

Let Set

On 88' P/L

55 P.S.A.

650

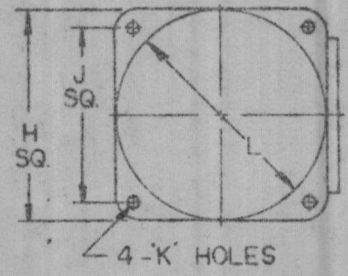
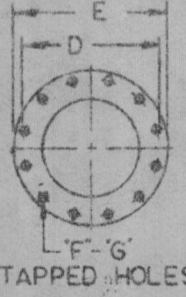
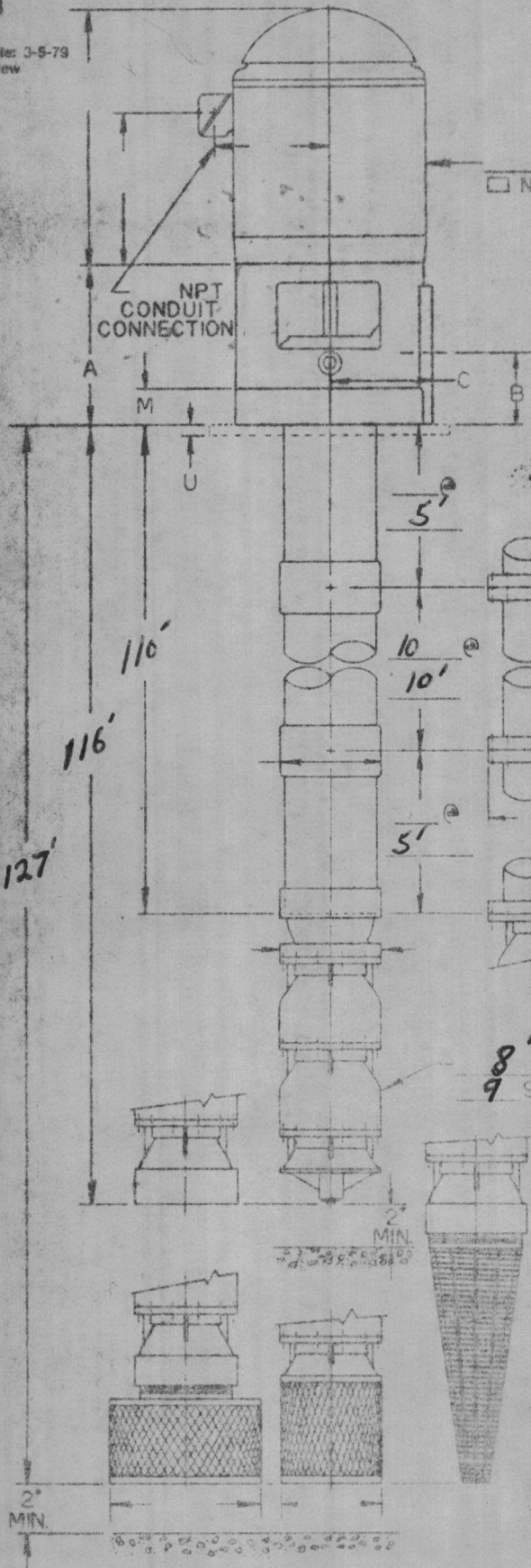


*Holcombs Blvd*  
*650*

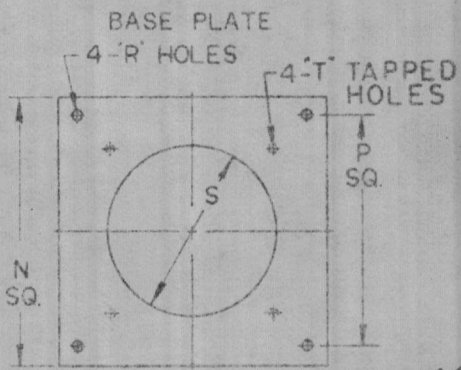


INSTALLATION PLAN  
 TYPE \_\_\_\_\_ DISCHARGE HEAD

HP \_\_\_\_\_ RPM, V. S. \_\_\_\_\_ VOLT, \_\_\_\_\_ PH. \_\_\_\_\_ HZ.  
 NRC, OTHER \_\_\_\_\_



**6"** COLUMN ASSEMBLY  
 COLUMN PIPE- THREADED,  FLANGED  
 ENCLOSING TUBE  
**1"** SHAFT



*21* INSTALLED 8-12-82

80 PREFIX DENOTES 125 LB OUTLET DRILLING.  
 81 PREFIX DENOTES 250 LB OUTLET DRILLING-NEXT SMALLER PIPE SIZE.  
 LAST THREE DIGITS DENOTE NOMINAL ELBOW SIZE.

TYPE HEAD	80-060	81-060	80-080	81-080	80-100	81-100	80-140	81-140
A			14 1/4	14 1/4	18 13/16	18 13/16	23	23
B			7 1/4	7 1/4	8	8	11 1/2	11 1/2
C			8 3/8	8 3/8	12	12	12 3/4	12 3/4
D			11 3/4	10 5/8	14 1/4	13	18 3/4	17 3/4
E			13 1/2	13 1/2	16	16	21	21
F			8	12	12	12	12	16
G			3/4	3/4	7/8	7/8	1	1 1/8
H			16 1/2	16 1/2	22	22	24 1/2	24 1/2
J			14	14	17	17	20 1/2	20 1/2
K			1	1	1	1	1 1/4	1 1/4
L			16 1/2	16 1/2	20	20	24 1/2	24 1/2
M			3 1/4	3 1/4	4 3/16	4 3/16	5	5
N			22	22	28	28	32	32
P			19	19	25	25	28	28
R			1	1	1	1	1 1/4	1 1/4
S			13	13	19	19	21	21
T			3/4	3/4	7/8	7/8	1	1 1/8
U								

DIMENSIONS ARE APPROXIMATE USE ONLY WHEN CERTIFIED.

CUSTOMER \_\_\_\_\_  
 LOCATION \_\_\_\_\_  
 SPEC NO \_\_\_\_\_  
 FOR APPROVAL \_\_\_\_\_ CERTIFIED \_\_\_\_\_

ITEM NO *GNC104* GPM **400**  
 QUOTE NO \_\_\_\_\_ T.D.H. **210**  
 PUMP NO **8HHE** RPM **1760**  
 DATE \_\_\_\_\_ B.H.P. **30**

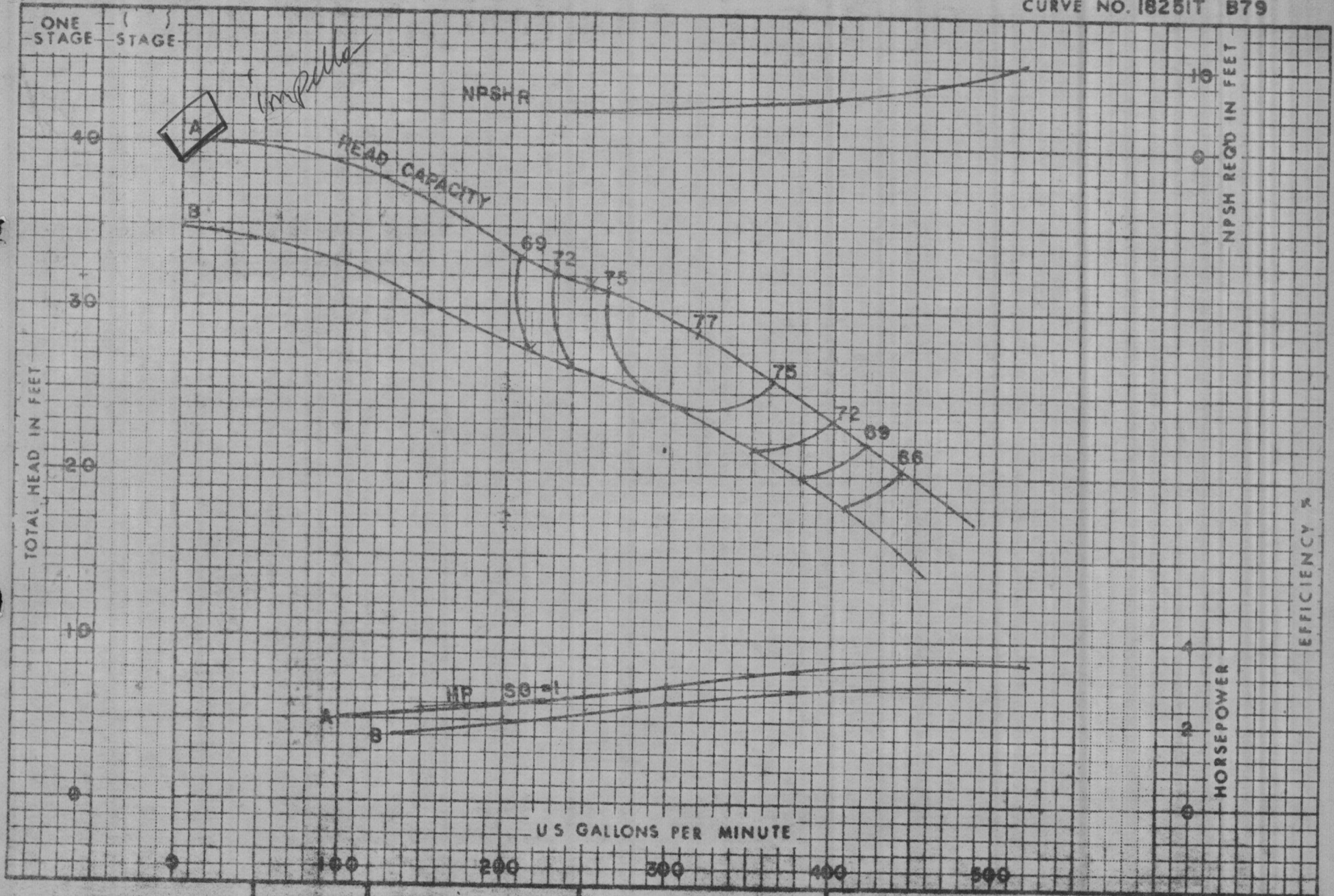


*Faint, illegible handwritten text.*

*Faint, illegible handwritten text.*

6-31-A

CURVE NO. 18251T B79

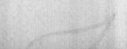


**V**  
**VALLEY/ARMOTOR**  
 A DIVISION OF VALLEY INDUSTRIES, INC.  
 CONWAY, ARKANSAS

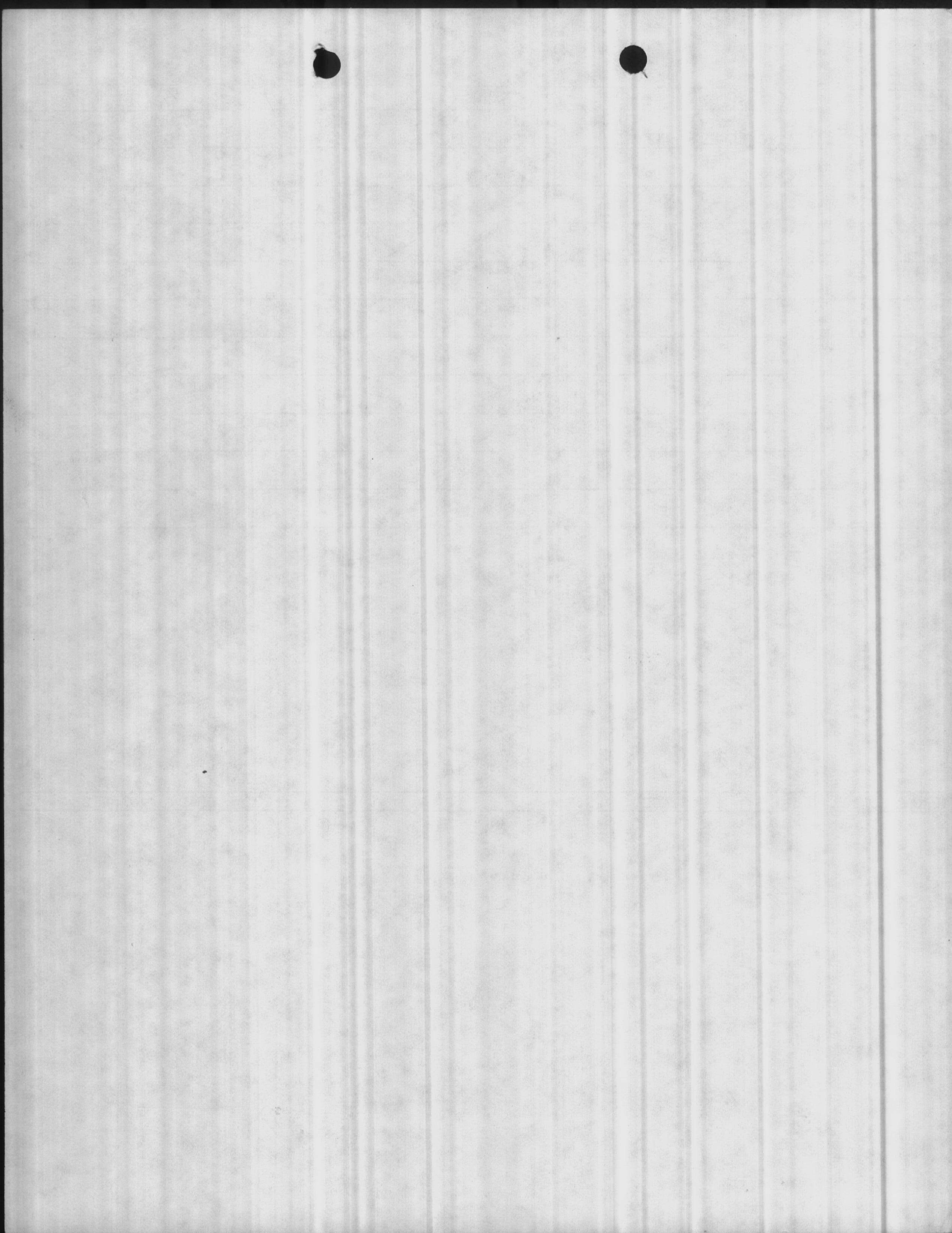
8"

8HHE  
ENAMELED

1760 RPM





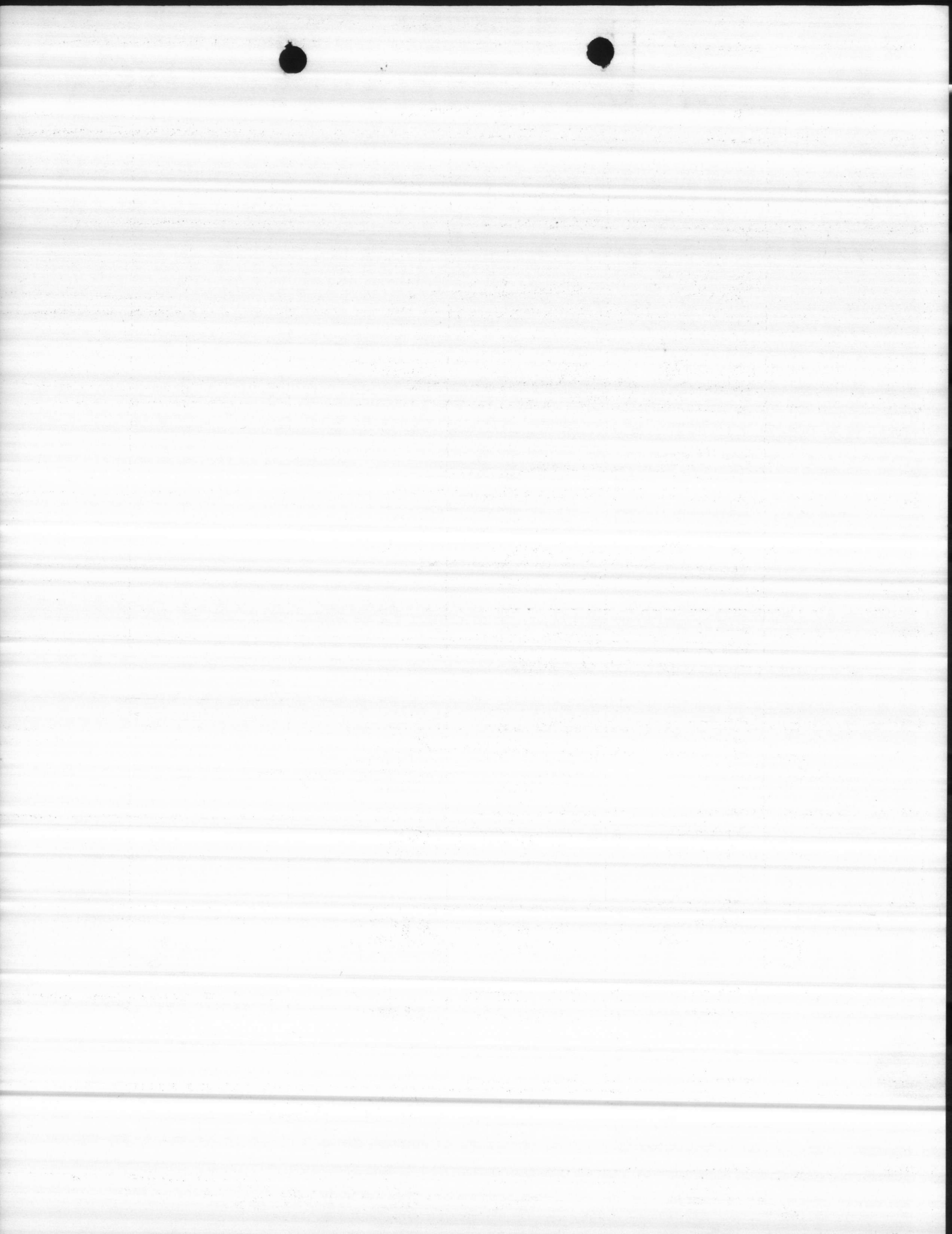




Corbin Construction Co. 10-8-71  
 Camp Lejeune N.C. Job # 40936  
 Formation Samples for Well # 4

0 - 10'	Sand + Clay
10 - 20'	Sand
20 - 30'	Sand
30 - 40'	Sand + Clay Streaks
40 - 50'	Sand + Clay Streaks
50 - 60'	Sand + limestone
60 - 70'	Sand + limestone
70 - 80'	Sand + limestone
80 - 90'	Sand + limestone
90 - 100'	Sand + limestone
100 - 110'	Sand + limestone
110 - 120'	Sand + limestone
120 - 130'	Sand + limestone
130 - 140'	Sand + limestone
140 - 150'	Sand + Rock
150 - 160'	Sand + Rock
160 - 170'	Sand, limestone + Rock
170 - 180'	Sand + limestone
180 - 190'	Sand + limestone
190 - 200'	Sand
200 - 210'	Sand + Clay
210 - 220'	Sand + Clay
220 - 230'	Sand + Clay
230 - 240'	Sand + clay
240 - 250'	Sand some clay
250 - 260'	Sand
260 - 270'	Sand
270 - 280'	Sand
280 - 290'	Sand + Clay
290 - 300'	Sand
300 - 310'	Sand

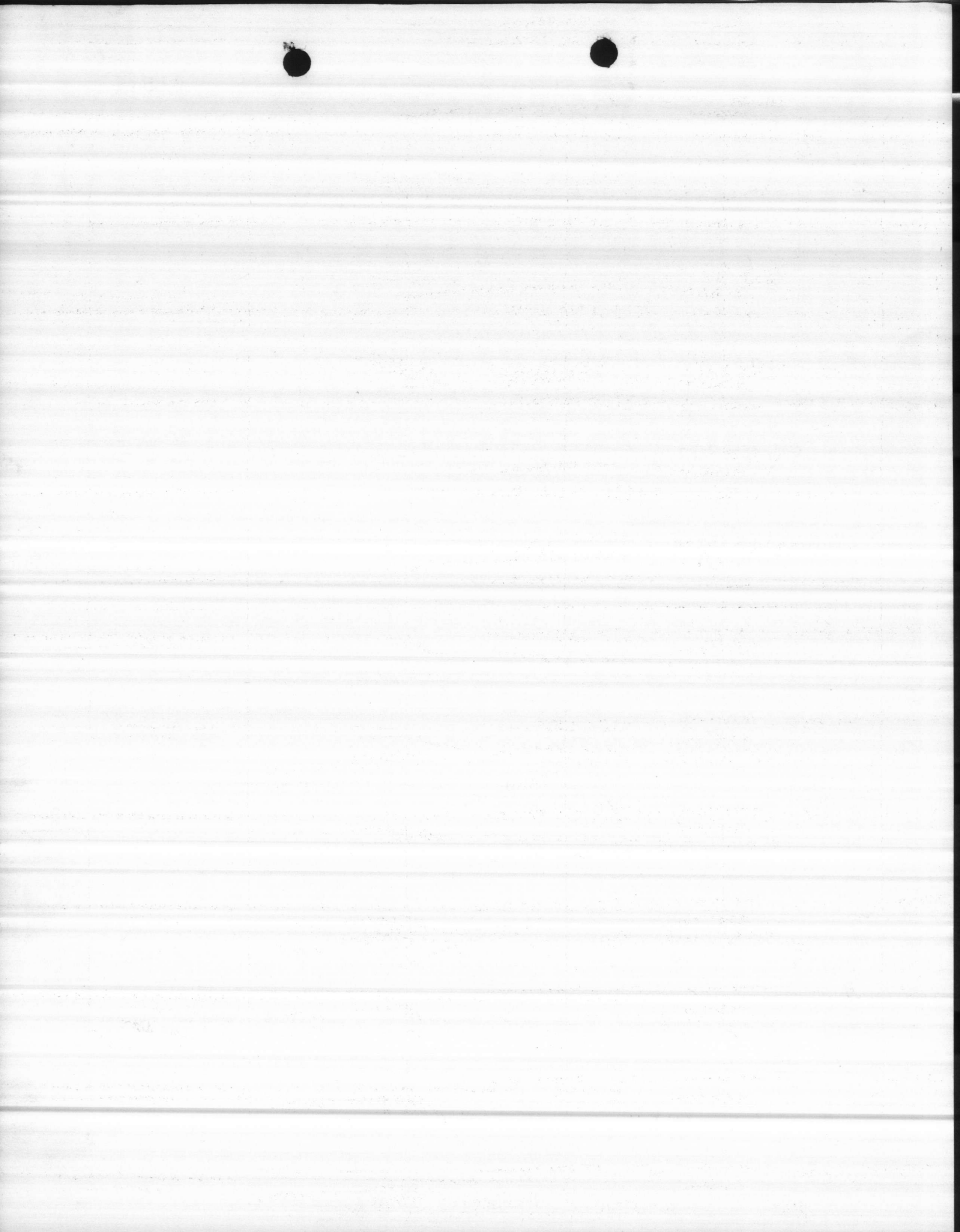
Date: \_\_\_\_\_  
 APPROVED  
 Subject To Meet Of  
 Job Plans & Specifications  
 By \_\_\_\_\_  
 Quality Control Representative



Corkin Construction Co. 10-8-71  
 Camp Lejeune N.C. Job # 40936  
 Formation Samples for Well # 4

0 - 10'	Sand + Clay
10 - 20'	Sand
20 - 30'	Sand
30 - 40'	Sand + Clay Streaks
40 - 50'	Sand + Clay Streaks
50 - 60'	Sand + limestone
60 - 70'	Sand + limestone
70 - 80'	Sand + limestone
80 - 90'	Sand + limestone
90 - 100'	Sand + limestone
100 - 110'	Sand + limestone
110 - 120'	Sand + limestone
120 - 130'	Sand + limestone
130 - 140'	Sand + limestone
140 - 150'	Sand + Rock
150 - 160'	Sand + Rock
160 - 170'	Sand, limestone + Rock
170 - 180'	Sand + limestone
180 - 190'	Sand + limestone
190 - 200'	Sand
200 - 210'	Sand + Clay
210 - 220'	Sand + Clay
220 - 230'	Sand + Clay
230 - 240'	Sand + clay
240 - 250'	Sand some clay
250 - 260'	Sand
260 - 270'	Sand
270 - 280'	Sand
280 - 290'	Sand + Clay
290 - 300'	Sand
300 - 310'	Sand

Date:  
 APPROVED  
 Subject To Meet Of  
 Job Plans & Specifications  
 By \_\_\_\_\_  
 Quality Control Representative



Well # 4

Discharge head per section 11A, par. 11A.3.1	----	120
Pumping level @ 400 gpm	----	90
Total head	----	210

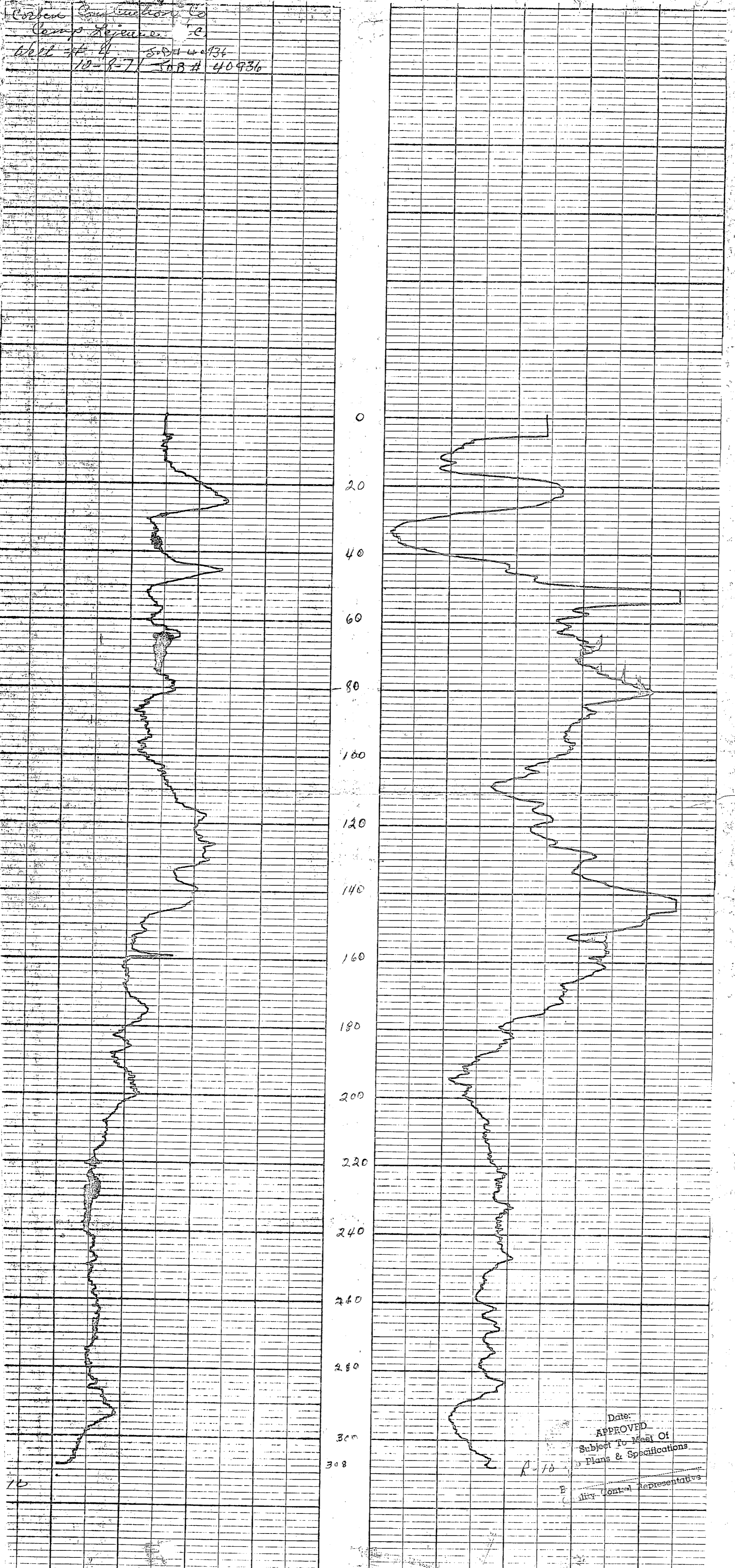
Pump

10" RKEH 5 stage 40 hp C curve

—————→



Corbett Construction Co  
Camp Lejeune, N.C.  
Well # 4-11  
10-8-71 S.P.A. 40936  
S.P.A. 40936



Date: \_\_\_\_\_  
APPROVED \_\_\_\_\_  
Subject To Meet Of \_\_\_\_\_  
Plans & Specifications \_\_\_\_\_  
By: \_\_\_\_\_  
City Central Representative

Handwritten text, possibly bleed-through from the reverse side of the page. The text is arranged in approximately 10 horizontal lines and is extremely faint and illegible. Some faint characters and lines are visible, but they do not form recognizable words or sentences.



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

O.M.B. No. 42-1485  
Approval Expires June 30, 1979  
This report is authorized by O.M.B. Circular A-67. While organizations other than Federal agencies are not required to respond, their cooperation is needed to make the results of this inventory complete.

1. AGENCY CODE <b>MC</b>	2. TYPE <b>Q</b>	3. LATITUDE <b>34 42 39 N</b>	4. LONGITUDE <b>77 18 00 W</b>	5.
-----------------------------	---------------------	----------------------------------	-----------------------------------	----

6. AGENCY STATION NO. <b>HP-650</b>	7. STATION NAME <b>HP-670-650</b>
--	--------------------------------------

8. DRAINAGE BASIN CODE No. Letter <b>06 N</b>	9. STATE CODE <b>32</b>	10. COUNTY CODE <b>133</b>	11. COUNTY NAME <b>Onslow</b>
---	----------------------------	-------------------------------	----------------------------------

12. PERIOD OF RECORD Began <b>1972</b> Discontinued <input type="checkbox"/> Continuous Interruption Exceeds 1 Year <input type="checkbox"/>	13.	14.
---	-----	-----

15. SITE

<input type="checkbox"/> 101 Stream	<input type="checkbox"/> 104 Reservoir	<input checked="" type="checkbox"/> 107 Well
<input type="checkbox"/> 102 Canal	<input type="checkbox"/> 105 Estuarine zone	<input type="checkbox"/> 108 Drain
<input type="checkbox"/> 103 Lake	<input type="checkbox"/> 106 Spring	<input type="checkbox"/> 109 Other

16. TYPES OF DATA AVAILABLE AND FREQUENCY OF MEASUREMENT (Enter appropriate number (1-8) beside each parameter to indicate frequency of measurement. For parameters telemetered, enter "T".)

1 Continuous	3 Daily	5 Monthly	7 Annual
2 Seasonal	4 Weekly	6 Quarterly	8 Other Periodic

<b>Physical</b> 311 Temperature 312 Specific conductance 313 Turbidity 314 Color 315 Odor 316 pH (field) 317 <sup>8</sup> pH (lab) 318 Eh 319 Suspended solids 320 Other	<b>Chemical</b> 331 Dissolved solids 332 <sup>8</sup> Chloride 333 Nutrients (nitrogen) 334 Nutrients (phosphorus) 335 Common ions 336 <sup>8</sup> Hardness 337 Radiochemical 338 Dissolved oxygen 339 Other gases 340 Minor elements 341 Pesticides (insecticides, herbicides, etc.) 342 Detergents - MBS 343 Biochemical oxygen demand 344 Carbon (total, dissolved, etc.)	<b>Biologic</b> 361 Coliforms 362 Other micro-organisms (Benthic organism, phytoplankton, etc.) 363 Other  <b>Sediment</b> 371 Concentration (suspended) 372 Particle size (suspended) 373 Particle size (bed load material) 374 Other
--	---	---

17. SUPPLEMENTARY DATA AVAILABLE FOR STATION

<input type="checkbox"/> 421 Surface water station	<input type="checkbox"/> 423 Water stage or level	<input type="checkbox"/> 425 Time of travel
<input type="checkbox"/> 422 Ground water station	<input checked="" type="checkbox"/> 424 Water discharge	<input type="checkbox"/> 426 Drainage area

18. STORAGE OF DATA

<input type="checkbox"/> 501 Published	<input type="checkbox"/> 503 Data on punchcard	<input type="checkbox"/> 505 Other
<input checked="" type="checkbox"/> 502 Not published	<input type="checkbox"/> 504 Data on magnetic tape, disc, data cell, etc.	

19. INQUIRIES ABOUT DATA SHOULD BE SENT TO:

Office Base Maintenance Department, Utilities Division

Street No. Marine Corps Base

City, State, Zip Camp Lejeune, North Carolina 28542 City Code 0735

20. DATA ARE AVAILABLE TO PUBLIC ON REQUEST  Yes  No

21. OFFICE COMPLETING FORM  
**BASE MAINTENANCE DEPARTMENT**

22. COMPILER'S NAME **BOB WILSON**

23. DATE  
Month **12** Year **1976**

00 1 00 10 20 30 40 50 60 70 80 90 100

01-0-10 02-0-10 03-0-10 04-0-10 05-0-10 06-0-10 07-0-10 08-0-10 09-0-10 10-0-10

0100 0200 0300 0400 0500 0600 0700 0800 0900 1000

100

1000 0900 0800 0700 0600 0500 0400 0300 0200 0100

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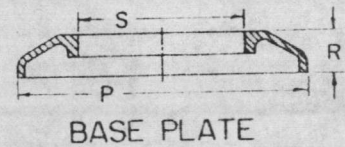
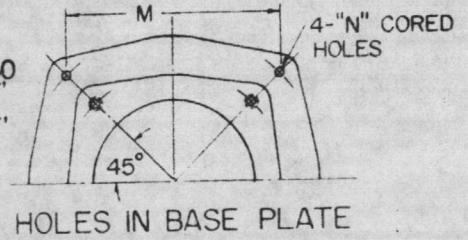
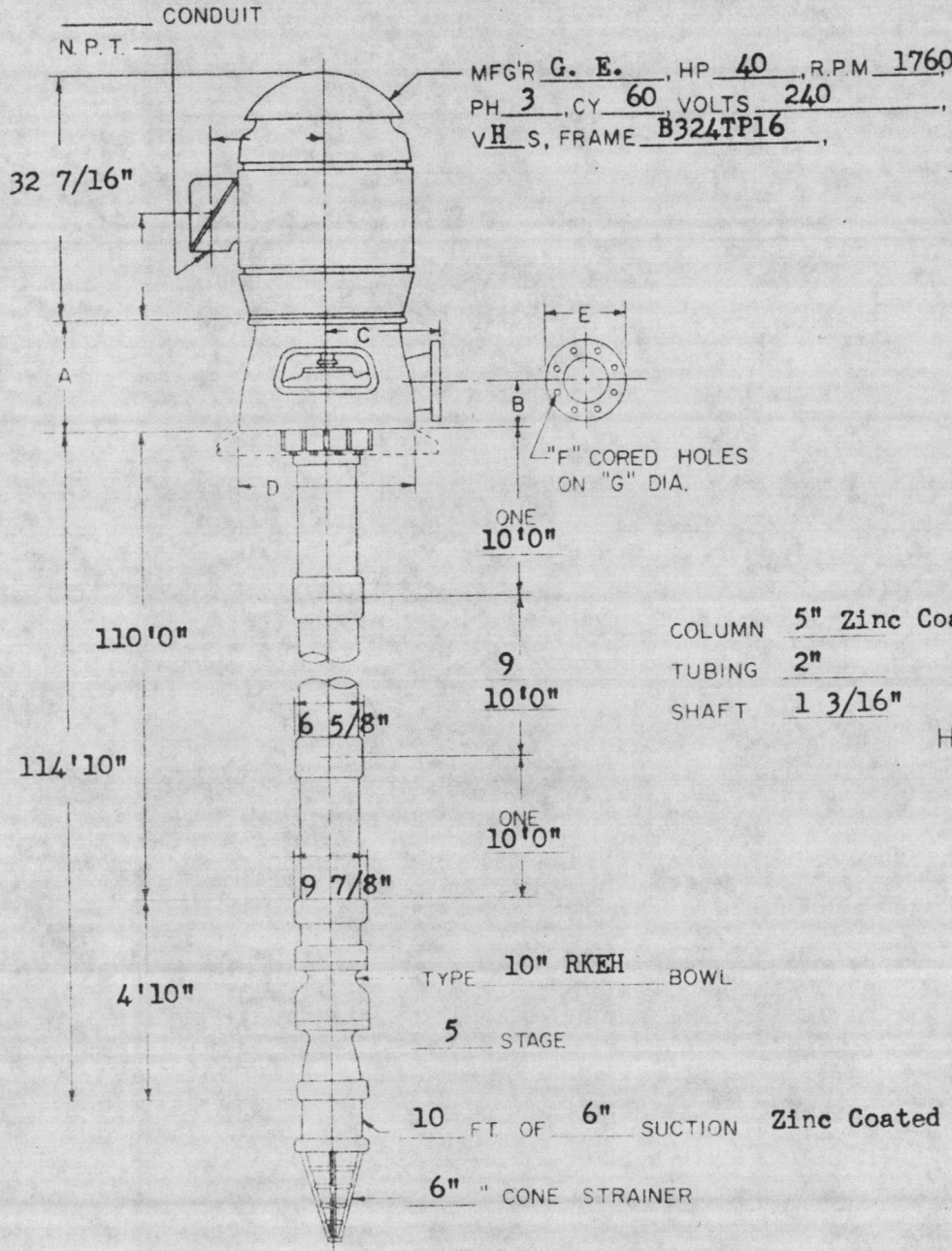
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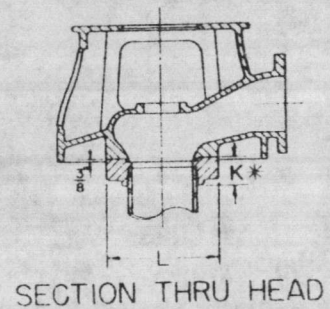
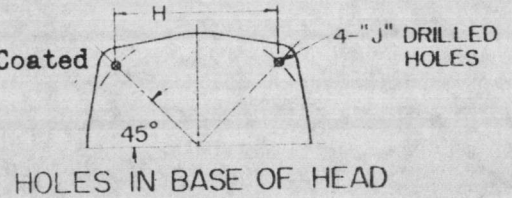


INSTALLATION PLAN  
TYPE TF413 DISCHARGE HEAD

USE THESE DIMENSIONS ONLY  
WHEN CERTIFIED BY FACTORY



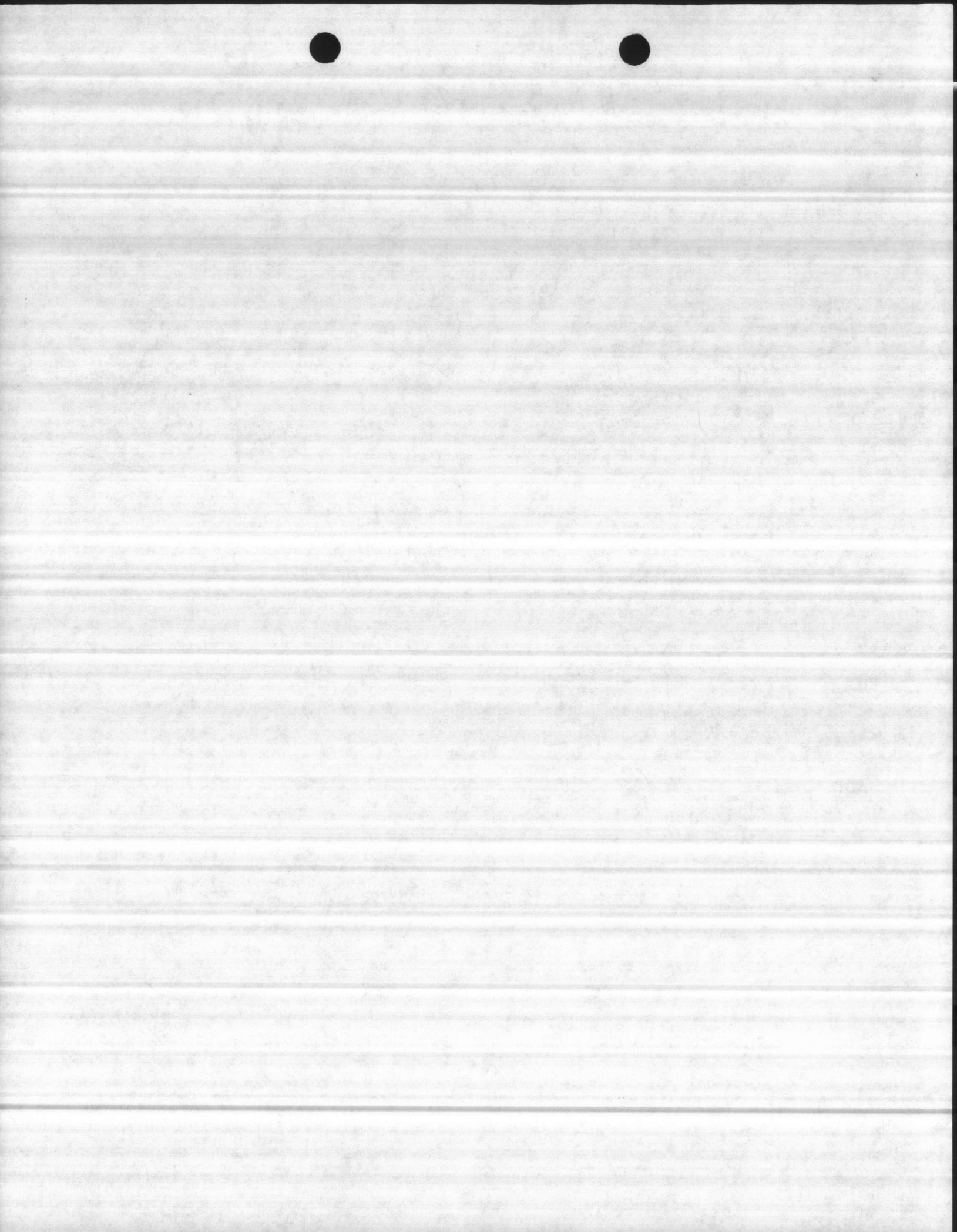
COLUMN 5" Zinc Coated  
TUBING 2"  
SHAFT 1 3/16"



\* FOR COLUMN SETTINGS OF 200' OR GREATER, "K"=11"

CUSTOMER: <u>Camp LeJuene, North Carolina</u>	YOUR NO <u>N-245-71</u>	G.P.M. <u>400</u>
LOCATION: _____	OUR NO: <u>71D-6804</u>	TD.H. <u>210</u>
FOR APPROVAL: _____	PUMP NO <u>71040</u>	R.P.M. <u>1760</u>
CERTIFIED: <u>John [Signature]</u>	DATE: <u>Dec. 20, 1971</u>	B.H.P. _____

HEAD	A	B	C	D	E	F	G	H	J	K*	L	M	N	P	R	S
TF413	13	6	11	18	9	8-3/4	7-1/2	14-1/8	11-1/16	2-13/16	10	16-15/16	7-7/8	21	2	17
TF613	14	6	11	18	11	8-7/8	9-1/2	14-1/8	11-1/16	2-7/8	11	16-15/16	7-7/8	21	2	17
TF418	13	6	14-1/2	23	9	8-3/4	7-1/2	17-5/8	13-1/16	2-13/16	10	20-1/16	7-7/8	26-1/2	2-3/4	21-3/4
TF618	15	6	14-1/2	23	11	8-7/8	9-1/2	17-5/8	13-1/16	2-7/8	12-1/2	20-1/16	7-7/8	26-1/2	2-3/4	21-3/4
TF818	18	7-3/4	14-1/2	23	13-1/2	8-7/8	11-3/4	17-5/8	13-1/16	3-1/16	13-1/2	20-1/16	7-7/8	26-1/2	2-3/4	21-3/4
TF1018	18	8-3/4	14-1/2	23	16	12-1/4	14-1/4	17-5/8	13-1/16	3-1/16	16	20-1/16	7-7/8	26-1/2	2-3/4	21-3/4



BY R.S. DATE 10-20-71  
CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

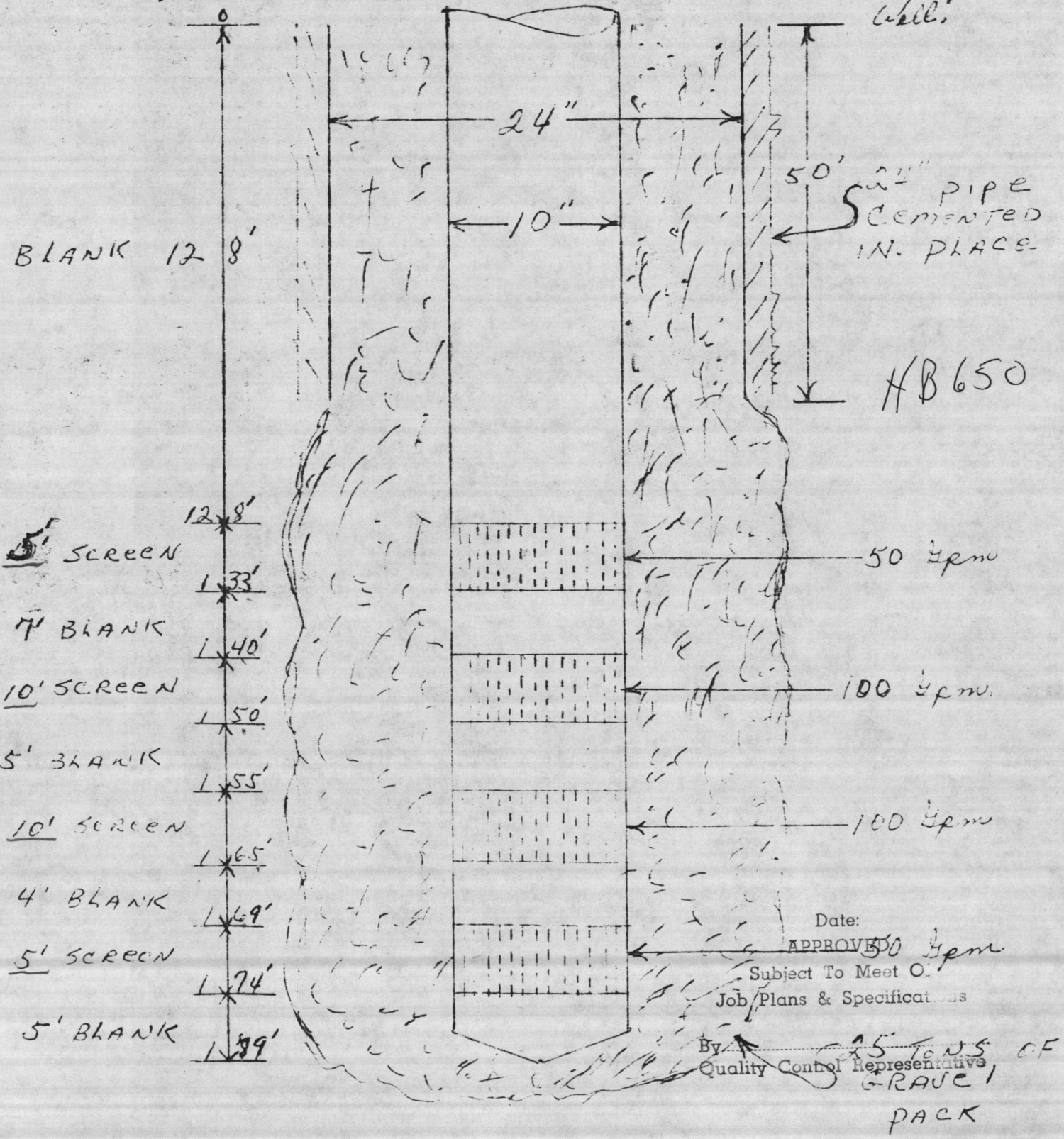
PROJECT Well # 4  
Curtin Construction Co  
Camp Lejeune N.C.

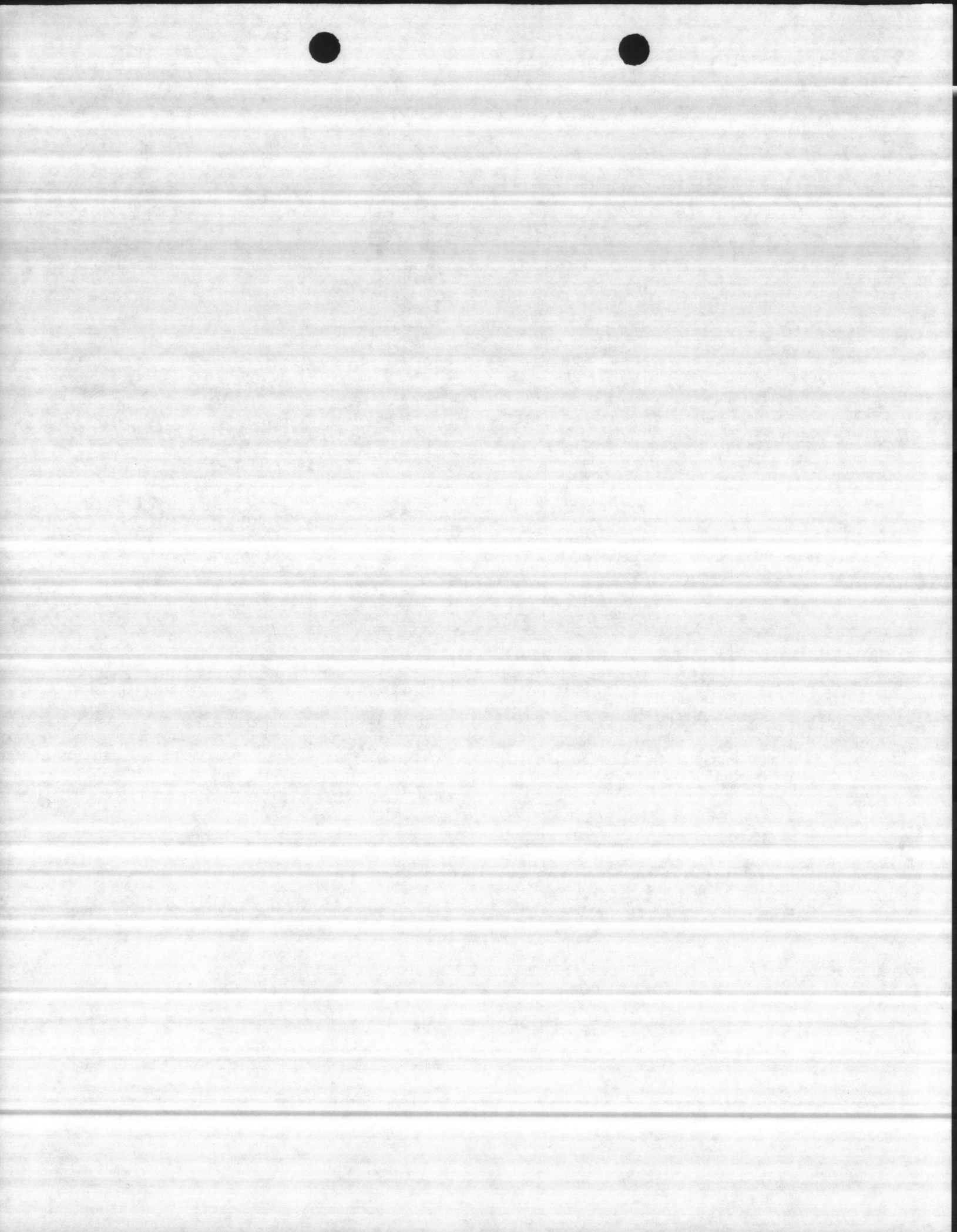
SHEET NO. 1 OF 1  
JOB NO. 40936

### Proposed Sketch of Well # 4

Total Depth 179'

300 gpm Well.





**SINGER**

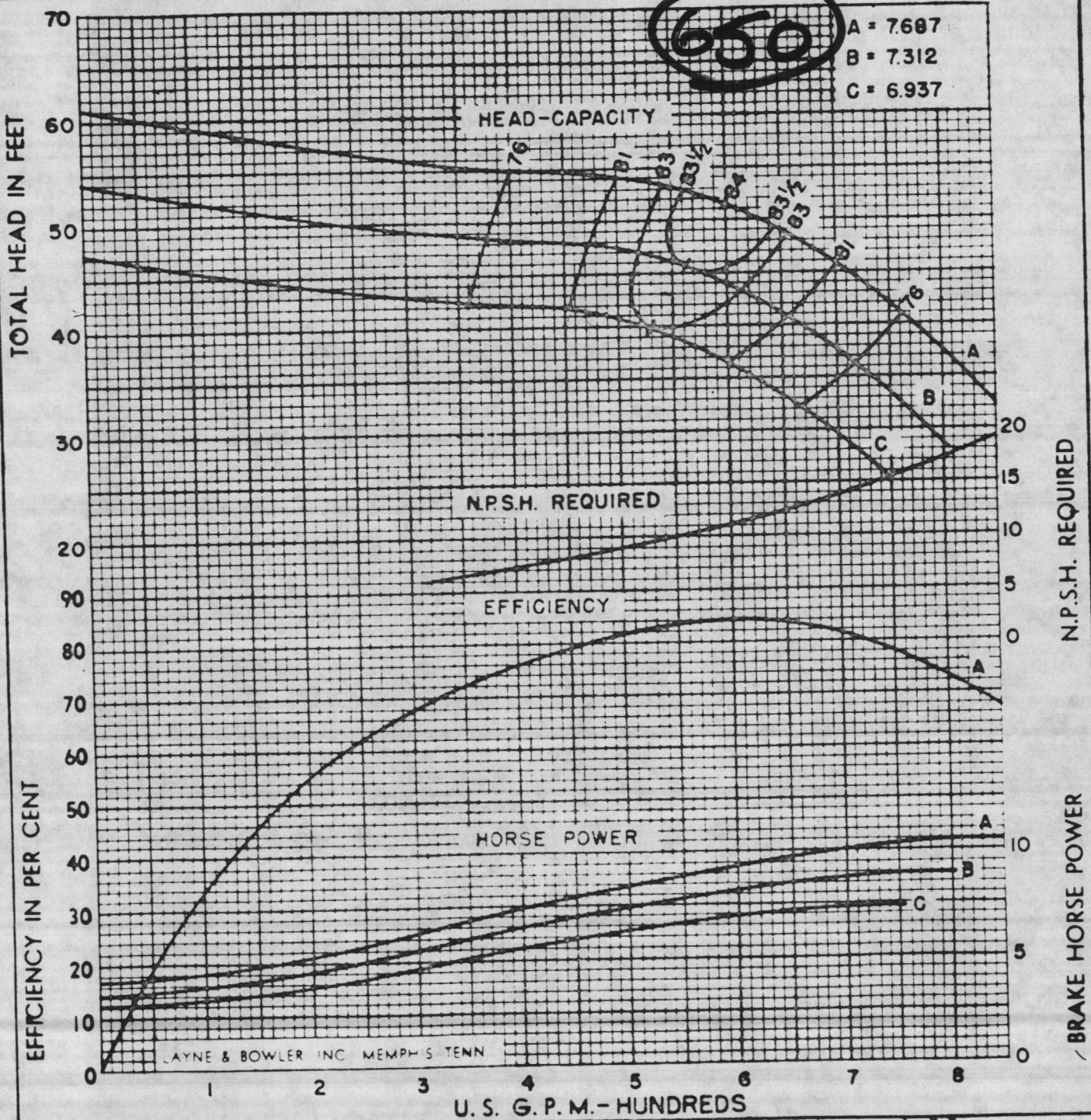
LAYNE & BOWLER DIVISION  
MEMPHIS, TENNESSEE U.S.A.



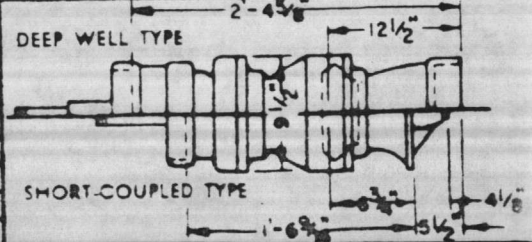
No. Stages	Eff. Change	MATERIAL	Eff. Change
1	-3	IMP.-C.I.	-2
2	-2	IMP.-C.I. ENM	-1
3	-1	IMP.-NI-RI	-1
4	0	BOWL-BRZ.	-1
5		BOWL-C.I.	-1
6		BOWL-NI-R.	-1

**10" RKEH**      **1760**      **R. P. M.**  
SINGLE STAGE LAB HEAD AND HORSE POWER WITH STANDARD CAST IRON BOWLS AND BRONZE IMPELLER

EFFICIENCY SHOWN FOR 4 OR MORE STAGES. HORSE POWER SHOWN FOR ONE STAGE BASED ON 4 STAGE EFFICIENCY. CORRECTIONS SHOULD BE MADE FOR STAGES AND MATERIAL.



EYE AREA - SQ. IN.	≡ 12.5	IMPELLER WT.-LBS.	≡ 10
THRUST CONSTANT	≡ 6	ONE STAGE WT.-LBS.	≡ 200
WR. PER IMPELLER	≡ 0.45 LB.-FT.†	ADD'L STAGE WT.-LBS.	≡ 50
MAX. SPHERE SIZE	≡ 0.843	IMPELLER NUMBER	≡ 5R19
MAX. NO. STD. STAGES	≡ 20	DISCH. SIZES	≡ 6, 7, 8
MAX. OPERATING P.S.I.	≡ 700	SUCTION SIZE	≡ 6
STD. LATERAL	≡ 0.502	BOWL CONN.-THREADED-COLLET	
STD. SHAFT DIA.	≡ 1.500		
	≡ 1.687	ADD. 7 1/8" PER ADDITIONAL STAGE.	







## FAX TRANSMITTAL

# of pages ▶ 4

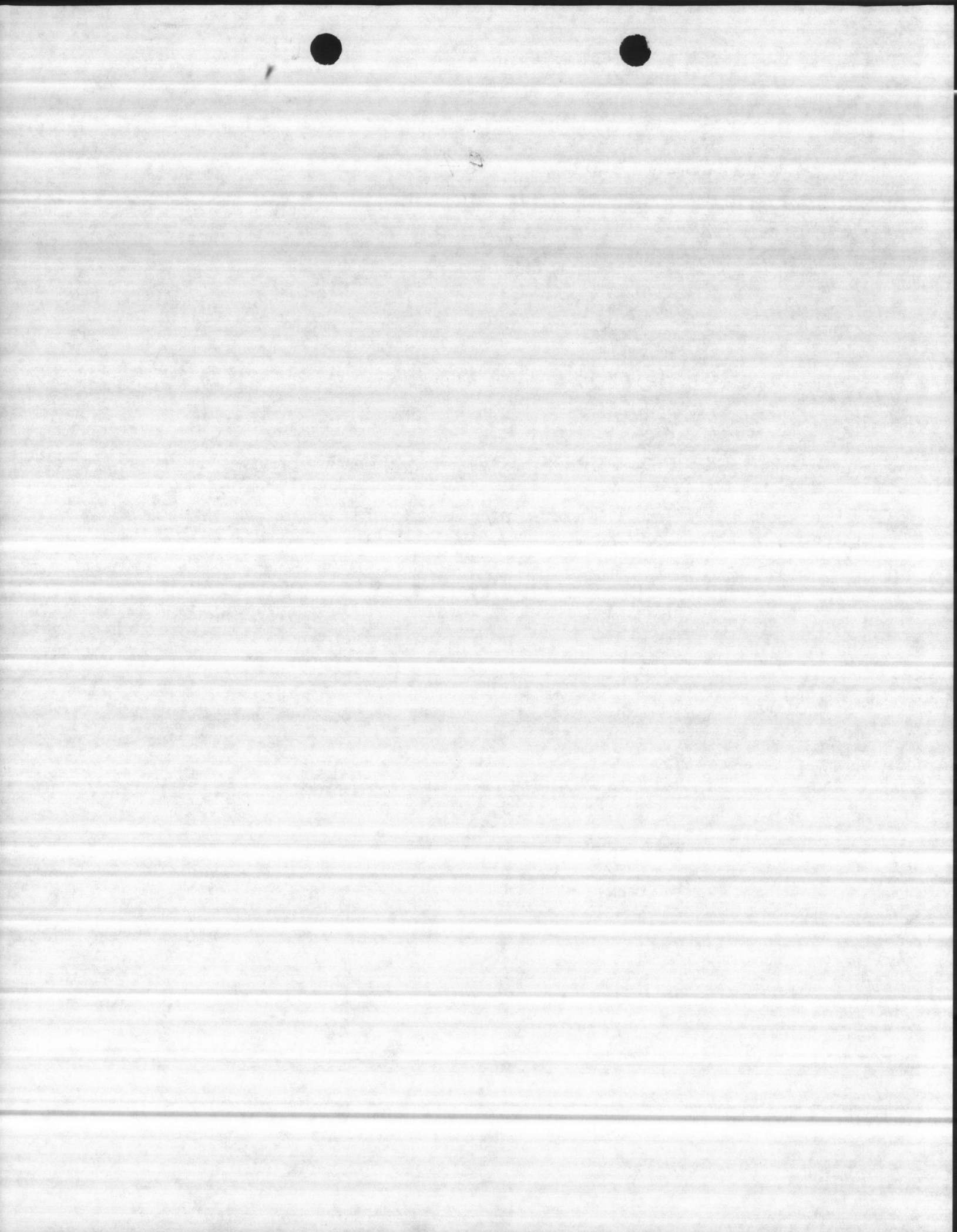
To	BOBTAYLOR	From	M. FRAZELLE
Dept./Agency	TENARVA	Phone #	910-451-5988
Fax #	910-799-8801	Fax #	910-451-3350

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Bob,

We ARE STRICTLY ON WATER Lub. Only.  
NO oil tube. THANKS For your time.

Bfr



CURVE NO. PT1818A.1

**SINGER**

LAYNE & BOWLER DIVISION  
MEMPHIS, TENNESSEE U.S.A.



No. Stages	Eff. Change	MATERIAL	Eff. Change
1	-3	IMP.-C.I.	-2
2	-2	IMP.-C.I. ENM	-1
3	-1	IMP.-NI-RI	-1
4	0	BOWL-BRZ.	-1
5		BOWL-C.I.	-1
6		BOWL-NI-R.	-1

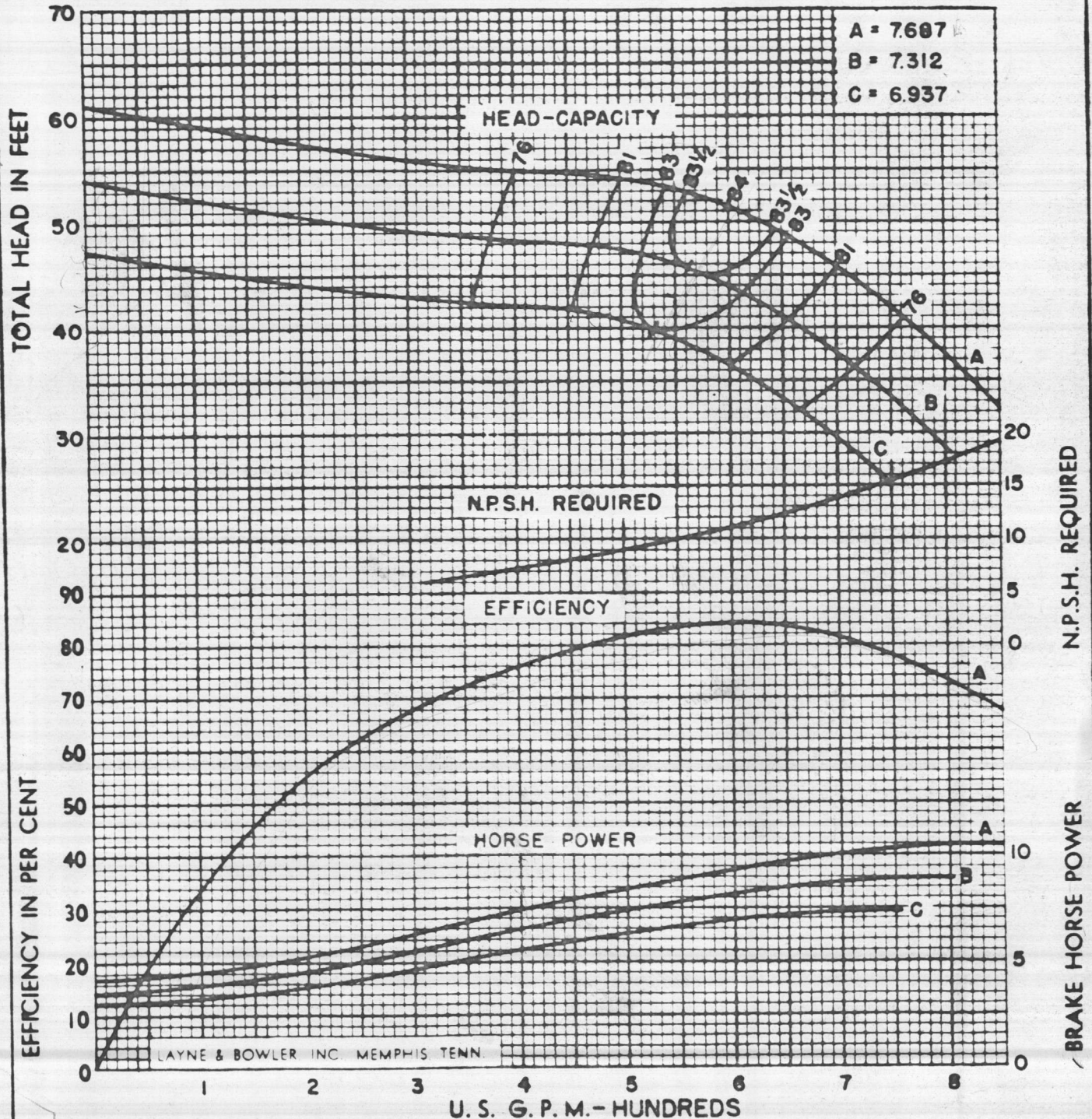
10" RKEH

1760

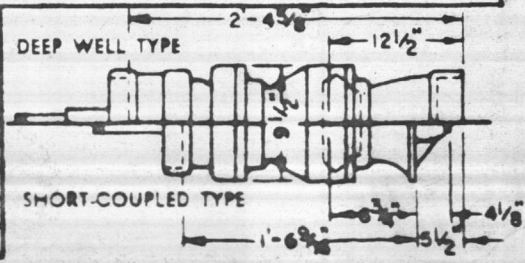
R. P. M.

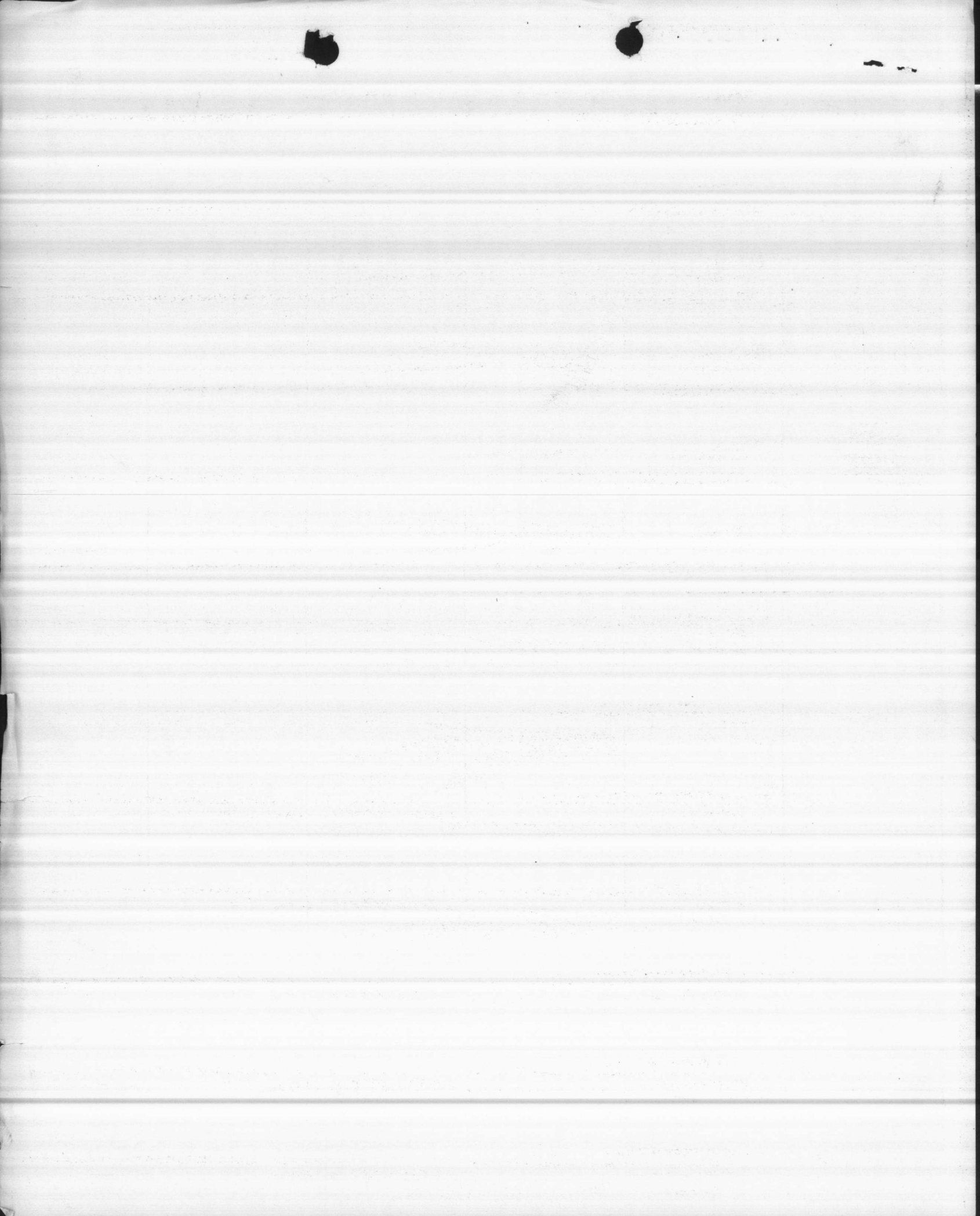
SINGLE STAGE LAB HEAD AND HORSE POWER WITH STANDARD CAST IRON BOWLS AND BRONZE IMPELLER

EFFICIENCY SHOWN FOR 4 OR MORE STAGES. HORSE POWER SHOWN FOR ONE STAGE BASED ON 4 STAGE EFFICIENCY. CORRECTIONS SHOULD BE MADE FOR STAGES AND MATERIAL.



EYE AREA - SQ. IN.	= 12.5	IMPELLER WT.-LBS.	= 10
THRUST CONSTANT	= 6	ONE STAGE WT.-LBS.	= 200
WR. PER IMPELLER	= 0.45 LB.-FT.	ADD'L STAGE WT.-LBS.	= 50
MAX. SPHERE SIZE	= 0.843	IMPELLER NUMBER	= 5RK19
MAX. NO. STD. STAGES	= 20	DISCH. SIZES	= 6, 7, 8
MAX. OPERATING P.S.I.	= 700	SUCTION SIZE	= 6
STD. LATERAL	= 0.582	BOWL CONN.-THREADED-COLLET	
STD. SHAFT DIA.	= 1.500		
MAX. SHAFT DIA.	= 1.687	ADD 77/16" PER ADDITIONAL STAGE.	





HB WELL #4

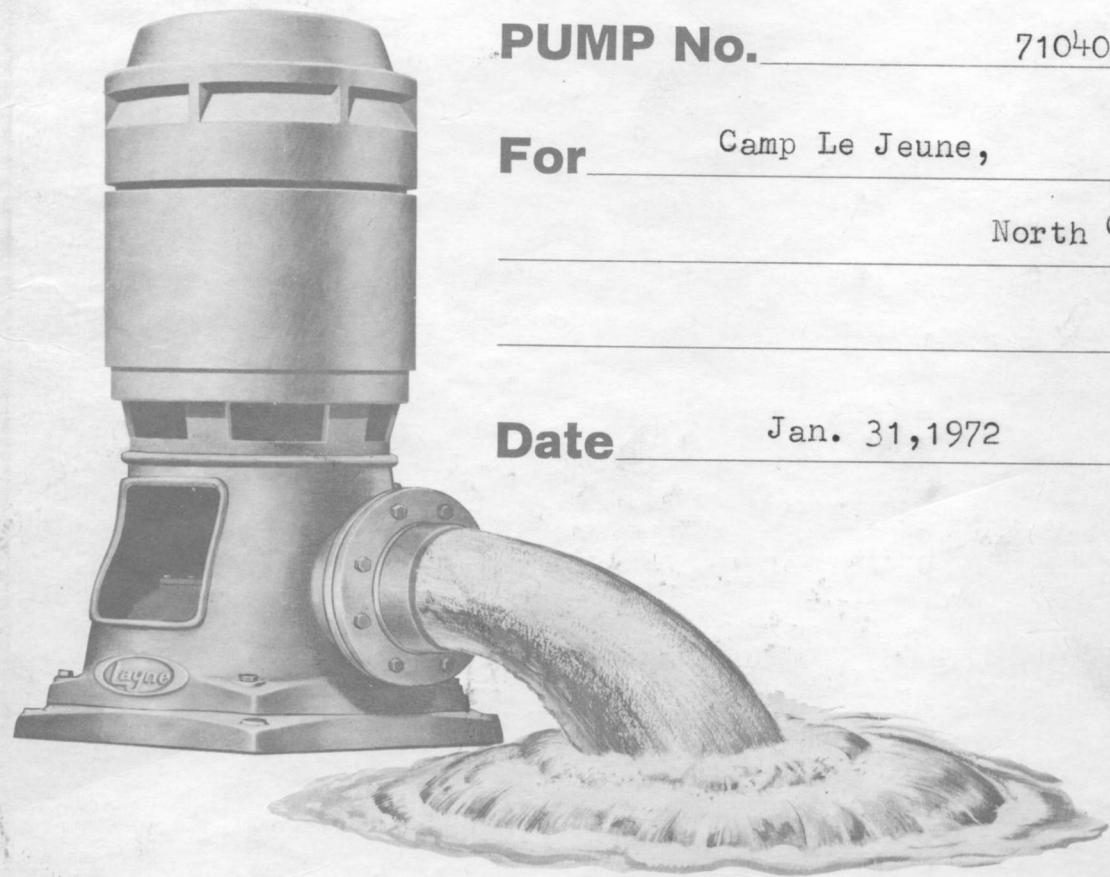
INSTALLED PUMP ~~VALLEY~~ 8 HAE IN  
PLACE OF LAYNE

RECEIVED  
FEB 2 1972  
RECEIVED



Pump pulled on Reservoir - B-20.

# PUMP RECORD



PUMP No. 71040

For Camp Le Jeune,  
North Carolina

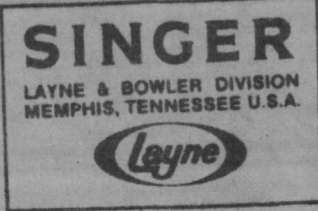
Date Jan. 31, 1972

SINGER- Layne Atlantic Co.  
Norfolk,  
Virginia

Manufactured By:

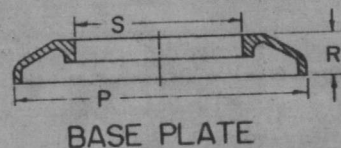
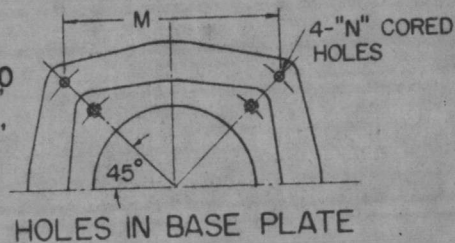
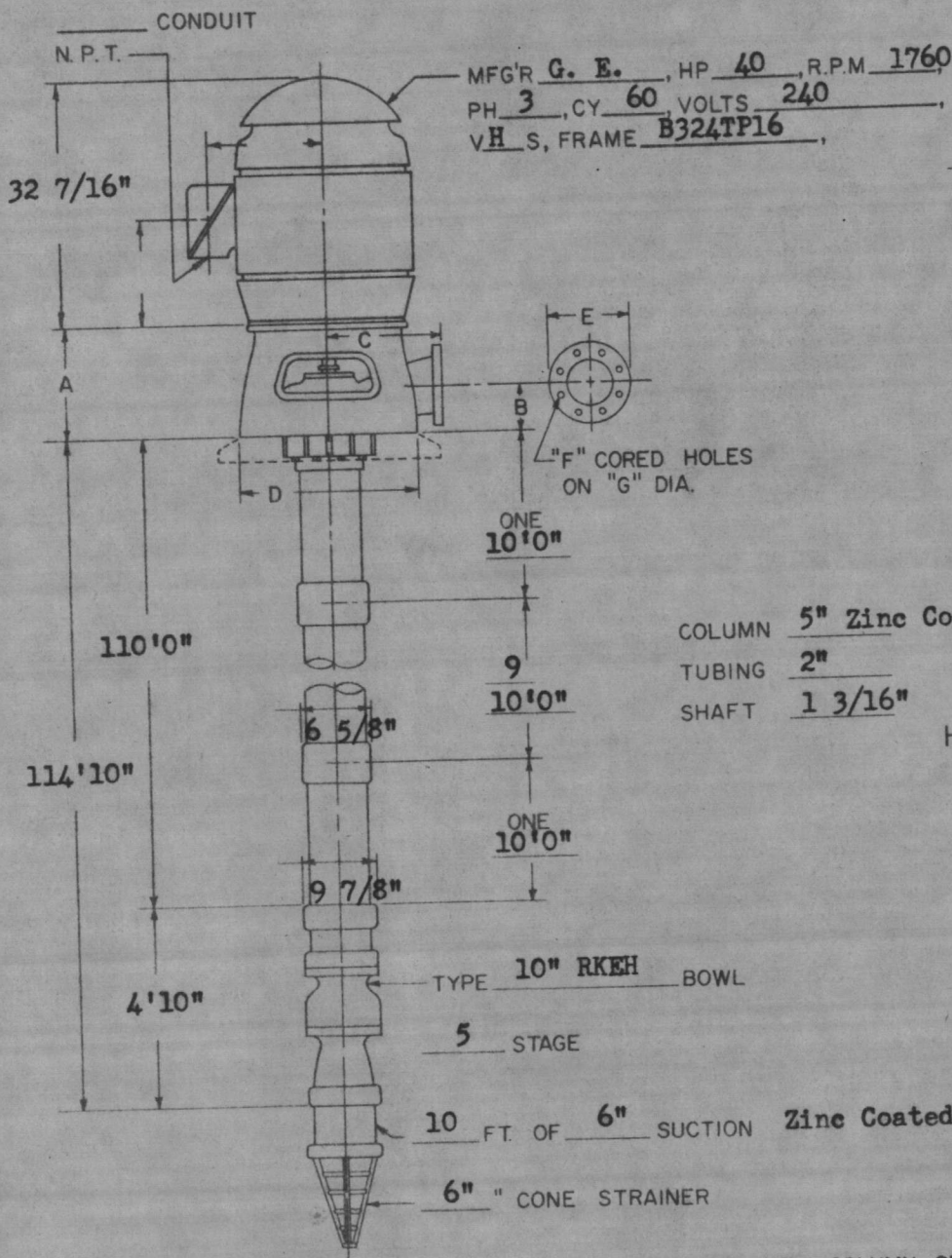
**SINGER**  
LAYNE & BOWLER DIVISION  
MEMPHIS, TENNESSEE U.S.A.



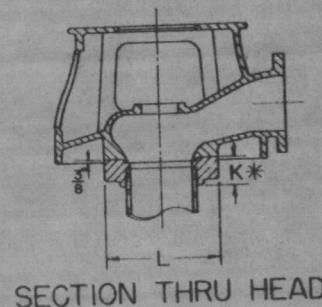
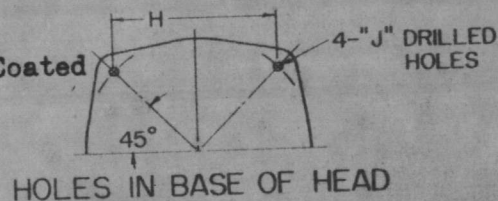


INSTALLATION PLAN  
TYPE TF413 DISCHARGE HEAD

USE THESE DIMENSIONS ONLY  
WHEN CERTIFIED BY FACTORY



COLUMN 5" Zinc Coated  
TUBING 2"  
SHAFT 1 3/16"

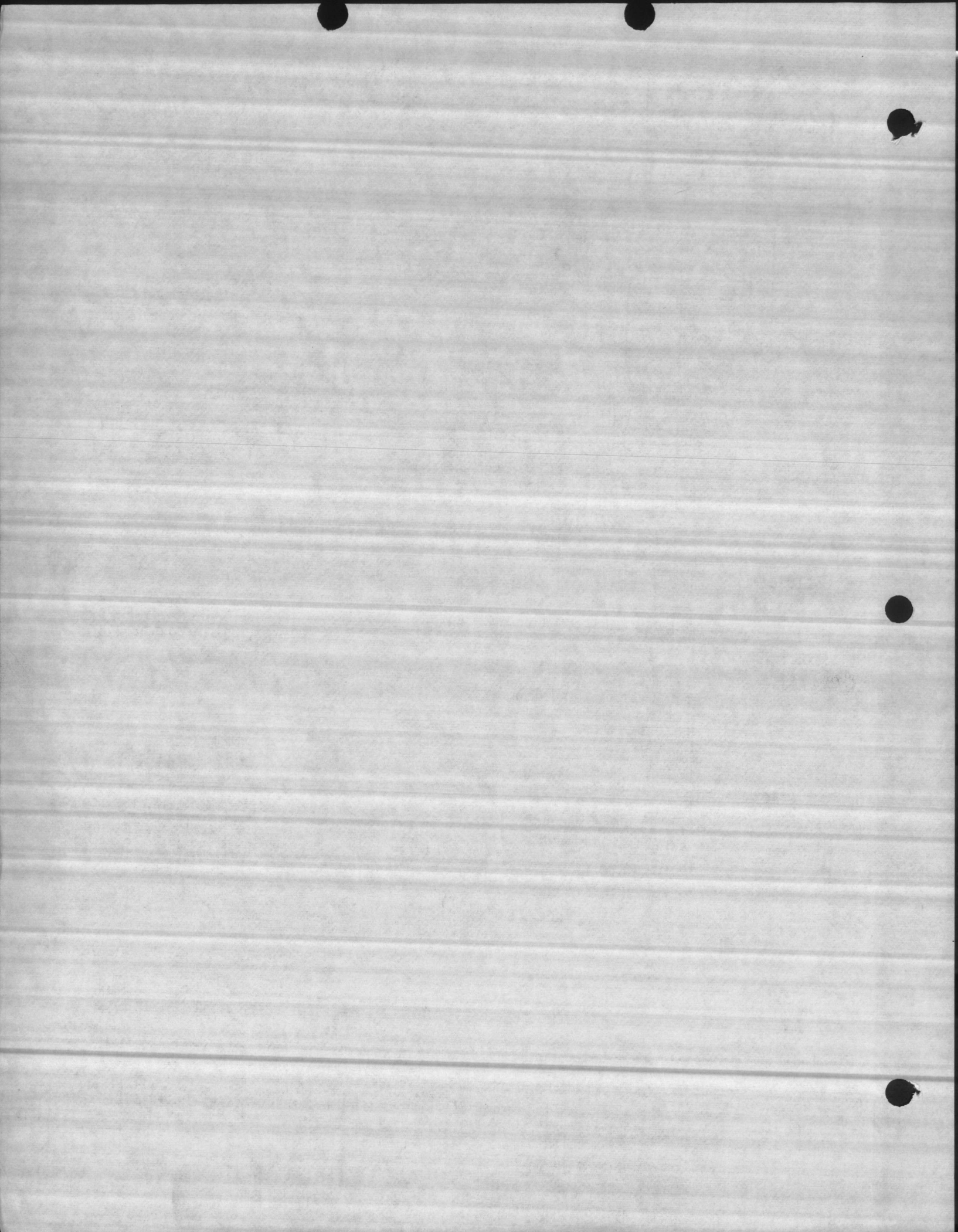


\* FOR COLUMN SETTINGS OF 200' OR GREATER, "K"=11"

CUSTOMER: <u>Camp LeJuene, North Carolina</u>	YOUR NO: <u>N-245-71</u>	G.P.M. <u>400</u>
LOCATION: _____	OUR NO: <u>71D-6804</u>	T.D.H. <u>210</u>
FOR APPROVAL: _____	PUMP NO: <u>71040</u>	R.P.M. <u>1760</u>
CERTIFIED: <u>John F. ...</u>	DATE: <u>Dec. 20, 1971</u>	B.H.P. _____

HEAD	A	B	C	D	E	F	G	H	J	K*	L	M	N	P	R	S
TF413	13	6	11	18	9	8 3/4	7 1/2	14 1/8	11 1/8	2 13/16	10	16 15/16	7 7/8	21	2	17
TF613	14	6	11	18	11	8 7/8	9 1/2	14 1/8	11 1/8	2 7/8	11	16 15/16	7 7/8	21	2	17
TF418	13	6	14 1/4	23	9	8 3/4	7 1/2	17 5/8	13 1/8	2 13/16	10	20 1/8	7 7/8	26 1/2	2 3/4	21 3/4
TF618	15	6	14 1/4	23	11	8 7/8	9 1/2	17 5/8	13 1/8	2 7/8	12 1/2	20 1/8	7 7/8	26 1/2	2 3/4	21 3/4
TF818	18	7 3/2	14 1/4	23	13 1/2	8 7/8	11 1/4	17 5/8	13 1/8	3 1/8	13 1/2	20 1/8	7 7/8	26 1/2	2 3/4	21 3/4
TF1018	18	8 1/8	14 1/4	23	16	12-1	14 1/4	17 5/8	13 1/8	3 1/8	16	20 1/8	7 7/8	26 1/2	2 3/4	21 3/4
TF1218	20	9 3/8	16 1/4	26	19	12-1	17	19 5/8	13 1/8	3 1/8	19	23 1/8	7 7/8	32	3 1/4	24

HEAD	A	B	C	D	E	F	G	H	J	K*	L	M	N	P	R	S
TF625	15	8 1/8	18 1/4	31	11	8 7/8	9 1/2	23 1/8	13 1/8	2 7/8	12 1/2	29	1	38	3 3/4	29
TF825	20	8 1/8	18 1/4	31	13 1/2	8 7/8	11 1/4	23 1/8	13 1/8	3 1/8	13 1/2	29	1	38	3 3/4	29
TF1025	20	8 1/8	18 1/4	31	16	12-1	14 1/4	23 1/8	13 1/8	3 1/8	16	29	1	38	3 3/4	29
TF1225	21	9 5/8	18 1/4	31	19	12-1	17	23 1/8	13 1/8	4 7/8	21	29	1	38	3 3/4	29
TF1425	21	10 5/8	18 1/4	31	21	12-1	18 3/4	23 1/8	13 1/8	4 7/8	21	29	1	38	3 3/4	29
TF1227	24 1/2	9 3/4	21	36	19	12-1	17	27 1/8	13 1/8	3 1/8	19	33 3/8	1	43	4 1/4	33 3/8





**VERTICAL CENTRIFUGAL PUMP-INSTALLATION OF PUMP HEADS WITH STYLE 60 STUFFING BOX  
HOLLOW SHAFT-MOTOR DRIVEN BUTT-JOINT TOP COLUMN FLANGE**

**DISASSEMBLE AND CLEAN** Before installation, the pump head should be disassembled and all parts thoroughly cleaned with kerosene. Remove the stuffing box from the discharge ell.

**MOUNT DISCHARGE ELL** With the style 60 packing box a butt-joint, top-column flange is used. Therefore, no adjustment is necessary. Clean the face of the top flange and the bottom flange of the discharge ell and coat with Layncote. Note condition of top of the projecting tubing and remove with a file any burrs or sharp edges that might cut the O ring when it is installed. Bolt discharge ell and column together.

**PACKING BOX** Clean the tension bearing and stuffing box thoroughly before continuing with installation. Insert the stuffing box first, having the "O" ring in place (a light coat of oil should be given the "O" ring). The tension bearing can now be installed, the threaded portion being coated with Layncote. Slip bearing over shaft and screw into tubing until the bearing flange butts the stuffing box. (This should be a hand tight snug fit). The bearing is now ready to take the tension.

**TENSION** The amount of tension should be based on 1/8" tube travel per 100 ft. of setting, this is put in terms of No. of turns of the tension bearing in the table below:

SIZE TUBING	NUMBER THREADS	NUMBER OF TURNS PER 100 FEET OF SETTING
1 1/4"	16	2
1 1/2"	12	1 1/2
2"	10	1 1/4
2 1/2", 3"	8	
ε 3 1/2"	OLD STD.	1
2 1/2", 3"	10	
ε 3 1/2"	NEW STD.	1 1/4
4" & UP	10	1 1/4

**ALIGNMENT** The pump shaft MUST now be in the exact center of the pump head and exactly perpendicular to the machined surface of the discharge ell. This can be checked with a straight edge, square, and pair of calipers. The discharge ell can be shafted slightly on the concrete foundation or tilted with shims until the shaft is properly aligned.

**MOTOR MOUNT** Lower the hollow shaft motor over the drive shaft, taking care not to disturb the alignment. To insure proper operation of the pump it is necessary that the motor be centered exactly, so great care should be taken in this operation. Bolt motor to discharge ell or motor stand with cap screws.

When a hollow shaft motor is used the drive shaft is keyed to a removable motor coupling. Screw on and tighten the drive shaft nut, lifting the shaft until the impellers are drawn against the top of the pump bowl. In this position the shaft cannot be rotated. The nut should then be loosened 1/4 to 1/2 turn or until the shaft turns freely. A gib key is then inserted to prevent the drive shaft nut from working loose.

**GROUT BASE AND CONNECT DISCHARGE** Grout the discharge ell in position, being careful not to disturb the alignment of the pump head. In case the discharge nipple is to be connected to a water main, a Dresser Coupling should be used. The main should be placed as nearly as possible in line with the discharge nipple. The Dresser Coupling prevents throwing any strain on the pump head if the discharge nipple and main are not exactly in line.

**LUBRICATING SYSTEM** Connect the hand oil pump, drip feed lubricator or automatic solenoid lubricator to the oil connection in the tension bushing. When first connected allow about one cup full oil to enter the tubing. Then adjust the drip cup or automatic lubricator to allow the following quantity of oil to enter the tubing:

- For setting up to 50 feet - 5 drops per minute
- For setting up to 100 feet - 10 drops per minute
- For setting up to 150 feet - 15 drops per minute
- For setting up to 200 feet - 20 drops per minute
- For setting up to 250 feet - 25 drops per minute
- For setting up to 300 feet - 30 drops per minute

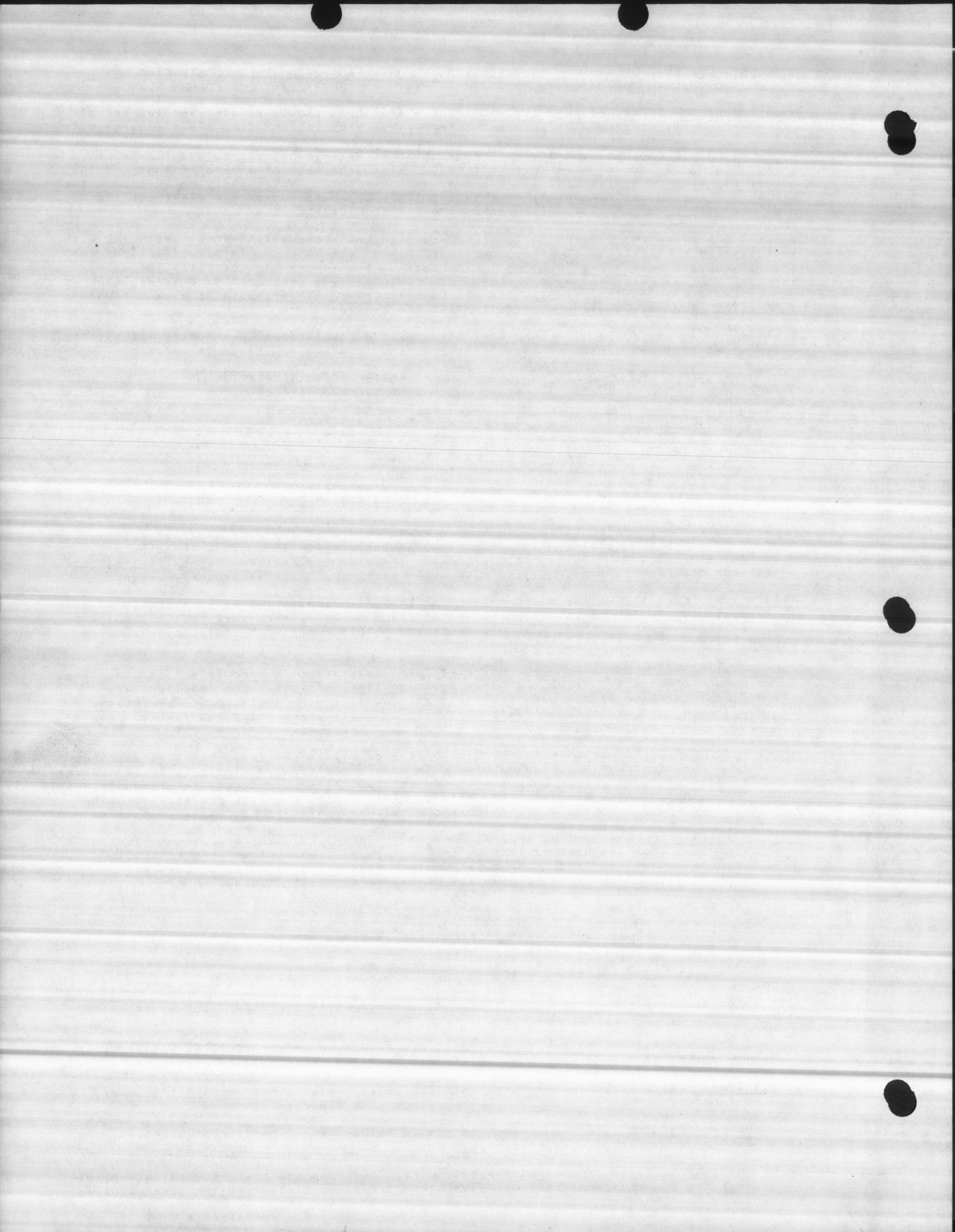
When using a force feed oil pump inject about one cup full of oil for each 24 hours of operation.

The oil should be of a good grade of mineral oil free from grit or foreign matter, with a viscosity rating of approximately S.A.E. 10 and having a relatively low cold pour point.

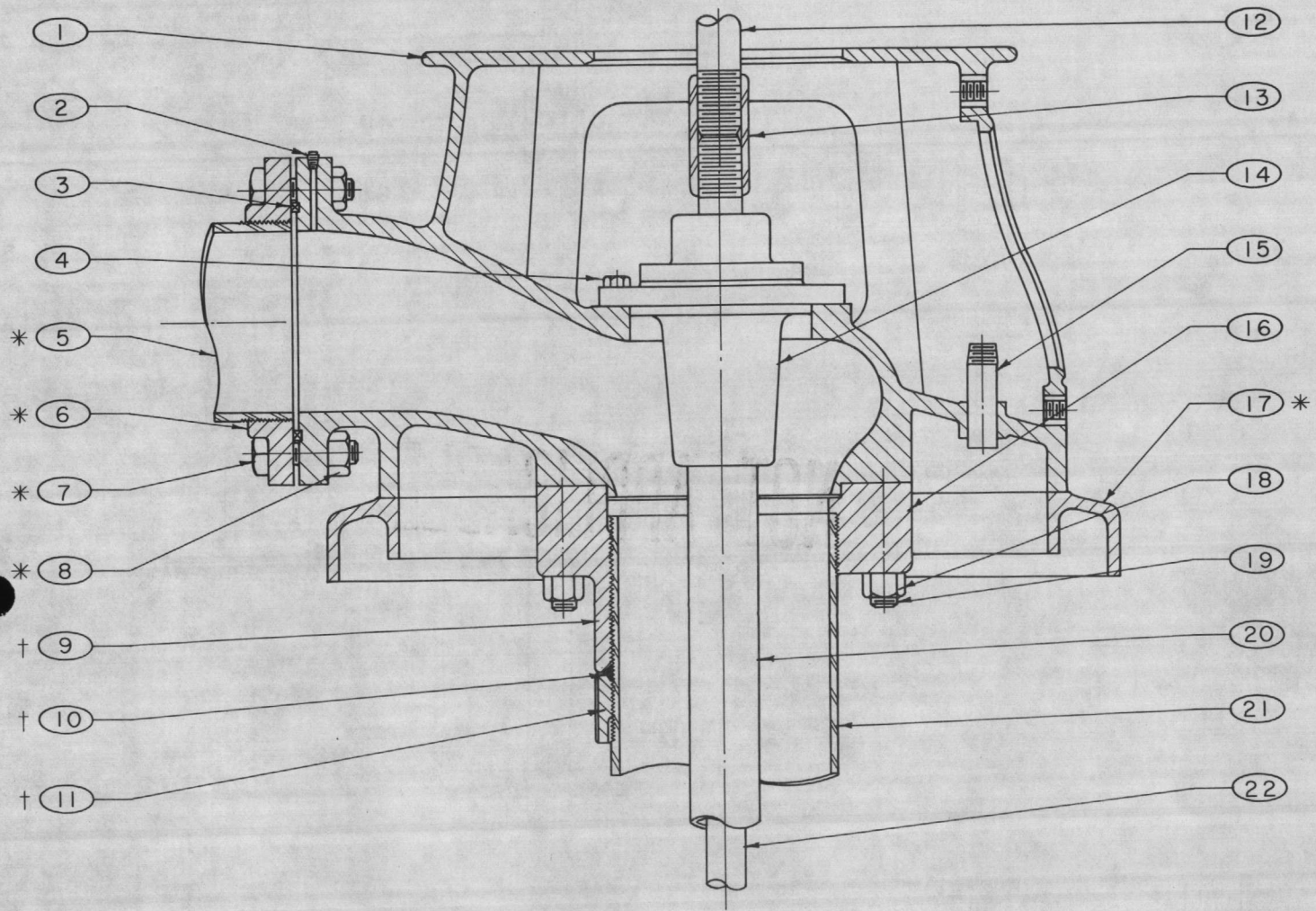
**STARTING PUMP CHECK DIRECTION OF MOTOR ROTATION** very carefully before applying power. The pump must operate in a left hand or counter clock-wise direction.

Open pet cock located adjacent to packing box to release air from discharge column, and close as soon as water discharges from pet cock.

After the pump has been in operation a few hours, shut down and check the adjustment of the pump runners. The pump shaft may have been screwed up tighter by the power applied and thereby shortened.



TYPE TF DISCHARGE HEAD  
ENCLOSED LINE SHAFT



\* NOT FURNISHED UNLESS SPECIFIED BY CUSTOMER

† USED FOR SETTINGS GREATER THAN 200 FT.

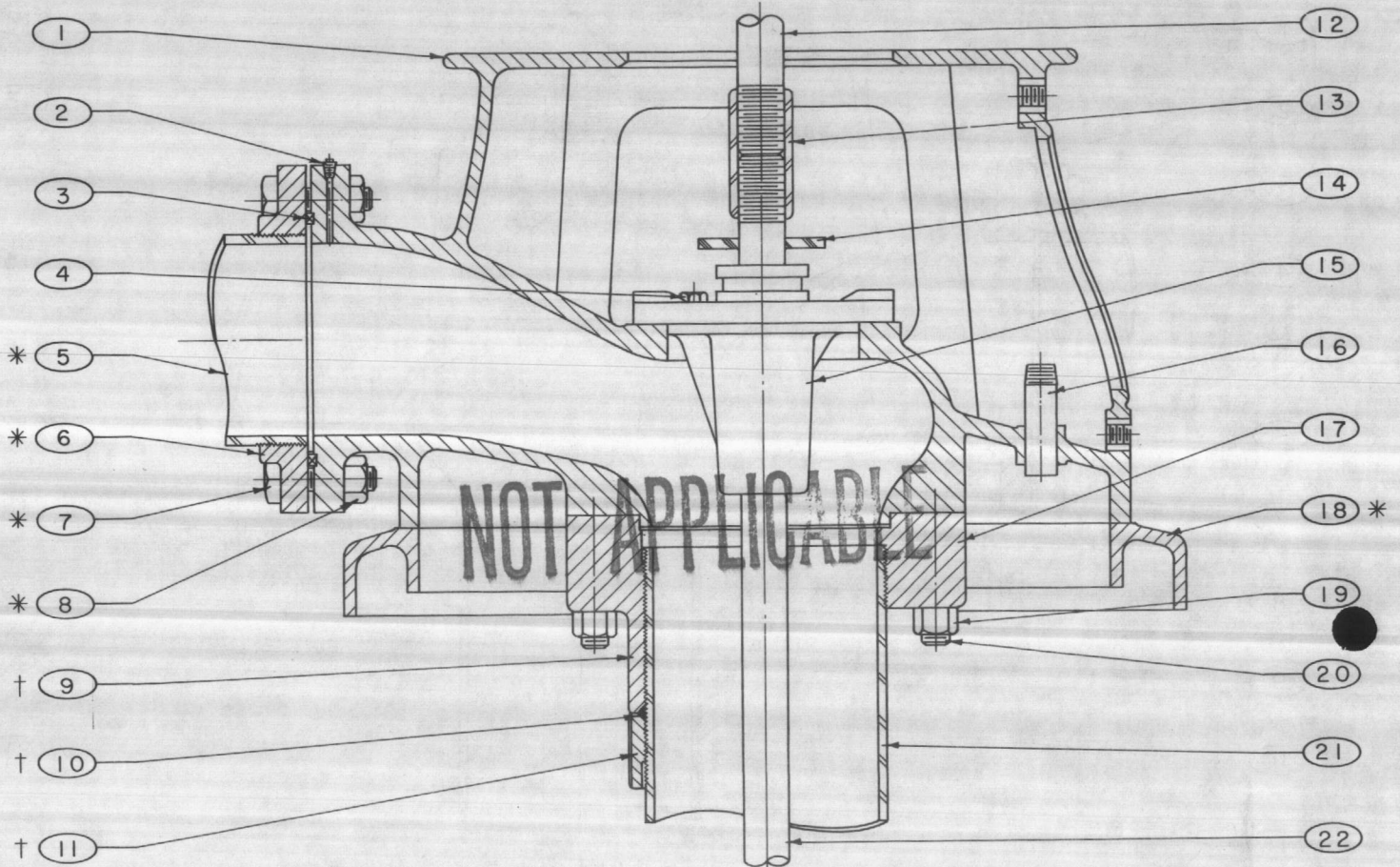
ITEM NO.	DESCRIPTION
1	DISCHARGE HEAD
2	PIPE PLUG, PRESSURE GAUGE
3	PACKING, COMPANION FLANGE
4	CAPSCREW (STUFFING BOX)
5	DISCHARGE PIPE
6	COMPANION FLANGE
7	MACHINE BOLT, COMPANION FLG.
8	HEX NUT, COMPANION FLANGE
9	ADJ. TOP COLUMN FLANGE
10	PACKING
11	PACKING RING

ITEM NO.	DESCRIPTION
12	MOTOR DRIVE SHAFT
13	HEAD COUPLING
14	STUFFING BOX (ASSEMBLY)
15	PIPE NIPPLE (AUXILIARY OPN'G)
16	TOP COLUMN FLANGE
17	BASE PLATE
18	HEX NUT
19	STUD
20	TUBING
21	TOP COLUMN PIPE
22	LINE SHAFT, TOP PIECE

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.

REVISED 10-1-67  
SUPERSEDES ORIGINAL PRICE BOOK ISSUE

TYPE TF DISCHARGE HEAD  
OPEN LINE SHAFT



\* NOT FURNISHED UNLESS SPECIFIED BY CUSTOMER

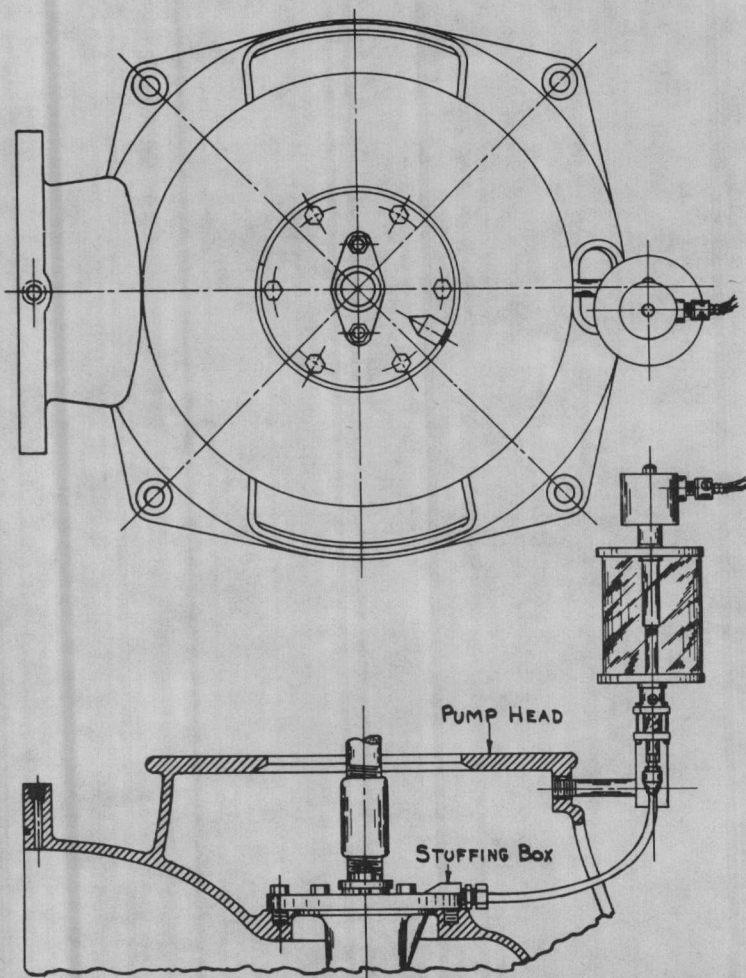
† USED FOR SETTINGS GREATER THAN 200 FT.

ITEM NO.	DESCRIPTION
1	DISCHARGE HEAD
2	PIPE PLUG, PRESSURE GAUGE
3	PACKING, COMPANION FLANGE
4	CAPSCREW (STUFFING BOX)
5	DISCHARGE PIPE
6	COMPANION FLANGE
7	MACHINE BOLT, COMPANION FLG.
8	HEX NUT, COMPANION FLANGE
9	ADJ. TOP COLUMN FLANGE
10	PACKING
11	PACKING RING

ITEM NO.	DESCRIPTION
12	MOTOR DRIVE SHAFT
13	HEAD COUPLING
14	WATER SLINGER
15	STUFFING BOX (ASSEMBLY)
16	PIPE NIPPLE (AUXILIARY OPN'G)
17	TOP COLUMN FLANGE
18	BASE PLATE
19	HEX NUT
20	STUD
21	TOP COLUMN PIPE
22	LINE SHAFT, TOP PIECE

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.

REVISED - 10-1-67  
SUPERSEDES ORIGINAL PRICE BOOK ISSUE



VOLT..... CYCLE.....

TAPPED FOR  $\frac{1}{2}$ "  
CONDUIT WITH ADAPTER  
FOR  $\frac{3}{8}$ " FLEXIBLE TUBING

SOLENOID

LUBRICATOR

BRACKET

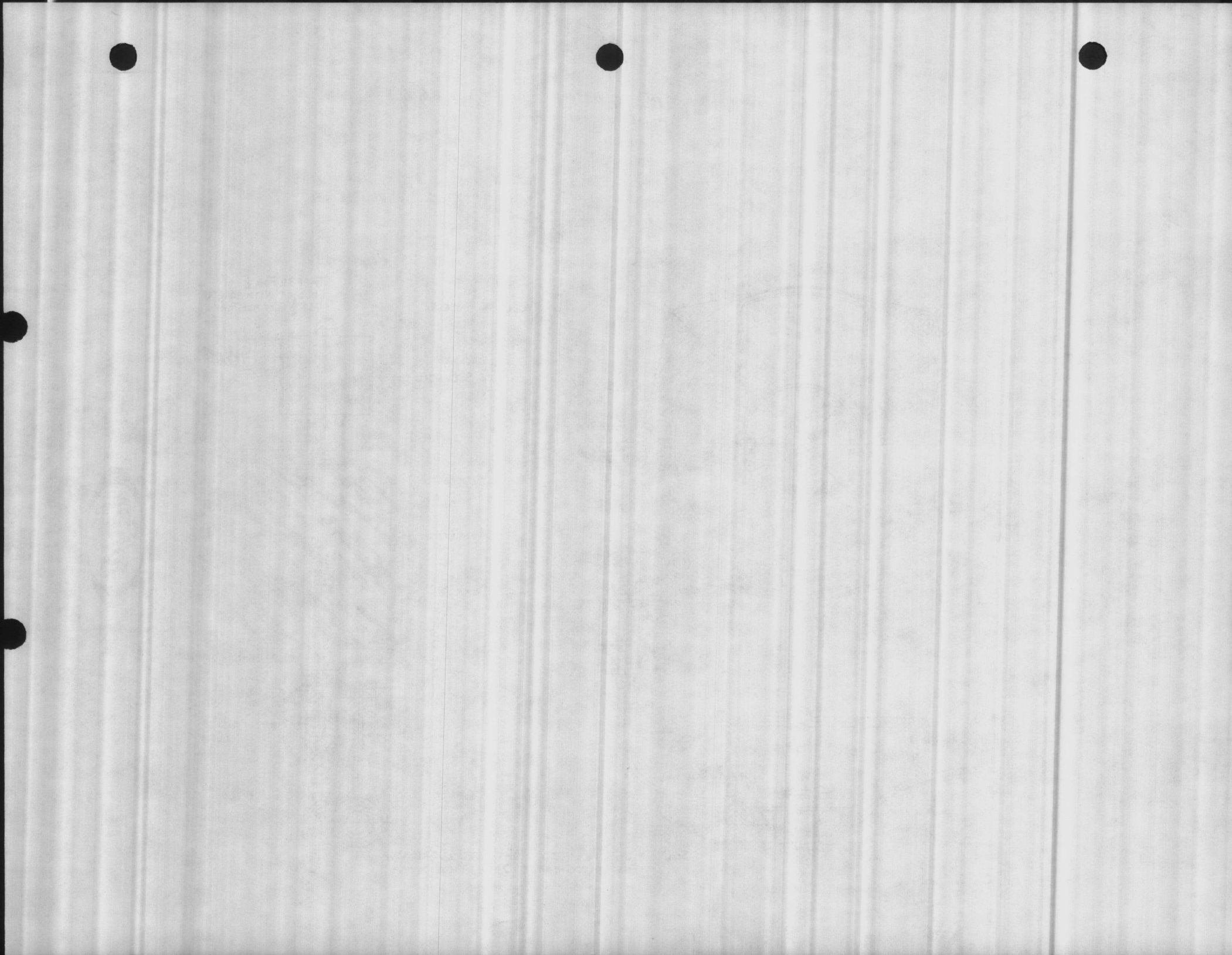
SIGHT FEED

SOLENOID - OPERATED SIGHT FEED LUBRICATOR  
FOR AUTOMATIC OPERATION

LMA99

PRINTED IN U.S.A.



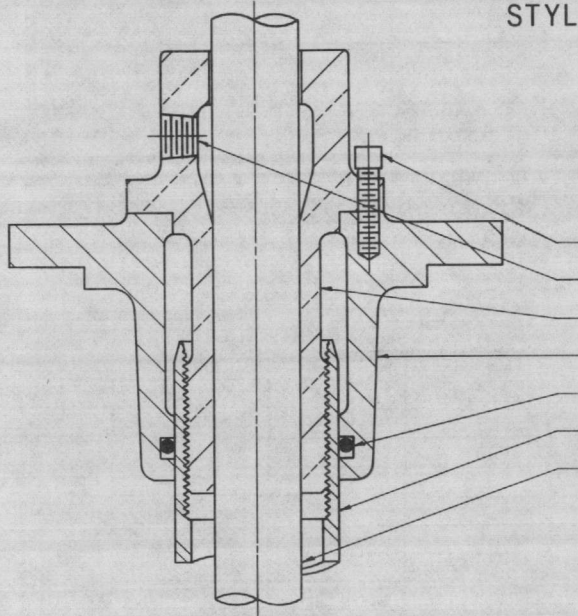


# SINGER

LAYNE & BOWLER DIVISION  
MEMPHIS, TENNESSEE U.S.A.



## STUFFING BOX ASSEMBLY OIL LUBRICATION STYLE 60



PART NAME	MATERIAL	
	STANDARD	SPECIAL
LOCK SCREW	STEEL	
OIL INLET		
TENSION BEARING	BRONZE	
TENSION BOX	CAST IRON	
O-RING	BUNA-N	
TUBING	C.S.-SCH. 80 PIPE	
LINE SHAFT	C-1045 CAR. STL.	

IN ORDERING REPLACEMENT PARTS, SPECIFY  
PARTS DESCRIPTION AND PUMP SERIAL NO.

### INSTALLATION AND OPERATING INSTRUCTIONS

- REMOVE THE LOCK SCREW AND THE O-RING AND THOROUGHLY CLEAN THE TENSION BOX INCLUDING THE O-RING GROOVE. REMOVE ANY NICKS OR BURRS FROM THE UPPER AND LOWER MOUNTING FACES AND MALE REGISTER WITH A FINE FLAT FILE. RE-INSTALL AND LIGHTLY OIL THE EXPOSED SURFACE OF THE O-RING.
- CLEAN THE SURFACE OF THE HEAD THAT RECEIVES THE TENSION BOX AND REMOVE ANY NICKS OR BURRS WITH A FINE FLAT FILE.
- CAREFULLY INSTALL THE TENSION BOX. ALIGN THE MOUNTING HOLES WITH THE TAPS IN THE HEAD AND SEAT THE BOX TO THE HEAD. INSTALL AND EVENLY TIGHTEN THE MOUNTING CAPSCREWS.
- CLEAN THE TENSION BEARING THOROUGHLY AND REMOVE ANY NICKS OR BURRS FROM THE MOUNTING FACE AND REGISTER WITH A FINE FLAT FILE. REMOVE ANY NICKS OR BURRS FROM THE THREADS WITH A THREE CORNERED FILE.
- OIL THE THREADS AND THE BORE AND CAREFULLY PLACE THE TENSION BEARING OVER THE SHAFT AND THREAD (RIGHT HAND) INTO THE TUBING. CONTINUE THREADING UNTIL THE LOWER FLANGE FACE FIRMLY CONTACTS THE TENSION BOX FACE.
- FOR THE PROPER AMOUNT OF TUBE TENSION, REFER TO INSTRUCTIONS PBI 100 PAGE 1 OR 2. FOR SETTINGS LESS THAN 100 FEET, TIGHTEN TO THE NEAREST LOCKING POSITION.

CHART 1 BELOW GIVES THE AMOUNT OF PULL-UP FOR EACH COMPLETE TURN,  
OF THE TENSION BEARING.

CHART 1

SIZE TUBING	1 1/4"	1 1/2"	2"	2 1/2"	3"	3 1/2"	4" & UP
NO. THD'S/IN	16	12	10	10		8	10
"A"	.063"	.083"	.100"	.100"		.125"	.100"

"A" = AMOUNT OF PULL-UP FOR EACH COMPLETE TURN OF THE TENSION BEARING.  
THE TOTAL NUMBER OF TURNS REQUIRED CAN BE CALCULATED BY DIVIDING THE  
FIGURE ABOVE INTO THE TENSION FIGURE FROM PBI 100.

EXAMPLE: 500 FEET OF 10" (.279" WALL) x 1 11/16" x 2 1/2": FROM PBI  
100, THE PROPER TENSION OR PULL-UP IS FOUND TO BE 0.529" AND FROM  
CHART 1, THE PULL-UP PER COMPLETE TURN IS 0.100" FOR 2 1/2" 10 THD.  
TUBING.

$$\text{TOTAL NO. OF TURNS} = \frac{0.529}{0.100} = 5.29 \text{ OR APPROXIMATELY } 5 \frac{1}{4}$$

IF AFTER ADJUSTING THE TENSION BEARING THE PROPER NUMBER OF TURNS, NO  
SLOT ALIGNS WITH THE LOCK SCREW TAP IN THE BOX. IT IS RECOMMENDED THAT  
THE BEARING BE BACKED OFF TO THE NEAREST ALIGNMENT POSITION IF IT  
TAKES MORE THAN AN EIGHTH TURN FORWARD TO ACHIEVE ALIGNMENT.

- INSTALL AND TIGHTEN THE LOCK SCREW.
- CONNECT THE LUBRICATOR TO THE OIL CONNECTION IN THE TENSION BEARING.  
FILL THE LUBRICATOR WITH A GOOD GRADE MINERAL OIL HAVING A VISCOSITY  
RATING OF APPROXIMATELY S.A.E. 10 AND HAVING A RELATIVELY LOW COLD  
POUR POINT.

CONTINUED ON PAGE 2



STYLE 60 INSTALLATION AND OPERATING INSTRUCTIONS

(CONTINUED)

IMPORTANT:

PRIOR TO INITIAL START-UP AND AFTER A SHUT DOWN OF 150 HOURS OR LONGER, THE LUBRICATOR SHOULD BE ADJUSTED FOR THE RECOMMENDED NUMBER OF DROPS PER MINUTE AS OUTLINED IN CHART 2 AND ALLOWED TO OPERATE AT THIS RATE FOR 20 MINUTES FOR EACH 100 FEET OF SETTING.

FOR NORMAL OPERATION, THE LUBRICATOR SHOULD BE ADJUSTED IN ACCORDANCE WITH CHART 2.

CHART 2

SHAFT SIZE	"A" LUBRICATOR SETTING IN DROPS PER MIN.	"B" DROPS PER MIN. PER EACH 100 FT. SETTING
7/8 - 1 3/16	5	2
1 1/2 - 1 11/16	7	3
1 15/16 - 2 7/16	10	4
2 11/16	12	5

$$\text{TOTAL DROPS/MIN.} = \frac{\text{"A"} + (\text{SETTING} \times \text{"B"})}{100}$$

EXAMPLE: 500 FEET OF 1 11/16" x 2 1/2"

$$\text{TOTAL DROPS/MIN.} = 7 \times \frac{(500 \times 3)}{100} = 7 + (5 \times 3) = 7 + 15 = \underline{22}$$

- THE LUBRICATOR SHOULD BE CHECKED PERIODICALLY AND RESET IF REQUIRED TO MAINTAIN THE PROPER FLOW.

THE APPROXIMATE NUMBER OF HOURS OF CONTINUOUS OPERATION AT VARIOUS FLOW RATES CAN BE FOUND IN CHART 3. IT IS GENERALLY RECOMMENDED THAT THE LUBRICATION BE RE-FILLED WHEN IT IS NO LESS THAN ONE QUARTER FULL.

CHART 3

FLOW RATE DROPS/MIN.	NUMBER OF HOURS OF CONTINUOUS OPERATION		
	LUBRICATOR CAPACITY		
	1 QUART	2 QUART	3 QUART
5	110	220	440
10	55	110	220
15	38	75	150
20	28	55	110
25	22	45	90
30	19	38	75
40	14	28	55
50	11	22	45



# SINGER

LAYNE & BOWLER DIVISION  
MEMPHIS, TENNESSEE U.S.A.



## TUBE TENSION ADJUSTMENT CHART

COLUMN SIZE	SHAFT AND TUBING SIZE	TUBE TENSION IN INCHES									
		SETTING IN FEET									
		100	200	300	400	500	600	700	800	900	1000
3" MC* (.187)	1 1/4 x 7/8	0.025	0.103	0.233	0.415	0.649					
	1 1/2 x 1	0.028	0.115	0.261	0.465	0.726					
4" * (.237)	1 1/4 x 7/8	0.020	0.083	0.186	0.333	0.520	0.750	1.021	1.334	1.688	2.084
	1 1/2 x 1	0.022	0.090	0.202	0.361	0.564	0.813	1.107	1.447	1.831	2.260
SCH. 40S	2 x 1 3/16	0.025	0.103	0.233	0.416	0.650	0.936	1.275	1.666	2.108	2.603
5" * (.258)	1 1/4 x 7/8	0.018	0.075	0.171	0.305	0.476	0.686	0.934	1.220	1.544	1.906
	1 1/2 x 1	0.020	0.081	0.182	0.325	0.508	0.733	0.998	1.303	1.650	2.036
SCH. 40S	2 x 1 3/16	0.022	0.091	0.205	0.366	0.571	0.824	1.121	1.465	1.854	2.289
6" * (.280)	1 1/4 x 7/8	0.017	0.071	0.160	0.286	0.447	0.644	0.878	1.146	1.451	1.791
	1 1/2 x 1	0.018	0.075	0.169	0.302	0.472	0.681	0.927	1.211	1.532	1.892
SCH 40S	2 x 1 3/16	0.020	0.083	0.187	0.333	0.521	0.751	1.022	1.335	1.690	2.086
	2 1/2 x 1 1/2	0.024	0.098	0.220	0.393	0.613	0.884	1.204	1.572	1.990	2.457
	2 1/2 x 1 11/16	0.025	0.102	0.231	0.412	0.643	0.927	1.263	1.649	2.088	2.577
	3 x 1 15/16	0.029	0.119	0.269	0.480	0.750	1.080	1.471	1.922	2.432	3.003
	1 1/2 x 1	0.017	0.071	0.161	0.287	0.449	0.647	0.881	1.151	1.457	1.798
	2 x 1 3/16	0.019	0.077	0.175	0.313	0.488	0.704	0.958	1.252	1.584	1.956
7" * (.300)	2 1/2 x 1 1/2	0.022	0.089	0.202	0.360	0.563	0.811	1.105	1.443	1.827	2.255
	2 1/2 x 1 11/16	0.023	0.093	0.211	0.376	0.587	0.846	1.153	1.506	1.906	2.353
	3 x 1 15/16	0.026	0.107	0.242	0.431	0.673	0.970	1.321	1.726	2.184	2.696
	3 1/2 x 2 3/16	0.030	0.121	0.272	0.485	0.757	1.092	1.486	1.941	2.457	3.034
	3 1/2 x 2 7/16	0.031	0.127	0.287	0.512	0.800	1.153	1.570	2.050	2.595	3.204
8" * (.277)	2 x 1 3/16	0.019	0.076	0.173	0.308	0.481	0.694	0.945	1.234	1.562	1.928
	2 1/2 x 1 1/2	0.022	0.088	0.198	0.354	0.552	0.796	1.084	1.416	1.793	2.213
	2 1/2 x 1 11/16	0.022	0.091	0.206	0.368	0.575	0.829	1.129	1.475	1.867	2.306
	3 x 1 15/16	0.026	0.105	0.236	0.421	0.657	0.947	1.290	1.684	2.132	2.632
	3 1/2 x 2 3/16	0.029	0.117	0.265	0.472	0.737	1.062	1.447	1.890	2.392	2.953
SCH 30	3 1/2 x 2 7/16	0.031	0.124	0.279	0.498	0.778	1.121	1.526	1.993	2.522	3.114
8" (.322)	2 x 1 3/16	0.018	0.074	0.166	0.297	0.464	0.668	0.910	1.189	1.505	1.858
	2 1/2 x 1 1/2	0.020	0.083	0.188	0.336	0.525	0.757	1.031	1.347	1.704	2.104
	2 1/2 x 1 11/16	0.021	0.087	0.196	0.349	0.545	0.786	1.070	1.398	1.769	2.184
	3 x 1 15/16	0.024	0.098	0.221	0.394	0.616	0.887	1.208	1.579	1.998	2.467
	3 1/2 x 2 3/16	0.027	0.109	0.246	0.439	0.685	0.987	1.344	1.756	2.223	2.744
SCH. 40S	3 1/2 x 2 7/16	0.028	0.115	0.259	0.461	0.720	1.038	1.413	1.846	2.336	2.884
9" * (.312)	2 x 1 3/16	0.018	0.072	0.163	0.291	0.455	0.655	0.892	1.166	1.476	1.822
	2 1/2 x 1 1/2	0.020	0.081	0.183	0.327	0.511	0.737	1.003	1.311	1.659	2.048
	2 1/2 x 1 11/16	0.021	0.084	0.190	0.339	0.530	0.763	1.040	1.358	1.719	2.122
	3 x 1 15/16	0.023	0.095	0.213	0.381	0.595	0.857	1.167	1.524	1.929	2.382
	3 1/2 x 2 3/16	0.026	0.105	0.236	0.422	0.658	0.949	1.292	1.688	2.136	2.637
SCH. 40S	3 1/2 x 2 7/16	0.027	0.110	0.248	0.442	0.690	0.995	1.355	1.770	2.240	2.766
10" * (.279)	2 x 1 3/16	0.018	0.072	0.163	0.291	0.454	0.655	0.891	1.164	1.474	1.819
	2 1/2 x 1 1/2	0.020	0.081	0.183	0.327	0.510	0.736	1.002	1.309	1.656	2.045
	2 1/2 x 1 11/16	0.021	0.084	0.190	0.338	0.529	0.762	1.038	1.355	1.716	2.118
	3 x 1 15/16	0.023	0.094	0.213	0.380	0.593	0.855	1.164	1.521	1.925	2.377
	3 1/2 x 2 3/16	0.026	0.104	0.236	0.420	0.657	0.946	1.289	1.683	2.131	2.630
	3 1/2 x 2 7/16	0.027	0.110	0.247	0.441	0.689	0.992	1.351	1.765	2.234	2.758
10" (.307)	4 x 2 11/16	0.030	0.122	0.276	0.492	0.769	1.108	1.509	1.971	2.494	3.079
	2 x 1 3/16	0.017	0.071	0.159	0.285	0.445	0.641	0.873	1.141	1.444	1.783
	2 1/2 x 1 1/2	0.019	0.079	0.178	0.318	0.496	0.715	0.974	1.272	1.610	1.988
	2 1/2 x 1 11/16	0.020	0.081	0.184	0.328	0.513	0.739	1.007	1.315	1.664	2.055
	3 x 1 15/16	0.022	0.091	0.205	0.366	0.572	0.824	1.122	1.466	1.855	2.290
	3 1/2 x 2 3/16	0.025	0.100	0.226	0.403	0.629	0.907	1.235	1.614	2.042	2.521
SCH. 30	3 1/2 x 2 7/16	0.026	0.105	0.236	0.422	0.659	0.949	1.292	1.688	2.137	2.638
	4 x 2 11/16	0.029	0.116	0.263	0.469	0.732	1.055	1.436	1.876	2.374	2.931

NOTE: ALL PIPE MARKED \* IS SINGER-LAYNE & BOWLER DIV. STANDARD

# SINGER

LAYNE & BOWLER DIVISION  
MEMPHIS, TENNESSEE U.S.A.



## TUBE TENSION ADJUSTMENT CHART

COLUMN SIZE	SHAFT AND TUBING SIZE	TUBE TENSION IN INCHES									
		SETTING IN FEET									
		100	200	300	400	500	600	700	800	900	1000
10" (365) 40S	2 x 1 3/16	0.017	0.068	0.154	0.276	0.430	0.620	0.845	1.104	1.397	1.725
	2 1/2 x 1 1/2	0.018	0.075	0.170	0.303	0.474	0.683	0.930	1.215	1.538	1.899
	2 1/2 x 1 11/16	0.019	0.077	0.175	0.312	0.488	0.703	0.958	1.251	1.583	1.955
	3 x 1 15/16	0.021	0.085	0.193	0.344	0.538	0.775	1.055	1.378	1.745	2.154
	3 1/2 x 2 3/16	0.023	0.093	0.210	0.376	0.586	0.845	1.151	1.504	1.903	2.349
	3 1/2 x 2 7/16	0.024	0.097	0.219	0.391	0.611	0.881	1.199	1.567	1.983	2.448
4 x 2 11/16	0.026	0.107	0.242	0.431	0.673	0.970	1.321	1.725	2.183	2.695	
12" * (330) SCH. 30	2 1/2 x 1 1/2	0.018	0.074	0.166	0.297	0.464	0.670	0.912	1.191	1.508	1.861
	2 1/2 x 1 11/16	0.019	0.076	0.171	0.306	0.477	0.688	0.937	1.225	1.550	1.913
	3 x 1 15/16	0.020	0.083	0.188	0.335	0.524	0.755	1.028	1.342	1.699	2.098
	3 1/2 x 2 3/16	0.022	0.090	0.204	0.364	0.569	0.820	1.116	1.458	1.846	2.278
	3 1/2 x 2 7/16	0.023	0.094	0.212	0.379	0.592	0.853	1.161	1.517	1.919	2.370
4 x 2 11/16	0.025	0.103	0.233	0.415	0.649	0.935	1.273	1.663	2.105	2.599	
12" (375) "S"	2 1/2 x 1 1/2	0.018	0.072	0.162	0.289	0.451	0.650	0.886	1.157	1.464	1.808
	2 1/2 x 1 11/16	0.018	0.073	0.166	0.296	0.463	0.667	0.908	1.187	1.502	1.854
	3 x 1 15/16	0.020	0.080	0.181	0.322	0.503	0.726	0.988	1.291	1.634	2.017
	3 1/2 x 2 3/16	0.021	0.086	0.195	0.348	0.543	0.783	1.066	1.393	1.763	2.177
	3 1/2 x 2 7/16	0.022	0.090	0.202	0.361	0.563	0.812	1.106	1.444	1.828	2.257
4 x 2 11/16	0.024	0.098	0.220	0.393	0.614	0.885	1.205	1.574	1.992	2.459	
14" * (375) SCH. 30S	2 1/2 x 1 1/2	0.017	0.070	0.158	0.283	0.442	0.637	0.868	1.133	1.435	1.771
	2 1/2 x 1 11/16	0.018	0.072	0.162	0.290	0.452	0.652	0.888	1.160	1.468	1.813
	3 x 1 15/16	0.019	0.078	0.175	0.313	0.489	0.705	0.961	1.255	1.588	1.961
	3 1/2 x 2 3/16	0.021	0.084	0.189	0.337	0.526	0.758	1.032	1.348	1.706	2.106
	3 1/2 x 2 7/16	0.021	0.086	0.195	0.348	0.544	0.784	1.067	1.394	1.765	2.179
4 x 2 11/16	0.023	0.094	0.212	0.378	0.590	0.850	1.157	1.512	1.914	2.362	
16" * (375) SCH. 30S	3 x 1 15/16	0.018	0.075	0.169	0.302	0.472					
	3 1/2 x 2 3/16	0.020	0.080	0.180	0.322	0.503					
	3 1/2 x 2 7/16	0.020	0.082	0.186	0.332	0.519					
	4 x 2 11/16	0.022	0.089	0.201	0.358	0.559					

NOTE: ALL PIPE MARKED \* IS SINGER-LAYNE & BOWLER DIV. STANDARD.



# VERTICAL CENTRIFUGAL PUMP

Installation of Pump Bowls and Column

## Butt Joint Column

### Enclosed Line Shaft

**Derrick** Installation of a Layne Pump requires a derrick 30 to 40 feet in height and a hand winch or power hoist of sufficient size to handle the total weight.

**Foundation** The concrete foundation for the pump base should be built in accordance with foundation plans furnished by the factory. Where a separate pump base plate is used it should be set in position in the concrete foundation before the pump bowls and column are installed but not grouted into position until the installation is completed.

**Dimensions of Well** Check the inside diameter of the well and the outside diameter of the pump bowls and column flanges or couplings to be sure that the pump and column will go in the well with ample clearance. The well casing must be straight and without obstructions that might bend the line shaft. Measure the static level of the water in the well to determine if the pump has been furnished with the proper depth of setting. The pump bowls should be submerged when the pump is operating and we do not recommend or guarantee satisfactory operation with a suction lift.

**Check Material** Check all parts of the pump against the packing list to find out whether all parts have been received. If any parts are missing claim should be made at once to the railroad company.

**Clean All Joints** All threads and flanged couplings of the discharge pipe and protective tubing should be carefully cleaned and at the time of installation coated with L A Y N C O T E. Care should be taken that there be absolutely no sand or grit between flanges or couplings when making up the joints.

**Suction** If a basket suction is used it should be lowered into the well first and held by pipe clamps. The suction pipe is picked up and screwed into the coupling at top of basket suction. The basket suction and suction pipe are then lowered into the well until about 18 inches of suction pipe extend above the well casing. The suction pipe is clamped in this position with pipe clamps. When the suction pipe has only threads at the top end care should be taken to place the clamps under the small lug welded on the pipe.

**Pump Bowls** The pump bowls should be carefully inspected before placing in the well. Rotate impeller shaft several times by hand to be sure that it does not bind at any point. The impeller shaft should have about  $\frac{1}{4}$ -inch or more end play. DO NOT STRAIN SHAFT IN ANY WAY THAT MIGHT BEND IT AND DO NOT LIFT PUMP BOWLS BY THE SHAFT. The pump bowls can best be handled by a pair of pipe clamps. The bowls should be lifted into position and screwed or bolted to the suction pipe. The clamps on the suction pipe are then removed and the bowls and suction pipe lowered into the well until the top of the discharge nozzle is about 18 inches above the well casing or top of foundation. The bowls are then supported at this point by pipe clamps.

**Discharge Column Pipe** Check the enclosed chart to determine the correct spacing of the spiders in the discharge column. If the discharge pipe screws into the pump bowl be sure to have the coupling at the top end of the first section either with the spider or without the spider as shown on the chart. If the lower section of discharge pipe has a special flange to connect to the pump bowls be sure to arrange the pipe with this flange at the lower end.

**Protective Tubing and Shaft** The shaft and protective tubing are shipped assembled in 20-ft. or 10-ft. lengths and packed with sufficient lubricant to prevent rusting. A 20-ft. length or 10-ft. length of shaft and tubing is required for each 20-ft. or 10-ft. length of pipe. Remove the protecting cap only from the top end of the tubing, which is the end fitted with the bronze shaft bearing and tubing coupling. Slide the assembled tubing and shafting into the discharge column pipe, making sure that the bronze bearing end of the assembly will be on top.

**Installing Discharge Column** Pull the tubing about six inches below the lower end of the discharge pipe and tie them together in this position with a piece of rope by taking several half hitches around the pipe and then the tubing.

Raise the assembled section of pipe, tubing and shafting until it is hanging vertically in the derrick with the lower end of the tubing about one inch above a board placed on the foundation. Remove the lower plug from the tubing to release the shaft. Raise the discharge pipe about six inches and take several half hitches around the shaft. This method avoids straining the shaft as the column is swung under the derrick. Swing the discharge pipe into position over the pump bowls and screw the shaft into the shaft coupling until it butts against the impeller shaft.

THE THREADS AND THE ENDS OF THE SHAFTING AND THE SHAFT COUPLINGS MUST BE PERFECTLY CLEAN.

Lower the discharge pipe and tubing and screw the tubing onto the main bearing box about 3 or 4 threads. Then coat the threads on the bronze box with L A Y N C O T E and screw the tubing on the box until it butts. The discharge pipe is then bolted or screwed to the pump bowls.

Remove the clamps from the pump bowls and lower the pump bowls with the section of discharge column until the column extends about 18 inches above the well casing or foundation. Clamp the discharge column in this position.

Remove the bronze shaft bearing and tubing coupling and pour about one pint of oil into the tubing. The oil used should be a good grade of mineral oil free from grit and foreign matter, with a viscosity rating approximately SAE 10 and having a relatively low cold pour point.

When the next section of discharge column is in position in the derrick replace the bronze bearing, screwing it into the tubing about 3 or 4 threads. After the spider and spider bushing or aligning ring have been installed (as described below) and the shaft connection is made, lower the discharge pipe and tubing and screw the tubing onto the bronze bearing about 3 or 4 threads. Then coat the threads of the bearing with L A Y N C O T E and screw the tubing on the bearing until the ends butt tightly together. IT IS VERY IMPORTANT THAT EVERY TUBING JOINT BE TIGHT AND to form a seal the ends of the tubing must be smooth and square. While handling and installing the tubing use care to keep from scoring or damaging the ends in any way.

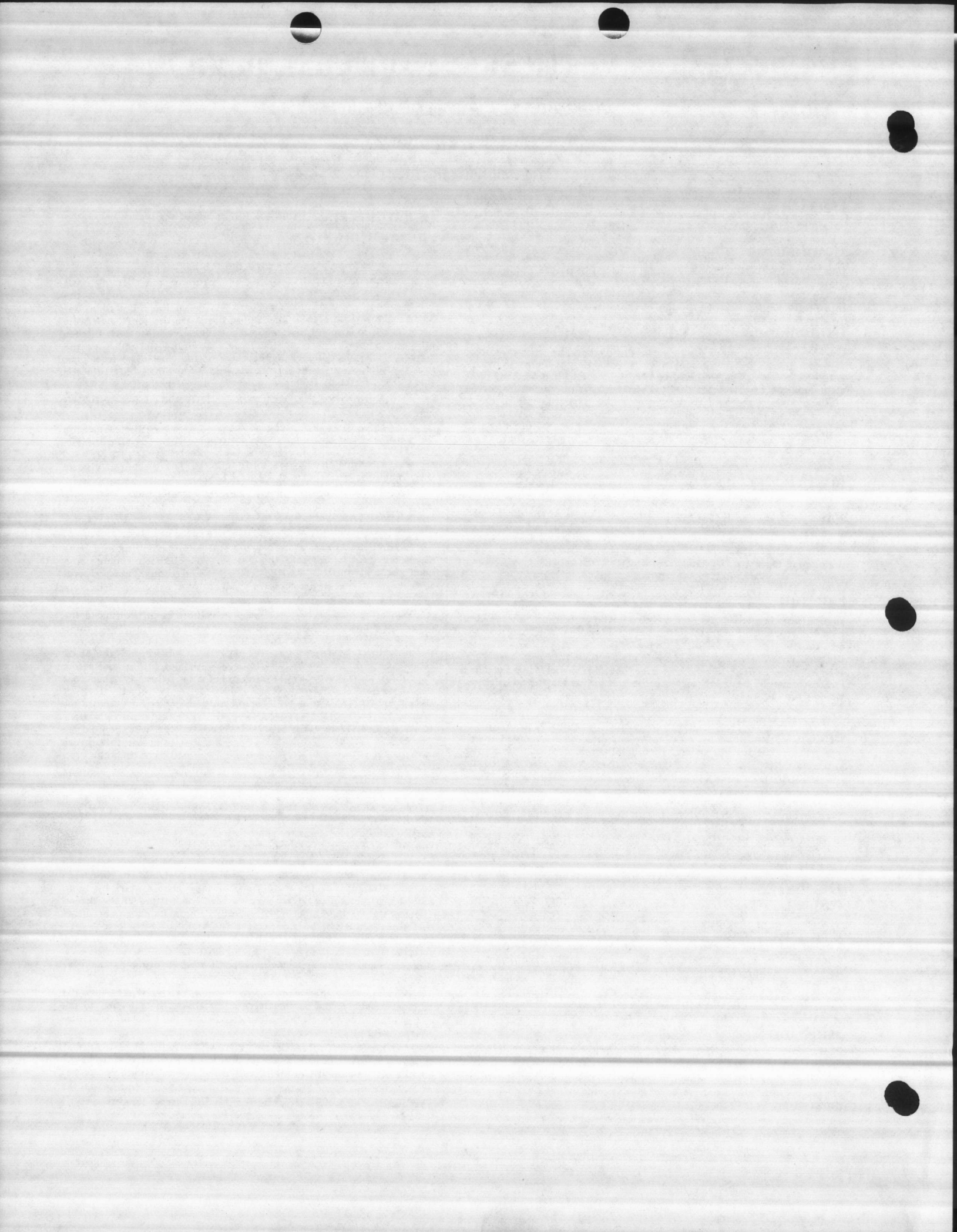
When flanged column is used, slip a bronze spider or aligning ring over the top of the tubing and fit it into the recess in the flange. (Refer to spider spacing chart to determine whether a flange or aligning ring should be used at the joint in question). When screw coupled column is used the spider is cast integral with the coupling. The rubber spider bushings are installed in the spiders before shipment from the factory.

Each section of discharge column is installed as described above. When screw couplings are used care should be taken in starting the pipe in the coupling. The pipe should start by hand and screw by hand to within 5 or 6 threads of butting. If the thread appears tighter than this check carefully for a damaged thread as the pipe should not be forced into the coupling. The last 5 or 6 threads should be made up with a chain tong, making sure that the joint is tight with the pipe butting against the shoulder in the coupling or against the end of the pipe in the coupling as the case might be.

When the line shaft connects to the motor drive shaft below the tension assembly, the motor drive shaft should be attached to the line shaft in the top section of tubing before the top length of discharge column is installed.

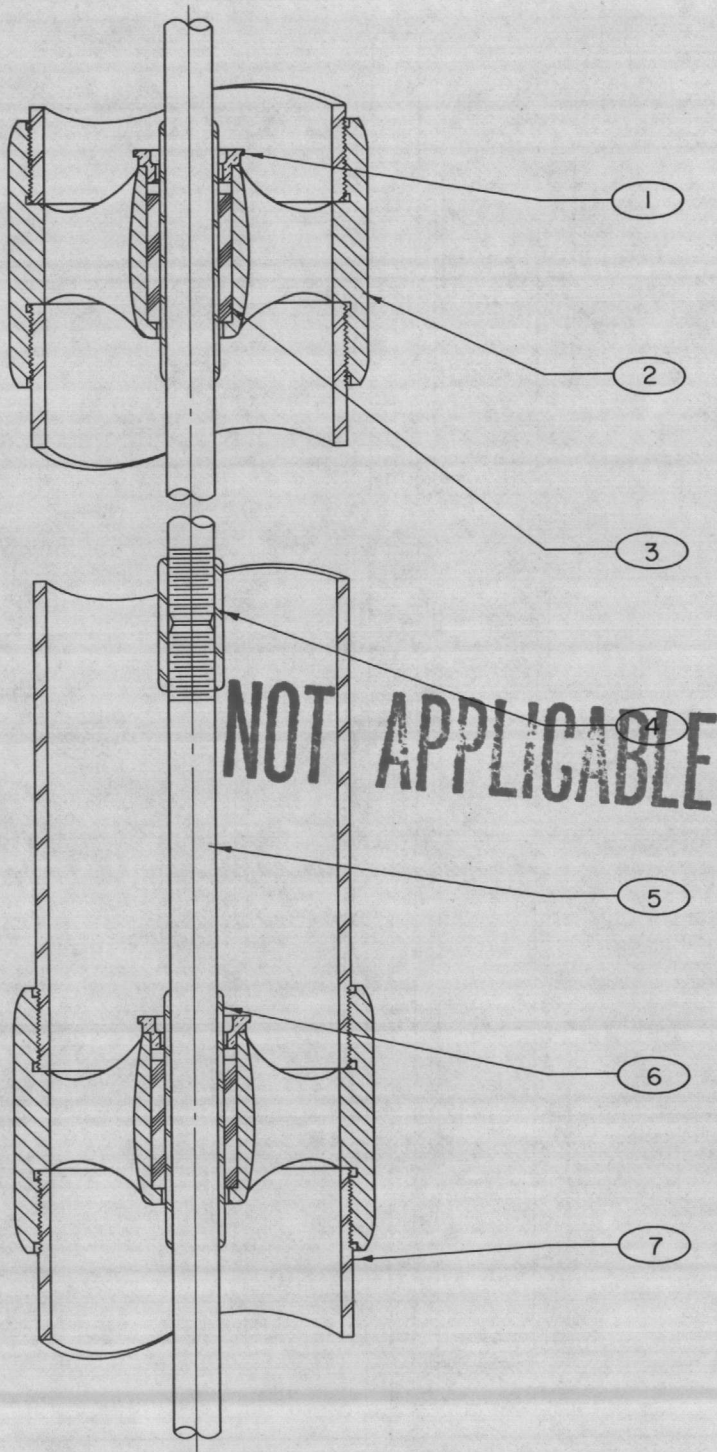
The top length of discharge pipe will usually have a special flange or special threads to connect to the bottom of the discharge ell and the top length of shaft will be of special length.

In case the discharge column does not check out within reasonable limits notify the factory to furnish the correct lengths.





DISCHARGE COLUMN ASSEMBLY  
SCREWED COUPLED - OPEN LINE SHAFT



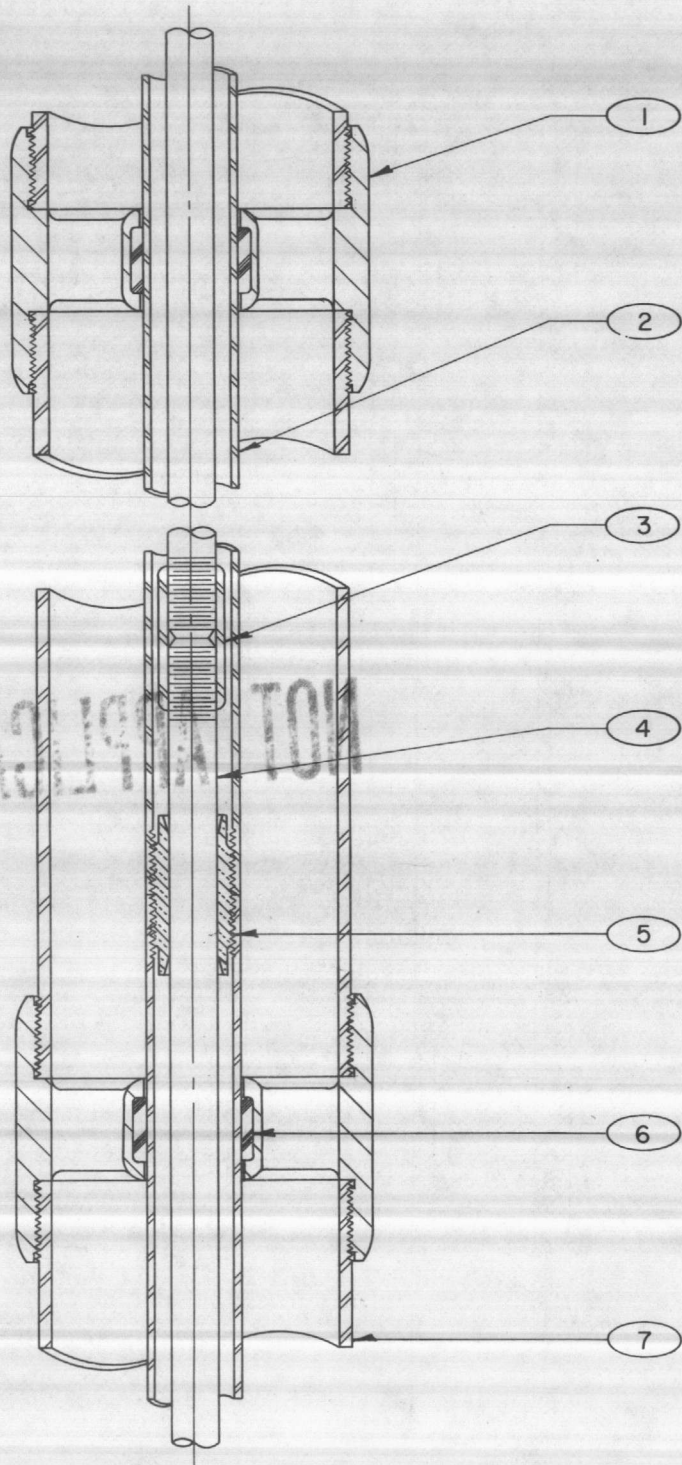
ITEM NO.	DESCRIPTION
1	LOCK RING
2	COMBINATION COUPLING
3	RUBBER BEARING
4	SHAFT COUPLING

ITEM NO.	DESCRIPTION
5	LINE SHAFT
6	MONEL SLEEVE
7	COLUMN PIPE

IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.



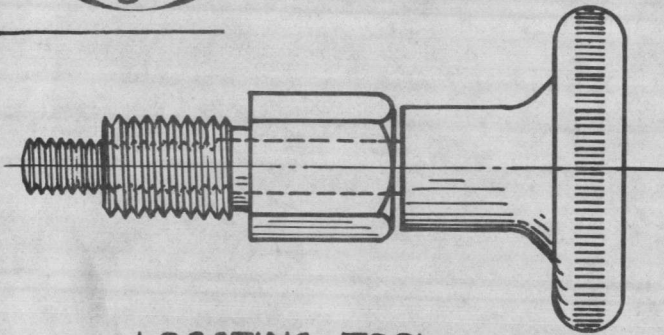
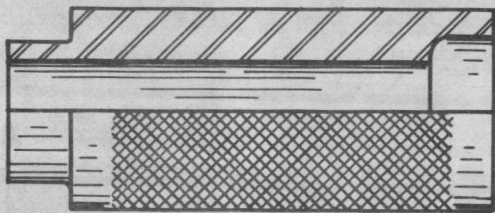
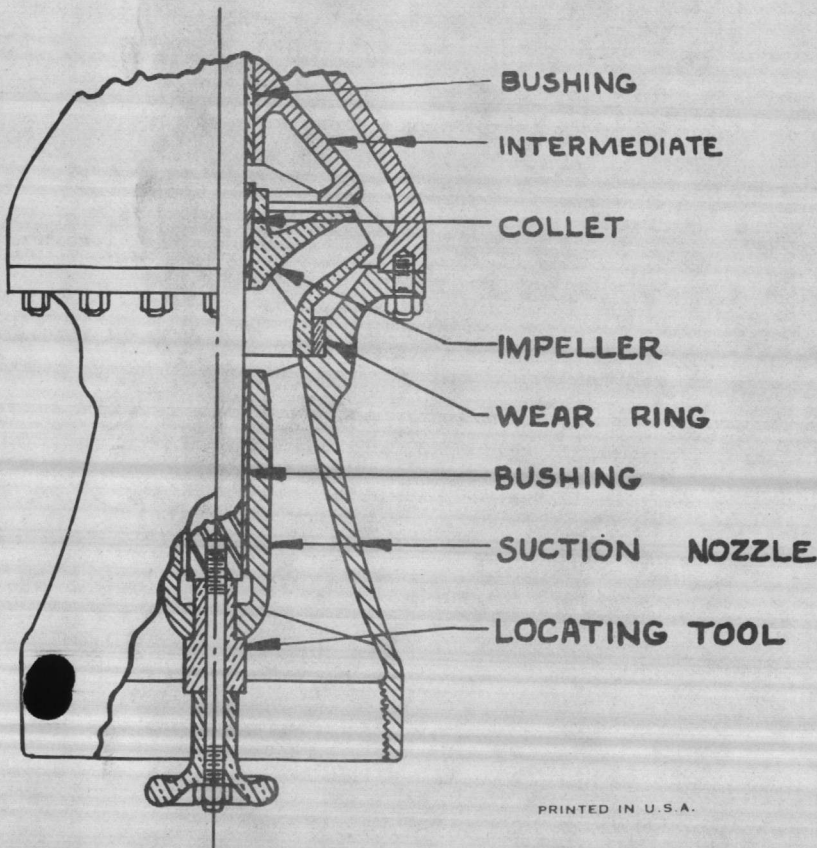
DISCHARGE COLUMN ASSEMBLY  
SCREWED TYPE - ENCLOSED LINE SHAFT



ITEM NO.	DESCRIPTION
1	COMBINATION COUPLING
2	SHAFT TUBING
3	SHAFT COUPLING
4	LINE SHAFT

ITEM NO.	DESCRIPTION
5	SHAFT BOX
6	RUBBER BEARING
7	COLUMN PIPE

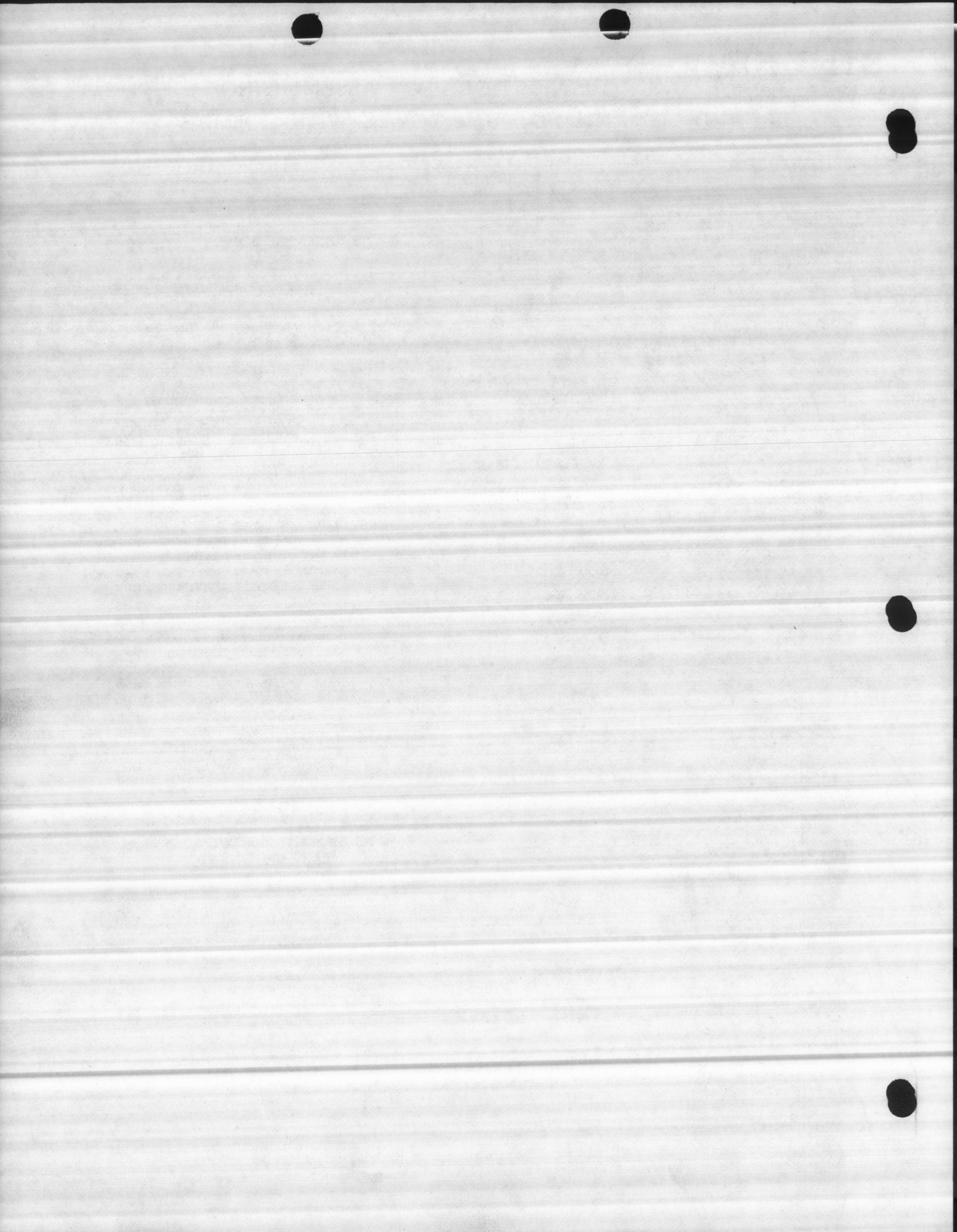
IN ORDERING REPLACEMENT PARTS, SPECIFY PART DESCRIPTION & PUMP SERIAL NO.

**SINGER**LAYNE & BOWLER DIVISION  
MEMPHIS, TENNESSEE U.S.A.**INSTRUCTIONS FOR ASSEMBLY  
AND DISMANTLING PUMP BOWLS WITH COLLETS****LOCATING TOOL****MALE  
END****FEMALE  
END****COLLET DRIVER****TO ASSEMBLE BOWL**

1. Remove cap screw from the bottom of the suction nozzle.
2. Screw locating tool into bottom end of suction nozzle hub.
3. Insert impeller shaft into suction nozzle bearing and turn hand-wheel of locating tool until impeller shaft is pulled down tight against the shoulder of the tool.
4. Place the impeller over the shaft. Slip the collet over the shaft with the small end first. (A screw driver can be used to spread collet for ease in slipping over shaft). Hold the impeller firmly into the wear ring recess and drive the collet into place with the male end of the collet driver.
5. Remove collet driver and assemble first intermediate stage. Place the next impeller over the shaft and continue to assemble as explained above.
6. When the bowl is completely assembled remove locating tool and replace cap screw in suction nozzle.

**TO DISMANTLE BOWL**

1. Remove discharge nozzle. Place collet driver over shaft with the female end first and while holding the impeller out of the wear ring recess, drive the impeller off of the collet. Remove the collet and impeller.
2. Remove the intermediate shell and drive the impeller off of the next collet. Continue to dismantle in like manner.

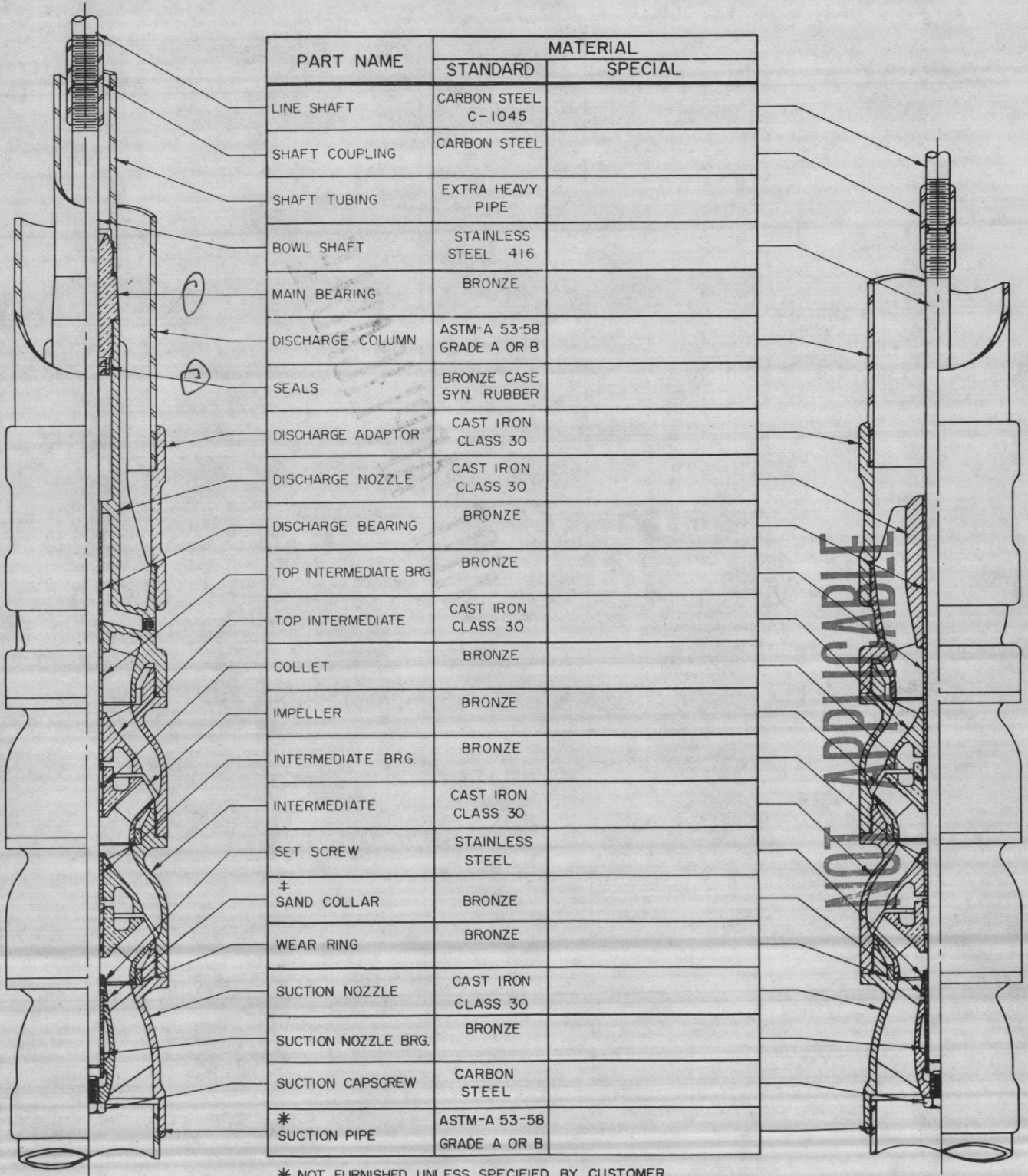






# VERTICAL TURBINE PUMP DEEP WELL

8" B, DR, PR, RK, T, UR - 10" RK, T, U - 12" T, UR



PART NAME	MATERIAL	
	STANDARD	SPECIAL
LINE SHAFT	CARBON STEEL C-1045	
SHAFT COUPLING	CARBON STEEL	
SHAFT TUBING	EXTRA HEAVY PIPE	
BOWL SHAFT	STAINLESS STEEL 416	
MAIN BEARING	BRONZE	
DISCHARGE COLUMN	ASTM-A 53-58 GRADE A OR B	
SEALS	BRONZE CASE SYN RUBBER	
DISCHARGE ADAPTOR	CAST IRON CLASS 30	
DISCHARGE NOZZLE	CAST IRON CLASS 30	
DISCHARGE BEARING	BRONZE	
TOP INTERMEDIATE BRG	BRONZE	
TOP INTERMEDIATE	CAST IRON CLASS 30	
COLLET	BRONZE	
IMPELLER	BRONZE	
INTERMEDIATE BRG.	BRONZE	
INTERMEDIATE	CAST IRON CLASS 30	
SET SCREW	STAINLESS STEEL	
‡ SAND COLLAR	BRONZE	
WEAR RING	BRONZE	
SUCTION NOZZLE	CAST IRON CLASS 30	
SUCTION NOZZLE BRG.	BRONZE	
SUCTION CAPSCREW	CARBON STEEL	
* SUCTION PIPE	ASTM-A 53-58 GRADE A OR B	

\* NOT FURNISHED UNLESS SPECIFIED BY CUSTOMER  
‡ HARD RUBBER USED ON 8" BOWLS

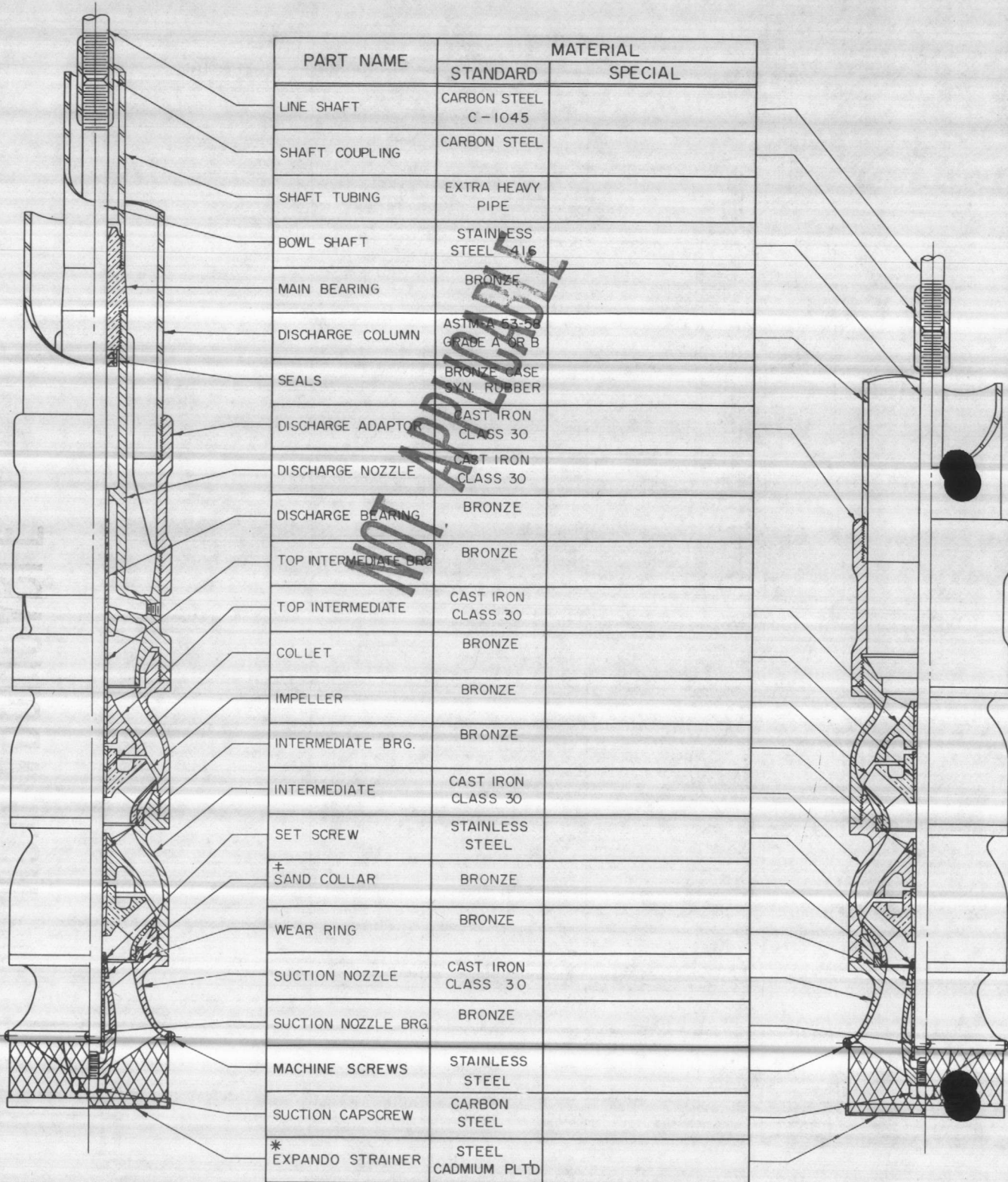
ENCLOSED LINE SHAFT

OPEN LINE SHAFT

# VERTICAL TURBINE PUMP SHORT COUPLED



8" B, DR, PR, RK, T, UR-10" RK, T, U-12" T, UR



PART NAME	MATERIAL	
	STANDARD	SPECIAL
LINE SHAFT	CARBON STEEL C-1045	
SHAFT COUPLING	CARBON STEEL	
SHAFT TUBING	EXTRA HEAVY PIPE	
BOWL SHAFT	STAINLESS STEEL 316	
MAIN BEARING	BRONZE	
DISCHARGE COLUMN	ASTM A 53-58 GRADE A OR B	
SEALS	BRONZE CASE SYN. RUBBER	
DISCHARGE ADAPTOR	CAST IRON CLASS 30	
DISCHARGE NOZZLE	CAST IRON CLASS 30	
DISCHARGE BEARING	BRONZE	
TOP INTERMEDIATE BRG.	BRONZE	
TOP INTERMEDIATE	CAST IRON CLASS 30	
COLLET	BRONZE	
IMPELLER	BRONZE	
INTERMEDIATE BRG.	BRONZE	
INTERMEDIATE	CAST IRON CLASS 30	
SET SCREW	STAINLESS STEEL	
± SAND COLLAR	BRONZE	
WEAR RING	BRONZE	
SUCTION NOZZLE	CAST IRON CLASS 30	
SUCTION NOZZLE BRG.	BRONZE	
MACHINE SCREWS	STAINLESS STEEL	
SUCTION CAPSCREW	CARBON STEEL	
* EXPANDO STRAINER	STEEL CADMIUM PLTD	

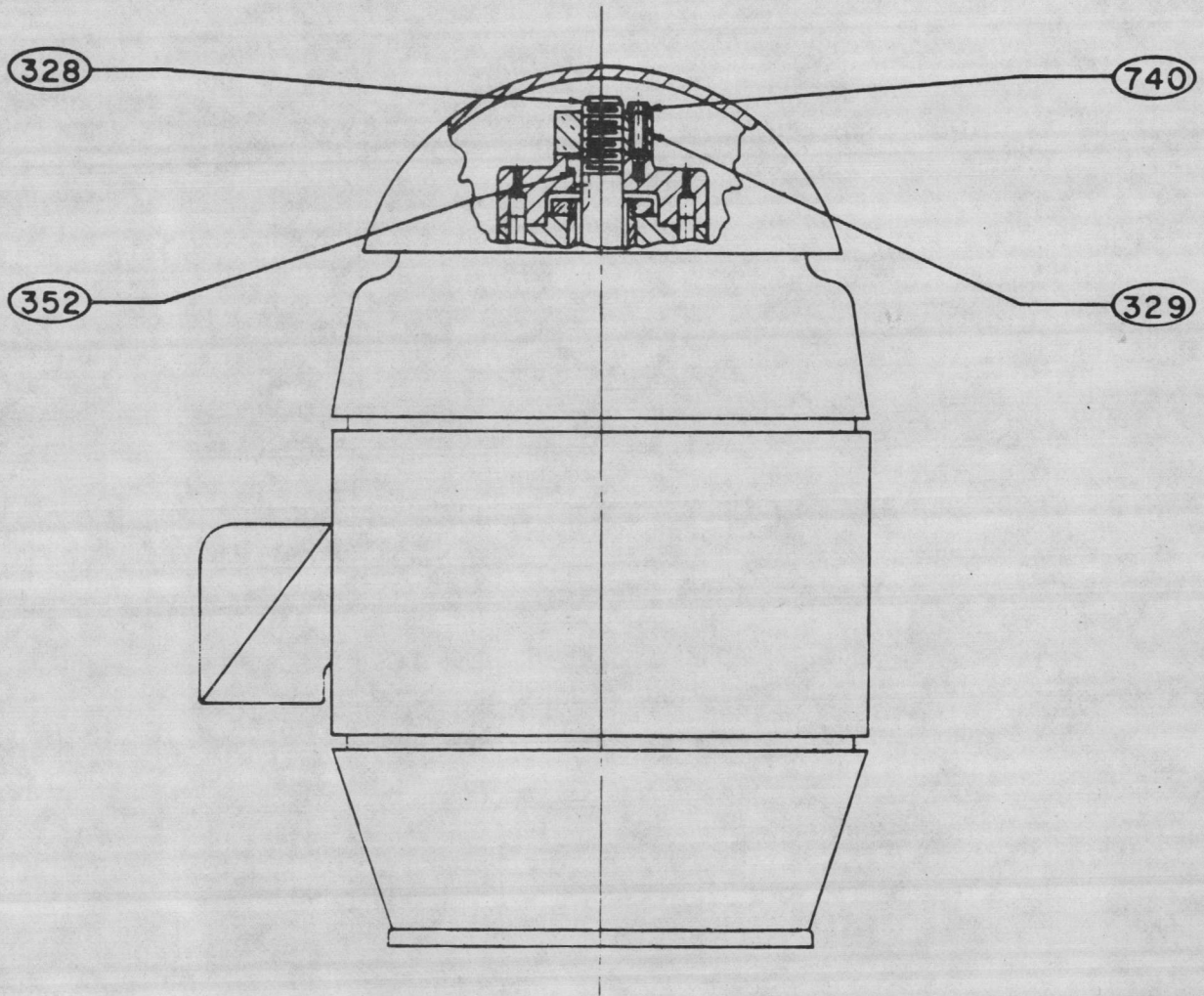
ENCLOSED LINE SHAFT

\* NOT FURNISHED UNLESS SPECIFIED BY CUSTOMER  
± HARD RUBBER USED ON 8" BOWLS

OPEN LINE SHAFT



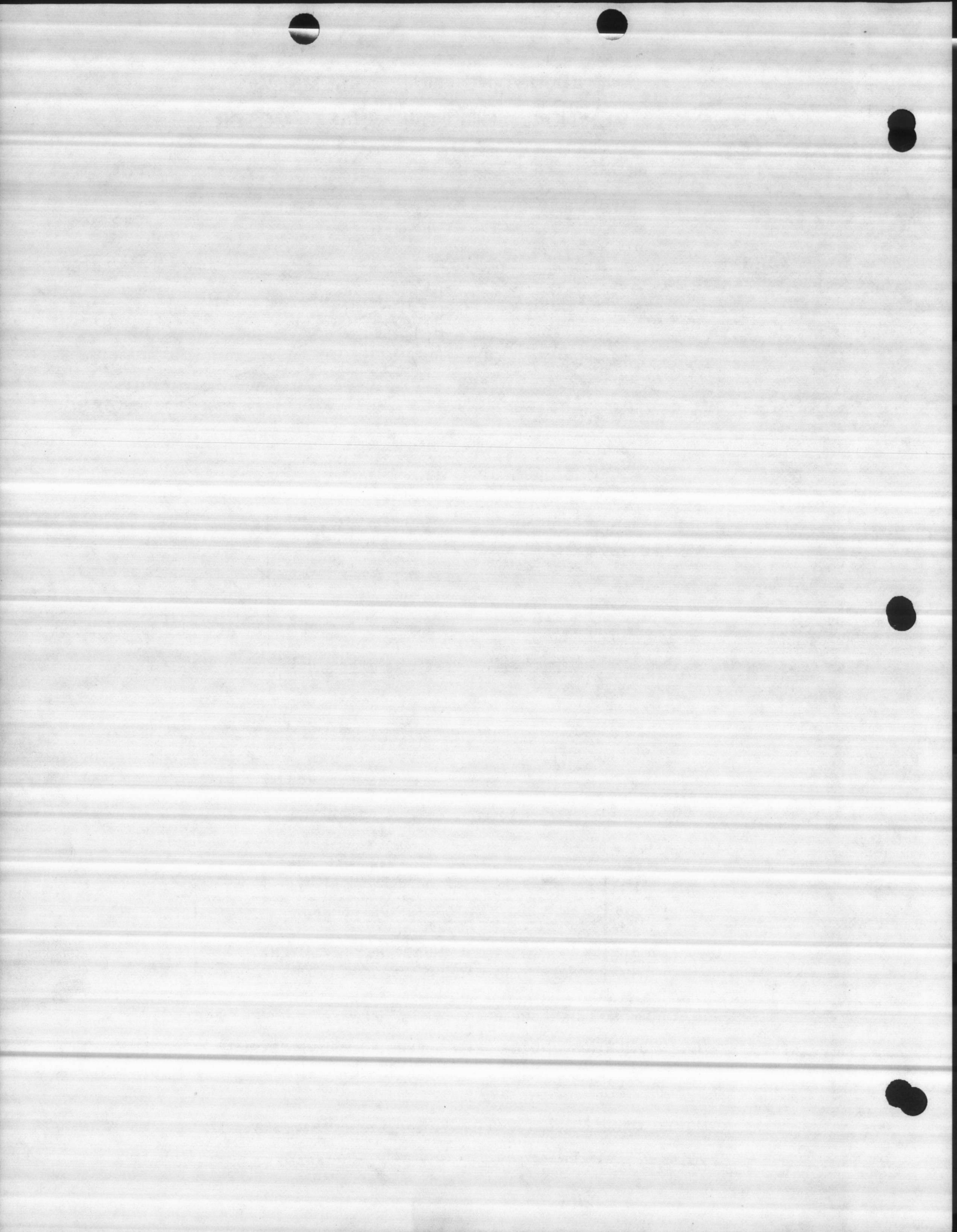
# ADJUSTING NUT ASSEMBLY VERTICAL HOLLOW SHAFT MOTOR



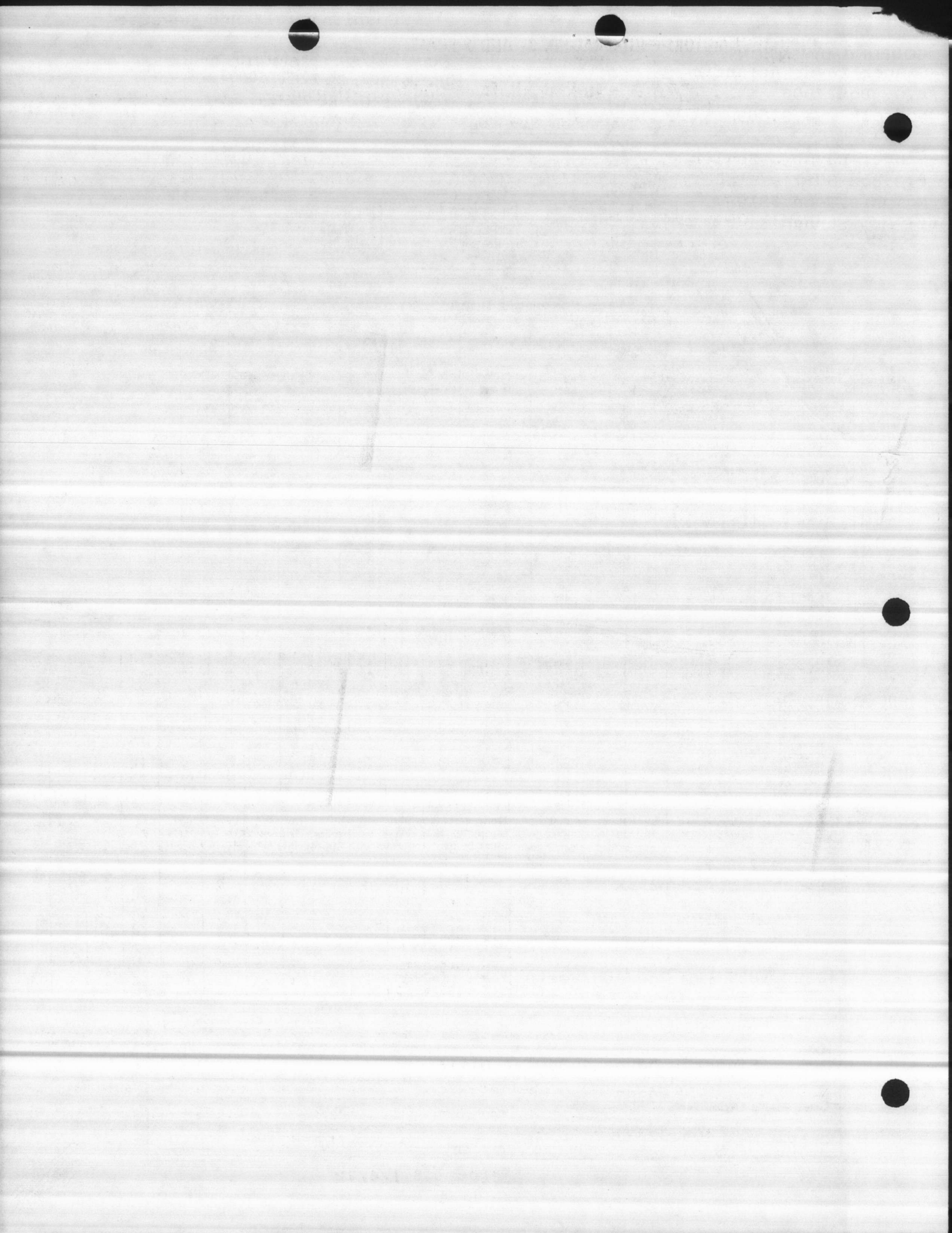
PART NO.	DESCRIPTION
3 2 8	MOTOR DRIVE SHAFT
3 2 9	ADJUSTING NUT
3 5 2	GIB. HEAD KEY (CLUTCH)
7 4 0	MACHINE SCREW (ADJUSTING NUT)

IN ORDERING REPLACEMENT PARTS, ALWAYS SPECIFY PARTS NO, DESCRIPTION, MOTOR SIZE, TYPE, & PUMP SERIAL NO.

MOTOR MFG. .... HP ..... R.P.M. ....  
VOLTS ..... PHASE ..... CY ..... FRAME .....







INDUCTION MOTORS—INTEGRAL-HP, 3- AND 2-PHASE  
VERTICAL

SQUIRREL-CAGE

**TRI/CLAD** • Hollow-shaft • Shielded (Dripproof)\*

**GEM-2296E**

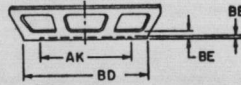
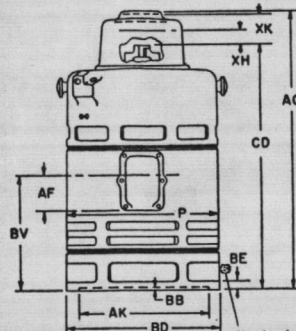
High-thrust • Normal-starting-torque • NEMA Type P Base

Type K  
Frames 213TP10 to B405TP20, 3600 Rpm and Below  
Frames B444TP16 to B445TP20, 1800 Rpm and Below $\theta$

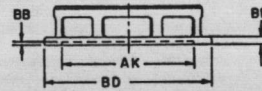
Self-release, Bolted or  
Nonreverse Coupling

Sept. 8, 1970

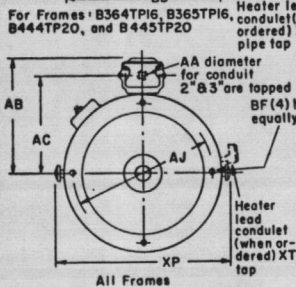
**DIMENSIONS**



For Frames: 213TP10, 215TP10, B254TP10, 254TP10, 254TP12, 256TP10, 256TP12, B284TP10, B284TP12, B286TP10, B286TP12, B324TP12, B326TP12, B364TP12, B365TP12, B404TP16, B405TP16, B444TP16, B445TP16



254TP16, 256TP16, B284TP16, B286TP16, B324TP16, B326TP16, B404TP20, B405TP20



For Frames: B364TP16, B365TP16, B444TP20, and B445TP20

Heater lead conduit (when ordered) XT pipe tap  
AA diameter for conduit  
2" & 3" are tapped  
BF (4) holes equally spaced  
Heater lead conduit (when ordered) XT tap  
All Frames

**FOR 3600-RPM MOTORS ONLY**

For a given pump-shaft diameter, the following table gives the maximum distance between the motor's top coupling and the pump's first line-shaft bearing. This table is based on keeping the headshaft critical at least 25% above operating speed. The selection of a small headshaft diameter may make it necessary to support the headshaft in a close-fitting bushing in the lower end of the motor shaft.

Pump-shaft Diameter in Inches	Maximum Distance Between Top Coupling and Lower Support in Inches
0.750	33
1.000	38
1.187	42
1.437	45
1.500	47
1.688	50
1.750	51

Frame No.	Approx Net Wt in Lb	Dimensions in Inches																	
		P	AA	AB	AC	AF	AG	AJ	AK	BB	BD	BE	BF	BV	CD	XH	XK	XP	XT
213TP10	165	10 7/8	1 1/4	9 3/8	7 1/8	3 1/2	23 13/16	9 1/8	8 1/4	3/8	10	3/4	7/8	10 15/16	20 15/16	1 3/4	2 3/4	...	1/2
215TP10	180	10 7/8	1 1/4	9 3/8	7 1/8	3 1/2	23 13/16	9 1/8	8 1/4	3/8	10	3/4	7/8	10 15/16	20 15/16	1 3/4	2 3/4	...	1/2
B254TP10	205	10 7/8	1 1/2	9 3/8	7 1/8	3 1/2	23 13/16	9 1/8	8 1/4	3/8	10	3/4	7/8	10 15/16	20 15/16	1 3/4	2 3/4	...	1/2
254TP10	270	12 1/8	1 1/2	10 3/8	8 3/8	3 1/2	26 1/2	9 1/8	8 1/4	3/8	10	3/4	7/8	13	23 3/8	1 3/4	2 3/4	...	1/2
254TP12	270	12 1/8	1 1/2	10 3/8	8 3/8	3 1/2	26 1/2	9 1/8	8 1/4	3/8	12	3/4	7/8	13	23 3/8	1 3/4	2 3/4	...	1/2
254TP16	270	12 1/8	1 1/2	10 3/8	8 3/8	3 1/2	26 1/2	14 3/8	13 1/2	1/4	16 1/2	3/4	7/8	13	23 3/8	1 3/4	2 3/4	...	1/2
256TP10	310	12 1/8	1 1/2	10 3/8	8 3/8	3 1/2	26 1/2	9 1/8	8 1/4	3/8	10	3/4	7/8	13	23 3/8	1 3/4	2 3/4	...	1/2
256TP12	310	12 1/8	1 1/2	10 3/8	8 3/8	3 1/2	26 1/2	9 1/8	8 1/4	3/8	12	3/4	7/8	13	23 3/8	1 3/4	2 3/4	...	1/2
256TP16	310	12 1/8	1 1/2	10 3/8	8 3/8	3 1/2	26 1/2	14 3/8	13 1/2	1/4	16 1/2	3/4	7/8	13	23 3/8	1 3/4	2 3/4	...	1/2
B284TP10	330	12 1/8	2	11 3/8	8 3/8	4 3/8	26 1/2	9 1/8	8 1/4	3/8	10	3/4	7/8	13	23 3/8	1 3/4	2 3/4	...	1/2
B284TP12	330	12 1/8	2	11 3/8	8 3/8	4 3/8	26 1/2	9 1/8	8 1/4	3/8	12	3/4	7/8	13	23 3/8	1 3/4	2 3/4	...	1/2
B284TP16	330	12 1/8	2	11 3/8	8 3/8	4 3/8	26 1/2	14 3/8	13 1/2	1/4	16 1/2	3/4	7/8	13	23 3/8	1 3/4	2 3/4	...	1/2
B286TP10	355	12 1/8	2	11 3/8	8 3/8	4 3/8	26 1/2	9 1/8	8 1/4	3/8	12	3/4	7/8	13	23 3/8	1 3/4	2 3/4	...	1/2
B286TP12	355	12 1/8	2	11 3/8	8 3/8	4 3/8	26 1/2	9 1/8	8 1/4	3/8	12	3/4	7/8	13	23 3/8	1 3/4	2 3/4	...	1/2
B286TP16	355	12 1/8	2	11 3/8	8 3/8	4 3/8	26 1/2	14 3/8	13 1/2	1/4	16 1/2	3/4	7/8	13	23 3/8	1 3/4	2 3/4	...	1/2
B324TP12	460	14 1/4	2 5/8	12 3/8	9 11/16	4 3/8	32 7/16	9 1/8	8 1/4	3/8	12	7/8	7/8	15 7/16	28 3/8	3 3/4	4	15 3/4	1/2
B324TP16	460	14 1/4	2 5/8	12 3/8	9 11/16	4 3/8	32 7/16	14 3/8	13 1/2	1/4	16 1/2	7/8	7/8	15 7/16	28 3/8	3 3/4	4	15 3/4	1/2
B326TP10	510	14 1/4	3	13 1/8	10 3/8	6 1/2	32 7/16	9 1/8	8 1/4	3/8	12	7/8	7/8	15 7/16	28 3/8	3 3/4	4	15 3/4	1/2
B326TP16	510	14 1/4	3	13 1/8	10 3/8	6 1/2	32 7/16	14 3/8	13 1/2	1/4	16 1/2	7/8	7/8	15 7/16	28 3/8	3 3/4	4	15 3/4	1/2
B364TP12	600	16 1/4	3	14 1/8	11 3/8	6 1/2	35 7/16	9 1/8	8 1/4	3/8	12	1 1/8	7/8	16 1/8	31 3/8	3 3/4	4	17 3/4	3/4
B364TP16	600	16 1/4	3	14 1/8	11 3/8	6 1/2	35 7/16	14 3/8	13 1/2	1/4	16 1/2	1	7/8	16 1/8	31 3/8	3 3/4	4	17 3/4	3/4
B365TP12	660	16 1/4	3	14 1/8	11 3/8	6 1/2	35 7/16	9 1/8	8 1/4	3/8	12	1 1/8	7/8	16 1/8	31 3/8	3 3/4	4	17 3/4	3/4
B365TP16	660	16 1/4	3	14 1/8	11 3/8	6 1/2	35 7/16	14 3/8	13 1/2	1/4	16 1/2	1	7/8	16 1/8	31 3/8	3 3/4	4	17 3/4	3/4
B404TP16	890	18 7/8	3	15 3/4	12 3/8	6 1/2	41 1/4	14 3/8	13 1/2	1/4	16 1/2	7/8	1 1/8	19 1/2	36 7/8	3 3/4	4 1/2	20 1/4	3/4
B404TP20	890	18 7/8	3	15 3/4	12 3/8	6 1/2	41 1/4	14 3/8	13 1/2	1/4	20	7/8	1 1/8	19 1/2	36 7/8	3 3/4	4 1/2	20 1/4	3/4
B405TP16	990	18 7/8	3	15 3/4	12 3/8	6 1/2	41 1/4	14 3/8	13 1/2	1/4	16 1/2	7/8	1 1/8	19 1/2	36 7/8	3 3/4	4 1/2	20 1/4	3/4
B405TP20	990	18 7/8	3	15 3/4	12 3/8	6 1/2	41 1/4	14 3/8	13 1/2	1/4	20	7/8	1 1/8	19 1/2	36 7/8	3 3/4	4 1/2	20 1/4	3/4
B444TP16	1180	20 3/8	3	16 1/8	13 3/8	6 1/2	47 1/8	14 3/8	13 1/2	1/4	16 1/2	1 1/8	1 1/8	23 1/4	41 3/8	3 3/4	5	22	3/4
B444TP20	1180	20 3/8	3	16 1/8	13 3/8	6 1/2	47 1/8	14 3/8	13 1/2	1/4	20	1 1/8	1 1/8	23 1/4	41 3/8	3 3/4	5	22	3/4
B445TP16	1330	20 3/8	3	16 1/8	13 3/8	6 1/2	47 1/8	14 3/8	13 1/2	1/4	16 1/2	1 1/8	1 1/8	23 1/4	41 3/8	3 3/4	5	22	3/4
B445TP20	1330	20 3/8	3	16 1/8	13 3/8	6 1/2	47 1/8	14 3/8	13 1/2	1/4	20	1 1/8	1 1/8	23 1/4	41 3/8	3 3/4	5	22	3/4

**Coupling dimensions on reverse side.**

\* These motors meet NEMA specifications for weather-protected Type 1 motors.

† 'AK' diameters of 8 1/4 inches will come within the limits of +0.003 inch, -0.000 inch; diameters of 13 1/2 inches will come within the limits of +0.005 inch, -0.000 inch.

‡ The total height of pump shaft and locking nut above top of coupling must not exceed dimension XH.

§ For 3600 rpm, Frames B324TP12 and B324TP16, conduit box dimensions are same as for Frames B326TP12 and B326TP16.

¶ For 3600 rpm in this frame size, refer to the Company.

Frames 213TP10 through B286TP16 have grease-lubricated upper guide and lower thrust bearings. All other frames have oil-lubricated upper thrust bearing and grease-lubricated lower guide bearing.

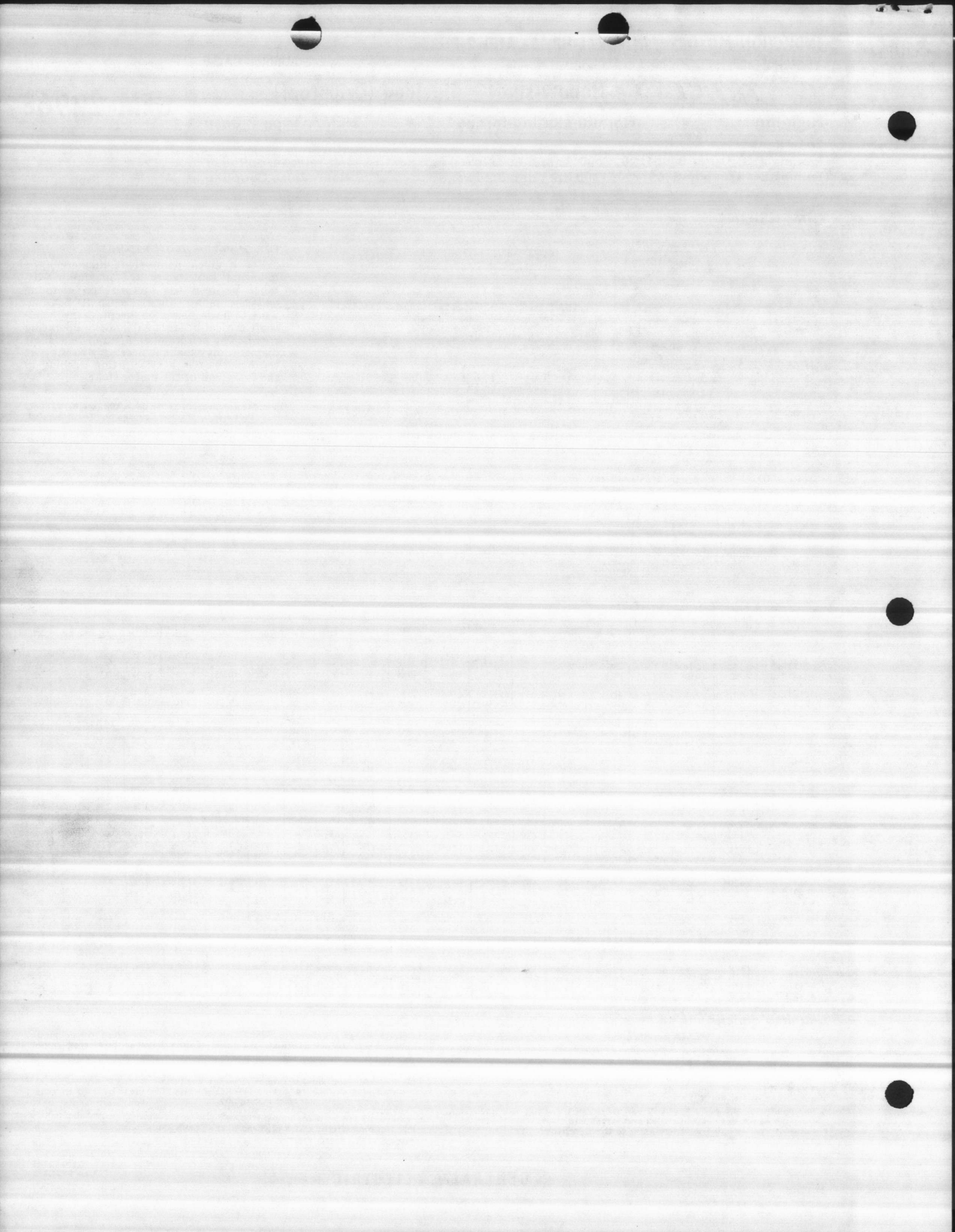
For 3600 rpm, Frames B404TP16 through B405TP20 inclusive maximum shaft permissible 1.751 inches.

Nonreverse coupling assemblies, Frames 213TP to B286TP are complete, nonreverse assemblies, Frame B324TP to B445TP, must be used together with appropriate self-release coupling.

Provided mounting conditions permit, conduit box may be turned so that entrance can be made upward, downward, or from either side.

For shipping weight add 5 per cent to the above net weights.

For ESTIMATING ONLY unless endorsed for construction.









Corbin Construction Co. 10-8-71  
 Camp Lejeune, N.C. Job # 40936  
 Formation Samples for Well # 4

0' - 10'	Sand + Clay
10' - 20'	Sand
20' - 30'	Sand
30' - 40'	Sand + Clay Streaks
40' - 50'	Sand + Clay Streaks
50' - 60'	Sand + limestone
60' - 70'	Sand + limestone
70' - 80'	Sand + limestone
80' - 90'	Sand + limestone
90' - 100'	Sand + limestone
100' - 110'	Sand + limestone
110' - 120'	Sand + limestone
120' - 130'	Sand + limestone
130' - 140'	Sand + limestone
140' - 150'	Sand + Rock
150' - 160'	Sand + Rock
160' - 170'	Sand, limestone + Rock
170' - 180'	Sand + limestone
180' - 190'	Sand + limestone
190' - 200'	Sand
200' - 210'	Sand + Clay
210' - 220'	Sand + Clay
220' - 230'	Sand + Clay
230' - 240'	Sand + clay
240' - 250'	Sand some clay
250' - 260'	Sand
260' - 270'	Sand
270' - 280'	Sand
280' - 290'	Sand + Clay
290' - 300'	Sand
300' - 310'	Sand

HB650

Date:  
 APPROVED  
 Subject To Meet Of  
 Job Plans & Specifications  
 By  
 Quality Control Representative



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BY R.S. DATE 10-20-71  
CHKD. BY \_\_\_\_\_ DATE \_\_\_\_\_

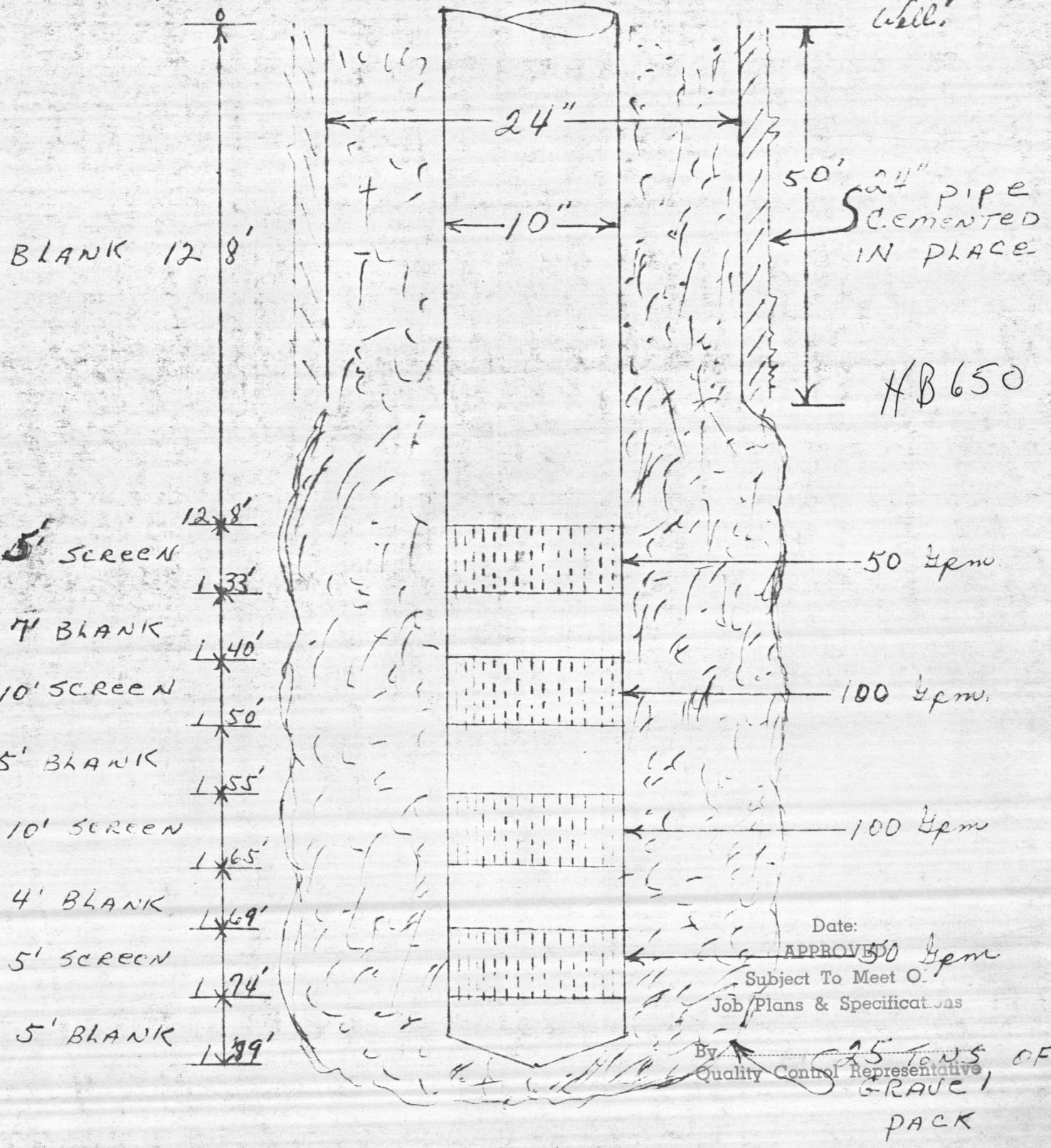
PROJECT Well # 4  
Cordin Construction Co  
Camp Lejeune N.C.

SHEET NO. 1 OF 1  
JOB NO. 40936

### Proposed Sketch of Well # 4

Total Depth 179'

300 gpm Well.





HR 220

HR 220

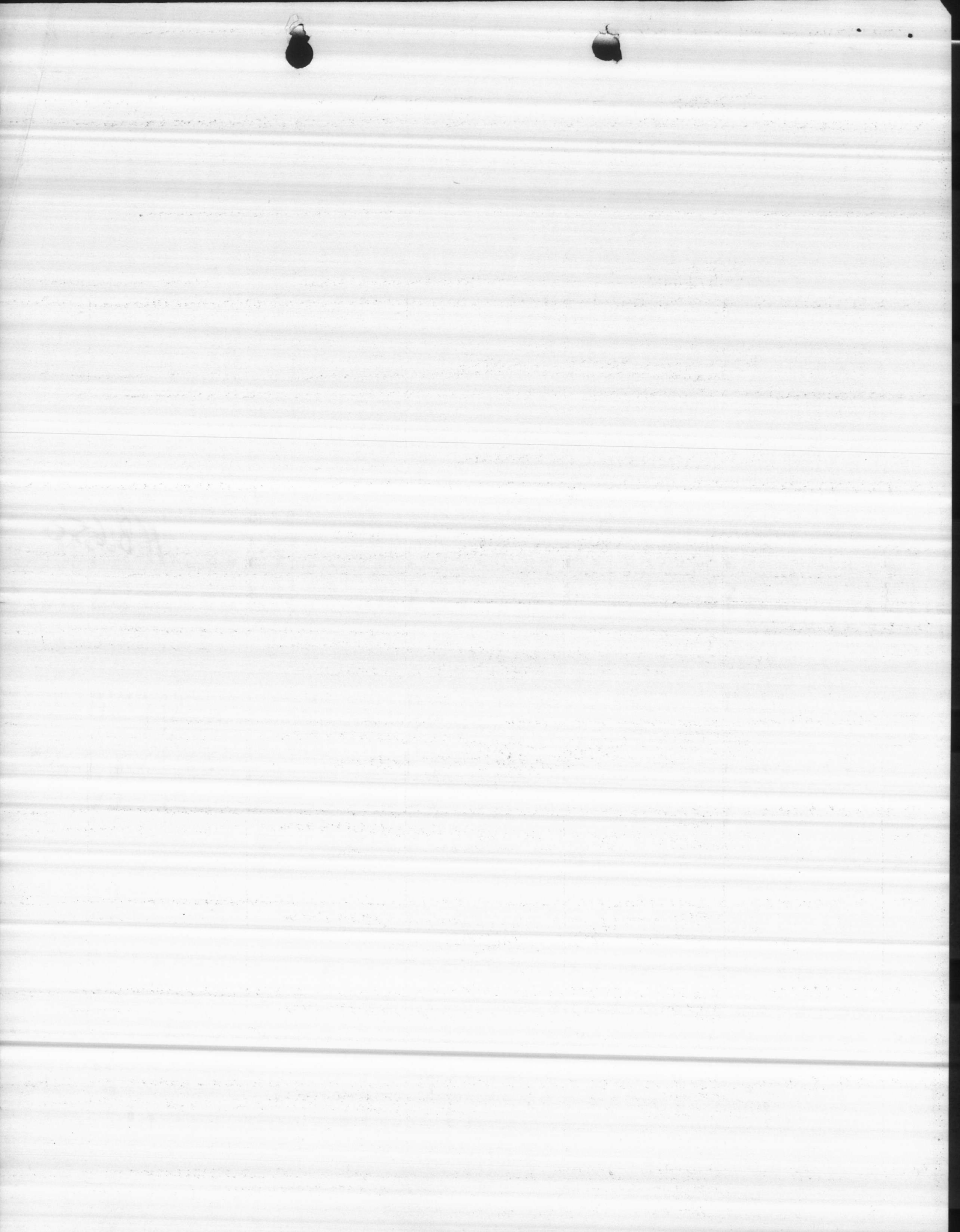
CORBIN CONSTRUCTION COMPANY

Camp LeJeune, N. C.  
 Pumping Test Well No. 4  
 November 10, 1971

Static Level 8' 9"

TIME	GPM	PUMPING LEVEL	TIME	GPM	PUMPING LEVEL
4:30	153	31' 9"	8:30	401	84' 6"
4:45	153	33' 5"	9:00	401	84' 9"
5:00	153	34' 1"	9:30	401	85' 1"
5:15	153	34' 4"	10:00	401	85' 8"
5:30	153	34' 8"	10:30	401	86' 6"
6:00	153	35' 6"	11:00	401	87' 8"
6:30	153	36' 0"	12:00	401	87' 8"
7:00	153	36' 4"	1:00	401	87' 3"
7:30	160	37' 2"	2:00	401	87' 3"
7:45	200	42' 10"	3:00	401	87' 4"
8:00	200	42' 9"	4:00	401	87' 8"
8:15	200	42' 10"	5:00	401	88' 9"
8:45	200	42' 6"	6:00	401	88' 7"
9:15	200	42' 7"	7:00	401	88' 8"
9:45	200	42' 2"	8:00	401	89' 5"
10:15	200	42' 4"	9:00	401	89' 3"
10:30	250	47' 4"	10:00	401	89' 5"
10:45	250	48' 9"	11:00	401	89' 6"
11:00	250	48' 6"	12:00	401	89' 5" (11/12/71)
11:15	250	48' 7"	1:00	401	89' 7"
11:45	250	48' 4"	2:00	401	89' 6"
12:15	250	47' 9" (11/11/71)	3:00	401	89' 5"
12:45	250	47' 3"	4:00	401	89' 7"
1:15	250	42' 2"	5:00	401	89' 8"
1:30	299	60' 11"	6:00	401	89' 8"
1:45	299	61' 9"	7:00	401	89' 5"
2:00	299	62' 7"	8:00	401	89' 3"
2:15	299	62' 9"	9:00	401	87' 5"
2:45	299	62' 11"	10:00	401	89' 9"
3:15	299	63' 5"	11:00	401	89' 9"
3:45	299	64' 5"	11:15	455	104' 6"
4:15	299	63' 10"	11:30	455	104' 8"
4:30	351	70' 9"	11:45	455	104' 9"
4:45	351	71' 2"	12:15	455	105' 1"
5:00	351	71' 11"	12:45	455	105' 4"
5:15	351	71' 3"	1:15	455	105' 6"
5:45	351	71' 6"	1:45	455	105' 9"
6:15	351	71' 7"	2:00	507	116' 8"
6:45	351	71' 2"	2:15	507	116' 11"
7:15	351	70' 2"	2:30	507	117' 0"
7:45	351	70' 5"	3:00	507	117' 3"
8:00	401	84' 0"	3:30	507	117' 5"
8:15	401	84' 4"	4:00	507	117' 7"
			4:30	507	117' 8"

Top of Screen Line 128 feet





"Hello Analysts, Goodbye Worry"

WATER ANALYSIS LABORATORY  
802 HAMLET HIGHWAY  
BENNETTSVILLE, SOUTH CAROLINA  
29512

CONSULTANTS FOR:  
INDUSTRY  
MUNICIPALITIES  
HOME OWNERS  
DEVELOPERS  
IRRIGATION  
OTHERS

(803) 479-4639

DATE: October 19, 1971

Well # 650

Well # 4      650

Report To: Layne Atlantic Co.  
Norfolk, Va.

Date Analyzed: 10/19/71  
Sample Number: #1, 130'--Down  
W0# 40936

Analysis Results--Parts Per Million

<u>Determination</u>		<u>Determination</u>	
pH	<u>7.1</u>	Carbon Dioxide (CO <sub>2</sub> )	<u>40</u>
Iron (Fe)	<u>0.25</u>	Total Acidity (CaCO <sub>3</sub> )	<u>67</u>
Nitrate (NO <sub>3</sub> )	<u>Trace</u>	Calcium Hardness (CaCO <sub>3</sub> )	<u>235</u>
Fluoride (F)	<u>0.2</u>	Magnesium Hardness (CaCO <sub>3</sub> )	<u>20</u>
Manganese (Mn)	<u>0</u>	Carbonate Hardness (CaCO <sub>3</sub> )	<u>247</u>
Total Hardness (CaCO <sub>3</sub> )	<u>255</u>	Noncarbonate Hardness (CaCO <sub>3</sub> )	<u>8</u>
Chlorides (Cl)	<u>8</u>	Alkalinity (Phenolphthalein) (CaCO <sub>3</sub> )	<u>0</u>
Sulfate (SO <sub>4</sub> )	<u>8.2</u>	Carbonate Alkalinity (CaCO <sub>3</sub> )	<u>0</u>
Phosphate (PO <sub>4</sub> )	<u>0.8</u>	Bicarbonate Alkalinity (CaCO <sub>3</sub> )	<u>247</u>
Magnesium (Mg)	<u>4.8</u>	Total Alkalinity (CaCO <sub>3</sub> )	<u>247</u>
Calcium (Ca)	<u>94</u>	Total Dissolved Solids	<u>257</u>
Carbonate (CO <sub>3</sub> )	<u>0</u>	Specific Conductance (micromhos at 25°C)	<u>395</u>
Bicarbonate (HCO <sub>3</sub> )	<u>302</u>	Appearance When Analyzed	<u>Clear</u>
Hydroxide (OH)	<u>0</u>	Odor When Analyzed	<u>Not Objectable</u>

*Water Analysis Laboratory*

SIGNED: 802 Hamlet Highway  
LABORATORY DIRECTOR  
Bennettsville, South Carolina 29512

ANALYTICAL METHODS REFERENCES: 'STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTE WATER.' APHA, AWWA AND WPCF AND 'METHODS FOR COLLECTION AND ANALYSIS OF WATER SAMPLES.' WATER SUPPLY PAPER 1454 (1960), U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C.

Date: \_\_\_\_\_  
APPROVED  
Subject To meet Of  
Job Plans & Specifications.  
By: \_\_\_\_\_  
Quality Control Representative

10-11-47

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"Hello Analysis, Goodbye Worry"

WATER ANALYSIS LABORATORY  
802 HAMLET HIGHWAY  
BENNETTSVILLE, SOUTH CAROLINA  
29512

CONSULTANTS FOR:  
INDUSTRY  
MUNICIPALITIES  
HOME OWNERS  
DEVELOPERS  
IRRIGATION  
OTHERS

(803) 479-4639

Well #650

DATE: October 19, 1971

Well # 4

Report To: Layne Atlantic Co.  
Norfolk, Va.

Date Analyzed: 10/19/71

Sample Number: #2, 70'--Down  
Job #40936

Analysis Results--Parts Per Million

Determination

pH	<u>6.9</u>
Iron (Fe)	<u>2.4</u>
Nitrate (NO <sub>3</sub> )	<u>0</u>
Fluoride (F)	<u>0.2</u>
Manganese (Mn)	<u>0</u>
Total Hardness (CaCO <sub>3</sub> )	<u>76</u>
Chlorides (Cl)	<u>10</u>
Sulfate (SO <sub>4</sub> )	<u>9.8</u>
Phosphate (PO <sub>4</sub> )	<u>0.6</u>
Magnesium (Mg)	<u>1.9</u>
Calcium (Ca)	<u>27</u>
Carbonate (CO <sub>3</sub> )	<u>0</u>
Bicarbonate (HCO <sub>3</sub> )	<u>95</u>
Hydroxide (OH)	<u>0</u>

Determination

Carbon Dioxide (CO <sub>2</sub> )	<u>18</u>
Total Acidity (CaCO <sub>3</sub> )	<u>87</u>
Calcium Hardness (CaCO <sub>3</sub> )	<u>68</u>
Magnesium Hardness (CaCO <sub>3</sub> )	<u>8</u>
Carbonate Hardness (CaCO <sub>3</sub> )	<u>76</u>
Noncarbonate Hardness (CaCO <sub>3</sub> )	<u>0</u>
Alkalinity (Phenolphthalein) (CaCO <sub>3</sub> )	<u>0</u>
Carbonate Alkalinity (CaCO <sub>3</sub> )	<u>0</u>
Bicarbonate Alkalinity (CaCO <sub>3</sub> )	<u>78</u>
Total Alkalinity (CaCO <sub>3</sub> )	<u>78</u>
Total Dissolved Solids	<u>112</u>
Specific Conductance (micromhos at 25°C)	<u>170</u>
Appearance When Analyzed	<u>Light Straw Color</u>
Odor When Analyzed	<u>Not Objectionable</u>

*Water Analysis Laboratory*  
802 Hamlet Highway

SIGNED: Bennettsville, South Carolina 29512

ANALYTICAL METHODS REFERENCES: 'STANDARD METHODS FOR THE EXAMINATION OF WATER AND WASTE-WATER,' APHA, AWWA AND WPCF AND 'METHODS FOR COLLECTION AND ANALYSIS OF WATER SAMPLES,' WATER SUPPLY PAPER 1454 (1960), U. S. GEOLOGICAL SURVEY, WASHINGTON, D. C.

Subject To Meet Of  
Job Plans & Specifications

By.....  
Quality Control Representative

June 1950  
Bell P

Miss Helen Johnson  
802 Hamlet Highway  
Bassettville South Carolina 29615