

FILE FOLDER

DESCRIPTION ON TAB:

Onslow Beach Wells

- Outside/inside of actual folder did not contain hand written information**
- Outside/inside of actual folder did contain hand written information**
***Scanned as next image**

DATE -----

PWSID -----

WELL # -----

WELL NAME -----

BLDG. -----

CODE -----

AVAILABILITY -----

LOCATION -----

LATITUDE -----

LONGITUDE -----

WELL DIAMETER -----

WELL DEPTH -----

SCREEN INTERVAL -----

YIELD -----

STATIC LEVEL -----

PUMPING LEVEL -----

PUMP TYPE -----

MOTOR HP -----

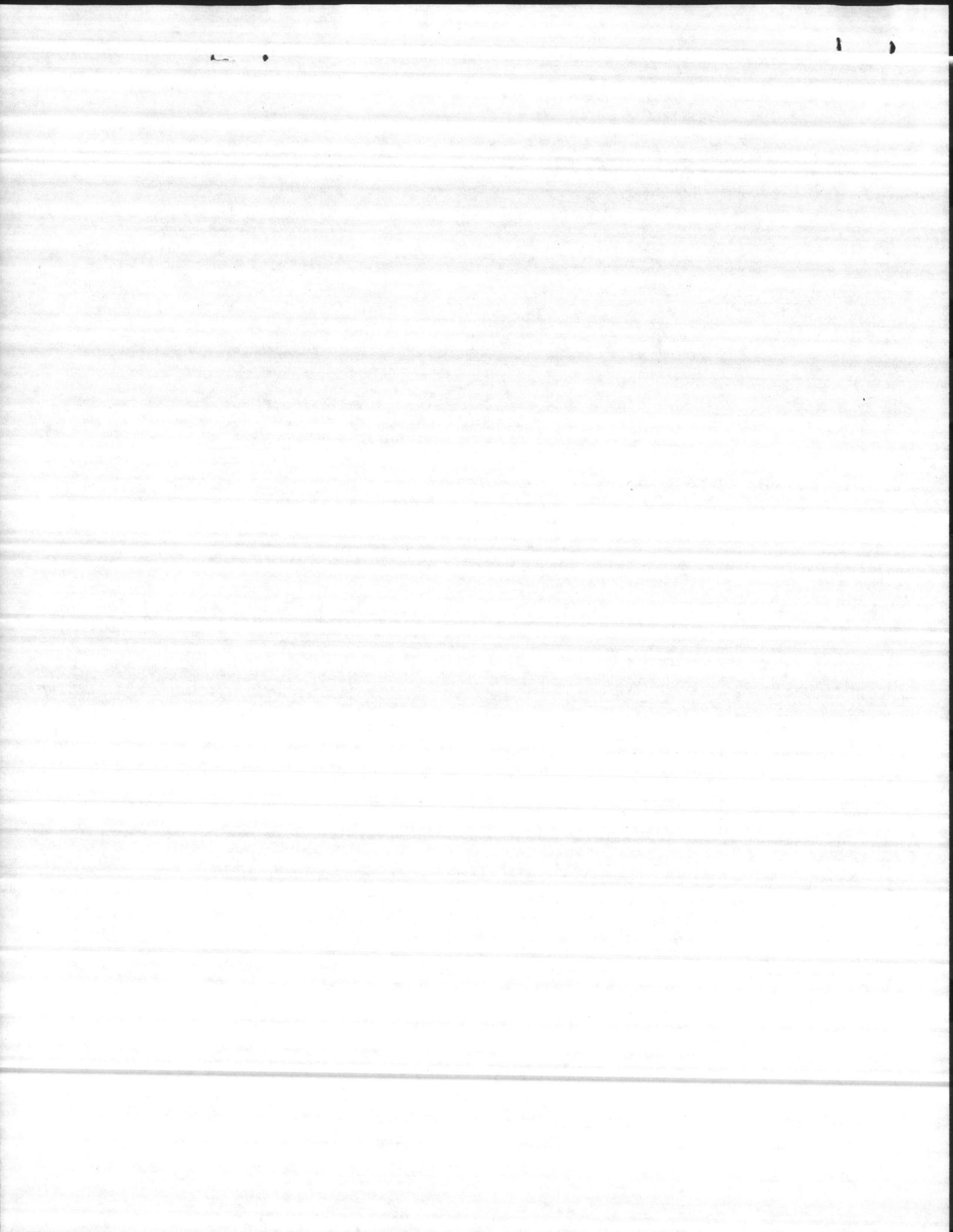
INTAKE DEPTH -----

DESIGN CAPACITY -----

ACTUAL GPM -----

SIZE OF CONCRETE SLAB -----

HEIGHT OF CASING -----



DATE 13 Apr 2020

PWSID 0467048

Plant
~~WELL #~~ BA138

WELL NAME -----

BLDG. -----

CODE -----

AVAILABILITY -----

LOCATION front door step

LATITUDE 34 34 28.381 N ✓

LONGITUDE 77 16 48.236 W ✓

WELL DIAMETER -----

WELL DEPTH -----

SCREEN INTERVAL -----

YIELD -----

STATIC LEVEL -----

PUMPING LEVEL -----

PUMP TYPE -----

MOTOR HP -----

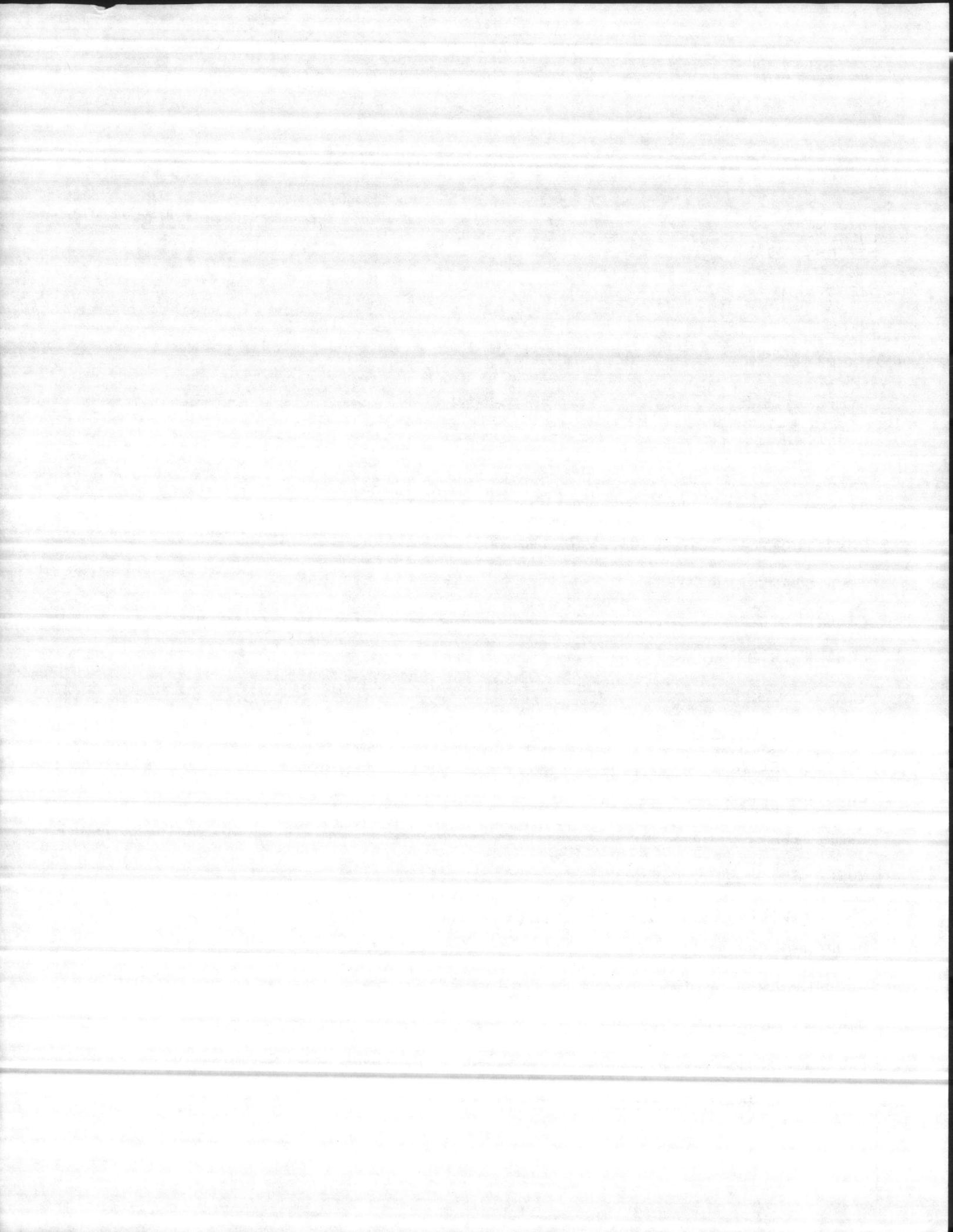
INTAKE DEPTH -----

DESIGN CAPACITY ----- X

ACTUAL GPM -----

SIZE OF CONCRETE SLAB -----

HEIGHT OF CASING -----



DATE 13 Apr 00
PWSID 0467048

elevated tank
~~WELL #~~ SBA108 -----

WELL NAME -----

BLDG. -----

CODE -----

AVAILABILITY -----

LOCATION Onslow Beach -----

LATITUDE 34 34 06.056 N ✓ -----

LONGITUDE 79 16 25.976 W ✓ -----

WELL DIAMETER -----

WELL DEPTH -----

SCREEN INTERVAL -----

YIELD -----

STATIC LEVEL -----

PUMPING LEVEL -----

PUMP TYPE -----

MOTOR HP -----

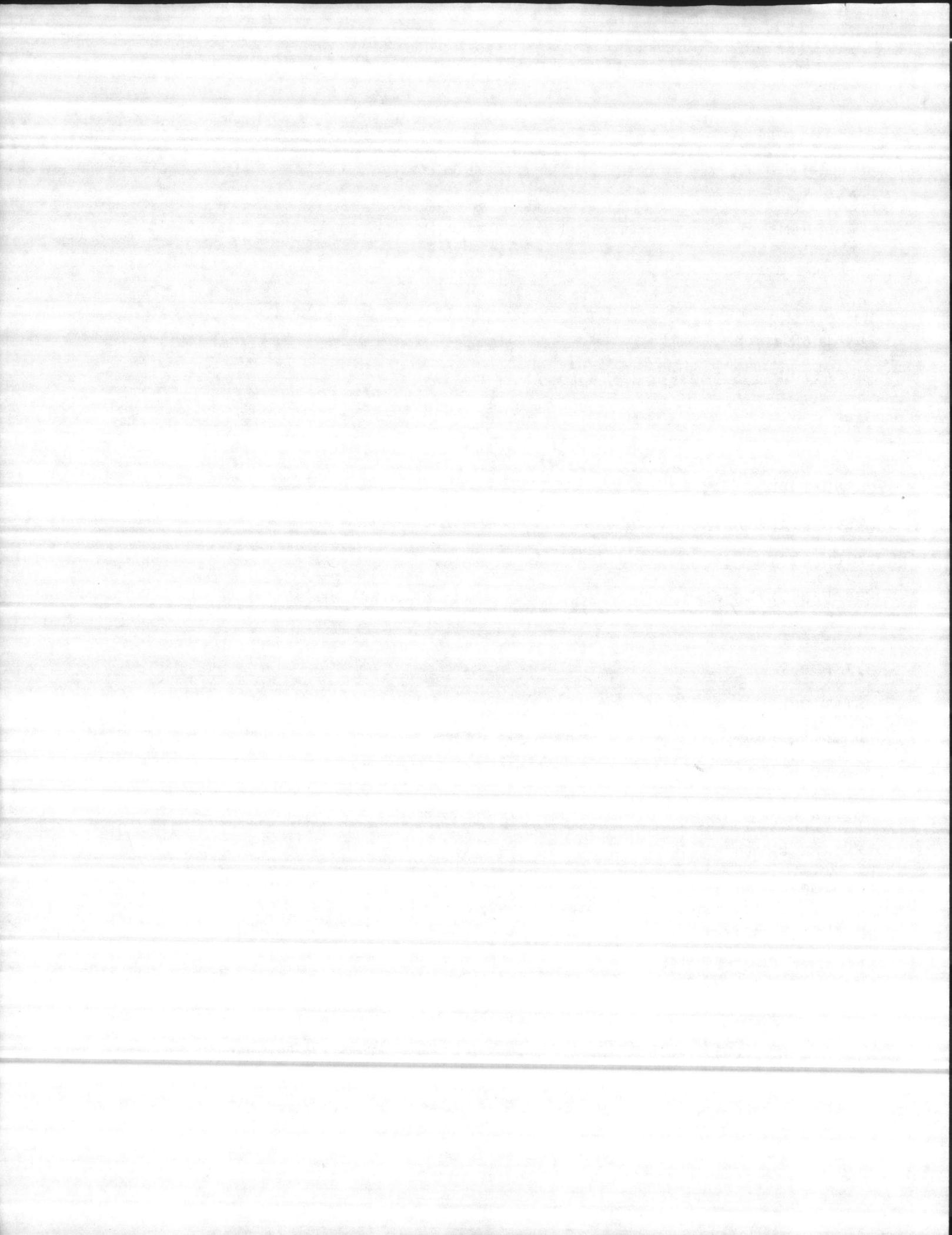
INTAKE DEPTH -----

DESIGN CAPACITY ----- X

ACTUAL GPM -----

SIZE OF CONCRETE SLAB -----

HEIGHT OF CASING -----



Delivered
Reservoir

WELL # 5BA139

DATE 13 Apr 2020

PWSID _____

WELL NAME _____

BLDG. _____

CODE _____

AVAILABILITY _____

LOCATION top/center of

LATITUDE 34 34 28.699 N

LONGITUDE 77 16 46.955 W

WELL DIAMETER _____

WELL DEPTH _____

SCREEN INTERVAL _____

YIELD _____

STATIC LEVEL _____

PUMPING LEVEL _____

PUMP TYPE _____

MOTOR HP _____

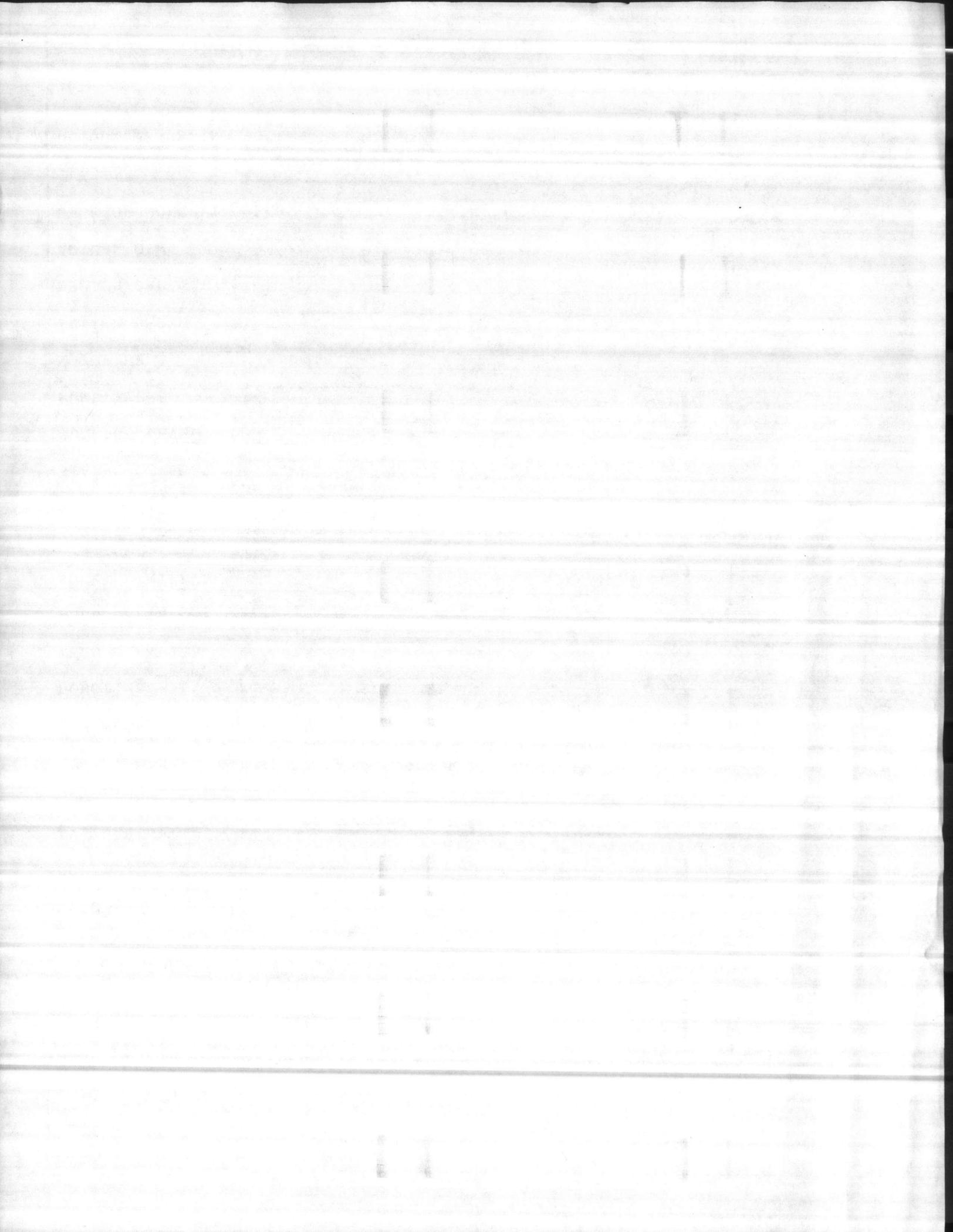
INTAKE DEPTH _____

DESIGN CAPACITY _____

ACTUAL GPM _____

SIZE OF CONCRETE SLAB _____

HEIGHT OF CASING _____



APPROVED AS NOTED

L. E. WOOTEN and COMPANY

Consulting Engineers

By Edm. Boone

Date: MAY 18 1984



IT IS HEREBY CERTIFIED THAT THE (MATERIAL) (EQUIPMENT) SHOWN AND MARKED IN THIS SUBMITTAL, SHOP DRAWINGS, CATALOG CUT (S), ETC., AND APPROVED/PROPOSED TO BE INCORPORATED INTO

CONTRACT NUMBER 1478 IS IN COMPLIANCE WITH THE CONTRACT DRAWINGS AND SPECIFICATIONS AND CAN BE INSTALLED IN THE ALLOCATED SPACE,

AND IS _____ APPROVED FOR USE/

SUBMITTED FOR GOVERNMENT APPROVAL _____
APPROVED FOR USE SUBJECT TO GOVERNMENT APPROVAL OF SPECIFIC DEVIATION.

Pump and Lighting Company

ENGINEERED PRODUCTS DIVISION

926 2ND STREET N.E. • P.O. BOX 2504 •
704/324-9705

AUTHORIZED REVIEWER _____
HICKORY, N.C. 28601
DATE _____
SIGNATURE COC REP [Signature]
DATE 5/14/84

SUBMITTAL DATA

PROJECT: Utilities Improvements - N62470-81-B-1478

LOCATION: Marine Corps Base, Courthouse Bay Area
Camp Lejeune, North Carolina

CONTRACTOR: Wilson Construction/Carolina Well & Pump

ENGINEER: L.E. Wooten & Company

SUBJECT: SECTION 11210, PARAGRAPH 1.2.1.1
New Vertical Turbine Well Pump

DESCRIPTION:

Conditions: 300 GPM @ 131' TDH
Setting: 65' 7 3/4" to Intake
RPM: 1770
Efficiency: 80%

One (1) Crane Deming, 6 Stage M-8, Figure 4700 vertical water lubricated turbine pump with:

- A. One (1) 5" galvanized zinc cone strainer
- B. One (1) 10' x 5" galvanized zinc suction pipe
- C. One (1) 5' x 6" galvanized zinc bottom column
- D. Four (4) 10' x 6" galvanized zinc intermediate column sections
- E. One (1) 5' x 6" galvanized zinc top column.
All column pipe is Schedule 40
- F. One (1) 5' x 1", 416 stainless steel bottom shaft section with stainless steel sleeve, bearing and monel coupling
- G. Four (4) 10' x 1" 416 stainless steel intermediate shaft sections with stainless steel sleeves, bearings and monel couplings
- H. One (1) 5' x 1" 416 stainless steel top shaft section with stainless steel sleeve and monel coupling
- I. One (1) SD66-12-0076678 surface discharge head with packing box, two piece top shaft and 6" flanged discharge
- J. One (1) SD66-12 foundation plate
- K. One (1) Johnson CH20-1:1 ratio combination right angle gear drive WITH FLEXIBLE JOINTED HORIZONTAL GEAR SHAFT &

OSHA APPROVED SHAFT GUARD.

IT IS HEREBY CERTIFIED THAT THE MATERIAL
SHOWN AND SHOWN AND MARKED IN THIS SUBMITTAL
SHOP DRAWING, CUTTING, ETC., AND
APPROVED FOR USE TO BE INCORPORATED INTO
CONTRACT NUMBER _____ IS IN COMPLIANCE
WITH THE CONTRACT DRAWINGS AND SPECIFICATIONS
AND CAN BE INSTALLED IN THE ALLOCATED SPACE
AND IS APPROVED FOR USE.

SUBMITTED FOR GOVERNMENT APPROVAL
AS SHOWN FOR USE SUBJECT TO GOVERNMENT
APPROVAL OF SPECIFIC DEVIATION.

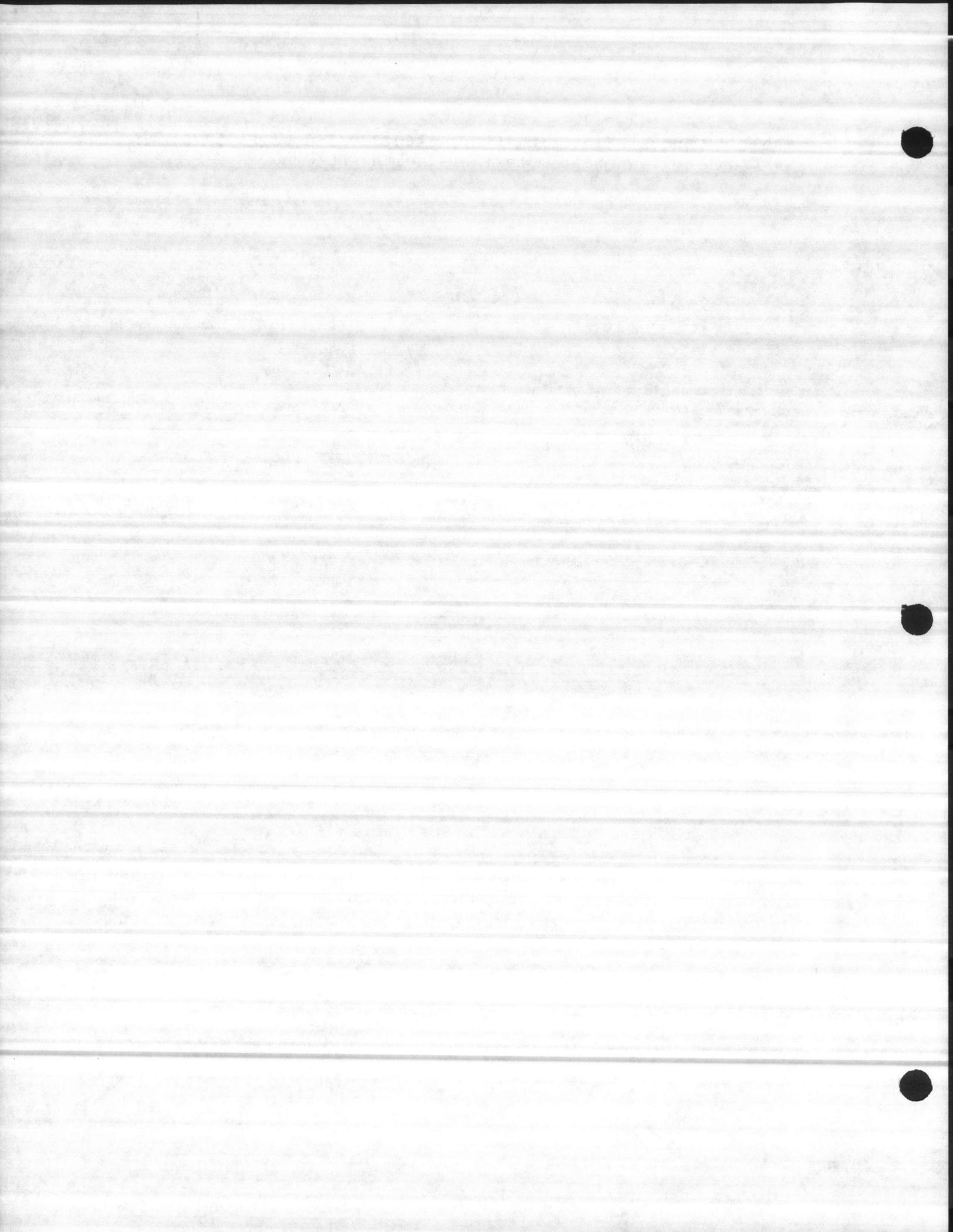
AUTHORIZED REVIEWER _____
DATE _____
SIGNATURE COORREP _____
DATE _____

APPROVED AS NOTED
L. E. WOOLFE and COMPANY
Consulting Engineers

By _____
Date: MAY 18 1984

- L. One (1) General Electric 15 HP, 3-60-230/460 volt, 1770 RPM vertical hollow shaft motor, WP-1 with NRC

APRIL 12, 1984





Pump and Lighting Company

ENGINEERED PRODUCTS DIVISION

926 2ND STREET N.E. • P.O. BOX 2504 • HICKORY, N.C. 28601
704/324-9705

April 12, 1984

Carolina Well & Pump
P.O. Box 1085
Sanford, North Carolina 27330

Subject: Certification of Equipment Furnished by Pump & Lighting Company/Engineered Products Division

Project: Utilities Improvements N62470-81-B-1478
U.S. Marine Corps - Courthouse Bay Area
Camp Lejeune, North Carolina

EQUIPMENT TO BE FURNISHED BY PUMP AND LIGHTING COMPANY ENGINEERED PRODUCTS DIVISION, SECTION 11210 PARAGRAPH 1.2.1.1 NEW WELL PUMP

Vertical Turbine Pump
Motor
Right Angle Gear Drive

This letter is certification that the above equipment to be supplied by our company is in compliance with the specifications, performance and material for Project N62470-81-B-1478. We are, to the best of our knowledge, in complete compliance with the specifications.

If you need additional information or service, please call on us.

Very truly yours,

PUMP AND LIGHTING COMPANY
ENGINEERED PRODUCTS DIVISION

Subscribed and sworn to before me this 12th day of April, 1984. R.M. Wilkinson did personally appear before me.

R.M. Wilkinson
Division Manager

Notary

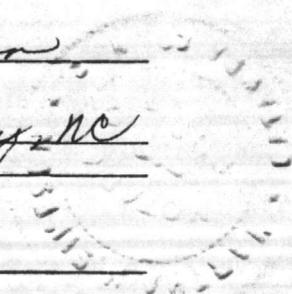
RMW:cb

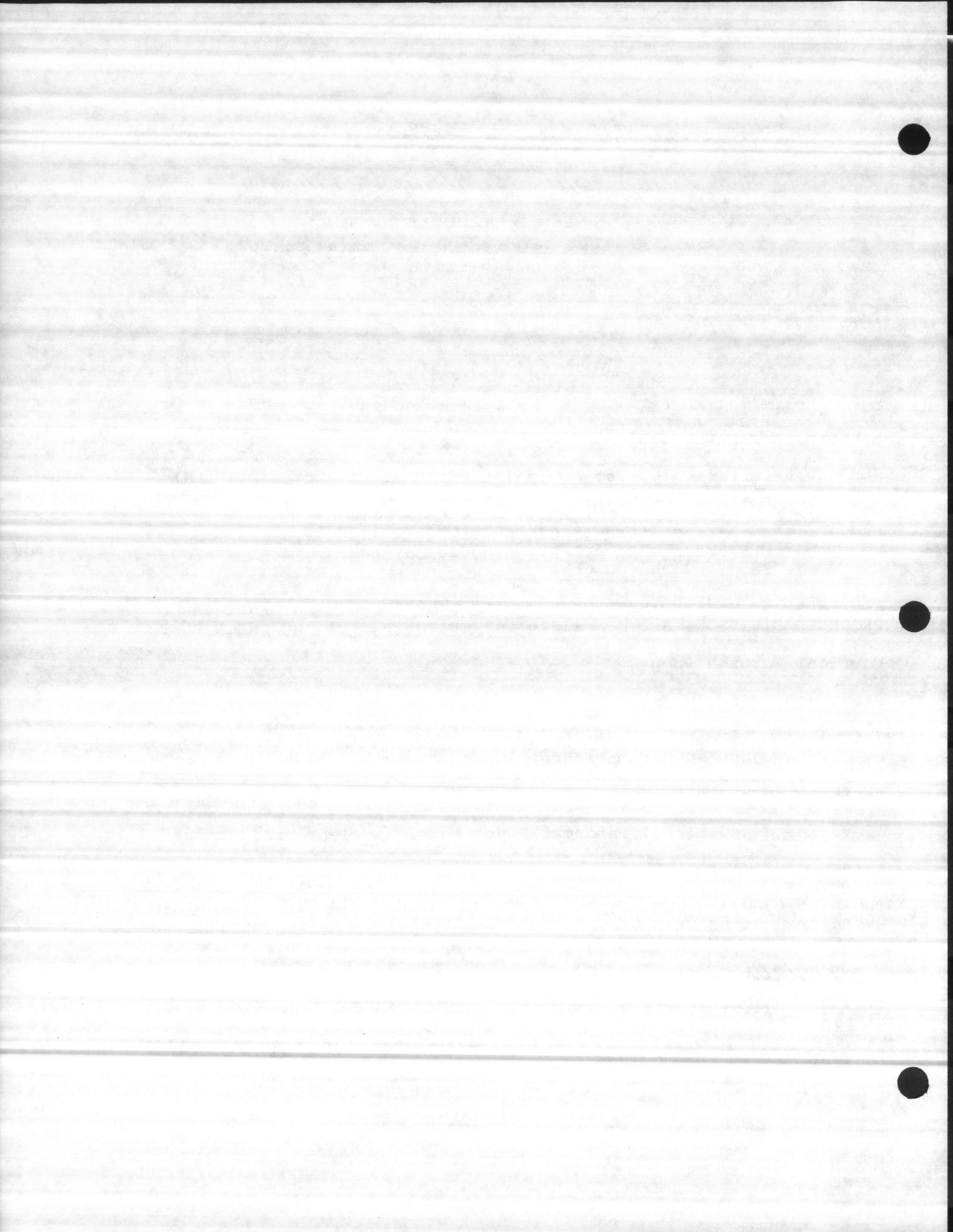
P.O. Box 1423, Hickory, NC

Address

My commission expires

12-8-85



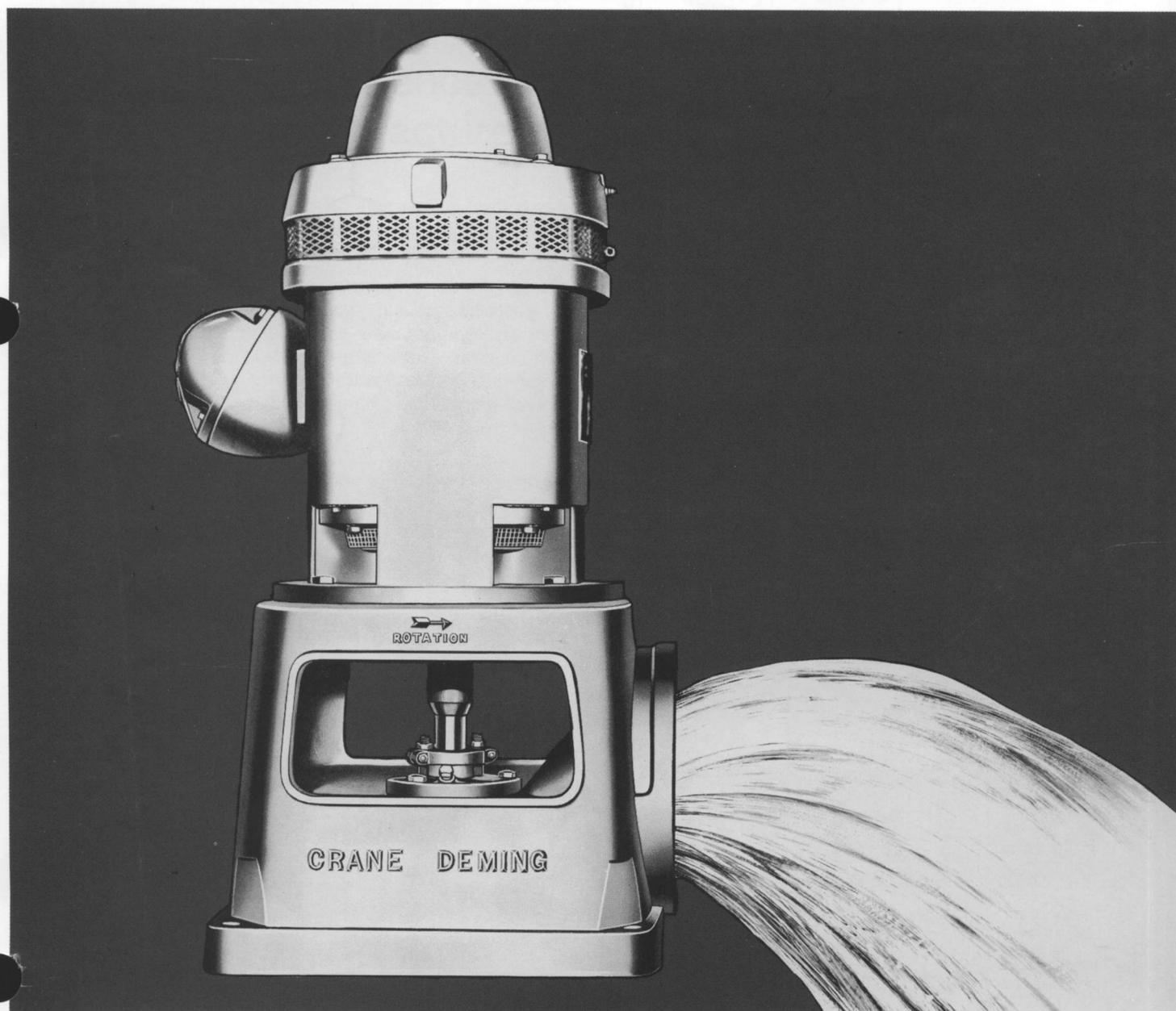


CRANE DEMING

BULLETIN NO. 4700C

Water and Oil Lubricated

VERTICAL TURBINE PUMPS



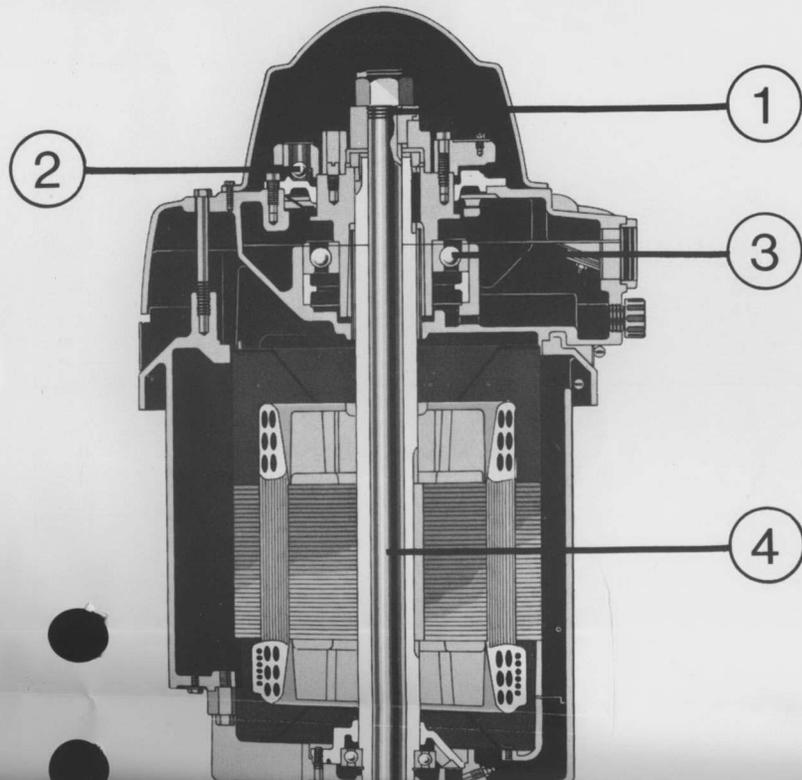
PRECISION ENGINEERED TO FILL EVERY MUNICIPAL, INDUSTRIAL & AGRICULTURAL REQUIREMENT

CRANE DEMING

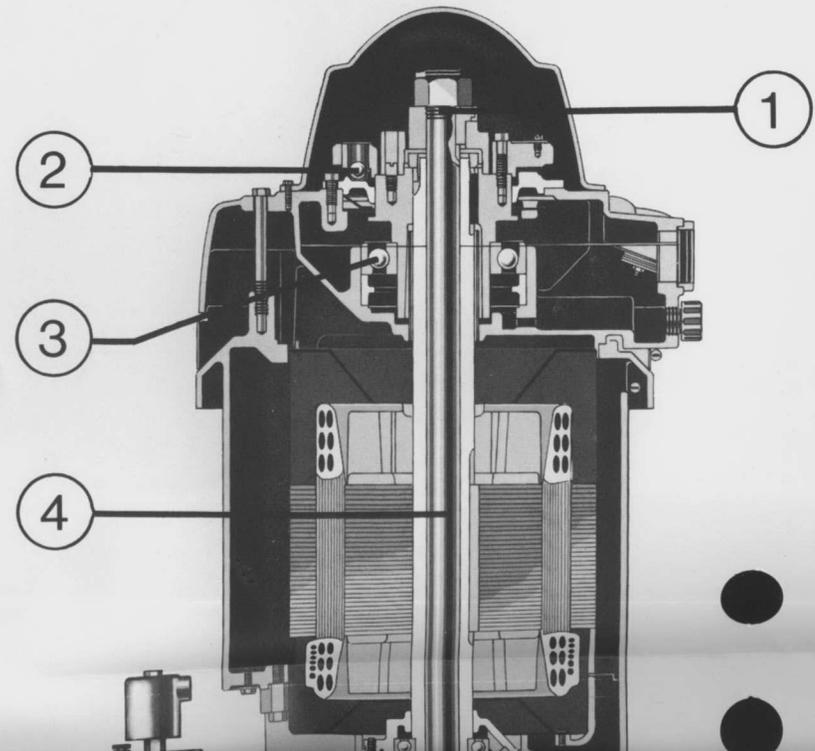
VERTICAL TURBINE PUMPS

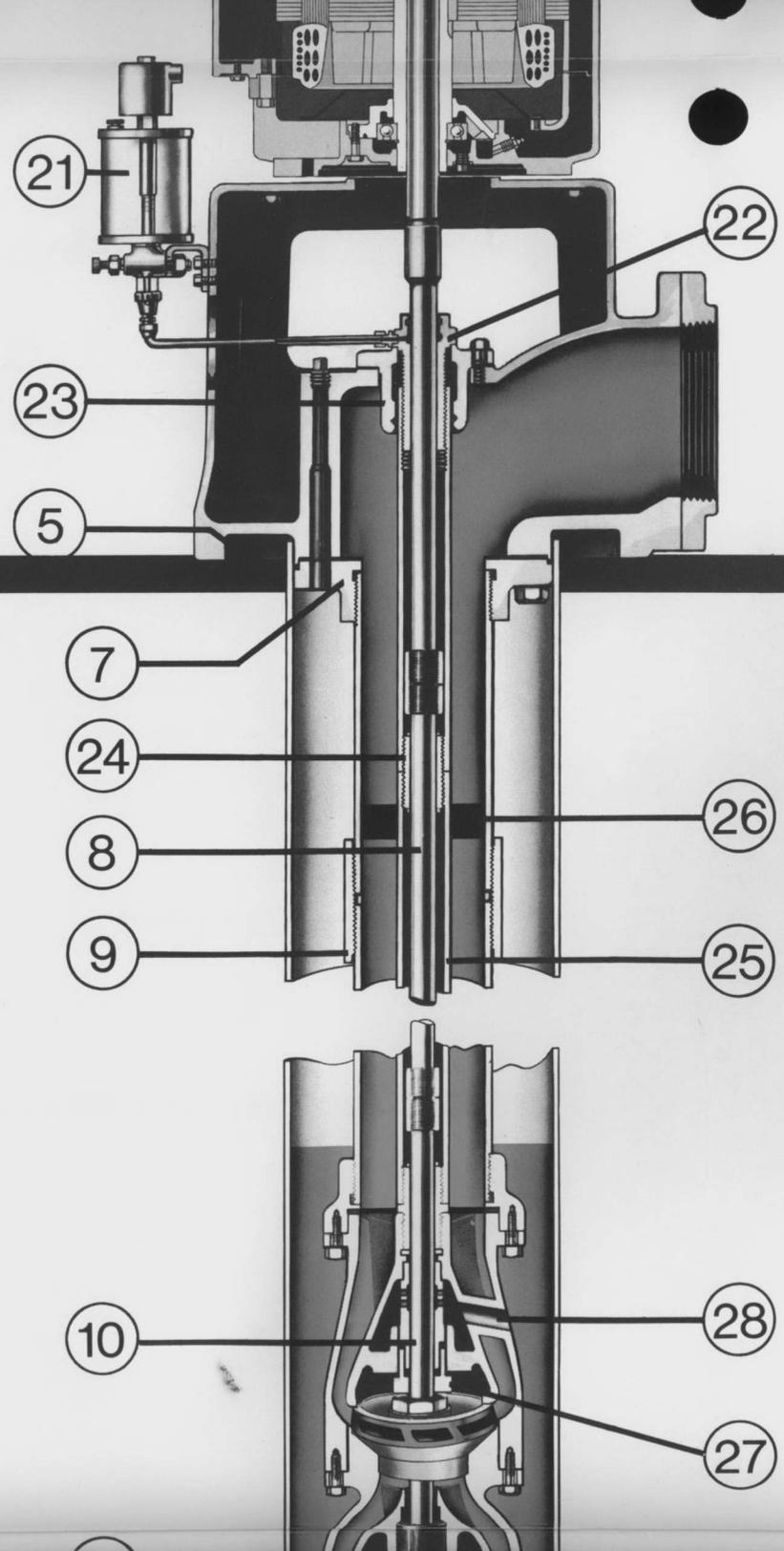
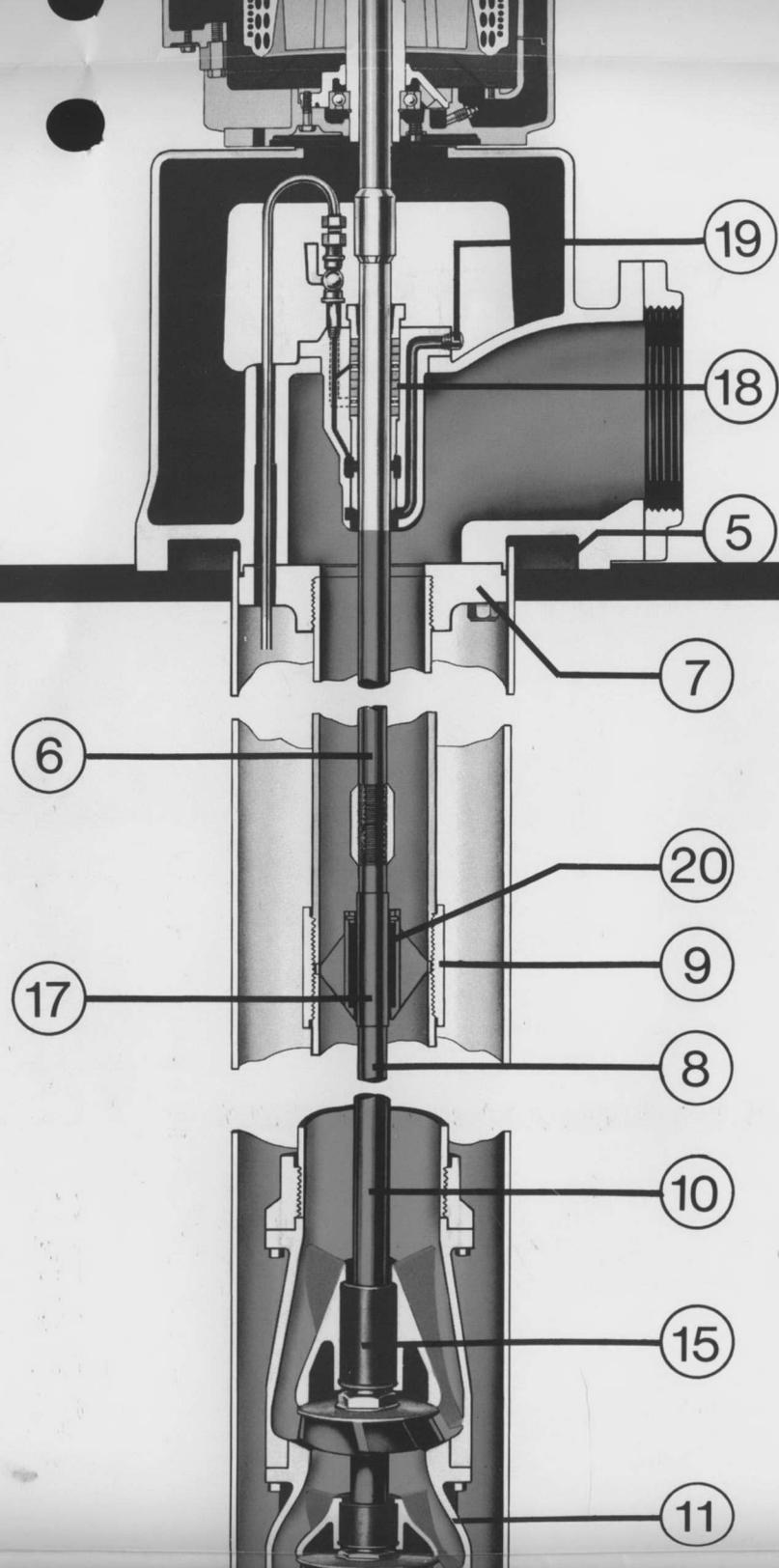
precision engineered to fill every municipal, industrial & agricultural requirement

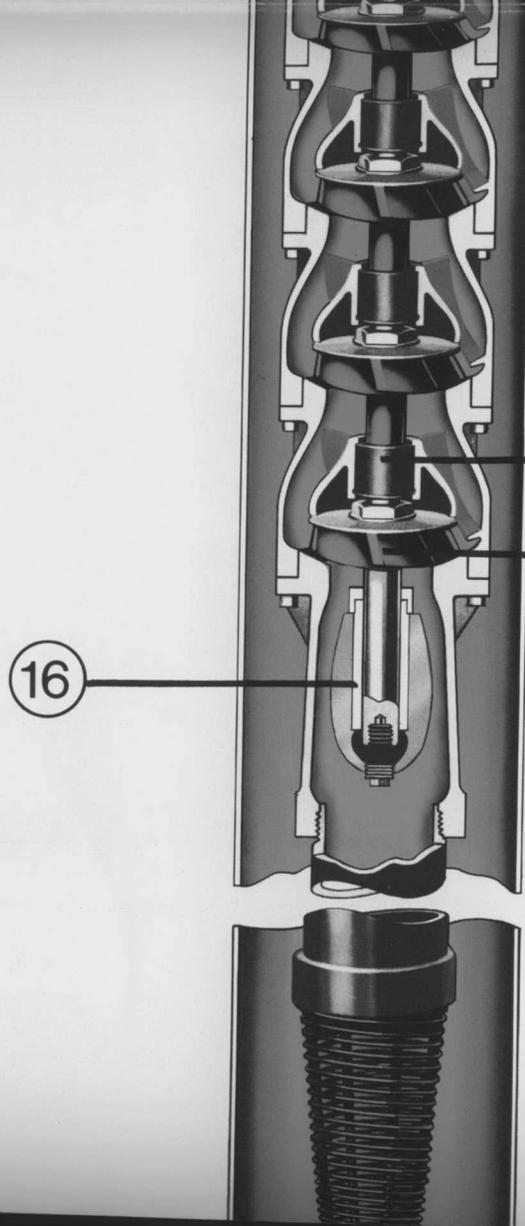
WATER LUBRICATED



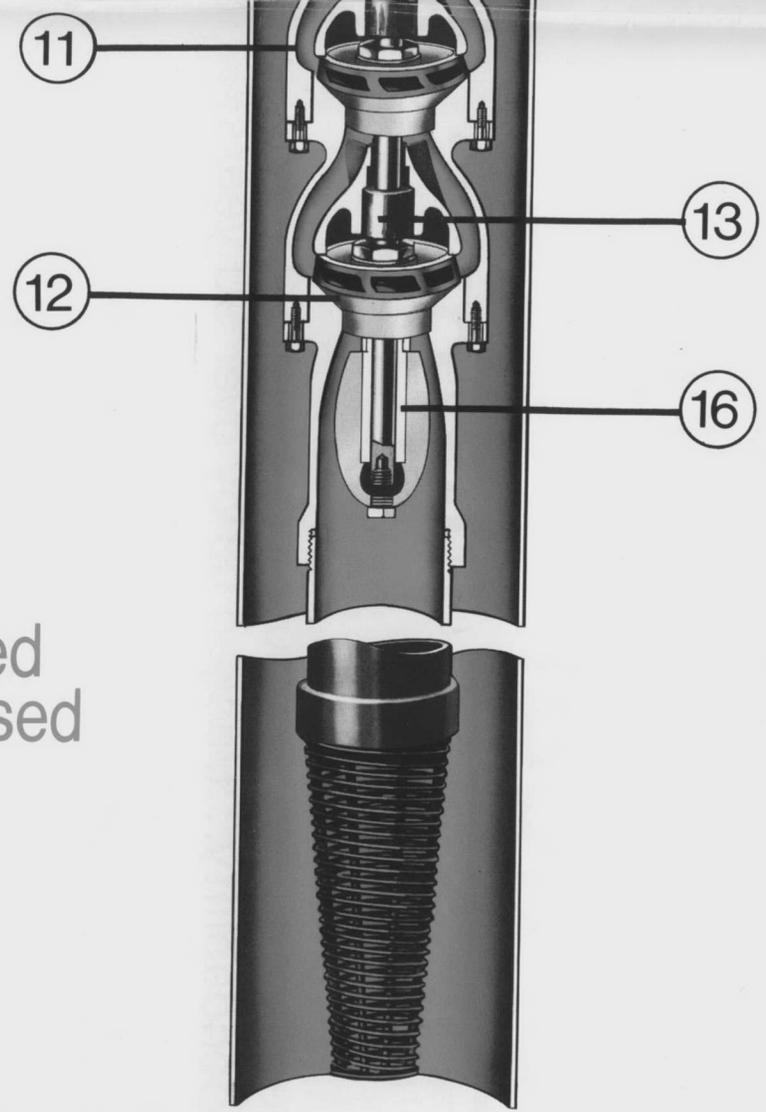
OIL LUBRICATED







NOTE: Enclosed or Semi-Enclosed Impellers are available on either Water or Oil Lubricated Crane-Deming Turbine Pumps





Crane Deming quality design features provide longer life...lower operating costs

OIL AND WATER LUBRICATED

1. IMPELLERS EASILY ADJUSTABLE — with adjusting nut located at top of motor.

2. RATCHET PREVENTS BACKSPIN — and avoids damage to pump in case of phase reversal.

3. HEAVY-DUTY THRUST BEARING — cooled by air entering motor.

4. SEPARATE HEADSHAFT — with coupling in pump head facilitates installation. Permits changing drives without raising pump.

5. BASE OF HEAD RECESSED — permits casing or sleeve to extend above foundation as required by many Public Health Departments.

7. FLANGED HEAD CONSTRUCTION — facilitates assembly of column and discharge head. Maintains accurate alignment between motor and column shaft assembly. (Some discharge heads feature threaded column connections. Refer to Factory.)

8. HIGH STRENGTH LINE SHAFT — of heat treated steel, ground and polished — one-third stronger than ordinary shaft.

9. COLUMN COUPLINGS — machined with 8 pitch threads for tight fitting butt joints. (Flanged column available.)

10. STAINLESS STEEL IMPELLER SHAFT — specially heat treated, ground and polished for longer life.

***11. STREAMLINED BOWL PASSAGEWAYS** — enameled to reduce friction and give greater pump efficiency.

12. ENCLOSED BRONZE IMPELLERS — have completely finished surfaces for maximum efficiency.

13. BRONZE BOWL BEARINGS — on all enclosed impeller pumps.

14. SEMI-ENCLOSED BRONZE IMPELLERS — have completely finished surfaces for greater efficiency.

15. RUBBER BOWL BEARINGS — on all semi-enclosed impeller pumps.

+16. ENCLOSED BRONZE BEARING — in suction bowl, protected with sand cap and packed with non-soluble grease.

WATER LUBRICATED ONLY

6. STAINLESS STEEL STUFFING BOX SHAFT — may be inverted to renew wearing surface.

17. STAINLESS STEEL SHAFT SLEEVES — welded to shaft. Specially heat treated, ground and polished for maximum resistance to wear and corrosion. Replaceable in the field.

18. ACCESSIBLE EXTRA-DEEP STUFFING BOX — with controlled lubrication for long packing life.

19. PRE-LUBRICATION CONNECTION — through stuffing box distributes water around shaft for proper lubrication before start up.

20. WATER LUBRICATED SHAFT BEARINGS — fluted, resilient rubber shaft bearings are lubricated by water flowing through the pump. Bearings are held in place by a machined bronze bearing retainer secured between two pipe ends.

OIL LUBRICATED ONLY

21. AUTOMATIC LINE SHAFT LUBRICATOR — on motor driven units — opens when pump starts, closes when it stops.

22. BRONZE TUBING TENSION NUT — is easily accessible for placing tube under proper tension — also provides close fitting bearing in pump head.

23. TUBING HEAD ADAPTER WITH "O" RING — assures water tight seal around shaft enclosing tube.

24. BRONZE LINESHAFT BEARINGS — provide accurate alignment for lineshaft and a coupling for enclosure tube. A spiraling internal oil groove permits uniform bearing lubrication and by-pass of oil to bearings below.

25. HEAVY-DUTY TUBULAR STEEL SHAFT ENCLOSURE TUBE — protects lineshaft. Specially machined for accurate bearing alignment.

26. ENCLOSURE TUBE STABILIZERS — reinforced rubber "spiders" are regularly spaced to maintain enclosure tube alignment.

27. BEARING PROTECTING SLINGER — prolongs bearing life by preventing entrance of sand into top bowl bearing.

28. RELIEF PORTS IN TOP BOWL — prevent water from rising in tube above water level in well.

*Some bowl sizes feature threaded construction. Refer to Factory.

†Semi-enclosed impellers 4" to 10" bowl sizes. Feature open rubber bearing construction.

Specifications subject to change without notice

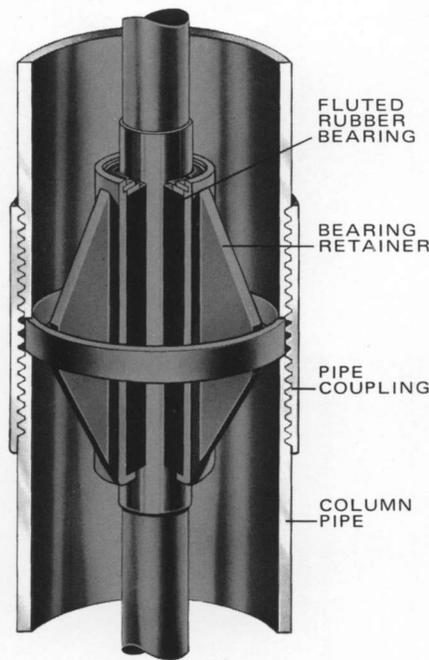
WATER OR OIL LUBRICATED

Crane Deming Vertical Turbine Pumps are available with either oil or water lubrication. The basic difference is in the construction of the lineshaft, its supporting mechanism and the bearings supplied with each. Either type may be furnished with semi-enclosed or enclosed impeller design.

WATER LUBRICATED CONSTRUCTION

Crane Deming water lubricated pumps are lubricated by the water that is being pumped, and require no supplemental lubricants or maintenance.

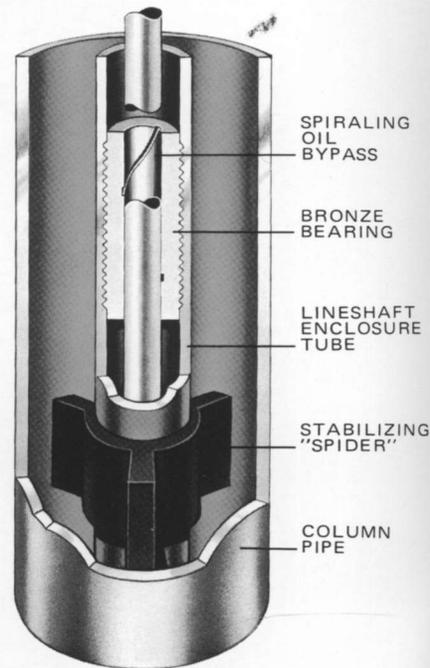
Water lubricated construction includes high strength steel lineshaft and rubber bearings throughout.



Bronze lineshaft bearing retainers are centered in each pipe coupling — tightly secured between the two pipe ends. Retainers are precision cast and machined to house the water lubricated, resilient rubber bearings and assure perfect vertical alignment of pump lineshaft. Rubber bearings are fluted to provide adequate lubrication and permit sand and other abrasive particles to flow through.

OIL LUBRICATED CONSTRUCTION

Oil lubricated construction has an enclosed lineshaft with bronze bearings used throughout. A heavy-duty steel enclosure tube contains the lubricating oil around the lineshaft and bearings, and shields both from foreign matter and corrosion.



In standard construction, machined bronze bearings are spaced every five feet to assure true pumpshaft alignment and smooth, quiet operation. Bearings are threaded and also serve as a coupling for lineshaft enclosure tubing. A spiraling groove in the bearing inner wall provides uniform oil distribution over the lineshaft surface and permits oil passage through the bearing to each succeeding bearing below. Reinforced rubber "spiders" are spaced at regular intervals to center the enclosure tube in the column pipe.

IMPELLERS



Corrosion-resistant bronze semi-enclosed impellers are easily adjustable at the top of the driver to handle changes in well capacity or ground conditions. Impellers can be temporarily adjusted upward to avoid pump wear when clearing a sandy well. Top pump efficiency can easily be maintained.



Enclosed impellers are high quality corrosion-resistant bronze with completely finished surfaces. The hydraulic design developed from years of engineering experience assures maximum efficiency with minimum operating costs in Crane Deming Vertical Turbine Pumps.

CRANE DEMING

precision engineered

Vertical Turbine Pumps

offer Unequaled Economy, Performance and Dependability...Backed up by over 90 years experience in the development and manufacture of quality pumps.

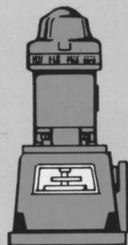
Crane Deming vertical turbine pumps are scientifically engineered and constructed of top quality materials to provide years of dependable service.

Close tolerance machining to increase operating efficiency — precision balancing of moving parts to eliminate vibration — special heat treating to reduce maintenance — using bronze to combat corrosion — stainless steel at critical wear points . . . Crane Deming has expended every effort to design

and build a pump that runs smoother, lasts longer and yet stays in line with competition. The pumps described in this bulletin are the result of this manufacturing philosophy — no short cuts — no sacrificing of quality.

Over 90 years of research, engineering and manufacturing experience stand behind your selection of a Crane Deming Vertical Turbine Pump. It will prove a wise choice.

Top Performance With All Types of Drives



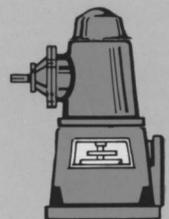
Unit Drive Head

For installations where electric power is available the Unit Drive with hollowshaft motor is compact, quiet and efficient.



Combination Motor — Right Angle Drive

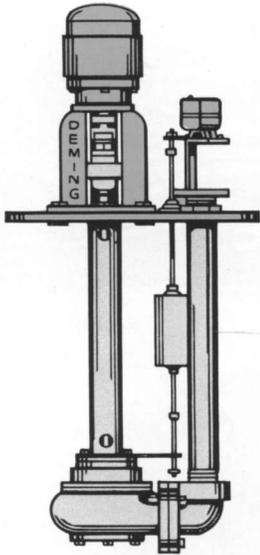
For municipal waterworks and installations where an auxiliary source of power must be available at a moment's notice.



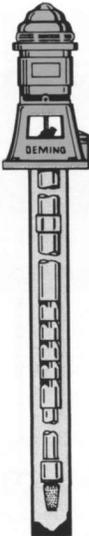
Right Angle Drives

For direct connection to gasoline or diesel power unit. Gear ratio permits unit to operate at the most economical speed.

For Maximum operating efficiency Specify **CRANE** DEMING For all your pumping requirements



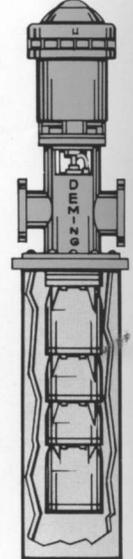
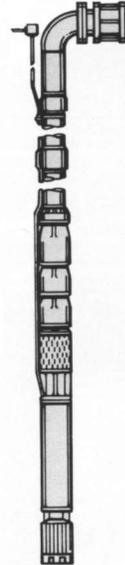
Sewage Pumps and
Cellar Drainers



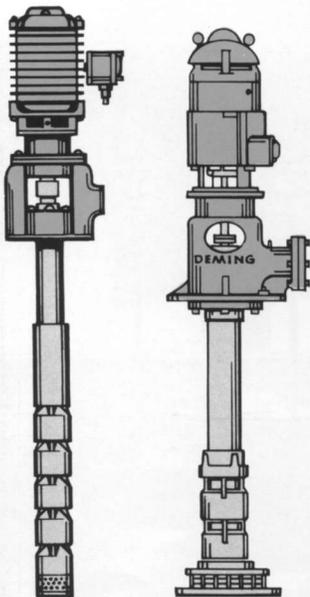
Close-Coupled
Vertical Turbine Pumps



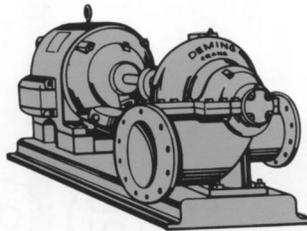
Submersible Pumps



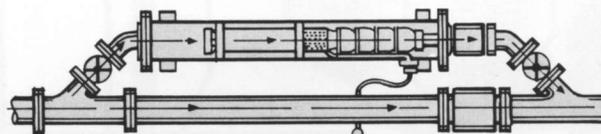
Tee Head Booster Pumps



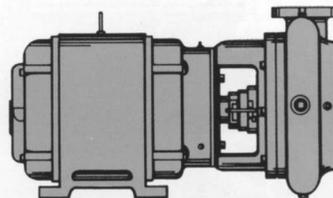
Gasoline, Fuel Oil and
Industrial Solvent Pumps



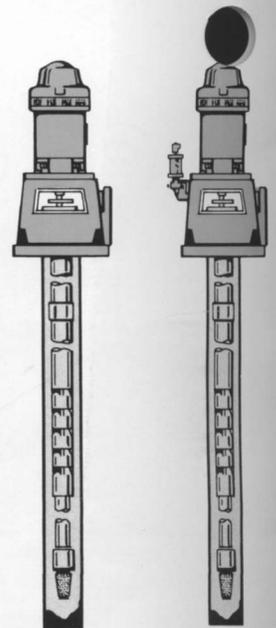
Split Case Centrifugal Pumps



Horizontal Submersible Pumps



Horizontal Motor Mount Pumps



Water Lubricated, Oil Lubricated
Vertical Turbine Pumps

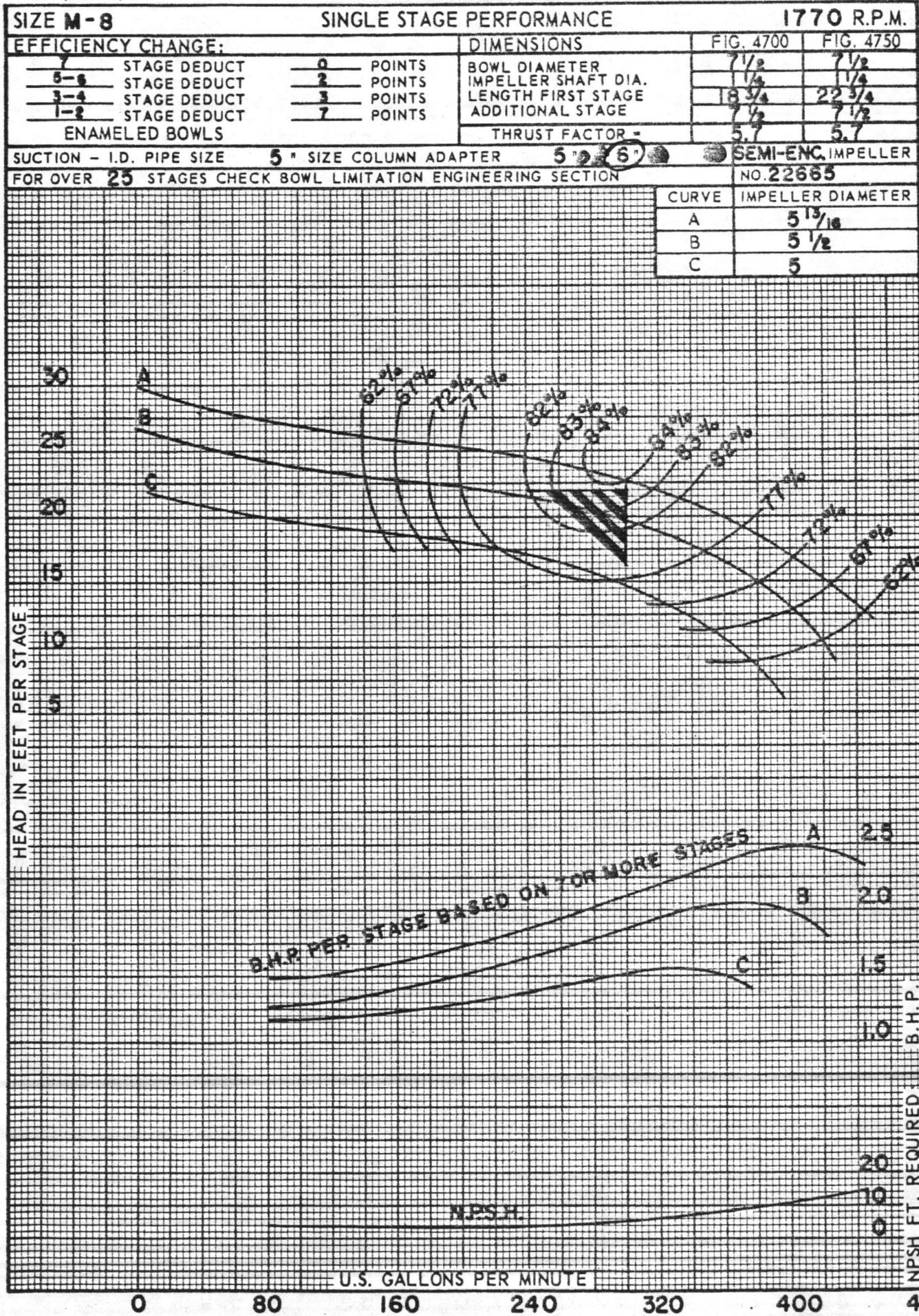
CRANE DEMING PUMPS ARE SOLD AND SERVICED BY:



VALVES • PUMPS • FITTINGS • WATER TREATMENT • PLUMBING

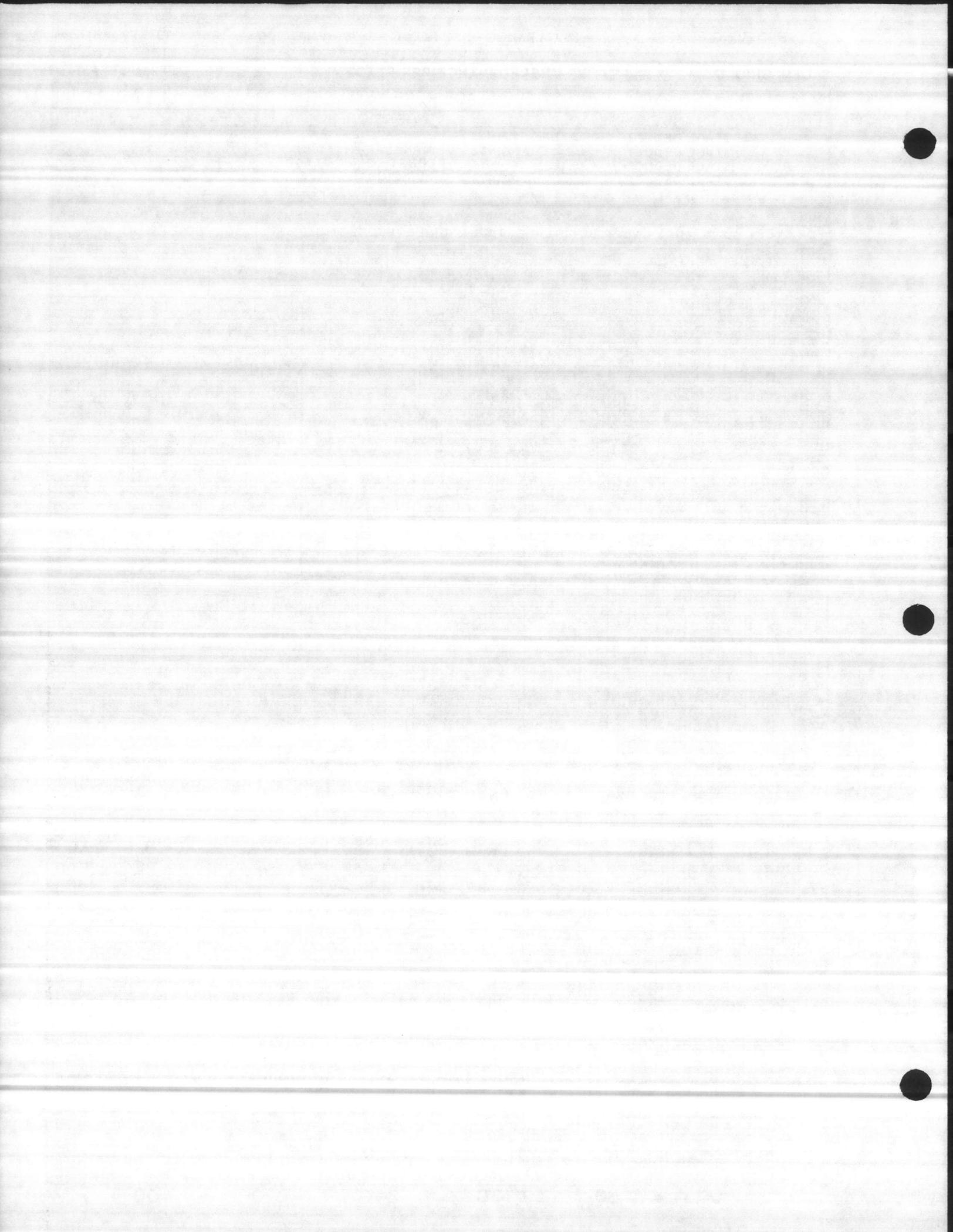
DEMING PUMPS

CRANE CO. DEMING DIV. • 884 SOUTH BROADWAY • SALEM, OHIO 44460

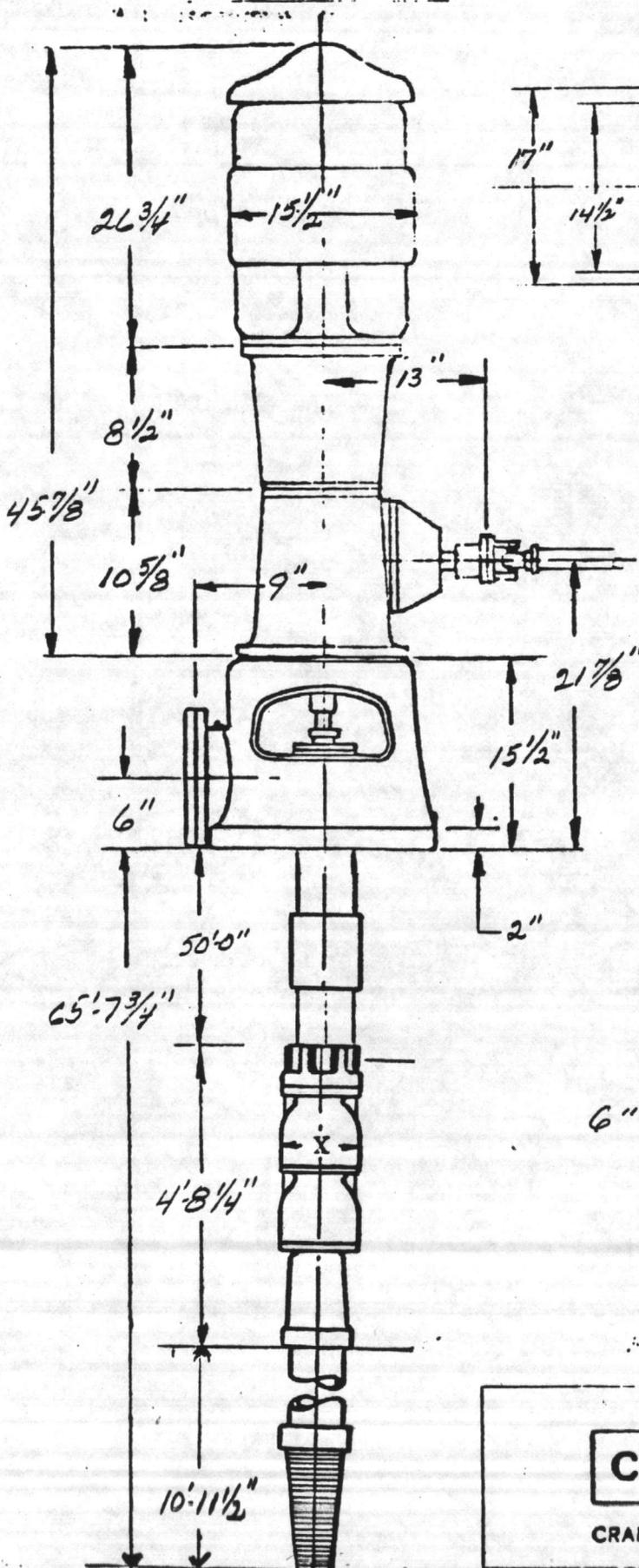


FOR APPROVAL
FABRICATION PENDING

NPSH FT. REQUIRED: B.H.P.



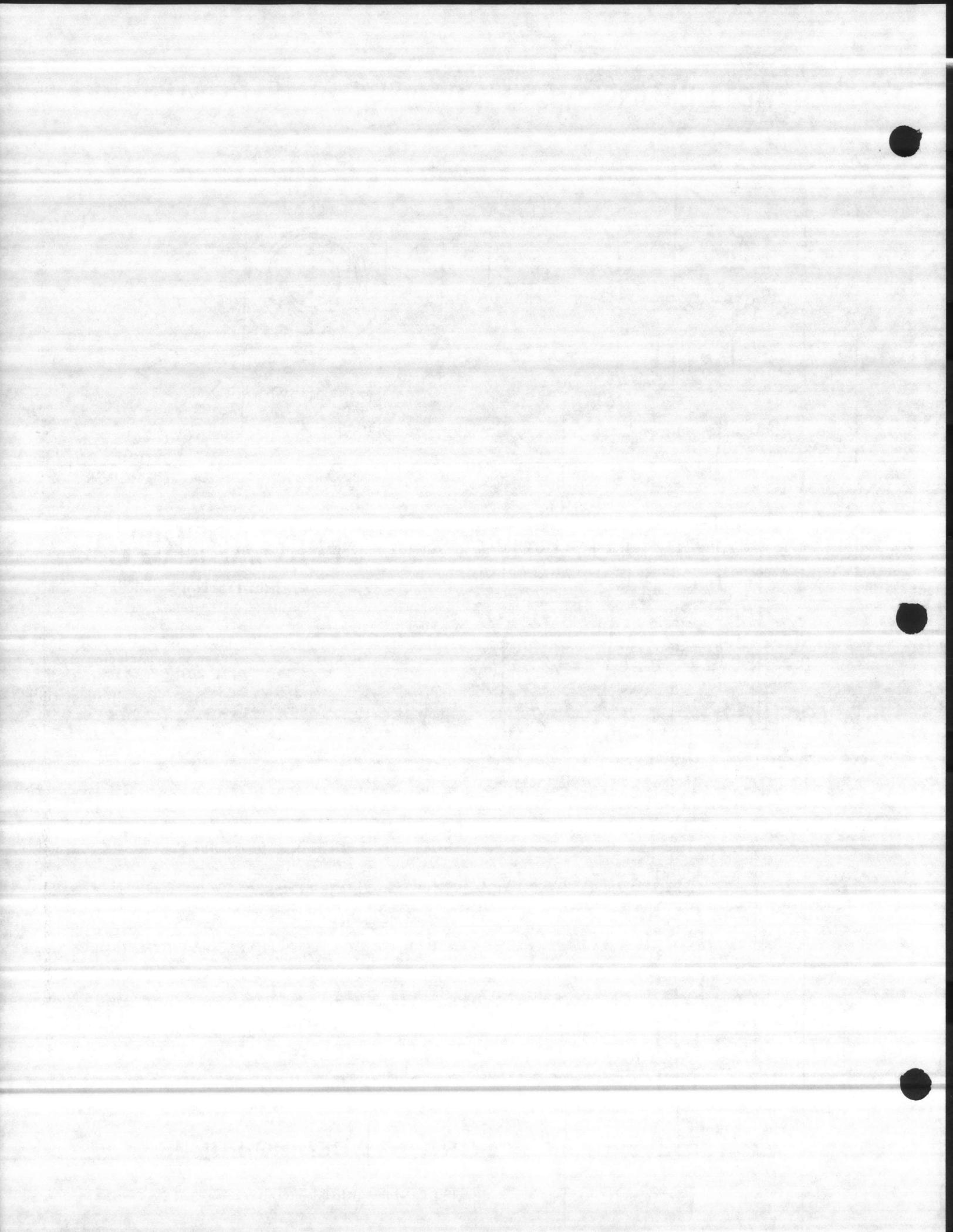
CRANE DEMING VERTICAL TURBINE PUMPS



FOR APPROVAL
FABRICATION PENDING

1-4700 Crane-Deming Vertical Turbine Pump designed
300 GPM at 131 feet head, including:
15 HP 1770 RPM 230/460 Volt 3
 Phase 60 Hertz 1-1 G.E. Vertical Hollow
 shaft Motor CUSTOMERS w/ MODEL CH-2
1:1 RATIO JOHNSON COMB. RIGHT ANGLE DR
 SD 50-66-12 Surface Discharge Head with 6 in
 discharge
50 feet 6 x 1 Column and sh
 with (5) RUBBER Bearings on 10 ft
 centers 6 Stage 1 1/8 inch STANDARD Bowl Assem
 using Impeller # 22665 from Curve Page 81 and v
10'- 5" GALV. SUCTION PIPE
5" GALV. KEYSTONE STRAINER
6" GALV. PIPE
1/6 ST. STL. SHAFTING w/ MODEL CALG'S,
 When properly endorsed this print is correct for:
PUMP & LIGHTING COMPANY
 Customer's P.O. 39246-12 Turbine No. T-
 Date 4/14/84 By w. Hahn SD # 03268.00
 For: CAROLINA WELL & PUMP
 PROJECT: N 62470 -81 -B-1478

CRANE DEMING PUMPS
 CRANE CO • 884 SOUTH BROADWAY • SALEM, OHIO 44460
 Form 1147-De



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

VERTICAL • SQUIRREL-CAGE

TRI CLAD • Hollow-shaft • Weather Protected
(NEMA Type I)

GEM-25

High-thrust

Normal-starting-torque

NEMA Type P Base

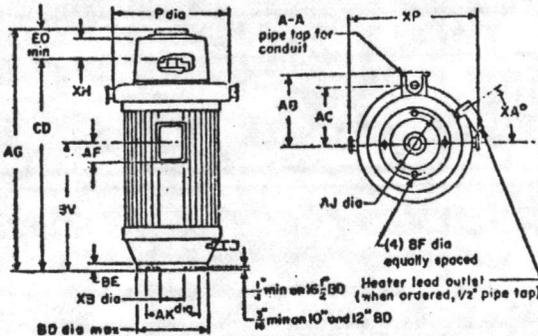
Type K

Frames L213TP to C404TP, 3600 Rpm and Below

Self-release, Bolted or
Nonreverse Coupling

Oct. 8,

DIMENSIONS—For ESTIMATING ONLY unless endorsed for construction.



For 3000- and 3600-RPM MOTORS ONLY

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

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

Frame No.	Approx Net Wt in Lb	Dimensions in Inches																
		CD	P	AA	AB	AC	AF	AG	AJ	AK	BD	BE	BF	BV	EO	XA*	XB	XH*
L213TP10	130	18 3/4	13 1/4	1	9 3/4	7 3/4	4	22 1/4	9 1/2	8 1/2	10	3/4	3/4	8 3/4	2 3/4	55	3 1/2	2
L254TP10	148	18 3/4	13 1/4	1	9 3/4	7 3/4	4	22 1/4	9 1/2	8 1/2	10	3/4	3/4	8 3/4	2 3/4	55	3 1/2	2
L254TP12	205	23 1/4	15 1/2	1 1/4	10 1/2	8 3/4	4	26 3/4	9 3/4	8 3/4	10	3/4	3/4	10 3/4	2 3/4	45	3 1/2	2
L256TP10	225	23 1/4	15 1/2	1 1/4	10 1/2	8 3/4	4	26 3/4	9 3/4	8 3/4	10	3/4	3/4	10 3/4	2 3/4	45	3 1/2	2
L254TP12	215	23 1/4	15 1/2	1 1/4	10 1/2	8 3/4	4	26 3/4	9 3/4	8 3/4	12	3/4	3/4	10 3/4	2 3/4	45	3 1/2	2
L256TP12	235	23 1/4	15 1/2	1 1/4	10 1/2	8 3/4	4	26 3/4	9 3/4	8 3/4	12	3/4	3/4	10 3/4	2 3/4	45	3 1/2	2
L254TP16	235	23 1/4	15 1/2	1 1/4	10 1/2	8 3/4	4	26 3/4	14 3/4	13 1/2	16 1/2	3/4	1 1/4	10 3/4	2 3/4	45	3 1/2	2
L256TP16	255	23 1/4	15 1/2	1 1/4	10 1/2	8 3/4	4	26 3/4	14 3/4	13 1/2	16 1/2	3/4	1 1/4	10 3/4	2 3/4	45	3 1/2	2
D284TP10	260	23	16	1 1/2	11	8 1 3/4	4	27 1/4	9 1/2	8 1/2	10	3/4	3/4	12 3/4	4	33	3 1/2	3 1/4
D284TP12	265	23	16	1 1/2	11	8 1 3/4	4	27 1/4	9 1/2	8 1/2	12	3/4	3/4	12 3/4	4	33	3 1/2	3 1/4
D284TPH16	275	23	16	1 1/2	11	8 1 3/4	4	27 1/4	14 3/4	13 1/2	16 1/2	3/4	1 1/4	12 3/4	4	33	3 1/2	3 1/4
C284TP10	280	23 3/4	16	1 1/2	11	8 1 3/4	4	28 3/4	9 1/2	8 1/2	10	3/4	3/4	13 1/4	4	33	3 1/2	3 1/4
C286TP10	280	23 3/4	16	1 1/2	11	8 1 3/4	4	28 3/4	9 1/2	8 1/2	10	3/4	3/4	13 1/4	4	33	3 1/2	3 1/4
C284TP12	285	23 3/4	16	1 1/2	11	8 1 3/4	4	28 3/4	9 1/2	8 1/2	12	3/4	3/4	13 1/4	4	33	3 1/2	3 1/4
C286TP12	285	23 3/4	16	1 1/2	11	8 1 3/4	4	28 3/4	9 1/2	8 1/2	12	3/4	3/4	13 1/4	4	33	3 1/2	3 1/4
C284TPH16	295	23 3/4	16	1 1/2	11	8 1 3/4	4	28 3/4	14 3/4	13 1/2	16 1/2	3/4	1 1/4	13 1/4	4	33	3 1/2	3 1/4
C286TPH16	295	23 3/4	16	1 1/2	11	8 1 3/4	4	28 3/4	14 3/4	13 1/2	16 1/2	3/4	1 1/4	13 1/4	4	33	3 1/2	3 1/4
K284TP10	305	24 3/4	16	1 1/2	11	8 1 3/4	4	29 3/4	9 1/2	8 1/2	10	3/4	3/4	14 1/4	4	33	3 1/2	3 1/4
C286TP10	305	24 3/4	16	1 1/2	11	8 1 3/4	4	29 3/4	9 1/2	8 1/2	10	3/4	3/4	14 1/4	4	33	3 1/2	3 1/4
K284TP12	310	24 3/4	16	1 1/2	11	8 1 3/4	4	29 3/4	9 1/2	8 1/2	12	3/4	3/4	14 1/4	4	33	3 1/2	3 1/4
C286TP12	310	24 3/4	16	1 1/2	11	8 1 3/4	4	29 3/4	9 1/2	8 1/2	12	3/4	3/4	14 1/4	4	33	3 1/2	3 1/4
K284TPH16	320	24 3/4	16	1 1/2	11	8 1 3/4	4	29 3/4	14 3/4	13 1/2	16 1/2	3/4	1 1/4	14 1/4	4	33	3 1/2	3 1/4
C286TPH16	320	24 3/4	16	1 1/2	11	8 1 3/4	4	29 3/4	14 3/4	13 1/2	16 1/2	3/4	1 1/4	14 1/4	4	33	3 1/2	3 1/4
D286TP10	330	25 3/4	16	1 1/2	11	8 1 3/4	4	30 3/4	9 1/2	8 1/2	10	3/4	3/4	15 1/4	4	33	3 1/2	3 1/4
D286TP12	335	25 3/4	16	1 1/2	11	8 1 3/4	4	30 3/4	9 1/2	8 1/2	12	3/4	3/4	15 1/4	4	33	3 1/2	3 1/4
D286TPH16	345	25 3/4	16	1 1/2	11	8 1 3/4	4	30 3/4	14 3/4	13 1/2	16 1/2	3/4	1 1/4	15 1/4	4	33	3 1/2	3 1/4
C324TP16	390	30 3/4	16	2	12 1/2	9 3/4	4 3/4	35 1/4	14 3/4	13 1/2	16 1/2	3/4	1 1/4	17 1/4	4 1/2	33	3 1/2	3 1/4
C324TPH12	380	30 3/4	16	2	12 1/2	9 3/4	4 3/4	35 1/4	9 1/2	8 1/2	12	3/4	3/4	17 1/4	4 1/2	33	3 1/2	3 1/4
C326TP16	445	32 1/4	16	2	12 1/2	9 3/4	4 3/4	37 3/4	14 3/4	13 1/2	16 1/2	3/4	1 1/4	17 1/4	4 1/2	33	3 1/2	3 1/4
C326TPH12	435	32 1/4	16	2	12 1/2	9 3/4	4 3/4	37 3/4	9 1/2	8 1/2	12	3/4	3/4	20 1/4	4 1/2	33	3 1/2	3 1/4
D324TP16	500	32 1/4	20	2	13 1/2	10 1 1/4	4 3/4	38	14 3/4	13 1/2	16 1/2	3/4	1 1/4	17 1/4	4 1/2	22 1/2	4 1/2	3 1/2
K326TP16	500	32 1/4	20	2	13 1/2	10 1 1/4	4 3/4	38	14 3/4	13 1/2	16 1/2	3/4	1 1/4	17 1/4	4 1/2	22 1/2	4 1/2	3 1/2
D324TPH12	475	32 1/4	20	2	13 1/2	10 1 1/4	4 3/4	38	9 1/2	8 1/2	12	3/4	3/4	17 1/4	4 1/2	22 1/2	4 1/2	3 1/2
K326TPH12	475	32 1/4	20	2	13 1/2	10 1 1/4	4 3/4	38	9 1/2	8 1/2	12	3/4	3/4	17 1/4	4 1/2	22 1/2	4 1/2	3 1/2
K324TP16	540	33 1/4	20	2	13 1/2	10 1 1/4	4 3/4	39	14 3/4	13 1/2	16 1/2	3/4	1 1/4	18 1/4	4 1/2	22 1/2	4 1/2	3 1/2
D326TP16	540	33 1/4	20	2	13 1/2	10 1 1/4	4 3/4	39	14 3/4	13 1/2	16 1/2	3/4	1 1/4	18 1/4	4 1/2	22 1/2	4 1/2	3 1/2
D364TP16	540	33 1/4	20	3	14 1/4	11 3/4	6 1/4	39	14 3/4	13 1/2	16 1/2	3/4	1 1/4	18 1/4	4 1/2	22 1/2	4 1/2	3 1/2
K324TPH12	515	33 1/4	20	2	13 1/2	10 1 1/4	4 3/4	39	9 1/2	8 1/2	12	3/4	3/4	18 1/4	4 1/2	22 1/2	4 1/2	3 1/2
D326TPH12	515	33 1/4	20	2	13 1/2	10 1 1/4	4 3/4	39	9 1/2	8 1/2	12	3/4	3/4	18 1/4	4 1/2	22 1/2	4 1/2	3 1/2
D364TP12	515	33 1/4	20	3	14 1/4	11 3/4	6 1/4	39	9 1/2	8 1/2	12	3/4	3/4	18 1/4	4 1/2	22 1/2	4 1/2	3 1/2
C364TP16	590	35 1/4	20	3	14 1/4	11 3/4	6 1/4	40 1/4	14 3/4	13 1/2	16 1/2	3/4	1 1/4	19 1/4	4 1/2	22 1/2	4 1/2	3 1/2
C364TPH12	565	35 1/4	20	3	14 1/4	11 3/4	6 1/4	40 1/4	9 1/2	8 1/2	12	3/4	3/4	19 1/4	4 1/2	22 1/2	4 1/2	3 1/2
K364TP16	650	36 3/4	20	3	14 1/4	11 3/4	6 1/4	41 1/2	14 3/4	13 1/2	16 1/2	3/4	1 1/4	20 1/4	4 1/2	22 1/2	4 1/2	3 1/2
C365TP16	650	36 3/4	20	3	14 1/4	11 3/4	6 1/4	41 1/2	14 3/4	13 1/2	16 1/2	3/4	1 1/4	20 1/4	4 1/2	22 1/2	4 1/2	3 1/2
K364TP12	625	36 3/4	20	3	14 1/4	11 3/4	6 1/4	41 1/2	9 1/2	8 1/2	12	3/4	3/4	20 1/4	4 1/2	22 1/2	4 1/2	3 1/2
C365TP12	625	36 3/4	20	3	14 1/4	11 3/4	6 1/4	41 1/2	9 1/2	8 1/2	12	3/4	3/4	20 1/4	4 1/2	22 1/2	4 1/2	3 1/2
D365TP16	730	38 3/4	02	3	14 1/4	11 3/4	6 1/4	43 1/2	14 3/4	13 1/2	16 1/2	3/4	1 1/4	22 1/4	4 1/2	22 1/2	4 1/2	3 1/2
C404TP16	730	38 3/4	20	3	14 1/4	11 3/4	6 1/4	43 1/2	14 3/4	13 1/2	16 1/2	3/4	1 1/4	22 1/4	4 1/2	22 1/2	4 1/2	3 1/2

THE FRAME NUMBERS SHOWN IN BOLD FACE TYPE INDICATE STANDARD NEMA BASE SIZES

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

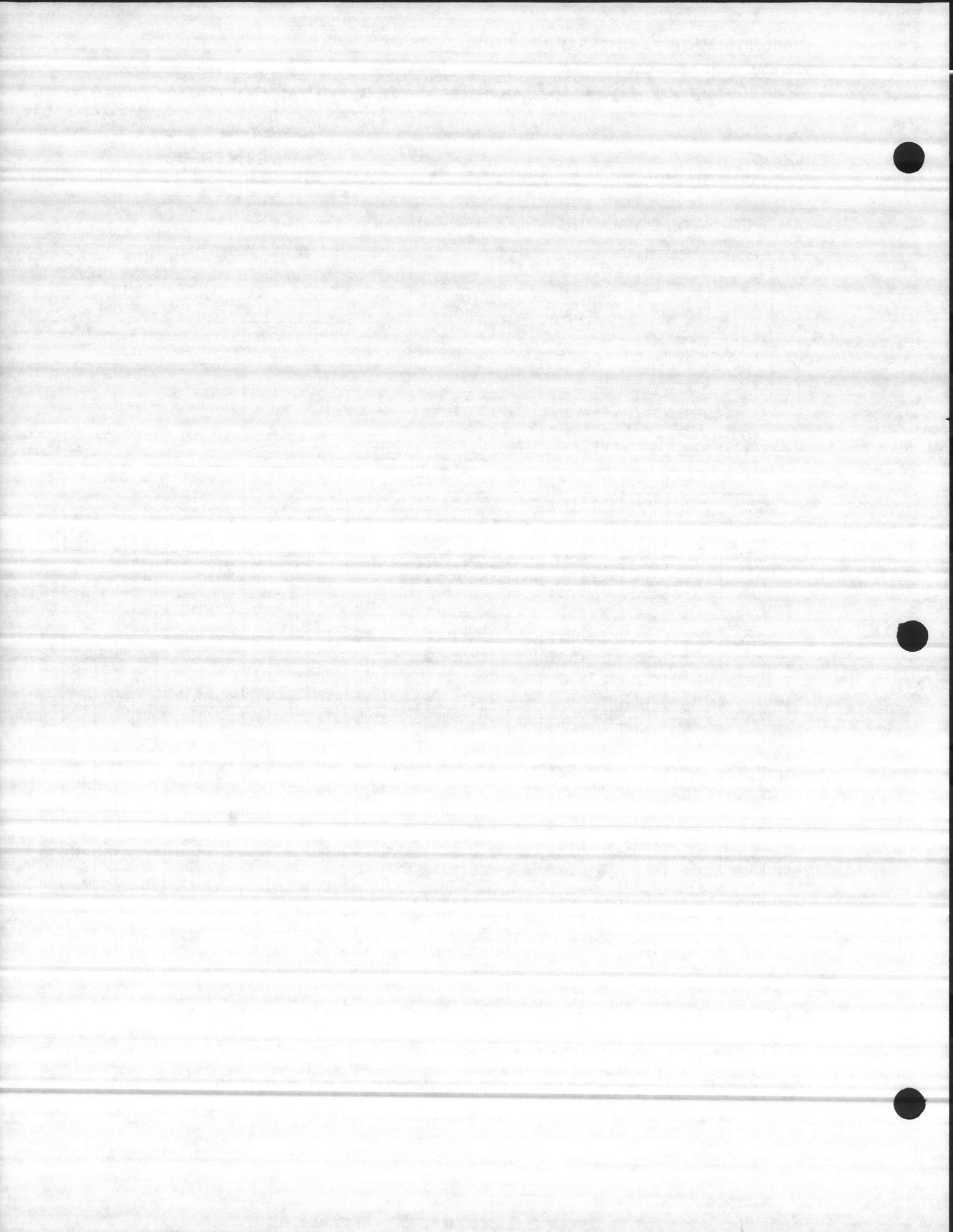
NOTES:

Provided mounting conditions permit, diagonally split conduit box may be turned so that entrance can be made from the bottom, or either side. Frames L213 through D286 have grease-lubricated upper guide and lower thrust bearings. Frames C324 through C404 have oil-lubricated upper

COUPLING DIMENSIONS ON REVER:

thrust and grease-lubricated lower guide bearings. Oil sight gage, plug and drain plug are located on opposite side of motor from box.

Tolerances: Face runout and permissible eccentricity of mounting re For "AK" dimension 8 1/4 inches, 0.004 TIR. For "AK" dimension 13 1/2 inches, 0.007 TIR. For shipping weight add 5 per cent to net weights.



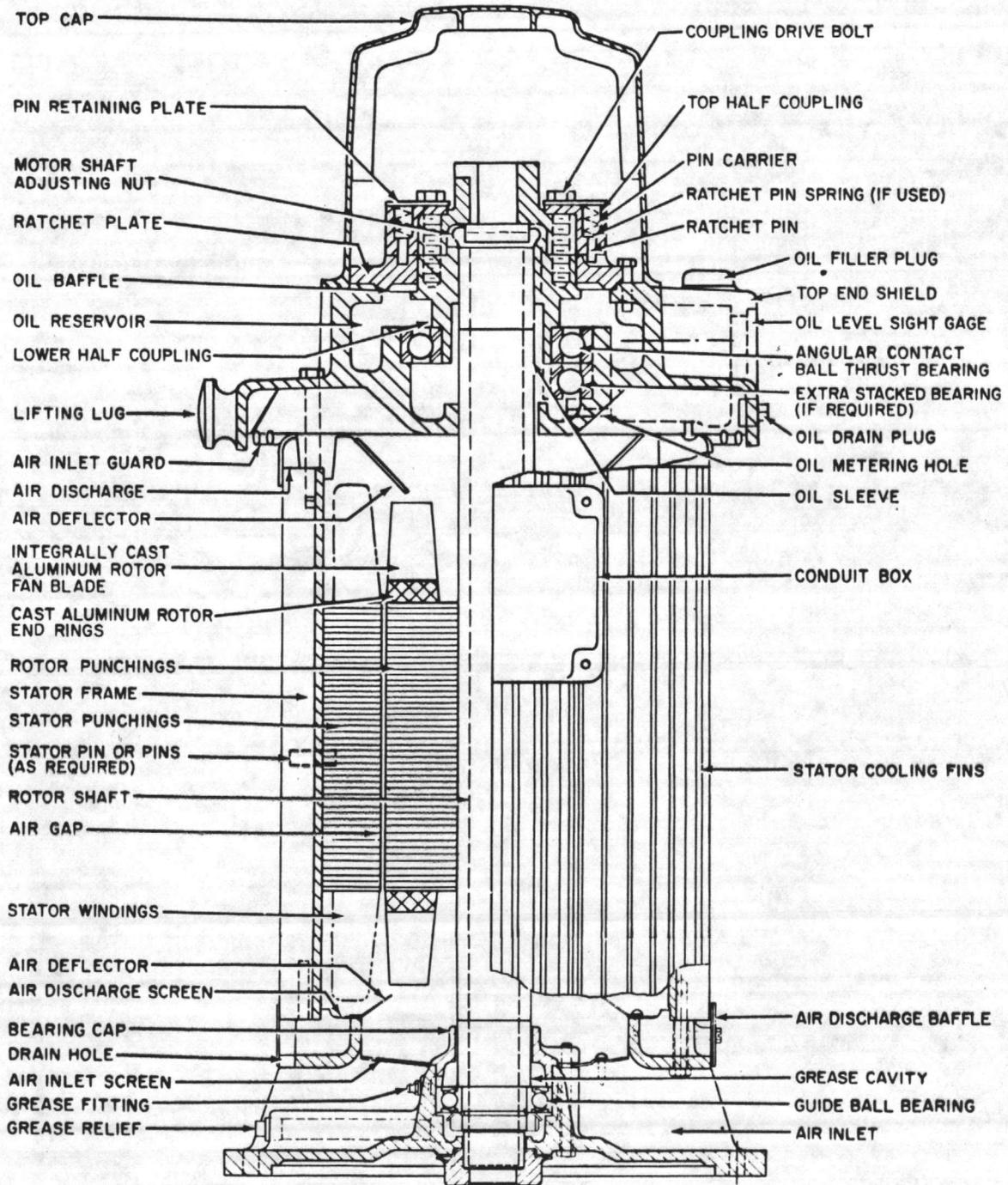
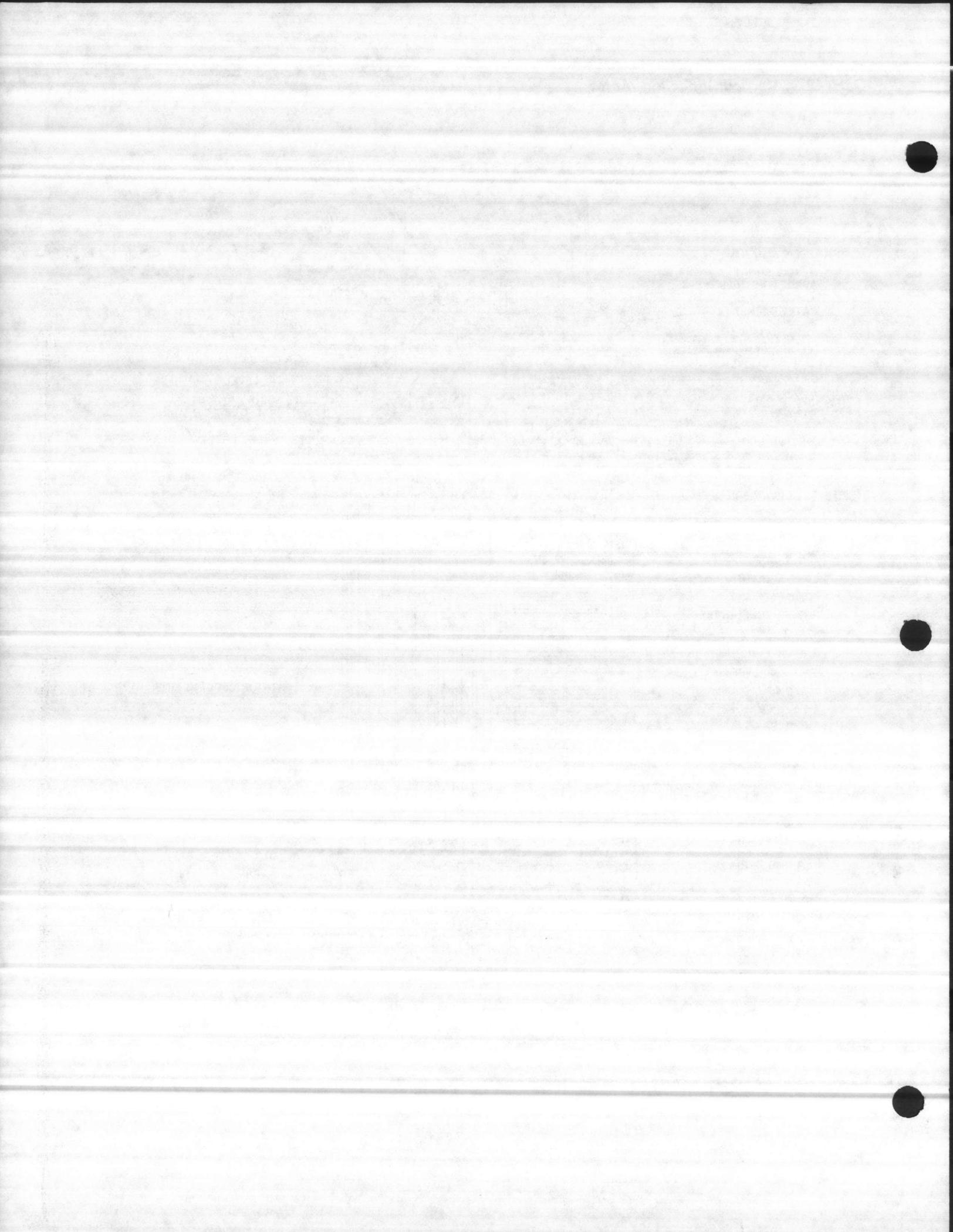
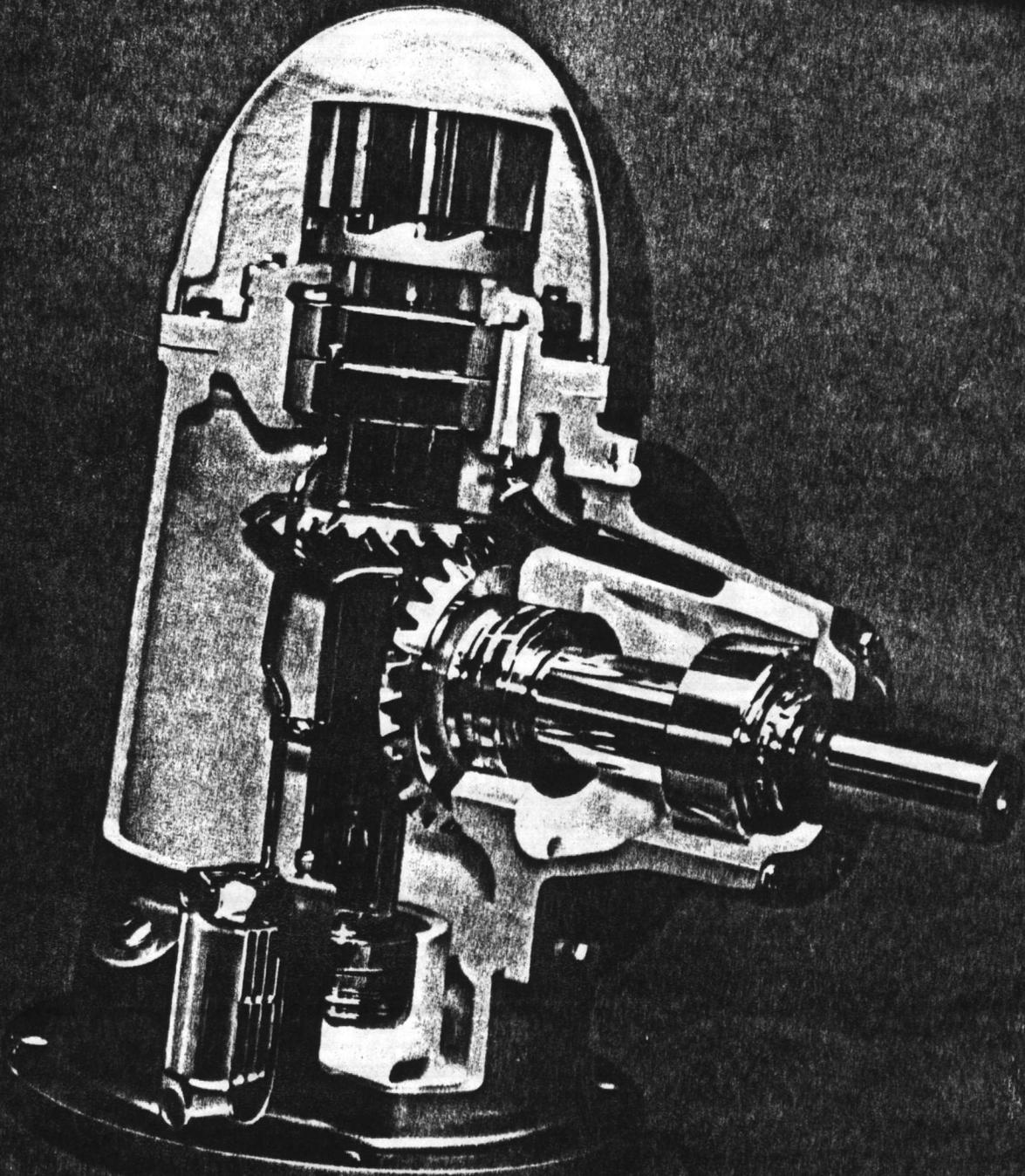


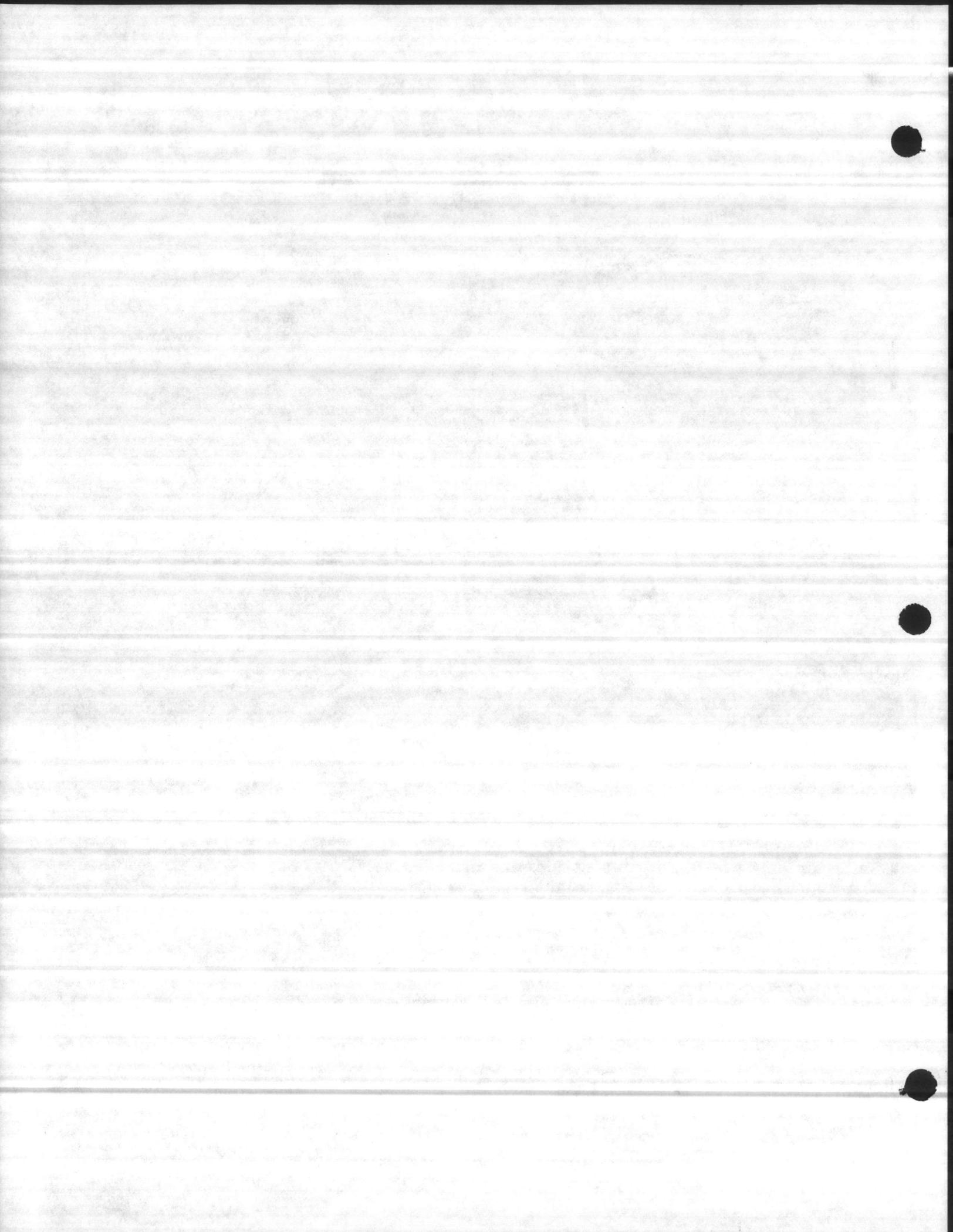
Fig. 2. Typical high-thrust, hollow-shaft motor with non-reverse coupling.



JOHNSON GEAR

Right angle drives for irrigation, industrial, and municipal pumping service





Johnson Right Angle Gear Drive

These features mean continuous on-stream performance,
low maintenance and dependability

**NON-REVERSE
COUPLING,**
standard on hollow-
shaft drives

**high tensile strength
cast iron HOUSING**

**quick visual inspection
of gear lubrication with
OIL SIGHT WINDOW
(not shown)**

**HOLLOW OR SOLID
SHAFT**

**externally mounted OIL
COOLER with top and
bottom cooling water
connections**

**weatherproof light weight
COVER**

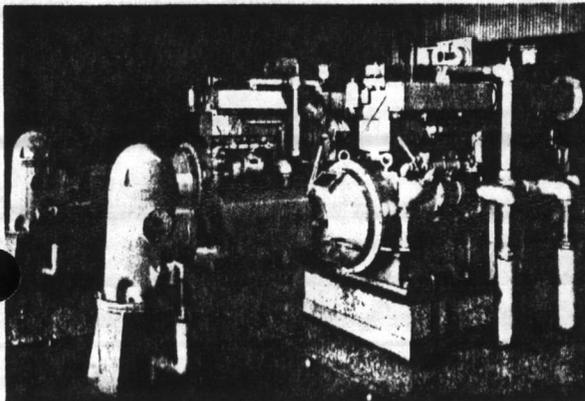
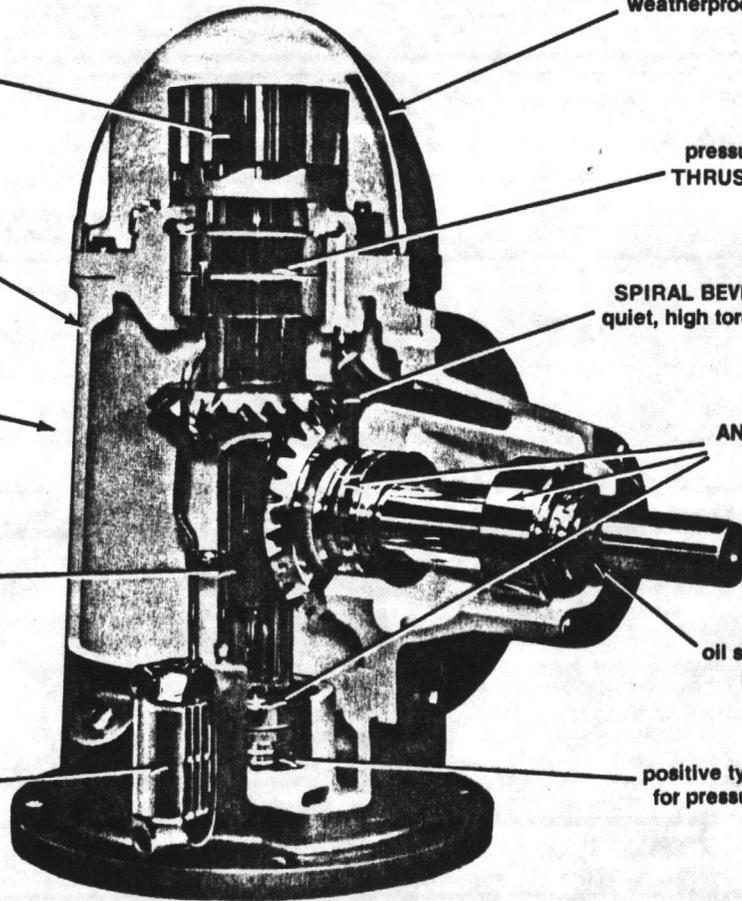
**pressure-lubricated
THRUST BEARINGS**

**SPIRAL BEVEL GEARS for
quiet, high torque operation**

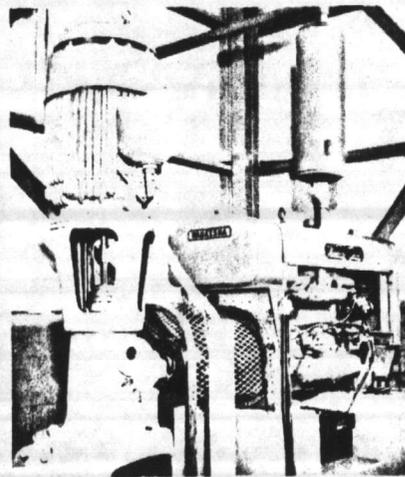
**ANTI-FRICTION
BEARINGS**

**oil seal protection
by SLINGERS**

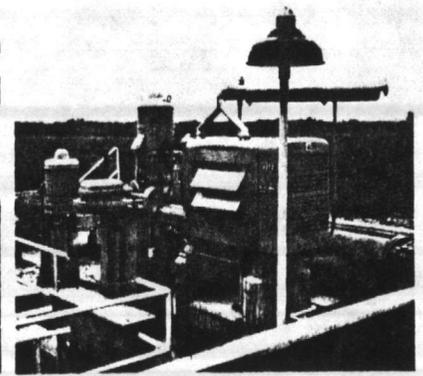
**positive type OIL PUMP
for pressure lubrication
of bearings**



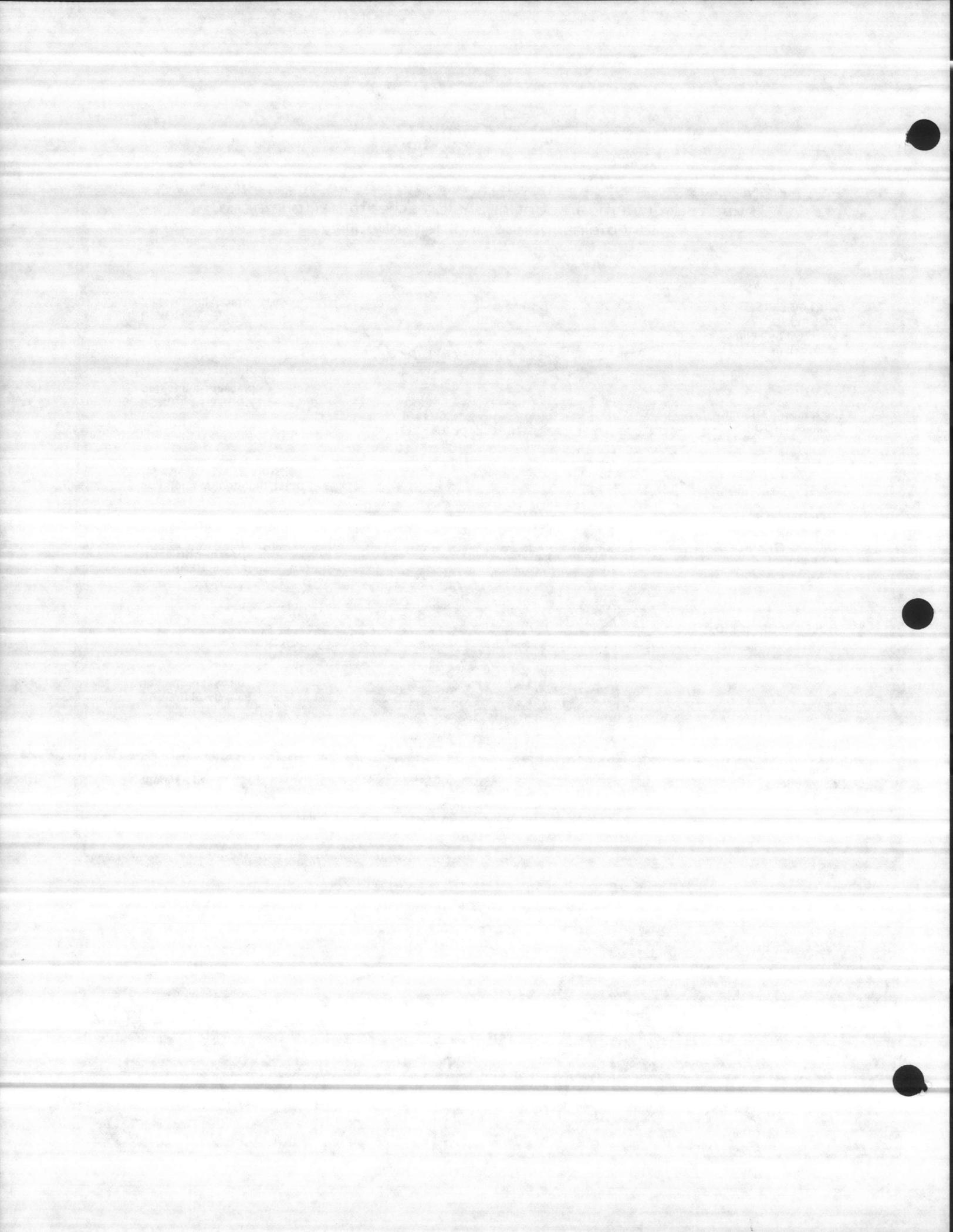
Standard right angle gear drive



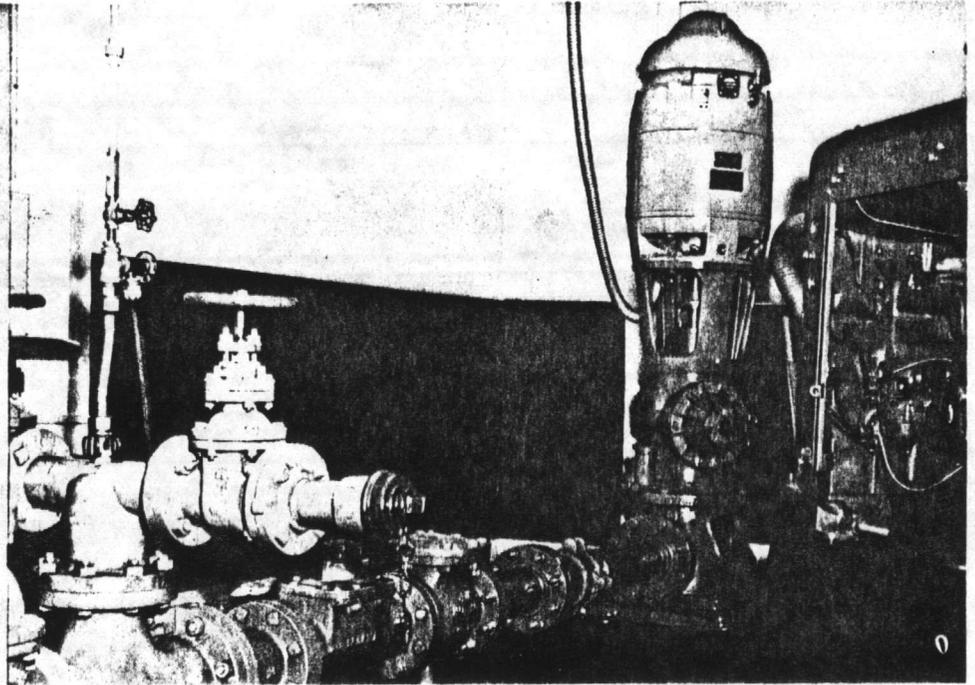
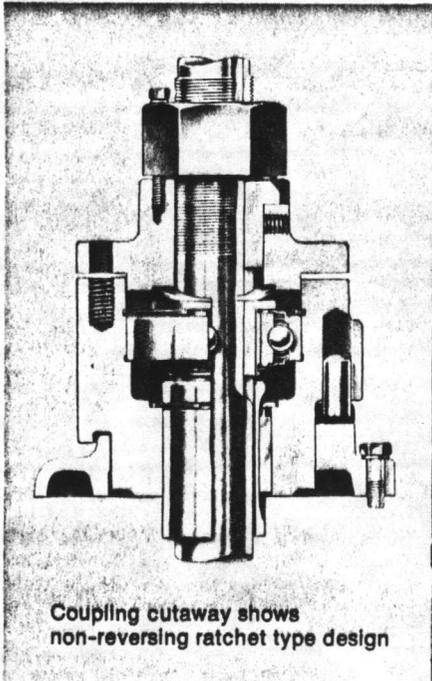
Combination Drive



Redi-Torq gear drive



Combination Drives



Fast changeover prevents costly downtime in emergencies

The Combination Drive—widely preferred by municipalities, waterworks corporations, and those responsible for fire and flood protection—provides pumping assurance when emergencies occur. Either a motor or a mechanical power unit can drive the pump to prevent costly service interruptions. When one of the driving units is down the pump can be operated by the other.

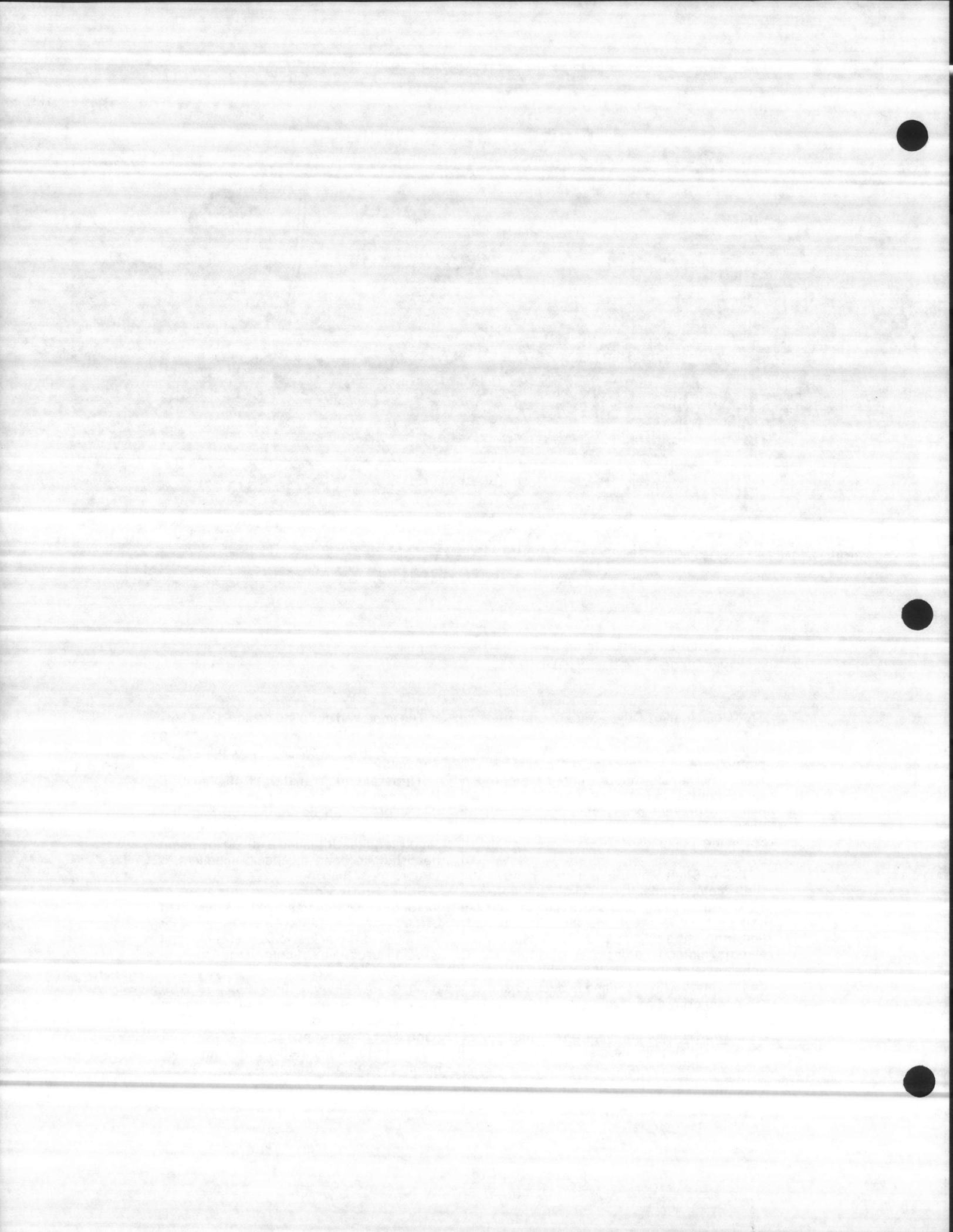
Hollow-Shaft Motor. In a normal hollow-shaft motor application either a through-shaft or a coupling and shaft combination can be used between the electric motor and the right angle gear drive. When the electric motor is doing the driving, the upper half of the gear drive coupling is free to rotate with the pump headshaft and the gears do not revolve. In case of electric motor or power failure the pump can be driven by a mechanical power unit by simply installing stainless steel bolts, supplied with the gear drive.

The improved coupling design gives better protection to the sealed steady bearing and eliminates the possibility of accidental engagement.

Thrust Load Transfer. If the electric motor has to be removed, the thrust load of the pump can be transferred from the motor thrust bearing to the gear drive. This simply requires adjusting a nut on the pump headshaft to bring the pump impellers to the proper setting.

Solid-Shaft Motor. With this type of motor the gear drive carries the thrust load of the pump. The gears revolve when either the electric motor or horizontal drive unit is being used. The recommendation is to use a standard over-running clutch coupling between the engine and the gear drive, and a flexible coupling between the electric motor and the gear drive. (See page 9 for dimensions.)

For various combination drive arrangements consult the factory.



Thrust Capacity

Hollow Shaft Drives

Large capacity thrust bearings are provided to handle a wide range of pump equipment and heads of water. In most instances, the natural thrust of the gears is used to reduce the load on the bearings. This condition necessitates a minimum downthrust requirement to prevent a bearing separation. Unless otherwise specified, Johnson Gear drive units are furnished with a thrust bearing arrangement DT. Ratings shown in the STANDARD column apply.

When there are conditions of sustained upthrust or the minimum downthrust is not available in the installation, other bearing arrangements can be furnished. The TWO-WAY column shows the ratings for bearing arrangement DF. Upthrust and downthrust can be accommodated with this configuration.

When the downthrust exceeds the values of the STANDARD column, select a suitable size from the HEAVY THRUST column. These ratings are for bearing arrangement DT/DT.

The heavy duty model can also be furnished with bearing arrangement of DF/DT. The downthrust ratings are taken from the STANDARD column. The upthrust ratings are taken from the TWO-WAY column.

Other Drives

Ratings for **Combination**, **Solid Shaft**, and **Redi-Torq®** drives are taken from the TWO-WAY column. Consult the factory when there are conditions not covered by the following table.

Bearing Arrangements

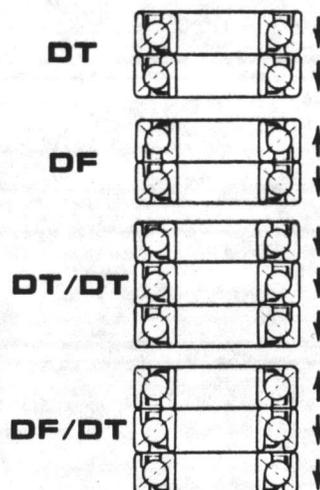


Table 2. THRUST CAPACITY (in pounds)

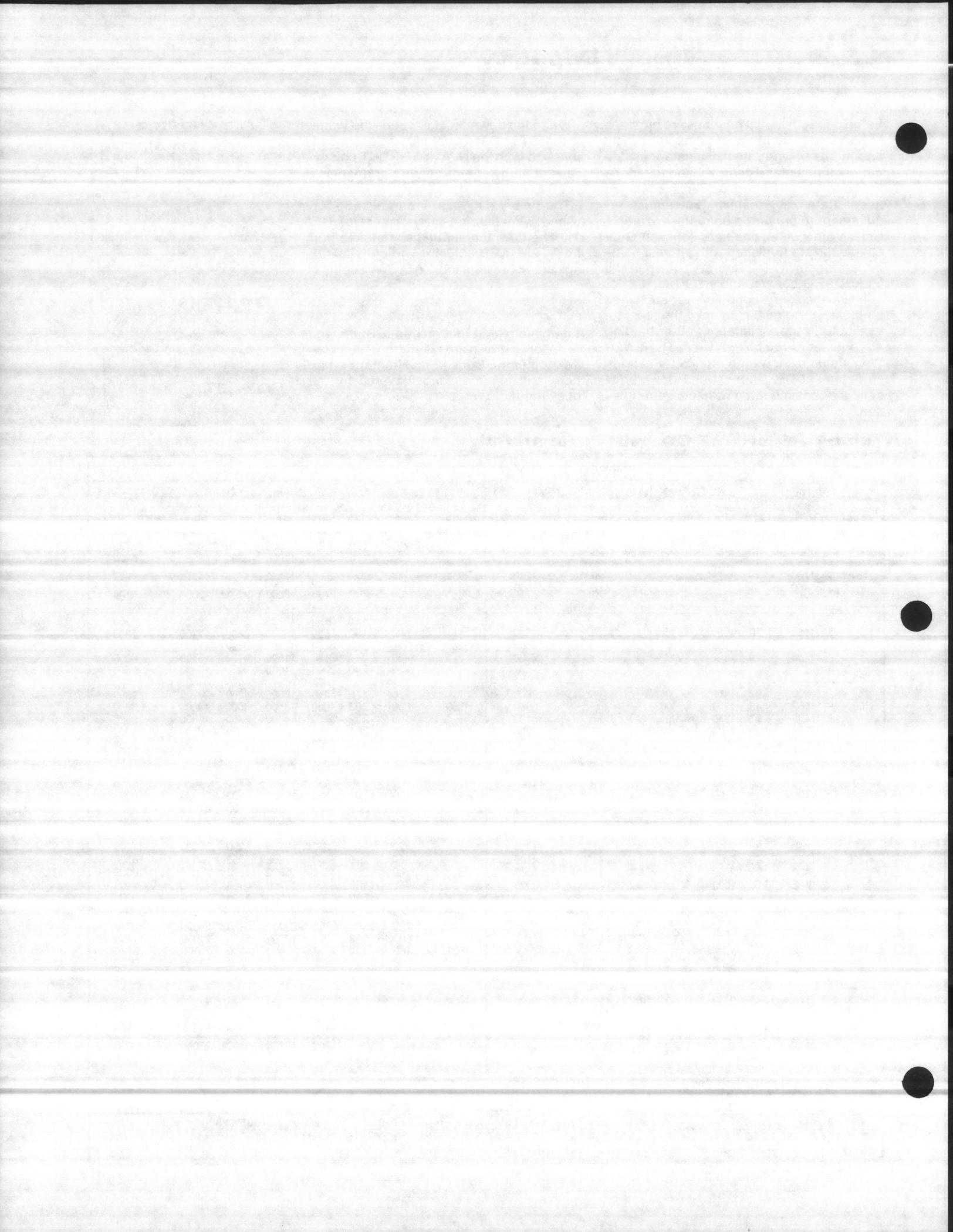
Model	Vertical Shaft RPM	H.P.	Standard		Heavy		Two-Way		Model	Vertical Shaft RPM	H.P.	Standard		Heavy		Two-Way	
			Downthrust Only				Downthrust or Upthrust Max.					Downthrust or Upthrust Max.					
H20	1160	15		1400	750	2300	1400		H200	720	100	3600	12000	3400	16200	6750	
	1460	17		1300	750	2200	1300		H200	860	116	3300	11000	3200	15300	6300	
	1760	20		1200	750	2000	1200		H200	1160	144	3050	10200	3000	14300	5700	
	3460	30		1000	750	1600	1000		H200	1460	172	2850	9500	2850	13500	5300	
H40	1160	30	900	4400			2600		H280	720	140	3750	13700	3750	18800	8200	
	1460	35	850	4200			2500		H280	860	162	3550	13000	3600	17900	7800	
	1760	40	800	4000			2400		H280	1160	202	3350	12200	3350	16700	7300	
									H280	1460	241	3150	11500	3150	15700	6900	
H60	860	34	1450	6000			3600		H350	720	175	4250	16300	4200	20000	9800	
	1160	43	1300	5500			3300		H350	860	203	4050	15500	4000	19000	9300	
	1460	52	1250	5200			3100		H350	1160	252	3750	14400	3750	17800	8600	
	1760	60	1200	5000			3000		H350	1460	301	3550	13600	3500	16700	8200	
H80	860	46	2050	7400	1500	9700	4400		H425	720	213	4650	18700	4750	25000	11200	
	1160	58	1950	6900	1500	9100	4100		H425	860	246	4450	17900	4550	24000	10700	
	1460	69	1800	6400	1500	8300	3800		H425	1160	306	4150	16600	4200	22000	10000	
	1760	80	1700	6000	1500	8000	3000		H425	1460	366	3900	15700	4000	21000	9400	
H110	860	63	2350	7400	1800	9700	4400		H500	720	250	5250	18700	5250	25000	11200	
	1160	80	2200	6900	1800	9100	4100		H500	860	290	5000	17900	5050	24000	10700	
	1460	95	2050	6400	1800	8500	3800		H500	1160	360	4650	16600	4600	22000	10000	
	1760	110	1900	6000	1800	8000	3000		H500	1460	430	4400	15700	4400	21000	9400	
H125	720	63	2900	8500	2800	12200	5100		H600	720	300	5500	20000	5450	26000	12000	
	860	72	2700	8000	2650	11600	4800		H600	860	348	5200	19000	5250	25000	11400	
	1160	90	2550	7500	2500	10800	4500		H600	1160	432	4900	17800	4850	23000	10700	
	1460	108	2400	7000	2300	10100	4200		H600	1460	516	4600	16700	4600	22000	10000	
H150	720	75	3050	9800	3150	15000	5900		H750	720	375	6200	20000	6250	26000	12000	
	860	87	2950	9400	3000	14300	5600		H750	860	435	5900	19000	6000	25000	11400	
	1160	108	2750	8800	2800	13300	5300		H750	1160	540	5500	17800	5500	23000	10700	
	1460	129	2600	8300	2600	12500	5000		H750	1460	645	5200	16700	5300	22000	10000	
	1760	150	2500	8000	2500	12000	4800		H750	1760	750	5000	16000	5000	21000	9600	

Ratings shown are for fig. 1, rotation only. Consult factory for other figure ratings.

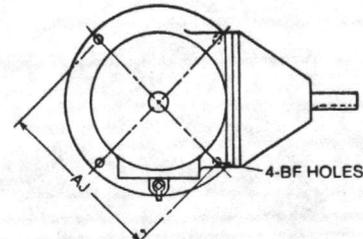
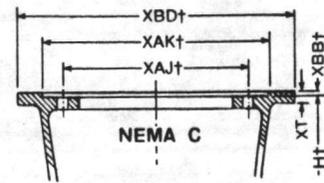
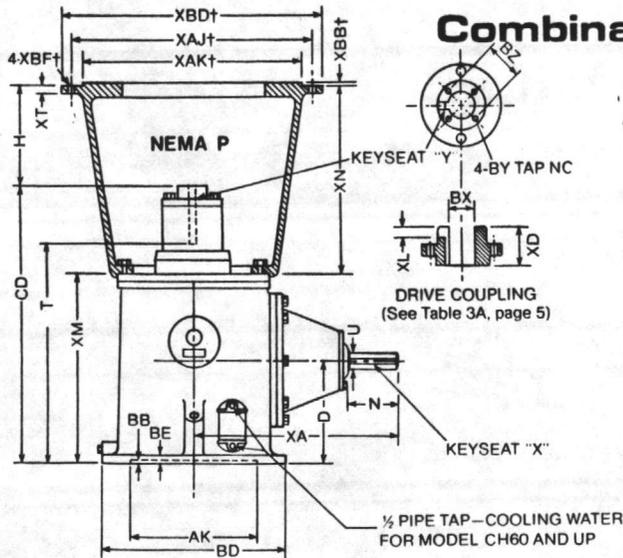
Table 2A. HORSEPOWER AND THRUST BEARING RATINGS

Vertical Shaft RPM	430	580	690	720	860	960	1160	1460	1760	2000*	2200*	2400*	2800*	3000*	3520*
% of HP at 1760 RPM	34	43	48	50	58	63	72	86	100	105	111	116	128	133	150
% of Thrust at 1760 RPM	160	144	136	134	126	122	115	106	100	96	92	90	85	83	79

*Consult factory when vertical shaft speed exceeds 1760 RPM.



Combination Drives – Hollow Shaft



Speed decreasing ratios in Models CH150 and up are subject to change in dimensions: U—XA—N—X. Contact factory for certified print.

Table 4. COMBINATION DRIVE DIMENSIONS (Hollow Shaft) in inches

Model	CD	D	U	XA	N	XM	H	BE	BD	AJ	AK	BB	BF	Keyseat X
CH20	16	6 ³ / ₁₆	1 ¹ / ₂	13	2 ³ / ₄	11 ¹ / ₄	7 ³ / ₄	⁵ / ₁₆	10	9 ¹ / ₁₆	8 ¹ / ₄	³ / ₁₆	⁷ / ₁₆	¹ / ₄ x ¹ / ₁₆ x 2 ¹ / ₄
CH40 (12)	22 ¹ / ₄	9	1 ¹ / ₂	16	3 ¹ / ₂	15 ¹ / ₄	9	³ / ₄	12	9 ¹ / ₁₆	8 ¹ / ₄	³ / ₁₆	⁷ / ₁₆	³ / ₈ x ³ / ₁₆ x 2 ³ / ₄
CH40	22 ¹ / ₄	9	1 ¹ / ₂	16	3 ¹ / ₂	15 ¹ / ₄	9	³ / ₄	16 ¹ / ₂	14 ³ / ₄	13 ¹ / ₂	³ / ₁₆	1 ¹ / ₁₆	³ / ₈ x ³ / ₁₆ x 2 ³ / ₄
CH60	22 ¹ / ₄	9	1 ¹ / ₂	16	3 ¹ / ₂	15 ¹ / ₄	9	³ / ₄	16 ¹ / ₂	14 ³ / ₄	13 ¹ / ₂	³ / ₁₆	1 ¹ / ₁₆	³ / ₈ x ³ / ₁₆ x 2 ³ / ₄
CH80	22 ¹ / ₄	9	1 ⁷ / ₈	16 ¹ / ₂	3 ¹ / ₂	15 ¹ / ₄	9	³ / ₄	16 ¹ / ₂	14 ³ / ₄	13 ¹ / ₂	³ / ₁₆	1 ¹ / ₁₆	¹ / ₂ x ¹ / ₄ x 2 ³ / ₄
CH110	26 ³ / ₄	11 ³ / ₁₆	2	17 ¹ / ₂	3 ¹ / ₂	19 ⁵ / ₁₆	9 ⁷ / ₁₆	1	16 ¹ / ₂	14 ³ / ₄	13 ¹ / ₂	³ / ₁₆	1 ¹ / ₁₆	¹ / ₂ x ¹ / ₄ x 2 ³ / ₄
CH125	26 ³ / ₄	11 ³ / ₁₆	2	17 ¹ / ₂	3 ¹ / ₂	19 ⁵ / ₁₆	9 ⁷ / ₁₆	1	16 ¹ / ₂	14 ³ / ₄	13 ¹ / ₂	³ / ₁₆	1 ¹ / ₁₆	¹ / ₂ x ¹ / ₄ x 2 ³ / ₄
CH150	31 ³ / ₄	13 ¹ / ₄	2 ⁷ / ₁₆	20 ¹ / ₂	4 ³ / ₄	23 ¹ / ₁₆	10 ³ / ₁₆	1	20	14 ³ / ₄	13 ¹ / ₂	³ / ₁₆	1 ¹ / ₁₆	⁵ / ₈ x ³ / ₁₆ x 3 ³ / ₄
CH200	31 ³ / ₄	13 ¹ / ₄	2 ⁷ / ₁₆	20 ¹ / ₂	4 ³ / ₄	23 ¹ / ₁₆	10 ³ / ₁₆	1	20	14 ³ / ₄	13 ¹ / ₂	³ / ₁₆	1 ¹ / ₁₆	⁵ / ₈ x ³ / ₁₆ x 3 ³ / ₄
CH280	36	15	2 ³ / ₄	24	5 ¹ / ₂	26 ³ / ₁₆	12 ³ / ₁₆	1 ¹ / ₈	20	14 ³ / ₄	13 ¹ / ₂	³ / ₁₆	1 ¹ / ₁₆	⁵ / ₈ x ³ / ₁₆ x 4 ³ / ₄
CH350	40 ¹ / ₂	16 ¹ / ₂	2 ³ / ₄	29	5 ¹ / ₂	29 ⁵ / ₁₆	12 ³ / ₁₆	1 ¹ / ₄	24 ¹ / ₂	22 ³ / ₄	13 ¹ / ₂	³ / ₈	1 ⁹ / ₁₆	⁵ / ₈ x ³ / ₁₆ x 4 ³ / ₄
CH425	41 ³ / ₄	16 ¹ / ₂	3	30	5 ³ / ₄	29 ⁵ / ₁₆	12 ¹ / ₁₆	1 ¹ / ₄	24 ¹ / ₂	22 ³ / ₄	13 ¹ / ₂	³ / ₈	1 ⁹ / ₁₆	³ / ₄ x ³ / ₈ x 4 ³ / ₄
CH500	41 ³ / ₄	16 ¹ / ₂	3 ¹ / ₂	31	6 ³ / ₄	29 ⁵ / ₁₆	12 ¹ / ₁₆	1 ¹ / ₄	24 ¹ / ₂	22 ³ / ₄	13 ¹ / ₂	³ / ₈	1 ⁹ / ₁₆	⁷ / ₈ x ⁷ / ₁₆ x 5 ¹ / ₂
CH600	45 ³ / ₄	16 ¹ / ₂	3 ³ / ₄	33	7 ¹ / ₂	31 ⁵ / ₁₆	10 ¹ / ₂	1 ¹ / ₄	24 ¹ / ₂	22 ³ / ₄	13 ¹ / ₂	³ / ₈	1 ⁹ / ₁₆	⁷ / ₈ x ⁷ / ₁₆ x 5 ¹ / ₂
CH750	49	19	4	36	7 ¹ / ₂	37	12	1 ¹ / ₂	30 ¹ / ₂	26	22	³ / ₈	1 ⁹ / ₁₆	1 x ¹ / ₂ x 6 ³ / ₄

H as determined using maximum XN
*Also 5/8-11 Tap on 14-3/4 Bolt Circle 1" Deep

Table 4A. MAX. DRIVE COUPLING BORE SIZE AVAILABLE MOTOR STAND

Model	XD	Max. BX		T	XN Available Motor Stand		XT	Top Flange †
		Fig. 1 & 4	Fig. 2 & 3					
CH20	1 ³ / ₄	1	³ / ₄	13 ¹ / ₄	8 ¹ / ₂	10	12 ¹ / ₂	⁷ / ₁₆
CH40	2 ³ / ₈	1 ¹ / ₂	1 ¹ / ₄	18 ³ / ₄	12 ¹ / ₂	16		⁵ / ₈
CH60	2 ³ / ₈	1 ¹ / ₂	1 ¹ / ₄	18 ³ / ₄	12 ¹ / ₂	16		⁵ / ₈
CH80	2 ³ / ₈	1 ¹ / ₂	1 ¹ / ₄	18 ³ / ₄	12 ¹ / ₂	16		⁵ / ₈
CH110	2 ³ / ₈	1 ¹ / ₂	1 ¹ / ₂	23	12 ¹ / ₂	17		⁵ / ₈
CH125	2 ³ / ₈	1 ¹ / ₂	1 ¹ / ₂	23	12 ¹ / ₂	17		⁵ / ₈
CH150	2 ³ / ₈	1 ¹⁵ / ₁₆	1 ³ / ₄	27 ¹ / ₂	15	19		³ / ₄
CH200	2 ³ / ₈	1 ¹⁵ / ₁₆	1 ³ / ₄	27 ¹ / ₂	15	19		³ / ₄
CH280	2 ³ / ₈	2	2	31 ¹ / ₂	15	22		³ / ₄
CH350	3 ¹ / ₈	2 ³ / ₁₆	2 ³ / ₁₆	35 ¹ / ₂	15	24		1
CH425	3 ³ / ₈	2 ⁷ / ₁₆	2 ⁷ / ₁₆	35 ³ / ₄	15	24		1
CH500	3 ³ / ₈	2 ⁷ / ₁₆	2 ⁷ / ₁₆	35 ³ / ₄	15	24		1
CH600	4	2 ¹ / ₁₆	2 ¹ / ₁₆	38 ¹ / ₄	19	24		1
CH750	4	3 ³ / ₁₆	3 ³ / ₁₆	41 ³ / ₄	**	24		1 ¹ / ₄

MACHINED TO SUIT**

Dimensions XBD, XAJ, XAK, XBB, and XBF to suit electric motor

ROTATION



FIG. 1



FIG. 2



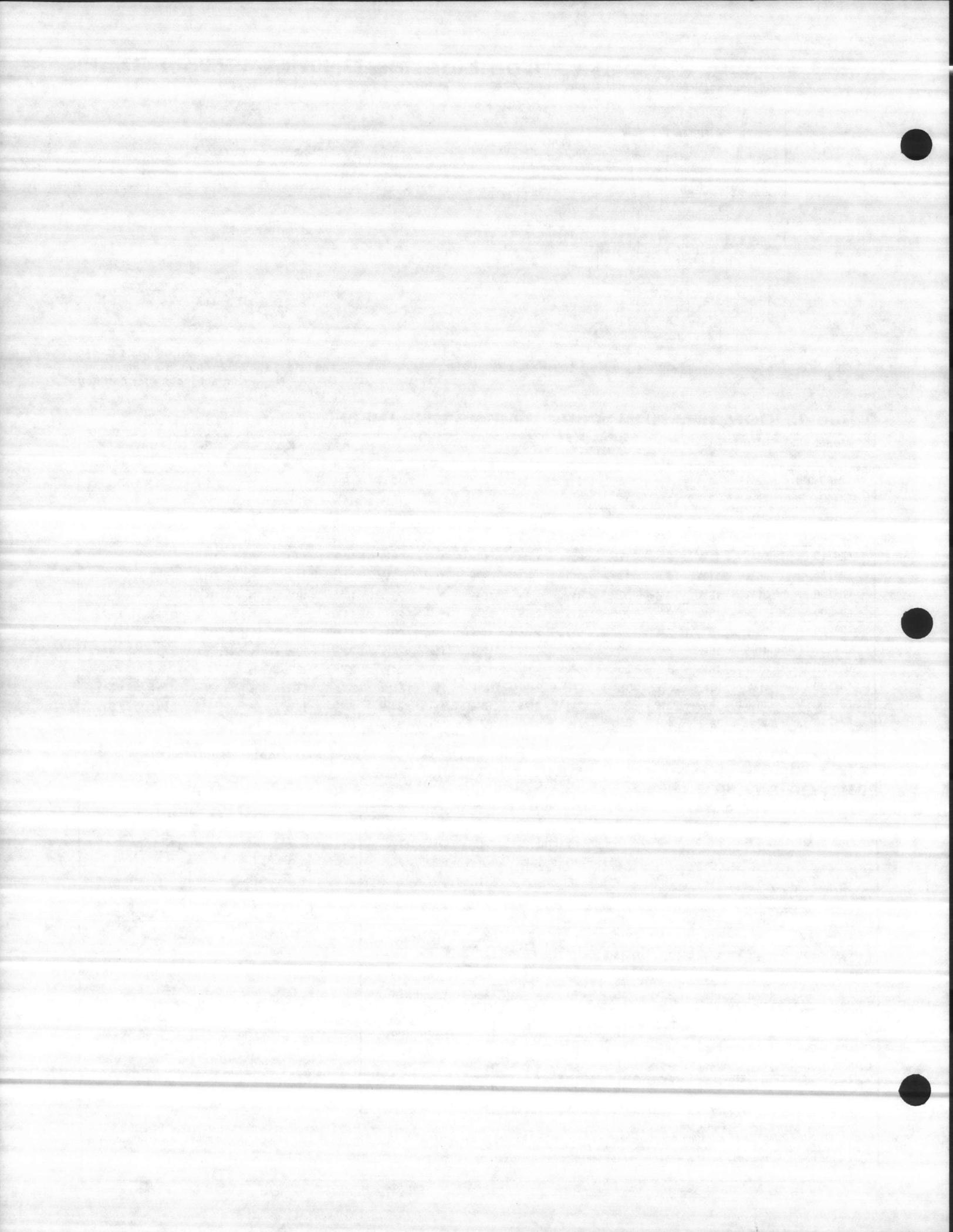
FIG. 3



FIG. 4

Gear drives with special rotation (Figs. 2, 3 and 4) and gear drives with speed decreasing of 7:4 or higher ratios are manufactured to order, and such orders are not subject to cancellation without charge for parts processed.

Tolerances: Shaft Extensions plus .000 minus .001; Base Rabbet AK plus .002 plus .005; Coupling Bore BX plus .0005 plus .0015. The combination drive is desirable where 24-hour service is mandatory and is preferred by municipalities and waterworks corporations. Electric motor or engine may be used to drive the pump, permitting removal of either for repairs without interrupting service. As with the standard drive, combination applications are also available with solid shaft construction. See page 6.



4700

INSTRUCTIONS

**INSTALLATION
and CARE
of
WATER
LUBRICATED
VERTICAL
TURBINE
PUMPS**

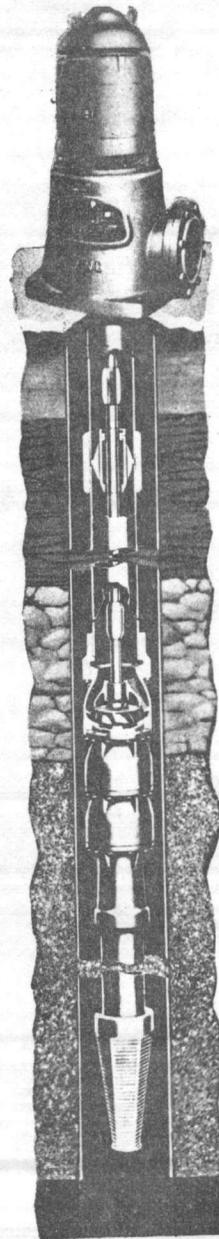


FIG. 4700

CRANE

VALVES • PUMPS • FITTINGS • WATER TREATMENT • PLUMBING

DEMING PUMPS

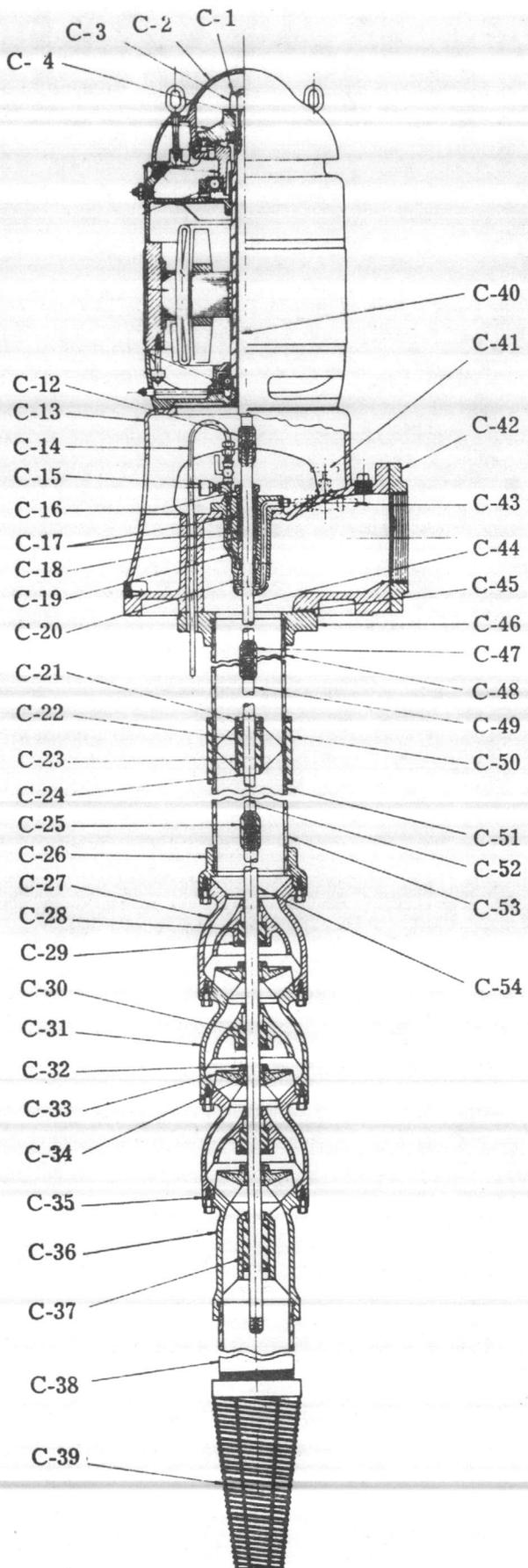
Form 914

CRANE CO. DEMING DIV. • 884 SOUTH BROADWAY • SALEM, OHIO 44460

Printed in U.S.A.

DEMING VERTICAL TURBINE PUMPS

Parts List No. 50 - Fig. 4700 Water Lubricated Pumps



- C- 1 Adjusting Nut Lock Screw
- C- 2 Canopy
- C- 3 Impeller Adjusting Nut
- C- 4 Gib Key
- C-12 Head Shaft Coupling
- C-13 Discharge Head
- C-14 Stuffing Box Relief Assembly
- C-15 Grease Cup
- C-16 Stuffing Box Gland
- C-17 Lantern Rings
- C-18 Stuffing Box Packing
- C-19 Stuffing Box
- C-20 Stuffing Box Bushing
- C-21 Snap Ring & Cover Plate
- C-22 Bearing Housing
- C-23 Column Bearing - Cutless Rubber
- C-24 Shaft Sleeve
- C-25 Impeller Shaft Coupling
- C-26 Column Adapter
- C-27 Discharge or Top Intermediate Bowl
- C-28 Discharge or Intermediate Bowl Bearing
- C-29 Snap Ring and Cover Plate
- C-30 Bowl Bearing
- C-31 Intermediate Bowl
- C-32 Impeller Nut
- C-33 Impeller
- C-34 Impeller Sleeve
- C-35 Bowl Gasket
- C-36 Suction Bowl
- C-37 Suction Bowl Bearing
- C-38 Suction Pipe
- C-39 Strainer
- C-40 Head Shaft
- C-41 Pre-lubricating Valve
- C-42 Discharge Flange
- C-43 Pre-lubricating Pipe
- C-44 Stuffing Box Shaft
- C-45 Top Column Flange Gasket
- C-46 Top Column Flange
- C-47 Shaft Coupling
- C-48 Top Column Pipe
- C-49 Intermediate Shaft
- C-50 Column Coupling
- C-51 Intermediate Column
- C-52 Bottom Shaft
- C-53 Bottom Column
- C-54 Impeller Shaft

NOTE

Specify pump serial number when ordering replacement parts. This will be found on the nameplate attached to the discharge head casting or to the bowl assembly.

WELL

Measure the well to make sure it is of ample size and depth to receive the pump. The well must be sufficiently straight to allow the pump to hang freely with no misalignment.

FOUNDATION

A concrete foundation should be constructed before the pump is installed to permit aligning the pump head with the well while lifting equipment is available. Provide an opening in the foundation large enough for the top column flange with ample clearance. If the well is out of plumb, the pump head must be placed so that the drive shaft will be on the same inclination as the well casing. This is important. The foundation should be large enough to carry the weight of the pump without settling.

TOOLS

The following tools and equipment are required for satisfactory installation:

Derrick, gin pole with chain hoist, winch truck, well rig or similar equipment with at least 12 foot clearance (more for long bowl assemblies) and sufficient capacity to safely handle the weight of the complete unit.

Two pipe clamps or pipe elevators of proper size for pump column.

Two chain pipe tongs (if column has screwed couplings).

Two small pipe wrenches for screwing shaft together.

Small tools including wire brush, three-cornered file, wrenches, can of pipe compound, etc.

PREPARATION

Immediately on receipt of pump check carefully with packing list. Report any loss or damage to transportation company and to factory. Keep all parts in good dry storage. When ready to install, unpack material and lay out on skids or boxes near well.

Place the column pipe with the coupling end toward the well. Check shafts for straightness. Roll on ways if any question as shafts must be almost perfectly straight. Place a shaft inside each length of column with the bearing sleeve toward the well. Screw a shaft coupling on the opposite end.

Note -- Short-coupled turbine pumps are usually shipped assembled except for mounting motor. To install these pumps it is only necessary to raise the pump over the sump or reservoir and lower it on foundation. Then mount motor or drive as explained later.

IMPORTANT NOTES

1. Column pipe threads are right hand; shaft threads are left hand.
2. Protect all parts from dirt; especially column and shaft threads, couplings, and all machined surfaces. Any dirt or foreign material between

ends of shafts or other parts may cause misalignment and unsatisfactory operation.

3. Handle shaft with extreme care to avoid bending.
4. All shaft and column must butt solidly in couplings; otherwise, differences in length may develop during installation. Ends of shafts should be even with small hole in side of shaft coupling.

INSTALLING BOWL ASSEMBLY

If headroom permits, screw strainer on suction pipe and suction pipe into bowl assembly before raising bowl assembly from ground. Where headroom is limited or assembly is long, lower suction pipe into well with strainer attached and hold with clamp. Then if headroom permits, assemble the bottom section of shaft, and column pipe on the top of the bowl assembly. Raise the complete assembly, taking particular care not to place too much strain on the bowls, and screw the bowl assembly on the suction pipe. If necessary to place clamp on bowl assembly, make sure this is located over joint and not on the shell of a bowl.

Loosen clamp on suction pipe and lower assembly into the well until the upper clamp or elevator rests on top of casing or foundation.

INSTALLING COLUMN

Place clamp or elevator under coupling on upper end of the bottom section of column and raise over the well. Support the shaft by hand or with a rope sling, taking particular care not to bend the shaft. On larger pumps a small clamp to fit the shaft or a length of manila rope will assist in supporting the shaft. Carry the lower end of the column or slide it on a plank so as not to damage threads. Make sure all threads are perfectly clean. Paint outside pipe threads with a good thread lubricant. Oil shaft threads and wipe off excess oil.

Screw the bottom shaft into the impeller shaft coupling and tighten. Then screw the column into the column adapter or if the adapter is flanged, bolt it to the top bowl. Lower the complete assembly into the well and hold with clamp.

Place a bearing assembly over the shaft with the snap ring at the top and slip it firmly in place in the column coupling.

Repeat this procedure until all of the column has been installed. Each section must butt rigidly in the couplings. Intermediate column lengths are regularly 10 feet for pumps up to 2200 RPM and 5 feet for pumps to operate over 2200 RPM. Rubber bearing should center in bearing sleeve in each column coupling. The top section of column has a flange for attaching to the discharge head. The top shaft which goes through the stuffing box is regularly of stainless steel, several inches longer than the top pipe.

INSTALLING HEAD ASSEMBLY

Hold the pump with clamps under the upper column coupling. This will support the top column flange several feet above the foundation where it is convenient to attach the discharge head. Remove the stuffing box assembly from the head. It may be necessary to bump it lightly with a wooden block. Place a double chain sling through the head and raise it over the pump. Make sure flange on lower side of head is clean and that studs are not damaged. Clean the top column flange and place paper gasket on it. Line up studs and the opening through the head with holes in top flange and lower the head carefully onto the top flange. Make sure the register fits and tighten stud nuts securely.

Then raise the complete pump assembly and remove the clamps. Rotate the unit until the discharge flange is in the desired direction and lower onto foundation. If the head does not rest evenly on the foundation, lift the unit and place metal shims under each corner. The head must be supported on the foundation so that it is in line with the column and shaft. Never level a pump head on the foundation with a spirit level.

Place paper gasket over stuffing box studs. Make sure the flange is clean and lower the stuffing box over the shaft using care not to damage packing. Tighten stud nuts securely and tighten gland nuts finger tight. Run stuffing box relief tube down through opening in head to return by-pass water to well; or place tube through drain opening in back of head and pipe to drain. If pump is to operate under pressure; leave relief valve partially open to relieve the pressure on the upper packing. Give grease cup several turns to lubricate packing and stuffing box bearing. Screw headshaft coupling on upper end of stuffing box shaft. Place a cloth over coupling to avoid any possibility of dirt or foreign material dropping into it while motor is being mounted.

INSTALLING MOTOR OR DRIVE

Check motor nameplate to make sure it is suitable for the electric current available and the proper speed for the pump. Use eye bolts in top of motor for lifting motor only. Do not use these eye bolts for lifting motor and pump together. Set motor on pump head making sure that base of motor and top of head are clean and that register fits properly. Bolt motor in place with bolts or cap screws furnished. Remove motor canopy and top drive coupling. Lower headshaft through hollowshaft of motor with end of shaft having keyway at the top. Tighten in headshaft coupling. It is important that shafts butt in coupling but do not use excessive force which might cause misalignment.

ALIGNING PUMP

Check alignment of pump head on foundation by noting the clearance around the headshaft at top of motor. If the headshaft stands to one side in hollowshaft, place metal shims between the head and foundation on the opposite side so that the headshaft will stand exactly in the center. The straightness of the headshaft, stuffing box shaft and coupling may be

checked by installing the top drive coupling, raising the impellers and turning the rotating assembly 180°. Then remove the top drive coupling and the shaft should remain in the center of the hollowshaft. Raise the complete pump assembly and without moving the shims, spread a layer of cement on the foundation. Then let the pump down until it rests in exactly the same position as before. Recheck position of top shaft. After cement sets tighten foundation bolts.

CHECKING ROTATION

Have the motor wired and check rotation before installing the top drive coupling. Rotation must be counter-clockwise when looking at top of motor. (See arrow on pump head.) Motors with built-in non-reverse ratchet may be energized momentarily without injury to the ratchet assembly. If rotation is incorrect, reverse two leads on three phase motor. Refer to diagram on single phase motor.

ADJUSTING IMPELLERS

Place top drive coupling over shaft and insert gib key. Tighten adjusting nut until impellers are raised off bowl seats and shaft just turns freely by hand. Then raise approximately one-half turn for each 100 feet of setting. It is better to raise more than necessary for starting and then make closer adjustment gradually. Install lock screw and tighten before starting pump. For maximum performance, impellers should be adjusted so that they run as close as possible and yet do not rub at maximum pressure. If there is any unusual noise or vibration, stop the pump and recheck impeller adjustment. A watt meter or ammeter may be used to obtain very close adjustment. If well may contain sand, raise impellers about twice normal amount when first starting pump and then readjust after well has cleared up. If the well does not produce sufficient water to supply the pump, the capacity of the pump should be reduced by raising the impellers.

PRELUBRICATING AND STARTING PUMP

Before starting deep well pumps the Cutless Rubber bearings above the static water level must be prelubricated with water. Connect pre-lube tank to opening in stuffing box assembly with fittings provided and fill tank with clean water. Allow at least half the tank of water to run down the shaft before starting pump. Then leave valve open and allow pre-lube water to continue to flow until the water from the pump reaches the surface. Allow tank to refill before closing valve. On large pumps with deep static water level refill tank from another source to provide ample prelubrication while the pump is coming up to speed. If such pumps are to be operated manually, it may be more convenient to install a 30 or 50 gallon barrel for prelubrication.

Pumps discharging into pressure systems are normally prelubricated by connecting a line around the check valve and installing the globe valve in this line. A small "V" groove should be filed in the valve seat so that the valve cannot be closed accidentally. Four to five gallons of water per hour is generally sufficient

to keep the bearings moist and in condition for automatic operation. Where pumps operate frequently and the water level is less than 50 feet from the surface, the bearings will normally remain sufficiently moist for smooth starting without prelubrication. Where pumps are started infrequently or the amount of water available for prelubrication is limited or on large installations to be operated automatically an electric solenoid operated valve should be installed in the pre-lube line with a timing relay to delay the starting of the pump until the bearings have been properly lubricated.

A gate valve should be placed in the discharge line. Leave this valve about three quarter closed when the pump is started. After the water reaches the surface, open the valve slowly to avoid over pumping the well and to maintain normal discharge pressure on the pump. Check the stuffing box and tighten gland, if necessary, with a small wrench, until there is only a small trickle of water to keep the packing lubricated.

LUBRICATION

PUMP LINE SHAFT AND BOWL BEARINGS

On Fig. 4700 Water Lubricated Pumps all bearings below ground are lubricated by the water flowing through the pump. Prelubrication during the starting period should be provided where necessary as explained on Page 4.

The water level in the well should be checked occasionally while the pump is in operation. If the water level draws down below the bowls, additional column and shaft should be installed, or the capacity of the pump should be reduced by either raising the impellers or throttling the discharge. The pump must not be allowed to operate if the water level drops to the strainer and the pump breaks suction.

STUFFING BOX

Apply a small amount of a good water resistant lubricant to the grease fitting on the stuffing box each time the pump is started or once a day if the pump is operated continuously. Special turbine stuffing box grease may be obtained from Deming Division, Crane Co. in 1 lb. cans. If necessary, an automotive water pump grease may be used.

MOTOR WITH GREASE LUBRICATED BEARINGS (Lubricated at factory before shipment)

- A. Motor with grease fitting and drain plug in each bearing housing.

Once each six months or once a year, depending on operating conditions, the motor should be relubricated as follows:

1. Remove drain plug or grease ejector.
2. Apply pressure gun to grease fitting and inject new grease until all old grease has been forced out of the bearing through the grease drain. If a grease ejector is supplied, assist flushing of old grease by slowly working the

plunger back and forth several times to remove grease from the drain.

3. Run motor for approximately five minutes to relieve bearing of excess grease using ejector immediately upon starting to assist removal of grease from drain.
4. Replace drain plug or ejector.

- B. Motor with grease fitting only in each bearing housing.

Once each six months or once a year, depending upon operating conditions, add a small amount of grease. Then remove grease fitting and operate the motor about one-half hour before replacing the fitting to allow any excess grease to be expelled. The bearing may run warm (without injury) until the excess grease has been expelled. An approval motor bearing grease may be obtained from Deming Division, Crane Co., in 1 lb. cans.

MOTOR WITH OIL LUBRICATED BEARINGS, BELT DRIVE OR FLEXIBLE COUPLING DRIVE (Fill with oil before starting)

Oil lubricated motors and drives are shipped without oil and should be filled with proper grade oil before starting. Check oil level once a week with pump idle. Change oil once a year or every 2000 hours operation, whichever occurs first. Change oil more frequently for continuous operation or under dusty conditions. For proper turbine oils refer to table. While special turbine motor oil is preferred, if necessary a SAE10 or SAE20 non-detergent pure paraffin base motor oil may be used temporarily.

MOTOR WITH OIL LUBRICATED TOP BEARING AND GREASE LUBRICATED LOWER BEARING (Fill top oil reservoir before starting. Lower bearing greased at factory.)

Relubricate according to instructions outlined above.

RIGHT ANGLE DRIVE (Fill before starting)

Refer to manufacturer's instructions which usually recommend changing oil once a year or after 2000 hours of operation, whichever occurs first. Use only an approved turbine oil as recommended by the drive manufacturer; SAE automotive oils are Not satisfactory for Right Angle Drives.

NOTE

See Page 6 for list of recommended oils and greases for motors.

RECOMMENDED OILS AND GREASES FOR MOTORS

<u>Manufacturer</u>	<u>Trade Name of Grease</u>	<u>Trade Name of Oil</u>
Continental Oil Co.	Conoco Race Lube	Conoco Turbine Oil Light
Esso Standard Oil Co.	Andok Lubricant B	Teresso 43
Magnolia Petroleum Co.	Mobilux Grease #2	Mobil DTE 797
Shell Oil Company	Alvania Grease #2	Tellus 27
Socony-Mobil Oil	Mobilux Grease #2	Mobil DTE 797
Standard Oil of California	Chevron Industrial Grease, Medium	Chevron OC Turbine 9
Standard Oil of Ohio	Sohio #78 or Lubtec Grease	Sohivis 43
Sun Oil Company	Sun N-52X	Sunvis 916
The Texas Company	Regal Starfak #2	Regal A (R & O)
Tidewater Oil Co.	Veedol All-Purpose	Tycol Aturbrio 50

CAUTION

Due to the high speed at which the smaller size units may operate, and since most of the pumping unit is underground, extreme care must be used in assembling and installing it and thoroughly checking the entire installation before it is put into operation.

If, after the well has been drilled and cased, it is crooked, the water supply is doubtful, the water level has dropped, or the water contains considerable sand, gravel or gas, the Crane Deming sales office from whom the unit was purchased should be consulted before it is started.

Under no circumstances will the Company guarantee the pump against the effects of corrosion, erosion or electrolytic action, those being entirely beyond the control of the Company.

In case any unusual vibration appears when starting the unit, or if vibration develops later, the unit should not be continued in operation, but Crane-Deming or authorized representative, should be requested to service the installation to place it in proper running condition.

If the above instructions are not followed or if the pump is operated without the proper submergence recommended by the Company, all guarantees are withdrawn and Crane-Deming will not assume any responsibility for the proper operation of the unit or the life of any of its parts.

LIMITED WARRANTY
APPLICABLE ONLY TO CONSUMER SALES

Crane Co., Deming Division gives a limited one-year warranty on the machinery of its own manufacture sold herewith. Crane Co., Deming Division warrants to any buyer or consumer that the machinery shall be free of defects in material and workmanship during normal use and service for a period of one year from the date of shipment.

Under this limited warranty, Crane Co., Deming Division shall, within 45 days from the date of notification, (1) repair the product at the factory or the nearest point of repair OR, (2) replace the product or any parts proven defective in material or workmanship OR, (3) refund the purchase price. The choice of such remedies shall be at the sole discretion of Crane Co., Deming Division.

This written warranty is the only warranty made by Crane Co., Deming Division. IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, IF ANY, ARE LIMITED TO THE SAME TERM AS THIS WRITTEN WARRANTY. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

HOWEVER, SOLELY WITH RESPECT TO A BUYER WHO IS NOT A CONSUMER, THE FOREGOING WARRANTY IS IN LIEU OF ANY AND ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR ANY PARTICULAR PURPOSE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED, AND NO OTHER WARRANTY IS MADE OR AUTHORIZED TO BE MADE.

The buyer or consumer must promptly and within the applicable limited warranty period notify the installing dealer or contractor in writing of any defect in the machinery and shall permit Crane Co., Deming Division to inspect the product so that it may determine its obligations under the warranty. The buyer or consumer must pay all labor costs, freight charges to the factory or the nearest point of repair, if any, and any charges for the installation of replacement parts, incurred by the Dealer, Contractor or this Company. Upon settlement of its obligations, if any, under this warranty, Crane Co., Deming Division, at its option, shall be entitled to the return of the defective product or part (s) (transportation prepaid).

This limited warranty does not cover unsatisfactory performance or failure due to misuse or abuse of the product, nor will Crane Co., Deming Division be responsible for unsatisfactory performance or failure due to improper installation, adjustment or repair of the product. The specifications for the machinery are descriptive and are not warranties.

This limited warranty does not cover equipment and accessories manufactured by third parties.

CRANE CO., DEMING DIVISION IS NOT RESPONSIBLE FOR CONSEQUENTIAL, SPECIAL, CONTINGENT, INCIDENTAL OR ANY OTHER DAMAGES WHATSOEVER IN CONNECTION WITH REPLACEMENT, REPAIR OR REFUND AS SET FORTH ABOVE. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY FROM STATE TO STATE.

ENGINEERED BY
BOX 2804
HICKORY, NC 28603
CRANE CO., DEMING DIVISION
884 South Broadway
Salem, Ohio 44460

WARRANTY

APPLICABLE WHEN THE MACHINERY IS SOLD AND INSTALLED ON
A COMMERCIAL OR INDUSTRIAL APPLICATION, AND NOT AS A
CONSUMER PRODUCT.

INDUSTRIAL PUMPS
CRANE CO., DEMING DIVISION
SALEM, OHIO, 44460

The following warranty, which is not a consumer warranty, is made in lieu of any and all implied or express warranties including, without limitation, implied warranties of merchantability and fitness for a particular purpose and no other warranty is made or authorized to be made.

Service under this warranty is the responsibility of the installing dealer or contractor. In the event service is required, the Buyer should request such service directly from the installing dealer or contractor. If for any reason the installing dealer or contractor is unknown or cannot be located, the Buyer should write Crane., Deming Division for the name and address of the nearest dealer or contractor.

If within one (1) year following date of delivery, any material supplied by Crane Co. hereunder proves defective or fails to meet the agreed specifications, Buyer shall not return it unless requested to do so but shall immediately notify the installing dealer or contractor, stating full particulars in support of his claim and if faulty workmanship or material is involved, or if material fails to meet the agreed specifications, Crane Co. will adjust the matter fairly and promptly. Under no circumstances shall Crane Co. be obligated to allow claims for subsequent or consequential damages or for any labor expense incurred by reason of the use or sale of any material which is defective or fails to meet the agreed specifications. The sole measure of damages shall be the price received therefore by Crane Co.

PUMP & LIGHTING CO.
ENGINEERED PRODUCTS DIV.
P. O. BOX 2504
HICKORY, NC 28603



INSTRUCTIONS

TRI/CLAD[®] VERTICAL INDUCTION MOTORS

HIGH THRUST, HOLLOW AND SOLID SHAFT, 'P' BASE FRAMES 284-405, B324-B445 OPEN ENCLOSURES

INTRODUCTION

General Electric standard high-thrust vertical motors (Fig. 1) 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. They are of either hollow- or solid-shaft construction, and are generally used to drive pumps. 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



Fig. 1. Typical high-thrust induction motor

imposed by the pump such as different magnitudes of down-thrust and either momentary or continuous up-thrust. Since overloading greatly reduces bearing life, the amount of thrust applied should not exceed the recommended values. Figure 5 shows a typical solid-shaft construction where continuous up-and-down thrust is required.

Motors driving pumps in pressure systems where the pressure is maintained after shutdown should be protected from overspeeding by check valves.

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. 6.)

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: THE MOTOR SHOULD BE LIFTED BY THE LUGS PROVIDED. THESE LUGS ARE INTENDED FOR LIFTING THE MOTOR ONLY AND MUST NOT BE USED TO LIFT ANY ADDITIONAL WEIGHT. BE CAREFUL NOT TO TOUCH OVERHEAD POWER LINES WITH LIFTING EQUIPMENT. FAILURE TO OBSERVE THIS WARNING MAY RESULT IN PERSONAL INJURY OR DEATH.

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. If the storage period is to exceed three months, the reservoirs of oil-lubricated bearing housings should be filled. It is suggested that such oil-filled motors be tagged in a fashion so as to be readily discernible in order to prevent mishandling, which would cause oil spillage and subsequent damage to the internal parts of the motor.

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

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 is 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.

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 temperature 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 pertinent data kept. Any significant decrease in insulation resistance should be investigated.

The oil and grease should be replaced at the end of the storage period per the Relubrication instructions on page 8.

If a 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

WARNING: MOTORS SHOULD BE LOCATED IN A SUITABLE ENCLOSURE TO PREVENT ACCESS TO THE MOTOR BY CHILDREN OR OTHER UN-

AUTHORIZED PERSONNEL IN ORDER TO PREVENT POSSIBLE ACCIDENTS. THIS IS ESPECIALLY IMPORTANT FOR MOTORS THAT ARE REMOTELY OR AUTOMATICALLY CONTROLLED OR HAVE AUTOMATIC RE-SETTING 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 not over 40°C. Where a choice of locations is possible, install the motor so that 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.

COUPLINGS FOR HOLLOW-SHAFT MOTORS

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

<u>Bolt Size</u>	<u>Torque</u>
5/16	20 lb ft
3/8	37 lb ft
1/2	90 lb ft
5/8	180 lb ft
3/4	320 lb ft
1	710 lb ft

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 COUPLING COMES MOUNTED IN 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 top cap to gain access to the coupling.

Two slots are provided in the outside rim of the coupling so that a bar can be inserted to keep the assembly from turning while the adjustment of pump impeller clearance is being made. A coupling bolt can be screwed into one of the extra tapped holes in the top end shield to provide a stop for the bar.

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. 3) 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 self-release 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 lock screw 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 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 top

cap be at least enough to allow the top-half coupling, when it releases, to clear the pins before the shaft hits the cap. Check this clearance after the adjusting nut has been drawn up to its final position. To facilitate making the check, the motor outline print 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 lift in order to clear the pins and still leave a small clearance between the shaft and cap. For standard motors, "XH" is shown as follows:

Frame Size	XH
284-326, B324-B365	3 1/8
364-365, B404-B405	3 1/4
404-405, B444-B445	3 7/8

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 top cap. However, if the above conditions are met, damage, even in the most severe cases, should be limited to a broken cap.

It is expected that the self-release coupling will be called upon to operate only at infrequent intervals. Operation from the usual cause, 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 pumps 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 back-spin 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.) This coupling 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

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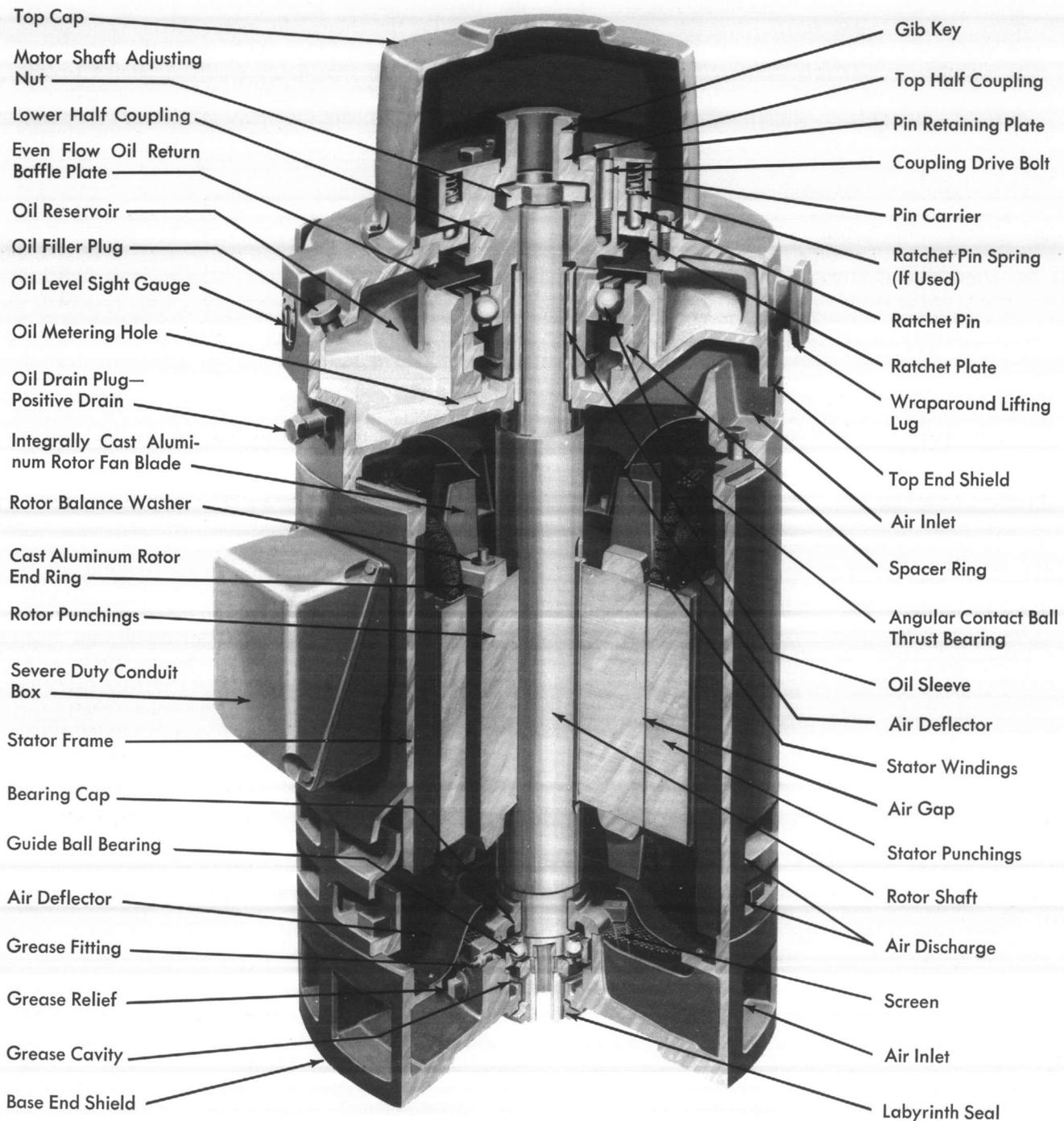


Fig. 2. Typical high-thrust, hollow-shaft motor with non-reverse coupling. (Motors for 3000- and 3600-rpm operation in frames B444 –B445 have oil-lubricated lower bearings; see Fig. 4.)

Vertical, High-thrust Induction Motors, GEH-3291E

rotating in the reverse direction. Thus, it not only prevents the pump shaft from unscrewing, but it also prevents damage from overspeeding and damage to water-lubricated pump shaft bearings when, on shutdown, the falling water column tends to drive the pump in the reverse direction. 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 differs from the number of teeth to multiply the number of stopping positions.

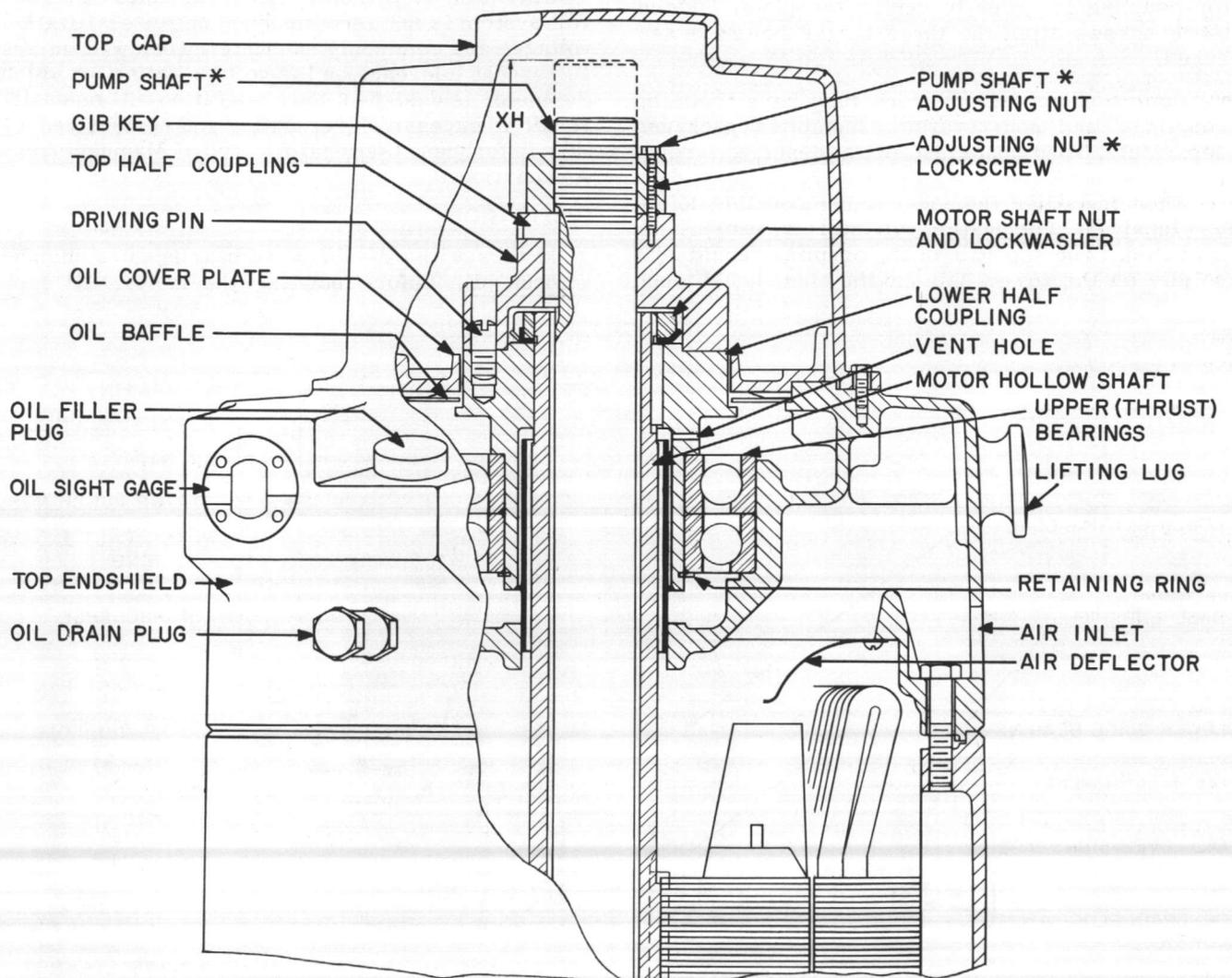
Too rapid a decrease in speed can result in inertia forces great enough to prevent the pins from drop-

ping. This condition is further aggravated when the pins become dirty, and their action sluggish. If the time from shutdown (the instant the stop button is pressed) to zero speed is greater than two seconds, operation will be satisfactory.

To permit operation, where stopping time 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.

Pins and springs are made of heat-treated stainless steel.

A complete non-reverse top coupling (see Fig. 2 and Fig. 6) consists of a self-release coupling plus



* SUPPLIED BY PURCHASER

Fig. 3. Upper end of typical hollow-shaft motor with self-release coupling

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a non-reverse assembly, which includes ratchet plate, pin carrier, pins, springs, pin retaining plate, and cap screws. A self-release or a bolted coupling can be converted to a non-reverse coupling without disturbing the adjustment of the pump shaft nut.

To make the conversion, remove the drive pins or bolts from the lower-half coupling. Remove the oil cover plate and replace it with the ratchet plate which should be securely bolted in place.

Slide the pin carrier down over the top coupling, insert the pins, and set the pin retaining plate in place. Insert the long cap screws through the plate, pin carrier, and top coupling and into the lower coupling. Tighten them securely.

The retaining plate is secured to the pin carrier with small cap screws. These screws may need to be loosened when this assembly is placed over the top coupling in order to center the plate. Tighten these screws after the three larger bolts are secured.

Motors shipped from stock may have their top couplings and non-reverse assemblies packaged separately. They can be installed as described above.

When installing the non-reverse coupling do not use 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.

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

Motors with oil-lubricated bearings are shipped without oil. Before starting the motor, fill each

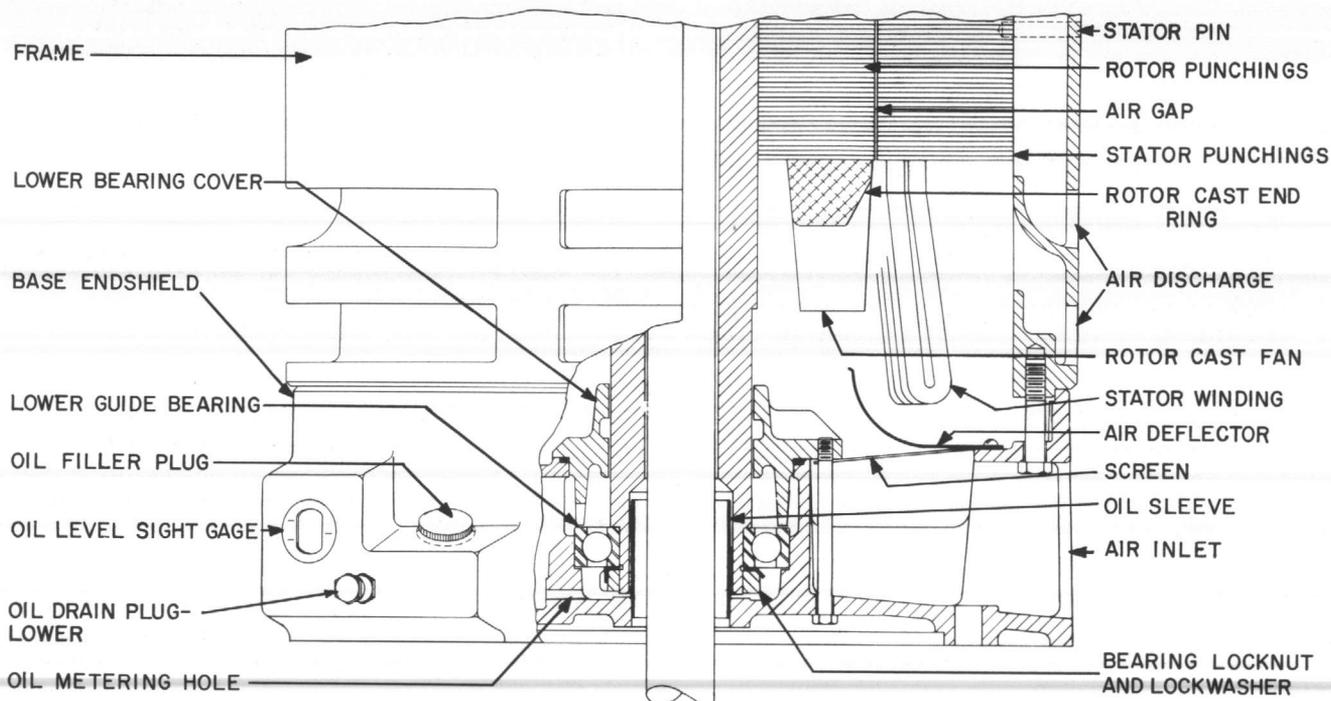


Fig. 4. Typical bottom bearing construction for 3000- and 3600-rpm motors in frames B444 - B445

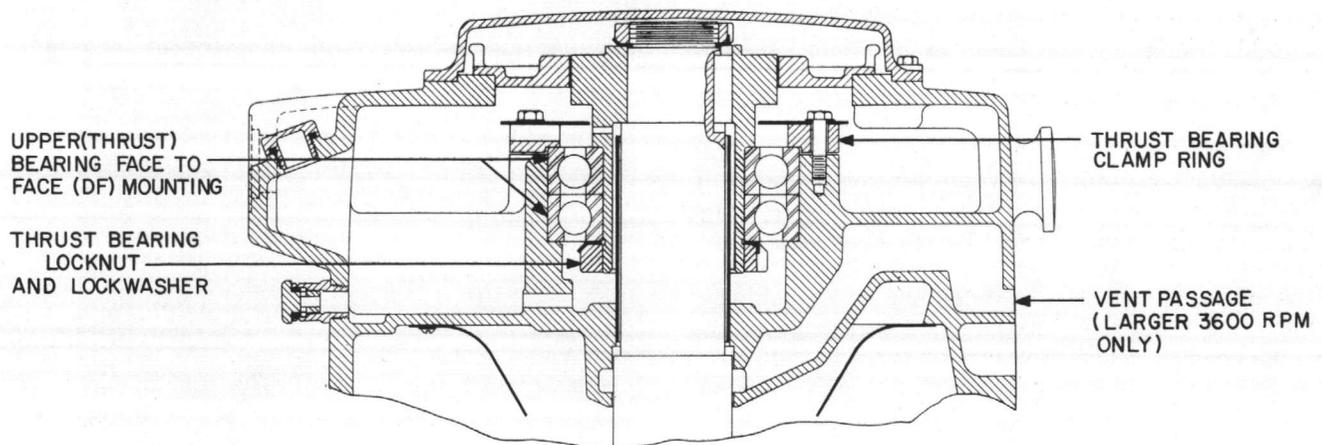


Fig. 5. Upper end of a typical solid-shaft motor which must withstand continuous up-thrust with DF-mounted bearings

reservoir to the standstill level shown on the sight gage. Use only the oil specified on the lubrication nameplate or the lubrication instructions supplied with each motor. Exercise care to keep dirt out of the lubricant and bearing housing. When filling for storage, fill to the maximum level shown on the gage or until the oil overflows at the filler hole. Before operating the motor, drain this oil and refill as instructed above.

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

See instructions under MAINTENANCE for re-lubrication recommendations.

OPERATION

Check electrical connections. Be sure that the drain plugs of oil-lubricated bearing housings are tight, and that the reservoirs are filled with oil.

When possible, leave the motor disconnected from the load for the initial start. In the case of hollow-shaft motors, this check should occur before installing the pump shaft. 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 windings.

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 current. Do not exceed steady value of nameplate amperes times service factor.

MAINTENANCE

WARNING: BEFORE INITIATING 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 COMPLY MAY RESULT IN SEVERE PERSONAL INJURY OR DEATH.

INSPECTION

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

CLEANLINESS

Keep both the interior and exterior of the motor free from dirt, oil, and grease. Open motors should be kept as dry as possible, and, 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. However, 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.

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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 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 stops and starts, 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.

RELUBRICATION

Motors covered by these instructions have oil-lubricated upper (thrust) bearings and grease-lubricated lower (guide) bearings except for 3000- and 3600-rpm motors in frames B444TP through B445TP which employ oil lubrication for both bearings.

Grease-lubricated Bearings

The housings of grease-lubricated bearings are packed at the factory with long-life grease. The oil in this grease will ultimately become depleted, and it will be necessary to regrease at an interval dictated by the severity of service.

Since under normal conditions guide bearings in vertical motors carry relatively light loads, the initial grease pack will usually last for many years. Then a small amount of grease can be added through the fitting located in the lower bearing cap.

Whenever the motor is disassembled for general cleaning and reconditioning, clean the housing of old grease with a suitable solvent and dry thoroughly. Refer to the mixture described under "Insulation Care." Pack the cavity above the bearing with new grease until approximately two-thirds full before reassembling.

For best results use GE long-life grease (No. D6A2C5) and take care to exclude dirt from the bearing housing and lubricant.

Oil-lubricated Bearings

Maintain proper lubrication by checking the oil level periodically and adding oil when necessary.

Because of the initial clearing action of the bearing and the expansion of the oil as it comes up to operating temperature, the oil level will be higher after the motor has been in operation for a while than it is with the motor at standstill. The normal level, with the motor stopped and the oil cold, is one-eighth inch below the center of the sight gage. Both the standstill level and operating range are marked on the gage.

Overfilling should be avoided not only because of the possibility that expansion may force the oil over the oil sleeve and into the motor, but also because too high an operating level prevents the bearing from clearing itself of excess oil. The resultant churning can cause extra loss, high temperatures, and oxidized oil. If, during operation, the oil level goes above the maximum shown on the sight gage, drain enough oil to bring the level back within the operating range.

Do not permit the operating level to fall below the minimum shown on the gage. Should it ever become necessary to add excessive amounts of make-up oil, investigate immediately for oil leaks.

Change oil at regular intervals. The time between oil changes depends upon the severity of operating conditions and, hence, must be determined by the motor user. Two changes a year is average, but special conditions such as high ambient temperature may require more frequent changes. Avoid operating motor with oxidized oil.

Select the proper grade of oil from the lubrication nameplate or the special lubrication instructions which accompany each motor. A good grade, oxidation-corrosion inhibited turbine oil having a viscosity of 150 SUS at 100 F and 45 SUS at 210 F is usually specified for ball bearings and is covered by GE Specification D6B6A. A tag attached to the motor lists specific recommendations.

Operation in ambient temperatures that are near or below freezing may require preheating the oil or the use of a special oil.

Oil-lubricated bearing housings are provided with large settling chambers in which dust, dirt, and sludge collect. Unless the oil has been permitted to oxidize, the draining of the old oil during regular changes will usually provide sufficient cleaning action.

Whenever the motor is disassembled for general cleaning and reconditioning, the bearing housing may be washed out with a suitable cleaning solvent. Refer to the mixture described under "Insulation Care." Be sure that the oil metering hole is clear, and then dry the housing thoroughly before reassembly.

Vertical, High-thrust Induction Motors, GEH-3291E

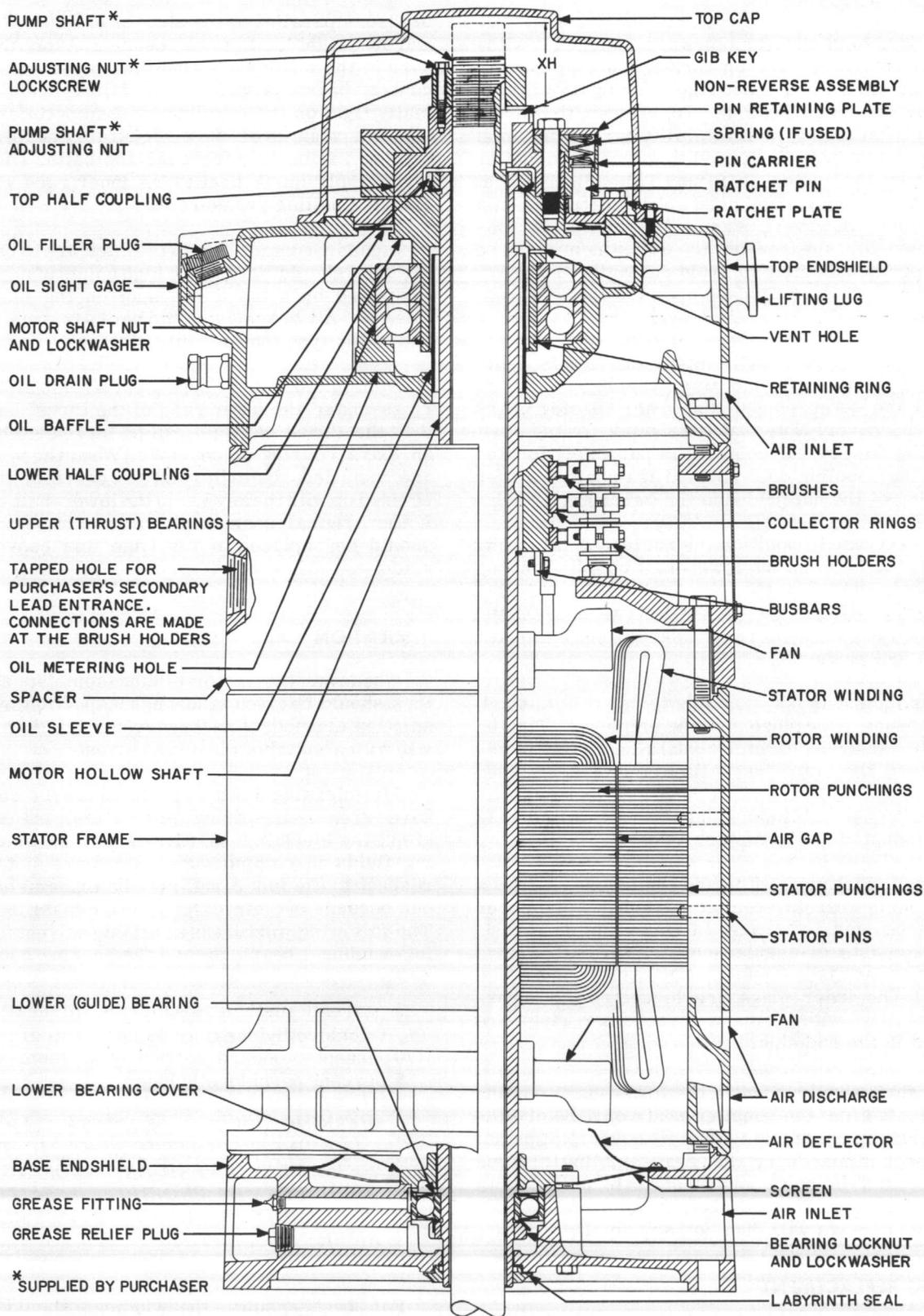


Fig. 6. Typical hollow-shaft Type M motor with non-reverse coupling. (Self-release type coupling shown in Fig. 3.)

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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 small amount by positioning the motor shaft nut. 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. The procedure depends upon the type of thrust bearing.

Refer to Fig. 2. When the motor shaft nut is tightened, the rotor, shaft, and lower bearing are drawn up until the outer ring of the lower bearing bears against its cover. Note that the shoulder on the shaft under the lower-half coupling is purposely located so that the coupling does not seat against it. Further tightening of the nut preloads the bearings.

The best way to position the nut is by trial, using an indicator between the lower-half coupling and top end shield, and lifting the rotor to check the end-play after each setting of the nut until between 0.002 and 0.005 inch is obtained. The nut should then be locked with its lockwasher.

If equipment is not available to use this method, the following procedure may be employed. Tighten the motor shaft nut carefully until all end-play is removed and the rotor just fails to turn freely. Then back the nut off one-sixth turn and lock with its washer. An assembly nameplate giving this information is mounted on the motor.

Motors which must withstand continuous up-thrust have a somewhat different construction. The upper (thrust) bearing is arranged to take this up-thrust, and it consists of angular-contact thrust bearings arranged for face-to-face (DF) mounting. (See Fig. 5.) The inner rings are locked on the lower-half coupling with a nut and the outer rings are clamped in the end shield with a ring.

The shaft shoulder under the lower-half coupling is so located that the coupling seats on it before the lower bearing comes up against its cover. No special adjustment is necessary when reassembling this type of motor, and the motor shaft nut can be pulled down tight and locked. The end-play of motors using DF-mounted bearings will then be very small.

BEARING REPLACEMENT

In general, replacement bearings should be of the same type, and installed in the same relative position, as the original bearings.

When removing bearings, apply steady, even pressure parallel to the shaft or lower-half coupling and at a right angle to the bearing. Apply this pressure to the inner race whenever possible. Angular-contact bearings which have failed, and are especially tight on the coupling, will sometimes yield to the following procedure. Separate the bearing by forcing the outer race over the balls. Then with a torch apply quick heat to the inner race while also applying pulling pressure.

Angular-contact bearings which are to be stacked together should have their high points of eccentricity (indicated by a burnished spot on the inner race) lined up. All bearings should be of same manufacture and of the type that permits stacking.

Some motors are supplied with removable spacer rings under the outer race of the thrust bearing so that the thrust capacity can be increased by adding an extra bearing or bearings. When these bearings are installed, the high points of eccentricity should be lined up with the keyway in the lower-half coupling. If the original bearings have been in service, they should be replaced at the time this conversion is made.

INSULATION CARE

Whenever the motor is disassembled, the windings should be given a thorough inspection and the insulation cleaned, if necessary, using 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.

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Vertical, High-thrust Induction Motors, GEH-329IE

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

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 non-linting 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 con-

ductors 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 INRUSH 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, 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 sales office of the General Electric Company.

PUMP & LIGHTING CO.
ENGINEERED PRODUCTS DIV.
P. O. BOX 2504
HICKORY, NC 28603

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ALASKA † Anchorage 99501 115 Whitney Rd.	MARYLAND * † Baltimore 21201 1 N. Charles St.	OREGON † Eugene 97401 1170 Pearl St. * † Portland 97210 2929 NW 29th Ave.
ARIZONA * † Phoenix 85012 3550 N. Central Ave. † Tucson 85716 151 S. Tucson Blvd.	MASSACHUSETTS * † Wellesley 02181 1 Washington St.	PENNSYLVANIA * Allentown 18102 1444 Hamilton St. * † Philadelphia 19102 3 Penn Center Plaza * † Pittsburgh 15222 300 6th Avenue Bldg.
ARKANSAS † North Little Rock 72119 120 Main St.	MICHIGAN * † Detroit 48202 700 Antoinette St. * † Jackson 49201 210 W. Franklin St. † Saginaw 48607 1008 Second National Bank Bldg.	SOUTH CAROLINA * † Columbia 29204 2700 Middleburg Dr. † Greenville 29507 41 No. Pleasantburg Dr.
CALIFORNIA * † Los Angeles 90054 212 N. Vignes St. † Palo Alto 94303 960 San Antonio Rd. † Sacramento 95808 2407 J St. † San Diego 92103 2560 First Ave. * † San Francisco 94119 55 Hawthorne St. * † Vernon 90058 3035 E. 46th St.	MINNESOTA * † Duluth 55802 300 W. Superior St. * † Minneapolis 55416 1500 Lilac Drive So.	TENNESSEE * † Chattanooga 37411 5800 Bldg, Eastgate Center † Memphis 38130 3365 Airways Blvd.
COLORADO * † Denver 80206 201 University Blvd.	MISSOURI * † Kansas City 64199 911 Main St. * † St. Louis 63101 1015 Locust St.	TEXAS * † Amarillo 79101 303 Polk St. * † Beaumont 77704 1385 Calder Ave. * † Corpus Christi 78401 205 N. Chaparral St. * † Dallas 75222 8101 Stemmons Freeway * † El Paso 79945 215 N. Stanton * † Fort Worth 76102 408 W. Seventh St. * † Houston 77027 4219 Richmond Ave. † San Antonio 78204 434 S. Main St.
CONNECTICUT * † Meriden 06450 1 Prestige Dr.	MONTANA † Butte 59701 103 N. Wyoming St.	UTAH † Salt Lake City 84111 431 S. Third East St.
FLORIDA † Jacksonville 32203 4040 Woodcock Dr. † Miami 33134 4100 W. Flagler St. * † Tampa 33609 2106 S. Lois Ave.	NEBRASKA * † Omaha 68102 409 S. 17th St.	VIRGINIA * † Newport News 23601 311 Main St. † Richmond 23230 1508 Willow Lawn Dr. † Roanoke 24015 2018 Colonial Ave.
GEORGIA * † Atlanta 30309 1860 Peachtree Rd., NW † Savannah 31405 5002 Paulsen St.	NEW JERSEY * † Millburn 07041 25 E. Willow St.	WASHINGTON * † Seattle 98188 112 Andover Park East, Tukwila † Spokane 99202 E. 1805 Trent Ave.
HAWAII * † Honolulu 96813 440 Coral St.	NEW YORK † Albany 12205 15 Computer Drive, West * † Buffalo 14205 625 Delaware Ave. * † X New York 10022 641 Lexington Ave. * † Rochester 14604 89 East Ave. * † Syracuse 13206 3532 James St.	WEST VIRGINIA * † Charleston 25328 306 MacCorkle Ave., SE
ILLINOIS * † X Chicago 60680 840 S. Canal St.	NORTH CAROLINA * † Charlotte 28207 141 Providence Rd. * † Wilmington Reigelwood 28456 P. O. Box 186	WISCONSIN * † Appleton 54911 3003 West College Dr. † Milwaukee 53202 615 E. Michigan St.
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KENTUCKY † Louisville 40218 2300 Meadow Dr.		

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ARIZONA • (Phoenix) Glendale 85019 4911 W. Colter St. • Phoenix 85019 3840 W. Clarendon St. • Tucson 85713 2942 So. Palo Verde Ave.	MARYLAND • Baltimore 21230 920 E. Fort Ave.	OREGON • Eugene 97402 570 Wilson St. • Portland 97210 2727 NW 29th Ave.
CALIFORNIA • Los Angeles 90301 6900 Stanford Ave. • (Los Angeles) Anaheim 92805 3601 E. LaPalma Ave. • (Los Angeles) Inglewood 90301 228 W. Florence Ave. • Sacramento 95814 99 North 17th St. • (San Francisco) Oakland 94608 1650 34th St.	MASSACHUSETTS • (Boston) Medford 02155 3960 Mystic Valley Pkwy.	PENNSYLVANIA • Allentown 18103 668 E. Highland St. • (Delaware Valley) Cherry Hill, N. J., 08034 1790 E. Marlton Pike • Johnstown 15802 841 Oak St. • Philadelphia 19124 1040 East Erie Ave. • (Pittsburgh) West Mifflin 15122 4930 Buttermilk Hollow Rd. • York 17403 54 N. Harrison St.
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CONNECTICUT • (Southington) Plantsville 06479 370 Atwater St.	MINNESOTA • Duluth 55807 50th Ave. W & St. Louis Bay • Minneapolis 55430 2025 49th Ave., N.	TENNESSEE • Knoxville 37914 2621 Governor John Sevier Hwy. • Memphis 38107 708 North Main St.
FLORIDA • Jacksonville 32203 2020 W. Beaver St. • (Miami) Hialeah 33010 1062 East 28th St. • Tampa 33601 19th & Grant Sts.	MISSOURI • Kansas City 64120 3525 Gardner Ave. • St. Louis 63110 1115 East Rd.	TEXAS • Beaumont 77705 1490 W. Cardinal Dr. • Corpus Christi 78401 115 Waco St. • Dallas 75235 3202 Manor Way • Houston 77036 5534 Harvey Wilson Dr. • Houston 77036 6916 Harwin Dr. • Midland 79701 704 S. Johnston St.
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KENTUCKY • Louisville 40209 3900 Crittenden Drive	OHIO • Akron (Canton) 44720 7900 Whipple Ave. N. W. • Cincinnati 45202 444 West 3rd St. • Cleveland 44125 4477 East 49th St. • Columbus 43229 6660 Huntley Rd. • Toledo 43605 405 Dearborn Ave. • Youngstown 44507 272 E. Indianola Ave.	WISCONSIN • Appleton Menasha 54910 1725 Racine St. • Milwaukee 53207 235 W. Oklahoma Ave.

• Electrical/Mechanical Service Shop • Instrumentation Shop • Special Manufacturing Shop

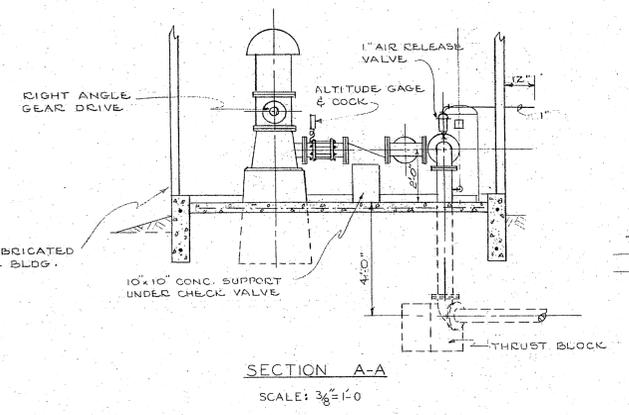
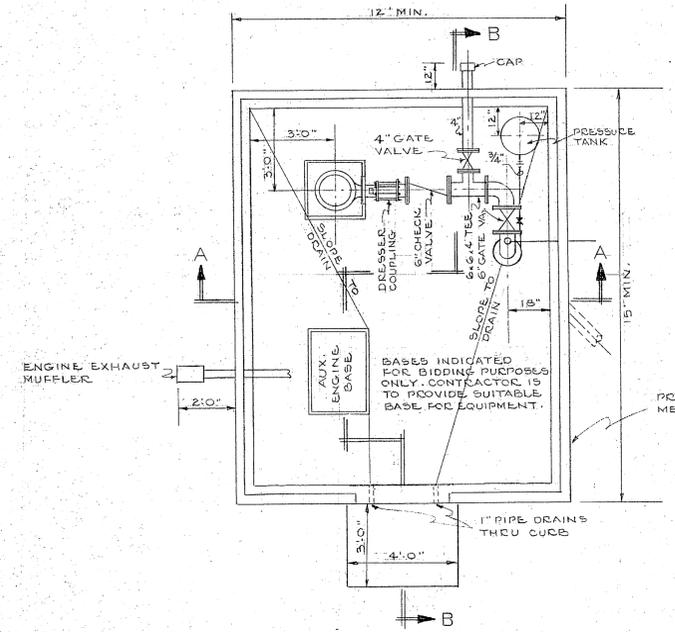
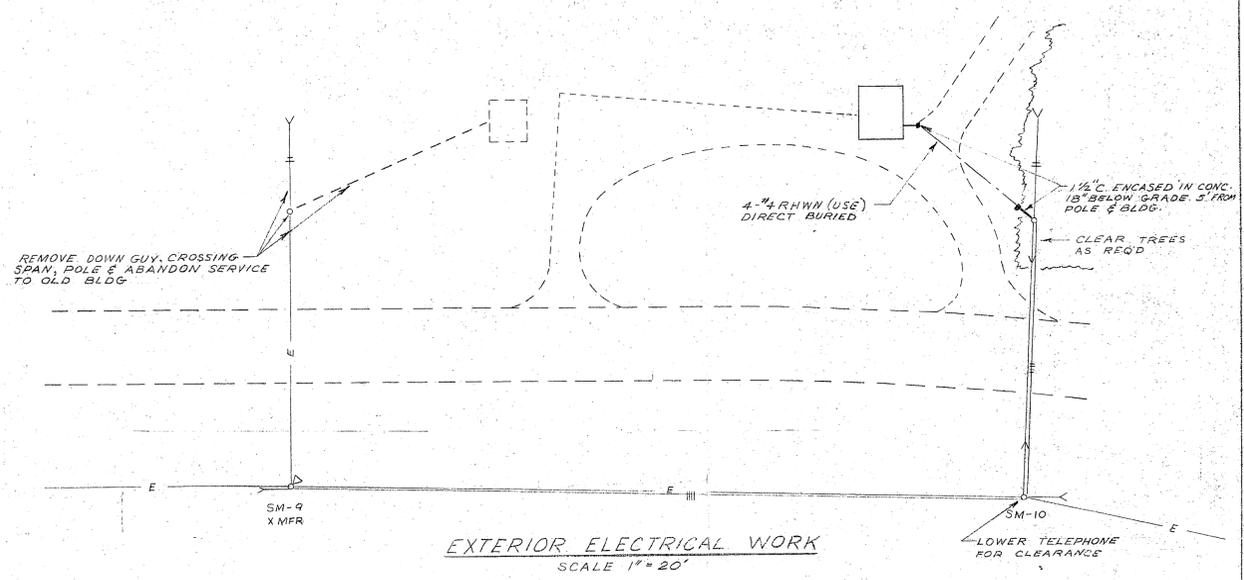
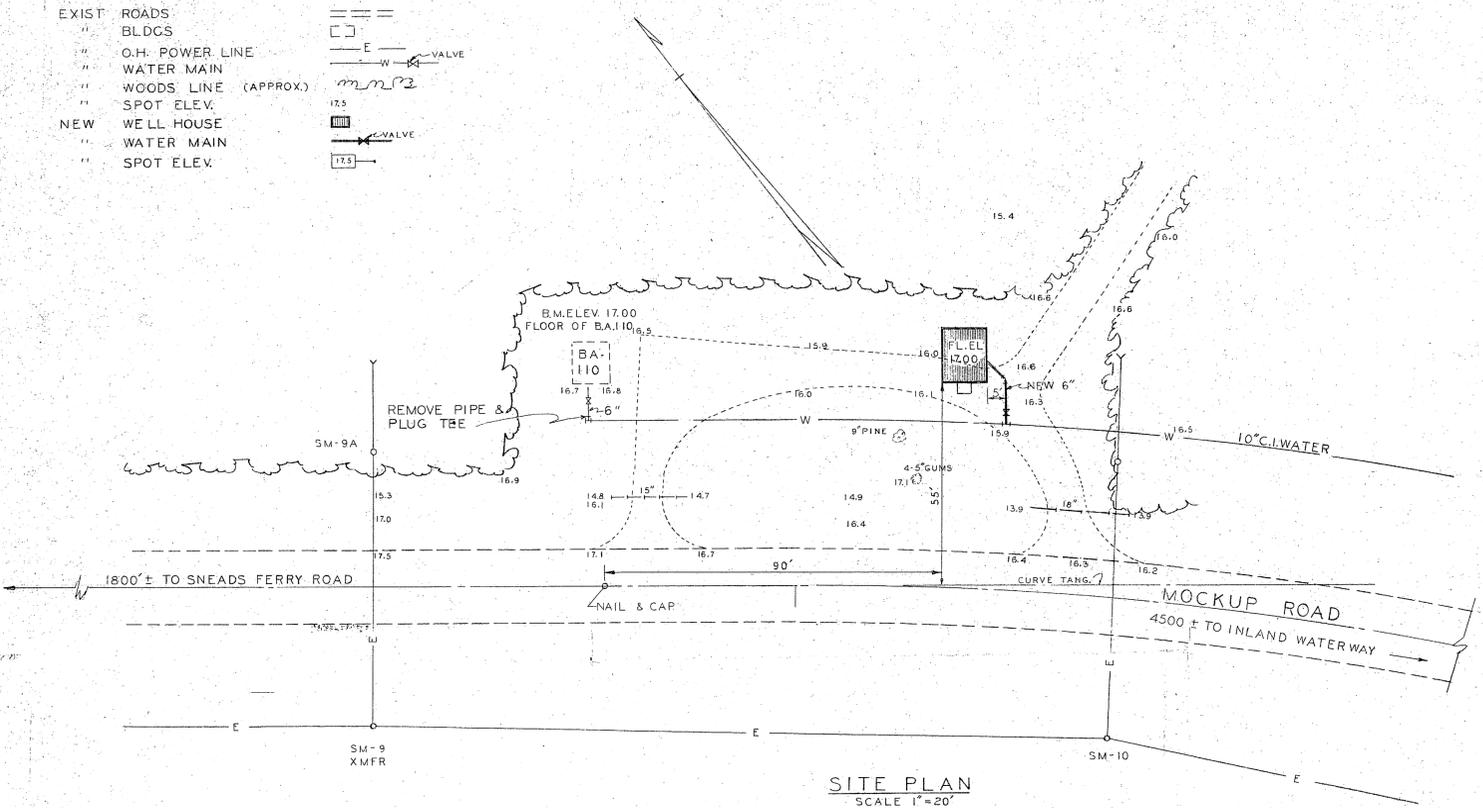
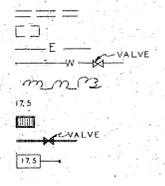
11-70 (50M)

GENERAL ELECTRIC COMPANY • VERTICAL MOTOR PRODUCTS SECTION • SAN JOSE MOTOR PLANT
SAN JOSE, CALIFORNIA 95114

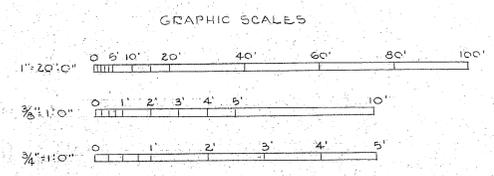
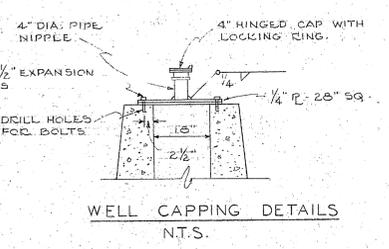
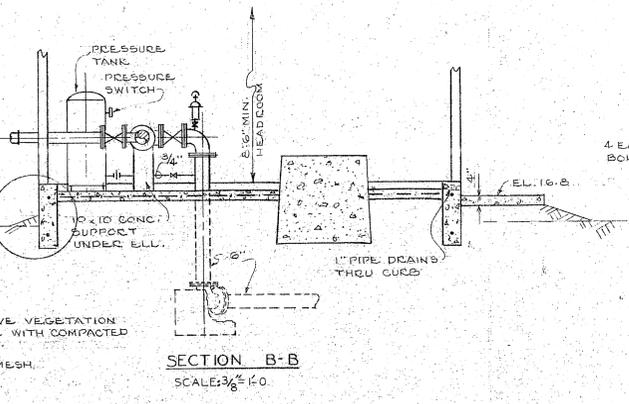
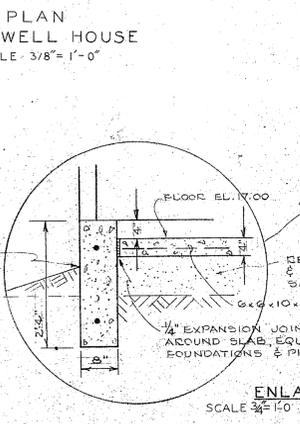
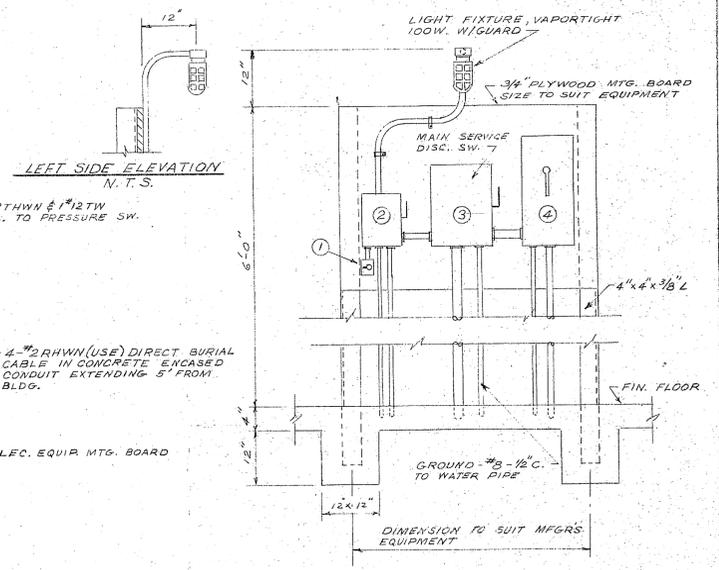
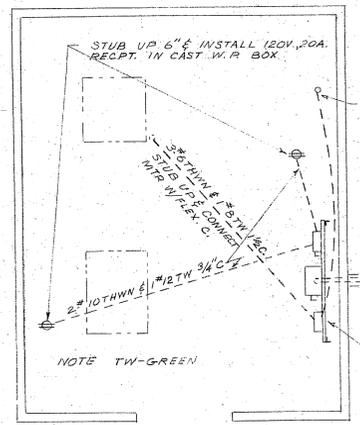
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVED

SITE LEGEND

- EXIST. ROADS
- BLDCS
- O.H. POWER LINE
- WATER MAIN
- WOODS LINE (APPROX.)
- SPOT ELEV.
- NEW WELL HOUSE
- WATER MAIN
- SPOT ELEV.



- ELECTRICAL NOTES & SYMBOLS**
- SWITCH, TOGGLE, 15A, 125V. IN CAST W.R. BOX.
 - SWITCH, SAFETY DISCONNECT, BR, 3W (2 FUSES & NEUTRAL) 30A., 240V., NEMA 4.
 - SWITCH, SAFETY DISCONNECT 3P., 3W (3 FUSES & NEUTRAL) 200A., NEMA 4.
 - STARTER, A.C. MAGNETIC, LINE VOLTAGE START 3Ø, 2ØBY., NEMA SIZE 2, NEMA 4 ENCLOSURE W/ UNFUSED DISCONNECT SW.
- EXISTING POLE
 - EXISTING DOWN GUY
 - E EXISTING SW., 3Ø, 12470V. PRI. CIRCUIT TO REMAIN.
 - D EXISTING TRANS. BANK TO REMAIN.
 - EXISTING SPAN GUY TO REMAIN.
 - NEW UNDERGROUND SERVICE, 4-#4 RHWN (USE)
 - NEW 4-#2 M.H.D. BARE CU, 3Ø, 120/2ØBY. SECONDARY
 - NEW 3/8" H.S. GALV. DOWN GUY W/ 8" ANCHOR.



PUBLIC WORKS DEPT. MARINE CORPS BASE CAMP LEJEUNE, N.C.		DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND ATLANTIC DIVISION NORFOLK, VIRGINIA	
DESIGNED BY: [Signature]		PROJECT: MARINE CORPS BASE, CAMP LEJEUNE, N.C.	
APPROVED: [Signature]		DATE: 3/1/71	
PUBLIC WORKS OFFICER: [Signature]		DATE: 3/1/71	
COMMANDING GENERAL: [Signature]		SIZE: CODE IDENT NO: NAWAC DRAWING NO: 1244059	
F 80091		CONSTR. CONTR. NO: N62470-71-B-0525	
SCALE: GRAPHIC		SPEC: 05-71-0525	
SHEET 1 OF 1		ENCLOSURE (1)	

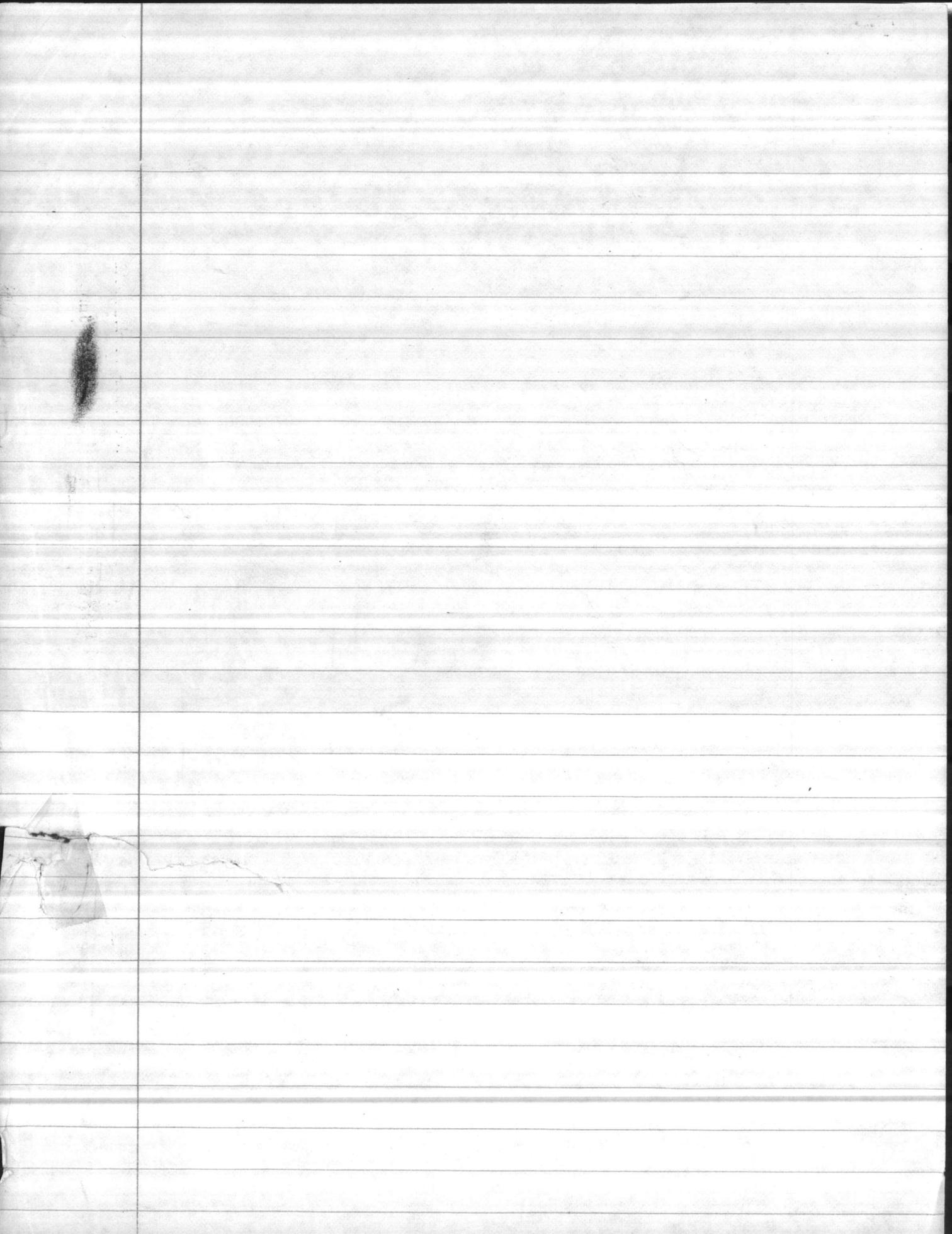


5 Courthouse Bay BB 190

Present 2 well system capacity	425,000 GPD
Present average daily demand	350,000 GPD
Present Peak daily demand	450,000 GPD
Plant Capacity	600,000 GALS
Total Storage	450,000 GALS

6 Onslow Beach BA 138

Present 2 well system capacity	350,000 GPD
Present average daily demand	80,000 GPD
Present Peak daily demand	100,000 GPD
Plant Capacity	250,000 GPD
Total Storage	350,000 GALS



DEPARTMENT OF THE NAVY
NAVAL FACILITIES
ENGINEERING COMMAND

N62470-71-B-0525

NAVFAC
SPECIFICATION
NO. 05-71-0525
ADDENDUM NO. 2

REPAIR WELL BA-110, ONSLOW BEACH

at the

Marine Corps Base, Camp Lejeune, North Carolina

DIVISION 1. GENERAL REQUIREMENTS

SECTION 1A. GENERAL PARAGRAPHS

1A.10x Minimum wage rates and other labor standards. Delete the first sentence in its entirety beginning with "The minimum wages...." and substitute the following sentences in lieu thereof: "The Contractor shall pay mechanics and laborers employed or working directly upon the site of the work wage rates not less than those contained in the wage determination decision of the Secretary of Labor No. AK-17,094. Rates for General Building Construction apply to this contract." A copy of the Secretary of Labor Decision No. AK-17,094 is attached to this addendum.

NOTICE

Each bidder shall refer in his bid to all addenda; failure to do so may constitute an informality in the bid.

Camp Lejeune, North Carolina

W. F. RUSSELL, CAPT, CEC, USN
Officer in Charge of Construction
26 April 1971

AS BUILT

DATE: 17 May 72

05-71-0525 - 1

ADD. NO. 2

Chen Summerlin
INSPECTOR

Caroline Russell of Pump Co
CONTRACTOR

ENCLOSURE (2)

Vertical text on the left margin, possibly a page number or reference code.

	AS-1011-2A
	INSPECTOR
	COORDINATOR

DEPARTMENT, AGENCY, OR BUREAU	DECISION NO.
Dept. of the Navy, Naval Facilities Engineering Command	AK-17094
LOCATION OF PROJECT (CITY OR OTHER DESCRIPTION)	DATE OF DECISION
Camp Lejeune and New River	4-13-71
STATE	COUNTY
North Carolina	Onslow
DESCRIPTION OF WORK:	EXPIRES
General building construction, heavy and highway.	8-10-71
	SUPERSEDES DECISION NO.

67 - NC - 1 - Y

BUILDING CONSTRUCTION	BASIC HOURLY RATES	FRINGE BENEFITS PAYMENTS			
		H & W	PENSIONS	VACATION	APP. TR
Asbestos workers	\$5.50	.15			
Boilermakers	6.25	.30	.50		.01
Boilermakers helpers	6.00	.30	.50		.01
Bricklayers	4.45				
Carpenters	2.98				
Cement masons	3.00				
Electricians	3.00				
Elevator constructors	5.12	.17	.185	1%+a+b	.005
Elevator constructors' helpers	3.58	.17	.185	1%+a+b	.005
Elevator constructors' helpers (prob.)	2.56				
Glaziers	2.25				
Ironworkers, structural, ornamental & Reinforcing	2.75				
LABORERS:					
Air tool operator (jackhammer, vibrator), common laborer	1.75				
Mason tender	2.15	.10			
Pipelayers	1.75				
Lathers	4.60				.01
Marble setters, tile setters & terrazzo workers	3.00				
Marble setters' helpers, tile & terrazzo helpers	1.75				
PAINTERS:					
Brush	2.78				
Plasterers	4.25				.01
Plumbers	5.25	.15	.10		.01
Roofers	1.80				
Sheet metal workers	2.65				
Soft floor layers	2.75				
Sprinkler fitters	4.425	.11	.10		.02
Steamfitters	5.25	.15	.10		.01
Truck drivers	1.75				
POWER EQUIPMENT OPERATORS:					
Backhoes & shovels	2.25				
Bulldozers	2.25				
Cableway, derricks, boom hoists & Draglines	2.125				
Cranes	3.75				
Dredging and other floating equipment	2.25				
Front end loaders & motor graders	2.00				

BUILDING CONSTRUCTION (continued)

67 - NC - 1 - Y

BASIC HOURLY RATES	FRINGE BENEFITS PAYMENTS			
	H & W	PENSIONS	VACATION	APP. TR

Hoist, double drum	1.875
Mechanics and Piledrivers	2.00
Pavers, trenching machines & truck cranes	2.125
Rollers, earth	1.75
Scrapers, wheel type	2.00
Tractors with attachments	2.50
Tractors without attachments	1.875

WELDERS - receive rate prescribed for craft performing operation to which welding is incidental.

Paid Holidays (where applicable):

A-New Years' Day; B-Memorial Day; C-Independence Day; D-Labor Day; E-Thanksgiving Day; F-Christmas Day.

FOOTNOTES:

a - Employer contributes 4% of basic hourly rate for 5 years or more of service or 2% basic hourly rate for 6 months to 5 years of service as vacation pay credit.

b - Holidays: A through F.

67-N.C.-2-3-C

HEAVY CONSTRUCTION

	PER HOUR		PER HOUR
BRICKMASONS	\$3.00	POWER EQUIPMENT OPERATORS:	
BRICKMASON, MANHOLE	1.625	AIR COMPRESSORS	\$1.60
CARPENTERS	1.70	BACKHOE	2.00
CEMENT FINISHERS	1.875	BULLDOZERS	2.375
FORM SETTERS	2.00	CRANES, DERRICKS, DRGLS.	2.75
IRON WORKERS, REINF.	1.75	CONCRETE PAVER OPERATOR	2.00
LABORERS:		FRONT END LOADER	1.75
Laborers, unskilled	1.60	GRADALL	1.875
Air Tool Operators	1.60	MECHANIC	1.60
Mason Tenders	1.60	MOTOR GRADERS	1.75
Mortar Mixers	1.60	PUMPS	1.60
Pipelayers, Conc. & Clay	1.60	ROLLERS	1.60
Asphalt Rakers	1.60	SCRAPERS	2.50
Mechanic	2.00	SHOVELS	2.125
PAINTERS, BRUSH	1.75	TRACTORS, WHEEL TYPE FARM	1.60
RAKERS (ASPHALT)	1.60		
TRUCK DRIVERS	1.60		

Welders - Rate for craft

HIGHWAY CONSTRUCTIONBASIC
HOURLY RATES

Asphalt raker	\$ 2.52
Asphalt laydown man	2.10
Builder-curb & gutter, etc.	2.35
Carpenters	3.00
Carpenter helper	2.59
Concrete finisher	2.97
Concrete rubber	2.75
Electrician	3.63
Fireman	2.60
Formsetter road	3.00
Groundman	2.60
Ironworker, reinforcing	2.75
Laborer, common	2.00
Linemen	3.58
Lute man	2.52
Mason	3.75
Mechanic	3.00
Mechanic helper	2.49
Oiler	3.33
Painter	2.25
Painter, bridge	3.85
Piledriver leadsman	2.80
Pipelayer	2.38
Powderman	3.00
<u>POWER EQUIPMENT OPERATORS:</u>	
Asphalt distributor	2.50
Asphalt paver	3.00
Asphalt plant	2.43
Asphalt plant helper	1.85
Bulldozer	3.00
Bulldozer (utility)	2.75
Concrete finishing machine	2.75
Concrete paving machine	3.25
Concrete plant operator	3.25
Concrete saw	2.92
Concrete spreader	3.00

HIGHWAY CONSTRUCTION
POWER EQUIPMENT OPERATORS (Cont'd)BASIC
HOURLY RATES

Crane, backhoe, dragline & shovel 1 yard and under	\$ 3.00
Over 1 yard	3.00
Crusher feeder	1.85
Curb machine operator	2.25
Drill operator	3.00
Greaseman	2.60
Hydro seeder	2.50
Loader	2.82
Machine-concrete curing	2.50
Mixer box	2.35
Motor grader (fine grade)	3.25
Motor grader (rough grade)	3.00
Pilot vehicle	1.93
Power tool	2.00
Roller	2.22
Roller (finish)	2.61
Rotary drill	3.13
Scraper	3.00
Screed, asphalt	2.78
Stone spreader	2.79
Subgrade machine	2.75
Sweeper	2.15
Tractor, crawler	2.00
Tractor operator (utility)	2.51
Tug boat operator	3.15
Weighman, truck scales	1.80
<u>Truck drivers:</u>	
Single-rear axle	2.16
Multi-rear axle	2.20
Concrete	2.75
Heavy duty	2.25
Welder	3.00

U. S. DEPARTMENT OF LABOR
OFFICE OF THE SECRETARY
WASHINGTON

AK-17094

DECISION OF THE SECRETARY

This case is before the Department of Labor pursuant to a request for a wage predetermination as required by law applicable to the work described.

A study has been made of wage conditions in the locality and based on information available to the Department of Labor the wage rates and fringe payments listed are hereby determined by the Secretary of Labor as prevailing for the described classes of labor in accordance with applicable law.

This wage determination decision and any modifications thereof during the period prior to the stated expiration date shall be made a part of every contract for performance of the described work as provided by applicable law and regulations of the Secretary of Labor, and the wage rates and fringe payments contained in this decision, including modifications, shall be the minimums to be paid under any such contract by contractors and subcontractors on the work.

The contracting officer shall require that any class of laborers and mechanics which is not listed in the wage determination and which is to be employed under the contract, shall be classified or reclassified conformably to the wage determination, and a report of the action taken shall be sent by the Federal agency to the Secretary of Labor. In the event the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers and mechanics to be used, the question accompanied by the recommendation of the contracting officer shall be referred to the Secretary for determination.

Before using apprentices on the job the contractor shall present to the contracting officer written evidence of registration of such employees in a program of a State apprenticeship and training agency approved and recognized by the U.S. Bureau of Apprenticeship and Training. In the absence of such a State agency, the contractor shall submit evidence of approval and registration by the U.S. Bureau of Apprenticeship and Training.

The contractor shall submit to the contracting officer written evidence of the established apprentice-journeyman ratios and wage rates in the project area, which will be the basis for establishing such ratios and rates for the project under the applicable contract provisions.

Fringe payments include medical and hospital care, compensation for injuries or illness resulting from occupational activity, unemployment benefits, life insurance, disability and sickness insurance, accident insurance (all designated as health and welfare), pensions, vacation and holiday pay, apprenticeship or other similar programs and other bona fide fringe benefits.

By direction of the Secretary of Labor,
/s/ Alfred L. Ganma
ALFRED L. GANMA, Director
Division of Wage Determinations
Workplace Standards Administration

REPAIR WELL BA-110, ONSLOW BEACH
at the
Marine Corps Base, Camp Lejeune, North Carolina

On Page 2:

Under "CONTENTS", add the following new Division:

- "8. Finishes
SECTION
8A. Field Painting".

DIVISION 1. GENERAL REQUIREMENTS

SECTION 1A. GENERAL PARAGRAPHS

1A.9 Information required of the Contractor. Immediately following this paragraph, add the following new paragraph and renumber the succeeding paragraphs accordingly:

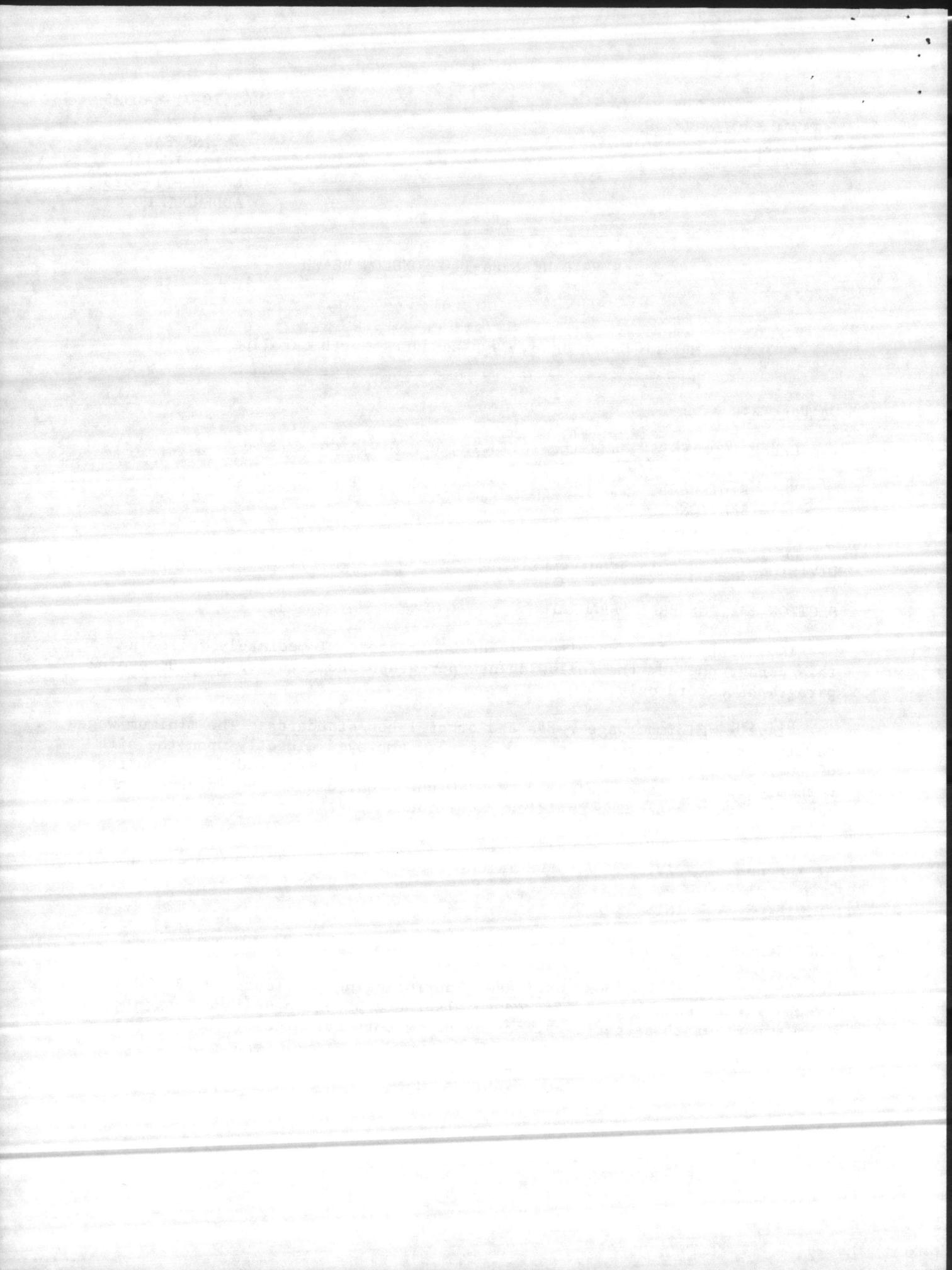
"1A.10x Minimum wage rates and other labor standards. The minimum wages required to be paid mechanics and laborers employed directly upon the site of the work will be attached to this specification by an addendum upon the determination of such minimum wages. Other requirements and information are contained in the section entitled "Additional General Paragraphs"."

At the end of "DIVISION 7. ELECTRICAL", add the following new Division:

"DIVISION 8. FINISHES

"SECTION 8A. FIELD PAINTING

"8A.1 Applicable publications. The following publications of the issues listed below, but referred to elsewhere by basic designation only, form a part of this specification to the extent indicated by the references



thereto (where a number is suffixed to the specification number, it denotes the effective amendment to the specification):

Government Specifications and Standards.

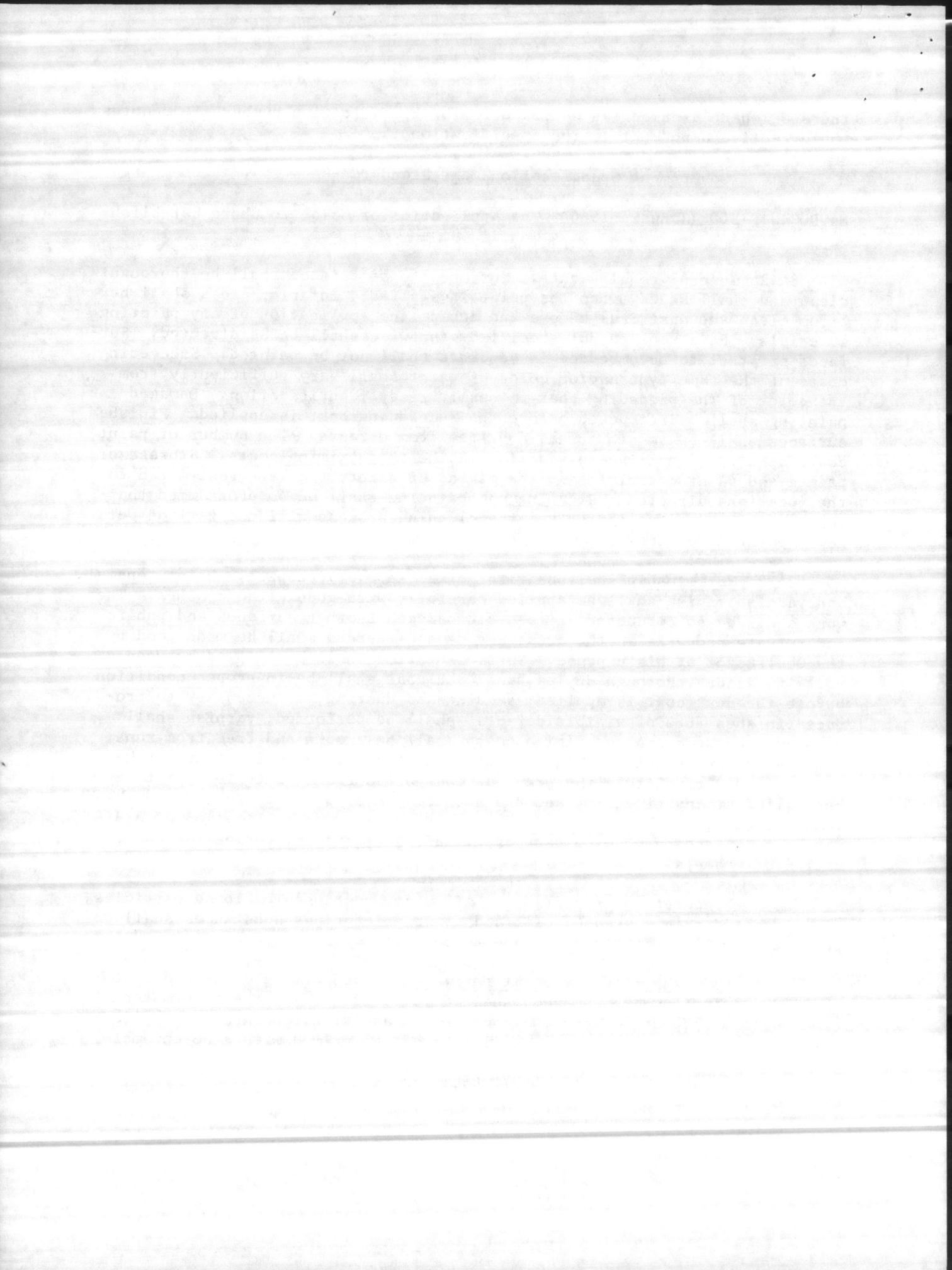
NAVDOCKS P-309 (January 1966) The Application of Color to Shore Establishment.

"8A.2 General requirements. Surfaces to be painted shall be thoroughly clean and shall be dry when the paint is applied. Interior areas shall be broom clean and dust free before and during the application of any painting materials. Paint colors not specified otherwise shall be as directed. Surfaces of steel to be embedded in concrete shall not be painted. Succeeding coats of the same type and/or color of paint shall vary sufficiently from the color of the preceding coat to permit ready identification. Damaged painting shall be retouched before the succeeding coat is applied. Finished surfaces shall be smooth, even, and free from defects. The number of paint coats specified shall be in addition to the shop-priming coats. Storage of paints and paint materials and the mixing of paints shall be restricted to the locations directed. Cleaning and painting shall be so programmed that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

"8A.3 Workmanship shall be first class in every respect. Paint, enamel, and varnish finish shall be applied carefully with good clean brushes. The work shall be so conducted as to avoid damage of other surfaces and public and private property in the area; any damage thereto shall be made good by the Contractor at his expense. Sufficient time shall be allowed between coats to assure thorough drying, and each coat shall be in proper condition before the next coat is applied; sanding and dusting, as necessary to produce finishes free of visible defects, shall be performed; varnish shall be sanded between coats. Finish coats shall be smooth and free from runs, sags, or other defects. Each coat of paint shall be of sufficient thickness to cover completely the previous coat or surface. Interior paint may be applied at any time provided the surfaces to be painted are dry and the temperature can be kept above 45 degrees F. during the application of ordinary paints, and between 65 degrees F. and 95 degrees F. during the application of enamels.

"8A.4 Preparation of surfaces. All dirt, rust, scale, loose particles, disintegrated paint, grease, oil, and other deleterious substances shall be removed from all surfaces which are to be painted or otherwise finished.

"8A.5 Painting interior metal surfaces. Shop priming coats and factory applied coatings, where damaged, shall be touched up with the same material used for the shop or factory coatings before additional paints are applied. Any surfaces not shop or factory primed shall be primed with zinc-chromate



primer prior to finish painting. Surfaces fully factory finished, that is, having finish coatings in addition to the prime coating, shall be restored to their original finished condition wherever damaged and additional painting will not be required.

"8A.5.1 Primed metal surfaces shall be given two coats of gloss enamel.

"8A.5.2 Varnished piping, valves, and fittings shall be given one prime coat of aluminum paint and two coats of gloss enamel.

"8A.5.3 Electrical switches and control panels shall be color painted to conform to NAVDOCKS P-309, The Application of Color to Shore Establishment requirements. Zinc-coated electric conduit, boxes and fittings do not require painting.

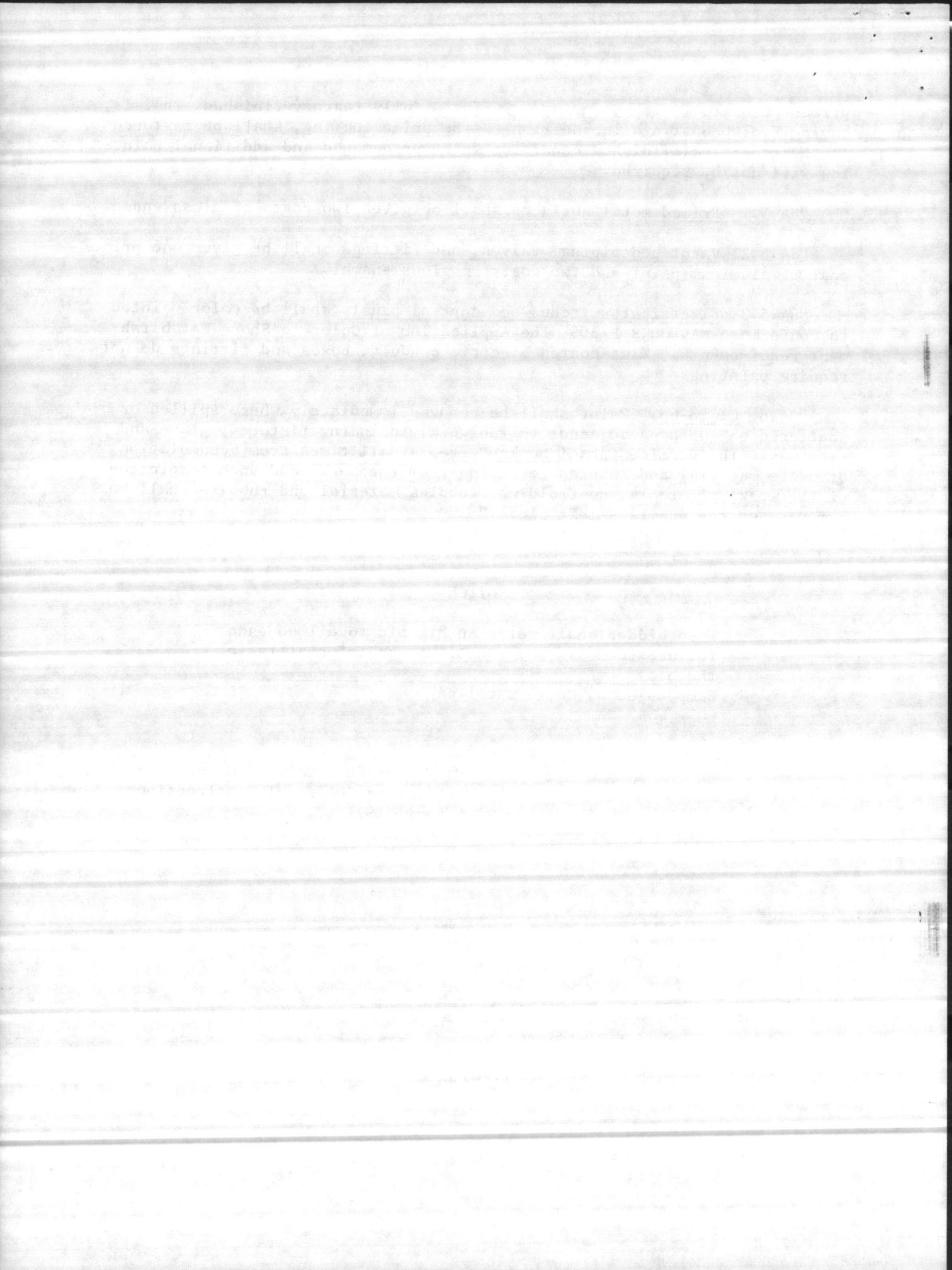
"8A.6 Clean-up. Paint shall be removed immediately where spilled or spattered on surfaces adjacent to the work, including fixtures, glass and fittings. The premises shall be kept free at all times from accumulation of waste material and rubbish resulting from the work, and upon completion of the work, all tools, scaffolding, surplus material and rubbish shall be removed and the premises left clean."

NOTICE

Each bidder shall refer in his bid to all addenda;
failure to do so may constitute an informality in
the bid.

Camp Lejeune, North Carolina

W. F. RUSSELL, CAPT, CEC, USN
Officer in Charge of Construction
5 April 1971



NOTICE:

Bids to be opened at 2:00 p.m., e.d.s.t.

MAY 13 1971 at the Office of
Officer in Charge of Construction
Jacksonville, North Carolina Area
Building 1005, Marine Corps Base
Camp Lejeune, North Carolina 28542

N62470-71-B-0525

NAVFAC
SPECIFICATION
NO. 05-71-0525

REPAIR WELL BA-110, ONSLOW BEACH

at the

Marine Corps Base, Camp Lejeune, North Carolina

Appropriation: 1711106.2720

A priority rating will apply to this contract upon award. The Contractor shall follow the provisions of DMS Reg. 1 and all other applicable regulations and orders of Business and Defense Services Administration in obtaining controlled materials and other products and materials needed to perform this contract.

All questions concerning the plans and specifications occurring prior to bid opening shall be presented to the Director of Design Division, Public Works Department, Building 1005, Marine Corps Base, Camp Lejeune, North Carolina, telephone, Jacksonville, North Carolina, 346-2111, extension 5668, area code 919. Questions requiring interpretation of drawings and specifications must be submitted at least 7 days before bid opening. Interpretations or modifications to specifications made as a result of questions will be made by addendum only, and unless so done, all bidders should base their bids on the plans and specifications as issued.

All questions pertaining to bidding and for prior appointment to inspect the site of the work before bid opening shall be presented to the Officer in Charge of Construction, Jacksonville, North Carolina Area, Building 1005, Marine Corps Base, Camp Lejeune, North Carolina, telephone, Jacksonville, North Carolina, 346-2111, extension 2581, area code 919.

The Government forms and Bureau of Yards and Docks/NAVFAC standard specifications may be obtained or examined at the Public Works Office, Building 1005, Marine Corps Base, Camp Lejeune, North Carolina. Federal and Military specifications and other non-Government materials referred to may be examined at the Public Works Office. Federal and Military specifications may be obtained from the Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120, telephone 697-3321, area code 215; requests for copies of the specifications should indicate the contract for which required.

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DIVISION 1. GENERAL REQUIREMENTS

- SECTION 1A. General Paragraphs
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SECTION 1A. GENERAL PARAGRAPHS

1A.1 General intention. It is the declared and acknowledged intention and meaning to provide and secure the repairing of raw water well, BA-110, Onslow Beach, complete and ready for use.

1A.2 General description. The work includes the provision of one new gravel-wall well, complete with prefabricated metal well house, pumping equipment, piping, connections to existing water supply mains, electrical work and other related work. The work further includes the removal of existing well house and foundations, pumping equipment, piping, wiring and other electrical devices and capping existing well.

1A.3 Location. The work shall be located at the Marine Corps Base, Camp Lejeune, North Carolina, approximately as shown. The exact location will be indicated by the Officer in Charge.

1A.4 Commencement, prosecution and completion of work. The Contractor will be required to commence work under this contract within 10 calendar days after the date of receipt by him of notice to proceed, to prosecute said work diligently, and to complete the entire work ready for use within 120 calendar days after date of receipt of a notice of award or any other communication authorizing the Contractor to proceed. The time stated for completion shall include final cleanup of the premises.

1A.5 Liquidated damages. In case of failure on the part of the Contractor to complete the work within the time fixed in the contract or any extensions thereof, the Contractor shall pay to the Government as liquidated damages pursuant to Clause 5 of Standard Form 23-A the sum of \$20 for each day of delay. (See also section entitled "Additional General Paragraphs".)

1A.6 Drawings accompanying specification. NAVFAC Drawing No. 1244059, "Plan and Details", accompanies this specification and is a part thereof. The drawing is the property of the Government and shall not be used for any purpose other than that contemplated by the specification.

1A.7 Factory inspection. (See Clause 10 of Standard Form 23-A and Clause 26 of form NAVFAC 4-4330/5.) Factory inspection of material and equipment for which tests at the place of manufacture are required may be waived at the option of the Government, if notarized copies of factory reports are furnished that show compliance with the specification

requirements. The Government reserves the right to charge to the Contractor any additional cost of Government inspection and tests when materials and equipment are not ready at the time inspection and tests are requested by the Contractor.

1A.8 Samples. As soon as practicable, and before installation, submit for approval samples of such materials and equipment as may be required, whether mentioned specifically herein or not.

1A.9 Information required of the Contractor. Specification MIL-D-1000 shall be used as a guide, and its use is encouraged, for all drawings and data submitted by the Contractor. Conformance to the provisions of specification MIL-D-1000 is not mandatory for maps, sketches, presentation drawings, perspectives, renderings, and all other drawings not requiring Naval Facilities Engineering Command drawing numbers. Submit for approval, and in accordance with Clause 67 of NAVFAC 4-4330/5, such drawings, catalog cuts, and/or descriptive data as may be required. Shop drawings shall be submitted and approval obtained before commencing the fabrication of the work. Other data requested shall be submitted and approval obtained prior to installation of the item or associated items. Information shall include, but not be limited to, the following:

1. Prefabricated metal building - manufacturer's data and shop drawings.
2. Well pump - manufacturer's data, showing dimensions, details of construction, H.P. requirements, make and H.P. rating of motor and pump characteristic curve.
3. Auxiliary gasoline engine - manufacturer's data, showing dimensions, details of construction, accessories and characteristic curve.
4. Right angle gear drive - shop drawings and manufacturer's data.
5. Air release valve - manufacturer's data.
6. Power panel - manufacturer's data and electrical characteristics.
7. Motor starter - manufacturer's data and electrical characteristics.
8. Battery charger - manufacturer's data.

1A.10 North Carolina Sales and Use Tax is required. (See also section entitled "Additional General Paragraphs".)

1A.11 Paragraph 1B.24 of Section 1B does not apply. Full size prints will be furnished to the Contractor without charge.

1A.12 Identification. All catalog cuts, shop drawings, samples and other data submitted for approval shall specifically identify the specification paragraph or contract drawing by number where each item submitted is required to be provided. All submittals shall be clearly marked in ink to indicate the specific item(s) submitted for approval.

1A.13 Disposal of materials and debris. Salvageable material removed from existing work shall be delivered as directed. Distance of haul shall not exceed 8 miles. Upon completion of the work, the Contractor shall remove all debris from the site. All debris shall be hauled to a Government dump, a distance not exceeding 8 miles from the site of the work, and placed where directed, and the premises shall be left free from all litter and refuse; exterior grounds shall be left in a clean condition.

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SECTION 1B. ADDITIONAL GENERAL PARAGRAPHS

1B.1 Form of contract. The contract will be executed on Standard Form 23, January 1961 edition, Construction Contract, and will include Standard Form 19-A, April 1965 edition, Labor Standards Provisions; Standard Form 19-B, December 1965 edition, Representations and Certifications; Standard Form 23-A, June 1964 edition, General Provisions; and Form NAVFAC 4-4330/5, (Revised 1-70), Additional General Provisions.

Clause 3 and Clause 4 of Standard Form 23-A are deleted and the following new clauses substituted in lieu thereof:

"3. CHANGES

"(a) The Contracting Officer may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make any change in the work within the general scope of the contract, including but not limited to changes:

"(i) in the specifications (including drawings and designs);

"(ii) in the method or manner of performance of the work;

"(iii) in the Government-furnished facilities, equipment, materials, services, or site, or

"(iv) directing acceleration in the performance of the work.

"(b) Any other written order or an oral order (which terms as used in this paragraph (b) shall include direction, instruction, interpretation, or determination) from the Contracting Officer, which causes any such change, shall be treated as a change order under this clause, provided that the Contractor gives the Contracting Officer written notice stating the date, circumstances, and source of the order and that the Contractor regards the order as a change order.

"(c) Except as herein provided, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment hereunder.

"(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any order, an equitable adjustment shall be made and the contract modified in writing accordingly: Provided, however, That except for claims based on defective specifications, no claim for any change under (b) above shall be allowed for any costs incurred more than 20 days before the Contractor gives written notice as therein required: And provided further, That in the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with such defective specifications.

"(e) If the Contractor intends to assert a claim for an equitable adjustment under this clause, he must, within 30 days after receipt of a written change order under (a) above or the furnishing of a written notice under (b)

above, submit to the Contracting Officer a written statement setting forth the general nature and monetary extent of such claim, unless this period is extended by the Government. The statement of claim hereunder may be included in the notice under (b) above.

"(f) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract.

"4. DIFFERING SITE CONDITIONS

"(a) The Contractor shall promptly, and before such conditions are disturbed, notify the Contracting Officer in writing of: (1) Subsurface of latent physical conditions at the site differing materially from those indicated in this contract, or (2) unknown physical conditions at the site, of an unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this contract. The Contracting Officer shall promptly investigate the conditions, and if he finds that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under this contract, whether or not changed as a result of such conditions, an equitable adjustment shall be made and the contract modified in writing accordingly.

"(b) No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required in (a) above; provided, however, the time prescribed therefor may be extended by the Government.

"(c) No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract."

Clause 5 of Standard Form 23-A is amended by adding the following sentence at the end of paragraph (d): "As used in this Clause 5(d)(1), the term "subcontractors or suppliers" means subcontractors or suppliers at any tier." The first sentence of subparagraph (a) of Clause 19 of Standard Form 23-A is amended by deleting the words "and Executive Order 10582, December 17, 1954 (3 CFR Supp.)".

Clause 21 of Standard Form 23-A

(a) Clause 21 of Standard Form 23-A is amended by deleting references to the President's Committee on Equal Employment Opportunity, Executive Order 10925 of March 6, 1961, as amended, and Section 303 of Executive Order No. 10925 of March 6, 1961, as amended, and substituting therefor the Secretary of Labor, Executive Order No. 11246 of September 23, 1965, and Section 204 of Executive Order 11246 of September 24, 1965, respectively.

(b) Clause 21 of Standard Form 23-A is amended to insert after the reference to "Executive Order 10925" the following: "or the clause contained in Section 201 of Executive Order No. 11114".

(c) The following additional footnote is added to Clause 21 of Standard Form 23-A: "In accordance with regulations of the Secretary of Labor, the rules, regulations, orders, instructions, designations, and other directives

issued by the President's Committee on Equal Employment Opportunity and those issued by the heads of various department or agencies under or pursuant to any of the Executive Orders superseded by Executive Order 11246, shall, to the extent that they are not inconsistent with Executive Order 11246, remain in full force and effect unless and until revoked or superseded by appropriate authority. References in such directives to provisions of the superseded orders shall be deemed to be references to the comparable provisions of Executive Order 11246.

The following new clauses are added to form NAVFAC 4-4330/5(1-70):

"102. SUSPENSION OF WORK

"(a) The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work for such period of time as he may determine to be appropriate for the convenience of the Government.

"(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted by an act of the Contracting Officer in the administration of this contract, or by his failure to act within the time specified in this contract (or if no time is specified, within a reasonable time), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent (1) that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or (2) for which an equitable adjustment is provided for or excluded under any other provision of this contract.

"(c) No claim under this clause shall be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of such suspension, delay, or interruption, but not later than the date of final payment under the contract."

"103. MODIFICATION PROPOSALS-PRICE BREAKDOWN (1968 APR)

The Contractor, in connection with any proposal he makes for a contract modification, shall furnish a price breakdown, itemized as required by the Contracting Officer. Unless otherwise directed, the breakdown shall be sufficient detail to permit an analysis of all material, labor, equipment, subcontract, and overhead costs, as well as profit, and shall cover all

work involved in the modification, whether such work was deleted, added or changed. Any amount claimed for subcontracts shall be supported by a similar price breakdown. In addition, if the proposal includes a time extension, a justification therefor shall also be furnished. The proposal, together with the price breakdown and time extension justification, shall be furnished by the date specified by the Contracting Officer."

"104. **EQUITABLE ADJUSTMENTS: WAIVER AND RELEASE OF CLAIMS**

"(a) Whenever the Contractor, after receipt of notification of a change made pursuant to the clause of this contract entitled "Changes" or after affirmation of a constructive change thereunder, submits any claim for equitable adjustment under that clause, such claim shall include all types of adjustments in the total amounts to which that clause entitles the Contractor, including but not limited to adjustments arising out of delays or disruptions or both caused by such change. Except as the parties may otherwise expressly agree, the Contractor shall be deemed to have waived (i) any adjustments to which it otherwise might be entitled under the aforesaid clause where such claim fails to request such adjustments, and (ii) any increase in the amount of equitable adjustments additional to those requested in its claim."

"(b) Further, the Contractor agrees that, if required by the Contracting Officer, he will execute a release, in form and substance satisfactory to the Contracting Officer, as part of the supplemental agreement setting forth the aforesaid equitable adjustment, and that such release shall discharge the Government, its officer, agents and employees, from any further claims, including but not limited to further claims arising out of delays or disruptions or both, caused by the aforesaid change."

1B.2 Performance and payment bonds, executed on Standard Form 25, June 1967 edition, Performance Bond, and Standard Form 25-A, June 1964 edition, Payment Bond, will be required as stipulated on the reverse side of Standard Form 20, January 1961 edition, Invitation for Bids. The performance bond shall specifically provide coverage for taxes imposed by the United States which are collected, deducted, or withheld from wages paid by the Contractor in carrying out the contract with respect to which such bond is furnished.

1B.3 Damages for delay. The Government will take no action pursuant to Clause 5 of Standard Form 23-A, Liquidated damages, to terminate the right of the Contractor to proceed or to assess liquidated or actual damages where failure of the Contractor to complete the work within the time specified is due solely to the operation of the Defense Materials System and Priorities, provided the Contractor and his subcontractors comply with the provisions of this System and the Contractor's lateness in completion of the work is not otherwise caused by the fault or negligence of the Contractor. Such delays will be excusable within the meaning of Clause 5, and the Contractor will be entitled to a time extension by reason thereof.

1B.4 Specifications and standards. The specifications and standards referenced in this specification (including addenda, amendments, and errata listed) shall govern in all cases where references thereto are made. In case of difference between the referenced specifications or standards and this specification or its accompanying drawings, this specification and its accompanying drawings shall govern to the extent of such difference; otherwise, the referenced specifications and standards shall apply. The requirements for packaging, marking, and preparation for shipment or delivery included in the referenced specifications shall apply only to materials and equipment that are furnished directly to the Government and not to materials and equipment that are to be furnished and installed by the Contractor. Unless specified otherwise in this specification, the requirements included in referenced specifications are modified as follows:

Radio-interference suppression: Not required.

Fungus control: Not required.

Identification or name plate: Manufacturer's standard acceptable.

Technical publications: Manufacturer's standard acceptable.

Production test model: In lieu of tests performed on a production test model, such tests, if required at the manufacturer's plant, shall be performed on the equipment being furnished under this specification.

When a number in parentheses is suffixed to a referenced Yards and Docks/NAVFAC, Federal or Military specification or standard symbol, it denotes the effective amendment or change to the document.

Referenced specifications or standards, other than Yards and Docks/NAVFAC, Federal, and Military, are not available for distribution by the Department of the Navy. Requests therefor should be made to the issuing organization. They may be examined at the office where the bids are being received.

1B.5 Work outside regular hours. If the Contractor desires to carry on work outside the regular hours or on Saturdays, Sundays, or holidays, he shall submit application to the Officer in Charge, but shall allow

ample time to enable satisfactory arrangements to be made by the Government for inspecting the work in progress. At night he shall light the different parts of the work in an approved manner.

1B.6 Optional requirements. Where a choice of materials and/or methods is permitted herein, the Contractor will be given the right to exercise the option unless stated specifically otherwise.

1B.7 Definitions. Where "as shown", "as indicated", "as detailed", or words of similar import are used, it shall be understood that reference is made to the drawings accompanying this specification unless stated otherwise. Where "as directed", "as required", "as permitted", "approved", "acceptance", or words of similar import are used, it shall be understood that the direction, requirements, permission, approval, or acceptance of the Officer in Charge of Construction is intended unless stated otherwise. As used in this specification, "provide" shall be understood to mean "provide complete in place", that is, "furnish and install". Where "Bureau", "Bureau of Yards and Docks", "NAVFAC" or words or phrases of similar import appear in this specification, on the drawings, or in documents referenced by the specification or the drawings, it shall be understood to mean the "Naval Facilities Engineering Command".

1B.8 Security requirements. No employee or representative of the Contractor will be admitted to the site of the work unless he furnishes satisfactory proof that he is a citizen of the United States, or if an alien, his residence within the United States is legal.

1B.9 Methods and schedules of procedures. The work shall be executed in a manner and at such times that will cause the least practicable disturbance to the occupants of the buildings and the normal activities of the station. Before starting any work, the sequence of operations and the methods of conducting the work shall have been approved.

1B.10 Approval of samples, cuts, and drawings. Matter submitted for approval shall be accompanied by complete information concerning the material, articles, and/or design proposed for use in sufficient detail to show compliance with the specification, and shall be approved before incorporation into the work. Approval thereof will not be construed as relieving the Contractor of compliance with the specification, even if such approval is made in writing, unless the attention of the Officer in Charge is called to the noncomplying features by letter accompanying the submitted matter. Partial submittals or submittals of less than the whole of any system made up of interdependent components, will not be considered. Approval of drawings, cuts, and samples by the Officer in Charge shall not be construed as a complete check or approval of the detailed dimensions, weights, gauges and similar details of the proposed articles. The conformance of such details with the contract requirements, together with the necessary coordination of dimensions and details between the various elements of the work and

between the various subcontractors and suppliers, shall be solely the responsibility of the Contractor, approval of submitted matter notwithstanding.

1B.11 Operation of station utilities. The Contractor shall not operate nor disturb the setting of any control devices in the station utilities system, including water, sewer, electrical and steam services. The Government will operate the control devices as required for normal conduct of the work. The Contractor shall notify the Officer in Charge, giving reasonable advance notice when such operation is required.

1B.12 Examination of premises. Before submitting proposals, bidders are expected to visit and inspect the site of the work and satisfy themselves as to the physical conditions at the site; the general and local conditions, including availability of labor; the nature and extent of the work; the character and effect of existing adjoining and/or adjacent work; and other factors that can affect the cost of the performance of the contract to the extent that such information is reasonably obtainable.

1B.13 Changed conditions. Wherever changed conditions as defined in Clause 4 of Standard Form 23-A are encountered, and wherever conditions exposed during the course of the work necessitate a change from quantities indicated or specified as either estimated quantities or as a basis for bids, whether or not provision for a change in price for such variation is specified, the Officer in Charge must be notified in writing and written directions to do so must be obtained before quantities stated in the contract documents are exceeded.

1B.14 Protection and repairs. The Contractor shall comply with the fire prevention requirements, security rules, and regulations of the activity; and shall provide approved means necessary for the protection of all Government and private property, including contents of buildings affected directly or indirectly by his operations. All damage to Government or private property, resulting directly or indirectly from the Contractor's actions, shall be made good by him without expense to the Government.

1B.15 Existing work damaged or otherwise affected by the Contractor's operations shall be restored to a condition as good as existed before the work was commenced, except where indicated or specified otherwise. Where new construction adjoins, connects to, or abuts the existing work, the junction shall be made in a substantial workmanlike and weathertight manner as the case requires. All new work shall match, as nearly as practicable, the existing adjoining and/or adjacent similar work unless indicated or specified otherwise. Except where specifically designated as being retained by the Government or to be reinstalled in the new construction, all materials, fixed equipment, and debris resulting from demolition and removal operations, shall be removed by the Contractor from the limits of the Government reservation at such times during the progress of the work as directed.

1B.16 Layout of Work (January 1965). The Contractor shall lay out his work from Government-established base lines and bench marks indicated on the drawings and shall be responsible for all measurements in connection therewith. The Contractor shall furnish, at his own expense, all stakes, templates, platforms, equipment, tools, and materials and labor as may be required in laying out any part of the work from the base lines and bench marks established by the Government. The Contractor will be held responsible for the execution of the work to such lines and grades as may be established or indicated by the Officer in Charge of Construction. It shall be the responsibility of the Contractor to maintain and preserve all stakes and other marks established by the Officer in Charge of Construction until authorized to remove them. If such marks are destroyed, by the Contractor or through his negligence, prior to their authorized removal, they may be replaced by the Officer in Charge of Construction at his discretion. The expense of replacement will be deducted from any amounts due or to become due the Contractor.

1B.17 Payrolls and affidavits. The Prime Contractor, subcontractor, and sub-subcontractors will be required to submit a copy of each weekly payroll together with a Contractor's Weekly Statement of Compliance covering the payroll to the Officer in Charge of Construction within seven days after the regular payment date of the payroll period. The receipt of these payrolls and statements is made a condition precedent to payment for any amounts due under the contract.

1B.17.1 Payroll. The payroll shall be identified by the name of the Contractor, contract number, and the location of the site of the work. Payrolls shall state accurately and completely for each employee, his name, classification, social security number, rate of pay, daily and weekly hours worked, wages earned, all deductions from such wages and the actual weekly wages paid. Contractors are required to submit employee's address with the payroll on which the employee's name first appears.

1B.17.2 Contractor's Weekly Statement of Compliance shall be executed on the form furnished for the purpose by the Officer in Charge. Contractors shall list by title or name, all deductions made, omitting from the listing the dollar amount of the deductions.

1B.17.3 A sworn affidavit accomplished by the Contractor, stating that he and his subcontractors have complied with the labor standards provisions of the contract, must accompany each request for reimbursement. Affidavit form will be furnished by the Officer in Charge of Construction.

1B.18 Subcontractors and personnel. Promptly after the award of the contract, the Contractor shall submit to the Officer in Charge of Construction, in triplicate, a list of his subcontractors and the work each is to perform. On this form shall appear the names of the key personnel of the Contractor and subcontractors, together with their home addresses and telephone numbers, for use in event of any emergency. From time to time as

changes occur and additional information becomes available, the Contractor shall amplify, correct, and change the information contained in previous lists.

1B.19 Storm protection. Should warnings of winds of gale force or stronger be issued, the Contractor shall take every practicable precaution to minimize danger to persons, to the work, and to adjacent property. These precautions shall include closing all openings, removing all loose materials, tools and/or equipment from exposed locations; and removing or securing scaffolding and other temporary work.

1B.20 Safety requirements. A copy of the Department of the Army, Corps of Engineers, "General Safety Requirements", referenced in Clause 55 of form NAVFAC 4-4330/5, may be examined or obtained on application to the office where the bids are being received. Prior to starting the work, the Contractor shall meet in conference with representatives of the Officer in Charge to discuss and develop mutual understandings relative to administration of the safety program.

1B.21 As-built drawings. On completion of the work, one print of each of the drawings accompanying this specification shall be neatly and clearly marked in red to show all variations between the construction actually provided and that indicated or specified in the contract documents, and delivered to the Officer in Charge. Where a choice of materials and/or methods is permitted herein, and where variations in the scope or character of the work from the entire work indicated or specified are permitted either by award on bidding items specified for that purpose or by subsequent change to the contract, the as-built drawings shall define the construction actually provided. The representation of such variations shall conform to standard drafting practice and shall include such supplementary notes, legends, and details as may be necessary for legibility and clear portrayal of the as-built construction; the marked prints shall be subject to approval before acceptance.

1B.22 Responsibility for testing. Where tests are specified to be made by the Government, the Government will make the initial tests at its expense. Should the initial samples fail to meet the requirements of the specifications, all succeeding tests of additional samples shall be made by an approved testing laboratory or agency at the expense of the Contractor.

1B.23 Schedule of prices. Unless otherwise specified in the section entitled "General Paragraphs", upon receipt of a notice of award, the Contractor shall prepare a detailed breakdown of the contract price, giving the quantities of the various kinds of work and the unit and total prices therefor. This breakdown shall be submitted promptly to the Officer in Charge on form NAVDOCKS 83, revised August 1963, Schedule of Prices, in octuplicate. The forms will be furnished by, and shall be executed in a manner satisfactory to, the Officer in Charge of Construction. The submission of this breakdown will not affect the contract terms.

1B.24 Prints furnished to Contractor. Five one-half size prints and one set of full-size reproducibles of each drawing accompanying this specification will be furnished the Contractor without charge. Additional prints and full-size prints required by the Contractor shall be reproduced by him at his own expense.

1B.25 Priorities, allocations, and allotments. The Contractor agrees, in the procurement and use of materials required for the performance of this contract, to comply with the provisions of all applicable rules and regulations of the Business and Defense Services Administration, including Defense Materials System regulations. If the initial contract price hereunder does not exceed \$100,000, this project is made a rated order pursuant to DMS Regulation 1 and is assigned DO rating C-2 unless a higher rating is specified in the section entitled "General Paragraphs". The Contractor is hereby made a self-authorizing Contractor as defined in Section 3(g) of that regulation and is required to use the self-authorization provision of Section 9 in obtaining controlled materials, as well as products and materials other than controlled materials needed to fill this rated order.

1B.26 Location of underground utilities. Where existing piping, utilities, and underground obstructions of any type are indicated in locations to be traversed by new piping, ducts, and other work provided hereunder, and are not indicated or specified to be removed, the elevations of the existing utilities and obstructions shall be determined before the new work is laid closer than the nearest manhole or other structure at which an adjustment in grade could be made. For any additional work required by reason of conflict between the new and existing work, an adjustment in contract price will be made in accordance with Clause 4 of Standard Form 23-A.

1B.27 Notice Regarding Buy American Act (October 1966). The Buy American Act (41 USC 10a-10d) generally requires that only domestic construction materials be used in the performance of this contract. Exception from the Buy American Act shall be permitted only in the case of nonavailability of domestic construction materials. A bid or proposal offering nondomestic construction material will not be accepted unless specifically approved by the Office of the Secretary of Defense. When a bidder or offerer proposes to furnish nondomestic construction material, his bid or proposal must set forth an itemization of the quantity, unit price, and intended use of each item of such nondomestic construction material. When offering nondomestic construction material pursuant to this paragraph, bids or proposals may also offer, at stated prices, any available comparable domestic construction material, so as to avoid the possibility that failure of a nondomestic construction material to be acceptable under this paragraph will cause rejection of the entire bid.

1B.28 Availability of utility services. In accordance with Clause 71 of form NAVFAC 4-4330/5, as modified herein, electric and water service will

be made available to the Contractor at the nearest available existing outlets at prevailing Government rates which may be obtained upon application to the Commanding Officer. The Contractor will be required to furnish all labor, equipment and materials to make utilities connections and to furnish and install valves, transformers, and meters for each service. The Contractor shall determine that each source is adequate and suitable for requirements of his equipment before making connection and on completion, shall reinstate all utility sources used to their original condition or a condition satisfactory to the Officer in Charge. No guaranty of any kind is made as to the continuity and level of the supply of such utility services. They will be reduced or suspended as the needs of the Government require and the Government shall not be liable for any damages sustained as a result of such reduction or suspension, nor for any failure of the supply lines to the Contractor's connections. Unless specified otherwise in section entitled "General Paragraphs", final connections to existing utilities shall be made by the Contractor under the direct supervision of Government personnel.

1B.29 Minimum wage rates and other labor standards. Any class of laborers and mechanics not listed in the Secretary's decision, which will be employed on the contract, shall be classified or reclassified by the Contractor or subcontractor conformably to the Secretary's decision, subject to the approval of the Contracting Officer. Mechanics and laborers shall be classified in conformance with prevailing practice. In the event of any difference between the Contractor and the Government concerning the proper wage rates to be paid, the classification of employees to conform to prevailing practice, the amount of wages due employees, or any other application or interpretation of the labor standards provisions of this contract, the difference shall be referred to the Contracting Officer (the Commander of the Naval Facilities Engineering Command or his specially authorized representative), and the Contracting Officer shall determine the matter with advice from and reports to the Secretary of Labor as required by Department of Labor regulations. This determination shall not be appealable under the Disputes clause, and the Contractor shall comply promptly with the determination of the Contracting Officer. If the Contracting Officer determines that the Contractor has not satisfied his obligations under the labor standards provisions of the contract, the Contracting Officer will forward a report on the violations to the Department of Labor and the Comptroller General for appropriate action.

1B.29.1 Investigation of labor conditions. The wage determination decision of the Secretary of Labor attached hereto, or included by addendum, is made a part of this contract solely for the purpose of setting forth the minimum hourly wage rates required to be paid by the Davis-Bacon Act and is not to be considered as a guaranty, warranty or representation as to the wage determination decision, the wage rates therein, the prevailing wages, or the availability of labor at the wage rates indicated. Bidders are advised to make their own investigations and to rely solely upon their own

information as to local labor conditions, such as wage rates necessary to attract labor, the length of the workday and workweek, overtime compensation, health and welfare contributions and available labor supply, and as to prospective changes or adjustments of wage rates or employment conditions in the area concerned that might affect the operations under the contract. Neither a mistake in attaching the wage determination decision of the Secretary of Labor or in the determination or statement of the wage rates set forth therein shall entitle the bidder to the cancellation of his bid or contract, to an increase in the contract price, or to other additional payment or recovery.

1B.29.2 Apprentices employed pursuant to the wage determination decision contained in this contract must be registered in a bona fide apprenticeship program registered with a state apprenticeship council recognized by the Federal Committee on Apprenticeship, Department of Labor, or if no such recognized council exists in a state, a program registered with the Bureau of Apprenticeship, Department of Labor. The ratio of apprentices to journeyman mechanics shall not exceed that recognized by the agency of registry as prevailing.

1B.29.3 Posting of wage rates. Where compliance with Clause 1 of Standard Form 19-A requires posting the wage determination decision in an exterior location, it shall, along with other documents required to be similarly posted, be displayed in a weatherproof display case.

1B.30 Equal Employment Opportunity.

(a) Certification of nonsegregated facilities. By the submission of this bid, the bidder, offeror, applicant, or subcontractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. He certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The bidder, offeror, applicant or subcontractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom or otherwise. He further agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will

obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of Equal Opportunity clause; that he will retain such certifications in his files; and that he will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES.

A certification of Nonsegregated Facilities, as required by the May 9, 1967 order on Elimination of Segregated Facilities, by the Secretary of Labor (32 Fed. Reg. 7439, May 19, 1967) must be submitted prior to the award of a subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually). (Mar. 1968) (Note: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001).

(b) Certification of nonsegregated facilities by subcontractors and federally assisted construction contractors (Mar. 1968). Prior to the award of any subcontract, required to contain the Equal Opportunity clause contained in this contract, the Contractor shall obtain the certification set forth in 2-201(a) (xli). This certification may be required by the Contractor, either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

(c) During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include but not be limited to the following: Employment, upgrading, demotion, or transfer, recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Contracting Officer setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(3) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided by the agency Contracting Officer, advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the Contractor's noncompliance with the non-discrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or in part, and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the provisions of Paragraph (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for non-compliance: Provided, however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Contractor may request the United States to enter into such litigation to protect the interest of the United States.

1B.31 North Carolina Sales and Use Tax

(a) As used throughout this clause, the term "materials" means building materials, supplies, fixtures and equipment which become a part of or are annexed to any building or structure erected, altered, or repaired under this contract.

(b) If this is a fixed-price type contract as defined in the Armed Services Procurement Regulation, the contract price includes North Carolina sales and use taxes to be paid with respect to materials, notwithstanding any other provision of this contract. If this is a cost-reimbursement type contract as defined in such regulation, any North Carolina sales and use taxes paid by the Contractor with respect to materials shall constitute an allowable cost under this contract.

(c) At the time specified in paragraph (d) below:

(i) The Contractor shall furnish the Contracting Officer certified statements setting forth the cost of the materials purchased from each vendor and the amount of North Carolina sales and use taxes paid thereon. In the event the Contractor makes several purchases from the same vendor, such certified statement shall indicate the invoice numbers, the inclusive dates of the invoices, the total amount of the invoices and the North Carolina sales and use taxes paid thereon. Such statement shall also include the cost of any tangible personal property withdrawn from the Contractor's warehouse stock and the amount of North Carolina sales or use tax paid thereon by the Contractor. The Contractor shall furnish such additional information as the Commissioner of Revenue of the State of North Carolina may require to substantiate a refund claim for sales or use taxes.

(ii) The Contractor shall obtain and furnish to the Contracting Officer similar certified statements by its subcontractors.

(d) If this contract is completed before the next July 1, the certified statements to be furnished pursuant to paragraph (c) above shall be submitted within 60 days after completion. If this contract is not completed before the next July 1, such certified statements shall be submitted on or before the 31st day of August of each year and shall cover taxes paid during the twelve month period which ended the preceding June 30.

(e) The certified statements to be furnished pursuant to paragraph (c) above shall be in the following form:

I hereby certify that during the period _____
to _____, (name of Contractor or subcontractor) paid
North Carolina sales and use taxes aggregating \$ _____ with respect to
building materials, supplies, fixtures and equipment which have become a part
of or annexed to a building or structure erected, altered or repaired by
(name of Contractor) for the United States of America, and that the vendors
from whom the property was purchased, the dates and numbers of the invoices
covering the purchases, the total amount of the invoices of each vendor, the
North Carolina sales and use taxes paid thereon, and the cost of property
withdrawn from warehouse stock and North Carolina sales or use taxes paid
thereon are as set forth in the attachments hereto.

1B.32 Quarantine for white-fringed beetles. The entire Camp Lejeune reservation (including Camp Geiger) and the Marine Corps Air Station (Helicopter), New River, have been quarantined by the United States and North Carolina Departments of Agriculture for the white-fringed beetle. Compliance with the quarantine regulations established by these authorities as set forth in the U.S.D.A. Quarantine No. 72 and North Carolina State Quarantine No. 7 is required for operations hereunder. Pertinent requirements of the quarantines include the following:

(a) Certification is required for the following articles and they shall not be moved from the reservation unless accompanied by a valid inspection certificate issued by an authorized white-fringed beetle inspector.

(1) Soil, sand or gravel moved independently or attached to other articles, such as heavy equipment, including draglines, road-grading machines, ditch diggers, bulldozers, and equipment with tracks or cleats.

(2) Nursery stock, plants and sod.

(3) Scrap metal.

Authorization for movement of equipment shall be obtained from the Officer in Charge, and requests for inspection shall be made sufficiently in advance of the date of movement to permit arrangements for the services of authorized inspectors. The equipment shall be prepared and assembled so that it may be readily inspected. Articles and materials requiring certification for movement shall be removed from the equipment by washing with water and such other means as necessary to accomplish complete removal. Resulting spoil shall be wasted as directed.

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SECTION 1C. BIDS

1C.1 Instruction to Bidders, Standard Form 22, June 1964 edition, and Invitation for Bids, Standard Form 20, January 1961 edition, shall be observed in the preparation of bids. Bidders shall affix their names and return addresses in the upper left corner of bid envelopes. Envelopes containing bids must be sealed.

1C.2 Bid guaranty will be required as stipulated on the reverse side of Standard Form 20.

1C.3 Items of Bids. Bids shall be submitted, in duplicate, on Standard Form 21, December 1965 edition, Bid Form, and in accordance with Standard Forms 20 and 22 upon the following items:

Item 1. (BASE BID) Price for the entire work, complete in accordance with the drawing and specification, but excluding demolition work as described in Bid Item 2, except the well pipe line shall be plugged at main as indicated.

Item 2. Price to be added for the demolition work specified in Section 2A entitled "Demolition".

NOTE: Additive or Deductive Items (Apr. 1968). The low bidder for purposes of award shall be the conforming responsible bidder offering the low aggregate amount for the first or base bid item, plus or minus (in the order of priority listed in the schedule) those additives or deductive bid items providing the most features of the work within the funds determined by the Government to be available before bids are opened. If addition of another bid item in the listed order of priority would make the award exceed such funds for all bidders, it shall be skipped and the next subsequent additive bid item in a lower amount shall be added if award thereon can be made within such funds. For example, when the amount available is \$100,000 and a bidder's base bid and four successive additives are \$85,000, \$10,000, \$8,000, \$6,000 and \$4,000, the aggregate amount of the bid for purposes of award would be \$99,000 for the base bid plus the first and fourth additives, the second and third additives being skipped because each of them would cause the aggregate bid to exceed \$100,000. In any case, all bids shall be evaluated on the basis of the same additive or deductive bid item, determined as above provided. The listed order of priority need be followed only for determining the low bidder. After determination of the low bidder as stated, award in the best interests of the Government may be made to him on his base bid and any combination of his additive or deductive bid for which funds are determined to be available at the

time of the award, provided that award on such combination of bid items does not exceed the amount offered by any other conforming responsible bidder for the same combination of bid items.

1C.4 Telegraphic modifications of bids in accordance with Standard Form 22 may be made. Two signed copies of the telegram in a sealed envelope marked "Copies of telegraphic modification of bid for Repair Well BA-110, Onslow Beach, Specification No. 05-71-0525" should be forwarded immediately to the office to which the written bids were submitted.

1C.5 Reference to addenda. Each bidder shall refer in his bid to all addenda to this specification; failure to do so may constitute an informality in the bid.

W. F. RUSSELL, CAPT, CEC, USN
Officer in Charge of Construction
24 March 1971

DIVISION 2. SITE WORK

SECTION 2A. Demolition
2B. Earthwork

SECTION 2A. DEMOLITION

2A.1 General requirements. The work includes the removal of existing well house, foundations, floor slabs, and all mechanical and electrical equipment and piping remaining in the well house. Piping outside of well house shall be removed as indicated. Underground electric service shall be removed back to the meter mounted on the service pole. The work further includes capping off existing well as indicated.

2A.2 Existing conditions. The existing well house is brick construction with concrete foundations and floor slabs, wood door and wood frame roof construction. Size of well house, construction details, equipment layout and piping are approximately the same as indicated for new construction. Well pump and gasoline engine have been removed and disposed of. Other mechanical equipment and some piping are in various stages of dismantlement.

2A.3 Materials which have been removed shall not be permitted to accumulate and shall be promptly removed from the site. All salvageable materials, including mechanical and electrical equipment, piping and valves, shall remain the property of the Government. All debris and other removed materials shall be removed from the site and disposed of as specified in SECTION 1A, General Paragraphs.

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SECTION 2B. EARTHWORK

2B.1 Scope. The work includes the excavation, filling, backfilling, and grading indicated and necessary for the proper completion of the project.

2B.2 Applicable publications. The following publications of the issues listed below, but referred to elsewhere by basic designation only, form a part of this specification to the extent indicated by the references thereto (where a number is suffixed to the specification number, it denotes the effective amendment to the specification):

(a) Bureau of Yards and Docks/NAVFAC Specifications.

42Yc Drainage, sanitary, electrical, and water service appurtenances.

(b) Non-Government Specifications and Standards.

American Association of State Highway Officials (AASHO).

T99-61 Moisture-density relations of soils, 5.5 lb. rammer and a 12-inch drop.

North Carolina Seed Improvement Association.

Requirements for certification. (current edition)

2B.3 General requirements. Bids shall be based on the following:

- (a) that the surface elevations are as indicated;
- (b) that no pipes or other artificial obstructions, except those indicated, will be encountered; and
- (c) that hard material will not be encountered.

In case the actual conditions differ substantially from those stated or shown, or both, the provisions of the contract respecting an adjustment for changed conditions shall apply, subject to the requirement of notification thereunder being given. Hard material shall be defined as solid ledge rock, firmly cemented unstratified masses or conglomerate deposits possessing the characteristics of solid rock not ordinarily removed without systematic drilling and blasting, and any boulder, masonry, or concrete except pavement, exceeding 1/2 cubic yard in volume.

2B.4 Topsoil. Material from the excavations and grading which, in the opinion of the Officer in Charge, is suitable for topsoil shall be

deposited in piles separate from other excavated material. Topsoil shall be free of stones, wood matter, cuttings, excessive quantities of vegetation, and debris of every kind. Piles of topsoil shall be located so that the material can be used readily for finished surface grading. Topsoil shall be protected and maintained until needed, and shall be spread uniformly over the ground in the areas where the natural soil conditions have been disturbed under the operations of this contract.

2B.5 Excavations shall be carried to the depths, contours and dimensions indicated or necessary. Excavations shall be kept free from water while construction therein is in progress.

2B.5.1 Excavations for structures and trenches. Excavations carried below the depths indicated, without specific directions, shall be refilled to the proper grade with suitable material and compacted thoroughly, except that in excavations for footings, the concrete shall be extended to the bottom of the excavations; all additional work of this nature shall be at the Contractor's expense. Trenches for pipe lines shall be excavated along straight lines and, unless indicated otherwise, shall provide a minimum of 6 inches between the outside of the pipe bell and the sides of the trench or bracing. Standard pipe trench excavation and bedding shall be in accordance with specification 42Y. Mechanical excavation, other than in rock, shall be held at least 2 inches above final invert grade. The remainder of the excavation shall be shaped manually and graded to provide uniform bearing on compacted soil, immediately before the pipe is laid.

2B.5.2 Excavations under new concrete slab. The entire area of the original ground under new concrete slab shall be excavated to remove all vegetable matter, topsoil, sod, muck, rubbish, and other unsuitable material to a minimum depth of 6 inches. In the event that it is required to remove unsuitable material to a greater depth than specified, an adjustment in the contract price will be made in accordance with the contract.

2B.5.3 Shoring and sheeting. Excavations shall be shored and sheeted with members of sizes and arrangement sufficient to prevent injury to persons, damage to structures, injurious caving, or erosion. Shoring, sheeting, and bracing shall be removed as the excavations are backfilled; care shall be exercised to prevent injurious caving during the removal of the shoring and sheeting.

2B.6 Borrow required shall be taken only from approved locations. Borrow pits shall be so excavated that drainage is provided and shall not be left in an unsightly or unsanitary condition. Maximum haul for borrow shall not exceed one mile.

2B.7 Filling and backfilling. All fill and backfill shall be free from roots, wood or other scrap material, and other vegetable matter and

refuse. Fill and backfill shall be placed in layers not more than 6 inches thick, except as specified otherwise herein, and each layer shall be compacted thoroughly and evenly. Backfill about structures shall be placed, as far as practicable, as the work of construction progresses. Backfilling of trenches shall progress as rapidly as the construction and testing of the work permits. In backfilling pipe trenches, approved fill shall be compacted in 6-inch layers to a depth of one foot over the top of the pipe; the remainder of the trench shall be backfilled in well-compacted one-foot layers.

2B.8 Compaction. The subgrade of soils in cut shall have a density of 95 percent of the maximum density to a depth of 12 inches below the subgrade surface. If the density of the existing material is less than 95 percent, it shall be compacted to a depth of 12 inches to the minimum 95 percent density. Fill and backfill under concrete floor slabs shall be compacted to not less than 100 percent of the maximum density for cohesionless materials and 95 percent of the maximum density for other materials; under grassed areas to 85 percent; and other backfill adjacent to structures to 90 percent. The moisture content of the specified densities shall be within 2 percent more or less than the optimum.

2B.9 Grading. The Contractor shall perform all grading in the areas so indicated or specified. Fill shall be brought to finished grades indicated within a tolerance of one-tenth of a foot and shall be graded to drain away from structures. Existing grades which are to remain and which are disturbed by the Contractor's operations shall be graded to provide surfaces suitable for the proper use of mowing machines.

2B.10 Disposition of surplus material. Surplus material not required for filling, backfilling, or grading and other spoil material shall be wasted by deposition at the site of the work, as directed. Wasted material shall be spread and leveled as directed.

2B.11 Quality assurance provisions. All soil tests will be performed by the Government. Maximum density at optimum moisture content will be determined by AASHTO method T99, Method D with the following modifications: (1) all material passing a 2-inch sieve and retained on a 3/4-inch sieve shall be removed and replaced with an equal portion of material between the no. 4 and 3/4-inch sieves, and (2) a separate batch of material shall be used for each compaction test specimen. No material shall be reused for compaction tests.

2B.12 Vegetation. The work includes seedbed preparation, liming, fertilizing and seeding of all areas where natural soil conditions have been disturbed by this contract.

2B.12.1 Materials.

(a) Lime shall be dolomitic agricultural ground limestone containing 10 percent Magnesium Oxide.

(b) Fertilizer shall be standard commercial product of 10-10-10 analysis.

(c) Seed shall be Bermuda (hulled) and shall be certified seed or equivalent based on North Carolina Seed Improvement Association requirements for certification.

2B.12.2 Seedbed preparation. The areas to be vegetated shall be prepared by thoroughly loosening the soil to a depth of 4 inches. After loosening the soil, all surface irregularities where surface water could collect and pond shall be smoothed out. A firm and compact seedbed is required, and after smoothing, it shall be lightly compacted with a land roller.

2B.12.3 Liming. Limestone shall be uniformly applied at the rate of 40 pounds per 1,000 square feet to all areas to be vegetated. Limestone may be applied to the area prior to the preparation of the seedbed, but in all cases, it shall be applied before seeding and thoroughly incorporated into the entire depth of prepared seedbed.

2B.12.4 Fertilizing. Fertilizer shall be uniformly applied at the rate of 20 pounds per 1,000 square feet. The fertilizer shall be incorporated into the upper three or four inches of prepared seedbed.

2B.12.5 Seeding. Seed shall be sown by hand or an approved seeder and distributed uniformly at the rate of two pounds per 1,000 square feet. The seed shall be planted no deeper than 1/4 inch. After seeding, the seeded areas shall be compacted with a land roller. All seeding and compacting shall be done when weather conditions are favorable and not when seedbed is wet.

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DIVISION 3. CONCRETE

SECTION 3A. CONCRETE CONSTRUCTION

3A.1 Applicable publications. The following publications of the issues listed below, but referred to elsewhere by basic designation only, form a part of this specification to the extent indicated by the references thereto (where a number is suffixed to the specification number, it denotes the effective amendment to the specification):

(a) Bureau of Yards and Docks/NAVFAC Specifications.

13Yh Concrete construction; including addendum no. 1.

(b) Federal and Military Specifications.

HH-F-341e Fillers, expansion-joint; bituminous and nonbituminous (preformed; for concrete).

3A.2 General requirements. Concrete construction, including reinforcing, shall be in accordance with specification 13Y, except as modified herein. Concrete for footings, walls, steps, and slabs on grade shall be Class D-1. Cement for exposed concrete surfaces of the building where appearance is a consideration shall be from the same source. Horizontal wall steel not otherwise indicated shall return lap 18 inches at corners.

3A.3 Expansion joints and cleavage joints between vertical and concrete surfaces and slabs shall be 1/2-inch wide, unless otherwise indicated, expansion joint material shall extend the full thickness of the concrete. Joints shall be filled with preformed joint filler conforming to specification HH-F-341.

3A.4 Surface finishes.

3A.4.1 All exposed surfaces cast against forms shall be given a special grout finish.

3A.4.2 All exterior concrete pads on grade shall be given a wood-float finish.

3A.4.3 All interior floor surfaces shall be given a troweled finish.

3A.5 Setting miscellaneous material. All dowels, bolts, anchors, pipes, hangers, insets, sleeves, and all other material in connection with the concrete work shall be placed and secured in position, when practicable, before the concrete is placed.

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DIVISION 4. METALS, STRUCTURAL AND MISCELLANEOUS

SECTION 4A. MISCELLANEOUS METAL WORK

4A.1 General requirements. Miscellaneous metal shall consist of standard shapes of commercial quality. Cast iron shall be soft, tough, gray iron; castings shall have sharp corners and edges, and shall be clean, smooth and true to pattern. Welding shall be done in a manner that will prevent permanent buckling and all welds exposed in the finished work shall be ground smooth.

4A.2 Workmanship and finish. Workmanship and finish shall be equal to the best practice of modern shops for the respective work. Exposed surfaces shall have smooth finish and sharp, well defined lines and arrises. Sections shall be well formed to shape and size with sharp lines and angles; curved work shall be sprung evenly to curves. All necessary rabbets, lugs, and brackets shall be provided so that the work can be assembled in a neat and substantial manner. Holes for bolts and screws shall be provided. Fastenings shall be concealed where practicable. Thickness of metal and detail of assembly and supports shall provide ample strength and stiffness.

4A.3 Shop painting. All surfaces of steel and iron work, except zinc-coated work and work with bituminous or other priming, shall be shop painted in accordance with the fabricator's standard practice.

4A.4 Anchors and fastenings. Ties anchors and other miscellaneous fastenings shown, specified or necessary for the securing of the work in place shall be furnished and installed.

4A.5 Prefabricated metal building is specified in DIVISION 5 in the section entitled "Prefabricated Metal Building".

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DIVISION 5. SPECIAL CONSTRUCTION

SECTION 5A. PREFABRICATED METAL BUILDING

5A.1 Applicable publications. The following publications of the issues listed below, but referred to elsewhere by basic designation only, form a part of this specification to the extent indicated by the references thereto (where a number is suffixed to the specification number, it denotes the effective amendment to the specification):

(a) Bureau of Yards and Docks/NAVFAC Specifications.

32Ye Metal doors.

(b) Federal and Military Specifications.

DD-G-451c Glass, plate, sheet, figures (float, flat, for glazing,
(INT.2) corrugated).
FF-H-00106b Hardware, builders'; locks and door trim.
FF-H-00111b Hardware, builders'; shelf and miscellaneous.
FF-H-116c(5) Hinges, hardware, builders'.
QQ-S-775d Steel sheets, carbon, zinc-coated.
TT-G-410E Glazing compound, sash (metal) for back bedding
and face glazing (not for channel or stop glazing).
TT-P-645 Primer, paint, zinc-chromate, alkyd type

MIL-S-4174B Steel sheet and strip, flat, aluminum coated, low carbon.
MIL-P-15328C Primer (wash), pretreatment blue (formula No. 117-B
for metals).
MIL-C-18969B Calking compounds, metal seam and wood seam.

(c) Non-Government Specifications and Standards.

American Institute of Steel Construction (AISC)

Manual of Steel Construction (6th Edition).

American Iron and Steel Institute (AISI)

Light gage cold-formed steel design manual - 1962.

Architectural Aluminum Manufacturers' Association (AAMA)

Aluminum window specification - 1969.

Metal Building Manufacturers' Association (MBMA)

Recommended design practices manual - 1963.

05-71-0525 - 31

Section 5A

Steel Window Institute (SWI)

Recommended standards for steel windows - 1967.

5A.2 Special requirements. The dimensions shown on the drawing depict minimum requirements for width and length of building. Building with slightly larger dimensions will be acceptable. Additional footings, floor slab or other details of construction required shall be provided by the Contractor at no expense to the Government. The Contractor shall submit a revised floor plan showing the proposed changes and receive approval prior to starting construction of foundations for well house or equipment.

5A.3 General requirements. Prefabricated metal building shall be the product of a manufacturer who is regularly engaged in the manufacture of prefabricated metal buildings. The building shall have clear spans. The building shall be one of the following types:

- Type I Truss (or beam) type
- Type II Rigid frame type
- Type III Self-framing type

5A.3.1 Assembly and disassembly. The size of the prefabricated components and the necessary field connections required for erection shall be such as will permit easy assembly and disassembly by means of the building manufacturer's standard fasteners and construction tools. The maximum size of any shop-assembled component of the building shall be such as will permit transportation from factory to site by commercial carrier. Components of the metal building shall be fabricated in such manner that once assembled, they may be disassembled, packaged, and reassembled with a minimum amount of labor and maximum salvageability. Each and every piece and part of the assembly shall be clearly and legibly marked to correspond with previously prepared erection drawings, diagrams, and/or instruction manuals.

5A.3.2 Storage and protection. Prefabricated components, sheets, panels, and other manufactured items shall be delivered, stored, handled, and erected in such a manner that they will not be damaged or deformed. Materials stored on the site before erection shall be stacked on platforms or pallets and covered with tarpaulins or other suitable weathertight covering. All metal sheets or panels shall be stored so that water which might have accumulated during transit or storage will drain off; the sheets or panels shall not be stored in contact with materials that might cause staining. Upon arrival on the job site, the sheets or panels shall be inspected; if found wet, the moisture shall be removed and the sheets or panels shall be re-stacked and protected until used.

5A.3.3 Design requirements. Unless specified otherwise herein, the design of all prefabricated metal buildings shall be in accordance

with the Metal Building Manufacturers Association's "Recommended Design Practices Manual". If required, the Contractor shall submit for approval the engineering design calculations and stress diagrams of all structural or load-bearing components.

(a) Normal design loads. The vertical live loads, in addition to the applicable dead loads, shall be applied on the horizontal projection of the roof structure. The wind load on the building shall be proportioned and applied as horizontal and uplift velocity pressures. The maximum deflection in roofing or roof panels shall not exceed 1/180th of the span, and the maximum deflection in siding or wall panels shall not exceed 1/90th of the span.

(b) Auxiliary loads. Superimposed dynamic and/or static loads shall be applied in addition to the normal design loads and shall be considered in combinations with normal design loads.

5A.4 Materials and components.

5A.4.1 Steel framework shall be in accordance with the Steel Construction Manual of the American Institute of Steel Construction. Steel framing less than 3/16-inch thick shall be in accordance with the American Iron and Steel Institute's Light Gage Steel Design Specification. Prefabricated sections of the framework shall be designed to assure easy packing, shipping, erection, dismantling, repacking, and re-erection, and shall be assembled in a manner which will assure the maximum strength and rigidity. Approved structural members, or structural assemblies, having cross-sectional areas and/or connections that differ from the section and connections indicated may be used, if the proposed framework adequately meets design requirements.

5A.4.2 Siding and roofing (sheets or panels) shall be either steel or aluminum conforming to the following requirements. As far as practical, one type of siding and one type of roofing shall be used throughout the project.

(a) Steel sheets or panels shall be either zinc-coated or aluminum-coated. Zinc-coating for steel shall conform to the requirements of specification QQ-S-775, class d. Aluminum-coated steel shall conform to the applicable requirements of specification MIL-S-4174, type II. The siding or panels shall be either (1) the standard corrugated type, (2) the deep corrugated type, or (3) the panel type. The standard corrugated type shall have corrugations not less than 1/2-inch deep spaced not to exceed 2-1/2 inches on centers. The deep corrugated type shall have corrugations, V-beams, ribs, channels, or other similar configurations not less than 1-inch deep spaced not to exceed 12 inches on centers or not less than 3/4-inch deep spaced not to exceed 6 inches on centers. The panel type shall have either (1) interlocking ribs not less than 3-inches deep

spaced not greater than 16 inches apart, or (2) configurations not less than 1-1/2 inches deep spaced not greater than 12 inches apart.

(b) Aluminum sheets or panels shall be manufactured from alloy 3003 alclad or 3004 alclad and shall be tempered as required to suit the respective forming operations. The minimum thickness shall be 0.032 inch (20 B&S gage). The sheets or panels shall be either (1) the standard corrugated type, (2) the deep corrugated type, or (3) the panel type. The standard corrugated type shall have corrugations not less than 7/8-inch deep spaced not to exceed 2-1/2 inches on centers. The deep corrugated type shall have corrugations, ribs, V-beams, channels, or other similar configurations not less than one inch deep spaced not to exceed 12 inches on centers or not less than 3/4-inch deep spaced not to exceed 6 inches on centers. The panel type shall have either (1) interlocking ribs not less than 3 inches deep, spaced not greater than 16 inches apart, or (2) configurations not less than 1-1/2 inches deep, spaced not greater than 12 inches apart.

5A.4.3 Fasteners for securing sheets and panels. Fasteners for attachment to structural supports and fasteners for attachment to adjoining sheets or panels shall be as approved, and in accordance with the manufacturer's recommendation. Unless specified otherwise herein, the fasteners shall be either self-tapping screws, bolts and nuts, self-locking rivets, self-locking bolts, end-welded studs, bolted or riveted studs, or step rivets held by aluminum straps. Other types of fasteners of the building manufacturer's standard type may be used if prior approval is obtained. The fastening system shall be designed to withstand the design loads specified hereinbefore. Fasteners shall be stainless steel, cadmium-plated steel, or aluminum. All fasteners, with the exception of those having integral Hex washer heads and those having aluminum drive caps, shall have composite metal and polymerized chlorophene washers. Fasteners having integral Hex washer heads and fasteners having aluminum drive caps shall have polymerized chlorophene washers. Side laps of roofing sheets or panels having configurations 3/4-inch deep, or less shall be fastened at a maximum spacing of 12 inches on centers.

5A.4.4 Sheet metal accessories. As far as practical, zinc-coated steel accessories shall be provided with zinc-coated siding or roofing, and aluminum accessories shall be provided with aluminum alloy siding and roofing. Zinc-coating for all sheet steel accessories shall conform to specification QQ-S-775, class d. All aluminum accessories shall be of the alloy and temper necessary to suit forming requirements. Ridge caps, eave and edge strips, fascia strips miscellaneous flashings, and miscellaneous sheet metal accessories, unless specified otherwise, shall be formed from the same material and gage as the roof covering. Wall plates, base angles or base channels, and other miscellaneous framing

members may be standard structural steel shapes, or they may be formed from steel not lighter than 16 gage.

5A.4.5 Miscellaneous accessories.

(a) Closure strips shall be formed of approved compressed rubber, synthetic rubber, bituminous impregnated materials, or metal of the same respective type as the roofing and siding, and as standard with the manufacturer. Molded closure strips shall be free of open voids and shall not absorb or retain water. Closure strips shall be formed to match the corrugations or configurations of the roofing or siding being used and shall be provided where indicated and where necessary to provide weather-tight construction.

(b) Joint sealing material. All side and end laps shall be sealed with Type I, Class B ribbon form sealant equal to or exceeding the performance characteristics of specification MIL-C-18969. Minimum sizes of ribbons shall be 3/32-inch by 1/2-inch for rectangular areas and 1/4-inch diameter for circular areas. All joints at doors, windows, accessories, and flashings shall be sealed in a manner similar to the sealing of sheets and panels. Bituminous type sealing materials shall not be used with painted sheets and panels.

5A.4.6 Metal door and frame. Metal door and frame shall conform to the applicable requirements of specification 32Y except as specified otherwise herein. Door shall have a minimum width of 3 feet and shall be 6'-8" or 7'-0" high in accordance with the building manufacturer's standard. Door shall be hinge-type and shall swing outward. Door shall be located on end of building approximately as indicated.

(a) Frames for hinged door. Hollow pressed steel frames shall be the full welded type or the knock-down field-assembled type. The frames shall be of a type standard with the metal building manufacturer and shall be constructed to be coupled or interlocked with the adjoining wall covering material in an approved manner. The edges of the wall covering material at the sides of the frames shall be reinforced as necessary to form a connection of strength and rigidity which adequately meets design requirements. Lintels above door frames shall be contoured to serve as combination framing and flashing. Doors and frames may be shipped as a part of a prefabricated wall section, or may be packaged for fabrication at the site. Approved structural steel frames may be provided in lieu of pressed steel frames if such construction is standard with the metal building manufacturer.

(b) Hollow metal hinged door shall be type III (Industrial) design for exterior use.

(c) Hardware for hinged door. All hardware shall, as far as practicable, be of one manufacturer's make. Hardware for application on metal shall be made to standard templates. Materials shall be in accordance with the applicable Federal specifications, except that approved aluminum alloy or corrosion-resistant steel hardware may be provided in lieu of the materials specified in the Federal specifications.

(1) Hinges and butts. The sizes and number of hinges shall conform to the minimum requirements given in specification FF-H-116. Loose pin hinges for exterior doors shall be so constructed that the pins cannot be removed when the doors are closed. Type of hinges and butts shall be as specified hereinafter in the paragraph entitled "Hardware sets".

(2) Locksets, latchsets, and deadlocks shall conform to the application requirements of specification FF-H-106, except as specified otherwise herein. Series 161 may be provided as an optional equivalent of series 86, and series 160 may be provided as an optional equivalent of series 85. Types and trim for locks and latches shall be as specified hereinafter in the paragraph entitled "Hardware sets".

(3) Miscellaneous hardware shall conform to the applicable requirements of specification FF-H-111, except as specified otherwise herein. Types and sizes of miscellaneous hardware used on doors, such as bolts, holders, and stops, shall be as specified hereinafter in the paragraph entitled "Hardware sets".

(4) Metal thresholds for hinged doors shall be extruded bronze or aluminum. Thresholds shall extend the full width of the openings and shall be fastened securely to the floor with screws set in expansion shields. Corrosion-resistant or cadmium-plated screws shall be used for fastening aluminum thresholds in place; bronze screws shall be used for fastening bronze thresholds in place. Thresholds, not indicated or specified otherwise, shall be double beveled with fluted tops, and shall be not less than 3 inches wide.

(5) Finishes. All hardware shall have US 10 finish, unless specified otherwise herein.

(6) Keys and keying. Two keys shall be provided for each lock. (Master keying shall be as directed.)

(7) Application of hardware. All hardware shall be installed in a neat, workmanlike manner in accordance with the hardware manufacturer's instructions. Fasteners shall be of the proper size, quantity, and finish. After application, hardware shall be protected from paint, stains, blemishes, and damage until acceptance of the

work. All hardware shall be properly adjusted and checked out to see that the butts, locks, latches, bolts, holders, and closers operate easily. After hardware is checked, keys shall be tagged, identified, and given to the Officer in Charge. Any errors in cutting or fittings or any damage to adjoining work shall be repaired, as directed.

(8) Hardware sets shall be provided as follows.

Butts	1½ pair	type T2107-US10	4-1/2" x 4-1/2"
Lockset	1 each	type 86-B-4	
Threshold	1 each	cast bronze with weatherstrip	interlock.

5A.4.7 Metal windows shall be complete, including frames, sash, flashings, hardware, operating devices, fastening devices, clips, and all other appurtenances necessary for a complete installation and for proper operation. At the option of the Contractor, the windows shall be either steel or aluminum. Windows shall be approximately 3'-8 7/8" by 2'-9" and one shall be provided in each side of the building, located approximately in the center. Ventilators shall be screened.

(a) Steel windows shall be the standard commercial projected type, conforming to the applicable requirements of the steel window specifications of the Steel Window Institute, except as specified otherwise herein. Steel windows shall be given a phosphoric acid treatment and a factory-applied prime coat of an approved rust-inhibitive primer, of a type standard with the window manufacturer.

(b) Aluminum windows shall be the standard commercial projected type, conforming to the applicable requirements of the aluminum window specifications of the Architectural Aluminum Manufacturers' Association, except as specified otherwise herein. The minimum metal thickness for principal members of solid section windows shall be 1/8-inch.

(c) Window lintels, heads, jambs, and sills shall be a type standard with the metal building manufacturer, and shall be constructed to be connected, or interlocked, with the adjoining wall covering material in an approved manner. The edges of the wall covering shall be reinforced as necessary to form jambs of strength and rigidity which adequately meet design criteria. Lintels, heads, and sills shall be formed from the same type of sheet metal as the wall covering, except that extruded aluminum may be used with aluminum windows. Structural steel frames and/or lintels may be provided in lieu of sheet metal or extruded aluminum frames and/or lintels, if such construction is standard with the metal building manufacturer. Sheet metal and extruded aluminum lintels, heads, and sills shall be contoured to serve as combination framing and flashing.

(d) Operation of windows. Ventilators within reach of the floor shall be operated by means of handles or push bars. Hardware for all windows shall be of plain pattern, and of malleable iron or steel of the manufacturer's standard type. Operators for screened windows shall work through, or under the screens, and shall be of a type that will permit the opening, closing, and locking of the ventilators without disturbing the screens.

5A.4.8 Roof hatch. A roof hatch not less than 3 feet square shall be provided. The hatch shall be centered over the center of the well and shall be provided with a curb, flashing and all else required for weathertight construction. Adequate fastening devices shall be provided on two sides of the hatch to secure it in place.

5A.4.9 Shop painting. All ferrous metal work, except factory finished work, zinc-coated work, aluminum-coated work, and work specified to be painted hereinbefore, shall be (1) cleaned of all dirt, rust, scale, loose particles, grease, oil, and other deleterious substances, (2) given a coat of pretreatment primer conforming to specification MIL-P-15328 applied to a dry film thickness of 0.3 to 0.5 mil or chemically treated with a phosphoric type cleaner, and (3) then be given one coat of an approved rust-inhibiting primer paint of the type standard with the metal building manufacturer.

5A.4.10 Factory finishing. Exterior and interior exposed surfaces of metal roofing, metal siding, and metal accessories shall be provided with a factory applied baked on enamel finish. The finish shall consist of cleaning, pretreatment with a chemical conversion coating and one coat of baked on synthetic enamel applied to a dry film thickness of not less than 1 mil; color shall be as selected from the manufacturer's standard color chart.

5A.4.11 Dissimilar materials. Where aluminum surfaces come in contact with ferrous metal or other incompatible metals, the aluminum surfaces shall be kept from direct contact by one of the following methods:

(a) Painting the incompatible metal with a coating of heavy-bodied bituminous paint;

(b) Painting the incompatible metal with a prime coat of zinc-chromate primer conforming to specification TT-P-645, followed by one or two coats of aluminum metal-and-masonry paint, or other suitable protective coating, excluding those containing lead pigmentation;

(c) An approved nonabsorptive gasket;

(d) An approved calking placed between the aluminum and the incompatible metal.

If drainage from incompatible metal passes over aluminum, the incompatible metal shall be painted by method (a) or method (b). Aluminum surfaces in contact with concrete or masonry materials shall be painted by method (a). Green or wet wood, or wood treated with incompatible wood preservatives, shall be painted by method (a) or shall be given two coats of aluminum paint.

5A.4.12 Glazing. Glass shall conform to specification DD-G-451. Elastic glazing compound, type I, conforming to specification TT-G-410, shall be used for glazing sash.

(a) Clear sheet glass, Type II, Class 1, quality q6, single strength shall be used for glazing windows.

(b) Setting. All glass shall be bedded and back puttied, using the elastic glazing compound or putty specified, and shall be set without springing or forcing. Glass in sash shall be set with glazing clips, and compound or putty.

(c) Cleaning. Following the completion of the building, all glass shall be washed clean.

5A.5 Erection. Concrete foundations and floor slabs shall be level and true, and shall be inspected and approved before the structural steel work is started. Anchor bolts shall be installed while the concrete work is in progress; templates or other gaging devices shall be used to assure accurate spacing of the anchor bolts. Defects or errors in the fabrication of building components shall be corrected by the Contractor in an approved manner. Defects or errors in fabrication of components, which cannot be corrected in an approved manner, shall be replaced by nondefective members at no additional cost to the Government. Columns, rigid frames, and walls of self-framing building shall be plumbed in both directions, guyed and stayed, and all framing elements shall be accurately spaced to assure the proper fitting of prefabricated wall and roof coverings.

5A.5.1 Rigid frames, column bases, and sill members shall be set accurately, using a non-shrinking grouting mortar to obtain uniform bearing on the concrete and to maintain a level base line elevation. Anchors and anchor bolts for securing rigid frames, columns, or sill members to foundations shall be steel, unpainted, set accurately to templates, and of proper size to adequately resist all applicable design

loads at the base. Grouting mortar shall be a mixture of one part of blended portland cement, to two parts of well-graded fine aggregate, and enough water to provide a maximum water cement ratio of 0.50. The blended portland cement shall be a mixture of cement with 1/4 ounce of aluminum powder to each sack of cement. Surfaces to receive the mortar shall be cleaned and moistened thoroughly immediately before placement of mortar. Exposed surfaces of mortar shall be water cured with wet burlap for 7 days.

5A.5.2 Wall construction. All sheets or panels shall be applied with the corrugations, V-beams, ribs, channels, or other configurations in a vertical position. Sheets or panels shall be supplied in full wall heights from base to eave with no horizontal joints except at the junctions of door frames, window frames, and similar locations. All side and end laps shall be sealed with the joint sealing material specified hereinbefore. All walls shall be flashed and/or sealed at the base, at the top, around windows, doors, and all other similar openings. The placement of closure strips, flashing and sealing material shall be accomplished in an approved manner that will assure complete weathertightness. Flashing will not be required where approved "self-flashing" sheets or panels are used. Minimum end laps for all types of sheets or panels shall be 2-1/2 inches. Minimum side laps for all types of sheets or panels shall be one corrugation or one configuration.

5A.5.3 Roof construction. All roofing sheets or panels shall be applied with the corrugations, ribs, channels, or other configurations parallel to the slope of the roof. The roofing sheets or panels shall be supplied in full lengths from ridge or ridge panel to eaves, top to eaves on shed roofs with no transverse joints except at the junction of curbs, and similar openings. All side laps shall be laid away from the prevailing wind, and all side and end laps shall be sealed with the joint sealing material specified hereinbefore. The roof shall be flashed and sealed at the ridge, at eaves and rakes, at projections through the roof, and elsewhere as necessary. The placement of closure strips, flashing, and sealing material shall be accomplished in an approved manner that will assure complete weathertightness. The use of various types of roof covering in relation to roof slopes shall be as follows:

Roof Slope	Minimum End Laps			Remarks
	Standard	Deep	Panel	
1:12	-	10	8	Deep corrugated or panel type only

(Slopes less than 1:12 shall not be used)

Minimum side laps for roof covering shall be as follows:

Roof Covering	Minimum Side Laps
Deep corrugated type	One full corrugation or configuration
Panel type	One full configuration or interlocking rib

5A.6 Quality assurance provisions.

5A.6.1 Samples. One sample of each proposed type of siding material, and roofing material shall be submitted and approved.

5A.6.2 Shop drawings, erection diagrams, and instruction manuals including anchor bolts plan, details of structural framework, structural connections, roofing, siding, fastening system, doors, windows, other openings, flashing, sealing of joints, and other details of diagrams as necessary to augment erection instructions shall be supplied. Shop drawings shall be submitted and approved before prefabricated components are delivered to the site.

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DIVISION 6. MECHANICAL

- SECTION 6A. Well Construction
6B. Well Pumping Equipment
6C. Piping

SECTION 6A. WELL CONSTRUCTION

6A.1 Applicable publications. The following publications of the issues listed below, but referred to elsewhere by basic designation only, form a part of this specification to the extent indicated by the references thereto (where a number is suffixed to the specification number, it denotes the effective amendment to the specification):

SS-C-192g(1) Federal and Military Specifications.
Cement, portland

6A.2 General requirements. The work includes the provision of a permanent gravel wall well at the site indicated and as hereinafter specified.

6A.3 Capacity and depth of wells. It is intended that the permanent well produce from 175 to 225 gallons of potable water continuously. Bids shall be based on the permanent well having the following construction details:

- (a) Total depth of well - 70 feet
- (b) Total length of 18-inch outer casing - 35 feet
- (c) Total length of 8-inch intercasing - 50 feet
- (d) Total length of 8-inch screen, two sections totaling - 20 feet.

In case the actual conditions differ substantially from those stated and/or shown, the provisions respecting an adjustment for changed conditions shall apply, subject to the requirement of notification thereunder being given.

6A.4 Permanent gravel wall well.

6A.4.1 A pit casing shall be installed by drilling a 24-inch diameter hole to the specified depth for the site and placing an 18-inch nominal diameter outer casing of the type hereinafter specified.

6A.4.2 Grouting. The area between the outer well casing and the native formation shall be thoroughly washed out and filled with portland cement grout, by pumping with approved equipment. The grout shall be pumped under pressure through a temporary down feed pipe in the wall so arranged that the grout will be forced into the bottom of the annular space between the casing and the hole. Grout shall be pumped continuously,

in one operation, until the annular space and all voids and fissures are completely filled, as evidenced by the grout overflowing on the surface. The grout shall be allowed 48 hours to set up before drilling operations are resumed.

6A.4.3 Gravel packing. The hole drilled below the pit casing shall be drilled to the depth indicated for well, and shall be 17 inches in diameter. Each indicated water-bearing formation to be developed shall be under-reamed to at least 22 inches in diameter and held open for placing of gravel after the screens and the inner casing have been set. All drilling shall be accomplished with proper drilling clay of the bentonite type having a weight not to exceed 9 pounds per gallon at 15 centipoise viscosity. The Ph value of the drilling mud shall be maintained at 7.6 or more at all times. The drilling clay shall be of a type readily thinned with commercial mud thinners for easy removal from the walls of the well and the introduced gravel. Screens of approved lengths shall be provided at the approved location. After introduction of the gravel is completed, the drilling clay shall be thinned and the well pumped free of all sand, mud, drillings, and other foreign matter.

6A.5 Tests. Upon completion of the permanent well, the Contractor shall provide a temporary pump for measuring the flow and drawdown. The temporary pump shall have a capacity of not less than 1,000 gallons per minute. After determining the static water level in the well, the pumping shall begin at a rate of approximately 75 gallons per minute and the drawdown checked at 15-minute intervals until it stabilizes, after which pumping shall be continued at that rate for 2 hours and the water level checked at 30-minute intervals. The pumping rate shall then be increased in uniform increments not exceeding 40 gallons per minute and the described procedure repeated at each increment of increased rate until the capacity of the well at the specified drawdown is determined. After the safe maximum yield of the well has been determined, a continuous 24-hour pumping test shall be conducted at that rate and the drawdown checked at hourly intervals. A complete written log of the tests showing static water level, pumping rate, and drawdown at the specified intervals shall be furnished to the Officer in Charge. At the end of the 24-hour test, water samples shall be taken and tested by an approved testing laboratory for complete chemical and bacteriological analysis. Additional samples shall be furnished in suitable containers to the Officer in Charge.

6A.6 Materials.

6A.6.1 Casings. The outer pit casing, 18-inch nominal diameter, shall be standard weight steel pipe. All other casings shall be genuine

wrought-iron pipe or schedule 80 black steel pipe. Joints shall be either threaded and coupled; with heavy recessed-type couplings in which the ends of the pipe shall butt, or they may be field welded.

6A.6.2 Well screen shall have an inside diameter of not less than 8 inches and be of not less than 6 gauge material, and shall be of corrosion resistant (stainless) steel type 304, with shutter-type openings or continuous horizontal opening type of proper size and design to hold back and support the gravel used in the gravel envelope around the screens. Joints shall be made with heavy butt-type couplings of the same materials, or by welding.

6A.6.3 All gravel used for the gravel envelope around screens shall be round, hard, water-worn, gravel of proper gradation that will allow free flow of water in the well and positively prevent the infiltration of sand. It shall be of siliceous material, reasonably smooth and round, and shall be free of flat or elongated pieces as well as of dirt, vegetable matter, or other foreign material. The gravel shall be thoroughly sterilized with hypochlorite before being placed.

6A.6.4 Cement grout for sealing the space between the casing and the drilled hole, shall be composed of portland cement, type I, conforming to specification SS-C-192, and water. The mixed grout shall weigh not less than 14 pounds per gallon.

6A.7 Air lines. The well shall be provided with an air line as indicated. The pipe shall be standard weight zinc-coated steel pipe.

6A.8 Sterilizing. The well shall be sterilized by adding chlorine or hypochlorine solution to the water used for placing the gravel. Sufficient chlorine or solution to give the water a chlorine content of 50 P.P.M. shall be fed into the water continuously during the gravel placing operation.

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SECTION 6B. WELL PUMPING EQUIPMENT

6B.1 Applicable publications. The following publications of the issues listed below, but referred to elsewhere by basic designation only, form a part of this specification to the extent indicated by the references thereto (where a number is suffixed to the specification number, it denotes the effective amendment to the specification):

Non-Government Specifications and Standards.

National Electrical Manufacturers' Association (NEMA).

Book of Standards (current edition).

6B.2 General requirements. The work includes the provision of a turbine-type deep well pump, complete with vertical, hollow shaft, electric motor drive, gasoline engine and right angle gear drive, and all appurtenances as indicated and specified herein. The installation shall be complete and ready to operate.

6B.3 Pump shall be the vertical turbine type, oil lubricated and provided with a non-reverse ratchet to prevent reverse rotation. Pump shall have an efficiency of not less than 70 percent.

6B.3.1 Pumping conditions. Speed of pump shall not exceed 1800 rpm. Bids shall be based on the pump operating under the following conditions:

<u>Well No.</u>	<u>Capacity</u> (gpm)	<u>T.D.H.</u> (feet)	<u>Depth of setting</u> (to top of bowl) (feet)
BA-110	200	155	40

In case the actual conditions differ substantially from those stated and/or shown, the provisions respecting an adjustment for changed conditions shall apply, subject to the requirement of notification thereunder being given.

6B.3.2 Pump head. Pump head shall be constructed from close-grained cast iron and shall be heavy duty type designed for hollow shaft drive. Pump shall have flanged above ground discharge.

6B.3.3 Pump column. The column shall be schedule 40 black steel pipe, and shall be ~~in~~ sections not to exceed 10 feet in length and of proper diameter to eliminate undue friction when pumping at pump capacity.

6B.3.4 Line shaft. The line shafting shall be high-grade ground and polished steel and not less than 1-3/16 inches in diameter. The shaft shall be furnished in interchangeable sections not over 10 feet in length and fastened with threaded steel couplings having a strength of not less than 100 percent of the strength of shaft after being assembled. The ends shall be machine finished and undercut for proper butting of the shaft. All threads shall be lathe cut.

6B.3.5 Bearings. The pumping unit shall have sufficient guide bearings to maintain the alignment of the pump and shafting and to prevent vibration. The inner column couplings shall be bronze and shall act as bearings for the line shaft which shall be turned and polished. Oil lubricated bearings shall be provided with oil grooves to effect passage of oil down through the entire length of oil tube and shafting. An automatic lubricator with capacity sufficient for one week of continuous operation shall be provided to feed oil to the bearings. Lubricator shall have sight glass and feed adjustment.

6B.3.6 Bowls. The pump bowls shall be made of close grained cast iron, free from blow-holes and all other defects which would impair their strength or durability for the service, and shall be lined with vitreous porcelain enamel. Bowls shall have smooth, curved vanes to efficiently direct the flow of water and to prevent air locking. The bowls shall be of suitable thickness and strength to withstand the shutoff pressure of the unit. Bowls shall be fastened together in such a manner that accurate alignment is assured and maintained. Guide passages for water shall be so designed and finished as to reduce friction to a minimum.

6B.3.7 Impellers shall be of the enclosed type, of heavy construction, and lined with vitreous porcelain enamel. Each impeller shall be accurately fitted and perfectly balanced both dynamically and hydraulically. Impeller shaft shall be of high grade stainless steel, carefully ground and polished and furnished with lathe cut threads. No keyways shall be cut into the shaft. Impellers shall have non-overloading characteristics and shall have head characteristics as steep as possible so that an increase or decrease in the operating head above the design point will not cause an excessive decrease or increase in pump capacity. Impellers shall be attached and locked to pump shaft in such a manner that they may easily be removed, and that they will not work loose for any reason.

6B.3.8 Suction pipe and strainer. A suction pipe of suitable diameter and 10 feet long shall be provided for the pump. A galvanized strainer having a net inlet opening area of at least five times the area of the suction pipe shall be provided at the lower end of the suction pipe.

6B.4 Motor. Motor shall be a hollow shaft, vertical, full enclosed electrical motor and shall be squirrel-cage induction type for operation on 208 volt, 3 phase, 60 Hertz service and shall have ample capacity to operate the pump properly through its entire head capacity range without exceeding its rated capacity, but shall be not less than 15 horsepower. The speed of the motor shall not exceed 1800 rpm. The motor shall conform to NEMA standards.

6B.5 Magnetic motor starter shall be of the full voltage across-the-line type conforming to the latest NEMA standards. Starter shall be of the quick-make and quick-break type having a low voltage and thermal overload release and hand reset device. Starter shall have hand-off-automatic switch and shall be provided with the pumping equipment, but shall be wired in accordance with the electrical section of this specification.

6B.6 Pressure tank shall be non-coded, welded steel tank, galvanized on inside and outside, designed for not less than 75 psi working pressure. Tank shall be a vertical-type tank not less than 30 gallon capacity, and shall have at least one tap in top and one tap in bottom of not less than 3/4-inch diameter. Two not less than 1-1/4 inch taps shall be provided in the side of the tank; one in upper section and one in lower section. The tank shall be provided with the following accessories:

6B.6.1 Pressure gauge, 3-1/2 inches dial, 0 to 100 psi, graduated to one-pound increments.

6B.6.2 Bottom drain with bronze gate valve.

6B.6.3 A mercury pressure switch which shall be connected to the electrical starting circuit to cut on and cut off the pump at selected pressure. The pressure switch shall contain 2 mercury switches, providing an adjustable start and a separate stop contact for operating the pump. The switch shall be adjustable from 10 to 60 psi.

6B.6.4 Safety relief valve, set at 65 psi.

6B.7 Right angle drive. A combination electric motor and right angle gear drive shall be provided for dual drive arrangement. The drive shall have one to one gear ratio to transmit the power from the engine to the pump at normal operating speed and shall be of the vertical, hollow shaft,

spiral bevel gear type equipped with anti-friction bearings and a base flange matching the pump head flange. It shall be conservatively rated to transmit the maximum power requirements of the pump and be equipped with a heavy duty ball thrust bearing capable of carrying the hydraulic thrust of the pump and the weight of the rotating element. An oil reservoir of ample capacity shall supply adequate lubrication to the gears and bearings. A suitable motor stand shall be furnished which provides ample room for a sliding clutch for alternating the prime mover. A sliding clutch shall be mounted on the head shaft so the gears do not operate when the pump is driven by the electric motor. A non-reverse ratchet shall be incorporated in the clutch to prevent backspin in the event of reverse rotation.

6B.8 Auxiliary gasoline engine shall be provided and shall be multi-cylinder, water-cooled, heavy duty gasoline power plant with maximum horsepower at least 30 percent in excess of the maximum brake horsepower required to operate the pump continuously at its rated speed, over the entire head capacity range of the pump. The engine shall be arranged for motor cranking and shall be equipped with a high tension ignition system, battery and required appurtenances, shall include an adjustable governor, carburetor, tachometer, oil pressure gauge, cylinder temperature gauge, gasoline pump and filter, gravity fuel tank, air cleaner, oil filter, generator, starting crank, radiator, exhaust pipe and muffler, and clutch take-off assembly.

6B.8.1 Battery charger, electric type, shall be mounted on wall of pump house where directed and shall be the rectifier type for operation with 120 volt, 60 Hertz current. Charger shall be protected by an automatic circuit breaker and shall have capacity to charge two 6-volt batteries or one 12-volt battery at eight to five amps. One direct current ammeter shall be included and shall be flush-mounted on the front of the enclosure. All metal parts shall be corrosion-resistant or shall be suitably protected against corrosion.

6B.8.2 Exhaust pipe from the engine shall be carried through the wall of the pump room in an asbestos-cement sleeve and a suitable muffler shall be mounted on the end of the exhaust pipe. The muffler shall be properly supported in an approved manner.

6B.8.3 A metal instruction plate shall be mounted on the engine unit giving the manufacturer's recommendations for lubricating oil and other pertinent information.

6B.8.4 Safety guards. The interconnecting shafting between the gasoline engine and the combination drive and all other rotating units shall be provided with approved safety guards for protection of operating personnel.

6B.9 Performance test. The unit shall be tested by the Contractor after being put in operation to determine conformance with this specification. Equipment failing to perform as specified shall be replaced by the Contractor at no additional cost to the Government.

6B.10 Warranty. All the equipment to be furnished under this section of the specification shall be guaranteed for a period of one year from the date of acceptance thereof, either for beneficial use or for final acceptance, whichever is earlier, against defective material, design and workmanship.

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SECTION 6C. PIPING

6C.1 Applicable publications. The following publications of the issues listed below, but referred to elsewhere by basic designation only, form a part of this specification to the extent indicated by the references thereto (where a number is suffixed to the specification number, it denotes the effective amendment to the specification):

(a) Bureau of Yards and Docks/NAVFAC Specifications.

42Yc Drainage, sanitary, electrical and water service appurtenances.

(b) Federal and Military Specifications.

FF-B-575b Bolts, hexagon and square.
HH-G-76b Gasket, asbestos metallic cloth.
WW-P-406c Pipe, steel, (seamless and welded)(for ordinary use).
WW-P-421c Pipe, cast gray and ductile iron, pressure, (for water and other liquids).
WW-P-521f Pipe-fittings, flange fittings and flanges, steel and malleable iron, (threaded and butt-welding), 150-pound.
WW-V-51d Valve, bronze, angle, check, and globe, 125, 150, and 200 pound, screwed, or flanged for solder (for land use).
WW-V-54c(1) Valve, gate, bronze (125, 150 and 200 pound, screwed, flanged, soldered, for land use).
MIL-V-18436B Valves, check.

(c) Non-Government Specifications and Standards.

American National Standards Institute, Inc. (ANSI).

A21.10-1964 Cast iron fittings, 2 inch through 48 inch, for water and other liquids.

American Water Works Association (AWWA).

C110-64 Cast iron fittings, 2 inch through 48 inch, for water and other liquids.
C500-61 Gate valves for ordinary water works service.
C601-68 A standard procedure for disinfecting water mains.

6C.2 General requirements. Piping shall be any of the types and materials as specified herein and shall be of new and unused materials.

All piping shall be placed to follow the general arrangement shown and shall be entirely out of the way of lighting fixtures, doors, windows and other openings. The interior of all pipe and fittings shall be thoroughly cleaned of debris and foreign matter prior to installation and shall be kept clean throughout the installation operation. When work is not in progress, open ends of pipe and fittings shall be secured with plugs, or other approved methods, in such a manner as to prevent trench water or other foreign matter from entering the pipe.

6C.3 Piping 4 inches and larger shall be cast iron pipe, class 150, outside coated, cement lined, conforming to specification WW-P-421, type I, II or III, or at the option of the Contractor, slip-on jointed pipe may be provided. Slip-on jointed pipe shall conform to specification WW-P-421 for class 150, outside coated, cement lined pipe, except for dimensional modifications to bell-and-spigot end to suit gaskets. Exposed piping and where indicated shall be flanged piping and shall be class 150 cast iron pipe as specified above, with ANSI class 125 flanges.

6C.4 Piping 3 inches and smaller shall be zinc-coated steel pipe conforming to specification WW-P-406.

6C.5 Fittings and specials.

6C.5.1 Fittings and specials for bell-and-spigot cast iron pipe shall be class D, in accordance with AWWA specification C110 with lead joints.

6C.5.2 Fittings for mechanical jointed pipe and flanged jointed pipe shall be short-body fittings in accordance with American National Standards Institute, Inc. specification A21.10 and flange fittings provided with American National Standards Institute, Inc. class 125 flanges.

6C.5.3 Fittings for use with pipe 3 inches and smaller shall be zinc-coated malleable iron conforming to specification WW-P-521.

6C.6 Placing and laying.

6C.6.1 Cast iron pipe.

(a) Pipe laid underground shall be inspected in the sling, tapped with a light hammer to detect cracks, before lowering into the trench. Defective, damaged, or unsound pipe will be rejected. Deflections from a straight line or grade, as required by vertical or horizontal curves or offsets shall not exceed 6/D inches per lineal foot of pipe, where D is the nominal diameter of the pipe in inches,

between the center lines extended, of any two connecting pipes. If the alignment requires deflection in excess of that limitation, the Contractor shall provide special bends or a sufficient number of shorter lengths of pipe to conform to the limitation specified. Except where necessary in making connections with other lines, pipe shall be laid with the bells facing in the direction of laying. Except at closures not less than two lengths of bell-and-spigot, pipe shall be in position ahead of each joint, with packing installed and earth fill tamped alongside the pipe, before the joint is poured. Where cutting of pipe is necessary, it shall be done with approved mechanical cutters in a manner that will not damage the pipe. Where coatings are damaged, they shall be touched up with material similar to that used for the original coating.

(b) All flanged pipe shall be accurately cut and shall be worked into place without springing or forcing.

6C.6.2 Zinc-coated steel piping shall be accurately cut, shall be worked into place without forcing or springing, and shall be free of burrs or fins.

6C.6.3 All water pipe laid underground shall be installed at an average depth of 3 feet to the top of pipe unless otherwise indicated and not less than 2 feet of cover shall be provided.

6C.7 Pipe supports. All piping shall be supported in a manner to adequately carry the weight of the lines and maintain proper alignment. Exposed piping in the well house shall be adequately supported from floor as required. Pipe laid underground shall have the bottom third (1/3) of the barrel supported on firm soil. All 1/16 and sharper cast iron bends, including connections to existing mains and services, shall be securely blocked in the direction of flow. Pipe laid underground shall be blocked in accordance with specification 42Y. Plugs shall be secured similarly except that concrete bracing shall be poured in a manner that affords easy removal of the concrete without disturbing the piping.

6C.8 Joints.

6C.8.1 Bell-and-spigot joints. Before jointing, all lumps, blisters and excess coating material shall be removed from the bell-and-spigot ends of the pipe. All oil or grease shall be removed. The outside of the spigot and inside of the bell shall be wire brushed and wiped clean and dry. Spigots shall be adjusted in the bells so as to give uniform space all around and if any pipe does not allow sufficient space for proper caulking, it shall be replaced with one of proper dimensions. Adjacent lengths of pipe shall be adjusted with reference

to each; blocking or wedging between hub and spigot will not be permitted. Molded or tubular rubber, asbestos, or especially prepared paper rings treated to prevent deterioration or support of bacteria shall be used as gaskets. The gasket shall be driven or caulked tightly into the annular spaces between the pipes, and shall be of proper size to seal the joint tightly and leave sufficient space for lead as specified. Where rubber rings are used as gaskets, a braided or twisted hemp or jute ring shall be caulked into the joint after the rubber ring is placed to prevent contact of the molten lead with the rubber. Gaskets shall not project into the bore of the finished joint. When the joints are approved for pouring, the joints shall be cleaned and the remaining space filled at one pouring with lead which shall be caulked in a manner that will assure tight joints without overstraining the bells. The depth of lead shall be not less than 2-1/4 inches measured from the face of the bell. After caulking, the lead shall be practically flush with the face of the bell.

6C.8.2 Roll-on joints shall be made with the standard materials furnished with the pipe, and in accordance with the recommendations of the manufacturer, subject to approval of the Officer in Charge.

6C.8.3 Mechanical joints. The jointing shall be in accordance with the recommendations of the manufacturer of the joint. Bolts, nuts and exposed threads shall be coated with asphalt varnish after installation.

6C.8.4 Flanged joints. The joints shall be firmly bolted with machine bolts. Bolts shall be regular hexagon bolts conforming to specification FF-B-575, type II. Gaskets shall be made of asbestos metallic cloth conforming to specification HH-G-76, and shall be full-faced.

6C.8.5 Screwed joints shall have the threads cut full and not more than three threads on the pipe shall remain exposed. Pipe lubricant shall be applied to the male threads only.

6C.9 Valves.

6C.9.1 Gate valves for use with pipe 4 inches and larger shall be the double-disc type with non-rising stems and shall conform to American Water Works Association standard AWWA C500. Stems shall have nuts similar to those on valves of the existing system except exposed flanged valve in well house shall have standard size wheel. Gate valves shall be of one make and shall open by a counter-clockwise rotation of the valve stem.

6C.9.2 Gate valves for use with pipe 3 inches and smaller shall be bronze wedge disc in accordance with specification WW-V-54, type I, class A.

6C.9.3 Check valves for use with pipe 4 inches and larger shall be cast iron body, bronze mounted, tilting disc, class 150, non-slamming type and shall conform to the applicable requirements of specification MIL-V-18436, type III.

6C.9.4 Check valves for use with pipe 3 inches and smaller shall be bronze and shall conform to specification WW-V-51, class A.

6C.9.5 Air release valves. Where indicated, an approved pressure air valve shall be provided to automatically permit air to escape while the pipe line is in service and under pressure. The valve shall be iron body, bronze-mounted and designed for 125 pounds working pressure. The float shall be made of hard rubber with phosphor-bronze levers. The seat shall be hard rubber and plunger of hard quality soft rubber. The construction of the valve shall be such that valve seats may easily be replaced.

6C.10 Roadway boxes. Each valve on underground piping shall be provided with an adjustable cast iron roadway box of a size suitable for the valve on which it is used. The head shall be round and shall have the word "WATER" cast upon it. The least diameter of the shafts of the boxes shall be 5.25 inches. Boxes shall be given a heavy coat of bituminous paint.

6C.11 Connection to existing main shall be made by means of tapping sleeve and valve where indicated. The valve shall meet the requirements of AWWA standard C500, except that ends and seat rings may be oversized to permit use of full size cutter. Joints in tapping sleeves shall be poured with lead and caulked.

6C.12 Tests. Before being covered, the completed pressure piping shall be subjected to a hydrostatic pressure test of 200 pounds per square inch maintained for two hours. All pipe, joints, valves and fittings in the test section shall be examined. Defective material disclosed as a result of the test shall be replaced and the test repeated; any joint showing visible leakage shall be made watertight.

6C.13 Sterilization. Before being placed in service, the new piping shall be flushed and sterilized by chlorination in accordance with the American Water Works Association standard AWWA C601. The chlorine solution shall remain in the system at least 24 hours. After final flushing, the quality of the water shall be approved by the Officer in Charge before acceptance.

6C.14 Warranty. All the equipment to be furnished under this section of the specification shall be guaranteed for a period of one year from the date of acceptance thereof, either for beneficial use or for final acceptance, whichever is earlier, against defective material, design and workmanship.

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DIVISION 7. ELECTRICAL

SECTION 7A. Interior Electrical
7B. Exterior Electrical

SECTION 7A. INTERIOR ELECTRICAL

7A.1 Applicable publications. The following publications of the issues listed below, but referred to elsewhere by basic designation only, form a part of this specification to the extent indicated by the references thereto (where a number is suffixed to the specification number, it denotes the effective amendment to the specification):

(a) Bureau of Yards and Docks/NAVFAC Specifications.

9Yi Electrical apparatus, distributing systems, and wiring;
including addendum no. 1.
42Yc Drainage, sanitary, electrical and water service appur-
tenances.

(b) Federal and Military Specifications.

J-C-30(2) Cable and wire, electrical (power, fixed installations).

7A.2 General requirements.

7A.2.1 The work includes the provision of an underground service to well house, lighting and power circuits in conduit, wiring of motor starter, lighting fixture complete with lamp, wall switch, receptacle and other miscellaneous items as required to provide complete and operating power and lighting circuits.

7A.2.2 Materials and methods of installation shall be in accordance with specification 9Y, except as indicated or specified otherwise.

7A.3 Electrical characteristics. Electrical service to well house shall be 120/208y volts, three phase, four wire, 60 Hertz, grounded neutral.

7A.4 Drawings diagrammatic. The electrical drawings are primarily diagrammatic in nature, intended to indicate the purpose and connections of the conduit and/or circuits rather than the exact locations of the runs which may be modified by the Contractor to meet conditions at the time of work.

7A.5 Method of wiring. All wiring shall be in rigid conduit concealed in concrete construction or underground or exposed on plywood panelboard.

7A.6 Backboard at load center. Wall mounted switches and starter shall be mounted on a backboard consisting of angle iron uprights embedded in the concrete slab and surfaced with 3/4-inch grade AD exterior type Douglas fir plywood as indicated. Previous to mounting equipment, the backboard shall be given two coats of asphaltum varnish.

7A.7 Wires and cables shall conform to the following where applicable, and meet the requirements of specification J-C-30. All wires shall be color coded. Color coding shall be integral with the sheath.

7A.7.1 No conductor smaller than No. 12 AWG shall be used for any purpose other than controls which shall be not smaller than No. 14 AWG.

7A.7.2 All wire in conduit installed in dry locations shall be type RHW or THW.

7A.7.3 All wire in conduit installed wholly or in part in damp locations, in or under the floor slab or underground, shall be type RHW with a neoprene jacket or type THWN.

7A.7.4 Underground service conductors shall be size indicated and shall be type RHW-USE with a neoprene jacket.

7A.8 Conduit. Conduit shall be of the rigid type, except where flexible type is indicated, and shall be zinc-coated for both inner and outer surfaces. Standard lengths shall be threaded previous to treatment. All conduit shall be cut with a hacksaw and reamed to size. No bends shall be made of greater than 90 degrees and manufactured elbows shall be used on one-inch size and above. Conduit installed underground or in fill under concrete slabs shall be encased in concrete in accordance with specification 42Y.

7A.9 Outlet boxes. Flush outlet boxes, wherever used to terminate conduit at equipment or lighting fixture location, shall be 4-inch square hot dipped zinc-coated boxes with a cover in each case suitable for the respective purpose. Pendant fixture boxes shall have aligning covers. Surface mounted outlet boxes shall have threaded hubs.

7A.10 Pull and junction boxes. The Contractor shall provide and install all necessary or required pull or junction boxes. Such boxes shall be constructed of code gauge of steel standard for the respective dimensions and equipped with a turned-in flange to which the cover shall be mounted by screws into threaded holes. All parts shall be zinc-coated.

7A.11 Local wall switches. Wall switches shall be single pole or three-way toggle type "T" rated, 20 ampere, 125 volt, in composition base. Covers shall have chrome finish.

7A.12 Convenience receptacles. Convenience receptacle outlets shall be single or duplex, as indicated, 15 ampere, 125 volts, grounding type, parallel slot, double-sided contacts with four terminal screws in composition base. Receptacles shall be grounded as specified in specification 9Y. Covers shall have chrome finish.

7A.13 Magnetic motor starter and motor. Magnetic starter and motor will be furnished with the equipment as specified in section entitled "Well Pumping Equipment", but shall, unless integral with the equipment, be installed and wired by the Contractor. If the approved equipment differs from that indicated or specified, the Contractor shall provide the correct wiring and control for same.

7A.14 Disconnect switch shall be of the size and type indicated. Type of enclosure shall be as indicated.

7A.15 Incandescent fixture shall be vaportight and of the highest quality of the type shown. Fixture varying in minor design will be acceptable, if drawings are submitted and approved.

7A.16 Grounding. Service neutral wire shall be grounded to the underground pressure water pipe at exit from the building.

7A.16.1 The continuity of grounding shall be assured by use of conduit lock nuts inside and outside of metallic enclosures, the removal of insulating coatings at points of contact, and bonding across any insulated joints. Grounding connections through continual metal raceways or conductor armor back to service ground will be considered effective.

7A.16.2 All exposed metallic non-current carrying materials of electrical equipment forming a part of the interior electrical system shall be effectively grounded, including conduit, metal enclosures of switching equipment, panelboard and motor frames.

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SECTION 7B. EXTERIOR ELECTRICAL

7B.1 Applicable publications. The following publications of the issues listed below, but referred to elsewhere by basic designation only, form a part of this specification to the extent indicated by the references thereto (where a number is suffixed to the specification number, it denotes the effective amendment to the specification):

Bureau of Yards and Docks/NAVFAC Specifications.

9Yi Electrical apparatus, distributing systems, and wiring; including addendum no. 1.

7B.2 General requirements. The work includes the provision of an extension to the existing secondary system, accessories indicated, specified or required for a complete and operating power service. Materials and workmanship shall be in accordance with specification 9Y, except as indicated or specified otherwise.

7B.3 Electric service. Secondary electric service shall be 120/208Y volts, three phase, four wire, 60 Hertz, grounded neutral.

7B.4 Conductors. Secondary conductors shall be of size indicated and shall be bare copper, medium hard drawn.

7B.5 Secondary rack shall be 4-wire, as required, complete with spool insulators. Racks shall be zinc-coated heavy duty steel type. Insulators shall be held in place with 5/8-inch button-head bolt equipped with a non-ferrous cotter pin, or equivalent, at the bottom. The minimum vertical spacing between conductors shall be 6 inches.

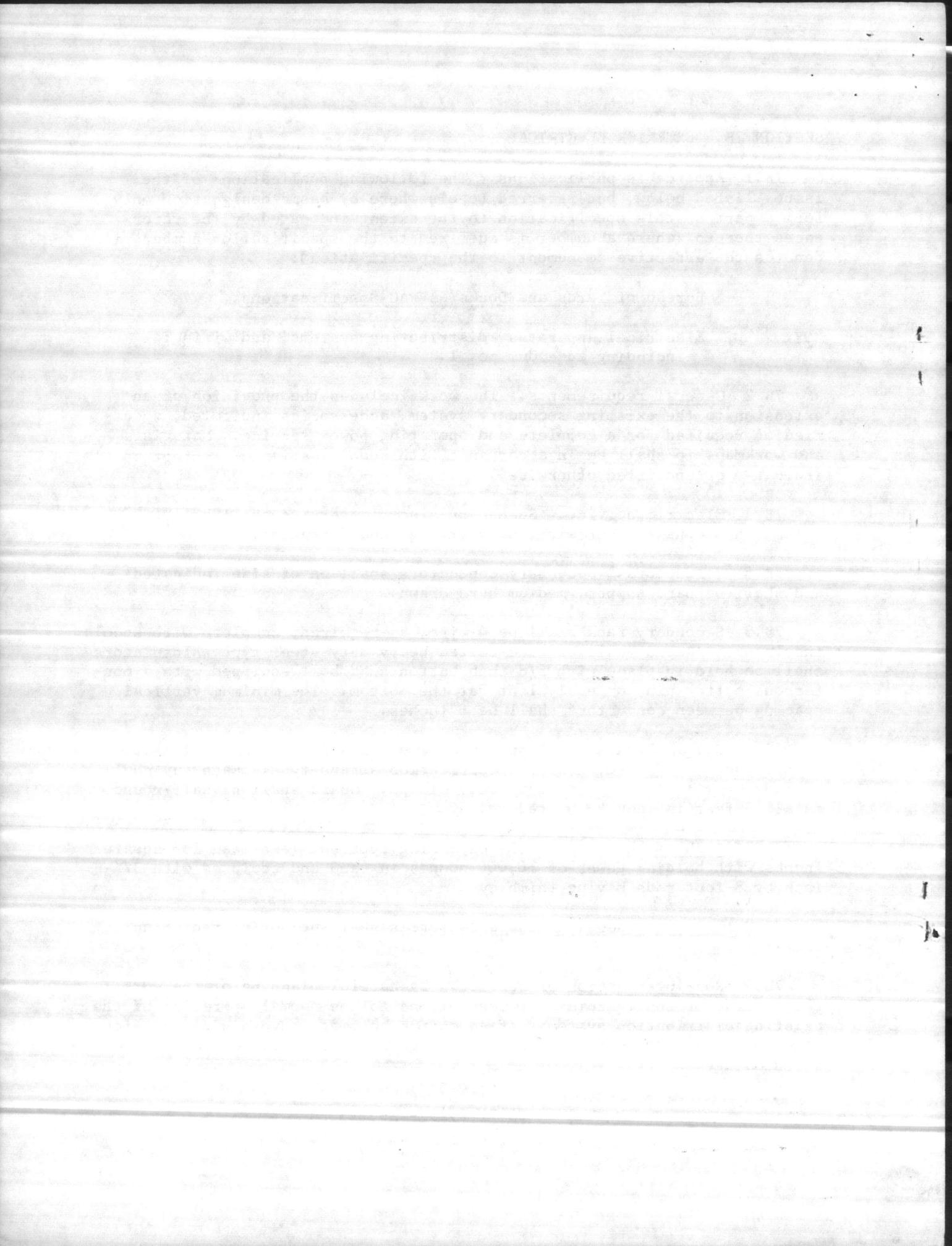
7B.6 Guys. Strand shall have a minimum breaking strength of 10,000 pounds and shall be seven-wire specification strand-type. Each guy shall be made up with three-bolt heavy duty clamps. Guard shall be half-round metal, 8 feet in length, bolted to guy.

7B.7 Anchors shall be of the expanding type not less than 135 square inches with holding power of 10,000 pounds in sand and equipped with 3/4-inch by 8-foot rods having thimbleye.

7B.8 Pole line hardware and accessories shall be hot-dipped, zinc-coated.

7B.9 Non-interruption of service. By careful planning of the work, the Contractor shall minimize interruptions to the normal operation of the existing distribution system. If an outage becomes unavoidable, notification shall be made to the Officer in Charge 24 hours previous to the proposed outage.

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DEPARTMENT OF THE NAVY
BUREAU OF
YARDS AND DOCKS

NAVDOCKS
SPECIFICATION
NO. 3885/56
ADDENDUM NO. 3

REPAIRS TO WELL PUMPS, MONTFORD POINT, RIFLE RANGE,
COURTHOUSE BAY AND ONSLOW BEACH (SECOND INCREMENT)

at the

Marine Corps Base, Camp Lejeune, N. C.

SECTION 2. PUMP REPAIRS

2-01. General requirements.- In the third line after "provision of," insert "new." In the sixth line after "pumping units," insert "Except as modified herein, the new pump parts shall be a regular commercial product of the manufacturer or his suppliers and shall be new and unused."

2-07. New pump parts.-

(f) Impellers.- In the fourth line after "dynamically", delete "and hydraulically."

NOTICE

Each bidder shall refer in his bid to all addenda; failure to do so may constitute an informality in the bid.

Camp Lejeune, N. C.

22 October 1956

R. E. HARRIS
CAPT (CEC) USN
Officer in Charge of Construction

FOR:

ROBERT H. MEADE
RADM (CEC) USN
Chief of Bureau of Yards and Docks
Department of the Navy

Contract NBy-3885

STATE OF TEXAS
COUNTY OF DALLAS
CITY OF DALLAS

BEFORE ME, the undersigned authority, on this _____ day of _____, 20____, personally appeared _____, known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

My commission expires _____.

Witness my hand and seal of office this _____ day of _____, 20____, at the City of Dallas, State of Texas.

Notary Public in and for the State of Texas

NOTICE

Each bidder shall refer to the bid to all
relevant items to be so considered
information in the bid.

State of Texas, Dallas County

NOT (C) 100

State of Texas, Dallas County

100

NOT (C) 100

State of Texas, Dallas County

100

DEPARTMENT OF THE NAVY
BUREAU OF
YARDS AND DOCKS

NAVDOCKS
SPECIFICATION
NO. 3885/56
ADDENDUM NO. 2

REPAIRS TO WELL PUMPS, MONTFORD POINT, RIFLE RANGE,
COURTHOUSE BAY AND ONSLOW BEACH (SECOND INCREMENT)

at the

Marine Corps Base, Camp Lejeune, N. C.

SECTION 1. GENERAL CLAUSES.

1-14. Rates of wages at the site.- Line 5, delete "Secretary of Labor No. R-962," and insert "Secretary of Labor No. R-5216."

Delete from the specification "LIST OF WAGE RATES, DECISION R-962, 20 July 1956, CAMP LEJEUNE, ONSLOW COUNTY, NORTH CAROLINA," and attach "LIST OF WAGE RATES, DECISION R-5216, 9 October 1956, CAMP LEJEUNE, ONSLOW COUNTY, NORTH CAROLINA," enclosed herewith.

NOTICE

Each bidder shall refer in his bid to all addenda; failure to do so may constitute an informality in the bid.

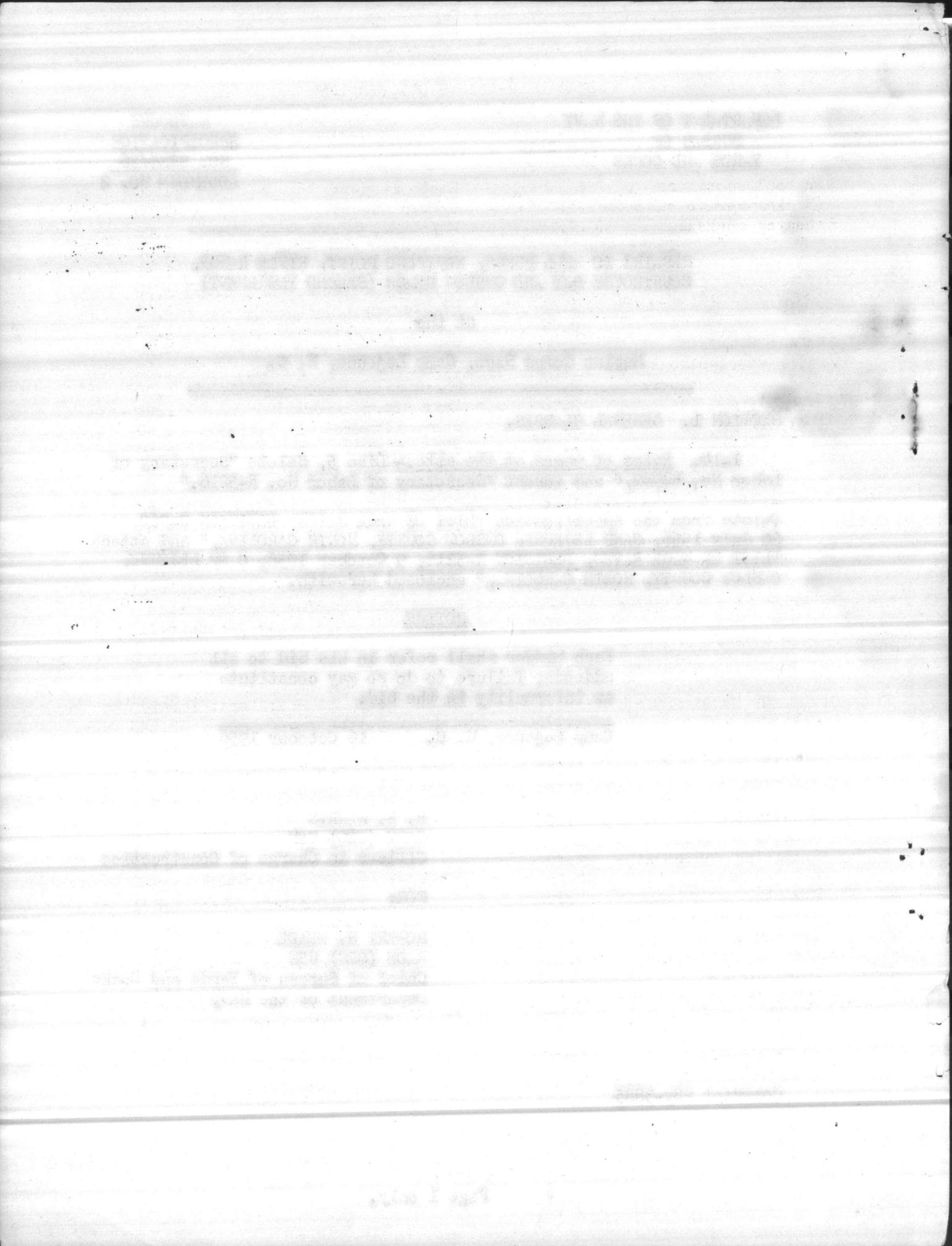
Camp Lejeune, N. C. 16 October 1956

R. E. HARRIS
CAPT (CEC) USN
Officer in Charge of Construction

FOR:

ROBERT H. MEADE
RADM (CEC) USN
Chief of Bureau of Yards and Docks
Department of the Navy

Contract NBy-3885



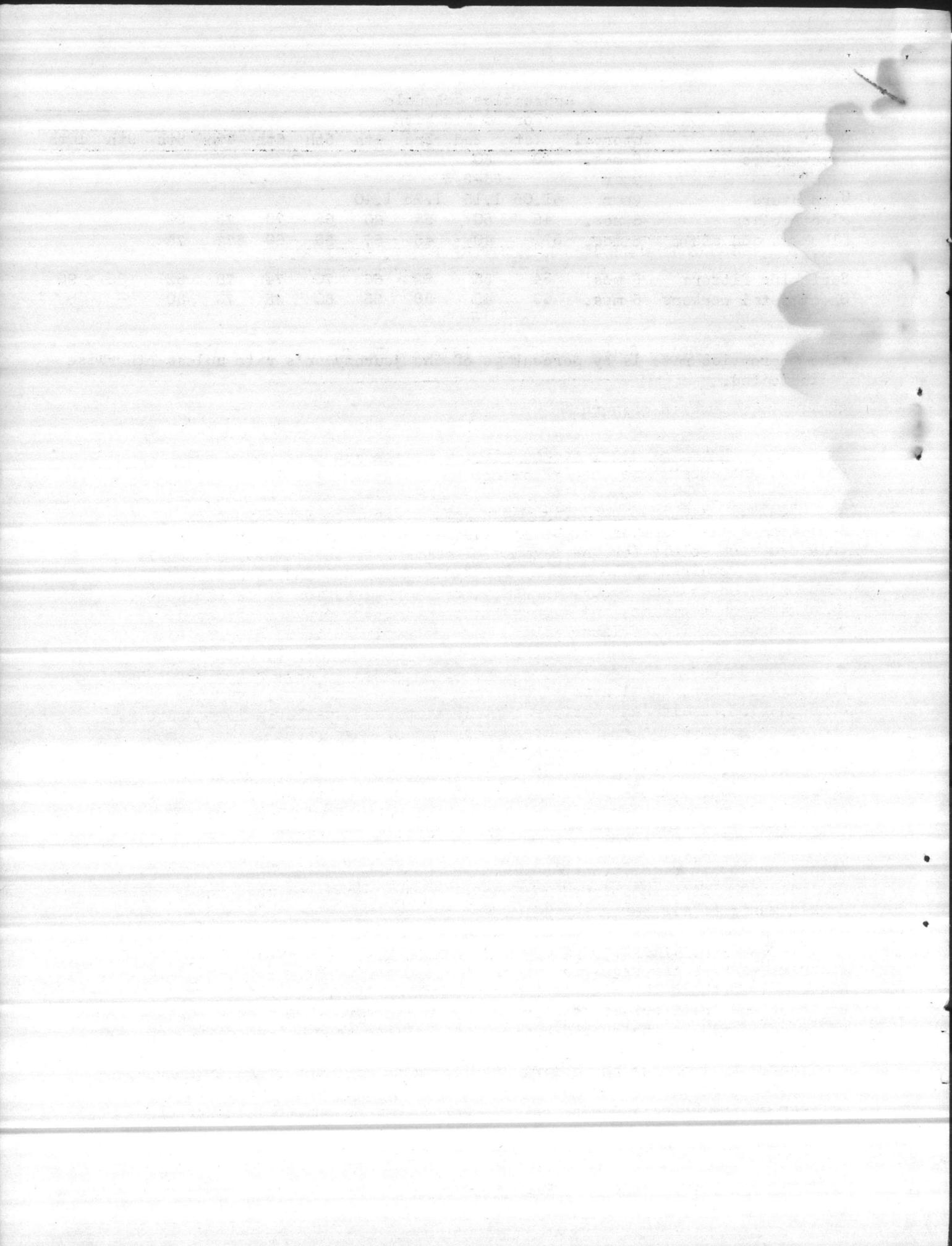
LIST OF WAGE RATES
 DECISION R-5216 9 OCTOBER 1956
 CAMP LEJEUNE, ONSLOW COUNTY, NORTH CAROLINA

	<u>Per Hour</u>		<u>Per Hour</u>
Air tool operators	\$	Mason tenders	\$1.00
(jackhammerman vibrator)	1.00	Mortar mixers	1.00
Asbestos workers	2.75	Painters, brush	1.65
" " improvers		Painters, structural steel	2.00
1st year	1.25	Piledrivermen	1.65
2nd "	1.64	Pipe layers (concrete & clay)	1.00
3rd "	1.85	Plasterers	2.00
4th "	2.07	" tenders	1.00
Asphalt rakers	1.00	Plumbers	2.50
Boilermakers-Blacksmith	2.975	Roofers	1.50
" helpers	2.725	Sheet metal workers	1.75
Bricklayers	2.50	Soft floor layers	1.65
Carpenters	1.65	Steam fitters	2.50
Cement masons	1.625	Stone masons	2.50
Electricians	2.40	Sprinkler fitters	2.95
Elevator constructors	2.20	Terrazzo workers	2.00
" " helpers	1.54	" " helpers	1.00
Glaziers	1.50	Tile setters	2.00
Ironworkers, structural	2.50	" " helpers	1.00
" ornamental	2.50	Truck drivers	1.00
" reinforcing	2.25	Welders - receive rate prescribed	
Laborers	1.00	for craft performing operation	
Lathers	1.75	to which welding is incidental.	
Marble setters	1.75		
" " helpers	1.00		
Power equipment operators:		Power equipment operators: (cont)	
Backhoes	\$2.125	Welding machines	\$2.125
Cranes	2.125	Tournapull	2.125
Cableways	2.125	Air compressors	1.75
Derricks	2.125	Bulldozers	1.875
Boom hoist	2.125	Fireman	1.55
Draglines	2.125	Hoist, double drum	1.875
Dredges or other		" one drum	1.625
floating equipment	2.25	Finishing machine	1.875
Pile drivers	2.25	Mixers (larger than 10-S)	1.75
Pavers	2.125	" (smaller than 10-S)	1.625
Heavy duty mechanics	2.125	Motor graders	2.00
Scrapers, wheel type	2.125	Pumps over 2" discharge	1.75
Shovels	2.125	Pumps under 2" discharge	1.625
Truck Cranes	2.125	Rollers, earth	1.87
Tractors with attach-		" asphalt	2.00
ments	2.125	Apprentice engineers and	
Tractors without		oilers	1.55
attachments	1.875		
Trench machines	2.125		

Apprentice Schedule

Craft	Interval	*Period and Rate									
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Ironworkers	6 mos.	50	60								
"	year		66-2/3								
Carpenters	year	\$1.05	1.15	1.25	1.40						
Electricians	6 mos.	45	50	55	60	65	70	75	80		
Plumbers and steam fitters	6 mos.	37½	40	45	50	55	60	67½	75		
Sprinkler fitters	6 mos.	54	58	62	66	70	74	78	82	86	90
Sheet metal workers	6 mos.	40	45	50	55	60	65	70	80		

*The apprentice rate is by percentage of the journeymen's rate unless otherwise indicated.



REPAIRS TO WELL PUMPS, MONTFORD POINT, RIFLE RANGE,
COURTHOUSE BAY AND ONSLOW BEACH (SECOND INCREMENT)

at the

Marine Corps Base, Camp Lejeune, N. C.

SECTION 1. GENERAL CLAUSES

1-14. Rates of wages at the site. - Delete sub-paragraphs (a) and (b), and substitute the following:

"1-14.1 Required by Davis Bacon Act. - The wage determination decision of the Secretary of Labor attached hereto is made a part of this contract solely for the purpose of setting forth the minimum hourly wage rates required to be paid by the Davis-Bacon Act and is not to be considered as a guaranty, warranty, or representation as to the wage determination decision, the wage rates therein, the prevailing wages, or the availability of labor at the wage rates indicated. Bidders are advised to make their own investigations and to rely solely upon their own information as to local labor conditions, such as wage rates necessary to attract labor, the length of the work day and work week, overtime compensation, health and welfare contributions and available labor supply, and as to prospective changes or adjustments of wage rates or employment conditions in the area concerned which might affect operations under the contract. Neither a mistake in attaching the wage determination decision of the Secretary of Labor or in the determination or statement of the wage rates set forth therein, nor the payment of higher wage rates than those set forth therein shall entitle the bidder to the cancellation of his bid or contract, to an increase in the contract price, or to other additional payment or recovery, except when the Contracting Officer modifies the specified wage rates and when the requirements of sub-paragraph 1-14.2 below are satisfied.

"1-14.2 Modification of Minimum Wage Rates. - The Contracting Officer reserves the right to require the contractor to pay the minimum wages set forth in the wage determination which is applicable to this contract and in effect at the time of award (irrespective of the wage rates set forth in the specification) and, if necessary, to modify the contract accordingly. The Government shall not be liable to the contractor to increase the contract price or to make any other additional payment as a result of any such modification made by the Contracting Officer in the specified wage rates, except that an equitable contract

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY

RESEARCH REPORT
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CHICAGO, ILLINOIS
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price adjustment shall be made (1) when the contractor clearly demonstrates that his investigation of the wage rates at the site did not, and that a reasonable investigation could not, disclose that wage rates higher than those previously specified would have to be paid, and (2) when the contractor clearly demonstrates that he actually and reasonably based his bid or proposal upon wage rates lower than those required to be paid by such modification."

NOTICE

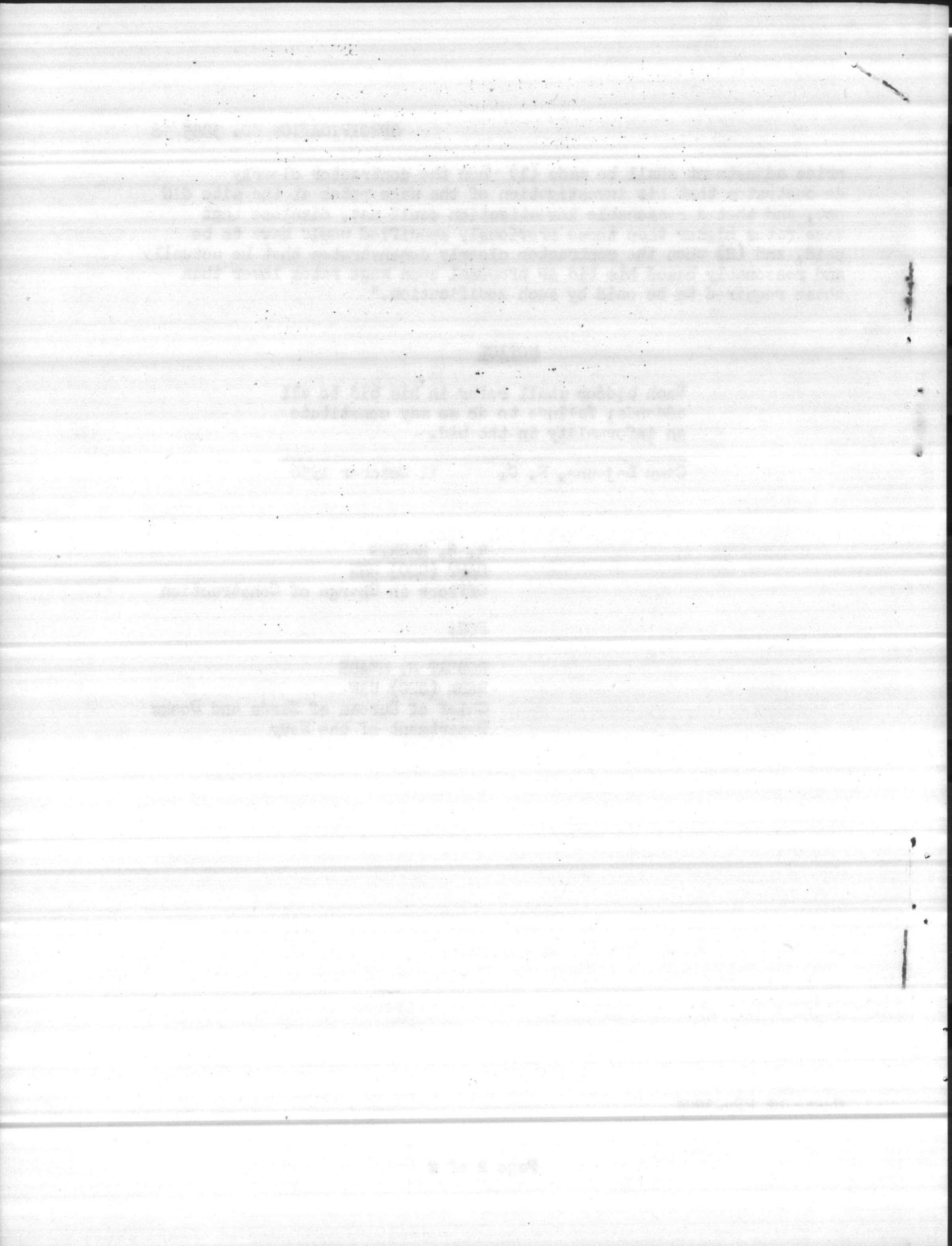
Each bidder shall refer in his bid to all addenda; failure to do so may constitute an informality in the bid.

Camp Lejeune, N. C. 11 October 1956

R. E. HARRIS
CAPT (CEC) USN
Officer in Charge of Construction

FOR:

ROBERT H. MEADE
RADM (CEC) USN
Chief of Bureau of Yards and Docks
Department of the Navy



NOTICE:
Bids to be opened at 2:00 P.M., EST,
6 November 1956, at the Public Works
Office, Marine Corps Base, Camp
Lejeune, North Carolina

NAVDOCKS
SPECIFICATION
NO. 3885/56

REPAIRS TO WELL PUMPS, MONTFORD POINT, RIFLE RANGE,
COURTHOUSE BAY AND ONSLOW BEACH (SECOND INCREMENT)

at the

Marine Corps Base, Camp Lejeune, N. C.

CONTRACT NBY-3885

Appropriation: 1771106.11 MCT&F 1957

A priority rating, in consonance with the rating system in effect at the time of award of this contract, will be issued by the Bureau of Yards and Docks.

SECTION 1. GENERAL CLAUSES.

1-01. General intention. - It is the declared and acknowledged intention and meaning to provide and secure repairs to well pumps at Montford Point, Rifle Range, Courthouse Bay and Onslow Beach, complete and ready for use.

1-02. General requirements. - Five deep well turbine pumps at Montford Point, three deep well turbine pumps at Rifle Range, two deep well turbine pumps at Courthouse Bay and two deep well turbine pumps at Onslow Beach are to be repaired. The work includes the removal of existing pumping units, cleaning and testing of wells and the renewal of all pump parts below the pump bases together with water level testing devices.

1-03. Location. - The work shall be located at the Marine Corps Base, Camp Lejeune, North Carolina, approximately as shown. The exact location will be indicated by the Officer in Charge.

1-04. Form of contract. - The contract will be executed on U. S. Standard Form No. 23 revised March 1953, and will include U. S. Standard Form No. 23A March 1953, General Provisions, and NavDocks Form 113, revised January 1956, Additional General Provisions, with the following modifications:

(a) The phrase "including connection charges" is inserted after the word 'utilities' in the fifth sentence of Clause 43, Government Utilities of Form No. NavDocks 113.

(b) At the end of Clause 17 of Form No. 23A, add the following thereto:

"No materials, supplies or manufactured products originating from sources within Soviet-Controlled countries or areas shall be used, furnished or installed under this contract. The prohibited areas presently include: Albania, Bulgaria, China, including Manchuria (and excluding Taiwan (Formosa)) (includes Inner Mongolia; The Provinces of Tsinghai and Sikang; Sinkiang, Tibet; the Former Kwantung Leased Territory, The Present Port Arthur Naval Base Area and Lisoning Providence), Communist-controlled area of Viet Nam and Communist-controlled area of Laos, Czechoslovakia, East Germany (Soviet Zone of Germany and the Soviet Sector of Berlin), Estonia, Hungary, Latvia, Lithuania, North Korea, Outer Mongolia, Poland and Danzig, Rumania, Union of Soviet Socialist Republics."

1-05. Performance and payment bonds, executed on U. S. Standard Form Nos 25 and 25a, respectively, will be required as stipulated in U. S. Standard Form No. 20, revised March 1953, Invitation for Bids.

1-06. Time for completion. - The entire work shall be completed within 120 calendar days after date of receipt of a notice of award or any other communication authorizing the contractor to proceed.

1-07. Damages for delay in accordance with Clause 5 of U. S. Standard Form No. 23A shall be at the rate of \$25.00 per calendar day. The Government will take no action pursuant to Clause 5, Liquidated Damages, to terminate the right of the contractor to proceed or to assess liquidated or actual damages where the failure of the contractor to complete the work within the time specified elsewhere in this contract is due solely to the operation of the priorities and allocations system and is not otherwise caused by the fault or negligence of the contractor. It is understood and agreed that such delays will be considered an act caused by the Government and as such will be excusable within the meaning of Clause 5, and the contractor will be entitled to a time extension by reason thereof.

1-08. Drawings accompanying specification. - The following drawings accompany this specification and are a part thereof. Drawings are the property of the Government and shall not be used for any purpose other than that contemplated by the specification.

Y&D Drawing No.

Title

647001
647002

Index and Location Plan
Site Plans and Well Construction Details

1-09. Standard specifications. - The standard specifications given in the following list or mentioned elsewhere herein (including the addenda, amendments, and errata listed) shall govern in all cases where references to standard specifications are made. In case of difference between these standard specifications and this specification or its accompanying drawings, this specification or its accompanying drawings shall govern. Especial care shall be exercised to refer in request for quotations, in orders, and in subcontracts to the standard specifications and to all modifications thereof. The requirements for packaging, packing, marking, and preparation for shipment or delivery included in the standard specifications shall apply only to materials and equipment which are furnished directly to the Government and not to materials and equipment which are to be installed by the contractor.

BUREAU OF YARDS AND DOCKS

WH-P-441h Dec. 1953 - Pipe, wrought iron (welded black or zinc-coated) including Amendment No. 1

1-10. "General specification for inspection of materials" (issued by the Navy Department) with such appendices thereto as may be applicable, of the issues in effect on the date of the invitation for bids, shall govern for the factory inspection of materials and equipment required under the contract including materials and equipment specified in detail herein or covered by standard specifications. (See also Clause 9 of U. S. Standard Form No. 23A). Factory inspection of material and equipment for which tests at the place of manufacture are required may be waived at the option of the Government, provided notarized copies of factory test reports are furnished which show compliance with the specification requirements. Factory inspection will not be required for lumber provided it is grade marked and trade-marked by the association under whose rules it is graded, or provided it is accompanied by certificates of inspection issued by the association under whose rules it is graded or by another inspection agency which is satisfactory to the Officer in Charge.

1-11. Optional requirements. - Where a choice of materials and/or methods is permitted herein, the contractor will be given the right to exercise the option unless stated specifically otherwise.

1-12. Definitions. - Where "as shown", "as indicated", "as detailed", or words of similar import are used, it shall be understood that reference to the drawings accompanying this specification is made unless otherwise stated. Where "as directed", "as required", "as permitted", "approved", "acceptance", or other words of similar import are used, it shall be understood that the direction, requirement, permission, approval or acceptance of the Officer in Charge is intended unless stated otherwise. As used herein, "provide" shall be understood to mean "provide complete in place", that is "furnish and install".

1-13. Drawings required of the contractor. - Before commencing the installation of any of this work, the contractor shall submit for approval and in accordance with Clause 29 (F) of NavDocks Form No. 113 such drawings as may be required, including those showing: Manufacturers' specifications and illustrations of deep well pump parts showing pump characteristic curves, maximum horsepower required, size of suction pipe, size of line shaft, type of bearings, spacing of bearings on line shafts, number of pump impellers, size of columns, type of column connection and spacing of guides between oil tube and column.

1-14. Rates of wages at the site. - (See Clause 20 of U. S. Standard Form No. 23A). The contractor shall pay mechanics and laborers employed or working directly upon the site of the work, wage rates not less than those contained in the wage determination decision of the Secretary of Labor No. R-962, which is attached hereto. Any class of laborers and mechanics not listed in the Secretary's decision, which will be employed on the contract, shall be classified or reclassified by the contractor or sub-contractor conformable to the Secretary's decision subject to the approval of the contracting officer; the classification shall be submitted on Form NavDocks 1882 to the Officer in Charge for approval, prior to their employment in any work under the contract. In the event the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers and mechanics to be used, the question shall be submitted through the contracting officer to the Secretary of Labor for final determination. Where differing rates are listed for the same trades according to the type of construction on which employed, their application shall be conformable to prevailing area practice, subject to the approval of the Officer in Charge.

(a) Required by Davis-Bacon Act. - The wage determination decision of the Secretary of Labor attached hereto is made a part of this contract solely for the purpose of setting forth the minimum hourly wage rates required to be paid by the Davis-Bacon Act and is not to be considered as a guaranty, warranty, or representation as to the wage determination decision, the wage rates therein, or the availability of labor at the wage rates indicated. Bidders are advised to make their own investigations, and to rely solely upon their own information, as to local labor conditions, such as wage rates necessary to attract labor, the length of the work day and work week, overtime compensation, health and welfare contributions, available labor supply and prospective changes or adjustments of wage rates in the area concerned which might affect operations under the contract. Under no circumstances shall any mistake in attaching the wage determination decision of the Secretary of Labor or in the determination or statement of the wage rates set forth therein, or the payment of higher wage compensation than set forth therein entitle the bidder to the cancellation of his bid or contract, to an increase in the contract price, or to other additional payment or recovery.

(b) Government right to change. - The Government reserves the right to change the wage determination decision attached to the specification or addendum, either before or after the award of this contract, in accordance with the latest wage determination decision applicable at the time of award of this contract under the regulations of the Secretary of Labor. Such change shall be made without liability upon the Government for any increase in the contract price or other additional payment or recovery.

(c) Apprentices employed pursuant to this determination of wage rates must be registered in a bona fide apprenticeship program registered with a State apprenticeship council recognized by the Federal Committee on Apprenticeship, U. S. Department of Labor; or if no such recognized council exists in a State, it shall mean a program registered with the Bureau of Apprenticeship, U. S. Department of Labor.

1-15. Work outside regular hours. - If the contractor desires to carry on work outside the regular hours or on Saturdays, Sundays, or holidays, he may submit application to the Officer in Charge, but shall allow ample time to enable satisfactory arrangements to be made by the Government for inspecting the work in progress. At night, he shall light the different parts of the work in an approved manner.

1-16. Security requirements. - No employee or representative of the contractor will be admitted to the site of the work unless he furnishes satisfactory proof that he is a citizen of the United States or if an alien, his residence within the United States is legal.

1-17. Storm protection. - Should warnings be issued of winds of gale force or greater, the contractor shall take every practicable precaution to minimize danger to persons, to the work, and to adjacent property. These precautions shall include closing all openings; removing all loose materials, tools, and/or equipment from exposed locations; and removing or securing scaffolding and other work.

1-18. Approval of samples, cuts, and drawings. - Matter submitted for approval shall be accompanied by complete information concerning the material, articles, and/or design proposed for use in sufficient detail to show compliance with the specification; and shall be approved before incorporation into the work. Approval thereof will not be construed as relieving the contractor of compliance with the specification, even if such approval is made in writing, unless the attention of the Officer in Charge is called to the non-complying features by letter accompanying the submitted matter. Partial submittals, or submittals of less than the whole of any system made up of inter-dependent components, will not be considered. Approval of drawings, cuts, and samples by the Officer in Charge shall not be construed as a complete check nor approval of the detailed dimensions, weights, gauges, and similar details of the proposed articles. The conformance of such details with the contract requirements, together with the necessary coordination of

dimensions and details between the various elements of the work and between the various subcontractors and suppliers, shall be solely the responsibility of the contractor; approval of submitted matter notwithstanding.

1-19. Methods and schedules of procedure. - The work shall be executed in a manner and at such times that will cause the least practicable disturbance to the occupants of the buildings and the normal activities of the station. Before starting any work, the sequence of operations and the methods of conducting the work shall have been approved.

1-20. Operation of station utilities. - The contractor shall not operate nor disturb the setting of any valve in the station water system. The Government will operate the valves as required for normal conduct of work. The contractor shall notify the Officer in Charge, giving reasonable advance notice, when such operation is required.

1-21. Examination of premises. - Before submitting proposals, bidders are expected to visit and inspect the site of the work and satisfy themselves as to the physical conditions at the site; the general and local conditions, including availability of labor, the nature and extent of the work, the character and effect of existing adjoining and/or adjacent work; and other factors that can affect the cost of the performance of the contract to the extent that such information is reasonably obtainable.

1-22. Protection and repairs. - The contractor shall comply with the Fire Prevention Requirements, as published by the Officer in Charge of Construction, security rules and regulations of the activity, and shall provide approved means necessary for the protection of all Government and private property, including contents of buildings affected directly or indirectly by his operations. All damage to Government or private property, resulting directly or indirectly from the contractor's actions, shall be made good by him without expense to the Government.

1-23. Existing work damaged or otherwise affected by the contractor's operations shall be restored to a condition as good as existed before the work was commenced, except where indicated or specified otherwise. Where new construction adjoins, connects to, or abuts the existing work, the junction shall be made in a substantial workmanlike and weathertight manner as the case requires. All new work shall match, as nearly as practicable, the existing adjoining and/or adjacent similar work unless indicated otherwise. Except where specifically designated as being retained by the Government or to be re-installed in the new construction, all materials, fixed equipment, and/or debris resulting from demolition and removal operations shall be removed by the contractor from the limits of the Government reservation at such times during the progress of the work as directed.

1-24. Accident reports. - The contractor and his subcontractors shall maintain an accurate record of, and shall report to the Officer in Charge, exposure data and all accidents resulting in death traumatic injury, occupational disease, or damage to property, materials, supplies, and equipment incident to work performed under the contract. The report shall be in accordance with the pamphlet entitled "instructions to Contractor for Preparation of Accident Reports, NavDocks P-275" and shall be submitted on the standard form prescribed therein; the pamphlet and the required forms will be furnished by the Officer in Charge.

1-25. Payrolls and affidavits. - The prime contractor, sub-contractors, and sub-subcontractors will be required to submit a copy of each weekly payroll together with a Notarized Contractor's Weekly Payroll Affidavit covering the payroll to the Officer in Charge of Construction within seven days after the regular payment date of the payroll period. The receipt of these payrolls and affidavits is made a condition precedent to payment for any amounts due under the contract.

(a) The payroll shall be identified by the name of the contractor, Navy Contract Number and the location of the site of the work. Payrolls shall state accurately and completely for each employee, his name, classification, social security number, rate of pay, daily and weekly hours worked, wages earned, all deductions from such wages and the actual weekly wages paid. Contractors are required to submit employees addresses with the payroll on which the employee's name first appears.

(b) Contractor's Weekly Payroll Affidavit (NavDocks Form 118) (1-55) which must be used shall be reproduced by the contractor for his use. This form combines the required payroll affidavit and certification of payrolls. In order to provide uniformity with regard to information, contractors are advised to list by title, or name, all deductions made, omitting from the listing, the dollar amount of the deductions.

(c) A sworn affidavit accomplished by the contractor, stating that he and his subcontractors have complied with the Labor Standards provisions of the contract, must accompany each request for reimbursement. Affidavit form will be furnished by the Officer in Charge of Construction.

1-26. Schedule of prices. - Upon award of the contract, the contractor shall promptly prepare Y&D Form 83, "Schedule of Prices", in triplicate and submit to the Officer in Charge of Construction. Submission of these prices shall not affect the contract terms. These forms will be furnished by the Officer in Charge of Construction.

1-27. Sub-Contractors and personnel. - Promptly after the award of the contract, the contractor shall submit to the officer in charge of construction in triplicate, a list of his subcontractors and the work each is to perform.

(a) On this form shall appear the names of the key personnel of the contractor and subcontractors, together with their home addresses and telephone numbers, for use in event of an emergency.

(b) From time to time as changes occur and additional information becomes available, the contractor shall amplify, correct and change the information contained in previous lists.

1-28. Lines and grades required for execution of the work shall be established by the contractor.

1-29. As-built drawings. - On completion of the work, one print of each of the drawings accompanying this specification shall be neatly and clearly marked in red to show all variations between the construction actually provided and that indicated or specified in the contract documents, and delivered to the Officer in Charge. Where a choice of materials and/or methods is permitted herein; and where variations in the scope or character of the work from the entire work indicated or specified is permitted either by award on bidding items specified for that purpose or by subsequent change to the contract; the as-built drawings shall define the construction actually provided. The representation of such variations shall conform to standard drafting practice and shall include such supplementary notes, legends, and details as may be necessary for legibility and clear portrayal of the as-built construction; the marked prints shall be subject to approval before acceptance.

1-30. Quarantine. - The entire Camp Lejeune reservation, including Camp Lejeune, Camp Geiger, and Marine Corps Air Facility, Peterfield Point (New River) have been quarantined by the United States and North Carolina Departments of Agriculture for the White Fringed Beetle. Compliance with the quarantine regulations established by these authorities as set forth in the U. S. D. A. Quarantine No. 72 and North Carolina State Quarantine No. 7 is required for operations hereunder. Pertinent requirements of the quarantines include the following:

(a) Certification is required for the following articles and they shall not be moved from the reservation unless accompanied by a valid inspection certificate issued by an authorized White Fringed Beetle Inspector.

1. Soil, sand, or gravel moved independently or attached to other articles, such as heavy equipment including drag-lines, road grading machines, ditch diggers, bulldozers, and equipment with track or cleats.

2. Nursery stock, plants and sod.

3. Scrap metal

Authorization for movement of equipment shall be obtained from the officer in charge, and requests for inspection shall be made sufficiently in advance of the date of movement, to permit arrangements for the services of authorized inspectors. The equipment shall be prepared and assembled so that it may be readily inspected. Articles and materials requiring certification for movement shall be removed from the equipment by washing with water and such other means as are necessary to accomplish complete removal. Resulting spoil shall be wasted as directed.

1-31. Cleaning up. - Upon completion of the work, the contractor shall remove all debris from the site. All debris shall be hauled to a Government dump, a distance not exceeding two miles from the site of the work, and placed where directed and the premises shall be left free from all litter and refuse; exterior grounds shall be left in a raked, clean condition. All salvageable material, including pump parts not used in the new work, shall be delivered as directed by the officer in charge; haul not to exceed ten miles.

SECTION 2. PUMP REPAIRS

2-01. General requirements. - The work includes the removal of existing pumping units, cleaning and testing of wells; the provision of water level testing device, the provision of pump bowls, impellers, pump columns, suction pipes, strainers, shafts, bearings, oil tubes, automatic lubricators, and all other parts required below existing pump base to provide complete repairs to the existing pumping units. The pumps to be repaired are located in the following wells:

(a) Montford Point

<u>Bldg. No.</u>	<u>Well No.</u>
M-142	Z-1
M-243	Z-2
M-244	Z-3
M-627	Z-4
M-226	Z-5

(b) Rifle Range

<u>Bldg. No.</u>	<u>Well No.</u>
RR-45	"S"
RR-47	S-1
RR-227	T-1

(c) Courthouse Bay

<u>Bldg. No.</u>	<u>Well No.</u>
BB-43	"W"
BB-44	"V"

(d) Onslow Beach

<u>Bldg. No.</u>	<u>Well No.</u>
BA-109	22
BA-110	23

2-02. Existing conditions. - The pumps to be repaired are located in well houses which are approximately 12 feet square of wood frame or brick wall construction with a 3 feet by 5 feet hatch in the roof centered over the pumping unit.

(a) Drawings. - The drawings indicate construction details of the wells when drilled and present the best available record of their construction.

(b) The existing pumping units are as follows:(1) Montford Point

Well No.	Manufacturer	Serial No.	Column Size	Shaft	Depth of Setting	Motor H. P.
Z-1	Layne & Bowler	12449	6"	1-3/16"	55°	7-1/2
Z-2	Layne & Bowler	12839	6"	1-3/16"	60°	10
Z-3	Layne & Bowler	11302	6"	1-3/16"	50°	20
Z-4	Layne & Bowler	13138	6"	1-3/16"	50°	7-1/2
Z-5	Layne & Bowler	12840	6"	1-3/16"	55°	7-1/2

(2) Rifle Range

Well No.	Manufacturer	Serial No.	Column Size	Shaft	Depth of Setting	Motor H. P.
"S"	Layne & Bowler	12116	6"	1-3/16"	90°	15
S-1	Layne & Bowler	13140	6"	1-3/16"	65°	20
T-1	Layne & Bowler	13139	6"	1-3/16"	50°	10

(3) Courthouse Bay

Well No.	Manufacturer	Serial No.	Column Size	Shaft	Depth of Setting	Motor H. P.
"W"	Layne & Bowler	12117	6"	1-3/16"	45°	10
"V"	Peerless	J7478	5"	1-3/16"	35°	15

(4) Onslow Beach

Well No.	Manufacturer	Serial No.	Column Size	Shaft	Depth of Setting	Motor H. P.
22	Layne & Bowler	13373	6"	1-3/16"	40°	10
23	Layne & Bowler	13374	6"	1-3/16"	40°	10

(c) Well Z-4 at Montford Point, Wells "S" and T-1 at the Rifle Range, Well "W" at Courthouse Bay and Well 22 at Onslow Beach are equipped with electric motors, right angle gear drives and auxiliary gasoline engines. The other wells are equipped with electric motors only.

2-03. Maintenance of service. - Cleaning and testing of wells and pump repairs shall be made at approved times and in such manner as to prevent all unnecessary interruptions to service. Not more than one well on any one water supply system shall be taken out of service at any one time unless approved by the officer in charge.

2-04. Cleaning wells. - After removal of existing pumping equipment, the wells shall be agitated and pumped off by means of an air lift until all accumulation of sand or gravel has been removed from the casing. During the cleaning operations the well shall be surged and agitated adjacent to each screen and the pumping continued until all traces of sand and turbidity have disappeared.

2-05. Testing. - After cleaning operations, a temporary gasoline driven turbine-type test pump with a capacity of at least 400 gpm shall be installed in the well, approved equipment provided for measuring rate of flow and water level in the well and the well tested to determine its safe maximum yield. After measuring the static water level in the well, the test shall begin at a rate of one-half the original capacity of the well as indicated on the drawings and the rate increased by one-tenth the original capacity at intervals. The pumping rate shall remain constant during each interval and shall be continued until the draw-down stabilizes. The draw-down shall be determined at end of each interval. The test shall continue until the maximum rate of flow at a stabilized draw-down is determined. The well shall be pumped at this rate of flow for one additional hour to confirm that the safe maximum yield of the well has been reached. The pump shall then be cut off and the draw-down measured at sufficient intervals to plot a recovery curve for the well.

(a) Water levels and rate of pumping shall be determined and recorded for all tests and the contractor shall submit a characteristic curve, in triplicate, for the well showing the draw-down level in feet for various rates of flow in gpm. Similar curves, in triplicate, showing the recovery of the well shall be provided.

2-06. Pumping conditions. -

(a) Bids shall be based on repairing the existing pumps to operate under the conditions as hereinafter specified at a speed of 1,800 rpm without overloading the existing electric motors. Final pumping conditions shall be determined by the contractor and approved by the officer in charge after testing the existing gravel wall wells. In case final pumping condition differs substantially from that specified and/or shown, an adjustment in the contract price and/or the time for completion of the work will be made in that same manner as provided by Clause 4, U. S. Standard Form No. 23A. The contractor, after determining the final pumping conditions, shall reinstall the existing pumping equipment and place the well in operation until the required pump parts can be obtained.

(b) Bids shall be based on the repaired pumps operating at an efficiency of not less than 70 per cent under the following conditions:

(1) Montford Point

Well No.	Discharge gpm	Total discharge head above impellers feet	Depth of setting feet
Z-1	100	141	55
Z-2	150	163	60
Z-3	300	170	50
Z-4	150	140	50
Z-5	130	142	55

(2) Rifle Range

Well No.	Discharge gpm	Total discharge head above impellers feet	Depth of setting feet
"S"	150	205	90
S-1	250	190	65
T-1	150	200	50

(3) Courthouse Bay

Well No.	Discharge gpm	Total discharge head above impellers feet	Depth of setting feet
"W"	150	170	45
"V"	200	160	35

(4) Onslow Beach

Well No.	Discharge gpm	Total discharge head above impellers feet	Depth of setting feet
22	200	130	40
23	150	163	40

2-07. New DUMP parts. - New pump parts shall be in accordance with the following:

(a) Pump head. - The contractor at his option may replace the existing pump heads provided new heads are adapted to fit existing motor bases or right angle gear drive bases, and pipe connections. If new pump heads are furnished they shall be constructed from close grained cast iron and shall be of the heavy duty type, designed for hollow shaft drive.

(b) Column. - The column shall be genuine wrought iron conforming to Specification No. WW-P-441b and shall be in sections not to exceed 10 feet in length and of proper diameter to eliminate undue friction when pumping at pump capacity.

(c) Line shaft. - The line shafting shall be high-grade ground and polished steel and of the same diameter as that of existing pumps. The shaft shall be furnished in interchangeable sections not over 10 feet in length and fastened with threaded steel couplings having a strength of not less than 100 per cent of the strength of shaft after being assembled. The ends shall be machine finished and undercut for proper butting of the shafts. All threads shall be lathe cut.

(d) Bearings. - The pumping unit shall have sufficient guide bearing to maintain the alignment of the pump and shafting and to prevent vibration. The inner column couplings shall be bronze and shall act as bearings for the line shaft, which shall be turned and polished. Oil lubricated bearings shall be provided with oil grooves to effect passage of oil down through the entire length of oil tube and shafting. An automatic lubricator with capacity sufficient for one week or continuous operation shall be provided to feed oil to the bearings. Lubricator shall have sight glass and feed adjustment.

(e) Bowls. - The pump bowls shall be made of close grained cast iron, free from blow holes, sand holes and other defects which would impair their strength or durability for the service; accurately machined and fitted to close dimensions. Bowls shall have smooth, curved vanes to direct the flow of water efficiently and to prevent air locking. The bowls shall be of suitable thickness and strength to withstand the shut-off pressure of the unit. Bowls should be fastened together in such a manner that accurate alignment is assured and maintained. Guide passages for water shall be so designed and finished as to reduce friction to a minimum.

(f) Impellers. - Impellers shall be enclosed type, cast bronze and of heavy construction. Each impeller shall be carefully machined, finished all over, accurately fitted and perfectly balanced both dynamically and hydraulically. Impeller shaft shall be high grade chrome-nickel steel carefully ground and polished and furnished with lathe-cut threads. No keyways shall be cut into the shaft. A long skirt shall be provided to eliminate bypassing under any adjustment of the impeller. Impellers shall have non-overloading characteristics and shall have head characteristics so that an increase or decrease in the operating head above the design point will not cause an excessive decrease or increase in pump capacity. Impellers shall be attached and locked to pump shaft in such a manner that they may be easily removed, and so that they will not work loose for any reason.

(g) Suction pipe and strainer. - A suction pipe of suitable diameter and 10 feet long shall be provided for each pump. A galvanized strainer having a net inlet opening area of at least five times the area of the suction pipe shall be provided at the lower end of the suction pipe.

2-08. Water-level testing device. - A 1/4 inch wrought iron pipe 60 feet long shall be provided in each well for measuring the water level in the well. The pipe shall be extended on the outside of the pump casing to the pump foundation. Pipe shall be fitted with an air valve, for connection to air pump, and with a 4 inch dial, brass case, altitude gauge, with a range of 0 to 100 feet. The entire installation shall be air tight.

SECTION 3. BIDS.

3-01. Instruction to bidders. - U. S. Standard Form No. 22 revised March 1953, and Invitation for Bids, U. S. Standard Form No. 20 shall be observed in the preparation of bids. Envelopes containing bids must be sealed, marked and addressed as follows:

Bid for Repairs to Well Pumps, Montford Point, Rifle Range, Courthouse Bay and Onslow Beach (Second Increment), Marine Corps Base, Camp Lejeune, N. C., Specification No. 3885/56	Public Works Officer Building No. 1005 Marine Corps Base Camp Lejeune, N. C.
--	---

3-02. Bid guarantee will be required as stipulated on the reverse side of U. S. Standard Form 20.

3-03. Items of bids. - Bids shall be submitted, in triplicate, on U. S. Standard Form No. 21 revised March 1953, Bid Form, and in accordance with U. S. Standard Form Nos. 20 and 22, upon the following items:

Item 1. Price for the entire work, complete in accordance with drawings and specifications.

Item 2. Price for the entire work, complete in accordance with the drawings and specifications based on the omission of all work in connection with the repairs to the deep well turbine pump in Well No. 22 at Onslow Beach.

Item 3. Price for the entire work, complete in accordance with the drawing and specifications based on the omission of all work in connection with the repairs to the deep well turbine pumps in Wells No. 22 and 23 at Onslow Beach.

3-04. Telegraphic modifications of bids in accordance with U. S. Standard Form No. 22 may be made. Two signed copies of the telegram in a sealed envelope marked "Copies of telegraphic modification of bids for Repairs to Well Pumps, Montford Point, Rifle Range, Courthouse Bay, and Onslow Beach (Second Increment), Marine Corps Base, Camp Lejeune, N. C., Specification No. 3885/56" should be forwarded immediately to the office to which the written bids were submitted.

3-05. Reference to addenda. - Each bidder shall refer in his bid to all addenda to this specification; failure to do so may constitute an informality in the bid.

NOTICE

The Government forms, Bureau of Yards and Docks standard specifications mentioned and other information necessary may be obtained from the District Public Works Officer, Headquarters, Fifth Naval District, U. S. Naval Base, Norfolk 11, Virginia, or Public Works Officer, Navy Department, Building No. 1005, Marine Corps Base, Camp Lejeune, N. C. The remainder of the standard specifications and other material referred to may be examined at the District Public Works Office or at the Public Works Office, or the standard government specifications may be obtained from the Superintendent of Documents, Washington 25, D. C. at their established prices.

Camp Lejeune, N. C.

2 October 1956

R. E. HARRIS
CAPT, (CEC), USN
Officer in Charge of Construction

FOR:

ROBERT H. MEADE
RADM (CEC) USN
Chief of Bureau of Yards and Docks
Department of the Navy

NOTICE

The Government has... (mirrored text, likely bleed-through from the reverse side of the page)

1 October 1951

W. J. ...

U. S. ...

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LIST OF WAGE RATES
 DECISION R-962, 20 JULY 1956
 CAMP LEJEUNE, ONSLOW COUNTY, NORTH CAROLINA

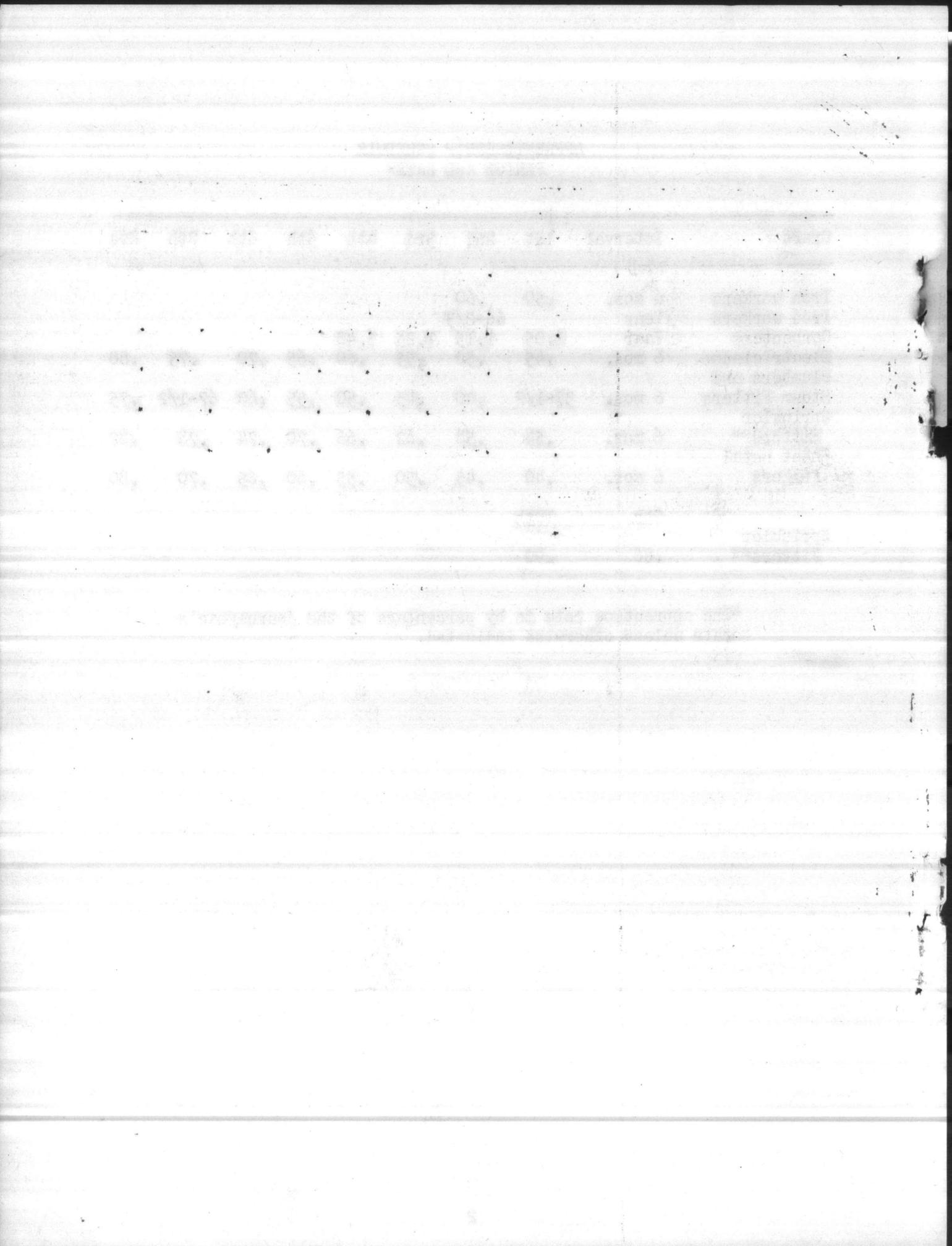
	<u>Per Hour</u>		<u>Per Hour</u>
	\$		\$
Air Tool Operators		Mason tenders	1.00
(jackhammerman vibrator)	.935	Mortar mixers	1.00
Asbestos workers	2.75	Painters, brush	1.65
Asbestos workers improvers:		Painters, structural	
1st year	1.25	steel	2.00
2nd year	1.64	Piledriverman	1.65
3rd year	1.85	Pipe layers (concrete	
4th year	2.07	and clay)	.90
Asphalt rakers	1.00	Plasterers	2.00
Boilermakers-blacksmith	2.975	Plasterers tenders	.935
Boilermakers helpers	2.725	Plumbers	2.50
Bricklayers	2.50	Roofers	1.50
Carpenters	1.65	Sheet metal workers	1.75
Cement masons	1.625	Soft floor layers	1.65
Electricians	2.40	Steam fitters	2.50
Elevator constructors	2.20	Stone masons	2.50
Elevator constructors		Sprinkler fitters	2.95
helpers	1.54	Terrazzo workers	2.00
Glaziers	1.50	Terrazzo workers helpers	.85
Iron workers, structural	2.50	Tile setters	2.00
Iron workers, ornamental	2.50	Tile setters helpers	.85
Iron workers, reinforcing	2.25	Truck drivers	.85
Laborers	.90	Welders - receive rate	
Lathers	1.75	prescribed for craft per-	
Marble setters	1.75	forming operation to which	
Marble setters helpers	.85	welding is incidental	
Power Equipment Operators:		Power Equipment Operators: (Cont'd.)	
Backhoes	2.125	Welding machines	2.125
Cranes	2.125	Tournapull	2.125
Cableways	2.125	Air compressors	1.75
Derricks	2.125	Bulldozers	1.875
Beam hoist	2.125	Fireman	1.55
Draglines	2.125	Hoist, double drum	1.875
Dredge or other float-		Hoist, one drum	1.625
ing equipment	2.25	Finishing machine	1.875
Pile drivers	2.25	Mixers (Larger than 10-S)	1.75
Pavers	2.125	Mixers (Smaller than 10-S)	1.625
Heavy duty mechanics	2.125	Motor graders	2.00
Scrapers, wheel type	2.125	Pump over 2" discharge	1.75
Shovels	2.125	Pump under 2" discharge	1.625
Truck cranes	2.125	Rollers, earth	1.87
Tractors with attach-		Rollers, asphalt	2.00
ments	2.125	Apprentice engineers and	
Tractors without		oilers	1.55
attachments	1.875		
Trench machines	2.125		

No.	Name	Address	Remarks
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APPRENTICESHIP SCHEDULE
PERIOD AND RATE*

Craft	Interval	1st	2nd	3rd	4th	5th	6th	7th	8th
Iron workers	6 mos.	.50	.60						
Iron workers	Year		66-2/3						
Carpenters	Year	1.05	1.15	1.25	1.40				
Electricians	6 mos.	.45	.50	.55	.60	.65	.70	.75	.80
Plumbers and Steam Fitters	6 mos.	37-1/2	.40	.45	.50	.55	.60	67-1/2	.75
Sprinkler Fitters**	6 mos.	.54	.58	.62	.66	.70	.74	.78	.82
Sheet Metal Workers	6 mos.	.40	.45	.50	.55	.60	.65	.70	.80
	<u>9th</u>		<u>10th</u>						
Sprinkler Fitters**		.86	.90						

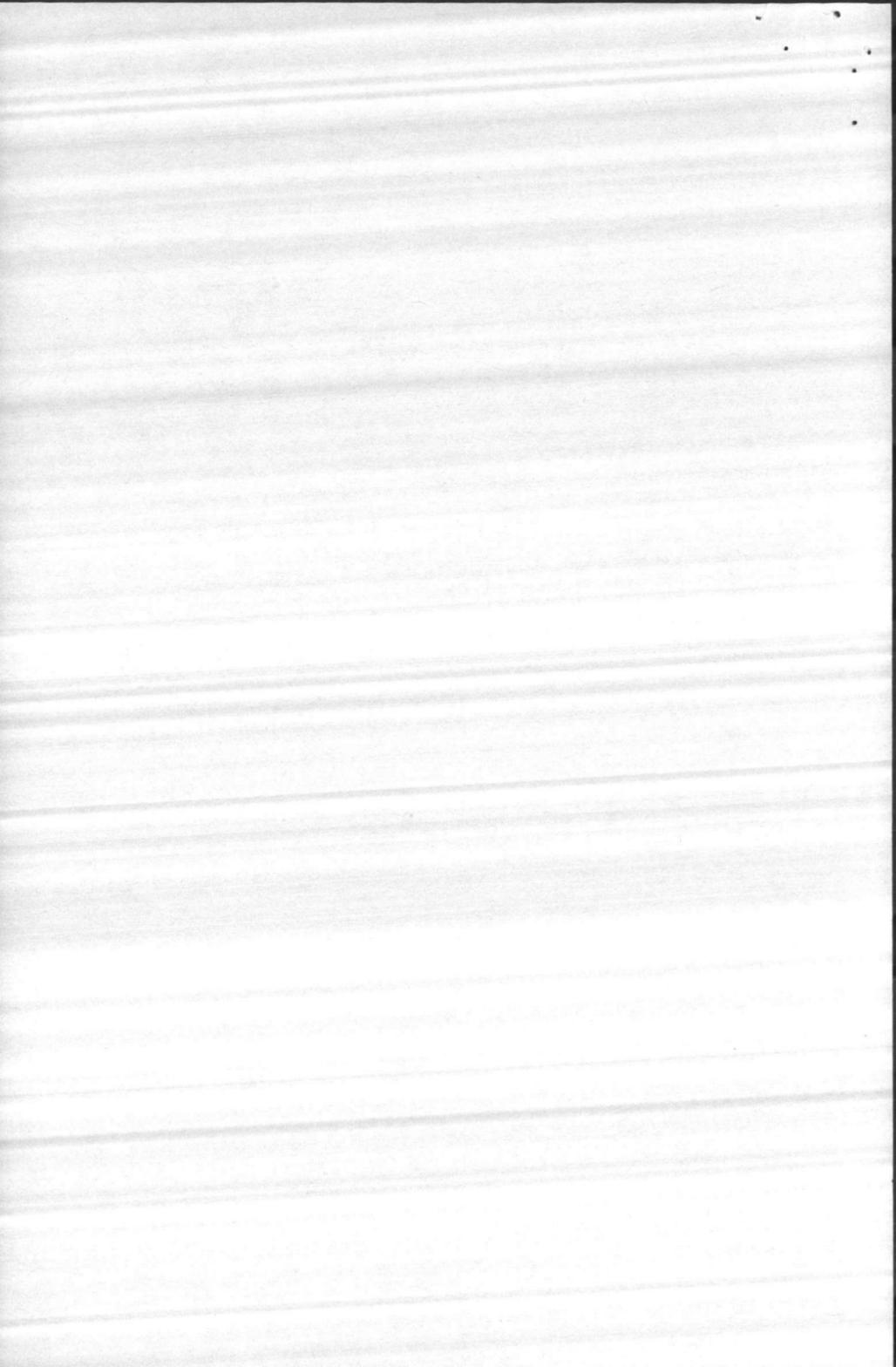
*The apprentice rate is by percentage of the journeyman's rate unless otherwise indicated.



IMPORTANT

This addendum should be acknowledged when your bid is submitted. Failure to acknowledge the addendum may constitute grounds for rejection of the bid.

If your bid has been submitted prior to the receipt of this addendum, acknowledgment should be made by writing or telegram, which should state whether the price contained in your sealed bid is to remain unchanged, is to be decreased by an amount, or is to be increased by an amount. The acknowledgment must be received prior to the time set for bid opening.



WATER TREATMENT FACILITIES, ONSLOW BEACH

at the

Marine Corps Base, Camp Lejeune, N. C.

SECTION 1. GENERAL CLAUSES

1-08. Drawings accompanying specification. - Y&D Drawing No. 646744 will be revised after bid opening to modify electrical symbols as follows:

- (a) 15 amp. duplex receptacle, polarized grounded type.
- (b) Magnetic motor starter sized to suit motor operator.
- (c) Fused safety switch sized to suit motor operator.
- (d) Single 20 amp. 2-wire receptacle for space heater, polarized grounded type.
- (e) Single 20 amp. 2-wire receptacle for exhaust fan, polarized grounded type.

SECTION 4. MASONRY

4-02. Materials

(b) Concrete blocks

(3) Protection from weather. - In the second line, delete, "jot site," and insert, "job site."

4-03. Mortar for brick and concrete-masonry unit work

(d) Sand. - Add to end of paragraph, "and shall conform to serial designation C 144-52I."

SECTION 19. INSTRUMENTATION

19-07. An elevated tank water level controller and register

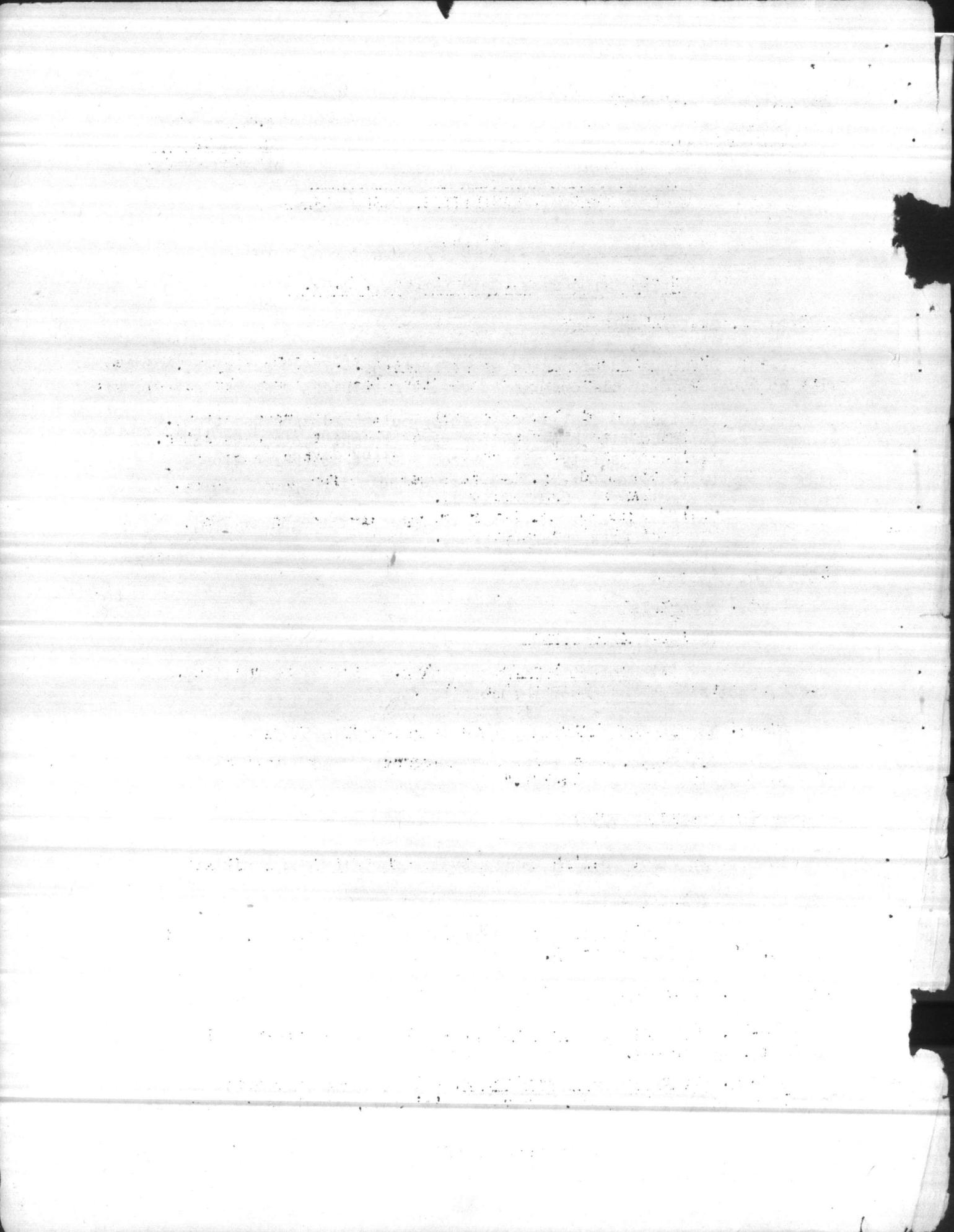
(b) A receiver

(5) In line 8, delete, "Pump No. 2 and No. 3," and insert, "Pump No. 2 or No. 3."

SECTION 20. INTERIOR ELECTRICAL

20-14. Convenience receptacles. - Delete this paragraph in its entirety, and insert,

"20-14. Convenience receptacles. - Convenience receptacle outlets shall be duplex, 15 ampere, 125 volts, 'T' slot, double sided contacts



with 4 terminal screws, in composition base. All receptacles shall be 3-pole polarized, equipped with 3-pole cord caps, one pole of receptacle and cord cap arranged for grounding appliance enclosure independent of power conductors."

20-16. Lighting panel. - In line 1, after "shall," insert, "be Class C and shall."

20-25. Grounding. - At the end of this paragraph, add the following: "An equipment grounding system in accordance with Specification No. 9Yf shall be provided for all equipment installed under this contract.

SECTION 21. EXTERIOR ELECTRICAL

21-04. New transformers. - Delete the following from the last sentence in the paragraph: "including a sampling device."

SECTION 22. PUMP EXTERIOR CONTROL LINE

22-17. Secondary racks. - In the last sentence of the paragraph, delete, "dry processed porcelain insulators," and insert, "wet processed porcelain insulators."

NOTICE

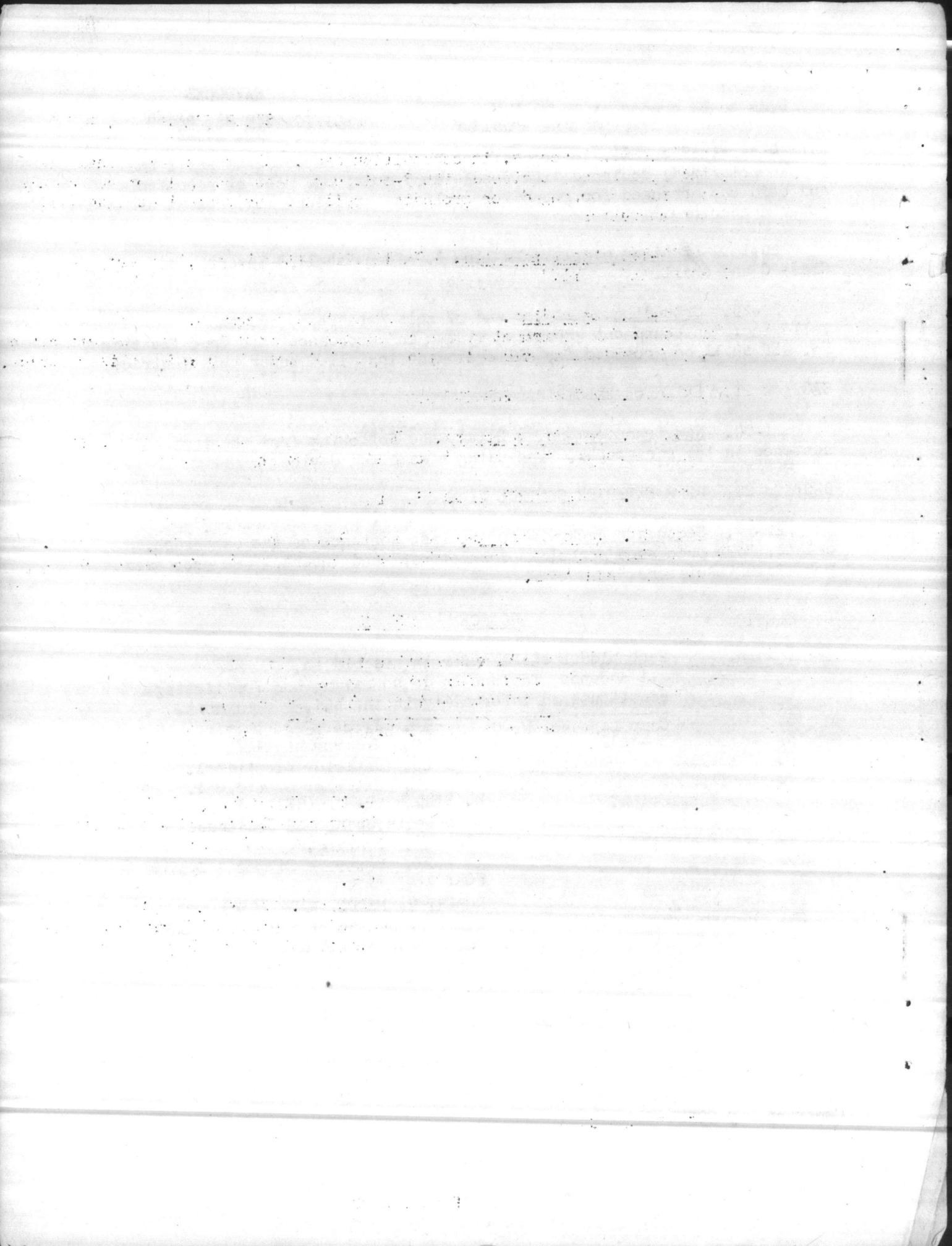
Each bidder shall refer in his bid to all addenda; failure to do so may constitute an informality in the bid.

Camp Lejeune, N. C. 27 February 1956

W. SIHLER, RADM, (CEC) USN
Officer in Charge of Construction
Fifth Naval District

FOR:

ROBERT H. MEADE, RADM (CEC) USN
Chief of Bureau of Yards and Docks
Department of the Navy



NOTICE:

Bids to be opened at 2:00 P.M., EST,
16 March 1956, at the Public
Works Office, Marine Corps Base,
Camp Lejeune, N. C.

**NAVDOCKS
SPECIFICATION
NO. 49928**

WATER TREATMENT FACILITIES, ONSLOW BEACH

at the

Marine Corps Base, Camp Lejeune, N. C.

CONTRACT NO. 93544

Appropriation: 17X1205 1956

A priority rating, in consonance with the rating system in effect at the time of award of this contract, will be issued by the Bureau of Yards and Docks.

CONTENTS

SECTION

- | | |
|---|---------------------------------------|
| 1. General Clauses. | 15. Plumbing. |
| 2. Earthwork. | 16. Heating and Ventilating. |
| 3. Concrete Construction. | 17. Mechanical Equipment. |
| 4. Masonry. | 18. Process and Service Water Piping. |
| 5. Structural Steel | 19. Instrumentation. |
| 6. Miscellaneous Metals. | 20. Interior Electrical. |
| 7. Roofing, Sheetmetal work,
and Insulation. | 21. Exterior Electrical. |
| 8. Metal Doors and Frames | 22. Pump Exterior Control Line. |
| 9. Metal Windows | 23. Paving and Drainage. |
| 10. Glazing | 24. Fencing. |
| 11. Calking. | 25. Sewerage Disposal System |
| 12. Carpentry. | 26. Bids |
| 13. Finish Hardware. | |
| 14. Field Painting. | |

SECTION 1. GENERAL CLAUSES.

1-01. General intention. - It is the declared and acknowledged intention and meaning to provide and secure water treatment facilities, Onslow Beach, complete and ready for use.

1-02. General description. - The work includes the construction of a 250,000 gallon per day water treatment plant approximately 38 feet by 40 feet with concrete foundations and floor slabs, concrete masonry exterior walls and interior partitions, precast lightweight concrete tongue and groove plank roof, plumbing, heating, electrical work, softening equipment, filters, chlorinators, service water pumps, meters, recording water level gauges and control equipment; 250,000 gallon concrete reservoir and piping work including valves and fittings; exterior electric, paving, fencing and drainage work; together with overhead and submarine exterior pump control line.

1-03. Location. - The work shall be located at the Marine Corps Base, Camp Lejeune, North Carolina, approximately as shown. The exact location will be indicated by the Officer in Charge.

1-04. Form of contract. - The contract will be executed on U. S. Standard Form No. 23 revised March 1953, and will include U. S. Standard Form No. 23A March 1953, General Provisions, and NavDocks Form 113, revised June 1955, Additional General Provisions, with the following modifications:

(a) The phrase "including connection charges" is inserted after the word 'utilities' in the fifth sentence of Clause 43, Government Utilities of Form No. NavDocks 113.

1-05. Performance and payment bonds, executed on U. S. Standard Form Nos. 25 and 25A, respectively, will be required as stipulated in U. S. Standard Form No. 20, revised March 1953, Invitation for Bids.

1-06. Time for completion. - The entire work shall be completed within 270 calendar days after date of receipt of a notice of award or any other communication authorizing the contractor to proceed.

1-07. Damages for delay in accordance with Clause 5 of U. S. Standard Form No. 23A shall be at the rate of \$70.00 per calendar day. The Government will take no action pursuant to Clause 5, Liquidated Damages, to terminate the right of the contractor to proceed or to assess liquidated or actual damages where the failure of the contractor to complete the work within the time specified elsewhere in this contract is due solely to the operation of the priorities and allocations system and is not otherwise caused by the fault or negligence of the contractor. It is understood and agreed that such delays will be considered an act caused by the Government and as such will be excusable within the meaning of Clause 5,

and the contractor will be entitled to a time extension by reason thereof.

1-08. Drawings accompanying specification. - The following drawings accompany this specification and are a part thereof. Drawings are the property of the Government and shall not be used for any purpose other than that contemplated by the specification.

<u>Y&D Drawing Nos.</u>	<u>Title</u>
646729	Location and Index
646730	Site, Grading, Drainage, Paving
646731	Stake Out Plan and Framing
646732	Yard Piping
646733	Water Plant, Foundation and Roof Framing
646734	Water Plant, Floor Plan and Elevations
646735	Water Plant, Sections and Details
646736	Water Plant, Equipment layout and Piping
646737	Water Plant, Plumbing and Heating
646738	250,000 Gallon Reservoir, Plan and Sections
646739	250,000 Gallon Reservoir, Details
646740	250,000 Gallon Reservoir, Piping and Miscellaneous Details.
646741	Salt Storage Tank, Plan and Details
646742	Instrumentation Arrangement
646743	Pump Exterior Control Line
646744	Interior Electrical
646745	Exterior Electrical

1-09. Standard specifications. - The standard specifications given in the following list or mentioned elsewhere herein (including the addenda, amendments, and errata listed) shall govern in all cases where references to standard specifications are made. In case of difference between these standard specifications and this specification or its accompanying drawings, this specification or its accompanying drawings shall govern. Especial care shall be exercised to refer in request for quotations, in orders, and in subcontracts to the standard specifications and to all modifications thereof. The requirements for packaging, packing, marking, and preparation for shipment or delivery included in the standard specifications shall apply only to materials and equipment which are furnished directly to the Government and not to materials and equipment which are to be installed by the contractor.

BUREAU OF YARDS AND DOCKS

7Yg Jan. 1934	Roofing, siding, and sheet metal work; damproofing and membrane waterproofing; including addendum No. 2.
9Yf Oct. 1946	Electrical apparatus, distributing systems, and wiring; including addendum No. 1
10Yc Jan. 1938	Metal windows
13Yd June 1951.	Concrete construction, including addendum No. 1 and errata No. 1 thereto

BUREAU OF YARDS AND DOCKS (CONT'D)

21Yc June 1940 Installation of power-plant, heating, and ventilating apparatus and piping.
 22Yc May 1955 Structural Steel work
 27Yb May 1939 Screens (for doors, windows, transoms, and porches).
 28Yc Oct. 1944 Carpentry and Joinery
 31Yc Sept 1947 Interior plumbing systems.
 34Yb Apr. 1943 Bituminous coatings of steel surfaces.
 42Ya May 1947 Manholes and frames and covers.

MILITARY (JOINT-ARMY-NAVY)

JAN-G-742 Sept 1949 Glass, fibrous: board and stripping tape, hard-surface (heat insulation), incl. amend. 1
 MIL-C-3458 Apr. 1951 Cables, telephone (19 and 22 AWG, paper-or-pulp-insulated, lead covered, and tape armored)
 MIL-F-16081B Sept 1954 Fans, exhaust, electric (for) wall or window
 MIL-C-16231A Jan. 1955 Calking compound (for metal seams), incl. amend. 1
 MIL-W-17121B Mar. 1955 Water softener unit, zeolite pressure type
 MIL-C-17226A Mar. 1954 Chlorinator, water purification, gas-solution
 MIL-P-17552A July 1955 Pump, centrifugal, water, horizontal, general service or boiler feed.
 MIL-L-18145 July 1954 Louver, metal, exhaust opening-gravity closing type.
 MIL-V-18436 Jan. 1955 Valves, check.
 MIL-P-18472 May 1955 Pumps centrifugal, condensate, feed booster
 MIL-V-18634 Apr. 1955 Valves, safety relief (shore use).

FEDERAL

DD-G-451a Jun. 1951 Glass, flat and corrugated, for glazing, mirrors and other uses, including Amendment No. 1
 FF-B-575 May 1955 Bolts, hexagon and square
 FF-H-106a Dec. 1952 Hardware, builders; locks and door-trim, including Amendment No. 1
 FF-H-111a Mar. 1955 Hardware, builders'; shelf and miscellaneous, including amendment No. 1
 FF-H-116b Oct. 1947 Hardware, builders'; hinges (nontemplate), including amendment No. 2
 FF-H-121c June 1954 Hardware, builders', door-closing devices
 GG-G-76a Feb. 1954 Gages; pressure and vacuum (for air ammonia, steam, oil and water), including amendment No. 1
 HH-G-76b May 1955 Gaskets, asbestos metallic cloth
 QQ-B-71a Apr. 1949 Bars, reinforcement, for concrete, including Amendment No. 3
 QQ-I-716 Nov. 1948 Iron and steel, sheet, zinc-coated (galvanized), including Amendment No. 3
 QQ-L-156 Nov. 1946 Lead, calking, including Amendment No. 1
 QQ-S-741 Apr. 1941 Steel, structural (including welding) and rivet, for bridges and buildings, includ. Amend. No. 3

QQ-S-775	Mar. 1955	Steel, sheet, zinc-coated, including Amend. No. 1
RR-F-183	Nov. 1949	Fence-post, Gates and accessories, incl. amd. No. 1
RR-F-191a	Apr. 1955	Fencing; chain-link fabric.
RR-F-221b	Mar. 1953	Fencing (barbed wire, woven wire, and wire netting)
Rk-S-141a	Aug. 1952	Screening, wire, insect.
SS-A-706b	Nov. 1943	Asphalt, for use in road and pavement construction
SS-B-656	June 1932	Brick, building (common) clay.
SS-C-181c	May 1955	Cement; masonry, including amendment No. 1
SS-C-192a	Apr. 1954	Cements; portland, including amendment No. 1
SS-C-466a	July 1955	Cloth, thread, and tape-asbestos
SS-C-621	May 1935	Concrete-Units, masonry, hollow, includ. Amend. No. 1
SS-C-731a	Nov. 1948	Crushed-stone, crushed-gravel, and crushed-slag; for bituminous-concrete-base or surface-course, in- cluding amendment No. 2
SS-L-351	Oct. 1930	Lime, hydrated, for structural purposes.
SS-P-351a	Oct. 1953	Pipe, asbestos-cement
SS-P-361a	Jan. 1953	Pipe clay, sewer, including amend. No. 1
SS-Q-351	Aug. 1930	Quicklime, for structural purposes
SS-S-71a	Aug. 1942	Sand, for use in sheet-asphalt or bituminous- concrete pavements.
TT-C-598	July 1951	Compound calking; plastic (for masonry and other structures), including amendment No. 2
TT-E-508	July 1953	Enamel; interior, semi-gloss, tints and white, including amendment No. 4
TT-E-543	Oct. 1949	Enamel - Undercoat, interior, tints and white
TT-P-21	Aug. 1951	Paint; cement-water, powder, white and tints (for interior and exterior use), including amend. No. 2
TT-P-25a	Aug. 1951	Primer, paint, exterior (undercoat for wood, ready- mixed, white and tints), includ. Amend. No. 1
TT-P-56b	Feb. 1954	Primer coating (primer-sealer), pigmented oil, plaster and wallboard.
TT-P-86a	Apr. 1951	Paint; red-lead-base, ready-mixed, including Amend. No. 1
TT-P-102	July 1953	Paint (titanium-lead-zinc and oil, exterior, ready-mixed, white and light tints), including Amend. No. 2
TT-P-781a	July 1943	Putty and elastic- compound, for metal-sash glazing, including Amendment No. 1
TT-P-791a	July 1943	Putty, pure-linseed-oil, for wood-sash glazing, including amendment No. 1
TT-W-571c	June 1950	Wood preservative; recommended treating practice
TT-V-51a	Aug. 1951	Varnish, asphalt, including amendment No. 1
WW-H-171	Feb. 1955	Hangars and supports, pipe.
WW-H-191	June 1954	Heaters, water, instantaneous, (steam-water-convertor type)
WW-P-401	July 1951	Pipe and pipe-fittings; soil, cast-iron, including amendment No. 3
WW-P-406	June 1945	Pipe; steel and ferrous alloy (for) ordinary uses (iron pipe size), including amend. No. 1
WW-P-421a	Mar. 1955	Pipe, cast-iron, bell-and-spigot, water
WW-P-441b	Dec. 1953	Pipe, wrought iron (welded, black or zinc-coated). including amendment No. 1

FEDERAL (CONTINUED)

WW-P-521b	Sept 1945	Pipe-fittings; malleable iron (screwed) 150-pound
WW-P-541b	Sept 1954	Plumbing fixtures, land use.
WW-T-799a	June 1946	Tubing, copper, seamless (for use with solder-joint or flared-tube fittings), includ. amendment No. 1
WW-V-51a	June 1954	Valves, bronze; angle, check and globe, 125- and 150-pound, screwed and flanged (for land use) including amendment No. 2
WW-V-54	June 1954	Valves, bronze, gate; 125- and 150-pound, screwed and flanged (for land use), includ. amend. No. 2
LLL-F-321b	Dec. 1942	Fiberboard, insulating, includ. amendment No. 1

NON-GOVERNMENT

NOTE: Non-government standards are not available for distribution by the Department of the Navy; application hereto should be made to the issuing organization.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS

Standard Method T 99-49, T 147-49

Desig. M 17-42, M 41-49

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

AMERICAN IRON AND STEEL INSTITUTE

AMERICAN STANDARDS ASSOCIATION

Specification 4 21.10-51

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

Unfired pressure vessel code.

AMERICAN SOCIETY FOR TESTING MATERIALS

Specification No. A-82

AMERICAN WOOD PRESERVERS ASSOCIATION

Standard Pl-51

AMERICAN WATER WORKS ASSOCIATION

Standard specifications: C 100-52T, C 500-52T, C 601-48

COMMERCIAL STANDARDS

CS-73-48, CS-120-46

GOVERNMENT SAFETY CODE

NATIONAL ELECTRICAL LIGHT ASSOCIATION

Specification No. E-209-22

NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION

NATIONAL BOARD OF FIRE UNDERWRITERS

Pamphlet Nos. 70 and 90

1-10. "General specification for inspection of material", (issued by the Navy Department) with such appendices thereto as may be applicable, of the issues in effect on the date of the invitation for bids, shall govern for the factory inspection of materials and equipment required under the contract including materials and equipment specified in detail herein or covered by standard specifications. (See also clause 9 of U. S. Standard Form No. 234). This factory inspection shall apply specifically, but not necessarily exclusively to the following: Poles and creosoting of poles. Factory inspection of material and equipment for which tests at the place of manufacture are required may be waived at the option of the Government, provided notarized copies of factory test reports are furnished which show compliance with the specified requirements. Factory inspection will not be required for lumber provided it is grade-marked and trade-marked by the association under whose rules it is graded, or provided it is accompanied by certificates of inspection issued by the association under whose rules it is graded or by another inspection agency which is satisfactory to the officer in charge.

1-11. Optional requirements. - Where a choice of materials and/or methods is permitted herein, the contractor will be given the right to exercise the option unless stated specifically otherwise.

1-12. Definitions. - Where "as shown", "as indicated", "as detailed", or words of similar import are used, it shall be understood that reference to the drawings accompanying this specification is made unless stated otherwise. Where "as directed", "as required", "as permitted", "approved", "acceptance", or words of similar import are used, it shall be understood that the direction, requirement, permission, approval or acceptance of the officer in charge is intended unless stated otherwise. As used herein, "provide" shall be understood to mean "provide complete in place", that is "furnish and install".

1-13. Samples. - The contractor shall submit for approval samples of the following and of such other materials and equipment as may be required whether mentioned specially herein or not: concrete blocks.

1-14. Drawings required of the contractor. - Before commencing the installation of any of this work, the contractor shall submit for approval and in accordance with Clause 29(f) of NavDocks Form No. 113 such drawings as may be required, including those showing:

(a) Shop drawings for structural steel roof framing and for reinforcing steel for reservoir; salt tank; precast roof plank, metal sash, metal doors and frames, hardware schedule listing manufacturer's name and stock number, miscellaneous steel and iron and wood cabinet.

(b) Manufacturer's data, descriptive literature, piping layout, electric diagram of automatic controls for water treatment equipment.

(c) Manufacturer's data, descriptive literature and piping layout for chlorination equipment and appurtenances.

(d) Manufacturer's data, descriptive literature and characteristic curves on service water pumps, motors and gasoline engine; recording water level devices for reservoir and overhead tank including wiring diagram for automatic controls; orifice type water meter, recorder and appurtenances; ventura meter including recorder, piping layout and appurtenances; brine pumps including characteristic curve; back pressure regulating valve including wiring diagram for solenoid; pressure control switch for well control.

(e) Manufacturer's data and descriptive literature on valves and hydrants.

(f) Manufacturer's data and descriptive literature on the heating unit, with registers and control system.

(g) Shop drawings on gasoline storage tank.

(h) Manufacturer's data on breakers, safety switches, disconnect switches, motor starters, breaker type panel, lighting fixtures and transformers.

(i) Manufacturer's data on submarine cable.

1-15. Rates of wages at the site. - (See Clause 20 of U. S. Standard Form No. 234). The contractor shall pay mechanics and laborers employed or working directly upon the site of the work wage rates not less than those contained in the wage determination decision of the Secretary of Labor No. P-8495 which is attached hereto. Any class of laborers and mechanics not listed in the Secretary's decision, which will be employed on the contract, shall be classified or re-classified by the contractor or sub-contractor conformable to the Secretary's decision subject to the approval of the contracting officer; the classification shall be submitted of Form NavDocks 1882 to the officer in charge for approval, prior to their employment in any work under the contract. In the event the interested parties cannot agree on the proper classification or re-classification of a particular class of laborers and mechanics to be used, the question shall be submitted through the contracting officer to the Secretary of Labor for final determination. Where differing rates are listed for the same trades according to the type of construction on which employed, their application shall be conformable to prevailing area practice, subject to the approval of the officer in charge.

(a) Required by Davis-Bacon Act. - The wage determination decision of the Secretary of Labor attached hereto is made a part of this contract solely for the purpose of setting forth the minimum hourly wage rates required to be paid by the Davis-Bacon Act and is not to be considered as a guaranty, warranty, or representation as to the wage determination decision, the wage rates therein, or the availability of labor at the wage rates indicated. Bidders are advised to make their own investigations, and to rely solely upon their own information, as to local labor conditions, such as wage rates necessary to attract labor, the length of the work day and work week, overtime compensation, health and welfare contributions, available labor supply and prospective changes or adjustments of wage rates in the area concerned which might affect operations under the contract. Under no circumstances shall any mistake in attaching the wage determination of the Secretary of Labor or in the determination or statement of the wage rates set forth therein, or the payment of higher wage compensation than set forth therein entitle the bidder to the cancellation of his bid or contract, to an increase in the contract price, or other additional payment or recovery.

(b) Government right to change. - The Government reserves the right to change the wage determination decision attached to the specification or addendum, either before or after the award of this contract, in accordance with the latest wage determination decision applicable at the time of award of this contract under the regulations of the Secretary of Labor. Such change shall be made without liability upon the Government for any increase in the contract price or other additional payment or recovery.

(c) Apprentices employed pursuant to this determination of wage rates must be registered in a bona fide apprenticeship program registered with a State apprenticeship council recognized by the Federal Committee on Apprenticeship, U. S. Department of Labor; or if no such recognized council exists in a state, it shall mean a program registered with the Bureau of Apprenticeship, U. S. Department of Labor.

1-16. Work outside regular hours. - If the contractor desires to carry on work outside the regular hours or on Saturdays, Sundays or holidays, he may submit application to the officer in charge but shall allow ample time to enable satisfactory arrangements to be made by the Government for inspecting the work in progress. At night, he shall light the different parts of the work in an approved manner.

1-17. Permits. - The Government will secure a permit from the U. S. Army Engineers, to place the armored submarine Cable under the Intra-coastal water-way.

1-18. Security requirements. - No employee or representative of the contractor will be admitted to the site of the work unless he furnishes satisfactory proof that he is a citizen of the United

States or if an alien, his residence within the United States is legal.

1-19. Hurricane protection. - Should hurricane warnings be issued, the contractor shall take every practicable precaution to minimize danger to persons, to the work, and to adjacent property, these precautions shall include closing all openings; removing all loose materials, tools, and/or equipment from exposed locations; and removing or securing scaffolding and other work.

1-20. Approval of samples, cuts and drawings. - Matter submitted for approval shall be accompanied by complete information concerning the material, articles, and/or design proposed for use in sufficient detail to show compliance with the specifications; and shall be approved before incorporation into the work. Approval thereof will not be construed as relieving the contractor of compliance with the specification, even if such approval is made in writing unless the attention of the officer in charge is called to the non-complying features by letter accompanying the submitted matter. Partial submittals, or submittals of less than the whole of any system made up of inter-dependent components, will not be considered.

1-21. Methods and schedules of procedure. - The work shall be executed in a manner and at such times that will cause the least practicable disturbance to the occupants of the buildings and the normal activities of the Station. Before starting any work, the sequence of operations and the methods of conducting the work shall have been approved.

1-22. Operation of station utilities. - The contractor shall not operate nor disturb the setting of any valve in the station steam distribution system. The Government will operate the valves as required for normal conduct of the work. The contractor shall notify the officer in charge, giving reasonable advance notice when such operation is required.

1-23. Examination of premises. - Before submitting proposals, bidders are expected to visit and inspect the site of the work and satisfy themselves as to the physical conditions at the site; the general and local conditions, including availability of labor, the nature and extent of the work; the character and effect of existing adjoining and/or adjacent work; and other factors that can affect the cost of the performance of the contract to the extent that such information is reasonably obtainable.

1-24. Protection and repairs. - The contractor shall comply with the Fire Prevention Requirements, as published by the Officer in Charge of Construction, security rules and regulations of the activity, and shall provide approved means necessary for the protection of all Government and private property, including contents

of buildings affected directly or indirectly by his operations. All damage to Government or private property, resulting directly or indirectly from the contractor's actions, shall be made good by him without expense to the Government.

1-25. Existing work damaged or otherwise affected by the contractor's operations shall be restored to a condition as good as existed before the work commenced, except where indicated or specified otherwise. Where new construction adjoins, connects to, or abuts the existing work, the junction shall be made in a substantial workmanlike and weathertight manner as the case requires. All new work shall match, as nearly as practicable, the existing adjoining and/or adjacent similar work unless indicated otherwise. Except where specifically designated as being retained by the Government or to be re-installed in the new construction, all materials, fixed equipment and/or debris resulting from demolition and removal operations shall be removed by the contractor from the limits of the Government reservation at such times during the progress of the work as directed.

1-26. Accident reports. - The contractor and his sub-contractors shall maintain an accurate record of, and shall report to the officer in charge, exposure data and all accidents resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, and equipment incident to work performed under the contract. The report shall be in accordance with the pamphlet entitled, "Instructions to Contractor for Preparation of Accident Reports, NavDocks P-275", and shall be submitted on the standard form prescribed therein; the pamphlet and the required forms will be furnished by the officer in charge.

1-27. Payrolls and affidavits. - The prime contractor, sub-contractors, and sub-sub-contractors will be required to submit a copy of each weekly payroll, together with a Notarized Contractor's Weekly Payroll Affidavit covering the payroll to the Officer in Charge of Construction within seven days after the regular payment date of the payroll period. The receipt of these payrolls and affidavits is made a condition precedent to payment for any amounts due under the contract.

(a) The payroll shall be identified by the name of the contractor, NOy Contract Number, and the location of the site of the work. Payrolls shall state accurately and completely for each employee, his name, classification, social security number, rate of pay, daily and weekly hours worked, wages earned, all deductions from such wages and the actual weekly wages paid. Contractors are required to submit employees addresses with the payroll on which the employee's name first appears.

(b) Contractor's Weekly Payroll Affidavit (NavDocks Form 118) (1-55) which must be used shall be reproduced by the contractor.

for his use. This form combines the required payroll affidavit and certification of payrolls. In order to provide uniformity with regard to information, contractors are advised to list by title or name, all deductions made, omitting from the listing the dollar amount of the deductions.

(c) A sworn affidavit accomplished by the contractor, stating that he and his sub-contractors have complied with the Labor Standards provisions of the contract, must accompany each request for reimbursement. Affidavit form will be furnished by the Officer in Charge of Construction.

1-28. Schedule of prices. - Upon award of the contract, the contractor shall promptly prepare Y&D Form 83, "Schedule of Prices", in octuplicate and submit to the Officer in Charge of Construction. Submission of these prices shall not affect the contract terms. These forms will be furnished by the Officer in Charge of Construction.

1-29. Sub-contractors and personnel. - Promptly after the award of the contract, the Contractor shall submit to the Officer in Charge of Construction in triplicate, a list of his sub-contractors and the work each is to perform together with the sub-contract price.

(a) On this form shall appear the names of the key personnel of the contractor and sub-contractors, together with their home addresses and telephone numbers, for use in event of an emergency.

(b) From time to time as changes occur and additional information becomes available, the contractor shall amplify, correct and change the information contained in previous lists.

1-30. Lines and grades required for execution of the work shall be established by the contractor.

1-31. As-built drawings. - On completion of the work, one print of each of the drawings accompanying this specification shall be neatly and clearly marked in red to show all variations between the construction actually provided and that indicated or specified in the contract documents, and delivered to the officer in charge. Where a choice of materials and/or methods is permitted herein; and where variations in the scope or character of the work from the entire work indicated or specified is permitted either by award on bidding items specified for that purpose or by subsequent change to the contract; the as-built drawings shall define the construction actually provided. The representation of such variations shall conform to standard drafting practice and shall include such supplementary notes, legends, and details as may be necessary for legibility and clear portrayal of the as-built construction; the marked prints shall be subject to approval before acceptance.

1-32. Quarantine. - The entire Camp Lejeune reservation, including Camp Lejeune, Camp Geiger, and Marine Corps Air Facility, Peterfield Point (New River) have been quarantined by the United States and North Carolina Departments of Agriculture for the White Fringed Beetle. Compliance with the quarantine regulations established by these authorities as set forth in the U.S.D.A. Quarantine No. 72 and North Carolina State Quarantine No. 7 is required for operations hereunder. Pertinent requirements of the quarantines include the following:

(a) Certification is required for the following articles and they shall not be moved from the reservation unless accompanied by a valid inspection certificate issued by an authorized White Fringed Beetle Inspector.

1. Soil, sand, or gravel moved independently or attached to other articles, such as heavy equipment including drag lines, road grading machines, ditch diggers, bulldozers, and equipment with tracks or cleats.
2. Nursery stock, plants and sod.
3. Scrap metal.

Authorization for movement of equipment shall be obtained from the Officer-in-Charge, and requests for inspection shall be made sufficiently in advance of the date of movement to permit arrangements for the services of authorized inspectors. The equipment shall be prepared and assembled so that it may be readily inspected. Articles and materials requiring certification for movement shall be removed from the equipment by washing with water and such other means as are necessary to accomplish complete removal. Resulting spoil shall be wasted as directed."

SECTION 2. EARTHWORK

2-01. Elevations and obstructions. - Bids shall be based on the following:

- (a) that the surface elevations are as indicated;
- (b) that no pipes or other artificial obstructions, except those indicated, will be encountered; and
- (c) that hard material will not be encountered.

In case the actual conditions differ substantially from those stated and/or shown, the provisions of Clause 4 of U. S. Standard Form No. 23A respecting an adjustment for changed conditions shall apply, subject to the requirement of notification thereunder being given. Hard material shall be defined as solid ledge rock, boulders more than one-half cubic yard in volume, or any cemented material requiring blasting for removal.

2-02. Topsoil. - Material from the excavation suitable for topsoil shall be deposited in piles separate from other excavated material. Piles of topsoil shall be so located that the material can be used readily for the finished surface grading in the areas designated for planting, and the topsoil shall be protected and maintained until needed. Topsoil shall be spread to a uniform thickness of four inches over the ground in the areas where the natural soil condition has been disturbed as a result of the operations of this contract and elsewhere within the project-area as defined for clearing where the undisturbed soil is not suitable for planting. If sufficient topsoil cannot be secured from the project area site, it shall be secured from borrow pit less than 2 miles distant. Where used for finished grading of the surfaces to be planted to grass, topsoil shall be spread uniformly over the designated areas.

2-03. Clearing and Grubbing. -

(a) Clearing shall be performed within the entire project area which is defined as being within the area bounded by a line drawn 5 feet on the outside of the perimeter fence; 5 feet each side of the center line on all underground offsite utility lines and 20 feet from the center line of all overhead utility lines.

(b) Pine trees over four inches in diameter, hardwood trees and natural shrubbery of ornamental value which do not interfere with the new construction shall be retained. The entire area shall be staked out at the beginning of the work and trees selected to remain shall be marked and care shall be taken by the contractor to protect same from injury.

(c) Grubbing shall be performed within all areas previously designated for clearing and shall include the removal of all vegetation and other objectionable material under foundations regardless of depth, to a depth 12 inches below subgrade or under fill within the limits of construction, to a depth of 6 inches below trench bottoms and to a depth of 6 inches below subgrade or natural ground within remaining area.

(d) Disposal of cleared and grubbed material. -

(1) All trees from which saw logs, pulpwood, posts, poles or ties can be produced shall be considered merchantable timber. All merchantable timber shall be trimmed of limbs and tops and shall be sawed into merchantable lengths and stockpiled adjacent to the site in areas designated by the Officer in Charge.

(2) All shrubs, brush, stumps, matted roots, refuse and other objectionable material shall be burned within the cleared area, except that when permitted by the Officer in Charge, large stumps and other material that will not burn may be otherwise disposed of. Materials that will not burn will be considered debris and disposed of as outlined elsewhere in these specifications. All fires for burning refuse shall be at locations specified by the officer in charge and shall be tended in a manner to eliminate all hazards to buildings, structures, trees, and other property. The officer in charge shall be notified before fires are set. Disposal by burning shall be under constant attendance until the embers have burned out or have been extinguished.

2-04. Excavation. -

(a) General. - All materials shall be excavated to dimensions and levels indicated on the drawings or in these specifications. Where roots, stumps, or other materials have been removed or excavations carried below grade, the spaces shall be filled with clean, thoroughly compacted earth except that when excavations for building foundations or concrete structures are carried below grade the spaces shall be filled with concrete of the same class as that of the structure.

(b) Precautions shall be taken for the protection of existing electrical, sewer, water, and other existing utility lines containing existing services until disposition of such services has been made as described in other sections of this specification.

(c) Trenching. - Pipe trenches shall be excavated true to line and grade and of sufficient width to afford six inches clearance between trench wall and extreme outside dimension of the pipe.

In the excavation of pipe trenches, beds of clean, well-tamped earth shall be provided, so placed as to insure that the full length of the pipe barrel is supported by a firm but slightly yielding bed.

(d) Trench backfill. -

(1) As soon as practicable after the pipe has been installed and joints have acquired a suitable degree of hardness, backfilling of the trench shall begin and shall thereafter be prosecuted expeditiously. The space between pipe and sides of the trench shall be packed full by hand shovel with selected sand and thoroughly compacted with hand tamper as fast as placed up to a level one foot above top of pipe. The fill shall be placed uniformly on both sides of the pipe and neither horizontal nor vertical alignment of the pipe shall be disturbed.

(2) The remainder of the trench shall be filled with clean earth free from vegetation or other objectionable material, and compacted as directed, either by puddling, rolling or mechanical tamping dependent upon the method best suited to the materials, sufficiently to prevent subsequent settlement.

(3) Puddling. - If backfill material is compacted by puddling, it shall be done by depositing the material in water. Where dams or dikes are constructed in trench to hold back water used for puddling, they shall be compacted by mechanical tamping as described below.

(4) Rolling. - If backfill material is compacted by rolling, a satisfactory roller or a tractor with caterpillar tread shall be used after the trench has been filled, care being exercised to compact thoroughly the material close to the bank as well as that in all other portions of the trench.

(5) Mechanical tamping. - Where impractical to compact by other methods and under all roadways, service drives, sidewalks, and other travelled areas, the backfill material shall be compacted by mechanical tamping. Clean, refuse-free material shall be placed in six inch layers and each layer thoroughly tamped with an approved mechanical tamper. If required, material shall be wet by sprinkling before rolling or tamping.

(6) Whatever method is used, care shall be taken that lumps shall not become nested and that all voids between lumps shall be completely filled with fine material. No large masses of backfilling material shall be dropped into the excavation, as from a grab bucket, in such manner as to disturb pipe or structure.

(e) Excavation for submarine cable shall have a minimum cover of 48 inches on the approaches to the waterway. This earth cover depth shall extend out from shore for a distance of 10 feet from either shore, and between these two points it shall have a minimum cover of 18 inches.

(1) Backfill shall be gravel, size graded from $1\frac{1}{2}$ inch down. Means of placing shall be any approved method.

(f) Drainage during construction. - During excavation operations, except for submarine cable, the work shall be kept shaped and drained at all times. Drains and ditches to insure proper drainage shall be installed as required.

(g) Slopes. - All slopes shall be uniformly dressed to the lines shown on the drawings or called for in the specifications, or as directed, and the work left in a finished, neat, and acceptable condition. Open drainage ditches shall be finished to a tolerance of 0.1 of a foot above or below the grades shown on the drawings.

2-05. Shoring and pumping. - Excavations shall be shored and braced by numbers of suitable sizes and arrangement where necessary to prevent danger to persons or structures, injurious caving or erosion. Shoring, bracing, and sheeting shall be removed, as the excavations are back-filled, in a manner such as to prevent injurious caving. Excavations, except for submarine cable, shall be kept free from water while construction therein is in progress.

2-06. Embankment. - Where shown on the drawings, embankments are to be formed to the lines, grades and elevations indicated.

(a) All depressions or holes below the ground surface, whether caused by grubbing or otherwise, shall be backfilled with suitable material and compacted to the ground surface before construction of embankment will be permitted to start.

(b) Preparation of subgrade. - Immediately prior to the placing of fill materials, the entire area upon which embankment is to be placed shall be scarified and harrowed to a depth of 6 inches. Scarifying shall be done approximately parallel to the axis of the fill. All roots, stones, or other objectionable material that would cause interference with compaction of the fill shall be removed and disposed of, as directed. A thin layer of fill material (approximately 3 inches thick) shall be spread over the scarified foundation and compacted to the required density.

(c) Material. - Embankments shall be formed of approved material spread in horizontal layers for the widths approved by the officer in charge of construction. The material shall be placed in

successive layers not to exceed 12 inches of loose thickness and shall be compacted to a density of 90 percent as determined by compaction test specified hereinafter.

(d) Slopes. - All slopes shall be trimmed neatly to the lines shown on the drawings, and all work shall be left in a finished, neat, and acceptable condition.

(e) Maintenance of embankment. - The contractor, shall be responsible for the stability of all embankments and shall replace all sections which have been damaged or misplaced due to the carelessness or neglect on the part of the contractor or due to natural causes other than those attributable to the unavoidable movement of the natural ground upon which the embankment is made until completion of the work.

2-07. Filling, backfilling and grading. -

(a) Immediately prior to the placing of fill material, the entire area of original ground under concrete slabs which are to be placed on fill shall be scarified and harrowed to a depth of 6 inches. All roots, stones, or other objectionable material that would interfere with compaction of the fill shall be removed and disposed of as directed. A layer approximately 3 inches thick of fill material shall be spread over the scarified foundation and compacted to the required density.

(b) Sand and gravel fill shall be provided under interior floor slabs on ground. Fill shall be not less than six inches thick and shall consist of a four inch base layer of gravel and a two-inch top layer of sand. The fill shall be compacted so that it will provide an unyielding base. All materials shall be clean; the sand shall be sharp and coarse; and the gravel shall be well-graded from fine to coarse, shall be retained on a No. 4 screen, and pass a $1\frac{1}{2}$ inch diameter ring.

(c) Material for fill and backfill shall be free from vegetable matter and refuse, and the moisture content shall be such that proper compaction will be obtained. Fill and backfill under concrete slabs shall be placed in successive layers not more than 6 inches thick when compacted, and shall be compacted to a density of 95 percent, as determined by compaction test specified hereinafter.

(d) All backfill about the structures shall be placed, as far as practicable, as the work of construction progresses, except that backfilling against foundation walls shall be done only when directed.

(e) Finished site grading in all cases shall conform to the grades shown on the drawings. Local variations above or below the grades shown on the drawings will be acceptable provided the

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variations represent unavoidable waves in the surface and not sharply defined hollows or high spots. All grades shall be sloped to drain surface water away from structures. Abrupt changes in slopes shall be rounded. All work shall be left in a finished, neat and acceptable condition for subsequent operation.

2-08. Compaction tests. -

(a) Wherever in the specifications percentages of density are called for, the percentages actually obtained shall be measured by in-place density tests made in accordance with A.A.S.H.O. Standard Method T 147-49.

(b) The in-place densities actually obtained shall equal or exceed the percentages of laboratory maximum densities at optimum moisture content, as determined in accordance with A.A.S.H.O. Standard Method T 99-49.

(c) Samples of all materials for testing, both before and after placement and compaction, will be taken at frequent intervals and if the degree of compaction obtained is not as specified, additional compaction will be required.

2-09. Borrow. - If borrow is required, it shall be taken only from approved locations. Borrow pits shall be so excavated that drainage is provided and shall not be left in unsightly or unsanitary condition. Maximum soil borrow haul shall not exceed two miles.

2-10. Disposal of surplus material. - Surplus material not required or unsuitable for fill, or grading shall be wasted as directed; waste haul shall not exceed two miles.

2-11. Subgrade. - Necessary traffic over the subgrade of paved or seeded areas shall be so distributed as to avoid the formation of ruts. Any ruts formed in the subgrade shall be removed by alternate filling and blading. Subgrade of areas to be seeded is defined as four inches below finish grade.

2-12. Priority of installation. - Where utility lines, foundations, or other subsurface structures are sufficiently close that excavation for one might disturb another, the lower shall be installed first. No change in grade or alignment shall be made to protect the contractor from the consequences of failure to observe this provision.

2-13. Drainage ditches. - The contractor shall schedule his operation in such a manner as to avoid pocketing water within the construction area and shall provide for the disposition of rainfall and/or runoff as rapidly as conditions permit. As far as possible he shall provide the designed drainage facilities in advance of the

grading work and shall make every reasonable effort to maintain a dry grade. Ditches shall be excavated true to line, grade and cross-section. Unsuitable materials shall be removed and replaced with clean well-tamped earth.

2-14. Seeding. - Areas specified to receive topsoil shall be seeded. The quality of all fertilizer, lime and seed and all operations in connection with the furnishing of this material shall comply with the requirements of the North Carolina Fertilizer, Lime and Seed Law; and with the rules and regulations adopted by the North Carolina Board of Agriculture in accordance with the provisions of said law.

(a) Seeding operations shall not be done if the completion of the work should occur after November 15 and before March 1, in this event the seeding shall be done by government forces during the next planting season and adjustment in the contract price will be made in accordance with Clause 4 of Standard Form 23-A.

(1) Lime and fertilizer shall be uniformly spread over the area and thoroughly disced, harrowed or raked into the top one and one-half inches of surface, and watered. The lime will be applied at the rate of 20 pounds per 1,000 square feet and fertilizer at the rate of 12 pounds per 1,000 square feet at least three days before seeding. The lime shall be an approved hydrated agricultural lime. The fertilizer shall be a ready-mixed fertilized or organic base bearing analysis of a recognized authority. Formula for the fertilizer shall be 6% nitrogen, 8% phosphoric acid, and 6% potash. Both lime and fertilizer shall be delivered on the job in the manufacturer's container, plainly marked and unopened.

(2) The seed shall be delivered to the job in original containers showing the guaranteed seed mixture, which shall contain the following percentages by weight:

80% Bermuda Grass
20% Red Top (Herd Grass)

No seed in the mixture shall show a purity of less than 90% or germination equality of less than 85%. The seed shall be uniformly sown, at the rate of seven pounds per 1,000 square feet of area, by hand or approved seeding equipment. The surface of the seed bed shall be lightly raked or otherwise worked to cover the seed with a layer of soil not more than one-fourth inch in depth, after which it shall be rolled with an approved lawn roller, weighing not more than two hundred ten pounds per foot of width, and watered with a fine spray.

(3) No lime, fertilizer or seed shall be applied when the wind is strong or when the soil is extremely wet or otherwise unworkable. No rolling shall be done if precipitation after seeding should

make the operation detrimental to the seed bed. The contractor shall notify the officer in charge and receive his approval before performing any planting operation. All seeded areas shall be maintained by watering, mowing, and weeding for a period of thirty days after rolling has been completed.

SECTION 3. CONCRETE CONSTRUCTION

3-01. General requirements. - Concrete work, including reinforcing, shall conform to the applicable requirements of Specification No. 13Yd except as modified herein. Horizontal steel shall be returned 18 inches at corners. In addition to intermediate-grade billet steel reinforcement bars as covered in Specification No. 13Yd, hard billet steel and hard rail steel as covered by Federal Specification No. QQ-B-71a are acceptable for use as reinforcement bars; however, bending of hard grade bars shall be at temperatures above 60 degrees F. and welding of hard grade bars will not be permitted.

3-02. Concrete for reservoir and brine tank construction. -

(a) Concrete for reservoir shall be air-entrained, class E-1. Concrete for salt storage tank shall be air-entrained, class F-1. Floor and wall of reservoir shall be placed in single pours respectively. Floors and walls of the salt storage tanks shall be placed monolithically. Internal vibrators shall be used for compacting all of the concrete.

(b) Forms. - Forms shall conform to paragraphs 4-01 and 4-02 of Specification No. 13Yd. Form ties shall be in accordance with paragraph 4-01 of Specification No. 13Yd, for watertight work.

(c) Placing reinforcement. - Reinforcement shall be placed in accordance with Section 5 of Specification No. 13Yd except that all ring bars in reservoir wall shall be lap spliced a minimum of 24 inches and all splices in adjacent bars shall be staggered a minimum of 8 feet horizontally. Splices shall not occur less than every fourth bar vertically.

(d) Placing and curing shall be in accordance with Sections 6 and 7 of Specification No. 13Yd, except as specified otherwise herein. Under floor slabs and footings, the subgrade shall be brought to a smooth surface compacted thoroughly and the entire subgrade under the slab shall be underlain with a single thickness of waterproof, reinforced craft paper immediately before the concrete is placed; all joints shall be lapped and sealed. The subgrade shall be maintained in a smooth condition during the time of the placing of the paper and concrete. Walls shall be placed in horizontal lifts not to exceed 2 feet. The concrete shall be deposited at frequent intervals around the periphery. No temporary joints shall be allowed to become "cold" before the adjacent concrete is placed. The time interval shall not exceed 45 minutes. All concrete shall be water-cured for not less than 14 days. Floor of reservoir, after pouring, shall be kept saturated with water until walls have been constructed. The exterior and interior surfaces of walls shall be protected from low temperature and shall be cured in accordance with Specification No. 13Yd except that the reservoir, immediately after testing and correction of any defects, shall be cleaned thoroughly and filled with water.

(e) Finishing shall be in accordance with paragraph 8-01 of Specification No. 13Yd, except as specified otherwise herein. A floated finish shall be provided for floor slabs; the surface of the slab shall be struck off true at the finish floor level; all surface water shall be removed and the surface floated to a smooth, hard, reasonably non-slip finish, using a wood float.

(f) Joint between the wall and floor slab of the reservoir shall be made by a continuous key and copper water stop. A copper strip not less than 10 inches wide and weighing not less than 20 ounces per square foot shall be placed before the floor slab is poured. Joints in copper strips shall be lapped, locked and soldered. All dirt and other foreign matter shall be removed from the key and the concrete surface scrubbed clean and slushed with a neat cement grout immediately before the wall is poured.

(g) Testing. - Upon completion of the work, the reservoir shall be filled completely with fresh water, furnished by the Government, permitted to stand for not less than 24 hours, and the entire exterior surface examined for leakage. No backfill shall be placed prior to the test and if water is present in the excavation, it shall be kept pumped down below the floor level during the test. All leaks shall be located and, after emptying, the reservoir shall be repaired as directed.

3-03. Concrete for building and miscellaneous structures. -

(a) Concrete shall be class D-1, except that concrete to be used in the channel or cavities of masonry lintel or bond beam units shall be class E-0.5.

(b) Forms for exposed surfaces of the building foundation shall provide a special smooth finish in accordance with paragraph 4-03 of Specification No. 13Yd. Other forms shall conform to paragraph 4-02 of Specification No. 13Yd.

(c) Sub-grades. - Floor slabs and footings shall be underlain with a single-thickness of waterproof, reinforced craft paper. All joints shall be lapped and sealed and the paper turned up into expansion joints 2 inches.

(d) Expansion joints between vertical concrete surfaces and floor slabs laid on the earth shall be as shown on drawings and as described in Paragraph 2.13 and 6.05 of Specification No. 13Yd.

(e) Floor shall be dished $3/4$ inch immediately at floor drains and the drains set to meet the dished portion.

(f) Surface finishes. -

(1) All exposed surfaces cast against forms shall be given a standard finish.

(2) All interior floor surfaces, except the trench, shall be given a light duty non-slip finish in accordance with paragraph 9-07a. The concrete shall be brought to final elevation in one lift, thoroughly compacted, and struck off. The aggregate shall be forced away from the surface and the slab floated and screeded to a true, level surface at the elevations indicated on the drawings. After the concrete has set sufficiently to support the weight of the equipment, excess surface water shall be removed and the surface compacted with a heavy power-driven rotary float of the metal disc type. Dry cement or cement aggregate mixtures shall not be sprinkled on the floor to absorb moisture. Following the compacting, and after water sheen has disappeared from the surface, the floor surface shall be troweled to a smooth, dense finish. Troweling shall be held to a minimum consistent with obtaining the desired finish. Concrete to be so finished shall not contain more than five gallons of water per sack of cement.

(3) Exterior steps and landings shall receive a light duty non-slip finish.

3-04. Materials installed in connection with the concrete work, including anchors, bolts and sleeves, shall be placed and secured in position when the concrete is poured.

3-05. Miscellaneous supports, including concrete piers and foundations for piping, pumps, and other equipment where not shown shall be of proper size and finished to correct elevation and shape as required by the manufacturer's equipment. Concrete supports shall be fastened to the structural floor slab with #6 dowels not less than 3 inches from each corner where vibration or dynamic forces will occur during operation of the equipment. Location and size of anchor bolts and other fasteners installed in the concrete shall suit manufacturer's equipment.

3-06. Precast Lightweight Roof Plank. -

(a) Materials. - Roof deck shall be nailable precast tongue and groove commercial quality plank of light weight aerated concrete reinforced top and bottom with galvanized welded wire mesh reinforcement accurately placed. Planks shall be tongue and grooved on the sides with square ends requiring 2-inch end bearing, shall be 2 inches thick and shall weigh not more than 14 pounds per square foot. The plank shall be designed to support a superimposed safe load of 75 pounds per square foot on a 6 foot span based on a safety factor of 4. All plank shall be as nearly perfect as good workmanship will permit.

(b) Installation. - Planks may span two or more spacings but must end over supports. No warped, cracked, or broken planks shall be placed in the roof. Joints of roof plank shall be fastened to supporting steel with 20 gauge galvanized steel clips and painted on upper side with high temperature asphaltic cement or grouted with Portland Cement. Planks shall be cut for chimney opening but such cutting shall be done to fit framed opening at time plank is installed.

SECTION 4. MASONRY

4-01. General requirements. - The contractor shall furnish all labor and materials necessary for the proper completion of the masonry work as indicated on the drawings and as specified herein.

4-02. Materials shall be delivered and stored and handled in a manner that will prevent inclusion of foreign materials or damage to the material.

(a) Brick shall be grade H conforming to Specification No. SS-B-656. Variations from the nominal dimensions, 2-1/4 inches x 3-3/4 inches x 8 inches, shall not exceed the tolerances given in Specification No. SS-B-656. All brick shall have true faces and straight, sharp edges and shall be so handled that exposed edges and faces shall be free from chips, spalls and cracks.

(b) Concrete blocks. - Concrete masonry units shall conform to the applicable requirements of Specification No. SS-C-621, except as may be modified by the drawings and/or this specification. The units shall be Type I, load bearing, smooth surfaced, cast from concrete weighing more than 100 pounds per cubic foot. The units shall be free from deleterious matter that will stain stucco, mortar, or paint or will corrode ferrous metal. All units for exterior walls shall be made by the same manufacturer.

(1) Moisture content of the units at time of delivery to the site and when laid up in the walls shall be not greater than 30 percent of the maximum absorption of the units when tested in accordance with Specification No. SS-C-621. Prior to delivery of the units, samples selected at the manufacturer's plant by the officer in charge shall be tested by a recognized testing laboratory at the contractor's expense and certified test reports showing compliance with the specification shall be furnished to the officer in charge for approval. The number of samples shall be in accordance with Specification No. SS-C-621; the contractor shall identify and weigh the units in the presence of a representative of the officer in charge before shipment to the laboratory. The contractor will be required to certify that concrete masonry units delivered to the site have been manufactured, cured, and dried in the same manner as were the samples tested, and shall so arrange the plant storage that the officer in charge may readily determine that the lots from which samples were selected are being held in separate storage and are the units to be delivered to the construction site. Additional samples will be selected at random during the period of delivery to the site and at least twice each week during construction, and shall be tested by the contractor as specified above; the field samples will be taken at the approximate rate of one unit per each 2,000 and will be so selected that they are representative of the units currently being used. Field stockpiles represented by samples failing to comply with the moisture content limitation shall not be used until re-test indicates compliance.

(2) Age. - The units shall not be laid up within thirty (30) days after manufacture; acceptable evidence of the age of the units shall be furnished as directed.

(3) Protection from weather. - Masonry units at the job site shall be stored on a cribbing or other suitable platform that will prevent contact with the ground and provide ventilation under the stacks. The units shall be covered in storage with a tarpaulin or other waterproof material. Masonry in walls shall be kept similarly covered until completed and capped, while work on the specific section of wall is not in progress.

(c) Precast concrete for window sills shall be class G-0-.75 concrete in accordance with the requirements of Specification No. 13Yd. Sills shall be reinforced as indicated and shall be set plumb, level and true to line. Soft wood, water-soaked, wedges shall be used to prevent crushing of mortar bed; they shall be removed before pointing. Faces of cast stone shall be kept free from mortar. All joints shall be brushed clean, wetted thoroughly and pointed flush; when initially set, they shall be finished with metal tool to form a dense, smooth concave surface without hair cracks or crevices.

(d) Flue lining and thimble shall be of fire clay, hard burned, and free from fractures, large or deep cracks and other defects. They shall be set in refractory mortar, pointed, and kept free from mortar droppings. A thimble of the dimensions necessary shall be provided for the flue and shall be located where directed.

4-03. Mortar for brick and concrete-masonry unit work shall be mixed in the proportions by volume, of one part portland cement, one part lime paste, and six parts sand, or of one part masonry cement and three parts sand. The aggregates shall be introduced and mixed in such a manner that the materials will be distributed uniformly throughout the mass, after which a sufficient amount of water shall be added gradually and the mass further mixed until a mortar of the plasticity necessary for the purposes intended is obtained. The mortar may be machine mixed in approved mixers of the type in which the quantity of water can be controlled accurately and uniformly. The mortar shall be used so that it will be in place before the initial setting of the cement has taken place; retempering of mortar in which cement has started to set will not be permitted. The color of the cement and sand used in the exposed exterior work shall produce, without the admixture of any coloring matter, a mortar of uniform shade.

(a) Portland cement shall be Type I conforming to Specification No. SS-C-192a.

(b) Masonry cement shall be Type II conforming to Specification No. SS-C-181c.

(c) Lime paste shall be made with pulverized quicklime or with hydrated lime, which shall be allowed to soak not less than 72 hours before use, except that hydrated lime processed by the steam method shall be allowed to soak not less than 12 hours, and shall be made by adding the lime to the water. In lieu of hydrated lime paste for use in mortar, the hydrated lime may, at the contractor's option, be added in the dry form. Pulverized quicklime shall conform to Specification No. SS-Q-351, and shall pass a No. 20 sieve, and 90 percent shall pass a No. 50 sieve; hydrated lime shall conform to the requirements as to chemical composition and finess given in Specification No. SS-L-351 and, in addition thereto, the total free (unhydrated) calcium oxide (CaO) and magnesium oxide (Mg O) in the hydrated product as delivered shall not exceed 8 percent. After being soaked for the period specified, the lime paste shall pass the test for plasticity given in Specification No. SS-L-351 for Type F lime.

(d) Sand shall be an approved grade; clean, and free from dirt, silt, organic matter, and other impurities.

(e) Water for mixing shall be fresh and clean, and free from excess acids, alkalies, and other deleterious matter.

4-04. Joints and coursing of walls. - Thickness of joints shall be 1/2 inch. All joints shall be tooled slightly concave. All vertical joints shall be staggered. Where anchor bolts and other ties occur within the cells of the units, such units shall be filled with mortar.

4-05. Joint reinforcement. - Longitudinal joint reinforcement shall be provided in horizontal joints in the exterior walls as follows:

(1) The joint located one course above concrete foundation walls.

(2) The joints located one and two courses below, and the joint located one and two courses above windows.

(3) The joint located one course above doors or other isolated openings. The reinforcing to extend 6 feet on either side of the opening or to a building corner, whichever is less.

(4) In additional intervening joints so that continuously reinforced joints are spaced not more than three courses apart.

The reinforcement, except as specified, shall be continuous around the entire periphery of the building, or to the jamb of an opening, as applicable. The reinforcement shall consist of two No. 9 U. S. Steel Wire Gauge side wires with laterally extending weld connected ties spaced not more than 16 inches apart, the lateral ties being designed

to insure proper positioning of each longitudinal member continuously in the approximate center of its respective face shell mortar bed. The ties shall be so arranged that the thickness of the assembly does not exceed that of the main longitudinal wires. The reinforcement shall have a minimum of 5/8 inch protective cover after tooling of the joints. The reinforcement shall be lapped not less than 12 inches at splices, and shall be bent and lapped at corners. The wire shall be cold drawn, steel wire conforming to A. S. T. M., Specification No. A-82, except that the ultimate tensile strength shall be 100,000 psi. Breakage of welds between ties and main wires will be cause for rejection of any piece. The reinforcement assemblies shall be zinc-coated after forming.

4-06. Workmanship. - Units shall be so handled that their edges and faces will not be chipped, spalled, or cracked. All beds on which masonry is to be laid shall be cleaned and wetted properly. The work shall be built level, square, plumb, and true. All drilling, cutting, and fitting required by other work and for making good after such work shall be done as necessary. The first course of concrete-masonry units shall be laid in full bed or mortar, for the full width of the unit. Concrete-masonry units laid with the cells vertical shall have the bed-joints formed by applying the mortar to the entire top surfaces of the inner and outer face shells and the head joints formed by applying the mortar for a width of about one inch to the ends of the adjoining units laid previously. The mortar for joints shall be smooth (not furrowed), and of such thickness that it will be forced out of the joints as the units are being placed in position. All joints between bricks shall be filled completely with fresh mortar. Bed joints shall be full, flat, and of uniform thickness; they shall not be furrowed. Cross joints shall be obtained by applying a full bed of mortar on the entire end of the stretcher or on the entire edge of the header to be laid, as the case requires, and then shoving the brick tightly against the brick already in place; the scrapings into the empty joints will not be permitted. Longitudinal joints within walls shall be formed as specified for cross joints, or may be formed by applying the mortar to the surfaces of the bricks previously laid, and then shoving the brick into place. Closure brick shall be laid with a bed joint and cross joints, and the brick shall be placed carefully without disturbing the brick previously laid.

4-07. Setting miscellaneous material. - All anchors, bolts, door and window frame, and all other material occurring in connection with masonry shall, where practicable, be placed and secured in position when the masonry is placed.

4-08. Cleaning. - Upon completion, all masonry work shall be pointed where necessary. All exposed surfaces of masonry work shall be scrubbed with water and soap and rinsed thoroughly with clean water. All other work that might be damaged, stained or discolored, shall be protected during the cleaning, and all work so affected by the process of cleaning shall be replaced.

SECTION 5. STRUCTURAL STEELWORK.

5-01. General requirements. - Structural steelwork including roof framing and incidental structural steel and fastenings shall conform to the applicable requirements of Specification No. 22Yc except as modified herein. Structural steel shall be Types I and II for riveted and welded work, respectively, and Grade B in accordance with Specification No. QQ-S-741 except that tolerances in rolling and cutting shall conform to the current editions of the manuals of the American Iron and Steel Institute.

5-02. Cement-mortar grout for setting steel bearing flanges of roof framing members shall consist of equal parts of portland cement, sand and dry powder compound composed of specially prepared metallic aggregates combined with cement dispersing agents and reagents to promote oxidation and strength. Before grouting the masonry surface shall be cleaned thoroughly and the surface flushed with neat cement grout immediately before the cement-mortar is placed.

SECTION 6. MISCELLANEOUS METALS.

6-01. General requirements. - Miscellaneous steel and iron work shall be well formed as to shape and size and sharp lines and edges. Shearing and punches shall leave clean, true lines and surfaces. Materials shall be clean, free from mill scale, flake, rust and pitting. Steel shall be stock material of commercial quality. Cast iron shall be soft, tough, gray iron. All steel and iron work, except anchor bolts, shall receive a shop coat of red lead paint.

6-02. Anchors and fastenings. - Ties, anchors, and other miscellaneous fastenings shown, specified or necessary for the securing of the work in place shall be furnished and installed.

6-03. Thresholds shall be made of extruded aluminum of the pattern shown on drawings. All thresholds shall be set in mastic and fastened with expansion screws not more than three inches from ends and eight inches on centers between end screws.

6-04. Metal ladder where shown shall be fabricated of sizes and to dimensions indicated, with flat mild steel side rails, and round steel rungs. Ladder shall be anchored as shown with brackets of same size as side rails and of proper length to hold ladder 8 inches away from wall; secure brackets to wall with expansion bolts.

6-05. Manhole steps shall be cast iron conforming to the applicable requirements of section 3-08 of Specification No. 42Ya.

SECTION 7. ROOFING, SHEET METAL WORK AND INSULATION

7-01. General requirements. - Materials and methods of installation shall conform to the applicable requirements of Specification No. 7Yg, except as specified otherwise herein.

7-02. Built-up roofing. - Materials and installation shall conform to the applicable requirements of Specification No. 7Yg for type 4TCS except that the primer coat shall be omitted where the roofing is applied over roof insulation. Surfacing material may be gravel, crushed stone or slag.

7-03. Roof insulation shall consist of single or multiple layers of boards, using one of the following:

(a) Insulating fiberboard not less than one and one-half inches thick, conforming to the requirements of Specification No. LLL-F-321b. Class C, except that it shall be treated chemically to resist dry rot and decay, insects and fungus growth, and in addition shall be coated on all surfaces, ends, and edges with a bituminous compound.

(b) Fibrous glass board shall be not less than one and one-quarter inches thick, conforming to the requirements of Specification No. JAN-G-742; except that bituminous impregnated kraft paper covering may be substituted on the upper surface and on the ends in lieu of the glass cloth covering specified.

(c) Insulation shall be applied in accordance with the requirements of Paragraph 2-17 of Specification No. 7Yg.

7-04. Cap flashing shall be copper weighing not less than 14 ounces per square foot.

7-05. Gravel stops shall be formed to details shown and shall be of copper weighing not less than 16 ounces per square foot; flange shall extend at least four inches on roof and shall be bedded in hot bitumen and covered with base flashing; lower edge shall be locked over continuous edge strip of 24 ounce copper.

7-06. Pipes passing through the roof shall be flashed to conform with applicable requirements of Paragraph 3-17 of Specification No. 7Yg.

7-07. Sheet metal for covering wood manhole covers shall be zinc-coated sheet steel in accordance with the requirements of paragraph 1-23 of specification 7Yg and shall be type A, class 5, specification No. QQ-S-775. Flashing shall be applied in accordance with the applicable requirements of paragraph 3-17 of specification No. 7Yg.

SECTION 8. METAL DOORS AND FRAMES.

8-01. General requirements. - Doors shall be pressed steel construction of the panel and glazed type. Sheet steel for forming stiles and rails shall be not less than .0598 inch thick and sheets for panels not less than .0478 inch thick. Bottom rails shall be not less than 6 inches wide and all other rails and stiles shall be not less than $4\frac{1}{2}$ inches wide. Connections of rails and stiles shall be welded thoroughly and all corners reinforced internally, insuring against sag and weave. All welded joints shall be ground leaving a smooth finished surface. Reinforcement shall be provided where necessary for the proper installation of hardware and where necessary for strength or rigidity. Astragals shall be provided for double doors. Glazing stops shall be placed on the interior side of exterior doors.

8-02. Metal frames shall be formed as detailed and fabricated from cold-rolled steel not less than .0598 inches thick. All corners shall be mitered, welded the full length of the joint and ground smooth. Each jamb shall be anchored securely with anchors spaced not more than 2 feet on centers. All frames shall be reinforced as required for proper installation of hardware.

8-03. Shop painting. - All doors and frames shall receive a shop applied coat of baked-on rust-inhibiting paint.

8-04. Hardware shall conform to the applicable requirements of Specification Nos. FF-H-106a, FF-H-111a, FF-H-116b and FF-H-121c. Hardware not specified otherwise shall have a U. S. 10 finish. Two keys shall be provided for each lock. Cylinder lock shall be keyed to match locks on wood doors. One flat brass key tag, approximately 1-1/8 inches in diameter, with brass chain shall be provided for each key.

(a) Schedule

- (1) Door 1/8 - shall have:
 - 4 pair of butts, type 2080 $\frac{1}{2}$ P, 5" x 5"
 - 1 lock set, type 86 C-4
 - 1 chain bolt, type F1023A, 6" long
 - 1 foot bolt, type F1023B, 6" long
 - 2 stops, type 1329E

SECTION 9. METAL WINDOWS

9-01. General requirements. - Metal windows shall conform to the applicable portions of Specification No. 10Yc except as modified herein. Windows shall be constructed of commercial grade new billet steel, given an approved rust preventative treatment and equipped with all necessary hardware. All windows shall be commercial projected with ventilator projecting out. Loading tests will be waived in cases where the contractor furnishes satisfactory evidence, including affidavits from the sash manufacturer, that units of a similar type have met such tests.

9-02. Screens shall be provided on all windows, shall be removable type and conform to the requirements of Specification No. 10Yc. All screens shall be rewirable and shall have 16 mesh cloth type III conforming to Specification No. RR-S-141a.

SECTION 10. GLAZING

10-01. General requirements. - Glass shall conform to Specification No. DD-G-451a, where applicable. Putty for glazing wood doors and windows shall be Type II, conforming to Specification No. TT-P-791a. Elastic glazing compound, Type I, conforming to Specification No. TT-P-781a, shall be used for glazing metal sash and metal doors.

10-02. Obscure glass, Type IIIc, Pattern Class IV, unpolished, not less than 1/8 inch in thickness shall be used for glazing the window in toilet room.

10-03. Clear sheet glass for glazing the remaining windows shall be Type II, B quality, double strength, and 7/32 inch in thickness for glazing doors.

10-04. Workmanship. - All glass shall be accurately cut to fit the openings and shall be set with equal bearing on the entire width of the pane. Glass shall be properly bedded and backputtied and set without springing or forcing. Glass in doors shall be held in place with stop beads. Glass in windows shall be secured with glazing clips and puttied on a bevel. The corners in putty shall be carefully made and all excess putty shall be removed and surface cleaned. On completion, all dirt and stains shall be removed and the glass shall be washed.

SECTION 11. CAULKING

11-01. General requirements. - The work includes the caulking of all joints between the heads, jambs, and sills of all door, window, louver and other openings in exterior walls; and where indicated or necessary to provide weather-proof and water-tight construction. Unless otherwise specified, the caulking material shall be applied with a gun in an approved manner.

11-02. Caulking material shall be Grade 1, in accordance with Specification No. TT-C-598 and shall be nonstraining and approved light gray color.

11-03. Preparation of surfaces. - Joints and spaces to be caulked shall be thoroughly dry before the caulking compound is applied and the joints shall be freed from dust by swabbing with waste moistened with turpentine or mineral spirits. Where the joints or spaces are deeper than $3/4$ " they shall be filled solidly to within $3/4$ " of the face with oakum.

11-04. Application of caulking. -

(a) No caulking compound shall be installed when the temperature is below 40 degrees F.

(b) In all cases, all joints and spaces shall be filled completely with the caulking compound forming neat and smooth beads with the edges flush with the adjoining surfaces and with the beads not extending more than $1/4$ inch out beyond the face of frames or moldings.

SECTION 12. CARPENTRY AND JOINERY

12-01. Materials and methods of application shall conform to the applicable requirements of Specification No. 28Yc, except as modified by the drawings and/or specification. Moisture content shall not exceed 19% for framing or 15% for finish items.

(a) Lumber for fascia and plates under gravel stops shall be No. 2 common short leaf southern pine.

(b) Plywood for cabinet shall be Douglas Fir, interior grade, A-B.

(c) Lumber for wooden covers and signs shall be No. 1 common grade of cypress.

12-02. Doors shall be Grade B Douglas Fir or Grade 2 Ponderosa Pine conforming to the requirements given in commercial standards CS-73-48 and CS-120-46 respectively. They shall be stock design and of the paneled or paneled and glazed type, except where specified otherwise. The doors shall be of water-resistant construction.

12-03. Screens. -- Material and methods of construction shall conform to the applicable requirements of Specification No. 27Yb, except as modified herein. Screen doors shall be Class I, type A. Screen for door 1/3 shall be 1-1/8" thick and shall be two panel type; screen for door 1/8 shall be 1-3/8" thick and shall be three panel type. Wire panel guards shall be installed in lower panels of screen doors. Wire screen cloth, type III, conforming to Specification No. RR-S-141a. Hardware shall be as specified under the hardware section of this specification.

12-04. Cabinet shall be of the size and style indicated on the drawings and shall be shop fabricated, or, at the option of the contractor, may be a manufactured product approximately of the size and arrangement shown. Plywood shall be used for all construction where practicable; it shall be interior grade A-B, except that for tops and other backing for laminated plastic, it shall be EXT-DFPA-A-B grade plywood with face veneers of birch, maple or other wood which is not susceptible to grain raising. Plastic counter top covering shall be a thermo-setting plastic laminate sheet of at least 1/16 inch thickness factory-bonded to wood counter with waterproof cement. Inside angles and exposed edges shall be trimmed with heavy gauge stainless steel mouldings. Plywood for tops and other backing for laminated plastic, shelves, doors, and drawer fronts shall be not less than 3/4 inch thick. Hardware shall be as specified under another section of this specification.

SECTION 13. FINISH, HARDWARE

13-01. General requirements. - All hardware necessary for the complete finish of the building shall be furnished and installed and shall conform to the applicable requirements of Specification Nos. FF-H-106a, FF-H-111a, FF-H-116b, and FF-H-121c. Hardware not specified otherwise shall have a U. S. 10 finish except that finish in toilet shall be U. S. 26. Cylinder locks shall be keyed alike. One brass key tag, approximately 1-1/8 inches in diameter, with brass chain, shall be provided for each key.

13-02. Schedule.

(a) Doors 1/3, 101, 103, 103A and 104 each shall have:

1 1/2 pair of butts, type 2014 1/2 P, 4 1/2" x 4 1/2"
 1 lock set, type 86C
 1 stop, type 1320 E

(b) Door No. 102 shall have:

1 1/2 pair of butts, type 2014 1/2 P, 4 1/2" x 4 1/2"
 1 lock set, 86L-5
 1 stop, type 1320 E

(c) Screen doors for opening 1/8 shall have:

3 pair of butts, type 2010 1/2 P, 4" x 4"
 2 closers, type 3010
 2 pulls, type 436
 4 push bars, type 472A
 2 kick plates, type 1226

(d) Screen door for opening 1/3 shall have:

1 1/2 pair of butts - 2010 1/2 P, 3" x 3"
 1 closer, type 3010
 1 pull, type 436
 2 push bars, type 472A
 2 kick plates, type 1226

(e) Cabinet shall be provided with the following:

Doors shall have 1 pair of semi-concealed hinges
 1 friction catch, type 1074 and one pull type 1306D.

SECTION 14, FIELD PAINTING

14-01. General requirements. - Surface to be painted shall include all work installed under the contract except exterior and interior concrete surfaces, brick above roof, zinc-coated metal, copper metal work. Exposed surfaces of concrete roof planks shall be painted. Paint shall be applied to dry and thoroughly clean surfaces and shall be worked thoroughly into all joints, crevices and open spaces. Surfaces shall be free of rust, dirt, loose and disintegrated paint and scale before the field coats are applied. Finish surfaces shall be smooth, even and free of defect. The number of paint coats specified for new work shall be in addition to the shop coat. At least 24 hours shall elapse between coats. Color and shade of colors shall be as selected by the officer in charge.

14-02. Materials shall be in accordance with the standard specifications listed; those not covered by special standards shall conform to the requirements given hereinafter and shall be of approved brands. Paints and materials therefor shall be delivered in unbroken original packages bearing the manufacturer's name and brand designation. Paints containing both linseed oil and varnish shall be mixed immediately prior to use and shall not be stored. Four notarized copies of paint formulae which show compliance with specifications shall be furnished the officer in charge of construction.

(1) Exterior oil paint

TT-P-102 Type A

For dark shades, the pigment composition given in Specification No. TT-P-102 shall be changed to the following:

	<u>Percent by weight</u>	
	<u>Maximum</u>	<u>Minimum</u>
White lead	-----	30
Zinc Oxide	-----	25
Color and extender pigments	45	---
Organic colors	none	----
Sulfide sulphur	none	----

(2) Wood primer, exterior

TT-P-25a

(3) Red-lead-primer for metal surfaces

TT-P-86a, Type I

(4) Portland cement paint

TT-P-21

(5) Paint; primer-sealer, plaster & wallboard

TT-P-56b

(6) Enamel-undercoat, interior

TT-E-543

(7) Enamel; interior, semi-gloss

TT-E-508

(8) Varnish, asphaltic

TT-V-51a

14-03. Exterior painting. -

(a) Exterior concrete masonry surfaces and exposed roof planking shall receive two coats of portland cement paint as specified hereinafter.

(1) Preparation of surfaces. -

(1a) Surface cleaning. - Dirt, dust, form oil, and other loose or objectionable matter shall be removed. The surface shall be hosed with clean water and brushed where necessary to insure cleaning. Form oil may be removed with lye solutions, with abrasive stones, or steel brushes or combinations thereof, or by light sandblasting.

(1b) Removing glaze. - Surfaces that are extremely dense and impervious (glazed) shall be acid washed, lightly sandblasted, or dry rubbed with coarse grit abrasive stones until the glaze is removed and a positive "tooth" and suction for the paint are provided.

(1c) Wetting of surface. - Before applying paint the masonry shall be thoroughly wetted to control surface suction and provide a reserve of moisture to aid in curing the paint. A garden hose nozzle adjusted to a fine spray is adequate for the purpose. Dampening with a brush dipped in water is not acceptable. The masonry shall be dampened in one operation not more than one hour nor less than thirty minutes before painting. The spray shall be applied in such manner that each part is sprayed three or four times for about ten seconds, time being allowed between applications for the water to soak into the surface. If the surface tends to dry rapidly, as in hot weather, it shall be redampened slightly just in advance of painting. The surface shall be moist but without free water when paint is applied.

(2) Mixing of paint. - The proportion of powder to water shall be as recommended by the manufacturer, but shall be subject to the approval of the officer in charge. The final coat shall have the consistency of rich cream, and shall be mixed in the proportion by volume of approximately one part water to one part powder. The first coat may be very slightly thinner to obtain some penetration. The paint shall be mixed as recommended by the manufacturer and shall be allowed to soak for thirty to forty-five minutes prior to application. No paint shall be applied more than four hours after mixing, and if it contains calcium chloride and the weather is hot, it shall be used sooner as directed. The batches shall be kept in tightly covered containers when not in use, and shall be kept vigorously stirred to uniform color and consistency during application.

(3) Application. - No painting shall be done when the paint may be exposed to temperatures below forty degrees F. within forty-eight hours after application. The paint shall be applied in two coats of the same color; the application shall be at the rate of not less than one gallon per fifty square feet for the two coats. Paint shall be scrubbed into the surface with short, stiff fiber bristle brushes. Coverage shall be uniform and laps well brushed out. At least twenty-four hours shall elapse between coats, and in no case shall the second coat be started until the first coat has become so hard that it cannot be marked with the brushes used. In hot weather, the first coat shall be slightly moistened before applying the second coat.

(4) Curing - Between coats and for at least two days following the final coat, the painted surfaces shall be sprinkled three times per day with the same fog spray used for dampening the surfaces before painting.

(b) Exterior wood work, including screen doors and putty shall receive one coat of wood primer and two coats of exterior oil paint. Signs for cable markers shall be included under this section. Lettering on sign shall be painted with an approved sign paint.

(c) Exterior ferrous metal. - The shop applied prime coat shall be touched up with red-lead primer and given two coats of exterior oil paint.

14-04. Interior painting. -

(a) Masonry walls and roof planking shall be neutralized with a solution consisting of four pounds of zinc sulphate to one gallon of water. The solution shall be allowed to dry at least forty-eight hours following which all loose crystals shall be removed by brushing. Next, all surfaces shall be primed with a primer sealer. If suction spots appear after this coat is dry, they shall be spot-primed with the primer. All walls and ceiling shall be given two finish coats of high quality rubber base flat wall paint. A band six inches high forming a color base shall be provided in all rooms.

(b) Ferrous metal shall have the shop applied primer spot painted as required with red-lead primer and given one coat of enamel undercoat followed by one coat of semi-gloss enamel.

(c) Exposed woodwork. - Interior woodwork and putty shall receive one coat of wood primer, one coat of enamel undercoat, and one coat of semi-gloss enamel.

(d) Mechanical equipment and piping shall be painted in accordance with Specification No. 21Yc, except that lead and oil paint colored as directed shall be substituted for aluminum paint.

(e) Electrical switch, fuse boxes and control panels shall be color painted to conform to the Government Safety Code requirements. Electrical conduit, where exposed in room spaces, shall be painted to match the spaces in which it occurs.

(f) Workmanship shall be first class in every respect. Paints and varnishes shall be applied carefully with good, clean brushes, or by approved spraying equipment, except that the initial coat on any surface shall be brushed in. The work shall be so conducted as to avoid contamination of other surfaces and public and private property in the area; any damage thereto shall be made good by the contractor at his expense. Sufficient time shall be allowed between coats to permit thorough drying and each coat shall be in proper condition to receive the next coat. Each coat shall be sufficiently heavy to cover completely the preceding coat or surface. Paint shall not be applied during foggy or rainy weather or, when in the opinion of the officer in charge, the surfaces are not in proper condition for painting. A period of at least one week of drying weather shall prevail between the completion of the painting of exterior masonry and before starting interior painting. Time for completion will be extended to compensate for time lost due to unfavorable weather conditions.

14-05. Exterior and interior metal work at the reservoir shall be given two coats of asphaltic varnish.

14-06. Clean-up. - Paint shall be removed immediately where spilled or splattered on surfaces adjacent to the work, including fixtures, glass and fittings. The premises shall be kept free at all times from accumulation of waste material and/or rubbish resulting from the work and upon completion of the work, all tools; scaffolding, surplus materials and rubbish shall be removed and the premises left clean.

SECTION 15. PLUMBING

15-01. General requirements. - The work includes the provision and installation of all fixtures, accessories, material, appurtenances, and equipment for complete plumbing system, including floor drains and sump drains, as shown. All piping shall be inspected, tested and approved before being covered, buried or concealed. Pipe, valves and accessories may be taken from stock, but if required, the contractor shall submit certificates identifying the materials furnished. Except as specified otherwise hereinafter, all work shall conform to Specifications No. WW-P-541b, No. 31Yc and material specifications hereinafter noted.

15-02. Piping. -

(a) Water piping shall be as specified in process and service water piping section.

(b) Drain lines below ground shall be extra heavy cast iron soil pipe in accordance with Specification No. WW-P-401, connected to outside drain not less than 5 feet outside of building wall.

(c) Sanitary piping above ground shall be standard weight zinc-coated steel pipe in accordance with Specification No. WW-P-406, except vent stacks which shall be extra heavy cast iron, in accordance with Specification No. WW-P-401.

(d) Drainage fittings above ground shall be cast iron, recessed and banded, screw-jointed, drainage pattern, long radius type except where short radius fittings are specifically permitted.

(e) Lead for caulking shall conform to Specification No. QQ-L-156, Type I.

15-03. Fixtures. - Fixtures, trimmings, fittings, accessories, and miscellaneous plumbing supplies shall be in accordance with Specification No. WW-P-541b. All trimmings and fittings shown and/or described therein for the fixtures specified herein, including compression stops shall be provided. The trimmings, fittings and accessories shall be brass or red metal, nickel or chromium plated.

(a) Water closet shall be outfit No. W116.

(b) Laboratory sink shall be outfit No. EK24GF with stainless steel rim with two Type 10 faucets furnished in lieu of combination faucet.

(c) Floor drains shall be area drain, Type 220.

(d) Lawn faucets shall be Type 207.

(e) Sampling faucets shall be Type 63.

(f) Miscellaneous plumbing supplies, as follows, shall be furnished and installed as directed in the toilet room; one (1) toilet paper holder, Type 433 and one (1) coat hook, Type 419.

15-04. Insulation. - Insulation of cold water piping is not required.

15-05. Sterilization. - The entire cold water plumbing system shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine. The chlorinating material shall be liquid chlorine gas-water mixture, calcium hypo-chlorite, or sodium hypo-chlorite, or chlorinated lime and water mixture conforming to the requirement of the American Water Works Association, and shall be introduced into the system in an approved manner. The sterilizing solution shall be allowed to remain in the system for a minimum period of 24 hours, but until pronounced safe and fit for human consumption by the officer in charge. During the sterilizing period, all valves and outlets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until residual chlorine content is not greater than 0.2 parts per million unless otherwise directed.

SECTION 16. HEATING AND VENTILATION

16-01. General requirements. - The work shall consist of the provision of a warm air heating system in the building and mechanical ventilation in the chlorinator room and includes an oil fired warm air furnace, all controls, fuel oil tank, sheet metal ducts, grille, registers, exhaust fan and all accessories and appurtenances for complete and operating heating and ventilation systems. Except as modified, all work shall comply with the applicable sections of Specification No. 21Yc, NBFU Pamphlet No. 90, NBFU Pamphlet No. 31, and to material specifications hereinafter listed.

16-02. Electrical requirements. - Motors, controls, and starters shall be furnished hereunder; wiring conduit and disconnect switches therefor shall be as specified in the Electrical Section.

16-03. Warm air furnace. -

(a) Furnace. - The furnace shall be of a self-contained sheet steel combustion chambers, designed especially for use with oil as a fuel, in which the furnace, fan, controls and accessories are housed in a single cabinet, with combustion chamber located above the fan and filter assembly. The furnace shall have a capacity of at least 112,000 btus per hour output at the bonnet. The furnace shall be complete with casing, access doors, smoke breaching, draft damper, all safety controls, temperature controls and all else required to comply with the Pamphlet No. 90. The automatic temperature limit control shall be of a type that cannot be set at a temperature exceeding 200 degrees.

(b) Fuel oil burner shall be of the pressure atomizing gun type with motor located outside the unit and shall be full-automatic with electric ignition. It shall have a maximum continuous capacity sufficient for a heat load 1.2 times the furnace rating and driven by an enclosed dust-tight electric motor. The burner shall comply with NBFU Pamphlet No. 90. It shall be complete with all necessary controls and safety devices. Safety devices to prevent burner operation in event of ignition failure shall include an automatic switch that shall require manual reset when ignition fails but shall recycle automatically on flame or power failure. Burner shall be attached to the unit or mounted in such a manner as to prevent transmission of mechanical noise to the structure through either the unit or through the oil lines.

(c) Motors shall be designed for use with 120 volt, single phase, 60 cycle current, and shall be of the capacitor or other similar type. Ignition shall be electric, properly shielded and grounded. Motors and ignition systems used in connection with this equipment shall be non-radio interfering.

(d) The fuel storage tank shall have a capacity of not less than 550 gallons and shall be buried in the ground as indicated. Installation shall be in accordance with NBFU Pamphlet No. 31. It shall have a 2-inch fill pipe and locked type cap, a vent not less than $1\frac{1}{2}$ inches in diameter running at least 10 feet up the side wall of the building and fitted with a proper screened twin opening vent protector. Fill and vent piping shall be zinc-coated steel. The oil supply line shall not be less than 1/2 inch OD soft copper tubing with the proper fittings. Sweat connections will not be permitted. The oil supply line shall have a strainer and gate valve immediately preceding the oil burner and a foot valve in the tank. The return line shall be of the same size and type as the supply line. By-passing excess oil from the burner to the suction line will not be permitted. Concrete for pad shall be class D-1. Tank, strap irons and bolts shall be given a heavy coat of asphalt paint prior to backfilling.

(e) The fan shall be of the centrifugal type, belt driven by a proper size motor. The fan shall be quiet in operation, shall have bearings of ample size, and shall have a capacity to deliver not less than 1440 cubic feet of air per minute against an external static pressure of 0.2 wg.

(f) Filters shall be of the refiller or throw-away type. Face velocity shall not exceed 300 FPM and one extra set of filters shall be furnished for the unit.

16-04. Ductwork. - Ductwork shall be provided in a neat workmanlike manner as indicated and/or required. Ductwork shall be constructed of zinc-coated sheet steel in accordance with Specification QQ-I-716, and the construction and installation shall conform to the applicable recommendations of the National Board of Fire Underwriters, Pamphlet No. 90, Part I. The cuts shall be properly braced and reinforced as specified and in no case spaced more than 48 inches on centers. All slip joints shall be made in the direction of flow. All ducts, unless otherwise approved, shall be true to the dimensions indicated and shall be straight and smooth on the inside with neatly finished airtight joints. The ducts shall be securely anchored into the building construction in an approved manner and shall be completely free from vibration under all conditions of operation.

16-05. Flexible connections. - Asbestos cloth connector shall be provided in air duct where indicated. The connector shall be supported at each end by metal angle frame bands, securely bolted in place so as to be air tight. Asbestos cloth shall conform to the applicable requirements of Specification SS-C-466a, Type I, Class D and Type IV.

16-06. Registers. - Air supply registers shall be of the double deflection, multi-shutter type arranged to provide adjustable positive control of air direction, throw, and drop as well as adjustable control of air volume. Registers shall be of the size and capacity indicated. Metals subject to corrosion shall be prime coated at the place of manufacture.

16-07. Return air grille. - Return air grille shall be of the stamped metal type, fabricated from steel weighing not less than 1.5 pounds per square foot and shall be of the plain lattice design with openings approximately 1 inch square and with 1/4 inch bars. Flange shall be at least 7/8 inch on all sides.

16-08. Controls. - The system shall be controlled by an inside thermostat located on the wall where indicated. On a falling temperature and a demand for heat, the thermostat shall start the oil pump, oil burner motor and ignition system. When the bonnet temperature reaches approximately 115° F., the fan motor shall start and continue to operate until the bonnet temperature falls to approximately 100° F. Limit switch shall be provided as specified above. The system shall remain in operation until the demand for heat is satisfied. An on-off automatic switch shall be provided at the thermostat location for manual control of the system when desired.

16-09. Instructions. - Complete printed instructions shall be provided by the contractor, covering the operation and maintenance of the entire system. Operating instructions shall be securely attached to the wall of the furnace room, or as directed.

16-10. Exhaust fan for installation in chlorination room shall be a 10-inch fan having a capacity of approximately 600 cfm at 1140 rpm and shall conform to the applicable requirements of Specification No. MIL-F-16081B. Motor shall be designed for 120 volt, 60 cycle, single phase current. Automatic gravity type louvers shall be provided and shall conform to the applicable requirements of Specification No. MIL-L-18145.

16-11. Test. - The system shall be tested as in service and in accordance with Specification No. 21Yc. Automatic controls shall be adjusted to the required setting. A balanced flow of warm air shall be demonstrated with thermostat calling for heat. All defects disclosed during the test shall be corrected promptly at the expense of the contractor, and the test repeated until satisfactory results are obtained.

SECTION 17. MECHANICAL EQUIPMENT

17-01. General requirements. - This section of the specification includes all material, equipment, appurtenances and labor required to provide where indicated, water treatment equipment, chlorination equipment, brine pumps, and service water pumps.

17-02. Water treatment equipment shall include water softening equipment, aeration equipment and filtration equipment, as specified, properly sized, arranged and installed to fulfill the service as described herein.

(a) Service. - This equipment shall perform the service of producing an effluent as specified from raw water, having an analysis as shown, in the quantities specified.

(b) Source. - The raw water supply is derived from wells located on the station as indicated on the plans.

(c) Raw Water Analysis is as follows:

<u>Iten</u>	<u>PPM</u>
(1) Calcium (Ca)	59
(2) Magnesium (Mg)	6.2
(3) Sodium (Na) and Potassium (K) (as Na)	15.6
(4) Silica (SiCl ₂)	12.0
(5) Iron (Fe) Total	1.2
(6) Bicarbonate (HCO ₃) (as Ca CO ₃)	144.0
(7) Carbonate (CO ₃) (as Ca CO ₃)	0.0
(8) Hydroxide (OH) (as Ca CO ₃)	0.0
(9) Sulphate (SO ₄)	48.0
(10) Chloride (Cl)	21.0
(11) Phosphate (PO ₄)	0.0
(12) Dissolved solids	207.0
(13) Suspended solids	6.6
(14) Carbon Dioxide (CO ₂) Free	12.0
(15) Total hardness (as CaCO ₃)	198.0
(16) pH	7.4
(17) Color	15.0

This is a composite analysis as taken from the wells and will be subjected to chlorination, prior to softening, to retain a residual chlorine content of 0.7 PPM subsequent to softening.

(d) Effluent - The effluent, or service water, produced shall have a total hardness as CaCO₃ not to exceed 60 ppm and a total combined iron and manganese content not to exceed 0.3 ppm. The solids in solution shall not be greater than those in the raw water and the PH need not be adjusted.

(e) Capacity. - The water treatment equipment shall have the capacity to produce a service water effluent as herein specified of not less than 250,000 gallons daily.

(f) Proportioning equipment. - Proportioning equipment shall be supplied to direct predetermined portions of flow through the softeners and the aerator and filters in such a manner as to produce a blend in accordance with the effluent specification. This apparatus shall maintain the proper proportioning for all rates of flow between 50 percent and 150 percent normal. It shall be readily adjustable to changing water conditions without dismantling and shall be hydraulically operated. It shall be accurate within plus or minus 5 percent.

(g) Controls. - Individual units of the water treatment equipment shall have automatic controls, as specified herein, interlocked in such a manner as to constitute an integral part of an automatic treatment facility. The controls governing the softening regeneration cycle and the filtering backwash and rinse cycle shall be interlocked with the controls governing the back pressure control valve in such a manner that the raw water supply will not be shut off during these cycles.

(h) Water softening equipment. - The equipment shall be the downflow, pressure type, sodium cycle, brine regenerated, zeolite water softeners conforming to the applicable requirements of Specification No. MIL-W-17121B, except as specified otherwise herein. The equipment shall consist of two softeners complete with all necessary working parts, interconnecting piping, valves, fittings, meters, gauges, and shall include a main operating valve system, brine measuring tanks, and all associated controls.

(1) Controls. - The softening equipment shall be automatically controlled.

(2) Water pressure available to operate the brine injectors will be 35 psi minimum.

(3) Current. - Power supply will be 120/208 volts, 60 cycles, 3 phase current.

(4) Electrical equipment shall have radio interference reduction.

(5) Repair and maintenance parts and tools. - A set of all special tools required for access to, repairs to, and operation of the equipment, other than ordinary mechanic's tools, shall be furnished.

(6) Production test model will not be required.

(7) Salt storage tanks will not be required.

(8) If the rinse water and backwash water flow rate controls are of the external type and require sumps, the sumps shall be constructed of reinforced concrete to dimensions as recommended by the manufacturer and as approved by the Contracting Officer.

(i) Pressure Aerator. - The pressure aerating unit shall operate to saturate the water directed to the filters with air to precipitate iron, and shall be complete with tank, air compressor, air vent, water level control switches, and solenoid valve for air line.

(1) Tank shall be welded steel, 18" diameter by 36" high, designed for 100 psi cold water working pressure in accordance with the standards of the ASME Code for unfired pressure vessels. Tank shall have all necessary openings for inlet, outlet, air, air vent, and gauge glass; and shall have at least one handhole at the bottom.

(2) Compressor. - Air compressor shall have a capacity of 2 cfm at 25 psi, with a 40° C rise, continuous duty drip proof motor, 20 gallon air receiver, automatic start and stop pressure control switches, and a pipe line filter for providing clean oil free air prior to aeration.

(3) Accessories. - Level switches for tank level control shall be mercury type and shall operate to open and close a solenoid valve on the air line. Water level gauge glass shall be provided with valved connections to tank, drains, gaskets, and one extra glass. Air vent shall operate to release air at the rate of one-half to one cubic foot per minute, and to close against release of any water, and shall be muffled.

(j) Filter Battery. - The filter battery shall include two pressure filter units, each with inlets, water distribution system, gravel, filter sand, under drain system, meter, automatic control, automatic operating valve, wash and backwash controls, and all controls, valves, fittings and piping specified or necessary for operation of the unit. Automatic controls shall be inter-locked so only one filter at a time will be undergoing washing.

(1) Filter tanks. - Shells shall conform to the ASME Rules for the construction of Unfired Pressure Vessels; for 75 pounds per square inch working pressure. Shells shall have a manhole and handholes permitting easy access to the entire interior, and screw jack supports, and shall not be lined. Flanged connections shall be provided for raw water inlet, and for filtered water outlet. A hand operated vent shall be placed on top of the shell.

(2) Water distribution system. - Each shell shall have a raw water inlet, and wash water collection system and outlet which will function without damage to the filter bed. Piping shall be brass or wrought iron. Under drain system shall be of the header and lateral

type equipped with strainers or deflector plates. System shall collect the filtered water without becoming clogged, and shall distribute the wash water laterally in a way that will not cause channeling of the sand and gravel bed.

(3) Filter media. - Each filter shall be provided with an aggregate depth of at least 42 inches of a filtering medium consisting of suitable grades of screened silica filter sand and gravel with layer apportioned approximately as follows:

- 12 inches of fine sand
- 10 inches of coarse sand
- 4 inches of 1/8 inch to 1/4 inch gravel
- 4 inches of 1/4 inch to 1/2 inch gravel
- 8 inches of 1/2 inch to 1 inch gravel
- 4 inches of 1 inch to 1 1/2 inch gravel

(4) Main operating valve for each unit shall have 3 positions; filter, wash and backwash (rinse). Valve shall have minimum pressure loss and shall open and close without hydraulic shock, and shall be designed for a working pressure of 75 psi and shall be tested at 1.5 times the working pressure. Positions shall be permanently marked on the valve.

(5) Automatic operation. - Filter operation shall be automatic, and all necessary additional electrical and mechanical equipment shall be supplied. The main operating valve shall be positioned by an electric motor and reduction gear, totally enclosed. Operation shall be initiated automatically by the water meter after the correct gallonage has been filtered. The valve shall be turned successively to the wash, backwash and filter position and be held for the correct length of time on wash and back wash. Controls shall be interlocked so that only one unit at a time is being washed. Provision shall be made for hand operation in case of power failure. Controls shall be adjustable.

(6) Rate of flow controllers shall be furnished for washing and rinsing. The controllers shall be the external float type or built-in type hydraulically operated. The controllers shall maintain the correct flow within ± 5 percent, regardless of pressure fluctuations in the line. Rates of wash and rinse shall be adjustable. When the controllers are of the external float type and require sumps, the sumps shall be constructed of reinforced concrete to dimensions as recommended by the manufacturer and as approved by the Contracting Officer.

(7) Rate of flow indicators shall be provided with each filter to indicate the rate of flow during filtration and backwashing.

(8) Pressure loss. - The pressure loss through a filter right after washing shall not exceed 15 feet of water, measured from ahead of the raw water meter to the filtered water outlet. Two pressure gauges shall be provided, one for mounting on the raw water inlet and one for the filtered water outlet. Gauges shall conform to specification GG-G-76a, Class 2, Type A, 6-inch brass case.

(9) Manufacturer's identification. - Components of the system shall bear the manufacturer's name or trade-mark on a name plate securely affixed in a conspicuous place. In lieu of the name plate, a cast, stamped, or other permanent marking may be applied to the components.

(10) Performance test. - Each unit shall be tested after being put in operation, to determine conformance with this specification.

17-03. Chlorination equipment. - Two (2) fully automatic manually adjustable gas-solution type chlorinators shall be provided. One chlorinator shall be installed to feed chlorine solution to the raw water prior to softening or to the raw water after softening; the points of application shall be as indicated. The other shall be connected to feed the chlorine solution to the suction side of the high lift pumps as indicated. The 2 chlorinators shall be interconnected for interchangeable use. The chlorinators shall be in accordance with Specification No. MIL-C-17226A except as modified herein. One platform scale without wheels having a maximum capacity of 500 pounds shall be provided for use with the 2 chlorinators as indicated.

(a) The equipment shall be the gas type, each designed to feed from 0 to 40 pounds of chlorine per 24 hours. A minimum water pressure of approximately 35 psig is available for the operation of the equipment. The water pressure at the point of application prior to softening will be approximately 25 psig, and the water pressure at the other points of application will not exceed 10 psig. Booster pumps shall be furnished as required for proper performance of the chlorinators. Booster pumps and associated piping shall conform in general arrangement to that as indicated on the plans. Booster pump starters shall be provided with hand-off-automatic selector switches.

(b) Chlorine solution piping shall be a standard product normally used in conveying chlorine in solution under the pressure as indicated herein with suitable flexibility.

(c) Chlorine gas piping shall be black extra heavy wrought iron pipe fitted with extra heavy black malleable iron fittings. Valves shall be standard products normally used with chlorine gas and capable of resisting the corrosive action of chlorine gas.

(d) Controls. - The chlorinator feeding the suction side of the service water pumps may be actuated by the service water meter and the other chlorinator may be actuated by the raw water meter.

(e) Three (3) copies of complete operating instructions and 3 copies of spare parts catalogue shall be furnished with the equipment.

(f) Spare parts auxiliary equipment and maintenance tools shall be furnished as specified in Paragraph 3.21 of Specification No. MIL-C-17226A.

(g) Radio-interference reduction is required.

17-04. Brine pumps, motors and starters shall be in accordance with the applicable requirements of Specification No. MIL-P-18472 except as modified herein, and starters shall be provided with hand-off-automatic selector switches.

(a) The pumps shall be of the centrifugal type and all parts exposed to the corrosive action of the brine shall be bronze designed and constructed to resist the action of the brine.

(b) Brine pumps shall be designed to deliver 15 gallons of brine per minute against a total dynamic head of 20 feet.

(c) Float switches, adjustable to start and stop pumps at pre-determined levels shall be provided in each brine tank. Parts exposed to the corrosive action of the brine shall be constructed of materials that will resist such corrosive action.

(d) Motors shall be drip proof, designed to operate on 208 volts, 60 cycle, 3 phase current. Starting equipment, wiring, etc., shall be in accordance with the Electrical Section of the specification.

17-05. Service water pumps. - Service water pumps shall conform to the applicable requirements of Specification No. MIL-P-17552A, Type I, Class 1, except as modified herein. Pumps No. 1 and No. 2 shall be electric motor driven and pump No. 3 shall be dual driven (electric motor and gasoline engine).

(a) Pumping conditions. - Each pump shall be designed to pump the capacity herein specified when discharging against a total dynamic head as shown. The speed of the pumps shall not exceed 1800 rpm.

<u>Pump</u>	<u>Capacity</u>	<u>TDH</u>
(1) Pump No. 1	300 GPM	125 feet
(2) Pump No. 2	750 GPM	215 feet
(3) Pump No. 3	1000 GPM	215 feet

(b) Stuffing boxes shall have packing rings.

(c) Pumps shall be of the split case, double suction type.

(d) Motors shall be designed to operate on 208 volt, 3 phase, 60 cycle current. Motors shall be of the squirrel-cage type and shall be drip-proof. Speed shall not exceed 1800 rpm. Motor shall have ample capacity to properly operate the pump through its entire head-capacity range without exceeding the temperature limits of N.E.M.A. and shall be rated on a basis of 55 degree centigrade temperature rise.

(e) Motor starters shall be provided in accordance with Paragraph 3.14.1.1 of Specification MIL-P-17552A, and shall contain thermal overload protection and under voltage protection. Starters shall be provided with hand-off-automatic selector switches.

(f) Gasoline engine for dual driven Pump No. 3 shall be a complete self-contained, multi-cylinder, water cooled, heavy duty gasoline power plant with maximum horse-power 30% in excess of the maximum brake horse-power required to operate the pump continuously at its rated speed, over the entire head-capacity range of the pump. The engine shall be arranged for motor cranking, and shall be equipped with high tension ignition system, battery and required appurtenances. Equipment and accessories shall include an adjustable governor, carburetor, gasoline pump and filter, one gallon emergency gasoline tank and hand priming pump, air cleaner, 18 ampere generator, oil filter, starting crank, exhaust pipe muffler, and radiator. The gasoline engine shall conform to the applicable requirements of Specification No. MIL-E-11275A, Class III, except as modified herein.

(1) The gasoline engine shall be connected to and arranged for operation from a 275-gallon underground storage tank. The tank shall conform to the standards of the National Board of Fire Underwriters and shall have a capacity not less than that indicated. Fuel piping shall be copper tubing. Painting of tank, hold draw rods and accessories shall be in accordance with Specification No. 34Yb.

(2) The exhaust pipe from the engine shall be carried through the wall of the pump room in an asbestos-cement sleeve, and a suitable muffler mounted on the end of the exhaust pipe, one foot from the wall. The muffler shall be properly supported in an approved manner.

(3) A metal instruction plate shall be mounted on the engine unit giving the manufacturer's recommendations for lubricating oil and other pertinent information.

(g) Centrifugal clutch-coupling shall be provided for connection of the auxiliary gasoline engine to the dual driven high lift pump (Pump No. 3). The coupling shall be designed to permit

the engine to idle at any pre-determined speed, automatically picking up the pump load when the engine speeds up and again releasing the pump at the idling speed. The coupling shall be of sufficient capacity to transmit the torque developed by the engine.

(h) Bedplate for dual driven pump shall conform to the applicable requirements of Paragraph 3.11 of Specification No. MIL-P-17552A, and shall be of sufficient strength for strains imposed and of sufficient size to maintain motor, pump, and gasoline engine in alignment.

(i) Overall efficiency (wire to water) of pumping units shall be not less than 70%. After the pumps are installed, field tests shall be run to determine compliance with guaranteed field performance curves submitted. The Government will furnish electric power and water for conducting the tests. The contractor shall furnish all equipment and personnel necessary for conducting the test.

(j) Approved safety guards shall be provided for all couplings and for cooling fan on gasoline engine.

17-06: Supervisory engineer. - The services of a supervisory engineer employed by the manufacturer of the water treatment equipment being furnished shall be provided for a period of 3 working days, and the services of a supervisory engineer employed by the manufacturer of the chlorination equipment being furnished shall be provided for a period of 2 working days. These engineers shall make such final adjustments to the system as may be required, and shall familiarize local maintenance forces with maintenance procedures on the equipment. Under supplementary bidding items, bidders shall state the amount by which the contract shall be increased or decreased for each working day in excess of or less than the working days specified, that the engineer is required to remain at the site of the system upon the written direction of the contracting officer and for cause for which the Government is responsible; such amount per day shall include the salary and all living and other expenses of the engineers. The services of the engineers shall be furnished upon written notice of the contracting officer.

SECTION 18. PROCESS AND SERVICE WATER PIPING

18-01. Services Covers. -

1. Raw Water
2. Treated Water
3. Brine
4. Air
5. Sampling Lines

18-02. General requirements. - Piping shall be any of the types and materials as specified herein and shall be of new and unused materials. All piping shall be placed to follow the general arrangement shown and shall be entirely out of the way of lighting fixtures, doors, windows and other openings. The interior of all pipe and fittings shall be thoroughly cleaned of debris and foreign matter prior to installation and shall be kept clean throughout the installation operation. When work is not in progress, open ends of pipe and fittings shall be secured with plugs, or other approved methods, in such a manner as to prevent trench water or other foreign matter from entering the pipe.

18-03. Pipe and fittings. -

(a) All pipe 4 inches and larger shall be cast iron pipe, Class 150, in accordance with Specification No. WW-P-421a, except that where indicated, flanged pipe shall be Class 150 pipe provided with ASA Class 125 flanges.

(b) Pipe 3 inches and smaller shall be standard weight, with threads and couplings, zinc-coated wrought iron pipe, in accordance with Specification WW-P-441b.

(c) Fittings and specials for use with pipe 4 inches and larger shall be flanged, bell and spigot or mechanical jointed as specified herein or indicated on the plans.

(1) Fittings for bell and spigot pipe shall be Class "D" in accordance with AWWA Specification C 100.

(2) Fittings for mechanical jointed pipe and flanged jointed pipe shall be short-body fittings in accordance with American Standards Association Specification No. A21.10 and flange fittings provided with ASA Class 125 flanges.

(d) Fittings for use with pipe three inches and smaller shall be zinc-coated malleable iron conforming to Specification No. WW-P-521b.

(e) Standard wall castings of the type indicated shall be provided where indicated and all necessary precautions shall be taken to accurately locate castings and to prevent their displacement

during the pouring of concrete. Sleeves through concrete walls shall be poured with lead on each side of the wall and caulked. Sleeves through masonry walls shall be caulked with compound conforming to Specification No. MIL-C-16231A.

18-04. Placing and laying

(a) Cast iron pipe

(1) Pipe laid underground shall be inspected in the sling before lowering into the trench, and tapped with a light hammer to detect cracks. Defective, damaged, or unsound pipe will be rejected. Deflections from a straight line or grade, as required by vertical or horizontal curves or offsets shall not exceed $6/D$ inches per lineal foot of pipe, where D is the nominal diameter of the pipe in inches, between the center lines extended, of any two connecting pipes. If the alignment requires deflection in excess of that limitation, the contractor shall provide special bends or a sufficient number of shorter lengths of pipe to conform to the limitation specified. Except where necessary in making connections with other lines, pipe shall be laid with the bells facing in the direction of laying. Except at closures, not less than two lengths of pipe shall be in position ahead of each joint, with packing installed and earth fill tamped alongside the pipe, before the joint is poured. Where cutting of pipe is necessary, it shall be done with approved mechanical cutters in a manner that will not damage the pipe. Where coatings are damaged, they shall be touched up with material similar to that used for the original coating.

(2) All flanged pipe shall be accurately cut and shall be worked into place without springing or forcing.

(b) Zinc-coated wrought iron piping shall be accurately cut, shall be worked into place without forcing or springing, and shall be free of burrs or fins. Each valved connection shall be provided with a union.

(c) All water pipe laid underground shall be installed at an average depth of 3 feet to the top of pipe unless otherwise indicated and not less than 2 feet of cover shall be provided.

18-05. Pipe supports. - All piping shall be supported in a manner to adequately carry the weight of the lines and maintain proper alignment. Exposed piping in the Water Plant shall be adequately supported from floor, ceilings or walls as required. Hangers shall conform to Specification No. WW-H-171. Pipe below the ceiling shall be suspended from steel roof beams, and where necessary, additional steel supports shall be provided between beams for adequate support of hangers. Pipe laid underground shall have the bottom third ($1/3$) of the barrel supported on firm soil. All $1/16$ and sharper cast iron bends shall be

securely blocked in the direction of flow. For pipe laid underground, this shall be accomplished with poured-in-place concrete bearing solidly against the pipe and affording a minimum of 3 square feet of bearing against undisturbed soil for 4-inch pipe and 8 square feet for larger pipe. This includes connections to existing mains and services indicated. Plugs shall be secured similarly except that concrete bracing shall be poured in a manner that affords easy removal of the concrete without disturbing the piping.

18-06. Joints. -

(a) Bell and spigot joints. - Before jointing, all lumps, blisters and excess coating material shall be removed from the bell and spigot ends of the pipe. All oil or grease shall be removed. The outside of the spigot and inside of the bell shall be wire brushed and wiped clean and dry. Spigots shall be adjusted in the bells so as to give uniform space all around and if any pipe does not allow sufficient space for proper caulking, it shall be replaced with one of proper dimensions. Adjacent lengths of pipe shall be adjusted with reference to each; blocking or wedging between hub and spigot will not be permitted. Molded or tubular rubber, asbestos, or especially prepared paper rings treated to prevent deterioration or support of bacteria shall be used as gaskets. The gasket shall be driven or caulked tightly into the annular spaces between the pipes, and shall be of proper size to seal the joint tightly and leave sufficient space for lead as specified. Where rubber rings are used as gaskets, a braided or twisted hemp or jute ring shall be caulked into the joint after the rubber ring is placed to prevent contact of the molten lead with the rubber. Gaskets shall not project into the bore of the finished joint. When the joints are approved for pouring, the joints shall be cleaned and the remaining space filled at one pouring with lead which shall be caulked in a manner that will assure tight joints without overstraining the bells. The depth of lead shall be not less than 2-1/4 inches measured from the face of the bell. After caulking, the lead shall be practically flush with the face of the bells. The lead shall conform to Specification No. QQ-L-156.

(b) Roll on joints shall be made with the standard materials furnished with the pipe, and in accordance with the recommendations of the manufacturer, subject to approval of the officer in charge.

(c) Mechanical joints. - The jointing shall be in accordance with the recommendations of the manufacturer of the joint except as specified otherwise. Installation shall conform to the procedure recommended in Specification No. WW-P-421a. Bolts, nuts and exposed threads shall be coated with asphalt varnish after installation.

(d) Flanged joints. - The joints shall be firmly bolted with machine bolts. Bolts shall be regular hexagon bolts conforming to Specification FF-B-575, Type II. Gaskets shall be made of asbestos metallic cloth conforming to Specification HH-G-76b, and shall be full-faced.

(e) Screwed joints shall have the threads cut full and not more than 3 threads on the pipe shall remain exposed. Pipe lubricant shall be applied to the male threads, only.

18-07. Valves. -

(a) Gate valves for use with pipe 4 inches and larger shall be the double disc type with non-rising stems unless indicated or specified otherwise, and shall conform to American Water Works Association Standard AWWA C500-52T. Stem shall have nuts similar to those on valves of the existing system except exposed flanged valves in Water Plant and Reservoir shall have standard size wheels. Gate valves shall be of one make and shall open by a counter-clockwise rotation of the valve stem for non-rising stems; valves with rising stems shall open by a counter-clockwise rotation of the operating wheel.

(b) Gate valves for use with pipe 3 inches and smaller shall be bronze wedge disc in accordance with Specification WW-V-54, Type I, Class A.

(c) Check valves for use with pipe 4 inches and larger shall be cast iron body, bronze mounted, tilting disc, Class 150, non-slamming type, and shall conform to the applicable requirements of Specification No. MIL-V-18436, Type II, Style A.

(d) Check valves for use with pipe 3 inches and smaller shall be bronze and shall conform to Specification No. WW-V-51a, Class A.

(e) Float valves for controlling the brine level in the brine tanks shall be of the angle, single seating type having an internal piston disc holder and pilot valve. The valve shall have bronze body and bronze internal parts except for the rubber composition disc. The float and lever arm shall be constructed of bronze or other suitable material that will resist the corrosive action of brine.

(f) Pressure air valves. - Where indicated, an approved pressure air valve shall be provided to automatically permit air to escape while the pipe line is in service and under pressure. The valve shall be iron body, bronze mounted and designed for 125 pounds working pressure. The float shall be made of hard rubber with phosphor-bronze levers. The seat shall be hard rubber and plunger of hard quality soft rubber. The construction of the valve shall be such that valve seats may easily be replaced.

(g) Back pressure control valve. - The back pressure valve shall be designed to maintain a back pressure, adjustable from 5 to 35 pounds, and shall be normally open with hydraulic pilot in control. The valve shall also be equipped with a solenoid pilot normally open when the hydraulic pilot is in control and when energized shall close.

and, in turn, close the main valve. The back pressure valve, when in the closed position, shall be drip tight with an up-stream pressure of 60 pounds per square inch. When the solenoid pilot valve is de-energized, the main valve shall open with hydraulic pilot again in control. The valve shall be cast iron bronze mounted, class 150; with flanges drilled for American 125 pound standard and shall be complete with all auxiliary valves, strainers and appurtenances.

(h) Safety valve shall be in accordance with Specification MIL-V-18634, Table 1, Class 2, water at 250 psig.

(i) Sampling cocks shall be as specified in plumbing section.

(j) Pressure gauges shall conform to Specification GG-G-76a, class 2, type a, 6 inch, Brass Case.

(k) Solenoid valve. - Solenoid valve shall be of the globe type constructed of bronze with non-metallic valve disc. The valve shall be designed for 125 psi water pressure. The valve shall have moisture proof coils designed for operation on 120 volts, 60 cycle, single phase current, and shall be normally open or closed as required.

18-08. Floor stands. - Valves shall be equipped with stem extensions, floor stands and operating wheels where indicated. Stem extensions shall be solid round steel rods of required size and length. Operating wheels shall be cast iron of sufficient diameter to easily operate the respective valves. Floor stands shall be manufacturer's standard with indicator for operation with non-rising stem valves and shall be arranged to permit secure bolting to concrete slab. The stands shall be approximately 36 inches in height.

18-09. Roadway boxes. - Each valve on underground piping shall be provided with an adjustable cast-iron roadway box of a size suitable for the valve on which it is used. The head shall be round and shall have the word "Water" cast upon it. The least diameter of the shafts of the boxes shall be 5.25 inches. Boxes shall be given a heavy coat of bituminous paint.

18-10. Hydrants shall be a standard type conforming to the latest specifications for valves and hydrants of the American Waterworks Association and shall be a type approved by the National Board of Fire Underwriters. They shall be 6 inches in diameter with 5-inch clear opening through the valve and shall be provided with a 4.5 inch pumper connection and two 2.5-inch hose connections. Hydrants shall be of the frost proof and non-flooding type which will not flood in case the barrel or valve stem is damaged, with waste orifices for draining the hydrant when the valve is closed, and shall be of the type which opens against the water pressure. Hydrant construction shall

permit 360-degree orientation without disturbing sub-surface setting. The hydrants shall be designed for 150 pounds working pressure or 300 pounds hydrostatic pressure and shall open counter-clockwise. All working parts shall be bronze. Hose and pumper connection threads and operating nut shall be National Standard. Each hydrant shall be preceded in the line by a gate valve.

18-11. Setting hydrants, valves and valve boxes. - Hydrants, valves and valve boxes shall be set plumb, and centered, with valve boxes placed directly over the valves. Valve boxes shall, if possible, be located outside the area of roads and streets. Earthfill shall be carefully tamped around the valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face if less than 4 feet. Hydrants shall be set with the invert of the pumper connection 18 inches above grade. The connecting pipe will have the same depth of cover as the distributing mains. The hydrant shall be set upon a slab of stone or concrete not less than 4 inches thick and 15 inches square. The back of the hydrant, opposite the pipe connection, shall be firmly blocked against the vertical face of the trench with poured-in-place concrete to prevent the hydrant from blowing off the line. If the character of the soil is such that in the opinion of the officer in charge the hydrant cannot be securely blocked, bridle rods and rod collars shall be used. Bridle rods and rod collars shall be not less than 3/4 inch stock and shall be protected by a coat of bituminous paint. Not less than 7 cubic feet of broken stone shall be placed around the base of the hydrant to insure drainage. The backfill around hydrants shall be thoroughly compacted to the grade line. Hydrants and valves shall have the interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and the hydrant or valve shall be inspected in opened and closed positions, to see that all parts are in working condition.

18-12. Connections to mains. - Connections of galvanized wrought iron pipe to existing and new cast iron mains pipe shall be made by cutting in or installing cast iron tees of the proper size or at the option of the contractor, inserting one inch (1") bronze corporation stops of sufficient number to provide the equivalent area of the pipe being connected and the final connection made with lead or copper goose-necks.

18-13. Tests. - Before being covered, the completed pressure piping shall be subjected to a hydrostatic pressure test of 200 pounds per square inch maintained for 2 hours. All pipe, joints, valves, and fittings in the test section shall be examined. Defective material disclosed as a result of the test shall be replaced and the test repeated; any joint showing visible leakage shall be made watertight.

18-14. Sterilization. -

(a) Before being placed in service, the new piping shall be flushed and sterilized by chlorination in accordance with the American Water Works Association Standard AWWA C601-48. The chlorine solution shall remain in the system at least 24 hours. After final flushing, the quality of the water shall be approved by the officer in charge before acceptance.

(b) Before being placed in service, the reservoir and piping shall be flushed out and scrubbed with scrub brushes and rinsed. After rinsing, the interior surface of the reservoir, outer surface of all pipes, columns, valve and appurtenances and manhole steps shall be mopped or sprayed with a strong chlorine solution and allowed to stand for 4 hours. The reservoir shall be given a final flushing prior to filling.

SECTION 19. INSTRUMENTATION

19-01. It is the intent of this specification that an instrumentation system be provided for the purpose of affording control and operational recording of this plant and associated facilities as indicated on the plans and as specified herein. This includes the provision and installation of the raw water meter, the service water meter, the reservoir water level controller and register, the elevated tank water level controller and register, and well control system, all complete with associated controls, related piping systems and wiring systems.

19-02. Instrumentation piping shall be installed in a neat and orderly manner without obstructing passages, openings or operating equipment.

(a) Exposed piping shall be copper tubing not less than 1/4 inch conforming to specification WW-T-799a, Type K. All instruments shall be provided with isolation valves and a union or flared connection.

(b) Pipe laid underground shall be in accordance with the section of this specification governing process and service water piping.

19-03. Wall mounted instruments shall be mounted approximately 5 feet above the finished floor.

19-04. The Raw Water Meter shall be the orifice type as herein specified.

(a) Orifice plate shall be stainless steel drilled for American Standard 125-pound flange and shall be capable of measuring flows within an accuracy of 3 percent for flows from 50 gpm to 400 gpm with a maximum 3-foot head loss.

(b) An indicating, recording and totalizing meter recorder, electrically controlled, designed for wall bracket mounting shall be provided for use with the orifice. The instrument shall indicate the instantaneous flow through the line at all times on a uniformly graduated direct reading flow scale having a peripheral length of approximately 9 inches. The rate of flow shall be recorded on a 12-inch diameter evenly spaced circular and concentrically graduated chart designed for daily removal. The totalizer shall have at least 6 digits and shall record the total amount pumped in thousands of U. S. gallons. The totalizer and chart elements shall be actuated by electric clock devices. The instrument shall be of the mercury, float-operated purely mechanical type.

(c) There shall be included with the meter recorder, a year's supply of charts, pens, ink, usual tools and accessories, together with a setting device for checking the accuracy of the meter at any time.

(d) This meter may be used to actuate the chlorinator feeding the raw water in addition to metering the raw water supply.

19-05. Service water meter. - The meter shall include a venturi tube installed in the treated water line where indicated, and a wall-mounted indicating, recording and totalizing recorder installed in the office where indicated, including all piping, valves and appurtenances for a complete and operating meter.

(a) Operating condition. - The venturi meter shall be designed to measure flows from a maximum of approximately 3,000,000 gallons per day to a minimum of approximately 300,000 gallons per day with an average error not exceeding plus or minus 2% over the entire range.

(b) The venturi tube shall be of the concentric type constructed of good gray cast iron of Class 150 thickness with flanged ends for installation in the 10-inch discharge main. The tube shall be designed for measurement of clear water and shall have a bronze lined throat. There shall be an annular pressure ring at the main diameter with a sufficient number of holes leading from the interior of the tube to the pressure ring. These holes shall be bronze bushed with the ends of the bushing at right angles to and flushed with the inside diameter of the tube and free of burrs. There shall also be a pressure ring at the throat section of the venturi tube, the inner wall of which will consist of the bronze throat liner. The liner shall contain a sufficient number of holes leading from the inside diameter of the throat section to the pressure ring, these holes being at right angles to the throat and free from burrs. On each pressure ring, there shall be at least 2 properly designed handholes and at least 4 suitably designed cleaning valves. Immediately downstream of the throat section, there shall be a handhole by means of which inspection can be given to the throat and upstream barrel at any time.

(c) An indicating, recording and totalizing meter register designed for wall bracket mounting shall be provided for use with the venturi tube. The instrument shall indicate the instantaneous flow through the line at all times on a uniformly graduated direct reading flow scale having a peripheral length of approximately 9 inches. The rate of flow shall be recorded on a 12-inch diameter evenly spaced circular and concentrically graduated chart designed for daily removal. The totalizer shall have at least 6 digits and shall record the total amount pumped in thousands of U. S. gallons. The totalizer and chart elements shall be actuated by electric clock drives. The instrument shall be of the mercury, float-operated purely mechanical type.

(d) There shall be included with the meter register, a year's supply of charts, pens, ink, usual tools and accessories, together with a setting device for checking the accuracy of the meter at any time.

(e) The metering equipment shall be installed complete in accordance with the manufacturer's recommendations.

(f) This equipment may be used to actuate the chlorinator feeding the pump suction as well as metering the service water.

19-06. A reservoir water level controller and register shall be provided to register the level of the water in the reservoir and to actuate equipment controlling the wells. This apparatus shall include a transmitter, a receiver and all associated piping and wiring installed as indicated or specified. This equipment shall operate on 120 volt, 60 cycle current.

(a) The transmitter shall be housed in a suitable weather proof metal case, shall be of the pedestal mounted type, and shall be located on the reservoir roof as indicated. The transmitter shall be float operated and shall transmit a signal registering the water elevation as measured by a float operating from a rotating shaft. The transmitter shall be furnished with float and all accessories necessary for its performance. The float chain or tape shall be of corrosion resistant stainless steel and the float shall be of ceramic or other approved material and shall not be larger than 6 inches in diameter. The transmitter shall be capable of registering from 0 to 16 feet water depth.

(b) A receiver which shall be housed in a suitable rectangular metal wall-mounted case with glass door and shall be located on the wall of the office as indicated. The receiver shall use a 12-inch circular chart for 24-hour rotation and have uniform gradations of from 0 to 15 feet. The receiver shall have incorporated in it, or in an auxiliary control box, at least 2 mercury switches actuated by the receiver providing an adjustable on and a separate adjustable off contact for opening and closing an electrical circuit.

(c) Installation. - The mercury switches in the receiver shall be connected into an electric circuit to the solenoid pilot valve of the back pressure control valve and to a solenoid valve connected between the high pressure system and the raw water supply line. This circuit shall be closed when the water in the reservoir reaches a selected upper level, closing the solenoid pilot valve on the back pressure control valve which is normally open, and opening the solenoid valve in the connection between the high pressure system and the raw water supply line which is normally closed. This circuit shall be connected into the control system operating the automatic regenerating and cleaning cycles of the water treatment equipment in such a manner as to prevent the circuit from closing while these cycles are in operation. This control circuit shall be open when the water in the reservoir falls to a pre-determined lower level. The back pressure control valve and the solenoid valves are specified in the Process and Service Water Piping Section of this specification. Electrical work shall be in accordance with the Electrical Section of this specification.

19-07. An elevated tank water level controller and register shall be provided to record at the water plant, where indicated, the elevation of the water level in the elevated tank approximately 3200 feet distance, and to schedule the operation of the 3 high lift pumps to maintain pre-determined water levels in the elevated tank. The equipment shall be designed to operate on 120 volt, 60 cycle current, and shall include the following:

(a) A transmitter which shall be housed in a suitable metal wall-mounted moistureproof case and shall incorporate a pressure measuring element calibrated for a range of 85 feet to 130 feet of water. The transmitter shall send out a time impulse (electrical), the duration of which will be proportional to the measured pressure.

(b) A receiver shall be provided, in the office, with a suitable metal wall mounted case having a glass paneled door. The receiver shall use a 12-inch circular chart for 24-hour rotation, and have uniform gradations from 0 to 25 feet. The receiver shall have incorporated in it, or in auxiliary control boxes, an electrically operated programming apparatus which shall be designed to control the service water pumps as follows:

(1) A common control circuit shall be provided for service pumps Nos. 2 and 3 from the receiver through a selector switch to service pumps Nos. 2 and 3.

(2) Service pump No. 1 shall have a control circuit to the receiver.

(3) The control circuit for pump No. 1 shall be interlocked with the common control circuit for pumps No. 2 and No. 3 in such a manner that when pump No. 2 or No. 3 is running that pump No. 1 will be off.

(4) Control circuits for both pump No. 1 and the common leg (2) and (3) shall have adjustable limits for starting and stopping.

(5) Considering high water level in the elevated tank to be level A, the No. 1 pump will come on when the water drops to a pre-determined level B and will continue to run until the water again reaches level A at which point No. 1 pump will shut off or if the water continues to drop after No. 1 pump comes on, it will continue to run until a pre-determined lower level C is reached at which point the common circuit to pumps No. 2 and No. 3 will be energized and No. 1 pump will go off. Pump No. 2 and No. 3 will continue to run until the water returns to level A at which point the said pump will cut off.

(6) The pump controls shall be accurate within 1 foot of water level.

(c) The pump control line from the transmitter house to the water plant shall be as shown on the plans and as specified in the Pump Exterior Control Line Section of this specification.

19-08. Well control system. - There shall be provided in an existing well house as indicated, a mercury pressure switch which shall be connected into the electrical starting circuit to cut on and cut-off the raw water pump at selected pressures. The pressure switch shall contain 2 mercury switches providing an adjustable start and a separate adjustable stop contact for operating the pump. The switch shall be adjustable from 10 to 60 psi.

(a) A steel surge tank shall be provided and connected into the well supply line as indicated on the drawings. The surge tank shall be designed for a maximum of 150 pounds per square inch water pressure. Materials and workmanship shall be as hereinbefore specified.

(b) Electrical work shall be in accordance with the Electrical Section.

SECTION 20. INTERIOR ELECTRICAL

20-01. General requirements. -

(a) The work shall include the provision of complete and operating interior electrical wiring systems in conduit for serving current to lighting, power and control.

(b) The work shall include the service entrance and distribution complete, all wires, conduit, outlet and junction boxes, wall switches, receptacles, fused switches or circuit breakers, lighting fixtures complete with lamps, wiring of motor starters and automatic control devices, lighting panel, service entrance switch, service entrance cable in conduit, conduit weather fitting and four spool wire rack.

(c) All electrical work shall be done as specified herein, as shown, and, unless otherwise specified or shown, in accordance with Specification No. 9Yf and other specifications listed therein.

20-02. Existing conditions. - The water softening plant in which the work is to be done will be a completely new building of concrete block construction.

20-03. Electrical characteristics. - The electrical service to the building shall be 120/208 volts, 3 phase, 4 wire solid grounded neutral, 60 cycles. Lighting and convenience receptacle outlets shall operate from 120 volt branch circuits. As may be specified or shown, motors under 1/2 H.P. shall operate from single phase 120 or 208 volts and motors 1/2 H.P. and above, on 3 phase, 208 volts.

20-04. Drawings Diagramatic. - The electrical drawings are primarily diagramatic in nature, intended to indicate the purpose and connections of the conduit and/or circuits rather than the exact locations of the runs which may be modified by the contractor to meet construction conditions at the time of work.

20-05. Method of wiring. - All wiring shall be done in rigid conduit exposed on and below the ceiling on construction. In order to avoid cutting into the concrete roof planking which will be installed in direct contact with the steel beams, the following system of conduit distribution shall be employed:

(a) Provide a conduit run on the wall surface just below the beams looping junction boxes installed at locations that will provide branch circuit access to required areas between the beams as shown.

20-06. Work at service entrance shall include the specified wire rack on the building, the service entrance weather cap, conduit, cable, service switch, secondary distribution backboard, secondary distribution switches, and all connections to and between all parts to establish a complete and operating electrical service to the building.

20-07. Service switch. - The service switch shall be a Type A, 800 ampere, 4 pole, solid neutral type, quick make and quick break fused safety switch, approved for service entrance duty, in a NEMA type 1 enclosure having an exterior operating handle interlocked to prevent access to the interior when switch is closed. An equivalent air circuit breaker, approved for service entrance duty and calibrated to protect the service entrance cable will be acceptable.

20-08. Fused safety switches. - All fused safety switches shall be Type "A" quick make and quick break type having ampere ratings as specified or shown in NEMA type 1 enclosure, equipped with exterior operating handle interlocked to prevent access to interior when switch is closed. Equivalent air circuit breakers calibrated to protect the associated feeders will be acceptable.

20-09. Magnetic motor controllers. - Magnetic motor controllers shall be of the quick make and quick break type having overload and low voltage release and with hand reset overload trip mechanisms. Controllers shall conform to the latest applicable NEMA standards for the type and class as specifically applied. All magnetic controllers will be furnished with the equipment under the mechanical section but shall, unless integral with the equipment, be installed and wired by the electrical contractor. The controller shall be in a NEMA type 1 enclosure, arranged for surface mounting.

20-10. Conduit. - Conduit shall be of the rigid type and shall be zinc-coated for both inner and outer surfaces. Standard lengths shall be threaded previous to treatment. All conduit shall be cut with a hacksaw and reamed to size. No bends shall be made of greater than 90 degrees and manufactured elbows shall be used on 1-inch size and above.

20-11. Outlet boxes. - Flush outlet boxes wherever used to terminate conduit at equipment or lighting fixture location, shall be 4-inch square hot dipped zinc-coated boxes with a cover in each case suitable for the respective purpose. Pendant fixture boxes shall have aligning covers. All surface boxes shall have threaded hubs.

20-12. Pull and junction boxes. - The contractor shall provide and install all necessary or required pull or junction boxes. Such boxes shall be constructed of code gauge of steel standard for the respective dimensions and equipped with a turned-in flange to which the cover shall be mounted by screws into threaded holes.

20-13. Local wall switches. - wall switches shall be single pole, or three-way toggle type, "T" rated, 20 ampere, 125 volt, in composition base.

20-14. Convenience receptacles. - Convenience receptacle outlets shall be duplex, 15 ampere, 125 volts, "T" rated, 20 ampere, 125 volt, in composition base.

20-15. Heavy duty receptacles shall be rated as noted on drawings, in composition base and equipped with one pole in addition to those required for power conductors for the purpose of independent grounding. A co-ordinating cord cap shall be furnished with each receptacle. Cords when furnished shall be three wire.

20-16. Lighting panel shall consist of the number of circuits noted, single, quick make and quick break branch circuit breakers rated as noted on drawing feeding from a 120/208 volt, 3 phase, 4 wire bus. The breakers shall be assembled on a heavy formed steel back plate drilled for universal mounting of 50 ampere frame size breakers and shall be arranged for easy removal from the front without disturbing adjacent units. Lugs only to be furnished on the mains. Breakers to be equipped with trip free handles. The breaker mechanism shall be mounted in a hot moulded phenolic case sealed to prevent unauthorized tampering with the fixed calibration. Tripping shall be accomplished by means of a bi-metallic thermostatic latch accurately calibrated for the specific rating. The cabinet shall be surface type made of not less than code gauge steel and shall have a turned-in flange around the outside edges for fastening the trim, and shall have a removable steel barrier. The trim shall be equipped with a hinged door having a latch and lock and a half round moulding around the edge for stiffening. Exposed surfaces of the cabinet shall be primed for finish painting. Allow for not less than two spare circuits.

20-17. Lighting fixtures shall be of the highest quality for the applicable design and wattage as called for under the fixture schedule shown on the electrical drawing and shall conform to the design, handling data and specifications as delineated in the applicable sections and charts of Specification No. 9Yf, or as shown. All fixtures shall be complete with lamps.

20-18. Floodlighting system. - The contractor shall provide a system of floodlighting for areas adjacent to the building. This system shall consist of two (2) floodlights mounted at maximum height on the outside surface of the building wall where shown, a branch circuit from the panel looping a w.P. angle type receptacle at each floodlight location, and a cord and plug attached to each floodlight. Provide a 20 amp. S.P.S.T. toggle switch 6 feet above the floor on inside wall surface opposite each flood for control.

20-19. Floodlight fixtures shall each be a 750 watt outdoor type unit consisting of a weatherproof heavy gauge steel or aluminum housing finished to offer maximum resistance to weather and atmosphere finished grey enamel on outside and alzak reflecting surface inside with auxiliary reflector for beam center. The housing shall be attached to the mounting base in a watertight manner and with an arrangement that will provide universal angular adjustment for vertical and horizontal directing of the beam. The mounting base shall be equipped with a flange of not less than 4 inches square having at least 4 holes for mounting bolts. The cover door shall consist of a spinning equipped with clear heat resisting vertically ribbed glass thoroughly gasketed to door frame. Door shall have slotted

hinges to assure seating against sealing gasket by means of adjustable lever type clamps. Lamp receptacle to be porcelain base skeleton type, mogul size, with flexible connections to terminal block in housing. The method of mounting shall provide for quick easy access for relamping or cleaning without disturbing the established setting of the beam. Each fixture shall be equipped with an outdoor type tough rubber jacketted extension cord of required length to engage the receptacle and a 20 ampere 2 pole weather-proof type attachment plug. Mount flood lights using lag bolts and expansion sleeves.

20-20. Roof receptacles. - Shall be 2-pole, 20-ampere water-proof angle type receptacles complete with gasketed screw-on cover attached by chain. This receptacle shall be enclosed in a cast metal outlet box with gasketed cover and drilled and tapped conduit entrance holes as required.

20-21. Wiring. - The branch circuit wires for the two flood lights shall consist of a 2-conductor No. 12 AWG type RHL wire in 1" rigid conduit looping the two receptacles and running back to a junction box within the building. From the junction box to the panel, the branch circuit shall consist of 2 No. 12 AWG type RH wires in 1/2" conduit.

20-22. Automatic control wiring. - Unless otherwise specified under this section, all electrically operated control devices integral with equipment specified under other sections for inclusion in the work shall be wired under this section. If such material is furnished separate from the equipment, both the installation and wiring of the devices shall be done under this section. The contractor shall secure the equipment manufacturer's diagrams and install in accordance therewith. This shall not include the portion of the work identified as "Exterior Control Line" which is covered by a separate section.

20-23. Backboards at service entrances and distribution locations. - Switches shall be mounted on a backboard consisting of 2 inch by 4 inch uprights (or channel iron) secured to the building structure and surfaced with 3/4 inch finished lumber. Previous to mounting equipment, the backboard shall be given two coats of asphaltum varnish.

20-24. Additional supports. - Wherever required to secure the locations shown on drawings for the lighting fixtures, electrical devices or the interior control equipment, the contractor shall provide and install additional supports such as wood bracing, angle iron or channel construction, steel strap extensions or by other approved means effect the proper and rigid support of the electrical work.

20-25. Grounding. - The grounding of the neutral shall be secured by connecting to the service point of the water service pipe using #8 bare wire. The overall resistance to ground shall not be greater than 3 ohms. A ground connection shall be made to all metal enclosures and the conduit system and the grounding terminals of receptacles shall be connected to the outlet box.

20-26. Secondary wire rack shall be of solid construction hot dipped zinc-coated of not less than #9 gauge steel, having points on 8-inch centers, welded or strongly riveted to the channel. Attached by one 5/8" through bolt at the top and 1/2" by 4" lag screw at the bottom. The rack shall be complete with wet processed procelain insulators.

20-27. wires and cables shall conform to the following where applicable:

(a) No conductor smaller than #12 A.G shall be used.

(b) All wire in conduit installed in dry locations shall be by type RH.

(c) All wire in conduit installed wholly or in part in damp locations, outside, in or under the floor slab or underground shall be type RHL.

(d) The number and size of conductors shall be as shown.

(e) The reservoir water level transmitter's power and control circuits shall be 2-2/C - 600 volt, type RHW #12 non-metallic, sheathed cables of the direct burial type. Between the plant and the reservoir this cable shall be buried to a depth of 24 inches with 1 inch by 8 inch creosoted pine planks resting immediately upon the cable to provide it protective covering. The runs at the plant and at the reservoir shall be housed in conduit.

SECTION 21. EXTERIOR, ELECTRICAL.

21-01. General requirements.

(a) The work shall include the extension to the building of the existing overhead primary distribution, and the provision at the building of a platform mounted transformer bank and a complete and operating service drop.

(b) The work shall include all primary and secondary wires, new transformers, fused outouts, lightning arrestors, complete grounding systems, a pole platform structure, guys and anchors, new pole numbers, and all incidental parts and devices required to establish the electrical service to the building.

(c) All electrical work shall be done as specified herein, as shown on drawings and, unless otherwise specified or shown, in accordance with Specification No. 9Yf and other standard specifications listed therein.

21-02. Existing conditions. - The primary source of electrical energy for the work shall be the 12470 volt, three phase, three wire overhead distribution line existing along access road. The three #4 primary wires are extended from Pole No. SM22 to terminate on Pole No. SM22A from which service is extended underground to the existing well house No. 109.

21-03. Revision of Service. - Existing poles No. SM22 and SM22A and the U.G. wiring consisting of four #4 in 1½ inch conduit to well house No. 109, together with the existing three #4 O.H. bare primary branch wires and guy and anchor assemblies shall be removed and the following renewals provided:

(a) A new 35 foot, Class 3 pole shall be provided approximately 18 feet southeast of pole SM22.

(b) A new transformer pole platform shall be provided approximately 19 feet from the new building wall constructed on new 35-foot, Class 3 poles.

(c) New O.H. primary service wires, guys and anchors.

(d) A new U.G. service to well house No. 109 from the same new transformers servicing the new water treatment plant. This new service shall be 4/c #4 RHL in fiber and concrete as shown.

(e) The new poles shall be equipped with numbers SM22, SM22A and SM22B as shown.

21-04. New transformers shall be pole platform mounted as shown and shall be of the outdoor, oil-filled type designed for single phase, 12470/240/120 volts with four $2\frac{1}{2}\%$ taps below normal rated voltage, 60 cycles and arranged for three phase delta primary, wye secondary, in a group of three to deliver 120/208 volts, three phase, four wire secondary current to the building. The transformers shall conform to the current standards of the NEMA, ASA and AIEE for transformers of this size and voltage, including a sampling device.

21-05. Line wires. - Primary and secondary line wires shall be medium hard drawn bare copper having 98% conductivity sized as indicated on drawing.

21-06. Lightning arresters. - Shall be of the 9,000 volt type for cross arm mounting. They shall be designed for outdoor service and of the encased valve type. Ground wires shall be protected by wood moulding extending at least 8 feet above ground. Arrester grounds shall be a separate grounding system.

21-07. Fused outouts. - There shall be a 15,000 volt fused outout in each primary wire connected to the transformer stations. The ampere ratings shall be in accordance with standards set up for good practice and adequate protection for the several conditions involved. The outouts shall be of the open trip-out type for cross arm mounting. They shall be point pressure type equipped with solderless connector terminals, swivel type mounting brackets, positive tripping mechanism and lifting hooks for easy installation and removal of cartridge. The thermal element of the fuse link shall be held under tension in the center of the cartridge tube surrounded by a dead air space to prevent carbonization of the cartridge. Flash-over values shall be in accordance with NEMA specifications.

21-08. Transformer ground. - The primary and secondary wye connections of the bank shall be grounded at the transformer pole. The transformer case and all pole hardware and equipment shall be grounded to the same common grounding system.

21-09. Ground rods. - Each ground rod required under this section of the specification for lightning arresters, transformer secondary, or for any other purpose, shall consist of two sections of ten foot lengths of not less than $5/8$ inches O.D. copper-encased sectional steel rod driven to a depth of at least twenty-one feet.

21-10. Ground resistance. - The ground resistance at each rod, previous to any connections, shall be not greater than 25 ohms. If additional material and/or labor is required to obtain the above resistance, payment will be made therefor, as described under Clause 4, U. S. Standard Form 23A.

21-11. Ground wires. - All ground wires shall be #6 AWG, bare solid copper and shall be protected by wood moulding to a height of not less than eight feet above ground. Attachment to ground rods shall be made by means of heavy duty solderless bronze clamps.

21-12. Suspension insulators. - There shall be two (2) 7 $\frac{1}{2}$ " diameter suspension insulators for each primary wire at every dead end. The overall flash-over value of the two (2) insulators in series shall not be less than 125 KV dry and 60 KV wet. The positive flash-over value shall be not less than 210 KV and the negative impulse flash-over value shall be not less than 210 KV. Insulators shall be of the wet process type.

21-13. Pin type insulators. - Shall be of the wet process type, having flash-over values not less than 85 KV dry and 55 KV wet.

21-14. Spool insulators shall be of the wet process type. The over-all flash-over value of the insulators shall be not less than 36 KV dry and 26 KV wet.

Radio influence voltage shall have approximately the following values:

<u>Type of Insulator</u>	<u>Test KV RMs to Ground</u>	<u>Maximum Micro Volts at 1000 KC</u>
Suspension insulators (2 in series)	10	50
Pin type insulators (ea)	15	100
Spool insulators (ea)	10 (Approx.)	50 (Approx.)

21-15. Pole hardware and accessories shall be hot dipped zinc-coated.

21-16. Guy. - Strand shall have a minimum breaking strength of 10,000 pounds and shall be 7-wire, specification strand type. Each guy shall be made up with 3-bolt heavy duty clamps and thimble eyes. Guard shall be half round metal, bolted to guy, eight (8) feet in length and installed on all guys in this contract.

21-17. Strain insulators. - Shall be installed on each guy and shall have a dry flash-over of 30 KV, a wet flash-over of not less than 15 KV, minimum strength of 10,000 pounds and made by the wet process method.

21-18. Anchors may be either of the expanding type not less than 120 square inches with holding power of 10,000 pounds in sand and equipped with 3/4 inches by nine (9) foot rods having thimble eye or five (5) feet by eight (8) inches diameter logs, creosoted after cutting and framing, complete with 3/4 inches by nine (9) feet thimble eye rod, nut and washer. Anchor or log shall be installed five (5) feet below grade.

21-19. Poles and cross arms. - Poles shall be American Standard Association, Class 3, as indicated on distribution drawing, yellow pine poles, creosoted to twelve pounds retention by the empty cell process according to the specifications of the American Wood Preservers Association. Cross arms shall be close-grained Douglas Fir (Coast).

21-20. Double arming. - All dead ends shall be double armed, with two (2) cross arms provided, one on either side of the pole; double arming bolts shall be installed.

21-21. Cross arm braces. shall be 1/4 inch by 1-1/4 inch by 32 inches (flat steel bars, galvanized after punching), punched for a 1/2 inch screw at the pole end and a 3/8-inch bolt at the arm end, bolted to the front of arm after it has been carefully aligned. They shall be secured to pole with 4-1/2 inches drive screws. Buck arms shall be installed if required for good construction as in standard practice.

21-22. Insulator pins. - Steel pole top and cross arm pins shall have a 1-inch lead thread and a minimum strength of 1,500 pounds based on a 10 degree deflection.

21-23. Bolts and nuts shall conform to NEIA Specification No. E-209-22. Bolts shall be of sufficient length to accommodate the necessary nuts, washers, etc., without projecting more than 1 inch at the free end except that they shall not project more than 1/4 inch into the eye when an eye nut is installed.

21-24. Pole numbering. - Provide on each of the renewal poles Nos. SM22, SM22A and SM22B a pole designation, on the side of the pole facing the road, and plant with the code letters arranged horizontally and the numerals arranged vertically not less than one (1) inch and not over two (2) inches below. The height of mounting shall be seven (7) feet above the adjacent road grade to the bottom of the lowest numeral.

(a) Letters and numerals shall be two (2) inches high embossed from polished aluminum and of Arabic Type. Each numeral shall have a minimum of two (2) nail holes and letters shall have a sufficient number of additional nail holes to insure firm support to the pole of all portions of the letter. Both the letters and numerals shall duplicate those on existing poles.

(b) For this purpose transfer the pole designations on the existing 35 foot Class 3 poles No. SM22 and No. SM22A to the new replacing poles and provide new numbers for pole No. SM22B.

21-25. Non-interruption of service. - By careful planning of his work, the contractor shall minimize interruptions to the normal operation of the existing distribution system. If an outage becomes unavoidable, notification shall be made in writing to the officer in charge seventy-two (72) hours previous to the proposed outage and a written directive obtained and followed stipulating the time and duration permitted.

SECTION 22. PUMP EXTERIOR CONTROL LINE.

22-01. General requirements. - The work covered by this section of the specification consists in furnishing all labor, equipment and materials required to provide a complete pole line control circuit in accordance with these specifications and the applicable drawings including all poles, brackets, guys, anchors, guy guards, insulators, wire, submarine cable, cable terminals, lightning arresters, conduit, weather-heads and connections, miscellaneous items and hardware in place and fully tested for grounds and short circuits for a two-wire circuit. The work shall be performed in accordance with Specification No. 9Yf, the National Electric Code and other applicable standards.

22-02. Pole line shall be located as shown on plans. All pole spans shall be 150 feet. Pole line right-of-way clearing is covered in another section.

22-03. Poles shall be Group V Southern Pine poles conforming to A.S.A. requirements. They shall be well proportioned from butt to top, sound, straight and free from decay, rot doted heart dead streaks, branchy wood, cracks, plugged holes, bird holes or any defect that will impair their strength or durability. The length, class, year of treatment and name of firm shall be branded 4 feet above normal ground line. The length and class shall be as designated on the drawings. Poles shall conform to the following minimum dimensions:

<u>Length</u>	Poles not in Marsh Std. Minimum Ground Line Distance from butt (feet) (See plans for adjustment)	Minimum	
		<u>Circumference</u> Top	(Ins.) <u>Butt</u>
30	5½	19	28
35	6	19	30

Poles shall be roofed, before treatment. Poles shall be set to the depth indicated ground line distance from butt in the above table except where otherwise directed or where otherwise shown on the drawings. On sloping ground, the depth of the hole shall be measured on the low side of the pole. Holes shall be dug large enough to admit a tamping bar on all sides for full depth of the hole. At the contractor's option, jetting or dynamiting may be used. Poles shall be set so as to stand vertically and shall be carefully aligned when the line is completed.

22-04. Poles and timber shall be treated with twelve (12) pounds final retention of creosote in accordance with American Wood Preserver's Association Standard Pl-51 and treated in accordance with Federal Specification No. TT-W-571c and A.W.P.A. recommendations.

22-05. Line wire.

(a) Line wire shall be bare 40% conductivity, .081 diameter copper clad steel and weighing approximately 18.1 pounds per 1,000 feet. Line wire shall be tied to the glass insulators with same type of wire 22 inches long. Splices in line wire shall be made with compression type sleeves. The number of splices shall be held to a minimum and not more than one splice shall be permitted in any one span. Splices shall be located no less than 12 inches from the insulators.

22-06. Pole brackets shall be of well-seasoned oak and shall be 2" x 2-3/8" x 12" threaded to receive a 1-inch hole insulator. They shall be attached to the poles with 1 60D and 1 30D galvanized wire nail for each bracket. At angle poles, the poles shall be double bracketed.

22-07. Insulators shall be clear glass, double peticoted, deep grooved and shall be 3-3/4" at the base, 3-31/32" high, 2-1/8" across at the bottom of the groove and a threaded pine hole of 1 inch.

22-08. Swamp anchors shall be installed where required and shall be of the screw type arranged so as to receive a 2-inch galvanized iron pipe for installation in swamp and muck areas so it can be installed to the required depth by adding the necessary sections of pipe.

22-09. Anchors shall be the screw type and shall be of the rating and size consistent with the rating of the guy strand.(10M). Anchors shall be equipped with an associated nine (9) foot galvanized thimble eye anchor rod. The rod shall be installed at a 1 to 1 ratio of lead over height where possible.

22-10. Guy strand shall be specification grade 7 wire (10M) galvanized steel strand.

22-11. Cable terminals. - Terminals shall be 11 pr. pole mounted type for outside use. They shall consist of a sealed chamber with a 10 ft. 22 gauge lead covered stub terminating on soldered lugs located in the sides of the chamber and extend through the sides near the back to form the clip which receives one end of the 7 ampere fuse. A contact shall be provided at the front end of the chamber to receive the other end of the 7 ampere fuse. Adjacent to this spring shall be a spring to receive the carbon cut out protection. A ground post shall be provided for connection of the ground wire. A #6 bare copper wire shall be run to a driven copper encased steel sectional electrode driven 20 feet. The resistance of the electrode shall not exceed 25 ohms. Should additional work and/or material be required to bring the resistance within the limits, payment will be made in the manner prescribed by Clause 3 of the contract (Form No. 23A).

22-12. Submarine cable characteristics.

(a) Cable shall be 11 pair, 19 gauge, made up of copper conductors insulated from each other with double wrapped paper or a pulp insulation. The conductors shall be formed into a highly dense

core with 2 layers of paper overall and covered with a continuous 125 mil lead antimony (1% antimony) sheath. The colors of the insulation used on the 2 conductors of a pair shall be different from each other and the color schemes shall be in accordance with Specification No. MIL-C-3458.

(b) The insulation between conductors and sheath shall be capable of withstanding, for two seconds, a test with 2,000 volt A.C. potential (maximum instantaneous value) and between conductors, 1,000 volts.

(c) Armored construction characteristics of cable beginning at the 125 mil lead sheath.

- (1) Two (2) layers impregnated jute roving
- (2) Asphalt compound
- (3) Layer of armor wire (.203" galvanized wire)
- (4) Asphalt compound
- (5) One (1) layer impregnated jute roving
- (6) Asphalt compound
- (7) Layer of armor wire
- (8) Asphalt compound
- (9) Two (2) layers impregnated 3/16 jute yarn
- (10) Asphalt compound
- (11) Coating of whitening

22-13. Submarine cable shall have a minimum cover of 48 inches on the approaches to the waterway. This earth cover depth shall extend out from shore for a distance of 10 feet from either shore, and between these two points it shall have a minimum cover of 18 inches. Slack coils and loops of approximately 30 feet shall be provided where shown on drawing.

22-14. Lightning arresters shall be of the pellet-type rated at 0-650 volts and consisting of 2 single-pole units mounted in a single hanger forming a double-pole arrester. These arresters shall be installed on the open-wire circuits, at poles adjacent to water plant and also transmitter building. The grounding terminals shall be connected to ground wire. A #6 bare copper wire shall be run to a driven copper encased steel sectional electrode driven 20 feet. The resistance of the electrode shall not exceed 25 ohms. Should additional work and/or material be required to bring the resistance within the limits, payment will be made in the manner prescribed by Clause 3 of the contract (Form No. 23A).

22-15. Wire. - All wire installed in conduit shall be Type T.W. No. 14 AWG.

22-16. Conduit shall be cut only with a hack saw and shall be reamed to size. No bends greater than 90 degrees shall be used and manufactured bends shall be used on 1 inch size and larger. In general, conduit shall be run exposed, secured to the construction of the building.

22-17. Secondary racks. - Secondary racks shall be of solid construction hot-dip galvanized of not less than No. 9 gauge steel, having points on 8-inch centers welded or strongly riveted to the channel. On straight runs, 2-wire racks shall be attached by one 5/8-inch through bolt at the top and $\frac{1}{2}$ inch by 4 inch lag screw at the bottom. They shall be complete with dry processed porcelain insulators.

22-18. Bolts and nuts shall conform to NELA Specification No. E-209-22. Bolts shall be of sufficient length to accommodate the necessary nuts, washers, etc., without projecting more than 1 inch at the free end except that they shall not project more than 1/4 inch into the eye when an eye nut is installed.

22-19. Cable crossing signs shall be constructed as shown on the drawing and mounted in the locations shown. Mounting piles shall be treated with 12 pounds final retention of creosote in accordance with American Wood Preservers Association Standard Pl-51, and treated in accordance with Federal Specification No. TT-W-571c and A.W.P.A. recommendation. Cypress boards shall be used to fabricate the sign faces using galvanized nails. Paint is covered under another section.

SECTION 23. PAVING AND DRAINAGE.

23-01. General requirements. - The work includes the provision of rolled shellrock base course; asphaltic concrete surface course; concrete catch basins; reinforced concrete pipe and shellrock gutter.

23-02. Rolled shellrock base course.

(a) After the sub-grade has been prepared and brought to true line, grade and cross-section as provided in another section, the base course shall be placed, consisting of rolled coquina rock (locally known as shellrock) to the thickness indicated. The base materials shall be combined in such proportions as to produce a mixture conforming to the following composition limits by weight:

Standard Square Mesh Laboratory Sieves

<u>Sieve Designation</u>	<u>Passing Percent by Weight</u>
2 $\frac{1}{2}$ "	100
2"	90 - 100
1"	55 - 90
$\frac{1}{2}$ "	45 - 75
No. 4	30 - 60
No. 40	10 - 35
No. 200	5 - 20

(b) The base course material shall be spread with shovels from dumping boards or from approved dumping devices attached to trucks. It may be spread directly from approved vehicles constructed for this purpose, but the material shall not be dumped in piles directly on the sub-grade.

(c) The base material shall be placed and rolled in at least two layers of approximately equal depth and shall be continually machined with a motor grader of approved design. The roller, either flat wheel or pneumatic tire type, satisfactory to the Officer-in-Charge, shall be used to obtain thorough compaction and the surface of the base course shall be sprinkled with water as directed to aid in the compacting and bonding.

(d) Spreading of the base material shall begin at the point nearest the source of supply. Hauling shall be done and traffic permitted over the base to assist in compaction. Any ruts formed by the traffic shall be carefully filled by the motor grader and re-rolled. After the base course is in place, machining and rolling shall continue until the surface is smooth, hard, well bonded and true to the designed cross-section.

(e) The base shall be machined as often as necessary to maintain it smooth and true to grade and cross-section until the surface course is applied.

23-03. Asphaltic concrete surface course.

(a) Materials. - The fine aggregate shall conform to the requirements of Specification No. SS-S-71a. The coarse aggregate shall be crushed stone, size 3/8 inch to No. 8 conforming to Specification No. SS-C-731a. The asphalt cement shall be type AP-3, Specification No. SS-A-706b. Mineral filler shall conform to AASHO designation M 17-42.

(b) Asphaltic concrete. - The mineral aggregate and bituminous material in the surface course shall be combined in such proportions as to produce a mixture conforming to the following composition limits by weight:

Standard Square-mesh Laboratory Sieves

<u>Passing</u>	<u>Retained on</u>	<u>Percent by Weight</u>
3/4 inch		100
3/4 inch	No. 4	10 - 35
No. 4	No. 10	5 - 25
No. 10	No. 40	15 - 40
No. 40	No. 80	10 - 30
No. 80	No. 200	5 - 30
No. 200		4 - 10

Bitumen

7 to 9.5

(c) Job mix. - Before starting work, the contractor shall submit for approval the formula for the mix he proposes to furnish for asphaltic concrete surface, specifying a definite percentage of bitumen to be added to the aggregate. The mixture shall remain uniform within the following tolerances:

Retained on 1/2 inch to No. 80 sieves	or - 7%
Retained on No. 200 sieve	or - 5%
Passing No. 200 sieve	or - 3%
Bitumen	or - 0.5%

(d) Mixing - The bituminous material shall be brought to a temperature between 250° and 325° and the aggregate shall be brought to a temperature between 250° and 400° F. before being introduced into the mixer. Temperatures selected from within the above range shall be maintained within a tolerance of 20° F. Minimum mixing time shall be as directed.

(e) Construction methods. - All equipment, tools, machinery and plant shall be subject to approval before the work is started and shall be maintained in satisfactory condition. The equipment shall be capable of spreading the bituminous mixture to a uniform density

and striking a smooth finish, true to section and free from inequalities. Rolling and the condition of the material while being deposited shall be as approved by the Officer-in-Charge and placing shall be as nearly continuous as possible. No material shall be placed except when the work is done under dry conditions with the temperature above 40° F. The finish asphaltic concrete surface shall have a minimum thickness of $1\frac{1}{2}$ " and no tack coat shall be required. The pavement shall be protected after final rolling and no traffic will be permitted until hardening and in no case less than six hours.

23-04. Reinforced concrete pipe. - Pipe shall be standard strength, reinforced concrete pipe conforming to American Association of State Highway Officials Standard Specification No. M-41-49, of sizes indicated.

(a) Culverts shall be laid to exact line and grade. The trench shall be excavated sufficiently far below grade so that the outside of the bell will clear the trench bottom when the pipe is placed on grade. The excavation shall then be brought to grade by back-filling the trench bottom with clean, sandy earth carefully tamped so that the pipe rests for its full length and 20% of its circumference on a firm, slightly yielding bed. The spigot shall be shoved home and centered in the bell and annular space completely filled with mortar composed of one part of Portland cement and two parts of clean, sharp sand.

(b) Before succeeding sections of the pipe are laid, the lower portions of the bell or groove of the pipe shall be filled from the inside with cement mortar with a sufficient thickness to bring the inner surface of the abutting pipes flush and even. After the pipe is laid, the remainder of the joints shall be solidly filled with mortar and sufficient additional mortar used to form a bed or ring around the outside of the joints. Inside of the joints shall be wiped and finished smooth. After the mortar has taken an initial set, the mortar on the outside shall be protected from the air and sun with a cover of thoroughly wetted earth or burlap.

(c) Pipe which is not in true alignment, or which shows any settlement after the laying, shall be taken up and relaid.

23-05. Drainage structures. - Concrete catch basins and brick man-holes shall be constructed in accordance with the applicable requirements of Specification No. 42Ya.

23-06. Frames, covers and gratings shall conform to the applicable requirements of Specification No. 42Ya and in accordance with the details on drawings.

23-07. Miscellaneous drainage pipe. - Drains from the building floor drains and sump drains shall be connected to the outside drainage system as indicated.

(a) Vitrified clay sewer pipe shall conform to Specification

SS-P-361a.

(b) Pipe laying.

(1) Each section of pipe shall be brought to exact line and grade, the spigot centered in the bell of the preceding length and shoved solidly home. The annular space shall be caulked with tight twisted tarred oakum driven solidly against the back of the bell. Joints shall then be made with hot poured bituminous compound. The interior of the pipe shall be kept clean by dragging a swab upstream past each joint immediately after its completion. Any defective joint shall be removed, thoroughly cleaned, and re-made.

(2) Bituminous joints shall be used for vitrified clay pipe. Material used for hot poured bituminous joints shall be approved by the Officer-in-Charge prior to delivery and shall be delivered to the job site in the manufacturer's package, plainly marked and unopened. Heating and pouring shall be in accordance with the manufacturer's recommendations. In pipe having a nominal diameter not greater than eight inches, as many as two lengths of pipe may be pre-jointed in a vertical position, provided that the pipe shall be supported for its full length when lowered into the trench and no joint shall be subjected to strain.

23-08. Shellrock gutter. - The gutter shall be constructed of shellrock, the grading of which shall be as specified for rolled shellrock base course.

(a) The stone shall be placed in one layer and thoroughly compacted by tamping to thickness shown. Finished surfaces shall be brought to a true grade at the elevations indicated.

23-09. Flared end concrete pipe sections. - Shall be precast and the product of an approved manufacturer in accordance with A.A.S.H.O. Specification No. M 41-49.

SECTION 24. FENCING

24-01. Materials. - Fence posts, gates and accessories shall conform to Specification No. RR-F-183. The fabric conforming to Specification No. RR-F-191a. The barb wire conforming to Specification No. RR-F-221b.

24-02. Fence Posts, Gates and Accessories. - Line posts, corner and gate posts shall be set in concrete footings. Footings for line post shall be 36" deep by 11" diameter and post set to bottom of concrete. Corner and gate post footing shall be 48" deep and 16" diameter and post set 42" in the concrete. Concrete footings to be Class D-1 in accordance with Specification No. 13Yd. The footings to extend about two inches above the finished grade with the tops and exposed surfaces floated to a smooth finish. Gates shall be double leaf vehicular and swing type and supplied with an approved type of padlock with three keys furnished for each lock with brass chains on brass identification tags properly marked. Top rail and bottom reinforcing wire shall be provided. An approved type of post top shall be provided for each post having one arm set at approximately 45° towards the outside and carrying three barbed wire.

24-03. Fabric shall be Type A, 2-inch woven wire diamond mesh No. 6 wire, 84 inches in height with the top and bottom selvage having a twisted and barbed finish.

24-04. Barb wire shall be Type A, 4-point. Strand to be 12 ga., barb to be 14 ga., 3 wires shall be constructed on top of fabric. The uppermost barb wire shall be approximately 12 inches horizontally from the fabric line.

24-05. Installation. - Fencing shall be installed in a workman-like manner with the wires stretched and fastened securely to the posts and fabric stretched so that there will be no slack edges or warped sections.

SECTION 25. SEWERAGE DISPOSAL SYSTEM

25-01. General requirements. - The work includes the provision of a sewage disposal system including building connection, septic tank, and disposal field as indicated.

25-02. Pipe.

(a) Terra cotta sewer and underdrain pipe shall conform to Specification No. SS-P-361a.

(b) Bell and spigot cast iron soil pipe shall be extra heavy and conform to Specification No. W-P-401.

25-03. Pipe laying.(a) Terra cotta sewer pipe.

(1) Each section of pipe shall be brought to exact line and grade, the spigot centered in the bell of the preceding length, and shoved solidly home. The annular space shall be caulked with tight twisted tarred oakum driven solidly against the back of the bell. Joints shall then be made with hot poured bituminous compound. The interior of the pipe shall be kept clean by dragging a swab upstream past each joint immediately after its completion. Any defective joint shall be removed, thoroughly cleaned, and remade.

(2) Bituminous joints shall be used for terra cotta sewer pipe. Heating and pouring shall be in accordance with the manufacturer's recommendations. In pipe having a nominal diameter not greater than 10 inches, as many as 2 lengths of pipe may be pre-jointed in a vertical position, provided that the pipe shall be supported for its full length when lowered into the trench and no joint shall be subjected to strain.

(b) Underdrain pipe. - The pipe shall be laid true to line and grade with open joints, the openings being $3/8$ inch wide. The top half of the joint shall be covered with a 6 inch strip of roofing felt. The pipe shall be entirely surrounded by gravel as shown on the drawing and placed in an approved manner to prevent the admission of fine material to the drain. Sizes shall be as shown. The gravel or broken stone used in the beds shall be hard, tough, clean, and free from dust, loam, clay or other improper substances in quantities sufficient to render it unsuitable.

25-04. Septic tank. - Concrete work shall be in accordance with Specification No. 13Yd. Concrete shall be Class D-1. Brickwork shall be in accordance with applicable sections of Specification No. 42Ya. At the option of the contractor, a commercial septic tank conforming to the North Carolina State Board of Health requirements, having not less than 550 gallons capacity, may be substituted for the above tank, subject to the approval of the Officer-in-Charge of Construction.

SECTION 26. BIDS

26-01. Instruction to bidders, U. S. Standard Form No. 22 revised March 1953, and Invitation for Bids, U. S. Standard Form No. 20, shall be observed in the preparation of bids. Envelopes containing bids must be sealed, marked and addressed as follows:

Bid for Water Treatment Facilities, Onslow Beach, Specification No. 49928	Public Works Officer Building No. 1005 Marine Corps Base Camp Lejeune, North Carolina
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26-02. Items of bids. - Bids shall be submitted, in triplicate, on U. S. Standard Form No. 21 revised March 1953, Bid Form, and in accordance with U. S. Standard Form Nos. 20 and 22, upon the following items:

Item 1. Price for the entire work, complete in accordance with drawings and specifications.

Item 2. Price the contract shall be increased or decreased for each working day of the supervisory engineer for the water softening equipment in excess of or less than the working days specified. The amount per day shall include the salary and all living and other expenses of the engineer.

Item 3. Price the contract shall be increased or decreased for each working day of the supervisory engineer for the chlorination equipment in excess of or less than the working days specified. The amount per day shall include the salary and all living and other expenses of the engineer.

26-03. Telegraphic modifications of bids in accordance with U. S. Standard Form No. 22 may be made. Two signed copies of the telegram in a sealed envelope marked "Copies of telegraphic modification of bids for Water Treatment Facilities, Onslow Beach, Specification No. 49928", should be forwarded immediately to the Office to which the written bids were submitted.

26-04. Reference to addenda. - Each bidder shall refer in his bid to all addenda to this specification; failure to do so may constitute an informality in the bid.

NOTICE

The Government forms, Bureau of Yards and Docks standard specifications mentioned and other information necessary may be obtained from the District Public Works Officer, Headquarters, Fifth Naval District, U. S. Naval Base, Norfolk 11, Virginia, or Public Works Officer, Navy Department, Building No. 1005, Marine Corps Base, Camp Lejeune, N. C. The remainder of the standard specifications and other material referred to may be examined at the District Public Works Office or at the Public Works Office, or the standard government specifications may be obtained from the Superintendent of Documents, Washington 25, D. C. at their established prices.

Camp Lejeune, N. C.

2 February 1956

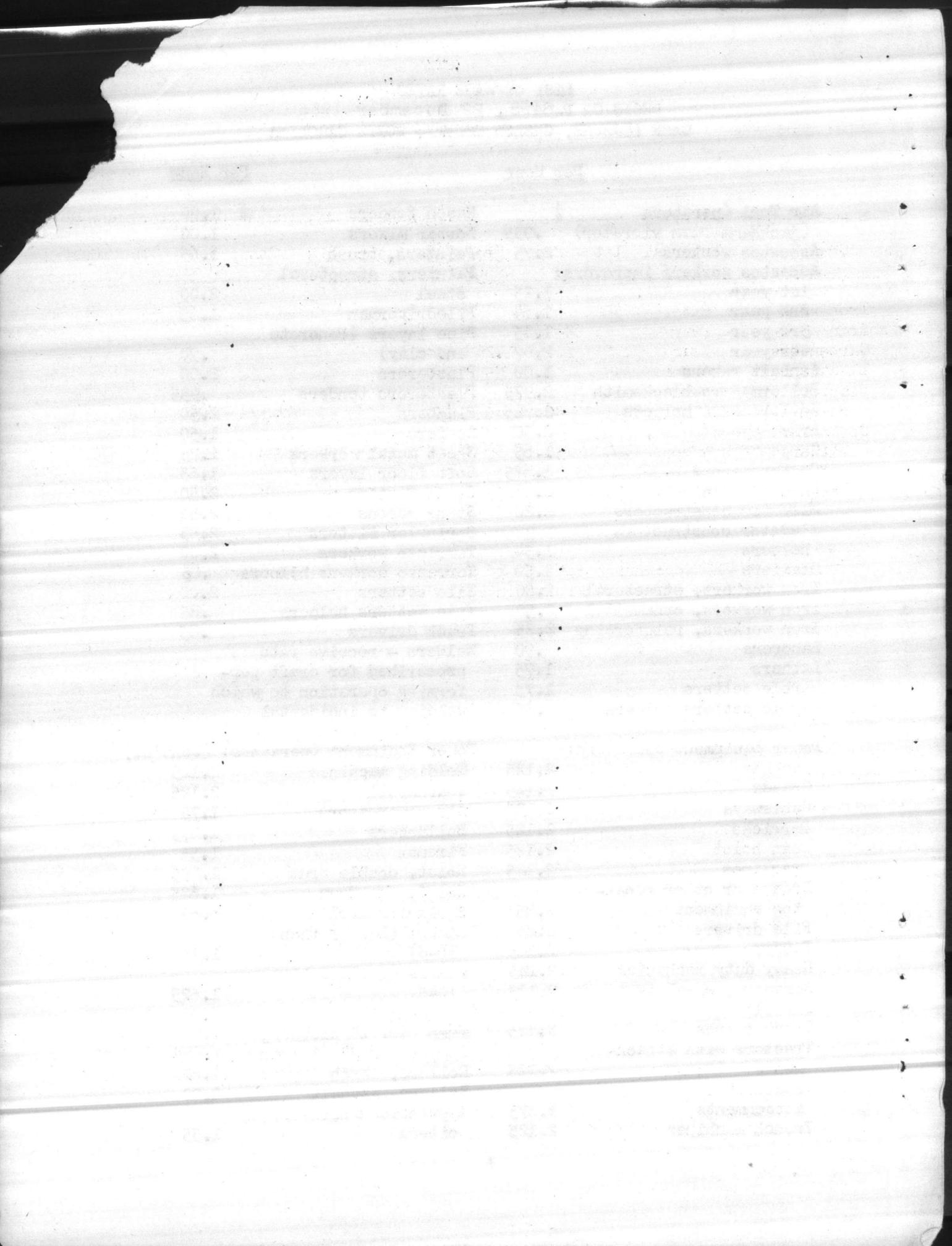
W. SIHLER
RADM (CEC) USN
Officer in Charge of Construction
Fifth Naval District

FOR:

ROBERT H. MEADE
RADM (CEC) USN
Chief of Bureau of Yards and Docks
Department of the Navy

LIST OF WAGE RATES
 DECISION P-8495, 29 December 1955
 CAMP LEJEUNE, ONSLOW COUNTY, NORTH CAROLINA

	<u>Per Hour</u>		<u>Per Hour</u>
Air Tool Operators	\$	Mason tenders	\$ 1.00
(jackhammerman vibrator)	.935	Mortar mixers	1.00
Asbestos workers	2.75	Painters, brush	1.65
Asbestos workers improvers:		Painters, structural	
1st year	1.25	steel	2.00
2nd year	1.64	Piledriverman	1.65
3rd year	1.85	Pipe layers (concrete	
4th year	2.07	and clay)	.90
Asphalt rakers	1.00	Plasterers	2.00
Boilermakers-blacksmith	2.975	Plasterers tenders	.935
Boilermakers helpers	2.725	Plumbers	2.50
Bricklayers	2.50	Roofers	1.50
Carpenters	1.65	Sheet metal workers	1.75
Cement masons	1.625	Soft floor layers	1.65
Electricians	2.40	Steam fitters	2.50
Elevator constructors	2.20	Stone masons	2.50
Elevator constructors		Sprinkler fitters	2.83
helpers	1.54	Terrazzo workers	2.00
Glaziers	1.50	Terrazzo workers helpers	.85
Iron workers, structural	2.50	Tile setters	2.00
Iron workers, ornamental	2.50	Tile setters helpers	.85
Iron workers, reinforcing	2.25	Truck drivers	.85
Laborers	.90	Welders - receive rate	
Lathers	1.75	prescribed for craft per-	
Marble setters	1.75	forming operation to which	
Marble setters helpers	.85	welding is incidental	
Power Equipment Operators:		Power Equipment Operators: (Cont'd.)	
Backhoes	2.125	Welding machines	2.125
Cranes	2.125	Tournapull	2.125
Cableways	2.125	Air compressors	1.75
Derricks	2.125	Bulldozers	1.875
Beam hoist	2.125	Fireman	1.55
Draglines	2.125	Hoist, double drum	1.875
Dredge or other float-		Hoist, one drum	1.625
ing equipment	2.25	Finishing machine	1.875
Pile drivers	2.25	Mixers (Larger than	
Pavers	2.125	10-S)	1.75
Heavy duty mechanics	2.125	Mixers (Smaller than	
Scrapers, wheel type	2.125	10-S)	1.625
Shovels	2.125	Motor graders	2.00
Truck cranes	2.125	Pump over 2" discharge	1.75
Tractors with attach-		Pump under 2" discharge	1.625
ments	2.125	Rollers, earth	1.87
Tractors without		Rollers, asphalt	2.00
attachments	1.875	Apprentice engineers and	
Trench machines	2.125	oilers	1.55



APPRENTICE SCHEDULE
PERIOD AND RATE *

Craft	Interval	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Iron workers	6mos.	50	60								
Iron workers	Year		66-2/3								
Carpenters	Year	\$1.05	1.15	1.25	1.40						
Electricians	6 mos.	45	50	55	60	65	70	75	80		
Plumbers and Steam fitters	6 mos.	37-1/2	40	45	50	55	60	67-1/2	75		
Sprinkler fitters	6 mos.	54	58	62	66	70	74	78	82	86	90
Sheet metal workers	6 mos.	40	45	50	55	60	65	70	80		

* The apprentice rate is by percentage of the journeymen's rate unless otherwise indicated.

APPRENTICE SCHEDULE
PERIOD AND RATE *

Craft	Interval	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Iron workers	6mos.	50	60								
Iron workers	Year		66-2/3								
Carpenters	Year	\$1.05	1.15	1.25	1.40						
Electricians	6 mos.	45	50	55	60	65	70	75	80		
Plumbers and Steam fitters	6 mos.	37-1/2	40	45	50	55	60	67-1/2	75		
Sprinkler fitters	6 mos.	54	58	62	66	70	74	78	82	86	90
Sheet metal workers	6 mos.	40	45	50	55	60	65	70	80		

* The apprentice rate is by percentage of the journeymen's rate unless otherwise indicated.



PUMP STATION START-UP REPORT

PROJECT DATA

DATE: 6-13-00
 PROJECT NAME: Onslow Beach - Water Treatment Plant
 LOCATION: Camp Lejeune
 CONTRACTOR: SO-PAC PHONE: _____
 OWNER: Camp Lejeune PHONE: _____

PUMP TEST DATA

	PUMP #1	PUMP #2
EQUIPMENT MFG:	<u>WGSOH-03</u>	<u>WGSOH-03</u>
PUMP MODEL:	<u>M1063</u>	<u>M1063</u>
ACTUAL VOLTAGE:	<u>208/3</u>	<u>208/3</u>
ROTATION CHECK	<u>YES/NO</u>	<u>YES/NO</u>
RUN AMPS	<u>RWB</u> <u>20920</u>	<u>RWB</u> <u>20920</u>
RAIL SYSTEM	<u>YES/NO</u>	<u>YES/NO</u>
INSTALLED	<u>YES/NO</u>	<u>YES/NO</u>
LIFTING CHAINS	<u>YES/NO</u>	<u>YES/NO</u>
INSTALLED	<u>YES/NO</u>	<u>YES/NO</u>
JUNCTION BOX	<u>YES/NO</u>	<u>YES/NO</u>
PAD LOCK ON HATCH	<u>YES/NO</u>	<u>YES/NO</u>

CONTROL PANEL TEST DATA

EQUIPMENT MFG: CSI
 PANEL MODEL # CPD 208/3/5
 TYPE OF CONTROL: Duplex Control - 5 Float Sys.

	PUMP #1	PUMP #2
HOA SWITCH	<u>PASS/FAIL</u>	<u>PASS/FAIL</u>
RUN LIGHT	<u>PASS/FAIL</u>	<u>PASS/FAIL</u>
TIME METER READING	<u>ON/OFF</u>	<u>ON/OFF</u>
SEAL FAILURE LIGHT	<u>ON/OFF</u>	<u>ON/OFF</u>
HIGH WATER ALARM LIGHT:	<u>PASS/FAIL</u>	<u>PASS/FAIL</u>
HIGH WATER ALARM AUDIBLE DEVICE:	<u>PASS/FAIL</u>	<u>PASS/FAIL</u>
OPTION DEVICES:	<u>LOW WATER ALARM W/REDUNDANT OFF</u>	

PADLOCK ON PANEL: YES/NO	SCHEMATIC INSIDE PANEL DOOR: YES/NO				
	#1	#2	#3	#4	#5
FLOAT POSITION	<u>LWA/OFF</u> LEAD/LAG HWA	<u>LWA/OFF</u> LEAD/LAG HWA	<u>LWA/OFF</u> LEAD/LAG HWA	<u>LWA/OFF</u> LEAD/LAG HWA	<u>HWA</u>
FLOAT ELEVATION	<u>OK/NEEDS</u> ADJUSTMENT	<u>OK/NEEDS</u> ADJUSTMENT	<u>OK/NEEDS</u> ADJUSTMENT	<u>OK/NEEDS</u> ADJUSTMENT	<u>ADDED ON 6/14/00</u>

SUMMARY INFORMATION

FIELD INSTRUCTION OF OWNERS PERSONNEL: YES/NO
 WET TEST PERFORMED: YES/NO
 OBSERVATIONS/ADJUSTMENTS NEEDED: ADD HWA (FLOAT) ON 6/14/00

WITNESSES AT STARTUP: Gene - SO-PAC Mitch - Hughes Supply
Chad - Preferred Sources Thomas Ryan - Centennial Cont.

Draw Down Test: $(3.14)(r \times r)(1) / 231 =$ Gallons per inch of diameter = _____
 $L \times W \times 7.48052 =$ Gallons per foot of Depth x Depth = Total Gallons in Tank

PREFERRED SOURCES, INC.
 374 R.L. HONEYCUTT DRIVE
 WILMINGTON, NC 28412
 PHONE/FAX : 910-397-0353



OPERATION AND MAINTENANCE MANUALS

PROJECT

BACKWASH AT ONSLOW BEACH FORCE MAIN
BUILDING BA-138
N62470-98-D-8019

CONTRACTOR

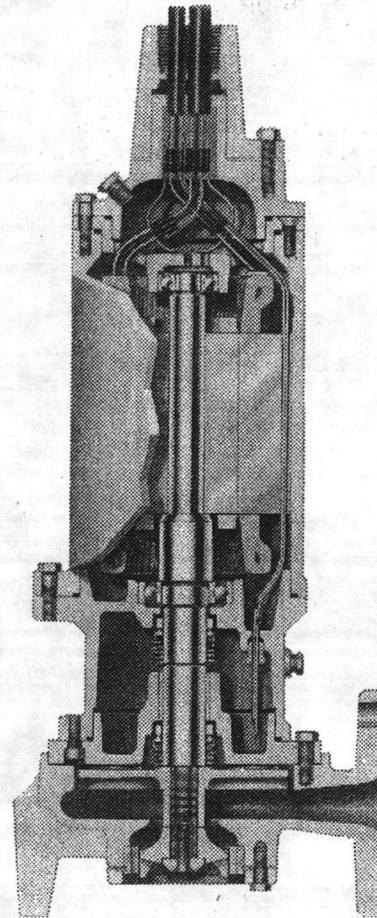
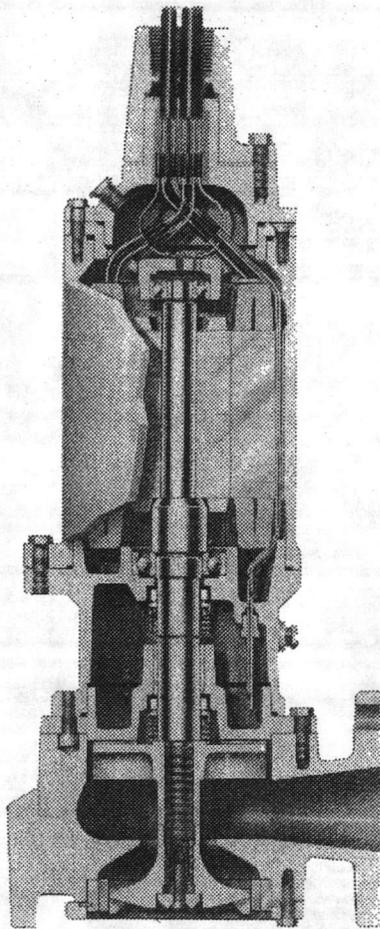
CENTENNIAL CONTRACTORS ENTERPRISES, INC.
BUILDING 1102
BIRCH & GIBB STREETS
P. O. BOX 8367
CAMP LEJEUNE, NC 28647-8367
(910) 451-0095

MECHANICAL CONTRACTOR

RHEM INSULATION
P. O. BOX 626
JACKSONVILLE, NC 28541
(910) 347-1754

WG30 & WG30H WG50 & WG50H WG75H Grinder Pumps

INSTALLATION AND SERVICING
INSTRUCTIONS FOR MYERS
WG75H, WG50, WG50H, WG30 AND
WG30H GRINDER PUMPS
3, 5 AND 7½ HORSEPOWER
3450 RPM



HIGH CAPACITY
GRINDER PUMP
WG

HIGH HEAD
GRINDER PUMP
WGH



PUMP MODELS—The 3, 5, and 7½ HP grinder pumps are made in two models. The WG50 and WG30-5 and 3 HP units are for high capacities at medium head conditions. (See curve sheets Page 304.) The WG75H, WG50H, and WG30H-7½, 5, and 3 HP units are for lower capacities at higher heads. (See curve sheet Page 304.) Both series are made for single phase 230 volts and three phase for 200, 230, 460 and 575 volts. (See Fig. 1 and Fig. 2 for pump construction.)

PACKAGING—Each pump with 25 ft. of power and control cable is packed in cardboard carton with wooden support base. Catalog number and engineering number are labeled on the carton.

INSTRUCTIONS—These instructions cover only the pump unit. Other instructions for lift out rail system and electrical controls are included with those items. Complete disassembly instructions are furnished only to authorized service stations.

CAUTION—PUMP IS NOT TO BE DISASSEMBLED IN THE FIELD EXCEPT AT CERTIFIED SERVICE STATIONS OR AT MYERS FACTORY. WARRANTY IS VOID IF PUMP IS TAKEN APART FOR ANY REASON EXCEPT TO REPLACE GRINDER IMPELLER AND GRINDER RING WHICH IS COVERED IN THESE INSTRUCTIONS.

DESCRIPTION OF PUMP—Fig. 1 and Fig. 2 are cut-away drawings of pump showing both high capacity and high head types. All motor components except shaft are the same on both series.

These pumps are designed for the rugged service of grinding and pumping commercial and industrial sewage. They are not intended for pumping *heavy slurries* or liquids containing *abrasives* or *corrosive* elements.

Three phase motors are generally used for commercial and industrial service but single phase motors are available where 3 phase

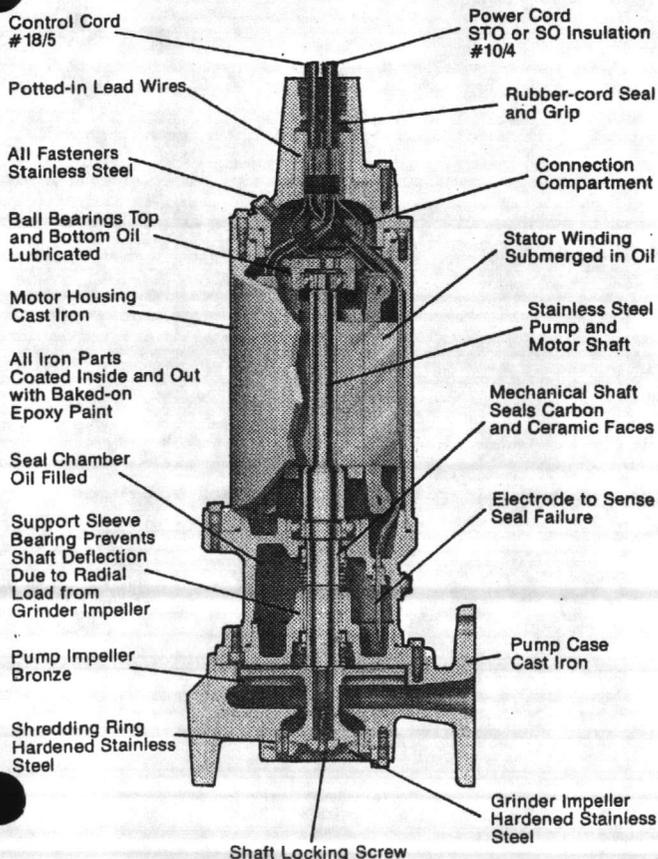


FIG. 1

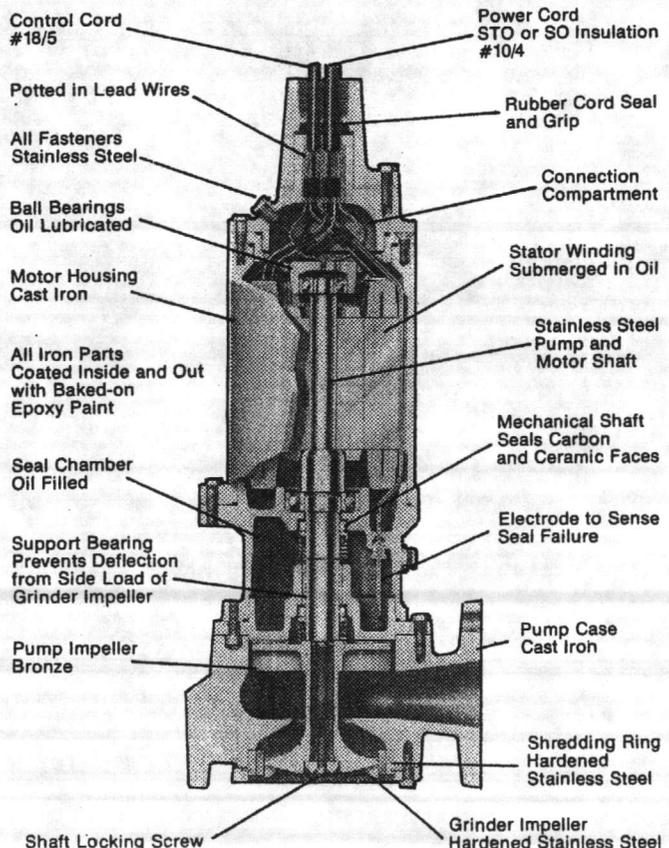


FIG. 2



cannot be obtained especially in rural areas. Transformers must be large enough to maintain full voltage for single phase. Low voltage on large single phase motors can cause considerable trouble and motors are not guaranteed to operate on low voltage. All single phase motors must have special electrical control box furnished by Myers.

INSTALLING SINGLE PHASE MOTORS WITH CONTROLS OTHER THAN MYERS VOIDS WARRANTY.

Pump motor chamber and seal chamber are oil filled for long life and best heat transfer.

The seal chamber is provided with an electrode to give signal to control panel if water enters the seal chamber due to worn or faulty lower seal.

Motor is provided with a heat sensor that automatically stops motor if overheating occurs for any reason. This sensor resets as soon as motor temperature drops to safe

range. Heat sensor trips at 200°F. Additional overload heaters are used in the control box to trip under overload conditions.

MOTOR CORDS— Each pump motor has two cords, one large power cord and one small control cord.

Both cords are the same for single and three phase. The power cord is a 4 conductor type with ST or SO 600 volt insulation. The wires are color coded blue, black, red and green. For 3 phase the blue, black and red lines are power lines and the green is ground. For single phase the black and blue lines are power and the red is for start winding and the green is ground. All cords are CSA and UL approved.

Any three phase motor can be reversed by interchanging any two line leads. Single phase motor is single rotation only. Correct motor rotation is counterclockwise when looking at the grinder end of pump.

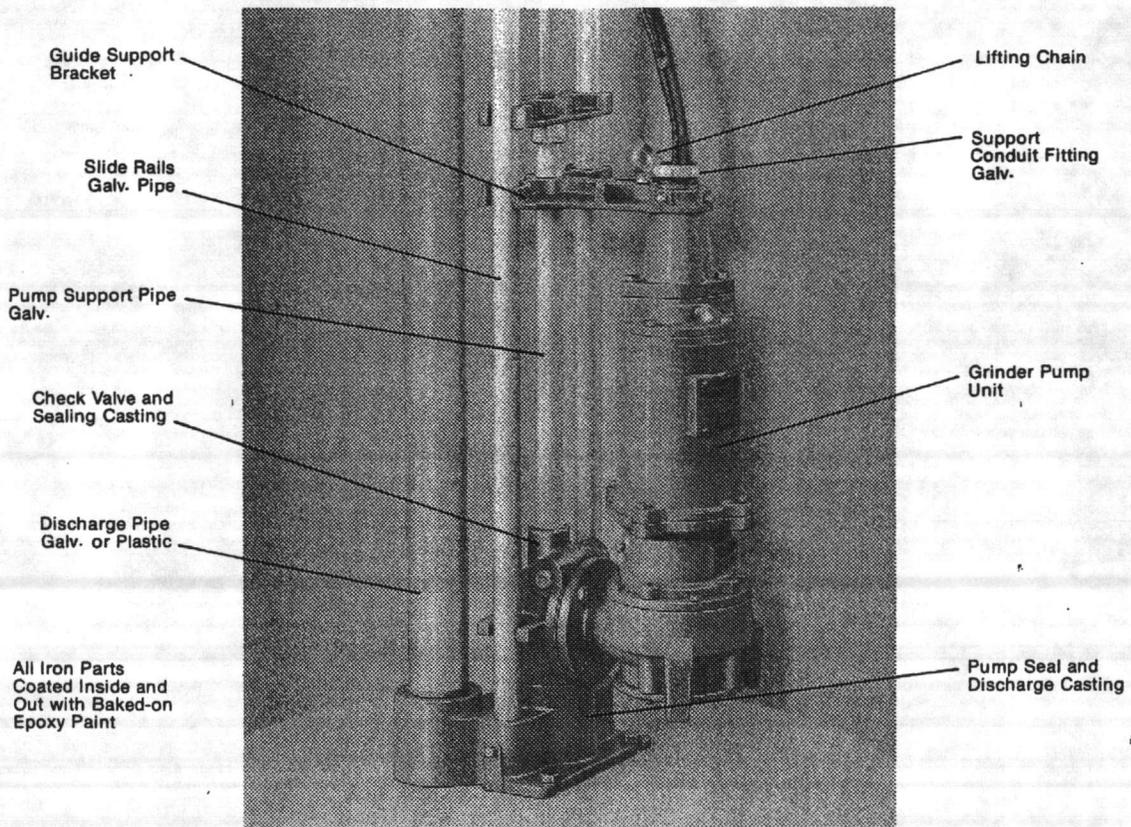


FIG. 3



The control cord is a 5 conductor type with ST or SO 600 volt insulation. The black and white leads connect to heat sensor and the red conductors connect to seal failure, green is ground.

All green ground wires connect to screw terminal in motor connection housing and to grounding bar in electrical control box.

IMPORTANT – These ground wires must be connected in control box to grounding bar that is connected to a good outside ground. MOTOR IS NOT SAFE UNLESS GROUNDED.

INSTALLING PUMP IN SUMP – These pumps are usually installed in concrete or fiberglass basins with the lift-out rail system. Fig. 3 shows pump mounted on the rail system. Instructions for installing rail system is furnished with rail package.

If pump is not installed with lift-out rail system it must be properly supported to discharge pipe so that space is provided under pump for entrance of sewage. Pump inlet should not be closer than 5 inches from bottom of sump.

It is not generally desirable to install these pumps without the rail system except on special O.E.M. packaged systems.

STARTING PUMP AFTER INSTALLING IN SUMP BASIN – If pump is 3 phase pump rotation must be checked. Before lowering pump into basin connect power lines and start motor using H-O-A switch in the hand position. Grinder impeller should turn counterclockwise when looking at grinder impeller. If rotation is wrong interchange any two line leads at control box.

CAUTION – KEEP HANDS COMPLETELY AWAY FROM GRINDER IMPELLER WHEN MAKING THIS CHECK.

Disconnect line leads from panel and mark wires so they can be reconnected in same manner as used for test.

THREE PHASE CONTROL BOX – Any suitable three phase control equipment can be used for simplex or duplex operation. These control boxes are also available from Myers. If other than Myers box is used overload heaters must be selected in accordance with full load amp ratings given in this instruction booklet.

SINGLE PHASE CONTROL BOX – Single phase pumps must use the Myers control box. Warranty is void if other than Myers single phase control box is used.

MAXIMUM AMP & WINDING RESISTANCE VALUES

MODEL	HP	SPEED	VOLTS	PHASE	WINDING RESISTANCE IN OHMS			MAX. AMPS
					BLACK TO WHITE	BLACK TO RED	RED TO WHITE	
WG30-21	3	3450	230	1	.47	3.14	3.61	36
WG30-03	3	3450	200	3	.72	.72	.72	20.5
WG30-23	3	3450	230	3	.72	.72	.72	17.8
WG30-43	3	3450	460	3	2.9	2.9	2.9	8.9
WG30-53	3	3450	575	3	6.5	6.5	6.5	7
WG50-21	5	3450	230	1	.47	3.14	3.61	43
WG50-03	5	3450	200	3	.72	.72	.72	28.5
WG50-23	5	3450	230	3	.72	.72	.72	24.8
WG50-43	5	3450	460	3	2.9	2.9	2.9	12.4
WG50-53	5	3450	575	3	6.5	6.5	6.5	9.9
WG30H-21	3	3450	230	1	.76	5.15	5.91	21
WG30H-03	3	3450	200	3	1.48	1.48	1.48	15
WG30H-23	3	3450	230	3	.98	.98	.98	13
WG30H-43	3	3450	460	3	3.9	3.9	3.9	6.5
WG30H-53	3	3450	575	3	11.4	11.4	11.4	5.2
WG50H-21	5	3450	230	1	.47	3.14	3.61	32
WG50H-03	5	3450	200	3	.72	.72	.72	21.6
WG50H-23	5	3450	230	3	.72	.72	.72	18.8
WG50H-43	5	3450	460	3	2.9	2.9	2.9	9.4
WG50H-53	5	3450	575	3	6.5	6.5	6.5	7.5
WG75H-03	7½	3450	200	3	.72	.72	.72	25.8
WG75H-23	7½	3450	230	3	.72	.72	.72	22.4
WG75H-43	7½	3450	460	3	2.9	2.9	2.9	11.2
WG75H-53	7½	3450	575	3	6.5	6.5	6.5	9

If amp readings are higher than listed it indicates voltage may be higher or lower than normal or that pump grinder may be clogged with trash causing extra load on motor.



CHECK LIST IF PUMP DOES NOT OPERATE PROPERLY

CHECKING FOR MOISTURE IN MOTOR – Use ohmmeter and set on highest scale. Readings on the large power cord between any of the conductors red, black, white to green conductor or motor shell should be more than 500,000 ohms. Motor probably will run with a lower reading, but if pump is out of service and reading is below 500,000 ohms the motor housing and stator should be removed and baked in a drying oven at 220°F. To be serviced only at authorized service station.

Readings should be taken with line leads disconnected from terminal strip.

RESISTANCE OF WINDINGS – Every motor winding has a fixed resistance and winding must check close to the values given below to operate properly. This winding resistance also shows if motor is connected for voltage being used.

Use ohmmeter for this test and set on scale to read directly in ohms.

TROUBLE CHECK LIST – Troubles listed are generally caused by the pump. Other trouble can occur from faulty control box operation.

These will be listed with the control box instructions.

CONDITION

Pump runs but does not pump liquid from basin.

PROBABLE CAUSE

1. Pump impeller may be air locked, this occasionally occurs on a new installation. Start and stop pump several times to purge air.
2. Run additional water into basin so that pump will be submerged deeper to clear air.
3. If pump is three phase, rotation may be wrong. See instructions for checking proper rotation.
4. If air does not clear it may be necessary to lift pump out of sealing elbow and start motor to allow pump to pump for a few seconds.
Airvent hole is provided in pump case, so some water will flow from this hole when pump is operating. If vent hole gets clogged clean out.
5. If pump has been installed for some time and does not pump, it may be clogged at grinder inlet.
6. Discharge gate valve may be closed.
7. Discharge check valve may be clogged or have a broken clapper.
8. Discharge head may be too high. Check elevation. Maximum pump head at zero flow is shown on pump curve sheet.
9. If above checks do not locate trouble, motor rotor may be loose on shaft which allows motor to run but will not turn impeller or only at low RPM.



TROUBLE CHECK LIST (Con't)**CONDITION**

Red light comes on at control box.

PROBABLE CAUSE

This indicates some water has leaked past the lower seal and has entered the seal chamber and made contact with the electrode probe. Pump must be removed from basin within approximately two (2) weeks for replacement of lower seal. This preventative repair will save an expensive motor.

Overload trips at control box and alarm buzzer or flashing red light comes on due to high water level in basin.

1. Push in on red reset button to reset overload. If overload trips again after short run, pump has some damage and must be removed from basin for checking.
2. Trouble may be from clogged grinder causing motor to overload or could be from failed motor.
3. Trouble may be from faulty component in control box. Always check control box before removing pump.

Yellow run light stays on continuously.

1. Indicates H-O-A switch may be in the hand position.
2. Level control switch may have failed causing pump to continue to operate when water is below lower weight, or lower weight may have dropped off.
3. Grinder assembly may be partially clogged causing pump to operate at very reduced capacity.
4. Gate valve or check valve may be clogged causing low pump flow.
5. Pump may be air logged.



TROUBLE CHECK LIST (Con't)**CONDITION****PROBABLE CAUSE**

Circuit breaker trips.

1. Reset breaker by pushing clear down on handle then back to on position. If breaker trips again in few seconds it indicates excessive load probably caused by a short in the motor or control box. Check out instructions given with control box before pulling pump.
2. If this condition happens after an electrical storm, motor or control box may be damaged by lightning.
3. Resistance reading of the motor with lead wires disconnected from the control box can determine if trouble is in motor or control box.

Pump is noisy and pump rate is low.

1. Grinder assembly may be partially clogged with some foreign objects causing noise and overload on the motor.
2. Grinder impeller may be rubbing on grinder ring due to bent shaft or misalignment.

Grease and solids have accumulated around pump and will not pump out of basin.

1. Lower weight of level switch may be set too high. Set bottom of lower weight even with bottom of inlet flange to grinder.
2. Run pump on hand operation for several minutes with small amount of water running into basin to clean out solids and grease. This allows pump to break suction and surge which will break up the solids. If level switch lower weight is set properly this condition generally will not occur.
3. Trash may have accumulated around lower weight causing pump to turn off too soon. Clean trash from weight and suspension cable.



REPLACING GRINDER IMPELLER AND GRINDER SHREDDING RING

This is the only disassembly operation allowed in the field. All other repair must be done at factory or at authorized service station.

STANDARD TOOLS REQUIRED:

1. Allen head socket set.
2. Standard socket wrench set.
3. Set of open end wrenches.
4. Plastic hammer.
5. Vise Grip pliers.
6. Large screwdriver $\frac{5}{8}$ " wide blade. Heavy handle.
7. Wire brush.
8. Three cornered file.
9. Several smaller screwdrivers.

IMPORTANT – Pump should be thoroughly cleaned of trash and deposits before starting disassembly operations.

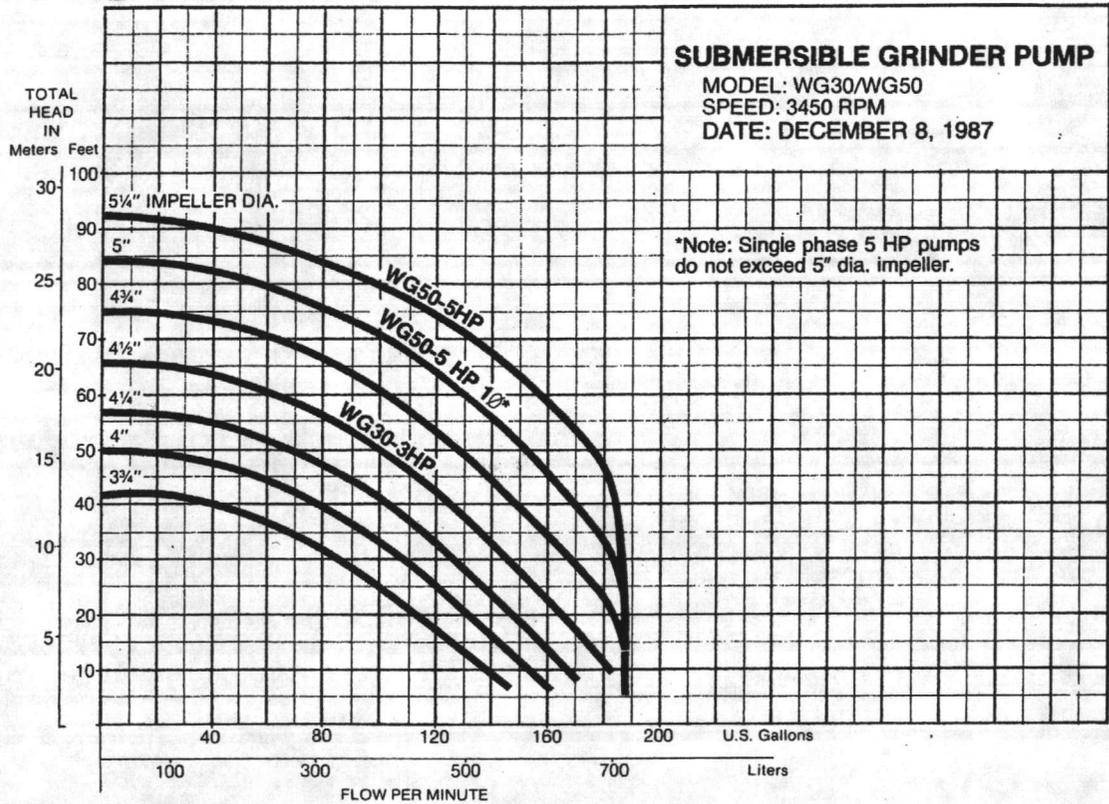
CAUTION – DISCONNECT ALL POWER AND CONTROL WIRES TO MOTOR AT CONTROL PANEL BEFORE STARTING DISASSEMBLY OPERATIONS. NEVER RELY ON OPENING CIRCUIT BREAKER ONLY.

DISASSEMBLY OF SHREDDING RING AND IMPELLER

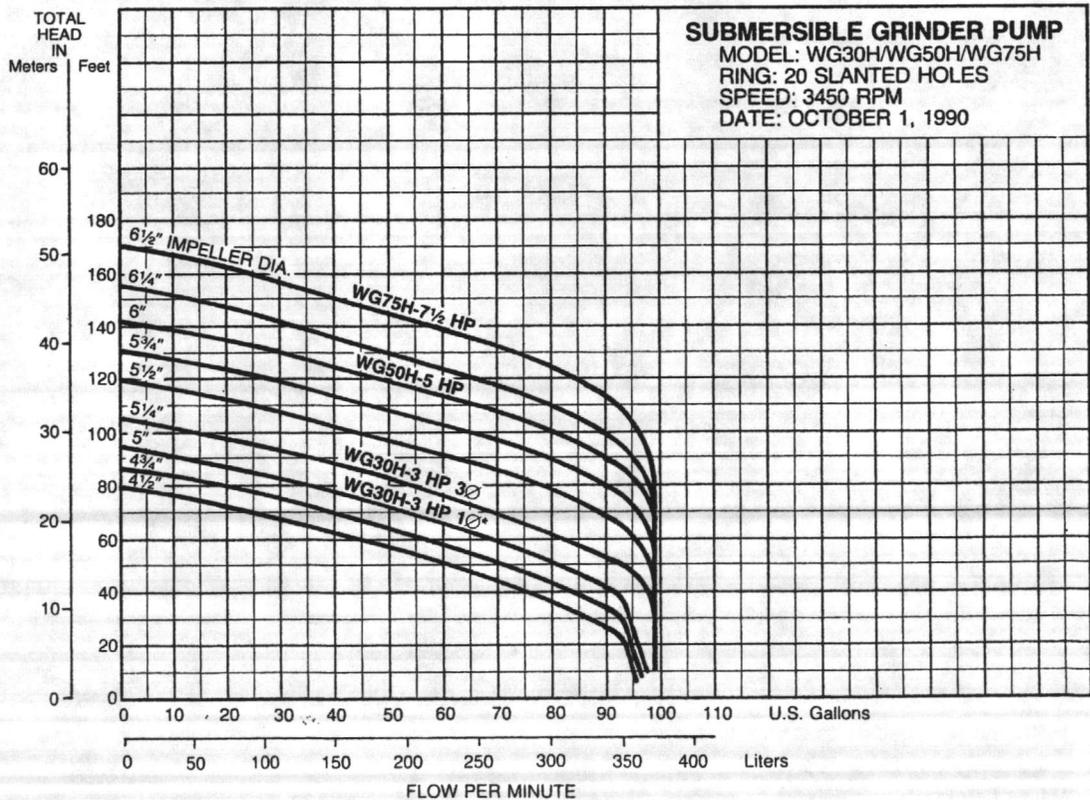
1. Remove screws from holding ring and remove ring.
 2. Use two screwdrivers, one each on opposite side of ring and pry on snap ring that holds shredding ring in place. Remove shredding ring.
 3. Hold impeller by prying against impeller cutting bar and remove cap screw from end of shaft.
 4. Use large screwdriver in slot in end of shaft and bump on cutter vane with plastic hammer. Bump in counterclockwise direction as thread is right hand. It may take several bumps to loosen impeller.
- If impeller cannot be loosened it will be necessary to take unit to service station for service. **DON'T CONTINUE TO POUND ON IMPELLER AS IMPELLER AND SHAFT CAN BE DAMAGED.**
5. If impeller comes off easily clean up and replace if worn.
 6. Be sure pump impeller has not loosened when grinder impeller is removed. This can be checked on reassembly of grinder impeller and shredding ring. Tips of impeller cutter vanes should extend about $\frac{1}{8}$ " below bottom of shredding ring. If more than $\frac{1}{8}$ " extends below ring it means pump impeller has loosened. See sectional drawing Fig. 1 or Fig. 2.
Remove grinder impeller and ring as described above and remove bolts from pump case and remove case. Use back off screws in motor mounting plate to pry loose from pump case.
 7. After case is removed wrap emery paper around shaft and hold with vise grip pliers. Use cloth on impeller and screw up against shoulder. Now pump can be re-assembled.
 8. Clean all threads with wire brush and file smooth any threads that may be nicked.
 9. Use Never-Seeze or other graphite compound on threads before replacing grinder impeller.
 10. Be sure cap screw in bottom of shaft is tight. Hold impeller with screwdriver between cutter bar and teeth of shredding ring while tightening cap screw.
 11. Be sure impeller turns free by hand after reassembly. Some drag will occur due to seals but there should be no binding or tight spots when turning the grinder impeller.
 12. **ALWAYS** use a rag on the impellers when turning to prevent cutting hands on the sharp corners of shredding ring.



Myers pump performance curves



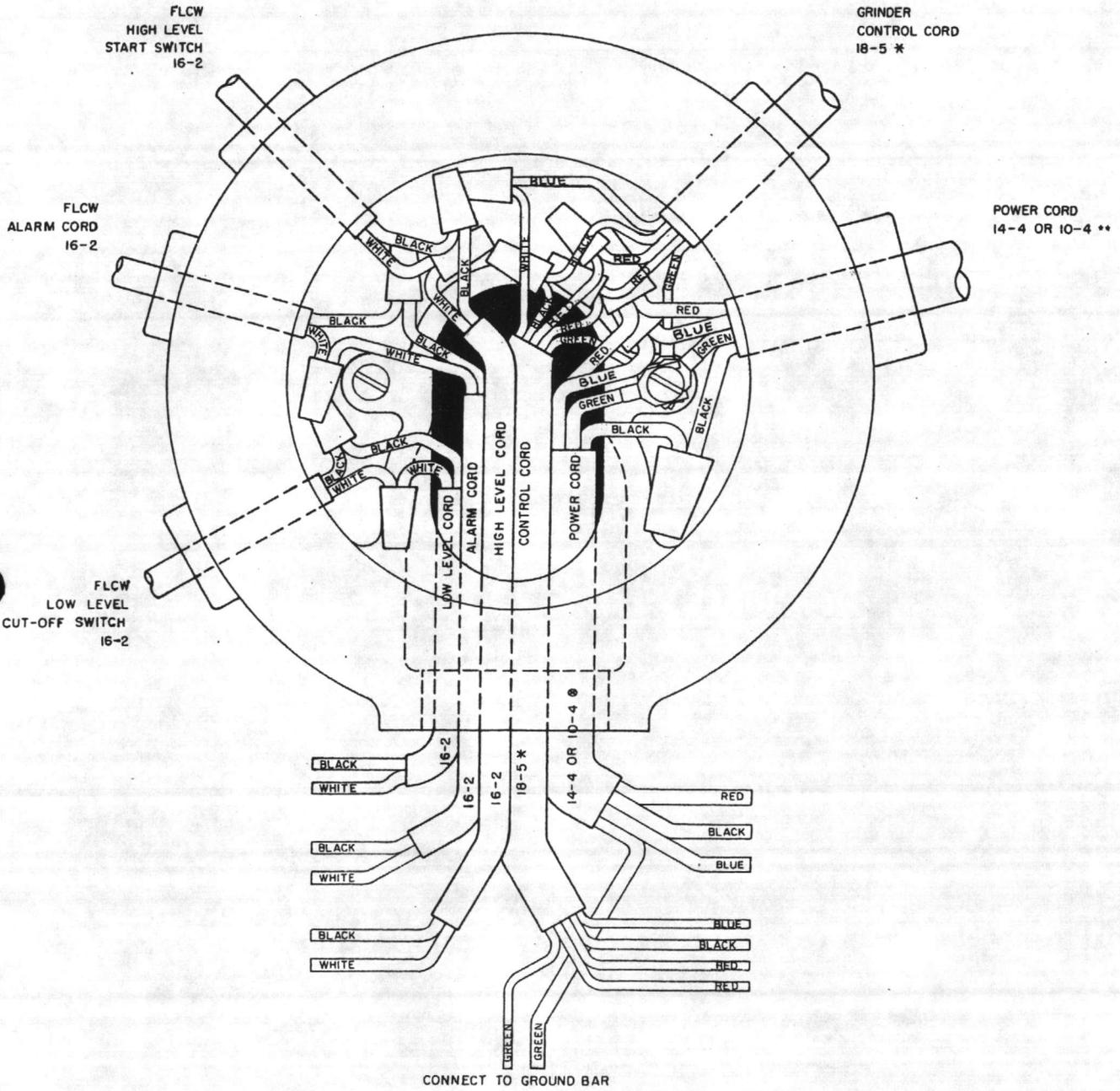
Myers pump performance curves





CONNECTION BOX, SIMPLEX GRINDER SYSTEM, FLCW 3 BALL CONTROL

FIG. 11



**GAGE DEPENDS ON HORSEPOWER OF PUMP.

Myers®

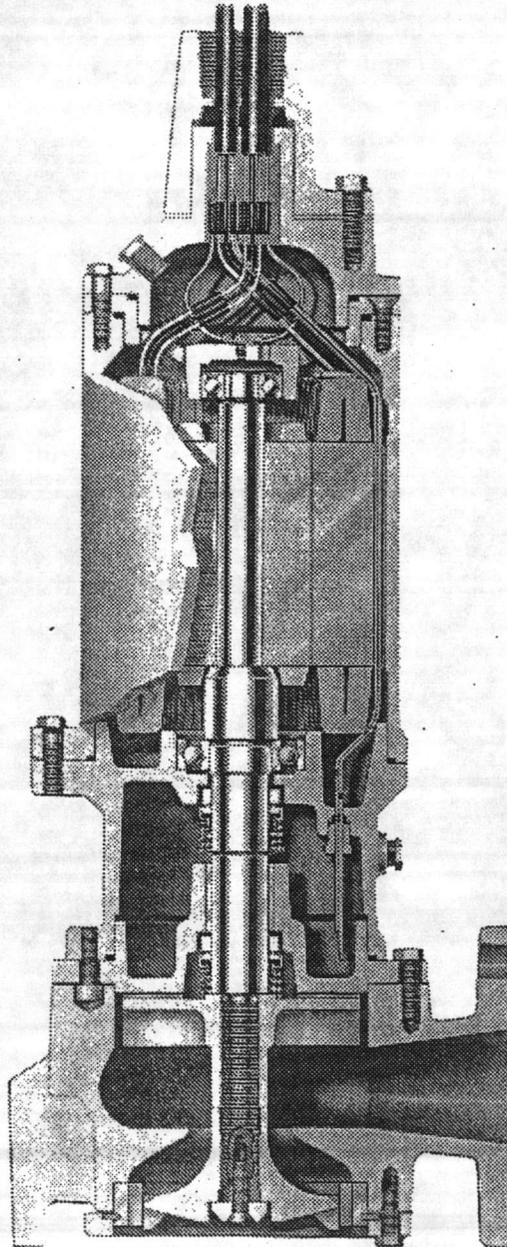
F.E. Myers
1101 Myers Parkway
Ashland, Ohio 44805-1923

419/289-1144
FAX: 419/289-6658, TLX: 98-7443



**WG30, WG30H, WG50,
WG50H & WG75H Series**

**Submersible Grinder
Pumps Parts List**

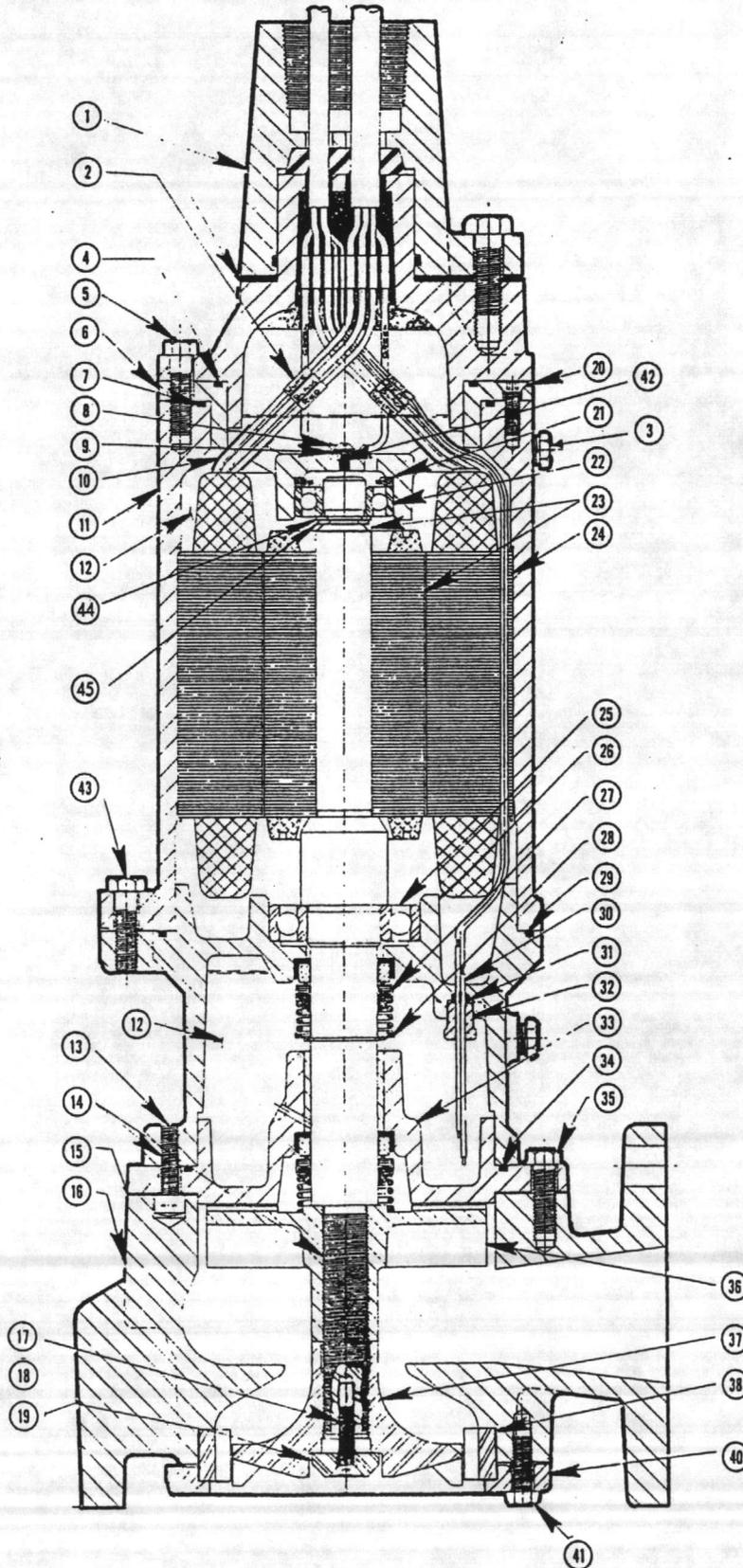




WG30 & WG50 Submersible Grinder Pumps Parts List



COVERS 3 & 5 HP — 1 AND 3 PHASE





WG30 & WG50 Submersible Grinder Pumps Parts List

Myers®

COVERS 3 & 5 HP - 1 AND 3 PHASE

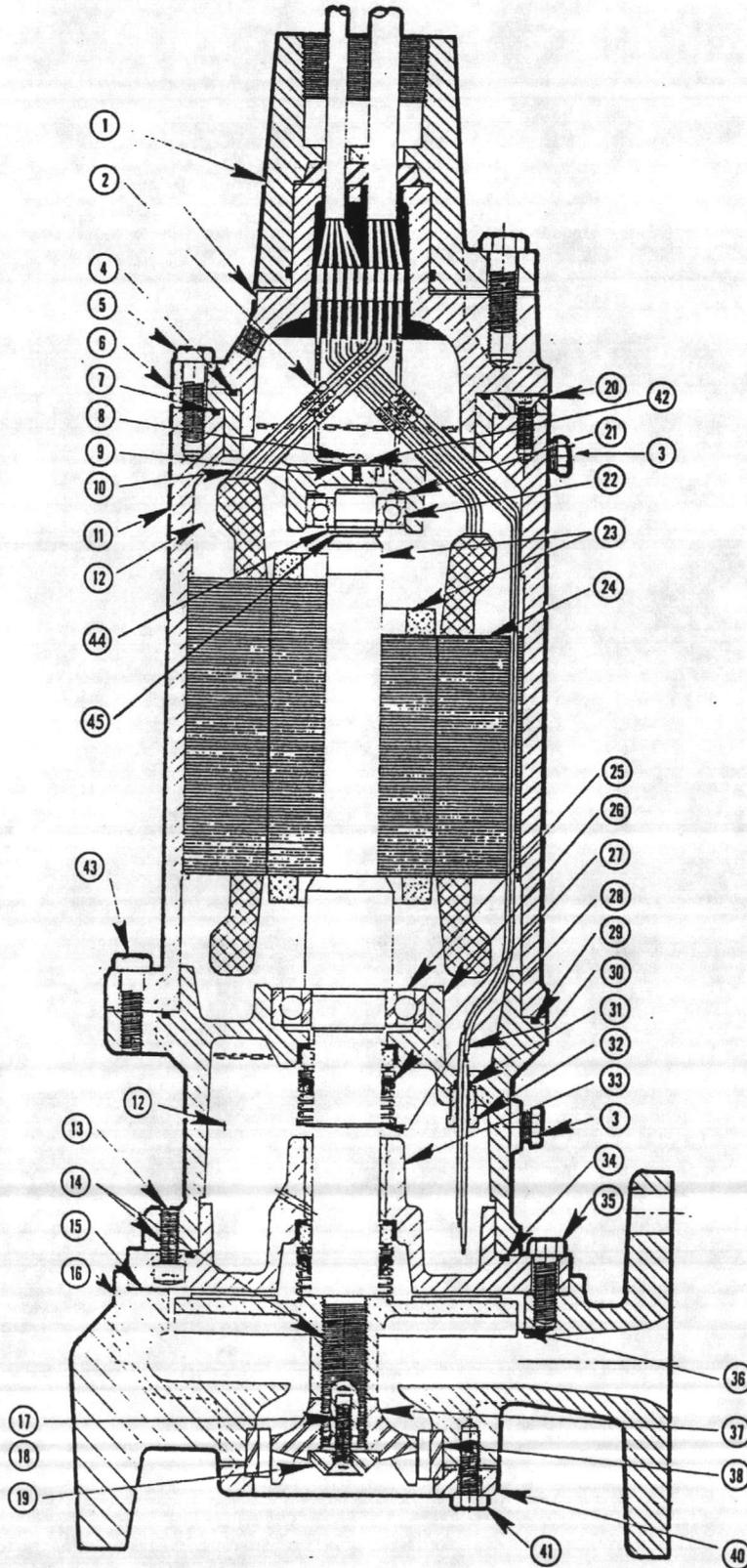
Ref. No.	Description	No. Req.	Part Number
1	Cord Cap Complete - 3Ø 25' Cord Length As Specified	1	22569B010
1	Cord Cap Complete - 1Ø 25' Cord Length As Specified	1	22569B900
2	Connector	3	15781A007
3	Pipe Plug, ¼" NPT, Hex Hd.	2	5022A54
4	"O" Ring, 4 7/8" x 4 5/8" x 1/8"	1	5876A123
5	Cap Screw, Hex Hd., 7/16"-14 x 1 1/2"	4	19102A6
6	Cap, Upper Bearing	1	22590B
7	"O" Ring, 5 1/2" x 5 1/4" x 1/8"	1	5876A112
8	Machine Screw, #10-24 x 3/8" Lg.	1	5434A43
9	Lockwasher, #10	1	6107A15
10	Tube, Plastic, 1 1/4" Lg. OR Tube, Plastic, 3" Lg.	2	10649A102
11	Housing, Motor	2	10649A116
12	Oil, Transformer (5 Gal. Can)	1.6 Gal.	22571D
13	Cap Screw, Socket Hd., 3/8"-16 x 1 1/4"	4	11009A6K
14	Lubricant, "Never Seez" Cat. No. NSBT-8, 8 Oz. Can	1	6106A27
15	Gasket, Vellumold	1	22386A
16	Case, Volute	1	22581A
17	Machine Screw, Socket Flat Hd., 5/16"-18 x 1 1/4"	1	22582D
18	Sealant, Loctite Grade 271	1	7597A21
19	Retainer, Impeller	1	14550A1
20	Machine Screw, Socket Flat Hd., 5/16"-18 x 1"	2	22585A
21	Washer, Finger Spring	2	7597A17
22	Bearing, Ball	1	19331A6
23	Rotor with Shaft Shaft Only (For All 3 & 5 HP Units)	1	8565A22
24	Stator	1	See Chart
25	Bearing, Ball	1	22573C100
26	Housing, Seal	1	See Chart
27	Seal, 1 1/4" Shaft	2	8565A23
28	Ring, Retaining	1	22576D
29	"O" Ring, 7" x 6 3/4" x 1/8"	1	22577A
30	Electrode, Wire	2	12558A8
31	Ferrule, Rubber	1	5876A114
32	Plug, Special	1	22578A
33	Housing, Lower Seal, with Bearing	1	22579A
34	"O" Ring, 6" x 5 3/4" x 1/8"	1	21577A
35	Cap Screw, Hex Hd., 7/16"-14 x 1 1/4"	4	22580C
36	Impeller, Pump, 3 HP (Specify O.D.) OR Impeller, Pump, 5 HP (Specify O.D.)	1	5876A113
37	Impeller, Grinder	1	19102A20
38	Ring, Shredding	1	22583B510
40	Clamp, Shredding Ring	1	22583B500
41	Cap Screw, Hex Hd., 3/8"-16 x 1"	4	22584C
42	Washer, 7/16" x 1 1/8" x 1/32" Thick	1	22586B
43	Cap Screw, Hex Hd., 7/16"-14 x 2 1/4"	4	22587C
44	Washer, Support	1	19101A10
45	Ring, Retaining	1	5030A126

Pump Cat. No.	(23) Rotor w/Shaft	(24) Stator Only	Stator w/Housing
WG30-01	22572C103	22574C118	22571D445K
WG30-21	22572C103	22574C100	22571D220K
WG30-03	22572C102	22574C101	22571D225K
WG30-23	22572C102	22574C102	22571D231K
WG30-43	22572C102	22574C102	22571D231K
WG30-53	22572C102	22574C104	22571D240K
WG50-01	22572C103	22574C118	22571D445K
WG50-21	22572C103	22574C100	22571D220K
WG50-03	22572C102	22574C101	22571D225K
WG50-23	22572C102	22574C102	22571D231K
WG50-43	22572C102	22574C102	22571D231K
WG50-53	22572C102	22574C104	22571D240K



WG30H, WG50H & WG75H Submersible Grinder Pumps Parts List

COVERS 3 & 5 HP — 1 AND 3 PHASE & 7½ HP — 3 PHASE





WG30H, WG50H & WG75H Submersible Grinder Pumps Parts List

Myers®

COVERS 3 & 5 HP - 1 AND 3 PHASE & 7½ hp - 3 PHASE

Ref. No.	Description	No. Req.	Part Number
1	Cord Cap Complete - 3 HP, 1Ø and All 3Ø	1	22569B010
	25' Cord	1	22569B900
	Length As Specified		
1	Cord Cap Complete - 5 HP, 1Ø	1	22569B011
	25' Cord	1	22569B901
	Length As Specified		
2	Connector	3	15781A007
3	Pipe Plug, ¼" NPT, Hex Hd.	2	5022A54
4	"O" Ring, 4 7/8" x 4 7/8" x 1/8"	1	5876A123
5	Cap Screw, Hex Hd., 7/16"-14 x 1 1/2"	4	19102A6
6	Cap, Upper Bearing	1	22590B
7	"O" Ring, 5 1/2" x 5 1/4" x 1/8"	1	5876A112
8	Machine Screw, #10-24 x 3/8" Lg.	1	5434A43
9	Lockwasher, #10	1	6107A15
10	Tube, Plastic, 1 1/4" Lg. OR Tube, Plastic, 3" Lg.	2 2	10649A102 10649A116
11	Housing, Motor	1	22571D
12	Oil, Transformer (5 Gal. Can)	1.6 Gal.	11009A6K
13	Cap Screw, Socket Hd., 3/8"-16 x 1"	4	6106A28
14	Lubricant, "Never Seez" Cat. No. NSBT-8, 8 Oz. Can	1	22386A
15	Gasket, Vellumoid	1	5231A78
16	Case, Volute	1	22639D
17	Machine Screw, Socket Flat Hd., 3/16"-18 x 1 1/4"	1	7597A21
18	Sealant, Loctite Grade 271	1	14550A1
19	Retainer, Impeller	1	22585A
20	Machine Screw, Socket Flat Hd., 3/16"-18 x 1"	2	7597A17
21	Washer, Finger Spring	2	19331A6
22	Bearing, Ball	1	8565A22
23	Rotor with Shaft Shaft Only (For All 3, 5, 7 1/2 HP Units)	1 1	See Chart 22637C100
24	Stator	1	See Chart
25	Bearing, Ball	1	8565A23
26	Housing, Seal	1	22576D
27	Seal, 1 1/4" Shaft	2	22577A
28	Ring, Retaining	1	12558A8
29	"O" Ring, 7" x 6 3/4" x 1/8"	1	5876A114
30	Electrode, Wire	2	22578A
31	Ferrule, Rubber	1	22579A
32	Plug, Special	1	21577A
33	Housing, Lower Seal, with Bearing	1	22638C
34	"O" Ring, 6" x 5 3/4" x 1/8"	1	5876A113
35	Cap Screw, Hex Hd., 7/16"-14 x 1 1/4"	4	19102A20
36	Impeller, Pump, 3 HP (Specify O.D.) OR Impeller, Pump, 5-7 1/2 HP (Specify O.D.)	1 1	22583B502 22640C501
37	Impeller, Grinder	1	26010B000
38	Ring, Shredding	1	25134B000
40	Clamp, Shredding Ring	1	22643B
41	Cap Screw, Hex Hd., 3/8"-16 x 1"	4	19101A10
42	Washer, 7/16" x 1 1/16" x 1/32" Thick	1	5030A126
43	Cap Screw, Hex Hd., 7/16"-14 x 2 1/4"	4	19102A23
44	Washer, Support	1	05030A215
45	Ring, Retaining	1	12558A025

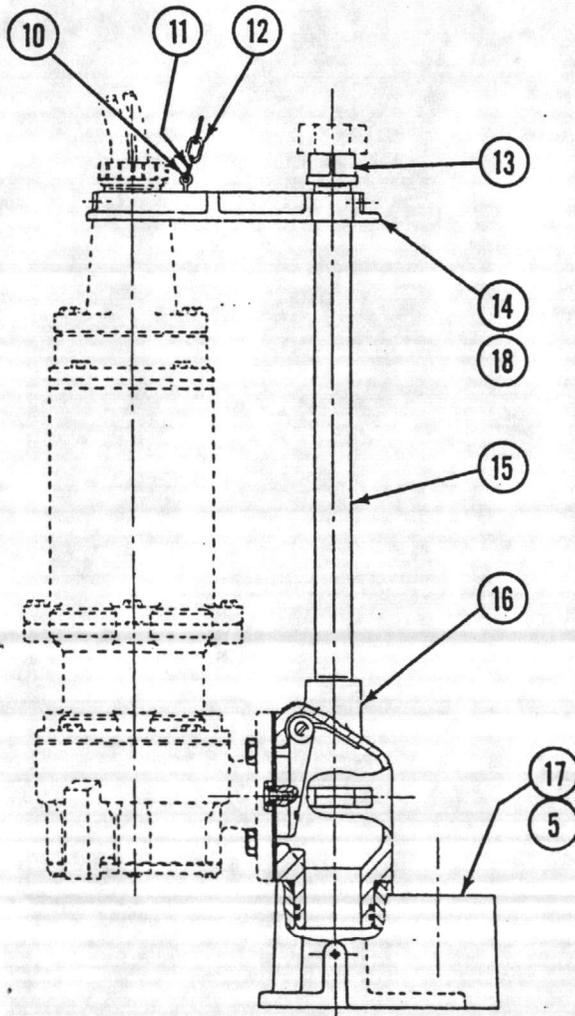
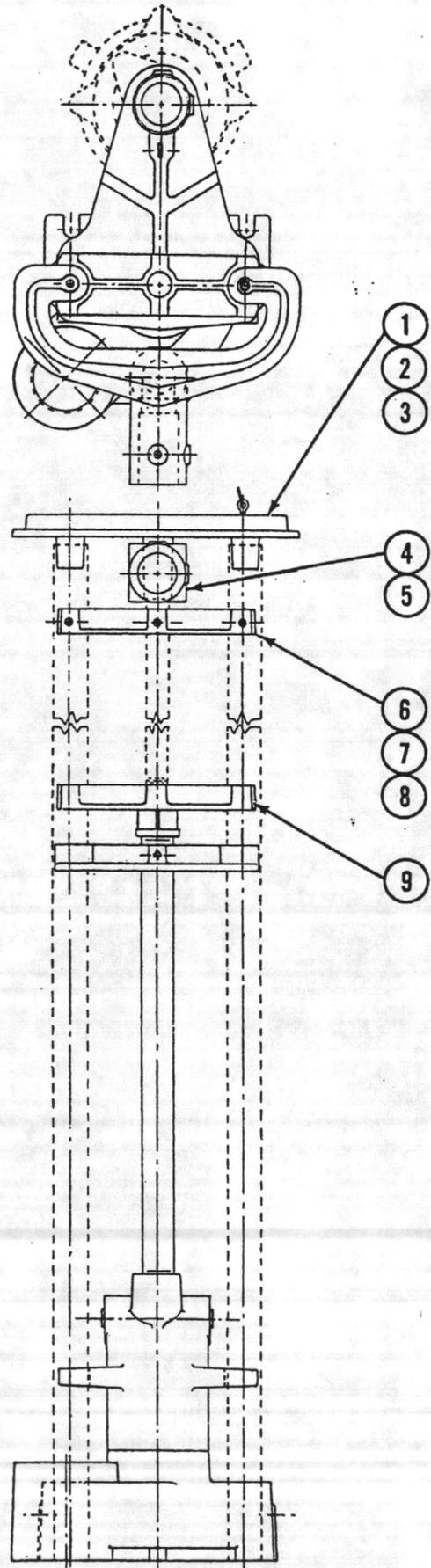
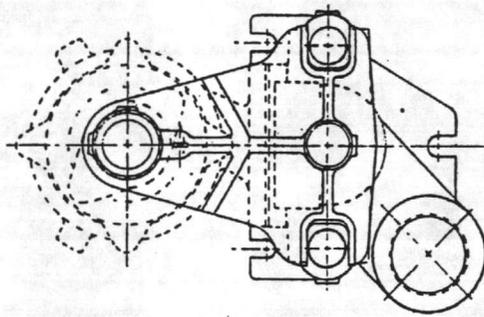
Pump Cat. No.	②③ Rotor w/Shaft	②④ Stator Only	Stator w/Housing
WG30H-21	22636C101	22574C110	22571D245K
WG30H-03	22636C100	22574C111	22571D250K
WG30H-23	22636C100	22574C112	22571D255K
WG30H-43	22636C100	22574C112	22571D255K
WG30H-53	22636C100	22574C114	22571D265K
WG50H-21	22636C103	22574C100	22571D220K
WG50H-03	22636C102	22574C101	22571D225K
WG50H-23	22636C102	22574C102	22571D231K
WG50H-43	22636C102	22574C102	22571D231K
WG50H-53	22636C102	22574C104	22571D240K
WG75H-03	22636C102	22574C101	22571D225K
WG75H-23	22636C102	22574C102	22571D231K
WG75H-43	22636C102	22574C102	22571D231K
WG75H-53	22636C102	22574C104	22571D240K

Effective after Sept. 1, 1990. New impeller and ring are interchangeable with previous impeller and ring.



RWG Series Rail System Parts List

Myers®





RWG Series Rail System Parts List

Myers®

Ref. No.	Description	No. Req.	Part Numbers			
			Standard		Explosion Proof	
			RWGRH-300	RWGLH-300	RWGXRH-300	RWGXLH-300
1	Guide, Upper Rail	1	22610C	22610C	22610C	22610C
2	Eye Bolt, 3/8"-16 UNC x 1" Eye	1	21929A2	21929A2	21929A2	21929A2
3	Clevis, Chain Shackle, 1/4" Screw Type	1	22417A1	22417A1	22417A1	22417A1
4	Support, Rail Guide	1	22611B	22611B	22611B	22611B
5	Set Screw, Square Hd., 7/16"-14 UNC x 1"	6	5057A31	5057A31	5057A31	5057A31
6	Plate, Top Hold-down	1	22612B	22612B	22612B2	22612B2
7	Cap Screw, Hex Hd., 7/16"-14 UNC x 1"	4	19102A21	19102A21	19102A21	19102A21
8	Cap Screw, Hex Hd., 7/16"-14 UNC x 1 1/4"	2	19102A20	19102A20	19102A20	19102A20
9	Plate, Bottom Hold-down	1	22612B1	22612B1	22612B3	22612B3
10	Eye Bolt, 1/2"-13 UNC x 1 3/16" Eye	1	21929A3	21929A3	21929A3	21929A3
11	Clevis, Chain Shackle, 3/16" Screw Type	1	22417A2	22417A2	22417A2	22417A2
12	Chain Assembly, 3/16" x 15 Ft.	1	23531A	23531A	23531A	23531A
13	Cap, 1 1/4" Pipe	1	5737A15	5737A15	5737A15	5737A15
14	Bracket, Top Guide	1	22613C	22613C	22613C1	22613C1
15	Pipe, 1 1/4" x 23"	1	5917A129	5917A129	5917A129	5917A129
16	Check Valve Assembly Complete	1	22602D	22602D	22602D1	22602D1
	Body, Check Valve	1	22604D	22604D	22604D1	22604D1
	Valve, Flapper	1	22605B10	22605B10	22605B11	22605B11
	Shaft	1	22607A	22607A	22607A	22607A
	Bearing, .627 x .878 x 3/4" Lg.	2	5806A36	5806A36	5806A36	5806A36
	Spring	1	22608B	22608B	22608B	22608B
	Pipe Plug, 3/4" NPT, (Crsk. Hd.)	2	5022A19	5022A19	5022A19	5022A19
	Gasket, Beveled Rubber, 3 1/2" I.D.	1	5085A9	5085A9	5085A9	5085A9
	"O" Ring, 3 3/8" x 3" x 3/16"	2	5876A97	5876A97	5876A97	5876A97
	Gasket, Rubber 7" x 4" x 1/8" Thick	1	5231A77	5231A77	5231A77	5231A77
	Cap Screw, Hex Hd., 3/8"-11 x 1 1/2"	4	19105A3	19105A3	19105A3	19105A3
17	Case, Discharge	1	22609D	22609D1	22609D	22609D1
18	Set Screw, Sk. Hd., 7/16"-14 UNC x 3/4" Lg.	3	6024A10	6024A10	6024A10	6024A10

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