COMPLETION REPORT

COVERING THE DESIGN OF

CAMP LEJEUNE U. S. MARINE BARRACKS NEW RIVER, NORTH CAROLINA

FOR THE

U. S. NAVY Bureau of Yards and Docks CONTRACT NOy 4751 APRIL 15, 1941 - SEPTEMBER 30, 1942

PREPARED BY

CARR AND J. E. GREINER COMPANY ARCHITECT ENGINEERS

G. W. CARR. ARCHITECT DURHAM. NORTH CAROLINA

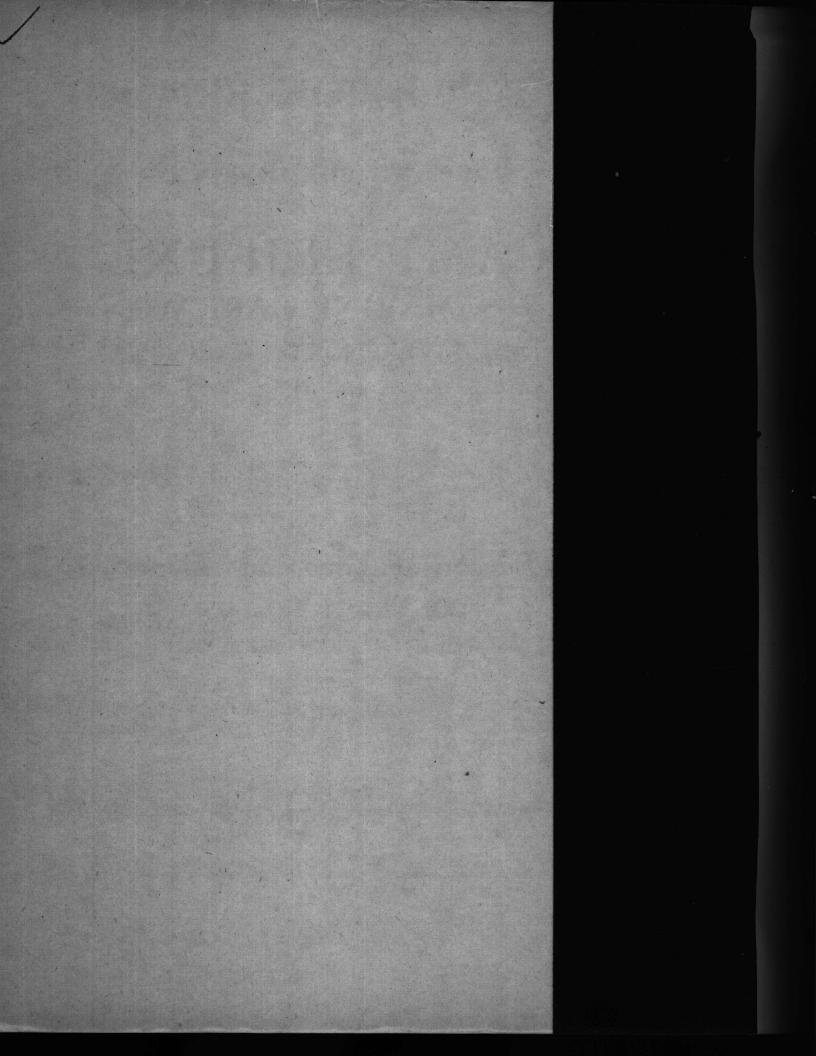
J. E. GREINER COMPANY BALTIMORE, MARYLAND

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VOL. II



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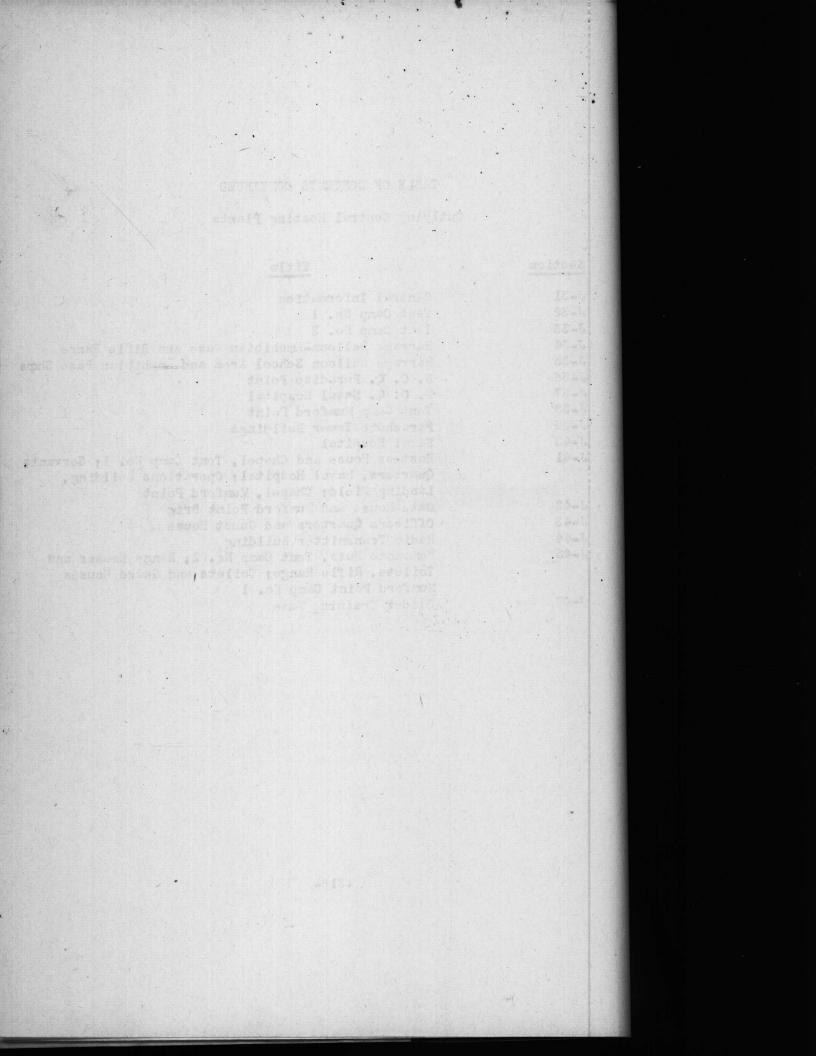
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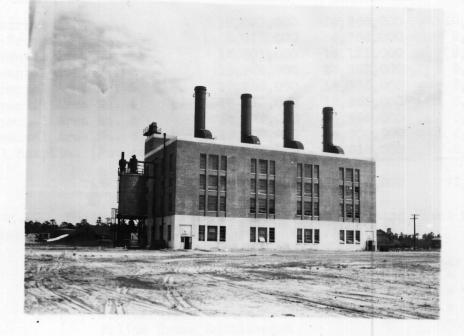
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J-38 J-39 J-40 J-41	B. O. Q. Naval Hospital Tent Camp Mumford Point Parachute Tower Buildings Naval Hospital Hostess House and Chapel, Tent Camp No. 1; Servants Quarters Naval Hospital
J-42 J-43 J-44 J-45	Quarters, Naval Hospital; Operations Building, Landing Field; Chapel, Mumford Point Gate House and Mumford Point Brig Officers Quarters and Guest House Radio Transmitter Building Homasote Huts, Tent Camp No. 2; Range Houses and Toilets Bigle Borne The
J-46	Toilets, Rifle Range; Toilets and Guard Houses Mumford Point Camp No. 1 Glider Training Base





CENTRAL HEATING PLANT - DIVISION TRAINING AREA



J-1. Design and Performance Data.

J-1.01. Purpose of Central Heating Plant. The purpose of the Central Heating Plant is to furnish the steam required for process, hot water and heating in the various buildings in the Industrial, Post Troops and Regimental Areas and, eventually, the Naval Hospital.

J-1.02. Total Connected Load. A tabulation of the total heat requirements in B.T.U's per hour to the various areas is as follows:

Area	Heating	Hot Water	Process
Industrial Post Troops Regimental Area No. 1 Regimental Area No. 2 Regimental Area No. 3 Regimental Area No. 4 Regimental Area No. 5	15,203,000 8,618,000 16,501,000 15,974,000 17,338,000 16,312,000 15,974,000 16,000,000	18,866,000 6,756,000 14,121,000 13,893,000 14,376,000 13,893,000 13,893,000 13,893,000 14,000,000	10,358,000 2,994,000 (8,140,000 8,140,000 8,250,000 8,140,000 8,140,000 8,140,000
Regimental Area No. 6 (Future) Naval Hospital (Future)	23,878,000	8,818,000	8,976,000
	45,798,000	118,616,000	71,278,000

J-1.03. Maximum Steam Demand. The Central Heating Plant maximum steam demand is estimated to be:

Heating	132,785	pounds	per	hour	
Hot Water	83,080	11	. 11 .	n	
Process	48,065	u	11	11	
Distribution Losses	16,070	"	**	U	
Boiler House Auxiliaries		manna			
& Feedwater Heating	15,800	H		the second	

Total:

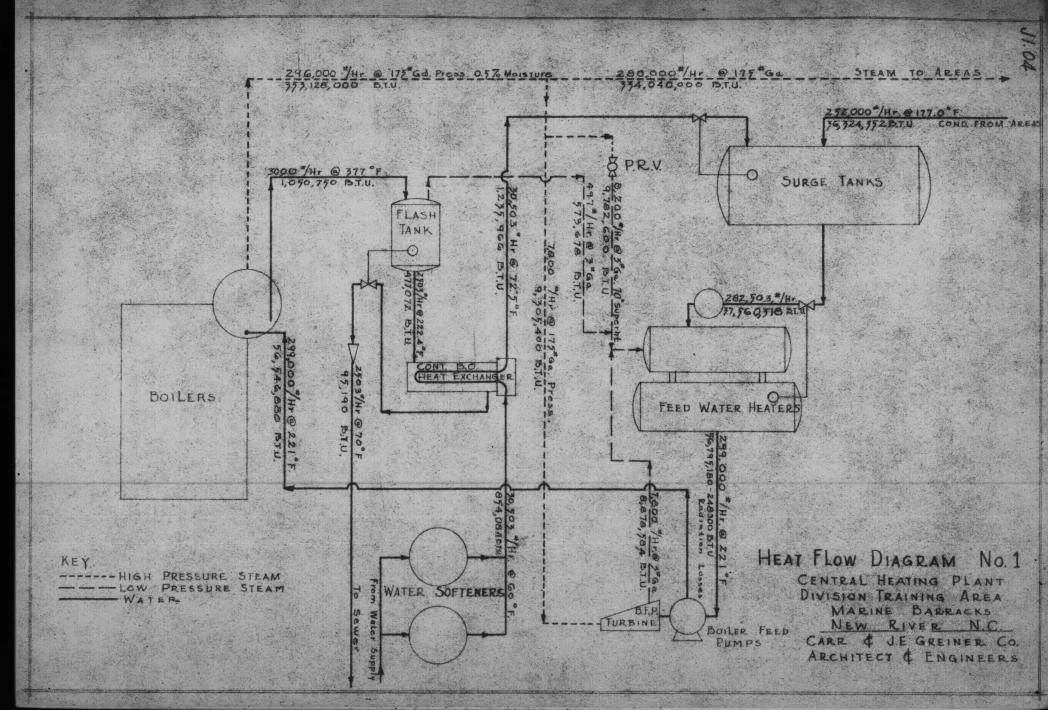
295,800 pounds per hour

J-1.04. Heat Flow Diagram No. 1 indicates the heat distribution in the Central Heating Plant when operating at the estimated maximum steam demand condition.

J-1.05. Present Steam Demand. A separate heating plant was constructed for the Naval Hospital Area which was built primarily for stand-by purposes, but which, is now being used to supply steam for this area. At this writing, the 6th Regimental Area has not been built; therefore, deducting the estimated heating, hot water and process steam requirements for the Naval Hospital and the 6th Regimental Area from the original design figures, we have the following Central Heating Plant estimated maximum steam demand requirements, which are based on the present actual conditions:

- 319 -

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,	Heating Hot Water Process Heating Distribution Losses Boiler House Auxiliaries and	65,677 32,841 13,823	pounds pounds pounds pounds	per per	hour hour	
	Feedwater Heating	12,800	pounds	per	hour	
						-

Total:

222,800 pounds per hour

J-1.06 Heat Flow Diagram No. 2 indicates the steam distribution in the central heating plant when operating at the present estimated maximum steam demand condition.

J-1.07 Selection of Equipment. The number and size of boilers, operating steam pressure, combustion equipment, method of handling coal and ash, and boiler house auxiliary equipment was selected to give continuity of service, long life, flexibility, and economy in operation, determined by studies of the steam load requirements of the various areas, pressure drop through the steam distribution system, types and grade of fuel that would be available for use in the plant.

Note: For heating, hot water and process steam requirements of the various buildings and pressure drop in steam distribution system, see Chapter G of this report.

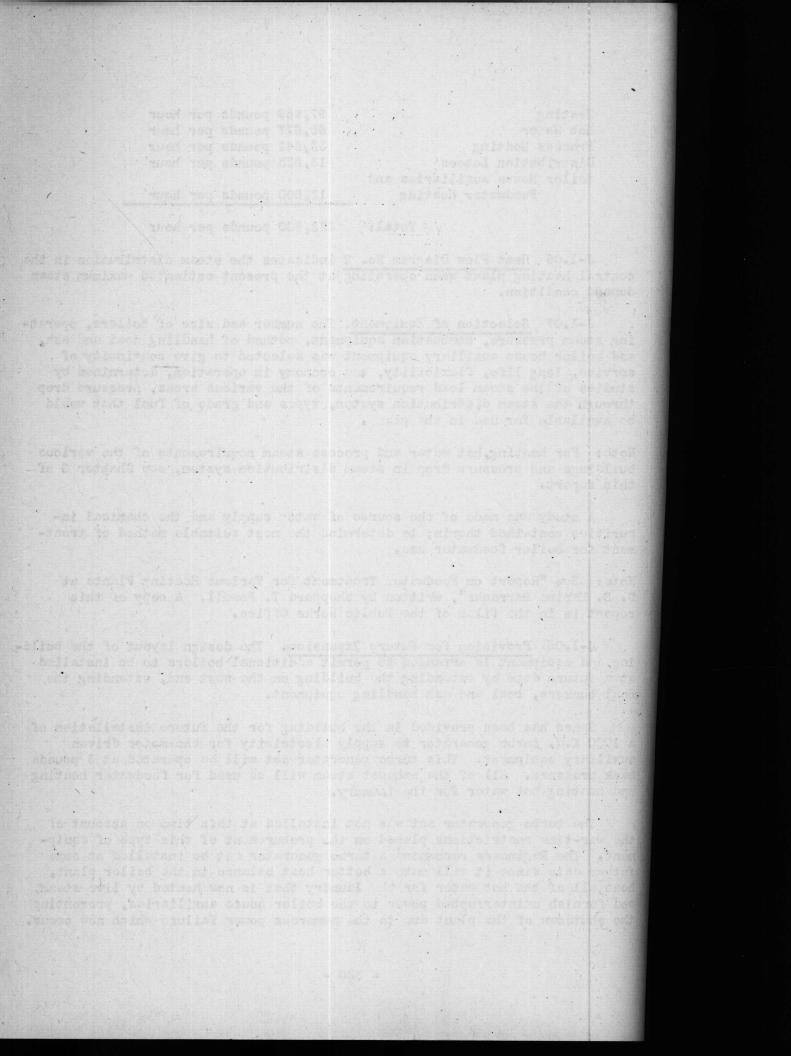
A study was made of the source of water supply and the chemical impurities contained therin; to determine the most suitable method of treatment for boiler feedwater use.

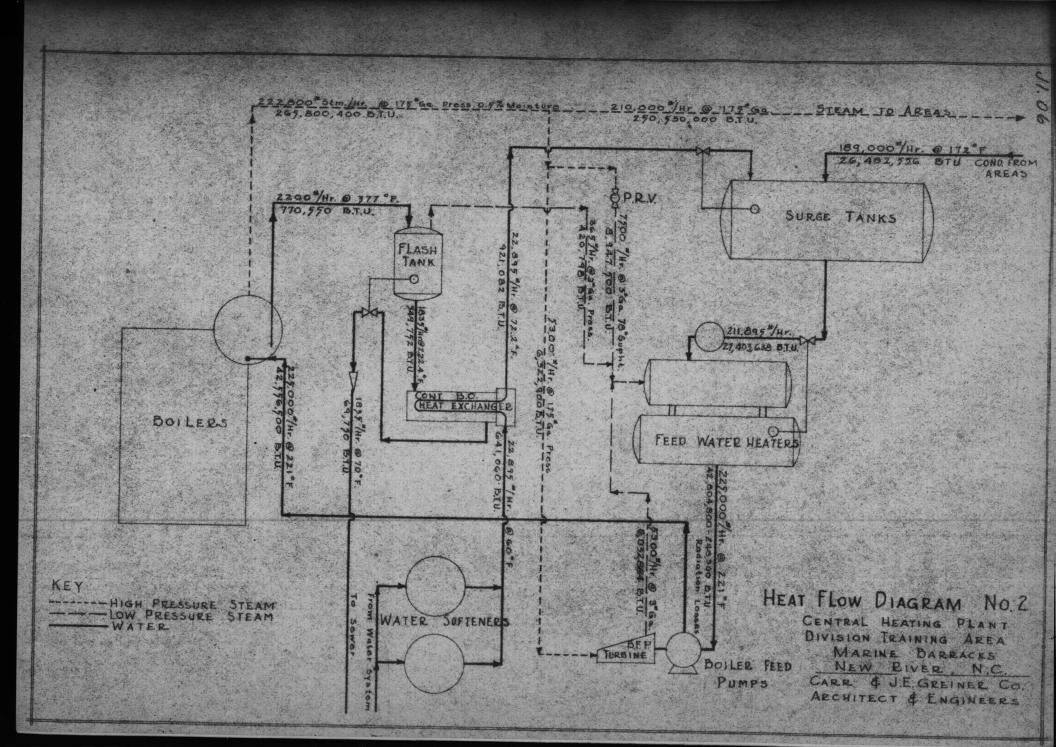
Note: See "Report on Feedwater Treatment for Various Heating Plants at U. S. Marine Barracks", written by Sheppard T. Powell. A copy of this report is in the files of the Public Works Office.

J-1.08 Provision for Future Expansion. The design layout of the building and equipment is arranged to permit additional boilers to be installed at a future date by extending the building on the west end, extending the coal bunkers, coal and ash handling equipment.

Space has been provided in the building for the future installation of a 1000 K.W. turbo generator to supply electricity for the motor driven auxiliary equipment. This turbo generator set will be operated at 3 pounds back pressure. All of the exhaust steam will be used for feedwater heating and heating hot water for the Laundry.

The turbo generator set was not installed at this time on account of the war-time restrictions placed on the procurement of this type of equipment. The Engineers recommend a turbo generator set be installed at some future date since it will make a better heat balance in the boiler plant, heat all of the hot water for the laundry that is now heated by live steam, and furnish uninterrupted power to the boiler house auxiliaries, preventing the shutdown of the plant due to the numerous power failure which now occur.







J-1.09. Boiler Performance Data. The expected performance data for steam generating unit operating under different load conditions, is given in the following tabulation. The performance data is based on a 150-pound per square inch gauge steam pressure with the temperature of a feedwater at 218 degrees F. and pulverized fuel from bituminous coal of the following analysis:

Moisture	2	per	cent				
Volatile Matter		11			basis		
Fixed Carbon	78	11	. 11	11	. 11		
Ash	5	=	· tt	11	11		
Heat Content Fusion Temperature Ash	14,	900 00 de	b.t.	u's p s F.	per pound	dry	basis

PERFORMANCE DATA - ONE STEAM GENERATING UNIT

1.	Pounds of steam per hour act.				
	evaporation	50,000	75,000	100,000	120,000
2.	Thousand b.t.u. in steam above				1.00
7	F.W. temperature	50,475	75,712	100,950	121,000
3.	Developed boiler H.P.	1,500	2,250	3,000	3,600
4.	Temperature of gases leaving				
-	furnace degrees F.		00,200	1,980	2,090
5.	CO2 in boiler exit gases per ce	nt 14.5	15.0	15.0	15.0
6.	Temperature of boiler exit				
-	gases degrees F.	465	515	570	615
7.	CO2 in airheater exit gases				
-	per cent	14.5	14.5	14.5	14.5
8.	Temperature of airheater exit		007363 8		
	gases degrees F.	275	280	320	355
9.	Temperature of air entering air	Te states in		henret a	ton openant
10	heater (room temp.) degrees F	• 80	80	80	80
10.	Temperature of air leaving air-			1	
	heater degrees F.	:335	395	415	. 430
11.	Draft loss through boiler (inch			P01107 174	
	water gauge)	.24	.53	.95	1.40
12.	Draft loss through airheater				
	(in. water gauge)	. 66	1.47	2.65	3.70
13.	Furnace draft (in. water gauge)	.10	.10	.10	.10
14.	Total static suction of air hear	ter			
	gas exit (in. water gauge)	1.00	2.10	.3.70	5.20
15.	Air pressure drop through air				
	heater (in. water gauge)	•70	1.40	2.70	3.90
16.	Air pressure drop through ducts			F. at	
	& dampers (in. water gauge)	.20	.30	.30	.40
17.	Air pressure in burner boxes				
	(in. water gauge)	. 60	1.70	3.00	3.50
18.	Total static pressure at forced	-			
	draft fan (in. water gauge)	1.50	3.40	6.00	7.60
19.	Number of pulverizers in				
00	operation	1	1	2	2
	Pounds of fuel per hour	3,880	3,813	7,840	9,530
21.	Pounds of air per hour	52,300	78,500	106,000	129,000

J-1.09. Boiler Performance Data, The expected performance data for a generating unit operating under different load conditions, is given a following tabulation. The performance data is based on a 150-pound quare inch gauge steam pressure with at many start of a foodwater at . dogroat P. and Friversouri and an analysis of the sollowing . and the second state and the second second second they a set of a second second and : Molsturg Milling and the Billing attended and

Section 2

17 " " dry baais Volatilo Matter 11 . 51 lout. Contonto 14:900 b.t.u's par pound dry basia Viscencersture Ash 2500 degrees W.

FERREN FAIL - ONE STRA CHERATING UNIT .tos word to? masta to abruel

100,001 660,081 .000 . 4. 121:000 100,005 76,712 80,475 Same bourgesture 5,600 3,000 1,600 bychoped bollor H.P. 025.5 Comporature of gases leaving 1.985 000.0 ... Curnade degrees P. 0.31 15.0 De in boiler exit gases per cent 16.5 Comparature of boiler exit. 61.6 00, in airbeator exit cases per cent. Temperature of sinacator cuit Sec. 1 12.41 14.5 3.11 320 275 cases degrees F. incorreture of air entering dirhouter (room tomp.) degrees F. mporeture of the leaving air-102N 415 heator degrees f. Draft less through beller (inches 1.60. .98 33. water gauge) . refelless through striester 3,70 20.55 The. (in. motor gauge) 01. OL. (anade draft (in. water going) 1. noteod win lo notion of air hoster 5:20 -05:5 38.40 r pressure drop through air . . 05. 02.8 Air prozeuro drop through ducts 08. OS. S. 00 . & dampers (in. mater gauge) pressure in burner baxes C . 08 . 5 DAL (agues totay .m) •• : forst in pressure at forced. -denit fan (in. water gauge) Autor of pulverizors in 9,530 7,840 auda of fuol per hour 106,000 129,000

;

PERFORMANCE DATA	- ON	e steam	GENERATING	UNIT	(CONT'D)	1
------------------	------	---------	------------	------	----------	---

22.	Pounds of gas per hour				
	leaving airheater	56,000	86,500	117,000	142,000
23.	Overall efficiency complete				
	unit - percent	89.0	89.2	89.2	86.8
24.	Heat release in furnace B.T.U.				
	per cu. ft. per hr. (not				
		11,300	17,000	22,900	27,800
	8j,		11,000	22,000	21,000
	HEAT B	ALANCE			
1.	Dry'flue gas loss at airheater				
	exit - percent	4.68	4.80	5.79	6.65
2.	Loss due to hydrogen at air-				0.00
	heater exit	2.95	2.96	3.00	3.04
3.	Loss due to mositure in fuel at			0.00	0.01
	airheater exit	.15	.15	.15	.17
4.	Loss due to radiation	1.32	.89		
5.				.65	.54
	Loss due to unburned combustibles	.40	.50	.70	1.30
	Unaccounted for and leeway	-	1.50	1.50	1.50
7.	Total losses	11.00	10.80	11.80	13.20
8.	Efficiencies of complete unit				
	percent	89.00	89.20	88.20	86.80

J-1.10. Forced and Induced Draft Fan Performance Data. The tabulation in paragraph J-1.13 gives the expected performance of the forced and induced draft fans under various boiler loads.

J-1.11. Electric Power Requirements of Boiler Auxiliaries. The graph in paragraph J-1.14 shows the kilowatt imput requirements for the motors on the forced draft fan, induced draft fan and one pulverizer when operating at various boiler loads.

J-1.12. Steam Requirements of Boiler Feed Pump Turbines. The curves in paragraph J-1.15 show the steam consumption of the boiler feed pump turbine with brake horsepower and efficiency of the pump when operating at various capacities and total head.

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TOTAL BLANCE

b. Poread and Induced Draft Par Performance Data. The balkilation belong of the area to a second performand of the forced and induced ander various beller lows.

1. Sloctrig fover foguirements of Boiler Auxilleriss. The crash a V-1.12 shows the Ellowath imput requirements for the motods without's ten, induced deals for and one pulveriser when apartitic boile loads.

. Steam Requirements of Joiler Food Pump Turbines. The curves during shew the steam consumption of the bollor food pump a brais horseporer and efficiency of the pump when aborating ab withos and total head. J-1.13

FAN PERFORMANCE DATA

1 050 -- 11-1

Forced Draft Fan

Pounds of steam per hour	50,000	75,000	100,000	120,000	Max. 7 25% 0	on static
Pounds of air per hour	52,000	78,500	106,000	129,000	148,000	
Cubic Feet per minute	11,300	17,800	24,000	29,200	33,500	. /
Air temperature F.	80	80	80	80	80	
Static pressure at fan						
outlet (W.G.)	1.5	3.4	6.0	7.6	9.6	
Fan R. P. M.		1770 F	R.P.M. Consta	ant Speed		
H.P. imput to fan shaft	35	38	47	-	69	

Clarage Fan Company #2-1/2 Type W Fan DWDI with inlet vane control and outlet damper. Fan driven by 75 H.P. 1800 R.P.M. constant speed motor.

Induced Draft Fan

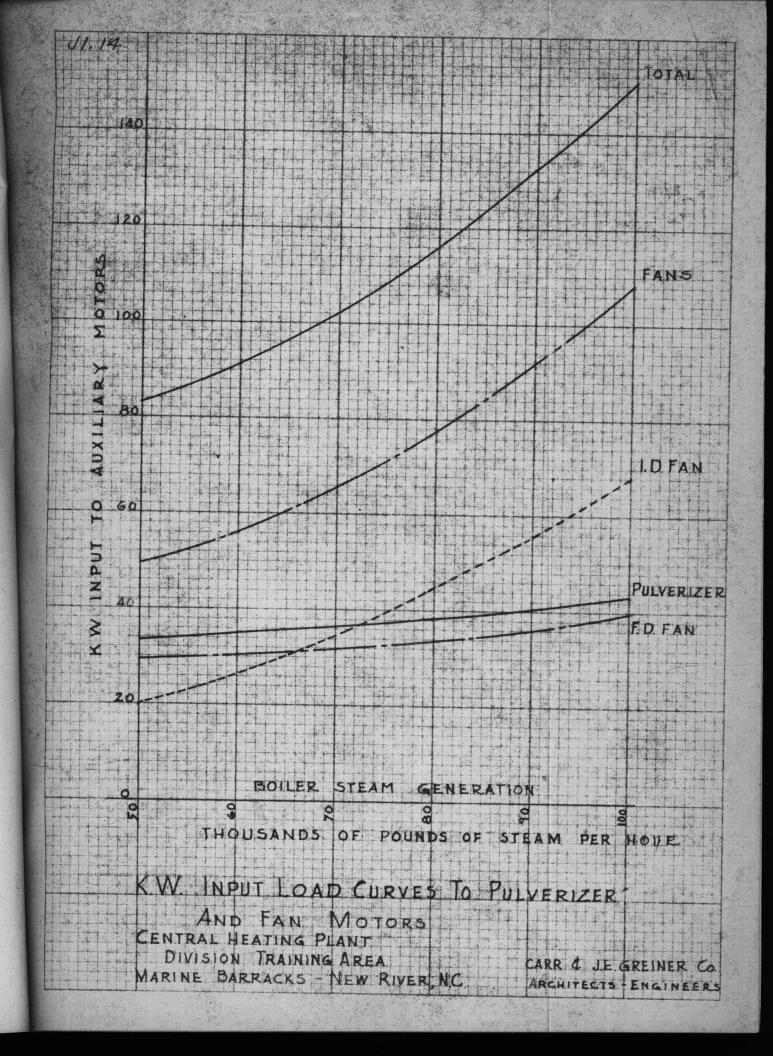
Pounds of steam per hour Pounds of gas per hour Gas temperature ^O F. Cubic ft. per minute Static suction at heater exit Loss through dust collector Loss through ducts and dampers Static suction at fan inlet Fan R.P.M.	50,000 56,000 275 16,700 1.00 .50 .30 1.80 415	75,000 86,500 280 26,000 2.10 1.15 .55 3.80 600	100,000 117,000 320 37,000 3.70 2.20 1.20 7.10 850	120,000 142,000 355 5.20	161,000 425 57,800 - - 11.3 1140
	415 6.9				11.3 1140 144.0 150.0

Clarage Fan Company #11 Type RT Fan DWD1, with rectangular inlet boxes and outlet damper. Fan driven by 150 H.P., 1200 R.P.M. constant speed motor through an American Blower #24 scoop control hydraulic coupling.

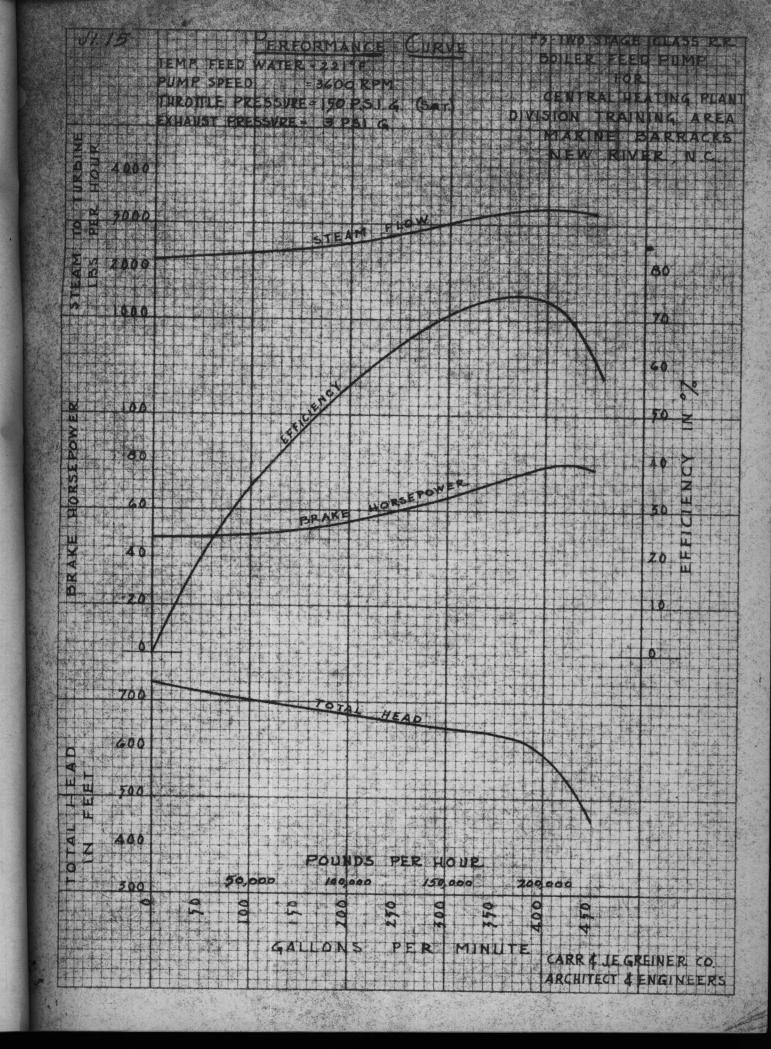
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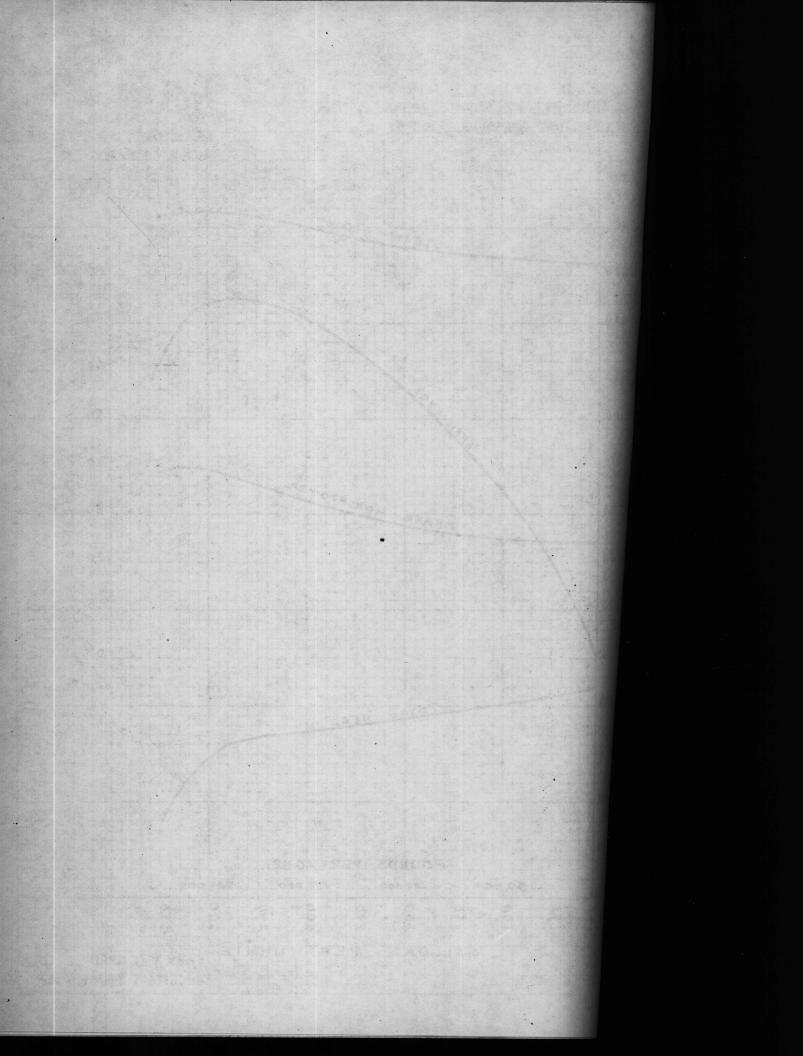
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J-2. Estimated Fuel Requirements.

J-2.01. Estimated Fuel Requirements: The annual fuel requirements have been estimated and approximately on a monthly consumption schedule as tabulated in paragraph J-2.10. The overall efficiency is estimated to be 70 per cent average with oil having a heating value of 6,300,000 B.T.U. per 42-gallons barrels or 80 per cent average efficiency with coal having a heating value of 13,500 B.T.U. per pound as fired.

J-2.02. Heating. The heating connected load at 105,920,000 B.T.U. per hour would require, on the basis of 70° F. inside and 10° F. outside design temperatures with a total of 2300 degree days, 4511 tons of coal per year, estimated as follows:

 $\frac{105,920,000 \times 24 \times 2300}{(70-10) \times 13,000 \times .80 \times 2,000} = 4511 \text{ tons of coal per year}$

J-2.03. Hot Water. The hot water heating connected load at 95,798,000 B.T.U. per hour would require, on the basis of 6 hours average use per day, 7770 tons of coal per year, estimated as follows:

 $\frac{95,798,000 \times 6 \times 365}{13,500 \times .80 \times 2,000} = 7770 \text{ tons of coal per year}$

J-2.04. Process. The process steam connected load at 54,162,000 B.T.U. per hour would require on the basis of 7 hours average use per day, 6407 tons of coal per year, estimated as follows:

 $\frac{54,162,000 \times 7 \times 365}{13,500 \times .80 \times 2,000} = 6407 \text{ tons of coal per year}$

J-2.05. Tabulation Losses. The steam distribution losses at 13,823,000 B.T.U. per hour would require 5606 tons of coal per year estimated as follows:

 $\frac{13,823 \times 365 \times 1000}{13,500 \times .80 \times 2,000} = 5606 \text{ tons of coal per year}$

J-2.06. Feed Water Heating. The feedwater heating would require on the basis entering temperature of water 143° F. approximately 1822 tons of goal per year estimated as follows:

Heating	4511	tons	
Hot Water	7770	11	
Process	6407	11	
Losses	5606	11	

Total - 24,294 tons coal

 $\frac{24,294 \times 2,000 \times 13,500 \times .80 \times 75 \text{ b. t. u's}}{13,500 \times 2,000 \times .80 \times 1,000} = 1822 \text{ tons of coal}$

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the second secon

Heating, hot water, process, losses Total for heating hot water	-	24,290 1,822		
Total annual fuel consumption	= .	26,116	tons	

J-2.07. Summer Minimum Load. The minimum demand of steam required for process distribution losses feedwater heating and boiler house auxiliaries is estimated to be 25,000 pounds per hour average for at least 8 hours per day during the summer time which would require the operation of the oil burning equipment. A total amount of oil consumed is 1360 barrels of oil per month estimated as follows:

 $\frac{25,000 \times 1,000 \times 8 \times 30}{6,300,000 \times .70} = 1360 \text{ bbls. oil per month}$

J-2.08. Winter Minimum Load. The handling of the winter minimum load by means of oil operation is similar to the summer, except the duration would not exceed an average of 3 hours per day and would require 540 bbls. of oil per month.

J-2.09. Oil Equivalent. The amount of oil equivalent to a ton of coal as fired and based on an average evaporation efficiencies is approximately 4.9 bbls, estimated as follows:

 $\frac{2,000 \times 13,500 \times .80}{6,300,000 \times .70} = 4.9 \text{ bbls. to a ton of coal}$

J-2.10. Tabulation of Monthly Quantities. The total amount of coal is estimated for 12 months operation; has been divided into month by month requirements; and a reduction has been made for the equivalent amount of oil burned each month in lieu of coal.

The variation in the monthly amounts is caused by the seasonable heating changes and variations in hot water demand from winter to summer.

	Oil	Coal
January	540 bbls	. 3071 tons
February	540	2598
March	540	2835
April	1360	1890
May	1360	1417
June	1360	1417
July	1300	1418
August	1360	1417
September	1360	1417
October	1360	1654
November	540	1890
December	540	2598
Total -	12,220 bbls.	23,622 tons

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J-3. Procurement of Equipment.

J-3.01. Specifications. The boilers and all auxiliary equipment was purchased on the basis of competitive bids taken from contract specifications prepared by the Architect-Engineers.

A complete list of the specifications covering the mechanical equipment is as follows:

Spec. No.

Title

810-1	Pulverized Coal Steam Generating Units and Appurtenant Equipment
810-2	Boiler Feed Pumps
810-3	Boiler Feed Water Regulators
810-4	Steel Stacks, Ducts and Brushings
810-5	Coal Handling Equipment
810-6	Fuel Oil Burning Equipment
810-7	Steam Pneumatic Ash Conveyer System
810-8	Deacrating Feed Water Heater
810-9-	Water Softeners
810-10	Surge and Boiler Blow-off Tanks
810-11	Combustion Control Equipment
810-12	Unit Sub-station, Low Voltage Switch Gear and Control Panels
810-13	Sump Pumps
810-14	Air Compressor
810-16	Condensate Pumps and Receiver
810-17	Piping, Valves, Fitting and Accessories
810-18	Insulation, Painting of Pipes, Ducts, Brushing, Stacks
810-19	Continuous Blow-off System
613	Chemical Feed System
824	Electrical Work and Miscellaneous Equipment

J-3.02. Tabulation of Bids and Contract Awards. The bids as received were tabulated by the Architect-Engineers and awards were made to the lowest bidder meeting all of the specified requirements.

J-3.03. Navy Specifications. The Navy Specification No. 21Yc for Installation of Power Plant, Heating, and Ventilating Apparatus and Piping was adhered to wherever possible; also, all the standard Navy Specifications including No. 66Pl mentioned in No. 21Yc were used for the purchase of materials and equipment with a few exceptions which were permitted due to scarcity of materials.

J-4. Central Heating Plant Building.

J-4.01. Location: The building is located six hundred feet southeast of Holcomb Boulevard on the southwest side of Gum Street in the Industrial Area.

J-4.02. Factors Governing the Design of Building. The principle factors governing the design of the building were the layout and arrangement of the mechanical equipment. Provisions were made for walkways, access platforms; clearances for removal of boiler tubes, repairing of equipment,

1-3. Cl. Specifications. The boilers and all auxiliary equipment was provided on the basis of constitute bids there are income a provide specification from property by the framited by the frame because in the frame beca

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J-4.03. Description of Building. The building is 138 feet long by 89 feet wide by 72 feet high and is of structural steel frame construction, with reinforced concrete floors and roof, brick walls and industrial type windows.

Details of design and construction of the building, specification, drawings, etc., are given in Section E-4.19 of the Completion Report.

J-5. Coal Handling and Storage:

J-5.01. Transportation of Coal: Coal is delivered by rail. A single track railroad located on the south side of building serves the plant. The siding has a capacity of five coal cars.

J-5.02. Coal Handling Equipment. The equipment was manufactured and erected by the Fairfield Engineering Co. and consists of a track hopper for unloading coal from cars, an apron feeder to convey coal from track hoppers to crusher, a double roll crusher to reduce run of mine coal to the proper size, a bucket elevator to lift coal from crusher to conveyor over coal bunker, and a flight conveyor which distributes the coal and discharges same into a 600 ton overhead coal bunker in the building.

A separate track hopper with reciprocating feeder and bucket elevator is provided for unloading coal and piling out to yard storage.

J-5.03. Track Hoppers. Track hoppers are 14' wide by 18' long and are of sufficient size to unload a hopper bottom coal car at a single "spotting". The hoppers are constructed of 3/8" steel plate. Track girders, over hoppers are 24" wide flange 120# beams, an eight inch square mesh grating constructed of 4" x 1/2" bars and 7/8" diameter rods, is placed over the track hoppers. This steel grating keeps out foreign materials and lumps that are larger than the lumps the crushing and conveying equipment are designed to handle.

J-5.04. Apron Feeder. The apron feeder used to convey the coal from the track hopper to crusher consists of two strands of roller chains connectod by double beaded steel pans. The large radius bead of each steel pan overlaps the smaller radius bead of its adjacent pan making a tight joint and preventing leakage of fine coal at all times. These beads also retard backward flow and prevents slippage of coal on the inclined feeder.

The apron feeder has 30" by 9" by 3/8" drip proof pans and is 51 feet long from head shaft to foot shaft. The pitch or rise of feeder is 4 3/8" per foot. The apron feeder is driven from the head shaft through sprockets and chain to a No. 150 D.H. Jones Speed Reducer #4 connected by flexible coupling to a 5 H.P. 900 R.P.M., 208 volt, 3 phase, 60 cycles General Electric Motor. The apron feeder operates at a lineal speed of 20 ft. per minute and at this speed, has the capacity to handle 75 tons of coal per hour. aite. Throughout the averya, proughle forme expandent dominations of min. sournos and sporstions and country of upoes requirements were tring into in sousiderestons

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J-5.05. Coal Crusher: The coal crusher is used to reduce run of mine coal to a suitable lump size for the Riley Atritas to handle efficiently in the final pulverization for burning. The crusher is a Marion No. 63 two roll spring relief type; driven by a 40 H.P., 900 R.P.M., 208 volt, 3 phase, 60 cycles General Electric motor through a V belt drive. Crusher rolls are adjustable and by spreading them apart slack coal can be by-passed through the crusher. The crusher has the capacity to reduce 75 tons per hour of run of mine coal to a maximum lump size of 1 1/4".

J-5.06. Bucket Elevator. The bucket elevator used to lift the coal from crusher to the flight conveyor over coal bunkers is of the double strand, heavy duty, continuous discharge type. The size of buckets are 20" x 10" x 11 5/8". The elevator is completely enclosed with a No. 10 gauge steel casing. The vertical height of elevator from foot shaft to head shaft is 90 feet 5 inches. Bucket elevator is driven from head shaft through sprockets and chain through a No. 150 D.H. Jones Speed Reducer No. 4 connected by flexible coupling to a 20 H.P., 900 R.P.M., 208 volt, 60 cycles, 3 phase General Electric Motor.

J-5.07. Flight Conveyor. The coal is discharged from a bucket elevator through a chute directly into the flight conveyor. The flight conveyor is supported by structural steel frame work carried on beams over the coal bunker. It is of the double strand roller chain type with reinforced flights 16" long x 8" wide x 3/8" thick. The conveyor trough is provided with eleven openings in the bottom for distribution of coal in bunker. Ten of these openings are fitted with rack and pinion operated gates. Flight conveyor is 116' 10" long from center of head shaft to center of foot shaft. Provisions have been made in the design to extend flight conveyor in case additional boilers are added to plant. The conveyor is driven from the head shaft by sprockets and chain to #150 D.H. Jones Speed Reducer No. 4 connected by a flexible coupling with 15 H.P., 900 R.P.M., 208 volts, 60 cycles, 3 phase, General Electric Motor. The capacity of flight conveyor at a lineal speed of 90 feet per minute is 75 tons of coal per hour.

J-5.08. Coal Handling System To Yard Storage. This system has a track hopper the same in size and construction as the track hopper described in the coal handling system to boiler house. A reciprocating plate feeder under track hopper feeds the coal to a vertical bucket elevator which lifts coal out of hopper and discharges same through a chute to an initial pile on ground. The bucket elevator is of the same size and constructed as the elevator described in the main coal handling system and parts are interchangeable. The capacity of the coal handling system to yard storage is 75 tons per hour. The coal is transported from the initial pile to yard storage and reclaimed by means of a caterpillar tractor equipped with bulldozer and 6-yard carryall scraper. The yard storage is 500 ft. long by 260 ft. average width and will hold 40,000 tons of coal. Space has been provided in the yard for the storing of 5,000 tons of stoker coal for use in the outlying heating plants.

J-5.09. Scales. A 20 ton Fairbanks platform scales with scale house is located adjacent to the coal storage area for weighing and keeping records of the amount of coal taken from storage and used by the outlying heating plants. ind to a substant and the same the same the used to maked to maked in the second of th

1-6.00%. Flidet report. The soul is discharged from a burght on another through the structured structure of antiput of the flight of all barrier. It is a fix double structure or burght to use the state the lights 10° loss a fix double structure of the source the state structure the eleven opening is the structure for distribution of coal in barrier. The flights 10° loss are double structure of the structure the the eleven opening is the structure of the distribution of coal in barrier. The flights 10° loss are double structure of bards and to be an and the eleven opening is the bards for distribution of coal in barrier. The distribution of the loss is the bards and the structure of the overall as 110° loss are done to be bard for distribution of coal in barrier. The distribution have been a done in the bards and the bards the barrier of the structure of the bards are bards and the bards and the distribution of the loss is the bards and the bards and the distribution of the loss is the bards are bard for distribution of the structure of the bards to plant. The structure flows a summation of the structure of the bards is the structure of bards a first in the bards of the bards are bards and the bards and the bards of the structure of the structure of the structure of the bards and the distribution of the bards is the structure of the bards of the double complete of the structure of the structure of the bards and the double of the bards of the structure of the bards are bards.

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J-7. Coal Scales .

J-7.01. Purpose of Coal Scale. Coal scales are placed between the overhead coal bunker and the pulvorizer feeders to weigh and record the quantity of coal burned by each boiler. There are two scales per boiler, one on each pulverizer.

J-7.02. Description. The coal scales are automatic, fully enclosed, dust proof, stationary floor mounted type "EE39" manufactured by the Richardson Scale Co. Each scale weighs 200 pounds of coal per dump and has an hourly capacity of 12 tons (based on 24-hour per day operation).

J-7.03. Operation. The scale weighs at each cycle 200 pounds of crushed coal drawn automatically from the overhead bunker, adds each preset draft on a dust proof, six figure, mechanical counter attached to the scale, and delivers the weighed coal into a hopper above the pulverizer feeder.

The scale embodies a motor driven rubberized conveying belt feeder for conveying the coal from its inlet to the weighing hopper, and directly the pre-set quantity has been delivered to the weighing hopper; the electtrical control operates and stops the motor driving the feeder. At the same time it actuates a solenoid which trips the discharge mechanism, whereupon the door of the weighing hopper opens and releases the weighed load. When the discharged coal no longer holds open the door of the weighing hopper this closes automatically and the scale repeats the cycle.

J-8. Coal Feeders, Pulverizers and Burners.

J-8.01. Function of Coal Feeders. The purpose of the feeder is to control the rate of flow of coal from scales to the pulverizer. There are two feeders per boiler, one on each pulverizer.

J-8.02. Description of Feeder. The Riley table type coal feeder consists of a hopper above a circular, slowly rotating table, a knife which varies the rate of coal feed, a magnetic separator and a suitable driving arrangement. The feeder knife extends onto the rotating table, scraping off the desired amount of coal into the coal chute to the pulverizer. An electromagnet is located under the table and forms an apron over which all the coal passes on leaving the table. The arrangement is such that the apron is magnetized while passing under the coal stream so that removal of magnetic material is positive and certain. The apron is de-magnetized at a later point in its rotation and drops the magnetic material into a suitable tramp

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iron pocket from which it can be removed at suitable intervals. Rate of coal feed is a function of relative speed and knife position. The feeder is driven through a gear assembly connected to a Reeves variable speed transmission by means of roller chains and sprockets. The Reeves transmission is driven by a 1 H.P., 1150 r.p.m. Allis Chalmers constant speed motor through a Texrope drive. By changing the position of a lever mechanism, connected to the Reeves transmission, the speed of feeder disc and agitator is varied to adjust the rate of coal flow to pulverizer operating under variable loads. The knife can be moved through 6 inches of travel across the table by an operating wheel outside of the housing, and, combined with the variable selective speeds of the drive, it controls the rate of coal feed to pulverizer.

J-8.03. Internal Construction of Feeder. The feeder table consists of a 20" diamter truncated cone. The top surface is covered with a renewable wearing plate, the edge apron contains provision for extending the magnetic field, and the bottom is open. The table is mounted on a vertical shaft extending both above and below the table. A renewable paddle agitator is attached to the shaft above the table to insure movement of wet coal out of the feeder hopper. The shaft below the table is connected to the feeder drive by a collar and replaceable shear pin arrangement. A magnet is fastened to the feeder housing under the truncated cone table, the face of the magnet faces the discharge chute. As the table rotates, the apron forming the edge of the table is magnetized while passing under the coal stream. When this portion of the apron reaches the other side of the housing it is out of the influence of the magnet and is de-magnetized so that material collected from the coal stream is deposited in the tramp iron pocket.

The feeder knife is mounted on a threaded shaft so that it can be moved across the table by the operating wheel outside the housing. The table, knife, magnet, etc. are fully enclosed in a housing equipped with adequate openings for observation and access.

J-8.04. Pulverizers. There are two Riley # 4 Atrita Unit Pulverizers per boiler. Each pulverizer has the capacity to pulverize from 6500 to 7500 pounds of Bituminous coal per hour, to such a fineness that 76 per cent will pass through a 200 mesh screen and 99 per cent through a 50 mesh screen.

J-8.05. Description of Pulverizer. The Riley Atrita unit pulverizer is built almost entirely of steel with the exception of grinding elements and cortain fittings. It is necessary to make regular inspections of pulverizers to determine whether or not the bearings are properly lubricated and to make minor adjustments to control the air flow from the machine to the burners from time to time as major load changes occur. These adjustments can be made manually or automatically as best suits the individual requirements. The following detailed description should prove helpful in the matters of maintenance and of proper operation. Fuel is fed at a controlled rate to the pulverizer by a feeder as previously described under feeder instructions. The fuel enters the machine through a feed chute, being accompanied by primary air. The first effect in the pulverizer is to break down any lumps or particles to a granular size. The second effect is to pulverize this granular fuel to the required degree of fineness, separate over-sized coarse material, and deliver the desired product to the pulverizer fan, which in turn conveys the material to the burner. The fan serves the purpose of conveying fuel through the pulverizer, as well as of transporting it to the

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burner by creating air flow, which is commonly known as primary air. The compartment in which grinding is accomplished is separated from the fan wheel compartment by a steel partition plate and both compartments are contained in a welded steel housing on either end of which are the bearing supports. The housing is split on the horizontal shaft center line and the top part readily can be removed to expose all interior parts for convenience of inspection and renewals as may be necessary. The housing is protected . from wear by renewable liners throughout, including the fan chamber. The steel discs which carry the moving grinding elements and the fan blades are likewise protected by the design of the renewable parts. An internal inspection of the machine should be made before placing it in service and during such inspection the details of construction can be ascertained clearly.

J-8.06. Coupling. A Rawson Type A coupling is used between pulverizer and motor. This coupling allows the motor to be started under no load. Across-the-line starting is recommended. Before mounting the coupling be sure that all parts are washed with kerosene and are free from dirt and grease. Do NOT lubricate any part of this coupling. Correct alignment of drive and driven shafts is essential. The frictional lining of the shoes will wear a long time if aligned correctly.

J-8.07. Pulverizer Motor. The pulverizer is driven by an Allis Chalmers 75 H.P. 208 volt, 3 phase, 60 cycle, 1170 R.P.M. constant speed motor.

J-8.08. Burners. Each boiler is equipped with two Riley # 3-1/2Flare Type Burners with # 4 heads. Each burner has the capacity to burn from 1000 to 5000 pounds of pulverized coal per hour. The burner tube is designed to accommodate a gun type oil burner.

J-8.09. Burner Piping. The interconnecting piping between the burners and pulverizers is so arranged that either pulverizer can be used to supply coal to either one or both burners at any one time by the proper manipulation of the two way plug valves located at the burners and pulverizers.

J-8.10. Description of Burner. The burner box or plenum chamber, of welded steel construction, is arranged for mounting against the furnace wall and contains a set of adjustable vanes for control of secondary air. Through the center of this box is a nozzle for primary air and fuel, with a fuel spreader located at its furnace end. A receiving head with adjustable vanes for equalizing the fuel distribution is attached to the outside of the box, the head supporting the burner nozzle. The pulverizer discharge pipe is attached to this receiving head. A pair of dampers for control of secondary veniently mounted on the ends of the damper shaft. The furnace side of the burner box has an opening which coincides with the opening in the furnace gral part of the burner.

J-9. Oil Burning Equipment and Gas Ignition System.

J-9.01. Purpose of Oil Burning System. The intention in the design and selection of the equipment was that the oil burners should be used only when the boiler load requirements are below the safe operating range of the

Added to an intervention is a second inter a second inter a most botween pairworks a apone. This would be allowe also mater to be started ander no bied. We the themist of an help its recommendal follow and the despite be that all parts are would be before and the fronting the despite and also. To for larian a to part of this consisting. Correct allowing of a we wil drives anothe is consisted of this consisting. Correct allowing of a we wil drives anothe is consisted of this consisting. Correct allowing of the second track of allowing the friend in the fractional intervention of a second track of allowing the track and its the shows is sear a long time is allowed correction.

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Adadle Person (011 Burning System: The infontion in the design Mattice of the equipment was that the oil burnets should be used calr. pulverized coal burner; that is, when the boiler load is under 20,000 pounds of steam per hour. Therefore, the oil burners are designed to take care of loads from 1,000 to 30,000 pounds of steam per hour per boiler, and the oil pumping equipment was designed to supply four boilers all operating on oil at the maximum rating.

J-9.02. Burners. Oil burners are Enco No. 10 steam atomizing, gun type, designed to fit in ignition tube of Riley pulverized coal burners. The oil burners were manufactured and furnished by the Engineering Company and two were supplied for each boiler. Each burner will have the capacity to burn from 100 to 1100 pounds of No. 6 bunker C fuel oil per hour. The capacity of the burners can be increased by changing burner tips.

J-9.03. Oil Pumping Set. The oil pumping set was furnished by the Engineering Company and consists of one 20 G.P.M. Warren 7-1/2" x 5" x 6" duplex steam driven pump and one 20 G.P.M. De Laval 1 Mo rotary screw pump driven by a 7-1/2 H.P. motor. Both pumps are mounted on a common bed plate over two Whitlock straight tube oil heaters. Each heater has a total heating surface of 75 square feet.

The pumping set is a completely automatic unit with all necessary interconnecting piping, strainers, relief valves, automatic temperature control, pump governor, thermometers, pressure gauges, traps, etc.

J-9.04. Meters. Oil meters are furnished for installation in the oil supply line to burners and in the return line to fuel oil tank. By subtracting reading of oil return meter from supply meter, the oil consumption can be computed over any period of time.

Meters are the Bassler Models 1-EXD manufactured by S. F. Bowser Co., with thermostatic control, which automatically compensates for changes in oil temperature.

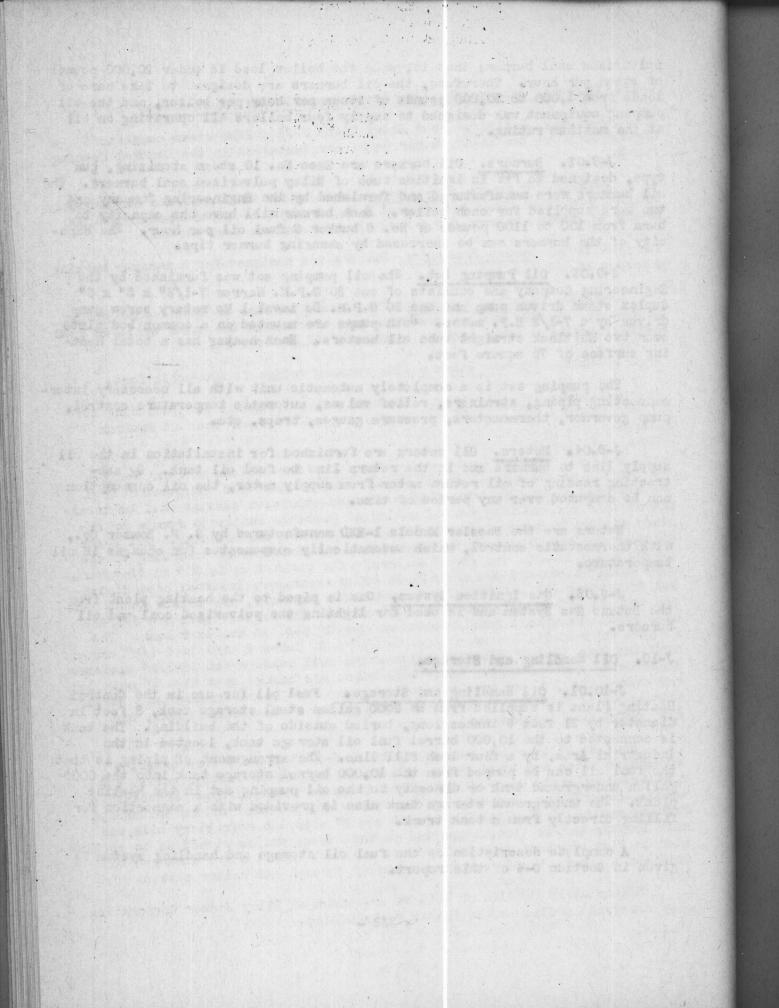
J-9.05. Gas Ignition System. Gas is piped to the heating plant from the Butane Gas System and is used for lighting the pulverized coal and oil burners.

J-10. Oil Handling and Storage.

J-10.01. Oil Handling and Storage. Fuel oil for use in the Central Heating Plant is supplied from an 8000 gallon steel storage tank, 8 feet in diameter by 21 feet 6 inches long, buried outside of the building. The tank is connected to the 10,000 barrel fuel oil storage tank, located in the Industrial Area, by a four inch fill line. The arrangement of piping is that the fuel oil can be pumped from the 10,000 barrel storage tank into the 8000 gallon underground tank or directly to the oil pumping set in the heating plant. The underground storage tank also is provided with a connection for filling directly from a tank truck.

A complete description of the fuel oil storage and handling system is given in Section G-4 of this report.

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J-11. Boilers, Ash Hoppers, Air Heaters and Boiler Accessories.

J-11.01. Boilers. Four Riley Class P-25 # 25WW steam generators manufactured by the Riley Stoker Corp. are installed in the Central Heating Plant.

J-11.02: Capacity of Boilers. Each boiler will generate continuously 100,000 pounds of steam per hour at 175 p.s.iig., no super-heat or 120,000 pounds of steam per hour for a three hour's maximum peak period.

J-11.03. Design Pressure. Boilers are designed for a maximum working pressure of 193 p.s.i.g.

J-11.04. Heating Surface. The heating surface in each boiler proper is 9000 sq. ft. and the projected heating surface in the water walls is 2900 sq. ft., making a total heating surface of 11,900 sq. ft.

J-11.05. Furnace Volume. The furnace volume is 500 cubic feet.

J-11.06. Heat Release. The heat release furnace not including air heater recovery, will be 27,800 b.t.u. per cu. foot per hour at maximum rating.

J-11.07. Boiler Construction Details. The boilers and air heaters are carried on structural steel supports and foundations independent from the building steel, assuring that no boiler expansion strains will be transmitted into the building steel, making it possible easily to remove or replace boilers without disturbing the steelwork of the building. All seams in steam and mud drums are fusion welded, and constructed according to the latest A.S.M.E. Code for Power Boilers. The steam drum is 60" in diameter with 13/16" shell and has a built-in steam separator, internal pipe distribution systems for chemical feed, continuous blow-off, and boiler feed. The mud drum is 36" in diameter with 1/2" shell. The boiler tubes are 3-1/4" 0.D. in the front and middle banks and 2-1/2" 0.D. in the last bank. The furnace water walls are made up of 3-1/4" O.D. tubes spaced in 4-1/2" centers expanded into 10-3/4" diameter upper water wall headers and 12-3/4" diameter lower water wall headers. Water wall tubes are backed up with a 3" ship lap refractory tile, 5" of insulation block, and 3/8" loose insulation. Boiler setting walls are 3" ship lap refractory tile, 4" insulation block, and 3/8" loose fill insulation.

Roof is 2" ship lap refractory tile, 2-1/2" Class C fire brick, 4" insulation block and 2" of felt. All furnaces, boiler setting walls, and roof are completely covered with a No. 10 gauge steel casing. Necessary access, observation, and tube lancing doors are provided in the boiler and furnace walls. Boiler baffles are 3" and 2" ship lap refractory tile and self locking baffle tile, supported on the tubes, and so placed as to obtain a cross flow of gases over the heating surface. Baffles are arranged to maintain a substantially constant velocity through all boiler passes.

Construction details of boilers are shown on Riley Stoker Corporation shop drawings on file in the Public Works Office.

Bollors, And Hoppers, Air Heaters and Heiler Ageneering

C-11.01. Bollores Four Biley Glass 2-26 § 2600 steam generators anatured by Wie Miley Stoker Corp. are installed in the Sadtral Heating Mi.

J-11.02. Gapacity of Bollers. Back boller will cenerate ophtinusualy .000 pounds of storm jer hour at 175 p.s.1.8. as super-boak or 120,000 ads of steam per hour for a three hour's maximum pant period.

dell.03: Beatrn Fressure. Boilers are designed for a mainum working

della08. Heating Lurince. The heating surface in each beiler proper 000 sq. ft. End the projected heating surface in the mater walls is 2200 ft., making a total heating surface of 11,800 ge. ft.

Jell.06. Furnace Volumes The Curnace valume is 500 aubid fosts

Jell.06. Heat Helegas. The heat release furnede not including air or recovery, will be dr.800 betaus per ous foot per hour at maximum.

d-lled?. Soller Construction Details. The builders and air heaters entried on structured these and foundations independent from building stori, assuring that no boilor expension strains will be transto the building theol, a king it possible basily to remove of rosome lia anthors of the standard of the buildings all some tion and much drune are funion wolded, and constructed according to the . at A.S.M.Z. Goda for fower Boilers. The steam drum is 60° in diameter 15/16ª shall and has a built-in storm sourator, internal pipe distria systems for chemic i feed, continuous blowwoff, and boiler feeds - Dic wow is 16" is dianoty with 1/2" shall. The bollor tubes are 3-1/4" the the front and mid to banks and 2-1/2" 0.0. in the last bank. The anotice "all-1 al papage setted 0.0 " diles to go ober one eller report Mod into 19-3/4* dis stor where where wait beaders and 18-3/4* dissector wall badde will boaderes. Water wall tubes are backed up with a 3" shabe lau winry tile, 5" of in mlation block, and 5/8" local haulation. Boiler the state are 38 anty lay refractory tile, 44 traulation block, and Jacks fill insulation

Nort is 2" ship isp retractory tils, 2-1/2" Class'S fire bries, 4" with block and 2" at fait, All furnesse, while setting walls, and are consistely severed with a No. 10 gauge steel-cosing. Noossary a classreation, and take impairs decre are provided in the boiler and a wails. Follor battles are 3" and 2" and 2" and a placed in the boiler and leasing battle tile, supported on the takes, sat. so placed at to obtai a flow of gauge over the moting surface, Baffles are arenged to an order attake over the moting surface, Baffles are arenged to an experimentally constant velocity through all baller reases.

Construction details of bollors are shown on Riley Stoker Corriersting

J-11.08. Ash Hopper. A water cooled ash pit hopper manufactured by the United Conveyor Corporation receives the ash from the furnace. The ash hopper is lined with 4-1/2" of first quality fire brick, backed up with 2-1/2 inches of insulating brick. The outside steel casing is two 1/4" steel plates spaced 2 inches apart. This space makes a water jacket through which cooling water is circulated. The ash hopper is provided with three (3) vertical lifting ash removal doors and necessary access doors in front and ends. The hopper is carried on spring supports to allow for movement of lower water wall headers.

J-11.09. Soot Hoppers. Soot hoppers are provided for the collection of soot and fly ash in the last pass of the boiler and first pass of air heater.

J-ll.lo. Air Heaters. Each boiler is equipped with a Riley two pass, tubular type air heater with 2-1/2" tubes. Total heating surface is 12,200 sq. feet. Air heater is arranged so that the flue gas flow is inside the tubes and the air flow is outside and around the tubes. Casing of air heater is constructed of 3/16" copper bearing steel plate.

J-11.11. Water Columns. One Reliance No. 7 water column with cast iron body fitted with high and low level alarm, and flat inclined prismatic gauge glass with Reliance gauge illuminator GL50 is furnished for each boiler.

J-11.12. Boiler Blow-off Valves. The boiler blow-off valves are manufactured by the Okadee Company and were furnished with the boilers.

Two 2-inch blow-off connections are provided on the mud drum and one 1-1/2" connection is provided on each of the three lower water wall headers. A tandem assembly of one Okadee Quick Action - Lever operating single seated Type "FSF" blow-off value and one Okadee geared slow operating double seated Type "BWL" blow-off value is furnished for each boiler and water wall blowoff connection.

J-11.13. Boiler Non-Return Valves. The non-return valves are 12-inch angle pattern, single acting, stop and check valves, built for a working pressure of 250 p.s.i.g. manufactured by the Golden-Anderson Valve Specialty Company.

J-ll.14. Safety Valves. Two 3-inch and one 6-inch type 1411 cast iron "Consolidated" steam safety valves are furnished for each boiler. One 3-inch valve is set to pop at 185 pounds pressure and has a relieving capacity of 17,000 pounds of steam per hour. One 3-inch valve is set to pop at 187 pounds pressure and has a capacity of 17,560 pounds of steam per hour. The 6-inch safety valve is set to pop at 190 pounds pressure and has a relieving capacity of 104,600 pounds of steam per hour. The total relieving capacity of the three valves is 139,160 pounds of steam per hour.

J-11.15. Boiler Feed Stop and Check Valves. Two sets of stop and check valves are furnished with each boiler. The feed stop valves are Crane 4" angle Fig. 156XR with 300 # standard cast alloy steel body, Exalloy seat, nickle alloy disc flanged end bolted bonnet, outside screw, and yoke. The feed check valves are Crane 4" globe Fig. 39B 250# standard with cast iron body, brass trim, flanged ends, bolted bonnet. Jollands. Sout long the Sout hoppers are provided for the selienticul mot and fly and in the Tast pass of the builds and first pass of are

J-11.11. Motor Coleman. One Holinged Hol F wayer colema with east been Fitted VICs and Lee Level slars, and Fiel Spolined printings av class with Sultance raws filweinster 200 is fermioned for each belles.

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Jell.14. <u>Britty Valance</u> No Jelach and the defining type 1912 cash included a line and the state is nine and the same of the state is a solution of the sta

J-11.16. Soot Blowers. Soot blowers are manufactured by the Diamond Power Specialty Company and consists of six Diamond Valve-in-Head units. Three of the units have "Dialoy" elements, "Dialoy" bearings, bolted type. One unit has colorized element, colorized bearings, bolted type, and three units have extra heavy steel elements, plain steel bearings, bolted type.

The soot blowers operate on saturated steam, a separate nozzle is provided on the steam drum for the soot blower piping connection. Soot blowers and piping were included in the boiler contract.

J-12. Fly Ash Collector.

J-12.01. Collector. A "Thermix" DES 6BH 4 #7-160 tubular dust collector manufactured by Prat-Daniel Corporation is furnished for each boiler.

The dust collector has 160 multiple cyclone tubes arranged in horizontal tube sheets. Four tube sections are provided. Fly ash storage hoppers are built integrally with the collector.

The dust collector is placed between the air heater outlet and the induced draft fan inlet and is located in the basement of the boiler house. The dust collector has an overall collection efficiency of 80 per cent. Draft loss through the dust collector at 100,000 pounds of steam per hour boiler rating is 2.20 inches of water, at 75,000 pounds rating 1.15 inches and at 50,000 pounds rating 0.50 inches of water.

J-12.02. Vibrator and Rotary Valves. The dust collector is equipped with a plate vibrator and motor driven rotary valve unloader furnished by the United Conveyor Corporation.

J-13. Forced and Induced Draft Fans.

J-13.01. Fans. Due to the draft loss through the boiler, air preheater, and fly ash collector it is necessary to install a forced and induced draft fan on each boiler to furnish the air required for conbustion and the necessary draft. These fans are located on the operating floor at the side and rear of boiler within easy access and under the constant observation of the operator.

The amount of air handled by the forced draft fan is controlled by a vortex damper on the inlet and a louvre type outlet damper.

The amount of gas handled by the induced draft fan is controlled by changing the speed of the fan by means of an American Blower Corporation No. 24 Scoop Type Hydraulic Coupling placed between the fan and driving motor. A louvre type outlet damper is also furnished. The fans and dampers are manufactured by the Clarage Fan Company and were furnished with the boiler contract.

J-13.02. Forced Draft Fan. Size 2-1/2, Type W, Class IV, double width, double inlet forced draft fan, driven by a 75 H.P. Allis Chalmers constant speed 1770 R.P.M., 208 volt, 3 phase, 60 cycle induction motor. Capacity of the forced draft fan is 33,500 cu. ft. of free air per minute at a temperature of 80° F. against a static pressure of 9.6" water gauge.

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J-13.03. Induced Draft Fan. Size 11, Type RT, double width, double inlet, furnished with scroll liners, water cooled bearings and structural steel sub base. Fan is driven by a 150 H.P. Allis Chalmers, constant speed, 1140 r.p.m., 208 volt, 3 phase, 60 cycle induction motor. Capacity of the induced draft fan is 57,800 cu. ft. of flue gas per minute at a temperature of 425° F, against a static pressure of 11.3 inches water gauge.

J-14. Ducts, Flues and Stacks.

J-14.01. Stacks. Individual steel stacks, supported on the roof of the building, are provided for each boiler.

Each stack is 6 ft. 6 in. inside diameter and 37 ft. high from the base. The top of stack is 60 ft. above boiler butlet and 100 ft. above grade. Stacks are constructed of 5/16 in. and 1/4 in. steel plate. All seams are tack riveted and welded on the inside of stack. A clean-out door, painters trolley, and ladder are provided on each stack. A conical hopper inside the stack at the base, is used for the collection of fly ash and soot that accumulates at this point. Aviation obstruction lights are provided.

Stacks are lined with "Gunite" 2 inches in thickness which was sprayed on wire mesh reinforcing, fastened to inside of stack with metal clips welded on.

J-14.02. Ducts and Flues. The flue between the induced draft fan and stack is 4 ft. wide by 6 ft. deep and has a cross sectional area of 24 square feet. Flue was designed for a gas velocity of 2400 f.p.m. at maximum rating.

A by-pass duct is provided between boiler uptake and flue, with a shut off damper placed in the uptake. Opening this damper allows the flue gas to pass directly from the boiler to stack, bypassing the induced draft fan and air preheater.

The ducts and flues are constructed of 3/16 inch steel plates, reinforced with stiffener angles, and provided with necessary access doors, exparsion joints, and dampers.

All outside surfaces of hot gas ducts and flues are insulated with 2 inches of 85 percent magnesia block over which is applied a hard finished asbestos cement troweled to a smooth surface.

The stacks, flues, and ducts were fabricated by Dewey Brothers, Inc. and erected by Contractors NOy 4750.

J-15. Ash Handling System.

J-15.01. Description of Ash Handling System. The ash removal and conveyor system is of the steam, pneumatic suction type manufactured by the United Conveyor Corporation. The capacity of conveyor system is 15 tons of ash per hour. Ash conveyor piping is 6 and 8 inches in diameter and made of abrasion resisting cast iron. Disc type inlet gates are furnished for the soot hopper and stack connections, and plug type gates are furnished for closing off the various branches of the system. All fittings and valves are made of abrasion resisting alloy cast iron. Fittings have renewable back

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sections. Rotary vane feeders with adjustable buckets driven by 1/4 H.P. motors are mounted on the fly ash collector hopper outlet connections and motor driven vibrators are supplied for the hoppers. Self feeding ash intakes with 24" x 24" expanding type grids and grid feeding hopper, three per boiler, are provided for removal of ash from boiler ash hopper.

J-15.02. Principles of Operation. The Nuveyer Exhauster produces a vacuum which induces a strong flow of air through the conveyor. This air stream picks up any material delivered into the conveyor and transports it to the receiver where the material is separated from the air and accumulates in the bottom of the receiver. The air then passes through the exhauster and to an air washer. In order not to overfill the receiver with material, the time controlled remote control steam valve periodically cuts off the steam to the receiver to open and discharge the material to the storage bin. At the end of the idle period the steam again is turned on automatically by the timer, the swing gate closes and more material is deposited in the receiver.

J-15.03. Ash Receiver. A four feet diameter cast iron receiver, built in sections and having renewable wear plates, is furnished and mounted above the ash storage bin.

J-15.04. Exhauster. An 8" multi-jet steam exhauster is placed between the receiver and air washer.

J-15.05. Air Washer. A four feet diameter sectional cast iron air washer is mounted above storage bin. Air washer is fitted with water sprays and a three bag vent filter for removal of dust.

J-15.06. Ash Storage Bin. The ash storage bin is 14' in diameter by 23' high and has a capacity of 50 tons of dry ash. Bin is constructed of 6 inch tile and is carried on structural steel supports 20 feet above the ground.

J-15.07. Hopper Under Storage Bin. The adapter hopper connecting the ash bin and dustless unloader is equipped with an electric motor driven vibrator to prevent the ash from clogging or arching over in hopper.

J-15.08. Ash Unloader. A rotary dustless unloader with rotary vane feeder under the storage bin discharges the ash directly into motor trucks. The unloader is driven by a 5 H.P., 208 volt, 3 phase, 60 cycle induction motor and has a capacity of 25 tons of ash per hour.

J-15.09. Electric Control. All electrical control equipment including motor operating steam valve, timer, flow contactor, motors, starters, and push button stations are furnished for 208 volts, 3 phase, 60 cycles service by the United Conveyors Corporation.

J-16. Combustion Control and Metering.

J-16.01. Combustion Control System. The boilers are controlled automatically to maintain constant steam pressure by means of fuel and air regulating equipment operated from individual boiler control panels. The comicons. Estary was foders with adjustable haddet artwor by 174 H.P. and and sourced on the fir ash collader hopper outist comparized or drives vibrators are assailed for the hoppers. Sait feeding ham ina dith tet z XX extending tree grids and rold feeding hopper. Alt a balant, the resting for reseval of ash from bailer ash hopper.

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1.16.01. Combustion Control Lystem. The bollers are controlled and diy to mainbain constant steem prosecute by mand of Trail and are read requipment operated from individual betier control grands. Mic.con. bustion control equipment is furnished by the Republic Flow Meters Company, and is the Smoot pneumatic type with provisions for manual-remote operation.

Separate boiler rating controls and fuel-air ratio controls are mounted on each boiler control panel together with a remote-manual control for the furnace pressure regulator operating the inlet vane control of the forced draft fan.

The fuel regulator varies the speed of the coal feeder and the air regulator varies the speed of the induced draft fan.

A master controller is provided with a steam pressure element for connection to the main steam header. The master controller maintains a constant steam pressure in the main steam header, and maintains the desired proportion between the fuel and air quantities used by all boilers in operation thereby making it possible to proportion the load carried by each boiler. The master controller is mounted on No. 2 Boiler Control Panel.

J-16.02. Motor Starting Equipment. The motor starting remote control switches for the pulverizers, coal feeders, automatic coal scales, forced and induced draft fans are centralized on the boiler control panels and are interlocked electrically to provide proper sequence of operation.

J-16.03. Instruments and Gauge. A Republic multi-pointer draft gauge for measuring furnace draft, pressure of air entering and leaving heater, pressure of gas entering and leaving heater, gas leaving fly ash collector, and pressure of air in burner windbox, Republic temperature recorders for measuring temperature of air and gas entering and leaving air heater, Ranerax CO2 recorder, Bailey steam flow air flow meter, Reliance Eye-Hye boiler water level gauge, and a steam pressure gauge, are mounted on each boiler control panel.

J-16.04. Meter Panel. A separate meter panel is provided on which are mounted meters for measuring the flow of all steam from the main steam header to the various areas, for measuring flow of feedwater to the boilers, recording steam pressures in main and auxiliary steam headers, and temperature of condensate return and water from feedwater heaters.

J-16.05. Combustion Control Diagram. The combustion control system and the connections to the various controlled equipment are shown in the following diagram, J-16.05.

J-17. Boiler Feed Punps. Four turbine driven 3 inch, two stage, class R.R. contrifugal boiler feed punps manufactured by the Buffalo Punp Co. Inc. are installed for boiler feed purposes.

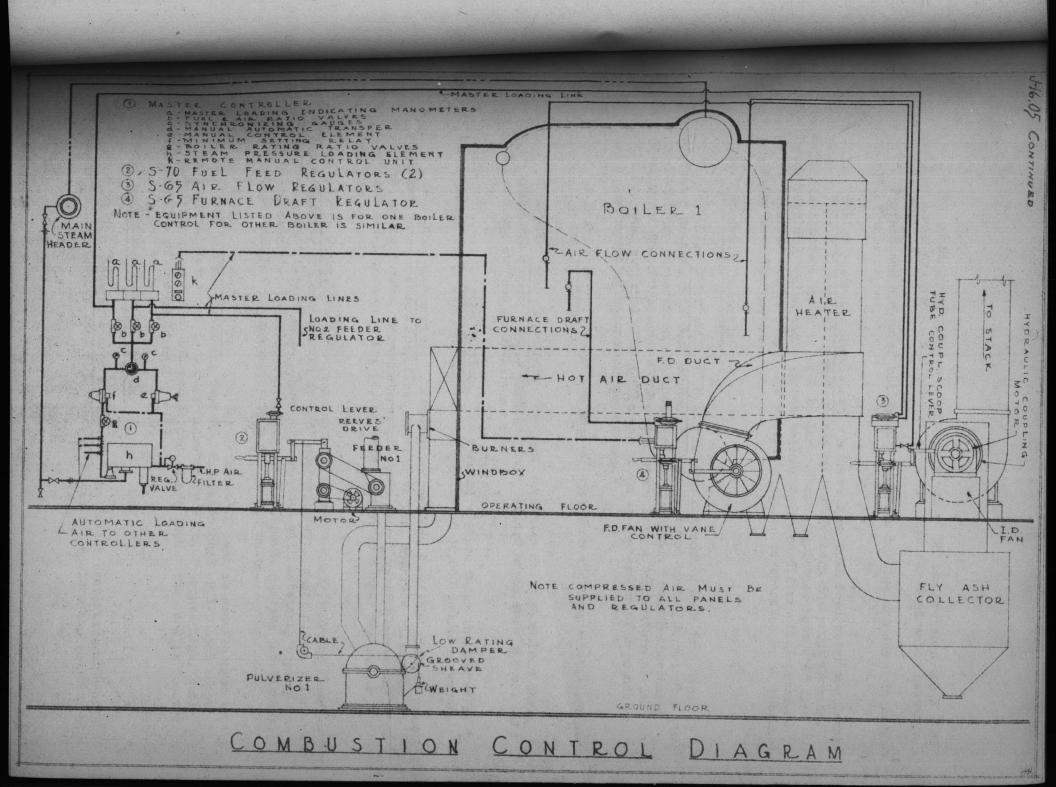
Each pump has a capacity of 275 g.p.n. of water at a temperature of 221°F against a total head of 650 ft.

The steam turbines driving the pumps are manufactured by the Elliott Company (Type BY) rated at 75 H.P. at 3600 r.p.m.

Turbines are equipped with overspeed trip and excess pressure governorand are connected directly with the feed pumps through flexible couplings.

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The turbines operate on saturated steam at boiler pressure and 3 lbs. exhaust steam pressure. All exhaust steam is used for feed water heating.

Performance curves of boiler feed pump and turbine are shown in Par. J-1.15 of this report.

J-18. Boiler Feedwater Regulators. A Copes Type RG-2 feed water regulator with a Type R Thermostat, manufactured by the Northern Equipment Company, controls the feed water to each boiler. These regulators have a 4" feed water regulator valve and a syphon bellows operated differential pressure valve combined in one body. The regulating valve is operated by an inclined expansion tube thermostat.

J-19. Feedwater Heaters.

J-19.01. Description of Heaters. Two deacrating open tray type, feedwater heaters with vent condensers, manufactured by the Worthington Pump and Machinery Corporation, are installed in the plant. Each heater has a capacity of 250,000 pounds of water per hour, from a temperature of 140° to 221° F., when supplied with sufficient steam at a pressure of 3 pounds gauge and a corresponding saturated temperature.

J-19.02. Trays. Trays are made of cast iron and have a total heating surface of 370 square feet.

J-19,03. Vent Condenser. The vent condenser has a cast iron shell with arsenical copper U tubes expanded into "Muntz" metal tube sheets. The total cooling surface is 134 square feet.

J-19.04. Storage Section. The storage section under the heater is 7 ft. diameter by 16 ft. long and has a capacity of 38,000 pounds of water.

J-19.05. Accessories. Feedwater heaters are furnished with necessary steam and water connections, float control valves, overflow valve, vacuum breaker, relief valve, thermometers, pressure gauge, water glasses and fittings and all interconnecting piping between vent condenser and heater section.

J-20. Surge Tanks. Two tanks manufactured by the Kennedy Tank and Manufacturing Company are constructed of 3/8" copper bearing steel plate, 9 feet diameter by 20' 9-3/8" long. Tanks are provided with necessary piping connections, overflow, manhole, supporting saddles, gauge glasses and fitting. Each surge tank has a capacity of 9000 gallons of water.

J-21. Boiler Blow-off Tank. The boiler blow-off tank is manufactured by the Kennedy Tank and Manufacturing Company, is constructed of 1/2 inch copper bearing steel plates and is 5 feet diameter by 9 ft. 3 inches high, built for a working pressure of 175 pounds per square inch. The tank is located in a pit outside of the building.

J-22. Continuous Blow-off System.

J-22.01. Description of Equipment. The boiler continuous blow-off system is comprised of four flow control valves to regulate the quantity of

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allor elder-off Tank. The bolion birs will have is minuretined by the set Madelseturin Company, is constructed of 1°2 inch. sope while plates and is 5 fort discreter by 8 fb. 3 inches high, built where pressed of 1% pounds per square inches The back is located ands of the building.

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blow-off from each boiler; a flash tank 24 inches diameter by 4 ft. high equipped with high level alarm, a float control valve, relief valve, and gauge glass; a heat exchanger 10 inches in diameter by 6 ft. long having 54 sq. ft. of cooling surface; a sample cooler; and necessary testing equipment for determining the density or concentration of solids in the boiler water. The continuous blow-off equipment was furnished by the Cochrane Corp.

J-23. Condensate Receiver and Pumps. Two motor driven single stage, double suction type centrifugal condensate pumps mounted on a common bed plate with a horizontal receiving tank 30 inches diameter by 42 inches long constructed of "Armco" rust resisting iron, manufactured by the Chicago Pump Company. Each pump has a capacity of twenty-five gallons of condensate per minute against a total head of 90 foet.

J-24. Water Softeners. Two Zeo-Dur automatic softeners manufactured by The Permutit Company are installed in the plant. The softener tanks are 5 ft. diameter by 8 ft. high and were furnished with multiport motor operated valves, salt storage tank, 2 brine measuring tanks, brine ejectors, meters, gauges, and all interconnecting piping.

Each softener has a capacity of 40,000 gallons of water of 5 grains hardness, per regeneration and has a maximum rate of delivery of 98 gallons of softened water per minute.

J-25. Piping, Valves and Fittings. In the design of the various piping systems and specifying of materials, the Bureau of Yards and Docks Specification No. 21Yc and Navy Department Specifications 66 Pla were followed closely.

The main steam boiler feed and high pressure drip piping was designed for 250 lbs. working pressure.

All low pressure steam and water piping was designed for 125 pounds working pressure.

Flanged joints were kept to a minimum and where necessary, butt wolding flanges were used. Welding fitting and welded nozzles were used in lieu of pipe bends and flanged fittings.

Expansion loops were installed to provide the necessary flexibility required for expansion and contraction.

All stop values over 2 inches are flanged, cast iron bodies, with outside screw and yoke and flanged bonnets. Globe values are used on bypesses and wherever control of flow is necessary by throttling.

Check valves are swing type with bolted bonnet.

J-26. Heat Insulation. Insulation on main steam, high pressure drip, and continuous blow-off piping including values and fittings is double standard thickness 85 per cent magnesia covering.

which from each holisers a flack bank, 24 inches distributed by 5 from high aread with high lowes class, a float contract valves failed valves an a classic a heat exchanges 10 inches in dismater by 6 fb. instants, and at fb. of evolute surflace a sample cooler; and missenary testing optiflar determining and density of consecutestics of valids in the ball of the fac sortiones blow-off equipment was forminged by the Goobrane Corrtant the sortiones blow-off equipment was forminged by the Goobrane Corrtant to the sortiones blow-off equipment was forminged by the Goobrane Corrtant to the sortiones blow-off equipment was forminged by the Goobrane Corrtant to the sortiones blow-off equipment was forminged by the Goobrane Corrtant to the sortiones blow-off equipment was forminged by the Goobrane Corrtant to the sortiones blow of the sort of the sole of the forminged by the Goobrane Corrtant to the sortiones blow off on the sole of the sole of the forminged by the Goobrane Corretant to the sortiones blow of the sole of the sole of the forminged by the contract of the sole of the sole

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Boiler feed, exhaust steam, low pressure drip, fuel oil, condensate return, and hot water piping is insulated with 85 percent magnesia standard thickness. All pipe covering has an 8 oz. canvas jacket sewed on.

Feed water heaters, surge tanks, and continuous blow-off flask tank is insulated with 1-1/2" magnesia block and 1/2" hard finish asbestos cement troweled to a smooth surface.

All cold water kines are covered with standard thickness wool felt insulation to prevent condensation and sweating.

All hot air and gas ducts are covered with 2-inch 85 percent magnesia block and 3/4 inch hard finish asbestos cement troweled to a smooth surface.

J-27. Compressed Air System.

J-27.01. Description of System. Compressed air is used throughout the plant for cleaning of equipment, boiler tube cleaning and rolling, air tools, ash unloading, etc.

J-27.02. Air Compressor. Worthington 7" x 7" horizontal, heavy duty, water cooled, double acting type, air compressor. The compressor has a piston displacement of 122 c.f.m. of free air when operating at 400 r.p.m.

The compressor is furnished with a dual control system, permitting the compressor to be operated with automatic start or stop control, or continuously running with automatic loading and unloading at a predetermined pressure.

The compressor is driven through a V belt drive by a 20 H.P. Class I, 208 volt, 3 phase, 60 cycle, General Electric motor.

J-27.03. Air Receiver. Compressed air receiver is a vertical tark 30 inches in diameter by 7 ft. high, A.S.M.E. code construction, and is fitted with safety value, pressure gauge and drain value.

J-27.04. Aftercooler. A pipe line water cooled aftercooler equipped with condensate and oil separator is placed between the compressor and air receiver.

J-28. Electric Power.

J-28.01. Primary Service. Electric service to the Central Heating Plant is through one 12,470 volt three wire, three phase overhead feeder, carried on wood poles from Station No. 2 located hear the Access Road in the Industrial Area to a manhole outside of the heating plant. A 15,000 volt 600 ampere oil circuit breaker connects this feeder with the Main Supply Feeder Loop. A space for an additional breaker is provided in Station No. 2 for a future feeder to the Central Heating Plant. The future feeder, what installed, will be laid underground from Station No. 2 to the heating plant. The overhead feeder also will be changed to underground at that time. The feeders will assure uninterrupted service to the plant which is dependent Antier foud, extrant stance les pressure drip, fuel oil, sondamete ro , tad het when piping is in suited with 85 serect memorie standed : bross. All pipe ervering has an 8.54. enoves jecket same one's

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entirely upon outside power for continuity of operation. The single feeder now serving the plant is split into two feeders before entering the manhole outside of building, and carried underground, one to each of the two substations located inside the building.

J-28.02. Unit Sub-Stations. The transformer section of each substation has a rating of 750 K.V.A., is filled with non-inflammable liquid, and is self cooled. High voltage windings are for 12,470 volts delta connected 3 phase. and the low voltage winding is for 120/208 volts, wye connected. Four 2-1/2% taps (below normal rated high voltage and for rated KVA) are in the high voltage windings. An externally operated manual tap changer, to be operated only when transformer is de-energized, is provided. The low voltage switch gear section is an indoor type metal enclosure, housing the main secondary air circuit breaker, the secondary "tie" air circuit breaker, and nine feeder air circuit breakers, as shown on Station Wiring Diagram, Paragraph J-28.07. The secondary main air circuit breaker and the secondary tie air circuit breaker are stationary type, manually operated with time over current protection and instantaneous short circuit trip. The secondary tie breaker also has an instantaneous under voltage release device. The nine feeder air circuit breakers are draw-out type, electrically operated, with time overcurrent protection, instantaneous short circuit trip, shunt trip coils, and clamp type cable terminals. The induced draft and forced draft fan breakers also are equipped with an instantaneous low voltage release device. The electrically operated feeder circuit breakers are operated from a 120 volt D.C. control bus, current being supplied by a storage battery.

Eight two stage pistol grip circuit breaker control switches for starting fans, pulverizers, feeders and coal scales are mounted on a switch panel on the Combustion Control Panel. Also located on this panel are red and green lamps and ammeters for indicating running and over load conditions of the motors, also a watt hour meter to register KWH and demand of the total motor load on each boiler. The air circuit breakers on feeders to the motor driven boiler auxiliaries are interlocked electrically for sequence operation. This is done to make sure the operator will start the equipment in proper order and also to protect the system in case of power failure or development of motor trouble in any one motor in the system. The starting sequence of motors is as follows:

- 1. Induced Draft Fan
- 2. Forced Draft Fan
- 3. Pulverizers
- 4. Feedors
- 5. Coal Scoles

Stopping sequence is in reverse order to the starting sequence. In case of motor failure stopping induced draft fan, all of the interlocked motors will be stopped automatically. If the pulverizer motor fails, the feeder and coal scales will stop and fans will continue running.

A switch is provided for shunting the induced draft fan out of the system in case it is desired to operate with the forced draft fan only, which will be the case when operating under light loads with natural draft or when using the oil burners. Unit Substation "A" normally supplies power aly upon a stalds parer for continuity of sporation. The single fooder arring the plant is split into two fooders before entering the manhold is of building, and corrist weterground, and to such of the two subima located inside the building.

W-20.02. Unit int-Stations. The transformer section of tach sub-a tas a ratio of VO K.V.A. is filled with non-inflammable liquid. soir cooled. Eith voltage windings are for 12,670 with doits cona phase, and the low voltage whather is for 120/208 withs, who done -. Four 2-1/25 taps (bolow mormal revol high woltage and for rated RVA) the high voltage windings, as externally operated manual top changer, more of only then transformed is do-energied, is provided. The last auttah gear section is an indoor type motal engloavery housing the condery air streak breaker, the secondary "the" air direct breaker, "Toodor air circuit breakers, as shown on Station Miring Disgram, th 4-28.07. The secondary main air sircuit breaker and the secondary alreads broaker are stationary types, manually oparated with time over approtection and instantaneous short sirely trip. The secondary tis also has an instantencess such voltage release device. The bine air elrevit breakers are draw-out type, electrically sporated, with addurroat protoction, instantanoous short airout trin, shunt trip ad along type cable terminals. The induced deals and foread defit pareloy upstion well appeared and in the begginge one dala and And electrically eperated feeder elread brockers are operated from the second bar, our out being supplied by a storage knowledge

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which acquines is in reverse order to the starting sequence. In the failur estimation induced deals fans all of the interlocked is be atopret subreationily. If the pulverisor motor fails, to cost scales will stop and fore will continue running.

Which is provided for shurting the induced dreft fam aut of the map it is desired to contrain with the forced dreft fam only, be the pase when operating under light loads with natural traff ag the oil burners. Unit Jubstation "4" scrally supplied poo to the motor driven auxiliaries for Boilers No. 1 and 2 and Unit Substation B supplies power to Boilers No. 3 and 4.

J-28.03. Secondary Tie Bus. A 2000 ampere tie bus connects Unit Substations "A" and "B", makes it possible to throw the load of all the boilers on either Unit Substation "A" or "B". This tie bus also connects the Auxiliary Papel with both Unit Substations.

J-28.04. Auxiliary Panel. There are eight feeder air circuit breakers in the auxiliary low voltage switch gear section. Each breaker is rated at 600 volts, 25,000 ampere interrupting capacity. Breakers are 3 pole, single throw, electrically operated, stationary type with time overcurrent protection and instantaneous short circuit trip mechanism. The current rating and service of each breaker is shown on Station Wiring Diagram Paragraph J-28.07.

Provisions are made in the auxiliary panel for the installation of a future generator control panel, and generator air circuit breaker.

All controls and starters for motors and equipment supplied from the auxiliary panel will be located at each piece of respective equipment.

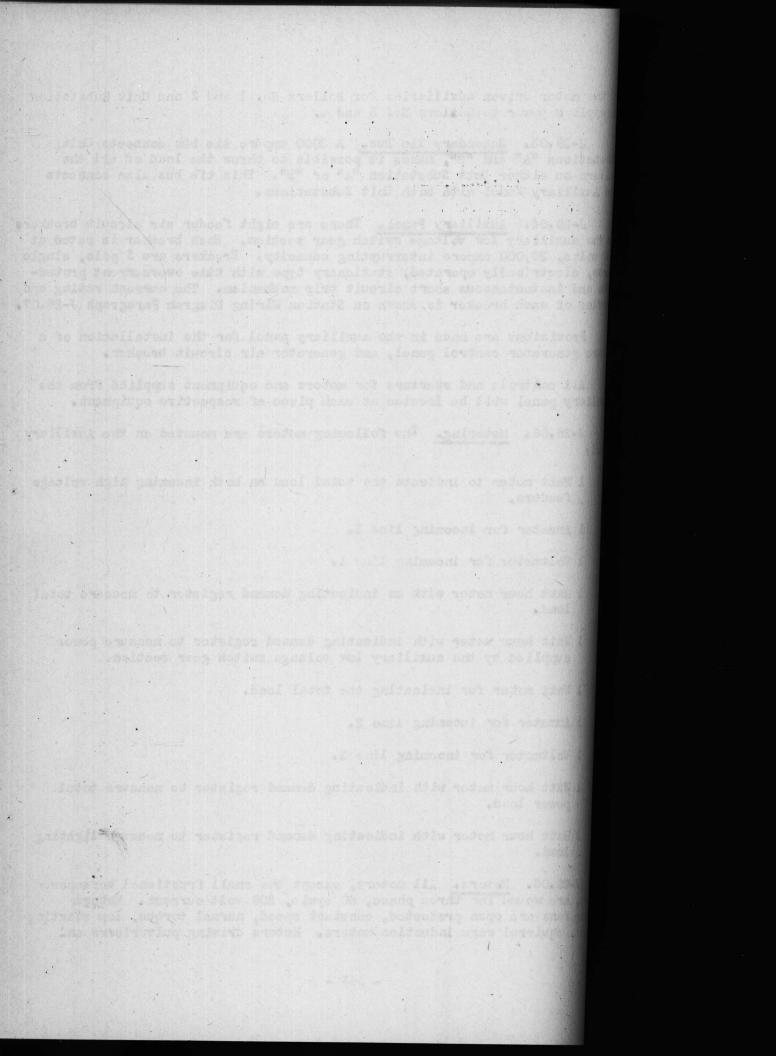
J-28.05. Metering. The following meters are mounted on the Auxiliary Panel:

- 1 Watt meter to indicate the total load on both incoming high voltage feeders.
- 1 Ammeter for incoming line 1.
- 1 Voltmeter for incoming line 1.
- 1 Watt hour meter with an indicating demand register to measure total load.
- 1 Watt hour meter with indicating demand register to measure power supplied by the auxiliary low voltage switch gear section.
- 1 Watt meter for indicating the total load.

1 Ammeter for incoming line 2.

- 1 Voltmeter for incoming line 2.
- 1 Watt hour meter with indicating demand register to measure total power load.
- 1 Watt hour meter with indicating demand register to measure lighting load.

J-28.06. Motors. All motors, except the small fractional horsepower motors, are wound for three phase, 60 cycle, 208 volt current. Motors driving fans are open protected, constant speed, normal torque, low starting current, squirrel cage induction motors. Motors driving pulverizers and



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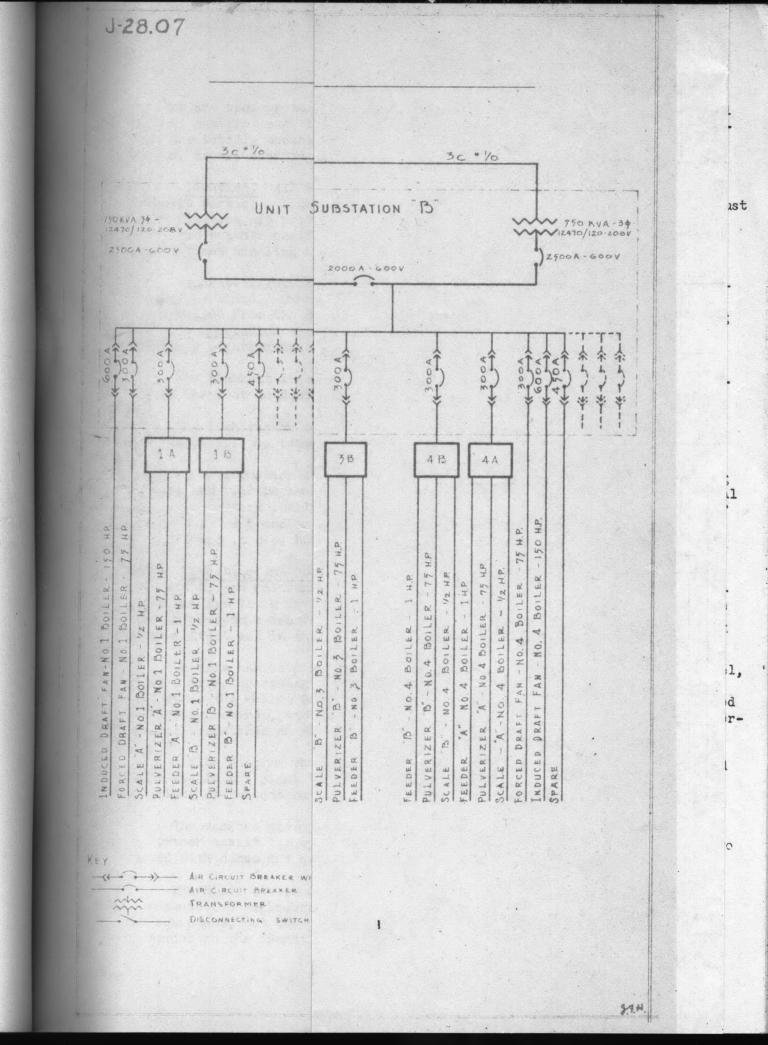
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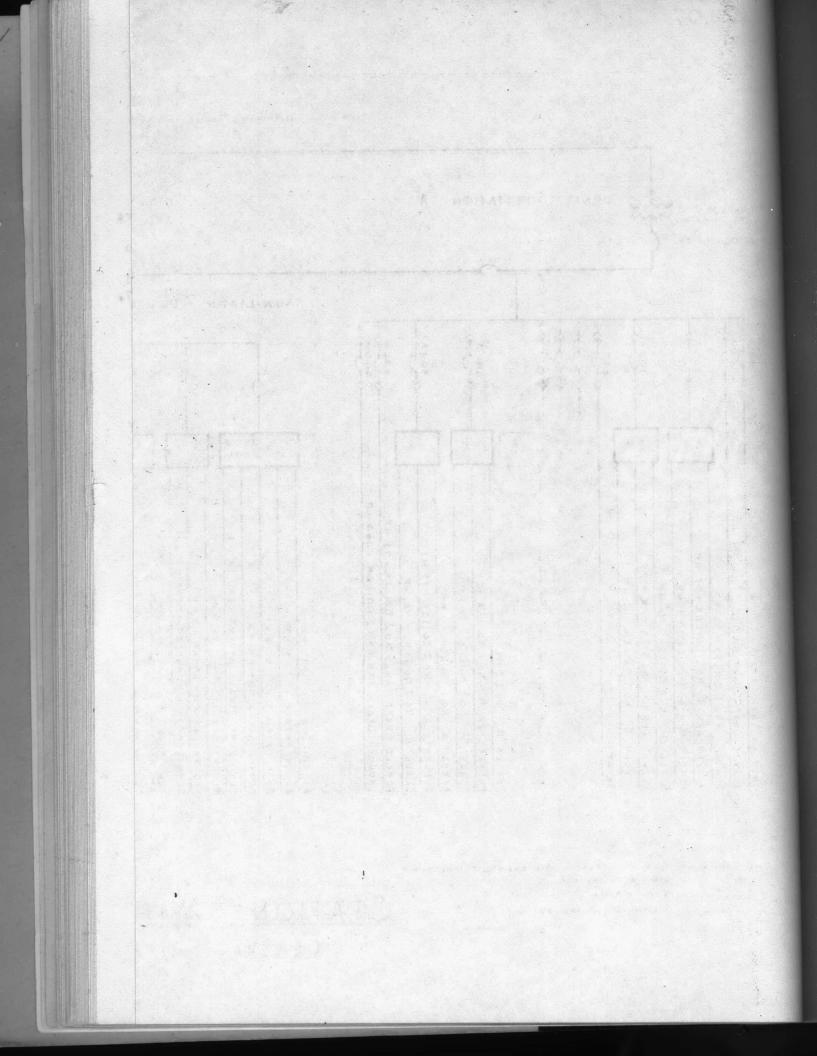
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Station Wiring Diggram Central Heating Plant



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feeders are open protected, constant speed, normal starting current, normal torque, squirrel cage induction motors. Motor driving coal handling equipment are totally enclosed, fan cooled, 55° C. rise, constant speed, normal torque, normal starting current, squirrel cage induction motors.

J-29. Lighting. All regular lighting is on 120 volt, 3 phase four wire 60 cycle service. Lights are installed in R.L.M. dome type reflectors. Dust tight fixtures are provided in area over coal bunkers and in coal handling pits, and weather proof fixtures are provided outdoors on building, and on coal and ash handling systems.

Separate lighting circuits for blackout lighting and emergency lighting are provided. Current for the emergency lighting and blackout lights are supplied from the 60 cell 125 volt, storage battery, used for operating the Unit Substation air circuit breakers. In case of power failure, the emergency lighting automatically is thrown on by a magnetic contactor.

The blackout lights are controlled from the Main Control System located in the Post Headquarters.

The lighting on combustion control panels, and boiler water columns will be on all the time, regardless of what system is in operation.

The obstruction lights installed on stacks are on the normal lighting circuit and will be controlled by an automatic time switch with astronomical dial which automatically turns the obstruction lights on at sundown and off at sunrise. A transfer relay operates to throw in a spare lamp should one of the lamps in use, burn out.

J-30. Operating Instructions. Detailed instructions for the operation, inspection, and maintenance of the equipment installed in the Central Heating Plant are given in Instruction Books and Shop Drawings furnished by the various equipment manufacturers, copies of which are on file in the Central Heating Plant and in the Public Works Office.

No data has been included in this report regarding operating personnel, their duties, operating log sheets, monthly records, inspection schedules, etc. since the Marine Corps has standard forms and systems that will be used in keeping records, and the Engineer in Charge no doubt will have his preferonce as to methods of management.

A flow diagram showing the principal piping systems was prepared, and is posted in the plant to assist the operating personnel in learning the locations of various control valves and their functions.

The various piping systems are identified with code bands painted on, to further assist the operators in tracing out the lines. Equipment is also marked with names and number.

The Riley Stoker Corporation and the Architect-Engineers furnished representative engineers for a period of sixty days to make adjustments ir the equipment, put the plant into operation, and train the Marine Corps personnel in the operation and maintenance of the plant. anders are open protocted, enalist speed, normal startling ourrow, sprach orque, equirrel engo industion potors. Hotor driving cost handling equipat are totally encloses, far ecoled, 50° C. rise, constant agend, dormal wews, percel terring prevent, equirrel care influction motors.

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The Alley Stater Corporation and the prohibect Spinetra furnished and other angineers for a period of sixty days to reprivativation referent, put the plant into operation, and from the Barker Corps and in the operation and maintenance of the clast. In conclusion, the Central Heating Plant is designed for efficient, economical operation, and maintenance with a minimum amount of labor. Records obtained from the recording flow meters, gauges, and automatic coal scales should be used for operating guidance, performance calculations, cost accounting, and in attaining and maintaining peak plant efficiency.

The equipment and materials used in the construction of the plant is of the most modern design obtainable and was selected for ruggedness and durability, assuring long life, and low maintenance.

J-31. General Information on Outlying Heating Plants.

J-31.01. Design Conditions established by the directives were used by the Architect-Engineers to calculate overall boiler requirements and to establish types of plants to be provided.

As initially set forth, automatic oil firing was required. This was later amended due to oil shortage and conversion to coal firing was made as directed.

J-31.02. Procurement of Equipment was carried out by the Contractor. In order to expedite and insure deliveries, purchases by direction were made from quotations on manufacturers standard stock, using above preliminary design data.

J-31.03. Boiler Feed Water Treatment. Complete recommendations covering the treatment of make up water together with a detailed description of equipment and chemicals required for this purpose is contained in a report by Mr. Sheppard T. Powell, Chemical Engineer. Copies of this report have been filed with the Officer in Charge.

J-31.04. Supplementary Report. At the time of writing this report it appears that certain changes may take place to meet unexpected increases in population or other unforeseen conditions. Accordingly, reference should be made to any subsequent information which may be prepared to augment this report.

J-32. Tent Camp No. 1.

J-32.01. Central Heating Plant. The purpose of this plant is to furnish steam for heating, hot water, and process to the various buildings in this area. Installed in this boiler house are four mechanical fired boilers. The steam distribution and condensate return system is carried overhead on wood poles. A complete description of the steam distribution system is given in Section G-2 of this report.

The original installation consisted of three 179 H.P. horizontal, return tubular, Kewenes boilers, oil fired. Due to the oil shortage, two of these boilers were converted to stoker fired, in the summer of 1942, and an additional 214 H.P. Kewanee boiler, stoker fired, was added to take care of additional load requirements.

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to reschaet installation consister of times 192 B.B. Lord Haral. ability, are the lift of all formations in the sole of install consister in the sole of the constant sole of the constant sole of the sole J-32102. Total Connected Load. A tabulation of the total heat requirements in Btu's per hour for the individual buildings is as follows:

	Heating	Hot Water	Process	Total
Mess Halls Enlisted men's wash rms. Officers wash rooms Hospital Additions to Hospital Hospital Administration Recreation Building Post Exchange	$\begin{array}{c} 3,686,400\\ 5,900,400\\ 403,200\\ 965,145\\ 1,406,305\\ 165,420\\ 803,440\\ 500,000 \end{array}$	1,547,000 28,634,100 4,186,000 1,321,200 1,117,060 92,080	3,461,800 - 4,855 19,144 -	8,695,200 34,534,500 4,589,200 2,291,200 2,542,519 165,420 895,520 500,000
Total	13,830,320	36,897,440	3,485,799	54,213,559
Distribution Losses	= 832,000	Btu per hour		
Peak Load	= 55,045,5	59 Btu per ho	ur	
Peak Load	$= \frac{55,045,5}{970 \times 3}$		biler H.P.	

Installed Boiler Capacity.

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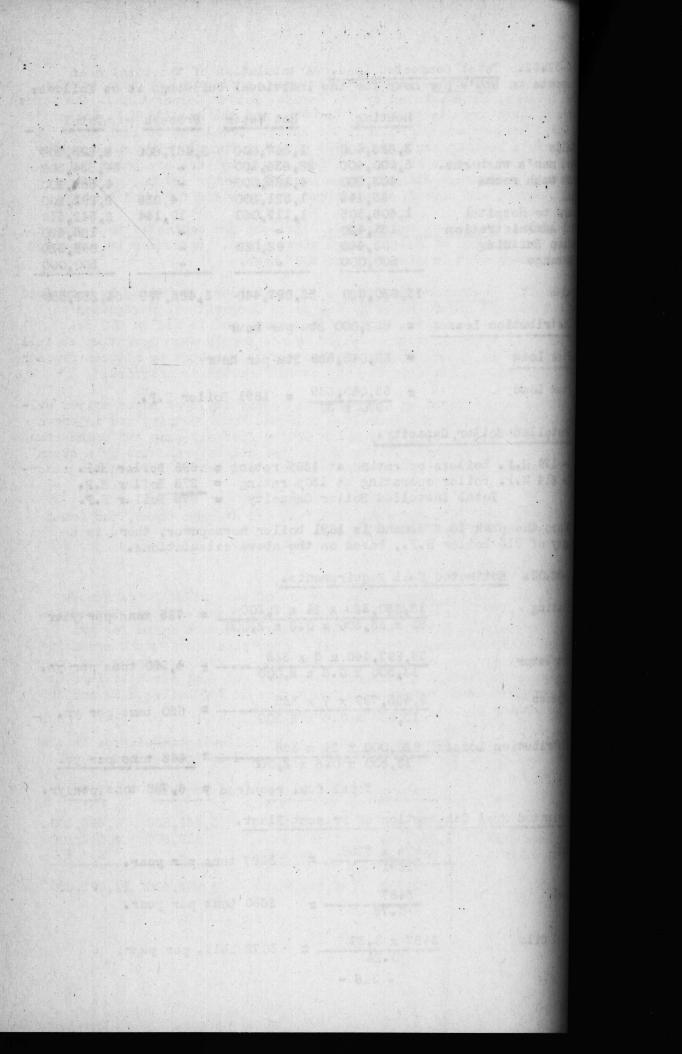
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3- 179 H.P. boilers operating at 130% rating = 698 Boiler H.P. 1- 214 H.P. boiler operating at 130% rating = 278 Boiler H.P. Total Installed Boiler Capacity = 976 Boiler H.P.

Since the peak load demand is 1891 boiler horsepower, there is a deficiency of 915 boiler H.P., based on the above calculations.

J-32.03. Estimated	Fuel Requirements.	1
Hoating	13,830,320 x 24 x 2,300 60 x 13,500 x 0.6 x 2,000	= 785 tons per year
Hot Water	36,897,440 x 6 x 365 13,500 x 0.6 x 2,000	= 4,980 tons per yr.
Process	3,485,799 x 7 x 365 13,500 x 0.6 x 2,000	= 550 tons per yr.
Distribution Losses	820,000 x 24 x 365 13,500 x 0.6 x 2,000	= 443 tons per yr.
	Total fuel required	= 6,758 tons per yr.
Estimated Fuel Consu	mption of Present Plant.	
Fuel	$\frac{976 \times 6758}{1891}$ = 3487 tor	ns per year.
Coal	$\frac{3487}{0.76}$ = 2650 ton	is per year.
Fuel Oils 3	$\frac{487 \times 3.67}{0.24} = 3072 \text{ bbl}$	s. per year.
	- 346 -	



J-32.04. Boilers. These are pertable, horizontal, return tubular, firebox boilers, manufactured by the Kewanee Boiler Corporation. The three 179 H.P. boilers are designated as No. 588, and the one 214 H.P. boiler is a No. 589. Boilers are fired as noted above. The three boilers rated at 179 H.P have a heating surface of 1786 sq. ft., the 214 H.P. rated boiler having a heating surface of 2143 sq. feet. All boilers are built for 125 lbs. working pressure. Standard trim including water column, pressure gauge, injector, and blowoff connections are provided for each boiler.

J-32.05. Breeching and Stacks. Boilers are connected to a common breeching constructed of No. 10 gauge steel plate. Breeching is connected to a steel stack 5'9" in diameter and 100' high.

J-32.06. Combustion Equipment. Three boilers are fired by worm feed mechanical stokers manufactured by the Conco Corporation, designated as Model H-7. Stoker is driven by a 5 H.P. motor, and is fed by 600 lb. hopper which is approximately one-half hour's supply when operating at full rating. Stoker is automatically started and is operated by a steam pressure actuated control. A low water safety cut-off switch is provided.

One boiler is fired by a horizontal rotary cup type motor driven oilburner, manufactured by the Petroleum Heat and Power Company and is known as the Petrol "Model W-8-5A". A motor driven fuel oil pump and combustion controls are integral parts of the unit. The oil is preheated by a steam heater for normal operation and 5 kw electric oil heater is used for starting.-

J-32.07. Fuel Oil Storage. Two fuel oil storage tanks, the total capacity -30,000 gallons, are provided.

J-33. Tent Camp No. 2.

J-33.01. Heating Plant. The purpose of this plant is to supply steam for heating, process and hot water to the Mess Halls and Recreation Building. A separate boiler house was constructed with space for two boilers and their necessary auxiliaries. Provisions for future expansion in boiler capacity were considered in building as well as piping design. It was decided to install a combination of oil and coal fired boilers to cover the present steam demand with capacities of 500 boiler H.P. and 250 boiler horsepower for oil and coal respectively.

J-33.02. Total Connected Load. In the following tabulation is the connected load given for each building, expressed in Btu per hour:

	Heating	Hot Water	Process	Total
Mess Halls Officers' Mess Hall Recreation Building	3,686,400 1,263,150 803,400	1,547,000 519,350 92,100	3,461,800 519,600	8,695,200 2,302,100 895,500
Total	5,752,950	2,158,450	3,981,400	11,892,800

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Overhead Distb. System Losses = 162,000 Btu per hr.

Peak Load = 12,044,800 Btu per hr.

J-33.03. Estimated Fuel Consumption. The annual fuel consumption is based on coal with a heat value of 13,500 Btu per pound and an overall boiler efficiency of 60% and is estimates as follows:

Heating	5,752,950 x 24 x 2,300 = 60 x 13,500 x 0.6 x 2,000 =	326 tons coal per yr.
Hot Water	2,158,450 x 6 x 365 13,500 x 0.6 x 2,000 =	291 tons coal per yr.
Process	3,981,400 x 7 x 365 13,500 x 0.6 x 2,000 =	629 tons coalper yr.
Distr. Losses	162,000 x 24 x 365 13,500 x 0.6 x 2,000 =================================	88 tons coal per yr.

Annual coal consumption= 1,334 tons coal por yr.

J-33.04. Boiler Operation on Coal at Peak Loads. Winter and summer peak loads may be carried by the coal or oil fired boiler, or in combination of both:

Winter

 $\frac{12,044,800}{970 \times 30}$ = 414 Boiler H.P. per hour

Coal fired boiler may carry this load at 165% of its normal rating; the oil fired boiler may be considered a "standby".

Summer

 $\frac{6,301,900}{970 \times 30}$ = 217 Boiler H.P. per hour

Coal fired boiler will operate at 87% of its normal rating, oil fired boiler is a "standby".

J-33.05. Combination Coal and Oil Firing at Peak Loads. Annual fuel requirements are as follows:

Winter Load

Coal fired boiler at normal rating - 250 B.H.P. or 60% of total coal per year, 1,344 tons = 800 tons

Oil fired boiler 40% of 1,334 tons = 534 tons

534 tons of coal are equivalent to oil of 18,500 Btu per pound heating value with an overall boiler efficiency of 70%

 $\frac{534 \times 2,000 \times 13,500 \times 0.6}{150,000 \times 42 \times 0.7} = 1,960 \text{ bbls. per year.}$ Total fuel: 800 tons of coal per year and 1,960 bbls. of oil per year

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J-33.06. Boiler Operation on Oil at Peak Loads. Winter and summer peak loads may be carried by the oil fired boiler with the coal fired boiler as a "standby".

Total steam load - 414 Boiler horsepower per hr. Oil fired boiler - 500 Boiler horsepower per hr. Winter Load carried at 83% of its usual rating. Summer Load at 43.5 % of its usual rating. Fuel Oil Consumption. 1,334 tons coal are equivalent to oil: $1,334 \times 2,000 \times 13,500 \times 0.6 = 4,900$ bbls. per year.

J-33.07. Boilers. Coal fired boiler, or Boiler No. 1, is a Fitzgibbon Boiler Company "Model P-250", stoker fired, with a heating surface of 2,500 sq. ft. and rated 250 B.H.P. at 125 p.s.i. working pressure. Emergency feed water injector, blow-off valves and standard trim were furnished by the manufacturer.

The oil fired boiler or Boiler No. 2, Cleaver-Brooks "Oil-built No. 0.B.50", integral unit, is rated 500 B.H.P. at 125 p.s.i. working pressure with standard trim, feed water injector and blow-off valves.

J-33.08. Combustion Equipment.

Coal Stoker. Boiler No. 1 is equipped with an Iron Fireman, Model 5A, under-feed worm type stoker, driven by a 7.5 H.P. motor, 3 phase, 60 cycle, 209 volt current characteristic. Its hopper capacity is 1,200 lbs. of coal, or approximately one hour's supply operating at normal rating. The stoker operation is fully automatic and regulated by steam pressure actuated controls in conjunction with the McDonneTl# 150 safety cut-off switch at low-water level.

Fuel Oil Burner. Boiler No. 2 has an integral rotary cup type fuel oil burner, driven by a 3 H.P. motor. It is designed to burn No. 6 fuel oil. The forced draft fan is mounted as a separate unit on the boiler support framing, with a 15 H.P. motor, tex-rope driven.

Burner operation is automatically regulated by steam pressure actuated controls and the McDonnellNo. 150 low-motor cut-off switch. A 3/4H.P. motor driven fuel oil pump of 300 gallons per hour capacity, Viking Model ZH-1, is installed on the boiler support framing together with a steam fuel oil pre-heater. A 5 kw electric fuel oil heater is provided for starting and emergency operation.

J-33.09. Boiler Feed Water System.

The Condensate Receiver of 250 gallons capacity is provided with a submerged heating coil supplied with exhaust steam from the boiler Arth date bei state for the bar ett in the Londer Milaton and Arth and Arth

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feed pump. Condensate from buildings and low pressure drips are returned to the receiver by individual pumps through a condensate return system. Raw water make-up is automatically regulated by float valves and the Mc-Donnell No. 51 safety cut-off at the receiver.

Feed Water Pumps. The feed water pump for Boiler No. 1 is a Worthington "Model VC" reciprocating type, steam driven, of 24 gallons per minute capacity. Feed water flow is controlled by a steam pressure governor. Boiler water level is automatically maintained by the "Copes" feed water regulator, and in emergency by a manually operated feed water injector.

Boiler feed pump No. 2 is a turbine type, "Aurora" Model No. 58 G D, 37 gallons per minute capacity, and is driven by a 7.5 H.P. motor. Water level is automatically regulated by a McDonnell # 150 safety cut-off, and manually by a feed water injector.

J-33.10. Boiler House Piping. Valves, and all steam, water and oil piping are installed in accordance with Navy Specifications 66 Pla and 21Yc. Welding fittings are used wherever possible and practicable.

J-33.11. Coal Storage. A coal storage yard of approximately 300 tons capacity or 2.5 months' supply is adjacent to the boiler house. Coal is wheeled to the stoker hopper, and no provisions have been made for mechanical coal handling equipment.

J-33.12. Fuel Oil Storage. One 8,000 gallons fuel oil tank is installed underground about 50 feet from the plant. Its capacity represents about 14 days' supply when only oil is being fired. Steam is provided for preheating the fuel oil in the tank.

J-34. Barrage Balloon Battalion and Rifle Range.

J-34.01. Heating Plants. These two are similar installations. The purpose of these plants is to furnish steam for heating, hot water and process to their respective areas. Located in soparate houses, each plant has identical boiler room equipment which includes two mechanically fired boilers, pumps, condensate tank, and auxiliaries.

J-34.02. Barrage Balloon Battalion Total Connected Load. A tabulation of the total heat requirements expressed in B.t.u. per hr.for various buildings is as follows:

	Heating	Hot Water	Process	Total
4 Barracks Mess Hall Infirmary Post Exchange Battalion Headquarters Drill & Recreation Bldg.	3,435,840 849,600 219,461 205,320 240,242 1,793,520	3,828,720 506,840 187,790 187,790 60,166 209,668	2,691,955 63,812 -	7,264,560 4,048,395 471,063 393,110 300,408 2,003,188
Total	6,743,983	4,980,974	2,755,767	14,480,724

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bilist food par her 2 is a torbine type, "Autore" food her 55 0 D. Louis per aines o capacity, and is driven by a 7.5 diff. attor, Water is subcaptically revelated by a Melonnell # 160 asforp set-off, and by by a food water disjoctor;

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Distribution Losses - 250,000 Btu per hour. Feak Load - 14,730,724 Btu per hour. J-34.03. Barrage Balloon Battalion Estimated Fuel Requirements. Heating 6,743,983 x 24 x 2,300 60 x 13,500 x 0.6 x 2,000 = 383 tons per year. Hot Water 4,980,974 x 6 x 365 = 475 tons per year. 13,500 x 0.6 x 2,000 Process 2,755,767 x 7 x 365 - = 434 tons per year. 13,500 x 0.6 x 2,000 Distb. Losses 250,000 x 24 x 365 13,500 x 0.6 x 2,000 = 135 tons per year. Total amt. of fuel = 1,427 tons per yr.

Oil Equivalent. One ton of coal with a heating value of 13,500 Btu per pound burned at 60% overall efficiency is equivalent to 3.67 bbls. of oil with content of 6,300,000 Btu per bbl. of oil burned at 70% overall efficiency:

 $\frac{2,000 \times 13,500 \times 0.6}{6,300,000 \times 0.7} = 3.67$

Percentage of Total Load Carried Per Boiler.

Peak Load (see above) $\frac{14,730,724}{970 \times 30} = 508 \text{ B.H.P.} = 100\% \text{ of total load}$ Boiler No. 1 (coal) carries 250 x 1.3 = 325 B.H.P. = 64\% of total load Boiler No. 2 (oil) carries 183 B.H.P. = 36\% of total load.

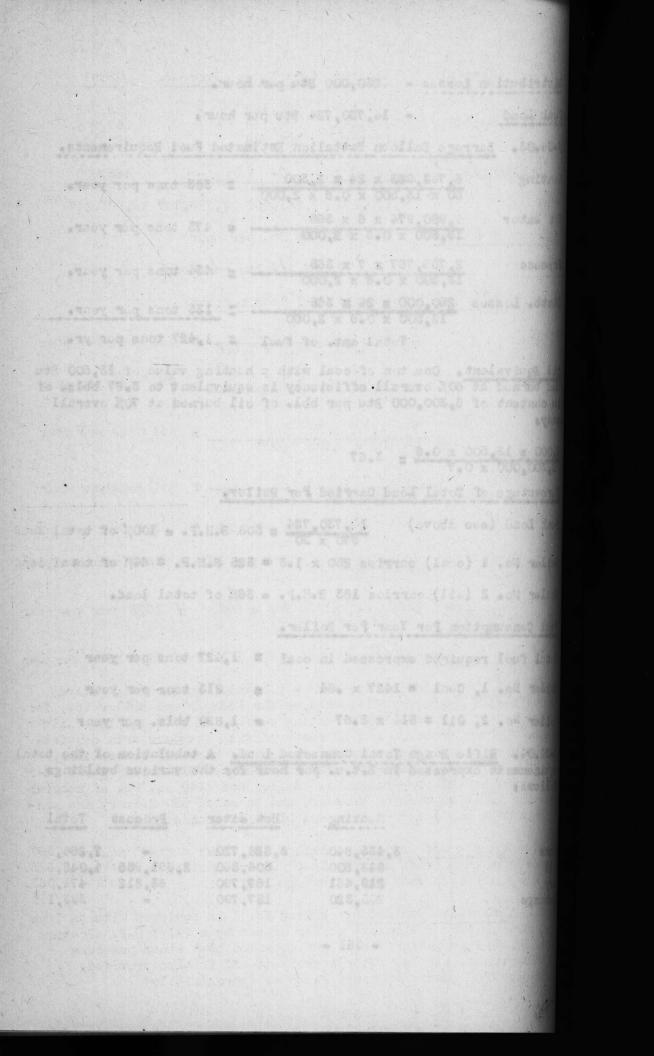
Fuel Consumption Per Year Per Boiler.

Total fuel required expressed in coal=1,427 tons per yearBoiler No. 1, Coal=1427 x .64=913 tons per yearBoiler No. 2, Oil = 514 x 3.67=1,890 bbls. per year

J-34.04. Rifle Range Total Connected Load. A tabulation of the total heat requirements expressed in B.t.u. per hour for the various buildings is as follows:

	Heating	Hot Water	Process	Total
4 Barracks Mess Hall Infirmary Post Exchange	3,435,840 849,600 219,461 205,320	3,828,720 506,840 187,790 187,790	2,691,955 63,812	7,264,560 4,048,395 471,063 393,110

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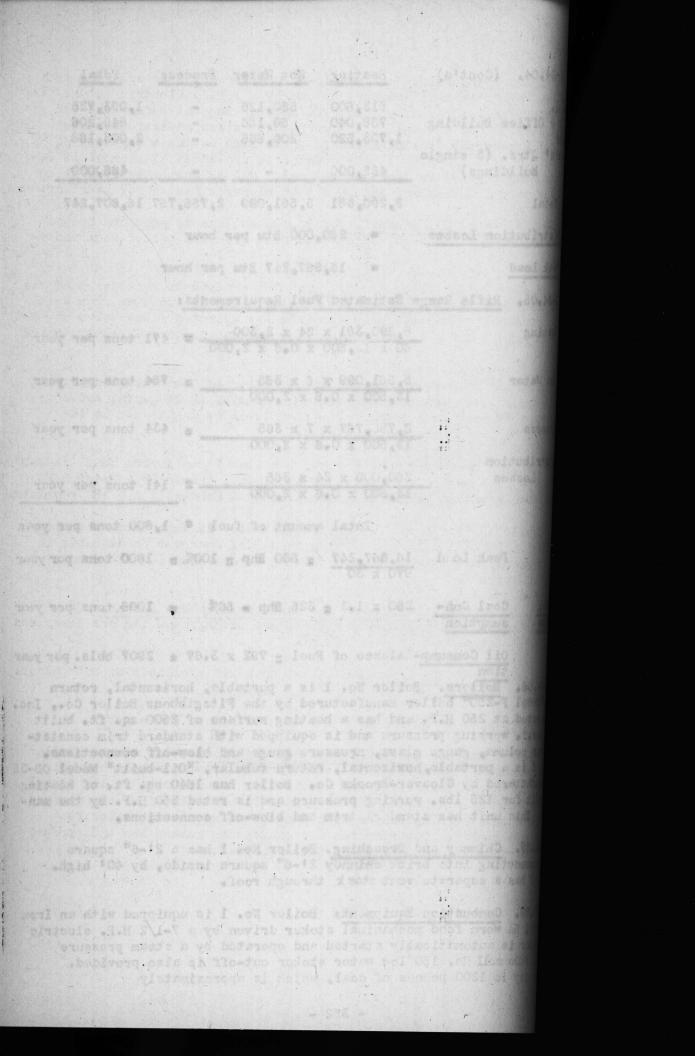
J-34.0	4. (Cont'd)	Heating	Hot Water	Process	Total
Theater	fice Building trs. (5 single	513,600 788,040 1,793,520	580,125 60,166 209,668		1,093,725 848,206 2,003,188
	uildings)	485,000	-		485,000
Total		8,290,381	5,561,099	2,755,767	16,607,247
Distri	bution Losses	= 260,	,000 Btu per	hour	
Peak Lo	bad	= 16,8	367,247 Btu	per hour	
J-34.0	5. Rifle Rang	e Estimated H	Fuel Require	ments:	
Heating		8,290,381 x 60 x 13,500	24 x 2.300		tons per year
Hot Wat	ter -	5,561,099 x 13,500 x 0.6	6 x 365 x 2,000	= 754	tons per year
Process	-	2,755,767 x 13,500 x 0.6	7 x 365 x 2,000	= 4 34	tons per year
Distrit Lo	osses	260,000 x 24 13,500 x 0.6	x 365 x 2,000	=141	tons per year
		Total a	mount of fu	01 = 1,8	00 tons per year
	Peak Load	16,867,247 970 x 30	= 580 Bhp =	100%. = 1	800 tons por year
tual Fuel	Coal Con- sumption	250 x 1.3 g	325 Bhp - 50	5% = 10	008 tons per year
	Oil Consump- tion	Balance of Fi	uel <u>=</u> 792 x	3.67 = 29	907 bbls.per year

J-34.06. Boilers. Boiler No. 1 is a portable, horizontal, return tubular, "Model P-250" boiler manufactured by the Fitzgibbons Boiler Co., Inc. Boiler is rated at 250 H.P. and has a heating surface of 2500 sq. ft. built for 100 p.s.i. working pressure and is equipped with standard trim consisting of water column, gauge glass, pressure gauge and blow-off connections. Boiler No. 2 is a portable, horizontal, return tubular, "Oil-built" Model OB-35 boiler manufactured by Cleaver-Brooks Co. Boiler has 1640 sq. ft. of heating surface built for 125 lbs. working pressure and is rated 350 H.P. by the manufacturer. This unit has standard trim and blow-off connections.

J-34.07. Chimney and Breeching. Boiler No. 1 has a 2'-6" square breeching connecting into brick chimney 2'-6" square inside, by 40' high. Boiler No. 2 has a separate vent stack through roof.

Act

J-34.08. Combustion Equipment: Boiler No. 1 is equipped with an Iron Fireman Model 5A worm feed mechanical stoker driven by a 7-1/2 H.P. electric motor. Stoker is automatically started and operated by a steam pressure control. A McDonnell No. 150 low water stoker cut-off is also provided. Hopper capacity is 1200 pounds of coal, which is approximately



one hour's supply operating at full load. Boiler No. 2 is equipped with a built-in rotary type oil burner, driven by a 2 H.P. electric motor. The forced draft fan is driven by a 15 H.P. motor, The oil burner and fan are nanually started and automatically operated by steam pressure actuated controls. A separate "Viking Model ZH-1"oil pump having a capacity of 91 g.p.h. driven by a 1/3 H.P. electric motor is provided. Equipment is designed to handle No. 6 or lighter fuel oil. Oil is preheated by a steam heater for normal operation, and by a 5 kw electric heater for starting.

J-34.09. Fuel Oil Storage, of 20,000 gallons is provided by two tanks of 10,000 gallons each, located 50 feet from the boiler room underground.

J-34.10. Boiler Feedwater System. The condensate receiver tank has approximately 940 gallons capacity. Make-up water is supplied from wells and is controlled by an automatic electrically operated float valve on condensate tank. Water is pumped from the condensate tank directly to the boilers.

The boiler feedwater pump for No. 1 boiler is a Worthington, duplex reciprocating, steam driven pump having a capacity of 24 g.p.m. and controlled by a "Copes" pump governor. Water level is maintained in the boiler by a "Copes" feedwater regulator.

The boiler feedwater pump for No. 2 boiler is an Aurora Model 58 G-D turbine type pump having a capacity of 37 g.p.m., driven by a 7-1/2 H.P. motor. Water level in boiler is controlled by a McDonnell No. 150 regulator

J-34.11. Boiler House Piping, is installed in accordance with Navy Specification 66Pla and 21 Yc. Piping is welded wherever practicable in lieu of screwed and flanged joints. Piping is designed for 125 pounds working pressure.

J-34.12. Steam Distribution and Condensate Return System. The steam distribution and condensate returns are underground and are described in detail in Section G-2 of this report.

J-34.13. Coal Storage. Sufficient space is available at both plants for approximately one half the annual coal requirements.

J-35. Barrage Balloon School Area and Amphibian Base Shops Area.

J-35.01. Barrage Balloon School Heating Plant. One of two similar plants, the purpose of this plant is to furnish steam for heat and hot water to the various buildings and provide for future units in the school areas. Located in a separate boiler house, it consists of a low pressure stoker fired coal burning boiler with condensate receiver, boiler feed pump and accessories. Distribution and condensate return are underground and are described in Section G-2 of this report.

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sessiondes. Matelouties and souther to return are inderground

J-35.02. Barrage Balloon School Total Connected Load. A tabulation of the total heat requirements in Etu per hour for the individual buildings is as follows:

· · · · · ·	Heating	Hot Water	Total
Administration School Balloon Transport Storage and Supply	130,560 207,120 468,000 56,000 147,000	60,166 60,166 -	190,726 267,286 468,000 56,000 147,000
Total	1,008,680	120,332	1,129,012
Distribution Losses	= 115,000	Btu per hour.	
Peak Load	1,244,012	Btu per hour.	

J-35.03. Barrage Balloon School Estimated Fuel Requirements. The annual fuel requirements have been estimated and tabulated below. The overall boiler efficiency is estimated to be 60 per cent average with coal having a heating value of 13,500 Btu per pound as fired.

Heating	1,008,680 x 24 x 2,300 60 x 13,500 x 0.6 x 2,000	-	57.3 tons per year.
Hot Water	120,332 x 6 x 365 13,500 x 0.6 x 2,000	=	16.3 tons per year.
Distribution Losses	115,000 x 24 x 365 13,500 x 0.6 x 2,000	=	.62.4 tons per year.

Total Coal Required for Present System - 136 tons per year.

Available Boiler Capacity for Future Expansion.

Installed Capacity Iresent Boiler = 70 Boiler H.P. Present Peak Load : $\frac{1,244,012}{970 \times 30}$ = 42 Boiler H.P.

Future Available Boiler Capacity = 28 Boiler H.P.

J-35.04. Amphibian Base Shops Heating Plant. The purpose of this plant is to provide steam for heat, hot water and process to the Machine Shop and Carpenter Shop. Located in the Carpenter Shop, it consists of a low pressure stoker fired, coal burning boiler and accessories. Distribution and condensate return are underground as described in Section G-2 of this report.

J-35.05. Amphibian Base Shops Total Connected Load. A tabulation of the total heat requirements in Btu per hour for the individual buildings is as follows:

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	Heating	Hot Water	Process	Total
Machine Shop Carpenter Shop	917,764 958,408	63,360 63,360	78,431	1,059,555 1,021,768
Total	1,876,172	126,720	78,431	2,081,323
Distribution	Losses -	15,000 Btu pe	er hour	
Peak Load	-	2,096.323 Btu p	er hour	

J-35.06. Amphibian Base Shops Estimated Fuel Requirements. The annual fuel requirements have been estimated and tabulated below. The overall boiler efficiency is estimated to be 60 per cent average with coal having a heating value of 13,500 Btu per pound as fired.

Heating	1,876,172 x 24 x 2,300 60 x 13,500 x 0.6 x 2,000	-	107 tons per year.
Hot Water	126,720 x 6 x 365 13,500 x 0.6 x 2,000	=	17.3 tons per year.
Process	78,431 x 7 x 365 13,500 x 0.6 x 2,000	=	12.5 tons per year.
Distribution Losses	15,000 x 24 x 365 13,500 x 0.6 x 2,000	=	8.5 tons per year.
T	otal Coal Required thus	=	145.3 tons per year

Installed Boiler Capacity

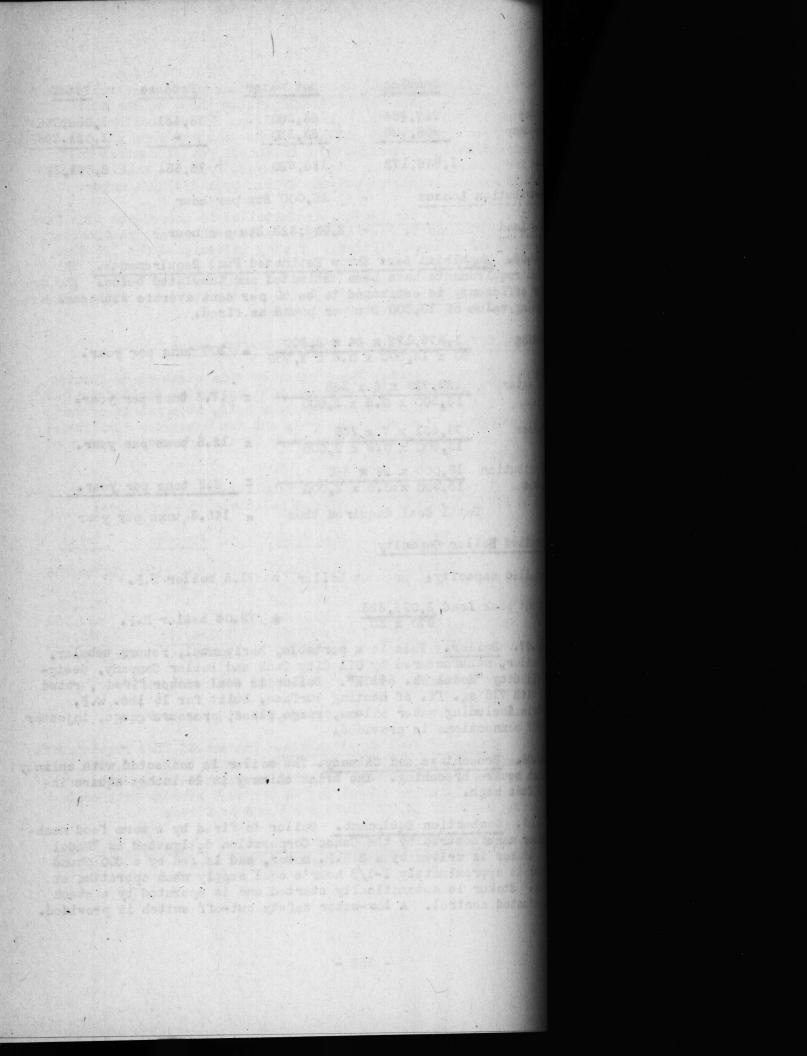
Installed capacity: present boiler = 71.5 boiler H.P.

Present peak Load 2,096,323 970 x 30 = 72.04 boiler H.F.

J-35.07. Boiler. This is a portable, horizontal, return tubular, fire box boiler, manufactured by Oil City Tank and Boiler Company, designated as Oil City "Model No. 5410H". Boiler is coal stoker fired., rated 71.5 H.P. with 715 sq. ft. of heating surface, built for 15 lbs. W.P, Standard trim including water column, gauge glass, pressure gauge, injector and blow-off connections is provided.

J-35.08. Breechings and Chimney. The boiler is connected with chimney by a 24-inch square breeching. The brick chimney is 24 inches square inside by 35 feet high.

J-35.09. Combustion Equipment. Boiler is fired by a worm feed mechanical stoker manufactured by the Conco Corporation designated as "Model No. H-4". Stoker is driven by a 2 H.R. motor, and is fed by a 600 pound hopper which is approximately 1-1/2 hour's coal supply when operating at full rating. Stoker is automatically started and is operated by a steam pressure actuated control. A low-water safety cut-off switch is provided.



J-35.10. Boiler Feedwater Systems. A condensate receiver tank of 50 gallons capacity is installed in the Amphibian Shops boiler plant. The condensate tank installed in the Barrage Balloon Schools boiler plant has a capacity of approximately 175 gallons. Make-up water from the local well supply is automatically controlled by a McDonnell No. 51 control valve mounted on the tank. The condensate is returned from the tank to the boiler by a 12 g.p.m. turbine type pump driven by a 3/4 H.P. motor.

J-35.11. Boiler House Piping, is installed in accordance with Navy Specification 66 Pla and 21 Yc. Piping is welded wherever practicable in lieu of screwed and flanged fittings. Piping is designed for 125 lbs. working pressure.

J-35.12. Coal Storage. Sufficient space is available for approximately a year's supply of coal at both plants.

J-36. Bachelor Officers' Quarters Group, Faradise Point.

J-36.01. Heating Plant. The purpose of this plant is to furnish steam required for process, hot water and heating in the various buildings of this group. Located in a wing of the mess hall, it consists of two boilers, one using coal and the other oil, and the necessary auxiliaries. Distribution to other buildings of the group is through underground piping systems as described under Section G-2.

J-36.02. Total Connected Load. A tabulation of the total heat requirements in Btu per hour to the various buildings is as follows:

	Heating	Hot Water	Process	Total
B.O.Q.	4,108,800	4,641,000		8,749,800
Men's Quarters	170,808	141,440		312,248
Women's Quarters	80,256	141,440		221,696
Fire House	203,420	227,630	-	431,050
Mess Hall	1,644,000	655,200	1,356,461	.3,655,661
Total	6,207,284	5,806,710	1,356,461	13,370,455
Dictribution	Annah T			

Distribution System Losses - 295,000 Btu per hour

Peak Load

- 13,665,455 Btu per hour

J-36.03. Estimated Fuel Requirements. The annual fuel requirements have been estimated and tabulated below. The overall boiler efficiency is estimated to be 70 per cent average with oil having a heating value of 6,300,000 Btu's per 42-gallon barrel and 60 per cent average with coal having a heating value of 13,500 Btu's per pound as fired;

Heating	6,207,284 x 24 x 2,300			A The Sector	
	(70-10) x 13,500 x 0.6 x 2.000	=	353	tons per ye	ar

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Hot Water	5,806,710 x 6 x 365 13,500 x 0.6 x 2,000	785 tons per year.
Process	$\frac{1,356,461 \times 7 \times 365}{13,500 \times 0.6 \times 2,000} =$	214 tons per year
Distribution Losses	295,000 x 24 x 365 13,500 x 0.6 x 2,000	160 tons

Total Fuel Required

1,512 tons coal per yr:

Oil Equivalent. The amount of oil equivalent to one ton of coal as fired and based on average evaporation efficiencies is approximately 3.67 barrels estimated as follows:

 $\frac{2,000 \times 13,500 \times .60}{6,300,000 \times .70} = 3.67 \text{ bbls. of oil per ton of coal}$ $\frac{\text{Percentages of Total Load Carried by Coal and Oil Fired Boilers.}}{970 \times 30} = 470 \text{ Boiler H.P. per hour}$ $\frac{13,665,455}{970 \times 30} = 470 \text{ Boiler H.P. per hour}$ $\frac{13,665,455}{970 \times 30} = 470 \text{ Boiler H.P. per hour}$ $\frac{13,665,455}{970 \times 30} = 470 \text{ Boiler H.P. per hour}$

470 B.H.P./hr = 100%

Fuel Consumption per year for each Boiler.

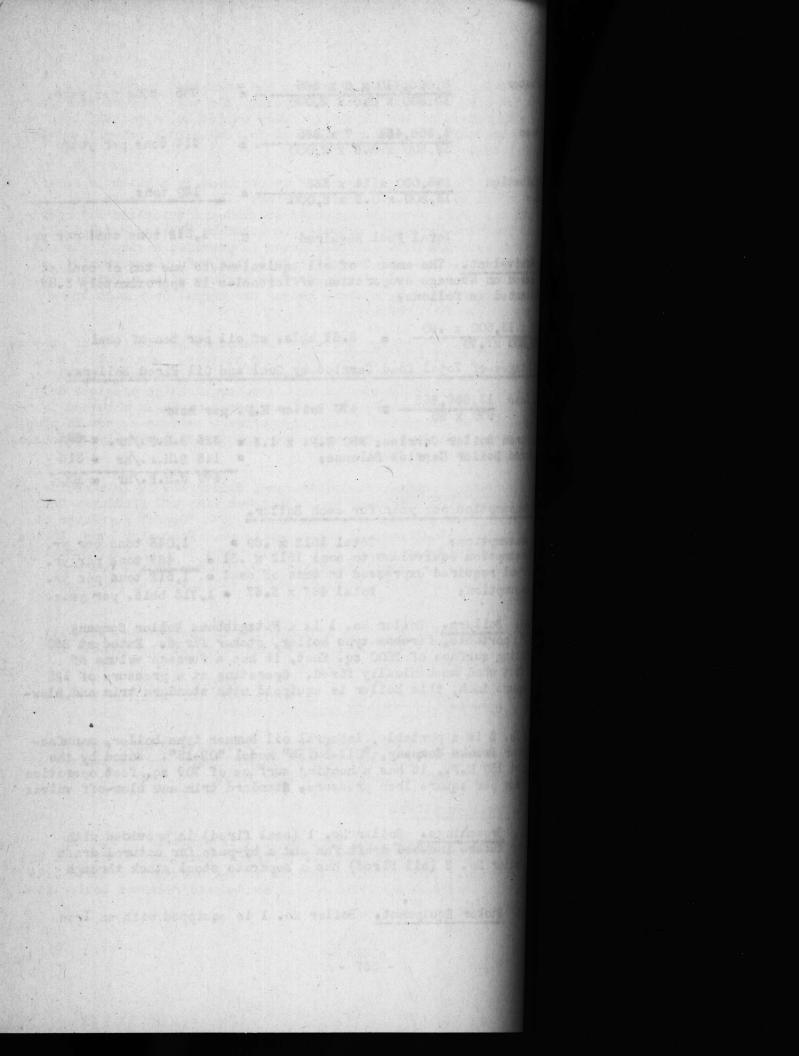
Coal consumption:Total $1512 \times .69 =$ 1,045 tons per yr.Oil consumption equivalent to coal $1512 \times .31 =$ 467 tons per yr.Total fuel required expressed in tons of coal =1,512 tons per yr.Oil consumption:Total 467 \times 3.67 = 1,713 bbls. per year.

J-36.04. Boilers. Boiler No. 1 is a Fitzgibbons Boiler Company Model "P-250", portable, firebox type boiler, stoker fired. Rated at 250 H.P. with heating surface of 2500 sq. feet, it has a furnace volume of 303.6 cubic feet when mechanically fired. Operating at a pressure of 125 pounds per square inch, this boiler is equipped with standard trim and blowoff valves.

Boiler No. 2 is a portable, integral oil burner type boiler, manufactured by Cleaver Brooks Company, "Oil-built" model "OB-15". Rated by the manufacturer at 150 H.P., it has a heating surface of 709 sq., feet operation is at 125 pounds per square inch pressure, Standard trim and blow-off valves are provided.

J-36.05. Breechings. Boiler No. 1 (coal fired) is provided with connections for future induced draft fan and a by-pass for natural draft operation. Boiler No. 2 (oil fired) has a separate steel stack through roof.

J-36.06. Stoker Equipment. Boilor No. 1 is equipped with an Iron



Fireman Corporation Model No. 5A stoker of the worm feed type. It is driven by a 7.5 H.P. motor, 3 phase, 60 cycles, 208 volt current characteristic. The operation of the stoker is fully automatic, regulated by steam pressure actuated controls with a McDonnell No. 150 safety cut-off switch at low-water level.

Oil Firing Equipment. Boiler No. 2 is provided by a built in rotary type burner driven by a 2 H.F. electric motor. The forced draft fan equipped with a 10 H.F. motor is manually started and automatically operated by steam pressure actuated controls. A separate "Viking Model ZGx2" oil pump driven by a 1/3 H.P. electric motor is provided having a maximum capacity of 91 g.p.h, fuel oil demand at full load being approximately 48 g.p.h. Equipment is designed to use No. 6 or lighter oils. Automatic preheating of oil is provided by a steam heater for normal operation and a 5 kw electric heater for starting.

J-36.07. Boiler Feedwater System. The condensate receiver of approximately 940 gallons capacity has two submerged heaters. One unit is a heater coil supplied by exhaust steam from the boiler feed pump, the other unit consists of a perforated tube element discharging high pressure drip returns into the receiver water. Low pressure condensate is returned to the receiver through a distribution system from primary condensate return pumps located in various buildings. Raw-water make-up is automatically controlled by float valves on the receiver.

Boiler Feedwater Pumps. Feedwater Pump, Boiler No. 1, is a reciprocating steam driven type furnished by Worthington Pump and Machinery Corp., Model VC. Boiler feedwater level is maintained by a "Copes" regulator of 24 g.p.m. capacity against maximum boiler pressure. Feedwater Pump, Boiler No. 2, is an electric driven 7-1/2 H.F. turbine type of 37 g.p.m. capacity against maximum boiler pressure, furnished by Cleaver Brooks Company, Aurora Model S8-G-D. Boiler feedwater level is maintained by McDonnell, #150 regulator.

J-36.08. Boiler House Piping is installed in accordance with Navy Specification 66Fla and 21Yc. Fiping is welded wherever practicable in lieu of flanged and screwed fittings.

J-36.09. Coal Storage Yard, of approximately 280 tons, or three month's supply at full load, is provided.

J-36.10. Fuel Oil Storage of 20,000 gallons is provided, this is approximately 3-1/2 month's supply at full load. There are two tanks located underground about 50 feet from boiler room.

J-37. B.O.Q. Naval Hospital.

J-37.01. Heating Flant. The purpose of this plant is to furnish steam for heat and hot water to Bachelor Officers' Quarters Building in the Naval Hospital Group. This plant is located in the basement of the B.O.Q. and consists of a low pressure steam boiler, condensate receiver boiler feed pump and accessories.

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J-37.02. Total Connected Load. A tabulation of the Btu per hour for this building is as follows:

			Heating		Hot Water	Total	
Bachelor	Officers'	Quarters	516,600		473,000	989,600	-
				Peak	Load	989,600	

J-37.03. Estimated Fuel Requirements. The annual fuel requirements have been estimated and are tabulated below. The overall boiler efficiency is estimated to be 60 per cent average with coal having a heating value of

Heating 516,600 x 24 x 2300 = 30 tons per year 60 x 13,500 x 0.6 x 2,000

Hot Wate

13,500 Btu per pound as fired.

er	473,000 x 6 x 365						
	13,500 x 0.6 x 2,000	:	64	tons	per	year	
	10,000 x 0.0 x 2.000		-		1		

Total Coal Required = 94 tons per year

989.600

J-37.04. Boiler. This is a portable horizontal return tubular firobox boiler manufactured by Oil City Tank and Boiler Company designated as "Oil City Model 63". Boiler is coal stoker fired, rated at 42 H.F. having 420 sq. feet of heating surface, designed for 15 lbs. working pressure. Standard trim including water column, gauge glass, pressure gauge, injector and blow-off connections are provided.

J-37.05. Breechings and Chimney. An 18" square breeching connecting with a brick chimney 18" in diameter by 30 ft. high is provided.

J-37.06. Combustion Equipment. Boiler is fired by a worm feed mechanical stoker manufactured by Conco Corporation designated as "Model H-2". Stoker is driven by a 1-1/2 H.P. electric motor and is fed by a 600 lb. hopper which is approximately 3 hours' coal supply when operating at full rating. Stoker is automatically started and is operated by a steam pressure actuated control. A low water safety cut-off switch is provided.

J-37.07. Boiler Feedwater System. A condensate receiver tank 50 gallons capacity together with a 12 g.p.m. turbine type condensate pump is driven by a 3/4 H.P. motor and is used to return the water to the boiler Water level in boiler is maintained by a McDonnell No. 150 feedwater control valve.

J-37.08. Boiler Room Piping. Is installed in accordance with Navy Specification No. 66Pla and 21 Yc. Fiping is designed for 125 lbs. working pressure.

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is istimated fuel an alrements. The ennual fuel requirement timeted and are tablanted balow. The granal holier officies it be b) per cont everage with well meving a hasting welly per pound as fored.

516,600 x 25 x 2500 + + 20 666 1 F 7062 .

15,000 x 0 x 300 10,000 x 0 x 0,000 === 21 04 0000 per year

Total Coal Booutred # Sectional Loop Lator

Autority This is a postable horizontal return turning fire autority of the big fire Int and Solid tongany Rosignatid and allo?. Doller is sold stoker fired, return at 46 fair hards a beating surface, suchand for 15 issa worlds product of including water solirs, gave glass, prossure cauge, injer autorious are provided.

A Broaddings and Chirmon. As 10" square troublag commetted

A Designants Asignants Asign is fired by a worm food made main here we by Conso Corporation most is fad by a "Hodal H-2". The individuation by Conso Corporation and is fad by a 400 lbs approximately i howes' soch samely whose operating at fails is automatically atomic's and is operating at fails by a standard and is operated by a stank prosecre with A low the selecty out-out without is provided.

Poiler Factorier Systems & condeptude resolver basin 50 galberether with a 12 gebane turbide type contentate part is the content and is used to return the water to the bailes ballor is minimalage or a belowed to , 100 foughter control

bile Baon Moinge in installed in accordance with Lary

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J-38. Mumford Point, Tent Camp # 1.

J-38.01. Heating Plant. The purpose of this plant is to furnish steam for heating, hot water and process steam to the principal buildings of this area. A separate boiler house was constructed with provision for future expansion in boiler capacity. The present installation consists of a 179 B.H.P., stoker fired boiler designed for 125 p.s.i. working pressure and the necessary auxiliaries.

J-38.02. Total Connected Load. A tabulation of the total connected load, expressed in Btu's per hour, to individual buildings is as follows:

Heating	Hot Water	Process	Total	
158,640	-	· · · ·	158,640	
525,760	773,500	1,730,900	3.030.160	
215,376	110,500			6
803,440	92,080	-		
500,000	-	- 111		
2,203,216	976,080	1,730,900	4,910,196	•
	158,640 525,760 215,376 803,440 500,000	158,640 - 525,760 773,500 215,376 110,500 803,440 92,080 500,000 -	158,640 525,760 773,500 1,730,900 215,376 110,500 803,440 92,080 500,000 -	158,640 158,640 525,760 773,500 1,730,900 3,030,160 215,376 110,500 325,876 803,440 92,080 895,520 500,000 - 500,000

Overhead distribution system losses: 246,000 Btu per hour Peak load 5,156,196 Btu per hour

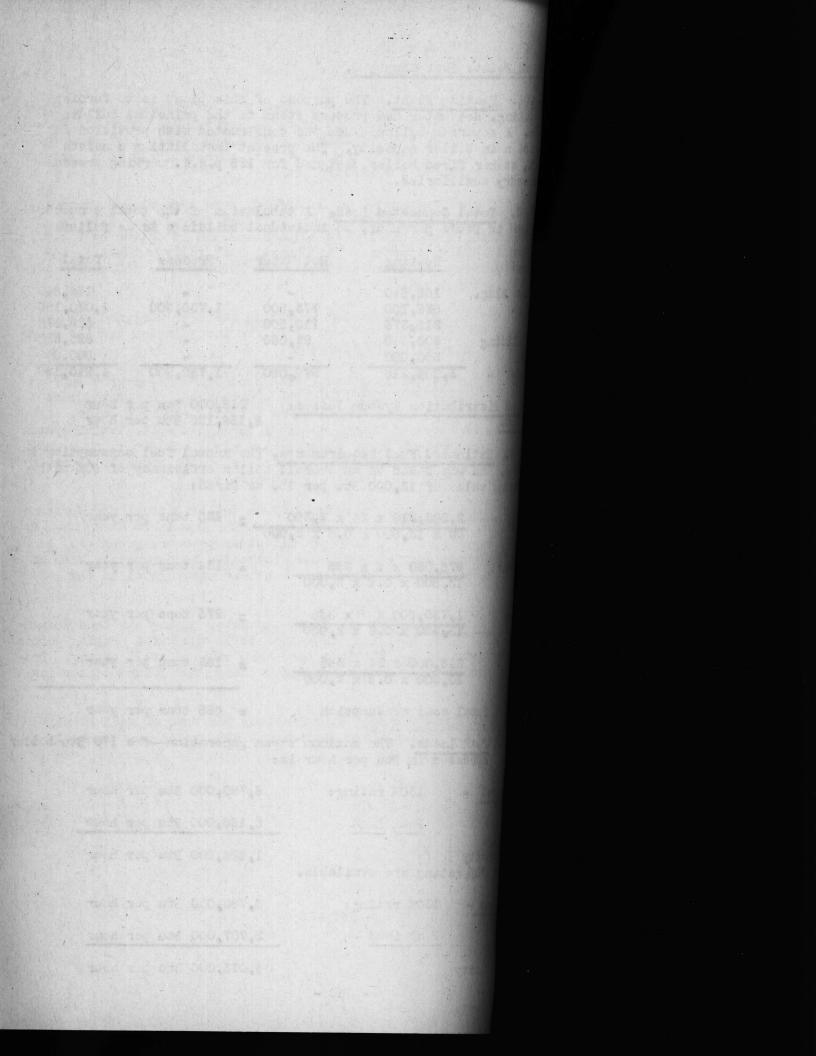
J-38.03. Estimated Fuel Requirements. The annual fuel consumption is estimated below, and was based on an overall boiler efficiency of 60% with coal of a heating value of 13,000 Btu per 1b. as fired:

Heating	2,203,216 x 24 x 2,300 60 x 13,500 x 0.6 x 2,000	=	125	tons	per	year	
Hot Water	976,080 x 6 x 365 13,500 x 0.6 x 2,000		134	tons	per	year	
Process	1,730,900 x 7 x 365 13,500 x 0.6 x 2,000	=	273	tons	per	year	
Losses	246,000 x 24 x 365 13,500 x 0.6 x 2,000	=	133	tons	per	year	
Tota	al coal consumption	-	665	tons	per	vear	

J-38.04. Peak Loads. The maximum steam generation of a 179 Btu boiler at 130% rating, expressed in Btu per hour is:

. Winter Load -	130% rating:	6,780,000	Btu	per	hour
	Peak Load	5,156,000	Btu	<u>p</u> er	hour
Spare capacity 43 b.h.p. at 130% ra	ting are available.	1,624,000	Btu	per	hour
Summer Load -	130% rating:	6,780,000	Btu	per	hour
· · · ·	Peak Load	2,707,000	Btu	per	hour
Spare capacity		4,073,000	Btu	per	hour
	- 360 -				

or 4



or 107 b.h.p. at 130% rating are available!

J-38.05. Boiler. The boiler is a Bison No. 582 manufactured by Farrar and Trefts, Inc. equipped with standard trim, boiler feed injector and blowoff valves. The heating surface of this unit is 1,786 square feet, and the normal rating is 179 b.h.p. at 125 p.s.i. working pressure. It is a portable firebox type boiler arranged for stoker firing.

J-38.06. Stoker Equipment. An underfeed, worm type stoker, manufactured by Conco Corporation, Model "Conco H-7" was installed. This is of the dead plate setting type, has 5-feed adjustments and is driven by 5 h.p., 3 phase, 60 cycles, 208 volt motor. The operation is fully automatic, regulated by steam pressure actuated controls with McDonmell No. 150, safety cutoff switch at low water level.

J-38.07. Breeching. The boiler breeching has been designed with the necessary connections for future induced draft fan installation and for a by-

J-38.08. Boiler Feedwater System. The condensate receiver of approximately 370 gallons capacity is provided with a submerged, perforated tube element discharging high pressure drip returns into the receiver water. Low pressure condensate is returned to the receiver through a distribution system from primary condensate return pumps located in various buildings. Raw water make-up is automatically controlled by float valves on the receiver operating in conjunction with McDonald No. 51 safety cut-off.

J-38.09. Feedwater Pump. A steam driven, duplex piston type Worthington pump of 24 g.p.m. capacity against naximum boiler prossure has been installed. Pump operation is controlled by a differential steam pressure governor. An automatic Copes feedwater regulator has been installed in connection with an injector for manual operation to maintain a constant water level in the boiler.

J-38.10. Boiler House Piping. Steam and water piping has been designed in accordance with U. S. Navy Specifications 66Pla and 21Yc. Piping joints were welded wherever possible and fittings were used only on small piping. Provisions have been made in the main steam piping design for future boiler installation.

J-38.11. Coal Storage Yard. Approximately 250 tons of coal storage space is adjacent to the boiler house providing a supply for approximately 4-1/2 months.

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J-39. Parachute Tower Buildings.

J-39.01. Heating Plant. The purpose of this plant is to furnish heat for the Parachute Training Building and Parachute Building. Located in a separate boiler house, the plant consists of one coal fired steam boiler condensate receiver tank, boiler feedwater pump and accessories. Distribution is overhead on wood poles and is described in Section G-2 of this report.

J-39-02. Total Connected Load. A tabulation of the total heat requirements in Btu per hour for the individual buildings is as follows:

Building	Heating
Parachute Training Building Parachute Building Total -	246,200 1,158,400 1,404,600
Distribution System Losses	90,000 Btu per hour
Peak Load	1,494,600 Btu per hour

J-39.03. Estimated Fuel Requirements. The annual fuel requirements have been estimated and tabulated below. The overall boiler efficiency is estimated to be 60 per cent average with coal having a heating value of 13,500 Btu per pound as fired.

Heating $\frac{1,404,600 \times 24 \times 2300}{60 \times 13,500 \times 0.6 \times 2,000} = 80$ tons per year

Distribution Losse

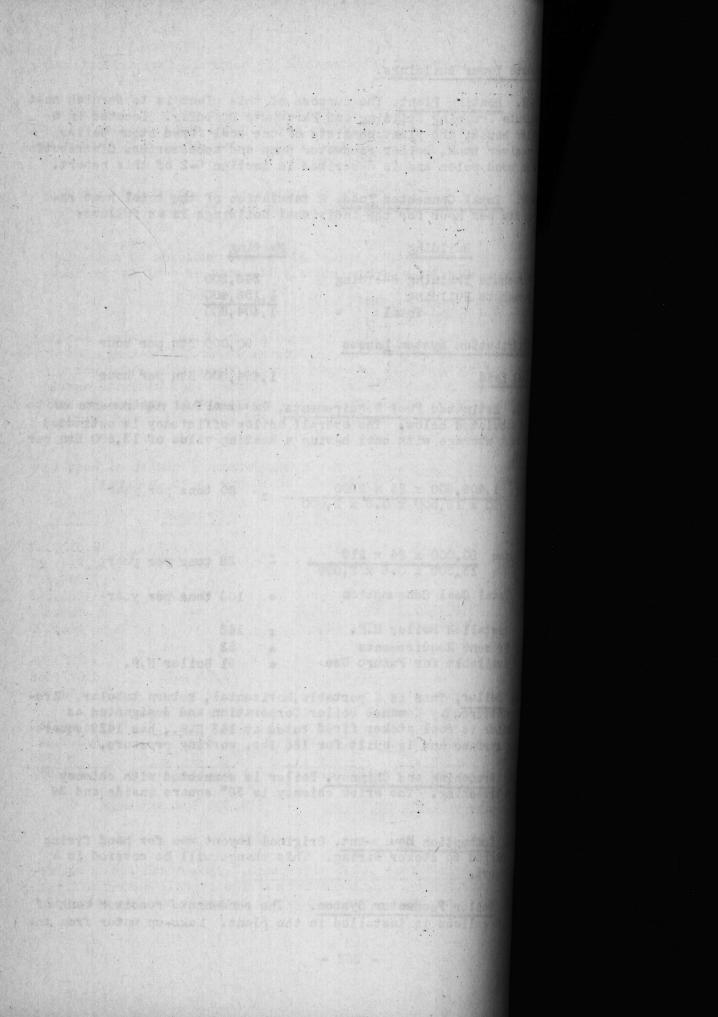
$\frac{90,000 \times 24 \times 210}{13,500 \times 0.6 \times 2,000}$	= 28 tons per year	
Total Coal Consumption	= 108 tons per year	
Installed Boiler H.P. Present Requirements Available for Future Use	= 143 = 52 = 91 Boiler H.P.	

J-39.04 Boiler; This is a portable, horizontal, return tubular, firebox boiler manufactured by Kewanee Boiler Corporation and designated as Model #587. Boiler is coal stoker fired rated at 143 H.P., has 1429 square feet of heating surface and is built for 125 lbs. working pressure.

J-39.05. Breeching and Chimney. Boiler is connected with chimney by a 33" square breeching. The brick chimney is 36" square inside and 36 feet high.

J-39.06. Combustion Equipment. Original layout was for hand firing but was later changed to stoker firing. This change will be covered in a supplementary report.

J-39.07. Boiler Feedwater System. The condensate receiver tank of approximately 175 gallons is installed in the plant. Make-up water from the



Division Training Area system is automatically controlled by a float valve mounted on the tank.

Condensate is pumped from the tank to the boiler by a Worthington, 21 gip.m. duplex steam driven boiler feedwater pump, controlled by a "Copes" pump governor. Water level is controlled in the boiler by a "Copes" feedwater regulator.

J-39.08. Boiler House Piping is installed in accordance with Navy Specifications 66Pla and 21Yc. Piping is designed for 125 lbs. working pressure.

J-39.09. Coal Storage. A space 30' square enclosed by a 4' high bulkhead having a capacity of approximately 125 tons of coal is provided.

J-40. Naval Hospital Group.

J-40.01. Heating Plant. The purpose of the Naval Hospital Heating Plant is to provide a standby system to furnish steam for heating, hot water and process to the buildings of the main group. While this plant now supplies steam to the Hospital group, it is intended that ultimate service will be from the Central Heating Plant in the Division Training Area. The plant consists of three semi-automatic oil fired boilers together with necessary auxiliaries.

J-40.02. Total Connected Load. A tabulation of the total heat requirements in Btu per hour to the various buildings is as follows:

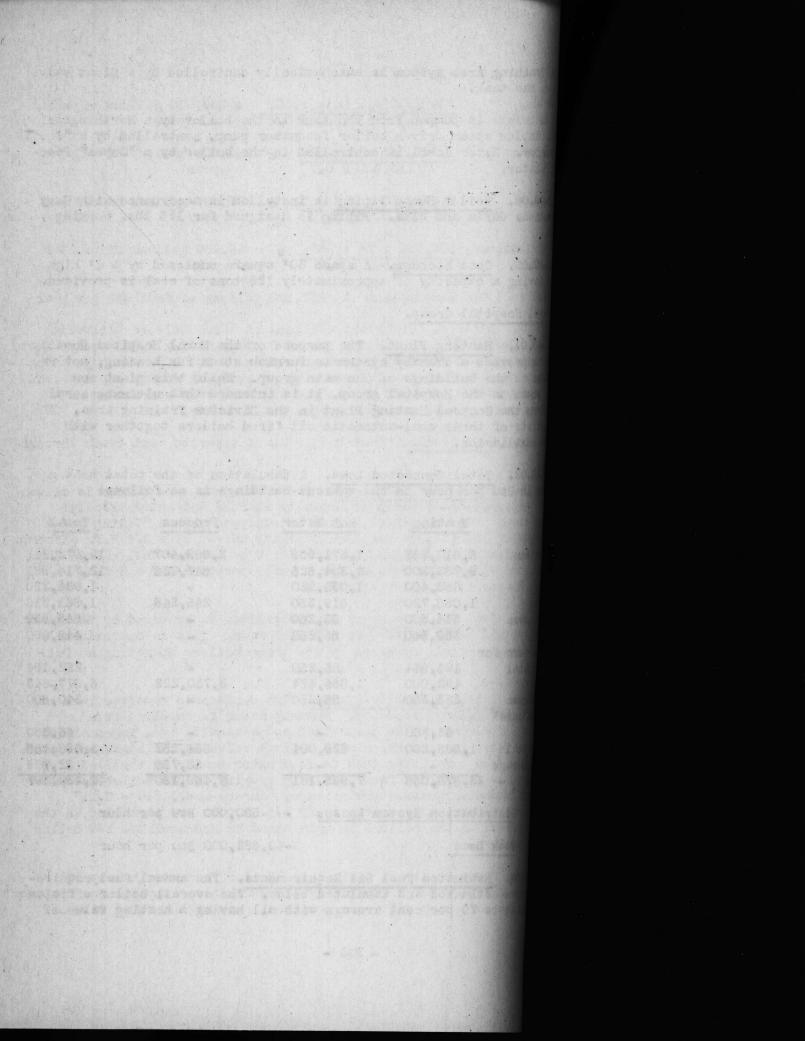
	Heating	Hot Water	Process	Total
Administration	8,610,752	1,371,958	2,889,407	12,872,117
Wards	9,763,200	2,304,525	647,236	12,714,961
Barracks	890,400	1,093,920		1,984,320
Nurses Home	1,086,720	519,350	255,248	1,861,318
Med. STorehouse	514,300	55,250		569,550
Garage	389,840	55,250	-	445,090
Nurses Quarters f	or	and the strength		
Family Hospital	196,944	55,250		252,194
Laundry	492,000	1,855,424	3,730,222	6,077,646
Hosp. Warehouse	285,350	55,250	-	340,600
Warrant Officers!			N X E Station	,
Quarters	63,360	-	_	63,360
Family Hospital	1,585,200	629,004	884,252	3,098,456
Gas & Oil Storage		and the states	52,785	52,785
Total -	23,878,066	7,995,181	8,459,150	40,332,397
Dist	ribution Syste	m Losson - I	550 000 Bty non 1	

Distribution System Losses - 550,000 Btu per hour

Peak Load

-40,882,000 Btu per hour

J-40.03. Estimated Fuel Oil Requirements. The annual fuel requirements have been estimated and tabulated below. The overall boiler efficiency is estimated to be 70 per cent average with oil having a heating value of



6,300,000 Btu's per 42-gallon barrel.

Heating	23,878,066 x 24 x 2,300 (70-10) x 150,000 x 0.7	
Hot Water	$\frac{7,995,181 \times 6 \times 365}{150,000 \times 0.7} =$	166,800 gallons of oil per year
Process	$\frac{8,459,150 \times 7 \times 365}{150,000 \times 0.7} =$	205,600 gallons of oil per year
Distribution Losses	$\frac{550,000 \times 24 \times 365}{150,000 \times 0.7} =$	46,000 gallons of oil per year

Total Fuel Oil Consumption = 627,800 gallons of fuel oil per year

J-40.04. Boilers. The plant consists of three boilers "Oilbuilt Model OB-50" manufactured by Cleaver Brooks Company having 2,500 square feet of heating surface and rated by the manufacturer at 500 h.p. when operating at 125 p.s.i. Each boiler is equipped with an integral rotary cup type oil burner. Yarway tandem blow-off valves and standard trim consisting of a water column, gauge glass, pressure gauge, and injector.

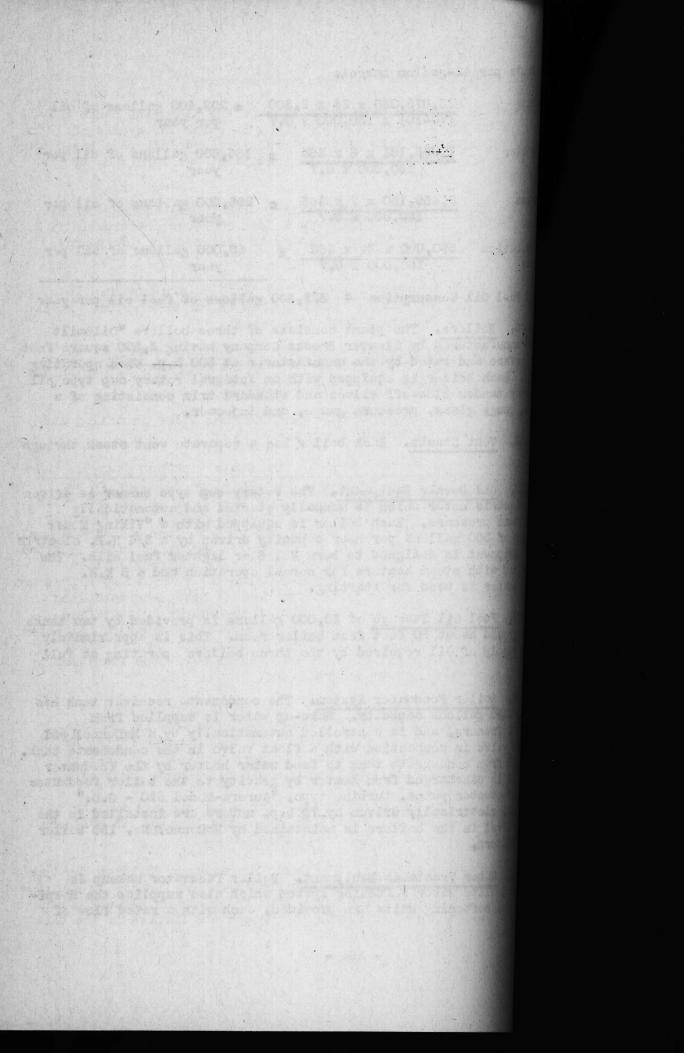
J-40.05. Vent Stacks. Each boiler has a separate vent stack through roof.

J-40.06. Oil Burner Equipment. The rotary cup type burner is driven by a 3 H.P. electric motor which is manually started and automatically operated by steam pressure. Each boiler is equipped with a "Viking Model ZH-1" oil pump of 300 gallons per hour capacity driven by a 3/4 H.P. electric motor. The equipment is designed to burn No. 6 or lighter fuel oils. The oil is preheated with steam heaters for normal operation and a 5 K.W. electric oil heater is used for starting.

J-40.07. Fuel Oil Storage of 30,000 gallons is provided by two tanks located underground about 50 feet from boiler room. This is approximately 2-1/2 week's supply of oil required by the three boilers operating at full load.

J-40.08. Boiler Feedwater System. The condensate receiver tank has approximately 1130 gallons capacity. Make-up water is supplied from Zeolite Water Softeners, and is controlled automatically by a McDonnell #51 feeder control valve in connection with a float valve in the condensate tank. Water is pumped from condensate tank to feed water heater by the feedwater heater pump and is discharged from heater by gravity to the boiler feedwater pumps. Three feedwater pumps, turbine type, "Aurora-Model 510 - G.D." rated 60 g.p.m., electrically driven by $7\frac{1}{2}$ h.p. motors are installed in the plant. Water level in the boilers is maintained by McDonnell No. 150 boiler feedwater regulators.

J-40.09. Water Treatment Equipment. Boiler feedwater makeup is taken from the Zeolite water softening system which also supplies the hospital laundry. Two softening units are provided, each with a rated flow of



300 g.p.m. and 100,000 gallons between regenerations.

Each unit is equipped with brine storage and measuring tanks and accessories for complete automatic operation, in which the cycles of softening and regeneration take place at predetermined intervals based upon the total amount of water softened. This equipment was furnished by the Permutit Company.

J-40.10. Boiler House Piping.is linstalled in accordance with Navy Specification 66Pla and 21Yc. Piping is welded wherever practicable in lieu of screwed and flanged joints. Piping is designed for 125 pounds working pressure.

J-40.11. Steam Distribution and Condensate Return System. The steam distribution and condensate return system is run underground and is described in detail in Section G-2 of this report.

J-40.12. Standby Electric Power for Naval Hospital Group. The original design included a 50 K.W. gasoline driven generator set which was never installed. See Electrical report Section H.

A 140 K.W. Diesel engine driven generator was later installed and will be covered in a supplementary report.

J-41. The Hostess House in Tent Camp #1, the Chapel in Tent Camp #1, the Servants Quarters at the Naval Hospital, the Operation Building at the Landing Field and the Mumford Point Chapel are heated by forced hot water systems. The boilers are of the sectional cast iron type, each fired by worm type, underfeed, single retort stoker designed to burn bituminous coal. The closed type of piping system has been employed utilizing properly sized air cushion tanks to absorb the expansion. Water is admitted to each system through a pressure reducing valve and each is protected by a pressure relief valve. Even though these protective devices have been installed eare should be taken to place the operation of the system in qualified hands as over firing over long periods may cause serious trouble. Circulating pumps properly controlled are provided to circulate the hot water through the heating systems and flow control valves have been installed to prevent circulation when no heat is required.

J-42. Gate House and Mumford Point Brig. Hot water systems similar to those described in J-41 but hand fired have been installed in the Gate House, and the Mumford Point Brig. Precautions against over firing as set forth in paragraph J-41 should be taken even more seriously in case of these hand fired installations, over firing may easily prove disasterous.

J-43. Officers' Quarters and Guest House. Hot water systems similar to those described in J-41 but oil fired have been installed in 196 Officers' Quarters and the Guest House in the Residential Area.

J-44. Radio Transmitter Building. The Radio Transmitter Building has been supplied with oil fired all steel warm air furnace. The furnace is equipped with a squirrel cage type fan which takes 100% fresh air in through a bank of "throw away" type filters and forces it through the furnace to the distributing ducts.

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J-45. The Homasote Huts at Tent Camp # 2, the Range Houses and Toilets at the Rifle Range and the Toilets and Guard Houses at Mumford Point Camp # 1 are heated by oil burning units equipped with fans to provide circulation of air.

J-46. Glider Training Base.

J-46.01. Heating Plant. The purpose of this plant is to furnish steam for heating the various buildings in this area. The equipment is located in a separate boiler house and consists of a coal burning boiler, condensate receiver, boiler feedwater pump and accessories. Distribution and condensate return system is overhead, carried on wood poles and is described in Section G-2 of this report.

J-46.02. Total Connected Load. A tabulation of the total heat requirements in Btu per hour for the individual buildings is as follows:

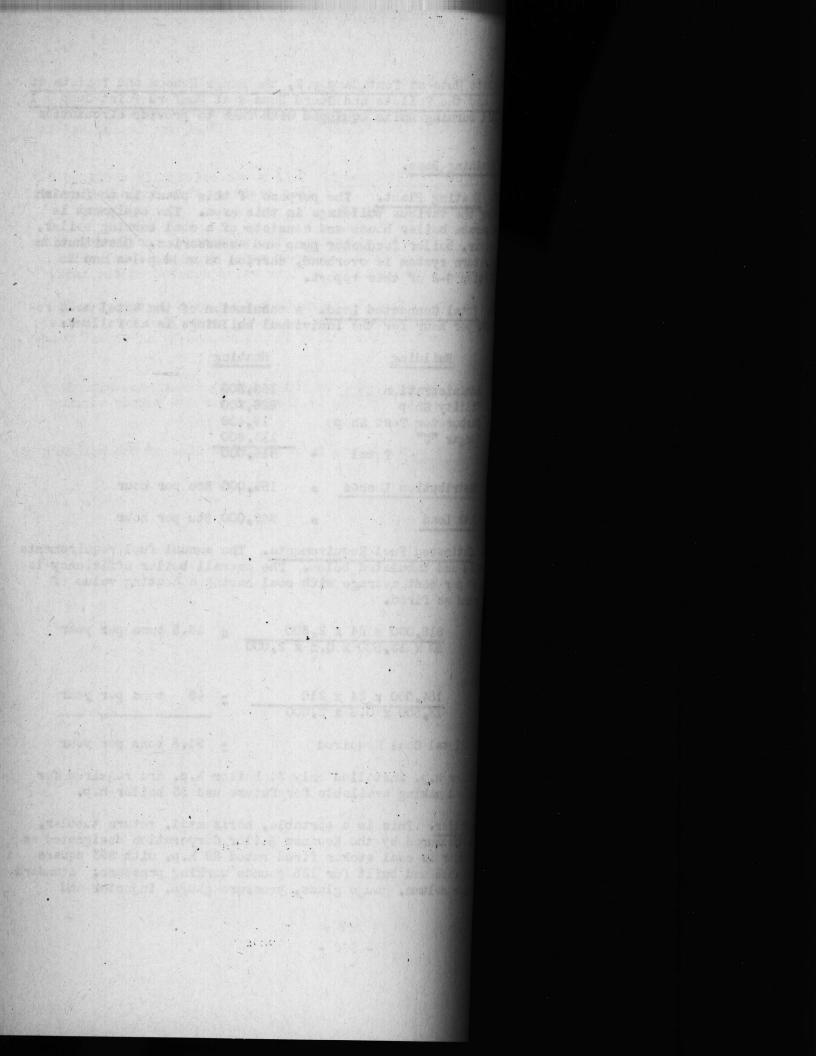
Building	Heating
Administration Utility Shop Carburctor Test Sh Hangar "C" Total	155,300 526,700 19,400 113,600 - 815,000
Distribution Losse	= 154,000 Btu per hour
Peak Load	= 969,000 Btu per hour

J-46.03. Estimated Fuel Requirements. The annual fuel requirements have been estimated and tabulated below. The overall boiler efficiency is estimated to be 60 per cent average with coal having a heating value of 13,500 Btu per pound as fired.

Heating	815,000 x 24 x 2,300 60 x 13,500 x 0.6 x 2,000	`=	46.5	tons	per	year
Distributio	n .					
Losses	154,000 x 24 x 210 13,500 x 0.6 x 2,000	=	48	tons	per	year .
	Total Coal Required	=	94.5	tons	per	year

With 89 boiler h.p. installed only 34 boiler h.p. are required for the present peak load making available for future use 55 boiler h.p.

J-46.04. Boiler. This is a portable, horizontal, return tubular, firebox boiler manufactured by the Kewanee Boiler Corporation designated as "Kewanee # 584" Boiler is coal stoker fired rated 89 h.p. with 893 square feet of heating surface and built for 125 pounds working pressure. Standard trim including water column, gauge glass, pressure gauge, injector and



blowoff connections are provided.

J-46.05: Breeching and Chimney: Boiler is connected with chimney by a 28" square breeching. The brick chimney is 36" square inside and is 36' high.

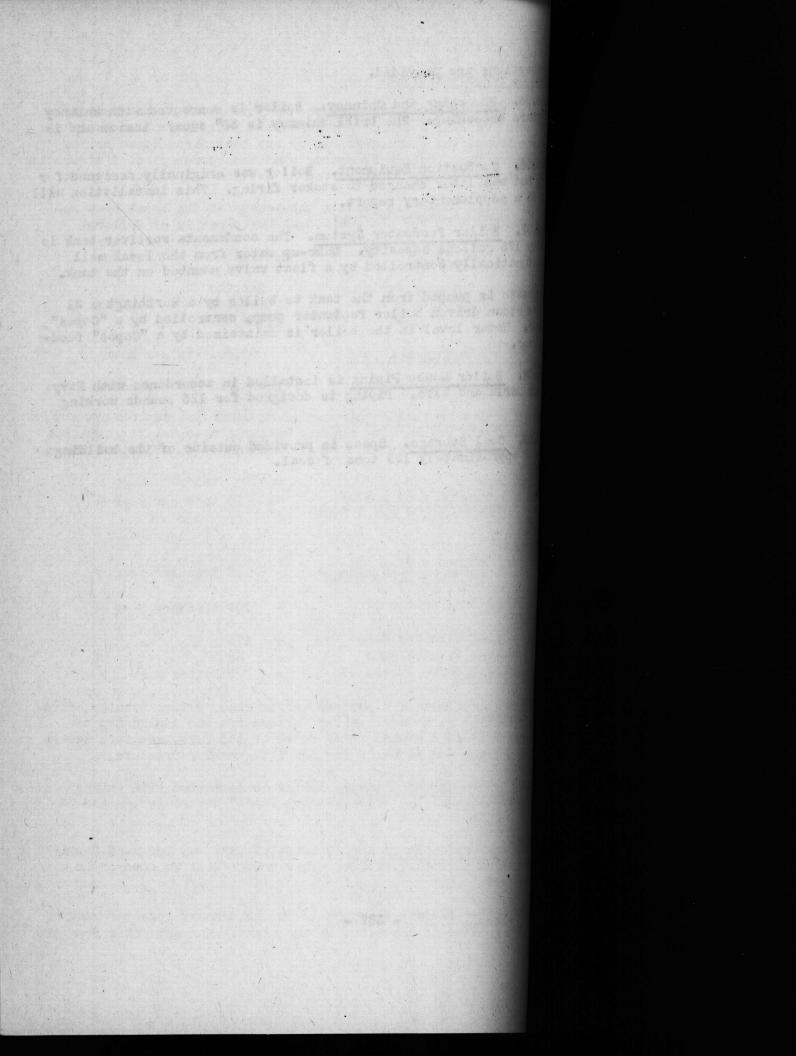
J-46.06. Combustion Equipment. Boiler was originally designed for hand firing but was later changed to stoker firing. This installation will be covered in a supplementary report.

J-46.07. Boiler Feedwater System. The condensate receiver tank is approximately 175 gallons capacity. Make-up water from the local well supply is automatically controlled by a float valve mounted on the tank.

Condensate is pumped from the tank to boiler by a Worthington 21 g.p.m. duplex steam driven boiler feedwater pump, controlled by a "Copes" pump governor. Water level in the boiler is maintained by a "Copes" feed- . water regulator.

J-46.08. Boiler House Piping is installed in accordance with Navy Specification 66Pla and 21Yc. Piping is designed for 125 pounds working pressure.

J-46.09. Coal Storage. Space is provided outside of the building for storage of approximately 125 tons of coal.



J-39. Parachute Tower Buildings.

J-39.01. Heating Plant. The purpose of this plant is to furnish heat for the Parachute Training Building and Parachute Building. Located in a separate boiler house, the plant consists of one coal fired steam boiler condensate receiver tank, boiler feedwater pump and accessories. Distribution is overhead on wood poles and is described in Section G-2 of this report.

J-39-02. Total Connected Load. A tabulation of the total heat requirements in Btu per hour for the individual buildings is as follows:

Building	Heating
Parachute Training Building Parachute Building Total -	246,200 1,158,400 1,404,600
Distribution System Losses	90,000 Btu per hour
Peak Load	1,494,600 Btu per hour

J-39.03. Estimated Fuel Requirements. The annual fuel requirements have been estimated and tabulated below. The overall boiler efficiency is estimated to be 60 per cent average with coal having a heating value of 13,500 Btu per pound as fired.

Heating	1,404,600 x 24 x 2300					5
	60 x 13.500 x 0.6 x 2.000	=	80	tons	per	year

Distribu-

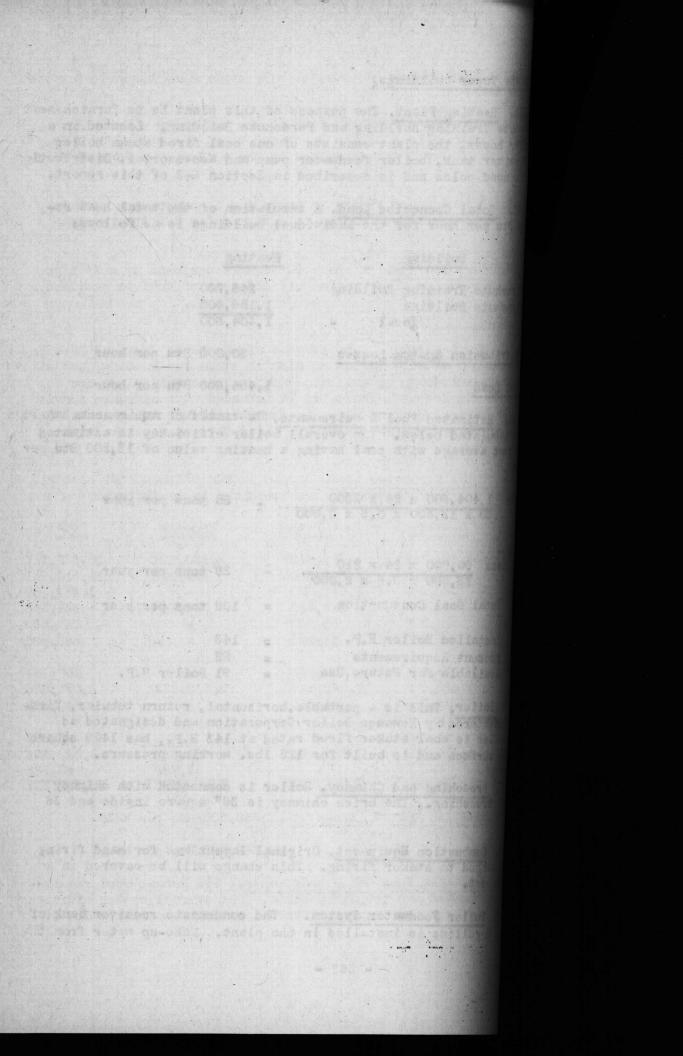
tion Losses 90,000 x 24 x 210 13,500 x 0.6 x 2,000	=	28 tons per year
Total Coal Consumption	=	108 ton's per year
Installed Boiler H.P. Present Requirements Available for Future Use		143 52 91 Boiler H.P.

J-39.04 Boiler: This is a portable, horizontal, return tubular, firebox boiler manufactured by Kewanee Boiler Corporation and designated as Model #587. Boiler is coal stoker fired rated at 143 H.P., has 1429 square feet of heating surface and is built for 125 lbs. working pressure.

J-39.05. Breeching and Chimney. Boiler is connected with chimney by a 33" square breeching. The brick chimney is 36" square inside and 36 feet high.

J-39.06. Combustion Equipment. Original layout was for hand firing but was later changed to stoker firing. This change will be covered in a supplementary report.

J-39.07. Boiler Feedwater System. The condensate receiver tank of approximately 175 gallons is installed in the plant. Make-up water from the



Division Training Area system is automatically controlled by a float valve mounted on the tank.

Condensate is pumped from the tank to the boiler by a Worthington, 21 g.p.m. duplex steam driven boiler feedwater pump, controlled by a "Copes" pump governor. Water level is controlled in the boiler by a "Copes" feedwater regulator.

J-39.08. Boiler House Piping is installed in accordance with Navy Specifications 66Pla and 21Yc. Piping is designed for 125 lbs. working pressure.

J-39.09. Coal Storage. A space 30' square enclosed by a 4' high bulkhead having a capacity of approximately 125 tons of coal is provided.

J-40. Naval Hospital Group.

J-40.01. Heating Plant. The purpose of the Naval Hospital Heating Plant is to provide a standby system to furnish steam for heating, hot waver and process to the buildings of the main group. While this plant now supplies steam to the Hospital group, it is intended that ultimate service will be from the Central Heating Plant in the Division Training Area. The plant consists of three semi-automatic oil fired boilers together with necessary auxiliaries.

J-40.02. Total Connected Load. A tabulation of the total heat requirements in Btu per hour to the various buildings is as follows:

	Heating	Hot Water	Process	Total
Administration Wards Barracks Nurses Home Med. STorehouse Garage	8,610,752 9,763,200 890,400 1,086,720 514,300 389,840	1,371,958 2,304,525 1,093,920 519,350 55,250 55,250	2,889,407 647,236 255,248	12,872,117 12,714,961 1,984,320 1,861,318 569,550 445,090
Nurses Quarters f Family Hospital		the Grand Ma		110,000
Laundry Hosp. Warehouse	196,944 492,000 285,350	55,250 1,855,424 55,250	3,730,222	252,194 6,077,646 340,600
Warrant Officers: Quarters Family Hospital Gas & Oil Storage Total	63,360 1,585,200 23,878,066	629,004 7,995,181	884,252 52,785	63,360 3,098,456 52,785
	ribution Syste		8,459,150 550,000 Btu per	40,332,397 hour

Peak Load

-40,882,000 Btu per hour

J-40.03. Estimated Fuel Oil Requirements. The annual fuel requirements have been estimated and tabulated below. The overall boiler efficiency is estimated to be 70 per cent average with oil having a heating value of

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serviced has 1 21 heads noness. The brown is analysis of the service of the servi

6,300,000 Btu's per 42-gallon barrel.

Heating	23,878,066 x 24 x 2,30 (70410) x 150,000 x 0.	
Hot Water	7,995,181 x 6 x 365 150,000 x 0.7	= 166,800 gallons of oil per year
Process	8,459,150 x 7 x 365 150,000 x 0.7	= 205,600 gallons of oil per year
Distribution Losses	$\frac{550,000 \times 24 \times 365}{150,000 \times 0.7} =$	46,000 gallons of oil per year

Total Fuel Oil Consumption = 627,800 gallons of fuel oil per year

J-40.04. Boilers. The plant consists of three boilers "Oilbuilt Model OB-50" manufactured by Cleaver Brooks Company having 2,500 square feet of heating surface and rated by the manufacturer at 500 h.p. when operating at 125 p.s.i. Each boiler is equipped with an integral rotary cup type oil burner. Yarway tandem blow-off valves and standard trim consisting of a water column, gauge glass, pressure gauge, and injector.

J-40.05. Vent Stacks. Each boiler has a separate vent stack through roof.

J-40.06. Oil Burner Equipment. The rotary cup type burner is driven by a 3 H.P. electric motor which is manually started and automatically operated by steam pressure. Each boiler is equipped with a "Viking Model ZH-1" oil pump of 300 gallons per hour capacity driven by a 3/4 H.P. electric motor. The equipment is designed to burn No. 6 or lighter fuel oils. The oil is preheated with steam heaters for normal operation and a 5 K.W. electric oil heater is used for starting.

J-40.07. Fuel Oil Storage of 30,000 gallons is provided by two tanks located underground about 50 feet from boiler room. This is approximately 2-1/2 week's supply of oil required by the three boilers operating at full load.

J-40.08. Boiler Feedwater System. The condensate receiver tank has approximately 1130 gallons capacity. Make-up water is supplied from Zeolite Water Softeners, and is controlled automatically by a McDonnell#51 feeder control valve in connection with a float valve in the condensate tank. Water is pumped from condensate tank to feed water heater by the feedwater heater pump and is discharged from heater by gravity to the boiler feedwater pumps. Three feedwater pumps, turbine type, "Aurora-Model 510 - G.D." rated 60 g.p.m., electrically driven by $7\frac{1}{2}$ h.p. motors are installed in the plant. Water level in the boilers is maintained by McDonnell No. 150 boiler feedwater regulators.

J-40.09. Water Treatment Equipment. Boiler feedwater makeup is taken from the Zeolite water softening system which also supplies the hospital laundry. Two softening units are provided, each with a rated flow of

300 g.p.m. and 100,000 gallons between regenerations.

Each unit is equipped with brine storage and measuring tanks and accessories for complete automatic operation, in which the cycles of softening and regeneration take place at predetermined intervals based upon the total amount of water softened. This equipment was furnished by the Permutit Company.

J-40.10. Boiler House Piping.is linstalled in accordance with Navy Specification 66Pla and 21Yc. Piping is welded wherever practicable in lieu of screwed and flanged joints. Piping is designed for 125 pounds working pressure.

J-40.11. Steam Distribution and Condensate Return System. The steam distribution and condensate return system is run underground and is described in detail in Section G-2 of this report.

J-40.12. Standby Electric Power for Naval Hospital Group. The original design included a 50 K.W. gasoline driven generator set which was never installed. See Electrical report Section H.

A 140 K.W. Diesel engine driven generator was later installed and will be covered in a supplementary report.

J-41. The Hostess House in Tent Camp #1, the Chapel in Tent Camp #1, the Servants Quarters at the Naval Hospital, the Operation Building at the Landing Field and the Mumford Point Chapel are heated by forced hot water systems. The boilers are of the sectional cast iron type, each fired by worm type, underfeed, single retort stoker designed to burn bituminous coal. The closed type of piping system has been employed utilizing properly sized air cushion tanks to absorb the expansion. Water is admitted to each system through a pressure reducing valve and each is protected by a pressure relief valve. Even though these protective devices have been installed eare should be taken to place the operation of the system in qualified hands as over firing over long periods may cause serious trouble. Circulating pumps properly controlled are provided to circulate the hot water through the heating systems and flow control valves have been installed to prevent circulation when no heat is required.

J-42. Gate House and Mumford Point Brig. Hot water systems similar to those described in J-41 but hand fired have been installed in the Gate House, and the Mumford Point Brig. Precautions against over firing as set forth in paragraph J-41 should be taken even more seriously in case of these hand fired installations, over firing may easily prove disasterous.

J-43. Officers' Quarters and Guest House. Hot water systems similar to those described in J-41 but oil fired have been installed in 196 Officers' Quarters and the Guest House in the Residential Area.

J-44. Radio Transmitter Building. The Radio Transmitter Building has been supplied with oil fired all steel warm air furnace. The furnace is equipped with a squirrel cage type fan which takes 100% fresh air in through a bank of "throw away" type filters and forces it through the furnace to the distributing ducts.

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J-45. The Homasote Huts at Tent Camp # 2, the Range Houses and Toilets at the Rifle Range and the Toilets and Guard Houses at Mumford Point Camp # 1 are heated by oil burning units equipped with fans to provide circulation of air.

J-46. Glider Training Base.

J-46.01. Heating Plant. The purpose of this plant is to furnish steam for heating the various buildings in this area. The equipment is located in a separate boiler house and consists of a coal burning boiler, condensate receiver, boiler feedwater pump and accessories. Distribution and condensate return system is overhead, carried on wood poles and is described in Section G-2 of this report.

J-46.02. Total Connected Load. A tabulation of the total heat requirements in Btu per hour for the individual buildings is as follows:

Administration		155,300
Utility Shop		526,700
Carburetor Test Shop		19,400
Hangar "C"		113,600
Total	-	815,000
Distribution Losses	`= .	154,000 Btu per hour
Peak Load	=	969,000 Btu per hour

Heating

J-46.03. Estimated Fuel Requirements. The annual fuel requirements have been estimated and tabulated below. The overall boiler efficiency is estimated to be 60 per cent average with coal having a heating value of 13,500 Btu per pound as fired.

Heating	815,000 x 24 x 2,300 60 x 13,500 x 0.6 x 2,000	=	46.5	tons	per	year
Distribution .						
Losses	154,000 x 24 x 210	-	48	tons	per	year
	13,500 x 0.6 x 2,000	-			-	•

Total Coal Required

Building

94.5 tons per year

With 89 boiler h.p. installed only 34 boiler h.p. are required for the present peak load making available for future use 55 boiler h.p.

J-46.04. Boiler. This is a portable, horizontal, return tubular, firebox boiler manufactured by the Kewanee Boiler Corporation designated as "Kewanee # 584" Boiler is coal stoker fired rated 89 h.p. with 893 square feet of heating surface and built for 125 pounds working pressure. Standard trim including water column, gauge glass, pressure gauge, injector and

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blowoff connections are provided.

J-46.05. Breeching and Chimney. Boiler is connected with chimney by a 28" square breeching. The brick chimney is 36" square inside and is 36" high.

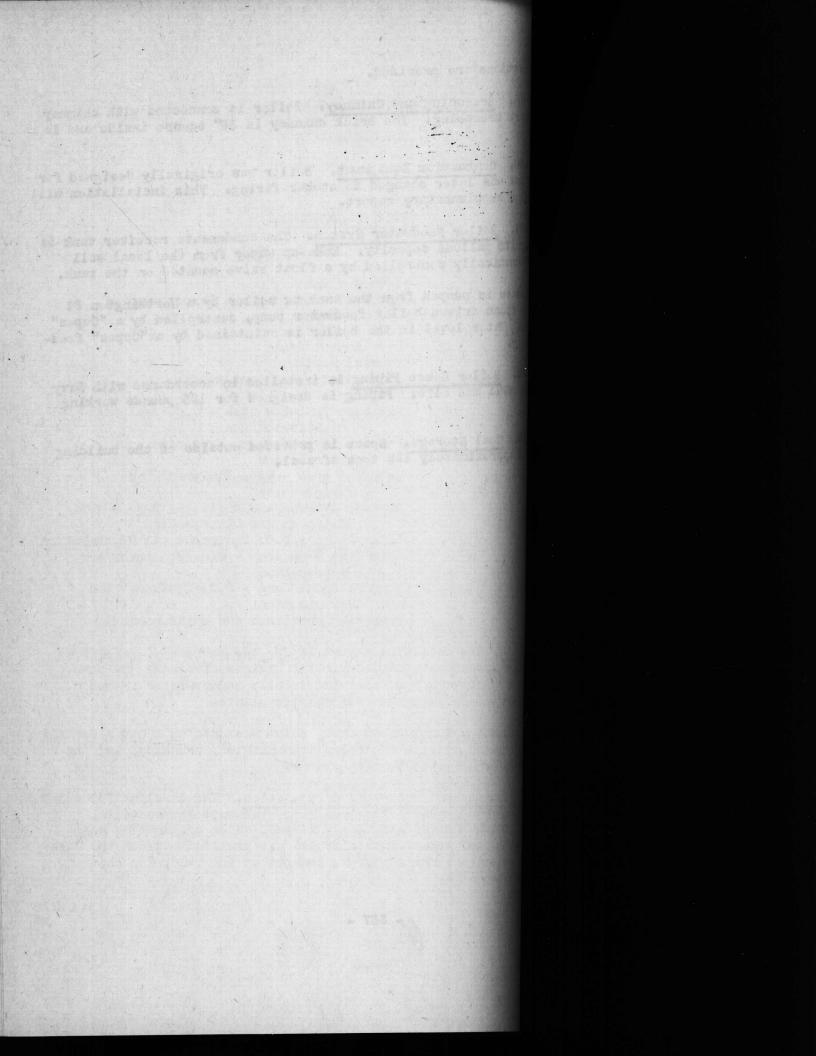
J-46.06. Combustion Equipment. Boiler was originally designed for hand firing but was later changed to stoker firing. This installation will be covered in a supplementary report.

J-46.07. Boiler Feedwater System. The condensate receiver tank is approximately 175 gallons capacity. Make-up water from the local well supply is automatically controlled by a float valve mounted on the tank.

Condensate is pumped from the tank to boiler by a Worthington 21 g.p.m. duplex steam driven boiler feedwater pump, controlled by a "Copes" pump governor. Water level in the boiler is maintained by a "Copes" feedwater regulator.

J-46.08. Boiler House Piping is installed in accordance with Navy Specification 66Pla and 21Yc. Piping is designed for 125 pounds working pressure.

J-46.09. Coal Storage. Space is provided outside of the building for storage of approximately 125 tons of coal.



CHAPTER K - PART II

COMMUNICATIONS

TABLE OF CONTENTS

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Section	Title
K-1	Introduction
K-2	Connecting Company and Description of Service
K-3	Toll Facilities
K-4	Development Study
K-5	General Design
K-6	Transmission and Protection
K-7	Trunking
K-8	Division Training Area - C.O. Equipment and Distribution
K-9	Paradise Point - C.O. Equipment and Distribution
K-10	Hospital Area - C.O. Equipment and Distribution
K-11	Barrage Balloon and Amphibian Base - C.O. Equipment and Distribution
K-12	Rifle Range - C.O. Equipment and Distribution
K-13	Main Tent Camp Area - C.O. Equipment and Distribution
K-14	Mumford Point Camp - C.O. Equipment and Distribution
K-15	Operating Practices and Maintenance

K-1 Introduction. The following report is for the purpose of describing the Communication System as provided for the Division Training and other associated areas and covers the essential details incorporated in the design of central office equipment and outside plants.

It also includes a development study which was used as a basis for the engineering design and details regarding transmission, trunking, and the outside plant feeder and distribution system.

K-2 Connecting Company and Description Facilities. The Carolina Telephone and Telegraph owns and operates the telephone system at Jacksonville, North Carolina, which handles all local and toll calls originating and terminating at Camp Lejeune. Trunk circuits are provided between the Jacksonville Exchange and the switchboards, located on the base, for the completion of these calls.

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an and Description Facilities. The Corolina Telephone distance the trippione system at Jacksonville, andies 411 leed, and tell calls sufficienting and ame. Trank circuits are provided between the Jackthe swivenboards, leested on the base. For the The Carolina Company Exchange consists of automatic step by step switching equipment employing a three digit numbering system. Toll equipment consists of an eight position toll board with direct circuits connecting with the Southern Bell Telephone Company and the Chesapeake and Potomac Tele-

K-3 Toll Facilities. In order to facilitate handling toll traffic, the Carolina Telephone and Telegraph Company established a tell center at Jacksonville in the early part of 1941.

The Jacksonville Exchange, in addition to caring for all toll calls at Camp Lejeune, also handles practically all toll traffic originating and terminating at Camp Davis which is located approximately 22 miles south on Highway No. 17. Following is the present number of toll circuits owned and operated by the Carolina Company with the description and connecting companies shown.

Description	No. Circuits	Connecting Company
Jacksonville - Norfolk	4	Chesapeake and Potomac Tel. Co.
Jacksonville - Raleigh	3	Southern Bell Telephone Co.
Jacksonville - Wilmington	9	Southern Bell Telephone Co.
Jacksonville - Kinston	1	Carolina Telephone Company
Jacksonville - New Bern	4	Carolina Telephone Company
Now Bern - Norfolk	4	Carolina Telephone Company
New Bern - Raleigh	4	Carolina Telephone Company

In the event that all direct northbound circuits are busy, alternate routing through New Bern can be utilized.

K-4 Development Study. Before the preparation of any preliminary design it was necessary that an estimate of main station requirements be made in order that proper sizing of feeder and distribution cables could be determined, and adequate switching quantities be arrived at. This original study was prepared with the collaboration of the camp communication officer, submitted to the Officer in Charge and approved after revisions had been made based on suggestions by the Quartermaster General, U. S. M. C.

The estimated total number of stations required was 1896 of which 1005 were located in the Division Training Area and 891 in outlying areas.

Following is a tabulation of the development study showing estimated main station requirements by buildings which was used as a basis for designing the entire communication system.

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TABULATION OF DEVELOPMENT STUDY

DIVISION TRAINING AREA MAX CENTRAL OFFICE

Type Bldg.	No. Bldgs.	Esti Stai Req.	
		per Bldg.	Required
Division Headquarters	1	56	56
Regimental Adm.	5	20	100
Battalion Adm.	15	13	195
Barracks	60	4	240
Mess Hall	15	1	15
Post Exchange	5	3	15
Infirmary	5	5	25
Battalion Warehouse	60	1/2	30
Service Club	5	3	15
Theater	5	3	15
Church	2	1	2
Fire House	1	23	23
Radio Transmitter	1	15	15
Incinerator	1	1	1
Hostess House	1	3	3
Sewage Treatment Plant	1	1	1
Sewage Pumping Station	1	1	1
Water Pumping Station	1	1	1

REGIMENTAL AREAS

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POST TROOPS AREA

Type Bldg.	No. Bldgs.	Est. Sta. Req.	Total Stations
		per Bldg.	Required
Post Headquarters	1	88	* 88 *
Dispensary	1	32	32
Battalion Administration	1 1	13	13
Barracks	4	4	16
Mess Hall	1	1	1
Post Exchange	1	3	3
Brig	1	8	8
Cobbler Shop	1	5	5
Theatre	1	3	3
Battalion Warehouse	4	1	4

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TON TRAINING AREA MAX CENTRAL OFFICE

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TABULATION OF DEVELOPMENT STUDY

DIVISION TRAINING AREA MAX CENTRAL OFFICE (CONT'D.)

Type of Bldg.	No. Bldgs.	Est. Sta. Req.	Total Stations
		per Bldg.	Required
Commissary	1	10	10
Cold Storage	1	2	2
Fire House	1 .	3	3
Bakery	1	2	2
Laundry	1	3	3
Propane Gas	1	i	1
Power House	1	3	3
Gas Station	1	1	1
Post Shop	ī	15	15
P.X. Warehouse	ī	4	4
Reclamation Bldg.	1	3	3
Garage	2	3	6
Balloon Bldg.	1	2	2
Warehouse	5	2	10
Equipment Shed	24		6
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		and the second second	
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INDUSTRIAL AREA

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MISCELLANEOUS BLDGS.

Type Bldg.	No. Bldgs.	Est. Sta. Req.	Total Stations
		per Bldg.	Required
Waller Gunnery	1	1	1
Parachute Training B.	1	ī	1
Parachute Bldg.	1	1	1
Gate House	1.	5	5
			8
	Total for Di	ivision Training Are	ea 1005

YOUTS THE DEVELOPMENT STUDY

ION TRAINING AREA MAX CRUTERS, OFFICE (CONT'D.)

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TABULATION OF DEVELOPMENT STUDY

SUBSIDIARY AND OUTLYING CENTRAL OFFICES

BARRAGE BALLOON AND AMPHIBIAN BASE

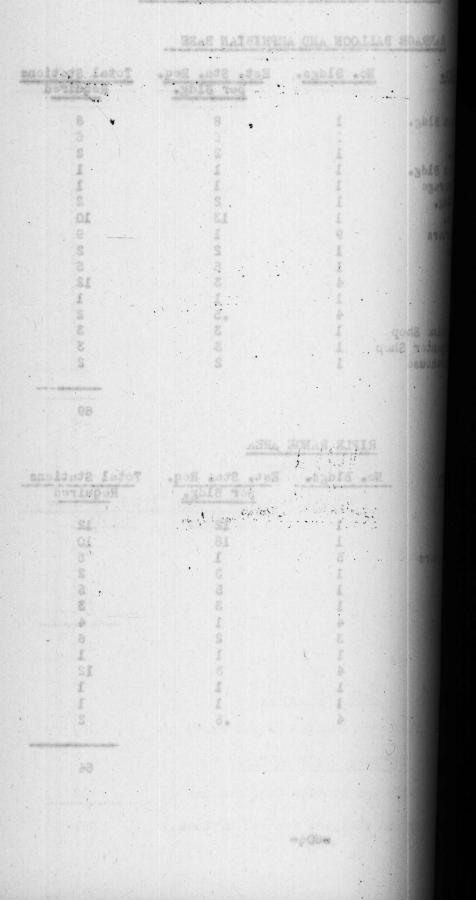
Type Bldgs.	No. Bldgs.	Est. Sta. Req. per Bldg.	Total Stations Required
Administration Bldg.	1	8	0
School Bldg.		c	o
Balloon Bldg.	1	C	6
Transportation Bldg.	÷	4	2
final and at	1	1	1
Supply and Storage	1	1	1
Operations Bldg.	. 1	2	2
Battalion Adm.	1	13	10
Officers Quarters	9	10	10
Post Exchange	1	1	9
Infirmary	1	5	2
	1	5	5
Barracks	4	3	12
Mess Hall	1	1	
Warehouses	4	.5	÷
Amphibian Machine Shop	1	3	4
Amphibian Carpenter Shop	1 1		3
Amphibian Storehouse	. 1	3	3
hupitutan Scorenouse	1	2	2

Type Bldgs. No. Bldgs. Est. Sta. Req. Total Stations per Bldg. Required Armory Bldg. B.O.Q. Officers' Quarters Post Exchange Infirmary Theater Range Houses Rifle Ranges Pistol Range Barracks Mess Hall Heating Plant Warehouses .5

RIFLE RANGE AREA

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DESIGNARY AND OUTLING CENTRAL OFFICES



TABULATION OF DEVELOPMENT STUDY

SUBSIDIARY AND OUTLYING CENTRAL OFFICES (Cont.d.)

HOSPITAL AREA

Type Bldgs.	No. Bldgs.	Est. Sta. Req.	Total Stations
	i fan i e	per Bldg.	Required
Administration Bldg.	1	43	43
Mess Hall - Recreation	1	5	5
Nurses Home	1	7	7
Ward Bldgs.	11	4	44
Family Hospital	1	18	18
Civilian Nurses Home	1	4	4
Medical Storehouse	1	2	2
Warehouse	1	1	1
Garage	1	1	ī
Shop	1	2	2
Power House	1	1	1
Laundry	1	2	2
Corpsmen Barracks	2	6	12
Medical Officer's Home	3	2	6
Warrant Officer's Home	1	1	1
B. O. Q.	1	10.	10 /

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PARADISE POINT

Type Bldgs.	No. Bldgs.	Est. Sta. Req.	Total Stations
and the training		per Bldg.	Required
B.O.Q.	8	25	200
Guest House	1	4	4
Fire House	1	3	/ 3
Officers Quarters	180	1	180

387

MAIN TENT CAMP

Estimated Station Requirements 180

MUMFORD PT. TENT CAMP

Estimated Station Requirements

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Total for Subsidiary and Outlying Central Offices.

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AND GUTLYING CENTRAL OFFICES (CONS'd.)

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Dorthpon COS + E	Este Star Rog. To por Bidge 28 -	e Bldgse 6 1 1	<u>or</u>
BogBreak 200 4 3 280 3 8 280	Este Star Rog. To por Bidge 28 -	e Bldgse 6 1 1	<u>or</u>
Dorthpon COS + E	Este Star Rog. To por Bidge 28 -	e Bldgse 6 1 1	<u>.</u>
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K-5. <u>General Design</u>. The telephone system at Camp Lejeune consists of three service areas.

1. A main automatic exchange in the Division Training Area and four subsidiary central offices at the Naval Hospital, Paradise Point residential area, Barrage Balloon and Amphibian Base, and the Rifle Range.

2. A smaller main automatic exchange provided at the Main Tent Camp and serves directly, without subsidiary exchanges, the Airport, Peterfield Point and Tank Battalion Areas.

3. The Mumford Point Tent Camp which is served directly by the Caroline Telephone and Telegraph Exchange at Jacksonville.

The connection between the three service areas is through the Jacksonville Exchange.

Several central offices were used. The distances involved made it more economical than to connect all stations through one exchange.

The outside plant consists chiefly of lead covered cable. Aerial construction is used locally for distribution to individual units and groups of building, underground entrances are made at all important buildings. Trunks to the Barrage Balloon and Rifle Range Areas are by open wiring to minimize line losses due to the excessive distance and to conserve critical material.

K-6. Transmission and Protection. In the preparation of detail construction plans, due to the segregated areas to be served and the distances involved, transmission studies were made of all trunk circuits and subscribers. In accordance with the Bureau of Yards and Docks Specification 9Ye, 19 gauge cable was used throughout the entire communication system for both trunk cables and distribution plant.

All transmission schematics, through the cooperation of the Chief Engineer of the Southern Bell Telephone Company, were submitted to the General Transmission Engineer, and all cable loading and transposition layouts were checked by his staff.

Throughout the entire system joint construction with the power lines was employed wherever possible. To meet standard requirements the electrical distribution, which is 7200 volts to ground, was equipped with Westinghouse H.C.B. pilot wire relays. These relays are of the quick acting typeand are designed to operate on two cycles. At all sectionalizing stations the relays are interconnected by means of a pilot wire. In the event that there is any unbalanced load or voltage, due to short circuit or fault in the electrical system, the relays instantaneously will disconnect the section of line which is affected. and has send an else Division Instance they bad he

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Throughout the entire telephone plant standard protection, as covered by the A.T. & T. Company's specifications, was employed.

1. At all central offices, zero readings were obtained on all grounds which in some cases involved driving connecting ground rods to a depth of eighty feet.

2. Fuse cables were used at all points where the underground plant connected to the aerial plant.

3. All underground services from aerial feeders were terminated in fuse protected terminals with adequate grounds not exceeding 5 ohms.

4. Fuse terminals and grounds were provided at all points of connection between aerial cable and open wire plant.

5. All telephone installations exposed to power or lightning were provided with standard substation protectors.

K-7 Trunking. In accordance with the request of the Carolina Telephone Company, two-way trunking with associated repeater equipment was installed between the Division Training Area Main Exchange and Jacksonville over 19 Gauge, B-88, loaded cable. Non-loaded, two-way trunks were also stipulated by the Connecting Company between the Tent Camp Exchange and Jacksonville.

However, within the base, one way trunk groups were set up, by direction, between the Division Training Area Exchange and the Paradise Point Exchange, and also between the Division Training Area Exchange and the Hospital area switchboard.

The Barrage Balloon Area and the Rifle Range are connected to the Division Training Area Exchange by .104 copper circuits terminating on the tactical common battery lines on the attendants cabinets. In addition, two tie lines are provided between the Barrage Balloon and Rifle Range switchboards.

Table of Trunk Line Qua					.104 Copper	
EXCHANGE	26-19	51-19	1-19	1-22	2 Circuits	3 Circui
Division Training MAX to	-					
Carolina Tel. & Tel Co.*			27.492	43		
Paradise Point			16,752	2,055		
Naval Hospital		8650			and there is	1
Bar. Balloon & Amph. Bs.					63,500	1 Starland
Rifle Range						107.500
Rifle Range PBX to						
Bar. Balloon & Amph. Bs.					44.000	
Tent Camp MAX to	and the second second					
Carolina Tel & Tel. Co.*	3220		and the second			
Total Trunk Line Cable or	· Pole I	ine 273	3 210 13	nogl F	+	372 3

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ison area and the Rifle Barge are connected to the and Barango by .104 coppor circuits termin ting on hetcory lines on the Attendants cobinets. In addition revised between the Barrage Salions and Mills Manna

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* Distance given is to point of connection with existing lines of Telephone Company.

K-8 Division Training Area.

K-8.01. The Central Office located in Post Headquarters Building handles all calls originating in the Regimental, Post Troops and Industrial Areas. It also handles all toll calls originating and terminating at several Camp Lejeune Exchanges, as noted hereafter, and the Naval Hospital through trunk circuits to the Carolina Telephone and Telegraph Company. Calls between certain exchanges within the camp are also handled through this office.

This exchange of MAX type consists of automatic step by step switching equipment of the sectional mounting, distributing terminal assembly type, permitting additional units to be added as required, without disturbing original lines and equipment, and without change in call numbers. A four digit numbering system is provided, of 1200 line initial capacity so designed that it may be readily expanded to 2000 lines. Provision is made for three attendants positions to handle information, intercept and handle calls between the automatic system and the Carolina Telephone and Telegraph Exchange.

A twenty station fire and crash alarm conference service is provided whereby nineteen telephones can be connected simultaneously to receive instructions by depressing a key at the preferred station.

K-8.02. Distribution is by underground conduit (combined with trunk circuits) following Main Service Road thence by aerial construction to the individual Regimental Areas and Post Troops Area. The Industrial Area is served by underground conduit (combined with trunk circuits) to Holcomb Boulevard and by buried cable parallel with the boulevard to Dogwood Street, thence by aerial construction throughout area. Drawings prepared for this area are shown in the following table:

Plan No.				Number	of pair	·s - Gai	ige				1
M.B.	11-19	16-19	26-19	50-19	51-19	1-19	2-19	3-19	4-19	6-22	9-22
778		alan an a				973	260			1.628	12.691
779	460		430	1	500	1,341	2,964				
780	530		320		1,630	2,180					
781	320		230		683	1,631	2,352				
782	490		405		1,493.	2,305					
783	245		445		1,589	3,233			1,350		
784	485		90		895	1.776	119				
785		1,265	1,970	1,410	940	1.370			1		
799	140			1,770		210	155	756	1,024		N

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		300.015					

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K-9 Paradise Point.

K-9.01. The Central Office is located in the upper story of the Officers' Mess and switches all calls originating or terminating in the B. O. Q. Areas and the Officers' Mess. The exchange, of PAX type, consists of automatic step by step switching equipment of the sectional mounting, distributing terminal assembly type, permitting additional units to be added, as required, without disturbing original lines and equipment, and without change in call numbers. There is provided a four digit numbering system of 600 line initial capacity. This is an entirely automatic unattended exchange providing intercommunication within the area. Connection with the Carolina Telephone Exchange and certain exchanges within the camp is through the Division Training Area MAX central office.

A twenty station Fire and Crash alarm conference service is provided whereby nineteen telephones can be connected simultaneously to receive instructions by depressing a key at the preferred station.

K-9.02. Distribution is by buried conduit (combined with trunk circuits) following River Drive thence by aerial construction to individual residences. Service to the B.O.Q. and Officers' Mess group is via buried cable.

K-9.03. Drawings prepared for this area are shown in the following table:

Drawing .		I	lumber of	Pairs -	Gauge .			
M.B. No.	16-19	26-19	50-19	51-19	1-19	150-19	3-19	6-22
1751			1735		535		a de la compañía de l	
1752		1285	1760	1095	2595	695		and y
1753	State State		470	850	3165	2990	575	300
1754	and the second	430		3490	2610			
1755	450	850						
1755				ole 25.88 Station		Fect or 4	.90 Mile	<u>s</u>

K-10. Hospital Area.

K-10.01. The Central Office equipment is located in Administration Building and consists of a two position 320 line manual PBX with a floor type main distributing frame and standard associated battery and power equipment. The Cantrol Office is located is the upper story of the and an tonas all calls originating or terminating in the aut the Officers' hass. The exchange, of FAK type, ecnatic stop by stop awitching equiptent of the sectional models to and a storadning equiptent of the sectional units are at a. without disturbing original lines and equiprent, and is call numbers. There is provided a four digit and in the initial capacity. This is an extircly automatic brag providing interesting within the area. Connect area in the line initial capacity and original brag providing interesting and contral offices within area of the Division Training area within the area.

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: Total Stations Provided 437

Control Critics equipment is located in Administration and a two position 520 line manual PBK with a floor approach admined associated bittory and pomore All intercommunicating calls are handled manually, with outgoing calls throughout the base completed by the operator over outdialing trunks. A three digit numbering system is used.

K-10.02. Distribution is by buried cable between the various buildings of the Hospital group.

Drawing	e'	Number of	Pairs - Gau	zo	
No.	11-19	26-19	50-19	1-19	150-19
M.B. 2750	830	335	1,885	1,135	265

K-11 Barrage Balloon and Amphibian Base.

K-11.01. The Central Office is located in the Barrage Balloon Administration Building and handles all calls originating or terminating in these areas. Connection with terminal stations throughout the base and with the Carolina Telephone and Telegraph Company is via Division Training Area MAX Central Office with the exception of the exchange at the Rifle Range which is tied direct. This exchange consists of a single position floor type manual PBX, common battery switchboard having a two digit numbering system of 80 line capacity.

K-11.02. Distribution is by aerial construction with the exception of the line along Marines Road and the line to the Operations Building which are underground.

K-11.03. Drawings prepared for this area are shown in the table below:

Drawing							
No. M.B.	4(prs)-20	11-19	16-19	26-19	50-19	51-19	1-19
2752		1635					
2753	1100	1	1400	1190	560	100	
2754			139	2356	1335	660	670

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K-12 Rifle Range.

K-12.01 The Central Office is located in the Armory and handles all routine calls originating or terminating in this area. However, direct connection between the Commanding Officer and all points on the firing ranges and intercommunication between the general firing lines and butts is provided; these calls do not pass through the Rifle Range switchboard. Connection with terminal station throughout the base and with the Carolina Telephone and Telegraph Company is via the Division Training Area MAX Central Office, with the exception of the exchange at the Barrage Balloon Area which is tied direct. This exchange consists of a single position, floor type, manual PBX, common battery switch-board having a two digit numbering system of 80 line dapacity!

K-12.02 Distribution is by aerial construction except for the firing ranges which is via buried cable, terminating in jacks mounted on pedestals.

Drawing	Number of Pairs - Gauge								
No. M.B.	2 (pr.)	7 (pr.)	16-19	26-19	50-19	1-19	150-19		
2755			2642	2205	755	390	125		
2756	4460	10,806							
	Total D	istributio	n Cable	21,383 Line	al Feet on	- 4.05 Mi	les		
				Fotal Stati					

K-12.03 Drawings prepared for this area are MB 2755, MB 2756.

K-13 Main Tent Camp

K-13.01. The Central Office is located in the C.O. Building at 5th and "C" Streets and handles all calls originating and terminating at the Airport, Peterfield Point, Tank Battalion and the Main Tent Camps. Toll calls and calls to other areas of Camp Lejeune are through trunk circuits to the Carolina Telephone and Telegraph Exchange. The Exchange of MAX type consists of automatic step by step switching equipment employing a three digit numbering system, of 180 line initial capacity, 30 designed that it may be readily expanded in 390 lines. Provision is made for one attendant position to handle information, intercept and handle calls between the automatic system and the Carolina Telephone and Telegraph Exchange.

K-13.02. Distribution to the Main Tent Camp and to the Tank Battalion Tent Camp is via aerial cable, distribution to the Airport and Amphibian Base Tent Camp is by buried cable throughout with the exception of a few stations which are extended beyond the cable area by open wiring.

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K-13.03. Drawings prepared for this area are shown in the following table:

Drawing No.		Number of Pairs - Gaugo								
10.	16-19	26-19	50-19	51-19	1-19	150-19	3-19			
TC 399		1,550	2,370	and and	700	1.350	100			
TC 400	1,511	200 .	1,937	1,100	1,078	1,326				
TC 401	2,085									
TC 402	5,808									
MB 1756		4,725								
MB 1757		7,385								

K-14 Mumford Point.

K-14.01. No Central Office was provided. Direct service is provided to Jacksonville over Government owned aerial cable. This cable plant was constructed to connect with the Carolina Telephone Company at the limit of their exchange rate area.

K-14.02. Distribution. With the exception of the outside services, all instruments, inside wiring, and protectors are the property of the Carolina Telephone and Telegraph Company.

K-14.03. Drawings prepared for this area are shown in the following Table:

Drawing		Number of Pairs - Gauge				
No.	16-19		26-19		51-19	
MB 1758					5,600	
MB 1759	974		996		1,202	

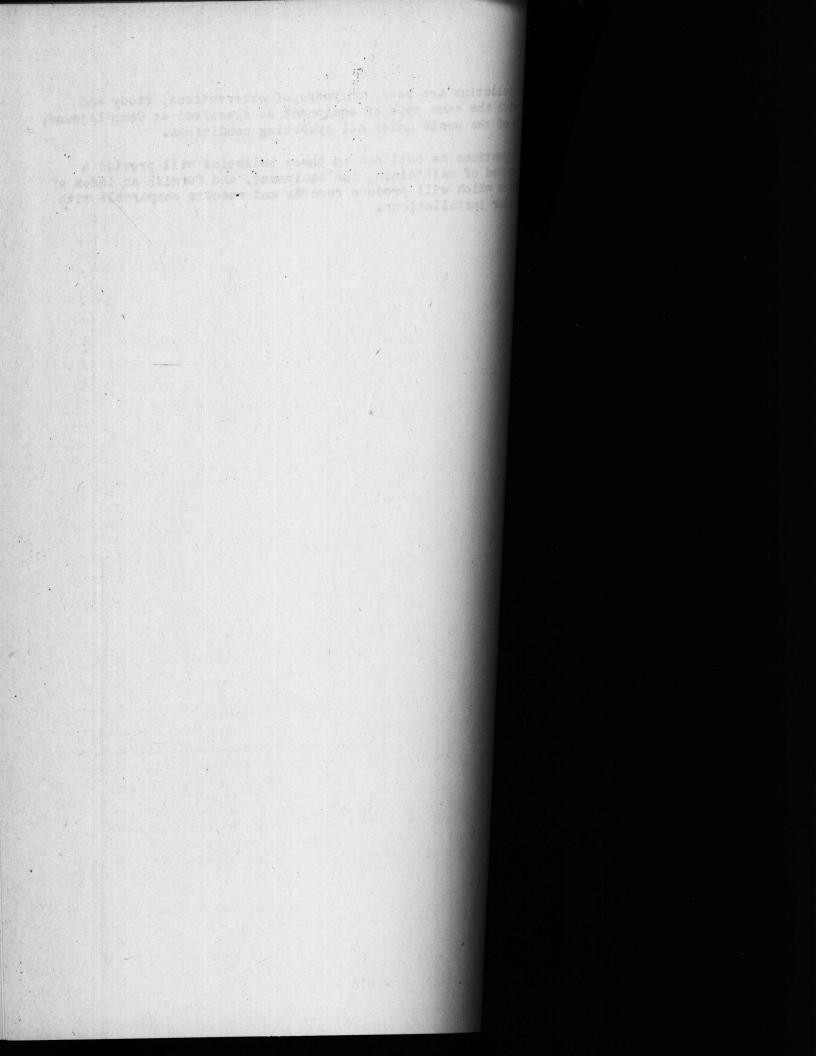
K-15. Operating Practices and Maintenance. For the proper operation and maintenance of the automatic central office equipment in the various offices it is recommended that records, routine reports, inspections, lubrication, and tests as outlined in detail by Bullentins 502, 505, 506, 543A and 656, issued by the American Automatic Electric Sales Company be followed. tig propered for this area or showing the following

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COL	11/080	700		2,370	1,550
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These bulletins are based on years of observations, study and experience with the same type of equipment as specified at Camp Lejeune, in all parts of the world under all operating conditions.

The suggestions as outlined in these bulletins will provide a systematic method of maintaining the equipment, and furnish an index of its performance which will produce records and results comparable with these of similar installations.



CHAPTER L - PART II

ROADS, RAILROADS AND AIRPORTS

L

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L-1.01. Introduction. The location and construction of the Highway and Street system for Marine Barracks, New River, N. C. presented problems of a poculiar nature. In ordinary highway construction, the problem of location is largely a problem of fitting the alignment and grades to the terrain. In the construction of this Post, however, it was necessary to select the most suitable terrain for the building sites and then locate the roads so as to adequately serve the various building areas. The adoption of the battalion pattern to the site selected and the adjustment of the various units to insure stable foundations tended to complicate the design of the road system. Figure L-1.01 shows the final layout

L-1.02. Proposed Road System. In planning the Highway System, three main objectives were given consideration:

(a) To provide a series of primary arterial routes designed

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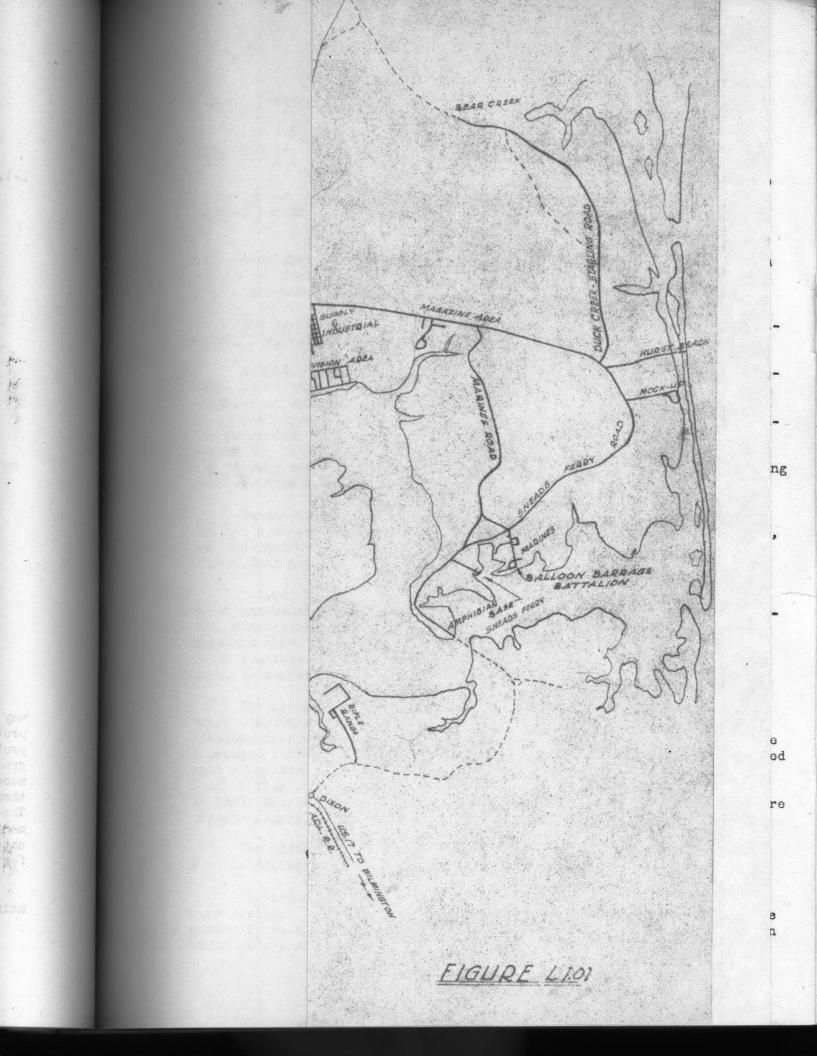
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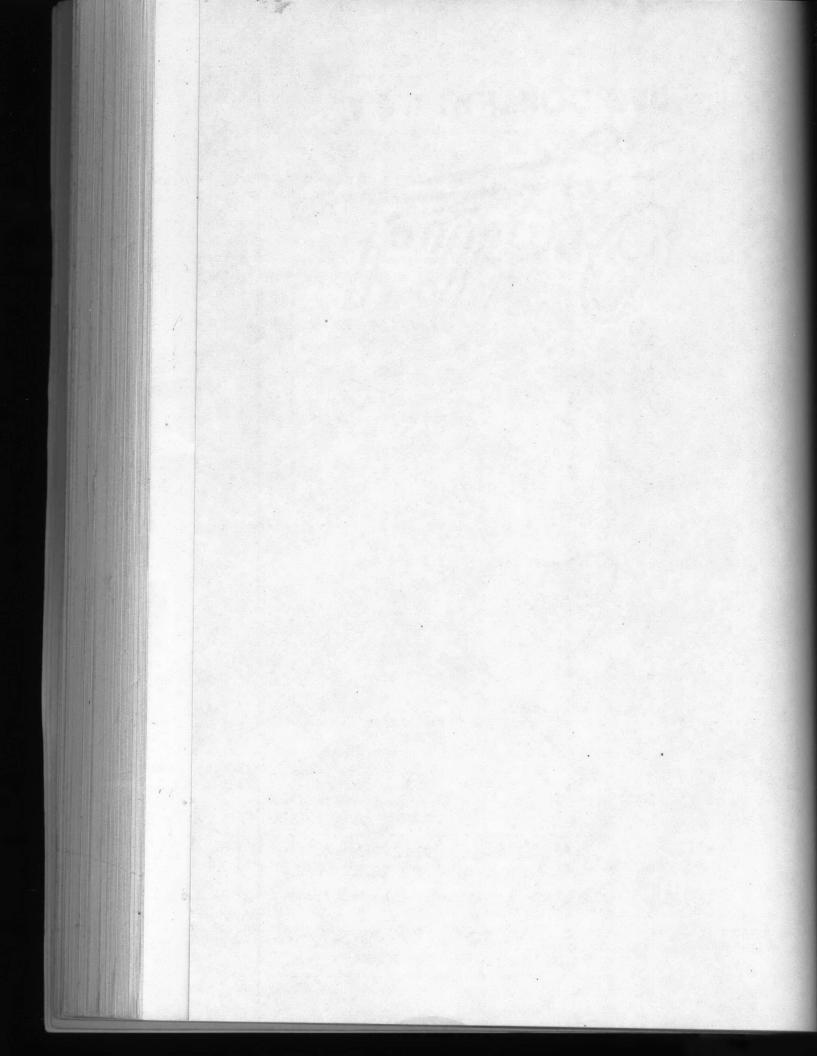
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L-1.02 (Cont'd)

for heavy duty and capable of carrying all kinds of motor vehicles and equipment to each and every section and unit of the Post.

(b) To project a secondary network of medium duty service roads around and through each developed area providing required access to each building unit, and

(c) To coordinate and combine these two classes of roads with additional access and intercommunication routes to provide a system capable of facilitating the movement of troops, equipment and materials with a minimum of delay and inconvenience.

The linking of this highway system with other transportation facilitios, air, rail and water, was an essential requirement.

L-1.03. Construction Roads. Before undertaking building construction, it was necessary to provide transportation facilities for the delivery of building material and the ingress and egress of employees. As it was impossible to construct the permanent road layout before building commenced, the existing roads in the area were utilized for these purposes. This was accomplished by the contractor shaping these roads and placing stone whenever additional strength was needed. No engineering problems were involved in this operation.

Construction began on the permanent roads as soon as the site plan and the necessary highway plans and profiles were completed and approved, and the Contractor made use of sections of these roads for the hauling of building materials as soon as the grading was completed.

L-1.04 General Design. After analyzing the anticipated volume, speed and weight of the traffic to which the road system would be subjected, three general types of highways were adopted, and the typical cross sections shown in Figure L-1.04 give the characteristics of each type. These sections were modified, particularly in the Industrial and Supply Area, to conform to the facilities which they were required to serve.

For access to the Division Training Area, it was felt that peak traffic movement would require more than two lanes of surfacing. Some consideration was given to a three-lane readway, but it was felt that the increased safety of a divided highway would more than offset the increased cost of construction, and the four-lane, divided type was selected. One half of this artery was graded, drained, surfaced and opened to traffic in 1941; the construction of the second half being deferred until the more urgent primary, secondary and service reads had been completed.

The width of 30 feet adopted for the center parkway permitted surface drainage, landscaping and safe turning and crossover operations.

The primary roads in the Regimental, Residential and other Areas were designed for two lanes of traffic, each lane of surfacing having the generally accepted width of eleven feet. Unpaved shoulders eight feet in width were provided along each side of this type of road as well as on an in consist of corrying all kinds of mator vohicles and a

b) To project a secondary notwork of medium duty service an through such coveleded area providing required access) height, and

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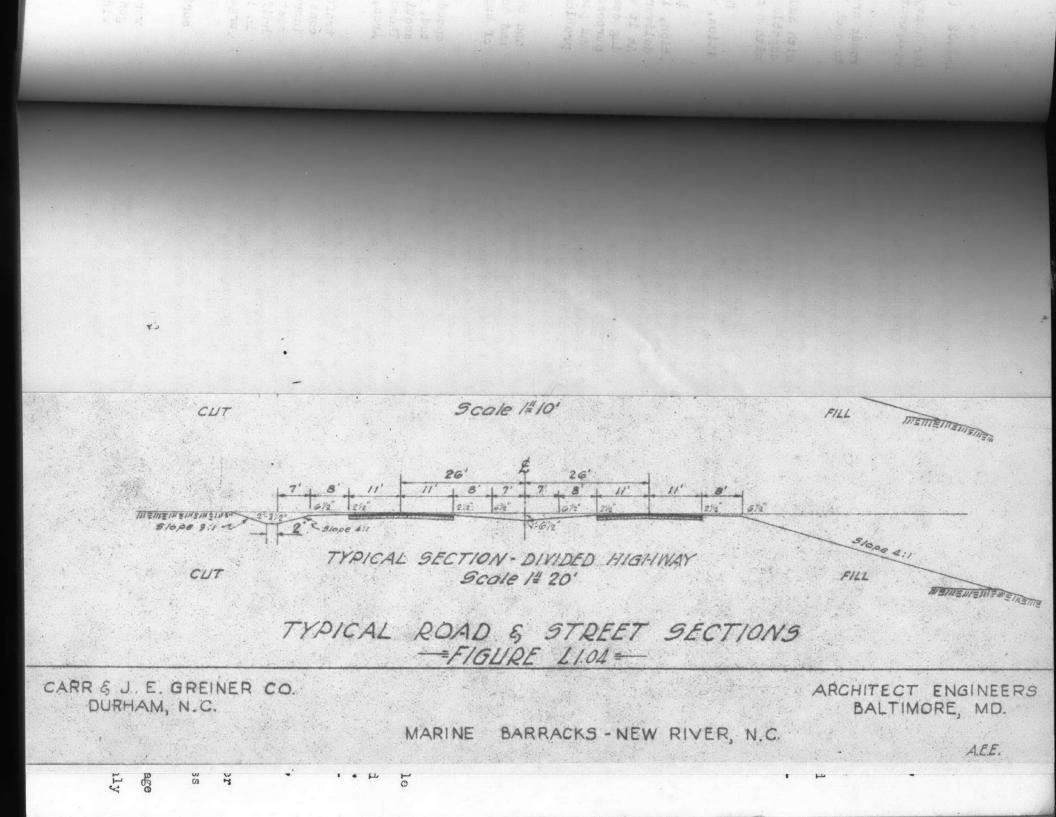
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the divided highway, permitting vehicles to park off the traveled way.

The surfacing of the service roads was limited to 18 feet in width, and where necessary the shoulder width was increased to give greater parking facility.

The slopes adjacent to the shoulders were graded on a ratio of 4 to 1, the drainage ditches were two feet in width and the back slopes were cut on a 3 to 1 grade. This so-called "Boulevard Section" permitted machine construction operations and minimized soil erosion. After the slopes have been grassed, their meintenance can also be effected by machine methods.

Longitudinal grades were limited to a maximum of 3 per cent and a minimum of 0.3 per cent wherever possible on the entire road system. However, primary consideration was given to the design of the grades on the drainage ditches due to the flat terrain and high water table, and these drainage requirements, combined with the necessity for conforming to the elevations fixed for buildings and other permanent structures, were the controlling factors in establishing the highway grades.

L-1.05. Drainage. The general topography is the type that might be expected in the lower coastal plains of the Atlantic Seaboard. The difficulty in draining this Area arises from the usual lack of available outlets for drainage ditches and structures where such facilities are installed at a sufficient depth to drain the subgrade. Free water has little or no lateral flow on account of long flat slopes. All drainage was carried in open streams and ditches and pipe culverts and low or medium cost bridges were installed to convey this surface water under the roads and other facilities. The widely accepted Talbot's formula was used in determining the sizes of culverts installed, and for the larger areas these sizes were checked by the Rational and other well known methods.

Organic acids present in swamp and marsh lands or wherever vegetable matter is decaying in quantities, as was the case in about ninety (90%) per cent of the land where drainage structures were installed, were found to be severe in their chemical disintegration of most drainage materials. In Tent Camp No. 1 where corrugated metal pipe was used, bituminous coating was specified to protect the metal from chemical action.

On the remaining projects, due to restrictions on the use of metal, reinforced concrete pipe of "standard" and "extra strength" classes was used. The "standard" class represents pipe designed to withstand an ultimate load of 2,000 D under the three edge bearing test, and pipe of the "extra strength" type will withstand an ultimate load of 3,000 D under the same test. In this formula, "D" equals the diamter of pipe in feet. All pipe culverts in the Division Training Area were provided with a class D-l concrete headwall, Navy Bureau of Yards and Docks Specification.

Several bridges were designed for crossing streams with large drainage areas. After much study it was decided to use a composite concrete and treated timber deck on treated timber piles over the larger streams, mainly Wallace Crock, and a laminated dock of treated timber on treated timber.

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WALLACE CREEK BOAT BASIN



WALLACE CREEK BRIDGE



piles over the small runs. The composite bridge was chosen not only for economy of construction, but for the conservation of strategic materials that would be necessary in a steel bridge. All bridges were designed in accordance with the standards of the American Association of State Highway Officials, and H-20 loading was used.

On the bridge across Wallace Creek on the Service Road and the bridge on River Drive just east of the B. O. Q., two 3" conduits were provided in the sidewalks for the telephone cables.

A Ponton Bridge was built across an Intra-coastal Waterway at Hurst Beach for traffic going to maneuvering operations on the beach. The approaches of this bridge were the same design as the treated timber bridges with laminated decks. The barge was designed by the Structural Department. Adequate mechanical equipment was provided to insure quick opening and closing and a minimum delay to traffic. The design is described in detail in Chapter F, Part II. The fender system to protect the bridge approaches consists of steel H-piling with treated timber batter piles for support.

L-1.06. Clearing and Grubbing. The clearing and grubbing for the areas designated involved the removal of trees, underbrush and coarse grass. In all clearing operations, the actual cutting of trees was controlled by landscape requirements as well as by the road construction. In the Magazine Area, the clearing consisted of cutting only the trees that were absolutely necessary to permit the actual construction of the fills and cuts, allowing the remaining trees to be left for purposes of concealment and camouflage. It was designated in the specifications that all timber of value should be cut into merchantable lengths and stockpiled for future use. All perishable materials were burned in small piles within the clearing so that timber and other valuable property would not be damaged. It was also specified that the grubbing would be carried to a depth of not less than one foot below sub-grade and roadway elevations.

L-1.07 Grade Establishment and Subgrade Design. The grades on the roads were designed to reduce to a minimum the moving of excavated material and to conform to the elevations of the adjacent buildings. Overhaul was eliminated by borrowing material outside of the right-of-way where necessary, and by wasting excess material in a sightly manner along the rightof-way itself.

The design and construction of the sub-grade involved merely the true finishing of the road bed surface and mucking and backfilling the marshes, bogs and swamps. The much was removed by a drag-line to a depth sufficient to insure a good foundation and the excavated areas backfilled with selected material. Borings were taken in most cases and the depth of the muck to be removed was indicated in the specification. In some locations gumbo (blue clay) was found underlying a sandy soil, and in all such cases, this clay was entirely removed and the roadway backfilled to the desired grade with a suitable material.

On sections of the Sneads Ferry Road, the sub-grade was made up entirely of a fine sand, and to prevent capillarity (the capacity to transmit finely divided moisture even against gravity) clay was added and mixed

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L-1.08. Types of Surfacing. In selecting the type of surface to be employed, it was necessary to weigh several important factors. The time involved in constructing the surface, with the resulting inconvenience caused to traffic by construction, played an important part in selecting the type of road finally adopted. The problem of securing materials made it desirable to use all local materials available. Several types of road were discussed with the leading Highway Engineers of the North Carolina State Highway and Public Works Commission. Cement concrete pavements were eliminated, principally due to the fact that concrete materials would have to be imported, and the Bureau of Yards and Docks issued a directive urging the conservation of cement. It was estimated that a seven-inch (7") cement concrete pavement would cost approximately fifty thousand (\$50,000) dollars per mile.

Various types of bituminous roads were considered, including a surface treatment of limestone with asphalt and a sand asphalt, hot plant mixed surface on a stabilized sand-clay or traffic bound macadam base. It was finally decided to use a sand asphalt surfacing with a traffic bound macadam base due to the following factors:

(1) Superior Stone Company of Raleigh, N. C. had located and installed a rock-crushing plant at Belgrade, N. C., about fifteen (15) miles north of Jacksonville, N. C. The stone found in this vicinity was a shell rock (limestone) formation and could be used as the base course. This plant was also located on the Atlantic Coast Line Railroad, making shipment by rail an important factor.

(2) Pits containing a grade of sand suitable for sand asphalt construction were discovered and opened near the center of the Post. This permitted the erection of the paving plant at a location adjacent to the access road and the railroad, with a short haul for the sand as well as for the delivery of the paving mixture to all points on the road system.

(3) No seal coat or metal cover was deemed necessary for this type of pavement.

(4) Time of construction and delay of traffic was reduced to a minimum.

L-1.09. Traffic Bound Macadam Base. The base course, consisting of crushed shell rock with an added binder material where necessary, was constructed with adequate and suitable equipment of approved design in the following manner:

The subgrade was shaped with motor graders weighing not less than twelve thousand (12,000) pounds. The base course material was transported to the job with trucks equipped with dual-pneumatic rear tires to help in the compaction of the material in place. The spreading of the stone began at the point nearest to the source of supply. Traffic was permitted on the road to secure the additional compaction accomplished by vehicular movement. The hauling was distributed over the entire surface in order to

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produce a uniform and true compaction of the base material. After the base course was placed upon the sub-grade, it was continually machined with the motor grader and further compaction was secured with ring rollers and other suitable compacting equipment.

L-1.10. Sand Asphalt Surfacing. The sand asphalt surfacing consisted of a hot, plant mixed material, base course having a minimum thickness of 1-3/4" and the top course of 3/4". The base course of this sand asphalt surfacing was a thorough mixture of mineral aggregate and bituminous material prepared to conform to the following composition limits by weights:

	Grading A	Grading B	Grading C
Retained on No. 10 Sieve	0 - 10%	0-10%	0-15%
Retained on No. 40 Sieve Retained on No. 80 Sieve	9 - 48% 27- 57%	4-57% 20-72%	0-58%
Retained on No. 200 Sieve	9 - 38%	4-48%	0-48%
Passing No. 200 Sieve Bitumen	0 - 7% 5 - 7%	0-10% 4-6.5%	0-12% 4-7%

A tolerance of 10% for each sieve graduation within the above master ranges for the designed job mix was permitted.

The bituminous material was asphalt made from petroleum and met the following requirements:

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	MIII.	Max.
Specific Gravity at 77° F.	1.000	0
Flash Point (Cleveland Open Cup) ^o F.	347	0
Penetration at 77° F. (100 g. 5 sec.)	85	100
Ductility at 77° F. (CMS)	100	0
Loss of Heating (50 g. 5 hrs. at 325° F.) %	0	1.0
Loss of Heating (50 g. 5 hrs. at 325° F.) % Penetration Residue at 77° F.(110 g. 5 sec.) 60% original		
Proportion of Bitumen Soluble in CCl4, %	99.5	0
Total Bitumen Soluble in CS2, %	99.5	0

The plant was of standard design equipped with separate chambers for heating and mixing the ingredients as specified. The hot mixed sand asphalt was hauled to the job by trucks and placed with a Barber-Greene paving machine. The base course mixture, upon arrival on the work, was dumped into the hopper of the paving machine, and spread and struck off to the given cross section.

The depth of this base course layer was gauged by means of a template cut to proper crown and section of the roadway. While still hot the mixture was thoroughly and uniformly compressed with ten (10) ton tandem rollers that weighed two hundred (200) pounds per inch width of tread. The rolling was done parallel to the center line, beginning at the outer edge and proceeding towards the center of the pavement, overlapping on successive trips by one-half (1/2) of the width of the roller. ing a with these

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The surface course of sand asphalt was constructed on the finished base course in the same manner as the above. Prior to laying the surface course, the base course was given an application of hot asphalt cement at a uniform rate of one-tenth (1/10) gallon per square yard as a prime coat. The mineral aggregate for the surface course was graded to meet the following composition limits:

	Grading A	Grading B	Grading C.
Passing No. 4 Sieve	100%	100%	100%
Retained on No. 10 Sieve	0-10%	0-10%	0-15%
Retained on No. 40 Sieve	10-50%	5-60%.	0-60%
Retained on No. 80 Sieve	36-60%	25-75%	20-80%
Retained on No. 200 Sieve	10-40%	5-50%	0-50%
Passing No. 200 Sieve	0-7%	0-10%	0-12%
Clay by Elutriation, Max.	6%	8%	10%

The mineral aggregate and bituminous material are combined in the following proportions to produce a mixture conforming to the following compositions limits:

	Grading A	Grading B	Grading C
Retained on No. 10 Sieve Retained on No. 40 Sieve Retained on No. 80 Sieve Retained on No. 200 Sieve Passing No. 200 Sieve	0-9% 7-47% 23-53% 7-37% 4-12%	0-10% 4-56% 20-70% 4-47% 0-10%	0-15% 0-57% 12-76% 0-48%
Bitumen	7.5 -10%	6-10%	0-12% 5-10%

A tolerance of 10% for each sieve graduation within the above master ranges for the designed job mix was permitted.

L-1.11. Motor Parking Areas. Motor parking areas were installed in convenient places over the Division Training Area and Tent Camp Areas. In the Division Training Area, particularly in the Industrial and Supply Area, parking areas were set up not only for trucks and other regimental auto equipment, but for heavy mobile war equipment. In the Tent Camps Nos. 1 and 2, the motor parking areas were located along the railroad, thus supplying a team track for the loading and unloading of supplies as well as for the movement of troops.

The same type surfacing with a traffic bound macadam base was used in these instances. Tests for stability were made by Froehing-Robertson Company of Richmond, Virginia, and the result was approximately four hundred (400) pounds per square foot. As this was not sufficient stability, a bituminous concrete surfacing was designed using 35% Belgrade stone, graded from one-half (1/2) inch down, 50% Goldsboro sand (concrete sand), 7% bitumen and 8% mineral filler (limestone dust). The construction method for placing this surfacing on the motor parking areas was the same method used in the paving of the roads.

L-1.12. Tent Camps Nos. 1 and 2. The first construction on roads on the Base was the building of the streets in Tent Camp No. 1. This layout was made up by the Site Planning Department giving a right-of-way area manuel as the blove little of laying the surface as manuel as the blove. Frier to laying the surface as was erven an availant to separt of a substant (2/10) railed par square vard as a prime or available workave course was graded to must

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103. 1 20 2. The firstenessruction on roads ing of the streets in Tant Comp No. 1. This lite Plannics Department giving a right-of-max -200of sixty (60) feet for the main streets and forty (40) feet for the secondary streets. It was decided by the Resident Officer in Charge that the main streets were to be paved with a twenty-two (22) foot section of sand asphalt on a sand clay base. The right-of-way, being only sixty (60) feet, necessitated a shallow ditch section, thus complicating the entire drainage system. To secure a minimum cover of one (1) foot over pipe culverts, an arch type corrugated metal pipe, treated with a bituminous coating, was used. Experiments were made using Belgrade stone for the base course and was found to be very satisfactory.

Tent Camp No. 2 was constructed according to the same designs as specified for the Division Training Area. The rights-of-way for the main streets were made eighty (80) feet, and for the secondary streets, sixty (60) feet, allowing ample width for the typical intersection. "A" Street was continued through to the Access Road to the Glider Training Base to facilitate the movement of traffic from the Tent Camps to the Base and Peterfield Point Tent Camp.

L-1.13. Peterfield Point, Tank Battalion and Mumford Point Camp No. 1. Standard 22-foot road sections were used in these areas with traffic-bound macadam surfacing in the Peterfield Point Tent Camp and the Tank Battalion Tent Camp and asphalt surfacing in the Mumford Point Camp No. 1.

L-1.14. Camp Knox. The only road constructed in this area was an access road which led from North Carolina Highway # 24, at point just east of the Marine Base Railroad grade crossing, to Northeast Creek and is a standard 18-foot asphalt section.

L-1.15. Paradise Point Road. The Paradise Point road was constructed primarily for access to the Residential Area on Paradise Point. It was thought at the time that a bridge across Wallace Creek between the Residential Area and Division Training Area would be too expensive for construction. At a later date the bridge and road connecting these two Areas was built.

L-1.15. Division Training Area. In this Area there were two types of road constructed; roads with a twenty-two (22) foot paved surface, and roads with an eighteen (18) foot paved surface. The road with twentytwo (22) foot paved surface traversed the center of each Regimental Area, and the roads with the eighteen (18) foot paved surface are used as service roads for access to the Battalion Warehouses, Mess Halls, etc.

L-1.17. Industrial and Supply Area. In the Industrial and Supply Area, the standard road sections of twenty-two (22) foot paved surfaces were used throughout with two exceptions. Center Road was paved the full distance between the warehouses and railroad track No. 3 with a storm drain with concrete drop inlets and cast iron gratings for drainage purposes placed down the center of the street. Gibb Road was paved with a width of 45' - 6" adjacent to railroad track No. 1 for its entire length. These two streets were paved in this manner to facilitate troop movement and loading and unloading supplies. #dr fino main strests and forty (40) fact for hts it was decided by the Resident Officer in Source iss and one pared with a twanty-the (22) fort sected of and einy bars. The right-of-way, balas only sixty (50) assist the uites and ton, inus complicating the entire converse a minimum cores of one (1) fort over give the corrected metal pipe, dreated with a Mituminus Sportion to be very subisfication;

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L-1.18. Approach Road to the Glider Training Base Area. An approach road to this Area was constructed with a standard twenty-two (22) foot paved surface from U. S. Highway No. 17. This road is connected with Tent Camps Nos. 1 and 2 by a junction with "A" Street, approximately one and one-quarter (1-1/4) miles from U. S. Highway No. 17.

L-1.19. Holcomb Boulevard. Holcomb Boulevard, the main access road to the Division Training Area, is a four-lane, divided highway, leading from N. C. Highway No. 24 to the Division Headquarters in the Division Training Area. The details of this road are explained in Paragraph L-1.04.

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L-1.20. Rifle Range, Balloon Barrage Battalion, Mock-up and Amphibian Base Areas. In these outlying areas, a road system similar to the one developed in the Division Training Area was used to satisfy the needs for service and troop movement. A standard section with a seventy (70) foot right-of-way and a twenty-two (22) foot paved surface was used in all cases except a fire road that was built in the Balloon Barrage Battalion Area. The purpose of this road was primarily for pedestrians and would be subject to traffic only in case of fire. It is made up of a cement concrete pavement similar to the pavement used for sidewalks.

L-1.21. Sneads Ferry Road and Verona Loop. The Sneads Ferry Road begins on Holcomb Boulevard about one-half (1/2) mile north of the Industrial and Supply Area. It traverses the Base by the Magazine Area to Duck Creek, and continues thence via the Mock-Up and Balloon Barrage Battalion and Amphibian Base Area to the existing Sneads Ferry bridge which connects to the road under construction at the present time by the North Carolina Highway and Public Works Commission, from Sneads Ferry to Folkstone, N.C. This road was constructed to give access to the outlying areas from the Division Training Area. It is a standard road section with a seventy (70) foot right-of-way and twenty-two (22) foot paved section.

The Verona Loop Road begins in the town of Verona, N. C. and makes a loop in a southeasterly direction, thence in a southerly direction and finally in a westerly direction back into N. C. Highway No. 17. This road was constructed to facilitate the maneuvering of troops and equipment in this territory.

L-1.22. Beach Road. The Beach Road begins on the Sneads Ferry Road at Duck Creek, continuing across the Inland Waterway to Hurst Beach. The purpose of this road was to give Marine Troops practicing amphibian tactics access to the coast.

L-1.23. Magazine Area. The Magazine Area lies in a section of the Post west of the Sneads Ferry Road, approximately two and one-half (2-1/2) miles south of Holcomb Boulevard. The roads in this Area were constructed as nearly as possible on the existing ground to aid in the camouflage of the magazines themselves. Ditches were eliminated in the typical section wherever possible, and the water was allowed to drain across the road. In the few cases where water was concentrated in existing ditches, concrete pipe culverts were installed.

L-1.24. Residential Area. The roads in the Residential Area were of the same standard twenty-two (22) foot paved section used in the Division Training Area. -622-

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L-1.25. Naval Hospital Area. Roads in the Naval Hospital Area are a continuation of the road and street system of the Division Training Area. The main road has a seventy (70) foot right-of-way with a twentytwo (22) foot paved surface, and the service roads have a seventy (70) foot right-of-way with an eighteen (18) foot paved surface.

L-1.26. Midway Park Residential Area. This area is on the north side of North Carolina Highway No. 24 between Northeast Creek and Piney Green, and in the vicinity of the main entrance to the Base. Several plans were submitted for the layout of this Park. The adopted plan follows a curvilinear pattern. The main streets are of the same section as that for 22-foot roads. The layout of the houses in this area presented drainage difficulties not encountered in any others, and a 9-foot asphalt-paved service drive with inverted crown was provided in the rear of the houses, for both access and surface drainage. Large parking areas were also provided so that no family had to walk over 200 feet from car to home.

L-1.27. Summary. To summarize briefly there were provided:

5.52 miles of divided highways 85.64 miles of 22-foot roads 1.48 miles of 20-foot roads 16.05 miles of 18-foot roads 2.00 miles of 16-foot roads 0.88 miles of 10-foot roads 5.22 miles of 9 -foot service lanes

Total 116.79 miles

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Seventeen (17) bridges were provided for the crossings of various streams and creeks.

The design, location and grades of these roads required the preparation of 178 construction drawings which were approved by and issued through the Resident Officer in Charge. Three sets of specifications, supplemented by 32 addenda were also prepared by this division and issued through the Officer in Charge embracing detailed requirements for the construction of the pavements and structures throughout the Area.

L-1.28. Miscellaneous Drawings. It was necessary to secure a permit from the War Department when any construction in navigable streams was contemplated. The following drawings were made and sent to the War Departmont:

MB 287	Trestle for Water and Sewer Line over Wallace Creek	Issued Sept. 11, 1941
MB 238	Trestle for Water and Sewer Line	1880ed Sept. 11, 1941
	over Wallace Creek	Issued Sept. 11, 1941
MB 1210	Wallace Creek Bridge	Issued Dec. 23, 1941
MB 1211	Wallace Creek Bridge	Issued Dec. 23, 1941
MB 1240	Details of Mock-Up	Issued March 20, 1942
MB 1242	Details of Mock-Up	Issued March 20, 1942
MB 1261	Map for Dredging Courthouse Bay	Issued April 10, 1942
MB 1276	Ponton Bridge	Issued May 19, 1942
MB 1277	Ponton Bridge -623-	Issued May 19, 1942

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L-2. Airports.

L-2.01. Location. Three (3) considerations governed the selection of the final site of the Glider Training Base! Proximity to New River, feasibility of large scale improvements, and a minimum of surrounding obstructions. The site selected lies approximately three (3) miles southwest of Jacksonville, N. C., and one (1) mile from Tent Camps Nos. 1 and 2. In addition to the above advantages, the river at this point is approximately one and one-half (1-1/2) miles wide, making it possible to develop seaplane landing facilities.

The site selected was low land with an average elevation of fifteen (15) feet above mean sealevel, ranging from zero at the river to twentyfive (25) feet on some of the ridges. The land is rolling and was traversed by several sloughs and drainage ditches. It was practically covered with woods and underbrush, necessitating clearing and grubbing on approximately ninety (90) per cent of the Area used for construction. The only obstructions within the glide angle proposed for the field were trees that grew on the Area. All buildings, towers, etc. were outside of a mile radius projected from the center of the field. All electrical and telephone lines were placed in underground cables.

L-2.02. General Design. Much consideration was given the design of typical sections, drainage, meteorological conditions, type of surfacing, soil conditions and clearing. The typical section adopted, shown in Figure L-2.02, was a crowned asphalt surfaced runway one hundred and fifty (150) feet wide with fifty (50) feet shoulders, and 8% grades on the slopes of the drainage ditches. The flat slopes on the ditches eliminate all hazards to moving planes, it being possible to land on these slopes should it be necessary.

Meteorological conditions, such as barometric pressures, temperature and wind velocities, were studied and determined the layout and alignment of the runway. A wind rose for this section was secured from the Bureau of Aeronautics, and it was decided to construct three (3) runways, each five thousand (5,000) feet long, lying northeast and southwest (runway #1), northwest and southeast (runway #2) and north and south (runway #3). The prevailing wind was from the Southwest and for this reason No. 1 was the first runway constructed.

The Area was cleared and grubbed for a distance of five hundred (500) feet from the center line of each runway, and a glide angle at the ends of each runway was provided with a fifty (50) foot clearance for any object at the end of a 20 to 1 slope. An additional area twenty-seven hundred (2700) feet by thirty-six hundred (3600) feet at the north end of the field was cleared for the Parachute Troops to use in jumping maneuvers.

The runways were joined by a seventy-five (75) foot paved taxiway, the typical section of which is shown on Figure L-2.02.

The bulk of the soil in this Area was classified as a sand loam suited for a dry, firm surface, consequently, no selected material was required for the sub-grade of the runways. Stability and bearing capacity tests were made and the soil was found to be adaptable to the requirements. Ation first of considerations covered the stir of the second star star as ason Fronthity to Star Lass and a store star of the second star and the star of the second star and the second star as a star and the second star and the second star as a star as a star and the second star as a star as a star as a star as a second star as a star as a star as a star as a second star as a star as a star as a star as a second star as a star as a star as a star as a second star as a star as a star as a star as a star second star as a star as a star as a star as a star second star as a star as a star as a star as a star second star as a star as a star as a star as a star second star as a star

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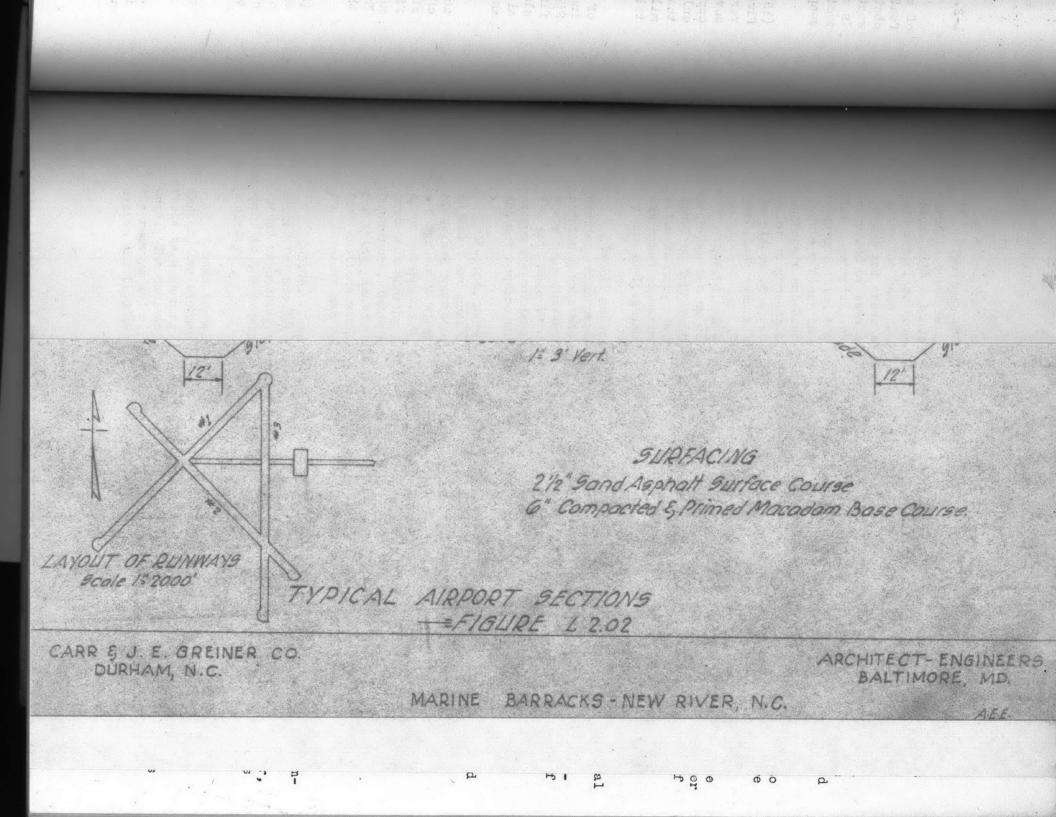
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The type of surfacing employed was an eight (8) inch compacted, traffic bound macadam base course, consisting of crusher run Belgrade stone with a binder added, if necessary, a prime coat of cutback asphalt and a surface course of sand asphalt pavement. The prime coat was used after the base course had been thoroughly compacted and brought to the grades and cross section designed on the plans. The surface course was composed of sand asphalt, a mixture of fine mineral aggregate and bituminous material, which was explained in Section I of this report. It was also specified that a light seal coat or armor coat be used, if requested by the Officer in Charge. This coat was to consist of a coarse mineral aggregate embedded in a bituminous material, the aggregate being of a color to present a light grey mosaic to the runway. The aggregate was to be placed at a rate of fifteen (15) to twenty-five (25) pounds per square yard, and then rolled with a ten ton power roller.

L-2.03. Drainage. The drainage system of the Glider Training Base Area was set up with two primary purposes: one, to lower the ground water level to improve the subsoil stability, and two, to carry surface run-off after storms. In making computations of run-off, the Rational formula was based on maximum of rainfall of 4" per hour, and the results checked by the application of other standard formulas.

In all cases natural drainage was used, supplemented with artificial drainage when necessary. Open ditches were cut along each runway and carried across the runways by means of a drop inlet and a reinforced conerete pipe culvert, "extra strength" class. The nature or composition of the soil made it unnecessary to cut any ditches in the surrounding areas except for outlets to the coast. The soil, being uniform and pervious, did not require any artificial sub-drainage.

L-2.04. Warming-up Apron. A concrete warming-up apron was provided adjacent and parallel to the North-South runway. This pavement was a class E-2 concrete, Navy Bureau of Yards and Docks Specification, having a compressive strength of three thousand pounds per square inch. The apron was provided with two pits for the distribution of fuel and water. Cast iron mooring eyes, of the dimensions and design shown on the Navy Department, Yards and Docks Drawing No. 140640, were placed in the slab for tying planes to the apron. The apron was constructed in eleven (11) foot sections with a transverse expansion joint every eighty (80) feet. The pavement was seven inches thick, reinforced with a wire mesh.

L-2.05. Seaplane Glider Base. Soon after the construction was completed for the landing field, a directive from the Officer in Charge was issued requesting that a Seaplane Glider Base be constructed in New River, opposite the runways with adequate facilities for glider training in this vicinity.

A sand asphalt taxi-way, seventy-five (75) feet wide and approximately two thousand (2,000) feet long, was constructed from the landing field to a Warming-up Apron, concrete sea wall, and ramp at the River edge. The taxi-way and warming-up apron were of the same construction as the runways and warming-up apron at the landing field. The drainage system was tied into the system already in operation.

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The preliminary plans for dredging were for three runways, approximately in the same direction as runways for the landing field, to a depth of 8 feet. Later it developed that this area was to be used by gliders and seaplanes, so the entire river between the Base and Hadnot Point was dredged to a minimum depth of 7 feet. After dredging operations were completed, the river was swept to a depth of seven feet. This operation was carried out using two sweeps and pulling across New River on a course S. 45° W until the entire area had been covered. A few obstructions such as stumps and shoals were removed.

The plans for sweeping and survey control which will be useful for future sweeping are shown on drawing No. 2156.

L-2.06. Drawings. Detail and design for construction purposes at the Landing Field are shown on the following drawings:

MB	1200	Structural Details	Issued	Dec.	31, 1941
MB	1201	Drainage Layout and Typical		•	
		Sections	Issued	Dec.	18, 1941
MB	1202	Details of Spill-way and Sections			
		of Taxi-way	Issued	Dec.	5, 1941
	1203	Northeast - Southwest Runway	Issued	Dec.	5, 1941
MB	1204	North-South Runway			19, 1941
MB	1205	Northwest - Southeast Runway			27, 1942
MB	2208	Taxi-way and Warming-up Apron,			
		Glider Base	Issued	Aug.	21, 1942

Construction requirements were contained in specifications prepared and issued to accompany these drawings.

L-3. Railroads.

L-3.01. Introduction. The Industrial and Supply Area lies approximately ten miles southeast of the Atlantic Coast Line Railroad in Jacksonville, N. C.

To adequately provide car storage and unloading facilities for the Marine Barracks, a railroad was built from Jacksonville to the Industrial and Supply Area, and general supplies for the base are transported on this railroad. Troop movements by railroad can also begin at a central distribution point lying in this area.

Approximately six thousand (6,000) feet of track in this Area were constructed as teamtrack; that is, the streets were paved to the edge of the track to permit loading and unloading between cars and trucks. At this writing, it is proposed to construct fifteen hundred (1500) additional feet of teamtrack just north of Center Road.

To serve all buildings in the Industrial and Supply Area, a system of sidings was located to conform with the buildings as shown on the Site Plans, and the three sidings were joined together by crossovers to facilitate switching and unloading.

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A railroad turn around wye was provided at the northeastern end of the Industrial and Supply Area to facilitate movements of trains and cars.

Along track No. 3 from Ash Street northeasterly a troop loading road was provided 1500 feet in length and 50 feet in width with a surfacing of 4-inch compacted stone.

A spur was built in to Tent Camps Nos. 1 and 2 to serve warehouses and other facilities.

L-3.02. Drainage. The drainage conditions existing in this area have been explained in Section I of this report. Drainage structures on the railroad consists of two (2) treated timber trestles, designed in accordance with the Atlantic Coast Line's specifications and numerous corrugated iron, cast iron and reinforced concrete pipe culverts.

L-3.03. Design and Construction. The typical section for railroads was designed by the Atlantic Coast Line Railroad Company. The sub-grade is thirteen (13) inches below the base of the rail. Ballast consisting of erusher run Belgrade stone was installed on the subgrade to a depth of six (6) inches, filled to the top of the ties and sloped on a 20 to 1 slope to meet the sub-grade.

In the Tent Camps 1 and 2 Area, the ballast was of a select local material (sand clay). First grade, 85 pounds relay rails were used in the construction of these railroad facilities. The turnouts, angle bars and tic plates, bolts, spikes and washers were of new material. The cross-ties were new No. 1, 2, and 3 mixed pine and cypress, the pine being creesote treated, both for cross and switch ties.

L-3.04. Summary. The total trackage and facilities installed at the expense of the Navy Department is as follows:

2.	Miles of track, Trestles	including sidings	13.6 miles	
3.	Pipe culvert		890 lineal fee	t
4.	Electric Warning	Signals for Highway	2040 lineal fee crossing 4	t

In addition to the above trackage, the Atlantic Coast Line Railroad Company without expense to the Government, laid a siding approximately two thousand (2,000) feet along their right-of-way, for the use of the Marine Corps in Tent Camp No. 2. Another siding about 600 feet in length was also installed at the location of the turnout of the track to the Industrial and Supply Area. Details are shown on the following drawings:

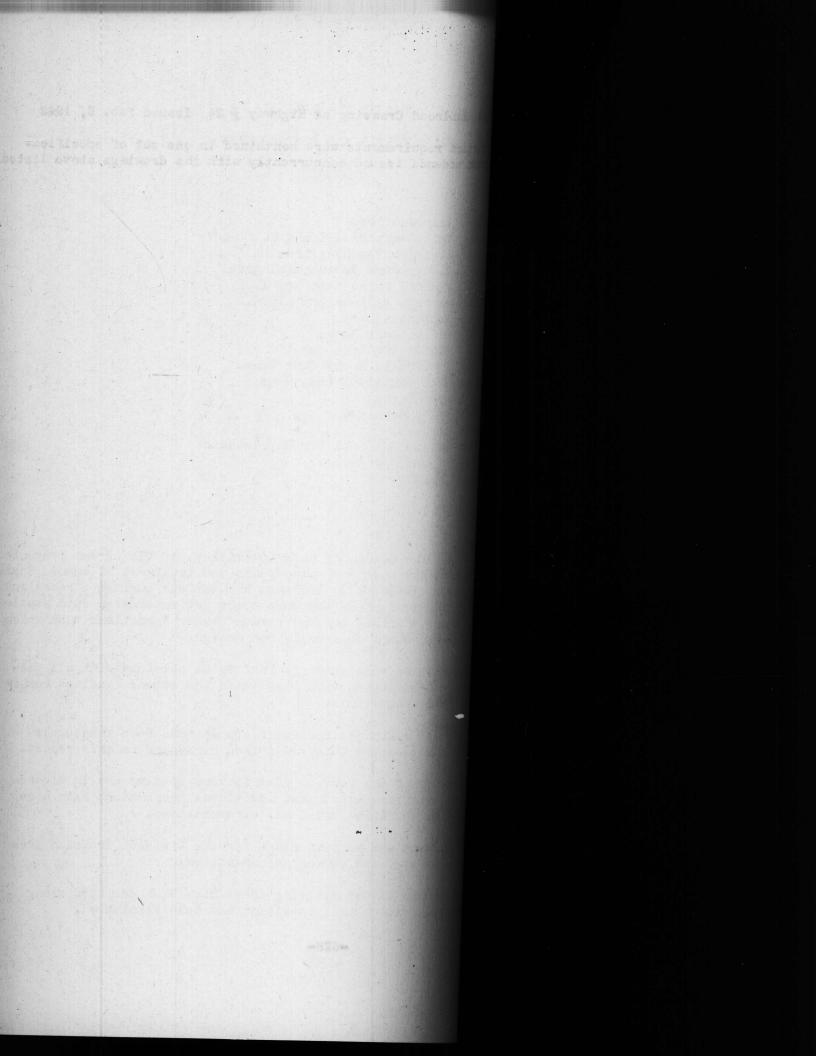
	202 241	Railroad Grade Revisions- Wallace Creek Railroad Tracks #1 and # 2.	Issued	June	13,1941
MB	242	Supply & Industrial Area Railroad Tracks $\#1$ and $\#2$,	Issued	July	24, 1941
MB		Supply & Industrial Area Railroad Track No. 3, Supply and	Issued	July	24, 1941
MB		Industrial Area Switching Tracks for Railroads.	Issued	Aug.	7,19 41
		Simplify and T-1	Issued	Feb.	11,1942

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MB 1236 Railroad Crossing at Highway # 24 Issued Feb. 6, 1942

Construction requirements were contained in one set of specifications and seven addenda issued concurrently with the drawings above listed.



CHAPTER M - PART II

WATER SUPPLY AND DISTRIBUTION

CONTENTS

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M-2	Tent Camps Nos. 1 and 2.
M-3	Division Training Area.
M-4	Midway Park Residential Area.
M-5	Mumford Point Camp No. 1.
M-6	Barrage Balloon Battalion.
M-7	Amphibian Base.
M-8	Rifle Range Area.
M-9	Glider Training Base.
M-10	
M-11	Tank Battalion Tent Camp.
M-12	Camp Knox.
M-13	White Cemetery.
M-14	Mock-Up.
M-15	Recommendations for Maintenance
in the second	and Operation.
M-16	Summary.

M-1. Introduction. The design of water utilities, at the outset presented major problems as to the source of supply and the treatment of same. There were no contour maps available to indicate the various surface streams and their respective catchment areas nor were there any conclusive data available covering local geological and underground water formations upon which to draw accurate conclusions as a basis for design.

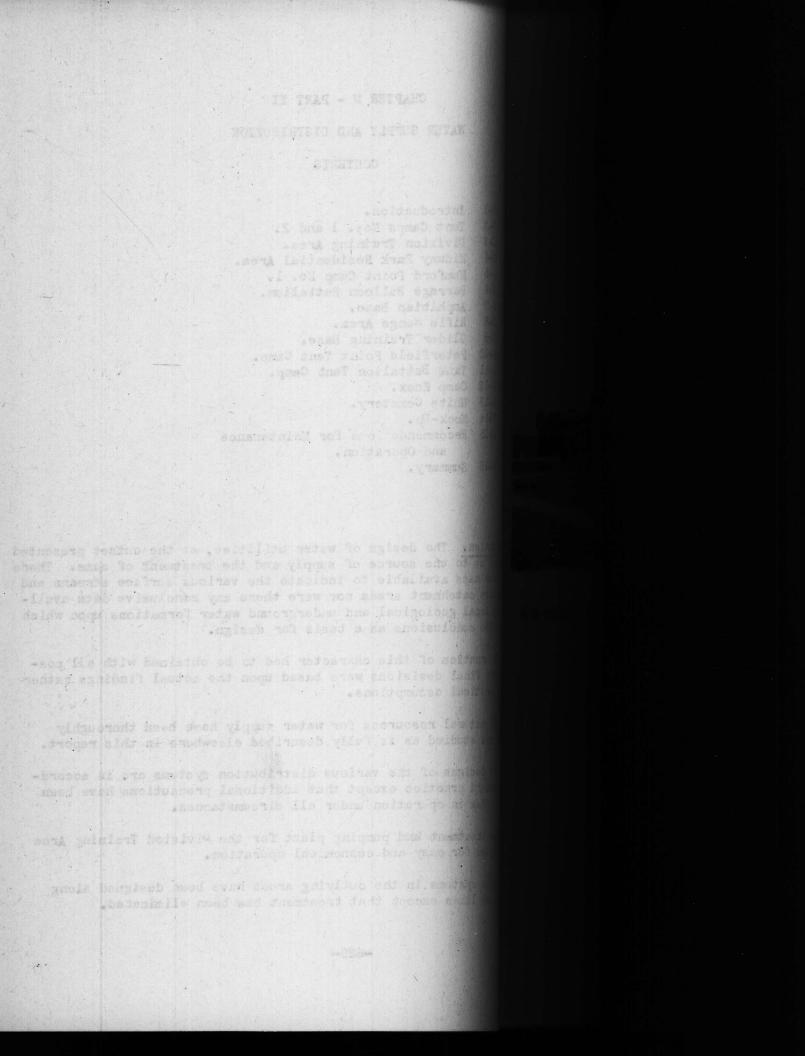
Information of this character had to be obtained with all possible speed and final decisions were based upon the actual findings rather than upon theoretical assumptions.

The natural resources for water supply have been thoroughly investigated and studied as is fully described elsewhere in this report.

The designs of the various distribution systems are in accordance with standard practice except that additional precautions have been taken to keep them in operation under all circumstances.

The treatment and pumping plant for the Division Training Area has been designed for easy and economical operation.

Water systems in the outlying areas have been designed along exactly the same lines except that treatment has been eliminated.





WATER TREATMENT PLANT - DIVISION TRAINING AREA

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M-2. Tent Camps 1 and 2 Water Supply. The original estimate for water requirements for Vamp No. 1 as per preliminary report of May 3, 1941, addressed to Resident Officer in Charge, was based upon a total population of 6,000.

The estimated consumption for all ordinary purposes is 120 gallons per capita, per day, or a total of 720,000 gallons.

Fire demand was estimated at 1000 gallons per minute from the elevated tank alone and 2000 g.p.m. total with elevated tank and pumping plant both in operation.

The recommendations contained in this report were briefly as follows:

That an elevated storage tank 100,000 gallons be provided on a tower not less than 100 feet high. (A standard steel tank of this description was later purchased by the Navy).

That a ground storage tank to hold 300,000 gallons be provided for supplying the high lift service pumps.

That the entire water supply be derived from wells, the construction details of which should be determined from the character of the formations disclosed by test drilling.

That water treatment may or may not be required depending entirely upon the physical characteristics of the supply obtained.

M-2.01. Investigation of Well Supply. Well drilling for this area was begun May 10, 1941, under a specification prepared in Washington, wherein percussion tools were used to sink a 10-inch casing and cement the lower end of same into the shell rock formation. Drilling was then continued into the shell rock for a sufficient depth to develop the required quantity of water per well. Pumpage from a given well was limited to a safe drawdown wherein the fresh water level was not to be lowered to such extent as would permit the underlying salt water to rise or to flow in from nearby tidewater stream.

The first well, located at "A" and "1st" Streets, designated as "A" was drilled to 107 feet and cased with 10-inch 0.D. steel pipe. The waterbearing rock formation was drilled to a depth of 75 feet below the casing (total depth 182 ft.) and then developed by pumping with air lift. The production was 450 gallons per minute with 12 ft. of drawdown from static level, which stood 4 ft. below elevation 18.4 at ground surface.

A supply of such magnitude from an open bottom well indicated a huge underground reservoir but unfortunately the quality was extremely poor due to high mineral content. As a matter of record the chemical analysis is stated below:

Total Hardness as CaCO₂, 86 p.p.m; Calcium Hardness, 40 p.p.m; Magnesium Hardness, 46 p.p.m; Methyl Orange Alkalinity, 424 p.p.m; Phenolphthalein Alkalinity, 0; Caustic Alkalinity, 0; Free Carbon Dioxide, 1 p.p.m; Chlorides, 372 p.p.m; Sulphates, 134 p.p.m; Iron, 0.1 p.p.m; Manganese, 0.

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A second well of this type designated as "D" was drilled at "A" and "6th" Streets in which a 10-inch casing was set 110 feet below the surface with open bottom hole drilled through water bearing shell rock for 74 feet, making the total depth 184 feet. This well produced 400 gallons per minute with 26.5 ft. of drawdown, the static level being 3.5 ft. below El. 20.3 at ground surface. The analysis of this water was almost identical with Well "A".

A ruling was made by the Bureau of Medicine and Surgery that this water was unfit for human consumption, due to its high mineral content, and accordingly, it was later used only in combination with shallow wells drilled subsequently.

While the first wells were being drilled, investigations were being made to determine the quality of water obtainable from shallower depths. A general discussion of this matter is contained in Section M-3.03 of this report. Findings were to the effect that water of good quality was obtainable at depths ranging from 70 to 138 feet (perhaps deeper in untried locations) and that there was a heavy layer of impervious clay between the shallow and deeper water bearing formations which prevented flow from one to the other. These findings made it necessary to eliminate the methods used thus far and to employ drillers and equipment capable of drilling by rotary process and installing gravel packed screens where water had to be developed from fine sand formations.

In the original set up, Wells "A" and "D" were drilled producing 850 gallons per minute of highly mineralized water and wells "B", "C", "E", "F", and "G" producing 505 gallons per minute of good quality water. It will be noted that 505 g.p.m. equal about 720,000 gallons per day or just sufficient supply for a population of 6,000 troops. This was apparently sufficient with a partial mixture of the deep well water. Wells "B", "C", and "F" were constructed by setting 18-inch C.D. steel casing to the first shell rock formation and grouting the same in from bottom to ground surface and then drilling through the full depth of rock below the casing. No gravel or screens were used in these three wells. Wells "E" and "G" produce from shell rock and sand. Accordingly, they were constructed with gravel packed screens, as described in Section M-3.07 of this report.

Because of the expansion of this activity to 12,000 troops when Tent Camp No. 2 was authorized in December, 1941, it was decided to drill additional wells to produce 950 g.p.m. or 1.37 million gallons per day. Accordingly, Wells "H", "J", "L" and "M" were constructed with gravel packed screens and wells "F", "I" and "k" were drilled into shell rock formation and finished without gravel enveloped screens.

An additional ground storage tank of 272,000 gallons capacity and identical with one already provided, with all necessary piping, cross connections and auxiliary equipment, together with an additional pump of same capacity and characteristics as specified for original installations under Section M-2.04 in this report, were constructed and installed subsequent to the authorization of Tent "amp No. 2. An 8-inch feeder main for the purpose of supplying water to Peterfield Point and the Glider Base was authorized later. The take-off for this 8-inch feeder main was at point where en 8-inch cross was installed at "11th" and "F" Streets. and to type contented on "D" was artited at "A" and the locineh content was set 110 heet holow the surface drilled through cator pearing shell root for 74 fest. 184 foot This well produced sol gallonb per minutemore, the state lover poing 3.5 ft. boltw 21. 20.2 by analysis of this water was placet identical with

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The total supply for Tent Camps 1 and 2 is now 2 M.G.D. of reasonably good water from eleven shallow wells and 1.2 M.G.D. of highly mineralized water from deep wells.

M-2.02. Transmission Mains. Transmission mains from all of the wells to the main pumping plant are of Class 100 cement-asbestos pipe with A.W.W.A. gate valves and cast iron fittings.

M-2.03. Well Pumping Equipment. All of the pumps are of the deep well vertical shaft turbine type. Wells "A", "B", "C", "E", "G", "H", "K", and "L" are electric motor driven only. Wells "D", "J", and "M" have dual electric and gasoline engine drive with a combined capacity of 850 G.P.M. or 1.2 M.G. All of the wells are comparatively close to the main pumping plant and are operated manually.

All data pertaining to manufacture, operating characteristics, maintenance and repair of well pumps has been turned over to the Public Works Officer. Construction details, underground formations, yield, drawdown and other information for each well is shown on P.W. Drawing No. 23.

M-2.04. <u>Main Pumping Plant</u>. The main pumping plant, for high lift service, was originally designed for Tent Camp No. 1, housing 6,000 troops. With the addition of Tent Camp No. 2 provision was made for a total of 12,000 troops and an additional ground storage tank and one additional high lift pump were installed at the Main Pumping Plant. The principal structures equipment, and sequence of operation are as follows:

Well water is pumped over coke tray aerators located on the roof of two ground water storage tanks 50 x 50 ft. inside by 15 ft. deep, each holding 272,000 gallons below the overflow line. Each aerator consists of 5 trays 7 x 7 ft. effective surface area, placed one above the other with 9 inches clearance between each tray, and has a safe working capacity of 1 M.G.D.

Aeration was installed to remove hydrogen sulphide gas which is present in objectionable quantities in several of the wells.

Sand traps are provided at the base of the aerators to prevent this material from entering the storage tank and distribution system.

From the ground storage tanks a suction header conveys the water to three identical high lift centrifugal pumps two electric driven and the other with dual electric and gasoline engine drive. Each pump is designed to deliver 700 g.p.m. against 160 feet total discharge head, requiring 40 horsepower. The gasoline engine is rated at not less than 55 H.P. and includes underground storage tank, hand priming apparatus and all usual accessories. The original equipment was furnished under Specification No.104 by Worthington Pump and Machinery Corp. The additional pumping equipment was furnished under same specifications by DeLaval Steam Turbine Company.

A cross connection is provided between the well supply and pumps so that when either or both of the ground storage tanks are out of service the high lift pumps can take suction directly from the wells.

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M-2.05. Meters. Both the raw water supply from the wells and the discharge from the service pumps into the distribution system are measured by velocity type meters with indicating-totalizing instruments mounted on the main panel. This equipment is manufactured by R. W. Sparling.

M-2:06. Automatic Controls. An automatic water level control has been furnished to start and stop the electrically driven pump so that storage in the elevated tank can be maintained between any predetermined limits of fill and draw. A float type water level control has been furnished to operate in conjunction with the ground storage tank in which contacters and circuits are provided for (a) starting one or more well pumps automatically; (b) stop all service pumps when the water level in the storage tank reaches low level and (c) to stop the gasoline engine driven pump at low water level. This equipment was furnished under Specification 104 by Automatic Control Company, St. Faul, Minn.

M-2.07. Chlorinator. Chlorination is effected by a solution feed manually adjusted chlorinator with maximum capacity of 40 lbs. per 24 hrs. This machine is semi-automatic, designed to start and stop when either of the service pumps is operated. This feature is accomplished through solenoid valves placed in the water supply line to the chlorinator with one solenoid in each pump circuit. This equipment was furnished by Wallace and Tiernan Company and is designated as Type S.A.S.V.M.

M-2.08. Distribution System. The entire distribution system is constructed of Class 150 cast iron pipe with A.W.W.A. specification gate valves and fittings. Fire hydrants are compression type conforming with A.W.W.A. specifications and Fire Underwriters requirements. In general the pipe sizes were held to a minimum because of the temporary nature of the project. Feeder Mains are 8-inch diameter with 6-inch grid system in Camp No. 1 and the same design was carried out for Camp No. 2 except for a short stretch of 10-inch pipe extending southerly in "A" Street from the main pumping plant and easterly in "7th" Street to "C" Street to connect with the distribution system in Camp No. 2.

This was done in order to effect proper hydraulic balance between the two activities and their respective elevated storage tanks.

The systems in Camps 1 and 2 are designed to provide ample domestic flow and 1000 g.p.m. fire flow in both camps simultaneously.

In addition to the above an 8-inch cast iron feeder main with takeoff at 8" x 8" cross at corner of "11th" Street and "F" Street, was authorized subsequent to authorization for Tent Camp No. 2. This main was constructed for the purpose of furnishing water to Peterfield Point and Glider Base Areas.

M-2.09. Elevated Storage. Two identical elevated steel water tanks of 100,000 gallons each on 132.5 ft. towers provide about 60 lbs. working pressure. One tank for Camp No. 1 is located south of "6th" Street back of the Supply Area. The second tank for Camp No. 2 is located south of "F" Street between "10th" and "11th" Streets. The elevation of the overflows on both tanks was specified to be 168.00. Both tanks were furnished and erected by R. D. Cole Manufacturing Company, Newnan, Ga. eres Both the res ater signly from the weits and the service purphing the the distribution system are non-modeters with indicating modulising instruments mounted an approximation instrument of R. W. Sparling.

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At the time of writing this report decision as to whether or not treatment is to be provided depends upon the chemical analysis of wells drilled but not yet in operation.

In the meantime, experiments are being performed in which "Micromet" is being introduced into a water heater to determine whether or not such treatment will satisfactorily prevent the coating of hot water coils and other difficulties with mechanical equipment. As directed by the Officer in Charge complete construction drawings Nos. T. C. 126 to 135, inclusive, dated October 7, 1942, together with Specification No. 170 covering all structures, equipment and appurtenances have been turned over to the Officer in Charge in the event that a treatment plant is authorized for Tent Camps 1 and 2.

M-2.11. Summary. In order to give a clear picture of the final structures and equipment after Tent Camp No. 2 was added, the following summary is given:

Shallow Wells constructed by Layne Atlantic Company of Norfolk, Va. Are B, C, E, F, G, H, I, J, K, L, and M with a total capacity of 2 M.G.D.

Deep Wells A and D with a total capacity of 1.2 M.G.D. were drilled by Virginia Machinery and Well Company.

There are two concrete ground water storage tanks complete with aerators and sand traps, each with a capacity of 272,000 gallons or 544,000 gallons total.

Three high lift pumps are each rated at 700 G.P.M. against 160 ft. head.

Two units, one single electric drive and one dual drive were manufactured by Worthington. The third unit is single electric drive manufactured by De Laval.

The interconnecting piping between the storage tanks, wells and pumps is so arranged that either one or both tanks may be put out of service without shutting down the plant.

No additional chlorinators or automatic equipment have been added.

M-3. Division Training Area.

M-3.01. Design Basis. The original estimate for water requirements for the Division Training Area, as per preliminary report of June 16, 1941, is based upon a total population of 12,500 including four Regimental Areas. Ander Frenkern. Considerable discussion has been opered to the matter sould nonhibure - industrial and solve has the water sounds for Tenne Gauge 1. Then has there are continen to the effect tank the solution as the solve of the bie purposes intended. Astronomic the high size all sources is constant that needed because of separate in the box mater and the source of the separate in the the testers and the second of separate in the testers.

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Hospital and Residential Areas. The normal consumption of water was estimated at 120 gallons per capita per day for all ordinary requirements including boiler plants, laundries, refrigeration and other uses. Based upon this figure, the total normal demand was 1.5 million gallons per day.

M-3.02. Investigation of Surface Supplies. Investigations for adequate sources of water supply were begun promptly after the arrival of the engineering force. These investigations included thorough field inspection and flow gaugings of numerous surface streams, also laboratory examination of water samples to determine the chemical content and other characteristics.

All stream gaugings were made by the U.S. Geological Survey who were most cooperative in rendering this valuable service.

The first gaugings were made between April 27 and May 21, 1941, of the following streams:

Cypress Creek, at Chinquapin, Duplin County. New River, near Gum Branch. Chapel Run, near Catherine Lake. New River near Richlands. N. E. Cape Fear River at Chinquapin, Duplin County. Muddy Creek, at Chinquapin, Duplin County.

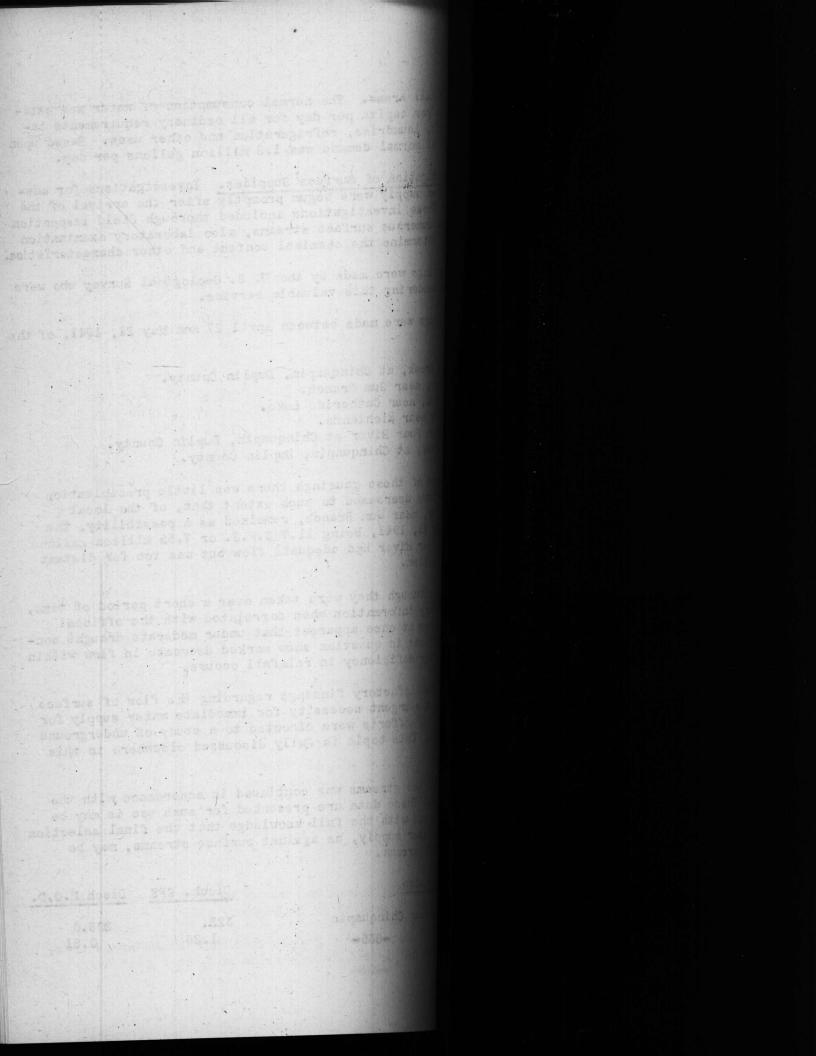
During the period of these gaugings there was little precipitation and as a result the flows decreased to such extent that, of the local streams, only New River, near Gum Branch, remained as a possibility, the minimum flow as of May 21, 1941, being 11.7 C.F.S. or 7.55 million gallons per day. N. E. Cape Fear River had adequate flow but was too far distant for immediate consideration.

These gaugings, although they were taken over a short period of time, gave valuable preliminary information when correlated with the official rainfall records. It was at once apparent that under moderate drought conditions, all of the streams in question show marked decrease in flow within a very short period after deficiency in rainfall occurs.

In view of the unsatisfactory findings regarding the flow of surface streams and because of the urgent necessity for immediate water supply for construction purposes, our efforts were directed to a study of underground water supply from wells. This topic is fully discussed elsewhere in this report.

The gauging of surface streams was continued in accordance with the summary tabulated below. These data are presented for such use as may be warranted in the future and with the full knowledge that the final selection of wells for permanent water supply, as against surface streams, may be questioned by interested persons.

Date	Stream & Location	Disch. CFS	Disch M.G.D.
4-29-41	Cypress Creek near Chinquapin	323.	208.0
5-21-41	-635-	1.26	0.81



Date	Stream & Location	Disch: CFS	Disch. M.G.D
4-29-41	Muddy Cr. at Chinquapin	59.8	38.60
5-21-41		.5	0.32
4-30-41	Chapel Run near Catherine Lake	6:00	3.88
5-21-41		2.84	1.83
6-24-41		3.02	1.95
9-23-41		1.84	1.19
4-30-41	New River near Richlands	25.7	16.60
5-21-41		1.19	0.77
5-24-41		2.40	1.55
4-29-41	N.E. Cape Fear River at Chinquapin	523.0	338.00 *
5-21-41		41.4	26.80
9-24-41	Trent River above Trenton	10.6	6.85
4-30-41	New River near Gum Branch	95.6	61.80
5-21-41		11.7	7.55
7-31-41		14.8	9.55
8-14-41		10.6	6.85
9-16-41		6.48	4.18
9-23-41		4.44	2.86
8-14-41	Northeast Creek near Kellum	5.74	3.71
9-23-41		.84	0.54
8-14-41	Little N.E. Creek near Piney Green	2.96.	1.91
8-14-41 9-23-41	Wallace Creek at Mumford's Mill	3.66 Tide	2.36
8-14-41	Southwest Creek at Mortons' Mill	1.85	1.20
9-23-41		.82	.0,53
3-31-41	Bryces Creek near Riverdale	97.1	62.70
9-24-41	White Oak River, 1 mi. N.E. of Belg (above Stone Quarry)	rade 1.58	1.02
9-24-41	White Oak River, S.E. of Rt. 17 bel Belgrade including discharge from S Quarry		2.86

By preliminary report of June 16th, directed to Resident Officer in Charge, we evaluated the cost and merits of securing water supply from New River.

The point selected for the intake was about 3-1/2 miles south of the county road leading from Gum Branch to U. S. Highway 258.

The development of this source of supply included intake structures, pumping plant and 13 miles of 24-inch transmission main at a cost of

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Tent Camp Area were finished in accordance therewith. All main supply wells drilled later are of gravel wall construction, drilled by rotary process.

The change in drilling methods and in the construction of individual wells together with estimated yield, drawdown, analyses, and other pertinent facts is fully described in a report from the Architect-Engineers to the Officer in Charge, dated Oct. 3, 1941.

This report is repeated, below, to such extent as is necessary to give a clear understanding of the subject:

October 3, 1941

To: Resident Officer in Charge, Marine Barracks, New River, N.C.

From: Carr and J. E. Greiner Co.

Subject: Water Supply, Main Area.

"In connection with the development of water supply for the Division Training Area, the following operations have been carried out to date:

Four test wells, drilled by cable-tool or percussion methods have been installed within the general area to be occupied by the Marine Barracks and associated activities. This work was begun in February, 1941, and terminated in May. Information covering these wells is contained in our Preliminary Report dated June 16, 1941."

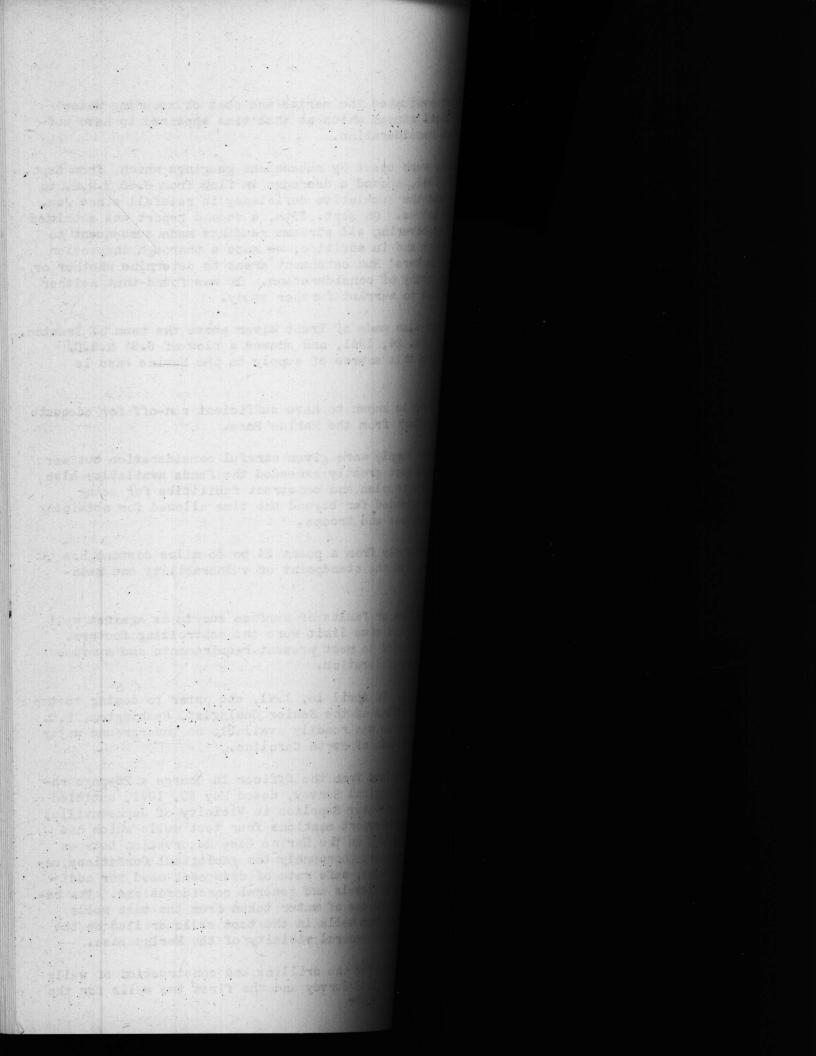
"A brief summation of the results is again stated for convenience -

Test Well No. 1. Location one half mile south of Jacksonville Cemetery near Montford Landing, depth $227\frac{1}{2}$ ft; Coquina rock penetrated for depth of 30.5 ft; yield 150 G.P.M. with 15 ft. draw-down. Chlorides 28.3 p.p.m.

Test Well No. 2. Location on Paradise Point Road 0.4 mile east of New River. Depth 265 ft; Coquina rock penetrated for depth of 35 ft; yield 420 G.P.M.(questionable) with 19 ft. drawdown. Analysis shows Chlorides 126 p.p.m.

Test Well No. 3. 8,000 ft. inland from Hadnot Point. Depth 325 ft. Well finished in "granite rock with sand and water pockets". Analysis showed Chlorides 580 p.p.m. "

"An attempt was recently made to obtain water from this well for construction purposes. When put into operation it sanded up immediately. The equipment was removed and the well bailed and drilled out to a point below the bottom of the casing. The well terminated in gray and black sand commonly known as "salt and pepper". No traces of "granite rock" were found. This well now yields about 100 G.P.M. of highly mineralized water."



\$ 655,000. This report evaluated the merits and cost of securing water supply from the only local stream which at that time appeared to have sufficient flow to warrant consideration.

These calculations were upset by subsequent gaugings which, from Sept. 14, 1941, to Sept. 23, 1941, showed a decrease in flow from 6.85 M.G.D. to 2.86 M.G.D. At that time the cumulative deficiency in rainfall since Jan. 1, 1941, was over 4.56 inches. On Sept. 29th, a second report was submitted to the Officer in Charge covering all streams gaugings made subsequent to June 16th, as listed above and in addition, we made a thorough inspection of White Oak River and Hunters' Run catchment areas to determine whether or not these streams were worthy of consideration. It was found that neither stream had sufficient flow to warrant further study.

Investigations were also made of Trent River above the town of Trenton. This stream was gauged Sept. 24, 1941, and showed a flow of 6.85 M.G.D. The air line distance from this source of supply to the Marine Base is about 24 miles.

N. E. Cape Fear River is known to have sufficient run-off for adequate supply but is 35 miles distant from the Marine Base.

These two sources of supply were given careful consideration but were discarded as the estimated cost greatly exceeded the funds available; also the length of time required to plan and construct facilities for using either source would have extended far beyond the time allowed for obtaining water for construction purposes and troops.

The taking of water supply from a point 24 to 35 miles distant has obvious strategiv faults, from the standpoint of vulnerability and main-tenance.

Regardless of the merits or faults of surface supply as against well supply, the available funds and time limit were the controlling factors. Accordingly, wells were selected to meet present requirements and surface supply was left for future consideration.

M-3.03. Wells-General. On April 16, 1941, and prior to coming to the Marine Base we visited the office of the Senior Geologist, Washington, D.C. and obtained such information as was readily available on underground water supplies within the Coastal Plain of North Carolina.

On June 9, 1941, we received from the Officer in Charge a 26-page report prepared by the U. S. Geological Survey, dated May 20, 1941, entitled "Memorandum in Regard to Ground-water Supplies in Vicinity of Jacksonville, N. C." by David Thompson. This report mentions four test wells which had been drilled or were being drilled on the Marine Base Reservation between March and May 20 and discusses very thoroughly the geological formations, occurrence of water, quality of water, safe rate of drawdown, need for addi tional information, ground water levels and general considerations. The report also contained chemical analyses of water taken from the test wells drilled on the Reservation and from wells in the test wells drilled on the Reservation and from wells in the general vicinity of the Marine Base.

The original specification for the drilling and construction of wells was prepared by the U. S. Geological Survey and the first two wells for the -638-

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"The second rotary drilled well is located on northwest side of Main Access Road near Cedar Street, in the Supply Area. Depth 195 ft; yield 250 g.p.m. with 32 ft. draw-down. This well penetrated one consolidated layer of Coquina rock from 90 to 100 ft. below the surface. The other water-bearing material is sand or shell rock and sand in unconsolidated layers. Analysis shows water of good quality, with Chlorides 16 p.p.m. Iron 0.7; soap hardness 180."

"This well and the one in the Housing Area will be used immediately for construction purposes."

"Review of the foregoing data shows several interesting points.

1. The so-called Coquina rock formation is by no means continuous as a consolidated formation. Apparently there are areas of appreciable extent where this formation does not occur, except in loose and comparatively shallow layers mixed with sand.

2. Of the wells drilled, the chloride content has increased with the depth. This holds good for the Tent Camp Area where the 70 ft. wells average 16 p.p.m. as against 400 p.p.m. for wells drilled to 180 ft. depth.

3. There is in the Tent Camp Area an impervious layer of clay between the upper and lower water-bearing formations. Pumpage tests conducted to date show no evidence of exchange of water between the two.

4. High chloride content has not been obtained within the Division Training Area from wells finished above the 250 ft. level. Fairly high concentration appears below the 300 ft. level. Data is now being collected for the purpose of establishing, if possible, the relationship between depth below normal water table and chloride content.

5. From information obtained to date covering underground formations within this area, it is not believed possible to develop adequate water supply from consolidated Coquina rock formations alone, as recommended by other authorities and in accordance with usual practice within the Coastal Plain region. This method may be used where conditions are favorable, but it has been clearly demonstrated that for local development, waterbearing sands must be largely depended upon for adequate yield.

6. In order to accomplish the desired results, gravel-packed wells must be used as the formations are generally of fine sand which will not permit open bottom construction and which will either clog or enter screens without gravel packing."

Recommended Design

"For the Division Training Area, including Residential, Industrial, Hospital and associated activities, with a population of 12,500 and an average estimated water consumption of 120 gallons per capita per day, the demand will be 1.5 M.G. The average will be exceeded by periodic peaks caused by hot weather, fires, increase in population or other reasons, which will approximate 50% above normal average of 2.25 M.G.D." Alight of the second second second standards
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Test Well No. 4. Location southwest side Piney Green Road about 8,000 ft. southwest of Supply Area. Depth 567 ft. No waterbearing rock formation was penetrated. The well produced 50 G.P.M. with 125 to 150 ft. drawdown. Analysis was not made. None of the above wells will be considered for permanent use."

"Since the original test wells were drilled, two additional "cable-tool wells" have been sunk, one 520 feet deep, located on the southeast side of the main access road near the northmost corner of the Supply Area. The so-called Coquina rock was encountered in shallow layers with alternate layers of sand, clay, loose shell beds and conglomerate. The underground formations were generally saturated with water, which, for cable-tool drilling, necessitated driving the well casing 10 feet or more in advance of drilling and bailing. This well did not penetrate any consolidated shell rock or other formation suitable for the development of an "open bottom well". Visual inspection of the drillings indicated that worth while yield could not have been developed, at this location, by other than gravel packed screen construction."

"Drilling at this site was abandoned September 25, 1941. Analysis of the water shows 5,000 p.p.m. of Chlorides, making the well unfit for use."

"A sixth cable-tool well was drilled at the location of the R.E.A. Power Plant southwest side of Route 24, about 1400 feet southeast of Northeast Branch of New River. The underground formations are understood to be comparable with those described above. At a depth of 588 feet the well was pumped at 4 gallons per minute for $l\frac{1}{2}$ hours and a water sample was then collected. The analysis September 4, 1941, showed total alkalinity, 520; Chlorides 2450; Sulphates 786; Bicarbonates 440; Sodium 2118; all results being expressed in parts per million. Obviously this water was unfit for use and the well was abandoned."

"A gravel-packed well is being constructed at this location, but no information has been received covering further details."

"A seventh cable-tool well was drilled to a depth of 103 feet for the C.C.C. Camp located on the north side of Northeast Branch, about two miles upstream from Mumford Point. This well penetrated Coquina rock from 46 to 75 feet depth. The hole below 75 feet was filled with gravel. The yield was 108 G.P.M. with 9 ft. drawdown. Analysis shows water of good quality: Chlorides 13 p.p.m; pH 7.8; Iron 0.20."

"Two rotary drilled wells with gravel-packed screens have recently been constructed as follows:

One well located on the northeast side of Route 24, about 6,000 feet southwest of Northeast Branch, to serve the 700 Unit Housing Development. This well penetrated shell rock from 99 feet to 132 feet. Drilling was continued below the rock, through sand and clay to 153 ft. The hole below the rock was plugged as the lower formation appeared questionable. Ground level at this well is 33.0 ft.; static water level 16 ft.below surface, yield 200 G.P.M. with 14 ft. draw-down. Quality of water good: Chlorides 13 p.p.m.; Iron 0.7 and pH 7.8." interview in the tion accordence is a de line of interview and accord 5,000,200, and a second second second so it is a second second second second second second second second accordence would be accordence as for an experimentation of the second second second second second second second accordence would be accordence of the second accordence would be accordence of the second seco

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"Development of the supply from underground sources is predicted upon the following:

Average annual precipitation, 50 inches, equivalent to 870 million gallons per sq. mile. Of the total rainfall, it is assumed that 25% remains within the depth limits of the proposed wells, after deducting run-off, evaporation, and transpiration. This figure is believed to be very conservative as in actual practice this type of terrain should yield 40% or more of the average annual precipitation. In view of the danger of salting from beneath, it is ungestionably wise to keep the draw-off within safe limits."

"On the basis of taking 25% of the annual precipitation, the daily yield will be 600,000 gallons per square mile. We have previously indicated an average required pumpage of 1.50 M.G.D. with a maximum of 3.00 M.G.D. To meet the 1.5 M.G.D. demand (1042 G.P.M.) five wells will be required at 208 G.P.M. each, spread over an area of 2.5 square miles. To meet the 3.00 M.G.D. demand (2080 G.P.M.), ten wells will be required, with an area of 3.84 square miles. The above figures are all on a 24 hour operating basis for the total respective outputs. If development is made on the basis of 3.00 M.G.D. maximum, then for 1.5 M.G.D. average daily consumption, the pumps would operate 12.0 hours."

"It is recommended that 10 wells be constructed for immediate use and that the yield per square mile be limited as closely as possible to 600,000 gallons per day."

"It is further recommended that all future wells be constructed by rotary drilling methods and that gravel enveloped screens be used throughout, unless special underground conditions warrant some other type of construction."

"If this project is carried out on the basis of our recommendations, we believe that an ample and dependable supply of water can be developed. The cost by this method will be appreciably less than for obtaining an equivalent amount of water from surface sources."

M-3.04. Wells Constructed for Division Training Area. The recommendations contained in this report were accepted and the work proceeded accordingly, except for minor changes to suit local conditions. The total number of wells was later increased to 16 and finally to 21 as mentioned later in this report. The proposed location and spacing of wells for immediate and future construction, together with the transmission mains, is shown on M. B. Drawing 521, approved October 2, 1941. This plan was carried out as to its general intent for ten wells in Group "A" and six wells in Group "B". Well Group "C" was relocated as mentioned later. The drilling of permanent wells within the Division Training Area was started about the middle of September, 1941, and the first 10 wells, Nos. 1 to 10, inclusive, in Group "A" were finished about the middle of April, 1942.

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The wells in this group run from 150 ft. to 210 ft.deep and have a combined yield of 3.096 M.G.D. Complete data covering location, spacing, transmission mains, yield, and other details are shown on M. B. Drawing No. 1500.

The total elapsed time does not represent actual working time on the first ten wells, as the drilling equipment was moved to other locations and back again as required to cover all of the activities where water was most urgently required for construction purposes.

The drilling of five wells, Nos. 11 to 16, inclusive, in Group "B" was started the middle of April 1942 and was completed the latter part of July 1942. The wells in this group range from 150 ft. to 190 ft. in depth and have a combined normal yield of 2.088 M.G.D.

Data showing location, spacing, transmission mains, yield and other details is shown on M. B. Drawing 1500.

With the completion of the ten wells in Group "A" and six wells in Group "B", the total supply will be 5.17 M.G.D. Under normal conditions this will be sufficient supply for the Division Training Area, with a population of 20,000 including the Hospital and all associated activities connected with this source.

However, at a conference between representatives of the Navy, Marine Corps, and Architect-Engineers held in July, 1942, the sufficiency of the water supply to meet demands of greatly increased personnel, fires and other abnormal conditions was discussed and it was decided that additional reserve should be provided at this time.

On July 27, 1942, we prepared an estimate for five additional wells in Group "C", including pumps, houses, transmission mains, electrical service, roads and miscellaneous, in the amount of \$ 125,000.

Authority to proceed with the five wells in Group "C" was given on August 12, 1942, and the drilling was started at once. The location, spacing, and transmission mains are shown on M. B. Drawing 1500. Well Group "C" consisting of Nos. 17, 18, 19, 20, and 21 were constructed as previously described except Well 20, which was constructed by setting and cementing in place on top of rock formation an 18-inch casing, and drilling to waterbearing formation. This well has no 8-inch casing, no screen and no gravel. The total quantity of water derived from these five wells is 1.58 G.P.D. making the grand total of 6.77 G.P.D. for the Division Training Area exclusive of high lift emergency wells described later in this report.

M-3.05. Emergency High Head Wells. In order to insure adequate water supply for the Officers' quarters Area, in the event that the long single line of transmission main serving that area should fail or be shut down for repairs, Well No. "R" was drilled near the site of the elevated tank. This well is equipped with both electric and gasoline engine drive for 250 G.P.M. delivery into the distribution system, against full tank pressure. No treatment is provided other than chlorination.

In order to insure a supply of water at all times for the Hospital Area, Well "E-1" was drilled. This well is equipped with both electric and gasoline engine drive, for delivery of 100 G.P.M. into the distribution terra a tribina a sub forda a sub forda a sub base a solution tribina contrata contrata logation, opering, brane-

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M-3.06. Well Construction. All of the wells within the Division Training Area, with the exception of Well No. 20, Group "C", which was constructed as above noted, are of the gravel wall type and all wells in this Area were constructed by the Layne-Atlantic Company of Norfolk, Va. The construction details are as follows:

A test well 2 inches diameter was drilled near each permanent well location and all strata penetrated were carefully examined and logged. Water samples were obtained and analyzed for mineral content. If sufficient water bearing material was found at a given location, the permanent well was drilled there. If not, a new site was selected. Rotary drills were used with clay slurry circulated through the drill rods into the well to seal the side walls and prevent caving. The slurry continuously overflowed the top of the well and was circulated through a ditch at ground level, the ditch following a circular path of sufficient length, from the well end back to a sump pump, to permit all drillings to settle out of the slurry. The slurry was repumped into the well to maintain an interrupted flow. A hole about 24 inches diameter was drilled to the first hard clay or rock stratum and an 18-inch standard weight steel casing was centered therein and grouted in place from bottom to top. This operation was carried out by welding a steel plate over the top of the casing through which a 4-inch grout pipe was extended to bottom of the hole. The casing was first pumped full of clay slurry, the air being released at the top, and pure cement grout was then pumped through the 4-inch pipe to the bottom of the hole.

Sufficient pressure was maintained to force the grout up between the earth and casing from bottom to ground level so as to provide a solid and uniform cement encasement around the 18-inch casing. After the cement had set, drilling was continued for the full depth of the well, as previously determined by the test well. All strata penetrated during permanent drilling were examined and logged.

The hole below the 18-inch casing was drilled with a 17-1/2 inch rock bit to the full depth of the well. A tube consisting of 8-inch standard weight steel pipe with 8-inch shutter type silicon bronze screen sections (iron screens were used in the last wells drilled) spaced to coincide with the main water bearing strata was centered in the hole and completely enveloped with gravel. The gravel used was of 1/8 to 1/4 inch size, expecially selected and graded. The gravel was pumped into the well, with water, under 40 to 50 lbs. pressure until the space between earth and well tube (pipe and screen sections) was completely filled from bottom to ground surface. After gravelling had been completed, each well was pumped at a high rate to flush out fine sand and the clay slurry used in drilling. In many instances wells were of necessity put into operation before being fully developed, and consequently, they were not free from sand and turbidity. This type of well invariably requires a considerable amount of development before reaching its maximum rate of production and efficiency. Development consists of pumping to waste with frequent starting and stopping, the pumpage rate to be somewhat in excess of that selected for normal operation. Any well on the project which shows sand and /or turbidity should be put out of service and be properly developed before being turned into the distribution system.

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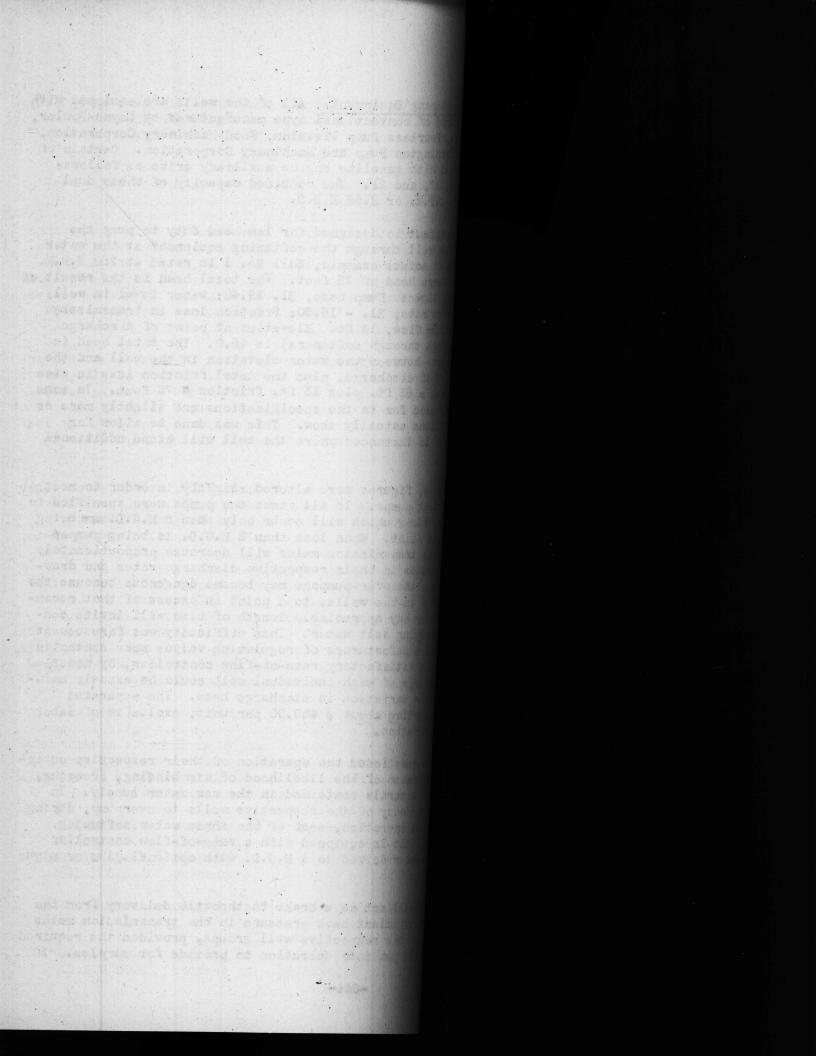
M-3.07. Well Pumping Equipment. All of the wells are equipped with deep well turbine pumps of conventional type manufactured by Layne-Bowler, Inc., Memphis, Tenn., Peerless Pump Division, Food Machinery Corporation, Canton, Ohio, and Worthington Pump and Machinery Corporation. Certain of the wells are equipped with gasoline engine auxiliary drive as follows: Nos. 1, 3, 8, 10, 13, 17, and 21. The combined capacity of these dual driven wells is 1750 G.P.M. or 2.52 M.G.D.

All of this equipment is designed for low head duty to pump the rated capacity of each well through the softening equipment at the water treatment plant. As an actual example, Well No. 1 is rated at 250 G.P.M. against a total discharge head of 75 feet. The total head is the result of fixed conditions as follows: Pump base, El. 26.40; water level in well, at 250 G.P.M. discharge rate, El. - 16.60; friction loss in transmission main at 5 M.G.D. maximum flow, 13 ft. Elevation at point of discharge (including friction loss through softeners) is 46.0. The total head is obviously the difference between the water elevation in the well and the elevation at the point of discharge, plus the total friction loss in pipe lines or - 16.0 to + 46 = 62 ft. plus 13 ft. friction = 75 feet. In some instances the heads called for in the specifications are slightly more or less than the computations actually show. This was done to allow for ground water recession in instances where the well will stand additional pumping.

In other instances, figures were altered slightly in order to meet known conditions of stock pumps. In all cases the pumps were specified to meet maximum head conditions which will occur only when 5 M.G.D. are being pumped to the treatment plant. When less than 5 M.G.D. is being pumped the friction loss in the transmission mains will decrease proportionately and the pumps will increase in their respective discharge rates and drawdown. In some instances the over-pumpage may become dangerous because the lowering of water levels in the wells, to a point in excess of that recommended, if carried on for any appreciable length of time will invite contamination by the underlying salt water. This difficulty was foreseen at the outset and numerous manufacturers of regulating valves were contacted in an effort to obtain a satisfactory rate-of-flow controller, by means of which the rate of discharge of each individual well could be exactly maintained, regardless of the variation in discharge head. The apparatus offered is expensive, costing about \$ 400.00 per unit, exclusive of labor and materials for installation.

The manufacturers questioned the operation of their respective equipment for this service because of the likelihood of air binding, freezing, and damage from sand or minerals contained in the raw water supply. In order to overcome the tendency of the respective wells to overpump, during periods of less than peak operation, each of the three water softening wits at the treatment plant is equipped with a rate-of-flow controller which will limit the water received to 1 M.G.D. with optional plus or minus variation.

These controllers will act as a brake to throttle delivery from the wells and should cause sufficient back pressure in the transmission mains to prevent overpumping of the respective well groups, provided the required number of wells are always put into operation to provide for surplus. If



there is a deficiency from the wells, for a given rate of plant operation, the controllers will remain wide open and there will be no throttling action. Recommendations for the operation of the system are described in detail under "Operation of Well System", Section M-3.11.

M-3.08. Well Transmission Mains. The entire system of wells discharge by groups into branch collecting systems leading by the shortest routes to the transmission main located along the west side of the Main Access Road. Cement-asbestos pipe has been used throughout for conveying well water, excepting the individual pump connections which are cast iron. Non-metallic pipe was selected for several reasons. It was more readily obtainable, more economical, was not a strategic material, has high initial carrying capacity and will maintain this capacity due to its non-corrosive quality. Valves and fittings in well transmission mains are cast iron, American Water Works Specification.

In general, the transmission main to the plant is capable of delivering 5 M.G.D. with a friction loss of 4.09 feet per 1000 feet of pipe, based upon C = 120, as applied to Hazen & Williams formula and hydraulic tables. This applies to the 18,825 ft. of 18-inch main from Well 13 to the treatment plant. The smaller branch mains are sized for head losses of 4 ft. or less per 1000 feet of pipe with the obvious result that the head and power to operate increases with the distance from treatment plant to a given well.

Complete details of Well Groups "A", "B", and "C", showing pipe sizes and distance between wells, together with valves and fittings, are shown on M. B. Drawings Nos. 503, 566, 567, 568, 577, and 599, respectively. Transmission of Groups "A", "B", and "C", together with all outlying areas, is shown on M. B. Drawing No. 1500.

M-3.09. Air Valves. It is the intent and recommendation to install automatic air release valves at all summits along the transmission and branch mains serving the well system as covered under Water Distribution Specification No. 501, Paragraph 31. This equipment is absolutely essential in order to maintain proper carrying capacity in the mains and branch lines. If the pipes are permitted to become air bound the friction head will increase to the point where the flow will be greatly curtailed.

M-3.10. Remote Control of Wells. The individual wells, for the purpose of efficient operation, are sub-grouped to produce water in increments of 1 M.G.D. Each sub-group is controlled by an electric carrier wave circuit operated from the main treatment plant. The carrier wave circuits are specified to operate as follows: Well Group "A" consisting of ten wells is sub-grouped to operate on four independent circuits, namely -

Circuit N	10.	1	Wells 3,	2.	and	10	+	a nnaduaa	0 070	
Circuit N	IO .		Wells 1,					o produce	0.936 M.G.D.	
Circuit N		_					t	o produce	0.936 M.G.D.	
			Wells 8,	5,	and	9		o produce	1.008 M.G.D.	
Circuit N	0.	4	Well No.	4						
							U U	o produce	0.216 M.G.D.	

Well Group "B" consisting of six wells is sub-grouped to operate on three independent circuits, namely -

Circuit No. 5 Wells 11, 13, and 15 to produce 1.08 Mells 12, 14 and 16 to produce 1.08 Mells 12, 14 and 18 to produce 1.08 Mells 14 and 18	M.G.D. M.G.D.	
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 This schedule was prepared before the wells in Group "C" were drilled, and developed, therefore the manner of remote control grouping cannot be determined at this time. Final development of wells in Groups "A" and "B" has not been completed. For these reasons it is probable that the schedule for these groups as shown will be subject to revision as to grouping, etc.

Attention is called to the fact that the wells are sub-grouped in such manner as will provide for the widest consistent spacing between individual units. This for the purpose of avoiding concentrated pumping over any given area and to spread the draw-off to as large an area as practicable.

Technical data covering the carrier wave circuits is contained in Specification No. 509.

The location of wells and schedules of remote control are also shown on M. B. Drawing No. 1500.

M-3.11. Operation of Well System. The exact operation of the well system, which will eventually include 21 units in Well Groups "A", "B", and "C" can be established only after the system has been in operation for a sufficient length of time to determine the actual characteristics of the various well groups, sub-groups, and individual wells. The chemical characteristics of any given sub-group, main group or combination of groups is very important and must be carefully determined and recorded at the beginning of the operation. The chemical characteristics must be checked carefully thereafter at frequent intervals for proper control of the softening plant and treatment process.

The following suggestions and recommendations are offered to assist those who will have charge of the well supply.

Before going into specific details, it is appropriate to point out that the water system is an extremely important utility and accordingly, it deserves the most careful and painstaking operation and maintenance. Only men who are thoroughly qualified by prior experience to obtain the best possible operating results and efficiency should be assigned to operate this utility, as by no other meanscan the desired results be obtained.

M-3.12. Adjustment of Pumpage Rate and Drawdown. The first important adjustment to be made is the regulation of each well in any particular group or sub-group to discharge its rated capacity at the recommended drawdown. The drawdown should be held to safe limits, meaning that where the well log shows, say -33.0 as the drawdown elevation for Well No. 3 when pumping 250 G.P.M., the water level should in this case not be drawn down to a lower level as this particular well is situated near New River where contamination by salt water is much more likely to occur than in some other well which is located further away from salt water. Accordingly, the final adjustment of each well in a given group should be based upon common sense practice with regard to the physical conditions as existing at the time the adjustment is made. It is entirely possible that recession of ground water level, caused by drought or pumping, may necessitate periodic changes in rates of pumpage wherein some of the wells may be throttled to less discharge while others may be increased. the vicest dust the wells are unbergeous for a well for the vicest consistent static netween for vital pose of violding screeningted pumping of a say 1 the rest-off to as large an area preciselies of the rest-off to as large an area of the to a set to a s

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As a basis for final adjustment of the individual wells, it should be noted that the water softeners and filters at the main plant are in 1 M.G.D. wits with a total capacity of 3 M.G.D. Accordingly, the remote control circuits, previously described, are arranged to supply water to the plant in 1 M.G. increments.

The operation of the wells and treatment plant should be at 1, 2 or 3 million gallons per day and no attempt should be made to split the operation into fractions of the stated increments.

The regulation of wells for maximum drawdown and rates of discharge is closely correlated with the operation of the treatment plant from several important standpoints; namely, the friction loss within the pipe lines at various rates of flow will vary considerably depending upon how the threewell sub-groups, each furnishing 1 M.G.D., are combined in order to supply 1 M.G.D., 2 M.G.D. or 3 M.G.D. The friction loss, in turn, will be an appreciable part of the total discharge head of a given pump and will greatly influence its adjustment. Therefore, all pump adjustments must be made in accordance with a definite prearranged program of plant operation. For example, in Well Group "A" there are 3 sub-groups each capable of delivering 1 M.G.D. and one well by itself which will deliver 0.216 M.G.D. The first step in well regulation will be to select a sub-group to deliver 1 M.G.D. through the treatment plant.

Select Circuit No. 1, Wells 2, 3, and 10 and regulate each discharge valve so that the maximum recommended drawdown is exceeded by, say, 3 feet. This is necessary as the friction loss will increase when 2 or 3 M.G.D. are being delivered. Next turn on Circuit No. 2, Wells 1, 7, and 6 to deliver 2 M.G.D. to the plant, and adjust each discharge valve to exceed the recommended drawdown by, say, 2 feet. Check wells 2, 3, and 10, Circuit No. 1, and note carefully the drawdown which occurs with 2 M.G.D. rate of discharge, plus or minus, as indicated by the plant meter. Repeat the entire operation for Well Circuit No. 3 and note the drawdown produced in all of wells with a discharge rate of 3 M.G.D. Any deficiency in flow, regardless of whether 1, 2, or 3 M.G.D. is being pumped, can be augmented by Well No. 4 on Circuit No. 4.

The above routine must be carried out in substance for Well Group "B" and also for Group "C" when the same is completed.

The example above cited, for Group "A", is given for the purpose of explaining the general procedure for the regulation of wells, in order to secure proper operating results. At the date of writing this report the treatment plant is incomplete as is Well Group "C", and the transmission main thereto. It is probable that final development of wells in Groups "A" and "B" will require readjustment of grouping in those groups. Accordingly, it is impossible at this time to give explicit directions for well regulation. The procedure given is for general guidance only and it may be entirely possible after the system is put into operation to improve upon the yield and drawdown conditions as above stated.

The other important correlation between the well system and treatment plant is the determination, by chemical analyses, of the quality of water discharged from each circuited sub-group of wells and the combining of these animant of the individual wells, it should be and filters at the main plant aso in 110.0.0. 3.9.0. Accordingly, the remote control case arranged to supply water to the plant

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a the well system and trustment. Lynne, of the quality of water wells and the contacted of these groups to give water of the most uniform quality regardless of whether 1 M.G.D., 2 M.G.D or 3 M.G.D. is being pumped. This procedure may involve departure from the example cited for the regulation of wells in Group "A", but regardless of how the combinations are finally made, it is of great importance that the plant operation be definitely scheduled so that the the chemical characteristics of the water will remain as nearly uniform as possible. It is obvious that if the plant operator knows beforehand the chemical characteristics of the water produced by the various combinations of well sub-groups that he can immediately set his chemical feed equipment to deliver proper dosage to the softeners for any given rate of flow from 1 to 3 million gallons per day. It is always anticipated that slight changes in chemical dosage will have to be made from time to time due to variation in the characteristics of the well water and in the quality of the chemicals purchased. However, such manipulation is a part of daily routine control common to every treatment plant of this type.

M-3.13. Water Storage, Treatment and Pumping Plant. The water treatment plant for the Division Training Area is designed to produce a total of 3 million gallons per day of softened filtered water.

An evaluation of the types of softening equipment considered for this application together with conclusions and recommendations, is fully contained in report dated October 3, 1941, to the Resident Officer in Charge. This report is repeated below to such extent as is necessary to give a clear description of the basic facts which governed the plant design and the selection of equipment.

"The characteristics of the well supply have not been known prior to analysis made October 2, 1941, from Well No. 1 located on the northwest side of the Main Access Road near Cedar Street. Analysis from prior wells, in this area, showed widely varying mineral content and, inasmuch as the waterbearing formations and depths were also materially different from the formations and depths selected for the new permanent wells, the old analyses were discarded as being too uncertain. Analyses, as above indicated, secured from the two new permanent wells, one located within the Low Cost Housing Area and the other near the Supply Area, show objectionable features as follows: Iron, 0.70 p.p.m; soap hardness, 180 p.p.m. "

"Observations of other wells within this vicinity indicate that the iron content will vary with drawdown and rainfall. We are of the opinion that an average of 2 to 3 p.p.m. of iron will be prevalent and that provision for its removal will be absolutely necessary. Iron content in excess of 0.20 p.p.m. is generally objectionable. The soap hardness is due almost entirely to 190 p.p.m. of bicarbonates in which calcium greatly predominates."

"For general domestic use a hardness of 5 grains (86 p.p.m.) is considered satisfactory. For the various activities connected with the Marine Barracks such as boiler plant, ice making, laundry, and perhaps the hospital, it is definitely certain that treated water will be required. It is : believed that treatment to remove iron to 0.2 p.p.m., or lower, and to remove hardness to a remaining value of 4 to 5 grains per gallon, will be satisfactory for laundry and ice making. If additional treatment is required for these activities, it can be installed and operated at very much lower cost than would be the case with water of original hardness." Mas show of wells of wells in Grade "A" the water will remain as nearly will be as light plant, operator interes beforely and the additioned for any river rate of fiow from adults that betagleltas segulated the

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"The boiler plant will unquestionably require water with less mineral content than that contemplated for general use. Again the cost of installing and operating equipment for final de-mineralization will be very much cheaper and more satisfactory with pre-treated water containing 4 to 5 grains of hardness."

"As a gauge for determining the saving effected by softening, Faulk's formula is generally used, wherein the amount of soap required to reduce the hardness of 1000 gallons of water one part per million is 0.2 lbs. In actual practice it has been found that the amount of water softened by soap amounts to 1.2 gallons per capita per day. Water softened from 180 to 80 p.p.m., or 100 g.p.m. removed, would represent a saving of 300 pounds of soap per day, or \$30.00 at 10 cents per pound. This is equivalent to \$11,000.00 annually."

"As previously stated, it will unquestionably be necessary to remove the iron content regardless of what additional treatment is provided for general or special purposes."

"In order to draw comparison between the various treatment processes and their respective construction and operating costs, the following figures are given. These figures represent the cost of bare equipment and structures of 3 M.G.D. capacity applicable to the respective processes and do not represent final cost of completed plants.

. Iron Removal Alone.

Aeration, chemical flocculation, sedimentation, and filtration.

Estimated cost of structures & equipment Operating cost per M.G. (chemicals only)

\$ 26,000.00 4.00

2. Combined Softening & Iron Removal

Lime-Soda Process

Aeration, chemical precipitation, filtration, sludge drying beds.

Estimated cost of structures & equipment \$ 38,100.00 Operating cost per M.G. (chemicals only) 9.00

5. Combined Softening & Iron Removal

Catalytic Process

Aeration, chemical conditioning, catalytic contact chamber, filtration, removal of inert waste material.

Estimated cost of structures & equipment 25,600.00 Operating cost per M.G. (chemicals only) 7.10

4. Combined Softening & Iron Removal

Zeolite Process

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This process would mix completely softened water with unsoftened water in a ratio of about 3 to 1 in order to obtain 80 p.p.m. final hardness.

Aeration, chemical flocculation, sedimentation & filtration for 1/3 of supply (1 M.G.D.). Zeolite for 2/3 of supply (2 M.G.D.)

Estimated cost of structures & equipment \$ 37,000.00 Operating cost per M.G. (chemicals only) 23.50

All of the treatment processes are based upon analyses of water samples which are as representative as can be secured at this time. It is entirely possible that the mineral content may vary somewhat in the wells which are drilled for permanent use, but it is obviously impossible to postpone construction of the main plant while more wells are being drilled.

The following data shows mineral content of raw well water and estimated values after softening; results in parts per million.

		me-Soda ocess No.2	Catalytic Process No. 3	Zeolite Process No. 4
Total Hardness as				
CaCoz	180	.68	68	68
Calcium	172	61	61	57
Magnesium	8	7	7	3
Methyl Orange Alk.	194	74	66	214
Phenolpthalein "	0	15	15	5
Caustic "	0	0	0	0
Free CO ₂	20 to 30	0	0 .	Ó
pH	7.2 to 7.7	9.4	9.4	8.4
Iron	0.7 to 3.0	0.1	0.1	0.1

The iron removal process is not shown as no added results will be accomplished.

Conclusions and Recommendations

Water served without treatment, other than aeration, will be very objectionable because of the iron content and will be well below accepted standards. A water treatment plant for iron removal alone will cost just about the same as a combined softening and iron removal plant of the catalytic type, namely, \$ 26,000. The standard lime-soda process will accomplish softening and iron removal at considerably higher installation cost, namely, \$ 38,000. This process has a decided disadvantage in that 10,000 gallons of lime sludge must be disposed of daily. This material cannot be flushed into the sewage system nor into New River. Disposal is generally accomplished by wasting into a lagoon, a flowing stream, or upon barren land. There is no such space available near this plant and the waste material would have to be hauled by tank truck to a suitable dumping ground.

Softening and iron removal by Zeolite is the most compact and the cleanest method to operate. The initial cost will be about \$ 37,000 or the same as for the lime-soda. The operating cost of this method is very high as shown below.

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notor imiela regista della The catalytic process will soften the supply to the required degree and remove the iron at the same time. The construction cost will be about \$ 26,000.00.

This process while comparatively new in this country has been used in Europe over a period of years, with great success. It is compact, the initial cost is low and it is believed that its worth has been sufficiently well established for acceptance wherever applicable. The operating cost is lower than for other comparable processes. The daily sludge output will amount to approximately 70 cu. ft. of coated catalyst which readily drains and can be hauled by dump truck to the point of disposal.

The estimated operating cost of the various processes for chemicals alone, per million gallons and annually, based upon an average consumption of 1.5 M.G.D., is as follows:

Iron Removal \$ 4.00 per million gallons; \$ 2200.00 annually.

Lime-Soda Softening plus Iron Removal \$9.30 per million gallons; \$ 5000.00 annually.

Zeolite Softening plus Iron Removal \$ 23.00 per million gallons; \$ 12,600 annually.

Catalytic Softening plus Iron Removal, \$ 7.10 per million gallons; \$ 3900.00 annually.

It is recommended that combined softening and iron removal be provided for the general water supply and that the specifications be prepared to permit bids on both Lime-Soda Softening and Catalytic Softening.

This recommendation carries with it a complete filtration plant of the rapid sand gravity type, this equipment being a necessary part of any of the processes specified. "

The Water Treatment Plant and Main High Lift Fumping Station includes water softening units, filters, main high lift pumping station, and a concrete ground storage tank of 800,000 gallons capacity, and is so designod that under normal operation, raw water entering the plant will pass successively through softening units, thence to filters, with filtered water effluent discharging into the 800,000 gallon clear water storage tank, from which point it will be discharge through high lift pumps into the main distribution system. If necessary, raw well water may be by-passed directly to the 800,000 gallon storage tank without passing through the building proper, and from that point discharged into main distribution system by high lift pumps as above noted. It will also be possible to by-pass the 800,000 gallon tank and furnish either raw water, treated water, or filtered water directly to the high lift pump for distribution, thereby permitting the storage basin to be put out of operation without shutdown of plant.

Raw water pumped from the wells passes through a 16-inch venturi meter located adjacent to the southwest wall of the Spiractor pit. The register-indicator-recorder is located on the balcony of the main pump room adjacent to the space selected for the remote control panel from which the

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wells will be operated. This equipment was furnished by the International Filter Company under Specification 502, Advance Specification "D", dated January 16, 1942. From the venturi meter the flow passes through a header and is distributed to the bottom inlets of each of the three Spiractor softening units. Each unit is equipped with rate-of-flow controller and a manometer type flow indicator. The incoming water is dosed with lime slurry at the inlet to each softener, through plunger type pumps especially designed for positive regulation of discharge whereby the dosage can be varied over a wide range by adjusting the length of stroke. Four pumps are provided, one for each softening unit and one standby. The suction and discharge piping are arranged to give various combinations of operation between the lime slurry tanks and softeners. Also to provide for taking units out of service without interrupting the plant operation. The lime slurry is prepared in steel tanks equipped with agitators, dust evacuators, steam lines for heating, gauges, and meters. Two complete mixing and agitating units are provided, each unit consisting of two tanks, one placed above the other. This arrangement permits the use of either stone lime or hydrated lime and also provides for ample peak capacity and standby. For normal operation the high level tanks are charged with either stone or hydrated lime and water to produce approximately a 5% slurry. This mixture is fed by gravity into the lower tanks and thence to the chemical feed pumps.

Each tank has a capacity of 1364 gallons, containing about 568 pounds of lime, sufficient to treat one-half million gallons, or two million gallons total for the four tanks.

Each Spiractor is to be charged with from 385 to 400 cubic feet of finely granulated calcite which forms the catalytic medium through which the well water passes upward with decreasing velocity and flows to the recarbonation tank and thence to the filters.

A concrete recarbonation tank with a total capacity of 2550 cubic feet has been provided because it was not known in advance whether or not this treatment would be required to reduce excess calcium brought over from the softening process. This question was fully discussed by letter of June 23, 1942, addressed to the Officer in Charge and it was decided to construct the tank but not to purchase recarbonation equipment until found necessary. The tank will provide for alternate chemical treatment and has otherwise proven indispensible in trapping material carried over from the softening units, thus eliminating undesirable material from the filter beds.

The softening process by this method is accomplished through the catalystic medium upon which the calcium and magnesium compounds build up as hard crystalline shells thus gradually enlarging each grain of calcite to the point where they gravitate to the bottom of the container and are drawn off periodically as waste material. Fresh calcite is added at intervals to the top of the bed to maintain proper depth and volume.

The equipment above described was furnished by The Permutit Company of New York City under Specification No. 502, Advance Specification "C".

After softening, the water passes through three typical rapid sand filters, each of 1 M.G.D. nominal capacity. These filters are orthodox in construction and are equipped in the usual manner with operating tables, rate of flow controllers, and gauges to indicate loss of head and rate of

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Filters are back-washed by means of a pump which is designed to deliver 6300 gallons per minute against 40 ft. total discharge head, equivalent to 2.4 ft. vertical rise per minute. This equipment was furnished by American Well Works, Aurora, Illinois, under Specification 502, Advance Specification "F". An auxiliary 12-inch wash water line is provided for emergency use. This line takes off of the post distribution system at standard pressure of about 60 lbs.

Filtered water is conveyed by an effluent header valved so that it will flow into the 800,000 gallon storage tank or directly to the pump suction header.

The piping in the gallery is so arranged that the softening units can be by-passed or both the filters and the softeners can be by-passed should an emergency make this necessary.

An overflow is provided on the main which conveys softened water to the filters so that any excess caused by clogged filters, faulty valves or controllers will automatically be wasted to the sewer and will not flood the building.

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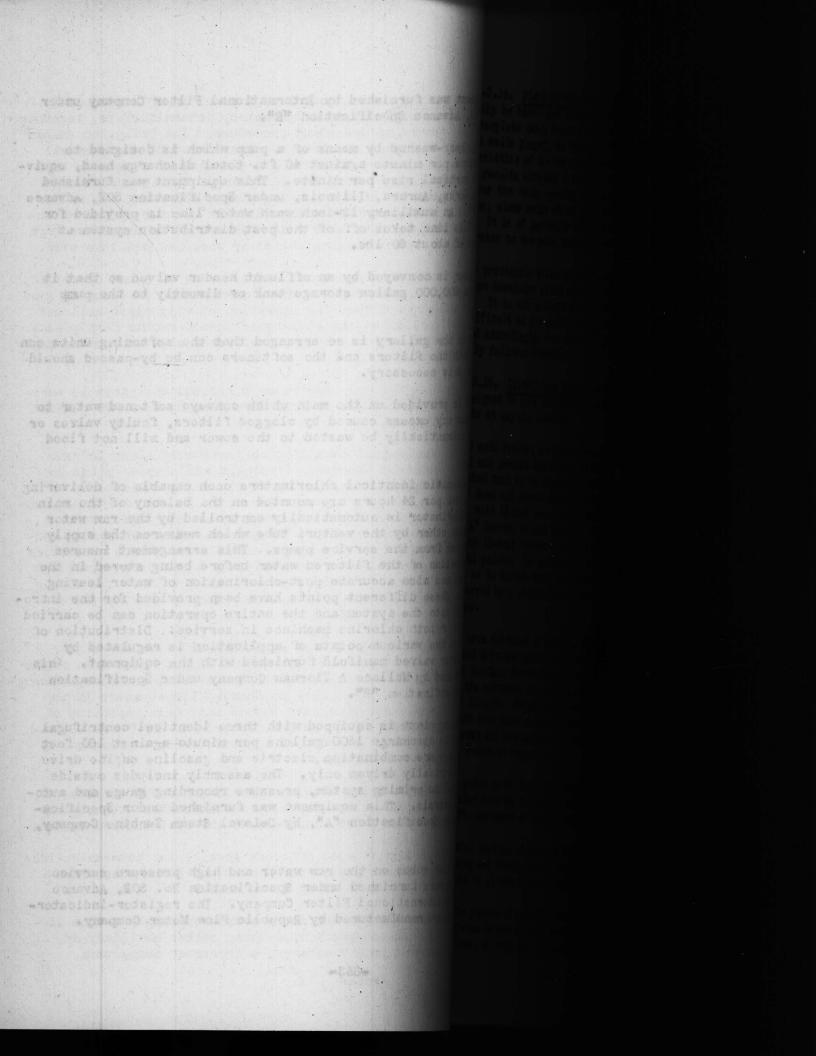
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Two fully automatic identical chlorinators each capable of delivering a maximum of 100 lbs. per 24 hours are mounted on the balcony of the main pump room. One chlorinator is automatically controlled by the raw water venturi tube and the other by the venturi tube which measures the supply going into the system from the service pumps. This arrangement insures accurate prechlorination of the filtered water before being stored in the 800,000 gallon tank and also accurate post-chlorination of water leaving the service pumps. These different points have been provided for the introduction of chlorine into the system and the entire operation can be carried out with either one or both chlorine machines in service. Distribution of chlorine solution to the various points of application is regulated by means of a hard rubber valved manifold furnished with the equipment. This equipment was furnished by Wallace & Tiernan Company under Specification Wo. 502, Advance Specification "B".

The main pumping plant is equipped with three identical centrifugal pumps each designed to discharge 1500 gallons per minute against 160 feet total head. Two pumps are combination electric and gasoline engine drive and one unit is electrically driven only. The assembly includes outside fuel tank, hand gasoline priming system, pressure recording gauge and automatic water level controls. This equipment was furnished under Specification No. 502, Advance Specification "A", by DeLaval Steam Turbine Company, Trenton, N. J.

The venturi meter tubes on the raw water and high pressure service lines, respectively, were furnished under Specification No. 502, Advance Specification "D" by International Filter Company. The register-indicatorrecorder instruments are manufactured by Republic Flow Meter Company.



M-3.14. Plant Control. The control of a plant of this kind must invariably be based upon carefully made laboratory determinations, together with a complete daily record of operating procedure. The daily log should show the wells pumped, the total quantity of water treated, the chemical characteristics of the raw water, the kind and quantity of chemicals used and the results obtained in softening and filtering. This record should also cover the daily operation of the pumping plant, chlorination, filter operation, clear water storage and all other details whether normal or abnormal. It is of particular importance that this record be passed on from one operator to the next, when changing shifts or when new men take over.

As previously stated the comprehensive scheduling of plant operation, based upon knowledge gained each day, is the surest method of securing good results. It is not anticipated that the operation of this plant will not prove difficult as the quality of the well water should remain fairly constant and accordingly, when once correctly established a given routine can be closely followed thereafter.

M-3.15. Distribution System. The water distribution system is carefully designed to give adequate domestic and fire flow up to 2,000 gallons per minute at any one location.

The main feeders are 12-inch extending northeasterly along Holcomb Boulevard and Service Road from the water treatment and pumping plant to the elevated tank in the Supply Area, northwesterly and southeasterly in the River Road and Service Road throughout the entire length of the Regimental Area, with 12-inch cross connections between River Road and Service Road at "A" Street, Holcomb Boulevard and "N" Street. The grid system connecting the 12-inch feeders is of 8-inch pipe with 6- and 8-inch crossovers at critical points. The entire system is completely looped and valves are placed so as to isolate breaks or other faults to small areas. The Supply Area is served by a 12-inch feeder with completely looped grid system of 8-inch pipe.

The area northwest of Wallace Creek, including all sections of the Commissioned Officers Quarters Area, is served by a 12-inch cast iron feeder main along the Main Service Road and by trestle across Wallace Creek, thence following the northeast side of River Road to Charles Street where it is reduced to 10-inch. The main feeder system beyond this point consists of 10-inch cast iron lines on River Road, Autumn Circle, St. Mary's Drive, and Charles Street and is completely looped with adequate cross connections of 6-inch and 8-inch at frequent intervals.

At a point on St. Mary's Drive between Carroll and Cecil Streets, a 12-inch feeder from the 200,000 gallon capacity elevated steel tank, lying about 600 ft. northeast of this point, connects to the distribution system.

Isolated sections of Commissioned Officers Area, lying between Wallace Greek crossing and Charles Street are serviced by 6 and 8-inch cast iron lines, looped to 12-inch feeder main along River Road.

For the purpose of providing a temporary source of supply to the distribution system in case of an emergency, and using either auxiliary or electric driven, or both, well pump discharge, a crossover connection, talizespe , scale almostab (scale to be a the most light Taugha goi gited all . . atubesting scitements to anosh the a president of the preside state shift hat is it if the ada to laborad abroad alletes reste ile bas epirode rate archeeler impartance that this require to have de from insideren theid lo grifussion evidentic and totats a been any, is the second and an an and the form stan illy parts and to conserve and this plant will not Smooles jacks virusaandtant pathraits doni-si ana ave acculate Bond throughout the entities langth of the Reptions. an arose since lone hotreen Biver Lond and Sorvives instructions had as had with the and the second a south the second of a levie of the second of the levies of the second seaton River abed, automi Circle, 97. Cary's Indres, en To any looped with stepsets arise concertings of and the ball of the second of the state of all the state of a second of a state of the second of the is and itsel the serviced by 6 and 9-mail deat in an to stalltais telle and loin and total a data

properly valved, has been made at the intersection of Holcomb Boulevard and Cypress Street. Of 12-inch cast iron, this connection permits discharge from the 18-inch asbestos-cement well water transmission main along Holcomb Boulevard into the main 12-inch feeder line on the distribution system at that point. Since the head against which the well pumps are designed to discharge is considerably lower than that against which the high lift pumps feeding the elevated tanks on distribution system are designed to discharge, the use of this crossover would result in a definite pressure loss over the entire distribution system, and should be used only in an emergency and for a very short period.

A second cross-over connection of 12-inch cast iron properly valved, is installed between the 12-inch asbestos-cement well water transmission main and the 12-inch cast iron main in the distribution system at the corner of Cypress Street and Michael Street and for the same purpose and limitations as noted above.

Elevated storage and working pressure is supplied by three identical steel tanks each of 300,000 gallons capacity, one located in the Supply Area, the second to the east of Regimental Area 1 and the third to the east of Regimental Area 5, and a 200,000 gallons capacity tank in the Officers Quarters Area. The overflows of all four tanks are approximately at Elevation 160.00.

With tanks so spaced and the main pumping plant in the center of the entire activity, an ideal arrangement is secured for the most efficient and effective operation under all circumstances.

All distribution pipe lines are of Class 150, cast iron with A.W.W.A. standard valves and fittings. Fire hydrants are of the compression type, and meet all requirements of A.W.W.A. and the National Board of Fire Underwriters. The distribution system is covered under Specification No. 501.

M-3.16. Emergency High-lift Fumping Station. As an emergency means for furnishing water to the main distribution system, an emergency high lift pumping station utilizing raw water from the wells, has been provided. This unit located at the intersection of Holcomb Boulevard and Post Lane consists of a concrete ground storage tank of 60,000 gallons capacity and a pumping station equipped with a gasoline engine driven centrifugal pump of 2100 G.P.M. capacity, capable of pumping slightly more than 3 M.G.D. against a maximum discharge head of 160 feet.

As designed, the concrete storage tank will act as a receiving basin for raw water from the wells and will be equipped with a float operated shut off value on the influent line from wells. By means of a cable operating from a second float within the storage tank, the gasoline engine driven high lift pump will be regulated so that while the unit is in operation, the water level in the tank will not fall below a predetermined safe level. It is the intent to empty the concrete ground storage tank after each operation, and this can be accomplished manually by drawing down with the high lift pump to the point desired. Final draining of tank is to be accomplished by use of an automatic sump pump. This sump pump is installed primarily for the purpose of draining the pump room and areaway outside of building as well as draining the manhole containing equipment installed for measuring the discharge from the high lift pump.

M-4. Midway Park Reside

M-4.01. Design. based upon 700 housing un water consumption was cell gallons with a peak flow maximum. For fire, 760 pu pumps in operation and bu

drilled by rotary process

Well No. 1 is loose Luray Courts. This well h at elevation 16.8, ground elevation -8.0. Pumpler tric driven turbine pumpler head.

Woll No. 2 is in Browity Courts. This elevation 17.50, ground -8.5. Pumping equiper Peorless vortical technology head.

M-4.03, Tre Tiernan water open cally regulate dam charge main.

M-4.04. Auto water lovel control Minn., which started ated tank. Well Do

H-4.05, Hold bution system earlier ing for the fall was gride, all consider

The gate is supplied from 65 Both wells dieder tion was given by A.W.W.A. spelfbol sign type ruth per

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M-4. Midway Park Residential Area.

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M-4.01. Design. The design of water utilities for Midway Park was based upon 700 housing units with a total population of 3,000. The normal water consumption was estimated at 60 gallons per capita per day or 180,000 gallons with a peak flow of 100 gallons per capita per day or 300,000 gallons maximum. For fire, 750 gallons per minute will be available without the pumps in operation and 1000 gallons per minute or more with pumps running.

M-4.02. Supply. Two wells designated as L.C.H. Nos. 1 and 2 were drilled by rotary process by Layne-Atlantic Company and finished with gravel packed screens.

Well No. 1 is located just north of Highway # 24 between Swiss and Luray Courts. This well has a total depth of 125 feet, static water level at elevation 16.8, ground surface elevation 32.8 and drawdown at 300 g.p.m. elevation -8.0. Pumping equipment consists of Layne-Bowler deep well electric driven turbine pump rated 300 g.p.m. against 170 ft. total discharge head.

Well No. 2 is located just north of Highway # 24 between Yard and Brevity Courts. This well has a total depth of 145 feet, static water level elevation 17.50, ground elevation 41.21, drawdown at 300 g.p.m. elevation -8.5. Pumping equipment consists of dual electric and gasoline engine drive Peerless vertical turbine pump rated 300 g.p.m. against 183 feet discharge head.

M-4.03. Treatment. No treatment is provided except by Wallace and Tiernan water operated hypochlorinators, one on each well, which automatically regulate dosage of hypochlorite solution and injects same into discharge main.

M-4.04. Automatic Controls. Well No. 1 is equipped with an automatic water level controller furnished by Automatic Control Company, St. Paul, Minn., which starts and stops the pump at predetermined levels in the elevated tank. Well No. 2 is operated manually.

M-4.05. Well Transmission Mains and Distribution System. The distribution system consists essentially of two parallel 8-inch pipe lines extending for the full length of the development, one on either side, with 6-inch grids, all completely looped.

The gate house at the main entrance to the Division Training Area is supplied from this system by a 6-inch main crossing State Highway No. 24. Both wells discharge directly into the distribution system and no authorization was given to consider treatment. Pipe is Class 150 cast iron with A.W.W.A. specification gate valves and fittings. Fire hydrants are compression type fully approved by Fire Underwriters.

M-4.06. Elevated Storage. An elevated steel water tank of 200,000 gallons capacity on 100 ft. tower located north of Butler Drive just east of Polk Court, with capacity line at elevation 161.16 furnishes storage and working pressure of 50 lbs. The tank was furnished and erected by R. D. Cole Company.

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150 pela is equip was pres works to protuction M-4.07. Future Water Treatment. Chemical analyses from these wells show an average hardness of 220 p.p.m. and Iron about 2 p.p.m. Well No. 2 contains Hydrogen Sulphide gas to a noticeable degree, while in Well No. 1 it is barely perceptible. The supply is potable and is typical of this area. The hardness and Iron content both exceed accepted standards for most municipalities, but as compared with many public water supplies within the Coastal Plain, this one is better than the average.

If treatment is considered at a later date, it must include aeration, softening and iron removal, both by the same process, and filtration followed by chlorination.

Two schemes are possible, one to provide a separate treatment plant, of the pressure type, at each well and the other to lay separate transmission mains from each well to a central treatment and pumping plant. In the latter case the existing pumps would be changed from high to low left and in general the cost would be appreciably more than for two separate pressure plants. The central plant idea is more desirable and has greater possibilities for more efficient and economical operation.

M-5. Mumford Point Camp No. 1.

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M-5.01. Design. The original design of water utilities for this area was based upon a total population of 1500 men, with normal consumption 100 gallons per capita per day or a total of 150,000 gallons per day. Fire demand was figured at 500 gallons per minute.

This camp was of temporary nature and the design was made with due consideration toward economy.

M-5.02. Supply. The supply is derived from two wells drilled by the Layne-Atlantic Company by rotary process.

Well "Z" located on the west side of the access road opposite the gate house, is equipped with gravel packed screen as described for wells in the Division Training Area. The total depth is 100 feet, the yield was originally 150 gallons per minute with drawdown at Elevation - 20.67. The ground elevation is 20.94 and the static water level, elevation + 2.44.

Pumping equipment consists of a Layne-Bowler deep well turbine, rated 150 gallons per minute against 139 feet total discharge head. This unit is equipped with both electric motor and gasoline engine drive. The well was greatly overpumped and excessive drawdown was maintained for several weeks throughout the period of camp construction. As a consequence, it produced sand in appreciable amounts and probably suffered permanent damage to the gravel envelope. However, at the present time it is discharging at the rate of 120 gallons per minute, equivalent to 173,000 gallons per day without sand or other difficulty.

Well "2-1" is located on the southwest side of Mumford Landing Road about 600 feet west of the elevated water tank. The total depth is 65 feet, the yield 100 gallons per minute at drawdown elevation -26.00, the ground elevation is 18.50 and static water level elevation 7.00. a considered as a later date, it must include earation.

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This well differs in construction from the gravel packed type in that no 18-inch pit casing or screen was used. Departure from standard construction was made because the underground waterbearing stratum consisted of pervious shell rock without the usual layers of sand. Accordingly, an 18inch hole was drilled to the full depth of the well and an 8-inch steel tube was set and cemented in to top of the shell rock at elevation - 33.50, leaving 31.5 feet of open 18-inch hole from which the supply is derived. Pumping equipment consists of a Layne-Bowler deep well turbine pump, rated 100 gallons per minute against 141.0 feet total discharge head.

M-503. Treatment. No treatment is provided other than sterilization with chlorine by electrically driven- manually controlled hypochlorinator, furnished by Wallace and Tiernan Company for Well "Z" only. It is understood that a chlorinator will be authorized for installation on Well "Z-1".

M-5.04. Automatic Controls. One automatic water level controller has been installed on Well "Z" to maintain predetermined levels in the elevated tank. This instrument was furnished by Automatic Control Company of St. Paul, Minn.

M-5.05. Well Transmission Mains and Distribution System. The distribution system consists essentially of a 6-inch feeder main from Well "Z" along the Access Road, through Camp No. 1 to the elevated tank and thence to the original tent camp located on the River. Both wells discharge directly into the distribution system. Pipe lines are of Class 150 cast iron pipe with A.W.W.A. valves and special castings. Fire hydrants are of the compression type as described for the other areas except that four 4-inch hydrants were installed where the branch lines are of this diameter.

M-5.06. Elevated Storage. One elevated wood stave tank of 40,000 gallons capacity on a steel tower with overflow at elevation 109.30 is located 150 feet south of intersection of Neuse and Roanoke Roads. This tank is 89 feet above average ground elevation, 20.0, and provides 35 pounds working pressure.

M-5.07. Future Treatment. The supply derived from Wells "Z" and "Z-1" according to the original analysis, is very hard and has objectionable Iron content. This water while potable may be discolored at times due to the precipitation of Iron. Due to the temporary nature of the camp, no further treatment is recommended at this time.

M-6. Barrage Balloon Area.

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M-6.01. Design. The original design of water utilities for this area was based upon a population of 1500 men with normal consumption of 120 gallons per capita per day equivalent to 180,000 gallons per day. Demand for fire fighting purposes was estimated at 1000 gallons per minute. The source of supply from wells is based upon Report of October 3, 1941.

M-6.02. Development of Supply. Two wells, designated as "V" and "W" drilled by rotary process by Layne-Atlantic Company, are of the gravel packed type, as specified for the Division Training Area. Well "V", located on the east side of Marine Road about 1450 feet south of Sneads Ferry Road, has a total depth of 62 feet and produces 200 G.P.M. with drawdown at elevation -12.20. Ground surface is at elevation 17.8 and static water level + 7.8. the differs in construction from the gravel parted type in that the differs in construction from the from standard an structure brance the adder found anterbacting structure constructed of rock atthout the scall basers of same. Accordingly, an 10billed to the full septh of the welk and an 0-inch sheet a constant a to top of the she half fort at viewating - 35.20. annute a class 101.0 feet Loval discharge head a shunde antered. The breakent is provided other than starilization autorized by driver man analy don troited by donia to Lies and lievess Company for Well "2" only. it is anderseriestor will be superised for installation on Well Maria Alemania Controlet One actomatic water level ognitediate this instrument was furnished by Automatic Control Company all Transmission Maine and Distribution System, The distri-audits estonishing of a S-inon freedor and from Wall 22* allid. through Camp No. 1 to the elevated tank and thente the man losetod on the River. Port weils distingthe dire lation system. Fips lines are of Class 250 cost from and to end special castings. Fire hydrants are of the an dimoribed for the ption areas axient that four 4-inch willes where the branch lizes are of this diameter, Imaked Storage. One elevated wood stave tank of 40,000 that officer total and the mainswork in the second include and stat intersection of Hours and Remarks Roaders This showed as another along all and provides as pounds ire freatmost. The supply derived from Wells "2" and at make walls potable may be discolored at times \$20 to of track . Doo to the temperary mature of the carpino seal and required and 100,000 galiade per day of the Sat paradas was arbitrated at 1000 gallons for minuta. in right is reduced in trong in and is decher 3. 1941: ... and has ave as betangles, designated as "ye and "he server as never at lantic. Company, and of the dravel cack-That and another 200 C.P. M. with Straduck at Shevating and is at algorithm if.8 and static water lovel + 7.8.

Pumping equipment consists of a Peerless deep well turbine pump rated at 200 G.P.M. against 160 ft. total discharge head, with a pump head equipped for both electric and gasoline engine drive. As installed, an electric drive only is provided.

Well "W", located on the east side of Marine Road about 2450 feet south of Sneads Ferry Road, is of the same type of construction as Well "V" and has a total depth of 60 feet. It produces 150 G.P.M. with drawdown at Elevation - 23.00. The ground elevation is 13.00 and static water level * 7.0. Pumping equipment consists of a Layne-Bowler deep well turbine provided with both electric and gasoline engine drive, rated at 150 G.P.M. against 170 ft. total discharge head.

Both wells produce potable water which however may become objectionable because of high mineral content. This matter is more fully discussed under "Future Water Treatment", paragraph 6.07.

M-6.03. Present Treatment. No treatment is provided except chlorination at both wells by means of Wallace & Tiernan water driven automatically controlled hypochlorinators.

M-6.04. Automatic Controls. One automatic water level controller has been installed to start and stop Well "V" at predetermined high and low water levels. This equipment was furnished by Automatic Control Company, St. Paul, Minn. It is the intent to operate Well "W" manually.

M-6.05. Well Transmission Mains and Distribution System. In preparing the design, the pipe lines were arranged so that the system could later be economically changed over to provide separate transmission of well water to a treatment plant should the quality of the water require Iron removal and softening. This arrangement was needed because at the time of issuing construction drawings, the wells had not been completed and the quality of the supply was not known. At the present time both wells discharge directly into the distribution system through an 8-inch main. The site for a future treatment, concrete ground storage tank and high lift pumping plant has been selected adjacent to Well "W" and all necessary valves, fittings, and well water transmission mains for future use are indicated on the construction drawings.

The distribution system, as constructed, consists essentially of a 10-inch feeder main from the site of the treatment plant to the junction of Marine Road and Trout Street. The main is fed by a 12-inch line from the elevated storage tank. A complete loop of 8-inch main serves Peach Street, Clinton Street, and Ellen Drive, also the residential area on Front Street is served by an 8-inch main. This system is constructed of Class 150 cast iron pipe with A.W.W.A. specification gate valves and fittings. Fire hydrants are of the compression type conforming with A.W.W.A. specifications and Fire Underwriters' requirements.

M-6.06. Elevated Storage. An elevated steel tank of 100,000 gallons capacity is located near the junction of Marine Road and Clinton Street. The capacity line is at Elevation 138.5, tops of foundation piers, elevation 13.50 and overall height 125.0. This structure was furnished and erected by R. D. Cole Company. densiste di a Pearless deen wall turtina punp dint 100 ft. total disolarge bead, with a funt head the und graphic angine drive. As installet, an trotidal.

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M-6.07. Future Water Treatment. Chemical analyses of Wells "V" and "W" show an average hardness of 170 p.p.m. and Iron as Fe about 2 p.p.m. At this time there is no objectionable taste or odor from Hydrogen Sulphide, but inasmuch as the mineral content is generally high and includes sulphates there is always a possibility that objectionable taste and odor will occur in the future. Aside from this possibility, the hardness is some 100 p.p.m. in excess of usual standards and the Iron content 1.8 p.p.m. in excess. The latter may prove particularly objectionable. It has been definitely determined that the mineral content of local well water is subject to change after pumping for several months and accordingly, the analysis should be checked at frequent intervals.

In the event that treatment of this supply is authorized, at a future date, the process should be essentially as follows: Aeration, followed by Iron removal and softening, filtration and sterilization with chlorine. A treated-water tank of about 100,000 gallons should be provided together with two service pumps of 500 G.P.M. capacity each, one unit to be equipped with dual electric and gasoline engine drive and both units to have automatic water level controls.

M-7. Amphibian Base.

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M-7.01. Design. The design of water utilities for this area was based upon a possible day-time population of 100, the supply being primarily for toilets, lavatories and drinking purposes. No provision was made for fire protection.

M-7.02. <u>Supply.</u> The entire supply is derived from Well "U" located about 200 feet southwest of Courthouse Road, and 350 feet southeast of Sneads Ferry Road. This well was drilled by rotary process by Layne-Atlantic Company and is of the gravel packed type. The total depth is 116 feet, production is 250 G.P.M. with drawdown at Elevation -17.6. Ground level is elevation 12.70 and static water level • 3.45. Pumping equipment consists of Peerless deep well turbine with dual electric and gasoline engine drive, rated 250 G.P.M. against 165.0 feet total discharge head.

M-7.03. Well Transmission Main and Distribution System. Well water is pumped directly into two underground 1000 gallon steel pressure tanks which are operated on hydropneumatic basis and hold about 1500 gallons when fully charged and about 1000 gallons at the point where the pump starts.

From storage tanks water is conveyed through 6-inch asbestos-cement pipe to a point near the Carpenter Shop and Machine Shop. From this point, individual branch lines serve the shops, tractor storage and dock.

M-7.04. Automatic Control. Pressure controls are provided to start and stop the pump within predetermined pressure ranges. This equipment, together with operating valves, drains, and electrical gear, is housed in a vault constructed over one end of the tanks.

M-7.05. Treatment. Sterilization is effected by means of a Wallace and Tiernan automatic hypochlorinator connected directly with the well pump. ther Prostnict. Chemical shalves of sails "70 and bisses of 100 p. m. and aren as to secue 2 p.r.m. objectionable tasks or oder from Hyprogen Silpatio, allity that abjectionable tasks and der will eccur this contain is generally high and includes subsaited in this consthilty, the herdness is seen 100 p.p.m. intis and the from contexts is seen 100 p.p.m. the is and the from contexts is seen 100 p.p.m. the is and the from contexts is seen 100 p.p.m. intis and the from contexts is seen 100 p.p.m. interests and the from contexts is seen 100 p.p.m. the is and the from contexts is seen 100 p.p.m. there is a seen of from the seen of the seen is a seen to the sector of the seen of the seen of the seen of the rests of the seconding p, the seen of the second to be

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M-7.06. Future Treatment. Water derived from this well is of good quality and it is not anticipated that treatment will be required for the general use of this activity.

M-8. Rifle Range.

M-8.01. Design. The original design of water utilities for the Rifle Range was based upon a population of 1500 troops with normal consumption 120 gallons per capita per day, or a total demand of 180,000 gallons per day. In addition to the normal consumption it was necessary to provide water for the lawn sprinkler systems installed on each of the firing lines. Each of the three ranges has four firing lines with 34 fixed sprinkler heads on each line. Each head requires 3.8 gallons of water per minute at 18 pounds pressure for proper operation.

Taking for granted that this system will be operated at off-peak loads and that each firing line will be sprinkled 30 minutes per day, during dry weather, the total requirement is 3876 gallons per line or 19,480 gallons per range, and 58,440 gallons per day for the three ranges. This with the domestic consumption, makes a grand total of 238,440 gallons per day equivalent to 166 gallons per minute. For fire fighting purposes, the demand was estimated at 1000 gallons per minute. Elevated storage requirement was estimated at 100,000 gallons at sufficient height to provide 45 pounds working pressure.

The above recommendations together with those pertaining to underground water supplies, as set forth in Report of October 3, 1941, were accepted by the Officer in Charge and plans were prepared accordingly. At the time the original recommendations were made, the quality of well water was unknown and inasmuch as this was to be a permanent activity, the design of the system included the possibility of installing a treatment plant for the removal of objectionable minerals, should this be found necessary.

M-8.02. Development of Supply. Two wells were authorized and drilling was begun about April 1st, 1942. Test borings at the first site selected at intersection of East-West section of Range Road and Powder Lane about 500 ft. east of elevated steel water tank showed dry formations with poor prospects of obtaining water. A second location on the southeast side of the Access Road about 3300 feet southwest of intersection of East-West Range Road and Powder Lane was selected and Well "T" was drilled at this site by rotary process to a total depth of 452. This well is of the gravel packed type, the details being the same as specified for the Division Training Area.

Production is 200 G.P.M. with drawdown at Elevation -13.00. The ground elevation is 54.7 and the static water level + 17.0. Pumping equipment consists of Layne-Bowler deep well turbine pump rated 200 G.P.M. against 195 feet total discharge head, electrically driven only. Water obtained from this well contains an appreciable amount of mineral and while potable is objectionable because of hydrogen sulphide gas and hardness.

The second well, designated as "S", is located on west side of Range Road about 1800 feet south of intersection of East-West Range Road and Powder Lane. It was drilled to a total depth of 138 feet by rotary process Adapte. White destrad from this rail is of good

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and finished with gravel packed screen as previously specified. This well produced 150 gallons per minute with drawdown at Elevation -21.30. The ground elevation is 54.70 and the static water level + 0.70. The quality of water is very good except for high iron content which may prove objectionable for permanent use. The pumping equipment consists of a Layne-Bowler deep well turbine pump rated 150 G.P.M. against 205 feet total discharge head. This unit has both electric and gasoline engine drive.

As noted, the total production of both wells is 350 G.P.M. against an estimated 166 G.P.M. required for all purposes. With Well "T" out of service, Well "S" at 150 G.P.M. will not meet all requirements, including the sprinkler systems and it has therefore been recommended that one additional well with dual driven pumping equipment be provided.

M-8.03. Treatment. No treatment is provided, at this time, except sterilization by means of water powered, automatically controlled hypochlorinators furnished by Wallace and Tiernan Company.

M-8.04. Automatic Controls. Automatic water level controllers, mounted in each pump house, serve to start and stop the individual well pumps in order to maintain predetermined high and low water levels in the elevated tank. This equipment was furnished by the Automatic Control Company, St. Paul, Minn.

M-8.05. Well Transmission Mains and Distribution System. In preparing the design particular attention was given to making a layout which would be economical and at the same time provide for the separate transmission of well water to a treatment plant should one be required in the future. In order to accomplish this a treatment plant site was selected and well sites were chosen so that the present distribution system will receive the discharge from both wells for present requirements and if a treatment plant is provided in the future, the proper control valves and connections have been provided for separation of raw and treated water supplies. The proposed arrangement is shown in detail on M.B. Drawing 562.

The entire distribution system is constructed of Class 150 cast iron pipe with A.W.W.A. specification gate valves and fittings. Fire hydrants are of compression type conforming with A.W.W.A. specifications and Fire Underwriters requirements. In general the system is composed of 10- and 8-inch feeder mains with 6-inch branches, laid out so that the draft required to operate the sprinklers can be obtained without reducing the working pressure required for other activites.

M-8.06. Elevated Storage. A steel storage tank of 100,000 gallons capacity on a 109 ft. tower located near the northwest corner of Powder Lane maintains 45 to 50 pounds working pressure. The capacity line is at Elevation 176.6, the tops of foundations piers are at Elevation 51.6 and overall height is 125 feet. The tank was furnished and erected by R. D. Cole Company.

M-8.07. Sprinkler Systems and Service to Butts. Sprinkler systems are provided on each firing line, are identical for all three ranges and consist essentially of the following: A 6-inch feeder main taking off the distribution system runs longitudinally through the center of each range inter parted seroes is previously precified. This well that set minute with trapicet of distantian "21.80. The 's 54.70 and the static water level + 0.70. The quality good anospt for high from consent which any prove objecmanont was. The purping sequipment consists of a laguer 's trained has been 180 G.F.H. against 205 Feet total distes with has both electric and casoling saring drive. 's

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From the feeder main, sprinkler lines run at right angles in both directions each carrying 17 sprinkler heads spaced 16 feet on centers and set to grade. Each head is designed to deliver 3.8 gallons per minute at 18 pounds pressure with a throw of 16 feet. A control valve is installed in each feeder main and in each branch sprinkler line so that watering may be closely confined to actual requirements.

Drinking fountains are provided on separate supply pipes, two to each ready line except the 600 yard line which is accessible to the range house where adequate drinking fountains are provided.

Water supply is carried to the target sheds by 4-inch extension through Range No. 3 and in the rear of the Butts to serve the toilets and target sheds. The sprinkler system which is laid at shallow depth is provided with values so that the pipe lines can be drained to prevent freezing.

M-8.08. Future Water Treatment. The water supply for this area was more difficult to obtain than for any of the other areas and apparently it is impossible to obtain a supply from wells which will be free from objectionable minerals. If treatment is provided at a future date, it should consist of aeration, Iron removal and softening by the same process, filtration and chlorination. Treated water storage should be provided for about 100,000 gallons with a high lift pumping plant consisting of two units of about 500 G.P.M. each, one to have dual electric and gasoline engine drive and both to have automatic water level controls.

M-9. Glider Training Base.

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M-9.01. Design. The design of water utilities for this area was based primarily upon the demand required for operating the gasoline fueling system and for fire protection. The supply is taken directly from the system serving Tent Camps 1 and 2 through approximately 11,400 feet of 8inch cast iron pipe which follows the north side of Curtis Road to the Glider Base.

The initial pressure on the Tent Camp system is about 60 lbs. equivalent to 140 ft. head. The friction loss through 11,400 feet of 8-inch pipe with 500 g.p.m. flowing is approximately 100 feet, leaving 40 feet or 17 pounds residual pressure. At 400 G.P.M. flow the residual pressure would be about 40 pounds. These figures assume that normal head conditions prevail within the Tent Camp Area, however, heavy draft in that area with accompanying drop in initial pressure will affect the residual pressure at the Glider Base by a like amount.

By report of April 6, 1942, to the Officer in Charge, the gasoline fueling system was discussed and recommendations were made for a 50,000 gallon underground storage tank and booster pump to furnish emergency water supply for the Glider Base. Verbal recommendations were also made for the installation of one well equipped with gasoline engine to maintain the supply in case of failure in the 8-inch supply line or the Tent Camp facilities. Apparently lack of funds prevented acceptance of these recommendations. As now set up about 450 g.p.m. can be obtained at fair working pressure. Message allow for the first are to be first are the in the first after through a first and the first are to be first are the first and in the head is desired to be first are a first are to are the first are to and to foot a second to be a first are to the the first are to be and the areas are the areas are the areas are to and be areas are the areas areas are after a second require the areas are the areas areas are areas areas areas to and the areas to a second to a second to a second to areas areas areas to a second to a s

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M-9.02. Transmission Main and Distribution System. The 11,400 feet of transmission main is Class 150 cast iron pipe with A.W.W.A. specification gate valves and fittings. The distribution system consists of an 8inch main passing through the westmost limit of the area, with 6-inch, 4-inch and 3-inch cast iron pipe serving the various buildings, pitts, and dock. One fire hydrant of the compression type furnishes fire protection.

M-10. Peterfield Point Tent Camp.

M-10.01. Design. The design of water utilities was based upon a population of 600 men with normal water consumption at 100 gallons per capita per day, equivalent to 42 gallons per minute or 60,000 gallons per day. For fire protection about 130 g.p.m. can be obtained.

M-10.02. Transmission Mains and Distribution System. The supply is furnished from Tent Camps 1 and 2 via 4850 feet of 8-inch main to the Glider Base and 2550 feet of 4-inch main which takes off of the 8-inch and extends to the Camp. The distribution system is mainly of 4-inch cast iron pipe with five 4-inch compression type fire hydrants. Pipe is Class 150 cast iron with A.W.W.A. specification gate valves and fittings. No storage facilities or emergency supply have been provided.

M-ll. Tank Battalion Tent Camp.

M-ll.Ol. Design. The design of water utilities for this area was based upon a population of 700 men with normal average consumption 60 gallons per capita per day, equivalent to 29 gallons per minute or 42,000 gallons per day. No fire protection was authorized.

M-11.02. Development of Supply. One well designated as "O", located 65 feet north of Lancaster Road and 140 feet east of Route No. 17 was drilled by rotary process and finished with gravel packed screen. This well has a total depth of 84 feet and produces 60 G.P.M. with drawdown elevation -12.90. Ground elevation is 25.70 with static water level at elevation 20.2. Pumping equipment consists of a Layne-Bowler deep well turbine pump rated 60 G.P.M. against 150 ft. total discharge head.

M-11.03. Treatment. Sterilization is effected by means of a Wallace and Tiernan water powered automatically controlled hypochlorinator.

M-11.04. Automatic Controls. The well pump discharges into an underground hydropneumatic pressure tank. Controls are provided to start and stop the pump between predetermined pressure ranges.

M-11.05. Well Transmission Mains and Distribution System. The well and hydropneumatic tank are located adjacent to one another and no transmission main is required. The distribution system consists of 4-inch cast iron pipe Class 150 with A.W.W.A. specification gate valves and fittings. Five 4-inch compression type fire hydrants are provided for fire flow which is limited to the output of the well pump.

M-11.06. Storage. An underground steel pressure storage tank of 2500 gallons nominal capacity, will operate under hydropneumatic conditions Anission (11 and 12 stribution Specess) for 11,200 1000 and 11 crees into used and 100 week and 100 an 80 Attrings. The distribution system consists of an 8anter, and constant limit of the serious buildings, pitts, and used of the constant tipe for sible of the protection.

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at about 1800 gallons fully charged to 900 gallons, at which point the pump starts. One end of the tank is housed over and contains controls, valves and electrical gear.

M-11.07.Future Treatment. The supply derived from this well is hard and contains an excess of Iron. However, no special treatment has been considered because of the temporary nature of the camp.

M-12. C.C.C. Camp (now Camp Knox).

M-12.01. Design. The original design of water utilities was based upon a total population of 500 at average consumption of 40 gallons per capita per day or a total demand of 20,000 gallons. No fire protection was authorized and no provisions were made in supply or storage facilities for fire fighting.

The Architect-Engineers handled certain details only, in connection with the design of this system and complete information pertaining to various features are lacking, as noted.

M-12.02. Development of Supply. Well No. 1 was drilled by Virginia Machinery and Well Company by percussion tool method to a depth of 103 feet, then filled with gravel and finished to a depth of 75 feet below ground level. A 10-inch steel casing was set and cemented into shell rock formation at about Elevation -28.5, leaving 23 feet of open hole between the bottom of casing and top of gravel fill. When tested, production was 108 G.P.M. with drawdown elevation at -6.50. Ground elevation is 23.50 and static water level elevation 4 2.50.

Pumping equipment consists of A. D. Cook, Inc. deep well turbine rated 50 G.P.M. against 88 ft. discharge head. The reason for limiting pumpage to 50 G.P.M. instead of taking the full capacity of the well is not definitely known but it is assumed that 50 G.P.M. was considered sufficient at that time. This well was completed in September, 1941.

Due to increase in population, a second well, designated as No. 2, was drilled in June 1942. Rotary process was used by Layne-Atlantic Company and the well was finished to a total depth of 90 feet with gravel packed screen, as described for the Division Training Area. Production, when tested, was 150 G.P.M. with drawdown at elevation -21.30. Ground elevation is 20.70 and static water level elevation 5.20. Pumping equipment consists of a Layne-Bowler deep well turbine rated 150 G.P.M. against 120 ft. total discharge head.

M-12.03. Treatment. No treatment whatever has been provided.

M-12.04. Automatic Controls. No automatic controls have been provided.

M-12.05. Well Transmission Mains and Distribution System. Both wells discharge directly into the distribution system and no provision is made for altering this arrangement in the future. The distribution system was designed in accordance with CCC Drawing No. 3, dated October 14, 1941. The pipe lines and other facilities were installed by C.C.C. labor under direction of C.C.C. officials. Pipe sizes and the general arrangement of the system differ and Siley cherces to 200 galands, at shidt paint the aut of the suit is housed over and wetterns controls.

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M-12.06. Elevated Storage. Two steel tanks on wooden towers located in Camp No. A, each of 10,500 gallons capacity with overflows at elevation 77.30 furnish about 24 pounds working pressure. A small tank of 2600 gallons capacity was installed in Camp No. E with top elevation 49.81, but this is obviously of little or no use, due to limited capacity and height.

M-13. White Cemetery.

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M-13.01. Design. The design of the water supply for this area was based entirely upon sprinkling requirements for lawn and shrubs. The maximum flow was fixed at 50 G.P.M.

M-13.02. Development of Supply. One well designated as"White Cemetery No. 1" was drilled by rotary process by Layne-Atlantic Company and finished with gravel packed screen. The total depth is 65 feet and production 50 G.P.M. at drawdown elevation -9.50. The ground elevation is 21.42 and static water level -9.50.

Pumping equipment consists of Layne-Bowler deep well turbine, rated 50 G.P.M. against 155 ft. total discharge head. The pump is manually controlled and discharges directly into a closed distribution system.

M-13.03. Distribution System. The distribution system consists of a 4-inch header with 2-inch laterals, all completely looped. Outlet connections are provided at frequent intervals so that the entire planted area can be watered without using excessive lengths of hose.

M-14. Mock-Up.

M-14.01. Design. The design of water utilities for this area was based upon furnishing a centrally located source of supply to be distributed by tank trucks, or other means of transportation, to local activities.

M-14.02. Development of Supply. A rotary drilled well, designated as "X" was constructed by Layne-Atlantic Company at the junction of Sneads Ferry Road and the road leading to the Mock-up. This well has an 18-inch casing cemented into shell rock without screens or gravel envelope. The underground formation yields sufficient water for the purposes intended, without pumping sand and construction costs were thus kept to a minimum. The total depth of the well is 40 feet, the yield 50 gallons per minute with drawdown at elevation +5.0. Ground elevation is 25.0 and static water level 416.0.

Pumping equipment consists of a Layne-Bowler deep well turbine rated 50 G.P.M. against 60 feet total discharge head, driven by electric motor only.

M-14.03. Treatment. Sterilization is given by means of a manually regulated Wallace and Tiernan hypochlorinator which starts and stops with the pump.

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M-14.04. Elevated Storage. The pump discharges directly into a 50,000 gallon wood stave tank on wooden tower located adjacent to the well, with capacity line at elevation 60.67. This tank is 22 ft. diameter by 20 ft. high and was furnished by the Challenger Company, Batavia, Ill.

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M-14.05. Distribution Facilities. Three 3-inch riser pipes equipped with valves and hose outlets are provided for filling tank trucks.

M-15. <u>Maintenance and Operation</u>. Fipe lines should be thoroughly flushed at such intervals as is necessary to keep them free from deposits which may accumulate during normal consumption but which will not become apparent until the velocity of flow is increased, as in case of fire or other unusual demand. At such times the sediment, if permitted to accumulate, will start moving and in most cases is extremely objectionable and will cause various difficulties and stoppage in plumbing and mechanical apparatus.

Flushing should always be carried out in accordance with a pre-arranged program wherein certain values are closed in order to confine the operation to a given pipe line and thus build up maximum velocity and flow therein. Effective results cannot be secured by merely opening fire hydrants at random.

Gate values should be operated at least once a year, the customary practice being to close the gate tight and record the number of turns required, then open the value fully for regular service.

Before operating it is good practice to oil the valve stem by means of a small diameter copper tube with funnel jointed to upper end. The tube should be bent to pass the operating nut and follower so that oil will reach the stem.

The inspection of values is very important as they are frequently found to be closed, particularly in a new system, and if not operated for long periods the working parts become corroded or incrustated and bind.

Fire hydrants should be oiled internally as specified by the manufacturer and the nozzles should be greased with a non-fluid dope to insure easy coupling of hoses. Every hydrant in the system should be inspected before cold weather to make certain that the barrel is free of water and will not freeze. Where the barrel can not be drained because of high ground water an anti-freeze compound should be introduced in quantity consistent with the lowest expected temperature.

M-16. Summary. A summary of the pipe quantities of various sizes used in the distribution systems and also for services, together with the number of fire hydrants installed, is shown in the following tabulation (as of September 30, 1942):

-667-

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Training to serve toper tont an they have transmitting

Sec. 1 Sec.

Cast	Iron Pipe	Cast	Iron Pipe
16"	380'		
12"	27,550	12"	7,075
811	28,9051	8"	10,710
6"	12,281'	 6"	6,170'
4"	16,910'	4"	4,200'
3"	3,050*	3"	270
2년 2 ¹ 2 ¹¹	2,545	2 ¹ / ₂ " 1 ¹ / ₂ "	120'
Oll	180	1=11	2901

Total: 92,301'

Fire Hydrants - 131

Hospital Area

Cast I	ron Pipe
12"	4,385'
10"	4,9301
8"	1,510'
6"	3,010'
4"	2701
3"	1,420'
2글"	100 1

Total: 15,625'

Fire Hydrants - 20

Ballocn Barrage Battalion Area

Cast	Iron Pipe	
12"	100'	
10"	1,325!	
¹¹ 3	5,070	
E"	2,310:	
4"	1,795'	
3"	470 *	
22"	430'	
2"	51.01	
12"	110'	
14"	130 %	
3/4"	30*	

Total: 12,280'

Total: 1,600'

10 ta1:

100*			

Fire	Hydrants	-	21	

-668-

Total: 53,750

Total: 28,835'

Fire Hydrants - 59

501

6501

250'

2:60

501 . 240!

	Cast	Iron	Pipe	
12	n	2,	8001	(Feeder
	Moir			(mana)

Officers Quarters Area

Amphibian Base Area

6"

4"

3"

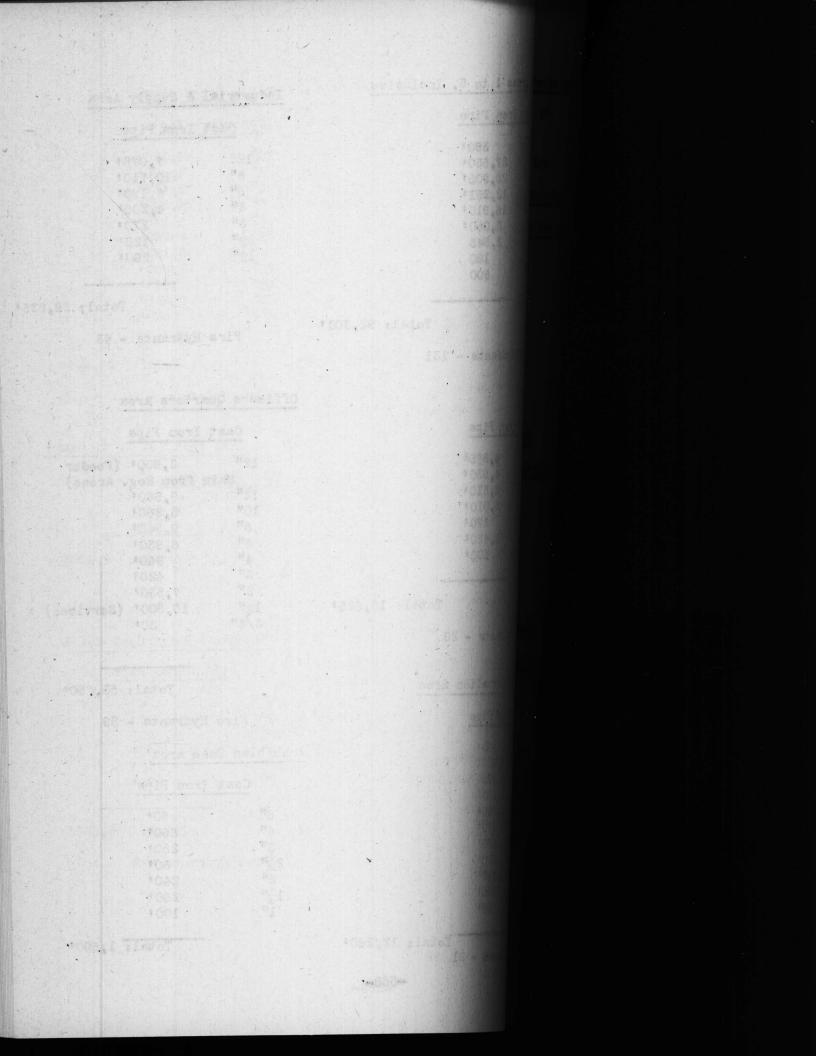
2¹/₂"

 $1\frac{1}{4}^{"}$

Cast Iron Pipe

Fire Hydrants - 43

	Main	from Reg.	Areas)
12"		9,9601	
10"		5,280'	
8"		9,340'	
6"		6,930'	
4"	•	9601	
3"		420'	5 h
2"		7,530'	
14"		10,500'	(Services)
3/4	11	301	



6"	1,670'		Cast T	ron Dina
			Cast 1.	ron Pipe
Total:	1,670'		10"	1,100'
10 041.	1,070-		8" 6"	4,895'
Landing Fie	eld		4"	5,425 4,830
Cast Iron I	Pipe		3"	570:
			2늘" 2" 1늘" 1날" 1 날"	780' 3,190'
8"	11,450'		11"	1,820'
6"'	5251		1-11	1,080'
4".	900 1		1"	5,3251
3"	1,780'		3/4"	630'
2"	9901		-, -	000
$\frac{1\frac{1}{4}n}{1^n}$	101			
_ 1 "	401			Total: 29,64
		<u> </u>	Dine II.	
	Total:	15,695'	Fire Hy	drants - 16
Mock-Up				
MOOK-OP		man and a second	Camp	Knox (C. C. C. C
Cast Iron P	ipe		Cast Iro	n Pipe
6"	451		4"	1,460'
4"	701			-,
3"	501			
2"	12"	his Prime		Total: 1,46
-				
	Total:	177:		and the second stand
White Cemet	ery		Montfo	rd Point Camp No.
A. S. M. Marker			MOILOLO	ra rome camp we.
Cast Iron P	ipe		C	ast Iron Pipe
4"	1,500'	*	8"	50'
2"	3,430'		6"	
14"	3901		4"	3,510;
			311	1,550'
-			2111	40
	Total:	5,320'	3" 2년" 2"	170'
Peterfield 1	Point Camp			
				Total: 5,560
Cast Iron P:	<u>rpa</u>		Fire H	drants - 9
4"	1,690'			
2"	9251			
3/4"	75 *			

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	3,630+		
	1,550*		1. S.
	CADDE.		ч.
	40P		
	1.120-1		1. 12 6

Total: 5,560"

Fire hydranta - 9

Cast	Iron Pipe	Ca	st Iron Pipe	
4"	1,750'	12"	6651	
2"	1,350'	10"	1,805'	
		8"	14,845'	in in a
Total:	3,100'	6"	16,550'	
	0,100	4" 7"	4,932'	
Fire Hydr	ants - 5	211	470' 10'	
		2"	1,220'	
		3" 2½" 2" 1½" 1½"	170'	
Low Cost	Defense Housing Area	$1\frac{1}{4}^{n}$	3301	
Cast	Iron Pipe			
10"	1,680'		Total:	40,997
8"	19,6501	Fire Hyd	lrants - 65	
6"	13,410			
2" /4"	5,2901			
	2,000' (Galvanized)			
/4"	18,700 (Copper)			

Total: 60,730

Fire Hydrants - 73

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1.65

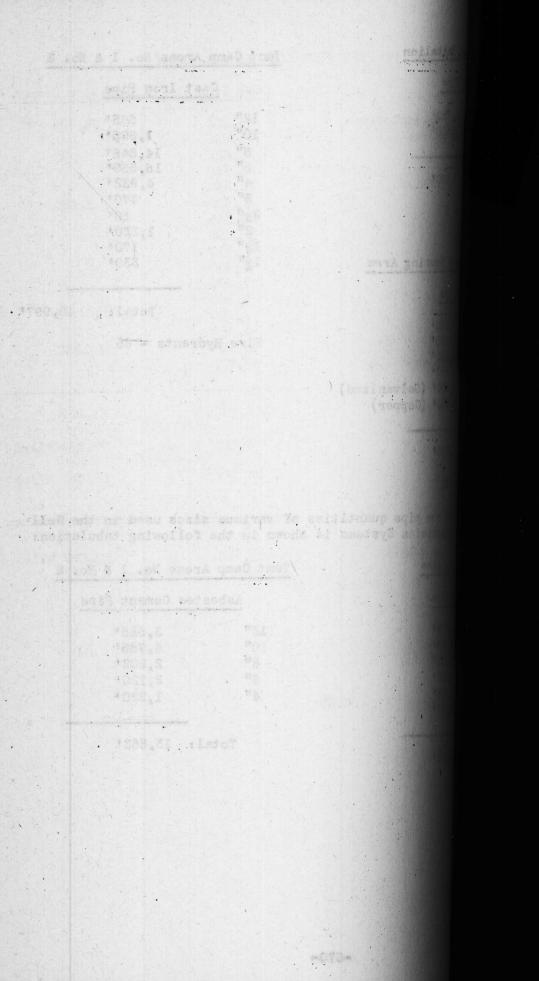
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A summary of the pipe quantities of various sizes used in the Well Water Supply Transmission Systems is shown in the following tabulation:

1

bestos Cement Pipe	Asbes	stos Cement Pipe
18,975	12"	3,525
2,5251	10"	4,785'
" 5,513'	8"	2,2021
" 6,520 ¹	6"	2,120'
7,9651	4"	1,220'
" 15,007'		



SUMMARY OF PIPE INSTALLED IN ALL AREAS

Areas	Cast Iron	Asbestos Cement
Regimental Areas 1-5, Inclusive	92,301	56,505
Industrial & Supply Area	28,835	00,000
Hospital	15,625	
Officers' Quarters	53,750	
Balloon Barrage Battalion	12,280	
Amphibian Base	1,600	1,670
Rifle Range	29,645	1,010
Landing Field	15,695	
Mock-Up	177	
Camp Knox	1,460	
White Cemetery	5,320	
Montford Point Camp No. 1	5,560	
Peterfield Point Camp	2,690	
Tent Camp Tank Battalion	3,100	
Tent Camps Nos. 1 and 2	40,997	13,852
Low Cost Defense Housing	60,730	13,852
Totals:	369,765	72,027
	369,765	= 70.032 Miles
	72,027	= 13,641 Miles
	and the second second second second	

Grand Total:

441,792

=

83.673 Miles

Total Fire Hydrants - 447

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360,765 # 72,027 4691766 # 70,027 MILOS 78,027 # 15,041 11105

eli 941,792 a 67.673 12165 6 Eydranta - 467

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CHAPTER N PART 11

SEWAGE COLLECTION AND TREATMENT

CONTENTS

a		
Section	N-1	Introduction
	N-2	General Design
	N-3	Tent Camps No. 1 and No. 2
	N-4	Division Training Area
	N-5	Midway Park Residential Area
	N-6	Mumford Point Camp No. 1
	N-7	Barrage Balloon Battalion and

- lion and Amphibian Base Area
- N-8 Rifle Range Area
- N-9 Glider Training Base Area
- N-10 Peterfield Point Tent Camp
- N-11 Tank Battalion Tent Camp
- N-12 Recommendations for Maintenance and Operation of Sanitary Sewers, Pumping Stations and Treatment Plants

N-13 Summary

N-1. Introduction. Due to widely scattered activities, the flatness of the terrain, the constricted outlet of New River and the rush nature of the project, the design of sewerage facilities was a complex and interesting problem. The department started work on April 19, 1941.

N-2. General Design.

Later South

.N-2.01. The first few days were spent in establishing a temporary field office in a farm house hear the proposed tent camp, in inspecting the reservation lying on both sides of New River, between Jacksonville and the Atlantic Ocean, interviewing prospective employees and working up a tentative general plan for the tent camp.

No. topographic maps ever had been made of the area and it was found that the land was generally heavily wooded and cut up by many small streams, marshes and pocosins, making it absolutely necessary to have contour maps before attempting the selection of exact sites for large military activities. It soon became apparent that very flat slopes would be required for sewers and that numerous pumping stations would be necessary. Test borings were made at various points in the areas considered for development, revealing the underlying strata to consist generally of fine sand and plastic clay with the ground water level very close to the surface in most instances. During this time, work also was progressing on the selection of the site for Tent

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1.1. Introduction
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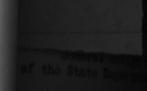
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alle fre first for deve wore scatt in establishing a paraphery as in a fort, nouse hier the proposed tont camp, in inspecting that inter on both sides of low River, botween Jacksonvilla and fores, the or the test of some on ployees and working in groups plan for the test camp.

according on the event have been made of the area and it and the last sease coverally beautify moded and dut up by wary small mean and to contain making it absolutely necessary to have whites. It can became apparent that very fist slopes died for severe and that numerous purping stations would be det borkers were rade at various points in the area due same of plantic the underlying station would have same of plantic die underlying station to consist the same of plantic die vich the ground water level and sufface in host finith the ground water level and sufface in host finith on a four station of the last sufface in host finith on a finith the station for the state of the sole time of the state for finith



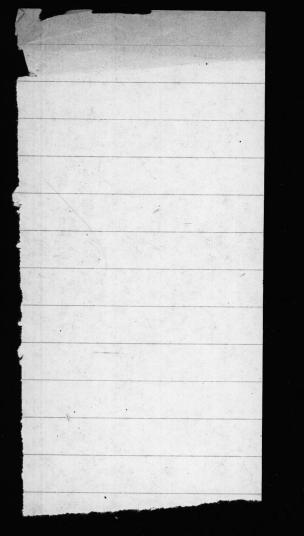
SSWAGE TREATMENT PLANT - DIVISION TRAINING AREA



J. A. Holson, End of L Ir. Z. L. Dudley and J. Department. The sime with regard to possible there were no existing there

N=5. Tent Corns Have

H-3.01. Those deck and about 15 feet about Brook, a tidal estimate



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Camp No. 1 and the location of an outfall sewer for same. From the information derived from test borings, it was decided that trenches should be kept as shallow as possible to minimize ground water difficulties, and that the bottom widths of trenches should be kept just wide enough to allow proper joining of pipe and to prevent excessive loads on pipe from back-fill material.

N-2.02. For the purpose of design a per capita use of water of 100 gallons per day was assumed, with a peak wet weather sewage flow of 300 gallons per capita per day. This was in line with previous municipal experience and with actual flow tests made at Fort George G. Meade. The sewers were designed for a minimum velocity of two feet per second according to tent camps, taken in May, 1942, with a population of 10,000, averaged 100 gallons per capita per day.

No provision was made for rain water in the sanitary sewers.

In order to permit greater salvage, it was decided that grease should be intercepted by means of traps at the sources rather than of at the treatment plants.

The usual construction materials, brick, terra cotta pipe, reinforced concrete pipe, etc., were found to be available readily and of good quality. Due to sulphates in the water supply, with the probability of hydrogen sulphide production, it was recommended that concrete pipe not be used except in very large sizes, and then should be coated with bituminous material.

Typical detailed drawings for manholes, drop connections, trench sections, special foundations, etc., were prepared for use on the entire job. These drawings were M.B. No. 402, M.B. No. 403 and M.B. No. 404.

General design features were discussed frequently with representatives of the State Department of Health and met with their approval.

N-2.03. On august 1, 1941, a conference was held with Captain J. A. Nelson, Head of the North Carolina Fisheries Commission, together with Mr. E. L. Dudley and Mr. Edward Willis of the North Carolina State Health Department. The scheme for the disposal of sewage was discussed thoroughly with regard to possible pollution of New River. Capt. Nelson stated that there were no existing oyster beds north of Sneads Ferry, and inasmuch as the main plant effluent would be discharged at a point more than seven miles from the oyster beds, it was generally agreed that contamination would not occur. Recommended methods of treatment were considered by the Health Department officials to be sufficient, it being agreed that the main plant would be designed for future enlargement and additional treatment in the event this becomes necessary.

N-3. Tent Camps No. 1 and No. 2.

N-3.01. These camps cover an area 5400 feet long and 2000 feet wide and about 15 feet above sea level. Most of the area is drained by Brinson Creek, a tidal estuary of New River. It was apparent that the outfall but and the location of an outfail some for same. From the informaderived from test borings, it was decided that transmos anould be hogt los as possible to minimize cround water difficulties and that the iddus of transmos should be kept just wide enough to allow promer call pipe and to prevent excessive leads on pipe from brockfill mate-

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must construction materials, brick, terrs ootto pipe, feindered is, etc., were found to be evailable readily and of good quality. intes in the actor supply, with the probability of hydrogen redation, it was recommoded that concrete pipe not be used or a large sizes, and then should be control with bituminous material.

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with request 1, 1941, a soul aronoe was hold with Captain had at the four Caroline Pleherics Commission, bog there with asy and 1. Saward Millis of the North Caroline State Haalth has account for the disposal of some point Malson at the that itsting coutor teals how hiver. Copt. Malson at the that itsting coutor teals horth of Smeads Ferry, and instruct as itsting coutor teals horth of Smeads Ferry, and instruct as itsting coutor teals horth of Smeads Ferry, and instruct as itsting coutor teals horthh of Smeads Ferry, and instruct as itsting to be discontrol at a point mate that soven while not be been its as point of the local to be the contained to be able to be sufficient, it boing agreed that the sain plant disk to be sufficient, it boing agreed that the sain plant call for future considered and additional teactions in the containe games interviewers and additional teaction to the containe games interviewers.

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More compt cover an area 5400 feet long and 2000 feet wide act above see level. Most of the area is drained by Brincon stury of New River. It was apparent that the outfall

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As soon as a final it became ovident that and we were instructed temporary one and mile Crock just east of well at an absolute minimum tion was based upon to a population of Mile to a population of Mile to conditions of instruthe conditions of instrufor discharging ris lo. TC-4 was apprendiced

H-5.02. of 5.6 million of H population of H out for a possibl out for a possibl On May 15, 1902. for Tent Carpins "Construction could "Construction could plotion of planets corporation min

On June D. Wore Farmusial distaly, Junio

the product above proved muto be used more the depth of prowith mall prove

As originally in Mathematically in With appendix in

farp activity fall another bir spelation sewer from the Tent Camp should follow Brinson Creek and at first it was planned to discharge into New River beyond the concfuence of Brinson and Strawhorn Creeks.

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As soon as a tentative layout was made for trunk and lateral sewers, it became evident that sewage could not be conveyed to New River by gravity and we were instructed by the Officer in Charge to consider the camp a temporary one and to furnish primary treatment only at a point on Brinson Creek just east of the Atlantic Coast Line Railroad and to keep the cost at an absolute minimum. By direction, the general scheme for sewage collection was based upon a population of 6,000 with a possible future expansion to a population of 12,000. The treatment plant was designed for a population of 6,000. In a report to the Officer in Charge, dated May 3, 1941, the conditions of design are more fully set forth. No provision was made for discharging rain water into the sower system. On May 10, 1941, drawing No. TC-4 as approved showing plan and profile of the outfall sewer, and work was started on May 12, 1941.

N-3.02. The 21" outfall sewer is designed for a total peak discharge of 3.6 million gallons per day, the estimated wet weather peak flow for a population of 12,000. It will be seen later that Tent Camp No. 2 was laid out for a possible population of 10,000 making a total population of 16,000. On May 15, 1941, drawing No. TC-5, covering the trunk and lateral sewers for Tent Camp No. 1 was completed. On May 10, 1941, Specification No. 102, "Construction and Material Specifications, Sanitary Sewers" was completed and forwarded to the Officer in Charge. During the period between the completion of plans and the completion of the specifications, work had been carried forward rapidly, by using temporary specifications and personal cooperation with the contractor.

On June 5, 1941, drawings for the tent camp sewage treatment plant were forwarded to the Officer in Charge and construction was started immediately. Specification No. 103 covers the treatment plant.

The trunk and lateral sewers in most cases were just a few inches above ground water and the work was completed rapidly, well points having to be used only in a few wet stretches. At the treatment plant, however, the depth of the hoppers was such that the entire work had to be dewatered with well point equipment.

N-3.03. Original Plant Facilities. The Tent Camp treatment plant, as originally designed and constructed, consisted of preliminary treatment with separate sludge digestion including the following features:

(a) Inclined bar screen with 1 1/4" clear spacing. Due to the large quantity of newspapers, clothing and other debris coming down the outfall sewer, a great deal of raking was necessary and at a later date, the bar spacing was increased to 1 1/2" to reduce the amount of digestible matter being caught in the screen.

(b) Grit Chamber. A grit chamber with two rectangular channels 19 feet long, designed for mean velocity of one foot per second, each channel having a capacity of 0.6 million gallons daily. and Camp should follow Srinson Crock and at lives it man

bistrin layout was mide for trunt and Lateral source, that source could not be conveyed to flow strar by gravity maked by and offician in Charge to consider the dark of the lumits primary trunctions only at a point of Strason the lumits primary trunctions in the resonant of a source anisam. By direction of 0,000 with a possible furner ofpansion is report to the contrast being the dost of a second for a second the rest and a bold of a strate for a possible date of the first of the second for the second for a strate of the contrast second for a possible furner ofpansion is report to the officer is there a bolg of the second date of the first of the second for the second for a possible date of the first of the first of the second for a possible date of the first of the first of the date of the second date of the second for the second for the second for a possible date of the first and for the second for the second for date of the second for the second for the second for a second date of the second for the second for the second for a second date of the second for the second for the second for the second showing the second for the second for the second for a second for the seco

[31] outfull near is designed for a total pack distinct allow pur day, the astimated not worther peak flow for a space is will be seen later that fant Camp No. 2 wes hild application of 10,000 method a total population of 10,000 reading To. Theb, covering the truck and lateral somers i was completed. On May 10, 1941, Specification No. 102 bistrial Specifications, Sanitary deverse was completed officer in Charge. Baring the period birmeon the contactive completed, the receifications, work had been officer by using the period flowtions and personal solutions.

(4), drawinge for the tent onep newige then went diants (Critece in George and construction was started innoused To. 105 covers the truntment pistte.

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Compart. A grit chamber with the rector ular historials for near valocity of one foot per scond, each channel be millen ralions daily.

and Property

(c) Diversion Manhole to divide the flow between settling tank No. 1 and a future settling tank.

(d) Primary Settling Tank No. 1. The bottom of the tank is formed by a series of three hoppers. The tank is 20 feet wide and 60 feet long; provides a three-hour detention period at average flow for a population of 6,000 (at 100 gals. per capita per day). The influent is distributed across the basin by a channel with slotted openings. The effluent flows over a steel weir into the effluent channel. The tank is constructed of reinforced concrete with concrete walk ways and steel pipe hand rails. Sludge is transferred to a separate digestion tank, constructed integrally with the settling tank, by means of three valved 6" pipes extending into the hoppers.

(e) Chlorine Contact Chamber. From the settling tank the sewage flows through a baffled chlorine contact chamber where chlorine gas is admitted to the compartment and absorbed by the flowing sewage. By direction, no water or power service was provided, hence, solution chlorinators could not be used at that time.

(f) Effluent Pipe. From the chlorine contact chamber the sewage flows through a 21" effluent pipe for a distance of about 225 feet into Brinson Creek.

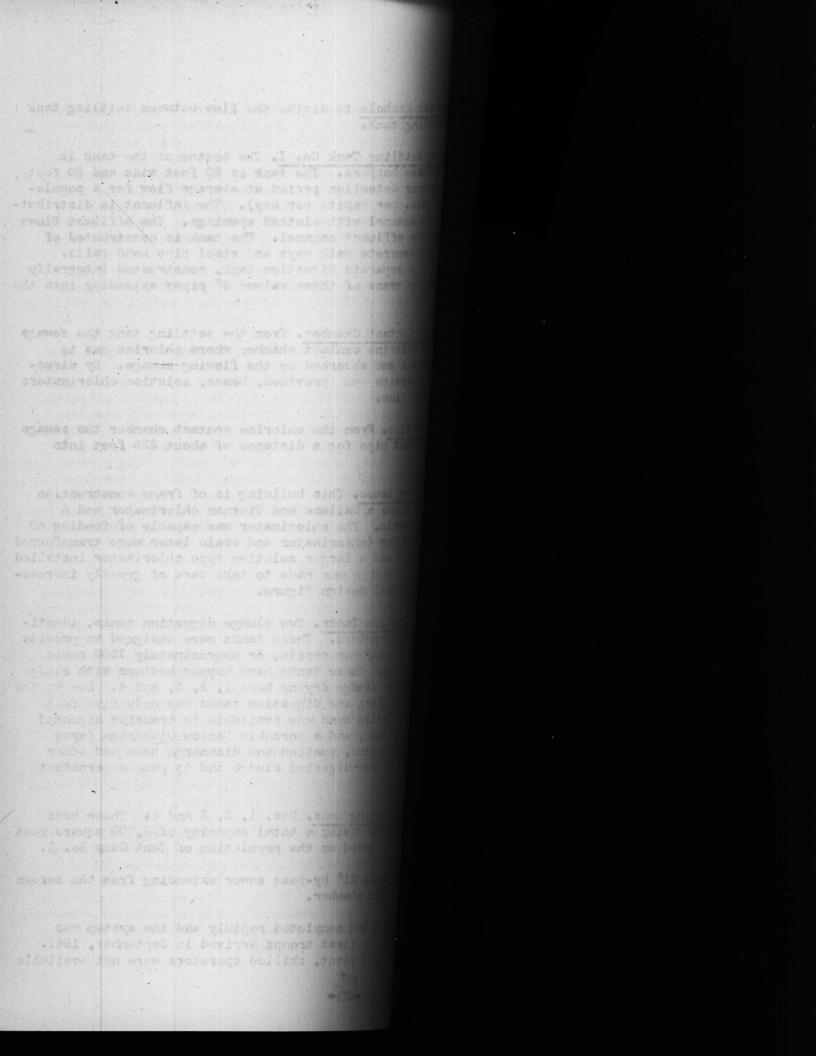
(g) Chlorinator House. This building is of frame construction with concrete floor and houses a Wallace and Tiernan chlorinator and a Fairbanks-Morse platform scale. The chlorinator was capable of feeding 40 pounds of chlorine gas per day (chlorinator and scale later were transferred to Mumford Point Camp No. 1 and a larger solution type chlorinator installed in a new building.) This change was made to take care of greatly increased population over the original design figure.

(h) Sludge Digestion Tanks. Two sludge digestion tanks, identified as tanks A and B, were provided. These tanks were designed to provide 2 1/4 cu. ft. of sludge capacity per capita, or approximately 7500 cubic feet in each of the two tanks. These tanks have hopper bottoms with sludge withdrawal pipes connected to sludge drying beds 1, 2, 3, and 4. Due to the fact that the top of the settling and digestion tanks was only five feet above mean sea level, very little head was available to transfer digested sludge to the sludge drying beds, and a portable Marlow Diaphragm force pump complete with gasoline engine, suction and discharge hose and other accessories, was provided to draw digested sludge and to pump supernatant liquor.

(i) Four Sludge Drying Beds. Nos. 1, 2, 3 and 4; These beds were thirty by fifty feet each, giving a total capacity of 6,000 square feet or one square foot per capita based on the population of Tent Camp No. 1.

(j) By-pass Sewer. A 21" by-pass sewer extending from the screen chamber to the chlorine contact chamber.

N-3.04. All of the work was completed rapidly and the system was ready to receive sewage when the first troops arrived in September, 1941. In the initial operation of this plant, skilled operators were not available



and alkaline digestion was not obtained. Consequently, in the early months a great deal of acid sludge accumulated in the digestion tank. This trouble was aggravated by great quantities of grease dumped into the sewers at the messhalls, and it was not until a large amount of lime was used that proper digestion began to take place. A complete report, including recommendations, was submitted to the Officer in Charge on November 14, 1941. A further report was submitted on December 1, 1941. Although at first digestion was at one time this tank was receiving the flow from a population over twice as large as that for which it was designed.

N-3.05. The design of the sewage treatment plant and sewer system was concurred in by the North Carolina State Department of Health by letter dated August 4, 1941.

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N-3.06. In December 1941, the construction of sewers for Tent Camp No. 2 was authorized. Construction was started before completion of plans, the contractor proceeding with the aid of sketches prepared by this department. The first plan was approved on December 17, 1941, and the collection system was completed a few days later. At this time, we were instructed by the Officer in Charge to plan for an eventual 10,000 population or 4000 more than had been contemplated in the original design. Tent Camp No. 2 discharges through an 18" trunk sewer connecting to the outfall sewer from Tent Camp No. 1 at Manhole #6. At the time of the construction of Tent Camp No. 2, the treatment plant was enlarged by the addition of settling tank No. 2 and digestion tanks C and D, which were duplicates of the original installation except that the influent and effluent channels had to be modified to fit in with those of the original tanks which were not constructed exactly according to the drawings.

After the second gettling tank was placed in operation, the effluent from the combined tanks improved somewhat, due to a longer detention period, and the performance of the plant seemed to be satisfactory in spite of the lack of careful operation. On March 16, 1942, Mr. Warren H. Booker, Director of Division of Sanitary Engineering, North Carolina State Board of Health, inspected the Tent Camp sewerage system and the following are extracts from his report:

"Commander Charles L. Pool called me on the telephone last week and requested that I accompany him to the Tent Camp at the Marine Barracks, a mile or two southwest of Jacksonville, on Monday, March 16, 1942.

This is to advise that we have made this trip and inspected the water supply and sewage treatment facilities for the Tent Camp.

The sewage treatment plant was designed for a Tent Camp, and I infer from the name that this is probably intended to be more or less temporary. As such, it seems to me that a very good primary sewage treatment plant has been installed, although unfortunately, it seems to be working up to capacity or perhaps even more. It is my information that it was intended originally to accommodate some 6,000 Marines, but there are probably in the neighborhood of 15,000 in the Tent Camp at this time. It should be added that another

flow through compartment which would probably brin neighborhood of 12,000. treatment given seems to this plant. The effluent discharged into Brinson (

No evidence of fouodor was noted in the occur musty odor due, in my opswamp adjacent to the str not over six inches which and downstream to a some of view, I could not see sewage effluent being di

If I might be perm mention the following:

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to aid in our war en issued provided that ed off and saved in give a higher grade traps are installed, mixed with these fat

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flow through compartment in the sewage treatment plant is now being used, which would probably bring the capacity of the plant up to within the neighborhood of 12,000. But even with this slight overload, the primary treatment given seems to be making a marked improvement in the effluent from this plant. The effluent is chlorinated by means of dry chlorine gas, and discharged into Brinson Creek, perhaps a hundred yards distant.

No evidence of fouling of this creek was noted, and no evidence of odor was noted in the occasion of this visit. The only odor was a slight musty odor due, in my opinion, to the decomposition of organic matter in the swamp adjacent to the stream. There is a slight tidal action of perhaps not over six inches which causes this material to surge up-stream slightly, and downstream to a somewhat greater extent, but from a public health point of view, I could not see any possible danger from this amount of settled sewage effluent being discharged into this stream.

If I might be permitted to make a few suggestions, I would like to mention the following:

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1. A bar screen was used, and, as a result, a lot of unsightly rags and rubbish is raked from the bar screen which was probably either buried or incinerated. It is believed, however, that if this unsightly vile smelling mess, which may a little later be exposed to flies, could be supplemented by means of a comminutor, all of this unsightliness and odor around the screen chamber, and the possibility of flies returning to the mess halls could be obviated. If the Tent Camp is to be used much longer, it is suggested that consideration be given to installing a communitor paralleling the present screen chamber, and permitting the screen chamber to be used in an emergency when the comminutor is out of use.

2. Another suggestion is that a considerable amount of fats and greases were noted on the surface of the settling chambers. Several suggestions in regard to handling this situation occur at this time.

(1) Inasmuch as fats, oils, and greases are so badly needed to aid in our war effort, it seems to be that appropriate orders might be issued provided that all excess fats and oils resulting from cooking be poured off and saved in the kitchens during cooking operations. This should give a higher grade of fats, oils and greases than will result if grease traps are installed, where soaps and other material are allowed to become mixed with these fats and greases resulting from cooking operations.

(2) Besides saving a very large portion of the fats, oils and greases at the source, that is at the ranges in the cook shacks, and aside from the possibility of installing grease traps, it is suggested that some form of floating squeegee be installed on the surface of the two flow through compartments of the sewage treatment plant. In my opinion, your engineers could readily design such a floating device which would collect all the grease and floating scum to one end where it could be dipped, or permitted to flow over into the sludge compartments very rapidly.

(3) A still further suggestion in regard to the operation of this plant is that should the population and resulting sewage flow be

and of fouring of this cross was noted, and no evidence of in the occasion of this visit. The only oder was a sitght in the decasion of this visit. The only oder was a sitght with the stream. There is a sitght tidal action of perhaps of a somewhat prester estent, but from a public health point and not soo any possible denger from this amount of setting their discharged is to this stream.

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(3) A still further suggestion in regard to the operation

still further increased, it may be necessary to still further increase the chlorine dosage now being applied.

The possibility of installing secondary treatment, or piping the effluent over to New River was mentioned, but, under the circumstances, I see no immediate need for either alternative from a public health point of view. In my opinion, the investment of an amount of money sufficient to secure secondary treatment would be far better made in some other line of war effort, certainly at this time."

N-3.07. Additional Facilities. In April 1942, at the request of the Officer in Charge, estimates were prepared for the addition of certain features to the sewage treatment plant. On April 9, 1942, a report was submitted to the Officer in Charge, comparing the cost of chemical precipitation with the cost of high rate trickling filters and secondary settling, and recommending that the latter be considered. This report also discussed the operation of the plant to date. On April 11, 1942, the Officer in Charge requested us to proceed with detailed plans and specifications for the following additional sewage treatment facilities, using chemical precipitation, as shown on drawing T.C. No. 355, the cost not to exceed \$125,000:

(a) A Parshall Flume and Flow Meter for measuring and recording the flow of sewage, and proportioning the feed of chemicals.

(b) An automatic control solution type chlorinator of 400 lbs. capacity per day. The small dry feed chlorinator originally installed was transferred to Mumford Point Camp No. 1.

(c) Chemical precipitation, including chemical feed machines, a flash mixing tank and two flocculation tanks with mechanical agitators.

(d) Six new sludge drying beds, Nos. 5-10, inclusive, having a total area of 8400 square feet, with provision for future glass covers.

(e) A sludge pumping station and complete piping to eliminate the necessity for using the Marlow portable pump for handling raw sludge, digested sludge, and supernatant liquor. Two pumps were to be provided, each with a capacity of 8400 G.P.H.

(f) A sewage pumping station (No.8) to pump settled sewage and upon occasion, to pump by-passed raw sewage. This station consisted of a receiving or wet well with screen, a pump room containing two pumps: No. 1, with a capacity of 1500 gallons per minute against a 10 foot head, No. 2, with a capacity of 2250 gallons per minute against an 11 foot head, a motor room containing one electric and one dual electric gasoline engine drive unit (for pump No. 2) with automatic controls and provision for a future pumping unit.

(g) A 16" force main on piles across Brinson Creek and an 18" outfall sewer discharging into New River, just south of Jacksonville.

(h) A new circular digester, similar to the ones constructed at

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Lisonndary treatment, or piping the offsmed, but, under the elreuratemess, i listrative from a public health point which of an amount of money sufficient there.

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the Division Training Area Plant, without gas utilization. Heating coils were installed and blanked off.

(i) A four inch water main from the Tent Camp.

(j) A power line extension from the main transmission line now serving the Tent Camps.

Work on these features was well underway on October 1, 1942.

N-3.08. Recommendations - Tent Camps No. 1 and No. 2 Sewage Treatment Plant. Chemical machines provided are for the use of dry chemicals and are arranged so that lime, ferric sulphate and alum can be used. Solution flumes and chemical lines should be cleaned often. Water supply has been provided for flushing flumes and lines. When chemical treatment is not being used, the Flash Mixing Chamber should be cleaned periodically. This may be accomplished by running the Flash Mixer.

Float wells in the Chemical Building should be cleaned monthly and connecting lines to Parshall Flume flushed with the water supply provided.

Existing settling tanks have been provided with revolving scum troughs that discharge into adjoining sludge tanks. Scum should be removed daily.

After each period of sludge pumping, sludge lines should be flushed by pumping settled sewage from the wet well of the pumping station.

In the control chamber of sludge digestion tank "E", two vents with valves have been provided. These should be left open when digested sludge and raw sludge lines are out of operation for longer than a day. The supernatant sampling sink in this chamber should be thoroughly flushed with the water supply provided after each period of sampling.

Recommendations and suggestions set forth in previous reports should also be adhered to as before.

N-3.09. The sewerage drawings prepared for Tent Camps Nos. 1 and 2 were as follows: TC Nos. 4, 5, 6, 63, 64, 65, 66; 76, 217, 246, 355, 356, 357, 358, 359, 360, 361, 363, 364, 365, 367, 368, 371, 372, 375, 376, 377, 378, 379, 383, 392, 393, 227, 366, and 398.

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Table N-3.10

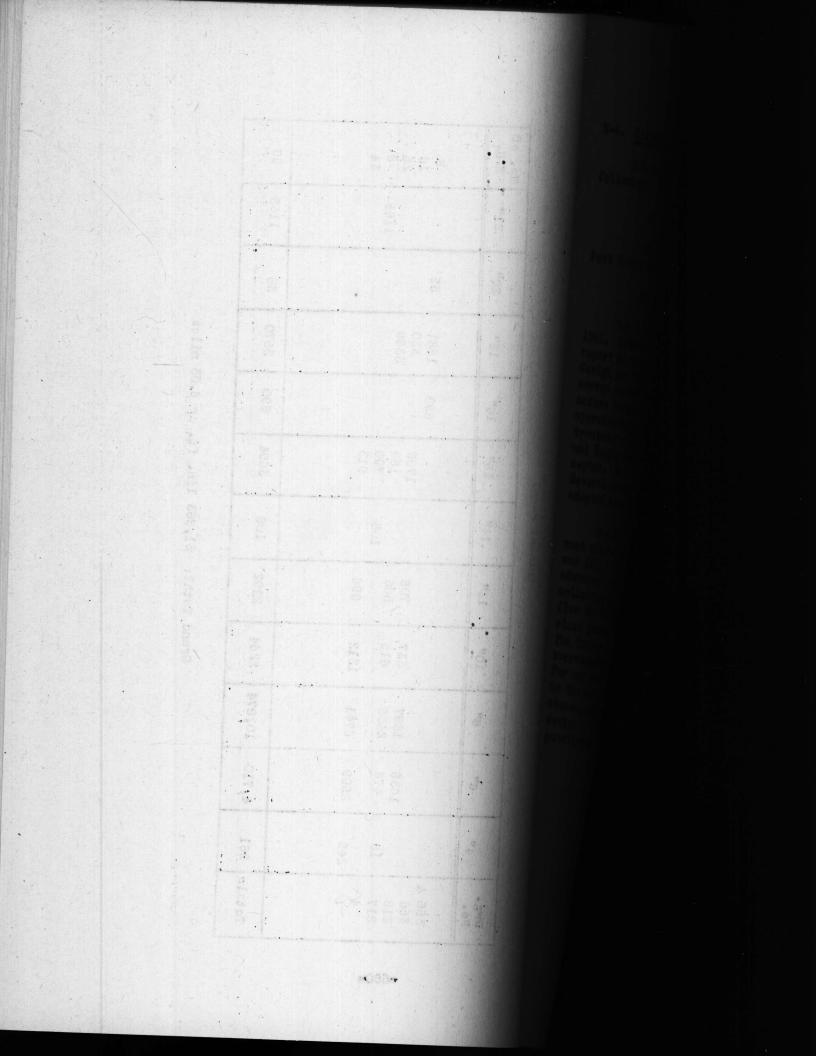
TENT CAMPS 1 AND 2

Dwg. No.	4"	6"	8"	10"	12"	14"	15"	16"	18"	20"	21"	No. of M.H.
355 & 356 218 217 4 5	16 245	1635 476 2599	1697 2436 6741	337 615 1312	708 886 698	108	1795 188 798 913	890	1881 320 3369	35	1165	6 16 25 8 34
Totals	261	4,710	10,874	2264	2292	108	3694	890	5570	35	1165	89

SEWER QUANTITIES (Lineal Feet)

Grand Total: 31,863 lin. ft. or 6.03 miles

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N-4. Division Training Area

N-4.01. This area lies on the east side of New River and includes the following:

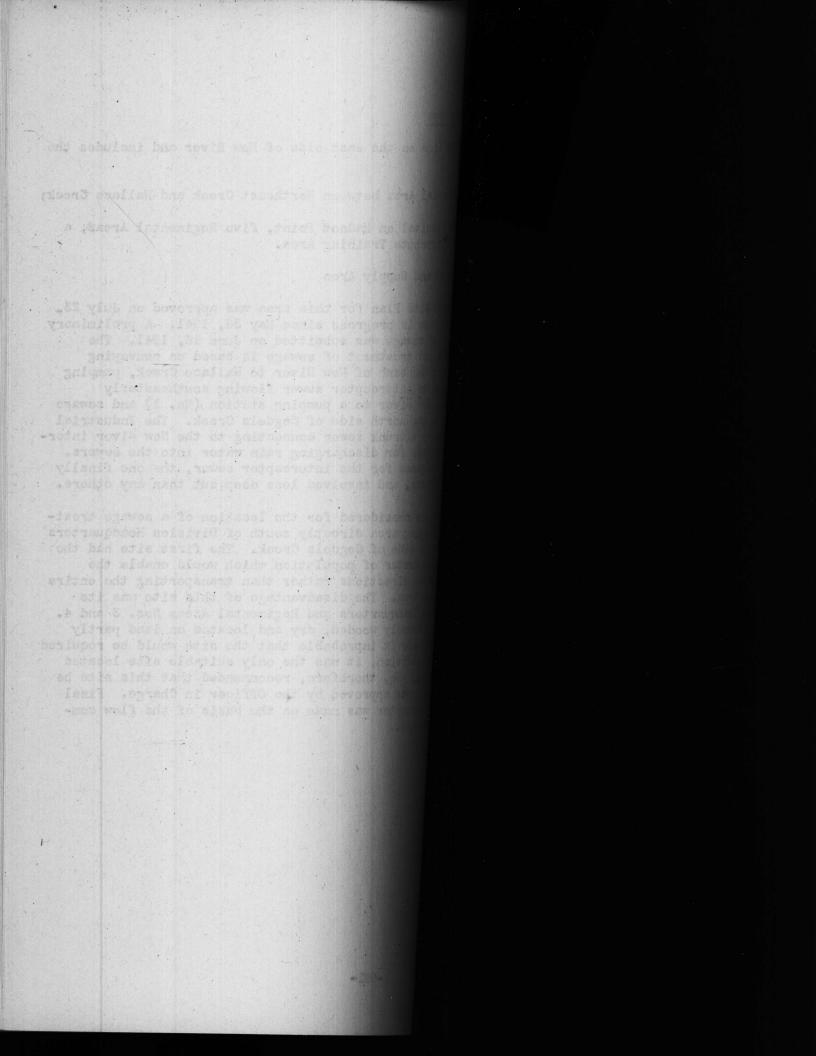
(a) A Residential Area between Northeast Creek and Wallace Creek;

(b) A Naval Hospital on Hadnot Point, five Regimental Areas, a Post Troops Area, and a Parachute Training Area.

(c) Industrial and Supply Area

N-4.02. The General Site Plan for this area was approved on July 23, 1941. Sewer surveys had been in progress since May 30, 1941. A preliminary report on the collection of sewage was submitted on June 16, 1941. The design for the collection and treatment of sewage is based on conveying sewage southeasterly along the bank of New River to Wallace Creek, pumping across Wallace Creek, into an interceptor sewer flowing southeasterly approximately parallel to New River to a pumping station (No. 1) and sewage treatment plant located on the north side of Cogdels Creek. The Industrial and Supply Area is served by a trunk sewer connecting to the New River interceptor. No provision was made for discharging rain water into the sewers. Several routes were investigated for the interceptor sewer, the one finally adopted being shorter, cheaper, and involved less deep cut than any others.

N-4.03. Two sites were considered for the location of a sewage treatment plant. (1), the low lying area directly south of Division Headquarters and (2), a site on the north side of Cogdels Creek. The first site had the advantage of being near the center of population which would enable the collecting of sewage from two directions rather than transporting the entire flow the full length of the Area. The disadvantage of this site was its close proximity to Division Headquarters and Regimental Areas Nos. 3 and 4. The Cogdels Creek site was densely wooded, dry and located on land partly surrounded by swamps which made it improbable that the site would be required for any other purpose. In addition, it was the only suitable site located to the north of French Creek. We, therefore, recommended that this site be chosen, which recommendation was approved by the Officer in Charge. Final design of the New River Interceptor was made on the basis of the flow computations shown in Table N-4.04.



FLOW SHEET - NEW RIVER INTERCEPTING SEWER FROM NORTHEAST CREEK TO COGDELS CREEK (TREATMENT PLANT)

N-4.04

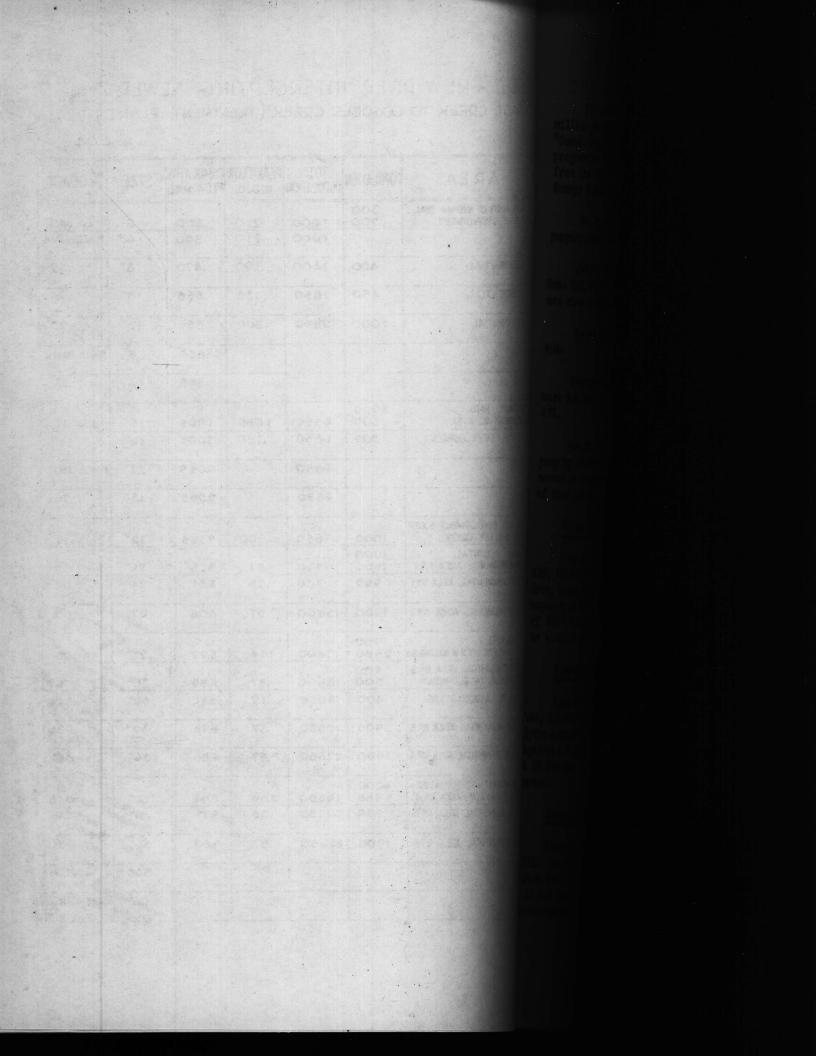
M.H. <i>fo</i>	M.H.	AREA	POPULATION	TOTAL		CUMULATIVE FLOW-M.GD	SIZE	% GRADE
	5.P.S. 5	AREA NORTH OF AUTUMN OVAL	300	1	n a seaso a seaso a	1.1.1.1	antere el erre	1
10.22 S.P.S. 5 to	4.80	FUTURE DEVELOPMENT	700	1000	.210	.300	8″	.42
	16.16			1000	.210	.300	6"	FORCE MAIN
201 fo 15.06	197	RESIDENTIAL	400	1400	.120	.420	8"	.42
197 to 8.18	194	RESIDENTIAL	450	18,50	.135	.555	10"	.28
194 to 4.90	5.P.S.4	RESIDENTIAL	1000	2850	.300	.855	12"	.20
S.R.S.4 10 -2.15	183				9	.855	8"	FORCE MAIN
183 to	182					.855	12"	
182 Fo 15.61	153	MIDWAY PARK RESIDENTIAL AREA	3000 500	6350	1.050	1.905	15"	.15, .17
153 to -2.06	S.R.S.3 - 2.15	FUTURE DEVELOPMENT	500	6850	.150	2.055	16"	.60
S.P.S.3 to -2.18	10.0 15.31			6850		2.055	12"	FORCE MAIN
100 to . 15.19	97 12.55			6850		2055	15"	.26
97 <i>Fo</i> 12.30	67 9.37	FUTURE DEVELOPMENT SOUTH SIDE WALLACE CREEK.	1000	7850	.300	2.355	18"	.12
67 to 9.13	65 8.26	NAVAL HOSPITAL MOF REGIMENTAL AREA Nº 1	1000	10750	.87	3.23	21"	.11
65 fo 8.01	61 694	VS OF REGIMENTAL AREA Nº I	950	11700	.28	8.51	24″	.08
61 to 6.69	58	3/3 OF REGIMENTAL AREA Nº2	1900.	13600	.57	4.08	27"	.07
58 to	55 5.10	1/3 REG. AREA 2 POST TROOPS & FUT. DEV. N. OF HOLLOMB BLI	950 2850	17400	1.14	5.22	27"	.08
55 to 4.85	54 4.60	3 OF REGIMENTAL AREA Nº 3, ADDITIONAL DEVELOPMENT	950 300	18650	.37	5.59	30"	.062
54 to 4.59	53 4.34	DIVISION HEADQUARTERS	400	19050	.12	5.71	80"	.064
53 to 4.33	49 3.64	33 OF REGIMENTAL AREA № 3	1900	20950	.57	6,28	30"	.066
49 to 3.14	47 2.75	33 OF REGIMENTAL AREA Nº 4	1900	22850	.57	6.85	36*	.046
47 to 2.74	45 2.40	INDUSTRIAL ". SUPPLY AREA - 13 OF REGIMENTAL AREA Nº 4	6000 950	29800	2.09	8.94	36"	.048
45 to 2.39	43	13 OF REGIMENTAL AREA Nº 5	950	30750	.28	9.23	36"	.04.8
43 to 2.15	41	3/3 OF REGIMENTAL AREA, Nº 5	1900	32650	.57	9.80	36"	.050
41 to	S.R.S. 1 0.44				and the second second	A. Mark	36"	.060
S.P.S.1 to	S.T.P. 21.68			1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.		Constant of	16"	FORCE MAIN

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The column headed "Peak Flow (M.G.D.)" gives the expected flow, in million gallons per day, from the various units listed. Column headed "Cumul. Peak Flow" gives the cumulative flow of sewage, as estimated, in progressive steps throughout the entire length of the intercepting sewer from its upper limit to the treatment plant. SPS is an abbreviation for Sewage Pumping Station.

The figure in parenthesis immediately below the manhole or sewage pumping station number give the invert elevation of the sewer at that point.

N-4.05. During the construction period temporary general sewer plans Nos. M.B. 415 and 434 were used to coordinate the work. These data now are shown on the 1"= 500' record drawings.

Typical sewer details are shown on M.B. Drawings Nos. 402, 403 and 404.

Construction drawings prepared for the New River Interceptor Sewer were M.B. Nos. 410, 405, 401, 408, 418, 419, 420, 421, 422, 463, 471 and 472.

N-4.06. As is seen on the flow sheet (Table N-4.04) three small pumping stations were needed along the interceptor for conveying sewage across Wallace Creek, and to avoid excessive depths. A brief description of them follows:

Wallace Creek Sewage Pumping Station No. 3

Plans for this station are shown on M.B. Drawings Nos. 435, 436, 437, 438, 439 and 736. This station receives sewage from the entire Residential Area, Midway Park Residential Area and Gate House Area. Pump No. 1 has a capacity of 500 G.P.M. against a 22 foot head. Pump No. 3 has a capacity of 800 G.P.M. against a 22 foot head. This unit may be driven by gasoline or electric motor. Space has been provided for a future pump No. 2.

River Road Sewage Pumping Station No. 4

Plans for this station are shown on M.B. Drawing Nos. 441, 442, 443, 444, 445 and 737. This station receives sewage from the Residential Area lying north of Whiteside Branch. Pump No. 1 has a capacity of 200 G.P.M. against a 21 foot head. Pump No. 2 has a capacity of 200 G.P.M. against a 23 foot head. This unit may be driven either by gasoline or electric motor.

Autumn Oval Sewage Pumping Station No. 5

Plans for this station are shown on M.B. Drawing Nos. 473, 474, and 1701. This station receives sewage from a small area in the vicinity of Autumn Oval. Pumps Nos. 1 and 2 have a capacity of 50 G.P.M. each against a 14 foot head. This station is built entirely underground and should be ventilated thoroughly before any employees are permitted to enter the same. "In (1.9.5.)" gives the expected flow, in the vertous units listed. Column hadded mulative flow of sewage, as essimated, in the batter length of the intercepting seven resent plant. SIT is an abhreviation for

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are on 1.8. Drawing Nos. 473, 474, and brow a small area in the violaty of an a capacity of 50 G.F.M. each against baits entirely underground and should be capacity of parmitted to estar the same. N-4.07. A brief description of the sewer systems for the various parts of the Division Training Area are given below:

Regimental Area No. 1 Sewers for this area are shown on Drawings M.B. Nos. 414, 405, 410 and 408. Many of the buildings in this area connect directly to the New River Interceptor Sewer and the Hospital Area Trunk Sewer. The 10" sewer between Manholes 65 and 150 was designed to serve the Brig and a few other buildings in a low lying part of the Post Troops Area.

Regimental Area No. 2 Sewers for this area are shown on Drawings Nos. M.B. 405 and 406. The 15" and 12" sewer between manholes 58 and 279 are designed for extension into the Post Troops Area.

Regimental Area No. 3 Sewers in this area are shown on drawings M.B. 407 and 401. None of the sewers in this area were designed for future extension.

Regimental Area No. 4 Sewers in this area are shown on Drawings Nos. M.B. 409 and 401. The 15" sewer between manholes 45 and 117 was designed for and serves as the trunk sewer from the Industrial and Supply Area.

Regimental Area No. 5 Sewers for this area are shown on Drawings Nos. M.B. 458 and 400. None of the sewers in this area were designed for future extension.

Naval Hospital Area Sewers in this area are shown on Drawings Nos. M.B. 410, 456, and 457 and 737. Due to the distance to the intercepting sewer and the elevation of some of the buildings, a sewage pumping station (No. 2) was required for this area. The station discharges through 1075 feet of 8" Force Main into Manhole No. 133. Pump No. 1 has a capacity of 200 G.P.M. against a 23.5 foot head. Pump No. 2 has a capacity of 300 G.P.M. against a 25 foot head. This unit may be driven by either gasoline or electric motor.

Industrial and Supply Area Sewers in this area are shown on the following drawings: M.B. 412 and 413. The 15" trunk sewer leading to this area has a capacity for a peak flow of 1.8 M.G.D. The sewer was designed to take sanitary sewage from the various buildings, including the laundry with the usual wastes and the parachute training area. This sewer was not designed to receive large quantities of water from the Central Heating Plant, etc., as no such need was anticipated.

The gas and oil station, which was added after all sewers had been constructed, was built on ground too low to be served by these sewers and a septic tank and disposal field were provided. The tank is 3'6" x 9'0" in plan, with a settling capacity of 668 gallons and a disposal field of 350 feet of 4" tile drain.

Gate House Area Sewers for this area are shown on M.B. Drawing No. 1402. Sewage from this area discharges into Manhole No. 628 on the Midway Park Residential Area sewerage system and eventually is pumped back into the main collecting system.

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third parameters the source is 16'0" in play outside the parameters 460. Post Troops Area Sewers for this area are shown on M.B. Drawing No.

Parachute Training Area Sewers for this area are shown on M.B. Drawings Nos. 462 and 1408. The sewage from the main buildings around the first two towers is pumped into the Industrial and Supply Area sewers by sewage pumping station No. 9. This station is shown on M.B. Drawings Nos. 1404, 1405, 1406, 1407 and 737. Pump No. 1 has a capacity of 100 gallons per minute against a nine foot head, and is electrically driven. Pump No. 2 has a capacity of 200 gallons per minute against an eleven foot head and has dual gasoline-electric drive.

It was necessary to install a septic tank and disposal field for the third parachute tower which was located on ground too low to be served by the sewers in the area around the first two towers. A septic tank 5'8" x 16'0" in plan, with a settling capacity of 3170 gallons, was provided just outside the landing area of the tower. Disposal field consists of 500' of four-inch tile drains.

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DIVISION TRAINING AREA

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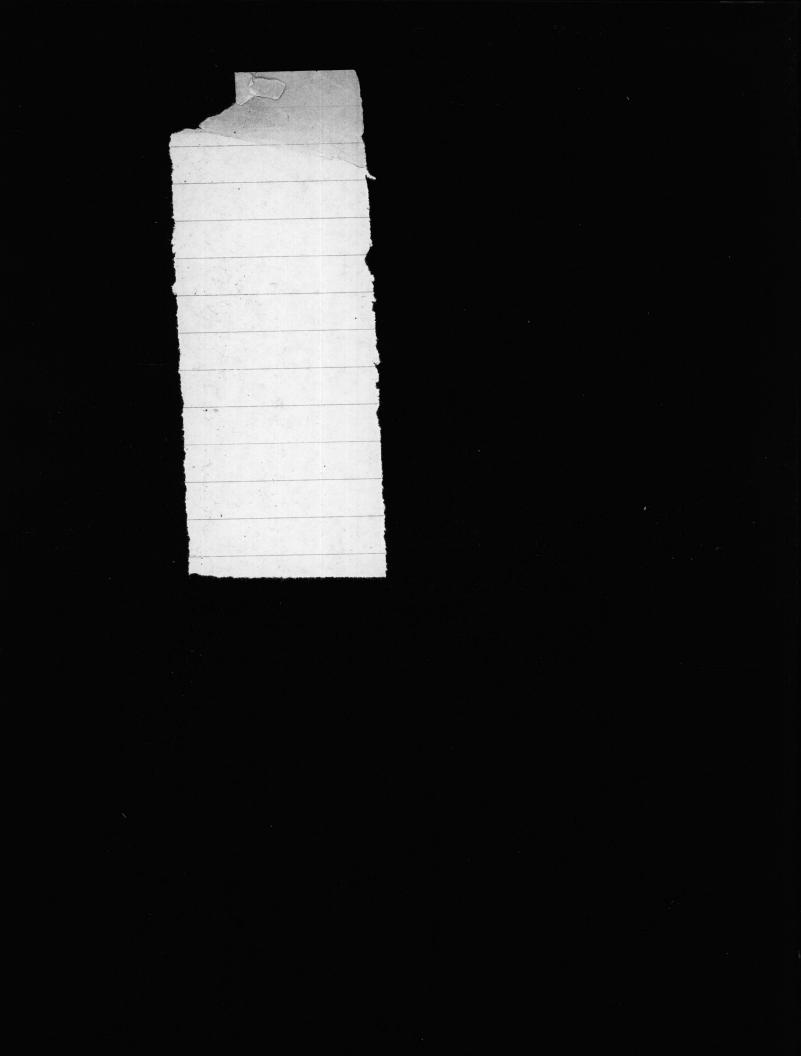
TABLE OF SEWER QUANTITIES (LINEAL FEET - AS OF SEPT. 4, 1942)

N-4.08

DWG. Ng	4"	6"	8°	10"	12"	15"	16"	18"	20"	21"	24"	27"	30"	36"	M.H. Nº
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462		870	1468	2384											12
463		1188	746												3
471		3110	1832												6
472		1020	2129									•			7
1402		65	760	e e											2
1408	548	624													2
TOTALS	946	34604	44426	12801	12126	16357	464	3952	12	769	1813	2003	1750	3629	305

GRAND TOTAL : 135,652 LIN. Fr. OR 25.69 MILES.







N-4.09. Sewage Pumping Station No. 1, Sewage Treatment Plant and Outfall Sewer The factors determining the site for the sewage treatment plant have already been discussed. Careful study was given to the problem of determining the degree of purification which would be required prior to discharging sewage into New River. Final decision was not made until all the information which was readily available had been collected and discussed with the Officer in Charge, Mr. Warren H. Booker, Sanitary Engineer, Stafe Health Department, the North Carolina State Fisheries Commission, and with an independent consulting engineer, who was retained to assist in this matter.

The oxygen content of the river water, tide and wind currents, the location of shell fish beds, rainfall records, present pollution, soundings, proposed use for bathing and recreational purposes, and other matters pertaining to the problem were investigated as thoroughly as the limited time would allow.

N-4.10. On August 28, 1941, the following report was submitted covering the disposal of sewage:

"REPORT COVERING THE DISPOSAL OF SEWAGE FROM MARINE BARRACKS

NEW RIVER, N. C."

August 28, 1941

"In order to determine the degree of treatment necessary for the disposal of sewage from the Division Training Area, we have made studies and determinations in New River, upon which to base final conclusions. These studies include soundings, tide gauge readings, float observations to determine tide and wind currents, chemical analysis to determine salinity and available oxygen, run-off from average annual precipitation and volumetric computations for available dilution. Other investigations have been carried out to ascertain the location, extent and value of oyster beds, and the extent to which New River will be used for bathing and recroational purposes.

Ordinarily, studies of this character are carried out over a period of several months in order to include seasonal and unusual weather and tidal conditions. Obviously, it has been impossible to spread our investigations over a period of time ordinarily alloted to studies of this character and our conclusions are based upon the best evidence obtainable and as summarized later in this report. In order to give a clear picture of the areas which will contribute sewage to New River and the characteristics of the River itself, the following facts are given as a general gauge for estimating the ratio between sewage contributed and river water available for dilution.

The Marine Barracks is located on the east side of New River, between Northeast Creek and French Creek. The town of Jacksonville is situated on the east side of the river about 20 miles above the inlet from the Atlantic Ocean. The Marine Corps Tent Camp, now constructed to house 6,000 men, is situated about a mile and one-half southwest of Jacksonville on Brinson Creek, a tributary of New River, N. C. A C.C.C. Camp, housing 400 men temp-

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rarily, is located on the north side of Northeast Creek, due north of Paradise Point. The proposed 700 family housing project with an estimated population of 3,000 will be located on the south side of Northeast Creek and east of State Highway No. 24. (Mumford Point Tent Camp was projected later.)

At Jacksonville, the river is comparatively narrow, but widens rapidly to an average of 8,000 feet, between Paradise Point and Cogdels Creek. New River inlet consists of a dredged channel and numerous small channels through the river delta. The Intracoastal Waterway crosses New River near the inlet. The area of the river above a line drawn between Rhodes Point and Cogdels Creek is 8660 acres, or 135 square miles. The channel to Jacksonville is dredged to a depth of 11 feet below mean sea level, or 9 1/4 feet below mean low water. The average depth between Paradise Point and Cogdels Creek is nine feet below mean sea level.

Soundings shown on the Coast and Geodetic Survey Charts are referred to mean low water, which is 1.5 feet lower than mean sea level. During the summer of 1941, the level of water in the river above Sneads Ferry stood at or above sea level. Therefore, the depth of water in New River is about 1.5 feet greater than the charts indicate with a correspondingly greater volume of water.

From tidal observations on four gauges, it is estimated that the periodic tide in New River above Cogdels Creek is 0.3 feet. Gauges were located as follows:

No. 1 Sneads Ferry Bridge

No. 2 New River near Cogdels Creek.

No. 3 Northeast Creek at railroad bridge

No. 4 Brinson Creek at railroad bridge

The zero points of these gauges are set at mean sea level, as determined by leveling from Bench Marks of the U. S. Coast and Geodetic Survey.

Assuming 1.92 tidal cycles each day, the daily tidal prism equals .576 feet. This would indicate a daily change in the water of New River above Cogdels Creek of 217,000,000 cubic feet or 1,630,000,000 gallons.

The drainage areas of New River above Cogdels Creek, at the point where the effluent from the sewage treatment plant will be discharged, is in excess of 340 square miles. The annual rainfall is estimated at 48 inches, or 280,000,000,000 gallons. It seems reasonable to assume that 20% of the precipitation reaches New River, which is equivalent to a run-off of 56,000,000,000 gallons annually, or an average of 153,000,000 gallons daily. In time of lowest flow probably six per cent of the average, or 9,000,000 gallons of fresh water enter the river daily above Cogdels Creek.

Samples of water from New River at the proposed outfall sewer were analyzed on July 3, 1941, with the following results:

Samples No. 1 - 1000 feet from shore

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To determine posed outfall, ex Creek, a number of July 15, 18, and 2 river, the floats two feet with four upon by water currs slow: consequently, are of value chief! ment of water takes it is believed, to to assume that thou the line from Rhods able location of the ently caused by

The estimate sewage, together Oxygen demand, are pounds of B.O.D. B.O.D. will be account treatment at any pounds (Rep

(Report of 8/28/41 Cont'd) Available Oxygen; Top Available Oxygen, Bottom Chlorides 13,350 P.P.M. PH 8.2

6.3 P.P.M. 6.0 P.P.M.

Sample No. 2 - 2000 feet from Shore

Available	Oxygen,	Top	5.9	P.P.M.	
Available	Oxygen,	Bottom	5.8	P.P.M.	

Sample No. 3 - 200 feet from Shore

Available Oxygen, Top6.2 P.P.M.Available Oxygen, Bottom6.2 P.P.M.PH and Chlorides same on all samples

Using an average of six parts per million or 50 pounds of oxygen per million gallons of water, the daily in-put of oxygen into New River, due to tidal changes is 1,630 M.G.D. x 50 or 81,500 pounds of oxygen. It is realized that some of the water carried out by one tide may be drawn in by the succeeding reversal of flow, resulting in water of less than 6 P.P.M. oxygen content entering the river, but in the lack of any long time, comprehensive measurements of currents in New River, it is felt safe to assume that this deficiency will be more than off-set by rainfall run-off, natural wind aeration and oxygen given off by aquatic and marsh plants.

To determine the dispersal of treated sewage discharged from the proposed outfall, extending approximately 1600 feet into New River near Cogdels Creek, a number of wooden floats were released and their courses observed on July 15, 18, and 21. Due to the presence of sand bars extending into the river, the floats were constructed so as to be submerged only a little over two feet with four sheet metal fins at the bottom to increase the area acted upon by water currents. The currents in New River were found to be quite slow: consequently, the floats were influenced greatly by wind action and are of value chiefly as the indication of the fact that a very definite movement of water takes place in the vicinity of the proposed outfall, sufficient it is believed, to provide adequate dispersal. Certainly it is conservative to assume that the effluent will be mixed with one-fifth of the water passing the line from Rhodes Point to Cogdels Creek, especially in view of the favorable location of the outlet, which is in a deep section of the river, apparently caused by a decided current at this point.

The estimated population which will use the New River for dilution of sewage, together with the estimated sewage flows and daily Biochenical Oxygen demand, are shown in the table below, computed on a basis of 0.17 pounds of B.O.D. per capita per day, and assuming that a reduction of 30% B.O.D. will be accomplished by primary treatment alone, a higher degree of treatment at any point will obviously react more favorably throughout the entire cycle of purification.

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AREA	POPU- LATION	DAILY AVERAGE SEWAGE FLOW	D <i>I</i> Raw	ILY B.O.D Treated	duction)
Division Training & Residential	15,000	1,500,000	2550#	1785#	
Tent Camp C. C. C. Camp Housing Project City of Jacksonville	6,000 400 3,000 6,000	600,000 40,000 300,000 600,000	10 20# 68# 510# 1020#	714# 48# 357# 714#	1
Totals:	30,400	3,040,000	5,168#	3,618#	

Due to the fact that the Tent Camp, the city of Jacksonville, the C. C. C. Camp and the Housing Project will discharge sewage into widely separated parts of the river and at some distance from the proposed outfall sewer serving the Division Training Area, it may be safely assumed that the sewage from these contributors will be throughly mixed with and will be oxydized by the waters of New River before reaching the area surrounding the outfall sewer near Cogdels Creek. Starting off with a total of 81,500 pounds daily imput of oxygen into New River, neglecting the in-put due to rainfall and deducting 1833 pounds for the four sewage contributors above mentioned, a remainder of 79,667 pounds of oxygen is available for dilution of treated sewage from the Division Training Area. It is estimated that the effluent from the proposed treatment plant will have a daily B.O.D. of 1785 pounds which will result in the daily use of a little more than two per cent of the daily oxygen in-put available from tides.

Investigations covering oyster beds show that none exist to the north of Sneads Ferry, which is more than seven land miles below the proposed sewage outlet. Furthermore, the location of the oyster beds is in close proximity to the ocean inlet where tidal changes are more pronounced and correspondingly greater dilution is afforded. Insofar as pollution to oyster beds is concerned, it is believed that no effect whatever will be felt because of the treated sewage discharged at Cogdels Creek.

The use of the river for bathing and recreation purposes has been given careful consideration. From the studies made to date covering prevailing wind, currents and other factors, it appears that, with the degree of purification recommended, that bathing should be restricted in the near vicinity of the outlet. The shore line at this point is alternately swampy and rugged for a distance of 1300 feet upstream and approximately the same distance downstream from the outlet. After the treatment plant has been in operation for a period of months the extent of restriction on bathing can be determined within close limits by appraising the results of bacteriological examinations from water samples taken at representative points along the shore.

It is assumed that this procedure will be carried out as a precautionary measure regardless of the degree of sewage treatment given, this practice being generally accepted as a necessary one.

Conclusions and Recommendations

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From the foregoing data the following conclusions are reached:

1. New River under the conditions as covered by our observations, will afford ample dilution for the sewage contributed from the Division Training Area for a population in excess of 15,000 persons, with primary treatment consisting of two hours minimum sedimentation in well designed and properly operated tanks.

2. Chlorination of the effluent will probably be required during certain seasons of the year, more particularly during the summer months.

3. The plant should be designed for flexibility of operation to meet wide fluctuation in population. The design should include all necessary provisions for future expansion, including blank pipe connections and space for future structures. All future structures should be indicated at this time on the general plan which will be 'used for current construction.

4. Provision should be made at this time in the plant design for complete biological treatment should additional purification be required in the future.

Plant Design

A general plan has been prepared covering the treatment of sewage on the following basis:

Authoriz	ed Population	12,500
Average	daily flow at 100 gallons per to	1.25 M.G.D.
Maximum	capita hourly peak flow at 200 gallons	1.20 M.G.D.
	per capita	2.50 M.G.D.

A general plant layout showing units proposed for immediate and future construction is attached hereto.

Comminutors

In order to prevent the nuisance and operating costs incident to raking and disposing of screenings, comminutors are recommended for instal-lation ahead of grit chambers and sewage pumping plant. This equipment will continuously grind or cut the coarse matter into small settleable particles within the raw sewage channel and will thus eliminate the difficulties encountered with sewage pumps where clogging frequently occurs from the solids ordinarily contained in sewage.

It is proposed to install two units for immediate use, each designed for an average flow of 1.75 M.G.D. and peak flow of 2.5 M.G.D. Space and pipe connections will be provided for two future units.

Grit Chambers

In order to prevent undue wear on sewage pumps and to eliminate operating difficulties due to sand settling in tanks, pipe lines, etc., throughout the treatment plant, it is considered essential that grit removal interesting this fillowing accolusions why reached

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be provided. This feature is considered very necessary in view of the soil conditions. For immediate and future requirements it is proposed to construct a three channed hand-cleaned grit chamber to include a coarse bar rack for removing large obstructions. The channels will provide for a velocity of one foot per second and will be arranged to take minimum expected flows and maximum future flows up to 7 M.G.D. Mechanically cleaned grit chambers are preferable to hand cleaned units but the former have been eliminated as being too costly.

Sewage Pumping Plant

As stated in prior reports, the trunk line sewer serving the Division Training Area, Hospital Area and Supply Area will terminate just north of Cogdels Creek at elevation -0.43. A pumping plant will be required to lift the sewage to elevation 19.5, (later raised to 21.5 to fit the site). From this point flow will be by gravity through the treatment plant and outfall sewer which will extend into New River about 1600 feet. The average lift will be 25 feet, for which the following pumping units have been selected:

1. Unit 1000 G.P.M. requiring 10 Horsepower
1. Unit 1500 G.P.M. requiring 15 Horsepower
1. Unit 2600 G.P.M. requiring 23 Horsepower

The average daily running cost for pumping will be equivalent to 8.5 continuous horsepower per 1.25 million gallons pumped, or 152 K.W. hours per day, at 0.0065 = 99 cents. This with a demand charge based upon 16.5 K.W. at 1.00 per K.W. per month = 55 cents per day, making the total cost for power 1.24 P.M.G., or 1.54 per day for normal flow.

Primary Tanks

Two primary tanks will be provided each 16 feet wide x 65 feet long x 10 feet average depth, 10,540 cubic feet each: total retention period three hours at average rate of flow for 12,500 population: 2 1/2 hours for 15,000 population. 1.87 hours for 20,000 population. Accepted practice indicates a retention period of one to three hours with an average of two hours being generally adopted. On this basis, it is obvious that the two tanks when operating together will handle a total population of 20,000 before additional settling tanks need be added. For minimum requirements it is possible to operate one tank only.

It is proposed to equip both tanks with mechanical sludge and scum collecting equipment. Sludge removal will be accomplished by means of sludge pumps which will take suction directly from the tank hoppers and discharge into the sludge digesters.

Sludge Digesters

Heated sludge digestion tanks will be provided together with gas collecting and utilization equipment. Two tanks 35 feet diameter x 19.5 feet average depth, 18,750 cubic feet capacity each, should be provided for immediate use. The total capacity is based upon three cubic feet per

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(Report of 8/28/41 Cont'd)

capita for 12,500 population or 2.5 cubic feet, for 15,000 population. If the population is materially increased beyond 15,000, or if activated sludge is added later, a third unit will be required. The sludge digesters are to be equipped with floating covers, or equally effective means for collecting sludge gas, gas burning and heating equipment for maintaining proper temperatures within the tanks and means for burning waste gas.

Sludge Pumping Equipment

Two identical duplex plunger type sludge pumps, of orthodox type, will be provided to transfer fresh sludge from the settling tanks to the digesters; also to transfer sludge from one digester to the other. It is proposed to house this equipment in a small building which will also contanin a laboratory, office and tool room.

Sludge Drying Beds

Beds for drying sludge will be provided on the basis of 2/3 square feet per capita, if covered and 1 square foot per capita if open. The area for a population of 12,500 will be 8330 square feet in six units, each 70 feet long by 20 feet wide. It is strongly recommended that the beds be roofed over to prevent direct wetting from rainfall but that side enclosures be omitted. It is believed that roofing will prove economical in the end by cutting down the area of drying beds and by permitting greater economy in handling sludge. (covers were ruled out by our charge, due to lack of funds) It is proposed to remove sludge by means of small industrial push cars to a central point accessible to trucks. (concrete runways were submitted later.)

Sterilization

Chlorinators will be provided, together with ducts and manifold arrangement for application as required to effect pre or post chlorination. The use of one ton chlorine containers will probably be required in the interest of economy. The design will be made to permit the installation of proper handling equipment for immediate and future requirements."

N-4.11. After careful study of the above report and of hydrologic data pertaining to North Carolina stream and rainfall, an independent expert consultant decided that the following values probably would apply to the New River drainage basin:

Mean discharge	0.61	M.G.D.	per	sa.	mila	
Minimum daily discharge		M.G.D.				
Minimum weekly discharge		M.G.D.				
Minimum monthly discharge		M.G.D.				

The records show the rainfall in Onslow County to average between 50 and 55 inches annually. It was considered that very little progressive and steady movement of the effluent toward the sea would occur and considered the principal value of the tides to be their dispersing effects upon the sewage effluent, and their resulting acceleration effect upon the rate of surface re-aeration due to the oscillations of the water. However, basing calculations upon an estimated minimum discharge of 20

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million gallons daily, the consultant estimated that the minimum residual dissolved oxygen content of the river would be three parts per million for a contribution population of 15,000. He considered that this result constituted a border line base and indicated the need of future secondary treatment to serve any increase in the contributing population. He pointed out that this study was theoretical and that observed conditions after the installation of the primary treatment plant may either indicate the immediate need for higher treatment, or no need for such treatment in the near future. He, therefore, concurred with the conclusions and the recommendations of the report of August 22, 1941, as applied for a contributing population not exceeding 15,000. A report submitted December 1, 1941, discussed the problem further and stressed the necessity for competent operation.

N-4.12. Design of the treatment plant was carried out substantially in agreement with the report of August 28, 1941. Drawings were as follows: M. B. 416, 417, 424, 425, 427, 428, 430, 431, 432, 433, 734, 735, 812, 961, 446, 447, 448, 449, 450, 451, 452, 453, 454, 459, 461, 465, 466, 467, 468, 469, 470, 475, 476, 477, 478, 480, 481, 488, 1730, 1731, 1891, 1892, 7851, 426, 429 and 440.

N-4.13. In February 1942, it became apparent that the population of the area would be in the excess of 20,000 instead of the 12,500 originally estimated. We were directed by the Officer in Charge to prepare plans for Digester No. 3, Primary Settling Tank No. 3, and Sludge Beds 7-14, inclusive. Two beds were added to M.B. drawing No. 453. Other sewer drawings were: M.B. 455, 482, 483, 484, 486, and 487.

N-4.14. As constructed according to the above listed drawings and specifications 400, 401 and 402, the plant is designed for a population of 20,000 with an average daily flow of 2,000,000 gallons with a peak flow at the rate of 4.0 M.G.D. A brief resume' of the capacity and characteristics of the structures is given below:

Coarse Bar Screen An inclined coarse screen fabricated from $1/2 \ge 1/2$ inch steel bars with 3 inch clear openings has been constructed in a concrete channel preceeding the comminutors. This screen is arranged for manual raking.

<u>Comminutors</u> Two Chicago Pump Company comminutors, driven by three-fourths horsepower weather proof Star electric motors, Serial Nos. 239817 and 239826, have been provided. The machines continuously and automatically cut and screen the coarse material in the raw sewage. Each machine is designed to pass an average flow of 1.75 M.G.D. at a head loss not to exceed eight inches. The mechanisms are fitted with one complete set of extra cutting teeth and one extra comb together with all special tools, hubricating equipment and instructions required for maintenance and repair. Each comminutor is controlled by an off-and-on maintained contact push-button station with an across-the-line type starter, with overload, low voltage and phase failure protection. The two comminutors are capable of passing a peak flow of 5.0 M.G.D. involters antitat de constitut setier sof the minimum and the state of the situation for the set of the state set the situat be sized to state set it. and the set situat best set to some set to some

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Sorial In (1) 15-horaceus Fine Bar Screen A fine bar screen has been provided for service when it becomes necessary to by-pass the comminutors. The fine bar screen is fabricated of $1/2" \ge 21/2"$ flat bars with 1 1/4" clear spacing. The screen is arranged for manual raking.

Grit Channels Two grit channels, one on either side of an overflow channel, have been provided. Flow through the grit channels is regulated at the influent end by means of removable stop gate weirs and at the effluent and by steel proportional weirs. For the purpose of draining the grit channels there have been provided four inch plug valves with a drain leading to the receiving well of sewage pumping station No. 1. The two channels together provide for a peak flow of 7.0 M.G.D.

TP751Z

Sewage Pumping Station No. 1

Pump	No-	1	1.44	M.G.D.	or	1000	G.P.M.
A CONTRACTOR OF CONTRACTOR			2.16	tt	11	1500	n
Pump			3.75	11		2600	
Pump	No.	3	0.10			2000	

Total installed capacity: 7.35 M.G.D. or 5100 G.P.M.

The capacity of the outfall sewer is 5.0 M.G.D. or 3470 G.P.M., so it is obvious that all three units of the pumping station ordinarily may not be operated at the same time. However, in case of emergency, by flooding the 24" by-pass sewer, the hydraulic gradient may be increased enough to cause the outfall to take the flow of all three pumps.

Specification No. 401 covers the construction of the sewage pumping station No. 1 and the equipment listed below:

Pump No. 1 Fairbanks Morse vertical five-inch sewage pump, Type 5413E, Serial No. 442982, with vertical Fairbanks Morse Type QSZU, Motor No. 400518, ten-horsepower, three-phase, 60 cycles, 1170 R.P.M., 220 volts: See pump characteristic curves (Diagram N-4.15)

Pump No. 2 Fairbanks Morse six-inch vertical sewage pump, Type 5414E, Serial No. 442983, with Fairbanks Morse vertical motor, Type QSZU No. 404226, 15-horsepower, three-phase, 60-cycles, 680 R.P.M., 220 volts. See pump characteristic curves (Diagram N-4.16)

Pump No. 3 Fairbanks Morse eight-inch vertical sewage pump, Type 5415EGS, No. 442984, equipped for dual drive, including Fairbanks Morse right angle pump drive, Serial No. 14416, Style FW-2, ratio 1:2, connected through a twin disc clutch to Continental gasoline motor No. E-61182, with a 300 gallon underground gasoline tank. The electric motor is Fairbanks Morse vertical Type QSZy, No. 403093, 25-horsepower, three-phase, 60-cycles, 690 R.P.M., 220 volts. See pump characteristic curves (Diagram N-4.17)

Future Pump Space and connections have been provided for a future Pump (No. 4)

Air Compressor Worthington 1 7/8" x 2", Serial No. 7638: driven by

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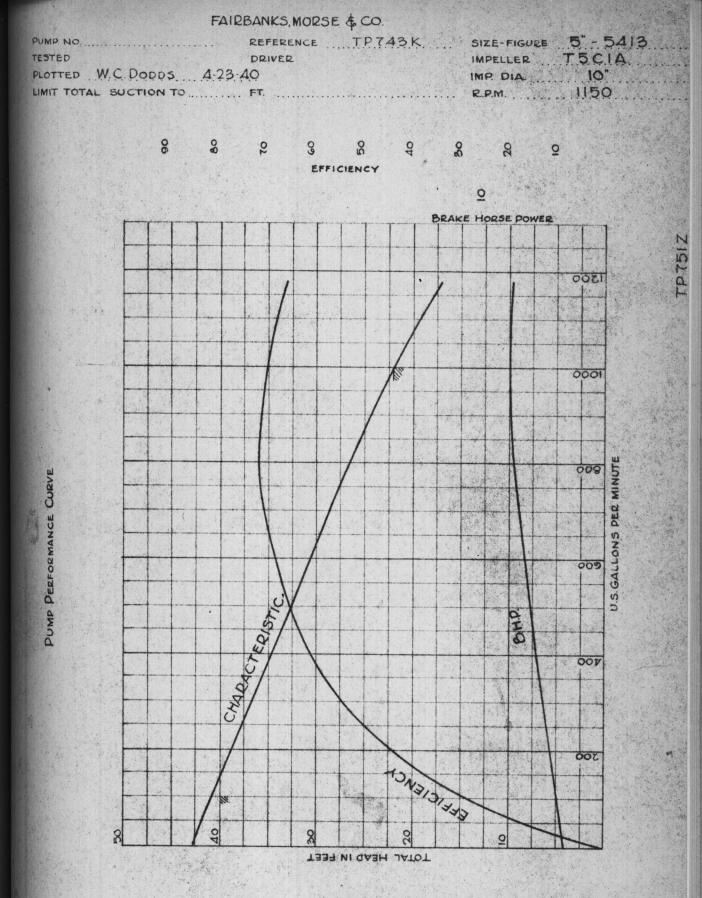
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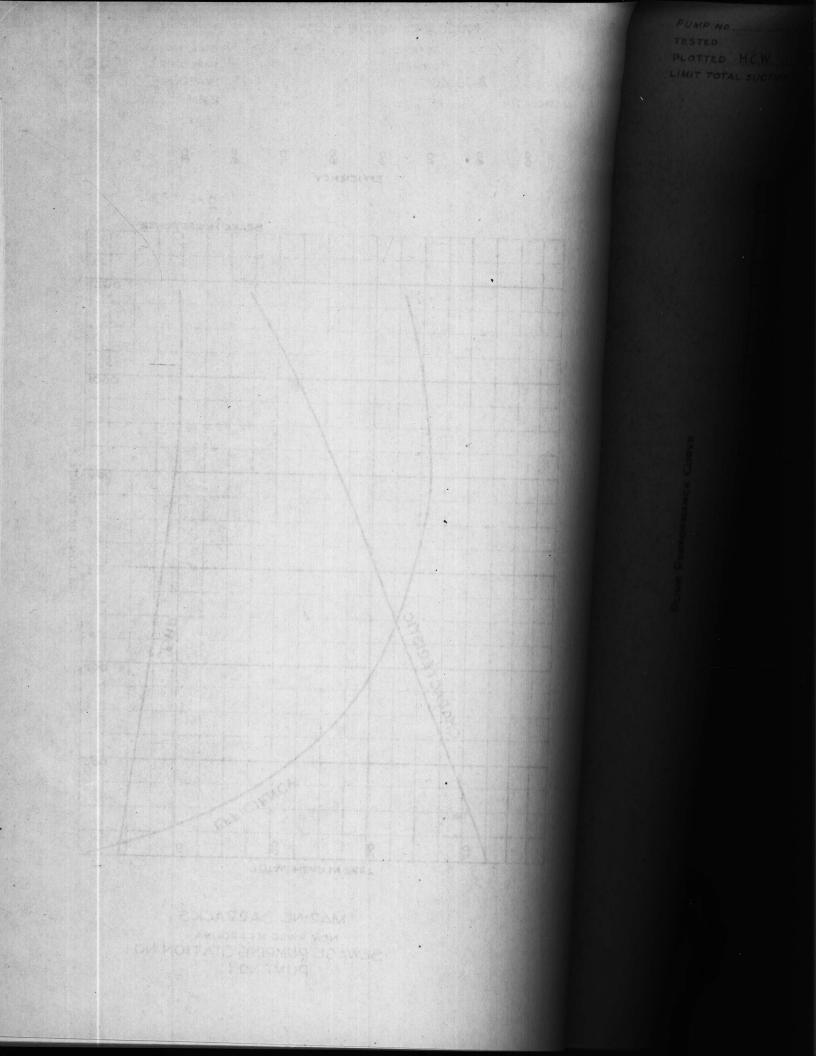
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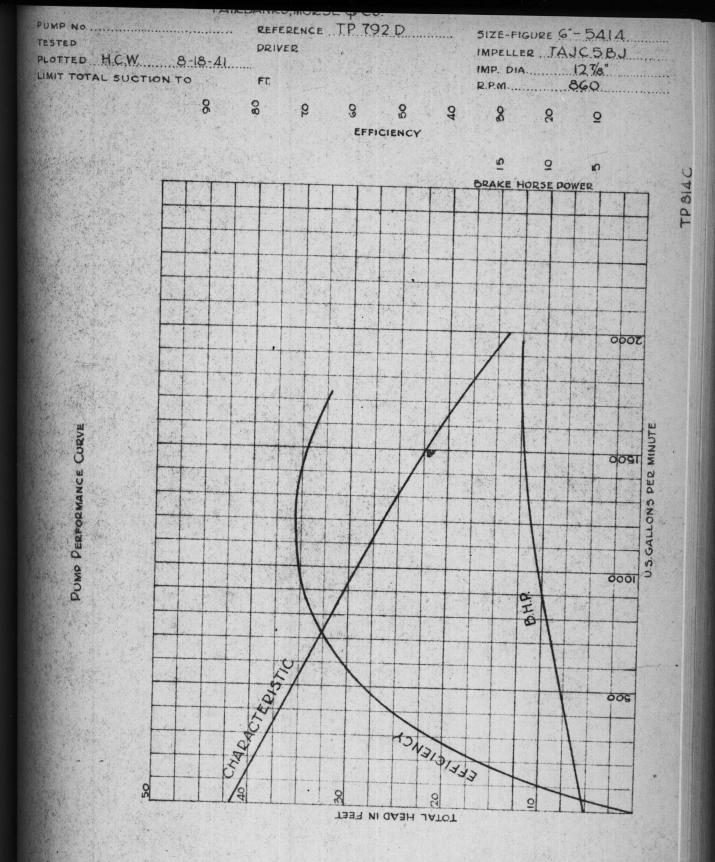
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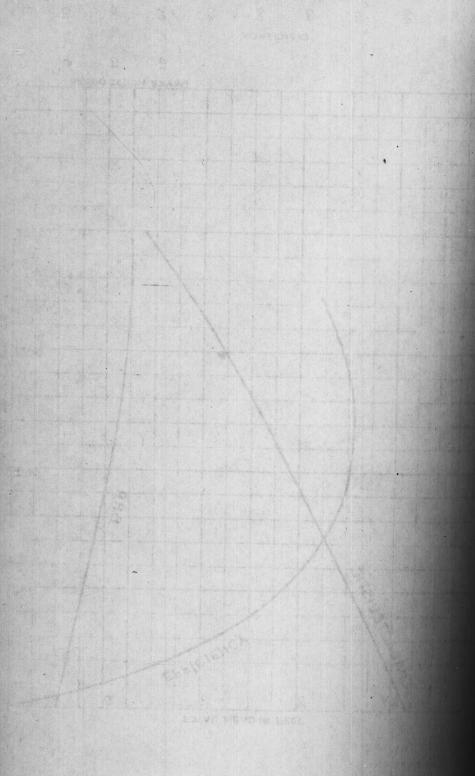
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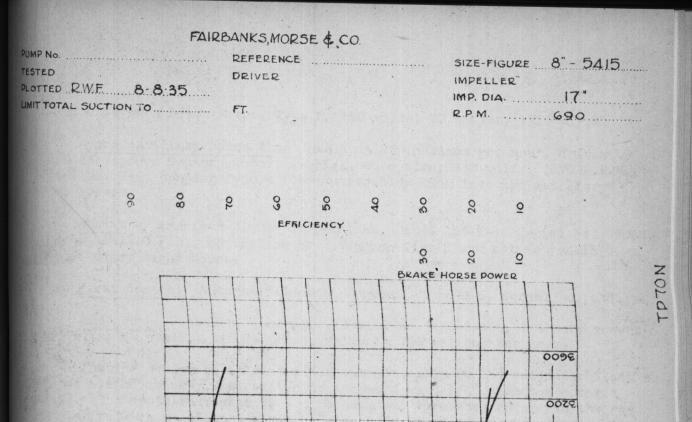


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PUMP PERFORMANCE CURVE

MARINE BARRACKS NEW RIVEL N.CAROLINA SEWAGE PUMPING STATION NO.I PUMP NO.3

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a 1/4 horsepower Delco Motor, Type M, 110 volts, 60 cycles, 1750 R.P.M.

Myers Auxiliary Water Pump rated at 750 gallons per hour, driven by a 3/4 horsepower Century Motor, 3-phase, 60 cycles, 220 volts, 1770 R.P.M., Serial No. R-1, pumping from a float controlled tank into the auxiliary water system.

Blower by American Blower Corporation, Model 150-A-1, Serial No. 79068, capacity 1015 C.F.M., controlled by a Sangamo Time Clock set to run 15 minutes every eight hours.

Float Control Automatic Control Company, Type M-5, Serial No. 4281;

Sump Pump Penberthy Automatic, Serial No. X80-94104, 1/4 horsepower, 110 volts, 60 cycles, single phase, rated at 750 gallons per hour.

Pumping equipment is controlled automatically by the automatic float switch listed above. This switch is actuated by 6 1/2" diameter ceramic float. The depth indicator is set to indicate zero when sewage in the receiving well is at elevation minus 7.42. The float switch is adjusted so that the proper pumps are selected to take the variable flow from the intercepting sewer and produce a smooth flow through the treatment plant. It will be noted from the characteristic curves that the discharge of Pump No. 1 varies from 1,000 to 700 G.P.M., Pump No. 2 varies 1500 to 1070 G.P.M. and Pump No. 3 varies from 2500 to 2050 G.P.M. For the design flow this should produce a close balance between pump discharge and sewage flow, reducing greatly the frequency of starting and stopping. In addition, the automatic switch is provided with connections whereby the sequence of operations may be altered and if necessary in the future, the entire program of operation may be changed by simply adjustments of the contacts. Full operating instructions have been furnished by the manafacturer of the float switch.

Visual electrical signals have been provided in the operators office to show which pumping units are in service, and in addition, a red light will show and a horn will sound when sewage in the wet well reaches a high elevation of 0.85 feet. As a further precaution, an emergency overflow has been provided which will discharge raw sewage into a ditch leading to Cogdels Creek when sewage in the intercepting sewer reaches an elevation of 2.25. This overflow elevation may be changed by varying the height of the overflow weir. A flap value of the overflow pipe will prevent flooding the pumping station by back water from an unusually high tide. The ditch leading from the flap value should be completely unobstructed at all time.

Tests should be made frequently to check pump efficiences. It should be noted that motors are 220 volts, requiring a different transformer tap than for the 208 volts used elsewhere in the area.

The Venturi meter described below, provides a convenient method of measuring pump discharges.

The proper lubrication of sewage pumps is essential to efficient

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operation and the life of the equipment. The stuffing boxes on the pumps are water sealed, the supply being furnished by auxiliary water system which precludes the possibility of contaminating the potable water supply. Sealing water is turned on and cut off automatically by solenoid valves connected to the pump circuit. It should be noted that it is necessary to supply water to the stuffing box of Pump No. 3 by a manually operated valve at such times as the gasoline engine is in operation. The governor on the gasoline engine should be set so that the unit will deliver 2600 G.P.M. with the wet well full. The lubrication of the ball bearings in pumps and motors should be checked at intervals of six months. Care should be exercised in greasing this type of bearing as a surplus will cause excessive heating. Extreme care must be taken to secure a perfect ball bearing grease which is non-acid and non-alkali.

Sewage in the wet well should be pumped down and all grit and other settled solids removed at such intervals as may be determined upon by trial.

Venturi Meter. The Venturi Meter was furnished by the Builders Iron Foundry. It is a type M, Model D-2, register, indicator, recorder, Tube No. 19636, diameter 16", throat diameter 6 1/2", register No. 8683. The meter will register a maximum flow of 4000 G.P.M. Full operating instructions have been furnished by the Manufacturer. The entire installation is valved so as to permit by-passing the Venturi Meter for necessary repairs.

The register, which is located on the ground floor of the Sewage Pumping Station, is actuated by two air diaphragm relays set close to the Venturi tube in a vault just outside of the building. The relays convert the liquid pressure to air pressure as a means of actuating the registerindicating-recorder mounted in the pumping station. A constant air supply under pressure is furnished by a small compressor, also located in the station. The converting diaphragms are equipped with clear pressure water inlets for flushing out matter which would in time clog the convertors and connecting pipes. This method of transmission between the venturi tube and register was selected in lieu of fluid transmission by sewage in order to avoid the difficulties which are known to exist, by the latter method, because of clogged pipe lines and erroneous readings caused thereby. Separate air relays are provided for actuating this automatic controls on the two chlorinators located in the Sludge Fumping and Chlorinating Station.

Influent Chamber. The influent chamber receives the sewage from the 16" force main which is enlarged 20" diameter to reduce entrance velocity. Pre-hlorination may be effected in this chamber. The supernatant line may be flushed by opening the shear gate provided. Flow to either primary settling tank may be adjusted or shut off altogether by inserting 14" pipe nipples of the proper length in the bells of the discharge elbows. An adjustable overflow weir has been provided leading to the by-pass sewer, also a sluice gate has been provided to drain the influent chamber or to by-pass raw sowage to the river if it should become necessary.

Primary Settling Tank. From the influent chamber the sewage flows through 14" cast iron pipes to the primary settling tank, welling up through a flared opening into a tapered distribution channel, thence through a number of ports into the tank. The three tanks now installed have a capacity

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of 10540 cubic feet, each giving a detention period of 2.85 hours with an average flow of 2 M.G.D. Link Belt Company sludge and scum collecting equipment have been installed in three tanks. Tanks 1 and 2 are equipped with a common unit, Link Belt No. W7931-G, input R.P.M. 1750, output 2.7, driven by a 1/2 horsepower G. E. Motor. Settling Tank No. 3 is equipped with a single Link Belt Company unit No. W55G of the same general characteristics, and driven by a 1/2 horsepower G. E. Motor. The driving motors are controlled by push button starting switches. The manufacturer has furnished a complete set of tools, lubricating devices and instructions for the maintenance and operation of this equipment. The collectors operate in a straight line sweeping scum to troughs near the effluent end of the tanks and on the return trip scraping the settled sludge into hoppers near the influent ends of the tanks. The settled sewage passes over an adjustable weir into a discharge channel leading to the effluent chamber. Each tank is equipped with a drain leading to the by-pass sewer.

Effluent Chamber. The effluent chamber is arranged so that the effluent of the settling tank may be routed to future activated sludge tanks, or to the by-pass sewer by means of sluice and stop gates.

Chlorinating Equipment. Two chlorinators have been provided, each with a maximum capacity of 400 pounds per day, with piping for pre- and post-chlorination. On the southwest side of the chlorinator room there are installed Wallace and Tiernan Company vacum chlorinator L-2095, differential converter L-1564, with Fairbanks springless scale F-741472. On the northeast side there are installed Wallace and Tiernan vacum chlorinator L-2098, differential converters L-1565 with Fairbanks springless scale F-741473. A monorail hoist is provided and either 150 pound, or 2,000 pound drums of chlorine may be used. The differential converters are actuated by impulses transmitted by compressed air through copper tubes connecting to relays on the Venturi meter at sewage pumping station No. 1, thus proportioning the amount of chlorine to the flow of sewage. Temporarily, chlorine is applied at a manhole on the by-pass sewer when post-chlorination is desired. For pre-chlorination the solution is discharged into the influent chamber.

Outfall Sewer. The 18" outfall sewer has a hydraulic gradient of 0.57 per cent with a capacity of 5.0 M.G.D. Five 8" outlets were installed at the end of this line with caps screwed tightly on each of them. Sufficient outlets have been installed to take the ultimate flow of 5 M.G.D. Caps should be removed or replaced on the outlets to meet conditions wherein marked increase or decrease in flow will prevail over a period of months, the idea being to maintain high exit velocities and thus prevent silting of the submerged pipe line. A 20" blank connection has been left in Manhole No. 152 for the construction of a second outfall sewer if the same ever should become necessary.

Scum Removal. The primary settling tanks are equipped with revolving scum removal troughs and scum chambers which may be emptied by opening a valve on a 6" line connecting to the primary sludge suction pipe.

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of 1000 c o.95 spin square for the allph alluigs into adding for to receive obversion sludge into well of per Primary Sludge Pumping Station. Two Chicago Pump Co. Vari-drive sludge pumps have been installed with a capacity of 8400 G.P.H. each. The pipe is arranged so that primary sludge may be pumped from the sludge hoppers into any digester, digested sludge may be pumped on to the sludge drying beds in case it is desired to empty a digester or the contents of any digester may be transferred to any other digester. Lubricated plug valves have been installed for ease of operation. These pumps are controlled manually.

Sludge Control Stations. The Sludge Control Station contains the valves for admitting and withdrawing sludge from the digesters, supernatant sampling and withdrawal pipes, gas collecting and metering equipment, a gas fired hot water boiler, circulating pumps for forcing hot water through the coils in the digesters, thermostatic control and manometers. By experiment, the optimum temperature for complete digestion should be determined and the thermostatic control set to maintain that temperature. It is expected that this temperature will be in the neighborhood of 90° F. It should be noted that pipe lines or valves containing sludge may not be closed tightly for any appreciable length of time, because the accumulation of gas will rupture the same. Valved vent pipes leading to the atmosphere have been provided in the places where observation of this safety precaution is most difficult. Flame traps have been provided together with a combination pressure relief valve and flame trap on the line leading to the waste gas burner.

Digesters. Three heated sludge digesters have been provided of 18,750 cubic feet capacity each, or 56,250 cubic feet total. On the basis of 20,000 population, this amounts to an allowance of 2.81 cubic feet per capita, slightly under the original design figure of three cubic feet per capita. This allowance is considered to be liberal. In starting the new digesters a large volume of well digested sludge should be used for seeding purposes. The digesters are equipped with Downes floating steel covers with wood deck and composition roofing. The covers are provided with sampling wells, a gas dome and a pressure and vacum relief. The tanks should be filled with sewage before sludge is discharged into them. This will prevent the accumulation of an explosive mixture of gas. Precautions should be taken in withdrawing digested sludge and in emptying digesters to avoid forming explosive gas mixtures.

Sludge Drying Beds. Fourteen beds have been provided with an area of 1400 square feet each or 19,600 square feet total. This amounts to 0.98 square feet per capita, which compares with the usual practice of one square foot per capita. Due to the high rainfall in North Carolina and the slight deficiency in digester capacity, it may be necessary to increase sludge drying capacity in the future. If so, this may readily be done by adding glass covers to the present beds, the walls of which are designed to receive standard sludge bed covers. Standard glazed covers were recommended in our design but were rulled out due to lack of funds. The sludge liquor is collected by a series of underdrains and flows to the wet well of sewage pump station No. 1 where it mingles with the raw sewage and is passed through the plant for treatment. The Chicks First and the Chicks First Car Mari-difference First Car Mari-difference First Car Mari-difference First Car Mari-difference First Car Mari Car M

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N-5. Midway Park Residential Area

N-5.01. Two schemes were considered for the disposal of sewage from the Midway Park Residential Area. (1) Contemplated collecting the sewage and constructing an activated sludge plant discharging into Lamott's Creek Deep Run; (2) Collecting the sewage and pumping the same approximately three miles into the New River Interceptor. Scheme (1) was estimated to cost \$9,000 more than scheme(2), with much higher operating costs; scheme (2) therefore, was adopted. A 15" trunk sewer was constructed from Manhole 182 on the New River Interceptor northeasterly for a distance of 10,981 feet. The 15" sewer is laid on a grade of 0.13 per cent and has a capacity of 1,500,000 G.P.D. Sewage Pumping Station No. 6 was installed on Butler Drive, North near First Street, discharging through 3,820' of 10" asbestos cement force main into the aforementioned trunk sewer. The sewers in this area, the pumping station and the force main, were designed for a population of 3,000 with an average daily flow of 300,000 gallons and a peak flow, daily, of 900,000 gallons. The main trunk sewer flowing northwesterly through the Residential Area has a peak capacity of 1,100,000 gallons per day.

N-5.02. The following drawings were prepared for this area:

Dwg. No.	Title
L.C.H. 7 L.C.H. 8	Low Cost Defense Housing, Trunk Sewer
L.C.H. 9	17 11 11 11 11 11
L.C.H. 10.	n n n n Sewers
L.C.H. 11	17 17 17 11 11
·L.C.H. 12	n n n n n
L.C.H. 73	Temporary Sewage Treatment and Permanent Emergency Overflow
L.C.H. 62	Onslow Drive, Sewage Pumping Station No. 6 Structural and Piping Details, location & grading plan.
L.C.H. 63	Sewage Pumping Station No. 6 Details Manhole No. 600 Steel Stairs, Stair Well, Hook, Float Tube
L.C.H. 64	Sewage Pumping Station No. 6, Details, Gasoline Engine Piping, Sump, Screen Trough, Overflow Head Wall
L.C.H. 65	Sewage Pumping Station No. 6 Reinforcing Details
L.C.H. 66	Sewage Pumping Station No. 6, Reinforcing Details
L.C.H. 74	Sewage Pumping Station No. 6, Electrical Distribution

N-5.03. Sewage Pumping Station No. 6. This pumping station contains three vertical shaft centrifugal sewage pumps, automatically controlled. The wet well is 19 $1/2' \times 12'$ in plan, with one side sloping to the sump and has a capacity of approximately 8,000 gallons. Before entering the wet

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Table N-5.0

N-6.

Post Train roads, w

well the sewage passes through a hand-raked bar screen, with $1 \frac{1}{2}$ openings.

Pump No. 1. This pump has a capacity of 300 gallons per minute against 22' total head.

Pump No. 2. This pump has a capacity of 300 gallons per minute against 22' total head.

Pump No. 3. This pump has dual electric gasoline engine drive and has a capacity of 600 gallons per minute against 29' total head.

The pumps are controlled automatically by a float switch. A 10" emergency overflow pipe extends from Manhole No. 500, just outside of the station, approximately 920' northeasterly to Lamott's Creek. This overflow is designed to gerate automatically when sewage in the wet well reaches elevation at 17.00 feet. As the station and structures between the Midway Park Residential Area and the Division Training Area Sewage Treatment Plant were not completed at the time of the first occupation of the area, this overflow was used as an outfall to a temporary sewage treatment plant, on Lamott's Creek. The plant consisted of two 14'6" x 30'0" settling tanks built of timber with no bottom or top. These tanks are now out-ofoperation and should be filled with earth. Branch connections from Manhole No. 626 to the temporary tank should be closed also.

Table N-5.04

MIDWAY PARK RESIDENTIAL AREA

Dwg. No.	6"	8"	10"	12"	14"	15"	16"	No. of M.H.
73 12 11 10 9 8 7	8367 6500 4763	8915 7872 6268	920 2500 3778	560 2831 1003	251	4312 6111	124 184	2 45 49 18 14 17
Totals:	19,630	23,055	7,198	4,394	251	10,423	308	145

Sewer Quantities (lineal ft.)

Grand Total: 65,259 lin. ft. or 12.36 miles

N-6. Mumford Point Camp No. 1

N-6.01. This area was originally occupied by a small tent camp for Post Troops. Early in 1942, plans were prepared providing for additional roads, wash rooms, messhalls, warehouses and sufficient huts to provide quarters for approximately 1,500 men. About 5,300 feet of sewer was re-

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quired. The sewer system, which did not require a pumping station, was designed for a population of 1,800. Due to the scarcity of steel and cement, an Imhoff tank of timber construction was selected for primary treatment of the sewage. The settling compartment of this tank has a capacity of approximately 23,000 gallons, giving a detention period of three hours for an average flow of 180,000 gallons per day.

N-6.02. The sewage enters the plant through a bar screen with 1 1/2" clear openings, passes through a grit chamber into a pre-chlorination manhole, and thence into the Imhoff tank. After flowing through the Imhoff tank the effluent flows through a post-chlorination manhole into an 8" cast iron outfall sewer, extending southeasterly 600' into Northeast Creek.

Two sludge drying beds have been provided, arranged to permit future extension. These beds have a total area of 1,580 square feet. The water line in the Imhoff tank is at elevation 8.6' and the top of the sludge bed is at elevation 4.5'; hence, sludge may be removed from the Imhoff tank and placed upon the beds by gravity.

Chlorination is provided by a Wallace and Tiernan Company manually controlled chlorinator. This chlorinator, originally installed as a direct feed machine for Tent Camp No. 1, was converted to a solution type chlorinator with a capacity of from 5 to 40 pounds of chlorine per 24 hours. A by-pass sewer was provided to permit by-passing the sewage for necessary repairs to the plant.

N-6.03. Sewerage drawings for this area were M.P. Nos. 7, 35, 36 and 37.

MUMFORD POINT CAMP NO.1

SEWER QUANTITIES (lineal feet)

Dwg. No.	6"	8"	10"	No. of M.H.
36 7	1156	673 1440	538 1492	3 10
Totals:	1,156	2,113	2,030	13

Grand Total: 5,299 lin. ft. or 1.00 mile

N-7. Barrage Balloon Battalion and Amphibian Base

. N-7.01. This area is divided into two parts:

(1) The Amphibian Base sewage, derived chiefly from lavatories and toilets in the carpentry and machine shops on Northwest shore of Courthouse Bay, flows through approximately 1,000 feet of sewer into a septic tank 15' long and 6' wide, with a settling capacity of 4,050 galons. Five hundred feet of 6" open joint disposal field, running parallel to the shore of Courthouse Bay, was provided. A parallel underdrain was

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provided to lower the ground water level. At the time the system was installed, no accurate estimate of the population could be secured, and it is possible that the disposal field will have to be enlarged or other means provided to take care of future increases in population. Drawing No. M.B. 494 covers this section of the work.

(2) The Barrage Balloon Battalion Area at Marines consists of four barracks, messhall and other Battalion buildings: Officers Quarters and a Balloon School. The Sewerage system, Sewage Pumping Station No. 7 and the Sewage Treatment Plant are designed for a population of 1,800.

N-7.02. Sewage Pumping Station No. 7 was installed at the southeast edge of the developed area, pumping the sewage through approximately 1,000 feet of 8" force main, running in a southeasterly direction to the Sewage Treatment Plant. The sewage enters the wet well through a bar screen with $1 \frac{1}{2}$ " clear openings. The wet well is 15'0" x 11'10" in plan with the bottom sloping steeply to the sump and has a capacity of approximately 7,000 gallons. Pump No. 1 is electrically driven only and has a capacity of 140 gallons per minute against 19 foot total head.

Pump No. 2 has dual electric-gasoline engine drive and a capacity of 200 gallons per minute against 19.5 feet total head.

N-7.03. The sewage treatment plant consists of an Imhoff tank with an integral grit chamber, sludge drying beds and chlorination. The settling compartment of this tank has a capacity of approximately 23,000 gallons giving a detention period of three hours for an average flow of 180,000 gallons per day. Water level in Imhoff tank is elevation 16.0. The sludge drying beds have an area of 1,550 square feet, with top of sand at elevation 9.0 feet. A manually controlled chlorinator, solution type with a capacity of 4 to 40 pounds per day, was provided together with a float switch to cut off the chlorinator during the periods when the pumping station was not operating.

Sludge may be withdrawn from the Imhoff tank to the sludge drying beds by gravity. From the plant the effluent passes through a 10" cast iron outfall sewer, entending southwesterly about 730 feet into New River.

N-7.04. Drawings prepared for the Barrage Balloon Battalion and Amphibian Base area were: M.B. Drawings Nos. 485, 494, 495, 496, 497, 49%, 499, 1400 and 2790. and a lotte to reach hits first inter and the start the bar and the start of a start of

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BARRAGE BALLOON BATTALION AND AMPHIBIAN BASE AREA

SEWER QUANTITIES (lineal feet)

Table N-7.05

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Dwg. No.	6"	8"	10"	12"	M.H.No.
1400 495 494 485	700 3435	1050 100 863 2253	230 1481 3293	20	5 5 17
Totals:	4,135	4,266	5,004	20	2.7

Grand Total: 13,425 lineal feet or 2.54 miles

N-8. Rifle Range Sewers

N-8.01. The Rifle Range Area lies on the west side of New River and is entirely separated from any other activities. Quarters are provided for one battalion together with Bachelor Officer's Quarters, five Married Officers' Quarters, Armory, Post Exchange, Infirmary, Theater, Range Houses, and other smaller buildings. The trunk sewer has a capacity of 650,000 gallons per day corresponding to a population of approximately 2100. Sewage from three toilet buildings located on the 300 yard line and from six toilet buildings located back of the butts is discharged into separate septic tanks. Sewage from the main part of the area flows by gravity into a treatment plant located near the shore of New River on an extension of Range Road. The treatment plant consists of an Imhoff tank, providing a settling capacity of approximately 23,000 gallons, giving a detention period of three hours for an average flow of 180,000 gallons per day. The sewage enters the plant through a bar screen with $1 \frac{1}{2}$ " clear openings. It passes through a grit channel into the Imhoff tank. From the Imhoff tank the sowage flows through a post-chlorination manhole into an eight-inch cast iron outfall sewer extending casterly 528' into New River. Two sludge drying beds have been provided, arranged to permit future extension. These beds have a total area of 1,580 square feet. The flow line in the Imhoff tank is at elevation 19.54 and the top of the sludge bed is at elevation 14.0'. Hence, sludge may be removed from the Imhoff tank and placed upon the beds by gravity. Chlorina. tion is provided by a Wallace and Tiernan Company manually controlled solution type chlorinator with a capacity of from 5 to 40 pounds of chlorine per 24 hours.

A by-pass sewer was provided to permit by-passing the incoming sewage to New River in case of repairs to the plant. ANNA BASE MAISIPIDIA CLI HOLLATAS TOALIAS TAREAS

N-8.02. Drawing 491, 492 and 1403.

Table N-8.03

M.H.M	184	"QL		*3	
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N-9. Glider True

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N-8.02. Drawings prepared for this area were M.B. Nos. 464, 489, 490, 491, 492 and 1403.

Table N-8.03

RIFLE RANGE

SEWER QUANTITIES (lineal feet)

Dwg.No.	4"	6"	'8"	10"	M.H. No.
1403 490 464	3546	643 · 14 6 3	640 3.739	233 1911	4 17
Totals:	3,546	2,106	4,379	2,144	21

Grand Total: 12,175 lineal feet or 2.31 miles

N-9. Glider Training Base Area

N-9.01. This area is located on the west side of New River and consists of the Landing Field, Operations Building, Administration Building and other facilities for parachute troops training and glider training. By direction, a septic tank, designed for a population of 50 was installed on the 8" sewer leading toward New River. Inasmuch as the initial population probably was to be considerably less than 50, only 500 lineal feet of disposal field was installed. As the population grows, it may become necessary to install additional disposal field and an emergency overflow.

N-9.02. Sewerage drawings prepared for this area were M.B. Nos. 493 and 1401.

Table N-9.03

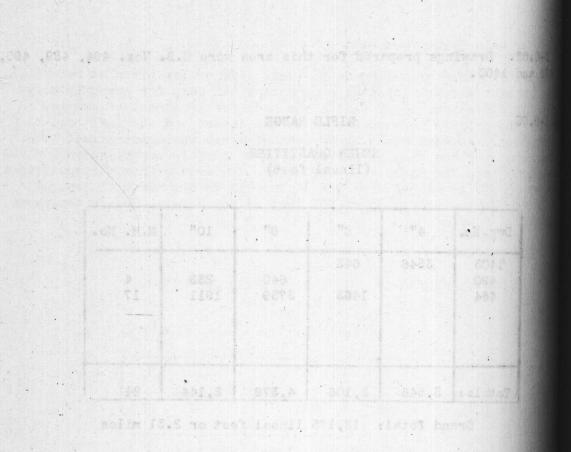
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GLIDER TRAINING BASE

SEWER QUANTITIES (lineal feet)

Dwg. No.	6"	8"	No. of M.H.
493	1586	1167	6
Totals:	1,586	1,167	6

Grand Total: 2,753 lin. ft. or .52 mile



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N-10. Peterfield Point Tent Camp

N-10.01. This area lies on the west side of New River at Peterfield Point. The area was developed as a temporary hut camp for approximately 600 men. By direction, no provision was made for treatment of sewage. Lavatories and urinals were connected to the sewers and chemical toilets were installed. Approximately 2,000 feet of sewer was constructed. The greater portion of the camp is served by an 8" outfall sewer, extending 400 feet easterly into New River. By direction, the sewage from the small area located south of the access road was discharged into a mosquito control ditch leading southeasterly about 600 feet to New River. Sewers are shown on drawing No. TC 303.

Table N-10.02

PETERFIELD POINT TENT CAMP SEWER QUANTITIES

SEWER QUANTITIES (lineal feet)

Dwg. No.	6"	8"	No. of M.H.
303	525	1541	7

Grand Total: 2,066 lin. ft. or 0.39 mile

N-11. Tank Battalion Tent Camp

N-11.01. This area is located on U. S. Route #17, between Jacksonville and Verona. The area included huts for approximately 600 men. By direction, no treatment was provided, the effluent discharging directly into a small stream. Lavatories and urinals were connected to the sewers. Chemical toilets were installed.

Table N-11.02

TANK BATTALION TENT CAMP

SEWER QUANTITIES (lineal feet)

Dwg. No.	6"	8"	No. of M.H.
2	160	1723	7

Grand Total: 1,883 lin. ft. or 0.36 mile

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N-12. Recommendations for Maintenance and Operation of Sanitary Sewers, Pumping Stations and Treatment Plants

N-12.01. It is recommended that sewer rods, winches, cable and necessary cleaning tools be secured for use on the reservation.

N-12.02. That the maintenance of the sewerage system be a continuous operation, preferably under the supervision of a permanent employee. Thorough inspection should be made of the entire system twice yearly and a written report prepared covering the results of the inspection. Special care should be taken to prevent ponding and consequent production of hydrogen sulphide in view of the large amount of concrete pipe installed.

N-12.03. That strict wash room discipline be enforced to prevent newspapers, clothing, bottles, cans, and other debris from being thrown into the sewers; that every effort be made to remove sand from clothing before laundering to prevent large quantities of grit from reaching the treatment plant; that all possible grease be salvaged and collected regularly from the mess halls rather than dumping the same into the sewers.

N-12.04. That gasoline, oil and rain water be excluded from the sanitary sewers.

N-12.05. That trees with a decided tendency to send their roots into sowers with consequent stoppage of the same be planted not closer than 100 feet to any sewer or building connection.

N-12.06. That all small pumping stations (Nos. 2 through 9, inclusive) be visited once a day. Each motor and pump should be checked to see that it is operating properly and the bar screen in the wet well should be cleaned. Screenings should be placed in a closed receptacle and burned at an incinerator.

Once a month the following should be checked:

(1) Overflow lines in connection with each station to see that lines are clean and that flap values are operating. (2) Stand-by engines to see that they start and operate easily. (3) Gasoline supplies (more often if stand-by engine is operated frequently.)

Pump and motors should be lubricated every six months. Care should be exercised in greasing ball bearings as a surplus will cause excessive heat. Extreme care must be taken to secure a perfect ball bearing grease which is non-acid and non-alkali.

Once a year, the operation of all pumps should be checked thoroughly and their capacity determined to ascertain their efficiency. This can best be done by determining the time to dewater a section of the wet well. Flow can be stopped temporarily with stop gate provided in manhole just outside of the wet well.

At certain other intervals, depending on operations, the wet well should be pumped out and cleaned, and sequence of pump operation should be

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changed as necessary.

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Recommendations for pumping station No. 1 were set forth in section N-4 of this report.

N-12:07. All small treatment plants (Barrage Balloon Area, Mumford Point Tent Camp, and Rifle Range) be visited daily. At this time, the bar screen should be cleaned and the screenings put in a closed receptacle for incineration.

Settling chamber of Imhoff tank should be skimmed if any scum has collected. Some should be broken up in the sludge compartment if relief of gas is being impeded.

Complete sewage analyses should be made once a week or at times of great changes in population to regulate the chlorine dosage. At times when pH of sludge is below 7.0 hydrated lime should be added in sludge chamber to obtain pH 7.0 to 7.3.

Once a month, settling chamber walls and bottom should be squeegeed to remove all material that has remained in this chamber. Sediment and grit should be removed also from pre-chlorination and post-chlorination manholes.

At other intervals depending on operation, flow and character of sewage, the following is recommended: (1) Clean grit channels when grit has reached a depth of 6". (2) Ascertain sludge level and keep the sludge level at least 2 ft. below the bottom of the settling chamber. (3) Draw off small amounts of sludge at frequent intervals rather than large amounts at infrequent intervals. (4) Flush sludge lines.

N-12.08. That during continuous operation septic tanks be visited monthly and the depth of sludge determined. If the depth is over 25% of the tank's depth, the tank should be cleaned. The effluent should also be examined and if solids are being carried through, the tank should be cleaned.

N-13. Summary.

N-13.01. To summarize briefly, there was completed, or well on the way to completion as of October 1, 1942, the following sewerage construction:

 270,375 lineal feet or 51.2 miles of sewers. (See table N-13.02)

2. Nine sewage pumping stations: (See table N-13.03)

3. Five sewage treatment plants. (See table N-13.04)

4. Thirteen septic tanks. (See table N-13.05)

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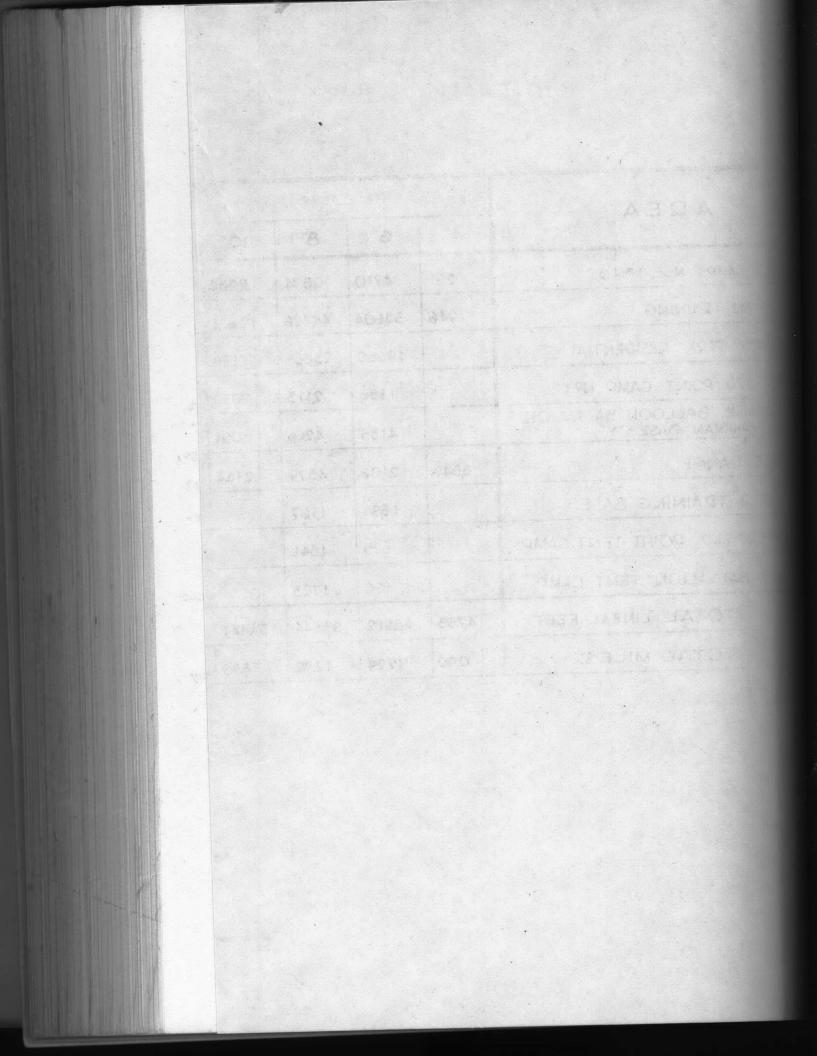
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2003	1,750	3,629	135,652	25,69	305
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			12,175	2.31	21
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LIST OF SEWAGE PUMPING STATIONS N-13.03

STATION	LOCATION	AREA		PUMP	SIZES	
Nõ	LUCATION	AREA	Nº I	Nº 2	Nº 3	Nº4
I.	SEWAGE TREATMENT PLANT.	DIVISION TRAINING.	1000 g. р. м.	1500 g. р. м.	(D) 2600 g. р. м.	FUTURE
2.	RIVER ROAD	NAVAL HOSPITAL	200 с. р. м.	(D) 300 G. P. M.	-	-
3.	WALLACE CREEK	RESIDENTIAL.	500 б.р. м.	FUTURE	(D) 800 g. p. m.	-
4.	NEAR BACHELOR OFFICERS' QUARTERS	RESIDENTIAL.	200 g. р. м.	(d) 200 б.р.м.	-	_
5.	AUTUMN OVAL	RESIDENTIAL.	50 g. p. m.	50 б, р. м.	-	
6.	BUTLER DRIVE, NORTH NEAR FIRST STREET.	MIDWAY PARK DESIDENTIAL.	300 с.р. м.	300 6. р. м.	(D) 600 G. Р. м.	-
7.	ELLEN PATH	BARRAGE BALLOON BATTALION AND AMPHIBIAN BASE.	140 6. р. м.	(D) 200 G. Р. М.	*	-
8.	SEWAGE TREATMENT PLANT.	TENT CAMPS Nos. 1, and 2.	1500 g. р. м.	(0) 2250 6.р.м.	FUTURE	-
9.	HOLCOMB BOULEVARD AT BIRCH STREET.	DARACHUTE TRAINING	100 g. p. m.	(D) 200 с.р.м.	-	+

NOTE: (D) ALONGSIDE SIZE OF PUMP INDICATES THE UNIT IS DUAL GASOLINE-ELECTRIC DRIVE FOR STANDBY AS WELL AS REGULAR SERVICE.

BUACE PLANTAL STATIONS NASS GALL SMIPTOT NO 2.10 . . 10 14 M. C. 1823.2 di a COMPACT TENTS CAMPS 10 10 1 1 1 201 A STAR LESS OF PHARE INCOMPANY THE GUT IS THAT GOLDER

LIST OF SEWAGE TREATMENT PLANTS

N-13.04

AREA	(L) CAPACITY-(Aver Flow) MILLION GALLONS PER DAY		R POPULATION CAN SERVE		(2.) TYPES OF TREATMENT
	PRESENT	BY FUTURE EXPANSION	PRESENT	BY FUTURE	
TENT CAMPS Nº 1ªnd2	1.2	EXPANDED TO LIMIT.	12,000		PRE-CHLORINATION, POST- CHLORINATION, CHEMICAL PRECIPITATION, SEPARATE SLUDGE DIGESTION.
DIVISION TRAINING	2.0	2.67	20,000	26,700	PRE-CHLORINATION, POST- CHLORINATION, PRIMARY SETTLING, SEPARATE HEATED SLUDGE DIGESTION.
MUMFORD CAMP Nº 1.	0.18	0.36	1,800	3,600	PRE-CHLORINATION, POST- CHLORINATION, IMHOFF TANK.
BARRAGE BALLOON BATTALION AND AMPHIBIAN BASE.	0.18	0.36	1,800	3,600	PRE-CHLORINATION, POST- CHLORINATION, IMHOFF TANK.
RIFLE RANGE,	0.18	0.36	1,800	3,600	PRE-CHLORINATION, POST- CHLORINATION, IMHOFF TANK.

NOTE: (1) CAPACITIES ARE COMPUTED ON BASIS OF AVERAGE FLOW OF 100 GALLONS' PER CAPITA PER DAY.

> (2) BAR SCREENS AND GRIT CHAMBERS PRECEDE ALL TREATMENT AND AT DIVISION TRAINING AREA TWO COMMINUTERS ARE PROVIDED.



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PARACHUTE TRAININgith vertical blind drains of 25'ctrs.

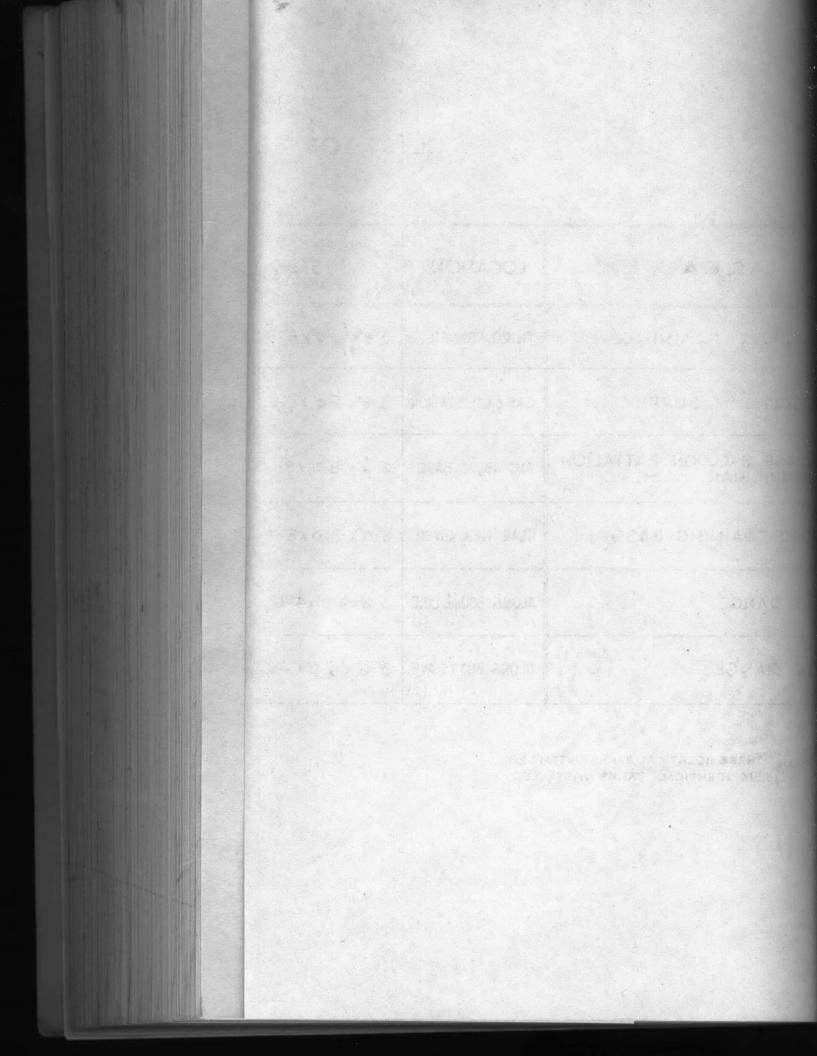
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ARRAGE BALLOON BA

GLIDER TRAINING BAith vertical blind drains at 25 ctrs.

RIFLE RANGE. th vertical blind drains at 25' ctrs. RIFLE RANGE. th vertical blind drains at 25' ctrs.

NOTE: (1.) THREE IDENTICAL (2.) SIX IDENTICAL T



PART II - CHAPTER O

SURVEY DEPARTMENT

TABLE OF CONTENTS

Section	Title
0-1	Introduction
0-2	Existing Data
0-3	Horizontal Control
0-4	Vertical Control
0-5	Topographic Surveys
0-6	Hydrographic Surveys
0-7	Construction Surveys
0-8	Final Surveys
0-9	Permanent Coordinate Stations
0-10	Permanent Bench Marks
0-11	Soil Borings
0-12	Records filed with Public Works Office

0-1. Introduction. The first survey party left Baltimore on April 17, 1941, and work was started on April 18, 1941. Upon arrival, it was found that survey parties furnished by the Atlantic Coast Line Railroad had surveyed the Marine Barracks railroad from a point near U. S. Route No. 17 to a point near the Industrial and Supply area, and had started taking topography on the site later approved for the Tent Camps No. 1 and No. 2. As field parties arrived they were assigned to this work and additional parties were organized as fast as possible. Great difficulties were encountered in securing competent men, and work was seriously handicapped by the lack of suitable headquarters and computing and drafting equipment. However, within one month the number of field parties had been expanded to twenty and a peak of twenty-three parties was reached on June 3, 1941.

The work of the department generally covered many phases of surveying, Horizontal and Vertical Control, Hydrographic and Topographic Surveys, Alignment and Construction Stakeouts, and certain final measurements for the preparation of Record Drawings. The various phases of the survey work will be discussed more fully in the ensuing sections.

0-2. Existing Data.

0-2.01. It was found that no topographic maps ever had been made of the area included within the reservation. The maps and other data which were secured from various Government Agencies are as follows:

0-2.02. Triangulation and Traverse in North Carolina. (1927 datum) U. S. Coast and Geodetic Survey. This volume gives description and geodetic coordinates of numerous triangulation stations on and near the Res-

ervation. It true Meridian System without from Table 2 ad

Carolina, (130 Volume contains Grid System of contains describ essary in most a table (table 0 North and astrotable is notwork of observation

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and, driver all traverse in North Carolins: (2027 datim.) an and Cauletters invove. This volume gives description and gascollecters of sumeroux triver sletter stations on and mear the Reservation. It should be noted that the azimuths given are referred to the true Meridian and may not be used in connection with the Plane Coordinate System without making the necessary corrections which may be obtained from Table 2 of the publication described in 0-2.03.

0-2.03. First and Second Order Triangulation and Traverse in North Carolina, (1927 datum) Volume 2, U. S. Coast and Geodetic Survey. This volume contains the Plane Rectangular Coordinates on the North Carolina Grid System of numerous triangulation stations and other points. It also contains description of some points but reference to item 0-2.02 is necessary in most cases for complete descriptions. This volume also contains a table (table 2) giving the mapping angle or the deviation between grid North and astronomical North for even minutes of longitude. Use of this table is necessary when it is desired to obtain a grid azimuth by means of observations of the sun or stars.

0-2.04. Leveling in North Carolina, Special Publication No. 10. U. S. Coast and Geodetic Survey. This publication gives the elevation above mean sea level and descriptions of a number of bench marks in the vicinity of the reservation.

0-2.05. U. S. Coast and Geodetic Chart No. 777, scale 1; 40,000, showing soundings and navigation aids in New River.

0-2.06. U. S. Coast and Geodetic Survey Compilation of Aerial Photographs. Scale 1; 20,000, sheet No. 5050, dated January 29, 1933. This sheet shows New River and the immediately adjoining land including some of the roads, wooded areas, and streams.

0-2.07. U. S. Coast and Geodetic Survey, Compilation of Aerial Photographs, Scale 1; 20,000, sheet No. 5049, dated January 14, 1941. This sheet shows parts of New River and the Atlantic Ocean between New River Inlet and Bear Inlet.

0-2.08. Aerial Mosaic Map of New River and Vicinity, Scale 1: 20,000 dated February 12, 1941.

0-2.09. A good many aerial photographs used by the County Agent for crop control were borrowed in order to expedite the work.

0-2.10. Highway Map of Onslow County, Scale 1" = 4 miles, prepared by the North Carolina State Highway and Public Works Commission, 1938.

0-3. Horizontal Control.

0-3.01. By direction of the Officer-in-Charge, horizontal surveys were coordinated on the North Carolina System of Plane Rectangular Coordinates. Basic control was obtained from triangulation stations along and near New River the positions of which were obtained from publications listed above. Unfortunately, the triangulation stations on the east side of New River had suffered more from erosion than those on the western shore. Stations Hadnot (U.S.E.) 1931, and Bluff (U.S.E.) 1931, which would have furnished ideal control for the Division Training Area, had been washed away, and it became necessary to execute precise triangulation at a time terto la la not 60 t at as salarias direa ano 301 Erra a la tie den 200 any any ased at connection with bis France Containers and the the scoresary corrections, as on new 30 sub-press salar the cost of containers is 0-2 55

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when the progress of the entire job depended upon prompt conclusions of surveys. In addition, the published position of station Little Ragged (U.S.E.) 1932 was found not to fit the actual location of a monument recovered on Little Ragged point and answering the description of the triangulation station. This made it necessary to extend the triangulation system both north and south of the Division Training Area in order to obtain quadrilaterals of the proper shape to furnish accurate positions for the new stations established in the Division Training Area.

0-3.02. The principal stations used in the various areas are as follows:

Area

Stations

Division Training Area	.Hadnot 1941, Bluff 1941, Sime 1941,
	Truesdale 1932, High 1932, Swamp
	1933, Paradise (U.S.E.) 1933, Para-
	dise ecc. 1933.
Midway Park Peridential	uise ecc. 1955.
Midway Park Residential	.Truesdale 1932.
Mumford Point Camp No. 1	Northeast 1933
Camp Knox (CCC Camp)	.Camp 1941
Amphibian Base and	- ANC
	.Poverty 1932, Court 1932, Marines 1941.
Rifle Range Area	10001 0y 1552, Court 1952, Marines 1941.
Rifle Range Area Landing Field and	.Stone ecc. 1932, Gin 1932.
Glider Training Base	.Southwest 1941
Tent Camps Nos. 1 and 2	.Positions in this area depend upon
	coordinates furnished by the Corps of
	Engineers of Third Order The
	Engineers of Third Order Traverse be-
	tween stations Verona 1932 and North-
	east 1933.
Tank Battalion Tent Camp	.Verona 1932.
Dixon Area	.Verona 1932.
Bear Creek Area	Russell 1932.
Jacksonville	Welton
	• 1142 0011

0-3.03. Positions of the above points and many others are given in Section 0-9 herein. Locations are shown on the 1"=500' and 1"=50' scale Record Drawings. The extent and arrangement of the grid system are shown on M.B. drawings Nos. 1174 and 2157. Specification No. 1000 describes in detail the entire record mapping and coordinate program. The State coordinate system is based on a Lambert conformal conic projection, with two standard parallels at which the scale is exact, one at Latitude north 34° 20' and one at Latitude north 36° 10'. The central Meridian of the coordinate system is at Longitude 79° 00' West, with an assigned easting value of 2,000,000 ft.

0-3.04. In order to furnish local control at frequent intervals, a network of careful traverse was established connecting various triangulation stations. This traverse served as a base for topographic mapping and as local control for the stakeout of construction.

0-3.05. Military Grid. The relation between North Carolina grid coordinates and the Military grid system is as follows:

Alter the entire of depanded upon promit academican of dividual the publiched not than of station Little Yerres at marina to the little satural investion of a mountant relitt size a point ind universing the description of the terdition all sector is necessary to extend the triangulation with all earth of the Division Training area to order to interals of the proper share to fraining area to order to the static sector in the Division Training area to order to the static sector in the Division Training area to order to the static sector in the Division Training area.

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Military Grid Coordinates	N. C. Grid Coordinate
N. 1,301,000 yds.	N. 336,910.47 ft.

E. 566,000 yds.

N. 336,910147 It. E 2,501,896.58 ft.

S

The Military Grid North is 3° 25' 30".6 west of the North Carolina grid North.

0-4. Vertical Control.

0-4.01. Approximately 700 temporary bench marks were established in various parts of the reservation in order to provide vertical control for the project. Basic bench marks were recovered along the Atlantic Coast Line, the elevations of which were obtained from publications listed herein. The elevations of 236 selected permanent bench marks are given in Section 0-10 herein. Elevations are referred to mean sea level. Leveling was run in loops generally with 18" Dumpy levels, and adjusted without regard to the curvature of the earth.

0-4.02. In order to control hydrographic work, tide gauges were established at various locations along New River. It was found that there are practically no periodic tides in New River above Hatch Point, the surface of the water ordinarily ranging from mean sea level to + 0.4 feet except when affected by Meteorological conditions.

0-5. Topographic Surveys. Most of the topographic surveys were made with the view of preparing contour maps to the scale 1" = 100'. Transit and stadia methods, profiling along parallel base lines and plane table surveys were used depending upon the topography of the area to be covered and the density of the wooded areas. The contour intervals varied from 1 to 2 feet, depending upon the slope of the ground and the purpose for which the topographic map was prepared. In many places the trees and underbrush were so dense that lanes had to be hacked through at 50' intervals, and quite often it was impossible to see from one lane to the next. The contour maps resulting are in work sheet form only, except where site plans actually were prepared and the contours traced thereon.

0-6. Hydrographic Surveys. Hydrographic surveys were made by triangulation, transit and stadia and sextant. The work included soundings and test borings for bridges, bulkheads, dredging operations, and sweeping for obstructions which would prohibit the use of the river as a sea plane base. After dredging operations were completed, new contours were taken to verify the depth of dredging.

0-7. Construction Surveys. As soon as drawings were approved, buildings, roads, water, steam, pole lines and other utilities were staked out in the field and marked plainly. In many cases tentative locations were surveyed for the purpose of preparing proper design and re-established in the field after approval of working drawings. Sewer locations and profiles were done by the Sanitary Department, the Survey Department furnishing parties for the field work. Most of the construction was staked out according to sketches prepared in the office and the actual stakeout verified by the submittal of complete field notes showing the points established. Most of the structures have been coordinated on the N. C. system. The presence of 1. gt . . .

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numerous curved roads in all areas increased greatly the amount of work required for construction stakeout for the roads, utilities, and buildings.

0-8. Final Surveys. Most of the final surveys to provide as-built data for the preparation of Record Drawings were made by field parties and inspectors of the U.S. Navy. Our parties secured some information for the mapping of culverts and buildings. In addition, we were requested by the Officer-in-Charge to survey accurately and set monuments along certain parts of the reservation boundary. This was done and the results shown on 1" = 500' scale record drawings.

0-9. Permanent Coordinate Stations."

Quad-			inates:
rangl	Le	North	East
82	Hubert 1932	370,177.15	2,530,733.61
97	Picture Point, centerline of intersec- tion. Church & 2nd. Sts. Tent Camp No.1 Picture Pt. Lat. 34° 45' 24".607; Long.	364,022	2,462,978
	77° 28' 49."912 (30th.Engrs)Picture Pt. # 8, Sta.# 27 -S. edge of U. S. Highway #258 at centerline of junction with rd. to Burgaw, N.C., approx. 3.0 miles south		
	of Jacksonville, N. C.	369,915	2,456,376
98	U.S.E. Monument No. 18	367,574.88	2,464,075.78
	U.S.E. Monument No. 19	368,322.00	2,465,420.06
	Walton 1933	368,293.33	2,465,215.88
	Beacon U.S.E. 1933	364,365.00	2,469,582.00
	Mill U.S.E. 1933	364,102.82	2,470,630.30
	Marsh U.S.E. 1933	363,258.93	2,470,694.47
	Wilson U.S.E. 1933	362,253.84	2,471,479.32
	Pine U.S.E. 1933	361,424.97	2,471,508.00
	Brier U.S.E. 1933	360,328.05	2,472,660.01
	Monument USMC 26	367,139.14	2,475,379.97
	Monument USMC 27	366,691.78	2,474,934.54
	Monument USMC 28	366,332.34	2,474,576.56
	Monument USMC 29	365,860.04	2,474,118.95
	Monument USMC 30	365,351.18	2,473,793.04
	Monument USMC 40	368,016,37	2,471,176.92
	Monument USMC 41	367,909.97	2,471,135.83
	Reference Monument USMC 31	364,521.87	2,473,263.83
	Center Line Hemby Branch at Wilson Bay	364,535.50	2,473,219.00
	Center Line 1st. & F sts.	364,566.70	2,464,992.42
	100,000 gal. elev. water tank (Tent	Stand Lands Martin	
	Camp No. 1)	361,948.98	2,465,532.87
	Manhole No. 235	360,888.57	2,465,424.46
	Monument "B" near 3rd & A Sts.	363,617.88	2,463,134.07
	Center Line 6th. & A Sts.	362,197.95	2,463,400.21
	Monument "A" near 1st. and Church Sts.	364,417.17	2,463,100.46
	Center Line 9th. & A Sts.	360,456.48	2,463,473.20

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		Coordinates		
Quad.	Station	North	East	
98	Manhole $\#$ 6	362,802.60	2,466,138.80	
	Monument	361,903.75	2,477,918.45	
		365,290.76	2,473,755.77	
	Pipe in Hemby Branch	000,200.10	2, ±10, 100.11	
	Picture Point, centerline of intersec-	704 505	D 4 C4 007	
	tion "C" & 1st. Sts., Tent Camp No. 1	364,525	2,464,003	
	Picture Point, centerline of inter-		- Contraction	
	section N.C. Hwy. #24 & Mumford Landing	ROBARE		
	Road at White Cemetery	367,135	2,475,707	
99	Northeast 1933	360,462.81	2,480,360,37	
	Monument USMC 97	360,843.41	2,483,519.98	
	Monument USMC 98	361,091.95	2,482,926.11	
	Monument USMC 99	361,790.93	2,483,215.78	
	Monument USMC 100	362,313.70	2,483,362.23	
	Monument USMC 89	360,678.95	2,480,316.76	
	Monument USMC 90	360,774.32	2,481,091.73	
	Picture Point, centerline of inter-	000,111.02	2,101,001.10	
	section Chowan & Neuse Rds., Mumford			
	Pt. Camp No. 1	360,714	2,478,858	
		200 . H. L. Mark		
100	200,000 Gal. Water Tank, LCH	360,808.98	2,499,051.52	
	Monument Boundary of REA	361,559.57	2,495,186.39	
	Monument	361,841.04	2,497,145.31	
	Monument	362,565.99	2,496,226.97	
	Monument	361,781.50	2,495,550.34	
	Monument	361,788.94	2,495,613.54	
	Monument	360,106.67	2,497,744.54	
	Monument	360,601.16	2,498,134.90	
	Monument	362,000.86	2,495,780.84	
	Monument	360,267.16	2,499,138.95	
	Monument	360,090.86	2,499,362.84	
	Picture Point, center line of inter-			
	section N.C. Hwy.# 24 and westmost en-			
	trance rd. to Midway Park, approx. 1600'			
	s.e. of eastern bank Northeast Creek	361,196	2,495,966	
117	Monument USMC 60	358,005.45	2,457,912.23	
	Monument USMC 61	358,041.63	2,459,411.80	
	Corps of Engineers Monument 10	352,840.25	2,456,205.65	
	Picture Point, east edge of U.S. Hwy			
	#17 at centerline of junction with			
	Lancaster rdTank Battalion Tent Camp	356,858	2,457,278	
118	Moss U.S.E. 1933	357,634.13	2,472,151.40	
***	Montford U.S.E. 1932	355,680.83	2,475,903.36	
	Solomons 1942			
1-		355,705.45	2,475,915.62	
	Southwest 1941	352,728.76	2,472,322.02	
~ .	Tulagi USMC 48 1942	352,709.68	2,472,298.87	
	Center Line "A" St. & Curtis Road	358,147.39	2,463,569.98	
	Center Line "A" St. & 10th St.	359,976.90	2,463,493.30	

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		and the second se	
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11.030.804.9		Burnarat CIIC PC	
2.483.215.75	561, 200 a 03	Total a state of the second	
2,463,362,23	362,312.70	Morenet USED 100	
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			119 Monte
2.499.001.63	260,808,98	100,000 Gal. Hittor Tank, LCL	
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38-216.352.5	335,705,45	Houtd ord U.S.1. 1932	
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2, 572, 815, 7	88,4408,548	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
2.465.660.28	255,147,28	Gater Ling "A" St. & Surels. 30ad	
02.064.385.9	369,976,30	, all good of the and manage	

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	, · /	Co	ordinates
Quad.	Station	North	East
118	Center Line "F" St. & 11th St.	359,370.27	2,465,210.22
	100,000 gal. elevated Water Tank		
	(Tent Camp No. 2)	359,672.05	2,465,532.87
	Monument USMC 91	358,591.70	2,476,754.66
	Monument USMC 92	359,298.68	2,477,521.27
	Picture Point, centerline of inter-		
	section Church & 11th St., Tent Camp No. 2.	750 004	0 407 100
	Picture Point, centerline of inter-	359,284	2,463,177
		359,328	2,464,221
	section Flounder & Salmon Rds. Peter-		
	field Point Tent Camp	357,371	2,471,305
	Picture Point, centerline of intersec-		
	tion Flounder & Curtis Rds, Peterfield		
	Point Tent Camp	357,225	2,470,146
	Picture Point, centerline of intersec-		
	tion Curtis Rd. & Taxiway, Landing Field		
	for Paratroops	352,913	2,470,217
119	Monument	359,915.88	2,479,585.44
	Monument	359,910.84	2,478,827.26
	Camp 1941	359,943.04	2,483,195.66
	Camp 1941 Ref. Monument	359,931.14	2,483,260.58
	Swamp 1933	356,978.40	2,481,530.58
	Paradise U.S.E. 1933	353,098.38	2,482,230,36
	Paradise Ecc. 1933	353,245.57.	2,482,316.57
	Monument USMC 65	355,999.56	2,481,326.95
	Monument USMC 66	355,531.92	2,481,353.03
	Monument USMC 69	357,544.80	2,483,450.60
- 114-9	Monument USMC 70	356,984.37	2,483,870.02
	Monument USMC 71	354,424.06	2,485,786.00
	Monument USMC 72	353,307.11	2,486,621.84
	Monument	352,541.81	2,484,252.49
	Monument	352,680.70	2,483,566.41
	Monument USMC 73	351,461.56	2,488,002.73
	Monument USMC 74	351,141.29	2,488,242.37
	Picture Point, centerline of inter-		
	section River Drive & Charles St.,		
	B.O.Q. Area	352,523	2,486,974
120	Truesdale 1932	356,181.01	2,499,102.26
	Truesdale Reference Monument # 3	356,657.76	
	Monument USMC 38	356,179.82	2,498,809.77
	Monument USMC 39	355,972,85	2,501,617.09
	Monument USMC 93	356,365.48	2,503,238.16 2,497,986.14
	Monument USMC 94	356,087.54	2,497,264.72
	Monument USMC 95	355,992.53	
	Monument USMC 96	356,055.60	2,496,470.51
	Monument USMC 82		2,495,314.05
	Monument USMC 83	357,977.03 358,878.58	2,500,369.62
-	Monument	356,214.02	2,499,227.59
	Monument	359,679.13	2,502,282.41 2,498,286.12
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2,463,606,42	362,680,70	in the second
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		Coordinates	
Quad	Station	North	East
120	Picture Point, at Piney Green, center line of intersection N. C. Hwy. # 24	255 804	
	and earth road to Snead's Ferry	355,786	2,504,639
121	Monument USMC 42	353,878.45	2,512,119.67
	Monument USMC 43	353,162.44	2,514,629.84
	Monument USMC 49 Picture Point, centerline N.C. Hwy. 24 (Approx. Sta. 509 + 36) at box culvert	353,919.95	2,522,661.30
	draining upper reaches of Wallace Creek	352,931	2,518,598
122	Monument USMC 50 (Forest Fire Observa-		
	tion Tower)	. 354,697.49	2,524,603.62
	Monument USMC 51	354,294.79	2,528,713.43
-	Monument USMC 52 Monument, 30th. Corps of Engrs.	353,372.29	2,530,892.98
	N. C. 1-TT-1/22	353,404.98	2,531,419.21
	Picture Point, center line of inter- section earth roads 2760' ± N. W. of		1
	Starling, between Starling and N. C.	REA 844	
	Hwy. # 24.	354,344	2,528,866
137	Corps of Engineers Monument # 9	349,771.46	2,457,011.96
138	Jarman 1933	348,526.23	2,472,581.67
	Stump 1933	344,437.47	2,472,656.46
	Bog 1933	344,716.64	2,470,964.43
139	Monument	340,988.34	2,492,923.60
	Monument	340,980.20	2,490,167.31
	Little Ragged 1941	342,082.92	2,480,909.31
	High 1932	349,323.47	2,488,657.35
	Hadnot 1941	340,331.27	2,487,613.08
	Monument USMC 67	345,087.36	2,489,689.07
	Monument USMC 68	344,648.06	2,490,020.03
	Monument	340,987.33	2,492,529.05
	Monument	340,986.74	2,492,297.47
	Monument	340,985.73	2,491,967.13
	Monument	341,182.45	2,492,141.79
	Monument	340,582.48	2,491,966.36
	Monument	340,530.92	2,492,630.22
	Monument	340,975.34	2,488,376.56
	Monument	340,782.10 340,690.92	2,488,14:.53 2,487,780.02
	Hadnot 1941 Ref. Monument # 2 Hadnot 1941 Ref. Monument # 1	340,381.00	2,488,009,93
	Monument	340,331.27	2,487,613.08
	Monument	345,616.95	2,492,373.86
	Monument	344,856.38	2,492,944.94
	Picture Foint, center line of inter-	011,000,00	.,
	section River Road and Cutler Avenue,		
	Naval Hospital	341,550	2,490,790

NUTON Stat 10m Motire Point, at Piney Green, renter in of intersection, i. C. Mr. . 24 0.804,63D what car bit most in Brend's Farry . 2,512,119,67 358,878,45 8.514.529.34 353,162,44 06.100.050,5 265,919.48 Califyrent Usi C 19 lotre Folkt, centerline N.C. Dw. 24 trovico and te (35 + 503 .et bar anivert 2, 124, 302, 62. ("tobrol sels 2,628,715,43 355, 404, <u>MR</u> S. SS\1-21-1 and the state of the sound of the state . 15 4 . 75 BE.LIO.TEL.S 34.407-646 Charten and a stranger of the C. 472, 502, 472. 2.472.572.46 65. Ma. A2.5 346,716.64 36,800,005 031.028.010 542,038.92 58.178.030 1401 20mbs N. 4605.664.5 346,007456 344,643,010 540,987,83 340.935.73 17.412.Ste.S 2,691,9269,5 340.693.040 1 and the state of the last 1961 the in · Lating. CE Let

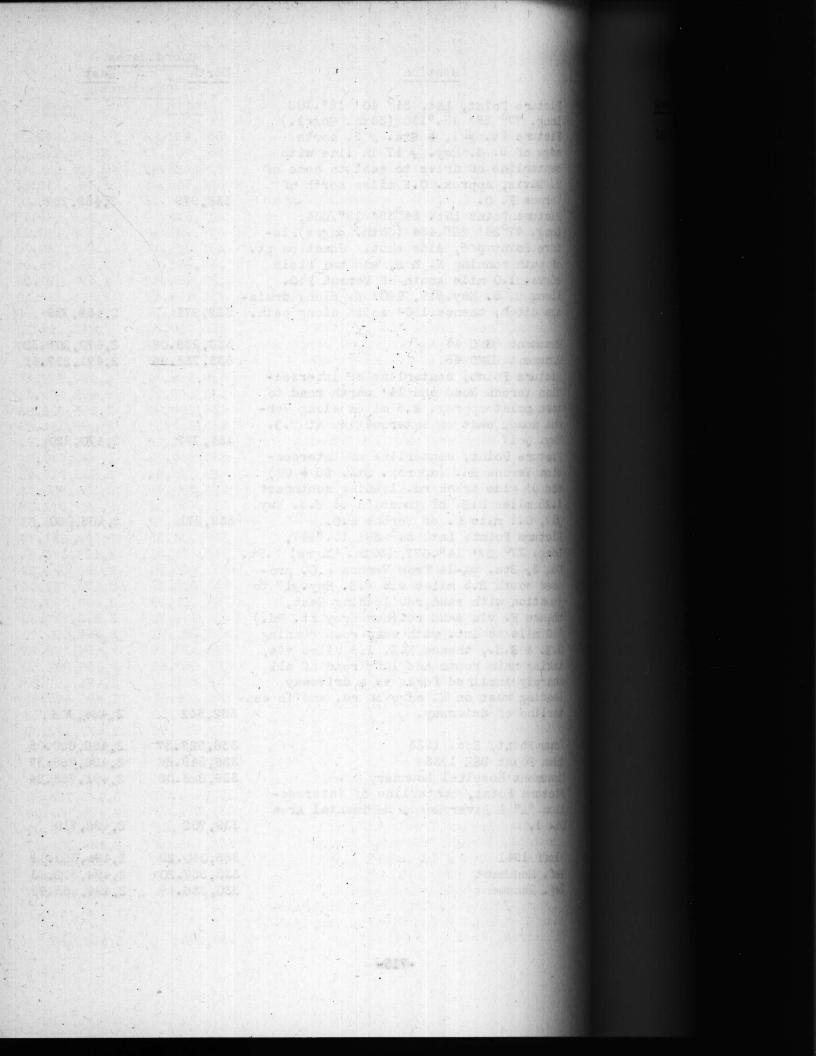
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A		Coordin	and the state data between
Quad	Station	North	East
140	Monument	342,486.57	2,504,081.11
140		342,351.69	2,500,127.88
	Parachute Tower 1 Parachute Tower 2	342,140.06	2,499,151.13
			2,497,137.24
	Parachute Tower 3	343,549.50	2,494,699.41
	Monument	340,775.59 342,825.74	2,500,989.26
	Monument	341,686.04	2,499,928.60
	Monument	340,369.41	2,500,095.51
	Monument	340,486.30	2,501,531.31
	Monument	340,991.23	
	Monument	340,989.95	2,494,051.56 2,493,552.87
	Monument		2,493,711.83
	Monument	341,149.72	2,494,230.17
	Monument	341,670.71	2,495,948.63
	Monument	340,996.07	2,495,423.64
	Monument	340,994.73 340,993.57	2,494,968.30
	Nonument	340,992.47	2,494,541.20 2,499,764.82
	Monument	342,198.49 342,552.46	
	Monument		2,500,062.72
	Monument	340,426.74	2,494,953.89
	Monument Monument	340,071.08 342,309.18	2,495,213.33 2,494,228.54
	Monument	342,510.69	2,494,228.03
	Monument	343,023.40	2,494,226.72
	Monument	342,881.85	2,497,777.11
	Picture Point, center line of inter-	012,001.00	L, 101, 111.11
	section Service Road & "A" St. Regimen-		
	tal Area No. 1.	340,577	2,495,204
	Picture Point, center line of inter-	010,011	.,,
	section W. Lane Holcomb Blvd. and Ap-	-	
	proach Rd. to Parachute Training Towers	343,062	2,501,830
	Picture Point, center line of inter-		
	section Ash St. and West Road, Supply		
-	and Industrial Area	340,162	2,500,834
142	Monument USMC 53	348,514.29	2,529,667.89
	Monument USMC 54	346,988.60	2,529,094.34
	Monument USMC 55	342,194.56	2,529,092.37
	Picture Point center line of intersec-		
•	tion Starling-Duck Creek Rd. and earth		and the second second
	road to Piney Green, approx. 2.5 miles		
	south of Starling	340,025	2,529,554
157	Intersection Verona Loop Rd. U.S. Hwy.17	338,666.23	2,459,643.52
	Monument USMC 32	339,032.72	2,459,841.23
	Monument USMC 33	338,885.94	2,460,213.68
	Monument USMC 34	337,415.50	2,459,634.19
	Monument USMC 35	337,354.44	2,459,486.46
	Monument USMC 36	337,328.28	2,459,341.78
	Verona Ref. Monument # 1	332,497.53	2,458,346.97 -
	Monument USMC 37	337,335.68	2,459,265.09
	Picture Point, center line of inter-		
	section U.S. Hwy. # 17 & Verona Road	338,666	2,459,644

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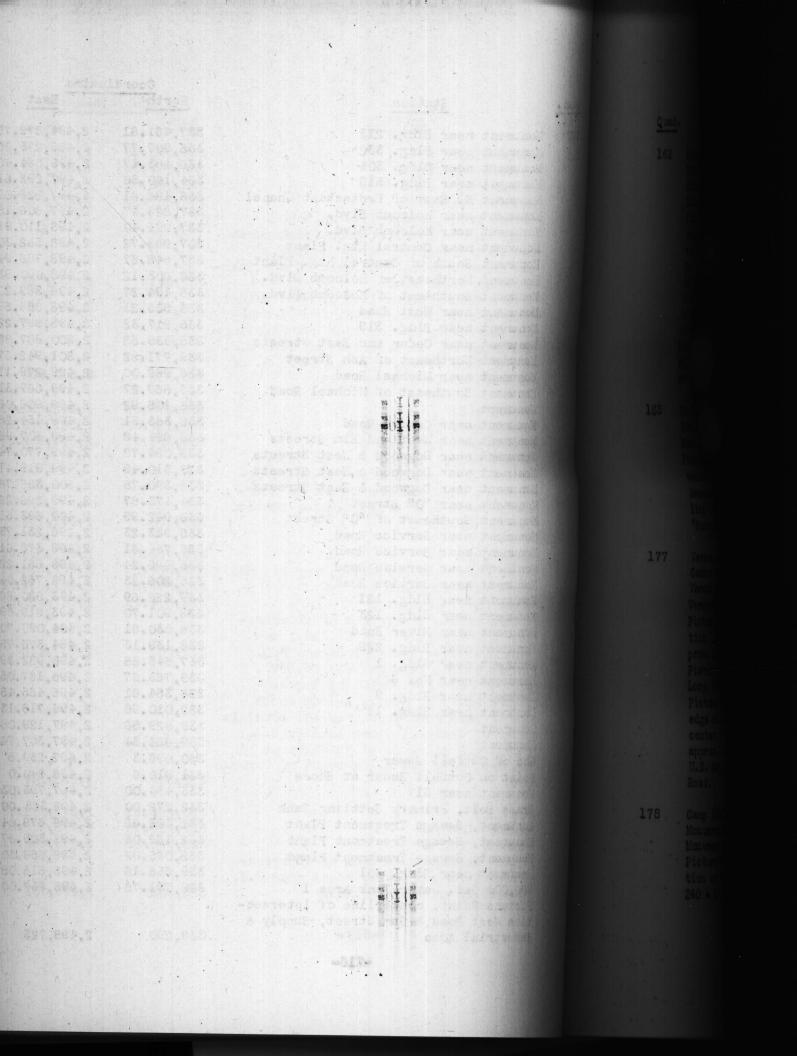
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			Coordinate	
•	Quad	' <u>Station</u>	North	East
	157	Picture Point, Lat. 34° 40' 18".106 Long. 77° 28' 15."130 (30th. Engrs.) Picture Pt. # 1, + Sta. # 2. north edge of U. S. Hwy. # 17 in line with centerline of drive to east to home of M. Davis, approx. 0.2 miles north of		
		Verona F. O. Picture Point Lat. $34^{\circ}39'$ 18".604, Long. 77°28' 28".434 (30th. Engrs)Fic- ture Point # 5, side shot. Junction pt. of path running N. & S, and two field edges. 1.0 mile south of Verona P.O. along U. S. Hwy.#17, 140' E. along drain-	338,979	2,459,757
		age ditch, thence 150' south along path.	332,971	2,458,799
	158	Monument USMC 44 Monument USMC 45 Picture Point, centerline of intersec- tion Verona Road and 14' earth road to town point approx. 2.6 miles along Ver-	336,968.08 333,738.96	2,470,208.30 2,471,257.42
		ona Road, east of intersection at U.S. Hwy. # 17 Picture Point, centerline of intersec- tiom Verona Rd. (approx. Sta. 66 + 00) and 8' wide track rd. leading southeast 1.25 miles N.E. of junction at U.S. Hwy.	334,777	2,470,920
		#17, 0.1 mile N. of Verona P.O. Picture Point, Lat. 34° 39' 13."647, Long. 77° 27' 14".677, (30th. Engrs) T.Pt. No. 3, Sta. #A-14 from Verona P.O. pro- ceed south 2.3 miles via U.S. Hwy.#17 to junction with sand rd. leading East, thence E. via sand rd. (now Grey Pt. Rd.) 1.0 mile to int. with sand road running N.E. & S.W., thence N.E. 1.6 miles via, taking main route and left road of all sharply inclined forks to a driveway Leading west on W. edge of rd. and in cen-		2,466,080
		terline of driveway.	332,542	2,464,906
	159	Town Point, Ecc. 1933 Town Point USE 1933 Monument Hospital Boundary Picture Point, centerline of intersec- tion "A" & River Road, Regimental Area	336,527.37 336,549.66 339,893.05	2,486,660.05 2,486,768.37 2,491,765.84
		No. 1.	339,702	2,492,710
	160	Bluff 1941 Ref. Monument Ref. Monument	335,040.29 335,587.20 335,336.49	2,494,350.11 2,494,372.63 2,494,555.48



		Coordinates		
Quad .	Station	North	East	
160	Monument near Bldg. 213	337,461.81	2,494,872.79	
	Monument near Bldg. 330	336,907.77	2,495,275.28	
	Monument near Bldg. 304	336,483.47	2,495,584.48	
	Monument near Bldg. 513	334,140.56	2,497,292.51	
	Monument N. East of Protestant Chapel	336,486.61	2,497,828.07	
	Monument near Holcomb Blvd.	337,623.57	2,497,606.18	
	Monument near Holcomb Blvd.	337,991.40	2,498,110.91	
	Monument near Central Htg. Flant	337,969.72	2,498,552.30	
	Monument South of Central Htg. Flant	337,646.67	2,498,786.94	
	Monument Northeast of Holcomb Blvd.	338,603.12	2,498,090.93	
	Monument Southeast of Holcomb Blvd.	338,194.27	2,498,389.20	
	Monument near West Road	338,535.21	2,498,856.58	
	Monument near Bldg. 319	335,917.32	2,495,997.22	
	Monument near Cedar and East Streets	338,835.52	2,500,887.86	
	Monument Northeast of Ash Street	339,771.52	2,501,942.37	
	Monument near Michael Road	336,969.00	2,499,279.17	
	Monument Southeast of Michael Road	336,569.27	2,499,569.31	
	Monument	336,105.92	2,499,906.06	
	Monument near Center Road	338,363.31	2,499,154.25	
	Monument near West and Elm Streets	338,864.48	2,499,307.98	
	Monument near Dogwood & West Streets	339,084.78	2,499,770.74	
	Monument near Dogwood & West Streets	339,310.49	2,499,919.41	
	Monument near Dogwood & East Streets	338,390.75	2,500,386.78	
	Monument near "O" Street	334,473.87		
	Monument Southeast of "O" Street	333,942.99	2,499,296.26	
	Monument near Service Road		2,499,683.51	
	Monument near Service Road	335,933.23	2,498,231.73	
	Monument near Service Road	335,734.61	2,498,376.61	
	Monument near Service Road	335,495.24	2,498,551.22	
	Monument near Bldg. 121	335,206.23	2,498,762.04	
	Monument near Bldg. 123	339,228.69	2,493,580.86	
	Monument near River Road	338,901.70	2,493,819.69	
		338,530.81	2,494,090.70	
	Monument near Bldg. 229	338,139.13	2,494,376.75	
	Monument near Bldg. 1	337,645.68	2,496,982.59	
	Monument near No. 6	338,763.67	2,496,167.05	
·	Monument near Bldg. 9	338,354.61	2,496,465.45	
	Monument near Bldg. 11	338,010.96	2,496,716.13	
	Monument	339,929.56	2,497,129.08	
	Monument	339,684.34	2,497,307.74	
	End of Outfall Sewer	330,698.3	2,497,239.5	
	Point on Outfall Sewer at Shore	331,910.6	2,498,240.0	
	Monument near 517	333,454.00	2,497,793.03	
	Brass Bolt, Primary Settling Tank	332,272.00	2,498,585.00	
	Monument, Sewage Treatment Plant	332,308.65	2,498,678.04	
	Monument, Sewage Treatment Plant	332,162.05	2,498,305.87	
	Monument, Sewage Treatment Plant	332,085.92	2,498,658.30	
	Monument near Bldg. 101	339,656.16	2,495,516.05	
	300,000 Gal. Water Tank Area 1	339,791.76	2,495,857.00	
	Picture Point, centerline of intersec-			
	tion West Road & Gum Street, Supply &			
	Industrial Area	338,290	2,498,725	



Quad.	Station	North Coordin	East
162	Monument USMC 57 Monument USMC 58 Monument USMC 59 Monument USMC 56 Picture Point, centerline of Wood	334,573.88 334,267.34 334,713.09 338,837.43	2,532,187.11 2,532,403.51 2,533,313.47 2,529,889.56
	Bridge on old Starling-Duck Creek earth road at intersection with S. edge of Bear Creek approx. 700' west of new Star- ling-Duck Creek road. Picture Point, centerline of wood bridge on earth road leading N.E. from Y junc- tion near intersection with new Starling-	337,511	2,530,082
	Duck Creek rd, at intersection with S.W. edge of Bear Creek, approx. 2500' E. of new Starling-Duck Creek Road.	335,964	2,535,998
163	Russell 1932 Russell Ref. Monument # 2 Russell Ref. Monument # 1 Picture Point, center line of inter- section- T - junction of Sneads Ferry- Swansboro road and earth road to Star-	335,278.66 335,134.32 336,191.71	2,542,692.02 2,542,723.93 2,544,954.36
	ling's Store near triangulation station "Russell 1932".	335,130	2,542,752
177	Verona 1932 Center Line U.S. Hwy. 17 & Grey Pt. Rd. Verona Ref. Monument 2 Verona Ref. Monument 3 Picture Point, centerline of intersec- tion U.S. Hwy. 17 & Grey Pt. Rd., ap-	328,763.30 325,987.18 328,889.80 328,604.19	2,457,596.51 2,457,122.01 2,457,684.34 2,457,580.33
7.	prox. 2.3 miles south of Verona P.O. Picture Point, Lat. 34° 38' 09."060, Long. 77° 28' 36".872(30th. Engrs.)- Picture Pt. # 1, Sta. # A-2 on south edge of sand road (now Grey Pt. road) in center of drainage ditch leading S.W. approx. 0.2 miles E. of junction at	325,987	2,457,122
	U.S. Hwy. #17, 2.3 miles south of Verona Road.	325,909	2,458,134
178	Camp 1932 Monument USMC 46 Monument USMC 47 Picture Point, centerline of intersec-	320,294.87 329,226.76 326,998.16	2,472,002.26 2,476,815.60 2,476,585.81
	tion at Y-fork of earth roads near P.I. 240 + 59.25 on Grey Pt. Road	326,995	2,476,731

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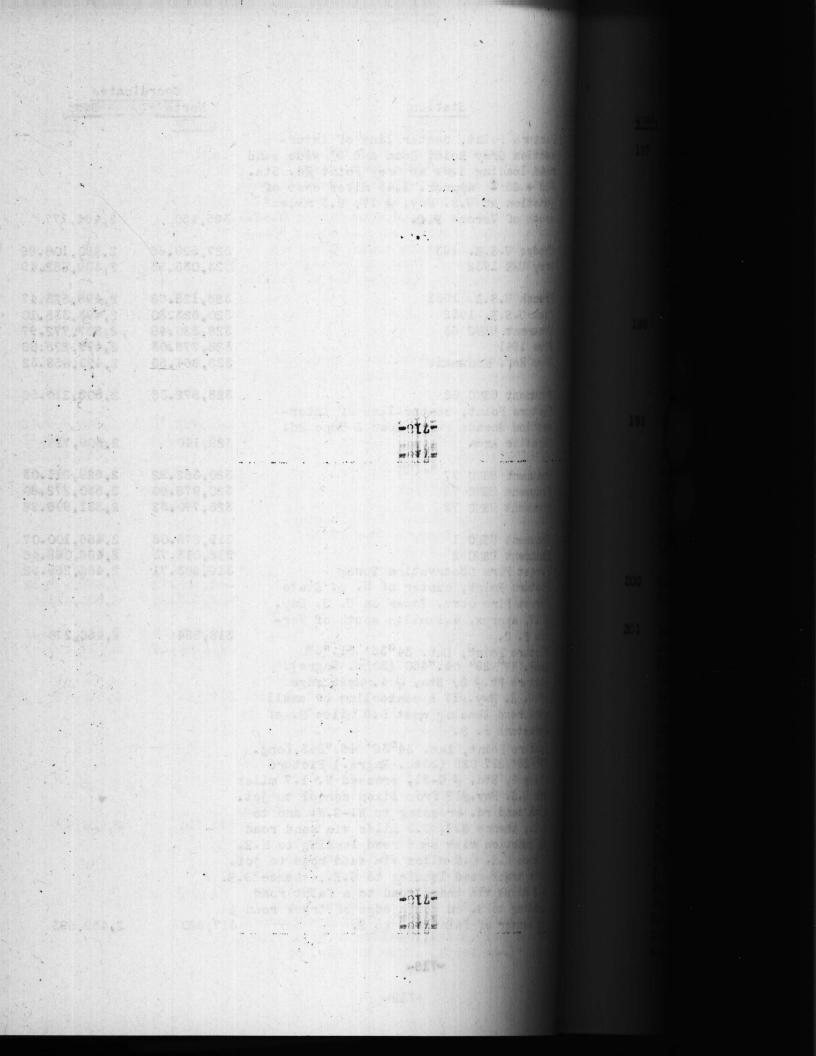
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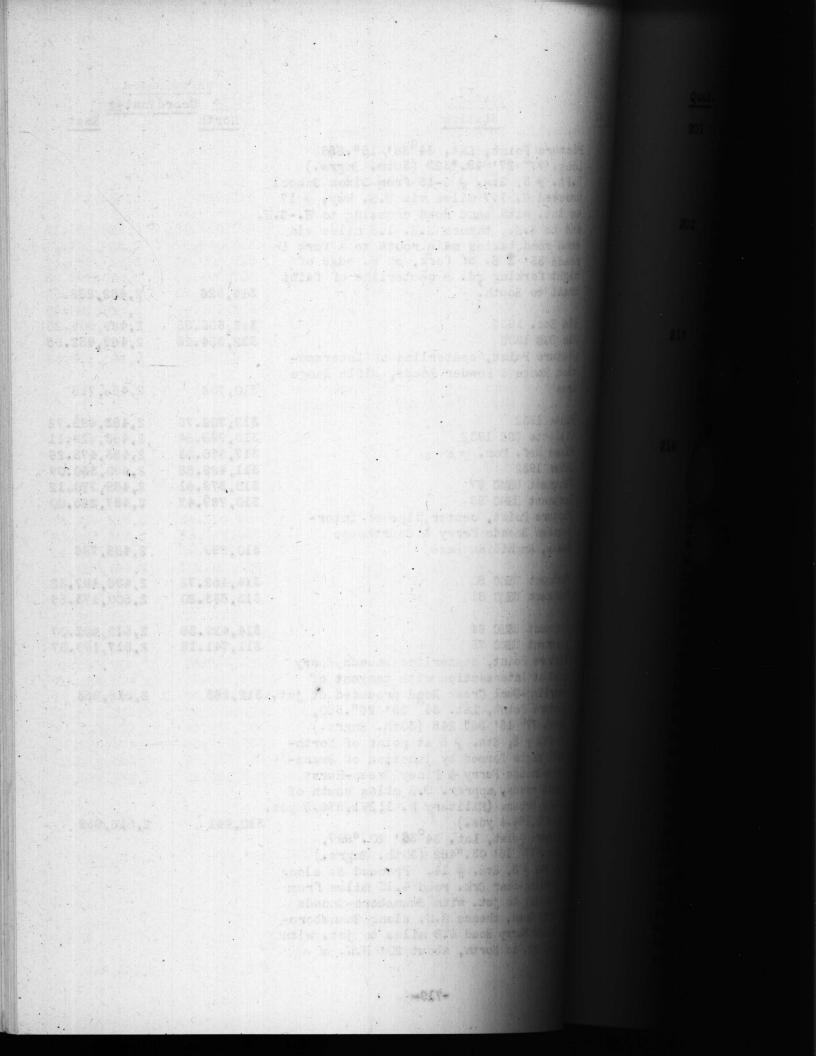
	Coordin	ates
Station	North	East
Picture Point, center line of inter- section Grey Point Road and 8' wide sand road leading S.W. at Grey Point Rd. Sta. 358 + 66 ¹ approx. 1.45 miles east of junction at U.S. Hwy. # 17, 2.3 miles south of Verona Pig.	325,450	2,464,777
Rhodes U.S.E. 1931 Grey USE 1932	327,529.66 323,035,95	2,490,108.86 2,489,652.49
French U.S.E. 1931 Fish U.S.E. 1932 Monument USMC 63 Sime 1941 Sime Ref. Monument	326,128.68 320,523.30 328,330.48 328,778.03 328,864.53	2,498,523.47 2,493,335.10 2,507,772.97 2,499,295.86 2,499,358.32
Monument USMC 62 Picture Point, center line of inter- section Sneads Ferry Road & Hope Rd. Magazine Area	328,572.38 329,140	2,508,210.56 2,509,725
Monument USMC 77 Monument USMC 78 Monument USMC 79	320,362.92 320,976.60 325,770.32	2,529,211.03 2,530,272.80 2,531,996.28
Monument USMC 1 Monument USMC 2 Forest Fire Observation Tower Picture Point, center of N. C. State Forest Fire Obsv. Tower on U. S. Hwy.	319,878.08 318,013.73 316,883.71	2,456,100.07 2,456,068.46 2,456,269.92
ona P. O. Picture Point, Lat. $34^{\circ}36' 51."570$ Long. $77^{\circ} 29' 04."460 (30th. Engrs).$ Picture Pt.# 2, Sta. # 4. West edge of U. S. Hwy.#17 & centerline of small sand road leading west 5.8 miles N. of Folkstone P. O. Picture Point, Lat. $34^{\circ}36' 46."843$,Long. $77^{\circ} 28' 21" 028 (30th. Engrs.)$ Picture Pt. # 4, Sta. # C-31, proceed N. 1.7 miles		2,456,270
with sand rd. crossing to WS.W. and to S.E., thence S.E. 0.3 miles via sand road to junction with sand road leading to N.E thence N.E. 0.2 miles via sand road to jc with track road leading to S.E., thence S 0.2 miles via track road to a faint road	• t. •E•	2,459,593
	 Picture Foint, center line of intersection Grey Point Road and 3' wide sand road leading S.W. at Grey Foint Rd. Sta. 358 + 66 1 approx. 1.45 miles east of junction at U.S. Hwy. # 17, 2.3 miles south of Verona Pig. Rhodes U.S.E. 1931 Grey USE 1932 French U.S.E. 1931 Pish U.S.E. 1932 Monument USMC 63 Sime Ref. Monument Monument USMC 77 Monument USMC 77 Monument USMC 78 Monument USMC 78 Monument USMC 79 Monument USMC 79 Monument USMC 71 Monument USMC 76 Porest Fire Observation Tower Picture Point, center of N. C. State Forest Fire Observation Tower Picture Point, Lat. 34°36' 51."570 Long. 77° 29' 04."460 (30th. Engrs). Picture Pt.# 2, Sta. # 4. West edge of U. S. Hwy.#17 & centerline of small sand road leading west 5.8 miles N. of Folkstone F. 0. Picture Point, Lat. 34°36' 46."843,Long. 77° 28' 21" 028 (30th. Engrs.) Picture Pt. # 4, Sta. # C-31, proceed N. 1.7 mile via U.S. Hwy.#17 from Dixon school to jot with sand road leading to S.E., thence S.E. 0.3 miles via sand road to jounction with sand road leading to S.E., thence S.E. 0.3 miles via sand road to jounction with sand road leading to S.E., thence S.E. 0.5 miles via sand road to jounction with sand road leading to S.E., thence S.E. 0.5 miles via sand road to jounction with sand road leading to S.E., thence S.E. 0.5 miles via sand road to jounction with sand road leading to S.E., thence S.E. 0.5 miles via sand road to jounction with sand road leading to S.E., thence S.E. 0.5 miles via sand road to jounction with sand road leading to S.E., thence S.E. 0.5 miles via sand road to jounction with sand road leading to S.E., thence S.E. 0.5 miles via sand road to jounction with sand road leading to S.E., thence S.E. 0.5 miles via sand road to jounction with sand road leading to S.E., thence S.E. 0.5 miles via sand road to jounction with sand road leading to S.E.	Picture Foint, center line of inter- section Grey Point Road and 3' wide sand road leading S.W. at Grey Foint Rd. Sta. 358 + 66 \pm approx. 1.45 miles east of junction at U.S. Hwy. # 17, 2.3 miles south of Verone Pig. 225,450 Rhodes U.S.E. 1931 Grey USE 1932 French U.S.E. 1931 Frish U.S.E. 1932 Monument USMC 63 Sime 1941 Sime Ref. Monument 326,564.53 Monument USMC 62 Picture Foint, center line of inter- section Sneads Ferry Road & Hope Rd. Magazine Area 329,140 Monument USMC 77 Honument USMC 77 Soc. 362.92 Honument USMC 77 Honument USMC 77 Soc. 362.92 Honument USMC 77 Honument USMC 77 Soc. 362.92 Honument USMC 77 Soc. 362.92 Honument USMC 77 Honument USMC 77 Forest Fire Observation Tower Forest Fire Observation Solut S. Hwy. For the Fire Fire Fire Fire Fire Fire Fire Fir

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1		***	Coordi	nataa
	Quad.	Station	North	East
	197	Picture Point, Lat. 34 ⁰ 36' 15".858 Long. 77 ⁰ 27' 49."325 (30th. Engrs.) P.Pt. # 3, Sta. # C-15 from Dixon School proceed N. 1.7 miles via U.S. Hwy. # 17 to int. with sand road crossing to WS.W and to S.E., thence S.E. 1.6 miles via sand road taking main route to a fork in roads 35' 1 E. of fork, on N. edge of right forking rd. & centerline of faint		0.460.000
		trail to South.	314,526	2,462,288
	198	Gin Ecc. 1932 Gin USE 1932 Picture Point, centerline of intersec- tion Range & Fowder Roads, wifle Range	312,385.95 312,354.25	2,469,908.26 2,469,982.58
		Area	310,706	2,466,716
	199	Hines 1932 Gillette USE 1932 Hines Ref. Mon. # 2	317,702.75 313,989.64 317,875.83	2,483,499.72 2,483,929.11 2,483,475.26
		Water 1932 Monument USMC 87 Monument USMC 88 Picture Point, center line of inter-	311,429.88 310,979.61 310,769.47	2,480,330.09 2,489,770.12 2,487,225.00
		section Sneads Ferry & Courthouse . Roads, Amphibian Base	310,899	2,488,796
	200	Monument USMC 80 Monument USMC 81	314,452.72 313,633.20	2,496,497.32 2,500,173.56
	201	Monument USMC 64 Monument USMC 75 Picture Point, centerline Sneads Forry Road at intersection with tangent of	314,429.58 311,741.16	2,515,482.07 2,517,199.87
		Starling-Duck Creek Road produced at jct. Picture Point, Lat. 34° 35' 26".560, Long. 77° 16' 56" 245 (30th. Engrs.) P. Pt. # 2, Sta. # 6 at point of North- east angle formed by junction of Swans- boro-Sneads Ferry & Piney Green-Hurst Beach roads, approx. 9.5 miles south of Piney Green. (Military N. 1,291,874.5 yds.		2,516,853
		E. 570,484.4 yds.) Picture Point, Lat. 34°36' 20."997, Long. 77° 16' 03."462 (30th. Engrs.) P. Pt. # 3, Sta. # 14. Proceed S. along Starling-Bear Crk. road 4.15 miles from Starling to jct. with Swansboro-Sneads Ferry Road, thence S.W. along Swansboro- Sneads Ferry Road 4.8 miles to jct. with sand rd. to North, about 20' N.W. of	310,441	2,516,959

-719-



	the standard and the stan	Coordina	ites
Quad.	Station	North	East
201 ·	centerline Swansboro-Sneads Ferry Rd., 8' E. of centerline of sand rd. approx. 8.95 miles S. of Starling. (Military N. 1,293,648.2 Yds, E. 572,031.8 yds.)	316,018	2,521,275
202	Free 1914 Monument #18, Corps of Engrs. Sta.#18 Monument USMC 76 Monument USMC 118 Monument USMC 119 Monument USMC 120	313,517.45 317,038.92 319,400.84 317,999.68 318,724.70 318,474.44	2,526,585.19 2,524,267.37 2,527,868.57 2,528,093.95 2,527,873.59 2,529,968.89
217	Monument USMC 3 Monument USMC 4 Picture Point, conterline of intersec- tion U.S. Hwy. 17 & Dixon-Sneads Ferry Road.	308,905.46 308,576.63 308,820	2,457,757.69 2,460,508.33) 2,457,661
218	Stone Ecc. 1932 Stone USE 1932 Monument USMC 5 Monument USMC 6 Monument USMC 7 Monument USMC 9 Monument USMC 10 Monument USMC 11 Monument USMC 11 Monument USMC 15 Monument USMC 16 Monument USMC 17 Monument USMC 18 Monument USMC 19 Monument USMC 21 Monument USMC 22 Monument USMC 23 Monument USMC 25 Picture Point, centerline of intersec- tion, Dixon-Sneads Ferry rd. & approach road to Rifle Range Picture Point, angle point of Power Pole Line 4000' N.W.'of mouth of Everetts Crk. Picture Point, Lat. 34 ⁰ 34' 42".558,	303,869.43 303,672.55 306,668.08 305,457.30 304,370.43 303,522.88 302,075.93 301,201.02 300,483.38 300,368.95 302,202.51 302,408.84 303,329.37 303,349.44 303,390.42 303,456.00 303,456.00 303,456.00 303,496.21 302,730.82 303,227.96 301,402.28 302,082.58	2,475,453.89 2,475,724.97 2,463,316.69 2,463,739.88 2,464,422.51 2,464,686.30 2,465,164.46 2,465,953.25 2,466,359.86 2,467,409.10 2,468,882.70 2,469,161.29 2,470,185.00 2,470,695.85 2,471,581.83 2,472,975.96 2,473,761.70 2,474,927.19 2,474,988.15 2,467,204.87 2,467,738.20 2,464,357 2,473,762
	Long. 77° 27' 32".815 (30th. Engrs.) P. Pt. # 1, Sta. # A-7 from Dixon School proceed E. 1.6 miles via sand rd. to jct. with sand rd. to E. on E. edge of sand rd. running N. & S. and on centerline of rd. to East. -720-	305,117	2,463,815

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		Coordin	ates
Quad.	Station	North	East
219	Covil 1932	307,599.58	2,430,924.35
	Ferry U.S.E. 1932	305,143.33	2,482,580.76
	Ferry Ecc. 1932	305,110.21	2,482,583.89
	Poverty 1932	301,854.98	2,486,235.71
	Court 1932	305,379.23	2,487,410.02
	Marines 1941	305,267.91	2,491,782.86
and the second	Monument USMC 85	307,936.37	2,491,112.85
	Monument USMC 86	308,307.99	2,491,338.95
	Forest Fire Observation Tower # 2 100,000 Gal. Water Tank, Barrage	307,619.54	2,481,774.23
	Balloon Battalion	306,221.00	2,492,388.00
	Buna 1942	301,836.01	2,486,229.39
-	Picture Point, centerline of intersec- tion Marines Rd. & Clinton St., Barrage	,	.,,
· · · · · · · · · · · · · · · · · · ·	Balloon Battalion Area	306,151	2,492,189
			5,105,100
220	Picture Point, centerline of inter-		
	section Sneads Ferry Road & Marines Rd.	309,017	2,493,551
221	Duck Creek 1932	307,798.89	2,512,004.00
	Picture Point, centerline of inter-	,	2,010,001000
	section, Sneads Ferry Rd. & Access Rd.	•	
	to Mock-up.	307,767	2,514,892
	Picture Point, Lat. 34°35' 05."607, Long.	001,101	w, 011, 000
	77° 17' 18".012 (30th. Engrs.) P. Pt. # 1	4	1
	Sta. # 3. Proceed south from Piney Green		1
	along Piney Green-Hurst Beach Rd. 9.5 mi.		
	to jct. with Swansboro-Sneads Ferry Rd.		7
	thence S. along Swansboro-Sneads Ferry Rd		
	0.50 miles to triangle formed by two cond		
	0.50 miles to triangle formed by two sand		4
	roads leading to West. Point is 12' west	of	•
-	roads leading to West. Point is 12' west centerline Swansboro-Sneads Ferry Rd. & 5	of	* *
	roads leading to West. Point is 12' west centerline Swansboro-Sneads Ferry Rd. & 5 N. of centerline of northermost sand road	of	
•	roads leading to West. Point is 12' west centerline Swansboro-Sneads Ferry Rd. & 5 N. of centerline of northermost sand road (Military N. 1,291,193.5 yds. E. 569,848.2	of	**
	roads leading to West. Point is 12' west centerline Swansboro-Sneads Ferry Rd. & 5 N. of centerline of northermost sand road	of	
23.8	roads leading to West. Point is 12' west centerline Swansboro-Sneads Ferry Rd. & 5 N. of centerline of northermost sand road (Military N. 1,291,193.5 yds. E. 569,848.2 yds.)	of 308,290	2,515,175
238	roads leading to West. Point is 12' west centerline Swansboro-Sneads Ferry Rd. & 5 N. of centerline of northermost sand road (Military N. 1,291,193.5 yds. E. 569,848.2 yds.) Monument USMC 12	of 308,290 299,241.58	2,515,175 2,466,601.64
238	roads leading to West. Point is 12' west centerline Swansboro-Sneads Ferry Rd. & 5 N. of centerline of northermost sand road (Military N. 1,291,193.5 yds. E. 569,848.2 yds.)	of 308,290	2,515,175
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238 239	roads leading to West. Point is 12' west centerline Swansboro-Sneads Ferry Rd. & 5 N. of centerline of northermost sand road (Military N. 1,291,193.5 yds. E. 569,848.2 yds.) Monument USMC 12	of 308,290 299,241.58	2,515,175 2,466,601.64
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239	roads leading to West. Point is 12' west centerline Swansboro-Sneads Ferry Rd. & 5 N. of centerline of northermost sand road (Military N. 1,291,193.5 yds. E. 569,848.2 yds.) Monument USMC 12 Monument USMC 13 Hall U.S.E. 1932 Hatch U.S.E. 1932 Cedar Point 1914	of 308,290 299,241.58 299,835.48 299,367.43	2,515,175 2,466,601.64 2,467,077.77 2,489,590,84
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239	roads leading to West. Point is 12' west centerline Swansboro-Sneads Ferry Rd. & 5 N. of centerline of northermost sand road (Military N. 1291,193.5 yds. E. 569,848.2 yds.) Monument USMC 12 Monument USMC 13 Hall U.S.E. 1932 Hatch U.S.E. 1932 Cedar Point 1914 Crag 1914 Passet 1932	of 308,290 299,241.58 299,835.48 299,367.43 295,926.51 296,011.58	2,515,175 2,466,601.64 2,467,077.77 2,489,590.84 2,493,249.72 2,500,477.32
239 240	roads leading to West. Point is 12' west centerline Swansboro-Sneads Ferry Rd. & 5 N. of centerline of northermost sand road (Military N. 1291,193.5 yds. E. 569,848.2 yds.) Monument USMC 12 Monument USMC 13 Hall U.S.E. 1932 Hatch U.S.E. 1932 Cedar Point 1914 Crag 1914 Passet 1932 Vim 1932	of 308,290 299,241.58 299,835.48 299,367.43 295,926.51 296,011.58 296,420.00	2,515,175 2,466,601.64 2,467,077.77 2,489,590,84 2,493,249.72 2,500,477.32 2,506,327.54
239 240	roads leading to West. Point is 12' west centerline Swansboro-Sneads Ferry Rd. & 5 N. of centerline of northermost sand road (Military N. 1291,193.5 yds. E. 569,848.2 yds.) Monument USMC 12 Monument USMC 13 Hall U.S.E. 1932 Hatch U.S.E. 1932 Cedar Point 1914 Crag 1914 Passet 1932	of 308,290 299,241.58 299,835.48 299,367.43 295,926.51 296,011.58 296,420.00 293,173.64	2,515,175 2,466,601.64 2,467,077.77 2,489,590,84 2,493,249.72 2,500,477.32 2,506,327.54 2,509,046.21 2,511,600.67
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239 240	roads leading to West. Point is 12' west centerline Swansboro-Sneads Ferry Rd. & 5 N. of centerline of northermost sand road (Military N. 1291,193.5 yds. E. 569,848.2 yds.) Monument USMC 12 Monument USMC 13 Hall U.S.E. 1932 Hatch U.S.E. 1932 Cedar Point 1914 Crag 1914 Passet 1932 Vim 1932	of 308,290 299,241.58 299,835.48 299,367.43 295,926.51 296,011.58 296,420.00 293,173.64 295,635.24	2,515,175 2,466,601.64 2,467,077.77 2,489,590,84 2,493,249.72 2,500,477.32 2,506,327.54 2,509,046.21 2,511,600.67

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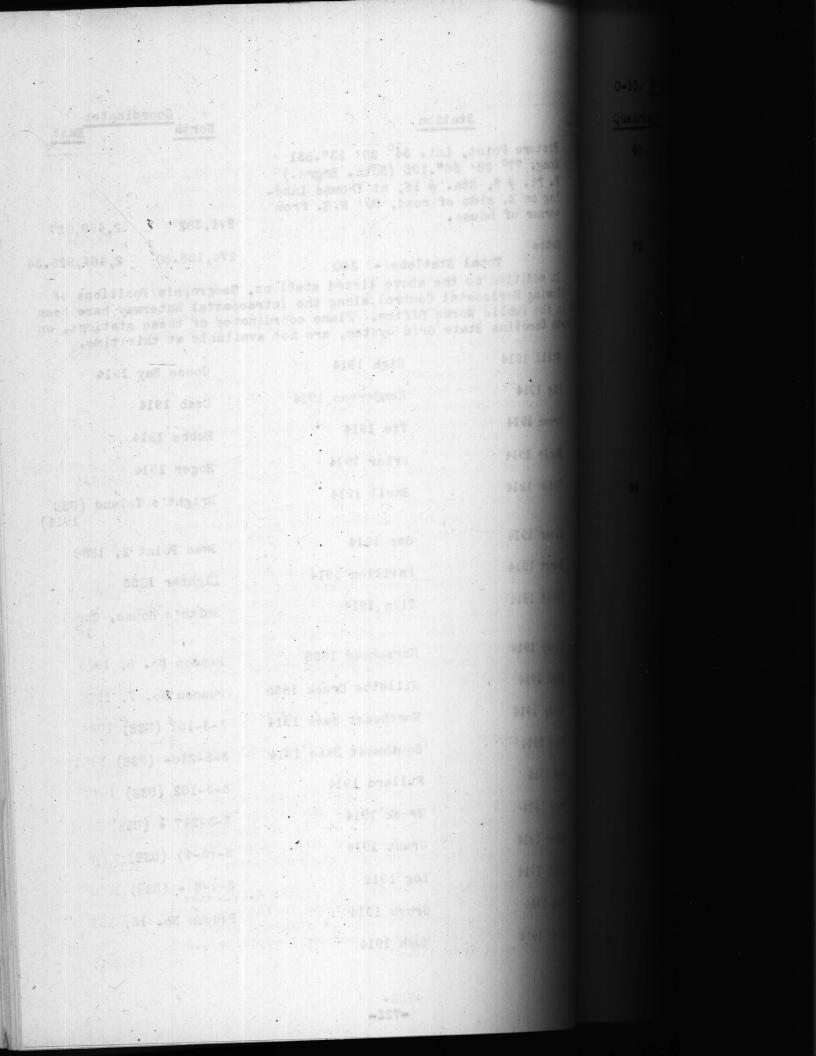
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		Coord	inates
Quad.	Station	North	East
277	Picture Point, Lat. 34° 29' 13".531 Long. 77° 28' 36".195 (30th. Engrs.) P. Pt. # 5, Sta. # 16, at Thomas Land- ing on E. side of road, 50' N.E. from corner of house.	271,782	2,459,027
278	Hobbs Total Stations - 360	274,158.80	2,464,925.34

In addition to the above listed stations, Geographic Positions of the following Horizontal Control along the Intracoastal Waterway have been filed in the Public Works Office. Plane coordinates of these stations, on the North Carolina State Grid System, are not available at this time.

Still 1914	High 1914	Goose Bay 1914
Pig 1914	Henderson 1914	Crab 1914
Brown 1914	Tie 1914	Hobbs 1914
Eagle 1914	Brier 1914	Roger 1914
Cedar 1914	Shell 1914	Wright's Island (USE 1914)
Fiver 1914	Gap 1914	Swan Point Z, 1888
Hurst 1914	Pavilion 1914	Lighter 1855
Point 1914	Tile 1914	Smith's House, Cupela 1974
Windy 1914	Horsehead 1855	Beacon No. 5, 1973
Week 1914	Gilletts Creek 1855	Beacon No. 7, 1923
Sandy 1914	Northeast Base 1914	3-3-151 (USE) 1933
Pine 1914	Southwest Base 1914	3-3-216+ (USE) 1933
Low 1914	Fullard 1914	3-3-182 (USE) 1935
Pass 1914	Wreck 1914	3-3-247 + (USE) 1935
Baker 1914	Grant 1914	3-(3-4) (USE) 1985
.Swamp 1914	Log 1914	3-4-8 + (USE) 1953
Snag 1914	Grove 1914	Beacon No. 13, 1930
Cross 1914	Mush 1914	

-722-



0-10. Permanent Bench Marks

Elevation Quadrangle Description 40 About 1/4 mile northeast along the A.C.L. RR. from Kellum, Onslow Co., at the highway bridge over N. E. Creek, in the top of the E. wing wall of the N. abutment, and about 2' lower than the highway. 32.264 A standard disk, stamped "E 27 1932". 79 About 2 miles northeast along the A.C.L. RR. from the station at Jacksonville, Onslow Co., about 265 yards N. of milepost W 51, W. of the track, at a box culvert under U. S. Highway 17, and in the top of the south end of the east head wall. A standard 26.473 disk, stamped "K 27 1932". About 4.2 miles northeast along the A.C.L. RR. from the station at Jacksonville, Onslow Co., about 0.3 mile northeast of milepost W 53, about 300 yds. N. of the crossing of the Swansboro Rd., about 55' W. of the west rail, and 24' E. of the center line of U. S. Highway #17. A standard disk, stamped "J 27 1932" and set in the top of a concrete post. 44.393 98 Cross mark on top of S. concrete walk on center line of middle walk, Settling Tank #1, Tent Camp Sewage Treatment Plant. 430' S. of Brinson Crk. 5.03 About 1.2 miles S. along the A.C.L. RR. from the station at Jacksonville, Onslow Co., about 275' south of the center of a RR. trestle, about 33 yards northwest of milepost W 48, 41.5' W. of the rail, at the center of a 1-foot triangular blaze on the E. side of 34-inch pine tree, and about 4' higher than the ground. A standard disk, stamped "W 147 1935" and 8.317 set vertically. Monument - N. 362,341.58; E. 2,466,827.20. 12.07 Spike' on 20" gum tree 50' N. of Tent Camp Outfall Sewer at station 15.96. 13.02 At Jacksonville, Onslow Co., at the Northwest corner of Main St. and Mills Ave., at the A.C.L. RR. station 94! W. of the west rail, and 34! N. of the center line of Mills Ave. A standard disk stamped "L 27 1932" and set in the top of a concrete post. 13.884 At Jacksonville, Onslow Co., E. of the A.C.L. RR. track, at the city water tank, and in the top of the footing of the southwest leg. A standard disk, stamped "M 27 1932" top of east rail opposite A.C.L.

RR. milepost W 49 (12.41)

L.donog duenant Quadrangle neligine.em 98 Abat 1/4 mile northeadt side the A.C.L. Rt. from Tolling, Onelow Co., at the highway bridge over I. abuttant, and about ? Iower than the biginary. . "SEEl 75 2" begmuts . Main brabauts A \$33.56 About 2 miles mortheast along the A.C.L. MR. From did station at Jacksonville, Cnelow Co., shout 665 side Is of allegest 7 51. T. of the track, at a oux suivert under U. S. Highney IT, and in the top. . "Sael TE T" beginses islate 28.475. About 4.2 miles northeast slong the A.C.L. BR. from the station at Jacksonville, Onsion Co., about 0.3 Mile northeast of alle get I 53, about 300 yda, IL al the crossing of the Stansberg id., shout 75, 12. at the west rall, and if I. of the center lind of be biginey wir. A standard disk, stanpod "J. af 1962" and set in the top of a concrete post. apro snet . He inst gatifred . flas elboin to wall Servic-Transmont Plant. 4301 S. of Bringon Crk. hous 1.2 miles S. cloff the s.C.L. ER. Bros the druns is Jacksonville, Chalow Co., about 2751 sauth and, of milepost 7 48, 41.54 T. af the rail, at the Melingh pine tree, and about 44 higher than the bus "Bassis a standard dist. stanped "T 147 1936" and ant Tortisality. 86319 10.51 pits on 20" gun tree 50" IL Sf Tont Chip Outfail-Sector at statist 15.95. an indiananyille, Onelow Co., at the Forthreat corner moltars . HE al. 0.4 ont to .. or all in .. of mildle "" I. of the reat rath, and lat I. of the center late had set in the top of a senerate post. A secondite. Orslow Co., L. of the A.C.L. RR. make at the sity water tank, and in the top of the 4085Per

Description

	Spike on root of 24" oak 95' southwest of Sewer Manhole #7, Tent Camp.	16.67
	Tent Camp $\frac{3}{1}$ - Middle porch floor N. end Mess Hall between C & D Sts. and Ninth & Tenth Sts.	17.29
	Tent Camp #2 - Middle porch floor S. end Mess Hall between C & D Sts. and Ninth & Tenth Sts.	17.33
	On south edge of concrete porch floor, Mess Hall 167' W. of C. St., 105' N. of 10th St.	17.83
	On north edge of concrete porch floor, Mess Hall 167' W. of C. St. 106' S. of 9th St.	17.91
	Spike on root of 12" pine 51' E. of D. St. and 54' S. of 6th St., Tent Camp.	18.47
·	Mess Hall 330 Tent Camp #1 Porch floor center N. end.	18.48
	Mess Hall 330 Tent Camp #1 Porch floor center S. end.	18.49
	Spike on base of 18" persimmon tree 58' W. of E St. and 165' south of 2nd St., Tent Camp.	18,73
	Monument - N. 361,903.75; E. 2,477,918.45	19.16
	U. S. Engineers Monument No. 18, on U. S. route #17. Coordinates: N. 367,575; E. 2,464,076	19.6
	Monument 40' N. of 2nd St. 30' W. of C. St.	19.10
	Mess Hall 321 Tent Camp #1 Porch floor at center N. end.	19.37
	Mess Hall 321 Tent Camp #1 Porch floor at center S. end.	19.38
	Monument 30' W. of C. St. 41' S. of 1st St. Tent Camp	19.72
÷ ;	Spike in base of 20" chinaberry tree 93' N. of 1st St. between A and B Sts., Tent Camp.	19.75
	U. S. Engineers Monument #19, U. S. route #17. Coordinates: N. 368,322; E. 2,465,420.	19.8
	Monument Tent Camp - Coordinates: N. 363,617.88; E. 2,463,134.07.	19.81

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Antice on root of 24" ont for southwest of sover hannole of , Tent Daug. Tent Canp 12 - Middle bires floor I. and Man Hall between C & D Rea. and Minch & Tenth Ster Hall Tent Canp 40 - (Middle bires floor I. and Man Hall between C & D Rea. and Minch & Tenth Ster between C & D Ster and Minch & Tenth Ster District T. of C & D Ster and Minch & Tenth Ster District T. of C & D Ster and Minch & Tenth Ster District T. of C & D Ster and Minch & Tenth Ster District T. of C & D Ster and Minch & Tenth Ster District T. of C & D Ster and Minch & Tenth Ster District T. of C & D Ster and Minch & Tenth Ster District T. of C & D Ster and Minch & Tenth Ster District T. of C & D Ster and Minch & Tenth Ster District T. of C & D Ster and Minch & Tenth Ster District T. of C & D Ster and Minch & Tenth Ster District T. of C & D Ster and Ster District T. of C & D Ster District T. of C &

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Manuarat 40' N. M 2nd St. 30' W. of C. St. 19.10 Milisa Hall 321 Tent Canp 41 Porch floor at senter N.

Stess Hall 221 Tant Carp el Foron floor at bontor S. . . .

Monument Tant Carro - Coordinates, N. 303, 577, 83; 13, 81

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Quadrangle

Elevation

9	8	

Top bolt northmost pier Elevated Water Tank, Tent Camp $\#1$	19.87
Monument near 1st and Church Sts. Coordinates: N. 364,417.17; E. 2,463,100.46	19,97
Spike in base of 6" pine. 79' W. of A St., 85' S. of 9th St.	20.85
About 0.9 mile W. along U. S. Highway #17 from Jacksonville, Onslow Co., at the junction of U. S. Highway 258, about 8 yds. S. of the center line of U. S. Highway 258, about 6 yds. N. of the center line of U. S. Highway #17, and about 1' higher than the highway, a standard disk, stamped "T 68 1934" and set in the top of a concrete post.	20.341
 North Meridain at Jacksonville, Onslow Co., at the northwest corner of the high school grounds, about 100' east of the A.C.L. RR. track, and 24' S. of the center line of a road leading to the school entrance. The top of a granite post, chiseled, "N.C.G.S.U.S. 1898".	20.784
About 0.7 mile W. along U. S. Highway #17 from Jacksonville, Onslow Co., about 1,500' E. of the junction of U. S. Highway #258, opposite a dirt Rd. leading to a state prison camp, about 11 yds. N. of the center line of the highway, and about 1' higher than the highway. A standard disk, stamped "S 68 1934" and set in the top of a concrete post.	20.902
Northeast corner, top of concrete slab, valve vault easterly water storage tank, Tent Camp #1	20.93
3 nails in base of 8" red oak, 38' N. of center line 5th St., 38' E. of center line of A. St., Tent Camp No. 1	21.60
Southeast corner, top concrete slab, valve vault, westerly water storage tank, Tent Camp #1	21.92
Spike in base of oak tree 72' W. of A St., 20' S. of 8th St.	22.48
Magnetic station, at Jacksonville, Onslow Co., about 150 yds. E. of the A.C.L. RR. track, about 125' S. of a flagpole in front of the high school and 67' W. of the southwest corner of the building. A standard magnetic-station disk, stamped "1931", and set in the	
top of a granite post.	23.058

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Top bals norshnast plan Elevered Futer Futer Fint

Thursont noute, 1st and Church Sta. Coordinates 1. 366,417.171 B. 2,463,190.46

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About 9.50 mile 7. along U. 5. Highway 37 Fruit Jactorrille, Chalow Da., at the Junction of 7.5. Nichary 155, about 8 yds. 8. of the conter line of U. 4. Lighway 255, about 4 yds. 1. of the conter line of 8. 5. stringy all, and about 1 higher than the highway, a string all disk, straped "7 65 1554" and set in the top of a concrete post.

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About 0.7 mile is intro 0. 8. Highway all from About 0.7 mile is intro 0. 8. Highway all from About in a line of the source 1.000* E. of the function of 0. ... Highway 2000, apposite a dirt Hd. Lading to a start when done, about 11 wish N. of the conter line of the Highway, and about 11 higher the the highway, a standard disk, standed "2 55 1864* and set is the top of a concrete pact.

Merthoust corner, top of concrete clad. valve wault

S mails in base of 8" red onis 30" H. of conter line Sth St., 38" G. of conter line of A. St., Test Camp.

Southent cerver, top concrete alab, walve visit, " masterly ator storigd tank, Tent Carp M

of Starses and a large of the starses of the starse

Repretio station, at decembrail, chalew Co., boost 150 Ma. 2. of the light RP. track, acout 180 S. of a flaggold in front of the high school and 37 T. of the southerst corner of the building. A stradard metrotic-statics what, starped "1921", and set in the top of a cruste root.

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Quadrangle Description Elevation 99 Triangulation Station "Northeast 1933" - Coordinates: N. 360,462.81; E. 2,480,360.37 3.195 USMC Monument 89. Coordinates: N. 360,678.95; E. 2,480,316.76 8.305 USMC Monument 98. Coordinates: N. 361,091.95; E. 2,482,926.11 15.61 Spike in base of pine 45' W. of Marine Barracks Railroad, station 79:00 15.88 USMC Monument 90. Coordinates: N. 360,774.32; E. 2,481,091.73 20.105 USMC Monument 100. Coordinates: N. 362,313.70; E. 2,483,362.23 21.72 USMC Monument 97. Coordinates: N. 360,843.41; E. 2,483,519.98 22,65 USMC Monument 99. Coordinates: N. 361,790.93; E. 2,483,215.78 23.365 Spike in base of 14" pine, 56' W. of Marine Barracks Railroad, station 30:40 23.38 Spike in base of 12" gum 55' W. of Marine Barracks Railroad, station 101:00 25.12 Spike in base of 8" gum 140' E, of Marine Barracks Railroad, station 120,00 25.84 Spike in base of 12" pine 60' W. of Marine Barracks Railroad, station 50+00 26.19 Spike in base of 18" pine 50' W. of Marine Barracks Railroad, station 60,00 26.94 Spike in base of 12" pine 55' E. of Marine Barracks Railroad, station 150,00 27.56 100 On southwest curb at northwest end of highway bridge, N. C. route #24, over Northeast Creek 7.42 On southwest curb at southeast end of highway bridge, N. C. route #24, over Northeast Creek 7,43 Northeast corner, top of concrete slab, Sewage Pumping

Station #6, L.C.D.H.	19.03
Monument - N. 361,841.04; E. 2,497,145.31	19.715
Monument - N. 362,565.99; E. 2,496,226.97	21.31

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. 12.2. Monument 97. Coordinates: N. 560,843,41:

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the in bate of 12" this 60' T. of Barine Barradia 26.19

mailroad, station 60-00 28,34 apies in base of 12" plan 55% 1. of Martine Barracka Allroad, station 100406

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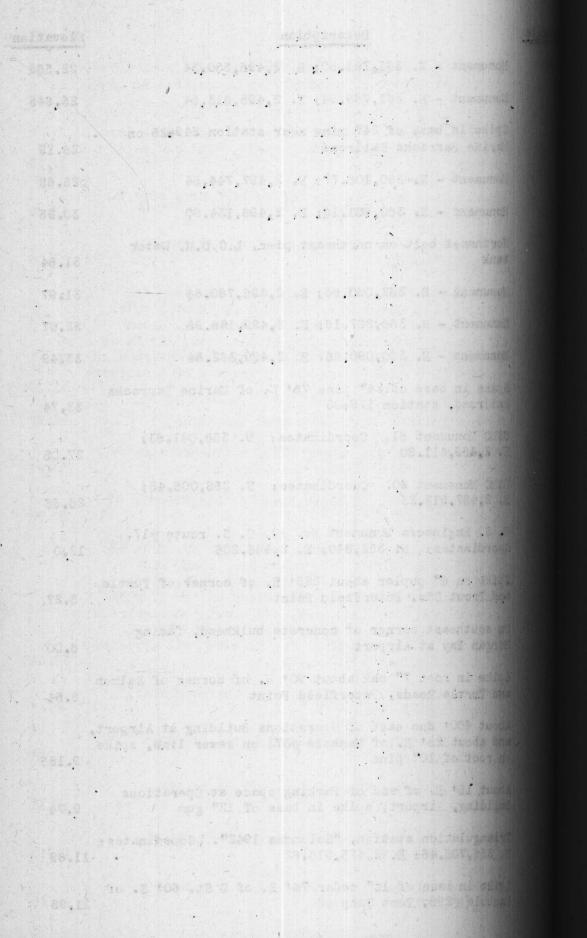
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onument - N. 362,265,39; E. 3,496,226,97

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Quadrangle	Description	Elevation
100	Monument - N. 361,781.50; E. 2,495,550.34	22.565
The second	Monument - N. 361,788.94; E. 2,495,613.54	25.645
	Spike in base of 24" pine near station 249+25 on Marine Barracks Railroad	26.19
	Monument - N. 360, 106.67; E. 2,497,744.54	28.68
	Monument - N. 360,601.16; E. 2,498,134.90	30.25
	Northmost bolt on northeast pier, L.C.D.H. Water tank	31.84
	Monument - N. 362,000.86; E. 2,495,780.84	31.97
	Monument - N: 360,267.16; E. 2,499.138.95	32.07
	Monument - N. 360,090.86; E. 2,499,362.84	33.49
	Spike in base of 24" pine 75' W. of Marine Barracks Railroad, station 179+00	33.74
117	USMC Monument 61. Coordinates: N. 358,041.63; E. 2,459,411.80	27.05
	USMC Monument 60. Coordinates: N. 358,005.45; E. 2,457,912.23	28.66
	U. S. Engineers Monument No. 10, U. S. route #17. Coordinates: N. 352,840; E. 2,456,206	12.0
118	Spike on 6" poplar about 225' E. of corner of Turtle and Trout Sts. Peterfield Point	5.27
	On southeast corner of concrete bulkhead, facing Morgan Bay at Airport	6.00
	Spike in root 7" oak about 90' W. of corner of Salmon and Turtle Roads, Peterfield Point	8.54
	About 400 ¹ due east of Operations Building at Airport and about 25 ¹ N. of Manhole #373 on sewer line, spike on root of 10" pine	, 9.135
	About 15' E. of end of Parking space at Operations Building, Airport, spike in base of 12" gum	9.74
	Triangulation station, "Solomons 1942". Coordinates: N. 355,705.45: E. 2,475,915.62	11.89
	Spike in base of 12" cedar 76' E. of D St. 60' S. of Manhole #295, Tent Camp #2	11,92



uadrangle	Description	Elevation
118	On front concrete porch landings at main floor level, Operations Building, Landing Field, center line of N. doorway	12.60
	On front concrete porch landings at main floor level, Operations Building, Landing Field, center line of S. doorway	12.59
	Nail in root of 12" pine, 50' W. of C St., 200' N. of 11th St., Tent Camp $\frac{4}{7}2$	16.68
	USMC Monument 91. Coordinates: N. 358,591.70; E. 2,476,754.66	18.00
	About 2.1 miles S. along the A.C.L. RR. from the station at Jacksonville, Onslow Co., about 2 poles N. of milepost W 47, at Phillips Crossing, about 55' south of the center line of the road, 28' E. of the east rail, and 4' N. of a pole. A standard disk stamped "N 27 1932", and set in the top of a concrete post	10.000
		19.006
	Northmost anchor bolt water tank Tent Camp #1	19.87
· /	On top of Northmost anchor bolt, northeast pier of 100,000 gal. water tank, Tent Camp #2	19.94
*	USMC Monument 92. Coordinates: N. 359,298.68; E. 2,477,521.27	20.92
	About 3.2 miles south along the A.C.L. RR. from the station at Jacksonville, Onslow Co., about 260' N. of milepost W 46, 51' E. of the east rail, at the center of a 1-foot triangular blaze on the W. side of a 38-inch sweet gum tree, and about $3\frac{1}{2}$ ' higher than the ground; a standard disk, stamped "X 147 1935" and set vertically. Top of east rail opposite	
	A.C.L. RR. milepost W. 46, 23.5:	26.030
119	Northeast corner, top of concrete stairway slab, Sewage Pumping Station #4	6.45
	USMC Monument 69. Coordinates N. 357,544.80; E. 2,483,450.60	9.35
	USMC Monument 70. Coordinates N. 356,984.37; E. 2,483,870.02	11.33
	Concrete Monument. Coordinates: N. 352,541.81; E. 2,484,252.49	15.18
	Concrete Monument. Coordinates: N. 352,680.70; E. 2,483,566.41	16.70

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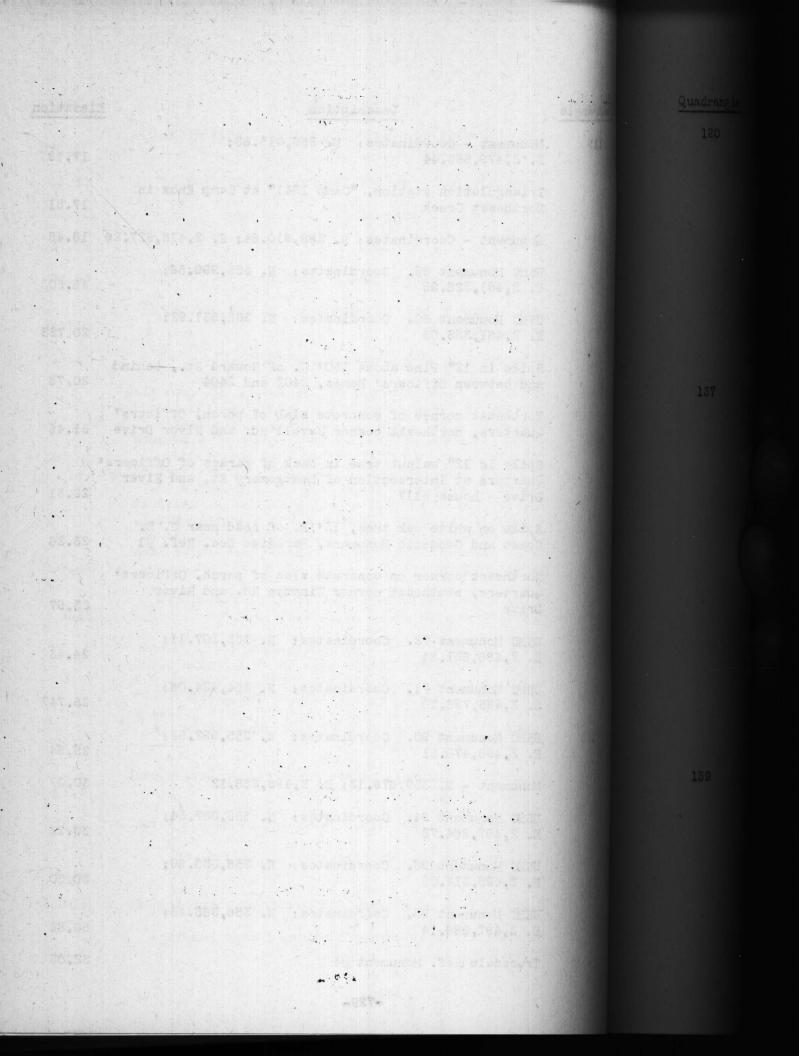
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Quadrangle	Description	levation
119	Monument - Coordinates: N. 359,915.88; E. 2,479,585.44	17.19
	Triangulation station, "Camp 1941" at Camp Knox in Northeast Creek	17.21
	Monument - Coordinates: N. 359,910.84; E. 2,478,827.26	18,48
	USMC Monument 65. Coordinates: N. 355,999.56; E. 2,481,326.95	18.503
	USMC Monument 66. Coordinates: N. 355,531.92; E. 2,481,353.03	20.723
	Spike in 12" Pine about 150' W. of Howard St., behind and between Officers' Homes, 2402 and 2404	20.78
· · · ·	Northeast corner of concrete slab of porch, Officers' Quarters, northeast corner Wavell Rd. and River Drive	21.45
•	Spike in 12" walnut tree in back of garage of Officers Quarters at intersection of Montgomery St. and River Drive - house 2117	22,31
	Spike on white oak tree, 15' E. of road near U. S. Coast and Geodetic Monument, Paradise Ecc. Ref. #1	23,26
	Northeast corner on concrete slab of porch, Officers' Quarters, southeast corner Winston Rd. and River Drive	23,97
	USMC Monument 72. Coordinates: N. 353,307.11; E. 2,486,621.84	24.43
	USMC Monument 71. Coordinates: N. 354,424.06; E. 2,485,786.10	25.747
120	USMC Monument 95. Coordinates: N. 355,992.53; E. 2,496,470.51	25.84
	Monument - N. 359,679.13; E. 2,498,286.12	30.07
•	USMC Monument 94. Coordinates: N. 356,087.54; E. 2,497,264.72	30.28
	USMC Monument 96. Coordinates: N, 356,055.60; E. 2,495,314.05	30,50
	USMC Monument 93. Coordinates: N. 356,365.48; E. 2,497,986.14	30.88
	Truesdale Ref. Monument #3	32.05



Quadrangle	Description	
	Description	Elevation
120	USMC Monument 83. Coordinates: N. 358,878.58; E: 2,499,227.59	32.375
	Truesdale 1932 - N. 356,181.01; E. 2,499,102.26	32.55
	Truesdale Ref. Monument #1	32.56
	Truesdale Ref. Monument #2	32.73
	Well No. 16, center line of doorway	33.26
	USMC Monument 82. Coordinates: N. 357,977.03; E. 2,500,369.62	35.315
	Monument - N. 356,214.02; E. 2,502,282.41	41.76
137	About 1.8 miles north along the A.C.L. RR. from the station at Verona, Onslow Co., about 250' S. of mile- post W 45 x 51' W. of the W. rail, at the center of a 1-foot triangular blaze on the E. side of a 34-inch pine tree, and about 3' higher than the ground. A standard disk, stamped "Y 147 1935" and set vertically Top of E. rail opposite A.C.L. RR. milepost W 45,	
	20.21. Top of E. rail opposite A.C.L. RR. milepost W 45, W 44, 41.51. About 0.5 mile north along the A.C.L. RR. from the station at Verona, at the crossing of U. S. Highway 17, top of E. rail at the center line of the highway, 48.31	24.649
-	U. S. Engineers Monument No. 9, U. S. route #17. Coordinates: N. 349,771; E. 2,457,012	25.5
	About 0.5 mile north along the A.C.L. RR. from the station at Verona, Onslow Co., about 0.3 mile S. of milepost W 44, at the crossing of U. S. highway #17, about 30' S. of the center line of the highway, 29' E. of the east rail, and about 50' N. of a pole. A standard disk, stamped "P 27 1932" and set in the top of a concrete post.	46.972
139	Monument (concrete), Hadnot Point triangulation Sta. "Hadnot 1941"	2.19
	Nail in root of 20" live oak at end of Hadnot Point	2.81
	USMC Monument 73. Coordinates: N. 351,461.56; E. 2,488,002.73	4.565
	Spike in root of 6" gum, 65' southwest, Manhole #158	5.42
	Outside Northwest corner landing, Sewage Pumping Station No. 2	6.517

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Quadrangle

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Quadrangle	Description	Elevation
139	N.E. corner of concrete slab, Sewage Pumping Station #3	6.97
	USMC Monument 67. * Coordinates: N. 345,087.36; E. 2,489,689.07	7.56
	Monument Naval Hospital Area, 1000: Northeast of Hadno Point	t 8.51
	Spike in base of 8" pine 85' northeast, Manhole #156	9.66
	Monument - Naval Hospital Area, 22' northwest of Nurses' Quarters	10.00
	USMC Monument 68. Coordinates: N. 344,648.06; E. 2,490,020.03	10.88
	Tree 30' northwest of Manhole #164	11.19
	Spike in root of 30" twin oak, about 100' southwest of Manhole #168, South end of Officers' Quarters	11.24
	Monument - Naval Hospital Area, 190' northeast of River Road, 114' W. of Hospital Boundary line. Coordinates: N. 340,985.73; E. 2,491,967.13	11.40
	Monument - Naval Hospital Area, 700' northeast of Hadnot Point	11.89
	Spike in root 12" maple tree, 30' southwest of Manhole # 160	12.232
	On iron pin in concrete monument, triangulation station "High 1932"	n 17.15
	Monument - Coordinates: N. 340,986.74; E. 2,492,297.4	7 18.25
	USMC Monument 74. Coordinates: N. 351,141.29; E. 2,488.242.37	18.55
	Monument - Coordinates: N. 340,987.33; E. 2,492,529.05	19.11
	Monument - Coordinates: N. 340,988.34; E. 2,492,923.60	22.04
• 4	Monument - Coordinates: N. 344,856.38; E. 2,492,944.94	23.883
and a second	Monument - Coordinates: N. 345,616.95; E. 2,492,375.86	24,61
	Monument - 162' northwest of Cross St., 375' north- east of River Road	25.26
140	Monument - Coordinates: N. 343,023.40; E. 2,494,226.72	10.03

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Description

Quadrangle

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Monument - Coordinates: N. 342,309.18; E. 2,494,228.54 12.81 Monument - Coordinates: N. 342,510.69; E. 2,494,228.03 17.67 Monument - Coordinates: N. 340,989,95; E: 2,493,552.87 19.89 Monument - Coordinates: N: 340,992:47; E: 2,494,541.20 20:57 Monument - 10' northwest of building 100. Coordinates: N. 340,426.74; E. 2,494,953.89 21.17 Monument - Coordinates: N. 340,775.59; E. 2,494,699.41 21.29 Monument east of Radio Towers - Coordinates: N. 341,670.71; E. 2,494,230.17 22.69 Monument - Coordinates: N. 340,996.07; E. 2,495,948.63 22.79 Monument 90' E. of Manhole #478. Coordinates: N. 341,686.04; E. 2,499,928.60 22.81 Monument - Coordinates: N. 340,994.73; E. 2,495,423.64 23.24 Monument - Coordinates: N. 340,991.23; E. 2,494,051.56-23.41 Monument south of Radio Towers - Coordinates: N. 341,149.72; E. 2,493,711.83 24.27 Monument - 42' northeast of Service Road. Coordinates: N. 340,993.57; E. 2,494,968.30 24.33 -Monument - Parachute Tower Area - Coordinates: 14:--N. 342,198.49; E. 2,499,764.82 25.00 . Monument - near Sewage Pumping Station #9. 44 Coordinates: N. 340,369.41; E. 2,500,095.51 25.67 East and West front door Mess Hall in Area #1, Building #106 center of doorways 27.11 Top bolt northern most pier, elevated water tank -Supply and Industrial Area 28.657 Monument - Parachute Tower Area. Coordinates: N. 342,552.5; E. 2,500,062.7 28.56 Monument - Supply and Industrial Area. Coordinates: N. 340,486.30; E. 2,501,531.31 29.39 Monument - Coordinates: N. 342,825.74; E. 2,500,989.26 35.13

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Quadrangle	Description	levation
157	1,720' east of Verona on Loop Road - 100' right of center line - spike in root of 18" pine	47.38
	At Verona) Onslow Co., about 25 yards northwest of the northwest corner of the A.C.L. RR. station about 16 yds. E. of the southeast corner of the G. W. Humphrey store, about 45 ¹ northwest of a road crossing, and 19.4 ¹ west of the west rail. A standard disk, stamped "Z 147 1955" and set in the top of a concrete post	48,924
	About 1.1 miles S. along the A.C.L. RR. from the station at Verona, Onslow Co., directly E. of milepost W 42, southwest of the intersection of U. S. highway #17, and a T road leading E., 105' E. of the east rail, and 18' E. of the east edge of U. S. Highway #17. A standard ref. mark disk, stamped "Verona No. 1, 1932" and set in the top of a concrete post.	70.827
158	USMC Monument 45. Coordinates: N. 333,738,96; E. 2,471,257.42	6 7. 50
	USMC Monument 44. Coordinates: N. 336,968.08; E. 2,470,208.30	63.195
	Spike in base of 18" pine, 90' left of station 136+54 on Verona - 11th Marines Loop Rd., and 40' S. of intersection of said road and Town Point Rd.	65.82
159	Monument - boundary of Naval Hospital, 60' N. of New River	15.67
160	Monument near building #518. Coordinates: N. 334,140.56; E. 2,497,292.51	7.22
	Brass bolt in pump room floor, Sewage Pumping Station #1	8.66
	Monument - Coordinates: N. 335,917.32; E. 2,495,997.22	10.03
	Spike on 12" white oak tree on edge of bank 125' from triangulation station. "Bluff 1941"	13.88
	Monument Triangulation Station "Bluff 1941"	16.34

Monument east of building 304. Coordinatos: 17.44 N. 336,483.47; E. 2,495,584.48

Monument 53' northeast of building #517. Coordinates: 18.44 N. 333,454.00; E. 2,497,793.03

18.50 Monument - Coordinates: N. 333,942.99; E. 2,499,683.51 Monument north of building #213. Coordinates:

18.79

N. 337, 461.81; E. 2,494,872.79

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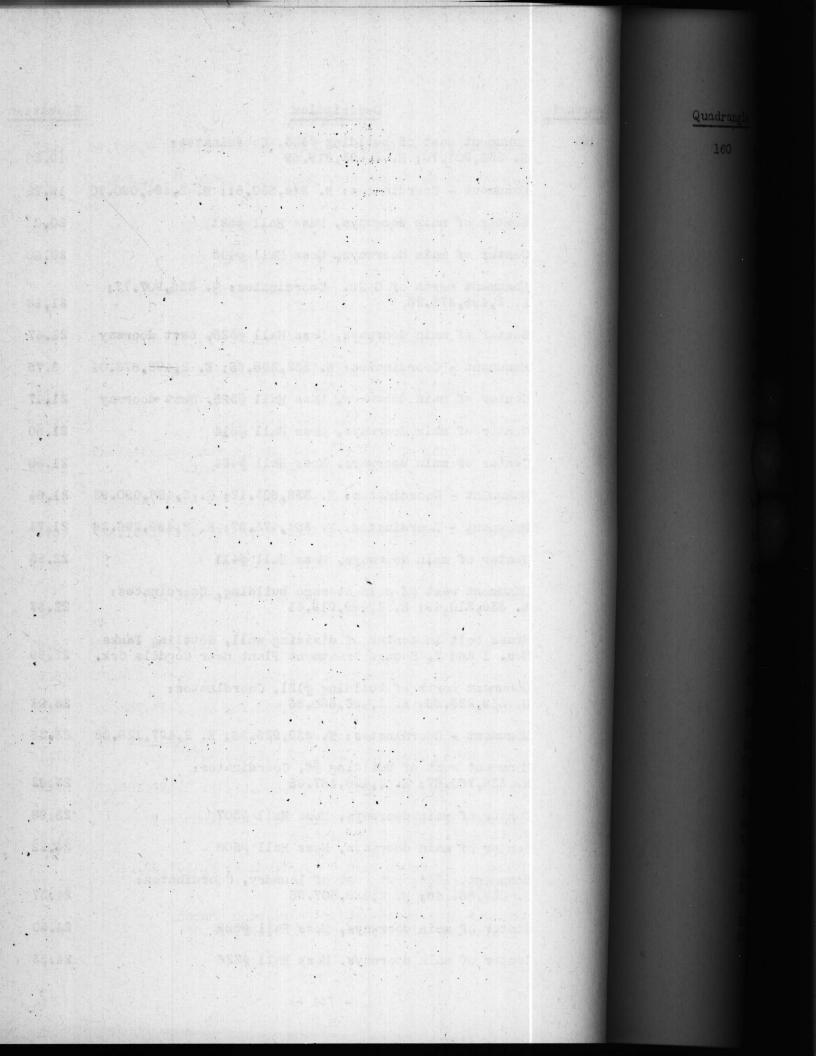
Description

Elevation

160	Monument east of building #123, Coordinates: N. 338,901.70; E. 2,493,819.69	19.38
	Monument - Coordinates: N. 338,530.81; E. 2,494,090.70	19.72
	denter of main doorways, Mess Hall #521	20.0
	Center of main doorways; Mess Hall #408	20.60
	Monument north of G St. Coordinates: N. 336,907.77; E. 2,495,275.28	21.16
	Center of main doorways, Mess Hall #325, east doorway	21.47
	Monument - Coordinates: N. 332,308,65; E. 2,498,678.04	8.75
	Center of main doorways, Mess Hall #325, West doorway	21.47
	Center of main doorways, Mess Hall #314	21.50
	Center of main doorways, Mess Hall #424	21.50
	Monument - Coordinates: N. 338,603.12; E. 2,498,090.93	21.64
	Monument - Coordinates: N. 334,473.87; E. 2,499,296.26	21.74
	Center of main doorways, Mess Hall #411	22.55
	Monument west of cold storage building, Coordinates: N. 339,310.49; E. 2,499,919.41	22.57
	Brass bolt in center of dividing wall, Settling Tanks Nos. 1 and 2, Sewage Treatment Plant near Cogdels Crk.	22.89
	Monument north of building #121, Coordinates: N. 339,228.69; E. 2,493,580.86	23.01
	Monument - Coordinates: N. 339,929.56; E. 2,497,129.08	23.36
	Monument west of building #6, Coordinates: N. 338,763.67; E. 2,496,167.05	23,82
	Center of main doorways, Mess Hall #307	23.98
	Center of main doorways, Mess Hall #508	24.22
2	Monument, 1731 north cost of Laundry, Coordinates: N. 338,864,48; E. 2,499,307.98	24.37
·	Center of main doorways, Mess Hall #509	24.50
	Center of main doorways, Mess Hall #226	24.53

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Description

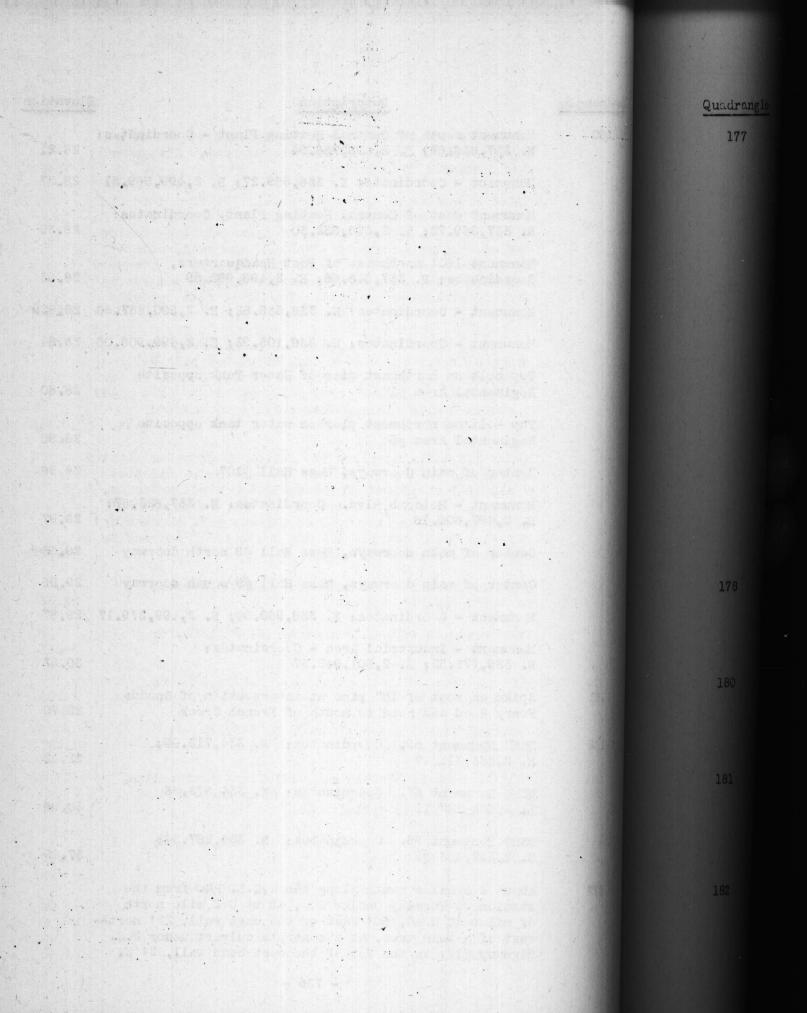
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Quadrangle

Monument - Coordinates: N. 339, 984.34; E. 2,497,307.74	24.64
Top of pin in 8" concrete monument, Cedar St. and W. Road	24.88
Center of East main doorway, Mess Hall #211	25.00
Center of West main doorway, Mess Hall #211	25.02
Monument 15: southwest of building #29, Coordinates: N. 338,139,13; E. 2,494,376.75	25.11
Monument - Coordinates: N. 332,085.92; E. 2,498,658.30	8.78
Monument 45' east of building #101, Coordinates: N. 339,656.16; E. 2,495,516.05	25,22
Center of main doorways, Mes's Hall #122	25.58
Spike in root of 350-year-old oak tree at opposite end of open field and 3000' from station Bluff.	25.78
Monument - Coordinates N. 338,535.21; E. 2,498,856.58	26.06
Monument - Coordinates N. 335,495.24; E. 2,498,551.22	26.40
Center of main doorways, Mess Hall #206	26.49
Monument 23' west of building #11. Coordinates: N. 338,010.96; E. 2,496,716.13	26.57
Monument - Coordinates: N. 335,933.23; E. 2,498,231.73	26.60
Monument - Coordinates: N. 335,734.61; E. 2,498,376.61	26.60
Monument - Coordinates: N. 335,206.23; E. 2,498,762.04	27.08
Monument south of intersection of Dogwood and East Rds. Coordinates: N. 338,390.75; E. 2,500,386.78	27.16
Monument - Coordinates: N. 338,194.27; E. 2,498,389.20	27.24
Monument 52' west of building #9, Coordinates: N. 338,354.61; E. 2, 296,465.45	27.59
Monument - Holcomb Blvd. Coordinates: N. 337,991.40; E. 2,498,110.91	27.77
Monument 250: northeast of Protestant Church, Coordinates: N. 336.486.61; E. 2.497.828.07	28,13

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Quadrangle	Description	Elevation
160	Monument south of Central Heating Plant - Coordinates: N. 337,646,67; E. 2,498,786.94	28.21
	Monument - Coordinates N. 336,569.27; E. 2,499,569.31	28.37
	Monument west of Central Heating Plant, Coordinates: N. 337,969.72; E. 2,498,552,30	28.39
	Monument 160' northeast of Post Headquarters, Coordinates: N. 337,645.68; E. 2,496,982.59	28.53
	Monument - Coordinates: N. 338,835.52; E. 2,500,887.86	28.629
	Monument - Coordinates: N. 336,105.92; E. 2,499,906.06	28,64
	Top bolt on northeast pier of Water Tank opposite Regimental Area #1	28.80
	Top bolt on northmost pier on water tank opposite Regimental Area #5	28.85
	Center of main doorways, Mess Hall #107	28.86
	Monument - Holcomb Blvd. Coordinates: N. 337,623.57; E. 2,497,606.18	28,97
	Center of main doorways, Mess Hall #9 north doorway	29.53
	Center of main doorways, Mess Hall #9 south doorway	29,55
	Monument - Coordinates: N. 336,969.00; E. 2,499,279.	17 29.87
-	Monument - Industrial Area - Coordinates: N. 339,771.52; E. 2,501,942.37	30.83
161	Spike on root of 18" pine at intersection of Sneads Ferry Road and road to mouth of French Creek	25.79
162	USMC Monument 59. Coordinates: N. 334,713.09; E. 2,533,313.47	22.42
	USMC Monument 57. Coordinates: N. 334, 573, 88 E. 2, 532, 187, 11	30, 95
	USMC Monument 58. Coordinates: N. 334,267,34; E. 2,532,403.51	37.49
177	About 2,9 miles south along the A.C.L. RR. from the station at Verona, Onslow Co., about 0.2 mile north of milepost W 40, 50' east of the east rail, 22' nor east of a twin tree, at a concrete culvert under U.S Highway #17, in the top of the west head wall, 2' N.	th-



60.725

70.581

34.52

21.32

Quadrangle 177

180

182

of the S. end 17! W. of the center line of the highway, and about 1' lower than the highway. A standard disk, stamped "A 148 1935"

About 1.8 miles S. along the A.C.L. RR. from the station at Verona, Onslow Co., about 1/4 mile N. of milepost W 41, about 160' S. of triangulation station Verona, described above, 57' E. of the rail, and 24' W. of the center line of U.S. Highway #17. A standard ref-mark disk, stamped "Verona No. 3 1932" and set in the top of a concrete post. Top of E. rail opposite A.C.L. RR. milepost W 41, 64.3'

About 1.8 miles S. along the A.C.L. RR. from the station at Verona, Onslow Co., about 0.3 mile N. of milepost W 41, 44' E. of the east rail, 36' W. of the center line of U.S. Highway #17, and 24' N. of a pole. A standard disk (triangulation station) stamped "Verona 1932" and set in the top of a concrete post. 70,610

About 1.8 miles S. along the A.C.L. RR from the station at Verona, Onslow Co., about 0.3 mile N. of milepost V 41, 154' northeast of triangulation station Verona, described above, about 110' E. of the track, and 28' E. of the center line of U.S. Highway #17. A standard ref-mark disk, stamped "Verona No. 2 1932" and set in 71.158 the top of a concrete post.

178 USMC Monument 47. Coordinates: N. 326,998.16; 32.35 E. 2,476,585.81

> USMC Monument 46. Coordinates: N. 329,262.76; E. 2,476,815.60

USMC Monument 63. Coordinates: N. 328,330.48; 35.04 E. 2,507,772.97

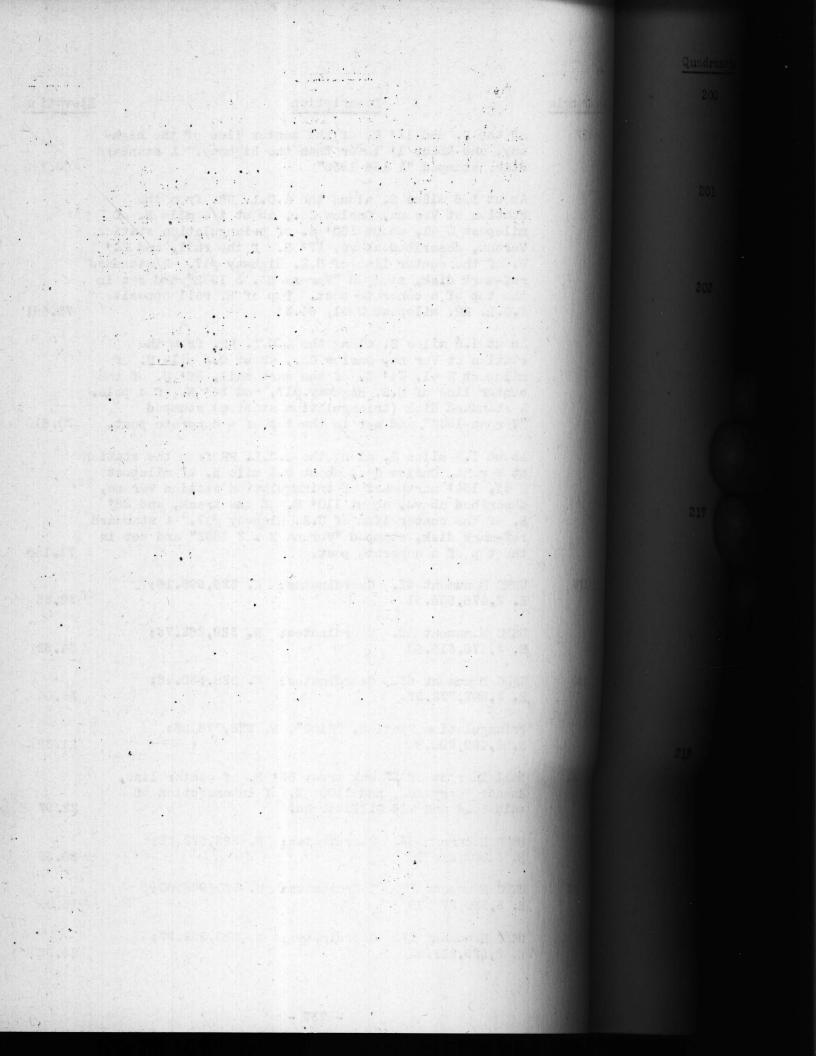
Triangulation Station, "Sime", N. 328,778,03; E. 2,499,295.86

Nail in root of 5" oak tree, 55' E. of center line, 181 Sneads Ferry Rd., and 1100' N. of intersection of 22.97 said Roud and old Gillette Rd.

> USMC Monument 62. Coordinates: N. 328, 572.38; 30.39 E. 2,503,210.56

Coordinates: N. 320, 976.60; USMC Monument 79. 15.05 E. 2,530,272.80 USMC Monument 77. Coordinates: N. 320.362.92; 24.98

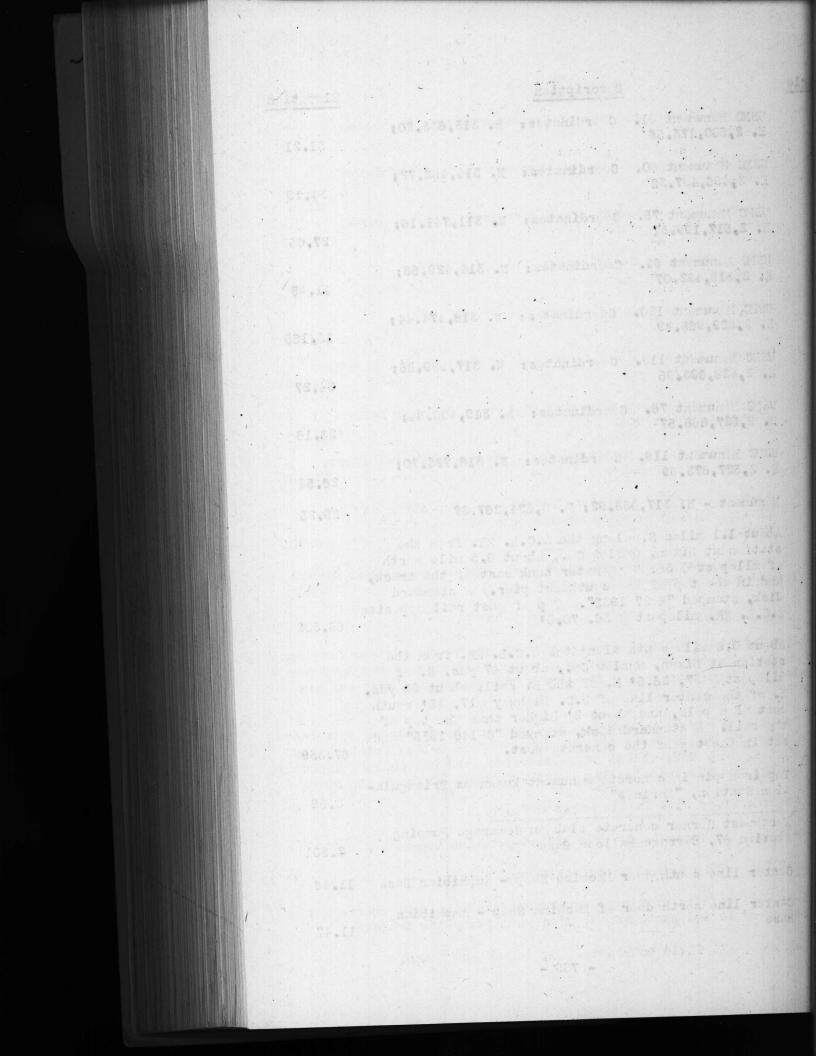
E. 2,529,211.03



Quadrangle	Description	Elevation
200	USMC Monument 81. Coordinates: N. 313,633.20; E. 2,500,173.56	31.21
	USMC Monument 80. Coordinates: N. 314,452.72; E. 2,496,497.32	34.19
201	USMC Monument 75. Coordinates: N. 311,741.16; E. 2,517,199.87	27.05
	USMC Monument 64. Coordinates: N. 314,429.58; E. 2,515,482.07	41.45
202	USMC Monument 120. Coordinates: N. 318,474.44; E. 2,529,968.89	15.155
	USMC Monument 118. Coordinates: N, 317,999.68; E. 2,528,093.95	24.27
	USMC Monument 76. Coordinates: N. 319,400.84; E. 2,527,868.57	25.16
	USMC Monument 119. Coordinates: N. 318,724.70; E. 2,527,873.59	26.54
	Monument - N. 317,038.92; E. 2,524,267.37	29.23
217	About 1.1 miles S. along the A.C.L. RR. from the station at Dixon, Onslow Co., about 0.5 mile north of milepost W 36, at a water tank east of the track, and in the top of the southwest pier. A standard disk, stamped "R 27 1932". Top of east rail opposite A.C.L. RR. milepost W 36. 70.0'	e 66.302
	About 0.6 mile south along the A.C.L. RR. from the station at Dixon, Onslow Co., about 47 yds. S. of milepost W 37, 26.5' E. of the E. rail, about 55 yds, W. of the center line of U.S. Highway #17, 45' south west of a pole, and about 2' higher than the top of the rail. A standard disk, stamped "C 148 1935" and set in the top of the concrete post.	
219	Top iron pin in concrete monument known as Triangula- tion Station, "Marines"	3.58
	Northeast Corner concrete slab on Sewerage Pumping Station #7, Barrage Balloon Base	7.501
	Center line south door Machine Shop - Amphibian Base	11.46
	Center line north door of Machine Shop - Amphibian Base	11.47

. . . ardinet : 7. 513,65. 90; : ald on DA CO 32.712.202.1.13 N. 511.741.163 27,05 1. 2. 517, 103. 87 11.5 T. Sid, Mr. 401 16.16 108.000.000 mil (rdinatia: N. 817, 959, 981 S. 3 10, 50, 095, 995, 98 25.10 10,010,150,0 . 107.127.818 .H : sed on bal of oll distant 1 030 63.878.738.6 the state is all and in the second with the second with the second secon ber see all and the short those a line of the the the 67.23 The life of the new of the second inform of Triengula-86.5 "aunitor" artitate 11 here and a state of the second 7.50 51.11 there then a still be related Shid - Andribian Base the lifting of the of the backing Shop - amphibitan That! - 037 -

Quadrangle	Description	Elevation
200	USMC Monument 81. Coordinates: N. 313,633.20; E. 2,500,173.56	31.21
	USMC Monument 80. Coordinates: N. 314,452.72; E. 2,496,497.32	34.19
201	USMC Monument 75: Coordinates: N. 311,741.16; E. 2,517,199.87	27.05
	USMC Monument 64. Coordinates: N. 314,429.58; E. 2,515,482.07	41.45
202	USMC Monument 120. Coordinates: N. 318,474.44; E. 2,529,968.89	15,155
	USMC Monument 118. Coordinates: N. 317,999.68; E. 2,528,093.95	24.27
	USINC Monument 76. Coordinates: N. 319,400.84; E. 2,527,868.57	25,16
	USMC Monument 119. Coordinates: N. 318,724.70; E. 2,527,873.59	26.54
	Monument - N. 317,038.92; E. 2,524,267.37	29:23
217	About 1.1 miles S. along the A.C.L. RR. from the station at Dixon, Onslow Co., about 0.5 mile north of milepost W 36, at a water tank east of the track, and in the top of the southwest pier. A standard disk, stamped "R 27 1932". Top of east rail opposite A.C.L. RR. milepost W 36. 70.0	66.302
	About 0.6 mile south along the A.C.L. RR. from the station at Dixon, Onslow Co., about 47 yds. S. of milepost W 37, 26.5' E. of the E. rail, about 55 yds. W. of the center line of U.S. Highway $\#17$, 45' south west of a pole, and about 2' higher than the top of the rail. A standard disk, stamped "C 148 1935" and set in the top of the concrete post.	
219	Top iron pin in concrete monument known as Triangula- tion Station, "Marines"	3.58
	Northeast Corner concrete slab on Sewerage Pumping Station #7, Barrage Balloon Base	7.501
	Center line south door Machine Shop - Amphibian Base	11.46
	Center line north door of Machine Shop - Amphibian Base	11.47



Quadrangle	Description	Elevation
219	Center line south door of Carpenter Shop - Amphibian Base	12.98
	Center line north door of Carpenter Shop - Amphibian Base	13.03
	Center line southwest front door Mess Hall, Barrage Balloon Base	15.541
	USMC Monument - Coordinates: N. 307,936.37; E. 2,491,112.85	3,41
	USMC Monument - Coordinates: N. 308,307.99; E. 2,491,338.95	4.35
	Center line southeast front door of Mess Hall - Barr Balloon Base	age 15.561
	Top northmost bolt on northmost pier - Barrage Ballo Elevated Water Tank	on 14.11
220	Top corner (s.e.) concrete wall, Sewage Treatment Pl Barrage Balloon Base.	ant, 17.487
221	Spike in root of 12" water oak 35' E. of station 61 25 - on Mockup Road, and being only 430' north of Mockup	4.14
	Elevations are given for top of iron pins in monuments ronze tablets were used.	, except

0-11. Soil Borings.

Approximately 800 soil borings were taken in the various developed areas on the reservation, to provide a basis for study of the load bearing capacity of the soil; also for studies in connection with various phases of sewage disposal.

The logs of these borings may be found in the following note books on file with the Public Works Office, (See Section 0-12); Notebook Nos. 114, 117, 124, 125, 127, 131 to 140, inclusive, and 164 to 168, inclusive. Other borings and all load bearing tests were made by the U. S. Navy

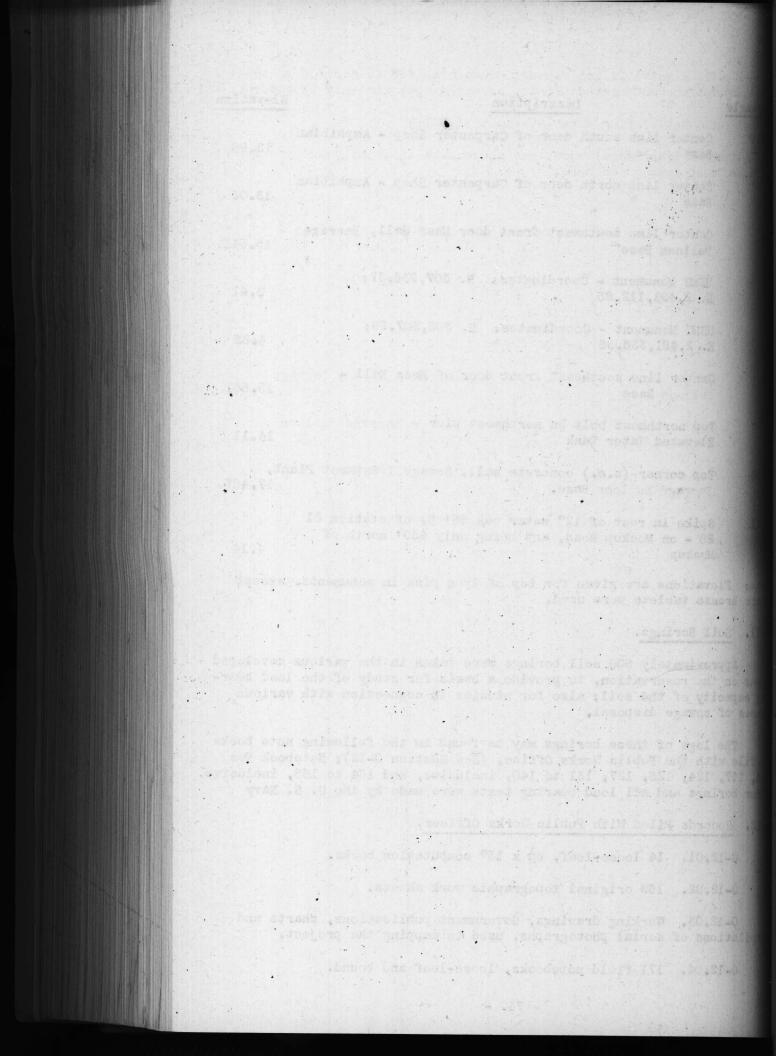
0-12. Records Filed With Public Works Officer.

0-12.01. 14 loose-leaf, $8\frac{1}{2} \ge 13''$ computation books.

0-12.02. 169 original topographic work sheets.

0-12.03. Working drawings, Government publications, charts and compilations of aerial photographs, used in mapping the project.

0-12.04. 171 field notebooks, loose-leaf and bound.



0-12.05. 1 metal filing cabinet containing 298 folders of loose-leaf notes, computations and marked prints, arranged approximately by quadrangles.

0-12,06. Soil boring data (See Section 0-11)

Letters of transmittal cover the above data in detail, and are too voluminous to be reproduced here.

well, do. 1 metal filing cabinet containing 208 folders of loce-levit

Gallion. Soil boring data (Spe Section 0411)

contert of transmittal cover the above data in detail, and are too

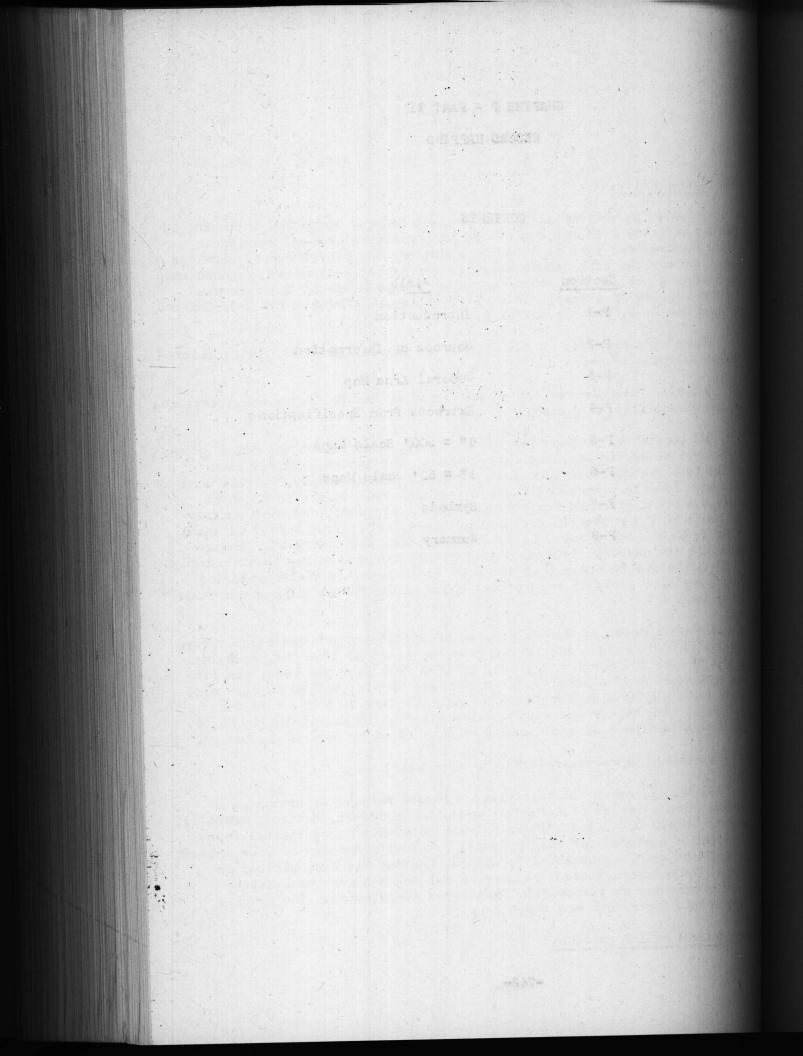
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CHAPTER P - PART II RECORD MAPPING

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Section	<u> ''itle</u>	
P-1	Introduction	
P-2	Sources of Information	
P-3	General Area Map	
P-4	Extracts from Specifications	
P-5	l" = 500' Scale Maps	
P-6	l" = 50' Scale Maps	
P-7	Symbols	
P-8	Summary	

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CHAPTER P - PART II

RECORD MAPPING

P-1. Introduction.

P-1.01. At various times the Project Manager requested instructions from the Officer in Charge concerning preparation of record drawings. Notice was received that it would be necessary to prepare record drawings and it was advised that sample drawings and specifications be prepared and submitted. A preliminary scheme and approximate scope of the work was submitted by use of a sample 1" = 50'scale map, Quadrangle 160 G-3, G-4 and an index map M. B. Drawing No. 1174.

These were approved by the Officer in Charge, April 12, 1942, deleting the outlying areas.

P-1.02. The approved system was based on the following considerations and was essentially as follows:

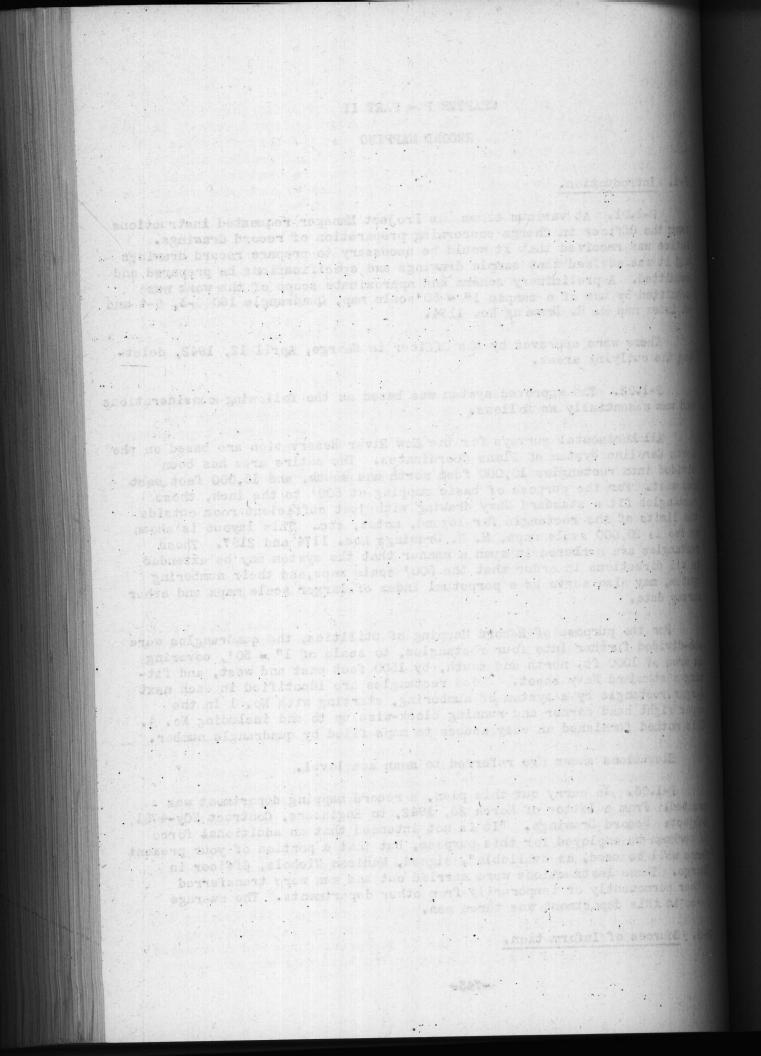
All horizontal surveys for the New River Reservation are based on the North Carolina System of Plane Coordinates. The entire area has been divided into rectangles 10,000 feet north and south, and 15,000 feet east and west. For the purpose of basic mapping at 500' to the inch, these rectangles fit a standard Navy drawing with just sufficient room outside the limits of the rectangle for legend, notes, etc. This layout is shown on two 1: 20,000 scale maps, M. B. Drawings Nos. 1174 and 2157. These rectangles are numbered in such a manner that the system may be extended in all directions in order that the 500' scale maps, and their numbering system, may also serve as a perpetual index of larger scale maps and other survey data.

For the purpose of Record Mapping of utilities, the quadrangles were sub-divided further into four rectangles, to scale of 1" = 50', covering an area of 1000 ft. north and south, by 1500 feet east and west, and fitting a standard Navy sheet. These rectangles are identified in each next larger rectangle by a system of numbering, starting with No. 1 in the upper right hand corner and running clock-wise up to and including No. 4. This method furnished an easy access to maps filed by quadrangle number.

Elevations shown are referred to mean sea level.

P-1.03. To carry out this plan, a record mapping department was created. From a letter of March 28, 1942, to Engineers, Contract NOy-4751, Subject: Record Drawings. "It is not intended that an additional force of workmen be employed for this purpose, but that a portion of your present force will be used, as available", signed, Madison Nichols, Officer in Charge. These instructions were carried out and men were transferred either permanently or temporarily from other departments. The average force in this department was three men.

P-2. Sources of Information.



P-2.01. In view of the fact that all construction inspection was under the supervision of the Navy, we were entirely dependent upon their records for "as-built" data. This method is not the most desirable and caused considerable delay before a steady flow of information could be established. Wherever possible, the Navy notes were used as a check as well as a source of information. They served also to show where construction differed from plan, and in all cases the work was mapped according to the as-built information furnished. Our own survey field notes furnished a large amount of the control for the maps, but the field work done by this organization solely for the purpose of record mapping was kept to a minimum. Where as-built field notes were not available, the work was plotted as shown on the plan and verified as far as possible by a field inspection before the map was inked. Where actual locations were not available, shore lines were transferred from U. S. Coast and Geodetic Survey Compilation of Aerial Photographs, Sheets 5049 and 5050, time and date of photographs: 10:30 A.M., 1:30 P.M. January 29, 1933. Scale 1: 20,000 1" = 1666.67'.

Frequent reference also was made to U.S.C. and G.S. Chart # 777, particularly during sweeping and dredging operations in New River and Courthouse Bay. All channels, markers and lights located have been shown on 1" = 500' maps.

A valuable source of information during the entire job was the aerial mosaic entitled:

Jacksonville, North Carolina Pilot Mears, H.P. - W. A. P. Photo Edgett, M.M. - P 1/c Baran, A. - P 1/c Date: February 12, 1941 F. L. 8 1/4 F. 56

Property maps, scale 1" = 660', by Boney and Broadfoot, Architects and Engineers at Wilmington, N. C. also were used. These maps were drawn under Contract NOy-4717 prior to the Carr and J. E. Greiner Co., contract, and were not coordinated.

P-3. General Area Map.

P-3.01. The General Area Map, M. B. Drawing No. 138, was begin August 15, 1941 with the intent of furnishing a unified picture of all projects on the reservation. Natural features were pantographed from Coast and Geodetic Quadrangle 777 and aerial photographic compilations previously referred to. Site plans frequently were reduced in scale by the same method prior to tracing on this 1" = 2000' map. In many cases buildings and roads were shown on this map before construction had begun. Naturally, there are inaccuracies in scale in a map so constructed and this fact was recorded on the map. However, its cost was more than repaid by its usefulness to all departments.

P-3.02. The Record Mapping Department was charged with keeping the general area map up to date. A considerable amount of information was furnished by the Liaison Officer of the U.S. Marine Corps and as various wits of the Marine Corps began training on the base this map was very

as activity is view of the face is a line of the face with a spin string of the way tions may disting the second of the second sec of bless contrations to will whence a sum of your of the state of the and the sector pole is a the lawy substance was also a discussion and a check and a sector as a sector -mail and a light warman and the bole land have an and a lad-ar in Not show big 17 and the second of the the the bar but the transfer but the ten error the state and a set a bear a set of a la base a set and a set of alliste, staro d'area e re transferred from 7. . Ceret and secotio dev Commission e sorest Electographe, d'acts 2069 and 4000, stre and the secondare 10:00 a.c. 1:00 F.S. der by 29, 1958. Soule at the term Brender, Main alle and the body by in the second of the Analysis and any of the second of deriver and and the second of the second and in lord with a later for the and and a state of a state of the state Thata Steats, 1.8. - F 1/a Particle by the P 1/0 Datas sabrany 13, 1941 (F. L. & L/C are Contract (Cy-123 prior) to the Corr on d. C. Grainer Co., bontract, a gold work interest There is not set in the set of -Hile to writely believe a principal of future of all the and the resource to a light of the second of the second of the sanditallence pincersologi litere ben 197 alphatelig domilioner applied prior to tracing or this 1" = 2000 pope. In prov cases build- " and reads were shows on Chie and before constraction had being sentry bloce are tracker to are an elected at a the start of the start and the ent collector as a the total & considerable against of information who

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valuable from a military standpoint. Machine gun ranges, fire observation towers, impact areas, roads, etc. were plotted with sufficient accuracy to guide troops on maneuvers and quickly orient officers and men, thus saving valuable time and avoiding needless confusion.

The quadrangle numbering system also is shown on this map, thus tying it in with all subsequent mapping work and furnishing a key to the system for the entire reservation.

P-4. Extracts from Specification No. 1000., "Specifications for the Preparation of Record Drawings", Marine Barracks, New River, N. C.

P-4.01. Preparation and General Style of Drawings. Drawings generally will be divided into two groups as follows:

(a) Original Drawings. Original drawings shall be made on the best quality of white paper with muslin backing.

(b) Linen Tracings. Linen tracings shall be made on the best quality linen tracing cloth.

Unnecessary work shall be avoided. Simplicity shall be practiced in every detail in inking tracings; lines shall never be shaded; lettering shall be plain and simple, and shall be limited to the amount required for clarity in reading the drawings. Ornateness in rendering borders or other figures will not be permitted; standard north points, symbol, and title blocks shall be used.

P-4.02. Sizes of Drawings.

(a) Original drawings on muslin backed paper shall be $33\frac{1}{2}$ " x $45\frac{1}{2}$ " overall.

(b) Linen tracings shall be 29" x 35" overall.

P-5. 1" = 500' Scale Maps.

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P-5.01. Tabulation of 1" = 500' Maps

Original Drawing	Tracings	
Quadrangle No.	Y. & D. No.	P. W. No.
98	228,331	1
118	228,334	4
99	228,332	2
119	228,335	5
100	228,333	3
120	228,336	6
101 121	228,412	76

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(a) Original Les ands. Original leavings shall to mais on

(5) (5) Linen Fracisza. Miner tracture apail to mide on the caller, him tracture slow.

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635,335 675,675

223,112

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P-5.01. (Cont'd)

Original Drawing Quadrangle No.	Y. & D. No. Tra	P. W. No.
102 122	228,413	77
137 157	228,408 228,350	72 20
138 158	228,419	81
139 159	228,337 228,339	7 9
140 160	228,338 228,340	8 10
142 162	228,409 228,410	73 74
177 197	228,400 228,401	70 71
178 198	228,344	14
179 199	228,341 228,345	11 15
180 200	228,342 228,411	12 75
181 201	228,343 228,355	13 25
182 202	228,414 228,415	78 79
217 237	228,346	16
21 8 238	228,347	17
219 239	228,348	18
220 240	228,349	19
221 241 Total 42	228,416	80 Total 3
	-746-	

33



P-5.02. The original drawing of 1" = 500 ' covers an area 20,000 north and south by 15,000 east and west, and contains the following data:

Building outline. Building numbering plan. Road right-of-way lines and approved names. Railroads. Natural features. Triangulation net. New River channel, markers and lights.

Accurate control was established for all 1" = 500' maps by means of triangulation and by coordinated traverses. Monuments set on the Reservation Boundary or in areas not covered by 1" = 50' maps were plotted accurately and coordinates tabulated. Certain boundary line courses and distances also were shown.

P-5.03. After the basic 500' scale maps were completed several tracing-cloth reproductions were made on which the various departments will plot their main utility layouts, resulting in small scale planning and operating maps, showing respectively the various utilities. The utilities to be mapped and P. W. Nos. assigned were as follows:

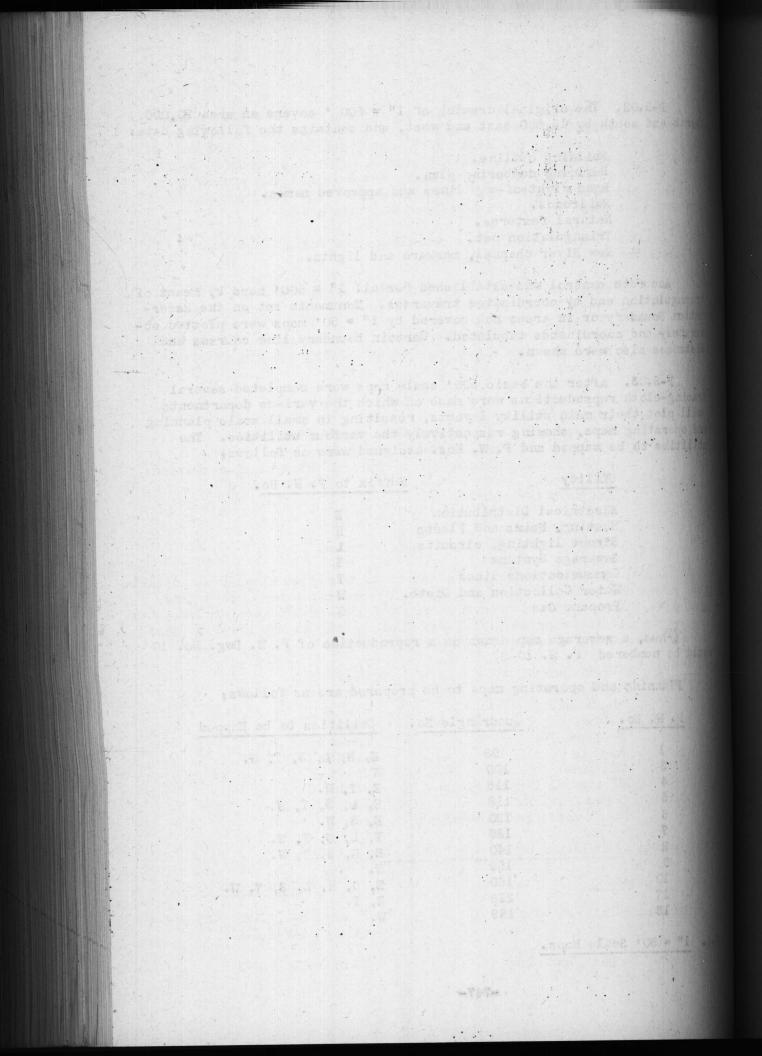
Utility	Suffix	to	P.	W.	No
Electrical Distribution		E			
Heating, Mains and Plants		Η			
Street lighting, circuits		L			
Sewerage Systems		S			
Communications lines		Т			
Water Collection and Dist!		W			•
Propane Gas		G			

(Thus, a sewerage map drawn on a reproduction of P. W. Dwg. No. 10 would be numbered P. W. 10-S)

Planning and operating maps to be prepared are as follows:

• W. No.	Quadrangle No.	Utilities to be Mappe
1	98	E, H, L, S, T, W.
3	100	W
4	118	E, T, W.
5	119	E, L, S, T, W.
6	120	E, S, W.
7	139	E, L, S, T, W.
8	140	E, H, S, T, W.
9 .	159	W.
10	160	E, G, H, L, S, T, W.
17	218	Е, Т.
18	159	W.

P-6. 1" = 50' Scale Maps.



P-6.01. This phase of the work by far was the most extensive. The original authorization of this project, as instructed by the Officer in Charge on M. B. Drawing No. 1174, April 1942, included only the Main Division Area, Industrial Area, and Tent Camps. This was expanded August 25, 1942, by the Officer in Charge, to twice the original assignment thus including the following areas! Amphibian Base, Tent Camp, Rifle Range, Mumford Point Camp No. 1, and Officers' Quarters Area.

P-6.02. The 50 * scale maps constitute the basic final record of utilities and show the following data:

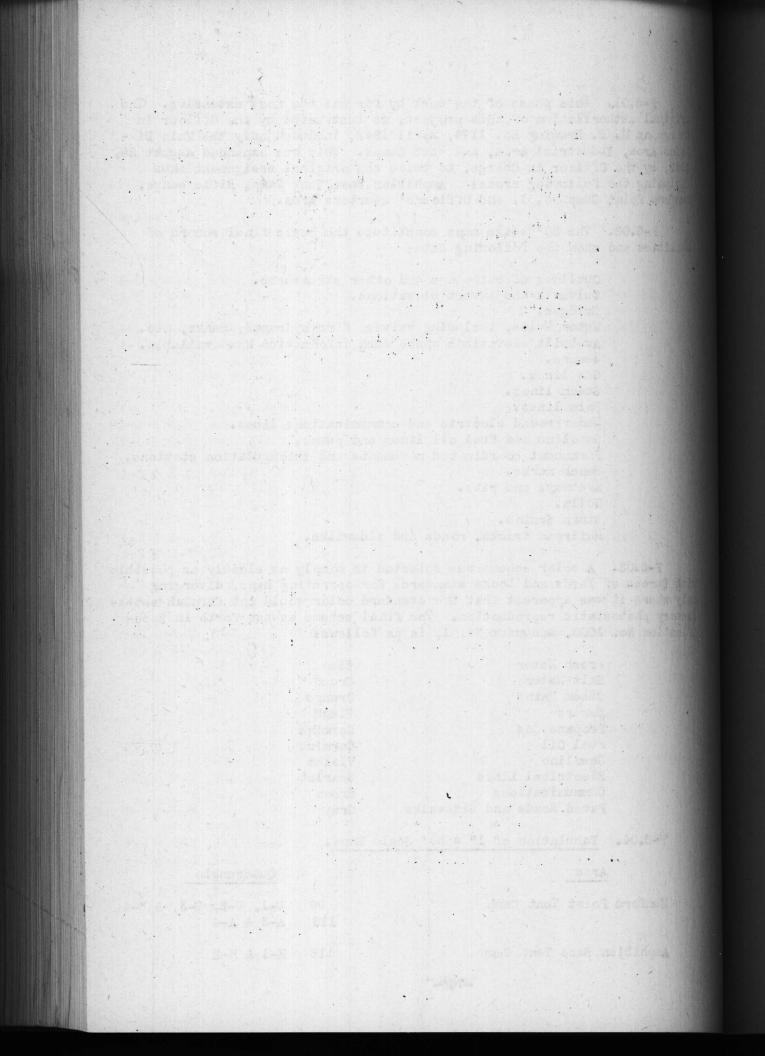
Outlines of buildings and other structures. Culverts and invert elevations. Bridges. Water Mains, including valves, fire hydrants, tanks, etc. As-built elevations where such information was available. Sewers. Gas linos. Steam lines. Pole lines. Underground electric and communications lines. Gasoline and fuel oil lines and pumps. Permanent coordinated monuments and triangulation stations. Bench marks. Areaways and pits. Wells. Storm drains. Railroad tracks, roads and sidewalks.

P-6.03. A color scheme was selected to comply as closely as possible with Bureau of Yards and Docks standards for operating maps, diverging only where it was apparent that the standard color would not furnish satisfactory photostatic reproduction. The final scheme as set forth in Specification No. 1000, Addendum No. 1, is as follows:

Fresh Water	Blue
Salt Water	Green
Steam Mains	Orange
Sewers	Black
Propane Gas	Carmine
Fuel Oil	Carmine
Gasoline	Violet
Electrical Lines	Scarlet
Communications	Brown
Paved Roads and Sidewalks	Gray
	•

P-6.04. Tabulation of 1" = 50' Scale Maps.

Area	Quadrangle		
Mumford Point Tent Camp	99 U-1, U-2, U-3, & U-4 119 A-3 & A-4		
Amphibian Base Tent Camp	118 H-1 & H-2		



P-6.04 (Cont'd) Area		Quadrangle
Residential Area	119	L-3 & L-4 Q-1, Q-2, Q-3 & Q R-1, R-2, R-3 & R S-1, S-2, S-3 & S W-1 & W-2
	139	X-1, X-2,X-3 & X D-1 & D-2 E-3 & E-4 J-3 & J-4 O-1, O-2, O-3 & O T-1, T-2, T-3 & T
Rifle Range	198	Q-1, Q-2, Q-3 & Q V-1, V-2, V-3 & V W-3 & W-4
	218	B-3 & B-4
Barrage Balloon & Amphibian Base		D-1 & D-2 E-1, E-2, E-3 & E J-1, J-2, J-3 & J I-1 & I-2
		0-1, 0-2, 0-3 & 0 F-3 & F-4 K-3 & K-4
Tent Camps Nos. 1 and 2	98	K-1, K-2, K-3 & K P-1, P-2, P-3 & P Q-3 & Q-4
	118	U-1, U-2, U-3 & U A-1, A-2, A-3 & A
Industrial Area	140 160	W-1, W-2, W-3 & W C-1, C-2, C-3 & C B-1 & B-2 G-1 & G-2 H-3 & H-4
Regimental Area	140	P-3 & P-4
Augumentar Area		U-1, U-2, U-3 & U-
	159 160	E-1 & E-2 A-1, A-2, A-3 & A- B-3 & B-4 F-1, F-2, F-3 & F- G-3 & G-4 K-1, K-2, K-3 & K-
		L-1, L-2, L-3 & L- M-3 & M-4 Q-1, Q-2, Q-3 & Q-



P-6.04 (Cont'd) Area

Parachute Buildings

Landing Field

Hospital Area

Quadrangle

140 R-3 & R-4

118 R-1, R-2, R-3 & R-4 S-3 & S-4

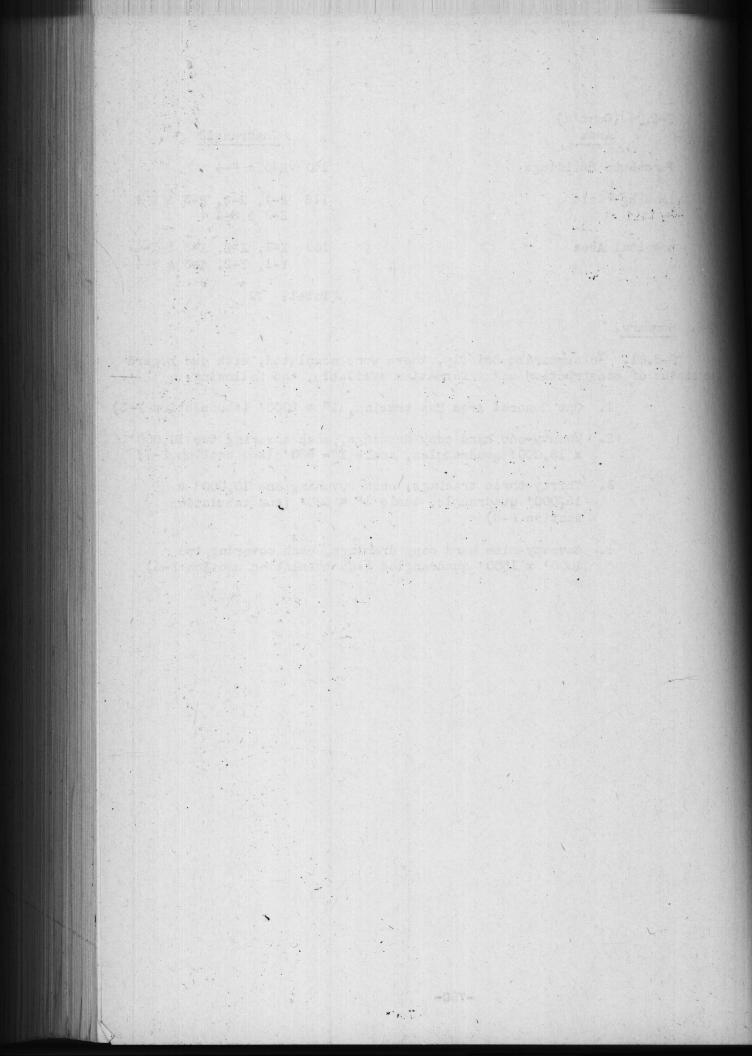
139 X-1, X-2, X-3 & X-4 Y-1, Y-2, Y-3 & Y-4

Total: 79

P-8. Summary.

P-8.01. To summarize briefly, there were completed, with due regard to status of construction and information available, the following:

- 1. One General Area Map tracing, 1" = 2000' (see section P-3)
- Twenty-one hard copy drawings, each covering two 10,000' x 15,000' quadrangles, scale 1"= 500' (see section P-4)
- 3. Thirty-three tracings, each covering one 10,000' x 15,000' quadrangle, scale 1" = 500' (see tabulation section P-6)
- 4. Seventy-nine hard copy drawings, each covering two 1000' x 1500' quadrangles (see tabulation section P-6)



SECTION P-7

METER

HOSE C

HOSE I

GREASE

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RECORD MAP STANDARD SYMBOLS . 5

PLUMBING

ELECTRICAL - CONTO.

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	- OIL CIRCUIT BREAKER	A STAN
RACK	HE STREET LIGHTING-STANDARD	
BIBB	HTB BRACKET	
E SEPARATOR	FLOODLIGHT	
	AIRCRAFT OBSTRUCTION LIGHT	

HEATING

A CARLES AND A CARLE	TELEPHONE - TELEGRAPH & FIRE ALARM
EXPANSION JOINT	TELEPHONE JACK
STEAM ANCHOR X	CHANGE IN CABLE SIZE OR TYPE OF CONST.
	TELEPHONE & TELEGRAPH - OVERHEAD

]

PIPING

FRESH WATER		DLOE
SALT WATER (FIRE & FLUSHIN	c) -	GREEN,
HARD WATER		Hd Hd
STORM SEWER		BLACK
SANITARY SEWER & MANH	OLE (100)	BINEN
CATCH BASIN		. 0
PROPANE GAS		CARMINE
AIR	, inter the state of the	BLACK
HIGH PRESSURE STEAM	(FEED) -	ORANGE
u	(RETURN) -	ORANGE
u	(OVERHEAD) =	ORANGE
LOW PRESSURE STEAM	(FEED) -	ORANGE
ar	(RETURN) -	ORANGE
FUEL OIL		CARMINE
GASOLINE	Train Road	Woret.
HYDRANT- (FRESH WATER)	-	\$3 \$2 \$1. BLUE

ELECTRICAL

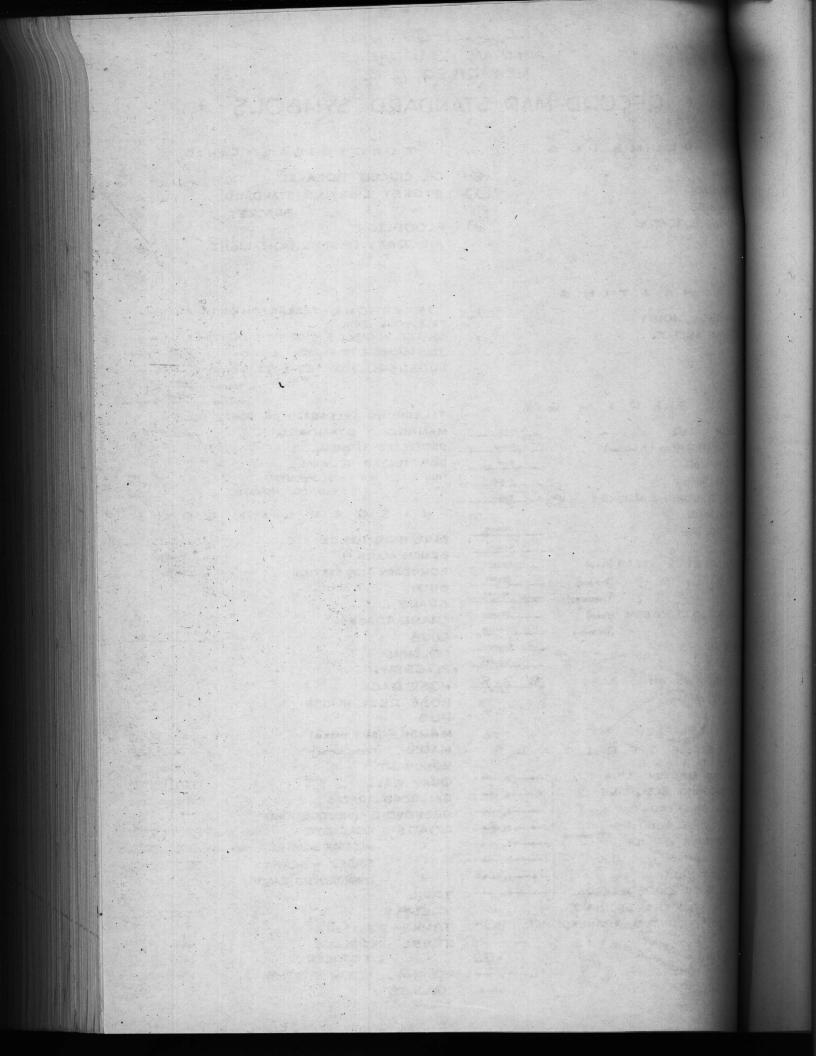
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UNDERGROUND ELEC LINE	
PRIMARY OVERHEAD	E1
	E2 -
SECONDARY & SERVICE RED ORANGE	E8
STREET LIGHTS	
BLACKOUT PILOT	ŧs
PILOT FOR OIL CIR. BREAKERS	E 6
POLE MOUNTED TRANSFORMER	0
PLATFORM MOUNTED TRANSFORME	R -0
GUY	
MANHOLE	
FUSED CUTOUT	
DISCONNECT SWITCH	

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UNPROTECTED TERMINAL.	4
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Series a	DRINKING FOUNTAIN	Blue 🔮



CHAPTER Q PART 11

LIST OF DRAWINGS BREPARED

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Section Q-1 Introduction

Utilities & General Drawings

Q-2 Roads, Streets, Railroads and Bridges

Q-3 Site Plans

Q-4 Sewers

Q-5 Sewage Structures

Q-6 Water

Q-7 Water Structures

Q-8 Telephone Q-9 Propane Gas System

Q-10 Electrical Distribution

Q-11 Topography

Q-12 Gasoline and Oil Storage and Distribution

Q-13 Steam Distribution

Area Drawings

Q-14 Division Training Area Q-15 Division Activities Q-16 Post Troops Activities Q-17 Supply and Industrial Area Q-18 Naval Hospital Area Q-19 Residential Area Q-20 Rifle Range Area Q-21 Barrage Balloon & Amphibian Base Area Q-22 Parachute Training Area Q-23 Glider Training Base Area Q-24 White Cemetery Q-25 Tent Camps No. 1 and No. 2 Q-26 Mumford Point Camp No. 1 Q-27 Peterfield Point Camp Q-28 Tank Battalion Camp Q-29 Midway Park Residential Area Q-30 Mockup Area.

Q-31 Miscellaneous

- Ca A CHAPTER OF PART 10 Suction Rele Indicidentian endernit Lasonal Armitettint Roads, Sectors, Isilroads and Science ishor Notes irractures 3754 C . () "-12 Geoline and 01; Storage and Distribution Sells Steastficture Classesta SING and Division antopyic disc weis the state is the state of the . bath exerts alite of. ton any reidrach & av list market 13-1 G-22 Tables had been area and The second second second land 10. se fin the

Q-1. Introduction. Insofar as possible, lists of drawings have been omitted from the preceding chapters of the report. Listed herein are the drawings completed and approved for the entire project. The tracings, 3078 in number, have been turned over to the Public Works Officer, indexed so that a desired drawing may be found readily if either the Yards and Docks number, the temporary drawing number, the accounting project number, the subject or the area involved is known.

Q-2. Roads, Streets, Railroads and Bridges

Q-2.01. Division Training Area.

Dwg. No.	Y&D No.	Proj. No.	Title
205	161885	P-108-2	Typical Cross Section of Highway Improvement
211	161891	P-108-2	Plan and Profile "D" Street
212	161892	P-108-2	Plan and Profile "E" Street
213	161893	P-108-2	Plan and Profile "F" Street
214	161894	P-108-2	Plan and Profile "G" Street
215	161895	P-108-2	Plan and Profile "H" Street
216	161896	P-108-2	Plan and Profile "I" Street .
217.	161897	P-108-2	Plan and Profile "J" Street
218	161898	P-108-2	Plan and Profile "K" Street
219	161899	P-108-2	Plan and Profile "L" Street
220	161900	P-108-2	Plan and Profile "M" Street
221	161901,	P-108-2	Plan and Profile "N" Street
222	161902	P-108-2	Plan and Profile "A" Street
223	161903	P-108-2	Plan and Profile "B" Street
224	161904	P-108-2	Plan and Profile "C" Street
225	161905	P-108-2	Dets. of Conc. Drop Inlet, Superelevated Sec
226	161906	P-108-2	River Road North Station 0 to 30
227	161907	P-108-2	River Road North Station 30 to 60
228	161908	P-108-51	West Lane Main Service Road North Sta. 0 to
229	161909	P-108-2	Main Service Road Reg. Area No. 1 Sta.30 to
230	161910	P-108-2	Main Access Road River Rd. to Traffic Circle
231	161911	P-108-51	Main Access Road Station 28 to 55
232	161912	P-108-51	Main Access Road Station 55 to 85
233	161913	P-108-51	Main Access Road Station 85 to 107
234	161914	P-108-51	Main Access Road Station 276 to 295
235	161915	P-108-51	Main Access Road Station 295 to 325
236	161916	P-108-51	Main Access Road Station 325 to 355
237	161917	P-108-51	Main Access Road Station 358 to 385
238	161918	P-108-51	Main Access Road Station 385 to 415
239	161919	P-108-51	Main Access Road Station 415 to 445
240	161920	P-108-51	Main Access Road Station 445 to 462
245	161925	P-108-51	Main Service Road South Station 0 to 30
246	161926	P-108-2	Main Service Road South Station 30 to 60
254	161934	P-108-2	River Road South Station 0 to 30
258	161938	P-108-2	Main Access Road Bridge over Wallace Creek
259	161939	P-108-2	Superstructure Dets. Main Access Rd. Bridge over Wallace Creek
260	161940	P-108-2	Main Access Road Bridge over Wallace Creek
261	161941	P-108-2	Dets. of Alternate Handrails Main Access Rd. Bridge over Wallace Creek

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161940 P-109-2 1341n Assess Road Bridge over Well	1246

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266	161946	P-108-2	River Road South Access Road to S.	т. Р.
281	161961	P-108-2	Layout - Typical Section and Profil	
		P-108-51	Circle at Int. Main Access Rd. and	Service
285	161965		Details of Conc. Drop Inlet 36"x 48	
286	161966	P-108-2	Dimensions, Quantities for Variable	u u o duro l
		1 100 5	for Single, Double, Triple and 4 pi	neauwa1
1207 -	229283	P-108-2	Special Dets. Incoming Lane Main Ac	pe cuive
		1 100-0	Bridge over Wallace Creek	cess Ra.
,1215	229284	P-108-2	Regimental Area No. 3 Parking Area	
	220101	1-100-2	Theatre from "G" Street	& Ra. to
1233	229285	P-108-2	Cross St. from River Rd. to Main Se	
1299	229286	P-221-3		ervice Ra
2201	229287	P-108-2	Coal Storage Yards for D. T. A.	
2202	229288	P-108-2	Roads Post Dispensary	
2203	229289	P-108-2	Parking Area for Reg. Area No. 4	
2204			Parking Area for Reg. Area No. 3	
2204	229290	P-108-2	Parking Area for Reg. Area No. 2	
2206	229291	P-108-2	Parking Area for Reg. Area No. 1	1
	2,29292	P-108-2	Parking Area for Reg. Area No. 5	
¥	-2.02 Post	Troops		
1208	229296		Post Troops Area Boundary Road Sta.	0 to 16
1209	229297		Post Troops Area Boundary Road Sta.	16 to 2
1222	229298		Plan of Post Lane Extension "J" Str	eet Ex-
			tension and Plan of Parking at Host	ess Hous
			and Protestant Chapel.	
1258	229299		Plan and Profile Gate Road- Gate How	use Area
(Q	-2.03 Suppl	y and Indust	rial Area	
200	161880	P-108-1	Northeast Grand Data and main	
200	161880	P-108-1	Northeast Creek Railroad Trestle	
200 201	161880 161881	P-108-1 P-108-1	Details of Highway and Railroad Cros	ssing and
201	161881	P-108-1	Details of Highway and Railroad Cros Headwalls.	
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201 202	161881 161882	P-108-1 P-108-1	Details of Highway and Railroad Cros Headwalls. Revised Grade Line on R.R. Connection Station 369 to 399	
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201 202 203 204	161881 161882 161883 161884	P-108-1 P-108-1 P-108-1 P-108-1	Details of Highway and Railroad Cros Headwalls. Revised Grade Line on R.R. Connection Station 369 to 399 Wallace Creek Railroad Trestle Bearhead Creek Railroad Trestle	on betwee
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201 202 203 204 241 242 243	161881 161882 161883 161884 161921 161922 161923	P-108-1 P-108-1 P-108-1 P-108-1 P-108-1 P-108-1 P-108-1	Details of Highway and Railroad Cros Headwalls. Revised Grade Line on R.R. Connection Station 369 to 399 Wallace Creek Railroad Trestle Bearhead Creek Railroad Trestle R.R. Tracks No. 1 and 2 Station 419 R.R. Tracks No. 1 and 2 thru Supply R.R. Track No. 3 thru Supply Area	on betwee to 480 Area
201 202 203 204 241 242 243 263	161881 161882 161883 161884 161921 161922 161923 161943	P-108-1 P-108-1 P-108-1 P-108-1 P-108-1 P-108-1 P-108-1 P-108-1	Details of Highway and Railroad Cros Headwalls. Revised Grade Line on R.R. Connection Station 369 to 399 Wallace Creek Railroad Trestle Bearhead Creek Railroad Trestle R.R. Tracks No. 1 and 2 Station 419 R.R. Tracks No. 1 and 2 thru Supply R.R. Track No. 3 thru Supply Area Rip Rap Dets. Trestle over Wallace C	on betwee to 480 Area Creek
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		P-224-3	Area
1248	229305	P-224-3	Plan & Profile Cedar, Maple S. Cypress Streets
10.0.0			5. & 1. Area Extensions to Oak. Pine. Gum Sts.
1267	229306	P-108-2	Typical Sec. Gibb Rd. Sta. 52 to 80
1271	229307	P-225-4	Fin. Grades on Pavement - Motor Parking Area
			Supply and Industrial Area
1275	229308	P-225-1	Ext. to Michael Rd. S & I Area to Sneadsferry F
1291	229309	P-108-2	Plan of parking bet. West Rd. & Central Rd.
1298	229310	P-108-7	Dets. of Conc. Slab at C.H.PCoal Storage
1236	229311		Grade Crossing #24 Elec. Flashing Warning Sig.
	Q-2.04. Nava	al Hospital	Area
276	191956	P-108-2	River Dd Hamital Ana dt an an
277	191957	P-108-2	River Rd. Hospital Area Sta. 60 to 90
278	161958	P-108-2	
1237	229313	P-108-2	the two prover the ore blas the to to
1279	229314		Roads - Hospital Area
2200	229315	1-400-1-	2 Surgeons Row and Ent. to Adm. Bldg.
2211	229316	P-400 1	Roads - Hospital Area
			2 Parking - Family Hosp. & Civilian Nurses Home
	Q-2.05. Resi	dential Ar	ea
206	161886	P-108-2	Paradise Pt. Rd. Plan & Profile
207	161887	P-108-2	Paradise Pt. Rd. Plan & Profile
208	161888	P-108-2	Paradise Pt. Rd. Plan & Profile
209	161889	P-108-2	Paradise Pt. Rd. Plan & Profile
210	161890	P-108-2	Paradise Pt. Rd. Plan & Profile
264	161944	P-108-2	Officers Quarters Area - Drainage Layout &
			Typical Section
265	161945	P-108-2	Officers Quarters Area - Autumn Oval & Kent Rd.
67	161947	P-108- 2	Officers Quarters Area - St. Mary's Drive
			Sta. 225 to 249
68	161948	P-108-2	Officers Quarters Area - St. Mary's Drive
			Sta. 196 to 225
69	161949	P-108-2	Officers Quarters Area - Charles, Howard, Cecil
			Carroll and Montgomery Sts.
	161950	P-108-2	Officers Quarters Area - River Rd. Sta. 230 to
70			
70	101000		253
		P-108-2	253
70 71	161951	P-108-2	253 Officers Quarters Area - River Rd. Sta. 200 to
71	161951		253 Officers Quarters Area - River Rd. Sta. 200 to 230
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<pre>Distribution from the first of the state is state of bight and Railroad Trossing and Heater, and bight and R.S. Contection instance bissing SSD to SDD District SSD to SDD States Creek Heatroad Tristle Bartiss Creek Heatroad Tristle Heat First States I the state heat First Month I and A that Angely Area heat First Heatle of an Alloco Creek heat First Heatle of Alloco Creek heat First Area, Supply a Lao. Heat First Area, Supply a Lao. Heat First Area heat First Heatle Heatle Heatle heat First Area heat First Area heat First Heatle Heatle Heatle heat First Area heat F</pre>	P=30042 P=105-1 P=105-1 P=105-1 P=105-1 P=105-1 P=205-1 P=205-1 P=205-1 P=205-2 P=100-2 P=100-	101820 101821 101822 101822 101822 101822 101924 101924 101924 101924 101924 101924 101924 101924 101924 101924 101924
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1212	229320	P-108-2	Officers' Quarters Area Plan and Profile B.O.Q. and Guest House Road.
1221	229321	P-108-2	Eden. Jewel. Sumpter and Jackson Streets.
235	229322	P-205-5	Officers' Qtrs.Area Wavell and Winston Roads.
263	229323	P-223-3	Superstructure Dets. Bridge on River Drive near Officers' Quarters.
264	229324	P-223-3	Superstructure Dets. Bridge on River Drive near Officers' Quarters.
278	229325	P-205-5	Officers' Qtrs. Area Charles St.Roads Extension and Road to Servants' Quarters.
210	229326	P-108-2	Plan of Parking in vicinity of B.O.Q.& Officers'
			Mess.
	Q-2.06. Rif	le Range Area	<u>a</u>
225	229329	P-223-2	Rifle Range Area. Approach Road Station 30 to 55.
226	229330	P-203-8	Rifle Range Area. Range Road Station 0 to 30.
227	229331	P-203-8	Rifle Range Area. Range Road Station 30 to 60.
28	229332	P-203-8	Rifle Range Area. Powder Lane & Typical Section.
29	229333	(P-203-7)	Rifle Range Area. Drainage Layout. Typical sec.
		(P-203-8) (P-203-15)	of Firing Point and Service Roads.
30	229334	P-203-8	Rifle Range Area. Dets. for retaining walls for Roads through Firing Lines.
231	229335	P-203-8	Rifle Range Area. Butts Ave. Station 0 to 20
32	229336	P-203-8	Rifle Range Area Service Roads in Ranges 1, 2 and 3.
34	229337	P-223-2	Rifle Range Area Approach Road.
		×	
	Q-2.07. Bal	loon Barrage	and Amphibian Base
10	101000	D 007 1	Course David Station 880 to 004
19	161969	P-223-1	Sneads Ferry Road. Station 772 to 804
0	161970	P-108-59	Sneads Ferry Road. Station 458 to 530
1	161971	P-108-59	Sneads Ferry Road. Station 530 to 610
22	161972	P-108-59	Sneads Ferry Road. Station 610 to 690
3	161973	P-223-1	Sneads Ferry Road. Station 690 to 772
94	161974	P-223-1	Sneads Ferry Road. Station 804 to 885
95	161975	P-223-1	Sneads Ferry Road. Station 885 to 965
96	161976	P-223-1	Sneads Ferry Road. Station 965 to 1045
217	229338	P-223-1	Sneads Ferry Road. Station 1045 to 1125
218	229339	P-223-1	Sneads Ferry Road. Station 1125 to 1205
.38 .		P-202-7	Typical Section. Dredging of Amphibian Base.
241	229341	P-202-7	General Layout of Dredging
4.3	229342 229343	P-202-18	Amphibian Base Area. Marines Road
	114545	P-202-18	Amphibian Base Area. Marines Road.
244			
	229344 229345	P-202-18 P-202-7	Amphibian Base Area. Courthouse Road. Plan of Dredging Details of Mooring Pile

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1253 1257	229 347 229 34 8	P-202-18 P-223-1	Plan and Profile Front Street Sneads Ferry Road Station 1205- 1283
1262	229349	P-202-18	Grace Lane & Typical Section for Roads in Balloon Barrage School
1265	229350	P-202-18	Area Poe St. Balloon Barrage School Area
1268	229351	P-223-1	Superstructural Dets. for Creo- soted Bridge on Sneads Ferry Rd.
1269	229352	P-223-1	Superstructural Dets. for Creo- soted Bridge with two spans
1270	229353	P-223-1	Superstructural Dets. for Creo- soted Bridge with three spans.
1280	229354	P-202-18	Higgins Brown and Kramer Rd. Marine R.R. into Carpentry and Machine Shop
2218	229355	P-150	Marines Road Station 0 to 30 Typical Sections and Layout
2219	229356	P-150	Marines Road Station 30 to 90
2220	229357	P-150	Marines Road Station 90 to 130
2221	229358	P-150	Marines Road Station 130 to 190
2222	229359	P-150	Marines Road Station 190 to 252
	Q-2.08. Parachute	Training Area	1
282	161962	P-108-54	Parachute Tower Road Plan & Pro.
	Q-2.09. Glider Tr	aining Base	
280	161960	P-108-2	
1200	229365	P-108-55 P-114	Approach Road to Landing Field Landing Field Parachute Troops Dets. of Drop Inlet & warm up Apron
1201	229366	P-114	Landing Field Parachute Troops
1202	229367	P-114	Drainage Layout and Typical Sec. Landing Field Parachute Troops Dets. of concrete spillway NE - SW Runway.
1203	229368	P-114	Landing Field Parachute Troops NE-SW Runway
1204	229369	P-114	Landing Field Parachute Troops NS Runway and taxi way warm up
1205	229370	P-114	apron Landing Field Parachute Troops
1206	229371	P-114 P-108-2	NWSW Runway Landing Field Parachute Troops Approach Road Intersection of NS
1213	229372	P-108-2	and NE-SW Runways Approach Road Landing Field #17
			to Station 60.

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1214 1297	229373 229374	P-108-2	Approach Road Landing Field Station 60 to 89 Approach Rd.Landing Field Grade crossing flashing signals.
2208	229375		Taxiway and Warm-Up Apron Glider Base
	Q-2.10. Cem	netary	
283	161963	P-108-56	Layout Plan and Profile White Cemetary
284	. 161964	P-108-56	Layout Colored Cemetary
	Q-2.11. Ten	t Camp No. 1	
10	161795	P-1-2	Typical Street Sections
11	161796	P-1-2	Drainage Layout
19	161936	P-1-2	lst and 2nd Streets
50	161836	P-1-2	"A" and "C" Streets
51	161837	P-1-2	"E" and "D" Streets
52	161838	P-1-2	3rd. and 4th. Streets
3	161839	P-1-2	5th. and 6th. Streets
4	161840	P-1-2	"F" and "B" Streets
9	161855	P-1-11	Railroad Layout
0	161856	P-1-2	Profile Access Road and "G" Street
1	161857	P-1-2	Proposed Sidewalk Ext. & Foot Bridge for Mess Hall
9	229378	P-1-2	MOSS HALL
		P-250-1-2	Church Street Plan and Profile
25	229379	P-1-17	Plan and Details Motor Parking Area
	Q-2.12 Tent	Camp No. 2	
00	229381	P-50-12	P. P. Diding Station 27 to 45
01	229382	P-50-12	R.R. Riding Station 23 to 45
02	229583	P-50-2	R.R. Riding Station 45 to 59
		P-50-1	Plan and Draftle HAll at
)3	229384	P-50-1	Plan and Profile "A" Street
	000001	P-50-2	Plan and Duggila Holl at 1
)4	229385	P-50-1	Plan and Profile "B" Street
	220000	P-50-2	Plan and Profile "C" Street
)5	229386	P-50-1	rian and Prolile "C" Street
	220000	P-50-2	Plan and Dug Sile Up! at
)6	229387	P-50-1	Plan and Profile "D" Street
	220001	P-50-2	Dian and Deaded - Hall at
)7	229388	P-50-1	Plan and Profile "E" Street
		P-50-2	Plan and Duckils IIII at
8	229389	P-50-1	Plan and Profile "F" Street
		P-50-2	Dian and Dur Oils This of
9	229390	P-50-1	Plan and Profile 7th Street
	220000		Dien and Dec 017 Other
0	229391	P-50-2	Plan and Profile 8th. Street
-	223031	P-50-1	
		P-50-2	Plan and Profile 9th. Street
1	229392	P-50-1	

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212	229393	P-50-1 P-50-2	Plan and Profile 11th. Street
	Q-2.13. Tent Camp	No. 2.	
213	229394	P-50-1	Typical Sections Dimensions and Quantities for Single
214	229395	P-50-1 P-50-2	Pipe Culverts.
215	229396	P-50-1	Drainage Layout
261	229397	P-50-2 P-250-1-2	"A" Street Station 45 to 63 Plan and Profile "G" St. Dets.
349 263		P-250-1-2 P-1-10	of Ext. to Motor Parking Area Church Street Station 30 to 52
		P-1-11	Coal Storage Yard for Tent Camp Area
	Q-2.14. Mumford Po	int Tent Camp	
2	229400	P-500-1	Mumford Landing Road Station
3	229401	P-500-1	0-30 Mumford Landing Road Station 30 to 60
1	229402	P-500-1	Mumford Landing Road Station 60 to 82
5	229403	P-500-1	Roanoke, Chowan, Paulico, Neuse, Catawba Road
3 .7		P-500-1 P-500-1	Plan and Profile Waccamaw Rd. Railroad Siding for Mumford Pt
	Q-2.15. Peterfield	Point Camp	
.254	229406	P-249-51	Coast Guard Facilities - Dets. of South West Creek
60	229407	P-250-4-2	Amphibian T.C. Flounder, Turtl Salmon Roads
	Q-2.16. Tank Batta	lion Camp	
		P-250-3-2 P-250-3-2	Bedford York and Allegheny Rds Plan and Profile Lancaster Rd.
	Q-2.17. Midway Parl	Residental Area	
6	229410 H	P-301-403	L.C.D.H. Reinforced Concrete Drop Inlet-Brick Masonry Drop
8	229412 H	2-301-403	L.C.D.H. Dimensions & Quantitie for various size Headwalls
9	229413 H	2-301-401	L.C.D.H. Drainage Layout

1-08-0 1-00-0 Pian and Profile 11th. Stweet 1. . oil cheb driet . M. ... S-08.00 PLOG CUSTON Store Coal Storage Yard for Tart autorat band pathral bushed Roshake, Chimnen, Paulitoa The same at a Provi ima molt gen' inici bich total. Aught Man 1.C. Plansher, 211 and little to the first first in the Systers burgettien . d. E. Syl

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20	229414	P-301-401	
		P-301-402	L.C.D.H. Typical Sec. and Layout
	1	1-001-100	of Parking Courts
21	229415	P-301-402	or rarking courts
	PROTIO	P-301-402	L.C.D.H. Onslow Drive Sta. 5 to 20
22	229416	P-301-401	B.C.D.M. ONSIGN DITVE SCA. 5 CO 20
	000110	P-301-402	L.C.D.H. Onslow Drive Sta.20 to 35
23	229417	P-301-401	L.C.D.H. Onslow Drive Sta.20 to 35
		P-301-402	Howard Road Station 0 to 5
24	229418	P-301-401	noward Road Station 0 00 5
		P-301-402	L.C.D.H. Evergreen Rd. Sta. 0 to 15
25	229419	P-301-401	Leordene Evergreen Ru. 502. 0 0015
		P-301-402	L.C.D.H. Evergreen Rd. Sta.15 to 30
26	229420	P-301-401	D.O.D.M. Evergreen Mu. Boa.15 CO 50
	220120	P-301-402	the starts basely
		P-301-403	L.C.D.H. Evergreen Rd.Sta.30 to 45
27	229421	P-301-401	L.C.D.M. Evergreen Ad.Sta.30 to 45
-	220121	P-301-402	L.C.D.H. Evergreen Rd.Sta.45 to 60
28	229422	P-301-401	L.O.D.M. Evergreen Au.Sta.45 to bo
	000100	P-301-402	L.C.D.H. Pine Rd. Carolina Rd.Sta.
	1	1-001-405	0 to 15
29	229423	P-301-401	0 00 15
. DEUTE	000100	P-301-402	
		P-301-403	L.C.D.H. Carolima Rd. Sta.15 to 30
30	229424	P-301-401	D.C.D.II. Carolina Rd. Sta.15 to 50
	000101	P-301-402	L.C.D.H. Carolina Rd. Sta.30 to 45
31	229425	P-301-401	Levelen. Carolina Rd. Sta. 50 to 45
-	DEUTEU	P-301-402	L.C.D.H. Carolina Rd. Sta.45 to 60
32	229426	P-301-401	L.C.D.H. Carolina Rd. Sta.45 to 60
00	DEDIED	P-301-402	
		P-301-403	ICDU Holifor Dd and Down Dd
33	229427	P-301-401	L.C.D.H. Halifax Rd. and Dare Rd.
	000101	P-301-402	L.C.D.H. Washington Square and
		1-001-102	Warren Road
34	229428	P-301-401	warren Road
01	660160	P-301-402	ICDU Common Dd Wilton Dd
		1-001-402	L.C.D.H. Smyrna Rd., Wilton Rd., Windsor Rd.
35	229429	P-301-401	WINdsor Rd.
	220120	P-301-402	ICDH Canalina Dd Cha CO to CA
36	229430	P-301-402	L.C.D.H. Carolina Rd. Sta.60 to 74
00	660400	P-301-402	I C D H Emergence Dd Ct. CO to CT
		1-001-402	L.C.D.H. Evergreen Rd.Sta.60 to 67
Q-2.	18. <u>C.C.C.</u>	amp	
262	161942	P-108-2	Access Rd. to C.C.C. Camp Station O to 54
Q-2.	19. Magazine	Area	A State of the sta
1050	000150		
1256	229432	P-216	Charity and Faith Road
1259	229433	P-216	Hope Road Station 0 to 30
1260	229434	P-216	Hope Road Station 30 to 60

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L.B. B. Evergreen ML. Ste. 15 to St	802-106-1 http://www.sec.edu	
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Dwg. No.	Y & D No.	Proj. No.	Title
Q-2.	20. Mockup	Area	
1220	229435		Access Road to Mockup and Typical Sec.
1239	229436		Access Road to Mockup Sta. 30 to 62
1265	229437	P-249-52	Access Road to Mockup Sta. 50 to 52
1272	229438	P-225-3	Access Road to Workt Data. 60 to 78
1273	229439	P-225-3	Access Road to Hurst Beach from Duck Ck. Access Road to Hurst Beach from Duck Ck.
1274	229440	P-225-3	Access Road to Hurst Beach from Duck Ck.
1289	229441	P-225-6	Superstructure Dets. Timber Approach Spans Ponton Bridge Hurst Beach
1290	229442	P-225-6	Superstructure Dets. Timber Approach Spans Ponton Bridge Hurst Beach
1292	229443	P-225-6	Plan and Elevation Fender Dets. Ponton Bridge Hurst Beach
1293	229444	P-225-6	Ponton Bridge Hurst Beach
1294	229445	P-225-6	Ponton Bridge Hurst Beach
1295	229446	P-225-6	Machinery House-General Dets. of Barge
1296	229447	12 005 0	Ponton Bridge Hurst Beach
		P-225-6	Operating Mechanism for Barge- Ponton Bridge Hurst Beach
2207	229448	P-225-6	General Dets. of Barge Ponton Bridge Hurst Beach
3741	229449	P-225-6	Ponton Bridge Hurst Beach- Obstruction
629	229450	P-225-6	and General Lighting Ponton Bridge- Hurst Beach- Piping and Dets. of Barge.
2154	229451	P-225-6	R.R. Grade Crossing Sneads Ferry Road for use in installing electric flash
			warning signals /
Q-2.2	1. Area "M		
281	229454	P-225-2	11th. Marines Road Station 0 to 60
282	229455	P-225-2	11th. Marines Road Station 60 to 120 Sec.
283	229456	P-225-2	11th. Marines Road Station 120 to 180
284	229457	P-225-2	11th. Marines Road Station 180 to 240
285	229458	P-225-2	11th. Marines Road Station 240 to 300
286	229459	P-225-2	11th. Marines Road Station 300 to 360
287	229460	P-225-2	11th. Marines Road Station 360 to 420
288	229461	P-225-2	11th. Marines Road Station 420 to 435 General Layout
Q-2.2	2. Area "G"		
212	229463	P-149	Manufacil Con 1 a constant
			Typical Sec. and Layout Duck Creek Road to Starling Store Station 6 to 40
213	229464	P-150	Duck Creek to Starling Store Road Sta. 160 to 250
214	229465		Duck Creek to Starling Store Road Sta. 250 to 310
215	229466	P-149	Duck Creek to Starling Store Road

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2216	229467	P-149		Duck Creek to Starling Store Road Sta.
				40 to 100
2217	229468	P-149		Duck Creek to Starling Store Road Sta. 100 to 160.
Q-3.	Site Play	ns		
100	161980		· · · · · ·	General Area and Layout Map
501	161981			Site Plan Regimental Area No. 1.
102	161982			Site Plan Regimental Area No. 2.
103	161983			Site Plan Regimental Area No. 3.
04	161984		×	Site Plan Regimental Area No. 4.
	·161985	Void		
106	161986			Site Plan Supply and Industrial Area
23	161967			Grading and Walk Plan Regimental Area
	101001			No. 1.
21	161988			Grading and Walk Plan Reg. Area No. 2
24	161989			Grading and Walk Plan Reg. Area No. 3
25	161990			Grading and Walk Plan Reg. Area No. 4
30	161991			Grading and Walk Plan Reg. Area No. 5
46	161992			Site Plan-Central Athletic Field -
	101000			Power House and Circle Area
29	161993			Grading and Walk Plan-Post Troops Area
67	161994			Site Plan - Gate House
63 .	161995			Preliminary Site Plan for Incinerator
	101330	1		Location and Radio Towers
16	161996			Post Troops Area - Site Plan
	161997	Void		
18	161998			Site Plan - Reg. Area No. 5.
28	161999			Landscaping Treatment Plan-Post Hdqrs. Post Troops Area
20	162000			Div. Training Area - Numbering of Bldgs
84	162001			Site Plan-R.R. Wye-Supply & Ind. Area
82	162002		*	Site Plan-Hospital Area
56	162003			Grading and Walks Plan - Naval Hospital
112	162004			Medical Officers' Qtrs. Hospital Area
147	162005			Naval Hospital Property Map
09	162006			Officers' Qtrs. Lot Sub-Division Lots
				1, 2, 3, 4, and Paradise Road Place
10	162007			Officers' Qtrs. Lot Sub-Division Lots 5 to 85 Incl.
n	162008			Officers' Qtrs. Lot Sub-Div. Lots 85 to
12	162009			133 Incl. Officers' Qtrs. Lot Sub-Division. River
13	162010			Road Location Officers' Qtrs. Lot Sub-Division. River
	100010			Road Location
57 .	162011			Grading and Walks Plan Bachelor Officer Qtrs. Area
58 .	162012			
				Numbering Plan of Officers' Qtrs. Area
30	162013			Typical Plans & Dets. Walks and Drives- Officers' Qtrs.
37	162014			Walk & Drive Plan for General's Qtrs.

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1, 2, 5, 4, and reading and Flood Flood		162007	
Officens' Otre. Lot Sub-Division Lots			
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Withours' Other, Lot Sub-Division Handling		162009	
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Dwg. No.	Y & D No.	Proj. No.	Title (Con't)
82	162015		Prelim. Studies for Officer's Quar. showing Rds. and Sites
342	162016		Site Plan-Rifle Range-near Dixon
343	162017		Site Plan Difle Denge near Dixon
386	162018		Site Plan-Rifle Range- near Dixon
A Charles			Site Plan-Rifle Range showing Number- ing of Bldgs.
1104	162019		
352	162020		Proposed Site for Rifle Range near Di-
000	100000		Balloon Barrage Battalion at Marines
353	162021		(Troop Area)
	100001	· · · ·	Balloon Barrage Battalion at Marines
3.58	162022		(Officers' Homes Area)
	100000	4	Site Plan-Amphibian Base and Boat
359	162023		Storage Yd.
385	162024		Site Plan-Balloon Barrage School Area
	TOPOLI		Site Plan-Balloon Barrage Battalion
-	162025		and Amphibian Base Showing Num. of Bl.
726 371	162026		Site Plan-Parachute Training Towers
UTA	102020		Site Plan-Bldg. Group-Parachute Tower
383	162027		Area
000	102021		Site Plan-Additional Parachute Train-
189	100000		ing Tower
103	162028		Site Plan for Parachute Troops land-
770	100000		ing Field
376	162029		Site Flan-Sea Plane Base near Peter-
10	100000		field Point.
40	162030		Suggestion for a Froposed Cemetery
15	1000071		N. C. Rt. 24
45	162031		Suggestion- for a proposed Cemetery
74.0	1 000 00		U.S. Route 17.
348	162032		Planting plan for White Cemetery
TC 3	161794		Tent Camp Site Plan
TC 112.	162033		Site Plan Tent Camp Hospital
TC 220	162034		Site Plan-Tent Camp No. 2
TC 340	162035		Site Plan-Location for R-2 Bldg.,
			Chapel, and Restaurant Buildings.
TC 275	162036		Addition to Tent Camp Hospital-Plot
		a series and the series of the	Plan
MP 1	162037		Site Plan- Mumford Point Tent Camp
1186	162038		Site Plan-Mumford Point Camp
IC 238	162039		Tent Camp Amphibian Base Site Plan
IS 1	162040	· · · · · · · ·	Site Plan-Tank Battalion
CH 45	162041		Site Flan- Low Cost Defense Housing
JCH 46	162042		Site Plan- Low Cost Defense Housing
JCH 47A	162043		Site Plan-Low Cost Defense Housing
100 1	162044		Site Development Plan for Civilian Con
Y Start X			servation Corps Camp
45	162045		Magazine Area-Site Plan
60	162046		Site Plan-Magazine Area-Small Arms and
A.A.	in the second		Detonators
61	162047		Site Plan-Magazine Area-High Explosive:
174	162048		Record Mapping Project-General Layout
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2157	162049		Record Mapping Project-General Layout
138	162050		General Area Map
389	162061		Officers' Quarters Area, Typical Plan
			and Section of Underdrains, Married
700	162052	100 St. 81 51	Officers' Homes
388	162052		Site Plan-Gun Emplacements-Onslow Beach
TC 121	162053		Site Plan-Tent Camp Hospital
TC 382	162054		Site Plan- Tent Camp Incinerator
LCH 72	162055		L. C. D. H Treatment of Walks and Oil Tanks
350	162056		Typical Athletic Fields- D. T. A.
351	162057		Typical Athletic Fields-rD. T. A.
LCH 78	162058		Numbering Plan- L. C. D. H.
CCC 8	162059		Camp Knox-Site Plan- Dog Training Are
381	162060		Naval Hospital- Athletic Facilities-
26	162061		Layout Plan
20	102001		Preliminary Site Development Plan No. 11
Q-	4. Sewers		
		200 5	
400	162080	108-5	New River Intercepting Sewer
401	162081	108-5	New River Intercepting Sewer
402	162082	108-5	Typical Sewer Details
103	162083	108-5	Typical Sewer Details
104	162084	108-5	Typical Sewer Details
105	162085	108_5	New River Intercepting Sewer
106	162086	108-5	Sewers Regimental Area No. 2
07	162087	108-5	Sewers Regimental Area No. 3
.08	162088	108-5	New River Intercepting Sewer
109	162089	108-5	, Sewers Regimental Area No. 4
10	162090	108-5	Hospital Area Trunk Sewer
12	162092	108-5	Supply and Industrial Area Trunk Sewe
13	162093	108-5	Sewers Supply and Industrial Area
14	162094	108-5	Sewers Regimental Area No. 1
15	162095	108-5	General Sewer Plan D. T. A.
16	162096	108-5	Outfall Sewer
18 .	162098	108-5	New River Intercepting Sewer
19	162099	108-5	New River Intercepting Sewer
20	162100	108-5	New River Intercepting Sewer
21	162101	108-5	New River Interceptor and Officers' Quarters: `lewer
22	162102	108-5	New River Incerceptor and Officers' Quarters' Sewer
34	162114	108-5	General Sewer Plan- Residential Area
56	162136	400-1-20	Hospital Area- Sewers
58	162138	200-11	Sewers Regimental Area No. 5
60	162140	201-5	Post Troops Area Sewers
	162142	123-6	Parachute Training Towers Sewers
62	106146		Parachure Training Toward Seware

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472 1485 493 1493 1402 11402 1400 11400 1408 11400 1408 11400 1408 11400 1408 11400 14005 11400 1406 11400 1407 11400 1408 11400 1408 11400 1408 11400 1408 11400 1408 11400 1408 11400 1408 11400 1408 11400 1408 11400 1408 11400 1408 11400 1408 11400 1408 11400 1408 11400 1408 11400 1409 11400 1400 11400 1400 11400 1400 11400 1400 11400 1400 11400 1400 11400 1400 11400 <td>162152 162165 162173 162174 162300 162301 162302 161790 161791 161792</td> <td>205-4 202-15 117 202-15 221-4 202-15 129-1 1-3</td> <td></td> <td>Additional Officers' Quarters Sewers Additional Officers' Quarters Sewers Balloon Barrage Battalion Sewers Landing Field Sewers & Disposal Field Amphibian Base and B.B. Sewers and Disposal Field Gate House - Sewers Balloon Barrage Battalion Area-Sewers Pumping Station No. 7. Additional Parachute Training Tower-</td>	162152 162165 162173 162174 162300 162301 162302 161790 161791 161792	205-4 202-15 117 202-15 221-4 202-15 129-1 1-3		Additional Officers' Quarters Sewers Additional Officers' Quarters Sewers Balloon Barrage Battalion Sewers Landing Field Sewers & Disposal Field Amphibian Base and B.B. Sewers and Disposal Field Gate House - Sewers Balloon Barrage Battalion Area-Sewers Pumping Station No. 7. Additional Parachute Training Tower-
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TC 4 1 TC 5 1 TC 6 1	161790 161791 161792	1-3		Additional Parachute Training Tower-
TC 5 1 TC 6 1	L61791 L61792			
IC 5 1 IC 6 1	L61791 L61792			Outfall Sewer Tent Camp Area
TC 6	L61792	1-0		
		1-3		Tent Camp Sewer Plan
	102303			Tent Camp Sewers Profile
		250-1-3		T.U. No. 2 Sewers
	62304	250-1-3		T.C. No. 2 Sewers
	.62305	250-1-3		T.C. No. 2 Sewer Profiles
TC 355 1	.62306	133		T.C. No. 1 and 2 - Addition to Sawage Treatment Plant Force Main & Outfall Sewer
MP 7 1	.62307	500-2		Sewers- Mumford Point T.C. No.1
	.62308	250-4-3		Amphibian Base Peterfield Point T.C. Sewage
TB 2 1	62309	250-3-3		Tank Battalion Tent Camp Sewers
LCH 7 1	62310	301-404		L.C.D.H. Trunk Sewer
	62311	301-404		L.C.D.H. Trunk Sewer
the second s	62312	301-404		L.C.D.H. Sewer Force Main
	62313	301-404		L.C.D.H. Sewer
	62314	301-404		
	62315	301-404		L.C.D.H. Sewer L.C.D.H. Sewer
Q-5. Sewage	Structures	1.		
Q-5.01	. Sewage Tr	eatment PI	ant	
417 1	62097	108-5		
	62126	108-5		Temporary Settling Tank D.T.A. Sewage Treatment Plant - General Plan
			- 1	Bypass Sewer and Force Main
447 16	62127	108-5		Sewage Treatment Plant - Grading Plan
448 16	62128	108-5	1	Sewage Treatment Plant - Primary Settling Tank Influent & Effulent
				Chambers
	62129	108-5		Sewage Treatment Plant-Premary Settling Fank, Sections and Details
450 16	62130	108-5	\$	Sewage Treatment Plant-Primary Settling tank, Reinforcing Details
	62131	108-5	5	Sewage Treatment Plant - Primary Settl- ing Tank, Reinf. Dets. and Schedule
		108-5	I	Digester & Sludge Control -Sta-Sleeve Layout
453 1.6	52134	108-5		Sludge Drying Beds

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454	162134	108-5	Digester and Sludge Control Station - Reinforcing Details.
455	162135	108-5	Control Chamber & Pig. #3-Structural and Piping Details
459	162136	108-5	Primour Cottline The State
461	162141	108-5	Primary Settling Tanks - Reinforcing Det
465	162145	108-5	Sludge Control Sta. and Pipe Tunnel
466	162146	108-5	Sludge Control Sta. Stair Dets. & Secs. Sludge Control Station - Reinforcing Details
467	162147	108-5	Pumping Station Piping and Structural Details
468	162148	108-5	Pumping Sta. Calorination Equipment & Miscellaneous details
469	162149	108-5	Pumping Station Dia Contract
470	162150	108-5	Pumping Station - Reinforcing Details
475	162155	108-5	Sludge Control Station - Piping Dets. Sludge Control Station - Pipe Tunnel &
476	162156	108-5	Driveway Reinforcing Schedule Sludge Control Station - Reinforcing dets.
477	162157	108-5	Sludge Control Station- Pipe Tunnel and
478	162158	108-5	Driveway Reinforcing Schedule
480	162160	108-5	Sludge Pumping & Chlorinating Sta.Heating Sludge Pumping and Control Station Plumbing
481	162161	108-5	
482	162162	108-5	Sludge Control Station - Heating Primary Settling Tank No. 3 - Piping and Structural Details
483	162163	108-5	Reinforcing Details and Bar Schedule -
484	162164	108-5	Piping & Structural Details
486	162166	108-5	Sludge Drying Beds 9 to 14 incl. Sludge Digestion Tank No. 3 and Bar Schedule-Reinf. Details
487	162167	108-5	Sludge Control Chamber and Pipe Tunnel Reinforcing Details
488	162168	108-5	Miscellaneous Details
1730	228686	108-5	Control Station - Electrical
1731	228687	108-5	Sludge Pumping Station - Electrical
1891	228688	108-5	Sludge Pumping and Chlorinating Sta. Plans, Elev. and Dets.
1892	228689	108-5	Roof Freming Plan and Details
5842	228690	108-5	Roof Framing Plan and Details
7851	228691		Sludge Pumping and Chlorinating Station Full size window details
			Sludge Pumping and Chlorination Station S.T.P. Bar Bending Schedule
Q-	5.02. Sõwage	Pumping Station	No. 1
424	162104	108-5	gewage Pumping Station - Discharge Pip-
425	162105	108-5	ing Misc. Details Location Diagram Sewage Pumping Station Pump and Piping Details D.T.A.

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427	162107	108-5	Sewage Pumping Sta. Steel Reinf. Dets. D.T.A.
428	162108	108-5	Sewage Pumping Sta. Stair and other Details D.T.A.
429	162109	108-5	Sewage Pumping Sta. Stcel Schedule & other dets. D.T.A.
£30 ·	162110	108-5	Sewage Pumping Sta. Dets. of Com- minutor Structural and Misc. Dets.
31	162111	108-5	Sewage Pumping Sta. Dist. Channel, Bar Screen and Comminutor Dets.
32	162112	108-5	Sewage Pumping Sta. Grit Chamber Air Water and Plumbing Dets.
33	162113	108-5	Sewage Pumping Sta. Sludge Beds and Drainage Roads
40	162120	108-5	Sewage Pumping Sta. Piping Dets Gas Engine
34	162414	108-5	Sewage Pumping Sta. Electrical Layout
12	228692	108-5	Sewage Pumping Sta. No. 1 - Plan Elev. Sec. and Details
61	228693	108-5	Sewage Pumping Sta. No. 1 - Full Sized Window Details
Ģ	2-5.03. Sewage	Pumping Statio	m No. 2.
57	162137	400-1-20	Hospital Area - Sewer Pumping Station
37	228694	400-1-20	River Rd. Sewer Pumping Sta. No. 4. Hospital Sewage Pumping Sta. No. 2. Electrical Layout
Ģ	-5.04. Wallac	e Creek Sewage	Pumping Station No. 3.
35	162115	108-5	Wallace Creek Pumping Sta. Structural
36	162116	108-5	Piping Dets. Location and Grading Plan Wallace Creek Pumping Sta.Steel Stairs
37	162117	108-5	Stair well Dets. Manhole No. 153. Wallace Creek Pumping Sta. Sump Screen
38	162118	108-5	Trough Gas., Engine, Piping Wallace Creek Pumping Sta. Steel Reinf Dets.
39	162119	108-5	Wallace Creek Pumping Sta. Steel Reinf Dets.
36	228695	108-5	Sewage Pumping Sta. No. 3 Wallace Cree. Electrical Layout
Q	-5.05. River	Road Sewage Pum	ping Station Ng. 4.
11	162121	108-5	River Rd. Sewage Pumping Sta. Structur

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443	162123	108-5	River Rd. S.P.S. Gas Engine Piping Sump.
444	162124	108-5	River Rd. S.P.S Reinf. Dets.
445	162125	108-5	River Rd. S.P.S Reinf. Dets.
737	228694	108-5	River Rd. S.P.S. No. 4
and the		400-1-20	Hospital Sewage Pumping Sta. No. 2 -
			Electrical Layout
Q	-5.06. Sewag	e Pumping Station	n No. 5.
473	162153	108-5	Autumn Oval Sewage Pumping Station - Structural and Piping Details, Loca- tion Plans
474	162154	108-5	Autumn Oval Sewage Pumping Station
1701	228696	108-5	and Reinf. Details - Grading Plan Autumn Oval Sewage Pumping Station -
			Electricical Work
Q-	5.07. Sewag	e Treatment Plant	- Rifle Range
89	162169	203-12	Imhoff Tank - Piping & Structural Dets
90	162170	203-12	Sludge Beds - Miscellaneous Dets Location and Layout Plans
91	162171	203-12	Rifle Range Sewage Treatment Plant Reinf. Details
92	162172	203-12	Rifle Range Sewage Treatment Plant
40 3	228697	203-12	Reinf. Details Rifle Range Septic Tanks & Disposal Field
Q-	5.08. Sewage	e Treatment Plant	- Balloon Barrage
95	162175	202-15	Sludge Beds, Outfall, Layout and Location Plan
16	162176	202-15	Imhoff Tank, Piping & Structural Dets.
7	162177	202-15	Chlorination Manhole
8	162178	202-15	Sewage Treatment Plant - Balloon
9	162179	202-15	Barrage Battalion Dets. Reinf. Sewage Treatment Plant - Balloon
90	228698	202-15	Barrage Battalion Dets. Reinf. Balloon Barrage Battalion & Amphibian Base Sewage Pumping Sta. Elec. Layout
Q-	5.09. Parach	ute Training Are	
04	228699		a triangle a straight ten a sin from t
			Parachute Training Tower - Structural
			& Piping Dets. Sewage Pumping Station Location and Layout Plan

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1406	228701		Parachute Training Tower. Pumping Station-Reinf. Dets.
1407	228702		Parachute Training Tower and special Sewage Pumping:Sta-Reinf. Dets. Man- hole No. 475
	Q-5.10. Glider	Training Base	
1401	228703	117	Standard Fifty Man Septic Tank Plan Schedule landing Field Sections and
			Bar
	Q-5.11. Tent Ca	mp No. 1 and No.	2
TC 63	161849	1-3	Sewage Treatment PltPlan Elevation and Section
TC 64	161850	1-3	Sewage Treatment PltReinf. Dets.
TC 65	161851	1-3	Sewage Treatment PltChlorinator Pip ing, Reinf., Sludge Bed Dets.
TC 66	161852	1-3	Sewage Treatment Plant-Bar List Sett- ling Tank and Sludge Tank
TC 76	161862	1-3	Sewage Treatment PltChlorinator House Dets.
IC 227	228704	250-1-3	Addition to Sewage Treatment Plt.
rc 361	228705	133	Sludge Pumping and Fevolving Scum Troughs
rc 363	228706	133	Addition to Sewage Treatment Plt Sludge Pumping StaStructural and Reinf. Dets.
C 364	228707	133	Sludge Pumping Sta. for Sewage Treat- ment Plt.
°C 365	228708	133	Addition to Sewage Treatment Plt. Sludge drying bed 5 to 10
°C 366	228709	133	Addition to Sewage Treatment Plt
X	2		Digestion Tank E Structural and Pip-
C 368	228710	133	ing Dets. Addition to Sewage Treatment Flant
0 371	228711	133	sludge Digestion Tank E Reinf. Dets. Addition to Sewage Treatment Plt
C 372	228712	133	General Plan Addition to Sewage Treatment Plant-
	· · · ·		Sludge Digestion Tank E Reinforcing Details
c 375	228713	133	Addition to Sewage Treatment Plant Sludge Digestion Tank E and Roof
0 376	228714	×	Framing Plan Flocculation Tank Structural and Pip-
			ing Dets.

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TC 378	228716	133	Flocculation and Parshall Flume Tank Reinf. Dets.
TC 379	228717	133	Flocculation and Parshall Flume Tank Reinf. Dets.
TC 383	228718	133	Addition to Sewage Treatment Plt. Misc Dets.
TC 384	228719	183	Chemical Building Structural and Pipin Dets.
TC 386	228720	133	Chemical Building Structural and Pipin Details
TC 392	228721	TC No. 1 & 2	
TC 393	228722	TC No. 1 & 2	Addition to Sewage Treatment PltChem ical Bldg. Dets.
TC 398	228723	TC No. 1 & 2	Addition to Sewage Treatment Plant
TC 356	228724	TC No. 1 & 2	Electrical Layout Brinson Ck. Sewage Pumping Station
TC 357	228725	(TC No. 1 & 2	
TC 358	228726	133	TC No. 1 & 2 Brinson Ck. Sewage Pump- ing Sta. Reinfore
TC 360	228727	133	TC No. 1 & 2 Brinson Ck. Sewage Pump- ing Sta. Reinforeing Dets.
TC 367	228728	133	TC No. 1 & 2 Brinson Ck. Sewage Pump- ing Station Electrical Layout
Q-	5.12. Mumfor	d Point T. C.	
MP 35	228729	500-2	Sewage Treatment Plt Imhoff Tank
MP 36	228730	500-2	Sewage Treatment Plant-Location Plans Outfall Sludge Beds
MP 37	228731	500-2	Sewage Treatment Plant-Details
Q-	5.13. Midway	Park Residents	1 Area
LCH 62	228732		O. D. S. P. S. Structural and Piping Details-Location and Grading Plan
LCH 63	228733		O. D. S. P. S. Details MH-500 Steel Stairs Well and Hood Float Tube
CH 64	228734		O. D. S. P. S. Dets. Gasoline Engine Piping and Overflow Headwall Screen
			Trough
LCH 65	228735		O. D. S. F. S. Reinforcing Details
CH 66	228736		O. D. S. P. S. Reinforcing Details
CH 73	228737		L. C. D. H. Temporary Sewage Treatment and Permanent Emergency Overflow
CH 74	228738		O. D. S. P. S. No. 6 Electric Layout
-6. Wate	or		
502	162182	108-4	Typical Water Details

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		503	162183	108-4	12" Feeder Main and Water Dist. System-Supply and Industrial Area
		504	162184	108-4	Water Distribution System Regimen- tal Area No. 1.
		505	162185	108-4	Water Dist. System - Regimental Area No. 2.
		506	162186	108-4	Water Dist. System - Regimental Area No. 3.
		507	162187	108-4	Water Dist. System - Regimental Area No. 4.
		508	162188	200-8	Water Dist. System - Regimental Area No. 5.
5.55		509	162189	108-4	Typical Fire Hydrant Locations
		510	162190	108-4	Water Main and Fire Hyrant Water
225		510	102190	100=4	Dist. System Location & Elev. Con- trols
		511	162191	108-4	Water Feeder Main and Dist. System
		512	162192	201-6	Water Dist. System for Post Troops
		513	162193	108-4	12" Feeder Main to Water Dist.
					System Officers' Qtrs. Area
		514	162194	108-4	12" Feeder Main to Water Dist.
155					System Officers' Qtrs. Area
		515	162195	108-4	12" Feeder Main to Water Dist.
285		010	TOPICO	100-1	System Officers' Qtrs. Area
1999 B		516	162196	108-4	12" Feeder Main to Water Dist.
		010	102190	100-4	
		61.0	100100	108-4	System Officers' Qtrs. Area
51.3		517	162197	100-4	Water Dist. System - Officers' Qtr
		c10	100100	200 4	Area
333	x 7 9 9 2	518	162198	108-4	Water Dist. System - Officers' Qtr
193				100.1	Area
		519	162199	108-4	Water Dist. System - Officers' Qtr
SS.					Area
		521 .	162201	108-4	Water Supply, Well Location and
61.0		and the second			Transmission Main D.T.A.
		538	162218	108-4	General Water Dist. System D.T.A.
222		539	162219	108-4	General Water Dist. System - Officers' Qtrs. Area
203	23 201	562	162242	203-11	Water Dist. System - Rifle Range
		563	162243	203-11	Water Dist. System - Rifle Range
		564	162244	123-5	Water Dist. System - Parachute Training Towers Area
		565	162245	108-4	Water Dist. System & Transmission
	ana mana				Mains- Parade Grounds D.T.A.
	100-100	566	162246	108-4	Well 7 and 8 & Well Transmission
				anna an dia an dia	Main D.T.A.
		568	162248	108-4	Well 2,4, & 10, Well Transmission
	20.000	000		200 2	Main D.T.A.
	* * 1.44	569	162249	117	Water Dist. System - Landing Field
		570	162250	203-11	Dets. for Sprinkling and Drinking
		010	102200	200-11	
		507	100051	110	Foundations for Rifle Range
	Clin	571	162251	112	Water Dist. System for Sprinkling
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1831		572	162252	202-14	Water Dist. System Balloon Barrage and Amphibian Base
1594		573	162253	202-14	Water Dist. System Balloon Barrage at Marines
1		575	162255	221-4	Water Dist. System for Gate House
1301		576	162256	202-14	Water Dist. System Balloon Barrage and Amphibian Base
1631		577	162257	108-4	Wells Nos. 11, 12, 13, 14, 15 and 16, Transmission Mains
LSQT.		578	162258	219-2	Well Water Trans.Mains, Dets. for Bridge Crossing Main Access and
162.					Snead's Ferry Bridge
162		597	162277	108-4	Water Dist. System - 3rd. Parachute Tower
1623		598	162278	226	Water Dist. System-Boat Basin- Hospital Area
		599	162279	219-1	respaced to ou
302 / 1 322 / 1				219-2	Wells Nos. 17, 18, 19, 20 and 21 and Trans. Mains D.T.A.
SOL		567	162247	108-4	Well 5,6, & 9, Well Trans.Main D.T.A
551		1500	162280	219-1	
501 531				1-4	Map showing well water supply sys- tem and Data - Gen. Area
		TC 7	161793	1-4	Water Dist. for Tent Camp Area
162		TC 58 TC 84	161844 161870	1-4 1-4	Typical Water Dets. (Van Dyke) Well Location and Discharge Main
nee is					T.C. Area
		TC 221	162281	250-1-4	Water Dist. System T.C. No. 2
183		TC 223	162282	250-1-4	Well Location & Transmission Line
		TC 344	162283	250-1-4	Additional Clear Water Storage and
		MP 24	100004	F00 7	Service to Church T.C. No. 1 & 2
		TC 224	162284 162285	500-3 250-1-4	Water Dist. System - M.P.T.C.
		10 224	102200	230-1-4	Water Feeder Main Tent Camp Amph. Base (Peterfield Point) and Landing Field
		TC 297	162286	250-4-4	Water Dist. System Tent Camp Amph.
10 X	- Cas				Base
201		TB 9	162287	250-3-4	Water Dist. System - Tank Battalion
the Lot		LCH 50	162288	301-408	L.C.D.H. Water Dist. System
		LCH 51	162289	301-408	L.C.D.H. Water Dist. System
		LCH 52A	162290	301-408	L.C.D.H. Water Dist. System
		LCH 53	162291	301-408	L.C.D.H. Typical Water Dets.
		LCH 61	162292	301-408	L.C.D.H. General Water Dist.
		CCC 3	162293		Watan and Saman Disa
		TC 122	162294		Water and Sewer Plan Water Dist. System - Hostess House

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522	162202	108-4	Water Plt. Location Plan Grading and Drainage
523	162203	108-4	Main Pumping PltPumps- Piping and and Venturi Meter
524	162204	108-4	Main Pumping Plt. Floor Plans and Chlorinator Dets
525	162205	108-4	Main Pumping Plt. Drainage System- Discharge Header Control Equipment
526	162206	108-4	Main Pumping Plt. Gasoline Engine- Fuel Supply-Cooling System
527	162207	108-4	Main Pumping Plt. Exhaust Fan-Pump Room-Air Vents at Balcony Floor
528	162208	108-4	Main Pumping Plt. Pumphouse-Reinf. Details
529	162209	108-4	Main Pumping Plt. Water Storage Bas- in -Plan and Dets.
530	162210	108-4	Main Pumping Plt. Water Storage Bas- in-Reinf. Dets. of Foundation
531	162211	108-4	Main Fumping Plan Water Storage Basin-Sec. and Reinf. Dets.
532	162212	108-4	Main Fumping Plt. Water Storage Bas- in-Reinf. Dets. and Chlorinator Hous
533	162213	108-4	Main Fumping Plan Water Storage Basi -Top Slab Reinf.
534 54 2	162214 162222	108-4	Bill of Material Reinf. Steel Water Plt. and Dets. of Stairs-
543	162223	108-4	Plans showing origin of Reinf. Sec. Water Plt. Reinf. Steel SecWater
544	162224	108-4	Fump Room-Filters and Wash Water Plt. Reinf. Steel SecFil- ters Reception Hall and Filter Beams
545	162225	108-4	Water Flant Reinf. Steel SecSec. and DetsFront Filter Walls
546	162226	108-4	Water Plt. Reinf. Steel SecWall Stair DetsRear Pipe Galley
647	162227	108-4	Water Plt. Reinf. Steel Flan-El. 27.5 End, Filter Foundation Walls and Details
648	162228	108-4	Water Plt. Reinf. Steel Plan-El. 37.0 Steel in Top Slabs and Catwalks
49	162229	108-4	Water Flt. Reinf. Steel Flan-El. 37.0 Steel in Bottom of Slabs and Waterproofing
50	172230	108-4	Water Plt. Reinf. Steel Sec Filter Walls, Roof Beams, Floor Slab
51	162231	108-4	Water Plt, Reinf, Steel Plan-Fipe Galley and Filter Wash Water Pump Room
52	162232	108-4 -772-	Water Plt, Bill of Materials-Reinf, Steel

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1. 303 BH		553	162233	108-4	Water Plt. Pipe Galley and Wash Water Pump - Underground System
21.		554	162234	108-4	Water Plt. Filters and Pipe Galley Section through Pipe Galley
10		555	162235	108-4	Water Plt. Plan-Filter Operating Floor-Section through Filter and Pipe Galley
		656	162236	108-4	Water Plt. Pumps, Piping & Control Equipment Sections-Two Longitudinal
		557	162237	108-4	Water Plt. Transition Piece, Manifold Pipe
1		558	162238	108-4	Water Plt. Pipe Railing, Trench Covers, Steel Floor Covers
		559	162239	108-4	Water Plt. Key Plans for Misc. Dets
1		560	162240	108-4	Water Plt. Bill of Materials, Reinf Steel
I		580	162260	108-4	Water Plt. Softening Equipment
		581	162261	108-4	Water Plt. Chemical Feed Equipment Piping D. T. A.
I		583	162263	108-4	Main Water PltKey Plans - Stair Details and Reinf.
		584	162264	108-4	Main Water Plt Reinf Walls - Chemical Feed Room
I		585 586	162265	108-4	Main Water Plt. Reinf. and El. Spiractor Pit and Chem. Feed Room
the state of the s		000	100000	100-1	Main Water PltMisc. Sec. and
		587	162267	108-4	Retaining Walls Main Water PltReinf. Spiractor and Sediment Pit
E.		588	162268	108-4	Main Water PltReinf 1st Floor Chemical Feed Room
:		589	162269	108-4	Main Water PltReinf2nd Floor Chemical Feed Room
		590	162270	108-4	Main Water Plant - Reinf Recarbonation Tank
•		591	162271	108-4	Main Water Plt Bill of Materials Reinf. Steel
		592 593	162272	108-4	Main Water PltBill of Materials Reinf. Steel
	510		162273	108-4	Main Water PltDiagram of Chlori- nation Control System and Differ- ential Lines
•		594	162274	108-4	Main Water PltReinfRoof Chemical Feed Room
	100	595	162275	108-4	Main Water PltWaste Wash Water Tank
£	diffe 1	1541	228745	108-4	Main Water PltFoundation Plan, Reinf. Dets. and Schedules
		1709	228746	108-4	Main Water Plant - Elec. Conduit
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Water Pit. Transition Ploce.		108-4		163561	
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1685	1 : 14	2867	228748	108-4	
SSE					Water Treatment and Fumping Flt. Door and Window Schedule First
		2868	228749	108-4	Floor Plan Sections
1631					Water Treatment and Fumping Flt.
					Dets. Roof Draining Plan - Second Floor Plan Sections
		2869	228750	108-4	Water Treatment and B
1621					Water Treatment and Fumping Flt.
	1.	2870	228751	108-4	Typical Window Dets El. Sec. Water Treatment and Fumping Flt.
Saf .					Gross Sections-Sec. DetsSlab and
162		7007			Beam Schedule
967		3897	228752	108-4	Water Treatment Fumping Plt. Sec.
162					Screen Wall 1st and 2nd Floor Toi-
162		70.00			let Wall
4421		3898	228753	108-4	Water Treatment Pumping PltDets.
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162		6883	000000		form Railing Dets. and Ret. Wall
and .		0000	228755	108-4	Water Treatment and Fumping Plt. Al
262		7007	000550	A Dates in	ternate Door and Wood Door Dets.
		7887	228756	108-4	Water Treatment Fumping Plant-
161		7888	000757	· · · · · · · · · · · · · · · · · · ·	Office Partitions Finish Schedule
5		1000	228757	108-4	Water Treatment Pumping Plant-Bar
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		10001	220100	108-4	Water Treatment Fumping Plant-Color
16	1 753	3658	228759	100 1	Scheme
			220109	108-4	Water Treatment Pumping Flant-1st
21		4678	228760	100 4	and chu ricor Heating
				108-4	Water Treatment Pumping Plant Page
21 19					ment- 1st and 2nd floor plumbing
		540	162220	108-4	
36				T00=4	Foundation Flan 300,000Gal. Tank
1		536	162216	230-2	Li. Reg. Area No. 1
				200-2	Foundation Flan 300,000 Gal. Tank
		596	162276	108-4	neg. Area No. 5
35				100-1	Well Pump Houses Main Div. Training
					Alea Mille Range-Amp. Base-Plans
L		3744	228771	108-4	Elev. and Det.
					Well Fump Houses Main Div. Train-
1					ing Area Rille Range-Amp. Base-
		537	162217	108-4	Elec. Layout
					Foundation Flan 300,000 Gal. Tank
£		3717	228772	108-4	(Elev.) Supply and Ind. Area
		6848	228773	108-4	Obstruction Lights for Water Tanks
1		5.03			Stabalizing Ping-300,000 Gal. Tank- Fd. for S. & I Area
2		561	162241	108-4	Ground Water Store T
- 7 -	1. 1.5421	1502	228774		Ground Water Stage Jecorder
	S. Anno 1	1507		•	Emergency H. L. Pumping Plant-Plans,
	Maria and	1503	228775		Elev. and Dets Architectural Dwgs.
	1012 A				Emergency H. L. Fumping Plant- Foundation Plans, Sections and
					Details-Reinf. Steel
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1504	228776		
	200110		Emergency H. L. Fumping Plant-Roof
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1505	228777	7	GOCCI
		tmergency	H. L. Fumping Plant-Schedules, Section
1506	228778		Douglise protoming dias
			Energency H. L. Fumping Plant Di-
3743	228779	230-1	Dous Location Plan
		200-1	Div. Training Area By-nose Dung
520	162200	108-4	South The Tac Tavout
		*00=±	Foundation Plan 20,000 Col Tomb
574	162254	203-11	officers otrs. Area
		200-TT	Foundation Plan-10,000 @1. Elev.
1501	228780	202-14	i and anti ie hance
		NON-TI	Water Balancing Tanks and Controls
574	162254	203-11	mupile Dase-Balloon Remana Date .
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		.1	Rifle Range- Balloon Barrage
T. C. 59	161845	1-4	
			Clear Water Storage and Pumping Flt
T. C. 60		1-4	
T. C. 61	161847	1-4	Clear Water Storage Rank Reinf. Det
			HOUGI DLOFADA and Dimedan mar
			Grading, Drainage, and Aereator Det
T. C. 62	161848	1-4	
T. C. 67	161853	1-4	Fump House-Plan Elev. and Dets.
T. C. 68	1.01.00.		Clear Water Storage and Fumping Fl Engine Cooling and Exhaust
0. 00	164854	1-4	Fump House-Misc. Details
C. C. 77	101000		provide Misc. Details
	161863	1-4	Typical Fump Connection Discharge
r. c. 78	161964	10.0	from wells T. C. Area
	161864	1-4	Well Fump Houses-T. C. Area-Flans
r. c. 91	161977		Elev. and Dets.
	TOT911	1-4	Obstruction Lights-Tent Camp Wa-
r. C. 345	228781	050 1	Jei lower
	ADDIOL	250-1-4	Aeroator Det. for Additional Clear
			in our Storage Tank-Grading and
. C. 222	228782	250 1 4	Di ainar e Fian
		250-1-4	T. C. No. 2 Foundation Flan 100,000
F 51	228783	500-2	Haver Tank
• H. 10	228784	000-c	Foundation-40,000 Gal Flow man
			Dalancing Tank and Contant
			T. C. Tank Battalion
CH 58	228785	301-407	
			L. C. D. H. Foundation Plan 200,000
79	162259	132	
			Mock-up Water Tank Fd. Plan-Dets.
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Q-8.	Telephones.		
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	Q-8.01. Divisio	on Training Area	
777	162320	124	The Jamma and Care built Country attack
778	162321	124	Underground Conduit Construction Underground Cable Construction
779	162322	124	O.P.C. Regimental Area No. 1.
780	162323	124	D.P.C. Regimental Area No. 2.
781	162324	124	O.P.C. Regimental Area No. 3.
782	162325	124	O.P.C. Regimental Area No. 4.
783	162326	124	O.P.C. Regimental Area No. 5.
787	162327	124	Trunking Cable M.A.X. with
			Carolina Telephone Co.
788	162328	124	Trunking Cable M.A.X. with
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789	162329	124	Trunking Cable M.A.X. with
			Carolina Telephone Co.
790	162330	124	Trunking Cable M.A.X. with
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791	162331	124	Trunking Cable M.A.X. with
799	169779 .	124	Carolina Telephone Co.
199	162332 .	124	O.P.C. Trunk Cable - M.A.X. to P.A.X. Office & Dist. Cable
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	Q-8.02. Post Tr	oops Area	N
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784	162333	124	O.P.C. Post Troops Area
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	g-0.03. Supply	& Industrial Area	
785	162334	124	O.P.C. Industrial Area
	Q-8.04. Naval H	lospital Area	
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2780	162335	400-1-24	O.P.C. Trunk and Distribution
			Cable
	Q-8.05. Residen	tial Area	
	d-0.00. Vestger	ictal Alca	
1750	162337	124	O.P.C. Trunking Cable M.A.X.
			to P.A.X. Office & Dist. Cable
1751	162338	124	O.P.C. Trunking Cable M.A.X. to
			P.A.X. Office & Dist. Cable
1752	162339	124	O.P.C. Trunking Cable M.A.X.
			to P.A.X. Office & Dist. Cable
1753	162340	124	O.P.C. Trunking Cable M.A.X.
			to P.A.X. Office & Dist. Cable
1754	162341	124	O.P.C. Trunking Cable M.A.X.
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1755	162342	124	O.P.C. Trunking Cable M.A.X. to P.A.X. Office & Dist. Cable
(2-8.06. Ri	fle Range	
2755	162343	217	O.P.C. Rifle Range Rear Dixon
2756	162344	217	O.P.C. Rifle Range Near Dixon
(-8.07. Ba	lloon Barrage	Area and Amphibian Base
749	162345	217	0.P.C. Snead's Ferry Road
2752	162346	217	O.P.C. Amphibian Base
2753	162347	217	O.P.C. Balloon Barrage Battalion
2754	162348	217	O.P.C. Balloon Barrage Battalion
G	-8.08. G1	ider Landing 1	Field
1756	162349	117	OPC disport Approach Day
1757	162350	117	0.P.C. Airport Approach Road 0.P.C. Airport Approach Road
-	8 00 m		
ų	-8.09. Ter	nt Camp No. 1	and 2
rc 399	162351	250-1-22	O.P.C. Tent Camp No. 1
IC 400	162352	250-1-22	O.P.C. Tent Camp No. 2
Q	-8.10. Mun	nford Point	
1758	162356	500-17	B.P.C. Mumford Point Tent Camp
1759	162357	500-17	O.P.C. Mumford Point Tent Camp
Q	-8.11. Pet	erfield Point	
c 401	162358	250-1-22	O.P.C. Amphibian Base-Peterfield Point
(2-8.12. Ta	nk Battalion	
°C 402	162359	250-1-22	0.P.C. Tank Battalion
Q-	-8.13. Gen	eral	
50	162360	124	Proposed Layout and Staking Sheet for
02	162361	108-10	Temporary Telephone Service Line Location Sketch Showing Carolina A.T. & T. Company's Proposed Pole Line in Boundary of Reservation
86	162362	124	Traffic Schematic and Switch Requirements
765	162363	145	0.P.C. Service Cable Main T.C. M.P.T.C. Officers Quarters

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2766	162364	145	O. P. C. Service Cable Main T. C. M. P. T. C Officers Quarters
Q-9.	Propane Gas System		
	Q-9.01. Division Traini	ing Area	
683	162372	127	Underground Plans
3624	162373	127	Regimental Area No. 1
3623	162374	127	Regimental Area Nos. 2 & 3
3626	162375	127	Regimental Area Nos. 4 & 5
	Q-9.02. P. T. & I. & S.	Areas	
3622	162676	127	Industrial and Post Troops
	Q-9.03. Naval Hospital	8	
3625	162377	127	Hospital Area
Q-10.	Electrical Distribution		the same to define the same
4-10.			
	Q-10.01. Division Train	ing Area	
700	162380	108-9	Detail & Layout Line to Paradise Point
705	162381	108-9	12,470 Volt Feeder-Main Access Roa
706	162382	108-9	12,470 Volt Feeder-Main Service Ros
708	162383	108-9	Regimental Area No. 1
709	162384	108-9	Regimental Area No. 2
710	162385	108-9	Regimental Area No. 3
711	162386	108-9	Regimental Area No. 4
719	162387	108-9	12,470 Volt Feeder-Main Access Roa Pole 450-382
720	162388	108-9	12,470 Volt Feeder-Main Service
728	162700	100.0	Road Pole 301-317
	162389	108-9	12,470 Volt Feeder
730	162390	108-9	DetsElec. Dist12,470 Volts
731	162391	108-9	Electrical Dist. Dets. 12,470 Volt
732	162392	108-9	Elec. Dist. Dets12,470 Volts
733	162393	108-9	Elec. Dist. Dets12,470 Volts
735	162394	108-5	Elec. Dist. DetsSewage Pumping Station No. 1
738	162395	108-9	Diesel Plt. to Pole 30-12,470 Volt Feeder
741	162396	108-9	12,470 Volt Loop Feeder - Main Service Road
742	162397	108-9	
755	162398	400-1-22	12,470 Volt Loop Feeder-River Drive
759	162399		Feeder to Hospital Area
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Dwg. No.	Y&D No.	Proj. No.	Title (Cont'd)
768	162400	108-9	12,470 Volt Feeder-Rear of Officer: Quarters
1700	162401	108-9	Location Plan for Sectionalizing
2714	162402	108-9	Metal Clad Oil Circuit Breakers - Loop Sectionalizing Station
2778	162403	108-9	Foundation Plan of four Section- alizing oil circuit breakers rear of Officers Quarters
3704	162404	108-9	Wells Nos. 14, 15, 16
3706	162405	108-9	Wells Nos. 11, 12, 13
3708	162406	108-9	WOILD NOS. II, 12, 10
		400-1-22	Street lights D. T. A. and Naval Hospital Area
3710	162407	128	Blackout Control D. T. A.
3711	162408	108-9	12,470 Volt Loop-Sect. Metal Clad Oil Circuit Breaker Stations 5 & 6
3749	162409	231	Wells Nos. 17, 18, 19, 20, & 21
3750	162410	231	Wells Nos. 17, 18, 19, 20, & 21
776	162411	201-7	Wells Nos. 17, 18, 19, 20, & 21 Post Troops Area
722	162412	108-9	Industrial Area
756	162413	203-10	Induscrial Area
		202-13	The to Greade Deven
1796	162415	400-1-22	Tie to Sneads Ferry
1797	162416	400-1-22	2400 Volts - Naval Hospital Area Transformer Vaults - Naval Hospital Area
1798	162417	400-1-22	Transformer Vaults - Naval Hospital Area
2789	162418	400-1-22	Main Feeder - Naval Hospital Area
2797	162419	400-1-22	Manhole Designs - Naval Hospital Area
2798	162420	400-1-22	Manhole Designs-Naval Hospital Area
3700	162421	108-9	Sub-station Elec. Dist. to Central Heating Plant
3701	160422	400-1-22	Sub-station Switching Station-Naval Hospital Area
3702	162423	400-1-22	Sub-station Plot Plan - Naval Hospital Area
3703	162424	400-1-22	Sub-station-Naval Hospital Area
3716	162425	400-1-22	Profile of Underground System - Naval Hospital Area
Q-10	0.02. Residenti	al Area	
2709	162426	108-9	0700 77.14
0710	169497	205-2	2300 Volts
710	162427	108-9	0700 7 31
717	169490	205-2	2300 Volts
711	162428	108-9	8700 m 11
710	162420	205-2	2300 Volts
712	162429	108-9 205-2	2300 Volts
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Dwg. No.	Y. &. D. No.	Proj. No.	Title (Con't)
2713	162430	108-9	
		205-2	2300 Volts
2723	162431	108-9	132/24 V-2850 Kva Sub-Station
3714	162432	108-9	
		205-2	Street Lights
3725	162433	128	Blackout Control
Q-1	0.03. Rifle Ra	nge	
748	162434	203-10	
1		202-13	Transmission Lines to Rifle Range
1703	162435	203-10	Rifle Range Area
704	162436	203-10	Feeder
1720	162437	128	
		203-10	Street Lights and Blackout Control
Q-1	0.04. Balloon	Barrage and Am	bhibian Base
704	3 60 4 70	000 35	
704	162438	202-13	Balloon Barrage and Amphibian Base
706	162439	202-12	Cable Layout
780	162440	202-13	Amphibian Base and Boat Storage Yd.
794	162441	202-13	Balloon Barrage School Area At Mar- ines.
			Dets. of Thansformer Platform at
722	162442	202-13	Operation Bldg.
753	162443	202	Generator Shed at Balloon Barrage
Q-10	0.05. Parachut	e Training Area	
70 7	162444	123-2	Dealers to Dealers to the m
145	162445	129=1	Feeder to Parachute Tower Additional Parachute Training Tower
Q-10	0.06. Glider Th	raining Base	
12	162446	117	Landing Field Underground Primary Cable and Sub-Station Dets. and
24	162447	117	Elec. Dist. Based on A. B. No. 503 Case No. 142
			Dated 2/10/42
	200440		Lighting & Fower-Electrical Dist.
27	162448	117	Feeder T. C. No. 2 to Airport Sub- Station
27	162449	117	Landing Field for Parachute Troops
		1. A.	Night Lighting System-Wiring Diagram
85	162450	117	Night Lighting Vault-Equipment Lay- out
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Bwg. No.	Y & D No.	Proj. No.	Title (Con't)
TC 13	161798	1-9	Tent Camp Outside Distribution
TC 14	161799	1-9	Inventory of Pole Line Const.
TC 93	162452	1-9	T. C. No. 1 Blackout Control Sev.
10 50	TOTADE	1-0	D. C. Relay Circuits
TC94	162453	250-1-10	Transmission Line to T. C. No. 1 &
1094	102400	200-1-10	Transmission Line to I. C. No. I &
MB 743	162454	250-1-10	Transmission Line to T. C. No. 142
MB 744	162455	250-1-10	Transmission Line to T. C. No. 142
MB 747	162456	250-1-10	Transmission Lines to T. C. No. 1 &
MB 752	162457	250-1-10	Transmission Line to T. C. No. 1 &
MB 753	162458	250-1-10	transmission Line to T. C. No. 1 and 2
MB 754	162459	250-1-10	Transmission Line to T. C. No. 1 and 2
MB 761	162460	250-1-10	New River Pole Line Construction
0.1	0.08 mont de	The P	
8-1	.0.08. Tent Cau	mp NO. Z	
TC 228	162461	250-1-10	Elec. Dist. Tent Camp No. 2
TC 359	162462	122	Elec. Dist. To Sewage Treatment Plt Tent Camp No. 1 and 2
TC 373	162463	250-1-10	Tent Camp No. 1 and 2 Elec. Dist. to Wells
TC 374	162464	250-1-10	Tent Camp No. 1 and 2 Elec. Dist. to Wells
TC 403	16246.5	140	Elec. Dist. to Tent Camp Incinerate
Q-1	0.09. Mumford	Point Tent Cam	<u>p</u>
MP 16	162466	500-9	M. P. T. C. Electrical Dist.
Q-3	0. 10. Peterf	ield Point (Amp	hibian Base)
TC 270	162467	250-4-6	
			Amphibian Base-Elec. System
Q-1	0.11. Tank Ba	ttalion	
TB 5	162468	250-3-6	T. C. T. B. Electrical Dist.
Q-1	0.12. Low Cos	t Housing	
LCH 55	162469	301-406	L. C. D. H. Electrical Dist.
LCH 56	162470	301-406	L. C. D. H. Electrical Dist.
LCH 57	162471	301-406	L. C. D. H. Electrical Dist.
LCH 67	162472	301-406	Sub-station 2000 KWA 12,470 to
			2400/416/ V. for L. C. D. H. Proj.
LCH 68	162473	301-406	
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LCH 69	162474	301-406	L. C. D. H. Elec. Dist. Dets.
LCH 70	162475	301-406	L. C. D. H. Elec. Dist. Dets.
LCH 76	162476	301-406	L. C. D. H. Elec. Dist. Dets.
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Q-1	0.13. General	×	
TC 117	162477	126	llth Marine Tent Camp-Elec. Ser- vice Plan
MB 729	162478	109-2	Single Phase Line to C. C. C. Ca and Mumford Point. Col.Hill Res.
Q-11. To	pography		
2158	228630		Topograph Part of Quad. 98
2159	228631		1 1 1 1 1 98
2160	228632		n n n n 98
2161	288633		m # m # 98
2162	288634		11 11 11 198
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2164	288636		n n n n 98
2165	228637		n n n 117
2166	228638		n n n n 117
2167	228639		110
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2171	228543		118
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2175	228647		110
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2177	228649		110
2178	228650		118
2179	228651		110
2180	228652		Topography " " 118
2181	228653		118
2182	228654		118
2183	228655		118
2184	228656		110
2185	228657		110
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2188	228658		100
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2189	228661		Topography Magazine Area-Part of Quad. 180
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2191	228663		Topography Quadrangle		Area-Part	of
2192	228664		Topography	Magazine	Area-Part	of
	and the second second		Quadrangle			
2193	228665		Topography Quadrangle	Magazine 181	Area-Part	of
2194	228666		Topography.		Juadrancie	18
2195	228667		1010010111	11 11	H H	18
2196	228668		11	17 11		19
2197	228669		**	17 17	11	190
2198	228670		**	** **		
2199	228671		tt	11 11	11	190
3100	228672		11	17 17	11	198
3101	228673		17	11 11	11	199
3102	228674		11	11 11		218
3103					12	219
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3104	228676		H	17 17	17	219
3105	228677		**	12 11	11	219
3106	228678		11	11 11	17 .	219
3107	226679		n	- 17 - 11	**	219
3108	228680		Hydrography	-Part of	Quadrangle	
3109	228681		Hydrography			
3110	228682		Topography-	Part of O	uadrancia	220
3119	248149		Topography-			
3120	248150		Topography-			
3121	248151					
3122	248152		Topography-	Part of Q	uadrangle	97,
3123	248153		Topography-			
3124	248154		Topography-			
3125	248155	×	Topography-			
3126			Topography-			
9750	248156		Topography-	Part of Q	uadrangle	118
Q.12. C	asoline and Oil	Storage and I	Distribution			
	12.01. Post Troo	ps Area		ų		
Q-1	228806	226	Wallace Cre Facilities	ek Boat B	asin - Gas	oli
Q-1 5603		226	Facilities	ek Boat B	asin - Gas	oli
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Dwg. N	Io. Y & D No.	Proj. No.	Title
	Q-12.03. Naval H	Iospital.	
3634	22814	400-1-9	
		400-1-18	Gasoline and Fuel Oil Storage Dist.
5625	228815	400-1-9 400-1-18	Inches Mate for 2 15000 (allos and 1
		400-1-10	Anchor Mats for 2-15000 Gallon and 1- 10,000 Gallon Tank
	C-12.04. Reside	ntal Area	
4650	228816	215	
		202-4	Bachelor Officers Mess Hall and Bal-
			loon Barrage Training School-Gasoline
			and fuel oil storage and Distribution
	C-12.05. Rifle	Range	
		203-18	
3659	228817	202-9	Balloon Barrage Amphibian Base and Rifle Range
		203-2	Gasoline and Storage Fuel Oil and Dist
		203-13	
5623	228818		See Schedule Balloon Barrage Amphibian Base and Rifle Range Mat Details
	Q-12.06. Amphib	ian Base	
4627	228819	202-21	Amphibian Base and Balloon Barrage
1001		202-5	Battalion Gasoline, Diesel Oil and
		202-6	Fuel Oil Stomage and Dist.
	6-12.07. Glide:	r Field	
1671	228820	116	Landing Field 25000 Gal. Gas. St. Tk.
3627	228821	142-4	Donoshuka masara Tandina Disti dan Ji
		116	Parachute Troops Landing Field Gasolin Storage and Dist.
3713	228822	116	Parachute Troops Landing Field-Elec.
	· · ·		Work for Gasoline Dist.
4666	228823	116	Anchor Details for 25,000 Gallon Tank
4667	228824	116	Concrete Fit Details for Aqua Gasoline System
	C-12.08. Tent	Camp No. 1 and	No. 2
TC 36	161821	1-12	Heating of Existing Fuel Oil Dist.
TC 87	161873	1.12	General Arrangement of Gasoline and
*			Fuel Oil Storage and Dist.
rc326	162072	250-1-13	Tent Camp No. 1-Addition to General
			Arrangement of Fuel Oil and Gasoline
			Storage and Dist.

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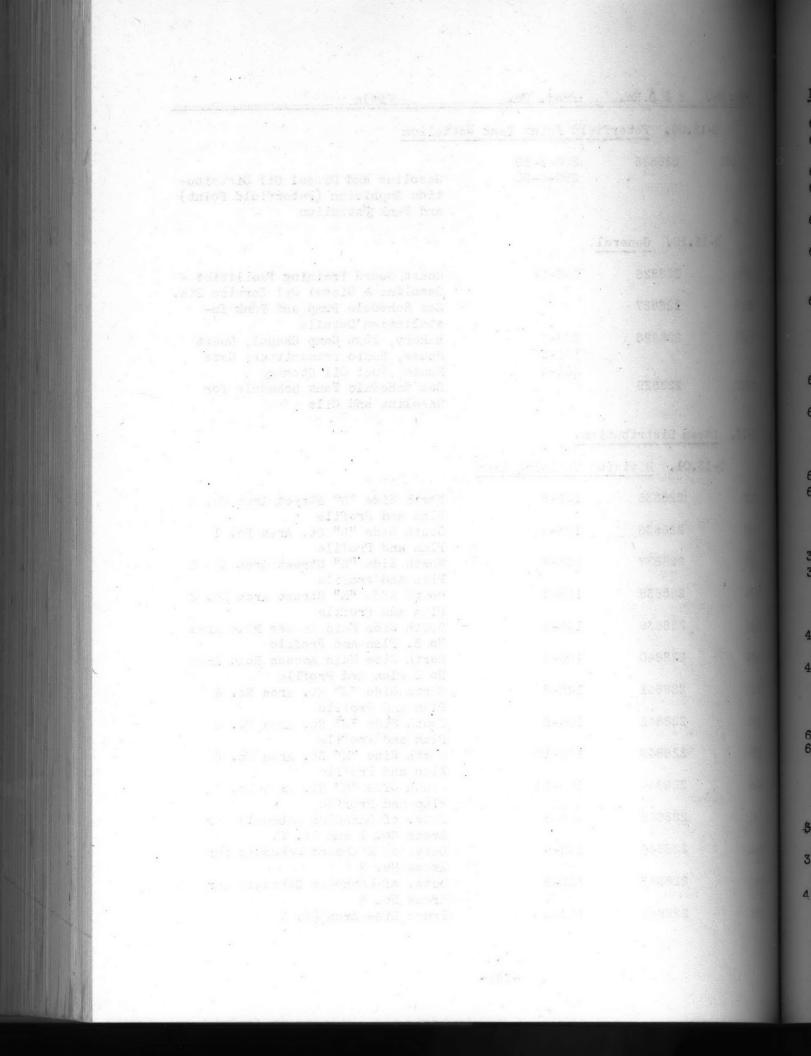
Dwg. No.	Y & Ď No.	Proj. No.	Title
Q-	12.09. Peterf	ield Point Tank	Battalion
TC 108	228825	250 - 3-50 250-4-50	Gasoline and Diesel Oil Distribu- tion Amphibian (Peterfield Point) and Tank Battalion
Q-	12.10. Genera	1	
3641	228826	249-51	Coast Guard Training Facilities - Gasoline & Diesel Oil Service Sta
3628	228827		See Schedule Pump and Tank In- stallation Details
4631	228828	208-8 104-2 221-4	Bakery, Tent Camp Chapel, Guest House, Radio Transmitter, Gate House, Fuel Oil Storage
5642	228829		See Schedule Tank Schedule for Gasoline and Oils
Q-13. 5	team Distribut	ion.	
Q-1	13.01. Divisi	on Training Area	
631	228835	108-8	North Side "B" Street Area No. 1 Plan and Profile
632	228836	108-8	South Side "B" St. Area No. 1 Plan and Profile
633	228837	108-8	North Side "E" Street Area No. 2 Plan and Profile
334	228838	108-8	South Side "E" Street Area No. 2 Plan and Profile
35	228839	108-8	South Side Main Access Road Area No 3. Plan and Profile
36	228840	108-8	North Side Main Access Road Area No 3 Plan and Profile
37	228841	108-8	North Side "J" St. Area No. 4 Plan and Profile
38	228842	108-8	South Side "J" St. Area No. 4 Plan and Profile
39	228843	200-10	North Side "M" St. Area No. 5 Plan and Profile
40	228844	200-10	South Side "M" St. Area No. 5 Plan and Profile
11	228845	108-8	Dets. of Manholes Schedule for Areas No. 1 and No. 2.
12	228846	108-8	Dets. of Manholes Schedule for Areas No. 3
13	228847	108-8	Dets. of Manholes Schedule for Areas No. 4

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673	228849	108-8	Trunk Line Area No. 2 and No. 3
674	228850	108-8	Trunk Line Central Heating Plt. to Circle
675	228851	108-8	Trunk Line Area No. 4 and 5
676	228852	108-8	Manhole DetsTrunk Line-Manhole T.L. No. 1 to T. L. No. 14
677	228853	108-8	Manhole DetsTrunk Line-Manhole T.L. No. 15 to T.L. No. 29
678	228854	200-10	
		108-8	Manhole DetsAnchor, Steam, Syphon, amd Sleeve
679	228855	200-10	Dets of Pits and Manholes_Schedule for Area No. 5
	Q-13.02 Post Tr	oops Area	
644	228856	201-8	Dets. of Manhole Schedule for Post
645	228857	201-8	Troops Area and Line Anchor Post Troops Area-Plan and Profile
	Q-13.03. Supply	and Industria	al Area
527	228858	108-8	Dian and Dradit
30	228859	108-8	Plan and Profile Manhole Details
	Q-13.04. Naval H	lospital Area	a faith faith to the set of the set of the
3664 3665	228860 228861	400-1-19 400-1-19	Naval Hospital-Plan and Profile . Manhole Details
	Q-13.05. Residen	tal Area)
611	22 ₈ 862	21.5	Bachelor Officers Quarters-Plan and Profile
612	228863	215	Bachelor Officers Quarters-Manhole Det
	Q-13.06. Rifle R	ange Area	
20	228864	203-13	Pifle Dance Dies on 1 D att
81	228865	203-13	Rifle Range-Plan and Profile
			Dets. of Manholes-Schedule for Rifle Range
	Q-13.07. Amphibis	an-Ball. Barr	. and Ball. Barr. S. A.
55	228866	202-16	Balloon Barrage Battalion and Amphi- bian Base-Plan and Profile
	228867	202-16	Manhole Dets Balloon Barrage Batta-
54			lion and Amph. Base Dets.

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	Y & D No.	·· Proj. No.	. Title
Q.	-13.08. Parac	hute Training	Area
5608	228869	138	Parachute Training Area-Steam Dist. And Dets.
ୟ-	13.09. Glide	or Training Ba	se Area
5626	228870	142-6	Glider Base-Plan and Profile
Q-	13.10 Tent (amp No. 1	
TC 37	161822	1-10	General Arrangement of Steam Dist. and Return System
TC 38	161832	1-10	Dets. of Steam Dist. and Condensate Return
TC 116	228871	1-19-1	110 000 11
		1-19-2	T. C. Hospital and Washroom Steam Dist.
Q-	13.11 Tent C	amp No. 2	
rc 318	228872	250-1-11	T. C. No. 2 -Steam Distribution
Q-	13.12. Mumfo	rd Point T. C	<u>•</u>
	A second second		
P 15	228873	500-16	M. P. ^T . C. Steam DistPlan and Pro file
	228873 ivision Train		M. P. ^T . C. Steam DistPlan and Prp file
-14. <u>D</u>		ing Area	M. P. ^T . C. Steam DistPlan and Prp file
-14. <u>D</u> Q-	ivision Train	ing Area cks 101-1	file Foundation Plans and DetsRaised
-14. <u>D</u> Q-	ivision Train 14.01. Barra	ing Area cks	file Foundation Plans and DetsRaised First Floor Foundation Plans & Dets. First Fl. o
-14. <u>D</u> Q- 01	ivision Train 14.01. <u>Barra</u> 162481	ing Area cks 101-1 2	file Foundation Plans and DetsRaised First Floor Foundation Plans & Dets. First Fl. or Bround or Slight Fill
-14. <u>D</u> Q- 01 02 03 04	ivision Train 14.01. <u>Barra</u> 162481 162482	ing Area cks 101-1 8 101-1	file Foundation Plans and DetsRaised First Floor Foundation Plans & Dets. First Fl. or Ground or Slight Fill First Floor Plan and Schedules
-14. <u>D</u> Q- 01 02 03 04 05	ivision Train 14.01. <u>Barra</u> 162481 162482 162483 162483 162484 162485	ing Area cks 101-1 201-1 101-1	file Foundation Plans and DetsRaised First Floor Foundation Plans & Dets. First Fl. o Bround or Slight Fill
-14. <u>D</u> Q- 01 02 03 04 05 06	ivision Train 14.01. <u>Barra</u> 162481 162482 162483 162483 162485 162485 162486	ing Area cks 101-1 201-1 101-1 101-1 104-1 101-1	file Foundation Plans and DetsRaised First Floor Foundation Plans & Dets. First Fl. o Ground or Slight Fill First Floor Plan and Schedules Second Floor Plan and Dets.
-14. <u>D</u> Q- 01 02 03 04 05 06 07	ivision Train 14.01. <u>Barra</u> 162481 162482 162483 162483 162484 162485 162486 162487	ing Area cks 101-1 201-1 101-1 101-1 104-1 101-1 101-1	file Foundation Plans and DetsRaised First Floor Foundation Plans & Dets. First Fl. o Bround or Slight Fill First Floor Plan and Schedules Second Floor Plan and Dets. Elevations Details Details
-14. <u>D</u> Q- 01 02 03 04 05 06 07 00	ivision Train 14.01. <u>Barra</u> 162481 162482 162482 162483 162484 162485 162486 162487 162488	ing Area cks 101-1 20 101-1 101-1 101-1 101-1 101-1 101-1 101-1	file Foundation Plans and DetsRaised First Floor Foundation Plans & Dets. First Fl. o Ground or Slight Fill First Floor Plan and Schedules Second Floor Plan and Dets. Elevations Details Details Full Sized Section Thru Cornice
-14. <u>D</u> Q- 01 02 03 04 05 06 07 20 811	ivision Train 14.01. <u>Barra</u> 162481 162482 162482 162483 162484 162485 162486 162487 162488 162489	ing Area cks 101-1 22 101-1 101-1 101-1 101-1 101-1 101-1 101-1	file Foundation Plans and DetsRaised First Floor Foundation Plans & Dets. First Fl. o Bround or Slight Fill First Floor Plan and Schedules Second Floor Plan and Dets. Elevations Details Details Full Sized Section Thru Cornice Revision Sheet
-14. <u>D</u> Q- 01 02 03 04 05 06 07 00 811 85	ivision Train 14.01. <u>Barra</u> 162481 162482 162482 162483 162484 162485 162486 162486 162488 162489 162490	ing Area cks 101-1 2 101-1 101-1 101-1 104-1 101-1 101-1 101-1 101-1 201-1	file Foundation Plans and DetsRaised First Floor Foundation Plans & Dets. First Fl. o Ground or Slight Fill First Floor Plan and Schedules Second Floor Plan and Dets. Elevations Details Details Full Sized Section Thru Cornice Revision Sheet Window Sill Dets.
-14. <u>D</u> Q- 01 02 03 04 05 06 07 00 811 855 845	ivision Train 14.01. <u>Barra</u> 162481 162482 162482 162483 162483 162485 162486 162487 162488 162489 162490 162491	ing Area cks 101-1 201-1 101-1 101-1 101-1 101-1 101-1 101-1 101-1 101-1 101-1 101-1 101-1	file Foundation Plans and DetsRaised First Floor Foundation Plans & Dets. First Fl. o Ground or Slight Fill First Floor Plan and Schedules Second Floor Plan and Dets. Elevations Details Details Full Sized Section Thru Cornice Revision Sheet Window Sill Dets. Suggested Color Scheme
-14. <u>D</u> Q- 01 02 03 04 05 06 07 20 811 885 945 57	ivision Train 14.01. <u>Barra</u> 162481 162482 162483 162483 162484 162485 162485 162486 162487 162488 162489 162490 162491 162492	ing Area cks 101-1 201-1 101-1 101-1 101-1 101-1 101-1 101-1 101-1 101-1 101-1 101-1 101-1 101-1	file Foundation Plans and DetsRaised First Floor Foundation Plans & Dets. First Fl. o Bround or Slight Fill First Floor Plan and Schedules Second Floor Plan and Dets. Elevations Details Details Full Sized Section Thru Cornice Revision Sheet Window Sill Dets. Suggested Color Scheme Revised Foundation Plan
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861	162497	101-1	lst Fl. on fill-1000#/0' Soil Press- ure Foundation Plan and Dets.
862	162498	101-1	First Fl. on fill-2000#/Sq. Ft. Soil Pressure Foundation Plan and Dets.
863	162499	101-1	Pile Foundation and Dets.
1846	162500	200-1	
1377	162501	200-1	Bar Bending Dets. Reinf. Steel Half Foundation Plan wall and foot- ing Dets.
2891	162502	202-8	
		203-1	Steam Pits and Sleeves
810	162503	101-1	Dets. of Mechanical Pit
814	162504	101-1	Dets. for Steam Pit
959	162505	101-1	Dets. of Steam Pits
1677	162506	201-1	Pit Details
656	162507	101-1	Mechanical Pit Dets.
1615	162508	101-1	Heating-First Floor Plan
1616	162509	101-1	Heating-Second Floor Plan
688	162510	200-1	moa orng-decond - 100F Fran
		201-1	
		202-8	
		203-1	Heating-First Floor Plan
689	162511	200-1	now offiger from Fian
		201-1	
		202-8	
		203-1	Heating Second Floor Plan
1617	162512	101-1	First Floor Reflected Ceiling Showing Heating Plans
687	162513	203-1	
		200-1	
		201-1	
		202-8	Heating Details
607	162514	101-1	Toilet and Washroom Ventilation Sys.
649	162515	101-1	Heating Expansion Bends Under First Floor
500	162516	101-1	Layout of Soil and Vent Piping
501	162517	101-1	Layout of Hot and Cold Water Piping
302	162518	101-1	Typical Layout of Plumbing Fixtures and Drains
590	162519	200-1	
		201-1	
		202-8	
(- ·		203-1	Plumbing-Foundation Plan
191	162520	200-1	and - our an of our I fau
		201-1	
		202-8	
		203-1	Flumbing and Dets_First and Second Floor Plans

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692	162521	200-1	
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		203-1	Riser Diagram
757	162522	101-1	Electrical - First Floor Plan
758	162523	101-1	Electrical - Second Floor Plan
	Q-14.02. Mess Hall		
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864	162530	101-2	Foundation Footings and Curb Plan
865	162531	101-2	Foundation and Footing Details
910	162532	101-2	Foundation-Footing & Curb Plan
911	162533	101-2	Foundation and Footing Details
1822	162534	101-2	Foundation Footing & Curb Plan
1823	162535	101-2	Foundation, Pier & Footing Details
866	162536	101-2	First Floor Plan
867	162537	101-2	Roof Plan - Louver Plan
871	162538	101-2	Front Right & Left Side Elevation
872	162539	101-2	Rear Elevation & Sec. of Storage
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873	162540	101-2	Sec. of Deck over Galley & Scullery Window and Typical Wall Details
874	162541	101-2	Dets. of Exterior Doors & Entrance Porch
875	162542	101-2	Rear Entrance Dets. Door Schedule and Details
376	162543	101-2	Plan Elevation & F. S. Dets. of Cupola
377	162544	101-2	Sec. & F. S. Dets. of Cupola
378	162545	101-2	Refrigeration Room Details
379	162546	101-2	Dets. of Dormer & Range Exhaust
			Flue (Galley)
180	162547	101-2	Dets. of Coffee Bar
82	162548	101-2	Dets. of Blower Platform in Service Corridor Dets. of Switch Closet in Galley
32	162549	101-2	Full Sized Dets. of Interior Cases
51	162550	101-2	Full Sized Dets. of Steel Casement Sash
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837	162552	101-2	Color Scheme
824	162553	101-2	First Floor Plan
825	162554	101-2	Roof Framing Plan
326	162555	101-2	Truss Details
327	162556	101-2	Truss Details
328	162557	101-2	Truss Details
329	162558	101-2	Elevations of Wall Framing
330	162559	101-2	Eleva. of Wall Framing & Truss Dets

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	10.	Y&D No.	Proj. No.	Title (Con't)
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870		162562	101-2	Elev. of Wall Steel Framing and Truss
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868		162563	101-2	Roof Framing Plan
883		162564	101-2	Reinf. Dets.
608		162565	101-2	Heating and Ventilating
654		162566		
			201-2	
			200-2	and the second
			203-2	
			250-4-9	Mechanical Pit Dets.
546		162567	101-2	Galley and Scullery Ventilation
1618		162568	101-2	Refrigerator Room
510		162569	101-2	Plumbing
511		162570 [®]	101-2	Plumbing
3621		162570	101-2	I FORITITE
0021		1020/1	200-2	
			201-2	Dison and Coiling Dising Lawout
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			250-1-5	
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			1-5	Grease Traps
723		162574	101-2	Electrical Layout
2731		162575	202-2	Electrical Roughing
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119	Q-1 4	.03. Bat	talion Wareho	Foundation and Dets. Rev. 32'X]10'
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316	Q-1 4	162580	101-3 101-3	Foundation and Dets. Rev. $32^{1}X^{1}C^{1}$ 28'-7 5/8" X 95'- $10\frac{1}{4}$ " Plans, Elev. and Dets.
16	Q-1 4	162580 162581	101-3	Foundation and Dets. Rev. 32'X]10' 28'-7 5/8" X 95'- $10\frac{1}{4}$ " Plans, Elev. and Dets. 32' x 110' Plans and Elev.
16	Q-1 4	162580 162581 162582	101-3 101-3 101-3	Foundation and Dets. Rev. $32^{1}X$ 10' 28'-7 5/8" X 95'-10 ¹ / ₄ " Plans, Elev. and Dets.
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916 915 917 921	Q-1 4	162580 162581 162582 162583 162584	101-3 101-3 101-3 101-3 101-3	Foundation and Dets. Rev. 32'X]10' 28'-7 5/8" X 95'-10 ¹ / ₄ " Plans, Elev. and Dets. 32' x 110' Plans and Elev. Dets. of Stone Window Sills and Brick Coursing 32' x 110' 32' x 110' Full Sized Section thru Con nice and Rake
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319 316 317 321 3849 338 343 10807 2885 3836	Q-14	162580 162581 162582 162583 162584 162584 162586 .04. Reg 162587 162588	101-3 101-3 101-3 101-3 227-6 imental Infir 101-4 101-4	Foundation and Dets. Rev. 32'X]10' 28'-7 5/8" X 95'-10 ¹ " Plans, Elev. and Dets. 32' x 110' Plans and Elev. Dets. of Stone Window Sills and Brick Coursing 32' x 110' 32' x 110' Full Sized Section thru Cor nice and Rake 32' x 112' - 8" Bearing Brick and Wood Rafters <u>maries</u> Foundation Foundation Plan and Dets.

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			Title (Con't)
2846	162592	200-4	Steel Pen Floor Dets.
2884	162593		1; 200-4; 202-20; 203-19Floor Plans
839	162594	101-4	Elev. and Roof Flan
840	162595	101-4	Section and Dets.
841	162596	101-4	Details
954	162597	101-4	Full Sized Window Dets.
2889	162598	1 Marca 1	; 202-11; 200-5;Full Siz. Window Dets
842	162599	101-4	Reinforcing Details
9802	162600	101-4;	Romoroing Decails
			20; 203-19;X-Ray Dark Room
5877	162601	101-4	Color Scheme
7815	162602	101-4; 200-4	• 202-20.
	I	203-19	Schedule of Venetian Blinds
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653	162604	101-4	Heating and Ventilation
623	162605	101-4	Mechanical Pit Dets.
624	162606	101-4	Waste and Vent Piping
726	162607	101-4	Hot and Cold Water Piping
	202001	101-4	Electrical Layout
	Q-14.05. Post 1	Exchanges	
326	1626.0	101-5	Flans
919	162611	101-5	Revised Foundation-Wall Dets.
931	162612	101-5	Foundation Flan and Dets.
327	162613	101-5	Elev. and Dets.
13	162614	101-5	Full Size Window Dets.
128	162615	101-5	Reinf. Dets.
834	162616	201-4	Torre Doop.
		101-5	
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		203-14	Foundation, Back Bar, Tobacco Case
			and Display Case
820	162617	136-5	Dets. and Equipment
801	162618	101-5	bees. and Equipment
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		202-11	Schedule of Venetian Blinds
832	162619	201-4	Schedule of Venetian blinds
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		203-14	
			Color Scheme
889	162598	200-4	COTOL SQUAMA
		200-5	
		201-4	
		200-11	Post Exchange and Reg. Infirmary
			Full Size Window Dets.

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657	162621	101-5	Mechanical Pit Dets.
628	162622	101-5	mommitul ito pers.
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		201-4	Hat and gald Wet Dt .
629	162623	101-5	Hot and Cold Water Piping
724	162624		Waste and Vent Piping
164	102023	101-5	Electrical Layout
	Q-14.06. Thea	tre	
889	162627	107-4	Foundation Wall Plan
904	162628	107-4	Foundation and Pile Footing Plan
2828	162629	107-4	Foundation and Footing 2000 Lbs. Per
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890	162630	107-4	First Floor Plan
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892	162632	107-4	Reflected Ceiling and Roof Plan-Cat-
			walk Dets.
893	162633	107-4	
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895	162635	107-4	Cross Section and Dets.
896	162636	107-4	Longitudinal Section and Dets.
397	162637	107-4	Typical Cornice and Wall Dets.
398	162638	107-4	Part Front Elev Arcade Dets.
399	162639		Door Jambs-Window and Brick Course Det
900	162640	107-4	Dets. of Fire Exit Hall
901	162641	107-4	Cupola Dets.
905		107-4	Cupola Details
8866	162642	107-4	Full Size Sash Detail
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902	162644	107-4	Stair and Stage Details
03	162645	107-4	Steel Framing Plan
07	162646	107-4	Bar Schedule
800	162647	107-4	Bar Bending Details
895	162648	107-4	Wood Substitutes
06	162649	107-4	Details of Steam Pipe Trench
52	162650	107-4	Mechanical Pit Details
681	162651	107-4	Heating and Ventilation
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683	162653	107-4	
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			Waste and Vent Piping
684	162654	107-4	
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721	162655		Hot and Cold Water Piping
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1722	162656	107-4	Merzanine Plan II
1723	162657	107-4	Mezzanine Plan - Electrical Layout Electrical Details
11813	162658	200-15	Breccrical Details
		209	Deles ti
	-		Relocation of 3'-2" Aerofuse
	Q-14.07. Reg	imental Headqua	rters
2810	162660	211	Finat D
			First Floor and Foundation Plans, Wall Sections
2811	162661	211	Hall Sections
2812	162662	221	Elevations, Roof Plan and Details
2883	162663	211	Entrance Details and Cross Section
		210	
		510	Window Details - Battalion Head-
5870	162664	211	quarters & Regimental Headquarters
6846	162665	211 211	orientation Plan
7816	162666		Color Scheme
	100000	211	
3843	162667	200-7	Schedule of Venetian Blinds
2813		211	Foundation and Footing Plan
2814	162668		First Floor Framing Plan
1693	162669	211	Bar Bending Details
1030	162670	211	botaris
1000		200-7	Heating
1692	162671	211	
		200-7	Plumbing
773	162672	211	Tanorng
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'97	162673	211	lst. Floor Electrical
		200-7	Tolonham
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307	162678	210	Foundation - First Floor Plan & Dets Roof Plan Sec. and Dets.
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45	162680	210	Elevations and Details Color Scheme
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44	162682	210	Schedule of Venetian Blinds
08	162683	210	Foundation and Footing Plan
09	162684		First Floor Framing Plan
91	162685	210	Bar Bending Details
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		202-12	
		200-6	Heating
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798	162688	210	190. FIODI, Electrical
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2883	162663	210	Telephone System-Conduit Layout
		211	Window Dotoile Dettel
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			and Regimental Headquarters
	and the second		(Filed with Regimental Headquarters)
	Q-14.09. Regin	nental Servic	e Club
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		646	Foundation Plan and Footings Bldgs.
4837	229645	212	1-29, 2-29 and 5-29.
4847	229646	212	Foundation Plan and Footings Bldg. 3-30
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4839	229647	010	Bldg. 4-29
4840	229648	212	1st Floor Plan and Dets.
4841	() · · · · · · · · · · · · · · · · · ·	212	2nd Floor and Roof Plan
	229649	212	Elevations
4842	229650	212	Wall Sections
4843	229651	212	Cross Sections-Toilet Stall Details
4844	229652	212	Stair Details
4846	229653	212	Exterior Details
4848	229654	212	Details of Entrance Door
4849	229655	212	Details of Stone Sill
4850	229656	212	Profile of Stone Cornices and Elev.
5878	229657	212	Bar, Back Bar, and Equipment for Game Room
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		and Regimental Headquarters
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974	162692	107-2	Preliminary Sketch Elev. Boulevard Side
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976	162693	107-2	Foundtion Details
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984	162699	107-2	Details of Entrances
985	162700	107-2	Details of Cupela and Main Cornice
986	162701	107-2	Dets. of Main Stairs
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989	162704	107-2	Dets. of Court Room Interior
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93	162728	107-2	Telephone System-Conduit Layout

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l	1010	162745	107-10	Plaster and Terrazzo Details
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1012	162747	107-10	Details of Doors and Vaults
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1051	162750	107-10	Plan and Details of Post Office
1052	162751	107-10	Details of Post Office
1052	162752	107-10	Details of Post Office
2880	162753	107-10	Full Size Wood Window Details
8835	162754	107-10-1	Details of Rooms
6878	162755	107-10	Schedule of Venetian Blinds
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998	162757	107-10	First Floor Framing Plan
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1679	162774	107-10	Plumbing - Ctool and Di
1714	162775	107-10	Plumbing - Stack and Riser
1715	162776	107-10	Electrical Layout - First Floor Plan
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751	162778	100 0	Electrical Layout
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631	228888	107-5	Dish Weshing Machine Tall
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98	228891	107-5	Heating and Details - First Floor
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33	228900	107-5	Electrical Layout - First Floor Electrical Layout - Second Floor
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53	228905	P-220	Exterior Details - Catholic Chapel
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2872	228909	P-220	Bar Bending Schedule - Catholic Chapel
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2873	228911	P-220	Mechanical Pit Details - Catholic Chapel
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3631	228914	P-220	Plumbing and Details Dustant
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2832			Floor Plans
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2859	228943	108-12	Bar Bending Schedule
3603	228944	108-12	Plumbing and Details
1706	228945	108-12	Electrical Layout
	Q-16.05. Rad	io Transmitter	
2800	228950	120	Floor Plans Details Elevations
2801	228951	120	Floor Plans Details Elevations
1853	228952	120	F.S. Window Details
1854	228953	120	F.S. Window Details
3879	228954	120	Schedule of Venetian Blinds
.0816		120	Color Scheme
892	228956	120	
802	228957	120	Details of Antenna Lead Thru's
803	228958	120	Structural Plans and Details
601	228959	120	Bar Bending Details
74			Heating and Plumbing
75	228960 , 228961	120 120	Electrical Layout - Basement Electrical Layout - First Flo
	Q-16.06. Radi	o Towers	
054	2480 30	119	150 Foot Radio Tower Foundation
726	248031	120	Details
		120	Obstruction Lights for Radio Towers
	Q-16.07. Gate	House and Gua	rd's Station
887	228965	221-4	Plans
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Dwg. 1	No. Y& D No.	Proj. No.	Title (Cont'd)
9826	228969	221-4	Color Scheme
3657	228970	221-4	1st. and 2nd. Floor Plan and
		· · · ·	Details - Heating
3651	228971	221-4	Soil Waste and Vent Piping Plumbing
3652	228972	221-4	1st. and 2nd. Floor Plan Plumbing
2732	228973	221-4	1st. and 2nd. Floor Plan - Guard
			Station - Electrical Layout
4890	228974	221-4	Guard's Station
11833	228975	235	Repair and Additions to Gate House
	Q-16.08 Wal	ler Gunnery Tr	ainer Building
8870	229732	130	Foundations, Plans and Details
10872		130	Color Schemes
	Q-16.09. Wal	lace Creek Boa	t Basin - House and Toilet
3111	229903	226	Preliminary - Plan
10818	229904	226	Plans, Elevations and Details
		220	Toilet House
10819	229905	226	Wall, Cross-Section and Details
0820	229906	226	Lantern Details and Sections
0829	229977	226	Fire Hose Cabinets
1815	229907	226	Color Schemes
876	229908	226	Piling Plan and Details
878	229909	226	Marine Railway
622	229910	226	Plumbing
3719	229911	226	Electrical
	Q-16.10. Host	ess House	
7866	230005	214	Foundation Plan
867	230006	214	First Floor Plan
868	230007	214	Second Floor Plan
869	230008	214	Elevations
871	230009	214	Sections
872	230010	214	Stair Details
870	230011	214	Chimney and Fireplace Details
874	230012	214	Interior Wood Details
875	230013	214	Exterior Wood Details
	230014	214	Cornice, Rake and Framing
		214	Bathroom Details
876	230015	~~ T	
876 873	230015	214	Venetion Plinda
876 873 894	230016	214	Venetian Blinds
876 873 894 833	230016 230017	214	Bar, Back Bar and Bar Equipment
876 873 894 833 0883	230016 230017 230018	214 214	Bar, Back Bar and Bar Equipment Color Schemes
876 873 894 833 0883 877	230016 230017 230018 230019	214 214 214	Bar, Back Bar and Bar Equipment Color Schemes Second Floor and Roof Framing
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			Title (Cont'd)
4622	230023	214	Foundation Heating Plan
4623	230024	214	First Floor Heating Plan
4624	230025	214	Second Floor Hosting Plan
4652	230026	214	Second Floor Heating Plan Galley Ventilation
4605	230027	214	Foundation Disable Di
4606	230028	214	Foundation Plumbing Plan
4607	230029	214	First Floor Plumbing Plan
4608	230030	214	Second Floor Plumbing Plan
4668	230031	214	Plumbing Details
2791	230032	214	Galley Plumbing Details
2792	230033	214	First Floor Electrical Plan Second Floor Electrical Plan
	Q-16.11. Pos	t Theatre	
10800	230752		
9881	230752	201-12	Substage Plan and Details
9882	230754	201-12	Orchestra Plan
9883	230755	201-12	Mezzanine and Part Balcony Plan
9884	230756	201-12	Machine Room Floor
885	230757	201-12	Roof Plan
886	230758	201-12	Front and Left Side Elevation
887		201-12	Rear and Right Side Elevation
888	230759	201-12	Sections
889	230760	201-12	Detail Plan of Dressing Rooms Wings
890	230761	201-12	Details of Service and Fire Stairs
891	230762	201-12	Details of Dressing Rooms
802	230763	201-12	Toilet Room Details
	230764	201-12	Interior Elevations and Details
893	230765	201-12	Ceiling Plans and Interior Corner Details
894	230766	201-12	
395	230767	201-12	Details of Lobby
396	230768	201-12	Details of Lobby
397	230769	201-12	Dets. of Main Entrance & Ticket Wind
		nnt-t0	Door and Window Schedule & Details
898	230770	201-12	Brick Coursing Diagram
99	230771	201-12	Terrazzo Floor Layout and Details
808	230772	201-12	Room Finish Details and Schedule Details and Stage Curtains and
835	230773	201-12	Ceiling
856	230774	201-12	Color Schemes
857	230775	201-12	First Floor and Foundation Plan
		COT-IC	Machine Room, Balcony, Mezzanine and
858	230776	201-12	boage rians and Schedule
859	230777	201-12	Roof Plan and Schedule
860	230778	201-12	Structural Details - Truss "D"
861	230779	201-12	Structural Details - Truss "E" Structural Details - Truss "C", "B"
862	230780	201-12	and "C" Structural Details - Right End Truss

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10863	230781	201-12	Structural Details - Truss "M" Between Field Splice
10864	230782	201-12	Structural Details - Truss "F" and Left End Truss "M"
10865	230783	201-12	Structural Details - Truss "A"
10866	230784	201-12	Concrete Details
10867	230785	201-12	Main Stair Structural Details and
			Miscellaneous Details
10874	230786	201-12	Foundation Plan for Placing Rein-
			forcing Steel
10875	230787	201-12	Bar Bending Schedule for Foundations
10876	230788	201-12	Machine Room, Balcony, Mezzanine and
			Stage Plans for Placing Reinforcing Steel
10877	230789	201-12	Machine Room, Balcony, Mezzanine and
10978	230790	201-12	Stage Bar Bending Schedule
10879	230791	201-12	Roof Beam and Bar Bending Schedule Roof Plan for Placing Reinforcing
			Steel
11840	230792	201-12	Catwalk Layout
5643	230793	201-12	Heating and Ventilation Machine
			Floor and Under Balcony
5644	230794	201-12	Heating Supply System above Auditor-
			ium Ceiling
5645	230795	201-12	Heating Supply and Exhaust System
			Under Balcony & above Lobby Ceiling
5646	230796	201-12	Heating Supply & Exhaust System under
		the set of the	Lobby Orchestra and Stage Floor
5647	230797	201-12	Heating Plans and Details Machine,
			Orchestra and Dressing Room Floors
648	230798	201-12	Heating Plans and Details Substage
			Floor Level
633	230799	201-12	Orchestra Floor Plan Plumbing
634	230800	201-12	Mezzanine Floor Plan Plumbing
635	230801	201-12	Machine Room Floor Plan Plumbing
636	230802	201-12	Sub-stage Plan and Section Elevation Plumbing
637	230803	201-12	Details Plumbing
638	230804	201-12	Details Plumbing
639	230805	201-12	Stack and Riser Diagram Plumbing
734	230806	201-12	Orchestra Floor Plan - Electrical
			Layout
735	230807	201-12	Mezzanine and Part Balcony Elect. Layout
736	230808	201-12	
	230809	201-12	Machine Room Floor Electrical Layout Dressing Room Details
			DIOBSTILL ROOM DECALLS
738	230810	201-12	Electrical Details

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Q	-16.12. Pos	t Tailor and Co	obbler Shop
5848	247999	221-7	Foundation Plan and Details
5849	248000	221-7	Floor Plan and Finish Schedule
5850	248001	221-7	Elevations
5851	248002	221-7	Wall Sections and Exterior Details
5852	248003	221-7	Toilet Room Layouts and Mech. Pit
11831	248004	221-7	Details of Steam Spotting Table -
		DD1-1	Work Table - Ramp and Runway
9810	248005	221-7	Color Scheme
4625	248006	221-7	
5670	248007	221-7	Heating and Process Steam
3699	248008	221-7	Cleaning Plant - Ventilation
5665	248009	221-7	Plumbing and Details
0000	210000	661-1	Cleaning Plant - Piping and Equipment Layout
2781	248010	221-7	Electrical Layout
3755	248011	221-7	Dur Cleaning Diant Flastein 2
3756	248012	221-7	Dry Cleaning Plant - Electrical Layou
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. 0	-16.13. Pos	t Dispensary	
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1166	248057	400-3	Plans & Sections of Elevator
3857	248058	400-3	Basement and Foundation Plan
3858	248059	400-3	lst. Floor Plan
3859	248060	400-3	2nd. Floor Plan
3860	248061	400-3	Roof Plan
3861	248062	400-3	Schedule of Room Finishes
3862	248063	400-3	Front and Sides Elevations
3863	248064	400-3	Rear and Inside Wing Elevation
			Dormer Details
3864	248065	400-3	Typical Wall Sections and Cornice Det
3865	248066	400-3	Plan of Entrance No.1 and Area and
			Stairs #7
3866	248067	400-3	Sections thru Entrance No. 1 and
		1	Portico Cornice Details
3867	248068	400-3	Details of Entrance 1 and Portico
			Cornice
3868	248069	400-3	Details of Entrance Door No. 1
3869	248070	400-3	Details of Elevator and Stairs No. 1.
3870	248071	400-3	Details of Elevator Penthouse and
		100 0	Cupola Framing
3871	248072	400-3	Details of Cupola
3872	248073	400-3	Details of Rear Entrance Bay
3873	248074	400-3	Details of Entrance No. 2.
3874	248075	400-3	Sections thru Main Bldg. and Wings
3875	248076	400-3	Details of Entrance No. 7 and A
3876	248077	400-3	Details of Entrance No. 3. and 4. Details of Entrance No. 5.
3877	248078	400-3	
3878	248079	400-3	Details of Entrance Nos. 6,7, and 8
1010	610013	400-3	Details of Stairs Nos. 2. and 3.

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3879	248080	400-3	Details of Stairs Nos. 4, 5, and 6.
3880	248081	400-3	Typical Interior Door Trim and Base
3881	248082	400-3	Door Schedule and Details
3882	248083	400-3	
0004	240000	400-0	Details of Pharmacy - Pharmacy
7007	240004	100 7	Storage and Lab.
3883	248084	400-3	Details of D.O.R. 239, 238, 237, 236, 235, 206, 205, 209, 203, 229 & 227
3884	248085	400-3	Details of Typical D.O.R.
7000	040000	100 8	Prostlitic Lab. E.E.N.T.
3885	248086	400-3	Details of X-Ray and Dark Rooms 208, 209. 110, and 111.
3886	248087	400-3	Details of Nurses' Office, Exam.
			Room 131 Minor Surgical and Malaria
	0.0000		Control Room
3887	248088	400-3	Details of Out Patients and Dental Waiting Room
3888	248089	400-3	Dets. of Linen Rooms 137 - 264 Fire
		100 0	Hose Cabinets Soiled Clothes and
			Clothes
7854	248090	400-3	Dets. of Toilets No. 121, 122
			Nurses Sta. 259 Sterl. Room 258
7855	248091	400-3	Dets. of Toilets No. 148,149,166, 167,106,138
7856	248092	400-3	Dets. of Toilets No. 234,243, O.R.,
	(*)		Sterl. Room, Dressing Room
7857	248093	400-3	Dets. of Toilets Nos. 220, 146, 268,
2050	040004	100 B	249, 265, 263. 144.
7858	248094	400-3	Dets. of Board Room and Library
7859	248095	400-3	Dets. of Diet Kitchen and Issue Room
7860	248096	400-3	Dets. of Veneral Treatment Room and Dispensary
7861	248097	400-3	Plans and Details of Lobby No. 101
7862	248098	400-3	Details of Entrance Lobby
0842	248099	400-3	Tile Wainscot Details
0855	248100	400-3	Schedule of Tile Terrazzo
1846			
.1040	248101	400-3	Locker Details for Rooms 138 - 172 - 215 and 251 Bench Details for Room
			105,
11847	248102	400-3	Storage Cabinet Details for Rooms 155-201 and 240
11810	248103	400-3	Schedule of Venetian Blinds
0888	248104	400-3	Color Scheme
810	248105	400-3	Foundation and Piling Plan
811	248106	400-3	Piling Caps and Miscellaneous Dets.
812	248107	400-3	Column Schedule and Steam Pit
836	248108	400-3	
000	C40100	÷00=3	Bar Bending Schedule Foundation and Exterior Features Plan "A"
837	248109	400-3	Bar Bending Schedule Foundation and
			Exterior Features Plan "B"

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3879	248080	400-3	Details of Stairs Nos. 4, 5, and 6.
3880	248081	400-3	Typical Interior Door Trim and Base
3881	248082	400-3	Door Schedule and Details
3882	248083	400-3	Details of Pharmacy - Pharmacy Storage and Lab.
3883	248084	400-3	Details of D.O.R. 239, 238, 237, 236 235, 206, 205, 209, 203, 229 & 227
3884	248085	400-3	Details of Typical D.O.R. Prostlitic Lab. E.E.N.T.
3885	248086	400-3	Details of X-Ray and Dark Rooms 208, 209. 110, and 111.
3886	248087	400-3	Details of Nurses' Office, Exam. Room 131 Minor Surgical and Malaria Control Room
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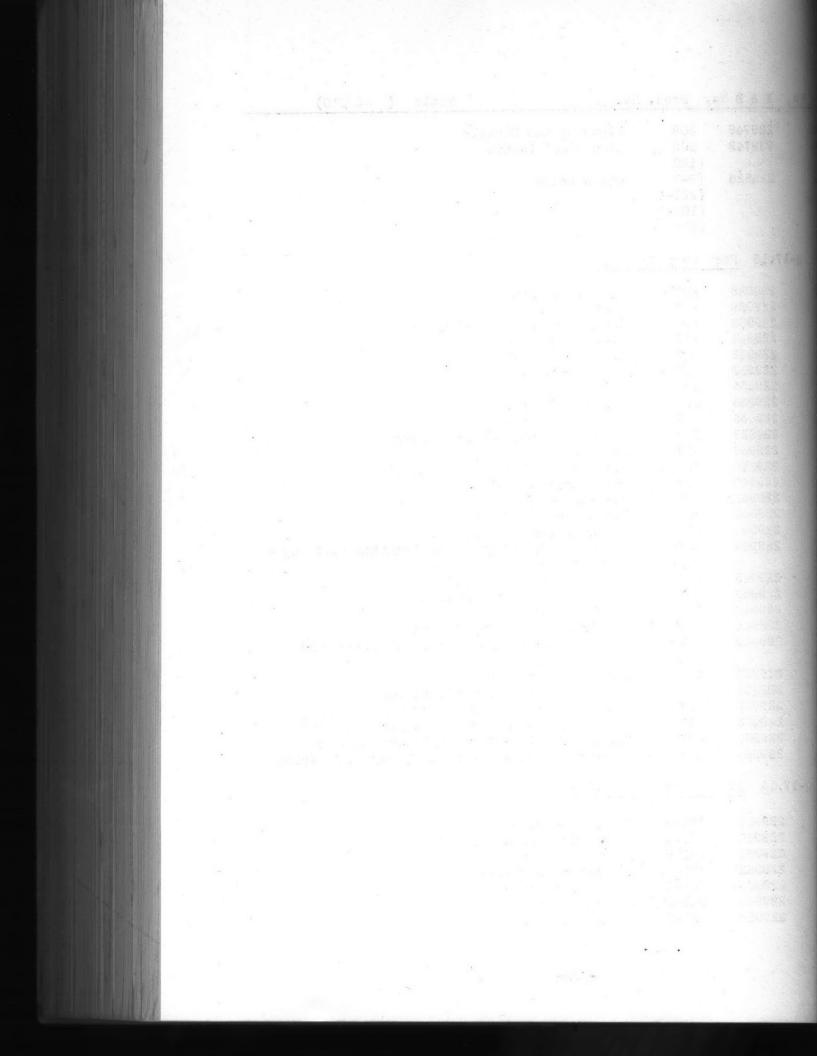
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1646	230168	108-7	Std. Service Water Pipings
1648	230169	108-7	Comp. Air Piping
2715	230170	108-7	Power Wiring Layout
2716	230171	108-7	Power Wiring Layout G. Floor
2717	230172	108-7	Power Wiring Layout
2718	230173	108-7	Lighting Layout
2719	230174	108-7	Lighting Layout
2720	230175	108-7	Lighting Layout
2721	230176	108-7	Primary Service
2728	230177	108-7	Emergency Light Control
2729	230178	108-7	Electrical Layout Coal Handling
2745	230179	108-7	Ash Conveyer Control Equip. Schedule Power Panels
2747	230180	108-7	Conveyor & Bucket Elevators
1725	230181	108-7	Unit Substation
3705	230184	108-7	Elec. Substation - Sleeves
2739	230185	108-7	Lighting Layout of Mezzanine and Lighting Riser Diagram
1639	230187	108-7	Machinery Location Plan - Ground Plan
1640	230188	108-7	Machinery Location Plan - Operating Floor
	Q-17.19 Gaso	line and	Oil Storage & Distribution Pump House
11806	248017	108-11	Foundations - Floor Plan Elevations Sections and Details
	Q-17.20 No.	6 Fuel Oi	1 Storage & Distribution Pump House
10894	248019	221-2	Complete on this sheet
	Q-17.21 Load	ling and U	Inloading Ramp Between Tracks 1 & 2 - Ind. Area
10886	248021	147	Complete on this sheet
	Q-17.22 Heat	ing Plant	at Traffic Circle
4651 4675	248045 248046	222-1 222-1	Foundation and Location Plan Piping Layout

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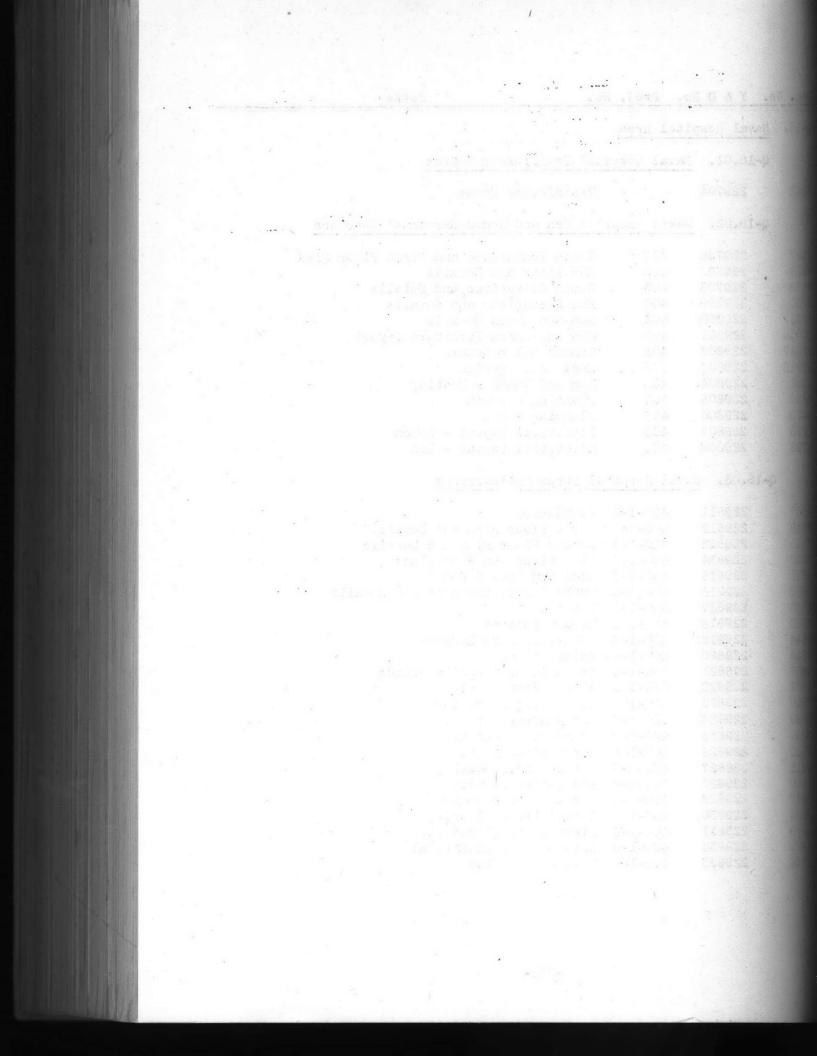
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Q-18. Naval Hospital Area

Q-18.01. Naval Hospital Transformer Houses

Title

8842	229794		Transformer House
	Q-18.02.	Naval Hospi	tal Men and Women Servants' Quarters
8827	229796	403	Women Foundation and First Floor Plan
8829	229797		Men Plans and Details
8828	229798	403	Women Elevations and Details
8830	229799	403	Men Elevations and Details
8831	229800	403	Men and Women Details
10844	229801	403	Men and Women Furniture Layout
11817	229802	403	Womens Color Scheme
11816	229803	403	Mens Color Scheme
4662	229804		Men and Women - Heating
4680	229805		Plumbing - Women
4679	229806		Plumbing - Men
2795	229807		Electrical Layout - Women
2796	229808	403	Electrical Layout - Men
	Q-18.03. 1	Naval Hospit	al Corpsmens' Barracks
		and a standard and an and a standard	an a
2847	229811	400-1-6	Foundation
2848	229812	400-1-6	First Floor Plan and Details
2849	229813	400-1-6	Second Floor Plan and Details
2850	229814	400-1-6	Elevations and Roof Plans
2851	229815	400-1-6	Room and Door Schedule
2852	229816	400-1-6	Typical Wall Sections and Details
2853	229817	400-1-6	Details
3800	229818	400-1-6	Wooden Lockers
8844	229819	400-1-6	Detail of Fire Ladders
9820	229820	400-1-6	Color Scheme
9837	229821	400-1-6	Schedule of Venetian Blinds
2854	229822	400-1-6	First Floor Framing
2855	229823	400-1-6	Second Floor Framing
2899	229824	400-1-6	Bar Bending Schedule
2609	229825	400-1-6	
2610	229826	400-1-6	First Floor Heating
2611	229827	400-1-6	Second Floor Heating
2606	229828	400-1-6	Foundation Plumbing
2607	229829	400-1-6	First Floor Plumbing
2608	229830	400-1-6	Second Floor Plumbing
1719	229831	400-1-6	First Floor Electrical
1720	229832	400-1-6	Second Floor Electrical
796	229833	400-1-6	Telephone System



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Title

	Q-18.04.	Naval Hospital	- Warehouse
1812	229838	400-1-13	Foundation and Floor Plan
1813	229839		Elevation and Details
1814	229840		Sections and Details
2887	229841		Window Details (Warehouse and Shop)
1810	229842		Electrical Layout
10841			Color Schemes (Warehouse and Shop)
3115	229844		Preliminary
	Q-18.05.	Naval Hospital	- Medical Storehouse
2841	229846	400-1-8	Foundation Column Schedule
2842	229847		Floor Plan Elevation Section Schedule
2843	229848		Roof Plan Detail and Beam Schedule
2844	229849		Details
8875	229850		Shelf Details
8876	229851		Shelf Details
1019	229852		
2601	229853		Bar Bending Schedule
26001	229854		Heating Plan and Dotails
1726	229855		Plumbing Plan and Details (Grade Floor)
10830			Electrical Layout Color
133	229857		Preliminary
	Q-18.06.	Naval Hospital	- Shops
1815	229860		Foundation and Floor Plan
1816	229861	400-1-13	Elevations
1817	229862	400-1-13	Details and Schedules
2887	229841	400-1-13	Window Details (Warehouse and Shop)
10841	229843	400-1-13	Color Schemes (Warehouse and Shop)
2605	229863	400-1-13	Heating
2604	229864	400-1-13	Plumbing
1702	229865	400-1-13	Electrical Layout
3114	229866	400-1-13	Preliminary
	Q-18.07. 1	Naval Hospital	Garage
1887	229869	400-1-9	Plans, Sections, Details
1888	229870	400-1-9	Elevations, Details
4851	229871	400-1-9	F.S. Window Details
4852	229872	400-1-9	F.S. Window Details
1889	229873	400-1-9	Oil Separator Pit
2886	229874	400-1-9	Bar Bending Schedule
2602	229875	400-1-9	Grade Fl. Rlumbing Plan
2603	229876	400-1-9	Grade Fl. Heating Plan
1711	229877	400-1-9	Electrical Layout
10839	229878	400-1-9	Color Schemes
196	229879	107-1-5	Preliminary
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1000	Q-18.08. Nu		
4800	229883	400-1-11	Foundation
4801	. 229884	400-1-11	
4802	229885	400-1-11	2nd. Floor and Roof Plan
4803	229886	400-1-11	Elevations
1804	229887	400-1-11	Elevations and Sections
1805	229888	400-1-11	
808	229889	400-1-11	Stair Details
807	229890	400-1-11	Toilet Details
806	229891	400-1-11	Mechanical Pit
822	229892	400-1-11	Venetian Blinds
.0815	229893	134-1	1st. and 2nd. Fl. Plans - Rugs & Furniture
690	229894	400-1-11	Foundation Heating
691	229895	400-1-11	lst. Floor Heating
692	229896	400-1-11	2nd. Floor Heating
644	229897	400-1-11	Foundation Plumbing
645	229898	400-1-11	lst. Floor Plumbing
646	229899	400-1-11	2nd. Floor Plumbing
0822	229900	400-1-11	Color Schemes
(	Q-18.09. Na	val Hospital	Warrant Officers' Quarters
874	229915	400-1-15	Plan and Elevation
827	229916	400-1-15	Foundation Plan and Details
828	229917	400-1-15	Floor Plan and Details
329	229918	400-1-15	Elevations
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330	229919	400-1-15	Details
830 811		400 <b>-1-1</b> 5 400 <b>-1-1</b> 5	Details Venetian Blinds
830 811	229919		
830 811 0806	229919 229920	400-1-15	Venetian Blinds
830 811 0806 656	229919 229920 229921	400 <b>-</b> 1 <b>-</b> 15 400 <b>-</b> 1 <b>-</b> 15	Venetian Blinds Color Schemes (N.H.) Heating
830 811 0806 856 837	229919 229920 229921 229922	400-1-15 400-1-15 400-1-15	Venetian Blinds Color Schemes (N.H.)
830 811 0806 656 637 638	229919 229920 229921 229922 229923 229924	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing
830 811 0806 556 537 538	229919 229920 229921 229922 229923 229924 Q-18.10. <u>Nar</u> 230196	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 vy Hospital 402	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing Floor Plan Plumbing - Bachelor Officers' Quarters Foundation Plan & Footing Details
830 811 0806 556 537 538 600 800	229919 229920 229921 229922 229923 229924 Q-18.10. <u>Nar</u> 230196 230197	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 402 402	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing Floor Plan Plumbing - Bachelor Officers' Quarters Foundation Plan & Footing Details
330 311 0806 556 537 538 600 800 800	229919 229920 229921 229922 229923 229924 Q-18.10. Nar 230196 230197 230198	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 402 402 402 402	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing Floor Plan Plumbing - Bachelor Officers' Quarters Foundation Plan & Footing Details
830 811 0806 556 537 538 800 800 801 803 804	229919 229920 229921 229922 229923 229924 2-18.10. <u>Nar</u> 230196 230197 230198 230199	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 vy Hospital 402 402 402 402	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing Floor Plan Plumbing - Bachelor Officers' Quarters Foundation Plan & Footing Details Footings - Foundation and Refrigeration Walls
330 311 0806 556 337 338 600 800 800 800 803 804 807	229919 229920 229921 229922 229923 229924 Q-18.10. Nar 230196 230197 230198	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 402 402 402 402	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing Floor Plan Plumbing - Bachelor Officers' Quarters Foundation Plan & Footing Details Footings - Foundation and Refrigeration Walls lst. and 2nd. Floor Plan
830 811 0806 556 537 538 600 800 801 803 804 807 811	229919 229920 229921 229922 229923 229924 2-18.10. <u>Nar</u> 230196 230197 230198 230199	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 vy Hospital 402 402 402 402	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing Floor Plan Plumbing - Bachelor Officers' Quarters Foundation Plan & Footing Details Footings - Foundation and Refrigeration Walls lst. and 2nd. Floor Plan Elevation and Details
830 811 0806 556 537 538 800 801 803 804 807 811	229919 229920 229921 229922 229923 229924 2-18.10. <u>Nat</u> 230196 230197 230198 230199 230200	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 vy Hospital 402 402 402 402 402 402	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing Floor Plan Plumbing - Bachelor Officers' Quarters Foundation Plan & Footing Details Footings - Foundation and Refrigeration Walls lst. and 2nd. Floor Plan Elevation and Details Stair Section and Details Brick Coursing Detail
830 811 0806 556 537 538 600 800 800 801 803 804 807 811 805	229919 229920 229921 229922 229923 229924 2-18.10. Nar 230196 230197 230198 230199 230200 230201	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 402 402 402 402 402 402 402 402	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing Floor Plan Plumbing - Bachelor Officers' Quarters Foundation Plan & Footing Details Footings - Foundation and Refrigeration Walls lst. and 2nd. Floor Plan Elevation and Details Stair Section and Details Brick Coursing Detail Section A-A Bay Window Details
330 311 0806 556 537 338 600 601 803 804 807 11 805 806	229919 229920 229921 229922 229923 229924 0-18.10. Nav 230196 230197 230198 230199 230200 230201 230202	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 402 402 402 402 402 402 402 402 402 402	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing Floor Plan Plumbing - Bachelor Officers' Quarters Foundation Plan & Footing Details Footings - Foundation and Refrigeration Wall: lst. and 2nd. Floor Plan Elevation and Details Stair Section and Details Brick Coursing Detail Section A-A Bay Window Details Section B-B Dining Room Cornice Details
830 811 0806 556 537 538 300 801 303 304 805 806 806 808	229919 229920 229921 229922 229923 229924 2-18.10. Nar 230196 230197 230198 230199 230200 230201 230202 230203	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 <b>vy</b> Hospital 402 402 402 402 402 402 402 402 402 402	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing Floor Plan Plumbing - Bachelor Officers' Quarters Foundation Plan & Footing Details Footings - Foundation and Refrigeration Walls Ist. and 2nd. Floor Plan Elevation and Details Stair Section and Details Brick Coursing Detail Section A-A Bay Window Details Section B-B Dining Room Cornice Details Main Entrance Details
330 311 0806 556 537 538 600 601 603 604 607 611 605 606 608 609	229919 229920 229921 229922 229923 229924 2-18.10. Nar 230196 230197 230198 230199 230200 230201 230200 230201 230202 230203 230204 230205	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 <b>vy Hospital</b> 402 402 402 402 402 402 402 402 402 402	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing Floor Plan Plumbing - Bachelor Officers' Quarters Foundation Plan & Footing Details Footings - Foundation and Refrigeration Walls Ist. and 2nd. Floor Plan Elevation and Details Stair Section and Details Brick Coursing Detail Section A-A Bay Window Details Section B-B Dining Room Cornice Details Main Entrance Details Side Entrance Details
830 811 0806 656 637 638 800 800 801 803 804 807 811 805 806 808 809 810	229919 229920 229921 229922 229923 229924 229924 230196 230196 230197 230198 230199 230200 230201 230200 230201 230202 230203 230204 230205 230206	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 <b>vy Hospital</b> 402 402 402 402 402 402 402 402 402 402	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing Floor Plan Plumbing - Bachelor Officers' Quarters Foundation Plan & Footing Details Footings - Foundation and Refrigeration Walls Ist. and 2nd. Floor Plan Elevation and Details Stair Section and Details Brick Coursing Detail Section A-A Bay Window Details Section B-B Dining Room Cornice Details Main Entrance Details Side Entrance Details Brick Terraces and Details
830 811 0806 656 637 638 800 800 801 803 804 807 811 805 806 808 809 810 812	229919 229920 229921 229922 229923 229924 229924 230196 230196 230197 230198 230197 230198 230199 230200 230201 230200 230201 230202 230203 230204 230205 230206 230207	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 402 402 402 402 402 402 402 402 402 402	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing Floor Plan Plumbing - Bachelor Officers' Quarters Foundation Plan & Footing Details Footings - Foundation and Refrigeration Walls Ist. and 2nd. Floor Plan Elevation and Details Stair Section and Details Brick Coursing Detail Section A-A Bay Window Details Section B-B Dining Room Cornice Details Main Entrance Details Side Entrance Details Brick Terraces and Details Room Finish and Door Schedule
830 811 0806 656 637 638	229919 229920 229921 229922 229923 229924 229924 230196 230196 230197 230198 230199 230200 230201 230200 230201 230202 230203 230204 230205 230206	400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 400-1-15 <b>vy Hospital</b> 402 402 402 402 402 402 402 402 402 402	Venetian Blinds Color Schemes (N.H.) Heating Foundation Plumbing Floor Plan Plumbing - Bachelor Officers' Quarters Foundation Plan & Footing Details Footings - Foundation and Refrigeration Walls Ist. and 2nd. Floor Plan Elevation and Details Stair Section and Details Brick Coursing Detail Section A-A Bay Window Details Section B-B Dining Room Cornice Details Main Entrance Details Side Entrance Details Brick Terraces and Details

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10892	230211	402	Color Schemes
8802	230212	402	Boiler Room Structural and
			Miscellaneous Details
3680	230213	402	Foundation - Heating
3681	230214	402	lst. and 2nd. Floor - Heating
1663	230215	402	Galley Layout and Exhaust Vent
3677	230216	402	Foundation Plumbing
678	230217	402	lst. and 2nd. Floor - Plumbing
3679	230218	402	Stacks and Risers - Plumbing
1677	230219	402	Galley Layout and Plumbing
1786	230220	402	Electrical Layout 1st. and 2nd.
1100	200220	100	Floor
(	Q-18.11. Navy Hos	pital - Nurses' H	ome
8801	230224	400-1-7	Foundation Plan
808	230225	400-1-7	lst. Floor Plan
809	230226	400-1-7	2nd. Floor Plan
3810	230227	400-1-7	Elevations
811	230228	400-1-7	Elevations
812	230229	400-1-7	Stair Details
813	230230	400-1-7	Bath Room Details
814	230231	400-1-7	Main Entrance
815	230232	400-1-7	Side Entrance Details
816	230233	400-1-7	Typical Sections
817	230234	400-1-7	Refrigerator Details
818	230235	400-1-7	Room Finish Schedule
865	230236	400-1-7	Venetian Blinds Schedule
0829	229077	400-1-7	Fire Hose Cabinets
802	230237	400-1-7	lst. Floor Framing Plan
803	230238	400-1-7	lst. Floor Framing Plan
804	230239	400-1-7	
	230239		lst. Floor Framing Plan
805		400-1-7	2nd. Floor Framing Plan
819	230241	400-1-7	Bar Bending Schedule
820	230242	400-1-7	Bar Bending Schedule
660	230243	400-1-7	Heating - Foundation & 1st. Fl. Pla
661	230244	400-1-7	Heating - 2nd. Floor Plan
664	230245	400-1-7	Galley Layout Exhaust Vent
628	230246	400-1-7	Plumbing - Foundation Plan
629	230247	400-1-7	Plumbing - 1st. Fl. Plan
630	230248	400-1-7	Plumbing - 2nd. Floor Plan
631	230249	400-1-7	Plumbing Details
661	230250	400-1-7	Galley Plumbing Details
782	230251	400-1-7	lst. Floor Electrical
783	230252	400-1-7	2nd. Floor Electrical
675	230253	400-1-7	Refrigeration Fixtures
605 0873	230254 230255	400-1-7 400-1-7	Galley Equipment Steam Color Scheme

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#### Dwg. No. Y & D No. Proj. No.

Q-18.12. Naval Hospital - Laundry 4861 230258 400-1-12 Foundation Plans, Str. Dets., Beam Schedule Floor, Monitor and Roof Plan 4862 230259 400-1-12 4863 230260 400-1-2 Elev. Sections, Details and Schedules 4865 230261 400-1-12 Details 4864 230262 400-1-12 Toilet Room Details 10871 230263 400-1-12 Color Scheme 4867 230264 400-1-12 Bar Bending Schedule and Roof 2689 230265 400-1-12 1st. Fl. Plan - Heating & Process Piping & Details 230266 400-1-12 2688 1st. Fl. Plumbing Plan & Details 400-1-12 Electrical Power Layout 3718 230267 1776 230268 400-1-12 Electrical Layout 1170 230269 400-1-12 Preliminary. Q-18.13. Naval Hospital - Wards and Corridors 2892 230283 400-1-5 West Wing - Foundation Plans East Wing - Foundation Plans 2893 230284 400-1-5 2894 230285 500-1-5 Foundation - Sections - Ward Stair Hall -Window Dets. 2895 230286 400-1-5 Service Bays 17, 18, 19 & 20 Basement and Foundation Plans Sections and Details 4895 230287 400-1-5 West Wing - 1st. Floor Key Plan 4896 230288 400-1-5 West Wing - 2nd. Floor Key Plan 4897 230289 400-1-5 East Wing - 1st. Floor Key Plan 4898 230290 400-1-5 East Wing - 2nd. Floor Key Plan 4899 230291 400-1-5 Ward 6 - 1st. Fl. Plan - Sick Officer Qtrs. 5800 230292 Ward 6 - 2nd. Fl. Plan - Sick Officer Qtrs. 400-1-5 5801 230293 400-1-5 Ward 7,8,9, & 10 - 1st. Fl. Plan - Typical Medical Ward Ward 7,8,9 & 10 - 2nd. Fl. Plan - Typical 5802 230294 400-1-5 Medical Ward 5803 230295 400-1-5 Ward 11 - 1st. Fl. Plan - Urological Ward Ward 11 - 2nd. Fl. Plan - Dermatology and 5804 230296 400-1-5 Syphillis Ward Ward 12 - 1st. Fl. Plan - Typical Medical 5805 230297 400-1-5 Ward 230298 400-1-5 Ward 12 - 2nd. Fl. Plan - Sick Officers Qtrs 5806 5807 230299 400-1-5 Ward 13,14, & 15 - 1st. Fl. Plan - Typical Medical Ward 5808 230300 400-1-5 Ward 13,14, & 15 - 2nd. Floor Plan - Typical Surgical Ward 5809 230301 400-1-5 Ward 16 - 1st. Fl. Plan - Neuropsychiatric Ward 5810 230302 400-1-5 Ward 16 - 2nd. Fl. Plan - Isolation Ward 5811 230303 Service Bays 17, 19, 20 and Connecting 400-1-5 Corridors & Elevations - 1st. & 2nd. Floor Plans 5812 400-1-5 230304 Service Bays 18 & Connecting Corridors & Elevations - 1st. & 2nd. Floor Plans 230305 400-1-5 5813 Typical Ward - Elevations

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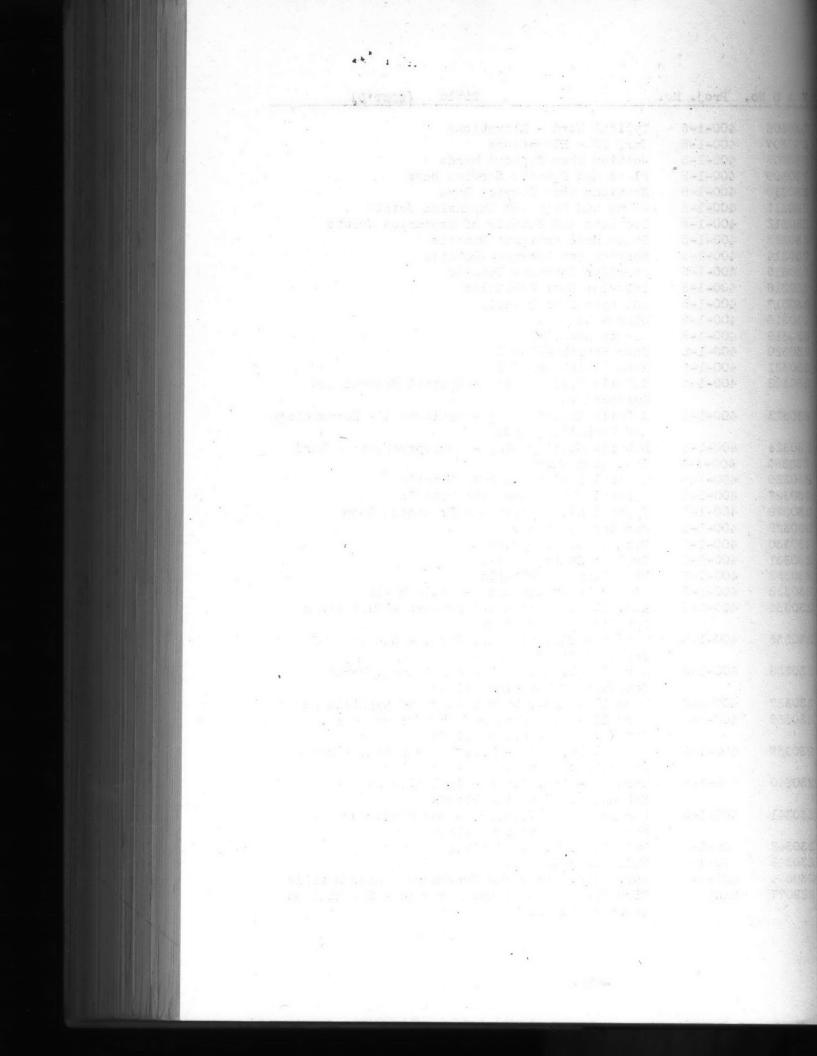
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5816	230308	400-1-5	Ward 16 - Elevations
5817	230309		Section thru Typical Wards
5818	230310	400-1-5	Plans and Details Service Bays
5819	230310	400-1-5	Sections thru Service Bays
5820	230312	400-1-5 400-1-5	Plans and Dets. of Expansion Joints
5821	230312		Sections and Details of Expansion Joints
5822	230313	400-1-5	Stair Hall Entrance Details
5823		400-1-5	Service Bay Entrance Details
5824	230315	400-1-5	Corridor Entrance Details
5825	230316	400-1-5	Interior Door Schedules
	230317	400-1-5	Interior Door Details
5826	230318	400-1-5	Window Schedules
5827	230319	400-1-5	Window Details
5828	230320	400-1-5	Room Finish Schedule
5829	230321	400-1-5	Room Finish Schedule
5830	230322	400-1-5	Details Utility Wing - Typical Medical and Surgical Wards
5831	230323	400-1-5	Details Utility Wing - Urological - Dermatolo and Syphillis Wards
5832	230324	400-1-5	Details Utility Wing - Neuropsychiatric Ward
5833	230325	400-1-5	Isolation Ward
5834	230326	400-1-5	Typical Toilet and Bath Details
5835	230327	400-1-5	Typical Toilet and Bath Details
5836	230328	400-1-5	Typical Dict Pantry and Treatment Room
5837	230329	400-1-5	Cornice Details
5838	230330	400-1-5	Dotails of Equipment
5839	230331	400-1-5	Typical Stair Details
5840	230332	400-1-5	Miscellaneous Details
5841	230333	400-1-5	Glazed Brick Coursing - Stair Halls
6818	230334	400-1-1	Adm. Bldg. Wards and Corridors - Full Sized Details - Basement Window
3847	230335	400-1-5	Ward 6 - Sick Officers Qtrs Schedule of Venetian Blinds
3848	230336	400-1-5	Ward 7,8,9, & 10 - Medical & Surg. Wards
3849	230337	400-1-5	Schedule of Venetian Blinds
3850	230338	400-1-5	Ward 11 - Uro., Dermatology and Syphilis Ward Ward 12 - Med. Ward & Sick Officers Qtrs. Schodule of Venetian Blinds
851 .	230339	400-1-5	Ward 13,14, & 15 - Mod. and Surgical Wards - Schedule of Venetian Blinds
852	230340	400-1-5	Ward 16 - 2nd. Floor - Isolation Ward -
853	230341	400-1-5	Schedulo of Venetian Blinds Service Bays 17,18,19,20 and Conn. Corr
830	230342	400-1-5	Schedule of Venctian Blinds
831	230343	400-1-5	Full Sized Window Details
0814	230344	400-1-5	Full Sized Details
0829	229077	400-1-4 Many	Adm. Bldg. Wards and Corridors - Door Details Fire Hose Cabinets and Schedule - See Balloon

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11826	230345	400-1-5	Color Scheme
11827	230346	400-1-5	
11828	230347	400-1-5	
11829	230348	400-1-5	
11830	230349	400-1-5	
4821	230350	400-1-5	
4822	230351	400-1-5	
2897	230352	400-1-5	
3838	230353	400-1-5	
3854	230354		Column and Pier Schedule
3893	230355	400-1-5	Wards - First Floor Framing Plan
0000	200000	400-1-5	Wards 6 & 12 - 1st. Floor Plans - De-
3894	020750	100 3 5	pressed Area and Pipe Sleeve Layout
3094	230356	400-1-5	, , , , , , , , , , , , , , , , , , , ,
7005	020755		Plan Depressed Area & Pipe Sleeve Layout
. 3895	230357	400-1-5	Wards 11 & 16 - 1st.Floor Plan - De-
7000			pressed Area & Pipe Sleeve Layout
3896	230358	400-1-5	Corridors - First Floor Framing Plans
4817	230359	400-1-5	Ward - Second Floor Framing Plans
4818	230360	400-1-5	Wards 6 & 12 - 2nd. Floor Framing Plans
			& Depressed Area & Pipe Sleeve Layout
4819	230361	400-1-5	Wards 7,8,9,10,13,14, & 15 Floor Framing
			Plans Depressed Area & Pipe Sleeve Layou
4820	230362	400-1-5	Wards 11 & 16 Floor Framing Plans de-
			pressed Area & Pipe Sleeve Layout
4823	230363	400-1-5	Corridors Sleeve Layout
6873 .	230364	400-1-5	Ward 13,14, & 15 2nd. Floor Plan - De-
/			pressed Areas & Pipe Sleeves Layout
6874	230365	400-1-5	Ward 16 2nd. Floor Plan - Depressed
			Areas & Pipe Sleeve Layout
5876	230366	400-1-5	Bar Bending Schedule
7810	230367	400-1-5	Wards & Corridors - 2nd. Floor - Bar
		100 1 0	Bending Schedule
2896	230368	400-1-5	
2613	230369	400-1-5	Wall Sections & Dets. of Expansion Joint
2010	200002		Ward 6 - 1st. and 2nd. Floor Plans Heat-
2614	230370	400-1-5	ing
007.2	200010	400-1-5	Ward 7,8,9,& 10 - 1st. & 2nd. Floor Plan
2615	230371	400 1 5	Heating
2616		400-1-5	Ward 11 1st. & 2nd. Floor Plans Heating
2617	230372	400-1-5	Ward 12 1st. & 2nd. Floor Plans Heating
1102	230373	400-1-5	Ward 13,14, & 15 1st. & 2nd. Floor Plan
2010	020224	100	Heating
2618	230374	400-1-5	Ward 16 1st. & 2nd. Floor Plans Heating
2619	230375	400-1-5	Service Bay #18 & Connecting Corridor
			lst. & 2nd. Floor Plan Heating
2620	230376	400-1-5	Service Bay 17,19, & 20 Connecting
			Corridor 1st. & 2nd. Floor Plan Heating
2621	230377	400-1-5	Ward 6 Foundation Plan Heating
2622	230378	400-1-5	Ward 7,8,9 & 20 Foundation Plan Heating
2623	230379	400-1-5	Ward 11 Foundation Plan Heating
2624	230380	400-1-5	Ward 12 Foundation Plan Heating
2625	230381	400-1-5	Ward 13,14 & 15 Foundation Plan Heating
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2626	230382	400-1-5	Ward 16 Foundation Plan Heating
2627	230383	400-1-5	West Wing Corridor Foundation Plan and Dets. Heating
3669	230384	400-1-5	East Wing Corridors Foundation Plans & Dets. Heating
3670	230385	400-1-4	Pipe Tunnel, H.P. Steam Line and Dets. Heating
3667	230386	400-1-5	Wards - Ventilation - 1st. and 2nd. Floors
3668	230387	400-1-5	Wards - Ventilation - Units in Attic
2640	230388	400-1-5	Naval Hospital N. & C., A & M., Post Disp.
		400-1-4	Plumbing
		400-1-5	5
2657	230389	400-1-5	Ward 6 - Foundation Plan Plumbing
2658	230390	400-1-5	Ward 6 - 1st. Floor Plan & Details Plumbing
2659	230391	400-1-5	Ward 6 - 2nd. Floor Plan & Details
2660	230392	400-1-5	Ward 6 - Plumbing Details
2661	230393	400-1-5	Ward 7,8,9, & 10 Foundation Plan Plumbing
2662	230394	400-1-5	Ward 7,8,9 & 10 1st. Floor Plan and Det.
2663	230395	400-1-5	Ward 7,8,9 & 10 2nd. Floor Plan and Det.
2664	230396	400-1-5	Ward 7,8,9 & 10 Plumbing Details
2665	230397	400-1-5	Ward 11 Foundation Plan - Plumbing
2666	230398	400-1-5	Ward 11 First Floor Plan and Details Plumbing
2667	230399	400-1-5	Ward 11 Second Floor Plan and Details Plumbin
2668	230400	400-1-5	Ward 11 Plumbing Details
2669	230401	400-1-5	Ward 12 Foundation Plan - Plumbing
2670	230402	400-1-5	Ward 12 1st. Floor Plan and Details Plumbing
2671	230303	400-1-5	Ward 12 2nd. Floor Plan and Details Plumbing
2672	230404	400-1-5	Ward 12 Plumbing Details
2673	230405	400-1-5	Ward 13,14 & 15 Foundation Plan Plumbing
2674	230406	400-1-5	Ward 13,14, & 15 1st. Fl. Plan and Dets.
2675	230407	400-1-5	Ward 13,14 & 15 2nd. Floor Plan & Dets. Plumbing
2676	230408	400-1-5	Ward 13,14 & 15 Plumbing Details
2677	230409	400-1-5	Ward 16 Foundation Plan Plumbing
2678	230410	400-1-5	Ward 16 1st. Floor Plan and Details Plumbing
2679	230411	400-1-5	Ward 16 2nd. Floor Plan and Details Plumbing
2680	230412	400-1-5	Ward 16 Plumbing Details
2681	230413		West Wing Corridors Foundation Plan Pjumbing
2682	230414	400-1-5	West Wing Corridors 1st. Floor Plan & Dets. Plumbing
2683	230415	400-1-5	West Wing Corridors 2nd. Floor Plan & Dets. Plumbing
2684	230416	400-1-5	East Wing Corridors Foundation Plan Plumbing
2685	230417	400-1-5	East Wing Corridors 1st. Floor Plan
2686	230418	400-1-5	East Wing Corridors 2nd. Floor Plan
2687	230419	400-1-4	Corridor and Adm. Bldg. Foundation Plan
		400-1-5	Plumbing Details
1762	230420	400-1-5	Ward 6 Sick Officers Qtrs Electrical

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1763	230421	400-1-5	Ward 6 Sick Officers Quarters Electrical
1764	230422	400-1-5	Ward 7,8,9 & 10 Typical Medical Ward - Electrical
1765	230423	400-1-5	Ward 7,8,9, & 10 Typical Medical Ward - Electrical
1766	230424	400-1-5	Ward 11 Cronological - Electrical
1767	230425	400-1-5	Ward 11 Cronological - Electrical
1768	230426	400-1-5	Ward 12 Medical Ward - Electrical
1769	230427	400-1-5	
1770	230428	400-1-5	Ward 12 Sick Officers Quarters - Electrical
1771	230429	400-1-5	Ward 16 Neuropsychiatric - Electrical
1772			Watd 16 Isolation - Electrical
	230430	400-1-5	West Wing Ward and Corridor - Electrical
1773	230431	400-1-5	Electrical Details - Nurses Call - Nurses
1004	0.504.50	100 3 5	Station Cabinet and Exp. Boxes
1774	230432	400-1-5	Electrical Details
1775	230433	400-1-5	Service Bays Plans - Emergency Lighting Dets.
1167	230434	400-1-4	Adm. Building Wards and Corridors Elevator
		400-1-5	Dets.
11842	230435	400-1-5	Additional Expansion Joint - 1st. and 2nd. Floors
1167	230434	400-1-4 400-1-5	- Administration Bldg. and Mess Hall Administration Building - Wards & Corridors
5880	230455	400-1-4	Administration Building - 1st. Floor Plan
5881	230456	400-1-4	Mess Hall - 1st. Floor Plan
5882	230457	400-1-4	Administration Building - 2nd. Floor Plan
5883	230458	400-1-4	Mess Hall - 2nd. Floor Plan
5884	230459	400-1-4	Administration Building - 3rd. Floor Plan
5885	230460	400-1-4	Mess Hall - 3rd. Floor Plan - Adm. Bldg. & Mess Hall - Roof Plan
5886	230461	400-1-4	Administration Building - Elevations
5887	230462	400-1-4	Administration Building - Elevations
5888	230463	400-1-4	Administration Building - Elevations
5889		400-1-4	Administration Building - Elevations
5890		400-1-4	Mess Hall - Cross Sections and Details
5891		400-1-4	Mess Hall - Cross Sections and Details
892		400-1-4	Mess Hall - Cross Sections and Details
893		400-1-4	
894		400-1-4	Administration Building - Wall Sections Administration Building - Wall Sections - Pavilion and Main Entrance
895	230470	400-1-4	Administration Building - Pavilion and Cupola Details
896	230471	400-1-4	Administration Building - Window Details
897		400-1-4	Administration Building - Cornice Details
898		400-1-4	Administration Building - Cornice Details
899		400-1-4	Administration Building - Fublic Lobby Details
800		400-1-4	Administration Building - Finish Schedule Mess Hall - Finish Schedule
801		400-1-4	
802		400-1-4	Administration Building - Door Schedule
002	200411	100-1-4	Mess Hall - Door Schedule

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6803	230478	400-1-4	Administration Building - 1st. Floor Toilet and Bath Room Details
6804	230479	400-1-4	Administration Building - 2nd. Floor Toilet Details
6805	230480	400-1-4	Administration Building - 3rd. Floor Toilet Details
6806	230481	400-1-4	Mess Hall - Details of Toilets
6807	230482	400-1-4	Administration Building - Details of Stairs No. 1
6808	230483	400-1-4	Mess Hall - Details of Stairs No. 2,3,4, & 5
6816	230484	400-1-4	Administration Building and Mess Hall - Glazed Brick Details and Galley
6817	230485	400-1-4	Administration Building - Revised 3rd. Floor Plan & Detail
6818	230334	400-1-4	Administration Building - Wards and Corridors
		400-1-5	Full Sized Details - Basement Window
6819	230486	400-1-4	Mess Hall - Half Ceiling Plan and Details of Pilaster and Cove Cornice
6820	230487	400-1-4	Mess Hall - Details of Accoustical Ceilings
6821	230488	400-1-4	Details of Promenade Tile for Decks
6835	230489	400-1-4	Mess Hall - Equipment for Refreshment Room and Kitchen Second Floor
8845	230491	400-1-4	Administration Building - Schedule of Venitian Blinds
8846	230491	400-1-4	Mess Hall - Schedule of Venitian Blinds
9829	230492	400-1-4	Administration Building - Full Sized Window Details
9832	230493	400-1-4	Mess Hall - Galley Dresser Details
9833	230494	400-1-4	Details of Rails and Counters in Record Office No. 155 & Administration Bldg Dis- bursing Office No. 161
9834	230495	400-1-4	Administration Building - Details of Counter in Public Lobby
9867	230496	400-1-4	Closet Details
9868	230497	400-1-4	Mess Hall - Post Office Equipment Details
9869	230498	400-1-4	Mess Hall - Post Office Equipment Details
9870	230499	400-1-4	Details of X-Ray Suite and Ship Stores
9871	230500	400-1-4	Details of Equipment E.E.N.G. and Library No. 241
9872	230501	400-1-4	Details of Operating Suite
10814	230344	400-1-4	Administration Building - Wards and Corridors Door Details
10829	229077	Several	Firehouse Cabinets and schedules ( See Ball- oon Storehouse and Shop )
10837.	230502	400-1-4	Mess Hall - Details of Store Shelving, Bins and Platforms in Dry Storage and Issue Room
10848	230503	400-1-4	Administration Building and Mess Hall - Tile and Terrazzo
10850	230504	400-1-4	Third Floor Corridor - Elevation Details
10852	230505	400-1-4	Details of Light Proof Shades

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11822	230508	400-1-4	
11823	230509	400-1-4	Administration Building - Color Scheme
11824	230510	400-1-4	Auministration Building - Color Schome
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11841	230512	400-1-4	Mess Hall - Color Scheme
3831		400-1-4	Details of Partitions in Room. No. 371
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	230523	400-1-4	MOSS nall - Foundation Plan
5855	230524	400-1-4	Administration Building - 1st. Floor Framing Plan
5856	230525	400-1-4	Moss Hall 1st. Floor Framing Plan
5857	230526	400-1-4	Administration Building Plan
5858	230527	400-1-4	Administration Building - 2nd. Floor Plan Mess Hall - 2nd. Floor Plan
5859	230528	400-1-4	Administration Building - 3rd. Floor Framing Plan
5860	230529	400-1-4	* * 041
5861	230530	400-1-4	Mess Hall - 3rd. Floor Framing Plan
5862	230531	400-1-4	Administration Building - Attic Francisco Di
5863	230532	400-1-4	MOSS Hall - Attic Framing Dian
5864	230533		Administration Building - Pool Francis Di
5867	230534	400-1-4	MOSS HALL - ROOI Framing Plan
5868		400-1-4	Administration Building Bar Bending Schedule and Details Footings, Walls and Pagament
	230535	400-1-4	Mess Hall - Footings Bar Bending Schedule and Details
5869	230536	400-1-4	Mess Hall - Basement Wall and Column Bar Bending Details
6850	230537	400-1-4	Administration Building Columns - Bar Bending Details
6851	230538	400-1-4	Mess Hall - 1st. 2nd, & 3nd Story Column
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6853	230540	400-1-4	Adm. Building - 1st. Floor Bar Bending Details
6854	230541	400-1-4	TOUR HOUR HOM DONDER DI 13
6855	230542		Bending Details
6856	230543	400-1-4	Adm. Building & Mess Hall - 3nd Floor Bar Bending Details
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6858	230544	400-1-4	Administration Building - 1st. Floor Depressed Area & Pipe Sleeve Layout
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6859	230546	400-1-4	Administration Building - 2nd. Floor Depressed Area and Pipe Sleeve Layout
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5861	230548	400-1-4	Adm. Bldg 3rd. Floor Dopressed Area & Pipe Sleeve Layout
6862	230549	400-1-4	Mess Hall - 3rd. Floor Depressed Area and Pipe

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10853	230506	400-1-4	Mess Hall Details of Refrigerator Doors and Glazed Brick Coursing
11821	230507	400-1-4	Administration Building - Color Scheme
11822	230508	400-1-4	Administration Building - Color Scheme
11823	230509		Administration Building - Color Scheme
11824	230510		Administration Building - Color Scheme
11825	230511	400-1-4	Administration Building - Color Scheme
11841	230512		Mess Hall - Color Scheme
3831			Details of Partitions in Room No. 371
3832	230522		Administration Building - Foundation Plan
	230523		Mess Hall - Foundation Plan
5855	230524	400-1-4	Administration Building - 1st. Floor Framing Plan
5856	230525	400-1-4	Moss Hall 1st. Floor Framing Plan
5857	230526	400-1-4	Administration Building - 2nd. Floor Plan
5858	230527	400-1-4	Mess Hall - 2nd. Floor Plan
5859	230528	400-1-4	Administration Building - 3rd. Floor Framing Plan
5860	230529	400-1-4	
5861	230530	400-1-4	Mess Hall - 3rd. Floor Framing Plan
5862	230531	400-1-4	Administration Building - Attic Framing Plan
5863	230532		Mess Hall - Attic Framing Plan
5864	230532	400-1-4	Administration Building - Roof Framing Plan
5867		400-1-4	Mess Hall - Roof Framing Plan
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5868	230535	400-1-4	Mess Hall - Footings Bar Bending Schedule and Details
5869	230536	400-1-4	Mess Hall - Basement Wall and Column Bar Bending Details
6850	230537	400-1-4	Administration Building Columns - Bar Bending Details
6851	230538	400-1-4	Mess Hall - 1st,2nd, & 3nd, Story Columns, Bar Bending Details
6852	230539	400-1-4	Adm Devilding Details
6853	230540	400-1-4	Adm. Building - 1st. Floor Bar Bending Details
6854	230541	400-1-4	Mess Hall - 1st. Floor Bar Bending Details
			Acm. Building & Mess Hall - 2nd. Floor Bar Bending Details
6855	230542	400-1-4	Adm. Building & Mess Hall - Znd Floor Bar Bending Details
6856	230543	400-1-4	Adm. Building & Mess Hall - 3rd. Floor Bar Bending Details
6857	230544	400-1-4	Administration Building - 1st. Floor
6858	230545	400-1-4	Depressed Area & Pipe Sleeve Layout Mess Hall - 1st. Floor Depressed Area and
6859	230546	400-1-4	Pipe Sleeve Layout Administration Building - 2nd. Floor Depressed
6860	230547	400-1-4	Mess Hall - 2nd. Floor Depressed Area and
6861	230548	400-1-4	Adm. Bldg 3rd. Floor Depressed Area & Pipe
6862	230549	400-1-4	Sleeve Layout Mess Hall - 3rd. Floor Depressed Area and Pipe Sleeve Layout

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8825	230551	400-1-4	Adm. Bldg. & Mess Hall - Attic Framing
8826	230552	400-1-4	Adm. Bldg. & Mess Hall - Attic Framing Bar
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2690	230554	400-1-4	Scale Pit Details
2691	230555	400-1-4	Adm. Bldg. Foundation Plan - Heating
2692	230556	400-1-4	Adm. Bldg. 1st. Floor Plan - Heating
2693	230557		Adm. Bldg. 2nd. Floor Plan - Heating
2694	230558		Adm. Bldg. 3rd. Floor Plan - Heating
3670	230385		Adm. Bldg. Pit and Details - Heating
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2695	220550	400-1-5	Heating
2696	230559	400-1-4	Mess Hall - Foundation Plan - Heating
2697	230560	400-1-4	Mess Hall - 1st. Floor Plan - Heating
	230561	400-1-4	Mess Hall - 2nd. Floor Plan - Heating
2698	230562	400-1-4	Moss Hall - 3rd. Floor Plan - Heating
3666	230563	400-1-4	Administration Bldg Ventilation Duct Work
3682	230564	400-1-4	Mess Hall Galley Heating & Duct Work in Basement
3684	230565	400-1-4	Mess Hall Heating Galley Ventilation
685	230566	400-1-4	Moss Hall 2nd. Floor Ventilation
686	230567	400-1-4	Exhaust Duct Work in Operation D
687	230568	400-1-4	Exhaust Duct Work in Operating Pavilion Air Condition Duct Work in Attic for Operation Pavilion
688	230569	400-1-4	Mess Hall - Heating and Ventilating Duct Worl
696	230570	400-1-4	3rd. Floor Ceiling Adm. Bldg Ventilation 1st, 2nd. and 3rd. Floors
689	230571	400-1-4	
670	230572	400-1-4	Mess Hall - Fan Room
671	230573	400-1-4	Moss Hall - Service Station
	200070	100-1-4	Mess Hall - Main Galley Layout - 1st. Floor
672	230574	400-1-4	Equipment Plan
671	230575	400-1-4	Mess Hall - Galley Storage Preparation Rooms
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540	230388	400-1-4	Mess Hall Refrigeration - Sh. 3.
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		400-1-5 400-1-3	Hall, Adm. Bldg. Post Dispensary, Family Hospital, Symbol and Fixtures Schedule -
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534		400-1-4	Adm. Bldg. Plumbing 1st. Floor
35	230580	400-1-4	Adm. Bldg. Plumbing 2nd. Floor
87	230581	400-1-4	Adm. Bldg. 3rd. Floor Plumbing
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36	230582	400-1-4	Adm. Bldg. Plumbing Dotails 1st. & 2nd.
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3638	230584	400-1-4	Adm. Bldg. Plumbing Stack Diagram
2639	230585	400-1-4	Adm. Bldg. Plumbing Risor Diagram
2647	230586	400-1-4	Mess Hall - Foundation Plan - Plumbing
2648	230587	400-1-4	Mess Hall - 1st. Floor Plan - Plumbing
2649	230588	400-1-4	Mess Hall - 2nd. Floor Plan - Plumbing
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2651	230590	400-1-4	Mess Hall - 3rd. Floor Plan - Plumbing
2652	230591	400-1-4	Mess Hall - 1st. Floor Details - Plumbing
2653	230592	400-1-4	Mess Hall - 2nd. Floor Details - Plumbing
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1779	230594		Adm. Bldg 1st. Floor - Electrical
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1781	230595	400-1-4	Adm. Bldg. 3rd. Floor - Electrical
	230596	400-1-4	Adm. Bldg X-ray Suite - Electrical
1784	230597	400-1-4	Adm. Bldg Foundation Plan - Electrical
1785	230598	400-1-4	Adm. Bldg X-ray Suite - 3rd. Floor -
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1787	230599	400-1-4	Adm. Bldg Electrical Details
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1789	230601	400-1-4	Mess Hall - First Floor Plan - Electrical
1790	230602	400-1-4	Mess Hall - Lighting Layout - Electrical
1791	230603	400-1-4	Mess Hall - 2nd. Floor Plan - Electrical
1792	230604	400-1-4	Mess Hall 3rd. Floor Plan - Electrical
1793	230605	400-1-4	Mess Hall - Risor Diagram
794	230606	400-1-4	Mess Hall - Electrical Panels and Air Con- ditioning
.795	230607	400-1-4	Mess Hall - Electrical Layout - Fan Room
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746	230610	400-1-4	Adm. Bldg Telephone System - Conduit
747	230611	400-1-4	Layout - 2nd. Floor Plan Adm. Bldg Telephone System - Conduit
748	230612	400-1-4	Layout - 2nd. Floor Plan Adm. Bldg Telephone System - Conduit
749	230613	400-1-4	Layout - 3rd. Floor Plan Adm. Bldg Telephone System - Conduit
810	230614	400-1-4	Layout - 3rd. Floor Plan Adm. Bldg 1st. Floor Plan - Equipment
811	230615	400-1-4	Plans Adm. Bldg 2nd. Floor Plan - Equipment
312	230616	400-1-4	Plans Adm. Bldg 3rd. Floor Plans - Equipment Plans
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	200021	400-1-4	Adm. Bldg. & Mess Hall - Details of Sheldon Equipment

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8877	230620	400-1-4	Adm. Bldg. & Mess Equipment	Hall -	Details	of Sheldon
8879	230622	400-1-4	Adm. Bldg. & Mess Equipment	Hall -	Details	of Sheldon
8880	230623	400-1-4	Adm. Bldg. & Mess	Hall -	Details	of Sheldon
8881	230624	400-1-4	Equipment Adm. Bldg. & Mess	Hall -	Details	of Sheldon
8882	230625	400-1-4	Equipment Adm. Bldg. & Mess	Hall -	Details	of Sheldon
8883	230626	400-1-4	Equipment Adm. Bldg. & Mess	Hall -	Details	of Sheldon
8884	230627	400-1-4	Equipment Adm. Bldg. & Mess	Hall -	Details	of Sheldon
8885	230628	400-1-4	Equipment Adm. Bldg. & Mess	Hall -	Details	of
8886	230629	400-1-4	Operating Suite Adm. Bldg. & Mess Operating Suite	Hall -	Details	of
	Q-18.15.	Naval Hospital	Boiler House			
5843	230645	400-1-18	Foundation and 1st	t. Floor	Section	,
5844	230646	400-1-18	Elevations and 3/			
5845	230647	400-1-18	Details	Decide		
11820	230648	400-1-18	Extension for Moto	or Gener	ator Set	
10840	230649	400-1-18	Color Schemes			
4871	230650	400-1-18	Foundation and For	oting Pl	an - Roc	f
4872	230651	400-1-18	Structural Details	S		-
3662	230652	400-1-18	lst. Floor Plan -		ig and De	tails
5632	230653	400-1-18	Piping		0	
3752	230654	400-1-18	Electrical Layout			
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4855	230658	400-1-14	Foundation Plans a	nd Data	110	
4856	230659	400-1-14	lst. and 2nd. Floo			
4857	230660	400-1-14	Elevations	I I I AIID	and Dec	arrs
7812	230661	400-1-14	Schedule of Veneti	on Plin	de	
9835	230662	400-1-14	Color Schemes	an prin	us	
3682	230663	400-1-14	Heating			
3674	230664	400-1-14	1st. and 2nd. Floo	or Plans	- Plumb	ing
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11834	230669	410	Architectural			
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9841	230672	134	Second Floor Plan
9842	230673	134	Roof Plan
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9857	230688	134	and Dets. of Counter in Lobby
9858	230689	134	Details of Toilets, Baths, Utility Room etc.
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8861	230706	134	Second Floor Framing Plan
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9806	230710	134	Roof Framing Details
9807	230711	134	Foundation Plan Bar Layout
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	200122	104	Schedule for Placing Bars in 1st. Floor
			Beams, Joists, Columns & Bar Bending Dets.

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Dwg.	No.	Y & D No.	Proj. No.	Title (CONT'D)
9809		230713	134	Second Floor Plan for Placing Steel
9877		230714	134	Second Floor Bar Bending Schedules
4698		230715	134	Foundation Plan - Heating
4699		230716	134	First Floor Plan - Heating
5600		230717	134	Second Floor Plan - Heating
5613	t s	230718	134	Foundation Plan - Air Conditioning - Galley Vent.
5614		230719	134	First Floor Plan - Air Conditioning - Galley Equipment
5615		230720	134	Second Floor Plan - Air Conditioning - Galley Equipment
5616		230721	134	Attic Floor Plan - Air Conditioning - Galley Equipment
5627		230722	134	Pent House Floor - Air Conditioning Equipment Layout
5601		230723	134	Galley Layout
4682		230724	134	Galley Refrigeration
2640		230388	Many	N.H. A.B. & M.H N.H.W. & C Post Dis- pensary Family Hospital
4692		230725	134	Foundation Plan - Plumbing
4693		230726	134	First Floor Plan - Plumbing
4694		230727	134	Second Floor Plan - Plumbing
4695		230728	134	Toilet Details
4696		230729	134	Galley Layout - Plumbing
4697		230730	134	Plumbing Details
3729		230731	134	First Floor - Electrical Layout
3730		230732	134	Second Floor - Electrical Layout
3731		230733	134	Power Layout for Basement Galley, Pent House and Electrical Details
3732		230734	134	Fixture Schedule Nurses Station - Electrical
2761		230735	134	Dets. Telephone System - Conduit Lecout
2762		230736	134	Telephone System - Conduit Layout Telephone System - Conduit Layout
9860			134	First Floor Equipment Drawings
9861			134	Second Floor Equipment Drawings
10880			134	Second Floor Equipment Drawings Dets. of Built-in Equipment
10881			134	Dets. of Built-in Equipment
10882			134	Dets. of Built-in Equipment

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Q-19.	Residential	Area	
-	Q-19.01. 0	fficors' Quart	ers
1035	229106	105-1	Foundation - First Floor and Dets House
1036	229107	105-1	Second Floor - Cross Sections and Dets House A
1037	229108	105-1	Elevations and Details - House A
1038	229109	105-1	Details - House A
10.39	229110	105-1	Supp. Plan and Elevations Porch Det. House A&A-1
1040	229111	105-1	Supp. Plan and Elevations & Dets House A
1043	229112	105-1	Supp. Plans Elevations & Dets. House C&C-1 B&B-1
1041	229113	105-1	Elevations - House B
1042	229114	105-1	Elevations - House C
1852	229115	105-1	Supp. Plans, Elevations and Det. House E&E- D&D-1
1850	229116	105-1	Elevations - House D
1851	229117	105-1	Elevations - House E
1856	229118	105-1	Foundation & First Floor Plan - House F & G
1878	229119	105-1	Elevations - House F
1879	229120	105-1	Elevations House G
1880	229121	105-1	Supp. Elevation Front Ent. Dets House G&C-1, F&F-1
1855	229122	105-1	Supp. Elevations, Front Ent. Det
	000107	105.1	House H&H-1, I&I-1
1853	229123	105-1	Elevations - House H
1854	229124	105-1	Elevations - House I
1881 1857	229125	105-1	Elevations - House J
6870	229126 229127	105-1	Foundation Plans Reversed
6871	229124	105-1 105-1	Foundation Plan - First & Second Floor Plan
6872	229129	105-1	Elevations
1858	229130	105-1	Details of Entrances
1000	223200	100-1	Det. of Kitchen Cabinets to be furnished by M. C.
1859	229131	105-1	Details of Main Cornice
1860	229132	105-1	Details of Rake Cornice House C-E&1
8843	229133	105-1	Details of Porch Screening
6877	229134	105-1	Schedule of Venetian Blinds
1863	229135	105-1	Interior Color Scheme
1862	229136	105-1	Exterior Color Scheme
685	229137	105-1	Heating Foundation - House A-2
686	229138	105-1	Heating First & Second Floor - House A-2
4601	229139	105-1	Steam Heating - Rifle Range
4640	229140	105-1	Heating - Kent Road Losts 1,2,3, & 4
684	229141	105-1	Plumbing Basement First & Sec. Fl. House A-2
4641	229142	105-1	Plumbing - Houses AA-E, G & DD
3630	229143	105-1	Details of Kitchen Sink - Plumbing
764	229144	105-1	House A-2 - 1st & 2nd Floor Electric
2757	229145		Telephone System

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Foundation + Pirat Floor and Date House A	105-1		
Second Misor - Group Second and Machine -	1-305-1	229107	
House A			
Elevations and Octails - Neuer A	105-1	229108	
Details - House'A	1-601	229109	
Supe. Fish and Flowstings Foren Set. Frence	100-10	229110	
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Supp. Plan and Elevations & Dets.'- Sours A.	105-1	111983	
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Elevations - House B	106-1	229113	
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Supp. Flans, Elevations and Date House Fallel	105-1	6120235	
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Foundation & First Floor Field - House F & G	305 - 1	811988	
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Elevations House 0	1~801	229130	
Supp. Elevation Frent Ent. Dates	1-301	229121	
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1-141 LI-HAR Teason		tarata	
Elevations - House H	108-1	220123	
Flovestons - Nouse I -		229124	
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Foundation Plans Reversed	108-1	829127	
Poundation Plan - First & Second Floor Flams Elevations	105~1	220123	
Details of Entrances	1.801	021053	
Det. of Kitchen Gablasta to be furnished	106-1	229130	
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Details of Main Cornico	1~801	Ittess	
Details of Rake Corpics House 5-241	1-601	326955	
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Schedule of Venetian Stirls	1-301	289134	
energy Color Scheme		229135	
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Steam Heating - Rifle Sange	1-201	289139	1. 2000
Heating - Manh Road Losbs 1.2.5, & 4	100-1	229140	
Plumbing Basement First & Sec. Fi. House A-R	10 N. M. F.	220141	
AL # D . 2-AA GEBORH - BRIDENIS		820102	
Retails of Kitchen Sink - Plumbing	108-1	289145	
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# Dwg. No. Y & D No. Proj. No.

Q-19.02, Bachelor Officers' Quarters

934	229150	104-1	Foundation Plan and Details		
936	229151	104-1	First and Second Floor Plan		
937	229152	104-1	Elevations and Details		
941	229153	104-1	Main Entrance Details		
942	229154	104-1	Side Entrance Details & Connector Details		
943	229155	104-1	Elevations of Public Lounge & Recp. Room		
944	229156	104-1	Entrance and Alt. Room Arrangement		
945	229157	104-1	Room Finish and Door Schedule		
2877	229158	104-1	Full Size Dets. of Typical Window and Transom Bar		
940	229159	104-1	Brick Coursing and Details		
946	229160	104-1	Color Schemes		
7800	229161	104-1			
		203-16	Schedule of Venetian Blinds		
2878	229162	104-1	Bay Window		
2879	229163	104-1	Bay Window		
933	229164	104-1	Foundation Plan & 1st. Floor Framing Plan		
3834	229165	104-1	Footing Plans and Details		
938	229166	104-1	Sec. "AA" Truss Dets. & Bay Window Dets.		
939	229167 104-1 Sec. "BB" and		Sec. "BB" and Details		
35	229168	104-1	Mechanical Pit & Misc. Details		
67	229169	104-1	Service Pit Mech. Plan and Detail		
62	229170	104-1	Location of Sleeves & Sump Pit		
65	229171 104-1		Basement Plan - Heating		
666	229172	104-1	First & Second Floor Plan - Heating		
63	229173 104-1		Riser and Basement Floor Plans		
64	229174	104-1	First & Second Floor Plan - Plumbing		
45	229175	104-1	Basement Plan - Electric		
746	229176	104-1	First & Second Floor Plan - Electric		
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14	229181	104-2	Foundation Plan and Details		
15	229182	104-2	First and Second Floor Plan & Details - also Electrical layout		
16	229183	104-2	Elevations, Roof Plan & Cross Sections		
18	229184	104-2	Details of Front Entrance		
17	229185	104-2	Details		
852	229186	104-2	Full Size Details of Windows		
872	229187	104-2	Color Scheme		
880	229188	104-2	Schedule of Venetian Blinds		
69	229189	104-2	Heating Basement Plan		
68	229190	104-2	Heating		
71	229191	104-2	Plumbing Basement		
	229192	104-2			

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First and Second Floor Plan	1-201	229151	
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Side Entreure Details & Connector Details	1-201	229164	
Elevations of Public Lounge & Reop. Room	1-AOI		
Fabrance and Ale. Room Arrangement	0++01		
Room Finiah and Door Schedule	104-1		
Full Size Deta. of Typical Window and	104-1	881958	
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Schedule of Venetian Blinds	803~16		
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Pooting Plane and Details		220165	
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Sec. "BR" and Istails		101685	
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Service Pit Menh. Plan and Detail	104-1	229363	
focation of Blooves & Summ Fit	. 1-201	228170	
Basamabt Flan - Heating			
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First & Second Floor Plan - Plumbing			
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Foundation Plan and Details			
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	Q-19.04.		Servants' Quarters Officers' Quarters
7863	229195	215	Men - Plans Elevations
7864	229196	215	Women - Plans Elevations
7865	229197	215	Men and Women - Details
10846	229198	215	Women's - Color Scheme
10847	229199		Men's - Color Scheme
4642	229200		Heating and Details
4613	229201		Women - Plumbing and Details
4654	229202		Men - Plumbing and Details
2786	229203		Electrical Layout
	Q-19.05.	Bachelor Off	icers' Mess and Officers' Club
7802	229672	215	Foundation and First Floor plan
10885	229673		Revised Boiler Room Foundations
7830	229674		lst Floor Plan
7831	229675		2nd Floor Plan and Roof Plan
7832	229676		Elevations
7833	229677		Sections and Details
7834	229678		Exterior Details
7835	229679		Exterior Details
7836	229680		Interior Details
7837	229681		Window Schedule and Jam Details
7838	229682		Refrigerator and Toilet Room Details
7839	229683		Schedules
7840	229684		Color Scheme
7841	229685		Layout of Terrazzo Floor in Bar
7893	229686		Schedule of Venetian Blinds
7897	229687		Bar Bending Schedule
7803	229688	215	Boiler Room Foundation Schedule & Details
7804	229689		Roof Framing Plan
7805	229690	215	Truss Details
7806	229691	215	Truss Details
7807	229692	215	
7808	229693	2:15	Truss Details 1st Floor Pine Sleeve & Opening Layout
4648	229694	215	lst Floor Pipe Sleeve & Opening Layout Refrigeration Details
5650	229695	215	Boiler Room Details
5651	229695	215	
1653	229697	215	Boiler & Stoker Setting Details
			lst Floor Plan - Heating
4654	229698	215	Foundation Plan Heating
2783	229699	215	Galley Details Plumbing and Heating
1655	229700	215	lst Floor Plan Ventilation
1656	229701	215	2nd Floor Plan Ventilation
1676	229702	215	Ventilation Details
1638	229703	215	lst Floor Plan Plumbing and Details
1639	229704	215	2nd Floor and Roof Plan Plumbing & Details
2771	229705	215	lst Floor Plan - Electrical Layout
2772	229706	215	2nd Floor Plan - Electrical Details
2782	229707	215	Kitchen Power Layout - Electrical

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2760	229708	215	Telephone System - Conduit Layout
Q-20			
	0-20.01 Ar	mory and Office	Building
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3833	229206	203-4	Foundation Plan
3822	229207	203-4	lst Floor Plan - Schedules & Details
3823	229208	203-4	2nd Floor Plan - Details
3824	229209	203-4	Elevations - Typical Wall Sections Details
3825	229210	203-4	Exterior Details
3826	229211	203-4	Sections and Interior Details
6881	229212	203-4	Schedule of Venetian Blinds
9812	229213	203-4	Color Schemes
3847	229214	203-4	Slab and Beam - 1st Floor
3610	229215	203-4	Foundation - Heating
3611	229216	203-4	First Floor - Heating
3612	229217	203-4	Second Floor - Heating
3605	229218	203-4	Foundation Plans - Plumbing and Details
3606	229219	203-4	First Floor Plans - Plumbing and Details
3607	229220	203-4	Second Floor Plans - Plumbing and Details
3608	229221	203-4	Riser Diagram - Plumbing and Details
1728	229222	203-4	First Floor - Electrical
1729	229223	203-4	Second Floor - Electrical
1740	229224	203-4	First Floor - Telephone
1741	229225	203-4	Second Floor - Telephone
	Q-20.02. Ra	nge Houses - Toi	lets and Target Sheds
1050			
2856	229228	203-20	Range House Plan Section and Details
2857	229229	203-20	Range House Exterior Details Range House Exterior and Interior Details
2858	229230	203-20 203-20	Range House - Rifle Range Toilets and
3609	229231	200-20	Target Shed, Plumbing and Heating
0007	229232	203-20	Range House - Electrical
2703		203-5	Target Shed - Rifle Range - Plans,
2871	229233	200-0	Elevations, Details
2875	229234	203-20	Toilets - Rifle Range
	Q-20.03. Pis	stol Range, Firi	ng Line Shelters and Target House
		0.07 5	Distal Panga - Fining Line Shelter
1893	229237	203-7	Pistol Range - Firing Line Shelter Pistol Range Target House - Plans
9825	229239	203-6	Elevations and Details
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8894 8895 8897 8898 8899 8899 8817 8818	229721 229722 229723		General Good & Here and A Here and
8895 8897 8898 8899 8817 8818	229722 229723	202-19	Cross Sections "X-X" & "W-W" & Stage Dets
8897 8898 8899 8817 8818	229723		Longitudinal Sections "Z-Z" & "Y-Y" Dets.
8898 8899 8817 8818		202-19	Wall - Pier and Cornice Details
8898 8899 8817 8818		202-19	Window and Brick Coursing Details
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4868	229772	(202-16	That and bor about at Decaris
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4869	229773	(202-16	Floor & Root Flans & Details
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1004	000000	(203-13	Elevations and Details
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4626	229775	(202-16	
		(203 - 13)	Boiler Piping Layout
3655	229776	(202-16	
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2773	229777	(202-16	
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10896	229778	(200 10	Temporary Stacks To Be Added To Stacks
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7898	229785	203-5	Rifle Range Butts Plan and Sections
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6842	229787	203-5	Rifle Range Butts Reinforcing Details

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6875	22979	203-	•5	Rifle Range Butts Wall, West End of Range No. 1 Sections Type B4 & B5
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010110	505-1	Area - Electrical Layout
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	123-3 123-3 123-3	Elevations Cross Sections Details Wall Sections Framing Stair & Ladder Dets Brick and Tile Coursing
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			System Including Lightning Protection &
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888	230823	123	Tower Foundations - Details
1046	230824	123	Tower No. 2 Foundation - Details
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10834		142-1	Structural Plans and Details
5630	230072	142-1	Heating
5628	230072	142-1	Plumbing
3747	230073	142-1	Electrical Layout
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5620	230077	142-1	Heating Sections and Details
5621	230078	142-1	Boiler Room Details
5609	230059	142-1	Heating Plant at Parachute Training School
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3742	230060	142-1	Electrical Layout (Parachute Training School)
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3724	230085	142-1	Electrical Layout - Unit "C" - Transformer
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	Q-25.01. Tent	Camp Subsist	ence Building
21.	161806	P-1-5	Foundation Plan
22	161807	P-1-5	lst Floor Plan
23	161808	P-1-5	Elevations and Sections
4	161809	P-1-5	Sections and Details
25	161810	P-1-5	Refrigeration Details
6	161811	P-1-5	Interior Electrical Work
27	161812	P-1-5	Steam and Condensate Piping Plan
51	161816	P-1-5	Soil Pipe Layout
32	161817	P-1-5	Hot & Cold Water Piping Layout
90	161876	P-1-5	Refrigeration Mech. Details
3600	162575	P-1-5	Grease Trap Regimental & Tent Camp Mess Halls
219	229476	P-250-1-5	Foundation Plan
226	229481	P-250-1-5	Refrigerator Rooms
231	229477	P-250-1-5 .	Elevations Sections and Details
232	229478	P-250-1-5	Sections and Details
234	229479	P-250-1-5	Roof Framing and Details
388	229480	P-250-1-5	Plan of Attic over Galley Showing Fire Stops
233	229482	P-250-1-5	Refrigerator Details
254	229483	P-250-1-5	Interior Electrical Work
363	229484	P-250-1-5	Condensate Pump House
	Q-25.02. Tent	Camp Storeho	ouse (Small)
20	161802	P-1-6	Storehouse Type SH-9 Plans
17	161803	P-1-6	Storehouse Type SH-9 Elevations
18	Q-25.03. Tent		
	4.000000	•	
	9 161804	P-1-7 ·	Storehouse Type SH-13 Plans
TC 19		P-1-7	Storehouse Type SH-13 Elevations
TC 19 TC 20			
			orage House
TC 20	Q-25.04. Tent	Camp Ice St	orage House Too Storage House - Plans Sections & Dets.
TC 20	0 161805 Q-25.04. Tent 8 161813	Camp Ice St P-1-18	orage House Too Storage House - Plans Sections & Dets.
TC 20	0 161805 Q-25.04. Tent 8 161813	Camp Ice St	orage House
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	Q-25.07. Enl	listed Mens'	Vashroom
35	161820	P-1-16	Officers' and Enlisted Men's Washroom
		P-1-15	Hot Water Storage Tank
43	161828	P-1-15	Enlisted Men's Washroom Plans & Sections
44	161829	P-1-15	Enlisted Men's Washroom Flans & Sections Enlisted Men's Washroom Elevations & Dets.
48	161834	P-1-15	Enlisted Men's Washroom Elevations & Dets.
55	161841	P-1-15	Enlisted Men's Washroom Soil Pipe Layout
	101011	1-1-10	Enlisted Men's Washroom Hot & Cold Water Piping Plan
56	161842	P-1-15	
57	161843	P-1-15	Endisted Men's Washroom Vent Layout
	101010	P-1-16	Officers' & Enlisted Men's Washroom
72	161858	P-1-15	Details Plumbing Fixtures
12	101000	P-1-16	Officers' & Enlisted Men's Washroom
74	161860		Electrical System
14	101000	P-1-15	Officers' and Enlisted Men's Washroom
75	101001	P-1-16	Water Supply Details
10	161861	P-1-15	Officers' and Enlisted Men's Washroom
040	000400	P-1-16	Steam and Condensate Piping
242	229486	P-250-1-15	The state of the s
0.47	000107		Plan and Sections
243	229487	P-250-1-15	The second most b mabin out
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253	<b>229</b> 488	P-250-1-15	official of printing of more
			Electrical System
339	229489	P-250-1-15	and a more a courter of the
			Floor Plan TC No. 2
	Q-25.08. Ter	it Camp Office	rs' Washrooms
35	161820	P-1-15	Officers' and Enlisted Men's Washroom
		P-1-16	Hot Water Storage Tank
16	161831	P-1-16	Officers! Washrooms - Plans and Dets.
		P-1-16	Officers' Washroom - Elevations & Plot Play
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	161832 161843		
	161852	P-1-15	Officers' and Enlisted Men's Washroom
57	161843	P-1-15 P-1-16	Officers' and Enlisted Men's Washroom Details Plumbing Fixtures
57		P-1-15 P-1-16 P-1-15	Officers' and Enlisted Men's Washroom Details Plumbing Fixtures Officers' and Enlisted Men's Washroom
57 72	161843	P-1-15 P-1-16	Officers' and Enlisted Men's Washroom Details Plumbing Fixtures Officers' and Enlisted Men's Washroom Electrical System
57 72 73	161843 161858 161859	P-1-15 P-1-16 P-1-15 P-1-16 P-1-16	Officers' and Enlisted Men's Washroom Details Plumbing Fixtures Officers' and Enlisted Men's Washroom Electrical System Officers' Washrooms - Plumbing Layouts
57 72 73	161843 161858	P-1-15 P-1-16 P-1-15 P-1-16	Officers' and Enlisted Men's Washroom Details Plumbing Fixtures Officers' and Enlisted Men's Washroom Electrical System
57 72 73 74	161843 161858 161859	P-1-15 P-1-16 P-1-15 P-1-16 P-1-16 P-1-15	Officers' and Enlisted Men's Washroom Details Plumbing Fixtures Officers' and Enlisted Men's Washroom Electrical System Officers' Washrooms - Plumbing Layouts Officers' and Enlisted Men's Washroom Water Supply Details Officers' and Enlisted Mens Washroom
57 72 73 74	161843 161858 161859 161860	P-1-15 P-1-16 P-1-15 P-1-16 P-1-16 P-1-15 P-1-16	Officers' and Enlisted Men's Washroom Details Plumbing Fixtures Officers' and Enlisted Men's Washroom Electrical System Officers' Washrooms - Plumbing Layouts Officers' and Enlisted Men's Washroom Water Supply Details Officers' and Enlisted Mens Washroom Steam and Condensate Piping
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	Q-25.09. Tent Camp. No	. 1 Boiler House
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39	16182 <b>6</b> P-1-10	Boiler House Equip. Foundation Details
0	161825 P-1-10	Boiler House Piping Details
1	161826 <b>P-1-10</b>	Boiler House Steel Stack & Breeching Dets.
2	161827 P-1-10	Boiler House Feed Water Heated Platform
0	161866 IP-1-10	Boiler House Plans and Elevations
1	161867 P-1-10	Boiler House Foundations & Details
2	161868 P-1-10	Boiler House Elevations Sections & Details
9	161875 P-1-10	Boiler House Plumbing Layout
8	229493 P-400-2	-5 Addition to Boiler House - Elevations, Plans and Details
.09	229494 P-400-2	-5 Addition to Boiler House - Electrical System
130	229495 P-1-10	Boiler House Stoker Installation Details
139	229496 P-1-10	Addition to Boiler House - TC No. 1
		Boiler Setting Breeching and Piping
	Q-25.10. Tent Camp No.	2 Boiler House
322	229497 P-250-1	-11 Boiler House T.C. No. 2 Foundation Plan
23	229498 P-250-1	
20	229490 F=200=1	Sections and Details
0.4	220400 D 250 1	-11 Boiler House T.C. No. 2 Details
24		
41	229500 P-250-1	Boilers, Pumps and Tanks
342	229501 P-250-1	
3522	229502 P-240-1	-11 Boiler House T.C. No. 2 Electrical System
887	229503 P-250-1	-11 Boiler House T.C. No. 2 Stoker Setting Pla
	Q-25.11. Tent Camp Str	ong Back Frames
	161830	Strong Back Frames for Tents
15		Strong Back Frames for Hospital Tents
.00	229505 P-1-19	and Ward Tents
		and hard follow
	Q-25.12. Tent Camp Ch	apel
96	229506 P-8	T.C. Chapel - Plumbing
97	229507 P-8	T.C. Chapel - Heating
	229507 P-8	T.C. Chapel - Footing & Foundation Plan
330		T.C. Chapel Floor'& Roof Framigg. Plan
531		T.C. Chapel - First Floor Plan & Interior
32	229510 P-8	Details
333	229511 P-8	T.C. Chapel - Truss and Exterior Details
334	229512 P-8	T.C. Chapel - Elevations
335	229513 P-8	T.C. Chapel - Dets. of Reversible Alter
	229514 P-8	T.C. Chapel - Color Scheme
336		
336 338 381	239515 P-8 228906 P-8	T.C. Chapel - Electrical Layout T.C. and Regimental Chapel - Details of

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	2-25.13. 1	Cont Camp Ho	spital
101	229517	P-1-19	Hermitel much f
102	229518	P-1-19	Hospital Tent Camp Area Foundation & Dets.
103	229519		Hospital Tent Camp Area Floor Plan
100	229519	P-1-19	Hospital Tent Camp Area Front & Rear
104	229520	P-1-19	Elevations and Details
	220020	r=1=19	Hospital Tent Camp Area Side Elevation
105	229521	P-1-19	Section and Roof Plan
113	229522		Hospital Tent Camp Area Structural Dets.
114	229523	P-1-19	Hospital Tent Camp Area Hesting Plan
115		P-1-19	Hospital Tent Camp Area Plumbing Plan
118	229524	P-1-19	Hospital Tent Camp Area Electrical Lavout
110	229525	P-1-19	Hospital Tent Camp Area Dets. Cabinets -
110	000000		Gate to Surgical Suite
119	229526	P-1-19	Hospital Tent Camp Area Mill work Cabinet
100	1		Dets.
120	229527	P-1-19	Hospital Tent Camp Area Mill Work Cabinet
			Dets.
276	229528	P-400-2-3	Addition to Tent Camp Hospital Foundation
			Plan and Details
277	229529	P-400-2-3	Addition to Tent Camp Hospital Foundation
			Plan and Details
278	229530	P-400-2-3	Addition to Tent Camp Hospital Floor Plan
279	229531	P-400-2-3	
280	229532	P-400-2-3	
			Addition to Tent Camp Hospital Elevations and Details
281	229533	P-400-2-3	
		1 100-2-0	Addition to Tent Camp Hospital Elevations and Details
282	229534	P-400-2-3	
	220001	1-100-2-0	Addition to Tent Camp Hospital Roof Framing
504	229535	P-400-2-3	and Truss Details
	220000	1-400-2-3	Addition to Tent Camp Hospital North Wing
05	229536	D 100 0 7	Plumbing
	223030	P-400-2-3	Addition to Tent Camp Hospital South Wing
06	229537	D 100 0 7	Flupping
00	229531	P-400-2-3	Addition to Tent Camp Hospital North Wing
07	000550		Heating
	229538	P-400-2-3	Addition to Tent Camp Hospital South Wing
3.0			Heating
15	229539	P-400-2-3	Addition to Tent Camp Hospital Electrical
10	2000		Layout
16	229540	P-400-2-3	Addition to Tent Camp Hospital Electrical
			Layout
	Q-25.14. Tent	Camp Hospit	tal Administration Bldg.
71	229542		
72	229543	P-400-2-12	Administration Bldg Tent Camp Hospital
-	220010	1-100-2-12	Administration Bldg Tent Camp Hospital
14	229544		Color Scheme
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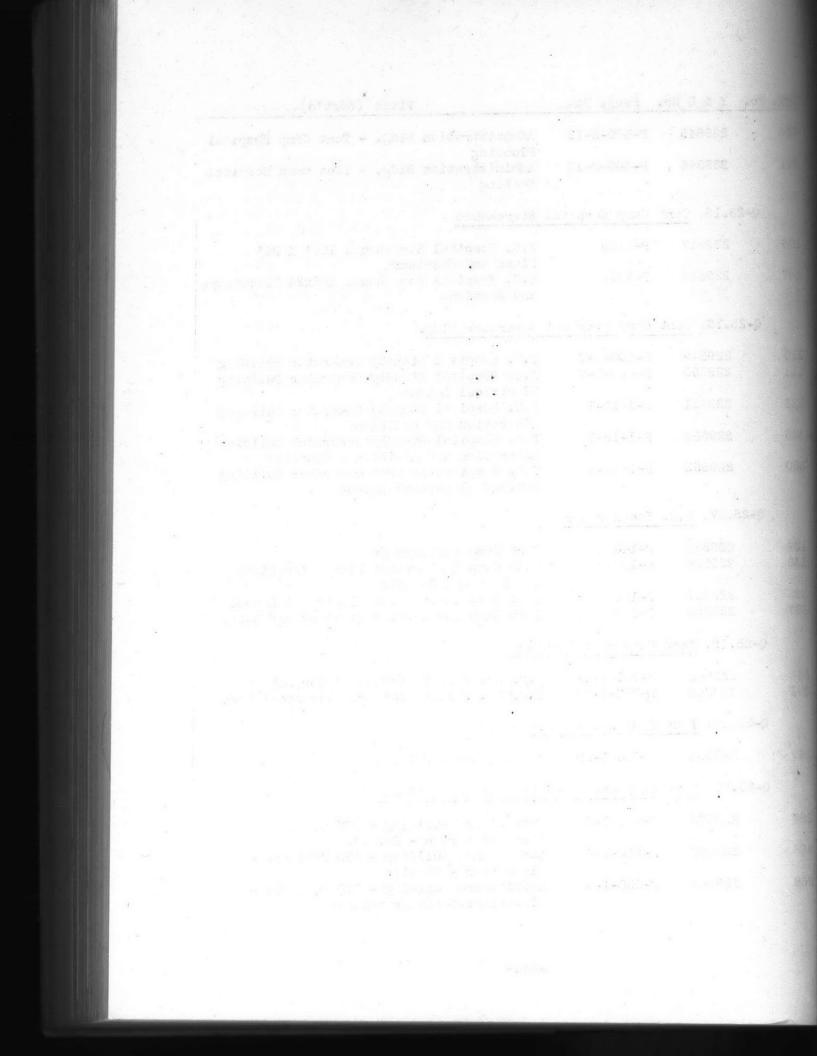
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320	229545	P-400-2-12	Administration Bldg Tent Camp Hospital Plumbing
321	229546	P-400-2-12	Administration Bldg Tent Camp Hospital Heating
	Q-25.15. Tent	Camp Hospital	Storehouse
106	229547	P-1-19	T.C. Hospital Storehouse 108' X 24' Plans and Sections
107	229548	P-1-19	T.C. Hospital Storehouse 108x24 Elevation and Sections
	Q-25.16. Tent	Camp Hospital	Generator Bldg.
110	229549	P-400-2-7	T.C. Hospital Standby Generator Building
111	229550	P-400-2-7	T.C. Hospital Standby Generator Building Electrical Layout
123	229551	P-1-19-1	T.C. Hospital Standby Generator Building Alteration and addition
395	229552	P-1-19-1	T.C. Hospital Standby Generator Building Alteration and Addition - Plumbing
380	229553	P-1-19-1	T.C. Hospital Standby Generator Building Revised Electrical Layout
	Q-25.17. T.C.	Incinerator	
137	229555	P-140	Tent Camp Incinerator
138	229556	P-140	Tent Camp Incinerator Plans Elevations Sections and Details
396	229557	P-140	Tent Camp Incinerator Electrical Layout
397	229558	P-140	Tent Camp Incinerator Plumbing and Dets.
	Q-25.18. Tent	Camp Post Excl	nange
264	229562	P-250-1-19	T.C. No. 2 Post Exchange Color Scheme
391	229563		T.C. No. 2 Post Exchange Electrical Work
	Q-25.19. Tent	Camp Guest Hou	ISC
369	229564	P-250-1-20	Guest House - Color Scheme
	Q-25.20. Tent	Camp Officers	Subsistance Building
287	229565	P-250-1-6	Subsistance Building - 570 Officers - Foundation Plan - Details
88	229566	P-250-1-6	Subsistance Building - 570 Officers -
89	229567	P-250-1-6	Floor Plan - Details Subsistance Building - 570 Officers - Elevations Sections Details

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290	229568	P-250-1-6	Subsistence Building - 570 Officers - Roof Framing
291	229569	P-250-1-6	Subsistance Building - 570 Officers - Window, Framing and Toilet Details
292	229570	P-250-1-6	Subsistance Building - 570 Officers - Meat Hanger, Refrigerator and Toilet Dets.
293	229571	P-250-1-6	Subsistance Building - 570 Officers - Refrigeration
308	229572	P-250-1-6	Subsistance Building - 570 Officers - Heating Plan
309	229573	P-250-1-6	Subsistance Building - 570 Officers Plumbing - Soil & Waste Piping
310	229574	P-250-1-6	Subsistance Building - 570 Officers - Plumbing - Water Piping
311	229575	P-250-1-6	Subsistance Building - 570 Officers - Plumbing - Riser Diagram
313	229576	P-250-1-6	Subsistance Building - 570 Officers - Electrical Layout
370	229577	P-250-1-6	Toilet Adjoining Officer Subsistance Bldg.
386	229578	P-250-1-6	Toilet Adjoining Officer Subsistance Bldg. Heating
390	229579	P-250-1-6	Toilet Adjoining Officer Subsistance Building - Plumbing

	327	229581	P-250-1-18	Recreation Plan	Bldg.	- Mod. R-2 - 1st. Floor
•	328	229582	P-250-1-18	Recreation & Sections	Bldg.	- Mod. R-2 - Elevations
	329	229583	P-250-1-18	Recreation	Bldg.	Mod. R-2 - Details
	346	229584	P-250-1-18			Mod. R-2 - Electrical
	347	229585	P-250-1-18	Recreation Dets.	Bldg.	Mod. R-2 - Electrical
	348	229586	P-250-1-18	Recreation	Bldg.	Mod. R-2 - Plumbing Dets.
	350	229587	P-250-1-18		Bldg.	Mod. R-2 - Foundation
	354	229588	P-250-1-18		4	Mod. R-2 - Color Scheme

Q-26. Mumford Point Camp No. 1

## Q-26.01. Mumford Point Subsistence Building

8	229596	P-500-4	Subsistence - Mu	mford Point -	Foundation
9	229597	P-500-4	Subsistence Build Floor Plan	ding - Mumford	Point -
10	229598	P-500-4	Subsistence Build Elevations	ding - Mumford	Point -

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Subsistence Building - 570 Officers -	8-1-985-T	608093	
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11	229599.	P-500-4	Subsistence Building - Mumford Point - Roof Plan
12	229600	P-500-4	Subsistence Building - Mumford Point - Details
30	229601	P-500-4	Subsistence Building - Mumford Point - Soil and Waste Piping Plumbing
31	229602	P-500-4	Subsistence Building - Mumford Point - Hot and Cold Water Piping Plumbing
¥3 ,	229603	P-500-4	Subsistence Building - Mumford Point - Electrical Layout
15	229604	P-500-4	Subsistence Building - Mumford - Heating Plan
	Q-26.02. Mum	ford Point Ad	ministration Building
4	229606	P-500-15	Administration Building - Mumford Point
1	229607	P-500-15	Administration Building - Mumford Point Electrical Layout
6	229608	P-500-15	Administration Building - Mumford Point Plumbing
0	229609	P-500-15	Administration Building - Mumford Point Heating
	Q-26.03. Mu	mford Point S	torehouse ( Large )
	Q-26.03. <u>Mu</u> 229611	mford Point S P-500-7	Storehouse SH-13 - Mumford Point - Founda
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.8 .9	229611 229612	P-500-7	Storehouse SH-13 - Mumford Point - Founda- tion Plan - Wall Section and Details Storehouse SH-13 - Mumford Point - Floor Plan - Elevations and Sections
8 9	229611 229612	P-500-7 P-500-7	Storehouse SH-13 - Mumford Point - Founda- tion Plan - Wall Section and Details Storehouse SH-13 - Mumford Point - Floor Plan - Elevations and Sections st Exchange Post Exchange - Mumford Point - Foundation
8 9	229611 229612 Q-26.04 Mum	P-500-7 P-500-7 ford Point Po	Storehouse SH-13 - Mumford Point - Founda- tion Plan - Wall Section and Details Storehouse SH-13 - Mumford Point - Floor Plan - Elevations and Sections st Exchange Post Exchange - Mumford Point - Foundation Plan & Dets. Post Exchange - Mumford Point - First
.8 .9 1 2	229611 229612 Q-26.04 <u>Mum</u> 229614	P-500-7 P-500-7 ford Point Po P-500-13	Storehouse SH-13 - Mumford Point - Founda- tion Plan - Wall Section and Details Storehouse SH-13 - Mumford Point - Floor Plan - Elevations and Sections st Exchange Post Exchange - Mumford Point - Foundation Plan & Dets. Post Exchange - Mumford Point - First Floor Plan and Details Post Exchange - Mumford Point - Elevations
8 9 1 2 3	229611 229612 Q-26.04 Mum 229614 229615	P-500-7 P-500-7 ford Point Po P-500-13 P-500-13	Storehouse SH-13 - Mumford Point - Founda- tion Plan - Wall Section and Details Storehouse SH-13 - Mumford Point - Floor Plan - Elevations and Sections st Exchange Post Exchange - Mumford Point - Foundation Plan & Dets. Post Exchange - Mumford Point - First Floor Plan and Details Post Exchange - Mumford Point - Elevations and Truss Details
8 9 1 2 3 0	229611 229612 Q-26.04 <u>Mum</u> 229614 229615 229616	P-500-7 P-500-7 ford Point Po P-500-13 P-500-13 P-500-13	Storehouse SH-13 - Mumford Point - Founda- tion Plan - Wall Section and Details Storehouse SH-13 - Mumford Point - Floor Plan - Elevations and Sections st Exchange Post Exchange - Mumford Point - Foundation Plan & Dets. Post Exchange - Mumford Point - First Floor Plan and Details Post Exchange - Mumford Point - Elevation and Truss Details Post Exchange - Mumford Point - Plumbing
8 9 1 2 3 0	229611 229612 Q-26.04 <u>Mum</u> 229614 229615 229616 229617	P-500-7 P-500-7 ford Point Po P-500-13 P-500-13 P-500-13 P-500-13	Storehouse SH-13 - Mumford Point - Foundation Plan - Wall Section and Details Storehouse SH-13 - Mumford Point - Floor Plan - Elevations and Sections st Exchange Post Exchange - Mumford Point - Foundation Plan & Dets. Post Exchange - Mumford Point - First Floor Plan and Details Post Exchange - Mumford Point - Elevation and Truss Details Post Exchange - Mumford Point - Plumbing
8 9 1 2 3 0 2	229611 229612 Q-26.04 Mum 229614 229615 229616 229617 229618	P-500-7 P-500-7 ford Point Po P-500-13 P-500-13 P-500-13 P-500-13	Storehouse SH-13 - Mumford Point - Foundation Plan - Wall Section and Details Storehouse SH-13 - Mumford Point - Floor Plan - Elevations and Sections st Exchange Post Exchange - Mumford Point - Foundation Plan & Dets. Post Exchange - Mumford Point - First Floor Plan and Details Post Exchange - Mumford Point - Elevations and Truss Details Post Exchange - Mumford Point - Plumbing Post Exchange - Mumford Point - Electrical Layout
8 9 1 2 3 0 2	229611 229612 Q-26.04 Mum 229614 229615 229616 229617 229618	P-500-7 P-500-7 ford Point Po P-500-13 P-500-13 P-500-13 P-500-13 P-500-13 P-500-13	Storehouse SH-13 - Mumford Point - Foundation Plan - Wall Section and Details Storehouse SH-13 - Mumford Point - Floor Plan - Elevations and Sections st Exchange Post Exchange - Mumford Point - Foundation Plan & Dets. Post Exchange - Mumford Point - First Floor Plan and Details Post Exchange - Mumford Point - Elevation and Truss Details Post Exchange - Mumford Point - Plumbing Post Exchange - Mumford Point - Electrical Layout rig Brig - Mumford Point - Foundation - 1st.
8 9 1 2 3 0 2	229611 229612 Q-26.04 Mum 229614 229615 229616 229616 229617 229618 Q-26.05. Muz	P-500-7 P-500-7 ford Point Po P-500-13 P-500-13 P-500-13 P-500-13 P-500-13 P-500-13	Storehouse SH-13 - Mumford Point - Foundation Plan - Wall Section and Details Storehouse SH-13 - Mumford Point - Floor Plan - Elevations and Sections st Exchange Post Exchange - Mumford Point - Foundation Plan & Dets. Post Exchange - Mumford Point - First Floor Plan and Details Post Exchange - Mumford Point - Elevation and Truss Details Post Exchange - Mumford Point - Plumbing Post Exchange - Mumford Point - Electrical Layout rig Brig - Mumford Point - Foundation - 1st. Floor Plan and Details Brig - Mumford Point - Elevations and
.8 .9 1 2 3 0 2	229611 229612 Q-26.04 <u>Mum</u> 229614 229615 229616 229616 229617 229618 Q-26.05. <u>Mu</u> 229621	P-500-7 P-500-7 ford Point Po P-500-13 P-500-13 P-500-13 P-500-13 P-500-13 P-500-13 P-500-13 P-500-6	Storehouse SH-13 - Mumford Point - Foundation Plan - Wall Section and Details Storehouse SH-13 - Mumford Point - Floor Plan - Elevations and Sections st Exchange Post Exchange - Mumford Point - Foundation Plan & Dets. Post Exchange - Mumford Point - First Floor Plan and Details Post Exchange - Mumford Point - Elevations and Truss Details Post Exchange - Mumford Point - Plumbing Post Exchange - Mumford Point - Electrical Layout rig Brig - Mumford Point - Foundation - 1st. Floor Plan and Details

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39		229625	P-500-6	Brig - Mumford Point - Electrical Layout
	Q-26	.06. Mumf	ford Point Dispen	sary Building
27		229627	P-500-11	Dispensary Bldg Mumford Point-Fl. Plans
28		229628	P-500-11	Dispensary Bldg Mumford Point-Elevation
29		229629	P-500-11	Dispensary Bldg Mumford Point-Details
34		229630	P-500-11	Dispensary Bldg Mumford Point-Plumbing
0±		223000	F-000-11	and Details
40		229631	P-500-11	Dispensary Bldg Mumford Point-Heating
38		229632	P-500-11	Dispensary Building - Mumford Point - Electrical Layout
53		229633	P-500-11	Dispensary Building - Mumford Point - Cabinet Details
	Q-26	.07. Mumfo	ord Point - Heati	ng Plant
44		229635	P-500-16	Heating Plant - Mumford Point
47		229636	P-500-16	Heating Plant - Mumford Point - Plans,
TI		2230000	1-000-10	Elevations, and Sections
48		229637	P-500-16	
49		229638	P-500-16	Heating Plant-Mumford Point-General Dets.
49		229030	P-500-10	Heating Plant - Mumford Point - Electrical Layout
52		229639	P-500-16	Heating Plant - Mumford Point - Stoker
04		220000	1-000-10	Installation Details
2130		229640	P-500-16	Sketch
	(			
	Q-27	· Peterfi	eld Point	
		Q-27.01.	Peterfield Poin	t Pier
262		229561	P-249-51	Dets. of Piers at Peterfield Point
	<b>Q-2</b> 8	• Tank Ba	ttalion	
		Q-28.01.	Tank Battalion	Huts
235		229559	P-50-10	T.C. No. 2 Enlisted Mens: Huts Elect. System
302		229560	250-3-8&9	5 <b>5</b> 5 5 5 5 5
			250-4-7&8	Officers Washroom Plumbing (Huts)
	Q-28	.02. Tank	Battalion Shops	
1899		229589	P-250-3-10	
1033		520000	P-250-4-10	Chan Bldg Mator Storage Chade
			L=C00=7=10	Shop Bldg Motor Storage Sheds
			,	Foundation Plan and Footing Dets.

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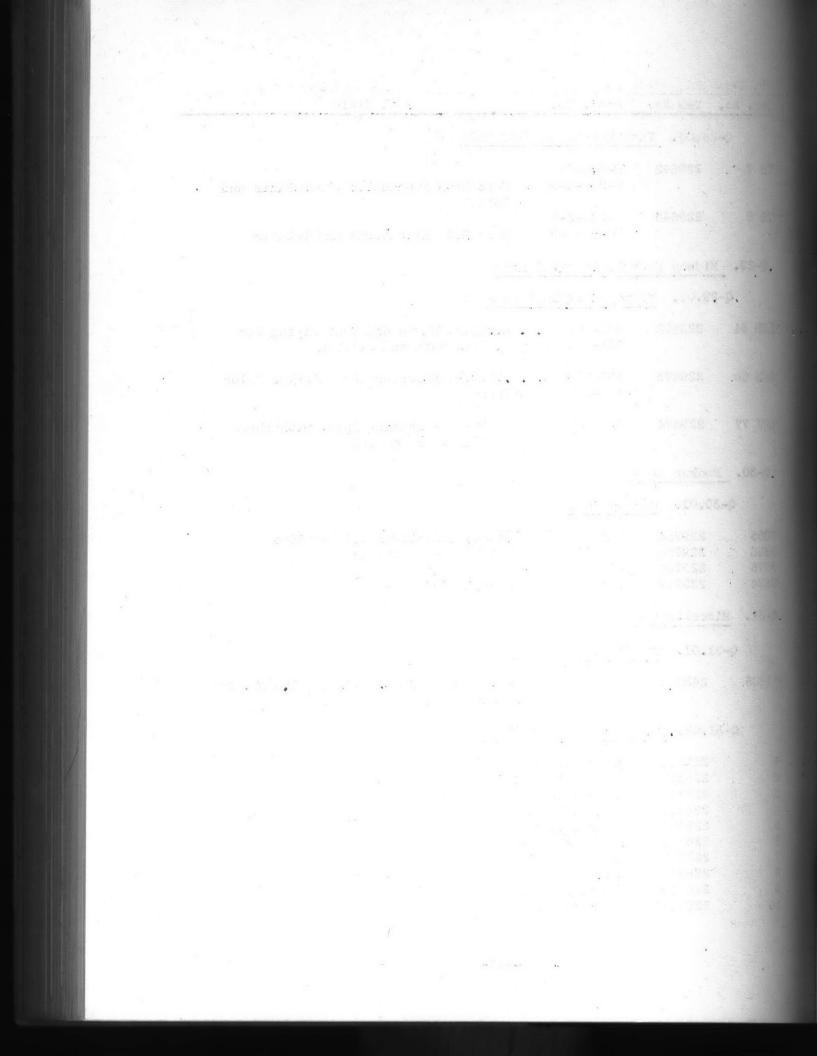
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	Y&D NO.	Proj. No.	Title	
Q-1	28.03. Ta	nk Battalion M	Mess Hall	
ő e	000040	D 250 7 7		
Ê 7	229642	P-250-3-7	Mess Hall Foundation Floor Plans an	a
		P-250-4-9		u
		D 050 7 7	Details	
B 8	229643	P-250-3-7	Mess Hall Elevations and Details	
		P-250-4-9	Mess Hall Elevations and Details	
Q-29.	Midway Par	k Residential	Area	
Q-	29.01. Mi	dway Park Dwel	ollings	
LCH 54	229472	301-201	L.C.D.H. Waste and Vent Piping for	
	000110	301-202	Typical Bath and Kitchen	
			-01	
CH 60	229473	301-201	L.C.D.H. Exterior and Interior Colo	r
00	NUCTIO	301-202	Schemes	
CH 77	229474	301-202	Revision - Showing Apts. with Three	
1011 11	NUVIII	COT NON	and One Bedroom each	
0-30	Mockup Are	0		
Q-00	MOCKUP AIG	<u>a</u>		
Q-	30.01. <u>Mo</u>	ckup Ship		
855	229754	132	Plans, Elevations and Sections	
3856	229755	249-52	Details and Sections	
		LID-OU	Devalls and becelons	
9875			Derrick "A"	
	229756	132 132		
		132	Derrick "A"	
874	229756 229757	132 132	Derrick "A"	
874	229756	132 132	Derrick "A"	3
)874 )-31. <u>M</u>	229756 229757 iscellaneo	132 132 us	Derrick "A"	3
)874 )-31. <u>M</u>	229756 229757	132 132 us	Derrick "A"	4
9874 9-31. <u>M</u> Q-	229756 229757 iscellaneo	132 132 us	Derrick "A"	Gun
9874 9-31. <u>M</u> Q-	229756 229757 iscellaneo 31.01. <u>Gu</u>	132 132 n Mounts	Derrick "A" Derrick "B"	Gun
9874 2-31. <u>M</u> Q-	229756 229757 iscellaneo 31.01. <u>Gu</u> 248043	132 132 <u>us</u> <u>n Mounts</u> 233	Derrick "A" Derrick "B" Foundations for 20 MM. and 155 MM. Mounts	Gun
9874 2-31. <u>M</u> Q-	229756 229757 iscellaneo 31.01. <u>Gu</u> 248043	132 132 <u>us</u> <u>n Mounts</u> 233 W.O. Record D	Derrick "A" Derrick "B" Foundations for 20 MM. and 155 MM. Mounts Drawings	Gun
9874 Q-31. <u>M</u> Q- 11805 Q-	229756 229757 iscellaneo 31.01. <u>Gu</u> 248043 31.02. P. 228331	132 132 <u>us</u> <u>n Mounts</u> 233 W.O. Record D: Quadrangle	Derrick "A" Derrick "B" Foundations for 20 MM. and 155 MM. Mounts Drawings 98	Gun
9874 Q-31. <u>M</u> Q- 1805 Q-	229756 229757 iscellaneo 31.01. <u>Gu</u> 248043 31.02. P <u>.</u> 228331 228332	132 132 <u>us</u> <u>n Mounts</u> 233 W.O. Record D: Quadrangle Quadrangle	Derrick "A" Derrick "B" Foundations for 20 MM. and 155 MM. Mounts Drawings 98 99	Gun
Q- 11805 Q-	229756 229757 iscellaneo 31.01. <u>Gu</u> 248043 31.02. P. 228331 228332 228333	132 132 <u>us</u> <u>n Mounts</u> 233 <u>W.O. Record D:</u> Quadrangle Quadrangle Quadrangle	Derrick "A" Derrick "B" Foundations for 20 MM. and 155 MM. Mounts Drawings 98 99 100	Gun
9874 Q-31. <u>M</u> Q- 1805 Q-	229756 229757 iscellaneo 31.01. <u>Gu</u> 248043 31.02. P. 228331 228332 228333 228333 228334	132 132 <u>us</u> <u>n Mounts</u> 233 <u>W.O. Record D:</u> Quadrangle Quadrangle Quadrangle	Derrick "A" Derrick "B" Foundations for 20 MM. and 155 MM. Mounts Drawings 98 99 100 118	Gun
9874 Q-31. <u>M</u> Q- 1805 Q-	229756 229757 iscellaneo 31.01. <u>Gu</u> 248043 31.02. P. 228331 228332 228333 228334 228335	132 132 us n Mounts 233 W.O. Record D: Quadrangle Quadrangle Quadrangle Quadrangle Quadrangle	Derrick "A" Derrick "B" Foundations for 20 MM. and 155 MM. Mounts Drawings 98 99 100 118 119	Gun
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9874 Q-31. <u>M</u> Q- 11805 Q-	229756 229757 iscellaneo 31.01. Gu 248043 31.02. P. 228331 228332 228333 228333 228334 228335 228336 228337	132 132 <u>us</u> <u>n Mounts</u> 233 <u>W.O. Record D:</u> Quadrangle Quadrangle Quadrangle Quadrangle Quadrangle Quadrangle Quadrangle	Derrick "A" Derrick "B" Foundations for 20 MM. and 155 MM. Mounts Drawings 98 99 100 118 119 120 139	Gun
9874 Q-31. <u>M</u> Q- 11805 Q-	229756 229757 iscellaneo 31.01. Gu 248043 31.02. P. 228331 228332 228333 228334 228335 228336 228337 228338	132 132 <u>us</u> <u>n Mounts</u> 233 <u>W.O. Record D:</u> Quadrangle Quadrangle Quadrangle Quadrangle Quadrangle Quadrangle Quadrangle Quadrangle	Derrick "A" Derrick "B" Foundations for 20 MM. and 155 MM. Mounts Drawings 98 99 100 118 119 120 139 140	Gun
9874 Q-31. <u>M</u> Q- 11805 Q-	229756 229757 iscellaneo 31.01. Gu 248043 31.02. P. 228331 228332 228333 228333 228334 228335 228336 228337	132 132 <u>us</u> <u>n Mounts</u> 233 <u>W.O. Record D:</u> Quadrangle Quadrangle Quadrangle Quadrangle Quadrangle Quadrangle Quadrangle	Derrick "A" Derrick "B" Foundations for 20 MM. and 155 MM. Mounts Drawings 98 99 100 118 119 120 139 140 159	Gun

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P. W	· I	)wg.	No.	Y&D No.	Title (Cont'd)
11				228341	Quadrangle 179
12				228342	Quadrangle 180
13				228343	Quadrangle 181
14				228344	Quadrangle 198
15				228345	Quadrangle 199
16				228346	Quadrangle 217
17				228347	Quadrangle 218
18				228348	Quadrangle 219
19		31.12		228349	Quadrangle 220
20	1	•		228350	Quadrangle 167
21				228351	Wells
22				228352	Wells
23				228353	Wells
24				228354	Wells
25				228355	Quadrangle 201
6				228356	M.B. Drawing Numbers 1 to 99 List
27				228357	M.B. Drawing Numbers 100 to 199 List
8				228358	M.B. Drawing 1100 to 1199 List
9				228359	
50				228360	M.B. Drawing Numbers 2100 to 2199 List
51				228361	M.B. Drawing Numbers 3100 to 3199 List
2				228362	M.B. Drawing Numbers 200 to 299 List
3				228363	M.B. Drawing Numbers 1200 to 1299 List
4				228364	M.B. Drawing Numbers 2200 to 2299 List
5				228365	M.B. Drawing Numbers 300 to 399 List
6				228366	M.B. Drawing Numbers 400 to 499 List
7				228367	M.B. Drawing Numbers 1400 to 1499 List
8					M.B. Drawing Numbers 500 to 599 List
9				228368	M.B. Drawing Numbers 1500 to 1599 List
0				228369	M.B. Drawing Numbers 600 to 699 List
1				228370	M.B. Drawing Numbers 1600 to 1699 List
2				228371	M.B. Drawing Numbers 2600 to 2699 List
3				228372	M.B. Drawing Numbers 3600 to 3699 List
				228373	M.B. Drawing Numbers 4600 to 4699 List
4				228374	M.B. Drawing Numbers 5600 to 5699 List
5				228375	M.B. Drawing Numbers 700 to 799 List
6				228376	M.B. Drawing Numbers 1700 to 1799 List
7				228377	M.B. Drawing Numbers 2700 to 2799 List
8				228378	M.B. Drawing Numbers 3700 to 3799 List
9				228379	M.B. Drawing Numbers 800 to 899 List
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54		228384	M.B. Drawing Numbers 3800 to 3899 List
55		228385	M.B. Drawing Numbers 4800 to 4899 List
56		228386	M.B. Drawing Numbers 5800 to 5899 List
57		228387	M.B. Drawing Numbers 6800 to 6899 L; st
68		228388	M.B. Drawing Numbers 7800 to 7899 List
59		228389	M.B. Drawing Numbers 8800 to 8899 List
60		22.8390	M.B. Drawing Numbers 9800 to 9899 List
61		228391	M.B. Drawing Numbers 10800 to 10899 List
62		228392	T.C. #1 Drawing Numbers T.C. 1 to 99 L st
63		228393	T.C. #1 Drawing Numbers T.C. 100 to 199 List
64		228394	T.C. #2 Drawing Numbers T.C. 200 to 299 List
65	•	228395	T.C. #2 Drawing Numbers T.C. 300 to 399 List
66		228396	T.C. #2 Drawing Numbers T.C. 400 to 499 List
67		228397	Tank Battalion, C.C.C. and Mumford Point Drawing
			No. Lists
68		228398	Mumford Point Continued and Barrage Balloon Battalion
			Drawing Number Lists
69		228399	Low Cost Housing Drawing Number List
70		228400	Quadrangle 177 - Scale 1" - 500'
71		228401	Quadrangle 197 - Scale 1" - 500'
1-S		228402	Quadrangle 98 - Sewage Key Map Scale 1" - 500'
5-S		228403	Quadrangle 119 - Sewage Key Map Scale 1" = 500"
6-S		228404	Quadrangle 120 - Sewage Key Map Scale 1" = 500'
7-S		228405	Quadrangle 139 - Sewage Key Map Scale 1" = 500'
8-S		228406	Quadrangle 140 - Sewage Key Map Scale 1" = 500"
10-S		228407	Quadrangle 160 - Sewage Key Map Scale 1" = 500'
73		228409	Quadrangle 142 - Scale 1" = 500'
74		228410	Quadrangle 162 - Scale 1" = 500!
76	. (	228412	Quadrangle 121 - Scale 1" - 500'
77		228413	Quadrangle 122 - Scale 1" = 500'
78		228414	Quadrangle 182 - Scale 1" - 500'
79		228415	Quadrangle 202 - Scale 1" = 500'
80		228416	Quadrangle 221 - Scale 1" = 500'
81		228417	Quadrangle 241 - Scale 1" = 500'
84		228420	M.S. Drawing Number 11800 to 11899 List
85		228421	Quadrangle 240 - Scale 1" = 500'
93		228429	New River Water Sampling Stations
94		228430	Sewage Treatment Plant Operating Map

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## CHAPTER R PART II

## LIST OF SPECIFICATIONS PREPARED

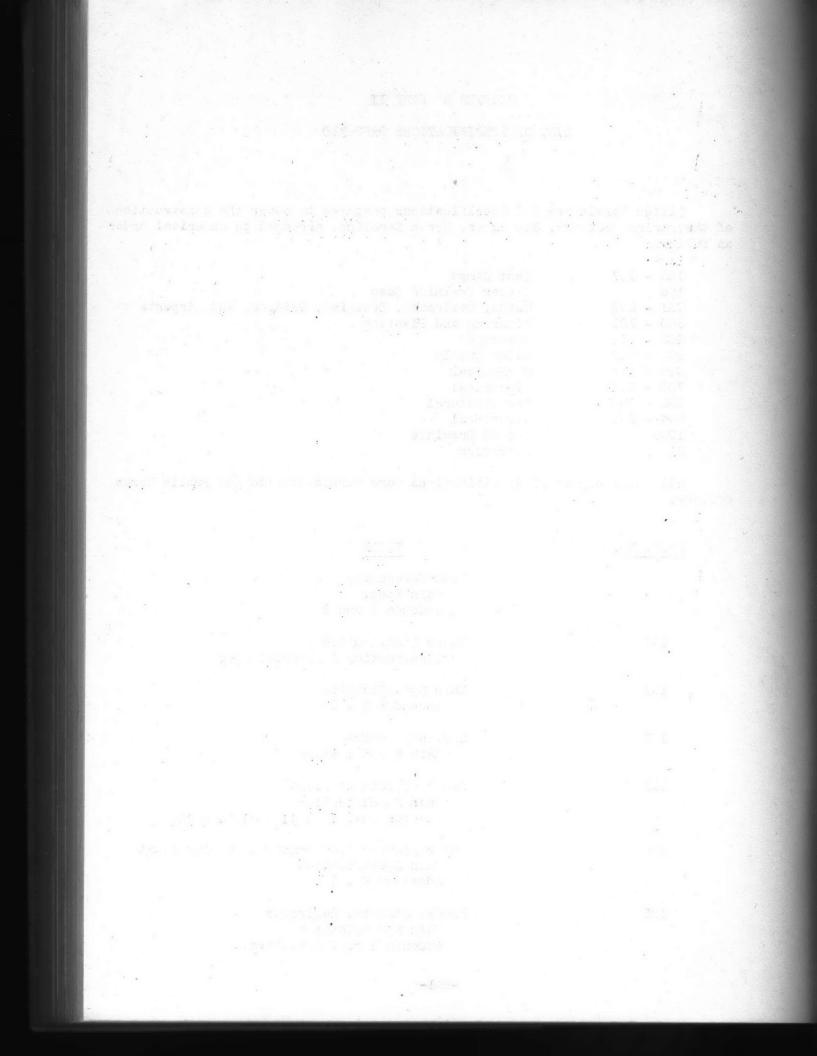
Listed herein are 201 Specifications prepared to cover the construction of the Marine Barracks, New River, North Carolina, arranged in numerical order as follows:

100 -	-	167		Tent Camps
168			÷	Glider Training Base
201 -	-	207		Roads, Railroads, Dredging, Bridges, and Airports
300 -	-	301		Clearing and Planting
400 .	•	411		Sewerage
500 .	-	509		Water Supply
600 .	-	608		Mechanical
700 .	-	708		Electrical
800 .	-	896		Architectural
994 .		999		Structural
1000				Record Drawings
EL				Elevators

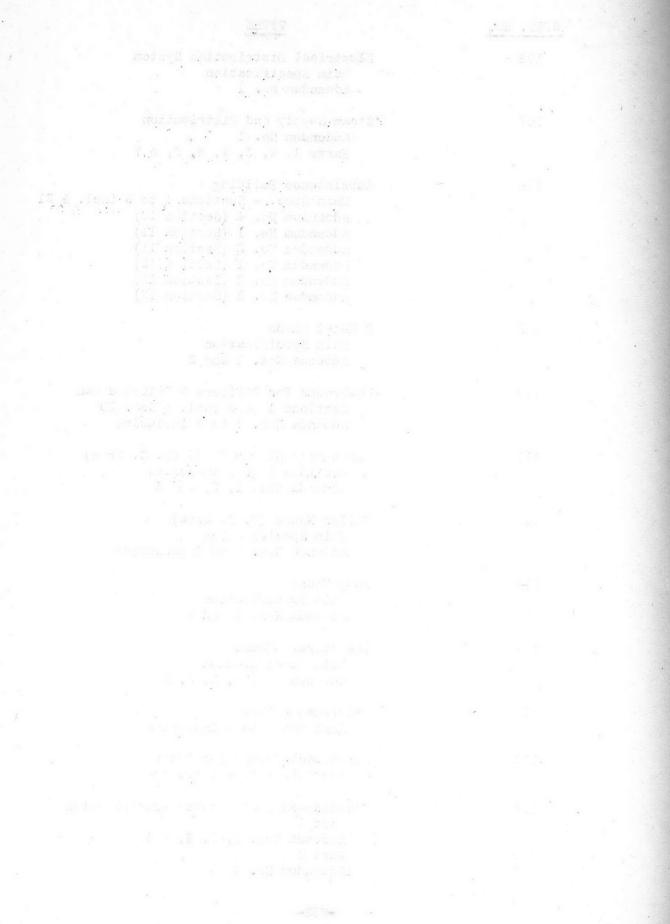
All extra copies of Specifications were turned over to the Public Works Officer.

SI	PEC. NO	0.		TITLE		2.3
				Wood Warehouses Main Spec. Addenda 1 and 2		
	100			 Water Distribution Construction & Materi	al Spec.	
	101			Main Specification Addendum No. 1		
	102			Sanitary Sewers Main Specification		
	103			Sewage Treatment Plant Main Specification Addenda Nos. 1 to 11	incl. and 13	× .
×	104			Water Storage Treatment Main Specification Addendum No. 1	and Pumping	Plant
	105	4	Ň	Roads, Streets, Railroad Main Specification Addenda 1 to 7 inclus		;

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SPEC. NO.	TITLE
106	Electrical Distribution System Main Specification Addendum No. 1
107	Steam Supply and Distribution Addendum No. 1 Parts 1, 2, 3, 4, 5, 6, & 7
108	Subsistence Building Main Spec Sections 1 to 9 incl. & 21 Addendum No. 4 (Section 10) Addendum No. 1 (Section 11) Addendum No. 2 (Section 11) Addendum No. 1 (Section 12) Addendum No. 2 (Section 12) Addendum No. 5 (Section 13)
109	2 Metal Sheds Main Specification Addenda Nos. 1 and 2
110	Washrooms for Officers & Enlisted Men Sections 1 to 9 incl. & Sec. 20 Addenda Nos. 1 to 7 inclusive
111	Warehouses SH 9 & SH 13 (T. C. Area) Sections 1 to 8 inclusive Addenda Nos. 1, 2, and 3
112	Boiler House (T. C. Area) Main Specification Addenda Nos. 1 to 5 inclusive
113	Pump House Main Specification Addenda Nos. 1 and 2
114 .	Ice Storage House Main Specification Addenda Nos. 1, 2, 3, & 4
115	Chlorinator House Sections 1 to 9 inclusive
116	Strongback Frames for Tents Sections 1 to 4 inclusive
117	Gasoline-Fuel Oil Storage-Distribution Part 1 Addenda Nos. 1, 2, 3, & 4 Part 2 Addendum No. 1



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SPEC. NO.		TITLE
118		Landscaping Section No. 1
119		Hospital Facilities Sections 1 to 16 inclusive Addenda Nos. 1 to 9 inclusive
120		Hospital Storehouse Sections 1 to 10 inclusive
121	14 1 ₁ 5	Outpost Buildings Sections 1 to 10 inclusive Addendum No. 1
122		T. C. Hospital Administration Building Sections 1 to 11 inclusive and Sections 12, 13, & 14 Addenda Nos. 1 and 2
123		Recreation Building - R-2 Section P and E
150		Refrigeration Units and Cold Storage Room in Mess Hall - Tent Camp No. 2 Sections Nos. 6, 13, & 14
151		Fuel Oil Fired Steam Generator Equipment and Appurtenances Addendum No. 1 Sections Nos. 1 and 2
152		Addition to T. C. Hospital Sections 1 to 11 inclusive and Sections 12, 13, 14, & 15
153		Subsistence Building, 570 Officers (Mess Hall) Sections 1 to 9 inclusive and Sections 10, 11, & 12 Addenda Nos. 1, 2, & 3
155		Chapels Sections 1 to 11 inclusive and Sections 12 and 13 Section H Addenda Nos. 1, 2, & 3
156		Well Pumps - H, I, J, K, L, & M - T. C. 1 & 2 O-Tank Bat. T. C Materials & Installation Main Specification
157		Naval Hospital - Equipment Purchase Main Specification

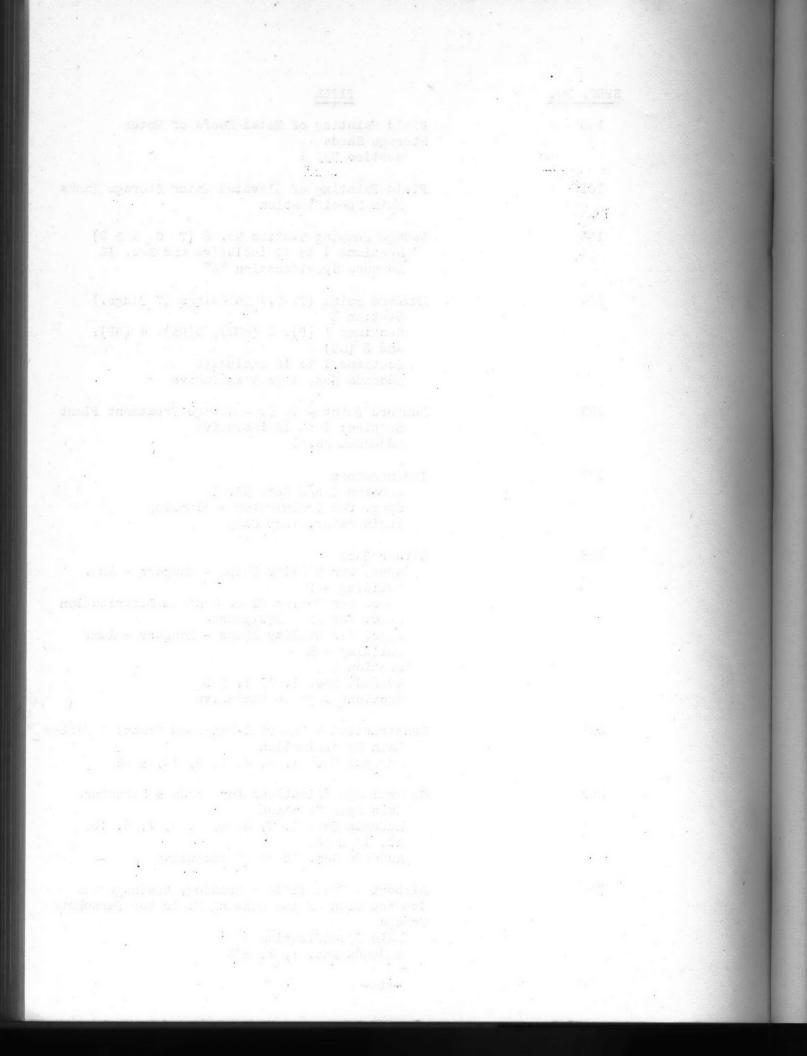
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SPEC. NO:	TITLE
160	Field Painting of Metal Roofs of Motor Storage Sheds Section No. 1
161	Field Painting of Elevated Water Storage Tanks Main Specification
163	Sewage Pumping Station No. 8 (T. C. 1 & 2) Sections 1 to 11 inclusive and Sec. 12 Advance Specification "A"
164	Mumford Point (T. C.) Buildings (7 Bldgs.) Section E Sections 1 (P), 2 (HHW), 3(HS), 4 (BP), and 5 (SD) Sections 1 to 16 inclusive Addenda Nos. 1 to 4 inclusive
165	Mumford Point - T. C Sewage Treatment Plant Sections 1 to 13 inclusive Addendum No. 1
167	Incinerators Section E and Sec. No. 1 Spec. for Incinerator - Plumbing Incinerator, Tent Camp
168	Glider Base Spec. for Utility Shops - Hangars - Adm. Building - P Spec. for Boiler Plant & Steam Distribution Spec. for Shop Equipment Spec. for Utility Shops - Hangars - Adm. Building - H Section E Addenda Nos. 1, 2, 4, & 5 Sections 1 to 16 inclusive
201	Construction & Material-Railroad Tracks & Timber Main Specification Addenda Nos. 1, 2, 3, 4, 5, 10, & 15
202	General Specifications for Roads & Structure Main Specification Addenda Nos. 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12 & 13. Addenda Nos. 15 to 27 inclusive
203	Airport - Full Title - Grading, drainage and Construction of the Landing Field for Parachute Troops
	Main Specification Addenda Nos. 1, 2, & 3 -854-



SPEC. NO.	TITLE
204	Dredging Basin & Channel at Amphibian Base Main Specification
205	Bridge on Sneads Ferry Road Main Specification
206	Concrete Pavement for Coal Storage Yards Sections No. 1 and 2 Addendum No. 1
207	Bulkhead, Ramp, Mooring Piles & Derrick Foundations Sections Nos. 1 to 3 inclusive
300	Clearing of Site Regimental Areas 1 to 4 incl. Main Specification Sec. 1 to 4 inclusive
301	Supplying & Planting Trees, Shrubs, Lawns, etc. Main Specification Sec. 1 to 10 incl. Addendum No. 1
400	Construction and Materials (Sewers) Main Specification Addenda Nos. 1 to 4 inclusive
401	Sewage Pumping Station #1 Advance Specification "A" Addenda 1 and 2 (Advance Spec. A) Main Specification
	Sections 30, 31, & 32 Addenda Nos. 1 and 2
402	Sewage Treatment Plant Advance Specification "C" Addendum No. 1 (Adv. Spec. C) Advance Specification "D" Addendum No. 1 (Adv. Spec. D) Main Specification Addenda Nos. 1 and 2
	Sections Nos. 16, 18, 19, 20, 24, 25, 26, & 27
403	Sewage Pumping Station No. 3 Sections Nos. 1 to 13 incl. and Sec. 15 Addenda Nos. 1 and 2 Advance Specification "A" Addendum No. 1 (Adv. Spec. A)
404	Sewage Pumping Equipment Sewage Pumping Station No. 4, River Road, 1200' Southeast of Charles St. Main Specification (Sec. 14 & 15 not included) Addenda Nos. 1, 2, & 3

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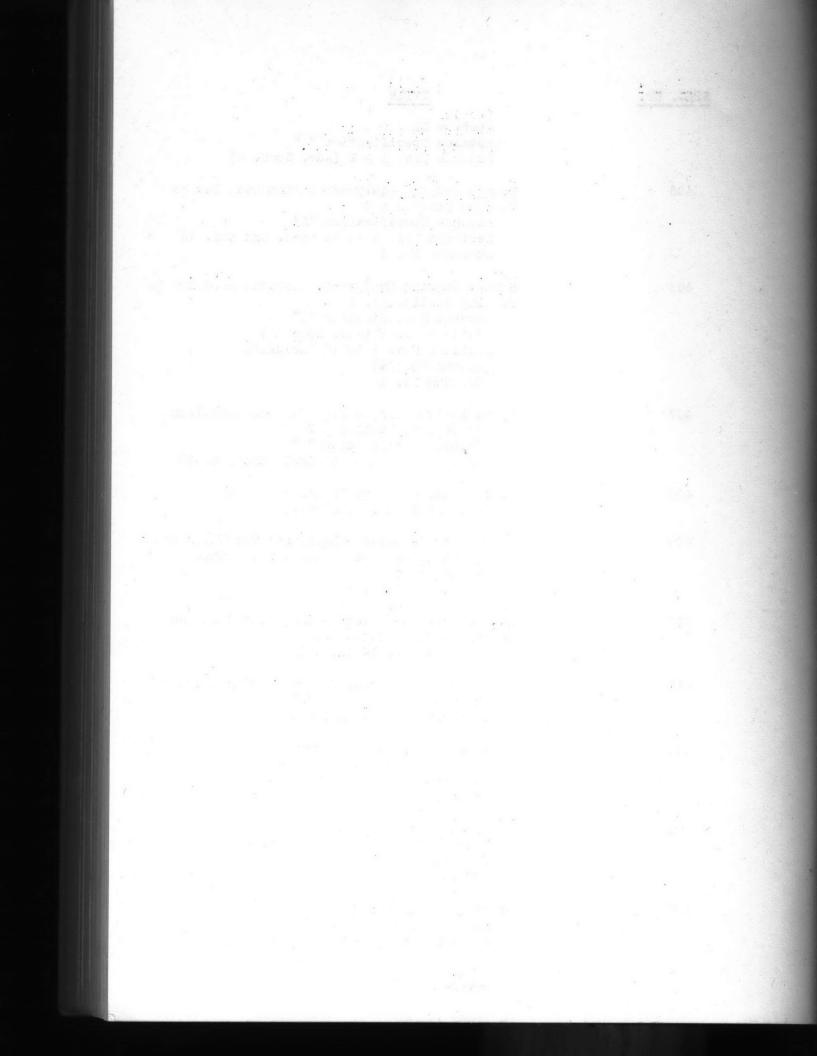
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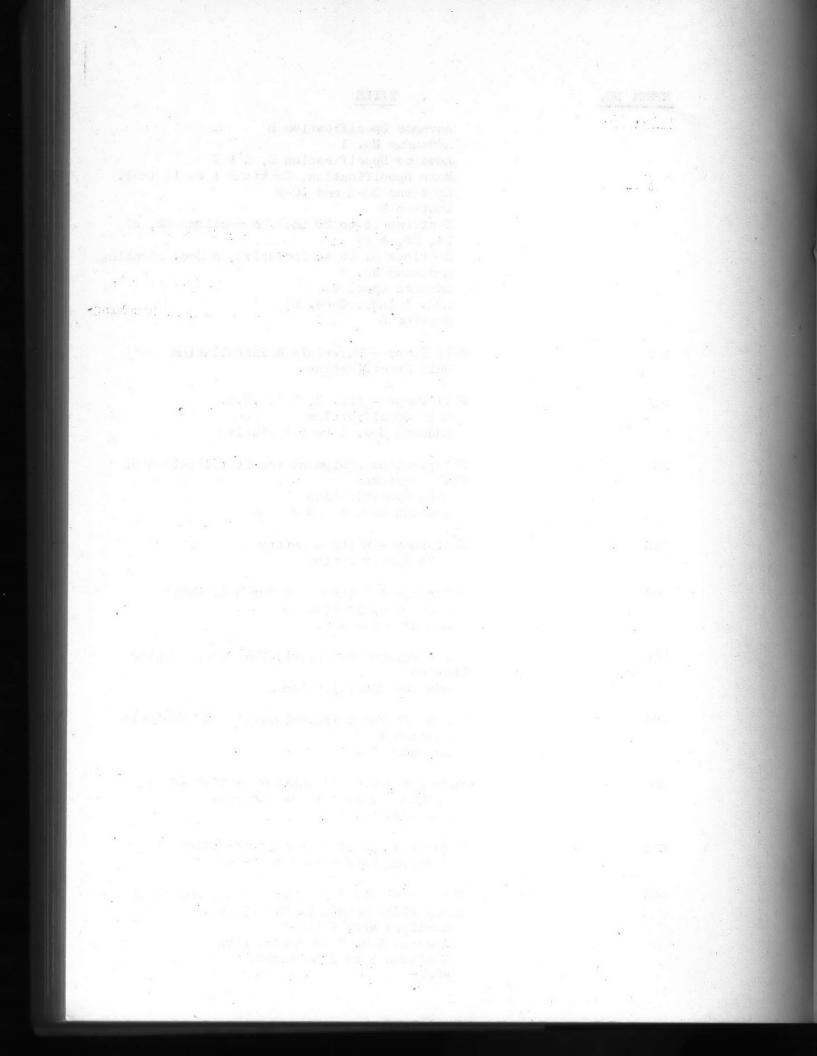
SPEC. NO.	TITLE
	Section EL Advance Specification "A" Addenda Nos. 1 & 2 (Adv. Spec. A)
405	Sewage Pumping Equipment Autumn Oval Sewage Pumping Station # 5 Advance Specification "A" Sections Nos. 1 to 12 incl. and Sec. 13 Addendum No. 1
406	Sewage Pumping Equipment, Hospital Area Sewage Pumping Station No. 2 Advance Specification "A" Addendum No. 1 (Adv. Spec. A) Sections Nos. 1 to 12 inclusive Section El (14) Addendum No. 1
407	Specification for Barrage Balloon Battalion Sewage Pumping Station # 7 Advance Specification "A" Sections Nos. 1 to 11 incl. and Sec. 12
408	Rifle Range - Sewage Treatment Plant Sections 1 to 12 inclusive
409	Laboratory Supplies & Equipment for Water and Sewage Analyses, Main Laboratory, Sewage Treatment Plant Main Specification
410	Sewage Treatment Plant - Amphibian Base and Barrage Balloon Battalion Sections 1 to 12 inclusive
411	Parachute Tower Area, Sewage Pumping Station Advance Specification "A" Sections 1 to 11 inclusive
500	Elevated Water Storage Tank Architectural Specification Addendum No. 1 Water Specification
501	Water Distribution System Main Specification - Well Pump Construction & Material Addendum No. 1
502	Water Pumping Equipment Advance Specification "A" Addenda Nos. 1 and 2

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# TITLE

	Advance Specification B
	Addendum No. 1
	Advance Specification D, E & F
	Main Specification, Sections 1 to 12 incl.
	Sections 30-A and 30-B
	Section H
	Sections 13 to 20 incl. & Sections 22, 23,
	24, 26, & 27
	Sections 31 to 45 inclusive, & Sec. Plumbing
	Addendum No. 3
	Advance Spec. C
	Add. 1 (Adv. Spec. C)
	Section E
503	Well Pumps - Materials & Installation
	Main Specification
504	Well Pumps - Nos. 2, 7 R.T.U.V.
	Main Specification
	Addenda Nos. 1 to 5 inclusive
COC	Ablanization Equipment for Starilization of
505	Chlorination Equipment for Sterilization of
	Well Supplies
	Main Specification Addenda Nos. 1 and 2
	Addenda Nos. 1 and 2
506	Well Pump - White Cemetery
000	Main Specification
507	Water Level Controllers for Well Pumps
X .	Main Specification
	Addendum No. 1
-	
508	Water Pumping Equipment, Emergency Pumping
	Station
	Advance Specification A
500	Equipment for Carrier-Current Well Controls
509	Section E
	Addendum No. 1
	Addondali No. I
600	Bachelor Officers' Quarters Boiler Spec.
	Sections Nos. 1 to 12 inclusive
	Addendum No. 1
601	Liquified Gas Storage & Distribution System
	Soctions Nos. 1 to 3 inclusive
20 B	a - a That Oil Maning for D M & Amphibian
603	Gas & Fuel Oil Tanks for D.T.A., Amphibian
	Base, Rifle Range, T. C. #2, etc. Sections Nos. 4 and 5
	Addenda Nos. 1 to 7 inclusive
	Sections 1 to 3 inclusive
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SPEC. NO.	TITLE
604	Steam Distribution - Division Training Area, Post Troops Area, Fifth Regimental Area, and Extension Steam Distribution Main Specification Addendum No. 1
605	Parachute Landing Field - Gasoline Distribution Section No. 1 and Section E Addenda Nos. 1 and 2
606	Mechanical Equipment for Amphibian Shops Main Specification Addenda Nos. 1 and 2
607	Steam Distribution - Amphibian Base & Rifle Range Section S
608	Steam Distribution - Naval Hospital Main Specification
700	Electrical Distribution Sections Nos. 1 to 4 inclusive and Sec. 5 Addenda Nos. 1 to 7 inclusive
701	Telephone Communication System Part I, Revised - Sec. 1 to 3 inclusive Revised (Sec. 1 to 3 incl.) Addenda Nos. 1 and 2 Part II Addendum No. 1 (Part 2)
702	Obstruction Light on Parachute Tower Section No. 1 Section No. 28 (Void) Addendum No. 1
703	Parachute Troops Landing Field - Electrical Power and Lighting Section No. 2
704	Equipment Specification for Transformer Sub- stations - Naval Hospital Administration Build-
	ing, Mess Hall, Wards and Corridors Section E Part 1 and Part 2 Part 3 and Part 5 Addenda Nos. 1 (Part 4) and 2
705	Private Branch Exchange Switchboard Section No. 1

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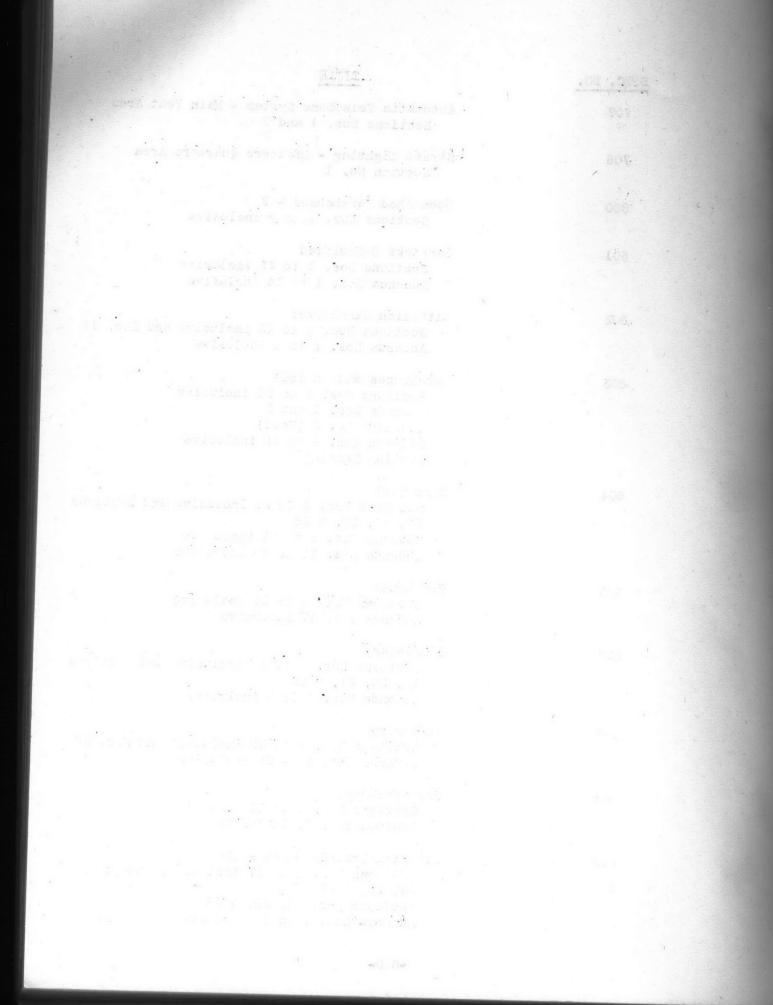
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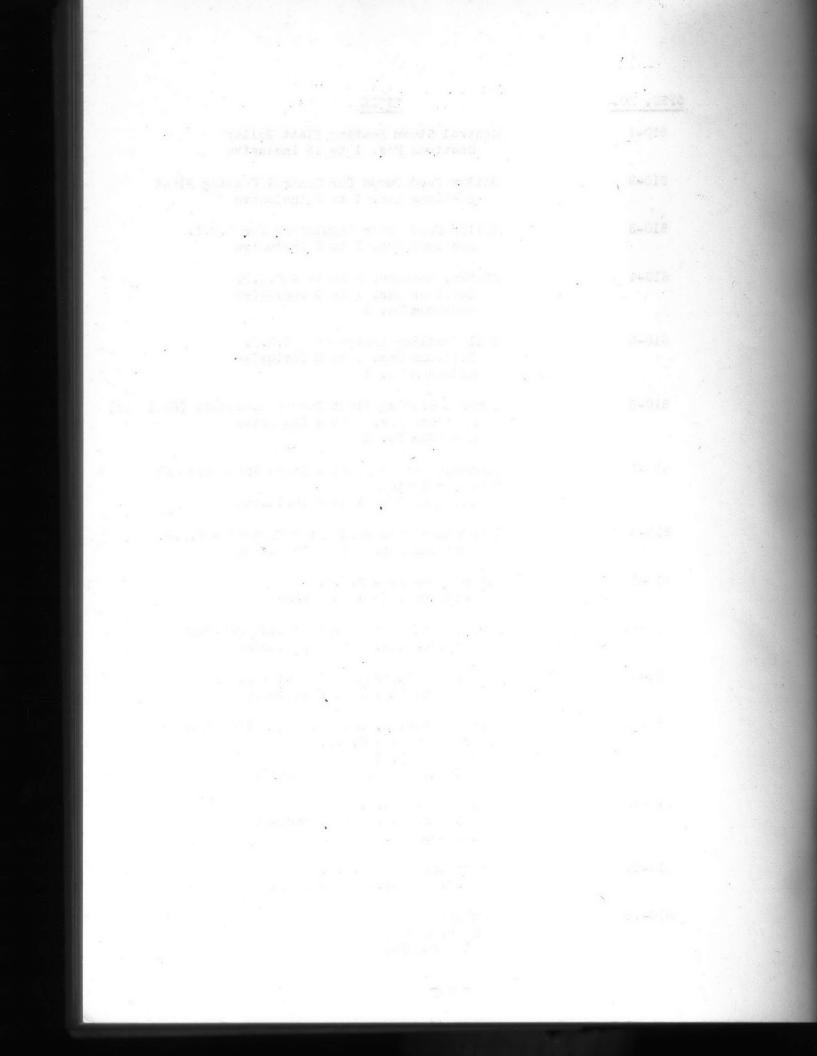
SPEC. NO.	TITLE
707	Automatic Telephone System - Main Tent Area Sections Nos. 1 and 2
708	Street Lighting - Officers Quarters Area Section No. 1
800	Open Shed Warehouses - 2 Sections Nos. 1 to 9 inclusive
801	Barracks B-Modified Sections Nos. 1 to 25 inclusive Addenda Nos. 1 to 34 inclusive
802	Battalion Warehouses Sections Nos. 1 to 13 inclusive and Sec. 14 Addenda Nos. 1 to 4 inclusive
. 803	Warehouses 36.0' x 180' Sections Nos. 1 to 21 inclusive Addenda Nos. 1 and 2 Addendum No. 3 (Void) Addenda Nos. 4 to 18 inclusive Section Heating
804	Mess Hall Sections Nos. 1 to 21 inclusive and Sections 22, 23, 24, & 25 Addenda Nos. 1 to 11 inclusive Addenda Nos. 13 to 20 inclusive
805	Firehouse Sections Nos. 1 to 25 inclusive Addenda 1 to 17 inclusive
806	Commissary Sections Nos. 1 to 18 inclusive and Sections 19, 20, 21, & 22 Addenda Nos. 1 to 8 inclusive
807	Infirmary Sections Nos. 1 to 25 inclusive and Sec. 26 Addenda Nos. 1 to 22 inclusive
808	Post Exchange Sections Nos. 1 to 21 inclusive Addenda 1 to 20 inclusive
809	Division Training Area - Theatre Sections Nos. 1 to 27 inclusive, except 24, 25, & 26 Sections Nos. 24, 25, & 26 Addenda Nos. 1 to 12 inclusive

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S	PEC. NO.	TITLE
	810-1	Central Steam Heating Plant Boiler Sections Nos. 1 to 15 inclusive
	810-2	Boiler Feed Pumps for Central Heating Plant Sections Nos. 1 to 3 inclusive
	810-3	Boiler Feed Water Regulators for C.H.P. Sections Nos. 1 to 3 inclusive
	810-4	Stacks, Breeches & Ducts - C.H.P. Sections Nos. 1 to 4 inclusive Addendum No. 1
	810-5	Coal Handling Equipment - C.H.P. Sections Nos. 1 to 8 inclusive Addendum No. 1
	810-6	Central Heating Plant Burner Equipment (Fuel Oil) Sections Nos. 1 to 4 inclusive Addendum No. 1
	810-7	Central Heating Plant - Steam Pneumatic Ash Conveyor System Sections Nos. 1 to 6 inclusive
	810-8	Deaerating Taps Feed Water Heaters - C.H.P. Sections Nos. 1 to 4 inclusive
	810-9	Water Softners - C.H.P. Sections 1 to 4 inclusive
	810-10	Surge, Condensate & Boiler Blow Off Tank Sections Nos. 1 to 3 inclusive
	810-11	Combustion Control Equipment - C.H.P Sections Nos. 1 to 6 inclusive
	810-12	Unit Substation, Low Voltage Switch Gear and Control Panels - C.H.P. Section No. 1 Addenda Nos. 1 to 3 inclusive
	810-13	Sump Pump - C.H.P. Sections Nos. 1 to 3 inclusive Addendum No. 1
	810-14	Air Compressor - C.H.P. Sections Nos. 1 to 4 inclusive
	810-15	Plumbing Section P Addendum No. 1

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SPEC. NO.	TITLE
810-16	Condensate Pumps and Receiver for C.H.P. Sections Nos. 1 to 3 inclusive
810-17	Piping, Including Valves, Fittings, & Accessories for C. H. P. Sections Nos. 1 to 3 inclusive
810-18	Insulation and Painting of Piping, Ducts, Breechings and Stacks for the Central Heating Plant Solutions Nos. 1 to 4 inclusive
810-19	Continuous Blow-Off System for Central Heating Plant - D. T. A. Sections Nos. 1 to 3 inclusive
810-20	Two Ton Chain Hoist and Trolley for C.H.P D.T.A. Main Specification
811	Guest House Sections Nos. 1 to 16 inclusive and Sections 17, 18, & 19 Addenda Nos. 1 to 9 inclusive
812	Quarter's Building - B.O.Q Wood Preservative Treatment Section No. 1
813	Quarters Building - B.O.Q. Sections Nos. 1 to 19 inclusive and Sections 20, 21 and 22 Addenda Nos. 1 to 13 inclusive
814	Mess Hall - B.O.Q. and Officers Recreation Bldg. Wall Sheathing Sections P, Rl, E, and EE Sections Nos. 1 to 23 inclusive Sections V, H, and BP Addenda Nos. 1 to 9 inclusive
815	Laundry Building Sections Nos. 1 to 25 incl, except 21, 22, & 23 Sections Nos. 21A, 21B, 22 (Plumbing), 23, 24, and 25 Addenda Nos. 1 to 3 inclusive Addenda Nos. 5 to 9 inclusive
816	Post Headquarters Sections Nos. 1 to 29 inclusive and 34 Sections Nos. 30, 31, 32, 33, 35, & 36 Section Ventilation and Sec. Radio Towers Addenda Nos. 1 to 5 inclusive

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SPEC. NO.	TITLE
817	Division Headquarters Building Sections Nos. 1 to 28 inclusive and 32 Sections Nos. 29, 30, 31, & 33 Addenda Nos. 1, 2, 4, 5, & 6
818	Naval Hospital - Medical Storehouse Sections Nos. 1 to 25 inclusive Sections P, H, E, & R (28) Addenda Nos. 1 to 6 inclusive
819	Naval Hospital - Shops and Warehouse Sections Nos. 1 to 24 inclusive and 25 Sections H and P Section No. 28 Addenda Nos. 1, 2, 4, 6, 7, & 8
820	Officers' Quarters Sections Nos. 1 to 16 inclusive and 20 Sections Nos. 17, 18, 19 & 19A Addenda Nos. 1 to 3 inclusive Addenda Nos. 5 to 17 inclusive
821	Radio Facilities, Tower Sections Nos. 1 to 4 inclusive Addenda Nos. 1 and 2
822	Brig Sections Nos. 1 to 23 inclusive and Sections 24, 25, & 26 Addenda Nos. 1 to 4 inclusive Addenda Nos. 6, 8, & 9
823	Incinerator Sections Nos. 1 to 10 inclusive and Sections 11, 12, 13A, & 13B Addenda Nos. 1 to 5 inclusive
824	Heating Plant - Structural Steel Specification - Sections Nos. 1, 8, 9, & 25 Sections 1 to 22 inclusive Sections Nos. 1 & 2 (Interior Elect. Work) Addendum No. 1
825	Cold Storage Plant Sections Nos. 1 to 20 inclusive Sections Nos. 21A, 21B, 22, 23, & 24 Addenda Nos. 1 to 7 inclusive
826	Building Under Parachute Tower Sections Nos. 1 to 22 inclusive and Sec. P Addendum No. 1

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SPEC. NO.	TITLE
827	Rifle Range - Butts, Targets, Firing Points Sections Nos. 1 to 8 inclusive
828	Radio Transmitter Building Sections Nos. 1 to 18 incl. and Sec. 22 Sections Nos. 19, 20, & 21 (Heating) Addendum No. 2
829	Battalion & Regimental Headquarters Building Sections Nos. 1 to 22 incl. & Sec. 26 Sections Nos. 23, 24, and 25 Addenda Nos. 1 to 6 inclusive
830	Naval Hospital Garage Sections Nos. 1 to 22 inclusive and Sections 23, 26, P, and H Addenda Nos. 1 to 5 inclusive
832	Operation Building - Parachute Landing Field Sections Nos. 1 to 18 inclusive and Sections Nos. 19, 20, and 21 Addenda Nos. 1 to 3 inclusive
833	<ul> <li>Naval Hospital - Administration Building and Mess Hall, Naval Hospital - Wards &amp; Corridors Sections E5, E2, EQ, Air Conditioning, H, E, P, E4, and E3.</li> <li>Sections Nos. 1 to 34 inclusive Part II (Galley Equipment) Sections Nos. 35 and 36</li> <li>Part 6 Sections R1, EA (Elect. Appliances), V (Wards &amp; Corridors), V (Adm. Building).</li> <li>Sections Nos. 37 to 43 inclusive and Sections Nos. 44, 45, 46, 47, 48, and 49.</li> <li>Spec. for Mess Hall - V.</li> <li>Section SEQ</li> </ul>
	Addenda Nos. 3 to 19 inclusive Addenda Nos. 21 to 47 inclusive
835	Post Dispensary - (Division Infirmary, Dental Clinic & Sick Bay & Out-Patient Clinic) Sections Ventilation, AC, H, P, E, and SEQ Sections Nos. 1 to 22 inclusive Addenda Nos. 1 to 6 inclusive
836	30 - Ton Derrick Amphibian Base Section No. 6
837	Chapels - Protestant & Catholic Sections 1 to 20 inclusive Sections P, H, and 18 Addenda Nos. 1 and 2

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SPEC. NO.	TITLE
838	Naval Hospital - Purchase X-Ray Equipment Main Specification Addenda Nos. 1 and 2
839	Naval Hospital - Corpsmen's Barracks Sections P, H, and E Sections Nos. 1 to 22 inclusive and Sec. 23 Addenda Nos. 1 to 4 inclusive
840	Amphibian Storehouse Section No. 1
841	Range House - Rifle Range Toilets - Target Shed for Rifle Range Sections Nos. 1 to 16 inclusive Section P Addendum No. 1
842	Armory & Office Building - Rifle Range Section P, E, and H Sections Not. 1 to 22 inclusive
843	Navel Hospital - Warrant Officers' Quarters Sections P, E, and H Sections Nos. 1 to 16 inclusive Addenda Nos. 1, 2, and 4
844	Naval Hospital - Nurses' Home Sections Nos. 1 to 25 inclusive and Sec. H Addendum No. 1 Sections P, E, V, and R1 Galley Equipment Sections 26 and LE Addenda Nos. 2 to 5 inclusive
845	Naval Hospital - Family Hospital Nurses: Qtrs. Sections E, H (Division Training Area), H (Naval Hospital), and P Sections Nos. 1 to 16 inclusive and Sec. 17 Addenda Nos. 1 to 4 inclusive
846	Naval Hospital - Laundry Sections WS, EQ, P, H, and E Sections Nos. 1 to 19 inclusive Addenda Nos. 1 to 8 inclusive
847	Field Painting for 2 Obaervation Towers Section No. 1
848	Magazines Section No. 4

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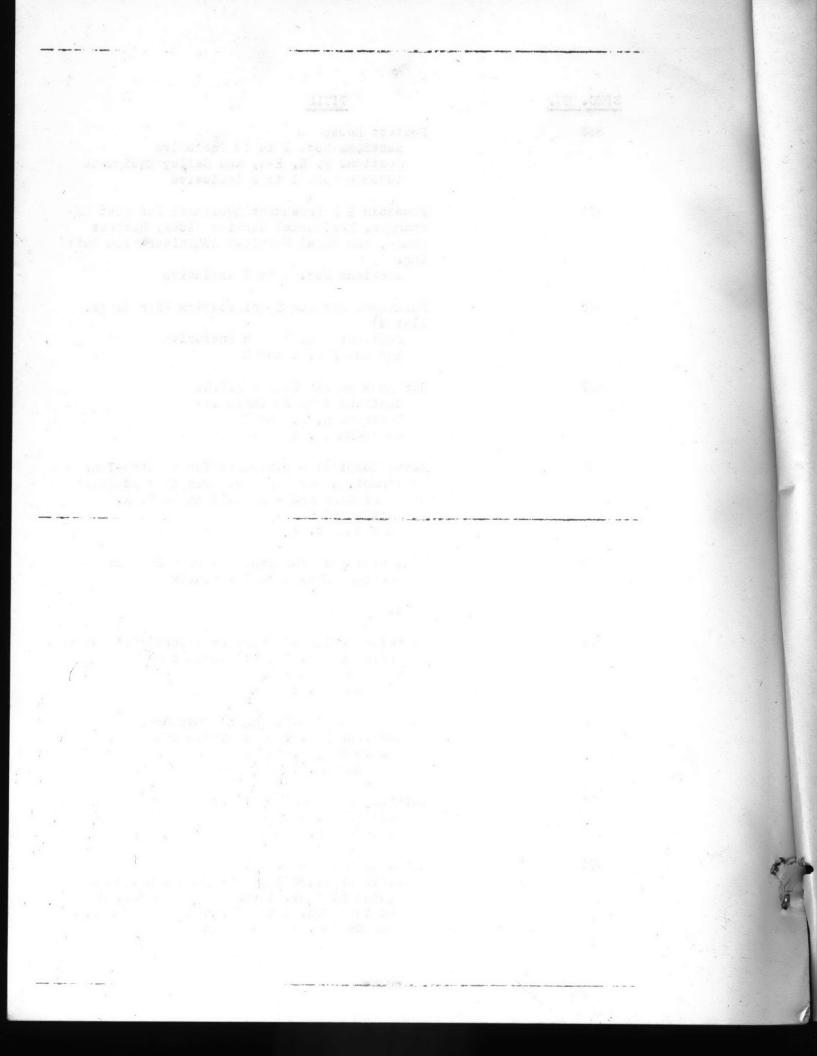
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SPEC. NO.	TITLE
849	Regimental Service Clubs Sections H, P, and E Sections Nos. 1 to 25 inclusive Addenda Nos. 1 to 5 inclusive
850	Gate House Sections P, H, and E Sections Nos. 1 to 19 inclusive Addenda Nos. 1 and 2
852	Amphibian Machine Shop and Carpenter Shop (2 Buildings) Sections Nos. 1 to 19 inclusive and Sections El, P, H, and C Addendum No. 1
853	Reclamation Building Sections Nos. 1 to 20 inclusive Sections P, H, and E Addendum No. 1
854	Post Shop Building Sections Nos. 1 to 26 inclusive Sections H, P, and E Addenda Nos. 1 to 4 inclusive
855	Building for Propane Gas Sections Nos. 1 to 12 inclusive and Sec. 13
856	Naval Hospital - Power Plant Sections Nos. 1 to 16 inclusive Sections P, E, and BP Addenda Nos. 1 and 2
857	Rifle Range - Boiler House Sections Nos. 1 to 14 inclusive Sections E, P, and BP Addendum No. 1
859	Post Tailor & Cobbler Shop Sections Nos. 1 to 17 inclusive Sections P and H
860	Bakery Sections Nos. 1 to 21 inclusive Sections H, P, E, and R1 Addenda Nos. 1 to 3 inclusive
861	Mockup Stiff-Leg Derricks
862	Naval Hospital - Officers' Quarters Sections Nos. 1 to 16 inclusive

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SPEC. NO.	TITLE
863	Hostess House Sections Nos. 1 to 19 inclusive Sections P, H, E-1, and Galley Equipment Addenda Nos. 1 to 3 inclusive
864	Fountain & Refreshment Equipment for Post Ex- changes, Regimental Service Clubs, Hostess House, and Naval Hospital Administration Build- ing. Sections Nos. 1 to 7 inclusive
866	Furniture and Rug Specification (for Bldgs. listed) Sections Nos. 1 to 8 inclusive Addenda Nos. 1 and 2
867	Garage & Repair Shop - D.T.A. Sections 1 to 20 inclusive Sections H, P, and E Addendum No. 1
868	Naval Hospital - Equipment for Electro-Therapy Treatment, Apparatus Naval Hospital Administra- tion Building and Mess Hall in D. T. A. Section El Addendum No. 1
. 869	Ecclesiastical Furnishings for 2 Chapels Sections Nos. 1 to 4 inclusive
870	Void.
871	Bachelor Officers' Quarters - Servants' Quarters Sections Nos. 1 to 15 inclusive Section H and P Addendum No. 1
872	Naval Hospital - Servants' Quarters Sections Nos. 1 to 16 inclusive Sections P, H, and 17 Addendum No. 1
873	Painting - Parachute Towers Section No. 1 Addenda Nos. 1 and 2
875	Naval Hospital - B.O.Q. Sections P, Galley Refrigerations, Galley Equipment List, E, Galley Equipment, H, and Sections Nos. 1 to 22 inclusive and Sec. 20 Addenda Nos. 1 to 5 inclusive



SPEC. NO.	TITLE
876	Bowling Alleys and Bleacher Seats for (5) Regimental Service Clubs Sections Nos. 1 to 4 inclusive (Void)
877	Balloon Storehouse and Shop Sections Nos. 1 to 15 inclusive and Sec. E
880	Post Theater Sections SE-1 to SE-3 inclusive Sections ES and E Sections Nos. 1 to 21 inclusive Section Plumbing Addenda Nos. 1 to 4 inclusive
881	Buildings at Barrage Balloon Training School Section E, H, and P Boiler House Addendum No. 1
882	Equipment for 3 Recreation Buildings Type (R-2) Sections Nos. 1 to 6 inclusive Section EE
883	Post Exchange Warehouses Sections H, E, and P Sections Nos. 1 to 18 inclusive Addendum No. 1
884	Lumber Storage Sheds Sections Nos. 1 to 7 inclusive
885	Parachute Training Building and Parachute Building Sections Nos. 1 to 5 inclusive Sections P and E Addenda Nos. 1 to 4 inclusive Section Heating Sections Nos. 1 to 14 inclusive
887	Transformer House at Landing Field Sections Nos. 1 to 9 inclusive
888	Transformer Houses at Naval Hospital Sections Nos. 1 to 9 inclusive
889	Architectural Bldg. Work, Well Pump Houses Sections Nos. 1 to 11 inclusive
890	Equipment Specification for Radiographic & X-Ray apparatus for Family Hospital Sections EX and R Part I & II

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<ul> <li>ing Base Nain Specification (Sections Nos. 1 to 19 in Addendum No. 1</li> <li>996 General Specification for Ponton Bridge Across Inland Waterway Ponton Bridge Across Inland Waterway Piping</li> <li>997</li> <li>997 Pile Foundations Sections Nos. 1 and 2</li> <li>998 Timber Pile Foundations, D.T.A. &amp; Industrial - Supply Area Main Specification</li> <li>999</li> <li>999</li> <li>999</li> <li>991</li> <li>901</li> <li>902</li> <li>903</li> <li>903</li> <li>904</li> <li>904</li> <li>905</li> <li>905</li> <li>905</li> <li>905</li> <li>906</li> <li>906</li> <li>907</li> <li>907</li> <li>908</li> <li>908</li> <li>908</li> <li>909</li> <li>909</li> <li>909</li> <li>900</li> <li>900<th>892</th><th>Soctions Nos. 1 to 24 inclusive Part I Heating - Part II Ventilation Addenda Nos. 1 to '7 inclusive Service Station at Post Exchange Sections Nos. 1 to 14 inclusive Section Plumbing and Electrical Boat House - W. Creek Boat Basin Plumbing Sections Nos. 1 to 10 inclusive Addendum No. 1</th></li></ul>	892	Soctions Nos. 1 to 24 inclusive Part I Heating - Part II Ventilation Addenda Nos. 1 to '7 inclusive Service Station at Post Exchange Sections Nos. 1 to 14 inclusive Section Plumbing and Electrical Boat House - W. Creek Boat Basin Plumbing Sections Nos. 1 to 10 inclusive Addendum No. 1
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SPEC. NO.

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Main Specification Addendum No. 1

Spec. El

Elevators for Administration Building, Wards, Corridors, and Post Dispensary Main Specification imin Specification Addapting No. 1

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Slavedors for Adulnia retion Building, Werds, Corridors, Aud Foot Disponsary Main Specification

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