AUTOMATION INDUSTRIES, INC.
VITRO ENGINEERING DIVISION

CERTIFIED VENDOR INFORMATION

PAGE ____ OF ____

CVI	EQUIPMENT TITLE	EQUIPMENT NO.	COST CODE
11996	Vacuum Equipment	E-C-2 E-C-3	21HM
DATE	**VENDOR**		**PROJECT NO.**
3-28-73	Schutte & Koerting Co.		HAP-655
P. O. NUMBER	**EQUIPMENT MANUFACTURER**		**BLDG. NO.**
AT(45-1)2178	Struthers Scientific & International Corp.		242-S

SHEET NO.	VENDOR DWG.	SUPERSEDED BY HAN. DWG.	REV.	HAN. MODIFIED DWG.	CURVES	VENDOR SPEC.	INSTR.	PARTS LIST	MISC.
1/14	72-K-045-J	Two Stg. Cond. Unit Curve							
	67-XS-035-J	Assembly Drawing 6" Single Stage Steam Jet Ejector							
	67-XS-033-J	Assembly Drawing 2 1/2" Single Stage Steam Jet Ejector							
	Form U-1	Manufacturer's Data Report for Unfired Pressure Vessels - Serial #76986 E-C-2							
	Form U-1	Manufacturer's Data Report for Unfired Pressure Vessels - Serial #76988 E-C-3							
		Operating & Maintenance Instructions for S & K Multi-Stage Condensing							
		Steam Jet Vacuum Pumps Having Surface Type Condensers							
	72-T-018-J-1	Exchanger Specification Sheet							

APR 30 1973

PERMANENT FILE

☐ COMPLETE
☐ PARTIAL

APPROVED: →

FOR DESIGN

RJ McA.

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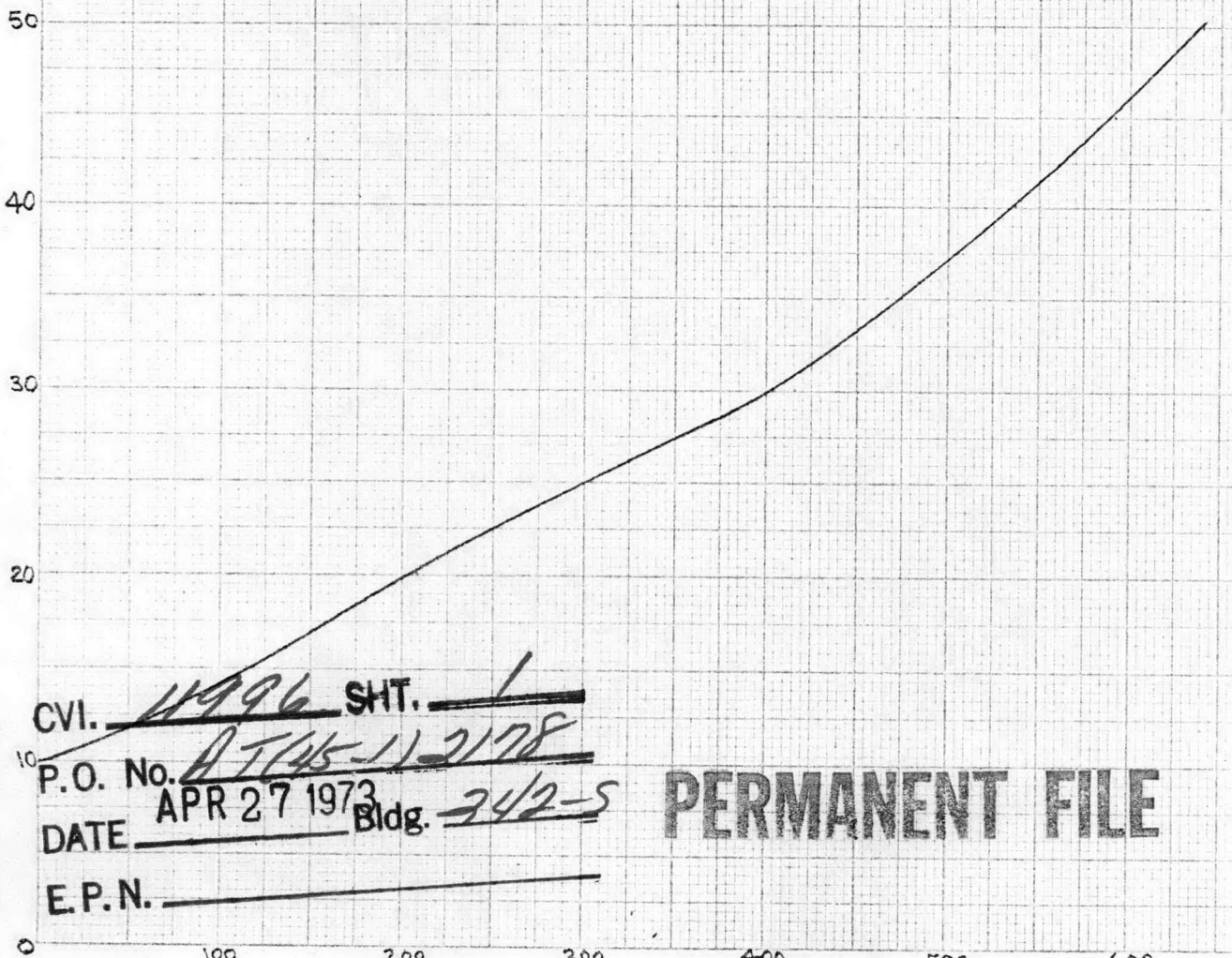
1(MO)	Cleo Bretz	ARHCO/FB	1(M)	T. Humason	ARHCO/FB	1(M)	IM Jacques	ARHCO/271-T
1(P)	GK Carpenter	ARHCO/202-A	1(P)	RJ Parazin	ARHCO/2704-W	1(P)	Al Prince	JAJ/1262
2(P)	KC Bolt	ARHCO/202-S	1(P)	BA Caldwell	VITRO/2101-M	0	AP Boston	ARHCO/2704-W
0	RA Kyle	ARHCO/271-T	0	DE Anderson	VITRO/FB	0	RI McAndrew	VITRO/FB

6" T-4 x 2½" S-2A TWO STG. COND. UNIT
1475 PPH. STM. @ 90 #G. & 410° F.
S & K. PO. 72-20865-J
STRUTHERS S.I.C. ORD. 9-71-05-10132-049

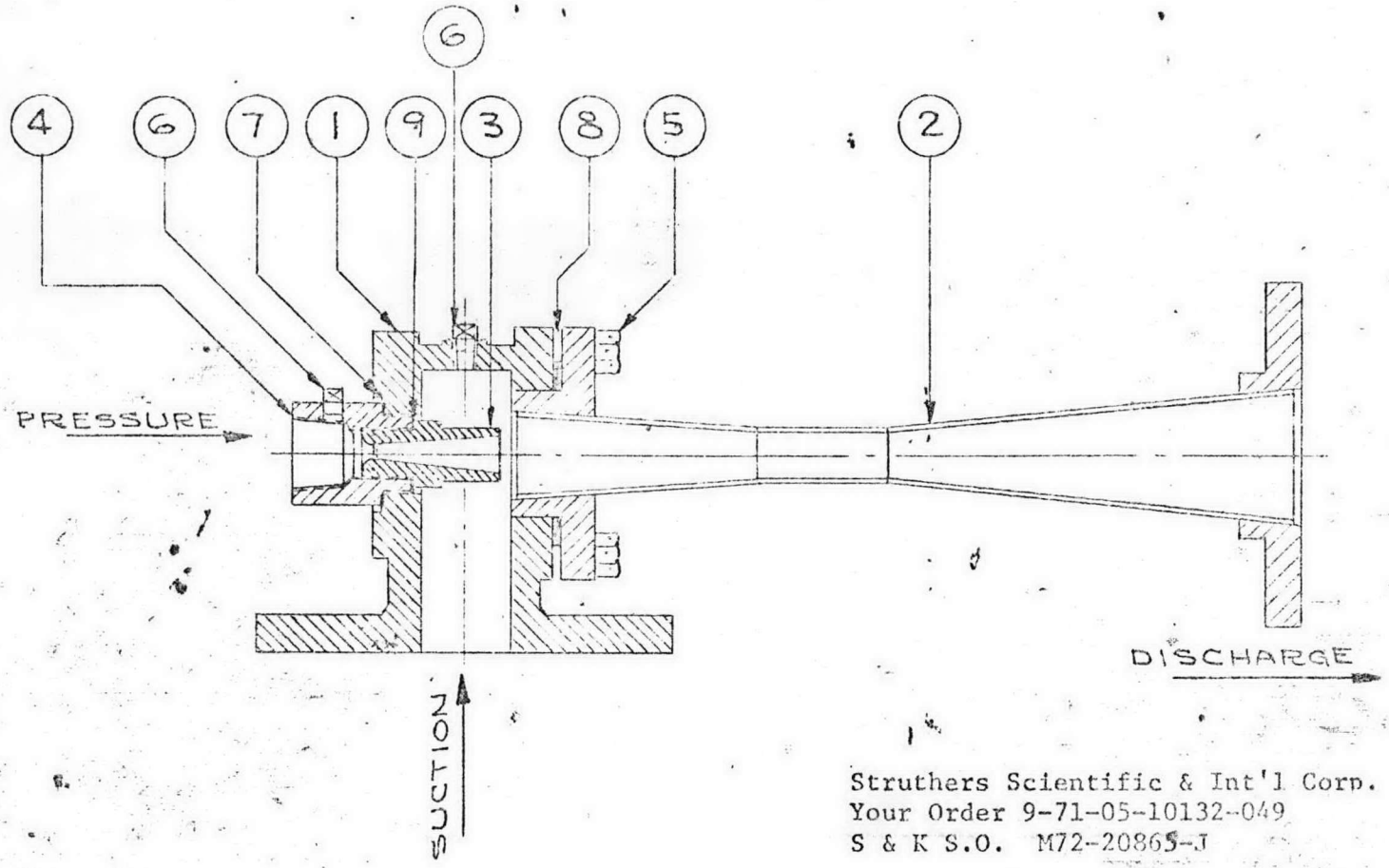


CVI. 4996 SHT. 1
P.O. No. AT45-1-2178
DATE APR 27 1973 Bldg. 242-S
E.P.N.

PERMANENT FILE

SCHUTTE & KOERTING CO.
CORNWELLS HG'TS., PA.

72-K-045-J



Struthers Scientific & Int'l Corp.
Your Order 9-71-05-10132-049
S & K S.O. M72-20865-J

* RECOMMENDED SPARE PART

PARTS LIST

NO.	PART NAME	MATERIAL	NO. PCS.
1	BODY	Cast Iron	1
2	TAIL	Steel	1
* 3	NOZZLE	Stainless Steel	1
4	NOZZLE HOLDER	Steel	1
5	CAPSCREWS	Steel	AS REQ'D.
6	PIPE PLUGS	Steel	4
7	GASKET	Soft IRon	1
8	GASKET	Compressed Asbestos	1
9	GASKET	Soft Iron	1

FOR DWG. WITH SPACER PIECE SEE 70-XS-023-J

FIG. NO. 555
S/M
S.O.
DRAWN 5-1-67 FV
CHECKED
SCALE NONE
MADE FROM 65-XS-124-J-1

ASSEMBLY DRAWING

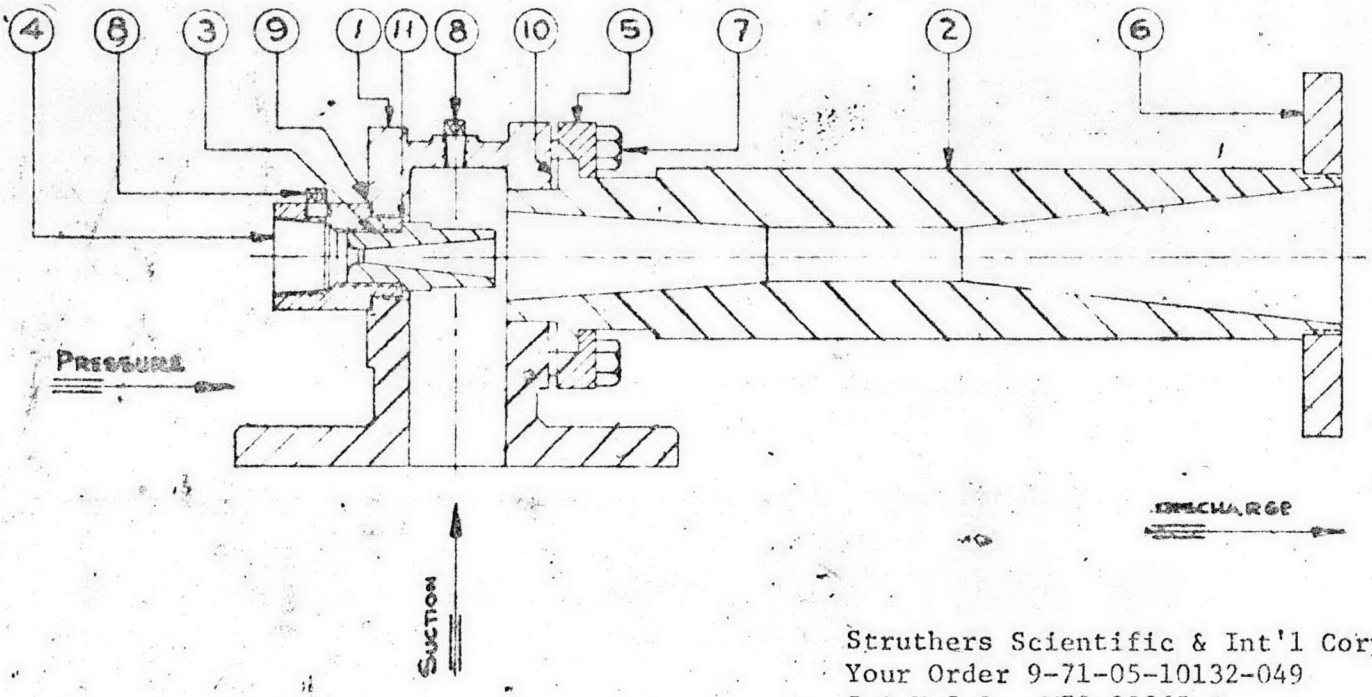
6" SINGLE STAGE

STEAM JET EJECTOR

SCHUTTE & KOERTING CO.
MANUFACTURING ENGINEERS
CORNWELLS HEIGHTS BUCKS COUNTY

67-XS-035-J

REVISIONS	
1	DATE
P.O.	



Struthers Scientific & Int'l Corp.
Your Order 9-71-05-10132-049
S & K S.O. M72-20865-J

* RECOMMENDED SPARE PARTS

PARTS LIST

NO.	PART NAME	MATERIAL	NO. PCS.
1	BODY	Cast Iron	1
2	TAIL	Steel	1
* 3	NOZZLE	Stainless Steel	1
4	NOZZLE HOLDER	Steel	1
5	SPLIT FLANGE	Nodular Iron	1
6	DISCHARGE FLANGE	Steel	1
7	CAPSCREWS	Steel	4
8	PIPE PLUGS	Steel	4
9	GASKET	Soft Iron	1
10	GASKET	Compressed Asbestos	1
11	GASKET	Soft Iron	1

FIG NO 555
B/M
P.O.
DRAWN D.P. 4-17-67
CHECKED
SCALE N.T.S.
MADE FROM

ASSEMBLY DRAWING
2½" THRU 4" SINGLE STAGE
STEAM JET EJECTOR

SCHUTTE & KOERTING CO.
MANUFACTURING ENGINEERS
CORNWELLS HEIGHTS BUCKS COUNTY, PENNA.

67-XS-033-J

REV

2

FORM U-1 MANUFACTURERS' DATA REPORT FOR UNFIRED PRESSURE VESSELS

As required by the Provisions of the ASME Code Rules

Job. No. 12U3525-1

1. Manufactured by THE WHITLOCK MANUFACTURING CO. WEST HARTFORD, CONN (Name and address of Manufacturer)

2. Manufactured for S & K CO. CORNWELLS HEIGHTS, PENN (Name and address of Purchaser)

3. Type Horiz (Horiz. or Vert.) Kind Heat Exch (Tank, Jacketed, Heat Exch.) Vessel No. (76986) (Mfrs. Serial) (_____) (State & State No.) Natl. Bd. No. 9806 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 SMS STL SA-53 Pipe-B (Kind and Spec. No.) T.S. 60000 (Fig. or F.B. & Spec. Min. T.S.) Nominal Thickness 5/16 in. Corrosion Allowance 1/16 in. Diam. 1 Ft. 4 In. Length 5 Ft. 5 3/4 In.

5. SEAMS: Long SMS (Welded, Dbl., Single, Lap, Butt) H.T. No (Yes or No)[1] X.R. No (Spot or Complete) Sectioned No (Yes or No) Efficiency 100 % 80% DS

Girth None H.T. No X.R. No Sectioned No No. of Courses One

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 maxint allowable working press[2] 100 psi at max. temp. 350 °F. Min. temp. (when less than –20°) _____ °F. Hydrostatic ~~Pneumatic or~~ Combination } Test Press 150 psi.

Items 10 and 11 to be completed for tube sections.

10. TUBE SHEETS: Stationary. Material STL SA-515-70 (Kind & Spec. No.) Diam. 16" (Subject to Pressure) In. Thickness 1 In. Attachment Welded (Welded, Bolted)

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

11. TUBES: Material STL W.A.W SA-214 (Kind & Spec. No.) O.D. 3/4" In. Thickness 16" Inches or Gage Number 144 Type Straight (Straight or U)

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

12. SHELL Material SMS STL Pipe SA-53-B (Kind and Spec. No.) T.S. 60000 (Fig. or F.B. & Spec. Min. T.S.) Nominal Thickness 5/16 in. Corrosion Allowance 1/16 in. Diam. 1 Ft. 4 In. Length 1 Ft. 6 3/4 In.

13. SEAMS: Long SMS (Welded, Dbl., Single, Lap, Butt) H.T. No (Yes or No)[1] X.R. No (Spot or Complete) Sectioned No (Yes or No) Efficiency 100 % 80 DS

Girth None H.T. No X.R. No Sectioned No No. of courses One

If riveted describe seams fully on reverse side of form.

14. HEADS (a) Material _____ T.S. _____ (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								
(b)	Channel covers	1 1/8						19 7/8	Flat
(c)	Floating								

If removable, bolts used (a) _____ (Material, Spec. No., T.S., Size, Number) (b) Alloy STL-SA-193-B-7, 12500 5/8-16

(c) _____ Other fastening _____ (Describe or Attach Sketch)

15. Constructed for maxint allowable working press[2] 100 psi at max. temp. 350 °F. Min. temp. (when less than –20°) _____ °F. Hydrostatic ~~Pneumatic~~ 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
Tube In & Out	2	3"	Flg	Stl	Sch 40	Stl	Welded
Shell In	1	8	"	"	"	"	"
Shell Out	1	2½	"	"	"	"	"
Cleaning Conns	2	2"	"	"	"	"	"
Drain	1	1	NPT	Stl	3000	"	"
Vents	2	1/2	"	"	6000	"	"
Thermowell Conn	1	3/4	"	"	3000	"	"
Pressure Conn	1						

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

FORM U-1 (back)

18. INSPECTION OPENINGS: Manholes, No. _____ Size _____ Location _____
Handholes, No. _____ Size _____ Location _____
Threaded, No. _____ Size _____ Location _____

19. SUPPORTS: Skirt _____ (Yes or No) Lugs _____ (Number) Legs _____ (Number) Other Cradles welded to shell (Describe) Attached (Where & How)

20. REMARKS: Type 1-V1-4 Size 16-B-66
Water in Tubes, Air & Steam in Shell

(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 Unfired Pressure Vessels.

Date 9-7 19 72 Signed THE WHITLOCK MANUFACTURING CO. WEST HARTFORD CONN (Manufacturer) By _____

Certificate of Authorization Expires December 31, 1972

CERTIFICATE OF SHOP INSPECTION

THE WHITLOCK MANUFACTURING CO. WEST HARTFORD, CONN.

VESSEL MADE BY _____ at _____

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State of CONN. and employed by THE HARTFORD STEAM BOILER INSPECTION & INSURANCE CO. of HARTFORD CONN have inspected the pressure vessel described in this manufacturer's data report on Sept 11 19 72, 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 Sept 11 19 72

K W Lidums (Inspectors Signature) Commissions NB 1313 Pa 1270 (Nat'l Board or State 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 of _____ 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 or State and No.)

Printed in U.S.A. (7/66)

FORM U-1 MANUFACTURERS' DATA REPORT FOR UNFIRED PRESSURE VESSELS

As required by the Provisions of the ASME Code Rules

Job No.

1. Manufactured by THE WHITLOCK MANUFACTURING CO., WEST HARTFORD, CONN 12U-3525-2
(Name and address of Manufacturer)

2. Manufactured for S & K CO. CORNWELL HEIGHTS, PENN
(Name and address of Purchaser)

3. Type Horiz (Horiz. or Vert.) Kind Heat Exch (Tank, Jacketed, Heat Exch.) Vessel No. (76988) (Mfrs. Serial) ( ) (State & State No.) Natl. Bd. No. 9807 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 SMS STL Pipe SA-53 GR-B (Kind and Spec. No.) T.S. 60000 (Fig. or F.B. & Spec. Min. T.S.) Nominal Thickness 322 In. Corrosion Allowance 1/16 In. Diam. 0 Ft 8 5/8 In. Length 7 Ft. 8 In. 1/8

5. SEAMS: Long SMS (Welded, Dbl., Single, Lap, Butt) H.T. No (Yes or No)[1] X.R. No (Spot or Complete) Sectioned No (Yes or No) Efficiency 100/80 %

Girth None H.T. No 1 X.R. No Sectioned No No. of Courses NO

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] 100 psi at max. temp. 350° F. Min. temp. (when less than −20°) ____ °F. Hydrostatic / Combination Test Press 150 psi.

Items 10 and 11 to be completed for tube sections.

10. TUBE SHEETS: Stationary. Material STL SA-515 GR 70 (Kind & Spec. No.) Diam. 8 5/8 (Subject to Pressure) In. Thickness 1 In. Attachment Welded (Welded, Bolted)

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

11. TUBES: Material STL SA-214 W.A.W (Kind & Spec. No.) O.D. 3/4 In. Thickness 16" Inches or Gage Number 44 Type Straight (Straight or U)

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

12. SHELL Material SMS STL Pipe SA-53 GR B (Kind and Spec. No.) T.S. 60000 (Fig. or F.B. & Spec. Min. T.S.) Nominal Thickness 322 In. Corrosion Allowance 1/16 Diam. 0 Ft 8 5/8 In. Length 1 Ft. 8 3/8

13. SEAMS: Long SMS (Welded, Dbl., Single, Lap, Butt) H.T. No (Yes or No)[1] X.R. No (Spot or Complete) Sectioned No (Yes or No) Efficiency 100/80 %

Girth None H.T. No X.R. No Sectioned No No. of courses One

If riveted describe seams fully on reverse side of form.

14. HEADS (a) Material ____ T.S. ____ (b) Material STL SA-515 GR-70 T.S. 70000 (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								
(b) Channel Covers 3/4							12½	Flat
(c) Floating								

If removable, bolts used (a) ____ (Material, Spec. No., T.S., Size, Number) (b) Alloy STL SA-193-B7, 12500 5/8

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

15. Constructed for max. int allowable working press[2] 100 psi at max. temp. 350 °F. Min. temp. (when less than −20°) ____ °F. Hydrostatic / 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
Tube In & Out	2	3"	Flg	Stl	Sch 80	"	Welded
Shell In	1	4"	Flg	Stl	"	"	"
Shell Out	1	1½	"	"	"	"	"
Cleaning Conn	2	2	"	"	"	"	"
Shell Drain	1	1"	NPT	Stl	3000	"	"
Tubes Vent	1	½	"	"	6000	"	"
" Drain	1	½	"	"	"	"	"
Thermowell	1	3/4	"	"	3000	"	"

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

(Over)

FORM U-1 (back)

18. INSPECTION OPENINGS: Manholes, No. _____ Size _____ Location _____
Handholes, No. _____ Size _____ Location _____
Threaded, No. _____ Size _____ Location _____

19. SUPPORTS: Skirt _____ (Yes or No) Lugs _____ (Number) Legs _____ (Number) Other Cradles welded to shell (Describe) Attached (Where & How)

20. REMARKS: Type 1-V1-2 Size 8-8-72
Water in Tubes, Air and steam in shell

(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 Unfired Pressure Vessels.

Date 9-7 19 72 Signed THE WHITLOCK MANUFACTURING CO. By C S Lahm
(Manufacturer)

Certificate of Authorization Expires December 31, 1972

CERTIFICATE OF SHOP INSPECTION

VESSEL MADE BY THE WHITLOCK MANUFACTURING at CO. WEST HARTFORD, CONN

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State of CONN and employed by THE HARTFORD STEAM BOILER INSPECTION & INSURANCE CO. of HARTFORD CONN have inspected the pressure vessel described in this manufacturer's data report on Sept 11 19 72, 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 Sept 11 19 72

W H Adams Commissions NB 1313 Pa 1270
Inspectors Signature Nat'l Board or State 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 of _____ 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 ____

_____ Commissions _____
Inspector's Signature Nat'l Board or State and No.

Printed in U.S.A. (7/66) This Form is obtainable from the ASME, 345 E. 47th St., New York, N.Y. 10017

SCHUTTE AND KOERTING COMPANY
Cornwells Heights, Penna.
19020

OPERATING AND MAINTENANCE INSTRUCTIONS FOR S&K MULTI-STAGE CONDENSING STEAM JET VACUUM PUMPS HAVING SURFACE TYPE CONDENSERS

INSTALLATION

The Multi-Stage Condensing Vacuum Pumps can be installed in any position, preferably with ejectors installed discharging horizontally or vertically downward. The drain connections of the condensers should discharge straight down into the hotwell. It is desireable to install a vacuum tight gate valve in the vacuum line close to the pump so as to be able to isolate the latter from the vacuum system and aid in analyzing any causes of faulty operation which may develop, or check the tightness of the system. Provide sufficient clearance at the channel end of the condenser to permit removal of the tube bundles from the shells. On the floating head type a space should be provided to permit the removal of the shell cover and floating head.

Connect the water supply line to the proper connections on the water boxes of the condensers. A hotwell should be located directly underneath the condenser and the distance between the condenser discharge flanges to the water level of the hotwell should not be less than 34 feet straight vertical pipe, without offsets. The hotwell should have sufficient volume to provide enough water to fill condenser tail pipes, after a vacuum has been developed, and maintain a seal of not less than 6 inches.

Connect the steam supply line to the steam inlets on the steam separators. If heating jackets are supplied on the primary or secondary vacuum booster diffusers, it will be necessary to pipe steam to them. Drain the lowest point of the heating jacket to a se[illegible] The steam supply line and fittings should be insulated. It is not necessary to insulate the exhausters. A valve should be insta[illegible]d in the steam lines for a complete shutdown. The steam separat[illegible] must be installed in a vertical position regardless of the po[illegible]on of the exhausters.

The steam separator condensate drains should be connected to suitable traps. Small traps are recommended, as traps which are too large may cause steam pressure fluctuations when they discharge. If it is preferred to drain to the atmosphere, valves should be installed on the drains to regulate the "blow-down".

continued.....

A steam pressure gauge at each ejector is recommended for accuracy in pressure readings and convenience of operation.

The discharge line should be vented to atmosphere or a suitable after-condenser. Avoid loops or sharp bends in discharge line, because condensate tends to collect in these low points which increases the back pressure. The latter should not exceed 1/2 PSIG. In case a loop is unavoidable, drain its lowest point to the sewer. This drain may contain a loop seal not over 6 inches in depth to prevent steam from blowing into the sewer. If at all possible, never make the discharge line more than 50 feet in total length in order to keep back pressure to a minimum.

If it is desired to measure the vacuum obtained, a mercury manometer, or other suitable vacuum measuring instrument may be connected to the first stage (booster or exhauster) by utilizing the pipe tap in the body.

STARTING AND OPERATING

1. Inspect and clean steam strainers.
2. Open vent connection and start to circulate the cooling water through the condensers.
3. Blow off all condensate in steam line to condensate drain keeping operating pressure valves closed. Keep condensate drain slightly open to insure carryoff of any accumulated condensate during the operation of the vacuum pump. This is not necessary if a steam trap is used, since a steam trap relieves automatically when any condensate accumulates.
4. Open the vapor line valve.
5. Open the operating pressure valves to each individual ejector, starting with the lowest vacuum stage on up to the highest vacuum stage. See that all steam gauges for each ejector are equal to, or slightly above the design pressure. Regulate each operating pressure valve individually for correct steam pressures.
6. When shutting the pump down, always close the vapor line valve first, before shutting off the operating pressure valves of the ejectors. Then shut off the injection water to the condensers. This is to prevent any discharge vapor or steam from being drawn back into the vacuum line, thus contaminating the process.

PROBABLE CAUSES OF FAILURE

1. No vacuum.

   a. One or more ejector nozzles clogged.

      To examine steam nozzle, shut off the steam pressure and

continued.....

remove nozzle, and clean out any loose scale or foreign matter which may have accumulated. Be careful not to mar the smooth finish inside the nozzle with a sharp instrument.

b. Suction line open to the atmosphere.
c. No steam pressure.
d. Condenser tail pipe not submerged in hot-well, or broken.

2. Fluctuating Vacuum.

a. Internal freezing in boosters. Be certain steam is supplied to jacket.
b. Wet steam.

3. Low Vacuum.

a. Insufficient or highly excessive steam pressure on any one or more exhausters.
b. Clogged steam strainers. (If one is included in system.)
c. Clogged vapor suction line.
d. Bad air leaks in vacuum line; in one or more exhausters; in one or both condensers.
e. Excessive back pressure in discharge line.
f. Pump too small to handle load (see performance specifications).
g. Clogged condenser tail pipe.
h. Clogged condenser tubes or shell.
i. Condenser injection water temperature too high (see performance specifications).

4. CAUTION:

When disassembling the vacuum pump it is of the utmost importance to note the positions of the respective parts and gaskets so that upon re-assembly all parts will be installed in their proper place.

MAINTENANCE OF CONDENSERS

Depending on the amount of fouling or scaling that is encountered a schedule for cleaning should be arranged. A light sludge or scale coating on the tube greatly reduces its effectiveness. A marked increase in pressure drop and/or reduction in performance usually indicates a cleaning is necessary.

Suggested Cleaning Methods

1. Circulating hot wash oil or light distillate through tubes or shell at high velocity will remove sludge or other similar soft deposits.

continued.....

2. For soft salt deposits use hot fresh water.
3. Chemical cleaning solutions.
4. Mechanical means.

REMARKS

After a longer period of operation the performance of the vacuum pump may become unsatisfactory because the steam nozzles or tails of one or more ejectors may be worn and need repairing. After checking to see if any of the steam nozzles are not clogged, it is necessary to check the performance of the pump separately from the vacuum line. Insert a blind flange between the low vacuum exhauster and the inter-condenser -- this joint must be air tight. Attach a mercury manometer or a suitable vacuum measuring instrument to the low vacuum exhauster, utilizing the pipe tap in the body.

Slowly apply the operating steam pressure to the low vacuum exhauster only. If the mercury picks up as the designed steam pressure is approached, and holds as many inches mercury as denoted by exhauster type below, then the low vacuum exhauster is performing satisfactorily.

TYPE NO.	INCHES MERCURY VACUUM AT SHUTOFF
S-1	28
S-3	27
S-4	20

NOTE: The exhauster type is stamped on the nameplate.

Should the vacuum of the low vacuum exhauster not come up to par, as noted in the preceding table, check the exhauster discharge pipe for clogging. If checking proves tail pipe in good condition then the cause of poor performance lies in the low vacuum exhauster. Examine nozzles for clogging, also, nozzle bore and tail bore for excessive wear and/or corrosion.

Should the test, so far, prove that the low vacuum exhauster is operating satisfactorily, the higher stage ejectors must be tested.

Remove the blind flange between the inter-condenser and the low vacuum exhauster and reconnect them. Then blank off the suction port of the next higher ejector stage. This joint must be air tight. Attach a vacuum measuring instrument to this ejector utilizing the pipe tap in the body. Repeat the above operation for each succeeding higher stage ejector.

After tests have been made using the above instructions as a guide and the system has been checked for air leaks and the pump is apparently at fault, notify Schutte and Koerting Company.

Form 175 (3-55) Rev. 1 — **SCHUTTE AND KOERTING COMPANY** —

EXCHANGER SPECIFICATION SHEET

15656-E

1			CUST. IND. NO. 1-71-05-10132-042
2	CUSTOMER STRUTHERS		S&K REF. NO. M72-20865-J
3	ADDRESS		DATE 4-17-72
4	PLANT LOCATION AEC		
5	SERVICE OF UNIT INTERCONDENSER		ITEM NO. A
6	SIZE 16-B-66	TYPE 1-VI-4	POSITION HORIZ.
7	SURFACE PER UNIT 155	SHELLS PER UNIT 1	SURFACE PER SHELL
8	NO. OF UNITS 1	SHELL ARRANGEMENT	
9			
10			

PERFORMANCE OF ONE UNIT

No.			SHELL SIDE	TUBE SIDE
13	FLUID CIRCULATED		AIR STEAM	WATER
14	TOTAL FLUID ENTERING	#/HR.		
15	VAPOR	#/HR.		
16	LIQUID	#/HR.		100 GPM
17	STEAM	#/HR.	914	
18	NON-CONDENSABLES	#/HR.	100	
19	FLUID VAPORIZED OR CONDENSED	#/HR.		
20	STEAM CONDENSED	#/HR.	876	
21	GRAVITY - LIQUID			
22	VISCOSITY - LIQUID			
23	MOLECULAR WEIGHT - VAPORS			
24	SPECIFIC HEAT - LIQUIDS	BTU/#/°F.		
25	LATENT HEAT - VAPORS	BTU/#		
26	TEMPERATURE IN	°F.	250	72
27	TEMPERATURE OUT	°F.	100	92
28	OPERATING PRESSURE P.S.I.A. P.S.I.G.		5.4 IN. HG ABS.	
29	NUMBER OF PASSES	PER SHELL	1	4
30	VELOCITY	FT/SEC.		2.9
31	PRESSURE DROP	P.S.I.	0.25 IN. HG	
32	FOULING		.001 TOTAL	

33	HEAT EXCHANGED - BTU/HR. 955000	M.T.D. (CORRECTED) 44.5
34	TRANSFER RATE - SERVICE 139	CLEAN

CONSTRUCTION - EACH SHELL

No.			SHELL SIDE	TUBE SIDE
36	DESIGN PRESS.	P.S.I.	100 & VAC	100
37	TEST PRESS.	P.S.I.	150	150
38	DESIGN TEMPERATURE	°F.	350	350

39	TUBES STEEL	NO. 144 O.D. .75" BWG 16	LENGTH 66"	PITCH .9375" △
40	SHELL STEEL	I.D. 15.375 O.D.		THICKNESS
41	SHELL COVER		FLOATING HD. COVER	
42	CHANNEL STEEL		CHANNEL COVER STEEL	
43	TUBE SHEETS - STATIONARY STEEL		FLOATING	
44	BAFFLES - SEGMENTAL STEEL	PITCH 24"	% CUT	THICKNESS
45	BAFFLE STEEL	TYPE INT. IMP	THICKNESS	
46	TUBE SUPPORTS		THICKNESS	
47	GASKETS			
48	CONNECTIONS - SHELL - IN ~~6~~ 8	OUT 2½	SERIES 150 FF	
49	CHANNEL - IN 3	OUT 3	SERIES 150 ~~RF~~ F.F.	
50	CORROSION ALLOWANCE - SHELL SIDE		TUBE SIDE	
51	CODE REQUIREMENTS ASME SEC. VIII, DIV. 1, TEMA C, NAT'L. BD. STAMP			
52	WEIGHTS - EACH SHELL & BUNDLE	BUNDLE ONLY	FULL OF WATER EACH SHELL	
53	(S.R.) INDICATES STRESS RELIEVING & (X.R.) INDICATES RADIOGRAPHING			
54	REMARKS- SEE ADDITIONAL REQUIREMENTS ON PG. 2.			

1	DATE 6-6-72	R.R.S.
	P.O. M72-20865-J	
	LINE 48 SHELL IN WAS 6" LINE 49 SERIES WAS 150# RF. PAGE 2 ADDED F & G FN. E-OUTL. 72.XE-001-J-1 REV TO J2	

10

BY ... DATE 4-17-72
CHKD. BY ... DATE ...

SCHUTTE and KOERTING COMPANY
Manufacturing Engineers Since 1876
Cornwells Heights, Bucks Co., Penna.

SHEET NO 2 OF 2
JOB NO. M72-2865-J

72-T-018-J-1

ADDITIONAL REQUIREMENTS FOR INTERCONDENSER:

A. NOZZLE FLANGE LOCATIONS ARE NOT STANDARD.

B. SHELL TO HAVE 2-2" NOZZLES FOR CLEANING.

C. 2½" VAPOR OUTLET TO HAVE ¾" NPT THERMOWELL AND PRESSURE TAPS.

D. TO BE MOUNTED ON BASEPLATE WITH AFTERCONDENSER. (BASEPLATE FURNISHED BY WHITLOCK).

E. S & K DWG 72-XE-001-J-215 A PART OF THIS SPECIFICATION TO SHOW NOZZLE ARRANGEMENTS, THERMOWELL AND PRESSURE TAPS, CLEANOUTS, AND BASEPLATE.

F. PRINTING PER FEDERAL SPECIFICATION TT-P-645 DTD. APRIL 12, 1962.

G. SPECIFICATION FOR WELDING CARBON STEELS, ATLANTIC RICHFIELD HANFORD COMPANY HWS 8821

H. INSPECTION & TEST PER CONTRACT NO AT(45-1)-2179 & ATTACHMENT "B".

72-T-019-J-1

Form 175 (3-55) Rev. 1

SCHUTTE AND KOERTING COMPANY

EXCHANGER SPECIFICATION SHEET

15636-E

1			CUST. ~~INQ.~~ NO. 9-71-05-10132-049
2	CUSTOMER STRUTHERS		S&K REF. NO. M72-20865-J
3	ADDRESS		DATE 4-17-72
4	PLANT LOCATION AEC		
5	SERVICE OF UNIT AFTERCONDENSER		ITEM NO. B
6	SIZE 8-B-72	TYPE 1-VI-2	POSITION HORIZ
7	SURFACE PER UNIT 51	SHELLS PER UNIT 1	SURFACE PER SHELL
8	NO. OF UNITS 1	SHELL ARRANGEMENT	
9			
10			

PERFORMANCE OF ONE UNIT

			SHELL SIDE	TUBE SIDE
13	FLUID CIRCULATED		AIR STEAM	WATER
14	TOTAL FLUID ENTERING	#/HR.		
15	VAPOR	#/HR.		
16	LIQUID	#/HR.		100 GPM
17	STEAM	#/HR.	789	
18	NON-CONDENSABLES	#/HR.	100	
19	FLUID VAPORIZED OR CONDENSED	#/HR.		
20	STEAM CONDENSED	#/HR.	759	
21	GRAVITY - LIQUID			
22	VISCOSITY - LIQUID			
23	MOLECULAR WEIGHT - VAPORS			
24	SPECIFIC HEAT - LIQUIDS	BTU/#/°F.		
25	LATENT HEAT - VAPORS	BTU/#		
26	TEMPERATURE IN	°F.	320	92
27	TEMPERATURE OUT	°F.	160	110
28	OPERATING PRESSURE ~~[illegible]~~	P.S.I.G.	1	
29	NUMBER OF PASSES	PER SHELL	1	2
30	VELOCITY	FT/SEC.		4.7
31	PRESSURE DROP	P.S.I.	0.2	
32	FOULING		.001 TOTAL	
33	HEAT EXCHANGED - BTU/HR. 815000		M.T.D. (CORRECTED)	99.5
34	TRANSFER RATE - SERVICE 160		CLEAN	

CONSTRUCTION - EACH SHELL

36	DESIGN PRESS.	P.S.I.	100 & VAC.	100
37	TEST PRESS.	P.S.I.	150	150
38	DESIGN TEMPERATURE	°F.	350	350
39	TUBES STEEL	NO. 45	O.D. .75" BWG 16 LENGTH 72"	PITCH .9375" Δ
40	SHELL STEEL		I.D. 8.125 O.D.	THICKNESS
41	SHELL COVER		FLOATING HD. COVER	
42	CHANNEL STEEL		CHANNEL COVER STEEL	
43	TUBE SHEETS - STATIONARY STEEL		FLOATING	
44	BAFFLES - SEGMENTAL STEEL	PITCH 12"	% CUT	THICKNESS
45	BAFFLE STEEL	TYPE INT IMP.	THICKNESS	
46	TUBE SUPPORTS		THICKNESS	
47	GASKETS			
48	CONNECTIONS-SHELL-IN 4	OUT 1 1/2	SERIES 150 FF	
49	CHANNEL-IN 3	OUT 3	SERIES 150 ~~RF~~ F.F.	
50	CORROSION ALLOWANCE - SHELL SIDE		TUBE SIDE	
51	CODE REQUIREMENTS ASME SEC. VIII, DIV. 1, TEMA C, NAT'L. BD. STAMP.			
52	WEIGHTS - EACH SHELL & BUNDLE	BUNDLE ONLY	FULL OF WATER EACH SHELL	
53	(S.R.) INDICATES STRESS RELIEVING & (X.R.) INDICATES RADIOGRAPHING			
54	REMARKS SEE ADDITIONAL REQUIREMENTS ON PAGE 2.			

[illegible] 6-6-72 R.A.U.
RO. M72-20865-J
LINE 49 SERIES WAS 150# RF.
PG. 2 ADDED F, G & H.
E-OUT. 72-RE-001-J-1 REV. TO J-2

12

SCHUTTE and KOERTING COMPANY
Manufacturing Engineers Since 1876
Cornwells Heights, Bucks Co., Penna.

12-T-019 - Jobs

ADDITIONAL REQUIREMENTS FOR AFTERCONDENSER:

A. NOZZLE FLANGE LOCATIONS ARE NOT STANDARD.

B. SHELL TO HAVE 2 - 2" NOZZLES FOR CLEANING.

C. WATER OUTLET TO HAVE 3/4" THERMOWELL TAP.

D. TO BE MOUNTED ON BASEPLATE WITH INTERCONDENSER. (BASEPLATE FURNISHED BY WHITLOCK).

E. S & K DWG. 72-XE-001-J-215 A PART OF THIS SPECIFICATION TO SHOW NOZZLE ARRANGEMENTS, THERMOWELL TAP, CLEANOUTS, AND BASEPLATE.

F. PAINTING PER FEDERAL SPECIFICATION TT-P-645 DTD. APRIL 13, 1962.

G. SPECIFICATION FOR WELDING CARBON STEELS, ATLANTIC RICHFIELD HANFORD COMPANY HWS 8821

H. INSPECTION & TEST PER CONTRACT NO. AT(45-1)-2178 & ATTACHMENT "B"

CERTIFIED VENDOR INFORMATION

PAGE ___ OF ___

CVI	EQUIPMENT TITLE	EQUIPMENT NO.	COST CODE
11996 ADD.	VACUUM EQUIPMENT		21HM
DATE	**VENDOR**		**PROJECT NO.**
12-1-76	SCHUTTE & KOERTING CO.		HAP-655
P. O. NUMBER	**EQUIPMENT MANUFACTURER**		**BLDG. NO.**
AT-(45-1) 2178	STRUTHERS SCIENTIFIC & INTERNATIONAL CORP.		242-S

SHEET NO.	VENDOR DWG.	SUPERSEDED BY HAN. DWG.	REV.	HAN. MODIFIED DWG.	CURVES	VENDOR SPEC.	INSTR.	PARTS LIST	MISC.
13/14	ADD DWG. # 76-X009J REV. as sheet 14								

☐ COMPLETE
☐ PARTIAL

APPROVED: →

FOR DESIGN

FOR CONTRACTOR

COPIES	DISTRIBUTION	ADDRESS
2	CVI FILES	
1	IM JACQUES	271-T ARHCO
1	GK CARPENTER	202-A ARHCO
1	KC BOLT	202-S ARHCO

COPIES	DISTRIBUTION	ADDRESS
1	R J PARAZIN	2704-W ARHCO
1	C.A.DIDATO	1262 JAJ.

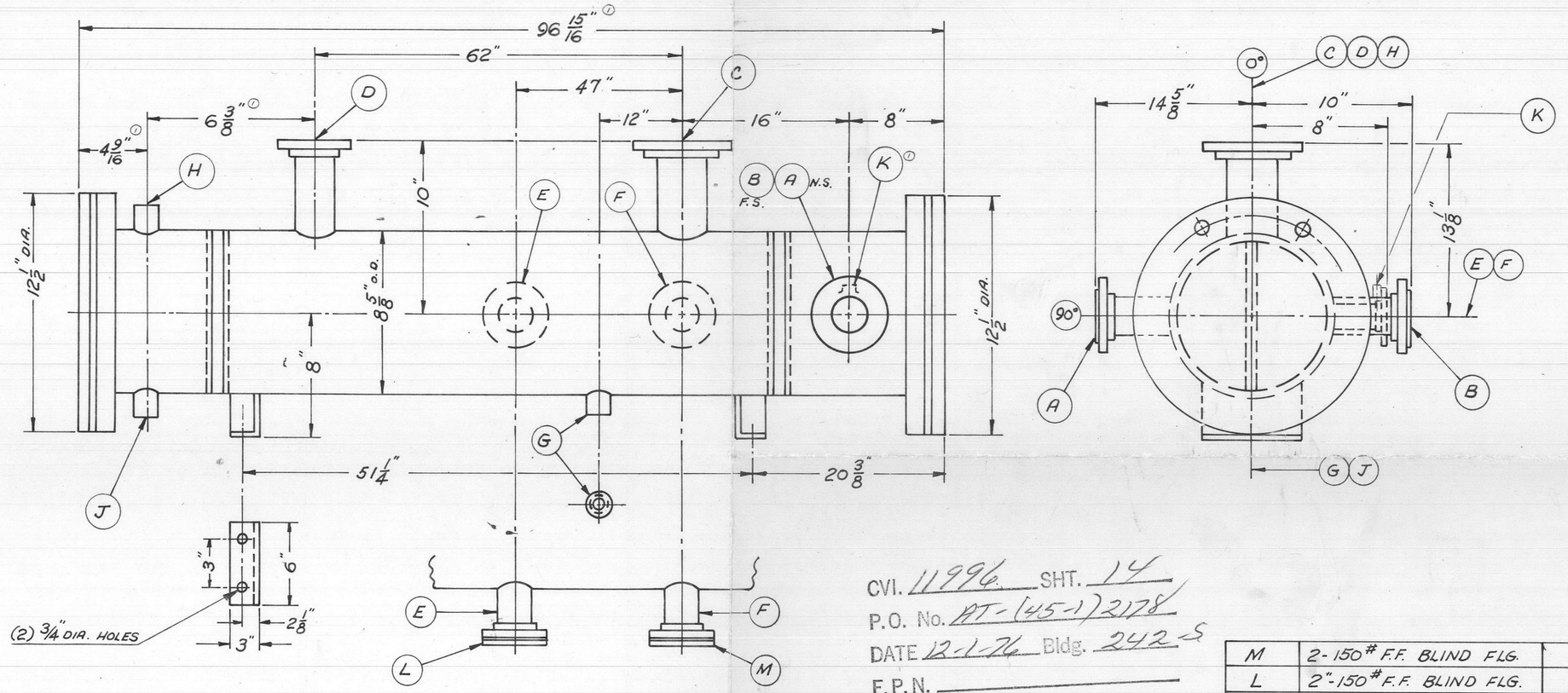
COPIES	DISTRIBUTION	ADDRESS

M

A-9300-038.1 (10-72)

COMPARE	
SIZE	DRAWING

REVISIONS				
FILMED	LTR.	DESCRIPTION	DATE	APPROVED
	/	OVERALL DIM. NOW 96 15/16" WAS 93 7/8". 4 9/16" DIM. WAS 3 9/16" & 6 3/8" DIM. WAS 4 5/16". THERMOWELL CONNECTION NOW ON WATER OUTLET SIDE. (MK. K)	3-11-76 B.B.	



CVI. 11996 SHT. 14
P.O. No. PT-(45-1)2178
DATE 12-1-76 Bldg. 242-S
E.P.N. _____

MARK	SIZE & RATING	DESCRIPTION
M	2-150# F.F. BLIND FLG.	
L	2"-150# F.F. BLIND FLG.	
K	3/4"-6000# NPT CPLG.	THERMOWELL CONN.
J	1/2"-6000# NPT CPLG.	DRAIN
H	1/2"-3000# NPT CPLG.	VENT
G	1"-3000# NPT CPLG.	DRAIN
F	2"-150# F.F. S.O. FLANGE	CLEANING CONN.
E	2"-150# F.F. S.O. FLANGE	CLEANING CONN.
D	1 1/2"-150# F.F. S.O. FLANGE	SHELL SIDE OUTLET
C	4"-150# F.F. S.O. FLANGE	SHELL SIDE INLET
B	3"-150# R.F. S.O. FLANGE	TUBE SIDE OUTLET
A	3"-150# R.F. S.O. FLANGE	TUBE SIDE INLET

CONSTRUCTION

ALL WELDED CONSTRUCTION IN ACCORDANCE WITH THE ASME CODE SECTION VIII DIV. 1 & STAMPED. ALSO TEMA CLASS "C".

MATERIAL

CHANNEL - CARBON STEEL
CHANNEL COVER - CARBON STEEL
TUBE SHEETS - CARBON STEEL
SHELL - CARBON STEEL
BAFFLE STRUCTURE - STEEL
TUBES - SST. TY. 316 .750 DIA. x 18# B.W.G.
GASKET - COMP. ASBESTOS.

CERTIFIED FOR ATLANTIC RICHFIELD HANFORD CO.
ORDER NO. W6S-X88-11151 DATE 3-15-76
S & K ORDER NO. M76-20171-J BY B. BREBNER
DO NOT USE FOR CONSTRUCTION UNLESS CERTIFIED FOR A SPECIFIC ORDER

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES STANDARD MACHINING TOLERANCES		
DIMENSION	FRACTIONAL	DECIMAL
0 TO 5	± 1/64	.015
OVER 5 TO 24	± 1/32	.031
OVER 24	± 1/16	.062
ANGLES	± 1/2°	

FIG NO.
S. O. M76-20171-J
B. M.
MADE FROM
FILMED

DR B. B. DATE 2/6/76
CHKD _____ DATE _____
APP'D _____ DATE _____
APP'D _____ DATE _____

PERMANENT FILE

SCHUTTE & KOERTING CO.
SUBSIDIARY OF AMETEK CORP.
CORNWELLS HEIGHTS BUCKS COUNTY, PENNA.

8-8-72 TYPE CEN
AFTER CONDENSER

SIZE	CODE IDENT NO.	DRAWING NO.	REV
		76E-X009J	1

SCALE. WT SHEET ____ OF ____

PT. NO.	DESCRIPTION	REMARK
001	ASSEMBLY	

FORM E-2 (69)