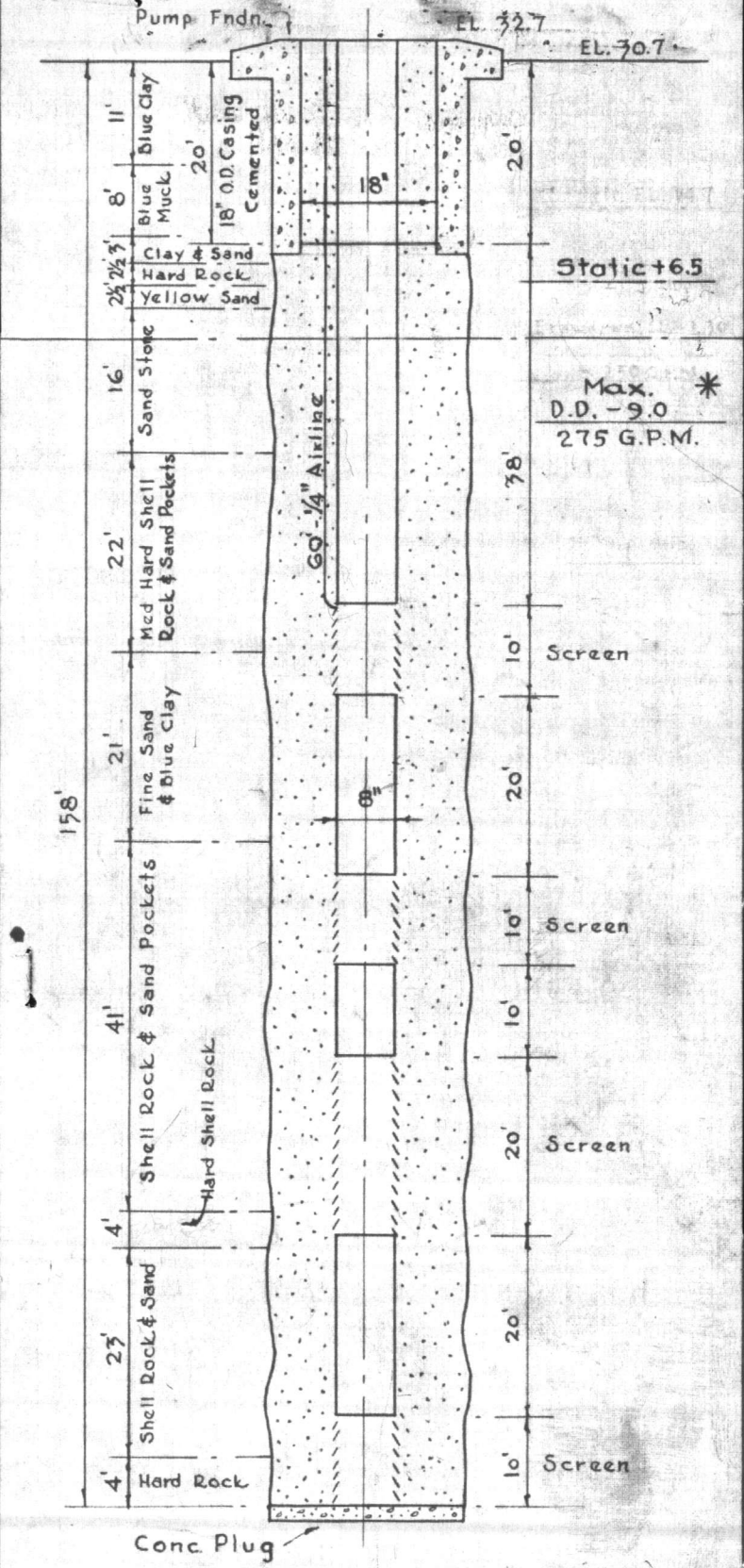
250 G.P.M. – SINGLE DRIVE – 7½ H.P.
400 " " actual D.D. – 4.0



Armco Iron Screen Used In This Well

D.T.A. WELL No. 15

615

DATE	LENGTH OF AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAW DOWN	DISCHARGE PRESSURE	CAP. PER FOOT OF DISCH. LINE	TOTAL GPM
		~~22~~			Start	Time	1400
9-30-82	47	22	30	8	40	100	1410
			32	10	37	122	1420
			33	11	34	154	1430
			37	15	25	214	1440

REMARKS: last set at 25 PSI 214 GPM

WELL # 615

DATE	LENGTH OF AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAW DOWN	DISCHARGE PRESSURE	CAP. PER FOOT OF DRAW DOWN	TOTAL CAP.
1-10-79		24'					150

REMARKS:

DEPTH OF WELL: 158'

AIRLINE ELEVATION: +47'

DATE INSTALLED:

FORM A-4
(JUNE '66)

U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
[redacted]CE OF WATER DATA COORDINATION
INVENTORY OF HYDROLOGIC DATA STATIONS
QUALITY OF WATER

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

1. AGENCY CODE	2. TYPE	3. LATITUDE	4. LONGITUDE	5.
MC	Q	° ' " N: 34 42 45	° ' " W: 77 20 51	

6. AGENCY STATION NO.	7. STATION NAME
615	HP20-615

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

12. PERIOD OF RECORD
Began: 1942
Discontinued:
Y ☐ Continuous
☐ Interruption Exceeds 1 Year

13. [ONSLOW]
14.

15. SITE
☐ 101 Stream
☐ 102 Canal
☐ 103 Lake
☐ 104 Reservoir
☐ 105 Estuary
☐ 106 Spring
☑ 107 Well
☒ 110 Other

16. FREQUENCY OF MEASUREMENT
☐ 201 Continuous Recorder
☐ 202 Telemetered
☐ 203 Daily
☐ 204 Weekly
☐ 205 Monthly
☐ 206 Quarterly
☐ 207 Seasonal
☐ 208 Annual
☐ 209 Other Periodic
☑ 210 Occasional

17. TYPES OF DATA AVAILABLE

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

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

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

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

Sediment
☐ 371 Concentration
☐ 372 Particle size
☐ 373 Other

18. SUPPLEMENTARY DATA FOR SITE
☐ 421 Surface Water Station
☐ 422 Ground Water Station
☐ 423 Water Stage or Level
☑ 424 Water discharge
☒
☐ 425 Time of Travel
☐ 426 Drainage Area

19. STORAGE OF DATA
☐ 501 Periodic Report
☐ 502 Areal Report
☑ 503 Not Published
☐ 504 Data on Punchcard
☐ 505 Data on Magnetic Tape
☐ 506 Other

20. OFFICE AT WHICH DATA AVAILABLE

Office: BASE MAINTENANCE DEPARTMENT, UTILITIES DIVISION

Street No.: MARINE CORPS BASE

City Code

City, State, Zip: CAMP LEJEUNE, N. C. 28542 0735

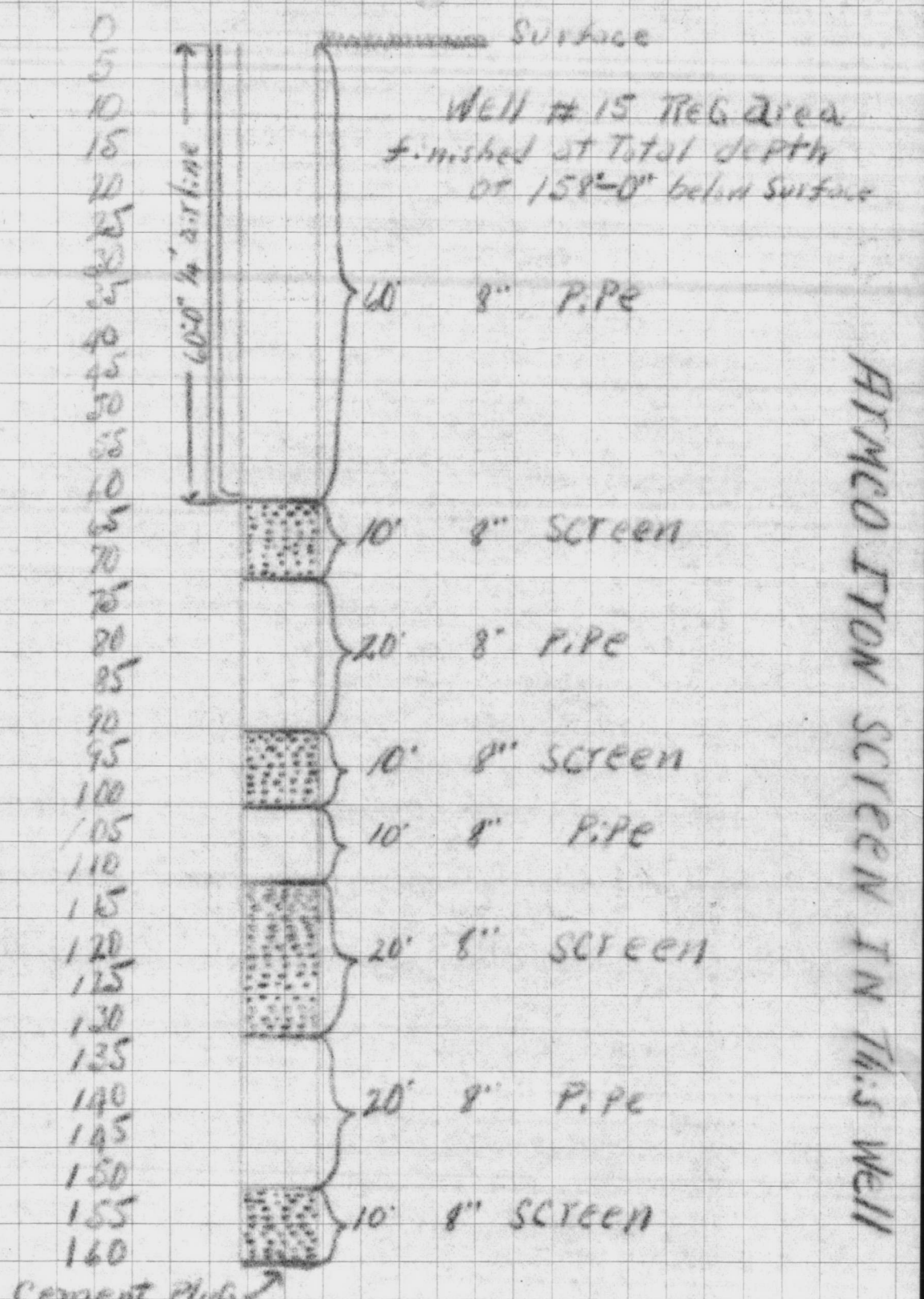
21. OFFICE COMPLETING FORM

BASE MAINTENANCE DEPARTMENT

22. COMPILER'S NAME

23. DATE
Month | Year 19

E. P. TEL. IP



ATMCO TION SCREEN IN THIS WELL

20'-0" 18" Casing set & cemented
WELL Pumps @ 225 G.P.M. WITH 30'-0" D.D. below Surface
Recovers To 23'-0" below Surface IN 1 MINUTE
Static 16'-0" below Surface
Test Pumped With 2 H.P. Jet

CC. Mr Monroe
Mr Kellam

Log of Formation Well # 15 Reg area.

158'-0" deep below surface

0	To 11'	blue Clay
11'	To 19'	blue Muck
19'	To 22'	blue Clay and sand
22'	To 24'6"	hard Rock
24'6"	To 27'	yellow Sand
27'	To 43	Sand Stone
43'	To 65	Medium hard Shell Rock and Sand Pockets
65'	To 86	fine sand and blue Clay
86'	To 127	Shell Rock and Sand Pockets
127	To 131	hard Shell Rock
131	To 154	Shell Rock with lots of sand
154'	To 162	hard Rock
162'		fine blue sand

C.C. Mr Monroe
Mr Kellam.

Mr Kellam Well #15 Rogers.

G P M Teston #15

STATIC	LINE PRES.	Disch PRE.	DRAW Down	G.P.M.	
20 ft	9 LBS.	57 ½	8 Ft.	192	(20)
		55 ½	7 ft.	203	
		53 ½	5 ½ ft	219	20 Hr
		56	6 ¼	205	

40'

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

Water Analysis

Location .....Camp Lejeune, N. C. -- Onslow County.....

Source .....Well No. 15.....

Depth: 160 ft. Collected at pump. Owner: U. S. Marine Corps.....

.....

Date of collection .....February 23, 1956.....

Gage height(ft.).....Discharge(sec. ft.).....Temp.(°F).....64..

(Parts per million)

Silica (SiO_2)	19	Carbonate (CO_3)	0
Iron (Fe)	1/ .01	Bicarbonate (HCO_3)	222
Manganese (Mn) (total)	.02	Sulfate (SO_4)	3.6
(Diss.)	.01		
Calcium (Ca)	69	Chloride (Cl)	7.3
Magnesium (Mg)	2.2	Fluoride (F)	.2
Sodium (Na)	5.5	Nitrate (NO_3)	.0
Potassium (K)	1.2	Phosphate (PO_4)	.0
Aluminum (Al)	.0		
Lithium (Li)	.2		

(Parts per million)

Dissolved solids	220	Color	7
Total hardness as $CaCO_3$	2/ 182	Oxygen consumed:	
		Unfiltered	
Suspended matter		Filtered	

pH value	7.2	Specific conductance (micromhos at 25°C.)	376

W.R.Lab.No. NC-17551.....

1/ T.Fe 2.5
sol. .01
ppt. 2.49

2/ Includes hardness of all polyvalent cations reported.

WATER ANALYSIS

By _____

Date 6 – 4 – 43

Sample from Well # 15

Total Solids _____ PPM Dissolved Solids _____ PPM

Suspended Solids _____ PPM Volatile Solids _____ PPM

Phenol. Alk. as $CaCO_3$	0 PPM	Silica as SiO_2	PPM
Total Alk. " "	181 "	Ferrous Iron as Fe	"
Carbonates " "	0 "	Total Iron as Fe	.5 "
Bicarbonates " "	181 "	Aluminum as Al.	"
Chlorides as Cl.	10 "	Calcium as Ca.	"
Sulphates as SO_4	"	Magnesium as Mg.	"
Nitrites as No_2	"	Sodium as Na.	"
Carbon Dioxide as CO_2	"		

pH 7.5 Soap Hardness as $CaCO_3$ _____ PPM

Odor _____ Turbidity 2

REMARKS _____

PHYSICAL AND CHEMICAL ANALYSIS OF WATER

SAMPLE NO.

FROM: *(Station or unit)* Well 615

DATE 8-1-57

TO: *(Name and location of laboratory)*

SAMPLE FROM *(Location of sampling point)*

COLLECTED BY	DATE	HOUR	SOURCE *(Designate ground, surface, raw, treated)*
Chadwick	8-1-57		Raw

REASON FOR EXAMINATION

EXAMINATION REQUESTED BY

NOTE: All results reported in parts per million unless otherwise noted except for pH, temperature, and specific conductance. One liter of potable water is assumed to weigh one kilogram.

I. FIELD ANALYSIS

1. pH	TEMPERATURE °F	TEMPERATURE °C

ITEM	PPM
2. CARBON DIOXIDE (CO_2)	
3. DISSOLVED OXYGEN (O_2)	
4. HYDROGEN SULFIDE (H_2S)	
5. CHLORINE DEMAND (Cl_2)	

FIELD ANALYSIS BY

DATE OF ANALYSIS

II. SPECIAL LABORATORY ANALYSES

Check (X) individual items to be included in the Special Analyses. Request determination only of those substances suspected of being present in significant amounts.

(X)	ITEM	PPM
	1. As	
	2. Se	
	3. Pb	
	4. B	
	5. Cu	
	6. Zn	
	7. Cr *(Hexavalent)*	
	8. PO	
	9. Cd	
	10. CN	
	11. Phenolic Compounds *(PPB)*	
	12. Others *(Specify)*	
	13.	
	14.	
	15.	
	16.	

III. ROUTINE LABORATORY ANALYSIS

(CHECK ONE)

	REQUESTED		NOT REQUESTED

1. COLOR
2. TURBIDITY
3. ALKALINITY ($CaCO_3$)

P	MO
0	165

4. TOTAL HARDNESS ($CaCO_3$) 170
5. NON-CARBONATE HARDNESS ($CaCO_3$) *(By Computation)*
6. CARBONATE HARDNESS ($CaCO_3$) *(By Computation)*
7. TOTAL DISSOLVED SOLIDS
8. SPECIFIC CONDUCTANCE *(Micromhos)*

ITEM	PPM
9. CALCIUM (Ca)	
10. MAGNESIUM (Mg)	
11. SODIUM (Na) AND POTASSIUM (K)	
12. HYDROXIDE ~~(OH)~~* $CaCO_3$	0
13. BICARBONATE ~~(HCO_3)~~* $CaCO_3$	165
14. CARBONATE ~~(CO_3)~~* $CaCO_3$	0
15. SULFATE (SO_4)	
16. CHLORIDE (Cl)	10
17. NITRATE (NO_3)	
18. IRON (Fe) TOTAL	2.0
19. MAGANESE (Mn)	
20. SILICA (SiO_2)	
21. FLUORIDE (F)	

**State whether determined or computed from P and MO alkalinity.*

REMARKS *(Such as unusual appearance, taste, odor, etc.)*

LABORATORY ANALYSIS BY Jashee

DATE OF ANALYSIS 8-1-57

DD FORM 1 APR 53 710 REPLACES WD AGO FORM 8-125, 1 APR 45, WHICH MAY BE USED.

GPO 912375

215

WELL #15

Date	Line Ft.	G.P.M.	D.D. El.	Static El.	Shut Off Head	D.D. Ft.	
			AIR LINE BAD.				
9-16-53	505	160	—	—	71	—	old Pump
9-30-53	37	195	-8.3	+5.2	92	13.5	NEW PUMP
"	44	167	-6.3	—	—	11.5	"
"	46	157	-5.3	—	—	10.5	"
"	69	145	-3.3	—	—	8.5	"
			Gage R.	Gage R.			
4-18-55	67	?	12	20	—	8	"
11/3/66		128		11'			SEE WELL TEST.
3/12/68		new 232 pump		26' Installed			" " "
9/11/69	46'	252		11'			SEE TEST
9-30-53	FROM PUMP BASE TO WATER				20'		
11-29-67	"	"	"	"	"	28'-2"	
9-4-69		252	-9.3	-2.3'		7.0'	

NEW PUMP. INSTALLED - 9-30-53.

20 FT TO WATER FROM BASE. - 9-30-53.

Air Line 46 FT.

Static Level: 16' below surface.

Pumping: Well was cleaned and pumped with airlift, and was measured with 12" weir. Well pumps 225 G.P.M. with 14' D.D. below static. Recovers to 7' below static in one minute.

See seperate report for chemical analysis.

N. H. Kellan
Asst. Chem. Eng.

30.7
1.6
+ 1 4.7

Marine Barracks
New River, N. C.
July 2, 1942

WELLS-PERMANENT WATER SUPPLY-REGIMENTAL AREA
By Layne Atlantic Company

Well No. 15

Location: 2350' west of station 332 + 33 on main access road as shown on M. B. Drwg. No. 577.

Date Drilled: June 1942

Drilling Equipment: Rotary Rig and Rotary Bits.

Status: A 23" hole drilled to a depth of 22'. 22' of 18" steel caseing set and the amular space filled with cement grout. A 17½" hole drilled to a depth of 162'.

Log of Formation:

0 to 11'	blue clay
11' to 19'	blue muck
19' to 24.5'	hard rock
24.5' to 27'	yellow sand
27' to 43'	sand stone
43' to 65'	medium hard shell rock and sand
65' to 86'	fine sand & blue clay (pockets
86' to 127'	shell rock and sand pockets
127' to 131'	hard shell rock
131' to 154'	shell rock with lot of sand
154' to 162'	hard rock
162'	fine blue sand

Remarks: Due to the fine sand it was necessary to construct a gravel wall well.

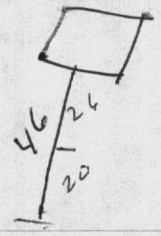
Gravel Wall Construction: 158' of 8" steel pipe with sections of 8" armco iron screen was placed in well and the amular space was filled with a special ¼" gravel.

Log of Screen Setting:

0 to 60'	8" pipe
60' to 70'	8" screen
70' to 90'	8" pipe
90' to 100'	8" screen
100' to 110'	8" pipe
110' to 130'	8" screen
130' to 148'	8" pipe
148' to 158'	8" screen

A total of 50' of screen was used.

Air Line: 60' of ¼" pipe was placed in the well for air line.



46
30
16

94.0
32.7
3.3

46
20
26

As of 3/1/67 Well 15 has a Johnston pump on Layne Bore

615 – 50' Casing new
Layne 30" impeller "
10' tailpipe "

} installed – 3-12-68
Designed Head 100'

Date	Well	G.P.M.	Line ft.	Static guage ft	D.D. guage ft	Ft. of D.D.	Shut off head ft	
9-30-53	15	145	69	18.5	10	8.5	92.	
"	15	157	46.	-	8	10.5		
"	15	167	44	-	7	11.5		✓
"	15	195	37	-	5	13.5		
10-8-53	-	-	34.5	20	-	-		
10-19-53	15	150	51	-	10	10	Opened	
4-18-55	15	?	67		12	8		

46 FT - AIR LINE - 20 FT. TO WATER FROM BASE ?

FOREMAN'S LABOR DISTRIBUTION CARD

NAVMC 10041–SD

DISTRIBUTION

ACCOUNT NO.

WORK ORDER NO.

DATE

NAME

231-
15

1155

231

3465

SIGNATURE OF FOREMAN

GPO: 1951—O-959671

W E L L D A T A

Well No. 15

SPECIFICATIONS

Pump Base Elevation	32.7
Ground Elevation	30.7
Static Elevation	14.7
Maximum allowed Drawdown	- 1.5
Total Discharge	250 G.P.M.
Total Head	82 Feet

TEST

205 G.P.M.	26#	Pressure	Drawdown	+5.7
250 G.P.M.	22#	Pressure	Drawdown	3.1
265 G.P.M.	19#	Pressure	Drawdown	2.2
300 G.P.M.	15#	Pressure	Drawdown	1.3

Recovers to elevation + 14.7 in three ($) minutes.

W E L L D A T A

Well No. 15

SPECIFICATIONS

Pump Base Elevation	32.7
Ground Elevation	30.7
Static Elevation	14.7 -
Maximum allowed Drawdown	- 1.3
Total Discharge	250 G.P.M.
Total Head	82 Feet

TEST

205 G.P.M.	26#	Pressure	Drawdown	+5.7
250 G.P.M.	22#	Pressure	Drawdown	3.1
265 G.P.M.	19#	Pressure	Drawdown	2.2
300 G.P.M.	15#	Pressure	Drawdown	1.3

Recovers to elevation + 14.7 in three (3) minutes.

Air line 63.3

W E L L D A T A

Well No. 15

SPECIFICATIONS

Pump Base Elevation	33.7
Ground Elevation	30.7
Static Elevation	11.7
Maximum Allowed Drawdown	- 1.3
Total Discharge	250 G.P.M.
Total Head	52 Feet

TEST

204 G.P.M.	20'	Pressure	Drawdown 4.5
250 G.P.M.	22'	Pressure	Drawdown 8.3
283 G.P.M.	19'	Pressure	Drawdown 6.3
340 G.P.M.	15'	Pressure	Drawdown 1.3?

Recovers to elevation + 34.7 in three (3) minutes.

H.P. Well 615

Armco Iron Screen Used In This Well

well Depth 147'

8-3-84 rcd

D.T.A. WELL No. 16

DATE 7-25-00

PWSID 04-62-041

WELL # HP 616

WELL NAME HAD NOT POINT HP20

BLDG. HP 616

CODE G.

AVAILABILITY P.

LOCATION HOLCOMB BLVD

LATITUDE 34.71334

LONGITUDE 77.34066

WELL DIAMETER 8"

WELL DEPTH ~~147'~~ 170'

SCREEN INTERVAL ---

YIELD ~~150~~ 167#

STATIC LEVEL 31'

PUMPING LEVEL 49'

PUMP TYPE VERTICAL TURBINE

MOTOR HP 7.5

INTAKE DEPTH 61

DESIGN CAPACITY 200

ACTUAL GPM 167

SIZE OF CONCRETE SLAB 12'X8'

HEIGHT OF CASING 26"

North [redacted]olina Department of Environment, Health, and [redacted]
Division of Environmental Health, Public Water Supply S[redacted]

SOURCE INFORMATION
GROUND WATER

Date Form Completed: M M D D Y Y = 01 24 95

PWSID: 0467010

Owner Assigned Source Code: 016

Well Name (If purchase, name of system): HADNOT POINT 616

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

If Purchase, seller ID#:

Source Begin Date (M M Y Y):

Source exempt—SWTR? (Y/N):

Direct Influence Date (M M D D Y Y):

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

Location of well within the system (If purchase, location of master meter): HOLCOMB BLVD

Latitude (N) Deg. Min. Sec.: 34 42 47

Longitude (W) Deg. Min. Sec.: 077 20 20

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

GPS Data: Q # or DOP #:

No. of Sats. Locked on:

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

Vulnerable (VOCs): (Y/N)

Assessment Date (M M D D Y Y):

ENTRY POINT INFORMATION

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

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

Owner Assigned Entry Point Code: 100

Entry Point Name: ~~HP 616~~ HADNOT PT WTP

Location:

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

Sources of pollution/distance: Hwy @ 60' / R/W Ditch @ 50'

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

Adequate slope? Y (Y,N) Flooding? N (Y,N) Maintenance: OK

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

Condition of house: OK Type of freeze protection: None

Well: Diameter: 8" Type: GRAVEL PACK Yield (gpm): ~~200~~ Properly sealed? Y (Y,N)

Properly vented? N (Y,N) Casing depth: 95 ft. (If unknown, put 'UNK') Well depth: 147 Meter available? N (Y,N)

Concrete slab adequate? Y (Y,N) If no, explain: Size: 12x8

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

Pumps: Capacity: GPM: ~~300~~ 190 HP: 7.5 Pump intake depth: 147 Auxiliary Power? N (Y,N)

Type pump: VERTICAL TURBINE Height above floor (pump/casing): 26" /

Storage at well site: Elev: Hydro: Ground:

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

High service pumps: 1. gpm hp 2. gpm hp 3. gpm hp Auxiliary Power? (Y,N)

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

If other wells are treated here, which ones? If treated elsewhere, where? HD-20 PLANT

If purchase, retreat? (Y/N) If yes, complete back of form. ① No well vent

② No meter

WELL NUMBER 616 BY Stevenson & Peterson DATE 6-10-97

AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAIN DOWN	DISCHARGE PRESSURE	GPM	START TIME
61	31	41	10	35	100	
		44	13	30	122	
		46	15	25	146	
		49	18	20	167	

REMARKS

D/H. 45

MANUFACTURER	STAGE	S.N.	TOTAL HEAD	SIZE

WELL NUMBER 616 BY Thomas - Stevens DATE 10-12-93

AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAIN DOWN	DISCHARGE PRESSURE	GPM	START TIME
61	33	41	8	42	100	0800
		46	13	35	133	
		49	16	25	172	
		51	18	20	190	< Pressure Set

REMARKS DH 50

MANUFACTURER	STAGE	S.N.	TOTAL HEAD	SIZE

WELL NUMBER 616		BY Thomas-Brown			DATE 3-28-90	
AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAIN DOWN	DISCHARGE PRESSURE	GPM	START TIME
61	32	39	7	34	104	05
		42	10	29	114	15
		43	11	25	134	25
		45	13	19	154	35
		46	14	15	162	45
		47	15	10	178	55

REMARKS

Dead Head @ 43 PSI

Set @ 10 PSI

MANUFACTURER	STAGE	S.N.	TOTAL HEAD	SIZE

WELL NUMBER	616	BY			DATE 9-16-88	
AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAIN DOWN	DISCHARGE PRESSURE	GPM	START TIME
61	31'	39'	8'	39	104	10:30
		41	10	34	122	10:45
		42	11	29	137	11:00
		44	13	24	154	11:15
Depth set →		46	15	19	164	11:30

REMARKS

D.H 44

AMP 20.7/18.7/17.4

MANUFACTURER	STAGE	S.N.	TOTAL HEAD	SIZE

HP 616

9-9-85

A/L	S/L	P/L	D/D	PSI	GPM	TIME
61	27	37	10	41	104	15
		39	12	38	111	15
		40	13	35	122	15
		41	14	32	133	15
		42	15	29	146	15
		44	17	25	159	15
		45	18	22	180	15
		46	19	19	183	15
		46	19	15	195	15
		45	18	10	210	15

0730-1030

WELL NUMBER 616		BY THOMAS / BROWN			DATE 10-22-84	
AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAIN DOWN	DISCHARGE PRESSURE	GPM	START TIME 0800
61'	26'	34	8	44	104	0813
		36	10	40	119	0823
		38	12	37	125	0833
		39	13	34	130	0841
		40	14	31	146	0854
		41	15	27	162	0906
		42	16	24	175	0922
		43	17	21	187	0937
		44	18	18	199	0948
		45	19	15	210	1000
		46	20	11	221	1010

REMARKS Best set at 15 PSI 210

MANUFACTURER	STAGE	S.N.	TOTAL HEAD	SIZE

WELL NUMBER	G16	BY	THOMAS / MORTOR		DATE	8-4-83
AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAIN DOWN	DISCHARGE PRESSURE	GPM	START TIME 1250
61'	28	40	12	41	100	1302
		41	13	38	122	1310
		42	14	35	137	1327
		43	15	32	149	1340
		45	16	29	157	1350
		45	17	26	170	1435
		48	20	21	192	1455
		48.5	20.5	18	205	1510
		50	22	14	221	1525
		51	23	10	235	1555

REMARKS Pump set 61' air line 61'

left set at 20 PSI 200 GPM

MANUFACTURER	STAGE	S.N.	TOTAL HEAD	~~SIZE~~ GPM
Verti-Line Aurora Pump	4	83-70231 type 8EDH	100 FT	200

61 NL

18

43 PL

28 SL

15 D.D.

616

DATE	LENGTH OF AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAW DOWN	DISCHARGE PRESSURE	CAP. PER POT. OF DRAW DOWN	TOTAL GAL.
9-24-82					Time Start		0925
	62'	40'	53'	13'	33 LB	104	0940
			55'	15'	30	128	0955
			38	18'	27	151	1010

REMARKS: need direct reading gage.

OF

LINE

WELL # 616

DATE	LENGTH OF AIR LINE	STATIC LEVEL	PUMPING LEVEL	DRAW DOWN	DISCHARGE PRESSURE	CAP. PER FOOT OF DRAW DOWN	TOTAL CAP.
4/1/77	62		51		30		
			51		28		
			52		26		
			52		24		
			52		(22)		
			53		18		
			54		14		100
			55		10		111
REMARKS:							
4-26-79	Pump Pulled & Repaired						
	Static - 18'						
	Depth						
	Airline - 62'						
	Installed - Direct Reading Gauge						
EPTH OF ELL:							
IRLINE LEVATION:	+	-					
ATE NSTALLED:							

PHYSICAL AND CHEMICAL ANALYSIS OF WATER

SAMPLE NO.: WW 2-11

FROM: (Station or unit): U. S. Marine Corps Base, Camp Lejeune, North Carolina

DATE: 1 March 1960

TO: (Name and location of laboratory): DPWO Sanitary Engineering Laboratory, Bldg. L-29, Naval Base, Norfolk 11, Virginia

SAMPLE FROM (Location of sampling point): Had not Point Area Well No. 16, Bldg. No. 616

COLLECTED BY	DATE	HOUR	SOURCE (Designate ground, surface, raw, treated)
Mr. R. L. Cox	3 Feb. 1960	—	Ground

REASON FOR EXAMINATION: E.S.P., DPWO PROJECT NO. 09-2455

EXAMINATION REQUESTED BY: Mr. R. L. Cox

NOTE: All results reported in parts per million unless otherwise noted except for pH, temperature, and specific conductance. One liter of potable water is assumed to weigh one kilogram.

I. Laboratory ~~FIELD~~ ANALYSIS

1. pH	TEMPERATURE °F	TEMPERATURE °C
7.55		24.

ITEM	PPM
2. CARBON DIOXIDE (CO_2)	
3. DISSOLVED OXYGEN (O_2)	
4. HYDROGEN SULFIDE (H_2S)	
5. CHLORINE DEMAND (Cl_2)	

~~FIELD~~ ANALYSIS BY: The temperature of the water at time of collection was 18°C.

DATE OF ANALYSIS:

II. SPECIAL LABORATORY ANALYSES

Check (X) individual items to be included in the Special Analyses. Request determination only of those substances suspected of being present in significant amounts.

(X)	ITEM	PPM
	1. As	
	2. Se	
	3. Pb	
	4. B	
	5. Cu	
	6. Zn	
	7. Cr (Hexavalent)	
X	8. PO_4	0.0
	9. Cd	
	10. CN	
	11. Phenolic Compounds (PPB)	
	12. Others (Specify)	
X	13. Aluminum (Al)	0.0
	14.	
	15.	
	16.	

III. ROUTINE LABORATORY ANALYSIS

(CHECK ONE)

X	REQUESTED		NOT REQUESTED

ITEM		PPM
1. COLOR	Apparent	30.
	True	2.
2. TURBIDITY	settled	0.7
	shaken	8.5
3. ALKALINITY ($CaCO_3$)	P	0.0
	MO	138.
4. TOTAL HARDNESS ($CaCO_3$)		140.3
(Ca + Mg) Hardness		138.4
5. NON-CARBONATE HARDNESS ($CaCO_3$) (By Computation)		2.3
6. CARBONATE HARDNESS ($CaCO_3$) (By Computation)		138.
7. TOTAL DISSOLVED SOLIDS		—
8. SPECIFIC CONDUCTANCE (Micromhos)		260.

ITEM	PPM
9. CALCIUM (Ca)	49.3
10. MAGNESIUM (Mg)	3.74
11. SODIUM (Na) AND POTASSIUM (K) **	8.2
12. HYDROXIDE (OH)* (as $CaCO_3$)	0.0
13. BICARBONATE (HCO_3)* (as $CaCO_3$)	138.
14. CARBONATE (CO_3)* (as $CaCO_3$)	0.0
15. SULFATE (SO_4)	2.4
16. CHLORIDE (Cl)	12.
17. NITRATE (NO_3)	—
18. IRON (Fe) TOTAL	0.7
19. MAGANESE (Mn)	0.0
20. SILICA (SiO_2)	14.
21. FLUORIDE (F)	0.0

*State whether determined or computed from P and MO alkalinity.

REMARKS (Such as unusual appearance, taste, odor, etc.)

* Computed from P and MO alkalinity
** Computed
Note: At the time of analysis there was a small quantity of sediment in the bottom of the sample bottle.
The well was in service at the time the sample was collected (discharge pressure = 9 psig).

LABORATORY ANALYSIS BY: George I. Earnest, Jr., Chemist

DATE OF ANALYSIS: 29 Feb. 1960

DD FORM 1 APR 53 710 REPLACES WD AGO FORM 8-125, 1 APR 45, WHICH MAY BE USED. Analysis no. 6

GPO 912375

WATER ANALYSIS

By N. H. Kellam

Date 5/27/42

Sample from Supply Well at Well site No. 16

108' Deep Per area

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

Phenol. Alk. as $CaCo_3$	0 PPM	Silica as Sio_2	PPM
Total Alk. " "	120 "	Ferrous Iron as Fe	"
Carbonates " "	0 "	Total Iron as Fe	"
Bicarbonates " "	120 "	Aluminum as Al.	"
Chlorides as Cl.	12 "	Calcium as Ca.	"
Sulphates as SO_4	"	Magnesium as Mg.	"
Nitrites as No_2	"	Sodium as Na.	"
Carbon Dioxide as CO_2	8 "		

pH 7.5 Soap Hardness as $CaCO_3$ 170 PPM

Odor Slight Turbidity 10

REMARKS

FORM A-4
(JUNE '66)

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

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

1. AGENCY CODE	2. TYPE	3. LATITUDE	4. LONGITUDE	5.
MO	Q	° ' " N: 34 42 48	° ' " W: 77 20 28	

6. AGENCY STATION NO.	7. STATION NAME
616	HP20-616

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

12. PERIOD OF RECORD
Began 1942 Discontinued
Y ☐ Continuous Interruption Exceeds 1 Year

13.

14.

15. SITE

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

16. FREQUENCY OF MEASUREMENT

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

17. TYPES OF DATA AVAILABLE

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

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

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

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

Sediment
☐ 371 Concentration
☐ 372 Particle size
☐ 373 Other

18. SUPPLEMENTARY DATA FOR SITE

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

19. STORAGE OF DATA

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

20. OFFICE AT WHICH DATA AVAILABLE

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

21. OFFICE COMPLETING FORM

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

23. DATE Month Year 19

SEPT 66

PHYSICAL AND CHEMICAL ANALYSIS OF WATER

SAMPLE NO.

FROM: *(Station or unit)* Well 16 Bldg 616 HP

DATE 8-8-57

TO: *(Name and location of laboratory)*

SAMPLE FROM *(Location of sampling point)*

COLLECTED BY	DATE	HOUR	SOURCE *(Designate ground, surface, raw, treated)*
Wilhoit	8-8-57		Raw

REASON FOR EXAMINATION

EXAMINATION REQUESTED BY

NOTE: All results reported in parts per million unless otherwise noted except for pH, temperature, and specific conductance. One liter of potable water is assumed to weigh one kilogram.

I. FIELD ANALYSIS

1. pH	TEMPERATURE °F	TEMPERATURE °C

ITEM	PPM
2. CARBON DIOXIDE (CO_2)	
3. DISSOLVED OXYGEN (O_2)	
4. HYDROGEN SULFIDE (H_2S)	
5. CHLORINE DEMAND (CI_2)	

FIELD ANALYSIS BY

DATE OF ANALYSIS

II. SPECIAL LABORATORY ANALYSES

Check (X) individual items to be included in the Special Analyses. Request determination only of those substances suspected of being present in significant amounts.

(X)	ITEM	PPM
	1. As	
	2. Se	
	3. Pb	
	4. B	
	5. Cu	
	6. Zn	
	7. Cr *(Hexavalent)*	
	8. PO	
	9. Cd	
	10. CN	
	11. Phenolic Compounds *(PPB)*	
	12. Others *(Specify)*	
	13.	
	14.	
	15.	
	16.	

III. ROUTINE LABORATORY ANALYSIS

(CHECK ONE)

	REQUESTED		NOT REQUESTED

ITEM		PPM
1. COLOR		
2. TURBIDITY		
3. ALKALINITY ($CaCO_3$)		
	P	0
	MO	128
4. TOTAL HARDNESS ($CaCO_3$)		132
5. NON-CARBONATE HARDNESS ($CaCO_3$) *(By Computation)*		
6. CARBONATE HARDNESS ($CaCO_3$) *(By Computation)*		
7. TOTAL DISSOLVED SOLIDS		
8. SPECIFIC CONDUCTANCE *(Micromhos)*		
9. CALCIUM (Ca)		49.6
10. MAGNESIUM (Mg)		1.6
11. SODIUM (Na) AND POTASSIUM (K)		
12. HYDROXIDE ~~(OH)*~~	$CaCO_3$	0.0
13. BICARBONATE ~~(HCO_3)*~~	$CaCO_3$	128.0
14. CARBONATE ~~(CO_3)*~~	$CaCO_3$	0.0
15. SULFATE (SO_4)		
16. CHLORIDE (Cl)		10.0
17. NITRATE (NO_3)		
18. IRON (Fe) TOTAL		1.0
19. MAGANESE (Mn)		
20. SILICA (SiO_2)		
21. FLUORIDE (F)		

*State whether determined or computed from P and MO alkalinity.

REMARKS *(Such as unusual appearance, taste, odor, etc.)*

LABORATORY ANALYSIS BY Justice

DATE OF ANALYSIS 8-8-57

DD FORM 1 APR 53 710 REPLACES WD AGO FORM 8-125, 1 APR 45, WHICH MAY BE USED.

GPO 912375

WELL # 16

Date	Line Ft. GAGE	G.P.M.	D.D. El. GAGE FT	Static El. GAGE FT	Shut Off Head 90 FT.	D.D. Ft.	
5-12-54	80	100	42	32	—	10	
"	40	200	52	32	—	20	
"	57	215	54	32	—	22	P. RATE.
"	50	235	57	32		25	
5-14-54	—	—	57	32		25	
5-24-54			59	32		27	
6-4-54			57	32		25	
6-30-54			53				
3/4/58	new pump Installed						SEE TEST
10/25/66	AIRLINE 60'	115		22'			
7/23/69	Replaced oil seal tubing and shaft						
8/11/69	AIRLINE 62	190		20'			SEE TEST.
9-4-69		190	-23.7'	-8.7'		15.0'	
7-23-69	REPLACED SHAFT + OIL TUBING						

as of 3/1/67 Well 16 has Pomona pump and Layne Bowl

New Pump Installed 5-11-54

28 FT. TO WATER - 5-7-54 - Depth measured - 168 FT - 5-7-54

Air Line 62 ?

52.0
34.3 30
17.7
57 ?
34.3
22.7

W E L L D A T A

Well No. 16

SPECIFICATIONS

Pump Base Elevation	35.3
Ground Elevation	33.3
Static Elevation	9.3
Maximum allowed Drawdown	-10.7
Total Discharge	250 G.P.M.
Total Head	85 Feet

TEST

250 G.P.M.	25#	Pressure	Drawdown	-4.7
257 G.P.M.	24#	Pressure	Drawdown	-5.2
275 G.P.M.	20#	Pressure	Drawdown	-6.7
300 G.P.M.	15#	Pressure	Drawdown	-8.6

3 August 1942

Wells: Permanent Water Supply, Regimental Area

By Layne Atlantic Company

Project P-108-4

Report on Well No. ~~14~~ 16

Location: West side of Main Access Road at Station 332 and 58

Date Drilled: July 1942

Drilling Equipment: Rotary Rig and Bits

Status: Twenty-three inch diameter hole reamed and cased with 18" I.D. steel casing to a depth of 28'4". The anular space around this was filled with cement grout to surface level. A 17" hole was then drilled to a depth of 176 feet.

Log of Formation:

0 to 5'	Marsh soil
5' to 14'	Yellow sand
14' to 27'	Blue clay
27' to 34'	Blue clay
34' to 41'	Clay and sand
41' to 71'	Rock and sand
71' to 87'	Fine sand
87' to 108'	Hard coquina rock
108' to 127'	Coquina rock
127' to 172'	Hard rock and fine sand in thin layers
172' to 176'	Fine sandy muck

Remarks: Due to the presence of fine sand, it was necessary to construct a gravel wall well. A well was drilled about 200' from this well and upon completion, it pumped so much sand that it was decided to discard it and drill a new well. The screen and pipe was not removed from the discarded well.

Wells: Permanent Water Supply, Regimental Area P-108-4 (Continued)

Gravel Wall Construction: An 8" steel pipe with sections of armco iron screen was placed in the 17" hole to a depth of 170". The anular space around this was filled with a special 1/4" washed gravel.

Log of Screen Setting:

0 to 95'	8" pipe
95' to 115'	8" screen
115' to 130'	8" pipe
130' to 140'	8" screen
140' to 160'	8" pipe
160' to 170'	8" screen

A total of 40' of screen was used.

Air Line: 60' of 1/4" pipe for air line

Static Level: 20' below surface

Pumping: Well pumps 200 G.P.M. with 20' drawdown from static. Recovers to 4' below static in one minute.

Report will be made later of pump instalation.

N. H. Kellam
Asst. Chem. Engineer

W E L L D A T A

Well No. 16

SPECIFICATIONS

Pump Base Elevation	35.3
Ground Elevation	33.3
Static Elevation	9.3
Maximum allowed Drawdown	-10.7
Total Discharge	250 G.P.M.
Total Head	85 Feet

TEST

250 G.P.M.	25#	Pressure	Drawdown	-4.7
257 G.P.M.	24#	Pressure	Drawdown	-5.2
275 G.P.M.	20#	Pressure	Drawdown	-6.7
300 G.P.M.	15#	Pressure	Drawdown	-8.6

Air line 62.3

INSTRUCTIONS

TRI/CLAD® VERTICAL INDUCTION MOTORS HIGH THRUST, HOLLOW AND SOLID SHAFT, "P" BASE

FRAMES C254-C286, D254-D286, K254-K286, L213-L256 OPEN ENCLOSURES

installed 8-4-83 yes

INTRODUCTION

General Electric vertical motors covered by these instructions are carefully constructed of high-quality materials and are designed to give long periods of trouble-free service when properly installed and maintained.

Standard high-thrust motors (see Fig. 1) are generally used to drive pumps, and, as their name implies, have provisions for accepting the axial thrust load imposed by the driven machine. They may be of either hollow or solid-shaft construction. Figure 2 shows a typical hollow-shaft motor. The solid-shaft construction is similar except that the top half coupling is omitted, and the motor shaft extends out the bottom of the motor. This standard construction is for high continuous down-thrust and is good for momentary up-thrust only in the magnitude of 30 percent of the rated down-thrust.

These motors may be supplied with bearing arrangements for various external thrust conditions imposed by the pump, such as different magnitudes of down-thrust and either momentary or continuous up-thrust.

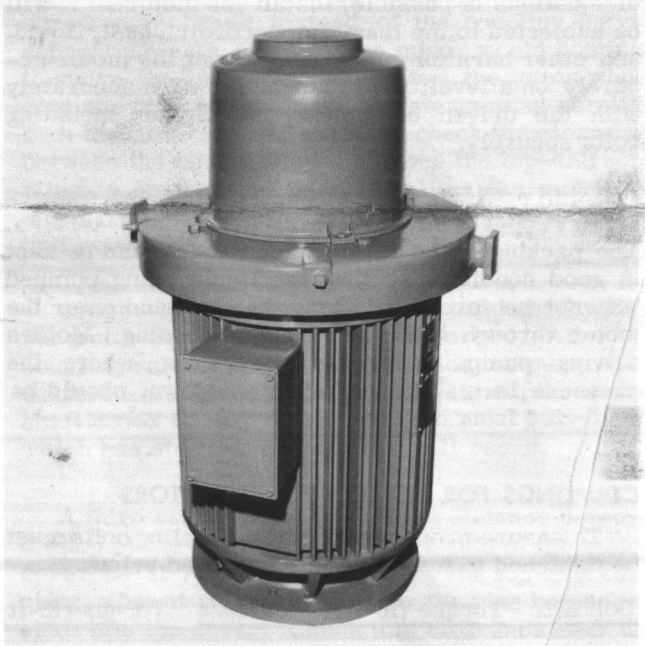


Fig. 1. Typical vertical motor

Figure 3 shows a typical solid-shaft construction where continuous up-and-down thrust is required. This construction utilizes a double-row bearing.

Since overloading greatly reduces bearing life, the amount of thrust applied should not exceed the recommended values.

General mechanical construction for wound-rotor motors is the same as for other types with the addition of rings, brushes, rotor windings, etc. (see Fig. 4).

RECEIVING, HANDLING AND STORAGE

Each motor should be carefully examined upon arrival, and any damage reported promptly to the carrier and to the nearest office of the General Electric Company.

WARNING: *LIFTING DEVICES ARE NORMALLY INTENDED TO BE USED IN HANDLING THE MOTOR ONLY, AND ARE NOT INTENDED TO LIFT THE COMBINED WEIGHT OF THE MOTOR AND ITS CONNECTED LOAD. HOWEVER, IF A SPREADER BAR IS USED TO PROVIDE PARALLEL LIFTING FORCES IN LINE WITH THE AXIS OF THE MOTOR AND PRECAUTION IS USED TO AVOID SHOCK LOADING, CONNECTED LOADS NOT EXCEEDING 200 PERCENT OF THE MOTOR WEIGHT CAN NORMALLY BE SAFELY HANDLED WITH THE MOTOR LIFTING DEVICES.*

If the motor is not to be installed immediately, it should be stored in a clean, dry location. Precautions should be taken to prevent the entrance of moisture, dust, or dirt during storage and installation.

During storage, windings should be protected from excessive moisture absorption by some safe and reliable method of heating. Space heaters, if supplied, may be used for this purpose. The tem-

SAFETY PRECAUTIONS

WARNING

High voltage and rotating parts can cause serious or fatal injury. The use of electric machinery, like all other utilization of concentrated power and rotating equipment, can be hazardous. Installation, operation, and maintenance of electric machinery should be performed by qualified personnel. Familiarization with NEMA Publication MG2, *Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators,* the National Electrical Code, and sound local practices is recommended.

For equipment covered by this instruction book, it is important to observe safety precautions to protect personnel from possible injury. Among the many considerations, personnel should be instructed to:

- avoid contact with energized circuits or rotating parts,
- avoid by-passing or rendering inoperative any safeguards or protective devices,
- avoid extended exposure in close proximity to machinery with high noise levels, and
- use proper care and procedures in handling, lifting, installing, operating and maintaining the equipment.

Safe maintenance practices with qualified personnel are imperative. Before initiating maintenance procedures, be sure that *all* power sources are disconnected from the machine and accessories to avoid electric shock. High potential insulation test for this equipment is not recommended; however, should it be required, procedures and precautions outlined in NEMA Standards MG-1 should be followed.

Failure to properly ground the frame of this machine may cause serious injury to personnel. Grounding should be in accordance with the National Electrical Code and consistent with sound local practice.

perature of the windings should always be maintained a few degrees above the temperature of the surrounding air. It is recommended that motors in storage be inspected, the windings meggered, and a log of insulation resistance and temperature kept. Any significant decrease in insulation resistance should be investigated.

See page 7 of the Relubrication Section for motors in storage.

If motor is to be in storage for over one year, it is recommended that competent technical inspection service be contracted for, such as General Electric Installation and Service Engineering Department, to ensure that the storage has been adequate and that the motor is suitable for service.

INSTALLATION

LOCATION AND MOUNTING

Motors should be located in a suitable enclosure to prevent access to the motor by children or other unauthorized personnel in order to prevent possible accidents. This is especially important for motors that are remotely or automatically controlled or have automatic resetting overload relays, since such motors may start unexpectedly.

Allow enough space around the motor to permit free flow of ventilating air and to maintain an ambient temperature of not over 40 C. Where a choice of locations is possible, install the motor so it will be subjected to the least amount of dirt, dust, liquid, and other harmful materials. Mount the motor securely on a level, firm foundation, align accurately with the driven equipment, and tighten mounting bolts securely.

Some precautions are necessary to assure satisfactory operation of motors in pumping service. The packing gland in the pump head should be kept in good condition so that the liquid being pumped will not be forced out along the shaft and enter the motor through the lower bearing housing. Motors driving pumps in pressure systems, where the pressure is maintained after shutdown, should be protected from overspeeding by check valves.

COUPLINGS FOR HOLLOW-SHAFT MOTORS

To ensure proper functioning, coupling bolts must be tightened to torque values indicated below:

Bolt Size	Torque (lb-ft)	Bolt Size	Torque (lb-ft)
5/16	20	5/8	180
3/8	37	3/4	320
1/2	90	1"	710

CAUTION: *IT SHALL BE THE INSTALLER'S RESPONSIBILITY IN ALL CASES TO ASCERTAIN THAT THESE TORQUE VALUES HAVE BEEN ADHERED TO. THIS SHALL INCLUDE THOSE INSTANCES WHEN THE COUPLING COMES MOUNTED IN THE MOTOR. FAILURE TO COMPLY MAY RESULT IN COUPLING BOLTS SHEARING AND EXTENSIVE DAMAGE TO EQUIPMENT.*

Vertical hollow-shaft motors are designed for driving deep-well, turbine-type pumps and can be equipped with either self-release, bolted, or non-reverse couplings. The type of coupling is specified by the pump manufacturer. Remove the drip cover or the top cap to gain access to the coupling.

Self-release Coupling

Should the motor accidentally operate in the reverse direction, the pump line-shaft joints may unscrew. The self-release coupling (see Fig. 2 inset) acts to limit the amount of this unscrewing. In normal operation, torque from the motor is transmitted by the lower-half coupling through the driving pins to the top-half coupling and thus to the pump shaft. When reversal occurs and the pump shaft starts to unscrew, the top-half coupling disengages from the driving pins, thus uncoupling the pump and motor.

Proper functioning of the self-release coupling depends upon several factors. The pump shaft adjusting nut must be securely attached to the top-half coupling, and the top-half coupling must not bind on the lower half. Otherwise the adjusting nut lockscrew may break instead of the coupling halves separating. As a result, the motor would continue to drive the pump line shaft, and the joints would continue to unscrew. Serious damage may result to both the motor and line shaft. To check the clearance between the coupling halves, place the top-half coupling in position prior to installing the motor. It should drop into place and rest solidly on the lower-half coupling without forcing.

Proper alignment of the pump head shaft within the motor hollow shaft is also important. After the coupling releases, it no longer holds the pump shaft centered. If the alignment is not good, the motor shaft which is still rotating may rub the pump shaft which has stopped, and damage will result.

A third requirement is that the distance between the top of the pump shaft and the inside of the motor cover be at least enough to allow the top-half coupling, when it releases, to clear the pins before the shaft hits the cover. Check this clearance after the adjusting nut has been drawn up to its final position. To facilitate making this check, refer to Fig. 2 which shows a maximum dimension "XH" from the top of the coupling to the top of the shaft. Adhering to this design limit will allow the shaft and coupling to fit to clear the pins and still leave a small clearance between the shaft and cover. For standard motors, dimension "XH" is 3 1/8 inches for C, D, and K-254-286. L-213-256 dimension "XH" is 2 inches.

Depending upon the circumstances causing reversal and upon which line shaft joint unscrews, there may be enough energy stored in the rotating parts, at the time the coupling clears the pins, to cause the pump shaft to continue to rise and strike the motor cover. However, if the above conditions are met, damage even in the most severe cases should be limited to a broken top cap.

It is expected that the self-release coupling will be called upon to operate only at infrequent intervals. Operation from the usual cause, i.e., application of single-phase power after an interruption, can be minimized by proper selection of control. When power is removed from the motor, the reverse flow of water through the pump tends to cause reverse rotation or "back spin." If single-phase power is applied during the back spin, the motor will continue to run in the reverse direction. It will drive the pump and tend to unscrew the line shaft joints. The selection of control which prevents automatic restarting after a power interruption, or which employs a backspin timer to delay restarting until the motor comes to rest, will reduce the frequency of such occurrences.

Bolted Coupling

The bolted coupling allows up-thrust from the pump to be taken by the motor bearings (see END-PLAY ADJUSTMENT under MAINTENANCE). It is similar to a self-release coupling except that the driving pins are replaced by bolts, which should be securely tightened to hold the two halves of the coupling solidly together. (See Torque Requirements on page 2.) This type of coupling does not have the self-release feature.

Non-reverse Coupling

The non-reverse coupling (see Fig. 2) is also a bolted type, and it keeps the pump and motor from rotating in the reverse direction. Thus, it not only prevents the pump shaft from unscrewing, but it also prevents damage from over-speeding and damage to water-lubricated pump shaft bearings which might occur during back spin. In normal operation, motor torque is transmitted to the pump shaft through the two halves of the coupling which are bolted together. The ratchet pins are lifted by the ratchet teeth, and are held clear by centrifugal force and friction as the motor comes up to speed. When power is removed, the speed decreases, and the pins fall. At the instant of reversal, a pin will catch in a ratchet tooth and prevent backward rotation. The number of pins dif-

fers from the number of teeth to multiply the number of stopping positions.

Too rapid a decrease in speed can result in inertia forces great enough to prevent the pins from dropping. This condition is further aggravated when the pins become dirty, and their action becomes sluggish. To permit operation when the time from shutdown (the instant the stop button is pressed) to zero speed is less than two seconds, the pins are spring-loaded. For those cases involving cycling (frequent starting and stopping) and stopping times greater than two seconds, the springs should be removed to decrease wear on the ratchet plate.

A complete non-reverse top coupling is shown in Fig. 2. This coupling includes a ratchet plate, pin carrier, pins, springs, pin retaining plate, and cap screws. Pins and springs are made of heat-treated stainless steel. The pin carrier is one piece and fits in place of the self-release coupling.

Motors shipped from stock may have their top couplings and non-reverse assemblies packaged separately.

When installing the non-reverse coupling, use no lubricant. Lubrication will interfere with proper operation. The top half of the coupling should seat solidly on the lower half and the pins should touch the bottom of the pockets between the teeth in the ratchet plate. The clearance between the top-half coupling and the top of the ratchet teeth should be between 1/32 and 1/8 inch.

Two slots are provided in the outside rim of couplings so that a bar can be inserted to keep the assembly from turning while the adjustment of pump impeller clearance is being made.

ELECTRICAL CONNECTIONS

Select and install control equipment and wiring according to National Electrical Code and sound local practice. Check the voltage and frequency with nameplate values. The motor will operate successfully, but with somewhat modified characteristics, when the line voltage is within plus or minus ten percent of nameplate value, the frequency within plus or minus five percent, or the combined variation within plus or minus ten percent (provided the frequency variation does not exceed five percent).

Motors rated 200 volts are designed for use on 208-volt systems.

Operation of a motor rated 230 volts on a 208-volt system is not recommended because utilization voltages are commonly encountered below the minus 10 percent tolerance on the voltage rating for which the motor is designed. Such operation will generally result in excessive overheating and serious reduction in torques (National Electrical Manufacturers Association).

LUBRICATION

All grease-lubricated bearing housings are packed with the proper amount of GE grease before leaving the factory and will not require regreasing until they have been in service for a time.

See instructions under MAINTENANCE for relubrication recommendations.

OPERATION

Check the electrical connections.

When possible, leave the motor disconnected from the load for the initial start. First make sure that the rotor turns freely, then operate the motor without load for about an hour to test for excessive vibration and for any unusual, localized heating in the bearings and winding.

To reverse the direction of rotation of a three-phase motor, interchange any two line leads; to reverse direction of a two-phase motor, interchange T_1 and T_3.

Operate the motor under load and check the current. Do not exceed the steady value of nameplate amperes times service factor.

MAINTENANCE

WARNING: *BEFORE INITITATING MAINTENANCE PROCEDURES, DISCONNECT ALL POWER SOURCES TO THE MACHINES AND ACCESSORIES AND COMPLETELY DISCHARGE ALL PARTS AND ACCESSORIES WHICH MAY RETAIN ELECTRIC CHARGE. FAILURE TO DO SO CAN RESULT IN SEVERE PERSONAL INJURY.*

INSPECTION AND CLEANING

A systematic inspection should be made at regular intervals, depending on service and operating conditions.

Keep both the interior and exterior of the motor free from dirt, oil, and grease. Open motors should be kept as dry as possible; if operating in dirty places, they should be disassembled periodically and thoroughly cleaned.

Motors may be blown out with dry compressed air of moderate pressure, but cleaning by suction is preferred due to the possibility of water in the compressed air lines and the danger of blowing metal chips into the insulation with compressed air.

WARNING: *SCREENS AND COVERS ARE PROVIDED AS NECESSARY FOR PROTECTION OF THE EQUIPMENT AND PERSONNEL. ALL SCREENS MUST BE KEPT FREE OF DIRT AND DEBRIS TO ENSURE PROPER VENTILATION, AND MAINTAINED IN PLACE FOR PROTECTION OF PERSONNEL.*

The condition of the non-reverse coupling should be checked periodically by removing the drip cover or top cap. If dirt has caused the action of the pins to become sluggish, the pin carrier should be removed, disassembled, and thoroughly cleaned with a suitable solvent. The parts should then be dried and reassembled in accordance with the instructions given under INSTALLATION – COUPLINGS.

Sometimes after a long period involving frequent starts and stops, the surface of the holes in the pin carrier becomes polished so that friction forces will no longer hold the pins clear of the ratchet teeth when the motor is running. This condition can be remedied by roughing these surfaces with a piece of emery paper wrapped around a rod.

Whenever the dismantling of couplings is necessary, the use of witness marks will assure a balanced condition when reassembly is complete.

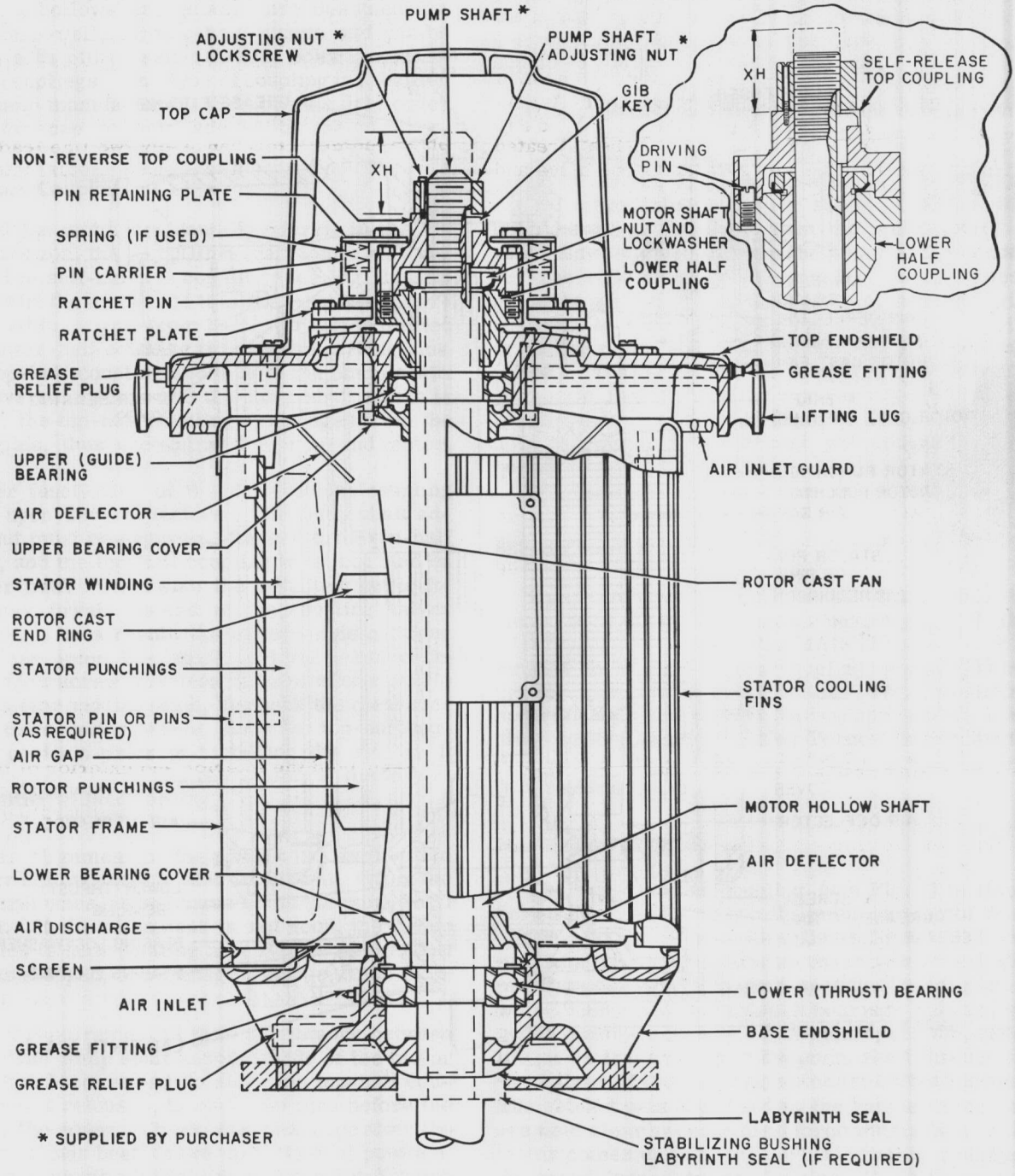


Fig. 2. Typical high-thrust, hollow-shaft motor with non-reverse coupling. Self-release type shown in inset.

RELUBRICATION

Motors covered by these instructions employ grease lubrication for both the upper (guide) bearing and the lower (thrust) bearing.

The bearing housings are packed at the factory with sufficient long-life grease for an initial operating period. Since the oil in the grease will ultimately become depleted, it is necessary to regrease at intervals consistent with the service. The following recommendations are offered as a guide in determining the relubrication period.

Guide bearings in vertical motors carry relatively light loads, and, under normal conditions of operation, can be regreased every three to five years. When conditions are more severe (high tem-

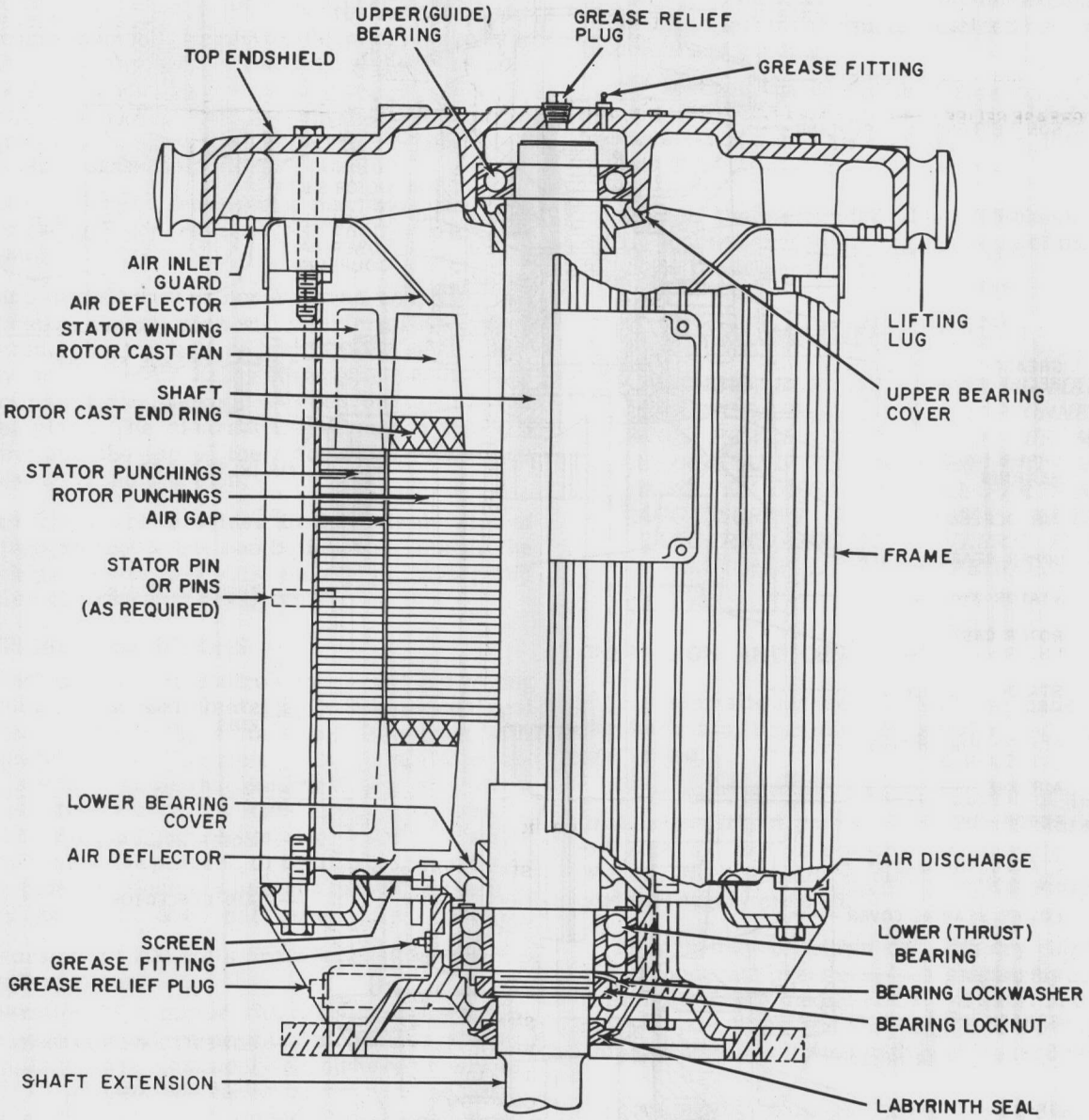


Fig. 3. Typical solid-shaft motor for continuous up-and-down thrust. (For standard down-thrust only, see bottom bearing arrangement in Fig. 2.)

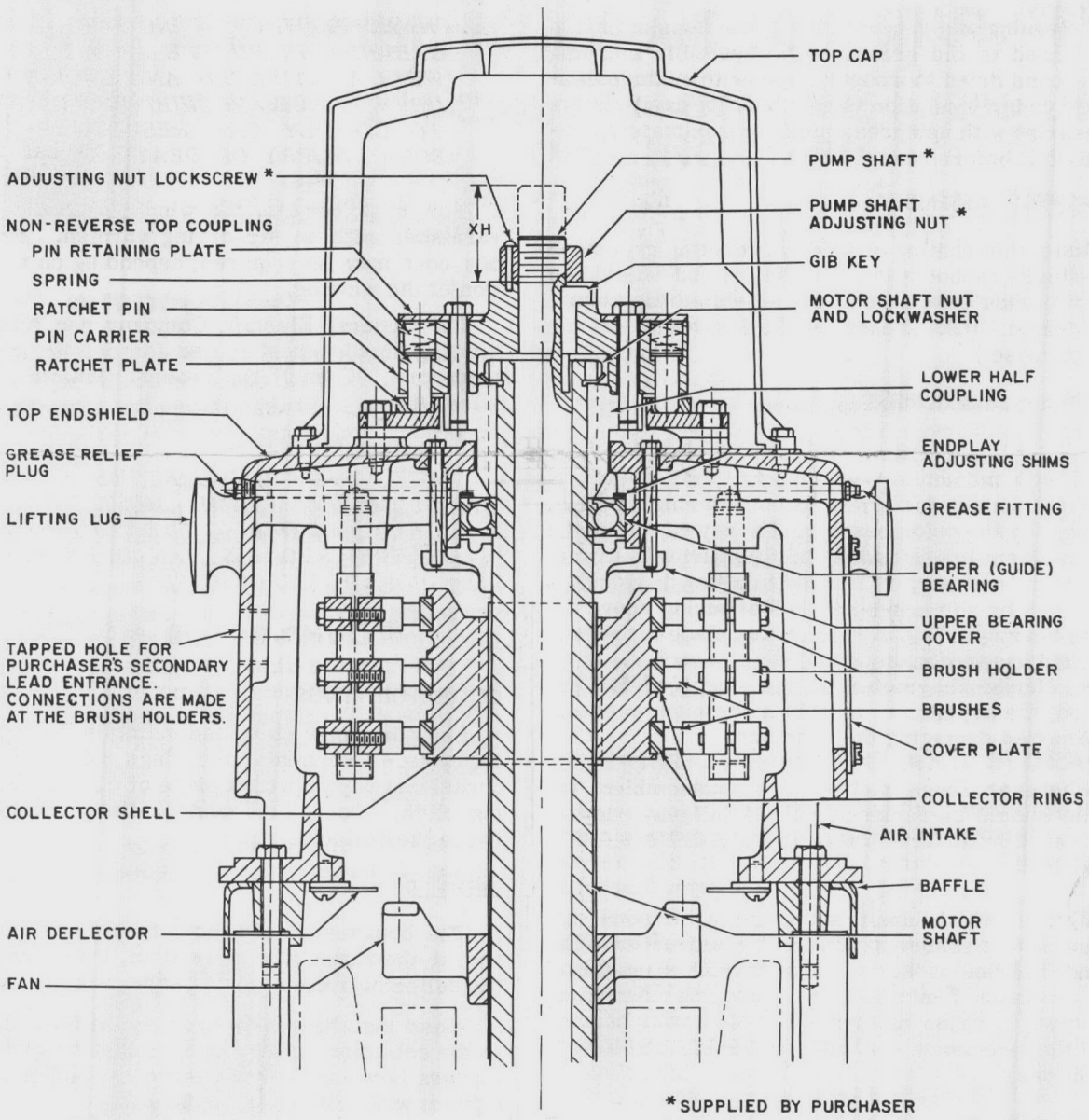


Fig. 4. Typical wound-rotor type motor, showing rings, brushes, etc.

peratures, dirty locations, motor running continuously, etc.), regrease every one to three years.

Regrease the thrust bearings of motors with speeds above 1800 rpm every 1000 hours of operation with the interval not to exceed three months. For motors with speeds 1800 rpm and below, regrease every 2000 hours of operation with the interval not to exceed six months.

Relubrication procedure is as follows. Remove the grease relief plug and free the relief passage of hardened grease. Wipe the grease fitting clean. Or, if no fitting is supplied, replace the 1/8-inch pipe plug with a standard fitting.

For best results, use GE long-life grease (No. D6A2C5). Take care to exclude dirt from the bearing housing and lubricant. With the motor at standstill, add grease, using a hand-operated gun until the grease begins to move in the relief passage. Allow the motor to run about ten minutes before replacing the relief plug.

For motors in storage and motors that are to stand idle for a prolonged period and be subject to moisture from condensation, the thrust bearing housing should be filled with grease to minimize corrosion. Add grease until it comes all the way out the relief passage. When the motor is again started, run it with the relief plug removed for about ten minutes to expel excess grease.

Since the above method tends to purge the bearing housing of used grease, complete removal of all grease should be required only at infrequent intervals. Whenever the motor is disassembled for gen-

eral cleaning and reconditioning, the housing should be cleaned of old grease with a suitable cleaning solvent and dried thoroughly. Refer to mixture described under insulation care. Pack the cavity above the bearing with new grease until approximately two-thirds full before reassembling.

END-SHIELD ASSEMBLY

Add a thin coating of a non-conducting grease on end-shield rabbet and to threads of end-shield cap screws when assembling end shields to the aluminum frame. (GE Grease D6A2C5 is excellent for this purpose.)

END-PLAY ADJUSTMENT

Standard high-thrust motors are designed to withstand only momentary up-thrust. This up-thrust, which can exist for a few seconds during starting, is taken by the guide bearing. To prevent the thrust bearing from losing radial stability during this time, the motor end play is limited to a few thousandths of an inch by shims inserted in the housing above the upper bearing. This adjustment is made at the factory and need not be disturbed on a new motor. However, should the motor be disassembled for any reason, the adjustment must be made upon reassembly to avoid damaging the bearings.

Whenever these motors are reassembled, the shims should be replaced and the end play checked to see that it falls within the allowable 0.005 to 0.007 inch.

Motors which must withstand continuous up-thrust have a somewhat different construction. The thrust bearing is arranged to take this up-thrust and is clamped in the bearing housing. No shims are used in these motors since the lower bearing is of the type which can withstand axial load in both directions.

INSULATION CARE

Whenever the motor is disassembled for general cleaning, the windings should be brushed free of dust and washed with a cloth or brush wet with a suitable cleaning solvent.

The cleaning fluid used to clean the coils must have grease-dissolving properties, but must not affect the electric insulation or varnish. Many cleaning fluids in common use, which are suitable with respect to the foregoing, may be extremely hazardous because of their toxicity, inflammability, or both. The following mixture is a suitable solvent for cleaning windings, bearings, and the bearing housing:

25 percent methylene-chloride (if unavailable, trichlorethylene may be substituted)
70 percent Stoddard solvent (petroleum spirits)
5 percent perchlorethylene

WARNING: *WHEN USING THE ABOVE CLEANING FLUID, THE AREA MUST BE WELL VENTILATED AND SMOKING OR OPEN FLAMES PROHIBITED. FAILURE TO COMPLY CAN RESULT IN PERSONAL INJURY OR DEATH.*

For best results, the windings should then be varnished with an air-drying varnish. More than one coat may be required, depending on the condition of the winding.

The General Electric Company can furnish insulating varnish best suited for definite operating conditions. Consult the nearest General Electric Sales Office.

REWINDING CAUTION: *TO AVOID DAMAGE, THE TEMPERATURE OF THE ALUMINUM FRAME MUST NOT EXCEED 200C DURING THE STRIPPING OR BAKING PROCESS. AN OPEN FLAME SHOULD NOT BE USED.*

WOUND-ROTOR MOTORS

COLLECTOR RINGS

Keep the rings clean and maintain their polished surfaces. Ordinarily, the rings will require only occasional wiping with a piece of canvas or nonlinting cloth. Do not let dust or dirt accumulate between the collector rings.

BRUSHES

The brushes should move freely in the holders, and at the same time make firm, even contact with the collector rings.

When installing new brushes, fit them carefully to the collector rings. Be sure that the pigtail conductors are securely fastened to, and make good contact with, the brush holders.

CAUTION: *DURING STARTING, EXTERNAL RESISTANCE MUST BE PROVIDED IN THE SECONDARY CIRCUIT TO PREVENT HIGH IN-RUSH CURRENT WHICH WOULD DAMAGE THE COLLECTOR RINGS AND BRUSHES.*

RENEWAL PARTS

When ordering parts, give description and state quantity of parts desired, together with the nameplate rating and model and serial number of the motor. For couplings, also specify the type, bore and keyway size.

Requests for additional copies of these instructions or inquiries for specific information should be addressed to the nearest office of the General Electric Company.

H.P. Well 616