



DEPARTMENT OF THE NAVY  
OFFICER IN CHARGE  
NAVAL FACILITIES ENGINEERING COMMAND CONTRACTS  
CAMP LEJEUNE, NORTH CAROLINA 28542

IN REPLY REFER TO: —

JAX/02/MLE/fao  
N62470-81-C-3554  
16 May 1983

From: Officer in Charge of Construction, Jacksonville, North Carolina Area  
To: Base Maintenance Officer

Subj: Contract N62470-81-C-3554, Repairs to Water Plant Equipment, MCB, Camp  
Lejeune, NC

Encl: (1) Operation & Maintenance Manuals (3 copies)

1. Enclosure (1), submitted by the Contractor under the subject contract,  
is forwarded for your use in the maintenance and operation of the facility.

M. L. ENNETT  
By direction

Received By: \_\_\_\_\_

Date: \_\_\_\_\_

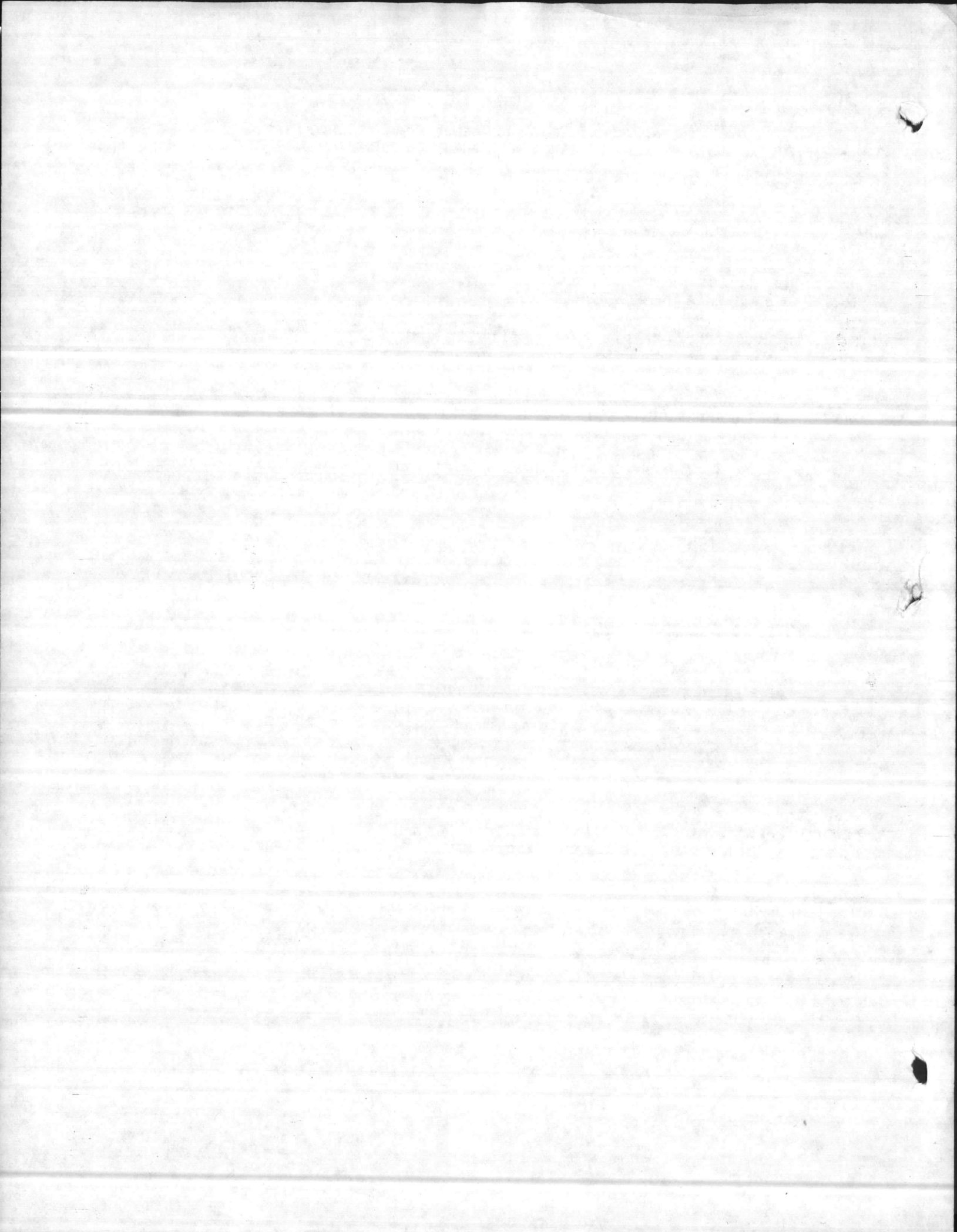
(sign and return enclosed copy)

Copy to:

→ PWO (Records Section) w/encls

Contract folder w/o encl (signed copy)

4068723



**RAY STURGILL & ASSOCIATES, INC.**

1883 I-85 SOUTH, CHARLOTTE, NORTH CAROLINA 28208, (704) 392-5301

US MARINE CORPS BASE  
Camp Lejeune, NC

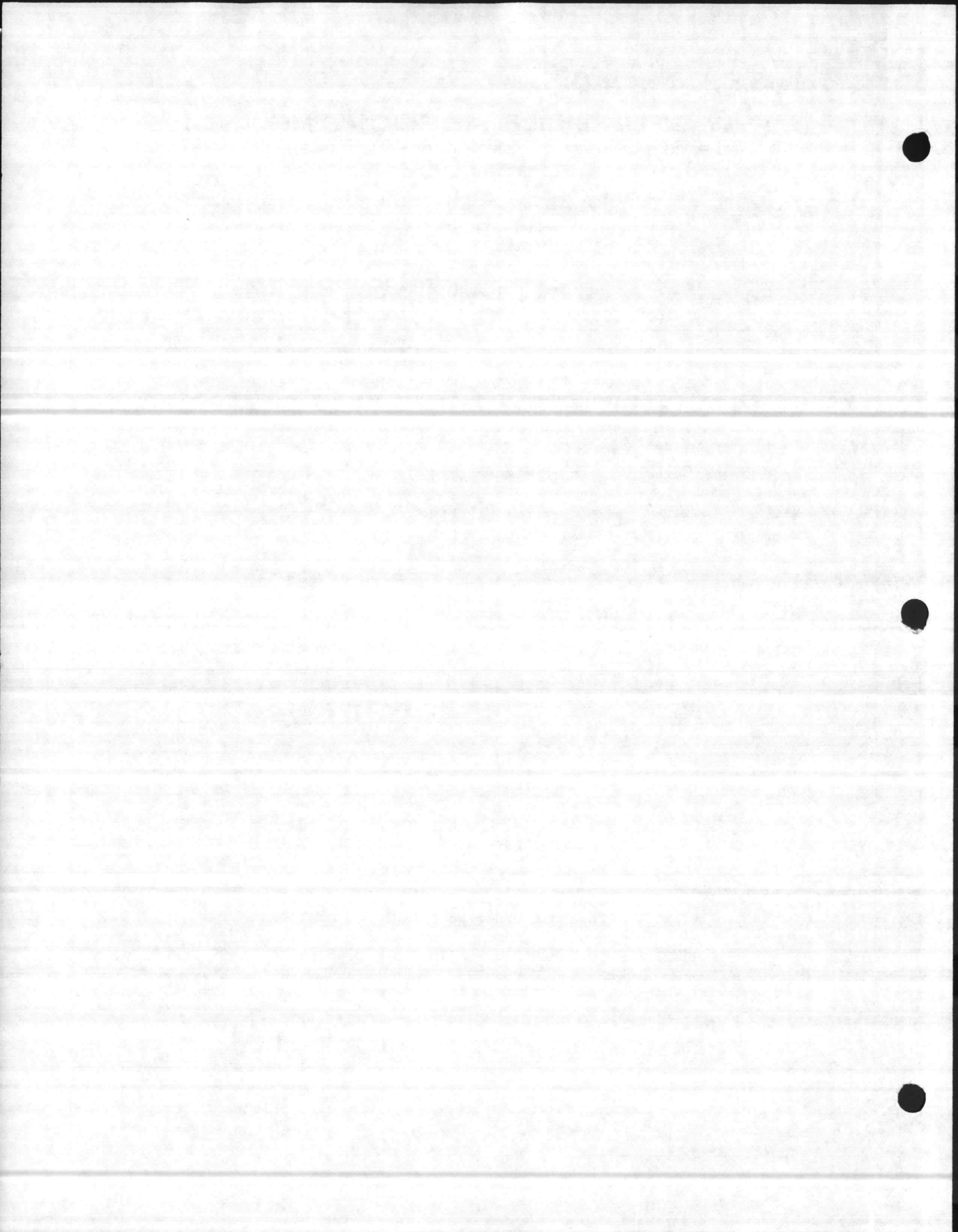
REPAIRS TO WATER PLANT EQUIPMENT  
CONTRACT NO. N62470-81-B-3554

INSTRUMENTATION  
OPERATION & MAINTENANCE  
MANUALS

CONTRACTOR: East Coast Construction Company  
Jacksonville, NC  
Purchase Order No: 1181

ENGINEERS: Design Div., Public Works Department  
Marine Corps Base, Camp Lejeune, NC

4062723



## INSTRUMENTATION EQUIPMENT LIST

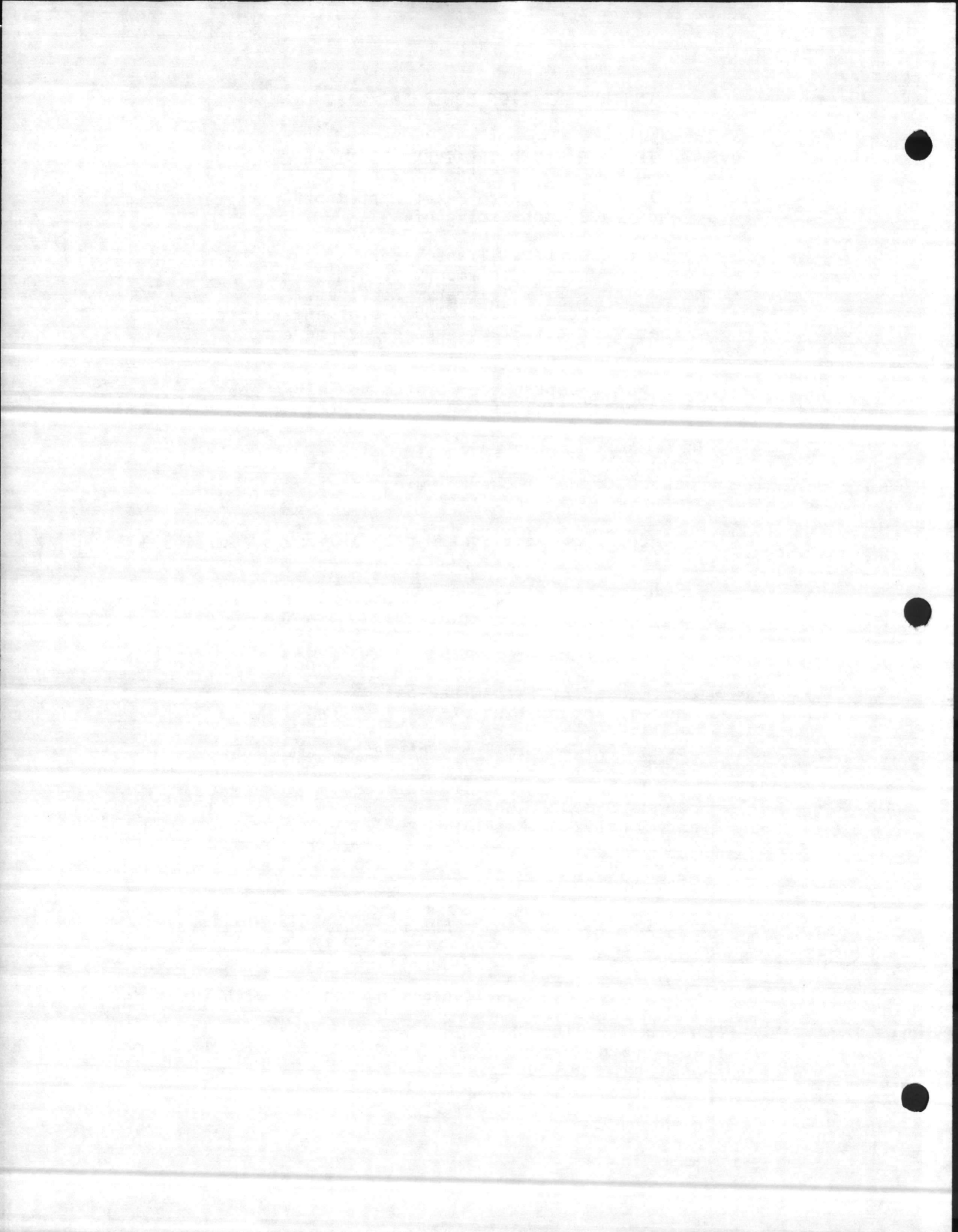
### TARAWA TERRACE WATER TREATMENT PLANT-SHEET 3

- 1 - Elevated Tank Water Depth Meter System per paragraphs 4.4, 4.4.1, and 4.4.2, consisting of:
  - 1 - Foxboro Tank Level Transmitter.
  - 1 - Moore Industries Telemetry Transmitter.
  - 1 - Moore Industries Telemetry Receiver.
  - 1 - Foxboro Circular Chart Indicating and Recording Meter with auxiliary switch for the control of four (4) pumps.
  
- 1 - Reservoir Water Depth Meter System per paragraphs 4.3, 4.3.1, and 4.3.2, consisting of:
  - 1 - Drexelbrook Reservoir Level Transmitter.
  - 1 - Foxboro Circular Chart Indicating and Recording Meter.
  
- 1 - Service Water Flowmeter System per paragraphs 4.5, 4.5.1, and 4.5.2, consisting of:
  - 1 - Foxboro Rate-of-Flow Transmitter for use with existing 12" venturi.
  - 1 - Foxboro Circular Chart Indicating, Recording, and Totalizing Meter.
  
- 1 - Raw Water Flowmeter System per paragraphs 4.2.2, 4.6, 4.6.1, 4.6.2, and 5., consisting of:
  - 1 - Badger 10" Venturi Tube, cast-iron with 125# flanges.
  - 1 - Foxboro Rate-of-Flow Transmitter.
  - 1 - Foxboro Circular Chart Indicating, Recording and Totalizing Meter.

NOTE: The four (4) meters listed above will be provided for mounting in the existing panel.

### HADNOT POINT WATER TREATMENT PLANT-SHEETS 4 & 5

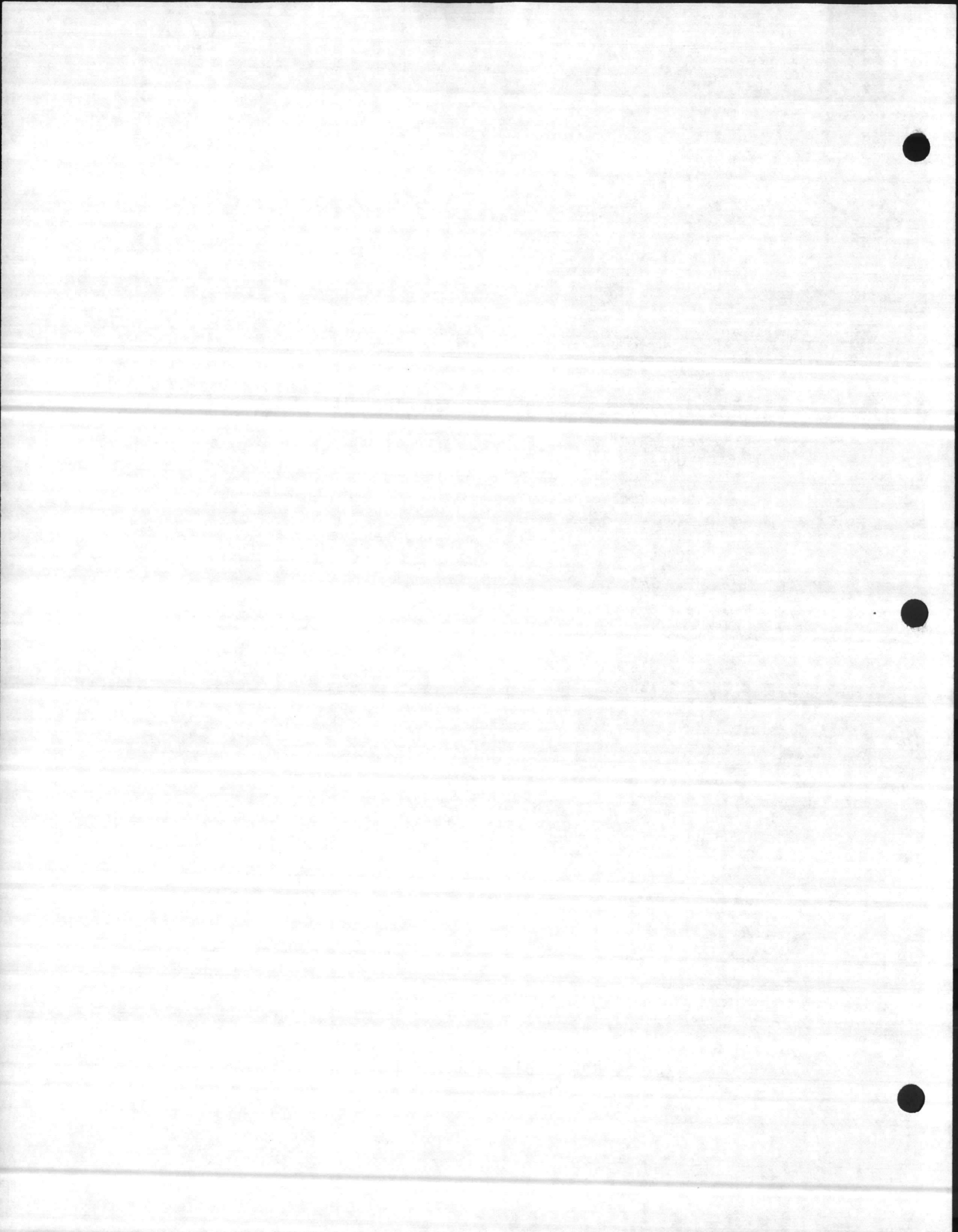
- 1 - Well Line Flowmeter System consisting of:
  - 1 - Foxboro Rate-of-Flow Transmitter for use with existing 16" venturi.
  - 1 - Foxboro Circular Chart Indicating, Recording, and Totalizing Meter.
  - 1 - Panel Box.



INSTRUMENTATION EQUIPMENT LIST - 2

HADNOT POINT (Continued)

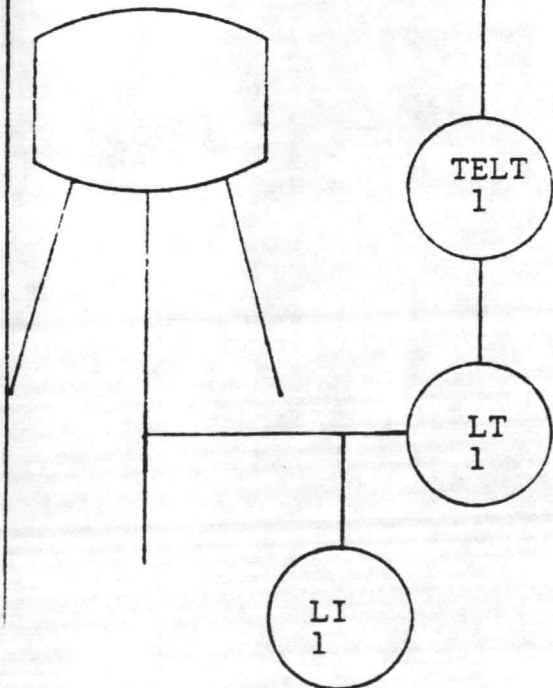
- 1--Service Line Flowmeter System per paragraphs 4.5, 4.5.1, and 4.5.2, consisting of:
  - 1--Foxboro Rate-of-Flow Transmitter for use with existing 16" venturi.
  - 1--Foxboro Circular Chart Indicating, Recording, and Totalizing Meter.
  - 1--Panel Box.
  
- 1--Raw Water Flowmeter System per paragraphs 4.2.1, 4.6, 4.6.1, and 4.6.2, consisting of:
  - 1--Foxboro 16" Orifice Plate with a pair of threaded end orifice flanges.
  - 1--Wallace & Tiernan Vacuum Flow Transmitter
  - 1--Foxboro Circular Chart Indicating, Recording, and Totalizing Meter for wall mounting.
  
- 5--8" OCV Rate-of-Flow Controllers per paragraph 4.7.
  
- 5--Kennedy 8" Butterfly Valves per paragraph 4.8 and per AWWA C504 mounted to Foxboro/Jordan electric motor actuators.





- LI-1 Altitude Gauge, 0-35 ft
- LT-1 Foxboro EllGM Level Transmitter per Work Sheet 2A-1, No. 3.  
0-35 ft. range, 4-20 mA output, suppression head 112 ft.
- TELT-1 Moore Ind. PDT Telemetering Transmitter in Nema 4 housing. 4-20 mA input. Pulse duration output.
- TELR-1 Moore Ind. PDR Telemetering Receiver. Pulse duration input. 4-20 mA output.
- LIR-1 Foxboro 40PR Level Indicating Recorder per Work Sheet 3-1, No. 1A  
0-35 ft. range, 4-20 mA input. Includes contacts to control 4 pumps through existing Automatic Program Control and indicate high water level alarm & telemetry reception outage.

Elevated Water Tank



TARAWA TERRACE WATER PLANT  
ELEVATED WATER TANK LEVEL

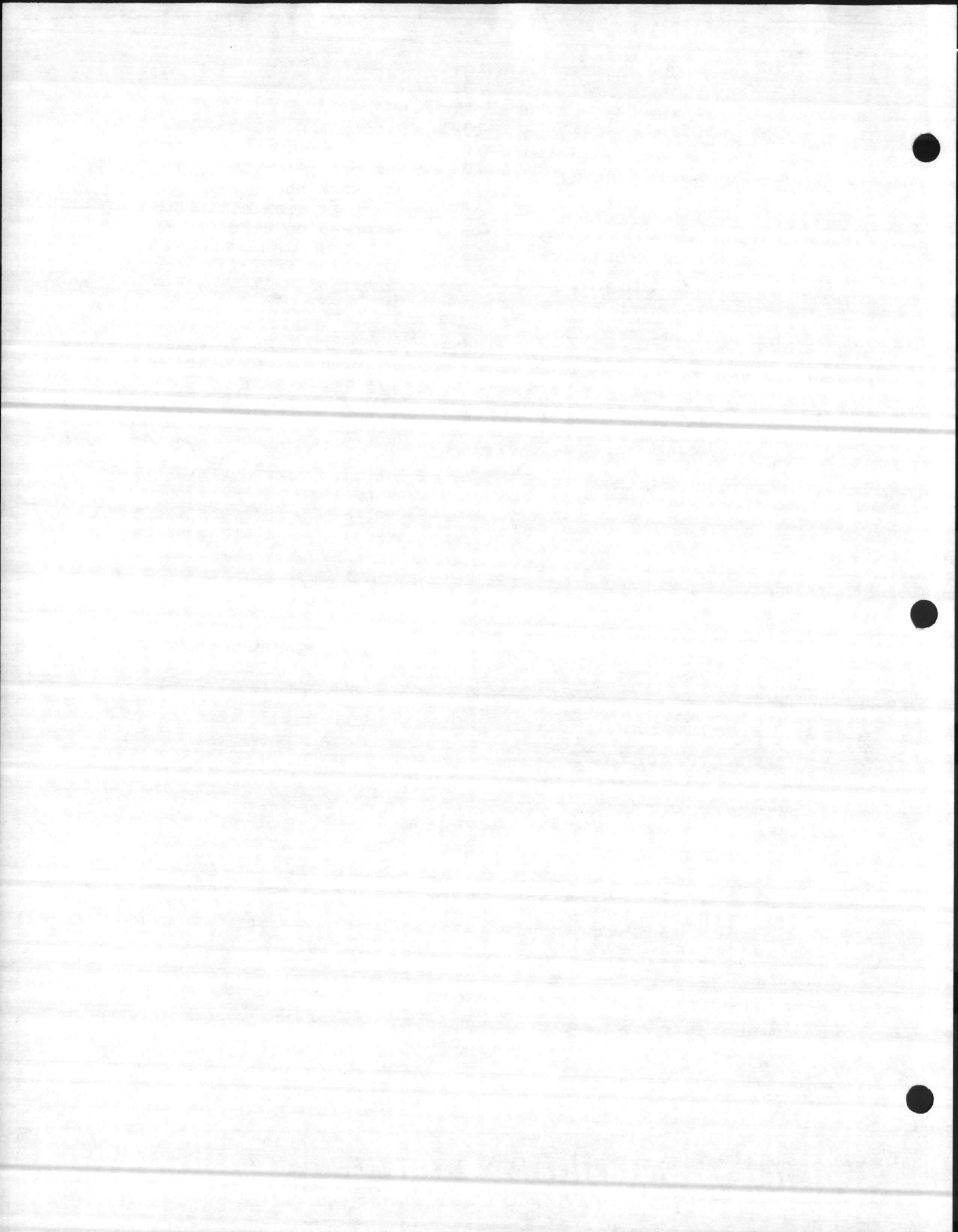
**HI-RAN SYSTEMS**

RAY STURDILL & ASSOCIATES, INC.

JOB  
CAMP LEJEUNE, N. C.

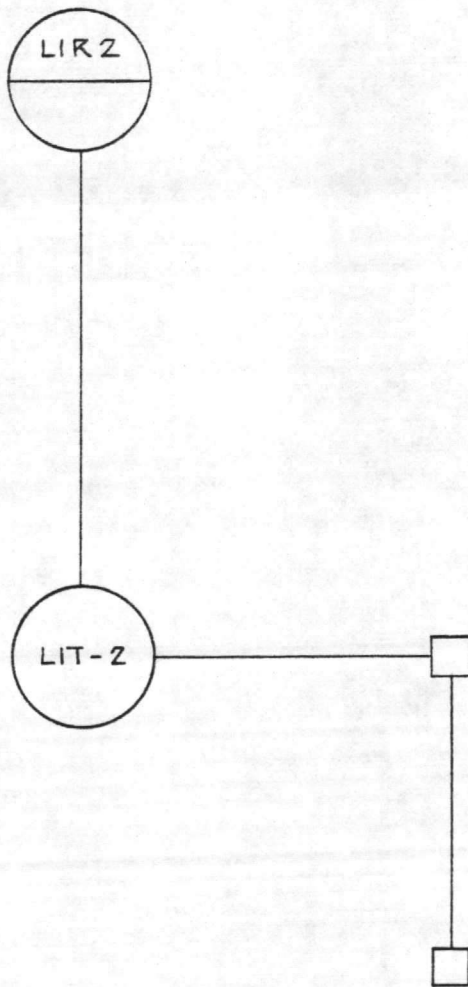
DATE  
12-20-81

DRAWING  
CL-811201-R1



LIT-2 Drexelbrook Engineering  
Level Transmitter with  
Indicator Reading 0-12 feet.  
Output 4-20 mA.

LIR-2 Foxboro 40PR Level Indicating  
Recorder per Work Sheet 3-1,  
No. 1A. Range: 0-12 feet.



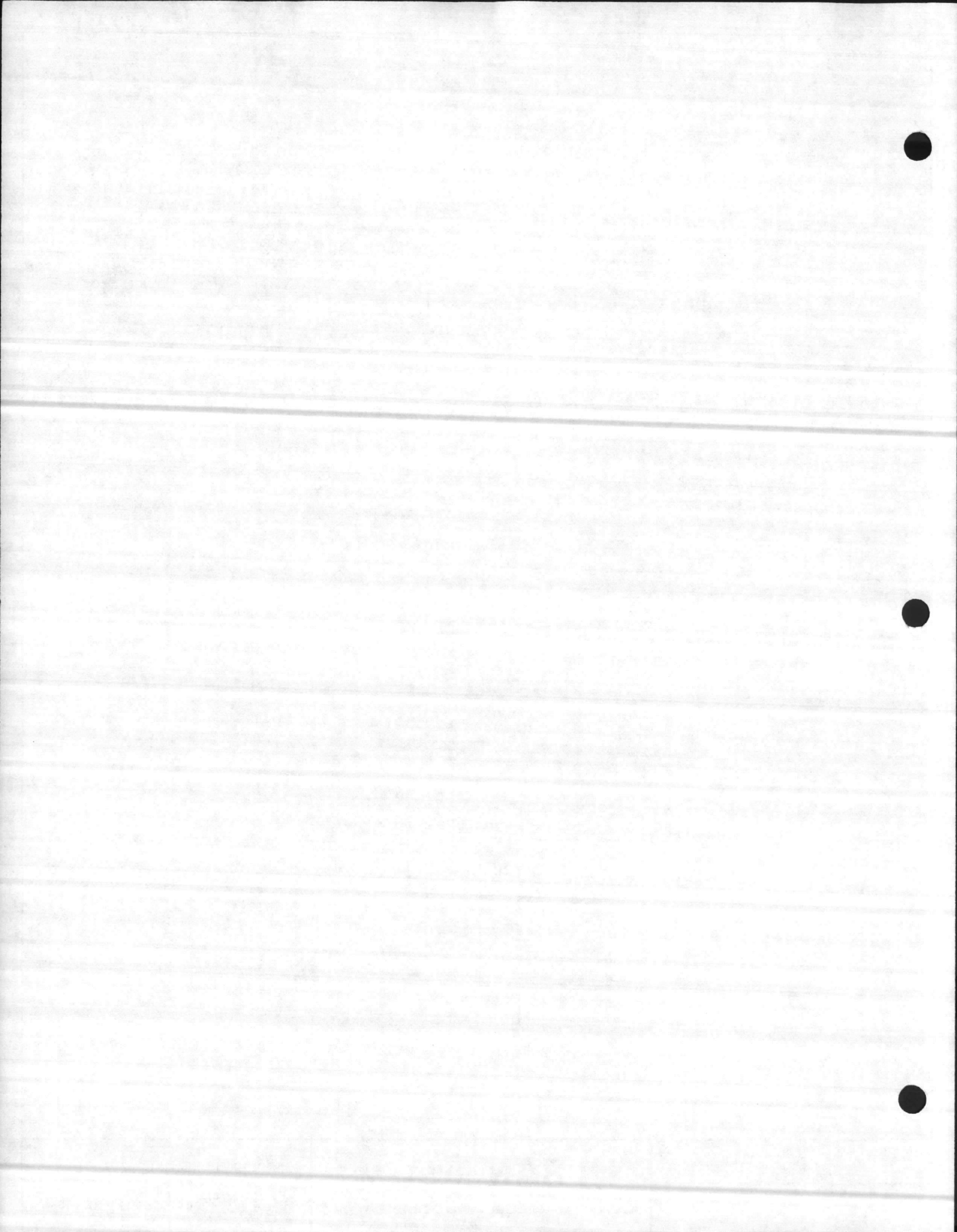
TARAWA TERRACE WATER  
PLANT  
RESERVOIR LEVEL

**HI-RAN SYSTEMS**  
RAY STURGILL & ASSOCIATES, INC.

JOB  
CAMP LEJEUNE, NC

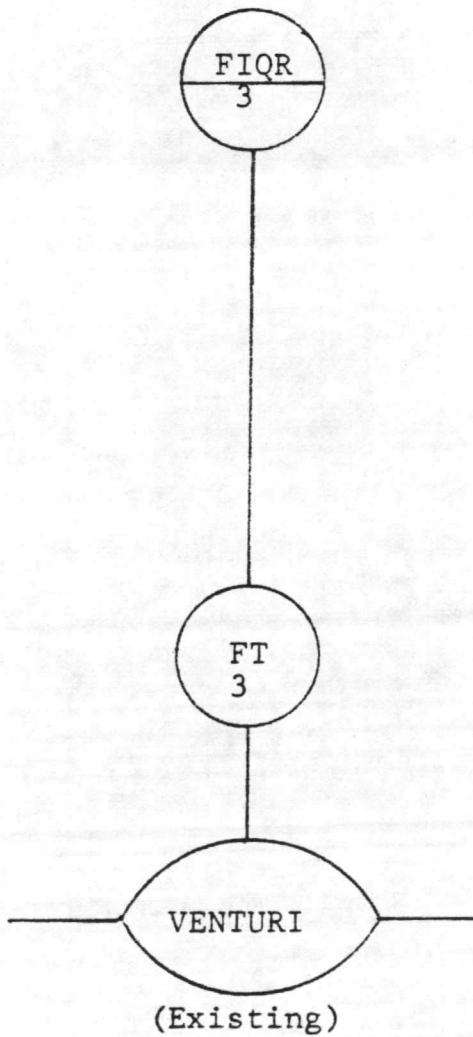
DATE 12-10-81

DRAWING  
CL-811202-R1



FT-3 Foxboro E13DM Flow Transmitter including 3 valve manifold and square root extractor. Range 0-2500 GPM. Calibrated for differential of 86" water at 2500 GPM. Output 4-20 mA. per Work Sheet 2A-1, No. 5A

FIQR-3 Foxboro 40 PR Indicating and Totalizing Recorder. Input 4-20 mA., 0-2500 GPM range. Per Work Sheet 3-1, No. 1A



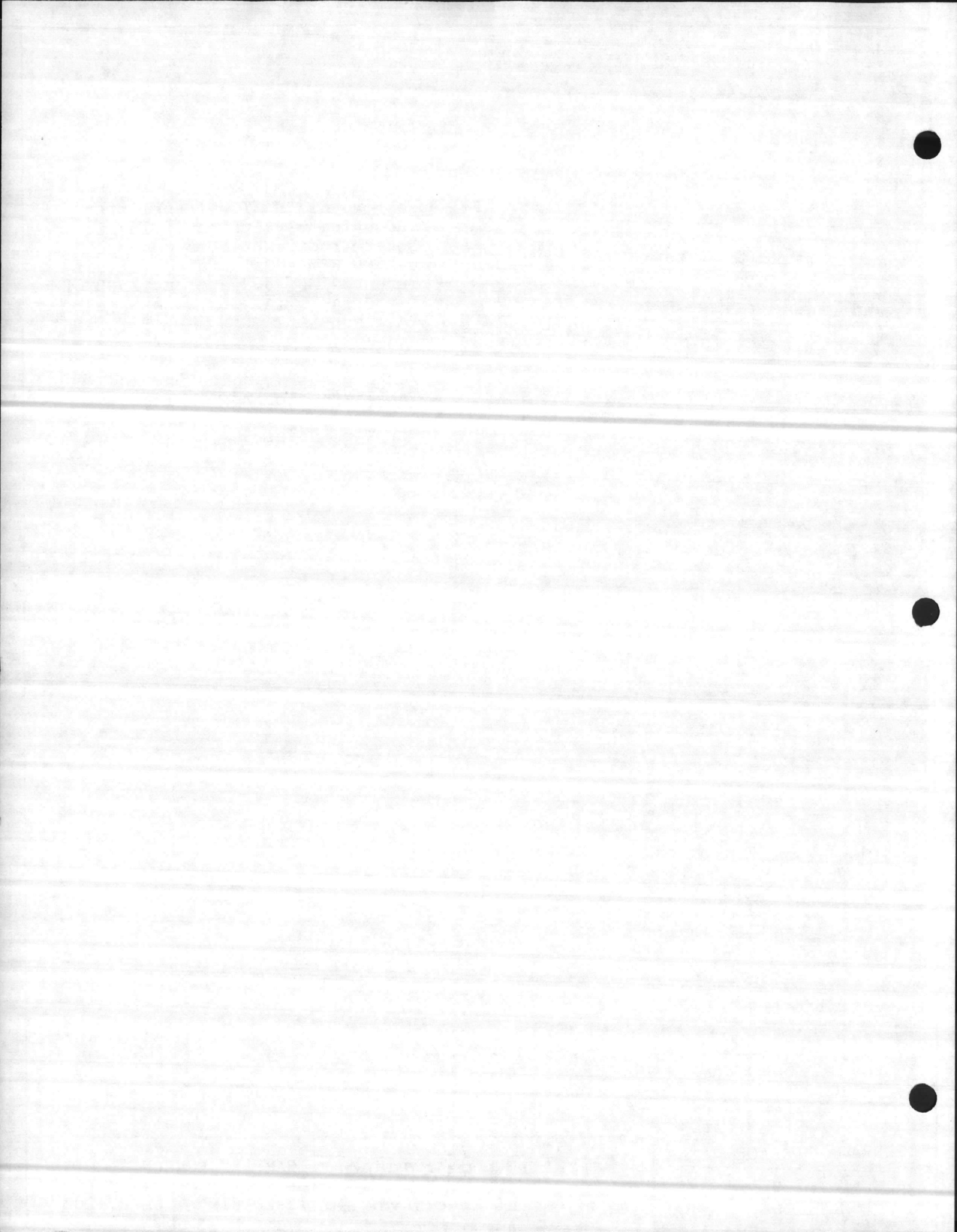
TERRAWA TERRACE WATER  
PLANT  
SERVICE WATER FLOW  
METERING

**HI-RAN SYSTEMS**  
RAY STURGILL & ASSOCIATES, INC.

JOB  
CAMP LEJEUNE, N.C.

DATE  
12-20-81

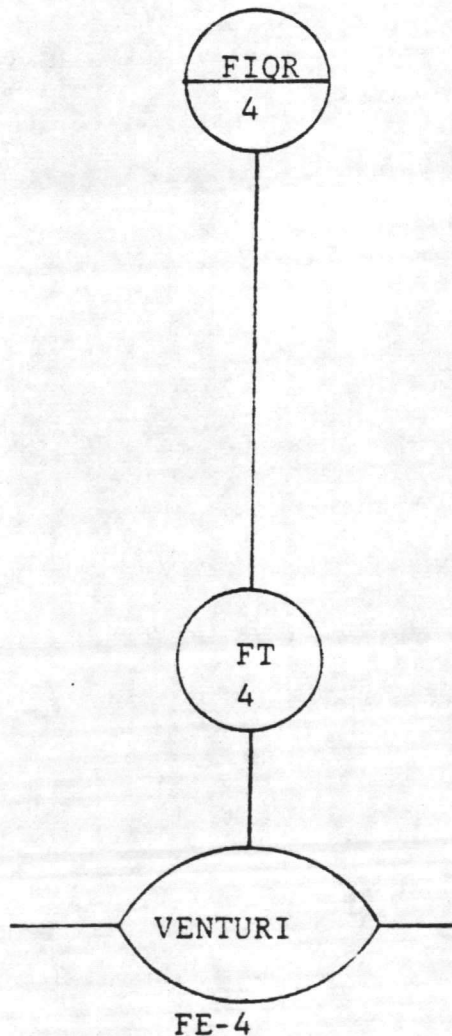
DRAWING  
CL-811203



FE-4 Badger 10" PMT-S Venturi Flow Tube, 125# flanged ends, Cast iron, bronze throat. Tube coated per MIL-P-24441.

FT-4 Foxboro E13DM Flow Transmitter, including 3 valve manifold and square root extractor. Range 0-1200 GPM. Output 4-20 mA per Work Sheet 2A-1, No. 5A. 0-23.99" Water at 1200 GPM

FIQR-4 Foxboro 40PR Indicating and Totalizing Recorder. Input 4-20 mA. 0-1200 GPM range. Per Work Sheet 3-1, No. 1A.



TARAWA TERRACE WATER PLANT  
RAW WATER FLOW METERING

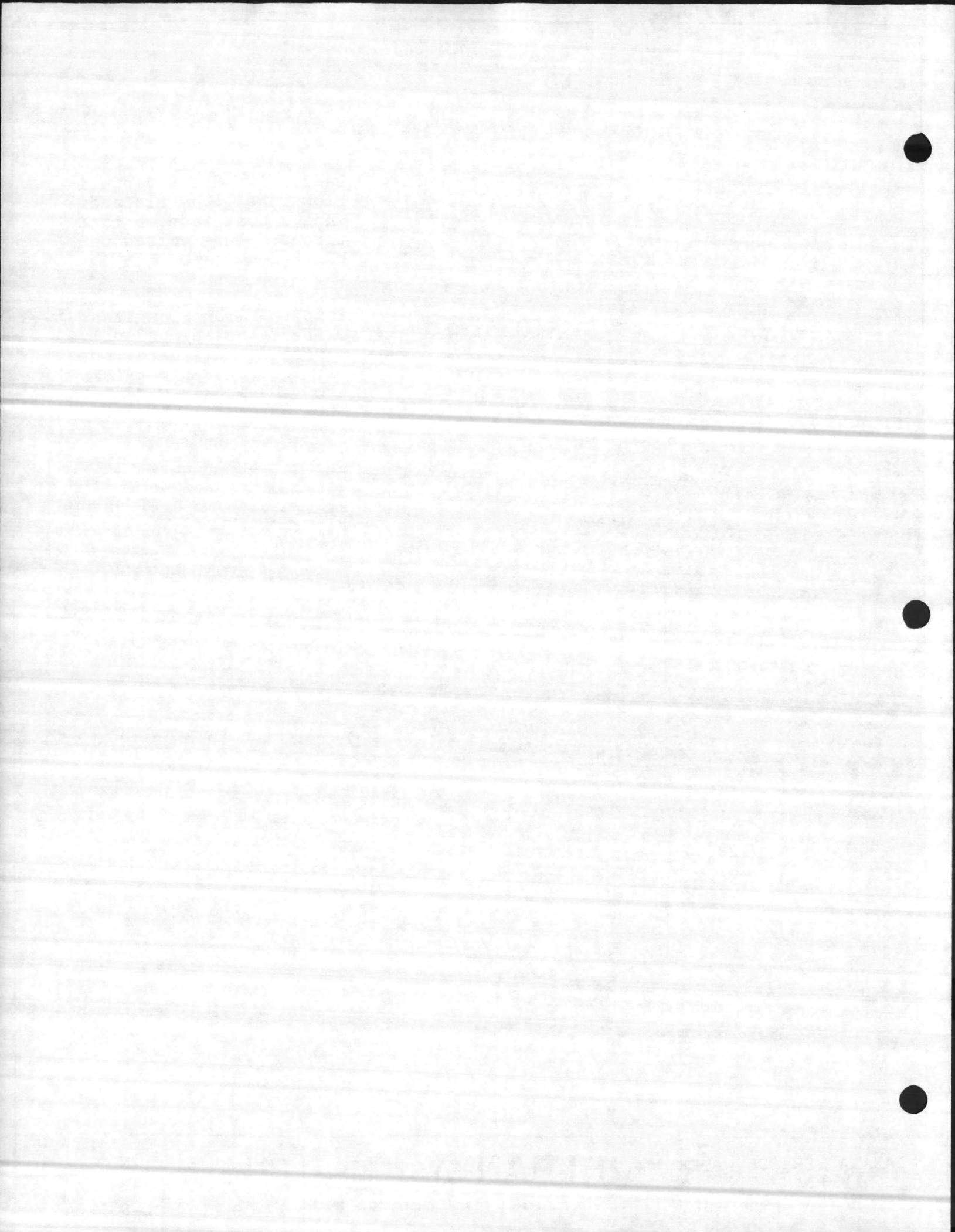
**HI-RAN SYSTEMS**

RAY STURDILL & ASSOCIATES, INC.

JOB  
CAMP LEJEUNE, N. C.

DATE  
12-20-81

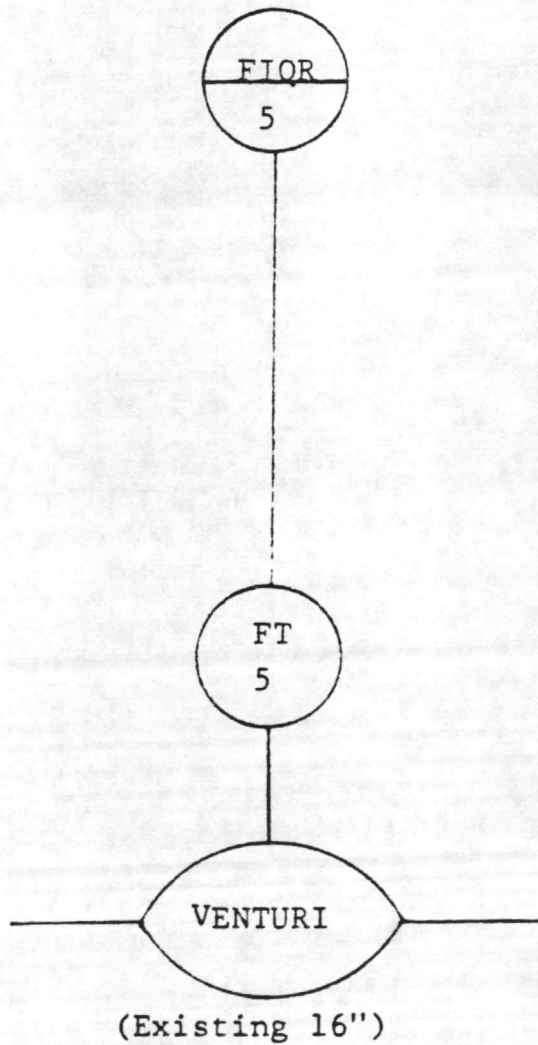
DRAWING  
CL-811204





FT-5 Foxboro E13DM Flow Transmitter, including 3 valve manifold and square root extractor. Range 0-6000 GPM. Output 4-20 mA per Work Sheet 2A-1, No. 5A.  
0-251.5" Water at 6000 GPM

FIQR-5 Foxboro 40PR Indicating and Totalizing Recorder. Input 4-20 MA, Range 0-6000 GPM per Work Sheet 3-1, No. 1A.



HADNOT POINT WATER  
TREATMENT PLANT  
WELL LINE FLOWMETER

**HI-RAN SYSTEMS**  
RAY STURDILL & ASSOCIATES, INC.

JOB

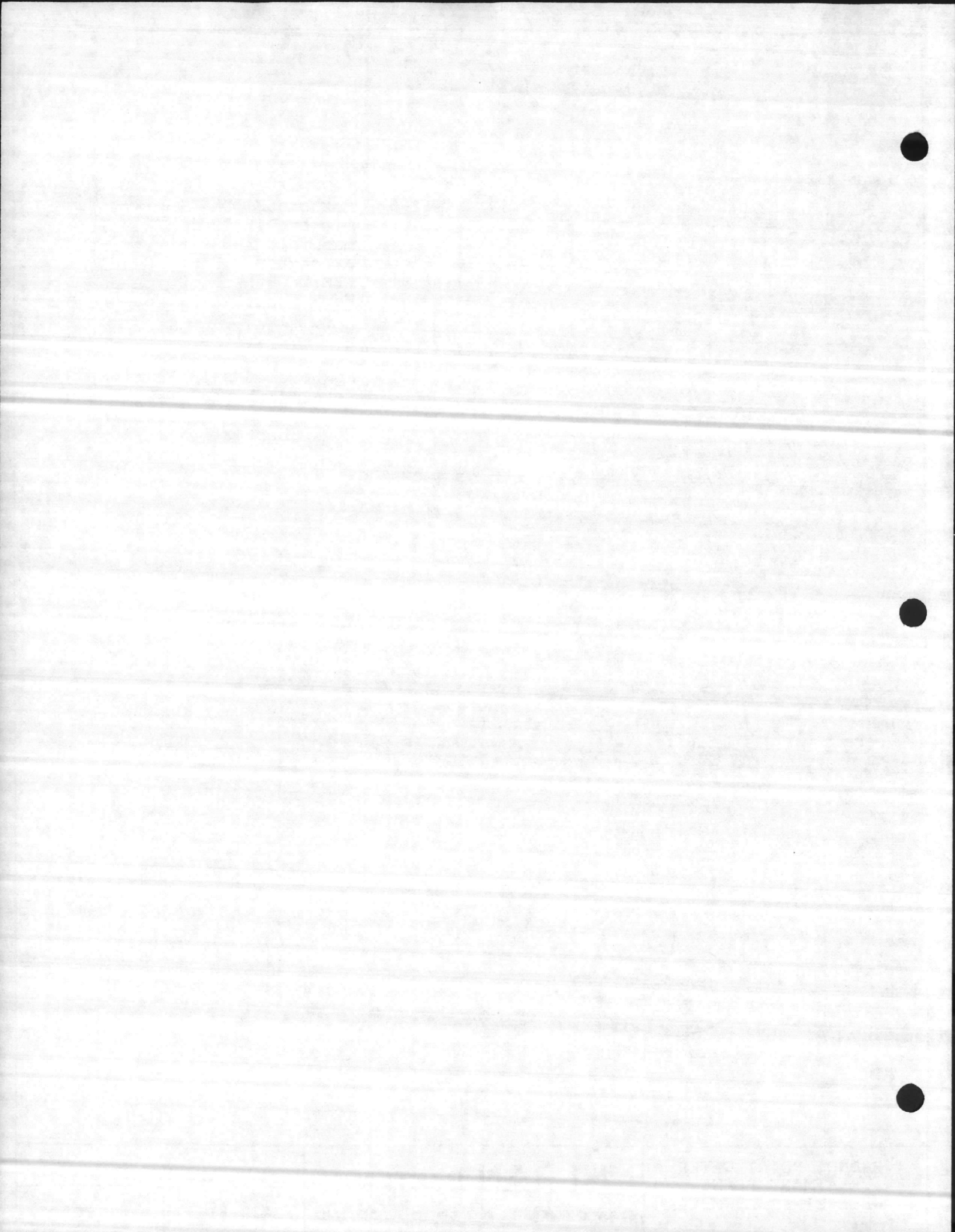
CAMP LEJEUNE, N. C.

DATE

12-20-81

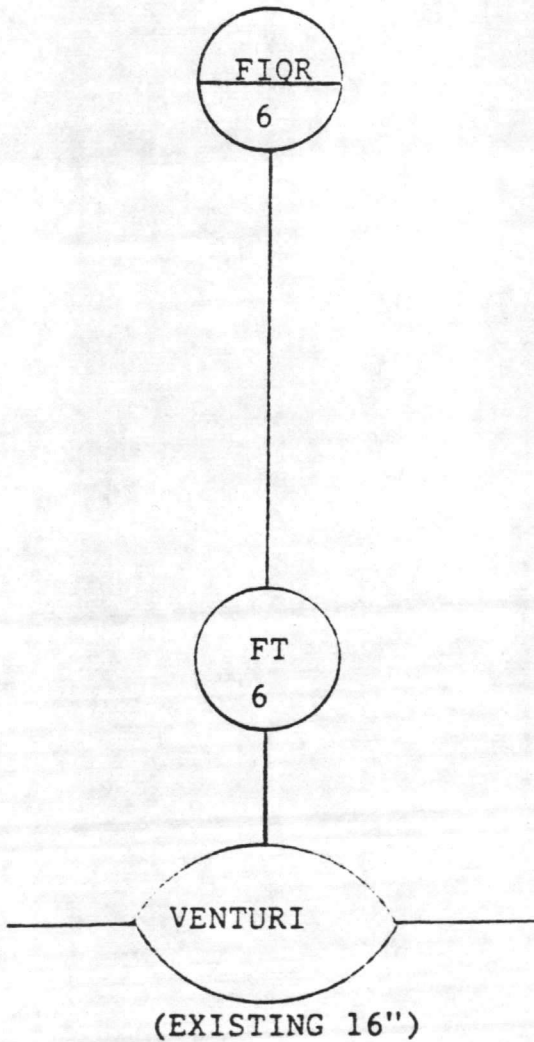
DRAWING

CL-811205



FT-6 Foxboro E13DM Flow Transmitter, including 3 valve manifold and square root extractor. Range 0-6000 GPM. Output 4-20 mA per Work Sheet 2A-1, No. 5A. 0-251.5" Water at 6000 GPM

FIQR-6 Foxboro 40P R Indicating and Totalizing Recorder. Input 4-20, mA Range 0-6000 GPM per Work Sheet 3-1, No. 1A.



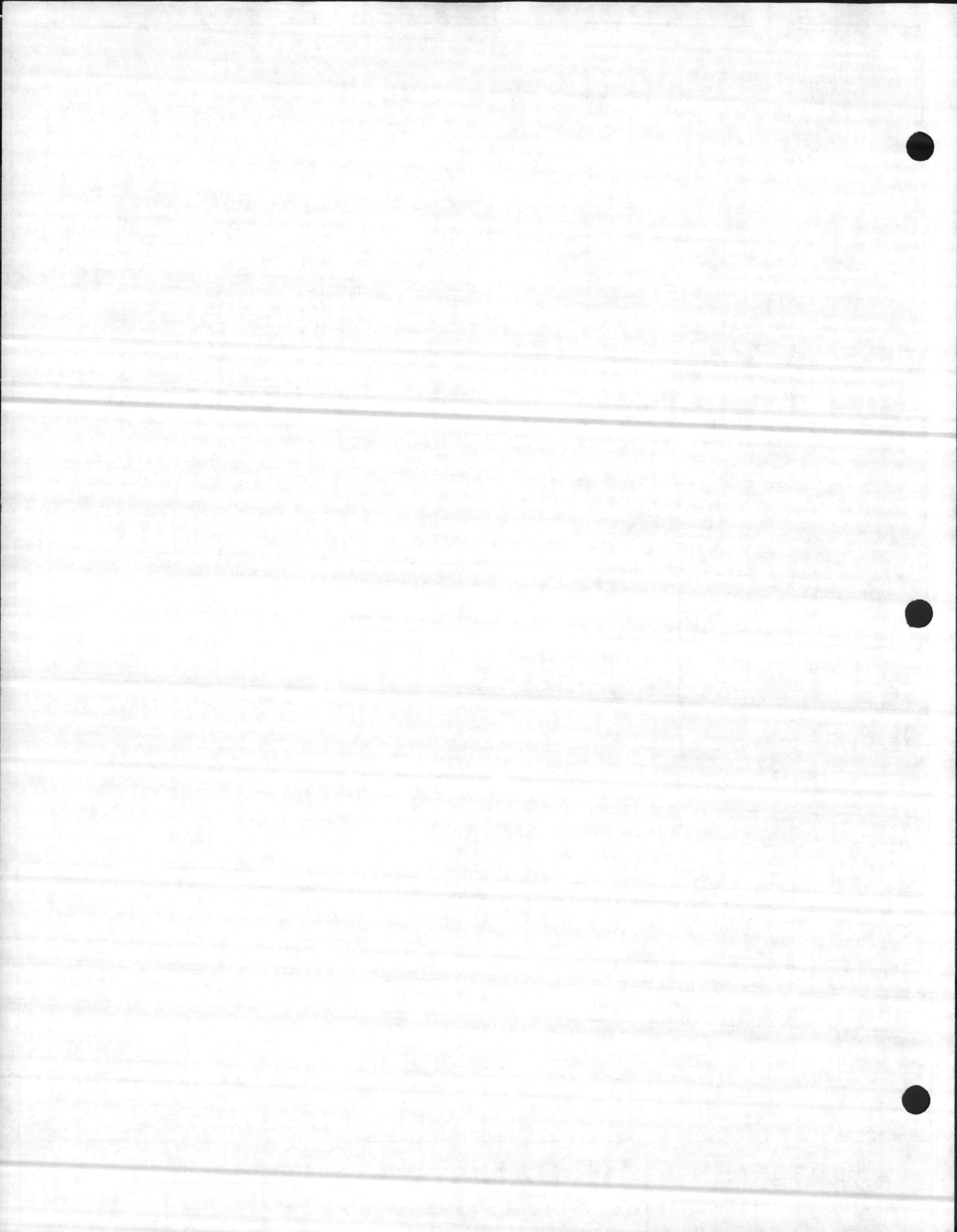
HADNOT POINT WATER  
TREATMENT PLANT  
SERVICE LINE FLOWMETER

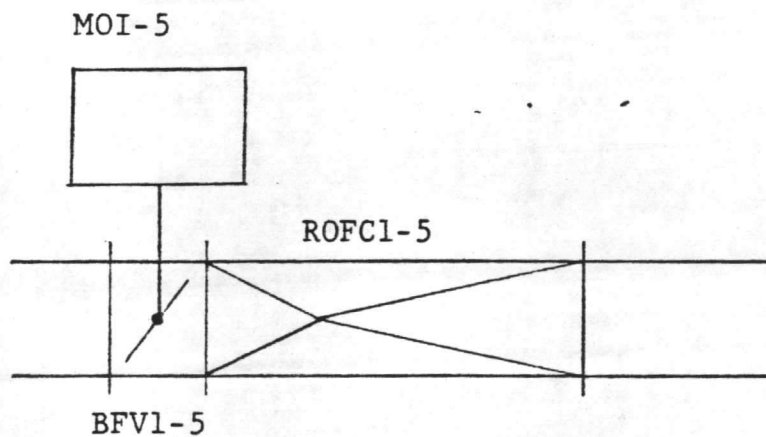
**HI-RAN SYSTEMS**  
RAY STURGILL & ASSOCIATES, INC.

JOB  
CAMP LEJEUNE, N. C.

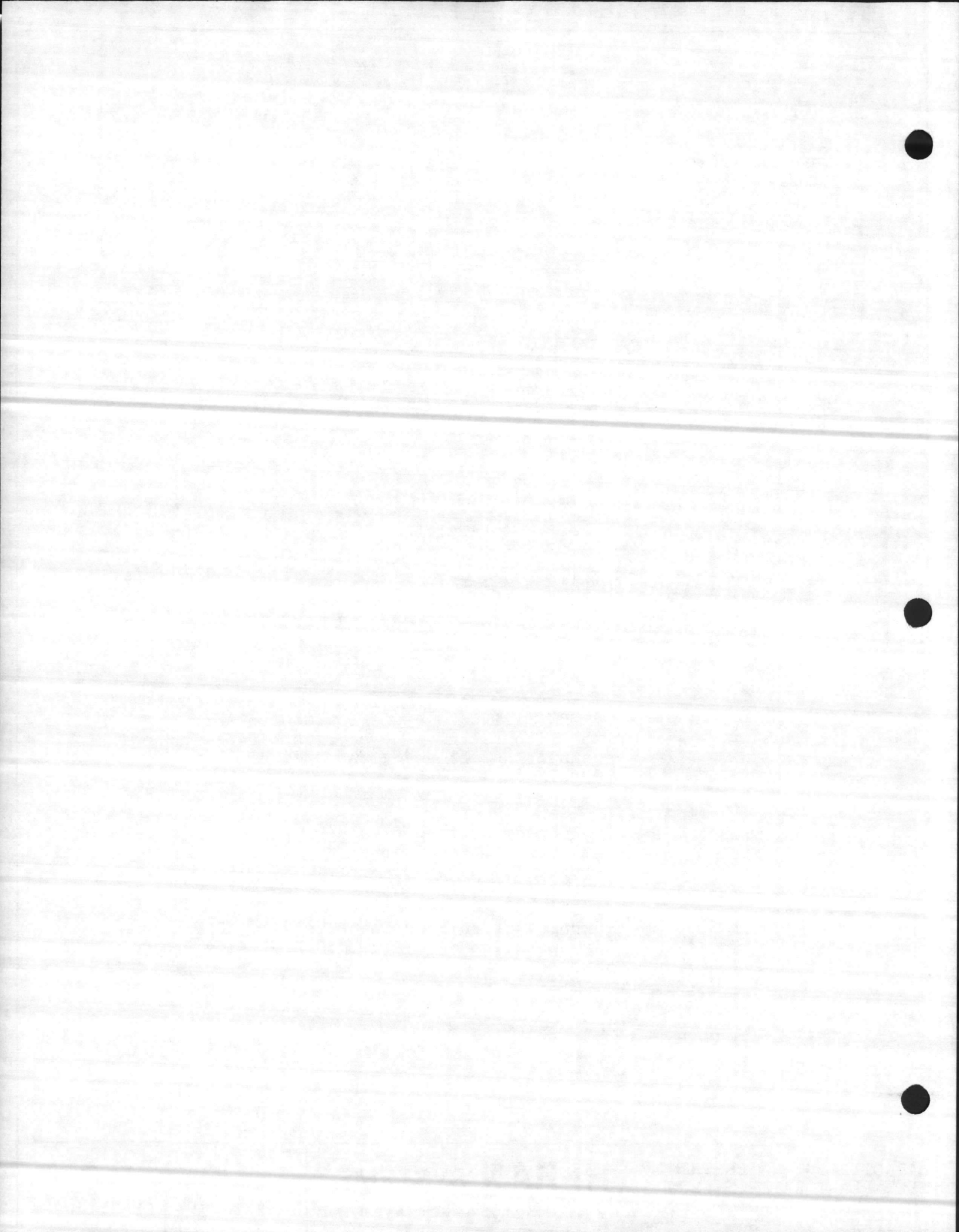
DATE  
12-20-81

DRAWING  
CL-811206





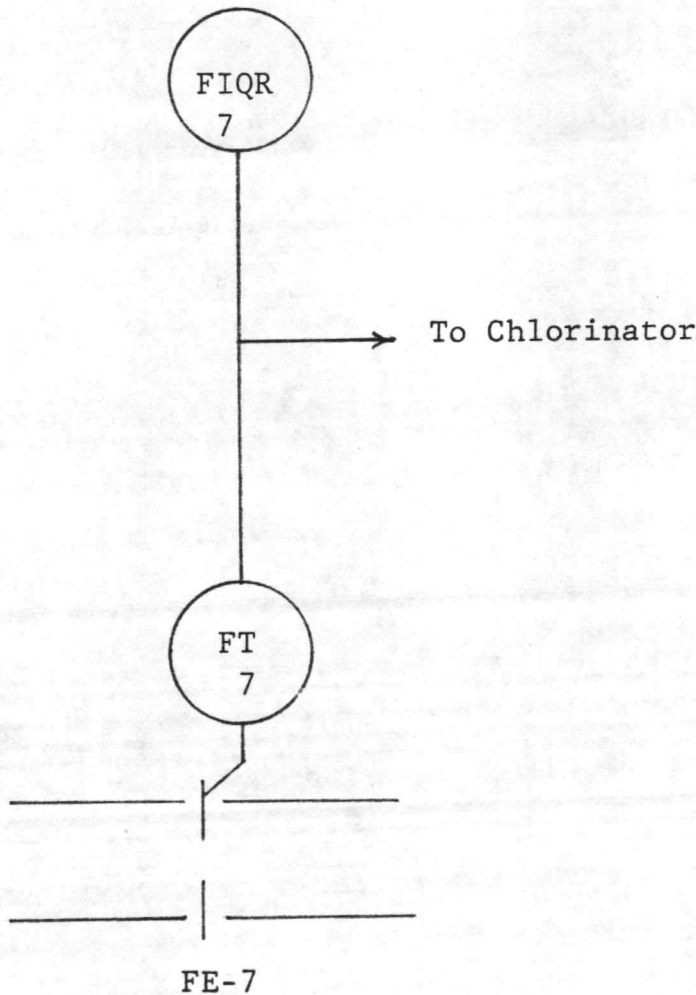
- ROFC1-5    5 - 8" OCV #120 G Rate-of-Flow Controllers. 125# flanges, globe type, cast iron with stainless steel shaft and spring. Rated 700 GPM at 125 psi.
- BFV1-5    5 - 8" Kennedy Vutterfly Valves, 125# flanges per AWWA C504 mounted to electric operators below.
- MOI-5    5 - Foxboro/Jordan 5120 Electric Valve Operators for operation on 120 v., 60 Hz., single phase power.



FE-7 16" Orifice Plate with 16" threaded orifice flanges. 120" water differential at 6000 GPM flow.

FT-7 Wallace & Tiernan A-746 Vacuum Transmitter. Range 0-6000 GPM Output 8-88" water vacuum to recorder and to chlorinator.

FIQR-7 Foxboro 40PR Indicating and Totalizing Recorder. Input 8-88" water vacuum Range 0-6000 GPM



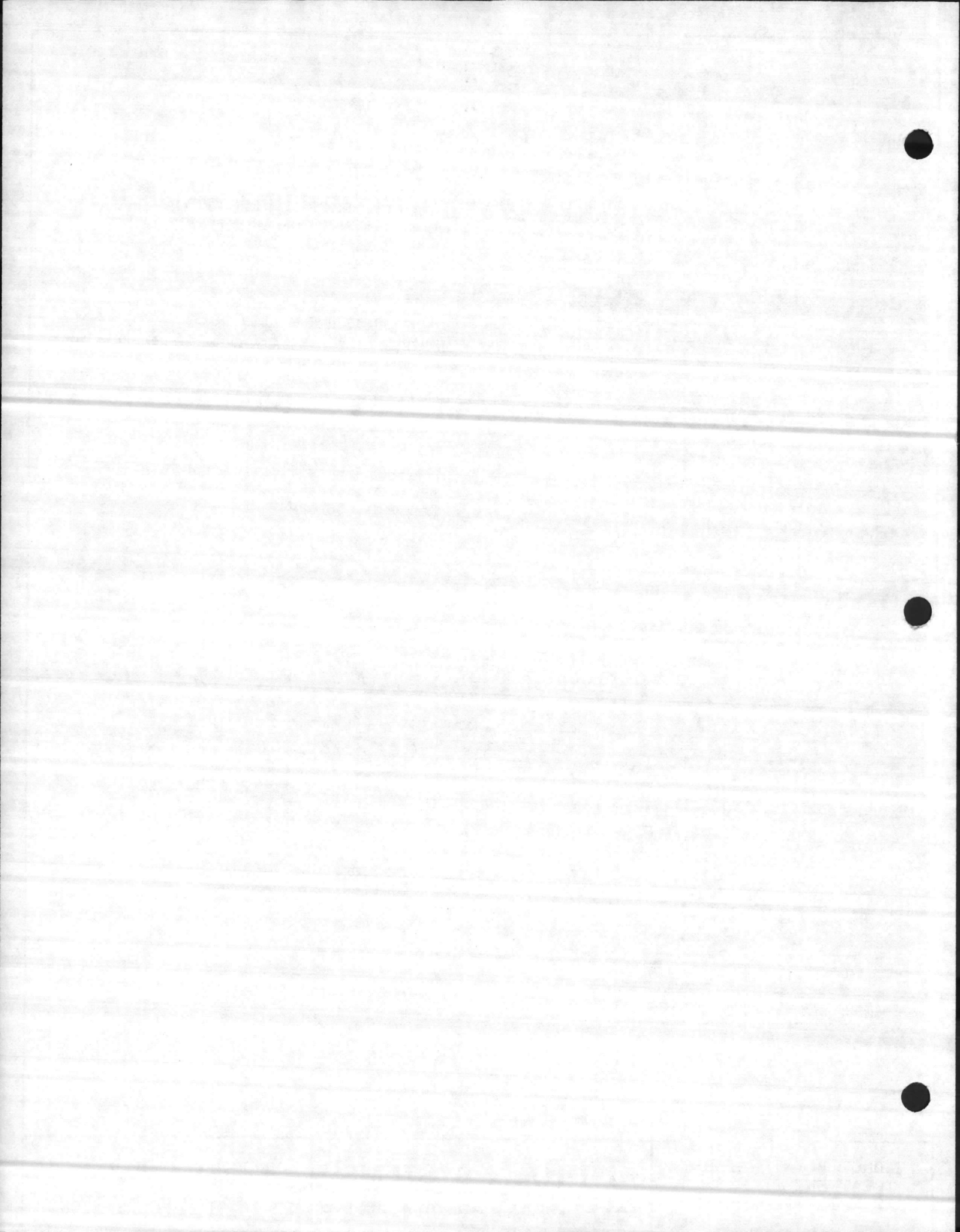
HADNOT POINT WATER  
TREATMENT PLANT  
RAW WATER FLOWMETER

**HI-RAN SYSTEMS**  
RAY STURGILL & ASSOCIATES, INC.

JOB  
CAMP LEJEUNE, N. C.

DATE  
12-20-81

DRAWING  
CL-811208





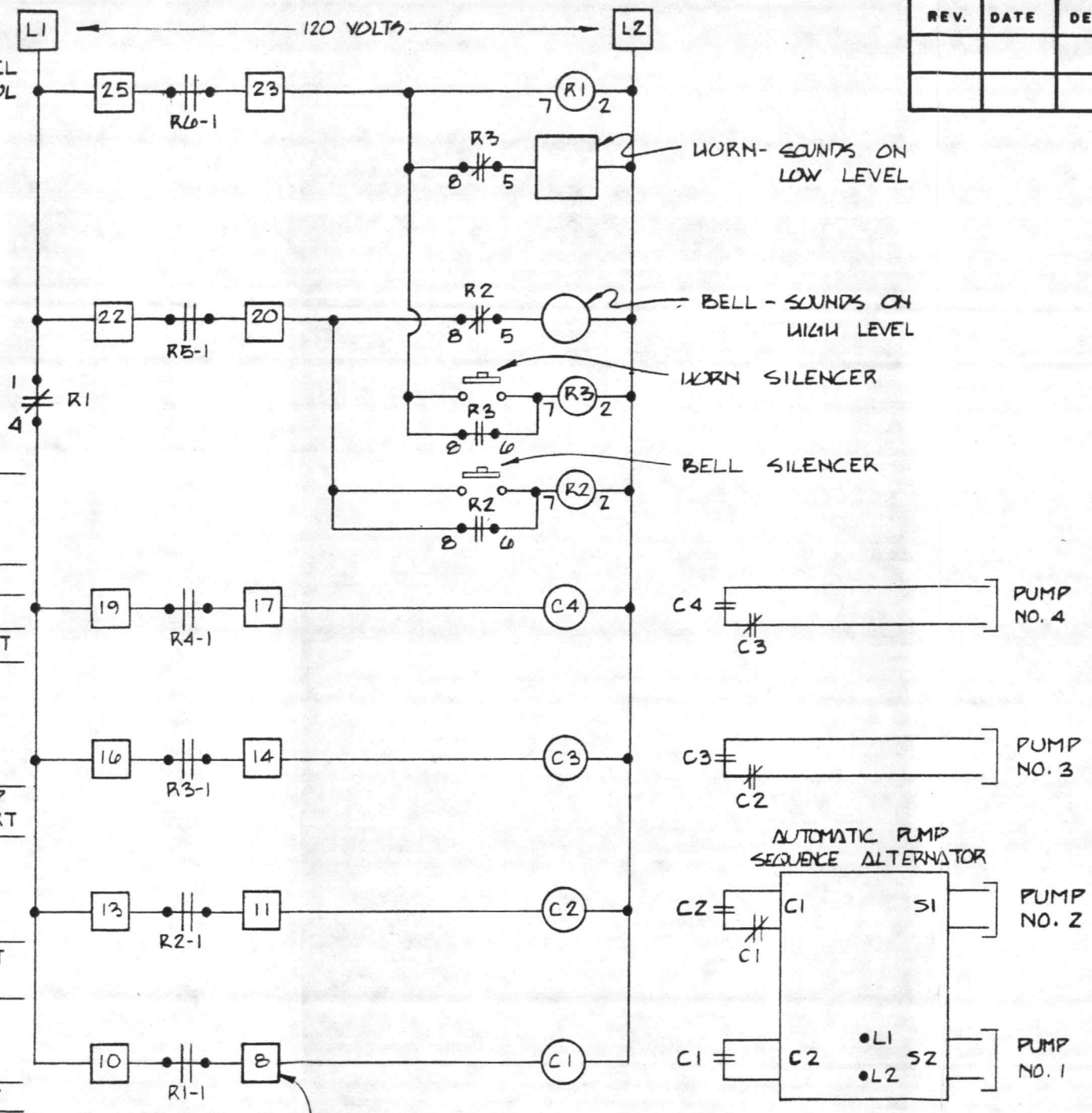
REV.	DATE	DESCRIPTION	APP.

OPENS ON RISING LEVEL  
TO RESTORE CONTROL  
TO PUMPS

CLOSES ON LOW  
LEVEL - CUT-OFF  
ALL PUMPS

CLOSES ON HIGH  
LEVEL & ON  
SHORTED SIGNAL  
LINE.

DESIGN LEVEL, FEET	ACTUAL LEVEL, FEET	RISING LEVEL	FALLING LEVEL
		ALL PUMPS OFF	
34		NO. 4 STOP	
33			NO. 4 START
32		NO. 3 STOP NO. 4 START	
31			NO. 4 STOP NO. 3 START
30		NO. 2 STOP NO. 3 START	
29			NO. 2 START NO. 3 STOP
29		NO. 1 STOP	
27			NO. 1 START



NEW FOXBORO TERMINAL  
NUMBERS

**NOTE:**  
 R1, R2, R3 P & B RELAYS NO. KRP-11A - MOUNTED ON PANEL  
 C1, C4 WESTINGHOUSE RELAYS NO. AF20A - MOUNTED ON PANEL  
 C2, C3 WESTINGHOUSE RELAYS NO. AF21A - MOUNTED ON PANEL

**RAY STURGILL & ASSOCIATES, INC.**  
CHARLOTTE, N.C.

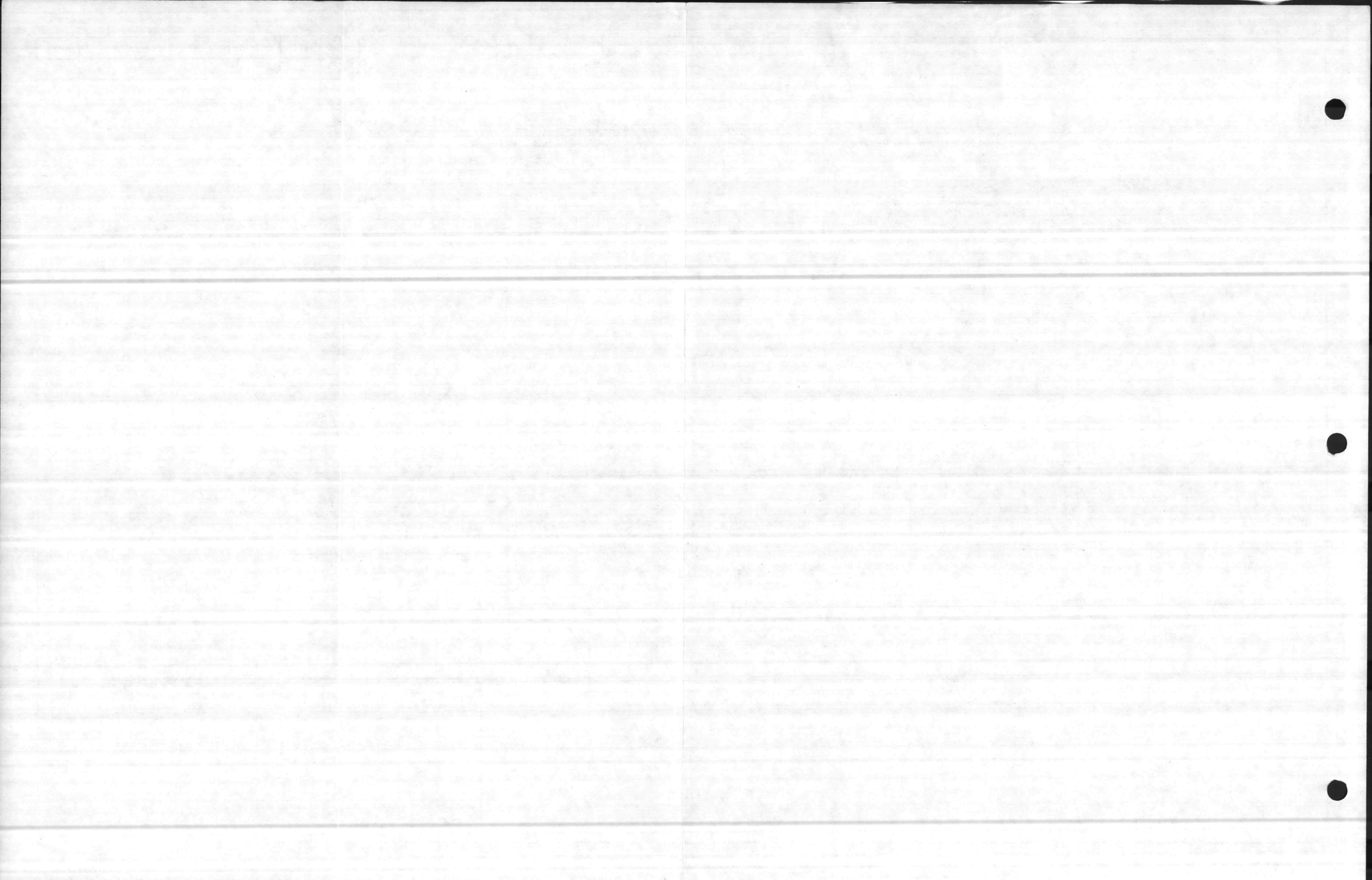
**HI-RAN SYSTEMS**

CAMP LESEUNE, N.C.  
TARAWA TERRACE WATER PLANT

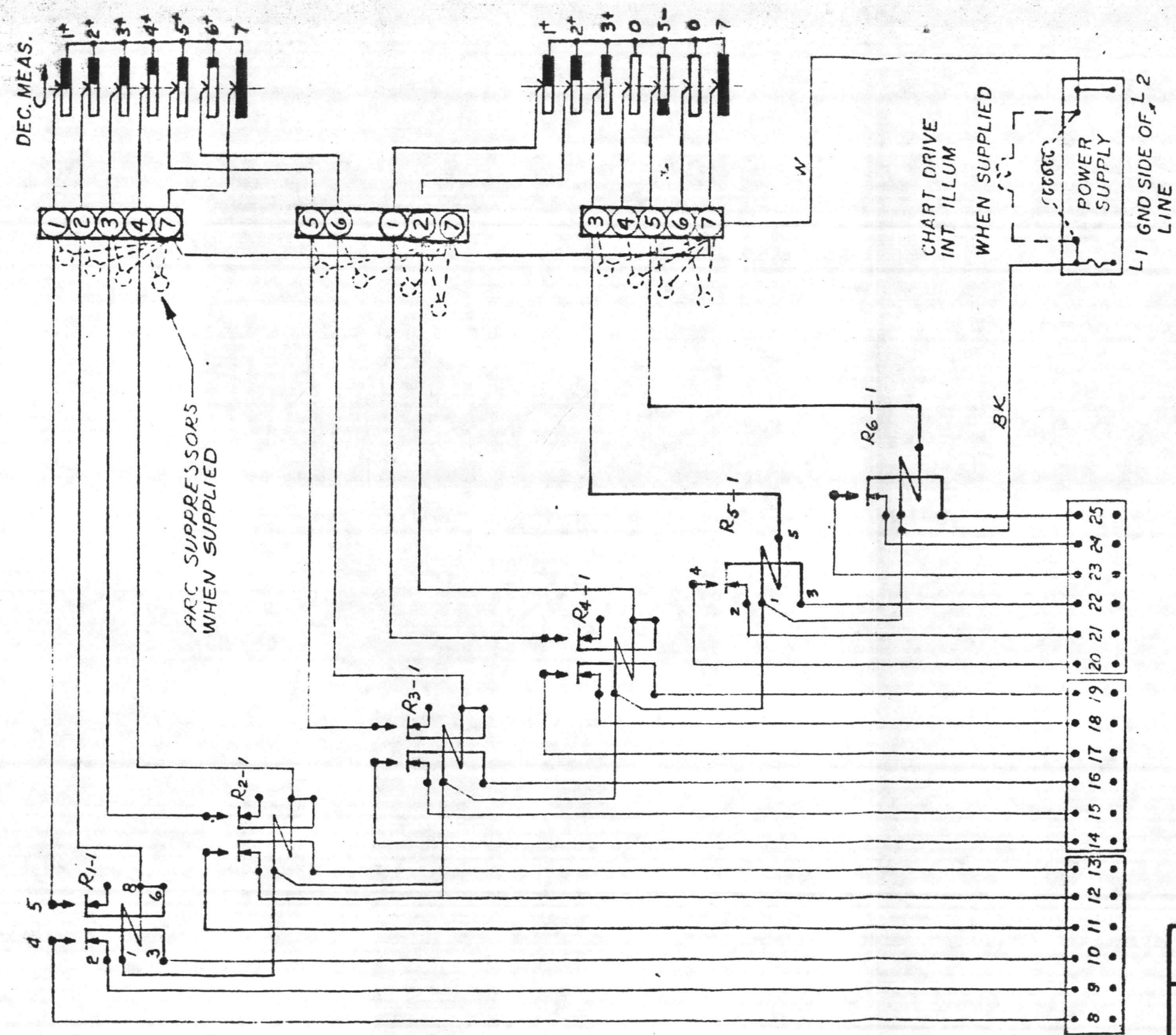
DRAWN BY: *JH*  
APPROVED BY:

LIR-1 ELEVATED TANK RECORDER  
AND PUMP CONTROL WIRING

SCALE: NONE	DATE: 4-20-83	DRAWING NUMBER: CL-830401
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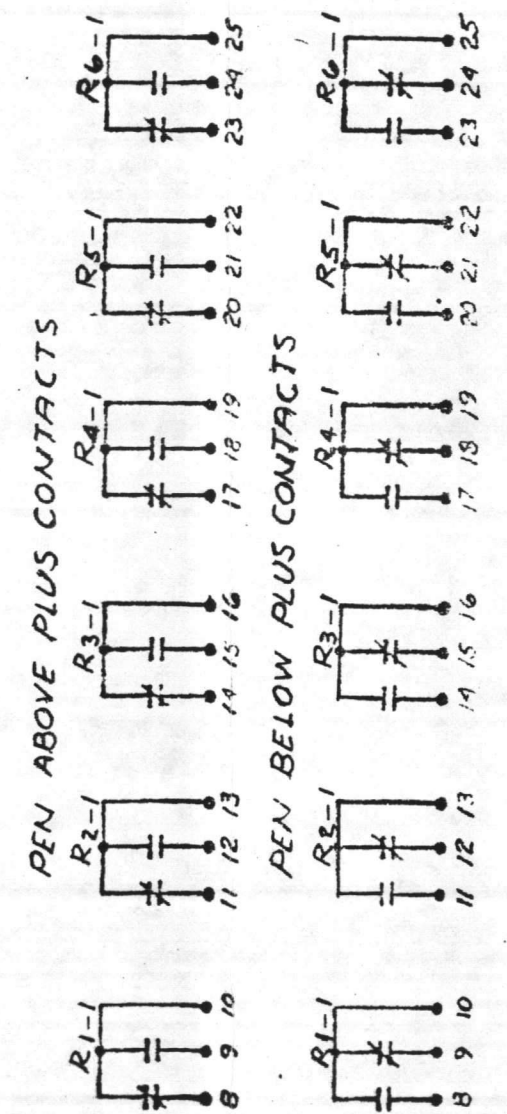


REV.	DATE	DESCRIPTION	APP.



ARC SUPPRESSORS  
WHEN SUPPLIED

CHART DRIVE  
INT ILLUM  
WHEN SUPPLIED  
POWER SUPPLY  
L1 GND SIDE OF L2  
LINE



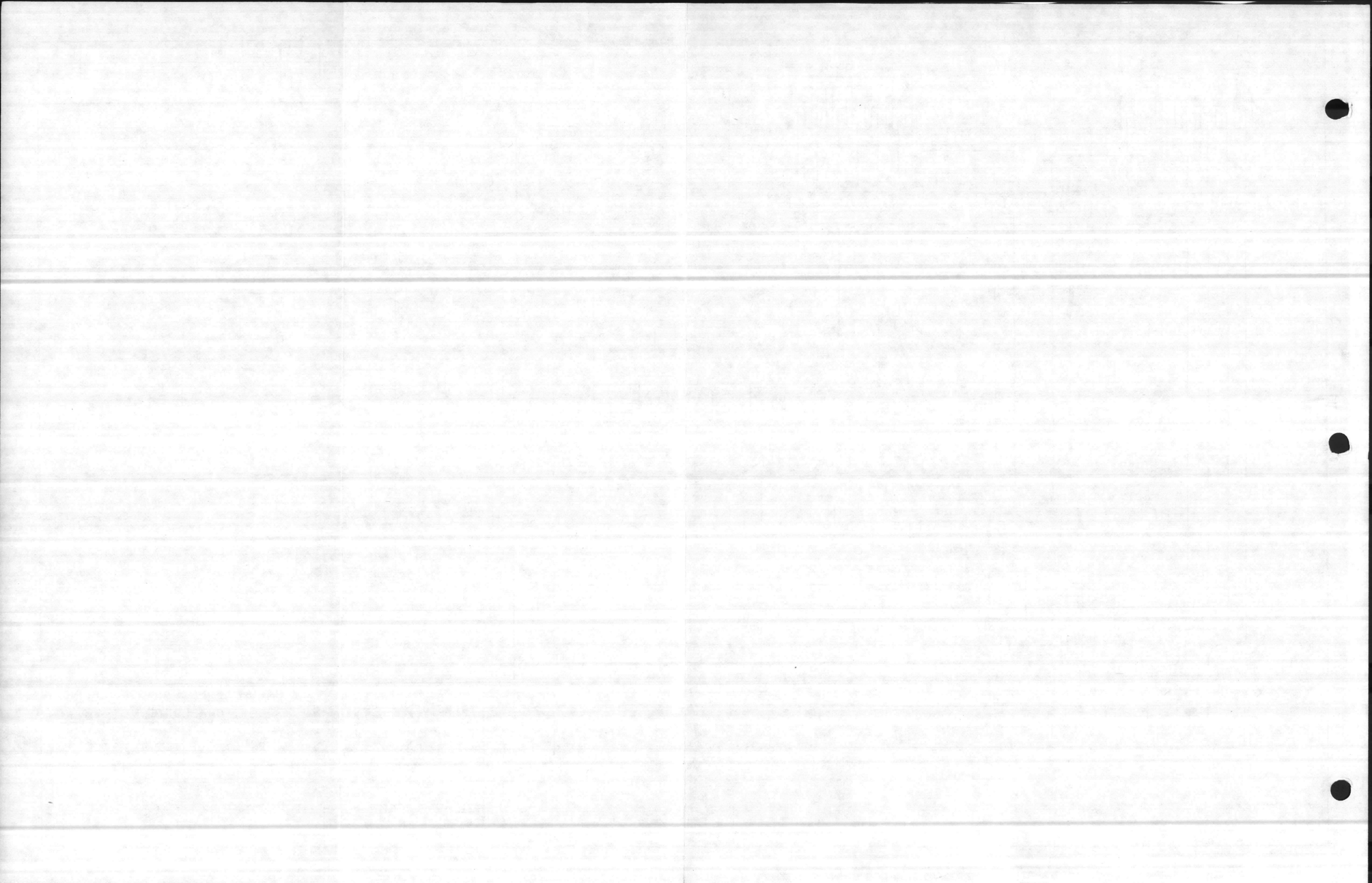
**HI-RAN SYSTEMS** RAY STURGILL & ASSOCIATES, INC.  
CHARLOTTE, N.C.

CAMP LEDEUNE, N.C.  
TARAWA TERRACE WATER PLANT

LIR-1 ELEVATED FOXBORO TANK  
RECORDER - INTERNAL WIRING

SCALE: NONE DATE: 4-20-83 DRAWING NUMBER: CL - B3040Z

DRAWN BY:  
APPROVED BY:



# Badger Meter, Inc.

## Precision Products Division

6116 East 15th Street  
Tulsa, Oklahoma 74112 (918) 836-8411



DATE 5JAN82  
BADGER S.O.NO. 960886  
CUSTOMER RAY STURGILL & ASSOCIATES  
CUSTOMER P.O.NO. 81239  
USER  
CONSULTING ENGR.

### DIFFERENTIAL ELEMENT PRIMARY DATA/CALCULATION SHEET WATER CALCULATION - VOLUMETRIC FLOW

TARAWA TERRACE  
RAW WATER FLOW  
FE-4

#### LO-LOSS DATA:

LO-LOSS STYLE	PMT-5	SERIAL NO.	960886
NOMINAL SIZE	10	TAG	CAMP LEJEUNE JOB
THROAT DIA (IN.)	6.907	BODY MATERIAL	CAST-IRON
BETA RATIO	.745	THROAT MATERIAL	BRONZE
TAP SIZE	1/2	FLANGE MATERIAL	CAST-IRON
TAP LOCATION	INTEGRAL		

DIFFERENTIAL PRESSURE IS 104.2 INCHES WATER AT 2500 GPM.  
PERMANENT PRESSURE LOSS IS 2.8 % OF DIFFERENTIAL.  
PERMANENT PRESSURE LOSS IS 2.92 INCHES OF WATER AT 2500 GPM.

#### FLUID DATA

FLUID	WATER	OPER. SP. GR.	1.00014
OPER. PRES. (PSIA)	60	BASE SP. GR.	1.00014
OPER. TEMP. (F)	60	OPER. VISC. (CP)	1.119
BASE TEMP. (F)	60		

#### FLOW DATA

MAX. FLOW (GPM)	2500	PIPE REYNOLDS NO.	532738
NORM. FLOW (GPM)	1750	THROAT REYNOLDS NO.	714997

#### PIPE & FLANGE DATA

NUM. PIPE SIZE	10	PIPE MATERIAL	METAL
PIPE SCHED/CLASS	40	PIPE I.D.	9.27
FLANGE TYPE	ANSI	FLANGE RATING	125

#### SPECIAL REQUIREMENTS

4COAT SYSTEM MIL-24441 TO TUBE LESS THE  
THROAT SECT. FORMULAS: 150, 151, 156, 152.  
4COATS GIVING TOTAL=LESS THAN 10 MILS.

#### APPLICABLE DOCUMENTS:

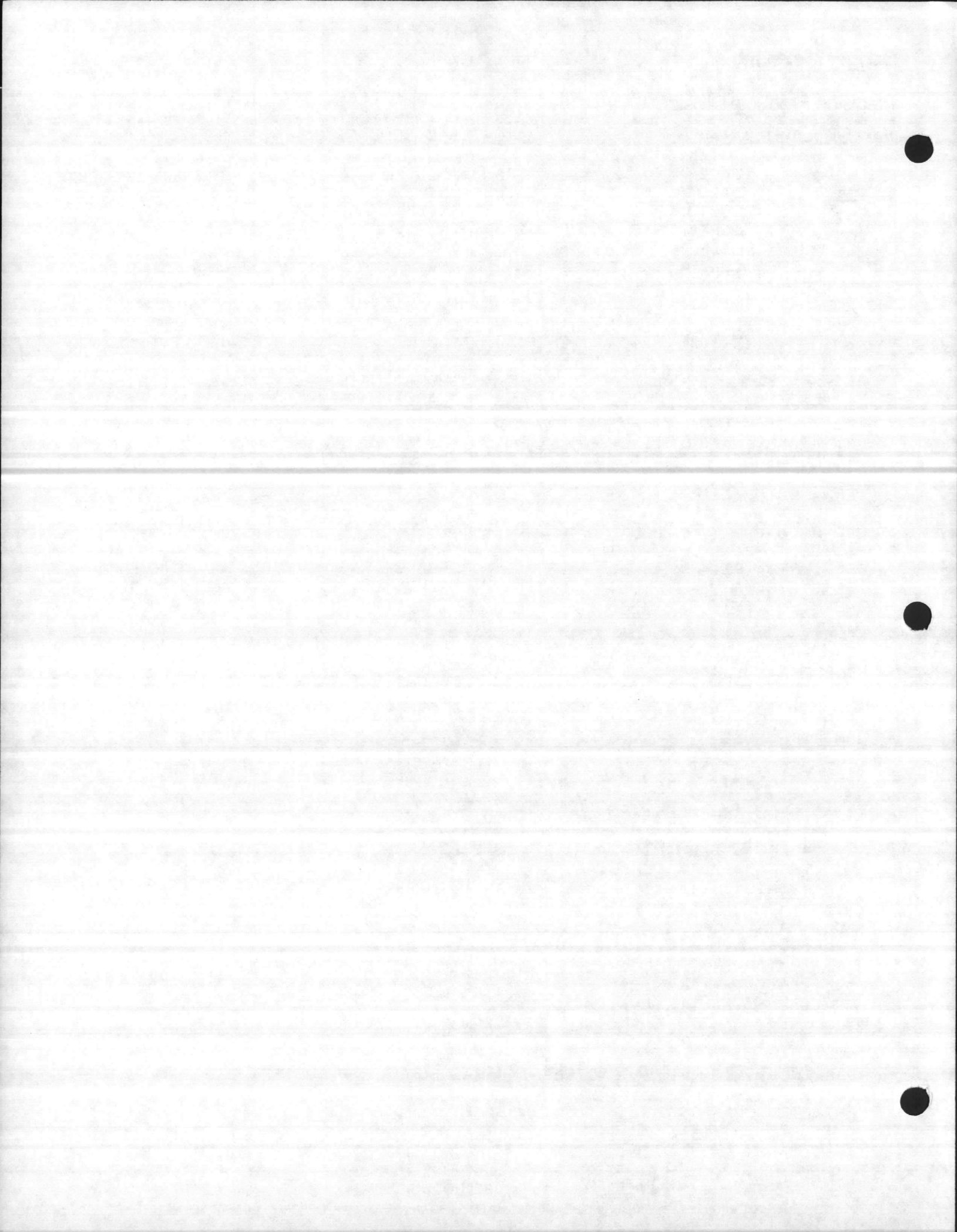
INSTALLATION/APPROVAL	PRODUCTION
.....	.....
.....	.....
.....	.....
.....	.....

REFERENCE: FLOW METER ENGINEERING HANDBOOK, C.F.CUSICK, 3RD ED., 1961

CERTIFIED CORRECT BY: \_\_\_\_\_, DATE: \_\_\_\_\_

REPRODUCIBLE

ALL PROPRIETARY RIGHTS IN THE SUBJECT MATTER SHOWN ARE EXCLUSIVE PROPERTY OF BADGER METER, INC.



# Badger Meter, Inc.

## Precision Products Division

6116 East 15th Street  
Tulsa, Oklahoma 74112 (918) 836-8411



BADGER S.O. 960886  
DATE 5JAN82  
CUSTOMER RAY STURGILL & ASSOCIATES  
ELEMENT 9.27 X 6.90 LO-LOSS  
SERIAL NO(S) 960886  
TAG INFO. CAMP LEJEUNE JOB

## DIFFERENTIAL METER

### FLOW VS DIFFERENTIAL CALCULATIONS

TARAWA TERRACE  
RAW WATER FLOW  
FE-4

FLUID WATER THROAT I.D. (IN) 6.9070  
OPER. TEMP. (F) 60.00 PIPE I.D. (IN) 9.2700  
OPER. PRES. (PSIA) 60.000

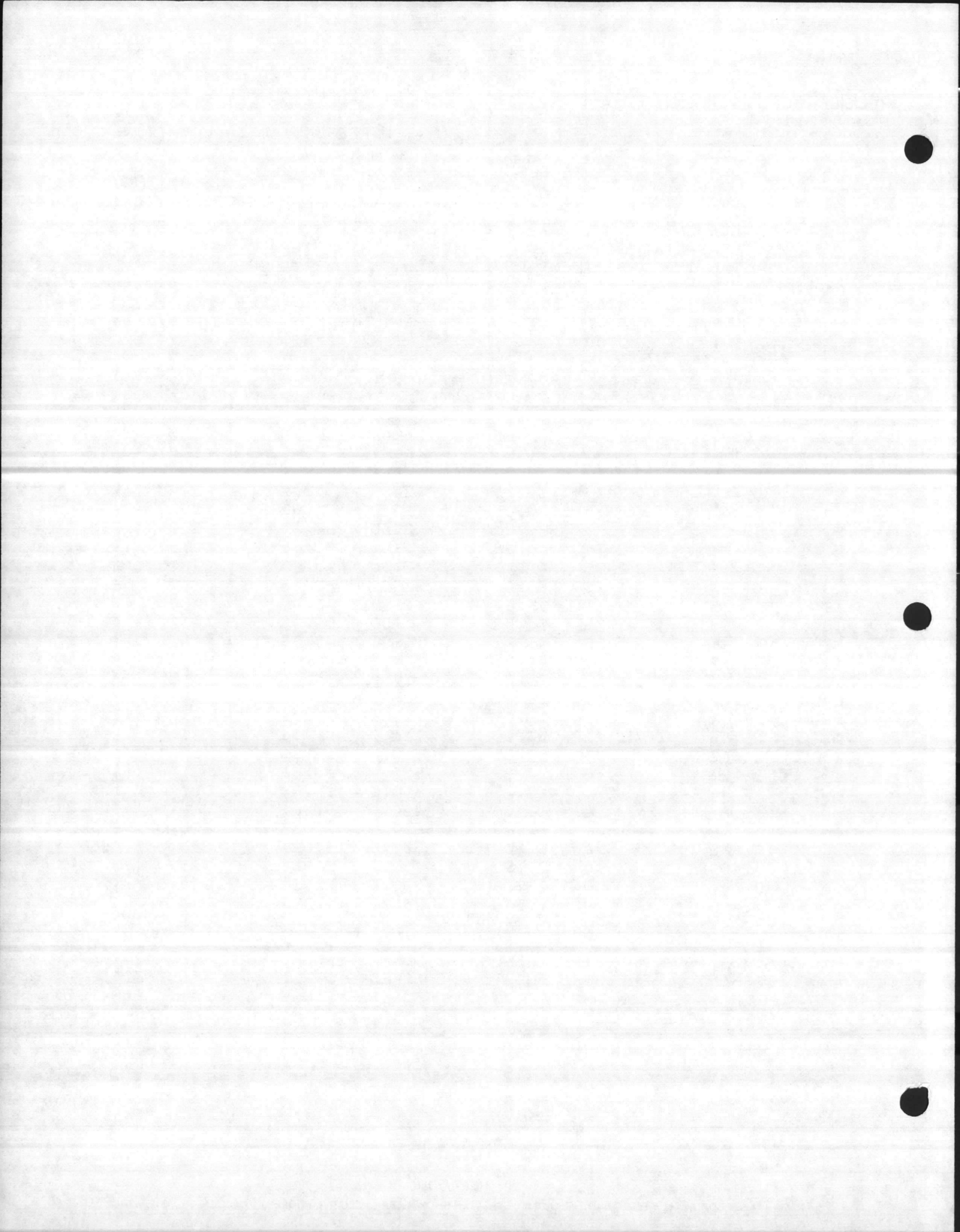
RESOLUTION 1.00 PERCENT OF MAXIMUM  
DIFF. UNITS INCHES OF 68F WATER

FLOW (GPM)	DIFF (IN)	FLOW (GPM)	DIFF (IN)	FLOW (GPM)	DIFF (IN)	FLOW (GPM)	DIFF (IN)
2500	104.2	2475	102.1	2450	100.1	2425	98.07
2400	96.06	2375	94.06	2350	92.09	2325	90.14
2300	88.22	2275	86.31	2250	84.42	2225	82.55
2200	80.71	2175	78.88	2150	77.08	2125	75.30
2100	73.53	2075	71.79	2050	70.07	2025	68.37
2000	66.69	1975	65.04	1950	63.40	1925	61.78
1900	60.19	1875	58.61	1850	57.06	1825	55.53
1800	54.01	1775	52.52	1750	51.05	1725	49.60
1700	48.18	1675	46.77	1650	45.38	1625	44.02
1600	42.67	1575	41.35	1550	40.04	1525	38.76
1500	37.50	1475	36.26	1450	35.04	1425	33.84
1400	32.66	1375	31.51	1350	30.37	1325	29.26
1300	28.16	1275	27.09	1250	26.03	1225	25.00
1200	23.99	1175	23.00	1150	22.03	1125	21.08
1100	20.16	1075	19.25	1050	18.36	1025	17.50
1000	16.66	975.0	15.83	950.0	15.03	925.0	14.25
900.0	13.49	875.0	12.75	850.0	12.03	825.0	11.33
800.0	10.65	775.0	10.00	750.0	9.366	725.0	8.752
700.0	8.158	675.0	7.585	650.0	7.033	625.0	6.502
600.0	5.992	575.0	5.502	550.0	5.034	525.0	4.586
500.0	4.159	475.0	3.753	450.0	3.368	425.0	3.004
400.0	2.660	375.0	2.338	350.0	2.036	325.0	1.755
300.0	1.495	275.0	1.256	250.0	1.038		

THIS CALIBRATION DATA MAY DIFFER FROM THE NORMAL SQUARE ROOT RELATION BETWEEN FLOW AND DIFFERENTIAL PRESSURE DUE TO THE EFFECTS OF DISCHARGE COEFFICIENT VS REYNOLDS NUMBER VARIATION AND/OR (IN COMPRESSIBLE FLOWS) ADIABATIC EXPANSION. EITHER OR BOTH OF THE EFFECTS ARE INCORPORATED INTO THIS DATA AS APPROPRIATE.

REPRODUCIBLE

ALL PROPRIETARY RIGHTS IN THE SUBJECT MATTER SHOWN ARE EXCLUSIVE PROPERTY OF BADGER METER, INC.





CUSTOMER RAY STURGILL & ASSOCIATES INC.  
 ADDRESS 1875 I-85 SOUTH CHARLOTTE N.C. 28208

FOXBORO NO. 82N-90007  
 CUST. NO. 81236

USER U.S.MARIEN CORPS  
 USER ADDRESS CAMP LEJEUNE N.C.

HADNOT POINT  
 RAW WATER FLOW  
 FE-7

INSTRUMENT DATA

METER DESCRIPTION MERCURYLES METER & M/40 REC.  
 TAG FE-7  
 SERIAL NO. \_\_\_\_\_  
 CHART OR DIAL SCALE \_\_\_\_\_  
 CHART NO. \_\_\_\_\_  
 FLOW PEN RDG. X \_\_\_\_\_  
 PRESS. PEN RDG. X \_\_\_\_\_  
 TEMP. PEN RDG. X \_\_\_\_\_  
 DIFF. RANGE (IN. H<sub>2</sub>O DRY CAL.) (h<sub>m</sub>) 120.00  
 STATIC PRESS. RANGE \_\_\_\_\_  
 TEMP. RANGE \_\_\_\_\_  
 INTEGRATOR TYPE \_\_\_\_\_  
 INTEGRATOR \_\_\_\_\_ @ MAX. FLOW  
 INTEGRATOR RDG. X \_\_\_\_\_

LIQUID FLOW (INPUT DATA)

FLOWING FLUID WATER  
 FULL SCALE FLOW (Q<sub>m</sub>) OR (W<sub>m</sub>) 6000. GAL/MIN  
 @ BASE COND. 60.00 (T<sub>b</sub>) \_\_\_\_\_ (p<sub>b</sub>) \_\_\_\_\_  
 NORMAL FLOW (Q<sub>n</sub>) OR (W<sub>n</sub>) 3000.00  
 SP. GRAV. @ T<sub>b</sub> (G or G<sub>f</sub>) 1.000  
 SEAL FLUID NONE  
 SEAL SP. GRAV. (G<sub>s</sub>) 0.000  
 CONSTANTS (L) \_\_\_\_\_ (N) 5.667000  
 SPECIFIC WGT. LBS. /CU. FT. (Y<sub>f</sub>) \_\_\_\_\_  
 CORRECTION FOR WATER VAPOR (F<sub>wv</sub>) \_\_\_\_\_  
 FLOW TEMP. (T<sub>f</sub>) 60.F  
 SP. GRAV. @ FLOW TEMP. (G<sub>f</sub>) 1.000 F<sub>p</sub> 1.000  
 FLOWING PRESSURE (PSIA) (P<sub>f</sub>) \_\_\_\_\_ k \_\_\_\_\_  
 @ PRIMARY DEVICE UPSTREAM \_\_\_\_\_ DOWNSTREAM \_\_\_\_\_  
 BAROMETER (PSIA) \_\_\_\_\_  
 COMPRESS. FACTOR \_\_\_\_\_ Z<sub>f</sub> \_\_\_\_\_ Z<sub>b</sub>  
 VISCOSITY @ FLOW TEMP. (μ<sub>cp</sub>) 1.1000  
 STEAM SUPH'T. \_\_\_\_\_ OR QUALITY \_\_\_\_\_

PRIMARY DEVICE AND FLANGES (INPUT DATA)

PRIMARY DEVICE ORIFICE PLATE  
 TAG FE-7  
 MATERIAL 304SS  
 LINE SIZE (NOM.) 16 IN CAST IRON  
 PRESS. TAP LOC. 16.5 IN UP 8.12 IN DOWNSTREAM  
 STRAIGHTENING VANE LOCATION \_\_\_\_\_ PIPE DIA. UPSTREAM \_\_\_\_\_  
 FLANGE RATING 125#  
 TEMP. CORR. FACTOR (F<sub>c</sub>) 1.000  
 PIPE INSIDE DIA. (D) 16.250  
 DRAIN HOLE DIA. \_\_\_\_\_  
 VENT HOLE DIA. \_\_\_\_\_ TAP LOCATION CODE 2

CALCULATED DATA

D <sup>2</sup>	264.06250	F <sub>pb</sub>		S <sup>1</sup>	0.36602	d/D <sup>1</sup>	0.71260
F <sub>m</sub>	1.00000	F <sub>tb</sub>	K <sub>c</sub> β <sup>2.1</sup>	F <sub>r</sub>	0.98363	@R <sub>D</sub>	530552.
√G <sub>f</sub>	1.00000	F <sub>ff</sub>	F <sub>r</sub>	S	0.37211	d/D	0.71692
√h <sub>m</sub>	10.95445	F <sub>g</sub>	Y <sub>1</sub>				
√γ <sub>f</sub>		F <sub>pv</sub>	Y <sub>2</sub>	@ h/p			
√P <sub>f</sub>			K <sub>c</sub> β <sup>2</sup>	@ h/p			

CALCULATED FOR BORE SIZE

D<sub>x</sub>d/D = BORE = 11.650

LIQUID (VOL)

Eq 21 Page 216 S = ( QM GL ) / ( N D<sup>2</sup> F<sub>a</sub> F<sub>m</sub> F<sub>i</sub> √G<sub>f</sub> √h<sub>m</sub> F<sub>c</sub> F<sub>p</sub> )  
 Page Reference: 172 154 155 156 157 158 166 237 271

STEAM

Eq 44 Page 332 S = ( W<sub>m</sub> ) / ( 359 D<sup>2</sup> F<sub>a</sub> F<sub>m</sub> F<sub>i</sub> √γ<sub>f</sub> √h<sub>m</sub> )  
 Page Reference: 155 156 157 166

GAS

Eq 81 Pg. 428 = ( Q<sub>m</sub> ) / ( 338.17 t D<sup>2</sup> F<sub>pb</sub> F<sub>tb</sub> F<sub>ff</sub> F<sub>g</sub> F<sub>pv</sub> F<sub>wv</sub> F<sub>a</sub> F<sub>m</sub> √h<sub>m</sub> √P<sub>f</sub> )  
 Page Reference: 491 155 453 453 454 455 425 156 424 166

SEE: PRINCIPLES AND PRACTICE OF FLOWMETER ENGINEERING (9th EDITION)

BY RJS DATE 7-2-82

