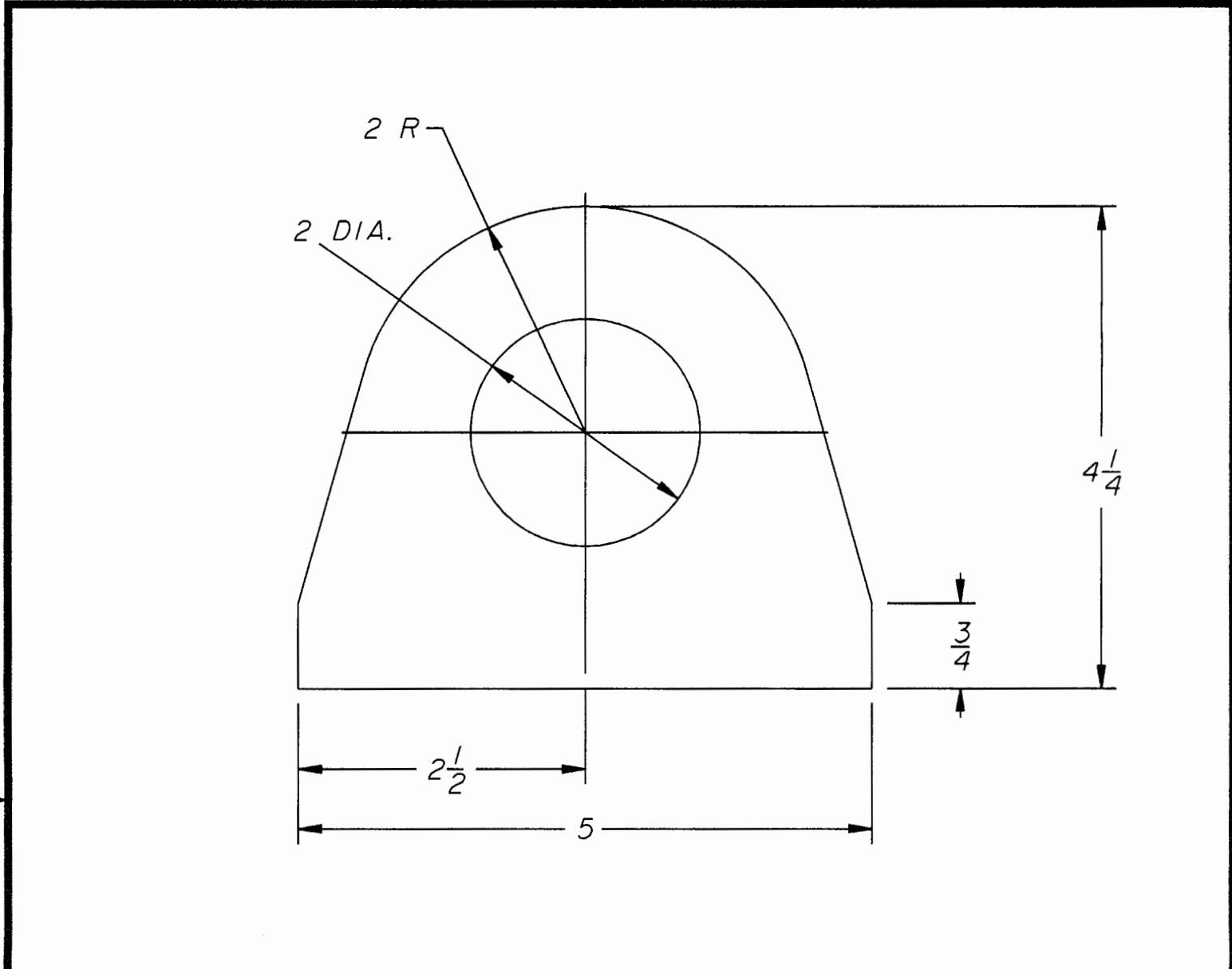


Ticket Number : 004676 Date: February 24, 2009 19:00 Page: 1 of 1
Ticket Gen Date: 2009-02-24 15:05 Person: Bonnie Dull

Ref	Part Name	Rev	OSiz	TSiz	Fld	Rot	Idt	Trm	Charge
1	0 075-00007-000.cgm ✓	-	A	A	Y				1874
2	1 075-10326-000.cgm ✓	B	C	C	Y				1874
3	2 075-10327-000.cgm ✓	B	C	C	Y				1874
4	3 075-10330-000.cgm ✓	-	B	B	Y				1874
5	4 075-10331-000.cgm ✓	A	B	B	Y				1874
6	5 075-10332-000.cgm ✓	-	B	B	Y				1874
7	6 075-14007-000.cgm	A	D	C	Y				1874



REV. LEV.	DATE	REVISION RECORD	CHG. NO.	DR.	CK.	<small> *ALL PROPRIETARY RIGHTS IN THE SUBJECT MATTER HEREOF ARE RESERVED. AND NO PERMISSION IS GRANTED TO REPRODUCE THIS PRINT IN WHOLE OR IN PART, OR DISCLOSE ANY OF THE INFORMATION UPON IT TO OTHERS WITHOUT WRITTEN RELEASE BY YORK INTERNATIONAL CORPORATION*. </small>
-		NEW	0888 2000			

YORK INTERNATIONAL CORPORATION
YORK, PA. 17405

<small> DIMENSIONS ARE IN INCHES DO NOT SCALE TOLERANCES PER ENG. STD. M-282 WELDING PER ENG. STD. M-30 REF. DWG. </small>	LUG, LIFTING	MATERIAL TYPE <u>STL.</u> _____ ENG. STD. <u>R-203</u> PART NO. _____ CUT SIZE <u>1/4 THK.</u> _____
--	---------------------	--

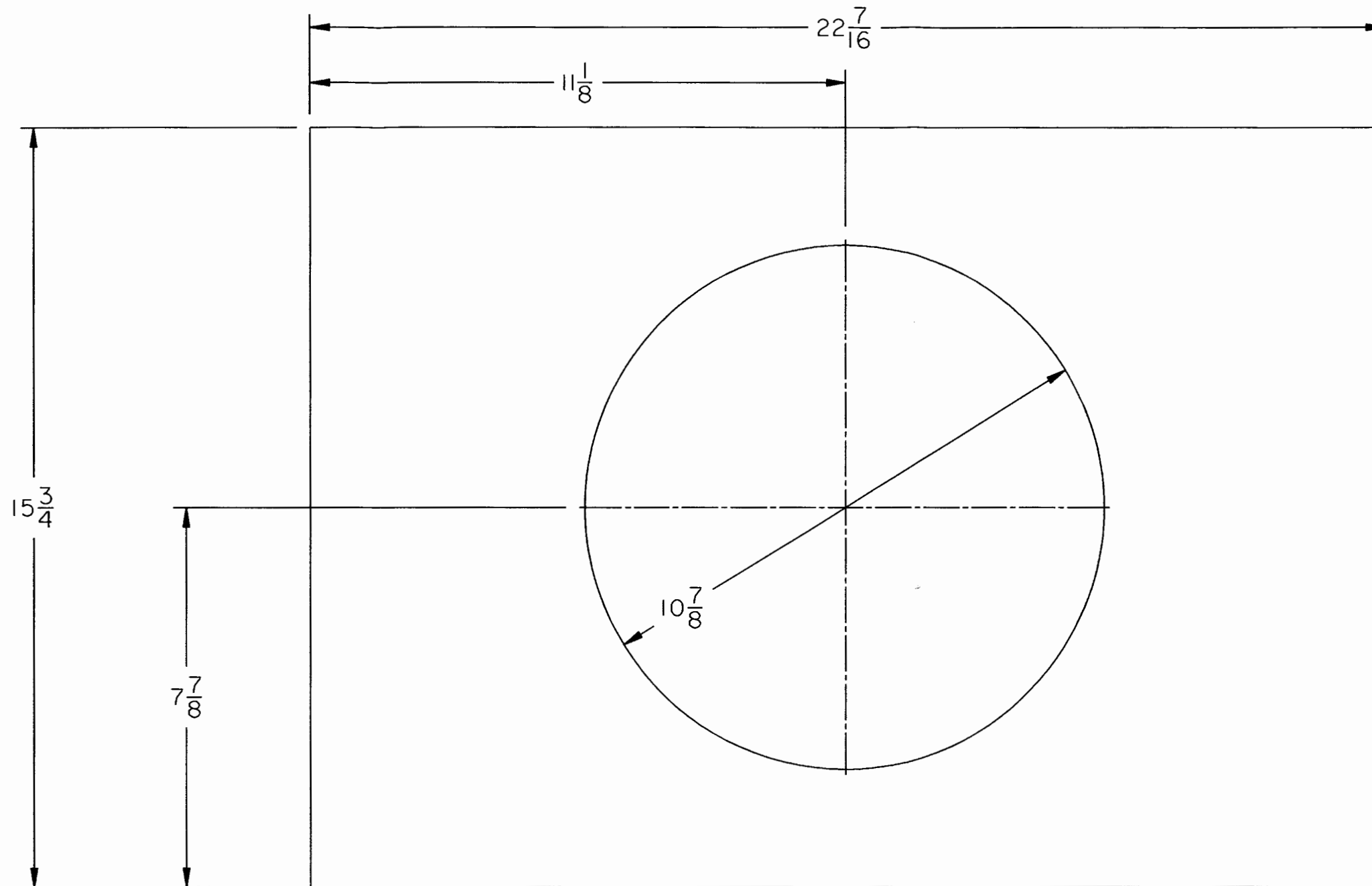
<small> NAME DR. <u>L.C. REIDER</u> APPR. <u>T.C. HARGET</u> SCALE: <u>N.T.S.</u> </small>	<small> DATE <u>02-05-88</u> <u>02-08-88</u> </small>	<small> SIZE A </small>	<small> CAGE NO <u>66935</u> </small>	<small> DRAWING NUMBER <u>075-00007-000</u> </small>
---	---	---	--	---

WT. = 1 LBS.	ORIG. NO. 066-92682A	SHEET
--------------	----------------------	-------

09-11-97

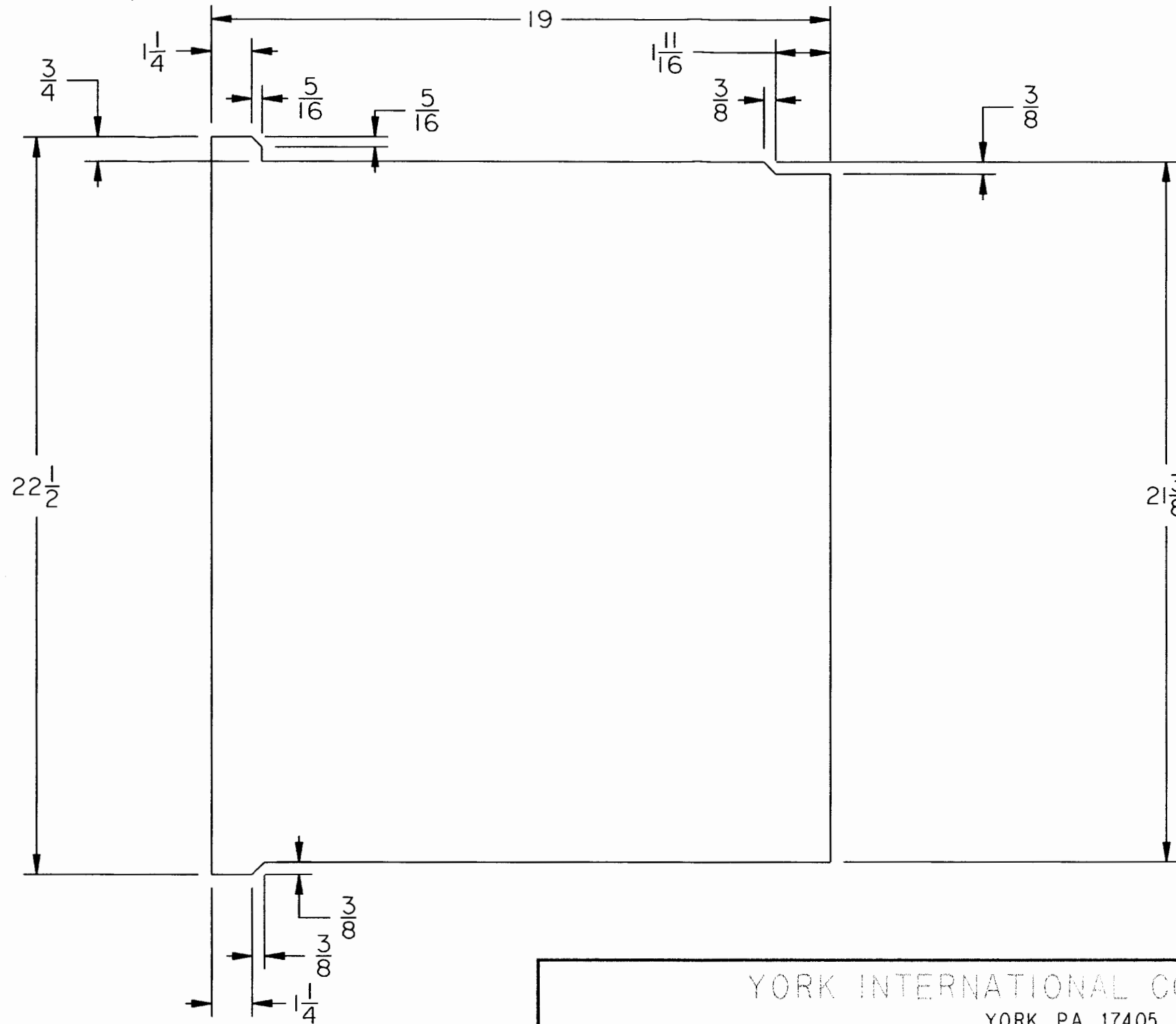
17:11

CK.160.45.LUG.LIFTING.075-00007A



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YORK, PA. 17405

REV. LEV.	DATE	REVISION RECORD	CHG. NO.	DR.	CK.	<small>*ALL PROPRIETARY RIGHTS IN THE SUBJECT MATTER HEREOF ARE RESERVED. AND NO PERMISSION IS GRANTED TO REPRODUCE THIS PRINT IN WHOLE OR IN PART. OR DISCLOSE ANY OF THE INFORMATION UPON IT TO OTHERS WITHOUT WRITTEN RELEASE BY YORK INTERNATIONAL CORPORATION.*</small>	<small>DIMENSIONS ARE IN INCHES DO NOT SCALE TOLERANCES PER ENG. STD. M-282 WELDING PER ENG. STD. M-30 REF. DWG.</small>		PLATE HEAD, COOLER 22G & 22GL		<small>MATERIAL TYPE STL. _____ ENG. STD. R203 PART NO. _____ CUT SIZE 7/8 THK.</small>	
-		NEW	0693 3015				<small>NAME</small> DR. J. BECKER <small>DATE</small> 01-22-93 <small>APPR.</small> _____ <small>SCALE: N.T.S.</small>	<small>SIZE</small> B	<small>CAGE NO</small> 66935	<small>DRAWING NUMBER</small> 075-10330-000		
							<small>WT. =</small> 65 LBS.	<small>ORIG. NO.</small> 075-07619B		<small>SHEET</small>		

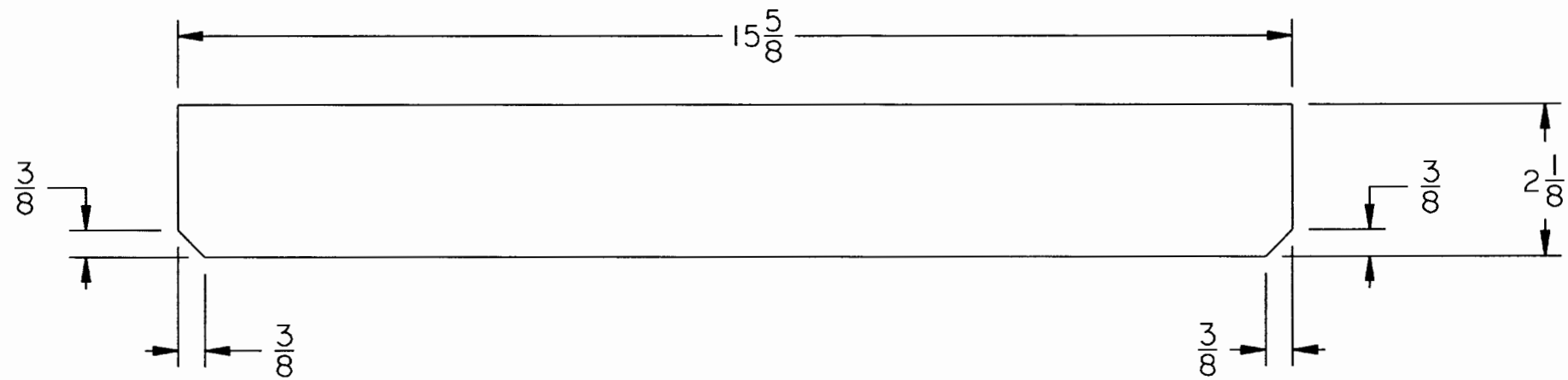


YORK INTERNATIONAL CORPORATION
YORK, PA. 17405

REV. LEV.	DATE	REVISION RECORD	CHG. NO.	DR.	CK.
-		NEW	0693 3015		
A	5-14-97	COMPLETELY REDRAWN: WAS 1/4 THICK.	0697 0055	CPW	

"ALL PROPRIETARY RIGHTS IN THE SUBJECT MATTER HEREOF ARE RESERVED. AND NO PERMISSION IS GRANTED TO REPRODUCE THIS PRINT IN WHOLE OR IN PART, OR DISCLOSE ANY OF THE INFORMATION UPON IT TO OTHERS WITHOUT WRITTEN RELEASE BY YORK INTERNATIONAL CORPORATION."

DIMENSIONS ARE IN INCHES DO NOT SCALE TOLERANCES PER ENG. STD. M-282 WELDING PER ENG. STD. M-30 REF. DWG.		BAFFLE, PASS. COOLER 22G & 22GL		MATERIAL TYPE <u>STL.</u> _____ ENG. STD. <u>R-19</u> PART NO. _____ CUT SIZE <u>22-1/2 X 19 X 3/8 THK.</u>	
NAME DR. J. BECKER APPR. _____ SCALE: <u>N.T.S.</u>	DATE 01-22-93	SIZE B	CAGE NO 66935	DRAWING NUMBER 075-10331-000	
WT. = 43 LBS.		ORIG. NO. 075-07620B		SHEET	

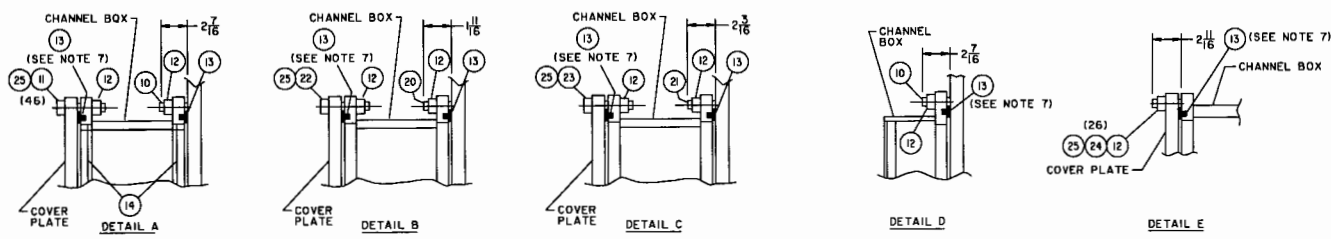


YORK INTERNATIONAL CORPORATION
YORK, PA. 17405

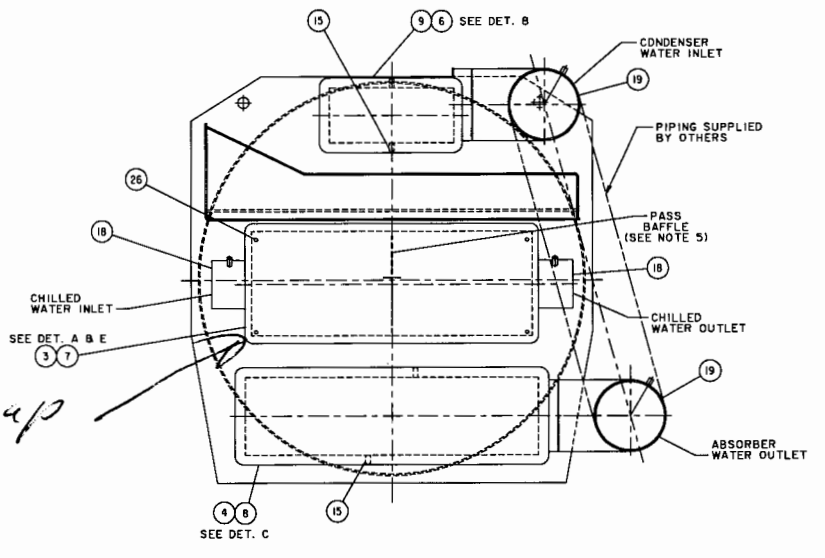
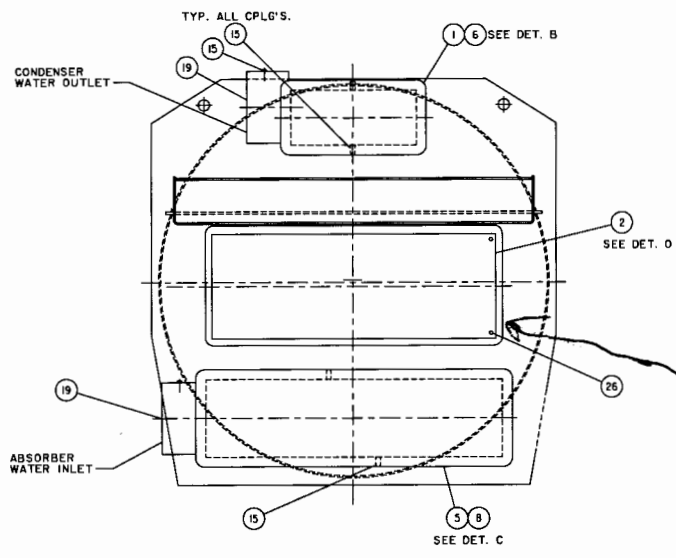
REV. LEV.	DATE	REVISION RECORD	CHG. NO.	DR.	CK.	*ALL PROPRIETARY RIGHTS IN THE SUBJECT MATTER HEREOF ARE RESERVED. AND NO PERMISSION IS GRANTED TO REPRODUCE THIS PRINT IN WHOLE OR IN PART, OR DISCLOSE ANY OF THE INFORMATION UPON IT TO OTHERS WITHOUT WRITTEN RELEASE BY YORK INTERNATIONAL CORPORATION.	DIMENSIONS ARE IN INCHES DO NOT SCALE TOLERANCES PER ENG. STD. M-282 WELDING PER ENG. STD. M-30 REF. DWG.		BAR, REINF. 22G & 22GL		MATERIAL TYPE STEEL _____ ENG. STD. R203 PART NO. _____ CUT SIZE 7/8 THK. _____		
-		NEW	0693 3015				NAME	DATE	SIZE	CAGE NO	DRAWING NUMBER		
							DR. J. BECKER	01-22-93	B	66935	075-10332-000		
							APPR. _____						
							SCALE: N.T.S.						
							WT. = 8.2 LBS.		ORIG. NO. 075-08916B		SHEET		

CK.AU.BAR.075-10332B

8 7 6 5 4 3 2 1



- NOTES:
1. BEFORE INSTALLATION OF STUDS, ITEMS 10, 20, 21 & 24 APPLY SEALER, ITEM 17, PER M-365.
 2. APPLY TAPE (044-01702) TO ALL THREADED PIPE JOINTS PER M-345.
 3. NUT TORQUE MUST BE BETWEEN 30 AND 50 FT. LBS.
 4. STAMP IN OR OUT AS INDICATED ON HEAD NEAR NOZZLE.
 5. MACHINE TUBE'S FLUSH WITH TUBE HEAD WHERE BAFFLE CROSSES TUBE PATTERN.
 6. HYDROSTATIC TEST BARE BOXES TO 225 PSIG, PER M-382, PARA. 5.1. AIR TEST TUBE SIDE TO 150 PSIG, PER M-382, PARA. 5.3. PURGE PER M-532, PARA. 5.1.
 7. SEAL BULB GASKET BUTT JOINT WITH ADHESIVE, ITEM 16. WHEN PASS BAFFLE REQ'D, TRIM CHANNEL GASKET TO SEAL AREA BETWEEN BAFFLE & BULB GASKET.

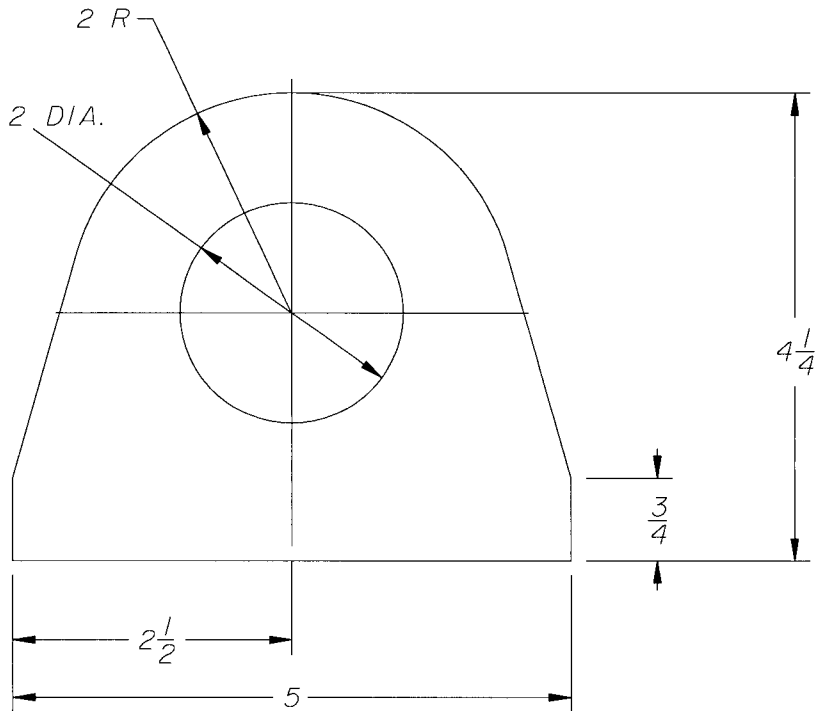


SIDE B SIDE A

YORK INTERNATIONAL CORPORATION
YORK, PA. 17405

REV. LEV.	DATE	REVISION RECORD	CHG. NO.	DR.	CK.	REV. LEV.	DATE	REVISION RECORD	CHG. NO.	DR.	CK.	REV. LEV.	DATE	REVISION RECORD	CHG. NO.	DR.	CK.
-	NEW		0003														
A	2-28-91	CHGD. LABEL WATER INLET, OUTLET; ADDED PIPING SUPPLIED BY OTHERS	0007														
			0008	RAM													

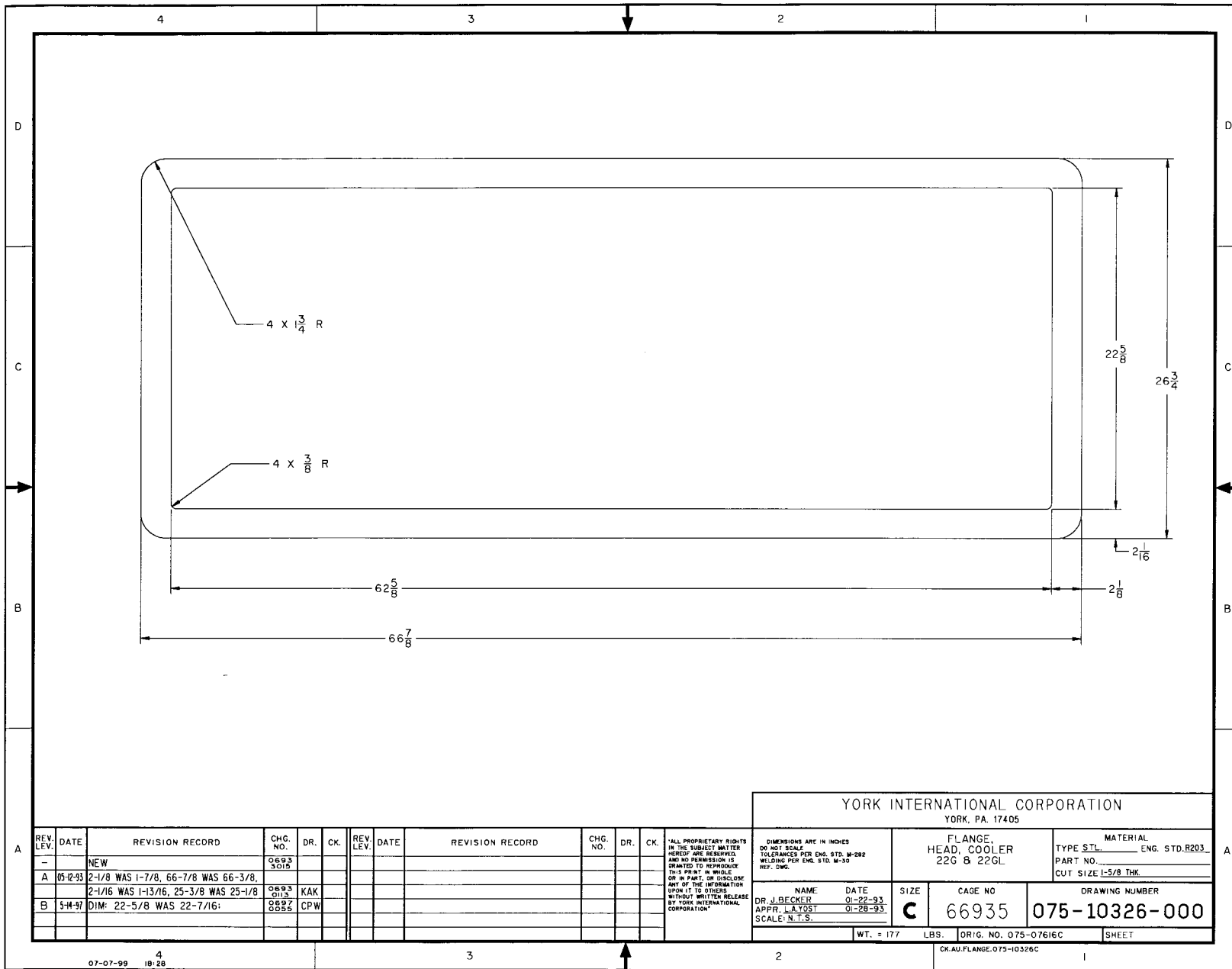
<small>ALL PROPRIETARY RIGHTS IN THE SUBJECT MATTER HEREOF ARE RESERVED AND NO PERMISSION IS GRANTED TO REPRODUCE THIS POINT IN WHOLE OR IN PART OR DISCLOSE ANY OF THE INFORMATION SPUN TO ITS OTHERS WITHOUT WRITTEN RELEASE BY YORK INTERNATIONAL CORPORATION.</small>		<small>DIMENSIONS ARE IN INCHES DO NOT SCALE TOLERANCES PER ENG. STD. M-292 WELDING PER ENG. STD. M-50 REF. DWG.</small>		DWG-ARRGT NOZZLE MARINE BOXES 22G B 22GL		MATERIAL TYPE _____ ENG. STD. _____ PART NO. _____ CUT SIZE _____	
NAME DR. J. MENTZER SCALE: N.T.S.	DATE 11-22-93	SIZE D	CADE NO 66935	DRAWING NUMBER 075-13785-000		WT. = 8444 LBS. ORIG. NO. 075-09133C SHEET _____	

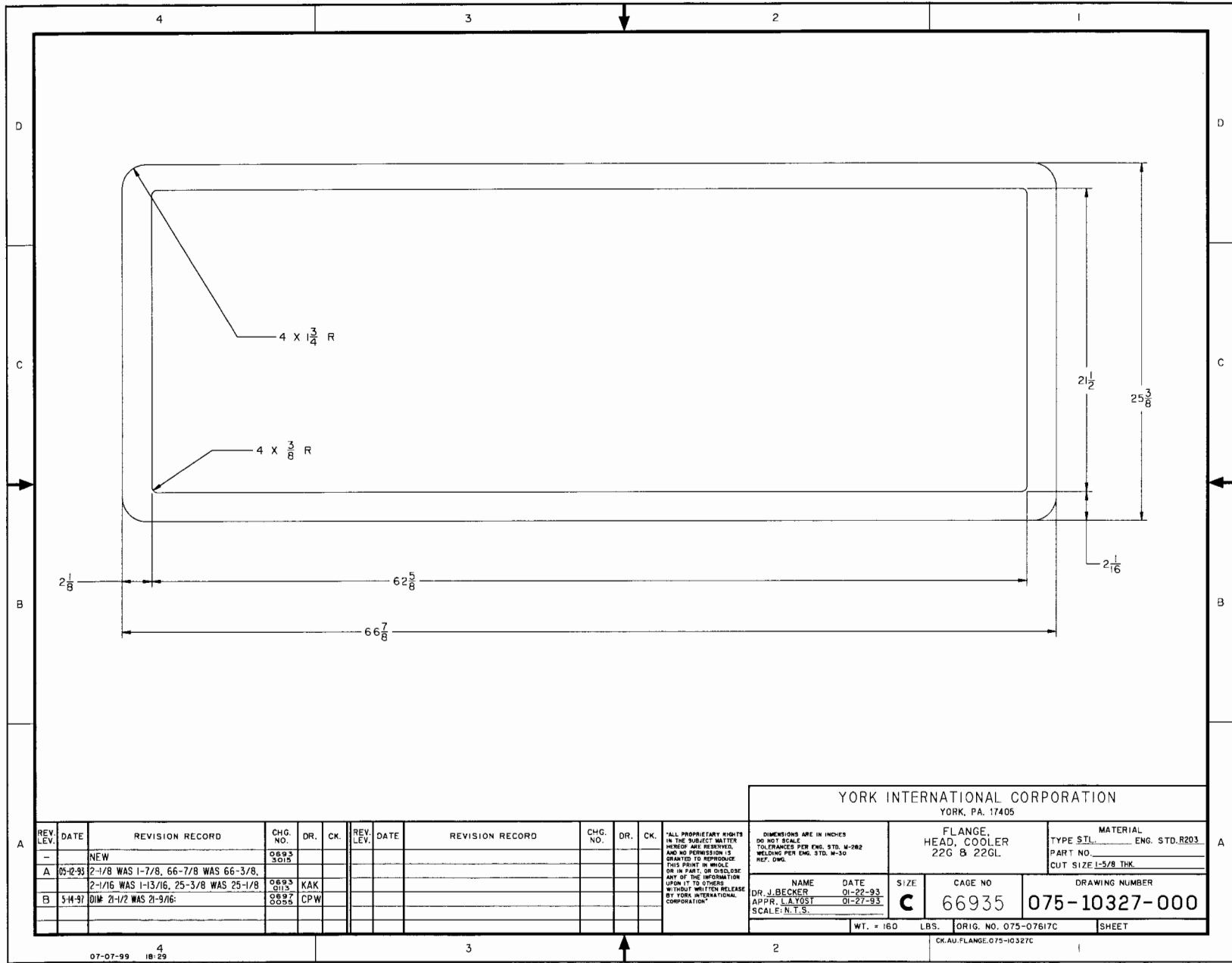


REV. LEV.	DATE	REVISION RECORD	CHG. NO.	DR.	CK.	*ALL PROPRIETARY RIGHTS IN THE SUBJECT MATTER HEREOF ARE RESERVED. AND NO PERMISSION IS GRANTED TO REPRODUCE THIS PRINT IN WHOLE OR IN PART, OR DISCLOSE ANY OF THE INFORMATION UPON IT TO OTHERS WITHOUT WRITTEN RELEASE BY YORK INTERNATIONAL CORPORATION*.
-		NEW	0888 2000			

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YORK, PA. 17405

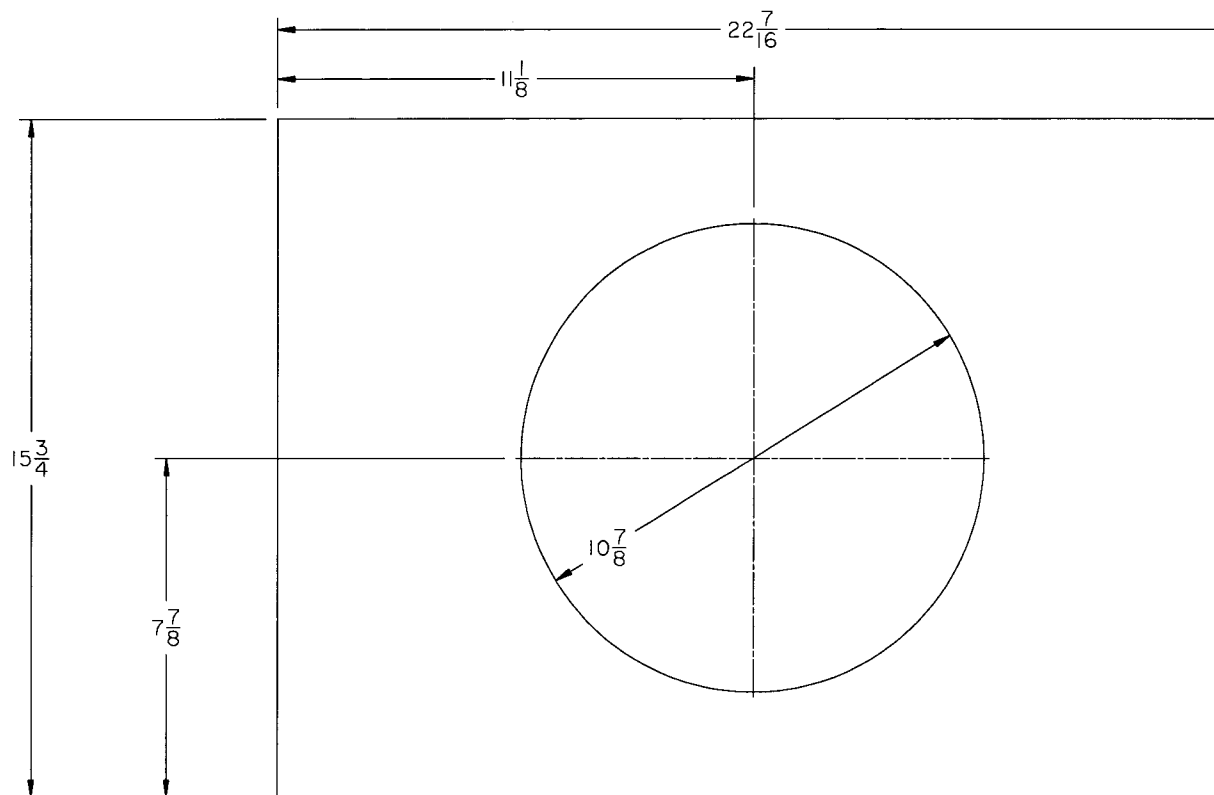
DIMENSIONS ARE IN INCHES DO NOT SCALE TOLERANCES PER ENG. STD. M-282 WELDING PER ENG. STD. M-30 REF. DWG.		LUG, LIFTING		MATERIAL TYPE <u>STL.</u> ENG. STD. <u>R-203</u> PART NO. _____ CUT SIZE <u>1/4</u> THK.	
NAME DATE DR. L.C.REIDER 02-05-88 APPR. T.C.HARGET 02-08-88 SCALE: N.T.S.	SIZE A	CAGE NO 66935	DRAWING NUMBER 075-00007-000		
WT. = 1 LBS.		ORIG. NO. 066-92682A		SHEET	





07-07-99 4
18-29

CK.AU.FLANGE.075-10327C

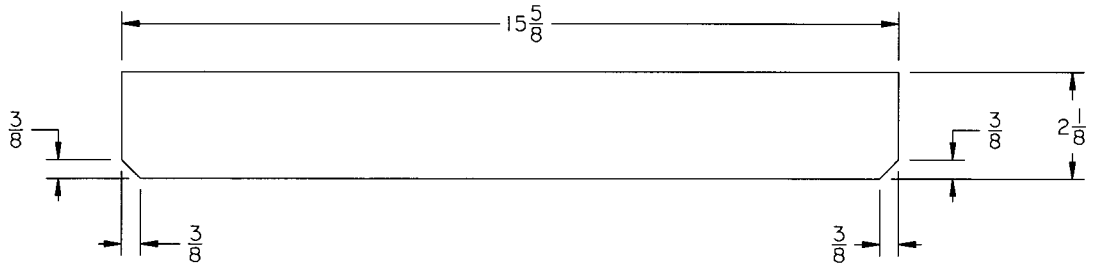


YORK INTERNATIONAL CORPORATION
YORK, PA. 17405

REV. LEV.	DATE	REVISION RECORD	CHG. NO.	DR.	CK.
-		NEW	0693 3015		

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DIMENSIONS ARE IN INCHES DO NOT SCALE TOLERANCES PER ENG. STD. M-282 WELDING PER ENG. STD. M-30 REF. DWG.		PLATE HEAD, COOLER 22G & 22GL		MATERIAL TYPE <u>STL.</u> ENG. STD. <u>R203</u> PART NO. _____ CUT SIZE <u>7/8</u> THK.	
NAME DR. J. BECKER	DATE 01-22-93	SIZE B	CAGE NO 66935	DRAWING NUMBER 075-10330-000	
SCALE: N.T.S.		WT. = 65 LBS.		ORIG. NO. 075-07619B	
				SHEET	



YORK INTERNATIONAL CORPORATION
YORK, PA. 17405

REV. LEV.	DATE	REVISION RECORD	CHG. NO.	DR.	CK.
-		NEW	0693 3015		

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DIMENSIONS ARE IN INCHES DO NOT SCALE TOLERANCES PER ENG. STD. M-282 WELDING PER ENG. STD. M-30 REF. DWG.		BAR, REINF. 22G & 22GL		MATERIAL TYPE STEEL _____ ENG. STD. R203 PART NO. _____ CUT SIZE 7/8 THK.	
NAME DR. J. BECKER	DATE 01-22-93	SIZE B	CAGE NO 66935	DRAWING NUMBER 075-10332-000	
SCALE: N.T.S.		WT. = 8.2 LBS.		ORIG. NO. 075-08916B	
				SHEET	

375 14007 000 Box Channel Cooler 22g & 22g1

User	Component	Description	Drawing number	Qty per	Oper	From	To
001-	075 10326 000	Flange Head Cooler 22g & 22g1	075 10326 000	1.000			
002-	075 10327 000	Flange Head Cooler 22g & 22g1	075 10327 000	1.000			
003-	075 10328 000	Plate Cut 1-1/8 X 15-3/4 X		1.000			
004-	075 10330 000	Plate Head Cooler 22g & 22g1	075 10330 000	2.000			
005-	066 82039 000	Conn Weld 10 Sch 40x9-1/2	066 82039 000	2.000			
006-	023 01564 000	Cplg Pipe 1/2 3000#:		2.000			
007-	075 10331 000	Baffle Pass Cooler 22g & 22g1	075 10331 000	1.000			
008-	075 00007 000	Lug Lifting	075 00007 000	2.000			
009-	075 10332 000	Bar Reinf 22g & 22g1	075 10332 000	3.000			
010-	075 10329 000	Plate Cut 3/4 X 15-3/4 X61-3/4		1.000			
9000	075 14007 000	Dwg-Box Channel Cooler	075 14007 000	0.000			



ORDER FORM

PARAFLOW STEAM FIRED CHILLER

Revision No. A	Rev. Date 5/17/94	Sheet 1	Of 5
Customer Order No. LOXT62267-HW	York Contract No. 93211038	York Order No. -01	
Job Name and Location DUPONT EXPERIMENTAL STATION, WIL, DE			York SQ. No.

S H I P T O:
E.I. DU PONT DE NEMOURS COMPANY
EXPERIMENTAL STATION
ROUTE 41 BETWEEN RTS. 202 AND RT. 52
WILMINGTON, DE 19898

VIA: PPD-F/A
S O L D:
E.I. DUPONT DE NEMOURS CO.
EXPERIMENTAL STATION P.O. BOX 80-0361
WILMINGTON DE 1980-0361

Special Shipping Instructions:
TRUCKER TO CONTACT (D.R. RICHARDS)
48 HOURS PRIOR (302) 615-8310
PARCEL (302) 894-6233

Region NE-AGENTS **Code** 01-211-0000-07-5324

Order Date 11-11-93 **Wanted Date** 9-30-94 **Partial Shipment** YES NO

Fabrication Release YES NO **Date Order Received** **Scheduled Date**

ITEM	PRICING TABLE	EQUIPMENT	QTY.	UNIT MLP	M	SELLING PRICE
------	---------------	-----------	------	----------	---	---------------

HEAT SOURCE	SIZE	ELEC. CODE	HTR	TUBE
Y P C S T	2 2 G	4 6	C	X
TABLE 1.1	UNIT TYPE			
TABLE 1.1	LITHIUM BROMIDE			
TABLE 2.1	TUBE ENHANCEMENT <input type="checkbox"/> "A" <input type="checkbox"/> "B"			
TABLE 2.1	<input type="checkbox"/> SEPARATE CHARGE (Std. for 20G-22G)			
TABLE 2.1	<input type="checkbox"/> 2 PIECE SHIPMENT (Includes Sep. Charge)			
TABLE 2.1	<input type="checkbox"/> SPARE PUMPS			
TABLE 2.1	<input checked="" type="checkbox"/> CUSTOMER WITNESS FACTORY TEST			
TABLE 2.2	<input checked="" type="checkbox"/> WATER FLOW SWITCH <input checked="" type="checkbox"/> 150 LB. <input type="checkbox"/> 300 LB.			
TABLE 2.3	<input type="checkbox"/> ANSI FLANGES <input type="checkbox"/> EVAP <input type="checkbox"/> ABS <input type="checkbox"/> COND			
TABLE 2.4	MARINE WATER BOX			
	<input checked="" type="checkbox"/> ABSORBER			
	<input checked="" type="checkbox"/> CONDENSER			
	<input checked="" type="checkbox"/> EVAPORATOR			
TABLE 2.5	300 lb. WATER BOXES			
	<input type="checkbox"/> ABSORBER / COND			
	<input type="checkbox"/> EVAPORATOR			
TABLE 2.6	SPECIAL TUBE MATERIAL & THICKNESS			
	<input checked="" type="checkbox"/> ABSORBER			
	<input checked="" type="checkbox"/> CONDENSER			
	<input checked="" type="checkbox"/> EVAPORATOR			
TABLE 2.7	REMOTE INTERFACE <input type="checkbox"/> CARD 1			
	<input type="checkbox"/> CARD 2			
ADDITIONAL HANDLING & STORAGE AT GRANLEY PLANT				

D-20
10-26-94
P. Witt



641547

GLMCI57836

Post-it® Fax Note 7671 Date **2-24** # of pages **5**

To **Jay Kohler** From **Paula**

Co./Dept. _____ Co. _____

Phone # _____ Phone # _____

Fax # **7297** Fax # _____

SHIPPING MEMORANDUM

PART SHPT. NO. _____ FINAL SHPT. NO. _____

SHIPPED VIA **Daily**

DATE SHIPPED _____

APPROVED BY: _____
 *Completed by factory

II. CHILLER SPECIFICATIONS

FORM 155.19-F1

Unit No. 1	Tag No. CH-2	Revision No.	Revision Date	York Sales Order 93211038-01	SHEET 2 OF 5
Model No. YPC-ST-226-46-C-X		Cooling Capacity (TON) 1500		No. of Units 1	
A. TUBES	B. VOLTAGE	C. TUBE WALL	TUBE MATL	D. WATER BOXES	
<input checked="" type="checkbox"/> STD	<input type="checkbox"/> 208/3/60	<input type="checkbox"/> STD	<input checked="" type="checkbox"/> STD	<input type="checkbox"/> STD	
<input type="checkbox"/> A	<input type="checkbox"/> 230/3/60	<input checked="" type="checkbox"/> SPECIAL	<input type="checkbox"/> SPECIAL	MARINE †	300 LB.
<input type="checkbox"/> B	<input checked="" type="checkbox"/> 480/3/60	<input checked="" type="checkbox"/> EVAP .035"	<input type="checkbox"/> EVAP	<input checked="" type="checkbox"/> EVAP	<input type="checkbox"/> Flanges
		<input checked="" type="checkbox"/> COND .035"	<input type="checkbox"/> COND	<input checked="" type="checkbox"/> COND	<input type="checkbox"/>
		<input checked="" type="checkbox"/> ABS .035"	<input type="checkbox"/> ABS	<input checked="" type="checkbox"/> ABS	<input type="checkbox"/>
				† 300lb. Marine not available	
F. SPECIAL SHIPMENT		G. FLOW SWITCHES		H. OTHER	
<input type="checkbox"/> SHIP UNCHARGED		FOR YORK FACTORY USE <input type="checkbox"/> NO BYPASS <input type="checkbox"/> BYPASS REQUIRED STEAM VALVE SIZE _____ CV VALVE _____ _____ * PIPE _____ * ORIFICE		<input type="checkbox"/> FACTORY WITNESS TEST	
<input type="checkbox"/> SPLIT SHIPMENT				<input type="checkbox"/> SPARE PUMPS	
<input type="checkbox"/> COND FLOW SWITCH				<input type="checkbox"/> INTERFACE CARD 1	
				<input type="checkbox"/> INTERFACE CARD 2	

IV. PERFORMANCE SPECIFICATIONS

CAPACITY 1500 T.R.	COOLER	COND.
STEAM CONSUMPTION (lb/hr)	GPM	
14632	2991	6702
9.75 lb/ton hr	EWT	57
@ 115 psig steam	LWT	45
	P.F.	0.00025
	PASS	2
	P.D.	42.3
	NOZZLE ARRANGE	E2 ACT

IV. DOCUMENTATION

Qty	Description	Copy To	Remaining To
9	Chiller/Heater Submittal Set	York International Corp. P.O. Box 1592 York, PA 17405 Attn: Service Dept. 358E	Client Address: BUILDING SYSTEMS SERVICES, INC. 4 CALDWAY AVE CLAYMONT, DE 19703 Attn: MIKE HUGGARTY
9	Parts List		
9	Pecking List		
9	Factory Test Report		
9	As Built Drawing Set		
9	As Built Sops Set		

York Sales Order: 93-211038-01
Customer / Job Name: Du Pont Experimental Station

Initial Issue Date:
Complete Issue Date:

Shipping Remarks	LEV	QTY	HS L	Module Description	Mod Qty	Module Part Number	Module Status	Sched. Modul. Release	
GLOM 157836 1 Unit 381x142x134 104,240 Steam Generator N.B. 67815 SN 0494-158026	/	1		Unit Assembly (22G ST)	1	375-05701-000			
	/	2		Piping (BUFFALO PUMPS)	1	375-07819-000			
	#	3		Main Shell	1	375-13394-000	New		
	/	4		Tubes (Main Shell)	1	375-13786-000	New		
	/	5		Heat Exchanger	1	375-05200-000			
	/	6		Generator, First Stage	1	375-05202-000			
	/	7		Water Boxes / Nozzle Arrg't	1	375-13785-000	New		
	/	8		Wiring, Unit	1	375-06506-102			
	/	9		Wiring, Support Brackets	1	375-08813-000			
	/	10		Micro-Panel	1	371-01288-101			
	/	11		Power Panel	1	371-01311-112			
	/	12		Painting Instructions	1	375-06947-005			
	/	13		Shipping Instructions	1	375-07170-005			
	/	14		Testing	1	375-11812-021			
				15	Burner (Direct Fired Only)				
	/			16	Solution Pump	1	026-32304-012		
	/			17	Refrigerant Pump	1	026-32304-016		
	/			18	Solution Pump (SP1)	1	026-32304-009		
	/			19	Solution Pump (SP2)	1	026-32304-003		
				20	U-Label				
				21	U-Label (Unit Shipped Charged)				
				22	Alcohol	36.98	011-00531-000		
				23	Refrigerant (Unit Shipped Charged)				
				24	Benzotriazole (Steam Unit Only)	1.03	013-02890-000		
				25	Heater, Water (Direct Fired Only)				
				26					
				27					

*Item 3 P/N was 375-05136-000 ECS 11/24/93

York Sales Order: 93-211038-01
 Customer / Job Name: DuPont Experimental Station

Initial I. Complete

Shipping Remarks	REV	QTY	MSL	Module Description	Mod Qty	Module Part Number	Module Status
			28	Flange Kit (Absorber and Condenser)			
			29	Flange Kit (Evaporator)			
			30	Flange Kit (Water Heater)			
	/		31	Bypass, Water (Condenser)	1	375-13792-000	New
(B)	/		32	Orifice, Bypass (Condenser)	1	075-16876-000	New
			33				
			34				
			35				
				The following are Ship Loose Items:			
	*		40	Steam Control Valve (Steam Only)	1	022-08886-000	
			41	Chilled Water Flow Switch	1	024-15793-000	
			42	Tower Water Flow Switch	1	024-15793-000	
			43	Hot Water Flow Switch			
			44	Miscellaneous Parts Kit	1	475-06550-000	
	(A)		45	Refrigerant (Units Shipped Uncharged)	490	011-00548-000	
	(A)		46	Li Br (Units Shipped Uncharged)	1630	011-00556-000	
			47				
			48				
			49				
			50				

* Item 40 P/N was 022-08887-000 ECS 11/22/93

(A) Items 45 & 46 REVISED TO UTILIZE MOLYBDATE INHIBITOR TAC 2/28/94

(B) Item 32 was 075-16871-000 changed to 075-16876-000

Pg 5 of 5

***** PARAFLOW TEST STAND SPECIFICATION SHEET *****

SALES ORDER: 93 211 038 01
FL TONNAGE = 1500 TONS

TYPE OF UNIT = 22G STEAM
PASS ARRANGEMENT CODE: E2 AC1

EVAPORATOR CONDITIONS

	SPECIFIED	MINIMUM	MAXIMUM
CAPACITY (TONS)	1500	1425	1575
FLOW (GPM)	2990.365	2840.847	3139.883
ENTERING TEMPERATURE (F)	57	N/A	N/A
LEAVING TEMPERATURE (F)	45	44.5	45.5
PRESSURE DROP (FT W.C.)	43.16532	36.69052	49.64012
EVAP TUBE WALL THICKNESS	.035	N/A	N/A
EVAP PASSES	2	2	2
EVAPORATOR FOULING FACTOR	.00025	N/A	N/A

TOWER WATER CONDITIONS

FLOW (GPM)	5588.149	5308.742	5867.557
ENTERING TEMPERATURE (F)	85	84.5	85.5
LEAVING TEMPERATURE (F)	97	N/A	N/A
PRESSURE DROP (FT W.C.)	39.72869	33.76938	45.68799
ABSORBER TUBE WALL THICKNESS	.035	N/A	N/A
CONDENSER TUBE WALL THICKNESS	.035	N/A	N/A
ABSORBER PASSES	1	1	1
TOWER FOULING FACTOR	.00025	N/A	N/A

PERFORMANCE PARAMETERS

1ST STG LEAVING TEMP (F)	303.7938	293.7938	313.7938
1ST STG GEN PRESSURE (PSIA)	9.462078	7.462078	11.46208
1ST STAGE GEN CONCENTRATION (WT %)	63.47372	62.47372	64.47372
2ND STG ENTER TEMP (F)	155.8108	145.8108	165.8108
2ND STG LEAVING TEMP (F)	187.4814	177.4814	197.4814
2ND STG CONCENTRATION (WT %)	61.35176	60.35176	62.35176
ABSORBER SOLUTION TEMP (F)	104.4141	99.41413	109.4141
WEAK SOLUTION CONCENTRATION (WT %)	57.85176	56.85176	58.85176
ENERGY INPUT (LBS/HR, UNINSULATED)	15458.56		
ENERGY INPUT/TON (LB/TON-HR, UNINSULATED)	10.30571	9.816185	10.79523
STEAM INLET PRESSURE (PSIA)	115	113	117

BYPASS PIPING IS REQUIRED:

THE BYPASS DIAMETER PIPE SIZE IS 6 INCHES
THE ORIFICE SIZE NEEDED IS 4 INCHES

CV VALUE FOR 115 PSI INPUT IS 89.05347

RECOMMENDED STEAM VALVE IS HONEYWELL 2.5 INCH VALVE, YORK # 022-08888-000

4" VACUUM REQ'D Per J Kohler

REVISED TEST STAND SHEET 9/14/94

Loose
38x142x134
WT 99,450

SER
GLNM 230107

STEAM
GENERATOR
NB 64991
SER 1094-230195

Shipping Remarks	LEV	QTY	HS L	Module Description	Mod Qty	Module Part Number	Module Status	Sche Modu Rele
		1		Unit Assembly	2	375-05701-000		
		2		Piping	2	375-07819-000		
		3		Main Shell	2	375-13394-000		
		4		Tubes (Main Shell)	2	375-13786-000		
		5		Heat Exchanger	2	375-05200-000		
		6		Generator, First Stage	2	375-05202-000		
		7		Water Boxes / Nozzle Arrg't	2	375-13785-000		
		8		Wiring, Unit	2	375-06506-102		
		9		Wiring, Support Brackets	2	375-08813-000		
		10		Micro-Panel	2	371-01288-101		
		11		Power Panel	2	371-01311-112		
		12		Painting Instructions	2	375-06947-005		
		13		Shipping Instructions	2	375-07170-005		
		14		Testing	2	375-11812-021		
		15		Burner (Direct Fired Only)	-	-		
		16		Solution Pump	2	026-32304-012		
		17		Refrigerant Pump	2	026-32304-016		
		18		Solution Pump (SP1)	2	026-32304-009		
		19		Solution Pump (SP2)	2	026-32304-003		
		20		U L Label	-	-		
		21		Ll Br (Unit Shipped Charged)	-	-		
		34.98		Alcohol	73.96	011-00531-000		
				Refrigerant (Unit Shipped Charged)	-	-		
		103		Benzotriazole (Steam Unit Only)	2.06	013-02890-000		
				Heater, Water (Direct Fired Only)	-	-		
					-	-		
		1		AUTO PURGE	2	375-14530-000		

York Sales Order: 94-211016-01
Customer / Job Name: DUPONT.

Initial Installation
Complete Issue #

Shipping Remarks	REV	QTY	HS L	Module Description	Mod Qty	Module Part Number	Module Status	Notes
			28	Flange, Kit (Absorber and Condenser)	1			
			29	Flange, Kit (Evaporator)	1			
			30	Flange, Kit (Water Heater)	1			
	(A)	1	31	Bypass, Water (Condenser)	2	375-13792-000		Per J. Kohler
	(B)	1	32	Orifice, Bypass (Condenser)	2	075-16876-000		
			33					
			34					
			35					
				The following are Ship Loose Items:				
			40	Steam Control Valve (Steam Only) 4"	2	022-08886-000		
			41	Chilled Water Flow Switch	4	024-15793-000		
			42	Tower Water Flow Switch	1			
			43	Hot Water Flow Switch	1			
			44	Miscellaneous Parts Kit	2	475-15101-000		
			45	Refrigerant (Units Shipped Uncharged)	980	011-00548-000		
			46	Lt. Br. (Units Shipped Uncharged)	3260	011-00556-000		
			47	REMOTE SETPOINT	1			
			48	CARD FILE	1	031-00827-000		
			49		1	031-00814-000		
			50					

(A) Revised By Pass to Accomodate mwb TAC 7/26/94

(B) REVISED ORIFACE DUE TO TUBES PER ECS + J. Kohler 9/15/94 TAC

Dupont Experimental Station
 YPC-ST-22G
 93-211,038
 tag # ABS 1

Inhibitor Molybdate	Sample Concent. LiBr % (converted)	Sp. Gr. @ 75° F	Lithium Molybdate Inhibitor mg/l	Alkalinity (Lithium Hydroxide) (N)	Dissolved Copper mg/l	Ammonia mg/l	Hours of Operation	Chemical Additions	Comments
Allowable Ranges	55	1.62	225-325 mg/l	0.14 - .187	0 - 50 mg/l	0 - 50 mg/l	Between samples		
Unit start-up date Approx. May 1995									
Aug. 22, 1995	55	1.62	344.76	0.149	10.91	39.28	739		high molybdate
Sept. 25, 1995	55	1.62	387.3	0.127	0	22.34	185	35.08 lbs. Hydox	molybdate went up?, low LiOH
Oct. 20, 1995	55	1.62	287.28	0.213	0	9.58	27		still low LiOH
June 20, 1996	55	1.62	358.43	0.156	10.14	19.18	51		high molybdate? none added?
July 22, 1996	55	1.62	362.46	0.237	9.89	19.77	304		higher molybdate? high LiOH
Aug. 29, 1996	55	1.62	301.22	0.215	0	19.64	731	5oz molyb., & 13oz nitrate	still high LiOH
June 2, 1997	55	1.62	329.6	0.238	9.82	43.11	264		higher LiOH, none added?
July 15, 1997	55	1.62	279	0.227	0	30	708		high LiOH
Aug. 13, 1997	55	1.62	221	0.226	0	27	524	1 lb. ,7 oz Molyb.	high LiOH
Sept. 4, 1997	55	1.62	274	0.22	0	31	403		high LiOH

ABS-1



93-211,038

ParaFlow™ Solution Analysis Report

Customer Name	DuPont Exp. Station	Sample Drawn	Sep 4, 1997
Unit Model No.	YPC-ST-22G-18-C-Y-A	Report Date	Sep 15, 1997
Unit Serial No.	GLCM157835	Report Number	R5090
		PO Number	1611-5675

Inhibitor Type: Molybdate 9/4/97 3936 HOURS

	<u>Sample Data</u>	<u>Allowable Range</u> <small>(Based on 55% LiBr)</small>	<u>Converted Data</u> <small>(Sample data converted to 55%)</small>
Sample Concentration	52.51 % LiBr		55.00 % LiBr
Sample Specific Gravity	1.571 at 75°F		1.620 at 75°F
Lithium Molybdate Inhibitor	254 mg/l	225-325	274 mg/l
Alkalinity (Lithium Hydroxide)	0.204 N	0.14-0.22	0.220 N
Dissolved Copper	0 mg/l	0-50	0 mg/l
Ammonia	20 mg/l	0-100	31 mg/l
Lithium Nitrate	0 mg/l		0 mg/l

Corrections Necessary:

Lithium Molybdate Inhibitor	no
Lithium Hydroxide	no
Copper Removal	no
Ammonia Removal	no

Newest

Data included in this report are the result of only one solution sample. If there is a drastic change in any parameter as compared with the last sample result, prior to adding chemicals or performing Copper or Ammonia Removal, it may be advisable to resample. The best method of preventing problems due to improper solution chemistry is by taking regular samples and trending the sample data. Maintaining proper Solution Chemistry is critical to the life of your ParaFlow Unit. York Factory Service is factory trained and authorized to perform the necessary chemical additions and adjustments required to keep your unit operable and reliable.



ABS-1

ParaFlow™ Solution Analysis Report

Customer Name	DuPont Experimental Stn	Sample Drawn	Aug 13, 1997
Unit Model No.	YPC-ST-22G-48-C-X-A	Report Date	Aug 20, 1997
Unit Serial No.	GLCM157838	Report Number	R5067
		PO Number	00012113

Inhibitor Type:

Molybdate

8/13/97

35-33 HOURS

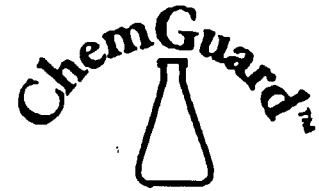
	<u>Sample Data</u>	<u>Allowable Range</u> (Based on 55% LiBr)	<u>Converted Data</u> (Sample data converted to 55%)
Sample Concentration	52.32 % LiBr		55.00 % LiBr
Sample Specific Gravity	1.663 at 75°F		1.620 at 75°F
Lithium Molybdate Inhibitor	203 mg/l	225-325	221 mg/l
Alkalinity (Lithium Hydroxide)	0.207 N	0.14-0.22	0.226 N
Dissolved Copper	0 mg/l	0-50	0 mg/l
Ammonia	24 mg/l	0-100	27 mg/l
Lithium Nitrate	3 mg/l		4 mg/l

Corrections Necessary

Lithium Molybdate Inhibitor	yes	Add .000065 lbs. of Li ₂ MoO ₄ per lb. of solution in the unit.
Lithium Hydroxide	no	
Copper Removal	no	
Ammonia Removal	no	

ADDED
1 LB. ?

Data included in this report are the result of only one solution sample. If there is a drastic change in any parameter as compared with the last sample result, prior to adding chemicals or performing Copper or Ammonia Removal, it may be advisable to resample. The best method of preventing problems due to improper solution chemistry is by taking regular samples and trending the sample data. Maintaining proper Solution Chemistry is critical to the life of your ParaFlow Unit. York Factory Service is factory trained and authorized to perform the necessary chemical additions and adjustments required to keep your unit operable and reliable.



ParaFlow™ Solution Analysis Report

Customer Name	DuPont Exp. Station	Sample Drawn	Jul 15, 1997
Unit Model No.	YPC-ST-22G-46-C-X-A	Report Date	Jul 22, 1997
Unit Serial No.	GLCM157836	Report Number	R5064
		PO Number	11544

Inhibitor Type: Molybdate

7/15/97

	<u>Sample Data</u>	<u>Allowable Range</u> <small>(Based on 55% LiBr)</small>	<u>Converted Data</u> <small>(Sample data converted to 55%)</small>
Sample Concentration	52.49 % LiBr		55.00 % LiBr
Sample Specific Gravity	1.571 at 75°F		1.620 at 75°F
Lithium Molybdate Inhibitor	258 mg/l	225-325	279 mg/l
Alkalinity (Lithium Hydroxide)	0.210 N	0.14-0.22	0.227 N
Dissolved Copper	0 mg/l	0-50	0 mg/l
Ammonia	27 mg/l	0-100	30 mg/l
Lithium Nitrate	13 mg/l		14 mg/l

Corrections Necessary

Lithium Molybdate Inhibitor	no
Lithium Hydroxide	no
Copper Removal	no
Ammonia Removal	no

3009 Hours

Data included in this report are the result of only one solution sample. If there is a drastic change in any parameter as compared with the last sample result, prior to adding chemicals or performing Copper or Ammonia Removal, it may be advisable to resample. The best method of preventing problems due to improper solution chemistry is by taking regular samples and trending the sample data. Maintaining proper Solution Chemistry is critical to the life of your ParaFlow Unit. York Factory Service is factory trained and authorized to perform the necessary chemical additions and adjustments required to keep your unit operable and reliable.



ParaFlow Solution Analysis Report

Customer Name	DUPONT EXP. STAT.	Sample Drawn	Jun 2, 1997
Unit Model No.	YPC-ST-22G-46-C-X-A	Report Date	Jul 23, 1997
Unit Serial No.	GLCM157836	Report Number	9845

Inhibitor Type: Molybdate

6/2/97

CORRECTED COPY

	<u>Sample Data</u>	<u>Allowable Range</u> <small>(Based on 55% LiBr)</small>	<u>Converted Data</u> <small>(Sample data converted to 55%)</small>
Sample Concentration	52.00 % LiBr		55.00 % LiBr
Sample Specific Gravity	1.67 at 75°F		1.62 at 75°F
Lithium Molybdate Inhibitor	302.00 mg/l	225-325	329.60 mg/l
Alkalinity (Lithium Hydroxide)	0.218 N	0.14-0.22	0.238 N
Dissolved Copper	9.00 mg/l	0-50	9.82 mg/l
Ammonia	39.60 mg/l	0-100	43.11 mg/l
Lithium Nitrate	85.00 mg/l		92.77 mg/l

Corrections Necessary

Lithium Molybdate Inhibitor	no
Lithium Hydroxide	no
Copper Removal	no
Ammonia Removal	no

2301 HOURS

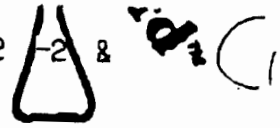
Submitted by:

Data included in this report are the result of only one solution sample. If there is a drastic change in any parameter as compared with the last sample result, prior to adding chemicals or performing Copper or Ammonia Removal, it may be advisable to resample. The best method of preventing problems due to improper solution chemistry is by taking regular samples and trending the sample data. Maintaining proper Solution Chemistry is critical to the life of your ParaFlow Unit. York Factory Service is factory trained and authorized to perform the necessary chemical additions and adjustments required to keep your unit operable and reliable.



ABS-1

PAGE 2



ParaFlow Solution Analysis Report

Customer Name	DUPONT STATION	Sample Drawn	Aug 29, 1996
Unit Model No.	YPCST22G48CXA	Report Date	SEPTEMBER 11, 1996
Unit Serial No.	GLCM157836	Report Number	9628

Inhibitor Type: Molybdate

8/29/96

SEP 12 '96 10:54AM YORK INTL.

P. 3/4

	<u>Sample Data</u>	<u>Allowable Range</u> (Based on 65% LiBr)	<u>Converted Data</u> (Sample data converted to 65%)
Sample Concentration	52.00 % LiBr		55.00 % LiBr
Sample Specific Gravity	1.57 at 76°F		1.82 at 76°F
Lithium Molybdate Inhibitor	276.00 mg/l	225-325	301.22 mg/l
Alkalinity (Lithium Hydroxide)	0.197 N	0.14-0.22	0.218 N
Dissolved Copper	0.00 mg/l	0-50	0.00 mg/l
Ammonia	18.00 mg/l	0-100	19.64 mg/l

Lithium Nitrate 56 mg/l



Corrections Necessary

Lithium Molybdate Inhibitor	no
Lithium Hydroxide	no
Copper Removal	no
Ammonia Removal	no

2037 HOURS

21870 #

ADDED 5.02 MOLYBDATE

" 13.08 NITRATE

Data included in this report are the result of only one solution sample. If there is a drastic change in any parameter as compared with the last sample result, prior to adding chemicals or performing Copper or Ammonia Removal, it may be advisable to resample. The best method of preventing problems due to improper solution chemistry is by taking regular samples and trending the sample data. Maintaining proper Solution Chemistry is critical to the life of your ParaFlow Unit. York Factory Service is factory trained and authorized to perform the necessary chemical additions and adjustments required to keep your unit operable and reliable.

B478848098 ANALYSTS

294 P05 AUG 02 '96 08:20



ABS-1



7-96

**ParaFlow
Solution Analysis Report**

Customer Name	DUPONT EXPERIMEN	Sample Drawn	Jul 22, 1996
Unit Model No.	YPCST22G46CXA	Report Date	Aug 2, 1986
Unit Serial No.	GLCM157836	Report Number	9213

Inhibitor Type: Molybdate

7/22/96

	<u>Sample Data</u>	<u>Allowable Range</u> (Based on 55% LiBr)	<u>Converted Data</u> (Sample data converted to 55%)
Sample Concentration	52.00 % LiBr		55.00 % LiBr
Sample Specific Gravity	1.86 at 75°F		1.82 at 75°F
Lithium Molybdate Inhibitor	330.00 mg/l	225-325	362.48 mg/l
Alkalinity (Lithium Hydroxide)	0.216 N	0.14-0.22	0.237 N
Dissolved Copper	9.00 mg/l	0-50	9.89 mg/l
Ammonia	18.00 mg/l	0-100	19.77 mg/l

Corrections Necessary

Lithium Molybdate Inhibitor	no
Lithium Hydroxide	no
Copper Removal	no
Ammonia Removal	no

1306 HOURS

Data included in this report are the result of only one solution sample. If there is a drastic change in any parameter as compared with the last sample result, prior to adding chemicals or performing Copper or Ammonia Removal, it may be advisable to resample. The best method of preventing problems due to improper solution chemistry is by taking regular samples and trending the sample data. Maintaining proper Solution Chemistry is critical to the life of your ParaFlow Unit. York Factory Service is factory trained and authorized to perform the necessary chemical additions and adjustments required to keep your unit operable and reliable.

8478848098 ANALYSTS



ABS-1



ParaFlow
Solution Analysis Report

Customer Name	DUPONT EXPERIMEN	Sample Drawn	Jun 20, 1996
Unit Model No.	YPCST22G48CXA	Report Date	Jun 24, 1996
Unit Serial No.	GLCM157838	Report Number	9759

Inhibitor Type:

Molybdate

6/20/96

	<u>Sample Data</u>	<u>Allowable Range</u> (Based on 55% LiBr)	<u>Converted Data</u> (Sample data converted to 55%)
Sample Concentration	81.00 % LiBr		55.00 % LiBr
Sample Specific Gravity	1.88 at 75°F		1.82 at 75°F
Lithium Molybdate Inhibitor	318.00 mg/l	225-325	358.43 mg/l
Alkalinity (Lithium Hydroxide)	0.138 N	0.14-0.22	0.158 N
Dissolved Copper	9.00 mg/l	0-50	10.14 mg/l
Ammonia	17.00 mg/l	0-100	19.18 mg/l

Corrections Necessary

Lithium Molybdate Inhibitor	no
Lithium Hydroxide	no
Copper Removal	no
Ammonia Removal	no

1002 HOURS

Data included in this report are the result of only one solution sample. If there is a drastic change in any parameter as compared with the last sample result, prior to adding chemicals or performing Copper or Ammonia Removal, it may be advisable to resample. The best method of preventing problems due to improper solution chemistry is by taking regular samples and trending the sample data. Maintaining proper Solution Chemistry is critical to the life of your ParaFlow Unit. York Factory Service is factory trained and authorized to perform the necessary chemical additions and adjustments required to keep your unit operable and reliable.

ABS-1

10-95

NOV 01 '95 04:51PM YORK INTE:

P.1/1

YORK INTERNATIONAL
CORPORATION

ParaFlow
Solution Analysis Report

Customer Name	DUPONT EXPER STA	Sample Drawn	Oct 20, 1995
Unit Model No.	YPCBT22G40CX	Report Date	Oct 23, 1995
Unit Serial No.	GLCM167638	Report Number	W319

Inhibitor Type: Molybdate

10/20/95

	Sample Data	Allowable Range (Based on 65% LIR)	Corrected Data (Sample data corrected to 65%)
Sample Concentration	63.00 % LIR		65.00 % LIR
Sample Specific Gravity	1.00 at 70°F		1.00 at 70°F
Lithium Molybdate Inhibitor	270.00 mg/l	225-325	287.50 mg/l
Alkalinity (Lithium Hydroxide)	0.300 N	0.14-0.22	0.313 N
Dissolved Copper	0.00 mg/l	0-50	0.00 mg/l
Ammonia	0.00 mg/l	0-100	0.00 mg/l

Corrections Necessary

957 HOURS

Lithium Molybdate Inhibitor	NO
Lithium Hydroxide	NO
Copper Removal	NO
Ammonia Removal	NO

Data included in this report are the result of only one solution sample. If there is a drastic change in any parameter as compared with the last sample result, prior to adding chemicals or performing Copper or Ammonia Removal, it may be advisable to resample. The best method of preventing problems due to improper solution chemistry is by taking regular samples and trending the sample data. **Maintaining proper Solution Chemistry is critical to the life of your ParaFlow Unit.** York Factory Service is factory trained and authorized to perform the necessary chemical additions and adjustments required to keep your unit operable and reliable.

OCT 11 '95 09:08AM YORK INTL.

ABS - 1

P.2/4

9-9

YORK INTERNATIONAL
CORPORATION

21,870 # Solution

ParaFlow
Solution Analysis Report

Customer Name	DUPONT EXP STA	Sample Drawn	Sep 28, 1995
Unit Model No.	YPCST22G48CX	Report Date	Sep 28, 1995
Unit Serial No.	GLCM187836	Report Number	9067

Inhibitor Type:

Molybdate

9/25/95

	Sample Data	Allowable Range (Based on 65% LIB)	Converted Data (Sample data converted to 65%)
Sample Concentration	53.00 % LIB		55.00 % LIB
Sample Specific Gravity	1.58 at 75°F		1.62 at 75°F
Lithium Molybdate Inhibitor	364.00 mg/l	225-325	367.30 mg/l
Alkalinity (Lithium Hydroxide)	0.119 N	0.14-0.22	0.127 N
Dissolved Copper	0.00 mg/l	0-50	0.00 mg/l
Ammonia	21.00 mg/l	0-100	22.34 mg/l

Corrections Necessary

Lithium Molybdate Inhibitor no
Lithium Hydroxide yes
Copper Removal no
Ammonia Removal no

Add .001604 lbs. of LiOH per lb. of solution in the unit.

35.08 #

924 Hours

Data included in this report are the result of only one solution sample. If there is a drastic change in any parameter as compared with the last sample result, prior to adding chemicals or performing Copper or Ammonia Removal, it may be advisable to resample. The best method of preventing problems due to improper solution chemistry is by taking regular samples and trending the sample data. Maintaining proper Solution Chemistry is critical to the life of your ParaFlow Unit. York Factory Service is factory trained and authorized to perform the necessary chemical additions and adjustments required to keep your unit operable and reliable.

4 August 28, 1995 17:01 ANALYSTS, INC.

2450 HASSELL ROAD
 HOFFMAN ESTATES, IL 60185
 (708) 884-7877
 (800) 222-8871

ABS-1
 Dupont Exp Station

YORK ORD - ~~93211038~~
 93211038

YORK INTERNATIONAL CORPORATION - 11
 P. DIBONA
 75 GREAT VALLEY PARKWAY
 MALVERN PA 19355-1320

Lab Number : 8724
 Logged Date : 25-AUG-95
 Sample Drawn : 22-AUG-95
 Report Date : 28-AUG-95
 Record Ref.# : 231541

Unit ID : GLCM157836
 Sample ID : LITHIUM BROMIDE
 Worksite : DUPONT EXPERIMENTAL STATION
 Time On Fluid :

Mfg. : YORK
 Model : YPCST22G46CX
 PO No. : K11-88282
 Time On System :

8/22/95

Post-It* Fax Note	7671	Date	9/16-97	# of pages	10
To	BRIAN HERSEY	From	J. R. KEENER		
Co./Dept.	YORK SERV	Co.	YORK - PAHA SVC		
Phone #	771-6656	Phone #	610-640-2314		
Fax #	771-6844	Fax #	302-798-3265		

TESTING PERFORMED:

MEASURED

LITHIUM BROMIDE SOLUTION ANALYSIS DATA

Specific Gravity @ 75°F
 Percent Lithium Bromide
 Dissolved Copper - mg/L
 Ammonia, mg/l (*)
 Alkalinity, N
 Lithium Nitrate, mg/L (*)
 Lithium Molybdate, mg/L
 * mg/L divided by Specific Gravity = ppm

1.5700 1.62
 52 55
 <10 10.91
 36 39.276
 0.137149
 <10 10.91
 316 344.756

F = 1.091

RECOMMENDATIONS / COMMENTS:

SAMPLE SUBMITTED AND PROCESSED FOR THE TEST DATA (ONLY). A FAX has been dispatched for this report.

739 HOURS

Respectfully Submitted,

Analysts, Inc.

YORK INTERNATIONAL CORP. APPLIED SYSTEMS ENGINEERING
P.O. BOX 1592-191A YORK, PA. 17405-1592
TELEPHONE: 717/771-7127 FAX: 717/771-7297

DATE: October 18, 1994

SUBJECT: YPC Factory Test Report

FROM: Jay Kohler - 191A



TO: Distribution Below

cc (cover sheet only):

Attached are copies of the factory test report for

SO94-211016-01 E. I. DuPont Nemours Experimental Station

This information is required for unit startup and service. A copy should be kept on-site with the unit.

Distribution:

1. York PA Service (1 copy) Joe Brillhart 36BE

2. Field Sales (2 copies) _____
Building Systems & Services, Inc.
Attn: Mike Haggarty
4 Colby Ave.
Claymont, DE 19703

3. Other (___ copies) _____

York International Corporation, York, PA
Applied Systems Performance Test

JOB NAME: DUPONT Date: 10/05/94
YORK ORDER: 93-211,038-01 Time: 10:45
UNIT MODEL: YPC-ST-226-46-C-X~~412~~
SERIAL NUMBER: YKBM032819

<u>OPERATING CONDITIONS:</u>	Test Actual
Evaporator:	
Capacity (TR)	1474.0
Flow (GPM)	2984.3
Entering Temp (degF)	57.13
Leaving Temp (degF)	45.29
Range (degF)	11.84
Pressure Drop (ft WC)	42.4
Fouling Factor	.00025
Liquid Type	WATER
Pass Arrangement	2 PASS
Absorber/Condenser:	
Flow (GPM)	4487.5
Entering Temp (degF)	83.48
Leaving Temp (degF)	98.65
Range (degF)	15.17
Pressure Drop (ft WC)	30.4
Fouling Factor	.00025
Liquid Type	WATER
Pass Arrangement	1 PASS

York International Corporation, York, PA
Applied Systems Performance Test

JOB NAME: DUPONT Date: 10/05/94
YORK ORDER: 93-211,038-01 Time: 10:45
UNIT MODEL: YPC-ST-226-46-C-X~~##~~
SERIAL NUMBER: YKBM032819

ENERGY INPUT: Test
Actual

Steam:

Temperature (degF)	348.3
Pressure (psig)	114.9
Flow (as Tested) (lb/hr)	15021.5
Flow (Insulated) (lb/hr)	14443.7
Condensate temperature (degF)	180.2
Condensate pressure (psig)	20.0

Voltage	480.0
	482.0
	480.0

Current	37.8
	37.7
	40.0

Power (KW)	16.2
------------	------

Calc Energy In (as Tested) - cooling mode (MBH)	15700.8
Calc Energy In (Insulated) - cooling mode (MBH)	15096.9

PERFORMANCE RESULTS - COOLING MODE:

$\frac{\text{Actual Capacity}}{\text{Design Capacity}} \times 100\% = 98.3 \%$

Heat Balance = $\frac{(Q_{\text{evap}} + Q_{\text{input}} - Q_{\text{cond}})}{Q_{\text{cond}}} \times 100\% = -1.6 \%$
 Closure

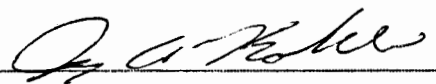
York International Corporation, York, PA
Applied Systems Performance Test

JOB NAME: DUPONT Date: 10/05/94
YORK ORDER: 93-211,038-01 Time: 10:45
UNIT MODEL: YPC-ST-226-46-C-X ~~RE~~
SERIAL NUMBER: YKBM032919

Barometric Pressure: 14.55
Ambient Temperature: 66.5

COMMENTS: Absorber/Condenser water flow is less than specified
flow due to test facility limitations. Water temperatures
were adjusted to compensate for flow reduction. Condenser
bypass pipe was replaced by a blankoff plate during testing.

DATA REVIEWED AND VERIFIED:

 10/5/94

Resident Engineer

York International Corporation, York, PA
Applied Systems Performance Test

Level 2 Startup Information

<u>JOB NAME:</u>	DUPONT	Date:	10/05/94
<u>YORK ORDER:</u>	93-211,038-01	Time:	10:45
<u>UNIT MODEL:</u>	YFC-ST-226-46-C- YKE		
<u>SERIAL NUMBER:</u>	YKBM032819		

	Test
<u>CYCLE CONDITIONS - COOLING:</u>	<u>Actual</u>
First Stage Generator:	
Pressure (psia)	12.9
Solution Leaving Temp (degF)	317.4
Second Stage Generator:	
Solution Entering Temp (degF)	172.5
Solution Leaving Temp (degF)	198.4
Absorber:	
Solution Concentration (%)	57.7
Solution Leaving Temp (degF)	97.2

York International Corporation, York, PA
 Applied Systems Performance Test

Level 2 StartUp Information

JOB NAME: DUPONT Date: 10/05/94
YORK ORDER: 93-211,028-01 Time: 10:45
UNIT MODEL: YPC-ST-226-46-C-X~~43~~
SERIAL NUMBER: YKBM032819

CHARGING QUANTITIES:

	LiBr Solution at $\frac{52.3}{55}\%$	Refrigerant	Alcohol	
Charged for testing	<u>21870</u> lb	<u>428</u> gal	<u>37</u>	gal
Removed for Shipping (1)	<u>20196</u> lb	<u>105</u> gal	---	
Add for start up (1)	<u>20196</u> lb	<u>105</u> gal	---	

Note: (1) LiBr and refrigerant charge shipped as 51.5 barrels of solution with an average LiBr concentration of 52.3 % + 3.5 barrels of refrigerant. Some alcohol will be in the solution and refrigerant which was removed for shipping.

**YORK INTERNATIONAL CORPORATION
APPLIED SYSTEMS PERFORMANCE TEST**

JOB NAME - DUPONT
 YORK ORDER - 93-211,038-01
 UNIT MODEL - YCP-ST-22G-46-C-~~YKCB~~
 SERIAL NO. - YKBM032819

10/6/94

VALVE SETTING CHART

VALVE	NAME	FINAL SETTING	REMARKS
V2	SOLUTION RETURN FROM 1st STAGE GEN.	2 1/2 TURNS OPEN	
V3	SOLUTION SUPPLY TO 2nd STAGE GEN.	2 TURNS OPEN	
V4	SOLUTION SUPPLY TO 1st STAGE GEN.	4 TURNS OPEN	
V7	REFRIGERANT BY-PASS FLOW RATE SETTING	2 TURNS OPEN	
V8	REFRIGERANT BLOWDOWN VALVE	CLOSED	
V9	REFRIGERANT PUMP ISOLATION VALVE-SUCTION	100% OPEN	
V10	REFRIGERANT PUMP ISOLATION VALVE-DELIVERY	100% OPEN	
V12	SOLUTION PUMP ISOLATION VALVE-SUCTION	100% OPEN	
V13	SOLUTION PUMP ISOLATION VALVE-DELIVERY	100% OPEN	
V15	PRESSURE GAUGE SHUT-OFF	CLOSED	
V22	SOLUTION SPRAY PUMP ISOLATION - SUCTION (1)	100% OPEN	
V23	SOLUTION SPRAY PUMP ISOLATION - DELIVERY (1)	100% OPEN	
V26	SOLUTION FLOW RATE SETTING VALVE	100% OPEN	
V28	SOLUTION FLOW RATE SETTING VALVE	6 TURNS OPEN	
V29	SOLUTION BY-PASS VALVE	1 3/4 TURNS OPEN	
V34	SOLUTION SPRAY PUMP ISOLATION - SUCTION (2)	100% OPEN	
V35	SOLUTION SPRAY PUMP ISOLATION - DELIVERY (2)	100% OPEN	
V38	REFRIGERANT FLOW RATE SETTING VALVE	4 TURNS OPEN	
V39	PURGE VALVE	CLOSED	
V40	PURGE VALVE	CLOSED	
V41	PURGE VALVE	CLOSED	
V42	PURGE VALVE	CLOSED	
VP1	PURGE OPER. VALVE - FROM COND. TO EDUCTOR	4 TURNS OPEN	
VP2	PURGE OPER. VALVE - FROM PURGE TANK	CLOSED	
VP3	PURGE OPER. VALVE-FROM COND.DIRECT PURGE	CLOSED	
VP4	PURGE OPER. VALVE-FROM ABS. DIRECT PURGE	CLOSED	
VP5	PURGE OPER. VALVE -MAIN VALVE.PURGE ISOL.	CLOSED	
VP7	PURGE OPER. VALVE -MECH. BOOSTER PUMP	CLOSED	
VP8	PURGE OPER. VALVE - CHECK VALVE	SPRING NOT REMOVED	
VP11	PURGE OPER. VALVE -SOL. FLOW TO EDUCTOR	4 TURNS OPEN	
VA	REFRIG. CHANGEOVER - REFRIG. TO CONDENSER	100% OPEN	
VB	SOLUTION CHANGEOVER-SOLUTION TO 1st STAGE	100% OPEN	
VD1	STEAM DRAIN DISCHARGE VALVE	CLOSED	
VD2	STEAM DRAIN DISCHARGE VALVE	1 7/8 TURNS OPEN	

**YORK INTERNATIONAL CORPORATION
APPLIED SYSTEMS PERFORMANCE TEST**

JOB NAME - DUPONT
 YORK ORDER - 93-211,038-01
 UNIT MODEL - YCP-ST-22G-46-C-X~~YKB~~
 SERIAL NO. - YKBM032819

10/6/94

SIGHT GLASSES

ABSORBER SHELL	● ○ ●
ABSORBER TANK	○ ●
EVAPORATOR	○
REFRIGERANT TANK	● ● ●
HI TEMP. GENERATOR -FRONT/REAR	● / ● ●
LOW TEMP. GENERATOR	○
ALCOHOL SEPARATOR	● ● ●

PROGRAMMED SETTINGS

LEAVING CHILLED WATER TEMPERATURE	44 DEG. F
CONDENSER ENTERING WATER TEMP. LIMIT	86 DEG. F
MAXIMUM STEAM VALVE OPENING	100%
TIME DELAY BETWEEN 2 SPRAY SOLUTION PUMPS	DEFAULT SETTING

SYMBOL	NAME AND FUNCTION
V2	SOLUTION FLOW RATE SETTING VALVE (FROM THE FIRST STAGE GENERATOR)
V3	SOLUTION FLOW RATE SETTING VALVE (TO THE SECOND STAGE GENERATOR)
V4	SOLUTION FLOW RATE SETTING VALVE
V7	REFRIGERANT BY-PASS SETTING VALVE
V8	REFRIGERANT BLOW VALVE
V9	REFRIGERANT PUMP ISOLATION VALVE (SUCTION)
V10	REFRIGERANT PUMP ISOLATION VALVE (DELIVERY)
V11	REFRIGERANT SAMPLING VALVE
V12	SOLUTION PUMP ISOLATION VALVE (SUCTION)
V13	SOLUTION PUMP ISOLATION VALVE (DELIVERY)
V14	SOLUTION SAMPLING VALVE (ABSORBER)
V15	PRESSURE GAUGE VALVE
V17	SOLUTION SAMPLING VALVE (SECOND STAGE GENERATOR)
V18	SOLUTION SAMPLING VALVE (FIRST STAGE GENERATOR)
V22	SOLUTION SPRAY PUMP (1) ISOLATION VALVE (SUCTION)
V23	SOLUTION SPRAY PUMP (1) ISOLATION VALVE (DELIVERY)
V24	SOLUTION SAMPLING VALVE (HEAT EXCHANGER)
V25	SOLUTION SAMPLING VALVE (FIRST SPRAY SOLUTION)
V26	SOLUTION FLOW RATE SETTING VALVE
V28	SOLUTION FLOW RATE SETTING VALVE
V29	SOLUTION BY-PASS VALVE
V30	SOLUTION SAMPLING VALVE (SOLUTION DISCHARGE)
V34	SOLUTION SPRAY PUMP (2) ISOLATION VALVE (SUCTION)
V35	SOLUTION SPRAY PUMP (2) ISOLATION VALVE (DELIVERY)
V36	SOLUTION SAMPLING VALVE (SECOND SPRAY SOLUTION)
V37	BT (INHIBITOR) CHARGING VALVE
V38	REFRIGERANT FLOW RATE SETTING VALVE
V39	PURGE VALVE
V40	PURGE VALVE
V41	PURGE VALVE
V42	PURGE VALVE
V43	SOLUTION SAMPLING VALVE (HEAT EXCHANGER)
V44	SOLUTION SAMPLING VALVE (HEAT EXCHANGER)
V60	PRESSURE GAUGE VALVE
VP1	PURGE OPERATION VALVE (FROM CONDENSER TO EDUCTOR)
VP2	PURGE OPERATION VALVE (FROM PURGE TANK)
VP3	PURGE OPERATION VALVE (FROM CONDENSER, DIRECT PURGE)
VP4	PURGE OPERATION VALVE (FROM ABSORBER, DIRECT PURGE)
VP5	PURGE OPERATION VALVE (MAIN VALVE, PURGE PUMP ISOLATION)
VP7	PURGE OPERATION VALVE (CONNECT TO MECHANICAL BOOSTER PUMP)
VP8	PURGE OPERATION VALVE (CHECK VALVE)
VP11	PURGE OPERATION VALVE (SOLUTION FLOW RATE SETTING TO EDUCTOR)
VA	REFRIGERANT CHANGEOVER VALVE (REFRIGERANT TO CONDENSER)
VB	SOLUTION CHANGEOVER VALVE (SOLUTION TO THE FIRST STAGE)
VD1	STEAM DRAIN DISCHARGE VALVE
VD2	STEAM DRAIN DISCHARGE VALVE
VD3	STEAM DRAIN DISCHARGE VALVE (SOLENIOD)
VD7	STEAM CONTROL VALVE

REV. LEV.	DATE	REVISION RECORD	CHK. NO.	DR.	CK.	REV. LEV.	DATE	REVISION RECORD	CHK. NO.	DR.	CK.	REV. LEV.	DATE	REVISION RECORD	CHK. NO.	DR.	CK.
-	NEW																
A	11-11-81	DELETED V04, V05 & V06	0003 0204	RDC	(initials)												

YORK INTERNATIONAL CORPORATION
YORK, PA. 17405

DIMENSIONS ARE IN INCHES DO NOT SCALE TOLERANCES PER ENR. STD. M-282 WELDING PER ENR. STD. W-30 REF. DWG.		DWG-UNIT VALVE AND SIGHT GLASS LOCATIONS 22G (1500) (STEAM)		MATERIAL TYPE _____ ENR. STD. _____ PART NO. _____ CUT SIZE _____
NAME DR. W.C. CRIDER APPR. J.A. KOHLER SCALE: N.T.S.	DATE 07-02-83 09-17-83	SIZE D	CAGE NO. 66935	DRAWING NUMBER 075-11629-000
WT. •	LBS.	ORIG. NO. 075-0570 D	SHEET 3 OF 3	

CEALOWS-CNT.075-04290.DWG

YORK[®] INTERNATIONAL

CORPORATION

March 7, 1995

Mike Haggarty
Building Systems & Services
4 Colby Avenue
Claymont, DE 19703

RE: E.I. DUPONT DeNemours & Company
S/O 93-211038 - Experimental Station
YPC-ST-22G S/N GLMC157836

Dear Mike,

This office recently became aware that the above referenced unit was sitting, for an undetermined amount of time, with the rupture disk removed at the above mentioned job site by memo from Joe Brillhart, dated February 24, 1995.

As your know, this unit was factory tested and therefore had been charged with lithium bromide. This unit was exposed to oxygen which will cause severe corrosion. The referenced unit will require extensive clean-up to minimize the damage resulting from this exposure. Any and all expenses incurred during this clean-up are the sole responsibility of the customer and will not be covered under warranty.

As always, York International is concerned with our customer's satisfaction. To protect York's long term warranty exposure and ensure customer satisfaction, this letter serves as notice to your office that only manufacturing defects will be honored under York's standard warranty. Any future issues that are reported and are related to the unit being exposed to atmosphere will not be covered under warranty.

If you have any questions or concerns please feel free to contact me at (717)771-7312.

Sincerely,



Paula A. Barnhart
Applied Systems Quality Engineer

PAB/der

C - Ron Filius
Tim Couch
Joe Lang
Joe Brillhart

FACSIMILE TRANSMISSION

YORK[®]
Applied Systems Service

York International Corporation
P.O. Box 1592
York, PA 17405
Fax: (717) 771-6844

*# 032
Buck Hill*

*Ron/Ian
Serial# that was
reported by Keener is
GLCM157836 - I am
concerned that the serial
on our test report is
wrong.*

Fax No. : ----
Attention : Joe Lang
Company : York Philadelphia

Date : 2/24/95
From: Joe Brillhart

This fax consists of 1 pages including this cover sheet.

Subject: Dupont Experimental Station

Joe,

I rec'vd a very alarming phone call yesterday from Charlie Keener after he visited the subject site. Apparently one unit has been sitting there for weeks (months?) with the rupture disks removed. Only one of these units was factory tested, which means it was charged with LiBr. We are still working on identification of the serial number Charlie gave me over the phone. If the unit that was factory tested is the one that Charlie is talking about, we are talking big, big, problems.

There is a factory installed tag that warns whoever not to remove the rupture disk(s) without contacting York and there is also a huge yellow sticker on the control panel shrink wrap that explains what installation manual they should be using and how to contact York for any questions.

Hopefully, the unit in question is one of the uncharged units (if that is the case we should still go on record that sitting open could have harmed the unit), but if it is the factory tested unit, we must quickly take a very hard line in writing to Dupont, that York will not take any responsibility for long term damage to this unit as a result of the contractor's negligence.

Unfortunately, I will be leaving for Houston today and will be gone for 2 1/2 weeks. Please contact either Ron Filius or Ian Casper about this. Right now it is paramount to determine which unit this is.

Regards,

*cc: Ron Filius
IAN CASPER*

*According to our records the
unit that was tested was YKMB032819
Please confirm that unit ~~is~~ is there and tight.*



ORDER FORM PARAFLOW STEAM FIRED CHILLER

Revision No. A	Rev. Date 5/17/94	Sheet 1	Of 5
Customer Order No. LOX762267-HW	York Contract No. 93211038	York Order No. -01	
Job Name and Location DU PONT EXPERIMENTAL STATION, WIL, DE		York SQ. No.	

SHIP TO:
E.I. DU PONT DE NEMOURS & COMPANY
EXPERIMENTAL STATION
ROUTE 141 BETWEEN RTS. 202 AND RT. 52
WILMINGTON, DE 19898

VIA: PPD-F/A
SOLD TO:
E.I. DUPONT DE NEMOURS & CO.
EXPERIMENTAL STATION P.O. BOX 80-0361
WILMINGTON, DE 19880-0361

Special Shipping Instructions:
TRUCKER TO CONTACT J.R. RICHARDS
48 HOURS PRIOR (302) 695-8310
FAX (302) 894-6233

Region NE AGENTS	Code 01-211-0000-07-5324	Partial Shipment <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	Fabrication Release <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	*Date Order Received	*Scheduled Date
Order Date 11-11-93	Wanted Date 9-30-94				

ITEM	PRICING TABLE	EQUIPMENT	QTY.	UNIT MLP	M	SELLING PRICE
		HEAT SOURCE SIZE ELEC. CODE HTR TUBE				
1		Y P C - S T - 2 2 G - 4 6 - C - X				
	TABLE 1.1	UNIT TYPE	1			
	TABLE 1.1	LITHIUM BROMIDE	1			
	TABLE 2.1	TUBE ENHANCEMENT <input type="checkbox"/> "A" <input type="checkbox"/> "B"				
	TABLE 2.1	<input type="checkbox"/> SEPARATE CHARGE (Std. for 20G-22G)				
	TABLE 2.1	<input type="checkbox"/> 2 PIECE SHIPMENT (Includes Sep. Charge)				
	TABLE 2.1	<input type="checkbox"/> SPARE PUMPS				
	TABLE 2.1	<input checked="" type="checkbox"/> CUSTOMER WITNESS FACTORY TEST	1			
	TABLE 2.2	<input checked="" type="checkbox"/> WATER FLOW SWITCH <input checked="" type="checkbox"/> 150 LB. <input type="checkbox"/> 300 LB.	1			
	TABLE 2.3	<input type="checkbox"/> ANSI FLANGES EVAP ABS COND				
	TABLE 2.4	MARINE WATER BOX				
		<input checked="" type="checkbox"/> ABSORBER	1			
		<input checked="" type="checkbox"/> CONDENSER	1			
		<input checked="" type="checkbox"/> EVAPORATOR	1			
	TABLE 2.5	300 lb. WATER BOXES				
		<input type="checkbox"/> ABSORBER / COND				
		<input type="checkbox"/> EVAPORATOR				
	TABLE 2.6	SPECIAL TUBE MATERIAL & THICKNESS				
		<input checked="" type="checkbox"/> ABSORBER	1			
		<input checked="" type="checkbox"/> CONDENSER	1			
		<input checked="" type="checkbox"/> EVAPORATOR	1			
	TABLE 2.7	REMOTE INTERFACE <input type="checkbox"/> CARD 1				
		<input type="checkbox"/> CARD 2				
		ADDITIONAL HANDLING & STORAGE AT GRANLEY PLANT.				

D-20
10-26-94
1-Wint



C41547

Post-it® Fax Note 7671

To Jay Kohler	Date 2-24	# of pages 5
Co./Dept. Paula	From Paula	
Phone #	Co.	
Fax # 7297	Phone #	
	Fax #	

SHIPPING MEMORANDUM

PART SHPT. NO. 1	FINAL SHPT.
SHIPPED VIA Daily	
DATE SHIPPED	

APPROVED BY: _____
 *Completed by factory

II. CHILLER SPECIFICATIONS

FORM 155.19-F1

Unit No. 1	Tag No. CH-2	Revision No.	Revision Date	York Sales Order 93211038-01	SHEET 2 OF 5
Model No. YPC-ST-226-46-C-X		Cooling Capacity (TON) 1500		No. of Units 1	
A. TUBES	B. VOLTAGE	C. TUBE WALL	TUBE MATL.	D. WATER BOXES <input type="checkbox"/> STD.	
<input checked="" type="checkbox"/> STD	<input type="checkbox"/> 208/3/60	<input type="checkbox"/> STD	<input checked="" type="checkbox"/> STD	MARINE †	300 LB. Flanges
<input type="checkbox"/> A	<input type="checkbox"/> 230/3/60	<input checked="" type="checkbox"/> SPECIAL	<input type="checkbox"/> SPECIAL	<input checked="" type="checkbox"/> EVAP	<input type="checkbox"/> <input type="checkbox"/>
<input type="checkbox"/> B	<input checked="" type="checkbox"/> 480/3/60	<input checked="" type="checkbox"/> EVAP .035"	<input type="checkbox"/> EVAP _____	<input checked="" type="checkbox"/> COND	<input type="checkbox"/> <input type="checkbox"/>
		<input checked="" type="checkbox"/> COND .035"	<input type="checkbox"/> COND _____	<input checked="" type="checkbox"/> ABS	<input type="checkbox"/> <input type="checkbox"/>
		<input checked="" type="checkbox"/> ABS .035"	<input type="checkbox"/> ABS _____	† 300lb. Marine not available	
F. SPECIAL SHIPMENT		G. FLOW SWITCHES		H. OTHER	
<input type="checkbox"/> SHIP UNCHARGED <input type="checkbox"/> SPLIT SHIPMENT <input type="checkbox"/> COND FLOW SWITCH		FOR YORK FACTORY USE <input type="checkbox"/> NO BYPASS <input type="checkbox"/> BYPASS REQUIRED STEAM VALVE SIZE _____ CV VALVE _____ _____ ° PIPE _____ ° ORIFICE		<input type="checkbox"/> FACTORY WITNESS TEST <input type="checkbox"/> SPARE PUMPS <input type="checkbox"/> INTERFACE CARD 1 <input type="checkbox"/> INTERFACE CARD 2 _____ _____ _____	

IV. PERFORMANCE SPECIFICATIONS

CAPACITY <u>1500</u> T.R.	COOLER	COND.
STEAM CONSUMPTION (lb/hr) <u>14632</u>	GPM 2991	6702
<u>9.75 lb/ton-hr</u>	EWT 57	85
<u>@ 115 psig steam</u>	LWT 45	95
	F.F. 0.00025	0.00025
	PASS 2	1
	P.O. 42.3	30
	NOZZLE ARRANGE E2	AC1

IV. DOCUMENTATION

Qty.	Description	Send To:	
		1 Copy To*	Remaining To:
9	Chiller/Heater Submittal Set	York International Corp. P.O. Box 1582 York, PA 17405 Attn: Service Dept. 358E	District Address: BUILDING SYSTEMS + SERVICES, INC. 4 COLBY AVE CLAYMONT, DE 19703 Attn: MIKE HULLGARTY
9	Parts List*		
9	Packing List		
9	Factory Test Report*		
9	As Built Drawing Set*		
9	As Built Sepsia Set*		

York Sales Order: 93-211038, 01
 Customer / Job Name: Du Pont Experimental Station

Shipping Remarks	L E V	Q T Y	H S L	Module Description	Mod Qty	Module Part Number	Initial Issue Data	
							Complete Issue Da	Module Status
GLCM 157836 1-Unit 381x142x134 104,240 Steam Generator M.B. 67815 S.N. 0494-158026		/	1	Unit Assembly (22G ST)				
		/	2	Piping (BUFFALO PUMPS)	1	375-05701-000		
		#/	3	Main Shell	1	375-07819-000		
		/	4	Tubes (Main Shell)	1	375-13394-000	New	
		/	5	Heat Exchanger	1	375-13786-000	New	
		/	6	Generator, First Stage	1	375-05200-000		
		/	7	Water Boxes / Nozzle Arrg't	1	375-05202-000		
		/	8	Wiring, Unit	1	375-13785-000	New	
		/	9	Wiring, Support Brackets	1	375-06506-102		
		/	10	Micro-Panel	1	375-08813-000		
		/	11	Power Panel	1	371-01288-101		
		/	12	Painting Instructions	1	371-01311-112		
		/	13	Shipping Instructions	1	375-06947-005		
		/	14	Testing	1	375-07170-005		
		/	15	Burner (Direct Fired Only)	1	375-11812-021		
		/	16	Solution Pump				
		/	17	Refrigerant Pump	1	02G-32304-012		
		/	18	Solution Pump (SP1)	1	02G-32304-016		
		/	19	Solution Pump (SP2)	1	02G-32304-009		
			20	Water Label				
			21	Alcohol (Unit Shipped Charged)				
			22	Alcohol				
			23	Refrigerant (Unit Shipped Charged)	36.98	011-00531-000		
			24	Benzotriazole (Steam Unit Only)				
			25	Heater, Water (Direct Fired Only)	1.03	013-02890-000		
			26					
			27					

* Item 3 P/N was 375-05136-000 ECS 11/24/93

York Sales Order: 93-211038-01
Customer / Job Name: DuPont Experimental Station

Shipping Remarks	LEV	QTY	MSL	Module Description	Mod Qty	Module Part Number	Initial Complete Module Status
			28	Flange, Kit (Absorber and Condenser)			
			29	Flange, Kit (Evaporator)			
			30	Flange, Kit (Water Heater)			
	/		31	Bypass, Water (Condenser)			
	(B) /		32	Orifice, Bypass (Condenser)	1	375-13792-000	New
			33		1	075-16876-000	New
			34				
			35				
				The following are Ship Loose Items:			
	*		40	Steam Control Valve (Steam Only)	1		
			41	Chilled Water Flow Switch	1	022-08886-000	
			42	Tower Water Flow Switch	1	024-15793-000	
			43	Hot Water Flow Switch	1	024-15793-000	
			44	Miscellaneous Parts Kit			
	(A)		45	Refrigerant (Units Shipped Uncharged)	1	475-06550-000	
	(A)		46	Li Br (Units Shipped Uncharged)	490	011-00548-000	
			47		1630	011-00556-000	
			48				
			49				
			50				

* Item 40 P/N was 022-08887-000 ECS 11/22/93

(A) Items 45 & 46 REVISED TO UTILIZE MOLYBDATE INHIBITOR TAC 2/28/94

(B) Item 32 WAS 075-16876-000 Changed per J. Keller TAC 9/14/94

Pg 5 of 5

***** PARAFLOW TEST STAND SPECIFICATION SHEET *****

SALES ORDER: 93 211 038 01
FL TONNAGE = 1500 TONS

TYPE OF UNIT = 22G STEAM
PASS ARRANGEMENT CODE: E2 AC1

EVAPORATOR CONDITIONS

	SPECIFIED	MINIMUM	MAXIMUM
CAPACITY (TONS)	1500	1425	1575
FLOW (GPM)	2990.365	2840.847	3139.883
ENTERING TEMPERATURE (F)	57	N/A	N/A
LEAVING TEMPERATURE (F)	45	44.5	45.5
PRESSURE DROP (FT W.C.)	43.16532	36.69052	49.64012
EVAP TUBE WALL THICKNESS	.035	N/A	N/A
EVAP PASSES	2	2	2
EVAPORATOR FOULING FACTOR	.00025	N/A	N/A

TOWER WATER CONDITIONS

FLOW (GPM)	5588.149	5308.742	5867.557
ENTERING TEMPERATURE (F)	85	84.5	85.5
LEAVING TEMPERATURE (F)	97	N/A	N/A
PRESSURE DROP (FT W.C.)	39.72869	33.76938	45.68799
ABSORBER TUBE WALL THICKNESS	.035	N/A	N/A
CONDENSER TUBE WALL THICKNESS	.035	N/A	N/A
ABSORBER PASSES	1	1	1
TOWER FOULING FACTOR	.00025	N/A	N/A

PERFORMANCE PARAMETERS

1ST STG LEAVING TEMP (F)	303.7938	293.7938	313.7938
1ST STG GEN PRESSURE (PSIA)	9.462078	7.462078	11.46208
1ST STAGE GEN CONCENTRATION (WT %)	63.47372	62.47372	64.47372
2ND STG ENTER TEMP (F)	155.8108	145.8108	165.8108
2ND STG LEAVING TEMP (F)	187.4814	177.4814	197.4814
2ND STG CONCENTRATION (WT %)	61.35176	60.35176	62.35176
ABSORBER SOLUTION TEMP (F)	104.4141	99.41413	109.4141
WEAK SOLUTION CONCENTRATION (WT %)	57.85176	56.85176	58.85176
ENERGY INPUT (LBS/HR, UNINSULATED)	15458.56		
ENERGY INPUT/TON (LB/TON-HR, UNINSULATED)	10.30571	9.816185	10.79523
STEAM INLET PRESSURE (PSIA)	115	113	117

BYPASS PIPING IS REQUIRED:

THE BYPASS DIAMETER PIPE SIZE IS 6 INCHES.

THE ORIFICE SIZE NEEDED IS 4 INCHES.

CV VALUE FOR 115 PSI INPUT IS 89.05347

RECOMMENDED STEAM VALVE IS HONEYWELL ~~2.5 INCH VALVE, YORK # 022-08888-000~~

4" VALVE REQ'D Per J. Kohler

REVISED TEST STAND SHEET 9/11/94

YORK

ORDER FORM

PARAFLOW STEAM FIRED CHILLER

Revision No. _____ Rev. Date _____ Sheet 1 of 5

Customer Order No. LOX-795666-IW York Contract No. 94211016 York Order No. -01

Job Name and Location DUPONT EXPERIMENTAL STATION, WIL, DE York SQ. No. _____

S H I P T O:

E. I. DUPONT DE NEMOURS ; COMPANY

EXPERIMENTAL STATION

ROUTE 141 BETWEEN RTS 202 AND RT 52

WILMINGTON, DE 19898

VIA: OPW TRUCK (PPD-FIA)

S O L D T O:

E. I. DUPONT DENEMOURS ; CO INC

EXPERIMENTAL STATION, P.O. BOX 80-0361

WILMINGTON, DE 19880-0361

MARKS CH-2:3

Special Shipping Instructions:
TRUCKER TO CONTACT J.R. RICHARDS @
(302) 695-8316 48HRS. PRIOR

Region NE AGENTS Code 01-211-0000-07-5324

Order Date 6-10-94 Wanted Date 1-5-95 Partial Shipment YES NO

Fabrication Release YES NO *Date Order Received _____ *Scheduled Date _____

ITEM	PRICING TABLE	EQUIPMENT	QTY.	UNIT MLP	M	SELLING PRICE
		HEAT SOURCE <u>YPC-8</u> SIZE <u>T-226</u> ELEG. CODE <u>46-C-X</u> HTR TUBE	<u>2</u>			
	TABLE 1.1	UNIT TYPE	<u>2</u>			
	TABLE 1.1	LITHIUM BROMIDE	<u>2</u>			
	TABLE 2.1	TUBE ENHANCEMENT <input type="checkbox"/> "A" <input type="checkbox"/> "B"				
	TABLE 2.1	<input type="checkbox"/> SEPARATE CHARGE (Std. for 20G-22G)				
	TABLE 2.1	<input type="checkbox"/> 2 PIECE SHIPMENT (Includes Sep. Charge)				
	TABLE 2.1	<input type="checkbox"/> SPARE PUMPS				
	TABLE 2.1	<input checked="" type="checkbox"/> CUSTOMER WITNESS FACTORY TEST	<u>2</u>			
	TABLE 2.2	<input checked="" type="checkbox"/> WATER FLOW SWITCH <input checked="" type="checkbox"/> 180 LB. <input type="checkbox"/> 300 LB.	<u>2</u>			
	TABLE 2.3	<input type="checkbox"/> ANSI FLANGES EVAP ABS COND				
	TABLE 2.4	MARINE WATER BOX				
		<input checked="" type="checkbox"/> ABSORBER	<u>2</u>			
		<input checked="" type="checkbox"/> CONDENSER	<u>2</u>			
		<input checked="" type="checkbox"/> EVAPORATOR	<u>2</u>			
	TABLE 2.5	300 lb. WATER BOXES				
		<input type="checkbox"/> ABSORBER / COND				
		<input type="checkbox"/> EVAPORATOR				
	TABLE 2.6	SPECIAL TUBE MATERIAL & THICKNESS				
		<input checked="" type="checkbox"/> ABSORBER	<u>2</u>			
		<input checked="" type="checkbox"/> CONDENSER	<u>2</u>			
		<input checked="" type="checkbox"/> EVAPORATOR	<u>2</u>			
	TABLE 2.7	REMOTE INTERFACE <input type="checkbox"/> CARD 1 <input type="checkbox"/> CARD 2				

12-22-94
C2



9RT-657

SHIPPING MEMORANDUM

PART SHPT. NO 1 FINAL SHPT. _____

SHIPPED VIA Daily

DATE SHIPPED _____

APPROVED BY: _____ FOB FACTORY, domestic per _____

*Completed by factory

York Sales Order: 94-211016-01
Customer / Job Name: DUPONT

Initial Issue Date
Complete Issue Date

Loose
38x142x134
WT 99,450
SER
GLNm 230107

✓ Steam
GENERATOR
NB 64991
SER 1094-230195

Shipping Remarks	L E V	Q T Y	H S L	Module Description	Mod Qty	Module Part Number	Module Status	Sche Mod Rate
		1		ST 229-46-C-X Unit Assembly	2	375-05701-000	.	
		1		Piping	2	375-07819-000	.	
		1		Main Shell	2	375-13394-000	.	
		1		Tubes (Main Shell)	2	375-13786-000	.	
		1		Heat Exchanger	2	375-05200-000	.	
		1		Generator, First Stage	2	375-05202-000	.	
		1		Water Boxes / Nozzle Arrg't	2	375-13785-000	.	
		1		Wiring, Unit	2	375-06506-102	.	
		1		Wiring, Support Brackets	2	375-08813-000	.	
		1		Micro-Panel	2	371-01288-101	.	
		1		Power Panel	2	371-01311-112	.	
		1		Painting Instructions	2	375-06947-005	.	
		1		Shipping Instructions	2	375-07170-005	.	
		1		Testing	2	375-11812-021	.	
				Burner (Direct Fired Only)	-	-	.	
		1		Solution Pump	2	026-32304-012	.	
		1		Refrigerant Pump	2	026-32304-016	.	
		1		Solution Pump (SP1)	2	026-32304-009	.	
		1		Solution Pump (SP2)	2	026-32304-003	.	
				U L Label	-	-	.	
				L1 Br (Unit Shipped Charged)	-	-	.	
		31.98		Alcohol	73.96	011-00531-000	.	
				Refrigerant (Unit Shipped Charged)	-	-	.	
		103		Benzotriazole (Steam Unit Only)	2.06	013-02890-000	.	
				Heater, Water (Direct Fired Only)	-	-	.	
							.	
		1		AUTO PURGE	2	375-14530-000	.	

York Sales Order: 94-211016-01
Customer / Job Name: DUPONT.

Initial Issue In
Complete Issue In

Shipping Remarks	L E V	Q T Y	H S L	Module Description	Mod Qty	Module Part Number	Module Status	Act Note Rele
			28	Flange, Kit (Absorber and Condenser)	-	-		
			29	Flange, Kit (Evaporator)	-	-		
			30	Flange, Kit (Water Heater)	-	-		
	(A)	1	31	Bypass, Water (Condenser)	2	375-13792-000		per J. Kohler
	(B)	1	32	Orifice, Bypass (Condenser)	2	075-16876-000		
			33					
			34					
			35					
				The following are Ship Loose Items:				
			40	Steam Control Valve (Steam Only) 4"	2	022-08886-000		
			41	Chilled Water Flow Switch	4	024-15793-000		
			42	Tower Water Flow Switch	-			
			43	Hot Water Flow Switch	-			
			44	Miscellaneous Parts Kit	2	475-15101-000		
			45	Refrigerant (Units Shipped Uncharged)	980	011-00548-000		
			46	L1 Br (Units Shipped Uncharged)	3260	011-00556-000		
			47	REMOTE SETPOINT	-			
			48	CARD FILE	-	031-00827-000		
			49		-	031-00814-000		
			50					

(A) REVISED By Pass to Accomodate MWB TAC 7/26/94

(B) REVISED ORIFACE DUE TO TUBES PER ECS & J. Kohler. 9/15/94 TAC



ORDER FORM PARAFLOW STEAM FIRED CHILLER

Revision No. Rev. Date Sheet **1** of **5**

Customer Order No. **LOX762267-HW** York Contract No. **93211038** York Order No. **-01**

Job Name and Location **DUPONT EXPERIMENTAL STATION, WIL, DE** York SQ. No.

S **H** **I** **P** **T** **O**:
E.I. DU PONT DE NEMOURS & COMPANY
EXPERIMENTAL STATION
ROUTE M1 BETWEEN RTS. 202 AND RT. 52
WILMINGTON, DE 19898

VIA: **PPD-F/A**
S **O** **L** **D** **T** **O**:
E.I. DUPONT DE NEMOURS CO.
EXPERIMENTAL STATION P.O. BOX 80-0361
WILMINGTON DE 19880-0361

MARKS **CH-1**

Special Shipping Instructions:
TRUCKER TO CONTACT GENE GUERRAZZI
48 HOURS PRIOR (302) 695-8310
FAX (302) 384-6233

Region **NE AGENTS** Code **01-211-0900-07-5324**

Order Date **11-11-93** Wanted Date **7-29-94** Partial Shipment YES NO Fabrication Release YES NO *Date Order Received **7-29-94** *Scheduled Date

ITEM **1** PRICING TABLE **Y P C - S T - 2 2 G - 4 6 - C - X** EQUIPMENT QTY. UNIT MLP M SELLING PRICE

HEAT SOURCE	SIZE	ELEC. CODE	HTR	TUBE	QTY.	UNIT MLP	M	SELLING PRICE
TABLE 1.1	UNIT TYPE							
TABLE 1.1	LITHIUM BROMIDE							
TABLE 2.1	TUBE ENHANCEMENT <input type="checkbox"/> "A" <input type="checkbox"/> "B"							
TABLE 2.1	<input type="checkbox"/> SEPARATE CHARGE (Std. for 20G-22G)							
TABLE 2.1	<input type="checkbox"/> 2 PIECE SHIPMENT (Includes Sep. Charge)							
TABLE 2.1	<input type="checkbox"/> SPARE PUMPS							
TABLE 2.1	<input type="checkbox"/> CUSTOMER WITNESS FACTORY TEST							
TABLE 2.2	<input checked="" type="checkbox"/> WATER FLOW SWITCH <input checked="" type="checkbox"/> 150 LB. <input type="checkbox"/> 300 LB.				1			
TABLE 2.3	<input type="checkbox"/> ANSI FLANGES EVAP * ABS * COND *							
TABLE 2.4	MARINE WATER BOX							
	<input checked="" type="checkbox"/> ABSORBER				1			
	<input checked="" type="checkbox"/> CONDENSER				1			
	<input checked="" type="checkbox"/> EVAPORATOR				1			
TABLE 2.5	300 b. WATER BOXES							
	<input type="checkbox"/> ABSORBER / COND							
	<input type="checkbox"/> EVAPORATOR							
TABLE 2.6	SPECIAL TUBE MATERIAL & THICKNESS							
	<input checked="" type="checkbox"/> ABSORBER				1			
	<input checked="" type="checkbox"/> CONDENSER				1			
	<input checked="" type="checkbox"/> EVAPORATOR				1			
TABLE 2.7	REMOTE INTERFACE <input type="checkbox"/> CARD 1 <input type="checkbox"/> CARD 2							

NOTE: SHADED ENTRIES ARE MANDATORY

APPROVED BY: _____
*Completed by factory **AGENT #211**

FOB FACTORY, domestic po

UPDCO
12-1

GRT

II. CHILLER SPECIFICATIONS

FORM 155.19-F1

Unit No. 1	Tag No. CH-2	Revision No.	Revision Date	York Sales Order 93211038-01	SHEET 2 OF 5	
Model No. YPC-ST-226-46-C-X		Cooling Capacity (TON) 1500		No. of Units 1		
A. TUBES <input checked="" type="checkbox"/> STD <input type="checkbox"/> A <input type="checkbox"/> B	B. VOLTAGE <input type="checkbox"/> 208/3/60 <input type="checkbox"/> 230/3/60 <input checked="" type="checkbox"/> 460/3/60	C. TUBE WALL <input type="checkbox"/> STD <input checked="" type="checkbox"/> SPECIAL <input checked="" type="checkbox"/> EVAP .035" <input checked="" type="checkbox"/> COND .035" <input checked="" type="checkbox"/> ABS .035"		TUBE MATL. <input checked="" type="checkbox"/> STD <input type="checkbox"/> SPECIAL <input type="checkbox"/> EVAP _____ <input type="checkbox"/> COND _____ <input type="checkbox"/> ABS _____		D. WATER BOXES <input type="checkbox"/> STD MARINE † 300 LB. Flanges <input checked="" type="checkbox"/> EVAP <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> COND <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> ABS <input type="checkbox"/> <input type="checkbox"/>
F. SPECIAL SHIPMENT <input type="checkbox"/> SHIP UNCHARGED <input type="checkbox"/> SPLIT SHIPMENT <input type="checkbox"/> COND FLOW SWITCH		G. FLOW SWITCHES <div style="border: 1px solid black; padding: 5px; margin: 5px;"> <p style="text-align: center;">FOR YORK FACTORY USE</p> <input type="checkbox"/> NO BYPASS <input type="checkbox"/> BYPASS REQUIRED STEAM VALVE SIZE _____ CV VALVE _____ _____ * PIPE _____ * ORIFICE </div>		H. OTHER <input type="checkbox"/> FACTORY WITNESS TEST <input type="checkbox"/> SPARE PUMPS <input type="checkbox"/> INTERFACE CARD 1 <input type="checkbox"/> INTERFACE CARD 2 _____ _____ _____		

IV. PERFORMANCE SPECIFICATIONS

CAPACITY <u>1500</u> T. R. STEAM CONSUMPTION (lbs/hr) <u>14632</u> 9.75 lb/ton·hr @ 115 psig steam	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td></td> <td style="width:25%;">COOLER</td> <td style="width:25%;">COND.</td> </tr> <tr> <td>GPM</td> <td>2991</td> <td>6702</td> </tr> <tr> <td>EWT</td> <td>57</td> <td>85</td> </tr> <tr> <td>LWT</td> <td>45</td> <td>95</td> </tr> <tr> <td>F. F.</td> <td>0.00025</td> <td>0.00025</td> </tr> <tr> <td>PASS</td> <td>2</td> <td>1</td> </tr> <tr> <td>P. D.</td> <td>42.3</td> <td>30</td> </tr> <tr> <td>NOZZLE ARRANGE.</td> <td>E2</td> <td>AC1</td> </tr> </table>		COOLER	COND.	GPM	2991	6702	EWT	57	85	LWT	45	95	F. F.	0.00025	0.00025	PASS	2	1	P. D.	42.3	30	NOZZLE ARRANGE.	E2	AC1
	COOLER	COND.																							
GPM	2991	6702																							
EWT	57	85																							
LWT	45	95																							
F. F.	0.00025	0.00025																							
PASS	2	1																							
P. D.	42.3	30																							
NOZZLE ARRANGE.	E2	AC1																							

IV. DOCUMENTATION

Qty.	Description	Send To:	
		1 Copy To*	Remaining To:
9 9 9 9 9	Chiller/Heater Submittal Set Parts List* Packing List Factory Test Report* As Built Drawing Set* As Built Sepia Set*	York International Corp. P.O. Box 1592 York, PA 17405 Attn: Service Dept. - 368E	District Address: BUILDING SYSTEMS + SERVICES, INC. 4 COLBY AVE CLAYMONT, DE 19703 Attn: MIKE HALLGARTY

Page 3 of 5			York Sales Order: 93-211038-01 Customer / Job Name: Du Pont Experimental Station				Initial Issue Date Complete Issue Date	
Shipping Remarks	L E V	Q T Y	M S L	Module Description	Mod Qty	Module Part Number	Module Status	Sched Modul Release
			1	Unit Assembly (22G ST)	1	375-05701-000		
			2	Piping (BUFFALO PUMPS)	1	375-07819-000		
		*	3	Main Shell	1	375-13394-000	New	
			4	Tubes (Main Shell)	1	375-13786-000	New	
			5	Heat Exchanger	1	375-05200-000		
			6	Generator, First Stage	1	375-05202-000		
			7	Water Boxes / Nozzle Arrg't	1	375-13785-000	New	
			8	Wiring, Unit	1	375-06506-102		
			9	Wiring, Support Brackets	1	375-08813-000		
			10	Micro-Panel	1	371-01288-101		
			11	Power Panel	1	371-01311-112		
			12	Painting Instructions	1	375-06947-005		
			13	Shipping Instructions	1	375-07170-005		
			14	Testing	1	375-11812-021		
			15	Burner (Direct Fired Only)				
			16	Solution Pump	1	026-32304-012		
			17	Refrigerant Pump	1	026-32304-016		
			18	Solution Pump (SP1)	1	026-32304-009		
			19	Solution Pump (SP2)	1	026-32304-003		
			20	W-L Label				
			21	Li-Br (Unit Shipped Charged)				
			22	Alcohol	36.98	011-00531-000		
			23	Refrigerant (Unit Shipped Charged)				
			24	Benzotriazole (Steam Unit Only)	1.03	013-02890-000		
			25	Heater, Water (Direct Fired Only)				
			26					
			27					

* Item 3 P/N was 375-05136-000 ECS 11/24/93

York Sales Order: 93-211038-01
Customer / Job Name: DuPont Experimental Station

Initial Issue Date
Complete Issue Date

Shipping Remarks	L E V	Q T Y	M S L	Module Description	Mod Qty	Module Part Number	Module Status	Sched Modul Release
			28	Flange, Kit (Absorber and Condenser)				
			29	Flange, Kit (Evaporator)				
			30	Flange, Kit (Water Heater)				
			31	Bypass, Water (Condenser)	1	375-13792-000	New	
			32	Orifice, Bypass (Condenser)	1	075-13791-004	New	
			33					
			34					
			35					
				The following are Ship Loose Items:				
	*		40	Steam Control Valve (Steam Only)	1	022-08886-000		
			41	Chilled Water Flow Switch	1	024-15793-000		
			42	Tower Water Flow Switch	1	024-15793-000		
			43	Hot Water Flow Switch				
			44	Miscellaneous Parts Kit	1	475-06550-000		
			45	Refrigerant (Units Shipped Uncharged)	426	011-00548-000		
			46	Li Br (Units Shipped Uncharged)	1818	011-00524-001		
			47					
			48					
			49					
			50					

* Item 40 P/N was 022-08887-000 ECS 11/22/93

***** PARAFLOW TEST STAND SPECIFICATION SHEET *****

SALES ORDER: 93211038
FL TONNAGE = 1500 TONSTYPE OF UNIT = 22G STEAM
PASS ARRANGEMENT CODE: E2AC1

EVAPORATOR CONDITIONS

	SPECIFIED	MINIMUM	MAXIMUM
CAPACITY (TONS)	1500	1425	1575
FLOW (GPM)	2990.365	2840.847	3139.883
ENTERING TEMPERATURE (F)	57	N/A	N/A
LEAVING TEMPERATURE (F)	45	44.5	45.5
PRESSURE DROP (FT W.C.)	43.16532	36.69052	49.64012
EVAP TUBE WALL THICKNESS	.035	N/A	N/A
EVAP PASSES	2	2	2
EVAPORATOR FOULING FACTOR	.00025	N/A	N/A

TOWER WATER CONDITIONS

FLOW (GPM)	6702.451	6367.328	7037.573
ENTERING TEMPERATURE (F)	85	84.5	85.5
LEAVING TEMPERATURE (F)	95	N/A	N/A
PRESSURE DROP (FT W.C.)	28.09688	23.88235	32.31142
ABSORBER TUBE WALL THICKNESS	.035	N/A	N/A
CONDENSER TUBE WALL THICKNESS	.035	N/A	N/A
ABSORBER PASSES	1	1	1
TOWER FOULING FACTOR	.00025	N/A	N/A

PERFORMANCE PARAMETERS

1ST STG LEAVING TEMP (F)	307.9449	297.9449	317.9449
1ST STG GEN PRESSURE (PSIA)	9.59643	7.59643	11.59643
1ST STAGE GEN CONCENTRATION (WT %)	64.09446	63.09446	65.09446
2ND STG ENTER TEMP (F)	157.0358	147.0358	167.0358
2ND STG LEAVING TEMP (F)	188.0382	178.0382	198.0382
2ND STG CONCENTRATION (WT %)	61.8625	60.8625	62.8625
ABSORBER SOLUTION TEMP (F)	106.2244	101.2244	111.2244
WEAK SOLUTION CONCENTRATION (WT %)	58.3625	57.3625	59.3625
ENERGY INPUT (LBS/HR, UNINSULATED)	15217.28		
ENERGY INPUT/TON (LB/TON-HR, UNINSULATED)	10.14485	9.662972	10.62673
STEAM INLET PRESSURE (PSIA)	115	113	117

BYPASS PIPING IS REQUIRED:

THE BYPASS DIAMETER PIPE SIZE IS 8 INCHES.

THE ORIFICE SIZE NEEDED IS 5.75 INCHES.

Cv VALUE FOR 115 PSI INPUT IS 97.22837

RECOMMENDED STEAM VALVE IS HONEYWELL 3 INCH VALVE, YORK # 022-08887-000

Change to 4" per Jay Kohler
11/18/93

BUILDING SYSTEMS & SERVICES, INC.
4 COLBY AVE.
CLAYMONT, DE 19703
TELEPHONE (302)792-0550
FAX (302)792-0233

FACSIMILE COVER SHEET

TO: ^{Jay} Jim Kohler
COMPANY: York International
SUBJECT: DuPont Experimental Station S.O. 93211038
PHONE: 717-771-7127
FAX: 717-771-7297

FROM: Michael J. Haggarty Jr.
DATE: May 31, 1995
TOTAL NUMBER OF PAGES INCLUDING THIS PAGE: 1

COMMENTS:

Jim,

The 1500 ton steam absorption chiller which was supplied to DuPont under the subject order was factory tested before delivery. The unit has been started up in the field the beginning of this month (5/95). Some problems occurred with the site tower water. Wood chips etc have clogged the tubes in the condenser. During inspection and cleaning of the tubes DuPont and York Service have found what seems to be calcium deposits on the insides of the tubes.

DuPont has requested to know what type of water York used to test the chiller at the factory (city, tower, river etc.). They would also like to know what form of water treatment is used of the condenser water.

Please help me in getting this information.

Mike

cc: Joe B

I discussed this with Mike & advised that we have not experienced calcium carbonate fouling on chillers tested on those test blocks

Jay K

SALES ORDER: 93 211 038 01-Dupont
 FL TONNAGE = 1500 TONS

TYPE OF UNIT = 22G STEAM
 PASS ARRANGEMENT CODE: E2 AC1

EVAPORATOR CONDITIONS

	SPECIFIED	MINIMUM	MAXIMUM
CAPACITY (TONS)	1500	1425	1575
FLOW (GPM)	2990.365	2840.847	3139.883
ENTERING TEMPERATURE (F)	57	N/A	N/A
LEAVING TEMPERATURE (F)	45	44.5	45.5
PRESSURE DROP (FT W.C.)	43.16532	36.69052	49.64012
EVAP TUBE WALL THICKNESS	.035	N/A	N/A
EVAP PASSES	2	2	2
EVAPORATOR FOULING FACTOR	.00025	N/A	N/A

TOWER WATER CONDITIONS

FLOW (GPM)	4500	4275	4725
ENTERING TEMPERATURE (F)	83.5	83	84
LEAVING TEMPERATURE (F)	98.37396		N/A
PRESSURE DROP (FT W.C.)	32.09185	27.27807	36.90562
ABSORBER TUBE WALL THICKNESS	.035	N/A	N/A
CONDENSER TUBE WALL THICKNESS	.035	N/A	N/A
ABSORBER PASSES	1	1	1
TOWER FOULING FACTOR	.00025	N/A	N/A

PERFORMANCE PARAMETERS

1ST STG LEAVING TEMP (F)	304.8958	294.8958	314.8958
1ST STG GEN PRESSURE (PSIA)	9.625326	7.625326	11.62533
1ST STAGE GEN CONCENTRATION (WT %)	63.50001	62.50001	64.50002
2ND STG ENTER TEMP (F)	156.3693	146.3693	166.3693
2ND STG LEAVING TEMP (F)	188.3246	178.3246	198.3246
2ND STG CONCENTRATION (WT %)	61.37588	60.37588	62.37588
ABSORBER SOLUTION TEMP (F)	104.4987	99.49866	109.4987
WEAK SOLUTION CONCENTRATION (WT %)	57.87588	56.87588	58.87588
ENERGY INPUT (LBS/HR, UNINSULATED)	15458.56		
ENERGY INPUT/TON (LB/TON-HR, UNINSULATED)	10.30571	9.816185	10.79523
STEAM INLET PRESSURE (PSIA)	115	113	117

NO BYPASS PIPING IS REQUIRED ON THIS UNIT

← Needs to block bypass piping for test

Cv VALUE FOR 115 PSI INPUT IS 86.70953

RECOMMENDED STEAM VALVE IS HONEYWELL 2.5 INCH VALVE, YORK # 022-08888-000

Alternate test conditions - Based on a maximum tower water flow of 4500 GPM for test facility and revised specification - Option A tubes #5/97 tower water conditions

FACSIMILE TRANSMISSION



Applied Systems Service

York International Corporation

P.O. Box 1592
York, PA 17405
Fax: (717) 771-6844

Fax No. : (302)695-7775

Date : 4/17/95

Attention : Charlie Keener

From: Joe Brillhart

Company : E.I. Du Pont De Nemours & Co.

This fax consists of 2 pages including this cover sheet.

Subject: PLEASE PASS THIS FAX TO YORK SERVICE MAN

York Order: 93-211,038

Charlie,

Attached is the BZT charging procedure.

Regards,

YORK INTERNATIONAL CORP. APPLIED SYSTEMS ENGINEERING
P.O. BOX 1592-191A YORK, PA. 17405-1592
TELEPHONE: 717/771-7127 FAX: 717/771-7297

DATE: ~~October 18, 1994~~ February 24, 1995

SUBJECT: YPC Factory Test Report

FROM: Jay Kohler - 191A



TO: Distribution Below

cc (cover sheet only):

Attached are copies of the factory test report for

93-211,038-01

~~SO94-211016-01~~ E. I. DuPont Nemours Experimental Station

This information is required for unit startup and service. A copy should be kept on-site with the unit.

Distribution:

1. York PA Service (1 copy) Joe Brillhart 36BE

2. Field Sales (2 copies) _____

Building Systems & Services, Inc.

Attn: Mike Haggarty

4 Colby Ave.

Claymont, DE 19703

3. Other (___ copies) _____

Attached are revised copies of the test report
for 93-211,038-01 with the corrected serial
number - GLCM 157,836. Please retain the
valve and sight glass location tag (075-11629-000)
from the original report - it has not changed. Please
note also that the SO number listed above was incorrect.
94-211016-01 was not tested in York. My apologies for
the errors.

York International Corporation, York, PA
Applied Systems Performance Test

JOB NAME: DUPONT Date: 10/25/94
YORK ORDER: 93-211,038-01 Time: 10:45
UNIT MODEL: YPC-ST-22G-46-C-~~X~~
SERIAL NUMBER: ~~YKBN002815~~
 GLCM 157,836

ENERGY INPUT: Test
Actual

Steam:

Temperature (degF)	348.3
Pressure (psig)	114.9
Flow (as Tested) (lb/hr)	15021.5
Flow (Insulated) (lb/hr)	14443.7
Condensate temperature (degF)	180.2
Condensate pressure (psig)	20.0

Voltage	480.0
	482.0
	480.0

Current	37.8
	37.7
	40.0

Power (KW)	16.2
------------	------

Calc Energy In (as Tested) - cooling mode (MBH)	15700.8
Calc Energy In (Insulated) - cooling mode (MBH)	15096.9

PERFORMANCE RESULTS - COOLING MODE:

$\frac{\text{Actual Capacity}}{\text{Design Capacity}} \times 100\% = 98.3 \%$

Heat Balance = $\frac{(\text{Q}_{\text{evap}} + \text{Q}_{\text{input}} - \text{Q}_{\text{cond}})}{\text{Q}_{\text{cond}}} \times 100\% = -1.6 \%$
 Closure

York International Corporation, York, PA
Applied Systems Performance Test

JOB NAME: DUPONT
YORK ORDER: 93-211,038-01
UNIT MODEL: YPC-ST-226-46-C-X~~111~~
SERIAL NUMBER: ~~YKBM032019~~
GLCM157,836

Date: 10/05/94
Time: 10:45

OPERATING CONDITIONS:

Test
Actual

Evaporator:

Capacity (TR)	1474.0
Flow (GPM)	2984.3
Entering Temp (degF)	57.13
Leaving Temp (degF)	45.29
Range (degF)	11.84
Pressure Drop (ft WC)	42.4
Fouling Factor	.00025
Liquid Type	WATER
Pass Arrangement	2 PASS

Absorber/Condenser:

Flow (GPM)	4487.5
Entering Temp (degF)	83.48
Leaving Temp (degF)	98.65
Range (degF)	15.17
Pressure Drop (ft WC)	30.4
Fouling Factor	.00025
Liquid Type	WATER
Pass Arrangement	1 PASS

York International Corporation, York, PA
Applied Systems Performance Test

JOB NAME: DUPONT Date: 10/05/94
YORK ORDER: 93-211,038-01 Time: 10:45
UNIT MODEL: YPC-ST-226-45-C-X
SERIAL NUMBER: ~~YK24832017~~
GLCM157,836

Barometric Pressure: 14.55
Ambient Temperature: 66.5

COMMENTS: Absorber/Condenser water flow is less than specified flow due to test facility limitations. Water temperatures were adjusted to compensate for flow reduction. Condenser bypass pipe was replaced by a blank off plate during testing.

DATA REVIEWED AND VERIFIED:

J. A. Koller 10/5/94

Resident Engineer

York International Corporation, York, PA
Applied Systems Performance Test

Level 2 Startup Information

JOB NAME: DUPONT Date: 10/05/94
YORK ORDER: 93-211,038-01 Time: 10:45
UNIT MODEL: YPC-ST-226-46-C-X
SERIAL NUMBER: ~~YKBR000019~~
GLCM 157,836

	Test
<u>CYCLE CONDITIONS - COOLING:</u>	<u>Actual</u>
First Stage Generator:	
Pressure (psia)	12.9
Solution Leaving Temp (degF)	317.4
Second Stage Generator:	
Solution Entering Temp (degF)	172.5
Solution Leaving Temp (degF)	198.4
Absorber:	
Solution Concentration (%)	57.7
Solution Leaving Temp (degF)	97.2

York International Corporation, York, PA
Applied Systems Performance Test

Level 2 StartUp Information

JOB NAME: DUPONT Date: 10/05/94
YORK ORDER: 93-211,038-01 Time: 10:45
UNIT MODEL: YPC-ST-226-45-C-X
SERIAL NUMBER: ~~XXXXXXXXXX~~
GLCM157,836

CHARGING QUANTITIES:

	LiBr Solution at $\frac{55}{55}$ %		Refrigerant		Alcohol
Charged for testing	<u>21870</u> lb		<u>428</u> gal		<u>37</u> gal
Removed for Shipping (1)	<u>20196</u> lb		<u>105</u> gal		---
Add for start up (1)	<u>20196</u> lb		<u>105</u> gal		---

Note: (1) LiBr and refrigerant charge shipped as 51.5 barrels of solution with an average LiBr concentration of 52.3 % + 3.5 barrels of refrigerant. Some alcohol will be in the solution and refrigerant which was removed for shipping.

**YORK INTERNATIONAL CORPORATION
APPLIED SYSTEMS PERFORMANCE TEST**

JOB NAME - DUPONT
 YORK ORDER - 93-211,038-01
 UNIT MODEL - YCP-ST-22G-46-C-XYKB
 SERIAL NO. - ~~YKBM032810~~ GLCM157,336

10/6/94

VALVE SETTING CHART

VALVE	NAME	FINAL SETTING	REMARKS
V2	SOLUTION RETURN FROM 1st STAGE GEN.	2 1/2 TURNS OPEN	
V3	SOLUTION SUPPLY TO 2nd STAGE GEN.	2 TURNS OPEN	
V4	SOLUTION SUPPLY TO 1st STAGE GEN.	4 TURNS OPEN	
V7	REFRIGERANT BY-PASS FLOW RATE SETTING	2 TURNS OPEN	
V8	REFRIGERANT BLOWDOWN VALVE	CLOSED	
V9	REFRIGERANT PUMP ISOLATION VALVE-SUCTION	100% OPEN	
V10	REFRIGERANT PUMP ISOLATION VALVE-DELIVERY	100% OPEN	
V12	SOLUTION PUMP ISOLATION VALVE-SUCTION	100% OPEN	
V13	SOLUTION PUMP ISOLATION VALVE-DELIVERY	100% OPEN	
V15	PRESSURE GAUGE SHUT-OFF	CLOSED	
V22	SOLUTION SPRAY PUMP ISOLATION - SUCTION (1)	100% OPEN	
V23	SOLUTION SPRAY PUMP ISOLATION - DELIVERY (1)	100% OPEN	
V26	SOLUTION FLOW RATE SETTING VALVE	100% OPEN	
V28	SOLUTION FLOW RATE SETTING VALVE	6 TURNS OPEN	
V29	SOLUTION BY-PASS VALVE	1 3/4 TURNS OPEN	
V34	SOLUTION SPRAY PUMP ISOLATION - SUCTION (2)	100% OPEN	
V35	SOLUTION SPRAY PUMP ISOLATION - DELIVERY (2)	100% OPEN	
V38	REFRIGERANT FLOW RATE SETTING VALVE	4 TURNS OPEN	
V39	PURGE VALVE	CLOSED	
V40	PURGE VALVE	CLOSED	
V41	PURGE VALVE	CLOSED	
V42	PURGE VALVE	CLOSED	
VP1	PURGE OPER. VALVE - FROM COND. TO EDUCTOR	4 TURNS OPEN	
VP2	PURGE OPER. VALVE - FROM PURGE TANK	CLOSED	
VP3	PURGE OPER. VALVE-FROM COND.DIRECT PURGE	CLOSED	
VP4	PURGE OPER. VALVE-FROM ABS. DIRECT PURGE	CLOSED	
VP5	PURGE OPER. VALVE -MAIN VALVE.PURGE ISOL.	CLOSED	
VP7	PURGE OPER. VALVE -MECH. BOOSTER PUMP	CLOSED	
VP8	PURGE OPER. VALVE - CHECK VALVE	SPRING NOT REMOVED	
VP11	PURGE OPER. VALVE -SOL. FLOW TO EDUCTOR	4 TURNS OPEN	
VA	REFRIG. CHANGEOVER - REFRIG. TO CONDENSER	100% OPEN	
VB	SOLUTION CHANGEOVER-SOLUTION TO 1st STAGE	100% OPEN	
VD1	STEAM DRAIN DISCHARGE VALVE	CLOSED	
VD2	STEAM DRAIN DISCHARGE VALVE	1 7/8 TURNS OPEN	

**YORK INTERNATIONAL CORPORATION
APPLIED SYSTEMS PERFORMANCE TEST**

JOB NAME - DUPONT
 YORK ORDER - 93-211,038-01
 UNIT MODEL - YCP-ST-22G-46-C-XYKB
 SERIAL NO. - ~~YKBM032819~~ G L C M 157,836

10/6/94

SIGHT GLASSES

ABSORBER SHELL	● ○ ●
ABSORBER TANK	○ ●
EVAPORATOR	○
REFRIGERANT TANK	● ● ●
HI TEMP. GENERATOR -FRONT/REAR	● / ● ●
LOW TEMP. GENERATOR	○
ALCOHOL SEPARATOR	● ● ●

PROGRAMMED SETTINGS

LEAVING CHILLED WATER TEMPERATURE	44 DEG. F
CONDENSER ENTERING WATER TEMP. LIMIT	86 DEG. F
MAXIMUM STEAM VALVE OPENING	100%
TIME DELAY BETWEEN 2 SPRAY SOLUTION PUMPS	DEFAULT SETTING

Tower Temp Split (F)	Flow (GPM)	Press. Drop (ft of Water)	Steam Consumption (lbs/hr)
85 - 100	4474	31.6	15377
85 - 99	4792	33.8	15200
85 - 98	5160	36.3	15035
85 - 97	5588	39.7	14864
85 - 96	6095	43.5	14694
85 - 95	6702	48.5	14528

11.17 ft/sec in absorber

48.6 ft of head

FACSIMILE TRANSMISSION



Applied Systems Service

York International Corporation
P.O. Box 1592
York, PA 17405
Fax: (717) 771-6844

Fax No. : ----
Attention : Joe Lang
Company : York Philadelphia

Date : 2/24/95
From: Joe Brillhart

This fax consists of 1 pages including this cover sheet.

*Ron/Ian
Serial# that was
reported by Keener is
GLCM157836 - I am
concerned that the serial
on our test report is
wrong.*

Subject: Dupont Experimental Station

Joe,

I rec'vd a very alarming phone call yesterday from Charlie Keener after he visited the subject site. Apparently one unit has been sitting there for weeks (months?) with the rupture disks removed. Only one of these units was factory tested, which means it was charged with LiBr. We are still working on identification of the serial number Charlie gave me over the phone. If the unit that was factory tested is the one that Charlie is talking about, we are talking big, big, problems.

There is a factory installed tag that warns whoever not to remove the rupture disk(s) without contacting York and there is also a huge yellow sticker on the control panel shrink wrap that explains what installation manual they should be using and how to contact York for any questions.

Hopefully, the unit in question is one of the uncharged units (if that is the case we should still go on record that sitting open could have harmed the unit), but if it is the factory tested unit, we must quickly take a very hard line in writing to Dupont, that York will not take any responsibility for long term damage to this unit as a result of the contractor's negligence.

Unfortunately, I will be leaving for Houston today and will be gone for 2 1/2 weeks. Please contact either Ron Filius or Ian Casper about this. Right now it is paramount to determine which unit this is.

Regards,

*According to our records the
unit that was tested was YKMB032819
Please confirm that unit ~~is~~ is there and tight.*

*cc: Ron Filius
IAN CASPER*

YORK[®] INTERNATIONAL

CORPORATION

March 7, 1995

Mike Haggarty
Building Systems & Services
4 Colby Avenue
Claymont, DE 19703

RE: E.I. DUPONT DeNemours & Company
S/O 93-211038 - Experimental Station
YPC-ST-22G S/N GLMC157836

Dear Mike,

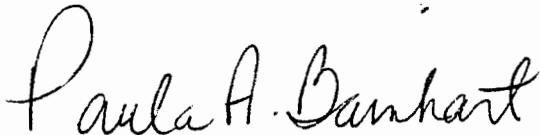
This office recently became aware that the above referenced unit was sitting, for an undetermined amount of time, with the rupture disk removed at the above mentioned job site by memo from Joe Brillhart, dated February 24, 1995.

As your know, this unit was factory tested and therefore had been charged with lithium bromide. This unit was exposed to oxygen which will cause severe corrosion. The referenced unit will require extensive clean-up to minimize the damage resulting from this exposure. Any and all expenses incurred during this clean-up are the sole responsibility of the customer and will not be covered under warranty.

As always, York International is concerned with our customer's satisfaction. To protect York's long term warranty exposure and ensure customer satisfaction, this letter serves as notice to your office that only manufacturing defects will be honored under York's standard warranty. Any future issues that are reported and are related to the unit being exposed to atmosphere will not be covered under warranty.

If you have any questions or concerns please feel free to contact me at (717)771-7312.

Sincerely,



Paula A. Barnhart
Applied Systems Quality Engineer

PAB/der

C - Ron Filius
Tim Couch
Joe Lang
Joe Brillhart

Qd

S/O
93211038

Shipped
10/27/94

SIN
GLCM157836
STM GEN N/B 67815
0494-158026

94211 016-01

12/28/94

GLNM230107
STM GEN N/B 67991
1094-230185

94211 016 - 01

1/27/95

GADM233620
STM GN N/B 68175
1194-233695

94211 016 - 02

2/16/95

GBDM248980
STM GN N/B 68318
0195-249073

Send To: <u>Bldg. Sys. + Serv.</u>	Attn: <u>Mike Haggerty</u>
Fax #: _____	cc: _____
Sender: IAN CASPER	Mail Code: 36BU Extn: 6359
YORK INTL Fax #: (717) 771-6820	Verify #: (717) 771-6856
DATE SENT: _____	TIME SENT: _____

Mike,

Attached is a little note
informing you of our change to
Molybdate. For a 22" - 5T
the solution charge is
22000 lbs, the molybdate
is in solution at 174ppm
which gives you a total
of 3.8 lbs of molybdate in
your unit.

Best Regards,
Jan



PO BOX 1592-36BU
YORK, PA 17405-1592

Inter-office Memo

To: Mike Haggarty

From: Ian Casper
Location: York PA, 36BU
Ext: 6359

Date: March 7, 1994

Re: Lithium Molybdate inhibitor replacing Lithium Nitrate

Several months ago Hitachi changed their inhibitor from Lithium Nitrate to Lithium Molybdate. The Molybdate has been successful in the field, and we feel confident that Molybdate is a superior inhibitor. As a result, York made the decision to supply Lithium Molybdate inhibitor in all new, U.S. built, ParaFlow absorption chillers.

The 22G-Steam unit for DuPont, sales order 93-211038-01, will receive the Lithium Molybdate inhibitor. Attached is the Material Safety Data Sheet (MSDS) for Lithium Molybdate. If you have any questions, please let me know.

Regards

A handwritten signature in black ink, appearing to read "Ian M. Casper", is written over the typed name.

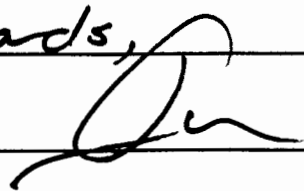
Date: 3/23/94

Send To: <u>Bldg. Sys + Serv.</u>	Attn: <u>Mike Haggarty</u>
Fax #: _____	cc: _____
Sender: IAN CASPER	Mail Code: 36BU Extn: 6359
YORK INTL Fax #: (717) 771-6820	Verify #: (717) 771-6856
DATE SENT: _____	TIME SENT: _____

Mike,

The cost add for you customer
to witness the running of his
unit will be \$15000.00 MLP.

This is the same thing everyone
who wants to see their chiller
running gets charged, it is
necessary for us to be consistent
with all customers on this issue.

Best Regards,


ENGINEERING TESTING MEMO

15 DEC 93

TO: J.A. Kohler 191A

FROM: G.C. Mitch 191A

SUBJECT: Factory Performance Testing Capabilities for LiBr Chillers

REF: Test Requests for

93-106,036...Ortho-McNeil, 22 G (steam)

93-211,038-01...DuPont, 22 G (steam)

Water flow requirements, gpm:	Evap	Cond
Ortho-McNeil	2,243	5,496
DuPont	2,990	6,702
Water flow limits, Bldg. 15	3,300	4,500

The condenser water flow requirements of these 2 chillers exceed the capabilities of the test facility in Bldg. 15. These limitations were made known to Marketing last year.

The fact is that we can not provide the condenser water flows required for these 2 chillers. The test facility was designed for a maximum test chiller capacity of 1000 TR. We were able to test the 1500 TR Squibb and Merck chillers because:

- 1.) they used a 15 deg F range for the condenser water, and
- 2.) we replaced the water pumps to give us the additional head and flow capacities that could be realized with the existing water piping.

If we are to test these chillers at Grantley, the test conditions will have to be revised to fall within our water flow limits.

If we need to discuss this issue further, I suggest that we do so prior to the end of 1993.

cc: J.R. Mann E.D. Graham J.O. Weber



Balanced
 Gpm
 4540
 4837
 5183
 5556
 6061
 6633

Tower Temp Split (F)	Flow (GPM)	Press. Drop (ft of Water)	Steam Consumption (lbs/hr)
85 - 100	4474	31.6	15377
85 - 99	4792	33.8	15200
85 - 98	5160	36.3	15035
85 - 97	5588	39.7	14864
85 - 96	6095	43.5	14694
85 - 95	6702	48.5	14528

Steam
 Heat Input
~~16,048,974~~
 15,864,240
 15,642,029
 15,513,556
 15,336,127
 15,162,873

16,048,974

Cooling
 Load
 Input
 18,000,000
 ↓

Total
 Input
 33,048,974
 33,864,240
 33,642,029
 33,513,556
 33,336,127
 33,162,873

Total Enthalpy per Pound: $h_g = 1191.7 \text{ BTU/lb @ } 130 \text{ lb abs}$

$h_f = 148.0 \text{ BTU/lb @ } 180^\circ \text{ T}$

Heat input/lb = 1043.7 BTU/lb

Date: 8/26/97

Send To:	Building Systems	Attn:	Mike Haggerty
Fax #:	[43]		
cc:		Attn:	
Fax #:			
cc:		Attn:	
Fax #:		cc:	
Sender:	JIM FURLONG	Mail Code:	361R Extn: 6355
YORK INTL Fax #:	(717) 771-6820	Verify #:	(717) 771-6832
DATE SENT:		TIME SENT:	

Re: DuPont

Mike:

Condenser water flows which reflect true heat balance are tabulated along left column on the attached table.

Please call Bernd Koch this morning if you have further questions. I will be at a meeting - Bernd can grab me if necessary. → Ext 6388

Best Regards
Jim

BUILDING SYSTEMS & SERVICES, INC.
4 COLBY AVE.
CLAYMONT, DE 19703
TELEPHONE (302)792-0550
FAX (302)792-0233

FACSIMILE COVER SHEET

TO: Tim Couch
COMPANY: York International
SUBJECT: DuPont Experimental Station : 93211038-01
PHONE: 717-771-7334
FAX: 717-771-6841

FROM: Michael J. Haggarty Jr.
DATE: August 29, 1994
TOTAL NUMBER OF PAGES INCLUDING THIS PAGE: 1

COMMENTS:

Tim,

I met with DuPont today concerning the absorption section tubing. DuPont has agreed to accept the enhanced 19 FPI 0.035 inch option "A" tubes which have been put in the first machine by mistake. DuPont has accepted this with the understanding that the first chiller will still ship on September 30, 1994.

DuPont has also agreed to accept the same option "A" tubes for the next three absorbers on order number 94211016-01,02. These enhanced tubes for all four chiller will be provided to DuPont at no extra charge.

Chillers 2 and 3 shall ship on January 6, 1995 and chiller 4 shall ship by February 17, 1995.

Thank you for your help and call me with any questions.

Mike

CC: Glen Smeltzer, fax ext. 6476
Ian Casper, fax ext. 6820 ←
Jim Furlong, Fax ext. 6820

Date: 9/2/94

Send To: Bldg. Sys and Services

Attn: Mike Haggarty

Fax #: _____

cc: _____

Sender: **IAN CASPER**

Mail Code: 36BU Extn: 6359

YORK INTL Fax #: (717) 771-6820

Verify #: (717) 771-6856

DATE SENT:

TIME SENT:

Mike,
It is becoming a priority that we know the operating conditions for the Dulont test. Of course, I recognize that the question is coming from the same people that caused the problem to begin with, but please pursue the answer as quickly as possible; Much of the piping will have to be pre fabricated ahead of time. Thank you,
Ian Casper

Date: 9/13/94

Send To: Bldg. Sys + Serv.

Attn: Mike Haggarty

Fax #: _____

cc: _____

Sender: **IAN CASPER**

Mail Code: 361P Extn: 6359

YORK INTL Fax #: (717) 771-6820

Verify #: (717) 771-6856

DATE SENT:

TIME SENT:

Mike,

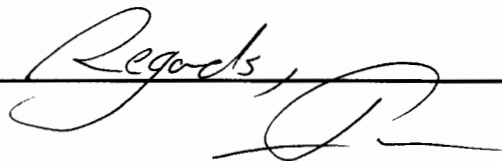
The DuPont 22G units will test at -

Evap: 2990 GPM 57/45

Abs/Cond: 4500 GPM 83.5/98.4

@ 1500 TONS

These conditions will allow us to simulate
the "head" (in vapor compression rings)
of the design load while using our
reduced flow.

Regards,


COST TO GO TO 0.035" Wall vs. Std. wall

Std
\$12,863.00

19 fpi
\$11,167.00

COST PREMIUM FOR OPTION A VS STD
AT STD TUBE THICKNESS.

\$6271.00

TOTAL TUBE PURCHASE COST for 0.035" wall tubes

<u>STD</u>	<u>19 fpi</u>
\$ 0.00	\$ 6271.00
+ \$ 12863.00	+ \$ 11167.00
<hr/>	<hr/>
\$ 12863.00	\$ 17438.00

Loss per chiller giving away 0.035" wall Option A tubes:

\$ 17438.00 - \$ 12863.00 =

\$ 4,575.00 / Chiller

Date: 10/19/94

Send To: Bldg. Sys. and Serv.

Attn: Mike Haggarty

Fax #: _____

cc: _____

Sender: **IAN CASPER**

Mail Code: 361P Extn: 6359

YORK INTL Fax #: (717) 771-6820

Verify #: (717) 771-6856

DATE SENT:

TIME SENT:

Mike,

I am assuming my interpretation of the drawings
is correct: there will be steel plate elevated on
steel I-beams in the same places our
foundation plan called for elevated pads.
York does not see a problem with this. York,
of course, cannot comment on the structural
integrity of their pad design.

The main things to keep in mind are not to have
an elevated platform anywhere besides where we
call for it because it restricts service access;
and keeping the machine level is important to
operation. Best Regards, Jm

**BUILDING SYSTEMS & SERVICES, INC.
4 COLBY AVE.
CLAYMONT, DE 19703
TELEPHONE (302)792-0550
FAX (302)792-0233**

FACSIMILE COVER SHEET

**TO: Ian Casper
COMPANY: York International
SUBJECT: DuPont Experimental Station 94211016-01,02
PHONE: 717-771-6359
FAX: 717-771-6820**

**FROM: Michael J. Haggarty Jr.
DATE: October 18, 1994
TOTAL NUMBER OF PAGES INCLUDING THIS PAGE: 5**

COMMENTS:

Ian,

Please have someone in engineering review the attached structural design drawings for a steel "I" beam foundation for the 1500 ton steam absorbers on the subject project. The steel foundation will be used instead of a concrete house keeping pad.

DuPont wants to know if York Int. sees any problem with this design.

Thank you for your help.

Mike

**STEINLE
CONSTRUCTION ENGINEERS, INC.**

2005 Concord Pike
WILMINGTON, DELAWARE 19803-2976
(302) 658-1522

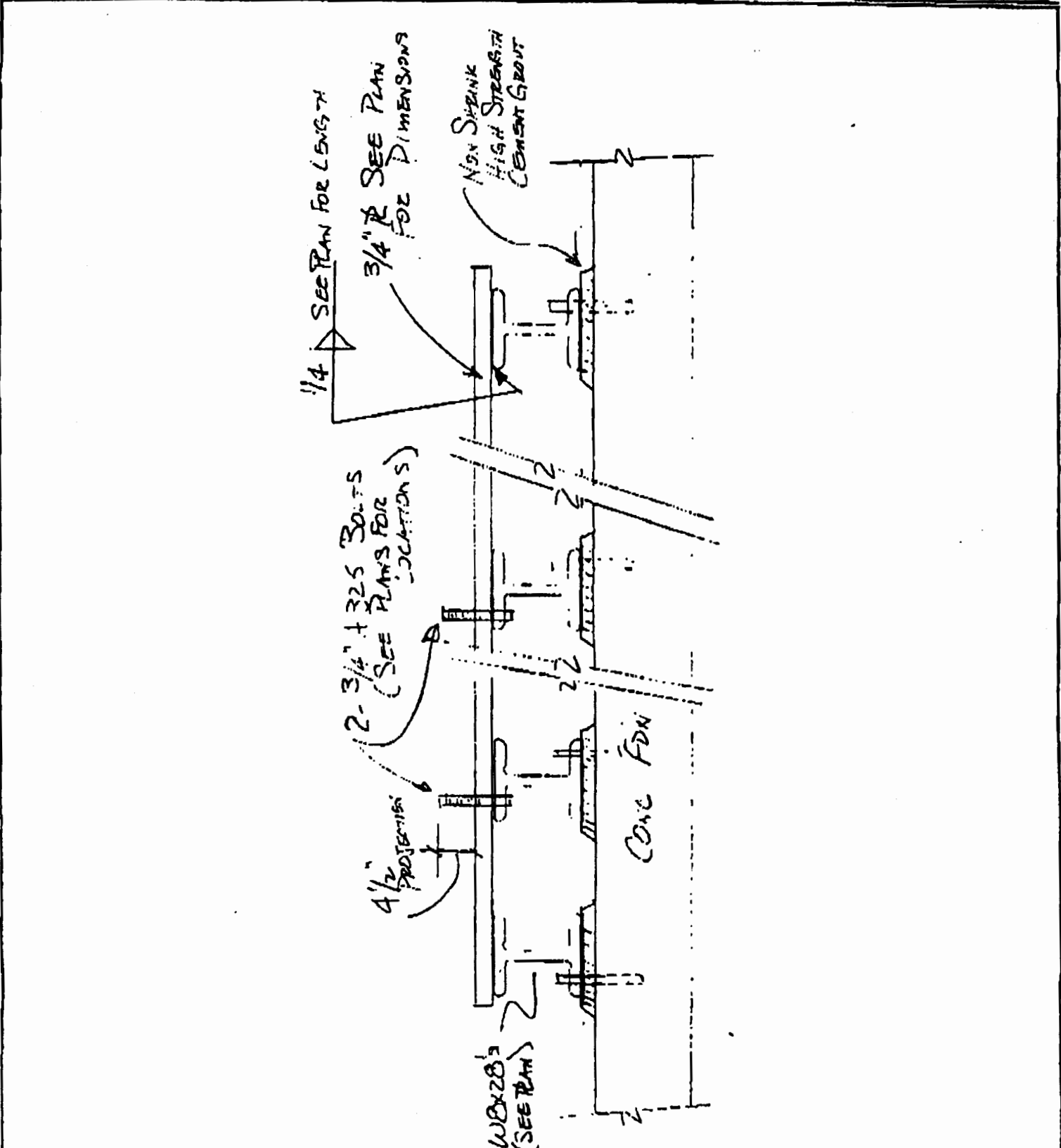
JOB 315 CHILLER FDN PEDESTALS

DRAWING NO. 4

DATE 10/12/94

CHECKED BY [Signature] DATE

SCALE 94-163



**STEINLE
CONSTRUCTION ENGINEERS, INC.**

2005 Concord Pike
WILMINGTON, DELAWARE 19803-2976
(302) 658-1522

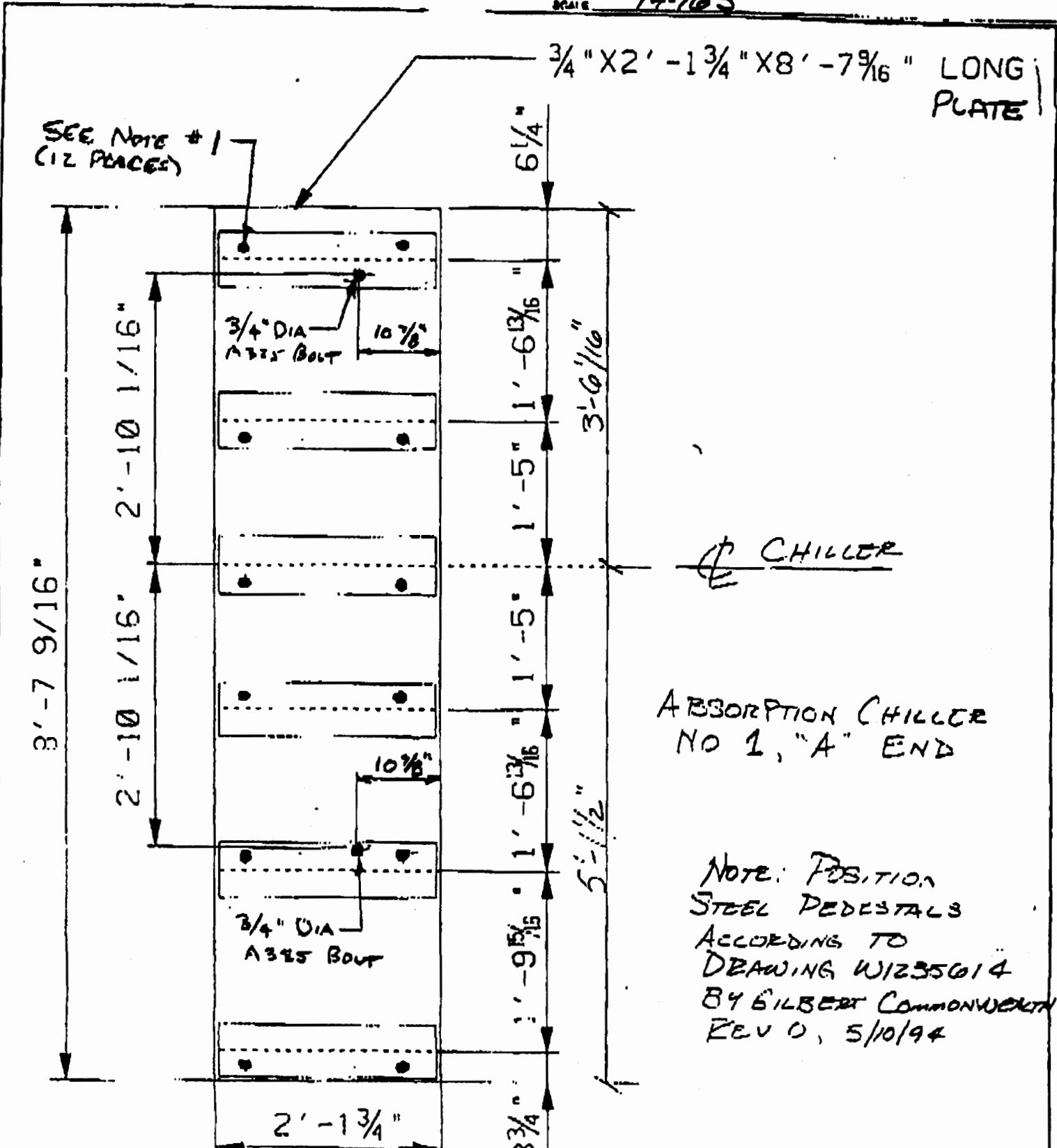
JOB 315 CHILLER - FDN PEDESTAL

SHEET NO. 2 OF 4

CALCULATED BY DBS DATE 10/12/94

CHECKED BY _____ DATE _____

SCALE 94-163



ABSORPTION CHILLER
NO 1, "A" END

NOTE: POSITION
STEEL PEDESTALS
ACCORDING TO
DRAWING W1235014
BY GILBERT COMMONWEALTH
REV 0, 5/10/94

10/12/94 16:21

STEINLE CONST. ENGRS

006

STEINLE
CONSTRUCTION ENGINEERS, INC.
2005 Concord Pike
WILMINGTON, DELAWARE 19803-2976
(302) 658-1522

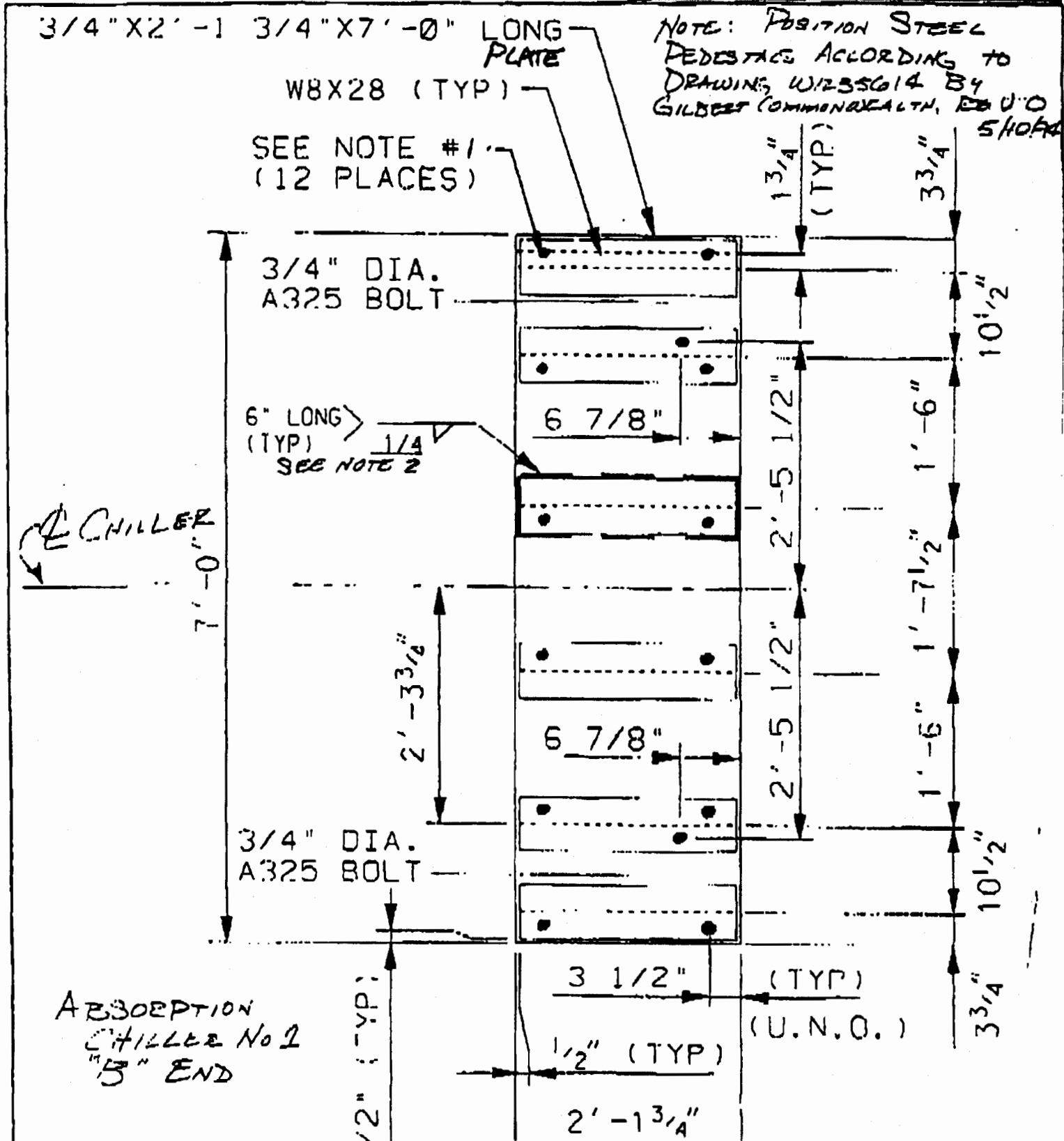
JOB 315 CHILLER - FDN PEDESTALS

SHEET NO 3 OF 4

CALCULATED BY WBS DATE 10/12/94

CHECKED BY _____ DATE _____

SCALE 94-103



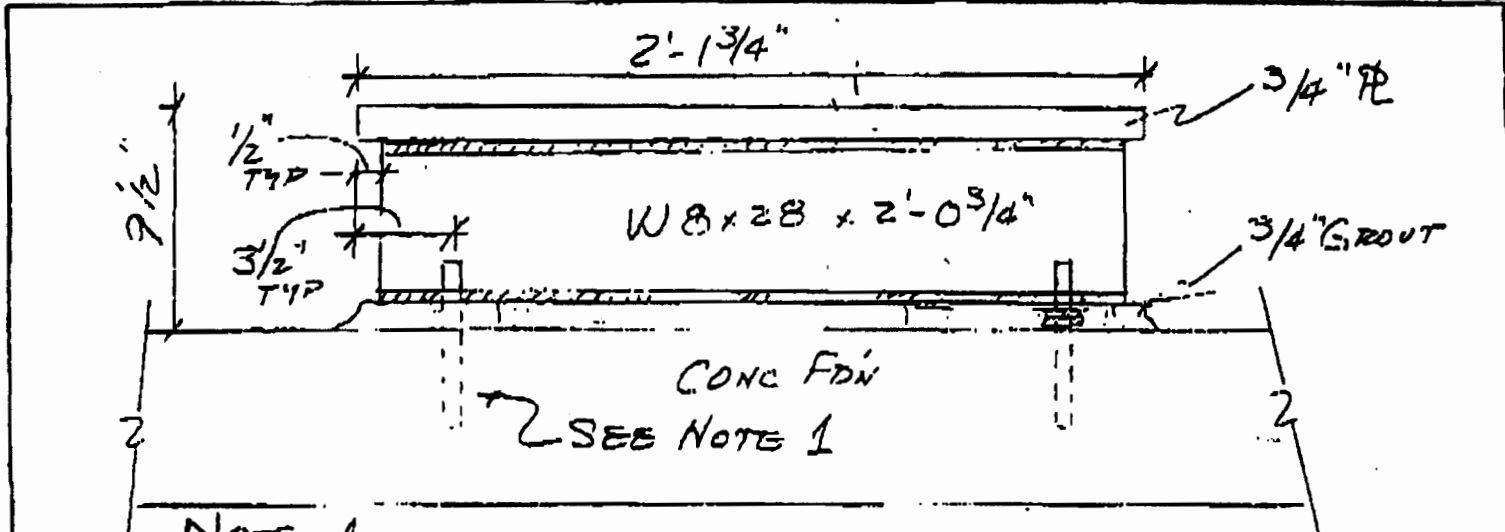
10/12/94 16:21

STEINLE CONST. ENGRS

007

STEINLE
CONSTRUCTION ENGINEERS, INC.
2005 Concord Pike
WILMINGTON, DELAWARE 19803-2976
(302) 658-1522

FOR 315 CHILLER FDN PEDESTALS
DIFF. NO. 4 IN 4
CALCULATED BY WES DATE 10/12/94
CHECKED BY _____ DATE _____
SCALE 94-163



NOTE 1

DRILL 7/8" DIA HOLE x 6 5/8" DEEP
FOR 3/4" DIA x 9 5/8" HAS ANCHOR
RODS, A36 STEEL. ANCHORS TO
BE SET USING HILTI HVA ANCHOR
SYSTEM USING HVA ADHESIVE.
CAPSULES & HAS THREADED RODS.
(12 ANCHORS REQ'D PER PEDESTAL -
SEE PLAN VIEWS FOR LOCATION)

NOTE 2

ALL WELDS SHALL BE 1/4" FILLET UNLESS
OTHERWISE SHOWN. SEE PLAN VIEWS FOR
TYPICAL LOCATIONS

Date: 11/23/94

Send To: Bldg. Sys + Serv.

Attn: Mike Haggarty

Fax #: _____

cc: _____

Sender: **IAN CASPER**

Mail Code: 361P Extn: 6359

YORK INTL Fax #: (717) 771-6820

Verify #: (717) 771-6856

DATE SENT:

Re: Rupture Disks

TIME SENT:

Mike,

The rupture disks are not certified by ASME ; this is not necessary for the low bursting pressures we are concerned with.

Zook, the manufacturer, is required by York Int. to test two disks from each batch with a third party witnessing the tests.

If this information is not enough, or you need it to look prettier let me know.

I

Date: 11/23/94

Send To: <u>Bldg. Sys. + Services</u>	Attn: <u>Mike Haggarty</u>
Fax #: _____	cc: _____
Sender: IAN CASPER	Mail Code: 361P Extn: 6359
YORK INTL Fax #: (717) 771-6820	Verify #: (717) 771-6856
DATE SENT: _____	TIME SENT: _____

Mike,

Responses to your 11/22/94 fax for Dupont:

1. Flow switches - McDonnell + Miller

Model FS8V , Paddle Type, Vapor Proof
Single Pole, Double Throw (SPDT)

2. Please clarify - certified for what or by what??

3. If all pumps (Chilled Water, Tower Water, Refrigerant, and Solution)
are still running and the steam was shut off it would be
the same as a dilution cycle which the machine is put through
during a normal shutdown. The dilution cycle lowers the concentration
so that the unit will not crystallize when it cools. Rate of
steam shut off (gradual or instantaneous) will not make a
difference. (next page)

If there is a chance of the steam being shut off, it would be prudent to connect it ~~sense~~ through the auxiliary safety shutdown contacts (see Fig N in the Field Modification Diagram Form 155.17-PA1) so the chiller would know to shut down; then the dilution cycle would end when the solution temp. reached acceptable temp. and shut the pumps off. ■

Please call if you have questions,

Enjoy your Holiday

A handwritten signature in cursive script, appearing to read "D. Lopez", written in black ink.

BUILDING SYSTEMS & SERVICES, INC.
4 COLBY AVE.
CLAYMONT, DE 19703
TELEPHONE (302)792-0550
FAX (302)792-0233

FACSIMILE COVER SHEET

TO: Ian Casper
COMPANY: York International
SUBJECT: DuPont Experimental Station
PHONE: 717-771-6359
FAX: 717-771-6820

FROM: Michael J. Haggarty Jr.
DATE: November 22, 1994
TOTAL NUMBER OF PAGES INCLUDING THIS PAGE: 1

COMMENTS:

Ian,

Could you please provide me with the following information.

- 1) A data specification sheet for the flow switches which are provided with the 1500 ton steam absorption chiller.
- 2) Are the rupture disks which are provided on these chillers certified by the supplying manufacturer? If so, I need something from that manufacturer in writing stating the products certification.
- 3) If the chiller is operating and the steam supply is shut-off instantly will the unit crystallize. The pumps would still be running.

McDonnell + Miller
Model FS8V
Paddle type
Vapor Proof
SPDT

Thank you for your help.

Have a Happy Thanksgiving!
m

Dilution Cycle? Sounds ok. to me.
- all: chilled, Tower, Sol., Refrig.?

Date: 10/7/94

Send To: <u>Bldg. Sys + Serv.</u>	Attn: <u>Mike Haggarty</u>
Fax #: _____	cc: _____
Sender: IAN CASPER	Mail Code: 361P Extn: 6359
YORK INTL Fax #: (717) 771-6820	Verify #: (717) 771-6856
DATE SENT: _____	TIME SENT: _____

Mike,
Here's the test papers from
the first DuPont Exp. Station
unit.

Rec'ds,
[Signature]

York International Corporation, York, PA
Applied Systems Performance Test

JOB NAME: DUPONT
YORK ORDER: 93-211,038-01
UNIT MODEL: YPC-ST-22G-46-C-X
SERIAL NUMBER: YKBM032819

Date: 10/05/94
Time: 10:21

OPERATING CONDITIONS: Test
Actual

Evaporator:

Capacity (TR)	1473.2
Flow (GPM)	2983.9
Entering Temp (degF)	57.12
Leaving Temp (degF)	45.29
Range (degF)	11.84
Pressure Drop (ft WC)	22.4 42.4
Fouling Factor	.00025
Liquid Type	WATER
Pass Arrangement	2 PASS

JAK
10/5/94

Absorber/Condenser:

Flow (GPM)	4493.3
Entering Temp (degF)	83.48
Leaving Temp (degF)	98.63
Range (degF)	15.16
Pressure Drop (ft WC)	42.4 30.4
Fouling Factor	.00025
Liquid Type	WATER
Pass Arrangement	1 PASS

JAK
10/5/94

York International Corporation, York, PA
 Applied Systems Performance Test

JOB NAME: DUPONT Date: 10/05/94
YORK ORDER: 93-211,038-01 Time: 10:21
UNIT MODEL: YPC-ST-22G-46-C-X
SERIAL NUMBER: YKBM032819

<u>ENERGY INPUT:</u>	<u>Test</u> <u>Actual</u>
<u>Steam:</u>	
Temperature (degF)	348.2
Pressure (psig)	114.8
Flow (as Tested) (lb/hr)	15022.3
Flow (Insulated) (lb/hr)	14444.5
Condensate temperature (degF)	180.1
Condensate pressure (psig)	20.0
Voltage	480.0 482.0 480.0
Current	37.8 37.7 40.0
Power (KW)	16.2
Calc Energy In (as Tested) - cooling mode (MBH)	15703.6
Calc Energy In (Insulated) - cooling mode (MBH)	15099.6

PERFORMANCE RESULTS - COOLING MODE:

$$\frac{\text{Actual Capacity}}{\text{Design Capacity}} \times 100\% = 98.2\%$$

$$\text{Heat Balance Closure} = \frac{(\text{Q}_{\text{evap}} + \text{Q}_{\text{input}} - \text{Q}_{\text{cond}})}{\text{Q}_{\text{cond}}} \times 100\% = -1.6\%$$

York International Corporation, York, PA
Applied Systems Performance Test

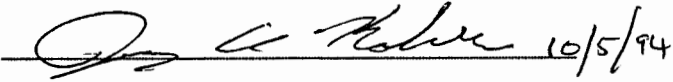
JOB NAME: DUPONT
YORK ORDER: 93-211,038-01
UNIT MODEL: YPC-ST-226-46-C-X
SERIAL NUMBER: YKBM032819

Date: 10/25/94
Time: 10:21

Barometric Pressure: 14.55
Ambient Temperature: 66.8

COMMENTS: _____

DATA REVIEWED AND VERIFIED:

 10/5/94
Resident Engineer

 10/5/94
 10/5/94

York International Corporation, York, PA
Applied Systems Performance Test

Level 2 Startup Information

<u>JOB NAME:</u>	DUPONT	Date: 10/05/94
<u>YORK ORDER:</u>	93-211,038-01	Time: 10:21
<u>UNIT MODEL:</u>	YPC-ST-22G-46-C-X	
<u>SERIAL NUMBER:</u>	YKBM032819	

	<u>Test</u>
<u>CYCLE CONDITIONS - COOLING:</u>	<u>Actual</u>
First Stage Generator:	
Pressure (psia)	12.8
Solution Leaving Temp (degF)	317.2
Second Stage Generator:	
Solution Entering Temp (degF)	172.4
Solution Leaving Temp (degF)	198.2
Absorber:	
Solution Concentration (%)	57.7
Solution Leaving Temp (degF)	97.1

York International Corporation, York, PA
Applied Systems Performance Test

Level 2 StartUp Information

JOB NAME: DUPONT Date: 10/05/94
YORK ORDER: 93-211,038-01 Time: 10:21
UNIT MODEL: YPC-ST-226-46-C-X
SERIAL NUMBER: YKBM032819

CHARGING QUANTITIES:

	LiBr Solution at 53%	Refrigerant	Alcohol
Charged for testing	_____ lb	_____ gal	_____ gal
Removed for Shipping (1)	_____ lb	_____ gal	---
Add for start up (1)	_____ lb	_____ gal	---

Note: (1) LiBr and refrigerant charge shipped as _____
barrels of solution with an average LiBr
concentration of _____ % + _____ barrels of
refrigerant. Some alcohol will be in the solution
and refrigerant which was removed for shipping.

York International Corporation, York, PA
Applied Systems Performance Test

JOB NAME: DUPONT
YORK ORDER: 93-211,038-01
UNIT MODEL: YPC-ST-22G-46-C-XYKB
SERIAL NUMBER: YKBM032819

Date: 10/05/94
Time: 10:45

<u>OPERATING CONDITIONS:</u>	<u>Test</u> <u>Actual</u>
Evaporator:	
Capacity (TR)	1474.0
Flow (GPM)	2984.3
Entering Temp (degF)	57.13
Leaving Temp (degF)	45.29
Range (degF)	11.84
Pressure Drop (ft WC)	42.4
Fouling Factor	.00025
Liquid Type	WATER
Pass Arrangement	2 PASS
Absorber/Condenser:	
Flow (GPM)	4487.5
Entering Temp (degF)	83.48
Leaving Temp (degF)	98.65
Range (degF)	15.17
Pressure Drop (ft WC)	30.4
Fouling Factor	.00025
Liquid Type	WATER
Pass Arrangement	1 PASS

York International Corporation, York, PA
 Applied Systems Performance Test

JOB NAME: DUPONT
YORK ORDER: 93-211,038-01
UNIT MODEL: YPC-ST-22G-46-C-XYKB
SERIAL NUMBER: YKBM032819

Date: 10/05/94
 Time: 10:45

<u>ENERGY INPUT:</u>	<u>Test</u> <u>Actual</u>
Steam:	
Temperature (degF)	348.3
Pressure (psig)	114.9
Flow (as Tested) (lb/hr)	15021.5
Flow (Insulated) (lb/hr)	14443.7
Condensate temperature (degF)	180.2
Condensate pressure (psig)	20.0
Voltage	480.0 482.0 480.0
Current	37.8 37.7 40.0
Power (KW)	16.2
Calc Energy In (as Tested) - cooling mode (MBH)	15700.8
Calc Energy In (Insulated) - cooling mode (MBH)	15096.9

PERFORMANCE RESULTS - COOLING MODE:

$$\frac{\text{Actual Capacity}}{\text{Design Capacity}} \times 100\% = 98.3 \%$$

$$\text{Heat Balance Closure} = \frac{(\text{Q}_{\text{evap}} + \text{Q}_{\text{input}} - \text{Q}_{\text{cond}})}{\text{Q}_{\text{cond}}} \times 100\% = -1.6 \%$$

York International Corporation, York, PA
Applied Systems Performance Test

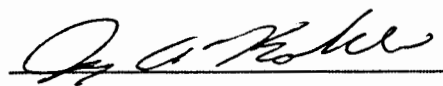
JOB NAME: DUPONT
YORK ORDER: 93-211,038-01
UNIT MODEL: YPC-ST-226-46-C-XYKB
SERIAL NUMBER: YKBM032819

Date: 10/05/94
Time: 10:45

Barometric Pressure: 14.55
Ambient Temperature: 66.5

COMMENTS: _____

DATA REVIEWED AND VERIFIED:

 10/5/94

Resident Engineer

York International Corporation, York, PA
Applied Systems Performance Test

Level 2 Startup Information

JOB NAME: DUPONT Date: 10/05/94
YORK ORDER: 93-211,038-01 Time: 10:45
UNIT MODEL: YPC-ST-22G-46-C-XYKB
SERIAL NUMBER: YKBM032819

	<u>Test</u>
<u>CYCLE CONDITIONS - COOLING:</u>	<u>Actual</u>
First Stage Generator:	
Pressure (psia)	12.9
Solution Leaving Temp (degF)	317.4
Second Stage Generator:	
Solution Entering Temp (degF)	172.5
Solution Leaving Temp (degF)	198.4
Absorber:	
Solution Concentration (%)	57.7
Solution Leaving Temp (degF)	97.2

York International Corporation, York, PA
Applied Systems Performance Test

Level 2 StartUp Information

JOB NAME: DUPONT Date: 10/05/94
YORK ORDER: 93-211,038-01 Time: 10:45
UNIT MODEL: YPC-ST-226-46-C-XYKB
SERIAL NUMBER: YKBM032819

CHARGING QUANTITIES:

	LiBr Solution at 53%	Refrigerant	Alcohol
Charged for testing	_____ lb	_____ gal	_____ gal
Removed for Shipping (1)	_____ lb	_____ gal	---
Add for start up (1)	_____ lb	_____ gal	---

Note: (1) LiBr and refrigerant charge shipped as _____
barrels of solution with an average LiBr
concentration of _____ % + _____ barrels of
refrigerant. Some alcohol will be in the solution
and refrigerant which was removed for shipping.

Joe Brillhart

York International Corporation, York, PA
Applied Systems Performance Test

JOB NAME: DUPONT
YORK ORDER: 93-211,038-01
UNIT MODEL: YPC-ST-226-46-C-X
SERIAL NUMBER: YKBM032819

Date: 10/05/94
Time: 10:45

OPERATING CONDITIONS:

Test
Actual

SUBMIT

Evaporator:

Capacity (TR)
Flow (GPM)
Entering Temp (degF)
Leaving Temp (degF)
Range (degF)
Pressure Drop (ft WC)
Fouling Factor
Liquid Type
Pass Arrangement

1474.0 - 1474
2984.3
57.13
45.29
11.84
42.4 - 43.0
.00025
WATER
2 PASS

Absorber/Condenser:

Flow (GPM)
Entering Temp (degF)
Leaving Temp (degF)
Range (degF)
Pressure Drop (ft WC)
Fouling Factor
Liquid Type
Pass Arrangement

4487.5 - 4487
83.48
98.65
15.17
30.4 - 31.9
.00025
WATER
1 PASS

Joe

With respect to your memo of 10/10,
please refer to above 226 data from Dupont
chiller with evap/absorb/cond machine WBS.
Test data indicates good correlation to
SUBMIT program (this unit = .025 in evap/absorb/cond),
when entering actual flow rates in SUBMIT

Jay Koller
10/10

Date: 3/18/94

Send To: <u>Bldg Systems</u>	Attn: <u>Mike Haggerty</u>
Fax #: <u>302 792 0233</u>	cc: <u>G. Smeltzer</u>
Sender: JIM FURLONG	Mail Code: 36BU Extn: 6355 <u>X6476</u>
YORK INTL Fax #: (717) 771-6820	Verify #: (717) 771-6856
DATE SENT:	TIME SENT:

Re: DuPont

Mike:

Per Glen Smeltzer's fax to you dated 3/15/94 (attached) he itemized ~~3~~ different tests to be performed (A-G). All of the first 6 tests (A-F) will be reconfirmed during test G.

We will allow DuPont to witness test G at no charge.

If they also choose to witness other tests (A-F) we will charge \$2,230 ~~MLP~~ MLP per test.

Best Regards,


C.C. TIM COUCH - 363E

PAUL ELSLAGER - 361B

(Fax 6820)
PAGE 1 OF 1

Copy Jan/Jan

TELEFAX MESSAGE



YORK INTERNATIONAL

MARCH 15, 1994
DUPONT
93-211,038-01

P.O. BOX 1592, YORK, PA 17405
TELEPHONE (717) 771-7890

TO	FROM
COMPANY BLDG. SYSTEMS	NAME: G. L. SMELTZER - 082F
ATTN . MIKE	TELEPHONE NO. (717) 771-7200
FAX NO. 302-792-0233	TELEFAX NO. (717) 771-6476

AS DISCUSSED - THIS REQUEST MUST COME THROUGH THE MARKETING / CONTRACT ADMINISTRATION DEPT. BEFORE I CAN PROCEED. CALL IF YOU HAVE ANY QUESTIONS.

AS REQUESTED - LIST OF TESTS FOR ABSORPTION UNIT

- (A) STEAM GENERATOR - HYDROSTATIC TEST - TUBE CHAMBER
AIR TEST - - - - SHELL CHAMBER
REFRIG. TEST - - - - " "
- HELIUM LEAK TEST - GENERATOR
- (B) SOL TO SOL. HTG EXCH. (RIGHT HAND) - AIR TEST
- (C) SOL TO SOL. HTG. EXCH. (LEFT HAND) - AIR TEST
- (D) SOL TO SOL HTG EXCH. (ASSY / PIPING) - AIR TEST
REFRIG. LEAK TEST
HELIUM LEAK TEST

(E) <u>MAIN SHELL</u> - AIR TEST REFRIG LEAK TEST HELIUM LEAK TEST
--

(F) REFRIG. TANK - AIR TEST

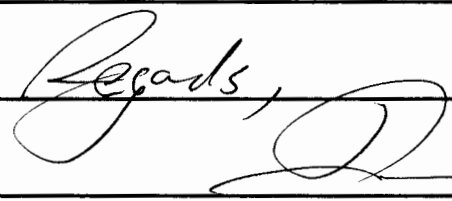
(G) UNIT ASSEMBLY - AIR TEST, REFRIG LEAK & HELIUM TEST

Date: 11/17/94

Send To: <u>Bldg Sys + Serv.</u>	Attn: <u>Mike Haggarty</u>
Fax #: _____	cc: _____
Sender: IAN CASPER	Mail Code: 361P Extn: 6359
YORK INTL Fax #: (717) 771-6820	Verify #: (717) 771-6856
DATE SENT: <u>Re: DUPONT</u>	TIME SENT: _____

Mike,

The quality testing information you asked for is attached.

Regards,


P.S. The quality testing for the remaining units would be the same as the procedures already in your/DuPont's hands for the first unit. Please call me to discuss.

INTER-OFFICE MEMO

DATE: November 17, 1994
SUBJECT: ParaFlow quality testing
FROM: Ian Casper
TO: Mike Haggarty

Listed below is a description of the quality testing that occur during the construction of a ParaFlow chiller.

For a discussion of the quality testing for ParaFlow units I would first like to define the three types of leak tests that are used:

Soap and air: This is the first level of leak checking used. The assembly to be tested is pressurized with air and then a soap solution is applied to all joints or potential leak spots to determine if air is escaping from the assembly.

Freon and air: This is the second level of leak checking used. The assembly to be tested is pressurized with a freon and air mixture. Then a electronic freon detector is used to locate any leaks where freon is escaping form the assembly.

Helium: This is the final level of leak checking that is used as the qualification of the assemblies integrity. The assembly to be tested is placed in an atmosphere of Helium. The unit is then evacuated using a vacuum pump. The exhaust of the vacuum pump is passed through a mass spectrometer to detect any helium that has entered the assembly (indicating a leak). Having the assembly under a vacuum with any potential leaks coming into the unit accurately simulates the condition under which the absorber functions normally. All the assemblies leak tested must pass a leak rate before construction of the chiller can continue. These leaks rates are listed below.

The following is a breakdown of the quality testing by assembly in the order they occur.

Solution to Solution Heat Exchanger:

Tube side -

Soap and air leak test before boxes are welded on (assures the heat exchanger is not bypassing from tube side to shell side)

Complete Assembly -

Soap and air leak test

Freon and air leak test

Helium leak test: leak rate shall not exceed 0.000002 cc/sec standard air

First Stage Generator:

Shell side -

Soap and air leak test

Freon and air leak test

Helium leak test: leak rate shall not exceed 0.000002 cc/sec standard air

Steam side -

Hydro test at 1.5 times the design pressure (test performed with water)

Main shell:

Welds -

All critical welds are die penetrant test

Complete assembly -

Soap and air leak test

Freon and air leak test

Helium leak test: leak rate shall not exceed 0.000002 cc/sec standard air

Final assembly (solution to solution, first stage gen., main shell, interconnecting piping,...):

Shell side -

Soap and air leak test

Freon and air leak test

Helium leak test: leak rate shall not exceed 0.000002 cc/sec standard air

Water boxes -

Hydro test at 1.5 times the design pressure (test performed with water)

Steam side -

Air tested at 1.25 times the design pressure. (double checks all welds, gaskets, and connections to drain coolers)

• Tube side -

Water boxes are mounted and the tube side of the heat exchangers are air tested at 1.25 times the design pressure (double checks that there are no tube leaks)

Electrical/Controls:

A complete electrical functional test is run, all thermistors are checked for accuracy, and a high potential (high pot) test is performed to verify integrity of wiring.

2450 HASSELL ROAD
HOFFMAN ESTATES, IL 60195
(708) 884-7877
(800) 222-0071

YORK INTERNATIONAL CORPORATION
J KOHLER (191A)
BLDG 19 DOOR 44
631 S RICHLAND AVE
YORK PA 17403-0999

Lab Number : 9849
Logged Date : 11-OCT-94
Sample Drawn : 04-OCT-94
Report Date : 24-OCT-94
Record Ref.# : 205980

Unit ID : YKBM032819
Sample ID : LITHIUM BROMIDE
Worksite : APPLIED SYSTEMS ENG DEPT
Time On Fluid :

Mfg. : YORK
Model : YPCST22G46CX
PO No.: 94M03012
Time On System :

TESTING PERFORMED:

MEASURED

LITHIUM BROMIDE SOLUTION ANALYSIS DATA

Specific Gravity @ 75°F	1.6700
Percent Lithium Bromide	58
Dissolved Copper - mg/L	<10
Ammonia, mg/l (*)	36
Alkalinity, N	0.147
Lithium Molybdate, mg/L	43
* mg/L divided by Specific Gravity = ppm	.

$43 \times \frac{55}{58} \times \frac{1.67}{1.67} = 40 \text{ mg/L}$ vs. 225-325 mg/L control range

RECOMMENDATIONS / COMMENTS:

SAMPLE SUBMITTED AND PROCESSED FOR THE TEST DATA (ONLY). A FAX has been dispatched for this report.

Respectfully Submitted,

Analysts, Inc.

Joe
This is the results from the solution analysis on the DuPont. We didn't ask for nitrate analysis and obviously didn't get nitrate levels. Molybdate level is quite low. Field Service should get another analysis to confirm this analysis. Attached is the certification test from FMC.

Jay K 10/24



FMC Corporation Lithium Division 449 North Cox Road
 Box 3925 Gastonia North Carolina 28054 Fax 704 868 5370

New solution certs.

QUALITY CERTIFICATE

PAGE : 01 of 01

LITHIUM BROMIDE SOLUTION, YORK, MOLYBDATE/NITRATE INHIBITED

CUSTOMER ORDER NO.: 94M01390 *Depart* FMC ORDER NO. : 014296 -001
 CUSTOMER CODE : None FMC PRODUCT CODE: 415-14-326
 CUSTOMER NUMBER : 004505 001 DATE CERTIFIED : 22-JUN-1994
 AMOUNT SHIPPED : 55 X 212 LBS CONT. DATE SHIPPED : 22-JUN-1994

SOLD TO: YORK INTERNATIONAL CORPORATION
 ATTN: ACCOUNTS PAYABLE
 P.O. BOX 15131
 YORK, PENNSYLVANIA

SHIP TO: YORK INT'L CORP (A/S)
 631 SOUTH RICHLAND AVE/DOOR 14
 YORK, PENNSYLVANIA

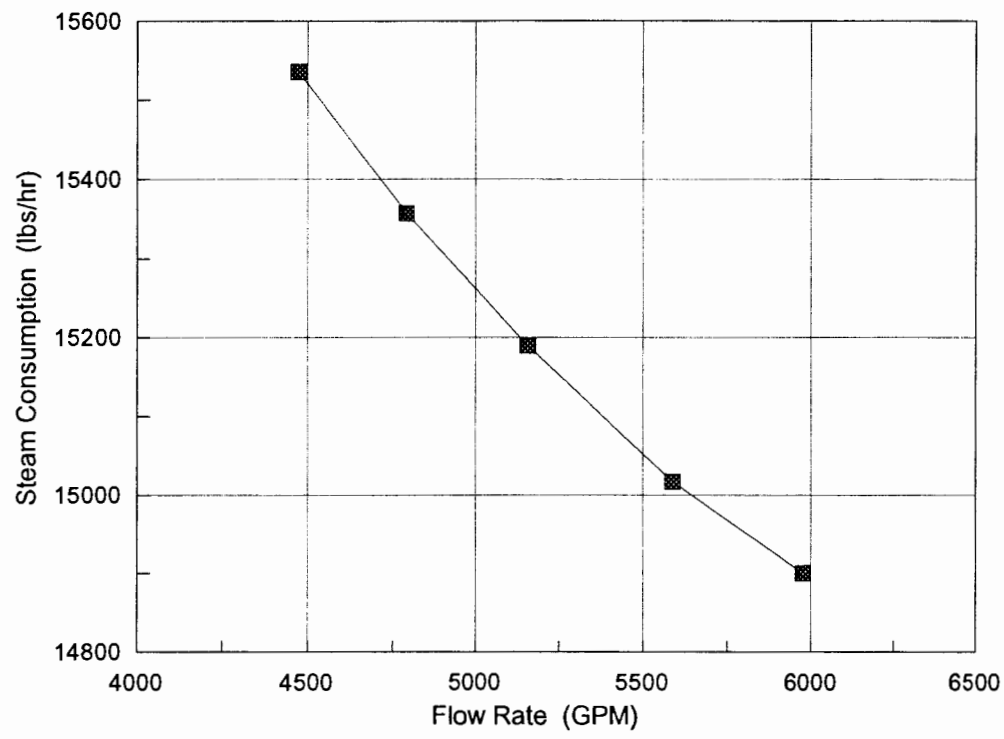
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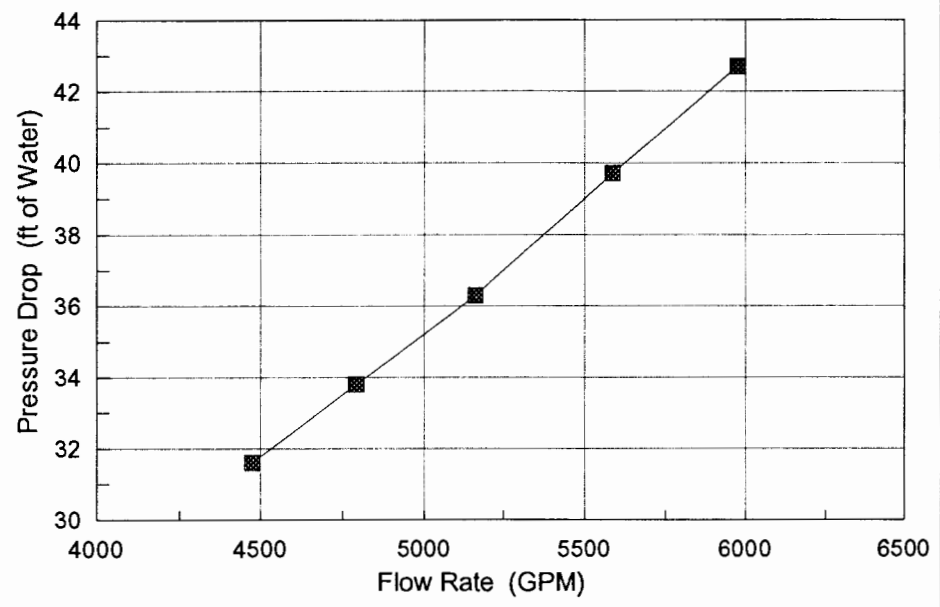
PARAMETER	SPECIFICATION		LOT NUMBER / ANALYSIS
	Minimum	Maximum	
			1156
Wt % LiBr	54.5	55.5	54.8
Wt %, Alk. as LiOH	0.22	0.28	0.24
wppm B		10	0
wppm Cu		1	0
wppm Fe		1	0
wppm SO4		200	134
Wt % Na + K		0.06	0.03
wppm Ca + Mg		10	0
Wt % Cl		0.10	0.04
wppm LiNO3	33	53	43
wppm Iodine		300	PASS
wppm NH3		2	0
wppm Li2MoO4	159	189	162 x 1.62 = 262 mg/L
Number of Drums			55

FMC, Lithium Division Certificator, CPL

Steam Consumption VS Flow



Pressure Drop VS Flow



flow		pd
	4474	31.6
	4792	33.8
	5160	36.3
	5588	39.7
	5975	42.7

flow		consump
	4474	15535
	4792	15357
	5160	15190
	5588	15017
	5975	14900

PARAFLOW CHILLER MODEL OUTPUT SHEET

TYPE OF UNIT = 22G ✓ STEAM ✓
 FL TONNAGE = 1500 TONS ✓
 CuNi TUBES: n
 EVAP:
 COND:
 ABS:
 COND TUBE WALL THICKNESS = .035 ✓
 EVAP TUBE WALL THICKNESS = .035 ✓
 ABS TUBE WALL THICKNESS = .035 ✓

ENTERING TOWER WATER = 85 F ✓
 LEAVING TOWER WATER = 100.1903 F ✓
 ENTERING CHILLED WATER = 57 F ✓
 LEAVING CHILLED WATER = 45 F ✓
 FOULING FACTOR: TOWER = 0
 EVAP = 0
 TUBE OPTION = a ✓
 EVAP PASSES = 2 ✓
 ABS PASSES = 1 ✓

PERFORMANCE DATA

EVAPORATOR LOAD = 1498.242 TONS
 ABSORBER LOAD = -2069.852 TONS.
 FIRST STAGE GENERATOR LOAD = 1314.813 TONS.
 EVAP RETURN TEMP = 57 F
 CONDENSER LOAD = -744.0718 TONS.

TOWER WATER RETURN TEMPERATURE = 100.1903 F. *312.23 (OK)*
 1ST STG ENTER AND LEAVE TEMP = 233.7061 , 312.0437 F, AT 537.5095 mm Hg.
 2ND STG ENTER AND LEAVE TEMP = 159.2388 , 192.0905 F
 EVAPORATOR REFRIGERANT TEMP = 41.29899 F, AT 6.614443 mm Hg.
 COND REFR. LEAVING TEMPERATURE = 103.432 F, AT 54.47953 mm Hg.
 ABSORBER SOLUTION LEAVING TEMPERATURE = 106.0314 F.

SOLUTION CONCENTRATION ENTERING ABSORBER = 62.82779 %.
 SOLUTION CONCENTRATION LEAVING 1ST STG GEN = 64.01067 % *64.5 (OK)*
 SOLUTION CONCENTRATION LEAVING 2ND STG GEN = 61.8078 %.
 WEAK SOLUTION CONCENTRATION = 58.3078 %.

NO BYPASS PIPING IS REQUIRED ON THIS UNIT

THE EVAPORATOR WATER FLOW IS 2990.365 GPM, AT 8.479651 FPS.
 THE CONDENSER WATER FLOW IS 4473.844 GPM, AT 9.782931 FPS.
 THE ABSORBER WATER FLOW IS 4473.844 GPM, AT 7.458774 FPS.

THE COOLING WATER PRESSURE DROP IS 43.16532 FEET.
 THE TOWER WATER PRESSURE DROP IS 31.64181 FEET.

STEAM CONSUMPTION IS 15137.69 LBS/HR.
 Cv VALUE FOR 115 PSI INPUT IS 112.1399
 RECOMMENDED STEAM VALVE IS HONEYWELL 3 INCH VALVE, YORK # 022-08887-000

$$Steam = 14850 \left(\frac{1520}{1500} \right) (1.06) = ~~15138~~ 15505$$

1530 1.065

$$15741 \left(\frac{15138}{15109} \right) = ~~15138~~ 15535$$

10F → 9 TONS
.006 CONSUMA.

PARAFLOW CHILLER MODEL OUTPUT SHEET

TYPE OF UNIT = 22G	STEAM	ENTERING TOWER WATER = 85 F ✓
FL TONNAGE = 1500 TONS		LEAVING TOWER WATER = 100.1724 F ✓
CuNi TUBES: n		ENTERING CHILLED WATER = 57 F ✓
EVAP:		LEAVING CHILLED WATER = 45 F ✓
COND:		FOULING FACTOR: TOWER = 0
ABS:		EVAP = 0
COND TUBE WALL THICKNESS = .028		TUBE OPTION = a ✓
EVAP TUBE WALL THICKNESS = .025		EVAP PASSES = 2 ✓
ABS TUBE WALL THICKNESS = .025		ABS PASSES = 1 ✓

PERFORMANCE DATA

EVAPORATOR LOAD = 1498.242 TONS	EVAP RETURN TEMP = 57 F
ABSORBER LOAD = -2068.94 TONS.	CONDENSER LOAD = -743.538 TONS.
FIRST STAGE GENERATOR LOAD = 1312.359 TONS.	

TOWER WATER RETURN TEMPERATURE = 100.1724 F.
 1ST STG ENTER AND LEAVE TEMP = 232.1245 , 309.6841 F, AT 527.5569 mm Hg.
 2ND STG ENTER AND LEAVE TEMP = 158.4012 , 191.1952 F
 EVAPORATOR REFRIGERANT TEMP = 41.23679 F, AT 6.598487 mm Hg.
 COND REFR. LEAVING TEMPERATURE = 103.3769 F, AT 54.39056 mm Hg.
 ABSORBER SOLUTION LEAVING TEMPERATURE = 105.2675 F.

SOLUTION CONCENTRATION ENTERING ABSORBER = 62.61603 %.
 SOLUTION CONCENTRATION LEAVING 1ST STG GEN = 63.77455 %.
 SOLUTION CONCENTRATION LEAVING 2ND STG GEN = 61.61128 %.
 WEAK SOLUTION CONCENTRATION = 58.11128 %.

NO BYPASS PIPING IS REQUIRED ON THIS UNIT

THE EVAPORATOR WATER FLOW IS 2990.365 GPM, AT 7.777717 FPS.
 THE CONDENSER WATER FLOW IS 4473.844 GPM, AT 9.39221 FPS.
 THE ABSORBER WATER FLOW IS 4473.844 GPM, AT 6.841346 FPS.

THE COOLING WATER PRESSURE DROP IS 35.2574 FEET.
 THE TOWER WATER PRESSURE DROP IS 27.30564 FEET.

STEAM CONSUMPTION IS 15109.43 LBS/HR.
 Cv VALUE FOR 115 PSI INPUT IS 103.7584
 RECOMMENDED STEAM VALVE IS HONEYWELL 3 INCH VALVE, YORK # 022-08887-000

PARAFLOW CHILLER MODEL OUTPUT SHEET

TYPE OF UNIT = 22G ✓ STEAM ✓
 FL TONNAGE = 1500 TONS ✓
 CuNi TUBES: n
 EVAP:
 COND:
 ABS:
 COND TUBE WALL THICKNESS = .035 ✓
 EVAP TUBE WALL THICKNESS = .035 ✓
 ABS TUBE WALL THICKNESS = .035 ✓

ENTERING TOWER WATER = 85 F ✓
 LEAVING TOWER WATER = 99.14907 F ✓
 ENTERING CHILLED WATER = 57 F ✓
 LEAVING CHILLED WATER = 45 F ✓
 FOULING FACTOR: TOWER = 0
 EVAP = 0
 TUBE OPTION = a ✓
 EVAP PASSES = 2 ✓
 ABS PASSES = 1 ✓

PERFORMANCE DATA

EVAPORATOR LOAD = 1498.242 TONS
 ABSORBER LOAD = -2065.35 TONS.
 FIRST STAGE GENERATOR LOAD = 1309.271 TONS.
 EVAP RETURN TEMP = 57 F
 CONDENSER LOAD = -744.1396 TONS.

TOWER WATER RETURN TEMPERATURE = 99.14907 F.
 1ST STG ENTER AND LEAVE TEMP = 231.8904 , 309.2788 F, AT 520.9196 mm Hg.
 2ND STG ENTER AND LEAVE TEMP = 158.1342 , 190.5401 F
 EVAPORATOR REFRIGERANT TEMP = 41.29899 F, AT 6.614443 mm Hg.
 COND REFR. LEAVING TEMPERATURE = 102.6606 F, AT 53.24554 mm Hg.
 ABSORBER SOLUTION LEAVING TEMPERATURE = 105.4984 F.

SOLUTION CONCENTRATION ENTERING ABSORBER = 62.66476 %.
 SOLUTION CONCENTRATION LEAVING 1ST STG GEN = 63.8325 %.
 SOLUTION CONCENTRATION LEAVING 2ND STG GEN = 61.6565 %.
 WEAK SOLUTION CONCENTRATION = 58.1565 %.

BYPASS PIPING IS REQUIRED:

THE BYPASS DIAMETER PIPE SIZE IS 3 INCHES.
 THE ORIFICE SIZE NEEDED IS 2.25 INCHES.

THE EVAPORATOR WATER FLOW IS 2990.365 GPM, AT 8.479651 FPS.
 THE CONDENSER WATER FLOW IS 4481.558 GPM, AT 9.799798 FPS.
 THE ABSORBER WATER FLOW IS 4792.218 GPM, AT 7.989565 FPS.

THE COOLING WATER PRESSURE DROP IS 43.16532 FEET.
 THE TOWER WATER PRESSURE DROP IS 33.83601 FEET.

STEAM CONSUMPTION IS 15073.89 LBS/HR.
 Cv VALUE FOR 115 PSI INPUT IS 102.1636
 RECOMMENDED STEAM VALVE IS HONEYWELL 3 INCH VALVE, YORK # 022-08887-000

$$STEAM = 14850 \left(\frac{1500}{1539} \right) \left(\frac{1058}{1.059} \right) = 15328$$
~~15556~~

$$\frac{15074}{15046} = \frac{15585}{15357}$$

PARAFLOW CHILLER MODEL OUTPUT SHEET

TYPE OF UNIT = 22G ^c	STEAM ✓	ENTERING TOWER WATER = 85 F ✓
FL TONNAGE = 1500 TONS ✓		LEAVING TOWER WATER = 99.1369 F ✓
CuNi TUBES: n		ENTERING CHILLED WATER = 57 F ✓
EVAP:		LEAVING CHILLED WATER = 45 F ✓
COND:		FOULING FACTOR: TOWER = 0
ABS:		EVAP = 0
COND TUBE WALL THICKNESS = .028 ✓	TUBE OPTION = a	
EVAP TUBE WALL THICKNESS = .025 ✓	EVAP PASSES = 2 ✓	
ABS TUBE WALL THICKNESS = .025 ✓	ABS PASSES = 1 ✓	

PERFORMANCE DATA

EVAPORATOR LOAD = 1498.242 TONS	EVAP RETURN TEMP = 57 F
ABSORBER LOAD = -2063.292 TONS.	CONDENSER LOAD = -743.6483 TONS.
FIRST STAGE GENERATOR LOAD = 1306.869 TONS.	

TOWER WATER RETURN TEMPERATURE = 99.1369 F.
 1ST STG ENTER AND LEAVE TEMP = 230.2613 , 306.9109 F, AT 511.0482 mm Hg.
 2ND STG ENTER AND LEAVE TEMP = 157.2422 , 189.6371 F
 EVAPORATOR REFRIGERANT TEMP = 41.23679 F, AT 6.598487 mm Hg.
 COND REFR. LEAVING TEMPERATURE = 102.598 F, AT 53.14654 mm Hg.
 ABSORBER SOLUTION LEAVING TEMPERATURE = 104.7192 F.

SOLUTION CONCENTRATION ENTERING ABSORBER = 62.45219 %.
 SOLUTION CONCENTRATION LEAVING 1ST STG GEN = 63.59578 %.
 SOLUTION CONCENTRATION LEAVING 2ND STG GEN = 61.45923 %.
 WEAK SOLUTION CONCENTRATION = 57.95923 %.

BYPASS PIPING IS REQUIRED:

THE BYPASS DIAMETER PIPE SIZE IS 3 INCHES.
 THE ORIFICE SIZE NEEDED IS 2.25 INCHES.

THE EVAPORATOR WATER FLOW IS 2990.365 GPM, AT 7.777717 FPS.
 THE CONDENSER WATER FLOW IS 4496.279 GPM, AT 9.439309 FPS.
 THE ABSORBER WATER FLOW IS 4792.218 GPM, AT 7.328199 FPS.

THE COOLING WATER PRESSURE DROP IS 35.2574 FEET.
 THE TOWER WATER PRESSURE DROP IS 29.19163 FEET.

STEAM CONSUMPTION IS 15046.23 LBS/HR.
 Cv VALUE FOR 115 PSI INPUT IS 95.9537
 RECOMMENDED STEAM VALVE IS HONEYWELL 3 INCH VALVE, YORK # 022-08887-000

PARAFLOW CHILLER MODEL OUTPUT SHEET

TYPE OF UNIT = 22G
FL TONNAGE = 1500 TONS
CuNi TUBES:

STEAM

ENTERING TOWER WATER = 85 F
LEAVING TOWER WATER = 98.11704 F
ENTERING CHILLED WATER = 57 F
LEAVING CHILLED WATER = 45 F
FOULING FACTOR: TOWER = 0
EVAP = 0

EVAP:
COND:
ABS:

COND TUBE WALL THICKNESS = .035
EVAP TUBE WALL THICKNESS = .035
ABS TUBE WALL THICKNESS = .035

TUBE OPTION = a
EVAP PASSES = 2
ABS PASSES = 1

PERFORMANCE DATA

EVAPORATOR LOAD = 1498.242 TONS
ABSORBER LOAD = -2060.207 TONS.
FIRST STAGE GENERATOR LOAD = 1304.009 TONS.
EVAP RETURN TEMP = 57 F
CONDENSER LOAD = -744.2125 TONS.

TOWER WATER RETURN TEMPERATURE = 98.11704 F.
1ST STG ENTER AND LEAVE TEMP = 230.0854 , 306.58 F, AT 505.2014 mm Hg.
2ND STG ENTER AND LEAVE TEMP = 157.0209 , 189.0406 F
EVAPORATOR REFRIGERANT TEMP = 41.29899 F, AT 6.614443 mm Hg.
COND REFR. LEAVING TEMPERATURE = 101.9264 F, AT 52.09359 mm Hg.
ABSORBER SOLUTION LEAVING TEMPERATURE = 104.9548 F.

SOLUTION CONCENTRATION ENTERING ABSORBER = 62.50245 %.
SOLUTION CONCENTRATION LEAVING 1ST STG GEN = 63.65508 %.
SOLUTION CONCENTRATION LEAVING 2ND STG GEN = 61.50587 %.
WEAK SOLUTION CONCENTRATION = 58.00587 %.

BYPASS PIPING IS REQUIRED:

THE BYPASS DIAMETER PIPE SIZE IS 5 INCHES.
THE ORIFICE SIZE NEEDED IS 3.25 INCHES.

THE EVAPORATOR WATER FLOW IS 2990.365 GPM, AT 8.479651 FPS.
THE CONDENSER WATER FLOW IS 4460.258 GPM, AT 9.753222 FPS.
THE ABSORBER WATER FLOW IS 5159.571 GPM, AT 8.602015 FPS.

THE COOLING WATER PRESSURE DROP IS 43.16532 FEET.
THE TOWER WATER PRESSURE DROP IS 36.31857 FEET.

STEAM CONSUMPTION IS 15013.3 LBS/HR.
Cv VALUE FOR 115 PSI INPUT IS 94.90149
RECOMMENDED STEAM VALVE IS HONEYWELL 3 INCH VALVE, YORK # 022-08887-000

Handwritten calculations:
STEAM = 14850 (1500 / ~~1548~~) (1.053 / ~~1.053~~) =
= 15152 (15013 / 14975)
= ~~15113~~ 15190

PARAFLOW CHILLER MODEL OUTPUT SHEET

TYPE OF UNIT = 22G ✓	STEAM ✓	ENTERING TOWER WATER = 85 F ✓
FL TONNAGE = 1500 TONS ✓		LEAVING TOWER WATER = 98.10143 F ✓
CuNi TUBES: n		ENTERING CHILLED WATER = 57 F ✓
EVAP:		LEAVING CHILLED WATER = 45 F ✓
COND:		FOULING FACTOR: TOWER = 0
ABS:		EVAP = 0
COND TUBE WALL THICKNESS = .028 ✓	TUBE OPTION = a ✓	
EVAP TUBE WALL THICKNESS = .025 ✓	EVAP PASSES = 2 ✓	
ABS TUBE WALL THICKNESS = .025 ✓	ABS PASSES = 1 ✓	

PERFORMANCE DATA

EVAPORATOR LOAD = 1498.242 TONS	EVAP RETURN TEMP = 57 F
ABSORBER LOAD = -2056.978 TONS.	CONDENSER LOAD = -743.8372 TONS.
FIRST STAGE GENERATOR LOAD = 1300.703 TONS.	

TOWER WATER RETURN TEMPERATURE = 98.10143 F.
 1ST STG ENTER AND LEAVE TEMP = 228.2878 , 303.9566 F, AT 493.421 mm Hg.
 2ND STG ENTER AND LEAVE TEMP = 155.9986 , 187.9203 F
 EVAPORATOR REFRIGERANT TEMP = 41.23679 F, AT 6.598487 mm Hg.
 COND REFR. LEAVING TEMPERATURE = 101.6922 F, AT 51.73079 mm Hg.
 ABSORBER SOLUTION LEAVING TEMPERATURE = 104.1751 F.

SOLUTION CONCENTRATION ENTERING ABSORBER = 62.28492 %.
 SOLUTION CONCENTRATION LEAVING 1ST STG GEN = 63.41376 %.
 SOLUTION CONCENTRATION LEAVING 2ND STG GEN = 61.30399 %.
 WEAK SOLUTION CONCENTRATION = 57.80399 %.

BYPASS PIPING IS REQUIRED:
 THE BYPASS DIAMETER PIPE SIZE IS 4 INCHES.
 THE ORIFICE SIZE NEEDED IS 2.75 INCHES.

THE EVAPORATOR WATER FLOW IS 2990.365 GPM, AT 7.777717 FPS.
 THE CONDENSER WATER FLOW IS 4663.091 GPM, AT 9.789508 FPS.
 THE ABSORBER WATER FLOW IS 5159.571 GPM, AT 7.889951 FPS.

THE COOLING WATER PRESSURE DROP IS 35.2574 FEET.
 THE TOWER WATER PRESSURE DROP IS 32.30924 FEET.

STEAM CONSUMPTION IS 14975.24 LBS/HR.
 Cv VALUE FOR 115 PSI INPUT IS 89.54629
 RECOMMENDED STEAM VALVE IS HONEYWELL 2.5 INCH VALVE, YORK # 022-08888-000

PARAFLOW CHILLER MODEL OUTPUT SHEET

TYPE OF UNIT = 22G / STEAM/

FL TONNAGE = 1500 TONS /

CuNi TUBES:

EVAP:

COND:

ABS:

COND TUBE WALL THICKNESS = .035 /

EVAP TUBE WALL THICKNESS = .035 /

ABS TUBE WALL THICKNESS = .035 /

ENTERING TOWER WATER = 85 F /

LEAVING TOWER WATER = 97.08746 F /

ENTERING CHILLED WATER = 57 F /

LEAVING CHILLED WATER = 45 F /

FOULING FACTOR: TOWER = 0

EVAP = 0

TUBE OPTION = a /

EVAP PASSES = 2 /

ABS PASSES = 1 /

PERFORMANCE DATA

EVAPORATOR LOAD = 1498.242 TONS

EVAP RETURN TEMP = 57 F

ABSORBER LOAD = -2053.126 TONS.

CONDENSER LOAD = -744.3074 TONS.

FIRST STAGE GENERATOR LOAD = 1298.703 TONS.

TOWER WATER RETURN TEMPERATURE = 97.08746 F.

1ST STG ENTER AND LEAVE TEMP = 228.1752 , 303.7938 F, AT 489.1959 mm Hg.

2ND STG ENTER AND LEAVE TEMP = 155.8108 , 187.4814 F

EVAPORATOR REFRIGERANT TEMP = 41.29899 F, AT 6.614443 mm Hg.

COND REFR. LEAVING TEMPERATURE = 101.1504 F, AT 50.89957 mm Hg.

ABSORBER SOLUTION LEAVING TEMPERATURE = 104.4141 F.

SOLUTION CONCENTRATION ENTERING ABSORBER = 62.3364 %.

SOLUTION CONCENTRATION LEAVING 1ST STG GEN = 63.47372 %.

SOLUTION CONCENTRATION LEAVING 2ND STG GEN = 61.35176 %.

WEAK SOLUTION CONCENTRATION = 57.85176 %.

BYPASS PIPING IS REQUIRED:

THE BYPASS DIAMETER PIPE SIZE IS 6 INCHES.

THE ORIFICE SIZE NEEDED IS 4 INCHES.

THE EVAPORATOR WATER FLOW IS 2990.365 GPM, AT 8.479651 FPS.

THE CONDENSER WATER FLOW IS 4486.839 GPM, AT 9.811346 FPS.

THE ABSORBER WATER FLOW IS 5588.149 GPM, AT 9.316539 FPS.

THE COOLING WATER PRESSURE DROP IS 43.16532 FEET.

THE TOWER WATER PRESSURE DROP IS 39.72869 FEET.

STEAM CONSUMPTION IS 14952.21 LBS/HR.

Cv VALUE FOR 115 PSI INPUT IS 89.05347

RECOMMENDED STEAM VALVE IS HONEYWELL 2.5 INCH VALVE, YORK # 022-08888-000

$$\begin{aligned}
 \text{STEAM} &= 14850 \left(\frac{1500}{1557} \right) \left(\frac{1.047}{\cancel{1.034}} \right) \\
 &= \cancel{15196} \cdot 14979 \\
 &= \cancel{15196} \left(\frac{14979}{14950 / 14914} \right) \\
 &= \cancel{15235} \\
 &= 15017
 \end{aligned}$$

PARAFLOW CHILLER MODEL OUTPUT SHEET

TYPE OF UNIT = 22G	STEAM	ENTERING TOWER WATER = 85 F
FL TONNAGE = 1500 TONS		LEAVING TOWER WATER = 97.0734 F
CuNi TUBES: n		ENTERING CHILLED WATER = 57 F
EVAP:		LEAVING CHILLED WATER = 45 F
COND:		FOULING FACTOR: TOWER = 0
ABS:		EVAP = 0
COND TUBE WALL THICKNESS = .028	TUBE OPTION = a	
EVAP TUBE WALL THICKNESS = .025	EVAP PASSES = 2	
ABS TUBE WALL THICKNESS = .025	ABS PASSES = 1	

PERFORMANCE DATA

EVAPORATOR LOAD = 1498.242 TONS	EVAP RETURN TEMP = 57 F
ABSORBER LOAD = -2051.355 TONS.	CONDENSER LOAD = -743.9929 TONS.
FIRST STAGE GENERATOR LOAD = 1295.421 TONS.	

TOWER WATER RETURN TEMPERATURE = 97.0734 F.
 1ST STG ENTER AND LEAVE TEMP = 226.5459 , 301.3648 F, AT 478.6441 mm Hg.
 2ND STG ENTER AND LEAVE TEMP = 154.9053 , 186.444 F
 EVAPORATOR REFRIGERANT TEMP = 41.23679 F, AT 6.598487 mm Hg.
 COND REFR. LEAVING TEMPERATURE = 100.9427 F, AT 50.584 mm Hg.
 ABSORBER SOLUTION LEAVING TEMPERATURE = 103.6762 F.

SOLUTION CONCENTRATION ENTERING ABSORBER = 62.13116 %.
 SOLUTION CONCENTRATION LEAVING 1ST STG GEN = 63.24617 %.
 SOLUTION CONCENTRATION LEAVING 2ND STG GEN = 61.16129 %.
 WEAK SOLUTION CONCENTRATION = 57.66129 %.

BYPASS PIPING IS REQUIRED:

THE BYPASS DIAMETER PIPE SIZE IS 5 INCHES.
 THE ORIFICE SIZE NEEDED IS 3.75 INCHES.

THE EVAPORATOR WATER FLOW IS 2990.365 GPM, AT 7.777717 FPS.
 THE CONDENSER WATER FLOW IS 4662.453 GPM, AT 9.788168 FPS.
 THE ABSORBER WATER FLOW IS 5588.149 GPM, AT 8.545328 FPS.

THE COOLING WATER PRESSURE DROP IS 35.2574 FEET.
 THE TOWER WATER PRESSURE DROP IS 34.96208 FEET.

STEAM CONSUMPTION IS 14914.43 LBS/HR.
 Cv VALUE FOR 115 PSI INPUT IS 85.15698
 RECOMMENDED STEAM VALVE IS HONEYWELL 2.5 INCH VALVE, YORK # 022-08888-000

PARAFLOW CHILLER MODEL OUTPUT SHEET

TYPE OF UNIT = 22G ✓ STEAM ✓
 FL TONNAGE = 1500 TONS ✓
 CuNi TUBES: n
 EVAP:
 COND:
 ABS:
 COND TUBE WALL THICKNESS = .035 ✓
 EVAP TUBE WALL THICKNESS = .035 ✓
 ABS TUBE WALL THICKNESS = .035 ✓
 ENTERING TOWER WATER = 85 F ✓
 LEAVING TOWER WATER = 96.28852 F ✓
 ENTERING CHILLED WATER = 57 F ✓
 LEAVING CHILLED WATER = 45 F ✓
 FOULING FACTOR: TOWER = 0
 EVAP = 0
 TUBE OPTION = a
 EVAP PASSES = 2
 ABS PASSES = 1

PERFORMANCE DATA

EVAPORATOR LOAD = 1498.242 TONS
 ABSORBER LOAD = -2048.999 TONS.
 FIRST STAGE GENERATOR LOAD = 1294.652 TONS.
 EVAP RETURN TEMP = 57 F
 CONDENSER LOAD = -744.3837 TONS.

TOWER WATER RETURN TEMPERATURE = 96.28852 F.
 1ST STG ENTER AND LEAVE TEMP = 226.813 , 301.7564 F, AT 477.8137 mm Hg.
 2ND STG ENTER AND LEAVE TEMP = 154.9638 , 186.3389 F
 EVAPORATOR REFRIGERANT TEMP = 41.29899 F, AT 6.614443 mm Hg.
 COND REFR. LEAVING TEMPERATURE = 100.5865 F, AT 50.04673 mm Hg.
 ABSORBER SOLUTION LEAVING TEMPERATURE = 104.0121 F.

SOLUTION CONCENTRATION ENTERING ABSORBER = 62.21262 %.
 SOLUTION CONCENTRATION LEAVING 1ST STG GEN = 63.33849 %.
 SOLUTION CONCENTRATION LEAVING 2ND STG GEN = 61.23689 %.
 WEAK SOLUTION CONCENTRATION = 57.73689 %.

BYPASS PIPING IS REQUIRED:

THE BYPASS DIAMETER PIPE SIZE IS 6 INCHES.
 THE ORIFICE SIZE NEEDED IS 4.75 INCHES.

THE EVAPORATOR WATER FLOW IS 2990.365 GPM, AT 8.479651 FPS. ✓
 THE CONDENSER WATER FLOW IS 4467.75 GPM, AT 9.769604 FPS. ✓
 THE ABSORBER WATER FLOW IS 5974.999 GPM, AT 9.961493 FPS. ✓

THE COOLING WATER PRESSURE DROP IS 43.16532 FEET. ✓
 THE TOWER WATER PRESSURE DROP IS 42.70897 FEET. ✓

STEAM CONSUMPTION IS 14905.57 LBS/HR.
 Cv VALUE FOR 115 PSI INPUT IS 85.62548
 RECOMMENDED STEAM VALVE IS HONEYWELL 2.5 INCH VALVE, YORK # 022-08888-000

$$\frac{96.3 - 95}{100 - 95} = \frac{RT - 1575}{1530 - 1575} = \frac{90}{106.5 - 103.5} \quad RT = 1563$$

$$\eta_0 = 104.28$$

$$\begin{aligned}
 \text{STEAM} &= 14850 \left(\frac{1500}{1563} \right) (1.0428) \\
 &= 14861 \\
 &= 14861 \left(\frac{14900}{14861} \right) \\
 &= 14900
 \end{aligned}$$

PARAFLOW CHILLER MODEL OUTPUT SHEET

TYPE OF UNIT = 22G	STEAM	ENTERING TOWER WATER = 85 F
FL TONNAGE = 1500 TONS		LEAVING TOWER WATER = 96.27549 F
CuNi TUBES: n		ENTERING CHILLED WATER = 57 F
EVAP:		LEAVING CHILLED WATER = 45 F
COND:		FOULING FACTOR: TOWER = 0
ABS:		EVAP = 0
COND TUBE WALL THICKNESS = .028		TUBE OPTION = a
EVAP TUBE WALL THICKNESS = .025		EVAP PASSES = 2
ABS TUBE WALL THICKNESS = .025		ABS PASSES = 1

PERFORMANCE DATA

EVAPORATOR LOAD = 1498.242 TONS	EVAP RETURN TEMP = 57 F
ABSORBER LOAD = -2047.43 TONS.	CONDENSER LOAD = -744.0173 TONS.
FIRST STAGE GENERATOR LOAD = 1291.298 TONS.	

TOWER WATER RETURN TEMPERATURE = 96.27549 F.
 1ST STG ENTER AND LEAVE TEMP = 225.123 , 299.2276 F, AT 467.2301 mm Hg.
 2ND STG ENTER AND LEAVE TEMP = 154.0333 , 185.2776 F
 EVAPORATOR REFRIGERANT TEMP = 41.23679 F, AT 6.598487 mm Hg.
 COND REFR. LEAVING TEMPERATURE = 100.4014 F, AT 49.76956 mm Hg.
 ABSORBER SOLUTION LEAVING TEMPERATURE = 103.2303 F.

SOLUTION CONCENTRATION ENTERING ABSORBER = 61.99341 %.
 SOLUTION CONCENTRATION LEAVING 1ST STG GEN = 63.0953 %.
 SOLUTION CONCENTRATION LEAVING 2ND STG GEN = 61.03345 %.
 WEAK SOLUTION CONCENTRATION = 57.53345 %.

BYPASS PIPING IS REQUIRED:

THE BYPASS DIAMETER PIPE SIZE IS 6 INCHES.
 THE ORIFICE SIZE NEEDED IS 4.5 INCHES.

THE EVAPORATOR WATER FLOW IS 2990.365 GPM, AT 7.777717 FPS.
 THE CONDENSER WATER FLOW IS 4616.855 GPM, AT 9.69244 FPS.
 THE ABSORBER WATER FLOW IS 5974.999 GPM, AT 9.136893 FPS.

THE COOLING WATER PRESSURE DROP IS 35.2574 FEET.
 THE TOWER WATER PRESSURE DROP IS 37.23204 FEET.

STEAM CONSUMPTION IS 14866.95 LBS/HR.
 Cv VALUE FOR 115 PSI INPUT IS 82.0446
 RECOMMENDED STEAM VALVE IS HONEYWELL 2.5 INCH VALVE, YORK # 022-08888-000

PARAFLOW CHILLER MODEL OUTPUT SHEET

TYPE OF UNIT = 22G	STEAM	ENTERING TOWER WATER = 85 F
FL TONNAGE = 1500 TONS		LEAVING TOWER WATER = 96.06268 F
CuNi TUBES: n		ENTERING CHILLED WATER = 57 F
EVAP:		LEAVING CHILLED WATER = 45 F
COND:		FOULING FACTOR: TOWER = 0
ABS:		EVAP = 0
COND TUBE WALL THICKNESS = .035	TUBE OPTION = a	
EVAP TUBE WALL THICKNESS = .035	EVAP PASSES = 2	
ABS TUBE WALL THICKNESS = .035	ABS PASSES = 1	

PERFORMANCE DATA

EVAPORATOR LOAD = 1498.242 TONS EVAP RETURN TEMP = 57 F
 ABSORBER LOAD = -2049.218 TONS. CONDENSER LOAD = -744.446 TONS.
 FIRST STAGE GENERATOR LOAD = 1293.486 TONS.

TOWER WATER RETURN TEMPERATURE = 96.06268 F.
 1ST STG ENTER AND LEAVE TEMP = 226.5438 , 301.2991 F, AT 475.2718 mm Hg.
 2ND STG ENTER AND LEAVE TEMP = 154.8145 , 186.0719 F
 EVAPORATOR REFRIGERANT TEMP = 41.29899 F, AT 6.614443 mm Hg.
 COND REFR. LEAVING TEMPERATURE = 100.4506 F, AT 49.84302 mm Hg.
 ABSORBER SOLUTION LEAVING TEMPERATURE = 103.922 F.

SOLUTION CONCENTRATION ENTERING ABSORBER = 62.18486 %.
 SOLUTION CONCENTRATION LEAVING 1ST STG GEN = 63.30833 %.
 SOLUTION CONCENTRATION LEAVING 2ND STG GEN = 61.21113 %.
 WEAK SOLUTION CONCENTRATION = 57.71113 %.

BYPASS PIPING IS REQUIRED:
 THE BYPASS DIAMETER PIPE SIZE IS 8 INCHES.
 THE ORIFICE SIZE NEEDED IS 5 INCHES.

THE EVAPORATOR WATER FLOW IS 2990.365 GPM, AT 8.479651 FPS.
 THE CONDENSER WATER FLOW IS 4437.163 GPM, AT 9.702721 FPS.
 THE ABSORBER WATER FLOW IS 6094.651 GPM, AT 10.16098 FPS.

THE COOLING WATER PRESSURE DROP IS 43.16532 FEET.
 THE TOWER WATER PRESSURE DROP IS 43.50871 FEET.

STEAM CONSUMPTION IS 14892.15 LBS/HR.
 Cv VALUE FOR 115 PSI INPUT IS 84.88651
 RECOMMENDED STEAM VALVE IS HONEYWELL 2.5 INCH VALVE, YORK # 022-08888-000

$$\text{STEAM} = 14850 \left(\frac{1520}{1566} \right) \left(\frac{1566}{1566} \right)$$

$$= \cancel{1500} 14807$$

$$= \cancel{1500} 14807 \left(\frac{14892}{14854} \right)$$

$$= \cancel{1500} 14845$$

NO GOOD

PARAFLOW CHILLER MODEL OUTPUT SHEET

TYPE OF UNIT = 22G	STEAM	ENTERING TOWER WATER = 85 F
FL TONNAGE = 1500 TONS		LEAVING TOWER WATER = 96.04945 F
CuNi TUBES: n		ENTERING CHILLED WATER = 57 F
EVAP:		LEAVING CHILLED WATER = 45 F
COND:		FOULING FACTOR: TOWER = 0
ABS:		EVAP = 0
COND TUBE WALL THICKNESS = .028		TUBE OPTION = a
EVAP TUBE WALL THICKNESS = .025		EVAP PASSES = 2
ABS TUBE WALL THICKNESS = .025		ABS PASSES = 1

PERFORMANCE DATA

EVAPORATOR LOAD = 1498.242 TONS	EVAP RETURN TEMP = 57 F
ABSORBER LOAD = -2046.286 TONS.	CONDENSER LOAD = -744.0416 TONS.
FIRST STAGE GENERATOR LOAD = 1290.147 TONS.	

TOWER WATER RETURN TEMPERATURE = 96.04945 F.
 1ST STG ENTER AND LEAVE TEMP = 224.7453 , 298.662 F, AT 464.12 mm Hg.
 2ND STG ENTER AND LEAVE TEMP = 153.7977 , 184.9549 F
 EVAPORATOR REFRIGERANT TEMP = 41.23679 F, AT 6.598487 mm Hg.
 COND REFR. LEAVING TEMPERATURE = 100.2383 F, AT 49.52621 mm Hg.
 ABSORBER SOLUTION LEAVING TEMPERATURE = 103.12 F.

SOLUTION CONCENTRATION ENTERING ABSORBER = 61.95928 %.
 SOLUTION CONCENTRATION LEAVING 1ST STG GEN = 63.05804 %.
 SOLUTION CONCENTRATION LEAVING 2ND STG GEN = 61.00178 %.
 WEAK SOLUTION CONCENTRATION = 57.50178 %.

BYPASS PIPING IS REQUIRED:
 THE BYPASS DIAMETER PIPE SIZE IS 6 INCHES.
 THE ORIFICE SIZE NEEDED IS 4.75 INCHES.

THE EVAPORATOR WATER FLOW IS 2990.365 GPM, AT 7.777717 FPS.
 THE CONDENSER WATER FLOW IS 4615.371 GPM, AT 9.689325 FPS.
 THE ABSORBER WATER FLOW IS 6094.651 GPM, AT 9.319863 FPS.

THE COOLING WATER PRESSURE DROP IS 35.2574 FEET.
 THE TOWER WATER PRESSURE DROP IS 38.03591 FEET.

STEAM CONSUMPTION IS 14853.7 LBS/HR.
 Cv VALUE FOR 115 PSI INPUT IS 81.28633
 RECOMMENDED STEAM VALVE IS HONEYWELL 2.5 INCH VALVE, YORK # 022-08888-000

PARAFLOW CHILLER MODEL OUTPUT SHEET

TYPE OF UNIT = 22G ✓ STEAM ✓
 FL TONNAGE = 1500 TONS ✓
 CuNi TUBES: n
 EVAP:
 COND:
 ABS:
 COND TUBE WALL THICKNESS = .035 ✓
 EVAP TUBE WALL THICKNESS = .035 ✓
 ABS TUBE WALL THICKNESS = .035 ✓

ENTERING TOWER WATER = 85 F ✓
 LEAVING TOWER WATER = 95.041 F ✓
 ENTERING CHILLED WATER = 57 F ✓
 LEAVING CHILLED WATER = 45 F ✓
 FOULING FACTOR: TOWER = 0
 EVAP = 0
 TUBE OPTION = a ✓
 EVAP PASSES = 2 ✓
 ABS PASSES = 1 ✓

PERFORMANCE DATA

EVAPORATOR LOAD = 1498.242 TONS
 ABSORBER LOAD = -2042.687 TONS.
 FIRST STAGE GENERATOR LOAD = 1288.501 TONS.
 EVAP RETURN TEMP = 57 F
 CONDENSER LOAD = -744.4855 TONS.

TOWER WATER RETURN TEMPERATURE = 95.041 F.
 1ST STG ENTER AND LEAVE TEMP = 224.706 , 298.6122 F, AT 460.9301 mm Hg.
 2ND STG ENTER AND LEAVE TEMP = 153.6598 , 184.6037 F
 EVAPORATOR REFRIGERANT TEMP = 41.29899 F, AT 6.614443 mm Hg.
 COND REFR. LEAVING TEMPERATURE = 99.76005 F, AT 48.81909 mm Hg.
 ABSORBER SOLUTION LEAVING TEMPERATURE = 103.3694 F.

SOLUTION CONCENTRATION ENTERING ABSORBER = 62.01427 %.
 SOLUTION CONCENTRATION LEAVING 1ST STG GEN = 63.12154 %.
 SOLUTION CONCENTRATION LEAVING 2ND STG GEN = 61.05281 %.
 WEAK SOLUTION CONCENTRATION = 57.55281 %.

BYPASS PIPING IS REQUIRED:
 THE BYPASS DIAMETER PIPE SIZE IS 8 INCHES.
 THE ORIFICE SIZE NEEDED IS 5.75 INCHES.

THE EVAPORATOR WATER FLOW IS 2990.365 GPM, AT 8.479651 FPS.
 THE CONDENSER WATER FLOW IS 4382.942 GPM, AT 9.584154 FPS.
 THE ABSORBER WATER FLOW IS 6702.451 GPM, AT 11.1743 FPS.

THE COOLING WATER PRESSURE DROP IS 43.16532 FEET.
 THE TOWER WATER PRESSURE DROP IS 48.45054 FEET.

STEAM CONSUMPTION IS 14834.75 LBS/HR.
 Cv VALUE FOR 115 PSI INPUT IS 81.07795
 RECOMMENDED STEAM VALVE IS HONEYWELL 2.5 INCH VALVE, YORK # 022-08888-000

STEAM = 14850 (1.0³⁵) (1520/1575)

- ~~14991~~ 14638
 = 14638
 = ~~14991~~ (14835/14795)
 = ~~15032~~ 14678

NO GOOD

PARAFLOW CHILLER MODEL OUTPUT SHEET

TYPE OF UNIT = 22G STEAM
 FL TONNAGE = 1500 TONS
 CuNi TUBES: n
 EVAP:
 COND:
 ABS:
 COND TUBE WALL THICKNESS = .028
 EVAP TUBE WALL THICKNESS = .025
 ABS TUBE WALL THICKNESS = .025

ENTERING TOWER WATER = 85 F
 LEAVING TOWER WATER = 95.02815 F
 ENTERING CHILLED WATER = 57 F
 LEAVING CHILLED WATER = 45 F
 FOULING FACTOR: TOWER = 0
 EVAP = 0
 TUBE OPTION = a
 EVAP PASSES = 2
 ABS PASSES = 1

PERFORMANCE DATA

EVAPORATOR LOAD = 1498.242 TONS
 ABSORBER LOAD = -2039.516 TONS.
 FIRST STAGE GENERATOR LOAD = 1285.02 TONS.
 EVAP RETURN TEMP = 57 F
 CONDENSER LOAD = -744.0977 TONS.

TOWER WATER RETURN TEMPERATURE = 95.02815 F.
 1ST STG ENTER AND LEAVE TEMP = 222.8848 , 295.9445 F, AT 449.7498 mm Hg.
 2ND STG ENTER AND LEAVE TEMP = 152.6204 , 183.4522 F
 EVAPORATOR REFRIGERANT TEMP = 41.23679 F, AT 6.598487 mm Hg.
 COND REFR. LEAVING TEMPERATURE = 99.51945 F, AT 48.46663 mm Hg.
 ABSORBER SOLUTION LEAVING TEMPERATURE = 102.5646 F.

SOLUTION CONCENTRATION ENTERING ABSORBER = 61.7872 %.
 SOLUTION CONCENTRATION LEAVING 1ST STG GEN = 62.8698 %.
 SOLUTION CONCENTRATION LEAVING 2ND STG GEN = 60.84208 %.
 WEAK SOLUTION CONCENTRATION = 57.34208 %.

BYPASS PIPING IS REQUIRED:

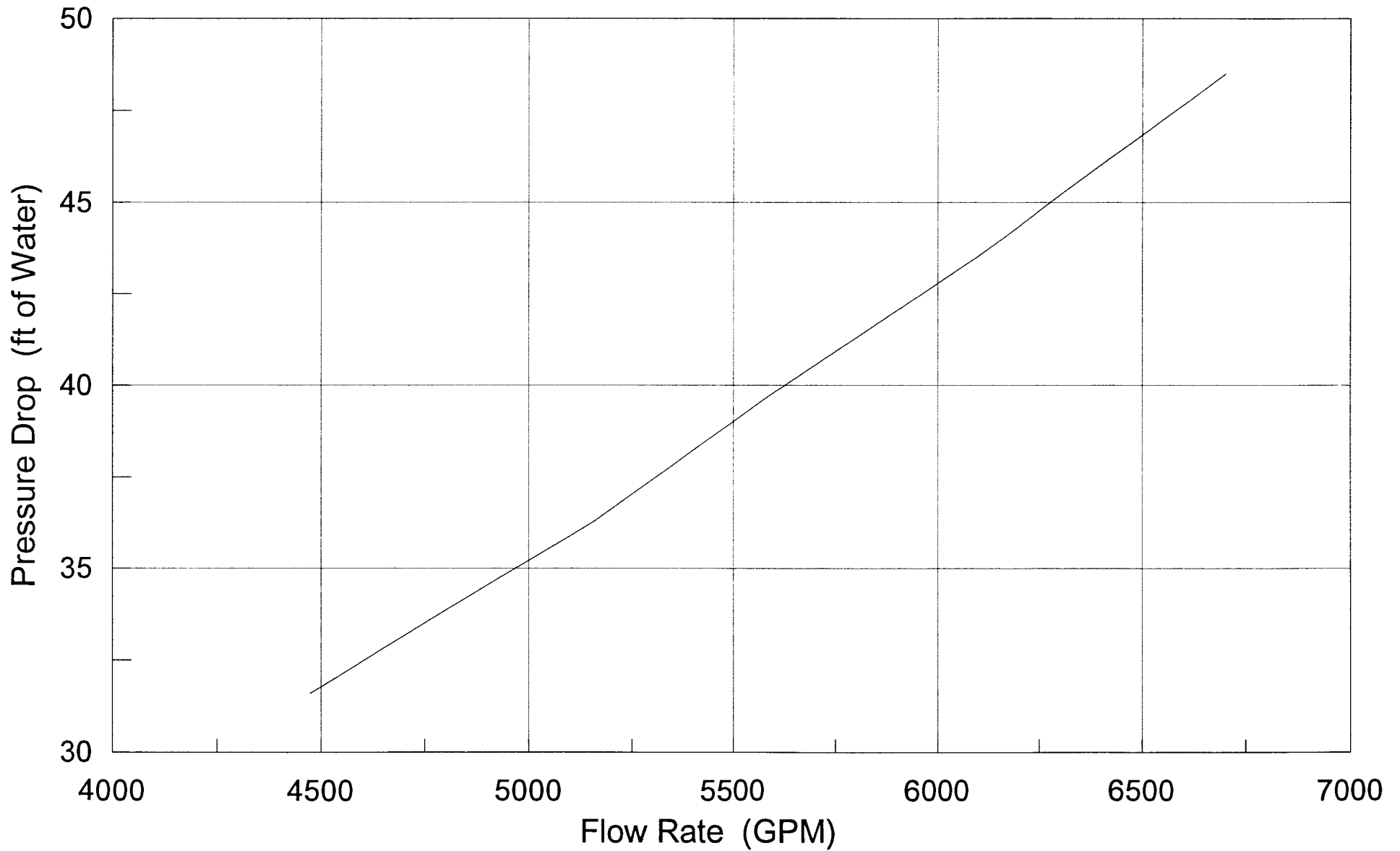
THE BYPASS DIAMETER PIPE SIZE IS 8 INCHES.
 THE ORIFICE SIZE NEEDED IS 5.5 INCHES.

THE EVAPORATOR WATER FLOW IS 2990.365 GPM, AT 7.777717 FPS.
 THE CONDENSER WATER FLOW IS 4588.393 GPM, AT 9.632689 FPS.
 THE ABSORBER WATER FLOW IS 6702.451 GPM, AT 10.2493 FPS.

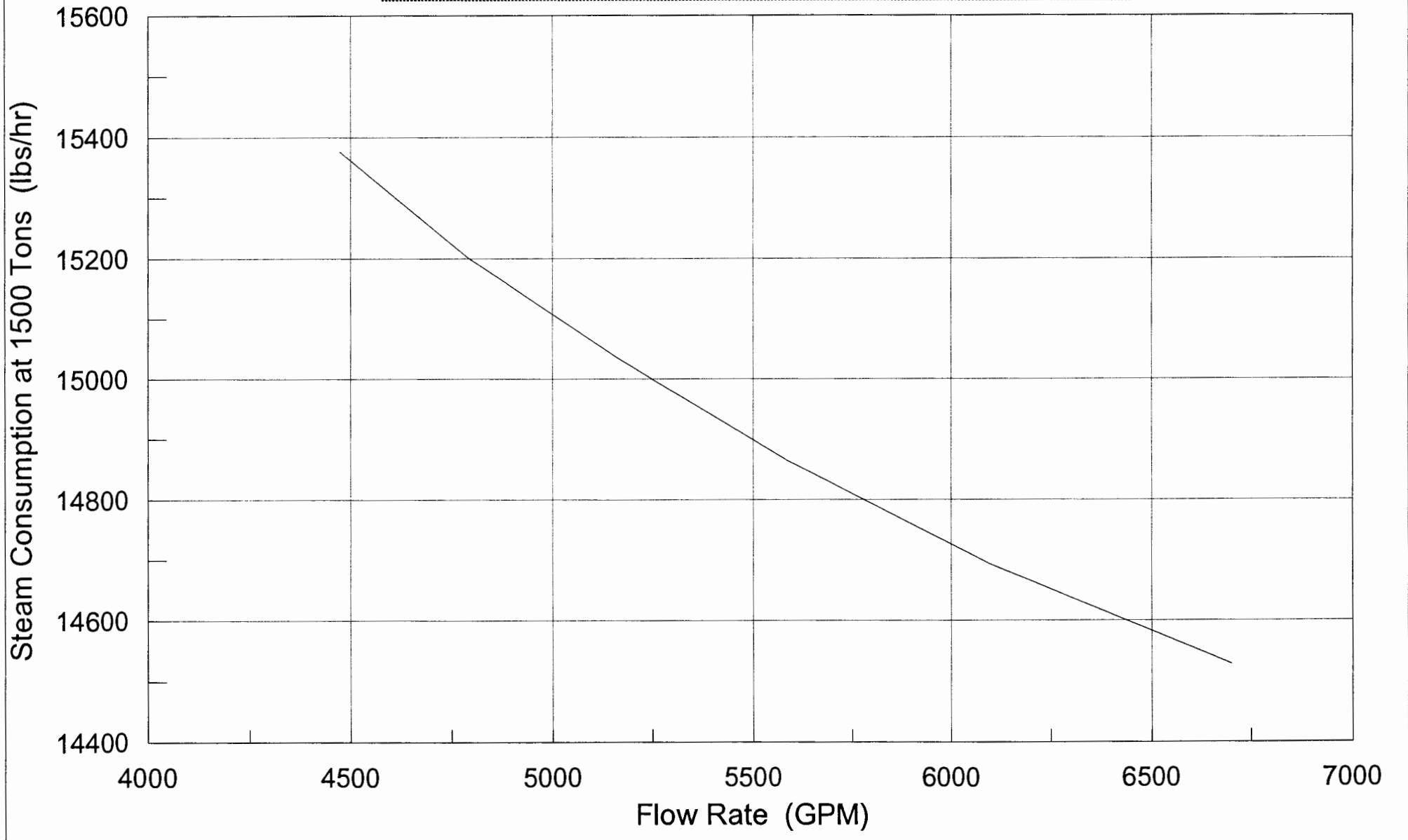
THE COOLING WATER PRESSURE DROP IS 35.2574 FEET.
 THE TOWER WATER PRESSURE DROP IS 42.20132 FEET.

STEAM CONSUMPTION IS 14794.67 LBS/HR.
 Cv VALUE FOR 115 PSI INPUT IS 78.01595
 RECOMMENDED STEAM VALVE IS HONEYWELL 2.5 INCH VALVE, YORK # 022-08888-000

Pressure Drop VS Flow



Steam Consumption VS Flow



Date: 8/18/94

Send To: <u>Mike Haggarty</u>	Attn: <u>Building Sys + Serv.</u>
Fax #: _____	cc: _____
Sender: IAN CASPER	Mail Code: 36BU Extn: 6359
YORK INTL Fax #: (717) 771-6820	Verify #: (717) 771-6856
DATE SENT:	TIME SENT:

Mike,
Memo and visuals attached regarding
DuPont tube situation.

Talk to you soon,

[Signature]



ORDER FORM PARAFLOW STEAM FIRED CHILLER

Revision No. A	Rev. Date 5/11/94	Sheet 1	Of 2
Customer Order No. LOX762267-HW	York Contract No. 93211038	York Order No. 01	
Job Name and Location Du Pont Experimental Station, WI, DE			York SQ. No.

S
H
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P
T
O:

**E.I. DU PONT DE NEMOURS & COMPANY
EXPERIMENTAL STATION
ROUTE 141 BETWEEN RTS. 202 AND RT. 52
WILMINGTON, DE 19898**

VIA: **PPD-F/A**

S
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O:

**E.I. DUPONT DE NEMOURS & CO.
EXPERIMENTAL STATION P.O. BOX 80-0361
WILMINGTON, DE 19880-0361**

MARKS **CH-1**

Special Shipping Instructions:
**TRUCKER TO CONTACT GENE GUERRAZZI
48 Hours Prior (302)695-8316
Pager (302)884-6233**

Region NE AGENTS	Code 01-211-0000-07-5324	Order Date 11-11-93	Wanted Date 7-29-94	Partial Shipment <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	Fabrication Release <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	*Date Order Received	*Scheduled Date
-------------------------	---------------------------------	----------------------------	----------------------------	--	---	----------------------	-----------------

ITEM	PRICING TAILLE	EQUIPMENT	QTY.	UNIT MLP	M	SELLING PRICE
		HEAT SOURCE SIZE ELEC. CODE HTR TUBE				
1	Y P C - S	T - 2 2 G - 4 6 - C - X				
	TABLE 1.1	UNIT TYPE	1	1183031	.42	496873
	TABLE 1.1	LITHIUM BROMIDE	1	127808	.42	53679
	TABLE 2.1	TUBE ENHANCEMENT <input type="checkbox"/> "A" <input type="checkbox"/> "B"				
	TABLE 2.1	<input type="checkbox"/> SEPARATE CHARGE (Std. for 20G-22G)				
	TABLE 2.1	<input type="checkbox"/> 2 PIECE SHIPMENT (Includes Sep. Charge)				
	TABLE 2.1	<input type="checkbox"/> SPARE PUMPS				
	TABLE 2.1	<input checked="" type="checkbox"/> CUSTOMER WITNESS FACTORY TEST	1	15000	.42	6300
	TABLE 2.2	<input checked="" type="checkbox"/> WATER FLOW SWITCH <input checked="" type="checkbox"/> 150 LB. <input type="checkbox"/> 300 LB.	1	180	.42	76
	TABLE 2.3	<input type="checkbox"/> ANSI FLANGES EVAP * ABS * COND				
	TABLE 2.4	MARINE WATER BOX				
		<input checked="" type="checkbox"/> ABSORBER	1	14139	.42	5938
		<input checked="" type="checkbox"/> CONDENSER	1	14139	.42	5938
		<input checked="" type="checkbox"/> EVAPORATOR	1	6186	.42	2598
	TABLE 2.5	300 lb. WATER BOXES				
		<input type="checkbox"/> ABSORBER / COND				
		<input type="checkbox"/> EVAPORATOR				
	TABLE 2.6	SPECIAL TUBE MATERIAL & THICKNESS				
		<input checked="" type="checkbox"/> ABSORBER	1	8756	.42	3678
		<input checked="" type="checkbox"/> CONDENSER	1	3600	.42	1512
		<input checked="" type="checkbox"/> EVAPORATOR	1	12902	.42	5419
	TABLE 2.7	REMOTE INTERFACE <input type="checkbox"/> CARD 1 <input type="checkbox"/> CARD 2				

NOTE: SHADED ENTRIES ARE MANDATORY

APPROVED BY:

FOB FACTORY, domestic packed

Total \$ **582011**

*Completed by factory

II. CHILLER SPECIFICATIONS

FORM 155.19-F1

Unit No. <u>1</u>	Tag No. <u>CH-1</u>	Revision No.	Revision Date	York Sales Order <u>93211038-01</u>	SHEET <u>2</u> OF <u>2</u>
Model No. <u>YPC-ST-226-46-C-X</u>		Cooling Capacity (TON) <u>1500</u>		No. of Units <u>1</u>	
A. TUBES <input checked="" type="checkbox"/> STD <input type="checkbox"/> A <input type="checkbox"/> B	B. VOLTAGE <input type="checkbox"/> 208/3/60 <input type="checkbox"/> 230/3/60 <input checked="" type="checkbox"/> 480/3/60	C. TUBE WALL <input type="checkbox"/> STD <input checked="" type="checkbox"/> SPECIAL <input checked="" type="checkbox"/> EVAP <u>.035"</u> <input checked="" type="checkbox"/> COND <u>.035"</u> <input checked="" type="checkbox"/> ABS <u>.035"</u>	TUBE MATL. <input checked="" type="checkbox"/> STD <input type="checkbox"/> SPECIAL <input type="checkbox"/> EVAP _____ <input type="checkbox"/> COND _____ <input type="checkbox"/> ABS _____	D. WATER BOXES <input type="checkbox"/> STD MARINE † 300 LB. Flanges <input checked="" type="checkbox"/> EVAP <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> COND <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> ABS <input type="checkbox"/> <input type="checkbox"/> † 300lb. Marine not available	
F. SPECIAL SHIPMENT <input type="checkbox"/> SHIP UNCHARGED <input type="checkbox"/> SPLIT SHIPMENT <input type="checkbox"/> COND FLOW SWITCH		G. FLOW SWITCHES <div style="border: 1px solid black; padding: 5px; margin: 5px;"> <p style="text-align: center;">FOR YORK FACTORY USE</p> <input type="checkbox"/> NO BYPASS <input type="checkbox"/> BYPASS REQUIRED STEAM VALVE SIZE _____ CV VALVE _____ _____ * PIPE _____ * ORIFICE </div>		H. OTHER <input checked="" type="checkbox"/> FACTORY WITNESS TEST <input type="checkbox"/> SPARE PUMPS <input type="checkbox"/> INTERFACE CARD 1 <input type="checkbox"/> INTERFACE CARD 2 _____ _____ _____	

IV. PERFORMANCE SPECIFICATIONS

CAPACITY <u>1500</u> T. R. STEAM CONSUMPTION (lbs/hr) <u>9.9 lbs/hr</u> <p style="text-align: center; font-size: 1.2em;">115 PSI</p> <p style="text-align: center;">STEAM SUPPLY</p>	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>COOLER</th> <th>COND.</th> </tr> </thead> <tbody> <tr> <td>GPM</td> <td>2991</td> <td>6702</td> </tr> <tr> <td>EWT</td> <td>57</td> <td>85</td> </tr> <tr> <td>LWT</td> <td>45</td> <td>95</td> </tr> <tr> <td>F. F.</td> <td>0.00025</td> <td>0.00025</td> </tr> <tr> <td>PASS</td> <td>2</td> <td>1</td> </tr> <tr> <td>P. D.</td> <td>44.0</td> <td>28.5</td> </tr> <tr> <td>NOZZLE ARRANGE.</td> <td>E2</td> <td>AC1</td> </tr> </tbody> </table>		COOLER	COND.	GPM	2991	6702	EWT	57	85	LWT	45	95	F. F.	0.00025	0.00025	PASS	2	1	P. D.	44.0	28.5	NOZZLE ARRANGE.	E2	AC1
	COOLER	COND.																							
GPM	2991	6702																							
EWT	57	85																							
LWT	45	95																							
F. F.	0.00025	0.00025																							
PASS	2	1																							
P. D.	44.0	28.5																							
NOZZLE ARRANGE.	E2	AC1																							

IV. DOCUMENTATION

Qty.	Description	Send To:	
		1 Copy To*	Remaining To:
9	Chiller/Heater Submittal Set	York International Corp. P.O. Box 1592 York, PA 17405 Attn: Service Dept. - 36BE	District Address: BUILDING SYSTEMS + SERVICES, INC. 4 COLBY AVE CLAYMONT, DE 19703 Attn: MIKE HALLGARTY
9	Parts List*		
9	Packing List		
9	Factory Test Report*		
9	As Built Drawing Set*		
9	As Built Sepsa Set*		

INTER-OFFICE MEMO

DATE: August 18, 1994
SUBJECT: DuPont YPC-ST-22G absorber, Order No. 93 211 038 - 01
FROM: Ian Casper
TO: Mike Haggarty

Through an error the absorber section of this machine was tubed with an enhanced surface area 19 fin per inch tube. The tube is 0.035 inch wall per the customer specification, but the fin height creates a smaller inner diameter resulting in a higher pressure drop at the design flow rate.

If DuPont can accept the higher pressure drop they will have a machine that will operate at lower lithium-bromide temperatures and concentrations. This condition normally increases the longevity of the unit and decreases maintenance costs.

The enhanced tubes are normally sold as a price add option to increase heat transfer surface area. At the specified operating conditions for this job the enhanced tubes will provide a higher efficiency. This added efficiency will be at the expense of a higher pressure drop as mentioned above. Attached are curves showing pressure drop and steam consumption vs flow rate through the absorber. The steam consumptions are based on 1500 Tons, chilled water temperatures of 57/45 deg F, and tower water entering at 85 deg F with the leaving temperature varying with the flow rate. The attached table shows the pressure drop and steam consumption in one deg F increments of tower water delta T, ranging from 85/95 to 85/100.

To maintain an on-time delivery it is important that we reach an agreement with DuPont so that the enhanced absorber tubes are acceptable. Since the enhanced tubes are a higher performance tube, it is likely that after reviewing the attached data that an operating point that works towards DuPont's advantage can be found. I apologize for the obvious inconvenience. Please contact me with any questions regarding this information.

***** PARAFLOW TEST STAND SPECIFICATION SHEET *****

SALES ORDER: 93 211 038 01
 FL TONNAGE = 1500 TONS

TYPE OF UNIT = 22G STEAM
 PASS ARRANGEMENT CODE: E2 AC1

EVAPORATOR CONDITIONS

	SPECIFIED	MINIMUM	MAXIMUM
CAPACITY (TONS)	1500	1425	1575
FLOW (GPM)	2990.365	2840.847	3139.883
ENTERING TEMPERATURE (F)	57	N/A	N/A
LEAVING TEMPERATURE (F)	45	44.5	45.5
PRESSURE DROP (FT W.C.)	43.16532	36.69052	49.64012
EVAP TUBE WALL THICKNESS	.035	N/A	N/A
EVAP PASSES	2	2	2
EVAPORATOR FOULING FACTOR	.00025	N/A	N/A

TOWER WATER CONDITIONS

FLOW(GPM)	5588.149	5308.742	5867.557
ENTERING TEMPERATURE (F)	85	84.5	85.5
LEAVING TEMPERATURE (F)	97	N/A	N/A
PRESSURE DROP (FT W.C.)	39.72869	33.76938	45.68799
ABSORBER TUBE WALL THICKNESS	.035	N/A	N/A
CONDENSER TUBE WALL THICKNESS	.035	N/A	N/A
ABSORBER PASSES	1	1	1
TOWER FOULING FACTOR	.00025	N/A	N/A

PERFORMANCE PARAMETERS

1ST STG LEAVING TEMP (F)	303.7938	293.7938	313.7938
1ST STG GEN PRESSURE (PSIA)	9.462078	7.462078	11.46208
1ST STAGE GEN CONCENTRATION (WT %)	63.47372	62.47372	64.47372
2ND STG ENTER TEMP (F)	155.8108	145.8108	165.8108
2ND STG LEAVING TEMP (F)	187.4814	177.4814	197.4814
2ND STG CONCENTRATION (WT %)	61.35176	60.35176	62.35176
ABSORBER SOLUTION TEMP (F)	104.4141	99.41413	109.4141
WEAK SOLUTION CONCENTRATION (WT %)	57.85176	56.85176	58.85176
ENERGY INPUT (LBS/HR, UNINSULATED)	15458.56		
ENERGY INPUT/TON (LB/TON-HR, UNINSULATED)	10.30571	9.816185	10.79523
STEAM INLET PRESSURE (PSIA)	115	113	117

BYPASS PIPING IS REQUIRED:

THE BYPASS DIAMETER PIPE SIZE IS 6 INCHES.

THE ORIFICE SIZE NEEDED IS 4 INCHES.

Cv VALUE FOR 115 PSI INPUT IS 89.05347

RECOMMENDED STEAM VALVE IS HONEYWELL 2.5 INCH VALVE, YORK # 022-08888-000

TOTAL 14 PAGES

Supersedes 40.05-F1(285)

ONE 40.05-F1(687)

<input type="checkbox"/>	REVISION NO. _____	DATE _____	BY _____
<input type="checkbox"/>	REVISION NO. _____	DATE _____	BY _____
<input type="checkbox"/>	REVISION NO. _____	DATE _____	BY _____
<input type="checkbox"/>	REVISION NO. _____	DATE _____	BY _____
<input type="checkbox"/>	REVISION NO. _____	DATE _____	BY _____
<input type="checkbox"/>	ORIGINAL	DATE _____	BY _____

YORK INTERNATIONAL CORP. EQUIPMENT ORDER TRANSMITTAL

TYPE ORDER

1 JOB NAME DUPONT EXPERIMENTAL STATION		REGION NE AGENTS	FACTORY REVIEW																
ADDRESS ROUTE 141 BETWEEN RTS 202 AND RT 52		YORK ORDER NO.(S) -01	CREDIT																
CITY & STATE & ZIP WILMINGTON, DE 19898			INSURANCE																
2 SOLD TO E.I. DUPONT DE NEMOURS CO.		CONTRACT NO. 93211038	TAX																
ADDRESS EXPERIMENTAL STATION P.O. BOX 80-0361		SQ. NO.	LEGAL																
CITY & STATE & ZIP WILMINGTON, DE 19880-0361			ORDER ACCEPTABLE <input type="checkbox"/>																
3 SHIP TO E.I. DU PONT DE NEMOURS COMPANY		FREIGHT CHARGES <input type="checkbox"/> COLL <input checked="" type="checkbox"/> PREPAID	ORDER ACCEPTABLE WITH QUALIFICATIONS: (SEE ATTACHED) <input type="checkbox"/>																
C/O EXPERIMENTAL STATION		<input checked="" type="checkbox"/> FREIGHT ALLOWED	RETURN APPROVED ORDER																
ADDRESS ROUTE 141 BETWEEN RTS. 202 AND RT. 52		<input type="checkbox"/> ADD TO INVOICE	TO _____																
CITY & STATE & ZIP WILMINGTON, DE 19898		<input type="checkbox"/> AIR FREIGHT	ATTN. _____																
MARK SHIPMENT CH-1		SHIP VIA OPEN TRUCK																	
SHIPMENT WANTED: DATE JULY 29, 1994	REQUESTED DATE AT JOBSITE JULY 29, 1994	SPECIAL SHIPPING INSTRUCTIONS Printer (302) 884-6233																	
ORDER/SALES CODE 02-211-0000-07-5324		CONTACT GENE GUERRAZZI (302) 695-7316 48 hrs PRIOR																	
TERMS YORK/DUPONT EEA#: 0993-558L	TRADING AREA # 068	DOES ORDER INCLUDE LIQUIDATED DAMAGE PENALTY OR OTHER CLAUSES APPLICABLE TO YORK? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/>																	
SALES CREDIT - PARTICIPANTS		ARE ALL ITEMS IN THIS ORDER IN ACCORDANCE WITH YORK APPROVED DESIGN, POLICY AND PROCEDURE? YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> IF "NO" SEE: IDENT. NO.																	
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>NAME</th> <th>DIST NO.</th> <th>CODE NO.</th> <th>VOL %</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>BUILDG SYS + SERV. INC</td> <td>02</td> <td>211</td> <td>593,832</td> <td>100</td> </tr> <tr> <td>TOTAL</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		NAME	DIST NO.	CODE NO.	VOL %	%	BUILDG SYS + SERV. INC	02	211	593,832	100	TOTAL					DISTRICT MGR. KDH		
NAME	DIST NO.	CODE NO.	VOL %	%															
BUILDG SYS + SERV. INC	02	211	593,832	100															
TOTAL																			
IS ORDER RELEASED FOR FABRICATION?		CHECK LIST (Transmit in Following Order)																	
1. 33211038-01		TRANSMITTAL LETTER																	
2. _____		E.O.T.																	
3. _____		ORDER FORMS																	
4. _____		PRICING SUMMARY																	
5. _____		VENDOR QUOTES AND DRAWINGS																	
6. _____		CUSTOMER P.O. (orig) LX 762267 DATE 11/12/93 ORIGINAL TO FOLLOW																	
		ACKNOWLEDGEMENT LETTER (A/C)																	
		ACCEPTANCE LETTER (I-P)																	
		OFFER OF SALE																	
		SPECIAL BILLING INSTRUCTIONS																	
		BUSINESS INFORMATION FORM																	
		YORK ORDER/LOST JOB SURVEY																	
		PRODUCT DATA SHEETS																	
		SPECIFICATIONS WITH GENERAL CONDITIONS AND NECESSARY CORRESPONDENCE																	
		INSTANT CREDIT AUTH. # _____ DATE _____																	
		M/C # _____																	
		M/C TRANSMITTAL ATTACHED																	
		FAB. RELEASE DATE FOR FIRM PRICE _____ R																	

ADJUSTED SECURED PRICE (PURCHASE ORDER LESS 1, 2 & 3 BELOW) ... \$ **593,832.00**

1. "USE" TAXES ONLY INCLUDED IN P.O.

2. MAINT. CONTRACTS

3. FEES, INSURANCE, BONDS, PERMITS, SPECIAL COMMISSIONS

TOTAL PURCHASE ORDER ... \$ **593,832.00**

SALES ASST.

11-12-93

009

<h2 style="margin: 0;">ORDER FORM</h2> <h3 style="margin: 0;">PARAFLOW STEAM FIRED CHILLER</h3>		Revision No. _____ Rev. Date _____ Sheet _____ of _____				
		Customer Order No. <u>LOXT 2267-HW</u> York Contract No. <u>93211038</u> York Order No. <u>-01</u>				
S H I P T O: MARKS <u>CH-1</u>		Job Name and Location <u>Du Pont Experimental Station, WIL, DE</u>				
		York SQ. No. _____				
S H I P T O: MARKS <u>CH-1</u>		VIA: _____ PPD-F/A S O L D T O: Special Shipping Instructions: TRUCKER TO CONTACT GENE GUERRAZZI 48 HOURS PRIOR (302) 675-8316 PAGE (302) 584-6233				
Region <u>NE AGENTS</u> Code <u>01-211-0000-07-5324</u>		Fabrication Release <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO *Date Order Received _____ *Scheduled Date _____				
Order Date <u>11-11-93</u> Wanted Date <u>7-29-94</u> Partial Shipment <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO						
ITEM	PRICING TABLE	EQUIPMENT	QTY.	UNIT MLP	M	SELLING PRICE
	HEAT SOURCE	SIZE	ELEC. CODE	MTR	TUBE	
<u>1</u>	<u>Y P C - S T - 2 2 G</u>	<u>- 4 6 - C - X</u>				
	TABLE 1.1	UNIT TYPE <u>326?</u>	<u>1</u>	<u>1123031</u>	<u>.42</u>	<u>496873</u>
	TABLE 1.1	LITHIUM BROMIDE <u>320?</u>	<u>1</u>	<u>127808</u>	<u>.42</u>	<u>53679</u>
	TABLE 2.1	TUBE ENHANCEMENT <input type="checkbox"/> "A" <input type="checkbox"/> "B"				
	TABLE 2.1	<input type="checkbox"/> SEPARATE CHARGE (Std. for 20G-22G)				
	TABLE 2.1	<input type="checkbox"/> 2 PIECE SHIPMENT (Includes Sep. Charge)				
	TABLE 2.1	<input type="checkbox"/> SPARE PUMPS				
	TABLE 2.1	<input type="checkbox"/> CUSTOMER WITNESS FACTORY TEST				
	TABLE 2.2	<input checked="" type="checkbox"/> WATER FLOW SWITCH <input checked="" type="checkbox"/> 150 LB. <input type="checkbox"/> 300 LB.	<u>1</u>	<u>180</u>	<u>.42</u>	<u>76</u>
	TABLE 2.3	<input type="checkbox"/> ANSI FLANGES EVAP * ABS * COND				
	TABLE 2.4	MARINE WATER BOX				
		<input checked="" type="checkbox"/> ABSORBER	<u>1</u>	<u>14139</u>	<u>.42</u>	<u>5938</u>
		<input checked="" type="checkbox"/> CONDENSER	<u>1</u>	<u>14139</u>	<u>.42</u>	<u>5938</u>
		<input checked="" type="checkbox"/> EVAPORATOR	<u>1</u>	<u>6186</u>	<u>.42</u>	<u>2598</u>
	TABLE 2.5	300 b. WATER BOXES				
		<input type="checkbox"/> ABSORBER / COND				
		<input type="checkbox"/> EVAPORATOR				
	TABLE 2.6	SPECIAL TUBE MATERIAL & THICKNESS				
		<input checked="" type="checkbox"/> ABSORBER	<u>1</u>	<u>8756</u>	<u>.42</u>	<u>3678</u>
		<input checked="" type="checkbox"/> CONDENSER	<u>1</u>	<u>3600</u>	<u>.42</u>	<u>1512</u>
		<input checked="" type="checkbox"/> EVAPORATOR	<u>1</u>	<u>12902</u>	<u>.42</u>	<u>5419</u>
	TABLE 2.7	REMOTE INTERFACE <input type="checkbox"/> CARD 1 <input type="checkbox"/> CARD 2				
NOTE: SHADED ENTRIES ARE MANDATORY						
APPROVED BY: _____			FOB FACTORY, domestic packed		Total \$ <u>575,711</u>	
*Completed by factory						

II. CHILLER SPECIFICATIONS

FORM 155.19-F1

Unit No. <u>1</u>	Tag No. <u>CH-1</u>	Revision No.	Revision Date	York Sales Order <u>93211038-01</u>	SHEET <u>2</u> OF <u>2</u>
Model No. <u>YPC-ST-226-46-C-X</u>		Cooling Capacity (TON) <u>1500</u>		No. of Units <u>1</u>	
A. TUBES <input checked="" type="checkbox"/> STD <input type="checkbox"/> A <input type="checkbox"/> B	B. VOLTAGE <input type="checkbox"/> 208/3/60 <input type="checkbox"/> 230/3/60 <input checked="" type="checkbox"/> 480/3/60	C. TUBE WALL TUBE MATL. <input type="checkbox"/> STD <input checked="" type="checkbox"/> STD <input checked="" type="checkbox"/> SPECIAL <input type="checkbox"/> SPECIAL <input checked="" type="checkbox"/> EVAP .035" <input type="checkbox"/> EVAP _____ <input checked="" type="checkbox"/> COND .035" <input type="checkbox"/> COND _____ <input checked="" type="checkbox"/> ABS .035" <input type="checkbox"/> ABS _____		D. WATER BOXES <input type="checkbox"/> STD MARINE † 300 LB. Flanges <input checked="" type="checkbox"/> EVAP <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> COND <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> ABS <input type="checkbox"/> <input type="checkbox"/>	
F. SPECIAL SHIPMENT <input type="checkbox"/> SHIP UNCHARGED <input type="checkbox"/> SPLIT SHIPMENT <input type="checkbox"/> COND FLOW SWITCH		G. FLOW SWITCHES <div style="border: 1px solid black; padding: 5px; margin: 5px;"> <p style="text-align: center;">FOR YORK FACTORY USE</p> <input type="checkbox"/> NO BYPASS <input type="checkbox"/> BYPASS REQUIRED STEAM VALVE SIZE CV VALVE _____ * PIPE _____ * ORIFICE </div>		H. OTHER <input type="checkbox"/> FACTORY WITNESS TEST <input type="checkbox"/> SPARE PUMPS <input type="checkbox"/> INTERFACE CARD 1 <input type="checkbox"/> INTERFACE CARD 2 _____ _____ _____	

IV. PERFORMANCE SPECIFICATIONS

CAPACITY <u>1500</u> T. R. STEAM CONSUMPTION (lbs/hr) <u>14632</u> 9.75 lb/ton-hr @ 115 psig steam	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td></td> <td>COOLER</td> <td>COND.</td> </tr> <tr> <td>GPM</td> <td>2991</td> <td>6702</td> </tr> <tr> <td>EWT</td> <td>57</td> <td>85</td> </tr> <tr> <td>LWT</td> <td>45</td> <td>95</td> </tr> <tr> <td>F. F.</td> <td>0.00025</td> <td>0.00025</td> </tr> <tr> <td>PASS</td> <td>2</td> <td>1</td> </tr> <tr> <td>P. D.</td> <td>42.3</td> <td>30</td> </tr> <tr> <td>NOZZLE ARRANGE.</td> <td>E2</td> <td>AC1</td> </tr> </table>		COOLER	COND.	GPM	2991	6702	EWT	57	85	LWT	45	95	F. F.	0.00025	0.00025	PASS	2	1	P. D.	42.3	30	NOZZLE ARRANGE.	E2	AC1
	COOLER	COND.																							
GPM	2991	6702																							
EWT	57	85																							
LWT	45	95																							
F. F.	0.00025	0.00025																							
PASS	2	1																							
P. D.	42.3	30																							
NOZZLE ARRANGE.	E2	AC1																							

IV. DOCUMENTATION

Qty.	Description	Send To:	
		1 Copy To*	Remaining To:
9	Chiller/Heater Submittal Set	York International Corp. P.O. Box 1592 York, PA 17405 Attn: Service Dept. 368E	District Address: BUILDING SYSTEMS + SERVICES, INC. 4 COLBY AVE CLAYMONT, DE 19703 Attn: MIKE HALGARTY
9	Parts List*		
9	Packing List		
9	Factory Test Report*		
9	As Built Drawing Set*		
9	As Built Sepia Set*		

***** PARAFLOW TEST STAND SPECIFICATION SHEET *****

SALES ORDER: 93211038
 FL TONNAGE = 1500 TONS

TYPE OF UNIT = 22G STEAM
 PASS ARRANGEMENT CODE: E2AC1

EVAPORATOR CONDITIONS

	SPECIFIED	MINIMUM	MAXIMUM
CAPACITY (TONS)	1500	1425	1575
FLOW (GPM)	2990.365	2840.847	3139.883
ENTERING TEMPERATURE (F)	57	N/A	N/A
LEAVING TEMPERATURE (F)	45	44.5	45.5
PRESSURE DROP (FT W.C.)	43.16532	36.69052	49.64012
EVAP TUBE WALL THICKNESS	.035	N/A	N/A
EVAP PASSES	2	2	2
EVAPORATOR FOULING FACTOR	.00025	N/A	N/A

TOWER WATER CONDITIONS

FLOW(GPM)	6702.451	6367.328	7037.573
ENTERING TEMPERATURE (F)	85	84.5	85.5
LEAVING TEMPERATURE (F)	95	N/A	N/A
PRESSURE DROP (FT W.C.)	28.09688	23.88235	32.31142
ABSORBER TUBE WALL THICKNESS	.035	N/A	N/A
CONDENSER TUBE WALL THICKNESS	.035	N/A	N/A
ABSORBER PASSES	1	1	1
TOWER FOULING FACTOR	.00025	N/A	N/A

PERFORMANCE PARAMETERS

1ST STG LEAVING TEMP (F)	307.9449	297.9449	317.9449
1ST STG GEN PRESSURE (PSIA)	9.59643	7.59643	11.59643
1ST STAGE GEN CONCENTRATION (WT %)	64.09446	63.09446	65.09446
2ND STG ENTER TEMP (F)	157.0358	147.0358	167.0358
2ND STG LEAVING TEMP (F)	188.0382	178.0382	198.0382
2ND STG CONCENTRATION (WT %)	61.8625	60.8625	62.8625
ABSORBER SOLUTION TEMP (F)	106.2244	101.2244	111.2244
WEAK SOLUTION CONCENTRATION (WT %)	58.3625	57.3625	59.3625
ENERGY INPUT (LBS/HR, UNINSULATED)	15217.28		
ENERGY INPUT/TON (LB/TON-HR, UNINSULATED)	10.14485	9.662972	10.62673
STEAM INLET PRESSURE (PSIA)	115	113	117

BYPASS PIPING IS REQUIRED:

THE BYPASS DIAMETER PIPE SIZE IS 8 INCHES.
 THE ORIFICE SIZE NEEDED IS 5.75 INCHES.

Cv VALUE FOR 115 PSI INPUT IS 97.22837
 RECOMMENDED STEAM VALVE IS HONEYWELL 8 INCH VALVE, YORK # 022-08887-000

Change to 4" per Jay Kohler
 11/18/93

engineering output for paraflow chiller

=====

model: 22g tube option (a) steam consumption [lb/hr] 13389.221

tube types:	absorber	condenser	evaporator
	mkt # 503	mkt # 777	mkt # 503
	cu(100%)	cu(100%)	cu(100%)
	19 fins/in	bare tube	19 fins/in
	# tubes=1194	# tubes= 404	# tubes=1404
	diam[in]= .523	diam[in]= .750	diam[in]= .523
	wall[in]= .025	wall[in]= .028	wall[in]= .025

tube leng (in) 315.00 pump ratio 14.34 conc split 3.78 educt split .00

location	t[deg f]	conc[%]	press[mm Hg]	mass flow[lb/hr]
=====	=====	=====	=====	=====
1	259.034	57.370	.000	137590.92
2	295.897	.000	.000	10532.52
5	295.897	62.126	.000	127058.41
10	128.927	62.126	.000	127058.41
12	115.478	57.370	.000	255971.98
13	103.589	57.370	.000	255971.98
13ed	103.589	57.370	.000	255971.98
ed	103.589	57.370	.000	.00
14	126.172	61.671	.000	238121.77
14ed	125.972	61.671	.000	238121.77
15	139.785	61.671	.000	238121.77
16	85.000	.000	.000	.00
17	94.028	.000	.000	.00
19	41.985	.000	6.793	17850.21
21	57.000	.000	.000	.00
22	45.011	.000	.000	.00
24	103.398	.000	54.425	.00
25	94.028	.000	.000	.00
26	97.812	.000	.000	.00
26mix	97.452	.000	.000	.00
29	189.287	.000	.000	7317.69
30	189.886	.000	481.491	10532.52
33	148.396	57.370	.000	118381.05
34	189.287	61.150	.000	111063.36
36	152.187	61.150	.000	111063.36

operating conditions:

=====

evaporator:		absorber/condenser (tower):	
load [tons]	1500.000	absorber flow [gpm]	5159.337
flow [gpm]	2990.231	total cond/bypass flow [gpm]	5159.337
entering temp. [deg f]	57.000	entering temp. [deg f]	85.000
leaving temp. [deg f]	45.011	leaving temp. [deg f]	97.812
pressure drop [psi]	15.269	pressure drop [psi]	14.002

heat ex #1 load [btu/min]	24283.988	abs load [btu/min]	-385982.688
heat ex #2 load [btu/min]	157950.460	cond load [btu/min]	-146168.814
heat ex #3 load [btu/min]	31121.512		
1st st gen load [btu/min]	232871.940	2nd st gen load [btu/min]	179158.241

evap fouling factor [hr-ft ² -f/btu]	.00025	# of evaporator passes	2
tower fouling factor [hr-ft ² -f/btu]	.00025	# of absorber passes	1

heat transfer coefficients [btu/hr-ft ² -f]:				water velocity [ft/s]:
	(inside)	(outside)	(overall)	
absorber	1968.003	344.248	272.243	7.89
condenser	2230.985	1109.970	620.857	9.79
evaporator	1415.489	1068.900	525.711	7.78
gen#1	3919.195	239.034	236.880	
gen#2	1746.116	374.270	323.540	

required steam pressure [psig] 85.9 customer pressure input [psig] 115.0

the bypass pipe diameter [in] 4 orifice size needed [in] 2.75

condenser bypass flow [gpm] 497.8

for a pressure input of 115.000 psi, the cv value is 77.890

honeywell 2.5 in. valve, york # 022-08888-000

engineering output for paraflow chiller

=====

model: 22g standard tube option steam consumption [lb/hr] 13327.108

tube types:	absorber	condenser	evaporator
	mkt # 666	mkt # 777	mkt # 503
	cu(100%)	cu(100%)	cu(100%)
	bare tube	bare tube	19 fins/in
	# tubes=1194	# tubes= 404	# tubes=1404
	diam[in]= .625	diam[in]= .750	diam[in]= .523
	wall[in]= .025	wall[in]= .028	wall[in]= .025

tube leng (in) 315.00 pump ratio 14.34 conc split 3.78 educt split .00

location	t[deg f]	conc[%]	press[mm Hg]	mass flow[lb/hr]
=====	=====	=====	=====	=====
1	256.877	57.395	.000	136875.98
2	293.446	.000	.000	10487.25
5	293.446	62.157	.000	126388.73
10	128.850	62.157	.000	126388.73
12	115.386	57.395	.000	255467.68
13	103.674	57.395	.000	255467.68
13ed	103.674	57.395	.000	255467.68
ed	103.674	57.395	.000	.00
14	125.956	61.697	.000	237652.64
14ed	125.756	61.697	.000	237652.64
15	139.369	61.697	.000	237652.64
16	85.000	.000	.000	.00
17	91.927	.000	.000	.00
19	41.985	.000	6.793	17815.04
21	57.000	.000	.000	.00
22	45.011	.000	.000	.00
24	101.405	.000	51.288	.00
25	91.927	.000	.000	.00
26	95.779	.000	.000	.00
26mix	94.474	.000	.000	.00
29	187.043	.000	.000	7327.79
30	187.686	.000	459.245	10487.25
33	147.101	57.395	.000	118591.70
34	187.043	61.175	.000	111263.91
36	151.299	61.175	.000	111263.91

operating conditions:

=====

evaporator:		absorber/condenser (tower):	
load [tons]	1500.000	absorber flow [gpm]	6702.147
flow [gpm]	2990.231	total cond/bypass flow [gpm]	6702.147
entering temp. [deg f]	57.000	entering temp. [deg f]	85.000
leaving temp. [deg f]	45.011	leaving temp. [deg f]	95.779
pressure drop [psi]	15.269	pressure drop [psi]	11.238
heat ex #1 load [btu/min]	23869.081	abs load [btu/min]	-384715.822
heat ex #2 load [btu/min]	154809.726	cond load [btu/min]	-146370.962
heat ex #3 load [btu/min]	30026.201		
1st st gen load [btu/min]	231791.652	2nd st gen load [btu/min]	178654.954
evap fouling factor [hr-ft ² -f/btu]	.00025	# of evaporator passes	2
tower fouling factor [hr-ft ² -f/btu]	.00025	# of absorber passes	1

heat transfer coefficients [btu/hr-ft ² -f]:				water velocity [ft/s]:
	(inside)	(outside)	(overall)	
absorber	1693.168	260.728	213.389	6.94
condenser	2167.094	1110.336	615.917	9.62
evaporator	1415.489	1068.900	525.711	7.78
gen#1	3914.716	239.034	236.864	
gen#2	1739.866	373.833	323.028	

required steam pressure [psig] 82.9 customer pressure input [psig] 115.0

the bypass pipe diameter [in] 8 orifice size needed [in] 5.50

condenser bypass flow [gpm] 2117.8

for a pressure input of 115.000 psi, the cv value is 74.260

honeywell 2.5 in. valve, york # 022-08888-000

engineering output for paraflow chiller
=====

model: 22g tube option (a) steam consumption [lb/hr] 13338.215

tube types: absorber	condenser	evaporator
mkt # 503	mkt # 777	mkt # 503
cu(100%)	cu(100%)	cu(100%)
19 fins/in	bare tube	19 fins/in
# tubes=1194	# tubes= 404	# tubes=1404
diam[in]= .523	diam[in]= .750	diam[in]= .523
wall[in]= .025	wall[in]= .028	wall[in]= .025

tube leng (in) 315.00 pump ratio 14.34 conc split 3.78 educt split .00

location =====	t[deg f] =====	conc[%] =====	press[mm Hg] =====	mass flow[lb/hr] =====
1	256.610	57.206	.000	137513.53
2	293.014	.000	.000	10506.39
5	293.014	61.939	.000	127007.14
10	128.259	61.939	.000	127007.14
12	114.863	57.206	.000	255761.58
13	103.021	57.206	.000	255761.58
13ed	103.021	57.206	.000	255761.58
ed	103.021	57.206	.000	.00
14	125.377	61.495	.000	237926.04
14ed	125.177	61.495	.000	237926.04
15	138.932	61.495	.000	237926.04
16	85.000	.000	.000	.00
17	93.178	.000	.000	.00
19	41.985	.000	6.793	17835.54
21	57.000	.000	.000	.00
22	45.011	.000	.000	.00
24	102.567	.000	53.098	.00
25	93.178	.000	.000	.00
26	96.967	.000	.000	.00
26mix	96.202	.000	.000	.00
29	187.627	.000	.000	7329.15
30	188.250	.000	464.869	10506.39
33	147.244	57.206	.000	118248.05
34	187.627	60.986	.000	110918.90
36	151.133	60.986	.000	110918.90

operating conditions:
=====

evaporator:	absorber/condenser (tower):
load [tons]	1500.000 absorber flow [gpm] 5682.324
flow [gpm]	2990.231 total cond/bypass flow [gpm] 5682.324
entering temp. [deg f]	57.000 entering temp. [deg f] 85.000
leaving temp. [deg f]	45.011 leaving temp. [deg f] 96.967
pressure drop [psi]	15.269 pressure drop [psi] 15.400

heat ex #1 load [btu/min]	24225.633	abs load [btu/min]	-385065.398
heat ex #2 load [btu/min]	156236.023	cond load [btu/min]	-146205.739
heat ex #3 load [btu/min]	30649.068		
1st st gen load [btu/min]	231984.819	2nd st gen load [btu/min]	178852.820

evap fouling factor [hr-ft ² -f/btu]	.00025	# of evaporator passes	2
tower fouling factor [hr-ft ² -f/btu]	.00025	# of absorber passes	1

heat transfer coefficients [btu/hr-ft ² -f]:				water velocity [ft/s]:
	(inside)	(outside)	(overall)	
absorber	2119.084	343.620	274.555	8.69
condenser	2214.881	1110.040	619.625	9.77
evaporator	1415.489	1068.900	525.711	7.78
gen#1	3913.887	239.034	236.861	
gen#2	1741.099	374.005	323.188	

required steam pressure [psig] 82.4 customer pressure input [psig] 115.0

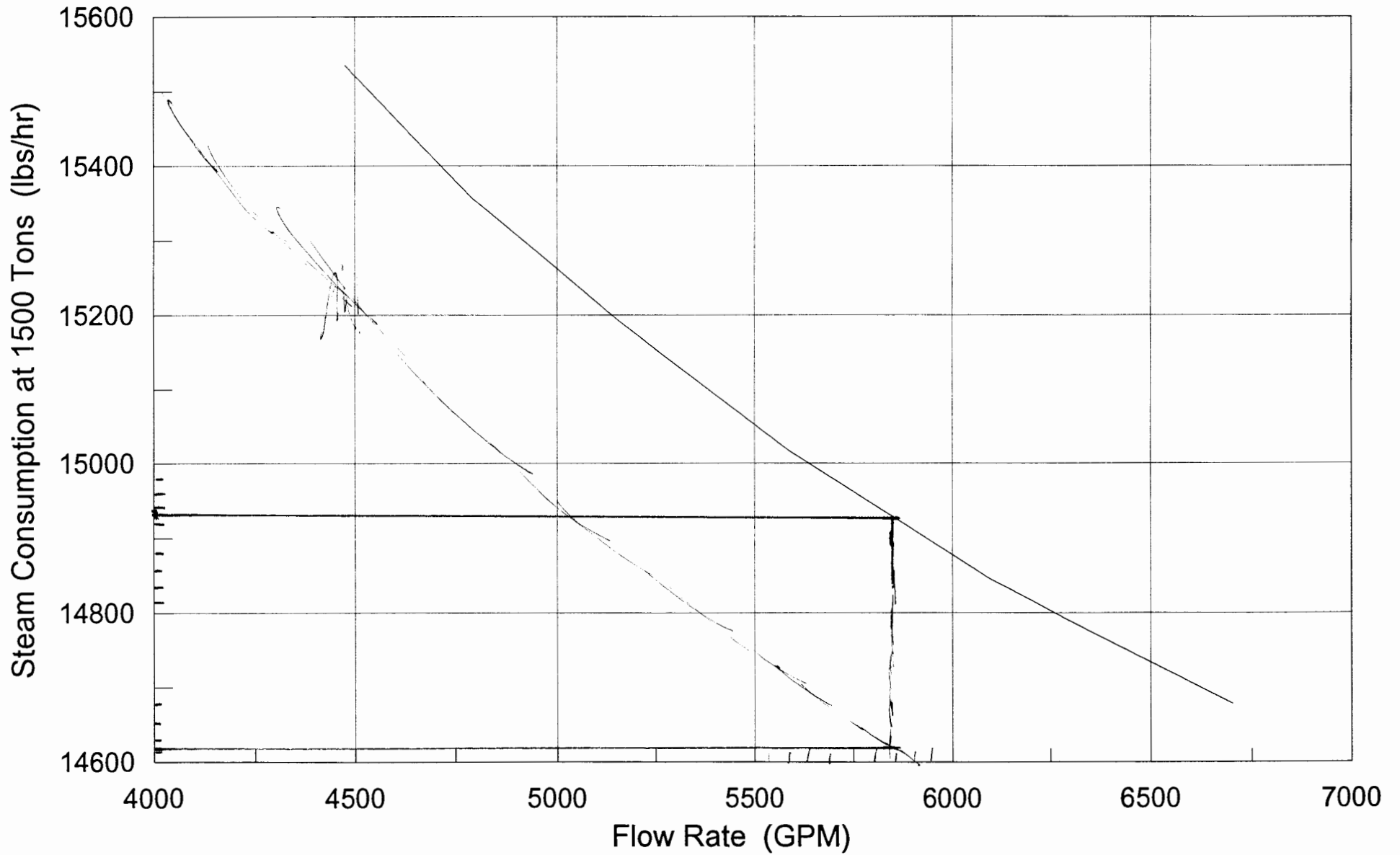
the bypass pipe diameter [in] 5 orifice size needed [in] 4.00

condenser bypass flow [gpm] 1026.6

for a pressure input of 115.000 psi, the cv value is 73.910

honeywell 2.5 in. valve, york # 022-08888-000

Steam Consumption VS Flow



Tower Temp Split (F)	Flow (GPM)	Press. Drop (ft of Water)	Steam Consumption (lbs/hr)
85 - 100	4474	31.6	15535
85 - 99	4792	33.8	15357
85 - 98	5160	36.3	15190
85 - 97	5588	39.7	15017
85 - 96	6095	43.5	14845
85 - 95	6702	48.5	14678

15184
 15010
 14847
 14678
 14500
 14347

14678 14/hr

85/97