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Accession #: D196052096

Document #: SD-WM-DA-189

Title/Desc:

DESIGN ANALYSIS SUPPORTING 101SY WATER DECON
SYSTEM

9/5/95 Sta- 37	ENGINEERING DATA TRANSMITTAL	Page 1 of 1 1. EDT No 611702
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2. To: (Receiving Organization) See Distribution List	3. From: (Originating Organization) Special Projects N2B2K	4. Related EDT No.: NA
5. Proj./Prog./Dept./Div.: 241-SY-101	6. Eng. Engr.: (MJO 5-25-95) M. J. Ostrom 75410 71650	7. Purchase Order No.: NA
8. Originator Remarks: HA (MJO 5-25-95) Approval and Release		9. Equip./Component No.: NA
11. Receiver Remarks: HA (MJO 5-25-95)		10. System/Bldg./Facility: 241-SY-101
		12. Major Assm. Dwg. No.: H-2-824680 NA 5/24/95
		13. Permit/Permit Application No.: NA
		14. Required Response Date: ASAP

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Impact Level	Reason for Transmittal	Originator Disposition	Receiver Disposition
1.	WHC-SD-WM-DA-189	N/A	0	Design Analysis Supporting 101-SY Water Decon System	SQ	1,2		

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

17. SIGNATURE/DISTRIBUTION (See Impact Level for required signatures)										(G)	(H)
Reason	Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
1,2	1	Eng. MJ Ostrom	<i>[Signature]</i>	5-25-95	45-68	COG ENG G.J. GAUCK	<i>[Signature]</i>	7-19-95	74-07	1,2	1
1,2	1	Eng. Mgr. CE Hanson	<i>[Signature]</i>	7/1/95	45-09	COG MGR S.H. RIFAAT	<i>[Signature]</i>	7-19-95	74-07	1,2	1
1,2	1	QA WL Adams	<i>[Signature]</i>	7-19-95	74-07						
1,2	1	Safety LS Krogsrud	<i>[Signature]</i>	7/25/95	R3-08						
		Env.									
		Proj/Prog.									
1,2	1	Review KJ Cleveland	<i>[Signature]</i>	5/24/95	62-50						

18. SA Talachy <i>[Signature]</i> 5/16/95 Signature of EDT Originator	19. CE Hanson <i>[Signature]</i> 7/1/95 Authorized Representative Date for Receiving Organization	20. CE Hanson <i>[Signature]</i> 7/13/95 Cognizant/Project Engineer's Manager	21. DOE APPROVAL (if required) Ltr. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
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RELEASE AUTHORIZATION

Document Number: Design Analysis Supporting 101-SY Water Decon System

Document Title: WHC-SD-WM-DA-189, Rev. 0

Release Date: August 5, 1995

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

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

T.L. Ontiveros

August 5, 1995

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SUPPORTING DOCUMENT

1. Total Pages ~~87~~ ^{TO} 87

2. Title

Design Analysis Supporting 101-SY Water Decon System

3. Number

WHC-SD-WM-DA-189

4. Rev No.

0

5. Key Words

101-SY, Removal, Decon

6. Author

Name: Kevin Cleveland

Kevin Cleveland 6/15/95
Signature

Organization/Charge Code 57400 ICF-KH/N2B2K

7. Abstract

This document contains the results of stress analysis and component sizing for the 101-SY mitigation pump, Water Decon System. Calculations included are a stress analysis of the High Pressure Manifold, the threaded connection on the Yoke Water Connector and a sizing of an air receiver tank.

8. RELEASE STAMP

OFFICIAL RELEASE
BY WHC
DATE 9/5/95 35
Sta. 37

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WHC-SD-WM-DA-189
REV 0

DESIGN ANALYSIS SUPPORTING 101-SY WATER DECON SYSTEM

PREPARED BY: Kevin Cleveland DATE: 6/22/95
K. J. Cleveland, Cognizant Engineer
Mitigation Engineering

REVIEWED BY: Mark J. Ostrom DATE: 6-27-95
M. J. Ostrom, Project Engineer
Mitigation Engineering

APPROVED BY: C. E. Hanson DATE: 7/13/95
C. E. Hanson, Manager
Mitigation and Characterization New Equipment

Westinghouse Hanford Company
Hanford Operations and Engineering Contractor
for the
U.S. Department of Energy

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WHC-SD-WM-DA-189
REV 0
DESIGN VERIFICATION METHOD

The need for design verification has been reviewed with the method selected as indicated below:

<u> X </u>	Independent Review
<u> </u>	Alternative Calculations
<u> </u>	Qualification Testing
<u> </u>	Formal Design Review

C. E. Hanson
Cognizant/Project/Design Manger

SD # WHC-SD-WM-DA-189

ECN # NA

DWG(S) # NA

CHECKLIST FOR INDEPENDENT REVIEW

Document Reviewed WHC-SD-WM-DA-189 REV 0

Author Kevin J. Cleveland

Yes No NA

- ☒ [] [] Problem completely defined.
- ☒ [] [] Necessary assumptions explicitly stated and supported.
- ☒ [] [] Computer codes and data files documented.
- ☒ [] [] Data used in calculations explicitly stated in document.
- ☒ [] [] Data checked for consistency with original source information as applicable.
- ☒ [] [] Mathematical derivations checked including dimensional consistency of results.
- ☒ [] [] Models appropriate and used within range of validity or use outside range of established validity justified.
- ☒ [] [] Hand calculations checked for errors.
- ☒ [] [] Code run streams correct and consistent with analysis documentation.
- ☒ [] [] Code output consistent with input and with results reported in analysis documentation.
- ☒ [] [] Acceptability limits on analytical results applicable and supported. Limits checked against sources.
- ☒ [] [] Safety margins consistent with good engineering practices.
- ☒ [] [] Conclusions consistent with analytical results and applicable limits.
- ☒ [] [] Results and conclusions address all points required in the problem statement.

MANDATORY Software QA Log Number D/N SGA25API-4.5 Rev. 0

m K P l
Reviewer Mohit Pal

5/10/95
Date

WHC-SD-WM-DA-189
REV 0

DESIGN ANALYSIS SUPPORTING
101-SY WATER DECON SYSTEM

April 11, 1995

by

K. J. Cleveland
Mechanical Engineering

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. DESIGN REVIEW FOR 241-SY-101

WATER DECON SYSTEM

1.0 INTRODUCTION

The water decon system will be used to decontaminate the inside and outside of the mixer pump in 241-SY-101. When the pump fails, the water decon components will be staged on the farm and assembled per drawing H-2-824680. The system is assembled using the following components; Drill Rod Washers (H-2-91670 & H-2-91671), 12 X 4 Riser Adapter (H-2-99332), SY-101 HMT Decon Spraywand Assembly (H-2-817857), HMT Pit 01-A Drain Plug Assembly (H-2-818120), Riser 3A Spray Wand Adapter (H-2-821382), Yoke Water Connection Assembly (H-2-824443), Water Distribution Skid Assembly (H-2-824447), Water Filter Skid Assembly (H-2-824448), Decon Spraywand Drop Limiter Assembly (H-2-824509), Portable Water Flush Pump Assembly (H-2-824514), Water Decon Air Purge Assembly (H-2-824675) and 101-01A Pump Pit Flood System (H-2-824676). The components for the water decon system were fabricated in the 200 area shops.

2.0 HISTORY

The water wands used to decontaminate the outside of the mixer pump were previously analyzed prior to original pump installation. The original decontamination system was put into place to support emergency removal of the pump. The analysis examined the stresses in the spray wands due to pressure and bending. The welds on the lifting bails were also examined. Additionally, testing was performed to determine which nozzles and spray pattern would be best to wash the pump. The results of this analysis can be found in document WHC-SD-WM-DP-038. WHC-SD-WM-DA-169 provided the radiological and structural calculations for the spray wand adaptor and lifting beam for riser 3A.

The intent of this support document is to analyze modifications or additions to the water decon system not previously addressed in the above referenced documents.

2.1 METHODS OF DESIGN VERIFICATION

1. This document contains calculations supporting stress analysis of the water distribution manifold, a stress analysis of the yoke water connector assembly, and a sizing calculation for the air blow down system.
2. An Acceptance Test Procedure (ATP) was performed per WHC-CM-6-1, EP-4.2 to evaluate some of the decon system components. Calibration tests were done on the water totalizers and flow meters. Other tests checked the performance of the air blowdown system and the pit flood system.

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Finally, an informational test was performed on the water filter skid to aid in the operations during pump removal. The results of the testing can be found in the Acceptance Test Report WHC-SD-WM-ATR-125.

3. All the components of water decon system were staged and hooked together during the Operability Test Procedure (WHC-SD-WM-OTP-168) at the cold test facility. The low pressure side of the water distribution skid was used to fill the fire hoses with water. There was no water in the high pressure manifold or hoses. However, it was determined that all the fittings and materials were present to hook the system up.
4. Finally, Mohit Pal performed an overall informal review of this supporting document, WHC-SD-WM-DA-189, and the installation and component drawings for the water decon system. Mohit reviewed drawings H-2-824445, Equipment Removal System Layout (Site layout), H-2-824443, Yoke Water Connection Assembly, H-2-824446, Equipment Removal System Water Decon Schematic and H-2-824447, Water Distribution Skid Assembly. This supporting document was reviewed for methodology and the system was reviewed for functionality and compliance with the Safety Assessment. As identified in the attached Review Comment Record (RCR) form there were no comments. (Attachment D)

3.0 CONCLUSION

The system meets applicable codes and design requirements.

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ATTACHMENT A
HIGH PRESSURE MANIFOLD
STRESS ANALYSIS

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HIGH PRESSURE MANIFOLD
STRESS ANALYSIS

1.0 INTRODUCTION

On July 3, 1993, a mixer pump was installed in tank 241-SY-101 to test the mitigation by mixing concept. As a result of this testing, it was determined that the mixing concept will mitigate the tank. A backup pump was built as a replacement for the test pump. When the test pump fails, a flush and decontamination system will be required for the removal of the existing pump and installation of the backup pump.

This document contains supporting calculations for portions of the flush and decon system. The calculations included are a stress analysis of the high pressure manifold, an analysis of the yoke water connector and a sizing of the air receiver tank.

2.0 BACKGROUND

High pressure manifold is a piping arrangement that delivers water to the spray wands in risers 3A, 13A, and 23A and the spray ring in the central pump pit. The operating pressure for the manifold is 3000 psi. Using a 10% margin over the operating pressure, gives a design pressure of 3300 psi. The high pressure manifold is analyzed using the Autopipe 4.5 computer code (EDA 1989).

The yoke water connector is a piping assembly that attaches to the mitigation pump lifting yoke. Hoses from the decon manifolds are laid out across the farm, routed over the containment tent and attached to the yoke water connector. During removal of the pump the hoses are raised along with the pump. Once the discharge of the pump clears the waste the last flush is preformed and the hoses are drained and disconnected.

Two check valves installed in the 2" internal flush line of the mitigation pump will prevent water in the line from draining. The water needs to be blown out of the 2" line so there will not be any spillage during the column cut off process. The safety assessment had some concerns with pressurizing the dome space by blowing air into the tank. Therefore the air receiver is designed to contain just enough air to empty the 2" line and not introduce excess air into the dome space.

3.0 RESULTS

3.1 HIGH PRESSURE MANIFOLD

The results of the stress analysis supporting the design of the high pressure manifold are included in Attachment A.

3.2 YOKE WATER CONNECTOR

The results of the analysis for the yoke water connector are included in Attachment B.

3.3 AIR RECEIVER TANK

The results of the sizing calculations for the air receiver tank are included in Attachment C.

OBJECTIVE

The objective of this calculation is to analyze the high pressure manifold on the flush and decon system, for removal of the 101SY hydrogen mitigation pump. The manifold is being analyzed per ASME B31.3. The loads determined from this analysis will be used to qualify the support skid.

DESIGN INPUTS

CRITERIA

1. ASME B31.3-1990 Edition & Addenda B31.3a-93.
2. DOE ORDER 6430.1A.

GIVEN DATA

1.	Design Temperature	= 150°F	REF 3
2.	Safety Class	= 3	REF 1
3.	Materials	= A106 GR B	REF 2
4.	Design pressure	= 3000 psi	REF 3

ASSUMPTIONS

The flush and decontamination system is for temporary use, thus a seismic analysis is not preformed because of the unlikelihood of a seismic event during system operation.

METHODS

AutoPipe version 4.5 is used to perform the analysis on the high pressure manifold. The results of that analysis are given in appendix A.

The worst case loads examined for the support skid are the gravity load + thermal load.

The worst case loads for the pipe stress analysis is the pressure load.

The low pressure manifold was not modeled in AutoPIPE. This was not necessary due to the high margin of safety in the maximum allowable pressure to the design pressure. Equation 3b in ASME B31.3 was used to determine the maximum allowable pressure.

P = pressure PSIG
D = outside diameter in
t = wall thickness in
S = allowable stress psi
E = quality factor

$$D := 6.625 \cdot \text{in} \quad S := 20000 \cdot \frac{\text{lb}}{\text{in}^2} \quad t := 0.280 \cdot \text{in} \quad E := 1$$

$$P := \frac{2 \cdot S \cdot t \cdot E}{D} \quad \text{eq 3b} \quad P = 1.691 \cdot 10^3 \cdot \frac{\text{lb}}{\text{in}^2}$$

REFERENCES

1. WHC-SD-WM-WP-275 & Safety Analysis SA-LA-UR-92-3196
2. Drawing H-2-824447
3. Letter of Instruction (LOI) MIT94-2229, dated October 14, 1994.

CONCLUSION

Based on the analysis presented in this calculation, the manifold meets B31.3 requirements.

DESIGN ANALYSIS

Client	WHC	WO/Job No.	
Subject	WATER DISTRIBUTION MANIFOLD	Date	3/23/95 By Keni Old
	STRESS ANALYSIS	Checked	By [Signature] 4-11-95
Location	200 W	Revised	By

DETERMINE LOADS AT THE END OF WELD-O-LETS
ON THE WATER DISTRIBUTION MANIFOLD.

LOAD FROM HANGING HOSE

HOSE PROPERTIES

AEROQUIP FC323-24

WEIGHT 2.2 lb/ft

MIN BEND RADIUS 20 in

TAKE LENGTH OF HOSE AS HALF THE CIRCUMFERENCE OF
A 20" CIRCLE

$$L = \frac{2\pi R}{2} = 63" = 5.23 \text{ ft}$$

$$\text{WEIGHT OF HOSE} = 5.23 \text{ ft} \cdot 2.2 \text{ lb/ft} = 11.5 \text{ lb}$$

USE 12 lb

DESIGN ANALYSIS

Client	WHC	WO/Job No.	
Subject	WATER DISTRIBUTION MANIFOLD	Date	3/23/95
	STRESS ANALYSIS	Checked	By <i>[Signature]</i>
Location	200 W	Revised	By <i>[Signature]</i> 4-11-95

DETERMINE LOAD ON END CAPS OF HIGH
PRESSURE MANIFOLD AT START-UP

Internal area of 6"
Sch 160 pipe is

$$A = 13.32 \text{ in}^2$$

THE FORCE ON THE END CAP IS $F = PA$

$$F = 3300 \text{ PSI} \times 13.32 \text{ in}^2 = 43956$$

$$\text{USE } F = 44000 \text{ lb}$$

Point A07 A

Prepared by Kim Chid 4/11/87
Checked by: Nguyen
4-11-95

101SY DECON SYSTEM
HIGH PRESSURE MANIFOLD

NGUAGE=PCL

GENERAL NOTES: ANALYSIS OTHERWISE SPECIFIED

1. DIMENSIONS AND TOLERANCES ARE IN INCHES.

2. TOLERANCES:
 1/2" - 1/16"
 1/4" - 1/32"
 3/16" - 1/64"
 1/8" - 1/128"

3. ALL MACHINED SURFACES SHALL BE 1/32" OR BETTER IN ACCORDANCE WITH ASME B46.1.

4. BREAK ALL SHARP EDGES/CORNERS & REMOVE ALL BURRS.

5. DO NOT FORM/PUNCH INWARDS. FLANGE FACES AND/OR GASKET SEALING AREAS.

6. PREPARE AND PAINT ALL EXPOSED CARBON STEEL SURFACES WITH 1 COAT OF AMERCOAT 140 PRIMER (CYCLO OXYTHANE) FOLLOWED WITH 2 COATS OF AMERCOAT 220 (POLYURETHANE) PER MANUFACTURER'S INSTRUCTIONS.

7. IDENTIFY IDENTIFY WELDS (WELDING/ISSUES) WITH 9 HIGH HIGH CHARACTERS APPROXIMATELY WHERE INDICATED USING PLAINTEXT POLYURETHANE (COLOR: WHITE) SHOWING IN LINES OF POLYURETHANE.

8. WELDING AND WELDING REPAIRS, INCLUDING WELDING & PAINT WELDING PER ASME-B31.1, TYPE B (COLOR: YELLOW) WITH 1/2" HIGH CHARACTERS LOCATED APPROPRIATELY AS SHOWN.

9. ALL WELDING-CARBON STEEL WELDING ARE AS SHOWN FROM DRAWING (P&ID).

10. VALVE SUPPORT ASSEMBLY (P&ID) SHALL BE FABRICATED AND WELDED INTO SHIP WELDMENT WELDMENT ASSEMBLY (P&ID) PRIOR TO THE FINAL WELDING OF ONE (1-1) OF THE WELDS (P&ID) AND THE SHIP WELDMENT ASSEMBLY. THE CHOICE OF WELD (P&ID) IS AT THE FABRICATOR'S DISCRETION.

11. ALL PARTS SUBSTITUTIONS ARE SUBJECT TO ENGINEERING APPROVAL.

12. WELD PER ASME-B31.1-14, W/ FINAL PASS OF ALL WELDS.

13. ALL WELDING PROCEDURES AND PERSONNEL SHALL BE QUALIFIED IN ASME-B31.1-14, WELD WELDING PER ASME SECTION II AND AN ACCEPTABLE SUPERVISOR OR ALL DESIGNATED WELDS.

14. ALL PIPE WELDS, WELD AND INSPECT PER ASME-B31.1, W/ ALL WELDS AT FINAL PASS, SECTION II PER APPROVED INSPECTION PLAN, WELDING QUALIFICATIONS PER ASME SECTION II ARE ACCEPTABLE. W/ ALL DESIGNATED WELDS.

15. HYDROSTATIC LEAK TEST HIGH PRESSURE WELDMENT ASSEMBLY PER AS-B31.1-14, TYPE B, PRESSURE TEST AT 1500 PSIG, HOLD AT PRESSURE FOR 15 MINUTES.

16. HYDROSTATIC LEAK TEST LOW PRESSURE WELDMENT ASSEMBLY PER AS-B31.1-14, TYPE B, PRESSURE TEST AT 150 PSIG, HOLD AT PRESSURE FOR 15 MINUTES.

17. FLUIT ONLY AS NECESSARY TO PROVIDE SMOOTH TRANSITION FROM WELD TO BASE METAL ALL AROUND.

18. SHIP AS REQUIRED, BETWEEN THE HIGH PRESSURE WELDMENT AND SHIP WELDMENT ASSEMBLY, WITHIN A MINIMUM CLEARANCE BETWEEN THE TWO WELDED WELDMENT PORTS AND SHIP WELDMENT ASSEMBLY TO ALLOW FOR FUTURE COUPLING INSTALLATION.

PARTS/MATERIAL LIST									
QTY	REF	DESCRIPTION	UNIT	QTY	REF	DESCRIPTION	UNIT	QTY	REF
1	1	PIPE, 2 SCH 160 X 10.125 L 10E	ASTM A53, TYPE B, GRADE B, CS	2	36				
		PIPE, 2 SCH 40 X 10.00 L 10E	ASTM A53, TYPE B, GRADE B, CS	2	36				
		W-ROD, 2 PIPE SIZE, 1/2-13UNC-2A	PLATED CS	2	40				
		W-ROD, 1 PIPE SIZE, 1/2-13UNC-2A	PLATED CS	2	41				
		WASHER, FLAT, 1/2"	ASTM F436 CS	2	42				
		WASHER, SPOT LOCK, 1/2", AND B10.11		2	43				
		NUT, HEAVY, HEX; 5/8-11UNC-2B	ASTM A563-L CS	2	44				
		WASHER, FLAT, 1/2"	ASTM F436 CS	2	45				
		WASHER, SPOT LOCK, 1/2" AND B10.11		2	46				
		NUT, HEAVY, HEX; 1/2-13UNC-2B	ASTM A563-L CS	2	47				
		VALVE, 3/4", FORGED STEEL, CLASS 1500, FLANGED	VELAM	2	48				
		VALVE, 3/4", FORGED STEEL, CLASS 1500, FLANGED	STONHAM	2	49				
		VALVE, 3/4", FORGED STEEL, CLASS 1500, FLANGED	BOHNEY FORCE	2	50				
		THREADED STUD, 1/2-13UNC-2A, 6 1/2"	ASTM A193 GRADE B7	2	51				
		WASHER, FLAT, 1/2"	ASTM F436, PIPE L CS	2	52				
		WASHER, FLAT, 1/2"	ASTM F436, PIPE L CS	2	53				
		WASHER, SPOT LOCK, 1/2"	ASTM B10.11	2	54				
		NUT, HEAVY, HEX; 1/2-13UNC-2B	ASTM A563-L CS	2	55				
		CAP, THREADED, 1/2" FNPT, FORGED, 30000	ASTM A105 CS	2	56				
		CAP, THREADED, 1" FNPT, FORGED, 30000	ASTM A105 CS	2	57				
		CAP, THREADED, 3" FNPT, FORGED, 30000	ASTM A105 CS	2	58				
		CAP, THREADED, 3" FNPT, FORGED, 30000	ASTM A105 CS	2	59				
		BUSHING, HEX REDUCER, 1/2" X 1/2" FNPT, 30000, AND B10.11	CS	2	60				
		PRESSURE GASKET, GLYCOLINE FILLER, 6-102000 X 5000, 2.50" FACT, BRASS CASE, 1/2" SHIPT (STEL)	(MCMMASTER-CARR)	2	61				
		PRESSURE GASKET, GLYCOLINE FILLER, 6-102000 X 5000, 2.50" FACT, BRASS CASE, 1/2" SHIPT (STEL)	(MCMMASTER-CARR)	2	62				
		UNION, 2 THREADED, 30000	ASTM A105 CS	2	63				
		UNION, 2, 30000, WALLEABLE IRON	ASTM A157 CS	2	64				
		DIAPHRAGM, 6 STN 5/8" X 3 1/2" SHIPT, 0-2000" X 2"	(MCMMASTER-CARR)	2	65				
		SAFETY RELIEF VALVE, ADJUSTABLE; 2" FNPT, 150/175 PSI, 10000, FULL LIFT, 1" FOR OVERPRESSURE	(KEYSSTONE)	2	66				
		SAFETY RELIEF VALVE, ADJUSTABLE; 2" FNPT, 150/175 PSI, 10000, FULL LIFT, 1" FOR OVERPRESSURE	(KEYSSTONE)	2	67				
		SCHEMATIC, TYPICAL (TAPE/DOPE)		2	68				
		PIPE, 2 SCH 160 X 3.0 L, TIE	ASTM A53, TYPE B, GRADE B, CS	2	69				
		PIPE, 2 SCH 160 X 3.0 L, TIE	ASTM A53, TYPE B, GRADE B, CS	2	70				
		INTERNAL BOHNEY NEEDLE VALVE	WATERY	2	71				
		WELDC, 2, 3/4", FORGED STEEL, CLASS 1500, THREADED	WPAK	2	72				
		BUSHING, 1/2" X 1/2", FORGED, 30000 LB	ASTM A105 CS	2	73				
		WELDC, 1/2" EXTRA HEAVY B 2 L, BLACK SEAMLESS	ASTM A105 CS	2	74				
		COUPLING, 1/2" 300 LB, AND B10.11	ASTM A105 CS	2	75				

PARTS/MATERIAL LIST									
QTY	REF	DESCRIPTION	UNIT	QTY	REF	DESCRIPTION	UNIT	QTY	REF
		WATER DISTRIBUTION SHIP ASSEMBLY							
		HIGH PRESSURE WELDMENT ASSEMBLY							
		LOW PRESSURE WELDMENT ASSEMBLY							
		SHIP WELDMENT ASSEMBLY							
		VALVE SUPPORT ASSEMBLY							
		HIGH PRESSURE INLET SPOOL ASSEMBLY							
		LOW PRESSURE INLET SPOOL ASSEMBLY							
		WASHER, CS 1/2" X 3/8" L	ASTM A56 CS	2	6				
		THREADED STUD, 3/4-10UNC-2A, 4 L	ASTM A193 GRADE B7 CS	2	6				
		BEAM, W16 X 24 X 70.0 L	ASTM A24 CS	2	10				
		BEAM, W8 X 31 X 34.4 L	ASTM A36 CS	2	11				
		CHANNEL, CS 8 X 13 X 14.0 L	ASTM A36 CS	2	12				
		CHANNEL, CS 8 X 13 X 15.12 L	ASTM A36 CS	2	13				
		SHIP FORGED END EYE (1) 3/16 (E), 2 3/8 (OAK)	(MCMMASTER-CARR)	2	14				
		FLAT BAR, 1/2" W X 2" X 10.75 L	ASTM A36 CS	2	15				
		WASHER, FLAT, 1/2"	ASTM F436 CS	2	16				
		WASHER, SPOT LOCK, 1/2", AND B10.11		2	17				
		NUT, HEAVY, HEX; 3/4-10UNC-2B	ASTM A563 CS	2	18				
		PIPE, 6 SCH 160 X 45.0 L	ASTM A53, TYPE B, GRADE B, CS	1	19				
		WELD CAP, 6 SCH 160	ASTM A234 CS	6	20				
		WELD CAP, REDUCING, SCH 160 X 1/2", 3 OUTLET	(BOHNEY FORCE) CS	4	21				
		FORGED INPOLET, 3 SCH 160	(BOHNEY FORCE) CS	4	22				
		FORGED INPOLET, 1" SCH 160	(BOHNEY FORCE) CS	4	23				
		FORGED INPOLET, 1/2" SCH 160	(BOHNEY FORCE) CS	4	24				
		PIPE, 2" SCH 160 X 4.0 L, TIE	ASTM A53, TYPE B, GRADE B, CS	4	25				
		PIPE, 2" SCH 160 X 4.0 L, TIE	ASTM A53, TYPE B, GRADE B, CS	4	26				
		PIPE, 2" SCH 160 X 5.0 L, TIE	ASTM A53, TYPE B, GRADE B, CS	4	27				
		FLANGE, 2, 10000, RASSED FACE SHIP ON	ASTM A105 CS	4	28				
		GASKET, 1/8" RH, COMPRESSED GRAPHITE FIBER	(CARPAC) (HIGH PRESSURE)	4	29				
		GASKET, 1/8" RH, COMPRESSED GRAPHITE FIBER	(CARPAC) (LOW PRESSURE)	4	30				
		PIPE, 6 SCH 40 X 3.0 L, TIE	ASTM A53, TYPE B, GRADE B, CS	5	31				
		WELD CAP, 6 SCH 40	ASTM A234 WPD	5	32				
		WELD CAP, REDUCING, SCH 510 WCD X 1/2", 3 OUTLET	(BOHNEY FORCE) CS	5	33				
		FORGED INPOLET, 2 SCH 160	(BOHNEY FORCE) CS	5	34				
		PIPE, 3 SCH 40 X 10.0 L, TIE	ASTM A53, TYPE B, GRADE B, CS	5	35				
		PIPE, 3 SCH 40 X 5.0 L, TIE	ASTM A53, TYPE B, GRADE B, CS	5	36				
		FLANGE, 3, 30000, RASSED FACE SHIP ON	ASTM A105 CS	5	37				

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REV 0

EQUIPMENT SYSTEM WATER DECON SCHEMATIC		DATE: 11-2-82		BY: [Signature]	
PROJECT: [Blank]		SHEET: [Blank]		TOTAL: [Blank]	
DESIGNED BY: [Blank]		CHECKED BY: [Blank]		APPROVED BY: [Blank]	
DATE: [Blank]		DATE: [Blank]		DATE: [Blank]	

WATER DISTRIBUTION
SKID ASSEMBLY

11-2-824447

7 LOW PRESSURE INLET SPOOL ASSY
SCALE: 1/4"

WHC-SD-WM-DA-189
REV 0

[illegible]

**FOR GENER
PARTS LIST**

[illegible]

30 GASKET
SCALE: 1/2"

**FOR GENERAL
PARTS LIST SEE**

3 LOW PRESSURE MANIFOLD ASSEMBLY
SCALE: 1/4"

[illegible]

TABLE OF DIMENSIONS

BASIC ORDERING NUMBER	ORIFICE		C _v	CONNECTION SIZE		DIMENSIONS												
	In.	mm		INLET	OUTLET	A	B	B1	B2	C	D	E	F	G	H OPEN			
-ORF2	0.080	2.0	0.09	1/8 Female NPT		1.88	.94	.94	.94	1.25	.44	.31	1.00	.47	2.29			
-ORM2				1/8 Male NPT		1.50	.75	.75	.75	1.06								
-ORM2-S2				1/8 Male NPT	1/8 SWAGELOK	1.72		.97	.97	1.28								
-ORS2				1/8 SWAGELOK		1.94	.97	.97	.97	1.28								
-ORS3MM				3mm SWAGELOK														
-1RF2	0.172	4.4	0.37	1/8 Female NPT		1.62	.81	.81	.81	1.19	.44	.38	1.38	.53	2.34			
-1RM2				1/8 Male NPT														
-1RM4				1/4 Male NPT		1.96	.98	.98	.98	1.36								
-1RM4-S4				1/4 Male NPT	1/4 SWAGELOK	2.11				1.51								
-1RS6MM				6mm SWAGELOK		2.26	1.13	1.13	1.13	1.51								
-1RS4				1/4 SWAGELOK														
-1RS6MM				8mm SWAGELOK		2.34	1.17	1.17	1.17	1.55								
-1RF4	0.250	6.4	0.73	1/4 Female NPT		2.12	1.06	1.06	1.06	1.56	.50	.50	1.88	.78	2.81			
-1RF4RT ¹				1/4 ISO Female Tapered														
-1RM4-F4				1/4 Male NPT	1/4 Female NPT	2.19				1.79								
-1RM4-S6				1/4 Male NPT	3/8 SWAGELOK	2.42		1.29		1.63								
-1RM6				3/8 Male NPT		2.26	1.13	1.13	1.13	1.79								
-1RM6-S6				3/8 Male NPT	3/8 SWAGELOK	2.42		1.29		1.90								
-1RM6-S8				3/8 Male NPT	1/2 SWAGELOK	2.53		1.40		1.90								
-1RS10MM				10mm SWAGELOK		2.60	1.30	1.30	1.30	1.80	.56	.50						
-1RS6				3/8 SWAGELOK		2.58	1.29	1.29	1.29	1.79								
-1RS12MM				12mm SWAGELOK														
-1RS8				1/2 SWAGELOK		2.80	1.40	1.40	1.40	1.90	.55							
-18RF6				0.375	9.5	1.80	3/8 Female NPT		3.00	1.50	1.50	1.50	2.25	.75	.75	3.00	1.03	3.91
-18RF6RT ¹							3/8 ISO Female Tapered											
-18RF8							1/2 Female NPT											
-18RF8RT ¹	1/2 ISO Female Tapered																	
-18RM8	1/2 Male NPT																	
-18RM8-F8	1/2 Male NPT	1/2 Female NPT																
-18RS8	1/2 SWAGELOK		3.80				1.90	1.90	1.90	2.65								
-18RS12	3/4 SWAGELOK																	

¹ Valves with RT ends conform to ISO 7/1. The following are various descriptions of the 7/1 thread: DIN-2999, BS 21, and JIS B0203. Consult your Authorized SWAGELOK Sales & Service Representative for further information.

ORDERING INFORMATION

Materials: Use B for brass, SS for 316 stainless steel, S for carbon steel, or M for alloy 400 as a prefix to the Basic Ordering Number. Example: S-1RF4

Stems: Basic Ordering Numbers specify Regulating stems (R). For a Vee stem, replace the R with V; for a Kel-F stem, replace the R with K. Example: SS-1VS4

Patterns: To order angle pattern valves, use -A as a suffix to the Ordering Number. Example: SS-1RF2-A. Some of the above valves are available in a cross pattern. Cross pattern valves offer uninterrupted flow between side ports at all times; on-off or metered flow through bottom port. Contact your Authorized SWAGELOK Sales & Service Representative for more information.

Dimensions shown with SWAGELOK nuts finger-tight, where applicable. All dimensions are in inches (except where mm is indicated)—for reference only, subject to change.

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SOUR GAS SERVICE

Materials are selected in accordance with NACE standard MR0175-92 requirements. Stems are alloy 400 and wetted stainless steel parts are annealed. To order, use -SG as a suffix to the Ordering Number.

Example: SS-ORF2-SG

® SWAGELOK is a trademark owned by Crawford Fitting Company.

For information on the use of stainless steel instrument tube fittings in sour gas service, please refer to the NACE MR0175-92 specification.

CAUTION:

Do not mix or interchange parts of tube fittings made by other manufacturers with SWAGELOK Tube Fitting parts.

Bolted & W.
Screwed or S. W. Ends

CONVENTIONAL & FULL PORT

BONNEY fig: 9HL-30 ...Conv. port.
9H-30 ...Full port.

Bolted Bonnet

fig. 9WL-30 ...Conv. port.
9W-30 ...Full port.

Welded Bonnet

Valves conform to API Standard 602 as far as applicable

VALVE DIMENSIONS

		1/4		3/8		1/2		3/4		1		1 1/4		1 1/2		2	
CONVENTIONAL PORT	A End to End	—	—	90	3 1/2	110	4 3/4	127	5	150	5 7/8	180	7 1/4	210	8 1/4	230	9
	B Centre to top-Open	—	—	166	6 1/2	210	8 1/4	247	9 1/4	256	10 1/8	299	11 3/4	374	14 3/4	428	16 3/4
	C Handwheel dia.	—	—	88	3 1/2	97	3 3/8	138	5 1/2	138	5 1/2	172	6 3/4	172	6 3/4	234	9 1/4
	D Seat port dia.	—	—	9	.354	12	.472	15	.590	20	.787	27	1.063	32	1.260	40	1.575
	WELDED BOLTED	Approx. weight - kg.		—	—	2.4	4.0	6.3	8.3	13.86	18.26	29.26	47.74	—	—	—	—
		Approx. weight - lbs.		—	—	5.28	8.8	13.86	18.26	29.26	47.74	—	—	—	—	—	—
	WELDED	Approx. weight - kg.		—	—	2.0	3.2	5.2	7.5	11.44	16.5	25.52	39.16	—	—	—	—
		Approx. weight - lbs.		—	—	4.4	7.04	11.44	16.5	25.52	39.16	—	—	—	—	—	—
FULL PORT	A End to End	90	3 1/2	90	3 1/2	110	4 3/4	127	5	150	5 7/8	180	7 1/4	210	8 1/4	230	9
	B Centre to top-Open	166	6 1/2	166	6 1/2	210	8 1/4	247	9 1/4	256	10 1/8	299	11 3/4	374	14 3/4	428	16 3/4
	C Handwheel dia.	88	3 1/2	88	3 1/2	97	3 3/8	138	5 1/2	138	5 1/2	172	6 3/4	172	6 3/4	234	9 1/4
	D Seat port dia.	7	.275	9	.354	12	.472	15	.590	20	.787	27	1.063	32	1.260	40	1.575
	WELDED BOLTED	Approx. weight - kg.		2.4	2.4	4.0	6.4	8.5	13.5	18.7	29.7	48.18	81.62	—	—	—	—
		Approx. weight - lbs.		5.28	5.28	8.8	14.08	18.7	29.7	48.18	81.62	—	—	—	—	—	—
	WELDED	Approx. weight - kg.		2.1	2.1	3.5	5.5	7.7	11.8	16.94	25.96	39.6	53.9	—	—	—	—
		Approx. weight - lbs.		4.62	4.62	7.7	12.1	16.94	25.96	39.6	53.9	—	—	—	—	—	—

— Complete pressure-Temperature Rating on page 32.
— Material specification on page 30.

— Threaded and S. W. dimensions on page 33.
— Ordering and Specifications on page 4.

MANIFOLD 101SY DECON SYSTEM
04/10/95

ICF KAISER HANFORD
AutoPIPE+4.50 MODEL PAGE 1

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

SYSTEM NAME : MANIFOLD

PROJECT ID : 101SY DECON SYSTEM

PREPARED BY : Keri Cld 8-31-95
K. CLEVELAND

CHECKED BY : NGUYEN HA Der Nelson 8-31-95

PIPING CODE : B31.3

AMBIENT TEMP. (deg F) : 70.0

COMPONENT LIBRARY : AUTOPIPE

MATERIAL LIBRARY : AUTOB313

MODEL REVISION NUMBER : 14

MANIFOLD 101SY DECON SYSTEM
04/10/95

ICF KAISER HANFORD
AutoPIPE+4.50 MODEL PAGE 2

P O I N T D A T A L I S T I N G

POINT NAME	TYPE	-----OFFSETS (ft)----- X Y Z			PIPE ID	DESCRIPTION
*** SEGMENT A						
A00	Run	0	0	0	6" SCH160	
A01	Tee	0.75	0	0		
A02	Run	0.50	0	0		
A03	Tee	0.50	0	0		
A04	Tee	1.00	0	0		
A05	Run	0.50	0	0		
A06	Tee	0.50	0	0		
A07	Run	1.00	0	0		
*** SEGMENT B						
A01	Tee	0.75	0	0	2" SCH160	
B01	Valv	0	0	-0.92		Weight = 1 lb Surface factor = 0.00, SIF = 2.30
B02	Run	0	0	-0.25		
*** SEGMENT C						
A03	Tee	1.75	0	0	2" SCH160	
C01	Valv	0	0	-0.92		Rating = 1500, Weight = 82 lb Surface factor = 0.00, SIF = 2.30
C02	Run	0	0	-0.75		
*** SEGMENT D						
A04	Tee	2.75	0	0	2" SCH160	
D01	Valv	0	0	-0.92		Weight = 1 lb Surface factor = 0.00, SIF = 2.30
D02	Run	0	0	-0.25		
*** SEGMENT E						
A06	Tee	3.75	0	0	2" SCH160	
E01	Valv	0	0	-0.92		Weight = 1 lb Surface factor = 0.00, SIF = 2.30
E02	Run	0	0	-0.25		

*** SEGMENT F

A01	Tee	0.75	0	0	3" SCH160
F01	Run	0	0	0.50	
F06	Run	0	0	0.33	
F02	Valv	0	0	0.90	

Rating = 1500, Weight = 200 lb
Surface factor = 0.00, SIF = 1.00

F03	Run	0	0	1.27
F04	Run	0	0	0.50
F05	Run	0	0	0.33
F07	Run	0	0	0.56

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ICF KAISER HANFORD
AutoPIPE+4.50 MODEL PAGE 3

P O I N T D A T A L I S T I N G

POINT NAME	TYPE	-----OFFSETS (ft)----- X Y Z			PIPE ID	DESCRIPTION
*** SEGMENT G						
A06	Tee	3.75	0	0	3" SCH160	
G01	Run	0	0	0.50		
G02	Run	0	0	0.33		
G03	Valv	0	0	0.50		Weight = 16 lb Surface factor = 1.00, SIF = 1.00
G04	Run	0	0	0.50		
G05	Valv	0	0	0.50		Weight = 16 lb Surface factor = 1.00, SIF = 1.00
G06	Run	0	0	0.50		
G07	Run	0	0	0.50		
G08	Run	0	0	0.33		
G09	Run	0	0	0.33		

Total weight of empty pipes : 330 lb

MANIFOLD 101SY DECON SYSTEM
04/10/95

ICF KAISER HANFORD
AutoPIPE+4.50 MODEL PAGE 4

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

POINT NAME	---COORDINATE(ft) X	Y	Z	DATA TYPE	DESCRIPTION
*** SEGMENT A					
A00	0.00	0.00	0.00	FORCES	Press 1
A01	0.75	0.00	0.00	TEE	Reinforced tee Pad thickness = 0.50inch SIF - In = 1.98, Out = 2.30
A02	1.25	0.00	0.00	ANCHOR	Transnational stiffness lb/in X= RIGID Y= RIGID Z= RIGID Rotational stiffness ft-lb/deg X= RIGID Y= RIGID Z= RIGID Release for Hanger design : X XXYYZZ Thermal movements : None
A03	1.75	0.00	0.00	TEE	Reinforced tee Pad thickness = 0.50inch SIF - In = 1.30, Out = 1.40
A04	2.75	0.00	0.00	TEE	Reinforced tee Pad thickness = 0.50inch SIF - In = 1.30, Out = 1.40
A05	3.25	0.00	0.00	GUIDE	ID : A05 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.30 Gaps set Weightless
A06	3.75	0.00	0.00	TEE	Reinforced tee Pad thickness = 0.50inch SIF - In = 1.98, Out = 2.30
A07	4.75	0.00	0.00	FORCES	Press 1
*** SEGMENT B					
A01	0.75	0.00	0.00	TEE	Reinforced tee Pad thickness = 0.50inch SIF - In = 1.98, Out = 2.30
B01	0.75	0.00	-0.92		
B02	0.75	0.00	-1.17	WEIGHT	12 lb , No offsets
*** SEGMENT C					
A03	1.75	0.00	0.00	TEE	Reinforced tee Pad thickness = 0.50inch SIF - In = 1.30, Out = 1.40
C01	1.75	0.00	-0.92		
C02	1.75	0.00	-1.67	WEIGHT	12 lb , No offsets

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*** SEGMENT D

A04	2.75	0.00	0.00	TEE	Reinforced tee
					Pad thickness = 0.50inch
					SIF - In = 1.30, Out = 1.40
D01	2.75	0.00	-0.92		
D02	2.75	0.00	-1.17	WEIGHT 12 lb	, No offsets

MANIFOLD 101SY DECON SYSTEM
04/10/95

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AutoPIPE+4.50 MODEL PAGE 5

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

POINT NAME	---COORDINATE(ft) X	Y	Z	DATA TYPE	DESCRIPTION
*** SEGMENT E					
A06	3.75	0.00	0.00	TEE	Reinforced tee Pad thickness = 0.50inch SIF - In = 1.98, Out = 2.30
E01	3.75	0.00	-0.92		
E02	3.75	0.00	-1.17	WEIGHT	12 lb , No offsets
*** SEGMENT F					
A01	0.75	0.00	0.00	TEE	Reinforced tee Pad thickness = 0.50inch SIF - In = 1.98, Out = 2.30
F01	0.75	0.00	0.50	GUIDE	ID : F01 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.30 Gaps set Weightless
F06	0.75	0.00	0.83	GUIDE	ID : F06 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.00 Gaps set Weightless
F02	0.75	0.00	1.73	FLANGE	Weld neck SIF = 1.00 Rating = 1500, Weight = 48 lb
F03	0.75	0.00	3.00	FLANGE	Weld neck SIF = 1.00 Rating = 1500, Weight = 48 lb
F04	0.75	0.00	3.50	GUIDE	ID : F04 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.30 Gaps set Weightless
F05	0.75	0.00	3.83	GUIDE	ID : F05 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.00 Gaps set Weightless
F07	0.75	0.00	4.39		

*** SEGMENT G

A06	3.75	0.00	0.00 TEE	Reinforced tee Pad thickness = 0.50inch SIF - In = 1.98, Out = 2.30
G01	3.75	0.00	0.50 GUIDE	ID : G01 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 0.03, Right = 0.03 inch

MANIFOLD 101SY DECON SYSTEM
04/10/95

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AutoPIPE+4.50 MODEL PAGE 6

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

POINT NAME	---COORDINATE(ft) X	Y	Z	DATA TYPE	DESCRIPTION
G02	3.75	0.00	0.83	GUIDE	Friction = 0.30 Gaps set Weightless ID : G02 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.00 Gaps set Weightless
G03	3.75	0.00	1.33		
G04	3.75	0.00	1.83		
G05	3.75	0.00	2.33		
G06	3.75	0.00	2.83		
G07	3.75	0.00	3.33	GUIDE	ID : G07 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.00 Gaps set Weightless
G08	3.75	0.00	3.66	GUIDE	ID : G08 1, Connected to Ground Stiffness = RIGID Gap-down = 0.00, Above = 0.00 inch Gap-left = 0.03, Right = 0.03 inch Friction = 0.00 Gaps set Weightless
G09	3.75	0.00	3.99		

Number of points in the system : 38

MANIFOLD 101SY DECON SYSTEM
04/10/95

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AutoPIPE+4.50 MODEL PAGE 7

P I P E D A T A L I S T I N G

Pipe ID/ Material	Nom/ Sch	O.D. inch	W.Th.	-----Thickness(inch)----- Corr Mill	Insu	Ling	Spec Grav	Weight(lb/ft) Pipe	Other	Total
6"SCH160 A106-B	6 160	6.625	0.718	0 0.09	0	0	1.00	45.25	0	54.41
2"SCH160 A106-B	2.000 160	2.375	0.343	0 0.04	0	0	1.00	7.44	0	8.41
3"SCH160 A106-B	3.000 160	3.500	0.438	0 0.05	0	0	1.00	14.31	0	16.65

MANIFOLD 101SY DECON SYSTEM
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AutoPIPE+4.50 MODEL PAGE 8

M A T E R I A L D A T A L I S T I N G

Material Name	Pipe ID	Density lb/cu.ft	Pois. Ratio	Temper. deg F	Modulus E6 psi	Expans. in/100ft	Allow. psi
A106-B	6"SCH160	489.0	0.30	70.0 150.0	29.50	0.6092	20000.0 20000.0
A106-B	2"SCH160	489.0	0.30	70.0 150.0	29.50	0.6092	20000.0 20000.0
A106-B	3"SCH160	489.0	0.30	70.0 150.0	29.50	0.6092	20000.0 20000.0

MANIFOLD 101SY DECON SYSTEM
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ICF KAISER HANFORD
AutoPIPE+4.50 MODEL PAGE 9

TEMPERATURE AND PRESSURE DATA

POINT NAME	-----C A S E 1-----			-----C A S E 2-----			-----C A S E 3-----		
	PRESS. psi	TEMPER deg F	EXPAN. in/100ft	PRESS. psi	TEMPER deg F	EXPAN. in/100ft	PRESS. psi	TEMPER deg F	EXPAN. in/100ft

*** SEGMENT A

A00	3300	150	0.609
A07	3300	150	0.609

*** SEGMENT B

A01	3300	150	0.609
B02	3300	150	0.609

*** SEGMENT C

A03	3300	150	0.609
C02	3300	150	0.609

*** SEGMENT D

A04	3300	150	0.609
D02	3300	150	0.609

*** SEGMENT E

A06	3300	150	0.609
E02	3300	150	0.609

*** SEGMENT F

A01	3300	150	0.609
F07	3300	150	0.609

*** SEGMENT G

A06	3300	150	0.609
G09	3300	150	0.609

MANIFOLD 101SY DECON SYSTEM
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AutoPIPE+4.50 MODEL PAGE 10

FORCES AND DISPLACEMENTS								
(Force - lb , Moment - ft-lb , Tran.- in , Rot.- deg)								
POINT NAME	LOAD CASE	TYPE	X	Y	Z	XX	YY	ZZ
A00	P1	FORCE	-44000	0	0	0	0	0
A07	P1	FORCE	44000	0	0	0	0	0

MANIFOLD 101SY DECON SYSTEM
04/10/95

ICF KAISER HANFORD
AutoPIPE+4.50 RESULT PAGE 1

A N A L Y S I S S U M M A R Y

Current model revision number : 14

Static - Date and Time of analysis Apr 10, 1995 9:18 AM
Model Revision Number 14
Number of load cases 3
Load cases analyzed GR T1 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 MANIFOLD.LOG
Base load cases for nonlinear analysis
GR = None
T1 = GR
P1 = T1
Weight of contents included Yes
Pressure stiffening case 0
Water elevation for buoyancy loads Not considered

MANIFOLD 101SY DECON SYSTEM
04/10/95

ICF KAISER HANFORD
AutoPIPE+4.50 RESULT PAGE 2

CODE COMPLIANCE COMBINATIONS

Combination	Category	Method	Load	Factor	Allowable	Remarks
GR + Max P	Sustain	Sum	Gravity Max Long	1.00 1.00	Automatic	Default
Cold to T1	Expansion	Sum	Thermal 1	1.00	Automatic	Default
Max P	Hoop		Max Hoop	1.00	Automatic	Default

OTHER USER COMBINATIONS

Combination	Method	Load	Factor	Remarks
GR	Sum	Gravity	1.00	Default
T1	Sum	Thermal 1	1.00	Default
P1	Sum	Press 1	1.00	Default
GR+T1	Sum	Gravity Thermal 1	1.00 1.00	User

CODE COMPLIANCE

Y - Factor 0.40
Weld efficiency factor 1.00
Range reduction factor 1.00
Design Pressure Factor 1.00
Minimum stress ratio used in reports... 0.00
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

MANIFOLD 101SY DECON SYSTEM
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AutoPIPE+4.50 RESULT PAGE 3

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

Point name	Load combination	TRANSLATIONS (in)			ROTATIONS (deg)		
		X	Y	Z	X	Y	Z
-----	-----	-----	-----	-----	-----	-----	-----
*** Segment A begin ***							
A00	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	-0.008	0.000	0.000	0.000	0.000	0.000
	P1	-0.003	0.000	0.000	0.000	0.000	0.000
	GR+T1	-0.008	0.000	0.000	0.000	0.000	0.000
A01	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	-0.003	0.000	0.000	0.000	0.000	0.000
	P1	-0.001	0.000	0.000	0.000	0.000	0.000
	GR+T1	-0.003	0.000	0.000	0.000	0.000	0.000
A02	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
	P1	0.000	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.000	0.000	0.000	0.000	0.000	0.000
A03	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.003	0.000	0.000	0.000	0.000	0.000
	P1	0.001	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.003	0.000	0.000	0.000	0.000	0.000
A04	GR	0.000	0.000	0.000	-0.001	0.000	0.000
	T1	0.009	0.000	0.000	0.000	0.000	0.000
	P1	0.003	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.009	0.000	0.000	-0.001	0.000	0.000
A05	GR	0.000	0.000	0.000	-0.001	0.000	0.000
	T1	0.012	0.000	0.000	0.000	0.000	0.000
	P1	0.004	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.012	0.000	0.000	-0.001	0.000	0.000
A06	GR	0.000	0.000	0.000	-0.001	0.000	0.000
	T1	0.015	0.000	0.000	0.000	0.000	0.000
	P1	0.005	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.015	0.000	0.000	-0.001	0.000	0.000
A07	GR	0.000	0.000	0.000	-0.001	0.000	0.000

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REV 0

T1	0.021	0.000	0.000	0.000	0.000	0.000
PI	0.007	0.000	0.000	0.000	0.000	0.000
GR+T1	0.021	0.000	0.000	-0.001	0.000	0.000

*** Segment A end ***

*** Segment B begin ***

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AutoPIPE+4.50 RESULT PAGE 4

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

Point name	Load combination	TRANSLATIONS (in)			ROTATIONS (deg)		
		X	Y	Z	X	Y	Z
A01	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	-0.003	0.000	0.000	0.000	0.000	0.000
	P1	-0.001	0.000	0.000	0.000	0.000	0.000
	GR+T1	-0.003	0.000	0.000	0.000	0.000	0.000
B01	GR	0.000	0.000	0.000	-0.002	0.000	0.000
	T1	-0.003	0.000	-0.006	0.000	0.000	0.000
	P1	-0.001	0.000	0.000	0.000	0.000	0.000
	GR+T1	-0.003	0.000	-0.006	-0.002	0.000	0.000
B02	GR	0.000	0.000	0.000	-0.002	0.000	0.000
	T1	-0.003	0.000	-0.007	0.000	0.000	0.000
	P1	-0.001	0.000	0.000	0.000	0.000	0.000
	GR+T1	-0.003	0.000	-0.007	-0.002	0.000	0.000
*** Segment B end ***							
*** Segment C begin ***							
A03	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.003	0.000	0.000	0.000	0.000	0.000
	P1	0.001	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.003	0.000	0.000	0.000	0.000	0.000
C01	GR	0.000	-0.002	0.000	-0.019	0.000	0.000
	T1	0.003	0.000	-0.006	0.000	0.000	0.000
	P1	0.001	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.003	-0.002	-0.006	-0.019	0.000	0.000
C02	GR	0.000	-0.005	0.000	-0.019	0.000	0.000
	T1	0.003	0.000	-0.010	0.000	0.000	0.000
	P1	0.001	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.003	-0.005	-0.010	-0.019	0.000	0.000
*** Segment C end ***							
*** Segment D begin ***							
A04	GR	0.000	0.000	0.000	-0.001	0.000	0.000

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REV 0

	T1	0.009	0.000	0.000	0.000	0.000	0.000
	P1	0.003	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.009	0.000	0.000	-0.001	0.000	0.000
D01	GR	0.000	0.000	0.000	-0.003	0.000	0.000
	T1	0.009	0.000	-0.006	0.000	0.000	0.000
	P1	0.003	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.009	0.000	-0.006	-0.003	0.000	0.000

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AutoPIPE+4.50 RESULT PAGE 5

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

Point name	Load combination	TRANSLATIONS (in)			ROTATIONS (deg)		
		X	Y	Z	X	Y	Z
D02	GR	0.000	-0.001	0.000	-0.003	0.000	0.000
	T1	0.009	0.000	-0.007	0.000	0.000	0.000
	P1	0.003	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.009	-0.001	-0.007	-0.003	0.000	0.000
*** Segment D end ***							
*** Segment E begin ***							
A06	GR	0.000	0.000	0.000	-0.001	0.000	0.000
	T1	0.015	0.000	0.000	0.000	0.000	0.000
	P1	0.005	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.015	0.000	0.000	-0.001	0.000	0.000
E01	GR	0.000	0.000	0.000	-0.003	0.000	0.000
	T1	0.015	0.000	-0.006	0.000	0.000	0.000
	P1	0.005	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.015	0.000	-0.006	-0.003	0.000	0.000
E02	GR	0.000	-0.001	0.000	-0.003	0.000	0.000
	T1	0.015	0.000	-0.007	0.000	0.000	0.000
	P1	0.005	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.015	-0.001	-0.007	-0.003	0.000	0.000
*** Segment E end ***							
*** Segment F begin ***							
A01	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	-0.003	0.000	0.000	0.000	0.000	0.000
	P1	-0.001	0.000	0.000	0.000	0.000	0.000
	GR+T1	-0.003	0.000	0.000	0.000	0.000	0.000
F01	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	-0.003	0.000	0.003	0.000	0.000	0.000
	P1	-0.001	0.000	0.000	0.000	0.000	0.000
	GR+T1	-0.003	0.000	0.003	0.000	0.000	0.000
F06	GR	0.000	0.000	0.000	0.001	0.000	0.000
	T1	-0.003	0.000	0.005	0.000	0.000	0.000
	P1	-0.001	0.000	0.000	0.000	0.000	0.000

WHC-SD-WM-DA-189
REV 0

	GR+T1	-0.003	0.000	0.005	0.001	0.000	0.000
F02	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	-0.003	0.000	0.011	0.000	0.000	0.000
	P1	-0.001	0.000	0.001	0.000	0.000	0.000
	GR+T1	-0.003	0.000	0.011	0.000	0.000	0.000

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AutoPIPE+4.50 RESULT PAGE 6

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

Point name	Load combination	TRANSLATIONS (in)			ROTATIONS (deg)		
		X	Y	Z	X	Y	Z
F03	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	-0.003	0.000	0.018	0.000	0.000	0.000
	P1	-0.001	0.000	-0.001	0.000	0.000	0.000
	GR+T1	-0.003	0.000	0.018	0.000	0.000	0.000
F04	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	-0.003	0.000	0.021	0.000	0.000	0.000
	P1	-0.001	0.000	0.000	0.000	0.000	0.000
	GR+T1	-0.003	0.000	0.021	0.000	0.000	0.000
F05	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	-0.003	0.000	0.023	0.000	0.000	0.000
	P1	-0.001	0.000	0.000	0.000	0.000	0.000
	GR+T1	-0.003	0.000	0.023	0.000	0.000	0.000
F07	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	-0.003	0.000	0.027	0.000	0.000	0.000
	P1	-0.001	0.000	0.000	0.000	0.000	0.000
	GR+T1	-0.003	0.000	0.027	0.000	0.000	0.000

*** Segment F end ***

*** Segment G begin ***

A06	GR	0.000	0.000	0.000	-0.001	0.000	0.000
	T1	0.015	0.000	0.000	0.000	0.000	0.000
	P1	0.005	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.015	0.000	0.000	-0.001	0.000	0.000
G01	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.015	0.000	0.003	0.000	0.000	0.000
	P1	0.005	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.015	0.000	0.003	0.000	0.000	0.000
G02	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.015	0.000	0.005	0.000	0.000	0.000
	P1	0.005	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.015	0.000	0.005	0.000	0.000	0.000
G03	GR	0.000	0.000	0.000	0.000	0.000	0.000

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REV 0

	T1	0.015	0.000	0.008	0.000	0.000	0.000
	P1	0.005	0.000	0.001	0.000	0.000	0.000
	GR+T1	0.015	0.000	0.008	0.000	0.000	0.000
G04	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.015	0.000	0.011	0.000	0.000	0.000
	P1	0.005	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.015	0.000	0.011	0.000	0.000	0.000

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AutoPIPE+4.50 RESULT PAGE 7

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

Point name	Load combination	TRANSLATIONS (in)			ROTATIONS (deg)		
		X	Y	Z	X	Y	Z
G05	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.015	0.000	0.014	0.000	0.000	0.000
	P1	0.005	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.015	0.000	0.014	0.000	0.000	0.000
G06	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.015	0.000	0.017	0.000	0.000	0.000
	P1	0.005	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.015	0.000	0.017	0.000	0.000	0.000
G07	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.015	0.000	0.020	0.000	0.000	0.000
	P1	0.005	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.015	0.000	0.020	0.000	0.000	0.000
G08	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.015	0.000	0.022	0.000	0.000	0.000
	P1	0.005	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.015	0.000	0.022	0.000	0.000	0.000
G09	GR	0.000	0.000	0.000	0.000	0.000	0.000
	T1	0.015	0.000	0.024	0.000	0.000	0.000
	P1	0.005	0.000	0.000	0.000	0.000	0.000
	GR+T1	0.015	0.000	0.024	0.000	0.000	0.000

*** Segment G end ***

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

Point name	Load combination	FORCES (lb)				MOMENTS (ft-lb)			
		X	Y	Z	Result	X	Y	Z	Result
A02	Anchor								
	GR	0	-182	0	182	-169	0	13	169
	T1	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	GR+T1	0	-182	0	182	-169	0	13	169
A05	Guide								
	GR	0	-241	0	241	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	GR+T1	0	-241	0	241	0	0	0	0
F01	Guide								
	GR	0	78	0	78	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	GR+T1	0	78	0	78	0	0	0	0
F06	Guide								
	GR	0	-253	0	253	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	GR+T1	0	-253	0	253	0	0	0	0
F04	Guide								
	GR	0	-289	0	289	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	GR+T1	0	-289	0	289	0	0	0	0
F05	Guide								
	GR	0	95	0	95	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	GR+T1	0	95	0	95	0	0	0	0
G01	Guide								
	GR	0	-2	0	2	0	0	0	0

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	T1	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	GR+T1	0	-2	0	2	0	0	0	0
G02	Guide								
	GR	0	-24	0	24	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	GR+T1	0	-24	0	24	0	0	0	0

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

Point name	Load combination	FORCES (lb)				MOMENTS (ft-lb)			
		X	Y	Z	Result	X	Y	Z	Result
G07	Guide								
	GR	0	-54	0	54	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	GR+T1	0	-54	0	54	0	0	0	0
G08	Guide								
	GR	0	14	0	14	0	0	0	0
	T1	0	0	0	0	0	0	0	0
	P1	0	0	0	0	0	0	0	0
	GR+T1	0	14	0	14	0	0	0	0

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ASME B31.3c (1992) CODE COMPLIANCE								
			(Moments in ft-lb)			(Stress in psi)		
Point	Load	In-Pl.	Out-Pl.	Torsion	S.I.F	Eq. Load	Code	Code
name	combination	Moment	Moment	Moment	In Out	no. type	Stress	Allow.
*** Segment A begin ***								
A00	Max P					(3a) HOOP	16086	20000
	GR + Max P	0	0	1.00 1.00	(18) SUST	10915	20000	
	Cold to T1	0	0	0 1.00 1.00	(17) DISP	0	30000	
A01	- Max P					(3a) HOOP	16086	20000
	GR + Max P	0	15	1.98 2.30	(18) SUST	10938	20000	
	Cold to T1	0	0	0 1.98 2.30	(17) DISP	0	30000	
A01	+ Max P					(3a) HOOP	16086	20000
	GR + Max P	0	15	1.98 2.30	(18) SUST	10938	20000	
	Cold to T1	0	0	0 1.98 2.30	(17) DISP	0	30000	
A02	- Max P					(3a) HOOP	16086	20000
	GR + Max P	44	0	1.00 1.00	(18) SUST	10944	20000	
	Cold to T1	0	0	0 1.00 1.00	(17) DISP	0	30000	
A02	+ Max P					(3a) HOOP	16086	20000
	GR + Max P	31	0	1.00 1.00	(18) SUST	10936	20000	
	Cold to T1	0	0	0 1.00 1.00	(17) DISP	0	30000	
A03	- Max P					(3a) HOOP	16086	20000
	GR + Max P	0	18	1.30 1.40	(18) SUST	10931	20000	
	Cold to T1	0	0	0 1.30 1.40	(17) DISP	0	30000	
A03	+ Max P					(3a) HOOP	16086	20000
	GR + Max P	0	18	1.30 1.40	(18) SUST	10931	20000	
	Cold to T1	0	0	0 1.30 1.40	(17) DISP	0	30000	
A04	- Max P					(3a) HOOP	16086	20000
	GR + Max P	0	27	1.30 1.40	(18) SUST	10940	20000	
	Cold to T1	0	0	0 1.30 1.40	(17) DISP	0	30000	
A04	+ Max P					(3a) HOOP	16086	20000
	GR + Max P	0	27	1.30 1.40	(18) SUST	10940	20000	
	Cold to T1	0	0	0 1.30 1.40	(17) DISP	0	30000	

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A05	Max P					(3a) HOOP	16086	20000
	GR + Max P	81	0	1.00	1.00	(18) SUST	10969	20000
	Cold to T1	0	0	0	1.00	(17) DISP	0	30000
A06	- Max P					(3a) HOOP	16086	20000
	GR + Max P	0	27	1.98	2.30	(18) SUST	10957	20000
	Cold to T1	0	0	0	1.98	(17) DISP	0	30000

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ASME B31.3c (1992) CODE COMPLIANCE									
		(Moments in ft-lb)			(Stress in psi)				
Point	Load	In-Pl.	Out-Pl.	Torsion	S.I.F	Eq. Load	Code	Code	
name	combination	Moment	Moment	Moment	In Out	no. type	Stress	Allow.	
A06	+ Max P					(3a) HOOP	16086	20000	
	GR + Max P	0	27		1.98 2.30	(18) SUST	10957	20000	
	Cold to Tl	0	0	0	1.98 2.30	(17) DISP	0	30000	
A07	Max P					(3a) HOOP	16086	20000	
	GR + Max P	0	0		1.00 1.00	(18) SUST	10915	20000	
	Cold to Tl	0	0	0	1.00 1.00	(17) DISP	0	30000	
*** Segment A end ***									
*** Segment B begin ***									
A01	Max P					(3a) HOOP	11743	20000	
	GR + Max P	0	19		1.98 2.30	(18) SUST	5936	20000	
	Cold to Tl	0	0	0	1.98 2.30	(17) DISP	0	30000	
B01	Max P					(3a) HOOP	11743	20000	
	GR + Max P	3	0		2.30 2.30	(18) SUST	5801	20000	
	Cold to Tl	0	0	0	2.30 2.30	(17) DISP	0	30000	
*** Segment B end ***									
*** Segment C begin ***									
A03	Max P					(3a) HOOP	11743	20000	
	GR + Max P	0	131		1.30 1.40	(18) SUST	7123	20000	
	Cold to Tl	0	0	0	1.30 1.40	(17) DISP	0	30000	
C01	Max P					(3a) HOOP	11743	20000	
	GR + Max P	40	0		2.30 2.30	(18) SUST	6841	20000	
	Cold to Tl	0	0	0	2.30 2.30	(17) DISP	0	30000	
*** Segment C end ***									
*** Segment D begin ***									
A04	Max P					(3a) HOOP	11743	20000	
	GR + Max P	0	19		1.30 1.40	(18) SUST	5916	20000	
	Cold to Tl	0	0	0	1.30 1.40	(17) DISP	0	30000	

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D01	Max P					(3a)	HOOP	11743	20000
	GR + Max P	3	0	2.30	2.30	(18)	SUST	5801	20000
	Cold to T1	0	0	0	2.30	2.30	(17)	DISP	0 30000

*** Segment D end ***

*** Segment E begin ***

MANIFOLD 101SY DECON SYSTEM
04/10/95

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AutoPIPE+4.50 RESULT PAGE 12

ASME B31.3c (1992) CODE COMPLIANCE									
(Moments in ft-lb) (Stress in psi)									
Point	Load	In-Pl.	Out-Pl.	Torsion	S.I.F		Eq. Load	Code	Code
name	combination	Moment	Moment	Moment	In	Out	no. type	Stress	Allow.
A06	Max P						(3a) HOOP	11743	20000
	GR + Max P	0	19		1.98	2.30	(18) SUST	5936	20000
	Cold to T1	0	0	0	1.98	2.30	(17) DISP	0	30000
E01	Max P						(3a) HOOP	11743	20000
	GR + Max P	3	0		2.30	2.30	(18) SUST	5801	20000
	Cold to T1	0	0	0	2.30	2.30	(17) DISP	0	30000
*** Segment E end ***									
*** Segment F begin ***									
A01	Max P						(3a) HOOP	13758	20000
	GR + Max P	0	1		1.98	2.30	(18) SUST	6602	20000
	Cold to T1	0	0	0	1.98	2.30	(17) DISP	0	30000
F01	Max P						(3a) HOOP	13758	20000
	GR + Max P	10	0		1.00	1.00	(18) SUST	6635	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000
F06	Max P						(3a) HOOP	13758	20000
	GR + Max P	46	0		1.00	1.00	(18) SUST	6783	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000
F02	Max P						(3a) HOOP	13758	20000
	GR + Max P	77	0		1.00	1.00	(18) SUST	6911	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000
F03	Max P						(3a) HOOP	13758	20000
	GR + Max P	50	0		1.00	1.00	(18) SUST	6799	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000
F04	Max P						(3a) HOOP	13758	20000
	GR + Max P	38	0		1.00	1.00	(18) SUST	6750	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000
F05	Max P						(3a) HOOP	13758	20000
	GR + Max P	3	0		1.00	1.00	(18) SUST	6603	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000

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F07	Max P					(3a)	H00P	13758	20000
	GR + Max P	0	0	1.00	1.00	(18)	SUST	6592	20000
	Cold to T1	0	0	0	1.00	1.00	(17)	DISP	0 30000

*** Segment F end ***

*** Segment G begin ***

MANIFOLD 101SY DECON SYSTEM
04/10/95

ICF KAISER HANFORD
AutoPIPE+4.50 RESULT PAGE 13

ASME B31.3c (1992) CODE COMPLIANCE									
Point name	Load combination	(Moments in ft-lb)			S.I.F		(Stress in psi)		Code Stress
		In-Pl. Moment	Out-Pl. Moment	Torsion Moment	In	Out	Eq. Load no. type	Code Allow.	
A06	Max P						(3a) HOOP	13758	20000
	GR + Max P	0	20		1.98	2.30	(18) SUST	6781	20000
	Cold to T1	0	0	0	1.98	2.30	(17) DISP	0	30000
G01	Max P						(3a) HOOP	13758	20000
	GR + Max P	13	0		1.00	1.00	(18) SUST	6645	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000
G02	Max P						(3a) HOOP	13758	20000
	GR + Max P	10	0		1.00	1.00	(18) SUST	6633	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000
G03	Max P						(3a) HOOP	13758	20000
	GR + Max P	3	0		1.00	1.00	(18) SUST	6607	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000
G04	Max P						(3a) HOOP	13758	20000
	GR + Max P	10	0		1.00	1.00	(18) SUST	6635	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000
G05	Max P						(3a) HOOP	13758	20000
	GR + Max P	10	0		1.00	1.00	(18) SUST	6636	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000
G06	Max P						(3a) HOOP	13758	20000
	GR + Max P	4	0		1.00	1.00	(18) SUST	6610	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000
G07	Max P						(3a) HOOP	13758	20000
	GR + Max P	8	0		1.00	1.00	(18) SUST	6626	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000
G08	Max P						(3a) HOOP	13758	20000
	GR + Max P	1	0		1.00	1.00	(18) SUST	6596	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000
G09	Max P						(3a) HOOP	13758	20000
	GR + Max P	0	0		1.00	1.00	(18) SUST	6592	20000
	Cold to T1	0	0	0	1.00	1.00	(17) DISP	0	30000

*** Segment G end ***

MANIFOLD 101SY DECON SYSTEM
04/10/95

ICF KAISER HANFORD
AutoPIPE+4.50 RESULT PAGE 14

SYSTEM SUMMARY

Maximum displacements (in)

Maximum X :	0.021	Point : A07	Load Comb.: T1
Maximum Y :	-0.005	Point : C02	Load Comb.: GR
Maximum Z :	0.027	Point : F07	Load Comb.: T1
Max. total:	0.029	Point : G09	Load Comb.: T1

Maximum rotations (deg)

Maximum X :	-0.019	Point : C02	Load Comb.: GR
Maximum Z :	0.000	Point : A07	Load Comb.: GR
Max. total:	0.019	Point : C02	Load Comb.: GR

Maximum restraint forces(lb)

Maximum Y :	-289	Point : F04	Load Comb.: GR
Max. total:	289	Point : F04	Load Comb.: GR

Maximum restraint moments(ft-lb)

Maximum X :	-169	Point : A02	Load Comb.: GR
Maximum Z :	13	Point : A02	Load Comb.: GR
Max. total:	169	Point : A02	Load Comb.: GR

MANIFOLD 101SY DECON SYSTEM
04/10/95

ICF KAISER HANFORD
AutoPIPE+4.50 RESULT PAGE 15

SYSTEM SUMMARY

Maximum sustained stress

Point : A05
Stress psi : 10969
Allowable psi : 20000
Ratio : 0.55
Load combination : GR + Max P

Maximum displacement stress

Point : A04
Stress psi : 0
Allowable psi : 30000
Ratio : 0.00
Load combination : Cold to T1

Maximum hoop stress

Point : A00
Stress psi : 16086
Allowable psi : 20000
Ratio : 0.80
Load combination : Max P

Maximum sustained stress ratio

Point : A05
Stress psi : 10969
Allowable psi : 20000
Ratio : 0.55
Load combination : GR + Max P

Maximum displacement stress ratio

Point : A04
Stress psi : 0
Allowable psi : 30000
Ratio : 0.00

Load combination : Cold to T1

Maximum hoop stress ratio

Point	:	A00
Stress psi	:	16086
Allowable psi	:	20000
Ratio	:	0.80
Load combination	:	Max P

MANIFOLD 101SY DECON SYSTEM
04/10/95

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AutoPIPE+4.50 RESULT PAGE 16

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

* * * The system satisfies ASME B31.3 code requirements * * *
* * * for the selected options * * *

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ATTACHMENT B
YOKE WATER CONNECTOR
STRESS ANALYSIS

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DESIGN ANALYSIS

Client WHC

Subject FLUSH LINE STRESS ANALYSIS

Location 200W

WO/Job No. CR1417

Date 8-30-94

Checked

Revised

By KEVIN CLEVELAND

By RAY SCHWEHR

By

OBJECTIVE

This calculation will verify the strength of the threads on the two inch flush line used for Yoke Water Connector and the threads of the firehose connector.

DESIGN INPUTSGIVEN DATA

1. Safety Class = 3
2. Materials Pipe = ASTM A53
 Hose connector = ASTM B584 C84400

ASSUMPTIONS

Threads on firehose connector are weakest link in system, if threads qualify then all other components qualify.

No seismic analysis is preformed because of the unlikelihood of an earthquake during pump removal.

METHODS

Mathcad 4.0 is used to do the calculation.

REFERENCES

1. Navco Piping Datalog, edition NO. 11-1984.
2. Machinery's Handbook, 24th edition.
3. Standard Handbook of Machine Design, 1986, Shingley & Mischke
4. Angus Fire vendor information
5. Drawing H-2-824443

CONCLUSION

Based on the analysis presented in this calculation the system passes.

DESIGN ANALYSIS

Client WHC

WO/Job No. CR1417

Subject FLUSH LINE STRESS ANALYSIS

Date 8-30-94

By KEVIN CLEVELAND

Location 200W

Checked

By RAY SCHWEHR

Revised

By

Thread stress calculation for a 2" pipe coupling

The following variables will be use in the calculation.

The force on the threads F The end-condtion factor ξ The number of threads engaged N_e Major diameter D Minor diameter d Angle of leading thread flank α Lead angle λ Thread coefficient of friction μ_t

The total force on the threads will be the weight of the hose and water + the pressure force on the inside of the pipe

Weight of 100 ft of hose and water W_1 is 177 lbs + 48 lbs for dragging additional hose on the ground
REF 4

$$W_1 = 225 \cdot \text{lb}$$

Force on end of pipe due to water pressure is: Pressure X Area

$$P = 300 \cdot \frac{\text{lb}}{\text{in}^2} \quad A = 4.43 \cdot \text{in}^2 \quad \text{REF 1}$$

$$W_2 = P \cdot A \quad W_2 = 1.33 \cdot 10^3 \cdot \text{lb}$$

Total force is

$$F = W_1 + W_2 \quad F = 1.55 \cdot 10^3 \cdot \text{lb}$$

DESIGN ANALYSIS

Client WHC

Subject FLUSH LINE STRESS ANALYSIS

Location 200W

WO/Job No. CR1417

Date 8-30-94

Checked

Revised

By KEVIN CLEVELAND

By RAY SCHWEHR

By

The lead angle and the angle of leading thread flank are the same for pipe threads. From REF 2 the angle between thread sides is 60°. From REF 3 the friction coefficient for metal to metal contact is 0.6.

$$\lambda = 30\text{-deg} \quad \alpha = 30\text{-deg} \quad \mu_t = 0.6$$

The end-condition factor is

$$\xi = \frac{\cos(\alpha)}{\left[1 + (\tan(\alpha))^2 \cdot (\cos(\lambda))^2\right]^{0.5} - \mu_t \cdot \tan(\lambda)} \quad \xi = 1.58 \quad \text{REF 3}$$

The major diameter, minor diameter and number of threads engaged are:

$$D = 2.339\text{-in}$$

REF 1

$$d = 2.199\text{-in}$$

For a 2" pipe the number of threads per inch is 11.5 and the effective length of engagement for handtight is 0.463

$$N_e = 11.5 \cdot 0.463$$

$$N_e = 5.32$$

REF 2

The thread bearing stress is found using the following equation

$$\sigma = \frac{4 \cdot F \cdot \xi}{\pi N_e (D^2 - d^2)} \quad \sigma = 924.33 \cdot \frac{\text{lb}}{\text{in}^2} \quad \text{REF 3}$$

Allowable stress for A53 is 20,000 psi > 924 psi OK

Allowable stress for B584 is 7250 psi > 924 psi OK

Pipe thread stresses pass analysis.

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PAGE B-5 OF B-5

Average Hose, Coupling, Water, and Total Weights(100f)

<u>SIZE</u>	<u>HOSE</u>	<u>COUP.</u>	<u>WATER</u>	<u>TOTAL</u>
1 1/2 CHIEF	31 lbs.	1 lbs.	78 lbs.	110 lbs.
1 3/4 Chief	35.5	1.5	104	141
1 3/4 H.C.	30	1.5	104	135.5
2 Chief	39.5	1.5	136	177
2 1/2 Chief	53.5	2.5	223	279
3 Chief	66.75	3.75	306	376.5
4 Hi Vol	77.25	7.75	544	629
5 Hi Vol	98.5	10.5	850	959

note: 4-5" Hi Vol coupling weights for corrug-grip

VOLUME OF WATER PER 100 FEET

1 1/2 in.	9.4 gals.
1 3/4	12.5
2	16.3
2 1/2	26.8
3	36.7
4	65.3
5	102

WHC-SD-WM-DA-189
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ATTACHMENT C
AIR RECEIVER TANK SIZING

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DESIGN ANALYSIS

client Westinghouse Hanford Company
Subject Blow-down of the 101-SY Mixer Pump
plenum flush line.

WO/Job No. 101-SY Pump Disposal Project

Date 4-3-95

By RP Schwehr

checked 4-4-95

By BD Andres

Location 241-SY Tank Farm

Revised

By

Objective:

Calculate the volume and initial charging pressure of an air tank needed to clear a 2" water pipe and hose assembly. This assembly is 44' long and includes 33' of 2" Sch 40 pipe within the 101-SY mixer pump, 8' of 2" suction hose and 36" of yoke water connection pipe and fittings (2" NPS). The hose and fittings extend up from the mixer pump column cap to the cross member of the mixer pump lifting yoke. The assembly will be blown out when vertically oriented with the air line attached at the top end. At the bottom end of the assembly are two series connected 2" spring loaded check valves. Check valve cracking pressure is 2 - 4 psi. Also, estimate the potential pressure spike the volume of air within the bag and blast shield will undergo when excess air leaves the pipe and hose assembly.

Assumptions:

Ideal gas law conditions prevail ($PV = mRT$). Mass, universal gas constant and temperature are constant regardless of changing volumes and pressures for a fixed amount of air.

References:

1. Grainger Catalog No. 386. (Refer to attached page C-9)
2. H-2-821387 Flexible Receiver Blast Shield Assembly
3. H-2-821391 Flexible Receiver Bag Assembly
4. H-2-815003 HMT Impact Limiting System Assemblies
5. DSI - HMT Mixer Pump Convenient As-Built Dimensions (pages C-10 & C-11)
6. HazletonTM DWG E-22679 (page C-12)
7. H-2-89948 HMT 16" Mid Column Assy & Details
8. HazletonTM Parts Reference Drawing (page C-13)
9. H-2-89950 HMT Pump Extension Piping Assy & Details

* Copies of H-2 Drawings can be obtained from Document Control. *

Conclusions:

A nine gallon air tank with an initial charge of air at 30 psig is sufficient to blow the flush line clear of water. The maximum pressure spike is estimated to be 0.5 inches of water. This estimate was determined from the requirement that the mixer pump be lifted a minimum of 34 feet or three feet above the tank's waste level at the time of blow-down. The estimate assumes that all excess air vents into the bag and blast shield air space although some will vent through the discharge legs and Disc #11 drain holes into the tank vapor space.

DESIGN ANALYSIS

client Westinghouse Hanford Company
Subject Blow-down of the 101-SY Mixer Pump
plenum flush line.

WO/Job No. 101-SY Pump Disposal Project
Date 4-3-95 By RP Schwehr

Checked 4-4-95 By BD Andres

Location 241-SY Tank Farm

Revised By

Sizing the air tank:

$$P_1 \times V_1 = P_2 \times V_2$$

P_1 = air tank charge pressure, psia

V_1 = air tank volume, ft³

P_2 = final system pressure, psia
(check valve cracking pressure x 2 check valves
in series)
= 2 x 4 psig (4 psi is the upper cracking limit)
= 8 psi
= 22.7 psia

V_2 = final system volume, ft³

$V_2 = V_1 + \text{air hose volume} + \text{pipe/hose volume}$

$$\begin{aligned} \text{air hose volume} &= 300 \text{ ft} \times (\pi/4) \times (.375/12)^2 \text{ ft}^2 \\ &= 0.23 \text{ ft}^3 \end{aligned}$$

$$\begin{aligned} \text{pipe/hose volume} &= 44 \text{ ft} \times (\pi/4) \times (2/12)^2 \text{ ft}^2 \\ &= 0.96 \text{ ft}^3 \end{aligned}$$

So: $V_2 = V_1 + 1.19 \text{ ft}^3$

And:

$$\begin{aligned} P_1 &= P_2 \times V_2 \div V_1 \\ &= P_2 \times (V_1 + 1.19 \text{ ft}^3) \div V_1 \end{aligned}$$

Let $V_1 = 9 \text{ gallons} = 1.2 \text{ ft}^3$ from Grainger Catalog No. 386,
Portable Air Tank, part # 4F693 (Refer to page C-9)

Then:

$$P_1 = (22.7 \text{ psia} \times (1.2 + 1.19) \text{ ft}^3) \div 1.2 \text{ ft}^3$$

$$P_1 = 45.2 \text{ psia} \text{ or } 30.5 \text{ psig}$$

DESIGN ANALYSIS

Client Westinghouse Hanford Company

WO/Job No. 101-SY Pump Disposal Project

Subject Blow-down of the 101-SY Mixer Pump
plenum flush line.

Date 4-3-95

By RP Schwehr

Checked 4-4-95

By BD Andres

Location 241-SY Tank Farm

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Estimating the pressure spike:mass of air ejected into the bag/blast shield air space = m_{ej}

$$m_{ej} = m_{initial} - m_{system}$$

$$m_{initial} = P_1 \times V_1 \div (R \times T)$$

$$R = 53.34 \text{ ft} \cdot \text{lb}/\text{lbm} \cdot \text{R}$$

$$T = 490 \text{ Rankine } (30^{\circ}\text{F})$$

$$m_{initial} = 45.2 \text{ psia} \times 1.2 \text{ ft}^3 \times (144 \text{ in}^2/\text{ft}^2) \div (53.34 \times 490)$$

$$= 0.299 \text{ lbm}$$

m_{system} = Mass of air left in the pipe/hose and air tank system up
to the check valves when cracking @ 2 psi or 16.7 psia.
Two psi is the minimum crack pressure - the more
conservative value to use.

$$= P_2 \times V_2 \div (R \times T)$$

$$= 16.7 \text{ psia} \times 2.39 \text{ ft}^3 \times (144 \text{ in}^2/\text{ft}^2) \div (53.34 \times 490)$$

$$m_{system} = 0.22 \text{ lbm}$$

Therefore:

$$m_{ej} = 0.299 - 0.22 \text{ lbm}$$

= 0.079 lbm of air ejected from the check valves into the bag/blast shield air space

Now, $P_{spike} = m_{ej} \times R \times T \div V_{bb-p}$

V_{bb-p} = Volume within the bag and blast shield less
the volume of the mixer pump.

$$V_{blast \ shield} = 120 \text{ ft}^3 \quad (\text{Ref. 2})$$

DESIGN ANALYSIS

client Westinghouse Hanford Company

WO/Job No. 101-SY Pump Disposal Project

Subject Blow-down of the 101-SY Mixer Pump
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Date 4-3-95

By RP Schwehr

Checked 4-4-95

By BD Andres

Location 241-SY Tank Farm

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The pump must be elevated a minimum of 31' to clear the waste. Another 3 feet will place disc #11 about even with the load frame. Disc #11 is just below the lower 45° elbows of the pump extension legs. The maximum bag diameter is 66".

So,

$$V_{\text{bag}} = 34 \text{ ft} \times (\pi/4) \times (66/12)^2 \text{ ft}^2$$

$$= 808 \text{ ft}^3 \quad (\text{Ref. 3})$$

$$V_{\text{pump}} = 80 \text{ ft}^3 \quad (\text{see the following two pages})$$

And,

$$V_{\text{bb-p}} = (120 + 808 - 80) \text{ ft}^3$$

$$= 848 \text{ ft}^3$$

$$P_{\text{spike}} = (0.079 \times 53.34 \times 490 \div (144 \times 848)) \text{ psi}$$

$$= 0.017 \text{ psi or } 0.47 \text{ in. water}$$

DESIGN ANALYSIS

client Westinghouse Hanford Company
subject Blow-down of the 101-SY Mixer Pump
plenum flush line.

WO/Job No. 101-SY Pump Disposal Project

Date 4-3-95

By RP Schwehr

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By BD Andres

Location 241-SY Tank Farm

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*Estimated Volume of mixer pump from bottom
side of mounting flange to Disc #11.*

Barrel Volume

Ref. - H-2-815003

- DSI-HMT Mixer Pump convenient
AS-Built Dimensions
- Hazleton DWG E-22679

Neglecting Gusset & flange volumes

$$V_{\text{Barrel}} = \frac{\pi}{4} \left(\frac{34}{12} \right)^2 \times \frac{46 \frac{1}{2}}{12}$$

$$= 24.4 \text{ ft}^3$$

Column and Transition Pipe Volumes

Ref. - H-2-89948

- DSI-HMT Mixer Pump
convenient AS-Built Dim.
- Hazleton DWG E-22679

$$V_{\text{column}} = \frac{\pi}{4} \left(\frac{16}{12} \right)^2 \times \left(250 \frac{1}{4} - 46 \frac{1}{2} \right) \frac{1}{12}$$

$$= 23.7 \text{ ft}^3$$

$$V_{\text{trans.}} = \frac{\pi}{4} \left(\frac{30}{12} \right)^2 \times \frac{24}{12} + \frac{\pi}{4} \left(\frac{16}{12} \right)^2 \times \frac{17}{12} +$$

$$\left(\frac{\pi}{4} \left(\frac{30+16}{2} \right)^2 \times 4 - \frac{\pi}{4} \left(\frac{16}{12} \right)^2 \times 4 \right) \frac{1}{1728}$$

*Volume
of
cone section (est.)*

$$V_{\text{trans.}} = 12.8 \text{ ft}^3$$

DESIGN ANALYSIS

client Westinghouse Hanford Company
subject Blow-down of the 101-SY Mixer Pump
plenum flush line.

WO/Job No. 101-SY Pump Disposal Project

Date 4-3-95

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Location 241-SY Tank Farm

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Stator Housing Volume

Ref. - Hazleton Parts DWG

Neglect shaft, walls of plenum,
and nozzles and flanges.

$$V_{\text{stator}} = \frac{\pi}{4} \left(\frac{24}{12} \right)^2 \times \frac{26}{12}$$

$$= 6.8 \text{ ft}^3 \text{ round up to}$$

$$7 \text{ ft}^3$$

Extension Leg Volume to 45° elbows (Disc #11)

Ref. H-2-89950

Ignore Pump suction pipe,
discharge pipes, flanges
and miscellaneous plates

$$V_{\text{dummy}} = 2 \frac{\pi}{4} \left(\frac{6.625}{12} \right)^2 \times 3$$

$$= 1.4 \text{ ft}^3 \text{ triple this to}$$

cover neglected items.

$$V_{\text{dummy}} = 4.2 \text{ ft}^3$$

$$V_{\text{pump}} = V_{\text{barnel}} + V_{\text{column}} + V_{\text{trans.}} + V_{\text{stator}} + V_{\text{dummy}}$$

$$= 24.4 + 23.7 + 12.8 + 7 + 4.2$$

$$= 72.1 \text{ ft}^3 \rightarrow \text{Round up to } 80 \text{ ft}^3 \text{ for uncertainty}$$

DESIGN ANALYSIS

client Westinghouse Hanford Company
subject Blow-down of the 101-SY Mixer Pump
plenum flush line.

WO/Job No. 101-SY Pump Disposal Project

Date 4-3-95

By RP Schwehr

Checked 4-4-95

By BD Andres

Brian Andres

Location 241-SY Tank Farm

Revised

By

ACCESSORIES BEST AVAILABLE COPY

AIR COMPRESSORS

PORTABLE AIR TANKS

Compact, lightweight air tanks provide portable air supply wherever you need it. Use for inflation, or in combination with blow gun for cleaning equipment or work areas. Maximum working pressure, 125 PSI. 6, 9, and 14 gallon sizes.

Tanks are fully assembled and feature:

- 6 Ft hose with brass tire chuck
- 0-160 PSI pressure gauge
- Brass manifold with shutoff and safety valves
- 14 Gauge steel construction
- Green scratch-resistant paint

Note: These tanks do not have ASME certification. Before ordering, check local and state code requirements.

INTAKE FILTERS/SILENCERS

up to 50%.

Welded steel base is epoxy coated for corrosion resistance. Thick-wall polypropylene hood is resistant to impact, vibration, and corrosion.

Tested from -20°F to 180°F for indoor or outdoor use. Filter/silencers use Solberg replacement elements, listed on page 2248.

© 1995, W. W. Grainger, Inc.

Speedaire intake filter/silencers are specifically designed for air compressor applications.

Patented hood-to-base seal and steel inlet tubes reduce compressor noise by up to 3 dB more than similar filter/silencers.

Polyester filter elements are 99% efficient, per SAE J726 test code. Moisture and heat resistant for use with head-unloading type compressors. Dust loading capacity

Inlet (NPT)	Max. CFM	Ht.	Dia.	Stock No.	List	Each	Shpg. Wt.
3/4"	20	4 1/2"	6 3/4"	5Z660	\$17.25	\$15.90	3.0
1"	20	4 1/2"	6 3/4"	5Z661	18.20	16.75	2.1
1 1/4"	60	7"	6 3/4"	5Z662	26.30	25.75	3.0

No 57661

No 57662

DON'T SAY IT - WRITE IT!

Date: March 29, 1993

To: HMT Project Files

From: Craig Shaw

Subject: HMT Mixer Pump Convenient As-Built Dimensions

This list of as built dimensions were taken at the MASF at the same time the pump diameter(s) were being measured, 3/25&26. These data have been added to the data issued on the DSI by the same title dated 11/14/92.

The dimensions of a number of pump features were measured directly (with a 50 foot tape, framing squares, and straight edges) from the bottom of the mixer pump mounting flange. The bottom of the mixer pump mounting flange is what rests on and bolts to the load frame. These dimensions are available from the issued drawings but only with a lot of digging and work; hopefully this will make things easier. Accuracy is +/- 1" inch.

Pump Features

<u>Ft.</u>	<u>In.</u>	<u>Feature</u>
00	00	Bottom of Mounting Flange/ Load Frame Connection
3	3 1/2	Center of Brake Shoes
3	10 1/2	Column rotating seal
14	7	Top of wasteburg crash bars
17	00	Top of upper cradle/pump support foot
(17'-00)		approximate waste surface
17	11 3/4	Weld between mid and lower column
19	4	Approx location of conduits exiting from column
19	4	Bottom of wasteburg crash bars
20	10 1/4	Lower column to pump flange joint
23	8	Flush manifold rolled ring - 2" tubing
24	7	Motor oil overflow plug
25	0	Diametral high point of flex conduit and tube fit
26	7	Bottom of barrier oil reservoir
26	10 3/8	6" discharge from pump (Top of extension legs)
27	10	Top of vertical run of 4" discharge pipes
28	00 00	Center of impeller
29	5	Top of dummy leg extension pipes
30	8 5/8	Mouth of 16" suction inlet
32	10	Bottom of max. diameter discharge legs
33	6	Center of extension leg flanges tilted at 45 deg.
39	8	Top of lower cradle/pump support foot
47	8 5/8	Center of discharge nozzle
48	3 1/2	Bottom of velocity disc

Riser Sealing Discs (Measured to bottom of steel)

<u>Ft.</u>	<u>In.</u>	<u>Disc # (Starting from top)</u>
00	00 00	Bottom of Mounting Flange —
5	7 5/8	#1
7	11 3/8	#2
9	10 1/8	#3
12	4 1/2	#4
14	6 3/4	#5
16	11 1/8	#6
19	1 3/8	#7
21	11 1/4	#8
29	5 00	#9
32	5 5/8	#10
34	4 7/8	#11 —
36	7 00	#12
39	5 7/8	#13
41	6 1/4	#14
44	00 00	#15
45	11 1/4	#16
48	3 1/2	#17 (Velocity disc)

SCALE: $34.5 \text{ mm} = 16''$

APPENDIX D

REVIEW COMMENT RECORD (RCR)

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WHC-SD-WM-DA-189
REV 0

ATTACHMENT E

101-SY DISPOSAL EQUIPMENT SUPPORT
LETTER OF INSTRUCTION
LOI MIT94-2229

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**Westinghouse
Hanford Company****Internal
Memo**

From: Special Projects MIT94-2229
Phone: 376-2478 H5-68
Date: October 14, 1994
Subject: 101-SY DISPOSAL EQUIPMENT SUPPORT LETTER OF INSTRUCTION (LOI) NO.
29

To: T. B. Salzano E6-36

INTRODUCTION

On July 3, 1993, a test mixer pump was installed to test the mitigation by mixing concept. As a result of this testing, it was determined that the mixing concept will mitigate the tank. A backup pump was built as a replacement for the test pump. When the test pump fails, a flush and decontamination system will be required for the removal of the existing pump and installation of the backup pump.

SCOPE

The flush and decon system will meet the system requirements as described in this document. The deliverables and completion date are also outlined.

ICF KH personnel involved in this effort will work to WHC procedures for the completion of this project.

SYSTEM REQUIREMENTS**Flow And Pressure Requirements At The Source**

ITEM	FLOW (GPM)	PRESSURE (PSI)
Burrowing Ring	80	300
Internal Flush	200	300
Barton/Heel Flush	2	1000
Spray Ring	120	3000
Spraywands	60	3000

Location Requirements

Pumps, tank trucks, pump trucks, and flow control valves are to be centrally located outside the fence.

Hoses will be routed across the farm and will tie into their respective

systems at the central pump pit.

Pump and water supply for the Barton/Heel flush will be located inside the fence near the mitigation pump.

- Functional Requirements

Hoses attached to the pump (internal flush, burrowing ring, barton/heel flush) will have quick disconnect at the top of the pump.

System will have capability to remove water from all pipes and hoses.

System must support removal of existing pump and installation of backup pump.

The system must be compatible with other removal and installation systems. These systems will include the flexible receiver, lifting yokes, transport container and tanker truck availability.

Check valves will be used where the possibility of waste flowing back through the system exists.

System shall be supplied by one tanker truck to allow for one backup tanker and one tanker available for refilling.

System will be designed to ASME B31.3.

Design temperature is 150° F.

DELIVERABLES

- Drawing Requirements For Flush And Decon

ITEM	NEW/ECN	DESIGNER	DRAWINGS/SKETCH
SY-101 HMT DECON SPRAYWAND RISER 3A INSTALLATION	NEW	EM	H-2-821381
SY-101 RISER 15A ENERGY DISSIPATION COVER	NEW	EM	H-2-XXXXX
SY-101 HMT DECON SPRAYWAND DROP LIMITER	NEW	EM	H-2-XXXXX
SY-101 HMT DECON SPRAYWAND ASSEMBLY	ECN	EM	H-2-817857
SY-101 HMT DECON SCHEMATIC	NEW	KC	H-2-824446
HMT PUMP RETRIEVAL DIAGRAM	NEW	KC	H-2-824445

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ITEM	NEW/ECN	DESIGNER	DRAWINGS/SKETCH
SKID ASSY HIGH PRESSURE CONTROL MANIFOLD	NEW	KC	H-2-824447
TOTALIZER/FILTER SKID	NEW	KC	H-2-824448
PUMP PIT DRAIN PLUG (REMOTE)	NEW	KC	H-2-XXXXX
PUMP PIT FLUSH	NEW	KC	H-2-XXXXX
YOKE WATER CONNECTIONS	NEW	KC	H-2-XXXXX

- Engineering

- Preparation of system design description
- Pressure losses calculations
- Components integrity calculations
- Preparation of structural supporting document
- Provide support in close out of LANL Safety Assessment issues

SHOP SUPPORT

The following drawings are currently released and need engineering support during construction.

ITEM	# REQ'D	DRAWINGS/SKETCH
SPRAY WAND RISER ADAPTER	1	H-2-821382
LIFTING YOKE	1	H-2-821383
DRILL ROD WASHERS	3	H-2-91670 H-2-91671
DECON CIRCUIT STUFF	As Shown	Sketch Attached
SPRAY WANDS	2 using nozzle I3 (Modify 1 existing, Fabricate 1 new)	H-2-817857 as modified by ECN
RISER ADAPTER	1	H-2-99332

REV 0

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ITEM	# REQ'D	DRAWINGS/SKETCH
SPRAY WAND HOLDERS	1	H-2-817858
SPRAY WAND DAMPERS	6	H-2-XXXXXX
RISER 15A COVER	1	H-2-XXXXXX

The drawings listed in the deliverables section will also require engineering support during fabrication.

COST

Work Order #E39730 for the amount of \$35,000 has been set up to fund this activity.

SCHEDULE

It is anticipated that the work scope outlined above can be completed by November 21, 1994. However, ICF KH shall be responsible for providing a detailed work activities schedule and weekly status. WHC will provide a scheduler to support schedule preparation. Contact is Eileen Green at 372-1495.

M. J. Ostrom

M. J. Ostrom, Principal Engineer
Special Projects

kdp