

ATTACHMENT 1

DAIRYLAND POWER COOPERATIVE
LA CROSSE BOILING WATER REACTOR (LACBWR)

SYSTEM DESIGN
EMERGENCY SERVICE WATER SUPPLY SYSTEM
(ESWSS)

JANUARY 30, 1981

- I. INTRODUCTION
- II. REFERENCES
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I. INTRODUCTION

The purpose of the Emergency Service Water Supply System (ESWSS) is to provide an alternate means of delivering Mississippi River water to critical LACBWR plant systems in the event the normal Crib House supply systems and associated underground piping are rendered useless. Therefore, the capabilities of the ESWSS are principally designed to restore the necessary in-plant cooling water services in the event of a Safe Shutdown Earthquake (SSE). The situations covered range from normal shutdown cooling needs to the worst case LOCA condition which are described in Reference 1. In addition, the design of the ESWSS takes into consideration the objectives set forth in Reference 2 to provide alternate capability to obtain water to combat a fire. Since it is postulated that a fire will not occur concurrently during a LOCA event, the primary design of the ESWSS has been sized to address the worst case LOCA as described in Reference 1, which is also adequate for fire protection needs.

Basically, the ESWSS consists of three portable pumps with a combined head/capacity of 346'/900 gpm, a three-way ball valve distributor, a relay hose, and two inlets into the in-plant High Pressure Service Water (HPSW) system as shown on the ESWSS illustration (Attachment 1A). Through the utilization of the HPSW system, with the incorporation of a 2" piping tie to the Low Pressure Service Water (LPSW) system which supplies the tube side of the Component Cooling Water (CCW) system, the ESWSS is capable of providing adequate cooling water to the following systems as shown on Attachments 1C and 1D, and as discussed in Reference 1:

- . Alternate Core Spray
- . In-Plant Fire Protection
- . LPSW/Tube-Side CCW Coolers (for Decay Heat Removal)
- . Shutdown Condenser
- . Emergency Core Spray
- . Overhead Storage Tank (via Demineralized Water System)

II. REFERENCES

- 1) Nuclear Energy Services Report No. 81A0039, "Design of an Emergency Service Water Supply System for LACBWR", dated 11/25/80.
- 2) Appendix R to 10CFR50, Section III, paragraph L, "Alternate and Dedicated Shutdown Capability", dated 11/19/80.

III. ATTACHMENTS

- 1A) ESWSS Illustration Diagram
- 1B) Dairyland Power Cooperative Drawing 83-51-001, Rev. 1
- 1C) Dairyland Power Cooperative Drawing LR-62, Rev. 1*
- 1D) Dairyland Power Cooperative Drawing LR-55, Rev. 3*
- 1E) Sargent & Lundy Piping Design Table "Class 125B" Carbon Steel, Revision dated 12-7-62
- 1F) Waterous Portable Pump Model SV45-4025B3, Bulletin F-2035.
- 1G) Float-Dock Suction Strainer

IV. EMERGENCY SERVICE WATER SUPPLY SYSTEM DESCRIPTION

A. HPSW/ESWSS Piping

Since the in-plant HPSW piping system is common for the distribution of the cooling water to those systems described in Section I, the ESWSS inlet has been incorporated into this piping as shown on Attachment 1B. Modifications to the HPSW piping includes the addition of in-plant isolation valves 75-24-091 and 75-24-092, and a tap into the HPSW stream for ESWSS inlet. The two isolation valves will permit isolation of the in-plant HPSW header piping in the event the buried piping exterior to the plant has been disturbed and incapable of performing its intended function post-SSE. The ESWSS tap into the HPSW in-plant piping header consists of an isolation valve (75-24-093), a balance check valve, a valved interior plant ESWSS manifold inlet, and a valved exterior plant ESWSS manifold inlet. The two ESWSS inlet stations (interior and exterior) are sized such that use of only one of the inlet stations is necessary for the required ESWSS flow rate. The balance check valve provides additional protection to the HPSW system when operated under normal conditions, and will permit operation of the ESWSS throughout its design flow ranges of 60 gpm to 900 gpm.

*Drawings marked up to show incorporation of ESWSS piping.

B. ESWSS Pumps

The ESWSS includes three identical Waterous Company Model SV45-4025BB portable, air cooled, gasoline engine driven centrifugal pumps which will provide a combined flow of 900 gpm @ 346' head. The discharge of each pump is factory fitted with a 3" check valve outlet and Storz type quick coupling. In order to insure pump availability, one additional and identical Waterous pump is provided for back-up purposes. Additional Waterous Pump information is provided in Attachment 1F.

C. ESWSS Relay Piping

The conduit to carry the pump discharges to the selected ESWSS inlet located at the Turbine Building consists of 5" Hi Volume, low resistance, light weight Duraline synthetic fire hose with a burst strength of 500 psi. Two 100' lengths fitted with factory installed Storz type connectors provides a coupled length which is sufficient for the optimum route from the 3-way pump discharge distributor to the exterior ESWSS inlet station located on the west side of the Turbine Building. Two additional 50' lengths of identical 5" hose with Storz fittings are provided to allow for flexibility in pump location or to permit utilization of the in-plant ESWSS inlet station which would be accessible through the overhead freight door or the southwest corner personnel door of the Turbine Building.

D. ESWSS Pump Discharge Hoses and 3-Way Distributor

The three pump discharge hoses consist of 3" Hi Volume hose similar in construction to the relay hose described in item IV.C. The discharge hoses are 25' long each and are fitted with factory installed 3" Storz quick couplings.

The discharge of the three pumps is feed into a single 3-way Angus Ball Distributor which has three 3" Storz fitted ball valve inlets and a single 5" Storz fitted outlet. The distributor is constructed of light weight cast aluminum alloy and has three 1/4 turn inlet ball valves.

E. Pump Suction Hoses and Strainers

The pump suction hoses consist of 4" x 20' long corrugated, flexible, PVC plastic cord reinforced core hose with standard NST couplings. The hose is rated for 30" Hg vacuum and has a smooth internal bore.

Each pump suction is fitted with a factory installed suction debris screen, but in order to provide additional protection against suction fouling, floating dock, self-leveling type strainers are provided for each pump. This type of strainer permits for the drafting of water from below the water surface where the water is cleanest, and also is demountable from the floating dock for conventional (non-floating) use. An illustration of the Float-Dock strainer is provided in Attachment 1G.

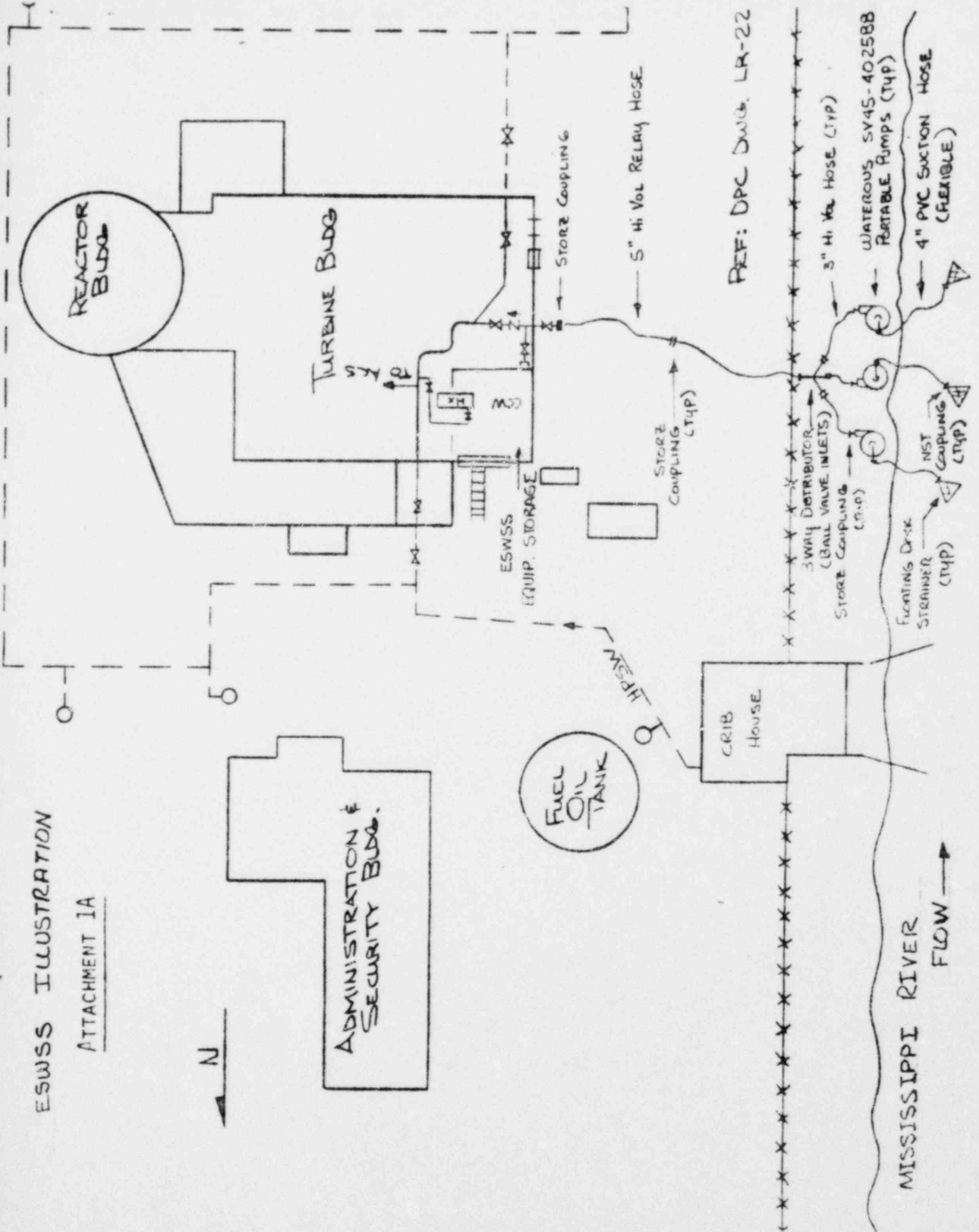
The portable equipment identified in Items IV.B through IV.E will be staged for deployment in the northwest corner of the Turbine Building on the grade floor where normal deployment can be performed using the overhead freight door. All of the equipment with the exception of the skid mounted pump units can be handled and set up by 1 or 2 men. Each pump will require 4 men to physically carry them to a suitable location at the river. In order to accommodate this function, each pump skid will be fitted with suitable litter-type provisions.

V. ESWSS DEPLOYMENT SUMMARY

Deployment of the ESWSS requires that the personnel be trained and adequately drilled in performing the following tasks to establish an operational ESWSS within the 28-minute prescribed time limit:

- . Transport three of the portable pumps to a suitable river location.
- . Set up the suction and discharge hoses for each pump.
- . Lay out the relay hose and connect the discharge to the selected inlet station.
- . Close the HPSW in-plant piping header isolation valves (75-24-091 and 75-24-092) and open valve 75-24-093.
- . Open the selected ESWSS inlet station valve.
- . Connect the relay hose and three pump discharge hoses to the 3-way distributor.
- . Start engines and prime pumps.
- . Open distributor valves and establish desired flow by adjusting engine/pump speed.

ESWSS ILLUSTRATION
ATTACHMENT 1A



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REASON

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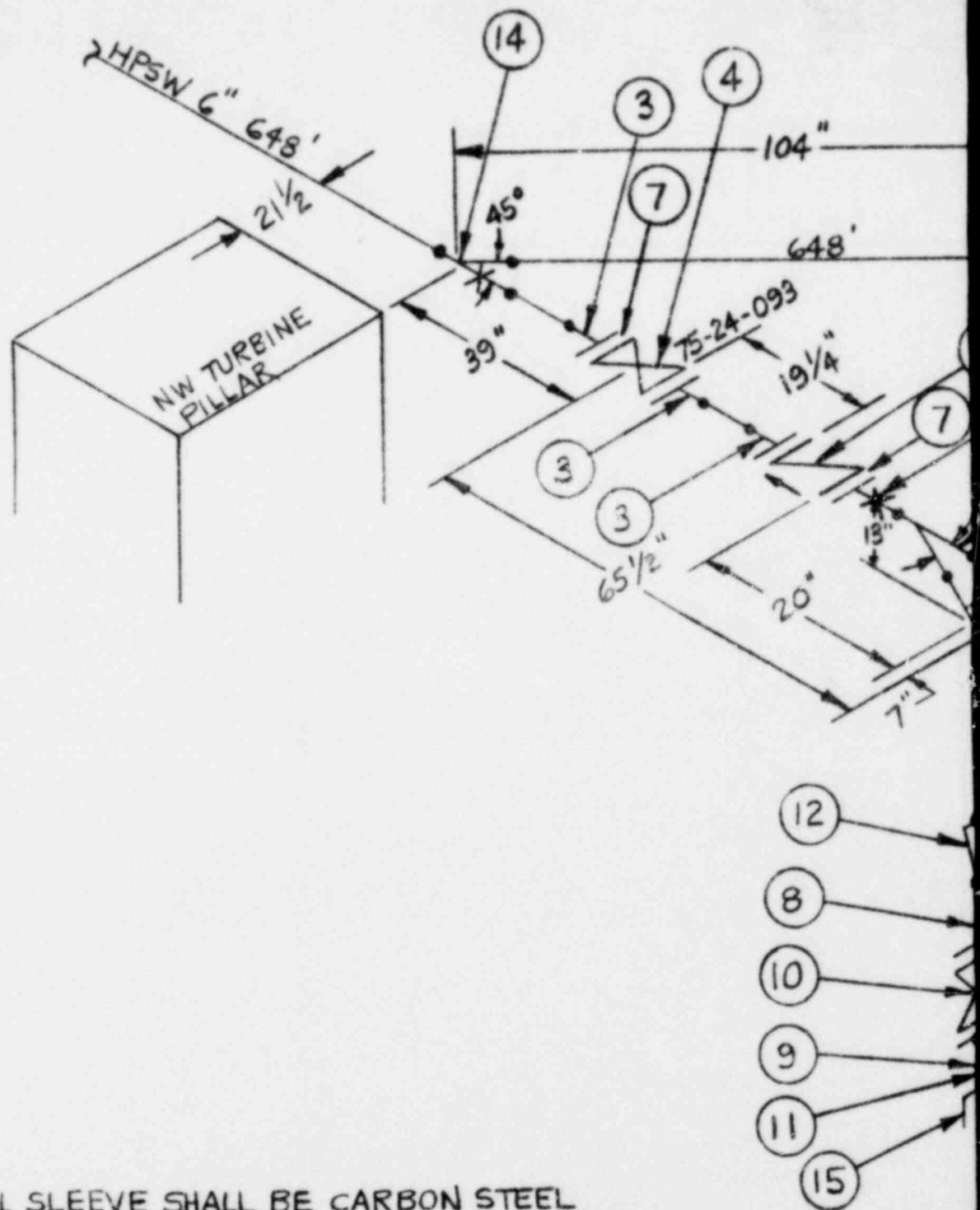
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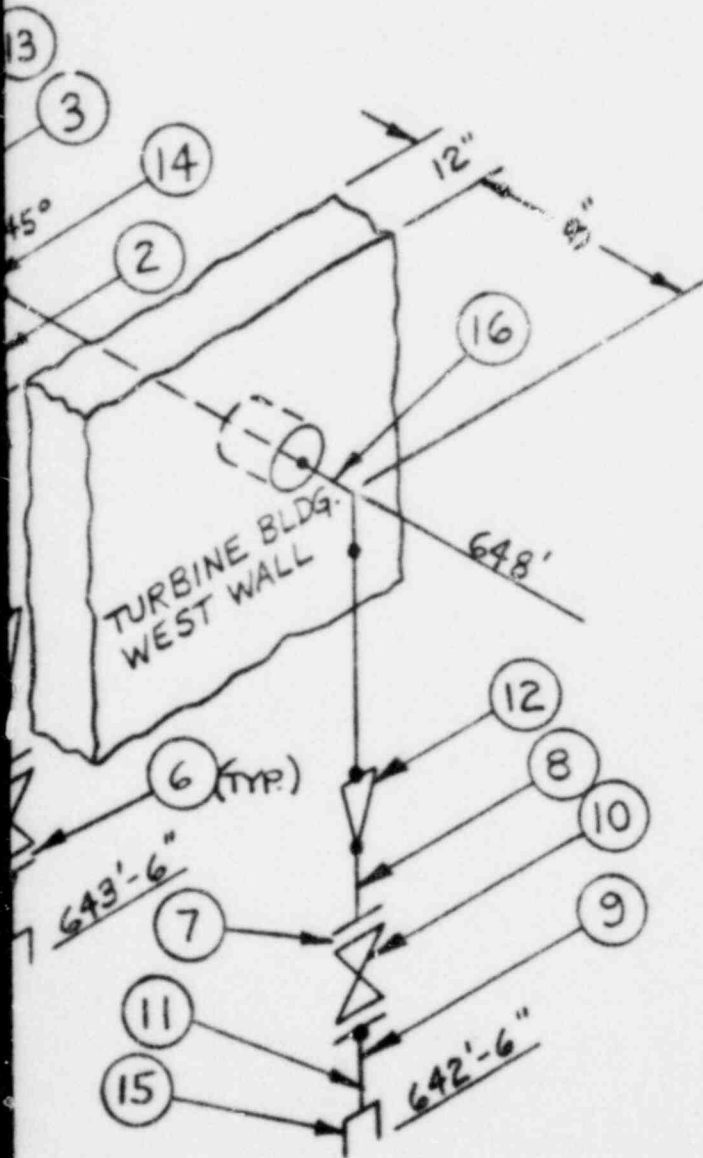
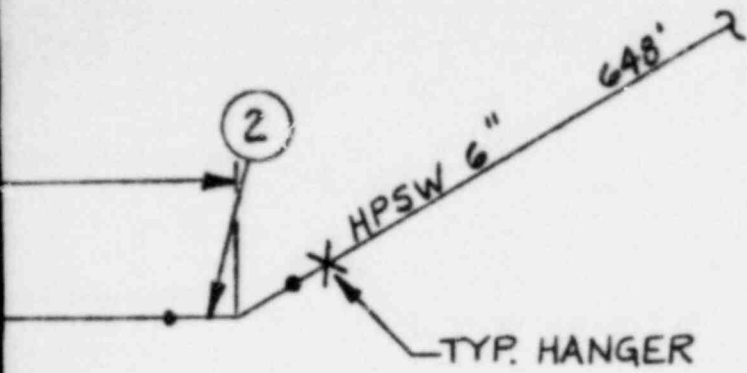
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NOTE :

1. EXTERIOR WALL SLEEVE SHALL BE CARBON STEEL PIPE OR MECHANICAL TUBING WITH A MINIMUM .250" WALL THICKNESS & OF SUFFICIENT I.D. TO MAINTAIN A 1" CLEARANCE BETWEEN THE SLEEVE & THE 6" PROCESS PIPE.
2. ANNULUS AREA BETWEEN 6" ESWSS WALL PENETRATING LINE & SLEEVE TO BE FILLED WITH FIRE RETARDANT SILICONE FOAM (CHASE FOAM CTC-PR-855) OR EQUIV.

ATTACHMENT 1B



ESWSS HEADERS

DAIRYLAND POWER COOPERATIVE
LA CROSSE, WISCONSIN

WORK ORDER NO. W0807	SCALE NONE	SHEET 2 OF 3
ISSUED	DATE 12-31-80	DRAWING NO.
	DRAWN DE	83-51-001
	TRACED	
	CHECKED	
	APPROVED	

NO.	DATE	REVISION	MADE BY	APPR'D BY

SUPERSEDES

EMERGENCY SERVICE WATER
BILL OF MATERIALS

ITEM	QTY.	DESCRIPTION	REMARKS
1	25'	6", A106 (GR A OR B) SCH 40 PIPE	
2	2	6", 45° L.R., A234, SCH. 40 ELBOW	
3	8	6", 150#, A105 W.N. FLANGE	
4	3	6", 125#, OS & Y GATE VALVE	CRANE #465 1/2 (CAST IRON BRONZE TRIM)
5	8	6" x 1/6" COMPRESSED ASBESTOS GASKETS RING OR FULL	TYP. 8 PLACES
6	4	5" x 1/6" COMPRESSED ASBESTOS GASKETS RING OR FULL	TYP. 4 PLACES
7	96	3/4"-10 x 3/4" A307 GR B HEX BOLTS W/HEAVY HEX NUTS	TYP. 12 PLACES
8	2	5", 150#, A105 W.N. FLANGE	
9	2	5", 150#, A105 THREADED FLANGE	
10	2	5", 125#, OS & Y GATE VALVE	CRANE #465 1/2 (CAST IRON BRONZE TRIM)
11	2	5", DBL. MALE THREADED ADAPTER	
12	2	6" x 5", A234, SCH. 40 CONC. REDUCER	
13	1	6", 125#, SWING CHECK VALVE	CRANE #383, (BRONZE TRIM BALANCED)
14	2	6", A234, SCH 40, 45° LATERAL	
15	2	5" STORZ SEXLESS COUPLING	
16	1	6", 90° L.R., A234, SCH. 40 ELBOW	
17	2	2", 200#, ISRS, GATE VALVE	CRANE #424 (BRONZE)
18	1	10 x 2", A105, 3000# THREDOLET	

ATTACHMENT 1D

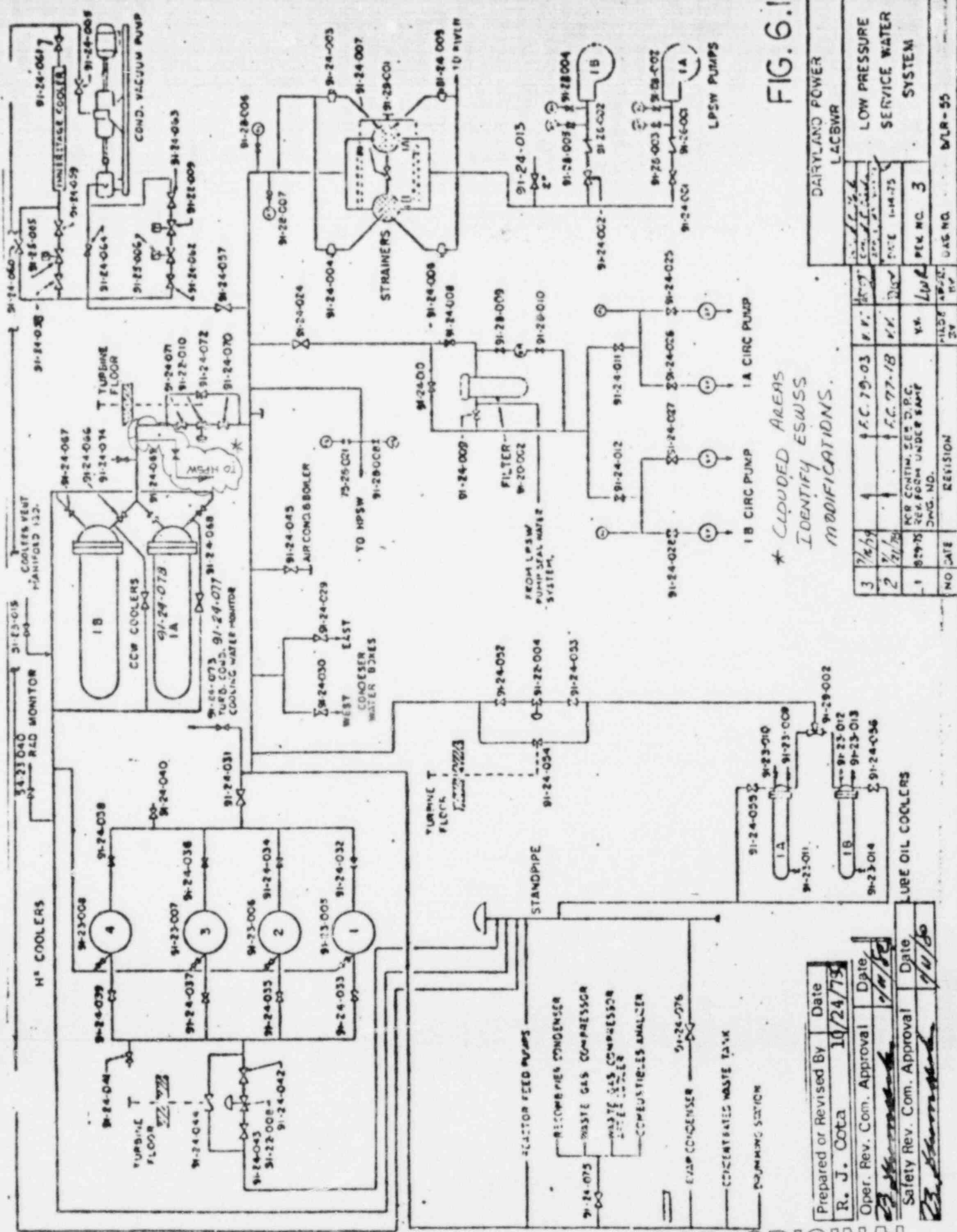


FIG. 6.1

* CLOUDED AREAS IDENTIFY ESWS MODIFICATIONS.

DAIRYLAND POWER LCBWR	
DATE	1-1-80
PER NO.	3
UAS NO.	BLR-55

NO.	DATE	REVISION	FILE NO.	BY	CHK.	APP.
3	7/1/79		FC-79-03	K.K.		
2	7/1/79		FC-77-18	K.K.		
1	9-19-78		NR CONTIN. SEC. D.P.C. REV. FORM UNDER SAME Dwg. NO.	YK		

Prepared or Revised By	Date
R. J. Cota	10/24/79
Oper. Rev. Com. Approval	Date
Safety Rev. Com. Approval	Date

POOR ORIGINAL

PIPING DESIGN TABLE "CLASS 125-B"
CARBON STEEL

ATTACHMENT 1E
PAGE 1 OF 2

1. PIPE	TYPE	ASTM SPEC.	SCHED. OR WALL THICKNESS
a. 30" and larger.....	Fusion Welded	A134, with mat. per A283, Gr. B	3/8" wall
b. 26" to 28" incl. ..	Fusion Welded	A139, Gr. B	3/8" wall
c. 12" to 24" incl. ..	Seamless	A106, Gr. A or B	Standard (3/8" wall)
d. 2-1/2" to 10" incl.	Seamless	A106, Gr. A or B	40
e. 2" and smaller.....	Seamless	A106, Gr. A or B	80

NOTE: Where ASTM A106 pipe is not obtainable for Sched. 40 wall thickness or less, ASTM A53 pipe may be substituted provided the specified maximum working temperature is not over 450 F. Where ASTM A106 pipe in 1-1/2" size and smaller is not available, ASTM A210 or A83, Gr. B certified to ASTM A106, Gr. B requirements may be used. No substitutions shall be made without approval of the Consulting Engineers.

2. TYPE OF JOINTS

- a. 2-1/2" and larger..... Butt-weld
- b. 2" and smaller..... Screwed

NOTE: Flanged joints shall be used only where specifically shown on the design drawings; these shall be 150 lb. or 125 lb. Am. Std.

3. WELD JOINT DETAIL

- a. Plate pipe..... Per design drawing details.
- b. 2-1/2" and larger schedule pipe..... Per S & L Std. Drawing M-135, with flat ring.

4. FLANGES (where necessarily used)

	TYPE	ASA	ASTM
a. 2-1/2" and larger.....	Slip-on or welding neck	150 lb. per B16.5	A181, Gr. I
b. 2" and smaller....	Screwed or socket-weld	150 lb. per B16.5	A181, Gr. I

NOTE: Slip-on flanges shall be welded front and back and refaced after welding. Pipe shall be screwed well through screwed flanges and refaced flush and true.

5. FLANGE FACING

- All sizes..... 150 lb.: 1/16" raised face with serrated finish
- 125 lb.: Flat face with smooth finish

NOTE: Where a 150 lb. steel flange is bolted to a 125 lb. cast iron flange, the 150 lb. flange raised face shall be removed by machining.

FITTINGS

	<u>TYPE</u>	<u>ASA</u>	<u>ASTM</u>	<u>WEIGHT OR SCHED.</u>
a. Over 24".....	Butt-weld	-	A234, Gr. WPA or WPB	3/8" wall
b. 2-1/2" to 24"...	Butt-weld	B16.9	A234, Gr. WPA or WPB	Standard —
c. 2" and smaller (including unions).....	Screwed		A105, Gr. I or II	2000 lb. WOG

7. GASKETS

All sizes..... 1/16" thick compressed asbestos composition

8. BOLTING

All sizes..... Carbon steel bolts conforming to ASA B16.5 and ASTM A307, Gr. B; or A107, Gr. 1120. Nuts shall be hexagon heavy series carbon steel with dimensions conforming to ASA B18.2.

9. VALVES


	<u>Gate - 2-1/2" and larger</u>	<u>Gate - 2" and smaller</u>
Pressure Rating.....	125 lb.	150 lb.
Body Material.....	Cast iron	Brass or bronze
Ends.....	Flanged	Screwed
Construction.....	OS & Y	Inside screw, rising stem
Bonnet.....	Bolted	Screwed
Stem.....	Brass or steel *	Brass
Wedge.....	Brass faced	Brass or bronze
Seat.....	Brass renewable	Brass or bronze
	<u>Globe and Angle - 2-1/2" and larger</u>	<u>Globe and Angle - 2" and smaller</u>
Pressure Rating.....	125 lb.	200 lb.
Body Material.....	Cast iron	Bronze
Ends.....	Flanged	Screwed
Construction.....	OS & Y	Inside screw, rising stem
Bonnet.....	Bolted	Union
Stem.....	Brass or steel *	Bronze
Disc.....	Brass or brass faced, swivel plug	Hardened stainless steel, swivel plug
Seat.....	Brass, renewable	Hardened stainless steel, renewable

*Steel stems shall be used for steam service only.

	<u>Check - 2-1/2" and larger</u>	<u>Check - 2" and smaller</u>
Pressure Rating.....	125 lb.	200 lb.
Type.....	Swing or balanced disc, as specified	Swing or lift
Body Material.....	Cast iron	Bronze
Ends.....	Flanged	Screwed
Bonnet.....	Bolted	Screwed
Trim.....	Brass or bronze renewable	Brass or bronze

NOTE: All valves shall also conform to the requirements set forth in Form 270, Standard Specification for Piping System.

WATEROUS

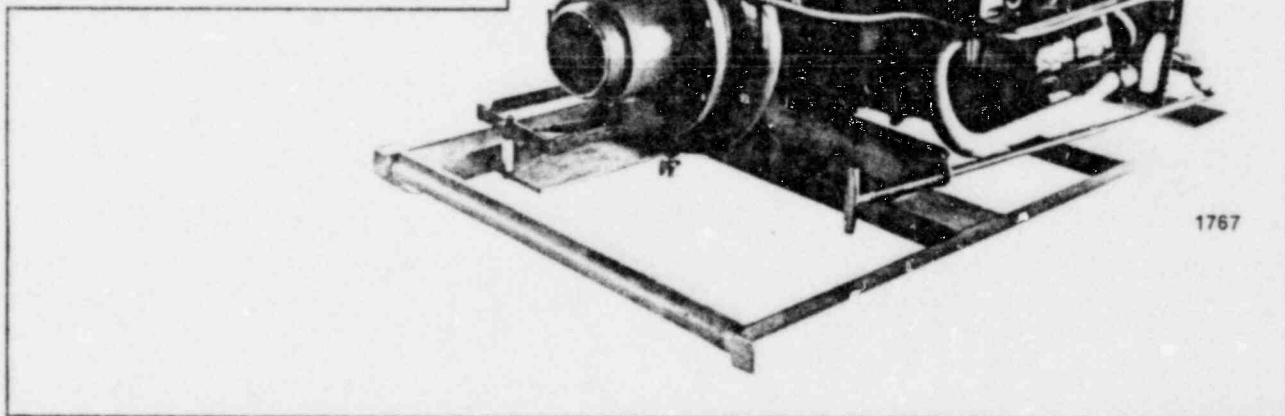
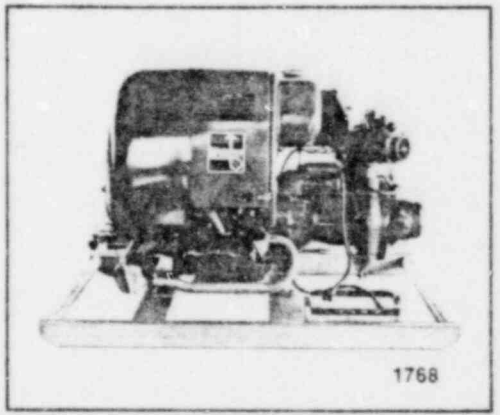
PORTABLE PUMP 
MODEL **SV45-4025BB**
F-2035

HIGH PERFORMANCE PORTABLE PUMPING UNIT

ATTACHMENT 1F
PAGE 1

- 500 GPM @ 100 PSI
- 100 GPM @ 200 PSI
- 1600cc Volkswagen "Beetle" engine powered

- 4 in. Suction
- 2-2½ in. Discharge
- Direct Drive Centrifugal Design



HIGH PERFORMANCE — No comparable pump made by a USA manufacturer has greater capacity or higher pressure.

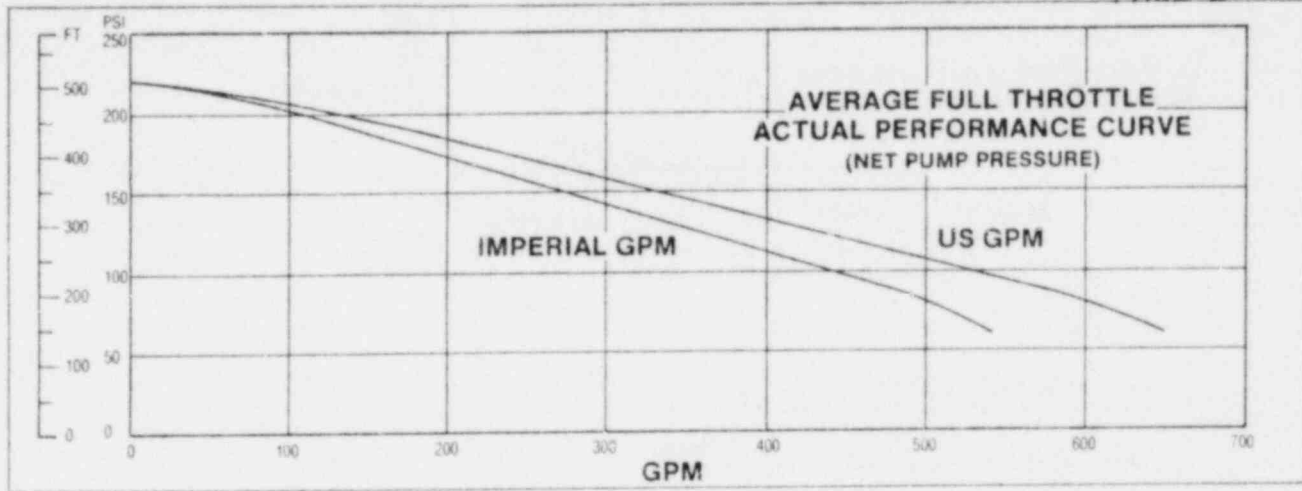
DEPENDABILITY — Backed by the experience of two of the most dependable names anywhere — Waterous and Volkswagen.

EASE OF SERVICE — Volkswagen's worldwide network of dealerships (1000 in the U.S. alone) makes service and parts available almost anywhere.

MANY USES — Fire fighting, tank filling, pump-and-rol performance on a mini-pumper, and more.

NOTE: The use or operation of this unit on any forest-covered, brush-covered, or grass-covered land in the State of California without a spark arrester (as defined in Section 4442.5, Public Resources Code, State of California) attached to the exhaust system and maintained in effective working order, constitutes a violation of the provisions of Section 4442.5

POOR ORIGINAL



PUMP SPECIFICATIONS:

TYPE: Direct drive centrifugal with enclosed, hydraulically balanced impeller.

SUCTION: 4 in. male NST with auxiliary 2½ in. NPT.

DISCHARGE: 2-2½ in. male NST with ball valves.

VOLUTE BODY AND HEAD: High strength aluminum alloy, anodized for superior corrosion resistance.

IMPELLER: High strength corrosion resistant bronze, fully enclosed, double hubbed to eliminate hydraulic thrust. Mechanically balanced to eliminate vibration.

WEAR RINGS: Long wearing high strength bronze. Easy to replace.

IMPELLER SHAFT: Stainless steel, designed for long life and maintenance free service.

SHAFT SEAL: Spring loaded mechanical type. Never needs adjustment.

PRIMING: Combination muffler and exhaust primer. Fast and simple to use. Quarter-turn bronze priming valve.

INSTRUMENTATION: On-off switch, push button starter, suction and discharge pressure gauges, oil pressure, temperature, and alternator lights, hour meter, hand throttle.

Ft. Head	PSI	USGPM	IGPM
231	100	500	416
346	150	300	250
462	200	100	83

ENGINE SPECIFICATIONS:

Volkswagen Model 126A, 4 cycle, 4 cylinder, horizontally opposed, air-cooled, regular gasoline fueled.

DISPLACEMENT: 96.6 cu. in. (1584 cc)

HORSEPOWER: Gross HP (SAE) 53 @ 3600 RPM (39.5 kW @ 3600 RPM)

TORQUE: Gross Torque (SAE) 78.94 lb/ft @ 2200 RPM (106.96 Nm @ 2200 RPM)

COMPRESSION RATIO: 7.5:1

MAX. FULL LOAD SPEED: 4200 RPM

IGNITION: 12 V system

STARTER: 12V electric, hand crank supplied as backup.

FUEL TANK CAPACITY: 5.8 US gallons (22 liters)

LUBRICANT CAPACITY: 2.5 quarts (2.4 liters)

APPROXIMATE DIMENSIONS AND WEIGHTS

Length	49 ¼ in. (1250 mm)
Width	30 ½ in. (780 mm)
Height	33 in. (840 mm)
Dry Wt.	450 lbs. (202.5 kg)
Shipping Wt.	600 lbs. (270 kg)

OPTIONS:

Standard equipment includes: skid with battery tray, hood, gas tank, bracket (required with hood and/or gas tank), alternator with integral regulator and battery cables. The pump is optionally available without some or all of these items. A single 3 in. female NPT discharge with check valve is also available.

Specifications are subject to change without notice

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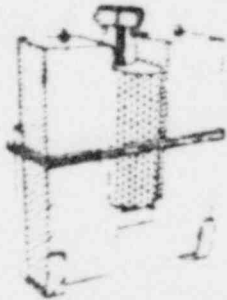
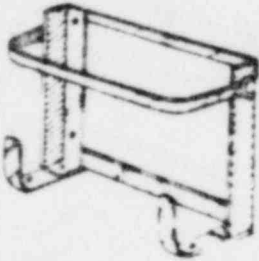
Waterous

WATEROUS COMPANY

ATTACHMENT 1G

**Eliminate critical interruptions
when drafting water!**

IDEAL IN EITHER SHALLOW
OR DEEP WATER



FLOAT-DOCK strainers fit snugly in this light-weight carrying rack with rubber bumpers and a live-rubber strap to hold the unit securely in place — even over rough roads. Mounts either on running board or inside a compartment.

THREE SIZES

Small for 2", 2½", 3" strainers

Large for 3½", 4", 4½", 5" strainers

Extra Large for 6" strainers

FLOAT-DOCK

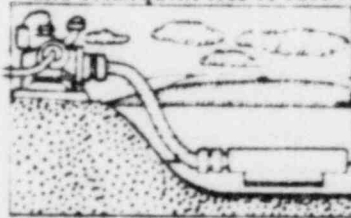
SELF-LEVELING STRAINER

At last, a suction hose intake strainer for all pumping conditions right down to a 5-inch depth. Engineered for lifetime service. With FLOAT-DOCK you'll wonder how you ever managed to get by with a conventional, old-fashioned intake screen or filter.

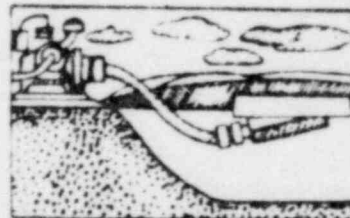
NO MORE sand, gravel, or debris entering your pump and wearing out impellers, packing, and bearings

NO MORE removing intake device out of water to clean a clogged strainer. FLOAT-DOCK keeps the intake on top where the water is cleanest and continues to do so down to the last 5 inches!

NO MORE whirlpool or suction loss. FLOAT-DOCK is designed to overcome whirlpool action which usually results in pumping of air and consequent loss of suction.

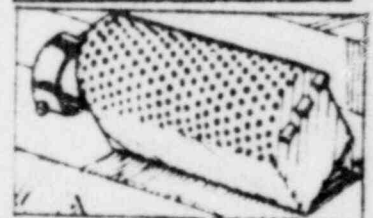


SHALLOW DRAFT Note how FLOAT-DOCK drafts in as little as 5 in. depth without any whirlpool or loss of suction.



DEEP DRAFT Strainer drafts from a few inches below surface where water is cleanest. Note how hose weight tilts strainer position while float remains level.

PRICES	
No. H224. Float-Dock with 2½" coupling	\$205.00
2" same price, 3" \$215.00	
Size: Float: 5" x 5" x 18"	
Strainer: 4" x 6" x 14"	
No. H225. Float-Dock with 4" coupling	\$325.00
3½", \$310.00; 4½", \$340.00; 5", \$365.00.	
Size: Float: 6" x 21" x 24"	
Strainer: 6" x 8" x 18½"	
No. T134. Float-Dock with 6" coupling	\$595.00
Size: Float: 8" x 25" x 33"	
Strainer: 8" x 10" x 29"	
Carrying Racks:	
No. T135. Small (2" - 2½" - 3")	\$35.00
No. T136. Large (3½", 4", 4½", 5")	\$45.00
No. T137. Extra Large (6")	\$75.00
Ship. Wts.: Float-Docks, each: 2", 2½", 3" 24 lbs.; 3½" thru 5" 45 lbs.; 6" 80 lbs. Racks: Small 5 lbs. Large 6 lbs. Extra large 12 lbs.	



DEMOUNTABLE Strainer may be removed from float in less than 30 seconds for use as a conventional type unit in cisterns or other vertical water sources.

POOR ORIGINAL