FILE FOLDER

DESCRIPTION ON TAB:

TC1000 Well L

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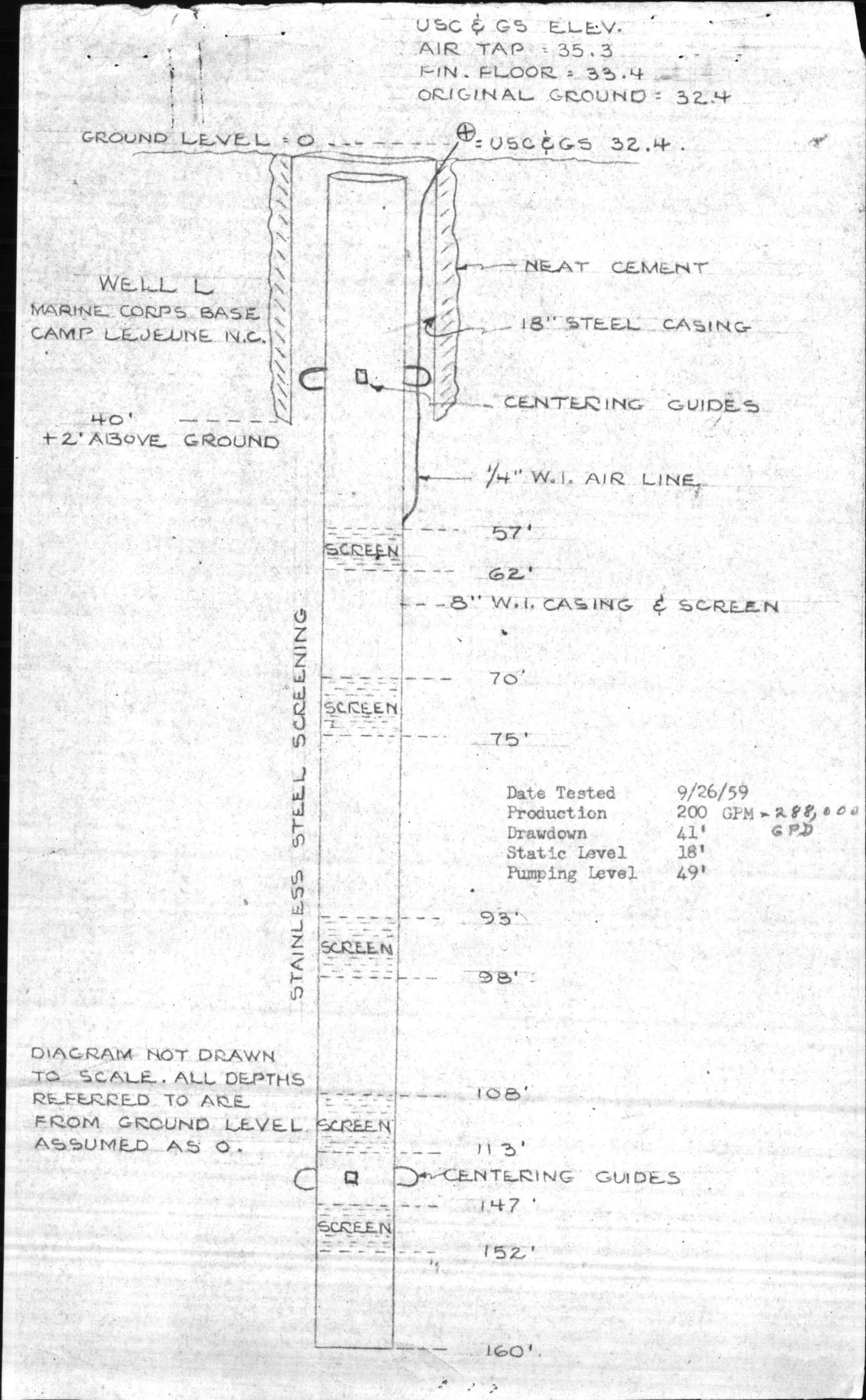
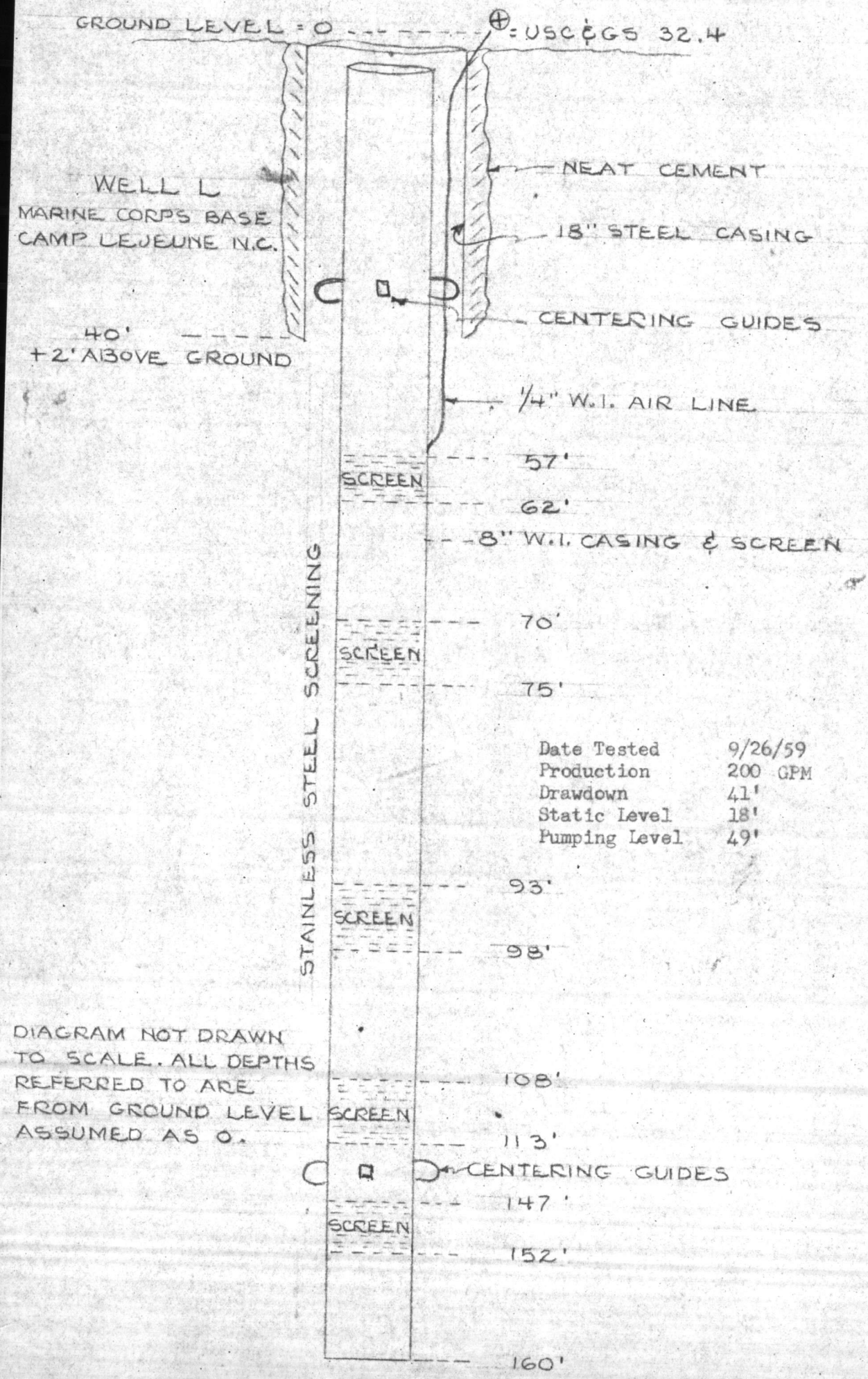

USC & GS ELEV.
AIR TAP = 35.3
FIN. FLOOR = 33.4
ORIGINAL GROUND = 32.4
GROUND LEVEL = 0
⊕ = USC&GS 32.4.
NEAT CEMENT
18" STEEL CASING
CENTERING GUIDES
1/4" W.I. AIR LINE
WELL L
MARINE CORPS BASE
CAMP LEJEUNE N.C.
40'
+2' ABOVE GROUND
57'
SCREEN
62'
8" W.I. CASING & SCREEN
70'
SCREEN
75'
STAINLESS STEEL SCREENING
Date Tested 9/26/59
Production 200 GPM - 288,000 GPD
Drawdown 41'
Static Level 18'
Pumping Level 49'
93'
SCREEN
98'
DIAGRAM NOT DRAWN TO SCALE. ALL DEPTHS REFERRED TO ARE FROM GROUND LEVEL ASSUMED AS 0.
108'
SCREEN
113'
CENTERING GUIDES
147'
SCREEN
152'
160'

USC & GS ELEV.
AIR TAP = 35.3
FIN. FLOOR = 33.4
ORIGINAL GROUND = 32.4



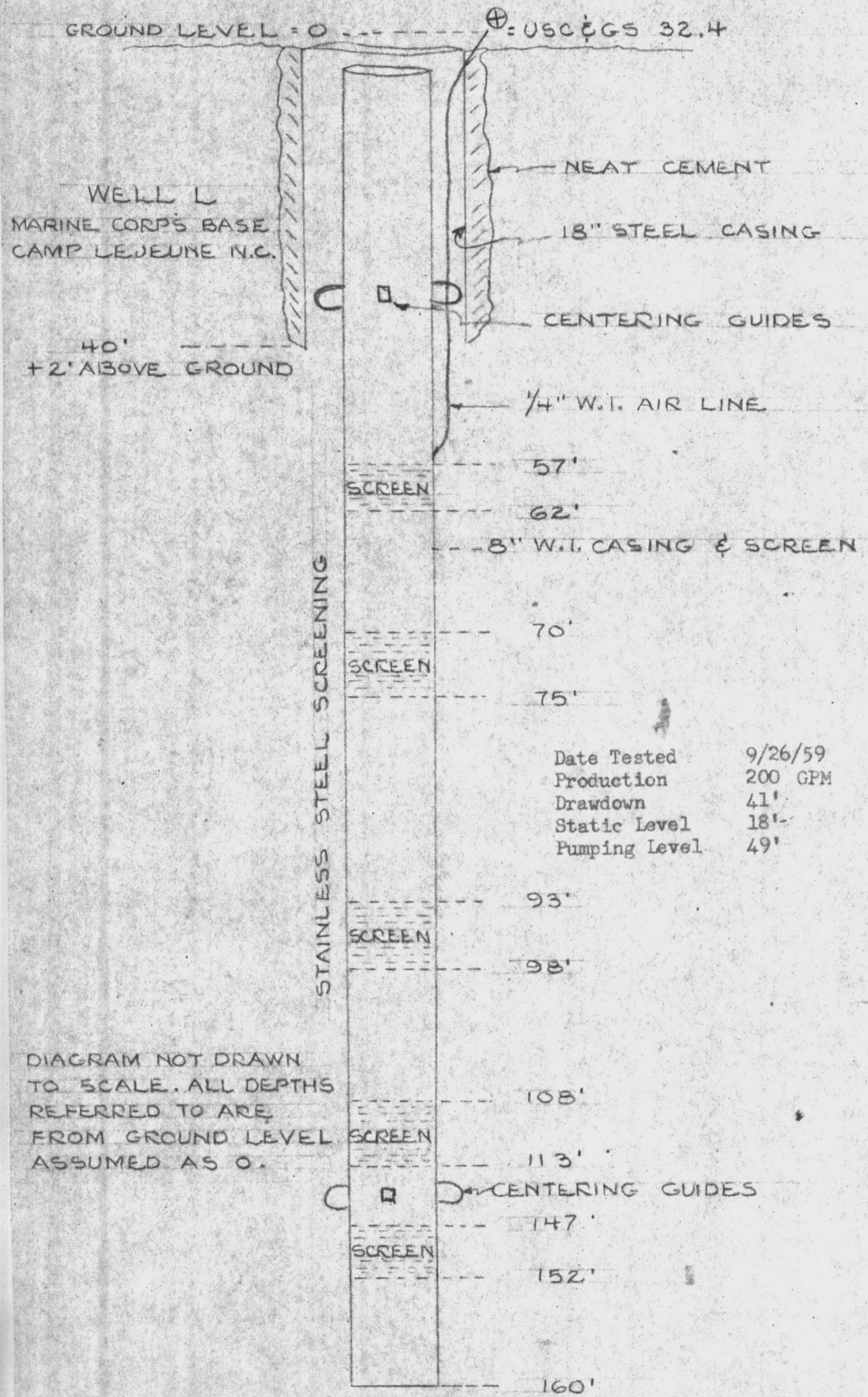
WELL L
MARINE CORPS BASE
CAMP LEJEUNE N.C.

40'
+2' ABOVE GROUND

Date Tested	9/26/59
Production	200 GPM
Drawdown	41'
Static Level	18'
Pumping Level	49'

DIAGRAM NOT DRAWN TO SCALE. ALL DEPTHS REFERRED TO ARE FROM GROUND LEVEL ASSUMED AS 0.

USC & GS ELEV.
AIR TAP = 35.3
FIN. FLOOR = 33.4
ORIGINAL GROUND = 32.4

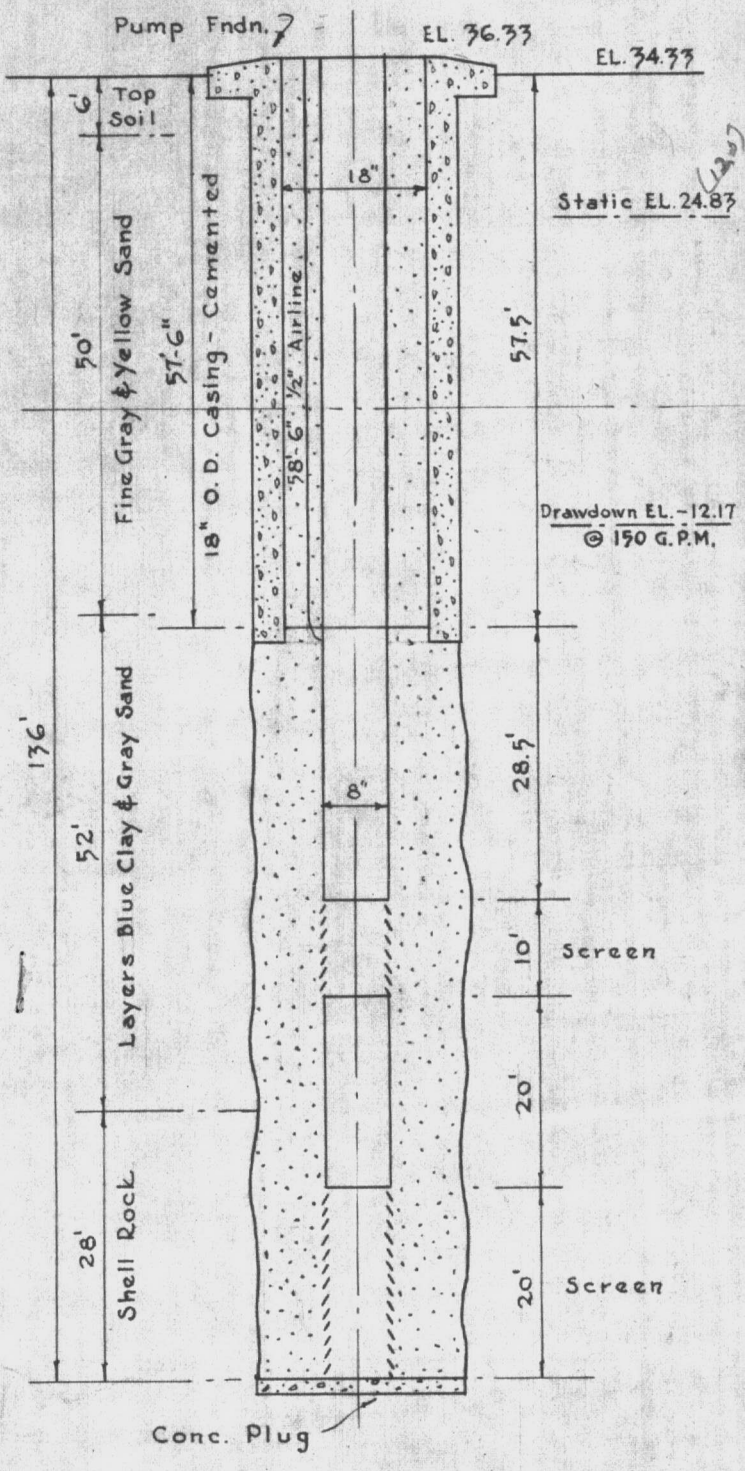


WELL L
MARINE CORPS BASE
CAMP LEJEUNE N.C.

Date Tested	9/26/59
Production	200 GPM
Drawdown	41'
Static Level	18'-
Pumping Level	49'

DIAGRAM NOT DRAWN TO SCALE. ALL DEPTHS REFERRED TO ARE FROM GROUND LEVEL ASSUMED AS 0.

150 G.P.M. – SINGLE DRIVE – 5 H.P.



T. C. A WELL "L"

North Carolina Department of Environment, Health, and [illegible]
Division of Environmental Health, Public Water Supply Section

SOURCE INFORMATION
GROUND WATER

Date Form Completed: M M D D Y Y: 01 27 95

PWSID: 0465042

Owner Assigned Source Code: 000

Well Name (If purchase, name of system): MCAS WATER PLANT 1000 (WAT, TC)

Code: G (G=Ground, W=Purchase/G, Y=G w/direct influence, Z=W w/direct influence)

If Purchase, seller ID#:

Source Begin Date: M M Y Y

Source exempt—SWTR? Y N

Direct Influence Date: M M D D Y Y

Availability: P (P=Permanent, E=Emergency, S=Seasonal, I=Interim, O=Other)

Location of well within the system (If purchase, location of master meter): CAMP GEIGER TRAILER PARK ROAD

Latitude (N): Deg. Min. Sec.: 34 43 43.

Longitude (W): Deg. Min. Sec.: 077 28 25.

How Determined: O (G=GPS, M=Map, S=Surveyed)

GPS Data: Q# or DOP #

No. of Sats. Locked:

(If purchase, use seller's primary source lat/long)

Vulnerable (VOCs)? Y N

Assessment Date: M M D D Y Y

ENTRY POINT INFORMATION

Use Code: C (C=Ground/Permanent, D=Ground/non-permanent)

Availability: P (P=Year-round, E=Emergency, S=Seasonal, I=Interim, O=Other)

Owner Assigned Entry Point Code: 400

Entry Point Name: ~~TC1000~~ MCAS NEW RIVER

Location:

Well Site: Owned or controlled? Y (Y,N) Control Area (100' radius)? Y (Y,N) If no, explain:

Sources of pollution/distance: 50' power R/W

Surface water within 200'? N Y If yes, actual distance ___ feet If yes, bact. samples collected? ___ (Y,N)

Adequate slope? Y (Y,N) Flooding? N (Y,N) Maintenance: needs paint & shingles

Well House: Free of stored materials? Y (Y,N) Properly drained? Y (Y,N) Locked? Y (Y,N)

Condition of house: OK Type of freeze protection: None

Well: Diameter: 8 Type: GRAVEL PACK Yield (gpm): 200 Properly sealed? ___ (

Properly vented? N (Y,N) Casing depth: 86 ft. (If unknown, put 'UNK') Well depth: 137 Meter available? No (

Concrete slab adequate? ___ (Y,N) If no, explain: Size: 8x8

Size of blow-off: 3" Sample tap: Before treatment? Y (Y,N) After treatment? ___ (

Pumps: Capacity: GPM: 104 HP: 7½ Pump intake depth: 60 Auxiliary Power? N (

Type pump: VERTICAL TURBINE Height above floor (pump/casing): 1F 1 S

Storage at well site: Elev: Hydro: Ground:

If hydroautomatic, air volume control? ___ (Y,N) Safety valves? ___ (Y,N) Coded? ___ (Y,N)

High service pumps: 1. ___ gpm ___ hp 2. ___ gpm ___ hp 3. ___ gpm ___ hp Auxiliary Power? ___ (

Is the water treated at this well? N Y If yes, complete back of form.

If other wells are treated here, which ones? If treated elsewhere, where? MCAS / Water Plant

If purchase, retreat? Y N If yes, complete back of form.

(1) Noisy bearings (5) Pkg leaking
(2) Seal pump base (6) Repair vent
(3) Change sample tap
(4) No Meter

DEHNR 3803 (Revised 12/93)
Public Water Supply Section (Review 12/96)

WELL NUMBER TC 1000 | BY Thomas + BROWN | DATE 6-16-84

AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAIN DOWN	DISCHARGE PRESSURE	GPM	START TIME
60	43	55	12	3.2	104	

REMARKS

MANUFACTURER	STAGE	S.N.	TOTAL HEAD	SIZE

WELL NUMBER TC 1000 BY THOMAS DATE 11-14-90

AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAIN DOWN	DISCHARGE PRESSURE	GPM	START TIME
60	43	55	12	34	110	

REMARKS

Dead head 44

MANUFACTURER	STAGE	S.N.	TOTAL HEAD	SIZE

WELL NUMBER 1000		BY THOMA / HUNTER			DATE 6-29-89	
AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAIN DOWN	DISCHARGE PRESSURE	GPM	START TIME
60	30	43	13	35	104	
		50	20	30	133	
		55	25	25	164	

REMARKS Dead head 44

MANUFACTURER	STAGE	S.N.	TOTAL HEAD	SIZE

TC 1000
10-10-85

A/L	S/L	P/L	O/O	PSI	GPM	TIME
60	14	21	7	37	104	15
		30	16	34	128	15
		33	19	31	137	15
		36	22	28	157	15
		39	25	25	175	15
		40	26	22	192	15
		42	28	20	203	15

Left set at 20 PSI 203 GPM

WELL NUMBER TC 1000 | BY THOMAS - BROWN | DATE 1-4-85

AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAIN DOWN	DISCHARGE PRESSURE	GPM	START TIME 1230
60'	10'	21	11	39	104	1240
		25	15	36	125	1250
		29	19	33	140	1300
		30	20	30	157	1310
		33	23	27	170	1320
		36	26	24	190	1330
		39	29	20	205	1340
		41	31	17	222	1350

REMARKS

MANUFACTURER	STAGE	S.N.	TOTAL HEAD	SIZE

WELL NUMBER TC 1000 | BY THOMAS / RAYNOR | DATE 7-12-83

AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAIN DOWN	DISCHARGE PRESSURE	GPM	START TIME 0905
60'	14	25'	11	35	100	0920
		32	18	30	128	0935
		37	23	25	167	0950
		42	28	20	195	1005

REMARKS used pressure gage + converted

MANUFACTURER	STAGE	S.N.	TOTAL HEAD	~~SIZE~~ GPM
VALLEY		SN-GMC 112 MODEL 8MMO 4A RPM - 1760 CODE - 6-17-83	75'	200

2D7100C Discharge head

TC1000

Install new Stuffing Box 3-1-93

+ Head Shaft

TC - 1000
6-21-83
Put in
I took care of work req.
I see Tommy if Any questions
MJ

LINESHAFT TURBINE PUMPS

Selection, Installation, Operation and Maintenance Manual

VALLEY PUMP CO.
A DIVISION OF VALLEY INDUSTRIES, INC.
COMMERCE & EXCHANGE STREETS / CONWAY, AR 72032

VPC-49

General Information

The working conditions of each turbine installation are such that rarely are orders received for two pumps of exactly the same specifications. Each pump is an engineered unit and must be ordered and built to suit specific requirements.

Selection by the salesman of the pump that will properly meet all conditions most efficiently is a very important part of installation. For this reason the pump data is presented in detailed form so as to enable the salesman to carefully select and correctly order the complete pump. Cooperation of the salesman with the factory will result in the most successful installation, the best selling argument in any line of business.

This catalogue covers equipment with principal dimensions and limiting capacities plainly stated. Standard equipment should always be used if possible as it insures more prompt shipment, and repair parts for standard equipment normally are carried in stock. When special equipment not covered in the catalogue is required, always consult the factory before quoting. All special orders must be approved by our Engineering Department.

Discharge heads can be furnished in any of three ways. i.e., above ground only, underground only or above ground with opening plugged and provided with underground discharge. For either of the last two, it is necessary to add the additional price for the underground discharge to the base price of the pump head, and when screw coupled column is being used and the underground connection is to be located in other than the top section, it will be necessary to add for an adjustable top column flange in order to line up the discharge connection.

VALLEY discharge heads in this catalogue are designed to be used primarily with either vertical hollow shaft motor or with hollow shaft right angle gears where the thrust bearing in the motor or gear drive carries the total pump thrust load consisting of the hydraulic thrust of pump, the weight of the pump shaft and the weight of the impellers. The head assembly should be selected on the basis of the size of discharge column to be used, size of discharge outlet on the head assembly desired, size of the line shaft used and finally upon the base diameter of the motor or gear drive. VALLEY discharge head assemblies can be supplied on special order for use with vertical solid shaft motors, vertical steam turbine or vertical solid shaft driver or in a separate thrust bearing assembly, and the factory should be consulted for engineering and pricing.

When desired, pumps can be furnished for combination vertical motor and right angle gear drive; and with this construction a combination drive shaft is required for which an additional charge is made.

Cast iron discharge heads have pressure limitations. The pump curve should be checked for maximum pressure conditions at shutoff and not at operating conditions. Furthermore, if water hammer is anticipated, a cast iron discharge head of any size or type should not be used since water hammer can increase the apparent pressures in excess of 300%.

It is essential that the allowable downthrust be checked carefully in all instances to insure having a thrust bearing of ample capacity. The hydraulic downthrust in pounds is determined by multiplying the total dynamic head in feet by the hydraulic thrust constant for the bowl to be used and adding thereto the weight of shafting, and the weight of the impellers. The hydraulic thrust "K" constants for the various bowls can be found on the catalogue curve sheets.

On oil lubricated pumps, the price of the discharge head includes a manually operated drip feed lubricator, whereas pump heads with water lubricated column include a grease cup with connection for pre-lubrication tank, but no pre-lubrication equipment is included. Optional type of lubricators are available at additional costs.

The intermediate bowls of current construction are cast iron non-enameled. Enameling is available at extra cost. Bronze impellers are standard equipment for all bowls. Impellers made from other materials can be furnished on special order, but the efficiency may be less than with bronze impellers. When non-bronze impellers are used, the efficiency obtained from the curve sheet should be reduced. Consult the factory for efficiency correction as all price book curves are made up from tests using bronze impellers.

Pumps can be furnished with all bronze or stainless steel bowls. Consult the factory for pricing.

When drip feed lubrication is specified for the line shaft, drain ports must be used.

Column assembly may be either oil lubricated type or water lubricated type. Oil lubricated type column assembly can be supplied with either Redwood bearing type inner column or Brass bearing type inner column.

Special lengths of column assembly take the price of the next longer increment.

Flanged column connection are available for some pipe sizes. Consult the factory for availability and pricing.

Suction pipe and discharge nipples are constructed with pipe having 3/4" taper per foot American Standard threading. More than 10 feet of suction pipe is not recommended. If more than one section of suction pipe is ordered, add one pipe coupling for each additional section of pipe.

IMPORTANT

UNITED STATES GALLON UNIT OF MEASUREMENT. In each and every instance where the term "gallon" or "gallons" is used or indicated whether on curves, data sheets, or in quotations and/or letters, United States Gallon or Gallons is meant, unless specifically and clearly stated otherwise.

Selection

Before selecting your pump the following should be determined.

1. Inside diameter of well.
2. Depth of well.
3. Gallons per minute to be pumped.
4. The type of power which will be used to drive the pump and the speed at which the pump will operate. If electricity is to be used, the voltage, cycles and number of phases must be determined. Use "full load" and not "no load" motor speed. If gear drive or steam turbine is to be used, the speed of the driver must be determined.
5. STATIC WATER LEVEL is the distance from the water level below the ground surface when the well is not being pumped.
6. DRAWDOWN is the distance the water level recedes below the static water level when pumping the desired capacity.
7. WELL LIFT, also called pumping level, is the sum of the static water level and the drawdown.
8. ABOVE GROUND HEAD is the height above the surface of ground to the point of discharge plus friction loss in the discharge pipe and fittings, or the pressure against which the water is pumped.
9. FIELD PUMPING HEAD is the well lift plus the above ground head.
10. PUMP SETTING or depth at which the pump bowls are to be installed below the ground surface.
11. Column friction head is the friction loss in the pump column and is obtained from hydraulic friction loss charts. This depends upon size of pump column and it's length.
12. TOTAL DYNAMIC HEAD is the sum of the well lift, the above ground head and discharge column friction head.
13. The desired length of column sections and type of line shaft bearing.

When the well diameter, the capacity, desired speed, pump setting and total dynamic head, (TDH) are known, refer to the pump performance curves for different bowls and select the most efficient unit for the required conditions, then determine the number of stages required for the TDH. If this figures out a fractional number of stages, use the next larger number in making up the bowl price – thus; if 5½ stages are required for the TDH, the selection would be that of a 6 stage pump bowl.

EXAMPLE:

1. 12 in. inside diameter well.
2. 300 ft. deep.
3. 900 GPM.
4. Use enclosed impellers.
5. Hollow shaft vertical motor drive to operate on 460 volt, 3 phase, 60 cycle current with full load speed of 1760 RPM.
6. Static water level 169 ft.
7. Drawdown 25 ft.
8. Well Lift = 169 ft. plus 25 ft., or 194 ft. = pumping level.
9. Above ground head = 64 PSI or 148 ft.
10. Field Head = 194 ft. plus 148 ft. = 342 ft.
11. Since it is desirable to have pump bowls submerged when operating, use a pump setting of 200 ft. of discharge column.

In order to figure the Column Friction in the discharge pipe, the first step is to make a rough check on the horsepower required in order to determine the size of line shaft. This can be done by substituting in the formula:

$$\text{Horsepower} = \frac{\text{Field Head in Ft. X Capacity in GPM}}{\text{3960 X Estimated Bowl Efficiency (expressed as a decimal)}}$$

$$\frac{342 \times 900}{3960 \times 0.75} = 103.6 \text{ Horsepower}$$

Next refer to the shaft selection chart, which indicated that 1½" line shaft is required for 103.6 HP at an operating speed of 1760 RPM. Therefore, the shaft size will be 1½". The discharge column sheets show that for a capacity of 900 GPM using 1½" line shaft with 2½" tubing and 8" pipe the friction loss per 100 feet amounts to 3.2 ft. which is less than the maximum of 5' recommended by AWWA. Therefore, the size of column will be 8' X 1½" X 2½". Be sure to check maximum O.D. of column coupling for well clearance. The limits for column and shaft must take into consideration the shaft stretch and bowl lateral and need to be considered. This data can be determined from charts in this manual.

Since 200 ft. of column is involved and the friction loss per 100 ft. amounts to 3.3 ft. the total column friction loss is 3.3 X 200 ÷ 100 = 6.6 ft. The total dynamic head then would be 194 ft. plus 148 ft., plus 6.6 ft. or 349 ft. It is to be stressed that the pump bowl must be selected on the basis of TOTAL DYNAMIC HEAD and not just on the field pumping head.

A study of the characteristic curves indicates a choice of two pumps for a capacity of 900 GPM with an operating speed of 1760 RPM: i.e., 12HMO with semi-open impellers, 12MHE with enclosed impellers.

By referring to bowl data sheets you will note that the outside diameter of the 12" bowls will both go into 12" well casing. The casing ID should be checked for the depth setting of the pump bowl. Liners, screens, etc. may have smaller ID than the top of the well casing.

Reference to the curve sheet for the 12HMO single stage bowl at 1760 RPM shows that this bowl will handle 900 GPM with a lift or head per stage of approximately 71 ft. with an uncorrected pump bowl efficiency of about 79%. For 349 ft. head, 4.9 stages are required; therefore, the selection would be on the basis of a 5 stage bowl.

Reference to curve sheet for the 12MHE single stage bowl at the 1760 RPM shows that this pump will handle 900 GPM with a lift or head per stage of about 73 ft. with an uncorrected bowl efficiency of 76.5%. For 349 ft. head 4.7 stages are required; therefore, selection would be on the basis of a 5 stage bowl unit.

As the 12MHE bowl requires the same number of stages as the 12HMO bowl and is almost as efficient and can be installed in a 12" well, it will be used in this example, although in actual practice it might be desirable to use another bowl from the standpoint of price, straightness of well and/or other factors.

If full diameter impellers were used, the maximum horsepower per stage would amount to about 22 HP, and for 5 stages would take 110 bowl horsepower, meaning that a 125 HP motor would be needed unless an overload was permissible.

Price book curves cover single stage performance but with multi-stage efficiency. On the 12MHE bowl, the efficiency must be corrected when the staging involved is three or less and should not be overlooked. In this example, since 5 stages are required, no efficiency correction is necessary. When impellers are trimmed the efficiency will drift back much the same as a reduction in pump speed as discussed later, but in this example the efficiency at designed capacity is so broad and the trim so slight that an efficiency correction is unnecessary.

Quite often it is necessary to make an overall efficiency or power guarantees. The 5 stage, 12MHE bowl which we have selected for our example has the following laboratory characteristics at 1760 RPM:

900 GPM
349 ft. of TDH
76.5% bowl efficiency

$$\text{Laboratory HP} = \frac{349.0 \times 900}{3960 \times .765} = 103.68 \text{ HP}$$

Reference to the chart in the Mechanical Friction Chart shows that it will require 1.28 HP to drive 100 ft. of 1½" line shaft using drip feed lubrication at 1750 RPM with a bowl having open drain ports, or 2.56 HP for 200 ft. pump setting with this size shaft. In addition to the horsepower loss in the line shaft, there will be horsepower loss due to thrust load in the thrust bearing of the driver.

The hydraulic downthrust is determined by referring to performance curve sheet for hydraulic thrust constants which for the 12MHE bowl amounts to 7.5 lbs. per ft. of head. This constant should be multiplied by the total dynamic head in ft. to arrive at the hydraulic thrust. Reference then should be made to the shaft chart for weight of 1½" shaft and it should be multiplied by the total length of the shafting. To this should be added the weight of the impellers and impeller shaft. The sum of the three is the total downthrust which the thrust bearing must support. Thus:

349 X 7.5	= 2,618 lbs. hydraulic load
200 X 6.08	= 1,216 lbs. shaft weight (includes shaft couplings)
45.76 + 4(23.2)	= 139 lbs. impeller and impeller shaft weight
Total downthrust	= 3,973 lbs.

Vertical hollow shaft motors and right angle gear drives are usually supplied with thrust bearings which carry most any thrust load involving the rated horsepower, but it is well to check the motor specifications to be sure of ample thrust capacity. The thrust capacity of any other type of driver likewise should be checked.

The horsepower loss due to thrust losses in the motor or gear drive using an angular contact thrust bearing is figured from the formula as follows:

$$\text{Horsepower Loss} = 0.0075 \times \frac{\text{RPM}}{100} \times \frac{\text{Downthrust}}{1000}$$

$$\text{Horsepower Loss} = \frac{0.0075 \times 1760 \times 3973}{100{,}000} = 0.52 \text{ HP}$$

Field brake horsepower can be figured with or without the thrust bearing losses in the motor included. While it appears to penalize the pump by including the thrust bearing losses in the calculations, these losses must be taken into account either here or later on by modifying the motor efficiency, and in this example we shall include the thrust bearing losses of the motor; therefore, the field horsepower or total horsepower required by this pump equals 103.68 lab HP + 2.56 HP shaft loss + 0.52 HP bearing losses or 106.76 field horsepower. It should be noted the horsepower of 106.76 arrived at above is slightly more than the 103.6 HP estimated and you should recheck the 1½" shaft for maximum horsepower allowable. It is still satisfactory.

$$\text{Field Efficiency} = \frac{\text{Field Head in Feet} \times \text{U.S. GPM}}{3960 \times \text{Field Horsepower}}$$

$$= \frac{342 \times 900}{3960 \times 106.76} = .728 = 73\%$$

With a vertical hollow shaft motor having a service factor of 15% a 100 horsepower motor could be used, but to be on the safe side and allow for future changes in pumping conditions, a 125 horsepower motor is recommended. Furthermore, a closer inspection of the characteristic curve on the 12MHE bowl selected indicates that the maximum horsepower has not been reached when pumping 900 U.S. GPM and, therefore, if the pumping head is reduced and the capacity increases, there would be an additional load set up by this particular bowl. Available coupling bore should be checked for 1½" shaft. Maximum bore available is 1-15/16" so this motor is satisfactory.

The 125 horsepower motor has a base diameter of 16½ inches, we are planning to use 8 inch column pipe, therefore the head selection would be the 19-01-080. This head is sized for 8 inch column and will accommodate a 16½ inch motor base.

At 230, 460 or 575 volts the published NEMA efficiency of a 125 HP motor uncorrected for thrust losses is 92.5% at both full and 3/4 load. Since we have included thrust bearing losses in the above field efficiency it will not be necessary to modify the motor efficiency, which would be required had we not included this in the above example.

$$\text{Over all or wire to water efficiency} = \text{field eff.} \times \text{motor eff.}$$
$$= .73 \times .925$$
$$= .675 = 67.5\%$$

To determine kilowatt hours per 1,000 gallons:

$$\frac{\text{Field HP}}{\text{Motor Eff.}} = \text{HP Input to Motor, or}$$

$$\frac{106.76}{.925} = 115.4 \text{ HP Input to Motor}$$

$$\text{Kilowatt Input to Motor} = \text{HP input} \times 0.746$$
$$115.4 \times 0.746 = 86.09 \text{ kilowatts}$$

This represents the instantaneous kilowatt reading, which means that in one hour's time the meter would register 86.09 kilowatt hours.

$$\text{Kilowatt hours per 1,000 gallons} = \frac{\text{Kilowatt hours per hour}}{\text{No. of 1000's of gal. pumped per hr.}}$$

$$= \frac{86.09}{\frac{900 \times 60}{1000}} = \frac{86.09 \times 1000}{900 \times 60}$$

$$= 1.59 \text{ kilowatt hours per 1000 gallons}$$

A commonly used alternate method used for determination of kilowatt hours per 1000 gallons is by the formula:

$$\text{Kilowatt hours per 1000 gallons} = \frac{\text{Field Head} \times 0.00314}{\text{Wire to Water Efficiency}}$$

$$= \frac{342 \times 0.00314}{.675}$$

$$= 1.59 \text{ kilowatt hours per 1000 gallons}$$

Selecting the Proper Shaft

From the shaft horsepower rating chart, select a size of shaft that seems to be the proper size shaft for the pump speed and bowl horsepower requirements.

Calculate Total Thrust Load as follows:

1. Hydraulic Thrust = TDH X Impeller Thrust Factor "K".
2. Weight of lineshaft = (Pump setting X weight of shaft per foot) + (number of shaft couplings X weight of one shaft coupling).
3. Weight of impellers = number of impellers X weight of one impeller.
4. Weight of impeller shaft = length of shaft X weight of shaft per foot.

Total Thrust Load = Sum of 1, 2, 3, & 4 above.

$$\text{Horsepower loss from thrust} = 0.0075 \times \frac{\text{RPM}}{100} \times \frac{\text{thrust load}}{1000}$$

Calculate line shaft horsepower loss due to friction.

$$\text{Lineshaft HP loss} = \text{Lineshaft friction loss per 100 ft. of shaft} \times \frac{\text{Pump Setting}}{100}$$

Calculate total horsepower requirement:

Total horsepower requirement = Bowl horsepower + thrust loss horsepower + shaft friction loss horsepower.

The allowable lineshaft horsepower must be selected on the basis of field total horsepower requirement and total thrust load. Select proper shaft size from lineshaft horsepower rating tabulation for C1045 lineshaft.

You should now check the shaft elongation. This is done as follows:

$$\text{Shaft elongation} = \frac{\text{Hydraulic thrust}}{1000} \times \frac{\text{Feet of shaft}}{100} \times \text{Shaft elongation in inches per 100 ft. of shaft}$$

Note that hydraulic thrust is used in this calculation NOT total thrust load.

In order to assure sufficient lateral or shaft end play in bowl, it is necessary that this end play exceed the elongation by 3/16". If the pump is operated at shut off or any head in excess of the design head, the shaft elongation should be calculated at the highest point of head operation.

After finding the elongation plus end play required, the chosen bowl assembly should be checked for lateral. If the lateral doesn't equal or exceed the elongation plus end play, redesigning must be done. In many bowls extra lateral can be machined into the bowl. The factory should be consulted for this operation and pricing. You might also choose a bowl that has more lateral. You would need to recalculate your data if the "K" factor for the new bowl is different from the first one calculated. You might want to choose a larger shaft that would have less elongation. Any changes in design should be recalculated for total thrust, horsepower and elongation to assure a proper installation.

Selecting the Proper Column Assembly

After selecting the correct lineshaft, the proper column pipe can be selected. If the pump is oil lubricated, be sure and use the proper size enclosing tube for the selected shaft. From the friction loss chart for standard pipe column, choose a pipe size with the chosen inner column size.

Friction loss in the column assembly should not exceed 5 feet per 100 feet of column assembly per AWWA requirements. Tabulations for some of the more common sizes of pipe with inner column friction losses, are also given for your quick reference.

Pump Speed Change

Variation of head, capacity and brake horsepower with an increase or decrease in pump speeds follow definite rules which are known as affinity laws. These laws may be stated as follows:

Capacity varies directly as the speed change.
Head varies directly as the square of the speed change.
Horsepower varies directly as the cube of the speed change.
Efficiency remains practically constant with the speed change.

The laws may be expressed mathmatically in the following manner:

Q1 = initial capacity
H1 = initial head
N1 = initial speed
BHP1 = initial brake horsepower

Q2 = new capacity
H2 = new head
N2 = new speed
BHP2 = new brake horsepower

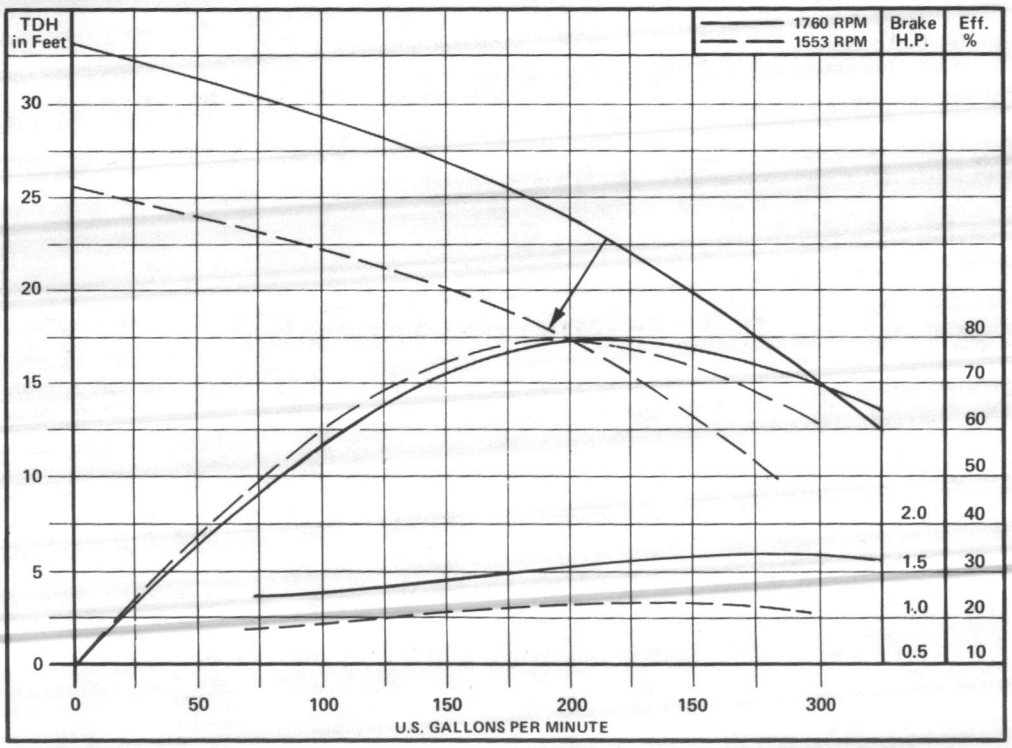
$$\frac{Q2}{Q1} = \frac{N2}{N1} \qquad \frac{H2}{H1} = \left[\frac{N2}{N1}\right]^2 \qquad \frac{BHP2}{BHP1} = \left[\frac{N2}{N1}\right]^3$$

Because of the effect of a speed change on the performance of a given pump, the actual running speed of the driver must be considered when determining the required number of stages for a particular condition. The catalogue performance curves are drawn at the nominal full load motor speed, with the speed for each curve clearly stated. Determine the actual speed of the driver and check this against the speed shown on the price book curve. If the driver speed is lower than the price book curve, care should be exercised against furnishing too few stages. If the speed is increased it may be possible to use fewer stages to meet given pumping conditions. It should also be noted that with a speed faster than shown on the performance curve the resulting horsepower is higher per stage and may cause an unwanted overload on the motor if not considered.

The effect of the speed change according to the affinity laws in illustrated by the following example and diagram. This example illustrates the change of one point on the basic curve brought about by assuming a decrease in speed from 1760 RPM to 1553 RPM. Therefore, the direct ratio of speed change is 1553 ÷ 1760 or 0.88, the ratio of the square of the speeds is 0.88 X 0.88 = 0.77. The ratio of the cube of the speeds is 0.88 X 0.88 X 0.88 = 0.68. By substituting in the various laws of affinity it is noted that the new values are determined by using the conditions of 215 GPM at 23 feet of head and 78% efficiency at 1760 RPM require 1.6 brake horsepower. Performance will change as follows:

215 GPM X 0.88 = 189 GPM
23 ft. X 0.77 = 17.7 feet
1.6 BHP X 0.68 = 1.1 HP
78% eff. at 215 GPM = 78% eff. at 189 GPM

By repeating this procedure at several points between shut off and the break off point on the curve, a complete new curve may be drawn. The diagram illustrates the results of recalculating the complete curve for this lower speed. The solid lines represent performance at 1760 RPM. The dashed lines represent performance at 1553 RPM. Using the law of affinity for changes of this type is accurate within a very small percentage provided the speed changes do not exceed 30%. It is also possible to use these same laws and methods to determine the results of a speed increase.



VALLEY PUMP INSTALLATION PROCEDURE

Well Conditions

The conditions affecting the installation of a Vertical Turbine Pump should be thoroughly understood to avoid misunderstandings or disappointments later. These notes are intended solely as an aid to satisfactory operation.

Straightness of the Well

Valley pumps are designed for operation only with all parts in correct alignment. It cannot operate properly or safely if it is forced into a crooked well. Ordinarily it should hang in a strictly vertical position. Not all wells are truly vertical and a slight departure can be allowed if the well casing is straight or with ample clearance to allow the pump itself to be perfectly straight and simply resting against the casing. The discharge head must be in proper alignment with pump column, and not forced into alignment with outside piping, or forced into a level position that would cramp it or introduce any strains.

Sand in the Well

No guarantee can be made against the erosive action of sand or other material suspended in the water. Although a small amount of sand can pass through the pump, when it becomes excessive it is only a question of time until the working parts are badly eroded and cut out.

Corrosive Action of Water

In agreement with the standard practice of the Hydraulic Institute and the American Mining Congress, no reliable pump manufacturer can guarantee his pump against corrosive action, which is impossible to predict. Such conditions may not even show in a chemical analysis of the water. When they are anticipated, the makers will be glad to offer suggestions on special materials as experiences may have developed, but without specific guarantees on performance. Experience with other installations in the same neighborhood is usually the best guide.

Air and Gas

All performance guarantees are made on the basis of pumping clear, cold water with the pump properly submerged. Air or gas in the water may result in a reduced capacity, or an unbalanced condition that sets up vibrations that may result in damage to the pump.

Foundation

A simple but substantial concrete foundation should be built around the well casing at the surface. It should be of sufficient size to carry the weight of the complete pump. The casing should not extend above the top of the foundation, and space must be provided in the foundation to receive the projecting hub or pipe flange at the bottom of the discharge head.

The following data and instructions are written for oil lubricated pumps. However, the same general information is also applicable to water lubricated pumps — except when reference is made to enclosing tube or oiling systems. Water lube column assembly will have a maximum length of 10' per section, spiders (1 per joint of standard column pipe) will be brass with neoprene inserts, shaft will have chromed journals.

Before the Pump is Installed

When the shipment is received, check all the parts which consist of the following:

1. Pump Bowl assembly.
2. The intermediate column pipe, oil tube and shaft assemblies in 20', 10' and/or 5' lengths, equal lengths and in equal numbers.
3. Bottom column, oil tube and shaft assemblies of all lengths will be identified by tag attached.
4. Top column, oil tube and shaft assemblies will be identified by tag attached. Oil tube will be equipped with combination column shaft and head shaft.
5. Column pipe in total length equal to the pump setting ordered.
6. Shaft couplings for each shaft.
7. Column spiders (rubber) - proper dimension for use with the oil tube and column pipe for each 40' of column.
8. Discharge head assembly with suitable threaded inlet and discharge openings. The discharge head assembly will include tension box and tension bearing, oil reservoir, oil reservoir mounting bracket, oil regulating valve and oil line fittings. Head shaft, adjusting nut and driver mounting bolts and nuts or cap screws.

Installation Equipment Required

1. A pump installation truck equipped with pole or derrick and winch is generally used if there is no permanent derrick. A minimum of 5' plus the length of the longest piece of column assembly will be necessary.
2. Two hook chains or a wire rope sling with two hooks.
3. Two sets of friction clamps or one set of friction clamps and one steel elevator clamp of the proper size for the column pipe.
4. A threaded nipple of proper size to fit column pipe coupling. This threaded nipple must be equipped with a bale of sufficient height to clear the column shaft. Generally the top of the bale should be at least 18" above the top of the short threaded nipple.
5. A 1" rope of sufficient length to pass around the column shaft with a half hitch around the oil tube and column shaft to keep the oil tube and column shaft in place in the column pipe when the column pipe assembly is being raised to a vertical position for installation.
6. Two chain tongs of sufficient size for use with the column pipe and couplings.
7. Two 24" pipe wrenches and one 36" pipe wrench.
8. Two crescent wrenches used to adjust head shaft nuts.
9. Ordinary hand tools, including a wire brush for cleaning the pipe threads.
10. Pipe thread compound.
11. A 10' length straight edge, to check column pipe alignment.

Installation Procedure

1. Before installation, all the pump parts should be carefully checked, cleaned and laid out in proper sequence for installation. Care must be taken in handling the shaft to keep it straight. It has been straightened at the factory before shipment, and it's straightness must be maintained. A careful installer will check each piece of shafting on a pair of simple supports, even a pair of wood blocks with "V" notches, and make corrections if necessary. A crooked shaft will cause vibration and trouble in the operation of the pump.
2. Check bowl lateral, record for later reference and make sure that the bowl shaft turns freely by hand. Preassemble the suction pipe, strainer, and bottom column assembly to the pump bowls before lifting the unit over the well.
3. A set of friction clamps should be attached to the upper end and just below the pipe coupling on the lower length of the column assembly.
4. The bale type threaded elevator should be screwed into the pipe coupling on lower length of column. After the threaded elevator has been securely attached to the column pipe coupling, attach the bale of the elevator to the hoist. Then lift the assembly into a vertical position and lower it into the well, being sure the elevator friction clamps rest securely on the well foundation. On this and subsequent moves, be sure that one friction clamp or threaded elevator is fastened securely to the pump column before the lower one is released to avoid any slippage or dropping of the pump into the well.
5. The column pipe has 8 threads, 3/16" taper. The pipe couplings have 8 straight threads per inch. It is necessary to butt up the column in the pipe couplings when the pipe is assembled. This type of thread on the pipe and in the coupling will result in the proper alignment of the column pipe when they are butted up in the collars. It is very important that when one length of pipe is attached to the other that the installer check the two lengths with a straight edge to hold the proper alignment. In the event that it is found that the pipe is not running true, the section should be removed that is causing the run-out and not used in the pump installation.
6. In the subsequent installation of the column assemblies, a 1" rope of sufficient length should be wrapped around the lower end of the shaft and oil tube and secured with a clove or timber hitch. This should be done to keep the shaft and oil tube from dropping out of the column pipe when it is lifted into the vertical position. The oil tube should be allowed to extend approximately 12" out of the lower end of the column pipe. A double half hitch of the rope should be taken around the oil tube. The column shaft should not be allowed to extend more than 12" out of the oil tube and the half hitch of the rope should be taken around the shaft. The long end of the rope must be held securely while the assembly is being lifted to a vertical position, lowered into place and connected with the assembly below. The oil tube and shaft are equipped with left hand threads.
7. When connecting the shaft, each shaft should be assembled to the same depth in a shaft coupling and securely butted up. The oil tube should also be butted up in the assembly. As each length of the assembly is installed, remove the shaft and tube bearing in the upper end of the oil tube, fill the oil tube with a good grade of turbine oil and then replace the bearing.
8. The top column nipple (pipe) is without a pipe coupling. The top tube has a machined and polished surface at the top. Be sure this polished surface is not damaged as the "O" ring in the tension box must seal around it.

9. A combination top column shaft and head shaft, or a one piece head shaft of proper length, will be supplied in the top column assembly of sufficient length to extend through the column pipe, oil tube, discharge head, and drive unit (Electric motor, gear drive, etc.)

10. The top column nipple can be assembled with the discharge head before installation.

11. Before lifting the discharge head, with or without the top column nipple, a short length of pipe should be assembled in the discharge opening in the head. The hook chain or wire rope sling should be passed under the pipe on one side of the head and under the lifting lug on the other side. Some heads have 2 lugs, one on each side, in which case the 2 lugs should be used for lifting.

12. Never attempt to lift the discharge head by attaching a chain or rope under or around the driver mounting flange on the discharge head. With the hook chain or wire rope properly placed around the discharge head, the unit can be lifted over the well and lowered for assembly.

    a. Rotate discharge head on the top column pipe until the top of the enclosing tube is 1¼" below the seat surface of the tension box on the discharge head.

    b. Clean the tension bearing, seal box and discharge head seat.

    c. Install "O" ring seal in seal box. A light film of oil or water will assist this assembly and step e.

    d. Coat discharge head seat with gasket compound.

    e. Slip seal box over enclosing tube. Seat in head and install cap screws.

    f. Apply oil lightly to the bore, threads and seat of the tension bearing. Slip over the top shaft and thread into the enclosing tubing until the bearing flange butts on the seal box.

    g. Additional turns of the bearing applies tension to the shaft enclosing tube. Refer to the tubing tension graph for the correct tension to apply.

    h. Connect the means of lubrication to the inlet.

    i. For drip feed oil lubrication allow about ½ pint to run in. Adjust needle valve to drip oil at the rate of one drop per minute per 10 feet of pump. (minimum 5 drops per minute.)

    j. For flooded oil lubrication or other lubrication see separate instructions.

8A-12A (Alternate)
Clean and assemble the top column nipple to the last standard section of column. This nipple consists of a length of pipe with a long thread on the top end. A lock ring and a hanger flange (if the head is bolted) is assembled on this long thread. A top special oil tube is furnished. One end of this tube has a long polished surface which should be installed up. The head shaft is assembled with this tube with the long thread and key way up. Clean up the discharge head machined surfaces. Using a rope sling with a sufficient length to clear the load hook above the head shaft, lower the head onto the top column. Bolt the head on the top column flange (hanger flange). Thread the head onto the top threads for the coupled head. Proceed with the installation of the tension assembly per instructions 12 a. thru 12 j. above.

13. There is a threaded opening in the tension bearing above the flanged segment. An oil line brass fitting is to be inserted in this opening. The oil reservoir is supplied with a mounting bracket. This bracket is to be mounted on the top side of the flange on the driver unit, using one of the bolts and nuts or cap screws that are supplied to attach the driver unit to the discharge head. The oil regulating valve, with copper oil line and fittings, is to be attached to the oil reservoir and connected to the brass fitting in the tension nut.

14. This completes the installation of the pump. However, before mounting the driver unit with the discharge head, the head must be resting on the foundation and it must be carefully checked to see that the head shaft is square with the machined surface of the driver mounting flange on the discharge head.

15. If the head shaft is not square with the machined surface of the driver mounting flange on the discharge head, it is best to drive wedges under the bottom of the discharge head to correct this misalignment. The pump itself must hang freely in the well, without any cramping or bending. It is not essential that the unit be exactly level, but it must be free of any bending force whatever and straight within itself.

16. Before mounting the driver unit, remove the cover on the top of the driver unit and the driver clutch. Attach and lift the driver unit high enough to be carefully lowered over the head shaft and onto the driver mounting base on the discharge head. Extreme care must be taken in lowering the driver unit over this shaft. Be sure that the unit does not come in contact with the head shaft while being lowered to avoid bending the shaft. After the driver unit is seated on the driver mounting flange on the discharge head, attach it securely with the 4 bolts and nuts or cap screws supplied. Before placing the clutch on the driver unit, check to determine that the shaft is centered in the opening in the unit through which it passed. If corrections are necessary, adjust the wedges under the discharge head until the shaft is in alignment for the fitting of the clutch to the driver unit. Install the clutch, insert a gib key between the clutch and the head shaft. Assemble the head shaft adjusting nut on the shaft and run it down to the clutch.

17. Adjust the impeller location within the bowls as follows:

    a. Continue to rotate the nut, lifting the shaft, until the impellers are free from the bottom of the bowls. Make sure that the shaft will rotate free by hand. In very deep settings with large shaft, it may be necessary to use a wrench and light pressure to rotate the assembly. Continue raising the shaft until the impellers are locked against the top of the bowl. The shaft will no longer turn freely. Do not attempt to force the shaft up by putting undue pressure on the adjusting nut. The total movement from the position where the impellers are free from the bottom to the locked position at the top should equal the lateral measured and recorded when the bowl assembly was examined before installation. If it is less, check the top shaft for sufficient threads and keyway. If the pump is equipped with a water slinger, be sure the slinger is not pulled up against the driver. Back the adjusting nut off until the impellers are free from the top of the bowls and the shaft again turns freely.

    b. The above adjustment is normally all that is necessary, if the bowl has enclosed impellers.

    c. A well may take a relatively long period of time to reach it's pumping level. If the bowl has semi-open impellers, a valve and pressure gauge should be installed on the pump discharge to artificially add the anticipated drop in water level and above ground head. Start the pump and partically close the valve until the pressure gauge gives a reading equal to the above ground head, if any. Measure the pumping level and calculate the difference between the present pumping level and the normal or anticipated pumping level. (2.31 feet of head equals one pound of pressure.) Add this difference to the above ground head shown on the pressure gauge by additional closing of the valve. Measure the quantity of water pumped and the current drawn by the motor. Stop the pump and lower the impellers by backing off of the adjusting nut 1/4 turn. Restart the pump, readjust the valve, if necessary, and measure the water and current. A slight drop in current may be noted. Continue the adjustment until a minimum amount of current with maximum water flow is obtained. Any sharp increase in current during the closing of the valve indicates that the additional pressure (head) on the pump has caused the impellers to drag on the bowls. The pump should be stopped and the impellers raised until this condition no longer exists. The valve should be closed enough to simulate the maximum lift the pump will have to overcome. If there are valves in the discharge line that might accidentally be closed, you should check the impeller setting against shut off head. At no time during the closing of the valve to obtain these conditions should the current rise. If the current does rise, it indicates that the impellers are dragging and must be raised to prevent damage in the event maximum pumping lift is ever encountered. In closing a valve on the discharge of any pump, the maximum pressure obtainable should not exceed the safe working pressure of the discharge head.

    After the adjustment in the shaft has been made as referred to above, be sure that the adjusting nut is locked in place with the lock screws.

Starting and Maintenance

18. Before putting the pump into regular operation, be sure that the driver unit is properly lubricated. Follow the instructions supplied with each unit. If, after two or three minutes of running, the pump does not discharge water, check the water level in the well as the pump bowls must be submerged below the pumping water level. If the water capacity gradually diminishes after running a few minutes, then the draw down in the well is too great, or the well may be accumulating sand. Do not continue operation as it may damage the pump. Be sure that the well is in good condition and able to supply water to the pump before assuming the pump is at fault. Be sure the pump is operating at the proper RPM.

Initial Start Up

1. Ensure that all of the pump installation as described in preceding sections of this manual is complete.
2. Ensure that auxiliary equipment has been installed, serviced, and is ready for operation. Automatic control systems and driver rotation should be checked prior to making the driver-to-driveshaft connection. Automatic controls that do not function properly can cause serious damage to the pump.
3. Service the driver as recommended by the manufacturer.
4. Open the air release system isolation valve if provided. Adjust the air release system throttling device so that it is partially open. It should not be closed or fully open. Not exhausting the air or exhausting it too quickly can damage the pump.
5. On oil lubricated units, clean and fill the lubricator tank with non-detergent turbine oil or ice machine oil. Manually open the lubricator valve and allow oil to run into the tubeline for at least 20 minutes for each 100 feet of setting prior to start-up. Assure that the oil is in fact flowing into the tubing before timing is commenced and that the flow rate is at least as much as given in Table 1.

   On systems equipped with a solenoid operated lubricator valve that cannot be energized independently, it will be necessary to remove the valve stem to allow the oil to flow. Replace the valve stem before starting the pump. The

pump should be started shortly after allowing the oil to flow into the tubeline. If the start up is delayed, the lubrication procedure must be repeated just prior to the actual start up.

6. Ensure that the system to which the pump is connected is ready to receive flow from the pump. For most well pumps the position of the discharge valve at start up is not critical and the general practice is to start the pump with the valve in a partially open position. Special consideration must be given to the following conditions:

   a. If the pump is to discharge into a system that is already pressurized, ensure that the system pressure will not cause reverse flow through the pump during start-up. This can be accomplished by installing a check valve between the pump and the system, or by starting the pump with the discharge valve shut and then opening the valve after all of the air is exhausted and the pump is developing a discharge pressure equal to or greater than the system pressure. Also see paragraph c below.

   b. A pump is designed to run at specific head and flow conditions. Operating at conditions other than design can damage the pump.

      (1) Operating at low head and high flow conditions can cause the impellers on some pumps to "float". This can occur if a pump which is designed to operate at system pressure is used to fill the system without throttling the discharge valve to create head (back pressure) on the pump.

      (2) Operating some pumps at high head and low flow conditions will cause the pump shaft to stretch sufficiently to allow the impellers to drag on the bowl.

   c. The water hammer created when starting a shallow setting high pressure pump can damage the pump. Special consideration must be given to the rate of releasing the air from these pumps and to the operation of the discharge valve.

      If the pump is discharging into a pressurized system it may be necessary to install an automatically operated discharge valve that opens at approximately the same time that the pump develops a discharge head equal to that of the system.

7. On open line shaft units equipped with prelube systems supplied from a pressurized header, open the supply valve and allow the prelube water to flow for 15 seconds plus 15 seconds per 100' of pump setting. The prelube system should be left running until after the pump has been started (unless the discharge pressure of the pump will damage the prelube system).

   On open lineshaft units equipped with a tank type prelube system, clean the tank and fill it with clean water. Open the valve between the prelube tank and the pump and allow approximately half of the water in the tank to run into the well. The pump should be started immediately (per Step 8 below) and the prelube valve should remain open during the start up.

8. Upon completion of the above preparations, energize the starter. If any abnormal noises, jerking or vibration is noted, stop the pump immediately, determine the cause of the abnormalities and correct them.

9. After the pump has come up to speed, and all of the air has been exhausted, regulate the discharge valve to achieve the desired pressure.

10. If the air release valve is manually operated, close it.

11. On oil lubricated units adjust the lubricator valve for the flow given in Table 1 below.

TABLE 1 - RECOMMENDED OIL LUBRICATION FLOW

SHAFT SIZE	"A" BASIC SETTING IN DROPS/MIN.	"B" ADDITIONAL DROPS/MIN. PER EACH 100' SETTING
1 thru 1-1/4	5	2
1-1/2 thru 1-11/16	7	3
1-15/16 thru 2-7/16	10	4
2-11/16	12	5

$$\text{Total Drops/Min.} = \text{"A"} + \frac{(\text{Setting} \times \text{"B"})}{100}$$

Example: 500 Feet of 1-11/16" x 2-1/2" Total Drops/Min. $= 7 + \frac{500 \times 3}{100} = 22$

12. On open lineshaft pumps equipped with a stuffing box, adjust the stuffing box packing gland to allow a liberal amount of leakage past the packing. A small trickle is desirable.

    On units where the pressure at the stuffing box is very low, it may be necessary to plug the "R" port on the stuffing box in order to obtain leakage through the top rings of packing. On high pressure units where leakage through the gland is excessive, it may be necessary to move the grease cup to the R port and install a throttle valve in the "G" port. The pressure on the gland can then be regulated using the throttle valve. Do not reverse the ports if a reverse ported stuffing box was supplied by the factory.

During the first four or five hours of operation, periodically observe the leakage and feel of the gland. If necessary, loosen the gland to restore the leakage to the desired rate or to prevent the gland from overheating. The water leaking past the packing should not be allowed to become hot enough to steam. If the packing is allowed to overheat, it will score the shaft, requiring replacement of the packing and the shaft. After five or six hours of operation gradually tighten the gland (do not tighten the gland follower nuts more than 1/6 turn in ten minutes) to reduce the leakage. DO NOT COMPLETELY STOP THE LEAKAGE PAST THE PACKING and DO NOT ALLOW THE GLAND TO OVERHEAT. Check periodically to see that the gland is not leaking excessively and that it is not over-heating.

13. If the unit is equipped with a prelube water tank and a manual valve, close the valve to the tank after the tank has filled with water.

14. Assure that the driver and auxiliary equipment is operating satisfactorily by performing the checks recommended by the manufacturer.

15. Check all fittings and joints for leakage.

16. Check the pumping level of the well to assure that the pump bowl remains submerged when it is operating.

17. If no trouble is encountered the pump should be allowed to run until the water from the well is clear and free of all solids. Short ON-OFF cycles at initial startup or at startup on a pump which has been idle for an extended period can cause "sand-locking" of the pump if the pump is not allowed to run long enough to obtain clear water.

18. On open lineshaft pumps requiring post-lube, assure that post-lube is provided when the pump is stopped. (Post-lube is required on open lineshaft pumps which operate at a static water level of greater than 100 ft. and which are not equipped with a non-reverse mechanism).

19. After the pump is shut down for the first time, repeat the impeller adjustment procedure. This is necessary because some of the shaft joints may have tightened during initial start up, thus changing the initial adjustment.

Normal Operation and Routine Maintenance

1. Subsequent normal start ups are essentially the same as the initial start up described above, consisting of:

   a. Checking that the driver, the auxiliary equipment and the system into which the pump is discharging are ready for operation.

   b. Prelubing the pump as recommended.

   c. Pressing the "Start" button.

   d. Checking or adjusting system for desired flow.

   e. Check for proper oil drip rate or stuffing box leakage whichever is applicable.

   f. Initiate post-lube (if required) when the pump is shut down.

2. On oil lubrication units, periodically check the oil level in the lubricator tank. Refill the tank if it is less than ½ full.

3. On water lubricated units, periodically check the packing for overheating or excess flow. The amount of adjusting done on the packing gland should be held to a minimum.

   Apply grease to the stuffing box at the rate of one turn of the grease cup handle for each 24 hours of operation. Refill the grease cup as necessary, using standard water pump grease.

   Usually up to two additional rings of packing can be installed in the stuffing box to compensate for wear and compression of the packing. However, if difficulty is enountered in adjusting the packing gland after the packing ring has been added, then all of the packing should be removed and the stuffing box completely repacked.

   To repack the stuffing box, remove all the old packing, separator rings and lantern ring if furnished. The packing can be removed using packing hooks which are designed for this purpose. The separator rings and lantern ring can be removed by forming a small hook at the end of a piece of small stiff wire and inserting this hook into the holes provided in the lantern ring and separator rings. A mirror will be useful for looking into the stuffing box cavity since the amount of working space is minimal. Also, some soft wire or string can be used to tie the separator rings and lantern rings up out of the way. Clean the stuffing box cavity, inspect the shaft for scoring and install the new packing using the instructions given on the "Stuffing Box Assembly" sheet originally supplied with the pump. Adjust the packing gland per the instructions given in Section 12 under INITIAL START UP.

Troubleshooting

When properly installed and operating in non-abrasive, non-corrosive water a pump is a relatively long lived piece of machinery, requiring a minimum of attention. However, machinery is subject to wear. The most common causes of improper operation are given below. These include problems created by wear and other adverse conditions. Note that most of these problems require removal of the pump from the well in order to correct the problem.

1. Low capacity or low pressure

   a. Impeller clogged or loose on shaft
   b. Air or gas in water
   c. Driver speed slow
   d. Clogged suction
   e. Incorrect rotation
   f. Excessively worn impeller or bowl or both
   g. Insufficient submergence
   h. Improper impeller adjustment when semi-open impellers are used

2. Excessive Power Consumption

   a. Speed too high
   b. Improper lateral adjustment
   c. Bad driver thrust bearing
   d. Pump out of alignment
   e. Shafting bent
   f. Head coupling mis-aligned
   g. Pumping foreign matter

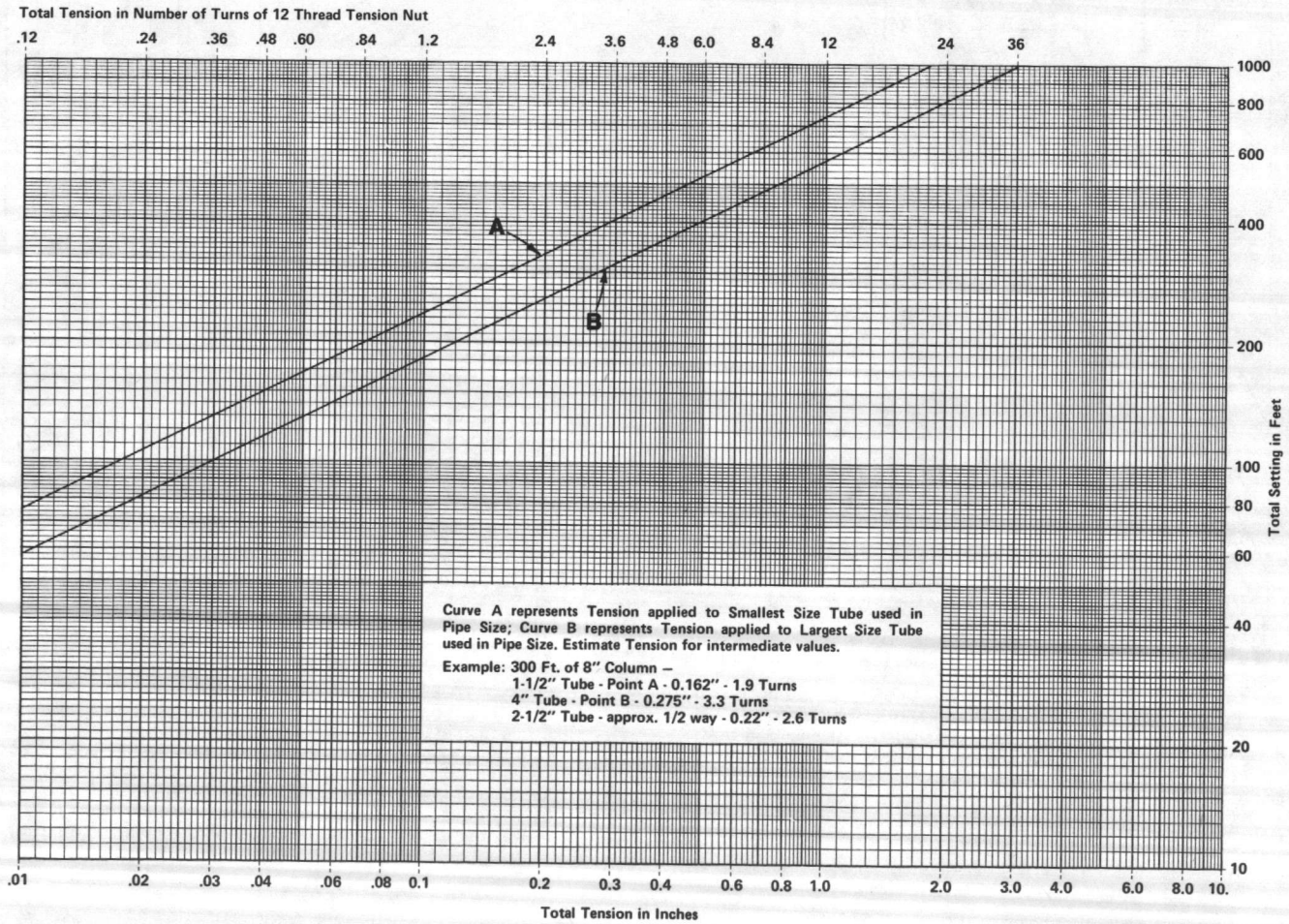
3. Vibration

   a. Bad driver thrust bearing
   b. Pump out of alignment
   c. Driver coupling mis-aligned or out of balance
   d. Shafting bent
   e. Bearings badly worn or broken
   f. Improper foundation

4. Water in Oil Tubing

   a. Discharge nozzle relief ports plugged
   b. Tubing joint leaking
   c. Shaft seals damaged
   d. Crack or hole in tubing or leaking at tension box "O" ring
   e. Excessively worn top intermediate and discharge nozzle bearings

TUBING TENSION



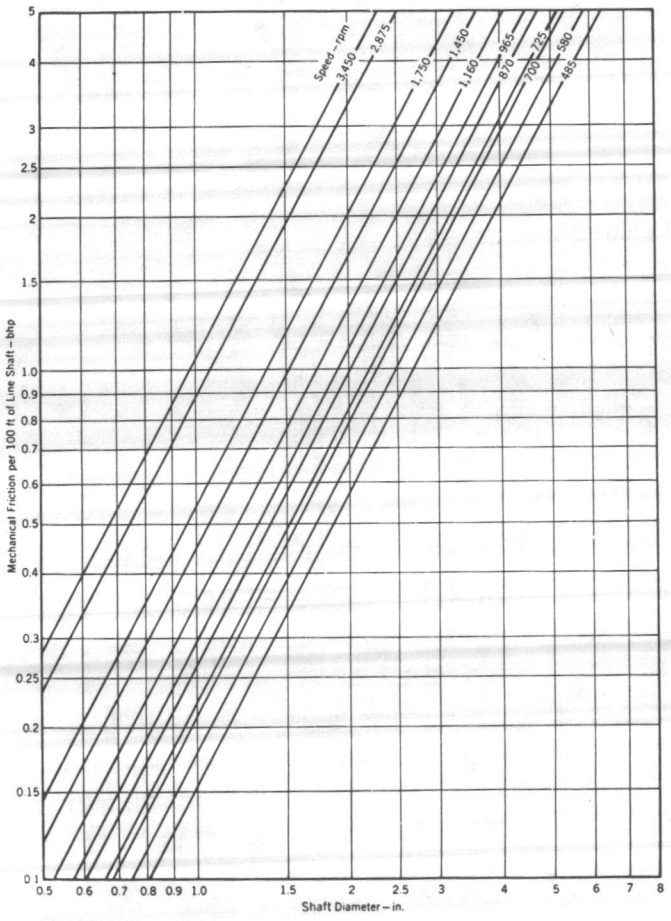
MECHANICAL FRICTION

(In Horsepower)
Required to drive 100 feet of Lineshaft

SHAFT RPM	SHAFT SIZE											
	¾"	1"	1 3/16"	1¼"	1 7/16"	1½"	1 11/16"	1 15/16"	2 3/16"	2 7/16"	2 11/16"	2 15/16"
3450	0.67	1.17	1.58	1.76	2.39	2.50	3.22	4.11	5.11	6.22	7.28	8.87
2900	0.57	0.98	1.37	1.44	2.11	2.14	2.67	3.56	4.33	5.22	6.22	7.28
1750	0.34	0.59	0.81	0.94	1.22	1.28	1.59	2.06	2.60	3.19	3.83	4.53
1450	0.28	0.49	0.68	0.72	1.00	1.07	1.31	1.72	2.18	2.67	3.19	3.77
1170	0.22	0.39	0.56	0.57	0.81	0.84	1.06	1.38	1.73	2.14	2.56	3.03
865	0.17	0.26	0.37	0.42	0.60	0.65	0.79	1.01	1.30	1.60	1.91	2.26

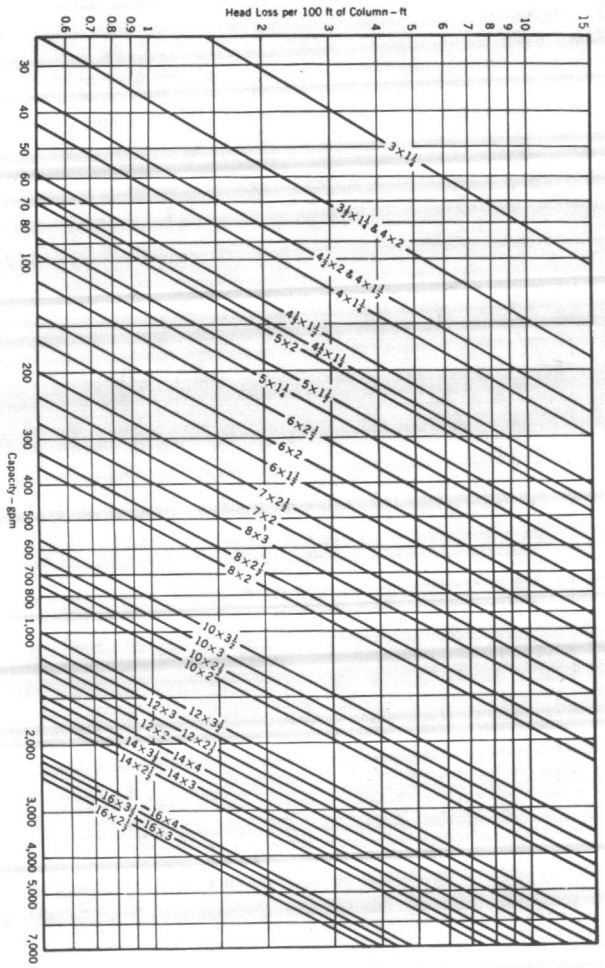
The above tabulation applies to Oil Lubricated pumps with Redwood Bearing type Inner Column with open drain ports and drip feed. If the pump is Oil Lubricated with Bronze Bearing type Inner Column with open ports and drip feed, or if the pump is Water Lubricated, the above friction loss values may be decreased by 10% (multiply by .90).

MECHANICAL FRICTION
(In Horsepower) Required to Drive 100 Feet of Line Shaft



The above chart applies to Oil Lubricated pumps with Bronze Bearing type Inner Column with open drain ports and drip feed or Water Lubricated type pumps. If enclosed shaft with flooded tube and closed drain ports is used, the values in the chart should be multiplied by 2.

COLUMN FRICTION LOSS
For Oil Lube and Water Lube Line Shaft Turbine Pumps



Sizes given are for nominal diameter outer pipe & shaft-enclosing tube. Calculations for outer column are based on inside diameters, which are close to the nominal size. For inner column the calculations are based on the outside diameters of schedule 40 or schedule 80 pipe. For open lineshaft (water lubricated) column assembly, the losses shown should be used by assuming the losses equal those for shaft-enclosing tube of a size that would normally enclose the open shaft in question.

COLUMN FRICTION LOSS

OIL LUBE & WATER LUBE TYPE For Lineshaft Turbine Pumps

(Loss at Head in feet per 100 feet of Column)

Column Assembly Size	GPM 20	25	30	40	50	60	80	100	125	150	175	200	225	250	275	300	325
2½" x ¾"	2.8	3.5	4.2	5.4	6.6	9.0											
3" x 1¼"	1.0	1.4	1.9	3.1	4.5	6.1	9.9										
3" x 1½"	1.3	1.8	2.5	4.1	5.9	8.0											
4" x 1¼"						0.9	1.5	2.2	3.3	4.5	5.9	7.4	9.1				
4" x 1½"						1.2	2.0	2.9	4.2	5.8	7.5	9.6					
4" x 2"						2.3	3.7	5.3	7.7								
5" x 1½"										1.3	1.8	2.2	2.7	3.3	3.9	4.5	5.3
5" x 2"										1.9	2.5	3.2	3.9	4.7	5.6	6.5	7.5
5" x 2½"										2.5	3.3	4.0	5.0	6.0	7.1	8.4	9.6
6" x 1½"															1.3	1.5	1.8
6" x 2"															1.7	2.0	2.3
6" x 2½"															2.5	2.9	3.3
6" x 3"															3.9	4.5	5.3

Column Assembly Size	GPM 350	375	400	450	500	550	600	650	700	750	800	900	1000	1100	1200	1300	1400
5" x 1½"	6.0	6.8	7.6	9.4													
5" x 2"	8.5	9.6															
5" x 2½"	10.3																
6" x 1½"	2.0	2.3	2.6	3.2	3.9	4.6	5.3	6.2	7.0	8.0	9.0						
6" x 2"	2.6	3.0	3.3	4.1	4.9	5.8	6.8	7.8	8.9	10.0							
6" x 2½"	3.8	4.3	4.7	5.8	7.0	8.3	9.6	9.9									
6" x 3"	6.0	6.8	7.6	9.4													
8" x 1½"	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.3	1.6	1.9	2.2	2.6	3.0	3.5
8" x 2"	0.3	0.3	0.5	0.7	0.9	1.1	1.3	1.5	1.7	1.9	2.2	2.7	3.2	3.9	4.5	5.2	6.0
8" x 2½"	0.3	0.5	0.7	0.9	1.1	1.3	1.5	1.8	2.0	2.3	2.6	3.3	3.9	4.7	5.5	6.3	7.2
8" x 3"	0.4	0.6	0.9	1.2	1.5	1.8	2.1	2.5	2.8	3.2	3.6	4.5	5.4	6.4	7.5	8.8	10.0
10" x 1½"										0.2	0.4	0.6	0.7	0.9	1.1	1.2	1.4
10" x 2"										0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6
10" x 2½"										0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8
10" x 3"										0.4	0.6	0.9	1.1	1.4	1.7	1.9	2.1
12" x 1½"												0.2	0.3	0.4	0.5	0.5	0.6
12" x 2"												0.3	0.3	0.4	0.5	0.5	0.6
12" x 2½"												0.3	0.4	0.5	0.5	0.6	0.7
12" x 3"												0.4	0.4	0.5	0.6	0.7	0.8
12" x 3½"												0.4	0.5	0.6	0.7	0.8	0.9
12" x 4"												0.5	0.6	0.7	0.8	0.9	1.0
12" x 5"												0.6	0.6	0.8	0.9	1.0	1.1

Column Assembly Size	GPM 1500	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	5000	6000	7000
8" x 1½"	3.9	4.5	5.5	6.7	7.9	9.4											
8" x 2"	6.8	7.6	9.4														
8" x 2½"	8.2	9.2															
8" x 3"	10.2																
10" x 1½"	1.6	1.8	2.2	2.7	3.2	3.8	4.3	5.0	5.7	6.4	7.1	7.9	8.7	9.6			
10" x 2"	1.8	2.0	2.5	3.0	3.6	4.2	4.9	5.6	6.4	7.2	8.0	8.9	9.8				
10" x 2½"	2.1	2.3	2.9	3.5	4.1	4.8	5.6	6.4	7.3	8.2	9.1						
10" x 3"	2.5	2.8	3.5	4.3	5.1	6.0	6.9	7.9	9.0	10.0							
12" x 1½"	0.6	0.7	0.8	1.1	1.2	1.5	1.7	2.0	2.2	2.5	2.8	3.1	3.5	4.0	6.0	8.5	
12" x 2"	0.7	0.8	1.0	1.2	1.4	1.7	1.9	2.2	2.5	2.8	3.2	3.5	3.9	4.2	6.7	9.2	
12" x 2½"	0.8	0.9	1.1	1.4	1.6	1.9	2.2	2.5	2.9	3.2	3.6	4.0	4.4	5.0	7.5		
12" x 3"	0.9	1.1	1.3	1.6	1.9	2.2	2.5	2.8	3.3	3.7	4.2	4.7	5.1	5.8	8.8		
12" x 3½"	1.1	1.2	1.5	1.8	2.1	2.5	2.9	3.3	3.8	4.3	4.8	5.3	5.9	6.7	10.0		
12" x 4"	1.3	1.4	1.7	2.0	2.3	3.0	3.2	4.0	4.2	4.7	5.3	5.8	6.5	7.4			
12" x 5"	1.4	1.6	1.9	2.2	2.6	3.3	3.6	4.5	4.7	5.2	5.9	6.4	7.2	8.2			
14" x 2"	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.4	3.5	5.0	6.4
14" x 2½"	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5	4.0	5.5	7.1
14" x 3"	0.5	0.5	0.7	0.8	1.0	1.1	1.3	1.5	1.7	1.9	2.1	2.4	2.6	2.8	4.2	6.1	8.0
14" x 3½"	0.5	0.6	0.7	0.9	1.1	1.2	1.4	1.6	1.9	2.1	2.4	2.6	2.9	3.2	4.9	7.0	9.1
14" x 4"	0.6	0.7	0.8	1.0	1.2	1.4	1.6	1.9	2.1	2.4	2.7	2.9	3.3	3.5	5.5	7.9	
14" x 5"	0.7	0.8	0.9	1.1	1.3	1.5	1.7	2.1	2.3	2.6	2.9	3.2	3.6	4.0	6.0	8.4	

Sizes given are for nominal diameter outer pipe and shaft-enclosing tube. Calculations for outer column are based on inside diameters, which are close to the nominal size. For inner column the calculations are based on the outside diameters of schedule 40 or schedule 80 pipe. For open lineshaft (water lubricated) column assembly, the losses shown should be used by assuming the losses equal those for shaft-enclosing tube of a size that would normally enclose the open shaft in question. Values shown for 2½" x ¾" are for open lineshaft, as it is not furnished in oil lube construction.

LINESHAFT HORSEPOWER RATING

For C1045 Lineshaft

Shaft Size	Shaft RPM	PUMP THRUST (In Pounds) 1000	2000	3000	5000	7500	10000	15000	20000	30000	Elongation in inches*	Shaft wt. per ft.
3/4"	3500	39.7	38.8	37.4	32.4						.09371	1.5
	2900	33.0	32.1	31.0	26.9							
	1760	20.0	19.5	18.8	16.3							
	1450	16.5	16.1	15.5	13.4							
	1160	13.2	12.9	12.4	10.7							
	860	9.8	9.5	9.2	8.0							
1"	3500	94.5	93.8	93.0	89.5	82.5					.05268	2.7
	2900	78.3	77.8	77.0	74.2	68.4						
	1760	47.5	47.2	46.7	45.0	41.5						
	1450	39.1	38.9	38.5	37.1	34.2						
	1160	31.3	31.1	30.8	29.7	27.3						
	860	23.2	23.1	22.9	22.0	20.3						
1 3/16"	3500	167.0	167.0	166.0	163.0	157.0	149.0				.03736	3.8
	2900	138.4	138.4	137.6	135.1	130.2	123.6					
	1760	84.0	84.0	83.5	82.0	79.0	75.0					
	1450	69.3	69.3	68.8	67.6	65.1	61.8					
	1160	55.4	55.4	55.0	54.1	52.1	49.4					
	860	41.0	41.0	40.7	40.0	38.6	36.6					
1 1/4"	3500	192.9	191.9	190.9	188.9	184.9	179.0				.03376	4.2
	2900	159.8	159.0	158.2	156.5	153.2	148.3					
	1760	97.0	96.5	96.0	95.0	93.0	90.0					
	1450	79.9	79.5	79.1	78.3	76.6	74.1					
	1160	63.9	63.6	63.3	62.6	61.3	59.3					
	860	47.4	47.2	46.9	46.4	45.4	44.0					
1 1/16"	3500			296.0	294.0	289.0	283.0	264.0			.02505	5.5
	2900			245.4	242.1	239.2	234.3	218.9				
	1760			149.0	146.0	145.0	142.0	133.0				
	1450			122.8	121.2	119.8	117.3	109.6				
	1160			98.3	97.6	96.0	94.0	87.6				
	860			72.7	72.3	71.0	69.5	64.8				
1 1/2"	3500			336.0	334.0	330.0	324.0	306.0			.02341	6.0
	2900			278.5	276.8	273.5	268.6	253.6				
	1760			169.0	168.0	166.0	163.0	154.0				
	1450			139.1	138.4	136.7	132.2	126.9				
	1160			111.2	110.7	109.2	107.2	101.4				
	860			82.6	82.1	81.1	79.6	75.2				
1 11/16"	1760			252.0	251.0	248.0	246.0	239.0	227.0		.01850	7.6
	1450			207.6	206.6	204.7	202.6	196.6	187.3			
	1160			166.0	165.0	164.0	162.0	157.0	150.0			
	860			123.0	122.0	121.0	120.0	117.0	111.0			
1 15/16"	1760				393.0	392.0	390.0	382.0	373.0	345.0	.01400	10.0
	1450				323.8	322.8	321.4	314.9	307.4	284.6		
	1160				259.0	258.0	257.0	252.0	246.0	228.0		
	860				192.0	192.0	191.0	187.0	182.0	169.0		
2 3/16"	1760				578.0	577.0	576.0	570.0	562.0	538.0	.01100	12.8
	1450				476.9	475.9	475.3	469.8	463.4	443.5		
	1160				382.0	381.0	380.0	376.0	371.0	355.0		
	860				283.0	282.0	281.0	279.0	275.0	263.0		
2 7/16"	1760					816.0	815.0	810.0	802.0	781.0	.00887	15.9
	1450					671.8	671.4	669.4	661.0	643.6		
	1160					537.0	537.0	533.0	529.0	515.0		
	860					398.0	398.0	395.0	392.0	381.0		
2 11/16"	1760						1070.0	1062.0	1055.0	1035.0	.00729	19.3
	1450						880.2	875.0	869.6	852.6		
	1160						703.0	700.0	696.0	682.0		
	860						520.0	518.0	515.0	505.0		
2 15/16"	1760							1500.0	1490.0	1475.0	.00610	23.1
	1450							1235.8	1227.6	1215.2		
	1160							988.6	982.0	972.2		
	860							733.0	728.1	720.7		

*per 100 ft. of shaft per 1000 lbs. of hydraulic thrust

Pump set at 60' with 5" column and 1" shaft
Head has 5" column with 6" discharge
Fairbanks Morse
Pump 2 stage - with 6" tail section

Static 9'
Depth - 135'

IMPELLER DATA

CURVE NO. 18165T J81

IMPELLER NO. 8M36 .TYPE OPEN .DIAMETER : A 6.062", B 5.796", C _____, D _____. SPECIFIC SPEED 2343

EFFICIENCY CORRECTION: ONE STAGE DEDUCT 4 %, TWO STAGE DEDUCT 2 %, THREE STAGE DEDUCT 1 %, FOUR STAGE DEDUCT 0

EFFECTIVE EYE AREA 9.17 sq. inches. NUMBER OF VANES 6 . THRUST CONSTANT K 5.6 lbs./ft. of head. WEIGHT 2 lbs.

WR2 .044 lbs. ft.2. EYE FLUID VELOCITY CK .035 ft./sec./GPM. PERIPHERAL VELOCITY 7.68 ft./sec./inch of impeller dia.

BOWL DATA

BOWL NO. 8B20 . CONNECTION TYPE BOLTED . NOMINAL DIAMETER (E) 7 13/16". MINIMUM DIAMETER (E) 7 11/16".

COLUMN PIPE SIZE 6 "STANDARD, 6 "MAXIMUM, 4 "MINIMUM. SUCTION PIPE SIZE 6 "STANDARD, 6 "MAXIMUM.

PUMP SHAFT DIAMETER 1 1/4 "STANDARD, 1 1/4 "MAXIMUM. LATERAL 5/8 "STANDARD, 5/8 "MAXIMUM

SHAFT BEARING CLEARANCE .010 . IMPELLER SKIRT CLEARANCE NA .

MAXIMUM HEAD 320 PSI (std. construction). MAXIMUM SPHERE SIZE 7/16

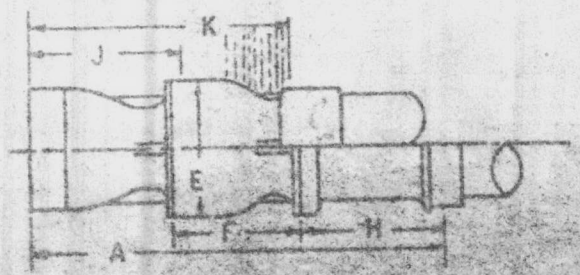
PROJECTIONS ABOVE COLUMN PIPE BUTT: TUBE 6"; SHAFT 14" - FOR EITHER OPEN OR ENCLOSED LINESHAFT.

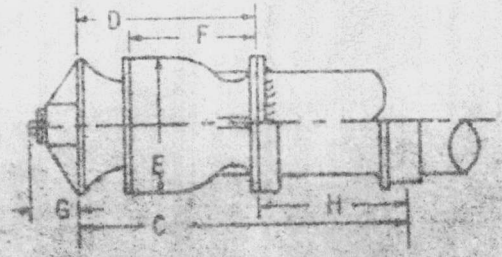
DIMENSIONS

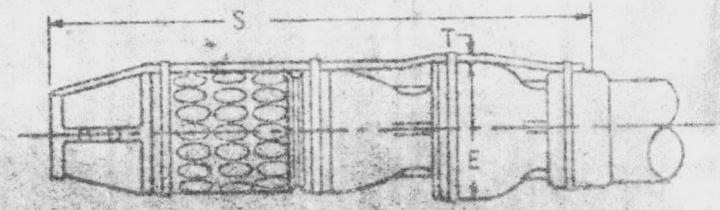
A-Length one stage assembly with discharge bowl.
B-Length one stage assembly less discharge bowl.
C-Length one stage assembly with discharge bowl and bell.
D-Length one stage assembly less discharge bowl with bell.
E-Bowl Diameter.
F-Length of additional stage.
G-Hub projection on bell suction.
H-Length of discharge bowl.
J-Length of impeller eye above bottom of bowl.
*K-Minimum required submergence.
R-Length submersible suction inlet.
S-Length one stage submersible assembly.
T-Height of cable guard.

DIMENSION	A	B	C	D	E	F	G	H	J	*K	R	S	T
INCHES	22 1/2		18 7/8	11 1/16	7 13/16	5 11/16	3 1/4	7 13/16	9 1/2	16 1/2		38 11/16	5/8

*This dimension to be used in conjunction with NPSH required. Pump installation and system must satisfy both values.

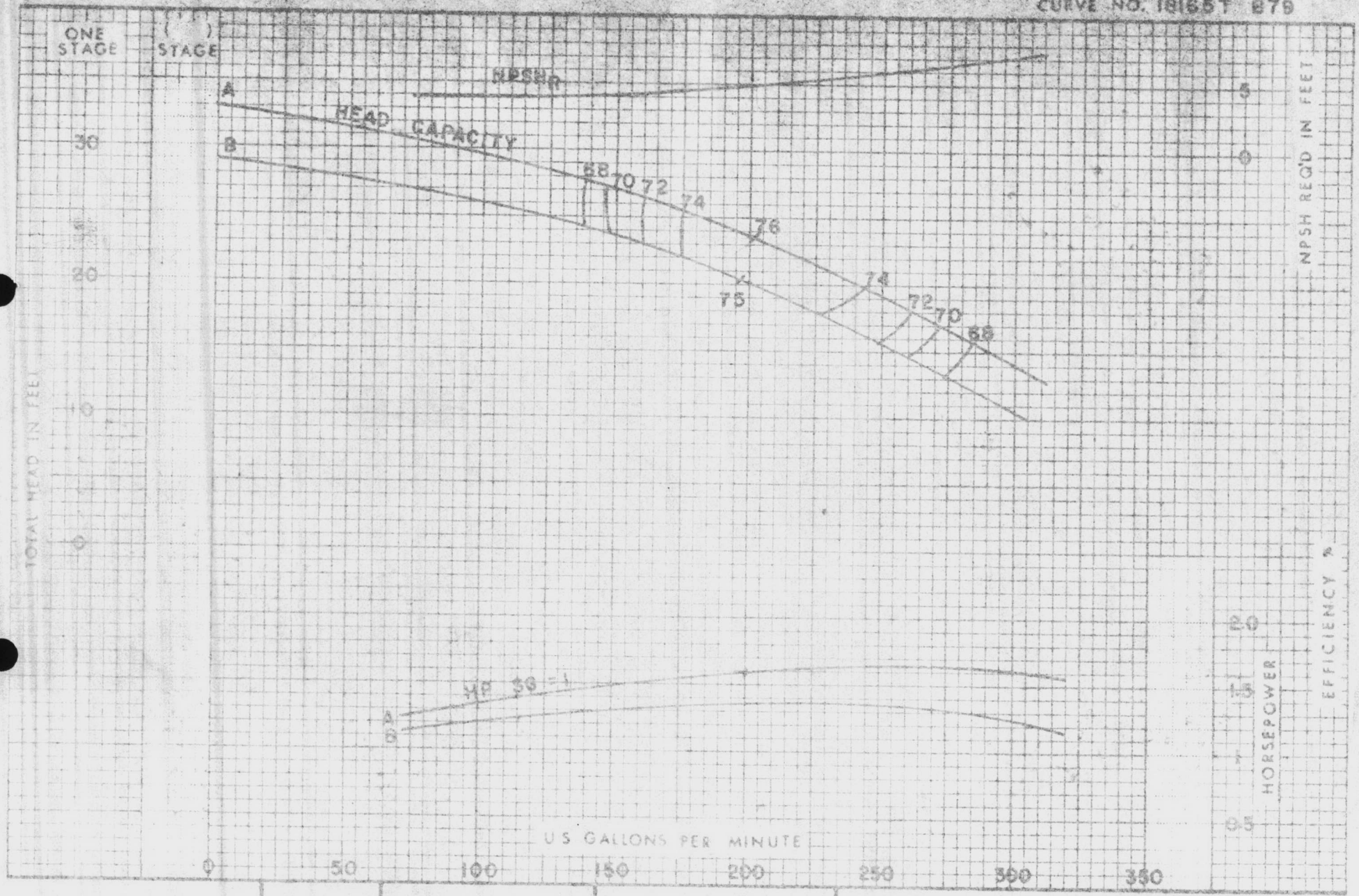






S-29-A

CURVE NO. 18165T B79



VALLEY/AERMOTOR
A DIVISION OF VALLEY INDUSTRIES, INC.
CONWAY, ARKANSAS

8"

8 MMO
ENAMELED

1760 RPM

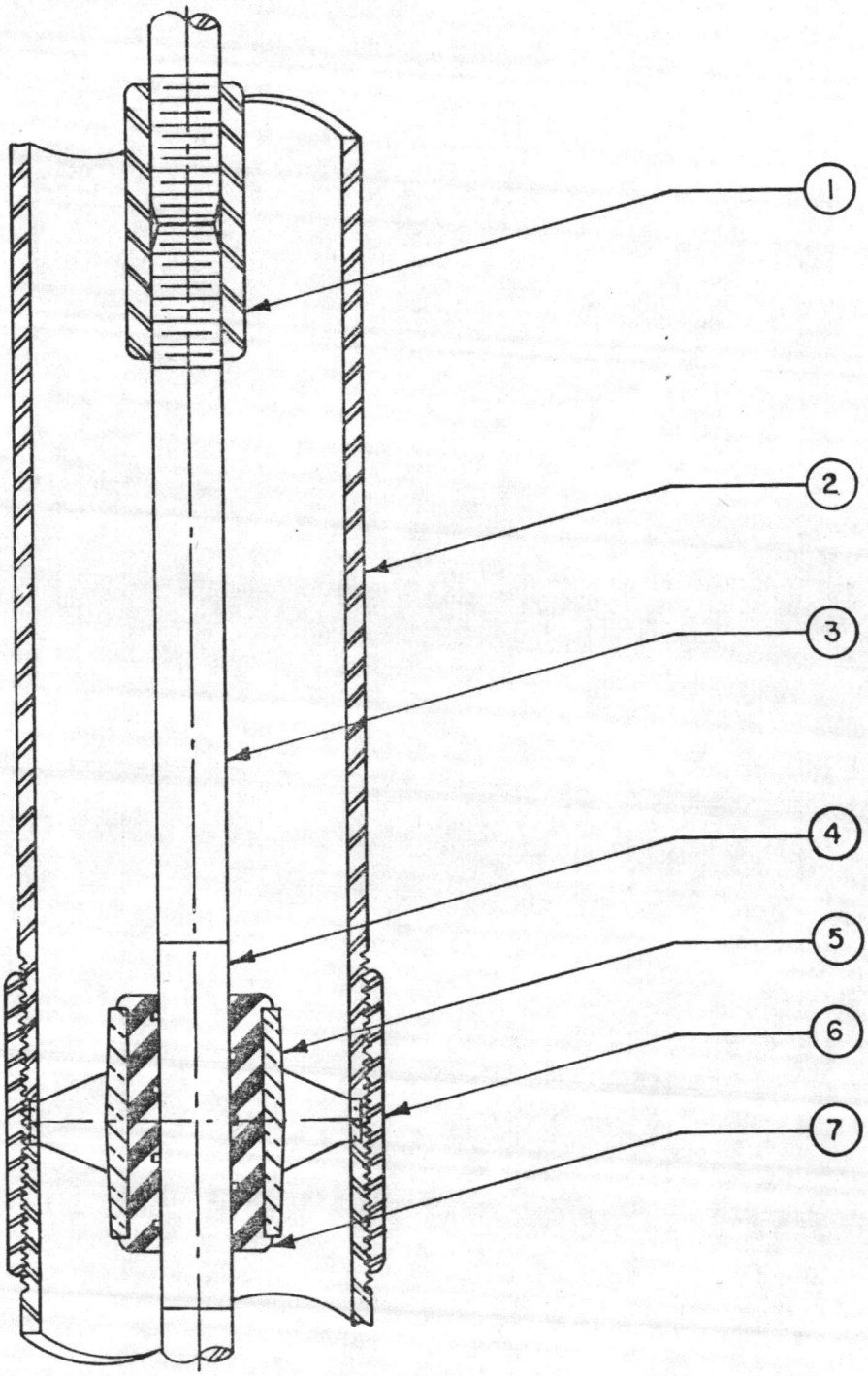
SEE REVERSE SIDE FOR DETAILED INFORMATION





COLUMN ASSEMBLY
OPEN LINE SHAFT

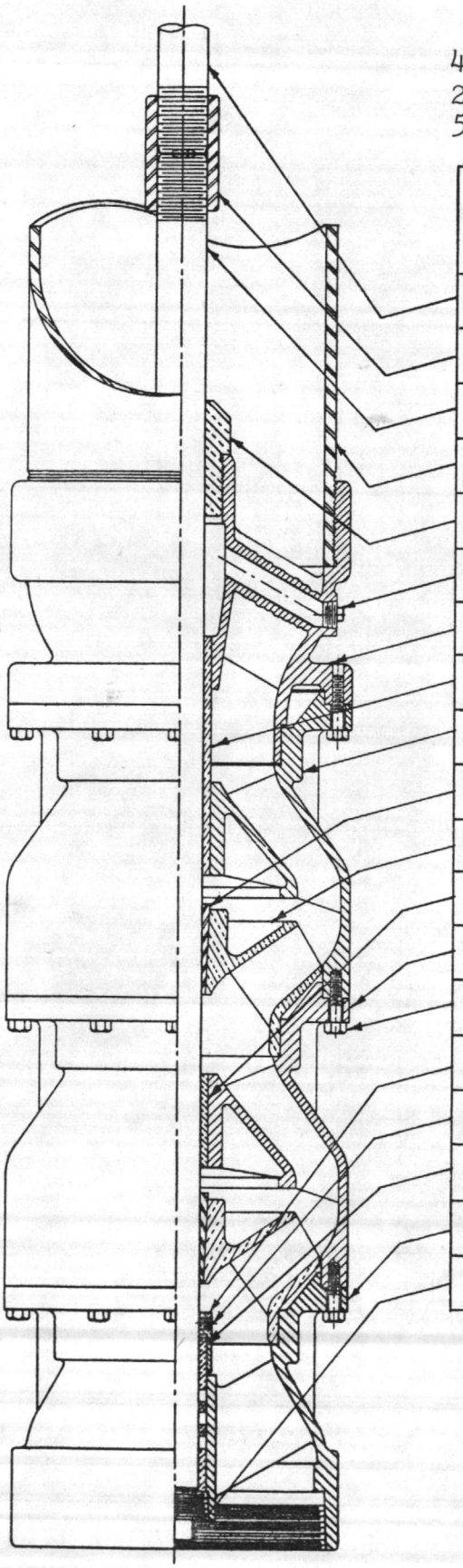
PEARSON PUMP SALES & SERVICE
P. O. Box 1254
Goldsboro, N. C. 27530



ITEM NO.	MATERIAL		DESCRIPTION
	STANDARD	SPECIAL	
1	STEEL		LINE SHAFT COUPLING
2	STEEL		COLUMN PIPE
3	STEEL		LINE SHAFT
4	CR. PLATING		JOURNAL - LINE SHAFT
5	BRONZE		BEARING RETAINER
6	STEEL		COLUMN COUPLING
7	SYN. RUBBER		BEARING INSERT

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NUMBER.

PUMP BOWL ASSEMBLY
OPEN LINE SHAFT



4 stage 8 MMO Bowl Assembly
200 GPM @ 75' TDH
5" Discharge

ITEM NO.	DESCRIPTION	MATERIAL	
		STANDARD	SPECIAL
1	LINE SHAFT	STEEL	
2	SHAFT COUPLING	STEEL	
3	IMPELLER SHAFT	STN. STEEL	
4	COLUMN PIPE	STEEL	
5	DISCHARGE CASE CAP	BRONZE	
6	PLUG	IRON	
7	DISCHARGE CASE	CAST IRON	
8	BEARING – DISCHARGE CASE	BRONZE	
9	TOP BOWL	CAST IRON	
10	IMPELLER LOCK COLLET	STEEL	
11	IMPELLER – ENCLOSED TYPE	BRONZE	
12	BEARING – INTERMEDIATE	BRONZE	
13	INTERMEDIATE BOWL	CAST IRON	
14	CAP SCREW	STEEL	
15	BEARING CAP – SUCTION CASE	BRONZE	
16	SET SCREW – SAND COLLAR	STEEL	
17	BEARING – SUCTION CASE	BRONZE	
18	SUCTION CASE	CAST IRON	
19	PLUG	IRON	

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION AND PUMP SERIAL NUMBER

NOTE:
FOUR INCH AND SIX INCH BOWLS WITH SEMI-OPEN IMPELLERS ARE SUPPLIED WITH SYNTHETIC RUBBER BEARINGS

PEARSON PUMP SALES & SERVICE
P. O. Box 1254
Goldsboro, N. C. 27530

LABOR 80 HRS EACH
CRANE 8 HRS EACH

Well TC-1000 1/23/79

✓ 1. PUMP, VERTICAL TURBINE DEEP WELL, SINGLE DRIVE, COMPLETE WITH 10 x 6 TYPE A DISCHARGE HEAD AND ELECTRIC MOTOR WITH NON-REVERSE
COLUMN SIZE 5" x 60', THREADED,
SUCTION PIPE 5" x 10'
STRAINER, CONE TYPE GALVANIZE
GPM 200
TDH 65'
RPM 1750
VOLTS 208
PH. 3
Cost $3691.00

DOC. IDENT. | ROUT IDENT. | M & S | FSC / STOCK NUMBER (NIIN) | ADD | UNIT OF ISSUE | QUANTITY | SIG | DOCUMENT NUMBER: REQUISITIONER / DATE / SERIAL | I & | SUPPLEMENTARY ADDRESS | S H | FUND | DISTRIBUTION | PROJECT | PRIORITY | REQ. DEL. DATE | ADV. STAT

SEND TO:

A

REQUISITION IS FROM:

B

C	EDITING DATA: DOC. IDENT. (1 2 3)	D	EDITING DATA: RI -- TO (4 5 6)	E	SUF (44)	F	DOC. IDENT. (1 2 3)	ROUTING IDENTIFIER (4 5 6)	M & S (7)	STOCK NUMBER: FSC (8 9 10 11)	NIIN (12 13 14 15 16 17 18 19 20)	ADDIT (21 22)	UNIT OF ISSUE (23 24)	QUANTITY (25 26 27 28 29)

DOCUMENT NUMBER: SERV (30)	REQUISITIONER (31 32)	DATE (33 34 35)	SERIAL (36 37 38 39 40)	DEMAND (41 42 43)	DEM AND (44)	SUPPLEMENTARY ADDRESS: SERV (45)	(46 47 48 49 50)	SIG H (51)

FUND (52 53)	DISTRIBUTION (54 55 56)	PROJECT (57 58 59)	PRIORITY (60 61)	REQ. DEL. DATE (62 63 64)	STATUS DATA: DOC. IDENT. (1 2 3)	SUFF. (44)	EST. AVAIL DATE (62 63 64)	STATUS (65 66)

G H I J

REMARKS

L M N O

P Q R S

ADVICE (65 66)	(67 68 69 70 71 72 73 74 75 76 77 78 79 80)	RI — TO (67 68 69)

K

DOLLARS	CENTS	UNIT PRICE

T

DOLLARS	CENTS	TOTAL PRICE

U V

DOC. IDENT. (1 2 3)	ROUTING IDENT. (4 5 6)	M & S (7)	STOCK NUMBER: FSC (8 9 10 11)	NIIN (12 13 14 15 16 17 18 19 20)	ADD (21 22)	UNIT OF ISSUE (23 24)	QUANTITY (25 26 27 28 29)	DOCUMENT NUMBER: SERV (30)	REQUISITIONER (31 32)	DATE (33 34 35)	SERIAL (36 37 38 39 40)	I & (41)	SERV (42 43 44)	SUPPLEMENTARY ADDRESS (45 46 47 48 49 50)	SIG TNT (51)	FUND (52 53)	DISTRIBUTION (54 55 56)	PROJECT (57 58 59)	PRIORITY (60 61)	REQ. DEL. DATE (62 63 64)	ADV. STAT (65 66)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

DD FORM 1348 (6-PT) 1 MAR 74

DOD SINGLE LINE ITEM REQUISITION SYSTEM DOCUMENT (MANUAL)

EDITION OF 1 AUG. 61 MAY BE USED UNTIL EXHAUSTED

CHECKED BOX APPLIES: [X] ORDER FOR SUPPLIES OR SERVICES

[ ] REQUEST FOR QUOTATIONS NO. — RETURN COPY(ES) OF THIS QUOTE BY

(THIS IS NOT AN ORDER. See DD Form 1155c)

PAGE 1 OF 2

5. CERTIFIED FOR NATIONAL DEFENSE UNDER DMS REG 1 DO

1. CONTRACT/PURCH ORDER NO.	2. DELIVERY ORDER NO.	3. DATE OF ORDER	4. REQUISITION/PURCH REQUEST NO.
M67001-79-M-4578		79 MAR 16	SEE SCHEDULE

6. ISSUED BY: CODE M67001
J.A. HARRIS/919-451-5065/ey
Purchasing & Contracting Office
P. O. Box 8368
Camp Lejeune, N.C. 28542

7. ADMINISTERED BY (If other than 6) CODE
6
6-26-79
6-8-79 PENDING

8. DELIVERY FOB
[X] DESTINATION
[ ] OTHER (See Schedule if other)

9. CONTRACTOR/OFFEROR CODE FACILITY CODE

NAME AND ADDRESS
ENVIRONMENTAL PRODUCTS, INCORPORATED
P.O. Box 2385
Hickory, North Carolina 28601

2186

10. DELIVER TO FOB POINT BY:
JULY 6
79 MAY 15

11. CHECK IF SMALL BUSINESS MBE [X]

12. DISCOUNT TERMS
NET - 10 days

13. MAIL INVOICES TO: (In sextuplicate)
SAME AS BLOCK 14

14. SHIP TO: CODE
Freight Traffic Branch
Bldg 1011, Camp Lejeune, N. Carolina 28542
79-M-4578

15. PAYMENT WILL BE MADE BY CODE M67001
Base Disbursing Officer
MCB, Camp Lejeune, North Carolina 28542

MARK ALL PACKAGES AND PAPERS WITH CONTRACT OR ORDER NUMBER

16. TYPE OF ORDER
DELIVERY [ ] This delivery order is subject to instructions contained on this side of form only and is issued on another Government agency or in accordance with and subject to terms and conditions of above numbered contract.
PURCHASE [X] Reference your TELEQUOTE, 79 MAR 16, furnish the following on terms specified herein, including, for U. S. purchases, General Provisions of Purchase Order on DD Form 1155r (Except CLAUSE NO. 13 APPLIES ONLY IF THIS BOX [ ] IS CHECKED, and NO. 15 IF THIS BOX [ ] IS CHECKED); special provisions and delivery as indicated. This purchase is negotiated under authority of 10 USC 2304(a)(3) or as specified in the schedule if within the U. S., its possessions or Puerto Rico, if otherwise, under 2304(a)(6).

[ ] If checked, Additional General Provisions apply; Supplier shall sign "Acceptance" on DD Form 1155r and return ___ copies.

17. ACCOUNTING AND APPROPRIATION DATA - ACCOUNTING CLASSIFICATION (REV. 7-65)

ITEM NO.	APPROPRIATION SYMBOL AND SUBHEAD	OBJECT CLASS	BUREAU CONT. NO.	SUB-ALLOT.	AUTH'N ACCT'G ACTY	TRANS. TYPE	PROPERTY ACCT'G ACTY	COUNTRY	COST CODE	AMOUNT
ALL	1791106.2720	000	67001	0	067001	2D	000000		92337652383T	$ 5,921.00

18. ITEM NO.	19. SCHEDULE OF SUPPLIES/SERVICES	20. QUANTITY ORDERED/ ACCEPTED*	21. UNIT	22. UNIT PRICE	23. AMOUNT
TC 1000	PRIORITY 14				
1	MML999 (ALL) 200 GPM @ 65'TDH M93058-9043-W010 4320-00-C99-1922, Pump, Fairbanks Morse two-stage, size 8M, Figure 7000, vertical turbine bowl assembly, for the above design conditions, water-lubricated, standard fitted with bronze impellers and enemeled cast iron bowls, for 5" column and 1" shafting, with 6" threaded suction, and including the following: A. 12"x6" type "D" surface discharge head, for	1	EA	$2909.00	2,909.00

* If quantity accepted by the Government is same as quantity ordered, indicate by ✓ mark. If different, enter actual quantity accepted below quantity ordered and encircle.

24. UNITED STATES OF AMERICA
BY: W.A. TWEED CONTRACTING/ORDERING OFFICER

25. TOTAL 5,921.00
26. DIFFERENCES

27. QUANTITY IN COLUMN 20 HAS BEEN:
[ ] RECEIVED [ ] INSPECTED [ ] ACCEPTED, AND CONFORMS TO THE CONTRACT EXCEPT AS NOTED
Date (Signature of authorized Government representative)

28. I CERTIFY that this account is correct and proper for payment
T.R. DEDMOND, FISCAL ACCTG. SUPV.
(Signature and title of Certifying Officer)

27. SHIP. NO. 28. D.O. VOUCHER NO. 29. INITIALS
[ ] PARTIAL [ ] FINAL
30. PAID BY
67001-
SYM #.5190
MCB CLNC
31. PAYMENT [ ] COMPLETE [ ] PARTIAL [ ] FINAL
32. AMOUNT VERIFIED CORRECT FOR
33. CHECK NUMBER
34. BILL OF LADING NO.

35. RECEIVED AT 36. RECEIVED BY 37. DATE RECEIVED 38. TOTAL CONTAINERS 39. S/R ACCOUNT NUMBER 40. S/R VOUCHER NO.

DD FORM 1 AUG 66 1155 (NAVY) (Overprint 1/70)

Form Approved by Comptroller General, U. S., 27 May 66
Exception to SF 18 under $2,500 Approved by Budget Bureau Oct 66

THIS PARAGRAPH APPLIES ONLY TO QUOTATIONS SUBMITTED:

Supplies are of domestic origin unless otherwise indicated by quoter. The Government reserves the right to consider quotations or modifications thereof received after the date indicated should such action be in the interest of the Government. This is a request for information and quotations furnished are not offers. When quoting, complete blocks 11, 12, 22, 23, 25. If you are unable to quote, please advise. This request does not commit the Government to pay any cost incurred in preparation or the submission of this quotation or to procure or contract for supplies or services.

GENERAL PROVISIONS

1. INSPECTION AND ACCEPTANCE—Inspection and acceptance will be at destination, unless otherwise provided. Until delivery and acceptance, and after any rejections, risk of loss will be on the Contractor unless loss results from negligence of the United States Government. Notwithstanding the requirements for any Government inspection and test contained in specifications applicable to this contract, except where specialized inspections or tests are specified for performance solely by the Government, the Contractor shall perform or have performed the inspections and tests required to substantiate that the supplies and services provided under the contract conform to the drawings, specifications and contract requirements listed herein, including if applicable the technical requirements for the manufacturers' part numbers specified herein.

2. VARIATION IN QUANTITY—No variation in the quantity of any item called for by this contract will be accepted unless such variation has been caused by conditions of loading, shipping, or packing, or allowances in manufacturing processes, and then only to the extent, if any, specified elsewhere in this contract.

3. PAYMENTS—Invoices shall be submitted in quadruplicate *(one copy shall be marked "Original")* unless otherwise specified, and shall contain the following information: Contract or Order number, Item number, contract description of supplies or services, sizes, quantities, unit prices and extended totals. Bill of lading number and weight of shipment will be shown for shipments on Government Bills of Lading. Unless otherwise specified, payment will be made on partial deliveries accepted by the Government when the amount due on such deliveries so warrants.

4. DISCOUNTS—In connection with any discount offered, time will be computed from date of delivery of the supplies to carrier when acceptance is at the point of origin, or from date of delivery at destination or port of embarkation when delivery and acceptance are at either of these points, or from the date the correct invoice or voucher is received in the office specified by the Government, if the latter is later than date of delivery. Payment is deemed to be made for the purpose of earning the discount on the date of mailing of the Government check.

5. DISPUTES—(a) Except as otherwise provided in this contract, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Contracting Officer, who shall mail or otherwise furnish a copy thereof to the Contractor. This decision shall be final and conclusive unless, within 30 days from the date of receipt of such copy, the Contractor mails or otherwise furnishes to the Contracting Officer a written appeal addressed to the Secretary. The decision of the Secretary or his duly authorized representative for the determination of such appeals shall be final and conclusive unless determined by a court of competent jurisdiction to have been fraudulent, or capricious, or arbitrary, or so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence. The Contractor shall be afforded an opportunity to be heard and to offer evidence in support of his appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the contract and in accordance with the Contracting Officer's decision. (b) This "Disputes" clause does not preclude consideration of law questions in connection with decisions provided for in (a) above, provided, that nothing in this contract shall be construed as making final the decision of any administrative official, representative, or board on a quesiton of law.

6. FOREIGN SUPPLIES—This contract is subject to the Buy American Act *(41 U.S.C. 10a-d)* as implemented by Executive Order 10582 of December 17, 1954, and any restrictions in appropriation acts on the procurement of foreign supplies.

7. CONVICT LABOR—The Contractor agrees not to employ for work under this contract any person undergoing sentence of imprisonment at hard labor.

8. OFFICIALS NOT TO BENEFIT – No member of or Delegate to Congress or resident commissioner, shall be admitted to any share or part of this contract, or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

9. CONVENANT AGAINST CONTINGENT FEES – The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bonafide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty the Government shall have the right to annul this contract without liability or in its discretion to deduct from the contract price or consideration or otherwise recover, the full amount of such commission, percentage, brokerage or contingent fee.

10. GRATUITIES – (a) The Government may, by written notice to the Contractor, terminate the right of the Contractor to proceed under this contract if it is found after notice and hearing, by the Secretary or his duly authorized representative, that gratuities *(in the form of entertainment, gifts or otherwise)* were offered or given by the Contractor, or any agent or representative of the Contractor, to any officer or employee of the Government with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending, or the making of any determinations with respect to the performing of such contract, provided, that the existence of the facts upon which the Secretary or his duly authorized representative make such findings shall be in issue and may be reviewed in any competent court. (b) In the event this contract is terminated as provided in paragraph (a) hereof the Government shall be entitled (i) to pursue the same remedies against the Contractor as it could pursue in the event of a breach of the contract by the Contractor and (ii) as a penalty in addition to any other damages to which it may be entitled by law to exemplary damages in an amount *(as determined by the Secretary or his duly authorized representative)* which shall be not less than three nor more than ten times the costs incurred by the Contractor in providing any such gratuities to any such officer or employee. (c) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

11. RENEGOTIATION – This contract, and any subcontract hereunder, is subject to the Renegotiation Act of 1951, as amended *(50 U.S.C. App. 1211 et seq.)* and shall be deemed to contain all the provisions required by Section 104 thereof, and is subject to any subsequent act of Congress providing for the renegotiation of contracts.

12. CONDITION FOR ASSIGNMENT – This Purchase Order may not be assigned pursuant to the Assignment of Claims Act of 1940, as amended *(31 U.S.C. 203, 41 U.S.C. 15)*, unless or until the supplier has been requested and has accepted this order by executing the Acceptance hereon.

13. COMMERCIAL WARRANTY – The Contractor agrees that the supplies or services furnished under this contract shall be covered by the most favorable commercial warranties the Contractor gives to any customer for such supplies or services and that the rights and remedies provided herein are in addition to and do not limit any rights afforded to the Government by any other clause of this contract.

14. PRIORITIES, ALLOCATIONS AND ALLOTMENTS DEFENSE MATERIALS SYSTEM – When the amount of the order is $500 or more the Contractor shall follow the provisions of DMS Reg. 1 and all other applicable regulations and orders of the Business and Defense Services Administration in obtaining controlled materials and other products and materials needed to fill this order.

15. FAST PAYMENT PROCEDURE –

(a) General. This is a fast payment order. Invoices will be paid on the basis of the Contractor's delivery to a post office, common carrier, or, in shipment by other means, to the point of first receipt by the Government.

(b) Responsibility for Supplies. Title to the supplies shall vest in the Government upon delivery to a post office or common carrier for shipment to the specified destination. If shipment is by means other than post office or common carrier, title to the supplies shall vest in the Government upon delivery to the point of first receipt by the Government. Notwithstanding any other provision of the purchase order, the Contractor shall assume all responsibility and risk of loss for supplies (i) not received at destination, (ii) damaged in transit, or (iii) not conforming to purchase requirements. The Contractor shall either replace, repair, or correct such supplies promptly at his expense, *provided* instructions to do so are furnished by the Contracting Officer within ninety (90) days from the date title to the supplies vests in the Government.

(c) Preparation of Invoice.

(1) Upon delivery of supplies to a post office, common carrier, or in shipments by other means, the point of first receipt by the Government, the Contractor shall prepare an invoice in accordance with Clause 3 of the General Provisions of Purchase Order, except that invoices under a blanket purchase agreement shall be prepared in accordance with the provisions of the agreement. In shipments by either post office or common carrier, the Contractor shall either (A) cite on this invoice the date of shipment, name and address of carrier, bill of lading number or other shipment document number, or (B) attach copies of such documents to his invoice as evidence of shipment. In addition the invoice shall be prominently marked "Fast Pay." In case of delivery by other than post office or common carrier, a receipted copy of the Contractor's delivery document shall be attached to the invoice as evidence of delivery.

(2) If the purchase price excludes the cost of transportation, the Contractor shall enter the prepaid shipping cost on the invoice as a separate item. The cost of parcel post insurance will not be paid by the Government. If transportation charges are separately stated on the invoice, the Contractor agrees to retain related paid freight bills or other transportation billings paid separately for a period of three years and to furnish such bills to the Government when requested for audit purposes.

(3) In the event this order requires the preparation of a Material Inspection and Receiving Report (DD Form 250), the contractor has the option of either preparing the DD Form 250 or including the following information on the invoice, in addition to that required in (c)(1) above: (A) a statement in prominent letters "NO DD 250 PREPARED"; (B) shipment number; (C) mode of shipment; and (D) at line item level, (i) National Stock Number and/or Manufacturer's part number, (ii) unit of measure, (iii) Ship-To-Point, (iv) Mark-For-Point if in contract, and (v) MILSTRIP document number if in contract.

(d) Certification of Invoice. The Contractor agrees that the submission of an invoice to the Government for payment is a certification that the supplies for which the Government is being billed have been shipped or delivered in accordance with shipping instructions issued by the ordering officer, in the quantities shown on the invoice, and that such supplies are in the quantity and of the quality designated by the cited purchase order.

OUTER SHIPPING CONTAINERS SHALL BE MARKED "FAST PAY"

16. *(This clause applies if this contract is for services and is not exempted by applicable regulations of the Department of Labor.)*

SERVICE CONTRACT ACT OF 1965 – Except to the extent that an exemption, variation, or tolerance would apply pursuant to 29 CFR 4.6 if this were a contract in excess of $2,500, the Contractor and any subcontractor hereunder shall pay all of his employees engaged in performing work on the contract not less than the minimum wage specified under section 6(a)(1) of the Fair Labor Standards Act of 1938, as amended ($1.60 per hour). However, in cases where section 6(e)(2) of the Fair Labor Standards Act of 1938 is applicable, the rates specified therein will apply. All regulations and interpretations of the Service Contract Act of 1965 expressed in 29 CFR Part 4 are hereby incorporated by reference in this contract.

ADDITIONAL GENERAL PROVISIONS

17. CHANGES – The Contracting Officer may at any time, by a written order, and without notice to the sureties, make changes, within the general scope of this contract, in (i) drawings, designs, or specifications, where the supplies to be furnished are to be specially manufactured for the Government in accordance therewith; (ii) method of shipment or packing; and (iii) place of delivery. If any such change causes an increase or decrease in the cost of, or the time required for performance of this contract, whether changed or not changed by any such order, an equitable adjustment shall be made by written modification of this contract. Any claim by the Contractor for adjustment under this clause must be asserted within 30 days from the date of receipt by the Contractor of the notification of change provided that the Contracting Officer, if he decides that the facts justify such action, may receive and act upon any such claim if asserted prior to final payment, under this contract. Failure to agree to any adjustment shall be a dispute concerning a question of fact within the meaning of the clause of this contract entitled "Disputes." However, nothing in this clause shall excuse the Contractor from proceeding with the contract as changed.

18. TERMINATION FOR DEFAULT – The Contracting Officer, by written notice, may terminate this contract, in whole or in part, for failure of the Contractor to perform any of the provisions hereof. In such event, the Contractor shall be liable for damages, including the excess cost of reprocuring similar supplies or services; provided that, if (i) it is determined for any reason that the Contractor was not in default or (ii) the Contractor's failure to perform is without his and his subcontractor's control, fault or negligence, the termination shall be deemed to be a termination for convenience under paragraph 19. As used in this provision the term "subcontractor', and "subcontractors" means subcontractors at any tier.

19. TERMINATION FOR CONVENIENCE – The Contracting Officer, by written notice, may terminate this contract, in whole or in part, when it is in the best interest of the Government. If this contract is for supplies and is so terminated, the Contractor shall be compensated in accordance with Section VIII of the Armed Services Procurement Regulation, in effect on this contract's date. To the extent that this contract is for services and is so terminated, the Government shall be liable only for payment in accordance with the payment provisions of this contract for services rendered prior to the effective date of termination.

20. ASSIGNMENT OF CLAIMS – Claims for monies due or to become due under this contract shall be assigned only pursuant to the Assignment of Claims Act of 1940, as amended *(31 U.S.C. 203, 41 U.S.C. 15)*. However, payments to an assignee of monies under this contract shall not, to the extent provided in said Act, as amended, be subject to reduction or set-off. *(See Clause 12.)*.

ACCEPTANCE

The Contractor hereby accepts the offer represented by the numbered purchase order as it may previously have been or is now modified, subject to all of the terms and conditions set forth, and agrees to perform the same.

NAME OF CONTRACTOR	SIGNATURE	TYPED NAME AND TITLE	DATE SIGNED

STANDARD FORM 36, JULY 1986 GENERAL SERVICES ADMINISTRATION FED. PROC. REG. (41 CFR) 1-16.101	**CONTINUATION SHEET**	REF. NO. OF DOC. BEING CONT'D. M67001-79-M-4578	PAGE 2	OF 2

NAME OF OFFEROR OR CONTRACTOR

ENVIRONMENTAL PRODUCTS, INCORPORATED

ITEM NO.	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
	a 6" above-ground discharge, for 5" column and 1" shaft, for water lubrication B. Foundation plate for discharge head C. Two-pc. topshaft construction (coupling above packing box and below motor, for ease of installing pump and pulling pump) D. Six (6) 10' sections of 5" standard wall, threaded and coupled, AWWA standard water well column pipe, with couplings E. Six (6) 10' sections of 1" diameter, C-1045, water lubricated shaft assemblies, with coupling, stainless steel shaft sleeves (located on the shaft at the bearing journals), with bronze bearing retainers and rubber bearings F. One (1) 6" suction pipe, 10' long, with coupling standard .280 wall, AWWA standard G. One (1) 6" galvanized cornucopia type strainer H. One (1) General Electric 5 HP, 1800 RPM, 3 phase, 60 cycle, 200 volt, vertical hollow shaft motor, with non-reverse ratchet, Nema design "B", class "B" insulated, 40° C. ambient, with 1.15 service factor, in a weather protected type one enclosure, in a L213TP10 frame.				

FORM A-4
(JUNE '66)

U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
OFFICE OF WATER DATA COORDINATION
INVENTORY OF HYDROLOGIC DATA STATIONS
QUALITY OF WATER

APPROVED.
Budget Bureau No. 42-R1485
Approval Expires June 30, 1968

1. AGENCY CODE	2. TYPE	3. LATITUDE	4. LONGITUDE	5.
MC	Q	°34 '43 "43 N	°77 '28 "25 W	

6. AGENCY STATION NO.	7. STATION NAME
TC1000	TC508-L

8. DRAINAGE BASIN CODE	9. STATE CODE	10. COUNTY CODE	11. COUNTY NAME
No. 6 Letter N	32	133	ONSLOW

12. PERIOD OF RECORD		13.	14.
Began 1957	Discontinued	Y ☐ Continuous Interruption Exceeds 1 Year	

15. SITE

- ☐ 101 Stream
- ☐ 102 Canal
- ☐ 103 Lake
- ☐ 104 Reservoir
- ☐ 105 Estuary
- ☐ 106 Spring
- ☒ 107 Well
- ☐ 110 Other

16. FREQUENCY OF MEASUREMENT

- ☐ 201 Continuous Recorder
- ☐ 202 Telemetered
- ☐ 203 Daily
- ☐ 204 Weekly
- ☐ 205 Monthly
- ☐ 206 Quarterly
- ☐ 207 Seasonal
- ☐ 208 Annual
- ☐ 209 Other Periodic
- ☒ 210 Occasional

17. TYPES OF DATA AVAILABLE

Physical
- ☐ 311 Temperature
- ☐ 312 Specific Conductance
- ☐ 313 Turbidity
- ☐ 314 Color
- ☐ 315 Odor
- ☐ 316 Radioactivity
- ☐ 317 pH (field)
- ☒ 318 pH (lab)
- ☐ 319 Eh
- ☐ 320 Other

Chemical
- ☐ 331 Dissolved solids
- ☒ 332 Chlorides Only
- ☐ 333 Nutrients (Nitrogen and phosphorus compounds)
- ☐ 334 Common ions
- ☒ 335 Hardness
- ☐ 336 Radiochemical
- ☐ 337 Dissolved oxygen
- ☐ 338 Other Gases
- ☐ 339 Other

Organic
- ☐ 351 Pesticides (insecticides, herbicides, etc.)
- ☐ 352 Synthetic detergents
- ☐ 353 Other

Biologic
- ☐ 361 Coliforms
- ☐ 362 Other Micro-organisms
- ☐ 363 BOD
- ☐ 364 Other

Sediment
- ☐ 371 Concentration
- ☐ 372 Particle size
- ☐ 373 Other

18. SUPPLEMENTARY DATA FOR SITE

- ☐ 421 Surface Water Station
- ☐ 422 Ground Water Station
- ☐ 423 Water Stage or Level
- ☒ 424 Water discharge
- ☐ 425 Time of Travel
- ☐ 426 Drainage Area

19. STORAGE OF DATA

- ☐ 501 Periodic Report
- ☐ 502 Areal Report
- ☒ 503 Not Published
- ☐ 504 Data on Punchcard
- ☐ 505 Data on Magnetic Tape
- ☐ 506 Other

20. OFFICE AT WHICH DATA AVAILABLE

Office: BASE MAINTENANCE DEPARTMENT
Street No.: MARINE CORPS BASE
City, State, Zip: CAMP LEJEUNE, N. C. 28542
City Code: 0735

21. OFFICE COMPLETING FORM: BASE MAINTENANCE DEPARTMENT

22. COMPILER'S NAME: F. E. TEW, JR.

23. DATE: Month 09 Year 19 66

WATER ANALYSIS

By _____

Date 8-12-43

Sample from WELL L
TENT CAMP

Total Solids	PPM	Dissolved Solids	PPM
Suspended Solids	PPM	Volatile Solids	PPM

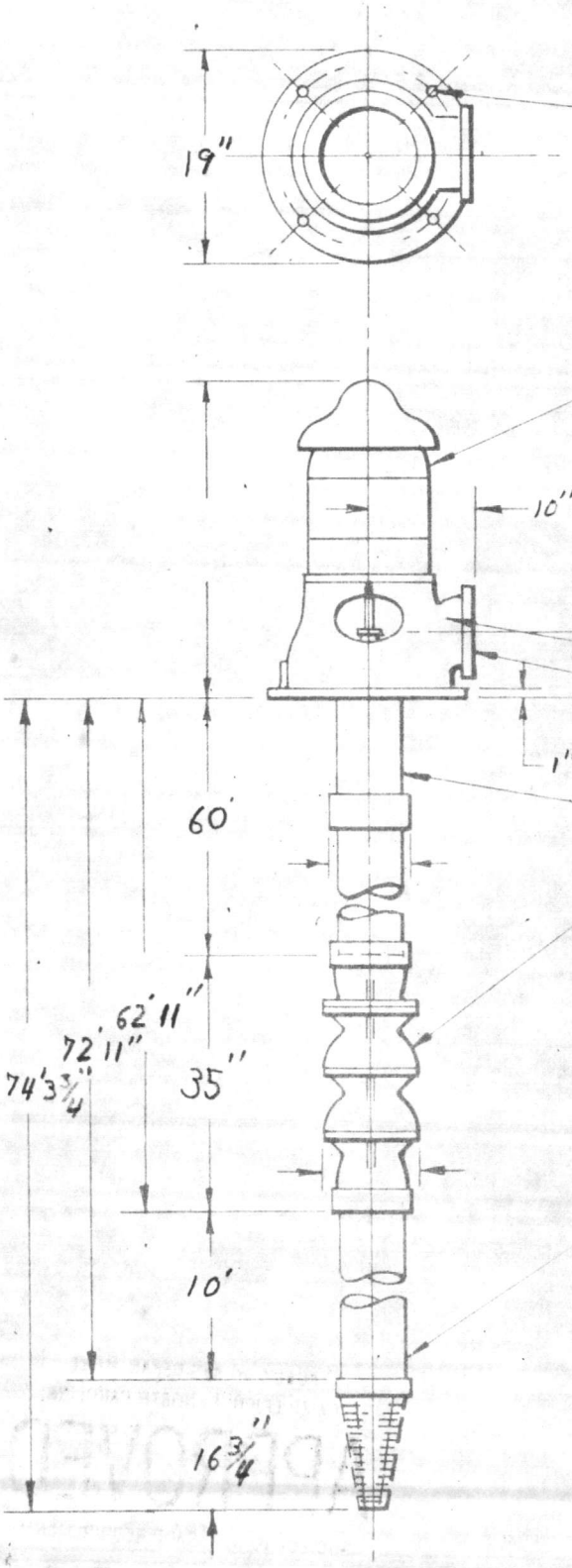
Phenol. Alk. as $CaCo_3$	0 PPM	Silica as Sio_2	PPM
Total Alk. " "	209 "	Ferrous Iron as Fe	"
Carbonates " "	0 "	Total Iron as Fe	3.5 "
Bicarbonates " "	209 "	Aluminum as Al.	"
Chlorides as Cl.	8 "	Calcium as Ca.	"
Sulphates as SO_4	"	Magnesium as Mg.	"
Nitrites as No_2	"	Sodium as Na.	"
Carbon Dioxide as CO_2	"		

pH 7.1 Soap Hardness as $CaCO_3$ 180 PPM

Odor _____ Turbidity _____

REMARKS _____

JOHNSTON VERTICAL TURBINE PUMP



VERTICAL HOLLOW SHAFT MOTOR

5 HP 3 PHASE 60 CYCLE
208 VOLT 1800 RPM
DRIP PROOF ENCLOSURE

10 X 6 TYPE "A" DISCHARGE HEAD
6" X 125# FLANGE

5" X 2" X L 3/16" COLUMN ASSEMBLY

4 STAGE 7 CC BOWL ASSEMBLY

CONDITIONS:
200 USGPM
65 FT. TOTAL HEAD
LIQUID WATER
SPEC. GRAV. @ °F PUMPING TEMP.

5" SUCTION PIPE 5" CONE STRAINER

CUSTOMER CAMP LEJEUNE
SPEC ~~#~~ 3884
DEALER HEATER WELL CO
PO#
JOHNSTON SERIAL #
JOHNSTON QUOTATION #

NOTE: DO NOT USE FOR CONSTRUCTION UNLESS CERTIFIED

GEIGER WELL "L"

JOHNSTON PUMP COMPANY
PASADENA, CALIFORNIA

H-1253-A

PUBLIC WORKS DEPARTMENT
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT NO. 3284 SPEC. NO. 3284/56

TITLE Repairs to Villa, Midway Park & Camp Geiger

DATE: 2/4/57

BY DIRECTION OF OFFICER IN CHARGE OF CONSTRUCTION

NOTE: ALL COLUMN LOSSES ARE INCLUDED

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF POINTS	FOR NUMBER OF STAGES

NOTE: ANY CHANGE IN EFFICIENCY CHANGES EITHER THE HEAD OR HORSE POWER IN PROPORTION

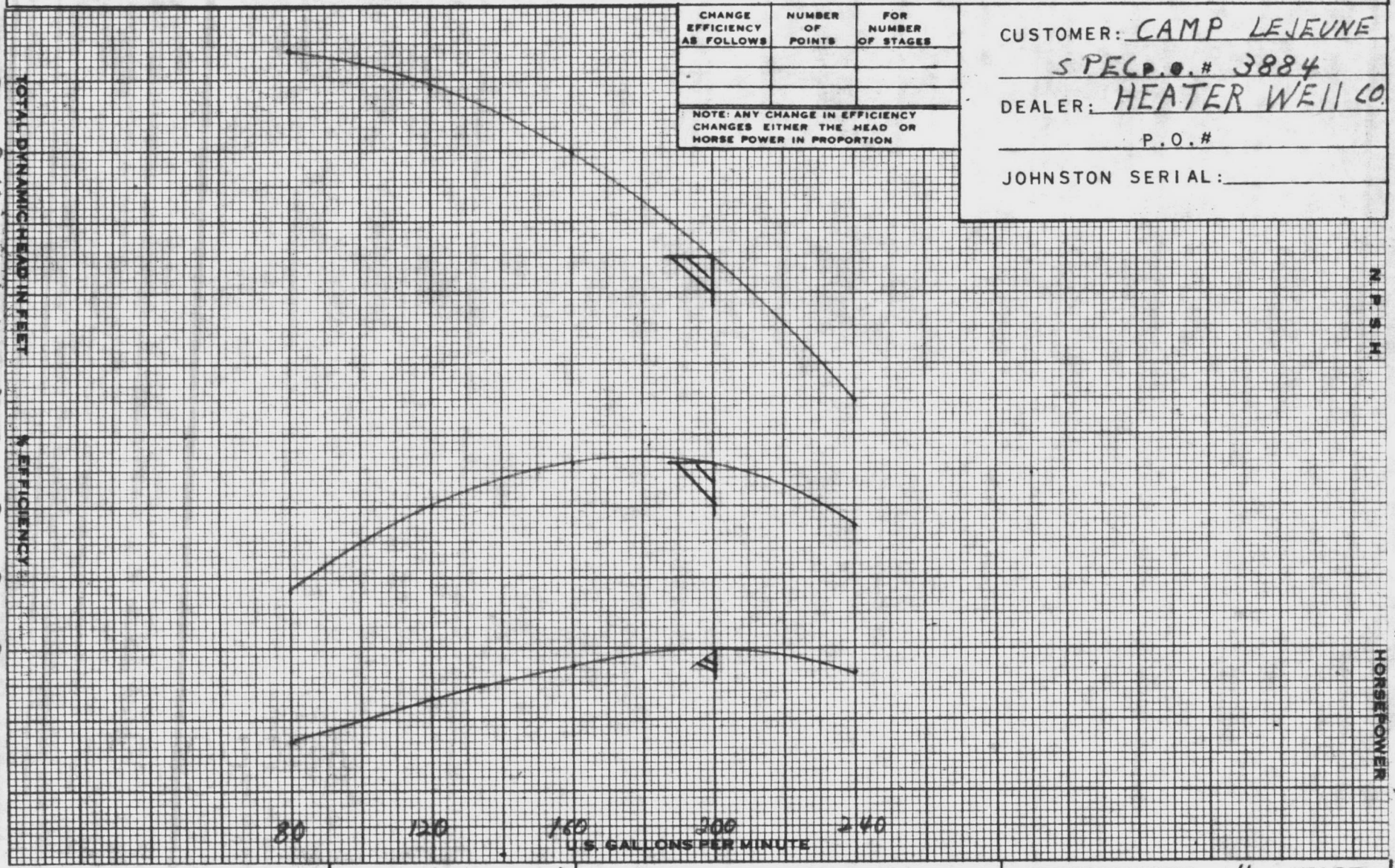
CUSTOMER: CAMP LEJEUNE

SPEC P.O.# 3884

DEALER: HEATER WELL CO.

P.O.#

JOHNSTON SERIAL:



THE CAPACITY, HEAD AND EFFICIENCY GUARANTEE IS FOR THE DESIGNATED POINT ONLY: IT IS BASED ON SHOP TESTS, WHEN HANDLING CLEAR, FRESH WATER AT A TEMPERATURE OF NOT OVER 85° F. AND UNDER SUCTION CONDITIONS AS SPECIFIED IN THE CONTRACT.

IMPELLER BRZ DIA. 3 5/16

BOWLS CI EN

LIQUID WATER

SP. GR.

DATE: 1-24-57 BY: RBH

JOHNSTON PUMP CO.

JOHNSTON

VERTICAL PUMPS

PASADENA • CALIFORNIA • U.S.A.

PERFORMANCE 4 STAGE

7CC GEIGER L PUMP

1800 R.P.M.

CURVE SHEET NO.

PUBLIC WORKS DEPARTMENT
CAMP LEJEUNE, NORTH CAROLINA

APPROVED

SUBJECT TO CONTRACT REQUIREMENTS

CONTRACT NO. 3884 SPEC. NO. 384/56

TITLE: Repairs to Huts, Midway Park - Camp Geiger

DATE: 2/4/57

BY DIRECTION OF OFFICER
IN CHARGE OF CONSTRUCTION

Well L Camp Geiger.

Date	Pumping HD.FT.	G.P.M.	Static Level FT. Gage	Pumping Level Ft Gage	Draw Down FT.	Shut Off HD.FT.
4-11-57	—	—	DIRECT RD. 8 ft	—	—	—
4-16-57	—	—	8 ft.	40 ft.	32	—

New Johnston Pump installed in new well by Heater well Co.

Put in operation 4/16/57

Pump setting _____ Air Line _____

New well Drilled Camp Gergu - Well L.
Put in Operation - 4-16-57
Static Direct Reading Gage - 4-11-57. 8-ft.
Pumping level 4-16-57. 40 ft by Direct Reading gage.
DO. in ft. 32
air line. ?

chemical anys. P. ALK - 0
M.O. ALK. - 199
CL. - 12
HARDNESS - 176
IRON. 4.0.

HEATER WELL COMPANY

INCORPORATED

Largest Well Drilling Organization in the Carolinas

TELEPHONE 2-4675 306 S. SALISBURY STREET

RALEIGH, NORTH CAROLINA

LOG OF WELL For Marine Corps, Camp Lejeune Well "L" Driller: Emmitte Fields

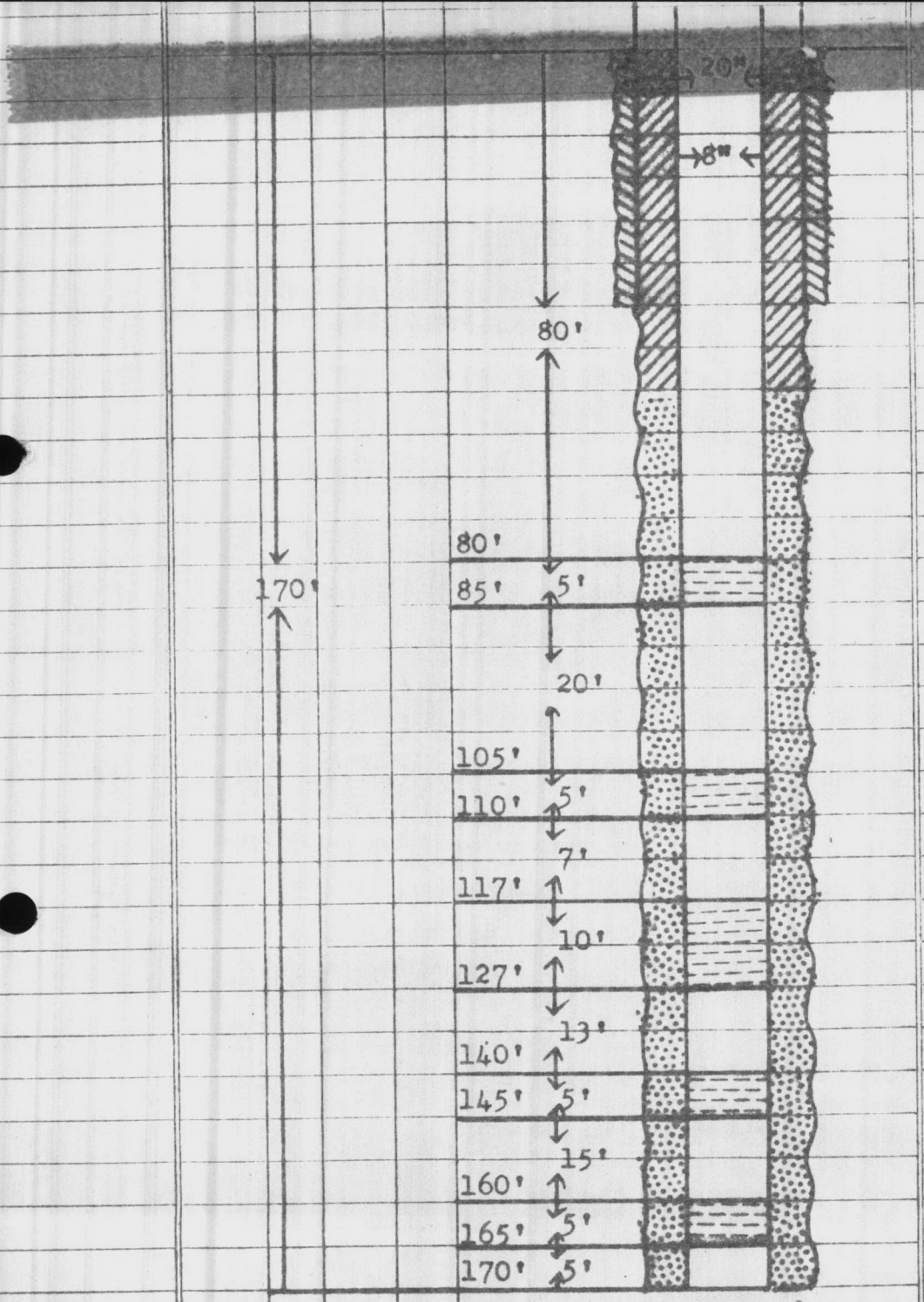
Located at Camp Geiger in Onslow County, State North Carolina

Date Drilling Started December 27, 1956 Date Started December 26, 1956

Finished Drilling January 5, 1957 Finished January 12, 1957

FORMATIONS AND DEPTH OF WELL					DIMENSIONS OF CASING AND SCREEN							
TOTAL DEPTH OF ALL STRATA		DEPTH OF EACH STRATUM		FORMATION FOUND AT EACH STRATUM	TOTAL LENGTH OF ALL SCREENS and CASINGS		LENGTH OF EACH SEC. OF SCREEN OR CASING		SPECIFY SCREEN OR CASING	SIZE OF SCREEN OR CASING	GAUGE OF SCREEN	
FT.	IN.	FT.	IN.		FT.	IN.	FT.	IN.		IN.		
3		3		Top soil	57		57		Pit Casing	20	2' above ground	
10		7		Loose white sand	81	6	81	6	Casing	8	1½' "	"
14		4		Sand and wood, hard, some clay	86	6	5		Screen	8		
					106	6	15		Casing	8		
21		7		Sand and wood, loose	111	6	5		Screen	8		
27		6		Very loose white sand	118	6	17		Casing	8		
77		50		Very loose white sand	128	6	10		Screen	8		
85		8		Loose, blue-gray sand	141	6	13		Casing	8		
102		17		Loose, blue-gray sand	146	6	5		Screen	8		
114		12		Medium to fine sand and shell (salt & pepper)	161	6	15		Casing	8		
					166	6	5		Screen	8		
127		13		Sand and shellrock	171	6	5		Casing	8		
140		13		Soft shellrock								
152		12		Medium soft shellrock								
167		15		Medium soft shellrock		14 tons of gravel from bottom of well up to approximately 75 ft. of top of well.						
177		10		Gray clay and shell								

31 July



WELL DATA:

Preliminary Test

Date Tested 19 Static Level

Production GPM Pumping Level

Permanent Test

Date Tested Jan. 9 19 57 Static Level 14'6"

Production 200 GPM Active St. Level

Drawdown Pumping Level 65'

Remarks:

PUMP DATA:

Shop No.	Type Lubr.
Type Head	Size Suction
Depth Setting	(BP to MB)
Size Column	Length Suction
Type Bowl	Length Air Line
No. Stages	Discharge-
Cap'y and Head	Pressure

MOTOR DATA:

Horsepower	Voltage
RPM	Phase
Type	Cycles
Make	Frame No.