	2.30	(17)	DISP	240	30000
	Sus. + E1	10	11		2.30	2.30	(18)	OCC	3386	26600
	Sus. + E2	1	10		2.30	2.30	(18)	OCC	2011	26600
	Sus. + E3	1	11		2.30	2.30	(18)	OCC	2107	26600
	Max P						(3a)	HOOP	473	20000
	GR + Max P	6	1		1.00	1.00	(18)	SUST	713	20000
	Cold to T1	1	0	0	1.00	1.00	(17)	DISP	73	30000
	Sus. + E1	7	16		1.00	1.00	(18)	OCC	1819	26600
	Sus. + E2	8	1		1.00	1.00	(18)	OCC	825	26600
	Sus. + E3	7	4		1.00	1.00	(18)	OCC	962	26600
D14 N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	2		1.00	1.00	(18)	SUST	354	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	18	30000
	Sus. + E1	1	9		1.00	1.00	(18)	OCC	943	26600
	Sus. + E2	1	2		1.00	1.00	(18)	OCC	365	26600
	Sus. + E3	1	6		1.00	1.00	(18)	OCC	712	26600
D14 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	1		1.02	1.00	(18)	SUST	356	20000
	Cold to T1	0	0	0	1.02	1.00	(17)	DISP	18	30000
	Sus. + E1	9	1		1.02	1.00	(18)	OCC	955	26600
	Sus. + E2	2	1		1.02	1.00	(18)	OCC	367	26600
	Sus. + E3	6	1		1.02	1.00	(18)	OCC	720	26600
D14 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	1		1.02	1.00	(18)	SUST	376	20000
	Cold to T1	0	0	0	1.02	1.00	(17)	DISP	23	30000
	Sus. + E1	11	2		1.02	1.00	(18)	OCC	1146	26600
	Sus. + E2	1	2		1.02	1.00	(18)	OCC	405	26600
	Sus. + E3	6	2		1.02	1.00	(18)	OCC	704	26600

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-75

Point name	Load combination	In-Pl. Moment (Moments in ft-lb)	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	Code Stress (Stress in psi)	Code Allow.
D14 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	1		1.00	1.00	(18)	SUST	375	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	23	30000
	Sus. + E1	2	11		1.00	1.00	(18)	OCC	1132	26600
	Sus. + E2	2	1		1.00	1.00	(18)	OCC	403	26600
	Sus. + E3	2	6		1.00	1.00	(18)	OCC	698	26600
S4A	Max P						(3a)	HOOP	473	20000
	GR + Max P	4	0		1.00	1.00	(18)	SUST	555	20000
	Cold to T1	1	0	0	1.00	1.00	(17)	DISP	50	30000
	Sus. + E1	5	24		1.00	1.00	(18)	OCC	2309	26600
	Sus. + E2	6	0		1.00	1.00	(18)	OCC	650	26600
	Sus. + E3	5	0		1.00	1.00	(18)	OCC	581	26600
S5A	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	3		1.00	1.00	(18)	SUST	437	20000
	Cold to T1	1	0	0	1.00	1.00	(17)	DISP	93	30000
	Sus. + E1	1	6		1.00	1.00	(18)	OCC	654	26600
	Sus. + E2	0	3		1.00	1.00	(18)	OCC	446	26600
	Sus. + E3	1	8		1.00	1.00	(18)	OCC	814	26600
[redacted] N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	3		1.00	1.00	(18)	SUST	456	20000
	Cold to T1	1	0	0	1.00	1.00	(17)	DISP	97	30000
	Sus. + E1	1	6		1.00	1.00	(18)	OCC	692	26600
	Sus. + E2	0	3		1.00	1.00	(18)	OCC	464	26600
	Sus. + E3	1	8		1.00	1.00	(18)	OCC	842	26600
D15 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	0		1.02	1.00	(18)	SUST	460	20000
	Cold to T1	0	1	0	1.02	1.00	(17)	DISP	97	30000
	Sus. + E1	6	1		1.02	1.00	(18)	OCC	700	26600
	Sus. + E2	3	0		1.02	1.00	(18)	OCC	468	26600
	Sus. + E3	8	1		1.02	1.00	(18)	OCC	852	26600
D15 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	1		1.02	1.00	(18)	SUST	481	20000
	Cold to T1	0	0	1	1.02	1.00	(17)	DISP	99	30000
	Sus. + E1	6	1		1.02	1.00	(18)	OCC	693	26600
	Sus. + E2	3	1		1.02	1.00	(18)	OCC	495	26600
	Sus. + E3	8	1		1.02	1.00	(18)	OCC	881	26600
D15 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	3		1.00	1.00	(18)	SUST	477	20000
	Cold to T1	0	0	1	1.00	1.00	(17)	DISP	99	30000
	Sus. + E1	1	6		1.00	1.00	(18)	OCC	685	26600
	Sus. + E2	1	3		1.00	1.00	(18)	OCC	491	26600
	Sus. + E3	1	8		1.00	1.00	(18)	OCC	870	26600

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-76

Point name	Load combination	In-Pl. Moment (Moments in ft-lb)	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	Code Stress (Stress in psi)	Code Allow.
D16 N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	3		1.00	1.00	(18)	SUST	486	20000
	Cold to T1	0	0	1	1.00	1.00	(17)	DISP	99	30000
	Sus. + E1	2	5		1.00	1.00	(18)	OCC	645	26600
	Sus. + E2	1	3		1.00	1.00	(18)	OCC	496	26600
	Sus. + E3	1	9		1.00	1.00	(18)	OCC	888	26600
D16 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	3		1.02	1.00	(18)	SUST	487	20000
	Cold to T1	0	0	1	1.02	1.00	(17)	DISP	99	30000
	Sus. + E1	2	5		1.02	1.00	(18)	OCC	646	26600
	Sus. + E2	1	3		1.02	1.00	(18)	OCC	496	26600
	Sus. + E3	1	9		1.02	1.00	(18)	OCC	888	26600
D16 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	0		1.02	1.00	(18)	SUST	320	20000
	Cold to T1	0	1	0	1.02	1.00	(17)	DISP	99	30000
	Sus. + E1	2	1		1.02	1.00	(18)	OCC	395	26600
	Sus. + E2	1	0		1.02	1.00	(18)	OCC	330	26600
	Sus. + E3	1	0		1.02	1.00	(18)	OCC	354	26600
F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	0		1.00	1.00	(18)	SUST	319	20000
	Cold to T1	0	1	0	1.00	1.00	(17)	DISP	99	30000
	Sus. + E1	2	1		1.00	1.00	(18)	OCC	393	26600
	Sus. + E2	1	0		1.00	1.00	(18)	OCC	328	26600
	Sus. + E3	1	0		1.00	1.00	(18)	OCC	353	26600
D17 -	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	1		2.30	2.30	(18)	SUST	449	20000
	Cold to T1	1	0	0	2.30	2.30	(17)	DISP	227	30000
	Sus. + E1	3	3		2.30	2.30	(18)	OCC	975	26600
	Sus. + E2	0	1		2.30	2.30	(18)	OCC	471	26600
	Sus. + E3	1	3		2.30	2.30	(18)	OCC	729	26600
D17 +	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	1		2.30	2.30	(18)	SUST	602	20000
	Cold to T1	9	0	0	2.30	2.30	(17)	DISP	1518	30000
	Sus. + E1	3	1		2.30	2.30	(18)	OCC	795	26600
	Sus. + E2	3	1		2.30	2.30	(18)	OCC	690	26600
	Sus. + E3	3	1		2.30	2.30	(18)	OCC	784	26600
D18 N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	2		1.00	1.00	(18)	SUST	364	20000
	Cold to T1	0	9	0	1.00	1.00	(17)	DISP	673	30000
	Sus. + E1	1	4		1.00	1.00	(18)	OCC	551	26600
	Sus. + E2	0	2		1.00	1.00	(18)	OCC	395	26600
	Sus. + E3	2	2		1.00	1.00	(18)	OCC	519	26600

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-77
(Moments in ft-lb) (Stress in psi)

Point name	Load combination	In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	Code Stress	Code Allow.
D18 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	0		1.02	1.00	(18)	SUST	366	20000
	Cold to T1	9	0	0	1.02	1.00	(17)	DISP	685	30000
	Sus. + E1	4	1		1.02	1.00	(18)	OCC	556	26600
	Sus. + E2	2	0		1.02	1.00	(18)	OCC	397	26600
	Sus. + E3	2	2		1.02	1.00	(18)	OCC	521	26600
D18 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	0		1.02	1.00	(18)	SUST	418	20000
	Cold to T1	1	0	0	1.02	1.00	(17)	DISP	73	30000
	Sus. + E1	4	0		1.02	1.00	(18)	OCC	494	26600
	Sus. + E2	3	0		1.02	1.00	(18)	OCC	468	26600
	Sus. + E3	4	1		1.02	1.00	(18)	OCC	513	26600
D18 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	0		1.00	1.00	(18)	SUST	415	20000
	Cold to T1	1	0	0	1.00	1.00	(17)	DISP	72	30000
	Sus. + E1	4	0		1.00	1.00	(18)	OCC	490	26600
	Sus. + E2	3	0		1.00	1.00	(18)	OCC	464	26600
	Sus. + E3	4	1		1.00	1.00	(18)	OCC	509	26600
	Max P						(3a)	HOOP	473	20000
	GR + Max P	4	0		1.00	1.00	(18)	SUST	498	20000
	Cold to T1	12	0	0	1.00	1.00	(17)	DISP	915	30000
	Sus. + E1	6	0		1.00	1.00	(18)	OCC	641	26600
	Sus. + E2	5	0		1.00	1.00	(18)	OCC	571	26600
	Sus. + E3	5	1		1.00	1.00	(18)	OCC	600	26600
D19	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		2.30	2.30	(18)	SUST	260	20000
	Cold to T1	12	0	0	2.30	2.30	(17)	DISP	2087	30000
	Sus. + E1	1	2		2.30	2.30	(18)	OCC	711	26600
	Sus. + E2	0	0		2.30	2.30	(18)	OCC	267	26600
	Sus. + E3	1	2		2.30	2.30	(18)	OCC	551	26600
D20	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	0		2.30	2.30	(18)	SUST	620	20000
	Cold to T1	12	0	0	2.30	2.30	(17)	DISP	2072	30000
	Sus. + E1	3	4		2.30	2.30	(18)	OCC	1308	26600
	Sus. + E2	3	0		2.30	2.30	(18)	OCC	714	26600
	Sus. + E3	3	3		2.30	2.30	(18)	OCC	1050	26600
D21	Max P						(3a)	HOOP	473	20000
	GR + Max P	4	0		1.00	1.00	(18)	SUST	524	20000
	Cold to T1	12	0	0	1.00	1.00	(17)	DISP	894	30000
	Sus. + E1	5	6		1.00	1.00	(18)	OCC	949	26600
	Sus. + E2	5	0		1.00	1.00	(18)	OCC	598	26600
	Sus. + E3	4	4		1.00	1.00	(18)	OCC	806	26600

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-78

Point name	Load combination	In-Pl. Moment (Moments in ft-lb)	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	Code Stress (Stress in psi)	Code Allow.
D22	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	0		2.30	2.30	(18)	SUST	792	20000
	Cold to T1	12	0	0	2.30	2.30	(17)	DISP	2040	30000
	Sus. + E1	4	8		2.30	2.30	(18)	OCC	2069	26600
	Sus. + E2	4	0		2.30	2.30	(18)	OCC	935	26600
	Sus. + E3	4	6		2.30	2.30	(18)	OCC	1818	26600
D23	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	0		2.30	2.30	(18)	SUST	561	20000
	Cold to T1	12	0	0	2.30	2.30	(17)	DISP	2025	30000
	Sus. + E1	2	9		2.30	2.30	(18)	OCC	2124	26600
	Sus. + E2	2	0		2.30	2.30	(18)	OCC	648	26600
	Sus. + E3	3	9		2.30	2.30	(18)	OCC	1988	26600
S4C	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	0		1.00	1.00	(18)	SUST	275	20000
	Cold to T1	12	0	0	1.00	1.00	(17)	DISP	872	30000
	Sus. + E1	1	11		1.00	1.00	(18)	OCC	1107	26600
	Sus. + E2	1	0		1.00	1.00	(18)	OCC	282	26600
	Sus. + E3	2	12		1.00	1.00	(18)	OCC	1132	26600
N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	1		1.00	1.00	(18)	SUST	284	20000
	Cold to T1	1	0	0	1.00	1.00	(17)	DISP	86	30000
	Sus. + E1	2	12		1.00	1.00	(18)	OCC	1132	26600
	Sus. + E2	1	1		1.00	1.00	(18)	OCC	292	26600
	Sus. + E3	1	9		1.00	1.00	(18)	OCC	894	26600
D24 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	1		1.02	1.00	(18)	SUST	284	20000
	Cold to T1	1	0	0	1.02	1.00	(17)	DISP	87	30000
	Sus. + E1	2	12		1.02	1.00	(18)	OCC	1133	26600
	Sus. + E2	1	1		1.02	1.00	(18)	OCC	292	26600
	Sus. + E3	1	9		1.02	1.00	(18)	OCC	894	26600
D24 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	1		1.02	1.00	(18)	SUST	280	20000
	Cold to T1	9	0	0	1.02	1.00	(17)	DISP	681	30000
	Sus. + E1	2	1		1.02	1.00	(18)	OCC	390	26600
	Sus. + E2	0	1		1.02	1.00	(18)	OCC	285	26600
	Sus. + E3	1	1		1.02	1.00	(18)	OCC	318	26600
D24 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	0		1.00	1.00	(18)	SUST	280	20000
	Cold to T1	0	9	0	1.00	1.00	(17)	DISP	669	30000
	Sus. + E1	1	2		1.00	1.00	(18)	OCC	388	26600
	Sus. + E2	1	0		1.00	1.00	(18)	OCC	284	26600
	Sus. + E3	1	1		1.00	1.00	(18)	OCC	318	26600

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-79
(Moments in ft-lb) (Stress in psi)

Point name	Load combination	In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	Code Stress	Code Allow.
D25	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	2		2.30	2.30	(18)	SUST	611	20000
	Cold to T1	9	0	0	2.30	2.30	(17)	DISP	1525	30000
	Sus. + E1	8	2		2.30	2.30	(18)	OCC	1821	26600
	Sus. + E2	2	2		2.30	2.30	(18)	OCC	675	26600
	Sus. + E3	3	15		2.30	2.30	(18)	OCC	2929	26600
*** Segment D end ***										
*** Segment E begin ***										
D17	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	3		2.30	2.30	(18)	SUST	782	20000
	Cold to T1	10	0	0	2.30	2.30	(17)	DISP	1545	30000
	Sus. + E1	4	5		2.30	2.30	(18)	OCC	1182	26600
	Sus. + E2	2	3		2.30	2.30	(18)	OCC	875	26600
	Sus. + E3	3	8		2.30	2.30	(18)	OCC	1515	26600
S5B	Max P						(3a)	HOOP	473	20000
	GR + Max P	4	3		1.00	1.00	(18)	SUST	577	20000
	Cold to T1	11	0	0	1.00	1.00	(17)	DISP	838	30000
	Sus. + E1	6	4		1.00	1.00	(18)	OCC	799	26600
	Sus. + E2	5	3		1.00	1.00	(18)	OCC	652	26600
	Sus. + E3	5	9		1.00	1.00	(18)	OCC	1025	26600
E01	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	2		2.30	2.30	(18)	SUST	600	20000
	Cold to T1	11	0	0	2.30	2.30	(17)	DISP	1953	30000
	Sus. + E1	2	3		2.30	2.30	(18)	OCC	974	26600
	Sus. + E2	0	2		2.30	2.30	(18)	OCC	611	26600
	Sus. + E3	1	8		2.30	2.30	(18)	OCC	1532	26600
E02	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	2		2.30	2.30	(18)	SUST	712	20000
	Cold to T1	11	0	0	2.30	2.30	(17)	DISP	1975	30000
	Sus. + E1	4	5		2.30	2.30	(18)	OCC	1300	26600
	Sus. + E2	3	2		2.30	2.30	(18)	OCC	804	26600
	Sus. + E3	3	7		2.30	2.30	(18)	OCC	1613	26600
E03	Max P						(3a)	HOOP	473	20000
	GR + Max P	4	1		1.00	1.00	(18)	SUST	541	20000
	Cold to T1	12	0	0	1.00	1.00	(17)	DISP	869	30000
	Sus. + E1	5	7		1.00	1.00	(18)	OCC	948	26600
	Sus. + E2	5	1		1.00	1.00	(18)	OCC	614	26600
	Sus. + E3	4	7		1.00	1.00	(18)	OCC	941	26600

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-80

Point name	Load combination	(Moments in ft-lb) In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	(Stress in psi) Code Stress	Code Allow.
E04	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	1		2.30	2.30	(18)	SUST	812	20000
	Cold to T1	12	0	0	2.30	2.30	(17)	DISP	2022	30000
	Sus. + E1	3	8		2.30	2.30	(18)	OCC	2119	26600
	Sus. + E2	4	1		2.30	2.30	(18)	OCC	954	26600
	Sus. + E3	4	7		2.30	2.30	(18)	OCC	1909	26600
E05	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	0		2.30	2.30	(18)	SUST	574	20000
	Cold to T1	12	0	0	2.30	2.30	(17)	DISP	2044	30000
	Sus. + E1	2	10		2.30	2.30	(18)	OCC	2241	26600
	Sus. + E2	2	0		2.30	2.30	(18)	OCC	662	26600
	Sus. + E3	3	8		2.30	2.30	(18)	OCC	1885	26600
S4B	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	0		1.00	1.00	(18)	SUST	274	20000
	Cold to T1	12	0	0	1.00	1.00	(17)	DISP	900	30000
	Sus. + E1	2	12		1.00	1.00	(18)	OCC	1191	26600
	Sus. + E2	1	0		1.00	1.00	(18)	OCC	281	26600
	Sus. + E3	2	10		1.00	1.00	(18)	OCC	982	26600
N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	0		1.00	1.00	(18)	SUST	285	20000
	Cold to T1	1	0	0	1.00	1.00	(17)	DISP	61	30000
	Sus. + E1	3	13		1.00	1.00	(18)	OCC	1211	26600
	Sus. + E2	1	0		1.00	1.00	(18)	OCC	293	26600
	Sus. + E3	1	7		1.00	1.00	(18)	OCC	796	26600
E06 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	0		1.02	1.00	(18)	SUST	286	20000
	Cold to T1	1	0	0	1.02	1.00	(17)	DISP	62	30000
	Sus. + E1	3	13		1.02	1.00	(18)	OCC	1212	26600
	Sus. + E2	1	0		1.02	1.00	(18)	OCC	293	26600
	Sus. + E3	1	7		1.02	1.00	(18)	OCC	797	26600
E06 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	1		1.02	1.00	(18)	SUST	300	20000
	Cold to T1	9	0	0	1.02	1.00	(17)	DISP	660	30000
	Sus. + E1	3	2		1.02	1.00	(18)	OCC	517	26600
	Sus. + E2	0	1		1.02	1.00	(18)	OCC	305	26600
	Sus. + E3	1	1		1.02	1.00	(18)	OCC	364	26600
E06 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	0		1.00	1.00	(18)	SUST	300	20000
	Cold to T1	0	9	0	1.00	1.00	(17)	DISP	649	30000
	Sus. + E1	2	3		1.00	1.00	(18)	OCC	513	26600
	Sus. + E2	1	0		1.00	1.00	(18)	OCC	305	26600
	Sus. + E3	1	1		1.00	1.00	(18)	OCC	363	26600

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-81

Point name	Load combination	(Moments in ft-lb) In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	(Stress in psi) Code Stress	Code Allow.
D25	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	2		2.30	2.30	(18)	SUST	659	20000
	Cold to T1	9	0	0	2.30	2.30	(17)	DISP	1506	30000
	Sus. + E1	3	2		2.30	2.30	(18)	OCC	936	26600
	Sus. + E2	2	2		2.30	2.30	(18)	OCC	723	26600
	Sus. + E3	2	13		2.30	2.30	(18)	OCC	2581	26600
*** Segment E end ***										
*** Segment F begin ***										
D25	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	0		2.30	2.30	(18)	SUST	671	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	17	30000
	Sus. + E1	8	23		2.30	2.30	(18)	OCC	4319	26600
	Sus. + E2	4	0		2.30	2.30	(18)	OCC	785	26600
	Sus. + E3	5	11		2.30	2.30	(18)	OCC	2437	26600
F01 N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	0		1.00	1.00	(18)	SUST	295	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	3	30000
	Sus. + E1	6	23		1.00	1.00	(18)	OCC	2088	26600
	Sus. + E2	1	0		1.00	1.00	(18)	OCC	309	26600
	Sus. + E3	2	2		1.00	1.00	(18)	OCC	411	26600
F01 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	1		1.02	1.00	(18)	SUST	295	20000
	Cold to T1	0	0	0	1.02	1.00	(17)	DISP	3	30000
	Sus. + E1	23	6		1.02	1.00	(18)	OCC	2117	26600
	Sus. + E2	0	1		1.02	1.00	(18)	OCC	309	26600
	Sus. + E3	2	2		1.02	1.00	(18)	OCC	413	26600
F01 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	3		1.02	1.00	(18)	SUST	450	20000
	Cold to T1	0	0	0	1.02	1.00	(17)	DISP	5	30000
	Sus. + E1	22	3		1.02	1.00	(18)	OCC	2075	26600
	Sus. + E2	0	3		1.02	1.00	(18)	OCC	459	26600
	Sus. + E3	2	5		1.02	1.00	(18)	OCC	642	26600
F01 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	0		1.00	1.00	(18)	SUST	450	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	5	30000
	Sus. + E1	3	22		1.00	1.00	(18)	OCC	2048	26600
	Sus. + E2	3	0		1.00	1.00	(18)	OCC	459	26600
	Sus. + E3	5	2		1.00	1.00	(18)	OCC	640	26600

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-82

Point name	Load combination	In-Pl. Moment (Moments in ft-lb)	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	Code Stress (Stress in psi)	Code Allow.
F02	Max P						(3a)	HOOP	473	20000
	GR + Max P	12	0		1.00	1.00	(18)	SUST	1110	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	34	30000
	Sus. + E1	12	8		1.00	1.00	(18)	OCC	1721	26600
	Sus. + E2	16	0		1.00	1.00	(18)	OCC	1407	26600
	Sus. + E3	18	1		1.00	1.00	(18)	OCC	1558	26600
S3C	Max P						(3a)	HOOP	473	20000
	GR + Max P	23	0		1.00	1.00	(18)	SUST	1973	20000
	Cold to T1	1	0	0	1.00	1.00	(17)	DISP	46	30000
	Sus. + E1	24	23		1.00	1.00	(18)	OCC	3679	26600
	Sus. + E2	30	0		1.00	1.00	(18)	OCC	2491	26600
	Sus. + E3	33	1		1.00	1.00	(18)	OCC	2663	26600
F03	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	0		2.30	2.30	(18)	SUST	537	20000
	Cold to T1	1	0	0	2.30	2.30	(17)	DISP	135	30000
	Sus. + E1	2	6		2.30	2.30	(18)	OCC	1589	26600
	Sus. + E2	2	0		2.30	2.30	(18)	OCC	557	26600
	Sus. + E3	11	0		2.30	2.30	(18)	OCC	2193	26600
F04	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	0		1.00	1.00	(18)	SUST	362	20000
	Cold to T1	1	0	0	1.00	1.00	(17)	DISP	59	30000
	Sus. + E1	2	1		1.00	1.00	(18)	OCC	441	26600
	Sus. + E2	2	0		1.00	1.00	(18)	OCC	371	26600
	Sus. + E3	11	0		1.00	1.00	(18)	OCC	1056	26600

*** Segment F end ***

*** Segment G begin ***

F04	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	1		1.00	1.00	(18)	SUST	370	20000
	Cold to T1	1	0	0	1.00	1.00	(17)	DISP	59	30000
	Sus. + E1	2	6		1.00	1.00	(18)	OCC	747	26600
	Sus. + E2	2	1		1.00	1.00	(18)	OCC	378	26600
	Sus. + E3	11	2		1.00	1.00	(18)	OCC	1066	26600
S3B	Max P						(3a)	HOOP	473	20000
	GR + Max P	35	0		1.00	1.00	(18)	SUST	2858	20000
	Cold to T1	1	0	0	1.00	1.00	(17)	DISP	46	30000
	Sus. + E1	35	1		1.00	1.00	(18)	OCC	2929	26600
	Sus. + E2	43	0		1.00	1.00	(18)	OCC	3433	26600
	Sus. + E3	44	1		1.00	1.00	(18)	OCC	3544	26600

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-83
(Moments in ft-lb) (Stress in psi)

Point name	Load combination	In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	Code Stress	Code Allow.
G01	Max P						(3a)	HOOP	473	20000
	GR + Max P	28	0		2.30	2.30	(18)	SUST	5116	20000
	Cold to T1	1	0	0	2.30	2.30	(17)	DISP	97	30000
	Sus. + E1	29	3		2.30	2.30	(18)	OCC	5493	26600
	Sus. + E2	35	0		2.30	2.30	(18)	OCC	6165	26600
	Sus. + E3	37	1		2.30	2.30	(18)	OCC	6539	26600
G02	Max P						(3a)	HOOP	473	20000
	GR + Max P	22	0		2.30	2.30	(18)	SUST	4085	20000
	Cold to T1	1	0	0	2.30	2.30	(17)	DISP	88	30000
	Sus. + E1	23	4		2.30	2.30	(18)	OCC	4635	26600
	Sus. + E2	27	0		2.30	2.30	(18)	OCC	4893	26600
	Sus. + E3	30	1		2.30	2.30	(18)	OCC	5354	26600
G03	Max P						(3a)	HOOP	473	20000
	GR + Max P	17	0		1.00	1.00	(18)	SUST	1481	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	34	30000
	Sus. + E1	17	4		1.00	1.00	(18)	OCC	1780	26600
	Sus. + E2	20	0		1.00	1.00	(18)	OCC	1734	26600
	Sus. + E3	23	1		1.00	1.00	(18)	OCC	1961	26600
	Max P						(3a)	HOOP	473	20000
	GR + Max P	14	0		2.30	2.30	(18)	SUST	2550	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	68	30000
	Sus. + E1	14	4		2.30	2.30	(18)	OCC	3222	26600
	Sus. + E2	16	0		2.30	2.30	(18)	OCC	3010	26600
	Sus. + E3	19	1		2.30	2.30	(18)	OCC	3490	26600
G05	Max P						(3a)	HOOP	473	20000
	GR + Max P	11	0		2.30	2.30	(18)	SUST	2144	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	59	30000
	Sus. + E1	11	4		2.30	2.30	(18)	OCC	2756	26600
	Sus. + E2	13	0		2.30	2.30	(18)	OCC	2519	26600
	Sus. + E3	16	1		2.30	2.30	(18)	OCC	2930	26600
WALL	Max P						(3a)	HOOP	473	20000
	GR + Max P	5	0		1.00	1.00	(18)	SUST	574	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	0	30000
	Sus. + E1	5	2		1.00	1.00	(18)	OCC	703	26600
	Sus. + E2	6	0		1.00	1.00	(18)	OCC	660	26600
	Sus. + E3	6	0		1.00	1.00	(18)	OCC	652	26600
G06 N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	0		1.00	1.00	(18)	SUST	312	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	0	30000
	Sus. + E1	1	0		1.00	1.00	(18)	OCC	343	26600
	Sus. + E2	1	0		1.00	1.00	(18)	OCC	332	26600
	Sus. + E3	2	0		1.00	1.00	(18)	OCC	390	26600

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Point name	Load combination	In-Pl. Moment (Moments in ft-lb)	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	Code Stress (Stress in psi)	Code Allow.
G06 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	1	0		1.02	1.00	(18)	SUST	313	20000
	Cold to T1	0	0	0	1.02	1.00	(17)	DISP	0	30000
	Sus. + E1	1	0		1.02	1.00	(18)	OCC	344	26600
	Sus. + E2	1	0		1.02	1.00	(18)	OCC	334	26600
	Sus. + E3	2	0		1.02	1.00	(18)	OCC	393	26600
G06 F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		1.02	1.00	(18)	SUST	243	20000
	Cold to T1	0	0	0	1.02	1.00	(17)	DISP	0	30000
	Sus. + E1	0	1		1.02	1.00	(18)	OCC	290	26600
	Sus. + E2	0	0		1.02	1.00	(18)	OCC	243	26600
	Sus. + E3	1	0		1.02	1.00	(18)	OCC	291	26600
G06 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		1.00	1.00	(18)	SUST	243	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	0	30000
	Sus. + E1	0	1		1.00	1.00	(18)	OCC	290	26600
	Sus. + E2	0	0		1.00	1.00	(18)	OCC	243	26600
	Sus. + E3	1	0		1.00	1.00	(18)	OCC	290	26600
	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		2.30	2.30	(18)	SUST	243	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	0	30000
	Sus. + E1	0	1		2.30	2.30	(18)	OCC	329	26600
	Sus. + E2	0	0		2.30	2.30	(18)	OCC	243	26600
	Sus. + E3	1	0		2.30	2.30	(18)	OCC	329	26600
G10	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		2.30	2.30	(18)	SUST	230	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	0	30000
	Sus. + E1	0	0		2.30	2.30	(18)	OCC	233	26600
	Sus. + E2	0	0		2.30	2.30	(18)	OCC	230	26600
	Sus. + E3	0	0		2.30	2.30	(18)	OCC	233	26600
G11	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		1.00	1.00	(18)	SUST	230	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	0	30000
	Sus. + E1	0	0		1.00	1.00	(18)	OCC	230	26600
	Sus. + E2	0	0		1.00	1.00	(18)	OCC	230	26600
	Sus. + E3	0	0		1.00	1.00	(18)	OCC	230	26600

*** Segment G end ***

*** Segment H begin ***

APPENDIX E-85

ASME B31.3a (1990) CODE COMPLIANCE

Point name	Load combination	(Moments in ft-lb) In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	(Stress in psi) Code Stress	Code Allow.
F03	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		2.30	2.30	(18)	SUST	223	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	0	30000
	Sus. + E1	0	1		2.30	2.30	(18)	OCC	314	26600
	Sus. + E2	0	0		2.30	2.30	(18)	OCC	223	26600
	Sus. + E3	1	0		2.30	2.30	(18)	OCC	314	26600
H01	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		2.30	2.30	(18)	SUST	224	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	0	30000
	Sus. + E1	0	0		2.30	2.30	(18)	OCC	271	26600
	Sus. + E2	0	0		2.30	2.30	(18)	OCC	224	26600
	Sus. + E3	0	0		2.30	2.30	(18)	OCC	271	26600
H02	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		2.30	2.30	(18)	SUST	229	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	0	30000
	Sus. + E1	0	0		2.30	2.30	(18)	OCC	231	26600
	Sus. + E2	0	0		2.30	2.30	(18)	OCC	229	26600
	Sus. + E3	0	0		2.30	2.30	(18)	OCC	231	26600
	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		1.00	1.00	(18)	SUST	230	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	0	30000
	Sus. + E1	0	0		1.00	1.00	(18)	OCC	230	26600
	Sus. + E2	0	0		1.00	1.00	(18)	OCC	230	26600
	Sus. + E3	0	0		1.00	1.00	(18)	OCC	230	26600

*** Segment H end ***

*** Segment I begin ***

D13	Max P						(3a)	HOOP	473	20000
	GR + Max P	2	5		2.30	2.30	(18)	SUST	1089	20000
	Cold to T1	1	2	1	2.30	2.30	(17)	DISP	257	30000
	Sus. + E1	4	8		2.30	2.30	(18)	OCC	1625	26600
	Sus. + E2	3	7		2.30	2.30	(18)	OCC	1317	26600
	Sus. + E3	14	6		2.30	2.30	(18)	OCC	2898	26600
I01	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	2		2.30	2.30	(18)	SUST	619	20000
	Cold to T1	1	1	1	2.30	2.30	(17)	DISP	192	30000
	Sus. + E1	3	6		2.30	2.30	(18)	OCC	1327	26600
	Sus. + E2	0	3		2.30	2.30	(18)	OCC	730	26600
	Sus. + E3	0	8		2.30	2.30	(18)	OCC	1648	26600

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-86

Point name	Load combination	(Moments in ft-lb) In-Pl. Moment	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	(Stress in psi) Code Stress	Code Allow.
I02	Max P						(3a)	HOOP	473	20000
	GR + Max P	7	2		2.30	2.30	(18)	SUST	1422	20000
	Cold to T1	0	1	1	2.30	2.30	(17)	DISP	126	30000
	Sus. + E1	9	11		2.30	2.30	(18)	OCC	2856	26600
	Sus. + E2	8	3		2.30	2.30	(18)	OCC	1719	26600
	Sus. + E3	7	3		2.30	2.30	(18)	OCC	1495	26600
I03 N-	Max P						(3a)	HOOP	473	20000
	GR + Max P	13	3		1.00	1.00	(18)	SUST	1210	20000
	Cold to T1	0	1	1	1.00	1.00	(17)	DISP	68	30000
	Sus. + E1	15	15		1.00	1.00	(18)	OCC	2129	26600
	Sus. + E2	16	3		1.00	1.00	(18)	OCC	1454	26600
	Sus. + E3	13	8		1.00	1.00	(18)	OCC	1574	26600
I03 N+	Max P						(3a)	HOOP	473	20000
	GR + Max P	13	3		1.02	1.00	(18)	SUST	1226	20000
	Cold to T1	0	1	1	1.02	1.00	(17)	DISP	68	30000
	Sus. + E1	15	15		1.02	1.00	(18)	OCC	2145	26600
	Sus. + E2	16	3		1.02	1.00	(18)	OCC	1474	26600
	Sus. + E3	13	8		1.02	1.00	(18)	OCC	1591	26600
F-	Max P						(3a)	HOOP	473	20000
	GR + Max P	16	3		1.02	1.00	(18)	SUST	1423	20000
	Cold to T1	0	1	1	1.02	1.00	(17)	DISP	75	30000
	Sus. + E1	16	4		1.02	1.00	(18)	OCC	1504	26600
	Sus. + E2	20	4		1.02	1.00	(18)	OCC	1730	26600
	Sus. + E3	17	4		1.02	1.00	(18)	OCC	1506	26600
I03 F+	Max P						(3a)	HOOP	473	20000
	GR + Max P	3	16		1.00	1.00	(18)	SUST	1403	20000
	Cold to T1	1	0	1	1.00	1.00	(17)	DISP	75	30000
	Sus. + E1	4	16		1.00	1.00	(18)	OCC	1483	26600
	Sus. + E2	4	20		1.00	1.00	(18)	OCC	1705	26600
	Sus. + E3	4	17		1.00	1.00	(18)	OCC	1485	26600
I04	Max P						(3a)	HOOP	473	20000
	GR + Max P	4	14		1.00	1.00	(18)	SUST	1289	20000
	Cold to T1	1	1	1	1.00	1.00	(17)	DISP	92	30000
	Sus. + E1	17	32		1.00	1.00	(18)	OCC	2978	26600
	Sus. + E2	5	18		1.00	1.00	(18)	OCC	1556	26600
	Sus. + E3	22	18		1.00	1.00	(18)	OCC	2698	26600

*** Segment I end ***

*** Segment J begin ***

ASME B31.3a (1990) CODE COMPLIANCE APPENDIX E-87

Point name	Load combination	In-Pl. Moment (Moments in ft-lb)	Out-Pl. Moment	Torsion Moment	S.I.F In	S.I.F Out	Eq. no.	Load type	Code Stress (Stress in psi)	Code Allow.
D09	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		2.30	2.30	(18)	SUST	236	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	0	30000
	Sus. + E1	1	0		2.30	2.30	(18)	OCC	316	26600
	Sus. + E2	0	0		2.30	2.30	(18)	OCC	236	26600
	Sus. + E3	0	1		2.30	2.30	(18)	OCC	316	26600
J01	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		2.30	2.30	(18)	SUST	236	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	0	30000
	Sus. + E1	0	0		2.30	2.30	(18)	OCC	283	26600
	Sus. + E2	0	0		2.30	2.30	(18)	OCC	236	26600
	Sus. + E3	0	0		2.30	2.30	(18)	OCC	283	26600
J02	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		2.30	2.30	(18)	SUST	230	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	0	30000
	Sus. + E1	0	0		2.30	2.30	(18)	OCC	232	26600
	Sus. + E2	0	0		2.30	2.30	(18)	OCC	230	26600
	Sus. + E3	0	0		2.30	2.30	(18)	OCC	232	26600
	Max P						(3a)	HOOP	473	20000
	GR + Max P	0	0		1.00	1.00	(18)	SUST	230	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	0	30000
	Sus. + E1	0	0		1.00	1.00	(18)	OCC	230	26600
	Sus. + E2	0	0		1.00	1.00	(18)	OCC	230	26600
	Sus. + E3	0	0		1.00	1.00	(18)	OCC	230	26600

*** Segment J end ***

S Y S T E M S U M M A R Y

Maximum displacements (in)

Maximum X :	0.130	Point : D17	Load Comb.: TOTAL
Maximum Y :	0.069	Point : H03	Load Comb.: TOTAL
Maximum Z :	0.150	Point : G11	Load Comb.: TOTAL
Max. total:	0.188	Point : H03	Load Comb.: TOTAL

Maximum rotations (deg)

Maximum X :	0.200	Point : F04	Load Comb.: TOTAL
Maximum Y :	0.171	Point : F02	Load Comb.: TOTAL
Maximum Z :	0.148	Point : G11	Load Comb.: TOTAL
Max. total:	0.258	Point : F04	Load Comb.: TOTAL

Maximum restraint forces(lb)

Maximum X :	28	Point : S3C	Load Comb.: SEIS
Maximum Y :	117	Point : S1A	Load Comb.: TOTAL
Maximum Z :	28	Point : I04	Load Comb.: TOTAL
Max. total:	118	Point : S1A	Load Comb.: TOTAL

Maximum restraint moments(ft-lb)

Maximum X :	28	Point : I04	Load Comb.: TOTAL
Maximum Y :	19	Point : I04	Load Comb.: TOTAL
Maximum Z :	34	Point : I04	Load Comb.: TOTAL
Max. total:	48	Point : I04	Load Comb.: TOTAL

S Y S T E M S U M M A R Y

Maximum sustained stress ratio

Point	: G01
Stress psi	: 5116
Allowable psi	: 20000
Ratio	: 0.26
Load combination	: GR + Max P

Maximum displacement stress ratio

Point	: D19
Stress psi	: 2087
Allowable psi	: 30000
Ratio	: 0.07
Load combination	: Cold to T1

Maximum occasional stress ratio

Point	: G01
Stress psi	: 6539
Allowable psi	: 26600
Ratio	: 0.25
Load combination	: Sus. + E3

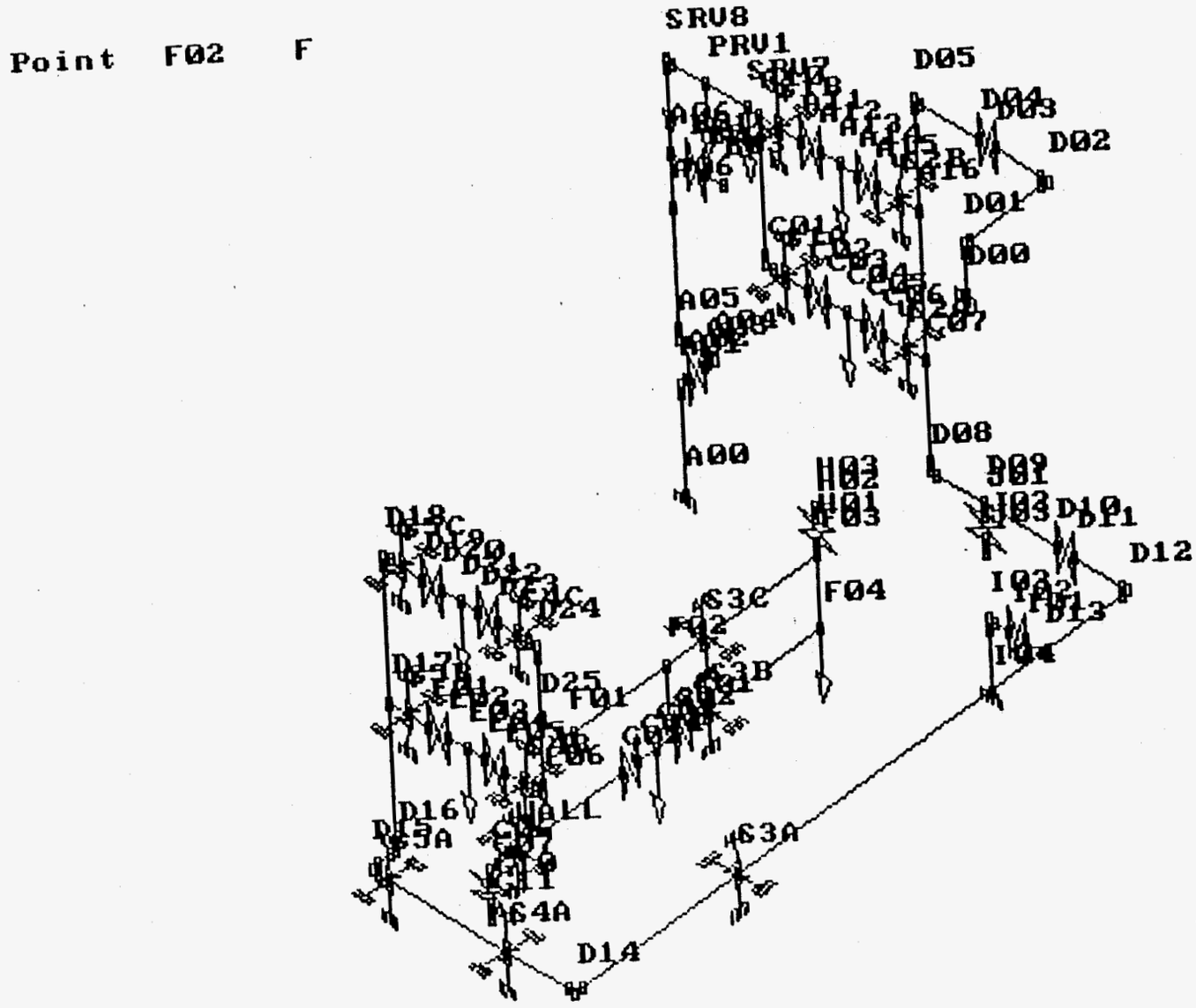
Maximum hoop stress ratio

Point	: A00
Stress psi	: 473
Allowable psi	: 20000
Ratio	: 0.02
Load combination	: Max P

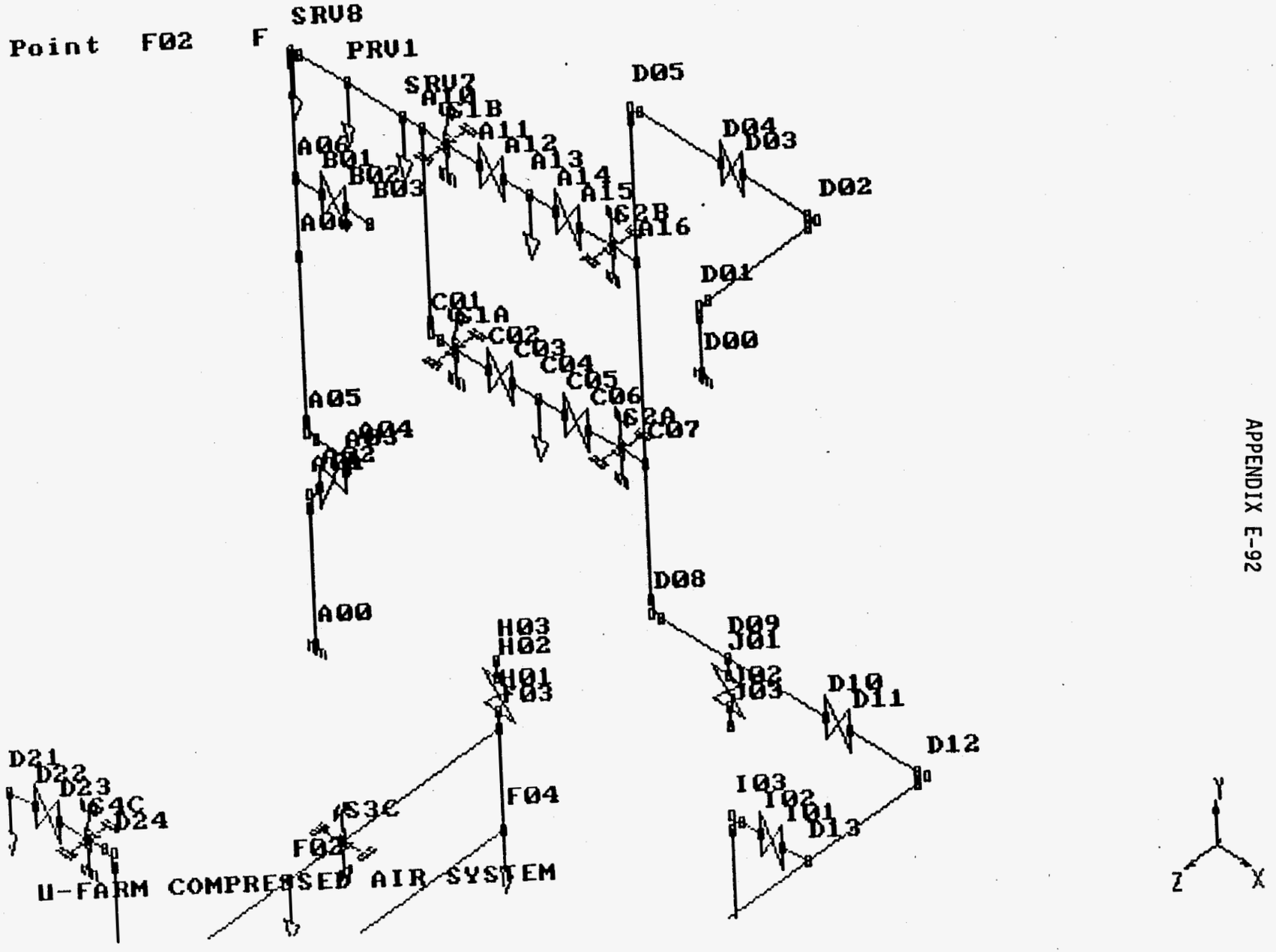
* * * The system satisfies ASME B31.3 code requirements * * *

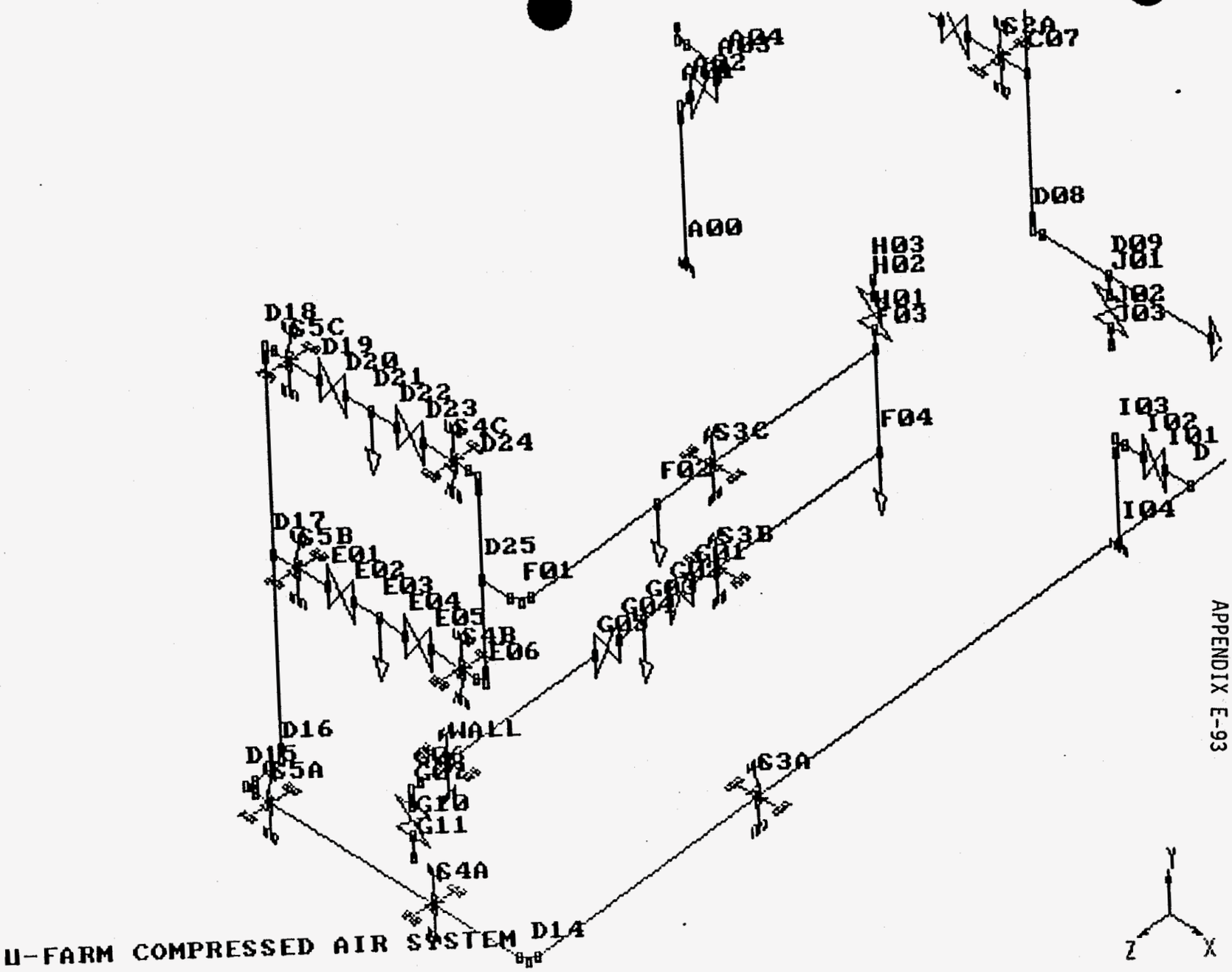
APPENDIX E-

PIPING ISOMETRIC SKETCHES AND AUTOPIPE NODE DIAGRAM

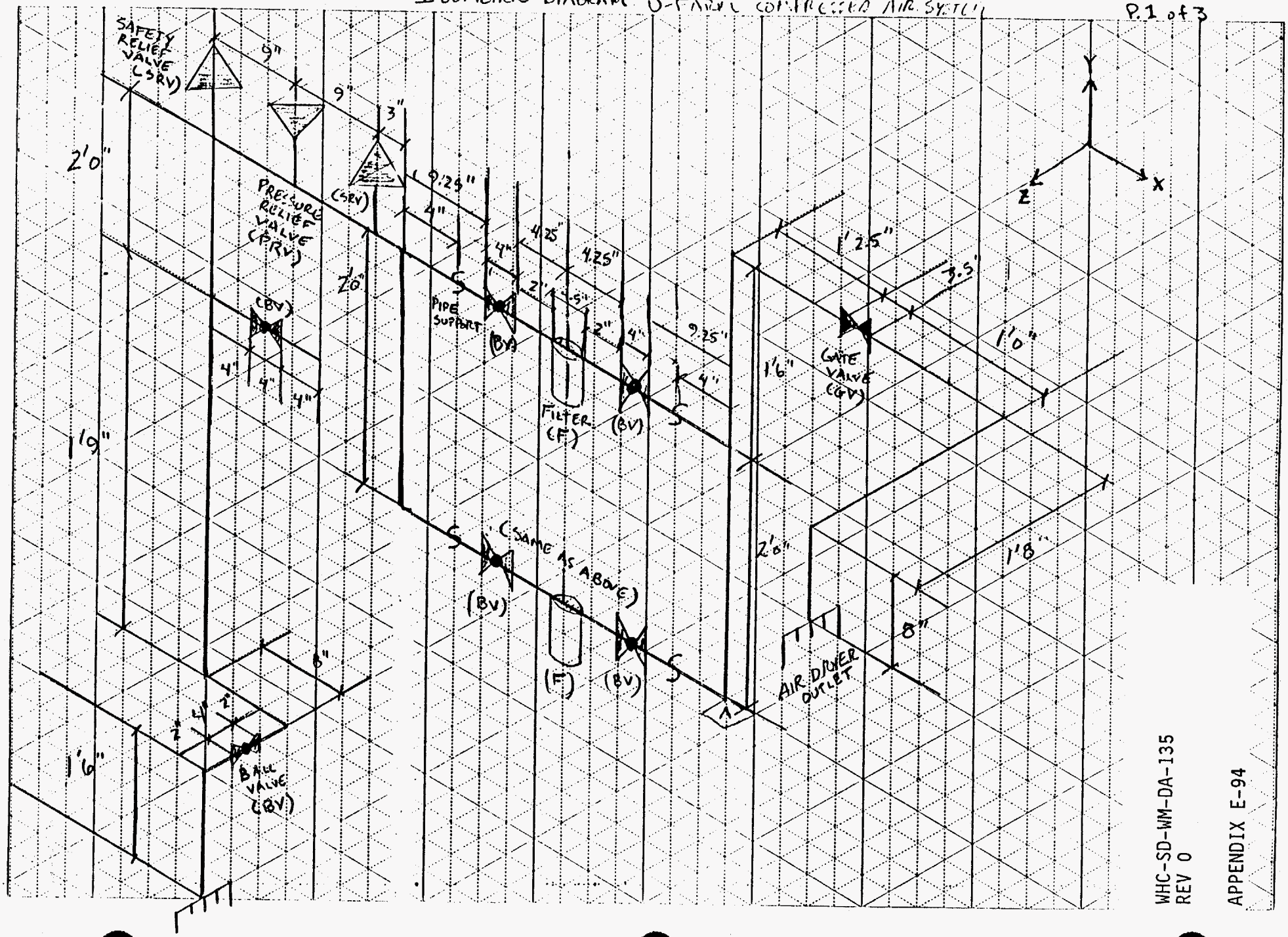


U-FARM COMPRESSED AIR SYSTEM


Point F02 F
SRV8
PRV1
SRV7
A10
S1B
A11
A12
A13
A14
A15
S2B
A16
A06
B01
B02
B03
A06
D05
D04
D03
D02
D01
D00
C01
S1A
C02
C03
C04
C05
C06
S2A
C07
A05
A04
A03
A02
A01
A00
D08
D09
J01
J02
J03
D10
D11
D12
H03
H02
H01
F03
F04
D21
D22
D23
S4C
D24
S3C
F02
I03
I02
I01
D13
U-FARM COMPRESSED AIR SYSTEM
Y
Z
X


A00
A04
A05
C07
D08
D09
J01
J02
J03
H03
H02
H01
F03
F04
D18
S5C
D19
D20
D21
D22
D23
S4C
D24
D25
F01
F02
S3C
S3B
D17
S5B
E01
E02
E03
E04
E05
S4B
E06
D16
D15
S5A
WALL
G10
G11
S4A
S3A
D14
I03
I02
I01
D
I04
U-FARM COMPRESSED AIR SYSTEM
Y
Z
X

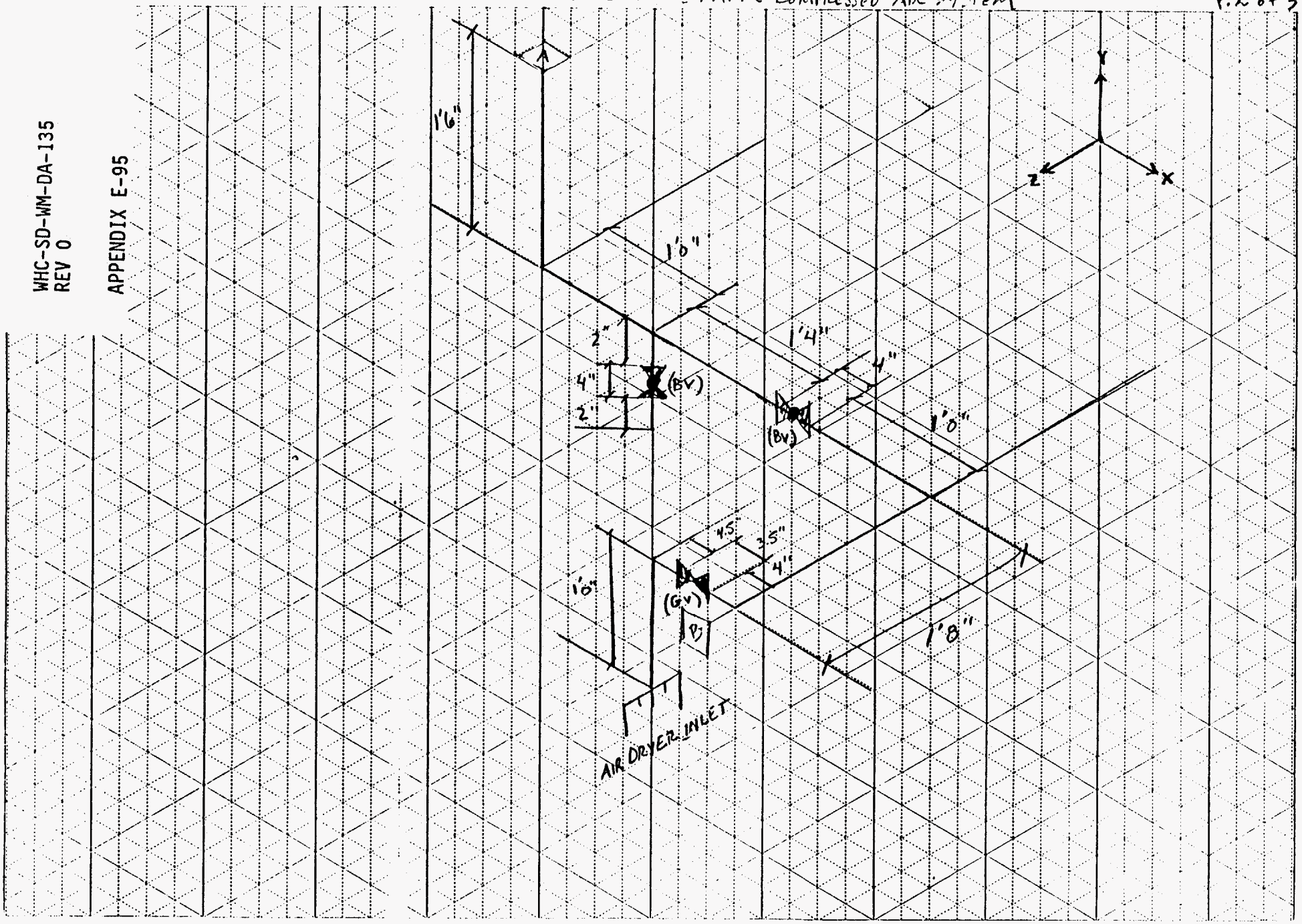
ISOMETRIC DIAGRAM: U-FARM COMPRESSED AIR SYSTEM



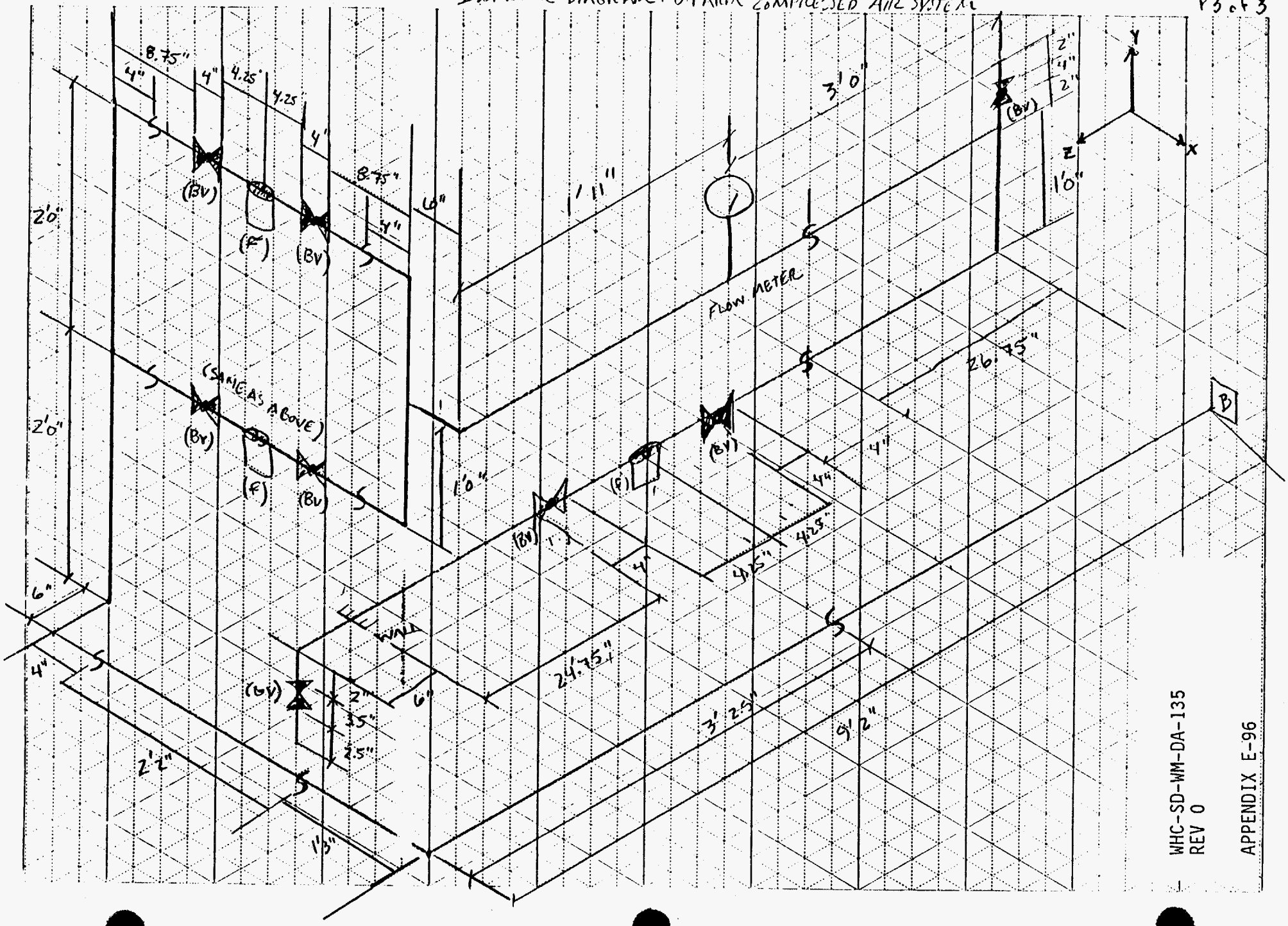
WHC-SD-WM-DA-135
REV 0

APPENDIX E-94

ISOMETRIC DIAGRAM OF FARM COMPRESSED AIR SYSTEM



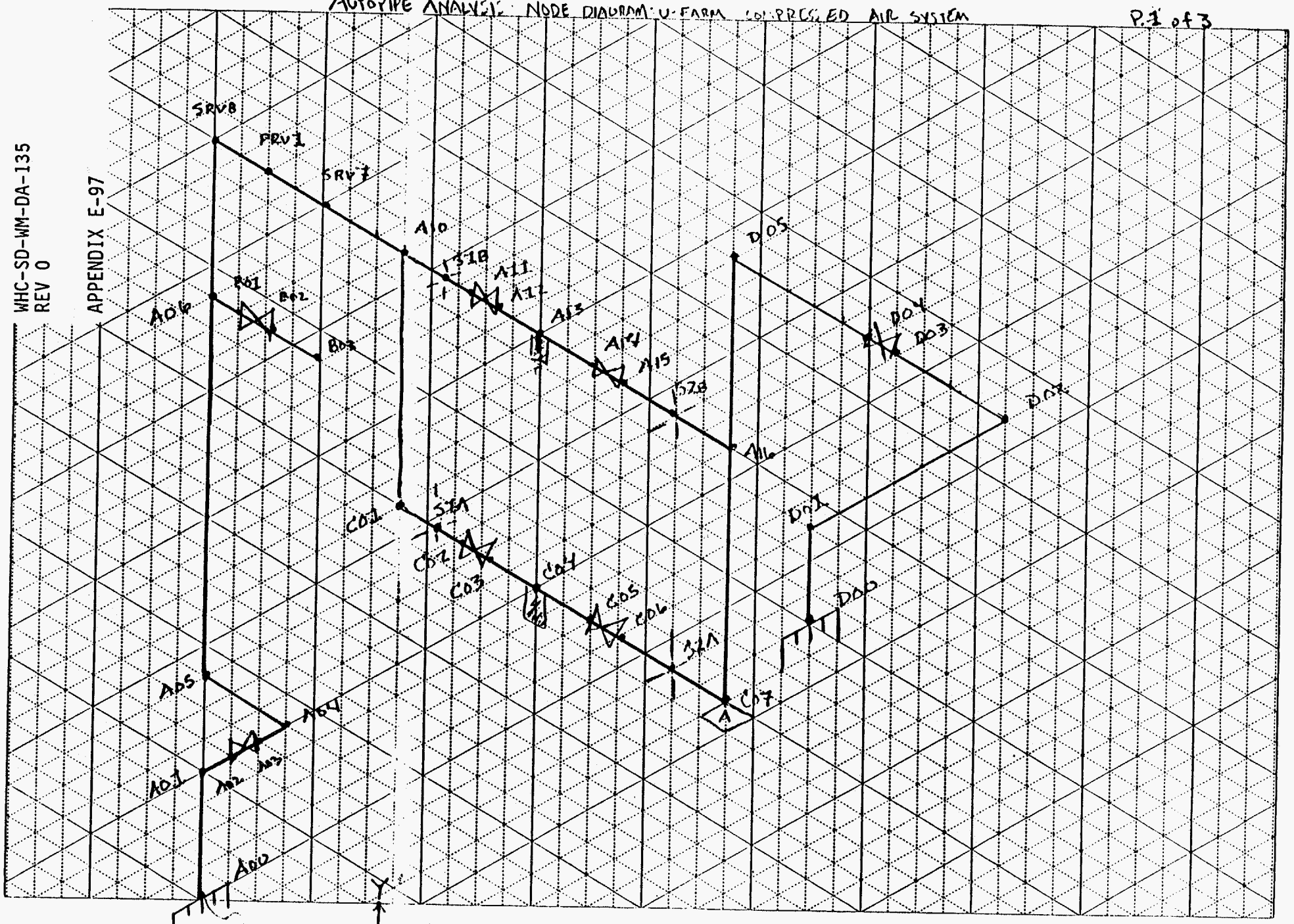
ISOMETRIC DIAGRAM : U-TANK COMPRESSED AIR SYSTEM



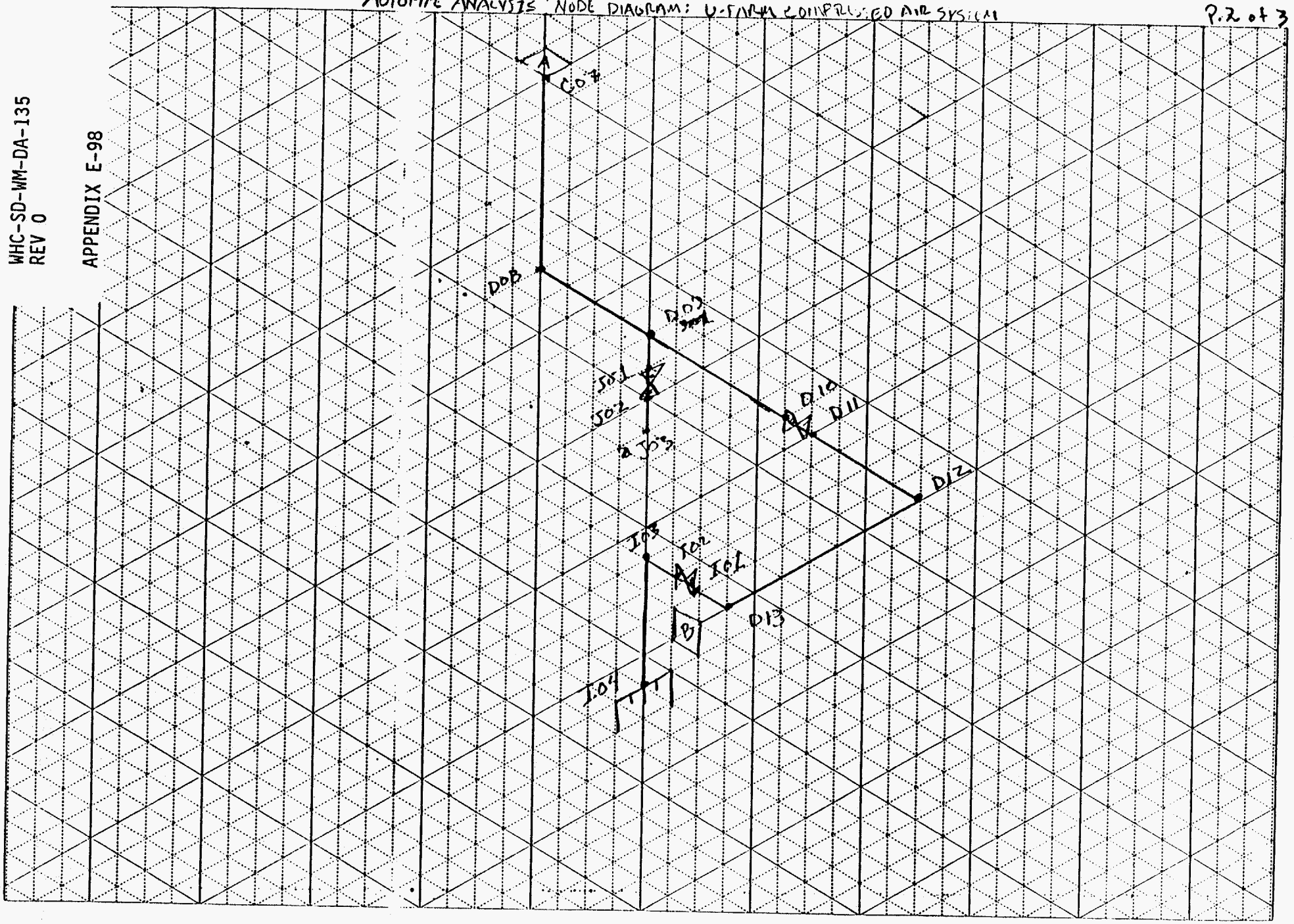
WHC-SD-WM-DA-135
REV 0

APPENDIX E-96

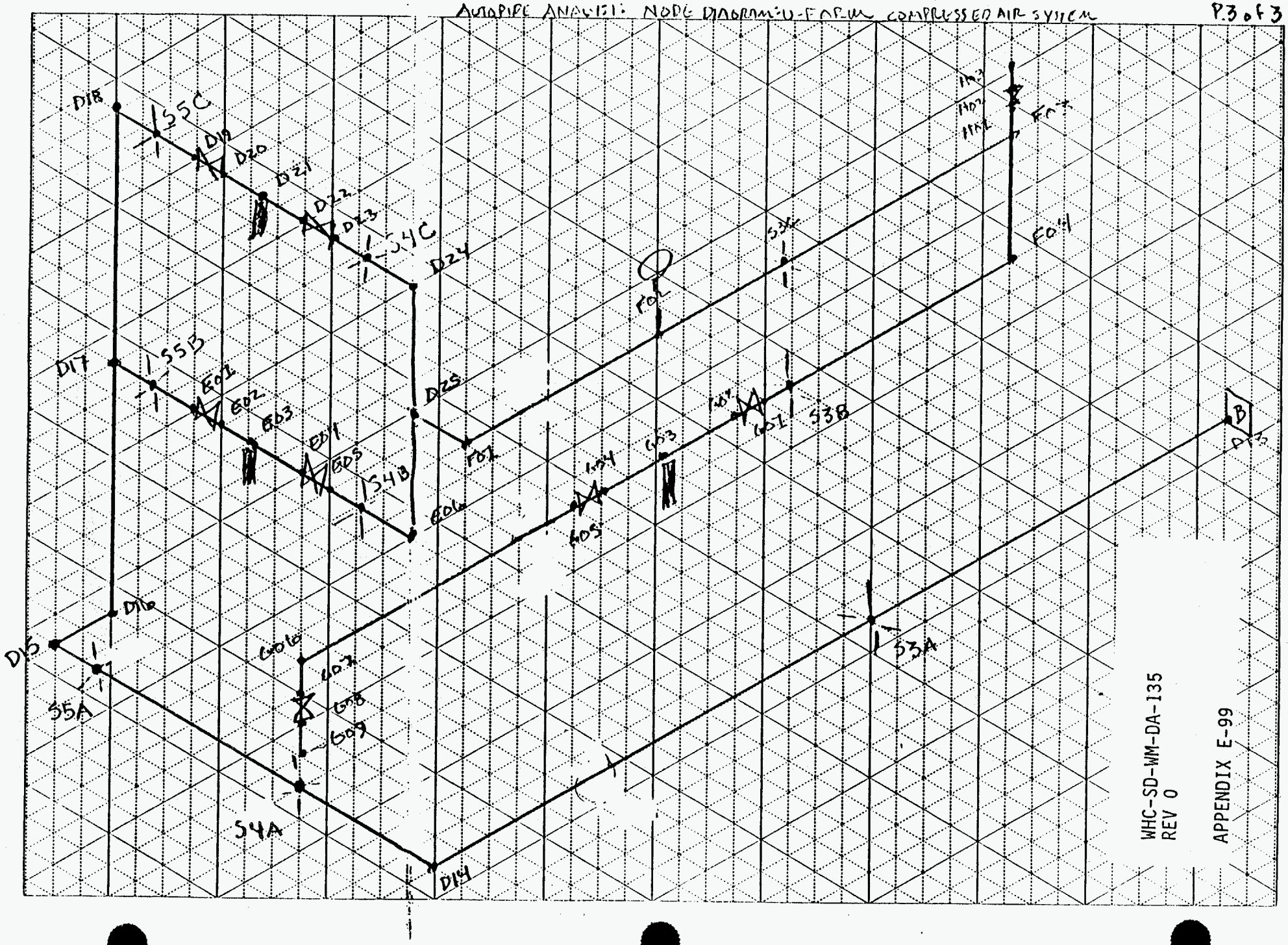
AUTOPIPE ANALYSIS NODE DIAGRAM: U-FARM COMPRESSED AIR SYSTEM



AUTOPIPE ANALYSIS: NODE DIAGRAM: U-FARM COMPRESSED AIR SYSTEM



AUTOPIPE ANALYSIS NODE DIAGRAM U-FAR-W COMPRESSED AIR SYSTEM



APPENDIX E

VENDER DRAWINGS AND DATAS

OPERATING CONDITIONS

Flow: maximum air flow for the various models at 100 psig is indicated in Table 1. To determine maximum air flows at inlet pressures other than 100 psig, multiply flow in Table 1 by multiplier from Table 2 that corresponds to the minimum operating pressure at the inlet of the filter.

EXAMPLE:
Choose a 3100 Series air line filter to handle 550 scfm at 150 psig. From Table 1 pick a T400 with an air flow of 400 scfm @ 100 psig. Multiply 400 scfm by the correction factor 1.43 for 150 psig from Table 2 (400 x 1.43 = 572). A T400 has ample capacity for this requirement.

CAUTION:
Do not select filters by pipe size. Make selection by flow rate and operating pressure only.

Pressure Drop:

Initial pressure drop (dry) is less than 1 psi. As the cartridge collects and coalesces liquid droplets a working pressure drop of 3 to 5 psi will develop. Increases in pressure drop above this point occur as the cartridge is loaded with solid contaminants. It is recommended that filter cartridge(s) be replaced when pressure drop exceeds 10 psi.

OPTIONS

Automatic Drains

Hankison drains automatically discharge liquids collected in the filter sump from the compressed air system. They are available with the drain mechanism mounted internally on smaller models or in their own housings for external mounting on larger models.

Diff

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APPENDIX E-101

The Hankison differential pressure alarm signals both audibly and visually when a 10 psi differential pressure has been reached, indicating the need for cartridge replacement.

Cartridges may be ordered with stainless steel materials for use in systems where corrosive fumes are present in the compressed air system.

TABLE 1
Maximum Air Flow (scfm*) @ 100 psig

MODEL	T20	T40	T100	T200	T300	T400	T850	T1700	T2550	T3400	T4250	T6800	T9350	T11900	T16000
FLOW	20	40	100	200	300	400	850	1700	2550	3400	4250	6800	9350	11900	16000

*Convert scfm to metric units as follows: 1 scfm = 1.736 m^3_n/h

TABLE 2
Air Flow Correction Factor

Minimum inlet pressure (psig)	20	30	40	60	80	100	120	150	200	250	300
Multiplier	0.30	0.39	0.48	0.65	0.82	1.00	1.17	1.43	1.87	2.31	2.74

PHYSICAL DESCRIPTION

Model Number with Manual Drain	Model Number with Internal Auto Drain	Housing Type	Maximum Operating Pressure (psig) with Manual Drain	Maximum Operating Pressure (psig) with Internal Auto Drain	Maximum Operating Temperature	Air Inlet/ Outlet Conn.	Width (Inlet to Outlet) and Height (in.)	Wt. (lb.)	Replacement Filter Cartridge No.	Replacement Filter Cartridge Qty. Reqd.
T20-03F-8P	—	8 oz. polycarbonate (2)	150	—	120°F	3/8" NPTF	3 1/4 x 6 1/4	1 5/8	0731-3	1
T20-03F-16P	T20-03F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	3/8" NPTF	3 1/4 x 10 1/4	2 1/2	0731-3	1
T20-03F-16M	T20-03F-16M-D	16 oz. metal	300	175	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0731-3	1
T20-04F-16P	T20-04F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	1/2" NPTF	3 1/4 x 10 1/4	2 1/2	0731-3	1
T20-04F-16M	T20-04F-16M-D	16 oz. metal	300	175	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0731-3	1
T40-03F-16P	T40-03F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	3/8" NPTF	3 1/4 x 10 1/4	2 1/2	0731-4	1
T40-03F-16M	T40-03F-16M-D	16 oz. metal	300	175	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0731-4	1
T40-04F-16P	T40-04F-16P-D	16 oz. polycarbonate (2)	150	150	120°F	1/2" NPTF	3 1/4 x 10 1/4	2 1/2	0731-4	1
T40-04F-16M-A	T40-04F-16M-D	16 oz. metal	300	175	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0731-4	1
T100-08F-48	T100-08F-48-D	48 oz. metal	300	175	120°F	1" NPTF	4 9/16 x 13 9/16	5 7/8	0731-5	1
T200-12F-100	(1)	100 oz. metal	300	—	120°F	1 1/2" NPTF	5 1/4 x 13 9/16	13 1/4	0731-6	1
T300-12F-205	(1)	205 oz. metal	300	—	120°F	1 1/2" NPTF	5 1/4 x 30 5/8	21	0731-7	1
T400-16M-5L	(1)	5" pressure vessel	300 (3)	300 (3)	120°F	2" NPTM (4)	10 1/4 x 40 7/8	36	0731-8	1
T850-24M-5L	(1)	5" pressure vessel	300 (3)	300 (3)	120°F	3" NPTM (4)	10 1/4 x 40 7/8	37	0731-9	1
T1700-24M-8L	(1)	8" pressure vessel	225 (3)	—	120°F	3" NPTM (4)	16 x 48	86	0731-9	2
T2550-24M-10L	(1)	10" pressure vessel	225 (3)	—	120°F	3" NPTM (4)	16 1/4 x 49	131	0731-9	3
T3400-4FL-12L	(1)	12" pressure vessel	225 (3)	—	120°F	4" flange (5)	20 x 52 1/4	179	0731-9	4
T4250-4FL-12L	(1)	12" pressure vessel	225 (3)	—	120°F	4" flange (5)	20 x 52 1/4	182	0731-9	5
T6800-6FL-16L	(1)	16" pressure vessel	225 (3)	—	120°F	6" flange (5)	24 x 54 5/8	271	0731-9	8
T9350-6FL-20L	(1)	20" pressure vessel	225 (3)	—	120°F	6" flange (5)	28 x 62 9/16	518	0731-9	11
T11900-6FL-20L	(1)	20" pressure vessel	225 (3)	—	120°F	6" flange (5)	28 x 62 9/16	527	0731-9	14
T16000-8FL-24L	(1)	24" pressure vessel	225 (3)	—	120°F	8" flange (5)	33 x 69 1/8	709	0731-9	19

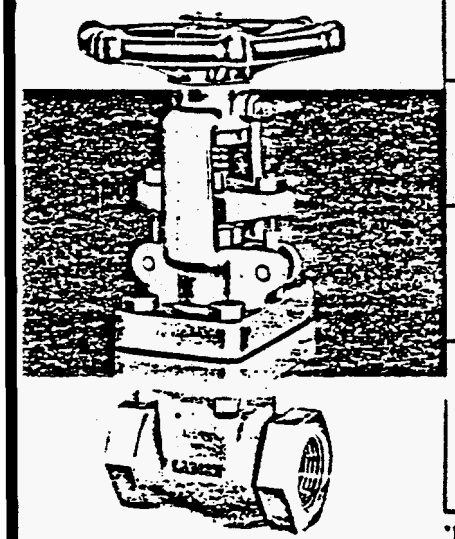
(1) Drain port is provided. Use externally mounted Hankison automatic drain. For models T200 and T300 use a model 504 Snap-Trap® (175 psig MWP); for models T400 thru T2550 a model 505 Trip-L-Trap®; for models T3400 and larger a model 506 Trip-L-Trap®. Models T400 and T850 may also be supplied with an internal drain.
(2) Polycarbonate bowls are furnished with bowl guards. Do not use polycarbonate bowls when synthetic lubricants are present.
(3) Units with higher maximum working pressures are available. Models T1700 and larger are ASME code constructed and stamped.
(4) Flanges and couplings are available.
(5) Optional flange sizes are available.

HANKISON DIVISION OF HANSEN INC.
CANONSBURG, PA 15317 U.S.A. TEL.: (412) 745-1555
PRICE AND ORDERING INFORMATION FROM

HANKISON

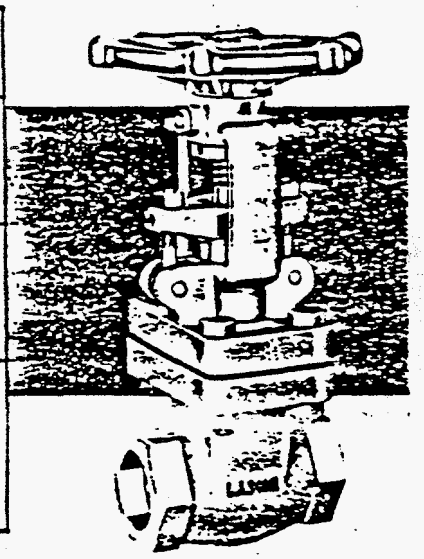
WHC-SD-WM-DA-135
REV 0

APPENDIX E-102



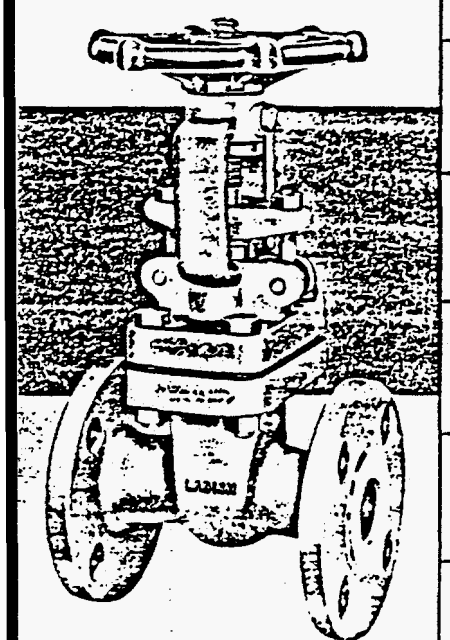
Nominal Pipe Size	End-to-End A	Open Height D	Handwheel Diameter H	Weight
1/4	2 1/4	6 3/8	2	3
3/8	2 1/4*	7 1/4	2	3
1/2	2 3/4	8	3 1/2	5
3/4	2 7/8	8	3 1/2	5
1	3 1/2*	9 1/2	4 7/8	8
1 1/4	4	10 1/4	4 7/8	11
1 1/2	4 1/4	12	6 1/2	16
2	5	15 3/8	6 1/2	22
2 1/2	5 3/4	15 3/4	7 1/2	32
3	6 3/4	19 1/4	7 1/2	46

*No. 8270 and No. 8271 dimensions are 2 7/8.



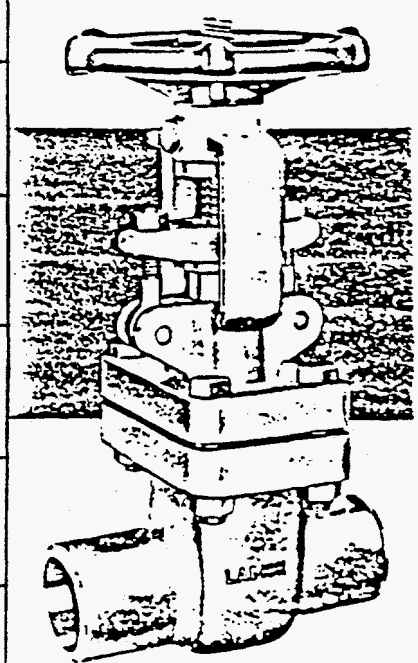
THREADED END
No. 8270 — Split Wedge Disc
No. 8273 — Solid Wedge Disc

SOCKET WELD END
No. 8271 — Split Wedge Disc
No. 8274 — Solid Wedge Disc



Nominal Pipe Size	End-to-End A		Open Height D	Handwheel Diameter H	Weight	
	Flanged	Butt Weld			Flanged	Butt Weld
1/4	4	—	6 3/4	2	4	—
3/8	4	—	6 3/4	2	4	—
1/2	4 1/4	4 1/4	8 1/4	3 1/2	7	5
3/4	4 5/8	4 5/8	8 1/4	3 1/2	7	6
1	5	5	9 3/4	4 7/8	11	8
1 1/4	5 1/2	—	10 1/2	4 7/8	15	—
1 1/2	6 1/2	6 1/2	12 1/2	6 1/2	24	17
2	7	8 1/2	15 3/8	6 1/2	31	24
2 1/2	7 1/2	9 1/2	15 5/8	7 1/2	48	36
3	8	11 1/8	19 1/4	7 1/2	59	51
4	9	12	23 3/8	9	92	72
6	10 1/2	15 7/8	29 3/8	11	164	140
8	11 1/2	16 1/2	40 3/8	13 1/2	305	240
10	13	18	48	16	480	400
12	14	19 3/4	56	19	700	615
14**	15	—	66 3/4	23 1/2	886	—
16**	16	—	75	23 1/2	1250	—
18**	17	—	84 1/2	28	1620	—
20**	18	—	93 1/4	28	2040	—

**Available in No. 8275 only.



FLANGED END
No. 8272 — Split Wedge Disc
No. 8275 — Solid Wedge Disc

BUTT WELD END
No. 8276 — Split Wedge Disc
No. 8279 — Solid Wedge Disc

BALL VALVES

Engineering Data

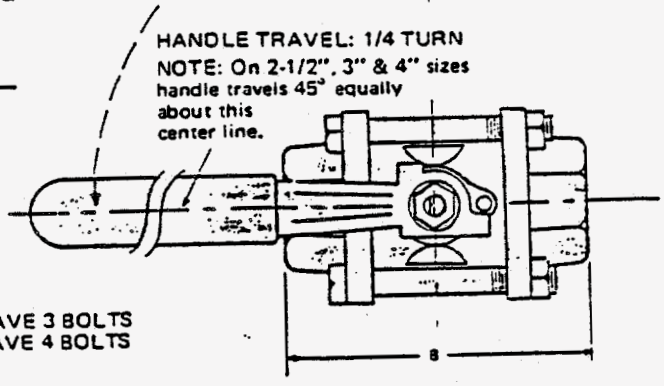
Dimensions for SP SERIES

...e NPT • Socket Weld

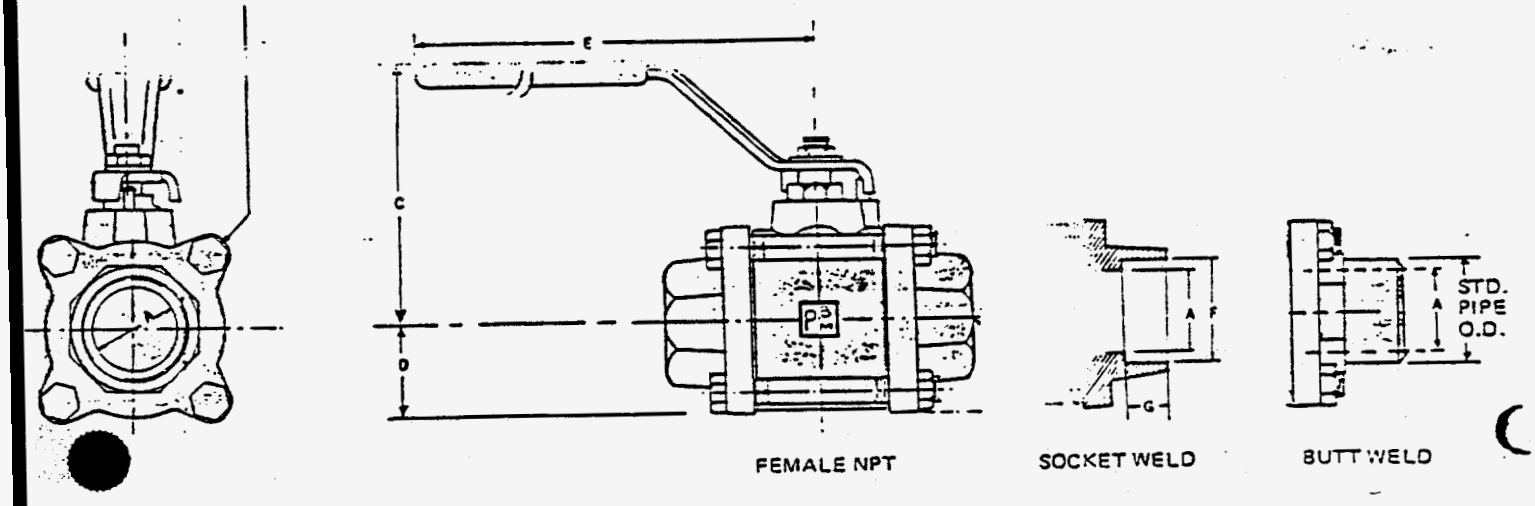
...4" thru 4"

Butt Weld

½" thru 4"



..., 3/8", 1/2", 3/4" & 1" VALVES HAVE 3 BOLTS
...4", 1-1/2", 2" & 2-1/2" VALVES HAVE 4 BOLTS
...VALVES HAVE 6 BOLTS
...VALVES HAVE 8 BOLTS



FEMALE NPT | SOCKET WELD | BUTT WELD

PIPE SIZE (Inch)	FEMALE NPT A Port Dia.	B Length	C Height	D Height	E Handles	SOCKET WELD F Dia.	G Depth	APPROX. WT. (LBS.) Bronze	Weldex	S/S	AL	C/S	Alloy 20
1/4"	5/8"	3-1/8"	2-1/8"	1-3/8"	3-3/4"	.555"	13/16"	2	1-1/2	1-3/4	3/4	1-3/4	1-3/4
3/8"	5/8"	3-1/8"	2-1/8"	1-3/8"	3-3/4"	.690"	13/16"	2	1-1/2	1-3/4	3/4	1-3/4	1-3/4
1/2"	5/8"	3-1/8"	2-1/8"	1-3/8"	3-3/4"	.855"	13/16"	2	1-1/2	1-3/4	3/4	1-3/4	1-3/4
3/4"	13/16"	3-3/8"	2-1/4"	1-1/2"	3-3/4"	1.065"	13/16"	2-1/4	1-3/4	2-1/4	3/4	2-1/4	2-1/4
1"	1"	3-7/8"	2-3/4"	1-3/4"	4-5/16"	1.330"	15/16"	3-3/4	3	3-1/2	1-1/4	3-1/2	3-1/2
1-1/4"	1-1/4"	5"	3"	1-5/8"	5-1/2"	1.675"	1-1/8"	7-1/2	6-1/4	7-1/4	2-1/2	7-1/4	7-1/4
1-1/2"	1-1/2"	5-3/8"	4"	1-3/4"	5-1/2"	1.915"	1-5/32"	9-1/2	8	9	3	9	9
2"	1-15/16"	5-3/4"	4-1/8"	2-1/16"	5-1/2"	2.406"	1-1/8"	12-3/4	11-1/2	12-1/2	4	12-1/2	12-1/2
2-1/2"	2-1/2"	9"	5-3/8"	2-3/4"	12"	2.940"	1-9/16"	31-1/2			10		
3"	2-3/4"	9"	7"	3-7/8"	12"	3.535"	1-7/8"	50	45	48	16	48	48
4"	3-1/2"	10-1/2"	9"	5"	12"	4.545"	2-1/8"	82	75	72	26	72	72

(NOTE: Male NPT, Solder-Joint, T-Klamp, Cherry Burrell, Sil-Braze, and Grooved Ends are available in certain sizes and metals. Call or write us for data.)

PIPE SIZE (Inch)	BUTT WELD A Port Dia.	B Length	C Height	D Height	E Handle	APPROX. WT. (LBS.) Weldex	S/S	AL	C/S
1/2"	5/8"	3-3/8"	2-1/8"	1-3/8"	4-7/8"	1-3/4	2	3/4	2
3/4"	13/16"	4"	2-1/4"	1-1/2"	4-7/8"	2	2-1/2	1	2-1/2
1"	1"	3-7/8"	2-3/4"	1-3/4"	4-7/8"	3-1/4	3-3/4	1-1/2	3-3/4
[illegible]	1-1/2"	6-1/8"	4"	1-3/4"	5-1/2"	8-1/2	9-1/2	3-1/4	9-1/2
	1-15/16"	6-5/8"	4-1/8"	2-1/16"	5-1/2"	12	13	4-1/4	13
	2-3/4"	8-1/2"	7"	3-7/8"	10"	45-1/2	48-1/2	16	48-1/2
4"	3-1/2"	10-1/2"	9"	5"	10"	76	73	26-1/2	73

Sch 40 dimensions shown. Sch 10 and Sch 5 Butt Weld Ends also available.

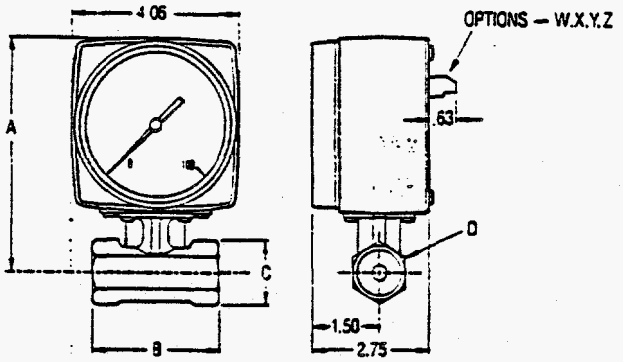
RCM

APPENDIX E-104

FLO-GAGE/ DIRECT READING FLOWMETERS

SERIES 7000

DIMENSIONAL DIAGRAM



Body Size (IPS)	Dimensions (inches)				Net Weight (Lbs)
	A	B	C	D	
¼	4.75	3.06	1.06	1.06 Sq.	3.5
½	4.75	3.06	1.06	1.06 Sq.	3.5
¾	5.50	3.06	1.50	1.25 Hex	3.6
1	5.62	3.06	1.75	1.50 Hex	3.8
1½	5.94	3.06	2.50	2.12 Hex	4.5
2	6.35	3.19	3.19	2.75 Hex	6.1

ORDERING INFORMATION

Order Series 7000 Flo-Gages by a.) body size, b.) series no., c.) material for wetted parts, d.) direction of flow, e.) full scale flow rate, and f.) options (if required):

Example: ¾-71-R-20-AD is the catalog no. for a ¾" NPT Series 7000 Flo-Gage of bronze construction, flow direction from left to right, flow rating of 20 GPM (full scale), equipped with optional seals of Viton and optional gasketed case.

Example: ¾" - 7 1 - R - 20 - AD
a b c d e f

a) BODY SIZE (NPTF connections):
¼", ½", ¾", 1", 1½", 2"

b) SERIES 7000 FLO-GAGE

c) MATERIAL FOR WETTED PARTS:
1 = Bronze (standard)
2 = Monel
3 = Series 300 Stainless Steel

d) FLOW DIRECTION:
R = Horizontal, flow to right
L = Horizontal, flow to left
VUR = Vertical, flow up, dial at right
VDR = Vertical, flow down, dial at right
VUL = Vertical, flow up, dial at left
VDL = Vertical, flow down, dial at left

e) FLOW RATES:
Select from "STANDARD FLOW RATES and BODY SIZES" table.
Specify GPM by full scale ratings from Chart A.
Specify metric scales (LPM) by full scale ratings from Chart B, preceded by "M" (e.g. M40 for 40 LPM).
Specify compressed gas ratings (SCFM) by full scale ratings from Chart C. Add "I" to designate compressed gas option.
Specify optional low flow rates from charts D, E, or F. Add "ES" to designate low flow rate. Add "ES" and "I" for Chart F.

f) OPTIONS (if required):
A = Viton seals
B = Customer-specified seals
C = Calibration for specific gravity
D = Gasketed case
E = Non-standard flow rate
F = Low flow rate
G = Custom scales and dials
H = 400 psig service
I = Compressed gas service
N = Ammonia service
T = 350° service rating
V = Calibration for high viscosity
W = 4-20 mA dc
X = Hi/Lo alarm relays
Y = 1000 Hz full scale frequency
Z = Combination of options W, X, Y

STANDARD FLOW RATES and BODY SIZES

Body Size (IPS)	Chart A: Gallons Per Minute (GPM)												
	2	3	4	6	10	15	20	30	40	60	100	150	200
¼"	•	•	•										
½"	•	•	•	•	•								
¾"				•	•	•	•						
1"						•	•	•	•				
1½"								•	•	•	•		
2"									•	•	•	•	•

Body Size (IPS)	Chart B: Liters Per Minute (LPM)											
	8	15	25	40	60	80	120	150	240	400	600	800
¼"	•	•										
½"	•	•	•	•								
¾"			•	•	•	•						
1"					•	•	•	•				
1½"							•	•	•	•		
2"								•	•	•	•	•

Body Size (IPS)	Chart C: Std. Cubic Feet Per Minute (SCFM)											
	10	20	30	40	60	100	150	200	300	400	600	800	1000
¼"	•	•	•										
½"	•	•	•	•	•								
¾"				•	•	•	•	•					
1"						•	•	•	•	•			
1½"								•	•	•	•	•	
2"									•	•	•	•	•

• in charts above indicate the various full scale flow rates available as standard for each body size

OPTIONAL LOW FLOW RATES (OPTION ES)

Body Size (IPS) ½"	Chart D: Gallons Per Hour (GPH)								
	4	6	10	15	20	30	40	60	100

Body Size (IPS) ½"	Chart E: Cubic Centimeters Per Minute (CCPM)							
	200	300	400	600	1000	2000	3000	4000	6000

Body Size (IPS) ½"	Chart F: Std. Cubic Feet Per Hour (SCFH)						
	40	60	100	150	200	300	400

P.O. Box 6554 · Concord, CA 94524-6554 · Tel: (415) 687-8363 · Fax (415) 671-9636

OPERATING CONDITIONS

Flow: maximum air flow for the various models at 100 psig is indicated in Table 1. To determine maximum air flows at inlet pressures other than 100 psig, multiply flow from Table 1 by multiplier from Table 2 that corresponds to the minimum operating pressure at the inlet of the filter.

EXAMPLE:
Choose a 3100 Series air line filter to handle 550 scfm at 150 psig. From Table 1 pick a T400 with an air flow of 400 scfm @ 100 psig. Multiply 400 scfm by the correction factor 1.43 for 150 psig from Table 2 (400 x 1.43 = 572). A T400 has ample capacity for this requirement.

CAUTION:
Do not select filters by pipe size. Make selection by flow rate and operating pressure only.

Pressure Drop:

Initial pressure drop (dry) is less than 1 psi. As the cartridge collects and coalesces liquid droplets a working pressure drop of 3 to 5 psi will develop. Increases in pressure drop above this point occur as the cartridge is loaded with solid contaminants. It is recommended that filter cartridge(s) be replaced when pressure drop exceeds 10 psi.

OPTIONS

Automatic Drains

Hankison drains automatically discharge liquids collected in the filter sump from the compressed air system. They are available with the drain mechanism mounted internally on smaller models or in their own housings for external mounting on larger models.

Differential Pressure Alarms

(Optional on models T20 thru T850; standard on models T1700 and larger.) The Hankison differential pressure alarm signals both audibly and visually when a 10 psi differential pressure has been reached, indicating the need for cartridge replacement.

Cartridges may be ordered with stainless steel materials for use in systems where corrosive fumes are present in the compressed air system.

TABLE 1
Maximum Air Flow (scfm*) @ 100 psig

MODEL	T20	T40	T100	T200	T300	T400	T850	T1700	T2550	T3400	T4250	T6800	T9350	T11900	T16000
FLOW	20	40	100	200	300	400	850	1700	2550	3400	4250	6800	9350	11900	16000

*Convert scfm to metric units as follows: 1 scfm = 1.736 m^3/h

TABLE 2
Air Flow Correction Factor

Minimum inlet pressure (psig)	20	30	40	50	80	100	120	150	200	250	300
Multiplier :	0.30	0.39	0.48	0.65	0.82	1.00	1.17	1.43	1.87	2.31	2.74

PHYSICAL DESCRIPTION

Model Number		Housing Type	Maximum Operating Pressure (psig)		Maximum Operating Temperature	Air Inlet/ Outlet Conn.	Width (Inlet to Outlet) and Height (in.)	Wt. (lb.)	Replacement Filter Cartridge	
with Manual Drain	with Internal Auto Drain		with Manual Drain	with Internal Auto Drain					No.	Qty. Reqd.
T20-03F-8P	—	8 oz. polycarbonate (2)	150	—	120°F	3/8" NPTF	3 1/4 x 6 1/4	1 5.8	0731-3	1
T20-03F-16P	T20-03F-16P-O	16 oz. polycarbonate (2)	150	150	120°F	3/8" NPTF	3 1/4 x 10 1/4	2 1/2	0731-3	1
T20-03F-16M	T20-03F-16M-O	16 oz. metal	300	175	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0731-3	1
T20-04F-16P	T20-04F-16P-O	16 oz. polycarbonate (2)	150	150	120°F	1/2" NPTF	3 1/4 x 10 1/4	2 1/2	0731-3	1
T20-04F-16M	T20-04F-16M-O	16 oz. metal	300	175	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0731-3	1
T40-03F-16P	T40-03F-16P-O	16 oz. polycarbonate (2)	150	150	120°F	3/8" NPTF	3 1/4 x 10 1/4	2 1/2	0731-4	1
T40-03F-16M	T40-03F-16M-O	16 oz. metal	300	175	120°F	3/8" NPTF	3 1/4 x 9 7/8	3 1/8	0731-4	1
T40-04F-16P	T40-04F-16P-O	16 oz. polycarbonate (2)	150	150	120°F	1/2" NPTF	3 1/4 x 10 1/4	2 1/2	0731-4	1
T40-04F-16M-A	T40-04F-16M-O	16 oz. metal	300	175	120°F	1/2" NPTF	3 1/4 x 9 7/8	3 1/8	0731-4	1
T100-08F-48	T100-08F-48-O	48 oz. metal	300	175	120°F	1" NPTF	4 9/16 x 13 9/16	5 7/8	0731-5	1
T200-12F-100	(1)	100 oz. metal	300	—	120°F	1 1/2" NPTF	5 1/4 x 13 9/16	13 1/4	0731-6	1
T300-12F-205	(1)	205 oz. metal	300	—	120°F	1 1/2" NPTF	5 1/4 x 30 5/8	21	0731-7	1
T400-16M-5L	(1)	5" pressure vessel	300 (3)	300 (3)	120°F	2" NPTM (4)	10 1/4 x 40 7/8	36	0731-8	1
T850-24M-5L	(1)	5" pressure vessel	300 (3)	300 (3)	120°F	3" NPTM (4)	10 1/4 x 40 7/8	37	0731-9	1
T1700-24M-8L	(1)	8" pressure vessel	225 (3)	—	120°F	3" NPTM (4)	16 x 48	86	0731-9	2
T2550-24M-10L	(1)	10" pressure vessel	225 (3)	—	120°F	3" NPTM (4)	18 1/4 x 49	131	0731-9	3
T3400-4FL-12L	(1)	12" pressure vessel	225 (3)	—	120°F	4" flange (5)	20 x 52 1/4	179	0731-9	4
T4250-4FL-12L	(1)	12" pressure vessel	225 (3)	—	120°F	4" flange (5)	20 x 52 1/4	182	0731-9	5
T6800-6FL-16L	(1)	16" pressure vessel	225 (3)	—	120°F	6" flange (5)	24 x 54 5/8	271	0731-9	8
T9350-6FL-20L	(1)	20" pressure vessel	225 (3)	—	120°F	6" flange (5)	28 x 62 9/16	518	0731-9	11
T11900-6FL-20L	(1)	20" pressure vessel	225 (3)	—	120°F	6" flange (5)	28 x 62 9/16	527	0731-9	14
T16000-8FL-24L	(1)	24" pressure vessel	225 (3)	—	120°F	8" flange (5)	33 x 69 1/8	709	0731-9	19

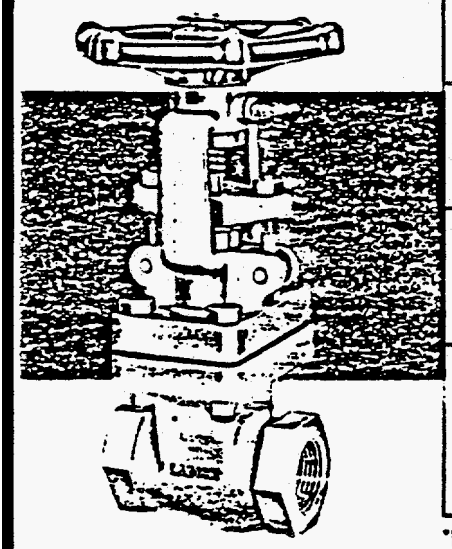
(1) Drain port is provided. Use externally mounted Hankison automatic drain. For models T200 and T300 use a model 504 Snap-Trap® (175 psig MWP); for models T400 thru T2550 a model 505 Trip-L-Trap®; for models T3400 and larger a model 506 Trip-L-Trap®. Models T400 and T850 may also be supplied with an internal drain.
(2) Polycarbonate bowls are furnished with bowl guards. Do not use polycarbonate bowls when synthetic lubricants are present.
(3) Units with higher maximum working pressures are available. Models T1700 and larger are ASME code constructed and stamped.
(4) Flanges and couplings are available.
(5) Optional flange sizes are available.

HANKISON DIVISION OF HANSEN INC.
CANONSBURG, PA 15317 U.S.A. TEL.: (412) 745-1555
PRICE AND ORDERING INFORMATION FROM

HANKISON

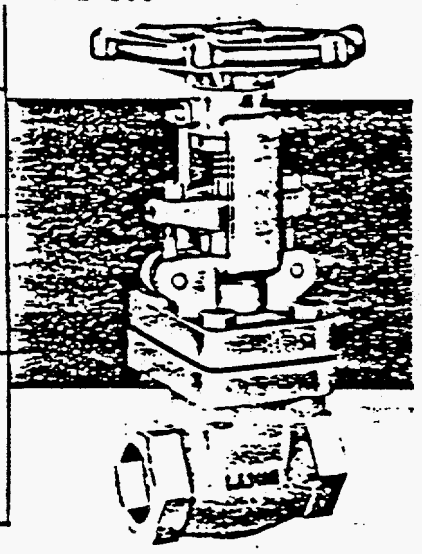
WHC-SD-WM-DA-135
REV 0

APPENDIX E-106



Nominal Pipe Size	End-to-End A	Open Height D	Handwheel Diameter H	Weight
1/4	2 1/4	6 3/8	2	3
3/8	2 1/4*	7 1/4	2	3
1/2	2 3/4	8	3 1/2	5
3/4	2 7/8	8	3 1/2	5
1	3 1/2*	9 1/2	4 7/8	8
1 1/4	4	10 1/4	4 7/8	11
1 1/2	4 1/4	12	6 1/2	16
2	5	13 5/8	6 1/2	22
2 1/2	5 3/4	15 3/4	7 1/2	32
3	6 3/4	19 1/4	7 1/2	46

*No. 8270 and No. 8271 dimensions are 2 7/8.



THREADED END
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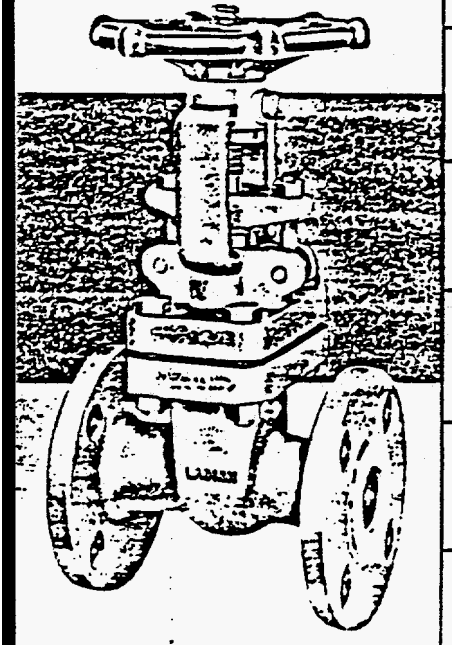
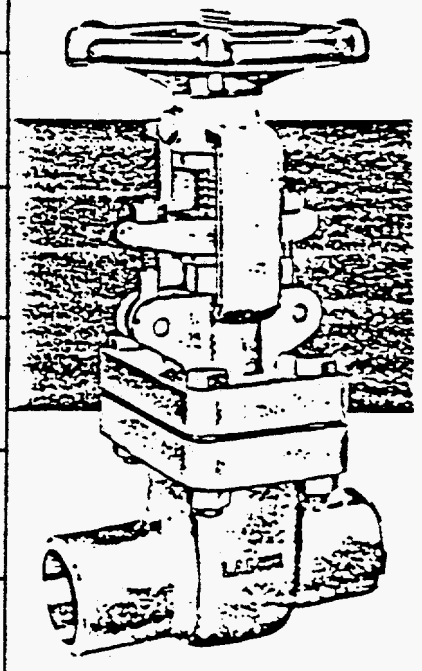
SOCKET WELD END
No. 8271 — Split Wedge Disc
No. 8274 — Solid Wedge Disc



Nominal Pipe Size	End-to-End A		Open Height D	Handwheel Diameter H	Weight	
	Flanged	Butt Weld			Flanged	Butt Weld
1/4	4	—	6 3/4	2	4	—
3/8	4	—	6 3/4	2	4	—
1/2	4 1/4	4 1/4	8 1/4	3 1/2	7	5
3/4	4 5/8	4 5/8	8 1/4	3 1/2	7	6
1	5	5	9 3/4	4 7/8	11	8
1 1/4	5 1/2	—	10 1/2	4 7/8	15	—
1 1/2	6 1/2	6 1/2	12 1/2	6 1/2	24	17
2	7	8 1/2	15 3/8	6 1/2	31	24
2 1/2	7 1/2	9 1/2	15 5/8	7 1/2	48	36
3	8	11 1/8	19 1/4	7 1/2	59	51
4	9	12	23 3/8	9	92	72
6	10 1/2	15 7/8	29 3/8	11	164	140
8	11 1/2	16 1/2	40 3/8	13 1/2	305	240
10	13	18	48	16	480	400
12	14	19 3/4	56	19	700	615
14**	15	—	66 3/4	23 1/2	886	—
16**	16	—	75	23 1/2	1250	—
18**	17	—	84 1/2	28	1620	—
20**	18	—	93 1/4	28	2040	—

**Available in No. 8275 only.



FLANGED END
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BALL VALVES

Engineering Data

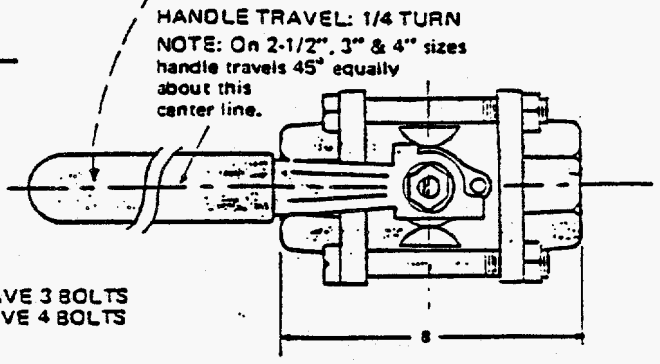
Dimensions for SP SERIES

ale NPT • Socket Weld

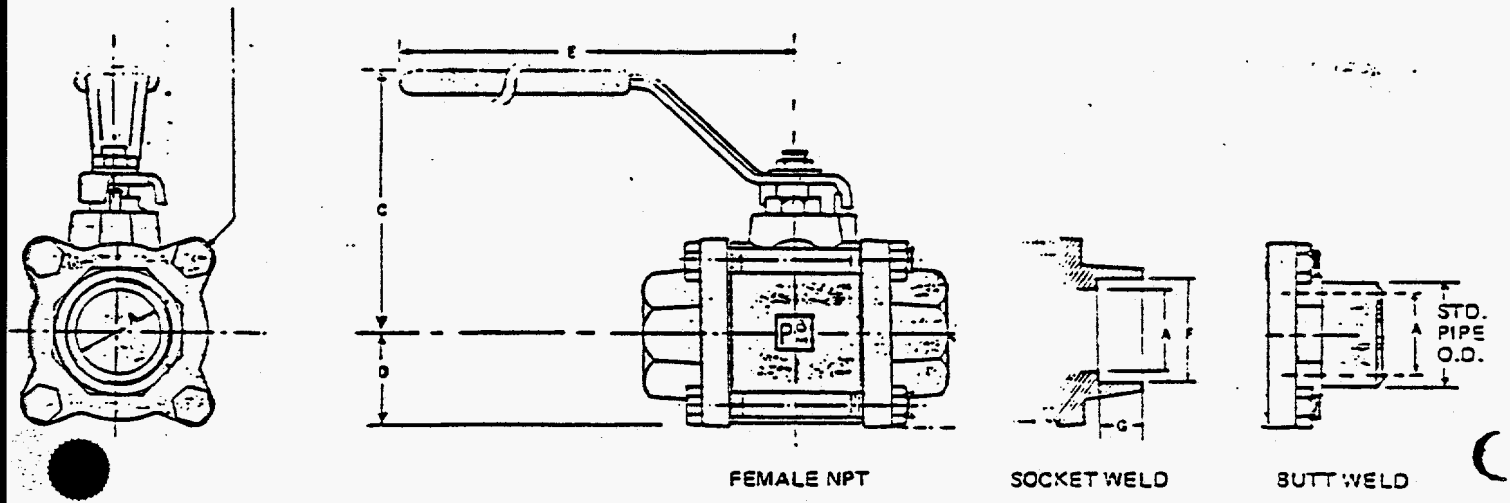
4" thru 4"

Butt Weld

½" thru 4"



, 3/8", 1/2", 3/4" & 1" VALVES HAVE 3 BOLTS
", 1-1/2", 2" & 2-1/2" VALVES HAVE 4 BOLTS
ALVES HAVE 6 BOLTS
ALVES HAVE 8 BOLTS



FEMALE NPT SOCKET WELD BUTT WELD

PIPE SIZE (Inch)	FEMALE NPT					SOCKET WELD		APPROX. WT. (LBS.)					
	A Port Dia.	B Length	C Height	D Height	E Handles	F Dia.	G Depth	Bronze	Weldex	S/S	AL	C/S	Alloy 20
1/4"	5/8"	3-1/8"	2-1/8"	1-3/8"	3-3/4"	.555"	13/16"	2	1-1/2	1-3/4	3/4	1-3/4	1-3/4
3/8"	5/8"	3-1/8"	2-1/8"	1-3/8"	3-3/4"	.690"	13/16"	2	1-1/2	1-3/4	3/4	1-3/4	1-3/4
1/2"	5/8"	3-1/8"	2-1/8"	1-3/8"	3-3/4"	.855"	13/16"	2	1-1/2	1-3/4	3/4	1-3/4	1-3/4
3/4"	13/16"	3-3/8"	2-1/4"	1-1/2"	3-3/4"	1.065"	13/16"	2-1/4	1-3/4	2-1/4	3/4	2-1/4	2-1/4
1"	1"	3-7/8"	2-3/4"	1-3/4"	4-5/16"	1.330"	15/16"	3-3/4	3	3-1/2	1-1/4	3-1/2	3-1/2
1-1/4"	1-1/4"	5"	3"	1-5/8"	5-1/2"	1.675"	1-1/8"	7-1/2	6-1/4	7-1/4	2-1/2	7-1/4	7-1/4
1-1/2"	1-1/2"	5-3/8"	4"	1-3/4"	5-1/2"	1.915"	1-5/32"	9-1/2	8	9	3	9	9
2"	1-15/16"	5-3/4"	4-1/8"	2-1/16"	5-1/2"	2.406"	1-1/8"	12-3/4	11-1/2	12-1/2	4	12-1/2	12-1/2
2-1/2"	2-1/2"	9"	5-3/8"	2-3/4"	12"	2.940"	1-9/16"	31-1/2			10		
3"	2-3/4"	9"	7"	3-7/8"	12"	3.535"	1-7/8"	50	45	48	16	48	48
4"	3-1/2"	10-1/2"	9"	5"	12"	4.545"	2-1/8"	82	75	72	26	72	72

(NOTE: Male NPT, Solder-Joint, T-Klamp, Cherry Burrell, Sil-Braze, and Grooved Ends are available in certain sizes and metals. Call or write us for data.)

PIPE SIZE (Inch)	BUTT WELD					APPROX. WT. (LBS.)			
	A Port Dia.	B Length	C Height	D Height	E Handle	Weldex	S/S	AL	C/S
1/2"	5/8"	3-3/8"	2-1/8"	1-3/8"	4-7/8"	1-3/4	2	3/4	2
3/4"	13/16"	4"	2-1/4"	1-1/2"	4-7/8"	2	2-1/2	1	2-1/2
1"	1"	3-7/8"	2-3/4"	1-3/4"	4-7/8"	3-1/4	3-3/4	1-1/2	3-3/4
	1-1/2"	6-1/8"	4"	1-3/4"	5-1/2"	8-1/2	9-1/2	3-1/4	9-1/2
	1-15/16"	6-5/8"	4-1/8"	2-1/16"	5-1/2"	12	13	4-1/4	13
	2-3/4"	8-1/2"	7"	3-7/8"	10"	45-1/2	48-1/2	16	48-1/2
4"	3-1/2"	10-1/2"	9"	5"	10"	76	73	26-1/2	73

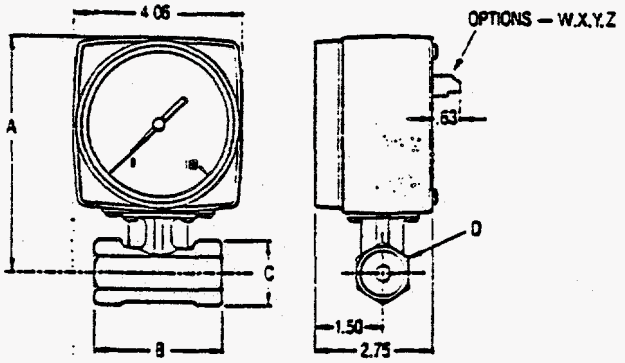
Sch 40 dimensions shown. Sch 10 and Sch 5 Butt Weld Ends also available.

RCM APPENDIX E-108

FLO-GAGE/ RECT READING FLOWMETERS

SERIES 7000

DIMENSIONAL DIAGRAM



Body Size (IPS)	Dimensions (inches)				Net Weight (Lbs)
	A	B	C	D	
1/8	4.75	3.06	1.06	1.06 Sq.	3.5
1/2	4.75	3.06	1.06	1.06 Sq.	3.5
3/8	5.50	3.06	1.50	1.25 Hex	3.6
1	5.62	3.06	1.75	1.50 Hex	3.8
1 1/2	5.94	3.06	2.50	2.12 Hex	4.5
2	6.35	3.19	3.19	2.75 Hex	6.1

ORDERING INFORMATION

Order Series 7000 Flo-Gages by a.) body size, b.) series no., c.) material for wetted parts, d.) direction of flow, e.) full scale flow rate, and f.) options (if required):

Example: 3/4-71-R-20-AD is the catalog no. for a 3/4" NPT Series 7000 Flo-Gage of bronze construction, flow direction from left to right, flow rating of 20 GPM (full scale), equipped with optional seals of Viton and optional gasketed case.

Example: 3/4" - 7 1 - R - 20 - AD
(a: 3/4" | b: 7 | c: 1 | d: R | e: 20 | f: AD)

a) BODY SIZE (NPTF connections):
1/4", 1/2", 3/4", 1", 1 1/2", 2"

b) SERIES 7000 FLO-GAGE

c) MATERIAL FOR WETTED PARTS:
1 = Bronze (standard)
2 = Monel
3 = Series 300 Stainless Steel

d) FLOW DIRECTION:
R = Horizontal, flow to right
L = Horizontal, flow to left
VUR = Vertical, flow up, dial at right
VDR = Vertical, flow down, dial at right
VUL = Vertical, flow up, dial at left
VDL = Vertical, flow down, dial at left

e) FLOW RATES:
Select from "STANDARD FLOW RATES and BODY SIZES" table.
Specify GPM by full scale ratings from Chart A.
Specify metric scales (LPM) by full scale ratings from Chart B, preceded by "M" (e.g. M40 for 40 LPM).
Specify compressed gas ratings (SCFM) by full scale ratings from Chart C. Add "I" to designate compressed gas option.
Specify optional low flow rates from charts D, E, or F. Add "ES" to designate low flow rate. Add "ES" and "I" for Chart F.

f) OPTIONS (if required):
A = Viton seals
B = Customer-specified seals
C = Calibration for specific gravity
D = Gasketed case
E = Non-standard flow rate
S = Low flow rate
[illegible]stic dial crystal
[illegible] = Custom scales and dials
H = 400 psig service
I = Compressed gas service
N = Ammonia service
T = 350° service rating
V = Calibration for high viscosity
W = 4-20 mA dc
X = Hi/Lo alarm relays
Y = 1000 Hz full scale frequency
Z = Combination of options W, X, Y

STANDARD FLOW RATES and BODY SIZES

Body Size (IPS)	Chart A: Gallons Per Minute (GPM)												
	2	3	4	5	10	15	20	30	40	60	100	150	200
1/4"	•	•	•										
1/2"	•	•	•	•	•								
3/4"				•	•	•	•						
1"						•	•	•	•				
1 1/2"								•	•	•	•		
2"									•	•	•	•	•

Body Size (IPS)	Chart B: Liters Per Minute (LPM)											
	8	15	25	40	60	80	120	150	240	400	600	800
1/4"	•	•										
1/2"	•	•	•	•								
3/4"			•	•	•	•						
1"					•	•	•	•				
1 1/2"							•	•	•	•		
2"								•	•	•	•	•

Body Size (IPS)	Chart C: Std. Cubic Feet Per Minute (SCFM)											
	10	20	30	40	60	100	150	200	300	400	600	800	1000
1/4"	•	•	•										
1/2"	•	•	•	•	•								
3/4"				•	•	•	•	•					
1"						•	•	•	•	•			
1 1/2"								•	•	•	•	•	
2"									•	•	•	•	•

• in charts above indicate the various full scale flow rates available as standard for each body size

OPTIONAL LOW FLOW RATES (OPTION ES)

Body Size (IPS) 1/2"	Chart D: Gallons Per Hour (GPH)								
	4	5	10	15	20	30	40	60	100

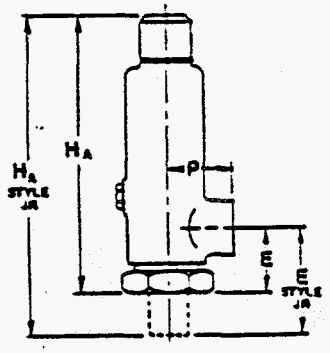
Body Size (IPS) 1/2"	Chart E: Cubic Centimeters Per Minute (CCPM)							
	200	300	400	600	1000	2000	3000	4000	6000

Body Size (IPS) 1/2"	Chart F: Std. Cubic Feet Per Hour (SCFH)						
	40	60	100	150	200	300	400

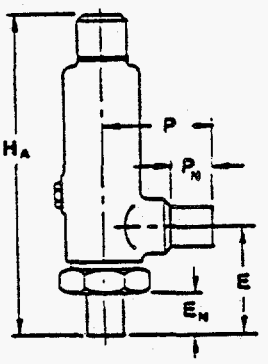
Dimensions — inches

SAFETY RELIEF VALVE

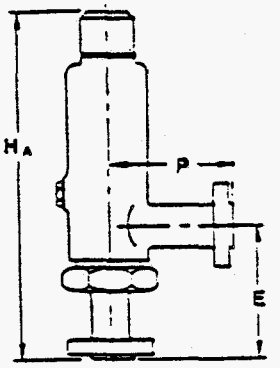
APPENDIX E-109



Screwed Connections



Welding Nipples



Flanged Connections

Valve	Valve Size Inlet x Outlet	Connections	ANSI Flange Rating Lbs	Center to Face (Approximate)				(Approximate)			Net Weight Lbs (Type A)
				Inlet		Outlet		H_A Types A&B Cap	H_C Type C Lifting Gear	H_D Types D&E Lifting Gear	
				E	E_N	P	P_N				
JR JRU	1/2" x 1" and 3/4" x 1" †	Screwed (M x F)		3-5/16		1-3/4		3-5/8	9-3/8	11-5/8	5
		Weld, nipple		5-1/4	3	3	2	10-1/2	11-1/4	13-1/2	7
		Flanged	150	5-1/4		3		10-1/2	11-1/4	13-1/2	
		Flanged	300	5-1/4		3-3/4		10-1/2	11-1/4	13-1/2	
		Flanged	600	5-1/4		3-3/4		10-1/2	11-1/4	13-1/2	
		Flanged	1500	5-1/4		4		10-1/2	11-1/4	13-1/2	
	1" x 1"	Screwed (M x F)		3-9/16		1-3/4		3-7/8	9-5/8	11-7/8	5
		Weld, nipple		5-1/4	3	3	2	10-1/2	11-1/4	13-1/2	7
		Flanged	150	6-1/4		3		11-1/2	12-1/2	14-1/2	
		Flanged	300	6-1/4		3-3/4		11-1/2	12-1/4	14-1/2	
		Flanged	600	6-1/4		3-3/4		11-1/2	12-1/4	14-1/2	
		Flanged	1500	6-1/4		4		11-1/2	12-1/4	14-1/2	
JMB JMBU	3/4" x 1"	Screwed (F x F)*		2-7/16		2-5/8		11-1/2	11-3/4	13-1/2	15
		Weld, nipple*		5-3/8	3	3-3/4	2	14-1/2	14-3/8	16-1/2	17
		Flanged	150	5-3/8		3-3/4		14-1/2	14-3/8	16-1/2	
		Flanged	300	5-3/8		4-1/2		14-1/2	14-3/8	16-1/2	
		Flanged	600	5-3/8		4-1/2		14-1/2	14-3/8	16-1/2	
		Flanged	1500	5-3/8		4-3/4		14-1/2	14-3/8	16-1/2	
		Flanged	2500	5-3/8				14-1/2	14-3/8	16-1/2	
	1" x 1-1/2"	Screwed (F x F)		2-7/16		2-5/8		11-1/2	11-3/8	13-1/2	15
		Weld, nipple		6-3/8	4	3-3/4	2	15-1/2	15-3/8	17-3/8	17
		Flanged	150	6-3/8		3-3/4		15-1/2	15-3/8	17-3/8	
		Flanged	300	6-3/8		4-1/2		15-1/2	15-3/8	17-3/8	
		Flanged	600	6-3/8		4-1/2		15-1/2	15-3/8	17-3/8	
		Flanged	1500	6-3/4		5		15-1/2	15-3/8	17-3/8	
		Flanged	2500	6-3/8				15-1/2	15-3/8	17-3/8	
	1-1/2" x 1-1/2"	Screwed (F x F)		2-7/8		2-5/8		12	11-7/8	14	15
		Weld, nipple		6-3/8	4	3-3/4	2	15-7/8	15-3/4	17-7/8	17
		Flanged	150	6-3/8		3-3/4		15-7/8	15-3/4	17-7/8	
		Flanged	300	6-3/8		4-1/2		15-7/8	15-3/4	17-7/8	
		Flanged	600	6-3/8		4-1/2		15-7/8	15-3/4	17-7/8	
		Flanged	1500	6-3/8		5		15-7/8	15-3/4	17-7/8	
		Flanged	2500	6-3/8				15-7/8	15-3/4	17-7/8	

Notes:

1. Inlet and outlet center to face and overall height dimensions given are for the type connection indicated. These may be furnished in numerous combinations of inlet and outlet and the particular dimensions tabulated in each type inlet or outlet connection should be used in every individual case.
2. 900 lb. ANSI Flanges are identical to 1500 lb. ANSI Flanges in sizes listed. Lap Joint stub ends will be furnished to Schedule 80 or 160 or XXS depending on Pressure-Temperature requirements.
3. Standard JR, JRU connections are male N.P.T. screwed inlet and female N.P.T. screwed outlet. Standard JMB and JMBU connections are female N.P.T. screwed inlet and outlet. For all styles, flanged connections and connections fitted with nipples are available as an option.
4. If optional flanged fittings are provided, specify whether RMS finish or type of serration required.

† Style JR valves for liquid service only are available on special order with 1/2" and 3/4" female N.P.T. outlets to match 1/2" and 3/4" inlet sizes.

* Available with 1-1/2" outlet; recommended for high back pressure gas or vapor service and flashing liquids. Valve dimensions are as listed.

supply and control for air and fuel lines for test apparatus.

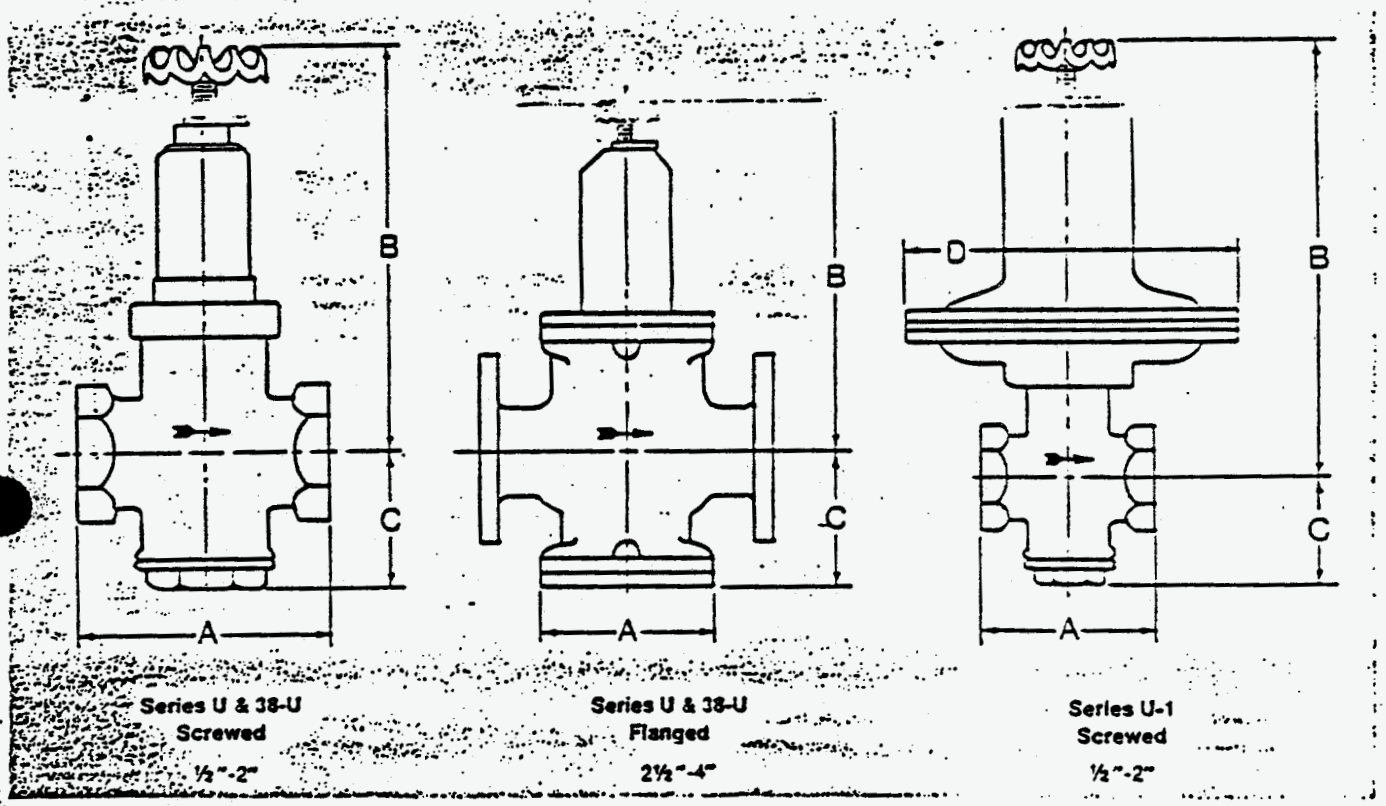
Seals The Series U & 38-U Pressure Regulators are similar in construction. The Series U is constructed with an "O" ring seal making it ideal for use with water, air and gases. The Series 38-U is constructed with a leather cup seal and is recommended for use with cold water and non-corrosive liquids.

Valve Discs and Seat Rings The Series U and 38-U Pressure Regulators have renewable main valve discs and 38-U 2½" or larger have renewable seat rings.

PRESSURE REGULATOR VALVE

Series U, U-1, 38-U Specifications

Dimensions and Weights



Series U & 38-U Screwed ½"-2"

Series U & 38-U Flanged 2½"-4"

Series U-1 Screwed ½"-2"

Size	Series U & 38-U									Series U-1					
	Screwed						125 lb & 250 lb Flanged			Screwed					
	½	¾	1	1¼	1½	2	2½	3	4	½	¾	1	1¼	1½	2
A	3⅜	3⅜	4	4⅝	4⅞	6	11	12	14	3¼	3¼	4	4⅝	4⅞	6⅛
B	7¼	7¼	7½	7¾	8⅝	10⅛	25	27	35	6⅝	6⅝	12	12¾	15¾	16
C	2⅛	2⅛	2¼	2⅝	2¾	3	5⅞	6¾	8	1¾	1¾	2¼	2⅝	2⅞	3
D	—	—	—	—	—	—	—	—	—	6	6	8	8	9½	9½
Weight (lbs)	5	5	6	8	11	16	85	100	170	9	9	20	23	32	37

APPENDIX F

PIPE SUPPORT CALCULATIONS
INSTRUMENT AIRLINE 1"IA-M7
U-FARM COMPRESSED AIR SYSTEM

KAISER ENGINEERS HANFORD | CALCULATI | APPENDIX F-2

WO/Job No. ER2100
Date 6/3/93

This sheet shows the status and description of the attached Design Analysis sheets.

Discipline PIPING

Project No. & Name 2101-00 U-FARM [illegible]

Calculation Item PIPE SUPPORT CALCULATIONS [illegible]

These calculations apply to:

Dwg. No. H-2-36291 sht 1 Rev. No. 2

Dwg. No. _____ Rev. No. _____

Other (Study, CDR) ECN No. 161[illegible] F-2

_____ Rev. No. _____

The status of these calculations is:

- ☐ Preliminary Calculations
- ☒ Final Calculations
- ☐ Check Calculations (On Calculation Dated _____)
- ☐ Void Calculation (Reason Voided _____)

Incorporated in Final Drawings? ☒ Yes ☐ No

This calculation verified by independent "check" calculations? ☐ Yes ☐ No

Original and Revised Calculation Approvals:

	Rev. 0 Signature / Date	Rev. 1 Signature / Date	Rev. 2 Signature / Date
Originator	[illegible] 6/3/93		
Checked by	[illegible] 6/24/93		
Approved by			
Checked Against Approved Vendor Data			

INDEX

DESIGN ANALYSIS

Client WHC	WO/Job No. E	APPENDIX F-3	
Subject [illegible]	Date 2/7/92	By A. T. ROMERO	
	Checked	By S Kaushal Gilules	
Location [illegible]	Revised	By	

OBJECTIVE :

The objective of this calculation is to confirm that the pipe supports for the 241-U-701 comply to the applicable rules of ASME B31.3 requirements.

DESIGN INPUT :

CRITERIA :

1. WHC-LOI-9352974, APRIL 7, 1993 (ADDENDUM TO LOI # 9258144)
2. ASME B31.3, 1990 EDITION.
3. PIPE SUPPORT DETAIL ECN No. 193240 Sh. 13.
4. HANFORD PLANT STANDARDS, DESIGN CRITERIA, SDC 4.1, REV 11
5. UNIFORM BUILDING CODE, 1991 EDITION.

GIVEN DATA :

1. DRAWING H-2-36331, SH 1, REV. 2.
2. ECN No. 193240, Sh. 6-12
3. AUTOPIPE ANALYSIS U-[illegible] ATTACHED AS APPENDIX-D OF THIS DOCUMENT.
4. SAFETY CLASS 3.

ASSUMPTIONS :

1. AUTOPIPE MODEL PROVIDES LOADS EQUAL TO OR GREATER THAN ACTUAL LOADS
2. PIPE ROUTING IS SIMILAR ACTUAL ROUTING OR CONSERVATIVE WORST CASE BY ENGINEERING JUDGEMENT
3. WORST CASE LOAD FROM AUTOPIPE ANALYSIS IS USED TO DESIGN PIPE SUPPORTS.
4. PIPE [illegible] THE FLOOR ADEQUATELY ANCHORED TO RESIST
5. TRANSIENT LOADS ARE NEGLIGIBLE THROUGHOUT THE PIPE SYSTEM.

METHODS

STANDARD HAND CALCULATIONS ON STRENGTH OF MATERIALS BASED ON AUTOPIPE [illegible] WORST CASE LOADINGS TO QUALIFY STEEL IN [illegible]

DESIGN ANALYSIS

Client [illegible]	WO/Job No. [illegible]	APPENDIX F-4
Subject [illegible]	Date [illegible]	By [illegible]
	Checked	By [illegible] 6/21/93
Location [illegible]	Revised	By

REFERENCES

1. AUTOPIPE ANALYSIS U-FARM COMPRESSED AIR SYSTEM, APPENDIX E OF THIS DOCUMENT.

2. AISC MANUAL OF STEEL CONSTRUCTION, NINTH EDITION.

3. INTERNAL DOCUMENT, KEH STEEL ALLOWABLES FOR ASME B31.3 [illegible].

4. DESIGN OF WELDED STRUCTURES, OMER [illegible], 1982.

5. DESIGN REPORT SUMMARY FOR FIGURE 1.3-7N U-FARM (NORMAL AND SEISMIC LOADS), [illegible] INFORMATION, 7-24-89.

6. ICBO REPORT No. 4627, HILTI [illegible] BOLT ALLOWABLE TENSION AND SHEAR VALUES, 5-91.

7. MARKS' STANDARD HANDBOOK FOR MECHANICAL ENGINEERS, NINTH EDITION.

CONCLUSION

ONE GENERAL PIPE SUPPORT DESIGN MAY BE USED TO SUPPORT THE 1 INCH COMPRESSED AIR PIPING FOR THE U-FARM COMPRESSED AIR SYSTEM IN BUILDING 241-U-701.

WORST CASE LOADS FOR THREE SIMILAR PIPE SUPPORTS WERE [illegible] INTO A SINGLE SUPPORT TO ENSURE THE PIPE SUPPORT DESIGN ADEQUATELY SUPPORTS THE WORST CASE LOADING.

THE PIPE SUPPORT MEETS ASME B31.3 REQUIREMENTS WITH SEISMIC LOADING PER HANFORD PLANT STANDARD DESIGN CRITERIA DOC 4.1 FOR SAFETY CLASS 2.

KAISER ENGINEERS
HANFORD

WHC-SD-WM-DA-135
REV 0

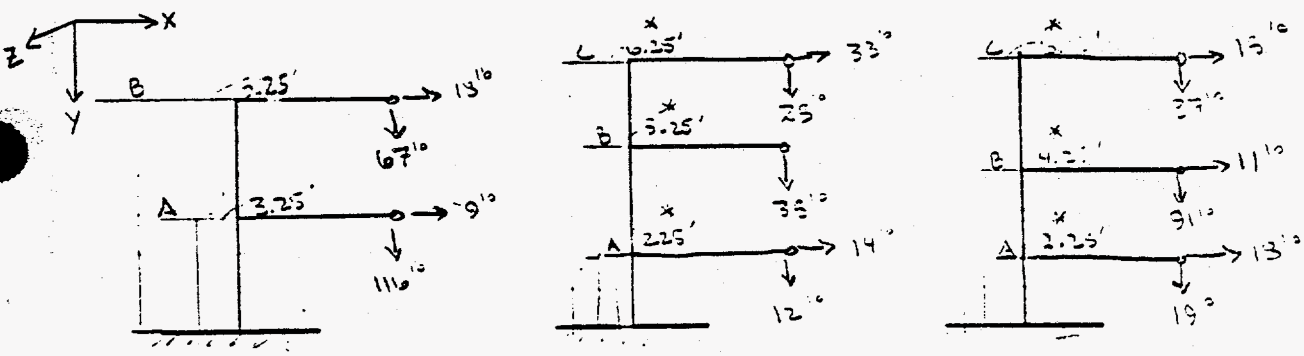
DESIGN ANALYSIS

Client WHC	WO/Job No. ER	APPENDIX F-5	
Subject U-FARM COMPRESSOR	Date 6/7/93	By A.R. Romero	
	Checked	By S.K. Gujral	6/24/93
Location 200W, 241-U-701	Revised	By	

CALCULATIONS:

ONE PIPE SUPPORT DESIGN WILL BE USED FOR THE U-FARM COMPRESSED AIR SYSTEM. THE PIPE SUPPORT MUST SUPPORT THE WORST CASE LOADS ON THE PIPING SYSTEM. DUE TO ELEVATION AND PIPE CONFIGURATION CHANGES, THREE SIMILAR PIPE SUPPORTS WILL BE USED FOR THE SYSTEM. TO ANALYZE THE PIPE SUPPORT DESIGN, THE MAXIMUM LOADS OBTAINED FROM THE U-FARM AUTOPIPE ANALYSIS (CALC. NO. ...). A GENERIC PIPE SUPPORT DESIGN IS ANALYZED BY SUPERIMPOSING THE WORST CASE LOADING ON THE PIPE SUPPORT DESIGN.

THREE SIMILAR PIPE SUPPORTS AND MAXIMUM AUTOPIPE LOADS (AUTOPIPE NODES).

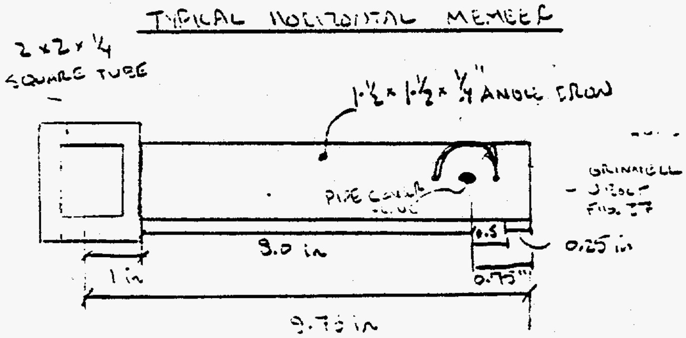


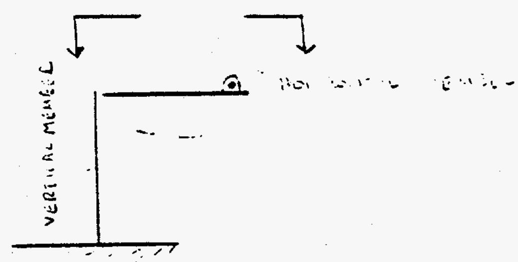
AUTOPIPE SUPPORT: S1, S2
TYPE 1

AUTOPIPE SUPPORT: S3
TYPE 2

AUTOPIPE SUPPORT: S4, S5
TYPE 3

TYPICAL HORIZONTAL MEMBER



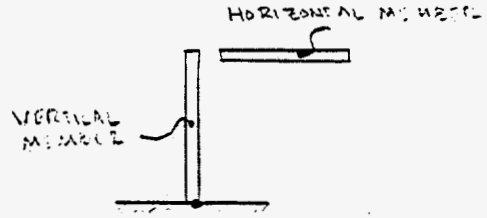


MOMENT ARM FOR VERTICAL FORCE = 9 in

* Actual heights from floor 6" less than shown. Conservative
SG

DESIGN ANALYSIS

Client WHC	WO/Job No. EE	APPENDIX F-6
Subject [illegible]	Date [illegible]	By [illegible]
	Checked	By [illegible]
Location [illegible]	Revised	By



WORST CASE LOADS

TYPE 1

HORIZONTAL MEMBER (MAXIMUM LOADS)

$F_x = 27^{lb}$ $M_x = 0$

$F_y = 116^{lb}$ $M_y = 0$

$F_z = 0$ $M_z = (116^{lb})(3.0\ in)$

$M_z = 925\ in\text{-}lb$

VERTICAL MEMBER (MAX LOADS)

$F_x = (18+9)^{lb}$ $M_x = 0$

$F_x = 27^{lb}$

$F_y = (116+67)^{lb}$ $M_y = 0$

$F_y = 183^{lb}$

$F_z = 0$ $M_z = (9^{lb})(3.25\ in + \frac{12\ in}{ft}) - (18^{lb})(3.25\ in + \frac{12\ in}{ft}) + (183^{lb})($

$M_z = 2949\ in\text{-}lb$

TYPE 2

HORIZONTAL MEMBER (MAX LOADS)

$F_x = 33^{lb}$ $M_x = 0$

$F_y = 35^{lb}$ $M_y = 0$

$F_z = 0$ $M_z = (35^{lb})(2\ in)$

$M_z = 280\ in\text{-}lb$

DESIGN ANALYSIS

Client		WO/Job No.	APPENDIX F-7
Subject		Date	By
		Checked	By Skrawdal 6/24/93
Location		Revised	By

TYP 2 CONT'D.

VERTICAL MEMBER (MAX LOAD)

$F_x = (32+14)^{lb}$ $M_x = 0$

$F_x = 47$ lb

$F_y = (12+33+27)^{lb}$ $M_y = 0$

$F_y = 72$ lb

$F_z = 0$ $M_z = [(14^{lb})(2.25^{in}) + (33^{lb})(6.25^{in})] \cdot (\frac{12in}{ft}) + (72^{lb})(3in)$

$M_z = 3429$ in-lb

TYP 3

HORIZONTAL MEMBER MAX LOAD

$F_x = 18^{lb}$ $M_x = 0$

$F_y = 91^{lb}$ $M_y = 0$

$F_z = 0$ $M_z = (91^{lb})(3in.)$

$M_z = 728$ in-lb

VERTICAL MEMBER MAX LOAD

$F_x = (18+11+15)^{lb}$ $M_x = 0$

$F_x = 44$ lb

$F_y = (19+91+37)^{lb}$ $M_y = 0$

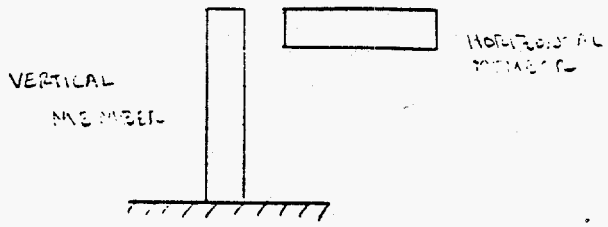
$F_y = 147$ lb

$F_z = 0$ $M_z = [(18^{lb})(3.25^{in}) + (11^{lb})(4.25^{in}) + (15^{lb})(6.25^{in})] \cdot (\frac{12in}{ft}) + (147^{lb})(3in)$

$M_z = 3348$ in-lb

Client	WO/Job No.	
Subject	Date	By
	Checked	By 6/24/93
Location	Revised	By

SUPER IMPOSED WORST CASE LOADS

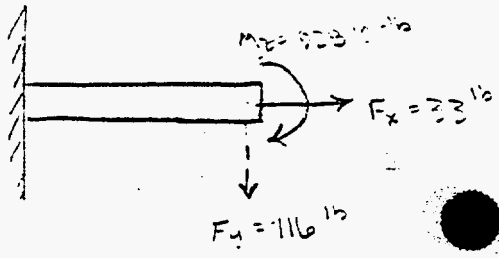


HORIZONTAL MEMBER

$F_x = 33^{lb}$ $M_x = 0$

$F_y = 116^{lb}$ $M_y = 0$

$F_z = 0$ $M_z = 928$ in-lb



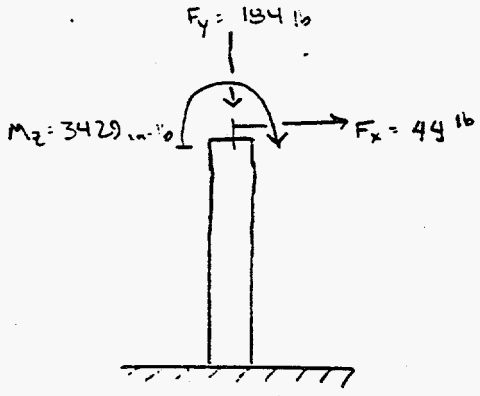
M

VERTICAL MEMBER

$F_x = 44^{lb}$ $M_x = 0$ in-lb

$F_y = 183^{lb}$ $M_y = 0$ in-lb

$F_z = 0$ $M_z = 3429$ in-lb

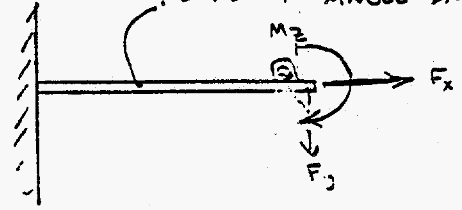


DESIGN ANALYSIS

Client WHC	WO/Job No. [illegible]		
Subject [illegible]	Date 6/17/93	By [illegible]	
	Checked	By [illegible]	6/24/93
Location [illegible]	Revised	By	

ANALYZE HORIZONTAL MEMBER

1½" x 1½" x ¼" ANGLE IRON A.I.S.C. A36 STEEL



TENSILE STRESS, σ_T

$$\sigma_T = \frac{F_x}{A} = \frac{33 \text{ lb}}{0.688 \text{ in}^2}$$

A = CROSS SECTIONAL AREA, in²

A = 0.688 in² [REF. 2]

$$\sigma_T = 48 \text{ psi}$$

BENDING STRESS, σ_B

$$\sigma_B = \frac{M_z}{S} = \frac{928 \text{ in-lb}}{0.134}$$

S = SECTION MODULUS [illegible]

S = 0.134 [illegible] [REF. 2]

$$\sigma_B = 6925 \text{ psi}$$

TOTAL STRESS $\sigma = \sigma_B + \sigma_T$

$$\sigma = \sigma_T + \sigma_B$$

$$\sigma = (48 + 6925) \text{ psi}$$

$$\sigma = 6973 \text{ psi}$$

Compressive stress small, no need to check KL/r. Allowable bending stress .6 x 36 = 21.6 Ksi member - ok.
[illegible signature]

ALLOWABLE STRESS, σ_{allow}

$$\sigma_{allow} = 23,674 \text{ psi (A36 steel)}$$ [REF. 3]

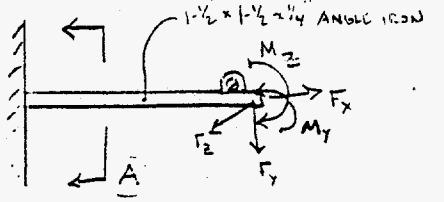
ANALYSIS OF HORIZONTAL MEMBER

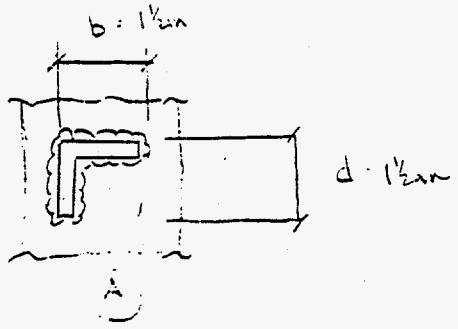
→ CALCULATED STRESS IN HORIZONTAL MEMBER [illegible] THAN ALLOWABLE STRESS ($\sigma < \sigma_{allow}$, 6973 psi < 23,674 psi) THEREFORE HORIZONTAL MEMBER O.K.

DESIGN ANALYSIS

Client WHC	WO/Job No.	APPENDIX F-10
Subject 10-FT [illegible]	Date 6/9/	By [illegible]
	Checked	By SK Gunstad 6/20/95
Location 241-U-701	Revised	By

ANALYZE HORIZ MEMBER NO. 2





WELD TREATED AS LINES: $A_w = (1\frac{1}{2}) + (1\frac{1}{2}) + (1\frac{1}{2}) + 1\frac{1}{2} = 6$ in

$S_w = \frac{4bd + d^2}{6}$ (CSC) OR $\frac{d^2(4b+d)}{6(2b+d)}$ (BOTTOM) USE CONSERVATIVE [REF. 4]

$S_w = \frac{4(1.5)(1.5)+1.5^2}{6}$ OR $\frac{1.5^2(4\cdot1.5+1.5)}{6(2\cdot1.5+1.5)}$

$S_w = 1.875$ OR 0.625 in²

$S_w = 0.625$ in²

$$f_x = \frac{F_x}{A_w} + \frac{M_z}{S_w} = \frac{33^{lb}}{6} + \frac{923\ in\cdot lb}{0.625\ in^2} = 1490\ lb/in$$

$$f_y = \frac{F_y}{A_w} = \frac{116^{lb}}{6\ in} = 19\ lb/in$$

$$F_z = \frac{F_z}{A_w} = 0$$

$$f_r = \sqrt{f_x^2 + f_y^2 + f_z^2}$$

$$f_r = \sqrt{(1490)^2 + (19)^2 + (0)^2}\ lb/in$$

$$f_r = 1490\ lb/in$$

Actual section modulus will be almost twice the section modulus calculated, as only one weld is considered. Calc is conservative. SK 6/21

REQUIRED FILLET SIZE TO SUPPORT THESE LOADS:

$$w = \frac{f_r}{\sigma_{allow\ weld}\ (0.707)} = \frac{(1490.\ lb/in)}{(13050\ lb/in^2)(0.707)}$$

$\theta = 45°$

$= 0.707$

$\sigma_{allow\ weld}$ 13050 psi [REF. 3]

$w = 0.162$ in

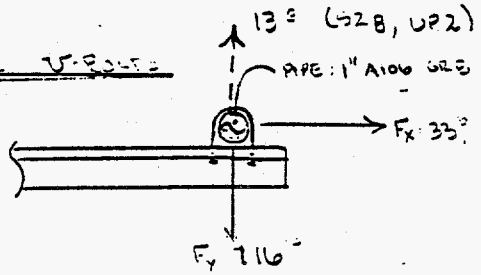
DESIGN ANALYSIS

Client WHC	WO/Job No. E7	APPENDIX F-11
Subject [illegible]	Date 6/3/93	By A R TOMMERS
	Checked	By K K Quindal 6/24/93
Location [illegible]	Revised	By

ANALYSIS OF HORIZONTAL MEMBER WELD

→ FILLET SIZE REQUIRED TO SUPPORT MAXIMUM LOADS IS LESS THAN THE SPECIFIED FILLET SIZE (W < 3/16", 0.162 < 0.187"), THEREFORE THE HORIZONTAL MEMBER WELD IS O.K.

ANALYZE U-BOLTS



THE LOADS SHOWN ARE ONLY 1 LOAD. GRAVITY LOAD IS IN OPPOSITE DIRECTION OF THE NORMAL OPERATING FORCES.
THE MAXIMUM [illegible] FOR THE [illegible] 13^S AT POINT S2B DUE TO SEISMIC LOADING, E2.
(UP2 = SR - T1 - E2)
[REF 1]

CALCULATED LOADS

NORMAL LOAD, P_N

$P_N = 13^{LD}$

SIDE LOAD, P_S

$P_S = 33^{LD}$

ALLOWABLE LOADS, 1" PIPE

MAXIMUM NORMAL LOAD, P_{NALLOW}, LEVEL D

$P_{NALLOW} = 645^{LD}$ [REF. 5]

MAXIMUM SIDE LOAD, P_{SALLOW}, LEVEL D

$P_{SALLOW} = 83^{LD}$ [REF. 5]

Interaction:

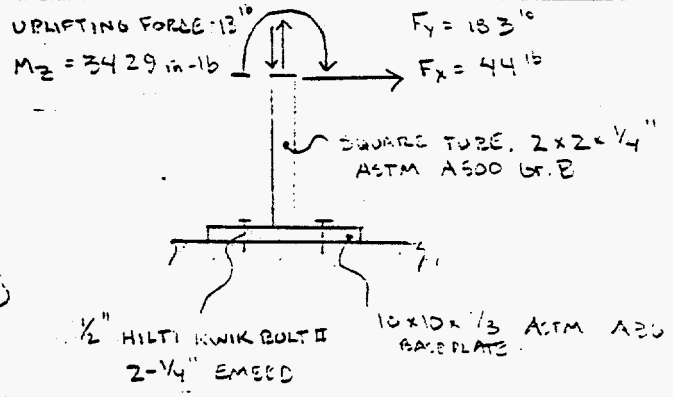
$\frac{13}{645} + \frac{33}{83} = 0.42 < 1$

ANALYSIS OF U-BOLTS

→ CALCULATED NORMAL AND SIDE LOADS ARE LESS THAN MAXIMUM ALLOWABLE NORMAL AND SIDE LOADS ($P_N < P_{NALLOW}$: $13^{LD} < 645^{LD}$, $P_S < P_{SALLOW}$: $33^{LD} < 83^{LD}$) THEREFORE THE U-BOLTS ARE O.K.

DESIGN ANALYSIS

Client WHC	WO/Job No. 5T2	APPENDIX F-12
Subject 241-AP FARM [illegible]	Date 6/4/92	By [illegible]
	Checked	By S Kaundal 6/24/92
Location 241-AP FARM	Revised	By



ANALYZE VERTICAL MEMBER

BENDING STRESS, σ_b

$\sigma_b = \frac{M_z}{S}$, $S = 0.7166\ in^3$ [REF 2]

COMPRESSIVE STRESS, σ_c ✓

$\sigma_c = \frac{F_y}{A}$, $A = 1.59\ in^2$ [REF 2]

TOTAL STRESS, $\sigma = \sigma_b + \sigma_c$

$\sigma = \frac{M_z}{S} + \frac{F_y}{A} = \frac{3429\ in\text{-}lb}{0.7166\ in^3} + \frac{183\ lb}{1.59\ in^2}$ ✓

$\sigma = 4592\ psi$

Compressive stress is small, no need to check buckling as stress is small.
SK

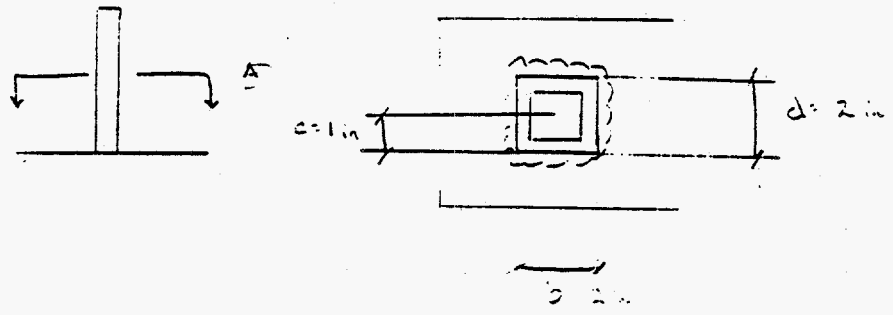
ALLOWABLE STRESS, σ_{allow}

$\sigma_{allow} = 17400\ psi$ [REF 3]

ANALYSIS OF VERTICAL MEMBER

→ CALCULATED STRESS IN VERTICAL MEMBER IS LESS THAN THE ALLOWABLE STRESS ($\sigma < \sigma_{allow}$, 4592 psi < 17400 psi) THEREFORE THE VERTICAL MEMBER IS O.K.

ANALYZE VERTICAL MEMBER WELD TO BASE PLATE



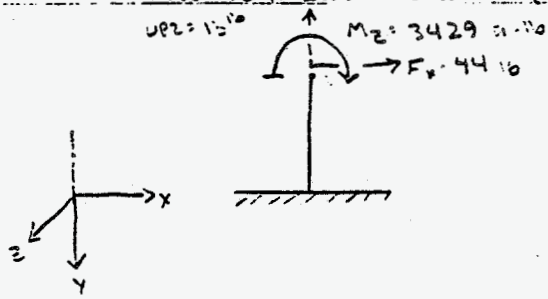
$I_w = bd \cdot \frac{d^2}{3} = \ldots$ [REF 4]

$A_w = (2 + 2 + 2)(1) = 6\ in$

DESIGN ANALYSIS

Client WHC	WO/Job No. ER	APPENDIX F-13	
Object D-ELEM CONNECTOR	Date 5/3/95	By A.R. RAMIREZ	
	Checked	By Sx gupta	6/21/95
Location 241-U-701	Revised	By	

ANALYZE VERT. WELD IN BASE PLATE (CONT'D)



$S_w = 5.33\ in^2$

$A_w = (2+2+2+2)\ in$

$A_w = 8\ in$

FORCES ON WELD, $f_z = 0$

$$f_x = \frac{F_x}{A_w} = \frac{44\ lb}{8\ in} = 6.0\ lb/in$$

$$f_y = \frac{(MAX.\ UPWIND\ FORCE)}{A_w} + \frac{M_z}{S_w} = \frac{1310\ lb}{8\ in} + \frac{3429\ in\text{-}lb}{5.33\ in^2}$$

$$f_y = 645\ lb/in$$

RESULTANT FORCE

$$f_r = \sqrt{f_x^2 + f_y^2 + f_z^2} = \sqrt{(6)^2 + (645)^2 + 0}\ lb/in$$

$$f_r = 645\ lb/in$$

REQUIRED FILLET WELD

$$w = \frac{f_r}{\sigma_{allow}\ (0.707)}$$

$\sigma_{allow} = 12500\ psi$ REF. 3

$$w = \frac{(645\ lb/in)}{(12500\ psi)(0.707)} = 0.070\ in$$

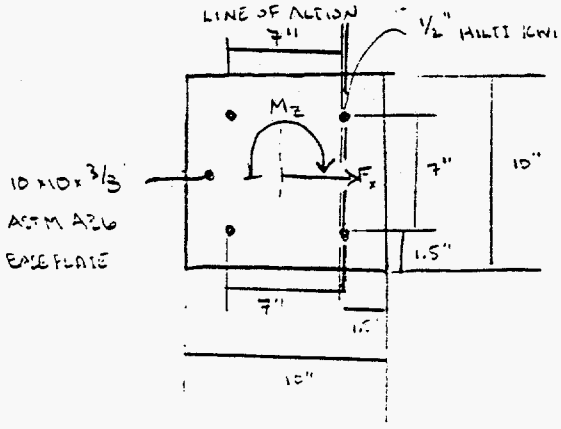
ANALYSIS OF VERTICAL MEMBER WELD

→ FILLET SIZE REQUIRED TO SUPPORT MAXIMUM LOADING IS 0.070 in. FILLET SIZE ($w < 3/16$", 0.070 in. OK), THEREFORE THE VERTICAL MEMBER WELD IS OK.

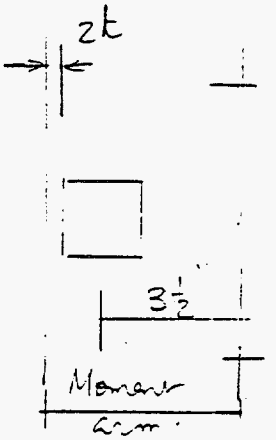
DESIGN ANALYSIS

Client WHC	WO/Job No. [illegible]	APPENDIX F-14
Subject [illegible]	Date [illegible]	By AR [illegible]
	Checked	By [illegible] 6/24/93
Location [illegible]	Revised	By

ANALYZE BASEPLATE ANCHOR BOLTS



Where t = Thickness of base plate.



Moment arm $= 3\frac{1}{2} + 1 + 2 \times \frac{3}{8} = 4.875$

Tension in bolt $= \frac{3429}{4.875 \times 2} = 352$ #

Pullout Force, F_{pull}

$$F_{pull} = \frac{M_z}{(\text{No. Bolts in Tension})(\text{distance from line of action})}$$

$$F_{pull} = \frac{3429 \text{ in-lb}}{(2)(7 \text{ in})} = 245 \text{ lb}$$

Maximum Shear, F_s

$$F_s = \frac{F_x}{(\text{No. Bolts in Shear})} = \frac{44^{lb}}{4}$$

$F_s = 11$ lb

Interaction $= \frac{352}{550} + \frac{11}{1810} = 0.65 < 1$

Direct tension due to Seismic & thermal is very small.

SK 6/24/93

ALLOWABLE PULLOUT AND SHEAR FORCES FOR 1/2" HILTI ANCHORS 2 1/4" MIN. EMBED, W/OUT EDGE EFFECTS, f'_c = 2000 psi

ALLOW. TENSILE FORCE, F_{TALLOW} = 550 lb [HILTI REF 6] Conservative
ALLOW. SHEAR FORCE, F_{SALLOW} = 1810 lb [HILTI REF 6] good for f'_c = 2000 psi

SK

ANALYSIS OF BASE PLATE ANCHOR BOLTS

INTERACTION $\frac{F_{pull}}{F_{TALLOW}} + \frac{F_s}{F_{SALLOW}} \leq 1$, [illegible] are o.k.

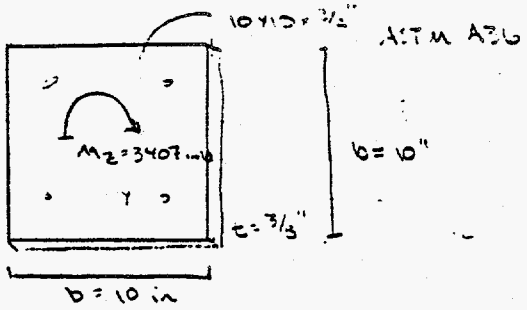
$$\frac{245 \text{ lb}}{550 \text{ lb}} + \frac{11 \text{ lb}}{1810 \text{ lb}} = .75 < 1$$

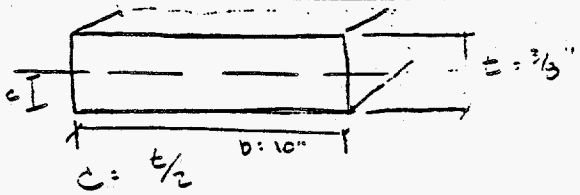
→ INTERACTION OF PULLOUT AND SHEAR LOAD [illegible]

DESIGN ANALYSIS

Client WHC	WO/Job No. ER	APPENDIX F-15
Subject U TANK COMPONENTS	Date 6/23/93	By A.R. Rogers
	Checked	By [illegible] 6/24/93
Location [illegible]	Revised	By

ANALYZE BASE PLATE





$c = t/2$

$I = \frac{bt^3}{12}$ [REF. 7]

$M = M_z$

BASE PLATE STRESS, σ_{BEND}

$$\sigma_{BEND} = \frac{Mc}{I} = \frac{(M_z)(t/2)}{(bt^3/12)} = \frac{6M_z}{bt^2} = \frac{6(3429\ in\text{-}lb)}{(10in)(3/8\ in)^2}$$

σ_{BEND} = 14,630 psi

Maximum moment on base plate = 2 x 352 x 2.5" (Tension normal to inside face of wall)

= 1760 in-lb

$f_b = \frac{1760 \times 6}{10 \times (.375)^2}$

= 7509 psi < .75 x 36 = 27 ksi

OK

6/24

ALLOWABLE PLATE STRESS

[illegible] = 23.6 KSI [REF 3]

ANALYSIS OF BASE PLATE

→ CALCULATED STRESS IN BASE PLATE IS LESS THAN ALLOWABLE STRESS, $\sigma_{BEND} < \sigma_{allow}$ (14,630 psi < 23,600 psi) THEREFORE THE BASE PLATE IS O.K.

CONCLUSION

→ THIS SUPPORT MEETS ASME B31.3 REQUIREMENTS.

(1) Drawing _____ (2) Doc. No. _____

(4) Building _____ (5) Rev. _____

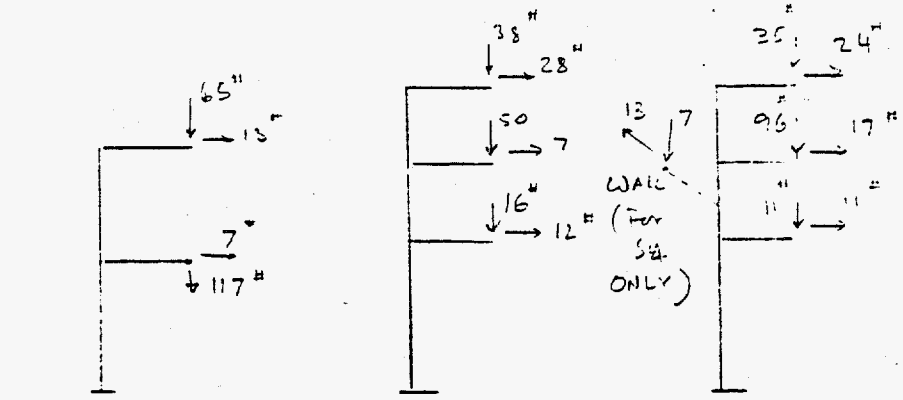
(7) Subject U-Tank Dome Riser

(8) Originator E.V. Mendal Date 6/24/93

(9) Checker W. J. KARWOSICI - WJK Date 6/28/93

(10)

Pipe support loads from AUTOPIPE Revised & final Computer output.



AUTOPIPE SUPP. S1 & S2

SUPPORT S3

SUPPORT S4 & S5

Compared to the loads used for design of pipe supports, the revised loads are almost same. changes in loads are insignificant. Support calculations o.k.

(1) Drawing _____ (2) Doc. No. _____

(4) Building 241-U-701 (5) Rev. _____ (6) Job APPENDIX F-17

(7) Subject U-Farm Compressor

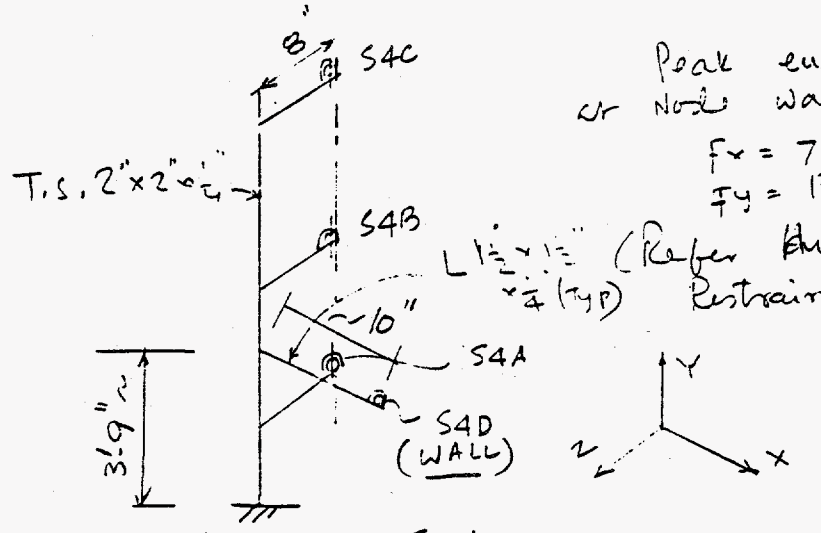
(8) Originator SK Gupta Date 6-24-93.

(9) Checker VJK Date 6/28/93

(10)

DESIGN OF SUPPORT AT THE WALL:

This support is close to support S4A S4B & S4C. A horizontal arm of L 1½" x 1½" x ¼" is connected with vertical post T.S. 2" x 2" o/4"



SUPPORT S-4

Peak envelope loads at Node wall

$F_x = 7$ #

$F_y = 13$ #

(Refer Enterprise results Restraint location)

V-Bolt is ok Compared to previous Calcs.

Horizontal member:

Max. moment = 13 x 10 = 130 # in

$\delta_b = \frac{130}{0.134}$ (Section modulus) = 970 psi

Small O's.

Vertical member, additional moment:

$M_2 = 7 \times (3.75 \times 12) + 130$

$= 445$ # in.

This additional moment is small. Since, the welded, base plate & anchor bolts have good margin of safety, support S4 as designed is good for the additional load & moment. No further calcs. reqd.

(1) Drawing _____ (2) Doc. No. _____

(4) Building 241-U-701 (5) Rev. _____ (6) APPENDIX F-18

(7) Subject U-Farm Condenser

(8) Originator 3K Quintal Date 6-24-93.

(9) Checker WJK Date 6/28/93

(10)

Comments on pipe Support Calculation.

(1) As the Support is designed with a good margin of safety additional Supports to Support field routed ½" condensate pipe line may be connected to the vertical post as and when required.

Explanation of AUTOPIPE legends

Legends	Description	Remarks
GR	Gravity loads	
T1	Thermal loads	
E1	Seismic loads in X-direction	
E2	Seismic loads in Y-direction	
E3	Seismic loads in Z-direction	
P1	Design pressure loads	
SUST	Sum of GR and P1	
SEIS	SRSS of E1, E2 & E3	
OCC	Absolute sum of SEIS and SUST	
UPLIFT1		Not used in calc.
UPLIFT2		Not used in calc.
TOTAL	Absolute sum of OCC & T1	
SUPPORT NAME		
Guide	Support restraint in vertical and one of the horizontal directions.	
Anchors	Support restraint in all six directions.	

R E S T R A I N T R E A C T I O N S

oint ame	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
34B	Guide								
	GR	0	-11	0	11	0	0	0	0
	T1	0	-63	0	63	0	0	0	0
	E1	0	-14	0	14	0	0	0	0
	E2	0	-10	0	10	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SUST	0	-11	0	11	0	0	0	0
	SEIS	0	17	0	17	0	0	0	0
	OCC	0	28	0	28	0	0	0	0
	UPLIFT1	0	-83	0	83	0	0	0	0
	UPLIFT2	0	-84	0	84	0	0	0	0
	TOTAL	0	91	0	91	0	0	0	0
S3C	Guide								
	GR	0	-17	0	17	0	0	0	0
	T1	0	-1	0	1	0	0	0	0
	E1	33	5	0	33	0	0	0	0
	E2	0	6	0	6	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SUST	0	-17	0	17	0	0	0	0
	SEIS	33	8	0	33	0	0	0	0
	OCC	33	25	0	41	0	0	0	0
	UPLIFT1	33	-12	0	35	0	0	0	0
	UPLIFT2	0	-12	0	12	0	0	0	0
	TOTAL	33	25	0	41	0	0	0	0
S3B	Guide								
	GR	0	-25	0	25	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	0	6	0	6	0	0	0	0
	E2	0	8	0	8	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SUST	0	-25	0	25	0	0	0	0
	SEIS	0	9	0	9	0	0	0	0
	OCC	0	34	0	34	0	0	0	0
	UPLIFT1	0	-20	0	20	0	0	0	0
	UPLIFT2	0	-18	0	18	0	0	0	0
	TOTAL	0	35	0	35	0	0	0	0

Notes : These AUTOPIPE restraint reactions are used for designing the supports. The AUTOPIPE stress run is revised, the revised reactions are included in this package. As the difference in loads are small the pipe support calculations are not revised. The calculations are accecptable.

6/29/93

R E S T R A I N T R E A C T I O N S

nt e	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
)	Anchor								
	GR	2	-22	1	22	-8	-2	0	8
	T1	-1	-1	0	2	-1	1	3	3
	E1	8	0	0	8	-1	-2	-14	14
	E2	0	-7	9	12	15	4	3	16
	P1	0	0	0	0	0	0	0	0
	SUST	2	-22	1	22	-8	-2	0	8
	SEIS	8	7	9	14	15	4	14	21
	OCC	10	30	10	33	23	5	14	33
	UPLIFT1	9	-24	0	25	-10	-4	-10	15
	UPLIFT2	1	-31	10	32	6	3	6	9
	TOTAL	11	31	10	34	24	7	17	30
3	Guide								
	GR	0	-5	0	5	0	0	0	0
	T1	0	5	0	5	0	0	0	0
	E1	0	0	-4	4	0	0	0	0
	E2	0	-35	17	39	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SUST	0	-5	0	5	0	0	0	0
	SEIS	0	35	18	39	0	0	0	0
	OCC	0	40	18	44	0	0	0	0
	UPLIFT1	0	0	-4	4	0	0	0	0
	UPLIFT2	0	-35	17	39	0	0	0	0
	TOTAL	0	46	18	49	0	0	0	0
3	Guide								
	GR	0	-20	0	20	0	0	0	0
	T1	0	20	0	20	0	0	0	0
	E1	0	-23	0	23	0	0	0	0
	E2	0	13	0	13	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SUST	0	-20	0	20	0	0	0	0
	SEIS	0	26	0	26	0	0	0	0
	OCC	0	47	0	47	0	0	0	0
	UPLIFT1	0	-23	0	23	0	0	0	0
	UPLIFT2	0	13	0	13	0	0	0	0
	TOTAL	0	67	0	67	0	0	0	0

Notes : These AUTOPIPE restraint reactions are used for designing the supports. The AUTOPIPE stress run is revised, the revised reactions are included in this package. As the difference in loads are small the pipe support calculations are not revised. The calculations are accecptable.

Skaarlat
6-29-93

R E S T R A I N T R E A C T I O N S

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
S1A	Guide								
	GR	0	-39	0	39	0	0	0	0
	T1	0	-63	0	63	0	0	0	0
	E1	0	-5	0	5	0	0	0	0
	E2	0	0	4	4	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SUST	0	-39	0	39	0	0	0	0
	SEIS	0	5	4	6	0	0	0	0
	OCC	0	44	4	45	0	0	0	0
	UPLIFT1	0	-107	0	107	0	0	0	0
	UPLIFT2	0	-102	4	102	0	0	0	0
	TOTAL	0	107	4	107	0	0	0	0
S2A	Guide								
	GR	0	-22	0	22	0	0	0	0
	T1	0	-69	0	69	0	0	0	0
	E1	0	22	0	22	0	0	0	0
	E2	0	-11	9	14	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SUST	0	-22	0	22	0	0	0	0
	SEIS	0	25	9	26	0	0	0	0
	OCC	0	47	9	48	0	0	0	0
	UPLIFT1	0	-69	0	69	0	0	0	0
	UPLIFT2	0	-102	9	103	0	0	0	0
	TOTAL	0	116	9	116	0	0	0	0
D00	Anchor								
	GR	0	-9	-1	9	-9	-2	-1	10
	T1	1	2	0	2	2	-1	-1	3
	E1	24	3	3	24	5	-24	-14	29
	E2	5	1	12	13	8	4	-3	10
	P1	0	0	0	0	0	0	0	0
	SUST	0	-9	-1	9	-9	-2	-1	10
	SEIS	24	3	12	27	10	25	14	30
	OCC	24	12	13	30	19	27	16	36
	UPLIFT1	24	-5	2	25	-2	-27	-16	32
	UPLIFT2	6	-6	11	14	1	2	-5	6
	TOTAL	25	14	13	32	21	28	17	39

Notes : These AUTOPIPE restraint reactions are used for designing the supports. The AUTOPIPE stress run is revised, the revised reactions are included in this package. As the difference in loads are small the pipe support calculations are not revised. The calculations are accecptable.

6-29-93

R E S T R A I N T R E A C T I O N S

int me	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
A	Guide								
	GR	0	-12	0	12	0	0	0	0
	T1	0	-1	0	1	0	0	0	0
	E1	12	-1	0	12	0	0	0	0
	E2	1	-1	0	2	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SUST	0	-12	0	12	0	0	0	0
	SEIS	12	2	0	12	0	0	0	0
	OCC	12	13	0	18	0	0	0	0
	UPLIFT1	12	-13	0	18	0	0	0	0
	UPLIFT2	1	-14	0	14	0	0	0	0
	TOTAL	12	14	0	18	0	0	0	0
4A	Guide								
	GR	0	-8	0	8	0	0	0	0
	T1	0	4	0	4	0	0	0	0
	E1	0	0	0	0	0	0	0	0
	E2	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SUST	0	-8	0	8	0	0	0	0
	SEIS	0	1	0	1	0	0	0	0
	OCC	0	9	0	9	0	0	0	0
	UPLIFT1	0	-5	0	5	0	0	0	0
	UPLIFT2	0	-4	0	4	0	0	0	0
	TOTAL	0	13	0	13	0	0	0	0
5A	Guide								
	GR	0	-1	0	1	0	0	0	0
	T1	0	-14	0	14	0	0	0	0
	E1	0	-1	11	11	0	0	0	0
	E2	0	-2	15	15	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SUST	0	-1	0	1	0	0	0	0
	SEIS	0	3	18	19	0	0	0	0
	OCC	0	4	18	19	0	0	0	0
	UPLIFT1	0	-17	11	20	0	0	0	0
	UPLIFT2	0	-18	15	23	0	0	0	0
	TOTAL	0	19	18	26	0	0	0	0

Notes : These AUTOPIPE restraint reactions are used for designing the supports. The AUTOPIPE stress run is revised, the revised reactions are included in this package. As the difference in loads are small the pipe support calculations are not revised. The calculations are accecptable.

S Kaufel
6-29-93

R E S T R A I N T R E A C T I O N S

Point Name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
S5C	Guide								
	GR	0	-14	0	14	0	0	0	0
	T1	0	14	0	14	0	0	0	0
	E1	0	7	10	12	0	0	0	0
	E2	0	-5	11	12	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SUST	0	-14	0	14	0	0	0	0
	SEIS	0	8	15	17	0	0	0	0
	OCC	0	23	15	27	0	0	0	0
	UPLIFT1	0	7	10	12	0	0	0	0
	UPLIFT2	0	-5	11	12	0	0	0	0
	TOTAL	0	37	15	40	0	0	0	0
S4C	Guide								
	GR	0	-11	0	11	0	0	0	0
	T1	0	11	0	11	0	0	0	0
	E1	0	5	0	5	0	0	0	0
	E2	0	-3	0	3	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SUST	0	-11	0	11	0	0	0	0
	SEIS	0	6	0	6	0	0	0	0
	OCC	0	17	0	17	0	0	0	0
	UPLIFT1	0	5	0	5	0	0	0	0
	UPLIFT2	0	-3	0	3	0	0	0	0
	TOTAL	0	28	0	28	0	0	0	0
S5B	Guide								
	GR	0	-13	0	13	0	0	0	0
	T1	0	-58	0	58	0	0	0	0
	E1	0	-2	7	7	0	0	0	0
	E2	0	0	9	9	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SUST	0	-13	0	13	0	0	0	0
	SEIS	0	2	11	11	0	0	0	0
	OCC	0	15	11	19	0	0	0	0
	UPLIFT1	0	-73	7	73	0	0	0	0
	UPLIFT2	0	-71	9	71	0	0	0	0
	TOTAL	0	73	11	74	0	0	0	0

Notes : These AUTOPIPE restraint reactions are used for designing the supports. The AUTOPIPE stress run is revised, the revised reactions are included in this package. As the difference in loads are small the pipe support calculations are not revised. The calculations are accecptable.

6-29-93

U2 U-FARM COMPRESSED AIR SYSTEM. Kaiser Engine
06/15/93 AutoPIPE 4.42

APPENDIX F-25

R E S T R A I N T R E A C T I O N S

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
WALL	Anchor								
	GR	0	-14	0	14	2	0	0	2
	T1	0	0	0	0	0	0	0	0
	E1	17	-5	25	32	-6	-21	6	23
	E2	-6	-7	46	46	-9	15	-5	19
	P1	0	0	0	0	0	0	0	0
	SUST	0	-14	0	14	2	0	0	2
	SEIS	18	9	53	56	10	27	8	30
	OCC	19	22	53	60	13	27	8	31
	UPLIFT1	17	-19	27	37	-3	-21	-6	22
	UPLIFT2	-6	-20	46	51	-6	16	-5	18
	TOTAL	19	22	53	60	13	27	8	31
I04	Anchor								
	GR	-2	-28	0	28	-3	2	-14	14
	T1	1	-2	0	2	-1	0	-1	1
	E1	23	-1	10	25	7	-15	-21	27
	E2	-4	1	37	37	31	-13	5	34
	P1	0	0	0	0	0	0	0	0
	SUST	-2	-28	0	28	-3	2	-14	14
	SEIS	24	2	38	45	32	20	22	44
	OCC	26	30	39	55	35	21	36	55
	UPLIFT1	22	-31	10	39	3	-13	-36	39
	UPLIFT2	-6	-28	37	47	27	-11	-9	31
	TOTAL	27	32	39	57	36	22	37	56

Notes : These AUTOPIPE restraint reactions are used for designing the supports. The AUTOPIPE stress run is revised, the revised reactions are included in this package. As the difference in loads are small the pipe support calculations are not revised. The calculations are accecptable.

6/29/93

(Revised final autopipe output S2)

RESTRAINT REACTIONS

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
A00	Anchor								
	GR	2	-22	1	22	-8	-2	0	8
	T1	-1	-1	0	2	-1	1	3	3
	E1	7	-5	3	9	8	-1	-9	12
	E2	-1	6	0	6	2	0	0	2
	E3	0	-6	9	11	16	4	2	17
	P1	0	0	0	0	0	0	0	0
	SEIS	7	9	9	15	18	4	9	21
	SUST	2	-22	1	22	-8	-2	0	8
	OCC	9	31	10	34	26	6	10	28
	TOTAL	10	32	10	35	26	7	13	30
S1B	Guide								
	GR	0	-5	0	5	0	0	0	0
	T1	0	5	0	5	0	0	0	0
	E1	0	0	0	0	0	0	0	0
	E2	0	1	0	1	0	0	0	0
	E3	0	-8	13	15	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	8	13	15	0	0	0	0
	SUST	0	-5	0	5	0	0	0	0
	OCC	0	13	13	19	0	0	0	0
	TOTAL	0	18	13	22	0	0	0	0
S2B	Guide								
	GR	0	-21	0	21	0	0	0	0
	T1	0	21	0	21	0	0	0	0
	E1	0	-23	0	23	0	0	0	0
	E2	0	5	0	5	0	0	0	0
	E3	0	1	0	1	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	23	0	23	0	0	0	0
	SUST	0	-21	0	21	0	0	0	0
	OCC	0	44	0	44	0	0	0	0
	TOTAL	0	65	0	65	0	0	0	0
S1A	Guide								
	GR	0	-39	0	39	0	0	0	0
	T1	0	-63	0	63	0	0	0	0
	E1	0	-2	0	2	0	0	0	0
	E2	0	10	0	10	0	0	0	0
	E3	0	12	7	14	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	15	7	17	0	0	0	0
	SUST	0	-39	0	39	0	0	0	0
	OCC	0	55	7	55	0	0	0	0
	TOTAL	0	117	7	118	0	0	0	0

RESTRAINT REACTIONS

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
S2A	Guide								
	GR	0	-22	0	22	0	0	0	0
	T1	0	-69	0	69	0	0	0	0
	E1	0	22	0	22	0	0	0	0
	E2	0	6	0	6	0	0	0	0
	E3	0	-1	4	4	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	23	4	23	0	0	0	0
	SUST	0	-22	0	22	0	0	0	0
	OCC	0	45	4	45	0	0	0	0
	TOTAL	0	114	4	114	0	0	0	0
D00	Anchor								
	GR	0	-9	-1	9	-9	-2	-1	10
	T1	1	2	0	2	2	-1	-1	3
	E1	27	4	13	30	10	-15	-16	25
	E2	0	2	0	2	2	0	0	2
	E3	3	1	10	10	6	4	-2	8
	P1	0	0	0	0	0	0	0	0
	SEIS	27	5	16	32	12	16	17	26
	SUST	0	-9	-1	9	-9	-2	-1	10
	OCC	27	14	17	35	22	18	18	33
	TOTAL	28	16	17	36	24	18	19	36
S3A	Guide								
	GR	0	-12	0	12	0	0	0	0
	T1	0	1	0	1	0	0	0	0
	E1	12	-1	0	12	0	0	0	0
	E2	0	3	0	3	0	0	0	0
	E3	0	-1	0	1	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	12	3	0	12	0	0	0	0
	SUST	0	-12	0	12	0	0	0	0
	OCC	12	15	0	19	0	0	0	0
	TOTAL	12	16	0	20	0	0	0	0
S4A	Guide								
	GR	0	-8	0	8	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	0	0	0	0	0	0	0	0
	E2	0	2	0	2	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	2	0	2	0	0	0	0
	SUST	0	-8	0	8	0	0	0	0
	OCC	0	11	0	11	0	0	0	0
	TOTAL	0	11	0	11	0	0	0	0

(Revised format on Sh 2

RESTRAINT REACTIONS

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
S5A	Guide								
	GR	0	0	0	0	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	0	0	11	11	0	0	0	0
	E2	0	0	0	0	0	0	0	0
	E3	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	0	11	11	0	0	0	0
	SUST	0	0	0	0	0	0	0	0
	OCC	0	0	11	11	0	0	0	0
	TOTAL	0	0	11	11	0	0	0	0
S5C	Guide								
	GR	0	-15	0	15	0	0	0	0
	T1	0	15	0	15	0	0	0	0
	E1	0	0	5	5	0	0	0	0
	E2	0	4	0	4	0	0	0	0
	E3	0	-2	0	2	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	4	5	7	0	0	0	0
	SUST	0	-15	0	15	0	0	0	0
	OCC	0	20	5	20	0	0	0	0
	TOTAL	0	35	5	35	0	0	0	0
S4C	Guide								
	GR	0	-7	0	7	0	0	0	0
	T1	0	7	0	7	0	0	0	0
	E1	0	5	0	5	0	0	0	0
	E2	0	2	0	2	0	0	0	0
	E3	0	4	24	24	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	7	24	25	0	0	0	0
	SUST	0	-7	0	7	0	0	0	0
	OCC	0	14	24	28	0	0	0	0
	TOTAL	0	21	24	32	0	0	0	0
S5B	Guide								
	GR	0	-16	0	16	0	0	0	0
	T1	0	-64	0	64	0	0	0	0
	E1	0	-15	5	16	0	0	0	0
	E2	0	4	0	4	0	0	0	0
	E3	0	-1	5	5	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	16	7	17	0	0	0	0
	SUST	0	-16	0	16	0	0	0	0
	OCC	0	31	7	32	0	0	0	0
	TOTAL	0	96	7	96	0	0	0	0

RESTRAINT REACTIONS

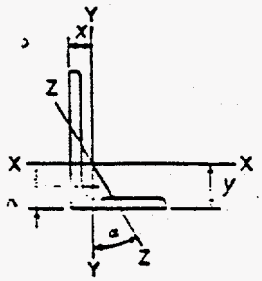
Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
S4B	Guide								
	GR	0	-7	0	7	0	0	0	0
	T1	0	-63	0	63	0	0	0	0
	E1	0	-5	0	5	0	0	0	0
	E2	0	2	0	2	0	0	0	0
	E3	0	3	17	18	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	0	6	17	18	0	0	0	0
	SUST	0	-7	0	7	0	0	0	0
	OCC	0	13	17	22	0	0	0	0
	TOTAL	0	76	17	78	0	0	0	0
S3C	Guide								
	GR	0	-28	0	28	0	0	0	0
	T1	0	1	0	1	0	0	0	0
	E1	28	0	0	28	0	0	0	0
	E2	0	8	0	8	0	0	0	0
	E3	1	-4	0	4	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	28	9	0	30	0	0	0	0
	SUST	0	-28	0	28	0	0	0	0
	OCC	28	37	0	46	0	0	0	0
	TOTAL	28	38	0	47	0	0	0	0
S3B	Guide								
	GR	0	-40	0	40	0	0	0	0
	T1	0	-1	0	1	0	0	0	0
	E1	7	0	0	7	0	0	0	0
	E2	0	9	0	9	0	0	0	0
	E3	0	-3	0	3	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	7	9	0	12	0	0	0	0
	SUST	0	-40	0	40	0	0	0	0
	OCC	7	49	0	49	0	0	0	0
	TOTAL	7	50	0	50	0	0	0	0
WALL	Guide								
	GR	0	-9	0	9	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	E1	7	0	0	7	0	0	0	0
	E2	0	3	0	3	0	0	0	0
	E3	0	3	0	3	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	SEIS	7	4	0	8	0	0	0	0
	SUST	0	-9	0	9	0	0	0	0
	OCC	7	13	0	14	0	0	0	0
	TOTAL	7	13	0	15	0	0	0	0

Revised final output

RESTRAINT REACTIONS

Point name	Load combination	FORCES (lb) X	Y	Z	Result	MOMENTS (ft-lb) X	Y	Z	Result
I04	Anchor								
	GR	-2	-28	-1	28	-4	3	-14	15
	T1	1	-2	0	2	-1	-1	-1	1
	E1	21	-1	16	26	13	-14	-18	27
	E2	1	7	0	7	1	-1	3	4
	E3	-4	1	22	22	18	-8	4	20
	P1	0	0	0	0	0	0	0	0
	SEIS	21	7	27	35	23	16	19	34
	SUST	-2	-28	-1	28	-4	3	-14	15
	OCC	23	35	28	51	27	19	33	47
	TOTAL	23	37	28	52	28	19	34	48

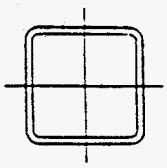
ANGLES
Equal legs and unequal legs
Properties for designing



Size and Thickness	k	Weight per Ft	Area	AXIS X-X				AXIS Y-Y				AXIS Z-Z	
				I	S	r	y	I	S	r	x	r	Tan α
In.	In.	Lb.	In.^{2}	In.^{4}	In.^{3}	In.	In.	In.^{4}	In.^{3}	In.	In.	In.	
L 1¾×1¾×¼	½	2.77	0.813	0.227	0.227	0.529	0.529	0.227	0.227	0.529	0.529	0.341	1.000
×⅜	7/16	2.12	0.621	0.179	0.144	0.537	0.506	0.179	0.144	0.537	0.506	0.343	1.000
L 1½×1½×¼	7/16	2.34	0.688	0.139	0.134	0.449	0.466	0.139	0.134	0.449	0.466	0.292	1.000
×⅜	⅜	1.80	0.527	0.110	0.104	0.457	0.444	0.110	0.104	0.457	0.444	0.293	1.000
L 1¼×1¼×¼	7/16	1.92	0.563	0.077	0.091	0.369	0.403	0.077	0.091	0.369	0.403	0.243	1.000
×⅜	⅜	1.48	0.434	0.061	0.071	0.377	0.381	0.061	0.071	0.377	0.381	0.244	1.000
L 1⅛×1⅛×⅛	7/32	0.900	0.266	0.032	0.040	0.345	0.327	0.032	0.040	0.345	0.327	0.221	1.000
L 1 ×1 ×⅛	¼	0.800	0.234	0.022	0.031	0.304	0.296	0.022	0.031	0.304	0.296	0.196	1.000

REF. 2

APPENDIX F-32



STRUCTURAL TUBING
Square
Dimensions and properties

Dimensions				Properties**					
Nominal* Size	Wall Thickness		Weight per Ft	Area	I	S	r	J	Z
In.	In.		Lb.	In.^{2}	In.^{4}	In.^{3}	In.	In.^{4}	In.^{3}
4.5×4.5	0.2500	¼	13.91	4.09	12.1	5.36	1.72	19.7	6.43
	0.1875	3/16	10.70	3.14	9.60	4.27	1.75	15.4	5.03
4×4	0.5000	½	21.63	6.36	12.3	6.13	1.39	21.8	8.02
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
	0.3125	5/16	14.83	4.36	9.58	4.79	1.48	16.1	5.90
	0.2500	¼	12.21	3.59	8.22	4.11	1.51	13.5	4.97
	0.1875	3/16	9.42	2.77	6.59	3.30	1.54	10.6	3.91
3.5×3.5	0.3125	5/16	12.70	3.73	6.09	3.48	1.28	10.4	4.35
	0.2500	¼	10.51	3.09	5.29	3.02	1.31	8.82	3.70
	0.1875	3/16	8.15	2.39	4.29	2.45	1.34	6.99	2.93
3×3	0.3125	5/16	10.58	3.11	3.58	2.39	1.07	6.22	3.04
	0.2500	¼	8.81	2.59	3.16	2.10	1.10	5.35	2.61
	0.1875	3/16	6.87	2.02	2.60	1.73	1.13	4.28	2.10
2.5×2.5	0.3125	5/16	8.45	2.48	1.87	1.50	0.868	3.32	1.96
	0.2500	¼	7.11	2.09	1.69	1.35	0.899	2.92	1.71
	0.1875	3/16	5.59	1.64	1.42	1.14	0.930	2.38	1.40
2×2	0.3125	5/16	6.32	1.86	0.880	0.880	0.690	1.49	1.11
	0.2500	¼	5.41	1.59	0.766	0.766	0.694	1.36	1.00
	0.1875	3/16	4.32	1.27	0.668	0.668	0.726	1.15	0.840

*Outside dimensions across flat sides.
**Properties are based upon a nominal outside corner radius equal to two times the wall thickness.

STRU[illegible]

Dimensions

Dimensions					
Nominal* Size	Wall Thickness		Weight per Ft	Area	I_x
In.	In.		Lb.	In.^{2}	In.^{4}
20×12	0.5000	½	103.30	30.4	1650
	0.3750	3/8	78.52	23.1	1280
	0.3125	5/16	65.87	19.4	1080
20× 8	0.5000	½	89.68	26.4	1270
	0.3750	3/8	68.31	20.1	988
	0.3125	5/16	57.36	16.9	838
20× 4	0.5000	½	76.07	22.4	889
	0.3750	3/8	58.10	17.1	699
	0.3125	5/16	48.86	14.4	596
18× 6	0.5000	½	76.07	22.4	818
	0.3750	3/8	58.10	17.1	641
	0.3125	5/16	48.86	14.4	546
16×12	0.6250	5/8	110.36	32.4	1160
	0.5000	½	89.68	26.4	962
	0.3750	3/8	68.31	20.1	[illegible]
	0.3125	5/16	57.36	16.9	[illegible]
16× 8	0.5000	½	76.07	22.4	722
	0.3750	3/8	58.10	17.1	565
	0.3125	5/16	48.86	14.4	481
16× 4	0.5000	½	62.46	18.4	481
	0.3750	3/8	47.90	14.1	382
	0.3125	5/16	40.35	11.9	327
14×10	0.6250	5/8	93.34	27.4	728
	0.5000	½	76.07	22.4	608
	0.3750	3/8	58.10	17.1	476
	0.3125	5/16	48.96	14.4	405

*Outside dimensions across flat sides.
**Properties are based upon a nominal thickness.

AMERICAN INSTITU

REF. 2

DESIGN ANALYSIS

APPENDIX F-33

Client KEH (For internal use) WO/Job No. 721310

Subject STRESS ALLOWABLES Date 4/5/90 By M.T. Hsiao

FOR B31.3 PIPE SUPPORTS (SC 3 & 4) Checked 4-17-90 By D.I. Kone

Location ALL PROJECTS Revised By

PIPE SUPPORTS PER ANSI 831.3 (See Note 6)

STRESS ALLOWABLES FOR SAFETY CLASS 3 AND 4 WHEN EQUIVALENT STATIC ANALYSIS, BASED ON UBC SEISMIC, IS PERFORMED.

Stress Type	Loads	A 36 Plates Min Temp to 100°F	A106, GrB Pipes & Tube Min Temp to 400°F	A312 TP304L Pipes & Tube Min Temp to 300°F	Criteria	A500, GrB Tubes 650°F Ref #3	Criteria	A36 Three Rods
Tension + Bending	Gr+Th	17800 psi (16900 psi 200°F-700°F)	20000 psi	16700 psi	S	14500	S	Ref # Table
	Gr+Th+ Seis or Wind	23674 psi (22477 psi 200°F-700°F)	26600 psi	22211 psi	1.33S Note 1	17400 psi	1.2S Note 3	
Shear	Gr+Th	14240 psi (13520 psi 200°F-700°F)	16000 psi	13360 psi	.8S	11600 psi	.8S	Not Recommended
	Gr+Th+ Seis or Wind	18939 psi (17980 psi 200°F-700°F)	21280 psi	17769 psi	1.33X 0.8S Note 2	13920 psi	1.2x.8S Notes 2&3	
Shear in Fillet Welding*	Gr+Th	13350 psi	15000 psi	12525 psi	.75S	10875 psi	.75S	Not Recommended
	Gr+Th + Seis or Wind	17755 psi	19950 psi	16658 psi	1.33x.75S Notes 1 & 5	13050 psi	1.2x.75S Notes 3&5	
Bearing (Pressure Bounday Only)			32000 psi	26720 psi	1.6 x S Note 2			
Hydro-static Test		28800 psi	28000 psi	20000 psi	$.8S_y$	33600 psi	$.8S_y$ Note 4	

References:

1. ANSI 831.3-87
2. MSS SP-58
3. MSS SP-69

Abbreviations:

Gr=Gravity Loads
Th=Thermal Loads
Seis=Seismic Loads
S=Stress Allowable from ref. 1 & 2
S_y=Yield Strength

Notes:

1. Ref. 1, Para 302.3.1(a), 302.3.6(a) and 321.1.3
2. Ref. 1, Para 302.3.1(b), 302.3.6(a) and 321.1.3
3. Ref. 3, Para 4.5(b)
4. Ref. 3, Para 4.5(c)
5. Ref. 3, Para 4.5(a)
6. If ANSI B31.3 does not give any clear cut direction for stress analysis criteria, follow AISC Manual of Steel Construction, where applicable.

*For welds other than fillet weld, use this allowable or see ref. 1 for further guidance.

REF 3

APPENDIX F-34

Normally the use of these standard design formulas results in a unit stress, psi; however, when the weld is treated as a line, these formulas result in a force on the weld, lbs per linear inch.

For secondary welds, the weld is not treated as a line, but standard design formulas are used to find the force on the weld, lbs per linear inch.

In problems involving bending or twisting loads Table 5 is used to determine properties of the weld treated as a line. It contains the section modulus (S_w), for bending, and polar moment of inertia (J_w), for twisting, of some 13 typical welded connections with the weld treated as a line.

For any given connection, two dimensions are needed, width (b) and depth (d).

For each joint, S_w is used for welds subject to bending loads, and polar moment of inertia (J_w) for twisting loads.

Section moduli (S_w) from these formulas are for maximum force at the top as well as the bottom portions of the welded connections. For the unsymmetrical connections shown in this table, maximum bending force is at the bottom.

If there is more than one force applied to the weld, these are found and combined. All forces which are combined (vectorially added) must occur at the same position in the welded joint.

Determining Weld Size by Using Allowables

Weld size is obtained by dividing the resulting force on the weld found above, by the allowable strength of the particular type of weld used (fillet or groove), obtained from Tables 6 and 7 (steady loads) or Tables 8 and 9 (fatigue loads).

If there are two forces at right angles to each other, the resultant is equal to the square root of the sum of the squares of these two forces.

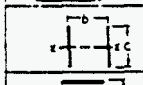
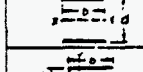
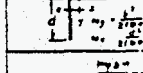
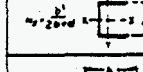
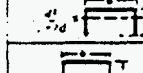
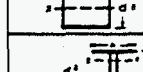
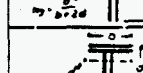
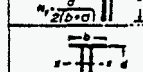
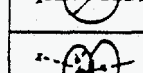
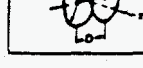
$$f_r = \sqrt{f_1^2 + f_2^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

If there are three forces, each at right angles to each other, the resultant is equal to the square root of the sum of the squares of the three forces.

$$f_r = \sqrt{f_1^2 + f_2^2 + f_3^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

One important advantage to this method, in addition to its simplicity, is that no new formulas must be used, nothing new must be learned. Assume an engineer has just designed a beam. For strength he has used the standard formula $\sigma = M/S$. Substituting the load on the beam (M) and the property of the beam (S) into this formula, he has found the bending stress (σ). Now, he substitutes the property of the

TABLE 5—Properties of Weld Treated as Line

Outline of Welded Joint (b=width, d=depth)	Bending (about horizontal axis x-x)	Twisting
	$S_w = \frac{d^2}{6}$ in.^{2}	$J_w = \frac{d^3}{12}$ in.^{3}
	$S_w = \frac{d^2}{3}$	$J_w = \frac{d(3b^2+d^2)}{6}$
	$S_w = bd$	$J_w = \frac{b^3+3bd^2}{6}$
	$S_w = \frac{4bd+d^2}{6}$ top, $\frac{d^2(4b+d)}{6(2b+d)}$ bottom	$J_w = \frac{(b+d)^4-6b^2d^2}{12(b+d)}$
	$S_w = bd + \frac{d^2}{6}$	$J_w = \frac{(2b+d)^3}{12} - \frac{b^2(b+d)^2}{(2b+d)}$
	$S_w = \frac{2bd+d^2}{3}$ top, $\frac{d^2(2b+d)}{3(b+d)}$ bottom	$J_w = \frac{(b+2d)^3}{6} - \frac{d^2(b+d)^2}{(b+2d)}$
	$S_w = bd + \frac{d^2}{3}$	$J_w = \frac{(b+d)^3}{6}$
	$S_w = \frac{2bd+d^2}{3}$ top, $\frac{d^2(2b+d)}{3(b+d)}$ bottom	$J_w = \frac{(b+2d)^3}{12} - \frac{d^2(b+d)^2}{(b+2d)}$
	$S_w = \frac{4bd+d^2}{3}$ top, $\frac{4bd^2+d^3}{6b+3d}$ bottom	$J_w = \frac{d^3(4b+d)}{6(b+d)} + \frac{b^3}{6}$
	$S_w = bd + \frac{d^2}{3}$	$J_w = \frac{b^3+3bd^2+d^3}{6}$
	$S_w = 2bd + \frac{d^2}{3}$	$J_w = \frac{2b^3+6bd^2+d^3}{6}$
	$S_w = \frac{\pi d^2}{4}$	$J_w = \frac{\pi d^3}{4}$
	$I_w = \frac{\pi d}{2}\left(b^2+\frac{d^2}{2}\right)$, $S_w = \frac{I_w}{c}$, where $c = \sqrt{b^2+\frac{d^2}{4}}$	

weld, treating it as a line (S_w), obtained from Table 5, into the same formula. Using the same load (M), $f = M/S_w$, he thus finds the force on the weld (f) per linear inch. The weld size is then found by dividing the force on the weld by the allowable force.

Applying System to Any Welded Connection

1. Find the position on the welded connection where the combination of forces will be maximum. There may be more than one which should be considered.

2. Find the value of each of the forces on the welded connection at this point. (a) Use Table 4 for the standard design formula to find the force on the weld. (b) Use Table 5 to find the property of the weld treated as a line.

3. Combine (vectorially) all of the forces on the weld at this point.

4. Determine the required weld size by dividing this resultant value by the allowable force in Tables 6, 7, 8, or 9.

REF 4

APPENDIX F-35

GRINNELL CORPORATION

DESIGN REPORT SUMMARY
FOR
FIG. 137N U-BOLT
(Normal & Side Loaded)

1. GENERAL INFORMATION

CODE CLASS: 1, 2, 3, MC
MATERIAL DATA: See Page 2
LOAD RATINGS: See Pages 3-5,7
DESIGN BY: Analysis

SERVICE LIMITS: Levels A,B,C,D
DESIGN TEMPERATURE: 650°F
DIMENSIONAL DATA: See Page 6

2. CERTIFICATION

I CERTIFY THAT THE LOAD CAPACITY OF THIS COMPONENT STANDARD SUPPORT IS RATED IN ACCORDANCE WITH THE REQUIREMENTS OF THE A.S.M.E. B&PV CODE, SECTION III, SUBSECTIONS NCA & NF AND GRINNELL'S DESIGN SPECIFICATION PE188-1.

THE SUBSTANTIATING DESIGN REPORT DR 137, DESIGN REPORT CERTIFICATION, AND GRINNELL'S DESIGN SPECIFICATION ARE LOCATED AT THE PIPE SUPPORT DIVISION - CRANSTON, RI.

RONALD T. WISNIEWSKI
NO. 4108
7/24/89
REGISTERED
PROFESSIONAL ENGINEER

Ronald T. Wisniewski

3. REVISIONS

DRS Rev.	DR Rev.	Code Edition	Code Addenda	P.E.	Date
5	2	1986	1988	RTW	7/24/89

REF. 5

4. COMPONENT SUPPORT INFORMATION		
ITEM	MATERIAL SPECIFICATION	ITEM TYPE
1. U-Bolt	SA-36	Linear
2. Hex Nut	SA-307 Gr. B or ASTM A-307 Gr. A*	Linear
	*Code Case N-249	
	REF. 5	

GRINNELL CORPORATION
QUALIFIED PRODUCT
LOAD RATINGS
FIG. 137N U-BOLT

PIPE SIZE	MAXIMUM NORMAL LOADS (LBS) @ 650°F		
	DESIGN LOADING & LEVELS A & B	LEVEL C	LEVEL D
1/2"	485	645	910
3/4"	485	645	910
1"	485	645	910
1 1/4"	1220	1620	2290
1 1/2"	1220	1620	2290
2"	1220	1620	2290
2 1/2"	2260	3010	4250
3"	2260	3010	4250
3 1/2"	2260	3010	4250
4"	2260	3010	4250
5"	2260	3010	4250
6"	3620	4810	6810
8"	3620	4810	6810
10"	5420	7210	10190
12"	7540	10030	14180
14"	7540	10030	14180
16"	7540	10030	14180
18"	9920	13200	18650

REF. 5

RINNELL CORPORATION
QUALIFIED PRODUCT
LOAD RATINGS

APPENDIX F-38

PIPE SIZE	MAXIMUM SIDE LOADS (LBS) @ 650°F.		
	DESIGN LOADING & LEVELS A & B	LEVEL C --	LEVEL D
1/2	63#	83#	120#
3/4	63#	83#	120#
1	63#	83#	120#
1 1/4	194#	260#	370#
1 1/2	194#	260#	370#
2	194#	260#	370#
2 1/2	184#	240#	350#
3	184#	240#	350#
3 1/2	184#	240#	350#
4	184#	240#	350#
5	184#	240#	350#
6	277#	370#	520#
8	277#	370#	520#
10	400#	530#	750#
12	422#	560#	790#
14	422#	560#	790#
16	422#	560#	790#

REF 5

APPENDIX F-39

TABLE NO. II—KB-II CARBON STEEL ALLOWABLE TENSION AND SHEAR VALUES (In Pounds)[1,4]

ANCHOR DIA. (Inches)	DEPTH EMBED. (Inches)	f'_c = 2000 psi			f'_c = 3000 psi			f'_c = 4000 psi			f'_c = 6000 psi		
		Tension			Tension			Tension			Tension		
		With[2] Sp. Insp.	Without[3] Sp. Insp.	Shear	With[2] Sp. Insp.	Without[3] Sp. Insp.	Shear	With[2] Sp. Insp.	Without[3] Sp. Insp.	Shear	With[2] Sp. Insp.	Without[3] Sp. Insp.	Shear
1/4	1 1/8	250	125	400	310	155	400	360	180	400	440	220	400
1/4	2	525	265	400	550	280	400	590	295	400	625	315	400
1/4	3 1/4	625	315	400	625	315	400	625	315	400	625	315	400
3/8	1 5/8	500	250	925	615	310	975	710	355	1,025	800	400	1,025
3/8	2 1/2	1,125	565	1,100	1,210	605	1,100	1,290	645	1,100	1,450	725	1,100
3/8	4 1/4	1,250	625	1,100	1,300	650	1,100	1,350	675	1,100	1,450	725	1,100
1/2	2 1/4	1,100	550	1,810	1,230	615	1,840	1,365	680	1,840	1,625	815	1,840
1/2	3 1/2	1,750	875	1,840	2,000	1,000	1,840	2,250	1,125	1,840	2,625	1,315	1,840
1/2	6	1,950	975	1,840	2,165	1,080	1,840	2,375	1,190	1,840	2,625	1,315	1,840
5/8	2 1/4	1,500	750	2,875	1,750	875	2,875	2,000	1,000	2,875	2,500	1,250	2,875
5/8	4	2,250	1,125	3,125	2,670	1,335	3,125	3,090	1,545	3,125	3,925	1,965	3,125
5/8	7	2,400	1,200	3,125	3,220	1,625	3,125	3,500	1,750	3,125	3,925	1,965	3,125
3/4	3 1/4	1,850	925	3,875	2,175	1,090	3,875	2,500	1,250	3,875	3,000	1,500	3,875
3/4	4 1/4	2,750	1,375	4,225	3,875	1,940	4,225	4,500	2,250	4,225	5,500	2,750	4,225
3/4	8	3,750	1,875	4,225	4,625	2,315	4,225	5,500	2,750	4,225	5,925	2,965	4,225
1	4 1/2	3,125	1,565	6,625	3,300	1,900	7,125	4,375	2,190	7,625	5,250	2,625	8,625
1	6	5,000	2,500	8,625	5,815	2,910	8,625	6,625	3,315	8,625	8,250	4,125	8,625
1	9	6,250	3,125	8,625	7,190	3,595	8,625	8,125	4,065	8,625	10,000	5,000	8,625

[1]The tabulated tension and shear values are for anchors installed in stone-aggregate concrete having the compressive strength at the time of installation. Concrete aggregate must comply with U.B.C Standard No. 26-2.

[2]These tension values are only applicable when the anchors are installed with special inspection as set forth in Section 306 of the code.

[3]These tension values are only applicable when the anchors are installed without special inspection as set forth in Section 306 of the code.

[4]The tabulated values are for anchors installed a minimum of 12 anchor diameters on center for 100 percent efficiency. Spacing may be reduced to 6 anchor diameters provided the values are reduced 50 percent. Linear interpolation may be used for intermediate spacings.

TABLE NO. III—AISI 304 AND 316 STAINLESS STEEL KB-II ALLOWABLE TENSION AND SHEAR VALUES (In Pounds)[1,4]

ANCHOR DIA. (Inches)	DEPTH EMBED. (Inches)	f'_c = 2000 psi			f'_c = 3000 psi			f'_c = 4000 psi			f'_c = 6000 psi		
		Tension			Tension			Tension			Tension		
		With[2] Sp. Insp.	Without[3] Sp. Insp.	Shear	With[2] Sp. Insp.	Without[3] Sp. Insp.	Shear	With[2] Sp. Insp.	Without[3] Sp. Insp.	Shear	With[2] Sp. Insp.	Without[3] Sp. Insp.	Shear
1/4	1 1/8	300	150	525	315	156	540	325	165	550	350	175	550
1/4	2	440	220	550	520	260	550	520	260	550	520	260	550
1/4	3 1/4	520	260	550	520	260	550	520	260	550	520	260	550
3/8	1 5/8	400	200	825	460	230	950	515	260	1,075	625	315	1,150
3/8	2 1/2	875	440	1,250	1,025	515	1,250	1,175	590	1,250	1,350	675	1,250
3/8	4 1/4	1,000	500	1,250	1,250	625	1,250	1,350	675	1,250	1,350	675	1,250
1/2	2 1/4	800	400	1,700	1,000	500	1,740	1,200	600	1,775	1,250	625	2,085
1/2	3 1/2	1,250	625	2,085	1,625	815	2,085	2,000	1,000	2,085	2,250	1,125	2,085
1/2	6	1,375	690	2,085	1,765	880	2,085	2,150	1,075	2,085	2,550	1,275	2,085
5/8	2 1/4	1,175	590	2,625	1,500	750	2,875	1,700	850	3,125	1,800	900	3,125
5/8	4	1,750	875	3,125	2,250	1,125	3,125	2,750	1,375	3,125	3,000	1,500	3,125
5/8	7	2,250	1,125	3,125	2,825	1,415	3,125	3,425	1,715	3,125	3,425	1,715	3,125
3/4	3 1/4	1,450	725	2,700	1,825	915	3,100	2,200	1,100	3,500	2,450	1,225	4,500
3/4	4 1/4	2,350	1,175	4,225	3,050	1,525	4,365	3,625	1,815	4,500	4,375	2,190	4,500
3/4	8	2,750	1,375	4,500	3,625	1,815	4,500	4,250	2,125	4,500	4,800	2,400	4,500
1	4 1/2	2,925	1,465	5,700	3,625	1,815	6,350	4,325	2,165	7,000	4,500	2,250	7,000
1	6	4,125	2,065	7,000	6,000	3,000	7,000	6,750	3,375	7,000	6,875	3,440	7,000
1	9	5,250	2,625	7,000	7,500	3,750	7,000	8,800	4,400	7,000	8,800	4,400	7,000

[1]The tabulated tension and shear values are for anchors installed in stone-aggregate concrete having the compressive strength at the time of installation. Concrete aggregate must comply with U.B.C. Standard No. 26-2.

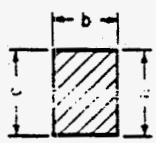
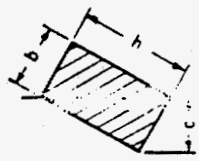
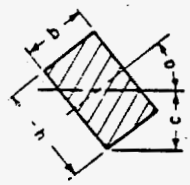
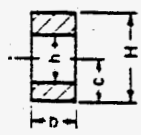
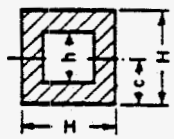
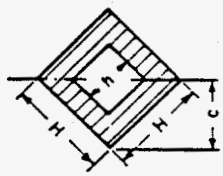
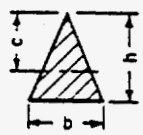
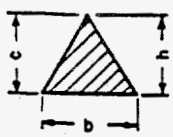
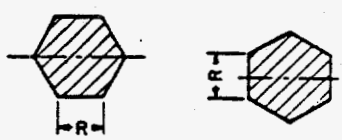
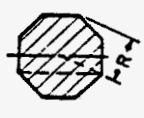
[2]These tension values are only applicable when the anchors are installed with special inspection as set forth in Section 306 of the code.

[3]These tension values are only applicable when the anchors are installed without special inspection as set forth in Section 306 of the code.

[4]The tabulated values are for anchors installed a minimum of 12 anchor diameters on center for 100 percent efficiency. Spacing may be reduced to 6 anchor diameters provided the values are reduced 50 percent. Linear interpolation may be used for intermediate spacings.

REF. 6

Table 5.2.6 Properties of Various Cross Sections
(I = moment of inertia; I/c = section modulus; $r = \sqrt{I/A}$ = radius of gyration)

Section	Moment of inertia	Section modulus	Radius of gyration
			
$I = \frac{bh^3}{12}$ $\frac{I}{c} = \frac{bh^2}{6}$ $r = \frac{h}{\sqrt{12}} = 0.289h$	$\frac{bh^3}{3}$ $\frac{bh^2}{3}$ $\frac{h}{\sqrt{3}} = 0.577h$	$\frac{b^3h^3}{6(b^2+h^2)}$ $\frac{b^3h^2}{6\sqrt{b^2+h^2}}$ $\frac{bh}{\sqrt{6(b^2+h^2)}}$	$\frac{bh}{12}(h^2\cos^2\alpha + b^2\sin^2\alpha)$ $\frac{bh}{6}\left(\frac{h^2\cos^2\alpha + b^2\sin^2\alpha}{h\cos\alpha + b\sin\alpha}\right)$ $\sqrt{\frac{h^2\cos^2\alpha + b^2\sin^2\alpha}{12}}$
			
$I = \frac{b}{12}(H^3 - h^3)$ $\frac{I}{c} = \frac{b}{6}\frac{H^3 - h^3}{H}$ $r = \sqrt{\frac{H^3 - h^3}{12(H - h)}}$	$\frac{H^4 - h^4}{12}$ $\frac{1}{6}\frac{H^4 - h^4}{H}$ $\sqrt{\frac{H^2 + h^2}{12}}$	$\frac{H^4 - h^4}{12}$ $\frac{\sqrt{2}}{12}\frac{H^4 - h^4}{H}$ $\sqrt{\frac{H^2 + h^2}{12}}$	$\frac{bh^3}{36}$; $c = \frac{2}{3}h$ $\frac{bh^2}{24}$ $\frac{h}{\sqrt{18}}$
			
$I = \frac{bh^3}{12}$ $\frac{I}{c} = \frac{bh^2}{12}$ $r = \frac{h}{\sqrt{6}}$	$\frac{5\sqrt{3}}{16}R^4$ $\frac{5}{8}R^3$ $\sqrt{\frac{5}{24}}R$	$\frac{5\sqrt{3}}{16}R^3$	$\frac{1+2\sqrt{2}}{6}R^4$ $0.6906R^3$ $0.475R$

NOTE: Square, axis same as first rectangle, side = h; $I = b^4/12$; $I/c = b^3/6$; $r = 0.289h$.
Square, diagonal taken as axis: $I = b^4/12$; $I/c = 0.1179b^3$; $r = 0.289h$.

of various beam
-steel shapes, see

that Table 5.2.6
ntal axis is not a
f vertical loading.
s a horizontal axis
ust be handled by

axes are always at
xes are axes with
spectively, a max-
roduct of inertia is
nmetry are always
, like a rolled angle
principal axis with
tan $2\theta = 2I_{xy}/(I_y$
f the principal axis
of the section with
nt of inertia of the
oment of inertia of
n this principal axis
it right angles to it.
ect to the principal
where in the section
Fig. 5.2.33) is S =
ich M = bending
tion, α = the angle
e plane of the loads
mponent of bending
ipal axis which has
= the component of
the principal axis
The sign of the
by inspection in the
n or compression
vo terms.
ne plane of the beam
cipal axes, the ordi-
he ordinary case
ess may be applied
oes not coincide with
a for oblique loading

sed for stresses
an experimental
formula is empirical
to the cross section
compression
le of a beam of
ne 1–1 shows the
rectilinear relation
stress-strain diagram
n, compression above
nen below the
to develop
use of the reinforcing
s that is not yet

Thus leads to an equalization of stress over the cross section. S_c exceeds the ultimate strength S_M in tension as follows: [illegible] $S_c = 2S_M$; for sandstone, $S_R = 3S_M$; for concrete, $S_c = 2S_M$; for wood (green), $S_R = 2.3S_M$.

In the case of I steel I beams, failure begins practically when [illegible] in the compression flange is reached.

[illegible] the support of adjoining material, the **elastic limit** [illegible] greater than in tension, depending upon the [illegible] breadth to depth of section. For the same breadth, [illegible] decreases with increase of height. No difference [illegible] the case of an I beam, or with hard materials. Bauschinger quotes for soft steel plates, 1.27; Considère, 1.37; Hatt, 1.5 (*Railroad Gaz.*, 1899).

Wide plates will not expand and contract freely, and the value of E will be increased on account of side constraint. As a consequence of lateral contraction of the fibers of the tension side of a beam and lateral swelling of fibers at the compression side, the cross section becomes distorted to a trapezoidal shape, and the neutral axis is at the center of gravity of the trapezoid. Strictly, this shape is one with a curved perimeter, the radius being r_c/μ, where r_c is the radius of curvature of the neutral line of the beam, and μ is Poisson's ratio.

REF 7

APPENDIX G

CONCRETE SLAB DESIGN

(1) Drawing _____ (2) Doc. No. _____ APPENDIX G-2

(4) Building 241-U-701 (NEW) (5) Rev. _____ (6) Jo _____

(7) Subject SLAB DESIGN

(8) Originator R.L. JORISSEN Date 7/25/93

(9) Checker [signature] Date 7/29/93

(10)

SLAB ON GRADE - NO FOOTING

Problem:

The proposed new compressor building (241-U-701) will be located in an area containing an existing asphalt slab positioned several inches below ground surface. An assessment of field conditions shows that radiological contamination exists immediately below the asphalt layer. Because of the contamination, the asphalt slab cannot be breached or the soil excavated without high costs associated with labor and disposal of contaminated material and severe impact on construction completion schedule. This preclusion of soil excavation results in a violation of an SDC 4.1 (Rev. 11) requirement specifying a minimum footing burial depth of 2-ft 6-in. below finished grade. The burial depth requirement is to ensure that the bottom of a footing is below the frost line. The volume changes (frost heave) that occur during freezing and thawing of the soil mass supporting the foundation can produce excessive stresses in the foundations in a building and, as a result, cause damage to the walls which are supported thereon.

Solution:

If a foundation is built above the frost line, a method to eliminate or minimize the effects of frost action on building integrity is to eliminate the water in the soil under the footings. Using a slab on grade without footings extending below the frost line is an acceptable structural support system in the 241-U-701 building if water is eliminated below the slab.

Frost action does not occur without the presence of water in the soil. There are three sources of water that could contribute to frost action.

1) The soil mass is below the water table.

2) The water table is within fairly close proximity to the soil that supports the foundation such that upward movement of moisture by capillary action, evaporation, or condensation can occur.

3) Percolation from rainfall or snow melt.

The deep water table in the 200E Area precludes concerns about items 1 and 2 shown above. Item 3, rain and snow melt percolation, can be controlled with proper drainage. The slab design will incorporate drainage controls that will eliminate percolation water. Note: The natural moisture content of the soil below the asphalt layer is the only water present. A typical value for Hanford sands is 5% moisture content. This low value will not contribute to frost heave.

(1) Drawing _____ (2) Doc. No. _____

(4) Building 241-U-701 (NEW) (5) Rev. _____ (6) Job No. _____

(7) Subject SLAB DESIGN

(8) Originator R.L. JORGENSEN Date 7/23/93

(9) Checker E.H. Huang Date 7/29/93

(10)

SLAB ON GRADE - NO FOOTING

REFERENCES

1.) "HILTI FASTENING TECHNICAL GUIDE" - 1990 VENDOR CATALOG

2.) ACI 318-89 - "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE"

3.) DEPT. OF THE ARMY TECHNICAL MANUAL - TM5-302-2 AFM 88-3 - CH. 2 - "CONCRETE STRUCTURAL DESIGN FOR BUILDINGS"

4.) ASCE 7-88 (ANSI A58.1) - ASCE "MINIMUM DESIGN LOADS FOR BUILDINGS + OTHER STRUCTURES" - 1990

5.) UNIFORM BUILDING CODE - UBC 1991

6.) UCRL-15910 - "DESIGN + EVALUATION GUIDELINES FOR DEPT. OF ENERGY FACILITIES SUBJECTED TO NATURAL PHENOMENA HAZARDS"

DESIGN

APP. C CALCS. FOR FOOTING MEETS SEC 4.1 (REV II) REQMT. FOR 2'-6" BURIAL DEPTH FOR FROST PROTECTION. HOWEVER, APP. C DID NOT ADDRESS SLAB DESIGN.

APP. B SLAB DESIGN IS VALID AND CONSERVATIVE (SUBGRADE MODULUS OF 50 pci WAS ASSUMED; TYPICAL 200E SOIL SUBG. MOD. = 200 pci).

MODIFICATIONS TO APP. B + C SLAB DESIGN

ELIMINATE FOOTINGS AND CONSIDER 6" SLAB ONLY

ANCHOR BOLTS

APP. B - ½" ϕ - 4" EMBED. - ASTM A307

(1) REF. 1 SPECS REQUIRES MIN. 6.30" (160 mm) SLAB FOR ½" HEAVY-DUTY ANCHOR (12 mm) - ASSUME SIMILAR REQMT. FOR ANCHOR BOLT; > 6" SLAB REQ'D

NOTE - EQUIPMENT ANCHOR BOLTS IN INTERIOR SLAB ARE HILTI KWIK BOLT II - REF. 1 REQUIRES 3" SLAB. 5" SLAB TYP. O.C.

(1) Drawing _____ (2) Doc. No. _____
(4) Building 241-U-701 (NEW) (5) Rev. _____ (6) Job No. _____
(7) Subject SLAB DESIGN
(8) Originator R.L. JORGENSEN Date 7/25/92
(9) Checker L.H. Huang Date 7/29/92

(10)

ANCHOR BOLTS (CONT.)

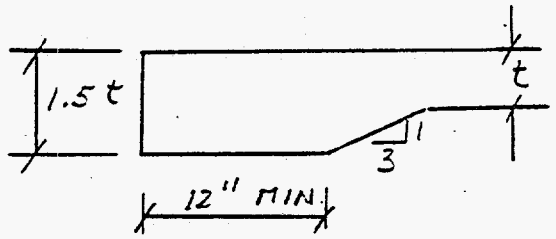
② CONCRETE COVER ON REBAR - 3" (REF. 2)
- MAINTAIN SAME FOR ANCHOR BOLTS
> 6" SLAB REQ'D

USE LOCALIZED THICKENING AT EDGES OF SLAB PER REF. 3 RECOMMENDATIONS

- THICKENED EDGE = 1.5 t WHERE t = SLAB THICK.

NOTE: THICKENED EDGE CONFINES FOUNDATION AND LESSENS CHANCE OF LOSING FOUNDATION SUPPORT

GENERAL CONFIGURATION



PIPING + MACHINERY ANCHORAGE - SEISM.C

EVALUATED IN APP. B + C

WIND

CHECK SLAB OVERTURNING + SLIDING

SC 3 FACILITY - SDC 4.1 { 70 mph; IMPORTANCE FACTOR = 1.07; EXPOSURE CATEGORY C

REF. 4 - O.T. MOMENT < 2/3 DEAD LOAD STABILIZING MOMENT (SAFETY FACTOR = 1.5)

DESIGN CALCULATION

(1) Drawing _____ (2) Doc. No. _____

(4) Building 241-U-701 (NEW) (5) Rev. _____ (6) Job No. _____

(7) Subject SLAB DESIGN

(8) Originator R.L. JORGENSEN Date 7/27/93

(9) Checker I H Huang Date 7/29/93

(10)

WIND LOADING - (REF. 4)

$$p = q_z G_h C_p - q_h (GC_{pi})$$

TABLE 6 ↑ SDC 4.1 ↑ ↑

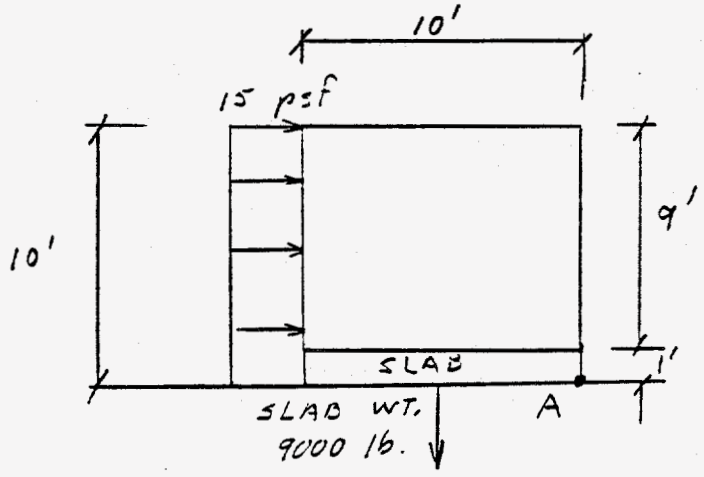
$$q_h = q_z = .00256\, K_z (IV)^2 = .00256\,(.30)\left[1.07\,(70)\right]^2 = 11.49$$

$G_h = 1.32$ (TABLE 8)

$C_p = 0.8$ (FIG. 2)

$GC_{pi} = \begin{matrix} +0.75 \\ -0.25 \end{matrix}$ } (TABLE 9)

$$p = 11.49\,(1.32)\,0.3 - 11.49\,(.75) = 3.52 \text{ psf}$$
$$- 11.49\,(-.25) = 15.0 \text{ psf}$$



10' x 12' BLDG.
~10' TOTAL HT.

O.T. MOMENT = 15 psf (10') 12' (5') = 9000 ft-lbs

RESTORING MOM. (SLAB WT. ONLY): SLAB WT =

= 9000 lb (5') = 45,000 ft-lb $0.5'(10')\,12' \times 150 \text{ pcf} = 9000\#$

$$S.F. = \frac{45{,}000}{9000} = 5 > 1.5 \quad \therefore \text{ O.K.} \leftarrow \frac{\text{WIND}}{\text{O.T.}}$$

SLIDING:

LATERAL WIND = 15 psf (10') 12' = 1800 lb.

μ - CONC. TO SOIL = 0.35 (REF. 5 - TABLE 2.1-A SANDY SOIL) INCLUDES S.F.=3

μ (D.L.) = .35 (9000 lb) = 3150 lb.

S.F. = 3150 / 1800 = 1.75 > 1.5 O.K. ← WIND / SLIDING

DESIGN CALCULATION

(1) Drawing _____ (2) Doc. No. _____

(4) Building 241-U-701 (NEW) (5) Rev. _____ (6) Job No. _____

(7) Subject SLAB DESIGN

(8) Originator B.L. JORISSEN Date 7/27/93

(9) Checker Z.H. Huang Date 7/29/93

(10)

SEISMIC

CHECK SLAB OVERTURNING + SLIDING

O.T. - $F_p = ZIC_p W_p$ (REF. 5 - EQN. 36-1)

NOTE: SDC 4.1 REQUIRES S.C. 3 SEISMIC EVALUATION PER UCRL-15910 (REF. 6)

$Z = 0.12\ g$ - (REF. 6)

↳ REF. 5 SPECIFIES 0.20 g FOR ZONE 2B (TABLE 23-I)

USE $Z = 0.20$

$I = 1.25$ (REF. 6 - TABLE 4-3)

$C = 0.75$ (REF 5 - TABLE 23-P)

W = WEIGHT

BLDG. WT. - VENDOR SPECS - APP C
- VERT. LOAD FOR FOUNDATION DESIGN
= 150 lb/ft (INCLUDES WIND - CONSERVATIVE)

$150\ lb/ft\ (2 \times 10' + 2 \times 12') = 6600\ lb$

EQUIPMENT/COMPRESSOR WT:
APPROX. 1500 lb + 250 + 1000 (PIPING + ELECTRICAL ESTIMATE) = 2750 lb

$W = 6600 + 2750 \approx 9400\ lb$

$F_p = 0.20(1.25)\,0.75(9400) = 1763$ lb. ACTING AT BLDG. C.G.

TOTAL WIND LOAD (PREVIOUS pg.) = 1800 lb.

WIND > SEISMIC →

SLAB O.K. FOR SEISMIC O.T. AND SLIDING ← SEISMIC O.T. SLIDING

DESIGN CALCULATION

(1) Drawing _____ (2) Doc. No. _____

(4) Building 241-U-701 (NEW) (5) Rev. _____ (6) Job No. _____

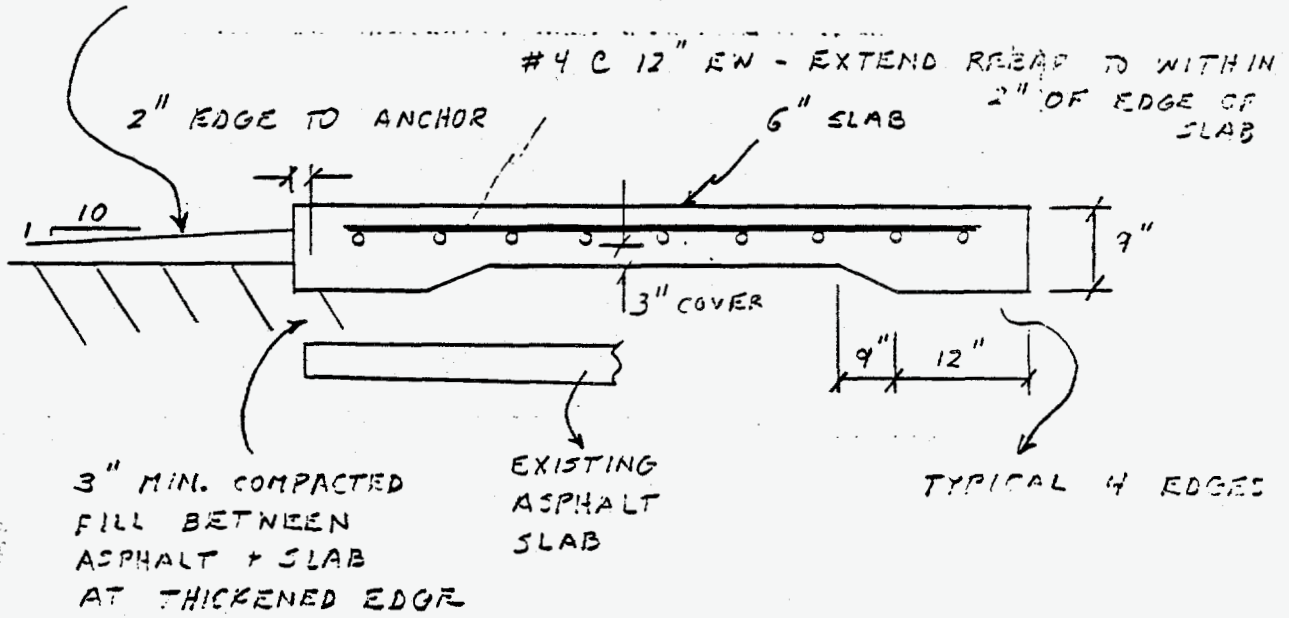
(7) Subject SLAB DESIGN

(8) Originator R.L. JORISSEN Date 7/26/93

(9) Checker T.K. Huang Date 7/29/93

(10)

CONFIGURATION (NTS)



- REMOVE MIN. 3" EXISTING SOIL - BACKFILL WITH NATIVE MATL. - 4" LIFT - COMPACT TO 120 pcf DRY DENSITY

REBAR - GR 60

CONC. - 4000 psi @ 23 DAYS (RECOMMENDED MINIMUM BY PCA "CONC. FLOORS ON GROUND" FOR LIGHT-DUTY FLOORS)

NOTE:

ASPHALT APRON WILL KEEP RAIN PERCOLATION FROM ACCUMULATING DIRECTLY UNDER SLAB.
- ELIMINATES FROST HEAVE

ECN 196637 - SIGNATURE PER TELECON - R.L. JORISSEN TO AL KOSTELNIK 7/29/93