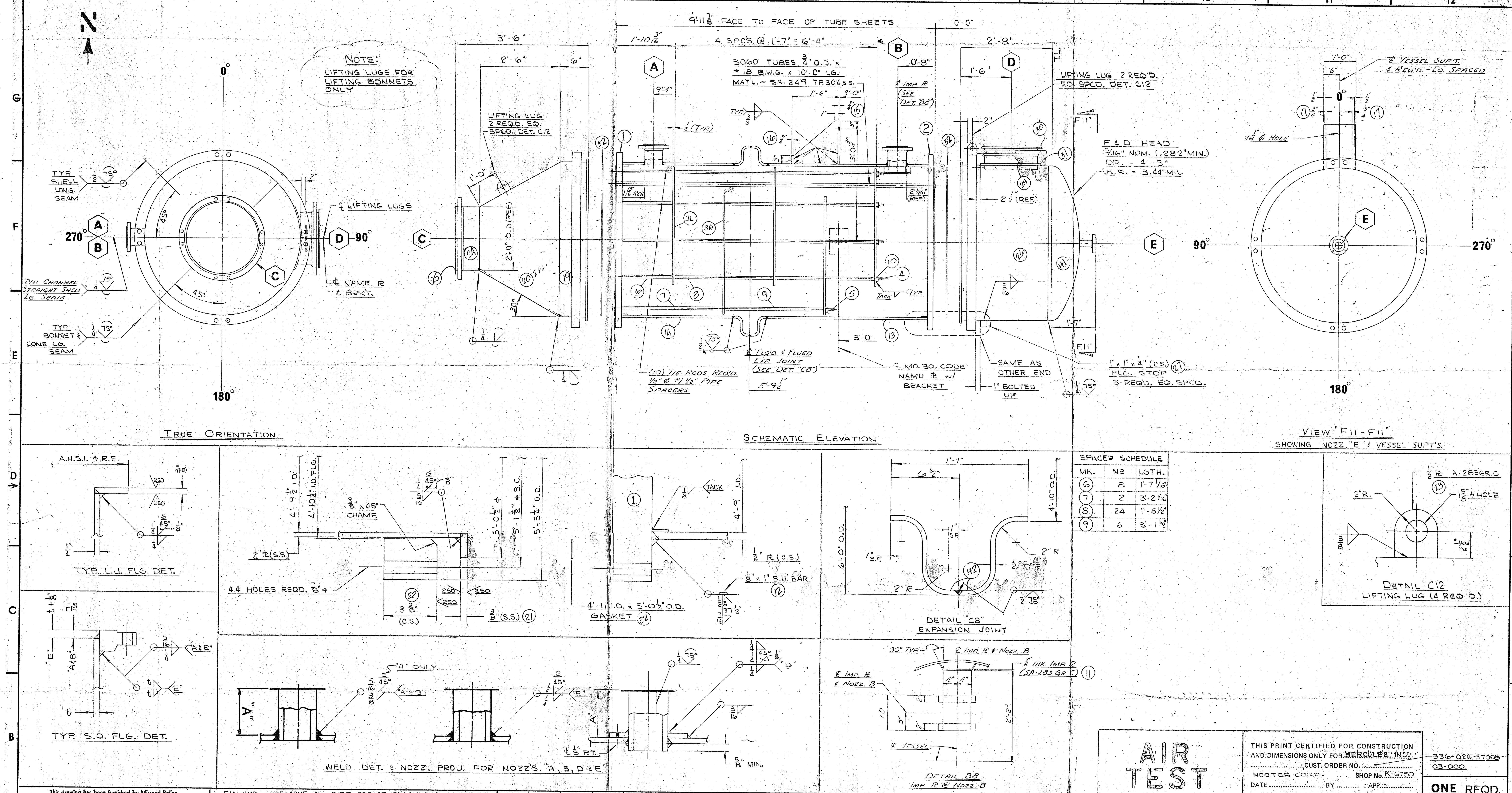


AIR TEST

THIS PRINT CERTIFIED FOR CONSTRUCTION AND DIMENSIONS ONLY FOR HERCULES INC. 336-026-57008-03-000
CUST. ORDER NO.
NOOTER CORP. SHOP No. K-6750
DATE .... BY .... APP. ....

ONE REQD.

This drawing has been furnished by Missouri Boiler. The information, know-how, and all new or patentable features are the property of Missouri Boiler and must not be copied or reproduced without permission. The foregoing in no way applies to design and features which are our customer's property.

NATIONAL BOARD NO. 3455
DIV. OF NOOTER CORP.
MISSOURI BOILER AND TANK COMPANY
ST. LOUIS, MISSOURI

MAXIMUM ALLOWABLE WORKING PRESSURE	TUBE SIDE P.S.I.	AT °F	SHELL SIDE P.S.I.	AT °F
	100	370	165	370
SHELL TK.	1/4"		1/2"	
HEAD TK.	.282" MIN.			
HEAD RAD.	53"			

SERIAL NO. K-6750 YEAR BUILT 1972

NOTES

1. FIN. INS. ~ REMOVE ALL DIRT, GREASE, SLAG & WELD SPATTER.
2. FIN. OUT'S. ~ SAME AS NOTE #1. (C.S.) ~ APPLY ONE COAT OF SHOP PRIMER PER HERCULES STD. SCS-3E1 PARA. S.8.
3. HYDRO TEST TO BE HELD A MIN. OF (2) HOURS.
4. COVER EXPOSED FLG. FACES W/WOOD COVERS FOR SHIPMENT.
5. EXT. BOLT THREADS TO BE COATED W/ A RUST PREVENTIVE LUBRICANT.
6. PAINT IN A CONSPICUOUS PLACE ON VESS. THE HERCULES EQUIP. Nº IN LETTERS @ LEAST 3" HIGH.
7. FURNISH (1) SET OF SPARE GASKETS.
8. AIR TEST TUBE SIDE @ 10 P.S.I. PER HERCULES STD. SCS-3E1 PARA. S.5 AFTER HYDRO. TEST

EQUIP. Nº ~ (Customer Please Furnish)
P.O. Nº ~ 336-026-57008-03-000

NOZZLE SCHEDULE

NOZZLE	NO. REQD	SIZE	RATING	FACING	TYPE	NECK	PAD	"A"
E	1	3"	150#	R.F.	S.O.	SCH.40 S.	——	——
D	1	20" O.D.	150#	——	L.J.	1/4" ℞ S.S.	5/8" x 1 3/4"	6"
C	1	24" O.D.	150#	——	L.J.	1/4" ℞ S.S.	——	——
B	1	6"	150#	R.F.	S.O.	SCH.80	——	6"
A	1	6"	150#	R.F.	S.O.	SCH.80	——	6"

BOLT HOLES STRADDLE ℄'S EXCEPT

MATERIAL	SHELL SIDE	TUBE SIDE OR JKT.
HEADS	——	SA-240 GR. 304 S.S.
SHELL	SA-516 GR. 70	SA-240 GR. 304 S.S.
NOZZLE NECKS	SA-53 GR. B	SA-312 TP 304 S.S. & SA-240 GR. 304 S.S.
NOZZLE FLGS.	SA-181 GR. I	SA-181 GR. I
REINF. PADS	——	SA-516 GR. 70
FLANGES	——	SA-105 GR. II
TUBES	——	SEE ELEVATION
TUBE SHEET	——	SA-240 GR. 304 S.S.
BAFFLES	SA-283 GR. C	——
TIE RODS & SPACERS	C.S.	
BOLTS OR STUDS	——	SA-193 GR. B7
NUTS	INT. (C.S.)	EXT. SA-194 CL. 2H
GASKETS	——	1/8" COMP. ASB. (J.M. 60)
EXP. JOINT	SA-516 GR. 70	——

DESIGN	SHELL SIDE	TUBE SIDE OR JKT.
CODE	1971 A.S.M.E. SEC. VIII	DIV. 1 & TEMA CL. "B"
MAX. DESIGN PRESS.	165 P.S.I.G.	100 P.S.I.G.
MAX. DESIGN TEMP.*	370°F	370°F
RADIOGRAPHY	SPOT PER CODE	SPOT PER CODE
JOINT EFF.	LONG. ~ 85%	LONG. ~ 85%
CORR. ALLOWANCE	1/16" (C.S. ONLY)	NONE
HYDRO-TEST	248 P.S.I.G. (SEE NOTE #3)	150 P.S.I.G.
TEST BASED ON	1.5 x DESIGN	1.5 x DESIGN
LIMITED BY	DESIGN	DESIGN
OTHER TESTS	NONE	SEE NOTE #8
HEAT TREATMENT	NONE	NONE

* TUBE & TUBESHEET DESIGN TEMP. = 100°F

NO.	DATE	REV
6		
5		
4		
3		
2		
1		

Cc sent to [illegible] 10-20-72
B.P.F. NO. 42892 DATE 9/26/72
SHEET 1 APPARATUS NO. E-6520-5
PROJECT & ACCOUNT 26057 2047
ORDER NO. 336-026-57008
PLANT HANOVER
APPROVED H. G. Schober

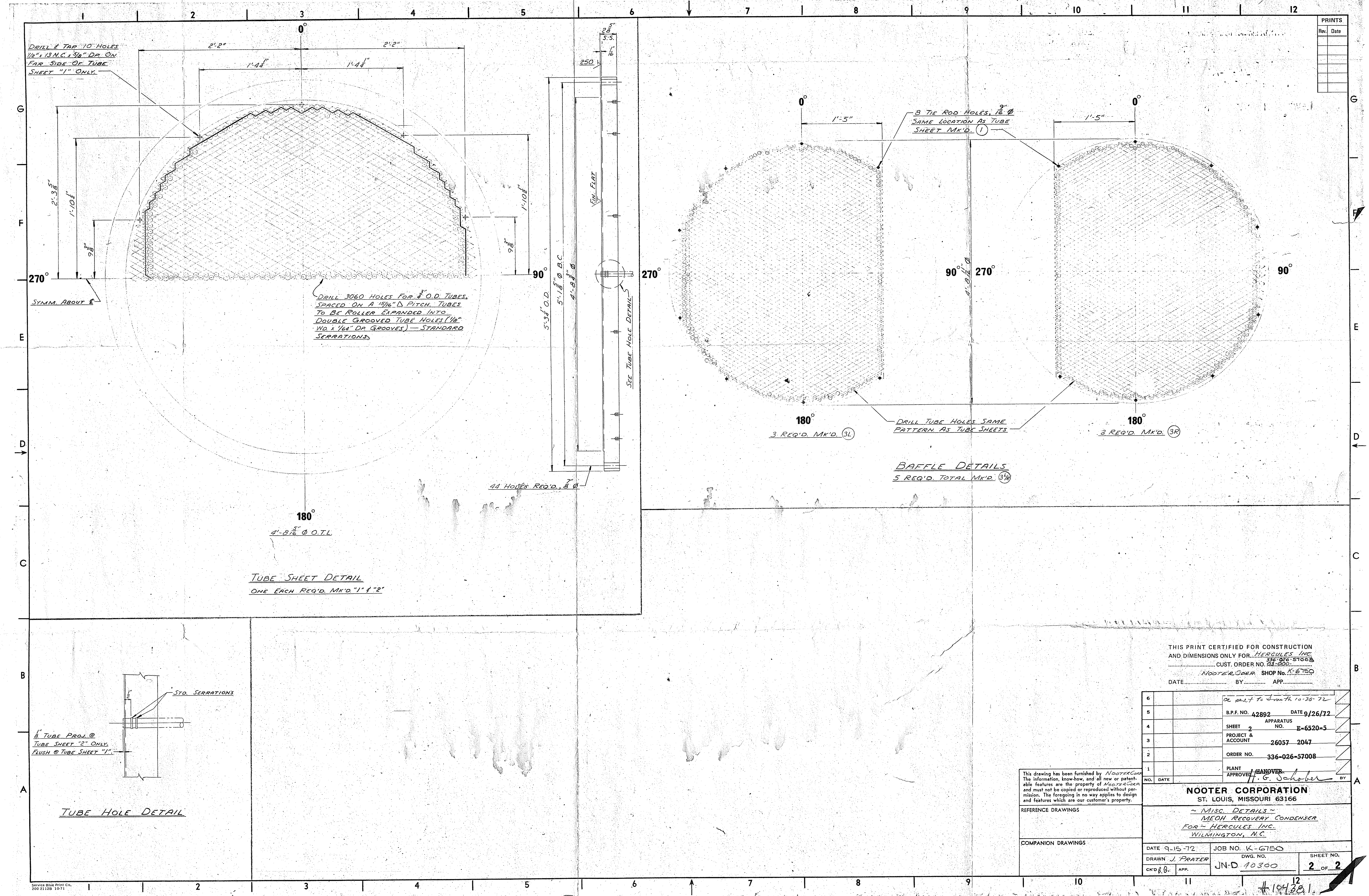
NOOTER CORP.
ST. LOUIS, MISSOURI

4'-9" I.D. x 10'-0" TUBE LENGTH
MEOH RECOVERY CONDENSER
FOR ~ HERCULES INC.
WILMINGTON, N.C.

DATE 9-15-72 JOB NO. K-6750
DRAWN R. MOON
CHKD [illegible] APP. E.B.
DWG. NO. JN-D 40299
SHEET NO. 1 OF 2

Service Blue Print Co. 250 120 2-70

104381



DRILL & TAP 10 HOLES 1/2" x 13 N.C. x 3/4" DP. ON FAR SIDE OF TUBE SHEET "1" ONLY.
SYMM. ABOUT ℄
DRILL 3060 HOLES FOR 3/4" O.D. TUBES, SPACED ON A 15/16" Δ PITCH. TUBES TO BE ROLLER EXPANDED INTO DOUBLE GROOVED TUBE HOLES (1/8" WD x 1/64" DP. GROOVES) — STANDARD SERRATIONS.
4'-8 5/16" Ø O.T.L.
TUBE SHEET DETAIL
ONE EACH REQ'D. MK'D "1" & "2"
FIN. FLAT
SEE TUBE HOLE DETAIL
44 HOLES REQ'D., 7/8 Ø
5'-3 3/4" O.D.
5'-1 1/8" Ø B.C.
4'-8 3/4" Ø
1/8" TUBE PROJ. @ TUBE SHEET "2" ONLY. FLUSH @ TUBE SHEET "1".
STD. SERRATIONS
TUBE HOLE DETAIL
8 TIE ROD HOLES, 9/16 Ø SAME LOCATION AS TUBE SHEET MK'D. 1
DRILL TUBE HOLES SAME PATTERN AS TUBE SHEETS
3 REQ'D. MK'D. 3L
2 REQ'D. MK'D. 3R
BAFFLE DETAILS
5 REQ'D. TOTAL MK'D. 3R/L
THIS PRINT CERTIFIED FOR CONSTRUCTION AND DIMENSIONS ONLY FOR HERCULES INC.
CUST. ORDER NO. 336-026-57008
NOOTER CORP. SHOP No. K-6750
B.P.F. NO. 42892 DATE 9/26/72
SHEET 2 APPARATUS NO. E-6520-5
PROJECT & ACCOUNT 26057 2047
ORDER NO. 336-026-57008
PLANT HANOVER
APPROVED H. G. Schober
This drawing has been furnished by NOOTER CORP. The information, know-how, and all new or patentable features are the property of NOOTER CORP. and must not be copied or reproduced without permission. The foregoing in no way applies to design and features which are our customer's property.
REFERENCE DRAWINGS
COMPANION DRAWINGS
NOOTER CORPORATION
ST. LOUIS, MISSOURI 63166
~ MISC. DETAILS ~
MEOH RECOVERY CONDENSER
FOR ~ HERCULES INC.
WILMINGTON, N.C.
DATE 9-15-72
DRAWN J. PRATER
CK'D G.B.
JOB NO. K-6750
DWG. NO. JN-D 10300
SHEET NO. 2 OF 2
PRINTS

FORM U-1 MANUFACTURERS' DATA REPORT FOR PRESSURE VESSELS
As required by the Provisions of the ASME Code Rules, Section VIII, Division 1

1. Manufactured by MISSOURI BOILER AND TANK COMPANY DIVISION OF MOOTER CORP. ST. LOUIS, MISSOURI
(Name and address of Manufacturer)

2. Manufactured for HERCULES INC. WILMINGTON, N.C.
(Name and address of Purchaser)

3. Type VERT. (Horiz. or Vert.) Kind HT. EXCH. (Tank, Jacketed, Heat Exch.) Vessel No. (Mfrs. Serial) K-6750 (----) (State & State No.) Natl. Bd. No. 3455 Yr. Built 1972

Items 4–9 incl. to be completed for single wall vessels (such as air tanks), jackets of jacketed vessels, or shells of heat exchangers.

4. SHELL: Material SA-516-70 (Kind and Spec. No.) T.S. 70,000 (Fig. or F.B. & Spec. Min. T.S.) Nominal Thickness 1/2 In. Corrosion Allowance 1/16 In. Diam. 4 Ft. 9 In. Length 9 Ft. 11 7/8 In.

5. SEAMS: Long DBL. BUTT (Welded, Dbl., Single, Lap, Butt) H.T. NO (Yes or No)[1] R.T. SPOT (Spot or Complete) Sectioned NO (Yes or No) Efficiency 85 %

Girth DBL. BUTT H.T. NO R.T. SPOT Sectioned NO No. of Courses 2

If riveted describe seams fully on reverse side of form.

6. HEADS (a) Material ____ T.S. ____ (b) Material ____ T.S. ____

Location (Top, bottom, ends)	Thickness	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)								
(b)								

If removable, bolts used ____ (Material, Spec. No., T.S., Size, Number) Other fastening ____ (Describe or Attach Sketch)

7. STAYBOLTS: ____ (Material) If hollow ____ (Size of Hole) Attachment ____ (Threaded, Welded) Pitch ____ (Horiz.) X ____ (Vert.) Diam. ____ (Nominal)

8. JACKET CLOSURE: ____ (Describe as ogee & weld, bar, etc. If bar, give dimensions, if bolted, describe or sketch)

9. Constructed for max. allowable working press[2] 165 psi at max. temp. 370° F. Min. temp. (when less than –20°) ---- °F. Hydrostatic / ~~Pneumatic~~ or ~~Combination~~ Test Press 248 psi.

Items 10 and 11 to be completed for tube sections.

10. TUBE SHEETS: Stationary. Material SA-240-304S.S. (Kind & Spec. No.) Diam. 57 (Subject to Pressure) In. Thickness 2 5/8 In. Attachment WELDED (Welded, Bolted)

Floating. Material ____ (Kind & Spec. No.) Diam. ____ In. Thickness ____ In. Attachment ____

11. TUBES: Material SA-249-304 (Kind & Spec. No.) O.D. 3/4 In. Thickness # 18 BWG Inches or Gage Number 3,060 Type STR (Straight or U)

Items 12–15 incl. to be completed for inner chambers of jacketed vessels, or channels of heat exchangers.

12. SHELL Material SA-240-304 (Kind and Spec. No.) T.S. 75,000 (Fig. or F.B. & Spec. Min. T.S.) Nominal Thickness 1/4 Corrosion Allowance 0 In. Diam. 4 Ft. 10 In. Length 6 Ft. 2 In.

13. SEAMS: Long DBL. BUTT (Welded, Dbl., Single, Lap, Butt) H.T. NO (Yes or No)[1] R.T. SPOT (Spot or Complete) Sectioned NO (Yes or No) Efficiency 85 %

Girth DBL. BUTT H.T. NO R.T. SPOT Sectioned NO No. of courses 2

If riveted describe seams fully on reverse side of form.

14. HEADS (a) Material SA-240-304 T.S. 75,000 (b) Material ____ T.S. ____ (c) Material ____ T.S. ____

Location	Thickness	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a) Top, bottom, ends	.282"	53	3.44"	---	---	---	---	CONCAVE
(b) Channel								
(c) Floating								

If removable, bolts used (a) ____ (Material, Spec. No., T.S., Size, Number) (b) ____

(c) ____ Other fastening WELDED (Describe or Attach Sketch)

15. Constructed for max. allowable working press 100 psi at max. temp. 370° F. Min. temp. (when less than –20°) --- °F. Hydrostatic / ~~Pneumatic~~ or ~~Combination~~ Test Press 150 psi.

Items below to be completed for all vessels where applicable.

16. SAFETY VALVE OUTLETS: Number ____ Size ____ Location ____

17. NOZZLES

Purpose (Inlet, Outlet, Drain)	Number	Diam. or Size	Type	Material	Thickness	Reinforcement Material	How Attached
IN & OUT	2	6"	SER 15 S.O.	SA-53-B	SCH 80	---	WELDED
do	1	20" O.D.	SER 15 L.J.	SA-240-304	1/4"	SA-516-70	do
do	1	24" O.D.	SER do	do	do	---	do
do	1	3"	SER 15 S.O.	SA-312-304	SCH 40S	---	do

P.O. 026-57008-FCD EQU. No. E-6580-B.S PROJ. 026857

[1] If postweld heat-treated. [2] List under remarks other internal or external pressures with coincident temperature when applicable.

(Over)

#104381

FORM U-1 (back)

18. INSPECTION Manholes, No. _____ Size _____ Location _____

OPENINGS: Handholes, No. _____ Size _____ Location _____

Threaded, No. _____ Size _____ Location _____

19. SUPPORTS: Skirt NO (Yes or No) Lugs 4 (Number) Legs --- (Number) Other --- (Describe) Attached WELDED TO SHELL (How)

20. REMARKS: M.E.O.H. RECOVERY CONDENSER

P.O. #336-026-57008-03-000

(Brief description of purpose of the vessel, as Air Tank, After Cooler, Jacketed Cooker, etc. State contents of each part.)

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division I.

Date Jan 25 19 73 Signed MISSOURI BOILER & TANK CO. (Manufacturer) By Robert J. Lucas

Certificate of Authorization Expires 12/31/73

CERTIFICATE OF SHOP INSPECTION

VESSEL MADE BY MISSOURI BOILER & TANK CO. at ST. LOUIS, MISSOURI

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province N.B. and employed by Lumberman's Mutual Casualty Co. of Chicago, Ill. have inspected the pressure vessel described in this manufacturer's data report on Jan 25 19 73, and state that to the best of my knowledge and belief, the manufacturer has constructed this pressure vessel in accordance with the applicable sections of the ASME Boiler and Pressure Vessel Code.

By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this manufacturer's data report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date Jan 25 19 73

R. D. Erickson (Inspectors Signature) Commissions 6180 (Nat'l Board, State, or Province and No.)

CERTIFICATE OF FIELD ASSEMBLY INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province _____ and employed by _____ of _____ have compared the statements in this manufacturer's data report with the described pressure vessel and state that parts referred to as data items _____, not included in the certificate of shop inspection have been inspected by me and that to the best of my knowledge and belief the manufacturer has constructed and assembled this pressure vessel in accordance with the applicable sections of the ASME Boiler and Pressure Vessel Code. The described vessel was inspected and subjected to a hydrostatic test of _____ psi.

By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this manufacturer's data report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date _____ 19 _____

_____ (Inspector's Signature) Commissions _____ (Nat'l Board, State, or Province and No.)

HERCULES STANDARD
PAGE 2 OF 2

HERCULES INCORPORATED

HEAT EXCHANGER SPECIFICATIONS

REFERENCE	1	PLANT Hanover	JOB NO. 026057	EQUIP. NAME	MeOH Recovery Condenser
	2	AREA Cryst.	NO. 2047	EQUIP. NO.	E-6520-5
	3	BLDG.	NO.	NO. UNITS	One
	4	ORDER 026-57008	VENDOR Nooter Corp.	B.P.F. NO.	42892
	5	MADE BY H.G. Schober	CHKD. BY	APPR. BY	DATE 2/7/72

PROCESS AND GENERAL	6	SURFACE AREA: EACH UNIT	6000 SQ. FT.	EACH SHELL	SQ. FT.		
	7	NO. SHELLS	1				
	8	WEIGHTS — EACH SHELL	LB.	BUNDLE	LB.	FULL OF WATER	LB.

		SHELL SIDE	TUBE SIDE
9			
10	FLUID CIRCULATED	MeOH-H_2O Brine	MeOH Vapor and Inc
11	TOTAL FLUID ENTERING	400,000 LB./HR.	LB./HR
12	TOTAL VAPOR ENTERING	LB./HR.	LB./HR
13	TOTAL LIQUID ENTERING	400,000 LB./HR.	LB./HR
14	TOTAL STEAM ENTERING	LB./HR.	LB./HR
15	TOTAL NON-CONDENSABLES ENTERING	LB./HR.	LB./HR
16	FLUIDS VAPORIZED OR VAPORS CONDENSED		
17	STEAM CONDENSED		
18	SPECIFIC GRAVITY @ TEMPERATURE	@ °F.	@ °F
19	VISCOSITY IN	CP.	CP
20	VISCOSITY OUT	CP.	CP.
21	THERMAL CONDUCTIVITY	BTU/HR-FT./°F.	BTU/HR-FT./°F
22	MOLECULAR WEIGHT OF VAPORS		
23	SPECIFIC HEAT OF LIQUIDS	BTU/LB./°F.	BTU/LB./°F.
24	LATENT HEAT OF VAPORS	BTU/LB.	BTU/LB
25	TEMPERATURE IN	31 °F.	95 °F.
26	TEMPERATURE OUT	41 °F.	78 °F.
27	OPERATING PRESSURE	70 PSIG	≤ 1 PSIG
28	DESIGN PRESSURE — TEMPERATURE	165 PSIG @ 370°F.	100 PSIG @ 370°F.
29	TEST PRESSURE — HYDROSTATIC	250 PSIG	250 PSIG
30	PRESSURE DROP — ALLOWABLE	10 PSIG	NIL PSIG
31	PRESSURE DROP — CALCULATED	PSIG	PSIG
32	PASSES PER SHELL	1	1
33	VELOCITY	FT./SEC.	FT./SEC.
34	FOULING RESISTANCE		

35	CODE REQUIREMENTS ASME Sect VIII	TEMA CLASS B	TEMA TYPE DESIGNATION	
36	HEAT EXCHANGED 4,000,000 BTU/HR.	MTD. (CORRECTED)		
37	TRANSFER RATE — SERVICE	CLEAN		

CONSTRUCTION AND MATERIALS	38	TUBES: MATERIAL 304 S.S.	QUAN. 3060	O.D. 3/4 IN.	18 GA.	LENGTH 120 IN.	PITCH △ ☐ ◊	
	39	TUBE ATTACHMENT ☐ ROLLED	☐ WELDED	☒ GROOVED AND ROLLED		PITCH 15/16 INCHES		
	40	TUBE SUPPORTS	PITCH	THICKNESS IN.	NO. TIE RODS			
	41	TUBE SHEETS 304 S.S. ☒ STATIONARY	☐ FLOATING					
	42	SHELL: C/S	I.D. 57 IN.	O.D. IN.	THICKNESS IN.	☒ VERT.	☐ HORIZ.	
	43	SHELL COVER	THICKNESS INCHES	O.D. INCHES	☐ REMOV.	☐ INTEG.		
	44	FLOATING HEAD COVER	THICKNESS INCHES	O.D. INCHES				
	45	EXPANSION JOINTS ☒ YES	☐ NO	TYPE Flanged and Flued				
	46	EXPANSION JOINT DESIGN CRITERIA	SHELL TEMP 365 °F.	TUBE TEMP 150 °F.				
	47	CHANNEL OR BONNET	THICKNESS INCHES	CHANNEL COVER	THICKNESS INCHES			
	48	BAFFLES — CROSS Yes	PITCH	TYPE	THICKNESS INCHES			
	49	BAFFLES — LONG No	TYPE		THICKNESS INCHES			
	50	GASKETS JM 60	TEST GASKETS JM 60					
	51	CONNECTIONS: SHELL IN 6"	OUT 6"	SERIES 150# R.F.				
	52	CONNECTIONS: CHANNEL IN 24"	OUT 20" 2" Drain	SERIES 150# R.F.				
	53	IMPINGEMENT PLATES ☒ YES	☐ NO	THICKNESS INCHES				
	54	CORROSION ALLOWANCE: SHELL SIDE	TUBE SIDE None					
	55	PAINTING Prime Coat Per Hercules 11CS-661 - C/S Parts						

REMARKS	56
	57
	58
	59
	60
	61

JOB NO.	NO.	DESCRIPTION	REV. BY	CHK'D	APPR'D

#104381

NATIONAL BOARD NO. 3455

MISSOURI BOILER AND TANK COMPANY

DIVISION OF NOOTER CORPORATION

ST. LOUIS, MISSOURI

U
W
DIV. 1

MAXIMUM ALLOWABLE WORKING PRESSURE

TUBE SIDE		SHELL SIDE	
P.S.I.	AT °F	P.S.I.	AT °F
100	370	165	370

SERIAL NO. K-6750 YEAR BUILT 1973

T S S S

SHELL TK 1/4" 1/2"

HEAD TK .282" MIN

HEAD RAD 53"

A

#104381