

PEERLESS-MIDWEST
Incorporated

28800 Wall Street
Wixom, Michigan 48393
Phone: (248) 348-6071
Fax: (248) 348-6371
www.pmidwest.com

Well - 4013 S. Ann
Page - 2540 Design TDH

"When it Comes to

Water Supply Contracting

& Hydrogeologic Services...

We're PEERLESS!"

July 28, 2006

City of Ann Arbor
Dept. of Public Works
919 Sunset Rd
Ann Arbor, MI 48103-2924

RE: 2006 Pump and Well Maintenance

Attn: Pat Irish - Water Utilities Supervisor

Enclosed with this letter please find the results of the Annual Well and Pump Inspections we recently performed on your water system

Well No. 21W Motor oil and packing were changed. Static water level was 8.6 ft, a drop of .2 ft. since last test. Well has a specific capacity of 300.9 GPM/Per. Ft. drawdown, a drop of 226.1 since last test. We achieved 2885 @ 208 TDH with a 16.95 foot pumping level. The pump is rated for 2500 GPM @ 252 TDH. Projecting the pump curve we get 2500 GPM @ 260 TDH. The well is performing 33% off since last test and 53% off original. The pump is operating 3% better on TDH. The well needs cleaning soon. Estimated cost to budget would be \$7,000 to \$10,000. The pump is ok.

Well No. 25W Packing was changed. Static water level was 11 feet a drop of 3 ft. since last test. The well has a specific capacity of 189.3 GPM/Per ft. drawdown. Current pump test pumped 2794 GPM @ 195 TDH with a 24 foot pumping level. Pump is rated for 2500 GPM @ 261 TDH. Projected curve capacity was 2500 GPM @ 232 TDH. Well is performing 17% better since last test but 63% off of original. Gear drive is leaking oil slightly. All data was projected to 1770 RPM. Pump is operating 11% off design TDH This well and pump are OK for this year. Run maintenance next year and evaluate results.

Page 2
7-28-06

2006 Maintenance Letter

Well No. 741 Motor oil and packing were changed. Static water level was 11.5 feet a drop of .5 ft. since last test. The well has a specific capacity of 49 GPM/Per ft. drawdown. Current pump test pumped 1500 GPM @ 336 TDH with a 39 foot pumping level. Pump is rated for 2500 GPM @ 261 TDH. Projected curve capacity was 2500 GPM @ 256 TDH. Data was projected to 1770 RPM. Well is performing 76.4% off since last test and 57 % off original. Pump is operating 2% off design TDH . This well needs cleaning immediately. Pump is OK for this year. Estimated cost to clean the well is \$ 8,000 to \$12,000 depending upon severity.

In conclusion we recommend cleaning well No. 741 before the pumping season. Well No. 21W should be at least scheduled to be cleaned next year.

Should you have any questions please give us a call.

Sincerely,

PEERLESS-MIDWEST, INC.

David Stinson
Project Manager



Peerless Midwest Inc. Water Supply Contractors

55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254 9650
28800 Wall Street / Wixom, Michigan 48339 / 248-348-6071 / Fax 248-348-6371



WELL & PUMP SERVICE INSPECTION REPORT

Owner City of Ann Arbor Water Utilities City Ann Arbor State MI

Location ± 2300 ft. West of State Road & ± 3500' South of Ellsworth Road

Well No. 21W Date Drilled 1962 Dia. 30" Depth 91' 2" Type Well Tubular

Screen ID. NDA Screen Length NDA Depth to Top of Screen NDA Type Screen NDA

Dates of Cleaning _____

Phone 734-994-2840 Person to Contact Sumedh Bahl / Patrick Irish

	DATE	STATIC	G.P.M.	PUMPING LEVEL	PRESSURE	SPECIFIC CAPACITY
ORIGINAL	1963	3'	2000	6.1'		645.2
AFTER LAST CLEANING						
AFTER LAST TEST	2002	8.8'	2107	12.8'	100#	526.8
PRESENT AT LINE PRESSURE	2006	8.6'	2513	16.95'	61#	300.9

Test Completed Through Meter _____ Flange Size 12" Confined Space Entry? No

Engine HP 200 Make _____ Cat _____ Volts N/A RPM 1800 ? Phase N/A

Gear Drive Johnson HP 200 Ratio 2 : 3 RPM Meter Required YES

Pump Mfg. Layne/Goulds Serial No. 47264 / 455027 Airline Length Use Probe

Rated Capacity: 2500 GPM 252' TDH Operating Pressure 100#

Total Setting 36' 6" Size of Packing 3/8" Date Installed 1963

Dates of Overhaul 1970 ?, 2002

THE FOLLOWING IS TO BE PERFORMED DURING EACH INSPECTION

Is Check Valve Leaking? No Change Motor Oil & Grease Yes Repack Pump Yes Grease Pump _____

Pump is Presently Developing ^{2513 or} *2885 GPM ^{158' or} *208' TDH Projected Curve Capacity 2500 GPM 260' TDH

Shut Off Pressure 153 PSI Rated Shut Off Head 464 ft. Calculated Shut Off Head 454 ft.

Electrical Data (With Pump in Operation): N/A V / / Amps N/A Full Load Amps _____

Location of Power Lines None Can Equipment Box be Locked Out? N/A

Distance from Top of pump pedestal to grade 7" Materials Needed to Clean Well Drop out 12" spool with dressor, very short 12" x 8" spool, 2- 8" elbows, 3 hoses to tank, 100' to waste

Need a Smeal to Raise Pump No Remarks Maint: 12" x 8", 10" x 8", two (2) 8" elbows, 8" valve,

40' of 8" flex hose. Ran 2513 GPM at 1542 RPM. Also ran step at 1250 GPM with a 12.65' PL at 120# at 1581 RPM

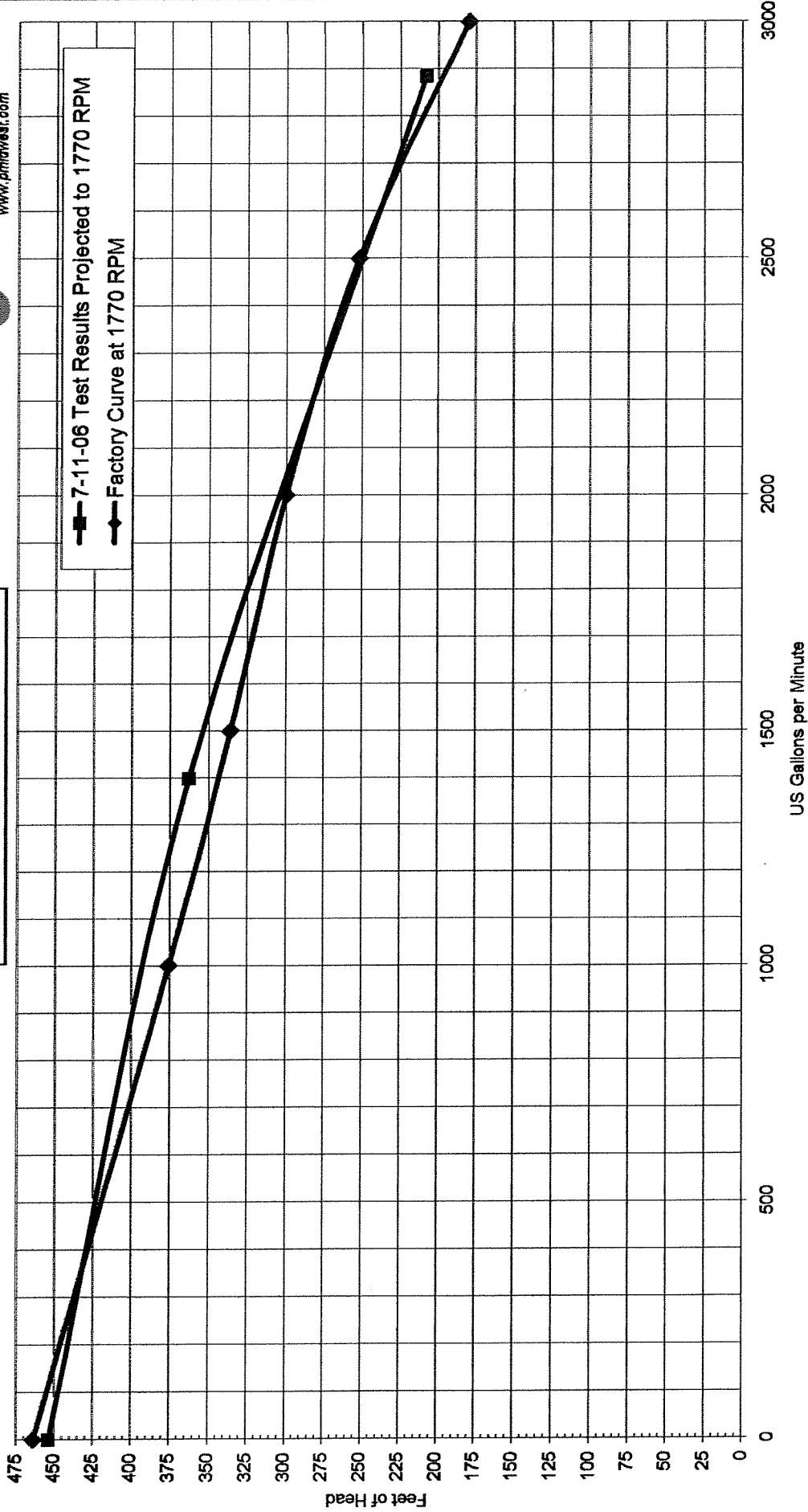
* = Data projected to 1770 RPM

Inspected By John Kollar/Cody Hoshaw Date Inspected July 11, 2006

City of Ann Arbor, MI
Steere Farm Well 21W
Goulds Pump # 47264/455027
14HMC - 4 stage at 1770 RPM



PEERLESS-MIDWEST
A Division of
Mishawaka, IN
Tonia, MI
Indianapolis, IN
Water Supply Contractors
& Hydrogeologists
www.pmidwest.com



Layne-Northern

a division of Layne Christensen Company
 3126 North Martin Luther King, Jr. Blvd.
 Lansing, Michigan 48906

VERTICAL TURBINE WELL PUMP EFFICIENCY FIELD TEST

Owner: City of Ann Arbor

Job No.: 54-6629

Well No.: 21-W

Pump Mfg: Layne

Pump No.: 47264

Test Date: 01-Nov-01

Static Water Level: 8.1 Static System Pressure: n/a Normal Operation Pressure: 100.0 Cost per KWH: 0.05
 Power Factor: 0.8 Line Voltage: 200 Horsepower: 375 Caterpillar Engine Full Load Amps.: 0.00

Test No.	Clock Time	Pumping Level	Discharge PSI	Field Head	GPM Meter	GPM Orifice	GPM Dev.	Volts Avg.	Check Voltage on			Amps. Avg.	Check Amperage on			HP Input	Wire to Water Eff. /1000gal	KWH /1000gal	Cost /1000gal	Specific Capacity
									L1	L2	L3		L1	L2	L3					
1	8:50	9.84	133.0	317.07	N/A	699	0.0%	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	408.77	
2	9:00	9.84	133.0	317.07	N/A	699	N/A	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	408.77	
3	9:10	9.84	133.0	317.07	N/A	699	N/A	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	408.77	
4	9:15	10.59	120.0	287.79	N/A	1205	N/A	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	489.84	
5	9:24	10.63	120.0	287.83	N/A	1205	N/A	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	482.00	
6	9:35	10.67	120.0	287.87	N/A	1205	N/A	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	474.41	
7	9:40	12.09	100.0	243.09	N/A	1808	N/A	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	456.57	
8	9:45	12.25	100.0	243.25	N/A	1808	N/A	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	438.83	
9	9:55	12.34	100.0	243.34	N/A	1808	N/A	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	429.45	
10	10:00	17.25	30.0	86.55	N/A	2521	N/A	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	276.43	

NOTES:

REMARKS:
 Blow Off is 8" flanged
 30' hose
 10x8 orifice
 RPM 1760
 wide open 86.6

Test by: Barrera/Larson

City : Ann Arbor
 State : Michigan
 Location : ±2,300 Ft W of S State Rd. &
 ±3,500 Ft S of West Ellsworth Rd.

County : Washtenaw
 Twp. (T/R) : Pittsfield (T3S/6ER)
 1/4,1/4,1/4,Sec.# : SW,NE,SE,17

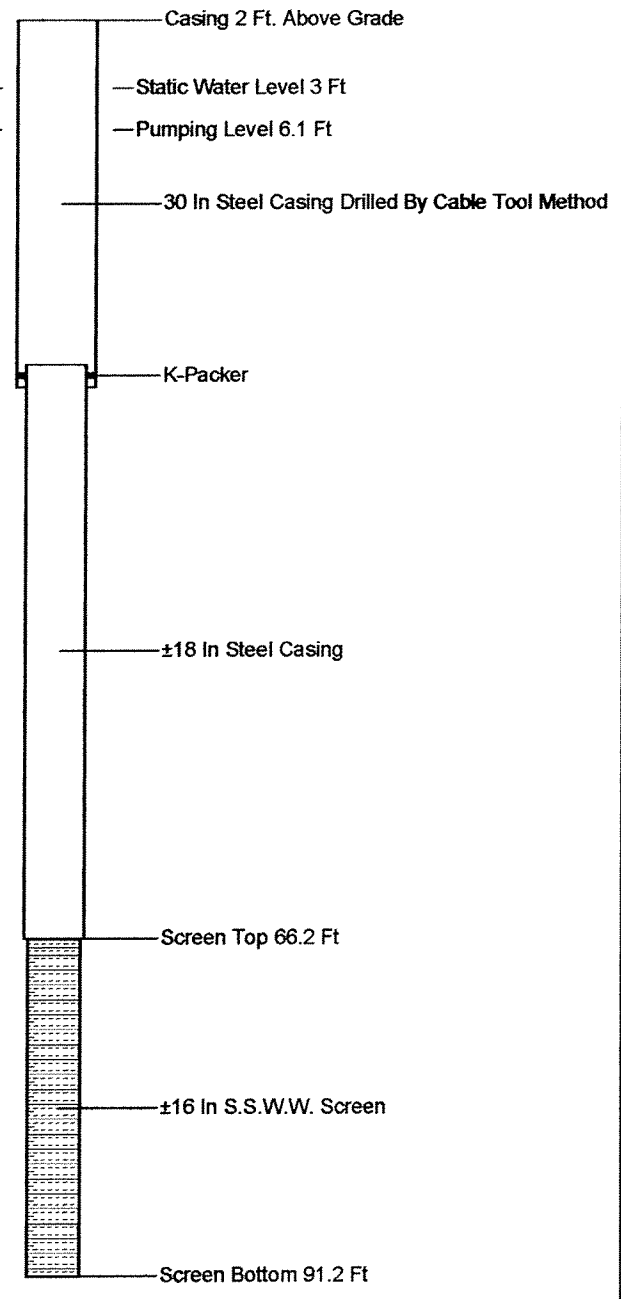
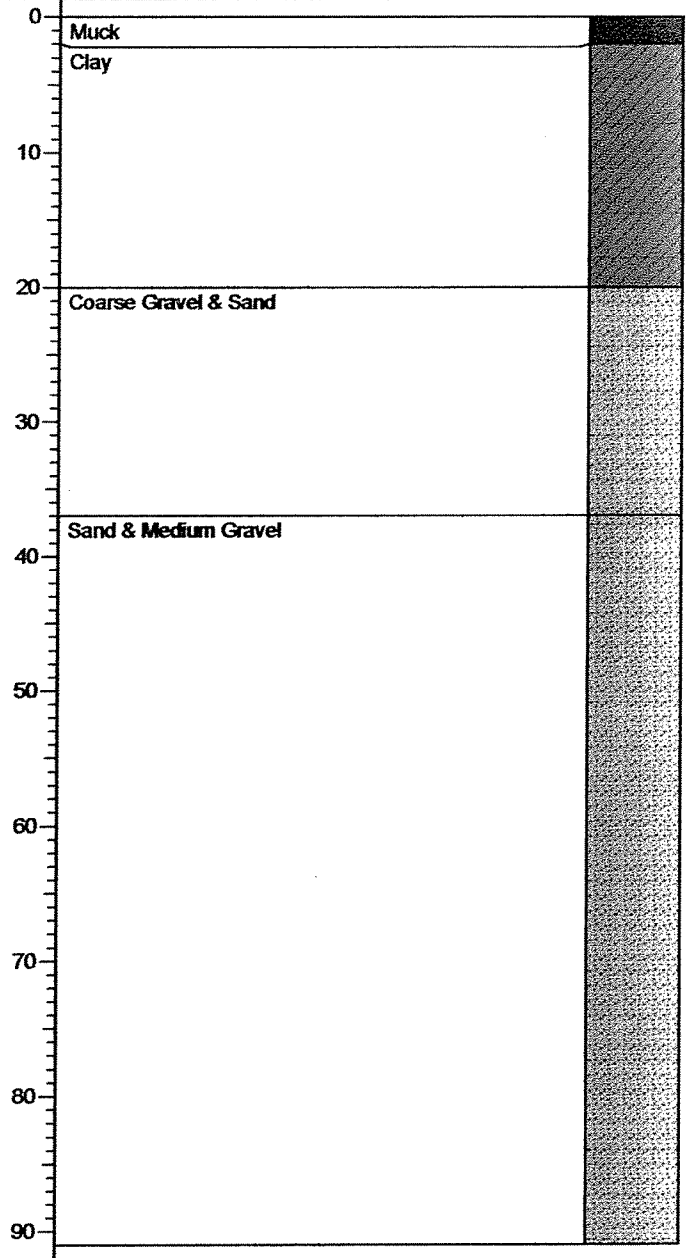
Test Rate : 2,000 GPM
 Static Water Level : 3 Ft
 Pumping Level : 6.1 Ft
 Specific Capacity : 645.2 GPM/Ft. D.D.
 Length of Test (hrs) :

Drilling Method : N.D.A.
 Driller : Others
 Date Drilled : 1963

Well: 21-W

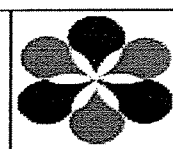
Depth In Feet

LITHOLOGY



08-30-2008 K:\JOB FILES\A-C\Ann Arbor\Steere Farm Well 21-W\Ann_Arbor_21_W_Well_Log.bor

City of Ann Arbor Water
 Steere Farm
 Ann Arbor, Michigan



PEERLESS-MIDWEST
 Water Supply Contractors
 & Hydrogeologists
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CITY OF ANN ARBOR, MICHIGAN
WATER UTILITY

HISTORY OF STEERE FARM WELL 21-W

1962 Tubular well drilled new to a depth of 91'2" with 30" steel casing. No other construction data available. Pumped 2000 GPM , pumping level 6.1', static water level 3', specific capacity 645.2 GPM/ft dd.

Layne Northern Company

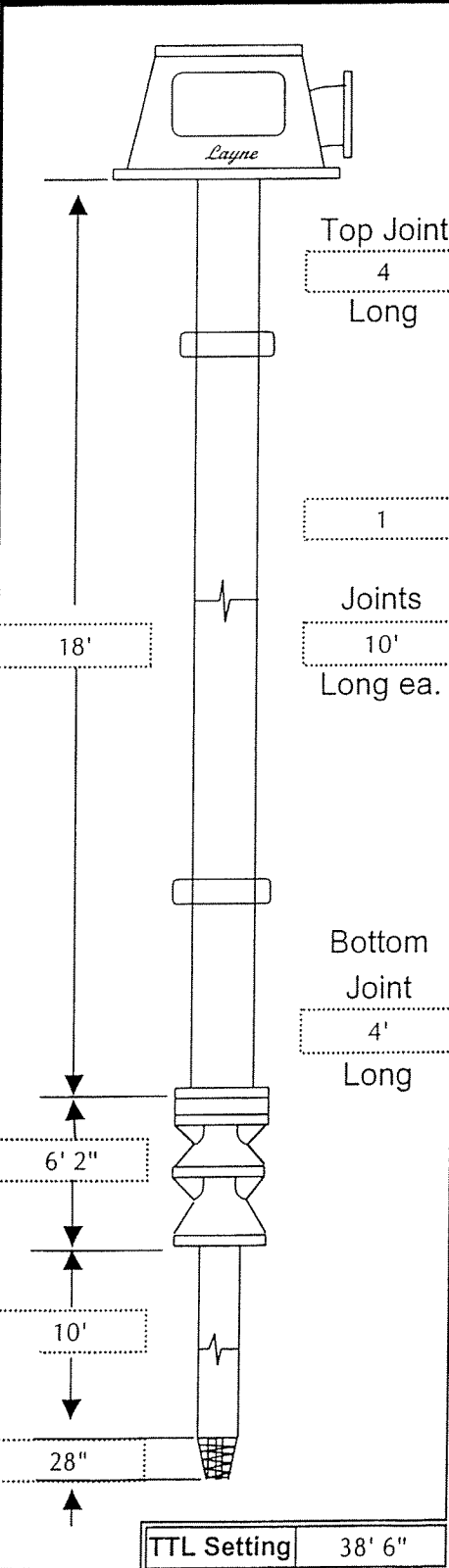
a division of Layne Christensen Company

Lansing, Michigan & Mishawaka, Indiana

PUMP INSTALLATION REPORT

Date 06/19/02

Job No.	54-6719	Owner	City of Ann Arbor		Pump No.	455027
Well No.	21-W	City	Ann Arbor	State	MI	
Location of Well		Airport on State Road				



MOTOR		HEAD		BOWL	
Manufacturer		Manufacturer	Layne	Manufacturer	Layne
Horsepower		Type	SDH	Model	HMC
RPM		Disc. Flg. Size	12"	Size	14"
Phase		BasePlate		No. Stages	4
Line Volts		Head Shaft Dia.	1 11/16"	Material	CI
Full Load Amps.		Head Shaft Length	4' 8"	Clm-Conn. Size	12"
Serial Number		Shaft Material	[] cs [X] sst	Sht Conn. Size	1 11/16"
Type		Couple in Head	(X) yes	Constant	
Frame		COLUMN		SUCTION	
Shaft Diameter		Water Lube	(X) YES	Threaded	(X) yes
Shaft Length		Oil Lube		Bell	
Thread Size		Pipe Size	12"	Size	10"
Key size		Oil Tube Size	N/A	Special Paint	
Bolt Circle		Shaft Size	1 11/16"	Strainer	[X] yes
CxD Dimension		Shaft Material	[] cs [X] sst	WELL	
Overhauled by		Shaft Coupling Ma	[] cs [X] sst	Casing Dia.	30"
GEAR DRIVE		PUMPING DATA		Well Depth	91' 2"
Manufacture	Johnson	Static Water Level	8' 4"	Top Hat Size	
Serial #	34836	System Pressure	100 #	Casing Vent	[X] yes
Gear Ratio	2 - 3.	gpm @ sys. psi	2107	MONITOR SYSTEMS	
ENGINE		Pumping Level	12' 10"	Airline	[] yes
Manufacture	Cat	Test Minutes	15	Airline type	[] plastic
Model	G342			Airline type	[] metal
Serial #				Airline Length	
BLOW OFF		Airline Fastener		Stilling tube	[] yes
Size	8"	Tube Material		Tube Length	
Connection	Flange				
Location	Last pump house				
SPECIAL INSTRUCTIONS		Head Coust. - 4 1/4"			
COMMENTS		On Airport - DPW has to let us in.			
New Bowl - Column - Shafting - New Strainer.					
TTL Setting		38' 6"			
				Installed by T. Brinson	

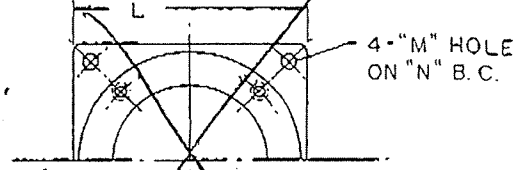
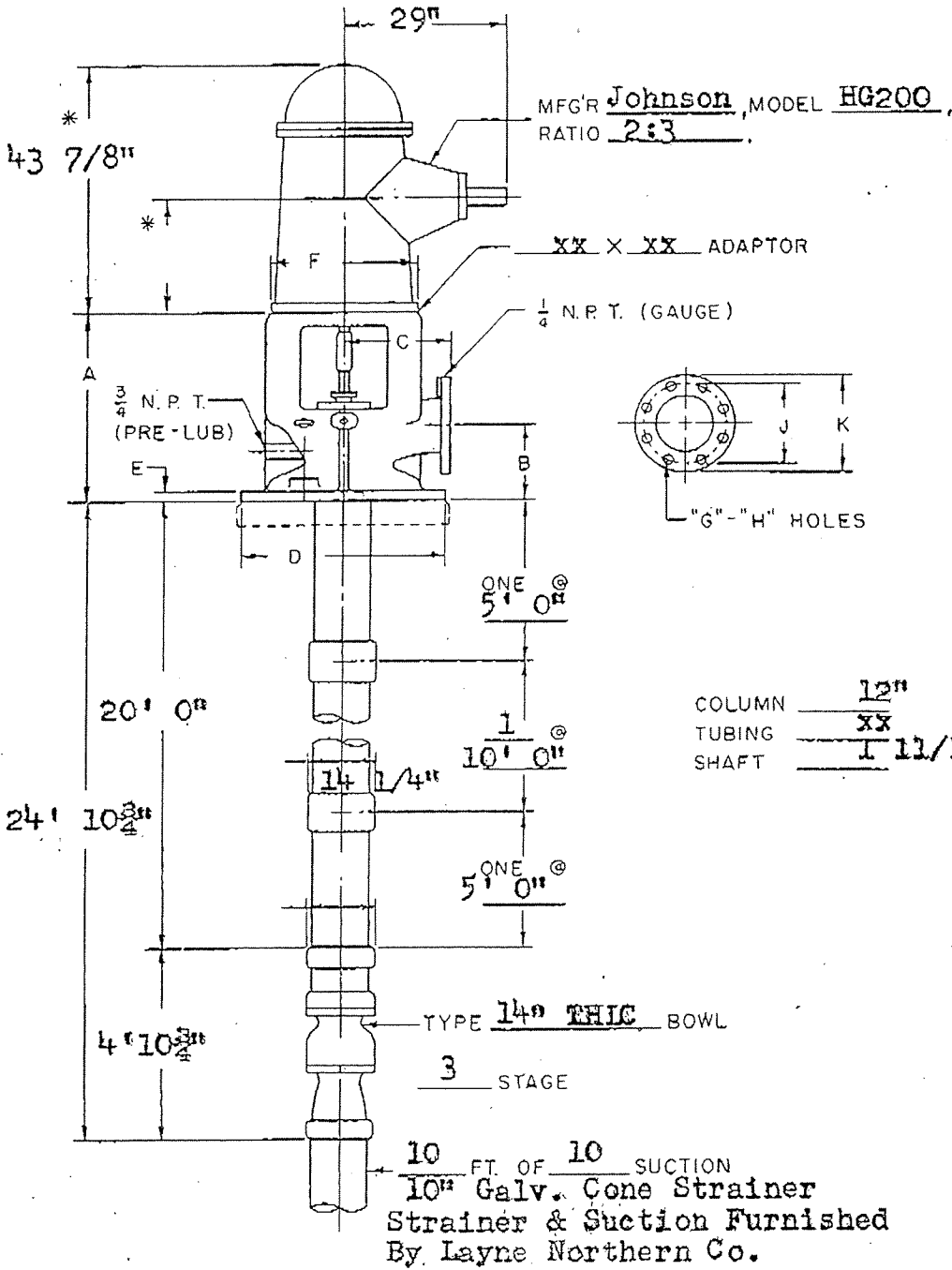
INSTALLATION PLAN

TYPE _____ SDH DISCHARGE HEAD

LAYNE & BOWLER, INC. MEMPHIS, TENNESSEE



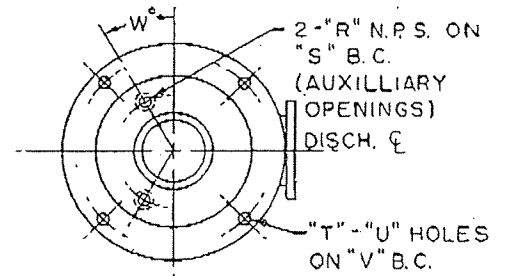
USE THESE DIMENSIONS ONLY WHEN CERTIFIED BY FACTORY



HOLES IN BASE PLATE

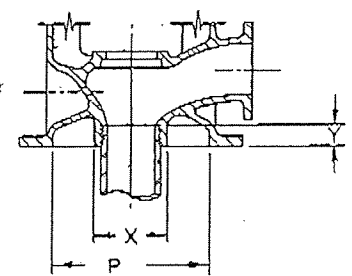


BASE PLATE

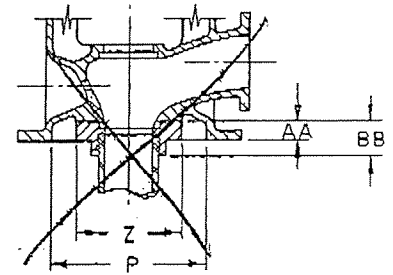


BASE OF HEAD

COLUMN 12"
TUBING XX
SHAFT 1 11/16"



SCREW TYPE HEAD

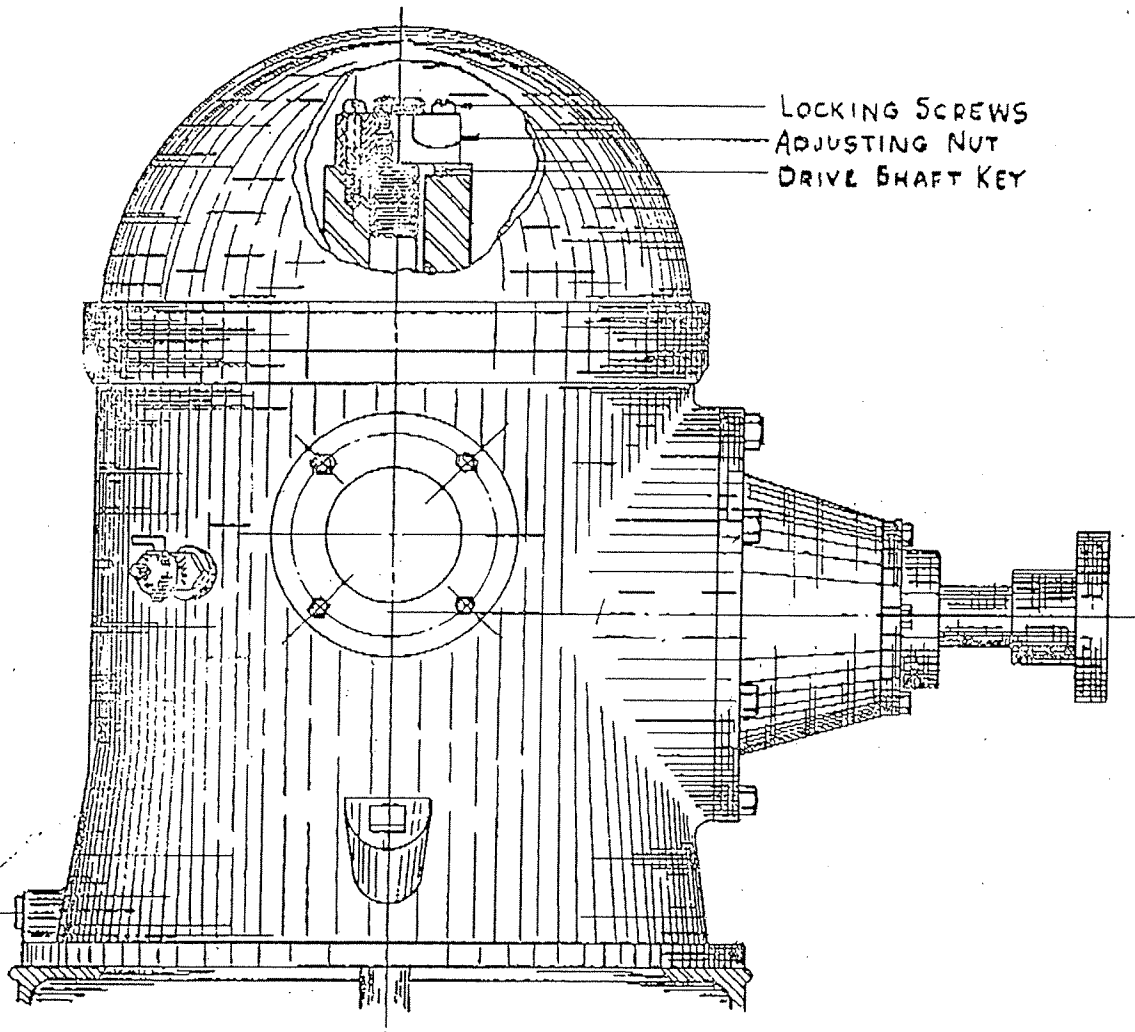


FLANGE TYPE HEAD

CUSTOMER: <u>City of</u>	YOUR NO: <u>117</u>	G.P.M: <u>2500</u>
LOCATION: <u>Ann Arbor, Mich.</u>	OUR NO: <u>63H-2262</u>	T.D.H: <u>250</u>
FOR APPROVAL: _____	PUMP NO: <u>47264-65</u>	R.P.M: <u>1770</u>
CERTIFIED: _____	DATE: <u>6-5-63</u>	B.H.P: _____

TYPE HEAD	HEAD DISCHARGE FLANGE																HEAD BASE																		
	125° ASA FLANGE								250° ASA FLANGE								L	M	N	P	Q	R	S	STD.					V	W	X	Y	Z	AA	BB
	G	H	J	K	G	H	J	K	T	U	T	U																							
SDH 3	14	5 1/8	7 1/2	13 1/2	10	4	6	7 1/2	8	7 1/2	6 3/8	8 1/4	13 3/4	15 3/4	9 1/2	1 1/2	1 1/2	7 3/8	4	3 1/2	8	7 1/2	11 3/4	24	4 1/2	1 1/2	5 1/2	1 1/2	3 1/2						
SDH 4	16 1/2	6	8	16	12	8	7 1/2	9	8	8 1/2	7 7/8	10	16 1/2	18 1/2	11 1/2	1 1/2	1 1/2	8 1/2	4	4 1/2	12	11	14 1/2	18 1/2	5 1/2	1 1/2	7	1 1/2	3 1/2						
SDH 6	20	7	11 1/2	21	16 1/2	8	9 1/2	11	12	10 1/2	10 1/2	12 1/2	21 1/2	24 1/4	14 1/2	1 1/2	1 1/2	11 1/2	4	5 1/2	12	16 1/2	20	7 1/2	2 1/2	1 1/2	9 1/2	1 1/2	4 1/2						
SDH 8	22	8 1/2	13	23 1/2	16 1/2	8	11 1/2	13 1/2	12	11	13	15	23 1/2	27 1/2	16 1/2	2	2	14	4	7 1/2	16	21 1/2	20	10	2 1/2	1 1/2	11 1/2	1 1/2	4 1/2						
SDH 10	25	11	15	27 1/2	1	20	12	14 1/2	16	18	15 1/2	17 1/2	27 1/2	31 1/2	20 1/2	2	2	17	4	7 1/2	20	25	24	12 1/2	2 1/2	1 1/2	14 1/2	2 1/2	5 1/2						
SDH 12	26	11 1/2	17	32	1	24 1/2	12	17	19	22 1/2	17 1/2	19 1/2	32 1/2	37	24 1/2	2	2	19 1/2	4	7 1/2	20 1/2	29 1/2	17	14	2 1/2	1 1/2	16 1/2	2 1/2	5 1/2						

* INCLUDES 3" HIGH MOTOR ADAPTOR WHEN USED



GEAR DRIVE

MAKE Johnson
 TYPE 2:3
 FRAME No. HG200

PART No	PART LIST	PART NAME
1/4-20-2"	ADJUSTING NUT	LOCKING SCREWS
AN168	ADJUSTING NUT	
F271	DRIVE SHAFT KEY	

NOTICE

TO INSURE PROMPT SERVICE ON REPAIRS
 BE SURE TO FURNISH THE MANUFACTURER
 WITH THE SERIAL NUMBER AND COMPLETE
 NAME PLATE DATA.

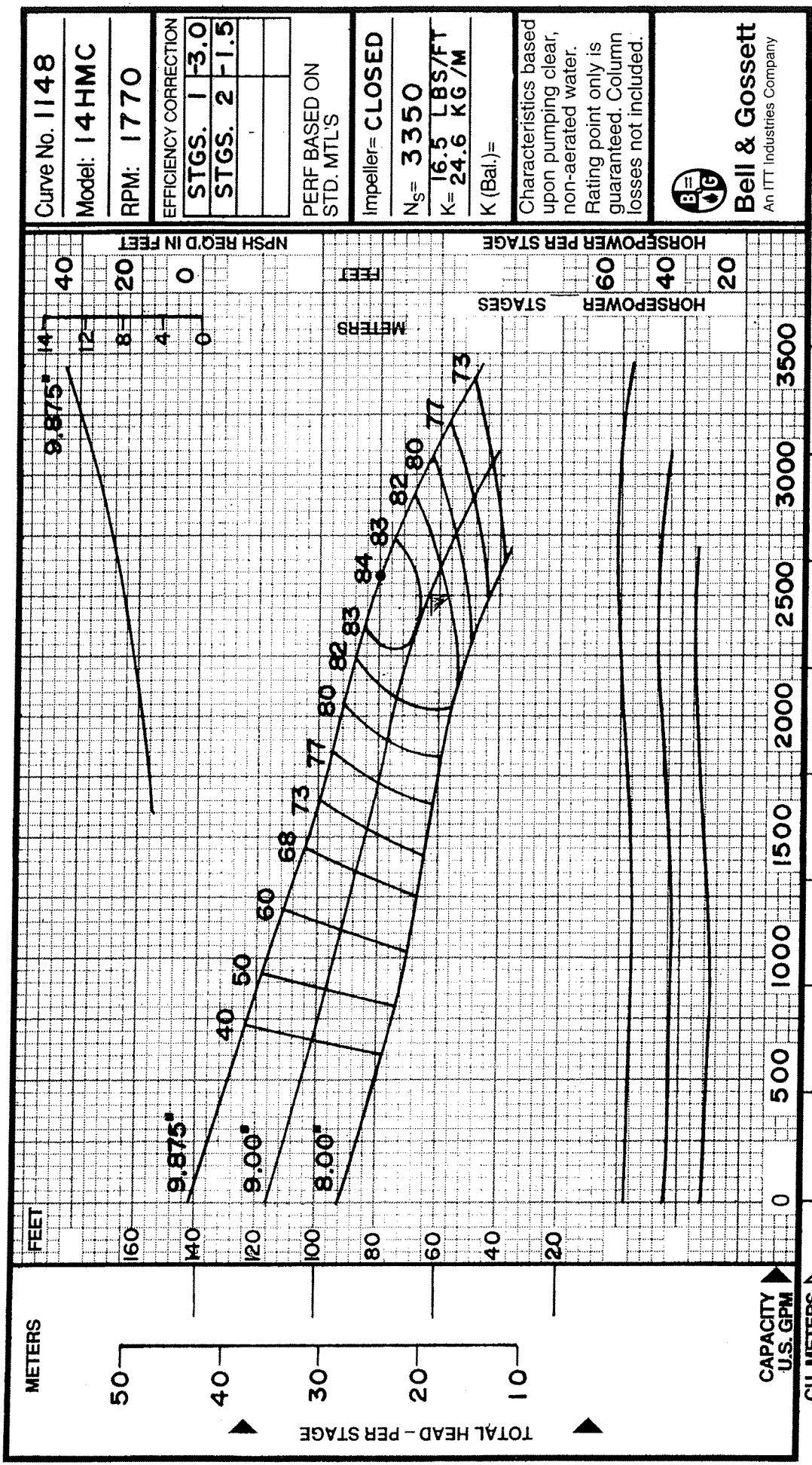
LMA 105

CITY OF ANN ARBOR, MICHIGAN
WATER UTILITY

HISTORY OF LAYNE/GOULDS PUMP #47264/455027 (STEERE FARM 21-W)

- 1963 Installed new Layne 14THLC 3-stage pump rated 2500 GPM at 250' TDH at 1770 RPM. New Johnson Model #HG200, 2:3 ratio, right angle drive installed. 20' of 12" x 1-11/16" column assembly.
- 1970(?)1969 report recommends pump be pulled for inspection. Possible pull and overhaul in 1970. No confirming data available.
- 2002 Pump pulled and overhauled. Set new Goulds 14HMC 4-stage bowl assembly rated 2500 GPM at 252' TDH with 20' of new 12" x 1-11/16" column assembly, suction pipe, and strainer.

B & G PROPOSAL NO.	B & G NO.	INQUIRY NO.	CUSTOMER P.O. NO.	P.O. DATE	ITEM NO.	CUSTOMER	PROJECT	
						City of Ann Arbor, mi-Steele Farm Well 21-W	City of Ann Arbor, mi-Steele Farm Well 21-W	
			SERVICE	F.T. TDH		% EFFICIENCY	RPM	
			4 Stage - Approx 9" impellers	252'		82%	1770	
				GPM CAPACITY				
				2500				



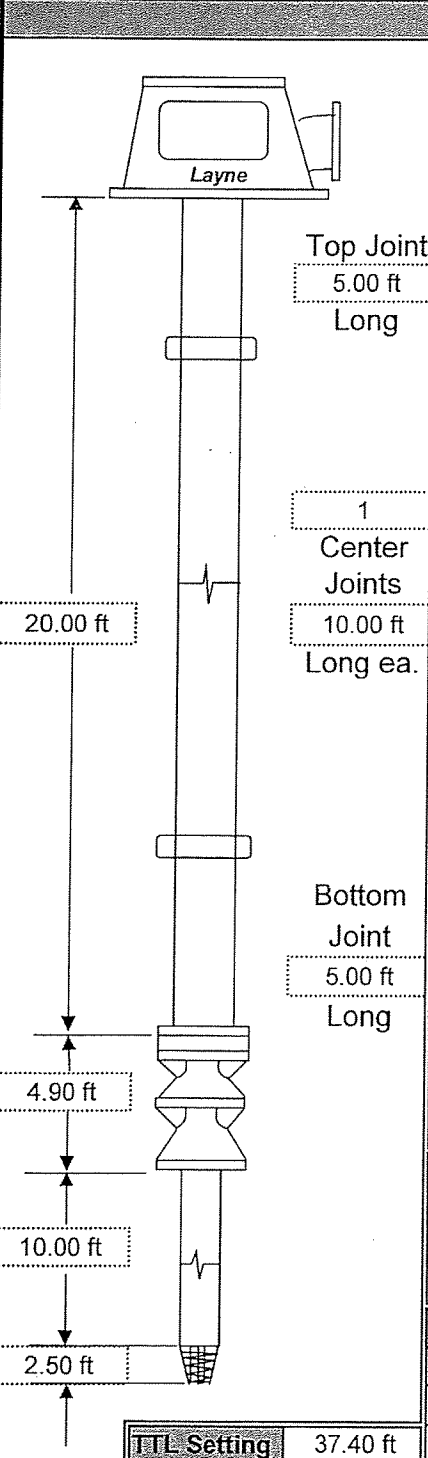
Layne Northern Company

a division of Layne Christensen Company

Lansing, Michigan

PUMP INSTALLATION REPORT

Job No.	548153				
Well No.	25W	Owner	City of Ann Arbor	Date	10/11/07
Pump No.		City	Ann Arbor	State	Michigan
Location of Well	Airport				



MOTOR		HEAD		BOWL	
Manufacturer		Manufacturer	Layne	Manufacturer	Layne
Horsepower		Type	SDH12	Model	THLC
RPM		Disc. Flg. Size	12"	Size	14"
Phase		BasePlate	N/A	No. Stages	3
Line Volts		Head Shaft Dia.	1 11/16"	Material	CI
Full Load Amps.		Head Shaft Length	5' 6"	Clm-Conn. Size	12"
Serial Number		Shaft Material	SST	Shft Conn. Size	1 11/16"
Type		Couple in Head	Yes	Constant	
Frame		COLUMN		SUCTION	
Shaft Diameter		Water Lube	Yes	Threaded	Yes
Shaft Length		Oil Lube	No	Bell	No
Thread Size		Pipe Size	12"	Size	10"
Key size		Oil Tube Size	N/A	Special Paint	No
Bolt Circle		Shaft Size	1 11/16"	Strainer	Yes
CxD Dimension		Shaft Material	SST	WELL TYPE	
Overhauled by		Coupling Material	SST	Casing Dia.	30"
GEAR DRIVE		PUMPING DATA		Well Depth	96'
Manufacturer	Johnson	Static Water Level	9'	Top Hat Size	No
Serial #	H6200	System Pressure		Casing Vent	In Head
Gear Ratio	2:3	gpm @ sys. psi		Well type	
ENGINE		Pumping Level		MONITOR SYSTEMS	
Manufacturer	CAT	Test Minutes		Airline	Yes
Model		SPECIAL CONCERNS		Airline type	Copper
Serial #		Over Head		Airline Length	23'
BLOW OFF		Underground		Airline Fastened	Tape
Size	12"	Access Limits		Stilling tube	No
Connection	Mech Joint Flg			Tube Material	
Location	Inside			Tube Length	
SPECIAL INSTRUCTIONS					
Hydro needed. Long ladder. 20' to reach eve's, large chaing tong's					
COMMENTS					
12" MJ x 12" pipe flange, 12 x 10, 10" Butterfly, 10" 8 elbow					
30' of 8" hose plus fitting & a 10 x 8 office & a 8" plate					
TTL Setting	37.40 ft	Installed by	J. Rutan & T. Brinson		

FOR SERVICE CALL 1-800-535-1297 (Lansing)

Layne-Northern

a division of Layne Christensen Company
 3126 North Martin Luther King, Jr. Blvd.
 Lansing, Michigan 48906

VERTICAL TURBINE WELL PUMP EFFICIENCY FIELD TEST

Owner: City of Ann Arbor Job No.: 8153 Well No.: 25W

Pump Mfg: Layne Pump No.: 47764 Test Date: 10/11/07

Static Water Level: 9.00 Static System Pressure: N/A Line Voltage: Cost per KWH: 0.06
 Horse Power: Normal Operation Pressure: N/A Full Load Amps: Power Factor: 0.82

Test No.	Clock Time	Pumping Level	Discharge PSI	Field Head	GPM Meter	GPM Orifice	GPM Dev. %	Volts Avg.	Check Voltage on			Amps Avg.	Check Amperage on			RPM	Wire to Water Eff. /1000gal	KWH /1000gal	Cost /1000gal	Specific Capacity
									L1	L2	L3		L1	L2	L3					
1	9:25	17.20	80.0	202.00	N/A	1044	0.0%								890				127.32	
2	9:30	17.20	80.0	202.00	N/A	1044									890				127.32	
3	9:35	17.20	80.0	202.00	N/A	1044									910				127.32	
4	9:40	21.80	90.0	229.70	N/A	1476									1000				115.31	
5	9:45	21.90	90.0	229.80	N/A	1476									1000				114.42	
6	9:50	21.90	90.0	229.80	N/A	1476									1000				114.42	
7	10:05	29.60	80.0	214.40	N/A	2194									1100				106.50	
8	10:10	29.70	80.0	214.50	N/A	2194									1100				105.99	
9	10:15	29.70	80.0	214.50	N/A	2194									1100				105.99	

REMARKS:

Tests were conducted using a 10" orifice with an 8" plate. (10" butterfly valve)

Operated by Natural gas CAT engine 342 into gear drive
 Dewayne was our operator

1200 RPM is normally okay speed, engine shut off at higher RPM's so the best we could get is 1100 RPM.

Test by: T. Brinson/J. Rulan



Peerless Midwest Inc. Water Supply Contractors

55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254 9650
28800 Wall Street / Wixom, Michigan 48339 / 248-348-6071 / Fax 248-348-6371



WELL & PUMP SERVICE INSPECTION REPORT

Owner City of Ann Arbor Water Utilities City Ann Arbor State MI

Location ± 1500 ft. West of South State Road & ± 3200 ft. South of Ellsworth Road

Well No. Steere Farm 25W Date Drilled 1962 Dia. 26" Depth 95' 6" Type Well GWW

Screen ID. NDA Screen Length 25' Depth to Top of Screen 70' 6" Type Screen SSWW

Dates of Cleaning _____

Phone 734-994-2840 Person to Contact Sumedh Bahl / Patrick Irish

	DATE	STATIC	G.P.M.	PUMPING LEVEL	PRESSURE	SPECIFIC CAPACITY
ORIGINAL	1962	3.8'	2700	9'		519.0
AFTER LAST CLEANING						
AFTER LAST TEST	2000	8'	2210	22'	104#	157.8
PRESENT AT LINE PRESSURE	2006	11'	2461	24'	55#	189.3

Test Completed Through Meter _____ Flange Size 12" Confined Space Entry? No

Engine HP 200 Make _____ Cat _____ Volts N/A RPM Pump 1770 Phase N/A

Gear Drive Johnson HP 200 Ratio 2 : 3 RPM Meter Required Yes

Pump Mfg. Layne/Floway Serial No. 47265 Airline Length 25'

Rated Capacity: 2500 GPM 261' TDH Operating Pressure 100#

Total Setting 37' Size of Packing 3/8" Date Installed 1963

Dates of Overhaul 1970 ?, 1985, 2000

Did not change motor oil - requires 7 gals. - did not have enough on hand.

THE FOLLOWING IS TO BE PERFORMED DURING EACH INSPECTION

Is Check Valve Leaking? Yes Change Motor Oil & Grease NO Repack Pump Yes Grease Pump _____

Pump is Presently Developing * 2794 GPM * 195' TDH Projected Curve Capacity 2500 GPM 232' TDH

Shut Off Pressure 180 PSI Rated Shut Off Head 432 ft. Calculated Shut Off Head 427 ft.

Electrical Data (With Pump in Operation): N/A V / / Amps N/A Full Load Amps _____

Location of Power Lines N/A Can Equipment Box be Locked Out? N/A

Distance from Top of pump pedestal to grade 7" Materials Needed to Clean Well drop out 12" spool &

dressor, very short 12" x 8" reducer, (1) one 8" elbow, 3 hoses to tank, 100' to waste

Need a Smeal to Raise Pump _____ Remarks Ran 2461 GPM at 1559 RPM. Also ran step at 1300 GPM

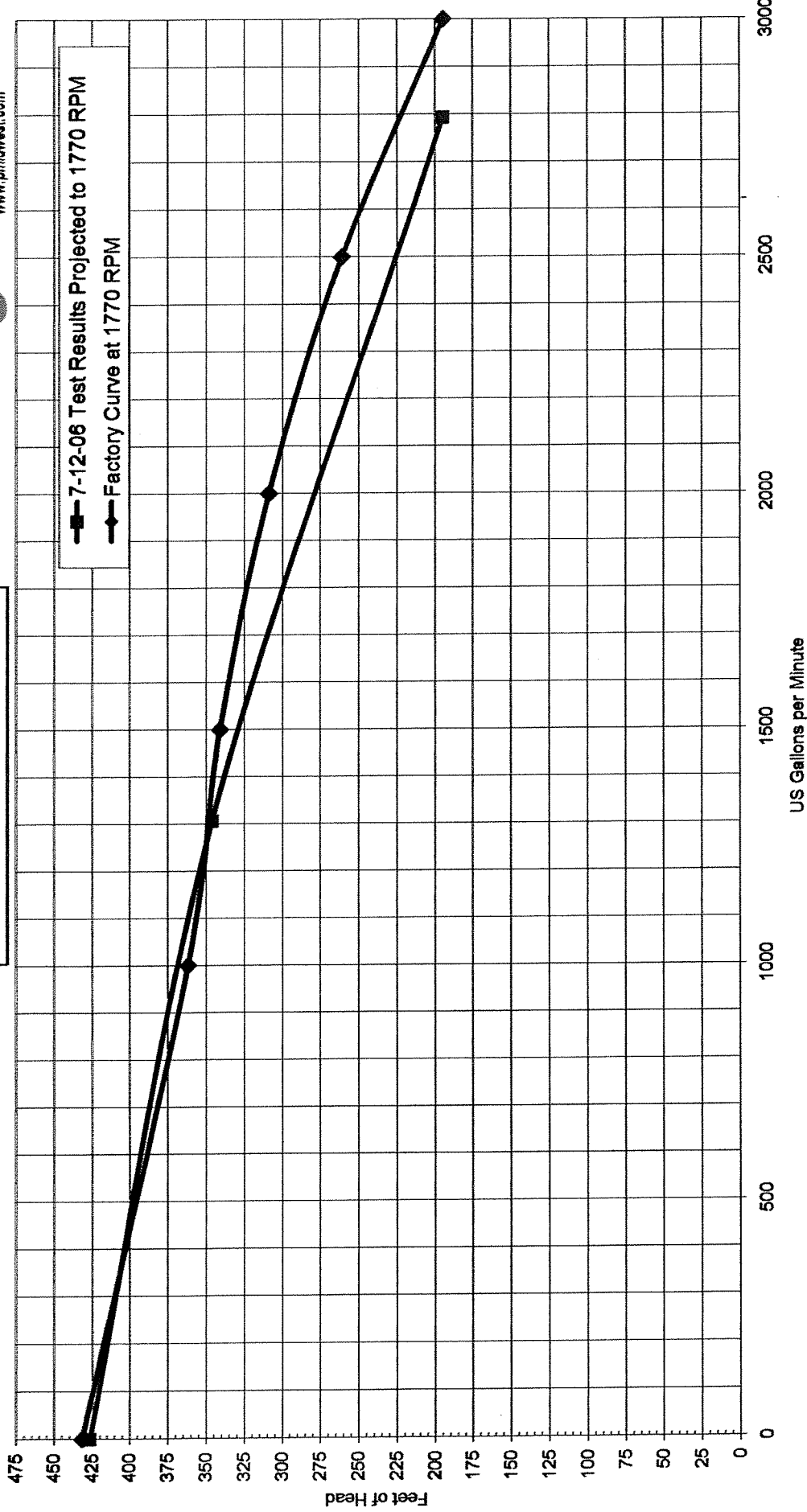
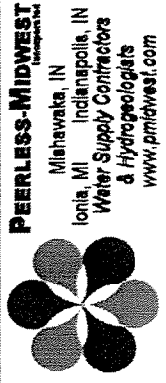
with a 19.5' PL at 140# at 1762 RPM. Used (1) 100' airline gauge. Gear drive leaking oil. * = Data projected to 1770 RPM

Maint: 12" x 10", 10" x 8", 8" elbow, 8" valve, 30' of 8" hose, 12" x 10" orifice

Inspected By John Kollar / Cody Hoshaw

Date Inspected July 12, 2006

City of Ann Arbor, MI
Steere Farm Well 25W
Floway Pump # 47265
15DKL - 3 stage at 1770 RPM



City : Ann Arbor
 State : Michigan
 Location : ±1,500 Ft W of S State Rd. &
 ±3,200 Ft S of West Ellsworth Rd.

County : Washtenaw
 Twp. (T/R) : Pittsfield (T3S/6ER)
 1/4, 1/4, 1/4, Sec.# : SE, NE, SE, 17

Test Rate : 2,700 GPM
 Static Water Level : 3.8 Ft
 Pumping Level : 9 Ft
 Specific Capacity : 519.0 GPM/Ft D.D.
 Length of Test (hrs) :

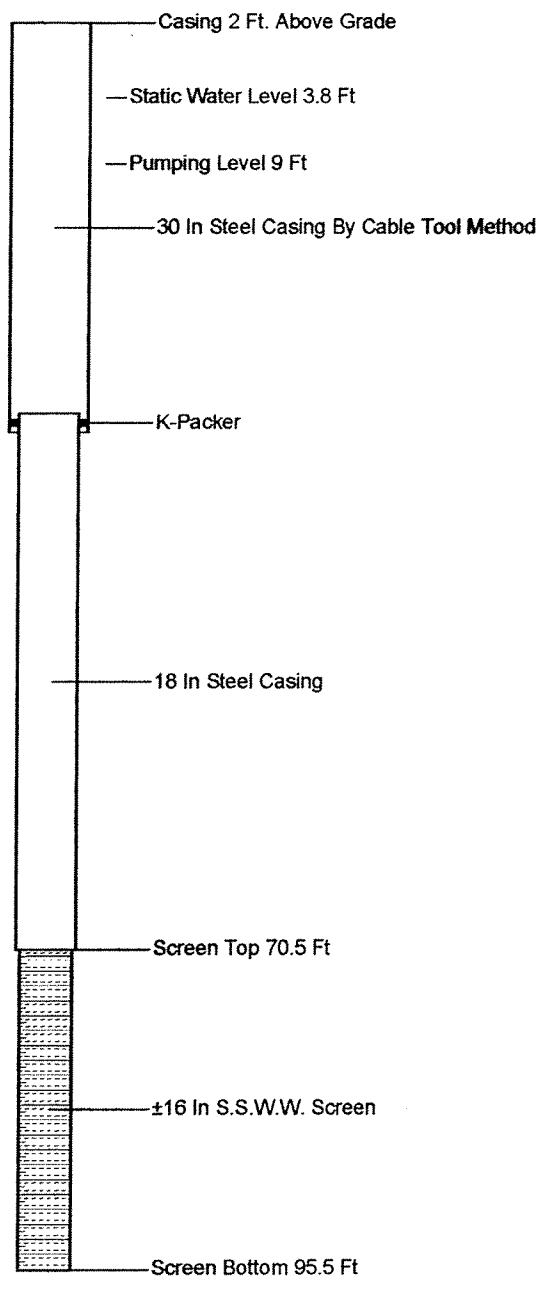
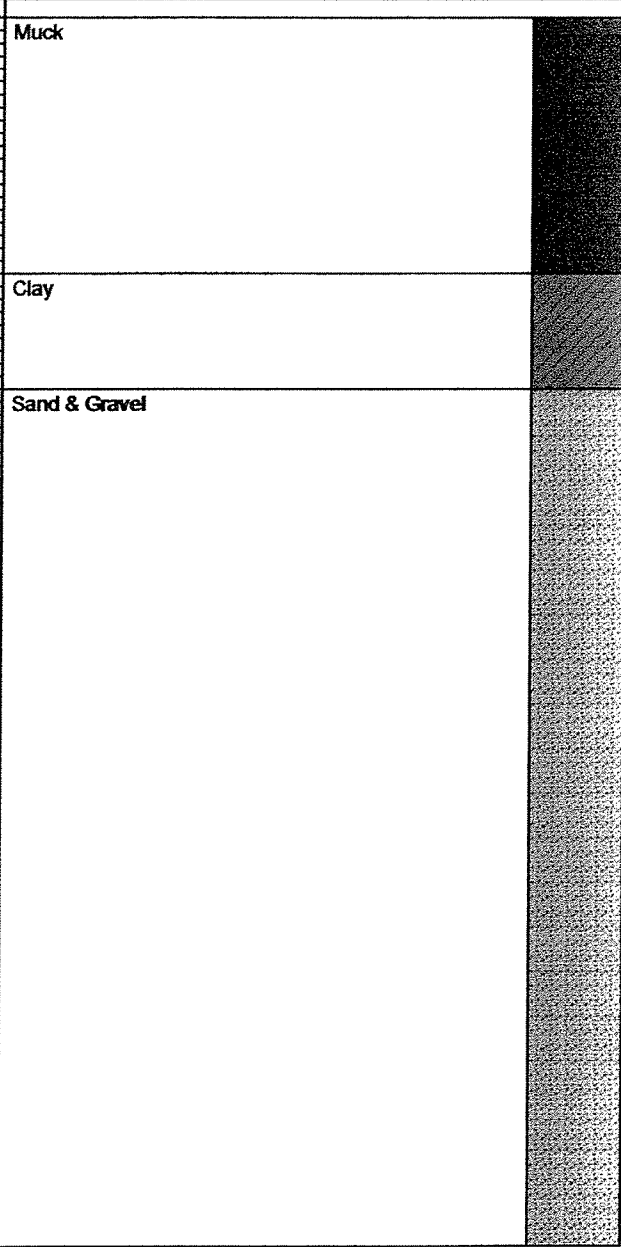
Drilling Method : N.D.A.
 Driller : Others
 Date Drilled : 1962

Well: 25-W

Depth In Feet

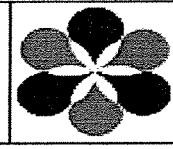
LITHOLOGY

0
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20
30
40
50
60
70
80
90



06-30-2008 K:\JOB FILES\A-C\Ann Arbor\Steere Farm Well 25-W\Ann Arbor_25_W_Well_Log.bor

City of Ann Arbor Water
 Steere Farm
 Ann Arbor, Michigan



PEERLESS-MIDWEST
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 Water Supply Contractors
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 www.pmidwest.com

CITY OF ANN ARBOR, MICHIGAN
WATER UTILITY

HISTORY OF STEERE FARM WELL 25-W

1962 Gravel wall well drilled new to a depth of 95'6" with 30" steel casing and 25' of SSWW screen. After work completed, static water level 3.8', pumped 2700 GPM, pumping level 9', specific capacity 519.0 GPM/ft dd.

2000 Well video logged.



PUMP INSTALLATION REPORT

es Order No. 16065 Date 9/28/00

Pump Mfg. Layne / Flow-A Serial No. 47265 Well No. 25W

Owner Ann Arbor Water City Ann Arbor State MI

Location of Well

MOTOR Make Johnson Type Frame Serial No.

HP Volts Line Voltage Phase RPM Non-Reverse Ratchet

GEAR DRIVE Make Johnson Serial No. 34835 Gear Ratio 2:03

Was motor and/or gear drive taken to a repair shop at this time? Motor Where

Gear yes Where TMS

ENGINE Make Model Serial No.

PUMP HEAD Type 125DH COLUMN Pipe Size 12"

Discharge Pipe Size 12" Flanged Coupled x

Located above x flanged x Ground below threaded Special Paint? no

Oil Lube Water Lube x

Separate Base Plate? no Shaft Size 1 11/16" SS or CS x

Head Shaft Length 5' Tubing Size Stl or Br

Dia. 1 11/16" Coupled above below x

Stuffing Box Size SUCTION PIPE Size 10'

MOTOR SHAFT Length 10' Special Paint no

Dia. 1 11/16" Length 44 1/2" Threads on Bottom?

Thread size in head Keyway Strainer yes Size 10"

PUMP BOWL Dia. 15" Type DKL Rubber Bumper? no

Imp. No. Open Enc. x Well Seal? no

of Stages 3 Bowls:CL x Brz

Wear Rings no

Length Shaft Dia. 2 1/4"

WELL INFORMATION All measurements from x Gravel Wall top of pump foundation Tubular

Inside Dia. 26" Depth 96' Static 8' Type Rock

Air Line Length 25' Strapped to Column? top 5'

Type Airline Plastic x Copper Tubing Steel Pipe

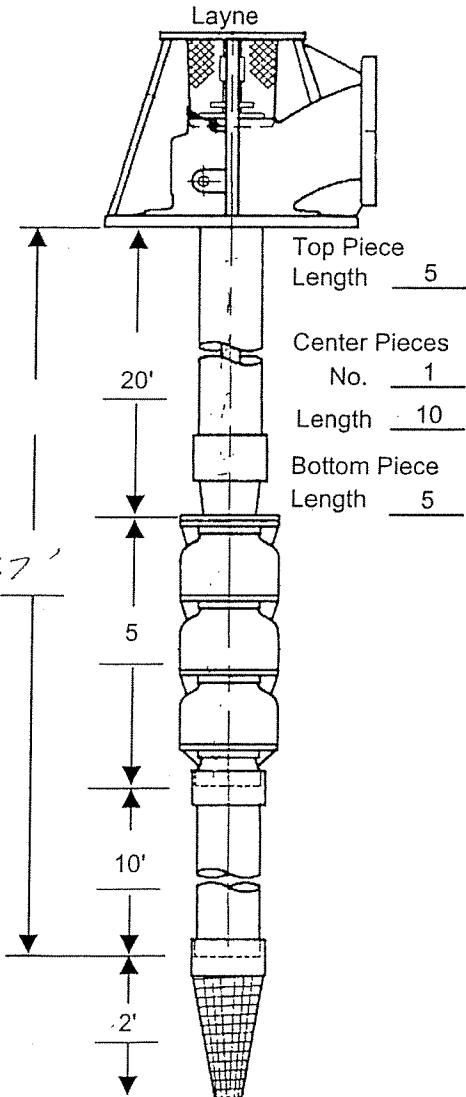
PUMPING TEST-Pumped 2210 GPM at 22' ft. Pumping Level

with 104# lbs. Discharge Pressure after 1/2 hours. Specific Capacity 157.8

SPECIAL EQUIPMENT OR PULLING INSTRUCTIONS

Big R.O.

Power Lines



37'

REMARKS 1800 RPM

Installer Tony Ross



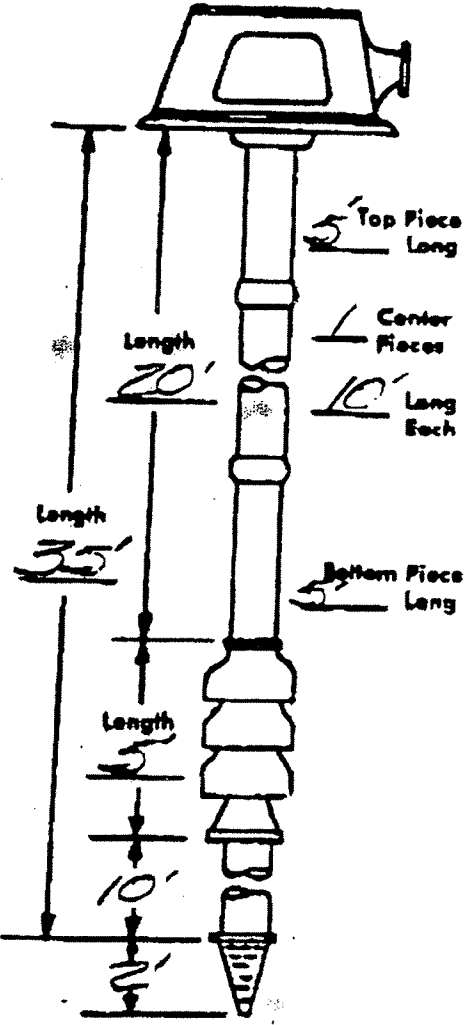
INDIANAPOLIS - MISHAWAKA - LANSING

PUMP INSTALLATION REPORT

#25

File No. _____
 Sales Order No. 44-2287
 Pump Mfg. LAYNE'S EQUIPMENT Serial No. 47265 Well No. E Well
 Owner ALICE HARRIS City SAME State MICHIGAN
 Location of Well AIRPORT ON STATE RD.
 MOTOR: Make N/A Type N/A Frame N/A Ser. No. N/A
 HP 1/2 Volts N/A Line Voltage N/A Phase N/A RPM N/A
 Was Motor Taken to a repair shop at this time? YES Where? LAYNE SHOP
 GEAR DRIVE: Make JOHNSON Serial No. 34835 Gear Ratio 2-3
 ENGINE: Make CAT. Model H6200 Serial No. BHP2000176

1100 E.F.M SYSTEM



PUMP HEAD Type 12SDH COLUMN Pipe Size 12"
 Discharge Pipe Size 12" Flanged _____ Coupled X
 Located X Above ground Special Paint? NO
 Flanged X Threaded _____ Oil Lube _____ Water Lube X
 Separate Base Plate? NO Shaft Size 1 1/4" SS or CS X
 Head Shaft Length 5' Tubing Size _____ SH _____ or Br _____
 Dia. 1 1/4" Coupled Above _____ X
 MOTOR SHAFT: Dia. 1 1/4" Length _____ SUCTION PIPE Size 10"
 Thread Size in Head _____ Keyway 1/4" Length 10' Special Paint? NO
 PUMP BOWL Type THLC Threads on Bottom? NO
 Dia. 14" No. of Stages 3 Strainer YES Size 10"
 Bowl Cast Iron or Bronze? CI Rubber Bumper? NO
 Shaft - SS X CS _____ Length _____ Well Seal? NO

NOTE - All measurements from top of pump foundation.
 WELL INFORMATION
 Inside Dia. 26" Depth 96'10" Static 7' Type: Gravel Wall Tubular _____ Rock _____
 Air Line Length 25' Strapped to Column? YES
 Type Airline _____ Plastic X Copper Tubing _____ Steel Pipe _____
 PUMPING TEST - Pumped 2353 GPM at 16' Ft. Pumping Level _____
 with 100 lbs. discharge pressure after 10 MIN hours.
 Pump to Waste Outside X Inside _____ Size _____ THD.O. _____

PULLING INSTRUCTIONS

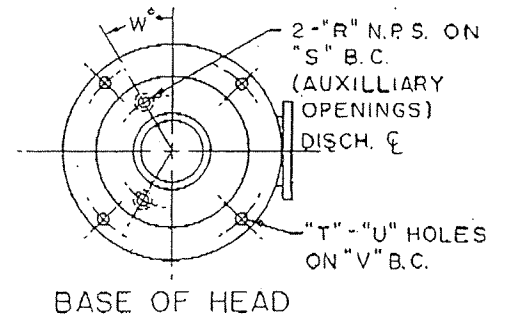
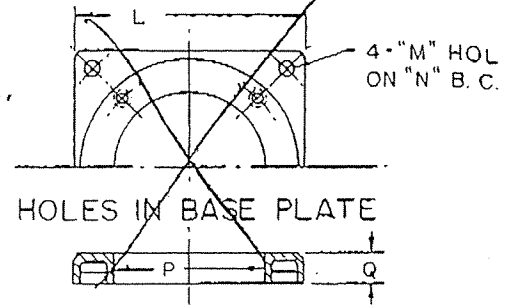
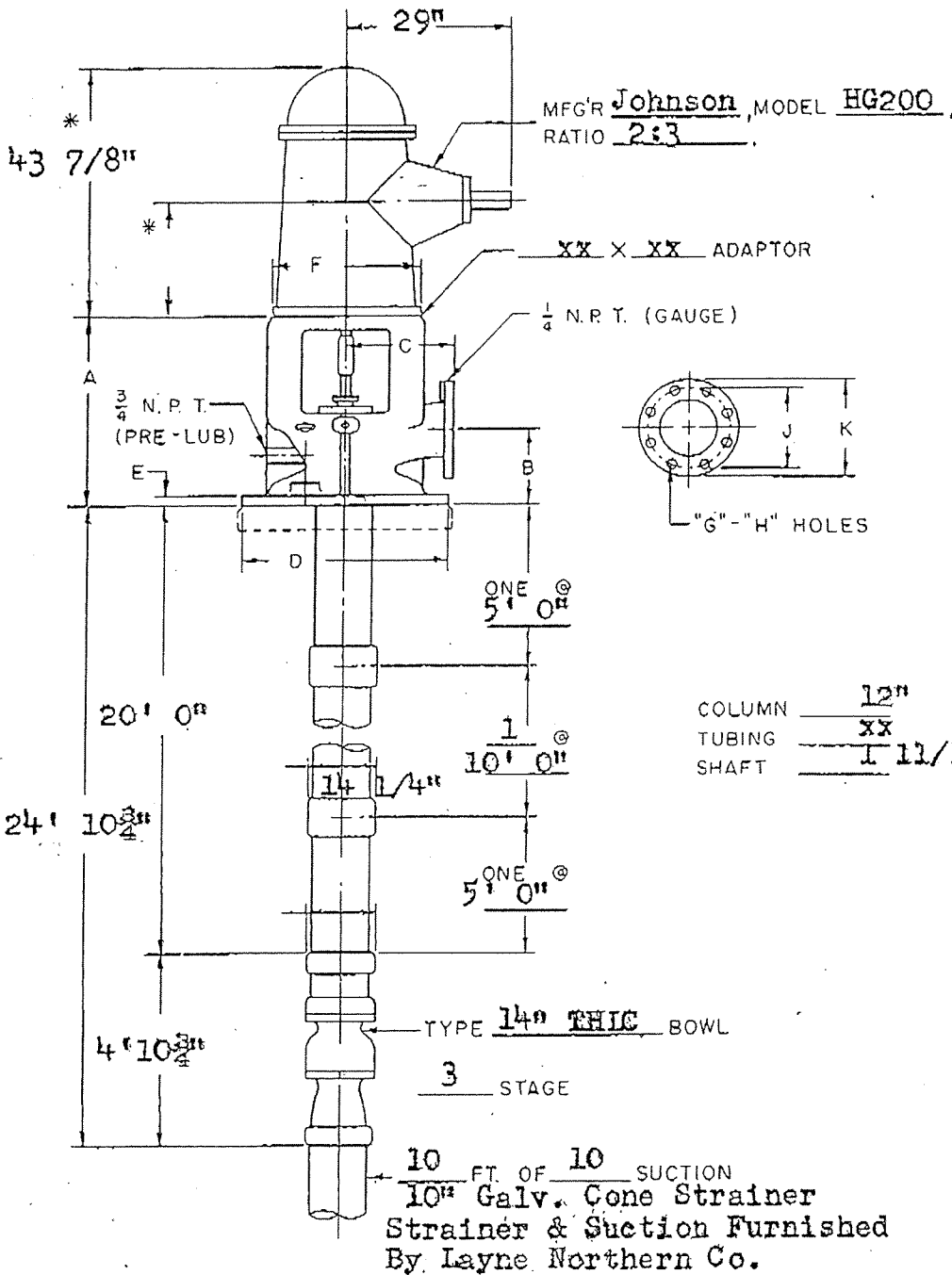
Length of Poles required FIG B.C. Special equipment or pulling instructions _____
 Power Lines: NO

MARKS: Turn Head & Pump to Waste. 8" Entry
9" x 10" Suction Pipe. Pump Discharge 12"
 Installer ALICE HARRIS

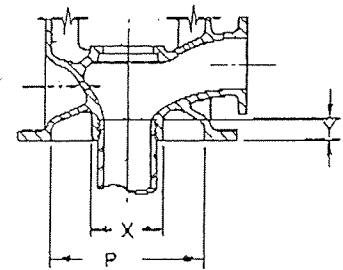
INSTALLATION PLAN
 TYPE _____ SDH DISCHARGE HEAD
 LAYNE & BOWLER, INC. MEMPHIS, TENNESSEE



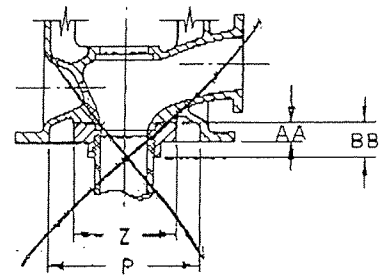
USE THESE DIMENSIONS ONLY
 WHEN CERTIFIED BY FACTORY



COLUMN 12"
 TUBING XX
 SHAFT 1 11/16"



SCREW TYPE HEAD

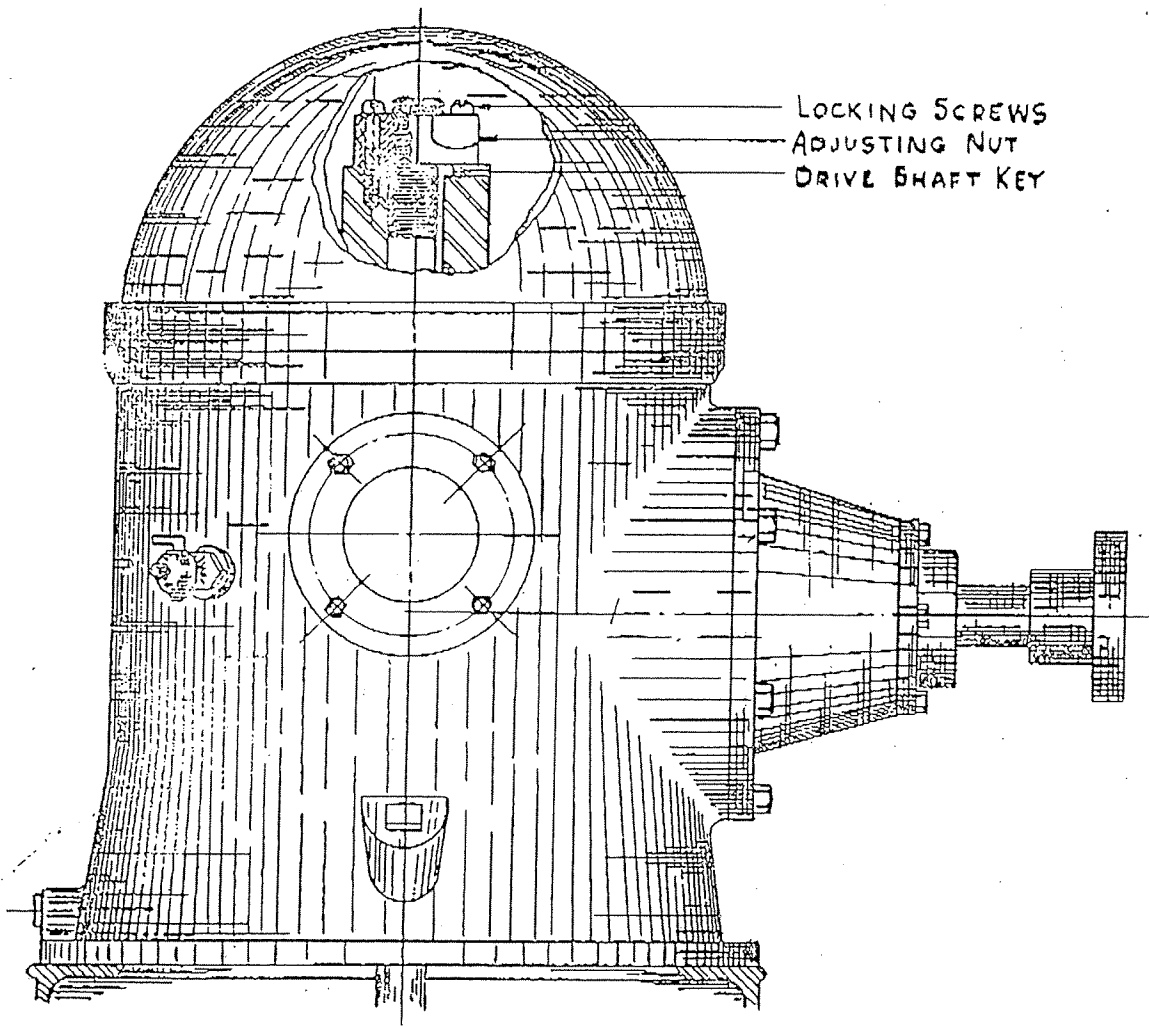


FLANGE TYPE HEAD

CUSTOMER: <u>City of</u>	YOUR NO: <u>117</u>	G.P.M.: <u>2500</u>
LOCATION: <u>Ann Arbor, Mich.</u>	OUR NO: <u>63H-2262</u>	T.D.H.: <u>250</u>
FOR APPROVAL: _____	PUMP NO: <u>47264-65</u>	R.P.M.: <u>1770</u>
CERTIFIED: _____	DATE: <u>6-5-63</u>	B.H.P.: _____

TYPE HEAD	A	B	C	D	E	F	HEAD DISCHARGE FLANGE								HEAD BASE															
							125° ASA FLANGE				250° ASA FLANGE				L	M	N	P	Q	R	S	STD.		V	W	X	Y	Z	AA	BB
							G	H	J	K	G	H	J	K								T	U							
SDH 3	14	5 1/2	7 1/2	13 1/2	8 1/2	10	4	6	7 1/2	8	7 1/2	6 3/4	8 1/2	13 1/2	15 3/4	9 1/4	11	7 1/2	4	6	8	7 1/2	11 3/4	24	4 1/2	1 1/2	5 1/2	1 1/4	3 1/2	
SDH 4	16 1/2	6	8	16	12	8	8	7 1/2	9	8	7 1/2	10	16 1/2	18 1/2	11 1/2	11 1/2	8 1/2	4	4	12	1	14 1/2	18 1/2	5 1/2	1 1/2	7	1 1/2	3 1/2		
SDH 6	20	7	11 1/2	21	2	18 1/2	8	9 1/2	11	12	10 1/2	12 1/2	21 1/4	24 1/2	14 1/2	11 1/2	11 1/2	4	4	16	1 1/2	18 1/2	20	7 1/2	2 1/2	1 1/2	4 1/4	1 1/4		
SDH 8	22	8 1/2	13	23 1/2	7 1/2	16 1/2	8	11 1/2	13 1/2	12	1	13	15	23 1/2	27 1/2	16 1/2	2	1	14	4	16	1 1/2	21 1/2	20	10	2	1 1/2	4 1/4	1 1/4	
SDH 10	25	11	15	27 1/2	1	20	12	14 1/2	16	18	1 1/2	15 1/2	17 1/2	27 1/2	31 1/2	20 1/2	2	1	17	4	20	1 1/2	25	24	12 1/2	2 1/2	1 1/2	5 1/4	1 1/4	
SDH 12	26	11 1/2	17	32 1/2	1 1/2	24 1/2	12	17	19	22	1 1/2	17 1/2	19 1/2	32 1/2	37	24 1/2	2	1	19 1/2	4	20	1 1/2	28 1/2	17	14	2 1/2	1 1/2	5 1/4	1 1/4	

* INCLUDES 3" HIGH MOTOR ADAPTOR WHEN USED



GEAR DRIVE

MAKE Johnson

TYPE 2:3

FRAME No. HG200

PART LIST

PART No	PART NAME
1/4-20-2"	ADJUSTING NUT LOCKING SCREWS
AN168	ADJUSTING NUT
F271	DRIVE SHAFT KEY

NOTICE

TO INSURE PROMPT SERVICE ON REPAIRS
BE SURE TO FURNISH THE MANUFACTURER
WITH THE SERIAL NUMBER AND COMPLETE
NAME PLATE DATA.

LMA 105

CITY OF ANN ARBOR, MICHIGAN
WATER UTILITY

HISTORY OF LAYNE/FLOWAY PUMP #47265 (STEERE FARM WELL 25-W)

1963 Installed new Layne 14THLC 3-stage pump rated 2500 GPM at 250' TDH at 1770 RPM. New Johnson model #HG200, 2:3 ratio right angle gear drive installed. 20' of 12" 1-1/16" column assembly.

1970(?) Pump possibly pulled and overhauled. No confirming data available.

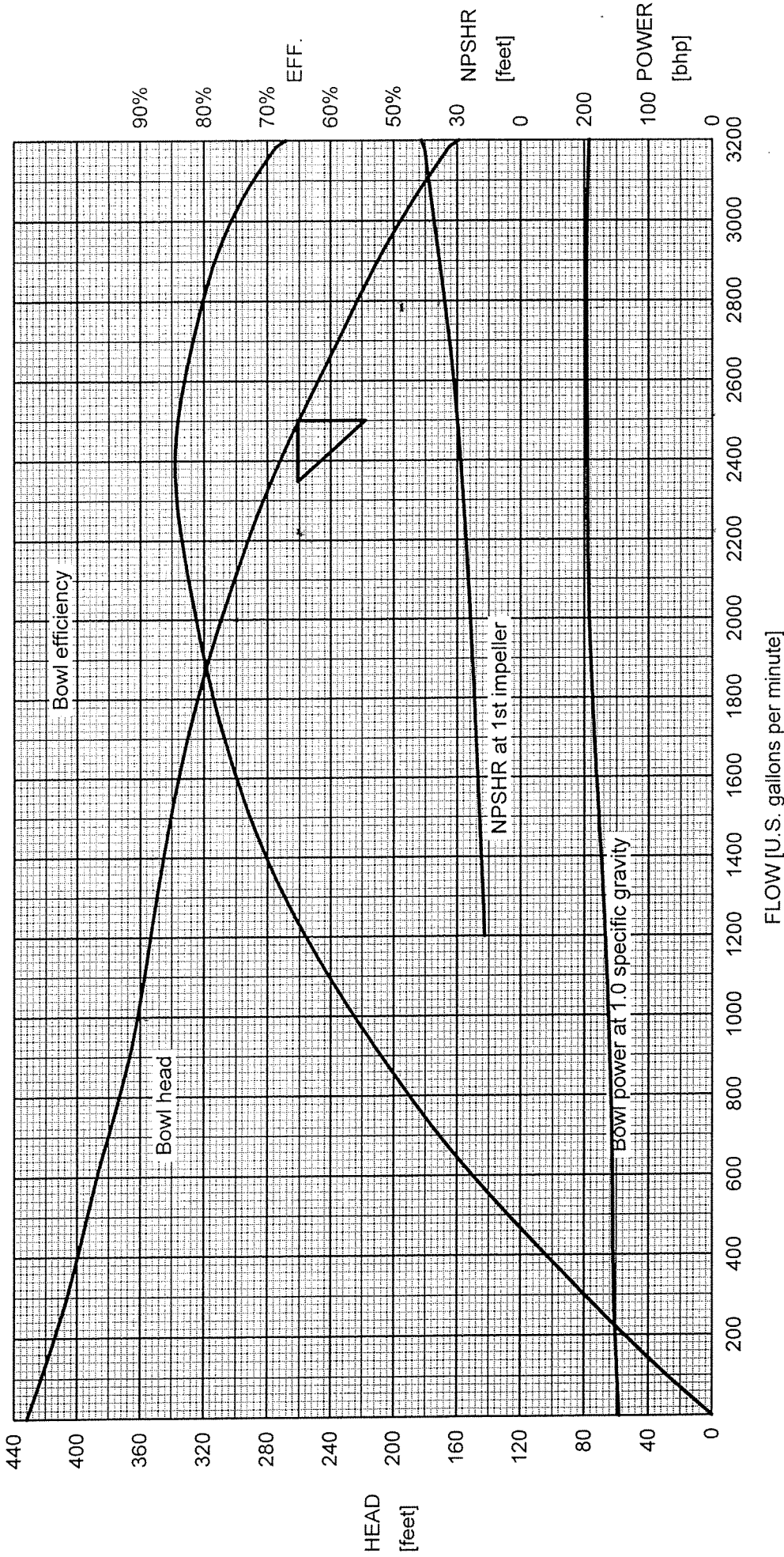
1985 Pump and gear drive pulled and overhauled.

2000 Pump and gear drive pulled and overhauled. Set new Floway 15DKL 3-stage bowl assembly rated 2500 GPM at 261' TDH at 1770 RPM.

The head and power may be different than shown in accordance with Hydraulic Institute standards.

PEERLESS-MIDWEST, INC.

City of Ann Arbor, MI Water Utilities
 Steere Farm Well 25W
 Rated 2500 GPM at 261' TDH (1770 RPM)
 Rated Shut off: 432'



Layne/FLOWAY Pump #47265



FRESNO, CALIFORNIA

A **WESCAM** COMPANY

DWN. BY: SP Geschke DATE: 06/27/2006

DWG. NO. Archimedes Professional 5.0.3 (printed: 6/27/2006 2:09:52 PM)

TYPE: 15DKL
 NO. OF STAGES: 3
 R.P.M.: 1770
 PUMP SERIAL NO.: 47265

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Peerless Midwest Inc. Water Supply Contractors

55860 Russell Industrial Parkway / Mishawaka, Indiana 46545 / 574-254-9050 / Fax 574-254 9650
28800 Wall Street / Wixom, Michigan 48339 / 248-348-6071 / Fax 248-348-6371



WELL & PUMP SERVICE INSPECTION REPORT

Owner City of Ann Arbor Water Utilities City Ann Arbor State MI

Location _____

Well No. Steere Farm 741 Date Drilled 1974 Dia. 18" Depth 79' Type Well GWW

Screen ID. 18" Nominal Screen Length 26' Depth to Top of Screen 53' Type Screen SSWW

Dates of Cleaning _____

Phone 734-994-2840 Person to Contact Sumedh Bahl / Patrick Irish

	DATE	STATIC	G.P.M.	PUMPING LEVEL	PRESSURE	SPECIFIC CAPACITY
ORIGINAL	1974	9.5'	2500	31.2'		115.2
AFTER LAST CLEANING						
AFTER LAST TEST	1998	11'	1250	17'	160#	208.0
PRESENT AT LINE PRESSURE	2006	11.5'	1350	39'	101#	49.0

Test Completed Through Meter Flange or Thread Size 8" Confined Space Entry? No

Engine HP 200 Make _____ Cat _____ Volts N/A RPM Pump 1770 Phase N/A

Gear Drive Amarillo HP 200 Ratio 2 : 3 RPM Meter Required YES

Pump Mfg. Peerless/Layne/Floway Serial No. 230209 Airline Length 42'

Rated Capacity: 2500 GPM 261' TDH Operating Pressure 100#

Total Setting 54' 10 1/2" Size of Packing 1/2" Date Installed 1975

Dates of Overhaul 1998, 2005 (gear drive)

THE FOLLOWING IS TO BE PERFORMED DURING EACH INSPECTION

Is Check Valve Leaking? No Change Motor Oil & Grease Yes Repack Pump Yes Grease Pump _____

Pump is Presently Developing *1500 GPM *336' TDH Projected Curve Capacity 2500 GPM 256' TDH

Shut Off Pressure NDA PSI Rated Shut Off Head 432 ft. Calculated Shut Off Head NDA ft.

Electrical Data (With Pump in Operation): N/A V / / Amps N/A Full Load Amps

Location of Power Lines N/A Can Equipment Box be Locked Out? N/A

Distance from Top of pump pedestal to grade 7' Materials Needed to Clean Well Drop 12" spool, one very short 12" x 8" reducer, two (2) 8" elbows, 3 hoses to tank

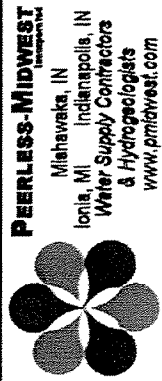
Need a Smeal to Raise Pump 7' Remarks Maint: 8" out wall, 20' of 8" hose, 12" x 10" orifice

Ran 1350 GPM at 1593 RPM. Also ran step at 1250 GPM with a 37' PL at 104# at 1594 RPM.

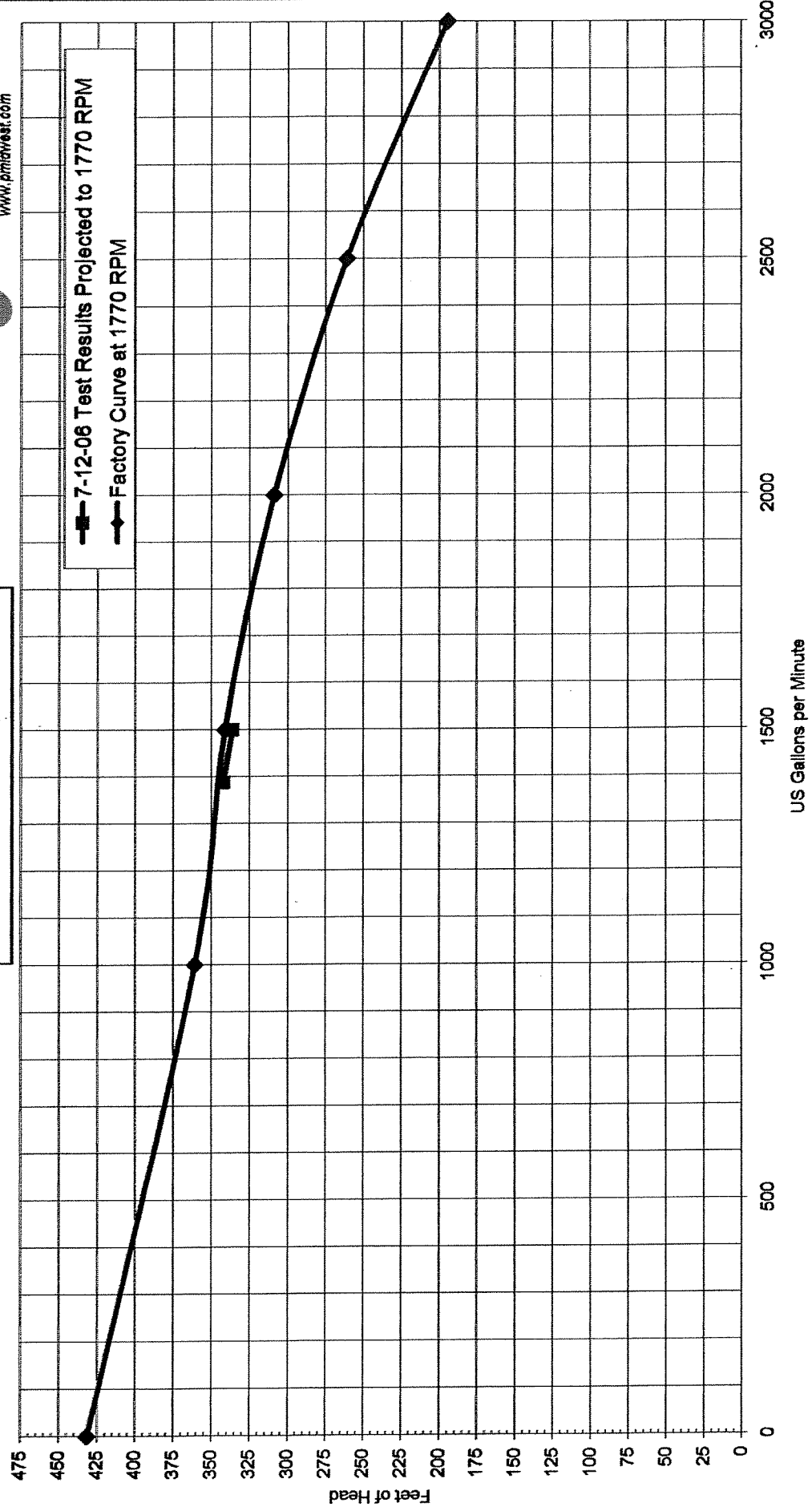
Used (1) one 100' airline gauge. * = Data projected to 1770 RPM

Inspected By John Kollar / Cody Hoshaw Date Inspected July 12, 2006

City of Ann Arbor, MI
Steere Farm Well 741W
Floway Pump # 230209
16DKL - 3 stage at 1770 RPM



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& Hydrogeologists
www.pmidwest.com
Mishawaka, IN
Lionia, MI
Indianapolis, IN



PEERLESS - MIDWEST INC., IONIA, MICHIGAN 48846 616 5270050

WELL & PUMP EFFICIENCY TEST

WELL #: 741

PUMP MAKE: Flaway

DATE OF TEST: 12-11-98

STATIC 11.0 FT.

NAME: City of Ann Arbor water utilities

ADDRESS: 919 Sunset Rd

CITY: Ann Arbor MI 48103

COMMENT NOTE: Has 8" Flaway outside, 20' to outside and 14' to center

Att: Liz Fanta - Dan Lorey

RPM: 1760

MAKE: 800

VOLTAGE: 1760

LN VOLTS:

TYPE:

FRAME:

SN:

PHASE:

MAKE: N/A

VOLTAGE:

PHASE:

Kh FACTO

MULTI-X

AUX DRIVE: AMMIRE 610

RATIO: 8-3

SN: 51200-98155

ENGINE: Caterpillar

MODEL/SN: G3342

(change to your rate)

POWER

COST 0.075

FACTOR =

Date: ORFICE Actual WATER (AIRLIN) WELL PUMP Friction TOTAL POWER

6x3&4 METER OR DRAW HEAD LOSS Ft. HEAD REV. LI-H L1-H L2-M L3-L L1-H L2-M L3-L L1-H L2-M L3-L IMP/hp HP-Calc EFF- %Cap.

12x10 1200 3400 170 160 130 90 170 60 1200 1200

1205 6.5 1230 170 160 130 90 170 60 1200 1200

1210 16.0 2023 270 130 90 170 60 1200 1200

1225 37.0 2681 360 90 170 60 1200 1200

1230 38.0 3069 404 170 60 1200 1200

1235 43.0 3065 404 170 60 1200 1200

City : Ann Arbor
 State : Michigan
 Location : ±1,400 Ft W of S State Rd. &
 ±2,600 Ft S of West Ellsworth Rd.

County : Washtenaw
 Twp. (T/R) : Pittsfield (T3S/6ER)
 1/4,1/4,1/4,Sec.# : SE,SW,NE,17

Test Rate : 2,500 GPM
 Static Water Level : 9.5 Ft
 Pumping Level : 31.2 Ft
 Specific Capacity : 115.2 GPM/Ft. D.D.
 Length of Test (hrs) :

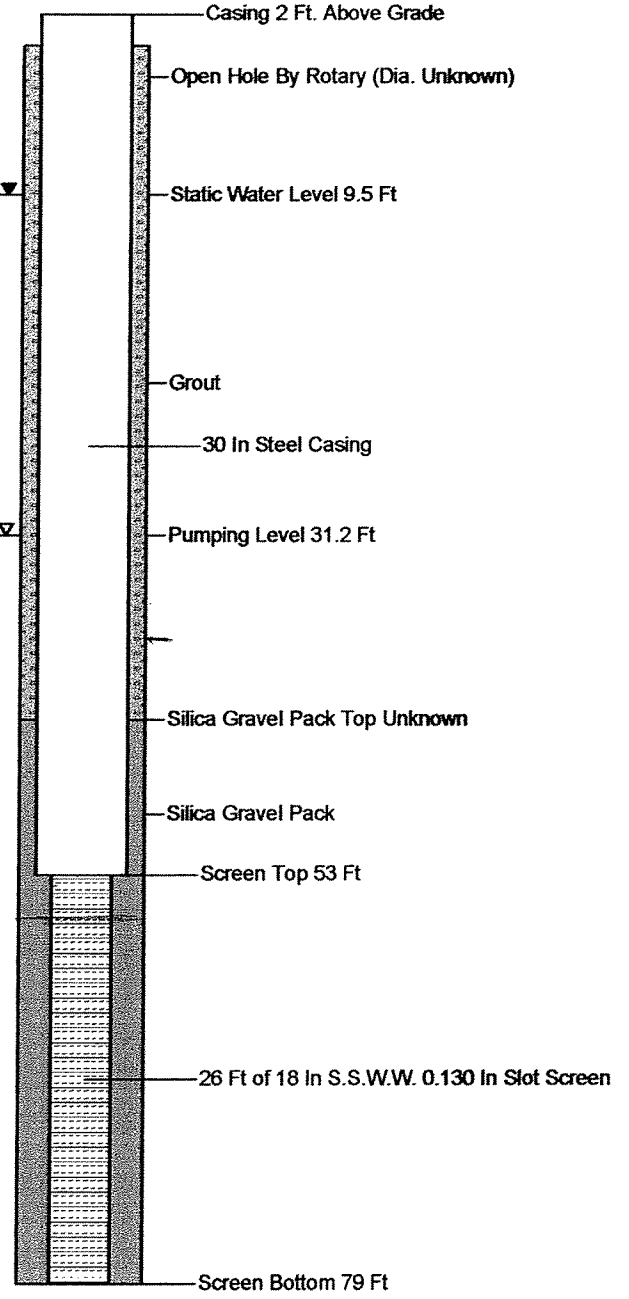
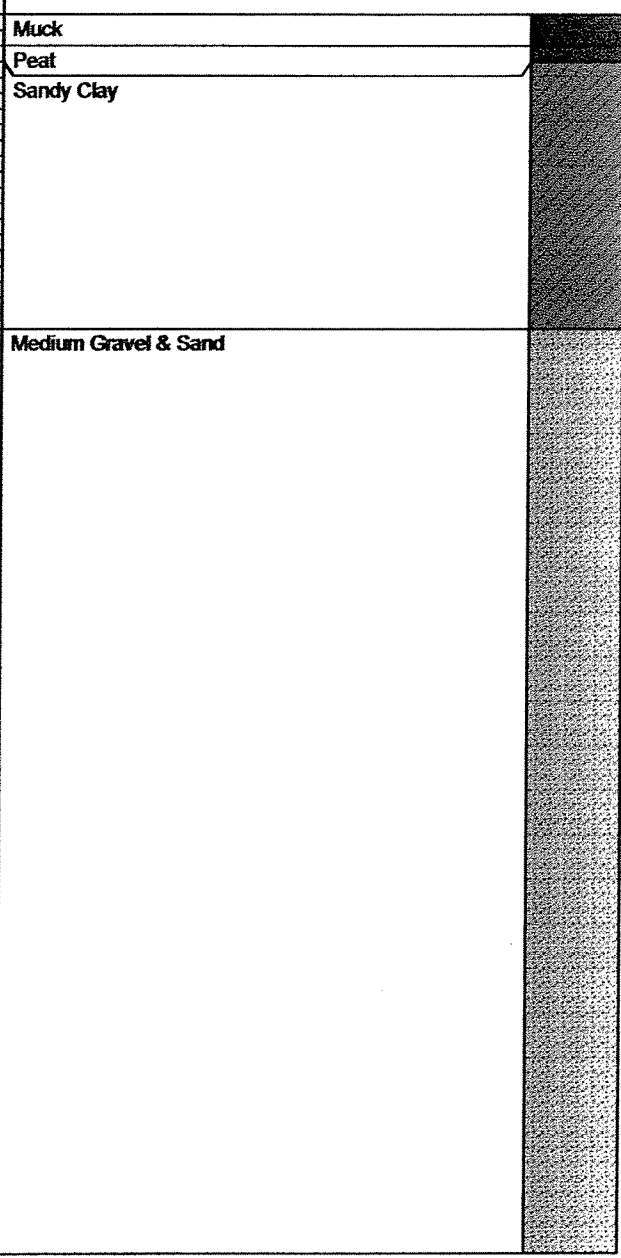
Drilling Method : N.D.A.
 Driller : Others
 Date Drilled : 1974

Well: 741

Depth In Feet

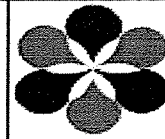
LITHOLOGY

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80



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City of Ann Arbor Water
 Steers Farm
 Ann Arbor, Michigan



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CITY OF ANN ARBOR, MICHIGAN
WATER UTILITY

HISTORY OF STEERE FARM WELL 741

1974 Gravel wall well drilled new to a depth of 79' with 30" steel casing and 26' of 18" SSWW screen. Pumped 2500 GPM with a 31.2' pumping level, 9.5' static water level. Specific capacity 115.2 GPM/ft drawdown.



PUMP INSTALLATION REPORT

Sales Order No. 14483 Date 12/11/98
 Pump Mfg. PEERLESS/LAYNE/FLOWAY Serial No. 230209 Well No. 741
 Owner City of Ann Arbor City Ann Arbor State MI
 Location of Well At Ann Arbor City Airport Off SR Exit 177

MOTOR: Make None Type _____ Frame _____ Serial No. _____
 HP 200 Volts - Line Voltage - Phase - RPM - Non-Reverse Ratchet Yes
 GEAR DRIVE: Make Amarillo Serial No. 56200-98495 Gear Ratio 2:3

Was motor and/or gear taken to a repair shop at this time? Motor _____ Where _____

Gear Yes Where TMS Electric

ENGINE: Make Caterpillar Model G342 Serial No. 71B2118

PUMP HEAD Type Peerless COLUMN Pipe Size 12"
 Discharge Pipe Size 12" Flanged _____ Coupled X
 Located ^{above} X ground, ^{flanged} X _{below} _____ ^{threaded} _____ Special Paint? None
 Separate Base Plate? Yes Oil Lube _____ Water Lube X
 Head Shaft Length 8'6" Shaft Size 1-11/16" SS _____ or CS X
 Dia. 1-11/16" ^{above} _____ _{below} X Coupled _____ Tubing Size _____ Stl _____ or Br _____
 Stuffing Box Size _____

MOTOR SHAFT SUCTION PIPE Size 12"
 Dia. 1-11/16" Length comb. head/motor Length 9'8" Special Paint? None
 Thread Size in Head _____ Keyway _____ Threads on Bottom? _____

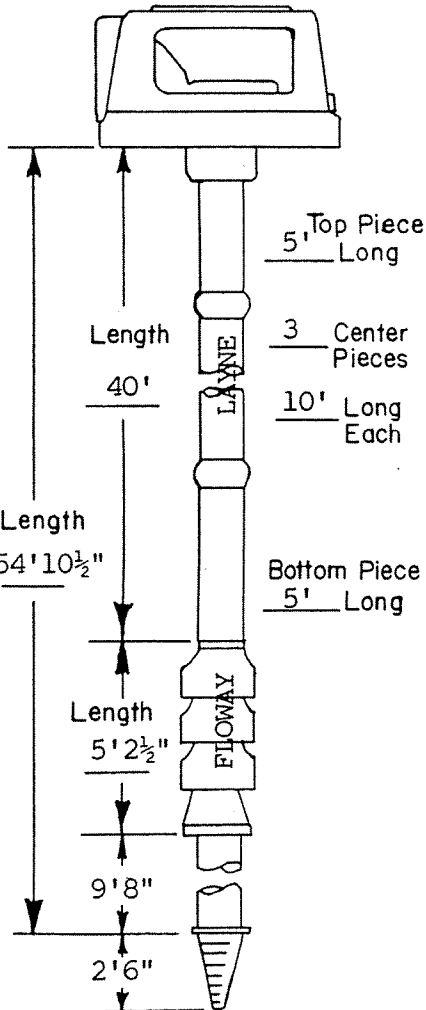
PUMP BOWL Dia. 15" Type DKL Strainer Yes Size 12"
 Imp. No. 2817046 Open _____ Encl. _____ Rubber Bumper? _____
 No. of Stages 3 Bowls: Cl X Brz _____ Well Seal? None
 Wear Rings Yes
 Length Shaft _____ Dia. _____

Note—All measurements _____ X Gravel Wall
 from top of pump foundation. WELL INFORMATION _____ Tubular
 Inside Dia. 30" Depth 77' Static 8'7" Type _____ Rock
 Air Line Length 42'6" Strapped to Column? Yes
 Type Airline: 1/4" Plastic _____ Copper Tubing X Steel Pipe
 PUMPING TEST—Pumped 268 GPM at 36 Ft. Pumping Level
 with 80 lbs. Discharge Pressure. After 15 Min ~~XXXX~~
 Specific Capacity 97.6

SPECIAL EQUIPMENT OR PULLING INSTRUCTIONS

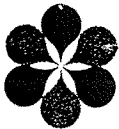
Big smeal, has 8" blow-off, 20' of 8" hose, 12"x10" orifice.

Power Lines: None



REMARKS: New bowl, column and shafting.

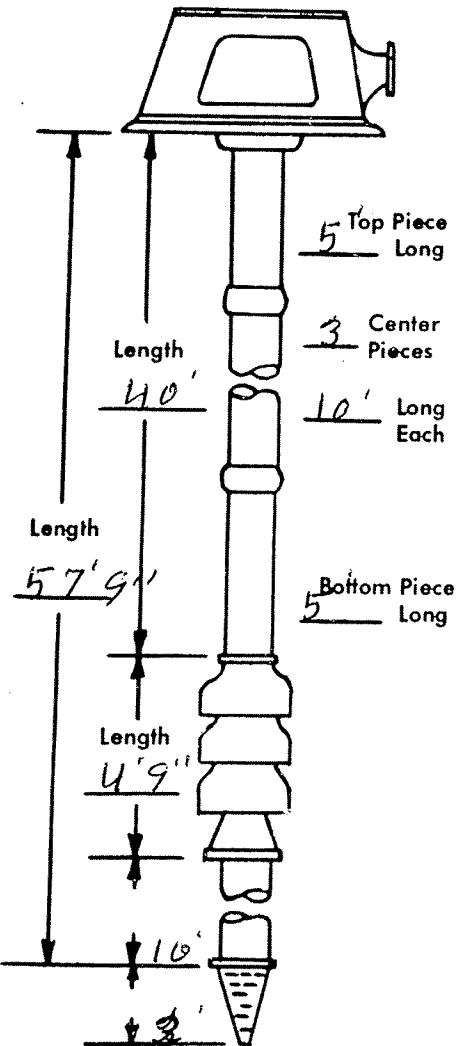
Installer Sam Hufnagel | Ron Mead
and Kevin Welton



PUMP INSTALLATION REPORT

Sales Order No. 397 Date 3-20-75
 Pump Mfg. PEERLESS Serial No. 230209 Well No. 741
 Owner ANN HARBOR AIRPORT City ANN HARBOR State MICH.
 Location of Well SOUTH SIDE OF AIRPORT, OFF OF STATE ST
 MOTOR: Make _____ Type _____ Frame _____ Ser. No. _____
 HP _____ Volts _____ Line Voltage _____ Phase _____ RPM _____
 Was Motor Taken to a repair shop at this time? _____ Where? _____
 GEAR DRIVE: Make AMARILLO Serial No. _____ Gear Ratio 2:3
 ENGINE: Make _____ Model _____ Serial No. _____

PUMP HEAD Type 12X12X20 **COLUMN** Pipe Size 12"
 Discharge Pipe Size 12" Flanged _____ Coupled
 Located ABOVE ^{above}/_{below} ground Special Paint? _____
 Flanged FLANGED Threaded _____ Oil Lube _____ Water Lube
 Separate Base Plate? YES Shaft Size 1 1/4" SS or CS
 Head Shaft Length 8' 10 1/4" Tubing Size _____ SH _____ or Br _____
 Dia. 1 1/4" Coupled below _____
MOTOR SHAFT: Dia. _____ Length _____ **SUCTION PIPE** Size 12"
 Thread Size in Head _____ Keyway _____ Length 10' Special Paint? _____
PUMP BOWL Type 15 MA Threads on Bottom? YES
 Dia. 15 1/4" No. of Stages 3 Strainer YES Size 12"
 Bowls - Cast Iron or Bronze? CAST Rubber Bumper? NO
 Shaft - SS _____ CS _____ Length _____ Well Seal? NO



NOTE - All measurements from top of pump foundation. **WELL INFORMATION**

Inside Dia. _____ Depth _____ Static _____ Type: Gravel Wall Tubular Rock _____
 Air Line Length _____ Strapped to Column? _____
 Type Airline _____ Plastic _____ Copper Tubing _____ Steel Pipe _____
PUMPING TEST - Pumped _____ GPM at _____ Ft. Pumping Level _____
 with _____ lbs. discharge pressure after _____ hours.
 Pump to Waste Outside _____ Inside _____ Size _____ THD.O. _____

PULLING INSTRUCTIONS

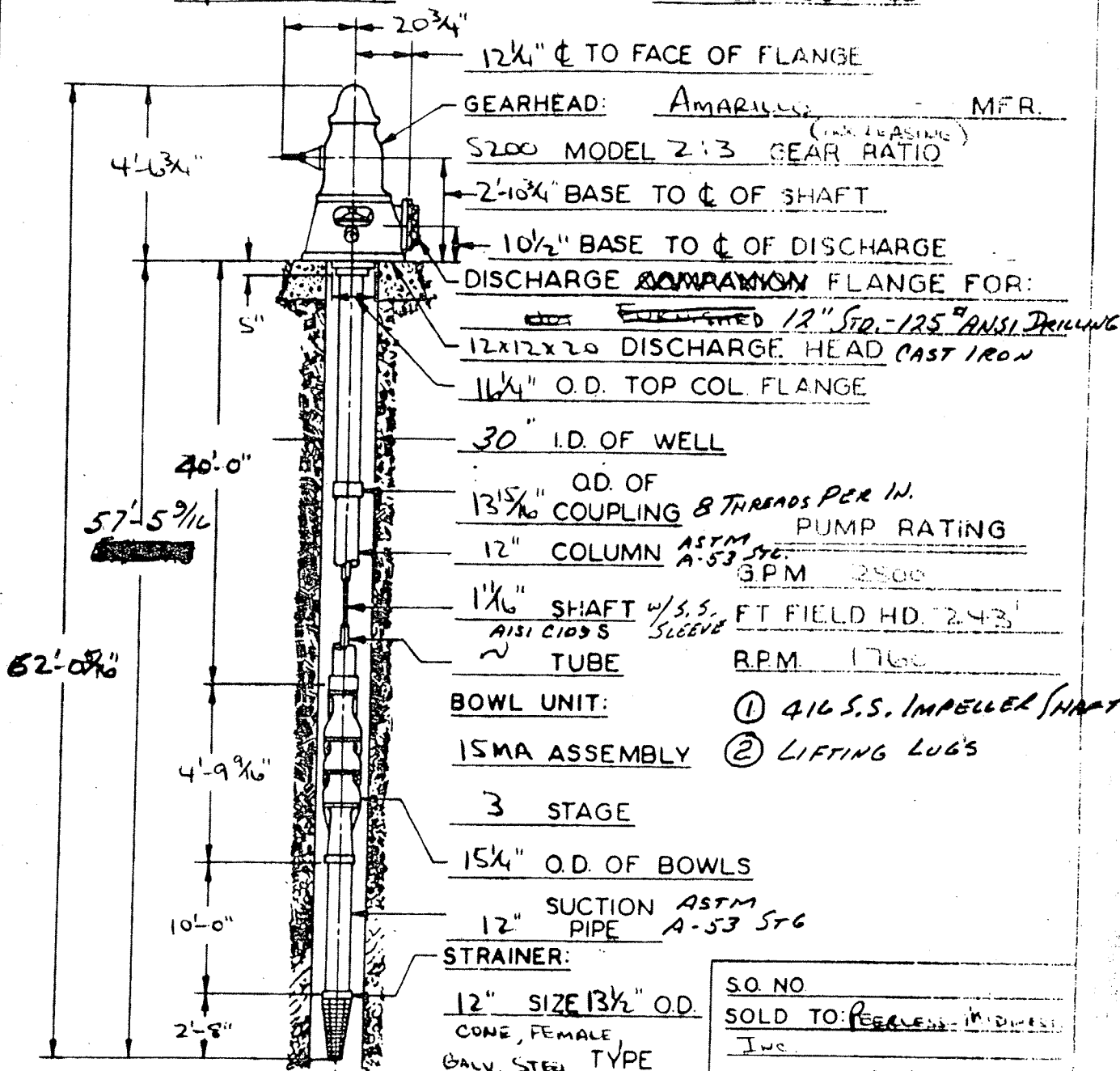
Length of Poles required STANDARD Special equipment or pulling instructions _____
 Power Lines: NO

REMARKS: Had to force first 10' of column on with hammer. No holes drilled in head for gear drive.
 Installer Paul Wyatt

PEERLESS PUMP

OPEN LINESHAFT

SURFACE DISCHARGE



GEARHEAD: AMARILLO MFR.

S200 MODEL 2:3 GEAR RATIO

2'-10 3/4" BASE TO C OF SHAFT

10 1/2" BASE TO C OF DISCHARGE

DISCHARGE ~~COMPANION~~ FLANGE FOR:

12" STD. - 125# ANSI DRILLING

12x12x20 DISCHARGE HEAD CAST IRON

1 1/4" O.D. TOP COL. FLANGE

30" I.D. OF WELL

13 5/16" O.D. OF COUPLING 8 THREADS PER IN.

12" COLUMN ASTM A-53 STG.

1 1/8" SHAFT w/ S.S. SLEEVE

ASTM A-53 STG. PUMP RATING

1 1/8" TUBE

BOWL UNIT: ① 416 S.S. IMPELLER SHAFT

ISMA ASSEMBLY ② LIFTING LUGS

3 STAGE

15 1/4" O.D. OF BOWLS

12" SUCTION PIPE ASTM A-53 STG

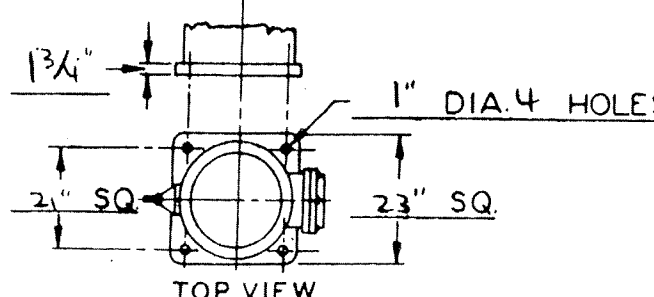
STRAINER:

12" SIZE 1 3/2" O.D. CONE, FEMALE GALV. STEEL TYPE

FT FIELD HD. 243'

R.P.M. 1760

G.P.M. 2500



TOP VIEW

S.O. NO. _____
 SOLD TO: PEERLESS - INDIANAPOLIS
 Inc.
 ORDER NO. P.O. # 719, 10/11/74
 USER: CITY OF ANY AREA
PEERLESS WELL FIELD
 PUMP IDENTIFICATION: _____

THIS CERTIFIED PRINT
 FOR APPROVAL
 BY _____ DATE _____
 FOR CONSTRUCTION
 BY H.B. DATE 4/24/74



HYDRODYNAMICS DIVISION
PEERLESS PUMP
 Los Angeles 31, Calif. • Indianapolis 8, Ind.

DRN. BY: H.B. CHK'D BY: H.B. DATE: 4/24/74

PUMP NO. 230209

CUSTOMER: FME

AMARILLO RIGHT ANGLE GEAR DRIVE

VERTICAL HOLLOW SHAFT — STANDARD THRUST

CUSTOMER ORDER NO.: MB16053

MODEL S-200 RATIO 2:3 SERIAL NO. _____

CUSTOMER JOB: _____

ROTATION: STANDARD (FIG 1)

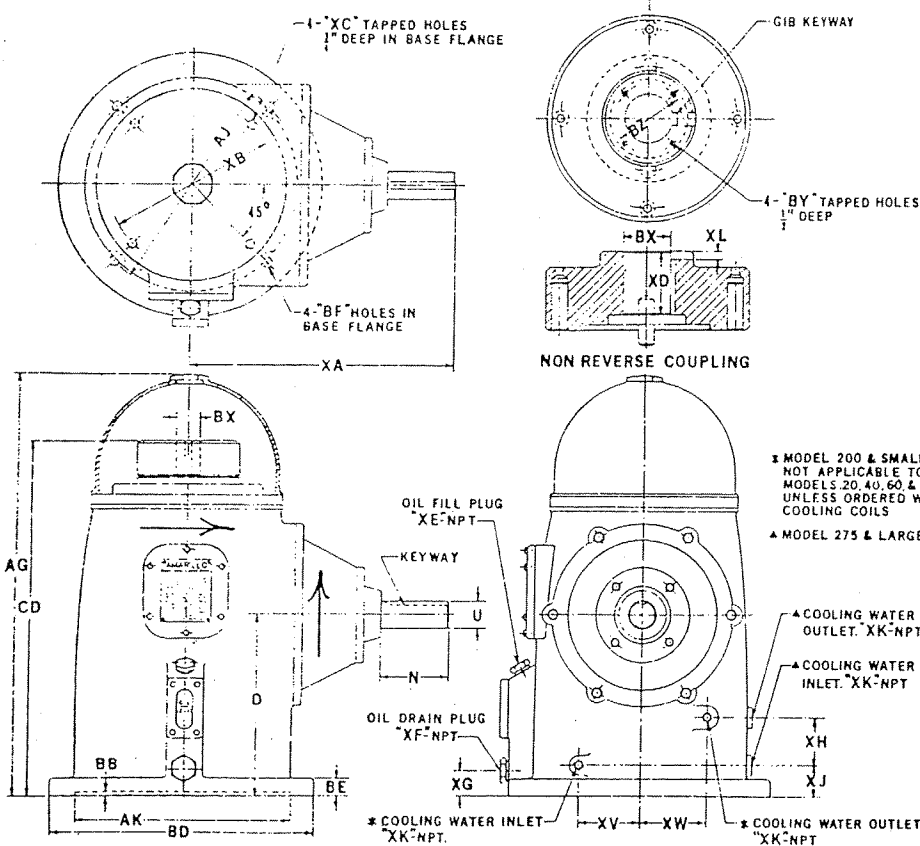
MARKS: _____

DRIVE SHAFT NO. _____ LENGTH _____

DRIVE FLANGE BORE _____ K. W. _____

ENGINE FLANGE BORE _____ K. W. _____

SPECIAL FEATURES: _____



COUPLING DIMENSIONS

BX	BORE	Gib	BY	BZ
NOM. INAL.	ACTUAL	KEYWAY		
3/2	.751	3/16 x 3/32	10-32	1 3/8
7/8	.876	1/4 x 1/8	10-32	1 3/8
1	1.001	1/4 x 1/8	10-32	1 3/8
1 1/8	1.188	1/4 x 1/8	1/4 - 20	1 3/4
1 1/4	1.251	1/4 x 1/8	1/4 - 20	1 3/4
1 5/8	1.438	3/8 x 1/8	1/4 - 20	2 1/8
1 3/4	1.501	3/8 x 1/8	1/4 - 20	2 1/8
1 7/8	1.688	3/8 x 1/8	1/4 - 20	2 3/8
2	1.751	3/8 x 1/8	1/4 - 20	2 3/8
2 1/8	1.938	1/2 x 1/4	1/4 - 20	2 3/4
2 1/4	2.188	1/2 x 1/4	3/8 - 16	3 1/4
2 3/8	2.438	5/8 x 3/8	3/8 - 16	3 1/4
2 1/2	2.688	5/8 x 3/8	3/8 - 16	3 3/4
2 7/8	2.938	3/4 x 3/8		

TOLERANCES

- "AK" DIMENSION:
8.250 DIA. +.003, -.000
13.500 DIA. +.005, -.000
22.000 DIA. +.005, -.000
- "BX" DIMENSION:
1 1/2 DIA. AND SMALLER +.001, -.000
LARGER THAN 1 1/2 DIA. +.0015, -.000
- "U" DIMENSION:
1 1/2 DIA. AND SMALLER ±.0003
LARGER THAN 1 1/2 DIA. ±.0005

MODEL	D	N	HORIZONTAL SHAFT U			AG	AJ	AK	BB	BD	BE	BF	CD	XA	XB	XC	XD	XE	XF	XG	XH	XJ	XK	XL	XV	XW	
			NOM. INAL.	ACTUAL	KEYWAY																						
S 20	6	2	2 5/8	1 1/2	1.249	5/16 x 5/16	16 1/2	9 1/8	8.250	3/16	10	5/8	7/16	13 3/4	10 7/8		1 5/16	1/2	1/2	1 5/16				3/32			
S 40A	8	4	4 3/8	1 1/2	1.499	3/8 x 3/16	21 3/4	9 1/8	8.250	1/4	12	1 1/16	7/8	18	15 5/8		1 3/4	3/4	1/2	1 1/4				3/32			
S 40B	8	2	4 3/8	1 1/2	1.499	3/8 x 3/16	21 3/4	14 3/4	13.500	1/4	16 1/2	1 1/16	1 1/16	18	15 5/8		1 3/4	3/4	1/2	1 1/4				3/32			
S 60	11	4	4 1/4	1 1/2	1.499	3/8 x 3/16	28	14 3/4	13.500	1/4	16 1/2	3/4	1 1/16	23 13/16	16 3/4		2	3/4	1/2	1 5/8	3	2	3/8	3/32	3 7/8	4 1/4	
S 80	11	4	4 1/4	1 7/8	1.874	3/8 x 3/16	28 1/2	14 3/4	13.500	1/4	16 1/2	3/4	1 1/16	23 13/16	16 3/4		2	3/4	1/2	1 5/8	3	2	3/8	3/32	3 7/8	4 1/4	
S 100	11	4	4 1/4	1 8/8	1.874	3/8 x 3/16	28 1/2	14 3/4	13.500	1/4	16 1/2	3/4	1 1/16	23 13/16	16 3/4		2	3/4	1/2	1 5/8	3	2	3/8	3/32	3 7/8	4 1/4	
S 125	11	4	4 1/2	2 7/16	2.436	5/8 x 5/16	29 3/8	14 3/4	13.500	1/4	16 1/2	3/4	1 1/16	24 1/4	18 3/4		2 1/4	3/4	1/2	1 5/8	3	2	3/8	3/32	3 7/8	4 1/4	
S 150	13	5	5 1/4	2 1/2	2.436	5/8 x 5/16	33 3/2	18 1/2	13.500	1/4	20	1 1/8	1 1/16	29 1/2	20 3/4	14 3/8	HINC	3	1	1	2 1/8	4 1/2	2 5/8	3/2	5	5	
S 200	13	5	5 1/4	2 3/8	2.436	5/8 x 5/16	33 3/2	18 1/4	13.500	1/4	20	1 1/8	1 1/16	29 1/2	20 3/4	14 3/8	HINC	3	1	1	2 1/8	4 1/2	2 5/8	3/2	5	5	
S 275	16	6	2 5/8	2 9/16	2.936	3/4 x 3/8	43 7/8	23	13.500	1/4	24 1/2	1 1/8	1 3/16	37 1/2	14 3/8	HINC	3	1	1	1 13/16	4 1/2	2 3/4	3/4	3/32	7 3/4	7 3/4	
S 375	16	6	2 5/8	2 9/16	2.936	3/4 x 3/8	43 5/8	23	13.500	1/4	24 1/2	1 1/8	1 3/16	38	14 3/8	HINC	3	1	1	1 13/16	4 1/2	2 3/4	3/4	3/32	7 3/4	7 3/4	
S 450	16	6				43 5/8	23	13.500	1/4	24 1/2	1 1/8	1 3/16	38	14 3/8	HINC	3	1	1	1 13/16	4 1/2	2 3/4	3/4	3/32	7 3/4	7 3/4		
S 600	18	6	3 3/4	3 7/16	3.749	7/8 x 7/16	50	23	13.500	1/4	24 1/2	1 1/8	1 3/16	42	14 3/8	HINC	3	1	1	1 13/16	6	2 7/8	3/4	3/32	8 1/4	8 1/4	
S 750	21	8	4	3 9/8	3.998	1 x 1/2	62 1/2	28 3/2	22.000	1/4	30 1/2	1 1/4	1 13/16	50 1/4	36 7/8	26 3/4	10NC	3 3/4	1	1	2 5/16	6 5/8	3	3/4	7/8	8	8 1/2

BY: Elmer S. Johnson

DATE: 6-26-74

AMARILLO GEAR COMPANY

P. O. BOX 1789, TELEPHONE 806-373-7491

AMARILLO, TEXAS 79105

Form 7188
R-4-73

(5)

CITY OF ANN ARBOR, MICHIGAN
WATER UTILITY

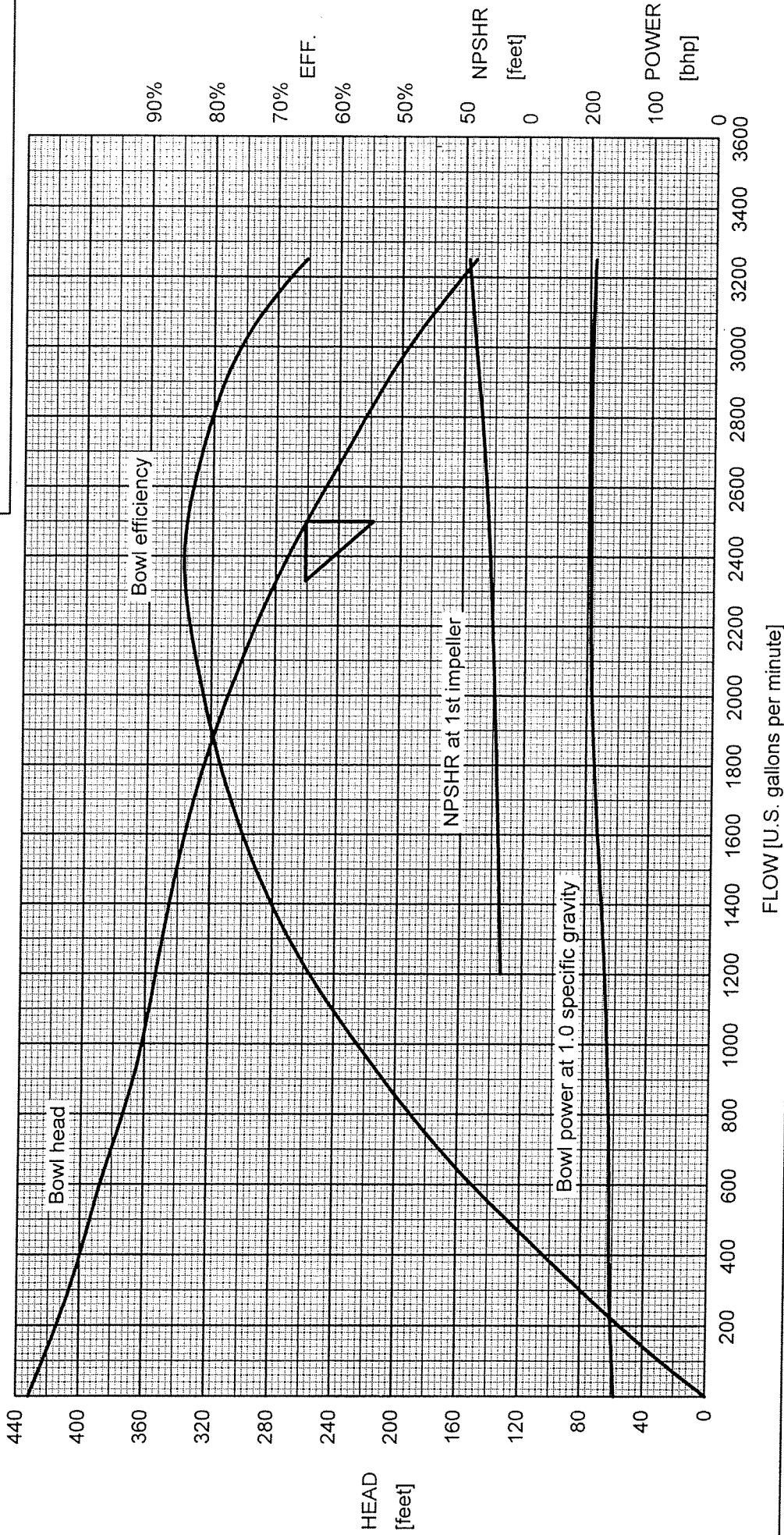
HISTORY OF PEERLESS/LAYNE/FLOWAY PUMP #230209 (STEERE FARM
WELL 741)

- 1974 Installed new Peerless 15MA 3-stage pump rated 2500 GPM at 243' TDH at 1760 RPM with 40' of 12" x 1-11/16" column assembly, and a new Amarillo Model #S-200 2:3 ratio right angle gear drive.
- 1998 Pump and gear drive pulled and overhauled. Set new Floway 15DKL 3-stage bowl assembly rated 2500 GPM at 261' TDH and 40' of new 12" x 1-11/16" column assembly and 12" suction and strainer.
- 2005 Gear drive pulled and overhauled.

The head and power may be different than shown in accordance with Hydraulic Institute standards.

PEERLESS-MIDWEST, INC.

City of Ann Arbor, MI Water Utilities
 Steere Farm Well 741
 Rated 2500 GPM at 261' TDH (1770 RPM)
 Rated Shut off: 432'



Peerless/Layne/Floway Pump # 230209



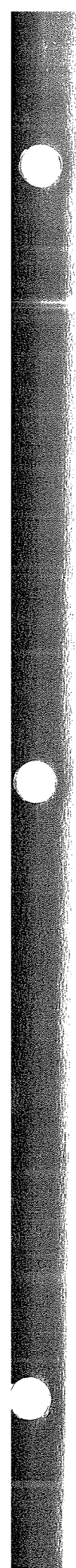
FRESNO, CALIFORNIA

A **WUEB** COMPANY

Copyright © 2002 Floway Pumps All Rights Reserved

TYPE: 15DKL
 NO. OF STAGES: 3
 R.P.M.: 1770
 PUMP SERIAL NO.: 230209

DWG. NO. Archimedes Professional 5.0.3 (printed: 6/27/2006 4:33:42 PM)
 DWN. BY: SP Geschke DATE: 06/27/2006



WINTERIZING PROCEDURE FOR STEERE FARM ENGINE & WELL LINES

ALL ENGINES

1. Cooling systems must be protected to a minimum of 35⁰ below zero. Drain and refill to desired protection with permanent type anti-freeze.
2. Oil tanks feed line valves must be closed.
3. Turn main gas valves off. These are located outside of buildings near gas meter.
4. Remove all batteries to storage. South Industrial Pumping Station.

ALL BUILDINGS

1. Remove anything in the building that could freeze.
2. Turn heat on in meter building on State Road about November 1st.
3. Secure all buildings for winter.

21-W & 25-W

1. Drain well discharge line into line pit.
2. Pump water out of pit.
3. Open drain cock on bottom side of discharge line and drain line completely.
4. Close drain cock tight.
5. Close discharge line gate.

741

1. Open gate on side of main discharge line. This gate faces east wall of building.
2. Insert pump suction hose about 10 feet and pump down completely.
3. Remove hose and close gate tight.
4. Close main discharge gate outside of building in manhole.

START UP 741

TURN ON MAIN GAS LINE
TURN ON OIL SUPPLY TANK LINE

RESET TADDIE TALES
ON GAGE PANEL

CRANK ENGINE

AFTER ENGINE STARTS RUN AT 650 TO 750 RPM
FOR 15 MINUTES WARM UP TIME.

ENGAGE CLUTCH TO RUN OUTPUT SHAFT.
HANDLE IS PULLED TOWARD ENGINE TO ENGAGE CLUTCH.

RUN ENGINE UP TO 1000 RPM
CHECK ENGINE TEMPERATURE GAGE
OIL PRESSURE

RETURN TACK READING WHEN EITHER STARTED
OR TURNED OFF. (ON WORKSHEET)

WHEN SHUTTING DOWN

SLOW ENGINE TO 650 TO 750 RPM
CHECK AND NOTE ALL GAGE READINGS

DISENGAGE CLUTCH

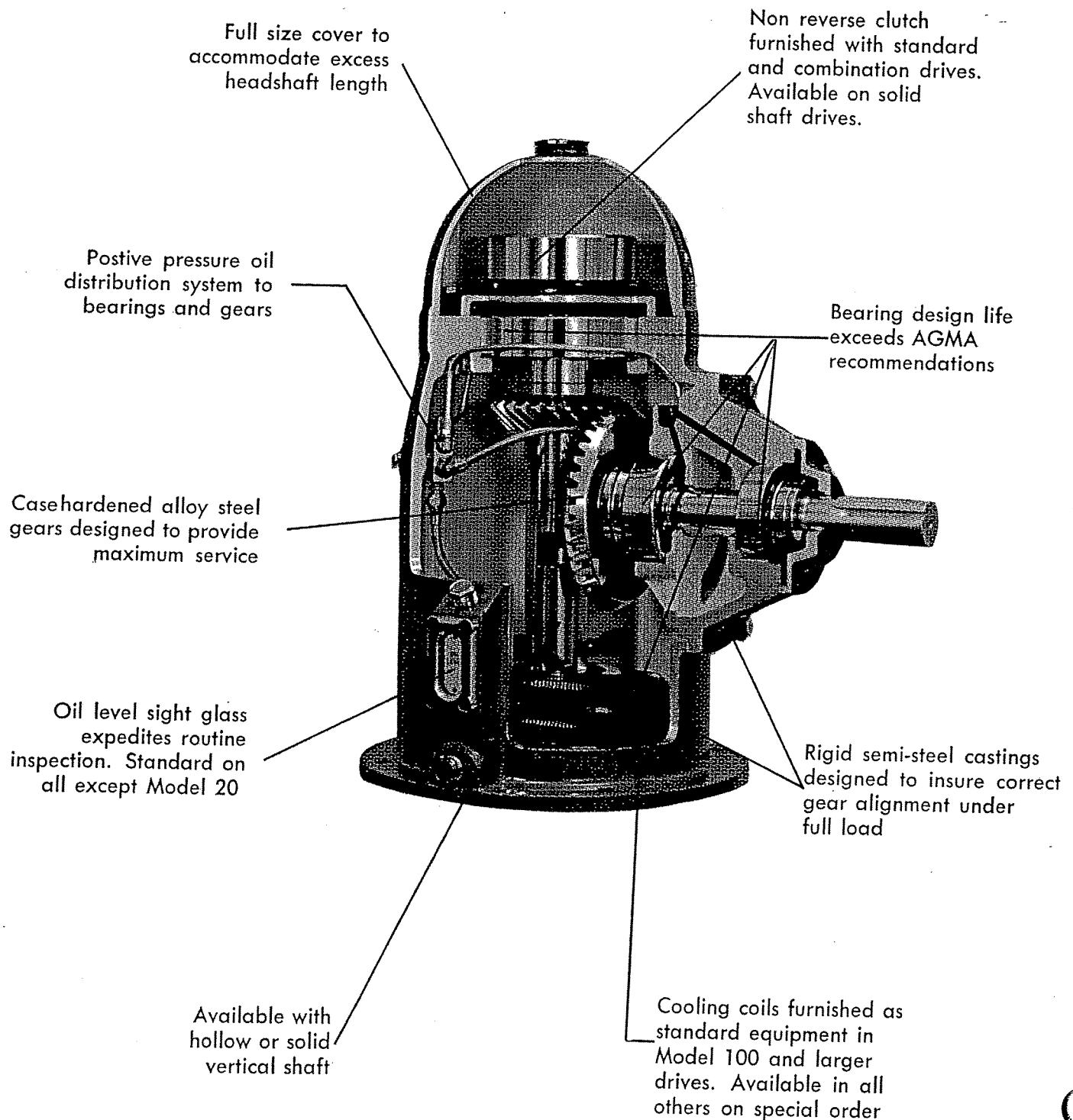
SLOW ENGINE TO 500 RPM BEFORE
SHUTTING OFF.

SHUT OFF ENGINE / SHUT OFF MAIN GAS LINE.

WINTER TIME - DIAL UP TEMPERATURE ON HEATER
THERMOSTAT BEFORE CLOSING BUILDING.

1145 = 1310
- 295 = 715
1145

OUTSTANDING HIGHLIGHTS OF AMARILLO'S PACE-SETTING DESIGNS



Every Drive Factory Tested Prior To Shipment To Assure Superior Performance

The Amarillo Gear Company enters the thirty-sixth production year with the most adaptable selection of drives to date. Twelve standard models are available, ranging from 20 to 750 HP. This range of sizes, available with a wide range of ratios, provides one of the largest selections in the industry. Amarillo Right Angle Gear Drives were developed primarily for the irrigation industry as a replacement for the quarter-turn belt drives. However, greater numbers of drives for industrial applications are being presented. This widespread acceptance is a direct result of "Amarillo's" reliable, efficient and economic operation.

FM Standard Drives Are Factory Mutual Approved for Use With Vertical Fire Pumps

SELECTION OF THE PROPER DRIVE

Several factors must be considered in the selection of a right angle drive to obtain maximum performance from minimum investment. The following information is presented to assist in making your selection:

EFFICIENCY: Through the use of high quality gears and bearings, transmission efficiency ranges from 94% to 97% varying with speed, horsepower and thrust. Actual efficiency values will be furnished upon request.

GEARS: All drives are furnished with spiral bevel gears, designed in accordance with AGMA (American Gear Manufacturers Association) standards for both strength and surface durability, employing a minimum service factor of 1.50 at rated horsepower. This service factor applies to both speed increasing and speed decreasing drives.

THRUST BEARINGS:

When possible, full advantage is taken of the thrust produced by the gears to provide maximum thrust ratings. This factor, in turn, requires either a minimum external downthrust or thrust bearings arranged to handle thrust in both directions. Thrust ratings of our standard drives are listed in Tables 3 and 5. Three types of thrust bearing arrangements are offered. They are explained as follows:

TYPE SL (Limited Thrust) drives are intended for shallow setting applications or for any application that does not produce a constant downthrust while operating. These thrust bearing arrangements will also handle continuous upthrust equal to 50% of the maximum downthrust rating.

TYPE S (Standard Thrust) drives produce maximum downthrust ratings which are adequate for most deep well applications. Type S gear drives are arranged for momentary conditions of zero downthrust or upthrust. If external thrust is less than the minimum values shown in Tables 3 and 5 for other than momentary conditions, a Type SL drive or a Type SH drive with opposed thrust bearings should be selected.

TYPE SH (Heavy Downthrust) drives have stacked thrust bearings for extreme thrust conditions. Type SH gear drives are arranged for momentary conditions of zero downthrust or upthrust. If external thrust is less than the minimum values shown in Tables 3 and 5 for other than momentary conditions, contact the factory for recommendations. When Type SH drives are supplied with opposed thrust bearings, the Type S maximum thrust ratings apply.

The thrust bearing options offered in Tables 3 and 5 are adequate for most irrigation and industrial applications. Special thrust bearing arrangements can be provided for unusual conditions that are not covered by Tables 3 and 5.

MODEL DESIGNATION: The model number designates the basic horsepower rating at 1760 RPM pump speed. The number is preceded by one of the following letter designations to define the type drive:

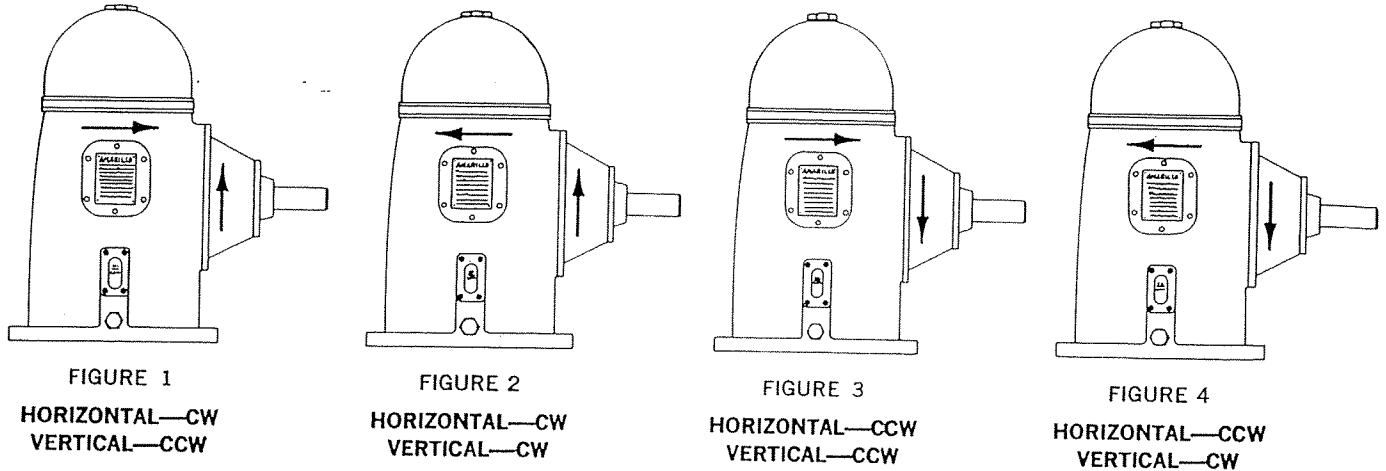
- SL Standard Hollow Shaft Drive with Limited Thrust Capacity
- S Standard Hollow Shaft Drive with Standard Thrust Capacity
- SH Standard Hollow Shaft Drive with Heavy Thrust Capacity
- SSL Solid Shaft Drive with Limited Thrust Capacity
- SS Solid Shaft Drive with Standard Thrust Capacity
- SSH Solid Shaft Drive with Heavy Thrust Capacity
- C Combination Drive
- CS Combination Drive with Solid Vertical Shaft
- D Double Drive

Example: S 60 designates a Model 60, standard vertical hollow shaft gear drive with standard thrust bearing.
SH 60 designates a Model 60, standard vertical hollow shaft gear drive with heavy thrust capacity.

All orders are processed immediately upon receipt; however, to obtain the best possible service, the following information should be supplied when ordering:

- Model Number and Type
- Ratio (or input and output speed)
- Coupling Bore in Hollow Shaft Type
- Vertical Shaft Dimensions for Solid Shaft Type
- Rotation Required
- Motor Base Diameter for Combination Type
- Flexible Shaft and Flange Requirements

RATIOS AND ROTATIONS: The ratio of a drive is defined as the ratio of the horizontal input speed to vertical output speed. For example, a 2:1 ratio would have a horizontal speed of twice the vertical speed. There are four rotational schemes available as shown in figure 1, 2, 3, and 4. Figure 1 is denoted as standard rotation. Figures 2, 3, and 4 are special rotation, being manufactured only on order, and are not subject to cancellation without charge for completed parts. CW—Clockwise; CCW—Counter-clockwise.



RATINGS: Only bearings of major manufacturers are used in the Amarillo drives. Average bearing design life far exceeds that specified by the AGMA.

The permissible loading varies with the speed, and in borderline cases, up to 10% overloading is permitted before the warranty is voided. This overloading condition should be used with the knowledge that a corresponding reduction of 25% to 30% in bearing life may be expected.

Tables 3 through 6 provide a means of rapid selection for most drive applications. The ratings given in these tables include a 1.5 service factor which is adequate for continuous operation of a deep well turbine or centrifugal pump driven by a multi-cylinder engine. Should speeds other than those listed be required, consult Table 1. Drives for special applications should be referred to the manufacturer. Our engineers will provide any necessary assistance in making your selection.

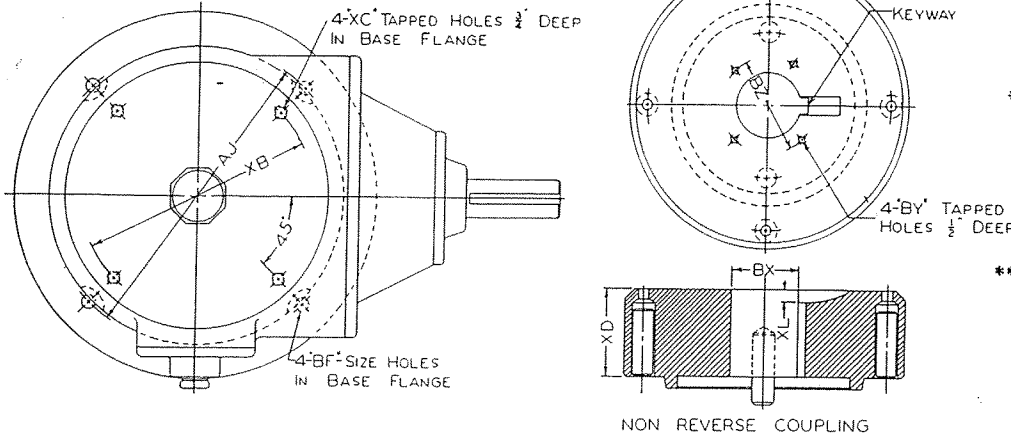
HORSEPOWER AND THRUST BEARING RATINGS

TABLE 1

Vertical Shaft R. P. M.	Percent of Rated Horsepower	Percent of Thrust Capacity	Vertical Shaft R. P. M.	Percent of Rated Horsepower	Percent of Thrust Capacity
430	37%	160%	*2000	105%	96%
580	46%	145%	*2200	111%	93%
690	52%	137%	*2400	116%	90%
720	54%	135%	*2600	122%	88%
870	61%	126%	*2800	128%	86%
960	66%	122%	*3000	133%	84%
1160	75%	115%	*3460	146%	80%
1460	88%	106%	*3600	150%	79%
1760	100%	100%			

*Cooling coils should be specified for Models 40, 60, and 80 operating with vertical speeds exceeding 1760 RPM. The factory should be consulted on Models 375 through 750 if vertical speeds exceed 1760 RPM.

**COUPLING DIMENSIONS
TABLE 2B**



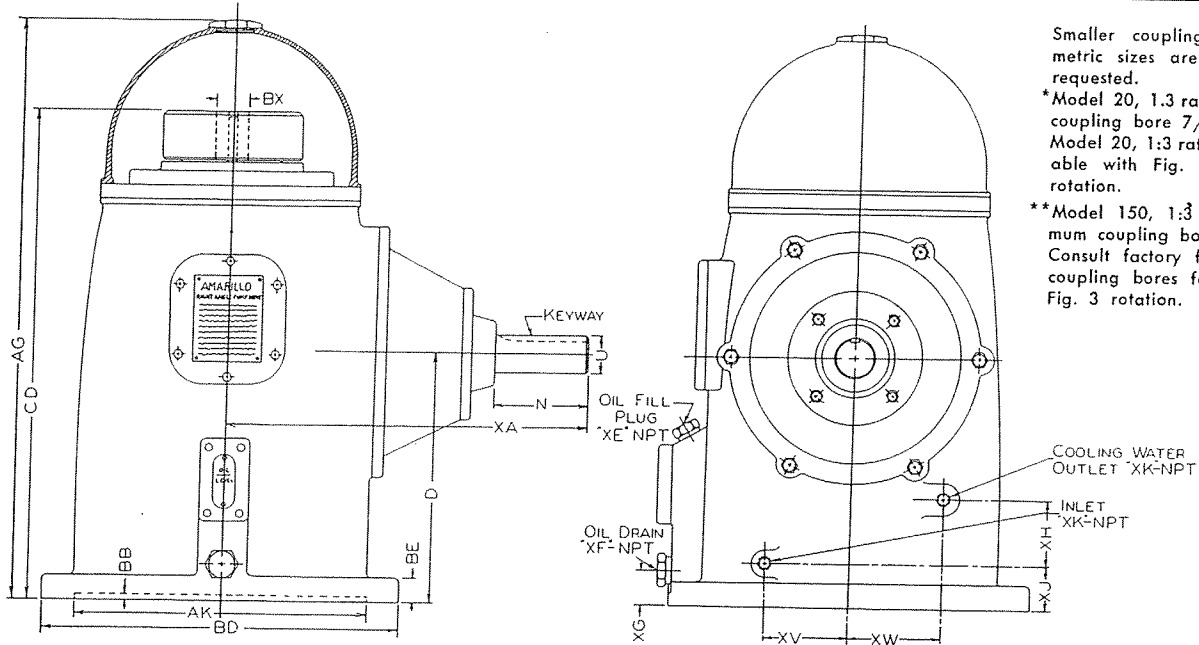
MODEL	BX	BORE MAXIMUM NOM- INAL	ACTUAL	GIB KEYWAY	BY	BZ	XD	XL
* 20	1	1.001	$\frac{3}{16} \times \frac{3}{32}$	10-32	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{9}{32}$	
40A	$\frac{1}{4}$	1.251	$\frac{1}{4} \times \frac{1}{8}$	10-32	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{9}{32}$	
40B	$\frac{1}{4}$	1.251	$\frac{1}{4} \times \frac{1}{8}$	10-32	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{9}{32}$	
60	$\frac{1}{2}$	1.501	$\frac{3}{8} \times \frac{3}{16}$	$\frac{1}{4}$ -20	$\frac{1}{8}$	2	$\frac{9}{32}$	
80	$\frac{1}{2}$	1.501	$\frac{3}{8} \times \frac{3}{16}$	$\frac{1}{4}$ -20	$\frac{1}{8}$	2	$\frac{9}{32}$	
100	$\frac{1}{2}$	1.501	$\frac{3}{8} \times \frac{3}{16}$	$\frac{1}{4}$ -20	$\frac{1}{8}$	2	$\frac{9}{32}$	
** 150	2	2.001	$\frac{1}{2} \times \frac{1}{4}$	$\frac{1}{4}$ -20	$\frac{1}{2}$	3	$\frac{9}{32}$	
200	2	2.001	$\frac{1}{2} \times \frac{1}{4}$	$\frac{1}{4}$ -20	$\frac{1}{2}$	3	$\frac{9}{32}$	
275	$2\frac{7}{16}$	2.438	$\frac{5}{8} \times \frac{5}{16}$	$\frac{3}{8}$ -16	$3\frac{1}{4}$	3	$\frac{9}{32}$	
375	$2\frac{7}{16}$	2.438	$\frac{5}{8} \times \frac{5}{16}$	$\frac{3}{8}$ -16	$3\frac{1}{4}$	3	$\frac{9}{32}$	
450	$2\frac{7}{16}$	2.438	$\frac{5}{8} \times \frac{5}{16}$	$\frac{3}{8}$ -16	$3\frac{1}{4}$	3	$\frac{9}{32}$	
600	$2\frac{7}{16}$	2.438	$\frac{5}{8} \times \frac{5}{16}$	$\frac{3}{8}$ -16	$3\frac{1}{4}$	3	$\frac{9}{32}$	
750	$2\frac{15}{16}$	2.938	$\frac{3}{4} \times \frac{3}{8}$			$3\frac{3}{4}$	$\frac{7}{16}$	

Smaller coupling bores and metric sizes are supplied as requested.

* Model 20, 1:3 ratio, maximum coupling bore 7/8".

Model 20, 1:3 ratio, not available with Fig. 2 or Fig. 3 rotation.

** Model 150, 1:3 ratio, maximum coupling bore 1-11/16". Consult factory for maximum coupling bores for Fig. 2 or Fig. 3 rotation.



**TABLE OF DIMENSIONS — STANDARD DRIVE
TABLE 2A**

MODEL	D	N	HORIZONTAL SHAFT U		TYPE SL	TYPE S	TYPE SH	AJ	AK	BB	BD	BE	BF	XA	XB	XC	XE	XF	XG	XH	XJ	XK	XV	XW				
			NOM- INAL	ACTUAL																					KEYWAY	AG	CD	AG
20	$6\frac{3}{4}$	$2\frac{5}{8}$	$1\frac{1}{4}$	1.249	$\frac{5}{16} \times \frac{5}{32}$	$16\frac{1}{4}$	$13\frac{3}{4}$	$16\frac{1}{4}$	$13\frac{3}{4}$	$17\frac{1}{4}$	$14\frac{3}{4}$	9 1/8	8.250	$\frac{3}{16}$	10	$\frac{5}{8}$	$\frac{7}{16}$	$10\frac{7}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{15}{16}$							
40A	$8\frac{1}{2}$	$4\frac{3}{8}$	$1\frac{1}{2}$	1.499	$\frac{3}{8} \times \frac{3}{16}$	$21\frac{3}{4}$	18	$21\frac{3}{4}$	18	23	$19\frac{1}{4}$	9 1/8	8.250	$\frac{1}{4}$	12	$\frac{13}{16}$	$\frac{7}{16}$	$15\frac{5}{8}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{4}$							
40B	$8\frac{1}{2}$	$4\frac{3}{8}$	$1\frac{1}{2}$	1.499	$\frac{3}{8} \times \frac{3}{16}$	$21\frac{3}{4}$	18	$21\frac{3}{4}$	18	23	$19\frac{1}{4}$	$14\frac{3}{4}$	13.500	$\frac{1}{4}$	$16\frac{1}{2}$	$\frac{13}{16}$	$\frac{11}{16}$	$15\frac{5}{8}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{4}$							
60	$11\frac{1}{2}$	$4\frac{1}{4}$	$1\frac{1}{2}$	1.499	$\frac{3}{8} \times \frac{3}{16}$	28	$23\frac{5}{16}$	28	$23\frac{5}{16}$	$29\frac{3}{8}$	$24\frac{11}{16}$	$14\frac{3}{4}$	13.500	$\frac{1}{4}$	$16\frac{1}{2}$	$\frac{7}{8}$	$\frac{11}{16}$	$16\frac{3}{4}$										
80	$11\frac{1}{2}$	$4\frac{1}{4}$	$1\frac{7}{8}$	1.874	$\frac{3}{8} \times \frac{3}{16}$	$29\frac{1}{4}$	$24\frac{9}{16}$	$28\frac{1}{2}$	$23\frac{13}{16}$	$30\frac{1}{4}$	$25\frac{9}{16}$	$14\frac{3}{4}$	13.500	$\frac{1}{4}$	$16\frac{1}{2}$	$\frac{7}{8}$	$\frac{11}{16}$	$16\frac{3}{4}$										
100	$11\frac{1}{2}$	$4\frac{1}{4}$	$1\frac{7}{8}$	1.874	$\frac{3}{8} \times \frac{3}{16}$	$29\frac{1}{4}$	$24\frac{9}{16}$	$28\frac{1}{2}$	$23\frac{13}{16}$	$30\frac{1}{4}$	$25\frac{9}{16}$	$14\frac{3}{4}$	13.500	$\frac{1}{4}$	$16\frac{1}{2}$	$\frac{7}{8}$	$\frac{11}{16}$	$16\frac{3}{4}$										
150	$13\frac{3}{4}$	$5\frac{1}{4}$	$2\frac{7}{16}$	2.436	$\frac{5}{8} \times \frac{5}{16}$	$35\frac{5}{16}$	$30\frac{13}{16}$	$33\frac{3}{4}$	$29\frac{1}{4}$	$33\frac{5}{8}$	$31\frac{1}{8}$	18 1/4	13.500	$\frac{1}{4}$	20	$\frac{1}{8}$	$\frac{11}{16}$	$20\frac{3}{4}$	$14\frac{3}{4}$	$\frac{5}{8}$ -11-NC	1	1	$2\frac{1}{8}$	$4\frac{1}{2}$	$2\frac{5}{8}$	$\frac{1}{2}$	5	5
200	$13\frac{3}{4}$	$5\frac{1}{4}$	$2\frac{7}{16}$	2.436	$\frac{5}{8} \times \frac{5}{16}$	$35\frac{5}{16}$	$30\frac{13}{16}$	$33\frac{3}{4}$	$29\frac{1}{4}$	$33\frac{5}{8}$	$31\frac{1}{8}$	18 1/4	13.500	$\frac{1}{4}$	20	$\frac{1}{8}$	$\frac{11}{16}$	$20\frac{3}{4}$	$14\frac{3}{4}$	$\frac{5}{8}$ -11-NC	1	1	$2\frac{1}{8}$	$4\frac{1}{2}$	$2\frac{5}{8}$	$\frac{1}{2}$	5	5
275	16	6	$2\frac{15}{16}$	2.936	$\frac{3}{4} \times \frac{3}{8}$	$43\frac{1}{4}$	$36\frac{7}{8}$	$43\frac{7}{8}$	$37\frac{1}{2}$	$43\frac{5}{8}$	38	23	13.500	$\frac{1}{4}$	$24\frac{1}{2}$	$\frac{1}{8}$	$\frac{13}{16}$	$25\frac{1}{2}$	$14\frac{3}{4}$	$\frac{5}{8}$ -11-NC	1	1	$1\frac{13}{16}$	$4\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{3}{4}$	$7\frac{3}{4}$	$7\frac{3}{4}$
375	16	6	$2\frac{15}{16}$	2.936	$\frac{3}{4} \times \frac{3}{8}$	$43\frac{1}{4}$	$36\frac{7}{8}$	$43\frac{7}{8}$	38	$46\frac{1}{8}$	$38\frac{1}{4}$	23	13.500	$\frac{1}{4}$	$24\frac{1}{2}$	$\frac{1}{8}$	$\frac{13}{16}$	$25\frac{1}{2}$	$14\frac{3}{4}$	$\frac{5}{8}$ -11-NC	1	1	$1\frac{13}{16}$	$4\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{3}{4}$	$7\frac{3}{4}$	$7\frac{3}{4}$
* 450	16	6	$3\frac{3}{4}$	3.749	$\frac{7}{8} \times \frac{7}{16}$	$43\frac{1}{4}$	$36\frac{7}{8}$	$43\frac{7}{8}$	38	$46\frac{1}{8}$	$38\frac{1}{4}$	23	13.500	$\frac{1}{4}$	$24\frac{1}{2}$	$\frac{1}{8}$	$\frac{13}{16}$	$25\frac{1}{2}$	$14\frac{3}{4}$	$\frac{5}{8}$ -11-NC	1	1	$1\frac{13}{16}$	$4\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{3}{4}$	$7\frac{3}{4}$	$7\frac{3}{4}$
600	18	6	$3\frac{3}{4}$	3.749	$\frac{7}{8} \times \frac{7}{16}$	$46\frac{5}{16}$	$40\frac{15}{16}$	50	42			23	13.500	$\frac{1}{4}$	$24\frac{1}{2}$	$\frac{1}{8}$	$\frac{13}{16}$	$26\frac{3}{4}$	$14\frac{3}{4}$	$\frac{5}{8}$ -11-NC	1	1	$1\frac{13}{16}$	6	$2\frac{7}{8}$	$3\frac{3}{4}$	$8\frac{1}{4}$	$8\frac{1}{4}$
750	21	8	4	3.998	$1 \times \frac{1}{2}$	$62\frac{1}{4}$	$50\frac{1}{4}$	$62\frac{1}{4}$	$50\frac{1}{4}$			$28\frac{3}{4}$	22.000	$\frac{1}{4}$	$30\frac{1}{2}$	$\frac{1}{4}$	$\frac{13}{16}$	$36\frac{7}{8}$	$26\frac{3}{4}$	10-NC	1	1	$2\frac{15}{16}$	$6\frac{5}{8}$	3	$3\frac{3}{4}$	8	$8\frac{1}{2}$

* Horizontal shaft dimensions shown for Model 450 apply to ratios in Table 4 only. Consult factory for dimensions of all others.

† "XA" dimensions shown apply to ratios in Table 4, and reducing ratios 11:10, 6:5, 5:4 and 4:3 only. Consult factory for dimensions of all others.

TABLE 3

NOTE: Drives that are rated at 1760 RPM vertical speed ARE NOT LIMITED to 1760 RPM. See Table 1.

MODEL	Vertical Shaft RPM	H.P. Rating	DOWNTHRUST CAPACITY IN POUNDS													
			HOLLOW SHAFT						SOLID SHAFT						COMB.	
			Type SL		Type S		Type SH		Type SSL		Type SS		Type SSH		Type C	
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
20	1160	15	0	978	797	2358	797	3680	0	978	0	2358			0	2358
	1460	18	0	901	760	2173	760	3392	0	901	0	2173			0	2173
	1760	20	0	850	700	2050	700	3200	0	850	0	2050			0	2050
	3460	30	0	680	534	1640	534	2560	0	680	0	1640			0	1640
40	1160	30	0	1495	1138	3565	1138	5520	0	1495	0	3565			0	3565
	1460	35	0	1378	1055	3286	1055	5088	0	1378	0	3286			0	3286
	1760	40	0	1300	1000	3100	1000	4800	0	1300	0	3100			0	3100
60	960	39	0	2074	1490	5002	1490	7320	0	2074	0	5002			0	5002
	1160	45	0	1955	1422	4715	1422	6900	0	1955	0	4715			0	4715
	1460	53	0	1802	1331	4346	1331	6360	0	1802	0	4346			0	4346
	1760	60	0	1700	1250	4100	1250	6000	0	1700	0	4100			0	4100
80	960	52	0	3904	2085	6954	2085	11224	0	3904	0	6954			0	6954
	1160	60	0	3680	1991	6555	1991	10580	0	3680	0	6555			0	6555
	1460	70	0	3392	1846	6042	1846	9752	0	3392	0	6042			0	6042
	1760	80	0	3200	1750	5700	1750	9200	0	3200	0	5700			0	5700
100	960	66	0	3904	2101	7198	2101	11224	0	3904	0	7198			0	7198
	1160	75	0	3680	1991	6785	1991	10580	0	3680	0	6785			0	6785
	1460	88	0	3392	1856	6254	1856	9752	0	3392	0	6254			0	6254
	1760	100	0	3200	1750	5900	1750	9200	0	3200	0	5900			0	5900
150	720	80	0	6750	3520	9180	3520	14243	0	6750	0	9180	0	14243	0	9180
	960	98	0	6100	3234	8296	3234	12871	0	6100	0	8296	0	12871	0	8296
	1160	112	0	5750	3059	7820	3059	12133	0	5750	0	7820	0	12133	0	7820
	1460	132	0	5300	2864	7208	2864	11183	0	5300	0	7208	0	11183	0	7208
200	1760	150	0	5000	2700	6800	2700	10550	0	5000	0	6800	0	10550	0	6800
	720	107	0	6750	3531	9180	3531	14243	0	6750	0	9180	0	14243	0	9180
	960	131	0	6100	3242	8296	3242	12871	0	6100	0	8296	0	12871	0	8296
	1160	150	0	5750	3072	7820	3072	12133	0	5750	0	7820	0	12133	0	7820
275	1460	176	0	5300	2864	7208	2864	11183	0	5300	0	7208	0	11183	0	7208
	1760	200	0	5000	2700	6800	2700	10550	0	5000	0	6800	0	10550	0	6800
	720	147	0	8100	3920	17213	3920	25650	0	8100	0	13973	3920	25650		
	960	180	0	7320	3600	15555	3600	23180	0	7320	0	12627	3600	23180		
375	1160	206	0	6900	3410	14663	3410	21850	0	6900	0	11903	3410	21850		
	1460	241	0	6360	3169	13515	3169	20140	0	6360	0	10971	3169	20140		
	1760	275	0	6000	3000	12750	3000	19000	0	6000	0	10350	3000	19000		
	580	172	0	8700	4871	27550	4871	36250	0	8700	0	15008	4871	27550		
450	720	201	0	8100	4586	25650	4586	33750	0	8100	0	13973	4586	25650		
	960	246	0	7320	4209	23180	4209	30500	0	7320	0	12627	4209	23180		
	1160	281	0	6900	3979	21850	3979	28750	0	6900	0	11903	3979	21850		
	1460	329	0	6360	3702	20140	3702	26500	0	6360	0	10971	3702	20140		
600	1760	375	0	6000	3500	19000	3500	25000	0	6000	0	10350	3500	19000		
	580	207	0	8700	5583	27550	5583	36250	0	8700	0	15008	5583	27550		
	720	241	0	8100	5236	25650	5236	33750	0	8100	0	13973	5236	25650		
	960	295	0	7320	4807	23180	4807	30500	0	7320	0	12627	4807	23180		
750	1160	337	0	6900	4545	21850	4545	28750	0	6900	0	11903	4545	21850		
	1460	395	0	6360	4232	20140	4232	26500	0	6360	0	10971	4232	20140		
	1760	450	0	6000	4000	19000	4000	25000	0	6000	0	10350	4000	19000		
	580	275	0	11600	6259	36250			0	11600	0	15008	6259	36250		
600	720	321	0	10800	5885	33750			0	10800	0	13973	5885	33750		
	870	367	0	10080	5568	31500			0	10080	0	13041	5568	31500		
	960	393	0	9760	5404	30500	CONSULT FACTORY		0	9760	0	12627	5404	30500	CONSULT FACTORY	
	1160	449	0	9200	5109	28750	CONSULT FACTORY		0	9200	0	11903	5109	28750	CONSULT FACTORY	
750	1460	527	0	8480	4765	26500	CONSULT FACTORY		0	8480	0	10971	4765	26500	CONSULT FACTORY	
	1760	600	0	8000	4500	25000	CONSULT FACTORY		0	8000	0	10350	4500	25000	CONSULT FACTORY	
	580	344	0	11310	6959	36250	CONSULT FACTORY		0	11310	0	15008	6959	36250	CONSULT FACTORY	
	720	401	0	10530	6535	33750	CONSULT FACTORY		0	10530	0	13973	6535	33750	CONSULT FACTORY	
750	870	458	0	9828	6177	31500	CONSULT FACTORY		0	9828	0	13041	6177	31500	CONSULT FACTORY	
	960	491	0	9516	6001	30500	CONSULT FACTORY		0	9516	0	12627	6001	30500	CONSULT FACTORY	
	1160	561	0	8970	5674	28750	CONSULT FACTORY		0	8920	0	11903	5109	28750	CONSULT FACTORY	
	1460	659	0	8268	5296	26500	CONSULT FACTORY		0	8268	0	10971	4765	26500	CONSULT FACTORY	
750	1760	750	0	7800	5000	25000	CONSULT FACTORY		0	7800	0	10350	4500	25000	CONSULT FACTORY	

TABLE 4

NOTE: Drives that are rated at 1760 RPM vertical speed ARE NOT LIMITED to 1760 RPM. See Table 1.

MODEL	VERTICAL SHAFT RPM	ENGINE RPM											
		1:1	10:11	5:6	4:5	3:4	2:3	5:8	4:7	1:2	4:9	2:5	1:3*
20	1160	1160				870	773			580			387
	1460	1460				1095	973			730			487
	1760	1760				1320	1173			880			587
	3460	3460				2595	2307			1730			1153
40	1160	1160		967		870	773			667	580		387
	1460	1460		1217		1095	973		667	840	730		487
	1760	1760		1467		1320	1173		1012	880			587
60	960	960	864	800	768	720	640	597	545	480		398	320
	1160	1160	1044	967	928	870	773	721	659	580		481	387
	1460	1460	1314	1217	1168	1095	973	908	830	730		605	487
	1760	1760	1584	1467	1408	1320	1173	1094	1000	880		730	587
80	960	960	864	800	768	720	640	597	545	480		398	320
	1160	1160	1044	967	928	870	773	721	659	580		481	387
	1460	1460	1314	1217	1168	1095	973	908	830	730		605	487
	1760	1760	1584	1467	1408	1320	1173	1094	1000	880		730	587
100	960	960	864	800	768	720	640	597	545	480		398	320
	1160	1160	1044	967	928	870	773	721	659	580		481	387
	1460	1460	1314	1217	1168	1095	973	908	830	730		605	487
	1760	1760	1584	1467	1408	1320	1173	1094	1000	880		730	587
150	720	720	650	597	576	540	480		409	360	320	293	240
	960	960	867	796	768	720	640		545	480	426	391	320
	1160	1160	1048	960	928	870	773		659	580	516	473	387
	1460	1460	1319	1210	1168	1095	973		830	730	649	595	487
1760	1760	1590	1458	1408	1320	1173		1000	880	782	717	587	
200	720	720	650	597	576	540	480		409	360	320	293	240
	960	960	867	796	768	720	640		545	480	426	391	320
	1160	1160	1048	960	928	870	773		659	580	516	473	387
	1460	1460	1319	1210	1168	1095	973		830	730	649	595	487
1760	1760	1590	1458	1408	1320	1173		1000	880	782	717	587	
275	720	720	656	623	576	540	480	450	409	352	318	291	240
	960	960	875	830	768	720	640	600	546	470	425	388	320
	1160	1160	1058	1003	928	870	773	725	660	568	513	468	387
	1460	1460	1331	1263	1168	1095	973	913	830	715	646	590	487
1760	1760	1605	1522	1408	1320	1173	1100	1000	862	778	711	587	
375	580	580	529	502	464	439	392	363	330	284			CONSULT FACTORY
	720	720	656	623	576	545	486	450	409	352			CONSULT FACTORY
	960	960	875	830	768	726	648	600	546	470			CONSULT FACTORY
	1160	1160	1058	1003	928	875	783	725	660	568			CONSULT FACTORY
1460	1460	1331	1263	1168	1105	985	913	830	715			CONSULT FACTORY	
1760	1760	1605	1522	1408	1332	1188	1100	1000	862			CONSULT FACTORY	
450	580	580	529	502		439	392	363	330	284			CONSULT FACTORY
	720	720	656	623		545	486	450	409	352			CONSULT FACTORY
	960	960	875	830		726	648	600	546	470			CONSULT FACTORY
	1160	1160	1058	1003		878	783	725	660	568			CONSULT FACTORY
1460	1460	1331	1263		1105	985	913	830	715			CONSULT FACTORY	
1760	1760	1605	1522		1332	1188	1100	1000	862			CONSULT FACTORY	
600	580	580				432	383	360	327	285			CONSULT FACTORY
	720	720				536	475	447	406	353			CONSULT FACTORY
	870	870				648	574	539	490	427			CONSULT FACTORY
	960	960				715	634	595	541	471			CONSULT FACTORY
1160	1160				864	766	719	654	569			CONSULT FACTORY	
1460	1460				1087	964	905	823	717			CONSULT FACTORY	
1760	1760				1311	1162	1091	992	864			CONSULT FACTORY	
750	580	565		486		429	383		327	276			CONSULT FACTORY
	720	700		603		533	475		406	342			CONSULT FACTORY
	870	846		729		643	574		490	414			CONSULT FACTORY
	960	933		804		710	634		541	456			CONSULT FACTORY
1160	1128		972		858	766		654	551			CONSULT FACTORY	
1460	1421		1223		1080	963		823	694			CONSULT FACTORY	
1760	1712		1475		1302	1162		992	837			CONSULT FACTORY	

*Model 20 1:3 ratio not available with Figure 2 or Figure 3 rotation.

TABLE 5

NOTE: Drives that are rated at 1760 RPM vertical speed ARE NOT LIMITED to 1760 RPM. See Table 1.

MODEL	Vertical Shaft RPM	H.P. Rating	DOWNTHRUST CAPACITY IN POUNDS													
			HOLLOW SHAFT						SOLID SHAFT						COMB.	
			Type SL		Type S		Type SH		Type SSL		Type SS		Type SSH		Type C	
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
20	1160	15	0	978	797	2358	797	3680	0	978	0	2358			0	2358
	1460	18	0	901	760	2173	760	3392	0	901	0	2173			0	2173
	1760	20	0	850	700	2050	700	3200	0	850	0	2050			0	2050
	3460	30	0	680	534	1640	534	2560	0	680	0	1640			0	1640
40	1160	30	0	1495	1138	3565	1138	5520	0	1495	0	3565			0	3565
	1460	35	0	1378	1055	3286	1055	5088	0	1378	0	3286			0	3286
	1760	40	0	1300	1000	3100	1000	4800	0	1300	0	3100			0	3100
60	960	39	0	2074	1490	5002	1490	7320	0	2074	0	5002			0	5002
	1160	45	0	1955	1422	4715	1422	6900	0	1955	0	4715			0	4715
	1460	53	0	1802	1331	4346	1331	6360	0	1802	0	4346			0	4346
	1760	60	0	1700	1250	4100	1250	6000	0	1700	0	4100			0	4100
80	960	52	0	3904	2085	6954	2085	11224	0	3904	0	6954			0	6954
	1160	60	0	3680	1991	6555	1991	10580	0	3680	0	6555			0	6555
	1460	70	0	3392	1846	6042	1846	9752	0	3392	0	6042			0	6042
	1760	80	0	3200	1750	5700	1750	9200	0	3200	0	5700			0	5700
100	960	66	0	3904	2101	7198	2101	11224	0	3904	0	7198			0	7198
	1160	75	0	3680	1991	6785	1991	10580	0	3680	0	6785			0	6785
	1460	88	0	3392	1856	6254	1856	9752	0	3392	0	6254			0	6254
	1760	100	0	3200	1750	5900	1750	9200	0	3200	0	5900			0	5900
150	720	80	0	6750	3520	9180	3520	14243	0	6750	0	9180	0	14243	0	9180
	960	98	0	6100	3234	8296	3234	12871	0	6100	0	8296	0	12871	0	8296
	1160	112	0	5750	3059	7820	3059	12133	0	5750	0	7820	0	12133	0	7820
	1460	132	0	5300	2864	7208	2864	11183	0	5300	0	7208	0	11183	0	7208
	1760	150	0	5000	2700	6800	2700	10550	0	5000	0	6800	0	10550	0	6800
200	720	107	0	6750	3531	9180	3531	14243	0	6750	0	9180	0	14243	0	9180
	960	131	0	6100	3242	8296	3242	12871	0	6100	0	8296	0	12871	0	8296
	1160	150	0	5750	3072	7820	3072	12133	0	5750	0	7820	0	12133	0	7820
	1460	176	0	5300	2864	7208	2864	11183	0	5300	0	7208	0	11183	0	7208
	1760	200	0	5000	2700	6800	2700	10550	0	5000	0	6800	0	10550	0	6800
275	720	147	0	8100	3920	17213	3920	25650	0	8100	0	13973	3920	25650	CONSULT FACTORY	
	960	180	0	7320	3600	15555	3600	23180	0	7320	0	12627	3600	23180		
	1160	206	0	6900	3410	14663	3410	21850	0	6900	0	11903	3410	21850		
	1460	241	0	6360	3169	13515	3169	20140	0	6360	0	10971	3169	20140		
	1760	275	0	6000	3000	12750	3000	19000	0	6000	0	10350	3000	19000		
375	580	172	0	8700	4871	27550	4871	36250	0	8700	0	15008	4871	27550	CONSULT FACTORY	
	720	201	0	8100	4586	25650	4586	33750	0	8100	0	13973	4586	25650		
	960	246	0	7320	4209	23180	4209	30500	0	7320	0	12627	4209	23180		
	1160	281	0	6900	3979	21850	3979	28750	0	6900	0	11903	3979	21850		
	1460	329	0	6360	3702	20140	3702	26500	0	6360	0	10971	3702	20140		
1760	375	0	6000	3500	19000	3500	25000	0	6000	0	10350	3500	19000			
450	580	207	0	8700	5583	27550	5583	36250	0	8700	0	15008	5583	27550	CONSULT FACTORY	
	720	241	0	8100	5236	25650	5236	33750	0	8100	0	13973	5236	25650		
	960	295	0	7320	4807	23180	4807	30500	0	7320	0	12627	4807	23180		
	1160	337	0	6900	4545	21850	4545	28750	0	6900	0	11903	4545	21850		
	1460	395	0	6360	4232	20140	4232	26500	0	6360	0	10971	4232	20140		
1760	450	0	6000	4000	19000	4000	25000	0	6000	0	10350	4000	19000			
600	580	275	0	11600	6259	36250	CONSULT FACTORY		0	11600	0	15008	6259	36250	CONSULT FACTORY	
	720	321	0	10800	5885	33750			0	10800	0	13973	5885	33750		
	870	367	0	10080	5568	31500			0	10080	0	13041	5568	31500		
	960	393	0	9760	5404	30500			0	9760	0	12627	5404	30500		
	1160	449	0	9200	5109	28750			0	9200	0	11903	5109	28750		
	1460	527	0	8480	4765	26500			0	8480	0	10971	4765	26500		
1760	600	0	8000	4500	25000	0	8000	0	10350	4500	25000					
750	580	344	0	11310	6959	36250	CONSULT FACTORY		0	11310	0	15008	6259	36250	CONSULT FACTORY	
	720	401	0	10530	6535	33750			0	10530	0	13973	5885	33750		
	870	458	0	9828	6177	31500			0	9828	0	13041	5568	31500		
	960	491	0	9516	6001	30500			0	9516	0	12627	5404	30500		
	1160	561	0	8970	5674	28750			0	8920	0	11903	5109	28750		
	1460	659	0	8268	5296	26500			0	8268	0	10971	4765	26500		
	1760	750	0	7800	5000	25000			0	7800	0	10350	4500	25000		

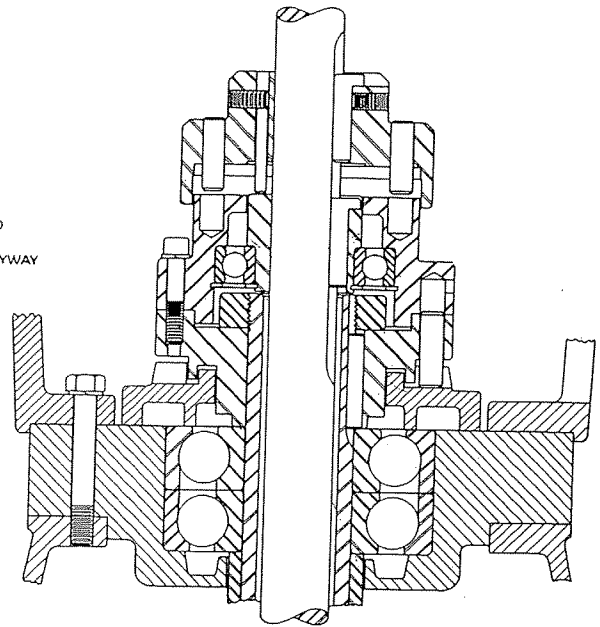
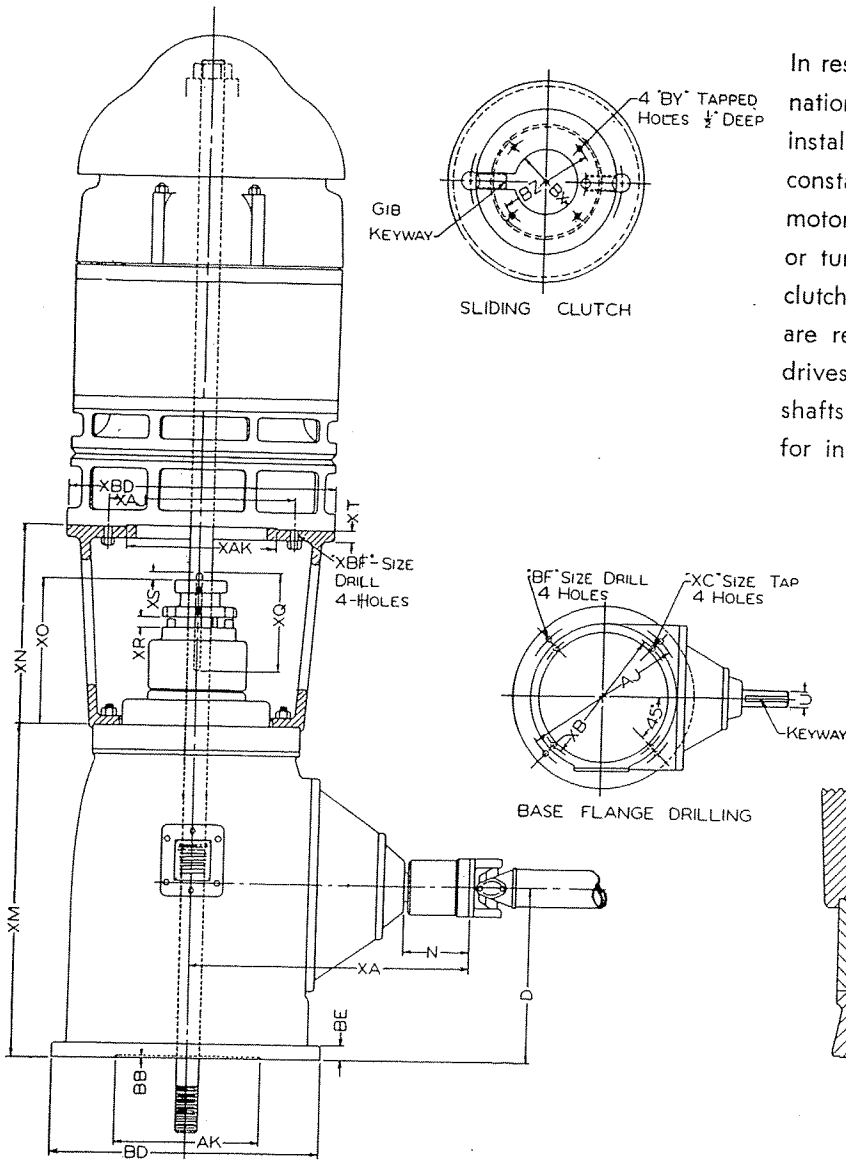
TABLE 6

NOTE: Drives that are rated at 1760 RPM vertical speed ARE NOT LIMITED to 1760 RPM. See Table 1.

MODEL	VERTICAL SHAFT RPM	ENGINE RPM										
		11:10	6:5	5:4	4:3	3:2	8:5	7:4	2:1	9:4	5:2	3:1
20	1160				1547	1740						
	1460				1947	2190						
	1760				2347	2640						
	3460											
40	1160		1392		1557	1740		2017	2320			3480
	1460		1752		1947	2190		2539	2920			4380
	1760		2112		2347	2640		3061	3520			—
60	960	1067	1152	1200	1280	1440	1544	1690	1920			2880
	1160	1289	1392	1450	1547	1740	1866	2042	2320			3480
	1460	1622	1752	1825	1947	2190	2348	2570	2920			—
	1760	1956	2112	2200	2347	2640	2831	3098	3520			—
80	960	1067	1152	1200	1280	1440	1544	1690	1920			2880
	1160	1289	1392	1450	1547	1740	1866	2042	2320			3480
	1460	1622	1752	1825	1947	2190	2348	2570	2920			—
	1760	1956	2112	2200	2347	2640	2831	3098	3520			—
100	960	1067	1152	1200	1280	1440						
	1160	1289	1392	1450	1547	1740						
	1460	1622	1752	1825	1947	2190						
	1760	1956	2112	2200	2347	2640						
150	720	797	869	900	960	1080	1158	1267	1440		1736	2160
	960	1063	1159	1200	1280	1440	1544	1690	1920		2315	2880
	1160	1284	1400	1450	1547	1740	1866	2042	2320		2798	3480
	1460	1616	1762	1825	1947	2190	2348	2570	2920		3521	—
1760	1949	2124	2200	2347	2640	2831	3098	3520		—	—	
200	720	797	869	900	960	1080		1267	1440			2160
	960	1063	1159	1200	1280	1440		1690	1920			2880
	1160	1284	1400	1450	1547	1740		2042	2320			3480
	1460	1616	1762	1825	1947	2190		2570	2920			—
1760	1949	2124	2200	2347	2640		3098	3520			—	
275	720	790	833	900	960	1080	1152	1267	1440	1620	1767	2160
	960	1053	1110	1200	1280	1440	1536	1690	1920	2160	2356	2880
	1160	1272	1341	1450	1547	1740	1856	2042	2320	2610	2847	3480
	1460	1601	1688	1825	1947	2190	2336	2570	2920	3285	3584	—
1760	1930	2035	2200	2347	2640	2816	3098	3520	—	—	—	
375	580	636	671	725	773	870	928	1020	1183	1305	1424	1740
	720	790	833	900	960	1080	1152	1266	1467	1620	1767	2160
	960	1053	1110	1200	1280	1440	1536	1688	1958	2160	2356	2880
	1160	1273	1341	1450	1547	1740	1856	2040	2366	2610	2847	3480
1460	1601	1688	1825	1947	2190	2336	2568	2978	3285	3584	—	
1760	1930	2035	2200	2347	2640	2816	3095	3590	—	—	—	
450	580	636	671	725	766	859	928	1020	1183	1311	1436	1769
	720	790	833	900	951	1067	1152	1266	1467	1628	1783	2196
	960	1053	1110	1200	1269	1422	1536	1688	1958	2170	2377	2928
	1160	1273	1341	1450	1533	1719	1856	2040	2366	2623	3872	3538
1460	1601	1688	1825	1929	2163	2336	2568	2978	3301	3615	—	
1760	1930	2035	2200	2326	2607	2816	3095	3590	—	—	—	
600	580				766	859	928	1020	1183	1311	1436	1769
	720				951	1067	1152	1266	1469	1628	1783	2196
	870				1150	1289	1392	1530	1775	1967	2154	2654
	960				1269	1422	1536	1688	1958	2170	2377	2928
1160				1533	1719	1856	2040	2366	2623	2872	3538	
1460				1929	2163	2336	2568	2978	3301	3615	—	
1760				2326	2607	2816	3095	3590	—	—	—	
750	580		692		779	879	935	1029	1183			1771
	720		859		967	1091	1161	1277	1469			2198
	870		1038		1168	1318	1403	1544	1775			2656
	960		1146		1289	1455	1548	1703	1958			2931
1160		1385		1558	1758	1871	2058	2366			3541	
1460		1743		1961	2212	2355	2590	2978			—	
1760		2100		2363	2667	2839	—	3590			—	

COMBINATION DRIVE

In response to the need for utmost reliability, a combination drive may be specified. This drive is normally installed with an electric motor top-mounted for constant service. In the event of power failure or motor failure the drive is simply converted for engine or turbine operation by lowering the integral sliding clutch into drive position. No additional pins or bolts are required for this conversion. These combination drives may be furnished with either solid or hollow shafts. Consult combination drive operation manual for installation instructions.



Combination Clutch - Sub-Assembly
Clutch Shown Disengaged

TABLE OF DIMENSIONS - COMBINATION DRIVE
TABLE 7

MODEL	D	N	HORIZONTAL SHAFT U			AJ	AK	BB	BD	BE	BF	XA	XB	XC	XL	XM	XN	XO	XQ	XR	XS	XT	XAJ	XAK	XBD	XBF	BX BORE			
			NOM-INAL	ACTUAL	KEYWAY																						MAXIMUM	MINIMUM		
C20	6 ³ / ₄	2 ⁹ / ₁₆	1 ¹ / ₄	1.249	5 ⁵ / ₁₆ X 3 ⁵ / ₃₂	9 ¹ / ₈	8.250	3 ³ / ₁₆	10	5 ⁷ / ₁₆	7 ¹⁰ / ₁₆	10 ⁷ / ₈			9 ⁹ / ₃₂	12 ¹ / ₄	12 ¹ / ₂	5 ¹ / ₂	5 ¹ / ₄	1 ¹ / ₂	1 ¹ / ₂	7 ⁷ / ₁₆								1 *
C40A	8 ¹ / ₂	4 ³ / ₈	1 ¹ / ₂	1.499	3 ³ / ₈ X 3 ³ / ₁₆	9 ¹ / ₈	8.250	1 ¹ / ₄	12	13 ¹³ / ₁₆	7 ¹⁵ / ₁₆	15 ⁵ / ₈			9 ⁹ / ₃₂	16 ³ / ₁₆	16	6 ¹ / ₂	7 ⁵ / ₈	2	2	5 ⁵ / ₈								1 ¹ / ₄
C40B	8 ¹ / ₂	4 ³ / ₈	1 ¹ / ₂	1.499	3 ³ / ₈ X 3 ³ / ₁₆	14 ³ / ₄	13.500	1 ¹ / ₄	16 ¹ / ₂	13 ¹³ / ₁₆	11 ¹¹ / ₁₆	15 ⁵ / ₈			9 ⁹ / ₃₂	16 ³ / ₁₆	16	6 ¹ / ₂	7 ⁵ / ₈	2	2	5 ⁵ / ₈								1 ¹ / ₄
C60	11 ¹ / ₂	4 ¹ / ₄	1 ¹ / ₂	1.499	3 ³ / ₈ X 3 ³ / ₁₆	14 ³ / ₄	13.500	1 ¹ / ₄	16 ¹ / ₂	7 ⁷ / ₈	11 ¹¹ / ₁₆	16 ³ / ₄			9 ⁹ / ₃₂	20 ¹ / ₄	18	7 ¹³ / ₁₆	7 ³ / ₄	3 ³ / ₄	2 ¹ / ₄	3 ³ / ₄								1 ¹ / ₂
C80	11 ¹ / ₂	4 ¹ / ₄	1 ⁷ / ₈	1.874	3 ³ / ₈ X 3 ³ / ₁₆	14 ³ / ₄	13.500	1 ¹ / ₄	16 ¹ / ₂	7 ⁷ / ₈	11 ¹¹ / ₁₆	16 ³ / ₄			9 ⁹ / ₃₂	20 ³ / ₈	18	8 ³ / ₈	7 ³ / ₄	3 ³ / ₄	2 ¹ / ₄	3 ³ / ₄								1 ¹ / ₂
C100	11 ¹ / ₂	4 ¹ / ₄	1 ⁷ / ₈	1.874	3 ³ / ₈ X 3 ³ / ₁₆	14 ³ / ₄	13.500	1 ¹ / ₄	16 ¹ / ₂	7 ⁷ / ₈	11 ¹¹ / ₁₆	16 ³ / ₄			9 ⁹ / ₃₂	20 ³ / ₈	18	8 ³ / ₈	7 ³ / ₄	3 ³ / ₄	2 ¹ / ₄	3 ³ / ₄								1 ¹ / ₂
C150	13 ³ / ₄	5 ¹ / ₄	2 ⁷ / ₁₆	2.436	5 ⁵ / ₈ X 5 ⁵ / ₁₆	18 ¹ / ₄	13.500	1 ¹ / ₄	20	1 ¹ / ₈	11 ¹¹ / ₁₆	20 ³ / ₄	14 ³ / ₈	5-11-NC	9 ⁹ / ₃₂	25 ⁵ / ₈	20	10 ⁵ / ₃₂	10	7 ⁷ / ₈	2 ³ / ₄	7 ⁷ / ₈								2 *
C200	13 ³ / ₄	5 ¹ / ₄	2 ⁷ / ₁₆	2.436	5 ⁵ / ₈ X 5 ⁵ / ₁₆	18 ¹ / ₄	13.500	1 ¹ / ₄	20	1 ¹ / ₈	11 ¹¹ / ₁₆	20 ³ / ₄	14 ³ / ₈	5-11-NC	9 ⁹ / ₃₂	25 ⁵ / ₈	20	10 ⁵ / ₃₂	10	7 ⁷ / ₈	2 ³ / ₄	7 ⁷ / ₈								2
C275	16	6	2 ¹⁵ / ₁₆	2.936	3 ³ / ₄ X 3 ³ / ₈	23	13.500	1 ¹ / ₄	24 ¹ / ₂	1 ¹ / ₈	13 ¹³ / ₁₆	25 ¹ / ₂	14 ³ / ₄	5-11-NC	9 ⁹ / ₃₂		27	12 ¹ / ₂	11 ¹ / ₂	1 ¹ / ₈	3 ¹ / ₂	1								2 ⁷ / ₁₆
C375	16	6	2 ¹⁵ / ₁₆	2.936	3 ³ / ₄ X 3 ³ / ₈	23	13.500	1 ¹ / ₄	24 ¹ / ₂	1 ¹ / ₈	13 ¹³ / ₁₆	25 ¹ / ₂	14 ³ / ₄	5-11-NC	9 ⁹ / ₃₂		27	12 ³ / ₈	11 ¹ / ₂	1 ¹ / ₈	3 ¹ / ₂	1								2 ⁷ / ₁₆
C450	16	6	3 ³ / ₄	3.749	7 ⁷ / ₈ X 7 ⁷ / ₁₆	23	13.500	1 ¹ / ₄	24 ¹ / ₂	1 ¹ / ₈	13 ¹³ / ₁₆	25 ¹ / ₂	14 ³ / ₄	5-11-NC	9 ⁹ / ₃₂		27	12 ³ / ₈	11 ¹ / ₂	1 ¹ / ₈	3 ¹ / ₂	1								2 ⁷ / ₁₆
C600	18	6	3 ³ / ₄	3.749	7 ⁷ / ₈ X 7 ⁷ / ₁₆	23	13.500	1 ¹ / ₄	24 ¹ / ₂	1 ¹ / ₈	13 ¹³ / ₁₆	26 ¹ / ₂	14 ³ / ₄	5-11-NC	9 ⁹ / ₃₂		30	16 ¹ / ₄	15	1 ³ / ₁₆	4	1 ¹ / ₄								2 ⁷ / ₁₆
C750	21	8	4	3.998	1 X 1 ¹ / ₂	28 ³ / ₄	22.000	1 ¹ / ₄	30 ¹ / ₂	1 ¹ / ₄	13 ¹³ / ₁₆	36 ³ / ₈	26	3 ³ / ₄ -10-NC	7 ⁷ / ₁₆		30	16 ¹ / ₄	15	1 ³ / ₁₆	4	1 ¹ / ₄								2 ¹⁵ / ₁₆

* Model C20, ratio 1:3, maximum clutch bore ⁷/₈" ; Model C150, ratio 1:3, maximum 1-11/16". Consult factory for maximum clutch bore for Fig. 2 and Fig. 3 rotation. Model C20, 1:3 ratio, not available with Fig. 2 or Fig. 3 rotation.

** Horizontal shaft dimensions shown for Model 450 apply to ratios in Table 4 only. Consult factory for dimensions of all others.

10 † "XA" dimensions shown apply to ratios in Table 4 and reducing ratios 11:10, 6:5, 5:4 and 4:3 only. Consult factory for

