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COMPLETION REPORT

U. S. ATOMIC ENERGY COMMISSION

CONTRACT NO. AT-(29-1)-507

Greenhouse #

ENIWETOK PROVING GROUND FACILITIES

VOL. X SPECIFICATIONS (2)

HOLMES & NARVER, INC.

LOS ANGELES, CALIFORNIA

1 September 1951

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SHN - 1497

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1 September 1951

PURCHASE SPECIFICATIONS

PURCHASE SPECIFICATIONS

TABLE OF CONTENTS

Invitation No. HN-2H-105
Dated: November 28, 1949

HOLMES & NARVER
824 South Figueroa Street
Los Angeles 14, California

INVITATION TO BID

FOR

WINDOW SCREENS

Lump sum proposals are invited for furnishing five hundred and fifty (550) Window Screens in accordance with the attached drawing and general specifications. Bidder shall submit with his proposal detailed specifications of materials where called for on the drawing or in the Specifications. All documents must be returned to this office with the proposal.

Bid price shall include the cost of packaging for export and delivery to Naval Supply Center, Oakland, California. No sales taxes shall be included in the bid price.

Delivery of two hundred and fifty (250) screens f.o.b. Naval Supply Center, Oakland, California, not later than February 9, 1950 is required. Delivery of the balance of three hundred (300) screens shall be made within thirty (30) days from date Contract is signed.

Proposals shall be addressed to Holmes & Narver, Engineers, at 824 South Figueroa Street, Los Angeles 14, California. Proposals will be received until January 23, 1950.

REFERENCE:

SECTION 8, "CARPENTRY AND RELATED WORK" -

Paragraph 8-12

Spec. No. HN-2H-105
Dated: November 28, 1949

SPECIFICATIONS

FOR

WINDOW SCREENS

INSTRUCTIONS TO BIDDERS:

1. The window screens called for in the following specifications will be purchased by Holmes & Narver, Engineers (hereinafter referred to as the Purchaser). Screens shall be delivered f.o.b. Naval Supply Center, Oakland, California.

2. Delivery not later than February 9, 1950, f.o.b. Naval Supply Center, Oakland, California, of the first increment of two hundred and fifty (250) screens is essential, and no proposal will be considered which is based upon a later delivery date.

3. The bidder shall incorporate into his proposal the following statement:

> The Undersigned agrees that the Purchaser may retain the sum of one hundred ($100.00) dollars from the amount of the compensation to be paid the Undersigned for each day after February 9, 1950 that the first increment of two hundred and fifty (250) window screens, or any part thereof, remains undelivered f.o.b. Naval Supply Center, Oakland, California.

5.
6. Paragraphs 5, 6, and 7 have been deleted.
7.

SCOPE OF CONTRACT:

8. The work to be performed under this Contract by the successful bidder (hereinafter referred to as the Vendor) shall comprise the fabrication and delivery of five hundred and fifty (550) window screens complete with accessories, and shall include:

SCOPE OF CONTRACT: (Continued)

9. Furnishing all labor, tools, equipment, and materials (except as otherwise specifically noted) required for the fabrication, packaging and delivery of the window screens as shown on the drawing and/or mentioned in these specifications.

10. Furnishing, packaging and delivering all rubber plugs, rubber cement, bolts, and any other materials shown on drawing or required for the installation of the screens.

11. The installation of the screens and work noted on drawing to be performed in the field are not a part of this Contract.

DRAWINGS:

12. The drawing referred to under "Scope of Contract" is entitled "Typical Screen Details", Sheet No. 2H-915.

13. In addition, work shall conform to supplemental detail sheets which may be issued, and to approved shop drawings insofar as they do not conflict with the requirements of the Contract Drawing.

SHOP DRAWINGS:

14. The Vendor shall furnish, at his own expense, complete shop drawings (in quadruplicate) of the window screens to the Purchaser for his approval. No work shall be done or material ordered prior to approval of these drawings.

INSPECTION:

15. The Purchaser shall at all times have access to the work wherever it is in preparation or in progress, and the Vendor shall provide proper facilities for such access and inspection.

16. The Purchaser shall have the right to reject materials and workmanship which are defective and require their correction; and the Vendor shall satisfactorily correct such defects without cost to the Purchaser.

17. The failure of the Purchaser during the progress of the work to discover or reject defective materials or workmanship shall not relieve the Vendor of the responsibility of performing the work strictly in accordance with the contract, specifications, and drawings.

FABRICATION AND WORKMANSHIP:

18. Screens shall be fabricated to fit closely and neatly around the entire perimeter of the openings as shown on drawing, and shall be interchangeable for openings of the same size.

19. Screens shall be of the re-wireable type permitting the replacement of screen cloth without injury to the frame or necessitating renewal or reconstruction of its parts.

20. Wood frames shall be smooth and free from tool marks. Frame members shall be accurately cut and fitted, securely fixed, and shall be true to line, plane, and plumb, with bolt holes accurately drilled. Splicing of members will not be permitted. All intersections shall be blind mortise and tenoned or doweled with hardwood dowels, and shall be set in waterproof glue. Dowels and tenons shall be made to driving fits.

21. Frames shall be grooved for securing the screen cloth which shall be fixed in the grooves and held taut and secure by beads or splines driven into the grooves. Tacks, nails, or staples shall not be used to secure screen cloth. Grooves shall be in rabbets and the beads shall be covered with flush moldings which shall fill the rabbets and shall be secured in place by aluminum staples.

22. Screens shall be completely assembled with all hardware set. Rubber plugs of sizes shown, rubber cement, and rough hardware required for field installation shall be delivered unattached.

PAINTING:

23. All surfaces to be painted shall be thoroughly clean and dry. Seal all sappy areas with shellac and sand corners to a slightly rounded surface.

24. All surfaces of all wooden members, after fabrication and before assembly, shall be given one prime coat of paint. After assembly, all exposed wooden surfaces shall be given a second coat of paint. Paint shall cover all surfaces thoroughly, and shall be free of sags or runs.

25. Screen cloth, rubber plugs, and aluminum items shall not be painted.

PACKAGING:

26. All materials shall be properly packaged or crated for export shipment. Each crate or package shall be clearly marked to show contents and gross weight.

27. Vendor shall obtain Purchaser's instructions in regard to code letter designation to be marked on each crate or package.

MATERIALS:

28. All materials used for the work shall be new and the best of their kind and grade. The term "or equal" shall mean "or equal as approved by Purchaser".

29. All materials used for the work shall be of corrosion resisting types or shall be suitably processed to resist corrosion.

30. Substitution of other materials for those herein specified may be made only with the approval of Purchaser.

31. Wood for window screen frames shall be well-seasoned, kiln-dried Idaho White Pine or Sugar Pine of the following grades, as grade-marked by the Western Pine Association:

Idaho White Pine	- Choice	- IWP
Sugar Pine	- C Select	- SP

32. Wood glue shall be a phenolic or resorcinol type glue of brand approved by Purchaser.

33. Screen Cloth shall be 18 x 14 plastic mesh with filament diameter of 0.015". Screen cloth shall be "Lumite Insect Screen" color, Chicopee gray as manufactured by the Chicopee Manufacturing Corp. or equal.

34. Rubber plugs shall be Neoprene synthetic sponge, medium grade, as fabricated by Rubbercraft Corp. of California, Ltd., or equal synthetic rubber.

35. Rubber cement shall be No. 101 rubber cement as manufactured by Rubbercraft Corp. of California Ltd., or equal waterproof type cement. Vendor shall furnish one quart of cement for each 250 screens or part thereof.

36. All rough hardware including bolts, screws, washers, nails, etc. shall be of aluminum alloy. 17S or 24S alloys shall have alumilite 205 or equal protective coating.

37. Vendor shall furnish and package for shipment 105% of the actual count of all types of rough hardware required for field installation of all window screens at final destination.

38. Finish Hardware, as follows, shall be furnished by Vendor for each screen:

1 pair aluminum clip hangers

2 door buttons with screws - to be aluminum or other metal processed against corrosion

2 washers for use with door buttons - to be waterproof fiber or aluminum

39. All rough and finish hardware items, if possible, shall be of aluminum. For items not reasonably obtainable in aluminum, Bidder shall furnish, for Purchaser's approval, a complete description of the materials he proposes to substitute.

40. Paint: The first or prime coat shall be a mixed pigment (LTZ) in a linseed oil vehicle with controlled penetration and shall be Dutch Boy #25 Exterior Wood Primer or equal.

41. The second or finish coat shall be a tung oil cumar vehicle containing not less than 2-1/2# of aluminum paste per gallon of vehicle and shall be Dutch Boy #1005 Ready Mixed Aluminum or equal.

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

DIESEL ENGINE GENERATOR UNITS

Proposals are invited for Diesel Engine Generator Units complete with heat exchangers and all appurtenances in accordance with the attached outline specifications. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax shall be included.

Proposals shall be addressed to Holmes & Narver, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until May 18, 1949.

REFERENCE:

SECTION 15 - "ELECTRICAL GENERATION AND DISTRIBUTION"

Paragraph 15-06

ADDENDUM #1 to

OUTLINE SPECIFICATIONS

FOR

DIESEL ENGINE GENERATOR UNITS

Under paragraph 8 add

"Main disconnect switch" as part of the equipment included with each 2400 volt control cubicle.

OUTLINE SPECIFICATIONS

FOR

DIESEL ENGINE GENERATOR UNITS

GENERAL:

1. It is contemplated that the equipment called for in the following specifications will be purchased by Holmes & Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired, and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. All equipment and material proposed shall be the product of manufacturers regularly engaged in the building of this type of equipment and material. Units shall consist of components which have been in regular production for at least three years.

REQUIREMENTS OF EACH UNIT:

4. Each unit shall be full diesel type designed for continuous operation in a hot, humid climate at sea level on Standard Navy Diesel Fuel.

5. It shall be designed, built, and equipped with suitable characteristics, governor, and automatic voltage regulator for close regulation (2%) and parallel operation of from two to six units.

6. The unit shall be furnished with a 2400 volt delta, three phase, 60 cycle generator capable of continuous operation at the specified capacities at 80% power factor. Its telephone influence factor shall not exceed 300.

7. All electrical equipment shall be moisture proofed and fungus proofed.

8. Each unit shall be complete with dead-front, floor standing 2400 volt control cubicle with

Generator circuit breaker
Potential transformers and fused switches
Synchronizing switch
Synchroscope
Voltmeter and ammeter with transfer switches
Indicating Kilowatt meter with transfer switch and phase shifting transformer to read reactive volt-amperes
Kilowatt-hour meter
Frequency meter
Exciter control consisting of meters, main switch, and rheostat
Generator bus for paralleling units and all panel wiring

9. A heat exchanger or heat exchangers shall be provided with each unit to recover exhaust heat or engine jacket cooling system heat and convert it to steam in the quantities indicated in paragraph 11.

10. Additional auxiliary equipment shall include

Exciter
Day Storage Tank
Lubricating system
Cooling system (see paragraph 9)
Gauges and automatic engine shutdown and alarm preventing damage due to low oil pressure, high water temperature, or engine overspeed
Starting equipment
Muffler (see paragraph 9)

NUMBER OF UNITS REQUIRED:

11. The initial requirement will consist of two units, each with a capacity of 90 to 175 kilowatts continuous at 80% power factor. The steam requirements of each unit at 5# psig are as follows:

90 to 100 KW 72# per hour, or
118 KW 90# per hour, or
175 KW 120# per hour

12. It is presently contemplated that requirements within six months will consist of the following units, each complete with all auxiliaries as described above:

18 90 to 100 KW units, or
16 118 KW units, or
7 100 KW and 7-175 KW units, or
9 100 KW and 5-175 KW units, or
7 118 KW and 6-195 KW units

INFORMATION REQUIRED WITH PROPOSAL:

13. Each proposal shall include the following information for each proposed unit:

(a) Complete information indicating in detail the proposed method of complying with the above requirements. This shall include detailed specifications of materials, guaranteed capacities, manufacturers model and size of appurtenances not manufactured by the vendor.

(b) Guaranteed fuel consumption table for 1/4, 1/2, 3/4, and full load.

(c) Expected lubricating oil consumption.

(d) The size and weight, uncrated and crated.

(e) The piston speed in R.P.M. and lineal feet per minute.

14. Each proposal shall include a firm price (including no sales tax) and delivery time for the following:

(a) Two units specified under paragraph 11.

(b) Any group of units specified under paragraph 12.

(c) Recommended spare parts to be ordered and crated with units.

Invitation No. HN-7H-302
Dated: July 15, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

SUBMARINE TELEPHONE CABLE

Proposals are invited for Submarine Telephone Cable in accordance with the attached specifications. Vendor shall submit with his proposal details of and reasons for any proposed deviations from this specification, the manufacturer of this cable and appurtenances not manufactured by the vendor, price, approximate dimensions and weights, and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax shall be included.

Proposals shall be addressed to Holmes & Narver, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until August 15, 1949.

REFERENCE:

SECTION 17 - "COMMUNICATIONS SYSTEMS" -

Paragraph 17-11

Spec. No. HN-7H-302
Dated: July 15, 1949

SPECIFICATIONS

FOR

NON-QUADDED WIRE ARMORED SUBMARINE

LEAD COVERED TELEPHONE CABLE

INDEX

1. GENERAL:

1.1 It is contemplated that the material called for in the following specifications will be purchased by Holmes & Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

1.2 Prompt delivery of the specified material is desired, and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders. The Purchaser reserves the right to reject any or all proposals.

1.3 All material proposed shall be the product of manufacturers regularly engaged in the building of this type of material. Cable proposed shall have been in regular production and successful use for at least three years.

1.4 This specification covers the physical and electrical requirements for dry core, paper insulated, wire armored, lead covered telephone and telegraph cable containing pairs of 19 gauge. It is to be installed on the coral floor of a lagoon in the Central Pacific Ocean under a maximum of approximately 25 fathoms of water.

1.5 The cable shall consist of dry paper insulated, solid 19 A.W.G. copper conductors twisted into pairs as hereinafter specified and enclosed in a lead sheath which is protected by an armor of galvanized steel wires for submarine installation.

1.6 Loading shall be incorporated in cable splices at the factory.

1.7 Item I shall consist of the following lengths of 16 pair cable with single armor and 88 milihenry loading coils (such as Western Electric Company Code No. 622) as indicated:

Cable No.	Length in Ft.	Loading
501	26,000	None
502	26,000	12 pairs 4 parts 88H @ 6,500 ft. 4 pairs none

503	26,000	12 pairs 4 parts 88H @ 6,500 ft. 4 pairs none
504	58,000	12 pairs 10 parts 88H @ 5,800 ft. 4 pairs none
505	58,000	12 pairs 10 parts 88H @ 5,800 ft. 4 pairs none
506	40,000	12 pairs 7 parts 88H @ 5,711 ft. 4 pairs none
507	40,000	12 pairs 7 parts 88H @ 5,711 ft. 4 pairs none
508	48,000	12 pairs 8 parts 88H @ 6,000 ft. 4 pairs none
509	48,000	12 pairs 8 parts 88H @ 6,000 ft. 4 pairs none
510	39,000	12 pairs 7 parts 88H @ 5,571 ft. 4 pairs none
511	39,000	12 pairs 7 parts 88H @ 5,571 ft. 8 pairs none
Total	448,000	

1.8 Item II shall consist of the following lengths of 6 pair cable with single armor. One end of this cable is to be fastened to a buoy in the lagoon.

Cable No.	Length in Ft.	Loading
A-1	27,000	None
B-1	5,000	None
C-1	18,000	None
D-1	23,000	None
E-1	10,000	None
Total	83,000	

1.9 Item III shall consist of the following lengths of 6 pair cable with single armor.

Cable No.	Length in Ft.	Loading
B-2	13,100	None
B-3	13,100	None
C-2	5,000	None
C-3	5,000	None
D-2	12,500	None
D-3	12,500	None
D-4	12,500	None
D-5	12,500	None
E-2	25,000	None
E-3	25,000	None
E-4	23,000	None
E-5	23,000	None
Total	182,200	

2. NUMBER OF PAIRS:

2.1 The number of pairs for this type of cable shall be as given in the following table:

Total Number of Pairs	Allowable Number of Defective Pairs
6	1
16	1

3. CONDUCTORS:

3.1 Each conductor in the cable shall consist of solid wire of commercially pure annealed copper, smoothly drawn, cylindrical, uniform in quality and resistance, and free from scales and other defects.

The nominal diameter of the conductors shall be 0.0359 inches, and any diameter at any point shall not differ from the nominal values by more than one percent.

3.2 Factory joints shall be avoided as far as possible. No twist joints shall be used. All joints shall be brazed.

3.3 Brazed joints shall be made by butting together the two ends of the conductor and brazing the joint with silver alloy solder, using a non-acid flux. Joints shall be free from lumps and sharp projections.

3.4 The tensile strength of any section of a conductor, including a factory joint, shall be at least 90 percent of the tensile strength of an adjacent section of the solid conductor of equal length without joint. The resistance of any 6-inch section of a conductor, including a factory joint, shall not be more than 105 percent of the resistance of an adjacent 6-inch section of the solid conductor without joint.

4. INSULATION:

4.1 Each conductor shall be insulated with two paper tapes each helically applied with overlap.

4.2 The insulating paper shall be made from clear rope stock or from clear rope stock with suitable proportions of chemical wood pulp, cotton rag, or both. There shall be no chemical wood pulp in paper less than 0.0025 inch in thickness. The amount of wood pulp in paper 0.0025 inch and 0.003 inch in thickness and in paper 0.0035 inch in thickness but less than 7/16 inch in width, shall not exceed 40 percent by weight. In 0.0035 inch paper with widths 7/16 inch and greater and all thicker paper, the amount of wood pulp shall not exceed 70 percent by weight.

4.21 For those sizes of paper for which a maximum of 40 percent wood pulp, by weight, is permitted, paper showing an average wood fibre content of 50 percent or less, as determined by microscopic count of the fibres, will be considered satisfactory. For those sizes for which a maximum of 70 percent wood pulp, by weight, is permitted, paper showing

an average wood fibre content of 75 percent or less, as determined by microscopic count of the fibres will be considered satisfactory. In determining fibre content, due allowance shall be made for sizes of the various kinds of fibres and the average shall be based on results for at least five representative samples.

4.22 By clear rope stock is meant stock composed of manila rope and hemp. Jute or sisal shall not be added and shall be present only in very small proportions. The chemical wood pulp shall be made by either the soda or the sulphate process from spruce or an equivalent coniferous wood, shall be free from residual chemicals, and shall not contain excessive amounts of non-cellulose materials. Materials treated by the sulphite process shall not be used. The paper shall be free from sizing and loading materials.

4.23 The acidity of the paper shall not exceed 0.02 percent if the material is acid in reaction or the alkalinity shall not exceed 0.07 percent if alkaline, expressed as equivalent weight of SO_3 and Na OH, respectively. These limits apply to the average of two determinations on five-gram samples of any sample pad of paper representing the paper used in the cable. If the percent acidities of the two samples differ from each other by more than 0.006, numerically, or if the percent alkalinities differ from each other by more than 0.032, numerically, tests on two additional samples from the same pad of paper shall be made.

4.24 The tensile strength of samples of paper taken from the finished cable shall be not less than 2 pounds per mil thickness per one-half inch width of tape. The tensile strength shall be determined in accordance with the Technical Association of the Pulp and Paper Industry's Method - Tensile Breaking Strength of Paper T-404-m Official Standard, Sept. 1936, - except that tests lengthwise of the tape only are required and that papers less than one-half inch wide shall be tested in their actual widths.

5. COLORS OF INSULATION:

5.1 The colors of one tracer pair in each cable shall be red for the wire, orange for its mate. The colors of insulation for the other pairs shall be red for each wire, white for its mate. The inner serving may be white in place of the color specified.

6. TWIST OF PAIRS:

6.1 Insulated conductors of the same gauge shall be twisted into pairs.

6.2 The average length of twist of any pair shall not exceed 6 inches. The average length of twist of any 20 consecutive twists of any pair in any length of a cable shall not exceed 6 inches.

6.3 By average length of twist is meant the average distance between successive points at which a given wire of a pair presents itself toward the outer surface of the cable.

7. CABLING:

7.1 The pairs in the cable shall be arranged in layers to form a cylindrical core, each layer being applied one pair thick. Layers of 19 gauge shall be cabled so that not more than two successive layers are applied in the same direction. Adjacent layers cabled in the same direction shall have average lengths of stranding lay in any 10-foot section of cable, differing by at least one inch.

7.2 Adjacent pairs of 19 gauge in each layer and in each portion of a double layer shall have average lengths of twist differing from each other by not less than 1/2 inch.

7.3 A stain may be applied to the insulation of 19-gauge pairs when necessary for identification purposes. This stain shall be of such a composition that it will not cause the acidity of the paper to exceed 0.02 percent if the paper is acid in reaction, or the alkalinity to exceed 0.07 percent if alkaline in reaction. The amount used shall not be sufficient to obscure the color code.

7.4 A type 3 pair shall be used only in layers or portions of double layers containing an odd number of pairs. In any layer or portion of a double layer, only one type 3 or one tracer pair shall be used.

7.5 In cables containing less than one hundred 19-gauge pairs, one tracer pair shall be placed in the outside layer of this gauge.

7.6 The average length of stranding lay used for any layer shall not exceed 35 inches. The average length of stranding lay is defined for this specification as the average for any 5 consecutive turns in any length of cable.

8. PAPER COVERING OF CORE:

8.1 The core shall be covered with wrappings of paper, the paper to have a nominal thickness of 0.007 inch or more. This paper shall be so laid on that all portions of the core are covered with not less than two thicknesses.

8.11 At least one of the wrappings next to the sheath shall be colored red. The other wrappings shall be either red or white.

8.2 The paper shall be made from clear rope stock or a stock made from clear rope and chemical wood pulp, the amount of wood pulp not exceeding 80 percent by weight. Paper showing an average wood fibre content of 85 percent or less, as determined by microscopic count of the fibres, will be considered satisfactory. In determining fibre content, due allowance shall be made for the difference in the size of the various kinds of fibres and the average shall be based on results for at least five representative samples.

8.21 By clear rope stock is meant stock composed of manila rope or manila rope and hemp. Jute or sisal shall not be added and shall be present only in very small proportions. The chemical wood pulp shall be made by either the soda or sulphate process from spruce or an equivalent coniferous wood, shall be free from residual chemicals, and shall not contain excessive amounts of non-cellulose materials. Materials treated by

the sulphite process shall not be used. The paper shall be free from sizing and loading materials.

8.22 The acidity of the paper shall not exceed 0.02 percent if the material is acid in reaction or the alkalinity shall not exceed 0.07 percent if alkaline, expressed as equivalent weight of SO_3 and Na OH, respectively. These limits apply to the average of two determinations on five-gram samples of any sample pad of paper representing the paper used in the cable. If the percent acidities of the two samples differ from each other by more than 0.006, numerically, or if the percent alkalinities differ from each other by more than 0.032, numerically, tests on two additional samples from the same pad of paper shall be made.

8.23 The tensile strength of samples of paper taken from the finished cable shall be not less than two pounds per mil thickness per one-half inch width of tape. The tensile strength shall be determined in accordance with the Technical Association of the Pulp and Paper Industry's method - Tensile Breaking Strength of Paper T-404-m Official Standard, Sept. 1936, except that tests lengthwise of the tape only are required.

9. DENSITY OF CABLE:

9.1 In the finished cable, of the volume inside the cable sheath exclusive of that occupied by the conductors and the paper covering over the completed core, not less than 55 percent shall be occupied by the insulating paper on the conductors and by the cotton binding where cotton is used as determined from a cable specimen 12 inches long. The volume occupied by the insulating paper and the cotton shall be as calculated from their measured dimensions. In determining the volume occupied by the wrapping paper over the core, 25 percent shall be added to the volume calculated from its measured dimensions.

10. SHEATH:

10.1 The core shall be enclosed in a sheath composed of an alloy of commercially pure lead and commercially pure antimony, the amount of antimony by weight in any sample being not less than 0.9 percent nor more than 1.1 percent.

10.2 The sheath shall be smooth and free from holes, splits, blisters or other defects and shall be of uniform composition. The desired average thickness of sheath shall be 85 mils, plus one mil for each increment of 0.04 inch or fraction thereof in nominal inside diameter of sheath above 0.2 inch.

10.3 The sheath shall be capable of meeting the following expansion test. A sample of sheath shall be expanded to rupture or to an amount corresponding to an increase in diameter of 80 percent. There shall be no ruptures below an expansion of 50 percent, and any ruptures which occur between 50 percent and 80 percent expansion shall show no square edged fracture indicative of a "split sheath" condition.

11. ARMORING:

11.1 The lead covered cable shall be covered with the following materials in the order named:

1-Two layers impregnated jute roving.
2-Asphalt compound.
3-Layer of armor wire.
4-Asphalt compound.
5-Two layers impregnated jute yarn.
6-Asphalt compound.
7-Coating of whiting.

11.11 Note: Where two layers of jute are specified, they shall be applied in opposite directions.

12. ASPHALT COMPOUND:

12.1 The asphalt compound shall consist of steam refined asphalt from asphalt base petroleum and shall be applied over each serving of impregnated jute and each serving of armor wires. It shall be such that it will not tend to drain from cables in summer (100° F. to 120° F.) nor crack when being handled in winter (32° F. to 0° F.). It shall be commercially free from dirt and other foreign materials and shall be neutral to litmus paper, when maintained for 24 hours in an atmosphere of any humidity and at any temperature up to 150 degrees Fahrenheit. The temperature as the asphalt is applied shall be such that it is very fluid but not sufficiently high to weaken fibres of jute or to affect its chemical composition.

13. JUTE:

13.1 Jute shall be long fibred and free from dirt, knots and lumps; roving being soft and yard hard twisted. The jute roving before impregnation shall weigh either 30, 48, 100 or 150 pounds per 14,400 yards with a tolerance of ± 10%, when corrected to a 13.75 percent moisture regain. The three-ply yarn, before impregnation, shall have individual strands weighing 16 pounds (16/3 ply) per 14,400 yards with a tolerance of ± 10%, when corrected to a 13.75% moisture regain.

13.2 All jute, before application to the cable, shall be thoroughly saturated by the vacuum process with a compound consisting of approximately 80 percent of anthracene oil and 20 percent coal tar pitch by weight. The anthracene oil and coal tar pitch shall be commercially free from dirt and other foreign materials and shall be neutral to litmus, when maintained for 24 hours in an atmosphere of any humidity and any temperature up to 150 degrees Fahrenheit. The amount of impregnant in any 50-gram sample shall not be less than 30 percent nor more than 53 percent of the weight of the untreated jute, when corrected to a 13.75 percent moisture regain.

13.3 The average breaking strength of the impregnated jute shall not be less than shown in the following table, based on an average of 5 samples in any lot per 5 miles of cable or fraction thereof, using a 20 inch test section between jaws of testing machine.

Size Of Jute	Minimum Average Breaking Strength Pounds
30 lb.	19
48 lb.	30
16/3 ply	37

14. APPLICATION OF JUTE:

14.1 The sizes of impregnated jute and the number of layers required for wire armored submarine cable are as follows:

Jute Bedding Applied over Sheath

Nominal Diameter Over Sheath Inches	Amount of Bedding
0.50 to 1.20	2 layers 30 lb. jute
1.21 to 1.75	2 layers 48 lb. jute

Jute covering over Armor Wires

All sizes	2 layers 16/3 ply jute

14.2 The layers of impregnated jute shall be applied using several strands under sufficient tension to insure a smooth and compact surface and without appreciable space between adjacent strands in a layer. The lay of jute strands shall not exceed 5 inches.

14.3 The minimum average radial thickness of the jute bedding, together with such compound as may be applied for any 10-foot section of cable shall be as noted below for the various amounts of bedding compressed as in the finished cable.

Amount of Bedding	Minimum Average Radial Thickness
2 layers 30 lbs. jute	0.055 inch
2 layers 48 lbs. jute	0.07 inch
2 layers 100 lbs. jute	0.085 inch
1 layer 100 lbs. jute	0.04 inch
1 layer 150 lbs. jute	0.05 inch

15. APPLICATION OF ARMOR WIRES:

15.1 The sizes of armor wires for cables of different diameters shall be as shown in the table below:

Outside Diameter Cable Sheath Inches	Size of Armor Wire
0.50 to 0.70	10 B.W.G.
0.71 to 1.20	8 B.W.G.
1.21 to 2.10	6 B.W.G.

15.2 The armor wires shall be applied closely without appreciable space between adjacent turns, in such a manner that a reference line on the surface of

and parallel to the center of any armor wire previous to the armoring operation will present itself throughout the length of the completed cable toward a single plane parallel to the axis of the cable. The length of lay shall be approximately 10 times the diameter of the cable after armor is applied but before jute is applied. The length of lay may be varied somewhat to insure the armor wires closing uniformly and tightly together, without undue pressure on the core.

15.3 The armor wire shall extend to within 2-1/2 feet of each end of each length of cable after final factory tests have been made. The ends of the armor wire shall be securely bound in place with several wrappings of galvanized steel or tinned copper wire.

16. JOINTS IN ARMOR WIRES:

16.1 Joints in the armor wires shall be electrically welded and no joint shall be located within 6 feet of a joint in any other wire.

17. ARMOR WIRE REQUIREMENTS:

17.1 The wire used for armoring shall be a zinc-coated steel wire. The steel shall be made by the open-hearth or electric furnace process. The steel shall be of such quality and purity that in the finished wire it will satisfy the requirements hereinafter specified.

17.2 Wire drawn from welded rod will be permitted, provided that the wire drawn from the welded portion of the rods meets the requirements as hereinafter specified. All joints shall be made prior to the last drawing operation.

17.3 The wire shall be cylindrical in form and of approximately uniform diameter and shall be free from scales, inequalities, splints and other flaws.

17.4 The diameter of the finished wire shall not have a greater variation from the nominal than noted below:

Nominal Diameter of Wire in Inches	Allowable Variation In Inches
0.116 to 0.165	± 0.004
0.166 to 0.285	± 0.005

17.5 The tensile strength of any wire shall be not less than 50,000 nor more than 70,000 pounds per square inch. The speed of the pulling head of the testing machine during the test shall not exceed 1 inch per minute.

17.6 The elongation of the finished wire shall not be less than 10 percent. The elongation shall be determined as the permanent increase in length, due to the breaking of the wire in tension, measured between bench marks originally 10 inches apart. Elongation determinations shall be disregarded in cases where the break is not located between the bench marks and at least 1 inch from either mark. The speed of the pulling head of the testing machine during the test shall not exceed 1 inch per minute.

17.7 The minimum number of torsion twists that a 6 inch length of finished wire at not more than 60 r.p.m. using a 5 pound weight for keeping the specimen under tension, shall withstand without fracture, shall be not less than that required for its size in the following table:

Nominal Diameter of Wire (Inch)	Torsion Twists 6" Length (Minimum)
0.126 to 0.135	11
0.136 to 0.150	10
0.151 to 0.165	9
0.166 to 0.260	8

17.8 The wire shall have throughout its length a continuous zinc coating. The weight of coating in ounces per square foot as determined by the antimony chloride-hydrochloric acid method described in the American Society for Testing Materials Specification for Standard Methods of Test for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles - Serial Designation A90-39, shall be not less than that required for its size in the following table:

Nominal Diameter of Wire (Inches)	Weight of Coating Ounces per Square Foot (Minimum)
0.120 to 0.142	0.85
0.143 to 0.187	0.90
0.188 to 0.285	1.00

17.9 It shall be possible to wrap two or more turns of the wire in a close helix about a cylindrical mandrel having a diameter as specified below at a rate of approximately fifteen turns per minute. As a result of this test, there shall be no fracture of the steel, the coating shall not flake and it shall not be possible to remove any of the coating from the wire by rubbing with the fingers.

Nominal Diameter of Wire in Inches	Mandrel Diameter in Number of Times Wire Diameter
0.090 to 0.160	1
0.161 to 0.195	2
0.196 to 0.285	3

18. NON-ADHESIVE COATING:

18.1 The coating of whiting applied to the completed cable shall be sufficient to prevent adjacent layers and adjacent turns from sticking to each other on the reel.

19. DIELECTRIC STRENGTH:

19.1 The insulation between conductor in every length of cable shall be capable of withstanding for 2 seconds a 60 cycle A. C. potential having sine wave form, whose maximum instantaneous value is not less than that given in the following table, each conductor for which a given voltage requirement is specified being tested against all other conductors in the cable which are required to meet this same or any higher voltage.

A. W. Gauge	A. C. Voltage Max. Inst. Value
19	700

19.2 The insulation between each conductor and sheath shall be capable of withstanding for 2 seconds a 60 cycle A. C. potential having approximately sine wave form, whose maximum instantaneous value is not less than 1400 volts.

19.3 The testing voltage for both these tests shall be obtained from a source of at least 1 kilowatt capacity.

20. CONDUCTOR RESISTANCE:

20.1 Each conductor in every length of cable shall have a resistance equivalent to not more than the values given in the following table for 68 degrees Fahrenheit.

A. W. Gauge	Resistance, Ohms Per Mile of Cable at 68 Degrees Fahrenheit Not Greater Than
19	46.0

20.2 The testing equipment shall be capable by measuring to the accuracy given below:

Range of Resistance Being Measured (In Ohms)	Overall Accuracy Required (Percent)
0.1 to 0.49	5.0
0.5 to 0.99	1.0
1.0 to 4.9	0.5
5.0 to 9.9	0.25
10.0 to 999.9	0.10

21. CAPACITANCE:

21.1 In every length of cable, the average mutual capacitance of all the pairs, as measured with 900 cycle alternating current, shall be equivalent to not more than the values given in the following table at 60 degrees Fahrenheit.

21.2 The mutual capacitance of a pair shall be measured between the two wires of the pair, the remainder of the conductors being connected to the sheath.

A. W. Gauge	Average 900 Cycle Mutual Capacitance Microfarads per Mile
19	0.095

21.3 The 900-cycle capacitance shall be determined by means of a testing bridge.

21.4 The capacitance shall be measured at a temperature not lower than 60 degrees Fahrenheit. If the cable, when measured at a temperature higher than 60 degrees Fahrenheit, fails to meet the requirement, no temperature correction factors shall be applied, but in such case the cable may, at the option of the manufacturer, be retested at a temperature not lower than 60 degrees Fahrenheit.

22. LOADING COILS:

22.1 Loading coils shall be installed and connected at factory as indicated in paragraphs 1.3, 1.4, and 1.5 of these specifications.

22.2 Armoring shall be carried over each loading coil so that quality of mechanical characteristics of cable are not reduced or impaired.

22.3 Total losses in each loaded pair shall not exceed 0.43 db per mile.

22.4 All loaded pairs shall be tested for total losses by means of direct reading transmission measuring sets.

22.5 Loaded pairs shall be provided with suitable identification at each end of cable.

23. INSULATION RESISTANCE:

23.1 Each conductor in every length of cable, when measured against all other conductors and the sheath connected to ground, after an electrification of not more than one minute with a D.C. potential of not less than 100 nor more than 550 volts, shall show an insulation resistance equivalent to not less than 500 megohm-miles at 60 degrees Fahrenheit.

23.2 The insulation resistance measurements shall be made to an accuracy of ± (10 + 0.002R) percent, where "R" is the resistance being measured, expressed in megohms.

23.3 The insulation resistance shall be measured at a temperature not lower than 60 degrees Fahrenheit. If the cable, when measured at a temperature higher than 60 degrees Fahrenheit, fails to meet this requirement, no temperature correction factors shall be applied but in such case the cable may be retested at a temperature not lower than 60 degrees Fahrenheit.

24. DEFECTIVE CIRCUITS:

24.1 Tests for continuity of the conductors shall be made with a D. C. potential not exceeding 14 volts and tests for shorts and crosses between conductors shall be made with a D. C. potential of at least 100 volts.

24.2 Each pair which is found by the final factory tests to be defective, shall be distinctly marked with a cloth tag at each end of the length of cable. Each of these tags shall be stamped to denote the type of defect, using the following symbols:

Symbols	Kind of Defect
Open	A break in one or both wires of a pair. A pair missing in part of a length must be replaced as specified below.
S	A short-circuited pair.
X_1, X_2	A wire crossed with a wire of another pair. When there is but one case in a length of cable where there is a wire crossed with a wire of another pair, each wire shall be tagged with the designation "X_1". When there is more than one case of this kind in a cable length, the designation "X_2" shall be used on the second set of tags.

24.3 The tags shall be securely attached to the conductors of the circuits involved and these conductors and tags shall be so laid into the cable core that they will not come in contact with the solder in the seal and that the tags will not be damaged or torn loose from the conductors.

24.4 Both ends of every length of cable containing defects shall be painted with red varnish in order to call attention to the fact that there are defective circuits in the cable. The marking on the outside end shall cover approximately one foot and on the inside end as much of the cable as can be conveniently reached.

25. MANUFACTURING IRREGULARITIES:

25.1 Certain manufacturing irregularities are permitted under the conditions described below. The pairs involved shall be tagged as provided for under "Defective Pairs", using the following symbols

Symbol	Kind of Defect
WG	A wrong gauge pair
MP	A misplaced pair
NG	A replaced pair

25.2 In groups of non-quadded pairs of 19 gauge, pairs of a wrong gauge which have been placed in the cable by mistake shall be tagged WG. The number of such pairs shall be limited to one in any cable. Such pairs shall also be limited to not more than three gauges larger or smaller than the correct gauge. Wrong gauge pairs, if good electrically, shall not be counted as defective in determining the number of good pairs in a cable.

25.3 If it is found that 19-gauge pairs are absent at one or both ends of a cable length, replacing pairs shall be laid into the outside layer and the cable core rewrapped. Also, if pairs appear in their proper position at each end of the cable length but are absent for a distance of 5 feet or more along the cable length, replacing pairs shall be laid into the outside layer and the core rewrapped, except under the conditions noted below. Such replacing pairs shall have

the same color arrangement as those which they replace and each such pair shall be tagged with the designation "MP". The replaced pair, if appearing at either or both ends of the cable, shall be marked with the designation "NG". Misplaced pairs, if good electrically, shall not be counted as defective in determining the number of good pairs in the cable.

25.4 In case pairs are in their proper position at each end of the cable but are absent for a distance of 5 feet or more along the cable length with the break in the pairs at a distance greater than 10 feet from either end, replacing pairs may be laid in the outside layer for the distance that they are missing and spliced to the sections of the pairs which are in their proper position. No tagging is required for this condition. Such replacing pairs shall have the same color arrangement as the pairs to which they are spliced.

26. GUARANTEE:

26.1 For a period of one year after the cable has been spliced and connected to the terminals, there shall be no defective circuits caused by grounds, nor shall the minimum number of good circuits in any length of cable be less than stated on the order, due to defective materials or manufacture.

26.2 Good extra circuits of a larger gauge shall be considered a satisfactory substitute for defective circuits of a smaller gauge in determing the number of good circuits in a cable.

26.3 The cable shall be so manufactured that when properly installed and spliced it will be commercially free from crosstalk.

27. INSPECTION:

27.1 The manufacturer shall furnish proper facilities at his plant for the inspection of this product for the requirements of this specification.

28. PREPARATION FOR SHIPMENT:

28.1 The actual lengths of cable on the reels after the final inspection at the factory shall be not less than the length of one loaded section of cable

(approximately 6000 feet - see paragraphs 1.4 and 1.5).

28.2 Each length shall be wound on a separate reel suitable for export shipment unless otherwise stated. The reels shall be substantial and able to withstand such reasonable handling as they are liable to receive in transit. The diameter of the drum shall be large enough to prevent damage to the cable from reeling. The inner end shall be cut off flush with the outside surface of the reel and the slot securely covered.

28.3 Each end of every length of cable shall be effectively sealed with solder to prevent the entrance of moisture. The seal shall be applied in such a way that the solder will not come in contact with the conductors in the cable.

28.4 The outer end of the cable shall be securely fastened to the reel head so that the cable will not come loose in transit.

28.5 Unless otherwise provided for, one head of each reel shall be stenciled or lettered with the name of the supplier and his order number, the purchaser's requisition number, the cable number, the number of pairs of each gauge, the length of cable on the reel, the number or other designation of the reel, together with the number of lags, gross and net weights, and the name and address of consignee.

28.6 The reel shall be plainly marked to indicate the direction in which it should be rolled so as not to loosen the cable on the reel.

29. INSTALLATION:

29.1 The manufacturer shall furnish complete details of the recommended method of splicing this cable.

29.2 As a separate item in the proposal, a basis shall be offered for the services of an installation engineer to supervise the field splicing, testing, and laying of the cable. He shall also instruct the Purchaser's operators in the maintenance of this cable. Transportation and subsistence to the job site will be furnished.

29.3 As a separate item in the proposal a basis shall be offered for the services of a cable splicing crew for making field splices if such services are available.

30. CHANGES IN QUANTITIES:

30.1 As a separate item in the proposal, a basis shall be offered for increasing or decreasing the quantities indicated in items I, II, and III (paragraphs 1.7, 1.8, and 1.9).

31. DIMENSIONS AND WEIGHTS:

31.1 The proposal shall include approximate dimensions and weights of the cables and reels.

Invitation No. HN-6B-303
Dated: July 18, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

POWER PLANT SWITCHGEAR

Proposals are invited for Power Plant Switchgear in accordance with the attached general specifications. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax shall be included.

Proposals shall be addressed to Holmes & Narver, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until August 1, 1949.

REFERENCE:

SECTION 15 - "ELECTRICAL GENERATION AND DISTRIBUTION"

Paragraph 15-12

Spec. No. HN-6B-303
Dated: July 18, 1949

SPECIFICATIONS

FOR

POWER PLANT SWITCHGEAR

GENERAL:

1. It is contemplated that the equipment called for in the following specifications will be purchased by Holmes & Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired, and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders. The Purchaser reserves the right to reject any or all bids or any portion thereof.

3. All equipment and material proposed shall be the product of manufacturers regularly engaged in the building of this type of equipment and material. Units shall consist of components which have been in regular production for at least three years.

4. All equipment and material shall be designed and constructed with suitable moisture and fungus-proofing for operation in a hot, humid, tropical climate at sea level.

5. These specifications cover the following equipment:

Item No.	Description
I	One (1) Primary Distribution Board.
II	One (1) Secondary Distribution Board named Control Center "A".
III	One (1) Ground Detector.

6. Manufacturers catalog numbers stated herein are intended to designate the type, characteristics, and quality required. Consideration will be given to other manufac-

turers' equipment which is equal and similar to that specified.

SCOPE OF CONTRACT:

7. The lump sum price named in the proposal under Item No. 1 shall include the furnishing of one (1) totally enclosed primary distribution board consisting of three (3) primary feeder cubicles as described herein.

8. The lump sum price named in the proposal under Item No. II shall include the furnishing of one (1) totally enclosed secondary distribution board as described herein.

9. The lump sum price named in the proposal under Item No. III shall include the furnishing of one (1) ground detector as described herein.

PRIMARY DISTRIBUTION BOARD:

10. The primary distribution board shall consist of three (3) primary feeder cubicles assembled in one unit at the factory.

11. Each cubicle shall be a totally enclosed metal clad unit rated at 2500 volts, 3 phase, 3 wire 60 cycles for operation on a 2400 volt delta system. It shall be complete with primary disconnecting devices.

12. Two (2) cubicles shall each consist of the following components:

    1-Oil circuit breaker, three (3) pole, (125A load)-5 ampere trip, single throw, 2500 volts, 15,000 KVA, with manual operating mechanism including three (3) current trip coils (instantaneous).

    1-Ammeter with 150 ampere scale, General Electric Type AD-7.

    2-Indicating lamps with red and green color caps, General Electric Type ET-5.

    1-Ammeter switch, General Electric Type SB-1.

    3-Relays, overcurrent, single pole with A-C. trip attachment, General Electric Type 1AC.

    3-Current transformers 150/5 Amperes, General Electric Type KC.

1-Three phase insulated bus with supports, necessary copper connections, small wiring and cable terminals.

1-Pothead for three (3) single conductors #1/0, 5000 volts, overall diameter of 0.79", complete with G.&W. Style "PB" plain bushing for 2½" conduit and Novoid "A" Compound.

13. One (1) cubicle shall consist of the following components

1-Oil circuit breaker, three (3) pole, (70A load) - 5 ampere trip, single throw, 2500 volts, 15000 KVA, with manual operating mechanism including three (3) current trip coils (instantaneous).

1-Ammeter with 100 ampere scale, General Electric Type AD-7.

2-Indicating lamps with red and green color caps, General Electric Type ET-5.

1-Ammeter switch, General Electric Type SB-1.

3-Relays, overcurrent, single pole with A.C. trip attachment, General Electric Type A1C.

3-Current transformers 100/5 Amperes, General Electric Type KC.

1-Three phase insulated bus with supports, necessary copper connections, small wiring and cable terminals.

1-Pothead for three (3) single conductors #4, 5000 volts, overall diameter of 0.60", complete with G. & W. style "PB" plain bushing for 2" conduit and Novoid "A" Compound.

1-Potential transformer, 2400/120 volts, with current limit fuses attachment and fuses, General Electric Type JE-42 mounted in a superstructure.

14. The following accessories shall be furnished with the primary distribution board:

1-Fuse tong for potential transformer fuses.

6-Extra fuses for potential transformer.

15. The primary distribution board shall conform with SK-315 attached herewith and with the following general specifications:

15.1 The switchgear shall contain a main bus compartment which will be continuous throughout the entire length and entirely isolated from the remainder of the switch-gear. The individual compartment frames shall have continuous steel barriers extending to the rear of the switchgear to completely isolate each circuit. Each frame shall be divided by sheet metal partitions into compartments for circuit breakers, current transformers, main bus, etc.

15.2 The structure and buses shall be so arranged that additional frames may be bolted to either end at any time. The structure shall be fabricated from cold-finished sheet steel, thoroughly cleaned bonderized, or equally prepared, prior to application of priming and finishing coats of gray lacquer.

15.3 The necessary meters, relays etc., mounted in this structure shall be semi-flush type.

15.4 The bus shall be made of high conductivity copper designed to carry 600 Amp. without exceeding 45° C temperature rise above 40° C ambient. It shall be mounted on insulated supports and be constructed and braced to withstand the maximum stresses resulting from short circuit of 15000 KVA. The main bus and all main connections shall be silver plated. The main bus shall have moulded insulation with bakelite moulded caps over the joints and tap connections.

15.5 The secondary and control wiring shall be #12 gauge stranded in conduit where required, terminating at terminal blocks.

15.6 The manufacturer shall supply fully-dimensioned drawings, including front view of the switchgear structure, sectional assembly drawings, floor plans, wiring diagrams, and outlines of all separately mounted equipment to the purchaser for approval before starting construction.

15.7 Each breaker shall be interlocked to prevent incorrect operation, with interlocks of the positive mechanical type, making it necessary that the

breaker be in the open position while engaging or disengaging the main separable contacts.

15.8 Provision shall be made for testing each breaker.

15.9 The current transformers used in the various circuits shall have five (5) amperes secondaries, standard accuracy characteristics, and thermal and mechanical ratings consistent with the circuit breaker's ratings specified above.

15.10 The switchgear shall be suitable for 2.5 KV maximum service and shall receive a dielectric test for that voltage class in accordance with NEMA Standards. It shall be designed, manufactured and tested in accordance with the latest standards of the A.I.E.E. and N.E.M.A. It shall be completely assembled, wired, adjusted, and tested for operation under simulated service conditions to assure the accuracy of the wiring and the functioning of the equipment.

15.11 This item shall be assembled and shipped in one complete unit, suitably boxed, skidded, and braced for protection during transit, during export shipment and for ease of handling during erection and placing in operation.

15.12 Non metallic nameplates engraved with white characters on a black phenolic composition background shall be furnished on the switchgear and individual compartments, where required. Titles for nameplates will be furnished when manufacturer's drawings are approved for construction.

SECONDARY DISTRIBUTION BOARD NAMED CONTROL CENTER "A":

16. The secondary distribution board shall consist of 9 secondary cubicles assembled in one unit at the factory.

17. It shall be a totally enclosed metal clad unit, suitable for indoor installation and operation from the front. The bus shall be three (3) phase, 240 volts, 60 cycles, sized to include the highest horsepower rating for each spare space. Main lugs only shall be located at the bottom. All units are to be wired to individual terminal boards for motor and control loads.

18. It shall consist of the following:

11-Size #1 combination magnetic starters and circuit breaker with hand-off-automatic control at panel for the following horsepower motors.
9-1½ H.P.
2- 5 H.P.

1-Size #1 combination magnetic starter and circuit breaker, no control at panel for the following horsepower motor.
1-3 H.P. (Manual Reset)

3-Size #5 combination magnetic starter and circuit breaker with hand-off-automatic control at panel for a 75 horsepower motor.

2-125 Amp.-600 V. 3 pole circuit breakers for Heaters Size 3.

19. The secondary distribution board shall be similar to SK-316 and SK-317 attached herewith and with the following general specifications:

19.1 The control center shall be suitable for 600 volt maximum service. All equipment shall be thoroughly tested at the factory before shipment. Operating and high potential tests, shall be included. It shall be floor mounted, free standing, metal enclosed general purpose, cubicle type with circuit breaker combination, across the line, magnetically operated starters in the individual compartments.

19.2 The starter units shall be of the combination linestart type, similar to Allen Bradley classes consisting of a full-voltage magnetic starter, providing external manual reset thermal overload and low-voltage protection. The disconnect switches shall be of the circuit breaker type, with thermal inverse time limit overload and instantaneous short-circuit protection.

19.3 All equipment shall be dead front operated and provision shall be made for locking all circuit breakers or motor circuit switch handles in either the open or closed position.

19.4 Bus bars and control units are to be selected in accordance with N.E.M.A. Industrial Control Standards. Each section shall be provided with hori-

zontal wiring trough which shall line up with a similar trough in the adjacent sections to form a convenient pull box the entire length of the control center. Each starter assembly or blank plate shall be supported by screws fasteners, so arranged that any unit may be removed, or remounted without having access to the rear of the section, and without any parts falling out of place.

19.5 The entire control center shall be completely finished in a gray lacquer, and assembled by the manufacturer, ready to receive line, motor and control circuit connections.

19.6 All sections' base plates shall be provided with 13½" x 15-1/8" square hole to allow stubbing conduits in through the floor

19.7 After receipt of order, the manufacturer shall furnish for approval an outline dimension print and a diagram showing both elementary and physical layouts of the internal wiring of the board.

GROUND DETECTOR:

20. The ground detector panel shall consist of suitable equipment to indicate and locate grounds in a 2400 volt delta system and to energize a 120 volt circuit.

21. It shall be assembled, wired, and totally enclosed in a cabinet of suitable size for the installation and maintenance of the equipment indicated in SK-318.

GUARANTEE:

22. The vendor shall guarantee all of the equipment to be free from defects of material and workmanship and shall replace or repair at his factory any part which within one year after shipment proves defective.

Invitation No. HN-7H-304
Dated: October 6, 1949

HOLMES & NARVER
INCORPORATED
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

TELEPHONE SWITCHBOARDS

AND INSTRUMENTS

Proposals are invited for Telephone Switchboards and Instruments in accordance with the attached general specifications. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax shall be included.

Proposals shall be addressed to Holmes & Narver Incorporated, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until October 26, 1949.

REFERENCE:

SECTION 17 - "COMMUNICATIONS SYSTEMS"

Paragraph 17-04

Spec. No. HN-7H-304
Dated: October 6, 1949

SPECIFICATIONS

FOR

TELEPHONE SWITCHBOARDS

AND INSTRUMENTS

GENERAL:

1. It is contemplated that the equipment called for in the following specifications will be purchased by Holmes & Narver, Incorporated, Engineers (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired, and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders. The Purchaser reserves the right to reject any or all bids or any portion thereof.

3. All equipment and material proposed shall be the product of manufacturers regularly engaged in the building of this type of equipment and material. Units shall consist of components which have been in regular production for at least three years.

4. All equipment and material shall be designed and constructed with suitable moisture and fungus-proofing for operation in a hot, humid, tropical climate at sea level.

5. These specifications cover the following equipment:

Item No.	Description
I	Two (2) Telephone Switchboards, each for 220 subscribers, 26 trunks, and 34 oords.
II	Three (3) Telephone Switchboards, each for 45 subscribers, 12 trunks, and a minimum of 15 cords.

III One (1) Telephone Switchboard for 60 subscribers, 12 trunks, and a minimum of 15 cords.

IV One hundred thirty (130) Wall Mounting Hand Telephone Sets for use at manual stations for common battery service.

V One hundred ninety-four (194) Desk Type Telephone Sets for use at manual stations for common battery service.

VI One hundred forty-eight (148) Field Type Telephone Sets for use at manual stations.

6. Manufacturers catalog numbers stated herein are intended to designate the type, characteristics, and quality required. Consideration will be given to other manufacturer's equipment which is equal and similar to that specified.

SCOPE OF CONTRACT:

7. The lump sum price named in the proposal for each of Items No. I, II, and III shall include the furnishing of complete telephone switchboard or switchboards as described herein, wiring diagrams, operating and maintenance instructions, packing for export, and freight to Oakland, California.

8. The lump sum price named in the proposal for Item No. IV shall include the furnishing of one hundred thirty (130) Wall Mounting Hand Telephone Sets as described herein, wiring diagrams, operating and maintenance instructions, packing for export, and freight to Oakland, California, Unit prices shall also be quoted so that quantities ordered may be increased or decreased.

9. The lump sum price named in the proposal for Item No. V shall include the furnishing of one hundred ninety-four (194) Desk Type Telephone Sets as described herein, wiring diagrams, operating and maintenance instructions, packing for export, and freight to Oakland, California. Unit prices shall also be quoted so that quantities ordered may be increased or decreased.

10. The lump sum price named in the proposal for Item No. VI shall include the furnishing of one hundred forty-eight (148) Field Type Telephone Sets as described herein, wiring diagrams, operating and maintenance instructions, packing for export, and freight to Oakland,

California. Unit prices shall also be quoted so that quantities ordered may be increased or decreased.

TELEPHONE SWITCHBOARDS:

11. Each of the two (2) Telephone Switchboards specified as Item No. I shall be similar and equal to the equipment specified below.

A. Cabinet:

(1) The switchboard cabinet shall consist of two positions, two-panel units of steel framework. The design shall be such that the cabinet will be shipped completely assembled.

(2) All exterior woodwork shall be of Kellogg #9 Oak which is quarter sawed and finished medium dark, dull rubbed. The interior woodwork shall be tropicalized. All cord racks and connecting racks shall be maple so treated as to be suitable for operation in a tropical climate.

(3) The woodwork of the cabinet shall consist of a box panel or cable turning section; lift type removable rear doors with door moulding for the box panel and for each position; a linoleum faced front door for each position held in place by outside wood stiles; ornamental frieze moulding for the box panel and for each position; key shelf lock rail for each position.

(4) The key, lamp, and plug shelves of each position shall be covered with black phenol fiber. A pilaster shall be provided between the key, lamp, and plug shelves of adjacent positions to give a neat, finished and durable appearance.

(5) The piling rail, pilot panels, and all apparatus blanks in the face of the switchboard shall be faced with black phenol fiber. Finishing stile strips of the same material shall be provided, equipped with ivoroid number plates engraved to designate the hundreds groups of local line multiple.

(6) The cabinet shall be designed to permit two sections to be lined up to present the appearance of one continuous whole and shall have an ulti-

mate capacity of 400 lamp signal local lines multipled on a 2 panel basis.

(7) The rear of the cabinet shall be designed to allow maximum accessibility to all equipment. The paneled rear doors shall be readily removable.

(8) Side-swinging relay frames shall be provided in the rear of each operator's position with the cord circuit and miscellaneous apparatus for that position. The connecting rack shall be rigidly placed inside the relay frame and shall carry a terminal strip for the miscellaneous circuits of that position. The operator's induction coil and condenser equipment shall also be mounted on the connecting rack, as well as a glass-enclosed fuse panel with alarm type fuses for all circuits in that position.

(9) The cord rack shall be located above the connecting rack and shall provide terminals for all cords of that position.

(10) The design of the section shall be such as to permit the ready accessibility of relay frame, connecting rack, cord rack, and key shelf, wired and connected together by the key cable. All assemblies shall be shipped from the factory connected, and the relays and keys shall be adjusted and the circuits tested before shipment.

(11) The key shelves of each of the two universal positions shall be extended two and one half inches with seventeen cord circuits and one wire chiefs test cord.

B. Wiring and Equipment:

	Wired	Equipped
Box panel for the initial end of switchboard		1
Universal operator's position #1	1	1
Universal operator's position #2	1	1
Universal cord circuits Pos. #1 & #2	34	34
Common battery local lines		
Relay equipments	30	30
Multiple jacks with lamps	260	220

	Wired	Equipped
Magneto lines (lamp signal)		
Relay equipment (1000 ohm)	5	5
Answering jacks with lamps	5	5
Wire chief's test trunks	2	2
Wire chief's test cord Pos.#1 & 2	2	2
Universal cord test Pos. #1 & 2	2	2
Answering supervisory pilots	2	2
Line lamp pilots	2	2
Ringing interrupter pilots	1	1
Night alarm circuit	1	1
Fuse alarm	1	1

C. Positional Equipment:

Positions No. 1 and No. 2 shall each be equipped as a universal position, wired with seventeen (17) universal cord circuits and equipped with seventeen (17), each having the following features:

(1) All cords full universal and automatically adapted to either common battery or magneto lines.

(2) A high efficience non-ring-through repeating coil permanently wired in the circuit on all types of connections.

(3) Audible multiple relay busy test when the tip of the ceiling plug is touched to the sleeve of a busy common battery or magneto line multiple jack.

(4) Double lamp supervision on all types of connections. The supervisory lamp on either cord connected to a magneto line shall be under ring-off control of the operator.

(5) The supervisory lamp on the answering cord connected to a common battery line shall be under hook-switch control of the calling common battery subscriber, and shall provide flashing recall.

(6) The supervisory lamp on the calling cord connected to a common battery line shall be extinguished as soon as the operator depresses the ringing key to start the automatic ringing, thus providing dark key shelf, but shall be under the hook-switch control of the called common battery subscriber.

(7) Single-frequency manual ringing on the calling cord on trunk connections by means of a cam type ringing key combined with the listening key.

(8) Machine ringing on common battery lines tripped in both the silent and ringing periods.

(9) Ringing and silent intervals timed by motor-driven ringing interrupter machine as specified under "Power".

(10) Uniform revertive ringing tone to the calling party at each ringing period when ringing on either magneto or common battery lines.

Each universal position shall be wired and equipped with one operator circuit, one line pilot per panel, one calling supervisory pilot, one answering supervisory pilot, one fuse pilot, one cord test, one manual peg count meter and key, and one wire chief's test trunk.

D. Common Battery Local Subscribers' Lines:

The common battery local subscribers' lines as specified under "Wiring and Equipment" shall be of the three-wire, bridged multiple type, and equipped with major line and cut-off relays. The jacks shall be mounted in strips of twenty and numbered 0 to 99. Line lamps shall be associated with the multiple jacks and located directly above the jack. The line relays shall be wound so as to provide positive operation on a subscriber's loop having a maximum resistance of 750 ohms, including the telephone, and a minimum leak resistance of 10,000 ohms. The cut-off relays shall be wound to a resistance which will provide positive operation with a minimum current consumption. The relays shall be mounted in pairs on the relay rack, twenty pairs per strip and covered with one overall can cover per strip. All equipment shall be tropicalized.

E. Trunk Lines:

(1) The trunk lines shall be of the lamp signal type, as specified under "Wiring and Equipment". They shall be located below the local subscribers' line multiple.

(2) Lamp signal trunk lines shall be of the three-relay type employing a three-wire circuit. The line relay shall be wound to 1,000 ohms and shall be removed from both sides of the line while a plug is in the jack. The circuit shall be so arranged that the line lamp will flicker in response to a code ring originating on trunk line circuits, and shall burn permanently when the ringing has ceased. The line lamp shall be extinguished by the insertion of a plug in the jack and audible busy test shall be provided.

F. Wire Chief's Test Trunks:

The wire chief's test trunks, as specified under "Wiring and Equipment", shall be of the combined test and plugging-up type, equipped with a single plug and cord, a through testing jack, a supervisory lamp, and a supervision switching key. The trunk plugs and cords shall be located in drillings provided for that purpose in the plug shelf of the trunk position. The test jacks and supervisory lamps and switching keys shall be mounted on a ten-per-strip basis in the miscellaneous multiple space. The trunks shall be so designed that out-of-order tone may be placed on the sleeve of each multiple appearance of the line in which the trunk plug is inserted.

G. Operator's Telephone:

Each position shall be equipped with an operator's telephone having anti-side tone induction coil, lightweight head transmitter and receiver equal and similar to Kellogg Type KS-52AW and four-conductor operator's cord and plug, twin operator's jack, telephone switching key and multiple busy test equipment. The transmitter shall be very light and durable and thoroughly insulated.

H. Generator Circuit:

A generator circuit shall be furnished for each position having a 110-volt 15-watt tungsten lamp as a current regulator for the ringing frequency used, to serve as a load equalizer, and to prevent damage when ringing on short or grounded lines.

All master keys shall be of the indicating push-button type.

I. Alarm Equipment:

A night alarm shall be furnished common to the entire switchboard and equipped with an alarm bell and cut-off key located in the first position.

A fuse alarm shall be furnished common to all fuse pilots and equipped with an alarm bell and cut-off key.

The alarm bells shall be operated from the A.C. ringing current.

J. Miscellaneous Equipment:

A set of switchboard maintenance tools shall be furnished with the switchboard, and shall consist of the following:

1-#11 socket wrench for relay armature nuts.
1-#12 socket wrench for relay shells.
1-#13 socket wrench for relay mountings.
1-#14 socket wrench for multiple nuts.
1-#16 socket wrench for cam keys.
1-#17 socket wrench for multiple nuts adjustable.
1-#22 plug screw driver.
1-#25 lamp cap extractor.
1-#31 wrench for combination drops and jacks.
1-#32 pliers for removing heat coils.
1-#33 pliers for 4-party key buttons.
1-#34 pliers for 4-party key stems.
1-#35 long handle cutters.
1-#36 long handle pliers.
1-#39 pliers for tinsel cords.
1-#40 #106 plug gauge.
1-#60 relay adjuster.
1-#67 key spring adjuster.

Sufficient installing material, such as rosin core solder, cable lacing twine, rubber and friction tape, special switchboard wire, moisture and fungus proofing finish, webbing, multiple separators, bolts, screws, etc., shall be furnished to install the equipment specified.

Five complete sets of blue prints of all circuits and drawings used in the switchboard and the manufacturer's engineering department's shop specifications shall be furnished.

K. Cabling and Wiring:

(1) All cabling and wiring shall be suitable for operation in a tropical location. This requirement shall take precedence over any types of insulation specified in the balance of this section.

(2) All wire used in hand-made cables shall be enameled with a suitable insulation and shall not be smaller than #22 B. & S. gauge commercial pure solid copper wire.

(3) The hand-made cables shall be carefully laced into form with the wires properly run in pairs, triple twists, etc., to prevent cross talk or inductive disturbance and the forms shall be saturated with a beeswax compound.

(4) All cord circuit equipment shall be mounted, connected, and tested before shipment. The relay, coil, and condenser equipment shall be permanently mounted on the relay gate and connected by a hand-made key cable to the connecting rack, plug rack, and the key, lamp, and plug shelf.

(5) The machine-made cables shall have one silk and one cotton serving over enamel insulated wire not smaller than #22 B. & S. gauge and shall be of the waxed core type with a double paper wrapping and an overall outer braided cotton covering saturated with lead colored fireproof paint. The cable pairs and single wires shall have colored insulation to provide a regular code to designate the circuits in the cable.

(6) The cables for the local lines shall be formed and attached to the multiple jacks and tested before shipment. The local line cables from relays to arresters will be cut and formed in the field.

(7) All magneto and miscellaneous line cables shall be shipped in bulk for the installer.

(8) 250'-41 pr. lead covered machine made cable shall be included to wire all the circuits specified running from the switchboard to the main distributing frame.

(9) All line relays shall be incorporated in the switchboard. Line relays shall be tested and adjusted before shipment.

L. Fusing:

(1) The negative side of the battery for all switchboard and line circuits shall be protected with alarm type fuses. Not more than 20 lines, 10 trunks, or 3 cords shall be connected to one fuse of 2-ampere capacity or less.

(2) The line circuits shall be fused on a panel at the top of each bay of relay rack. The switchboard circuits shall be fused on an asbestos covered panel inside the section having a hinged cover with a glass top.

(3) Each operator's position and each bay of relay rack shall be provided with a separate fuse pilot. One audible alarm bell with a cut-off key shall be furnished and wired common to all fuse pilots.

M. Cable Rack:

A cable rack shall be supplied running from the box panel to the main distribution frame constructed of bar iron with sufficient capacity for the ultimate of the switchboard. The cable rack is estimated at 20 running feet having one turn and one bend and complete with ceiling hangers. All the ironwork shall be finished with black asphaltum paint.

N. Power Equipment:

No storage batteries are included in these specifications. All batteries will be furnished by the purchaser. Other items of power equipment to be furnished by the manufacturer are as follows:

1-#1067 Raytheon RectiCharger to operate from 110-volts 60 cycle single phase alternating current, for charging the main battery, and having a direct current output range of .1 to 6.0 amperes.

1-F-24 Kellogg power board complete with ironwork for separate rack mounting, and ebony asbestos panels; equipped as follows:

1-Power control panel complete with ammeter, voltmeter, rheostat switches and fuses.

1-Ringing machine panel with: Sub Cycle and
1-#36-A vibrating unit with automatic ringing machine switching circuit.

1-Kellogg #10-A motor-driven automatic ringing interrupter arranged to operate from 110-115 volts 60 cycle single phase alternating current with four circuit interrupters, each interrupter having a periodicity of one second ring and five seconds silent. Complete with base and glass top ventilated steel covers and iron detail for rack mounting.

Each interrupter will be additionally equipped with a tone wheel to provide an "out-of-order" tone; recall flash interrupter contacts, and one and two code ringing springs.

1-Two tier steel battery rack for mounting eleven cells of main exchange battery.

O. Main Distributing Frame:

A Cook type "L" main distributing frame with a double floor angle construction shall be furnished. The vertical sections shall be arranged on 9-inch horizontal centers with sufficient protector capacity for local switchboard lines on three vertical sections. The ironwork shall be finished with aluminum paint.

The present equipment will be as follows:

3- Vertical sections of ironwork each having capacity for 100 pairs of protectors on the switchboard cable side mounted vertically and 5 terminal strips on the line cable side mounted horizontally and equipped with enameled jumper rings.

300- Pairs of Cook #100 protectors with carbon blocks and heat coils arranged in banks of twenty (20) pairs each.

3- Fanning strips of 100 lines each to be mounted vertically on the protector side and numbered for lines.

12- Line terminals of twenty-six (26) pairs each Cook #1002 to be mounted vertically and to be numbered for lines.

3- Heat coil pilots with two (2) lamps each on bracket for mounting at the top of protectors.

1- Pilot alarm with buzzer and cut-off key.

1- Protector test plug.

1000- Ft. Kellogg #1002 #22 B. & S. gauge duplex tinned flameproof jumper wire.

All above mentioned material shall be suitably moisture and fungus proofed for operation in tropical climate.

P. Wire Chief's Testing Equipment:

A wire chief's testing equipment of the rack mounting type shall be furnished and shall consist of the following

1- Senior type T-20 wire chief's test set complete with bakelite faced panel arranged for rack mounting, wired and equipped

	Wired	Equipped
Testing circuit complete with necessary test keys and Weston #24 double-scale voltmeter, flush type, with scales of 0 to 30 volts 10,000 ohms and 0 to 150 volts 50,000 ohms	1	1
Order wire circuit with keys	1	1
Common battery talking key	1	1
Operator's telephone circuit with Masterphone type equipment	1	1
Howler equipment	1	1
Writing shelf, bakelite faced		1
Main Distributing Frame test trunk (#100 protector)	1	1

12. Each of the three (3) Telephone Switchboards specified as Item No. II shall be similar and equal to the equipment specified below.

A. Cabinet:

Each cabinet shall be similar and equal to that specified under Section 11A except that:

(1) The switchboard cabinet shall consist of a one position, one-panel unit of steel framework.

(2) The cabinet shall have an ultimate capacity of 100 lamp signal local lines.

(3) Only one universal position will be required for each switchboard.

B. Wiring and Equipment:

	Wired	Equipped
Universal operator's position	1	1
Universal cord circuits	17	17
Common battery local lines		
Relay equipments	15	15
Multiple jacks with lamps	100	45
Magneto lines (lamp signal)		
Relay equipments (1000 ohm)	5	5
Answering jacks with lamps	5	5
Wire Chief's test trunk	1	1
Wire Chief's test cord	1	1
Universal cord test	1	1
Answering supervisory pilot	1	1
Line lamp pilots	1	1
Ringing interrupter pilots	1	1
Night alarm circuit	1	1
Fuse alarm	1	1

C. Positional Equipment:

Positional equipment shall be similar and equal to that specified under Section 11C except that one universal position wired and equipped with fifteen (15) cord circuits will be required.

D. Common Battery Local Subscribers Lines:

The common battery local subscribers' lines shall be similar and equal to those specified under Section 11D except that jacks shall be numbered 0 to 45.

E. Trunk Lines:

F. Wire Chief's Test Trunks:

G. Operator's Telephone:

H. Generator Circuit:

I. Alarm Equipment:

These switchboards shall comply with the requirements of Section 11 for the above paragraphs.

J. Miscellaneous Equipment:

Each of the three switchboards shall be furnished with sufficient installing material, plans, and specifications as specified in paragraph 11J. One set of switchboard maintenance tools will be sufficient for the three switchboards.

K. Cabling and Wiring:

Each of the switchboards shall comply with the requirements of Section 11K for cabling and wiring except that only 100 feet of 41 pair lead covered machine made cable shall be included to wire all the circuits specified running from the switchboard to the main distributing frame.

L. Fusing:

Each switchboard shall comply with the requirements of Section 11L.

M. Cable Rack:

A cable rack similar and equal to that specified in paragraph 11M shall be provided with each switchboard.

N. Power Equipment:

The power equipment specified under Section 11N shall be provided with each switchboard except that:

(1) 1- #1058 Raytheon Recticharger having a direct current output range of .1 to 3.0 amperes shall be substituted for the 1- #1067 Raytheon Recticharger.

(2) 1- Model M-7.5-60 sub cycle ringing converter shall be substituted for the unit specified as a ringing machine panel.

O. Main Distributing Frame:

A Cook type L-9 Catalog No. 361-1058 wall type distributing frame shall be furnished. It shall be equipped with

80- Pairs of Cook #100 protectors with carbon blocks and heat coils arranged in banks of twenty (20) pairs each.

1- Heat coil pilot with two (2) lamps on bracket for mounting at the top of protectors.

1- Pilot alarm with buzzer and cut-off key.

1- Protector test plug.

500- Ft. Kellogg #1002 #22 B. & S. gauge duplex tinned flameproof jumper wire.

1- Metal cabinet for enclosing above mentioned equipment complete with lock. All cabinets included in this specification shall be keyed alike. A suitable weatherproof gasket shall be provided on door.

All above mentioned material shall be suitably moisture and fungus proofed for operation in tropical climate.

P. Wire Chief's Testing Equipment:

One Cook No. 1025 Test Set (common battery) with two No. 27 universal test clips and test cords shall be furnished.

13. The one (1) Telephone Switchboard specified as Item No. III shall be similar and equal to those specified under Section 12 with the following exceptions:

A. Wiring and Equipment:

Wiring and equipment required for this board is identical with that specified under paragraph 12 B except that the common battery local lines multiple jacks with lamps shall be increased from 45 to 60.

B. Common Battery Local Subscribers Lines:

The common battery local subscribers' lines shall be similar and equal to those specified under Section 12 D except that jacks shall be numbered 0 to 60.

C. Main Distributing Frame:

A Cook type L-9 Catalog No. 361-1056 wall type distributing frame shall be furnished in lieu of the Catalog No. 361-1058 specified under Section 12-0. The equipment furnished with this item shall be identical with that specified under Section 12-0.

TELEPHONE INSTRUMENTS:

14. Each of the Wall Mounting Hand Telephone Sets specified under Item No. IV shall be similar and equal to Western Electric type 354 AW-3. It shall be for use in a manual system. The telephone set mounting shall be complete with ringer, induction coil, condenser, contact springs, and a hook for supporting a handset, apparatus blank, and the necessary wiring. The handset shall consist of a handset handle with caps, an F-1 transmitter, and HA1 receiver, and 4 ft. long, 3-conductor cord. All of the above material and equipment shall be so constructed and treated to make it moisture and fungus proofed for operation in a humid tropical climate.

15. Each of the Desk Type Telephone Sets specified under Item No. V shall be similar and equal to Western Electric type 302EW-3. It shall be for use in a manual system. The telephone set mounting shall consist of a housing and a base on which is mounted the induction coil, condenser, ringer and other apparatus so that the telephone set mounting, together with a handset and cord which comprise a part of this equipment, form a complete telephone set. All of the above material and equipment shall be so constructed and treated to make it moisture and fungus proofed for operation in a humid tropical climate.

16. Each of the Field Type Telephone Sets specified under Item No. VI shall be similar and equal to Signal Corps Type EE-8A. It shall be for use in a manual system. It shall contain in one leather carrying case with strap a hand generator, a handset, induction coil, ringer, hookswitch, capacitor, battery compartment, cord and wiring to form a complete telephone set suitable for use with

either common-battery or local-battery telephone equipment. Two complete sets of batteries shall be provided with each Telephone Set. All of the above material and equipment shall be so constructed and treated to make it moisture and fungus proofed for operation in a humid tropical climate. Surplus sets in new condition will be acceptable.

GUARANTEE:

17. The vendor shall guarantee all of the equipment to be free from defects of material and workmanship and shall replace or repair at his factory or shops any part which within one year after shipment proves defective.

Invitation No. HN-2B-401
Dated: June 9, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

PACKAGED STEAM GENERATORS

Proposals are invited for Packaged Steam Generator Units in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, guaranteed capacities, manufacturers, model and size of appurtenances not manufactured by the vendor and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until June 23, 1949.

Spec. No. HN-2B-401
Dated: June 9, 1949

SPECIFICATIONS

FOR

PACKAGED STEAM GENERATORS

GENERAL:

1. The equipment called for in the following specifications will be purchased by Holmes & Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland. California.

2. Prompt delivery of the specified equipment is especially desired and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	Two (2) identical Packaged Steam Generators having a nominal rating of 50 boiler horsepower each and a working pressure of 150 pounds per square inch gauge.

SCOPE OF CONTRACT:

4. The lump sum price named in the proposal under Item No. I shall include the furnishing of two (2) identical Packaged Steam Generators, each with a nominal rating of 50 boiler horsepower including all appurtenances listed under the headings of Boiler Design, Boiler Fittings, Burner Equipment, Mechanical Draft Equipment, Automatic Controls, and Condensate Unit, except as may be noted within this specification. It shall also include installation drawings, operating instructions, packing for export and freight to Oakland, California.

Each unit shall be a Diesel oil fired packaged type steam generator. It shall consist of a steel boiler, burner equipment, mechanical draft equipment and a full complement of boiler fittings and automatic controls. It shall be completely factory assembled on a structural steel base as a compact, self-contained unit. It shall be fully automatic. Any substitutions or variations from the specifications shall be fully illustrated and data submitted to support such substitutions or variations.

STEAM CAPACITY AND EFFICIENCY:

6. Each unit shall have a nominal rating of 50 boiler horsepower. It shall be capable of generating continuously 1725 pounds of steam per hour from and at 212°F.

7. The unit shall operate at a guaranteed overall efficiency of 80% through the full range of firing from 30% to 100% of rating.

BOILER DESIGN:

8. The boiler shall be a steel multi pass, horizontal firetube, modernized scotch marine type. It shall be designed, constructed and hydrostatically tested in accordance with the requirements of the A.S.M.E. Boiler Construction Code for a maximum working pressure of 150 pounds per square inch gauge.

9. The boiler shall be provided with adequate handholes and manholes, and boiler feed, blowdown, water column, safety valve and steam connections as required by the code. The combustion chamber shall be provided with a spring loaded pressure relief or explosion door.

10. The front and rear flue doors shall be gas tight and insulated. They shall be readily removable to permit access to all fire surfaces. The method of tube removal shall be indicated.

11. The boiler shall be mounted on a structural steel base together with the mechanical draft fan, burner equipment, accessories and burner controls.

BOILER FITTINGS:

12. The boiler shall be fitted as follows:

(a) Boiler Feed and Blowdown Piping: Shall conform to the requirements of the A.S.M.E. Boiler Code with respect to materials, pressure ratings and arrangements.

(b) Injector: The boiler shall be fitted with an injector complete with all necessary steam and water valves connected to the boiler within view of the water column.

(c) Safety Valves: Shall be of A.S.ME. approved type. They shall be furnished in sufficient number and size to provide ample relieving capacity in accordance with the A.S.M.E. Boiler Code.

(d) Water Column: Shall be complete with gauge glass, try cocks and blowdown valve. The water column shall be piped to the boiler.

(e) Steam Pressure Gauge: Shall be mounted on the boiler complete with siphon, gauge cock and test cock.

(f) Main Steam Outlet Valve & Boiler Blowoff Valves: Shall be supplied with each unit.

BURNER EQUIPMENT:

13. For Diesel Oil Burner: The unit shall be furnished with fully automatic Diesel oil burning equipment. The oil burner shall be an air-atomizing type, mechanical pressure atomizing type or horizontal rotary type.

MECHANICAL DRAFT EQUIPMENT:

14. The unit shall be equipped with a motor-driven forced or induced draft fan capable of supplying entire air requirements for combustion at maximum capacity. The fan shall be mounted on the unit complete with necessary duct work.

AUTOMATIC CONTROLS:

15. The unit shall be equipped with a complete control system including motor starting switches with Thermal overload and under-voltage protection, control devices and relays mounted on a steel panel, housed in a steel cabinet with hinged doors, permanently affixed to the boiler, except for devices necessarily remotely located.

16. All motors shall be designed to operate on 240 volt, 3 phase, 60 cycle current.

17. All motors, devices and wiring shall conform with the requirements of the Underwriters' Laboratories and the National Electrical Code. All motors shall be moisture proof and fungus proof for operation in a tropical location.

(a) Boiler Feed Control And Low Water Cutoff: Shall be furnished integral with water column or piped to boiler near water column. This combination control shall be of the electrode probe type with induction relays or of float actuated mercury switch type, or equal.

(b) Burner Controls: The sequence of burner operation shall be controlled by a combustion programming relay. Operation of the programming relay shall be governed by a limit switch, a flame failure protection device and a low water cutoff. A flame failure or low water condition shall cause the burner to shut down on safety. It shall be necessary to reset the system manually before the burner can be restarted after a safety shutdown.

The Burner - Blower Controls shall be interlocked to prevent burner operation without required mechanical draft. Means shall be provided for automatically delaying burner operation while allowing fan to scavenge boiler passes of combustion gases after flame failure or other burner stoppage.

Ignition: Ignition of the burner shall be through the medium of straight electric ignition with industrial type electrodes. No gas will be available. The modulating controls shall be governed by the boiler steam pressure to automatically adjust the firing rate in response to changing steam demands.

The bidder shall submit a complete list of control equipment to be furnished on the proposed steam generator.

(c) Boiler Feed Pump Control: A boiler feed pump control shall be furnished to automatically operate a motor driven feed pump.

TESTS:

18. Boiler Inspection: The boiler shall be subjected to a hydrostatic pressure test in the presence of a National Board inspector. The test shall conform to the requirements of the A.S.M.E. Boiler Code.

19. Operational Test: The complete unit shall be subjected to a firing test prior to shipment from factory.

INSULATION AND METAL JACKET:

20. Each steam generator is to be provided with the proper thickness of insulation and provided with a metal jacket over such insulation.

PAINTING:

21. After operational test and before shipment, the steam generator shall be painted with final coat of rust and heat resistant enamel.

STACK:

22. A 12 gauge steel vent stack shall be supplied to extend 17'-0" above the boiler room floor. It shall include taper section, top band, umbrella top, roof flashing and bolts for attaching to gas vent.

SPARE PARTS:

23. Each steam generator shall be supplied with a complete spare parts kit, moisture and fungus proof packed for export and containing, as a minimum, the following items and quantities:

2-Ignition Electrodes
2-Ignition Cables and Connectors
5-Hand Hole Gaskets
2-Heater Coils for Blower Motor Starter
1-Set Asbestos Packing for Burner Head

2-Water Gauge Glass for Boiler
4-Water Gauge Glass Gaskets
2-Pyrex Observation Window Glasses
4-Pyrex Observation Window Glasses Gaskets
1-Tube Brush and Handle
1-Set Allen Set Screw Wrenches
1-Blowoff Cock Wrench
1-Injector Wrench
1-Oil Nozzle Complete
1-V-Belt for Oil Pump Drive
1-Oil Filter Refill
1-Oil Filter Gasket
1-Visi-Flame Bulb
1-Ignition Transformer
1-Low Water Cutout
1-Set Tubes (for 1 boiler only)

Should the Bidder wish to supplement or amend the above list, he shall submit with his bid a list of spare parts he proposes to furnish, together with the deduction or addition to the base bid price for any such alternate list.

CONDENSATE UNIT:

24. (a) General Requirements: One (1) single condensate unit shall be furnished for each steam generator. The units shall conform to the requirements hereinafter specified.

(b) Type: Each unit shall consist of one electric motor-driven pump and one cast iron, or rust-resisting steel, receiver. Pump, motor and receiver shall be mounted on one sub-base. Receiver shall be mounted above pump so that condensate shall flow by gravity to pump suction.

(c) Pump Capacity The pump shall have a capacity of not less than 9 gallons per minute when discharging condensate up to 200°F at a pressure of 160 pounds per square inch gauge at the pump.

(d) Receiver: Receiver shall be provided with an internal float which shall actuate a float valve on the makeup water line so that at high water condition the float valve will be shut and at low water condition the valve shall be open. The receiver shall have a capacity of 60 gallons.

(e) Motor: Motor shall be capable of handling the load imposed on it by the operating conditions specified above without undue heating or sign of overload, but shall not be less than 3 horsepower, suitable for operation on 240 volt, 3 phase, 60 cycle current. Motor shall be moisture and fungus proof for operation in a tropical location.

(f) Pump Motor Control: Pump motor control shall be furnished as indicated under section 17 (c).

EQUIPMENT AND SERVICES TO BE PROVIDED BY PURCHASER:

25. Piping and electrical wiring external to the units and concrete pad to receive base frame will be provided by Purchaser.

26. Installation of units in accordance with assembly drawings and instructions furnished by Vendor.

MANUAL:

27. A manual of instructions completely describing installation, operation and maintenance shall be provided with the unit. Copies of the boiler inspection and operational test reports shall be submitted with the manual.

GUARANTEE:

28. The Vendor shall guarantee all of the equipment to be free from defects of material and workmanship and shall replace or repair at his factory any part which within one year after shipment proves defective.

The Vendor shall further guarantee that the unit shall operate at an overall efficiency of 80% through the full range of firing from 30% to 100% of rating and be capable of generating continuously 1725 pounds of steam per hour from and at 212°F, provided the equipment is installed and operated in accordance with the manufacturer's instructions.

Suggested list of Bidders for

Packaged Steam Generators

Superior Combustion Industries Inc.
c/o Beeson Eng. Co.
1628 E. 7th St.
L. A. 21 MU-9151

Cyclotherm Corp.
c/o Pacific Eng. Eq. Co.
P.O. Box 166
Alhambra, Calif. CH-5-3621

Ames Iron Works
c/o Horrell Co.
8006 Melrose Ave.
L. A. WE-1-1016

Cleaver-Brooks Co.
c/o A.R. Johnson Co.
2322 Linden Ave.
Long Beach 6 L.B. 484-23

Invitation No. HN-5B-402
Dated: July 8, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

FOOD STORAGE REFRIGERATOR

AND

REFRIGERATION EQUIPMENT

Proposals are invited for Food Storage Refrigerator and Refrigeration Equipment in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials guaranteed capacities, manufacturers, model and size of appurtenances not manufactured by the vendor and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until July 18, 1949.

REFERENCE:

SECTION 26 - "MISCELLANEOUS MECHANICAL EQUIPMENT"

Paragraph 26-08 - sub g (1)

Spec. No. HN-5B-402
Dated: July 8, 1949

SPECIFICATIONS

FOR

FOOD STORAGE REFRIGERATOR

AND

REFRIGERATION EQUIPMENT

GENERAL:

1. The equipment called for in the following specifications will be purchased by Holmes & Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired and the guaranteed delivery time will be considered in the evluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	One (1) Four-Compartment, Pre-Fabricated, Portable, Knock-Down, Walk-In, Food Storage Refrigerator.
II	Five (5) Identical, Pre-Fabricated, Panel-Mounted, Refrigeration Equipment Assemblies; one for each compartment of Item No. I, and one spare.

SCOPE OF CONTRACT:

4. The lump sum price named in the proposal under Items Nos. I and II shall include the furnishing of one (1) four-compartment, pre-fabricated, portable, knock-down, walk-in, food storage refrigerator; five (5) identical, pre-fabricated, panel-mounted, refrigeration equipment assemblies; instruments, controls, accessories, spare parts,

refrigerant, erection and installation drawings, operating instructions, and packing for export and freight to Oakland, California. In addition, the proposal shall state the basis upon which a service engineer will be provided to check the Purchaser's installation, start the equipment in service, and to instruct the Purchaser's operators.

FOOD STORAGE REFRIGERATOR:

5. The refrigerator shall be 42'-6" long by 12'-0" wide by 8'-6" high overall outside dimensions, and shall be divided by partitions into four (4) equal compartments.

6. The refrigerator shall be of portable, sectional, design to facilitate transporting, handling, and erecting in the field, and shall be completely self-sustaining, requiring only a level surface on which to lay the floor.

7. Walls, partitions, floor, and ceiling shall be constructed of sections, or panels, each of which shall not exceed 48-inches in width. Each section shall consist of a frame of Douglas Fir, wolmanized or otherwise made resistant to water and rot, insulated with not less than 5½-inches of 4-lb. density Fiberglas, and completely sealed between sheets of 18-gauge aluminum.

8. Members of the wood frame shall be dadoed together and held with wood screws. No nails will be permitted. The aluminum sheathing shall be fastened to the wood frame in such manner as to insure that each complete section will be absolutely air and water-tight. If screws are used to fasten sheathing to frame, the screw heads shall be soldered to the aluminum. Joints between wall, floor, and ceiling section shall be of tongue and groove construction, and the sections shall be drawn together with lag bolts on gaskets of resilient cork.

9. One rear wall section of each compartment shall be provided with an opening for insertion of a demountable, plug-type, insulated panel furnished as a part of the refrigeration equipment assembly.

10. Each compartment shall be equipped with an aluminum clad, insulated, walk-in door having a suitable gasket to minimize frosting around the door frame. All hardware shall be brass, chromium plated. Each door shall be mounted on three hinges. Latches shall be safety type, permitting positive opening from inside, and shall be provided with holes for padlocks.

11. Each compartment shall be furnished with three 30-inch deep shelves along one side, and with hardwood floor racks.

12. Each compartment shall be equipped with a vapor-proof light, with a pilot-light switch located outside adjacent to the door.

13. Each compartment shall be equipped with a 5-inch dial type indicating thermometer mounted outside adjacent to door.

REFRIGERATION EQUIPMENT ASSEMBLIES:

14. Refrigeration equipment assemblies shall each be capable of maintaining any compartment of the refrigerator at either 0°F. or 35°F. when refrigerator and condensing unit are installed in a room having an ambient temperature of 100°F.

15. Each assembly shall consist of an evaporator, a condensing unit, refrigerant piping, valves, automatic controls, and other standard accessories all completely pre-fabricated and factory assembled on an insulated plug-type panel, suitable for insertion in rear wall section of each refrigerator compartment as provided in Paragraph 9.

16. Evaporators shall be blower type, with finned coils having not over four fins per inch, designed for Freon service, and shall be equipped with heaters and controls for automatic electric defrost.

17. Condensing units shall be electric motor driven, air cooled, designed for Freon service, and equipped with automatic controls to maintain temperatures specified in Paragraph 14. A manual change-over device shall be provided for dual temperature operation.

18. Controls shall be so arranged that at 35°F. the evaporator will defrost automatically each time the condensing unit turns off in its normal operating cycle. When turned to 0° position, the automatic electric defrost shall operate once each day to keep the coil free of ice.

19. Motors shall be suitablefor operation on 220 volt, 3 phase, 60 cycle current. All motors shall be moisture proof and fungus proof for operation in a tropical location.

20. Each motor supplied under this specification shall be provided with a magnetic starter. Starters shall be mounted on equipment assembly panel.

21. All wiring necessary for control and operation of each refrigeration equipment assembly shall be furnished and installed as a part of each pre-fabricated, factory built assembly. Wiring for each assembly shall be brought to a single terminal block, requiring field connection of power wiring at one point only for each assembly.

SPARE PARTS AND TOOLS:

22. A complete spare parts and tool kit shall be furnished, moisture and fungus proof packed for export, and containing, as a minimum, the following items and quantities:

1-Pressure Control
2-Thermostatic Expansion Valves
1-Defrost Control (relay and timeclock)
1-Sight Glass
1-Dehydrator
12-Dehydrator Cartridges
1-Heat Exchanger
5-Relay and Starter Coils
1-145 lb. Cylinder of Freon
2-Gallons of Oil
1-Dial Type Thermometer
1-Style B Prest-O-Lite Gas Tank and Regulator
1-Halide Leak Detector
1-Torch
2-Sets of Belts

23. Should the Bidder wish to supplement or amend the above list, he shall submit with his bid a list of spare parts and tools he proposes to furnish together with the deduction or addition to the base bid price for any such alternate list.

EQUIPMENT AND SERVICES TO BE PROVIDED BY PURCHASER:

24. Electric wiring external to equipment and level concrete pad to receive refrigerator floor will be provided by Purchaser.

25. Erection of refrigerator in accordance with assembly drawings and instructions furnished by Vendor.

SERVICES OF ENGINEER:

26. As a separate item in the proposal, a price shall be quoted on a per diem basis for the services of an erection or service engineer to check the installation, start the equipment in service, and instruct the Purchaser's operators. Purchaser will provide transportation, subsistence, and lodging.

GUARANTEE:

27. The Vendor shall guarantee all of the equipment to be free from defects of material and workmanship and shall replace or repair at his factory any part which within one year after shipment proves defective.

28. The Vendor shall further guarantee that the refrigeration equipment will produce the refrigerator temperatures specified, provided the equipment is installed and operated in accordance with the manufacturer's instructions.

Invitation No. HN-2B-403
Dated: July 12, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

PLUMBING FIXTURES

Proposals are invited for Plumbing Fixtures in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, manufacturers, model and size of appurtenances not manufactured by the vendor and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until July 21, 1949.

REFERENCE:

SECTION 19 - "PLUMBING"
Paragraph 19-25 Sub - a to h, inclusive

Spec. No. HN-2B-403
Dated: July 12, 1949

SPECIFICATIONS

FOR

PLUMBING FIXTURES

GENERAL:

1. The equipment called for in the following specifications will be purchased by Holmes & Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
	Lavatories
I	One hundred eighty eight (188) Standard F-367 "Lucerne", or equal 20" x 18" vitreous china lavatory with square bowl, rear outlet, open overflow, cast in soap dish. Fitted with one only B-1052 Chromard self-closing faucet with metal lever handle, coupling nut and tail piece threaded 1/4" I.P.S. Fitted with B-757 Chromard faucet hole cover for unused opening and B-756 chain stay and B-758 plug with rubber stopper and chain.
II	Two (2) Lavatories as specified above except fitted with 2-B-1052 self-closing faucets and no faucet hole cover.
III	Two (2) Crane Norwich Barber 1-640, or equal, vitreous china barber lavatory with rectangular basin, splash lip and soap depression. Supported on Crane 8-763 cast iron white enameled brackets. Lavatory supply and shampoo fitting with faucets, control valves and spray. 8-353, - 1½" open strainer. 3/8" I.P.S. angle supplies with loose key stops. No trap. Size 24" x 21".

IV One (1) Standard H F 12030, or equal, vitreous china surgeons lavatory with instrument trays, center leg, and wall hanger. HB15006 Re-Nu wrist control fitting with 3/8" gooseneck spout, 4" handles, escutcheons and drain plug with metal grid and 1¼" O.D. tailpiece, 3/8" I.P.S. angle supplies with loose key stops size 28" x 21".

Water Closets

V One hundred one (101) Standard F-3141 "Devoro ", or equal syphon jet round front closet with F-4070 vitreous china tank. Furnish straight hard rubber or plastic connection between tank and closet. Tank shall be equipped with hard rubber ball cock and flush valve. Furnish Church No. 5700 Sani-black hard rubber open front seat, no cover, with black molded check hinge.

Urinals

VI One hundred one (101) Standard F-6281 "Bering", or equal, vitreous china flat back urinal with flushing rim and integral strainer; 3/4" spud on inlet; 1½" spud on outlet with 1½" O.D. tubing tailpiece. Urinal stops shall be Chicago Faucet Company's No. 703, or equal, straightway urinal stop with oscillating handle and 3/4" O.D. tubing tailpiece.

Gang Showers

VII Eighty nine (89) Shower Heads and Valves. One valve for each head. Shower Heads shall be Standard B-268 "Boyd", or equal, Chromard ball joint for 1/2" I.P.S. connection. Valves shall be Standard "Re-Nu" compression type, straightway with four arm metal handles and union connections for exposed use.

Service Sinks

VIII One (1) Standard "Ardmore" P-7605R, or equal, vitreous china service sink with wall hanger and P-7782L trap standard enameled inside, painted outside, B-922 compression fitting, B-997V plug with strainer and B-2050 rim guard. Size 20" x 16".

IX Three (3) service sinks as specified above except B-1150 faucet for cold water only and fitted with B-757 Chromard faucet hole covers for unused openings.

Sinks

Standard HF 12259D, or equal, vitreous china laboratory sinks with HB-15573 drain plug.

X One (1) 30" x 20" sink as specified above, fitted with B-904 Chromard deck type double sink faucet with renewable seats.

XI One (1) 24" x 16" sink as specified above and fitted as specified for item X.

XII One (1) 18" x 12" sink as specified above and fitted as specified for item X.

XIII One (1) 20" x 14" sink as specified above and fitted with B-1141 faucet with hose end for cold water only.

XIV One (1) 30" x 20" sink as specified above and fitted as specified for item XIII.

XV One (1) 24" x 16" sink as specified above and fitted as specified for item XIII.

XVI One (1) Standard HF 12045N, or equal vitreous china Surgeons scrub-up sink with wall hanger and HP13729 iron supporting brackets fitted with HB 15263 Re-Nu elbow control fitting with integral stops, HB 15573 drain plug with metal grid and 1½" O.D. tailpiece. Size 30" x 22.

Hose Bibbs

XVII Thirty eight (38) 1/2" chromium plated loose key hose bibbs.

Laundry Tub

XVIII One (1) Crane 6-240, or equal, double cast cement composition laundry tub with metallic rim, and painted angle iron supporting frame. Two Crane 8-203-½" Vantage Dial-ese faucets with hose ends chromium plated. Cast in waste connections with nickle plated brass strainers, rubber stoppers and 1½" tailpieces. Two part continuous waste. Size 48" x 24" x 16" deep.

4. Note:

All wall hung fixtures and tanks will be bolted to 3/8" thick plates. Holes in tanks, fixtures, hangers or brackets for securing to the plates shall be drilled for bolts one size larger than standard. Furnish oversized steel bolts and nuts for hanging tanks and fixtures.

Invitation No. HN-2B-404
Dated: July 12, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

CABINET SHOWERS

Proposals are invited for Cabinet Showers in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, manufacturers, model and size of appurtenances not manufactured by the vendor and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until July 19, 1949.

REFERENCE:

SECTION 19 - "PLUMBING"

Paragraph 19-25 - Sub 1

Spec. No. HN-2B-404
Dated: July 12, 1949

SPECIFICATIONS

FOR

CABINET SHOWERS

GENERAL:

1. The equipment called for in the following specifications will be purchased by Holmes & Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	One (1) Weisway "Standard" or approved equal 32" x 32" x 78" with Armco iron, porcelain enameled receptor, galvanized steel walls with baked enamel finish. CWX two valve unit with adjustable self-cleaning head, cast waste and strainer for 2" pipe, inside caulking. Soap dish, curtain rod, white duck curtain with chromium rings. Valves and head shall be located on rear wall near corner.
II	Fifty six (56) Showers as specified above except to be equipped with one valve only. Valve and head shall be located on rear wall near corner.

Invitation No. HN-2B-405
Dated: July 12, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

ELECTRIC WATER COOLERS

Proposals are invited for Electric Water Coolers in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, guaranteed capacities, manufacturers, model and size of appurtenances not manufactured by the vendor and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until July 19, 1949.

REFERENCE:

SECTION 19 - "PLUMBING"

Paragraph 19-25 - Sub j

Spec. No. HN-2B-405
Dated: July 12, 1949

SPECIFICATIONS

FOR

ELECTRIC WATER COOLERS

GENERAL

1. The equipment called for in the following specifications will be purchased by Holmes & Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	Forty-two (42) Haws self-contained water coolers Model HT 10, or equal. Cabinet shall be heavy gauge sheet steel mounted on welded steel frame and finished with baked enamel. Top and drain shall be polished 18-8 stainless steel. Cooler and storage tank shall be 18-8 stainless steel welded at all seams. Cooler shall be equipped with an automatic water flow regulator and thermostatic temperature regulator. Cooler shall have a capacity of not less than 10 g.p.h. of 50° F. water with ambient room temperature of 80°F and inlet water temperature of 80° F. Motor shall be not less than 1/6 HP., 110V., single phase, 60 cycle.

Invitation No. HN-2B-406
Dated: July 12, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

ELECTRIC WATER HEATERS

Proposals are invited for Electric Water Heaters in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, guaranteed capacities, manufacturers, model and size of appurtenances not manufactured by the vendor and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until July 19, 1949.

REFERENCE:

SECTION 19 - "PLUMBING"

Paragraph 19-25 - Sub k

Spec. No. HN-2B-406
Dated July 12, 1949

SPECIFICATIONS

FOR

ELECTRIC WATER HEATERS

GENERAL:

1. The equipment called for in the following specifications will be purchased by Holmes & Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	Two (2) Thermador Model No. D32G, or equal, 30 gallon heater with 750 watts lower element and 1500 watts upper element. Heater shall have galvanized copper bearing steel tank, drain cock, not less than three inches of rock wool insulation, rust proof steel shell with baked enamel finish, snap acting type adjustable thermostat and removable hairpin tube type heating elements.
II	One (1) Thermador Model No. E82, or equal, 8 gallon heater as specified above with 1500 watts single element.

Invitation No. HN-2B-407
Dated: July 12, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

FLOOR DRAINS AND FLOOR SINKS

Proposals are invited for Floor Drains and Floor Sinks in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, manufacturers, model and size of appurtenances not manufactured by the vendor and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until July 19, 1949.

REFERENCE:

SECTION 19 - "PLUMBING"

Paragraph 19-25 - Sub 1 (L)

Spec. No. HN-2B-407
Dated: July 12, 1949

SPECIFICATIONS

FOR

FLOOR DRAINS AND FLOOR SINKS

GENERAL:

1. The equipment called for in the following specifications will be purchased by Holmes & Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	Seventy-five (75) Josam Type 302 floor drains, or approved equal, cast iron bodies with double drainage flanges and bottom outlets for inside caulking and chromium plated brass strainers.
II	Six (6) Josam Type V-52, or equal, cast iron sinks with internal strainers and bottom outlets for inside caulking.

Invitation No. HN-2B-408
Dated: July 22, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

DEAERATING FEEDWATER HEATERS

Proposals are invited for Deaerating Feedwater Heaters in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, guaranteed capacities, design computations, manufacturers, model and size of appurtenances not manufactured by the vendor and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until August 1, 1949.

REFERENCE:

SECTION 22 - "STEAM SYSTEMS"

Paragraph 22-16

Spec. No. HN-2B-408
Dated: July 22, 1949

SPECIFICATIONS

FOR

DEAERATING FEEDWATER HEATERS

GENERAL:

1. The equipment called for in the following specification will be purchased by Holmes & Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	Two (2) Deaerating Feedwater Heaters, each having a delivery capacity of 2000 pounds per hour of deaerated water with a maximum oxygen content of effluent of 0.03 c.c. per liter.

SCOPE OF CONTRACT:

4. The lump sum price named in the proposal under Item No. I shall include the furnishing of two (2) deaerating feedwater heaters each having a delivery capacity of 2000 pounds per hour of deaerated water with a maximum tolerance of 0.03 c.c. per liter oxygen remaining. Each unit shall be supplied with one (1) makeup water float operated valve and two (2) thermometers with separable sockets, one thermometer to show temperature in the steam space and the other, the temperature of the deaerated water. The float and float chamber shall be externally mounted for each unit. Each overflow shall be of the loop seal type with piping adequate for the operating conditions. The storage capacity of each unit shall be sufficient for a period of 20 minutes minimum. Heaters and storage tanks shall be constructed to the ASME Boiler Code for unfired pressure vessels designed for a pressure of

30# per square inch gauge and subject to a hydro-static test pressure of 60# before shipment. For those units which are of the tray type or combination tray-spray type, the trays shall be 18/8 stainless steel. Heaters and storage tanks shall be welded construction, either copper bearing steel or flange quality (ASTM A-70) steel plate.

OPERATING CHARACTERISTICS:

5. Steam will be supplied from the boilers, the first operating at 100# gauge and the second at 30# to 40# gauge. These pressures will be reduced to approximately 5# gauge by pressure reducing valves supplied by the purchaser at each deaerating heater. Makeup water (distilled) will be available at 25# gauge pressure and 80° F. The output of oxygen-free water shall be 2000# per hour for each unit. Approximately 75% of the water to be supplied to the heater will be condensate from traps at approximately the temperatures corresponding to the respective boiler pressures. The remaining 25% is makeup from a distilled water storage tank at 80° F. The condensate shall enter into the heater without float control and to prevent wastage of condensate, the deaerating heater shall have a storage for approximately 700# of deaerated water. The admission of makeup water shall be controlled by a float operated valve. The controlling float shall be set to normally keep the storage tank half to two thirds filled with water. If condensate returns fast enough to keep the storage tank one half to two thirds filled, the float shall completely close the inlet makeup valve, to keep the upper part of the storage tank available for condensate for such periods of operation when it returns more rapidly than required to supply the boiler feed pump.

EQUIPMENT AND SERVICES TO BE PROVIDED BY PURCHASER:

6. The following will be provided by purchaser:

Insulation of all units

Structural framework for elevating units

Piping between units and equipment to be served

Erection of all units

Final coat of paint before applying insulation

GUARANTEE:

7. The vendor shall guarantee all of the equipment to be free from defects of material and workmanship and shall replace or repair at his factory any part which within one year after shipment proves defective.

8. The vendor shall further guarantee that the deaerating heater will heat the water to the temperature of saturation at the steam pressure within the heater.

9. The oxygen in the deaerated effluent is not to exceed 0.03 c.c. per liter, as determined by the Schwartz-Gurney Method or the Winkler Test.

DATA TO BE SUBMITTED WITH BIDS:

10. Following information shall accompany each bid

Guaranteed maximum oxygen content of water leaving heater.

Weight of heater when empty.

Operating weight of heater when filled with water.

Storage of deaerated water, in pounds.

Dimensioned outline drawings with full description of equipment and method of operation.

Complete design and performance computations indicating basis for recommending particular design of deaerator.

Invitation No. HN-5B-409
Dated: August 11, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

FOOD STORAGE REFRIGERATOR

Proposals are invited for Food Storage Refrigerator in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, guaranteed capacities, manufacturers, model and size of appurtenances not manufactured by the vendor and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Incorporated, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until August 22, 1949.

REFERENCE:

SECTION 26 - "MISCELLANEOUS MECHANICAL EQUIPMENT"

Paragraph 26-08 - Sub a (5) and Sub e (7)

Spec. No. HN-5B-409
Dated: August 11, 1949

SPECIFICATIONS

FOR

FOOD STORAGE REFRIGERATOR

GENERAL:

1. The equipment called for in the following specifications will be purchased by Holmes & Narver, Incorporated, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired, and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	One (1) Three-Compartment, Pre-Fabricated, Portable, Knock-Down, Walk-In, Food Storage Refrigerator, complete with unit coolers and condensing unit.

SCOPE OF CONTRACT:

4. The lump sum price named in the proposal under Item No. I shall include the furnishing of one (1) three-compartment, pre-fabricated, portable, knock-down, walk-in, food storage refrigerator, complete with unit coolers and condensing unit; instruments, controls, accessories, spare parts, refrigerant, erection and installation drawings, operating instructions, and packing for export and freight to Oakland, California. In addition, the proposal shall state the basis upon which a service engineer will be provided to check the Purchaser's installation, start the equipment in service, and to instruct the Purchaser's operators.

FOOD STORAGE REFRIGERATOR:

5. The refrigerator shall be 19'-0" long by 10'-0" wide by 7'-6" high overall outside dimensions, and shall be divided by partitions into three (3) equal compartments.

6. The refrigerator shall be of portable, sectional design to facilitate transporting, handling, and erecting in the field, and shall be completely self-sustaining, requiring only a level surface on which to lay the floor.

7. Walls, partitions, floor, and ceiling shall be constructed of sections, or panels, each of which shall not exceed 48-inches in width. Each section shall consist of a frame of Douglas Fir, wolmanized or otherwise made resistant to water and rot, insulated with not less than $3\frac{1}{2}$-inches of $4\frac{1}{2}$-lb. density Fiberglas, and completely sealed between sheets of 18-gauge aluminum.

8. Members of the wood frame shall be dadoed together and held with wood screws. No nails will be permitted. The aluminum sheathing shall be fastened to the wood frame in such manner as to insure that each complete section will be absolutely air and water-tight. Joints between wall, floor, and ceiling sections shall be of tongue and groove construction, and the sections shall be drawn together with lag bolts on gaskets of resilient cork.

9. One rear wall section of each compartment shall be provided with brackets for mounting unit cooler.

10. Each compartment shall be equipped with an aluminum clad, insulated, walk-in door having a suitable gasket to minimize frosting around the door frame. All hardware shall be brass, nickel, or chromium plated. Each door shall be mounted on three hinges. Latches shall be safety type, permitting positive opening from inside, and shall be provided with holes for padlocks.

11. Each compartment shall be furnished with two 20-inch wood slat shelves along one side, and with hardwood floor racks. In addition, one compartment shall be furnished with two bar meat rails on opposite side from shelves. Provide twelve bar meat hooks to fit rails.

12. Each compartment shall be equipped with a vapor-proof light, with a pilot-light switch located outside adjacent to the door.

13. Each compartment shall be equipped with a 5½-inch dial type indicating thermometer mounted outside adjacent to door.

14. Each compartment shall be equipped with a Model No. UC-65 Standard Unit Cooler, as manufactured by the Bush Manufacturing Co., and having a rating of 6,500 BTU/hr. at 10° F. temperature difference.

15. Condensing unit shall be electric motor driven, air cooled, designed for Freon service, Model No. A-200, as manufactured by the Brunner Manufacturing Co. and having a rating of 17,300 BTU/hr. at 25° F. evaporating temperature when operating in a 100° F. ambient air temperature. Motor shall be a 3 H.P., two-speed, as manufactured by Wagner Electric Corp.

16. Motors shall be suitable for operation on 220 volt, 3 phase, 60 cycle current. All motors and controls shall be moisture proof and fungus proof for operation in a tropical location.

17. Control of individual unit coolers shall be by means of electric thermostats and electric solenoid valves to maintain each compartment at a minimum of 35° F. or at a higher temperature at the discretion of the operator. Condensing unit shall be controlled by means of a dual pressure controller.

18. Sufficient hard drawn copper tubing and sweated fittings shall be furnished to connect up the unit coolers with the condensing unit, which will be located at one end of the refrigerator on a concrete pad.

19. The following accessories shall be furnished for installation in the piping system:

    a. One DFN standard demountable, double flange, Type 1318 dryer.

    b. One Sporlan Type Y line strainer.

    c. One Mueller double port liquid indicator.

    d. One Mueller Tripl-Seal diaphragm line valve in each suction and liquid line to each unit cooler.

20. A complete spare parts and tool kit shall be furnished, moisture and fungus proof, packed for export, and containing, as a minimum, the following items and quantities:

1 - thermostat
1 - solenoid valve
1 - pressure control
1 - sight glass
6 - dehydrator cartridges
3 - relay and starter coils
1 - dial type thermometer
1 - 145-lb. cylinder of Freon
1 - gallon of oil
3 - sets of belts

21. Should the Bidder wish to supplement or amend the above list, he shall submit with his bid a list of spare parts and tools he proposes to furnish together with the deduction or addition to the base bid price for any such alternate list.

EQUIPMENT AND SERVICES TO BE PROVIDED BY PURCHASER:

22. Electric wiring, external to equipment and level concrete pad to receive refrigerator floor will be provided by Purchaser.

23. Erection of refrigerator and installation of equipment and piping in accordance with assembly drawings and instructions furnished by Vendor.

SERVICES OF ENGINEER:

24. As a separate item in the proposal, a price shall be quoted on a per diem basis for the services of an erection or service engineer to check the installation, start the equipment in service, and instruct the Purchaser's operators. Purchaser will provide transportation, subsistence, and lodging.

GUARANTEE:

25. The Vendor shall guarantee all of the equipment to be free from defects of material and workmanship and shall replace or repair at his factory any part which within one year after shipment proves defective.

26. The Vendor shall further guarantee that the refrigeration equipment will produce the refrigeration ratings specified, provided the equipment is installed and operated in accordance with the manufacturer's instructions.

Invitation No. HN-5B-410
Dated: September 27, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

BEVERAGE STORAGE REFRIGERATOR

Proposals are invited for Beverage Storage Refrigerator in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, guaranteed capacities, manufacturers, model and size of appurtenances not manufactured by the vendor, and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Incorporated, Engineers, 824 South Figueroa Street, Los Angeles 14, California. Proposals will be received until October 10, 1949.

REFERENCE:

SECTION 26 - "MISCELLANEOUS MECHANICAL EQUIPMENT"

Paragraph 26-08 - Sub i (1)

Spec. No. HN-5B-410
Dated: September 27, 1949

SPECIFICATIONS

FOR

BEVERAGE STORAGE REFRIGERATOR

GENERAL:

1. The equipment called for in the following specifications will be purchased by Holmes & Narver, Incorporated, Engineers, (hereinafter referred to as the Purchaser.) Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired, and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	One (1) Two-Compartment, Pre-Fabricated, Portable, Knock-Down, Walk-In, Beverage Storage Refrigerator.
II	Two (2) Identical, Pre-Fabricated, Panel-Mounted, Refrigeration Equipment Assemblies; one for each compartment of Item No. I.

SCOPE OF CONTRACT:

4. The lump sum price named in the proposal under Items Nos. I and II shall include the furnishing of one (1) two-compartment, prefabricated, portable, knock-down, walk-in, beverage storage refrigerator; two (2) identical, pre-fabricated, panel-mounted, refrigeration equipment assemblies; instruments, controls, accessories, spare parts, refrigerant, erection and installation drawings, operating instructions, and packing for export and freight to Oakland, California. In addition, the proposal shall state the basis upon which a service engineer

will be provided to check the Purchaser's installation, start the equipment in service, and to instruct the Purchaser's operators.

BEVERAGE STORAGE REFRIGERATOR:

5. The refrigerator shall be 13'-6" long by 10'-0" deep by 7'-6" high overall outside dimensions, and shall be divided by a partition into two (2) equal compartments.

6. The refrigerator shall be of portable, sectional design to facilitate transporting, handling, and erecting in the field, and shall be completely self-sustaining, requiring only a level surface on which to lay the floor.

7. Walls, partitions, floor, and ceiling shall be constructed of sections, or panels, each of which shall not exceed 48-inches in width. Each section shall consist of a frame of Douglas Fir, wolmanized or otherwise made resistant to water and rot, insulated with not less than 5-1/2 inches of 4-1/4 pound density Fiberglas, and completely sealed between 18-gauge Alclad 4S aluminum sheets.

8. Members of the wood frame shall be dadoed together and held with wood screws. No nails will be permitted. The aluminum sheathing shall be fastened to the wood frame in such manner as to insure that each complete section will be absolutely air and water-tight. Joints between wall, floor and ceiling sections shall be of tongue and groove construction, and the sections shall be drawn together with lag bolts on gaskets of resilient cork.

9. One rear wall section of each compartment shall be provided with an opening for insertion of a demountable, plug-type, insulated panel furnished as a part of the refrigeration equipment assembly.

10. Each compartment shall be equipped with an aluminum clad, insulated, walk-in door having a suitable gasket to minimize frosting around the door frame. All hardware shall be brass, chromium plated. Each door shall be mounted on three hinges. Latches shall be safety type, permitting positive opening from inside, and shall be provided with holes for padlocks.

11. Each compartment shall be furnished with hardwood floor racks.

12. Each compartment shall be equipped with a vapor-proof light, with a pilot-light switch located outside, adjacent to the door.

13. Each compartment shall be equipped with a 5-1/2 inch dial type indicating thermometer mounted outside adjacent to door.

REFRIGERATION EQUIPMENT ASSEMBLIES:

14. Each refrigeration equipment assembly shall consist of a unit cooler, a condensing unit, refrigerant piping, valves, automatic controls, and other standard accessories all completely pre-fabricated and factory assembled on an insulated plug-type panel, suitable for insertion in rear wall section of each refrigerator compartment as provided in Paragraph 9.

15. Each unit cooler shall be a Model No. UC-85 Standard Unit Cooler, as manufactured by the Bush Manufacturing Co., and having a rating of 17,000 BTU/hr. at 20° F. temperature difference.

16. Each condensing unit shall be electric motor driven, air cooled, designed for Freon service, Model No. A-200, as manufactured by the Brunner Manufacturing Co., and having a rating of 17,300 BTU/hr. at 25° F. evaporating temperature when operating in a 100° F. ambient air temperature. Motors shall be 3 H.P., two-speed, as manufactured by Wagner Electric Corp.

17. Each motor shall be provided with a suitable magnetic motor starter. Starters shall be mounted on equipment assembly panels.

18. Control of unit coolers shall be by means of thermal expansion valves, electric room thermostats, and electric solenoid valves to maintain each compartment at a temperature not to exceed 45° F. Condensing units shall be controlled by means of dual pressure controllers.

19. Motors, starters, and controls shall be suitable for operation on 220 volt, 3 phase, 60 cycle current. All motors, starters, and controls shall be moisture proof and fungus proof for operation in a tropical location.

20. All wiring necessary for control and operation of each refrigeration equipment assembly shall be furnished and installed as a part of each pre-fabricated, factory built assembly. Wiring for each assembly shall be brought to a single terminal block, requiring field connection of power wiring at one point only for each assembly.

21. The following accessories shall be provided and installed as a part of the piping system for each refrigeration assembly:

    a. One DFN standard demountable, double flange, Type 1318 dryer.
    b. One Sporlan Type Y line strainer.
    c. One Mueller double port liquid indicator.
    d. One Mueller Tripl-Seal diaphragm line valve in each suction and liquid line.

22. Condensing units, starters, controls, and other parts of the refrigeration assemblies which are exposed on the exterior of the refrigerator shall be enclosed in weather-tight enclosures. Enclosures shall be constructed of aluminum sheets to match the refrigerator construction, shall be suitably reinforced, and shall be easily removable to afford access to the equipment contained therein, or shall be provided with suitable removable access panels. Means shall be provided in the enclosures for adequate ventilation to remove heat released by condensing units.

SPARE PARTS AND TOOLS:

23. A complete spare parts and tool kit shall be furnished, moisture and fungus proof packed for export, and containing, as a minimum, the following items and quantities:

    1-Pressure Control
    1-Thermostatic Expansion Valve
    1-Thermostat
    1-Solenoid Valve
    1-Sight Glass
    12-Dehydrator Cartridges
    6-Relay and Starter Coils
    1-145 lb. Cylinder of Freon
    2-Gallons of Oil
    1-Dial Type Thermometer
    6-Sets of Belts

24. Should the Bidder wish to supplement or amend the above list, he shall submit with his bid a list of spare parts and tools he proposes to furnish, together with the deduction or addition to the base bid price for any such alternate list.

SHOP DRAWINGS:

25. Before beginning fabrication or assembly of any of the equipment specified herein, the Vendor shall submit for

approval by the Purchaser four certified copies of shop drawings showing details of design and construction which he proposes to use, and giving complete dimensional information for the refrigerator and refrigeration equipment assemblies.

EQUIPMENT AND SERVICES TO BE PROVIDED BY PURCHASER:

26. Electric wiring external to equipment and level concrete pad to receive refrigerator floor will be provided by Purchaser.

27. Erection of refrigerator in accordance with assembly drawings and instructions furnished by Vendor.

SERVICES OF ENGINEER:

28. As a separate item in the proposal, a price shall be quoted on a per diem basis for the services of an erection or service engineer to check the installation, start the equipment in service, and instruct the Purchaser's operators. Purchaser will provide transportation, subsistence, and lodging.

GUARANTEE:

29. The Vendor shall guarantee all of the equipment to be free from defects of material and workmanship and shall replace or repair at his factory any part which within one year after shipment proves defective.

30. The Vendor shall further guarantee that the refrigeration equipment will produce the refrigerator temperatures specified, provided the equipment is installed and operated in accordance with the manufacturer's instructions.

HOLMES & NARVER
Incorporated
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

DEHUMIDIFICATION EQUIPMENT

Proposals are invited for Dehumidification Equipment in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, guaranteed capacities, manufacturers, model and size of appurtenances not manufactured by the vendor and the time of delivery. Vendor shall also submit with his proposal drawings indicating general assembly of equipment he proposes to furnish and giving approximate overall dimensions of same. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Incorporated, Engineers, 824 South Figueroa St., Los Angeles 14, California. Proposals will be received until January 9, 1950.

REFERENCE:

SECTION 23 - "DEHUMIDIFICATION, VENTILATION, AND REFRIGERATION" - Paragraph 23-14

Spec. No. HN-2H-411
Dated: December 27, 1949

SPECIFICATIONS

FOR

DEHUMIDIFICATION EQUIPMENT

GENERAL:

1. The equipment called for in the following specifications will be purchased by Holmes & Narver, Incorporated, Engineers (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired, and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	Dehumidification Equipment Assembly Type "A"
II	Dehumidification Equipment Assembly Type "B"
III	Dehumidification Equipment Assembly Type "C"

SCOPE OF CONTRACT:

4. The lump sum price named in the proposal under Items Nos. I, II, and III shall include the furnishing of seven (7) Dehumidification Equipment Assemblies Type "A", one (1) Assembly Type "B", and one (1) Assembly Type "C"; complete with fans, coils, dampers, air filters, refrigeration compressors, air-cooled condensers, receivers, refrigerant piping, valves, automatic controls, instruments, motors, refrigerant, oil, spare parts, erection and installation drawings, operating instructions, and packing for export and freight to Oakland, California.

DEHUMIDIFICATION EQUIPMENT ASSEMBLIES:

5. Assembly Type "A" shall consist of one (1) self-contained air conditioner; complete with conditioned air fan and motor, direct expansion evaporator coil, hot gas reheat coil with automatic face and by-pass dampers, cleanable return air and outside air filters, refrigeration compressor and motor, integral air-cooled refrigerant condenser, refrigerant receiver, automatic controls, instruments, and other necessary auxiliaries and appurtenances, completely factory assembled, piped and wired. Unit shall require only field connection of power wiring to make it operable.

6. Assembly Type "B" shall consist of two (2) self-contained air conditioners, each of which shall be identical with that specified for Assembly Type "A", except that integral air-cooled refrigerant condenser, for each conditioner shall be eliminated and shall be replaced with one (1) air-cooled two-circuit condenser designed for remote installation.

7. Assembly Type "C" shall consist of three (3) self-contained air conditioners, each of which shall be identical with that specified for Assembly Type "A", except that integral air-cooled refrigerant condenser for each conditioner shall be eliminated and shall be replaced with one (1) air-cooled three-circuit condenser designed for remote installation.

DESIGN:

8. Dehumidification Units are intended to maintain temperature and humidity conditions of 82 degrees D. B. and 40% R. H. within the spaces they serve when outside conditions are 82 degrees D. B. and 80 degrees W. B.

9. Each air conditioner and its component parts, also including evaporator coil, compressor, integral or remote condenser coil or coils, piping and specialties, shall be designed to have a refrigeration capacity of not less than 42,000 BTU per hour at a refrigerant evaporating temperature of 41.5 degrees F (approximately) and a condensing temperature of 110 degrees F (approximately).

10. Conditioned air fan of each conditioner shall be designed to deliver 1000 cfm (nominal) against a static pressure (external to the conditioner) of 1/2-inch W. G.

11. Units shall be capable of operating on 220 Volt, 3 phase, 60 cycle current supply, and a transformer shall be furnished, installed in the Unit, for controls requiring current of other characteristics.

12. Units shall be designed for complete automatic control. Controls shall include a hi-lo pressurestat to control compressor operation, a thermostat operating in conjunction with reheat coil automatic face and by-pass dampers to control room temperature, a humidistat to control room humidity, and the relays, switches, automatic motor starters and auxiliaries necessary to make operation completely automatic.

CONSTRUCTION:

13. This equipment is to be used in a tropical location, possibly without benefit of shelter and subject to extremely difficult moisture conditions. The construction shall, insofar as is practicable, be of non-corrosive materials, and all electrical equipment (motors, starters, controls, etc.), where possible, shall be moisture-and-fungus-proof.

14. The air conditioners shall be constructed of aluminum extruded structural members. The exterior enclosing panels shall be of 4S Alclad aluminum. Conditioners shall be not over 7'-9" in height and not over 2'-4" in depth. Conditioned air fans shall discharge in horizontal direction.

15. All controls shall, if practicable, be located in a control box built into each air conditioner. For Assemblies "B" and "C" starters for fan motors of remote condensers shall be built into condensers.

16. Refrigeration compressors for all units shall be identical in type, size and capacity. See Paragraphs 8 and 9 for specified requirements. Compressors shall be electric motor driven and designed for Freon (F-12) service.

17. Remote condensers for Assemblies "B" and "C" shall be of similar design and construction to an evaporative condenser, without sprays. The number of circuits in each condenser shall depend upon the number of air conditioners in the assembly. Each circuit coil shall be capable of rejecting the total heat output of one compressor when operating under the conditions specified in Paragraphs 8 and 9. The materials of construction of the condensers shall be aluminum, insofar as if practicable.

18. Filters shall be provided for return air and outside air openings of air conditioners and for air intake openings of condensers for assemblies "B" and "C". Filters shall be cleanable type, 2" thick, with aluminum media and frames.

19. Fresh air opening of each air conditioner shall be provided with a manually operated louver damper constructed of aluminum.

20. The refrigerant piping system of each air conditioner shall be equipped with a DFN standard demountable, double flange liquid line dehydrator, with the proper number of silica gel cartridges, and of proper rating for the refrigeration piping system. Dehydrator shall be installed with a three-valve by-pass.

SPARE PARTS AND TOOLS:

21. One (1) only complete spare parts and tool kit shall be furnished, moisture and fungus proof, packed for export, and containing, as a minimum, the following items and quantities:

1 - Compressor motor
1 - Air Conditioner fan motor
1 - Remote condenser fan motor
24 - Compressor Belts
12 - Conditioned air fan belts
6 - Condenser fan belts
12 - Expansion valves
2 - Hi-lo pressure controllers
2 - Humidistats
2 - Electric damper motors
24 - Overload heater elements
1 - High pressure refrigerant gauge
1 - Low pressure refrigerant gauge
24 - Dehydrator cartridges
12 - Air filters
3 - 145 lb. cylinders of Freon - 12
24 - 1 gal. cans refrigeration oil

22. Should the bidder wish to supplement or amend the above list, he shall submit with his bid a list of spare parts and tools he proposes to furnish, together with the deduction or addition to the base bid price for any such alternate list.

SHOP DRAWINGS:

23. Before beginning fabrication or assembly of any of the equipment specified herein, the Vendor shall submit for approval by the Purchaser four certified copies of shop drawings showing details of design and construction which he proposes to use, and giving complete dimensional information for the various items of equipment.

OPERATION AND MAINTENANCE INSTRUCTION MANUAL:

24. Vendor shall prepare and submit for approval by the Purchaser a manual presenting detailed instructions for installation, operating, and maintenance of the equipment furnished. Necessary assembly drawings, wiring diagrams, etc., shall be included. After receipt of Purchaser's approval, Vendor shall make up and deliver to the Purchaser twelve (12) copies of the Manual in its approved form.

EQUIPMENT AND SERVICES TO BE PROVIDED BY PURCHASER:

25. Electric wiring external to equipment. Also, refrigerant piping external to equipment.

26. Installation of equipment in accordance with instructions and drawings furnished by Vendor.

GUARANTEE:

27. The Vendor shall guarantee all of the equipment to be free from defects of material and workmanship and shall replace or repair at his factory any part which within one year after shipment proves defective.

28. The Vendor shall further guarantee that the equipment will produce the specified refrigerating effect under the conditions specified, provided the equipment is installed and operated in accordance with the manufacturer's instructions.

Invitation No. HN-2H-413
Dated: April 26, 1950

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

DEHUMIDIFICATION EQUIPMENT

Proposals are invited for Dehumidification Equipment in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, guaranteed capacities, manufacturers, model and size of appurtenances not manufactured by the vendor and the time of delivery. Vendor shall also submit with his proposal drawings indicating general assembly of equipment he proposes to furnish and giving approximate overall dimensions of same. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Incorporated, Engineers, 824 South Figueroa St., Los Angeles 17, California. Proposals will be received until May 15, 1950.

REFERENCE:

SECTION 23 - "DEHUMIDIFICATION, VENTILATION AND REFRIGERATION"

Paragraph 23-14

Spec. No. HN-2H-413
Dated: April 26, 1950

SPECIFICATIONS

FOR

DEHUMIDIFICATION EQUIPMENT

GENERAL:

1. The equipment called for in the following specifications will be purchased by Holmes & Narver, Incorporated, Engineers (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired, and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	Dehumidification Equipment Assembly Type "D".

SCOPE OF CONTRACT:

4. The lump sum price named in the proposal under Item No. I, shall include the furnishing of thirteen (13) Dehumidification Equipment Assemblies Type "D"; complete with fans, coils, dampers, air filters, hermetically sealed refrigeration compressors, air-cooled condensers, receivers, refrigerant piping, valves, automatic controls, instruments, motors, refrigerant, oil, spare parts, erection and installation drawings, operating instructions, and packing for export and freight to Oakland, California. In addition, the proposal shall state the basis upon which a Service Engineer will be provided to check the Purchaser's installation, start the equipment in service, and to instruct the Purchaser's operators.

DEHUMIDIFICATION EQUIPMENT ASSEMBLY:

5. Assembly Type "D" shall consist of one air conditioner; complete with conditioned air fan and motor, direct expansion evaporator coil, hot gas reheat coil with automatic face and by-pass dampers, cleanable return air and outside air filters, automatic controls, and instruments; and one hermetically-sealed compressor built into the base-section of a remote dry-coil condenser, complete with fan, motor, air filters, refrigerant receiver, and other auxiliaries.

DESIGN:

6. Dehumidification Units are intended to maintain temperature and humidity conditions of 82 degrees D. B. and 40% R. H. within the spaces they serve when outside conditions are 82 degrees D. B. and 80 degrees W. B.

7. Each air conditioner and its component parts, also including evaporator coil, remote condenser coil, compressor, piping and specialties, shall be designed to have a refrigeration capacity of not less than 42,000 btu per hour at a refrigerant evaporating temperature of 41.5 degrees F (approximately) and a condensing temperature of 110 degrees F (approximately).

8. Conditioned air fan of each conditioner shall be designed to deliver 1000 cfm (nominal) against a static pressure (external to the conditioner) of 1/8-inch W. G.

9. Units shall be capable of operating on 220 Volt, 3 phase, 60 cycle current supply, and a transformer shall be furnished, installed in the Unit, for controls requiring current of other characteristcis.

10. Units shall be designed for complete automatic control. Controls shall include a hi-lo pressurestat to control compressor operation, a thermostat operating in conjunction with reheat coil automatic face and by-pass dampers to control room temperature, a wet bulb thermostat to control room humidity, and the relays, switches, automatic motor starters and auxiliaries necessary to make operation completely automatic.

CONSTRUCTION:

11. This equipment is to be used in a tropical location, possibly without benefit of shelter and subject to extremely difficult moisture conditions. The construction

shall, insofar as is practicable, be of non-corrosive materials, and all electrical equipment (motors, starters, controls, etc.), where possible, shall be moisture-and-fungus-proof.

12. The air conditioners shall be constructed with aluminum structural members. The exterior enclosing panels shall be of 4S Alclad aluminum. Conditioners shall be not over 6'-4" in height, 2'-0" in depth, and not over 4'0" wide. Conditioned air fans shall discharge in vertical direction.

13. All controls shall be located in a control box built into each air conditioner. Starters for fan motors of remote condensers and compressor motors shall be built into condensers.

14. Hermetically sealed refrigeration compressors for all units shall be identical in type, size, and capacity. See Paragraphs 6 and 7 for specified requirements. Compressors shall be electric motor driven and designed for Freon (F-12) service.

15. Remote condensers shall be of similar design and construction to an evaporative condenser, without sprays, and shall discharge in a horizontal direction. Coil shall be capable of rejecting the total heat output of one compressor when operating under the conditions specified in Paragraphs 6 and 7. The materials of construction of the condensers shall be aluminum, insofar as is practicable.

16. Filters shall be provided for return air and outside air openings of air conditioners and for air intake openings of condensers. Filters shall be cleanable type, 2" thick, with aluminum media and frames.

17. Fresh air opening of each air conditioner shall be provided with a manually operated louver damper constructed of aluminum. The refrigerant piping system of each air conditioner shall be equipped with a DFN standard demountable, double flange liquid line dehydrator, with the proper number of silica gel cartridges, and of proper rating for the refrigeration piping system. Dehydrator shall be installed with a three-valve by-pass.

SPARE PARTS AND TOOLS:

18. One (1) only complete spare parts and tool kit shall be furnished, moisture and fungus proof, packed for export, and containing, as a minimum, the following items and quantities

1 - Hermetically sealed compressor
1 - Air Conditioner fan motor
1 - Remote condenser fan motor
13 - Conditioned air fan belts
26 - Condenser fan belts
13 - Expansion valves
2 - Hi-lo pressure controllers
2 - Dry bulb thermostats
2 - Wet bulb thermostats
2 - Electric damper motors
26 - Overload heater elements
1 - High pressure refrigerant gauge
1 - Low pressure refrigerant gauge
40 - Dehydrator cartridges
12 - Air filters
4 - 145 lb. cylinders of Freon - 12
36 - 1 gal. cans refrigeration oil

19. Should the bidder wish to supplement or amend the above list, he shall submit with his bid a list of spare parts and tools he proposes to furnish, together with the deduction or addition to the base bid price for any such alternate list.

SHOP DRAWINGS:

20. Before beginning fabrication or assembly of any of the equipment specified herein, the Vendor shall submit for approval by the Purchaser four certified copies of shop drawings showing details of design and construction which he proposes to use, and giving complete dimensional information for the various items of equipment.

OPERATION AND MAINTENANCE INSTRUCTION MANUAL:

21. Vendor shall prepare and submit for approval by the Purchaser a manual presenting detailed instructions for installation, operation, and maintenance of the equipment furnished. Necessary assembly drawings, wiring diagrams, etc., shall be included. After receipt of Purchaser's approval, Vendor shall make up and deliver to the Purchaser thirteen (13) copies of the Manual in its approved form.

EQUIPMENT AND SERVICES TO BE PROVIDED BY PURCHASER:

22. Electric wiring external to equipment. Also, refrigerant piping external to equipment.

23. Installation of equipment in accordance with instructions and drawings furnished by Vendor.

SERVICE OF ENGINEER:

24. As a separate item in the proposal, a price shall be quoted on a per diem basis for the service of an erection or service engineer to check the installation, start the equipment in service, and instruct the Purchaser's operators. Purchaser will provide transportation, subsistence, and lodging.

GUARANTEE:

25. The Vendor shall guarantee all of the equipment to be free from defects of material and workmanship and shall replace or repair at his factory any part which within one year after shipment proves defective.

26. The Vendor shall further guarantee that the equipment will produce the specified refrigerating effect under the conditions specified, provided the equipment is installed and operated in accordance with the manufacturer's instructions.

Invitation No. HN-9H-501
Dated: April 22, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

WATER DISTILLATION UNITS

Proposals are invited for Water Distillation Units in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, guaranteed capacities, manufacturers, model and size of appurtenances not manufactured by the vendor and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until May 2, 1949.

REFERENCE:

SECTION 25 - "FRESH AND SALT WATER DISTRIBUTION SYSTEM"

Paragraph 25-13

Spec. No. HN-9H-501
Dated: April 22, 1949

SPECIFICATIONS

FOR

WATER DISTILLATION UNITS

GENERAL:

1. The equipment called for in following specifications will be purchased by Holmes & Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	One (1) Compression Water Distillation Unit having a distilled water capacity of 600 GPH
II	Five (5) Compression Water Distillation Units each having a distilled water capacity of 83 GPH
III	Seventeen (17) Compression Water Distillation Units, five (5) units having a distilled water capacity of 600 GPH each and twelve (12) units having a distilled water capacity of 83 GPH each.
IV	Thirteen (13) Compresson Water Distillation Units, six (6) units having a distilled water capacity of 600 GPM each and seven (7) units having a distilled water capacity of 83 GPH each.

It is planned to enter into a contract for either Item No. I or Item No. II immediately and it is presently contemplated that an order will be placed for Item III or Item IV prior to October 1, 1949.

SCOPE OF CONTRACT:

4. The lump sum price named in the proposal under Item No. I shall include the furnishing of one 600 GPH water distillation unit including evaporator, steam compressor, electric motor and V-belt drive, vent condenser, heat exchangers, electric motor driven feed water, distillate and blowdown pumps, instruments and control devices, duct work to carry steam to and from the compressor and evaporator, interconnecting piping, chemical cleaning tank, foundation bolts, installation drawings, operating instructions, packing for export and freight to Oakland, California. In addition, the proposal shall state the basis upon which a service engineer will be provided to check the Purchaser's installation, start the unit in service, and to instruct the Purchaser's operators.

5. The lump sum price named in the proposal under Item No. II shall include the furnishing of five (5) 83 GPH water distillation units. Each unit shall include evaporator, steam compressor, electric motor and V-belt drive, vent condenser, heat exchangers, electric motor driven feed water pump, instruments and control devices, duct work to carry steam to and from the compressor and evaporator, interconnecting piping, motor starters, push button stations and disconnect switches mounted on panel, structural steel frame and base, foundation bolts, insulation for evaporator, vent condenser, duct work and heat exchangers, drawings and operating instructions, packing for export and freight to Oakland, California. Proposal shall also include one (1) chemical cleaning tank and the basis upon which a service engineer will be provided to check the Purchaser's installation, start the unit in service, and to instruct the Purchaser's operators.

6. The lump sum price named in the proposal under Item No. III shall include the furnishing complete of seventeen (17) water distillation units. Five (5) units shall be similar to the 600 GPH unit specified under Item No. I and twelve (12) units shall be similar to the 83 GPH unit specified under Item II. One (1) chemical cleaning tank suitable for the 600 GPH units and three (3) chemical cleaning tanks suitable for the 83 GPH units shall be included. The services of a service engineer will not be required under this item.

7. The lump sum price named in the proposal under Item No. IV shall include the furnishing complete of thirteen

(13) water distillation units. Six (6) units shall be similar to the 600 GPH unit specified under Item I and seven (7) units shall be similar to the 83 GPH unit specified under Item II. Two (2) chemical cleaning tanks suitable for the 600 GPH units and two (2) chemical cleaning tanks suitable for the 83 GPH units shall be included. The services of a service engineer will not be required under this item.

OPERATING CHARACTERISTICS:

8. When operating on sea water in the Central Pacific area having an average temperature of 80° F, the units shall have the following characteristics:

	83 GPH Unit	600 GPH Unit
Distilled water capacity with clean evaporator, minimum	83 GPH	600 GPH
Blowdown	83 GPH	600 GPH
Feed Water	166 GPH	1200 GPH
Pressure differential	5 psi	5 psi
Distilled water purity (expressed as sodium chloride by the conductivity method after boiling)	5 ppm	5 ppm

9. Vendor shall state, for each size unit:
Motor horsepower required with clean evaporator.
Motor horsepower required after 25-day continuous run.
Average motor horsepower for 25-day cleaning period.
Average motor horsepower for 12-day cleaning period.
Pump motor sizes.
Steam requirements, in pounds per hour.

EVAPORATORS:

10. The evaporators shall be of the shell and tube type with vertical straight tubes. Water shall be in the lower head and tubes with vapor in the shell. An efficient steam separator shall be provided in the upper head to remove entrained moisture from the steam. A vent condenser, either integral or separate, shall be provided to remove air and other non-condensable gases. A distillate hot well shall be provided for the collection of condensate.

STEAM COMPRESSORS:

11. The steam compressors shall be of the positive displacement type with forced feed lubrication system, oil pump and cooler and shall be designed for heavy duty and

continuous operation. The capacity of each steam compressor shall be adequate to deliver the specified quantity of distilled water at a pressure differential of five (5) pounds per square inch.

COMPRESSOR DRIVES:

12. Each steam compressor shall be electric motor driven through multiple "V" belts with properly grooved driving and driven sheaves.

COMPRESSOR MOTORS:

13. The compressor motors shall be of adequate size for the maximum horsepower requirements and shall be open type, ball bearing, high starting torque, low starting current motors for 220 volt, 3 phase, 60 cycle operation. All motors shall be moisture proof and fungus proof for operation in a tropical location. A magnetic starter with start-stop push button shall be provided for compressor motor on each 83 GPH unit. Starters for compressor motors on 600 GPH units will be furnished by others.

HEAT EXCHANGERS:

14. For each unit there shall be a distillate-to-feed water heat exchanger and a blowdown-to-feed water heat exchanger of adequate capacity to lower the temperature of both distillate and blowdown to 105° F when incoming feed water has a temperature of 80°.

PUMPS:

15. For each 600 GPH unit there shall be three (3) centrifugal pumps, each direct connected to an electric motor. One pump to receive feed water from a salt water distribution main at approximately ten (10) psi pressure and discharge through heat exchangers to the evaporator. One pump to discharge distillate from evaporator through heat exchanger to reservoir. The head required leaving heat exchanger will be approximately twenty (20) feet. The third pump will deliver blowdown from evaporator through heat exchanger to sewer. The capacities of the above pumps shall be 25% greater than the quantities specified hereinbefore. Electric motors shall be ball bearing, open type, general purpose, squirrel cage motors for operation on 220 volt, 3 phase, 60 cycle current. All motors shall be moisture proof and fungus proof for

operation in a tropical location. Motor starters will be provided by others. Each pump and motor shall be mounted on a common base.

16. For each 83 GPH unit there shall be furnished one (1) centrifugal pump, direct connected to electric motor to deliver feed water from a salt water distribution main at approximately ten (10) psi pressure, through heat exchangers to the evaporator. No distillate or blowdown pumps will be required. The capacity of the pump shall be 25% greater than the quantity of feed water specified hereinbefore. Electric motor shall be ball bearing, open type, general purpose, squirrel cage for operation on 220 volt, 3 phase, 60 cycle current. A magnetic motor starter with start-stop push button control. Pump and motor shall be mounted on frame for the entire unit.

INSTRUMENTS AND CONTROLS:

17. Each distillation unit shall be provided with sufficient instruments and automatic controls to make operation, once started, completely automatic. The following devices, or their equivalent, shall be included for each unit:

(a) A liquid level control to maintain the proper operating level in the evaporator.
(b) A float switch to operate alarm and shut down unit in case the water level should go too high.
(c) A thermostatic valve to control admission of auxiliary steam.
(d) A pressure relief valve for evaporator.
(e) An automatic vent control valve to vent non-condensable gases.
(f) Compound pressure gauges or manometers for compressor suction and discharge.
(g) Dial thermometer for evaporator.
(h) Evaporator gauge glass or observation port.
(i) Gauge glass and thermometer for hot well.

UNIT ASSEMBLY:

18. The 83 GPM units shall be completely assembled on rigid structural steel base with all interconnecting steam duct work, piping and electrical wiring between motors, starters and disconnect switches in place.

19. The 600 GPM units will not be assembled units, but each piece of equipment shall be provided with base or legs

for mounting on a concrete base. All foundation bolts and necessary templates shall be included.

DUCT WORK AND PIPING:

20. For the 83 GPH units, all necessary duct work between compressor and evaporator shall be furnished and installed with flexible high temperature rubber joints to absorb vibration. Also all piping, with necessary valves, to connect pump, evaporator and heat exchangers shall be furnished and installed.

21. For the 600 GPH units, all necessary duct work between compressor and evaporator and between hot well and vent condenser and hot well and evaporator, if hot well and vent condenser are external to evaporator shall be furnished for field assembly, including flexible high temperature rubber joints. No piping or valves, except special controls specified hereinbefore, will be included.

INSULATION:

22. For the 83 GPH units, furnish and install insulation for the evaporator, vent condenser, hot well, duct work and heat exchangers. This insulation shall be 1½" of 85% magnesia block, 1/4" trowelled coating of asbestos and Portland Cement and canvas or mastic jacket.

23. No insulation to be included for 600 GPH units.

EQUIPMENT AND SERVICES TO BE PROVIDED BY PURCHASER:

24. For the 83 GPM units, piping and electric wiring external to the units and concrete pad to receive base frame will be provided by Purchaser.

25. For the 600 GPM units, the following material, equipment and labor will be provided by the Purchaser:

All motor starters.
All insulation.
All electric wiring.
All piping to connect the several pieces of equipment comprising a unit and all external piping.

26. Erection of units in accordance with assembly drawings and instructions furnished by vendor. The units to be preassembled by the manufacturer to insure accurate fit.

SERVICES OF ENGINEER:

27. As a separate item in the proposal, a basis shall be offered for the services of an erection or service engineer to check the installation, start the equipment in service and instruct the Purchaser's operators.

GUARANTEE:

28. The vendor shall guarantee all of the equipment to be free from defects of material and workmanship and shall replace or repair at his factory any part which within one year after shipment proves defective.

29. The vendor shall further guarantee that the distillation equipment will produce the specified quantity and quality of distilled water when operating on sea water of the Central Pacific Ocean and will require no greater horsepower than stated in the proposal, provided the equipment is installed and operated in accordance with the manufacturer's instructions.

Invitation No. HN-9B-502
Dated: August 10, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

WATER SUPPLY PUMPS

Proposals are invited for Water Supply Pumps in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, guaranteed capacities, manufacturers, model and size of appurtenances not manufactured by the vendor, and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Incorporated, Engineers, 824 S. Figueroa St., Los Angeles 14, California. Proposals will be received until August 19, 1949.

REFERENCE:

SECTION 25 - "FRESH AND SALT WATER DISTRIBUTION SYSTEMS"

Paragraph 25-07

Spec. No. HN-9B-502
Dated: August 10, 1949

SPECIFICATIONS

FOR

WATER SUPPLY PUMPS

GENERAL:

1. The equipment called for in following specifications will be purchased by Holmes & Narver, Incorporated, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired, and the guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	Two (2) Single stage, split case, motor driven horizontal centrifugal pumps, each having a capacity of 100 g.p.m. when operating against a total dynamic head of 75 feet made up to 72 feet of discharge head plus 3 feet of suction lift. The maximum allowable speed is 1750 R.P.M.
II	One (1) gasoline engine driven pump otherwise identical to those described under Item I.
III	Three (3) Single stage, double suction, split case, motor driven horizontal centrifugal pumps, each having a capacity of 300 g.p.m. when operating against a total dynamic head of 90 feet made up of 78 feet of discharge head and 12 feet of suction lift. The maximum allowable speed is 1750 R.P.M.
IV	One (1) gasoline engine driven pump otherwise identical to those described under Item III.

4. The single-stage split-case motor driven ball bearing centrifugal pumps shall be designed for handling clear water. Each motor driven pump is to be provided with an approved flexible coupling of the pin and rubber bushing type. Each pump is to be mounted upon a common base supporting also the driving unit. All pumps of different sizes must have identical features of construction so that they will be similar in appearance. Motor driven pumps shall have the same direction of rotation as the gasoline engine driven pumps. Overall pump and motor efficiency shall be stated in the bidder's proposal.

PUMP CASING:

5. The pump casing shall be of the horizontally split type with casing faces accurately machined and dowelled for bolting together. It shall be made of alloy cast iron to improve the density of the metal and increase its tensile strength. Suction and discharge openings shall be cast integrally with the lower half casing. Removal of the upper half casing and bearing caps shall permit the removal of the complete rotating element without disturbing pipe connections.

SINGLE SUCTION IMPELLER:

6. Single suction pumps may be acceptable for Item I and Item II, covering the 100 g.p.m. capacity motor and gasoline driven pumps. Single suction pump shall be provided with bronze single suction enclosed type propeller. The impeller shall be balanced for smoothness of operation.

DOUBLE SUCTION IMPELLER:

7. The impeller, except those described under "Single Suction Impeller" above, shall be of the enclosed, double-suction type. It shall be cast iron, of radial flow design and shall be balanced both mechanically and hydraulically. The impeller shall be pressed upon the shaft over a key extending beyond the impeller to lock the shaft sleeves in place. Axial adjustment shall be provided by means of shaft sleeve locking nuts.

WEARING RINGS:

8. Removable wearing rings shall be provided on both the pump casing and the impeller. Casing wearing rings shall be made of cast iron and shall have streamlined water

guiding surfaces. Impeller wearing rings shall be made of bronze and shall be pressed and keyed in place on the impeller for ease of replacement when subjected to wear.

SHAFT ASSEMBLY:

9. Shafts shall be made of manganese alloy steel, machined and accurately ground to size. They must be of ample size to insure low working stresses under all normal conditions imposed by the driver. They shall be protected against corrosion and abrasive action of the liquid by means of centrifugally cast bronze shaft sleeves held in place by lock nuts on the outside of the stuffing box.

BEARINGS AND HOUSING:

10. Ball bearings shall be of the single row, deep groove type and shall be of ample size to withstand all axial and radial loads imposed upon the pump shaft. Bearing housings shall be of the cartridge type, designed so that the entire rotating element may be removed from the pump without disturbing the alignment or exposing the bearings to dirt, water, grit, etc. Housings shall be positioned by means of dowel pins in the lower half of the pump casing and shall be securely clamped in place by covers fit on the horizontal plane.

STUFFING BOXES:

11. Stuffing boxes shall be placed on both sides of the impeller, and they shall be of regulation depth arranged for five or more rings of packing, depending upon the pump size. Clear water under pressure shall be admitted to the stuffing boxes for lubrication and sealing purposes. Stuffing box neck rings shall be provided, and they shall be held in place by machined grooves in the lower half casing. Horizontally divided stuffing box glands shall be made of bronze and shall be held in place by bronze clips for ease of removal and adjustment of packing.

ELECTRIC MOTORS:

12. Motors for driving the centrifugal pumps under Items I and III shall be of the open type, ball bearing, high starting torque, and of ample size, and shall operate on 220 volt, 3 phase, 60 cycle, alternating current and shall be connected to the pump by means of a flexible coupling. Motors shall be moisture proof and fungus proof for operation in a tropical location. Motor starters will be furnished by others.

GASOLINE ENGINES:

13. Gasoline engines required for operation of the pumps under Items II and IV shall be identical in size and of sufficient horsepower rating to operate the larger size pumps under Item IV. The engines shall be of the water cooled, heavy duty, L-head or valve in head type, similar or equal to International Harvester Company's Model U-2A. Each engine shall be provided with gasoline tank, electric starting equipment and storage battery, a charging generator, an exhaust muffler and radiator cooling system. Each engine shall be connected to the pump by means of a clutch. The materials used in the construction of the engine shall be of the quality used in the best automotive engineering practice for this type of equipment.

MANUFACTURER'S DRAWINGS:

14. Four (4) copies of certified manufacturer's or shop drawings for each of the items of equipment shall be submitted by the vendor to the Purchaser within ten days after notification of award of contract or after receipt of purchase order covering specified equipment. The manufacturer shall also furnish four (4) copies of performance curves for each individual size pump furnished.

Invitation No. HN-9B-503
Dated: August 15, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14 California

INVITATION FOR BIDS

FOR

PREFABRICATED SEWER MANHOLES

Proposals are invited for prefabricated asbestos bonded #12 gauge double asphalt dipped corrugated iron manholes for use in connection with a sanitary sewer system. Vendor shall submit with his proposal detailed specifications of materials and coatings, and detailed appurtenances either manufactured by the vendor or manufactured by others. Proposals shall state time of delivery and shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax is to be included.

Proposals shall be addressed to Holmes & Narver, Incorporated, Engineers, 824 South Figueroa St., Los Angeles 14, California. Proposals will be received until August 23, 1949.

REFERENCE:

SECTION 24 - "SANITARY SEWERS"

Paragraph 24-02, Sub d

Spec. No. HN-9B-503
Dated August 15, 1949

SPECIFICATIONS

FOR

PREFABRICATED SEWER MANHOLES

GENERAL:

1. The prefabricated manholes called for in the following specifications will be purchased by Holmes & Narver, Incorporated, Engineers, (hereinafter referred to as the Purhcaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified manholes is especially desired, and the guaranteed delivery time will be used to evaluate the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following items:

Item No.	Description
I	Thirty (30) prefabricated asbestos bonded #12 gauge double asphalt dipped corrugated iron manholes.

4. The manholes shall be so constructed that each of the six packages shall contain a group of five (5) manholes which will "nest" one within the other to form the bundle or package for export shipment. Each such group or package which contains five (5) manholes shall consist of the following separate sizes:

No. of Units	Diameter at Base	Overall Height
1	41"	6'-0"
1	44"	7'-0"
1	47"	9'-0"
1	50"	10'-0"
1	53"	12'-0"

All manholes shall be tapered to accommodate a cast iron manhole ring and cover at the top. The length of taper shall not exceed 6'-0".

CAST IRON RING AND COVER:

5. Each manhole shall be equipped with a cast iron ring and cover. Ring and cover shall correspond to Alhambra Foundry #A-1264 or approved equal and shall be fitted, drilled, bolted, and marked prior to shipment. Necessary clips, bolts, nuts, etc., for securing the cover to the manhole shall be furnished. If so desired, the manhole covers may be packaged separately if appropriately marked for reassembly.

LADDER:

6. Each manhole shall also be equipped with a suitable iron ladder galvanized after fabrication. Ladder rungs shall be at least 1/2" diameter metal and spaced at not to exceed 1'-0". Necessary clips, bolts, nuts, etc. for securing the ladder to the manhole shall at not to exceed 3'-0" centers shall also be furnished. Ladders shall be at least 14" wide between vertical members and shall be of sufficient length to provide easy access to and from the manhole.

Invitation No. HN-9B-504
Dated: August 17, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

AUTOMATIC AND PROPORTIONAL CHEMICAL FEED APPARATUS

Proposals are invited for Automatic and Proportional Chemical Feed Apparatus in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, guaranteed capacities, manufacturers, model and size of appurtenances not manufactured by the vendor, and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Incorporated, Engineers, 824 South Figueroa Street, Los Angeles 14, California. Proposals will be received until August 29, 1949.

REFERENCE:

SECTION 25 - "FRESH AND SALT WATER DISTRIBUTION SYSTEMS"

Paragraph 25-05

Spec. No. HN-9B-504
Dated: August 17, 1949

SPECIFICATIONS

FOR

AUTOMATIC AND PROPORTIONAL CHEMICAL FEED APARATUS

GENERAL:

1. The chemical feed apparatus called for in the following specifications will be purchased by Holmes & Narver, Incorporated, Engineers (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified apparatus is especially desired, and the guaranteed delivery time will be used to evaluate the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following item.

Item No.	Description
I	One (1) automatic and proportional chemical feed apparatus.

4. The apparatus primarily is to be used to raise the pH of the product of the distillation units which are used to convert sea water to fresh water. The distilled or fresh water as it leaves the stills will have a pH of approximately 6.0, at an estimated temperature of not to exceed 110 degrees Fahrenheit, and it is desired to raise this pH to range between 7.0 and 9.0. It is contemplated to use soda ash solution as the chemical reagent. It is further contemplated to treat the soda ash solution prior to injection into the system with hypochlorite solution to sterilize or decontaminate this reagent solution. The meter and control apparatus will be installed in the main line between the discharge side of the distillation units and the fresh water surface storage reservoirs. The static pressure exerted upon this line will not exceed 5 p.s.i. A fresh water connection under a static pressure of 30 p.s.i. is available for operation of the apparatus and as the motivating

power to inject the solution into this main line at a point downstream from the metering and control device.

5. The apparatus is to be installed in the main line, which is 3-in. I.P.S. brass pipe. All pipes and fittings pertaining to the installation of the chemical feed apparatus in the main line are to be supplied by the bidder.

6. Pressure of approximately 30 lbs. per sq. in. is available at the location of the injector pump. The maximum load is 50 gallons per minute; the minimum load is 5 gallons per minute. The chemical feed apparatus shall feed soda ash solution with an accuracy of not less than 95% within the above maximum and minimum loads. The soda ash solution shall be treated with hypochlorite to sterilize the soda ash solution.

7. The apparatus shall function in strict ratio to flow changes, automatically, continually, and accurately, independent of variation in line pressure. It shall measure the treatment, build it up to line pressure, and inject it into the passing stream. The equipment shall be provided with a manual adjusting device with adjusting scale for varying the rate of soda ash solution feeds from the minimum to maximum rate, as determined by solution demand of the water supplied.

8. The bid price shall include all items of equipment necessary to make a complete operating installation, including water main connections, strainers, solution hose, valves, automatic injection nozzle check-valve, foot valves, reagent tank, and control meter, and all equipment to be used in connection with the control meter for automatic proportional control.

9. The feeding unit shall be built for operation against a main pressure of approximately 5 lbs. per sq. in. and shall be of remote control type so that it can be placed in the most convenient place above, below, or beside the control meter.

10. The control meter shall be of standard type, meeting the requirements of the American Waterworks Association and shall be connected to hydraulic control valve in such a way that almost no load or strain is placed on the meter itself. The accuracy of the meter shall not be affected by this connection. The control meter shall be provided with a register for registering total thru-put of water passing thru the control meter.

11. The reagent head of the feeding unit shall be made of transparent molded plastic material which is impervious to the corrosive action of soda ash solution and hypochlorite and will permit the operator to view the action of diaphragm and check-valve tits. Sight feeder domes shall be built into both suction and discharge valve bodies and shall be screwed into reagent head so as to avoid clamping bars and other metal parts subject to corrosion. These sight feeders shall clearly indicate flow of reagent fed.

12. The diaphragm of the apparatus shall be of the preformed type, with dish or curvature molded into its surface so as to supply a circular section to withstand diaphragm bending action and consequent diaphragm cracking.

13. Spare parts shall be furnished for all parts subject to wear or damage, such as diaphragms, gaskets, etc. Any special wrenches, keys or other special tools needed in the repair, adjustment, or operation of the apparatus shall be furnished. One complete set of instructions for assembling, operating and procuring spare parts, and a spare parts list and diagram shall be furnished. Six prints of drawings showing in general the dimensions of the items comprising the complete installation shall be furnished to the Purchaser within 10 days after receipt of purchase order for this equipment.

14. The apparatus furnished under this specification shall be guaranteed against defective material and workmanship for one year from date of installation.

Invitation No. HN-9F-505
Dated: December 19, 1949

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

CENTRIFUGAL PUMPS

Proposals are invited for Centrifugal Pumps in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, guaranteed capacities, manufacturers, model and size of appurtenances not manufactured by the vendor, and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Engineers, 824 South Figueroa Street, Los Angeles 14, California. Proposals will be received until January 5, 1950.

REFERENCE:

SECTION 25 - "FRESH AND SALT WATER DISTRIBUTION SYSTEMS"

Paragraph 25-08

Spec. No. HN-9F-505
Dated: December 19, 1949

SPECIFICATIONS

FOR

CENTRIFUGAL PUMPS

GENERAL:

1. The equipment called for in the following specifications will be purchased by Holmes & Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired, and guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	Two (2) close-coupled or built-together type electric motor driven horizontal centrifugal pumps, each having a capacity of 100 gpm when operating against a total dynamic head of 80 feet. Total dynamic head shall be made up of 68 feet of discharge head and 12 feet of suction lift.

4. Shut-off head shall be not less than 100 feet, and operation at lower heads than at the previously stated condition point shall not cause overloading of the motor. The motors shall be not less than 3 HP, for operation at 3460 RPM, on 220 volt, 3 phase, 60 cycle alternating current. Motors shall be of the ball bearing protected frame type. Motors shall also be moisture proof and fungus proof for operation in a tropical location. Motor starters will be furnished by others.

PUMP CASING:

5. Pump casing shall be of heavy casting of high grade iron. Impellers to be cast from high grade bronze, finished

smooth with streamlined water patches and shall be of the single suction, closed type for clockwise rotation when viewed from the driven end. Stuffing boxes shall be deep, to permit at least five rings of packing. Split glands are to be furnished to facilitate removal and replacement of packing.

MANUFACTURERS DRAWINGS:

6. Four (4) copies of certified manufacturers shop drawings of the complete unit, and performance curves, shall be submitted by the Vendor to the Purchaser within ten (10) days after notification of award or after receipt of purchase order covering specified equipment.

Invitation No. HN-9CDE-506
Dated: February 27, 1950

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

INVITATION FOR BIDS

FOR

SEMI-PORTABLE GASOLINE ENGINE DRIVEN FIRE PUMPS

Proposals are invited for Semi-Portable Gasoline Driven Fire Pumps in accordance with the attached general specifications. Vendor shall submit with his proposal detailed specifications of materials, guaranteed capacities, manufacturers, model, and size of appurtenances not manufactured by the Vendor, and time of delivery. Proposals shall include packaging for export and delivery to warehouse rail siding at Oakland, California. No sales tax to be included.

Proposals shall be addressed to Holmes & Narver, Incorporated, Engineers, 824 South Figueroa St., Los Angeles 14, California. Proposals will be received until March 6, 1950.

REFERENCE:

SECTION 25 - "FRESH AND SALT WATER DISTRIBUTION SYSTEM"

Paragraph 25-09

Spec. No. HN-9CDE-506
Dated: February 27, 1950

SPECIFICATION

FOR

SEMI-PORTABLE GASOLINE ENGINE DRIVEN FIRE PUMPS

GENERAL:

1. The equipment called for in the following specification will be purchased by Holmes & Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.c.b. cars at Oakland, California.

2. Prompt delivery of the specified equipment is especially desired, and guaranteed delivery time will be considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon the bidders.

3. These specifications cover the following equipment:

Item No.	Description
I	Two (2) semi-portable gasoline engine driven centrifugal fire pumps, each having a continuous duty rated capacity of 150 gallons per minute when operating against a total dynamic head of 230 feet. Pump shall also be capable of delivering 200 gallons per minute when operating against a total dynamic head of 200 feet (intermittent duty). Pumps shall be of approved Fire Underwriter type and shall be similar and equal to "Hale" Model FHH. Gasoline engine drives shall be similar and equal to "Hercules" ZXB four cylinder, four cycle, 25 horsepower engines, complete with gasoline supply tanks, necessary controls, etc. Each pump and engine combination shall be mounted on a common skid type base. Each unit shall be equipped with an exhaust ejector type device for priming the pump. A connection at the discharge end of each pump shall be provided for attaching a 2-1/2" diameter fire hose.
II	One (1) fifty (50) foot length of 2-1/2" diameter Fire Underwriter approved cotton rubber lined

multiple jacketed standard fire hose shall be provided with each fire pump specified under Item No. I. For each pump there shall also be provided one (1) 1-1/8" diameter fire hose nozzle. Each hose length shall be fitted to accommodate its connection with the pump discharge at one end and the hose nozzle at the other end. Lump sum bid for Item II shall include the 100 lineal feet of hose and the two (2) hose nozzles. No suction hose is to be provided with this equipment.

4. Four copies of certified manufacturers shop drawings of the complete unit, and performance curves, shall be submitted by the Vendor to the Purchaser within ten (10) days after notification of award or after receipt of purchase order covering specified equipment.

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

February 2, 1950

ADDENDUM #4 TO SPECIFICATIONS

FOR

300-FOOT STEEL TOWER AND APPURTENANCES

The following changes shall be incorporated into and made a part of the specifications.

Section F, Mechanical and Electrical Work

(1) On sheet F-3 under heading "Hoisting Machines", change paragraph F-09 to read as follows:

"Conditions of Operation: Machines will be required to function satisfactorily when installed at an elevation of approximately ten (10) feet above sea level and when operating in an ambient temperature of 95° F. and a relative humidity of 87 percent, with heavy concentrations of fine salt spray, and under the following conditions of load and use:

1. Main Hoisting Machine shall have a capacity of 6,000 pounds line pull at a line speed continuously variable between the limits of 10 feet per minute minimum and 60 feet per minute maximum. See Paragraph F-04.

2. Elevator Hoisting Machine shall have a capacity of 2,000 pounds line pull at a line speed of 250 feet per minute maximum. See Paragraph F-06."

(2) On sheet F-4 under heading "Construction" delete item 7 under paragraph F-10 and substitute the following:

7. An Overspeed Switch shall be provided to stop the machine when the speed of the drum exceeds the rated maximum speed.

(3) On sheet F-5 under heading "Electrical Control Systems" change paragraph F-18 to read as follows:

"Type of System: The elevator and the main hoist shall be provided with a motor generator set, control panel,

controllers, safety devices and wiring materials for a complete Ward-Leonard, or approved equal, variable voltage type of control".

(4) On sheet F-5 under heading "Electrical Control Systems" change paragraph F-20 to read as follows:

"Motor Generator Sets: One motor generator set with attached exciter shall be provided for the elevator hoisting machine and the main hoisting machine. This set shall be of suitable capacity and output voltage to supply either hoisting machine motor. See Paragraph F-09 for description of hoisting machine operations. The set shall be equipped with a special elevator motor generator set and exciter mounted on a substantial rigid base with a set of rubber pads. Base shall be equipped with suitable lifting eyes for easy sling handling from a truck crane."

(5) On sheet F-6 under heading "Electrical Control Systems" change paragraph F-21 to read as follows:

"Control Panel: The alternating current magnetic motor starter and direct current control panel shall be provided as an integral unit for both the elevator and the main hoisting machine. Means shall be provided for easy sling handling from a truck crane. The panel shall be suitable for use with a 120/208, 3 phase 60 cycle source and the variable voltage system referred to herein so arranged as to give smooth acceleration and deceleration, and a positive stopping method on the failure of power. Terminal strips shall be provided so that all incoming wires can be readily disconnected and control panels removed with a minimum of effort and time. A weatherproof pedestal mounted master controller shall be provided for each hoisting machine. In addition, a controller shall be provided for use in the elevator cab and one for main hoist in Tower House, paralleling the ground level controller."

(6) On sheet F-6 under heading "Tower House Electrical Facilities" change paragraph F-25 to read as follows:

"Provide all materials, including fixtures, switches, receptacles, boxes, plates, conduit, wire and miscellaneous wiring material, to install and connect the electrical facilities in the Tower House as shown on the drawings."

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

November 10, 1949

ADDENDUM #3 TO SPECIFICATIONS

FOR

300-FOOT STEEL TOWER AND APPURTENANCES

Refer also to drawings entitled "300' Steel Tower", Sheet No. 640-1 (A-1) and Sheet No. 640-1(S-3) for Revision No. 2 dated 11-10-49.

The following changes shall be incorporated into and made a part of the Specifications:

Section D, Sheet Metal and Canvas

(1) On sheet D-2 under heading "Canvas", delete paragraph D-09 in its entirety.

(2) On sheet D-2 under heading "Canvas", add to paragraph D-10 the following "Canvas covers shall be fabricated from #10 (approximately 15 oz./sq.yd.) canvas."

(3) Beginning on sheet D-2 add the following paragraphs:

GRATING COVERS:

D-13. House floor grating, trap door over man lift, and removable floor panels shall be covered with flat sheet aluminum which shall be 61S-T6 Alcoa Flat Sheet Aluminum, or approved equal.

D-14. Each panel or section shall be separately covered. Aluminum sheet shall be tack welded to grating at 8 inches on centers in all directions, except at perimeters, where tack welds shall be approximately 3 inches on centers.

D-15. Grating covers shall be painted on wearing surface with a non-slip paint which shall be "Lay-Tite Non-Slip", color light gray, as manufactured by Steelcote Manufacturing Co., or approved equal.

D-16. Surfaces shall be first cleaned with a sal soda wash, and then given - first coat of "Laytite" reduced approximately

35% with Steelcote's "B&L Reducer". Final coat of "Laytite" shall be applied full body, and while still plastic, brush in 1# per gallon of carborundum grains as supplied by Steelcote Manufacturing Co.

ABRASIVE CLOTH:

D-17. Abrasive cloth for catwalk shall be Minnesota Mining and Metals Company Safety-Walk "Wetordry" non-slip surfacing, or approved equal. Run 18" wide strip full length of catwalk.

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

October 7, 1949

ADDENDUM #2 TO SPECIFICATIONS

FOR

300-FOOT STEEL TOWER AND APPURTENANCES

The following changes shall be incorporated into and made a part of the Specifications.

Add to Section A, General Conditions, the following:

CERTIFICATES OF COMPLIANCE:

A-04.1 Manufacturer's or processor's certificates of compliance with these Specifications shall be delivered to the Purchaser with each delivery of materials not herein specified or called for on drawings to be tested for compliance. Certificates shall be signed by a qualified, responsible employee of the manufacturer or processor.

A-04.2 Separate certificates of compliance shall be prepared for each shipping package, crate or bundle. Each certificate shall include statements to the effect that (a) all materials comply with the provisions of these Specifications, (b) all materials are identical (as far as fabricating processes permit) with the materials employed in making the tests of one complete main hoist system and one complete elevator system as provided in paragraphs F-41 and F-42.

A-04.3 In addition to the statements outlined above, each certificate shall describe the contents of the package, crate, or bundle including the quantities, types of materials, sizes, and any other information required to clearly and completely identify the contents (refer to Paragraph A-06 that follows.)

A-04.4 In preparing certificates of compliance, special attention shall be given to any uncommon or unusual provisions of the specifications such as type of insulation for electric wiring, type of electrical tape, moisture proofing of electrical connections, etc.

A-04.5 Certificates of compliance shall be furnished in quadruplicate, with one copy enclosed in each container, one copy enclosed in a heavy manila envelope and securely attached to the outside of each container, and two copies forwarded to the Purchaser.

TEST REPORTS:

A-04.6 Each driving motor and each motor generator set shall be tested by the manufacturer, using the "Standard Commercial Test". Copies of these test reports shall be distributed in the same manner as copies of certificates of compliance. (Refer to paragraph A-04.5 preceding).

SPECIFICATIONS

FOR

300-FOOT STEEL TOWER

AND APPURTENANCES

300 FOOT TOWER

REFERENCE:

Section 29, "Steel Towers" - Paragraph 29-05

Invitation No._____

Dated May 3, 1949

INVITATION FOR BIDS

SEALED BIDS, in duplicate, subject to the conditions contained herein, will be received until 2:00 P.M. June 3 1949 at the office of Holmes & Narver, Engineers, 824 South Figueroa St., Los Angeles 14, California, and then publicly opened, for furnishing and delivering the items listed on the attached Bid Form and as described in detail in the Specifications, Plans and Details covering the listed items, as prepared by Holmes & Narver Engineers, hereinafter designated as the "Purchaser."

1. Guarantee will not be required with each bid.

2. Performance Bond will be required.

3. Bid Bond on U. S. Standard Form No. 24 in a penal sum of 20% of the bid price will be required.

4. Liquidated Damages will not be prescribed.

5. Partial Payments will be made in accordance with Article 8 of the attached Standard Contract form.

6. Article on Patents will be made a part of the Contract.

7. Article on Assignment of Claims will be made part of the Contract.

8. Bid Form attached hereto shall be used by the Bidder in submitting his proposal. Bids not on this form will be rejected.

9. Bid and Contract:

   a. The bid form has an entry for the items on which quotations will be given or payment made, and no other allowances of any kind will be made unless specifically provided for in the Specifications or the Contract, or by adjustments made under Article 2 of the Contract Form.

b. The quantity of material and/or equipment fabricated or delivered will determine the amount of each progress payment and will be based on the unit prices set forth in Price Schedule submitted by the Contractor in his bid. The total price set forth in the Price Schedule also determines the total payments to be made by the Purchaser under the Contract. The unit price bid must be a firm price. The Purchaser reserves the right to reject any and all bids where prices submitted are not firm prices. It is obligatory that prices submitted include all costs of packing, marking, indexing, and transportation and all other costs for delivery to the designated delivery point.

10. Award of Contract. The Purchaser reserves the right to reject any and all bids and to waive any informality in the bids. In case of error in the extension of prices in the bids, the unit prices shall govern.

11. Walsh-Healy Act. The representations and stipulations required by Section 1 of the Act of June 30, 1936 (Walsh-Healy Act, Public No. 846, 76th Congress), are to be included in and made a part of this Contract awarded as a result of this Invitation for Bids with the same force and effect as if fully set forth herein. Such representations and stipulations shall be subject to all applicable regulations, determinations, and exemptions of the Secretary of Labor now or hereafter in effect.

12. Taxes. Prices bid herein shall include any Federal tax heretofore imposed by the Congress which is applicable to the material and equipment in this Bid. If any sales tax, processing tax, adjustment charge, or other taxes or charges are imposed or changed by the Congress after the date set for the opening of Bids, and made applicable directly upon the production, manufacture, or sale of the supplies covered by this Bid, and are paid by the Contractor on the supplies or articles herein contracted for, then the prices named in this Bid will be increased or decreased accordingly and any amount due the Contractor as a result of such change will be charged to the Purchaser and entered on vouchers or invoices as separate items.

13. Submission of Bids. Envelopes containing Bids must be sealed, marked, and addressed as follows:

To Holmes and Narver, Engineers
824 South Figueroa Street
Los Angeles 14, California

Bid under Invitation No._____to be opened at_____
(hour) 2:00 P.M. (date) June 3, 1949

PRICE SCHEDULE

ITEM	DESCRIPTION	AMOUNT	DELIVERY TIME
1.	Four Steel Towers with tower houses complete	$	days
2.	Four Main Hoists, complete with cables, main hoisting machines and electrical control systems	$	
3.	Four Elevators, complete with cabs, cables, elevator hoisting machines and electrical control systems	$	
4.	Four Hand Winches	$	
5.	All other mechanical and electrical materials and equipment including lightning rods and grounding systems, obstruction lights, tower house electrical facilities, wiring for main hoists and elevators and miscellaneous material as shown on the Drawings and/or called for in the Specifications.	$	
	TOTAL BID	$	

FORM OF BID

Invitation for Bids No.____

Dated May 3, 1949

OPENING DATE FOR THIS BID

2:00 P.M. June 3, 1949

TO: Holmes and Narver, Engineers
824 South Figueroa Street
Los Angeles 14, California Date_____

Gentlemen:

In compliance with your Invitation for Bids to furnish the equipment, materials and supplies listed in the attached Price Schedule numbered one to five, inclusive, the undersigned _____
a corporation organized and existing under the laws of the State of _____
a partnership consisting of _____
_____
an individual trading as _____
_____ of the City of _____
hereby proposes to furnish, within the time specified, the equipment, materials, and supplies at the prices stated opposite the respective items listed on the attached Price Schedule and as more completely described in the Plans and Specifications dated _____
as prepared by the Purchaser. He further agrees that, upon receipt of written notice of the acceptance of this Bid within _____ days after the date of opening of the Bids, to execute, if required, the Standard Form of Contract, (mentioned in the Invitation for Bids), in accordance with the Bid as accepted, and to give Bond, if required, with good and sufficient surety or sureties, for the faithful

performance of the Contract, within ten (10) days after the prescribed forms are presented for signature.

The Bidder agrees to allow discounts for prompt payment by the Purchaser as follows: 10 calendar days _____ per cent; 20 calendar days _____ per cent; 30 calendar days _____ per cent.

(Time will be computed from date of receipt of correct bill or voucher properly certified by the Contractor in the case of Progress Payments, or from the date of final inspection and acceptance at delivery point in the case of final payment for the completed Contract.

_____ _____
(Witness to Signature) (Full Name of Bidder)

By _____
(Title)

_____
(Address)

CONTRACT

CONTRACT FOR SUPPLIES

THIS CONTRACT, entered into this _____ day of _____, 19___, by Holmes & Narver, Engineers, hereinafter called the Purchaser, and

a corporation organized and existing under the laws of the State of _____
a partnership consisting of _____

an individual trading as _____
of the city of _____, in the State of
hereinafter called the contractor, witnesseth that the parties hereto do mutually agree as follows:

Article 1. Scope of this contract. The contractor shall furnish and deliver to location stated in the General Conditions of the Contract, the following items, all as described in the below described Drawings and Specifications:

a. Four Steel Towers with tower houses complete.
b. Four Main Hoists complete with cables, hoisting machine and controls.
c. Four Elevators complete with cabs, cables, hoisting machine and controls.
d. Four Hand Winches.
e. Miscellaneous mechanical and electrical materials as called for in the Specifications and shown on the above-titled Drawings.

for the consideration stated

in strict accordance with the specifications, schedules and drawings, all of which are made a part hereof and designated

as follows:

a. Specifications entitled "Specifications for 300-Foot Steel Tower and Appurtenances" comprising five sections A to F, inclusive, and totaling 22 pages and dated January 15, 1949.

b. Working Drawings and Details entitled "300' Aluminum Tower" and comprising Sheets No. A2, S5,6,7,8, and 9, and dated September 2, 1949.

Deliveries shall be made as follows:

Article 2. Changes. Where the supplies to be furnished are to be specially manufactured in accordance with drawings and specifications, the Purchaser may at any time, by a written order, and without notice to the sureties, make changes in the drawings or specifications. Changes as to shipment and packing of all supplies may also be made as above provided. If such changes cause an increase or decrease in the amount due under this contract, or in the time required for its performance, an equitable adjustment shall be made and the contract shall be modified in writing accordingly. Any claim for adjustment under this article must be asserted within 10 days from the date the change is ordered, provided, however, that the Purchaser, if it determines that the facts justify such action, may receive and adjust any such claim asserted at any time prior to the date of final settlement of the contract. If the parties fail to agree upon the adjustment to be made, the dispute shall be determined as provided in Article 12 hereof. But nothing provided in this article shall excuse the contractor from proceeding with the contract as changed.

Article 3. Extras. Except as otherwise herein provided, no charge for extras will be allowed unless the same have been ordered in writing by the Purchaser and the price stated in such order.

Article 4. Inspection. (a) All material and workmanship shall be subject to inspection and test at all times and places and, when practicable, during manufacture. In case any articles are found to be defective in material or workmanship, or otherwise not in conformity with the specification requirements,

the Purchaser shall have the right to reject such articles, or require their correction. Rejected articles, and/or articles requiring correction, shall be removed by and at the expense of the contractor promptly after notice so to do. If the contractor fails to promptly remove such articles and to proceed promptly with the replacement and/or correction hereof, the Purchaser may, by contract or otherwise, replace and/or correct such articles and charge to the contractor the excess cost occasioned by Purchaser thereby, or the Purchaser may terminate the right of the contractor to proceed as provided in Article 5 of this contract, the contractor and surety being liable for any damage to the same extent as provided in said Article 5 for terminations thereunder.

(b) If inspection and test, whether preliminary or final, is made on the premises of the contractor or subcontractor, the contractor shall furnish, without additional charge, all reasonable facilities and assistance for the safe and convenient inspections and tests required by the inspectors in the performance of their duty. All inspections and tests by the Purchaser shall be performed in such a manner as not to unduly delay the work. Special and performance tests shall be as described in the specifications. The Purchaser reserves the right to charge to the contractor any additional cost of inspection and test when articles are not ready at the time inspection is requested by the contractor.

(c) Final inspection and acceptance of materials and finished articles will be made after delivery, unless otherwise stated. If final inspection is made at a point other than the premises of the contractor or a subcontractor, it shall be at the expense of the Purchaser except for the value of samples used in case of rejection. Final inspection shall be conclusive except as regards latent defects, fraud, or such gross mistakes as amount to fraud. Final inspection and acceptance or rejection of the materials or supplies shall be made as promptly as practicable, but failure to inspect and accept or reject materials or supplies shall not impose liability on the Purchaser for such materials or supplies as are not in accordance with the specifications. In the event necessity requires the use of materials or supplies not conforming to the specifications, payment therefor shall be made at a proper reduction in price.

Article 5. Delays - Damages. If the contractor refuses or fails to make deliveries of the materials or supplies within the time specified in Article 1, or any extension thereof, the Purchaser may by written notice terminate the right of the contractor to proceed with deliveries or such part or parts thereof

as to which there has been delay. In such event, the Purchaser may purchase similar materials or supplies in the open market or secure the manufacture and delivery of the materials and supplies by contract or otherwise, and the contractor and his sureties shall be liable to the Purchaser for any excess cost occasioned thereby: Provided, That the contractor shall not be charged with any excess cost occasioned the Purchaser by the purchase of materials or supplies in the open market or under other contracts when the delay of the contractor in making deliveries is due to unforeseeable causes beyond the control and without the fault or negligence of the contractor, including, but not restricted to, acts of God or of the public enemy, acts of the Government, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, and delays of a subcontractor due to such causes unless the Purchaser shall determine that the materials or supplies to be furnished under the subcontract are procurable in the open market, if the contractor shall notify the Purchaser in writing of the cause of any such delay, within 10 days from the beginning thereof, or within such further period as the Purchaser shall, prior to the date of final settlement of the contract, grant for the giving of such notice. The Purchaser shall then ascertain the facts and extent of delay, and his findings of fact thereon shall be final and conclusive on the parties hereto, subject only to appeal within 30 days by the contractor to the arbitrator selected in conformity with Article 12 hereof, whose decision on such appeal as to the facts of delay shall be final and conclusive on the parties hereto.

Article 6. Responsibility for supplies tendered. The contractor shall be responsible for the articles or materials covered by this contract until they are delivered at the designated point, but the contractor shall bear all risk on rejected articles or materials after notice of rejection. Where final inspection is at point of origin but delivery by contractor is at some other point, the contractor's responsibility shall continue until delivery is accomplished.

Article 7. Increase or decrease. Unless otherwise specified, any variation in the quantities herein called for, not exceeding 5 percent, will be accepted as a compliance with the contract, when caused by conditions of loading, shipping, packing, or allowances in manufacturing processes, and payments shall be adjusted accordingly. This article shall not apply to assembled items of equipment.

Article 8. Payments. The contractor shall be paid, upon the submission of properly certified invoices or vouchers, the prices stipulated herein for articles delivered and accepted or services rendered, less deductions, if any, as herein provided.

Unless otherwise specified, payments will be made on partial deliveries accepted by the Purchaser when the amount due on such deliveries so warrants; or, when requested by the contractor, payments for accepted partial deliveries shall be made whenever such payments would equal or exceed $1,000.

Article 9. Additional security. Should any surety upon the bond for the performance of this contract become unacceptable to the Purchaser, or if any such surety shall fail to furnish reports as to his financial condition from time to time as requested by the Purchaser, the contractor must promptly furnish such additional security as may be required from time to time to protect the interests of the Purchaser and of persons supplying labor or materials in the prosecution of the work contemplated by the contract.

Article 10. Officials not to benefit. No member of or delegate to Congress or resident commissioner shall be admitted to any share or part of this contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

Article 11. Covenant against contingent fees. The contractor warrants that he has not employed any person to solicit or secure this contract upon any agreement for a commission, percentage, brokerage, or contingent fee. Breach of this warranty shall give the Purchaser the right to annul the contract, or, in its discretion, to deduct from the contract price or consideration the amount of such commission, percentage, brokerage, or contingent fees. This warranty shall not apply to commissions payable by contractors upon contracts or sales secured or made through bona fide established commercial or selling agencies maintained by the contractor for the purpose of securing business.

Article 12. Disputes. Except as otherwise specifically provided in this contract, all disputes concerning questions of fact arising under this contract shall be decided by the Purchaser, subject to written appeal by the contractor within 30 days to an arbitrator mutually satisfactory to the contractor and the Purchaser. His decision shall be final and conclusive upon the parties hereto. In the meantime, the contractor shall diligently proceed with performance. Arbitrator's fee will be paid by the party to this contract against whom the arbitrator's decision is made.

Article 13. Domestic articles. Unless the Purchaser shall determine it to be inconsistent with its interest, or the cost

to be unreasonable, only such unmanufactured articles, materials, and supplies as have been mined or produced in the United States, and only such manufactured articles, materials, and supplies as have been manufactured in the United States substartially all from articles, materials, or supplies mined, produced, or manufactured, as the case may be, in the United States shall be delivered pursuant to this contract, except as noted in the specifications and/or other papers hereto attached. The provisions of this article shall not apply with respect to articles, materials, or supplies if articles, materials, or supplies of the class or kind to be used, or the articles, materials, or supplies from which they are manufactured are not mined, produced, or manufactured, as the case may be, in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality.

Article 14. Alterations. The following changes were made in this contract before it was signed by the parties hereto:

In Witness Whereof, the parties hereto have executed this contract as of the day and year first above written.

HOLMES AND NARVER, ENGINEERS

By _____

_____
(Official Title)

Two witnesses:

_____ _____)
_____ _____) Contractor
)

_____
(Business Address)

I, _____, certify that I am the _____ Secretary of the corporation named as contractor herein; that _____

_____

who signed this contract on behalf of the contractor, was then

_____

of said corporation; that said contract was duly signed for and in behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

(Corporate)
_____ (Seal)

CFS-7

I hereby certify that, to the best of my knowledge and belief, based upon observation and inquiry, _____, who signed this contract for the _____, had authority to execute the same, and is the individual who signs similar contracts on behalf of this corporation with the public generally.

_____

_____
(Official Title)

SECTION A

GENERAL CONDITIONS

GENERAL:

A-01. The equipment called for in the following specifications will be purchased by Holmes and Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars or trucks at vendor's plant.

DELIVERY:

A-02. Prompt deliver of the specified items is especially desired and the guaranteed delivery time specified by each bidder will be definitely considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon all bidders.

SCOPE OF THE WORK:

A-03. The lump-sum price named in the proposal shall include the furnishing of all labor, materials, tools, equipment, and transportation to completely fabricate, package, and deliver the following items to the above-designated shipping point:

1. Four Steel Towers and their appurtenances as herein described and as detailed in the accompanying drawings.

2. Four Main Hoists of 10,000 pound net capacity complete with all appurtenances as herein described and as detailed in the accompanying drawings.

3. Four Elevators of 2,000 pound net capacity complete with all appurtenances as herein described and as detailed in the accompanying drawings.

4. Four Hand Winches for hoisting special cables complete with all appurtenances as herein described and as detailed in the accompanying drawings.

PREFABRICATION AND TESTS:

A-04. The equipment listed in Paragraph A-03 shall be prefabricated and/or shop tested before shipping as hereinafter

described. Duplicate items not required to be prefabricated or tested under the following specifications, shall be guaranteed to be identical in every respect to the similar items so prefabricated and/or tested.

CORROSION RESISTANCE:

A-05. All materials used in the following-described work shall be of corrosion resisting types or shall be suitably processed to resist corrosion. There shall be no destructive corrosion after a 50-hour salt spray test in accordance with Army-Navy Aeronautical Specification A-QQ-S-91. Certification of corrosion resistance by the primary manufacturer will be acceptable to meet this requirement.

PACKING AND SHIPPING:

A-06. The procedure described in Paragraphs B-08, B-09 and B-10 for shipping of structural steel is typical for the entire job and shall be followed in processing all items of material and equipment for overseas shipment.

ANTI-SEIZE COMPOUND:

A-07. Anti-Seize Compound shall be used in all threaded aluminum alloy assemblies except those involving machine screws or self tapping screws only. The compound shall be in accordance with Army-Navy Aeronautical Specification AN-53 or AN-P-51 or shall have equal or greater anti-seized properties and equivalent characteristics in other respects.

APPLICABLE GOVERNMENT SPECIFICATIONS:

A-08. Where referred to in these specifications such as Federal, Army-Navy, Navy, Army-Navy Aeronautical, etc. shall be considered a part of these specifications.

CONTRACT DOCUMENTS:

A-09. The contract documents consist of the following documents:

1. The Invitation for Bids.
2. The Contractor's Bid.
3. The General Conditions.
4. The Specifications.
5. The Working Drawings and Details.
6. The Contract Form accepting the successful Bidder's Proposal, including Notice to Proceed with the Work.

SECTION B

STRUCTURAL STEEL

GENERAL REQUIREMENTS:

B-01. The General Conditions of the Contract apply the same as if here written.

STRUCTURAL STEEL:

B-02. See general notes on the drawings for general requirements.

SCOPE OF WORK:

B-03. Includes the furnishing of all labor, materials, transportation, and equipment required to fabricate four steel towers and their appurtenances, complete and delivered f.o.b. trucks or cars at a designated location. Each unit shall be completely coded and indexed and each piece marked for easy identification. One complete tower unit shall be completely shop assembled to provide a check on the fitting together of all parts and the accuracy of templets and jigs. All steel shall be shop painted.

B-04. All anchor bolts or other fastenings foranchoring of towers and tower guys in concrete footings shall be furnished under this Contract.

SHOP AND SETTING DRAWINGS:

B-05. Four sets of prints of complete shop and setting drawings for each tower shall be submitted to abd be approved by the Purchaser before work proceeds. Same shall be completely indexed, shall show piece marks, shall be in sequence, and shall show sequence of welding when excessive locked-in stresses might develop. Apparent discrepancies in the Contract drawings and/or specifications shall be promptly referred to the Purchaser for proper adjustments. Work performed without such disposition may be rejected by the Purchaser.

B-06. Upon approval of shop drawings, tracings shall be corrected as indicated and duplicate sets of prints thereof shall be delivered to the Purchaser. One set of prints shall be delivered to the Inspection Laboratory.

SHOP ERECTION:

B-07. This Contractor shall submit his bid on the basis of shop erection in a prone position or by erection of two or more levels at a time in a vertical position or any variation of these two methods which will assure a complete and accurate check of the various parts to guarantee against discrepancies in fit in the final field erection. Attention is called to Paragraph F-41, Section "F" of the Specifications as the test procedure required in paragraph F-41 may be affected by the work required under paragraph B-07.

ALTERNATE BID:

B-07.1 In addition to the above, the Contractor shall submit an alternate bid for the complete erection of the tower and appurtenances in a vertical position. Where Dardalet bolts are shown on the Drawings for field erection, turned bolt connections shall be used in the test erection. Turned bolts shall be not smaller than 1/32" less in diameter than the holes for which they are intended. As called for in paragraph F-41, Section "F", the test erection of one complete elevator system and one complete main hoist, together with guides and all mechanical and electrical appurtenances, ready for operation, shall be included in this alternate bid. For the purpose of making elevator and skip hoist tests, pit and guides below ground level may be omitted.

PACKING AND SHIPPING:

B-08. All material shall be boxed, crated or bundled securely and so loaded as to suffer no damage in transit. Maximum weight of bundles shall be 2,500 pounds, except packaged unit mechanical assemblies which may exceed this weight. Gross weight shall be marked on each bundle.

B-09. All rivets, bolts, clips, and other devices for use in field erection shall be separately packaged, suitably marked, coded and indexed and shall be securely boxed in packing boxes of 2" material reinforced with metal strap bindings. Aluminum gratings and metal sash shall be securely boxed or suitably crated. All canvas shall be boxed in weatherproofed boxes as described in paragraph B-10. All other items which may be bent or damaged in shipment shall be securely crated or boxed to the satisfaction of the purchaser. Duplicate copies of index of box contents will be packed inside each box and in a

heavy manila envelope tacked to the outside of each box. Duplicate copies of all lists will also be furnished direct to the Purchaser for use in supervising erection, Gross weight shall be marked on each package.

DAMP PROOFING:

B-10. Interiors of all boxes, cable reels, etc. shall be lined with doubled layers of Sisalkraft or similar tear-resistant waterproof paper with overlapped joints. All metal items not galvanized or coat with rust preventive paint shall be coated with heavy grease or cosmolene before packing. Wood cable reels shall be lagged with 2" material, and securely metal banded. Metal reels shall be sealed with metal covers welded to the sides. Silica gel dessicants will be inserted in all boxes or sealed packages.

REFERENCES:

B-11. "A.S.T.M." as used herein means "American Society of Testing Materials." "A.I.S.C." as used herein means "American Institute of Steel Construction." "A.W.S." as used herein means "American Welding Society". The specifications of these organizations as referred to herein by name and/or by number shall be as last revised, and are hereby declared a part of this specification insofar as they are applicable to this work and shall have the same force as if written herein. Where the requirements of this specification are in excess of those called for in the A.I.S.C. Specifications or Code of Standard Practice, this specification shall govern.

MATERIALS - KIND AND QUALITY

B-12. Except as otherwise provided, all shall be of the exact size, weight and shape shown, specified or otherwise required; all steel shall be thoroughly cleaned of all rust and millscale before fabrication. Materials that do not comply with this specification, as evidenced by inspection and/or test reports, will be unconditionally rejected. See general notes on drawings for further information on materials required.

SPECIAL REQUIREMENTS:

B-13. All fabrication shall conform to A.I.S.C.Manual, 1947 Edition, except that tolerances shall be more exacting as follows:

a. No reaming of unfair holes shall be required or permitted. The open holes in all joints, when assembled, shall so match a rod having the same diameter as the bolts for which they are intended, may be inserted in all holes perpendicular to the face of the joint.

b. Leg angles at splices shall be in full bearing at their milled ends with all open holes matched as noted above.

SUBSTITUTIONS:

B-14. Substitutions as are necessary to best fit available stock, will be permitted only on approval by the Purchaser before work proceeds.

CABLE:

B-15. GENERAL REQUIREMENTS. All cable fittings, except for temporary guys, shall develop the full strength of the cables to which they are attached.

B-16. Cutting lengths for all cables shall be verified by the Purchaser before fabrication. This Contractor shall check all clearances for cable hardware provided in the towers and their anchorage shall notify the Purchaser if any changes are required.

B-17. Cables shall be suitably packaged in well made wood or metal containers and properly marked for easy identification. See paragraph B-10 for weatherproofing, etc..

TEMPORARY GUYS:

B-18. Temporary guys shall be 7/8" galvanized cast steel rigging and guy rope, minimum breaking strength 40,000 lbs. Guys shall be provided with all necessary hardware for installation including take up turn buckles and anchor bolts. All fittings shall be given an approved rust preventive coating before packing.

PERMANENT GUYS:

B-19. Permanent guys shall be 1-1/2" galvanized steel bridge strand having the following properties:

Min. Breaking Strength	270,000 lbs.
Min. Elastic Limit	135,000 lbs.
Min. Modulus of Elasticity of the Cable	24,000,000 p.s.i.

Sockets for these cables shall be installed at the fabricating plant and tested to 150% of working load.

MESSENGERS FOR SPECIAL CABLES:

B-20. Messengers for special cables shall be 1/2" galvanized high strength seven wire strand having the following properties:

Min. Breaking Strength	18,000 lbs.
Min. Elastic Limit	9,400 lbs.

CLEANING:

B-21. All structural steel after shop fabrication shall be thoroughly cleaned of all grease, oil or mill scale. Cleaning shall be done with steel brushes, sand blast, hammers, scrapers, or chisels. Oil and grease shall be removed by wiping with benzine or gasoline. This Contractor may use any other method for cleaning structural steel, if approved by the Purchaser.

PAINTING:

B-22. Before removal from the shop, the steel work shall be given two (2) shop coats, brushed on, of oil base Chromic Metal Primer rust preventive paint of a standard brand approved by the Purchaser. Abrasions which occur in prefabrication, packing or loading shall be touched up with the same material before shipment. Surfaces to which paint is applied shall be perfectly dry and clean. Machine finished surfaces shall be given a temporary coat of white lead and tallow. Successive coats shall vary in shade to avoid confusion as to which have been painted.

B-23. Anchors, etc. which are later to be buried in concrete shall be given the same temporary paint treatment as specified for milled surfaces.

SECTION C

MISCELLANEOUS METAL WORK

GENERAL REQUIREMENTS:

C-01. The General Conditions of the Contract apply the same as if here written.

C-02. The following items of miscellaneous metal work shall be completely fabricated and shop fitted to the structural frame of the towers with all connections ready for field erection. All shall be completely indexed, coded and marked for easy identification. Steel items shall be shop painted as specified for structural steel. Provide all required fastenings for field erection

VERTICAL LADDERS:

C-03. Vertical ladders shall be provided as detailed, from Tower House floor level to the ground. A twelve-foot section of ladder at the bottom shall be removable, as detailed, of aluminum 2-1/2" x 1-1/2" x 1/4" angle side members and 3/4" round aluminum rungs 12" o.c. plug welded to rails. Ladder from Tower House floor to roof shall be similar construction, fixed. Alloy shall be 61T.

C-04. Remainder of ladders above the 12' ground level section to the Tower House floor level shall be fabricated of 2-1/2 x 1-1/2 x 1/4 steel angle side rails with 3/4" round steel rungs 12" o.c. plug welded to rails. Provide bent plate or angle fastenings for ladders as detailed. Provide all required bolts, rivets, clips, or other fastenings required for field erection.

LADDER LANDINGS:

C-05. Ladder landings shall be fabricated of steel with angle posts and rectangular bar stock rails. Landdecks shall be steel rectangular bar stock of sized marked, Irving Subway Grating Co. "X-Bar" Type AA, or equal. Deck sections shall be cut to fit each landing ready for bolting to the landing channel frames. Provide all required bolts, rivets, clips, or other fastenings required for field erection.

BASKET GUARDS:

C-06. Basket guards around ladders shall be fabricated in sections and made ready for bolting together as detailed. Hoop bands and vertical members shall be 1-1/2" x 1/4 flat bar with all connections bolted. Provide all required bolts, washers, rivets or other fastenings required in field erection. Basket guards and fittings shall be packaged knocked down, as elsewhere required in these Specifications.

METAL DOOR:

C-07. Metal door for access to Tower House floor from outboard ladder shall be fabricated from 0.032 sheet aluminum, alloy 38 riveted 6" o.c. to 1-1/2" x 1-1/2" x 3/16" steel angle frame. Provide 4" x 12" x 3/16" plate welded to angle frame for mounting lock and door pulls.

C-08. Hinges shall be Corbin 061 1/2 BT-DL 4x4. Padlock shall be Sargent 1-3/4 extruded brass self-locking cylinder Padlock No. 753 HS. Furnish three keys. See detail of door frame on Sheet A-1 for welded eyes to receive padlock. Door pulls each face shall be Sargent 633-AN.

TOWER HOUSE GRID FLOOR:

C-09. Tower House grid floor shall be fabricated of aluminum rectangular bar stock, Irving Subway Grating Co. "X-Bar" Type AA, or equal, of bar sizes marked on drawings, Alloy 63S-T5. Floor sections shall be ready for bolting to steel floor beams. Three center sections of grid shall be movable with flush drop bar handles for lifting, as detailed. Man lift trap door shall be steel frame with aluminum grid cover similar to floor. Provide two pair extra heavy 4 x 4 five knuckle full surface, steel hinges, blank for welding, with loose button tip pins. Provide bar lift to drop flush with floor when not in use. Provide all required bolts and miscellaneous clips or fastenings required for field erection. Trap door shall be designed to be self-closing as elevator drops below floor line.

PAINTING:

C-10. Miscellaneous steel items shall be painted the same as herein specified for Structural Steel. See "Painting - Structural Steel," Paragraph B-22.

PACKING:

C-11. See Paragraphs B-08, B-09, B-10 for requirements as to packing of miscellaneous fittings and small parts.

PROTECTIVE COATING:

C-12. All contacts between aluminum and steel frame shall be protected as specified in Paragraph D-07 of these Specifications.

SECTION D

SHEET METAL AND CANVAS

GENERAL REQUIREMENTS:

D-01. The General Conditions of the Contract apply the same as if here written.

D-02. The following items shall be shop fabricated and prefitted so far as possible for later field erection. All rivets, clips, bolts, or other fastenings shall be provided and packaged with proper markings for easy identification in field erection as specified in Paragraphs B-08, B-09 and B-10.

ROOFING:

D-03. Roofings shall be Alcoa, or equal, Industrial Roofing 2.67" x 7/8" x 0.032, Alloy 3S.

SIDING:

D-04. Siding shall be Alcoa, or equal, 2.67" x 7/8" x 0.024, Alloy 3S.

FASTENINGS:

D-05. Fastenings for roofing and siding shall be aluminum 0.032, Alloy 3S. Rivets shall be aluminum Army-Navy Aeronautical Spec. AN-R-19 latest revision.

FLASHINGS:

D-06. Flashings as detailed shall be sheet aluminum alloy 3S of thicknesses called for on drawings. Flashings shall be cut with allowances in length for field fitting and erection.

PROTECTIVE COATINGS:

D-07. When aluminum members are to be fastened to steel supporting members, the aluminum shall be kept from direct contact with such parts by a heavy shop coat of alkali resistant, bituminous paint or by a shop coat of zinc chromate primer of phenolic resin or alkyd resin type.

ROOF ACCESS HATCH:

D-08. Roof access hatch shall be provided with 2 x 8 wood curb bolted to channel frame. Hatch cover shall be hinged and equipped with heavy inside hook and eye fastener. Hatch cover shall be made of 1/2" D. F. water resistant plywood covered on top with 0.02 sheet aluminum Alloy 3S.

CANVAS:

D-09. Provide #10 (approx, 15 oz/sq.yd.) canvas covers for Tower House floor and joist block and access hatches on the roof. Canvas covers for each section of the three center movable floor panels and for the man lift trap door shall be made separate from the cover for the remainder of the Tower House floor. Each section of floor canvas shall be provided with a 3" wide hem and #4 brass grommets at 4" o.c. shall be installed in the inner edge of the hem all around all edges for lacing canvas to the metal floor grids. Provide bound slots in canvas at all bar lifts. Provide #72 three-ply, hand laid, white cotton seine twine for lacing canvas to Tower House grid decks.

D-10. Hoist block hatch canvas covers shall be provided with brass turn buttons 8" o.c. on the curbs and leather gasketed brass eyes on the canvas covers to match. Canvas shall turn down over curb 3" all around and shall be well reinforced with boxed, closed corners to fit the curb. Canvas cover for Hoist Block hatch covers shall be made in two sections with a 4" overlap at the center for weathering.

FUNGUS AND WATER REPELLENT TREATMENT:

D-11. All canvas shall be fungus and water repellent treated so as to meet tests and requirements of U.S.Army Specifications No. 100-17. Treating compounds and processes need not be restricted to those described in said specification. All canvas shall be "Flame Foil" treated.

PACKING:

D-12. See Paragraphs B-08, B-09 and B-10 for packing and shipping requirements.

ABRASIVE CLOTH:

D-13. Abrasive cloth for catwalk shall be Minnesota Mining and Metals Company Safety-Walk "Wetordry" non-slip surfacing, or approved equal.Run 18" wide strip full length of catwalk.

SECTION E

METAL SASH AND GLAZING

GENERAL REQUIREMENTS:

E-01. The General Conditions of the Contract apply the same as if here written.

E-02. Furnish sash and glazing units for field erection, providing all necessary fastenings for attachment to steel frame of Tower Houses. Sash shall be shop fitted to steel frame before shipping.

METAL SASH:

E-03. Metal sash for Tower Houses shall be fabricated from extruded aluminum shapes, Thorn Warehouse Type or equal, having a guaranteed ultimate tensile strength of 22,000 lbs. per square inch, Alloy 52S3/4H or 53 ST. Window frames shall be manufactured in accord with The Aluminum Window Manufacturers' Association Standard Specifications. Sash shall be designed for inside glazing with inside continuous aluminum glazing angles set with aluminum screws. Aluminum sash shall be standard factory finish.

GLAZING:

E-04. Aluminum sash shall be glazed with clear acrylic resin plastic units of Lucite, as manufactured by Du Pont de Nemours, or Plexiglass, as manufactured by Rohn & Haas. Sheets shall be 3/16" thick. Set all panes in Neoprene gaskets.

PROTECTIVE COATING:

E-05. All contacts between aluminum sash and steel frame shall be protected as specified in Paragraph D-07 of these Specifications.

PACKING:

E-06. See Paragraphs B-08, B-09, and B-10 for packing and shipping requirements.

SECTION F

MECHANICAL AND ELECTRICAL WORK

GENERAL REQUIREMENTS:

F-01. The General Conditions of the Contract apply the same as if here written.

SCOPE OF WORK:

F-02. The work included under this section of the specifications shall include furnishing all material, equipment, and labor to deliver the following items properly painted, tested, packaged, and identified in a manner suitable for export, as specified in Paragraphs B-08, B-09 and B-10 , to the point designated under Paragraph A-01, General Conditions:

1. Main hoists, complete with cables, main hoisting machines, and electrical control systems.
2. Elevators, complete with cabs, cables, elevator hoisting machines, and electrical control systems.
3. Hand winches.
4. Lightning rods and grounding systems.
5. Obstruction lights.
6. Tower house electrical facilities.
7. Wiring for main hoists and elevators.
8. Miscellaneous materials.

QUANTITY REQUIRED:

F-03. All of the equipment and materials specified herein of shown on the drawings is required for each of the four towers.

MAIN HOIST:

F-04. Load Capacity and Speed. Main hoist shall be capable of lifting a net working load of 10,000 pounds. Speed of hoist shall be continuously variable between the limits of 5 feet per minute minimum and 30 feet per

minute maximum, with full torque available over this entire speed range.

F-05. Construction shall be as detailed on the drawings.

1. Sheaves shall be cast steel for wire rope, with machined grooves as detailed on the drawings.

2. Bushings shall be phosphor bronze (SAE Standard No. 64), with four 1/8" x 1/16" grooves for lubricating grease.

3. Spindles shall be cold rolled steel, turned and ground, and provided with 1/8" grease hole tapped at end for 1/8" Alemite fitting.

ELEVATOR:

F-06. Load Capacity and Speed. Elevator shall be capable of lifting a net working load of 2,000 pounds at a maximum hoisting speed of 125 feet per minute. Speed shall be variable for starting and stopping, particularly for passing through trap door in floor of Tower House.

F-07. Construction shall be as detailed on the drawings.

1. Cab shall be of open-type, all-welded steel construction.

   Platform shall consist of 2" thick Douglas Fir planks, bolted at each end to cab frame.

2. Sub-structure shall be all-welded steel construction, bolted to underside of cab frame.

3. Guide Shoes shall be phosphor bronze (SAE Standard No. 64), milled to give free running clearance to the car rails.

4. Guide Rollers shall be phosphor bronze (SAE Standard No. 64), provided with grooves for grease. Spindles shall be drilled 1/8" for grease hole and provided with 1/8" Alemite threaded drive fittings.

5. Sheaves, Bushings, Spindles shall be same as specified above for Main Hoist.

F- 08. Mechanical Safety Device shall be of the automatic rail gripper type actuated by an overspeed governor and/or a broken-rope safety.

1. Safety Device shall be Type "RT" Safety, manufactured by Kimball Elevator Co., Ltd., Los Angeles, California, or an approved equal thereto, and shall consist of two cast steel shoes of proper design to receive and maintain, in each shoe, a knurled hardened roller in a beveled milled pocket, and arranged with a rotatable square shaft between said shoes, the shaft being turned at each end and fitted with lever arms, clevises, and pre-adjustable pins. The safety shoes shall be milled to give free running clearance to the car rails and shall not be in contact with the rails in normal elevator operation. A cast steel arm shall be attached to the rotatable shaft at one end, and the opposite end of the arm shall be arranged to receive one end of each of the cables from the overspeed governor and the broken-rope safety. This operating arm shall be maintained in its retired position by a guided compression spring adequate to overcome the normal inertia of the governor and the broken-rope safety. When the Safety Device is actuated by either of the cables attached to the safety actuating arm, said arm shall compress its maintaining spring and rotate the cross shaft, which shall, through action of the lever arms and pins, drive the knurled rollers into contact with the rails and thus wedge and lock the elevator in an instantaneous stop.

2. Overspeed Governor shall consist of a wire rope sheave of special design to accommodate pre-adjustable spring-maintained counterweighted pawls which shall be preset to fly out under a speed 40 percent in excess of normal elevator speed. In the down direction, the opening pawls shall strike a steel cover eccentrically mounted and spring-maintained upon the governor shaft, which shall cause the steel cover to rotate and thus actuate the governor cable which is fastened at one end to said cover and at the other end to safety actuating arm of Safety Device.

3. Broken-rope Safety shall consist of an idler sheave held against the hoisting rope by means of an extension spring. In the event of breakage of

the hoisting rope, the spring shall return to its unloaded length, thus actuating a cable which is fastened at one end to the idler sheave housing and at the other end to the safety actuating arm of the Safety Device.

HOISTING MACHINES:

F-09. Conditions of Operation. Machines will be required to function satisfactorily when installed at an elevation of approximately ten (10) feet above sea level and when operating in an ambient temperature of 95°F. and a relative humidity of 87 percent, with heavy concentrations of fine salt spray, and under the following conditions of load and use:

1. Main Hoisting Machine shall have a capacity of 6,000 pounds line pull at a line speed continuously variable between the limits of 10 feet per minute minimum and 60 feet per minute maximum. See Paragraph F-04. Use will be intermittent.

2. Elevator Hoisting Machine shall have a capacity of 2,000 pounds line pull at a line speed of 250 feet per minute maximum. See Paragraph F-06. Use will be similar to that of a typical industrial elevator.

CONSTRUCTION:

F-10-. Each machine shall conform to the following requirements of construction and design:

1. Type: Base-mounted drum type with all operating mechanism completely enclosed within a dust and moisture-proof enclosure.

2. Hoist Gearing: Single worm or spur gear type.

3. Bearings: Ball or roller type.

4. Lubrication: All gears and bearings shall operate in an oil bath.

5. Winding Drum: Machine grooved and capable of holding not less than 635 feet of 3/4" wire rope in a single layer without overlapping. Drum shall be provided with flanges effectively guarded to prevent rope leaving drum.

6. Rope Anchorage: Hoisting rope shall be dead-ended to the hoist drum by means of a suitable safety anchorage.

7. Load Brake shall be provided to hold load when motor is at rest and to prevent excessive speed when lowering load.

8. Motor Brake shall be provided to bring the motor to rest immediately in the event of current interruption from any cause. Brake shall be connected in the motor circuit and shall be normally locked, except when held off by current flowing through its windings.

9. Motor: Totally enclosed, direct current, specifically designed for hoisting service, and suitable for operation with the electrical equipment and control system specified hereinafter. See Paragraphs F-18 through F-22.

10. Limit Switches shall be provided as an integral part of each hoisting machine to bring the load to a positive stop at both the upper and lower limits of travel.

HOISTING CABLES

F-11. Paragraphs B-15, B-16 and B-17, Cable, shall also apply to cable specified below.

F-12. Main Hoist Cable shall be John A. Roebling's Sons Company's or the approved equal, 3/4" diameter 18 x 7 preformed, plow steel, non-rotating wire hoisting rope having a breaking strength of not less than 38,000 pounds.

F-13. Elevator Cable shall be John A. Roebling's Sons Company's, or the approved equal, 3/4" diameter 6 x 19 preformed, mild plow steel, standard wire hoisting rope having a breaking strength of not less than 36,000 pounds.

F-14. Pulling Cable shall be 3/16" diameter 7 x 19 tinned steel wire aircraft cord having a breaking strength of not less than 4,200 pounds.

HAND WINCH AND ACCESSORIES:

F-15. Winch shall be David Round & Son's No. 66 Light Derrick Winch, or the approved equal, having a single

line load capacity of 750 pounds. Winch shall be spur gear driven, with crankshaft ends for two-speed operation, and shall be equipped with brake band for controlled free-fall of load, if desired. Drum shall have a rope capacity of 650 feet of 3/16" wire rope. Single layer winding will not be required. Weight of winch, including handles, shall not exceed 80 pounds.

F-16. Mountings shall be provided as detailed on the drawings to permit winch to be readily mounted at will in either of two locations in Tower House.

F-17. Sheaves shall be cast steel machine grooved for 3/16" wire rope. Bushings shall be phosphor bronze (SAE Standard No. 64).

ELECTRICAL CONTROL SYSTEMS:

F-18. Type of System. The elevator and the main hoist shall each be provided with a motor generator set, control panel, controller or controllers, safety devices and wiring materials for a complete Ward-Leonard, or approved equal, variable voltage type of control.

F-19. Power Service. The power which will be available at each starter control panel will be 120/208 volt, three phase, 60 cycles.

F-20. Motor Generator Sets. One motor generator set with attached exciter shall be provided for elevator hoisting machine, and one shall be provided for main hoisting machine. Each set shall be of suitable capacity and output voltage to supply either hoisting machine motor. See Paragraph F-09 for description of hoisting machine operations. Each set shall be made as a single integral unit with a special elevator motor generator set and exciter mounted on a substantial rigid base with a set of rubber pads. Base shall be equipped with suitable lifting eyes for easy sling handling from a truck crane.

F-21 Control Panels. One alternating current magnetic motor starter and one direct current control panel shall be provided as an integral unit for the elevator and a similar unit shall be provided for the main hoisting machine. Means shall be provided for easy sling handling from a truck crane. Each panel shall be suitable for use with a 120/208, 3-phase 60-cycle source and the variable voltage

system referred to herein so arranged as to give smooth acceleration and deceleration, and a positive stopping method on the failure of power. Terminal strips shall be provided so that all incoming wires can be readily disconnected and control panels removed with a minimum of effort and time. A weatherproof pedestal mounted master controller shall be provided for each hoisting machine. In addition, a controller shall be provided for use in the elevator cab and one for main hoist in Tower House, paralleling the ground level controller.

F-22. Limit Switches. Main hoist shall be provided with an up travel limit switch in addition to those devices specified in Paragraph F-10. Elevator shall be provided with up and down travel limit switches for slow-down, stop, and emergency stop in addition to those devices specified in Paragraph F-10.

LIGHTNING RODS AND GROUNDING SYSTEM:

F-23. Two air terminals and a complete grounding system for same shall be provided for the tower as shown on the drawings. Down conductors shall consist of 4/0 bare MHD stranded wire. Conductors shall be grounded to tower structure by means of one-hole conduit straps as indicated on the drawings, and at maximum intervals of 13 feet. Avoid short radius bends for these conductors, and wherever a bend is made, use Burndy Servit Post, or equal, to bond conductor to tower.

OBSTRUCTION LIGHT:

F-24. Provide Crouse Hinds Type VAW, or equal, double fixture obstruction light complete with lamps, transfer relay, time clock and pilot light as indicated on the drawings.

TOWER HOUSE ELECTRICAL FACILITIES:

F-25. Provide all materials, including fixtures, switches, receptacles, boxes, plates, conduit, wire, and miscellaneous wiring material, to install and connect the following electrical facilities in the Tower House as shown on the drawings:

1. Four lighting fixtures, 100 watt shallow dome RLM, Smoot-Holman #191251 or equal.

2. One single pole switch, Bryant #4961 or equal.

3. Two three-way switches, Bryant #4963 or equal.

4. Five convenience receptacles, Bryant #TL 7580 or equal.

5. Three telephone outlets with .100" brass plate, Bryant No. OG 11 or equal.

6. One four circuit 120/240 volt, SN, lighting panel, Square D Company #35540, or equal.

WIRING FOR MAIN HOIST AND ELEVATOR:

F-26. Provide all conduit, wire, cable, pull boxes, and miscellaneous wiring material necessary for the complete installation of the equipment and systems specified herein. The contractor shall determine the number and size of conductors and the conduit sizes required based on the equipment which he proposes to furnish and the 1948 National Electrical Code.

Drawings indicate typical requirements only and must be verified in detail by this contractor prior to bid submission.

WIRING TROUGH:

F-27. Provide open wiring trough for the tower in accordance with drawings. Trough shall be constructed of 16 gauge galvanized steel as detailed and painted as indicated in Paragraph F-40.

ELECTRICAL MATERIALS AND EQUIPMENT:

F-28. Insulating and Dielectric Materials.

1. Ceramic Insulators. Where ceramic parts are used, all surfaces shall be glazed, or if glazing is impracticable, the surfaces shall be treated with DC-200 made by Dow-Corning, or equal. Ceramic parts shall not be treated with wax.

2. Cotton and Linen. No insulated wire using cotton or linen in its construction shall be used in the equipment. Cotton or linen shall not be used as the base or filler for laminated or molded phenolic materials. Cotton or linen shall not be used in the form of fabric or tape.

3. Impregnating and Potting Compounds shall not, either in the state of their original application or as the result of aging, have any injurious effect upon the

insulation which they are designed to protect and shall not cause corrosion or deterioration of any adjacent parts. The compound shall not crack at temperatures above -55° C (-67° F) nor flow at temperatures below + 85° C (+ 185° F) unless contained in such a manner that the compound will not flow from the container.

4. Laminated Thermosetting Plastic Materials - Sheets and Plates shall be in accordance with Specification JAN-P-13. Parts made of such materials when used for electrical insulation, except Types LTS-E-4, LTS-E-5, LTS-E-6 and transparent plastics shall be vacuum impregnated with a suitable varnish and baked dry after all machining and punching operations are completed. The preferred base is nylon cloth.

5. Cast Thermosetting Plastic Materials shall be in accordance with Specification JAN-P-77. Parts made of such materials shall be vacuum impregnated with a suitable varnish and baked dry after all machining and punching operations have been completed.

6. Modeled Thermosetting Plastic Materials shall be in accordance with Specification JAN-P-14. Parts made of such materials, except Types MTS-E-3, MTS-E-4, MTS-G-2 and transparent plastics shall be vacuum impregnated with a suitable varnish and baked dry after all machining and punching operations are completed. Parts preferably shall be molded in final forms without need for subsequent machining.

7. Rigid Thermoplastic Materials shall be in accordance with Specification JAN-P-15.

8. Vinyl Tubing used as an outer cable sheath shall have a wall thickness not in excess of .040 inch. If Varflex Syntholvar manufactured by Varflex Corporation, Rome, New York, is used, it should be of the "Electrical grade". Where sleeving is necessary for voltage insulation, it may be used over soldered connections.

F-29. Tape, Electrical. Fabric or textile, pressure sensitive (adhesive or "friction") tape shall not be used. "Scotch" cellulose acetate tape with a moisture and vapor proof adhesive as manufactured by Minnesota Mining and Manufacturing Company, or equal; or Polyvinyl chloride tape with a moisture and vapor proof adhesive, may be used where necessary. Taping will require additional tropicalization treatment after application.

F-30. Soldering shall be done in such a manner that both a good electrical and mechanical connection is assured. Solder for equipment wiring shall be 50-50 rosin core.

1. Cleaning. All joints shall be clean before the application of solder.

2. Cold Joints. There shall be no evidence of "cold joints". Sufficient heat shall be applied to the joint so that the solder flows freely and completely over the joint.

3. Damage: Soldering shall be performed in such a manner as to cause no damage to adjacent parts.

4. Electrical Connections shall be mechanically secure before soldering.

5. Excess Solder and Flux. Soldered connections shall be free from flux and excess solder such as drippings and points. Generally, only the amount of solder and flux necessary to properly solder the joint shall be applied.

6. Mechanical Assemblies. No assembly shall depend on soft solder for mechanical strength.

7. Soldering Flux. Only rosin, rosin and alcohol, or equivalent plastic rosin mixtures may be used as a flux in the assembly of the equipment or any part thereof, or for cleaning soldering irons.

F-31. Wiring of Equipment

1. Cabling. Wherever possible, conductors shall be bound into a cable and securely held by means of cord. All lacing cords shall be made of fungus-inert plastic (such as nylon or cellulose-acetate rayon, etc.).

2. Connections. In no case shall electrical connections depend upon wires, lugs, terminals, and the like clamped between a metallic member and an insulating material. Such connections shall be clamped between metal members, preferably an assembly of two nuts, two washers and a machine screw or equivalent. Wherever any bolts, screws, nuts, studs, or rivets are used in or as a part of a circuit, all connections thereto shall be securely soldered wherever

practicable. Specifically, soldered connections are not considered practicable at studs of molded phenolic capacitors, meter terminals, relay contacts and the like.

3. Moisture Proofing. All electrical connections, including solder connections and terminals, and the insulation immediately adjacent thereto (including insulation on wire) shall receive a moisture and fungus-resistant treatment using a Class A coating material in accordance with the following:

"Moisture Proofing - All receptacles and sockets furnished as an integral part of an article of equipment shall be processed as follows: After all soldering and connecting of wires thereto has been completed, coat all surfaces of the receptacle or socket, including terminals, soldered joints and wires (including at least one (1) inch of insulation), with a Class A moisture and fungus-resistant coating material such as General Electric #8830-F Compound, or Sherwin Williams #34596. Where necessary, sleeving, (reference F-28) is then applied and the assembly is then recoated. Wherever two non-metallic parts are in contact with each other, insulating and sealing compound in accordance with Army-Navy Aeronautical Specification AN-C-128 shall be applied between adjacent surfaces. The receptacle and plug, other than the electrical contact areas, shall be covered with insulating and sealing compound in accordance with Specification A N-C-128 to not more than one-sixteenth (1/16) inch. Where practicable, the application of this compound shall be during the last stage of final assembly and precaution shall be taken to prevent the accumulation of dirt by the compound or smearing of the compound on the equipment or its parts."

4. Partitions. Wherever wires are run through holes in metal partitions, the holes shall be equipped with suitable grommets for mechanical protection of insulation otherwise subject to abrasion. Care must be exercised in the running of hookup wire to insure that it is not carried over or bent around any sharp corner or edge which might in time cut through the insulation.Care shall be taken to insure that wiring is not exposed to

local temperatures appreciably above ambient temperatures and that it cannot come in direct contact with heated parts.

5. Terminals. Before soldering, all wires connecting to terminals shall be securely fastened to the terminals by crimping the terminals firmly upon the wire or the wire upon the terminals, except in cases where the mechanical configuration of the wire or design of the terminal is such as to hold the wire securely in place without crimping. No wire connection shall depend solely upon solder for mechanical strength. In no case shall electrical connections be made by clamping wires smaller than AWG #14 between metal parts. Such connections shall be soldered, or soldering lugs, or terminals may be used in lieu thereof.

F-32. Wire in Conduit. Both above ground and underground, shall be an approved moisture resisting type (RW or TW) as manufactured by General Electric, Simplex, National Electric or equal.

F-33 Portable Elevator Control Cable shall be designed and constructed for this class of service and shall contain the number of spare conductors indicated in addition to the required active conductors. It shall be equal to General Electric Geoprene or Simplex Tirex.

F- 34 Conduit shall be rigid steel conduit and shall have all of the characteristics specified in the Rigid Conduit Industry Standard for standard rigid steel conduit (zinc coated). Underground conduits shall be sealed at joints with red lead or equal, and encased in a concrete envelope as shown.

F- 35. Equipment Grounding. All equipment enclosures shall be grounded with a 1/0 bare MHD stranded wire buried in ground 18" below surface and connected to a ground rod or rods as required to obtain a maximum resistance of 25 ohms to ground.

F-36. Pull and Terminal Boxes shall consist of 12 gauge galvanized steel, flanged with screw cover and gasket. Boxes shall be painted as indicated in Paragraph F-40.

MISCELLANEOUS:

F-37. Anchor Bolts and Nuts shall be provided to permit anchoring each base-mounted piece of equipment to

concrete foundation.

F-38. Templets. Full size bolt setting templates shall be furnished to permit accurate setting of anchor bolts in concrete foundations at time of pouring.

F-39. Miscellaneous Hardware and Material required for a complete workmanlike installation shall be furnished whether shown on drawings or mentioned in these specifications.

PAINTING:

F-40 All exposed metal, unless otherwise protected with an approved factory applied finish, shall be given two shop coats, brushed on, of oil based Chromic Metal Primer rust preventive paint, or quick drying Red Lead multiple pigment primer, of a standard brand approved by the Purchaser. All metal to be painted shall be thoroughly cleaned after fabrication of all grease, oil or other foreign substance. Oil or grease shall be cleaned by wiping with benzine or gasoline, other foreign substances by use of wire brushes or other acceptable means so that all surfaces are perfactly clean before painting.

TESTS:

F-41. This Contractor shall furnish all material, equipment and labor to test the operation of one complete main hoist system and one complete elevator system prior to its packaging and delivery. These tests shall be made in the presence of a representative of the Purchaser prior to the packaging and delivery of the systems. In order to make the tests, a temporary installation of each complete system shall be made utilizing suitable structures and facilities available to the contractor. Full 300-foot lift will not be required. Tests shall fully verify the proper functioning of both systems and shall include power consumption, safety, and time-distance tests at specified loads.

F-42. In order to test the elevator safety device, a drop test shall be made. The elevator with full load shall be dropped and the following data reported:

1. Governor tripping speed.

2. Dead weight of cab, cab sling, safety device, etc.

3. Live load on the cab.

4. Total distance in inches which the cab traveled until stopped by safety device.

5. Distance in inches cab traveled after safety device engaged the rails, as measured from the actual marks on the rails.

6. Speed in feet per minute at the instant the safety device engaged the rails.

7. The difference in elevation of the guide shoes on the opposite sides of the cab.

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 17, California

July 24, 1950

ADDENDUM #2 TO SPECIFICATIONS

FOR

200 FOOT STEEL TOWER

The following changes shall be incorporated into and made a part of the specifications:

(1) Under paragraph 4, Drawings, revise the drawing list to read as follows:

TITLE: 200 FT. STEEL TOWER

Drawing No.	3G-682	Erection Diagram and Details
" "	3G-683	Tower Shaft Details
" "	3G-684	Tower Cab - Structural Framing and Details
" "	3G-687	Miscellaneous Details
" "	3G-5422	Main Hoist
" "	3G-5423	Elevator Cab
" "	3G-5430	Cable Hoist
" "	3G-5625	Erection Diagram and Details
" "	3G-5626.1	Tower Cab - Structural Framing and Details
" "	3G-5627.1	Tower Cab - Structural Sections and Details
" "	3G-5630	Tower Cab - Structural Elevations and Details
" "	3G-5138	Tower Cab - Architectural Plans and Details

Drawing No.	3G-5139	Tower Cab - Architectural Sections and Details
"	" 3G-5140	Tower Cab - Architectural Elevations
"	" 3G-5141	Tower Cab - Architectural Elevations
"	" 3G-5142	Tower Cab - Architectural Elevations

The balance of the paragraph shall remain unchanged.

ADD. #2-2

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 17, California

June 9, 1950

ADDENDUM #1 TO SPECIFICATIONS

FOR

200 FOOT STEEL TOWER

The following changes shall be incorporated into and made a part of the specifications:

(1) Add the following to paragraph 3:

Details shall be so made that the ladders and hoist and skip guides now on hand, all as shown on Pacific Iron & Steel Company's details of the 300 foot Steel Tower, may be used on these towers with a minimum of field work necessary on them.

This contractor shall furnish shop details for any field work necessary on the ladders and guides which will be required to adapt them to the 200-foot towers.

(2) In paragraph 3a change the second line to read:

"Ladders will be furnished by others, except the ladder for the one 25-foot top section will be furnished by this Contractor."

(3) Add paragraph 3f as follows:

f. Skip and Main Hoist Guide Rails:

Skip and main hoist guide rails will be furnished by others except this Contractor shall furnish guides for the one 25-foot top section.

(4) Add paragraph 3g as follows:

g. Cable Sheaves:

Cable sheaves for the one top 25-foot section only shall be furnished by this Contractor. Refer to Pacific Iron & Steel Company drawings of the 300-foot tower for details.

(5) Add to drawing list paragraph 4, the following:

"Pacific Iron & Steel Company's shop drawing of the 300-foot steel tower."

(6) In paragraph 5a delete the first sentence and substitute the following:

"Contractor shall submit initially two (2) sets of prints of shop drawings for Purchaser's approval. If changes are required, one set will be returned to the Contractor for alterations, whereupon Contractor shall furnish Purchaser with four (4) corrected sets of prints. If no changes are required, Contractor shall furnish to Purchaser an additional three (3) sets of prints."

(7) Change paragraph 5b to read as follows:

Upon completion of fabrication, Contractor shall deliver to the Purchaser six (6) sets of "As fabricated" prints made from corrected drawings.

(8) Add to the first sentence in paragraph 11c, "when such boxing is required by Export Regulations".

(9) Add to paragraph 12 the following:

"Purchaser will determine the necessity for damp proofing, and will bear the expense of waterproof paper and dessicants as required."

SPECIFICATIONS

FOR

200-FOOT STEEL TOWER

200 FOOT TOWER

REFERENCE:

Section 29, "Steel Tower" - Paragraph 29-04

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 17, California

June 7, 1950

SPECIFICATIONS FOR 200-FOOT STEEL TOWER

1. GENERAL: The equipment called for in the following specifications will be purchased by Holmes and Narver, Engineers, (hereinafter referred to as the Purchaser).

2. SCOPE OF THE WORK: The work to be performed under these specifications includes the furnishing of all labor, materials, equipment and transportation required to fabricate three (3) 200-foot towers, complete, and one (1) additional 25-foot top section of tower including cab framing; in strict accordance with these specifications and the accompanying drawings. Delivery will be required f.o.b. cars or trucks at vendor's plant.

3. DIVISION OF THE WORK: The following list of work items included in this contract is a partial list only. This contract shall include all items of work except those items specifically noted on the drawings to be performed by others or so specified herein. The work to be performed under this contract shall include the drilling of all holes required for attaching the work of others. Other suppliers will furnish the necessary templates or such information as may be required.

   a. Ladders and Landings:

      Ladder Landings are a part of this contract.

      Ladders will be furnished by others.

   b. Crane and Crane Bridge

      Crane rail and supports for same are a part of this contract.

      Crane and Crane bridge will be furnished by others.

   c. Cables:

      Guy and Messenger cables and foundation anchors therefor will be furnished by others.

   d. Cab:

      Cab framing, including removable aluminum floor beams and plates, is a part of this contract.

Aluminum siding, sash, roof deck and other wood details and aluminum sheet will be furnished by others.

e. Fastenings:

Fastenings, including foundation bolts, angles, etc., will be furnished by others.

4. DRAWINGS: The drawings referred to under "Scope of the Work" are as follows:

TITLE: 200 FT. STEEL TOWER

Drawing No.	3G-682	Erection Diagram and Details
" "	3G-683	Tower Shaft Details
" "	3G-684	Tower Cab - Structural Framing and Details
" "	3G-687	Miscellaneous Details
" "	3G-688	Cab Elevations and Details

In addition, work shall conform to supplemental detail sheets which may be issued, and to approved shop drawings insofar as they do not conflict with the requirements of Contract Drawings.

5. SHOP AND SETTING DRAWINGS:

a. Four (4) sets of prints of complete shop and setting drawings for each tower shall be submitted to and be approved by the Purchaser before work proceeds. Same shall be completely indexed, shall show piece marks, shall be in sequence, and shall show sequence of welding when excessive locked-in stresses might develop. Apparent discrepancies in the Contract drawings and/or specifications shall be promptly referred to the Purchaser for proper adjustments. Work performed without such disposition may be rejected by the Purchaser.

b. Upon approval of shop drawings, tracings shall be corrected as indicated and six (6) sets of prints thereof shall be delivered to the Purchaser.

6. SHOP ASSEMBLY AND ERECTION:

a. The lower fifty (50') feet of one tower, and the top twenty-five (25') feet of one tower complete with cab

framing, shall be shop assembled in sufficient detail to insure fit in field erection. Assembly shall be made in the prone position.

b. All leg angle splices shall be assembled, sub-punched, reamed and match-marked to insure full bearing at the milled ends.

7. REFERENCES: "A.S.T.M." as used herein means "American Society of Testing Materials". "A.I.S.C." as used herein means "American Institute of Steel Construction". "A.W.S." as used herein means "American Welding Society". The specifications of these organizations as referred to herein by name and/or by number shall be as last revised, and are hereby declared a part of this specification insofar as they are applicable to this work and shall have the same force as if written herein. Where the requirements of this specification are in excess of those called for in the A.I.S.C. Specifications or Code of Standard Practice, this specification shall govern.

8. MATERIALS - KIND AND QUALITY: Except as otherwise approved, all materials shall be of the exact size, weight and shape shown, specified or otherwise required; all steel shall be thoroughly cleaned of all rust and millscale before fabrication. Materials that do not comply with this specification, as evidenced by inspection and/or test reports, will be unconditionally rejected. See general notes on drawings for further information on materials required.

9. FABRICATION:

a. All fabrication shall conform to A.I.S.C. Manual, 1947 Edition, except that tolerances shall be more exacting as follows:

(1) No reaming of unfair holes shall be required when the towers are erected in the field. The open holes in all joints, when assembled, shall so match that a rod having the same diameter as the bolts for which they are intended, may be inserted in all holes perpendicular to the face of the joint.

(2) Leg angles at splices shall be in full bearing at their milled ends with all open holes matched as noted above.

b. Further requirements regarding fabrication and assembly are contained in "General Notes" on the drawings.

10. SUBSTITUTIONS: Substitutions as are necessary to best fit available stock, will be permitted only on approval by the Purchaser before work proceeds.

11. PACKING AND SHIPPING:

a. Export packing will be required on the three (3) towers. Each tower shall be separately bundled or boxed in accordance with the current Export Regulations (United States Department of Commerce). The 25-foot top section of tower will require only bundling and boxing for interstate truck shipment.

b. All material shall be boxed, crated or bundled securely and so loaded as to suffer no damage in transit. Maximum weight of bundles shall be 2,500 pounds. Gross weight shall be marked on each bundle.

c. All rivets, bolts, clips, and other devices for use in field erection shall be separately packaged, suitably marked, coded and indexed and shall be securely boxed in packing boxes of 2" material reinforced with metal strap bindings. All items which may be bent or damaged in shipment shall be securely crated or boxed to the satisfaction of the purchaser. Duplicate copies of index of box contents will be packed inside each box and in a heavy manila envelope tacked to the outside of each box. Duplicate copies of all lists will also be furnished direct to the Purchaser for use in supervising erection. Gross weight shall be marked on each package. Vendor shall obtain Purchaser's instructions in regard to the code letter designation to be marked on each crate or package.

12. DAMP PROOFING: Interiors of all boxes, etc. shall be lined with double layers of Sisalkraft or similar tear-resistant waterproof paper with overlapped joints. Silica gel dessicants will be inserted in all boxes or sealed packages.

13. CLEANING: All structural steel after shop fabrication shall be thoroughly cleaned of all grease, oil or mill scale. Cleaning shall be done with steel brushes, sand blast, hammers, scrapers, or chisels. Oil and grease shall be removed by wiping with benzine or gasoline. This Contractor may use any other method for cleaning structural steel, if approved by the Purchaser.

14. PAINTING:

a. Before removal from the shop, the steel work shall be given two (2) shop coats of oil base zinc chromate metal primer rust preventive paint of a standard brand approved by the Purchaser. Abrasions which occur in fabrication, packing or loading shall be touched up with the same material before shipment. Surfaces to which paint is applied shall be perfectly dry and clean. Machine finished surfaces shall be given a temporary coat of white lead and tallow. Successive coats shall vary in shade to avoid confusion as to which have been painted.

b. Structural rib bolts for field connections shall be dip coated with Standard Oil Company's No. 1 Rust Preventative or approved equal, before packaging for shipment.

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, California

January 19, 1950

ADDENDUM #1 TO SPECIFICATIONS

FOR

75 FOOT STEEL TOWER AND APPURTENANCES

The following changes shall be incorporated into and made a part of the Specifications:

INDEX SHEET:

(1) Change title of Section C to read: "Miscellaneous Metal Work and Windows".

Section C, Miscellaneous Metal Work, Windows and Plywood Siding:

(1) On sheet C-1 change title of Section C to read: "Miscellaneous Metal Work and Windows".

(2) Paragraph C-03: Delete "and plywood work".

(3) Paragraph C-05: Delete "and wood".

(4) Paragraph C-12: Delete "except for plywood siding".

(5) Change paragraph C-13 to read: Cabs shall have aluminum sheet roofs and siding and aluminum tread plate floors shop riveted to the frame work. Floor and roof shall be fabricated in two sections each and siding into panels, all as indicated on drawings.

(6) Paragraph C-14: Delete "including fastenings for plywood siding".

(7) Delete paragraph C-16.

(8) Change paragraph C-17 to read: Provide aluminum swing doors to tower cabs where shown and as detailed on drawings. Door shall be of aluminum sheet riveted to aluminum frame as shown. Provide 2-1/2 pr. of strap hinges of suitable size and hasps and staples as indicated. Bolts of proper size shall be furnished for

securing hasps to staples. All door hardware, including fastenings, shall be aluminum or brass. Doors shall be shop fitted with all hardware set.

(9) Add paragraph C17.1 as follows:

Aluminum rolling doors, complete with door guides, weatherseal and finish hardware shall be furnished by others. Contractor shall provide all holes and fastenings required for installation of doors in accordance with shop drawings to be furnished to him by the Purchaser.

(10) Delete paragraph C-20.

SECTION E, ELECTRICAL WORK:

(1) Paragraph E-02 (D); Delete "plywood".

(2) Paragraph E-05 - Change the 3rd sentence to read:

Aluminum conduit shall be equal in quality to aluminum pipe manufactured for conduit use by the Aluminum Company of America.

(3) Change paragraph E-13 to read:

Pull box "A" and cover shall be made of #14 gauge galvanized steel, flanged for cover complete with brass machine screws. Pull box "A" shall be of weatherproof construction with provisions for time switch installation, as detailed on the drawings. Pull box "B" and cover shall be made of aluminum sheet, .125" in thickness, flanged for cover, complete with aluminum machine screws.

SPECIFICATIONS

FOR

75-FOOT STEEL TOWER

AND APPURTENANCES

75 FOOT STEEL TOWER

REFERENCE:

Section 29 - "Steel Towers" - Paragraph 29-03

HOLMES & NARVER
Engineers
824 South Figueroa Street
Los Angeles 14, Calif.

December 9, 1949

Invitation No. HN-3H-603

Dated Dec. 9, 1949

INVITATION FOR BIDS

SEALED BIDS, in duplicate, subject to the conditions contained herein, will be received until _____ at the office of Holmes & Narver, Engineers, 824 South Figueroa St., Los Angeles 14, California, and then publicly opened, for furnishing and delivering the items listed on the attached Bid Form and as described in detail in the Specifications, Plans and Details covering the listed items, as prepared by Holmes & Narver, Engineers, hereinafter designated as the "Purchaser".

1. Guarantee will not be required with each bid.

2. Performance Bond will be required.

3. Bid Bond on U. S. Standard Form No. 24 in a panel sum of 20% of the bid price will be required.

4. Liquidated Damages will not be prescribed.

5. Partial Payments will be made in accordance with Article 8 of the attached Standard Contract form.

6. Article on Patents will be made a part of the Contract.

7. Article on Assignment of Claims will be made part of the Contract.

8. Bid Form attached hereto shall be used by the Bidder in submitting his proposal. Bids not on this form will be rejected.

9. Bid and Contract:

   a. The bid form has an entry for the items on which quotations will be given or payment made, and no other allowances of any kind will be made unless specifically provided for in the Specifications or the Contract, or by adjustments made under Article 2 of the Contract Form.

   b. The quantity of material and/or equipment fabricated or delivered will determine the amount of each progress payment and will be based on the unit prices

set forth in Price Schedule submitted by the Contractor in his bid. The total price set forth in the Price Schedule also determines the total payments to be made by the Purchaser under the Contractor. The unit price bid must be a firm price. The Purchaser reserves the right to reject any and all bids where prices submitted are not firm prices. It is obligatory that prices submitted include all costs of packing, marking, indexing, and transportation and all other costs for delivery to the designated delivery point.

10. Award of Contract: The Purchaser reserves the right to reject any and all bids and to waive any informality in the bids. In case of error in the extension of prices in the bids, the unit prices shall govern.

11. Walsh-Healy Act: The representations and stipulations required by Section 1 of the Act of June 30, 1936 (Walsh-Healy Act, Public No. 846, 76th Congress), are to be included in and made a part of this Contract awarded as a result of this Invitation for Bids with the same force and effect as if fully set forth herein. Such representations and stipulations shall be subject to all applicable regulations, determinations, and exemptions of the Secretary of Labor now or hereafter in effect.

12. Taxes: Prices bid herein shall include any Federal tax heretofore imposed by the Congress which is applicable to the material and equipment in this Bid. If any sales tax, processing tax, adjustment charge, or other taxes or charges are imposed or changed by the Congress after the date set for the opening of Bids, and made applicable directly upon the production, manufacture, or sale of the supplies covered by this Bid, and are paid by the Contractor on the supplies or articles herein contracted for, then the prices named in this Bid will be increased or decreased accordingly and any amount due the Contractor as a result of such change will be charged to the Purchaser and entered on vouchers or invoices as separate items.

13. Submission of Bids: Envelopes containing Bids must be sealed, marked, and addressed as follows:

To Holmes and Narver, Engineers
824 South Figueroa Street
Los Angeles 14, California

Bid under Invitation No._____ to be opened at_____
(hour) (date).

PRICE SCHEDULE

ITEM	DESCRIPTION	AMOUNT	DELIVERY TIME
1.	Six Steel Towers with tower cabs complete	$	days
2.	Six Dumb Waiters, complete with cabs, cables, hoisting machines and electrical control systems.	$	
3.	All other mechanical and electrical materials and equipment including lightning rods and grounding systems, obstruction lights, tower house electrical facilities, and miscellaneous material as shown on the Drawings and/or called for in the Specifications.	$	
	TOTAL BID	$	

FORM OF BID

Invitation for Bids No. HN-3H-603

Dated Dec. 9, 1949

OPENING DATE FOR THIS BID

_____

TO: Holmes and Narver, Engineers
824 South Figueroa Street
Los Angeles 14, California Date_____

Gentlemen:

In compliance with your Invitation for Bids to furnish the equipment, materials and supplies listed in the attached Price Schedule numbered one to three, inclusive, the undersigned_____

_____

a corporation organized and existing under the laws of the State of_____

a partnership consisting of_____

_____

an individual trading as_____

_____of the City of_____

hereby proposes to furnish, within the time specified, the equipment, materials, and supplies at the prices stated opposite the respective items listed on the attached Price Schedule and as more completely described in the Plans and Specifications dated _____as prepared by the Purchaser. He further agrees that, upon receipt of written notice of the acceptance of this Bid within_____days after the date of opening of the Bids, to execute, if required, the Standard Form of Contract, (mentioned in the Invitation for Bids), in accordance with the Bid as accepted, and to give Bond, if required, with good and sufficient surety or sureties, for the faithful performance of the Contract, within ten (10) days after the prescribed forms are presented for signature.

The Bidder agrees to allow discounts for prompt payment by the Purchaser as follows 10 calendar days_____per cent; 20 calendar days_____per cent; 30 calendar days_____ per cent.

(Time will be computed from date of receipt of correct bill or voucher properly certified by the Contractor in the case of Progress Payments, or from the date of final inspection and acceptance at delivery point in the case of final payment for the completed Contract.

(Witness to Signature) _____ (Full Name of Bidder) _____

By _____
(Title)

_____
(Address)

CONTRACT FOR SUPPLIES

THIS CONTRACT, entered into this _____ day of _____, 19__, by Holmes & Narver, Engineers, hereinafter called the Purchaser, and

a corporation organized and existing under the laws of the State of _____
a partnership consisting of _____

an individual trading as _____
of the city of _____, in the State of _____
hereinafter called the contractor, witnesseth that the parties hereto do mutually agree as follows:

Article 1. Scope of this contract. The contractor shall furnish and deliver to location stated in the General Conditions of the Contract, the following items, all as described in the below described Drawings and Specifications:

a. Six Steel Towers with tower cabs complete.
b. Six Dumb Waiters complete with cab cables, hoisting machine and controls.
c. Miscellaneous mechanical and electrical materials as called for in the Specifications and shown on the above-titled Drawings.

for the consideration stated

in strict accordance with the specifications, schedules and drawings, all of which are made a part hereof and designated as follows:

a. Specifications entitled "Specifications for 75-Foot Steel Tower and Appurtenances" comprising four sections A to E, inclusive, and totaling 19 pages and dated December 9, 1949.

b. Working Drawings and Details entitled "75' Tower" and comprising Sheets No. (3H-603, 3H-604, 3H-605, 3H-606, 3H-345, 3H-346, 3H-370) and dated December 9, 1949

Deliveries shall be made as follows:

Article 2. Changes: Where the supplies to be furnished are to be specially manufactured in accordance with drawings and specifications, the Purchaser may at any time, by a written order, and without notice to the sureties, make changes in the drawings or specifications. Changes as to shipment and packing of all supplies may also be made as above provided. If such changes cause an increase or decrease in the amount due under this contract, or in the time required for its performance, an equitable adjustment shall be made and the contract shall be modified in writing accordingly. Any claim for adjustment under this article must be asserted within 10 days from the date the change is ordered, provided, however, that the Purchaser, if it determines that the facts justify such action, may receive and adjust any such claim asserted at any time prior to the date of final settlement of the contract. If the parties fail to agree upon the adjustment to be made, the dispute shall be determined as provided in Article 12 hereof. But nothing provided in this article shall excuse the contractor from proceeding with the contract as changed.

Article 3. Extras: Except as otherwise herein provided, no charge for extras will be allowed unless the same have been ordered in writing by the Purchaser and the price stated in such order.

Article 4. Inspection: (a) All material and workmanship shall be subject to inspection and test at all times and places and, when practicable, during manufacture. In case any articles are found to be defective in material or workmanship, or otherwise not in conformity with the specification requirements, the Purchaser shall have the right to reject such articles, or require their correction. Rejected articles, and/or articles requiring correction, shall be removed by and at the expense of the contractor promptly after notice so to do. If the contractor fails to promptly remove such articles and to proceed promptly with the replacement and/or correction hereof, the Purchaser may, by contract or otherwise, replace and/or correct such articles and charge to the contractor the excess cost occasioned by Purchaser thereby, or the Purchaser may terminate the right of the contractor to proceed as provided in Article 5

of this contract, the contractor and surety being liable for any damage to the same extent as provided in said Article 5 for terminations thereunder.

(b) If inspection and test, whether preliminary or final, is made on the premises of the contractor or subcontractor, the contractor shall furnish, without additional charge, all reasonable facilities and assistance for the safe and convenient inspections and tests required by the inspectors in the performance of their duty. All inspections and tests by the Purchaser shall be performed in such a manner as not to unduly delay the work. Special and performance tests shall be as described in the specifications. The Purchaser reserves the right to charge to the contractor any additional cost of inspection and test when articles are not ready at the time inspection is requested by the contractor.

(c) Final inspection and acceptance of materials and finished articles will be made after delivery, unless otherwise stated. If final inspection is made at a point other than the premises of the contractor or a subcontractor, it shall be at the expense of the Purchaser except for the value of samples used in case of rejection. Final inspection shall be conclusive except as regards latent defects, fraud, or such gross mistakes as amount to fraud. Final inspection and acceptance or rejection of the materials or supplies shall be made as promptly as practicable, but failure to inspect and accept or reject materials or supplies shall not impose liability on the Purchaser for such materials or supplies as are not in accordance with the specifications. In the event necessity requires the use of materials or supplies not conforming to the specifications, payment therefor shall be made at a proper reduction in price.

Article 5. Delays - Damages: If the contractor refuses or fails to make deliveries of the materials or supplies within the time specified in Article 1, or any extension thereof, the Purchaser may by written notice terminate the right of the contractor to proceed with deliveries or such part or parts thereof as to which there has been delay. In such event, the Purchaser may purchase similar materials or supplies in the open market or secure the manufacture and delivery of the materials and supplies by contract or otherwise, and the contractor and his sureties shall be liable to the Purchaser for any excess cost occasioned thereby: Provided, That the contractor shall not be charged with any excess cost occasioned the Purchaser by the purchase of materials or supplies in the open market or under other contracts when the delay of the contractor

in making deliveries is due to unforeseeable causes beyond the control and without the fault or negligence of the contractor, including, but not restricted to, acts of God or of the public enemy, acts of the Government, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, and delays of a subcontractor due to such causes unless the Purchaser shall determine that the materials or supplies to be furnished under the subcontract are procurable in the open market, if the contractor shall notify the Purchaser in writing of the cause of any such delay, within 10 days from the beginning thereof, or within such further period as the Purchaser shall, prior to the date of final settlement of the contract, grant for the giving of such notice. The Purchaser shall then ascertain the facts and extent of delay, and his findings of fact thereon shall be final and conclusive on the parties hereto, subject only to appeal within 30 days by the contractor to the arbitrator selected in conformity with Article 12 hereof, whose decision on such appeal as to the facts of delay shall be final and conclusive on the parties hereto.

Article 6. Responsibility for supplies tendered: The contractor shall be responsible for the articles or materials covered by this contract until they are delivered at the designated point, but the contractor shall bear all risk on rejected articles or materials after notice of rejection. Where final inspection is at point of origin but delivery by contractor is at some other point, the contractor's responsibility shall continue until delivery is accomplished.

Article 7. Increase or decrease: Unless otherwise specified, any variation in the quantities herein called for, not exceeding 5 percent, will be accepted as a compliance with the contract, when caused by conditions of loading, shipping, packing, or allowances in manufacturing processes, and payments shall be adjusted accordingly. This article shall not apply to assembled items of equipment.

Article 8. Payments: The contractor shall be paid, upon the submission of properly certified invoices or vouchers, the prices stipulated herein for articles delivered and accepted or services rendered, less deductions, if any, as herein provided. Unless otherwise specified, payments will be made on partial deliveries accepted by the Purchaser when the amount due on such deliveries so warrants, or, when requested by the contractor, payments for accepted partial deliveries shall be made whenever such payments would equal or exceed $1,000.

Article 9. Additional security: Should any surety upon the bond for the performance of this contract become unacceptable to the Purchaser, or if any such surety shall fail to furnish reports as to his financial condition from time to time as requested by the Purchaser, the contractor must promptly furnish such additional security as may be required from time to time to protect the interests of the Purchaser and of persons supplying labor or materials in the prosecution of the work contemplated by the contract.

Article 10. Officials not to benefit: No member of or delegate to Congress or resident commissioner shall be admitted to any share or part of this contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

Article 11. Covenant against contingent fees: The contractor warrants that he has not employed any person to solicit or secure this contract upon any agreement for a commission, percentage, brokerage, or contingent fee. Breach of this warranty shall give the Purchaser the right to annul the contract, or, in its discretion, to deduct from the contract price or consideration the amount of such commission, percentage, brokerage, or contingent fees. This warranty shall not apply to commissions payable by contractors upon contracts or sales secured or made through bona fide established commercial or selling agencies maintained by the contractor for the purpose of securing business.

Article 12. Disputes: Except as otherwise specifically provided in this contract, all disputes concerning questions of fact arising under this contract shall be decided by the Purchaser, subject to written appeal by the contractor within 30 days to an arbitrator mutually satisfactory to the contractor and the Purchaser. His decision shall be final and conclusive upon the parties hereto. In the meantime, the contractor shall diligently proceed with performance. Arbitrator's fee will be paid by the party to this contract against whom the arbitrator's decision is made.

Article 13. Domestic articles: Unless the Purchaser shall determine it to be inconsistent with its interest, or the cost to be unreasonable, only such unmanufactured articles, materials, and supplies as have been mined or produced in the United States, and only such manufactured articles, materials, and supplies as have been manufactured in the United States substantially all from articles, materials, or supplies mined, produced, or manufactured, as the case may be, in the United

States shall be delivered pursuant to this contract, except as noted in the specifications and/or other papers hereto attached. The provisions of this article shall not apply with respect to articles, materials or supplies if articles, materials, or supplies of the class or kind to be used, or the articles, materials, or supplies from which they are manufactured are not mined, produced, or manufactured, as the case may be, in the United States in sufficient and reasonably available commercial quantities and of a satisfactory quality.

Article 14. Alterations: The following changes were made in this contract before it was signed by the parties hereto:

In Witness Whereof, the parties hereto have executed this contract as of the day and year first above written.

HOLMES AND NARVER, ENGINEERS

By_____

_____
(Official Title)

Two witnesses:

_____ _____ } Contractor

_____ _____ }

_____
(Business Address)

I,_____, certify that I am the_____Secretary of the corporation named as contractor herein; that_____

_____

who signed this contract on behalf of the contractor, was then

_____

of said corporation; that said contract was duly signed for and in behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

_____ (Corporate Seal)

CFS-7

I hereby certify that, to the best of my knowledge and belief, based upon observation and inquiry,_____, who signed this contract for the_____, had authority to execute the same, and is the individual who signs similar contracts on behalf of this corporation with the public generally.

_____

_____
(Official Title)

CFS-8

SECTION A

GENERAL CONDITIONS

GENERAL:

A-01. The equipment called for in the following specifications will be purchased by Holmes and Narver, Engineers, (hereinafter referred to as the Purchaser). Delivery will be required f.o.b. cars or trucks at vendor's plant.

DELIVERY:

A-02. Prompt delivery of the specified items is especially desired and the guaranteed delivery time specified by each bidder will be definitely considered in the evaluation of the bids. The decision of the Purchaser will be final and conclusive upon all bidders.

SCOPE OF THE WORK:

A-03. The lump-sum price named in the proposal shall include the furnishing of all labor, materials, tools, equipment, and transportation to completely fabricate, package and deliver the following items to the above-designated shipping point:

1. Six Steel Towers and their appurtenances as herein described and as detailed in the accompanying drawings.

2. Six Dumbwaiters of 1,500 pound net capacity complete with all appurtenances as herein described and as detailed in the accompanying drawings.

PREFABRICATION AND TESTS:

A-04. The equipment listed in Paragraph A-03 shall be prefabricated and/or shop tested before shipping as hereinafter described.

TESTS:

A-05. Materials tests shall be performed as called for under the respective A.S.T.M. or other Standard Specifications as noted on the drawings. Required tests shall be made by a Testing Agency approved by the Purchaser and results of such tests shall be reported to the Purchaser

in the form of affidavits attested to by the Testing Agency.

A-06. Other tests shall be conducted as hereinafter specified in the following paragraphs:

Tower Erection	Paragraph B-08
Cab Erection	Paragraph C-22
Mechanical Equipment	Paragraph D-15, D-16

A-07. The costs of all tests called for on the drawings or in these specifications will be borne by the Contractor.

CERTIFICATES OF COMPLIANCE:

A-08. Manufacturer's or processor's certificates of compliance with these Specifications shall be delivered to the Purchaser with each delivery of materials not herein specified or called for on drawings to be tested for compliance. Certificates shall be signed by a qualified, responsible employee of the manufacturer or processor.

A-09. Separate certificates of compliance shall be prepared for each shipping package, crate or bundle. Each certificate shall include statements to the effect that (a) all materials comply with the provisions of these Specifications, (b) all materials are identical (as far as fabricating processes permit) with the materials employed in making the tests listed in Paragraphs A-05 and A-06.

A-10. In addition to the statements outlined above, each certificate shall include a description of the contents of the package, crate, or bundle including the quantities, types of materials, sizes, and any other information required to clearly and completely identify the contents (refer to Paragraphs A-13, A-14 and A-15 that follow).

A-11. Certificates of compliance together with contents lists shall be furnished in quadruplicate, with one copy enclosed in a heavy manila envelope and securely attached to the outside of each container, and two copies forwarded to the Purchaser.

A-12. All material shall be boxed, crated or bundled securely for overseas shipment, and shall be so loaded as to

suffer no damage in transit. Maximum weight of bundles shall be 2,500 pounds, except packaged unit mechanical assemblies which may exceed this weight. Gross weight shall be marked on each bundle.

A-13. All rivets, bolts, clips, and other devices for use in field erection shall be separately packaged, suitably marked, coded and indexed and shall be securely boxed in packing boxes of 2" material reinforced with metal strap bindings. All items which may be bent or damaged in shipment shall be securely crated or boxed to the satisfaction of the Purchaser.

A-14. Vendor shall obtain Purchaser's instructions in regard to the code letter designation to be marked on each crate or package.

DAMP PROOFING:

A-15. Interiors of all boxes, cable reels, etc. shall be lined with doubled layers of Sisalkraft or similar tear-resistant waterproof paper with overlapped joints. All metal items not galvanized or coated with rust preventive paint shall be coated with heavy grease or cosmolene before packing. Wood cable reels shall be lagged with 2" material, and securely metal banded. Metal reels shall be sealed with metal covers welded to the sides. Silica gel dessicants will be inserted in all boxes or sealed packages.

APPLICABLE GOVERNMENT SPECIFICATIONS:

A-16 Where herein referred to, specifications such as Federal Army-Navy, Navy, Army-Navy Aeronautical, etc. shall be considered a part of these specifications.

CONTRACT DOCUMENTS:

A-17 The contract documents consist of the following documents:

1. The Invitation for Bids.
2. The Contractor's Bid.
3. The General Conditions.
4. The Specifications.
5. The Working Drawings and Details.
6. The Contract Form accepting the successful Bidder's Proposal, including Notice to Proceed with the Work.

SECTION B

STRUCTURAL STEEL

GENERAL REQUIREMENTS:

B-01. The General Conditions of the Contract apply the same as if here written.

STRUCTURAL STEEL:

B-02. See General Notes on the drawings for general requirements.

SCOPE OF WORK:

B-03. Includes the furnishing of all labor, materials, transportation, and equipment required to fabricate six steel towers and their appurtenances, complete and delivered f.o.b. trucks or cars at a point designated in Paragraph A-01, General Conditions. Each unit shall be completely coded and indexed and each piece marked for easy identification. One complete tower shaft shall be completely shop assembled to provide a check on the fitting together of all parts and the accuracy of templets and jigs. All steel shall be shop painted.

B-04. Includes the furnishing of all rivets, bolts, clips and other fastening devices required for field erection. Contractor shall furnish all such fastenings in quantities 105% of the actual count of the different types and sizes required.

B-05. All anchor bolts or other fastenings for anchoring of towers and tower guys in concrete footings shall be furnished under this Contract.

SHOP AND SETTING DRAWINGS:

B-06. Four sets of prints of complete shop and setting drawings for each tower shall be submitted to and be approved by the Purchaser before work proceeds. Same shall be completely indexed, shall show piece marks, shall be in sequence, and shall show sequence of welding when excessive locked-in stresses might develop. Apparent discrepancies in the Contract drawings and/or specifications shall be promptly referred to the Purchaser for proper adjustments. Work performed without such disposition may be rejected by the Purchaser.

B-07. Upon approval of shop drawings, tracings shall be corrected as indicated and duplicate sets of prints thereof shall be delivered to the Purchaser.

SHOP ERECTION:

B-08. Contractor shall submit his bid on the basis of a complete shop assembly of one tower shaft. Tower shaft may be erected vertically or horizontally, at Contractor's option, but in such manner as to assure a complete and accurate check of the various parts to guarantee against discrepancies in fit in the final field erection. Turned bolts shall be substituted for Dardelet bolts in test erection. Test erection shall include the erection of stairs, platforms and landings, dumbwaiter guide rails and other items, exclusive of electrical and mechanical items, required to complete the tower shaft below the cab platform level. (Refer to Paragraphs C-23 and D-05(2).

REFERENCES:

B-09. "A.S.T.M." as used herein means "American Society of Testing Materials", "A.I.S.C." as used herein means "American Institute of Steel Construction". "A.W.S." as used herein means "American Welding Society". The specifications of these organizations as referred to herein by name and/or by number shall be as last revised, and are hereby declared a part of this specification insofar as they are applicable to this work and shall have the same force as if written herein. Where the requirements of this specification are in excess of those called for in the A.I.S.C. Specifications or Code of Standard Practice, this specification shall govern.

MATERIALS - KIND AND QUALITY:

B-10. Except as otherwise provided, all materials shall be of the exact size, weight and shape shown, specified or otherwise required. Materials that do not comply with this specification, as evidenced by inspection and/or test reports, will be unconditionally rejected. See general notes on drawings for further information on materials required.

SPECIAL REQUIREMENTS:

B-11. All fabrication shall conform to A.I.S.C. Manual, 1947 Edition, except that tolerances shall be more exacting as follows:

a. No reaming of unfair holes shall be required or permitted. The open holes in all joints, when assembled, shall so match that a rod having the same diameter as the bolts for which they are intended may be inserted in all holes perpendicular to the face of the joint.

b. Leg angles at splices shall be in full bearing at their milled ends with all open holes matched as noted above.

SUBSTITUTIONS:

B-12. Substitutions as are necessary to best fit available stock, will be permitted only on approval by the Purchaser before work proceeds.

CABLE:

B-13. GENERAL REQUIREMENTS: All cable fittings shall develop the full strength of the cables to which they are attached.

B-14. Cutting lengths for all cables shall be verified by the Purchaser before fabrication. This Contractor shall check all clearances for cable hardware provided in the towers and their anchorage shall notify the Purchaser if any changes are required.

B-15. Cables shall be suitably packaged in well made wood or metal containers and properly marked for easy identification. See paragraph A-15 for weatherproofing, etc.

GUYS:

B-16. Guys shall be 1¼" galvanized steel bridge strand having the following properties:

Min. Breaking Strength	194,000 lbs.
Min. Elastic Limit	97,000 lbs.
Min. Modulus of Elasticity of the Cable	24,000,000 p.s.i.

Sockets for these cables shall be installed at the fabricating plant and tested to 150% of working load.

CLEANING:

B-17. All structural steel after shop fabrication shall be thoroughly cleaned of all grease, oil or mill scale. Cleaning shall be done with steel brushes, sand blast,

hammers, scrapers, or chisels. Oil and grease shall be removed by wiping with benzine or gasoline. This Contractor may use any other method for cleaning structural steel, if approved by the Purchaser.

PAINTING:

B-18. Before removal from the shop, the steel work shall be given two (2) shop coats of oil base zinc chromate Metal Primer rust preventive paint of a standard brand approved by the Purchaser. Abrasions which occur in prefabrication, packing, shall be touched up with the same material before shipment. Surfaces to which paint is applied shall be perfectly dry and clean. Successive coats shall vary in shade to avoid confusion as to which have been painted. Machine finished surfaces shall be given a temporary coat of white lead and tallow.

B-19. Anchors, etc. which are later to be buried in concrete shall be given the same temporary paint treatment as specified for milled surfaces.

SECTION C

MISCELLANEOUS METAL WORK, WINDOWS, AND PLYWOOD SIDING

GENERAL REQUIREMENTS:

C-01. The General Conditions of the Contract apply the same as if here written.

C-02. Refer also to General Notes on the drawings for general requirements.

SCOPE OF WORK:

C-03. Includes furnishing all labor, materials, transportation and equipment required to fabricate miscellaneous metal work and plywood work and shop fit same to the structural frame of the towers with all connections ready for field erection. All items shall be completely indexed, coded and marked for easy identification.

C-04. Includes furnishing and installing aluminum marine windows as specified.

C-05. The painting of all steel and wood items is included.

C-06. Includes the furnishing of all bolts and other fastening devices required for field erection. Contractor shall furnish all such fastenings in quantities 105% of the actual count of the different types and sizes required.

SHOP DRAWINGS:

C-07. Four sets of prints of complete shop drawings of all stairs, platforms, and tower cabs shall be submitted to and approved by the Purchaser before work proceeds. Drawings shall be completely indexed and shall show piece marks.

STAIRS:

C-08. Steel stairs shall be provided as detailed, from cab floor level to ground level. Stairs shall consist of channel stringers with plate treads. Stair sections shall be shop fabricated with pipe railings attached and with shelf angles set and drilled for attachment of treads in the field.

PIPE HANDRAILS:

C-09. Pipe handrails shall be provided at stairs and platforms as shown on drawings and shall be fabricated of galvanized steel pipe formed and attached as detailed.

PLATFORMS AND LANDINGS:

C-10. Platforms and landings shall have steel plate decking cut to fit and ready for bolting to channel frames. Steel plate decking and stair treads shall be of thicknesses shown on plans and shall be solid plates with raised pattern "U.S.S. Miltigrip" as manufactured by U. S. Steel or approved equal.

SAFETY CHAINS:

C-11. Provide steel link safety chains where called for on drawings. Safety chains shall be coil chains galvanized proof size 3/16", and shall be furnished with corrosion resistant snap having covered brass spring. Provide galvanized eye bolts at pipe railing posts for attaching safety chains.

TOWER CABS:

C-12. Tower cabs shall be fabricated as detailed on the drawings and, except for plywood siding, shall be of all aluminum construction.

C-13. Cab shall have aluminum sheet roofs and aluminum tread plate floors shop riveted to the frame work. Floors and roof shall be fabricated in two sections each as indicated on drawings.

C-14. All aluminum, including fastenings for plywood siding, shall be R361-T6(T) or other alloy if approved by Purchaser. Rivets, bolts or other fastenings if supplied in 17S or 24S alloys shall be anodized or otherwise made corrosion resistant. All steel fastenings required for attaching aluminum members to steel shall be galvanized.

C-15. Anti-Seize Compound shall be used in all threaded aluminum alloy assemblies except those involving machine screws or self tapping screws only. The compound shall be in accordance with Army-Navy Aeronautical Specification AN-53 or AN-P-51 or shall have equal or greater anti-seized properties and equivalent characteristics in other respects.

C-16. Plywood siding shall be of sizes called for on drawings and shall be exterior type Douglas Fir plywood "EXT-DFPA·A-B", as graded by the Douglas Fir Plywood Association. Siding shall be shop riveted to framework and fabricated into panels, as shown on drawings, for field erection.

C-17. Provide wood doors to tower cabs where shown and as detailed on drawings. Plywood for door panels shall be as above specified for siding. Panel frame shall be Douglas Fir stress grade No. 2 Framing as graded by the West Coast Lumberman's Association. All intersections shall be blind mortise and tenoned or doweled with hardwood dowels, and shall be glued up with an approved phenolic resin or resorcinol resin type glue. Panels shall be securely attached to frame with aluminum wood screws set in. Provide brass strap hinges, safety hasps, and hook and eye sets as shown. Doors shall be shop hung with all hardware set.

C-18. Provide marine type windows where called for on drawings. Windows shall be aluminum frame marine windows Wilcox, Crittenden & Co., Inc. Fig. 5258 size 10" x 21" as distributed by Marine Hardware Co., San Pedro, California or approved equal. Windows shall be furnished and installed complete with 3/8" wire glass and chrome-plated window screens covered with plastic or aluminum mesh screening. Windows shall be shop riveted to panels and installed to open in. Openings between window frame and panel shall be calked solid with mastic, which shall be Kuhls' "Elastic" or approved equal. Mastic elsewhere called for or required shall be the same.

PAINTING:

C-19. Miscellaneous steel items shall be painted as called for in paragraph B-18, except that the first coat over galvanized steel shall be a standard approved brand of galvanized metal primer paint.

C-20. All surfaces of all wooden members such as siding and doors, after fabrication and before assembly, shall be given one coat of paint; with a second coat applied after tower cab panels are assembled. Paint shall have a phenolic or vinyl base and shall be subject to Purchaser's approval. Paint shall be applied by brush, well worked in, with first and second coats tinted a different shade. Surfaces to receive paint shall be perfectly clean and dry, with sappy areas sealed with shellac.

C-21. Where aluminum members are to be fastened to steel supporting members, the aluminum bearing surfaces shall be given a heavy shop coat of alkali resistant, bituminous paint or coat of zinc chromate primer of phenolic resin or alkyd resin type. Except for this provision, aluminum surfaces shall not be painted.

SHOP ERECTION:

C-22. Contractor shall submit his bid on the basis of a complete shop assembly of one tower cab. Cab shall be erected in a vertical position and shall be demonstrated to be accurately fitted to the tower shaft.

C-23. The shop erection of one tower shaft as called for in Paragraph B-08 shall include the erection of stairs, platforms and landings, and all other items herein specified or shown on drawings, required to complete the tower shaft below the cab platform level.

SECTION D

MECHANICAL WORK

GENERAL REQUIREMENTS:

D-01. The General Conditions of the Contract apply the same as if here written.

SCOPE OF WORK:

D-02. The work included under this section of the specifications shall include furnishing all material, equipment, and labor to deliver the following items properly painted, tested, packaged, and identified in a manner suitable for export, to the point designated; all as called for in Section A, General Conditions:

1. Dumbwaiters, complete with cabs, guide rails, cables, hoisting machines, and electrical control equipment.

2. Miscellaneous materials.

QUANTITY REQUIRED:

D-03. All of the equipment and materials specified herein or shown on the drawings is required for each of the six towers.

DUMBWAITER:

D-04. Load Capacity and Speed: Dumbwaiter shall be capable of lifting a net working load of 1500 pounds at a maximum hoisting speed of 40 feet per minute.

D-05. Construction shall be as detailed on the drawings.

1. Cab shall be of open-type, all-welded steel construction.

2. Guide rails shall be standard 15 pounds per foot, elevator type steel rails as detailed on the drawings. Test erection of tower shaft called for in Paragraph B-08 shall include erection of these rails.

3. Guide Rollers shall be phosphor bronze (SAE Standard No. 64), provided with grooves for grease. Spindles shall be drilled 1/8" for grease hole and provided with 1/8" Alemite threaded drive fittings.

4. Sheaves shall be cast steel for wire rope, with machined grooves as detailed on the drawings.

5. Bushings shall be phosphor bronze (SAE Standard No. 64), with four 1/8" x 1/16" grooves for lubricating grease.

6. Spindles shall be cold rolled steel, turned and ground, and provided with 1/8" grease hole tapped at end for 1/8" Alemite fitting.

D-06. Mechanical Safety Device shall be of the automatic rail gripper type actuated by a broken or slack rope.

1. Safety Device shall consist of two steel shoes of proper design to receive and maintain, in each shoe, a knurled hardened roller in a beveled milled pocket, and connected to the rotatable lifting lever by an arrangement of adjustable rods, clevises, and levers. The levers are connected, at the lifting cable end, of the rotatable lifting lever, through a suitable linkage. A suitable extension spring is attached to the opposite end of the lifting lever. The lifting lever is maintained in its retired position by the pull of the lifting cable, allowing the knurled rollers to remain at the bottom of the milled pockets and clear of the guide rails. In the event of breakage of the lifting cable, the extension spring will return to its unloaded position, causing the lifting lever to rotate clockwise, thereby actuating the levers which in turn push the knurled rollers up into contact with the guide rails and thus wedge and lock the dumbwaiter in an instantaneous stop. The safety shoes shall be milled to give free running clearance to the guide rails and shall not be in contact with the rails in normal operation.

HOISTING MACHINES:

D-07. Conditions of Operation: Machines will be required to function satisfactorily when installed at an elevation of approximately ten (10) feet above sea level and when operating at an ambient temperature of 95° F. and a relative humidity of 87 percent, with heavy concentrations of fine salt spray. Use will be similar to that of a typical industrial dumbwaiter.

D-08. Construction: Each machine shall conform to the following requirements of construction and design:

1. Type: Base-mounted drum type with all operating mechanism completely enclosed within a dust and moistureproof enclosure.

2. Hoist Gearing: Single worm or spur gear type.

3. Bearings: Ball or roller type.

4. Lubrication: All gears and bearings shall operate in an oil bath.

5. Winding Drum: Machine grooved and capable of holding not less than 96 feet of 3/8" wire rope in a single layer without overlapping. Drum shall be provided with flanges effectively guarded to prevent rope leaving drum. Provide sufficient space between drum and dust cover to allow two layers of 3/8" wire rope.

6. Rope Anchorage: Hoisting rope shall be dead-ended to the hoist drum by means of a suitable safety anchorage.

7. Load Brake shall be provided to hold load when motor is at rest and to prevent excessive speed when lowering load.

8. Motor Brake shall be provided to bring the motor to rest immediately in the event of current interruption from any cause. Brake shall be connected in the motor circuit and shall be normally locked, except when held off by current flowing through its windings.

9. Motor: Totally enclosed, alternating current, specifically designed for hoisting service, and suitable for operation with 208 volt, 3 phase, 60 cycle current.

10. Limit Switches shall be provided as an integral part of each hoisting machine to bring the load to a positive stop at both the upper and lower limits of travel.

11. Controller shall be single speed magnetic contactor type, operated by holddown type "up" and "down" push buttons. Controller and push button control shall be integral parts of each hoisting machine, with all wiring enclosed in permanent metal conduits.

12. Dumb Waiter Hoisting Machine shall be "Yale Cable King" wire rope electric winch Model SC 3/4 C 96 Ft 40, or approved equal, having a capacity of 1500 pounds line pull at a line speed of 40 feet per minute maximum.

HOISTING CABLES:

D-09. Paragraphs B-13, B-14 and B-15, Cable, shall also apply to cable specified below.

D-10. Dumbwaiter Cable shall be John A. Roebling's Sons Company's or the approved equal, 3/8" diameter 8 x 19 extra flexible, blue center steel hoisting rope having a breaking strength of not less than 10,480 pounds.

MISCELLANEOUS:

D-11. Anchor Bolts and Nuts shall be provided to permit anchoring each base-mounted piece of equipment to concrete foundation.

D-12. Templets: Full size bolt setting templates shall be furnished to permit accurate setting of anchor bolts in concrete foundations at time of pouring.

D-13. Miscellaneous Hardware and Material required for a complete workmanlike installation shall be furnished whether shown on drawings or mentioned in these specifications.

PAINTING:

D-14. All exposed metal, unless otherwise protected with an approved factory applied finish, shall be given two shop coats, brushed on, of oil based Chromic Metal Primer rust preventive paint, or quick drying Red Lead multiple pigment primer, of a standard brand approved by the Purchaser. All metal to be painted shall be thoroughly cleaned after fabrication of all grease, oil or other foreign substance. Oil or grease shall be cleaned by wiping with benzine or gasoline, other foreign substances by use of wire brushes or other acceptable means so that all surfaces are perfectly clean before painting.

TESTS:

D-15. This Contractor shall furnish all material, equipment and labor to test the operation of one complete dumb-

waiter system prior to its packaging and delivery. These tests shall be made in the presence of a representative of the Purchaser prior to the packaging and delivery of the systems. In order to make the tests, a temporary installation of each complete system shall be made utilizing suitable structures and facilities available to the contractor. Full 75-foot lift will not be required. Tests shall full verify the proper functioning of the system and shall include power consumption, safety, and time-distance tests at specified loads.

D-16. In order to test the dumbwaiter safety device, a drop test shall be made. The dumbwaiter with full load shall be dropped and the following data reported:

1. Dead weight of cab, cab sling, safety device, etc.

2. Live load on the cab.

3. Total distance in inches which the cab traveled until stopped by safety device.

4. Distance in inches cab traveled after safety device engaged the rails, as measured from the actual marks on the rails.

5. Speed in feet per minute at the instant the safety device engaged the rails.

6. The difference in elevation of the guide shoes on the opposite sides of the cab.

SECTION E

ELECTRICAL WORK

GENERAL REQUIREMENTS:

E-01. The General Conditions of the Contract apply the same as if here written.

SCOPE OF WORK:

E-02. The work included under this section of the specifications shall include furnishing all material, equipment, and labor to deliver the following items properly painted, tested, packaged, and identified in a manner suitable for export to the point designated; all as specified in Section A, General Conditions:

A. Grounding system
B. Obstruction light and controls
C. All electrical materials and equipment on the tower and in the tower cab, except as noted in Paragraph E-03.
D. All clamps, bolts, plywood, structural supports, and miscellaneous materials.

E-03. The following items are shown on the drawings but are to be furnished by others:

A. Conduit and wiring for winch.
B. Cables, wire, and terminal box for telephone and signal.

QUANTITY REQUIRED:

E-04. All of the equipment and materials specified herein or shown on the drawings is required for each of the six towers.

CONDUIT:

E-05. All conduit on the tower shall be steel; conduit at the tower cab level shall be aluminum, except as noted otherwise on the drawings. Steel conduit shall be galvanized, rigid steel and shall have all the characteristics specified in the Rigid Steel Conduit Industry Standards for standard rigid steel conduit (zinc coated). Aluminum conduit shall be equal in quality to tubing

manufactured for conduit use by Aluminum Company of America. All conduit shall bear the Underwriters' label of approval. Conduit shall be provided in standard lengths of ten feet, complete with coupling.

CONDUIT CLAMPS:

E-06. Provide clamps for securely supporting all conduits. Vertical conduit risers on tower shall be supported by means of Korn conduit supports, or equal, spaced as indicated on the drawings. All aluminum conduits shall be supported by means of one-hole cast aluminum clamps. A sufficient quantity of clamps shall be provided to support conduit within 12 inches of each outlet and at spacings not to exceed five (5) feet.

WIRE:

E-07. All wire shall be solid copper conductors (98% conductivity), 600 volt insulation, stamped for size, type and voltage with registered marker. All wire shall be approved for installation in wet locations and shall be Type TW as manufactured by General Electric, Simplex, National Electric, or equal.

CONDUIT FITTINGS:

E-08. All conduit fittings shall be of the cast metal type. Fittings installed on the tower shall be of cast iron alloy material and shall be equal to Crouse-Hinds condulets; fittings installed at the cab level shall be cast aluminum and shall be Millark, or equal. Provide gaskets for all fittings installed in outside locations.

LOCKNUTS AND BUSHINGS:

E-09. Provide two locknuts and one bushing at locations at which conduit terminates in panels or pull boxes, except where hubs are shown. Provide one locknut at locations at which conduit terminates at a conduit fitting, or a fixture. Locknuts and bushings shall be of the same type of metal as the conduit to which they are attached. Provide extra material in the amount of ten percent above the required quantity.

WIRING DEVICES:

E-10. Wiring devices shall be provided as follows:

A.	Single pole switch	Bryant #4961, or equal
B.	Three way switch	Bryant #4963, or equal

C.	Duplex receptacles	Bryant #TL7580, or equal
D.	Push button station	Square D, B-32, or equal

FIXTURES:

E-11. Provide all lighting fixtures as described on the drawings, as manufactured by Killark, Electric Manufacturing Company, or equal.

PANEL:

E-12. Panel shall be provided for 120/240 volt, 3 wire supply with branch circuit breakers as indicated on the schedule, and shall be Square D Company, Type MB, or equal.

PULL BOXES:

E-13. Pull boxes and covers shall be made of #14 gauge galvanized steel, flanged for cover, complete with brass machine screws. Pull box "A" shall be of weatherproof construction with provisions for time switch installation, as detailed on the drawings.

SIGNAL LIGHT:

E-14. Provide signal light as indicated on the drawing.

GROUNDING SYSTEM:

E-15. Provide one lightning rod, ground cable, ground rods and clamps as shown on the drawings. Ground cable shall be #4/0 MHD stranded, bare copper wire. Cable shall be fastened to tower by means of one-hole, galvanized steel, conduit clamps; quantity furnished shall provide for spacing of clamps as indicated on the drawings. Ground rods shall be 1" O.D. x 8 feet long, of copperweld construction. Ground clamps shall be equal to the types and makes indicated on the drawings.

OBSTRUCTION LIGHT AND CONTROLS:

E-16. Provide Crouse-Hinds Type VAW, or equal, double fixture obstruction light, complete with lamps, transfer relay time clock and pilot light, as indicated on the drawings.

PAINTING:

E-17. All exposed metal, unless otherwise protected with an approved factory applied finish, shall be given two shop

coats, brushed on, of oil based Chromic Metal Primer rust preventive paint, or quick drying Red Lead multiple pigment primer, of a standard brand approved by the Purchaser. All metal to be painted shall be thoroughly cleaned after fabrication of all grease, oil or other foreign substance. Oil or grease shall be cleaned by wiping with benzine or gasoline, other foreign substances by use of wire brushes or other acceptable means so that all surfaces are perfectly clean before painting.

SPECIFICATIONS
for
CONSTRUCTION OF FACILITIES
on
ISLAND "A"

HOLMES & NARVER
Incorporated
ENGINEERS
824 South Figueroa Street
Los Angeles 17, California

April 20, 1950

ADDENDUM #1 TO SPECIFICATIONS

FOR

CONSTRUCTION OF FACILITIES ON ISLAND "A"

FOR

THE UNITED STATES ATOMIC ENERGY COMMISSION

The following changes shall be incorporated into and made a part of the specifications:

TABLE OR CONTENTS:

Under Division 5 add additional line to read: "Emulsified Asphalt Dust Palliative".

DIVISION 1:

In paragraph 1-16, line 3 delete the word "unused" and substitute therefore the word "surplus".

DIVISION 2:

In paragraph 2-07, starting at line 2 delete the following "not more than 6" in greatest dimension and stock piled".

DIVISION 3:

In paragraph 3-07, line 1 delete the following: "Footing excavations and".

DIVISION 4:

(1) In paragraph 4-01, line 3 after the word "of" insert the word "building".

(2) Change paragraph 4-04 to read as follows:

Excavations shall be of the open cut type. Banks shall be cut as nearly vertical as possible. The

banks of trenches in coral sand may be sloped back to the natural angle of repose of the material being excavated, but care shall be exercised not to exceed the natural angle of repose.

(3) Change paragraph 4-05 to read as follows:

Trenches to receive pipe, conduit, etc. shall be excavated true to line and grade and accurately sloped to drain in accordance with the drawings and the requirements of the mechanical tradesmen concerned. Trench bottoms shall be of sufficient width to provide a clear space of not less than six (6) inches on either side of the outside of the barrel of the pipe. The width of trench bottoms shall be not more than the outside diameter of the barrel of the pipe plus eighteen (18) inches. However, where ground conditions are such as to make this impractical, or where the width is increased for any other reason, the pipe shall be bedded in such a manner that the resulting increased supporting strength of the pipe will be sufficient to provide adequately for the increase in load or vulnerability to impact which such widening will cause. Where sheathing is required, trench widths shall be increased correspondingly.

DIVISION 5:

Add the following paragraphs to this division:

EMULSIFIED ASPHALT DUST PALLIATIVE:

5-15. Description: Emulsified Asphalt Dust Treatment shall consist of dust lightly bound and penetrated with diluted emulsified asphalt as hereinafter described. The treatment will not produce a pavement, but only a dust palliative to reduce dust nuisance.

5-16. Materials: The material to be treated consists of coral surfacing in place on the area to be treated. The only additional materials required for the treatment are emulsified asphalt, Grade, HRM, and water.

5-17. Construction: The surface to be treated shall be dragged or fine-graded to required smoothness. If the depth of loose dusty material is excessive or unequal, the area should be thoroughly wetted with water and compacted under traffic or by rolling before treatment is begun. Deep dusty spots shall be eliminated prior to treatment.

An ordinary water tank sprinkler or a pressure distributor truck equipped with either gravity or a pressure fed spray-bar shall be used for distribution of the emulsified asphalt. The emulsified asphalt shall be diluted with from ten (10) to twenty (20) parts of water for each part of emulsified asphalt. The dilution shall be made by placing the required quantity of emulsified asphalt in the tank of the distributor, and then the required amount of water shall be added to the emulsified asphalt.

The rate of dilution will depend on the quantity of fine dusty material on the surface to be treated. The higher dilutions will be used where there is a considerable quantity of dust to be treated, and the lower dilutions where there is a relatively small quantity of fine, loose material, or where the material is sandy or coarse in character. Where there is a considerable quantity of loose material, it will be desirable to drag the surface with a chain-fence drag or a broom drag immediately after the application of diluted emulsified asphalt, to secure better dispersion and to prevent the formation of pools and asphalt skin.

Each treatment will usually require two (2) or more separate applications of dilute emulsified asphalt. The total quantity of emulsified asphalt required for each treatment will usually range between .15 and .25 gallon of emulsified asphalt per square yard measured prior to dilution. Several trials should be made to determine the most suitable quantity of emulsified asphalt, the proper rate of dilution, and the number of applications in each treatment. The objective is to coat the dust particles with a thin film of asphalt without forming a sticky crust or a brittle mat. Where a heavy layer of dust exists, as on earth roads, a preliminary application of water will improve the uniformity of the results. Retreatments may usually be somewhat lighter than the original treatment.

DIVISION 6:

(1) In paragraph 6-13, line 1, after "1" x 8" ", insert in parenthesis the word "(minimum)".

(2) In paragraph 6-32, line 1, change "surfaced" to "surfaces"; line 3, change "beveled" to "chamfered".

(3) In paragraph 6-33, last line, add: "or a wood float finish".

(4) In paragraph 6-34, line 1, delete: "Base Operations Building and the" and change the "doors", line 1 and "locations", line 3 to the singular number.

DIVISION 7:

In paragraph 7-08, line 5, complete sentence by adding: "Steel Company".

DIVISION 8:

(1) In paragraph 8-08, "Schedule" change sub-paragraphs to read as follows;

Studs to bearings:
Toe nail----------3-16d

Joists or rafters to bearings:
Toe nail----------3-16d

Tail joists to headers, except when in hangers:
Toe nail---------- 16d

(2) In paragraph 8-16, line 5, delete the word "putty" and substitute therefor "cold water type putty, sanded smooth".

DIVISION 10:

In paragraph 10-23 j. line 2, page 10-10, delete the words "throughout the entire length", and substitute therefor the words "on the south 6200 feet".

DIVISION 13:

In paragraph 13-19, delete the second sentence and substitute therefor: "All fittings will be belled on both ends."

DIVISION 15:

In paragraph 15-37 c. change the first word from "Ware" to "War".

DIVISION 18:

In paragraph 18-47, change the second sentence to read as follows: "All Soil, Waste and Vent lines shall be tested by filling with water to the highest point in the system."

DIVISION 20:

(1) In paragraph 20-05, starting with line 4, delete the phrase beginning with the words "and grouted" and substitute therefor "and shall be bedded in grout consisting of one part cement and two parts sand to a minimum thickness of 1/2 inch".

(2) In paragraph 20-11, line 2, after the word "be" insert the word "schedule".

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Incorporated
824 South Figueroa Street
Los Angeles 17, California

March 23, 1951

ADDENDUM #2 TO SPECIFICATIONS

FOR

CONSTRUCTION OF FACILITIES ON ISLAND "A"

FOR

THE UNITED STATES ATOMIC ENERGY COMMISSION

The following changes shall be incorporated into and made a part of the specifications:

DIVISION 1.

(1) Add the following paragraphs under heading "Statement of Work".

1-01a. Scientific Structures classified "Secret" are not included in these specifications. The complete specifications for scientific structures, including those on Island "A" are contained in Volume IV of "Specifications for Construction of Proving Ground Facilities at Eniwetok Atoll for The United States Atomic Energy Commission" dated March 23, 1951, which is on file with the Commission and the A-E-C-M.

1-01b. Specifications covering Building No. 116 are not included in these specifications but are contained in the four Volumes comprising "Specifications for Construction of Proving Ground Facilities at Eniwetok Atoll for the United States Atomic Energy Commission" dated March 23, 1951.

(2) Rewrite the first sentence of paragraph 1-03 to read as follows:

The list of the drawings accompanying these specifications, for security reasons, is not attached hereto, but is contained in Appendix "A" which is hereby incorporated into these specifications. Copies of Appendix "A" to these specifications are on file with the Commission and the A-E-C-M.

SPECIFICATIONS FOR CONSTRUCTION OF FACILITIES ON ISLAND "A"

TABLE OF CONTENTS

TABLE OF CONTENTS

DIVISION 1

GENERAL CLAUSES

DIVISION 2

SITE PREPARATION AND DEMOLITION

DIVISION 3

EARTHWORK FOR STRUCTURES

DIVISION 4

EARTHWORK FOR UTILITIES

DIVISION 5

ROADS, AIRFIELD, ASPHALTIC CONCRETE PAVING AND DIKES

DIVISION 6

CONCRETE AND FORM WORK

DIVISION 7

METALWORK AND METAL BUILDINGS

DIVISION 8

CARPENTRY AND RELATED WORK

DIVISION 9

MINERAL SURFACED ROOFING

DIVISION 10

PAINTING

DIVISION 11

FENCING AND GATES

DIVISION 12

TIMBER PIERS AND APPROACHES

DIVISION 13

FRESH AND SALT WATER DISTRIBUTION SYSTEMS

DIVISION 13
(cont'd)

DIVISION 14

SANITARY SEWERS

DIVISION 15

ELECTRICAL GENERATION AND DISTRIBUTION

DIVISION 15
(cont'd)

DIVISION 16

INTERIOR WIRING FOR LIGHT AND POWER

DIVISION 17

TELEPHONE SYSTEM

DIVISION 18

PLUMBING

DIVISION 18
(cont'd)

DIVISION 19

INSTALLATION OF MISCELLANEOUS MECHANICAL EQUIPMENT

DIVISION 20

INSTALLATION OF EQUIPMENT AND PIPING FOR POWER AND WATER DISTILLATION PLANT

DIVISION 21

P. O. L. FACILITIES

DIVISION 22

BOILER HOUSE STEAM AND CONDENSATE PIPING

DIVISION 23

DEHUMIDIFICATION, VENTILATION AND REFRIGERATION

DIVISION 23
(cont'd)

Where "as shown", "as indicated", "as detailed", or terms of similar import are used, it shall be understood that reference to these drawings is made unless otherwise stated. Drawings are the property of the United States Atomic Energy Commission, and shall not be used for any other purpose other than that contemplated by the specifications.

1-04. In addition, work shall conform to supplemental detail sheets which may be issued, and to approved shop drawings insofar as they do not conflict with the above listed drawings.

DEFINITION OF TERMS:

1-05. The following terms as used in these specifications shall be defined and interpreted as follows:

a. "Owner": The United States Atomic Energy Commission, or its authorized representative.

b. "Builder": The United States Army, Seventh Engineer Brigade.

c. "Engineer": The authorized supervisory representative of the United States Atomic Energy Commission.

d. "Work" or "Project": The construction work in whole or part as outlined under "General Requirements" paragraph 1-01.

e. "Plan", "Plans" or "Drawings": Drawings as defined in paragraphs 1-03 and 1-04.

AUTHORITY OF ENGINEER:

1-06. The Engineer shall have the authority to establish lines, grades and controls for construction, and to inspec all work for quality and for compliance with plans and specifications.

1-07. The Engineer shall decide, within the provisions of the specifications, all questions which may arise concerning the quality or acceptability of work performed. He shall have the right to reject materials and workmanship which he judges to be defective or not in compliance with the plans and specifications, and to require their correction.

DIVISION 1

GENERAL CLAUSES

STATEMENT OF WORK:

1-01. The intent of these specifications and accompanying drawings is to provide for the construction of the designated facilities, including all necessary utilities and appurtenances, complete and ready for use, on Island "A", for the United States Atomic Energy Commission; the project including principally:

a. Ground Improvements, including roads, air field, earth stabilizing, surface drainage and fence work.

b. P. O. L. (Fuel) Facilities.

c. Fresh and Salt Water Facilities and Distribution Systems.

d. Sanitary Sewage System.

e. Electric Generating and Distribution System.

f. Interior Wiring.

g. Piers and Approaches.

h. Buildings and Other Structures of the Type indicated on the drawings and further described in these specifications; and the installation therein of all equipment shown on the drawings or required for the work.

1-02. The specifications and accompanying drawings are complementary. Work called for in either of them shall be executed the same as if called for by both. Errors or inconsistencies in the specifications and/or drawings or the omission from them of work or information necessary to the proper completion of the project shall be reported immediately to the Engineer and his instruction obtained before work proceeds.

DRAWINGS:

1-03. The drawings accompanying these specifications are to be found in Appendix "A" of these specifications.

1-08. When the terms "as directed", "as required", "approved" or words of similar import are used, it shall be understood that the direction, requirement or approval of the Engineer shall be obtained before work proceeds.

CHANGES:

1-09. The owner may at any time, by a written Addendum to the specifications, or Revision to a drawing, make changes in the specifications and drawings, change the location of the work, omit certain work and/or require additional work.

WORK TO BE PERFORMED BY OWNER:

1-10. All materials and equipment required by and becoming a permanent part of the completed project will be furnished at the jobsite shipside by the Owner, except those items which are clearly specified to be furnished by the Builder.

1-11. The owner, through his representative, the Engineer shall provide such trades foremen and other supervisory personnel as he shall judge to be required.

WORK TO BE PERFORMED BY THE BUILDER:

1-12. The Builder shall unload at shipside all materials and equipment as furnished by the Owner, shall transport same to the jobsite, and shall suitably protect all equipment and materials until the project is completed.

1-13. The Builder shall furnish all labor except supervisory personnel hereinbefore mentioned, and all storage facilities, tools, equipment, forms, scaffolding, etc., required for the work. He shall provide all necessary temporary service, such as electric power, water, steam, compressed air, heat, etc. He shall furnish for the permanent installations, only such materials as are specifically noted on the plans or specifications to be furnished.

1-14. The builder shall provide all barricades, guards, lights, and warning signs usual, necessary, or required by the Engineer for the safety of all persons and property and of the work.

CONSTRUCTION SCHEDULE:

1-15. The Builder shall, within ten (10) days after

starting work, furnish to the Engineer for approval, a construction schedule, showing the order in which he proposes to carry on the work, the dates on which he will start the several salient features, and the contemplated dates for completing the same. The schedule shall be in the form of a progress chart to be prepared on a form approved by the Engineer. The Builder shall enter on the chart the actual progress at the end of each week or at intervals as specified by the Engineer, and shall immediately deliver to the Engineer five copies thereof.

CLEANUP:

1-16. The Builder shall at all times keep the constructic and storage areas free from accumulations of waste materia or unused construction materials, and upon completion of the work shall remove any rubbish from and about the premises and all tools, scaffolding, equipment and materials not the property of the owner.

DIVISION 2

SITE PREPARATION AND DEMOLITION

GENERAL REQUIREMENTS:

2-01. The work covered by this division of the specifications consists of furnishing all labor and equipment and of performing all work required to prepare the site for construction operations.

CLEARING:

2-02. Clearing shall consist of the removal of trees and other vegetation within the construction areas, together with down timber, snags, brush and rubbish. Only such trees shall be removed as are designated for removal on the plans or directed to be removed by the Engineer. Trees designated to be left standing within the cleared areas shall be protected from damage during construction operations by the erection of barriers or by other approved means.

GRUBBING:

2-03. Grubbing shall consist of the removal and disposal of all stumps and roots within the designated areas. In foundation areas, stumps, roots and other debris not suitable for foundation purposes shall be removed to a depth not less than 18 inches below any subgrade.

DEMOLITION:

2-04. Demolition shall consist of the removal and disposal of all buildings or other structures, including concrete slabs, shown on the plans or required by the Engineer to be removed.

DISPOSAL OF CLEARED MATERIAL:

2-05. All timber, stumps, roots, brush and other refuse shall be burned or otherwise disposed of as directed by the Engineer.

2-06. Salvageable materials, as designated by the Engineer, shall be separated and stored as directed. Suitable salvaged materials may be used in the new construction if approved for use by the Engineer. Materials not designated as salvageable shall be disposed of as directe

2-07. When so directed by the Engineer, concrete slabs or other concrete to be removed shall be broken into fragments not more than 6" in greatest dimension and stock piled for use as fill material.

DIVISION 3

EARTHWORK FOR STRUCTURES

GENERAL REQUIREMENTS:

3-01. This division of the work includes furnishing all labor and equipment required to complete earthwork for structures and appurtenances as shown on the plans and herein specified.

3-02. Earthwork for utility lines outside structures is specified in Division 4 of the specifications, and for roads and airfield is specified in Division 5.

EXCAVATION:

3-03. All debris, including roots, weeds, sod or other organic matter, shall be removed from earth over which buildings or other structures are to be placed.

3-04. Excavations shall be to depths, lengths and breadths indicated and/or required for the proper installation of all work to be placed on or in earth, with ample allowance for proper installation and removal of form work, for placing of waterproofing, and for inspection.

3-05. Excavations to depths shown for foundations shall reach suitable supporting material. When suitable supporting material is not reached at depths shown on drawings, the Engineer's instructions shall be obtained and followed.

3-06. When foundation excavations are erroneously made deeper than required, the extra depth shall be filled with concrete as specified for foundations.

3-07. Footing excavations and all trimming shall be by hand. Excavations for footings may be made to net sizes only if approved by Engineer. Changes in footing grades shall be stepped, not sloped.

3-08. Bottoms of trenches shall be trimmed to true level, all loose materials removed, and bottoms moistened and tamped firm before concrete is placed.

3-09. The Engineer shall inspect and approve all earthwork before earth fill and/or concrete is placed thereon.

WATER AND SHORING:

3-10. Water shall be removed from excavations as soon as it accumulates. Ground surfaces near excavations shall be sloped to drain away when possible.

3-11. Shoring, bracing and like devices shall be provided as required for support of adjoining materials to remain in place and shall be removed when no longer required.

BACKFILL:

3-12. Backfill material shall be sound excavated material or equal borrowed materials as approved by Engineer; and shall be free of debris and organic matter, and rock or concrete fragments over 6 inches in diameter. Material shall be thoroughly divided and properly dampened to optimum moisture content.

3-13. Backfill shall be placed only after all formwork, shoring, debris, cave-in or other loose material has been removed, after waterproofing, if called for, has been applied; and after work on which or against which backfill is to be placed has been inspected and approved by the Engineer.

3-14. Placing of backfill shall be in layers of 6 inch maximum thickness, each layer being compacted to 90% of maximum density. Compaction shall be by hand tools or mechanical equipment approved by Engineer. Puddling with water shall be done only when approved by Engineer.

FILL:

3-15. Material for fill and manner of placing shall be as hereinbefore specified for backfill, except where otherwise provided.

3-16. Areas to receive fill shall be stripped and cleared and soil scarified and loosened to a depth of 3 inches before fill is placed.

EARTH UNDER CONCRETE SLABS:

3-17. Earth to receive concrete slabs shall be brought to required grades, dampened to optimum moisture content and compacted to 90% of maximum density.

3-18. On natural or cut grades, the area shall be scarified and loosened to a depth of 3 inches before compaction.

GRADING:

3-19. All earth surfaces adjacent to structures shall be left smooth and true to line, level and plane, and shall be sloped to drain away from structures. Fill and/or cut banks shall be accurately finished to the lines and profiles indicated or required.

CLEANUP:

3-20. Excess excavated materials, if any, shall be disposed of as directed. All debris shall be removed and disposed of as hereinbefore specified for cleared material, and sites shall be left rake clean.

DIVISION 4

EARTHWORK FOR UTILITIES

GENERAL REQUIREMENTS:

4-01. This division of the work includes furnishing all labor, materials, and equipment required to complete trench and related work outside of structures, as required for the installation of all pipe, conduit and other earth embedded utility lines as shown and as specified elsewhere in these specifications.

4-02. All work shall be coordinated with that of the mechanical craftsmen concerned to the end that all work is properly installed. Depth and breadth of excavations and slope and contour of trench bottoms shall be as required for proper installation of the utilities as specified in other divisions of these specifications or otherwise required, and as herein specified.

WATER AND SHORING:

4-03. Excavations shall be kept free of standing water and protected as required to prevent surface water run-of into them. All shoring required to protect the work shal be provided and maintained in approved manner.

EXCAVATION:

4-04. Excavations shall be of the open cut type. Banks shall be cut as nearly vertical as possible. Trench work shall not proceed until all compacted fill is in place.

4-05. Trenches to receive pipe, conduit, etc., shall be excavated true to line and accurately sloped to drain in accordance with the drawings and the requirements of the mechanical tradesmen concerned. Trenches shall be of sufficient width to provide a clear space of not less than 6 inches or more than 8 inches on either side of the pipe, and except as otherwise directed, shall have a minimum width at the bottom of 18 inches. Where sheathin is required, the trench widths shall be increased correspondingly.

4-06. Trench bottoms shall be dished out as required for bedding bell and spigot and flanged pipe work to the end that pipe rests for its entire length upon the bottom of

the trench. The bottoms of all trenches for sanitary sewers shall be rounded so that at least 1/3 of the circumference of the pipe will rest firmly on undisturbed soil.

4-07. Excavations for prefabricated sheet metal manholes shall be sufficient to permit of proper installation, and for formed concrete work shall be as required to suitably form the same.

4-08. Depth of trenches shall be as required for slopes shown on the drawings or as directed by Engineer. Unless otherwise directed the minimum distance from top of pipe to finished grade shall be 2'-6".

4-09. Except at locations where excavation of rock is required, care shall be taken not to excavate below specified depths. Where rock is encountered during excavating, the rock shall be removed to a minimum overdepth of 6 inches below the required trench depths. The overdepth rock excavation and all excessive trench excavation shall be backfilled with loose, moist sand, thoroughly tamped to the satisfaction of the Engineer.

BACKFILL:

4-10. No backfilling of excavations shall proceed until work therein has been inspected and approved by the Engineer.

4-11. Backfill material shall be finely divided material from excavations as approved by the Engineer, shall be free of debris and organic matter, and shall be dampened to optimum moisture content. Material for backfilling up to a level of 1 foot above top of pipe shall be free of rocks.

4-12. Backfilling of trenches prior to testing of pipe therein shall be the minimum required to maintain positio Pipe joints shall remain uncovered until testing is completed.

4-13. Backfill for pipe installed or structure completed shall be placed alongside the pipe or structure in layers not exceeding 6 inches in depth. Backfill shall be place in a symmetrical manner and care shall be taken to preven any wedging action or eccentric loading on or against the pipe or structure. Each layer shall be thoroughly compac ed by rolling, tamping with mechanical rammers, or by hand tamping with heavy iron tampers. Water settling

will be permitted and may be required.

4-14. Surface finish shall conform to natural ground contours as approved by the Engineer. Additional backfill shall be placed on all trench work that settles below adjacent ground levels.

CLEANUP:

4-15. Excess excavated materials shall be deposited where directed, and shall be leveled and graded to suit ground contours in the vicinity.

DIVISION 5

ROADS, AIRFIELD, ASPHALTIC CONCRETE PAVING AND DIKES

GENERAL REQUIREMENTS:

5-01. The work of this section includes the furnishing of all labor, equipment, transportation and materials, exclusive of Bitumuls HRM, required to complete the airfield and all roads and all work related thereto. It includes grading for surface drainage, includes all asphaltic concrete road paving, and includes all coral stabilizing necessary to complete the airfield, taxiways and parking areas and dikes in the P.O.L. area. All shall be where indicated on the Road, Paving and Building Location Plans.

ROADS:

5-02. Areas for the work of this section shall be entirely cleared of all debris, organic matter, including roots, weeds and other unstable and unsuitable material. Disposal of cleared materials shall be in the manner directed by the owner or his authorized representative.

5-03. For all areas to be paved, the subgrade shall be brought to proper elevation by filling and blading. Fill shall be suitable native surface coral or crusher run ledge coral placed in layers not greater than six (6) inches and thoroughly compacted at optimum moisture content with pneumatic tired rollers, or sheep-foot rollers. The surface shall be finished by blading and rolling and the final rolling shall be done with a steel wheel roller of six to ten tons weight. The completed subgrade shall be true to section and grade, smooth and uniformly compacted over the entire section.

5-04. Roads and parking areas not to be paved with asphaltic concrete shall be constructed in the same manner as outlined above for subgrade under paved areas.

AIRFIELD:

5-05. Areas for the work of this section shall be cleared as outlined under "Roads" and all fill material necessary for airfield shall be crusher run ledge coral or native coral of suitable gradations placed in layers not exceeding six inches in depth and thoroughly compacted at optimum moisture content with sheep-foot rollers. The upper

six inches of the runway shall be specially selected and graded material compacted with sheep-foot rollers. The strip shall be finished by blading and rolling with a steel wheel roller of six to ten ton weight to produce a dust free surface true to a smooth section and grade, and uniformly compacted throughout. All existing irregularities and soft or unstable area in that portion of the old strip remaining within the limits of the new runway shall be repaired by cutting or filling as the case requires and rolling to the same compaction and smoothness as the new work.

TAXIWAYS AND PLANE PARKING AREAS:

5-06. To be constructed in the same manner as outlined herein for roads not to be paved.

ASPHALTIC CONCRETE PAVING:

5-07. Bitumuls Grade HRM: Wherever the word "Bitumuls" is used hereafter, it is understood to be Bitumuls grade HRM meeting the requirements of Federal Specifications SSA-674A, Type 6.

5-08. Water: Wherever water is referred to in the making of the mix, it refers to brackish water rather than ocean water. However, ocean water can be used if absolutely necessary, but its use should be avoided if possible.

5-09. Equipment for Mixing: Equipment for making the Bitumuls mixes may be concrete mixers, paddle type plaster mixers, pugg mills as commonly used in plants for making standard hot asphaltic mixtures, or accepted types of travel mixers normally used with any type of asphaltic product. Where permitted, mixing can be done in place on roads by the use of harrows, disks, or motor patrol blades.

5-10. Aggregate: Aggregate shall consist of crushed ledge coral or coral beach sand or a combination of both. Where possible, the aggregate shall fall within the gradation listed below:

a.	Percent passing	1-1/2"	100 to 100
b.	" "	3/4"	80 to 100
c.	" "	1/2"	60 to 80
d.	" "	1/4"	40 to 60

e.	Percent	passing	#10	Sieve	35 to 50
f.	"	"	#40	"	15 to 30
g.	"	"	#80	"	10 to 15
h.	"	"	#200	"	2 to 7

5-11. Proportioning: Approximately 8% Bitumuls shall be used in the mix, which equals 0.8 gallon per cubic foot loose of the coral aggregate. For coral sand alone, the quantity of Bitumuls shall be increased to approximately 1 gal. per cubic foot loose. Sufficient water shall be added at the time of mixing to insure thorough coating of the coral and to give the desired degree of workability. If the coral is wet it may not be necessary to add any water, but if the coral is dry, it may be necessary to add as much water as there is Bitumuls in the mix. It is better to have the mix overwet than too dry. The methods of measuring the materials and the exact proportions shall be determined and regulated as required to produce a dense mixture with a minimum of voids and with all particles uniformly coated with bitumen.

5-12. Mixing: One of the types of mixers mentioned under "Mixing Equipment" shall be used for mixing the aggregate and bitumuls. The mixing shall continue for at least thirty-five seconds after all materials are introduced into the mixer and for such longer period as may be necessary to uniformly coat all of the particles and obtain a mixture homogeneous in character.

5-13. Placing and Rolling: The mix shall be laid so as to produce the compacted thickness shown on the plans, using an accepted type of mechanical paver, Barber-Greene, or equal, or the mix can be laid by using a motor patrol grader. Compaction shall be made with pneumatic tired rollers and final surface rolling shall be with a steel wheel roller weighing five to eight tons. Rolling shall continue until a smooth and uniform riding surface is produced.

DIKES:

5-14. Material for dikes shall be native coral obtained from the P.O.L. site grading or crusher run ledge coral placed in layers not greater than six inches and thoroughly compacted at optimum moisture content with suitable rolling or tamping equipment. The dikes shall be constructed to the lines, grades and section indicated on the drawings.

DIVISION 6

CONCRETE AND FORM WORK

GENERAL REQUIREMENTS:

6-01. This division of the work includes the furnishing of all labor, equipment, transportation, and such materials as are hereinafter specified; required to complete all concrete work and cement finish for all structures and appurtenances as shown on the drawings or required for the work.

MATERIALS TO BE FURNISHED BY BUILDER:

6-02. The following materials shall be furnished by the Builder and shall be of type and quality herein specified, or as approved by Engineer.

6-03. Aggregates both fine and coarse, as supplied by Builder, shall be coral aggregates. Aggregates shall be produced by crusher plant operation or may be bank-run aggregates if approved by the Engineer. The quality and grading of all aggregates used in the work shall be subject to testing and approval by the Engineer.

6-04. Water for use in mixing concrete shall be fresh or brackish water where obtainable. Sea water for mixing concrete shall be used only as approved by Engineer. Water for mixing concrete shall be strained or otherwise processed as directed to remove organic matter or debris. Sea water may be used for curing concrete.

MATERIALS TO BE FURNISHED BY OWNER:

6-05. All other concrete materials not hereinbefore specified to be furnished by Builder will be furnished by Owner, including cement, reinforcing steel, admixtures, etc.

MATERIAL STORAGE:

6-06. The Builder shall be responsible for the proper storage and protection of all concrete materials.

6-07. Aggregates shall be separately stored and marked for identification as to kind and size, and shall be kept free of each other and of foreign substances.

6-08. Cement, admixtures, etc. shall be stored off the ground in dry storage.

6-09. Reinforcing Steel shall be piled on dunnage off the ground and shall be kept clean.

FORM WORK:

6-10. The Builder shall furnish all spacers, chairs and hangars required and all form materials and shoring necessary for the work.

6-11. Owner shall furnish all bolts, anchors, sleeves and other inserts (except spacers, etc.) required to be set in concrete.

6-12. Forms shall be provided for all concrete work except where their omission is approved by Engineer.

6-13. Wooden forms, other than plywood, shall be 1" x 6" or 1" x 8" No. 1 boards and sheathing S1S1E. Nailing shall be two or more 8d nails at each bearing. Construction of wooden forms will be such that all concrete will be formed to true line, level, plumb and plane. Forms shall be leakproof, and so constructed that wet loads will not distort them and so that their removal will not damage the work. No wood other than nail blocks shall be permitted inside the forms. Forms shall be adequately blocked and braced vertically and horizontally with sufficient struts and knee bracing to hold all sections rigidly in place under all loads imposed on them. Stud supports shall be 2" x 4" minimum at 16 inch centers maximum.

6-14. Form spreaders shall be of the cold drawn steel rod type with removable cone nuts or equal as approved.

6-15. Cleanout holes shall be provided at the bottom of all form sections which are not otherwise accessible.

6-16. Removal of Forms: Forms shall not be disturbed until the concrete has hardened sufficiently to permit their removal with safety.

SETTING INSERTS:

6-17. All anchors, bolts, sleeves and other inserts shall be placed, if practical, before reinforcement is placed and in every case before concrete is poured. All such items shall be placed in true position and shall be securely tied or otherwise supported.

PLACING REINFORCING STEEL:

6-18. Metal reinforcement, at the time concrete is placed, shall be free of rust, scale or other coating that would reduce the bond.

6-19. The bending and placing of metal reinforcement shall be as noted on the drawings. Except where otherwise noted or directed, the minimum clear distance between reinforcement and face of concrete shall be 3 inches.

PROPORTIONING AND MIXING CONCRETE:

6-20. Grades of concrete and required compressive strengths shall be as designated in notes on the drawings.

6-21. Proportioning of cement, aggregates, water and admixtures to obtain the required strengths shall be as specified by the Engineer.

6-22. The methods of measuring concrete materials shall be such that the proportions of all materials can be accurately controlled during the progress of the work and easily checked at any time by the Engineer.

6-23. The method of storing and handling the aggregates shall be such that the moisture content of the aggregates at the mixer shall not be subject to unnecessary changes.

6-24. Mixing; The concrete shall be mixed until there is a uniform distribution of the materials and the mass is uniform in color and homogeneous. Mixing shall be done in batch mixers of approved type. Each batch shall be mixed not less than one minute after all materials are in the mixer and must be discharged completely before the mixer is recharged. Transit mixed concrete may be used on the work if approved.

6-25. Consistency: The consistency of concrete shall be determined by testing with a standard slump cone, and consistencies for different types of work shall be within the limits prescribed by the Engineer.

PLACING CONCRETE:

6-26. Trenches, forms and reinforcing steel shall be inspected and approved by the Engineer before any concrete is placed.

6-27. Before pouring any concrete, all inserts shall be accurately set and secured in place and reinforcing properly spaced and tied. Retempered mortar shall be used. Concrete shall not be placed until subgrade or fill has received approved compaction. Concrete shall not be poured against vertical earth surfaces except where specific approval of the Engineer has been granted to omit wood forms.

6-28. Continuous Pouring: Concrete shall be deposited continuously between the limits of the construction and expansion joints shown on drawings or approved by the Engineer. All shall be thoroughly vibrated and compacted to eliminate gravel pockets and to produce a smooth, dense, unbroken surface.

6-29. Bonding: Before depositing new concrete on or against concrete which has hardened, the forms shall be retightened. All laitance shall be removed by wire brush and stream of water, or other approved method, leaving the coarse aggregate slightly exposed. Immediately before pouring, brush on coat of one to three mix mortar.

6-30. Curing: Exposed surfaces of concrete shall be kept moist for at least seven days.

6-31. Protection: Concrete and cement finish shall be adequately protected from injurious action of sun, rain, or flowing water and shall be protected from mechanical injury during progress of work.

SURFACE FINISHES:

6-32. Exposed surfaced of concrete walls, bulkheads, vertical faces of slabs, etc. shall be finished smooth with edges beveled. Rock pockets or other defects shall be patched with 1 to 3 mortar.

6-33. Horizontal surfaces of concrete slabs shall be worked with suitable tools to maximum densities with coarse aggregate pushed down, all holes filled, and surfaces left true and level. Slabs shall be trowelled in two operations to produce a hard burnished finish, except that exterior slabs shall have a stippled finish produced by circular motion and lifting of the trowel.

VAULT DOORS:

6-34. Location: Vault doors shall be installed in the Base Operations Building and the Group Headquarters Building in locations shown on the drawings.

6-35. Installation; of vault doors shall conform to door manufacturer's detailed instructions. Wall openings shall be constructed accurately to the sizes shown on the drawings and shall be square and plumb. Door frame shall be installed level and plumb to the end that door will stand stationary in any position. Grout, if required, shall be of a consistency approved by Engineer.

TESTS:

6-36. Specimens for concrete test cylinders shall be taken when called for by the Engineer, but at least one test cylinder shall be taken for each 250 cu. yds. of continuous pour or fraction thereof.

6-37. The necessary equipment for concrete tests will be supplied by the Owner. The making, curing and testing of concrete specimens will be as directed by the Engineer.

DEFECTIVE CONCRETE:

6-38. The Builder shall remove any concrete work which, in the judgement of the Engineer, is defective for any reason; and replace same with proper materials and/or workmanship.

DIVISION 7

METALWORK AND METAL BUILDINGS

GENERAL REQUIREMENTS:

7-01. Scope: The work covered by this division of the specifications consists of furnishing all labor and equipment and performing all structural steel work, all sheet metal work, all miscellaneous metal work and erection of all prefabricated metal buildings, (except as below listed), as shown on the drawings or required for the work.

7-02. Work by the Owner: The Owner will furnish all labor and equipment and perform all work in erecting the following buildings:

a. Transmitter Building and its Powerhouse.

b. Receiver Building and its Powerhouse.

MATERIALS:

7-03. All materials entering into and becoming a part of the permanent installation will be furnished by the Owner. Builder shall furnish all required scaffolding, shoring and rough hardware therefor.

STRUCTURAL AND MISCELLANEOUS STEEL WORK:

7-04. Scope: Builder shall erect and/or install all structural and miscellaneous steel work as shown on the drawings or required for the work.

7-05. Codes: The provisions of the following codes and specifications shall govern the work insofar as these provisions are applicable:

a. American Institute of Steel Construction publications (latest revision).

1. Code of Standard Practice for Steel Buildings and Bridges.

2. Specification for the Design, Fabrication and erection of Structural Steel for Buildings.

b. American Welding Society Code (latest revision).

1. Arc and Gas Welding in Building Construction.

SHEET METAL WORK:

7-06. Scope: The Builder shall install all sheet metal as shown on drawings or required for the work.

7-07. Workmanship: Sheet metal shall be formed to the shapes and dimensions called for on the drawings. All work shall be accurately cut, fitted and formed, and shall be wave free. Work shall be securely fixed with fastenings of types and sizes shown or required. Flashings, where called for on drawings, shall be properly placed to attain a proper, weathertight installation. Seams for horizontal or nearly horizontal work shall be standing type, and all exposed edges shall be hemmed. All work shall be installed with ample provision for expansion and contraction.

METAL BUILDINGS:

7-08. Scope: Where called for on the drawings, (with the exception of buildings hereinbefore listed as being erected by the Owner) Builder shall erect all pre-fabricated aluminum buildings, which shall be "Pacific Buildings as fabricated by Pacific Iron and Steel Company.

7-09. Manufacturer's Drawings: The Owner will furnish the Builder prints of Pacific Iron and Steel Company's erection diagrams and part detail drawings. These drawings show suggested methods of assembly and procedure in erecting the buildings, as well as details of part and assemblies.

7-10. H. & N. Drawings: Dimensions, arrangements and additional details of buildings are shown on the Holmes & Narver drawings accompanying these specifications.

7-11. Erection: Erection methods and procedures are shown on the drawings previously mentioned. In addition, the following instructions shall be followed when advisabl or directed by the Engineer. (Drawing numbers referred to are Pacific Iron and Steel Company drawing numbers)

a. Dwg. E-100. Anchor bolt and nut (part #D60-2) shall be replaced by explosive driven studs, when so directed.

b. Dwg. E-101. Eave strut as shown on Dwg. E-102 can be installed on frame prior to raising into position. Waler clips can be installed at this time for double-roof buildings.

c. Dwg. E-102. It should be noted that blocks and tackles may be required to pull framed structure into square when installing roof sheets. Block and tackles should be placed diagonally across structure approximately every third or fourth frame with ends secured by passing completely around knees. Tackle ends should not be secured to knee straps.

d. Dwg. E-104. Care should be taken to avoid walking on roof sheets. Builder shall supply catwalks or adequate planking for this purpose. Refer to block and tackle referred to in next preceeding paragraph.

e. Dwg. E-108. When installing hinge clevices (part #D15) care should be taken to see that clevis and bolt are pushed against top of hole in girt before tightening, to avoid shutter arm projecting beyond wall face when in closed position. In no case shall arms, when closed or while closing project beyond the interior face of wall girts.

f. Dwg. E-109. 2" x 4" blocking of suitable length should be placed at top and bottom of door openings between door posts to assure proper clearance before bolting posts to eave strut foundation angles.

7-12. Sheeting: When installing sheeting it may be necessary to drift holes with drift pins, since corrugations are flexible and may have been stretched or compressed in shipment.

7-13. Drift Pins: When using drift pins care should be taken not to elongate holes, since elongated holes may not be sufficiently covered by washers to prevent leaks.

7-14. Partitions: Partitions, partition caps, full height posts, etc., may be required to be cut to size in the field. Portable electric saws will be useful for this work.

7-15. Fixture Supports: Support plates for mechanical and electrical fixtures shall be installed where shown or required. Cooperate with mechanical and electrical tradesmen to install support plates in proper locations fo the work.

7-16. Equipment: The following is a partial list of equipment required for the erection of metal buildings.

a. Scaffolding, including saw horses, step ladders and planking.

b. Screw drivers and socket wrenches, (up to 3/8") Air or electric tools may be substituted if desired.

c. Open end wrenches, 1/4" and 3/8".

d. Drift pins, 1/4" and 3/8".

e. Portable electric saws, of type suitable for cutting aluminum.

f. Electric hand drills, (1/4" and 3/8" drills) high speed for aluminum.

g. Shot stud guns, for explosive-driven studs.

h. Blocks and tackles, 1/2" line.

ROOFING AND SIDING FOR WOOD FRAMED STRUCTURES:

7-17. Scope: Builder shall install corrugated aluminum siding and roofing for wood framed structures where called for on drawings.

7-18. Roofing Application: Application shall be started true to line and care shall be taken to keep the horizontal and vertical lines of the sheet straight and plumb. Work shall start at the end of the building opposite the prevailing winds. The first sheet shall be applied with the edge turned down at the roof. End laps shall be a minimum of 8", side laps a minimum of 1-1/2 corrugations.

7-19. Siding Application shall be similar to roofing, except end laps shall be a minimum of 4", side laps a minimum of one corrugation.

7-20. Fastening shall be with aluminum nails through neoprene or fibre washers, 6" to 8" O.C. at side laps and at every other corrugation at end laps. Nail through top of corrugations only.

7-21. Protection: Where aluminum overlaps dissimilar metal or masonry, apply bituminous coating to overlapped portion.

STORING MATERIALS:

7-22. Builder shall maintain all materials in dry storage until used. Aluminum sheets shall be stored edgewise or endwise off the ground.

DIVISION 8

CARPENTRY AND RELATED WORK

GENERAL REQUIREMENTS:

8-01. The work covered by this division of the specifications consists in furnishing all labor, equipment and transportation required to complete all carpentry and related work as shown on the drawings or required for the work.

MATERIALS:

8-02. All materials entering into and becoming a part of the permanent installation will be furnished by the Owner. Builder shall furnish all required scaffolding.

STORAGE:

8-03. Builder shall provide and maintain adequate storage facilities for all materials to the approval of the Engineer. Lumber and building boards shall be carefully piled off the ground in such manner as to assure proper drainage, ventilation, and protection from the weather.

GRADE MARKS:

8-04. Each length of wood, as furnished by Owner will be grade and kind and marked in accordance with the following Associations' latest revised grading rules:

Douglas Fir	West Coast Lumbermen's Assn.
Redwood	California Redwood Assn.
Sugar & Ponderosa Pine	Western Pine Assn.
Plywood	Douglas Fir Plywood Assn.

LUMBER:

8-05. Where not otherwise called for on the drawings, framing and structural lumber shall conform, within the limits of availability, to the following standards:

a. All grounds, sheathing and other unspecified lumber 1-1/2" or less in thickness shall be D.F. No. 2 Boards and Sheathing. Concealed Sheathing may be D.F. No. 3.

b. Small timbers 4" or less in thickness including joists, rafters, headers, bracing, plates and roof planks shall be D.F. stress grade 1450f No. 1.

c. Studs, caps, and bucks less than 4" in thickness shall be D.F. stress grade 1100f No. 2.

d. Beams and stringers 5" and thicker shall be D.F. stress grade 1700f Dense No. 1.

e. Post and timbers 5" and thicker shall be stress grade No. 1.

f. Mudsills, where noted on plans to be redwood shall be foundation grade Redwood.

CUTTING AND FITTING:

8-06. Lumber shall be accurately saw-cut, fitted into position, rigidly braced true to plane and plumb and securely nailed, lag screwed or bolted into place in accordance with the drawings. Splicing of framing members shall be only as indicated or approved. Care shall be exercised in framing so that cutting of important members will not be required; such cutting to be done only with the Engineer's approval. The various fastenings shall be adequate to resist the forces produced.

FASTENINGS:

8-07. General Requirements: Fastenings, not otherwise shown or required, shall be to full penetration without splitting, in accordance with the following minimum schedule. Work not here specified or otherwise required shall be proportionate. In general, nails, screws, etc., shall penetrate the member fastened to not less than 1/2 their length, shall not be closer to edges than 1/4 their length and shall occur once for each 3 inches or part of 3 inches of width of face for member being fastened. Screws shall be twisted, not hammered home. Bolts, pins, etc., shall be set with driven fit. Bolt heads and nuts shall have cut steel or malleable iron washers under them.

8-08. Schedule: Fastenings, except as otherwise shown on drawings or otherwise required, shall be:

> Wooden sole plates to concrete: (type of fastenings as indicated or directed). Bolts on 6'-0" centers maximum and within 9" of ends, openings or corners and embedded not less than 7"-----1/2"

Shot studs spaced as above specified for bolts, penetration 1-3/4"----------3/8"

Aluminum Angle plates to concrete: (type of fastening as indicated or directed). Bolts on 4'-0" centers maximum and within 6" of ends, openings or corners and embedded not less than 7"----------1/2"

Shot studs spaced as above specified for bolts, penetration 1-3/4"----------3/8"

Studs on concrete: (type of fastening as indicated or directed).

Bolts at midpoint and 1'-0" from floors and ceilings, embedded 4"----------1/2"

Shot studs spaced as above specified for bolts----------3/8"

Studs to bearings:

Toe Nails each side----------2-10d

Joists or rafters to bearings:

Toe Nails each side----------2-10d

Built-up beams 8" or less deep; 12" centers staggered---------- 16d

Built-up beams over 8" deep:

Bolts on 24" centers staggered----------1/2"

Double joists under partitions:

Where not blocked apart 12" centers staggered---------- 16d

Where blocked apart - at each block--------2-20d

Tail joists to headers, except when in hangers:

Toe nails, 2" centers on each side--------- 10d

Tail joists to headers in hangers:

Through header into tail joists on 4" centers---------- 20d
Toe nails 4" centers---------- 16d

Double tail joists over 4 feet long:

6" centers staggered---------- 16d

Solid blocking between joists and rafters:

Toe nails each side, each end----------2-10d
Toe nails to bearings, each open side-------2-10d

Cross-bridging between joists or rafters:

Toe nails each end----------2- 8d

Joist or rafters to sides of studs:

8" joist or less----------3-16d
For each additional 4" of depth----------1-16d

Double top plates:

Lower plate to top of stud----------2-20d
Upper plate to lower plate, 12" centers staggered---------- 16d

Herringbone or fire blocking, each end------2-10d

Sheathing and sub-flooring at all bearings:

1" x 6"----------2- 8d
1" x 8"----------3- 8d

Diagonal sheathing and sub-flooring:

As above, with one additional nail at ends, including intermediate butt end joinings.

Ribbons to studs:

1" ribbons----------2- 8d
2" ribbons----------2-16d

Joist anchors across interrupting beams and/or trusses 3/16" x 1-1/2" steel, 24" longer than breadth of beam. Centers to be 72".

FRAMING:

8-09. Joists, Rafters, Purlins, etc., shall be set with crown up, and be dapped over bearings as required for leveling. Shimming will not be permitted. Splices shall

be only over bearings and shall be lapped as shown, but lap not less than 4 inches. Headers, trimmers, and tail joists shall be increased to equal strength of surrounding work.

8-10. Wall framing, not otherwise shown on drawings, shall be framed with 2" x 4" studs spaced 16" on centers with single bottom plate and double top plate. Studs at angles shall be tripled, and at sides of openings shall be doubled. Walls shall be herringbone braced or fire stopped with one row of 2" by stud deep blocking. Where so indicated, install two rows of horizontal blocking of stud thickness cut in between studs, for securing corrugated metal siding.

8-11. Sheathing, unless otherwise shown, shall be laid diagonally with driven sides and ends, and nailed as shown or hereinbefore specified.

8-12. Posts and columns shall be accurately set and rigidly anchored as indicated or required. Bottom ends of all posts shall be coated with bituminous paint before setting.

8-13. Stair framing shall be constructed to size and detail shown on the drawings. Carriages shall be cut from a single piece of lumber. Risers shall be of uniform height and treads of uniform width, except as otherwise shown. Provide stair railings where and as shown.

FURRING:

8-14. Furring, of sizes called for on drawings, shall be installed on walls where shown. Furring strips shall be erected plumb and rigid, using wood shims as required. Furring for paneling in metal buildings shall be bolted to wall girts as shown.

PLYWOOD PANELS:

8-15. Plywood panels, of thicknesses noted, shall be installed in locations as shown on drawings. Panels shall be installed in as large sections as possible, butt joined and face nailed over bearings. At interior angles and at intersections of walls with floors and ceilings install 1/4 round mouldings.

ASBESTOS-CEMENT SCREENS:

8-16. Asbestos-cement panels for motion picture screens

shall be of dimensions as shown on the drawings. Joints shall be butted and shall occur only over solid bearings. Nails shall be countersunk and nail holes and joints filled with an approved putty. All holes for nails through asbestos-cement panels shall be drilled.

FLOORS:

8-17. Finish flooring shall be dressed and matched, of dimensions shown, laid with close joints, tightly driven up, and blind nailed with aluminum nails into each floor joist. Joints over the same bearing shall be alternated, so that there will be at least two boards between them.

8-18. Ladders and catwalks shall be constructed of wood selected from lumber delivered to the job site for structural purposes, so as to be free of structural defects that would make it unsuitable for the use intended. Knots shall not appear in the narrow faces of side rails, cleats or rungs, and cross-grain shall not exceed a slope of one (1) inch in twelve (12).

8-19. General Requirements: Unless otherwise shown on drawings or directed by Engineer, finish carpentry work shall conform to the following standard:

a. All work shall be accurately and skillfully worked and set true to line, level and plumb.

b. All work shall be substantially reinforced and secured and shall be properly sanded.

c. Opening frames and trim shall be in one piece from angle to angle. Rails, moulds, etc., shall be in as long length pieces as are available.

d. Outside trim angles shall be mitred, and inside angles coped.

e. Butt end joints shall be beveled, exposed ends of aprons, rails, etc., returned on themselves and outside arris rounded off.

f. Glue joints, where indicated, shall be glued up with waterproof glue and held with clamps until set. Fastenings shall be blind where possible.

g. Rough hardware, as furnished by Owner, and including bolts, washers, nails, screws, angles, plates,

etc., will be of aluminum or metal processed to resist corrosion. Rough hardware items other than as above specified shall not be used in the permanent installations. Size and type of fastenings and anchors shall be as shown or required for the work.

8-20. Dimensions as shown for counters, shelves, partitions, etc., are nominal. Builder shall take off his own measurements and make such adjustments as are required by working conditions.

8-21. Counters, shelves, partitions, etc., shall be of materials and in location shown and shall be secured to concrete slabs with anchor bolts, bent plates, or angles as indicated. Install all hardware, including hinges, shelf supports, shelf brackets, etc.

8-22. Cutting: To avoid waste in 4'-0" x 8'-0" plywood or hard board sheets; sheets wherever practical, shall be cut into increments of 8", 12", and 24" in width and 2'-0" in length.

8-23. Hardboard and linoleum shall be applied to tops of counters as shown on the drawings. Materials shall be bedded in cement of appropriate types, and shall be applied under pressure. Tops where linoleum is to be applied shall first be covered with a layer of lining felt cemented to the top. Linoleum shall then be cemented to the felt and joints and edges weighted with sand sacks for 24 hours. Wooden nosings and metal edgings shall be installed as shown.

DOORS AND DOOR FRAMES:

8-24. Builder shall construct wood doors,half doors & gat where called for and as detailed on the drawings. Stock doors, as furnished by the Owner, shall be installed where shown. Install louvered panels where called for.

8-25. Door frames shall be of dimensions and construction as detailed on plans with stops nailed on. Frames shall be set plumb and square and properly secured.

8-26. Unless otherwise shown or directed, doors shall be hung and fitted to a 1/8" clearance at top and sides, and 3/8" clearance at the bottom and shall have 1-1/2 pair of hinges per door.

SCREENS:

8-27. Builder shall install at openings designated by the Engineer, insect screens as furnished by the Owner. Builder shall perform all work required to install screens insect-proof and with all hardware in proper working order

8-28. Builder shall construct and install all other screens as shown on the drawings. Plastic mesh screening shall be drawn tightly over the framed openings and secured with aluminum staples. Cut edges of screening shall be covered with flat moulding strips, attached to screen frame with aluminum brads.

GLASS:

8-29. Openings, for the most part, will not be glazed. Where glazed openings are called for on the drawings, install glass of types noted in accordance with details shown. Sizes for glass shall be taken from the actual frames and sash; sizes shown are nominal.

8-30. Glass for sliding sash in Commissary Building (Building No. 37) shall be bedded in putty and secured with wooden stops.

PLASTIC CLOTH:

8-31. Plastic cloth shall be installed where shown or required, and shall be attached as hereinbefore specified for plastic mesh screening.

INSULATION:

8-32. Insulating batts shall be installed where shown and as detailed on drawings. Insulating batts, as furnished by the Owner, will be of the fiberglas or rock wool type with moisture resistant paper on one side; and will be of appropriate sizes to fit between walls, studs or ceiling joists as the case may be. Batts shall be securely stapled to the studs or joists with the moisture resistant paper toward the exterior or "hot" side. (Refe to "Painting" Division for vapor seal insulation).

FINISH HARDWARE:

8-33. Builder shall install all finish hardware for work included under this division of the specifications. Hardware shall be of types and sizes noted in hardware lists

on drawings, or as required for the work. All hardware shall be accurately fitted, and with the exception of supporting hardware, all surface applied hardware shall be removed before the painter's finish is applied; and subsequent to completion of painting shall be replaced and left in good working condition. (Refer to "Metal Work and Metal Buildings" Division for finish hardware for pre-fabricated metal buildings).

DIVISION 9

MINERAL SURFACED ROOFING

GENERAL REQUIREMENTS:

9-01. The work covered by this division of the specifications includes furnishing all labor, tools and equipment required for the installation of all mineral surfaced roofing as shown on the drawings or required for the work.

9-02. Refer to "Metalwork and Metal Buildings" division of these specifications for prefabricated metal roofs and corrugated metal roofing.

PREPARATION OF SURFACES:

9-03. Roof surfaces shall be broom clean, smooth, firm, dry, and properly pitched to drain. Holes and loose knots in roof sheathing shall be covered with aluminum sheet tabs tacked on, loose boards secured and projecting nails driven home. Vents and other projections through roofs shall be properly flashed and secured in position. Chamfer off all rough edges at eaves where roofing is to be turned down.

MATERIALS:

9-04. Materials, as furnished by Owner, will include 90# mineral surfaced roofing, roofing cement, plastic cement, flashing fabric, and large head aluminum roofing nails.

APPLICATION OF ROOFING:

9-05. Roofing shall be cut to required lengths and allowed to flatten in properly protected piles a minimum of one day before laying. Roofing shall be applied in one layer as follows:

9-06. Starting at lowest roof eave, apply first course of roofing across the slope of the roof. Apply succeeding courses allowing 2" overlaps over preceding course, and 4" end laps. Turn down roofing sheet neatly at all eaves and edges.

9-07. Nail all laps through both layers of roofing, using ample roofing cement between laps. Nail along all edges of roofing sheet at 4" on centers, and after nailing is completed, brush coat nail heads with roofing

cement. Place nails approximately 1" in from edge of roofing sheets.

9-08. Fill all breaks or holes in roofing and caulk flashings as required with plastic cement, troweled on.

DIVISION 10

PAINTING

GENERAL REQUIREMENTS:

10-01. Scope: The work covered by this division of the specifications consists in furnishing all labor, tools, equipment and scaffolding required for all painting and finishing shown on the drawings, hereinafter specified or required for the work. Surfaces to be painted, except as hereafter noted or directed by the Engineer, shall be as follows:

10-02. Interior Painting:

All Woodwork, including:

a. Doors and door frames.

b. Window sash.

c. Plywood walls, ceilings and partitions.

d. Moulding and trim.

e. Exposed studs and sheathing.

f. Exposed roof construction.

g. Finish flooring.

h. Benches, shelves, counters, cabinets, etc.

Aluminum walls and ceilings where called for on the drawings.

Piping - steel and iron pipe and fittings.

Piping - insulated pipe and fittings.

Equipment not furnished with finish coat.

Ferrous Sheet Metal Work.

10-03. Exterior Painting:

Woodwork, including:

a. Unpainted screen sash.

b. Tent frames.

c. Towers.

d. Benches.

e. Theatre screen frames and stages.

f. Platforms and landings.

g. Ladders, catwalks and railings.

Asbestos-cement screens.

Structural steel work and miscellaneous ferrous metal work.

Gasoline and Oil Tanks (Exterior sides).

Water Tanks (Exterior and Interior sides).

Piping - Steel and iron pipe and fittings.

Piping - Insulated pipe and fittings.

Equipment not furnished with finish coat.

Fire Hydrants.

Airstrip Centerline.

10-04. Items Not to Be Painted: Except where otherwise indicated or directed, the following items shall not be painted.

10-05. Interior:

a. Aluminum walls and ceilings.

b. Concrete floors.

c. Tempered hardboard.

d. Linoleum.

e. "Plyglaze".

f. Stainless steel.

g. Aluminum or chrome trim.

h. Finish equipment and machinery.

i. Aluminum or plated piping.

j. Chain link gates and partitions.

10-06. Exterior:

a. Aluminum roofing and siding.

b. Concrete work.

c. Composition roofing.

d. Chain link fencing and gates.

e. Timber piers.

f. Cast iron manholes and valve covers.

10-07. Definition: The term paint, as used herein, includes paints, enamels, varnished, lacquer, stains, emulsions and sealers.

10-08. Other Coatings: Coatings to be applied for waterproofing or insulating purposes are provided for in other divisions of these specifications (except as herein specified for vapor seal).

MATERIALS:

10-09. Type: Paint materials, as furnished by Owner shall be of types and colors required for the various uses indicated on the drawings, hereinafter specified; or directed by the Engineer. Finish paints will contain mold and fungi resisting agents.

10-10. Storage: The Builder shall provide adequate storage off the ground for paint materials, and materials shall be kept in the original unbroken containers until required for use.

10-11. Colors shall be as hereinafter specified in "Painting Schedules". Successive coats of paint shall, where practicable, be of a slightly different color.

PREPARATION OF SURFACES:

10-12. General: All surfaces to be painted shall be thoroughly dry and shall be free of oil, dirt, dust, rust, or cement.

10-13. Finish Woodwork including doors and frames, windo sash, plywood panels and partitions, moulding and trim, benches, counters, cabinets, and finish flooring shall be sanded smooth and shall be free of cracks, splinters, gouges or other defects. All sappy places shall be seale with shellac and corners of finish woodwork shall be sand ed to a slightly rounded surface. All finish woodwork shall be primed on all sides before installation. After the priming coat has been applied to finish woodwork, nail holes or other voids shall be filled flush with putt and sand papered smooth. Putty shall be dry before subsequent painting.

10-14. Exterior Wood Benches, stairs, ladders, catwalks, railings, and landings shall be reasonably smooth and shall be free of splinters, cracks, or other defects which might result in injury to personnel using them.

10-15. Metal Surfaces to be painted shall be cleaned of mill scale, dirt and rust by means of scrapers, wire brushes or other suitable devices. Oil or grease shall be removed by use of an approved solvent.

10-16. Galvanized Metal not bonderized shall be cleaned of any grease or oil by use of an approved solvent.

10-17. Asbestos-Cement Screens shall be carefully cleane of dirt or stains by the use of suitable solvents. Scree shall not be wire-brushed.

APPLICATION:

10-18. General: Application of paints shall be in accordance with manufacturer's directions, unless otherwise herein specified. No materials shall be reduced or changed except as specified by the manufacturer, or as hereinafter noted. When thinners are required, use only manufacturer's recommended thinners.

10-19. Painting Conditions: Paint shall be applied only under dry and dust-free atmospheric conditions.

10-20. Workmanship: Paint may be applied by the spray method except, when in the opinion of the Engineer,

spraying in any particular application would produce unsatisfactory results. Brush applications shall be applied with clean, long bristled brushes of suitable sizes. During application, the paint shall be continuously stirred and no thinner shall be added in excess of that specified. Each coat of paint shall be full and even on all surfaces, well worked into joints, corners and end grain of wood, and shall be free of brush marks, sags, runs or other defects.

PAINTING SCHEDULES:

10-21. The following Interior and Exterior Painting Schedules shall govern, except as otherwise called for on the plans or otherwise directed by the Engineer. Surfaces not herein specifically mentioned shall be painted in the same manner as like surfaces set forth in the schedules. Additional coats of paint shall be applied if, in the opinion of the Engineer, they are required. Since interior areas will be to some extent exposed to outside atmospheric conditions, "exterior" types of paint have in some instances been specified for interior use. Paint coats as specified in the following Painting Schedules shall be applied full body except as otherwise called for therein or otherwise specified by paint manufacturer.

INTERIOR PAINTING SCHEDULE:

10-22. a. Finish Woodwork:

Doors and door frames (both interior and exterior sides).
Window sash (both interior and exterior sides).
Plywood wall and ceiling panels and partitions.
Moulding and trim.
Exposed studs and sheathing.
Exposed roof construction.
Benches, shelves, counters, cabinets, etc.

First Coat: Dutch Boy #600 "Interior Primer and Sealer".

Second Coat: Dutch Boy "Nalco Synthetic Finish" color #5269 Silver Gray, reduced by adding 10% of mineral thinner ("Dutch boy "Tex-Thin").

Third Coat: Same as second coat except apply unreduced.

f. Insulated Pipe and Fittings:

First Coat: Dutch Boy "Lead Mixing Oil" reduced 20% by adding mineral thinner.

Second and Third Coats: Dutch Boy #1005 "Ready Mixed Aluminum".

g. Uninsulated Iron and Steel Pipe and Fittings:

Same as Item (e) in "Exterior Painting Schedule" below.

h. Ferrous Metalwork:

First Coat: Dutch Boy #1001 "Zinc Chromate primer".

Second and Third Coats: Same as item (a) above.

EXTERIOR PAINTING SCHEDULE:

10-23. a. Woodwork, including towers, (except platforms, landings, ladders and railings), tent frames, theatre screen frames and supports, woodwork at theatre stage and unpainted screen sash.

First Coat: Dutch boy #25 "Exterior Wood Primer" reduced 10% with mineral thinner.

Second and Third Coats: Dutch Boy #1005 "Ready Mixed Aluminum".

b. Woodwork, including theatre benches, platforms landings, ladders, catwalks and railings.

First Coat: Dutch Boy #25 "Exterior Wood Primer" reduced 10% with mineral thinner.

Second Coat: Dutch Boy "Nalco Synthetic Finish" color #5269, Silver Gray, reduced 10% with mineral thinner.

Third Coat: Same as second coat, except apply unreduced.

c. Theatre Screens (asbestos-cement)

First Coat: Wesco Water Paints Inc., "Exterio Masonry Primer".

Second and Third Coats: Wesco Water Paints, Inc., "Durasite" colors, black and white as shown on drawings.

d. Structural Steel and Miscellaneous Metal Work:

First Coat: Dutch Boy #1001 "Zinc Chromate Primer". If material is shop primed omit this coat and touch up abraded paint as required.

Second and Third Coats: Dutch Boy #1005 "Ready Mixed Aluminum".

e. Exterior Surfaces of all Steel Tanks, Steel and Iron Pipe, Valves and Fittings (uninsulated), and Equipment:

First Coat: "Coro-Gard #9" zinc chromate base primer.

Second Coat: "Coro-Gard #14" corrosion resisting coat.

Third Coat: "Coro-Gard #24" corrosion resisting top coat, flat aluminum color (except valves or equipment to be color coded).

f. Color Codes: P.O.L. facilities items including block valves on pump discharge lines, meter outlet lines to loading racks, and loading arms, loading valves and block valves on loading arms, shall be color coded as follows:

100 Octane Aviation gasoline - Bright Red.

91 Octane Aviation gasoline - Red and Yellow.

Motor gasoline - Red and White.

Diesel Oil - Yellow.

J.P.I. fuel - Yellow and White.

Color code paints shall be applied in approximately 3-inch wide stripes after the first and second coats specified in paragraph (e) above have been applied.

g. Insulated Pipe, Valves and Fittings:

First Coat: Dutch Boy "Lead Mixing Oil" reduced 20% with mineral thinner.

Second and Third Coats: Dutch Boy #1005 "Ready Mixed Aluminum".

h. Water Tanks: Painting of exterior surfaces is specified in paragraph (e) above; interior surfaces of both fresh and salt water tanks shall be finished as follows:

Preparation:

1. Remove "Rust-Veto" coating carefully from all inside surfaces by means of wiping rags and kerosene.

2. Scrub thoroughly, using fibre brushes and a solution of 1/2 pound of tri-sodium-phosphate ("TSP") per gallon of water. Gloves should be worn when using this solution.

3. Rinse thoroughly with clear water.

4. Care shall be taken in cleaning so that all rust inhibitive coating and cleaning agents are entirely removed with particular attention to the seams and joints.

Painting: After interiors are thoroughly clean and dry apply two (2) coats of Dutch Boy #5668 "Zinc Dust Zinc Oxide Interior Water Tank Coating".

i. Fire Hydrants:

First Coat: Touch up shop coat as required.

Second Coat: Dutch Boy "Nalco Synthetic Finish" color #382, Red, reduced 10% with mineral thinner.

Third Coat: Same as second coat, except apply unreduced.

j. Airfield Center Line: A center line two feet (2') in width shall be painted throughout the entire length of the runway and a cross mark ten (10') feet in length shall be provided two thousand (2000') feet from the northeast end of the runway as indicated on the drawings.

Paint to be used shall be spraying grade traffic line lacquer of the color furnished by the Owner.

Lacquer shall be applied only when the surface is dry and broomed free of small particles of sand and dust. After preparation of the surface, lacquer shall be applied at the rate of approximately one gallon (1 gal.) per one hundred and twenty (120 sq. ft.) square feet of surface.

Equipment: Application of the lacquer shall be with approved traffic line spray equipment or hand spray guns provided suitable guides are used to produce a line of uniform width, with sharp, neat edges.

DRYING TIME:

10-24. Allow a minimum of three (3) days drying time between paint coats on asbestos-cement screens. In general, drying time between coats shall be sufficient to allow thorough drying of the paint, and shall not be less than 24 hours. All undercoats shall be tested with hard pressure of the thumb to be sure they are dry.

PROTECTION AND CLEANING:

10-25. Oily rags or cotton waste shall not be stored inside buildings or allowed to accumulate on the premises. Upon completion of the work all scaffolding and paint containers shall be removed from the site or destroyed in a manner approved by the Engineer. Paint spots, oil or stain upon adjacent surfaces shall be removed and the work left clean and acceptable to the Engineer.

DIVISION 11

FENCING AND GATES

GENERAL REQUIREMENTS:

11-01. This division of the work includes the furnishing of all labor, equipment and transportation required to erect all fencing and gates as shown on the drawings or required for the work.

MATERIAL:

11-02. Fencing material, as furnished by the Owner, shall be of the chain link type of dimensions required for the various locations shown on the drawings.

ERECTION:

11-03. General: Except as otherwise directed by the Engineer, erection of fencing and gates shall conform to the following provisions, where applicable.

11-04. Post Placement: The drawings shall be checked to make sure that the lengths of the various sections are correct. Starting from one end or corner stake off distances between posts as called for on the drawings. Line posts next to end, corner or gate post should be set exactly as required for the horizontal braces.

11-05. Foundations: Posts shall be set in concrete foundations, using foundation grade concrete. (Refer to "Concrete and Form Work" division of these specifications). All posts shall be set to a minimum depth of 36 inches. Holes for line posts shall be approximately 10" in diameter, and for end, gate and corner posts approximately 14" in diameter. Post holes shall be formed so as to be slightly larger in diameter at the bottom than at the top; this is to be accomplished by a gradual slant of the earth wall. Top of concrete foundations shall be finished convex to permit surface drainage away from posts.

11-06. Setting Posts: Particular care should be used in setting gate posts to the end that they are set to the exact distance required for the installation of gates. Tops of gate posts shall be at the same level regardless of ground slope. Set the upgrade post first to get the proper height for the downgrade post. After posts are

set, spread and slip on stretcher bar bands and truss bands and then insert post tops.

11-07. Rails and Braces: Run a length of top rail through the first and second line post tops and butt the end into the terminal post rail clamp. Add additional top rail sections to reach the next terminal post (end, gate or corner post) joining the sections with plain sleeve couplings. Install an expansion spring coupling every 100 feet of top rail. Next attach horizontal braces, and truss wires at all terminal posts.

11-08. Attaching Fencing: Unroll fence fabric on outside of fence line with bottom edge against the posts. Splice rolls of fabric by weaving in a picket so as to engage both roll ends at each separate mesh. Fabric shall then be raised and tied loosely at 20-foot intervals. Stretch fabric at maximum intervals of 100 feet, using clamps and double-block arrangement or other approved device. After stretching is completed, tie fabric to top rails with galvanized fabric bands, using a minimum of 5 bands per post with top and bottom bands as near the fabric edge as possible.

Note: All bolt heads shall be outside, and all nuts on the inside of the fence line.

11-09. Gates: Builder shall install all fence gates and interior chain link gates where shown on plans. Gate truss rods shall be adjusted so that gates set in good alignment and latch properly.

DIVISION 12

TIMBER PIERS AND APPROACHES

GENERAL REQUIREMENTS:

12-01. Timber piers and approaches shall be constructed at the locations specified, in the position, to the elevations, and conforming to the design shown on the plans and in accordance with these specifications.

MATERIAL:

12-02. The material furnished by the Owner shall include the following; creosoted structural timber, creosoted piles, Port Orford cedar decking, timber guard rails, fender logs and **galvanized hardware.**

CONSTRUCTION:

12-03. General: The various kinds and grades of timber used in the structures shall be as indicated on the plans or as herein specified.

12-04. Storage: Piles, lumber and timber shall be stored in piles on the site unless it is being immediately placed in the structure. Structural timber and piles shall be neatly piled on skids to raise it from the ground and shall be protected from the sun when required.

12-05. Handling: All lumber shall be handled or piled so that it may be readily inspected and shall be handled in such a way as to avoid injury or breakage. Treated timber and piles shall be handled with slings. Cant hooks peaveys, or other sharp instruments shall not be used in handling treated material.

12-06. Framing: Workmanship shall be first class throughout and all framing shall be true and exact. All lumber and timber shall be accurately cut and framed to a close fit in such a manner that the joints will have an even bearing over the entire contact surfaces.

12-07. Holes for drift pins and dowels shall be bored with a bit one-eighth (1/8) inch less in diameter than the pin or dowel.

12-08. Bolt heads and nuts shall be countersunk where smooth surfaces are required and at such other places as are shown on the plans.

12-09. Caps shall have an even bearing on all piles in the bent and shall be securely drifted to the piles by drift pins of the dimensions shown on the drawings, and all drifts shall be approximately in the center of the end of the pile.

12-10. Bents shall be aligned before bracing is placed and all bracing shall be of sufficient length to provide a minimum distance of eight (8) inches between the outside bolt and the end of the brace.

12-11. After the framing, cutting, or boring of treated timber, all cuts, holes and reams shall be thoroughly swabbed with hot creosote oil of the kind used in the treatment of the timber.

12-12. Decking shall be Port Orford cedar laid diagonally at thirty degrees (30°) to a line perpendicular to the longitudinal axis of the stringers, and nailing shall be as indicated on the drawings.

12-13. Timber Piles: During driving operations, the pile heads shall be protected and held in position by the use of a driving block and all piles shall be driven to the position and line indicated on the plans.

12-14. A minimum penetration of ten feet (10') in the ground shall be obtained for bearing piles when a greater penetration is not required to obtain a safe bearing value.

12-15. Timber piles which are to be capped shall be accurately cut off so that true bearing is obtained on every pile without the use of shims. Other timber piles shall be cut off as indicated on the drawings.

12-16. The heads of all piles shall be treated with a hot mixture of sixty percent (60%) creosote oil and forty percent (40%) roofing pitch after the piles have been driven and cut off to the proper elevation. All other cuts, daps reams, bolt holes and pin holes shall be swabbed with hot creosote oil.

12-17. Fender Logs: Fender logs shall be fitted with galvanized hardware of the type indicated on the drawings and shall be located as required. All surfaces shall be brush coated with two heavy coats of Creosote oil, allowing time for penetration between coats.

12-18. Each fender log shall be held in place by two chains, as shown on the plans. Two (2") inch galvanized

pipe sleeves are to be inserted into tight-fitting holes, four (4') feet from each end of log. These holes are to be thoroughly swabbed with creosote before inserting the sleeves; then each end of the two (2") inch pipe is to be swaged to hold sleeve in place.

12-19. Chains should be cut to such lengths as will insure bottom plate being one (1') foot below fender log at extreme low tide. Lower end of chain should be welded to center of the plate. Top end of chain is to be connected to eye bolt anchor by means of a special connecting link provided for that purpose.

DIVISION 13

FRESH AND SALT WATER DISTRIBUTION SYSTEMS

GENERAL REQUIREMENTS:

13-01. The work covered by this division of the specifications consists in furnisning all labor, tools and equipment required for the construction of fresh and salt water distribution systems, including building service lines, all as shown on the drawings or required for the work.

13-02. Excavation and backfilling shall conform to the "Earthwork for Utilities" division of these specifications.

MATERIALS:

13-03. Materials as furnished by the Owner will include the following:

a. Asbestos cement pipe ("Transite") and couplings, with cast iron fittings therefor.

b. Cast iron pipe and fitttings.

c. Galvanized steel pipe and fittings.

d. Copper tubing and fittings.

e. Corrugated metal pipe and fittings.

f. Bolted steel tanks and concrete pipe well.

g. Valves, valve boxes and fire hydrants.

h. Joint packing and joint compound.

i. Portland cement for mortar and concrete.

j. Piping and mechanical equipment for Salt Water Pumping Station.

13-04. Mortar, concrete and forms used in the work shall conform to the provisions of the "Concrete and Form Work" division of these specifications. Concrete and mortar proportioning shall be as directed by the Engineer.

SALT WATER DISTRIBUTION SYSTEM:

13-05. That portion of the Salt Water Distribution System covered by this division of the specifications shall include in general, (1) the installation of the salt water intake line from the Lagoon to the Salt Water Pumping Station, (2) the installation of the piping and equipment at the Salt Water Pumping Station, (3) the installation of the salt water supply line from the Salt Water Pumping Station to the Power and Water Distillation Plant, and (4) the installation of the salt water lines from the Salt Water Pumping Station to the various structures, and including the elevated storage tank, fire hydrants, and connections to building services. Pipe lines and appurtenances and equipment shall be of dimensions and materials and in locations as shown on the drawings.

FRESH WATER DISTRIBUTION SYSTEM:

13-06. That portion of the Fresh Water Distribution System covered by this division of the specifications shall include in general, (1) the installation of the line from the Power and Water Distillation Plant to the adjacent reservoirs, installation of the reservoirs and installation of the return line to the Power and Water Distillation Plant, and (2) the installation of the fresh water distribution lines from the Power and Water Distillation Plant to the various structures, including the elevated storage tank and connections to the building services. Pipe lines and appurtenances and equipment shall be of sizes and materials and in locations as shown on the drawings.

13-07. The installation of piping and equipment at the Power and Water Distillation Plant is described under Division 20 of these specifications.

PIPE LAYING - GENERAL:

13-08. The full length of each section of pipe shall rest solidly upon the pipe bed with recesses excavated to accommodate the bells, joints and couplings. The work shall conform to all provisions contained in the "Earthwork for Utilities" division of these specifications.

13-09. Any section of pipe that is disturbed in any way after laying shall be taken up and relaid.

13-10. The interior of the pipe shall be thoroughly clean of all foreign matter before being lowered into the trench.

and shall be kept clean during the laying operations by means of plugs or other approved methods.

13-11. The pipe shall not be laid in water, or when trench or weather conditions are unsuitable for the work, except as approved by the Engineer. When work is not in progress, open ends of pipe and fittings shall be securely closed.

CORRUGATED METAL PIPE:

13-12. All relevant provisions contained under the heading "Corrugated Metal Pipe" of the "Sanitary Sewers" division of these specifications shall here apply.

13-13. The salt water intake line shall be incased in rip rap material or otherwise secured and protected as directed by the Engineer.

ASBESTOS-CEMENT PIPE:

13-14. Material: Asbestos-cement pipe, as furnished by Owner shall be "Transite" pipe with manufacturer's "Simplex" couplings, and shall have cast iron fittings.

13-15. Handling: Care shall be taken to avoid dropping pipe when unloading or placing in trenches. In transporting pipe, boards should be placed between pipe and chains or load binders. Pipe shall be carefully examined before laying for bruises or cracks and scratches or chips on machined surfaces, and such defects shall be repaired or damaged sections cut out.

13-16. Pipe Laying: Where selected backfill material can be firmly tamped under the entire length and up to the horizontal diameter of the pipe, wooden blocks may be used as temporary support to provide space between pipe and trench bottom to facilitate installation of couplings. As the backfilling and tamping progresses on each side of each wood block, it may be removed and used again. As an alternate method, holes approximately three times the length of the coupling may be dug under each pipe joint, the balance of the pipe resting in contact with the undisturbed soil.

13-17. Couplings: Rubber rings and sleeves shall be placed on the pipe end in accordance with the manufacturer's directions, the sections to be joined properly aligned, and the sleeve pulled over the joint by a "puller" device of a type recommended by the manufacturer.

13-18. Cutting of pipe should be done with a carpenter's rip handsaw and mitre box, or with a power saw with a carborundum blade. Cut ends shall be machined to the required tolerances.

13-19. Fittings: Pipe is furnished in straight lengths only and fittings therefor, as furnished by Owner, will be cast iron. Pipe to pipe fittings will be of the all bell and no spigot type. Joints at fittings shall be made up with packing and sulphur jointing compound.

13-20. Service Connections: Service connections shall be made by means of cast iron tees or by drilling and tapping directly into pipe and installing corporation stops, as called for on the drawings. The size and arrangements of multiple corporation stops shall be as detailed. Drilling for multiple corporation stops shall in all cases by staggered.

CAST IRON PIPE:

13-21. Cast iron pipe and fittings shall be of sizes and types called for on the drawings. Pipe and accessories shall be handled in such manner as to avoid damage to pipe or pipe coating. Material shall be carefully inspected before being installed and defective pipe or fittings shall be rejected.

STEEL PIPE:

13-22. Steel pipe shall be galvanized or black as called for with size of pipe and size and type of fittings as shown on drawings.

COPPER TUBING:

13-23. Copper tubing for services or elsewhere as called for shall be of sizes shown with flared joints. Service connections to house lines shall be properly capped.

JOINTS:

13-24. Unless otherwise called for on plans or otherwise directed, joints shall be made as follows:

a. Bell-and-Spigot Joints:

1. Before jointing bell-and-spigot pipe, all lumps, blisters, and excess coating material shall be removed from the bell-and-spigot ends of the pipes. All oil

or grease shall be removed. The outside of the spigot and the inside of the bell shall be wire-brushed and wiped clean and dry.

2. Joint Packing: The packing shall be carefully placed and tightly calked to uniform thickness. No loose or frayed ends of fibre shall protrude into the space to be filled with joint filler. Each joint shall be carefully inspected and checked for proper depth before the joint runner is attached.

3. Sulphur Compound Joints: The depth of compound in joints shall be not less than 2-1/2 inches back of the face of the bell. The compound shall be heated and manipulated in accordance with the recommendations of the manufacturer of the joint material. The melting pot, ladle, and pouring pot shall be kept free of any deleterious substances and shall be thoroughly cleanse frequently to assure clean and live compound in the joints Sulphur jointing compound shall be stirred thoroughly and continuously while melting and until used and shall be poured into the joint as quickly as possible after being removed from the melting pot. The pot shall be kept as close to the joints being poured as is practicable, and in no case more than 50 feet distant. When poured, the sulphur compound shall be liquid, free from foam, froth, bubbles, or any foreign matter, and shall show a mirror-like surface. Suitable funnel-shaped metal pouring gates shall be adequately bonded and anchored to the joint runner with clay. The joint space and gate shall be completely filled with one continuous pour while the compound is at the proper temperature. The solidified compound in the pouring gate shall be cut off flush with the top of the bell. Any sulphur joint compound burned in the melting pot shall be dumped out and not reused.

b. Mechanical Joints: Mechanical joints shall be installed in strict accordance with the recommendations of the joint manufacturer.

c. Bolted Joints: Bolted joints shall be made in strict accordance with the recommendations of the pipe manufacturer.

d. Welded joints, threaded joints, flanged joints and flared tube connections shall conform to sections 21-06 through 21-09 respectively, Division 21 of these specifications, where applicable.

SETTING HYDRANTS, VALVES AND VALVE BOXES:

13-25. Hydrants, valves and valve boxes shall be installed in the lines as shown on the drawings or as directed by the Engineer. Hydrant connections shall face in the direction of the nearest road or parking area. Care shall be taken to install valves and hydrants in a vertical position. Each embedded valve shall be equipped with a valve box and cover.

VALVE ASSEMBLIES:

13-26. Valve assemblies shall be constructed as indicated. Pipe, valves and fittings shall be installed in a workmanlike manner without forcing or springing. Flanged joints shall be fitted with suitable gaskets. Where indicated the valve assembly shall provide space for a strainer of size indicated.

THRUST BLOCKS:

13-27. Where pressure lines change direction of flow or elsewhere as directed, install concrete thrust blocks in the manner detailed on the drawings. Dimensions of thrust blocks shall be as determined by Engineer.

ELEVATED TANKS AND RESERVOIRS:

13-28. Pipe line connections to elevated tanks and reservoirs shall be as shown on the drawings. Assembling of tanks shall conform to Section 21-13, Division 21 of these specifications where applicable. Foundations and towers shall be as stipulated in other divisions of these specifications. Interior surfaces of reservoirs and tanks shall be painted as called for in the "Painting" division.

SALT WATER PUMPING STATION:

13-29. Piping and equipment at the Salt Water Pumping Station shall be installed in the locations shown on the drawings. The installation of equipment shall conform to applicable provisions contained in Sections 21-05 and 21-12, Division 21 of these specifications.

RECORD DRAWINGS:

13-30. The Builder shall assist the Engineer in maintaining in good condition a complete set of water lines drawings, upon which shall be drawn any and all work which is installed differently than indicated on the drawings.

STERILIZATION:

13-31. General: Each unit of the completed fresh water distribution system shall be sterilized with a chlorine solution before being placed in service.

13-32. Method: The sterilizing solution shall contain not less than 50 parts of chlorine to one million (1,000,000) parts of water. The chlorinating material shall be introduced into the fresh water distribution system in a manner approved by the Engineer. All valves in the lines shall be opened and closed several times during the process to insure an even and thorough distribution of the sterilizing solution. After a contact period of not less than eight (8) hours, the system shall be flushed with clear water until the residual chlorine content is not greater than 0.2 parts per million of water.

TESTING:

13-33. Backfilling: When a section of work is ready for testing, pipe trenches shall be partially backfilled as specified in the "Earthwork for Utilities" division of these specifications. Backfill shall be placed to a depth of one foot over the top of pipe with joints exposed, or as directed.

13-34. Testing of lines shall proceed after lines have been filled with water for at least 24 hours prior to testing. All entrapped air shall be released from the section to be tested, and a water pressure of one hundred (100) pounds shall be developed and maintained as nearly constant as possible for at least 24 hours. Permissible leakage expressed in terms of gallons per inch of diameter of the pipe per mile per 24 hours shall not exceed eighty (80) inch-gallons. Sections of pipe lines showing leakage in excess of 80 gallons shall be repaired and retested until the leakage is within the specified limit.

DIVISION 14

SANITARY SEWERS

GENERAL REQUIREMENTS:

14-01. The work covered by this division of the specifications consists in furnishing all labor, tools and equipment required for the construction of all sanitary sewers, including appurtenant structures and branch sewers to points of connection with the building drains, all as shown on the drawings or required for the work.

14-02. Excavation and backfilling shall conform to the "Earthwork for Utilities" division of these specifications.

MATERIALS:

14-03. Materials, as furnished by the Owner, will include the following:

a. Vitrified clay pipe and fittings, bell-and-spigot type, including wye branches.

b. Prefabricated sheet metal manholes with cast iron covers.

c. Joint packing-jute, oakum or hemp.

d. Portland cement for concrete or mortar.

e. Corrugated metal pipe, coupling bands and caulking material.

14-04. Mortar, concrete and forms used in the work shall conform to the provisions of the "Concrete and Form Work" division of these specifications. Concrete and mortar proportioning shall be as directed by the Engineer.

PIPE LAYING:

14-05. All pipe shall be laid up grade from structure to structure without breaks and with socket ends up grade. Foundation for pipe shall be firm and true to line and grade with uniform bearing under full length of pipe barrel. Builder shall note stipulations regarding bottom of trench for clay pipe as contained in the "Earthwork for Utilities" division of these specifications.

14-06. As the work progresses, the interior of the pipe shall be cleared of all dirt and superfluous material of any description. Where cleaning after laying is difficult because of small pipe size, a suitable swab or drag shall be kept in the pipe and pulled forward past each joint immediately after jointing has been completed.

14-07. Protection: Walking upon or disturbing pipe in any manner after joint work is completed will not be permitted. Open ends of pipe shall be closed with loose fitting stoppers whenever work ceases and always at openings to manholes and like work. Trenches shall be kept free from water until the pipe jointing material has set.

ALIGNMENT:

14-08. All lines shall be laid to true line and grade. Before backfilling proceeds, each section of lines shall be tested for trueness by means of reflection on mirrors.

BRANCH CONNECTIONS:

14-09. "Branch connections" shall be interpreted to mean branch sewers laid from main sewers to points indicated on drawings to which sewer service is to be connected.

14-10. Branch connections shall be constructed on an unyielding foundation true to line and on a straight grade from the main sewer to the upper end, unless otherwise directed.

14-11. "Y" Branches for branch connection lines shall be placed where indicated, and except where otherwise shown or directed shall be a minimum distance of five feet away from structures. Branch connection sewer lines shall be joined to "Y" branches by eight bends. Upper end of branch connection sewers shall be tightly closed with a suitable stopper.

14-12. Cutting into pipe for connections shall not be done except in special cases approved by the Engineer.

JOINTING:

14-13. The spigot of the joining pipe shall be entered firmly against the base of the bell socket and centered by calking the gasket from the lower part of the bell to the top. The joint shall then be carefully filled with portland cement mortar, well rammed in by a wooden calking

tool, then over filled and left with a smooth wiped or troweled bevel. Joint packing material shall be employed when connecting clay and cast iron pipes, and at other joints as directed.

14-14. Superfluous material inside the pipe shall be removed by a swab. In the event that mortar may sag, run or be washed out before setting, a suitable bandage shall be used to hold the mortar in place as directed by the Engineer.

14-15. All joints shall be water tight and any leaks or defects shall be immediately repaired. Any pipe which has been disturbed after being laid shall be taken up, the joints cleaned and the pipe properly relaid.

MANHOLES:

14-16. Manholes shall be constructed where shown or as required for the work. Manholes shall consist of sheet metal shells with cast iron covers and shall be set in a concrete base.

14-17. The invert channels may be formed directly in the concrete of the manhole base, or may be constructed by laying full section sewer pipe through the manhole and breaking out the top after the surrounding concrete has hardened. The invert channels shall be smooth and semicircular in shape and shall conform to the inside diameter of the adjacent sewer section. Changes in direction of flow shall be made with a smooth curve of as large radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly.

14-18. The floor of the manhole base outside the channels shall be smooth and shall slope toward the channels not less than one inch per foot, nor more than 2 inches per foot. The free drop from the invert of the inlet pipe to the invert of the outlet pipe shall be as indicated on the drawings.

CLEANOUTS:

14-19. Cleanouts shall be placed where indicated or required by Engineer. Cleanouts shall be formed of "Y" branches, placed in position as directed, and shall be tightly sealed with suitable caps.

CORRUGATED METAL PIPE:

14-20. Material: Corrugated metal pipe, as furnished by the Owner, shall be asbestos-bonded asphalt coated corrugated metal pipe of riveted construction; with water tight bands and rods and caulking material.

14-21. Handling: Plank skids and rope slings shall be used in unloading pipe or in lowering into trenches. Care shall be taken to avoid dropping pipe or dragging pipe over abrasive surfaces, so as to avoid injury to protective coating.

14-22. Pipe Laying: The stipulations regarding excavating, backfilling and shaping of trench bottom for clay pipe as contained in the "Earthwork for Utilities" division of these specifications, shall here apply.

14-23. Pipe shall be laid with the longitudinal seams at the sides or quarter points, never at the top and bottom.

14-24. Couplings: Coupling, unless otherwise directed shall be by means of watertight band couplers and rods. The use of band couplers does not involve overlapping the end corrugations of pipe sections. Bands shall first be slipped over the end of one pipe section; the adjoining length should then be brought to within an inch of the first length so that pipe and band corrugations match. The band should then be opened and slid over the joint. Finally, the band is tightened, being tapped lightly at the same time. Caulking material shall be placed between bands and pipe.

OUTFALL SEWER:

14-25. The outfall sewer section to be placed under water should be made up in the required length with the discharge end tightly capped. The section should then be floated into the designated position, the cap removed, and the pipe allowed to sink into place.

TESTS:

14-26. Every precaution shall be taken to insure that completed sewer lines are leak-proof. Builder shall test sections of sewers before backfilling when and as directed. If, in the opinion of the Engineer, inspection and/or tests indicate excessive infiltration, such sections

of sewers shall be taken up and relaid to the satisfaction of the Engineer.

RECORD DRAWINGS:

14-27. The Builder shall assist the Engineer in maintaining in good condition a complete set of sewer drawings, upon which shall be drawn any and all work which is installed differently than indicated on the drawings.

DIVISION 15

ELECTRICAL GENERATION AND DISTRIBUTION

GENERAL CONDITIONS:

15-01. See Division 1 of these specifications for General Requirements, Definition of Terms, Authority of Engineer, Changes, Work to be performed by Owner, Work to be performed by the Builder, Construction Schedule and Cleanup.

15-02. All work shall be executed in a workmanlike manner and shall present a neat mechanical appearance when completed.

15-03. The installations shall comply with the regulations of the 1947 National Electrical Code and Rules Overhead Line Construction, General Order No. 95 of the California Utilities Commission.

15-04. Approximate locations of existing communications cables are indicated on the drawings. A cable locator shall be used as required to determine where any digging, trenching, or other construction work may endanger these cables and every reasonable precaution shall be taken to prevent damage to these cables. This shall include rerouting cables as required by the Engineer.

15-05. The Engineer shall prepare "as built" drawings showing electrical facilities as installed. The Builder shall co-operate with the Engineer to the end that all required and approved changes shall be indicated on the drawings.

15-06. The work to be done under this division of these specifications shall include the furnishing of all labor, equipment and tools required to complete and have ready for operation the installation of the following items in accordance with these specifications and the applicable drawings.

a. Power Plant

b. Overhead and Underground Distribution Systems.

POWER PLANT:

15-07. The power plant shall consist of the number and size of Diesel Engine Generator units complete with control cubicles and all auxilliary equipment as shown on the plans.

15-08. The plant electrical equipment and wiring shall also include the following items as shown on the plans.

a. All primary distribution switchgear and and wiring.

b. Station service transformer bank.

c. Secondary Feeders.

d. Two secondary switchboards and all branch circuit wiring to motors, heaters, and all miscellaneous power equipment.

e. One lighting panelboard and all wiring to lights and receptacles.

f. All control wiring.

15-09. See applicable portion of Division 16 of these specifications for interior wiring.

15-10. The trades foremen and other supervisory personnel which the Owner, through his representative, the Engineer, furnishes, will be experienced in constructing similar plants with similar equipment.

OVERHEAD AND UNDERGROUND DISTRIBUTION SYSTEMS:

15-11. The primary system to be used will be three wire, 2300 volts, 60 cycles.

15-12. The secondary systems to be used will be one of the following; as indicated on the plans;

a. four wire, three phase, 120/208 volt wye, or or

b. three wire, three phase, 240 volt, delta, or

c. four wire, three phase, 240 volt delta with neutral teaser in one phase for 120/240 volt service.

d. three wire, single phase, 120/240 volt.

POLES:

15-13. All poles must be roofed.

15-14. Set poles "back to back" or "gain to gain" on straight lines. On curves, gains face apex of the angle.

15-15. Poles shall be set to the following depths unless otherwise approved by the Engineer.

Length of pole in feet	Setting depth in soil	Setting depth in rock
20	5	3
25	5	3.5
30	5.5	3.5
35	6	4
40	6	4
45	6.5	4.5
50	7	4.5

15-16. Cut gains for arms as required square with the axis of the pole to a depth of not more than 1/2 inch with a flat surface 4-3/4 inches high and approximately 4 inches wide.

15-17. Where more than one gain is required, the gains shall be parallel and all holes shall be squared with the axis of the pole.

15-18. When the pole has sweep or curvatures, the gains shall be made on the concave side.

15-19. Keep all poles free from posters, banners, nails, radio antennas, signs, or other devices that might interfere with safe climbing of the pole.

15-20. All operating poles, such as transformer poles and cable poles shall be stepped from a point 10 feet above the ground to within 18 inches to 36 inches below the lowest arm, unless otherwise directed. Steps shall be in line and shall be spaced approximately 18 inches between consecutive steps.

15-21. Poles which have to be stored for more than two weeks shall be stacked in close piles upon treated or other non-decaying skids. The skids shall be of such strength and dimensions properly spaced so as to support the poles without producing noticeable distortion of any of them.

CONDUCTORS:

15-22. For overhead distribution, bare copper conductors shall be used for primary service, copper conductors with weatherproof covering shall be used for secondary service.

15-23. Taps shall be made with solderless connectors.

15-24. When facing the direction the power is coming from the primary conductors from right to left will be phase A, Phase B, Phase C.

15-25. Secondary lines on service racks shall be identified as follows: Top wire, neutral, second wire phase"A", third wire phase "B", bottom wire phase "C".

15-26. The following sag tables are intended as guidance for installation in a tropical climate of hard and medium hard drawn bare copper for different span lengths:

Wire Size AWG	Stringing Temp. Deg. F	Span in Feet 125	Span in Feet 150	Span in Feet 175	Span in Feet 200
		SAG IN INCHES			
4	90	13	18	24	28
	60	9	13	18	18
0	90	13	18	24	23.5
	60	9	13	18	18
00	90	13	18	24	23.5
	60	9	13	18	18

15-27. For required clearance and minimum separation of conductors, see regulations referred to in paragraph 15-03.

15-28. Underground primary cable shall be direct burial, 5 KV, three conductor cable. It shall be installed either in conduit or buried directly in a trench as shown on the plans.

15-29. Underground conduit shall be painted with an asphalt base paint before laying.

15-30. Where direct burial in a trench is indicated, cable shall be laid on 6 inch and covered by 3 inches of fine smooth sand. It shall be covered with a 2 inch x 6 inch fully treated plank.

15-31. Minimum cover for underground cable shall be 2 feet - six inches unless otherwise approved. Trenching, backfilling, etc., shall conform to applicable provisions of "Earthwork For Utilities" division of these specifications.

15-32. All Underground Primary Cable shall be adequately identified by signs warning of the presence of underground high voltage lines.

TRANSFORMERS:

15-33. Before installing transformers, check oil for moisture, core for loose connections and excess heating, and insulators for tightness.

15-34. When facing the direction the power is coming from, the transformers of a three (3) phase bank shall be named from right to left, "A", "B", "C".

15-35. Unless otherwise indicated on the plans, primary fuse size for single phase transformers shall be as follows:

Transformer Size in KVA	Fuse Size in Amperes
3	5
5	5
7.5	5
10	10
15	15
25	25

Transformer Size in KVA	Fuse Size in Amperes
37.5	25
50	40
75	50
100	75
150	100

SAFETY:

15-36. Safety is of primary importance in the construction of power lines. For this reason it is important that the lineman understand the principles of this type of construction.

REFERENCES:

15-37. Any of the following publications which are available can be used for further reference on this subject:

a. American Electricians' Handbook, by Terrel Croft, published by McGraw Hill. .

b. Safety Rules for the Installation and Maintenance of Electric and Communication Lines, Handbook No. 32, from Superintendent of Documents, GovernmentPrinting Office, Washington, D. C.

c. Ware Department Technical Manual T M 5-680C, Overhead Distribution Systems, Repairs and Utilities, Electrical Facilities.

DIVISION 16

INTERIOR WIRING FOR LIGHT AND POWER

GENERAL CONDITIONS:

16-01. References: The following paragraphs of Division 15 of these specifications shall apply to this division: 15-01, 15-02, 15-05, and 15-06.

16-02. The Installation shall comply with the regulations of the 1947 National Electrical Code.

16-03. Scope: The work to be done under this division of these specifications shall include the furnishing of all labor, equipment, and tools required to complete and leave ready for operation the installation of interior wiring for Light and Power in accordance with these specifications and applicable drawings.

16-04. Electrical Characteristics of equipment shall be ehecked in the field. If necessary, make connections and re-schedule panel wiring to suit in field.

16-05. Rerouting of Cable or conduit runs to suit conditions in the field is permissible.

16-06. To Prevent Leakage in the roof structure, penetration of roofing panels for cable or conduit support bolts is not permissible.

METHODS OF BUILDING WIRING:

16-07. Non-Metallic Sheathed Cable shall be used for exposed and concealed overhead branch circuit wiring for lighting unless otherwise indicated on the drawings. It shall not be used as service entrance cable; nor shall it be embedded in concrete.

16-08. Service Entrance Cable shall be used for service equipment to service head where indicated on the drawings.

16-09. Rigid Conduit shall be used for underground branch circuit wiring for power unless otherwise indicated on the drawings.

INSTALLATION OF NON-METALLIC CABLE:

16-10. Cable shall be secured in place at intervals not exceeding 4-1/2 feet and within 12 inches from every outlet box or fitting.

16-11. Bends in cable shall be so made, and other handling shall be such that the protective covering of the cable will not be injured, and no bend shall have a radius less than 5 times the diameter of the cable.

16-12. Splices cannot be made in non-metallic sheathed cable wiring except at outlet, junction, or splicing boxes. These boxes must be accessible. Splices shall be soldered and taped.

16-13. Outlet boxes must be installed at all outlet or switch locations as shown on the plans. Cable shall be fastened to boxes by means of built-in clamps.

INSTALLATION OF RIGID - METAL CONDUIT WIRING:

16-14. Running threads shall not be used. (Running threads are made by cutting enough threads on a conduit so the entire coupling can be screwed on to the conduits, resulting in loose joint with poor conductivity). In lieu of running threads, conduit unions shall be used. Couplings and connectors shall be made tight. They shall be of the water-tight type if buried in concrete, or fill, or installed in wet places.

16-15. Factory ells and/or sweeps shall be used as required and available. When field bends are required, the radius of the curve of the inner edge must be at least six times the internal diameter of the conduit when rubber and braid covered conductors are installed and not less than ten times the internal diameter of the conduit when lead covered conductors are to be installed.

16-16. Conduit shall be held in a vice while being cut. Care must be taken to see that the cut is at a right angle to the side of the pipe. Cutting oil shall be used when cutting threads or conduit.

16-17. Conduit shall be reamed after cutting.

16-18. Rigid galvanized conduit coated with an asphaltic base paint shall be used for underground conduit runs where indicated on the plans.

16-19. Where exposed overhead conduit is indicated on plans aluminum conduit shall be used if available. If it is not available, galvanized conduit may be substituted.

16-20. Conduit shall be run as straight and direct as possible. The contact of dissimilar metals throughout the

system shall be eliminated if practical to eliminate the possibility of galvanic action.

16-21. A run of conduit between outlet and outlet, between fitting and fitting, or between outlet and fitting shall not contain more than the equivalent of 4 quarter bends, including those bends located immediately at the outlet or fitting.

16-22. Type TW wire of the indicated sizes shall be installed in conduit runs unless otherwise specified.

SERVICES AND PANELS:

16-23. Locations, sizes and types of services and panels for lighting and power are indicated on the plans.

GROUNDING:

16-24. Equipment and systems shall be grounded in accordance with the National Electrical Code, and as shown on the plans.

LIGHTING FIXTURES:

16-25. Lighting fixtures of the types shown shall be installed in the indicated locations.

16-26. Special brackets will be provided and shall be utilized for fixture supports as shown on the plans.

16-27. An inside frosted Mazda lamp of the indicated wattage shall be installed in each fixture.

OUTLETS FOR POWER:

16-28. Each, motor, heater, and other power consuming device shall be installed, connected, tested and left in operating condition.

16-29. Every effort shall be made to check conduit stub-ups and power outlet locations with available equipment which is provided and installed.

MISCELLANEOUS WIRING:

16-30. All miscellaneous equipment installation and wiring called for on the plans shall be provided.

REFERENCE PUBLICATIONS:

16-31. Any of the following publications which are available can be used for further reference on this subject:

a. American Electricians' Handbook by Terrell Croft, published by McGraw Hill.

b. War Department Technical Manual TM-5-680B, Interior Electric Systems, Repairs and Utilities, Electrical Facilities.

DIVISION 17

TELEPHONE SYSTEM

GENERAL CONDITIONS:

17-01. The following paragraphs of Division 15 of these specifications shall apply to this division: 15-01, 15-02, 15-04, and 15-05.

17-02. The work to be done under this division of these specifications shall include the furnishing of all labor, equipment, and tools to install conduits in buildings as shown on applicable drawings, dig necessary ditches, and install poles as required.

17-03. The balance of the work necessary to complete the telephone system will be performed by others.

DIVISION 18

PLUMBING

GENERAL REQUIREMENTS:

18-01. The Work covered by this division of the specifications consists of furnishing all labor, tools, equipment and transportation necessary to install the plumbing system in each building as indicated on the drawings, and as specified herein. See "General Clauses" division of these specifications.

18-02. Trenching and Backfilling shall conform to the "Earthwork for Utilities" division of these specifications.

18-03. All concrete work in this Division shall conform to the provisions of the "Concrete and Form Work" division of these specifications.

MATERIALS:

18-04. All piping, fittings, valves, fixtures, equipment and accessories, necessary to install the plumbing systems as shown on the drawings, will be furnished by the Owner.

LOCATIONS:

18-05. Locations as indicated on the drawings show the arrangements desired for the principal apparatus, etc., and shall be followed as closely as possible. Proper judgement must be exercised in carrying on the work to secure a neat arrangement of the fixtures, piping, etc.

SANITARY SYSTEMS:

18-06. Scope: Extend house sewer or sewers five feet (5') out from the building line and connect to sanitary sewers brought to these points under Division 14 of these specifications.

18-07. Connections: Provide properly trapped connections to all sanitary fixtures throughout the buildings and run all soil and water lines from these fixtures to main house sewer or sewers. Soil, waste and vent lines shall be run as indicated on the drawings.

FRESH WATER SYSTEM:

18-08. Make connections to fresh water services brought to a point or points five feet (5') outside the building line under Division 13 of these specifications. Run distributing mains with branches to supply all fixtures and equipment as indicated on the drawings. Water closets, urinals, and hose bibbs will be supplied with salt water; all other fixtures and equipment with fresh water.

SALT WATER SYSTEM:

18-09. Make connection to salt water services brought to a point or points five (5') feet outside the building line under Division 13 of these specifications. Run distributing mains with branches to supply all water closets, urinals, and hose bibbs as indicated on the drawings.

HOT WATER SYSTEMS:

18-10. Scope: Hot water systems are shown installed in the Dispensary, P. O. & P. X., Mess Hall, Bakery and Laundry.

18-11. Dispensary: For the Dispensary Building 180 degree water is piped from the oil fired heaters in the Heater Room to fixtures and equipment in the kitchen, as indicated on the drawings. This is a dead end system and does not return to the heaters. 180 degree water from the heaters is mixed with fresh cold water by means of a No. 11 Powers regulator to produce 140 degree water for domestic use in the balance of the building. From the regulator run a distributing main around the building, overhead, with branches to all fixtures requiring hot water. The end of the main shall run to a circulating pump in the Heater Room and from the pump to the return header at the water heaters. All as indicated on the drawings.

18-12. P. O. & P. X.: Hot water for the P.O. and P.X., will be supplied from an electric water Heater. Run main with branches to the barber lavatories and fixtures as indicated on the drawings. This will be a dead end system without a return to the heater.

18-13. Mess Hall and Bakery: For the Mess Hall and Bakery, 140 degree water will be supplied from a steam heated storage heater, located in the Mess Hall. Mains with branches shall supply all fixtures and equipment requiring hot water, as indicated on the drawings. Pot sinks

will be supplied with high temperature water by means of steam and water mixers. The dish washers are equipped with booster heaters to supply high temperature water for dish rinsing.

18-14. Return Lines: A return hot water system will supply the bakery. A return line from the end of the hot water main shall run to a hot water circulator, near the water heater, and from the circulator to the water heater, as shown on the drawings. The hot water lines in the Mess Hall will dead end to the fixtures.

18-15. Laundry: Hot water for the laundry will be supplied from a steam heated storage heater located in the Boiler House. A main will be run from the water heater to the laundry building and branches in the Laundry will supply fixtures and equipment as shown on the drawings.

OIL SYSTEM:

18-16. Set oil tanks, make pipe connections, and run piping to all equipment requiring fuel oil in the Mess Hall, Bakery and Dispensary as indicated on the drawings.

AIR SYSTEM:

18-17. Install Air Compressor and Storage Tank in Boiler House. Run piping from tank to presses in Laundry as indicated on the drawings.

PIPE:

18-18. All Soil and Waste Lines shall be standard weight, cast iron, bell-and-spigot soil pipe.

18-19. All Vent lines above ground shall be 63S-T6 aluminum pipe, anodized. See details showing connections from cast iron to aluminum pipe.

18-20. All Hot and Cold Water lines above ground shall be 63S-T6 aluminum pipe anodized. All connections from aluminum pipe or fittings to brass, iron or steel pipe or fittings shall be made with plastic nipples or fittings. "Parmelee" pipe wrenches shall be used on aluminum pipe.

18-21. All Oil lines and Water Service lines shall be type K soft copper tubing.

18-22. All Air lines shall be schedule 40 galvanized steel pipe.

18-23. All Plastic Pipe and Nipples shall be I.P.S. Mills Plastic made of Saran.

FITTINGS:

18-24. All fittings in Cast Iron lines shall be of the same material, weight, and quality as the pipe.

18-25. All fittings in Steel Waste lines shall be standard weight, black, beaded, recessed, screwed drainage fittings.

18-26. All fittings in Aluminum lines shall be I.P.S. cast aluminum, anodized.

18-27. All fittings in Steel Air lines shall be standard weight, galvanized, beaded, screwed malleable iron fittings.

18-28. All fittings in Copper Oil lines shall be Streamline, or equal, brass solder fittings. Solder and flux used for making joints shall be #50 Streamline solder and flux or equal.

18-29. All fittings in Copper Water Service lines shall be red brass compression type fittings.

18-30. All Brass fittings shall be 125#, 85% cast red brass.

18-31. All Plastic fittings shall be I.P.S. Mills Plastic made of Saran.

VALVES:

18-32. Provide shut-off valves in all main water services. Each water closet shall be provided with a straight stop. Shut off valves shall be Crane #438 or equal.

MAKING UP PIPE:

18-33. Cleaning: All pipe shall be carefully cleaned and all scale, sand, dirt, etc. removed before installation.

18-34. Joints in Cast Iron soil pipe shall be standard caulked joints, made by first packing the joint tight with oakum, filling to the top with molten lead and caulking tight.

18-35. Threaded Joints: All threads on screwed pipe shall be cut with sharp clean dies full thickness of the die and so that not more than two threads are left exposed on the pipe when joint is made up in the fitting or valve. The ends of all threaded pipes shall be reamed out full size with long taper reamer so as to be partially bell-mouthed and perfectly smooth. Joints in all screwed steel or brass piping shall be made with red lead and boiled linseed oil completely covering the male thread.

18-36. Joints in Aluminum piping shall be made with "Alcoa" thread lubricant used on the male thread.

18-37. Solder Joints: In making solder joints in copper tubing the tubing and fitting shall be thoroughly cleaned with sand paper, sand cloth or steel wool, after which a thorough coating of paste flux shall be applied. Tubing shall be cut square and all burrs removed. Tube shall fit snugly and squarely against shoulder of fitting. Solder feed hole shall be completely filled and solder shall appear at end of fitting for the full circumference.

PITCH OF PIPES:

18-38. All Soil and Waste lines shall run at a uniform grade of not less than 1/4 inch per foot where practical. Where this is impractical due to the depth of the sewer main a fall of not less than 1/8 inch per foot may be used.

18-39. All Hot Water, Cold Water, and Air lines shall be laid to drain, and runs shall be free from sags or traps.

PIPE SUPPORTS:

18-40. Aluminum angle or strap hangers fastened to the building purlins and as detailed on the drawings shall be used to support all overhead piping at intervals of not more than 10 feet.

CLEANOUTS:

18-41. Cleanouts shall be placed where indicated on the drawings. Where lines are in ground under floor, cleanouts shall be brought to the floor line and provided with brass cleanout plugs flush with the floor.

PIPE CONNECTIONS:

18-42. All apparatus, fixtures and appliances, which require pipe connections, shall be so equipped, and each such pipe connection shall be valved or trapped or provided with special control apparatus as shown on the drawings or elsewhere specified.

18-43. Where such connections are not shown on the drawings, they shall be made in the usual manner recommended by common practice, and, in the case of special equipment, as recommended by the manufacturer of such equipment.

COVERING:

18-44. Cover all Hot Water Piping with standard thickness 85% Magnesia insulation in sectional form with canvas jackets and metal bands. Cover all valves and fittings in these lines with 85% Magnesia Cement and recover with 8 oz. canvas neatly pasted on.

18-45. Hot Water Storage Heaters shall be covered with poultry wire mesh and plastered with 1-1/2" thick 85% Magnesia insulating cement troweled smooth.

CLEANING EQUIPMENT:

18-46. All exposed piping, apparatus, and equipment shall be thoroughly cleaned of all cement, dirt and other foreign materials. All grease or oil spots shall be removed with gasoline. All surfaces shall be carefully wiped and all cracks and corners scraped out. All fixtures shall be thoroughly cleaned. All chromium plated work shall be polished and the entire plumbing installation shall be left in a neat and clean condition. All pipes and tanks shall be thoroughly washed out and left free from all sediment, scale or grease.

TESTS:

18-47. All Water lines shall be tested to a water pressure of 50 pounds per square inch.

All Soil, Waste and Vent lines shall be tested to a water pressure of 15 pounds per square inch.

All Air lines shall be tested to an air pressure of 100 pounds per square inch.

All Oil lines shall be tested to an air pressure of 25 pounds per square inch.

FINAL INSPECTION:

18-48. Upon completion of the work the water shall be turned on and all pipes, drains, etc. shall be filled and flushed out. The plumbing work must be left in perfect working condition throughout.

DIVISION 19

INSTALLATION OF MISCELLANEOUS MECHANICAL EQUIPMENT

SCOPE:

19-01. The Builder shall provide all labor, tools, and transportion required to install, complete in place, the equipment as indicated on the drawings.

GENERAL DIRECTIONS:

19-02. All installation shall be performed in coordination with other work in the buildings, and at such times as directed. The Builder shall do all required cutting and repairing of structural work. The performance of all equipment required but not covered by this section, shall comply with the applicable requirements of these specifications. Installations shall be made in accordance with recommendations of the manufacturer.

PROTECTION OF WORK:

19-03. All work, materials and equipment shall be fully protected at all times against dirt, water, chemical, or mechanical injury.

CONNECTIONS:

19-04. a. General: Required utility (i.e., water, electric, oil and steam) services, ducts, vents, smoke pipes and drains, whether indicated on the drawings or not, shall be installed by the Builder to or from the designated locations, and the quipment connected thereto by the Builder in correct and complete working order and ready for operation. All equipment to be installed is scheduled on the drawings.

b. Piping: All piping indicated or required shall be installed and shall conform to the requirements of the "Plumbing" division. Final connections to the equipment shall be of the same size as the actual service connections of the equipment. Supply piping shall be installed with valves where such valves are not integral with equipment.

c. Electrical Work: All necessary electric wiring and service connections shall be installed whether indicated or not. All electric work shall comply with the applicable requirements of the "Interior Wiring for Light and Power" division of these specifications.

ASSEMBLY:

19-05. All equipment which has arrived at the site knocked down for shipment and is to be assembled in the field will be accompanied by manufacturer's information. The Builder shall be guided by this information in assembling such pieces of equipment.

ROUGHING-IN:

19-06. For roughing-in dimensions of equipment, the Builder shall consult manufacturer's data and/or field measurements of the actual equipment. In particular, no underground services should be brought to equipment until the sizes and locations are accurately established with field measurements.

LEVELING:

19-07. All equipment, and especially that containing liquids, shall be carefully leveled prior to making final connections. This shall be done by means of either adjustable feet or shims.

LOCATIONS:

19-08. The locations of equipment on drawings are indicative and may be changed only upon recommendation of the Engineer. The Builder shall cooperate with the Engineer in maintaining a record set of prints incorporating such changes as may be deemed necessary.

TEST OF COMPLETED SYSTEMS:

19-09. After the installation is completed, the Builder shall conduct a working test of the various equipment and the systems supplying this equipment covering a period of not less than two (2) hours.

DIVISION 20

INSTALLATION OF EQUIPMENT AND PIPING FOR POWER AND WATER DISTILLATION PLANT

GENERAL REQUIREMENTS:

20-01. References: See Division 1 of these specifications for General Requirements, Definitions of terms, Authority of Engineer, changes, work to be performed by Owner, Work to be performed by Builder, Construction Schedule and Cleanup.

20-02. Workmanship: All work shall be executed in a workmanlike manner and shall present a neat mechanical appearance when completed.

20-03. Scope: The work to be done under this division of the specifications shall include the furnishing of all labor, equipment and tools required to complete and have ready for operation the installations of equipment and piping in accordance with these specifications and the applicable drawings.

PLANT:

20-04. The plant shall consist of the following items all as shown on drawing sheets 4A-459, 4A-460, 4A-461, 4A-462 and 4A-463:

a. Five Diesel Engine Generator Units complete with auxiliary equipment.

b. Two air compressors and two air tanks.

c. Eight Water Distillation units complete with all auxiliary equipment.

d. Three fresh water pumps and chemical feeder.

e. Five expansion tanks with liquid level controllers for diesel engine cooling water make-up.

f. Five 200-gallon, and one 5,000-gallon fuel oil tanks for diesel engine fuel.

g. One 200-gallon wood tank for acid solution (for cleaning distillation units.)

INSTALLATION OF EQUIPMENT:

20-05. All pieces of equipment shall be mounted on their respective foundations or supports. Those which are mounted on concrete foundations shall be accurately leveled with suitable wedges or jacks, and grouted with a thin mixture consisting of one part cement and two parts sand. The grout shall fill all pipes around foundation bolts. After the grout has thoroughly set, the wedges or jacks shall be removed and all foundation bolt nuts shall be tightened down before making any pipe connections to the equipment. Expansion tanks shall be located on structural supports as shown on drawings. Diesel engine auxiliary equipment shall be attached to engine foundation with machine bolts and two unit cinch anchors.

20-06. All piping shall be installed as shown on the drawings.

20-07. The Salt water header and Steam Header, shown running through center of building shall be made up of schedule 40, 6-inch steel pipe with 150-lb. F. S. Slipon flanges, and 150-lb. ring gaskets. Nozzles shall be schedule 40 steel pipe nipples, threaded one end, welded to headers.

20-08. Steam header shall have 1/2" steam trap at each end. Provide one 4" atmospheric relief valve near south end of steam header. This valve shall be set to open at 3-1/2 PSIG steam pressure.

20-09. All other headers are to be made up with standard screwed fittings.

20-10. Compressed air piping for engine starting air shall be schedule 80 steel pipe, and piping for 20 PSIG instrument air shall be standard IPS red brass pipe.

20-11. Piping for fresh water pumps and Chemical Feeder shall be 40 steel pipe with screwed companion flange connections.

20-12. Fuel oil piping between oil tanks and engines shall be 1/2" O. D. soft copper tubing. Fuel oil tank filler, vent, and gauge piping shall be schedule 40 steel pipe.

20-13. All other piping inside of the building above the floor shall be standard IPS red brass pipe and fittings.

20-14. All pipe fittings and valves shall be screwed unless otherwise shown or noted on the drawings or in these specifications.

20-15. All underground drain piping shall be bell-and-spigot cast iron or "Duriron" pipe as indicated on the drawings, and shall be installed in accordance with the "Plumbing" division provisions of these specifications applicable to this type of work. All piping which runs under the floor shall be installed before concrete is poured.

20-16. Connections: All screwed, welded and flanged piping connections shall be installed in accordance with "P.O.L. Facilities", Division 21, paragraphs 21-06, 21-07 and 21-08 of these specifications.

20-17. All Underground Fresh Water Piping, to and from fresh water pumps shall be installed in accordance with Division 13 "Fresh and Salt Water Distribution Systems" of these specifications.

20-18. All copper tubing and connections shall be installed in accordance with "P.O.L. Facilities", Division 21, paragraph 21-09 of these specifications.

SUPPORTS:

20-19. All headers running lengthwise of the building shall.be supprted at each pair of columns on a 5" channel support as shown in drawings. The steam header shall be supported on Crane #277-G, or equal, pipe rollers, at each pair of columns. Pipe covering protection saddles, Crane 186-G - Type "A", or equal, shall be welded to under side of steam header at all points where header is supported by rollers. All other headers shall be held in place on the 5" channel supports by means of 3/8" diameter steel yokes attached to the 5" channels. The yokes shall be located not over 24 feet apart. These yokes are to serve as guides only, and must not be pulled tight to pipes.

20-20. All other Overhead Piping shall be supported by 1/8" x 3/4" aluminum strip hangers, attached to the roof purlins and looped around pipe. Hangers shall be attached to purlins and around pipe with 1/4" x 3/4" aluminum bolts.

20-21. Engine piping shall be supported on Crane #168-G, or equal, hooks. The hooks shall be attached to side of engine foundation with machine bolts and cinch units, as required.

20-22. Fresh Water Pump Piping shall be supported on pipe supports, as shown on drawings. The supports for heat recovery silencer, electric heater, expansion tanks, pipe headers between columns, fresh water pump piping and distillation unit steam ducts shall be fabricated in the field. The support for distillation unit steam ducts shall be similar to type "A" pipe support shown on drawings.

VALVES:

20-23. a. All steam line valves shall be 150-lb. rising stem, wedge disc gate valves, Crane #431, or equal, except by-pass valves around traps, which shall be Crane #14-1/2 P. or equal, brass globe valves.

b. All fresh water pump valves shall be Crane #465-1/2, or equal, standard iron body, flanged, O. S. & Y. wedge gate valves with brass trim. Fresh water pump check valves shall be Crane #373, or equal, iron body flanged swing check with brass trim.

c. Compressed Air valves shall be Ohio Injector Company #262, or equal, 250-lb. brass globe valves, for air. Compressed air check valve shall be Ohio Injector Company #203, or equal, 300-lb. brass check valve, for air.

d. Compressed Air Pressure Reducing Valve shall be Crane #960, or equal, set for 250 PSIG inlet and 25 PSIG outlet.

e. Compressed Air Relief Valves shall be Crane #2560, or equal, set at 260 PSIG and Crane #2550, or equal, set at 25 PSIG.

f. Atmospheric Relief Valve shall be Kieley & Mueller #520, or equal, set at 3-1/2 PSIG.

g. Fuel Oil Valves shall be Buckeye #658, or equal, self closing loading valve and Nordstrom 150-lb. #1925 lubricated plug valve (with wrenches).

h. All Other Valves, unless otherwise noted or shown, shall be Crane #438, or equal, standard brass gate valves and Crane #27, or equal, brass check valves.

EXPANSION TANKS:

20-24. One expansion tank with liquid level controller shall be provided for each engine. They shall be mounted on supports between columns, under headers, as shown on drawings. The liquid level controller shall be Fisher Type 227C direct operated liquid level controller with type 120-1/2 bronze globe body valve.

WOOD TANK:

20-25. One 200 gallon open top wood tank approximately 48" O. D. x 36" high shall be installed, as shown on drawings. This tank is to hold acid solution which is used for cleaning scale out of the distillation units. Install two 1" brass tank nipples in the side of the tank, as near the bottom as possible, for outlet and drain connections. The drain piping shall empty into the Duriron hemispherical sink.

INSULATION:

20-26. All Steam Piping shall be covered with standard thick 85% magnesia sectional pipe covering with metal bands. All fittings and valves in steam lines shall be plastered flush with 85% magnesia insulating cement - Carey MW-50, or equal. Do not cover steam line vibration eliminators.

20-27. All Distillation unit Evaporators, hot wells, and steam ducts, and diesel engine exhaust silencers shall be covered with 1-1/2" thick 85% magnesia insulating Cement - Carey MW-50 or equal, over galvanized stucco netting. Stucco netting shall be securely fastened to equipment which is to be insulated. Insulating cement shall be troweled to a smooth finish.

20-28. All Distillation Unit Exchangers shall be entirely enclosed with 1" thick asbestos millboard and #16 ga. aluminum as shown on drawings.

DIVISION 21

P. O. L. FACILITIES

GENERAL REQUIREMENTS:

21-01. Scope: The work covered by this division of the specifications consists of furnishing all labor, tools, equipment and transportation necessary to install the P. O. L. facilities equipment and piping as indicated on the drawings and as specified herein.

21-02. Trenching and Backfilling shall conform to the "Earthwork for Utilities" Division of these specifications.

21-03. All Concrete Work in this Division shall conform to the provisions of the "Concrete & Form Work" Division of these specifications.

MATERIALS:

21-04. All pipe, Fittings, Valves, Fixtures, Equipment, and accessories, necessary to install the P. O. L. facilities as shown on the drawings, will be furnished by the Owner.

LOCATIONS:

21-05. Locations as indicated on the drawings show the arrangement desired for the principal apparatus, etc., and shall be followed as closely as possible. Proper judgment must be exercised in carrying out the work to secure a neat and orderly arrangement of equipment, instruments, piping, etc.

WELDED PIPE JOINTS:

21-06. a. In General all pipe joints in pipe 2" and larger shall be butt welds of full depth plus a minimum crown at weld center of 1/16".

b. Surfaces for Welding shall be cleaned and shall be free from paint, oil, rust, or scale before welding, except that a light coat of a rust preventative will not be detrimental to the finished weld.

c. Before Welding, the piping or other equipment shall be carefully lined up so that no part is offset

with respect to the adjacent part by more than 20% of the pipe thickness. This alignment shall be preserved during welding.

d. If Tack Welds are Used, they shall be of the same quality and made by the same procedure as the finished weld. Otherwise they shall be removed by chipping to parent metal before completing weld.

e. No Weld Metal shall project within the pipe so as to seriously restrict its area or be in danger of loosening and falling into the pipe.

f. Any Defects to be repaired shall first be removed by chipping, machining or flame cutting the entire defect before rewelding.

g. Butt Weld Flanges shall be welded in the same manner as outlined herein for pipe joints, and unless specifically otherwise noted on drawings, all bolt holes shall straddle vertical and horizontal center lines.

h. Slip on Flanges shall be welded with a full pipe thickness plus 1/16" fillet on exterior joint and a 1/8" seal weld on interior joint. Care shall be taken to protect flange face from all weld spatter while making seal weld and all spatter shall be removed from flange face by machining or grinding.

THREADED PIPE JOINTS:

21-07. a. In General, all pipe joints 1-1/2" and smaller shall be threaded joints.

b. All Threads shall be cut with sharp clean pipe thread dies full thickness of the die and so that not more than two threads are left exposed after making up joint.

c. All Threaded Pipe shall be reamed out full size with a long taper reamer so as to be partially bell mouthed and perfectly smooth. Joints in all threaded pipe shall be made with Parker "Unipac" thread compound completely covering the male thread.

d. All Fittings, Couplings, Unions, etc. on threaded pipe shall be 300# malleable iron fittings, except that standard fittings may be used on vent lines.

FLANGED JOINTS:

21-08. a. All Connections to Flanged Equipment, Valves, Meters, etc., shall be made with steel flanges of the proper size and pressure rating and any flange connection to 125# C. I. flanged equipment shall be made with 150# flat faced steel flanges and using full faced gaskets cut from 1/16" asbestos gasket material, all other flanged connections to have standard asbestos ring gaskets of proper size and rating.

b. All Flanged Connections shall be made in such manner that bending stresses will not be transmitted to the flanges in bolting up, particularly in the case of matting cast iron with steel flanges. In no case shall the use of drift pins or bars be used to align flange bolt holes.

FLARED TUBE CONNECTIONS:

21-09. a. Flared Tube Connections on instrument lines, etc. shall be located as shown on drawings. Tubing shall be 3/8" O. D. x .035 wall soft annealed copper tubing.

b. Tubing Connections to I. P. S. threaded connections shall be made with Triple Type Compression Fittings.

c. Tubing Shall be Cut Square and shall be free from burrs, etc., before flaring.

d. Tubing shall be Flared to the proper angle in a flaring die. Proper alignment of tube and die must be maintained during flaring operation to insure a smooth even flare, square with the tube and free from cracks, pits or thin spots.

PIPE SUPPORTS:

21-10. a. Pipe Supports in buildings and on horizontal storage tanks shall be installed as located and detailed on drawings.

b. Pipe Supports at not less than 12'-0" on center of concrete, native stone, cut coral, or other suitable material shall be provided in the field for above ground pipe lines and shall have a minimum height of 6" above normal grade.

SUBMARINE FUEL LINES:

21-11. Submarine fuel lines shall be located as shown on the drawings. Pipe on ocean bottom shall be of welded joint construction and shall be installed as detailed on drawings.

21-12. Flexible Hose Connection between buoy and submarine pipe shall be 4" Submarine Hose of such length to be at least one and one-half times the depth of water at the buoy.

21-13. Buoy shall be as detailed on the drawings. Buoy and fuel lines, valves, etc., above water line shall be painted in contrasting colors to indicate service; Red for gasoline, Yellow for Diesel Oil, Yellow and White for jet fuel. Painting shall be as per Division 10, Paragraph 10-23 (f) of these specifications.

MACHINERY AND EQUIPMENT SETTING:

21-14. Machinery and equipment shall be located as shown on drawings and shall be set on concrete pads, poured on and dowelled to the floor slab. Foundation bolts shall be located and sized to fit equipment by field and shall be poured in place in pads, or if conditions warrant, pads may be poured and drilled for cinch anchors. A minimum of 1/2" of grout shall be used to set all equipment. All equipment shall be carefully leveled and aligned before grouting. Grout shall be allowed to completely harden before tightening anchor bolt nuts.

TANKS:

21-15. a. Horizontal Tanks shall be installed as shown on drawings.

b. Underground Tanks shall be installed at Gasoline Service Station as shown on drawings. Care shall be taken not to damage asphalt coating of this tank and any damage shall be repaired before cementing in.

c. Bolted Steel Storage Tanks of capacity as shown on drawings shall be installed on concrete pads as located on drawings.

d. Erection: Bolted Steel Tanks shall be erected in accordance with "General Instructions for

the Erection of A. P. I. Bolted Steel Tanks Smaller than Low 1000 Barrel (29'-8-5/8" dia.)", a copy of which is furnished with each tank. Particular attention should be paid to that portion of these instructions labeled "Warning" and which reads as follows:

"WARNING"

"BOLTS AND NUTS SHOULD BE DRAWN UP SO THAT THE GASKET IS COMPRESSED FIRMLY BUT DO NOT OVER TIGHTEN OR SEVERE LEAKS WILL RESULT. THE EDGE OF THE GASKET AND THE SEAMS USUALLY COINCIDE BEFORE THE BOLTS ARE TIGHTENED. THE GASKET WILL PUSH OUT SLIGHTLY WHEN THE PROPER PRESSURE IS APPLIED.

"THIS TANK HAS BEEN SPRAYED WITH RUST-VETO ON ALL INSIDE SURFACES. IT IS VERY IMPORTANT THAT THIS RUST PREVENTATIVE IS THOROUGHLY CLEANED FROM ALL SEAMS BEFORE THE GASKET IS INSTALLED. IT IS ALSO IMPORTANT THAT THIS SUBSTANCE IS REMOVED FROM ALL OTHER INSIDE SURFACES BEFORE FILLING TANK WITH GASOLINE, IN ORDER TO AVOID POLUTION. THESE OPERATIONS REQUIRE A GENEROUS SUPPLY OF RAGS AND KEROSENE. WE HAVE FURNISHED THE REQUIRED AMOUNT OF WIPING RAGS WITH EACH TANK. THE KEROSENE IS NOT INCLUDED AS A PART OF THIS ORDER AND SHOULD BE FURNISHED BY OTHERS.

"NON-SOL BOLT SEAL IS FURNISHED WITH THESE TANKS AND A PROPORTIONATE AMOUNT OF BOLT SEAL THINNER. THIS MATERIAL IS HIGHLY VOLATILE, AND SHOULD BE KEPT TIGHTLY COVERED AS MUCH AS POSSIBLE."

VALVES:

21-16. a. Valves of size and type as indicated on the drawing shall be located as nearly as possible where shown. Variations in location for ease of operation is permissible.

b. Block Valves - 2" and larger are Flanged Lubricated Plug Valves and shall be checked for lubricant at time of installation.

c. Block Valves - 1-1/2" and smaller are standard screwed Brass Gate Valves, except that block valves on instrument lines, pressure gages, etc., are 1/2" - 600# Steel Gate Valves and shall be installed as detailed on drawings.

DIVISION 22

BOILER HOUSE STEAM AND CONDENSATE PIPING

GENERAL REQUIREMENTS:

22-01. The work covered by this division of the specifications consists of furnishing all labor, tools, equipment and transportation necessary to install the Boiler House Equipment, Steam piping and Condensate return piping.

22-02. Trenching and backfilling shall conform to the provisions of the "Earthwork For Utilities" Division of these specifications.

22-03. All Concrete Work in this division shall conform to the provisions of the "Concrete and Form Work" Division of these specifications.

MATERIALS:

22-04. All pipe, fittings, valves, fixtures, equipment and accessories, necessary to install the Boiler House Equipment, steam piping and condensate return piping as shown on the drawings, will be furnished by the Owner.

LOCATIONS:

22-05. Locations indicated on the drawings show the arrangement desired for the principal apparatus, etc., and shall be followed as closely as possible. Proper judgement must be exercised in carrying out the work in order to secure a neat and orderly arrangement of equipment, instruments, piping, etc.

WELDED PIPE JOINTS:

22-06. In general all pipe joints 4" and larger shall be welded and all pipe joints in underground lines shall be welded. For specifications for welded joints see Division 21, paragraph 21-06 of these specifications.

THREADED PIPE JOINTS:

22-07. In general all pipe joints 3" and smaller shall be threaded joints except where otherwise indicated on drawings. For specifications for threaded joints see Division 21, paragraph 21-07 of these specifications.

FLANGED JOINTS:

22-08. For specifications for flanged joints see Division 21, paragraph 21-08 of these specifications.

REDUCERS:

22-09. a. Reduction of line size in horizontal run of line shall be by eccentric weld reducers, or eccentric swage nipples, the bottom of the line will be held even and all reduction will be eccentric to the top of the line.

b. Reduction of line size in vertical run of line will be concentric weld reducers, or concentric swage nipples, and in close quarters the use of pipe bushings is permissible if reduction is two pipe sizes or more.

c. Reduction of line size to branch lines from header will be by eccentric weld tee, reducing screwed tee, or tee and swage nipple. All branch connections for steam shall be from top of main.

STEAM TRAPS:

22-10. Steam Traps of the impulse type, of size as noted on drawings, shall be installed in locations as shown on drawings and at any low point in steam mains that may be caused by field rearrangement of piping. Trap stations shall be as detailed on drawings, with globe valve by-pass at each trap, line strainer ahead of each trap, block valve up-stream and downstream of each trap and a swing check valve between trap station and condensate return main.

PRESSURE REDUCING STATIONS:

22-11. Pressure reducing stations shall be installed as detailed on drawings.

22-12. Relief valves: Relief valve piping shall vent to atmosphere above roof of building and all vent piping from relief valve shall be at least one pipe size larger than the relief valve outlet, a 1/2" drip valve and line from bottom of relief valve outlet shall be installed as detailed on drawings.

BOILER FEED PIPING:

22-13. Boiler feed piping shall be as shown on drawings and shall not be pocketed between deaerators and boiler feed pump.

INSULATION:

22-14. a. All steam, condensate return and boiler feed water piping shall be insulated with standard 85% magnesia sectional pipe covering of line size.

b. All insulated lines above ground exposed to the weather shall be insulated as outlined above and in addition shall receive a 1/4" troweled coat of Carey insulating cement and two (2) coats of Carey Fibre Coating.

c. All valves, flanges, reducers, etc., shall be finished full thickness of standard insulation with Carey insulating cement.

d. All underground insulated lines shall be Durant insulated pipe and shall be installed as shown on drawings and in accordance with manufacturer's instructions as follows:

1. Line must be thoroughly tested by responsible party and passed on by project inspector before insulation joint work can be started.

2. First straighten out ends of casing if damaged. Clean all mud, dirt, and foreign matter from end of mastic.

3. Cut canvas from ends of covering. Never fit covering against turned down canvas.

4. Fit in length of covering cut to exact length. If cut too short, fill in space with wet powdered magnesia or asbestos cement.

5. Scrape out covering on the inside to allow clearance for the weld bulge to travel with the expansion of the pipe. This clearance should be approximately 1/2" at the first joint from the anchor point and should increase in length by 1/2" increments

on succeeding joints to the expansion loop. If pipe is hot when joints are made, clearance shall be on the contracting or anchor side of the weld bulge and, if this line is cold, clearance shall be on the loop or expansion side of the weld bulge.

6. Fit this section of covering tightly together, paste down the canvas, then pull tightly together with a circle of wire. Paste a band of canvas around these two joints. At this point care should be taken to prevent the hot mastic from penetrating through to the pipe.

7. Install sheet metal connector. First make four cuts with snips, two on each edge of connector, in the center for level ground, and at the highest point for graded work, about 3" deep and 3" apart opposite each other. Slip connector around casing, bend up these pieces of metal, which will form 2 sides of a 3" x 3" x 3" filling hole. Pull connector tightly around casing and fasten in place with sheet metal screws; two at each end. Wrap a small strip of canvas around the two upturned pieces of metal to form a square filling hole. Note: When this job is finished it is not necessary to cut this filling hole flush when the pipe is underground.

8. Putty all seams with asbestos cement or wet magnesia; then fill with mastic hot enough to run like oil.

9. First fill the connector with mastic let cool for two to three hours, then dig out crust from filling hole, repair with very hot mastic. Repeat this operation until the joint is full to the top with cold, hard mastic. never allow casing to be covered with dirt until mastic has set and cooled. A 1" thickness of mastic must at all times be the minimum, and never allowed to penetrate through to the pipe.

10. Lay underground pipe with slots down - never fill trenches with rocks - only with soil or sand. If rain prevents or postpones joint making, place metal connectors upside

down over joints until joints can be made. Caution - Do not seal joints if insulation is at all wet. If wet, let steam through line with joints open until thoroughly dry.

PIPE SUPPORTS:

22-15: Pipe supports shall be as detailed on the drawings and shall be located not less than 8'-0" on centers inside of buildings, or less than 12'-0" on centers outside buildings, except at road or driveway crossing when the minimum possible span to allow vehicle clearance shall govern spacing.

VALVES:

22-16. Unless otherwise noted on drawings all gate valves, globe valves and check valves shall be 150# screwed brass valves of line size.

22-17. Non-return valves shall be 250# flanged C. I. valves, Lunkenheimer #1408, and shall replace existing outlet valves furnished with 50 H.P. Boilers.

MACHINERY AND EQUIPMENT SETTING:

22-18. Boilers, deaerators, and all other equipment for which foundation details are shown on drawings shall be set level and true on these foundations before grout is poured. Foundation bolts shall not be tightened until grout has hardened. All equipment for which foundations are not detailed on drawings shall be mounted on concrete pads, 6" high poured on and dowelled to the floor. These slabs are to be sized to suit equipment, and anchor bolts located and sized by the field. A minimum of 1/2" grout shall be used in setting this equipment. All equipment shall be set level and true before grouting. Anchor bolts shall not be tightened before grout has hardened.

DIVISION 23

DEHUMIDIFICATION, VENTILATION, AND REFRIGERATION

GENERAL REQUIREMENTS:

23-01. Scope: The work covered by this division of the specifications consists of furnishing all labor, tools, equipment and transportation necessary to install the dehumidification, ventilation and refrigeration systems as indicated on the drawings and as specified herein.

INSTALLATION OF DEHUMIDIFICATION UNITS:

23-02. a. The first step to be taken should be the delivery of the cases containing the units intact close to their final location.

b. The uncrating of this equipment should be done with considerable care to prevent damage. The top of the case should be removed first, then the sides can be more easily removed in one piece. The equipment can then be unbolted from the skids and lifted off. In lifting the equipment do not lift it by any pipes or other extending parts, but rather from its base whenever possible.

c. The exact location of the units can be determined by scaling Drawing #2A-473.

d. The condenser discharge duct should be attached to the units first so that it will extend through the wall when moved into position. After unit has been moved into final position use shims to level it if necessary, so as it will sit firmly on the concrete with all four corners bearing an equal share of the weight. Lead shields and bolts must be put into the concrete to keep the unit from walking. Take special care in tightening down these bolts so as not to warp the base which would pull the motor and compressor out of line. The weight of the unit will hold it down. The bolts are only to keep it from walking, therefore, when tightening them down, keep this in mind.

e. The unit should be thoroughly secured to the floor as described above before attempting to make the rest of the duct connections. This would prevent any danger of damage to the equipment by the possibility of tipping it over.

INSTALLATION OF VENTILATION FANS FOR EXHAUST HOODS:

23-03. a. The installation of ventilating fans should be approached in a manner similar to the installation of dehumidification units.

b. The exact location of the ventilating fans can be determined after the exhaust hood which the fan or fans served has been installed.

c. After the location of each fan has been determined, the fan should be mounted on its foundation as indicated on Drawings Nos. 2A-484, 2A-485, and 2A-491. Fan shall be shimmed plumb and level. Before anchoring fan or collar to foundation, the first section of duct work should be in place.

DUCT WORK GENERAL REQUIREMENTS:

23-04. Ducts shall be of the sizes indicated on the drawings. Where building conditions require changes to be made in the sizes of the ducts, the sizes and details of such work shall be such as will produce satisfactory operation and will be subject to the approval of the Engineer. All horizontal ducts shall be installed to allow all the possible head room under them in the various rooms through which they pass. Where necessary, changes of elevation in the duct shall be made to serve this result.

DUCT CONSTRUCTION DETAILS:

23-05. a. All ducts shall be made of 3S 1/2 H aluminum of the gauges shown on drawings. Duct sections shall be constructed of a minimum number of pieces assembled with Pittsburgh lock or grooved seams carefully closed for tightness.

b. Duct sections shall be joined by pocket slip or bar slip spaced not more than 4 feet apart.

c. All duct panels shall be cross-broken and supplemental reinforcing shall be added as required to prevent drumming and to provide structurally sound assembly. Changes in direction or elevation of ducts shall be made as shown on the drawings. Where curved sections are shown and no radius is shown, it shall be the same as the dimensions of the duct in the plane in which the bend is made. Where square turns are indicated on the drawings, only those shown as having air turns shall be installed.

d. Changes in the size of ducts shall be made by tapering sections, the length of which should not be less than 4 inches for each inch or fraction thereof, of difference between the sizes of the two sections.

HANGERS AND SUPPORTS:

23-06. All horizontal ducts shall be carried by hangers spaced not over ten (10) foot centers with a separate hanger for each branch less than ten (10) feet long. Hangers for ducts and exhaust hoods shall be made of aluminum angles, assembled and bolted as shown on drawings.

ASBESTOS CONNECTIONS:

23-07. Connections of ducts to dehumidification units shall be made by sleeves 6 inches long of asbestos style 10-P-250, weight 2.5 lbs. per square yard. This material shall be placed under 1-inch bands of 20 gauge aluminum and connected to the duct and to the outlets and inlets of the units with #10 x 3/4" cadmium plated sheet metal screws at 4 inch centers.

ASBESTOS GASKETS:

23-08. Provide sheet aluminum cover of #20 gauge for 12-inch diameter cleanout openings in hood exhaust ducts as shown on the drawings. Each shall have a gasket of asbestos made from the same material used for asbestos connections. The gasket shall be placed over the opening with the aluminum cover on the outside and connected to the duct with eight (8) No. 10 x 3/4" cadmium plated sheet metal screws equally spaced around the diameter of the cover.

DUCT INSULATION:

23-09. Application to exterior of dehumidified air duct runs: The fibrous glass board for horizontal duct runs shall be cut so the top and bottom insulation laps the side pieces; similar cutting of insulation shall be applied to vertical runs and curved pieces of duct. Insulation shall be secured to the duct with #10 x 1-1/2" cadmium plated sheet metal screws with 1-1/2" diameter aluminum washer. Screws and washers should be attached close to the edge of duct for greatest support and not more than one screw per one square foot of insulation should be used. Where standing seams or angles extend through the insulation, there shall be a 1/2 inch layer

of fibrous glass felt extending 3 inches on the duct work on each side of the seam or angle and placed tight around the projecting leg of the angle or seam. The insulation shall then be applied overlapping the edge of this felt and tight to the felt on the angle or seam so that the vertical part of the insulated angle or seam will project through. After insulation is in place and secured to duct, two coats of a white oil base paint shall be applied to the exterior side of the insulation. Paint should be used without any thinner added.

GRILLES:

23-10. a. All grilles will be furnished to the jobsite without holes for mounting, due to difficulties that may occur when grilles are located for final securing to duct. All holes shall be punched 3/16 inches in diameter, 3/8" in from the outside edge rim. Holes near the corners shall be punched on the top and bottom rim 2 inches in from the outside edge of the end rims.

b. Where the drawings call for volocitrols to be mounted with the grilles, they shall be mounted approximately 2 inches behind the grille in the duct.

CLEANING:

23-11. The outside of all ducts shall be wiped and brushed clean so as to remove all dirt, grease, and rust before any insulation or painting is done. The inside of ducts shall be thoroughly brushed out and all refuse removed before painting is done. The exposed parts of equipment shall be cleaned, oil and grease removed, and the bright metal parts left clean and polished.

TEST AND ADJUSTMENTS:

23-12. Complete and thorough tests of the system and its various parts shall be under the supervision of the Engineer. No piece of equipment should be initially started up unless the Engineer is present.

INSTALLATION OF REFRIGERATOR BOXES:

23-13. a. The cases containing the compressors, refrigerant piping, and knockdown refrigerators should be delivered close to their final location before uncrating.

b. In each case containing a knockdown refrigerator will be an assembly drawing that should be followed to assemble the box correctly.

c. Plug-in type refrigeration units are completely factory assembled, and it should be only necessary to check the compressor oil level and the refrigerant charge before placing in operation.

d. For refrigerators with remote compressors, the compressor should be uncrated and prepared for final location and setting. Flywheel should not be installed before placing on floor. The compressor base should be used for lifting. Machine should not be lifted by compressor body, manifolds, piping, shaft, or motor. To do so may cause serious damage.

e. Lead shields and bolts must be put into the concrete to keep the compressor from walking. After the compressor is placed, but before it is anchored, the flywheel should be installed and locked tightly on the shaft. The compressor should be leveled carefully using shims or wedges under the steel base if necessary. The level should be checked width-wise by placing the level across the grooved rim of the flywheel directly above the shaft. When the compressor is absolutely level the bolts should be tightened. Special care should be taken in tightening down these bolts so as not to warp the base, which would pull the motor and compressor out of line. The weight of the compressor assembly will hold it down. The bolts are only to keep it from walking; therefore, when tightening them down, keep this in mind. After compressor is in place and secured to the floor, check the level both ways to insure that position has not changed.

f. The vee-belt drive should now be installed and aligned. Belts should be absolutely straight in grooves and adjusted for correct tension. To check belt tension press downward on each belt using thumb. A single belt should deflect about 1/2 inch under normal pressure. Each belt should be tested. Under the same pressure each belt should deflect the same amount.

g. All protecting plugs should remain intact and all valves closed until refrigerant piping is ready to be attached.

PIPING SYSTEMS:

23-14. In the cases containing the refrigerant piping, valves, fittings, strainers and accessories necessary to completely and properly connect up all refrigeration apparatus, including refrigerant discharge, suction and liquid lines, will be a detailed drawing showing the pipe sizes and location of accessories on pipe runs.

PIPE:

23-15. All refrigerant piping shall be type "L" hard temper copper tubing.

FITTINGS:

23-16. All fittings in refrigerant lines shall be wrought copper fittings.

MAKING UP PIPE:

23-17. Refrigerant piping should be carefully laid out and installed. All piping shall be well aligned and free from liquid collecting traps and pockets. The refrigerant liquid line shall be installed to provide a gradual slope to the evaporator coil and the suction line a gradual slope to the compressor. All piping shall be well supported and anchored with ample provision made for expansion and contraction. All piping shall be straight, thoroughly reamed and cleaned of all dirt before being made up. All runs shall be made up of full length sections of pipe or lengths cut to fit. Short lengths shall be used at the end and not in the middle of the runs. Joints in the refrigerant lines shall be made with Sil-Foss or 95-5 solder. The tubing and fitting shall be thoroughly cleaned with sandpaper or steel wool, after which a thorough coating of flux should be applied. Tubing shall be cut squarely and all burrs reamed. Tube should fit snugly and squarely against shoulder of fitting. Solder feed hole should be completely filled and solder should appear at the end of the fitting for the full circumference. All joints must be made gas tight and unless special care is taken in cleaning, much trouble will be encountered with leaks.

PIPE HANGERS:

23-18. Pipe hangers shall be made from aluminum strip and spaced not over six (6) feet apart.

TEST AND ADJUSTMENT:

23-19. None of the refrigeration equipment shall be started for any reason until the refrigerant lines have been checked by the Engineer for bad joints, air removed from the lines and the refrigerant charge is ready to be admitted into the lines.

INSULATION OF PIPING:

23-20. After the system has been operating long enough to prove it is gas tight, insulate the suction line, but just before insulating, leak test the entire system as a final check. Fibrous glass sectional pipe insulation will be furnished for insulating refrigerant suction lines. Before applying insulation, all piping shall be properly cleaned and shall be free from moisture. All suction lines shall be spaced to allow ample room for application of insulation and vapor seal. The thickness of the fibrous glass insulation for suction lines shall be 2 inches. The insulation shall be applied with all joints tight, and the canvas jacket pasted on smooth and tight. The insulation shall be ended at each fitting, and hangers, etc. which shall be insulated separately. A vapor seal shall be applied over the insulation to seal the insulation to the pipe at all fittings, hangers, etc. The vapor seal, which is a fibrated asphalt emulsion, shall be applied to the entire outer surface of the insulation at least 1/8 inch thick. While this is still plastic, wrap the insulation with fibrous glass tape, spiralled tightly around the insulation with an edge lap of at least 1/2 inch. When the first coat of vapor seal material is dry, apply a second coat over the glass tape at least 1/8" thick when wet. This shall be palmed or troweled to a smooth finish. When this coat is dry, apply a coat of asphalt base aluminum paint. All fittings, hangers, etc., shall be insulated with layers of 1/2 inch thick fibrous glass superfine roll insulation, built up flush with the adjoining insulation. The roll insulation shall be cut to fit and secured in place with two-ply twine. The vapor seal shall be applied over the fitting insulation and thoroughly sealed to the adjoining pipe insulation. Hangers shall be applied outside the insulation wherever possible, and when applied to the pipe, shall be insulated for a distance of at least six inches beyond the pipe insulation.