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# COMPLETION REPORT

407995

U. S. ATOMIC ENERGY COMMISSION

CONTRACT NO. AT (20-1) 507

*Greenhouse #56*

## ENIWETOK PROVING GROUND FACILITIES

### VOL. IX SPECIFICATIONS (1)

PROPERTY OF  
U. S. GOVERNMENT

**HOLMES & NARVER, INC.**

LOS ANGELES, CALIFORNIA

1 September 1951

Special Review  
Final Determination

DECLASSIFIED BY WASHINGTON  
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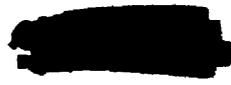
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AUTHORITY: D.O.C.

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by wife*



SECRET

COMPLETION REPORT

U. S. ATOMIC ENERGY COMMISSION  
CONTRACT NO. AT-(29-1)-507

ENIWETOK  
PROVING GROUND FACILITIES

VOL. IX

SPECIFICATIONS (1)		
Reviewers	Class.	Date
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HOLMES & NARVER, INC.  
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SPECIFICATIONS

VOLUME IX

CONSTRUCTION SPECIFICATIONS

- Part I. General Conditions
- Part II. Special Conditions
- Part III. Technical Provisions

VOLUME X

PURCHASE SPECIFICATIONS

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- Electrical
- Mechanical
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SPECIFICATIONS FOR CONSTRUCTION OF  
FACILITIES ON ISLAND "A"

CONSTRUCTION SPECIFICATIONS

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I

PART IGENERAL CONDITIONS

## GC-I      CONDITIONS OF WORK - CONSTRUCTION

I-1    SITE INVESTIGATIONS AND REPRESENTATIONS - The Contractor acknowledges that he has satisfied himself as to the nature and location of the work, the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, and electric power, roads, uncertainties of weather, physical conditions at the site, the conformation and condition of the ground, the nature, quality and quantity of surface and subsurface materials to be encountered, the type of equipment and facilities needed preliminary to and during the prosecution of the work and all other matters which can in any way affect the work or the cost thereof under this contract. Any failure by the Contractor to acquaint himself with all available information concerning these conditions will not relieve him from responsibility for estimating properly the difficulty or cost to successfully performing the work. The Government assumes no responsibility for any understanding or representations made by any of its officers or agents during or prior to execution of this contract unless (1) such understanding or representations are expressly stated in the contract and (2) the contract expressly provides that responsibility therefor is assumed by the Government. Representations made but not expressly stated and for which liability is not expressly assumed by the Government in the contract shall be deemed only for the information of the Contractor and the Government will not be liable or responsible therefor.

I-2    JOB CONDITIONS:

a.    Camp Facilities - The Contractor shall furnish all labor, equipment, materials, tools and supplies for, and manage, operate and maintain the facilities including but not limited to housing, messing, commissary, medical services, first aid and emergency treatment and recreational facilities as are necessary to adequately meet the requirements of all authorized Government agencies.

b.    Other Facilities - The Contractor shall construct, maintain and operate all other facilities necessary to conduct the operations of the entire project including utilities, laundry, transportation, communications, etc.

GC-1

Existing utilities will be available to the Contractor, and the Contractor may repair existing disused utilities at his option.

c. Transportation of Equipment and Materials - Except as specifically modified by other paragraphs of these specifications, it shall be the Contractor's responsibility to transport all equipment and materials used by him to the site. Existing roads built inside the area will be available to the Contractor.

### I-3 OPERATIONS:

a. Warehouse, shop and office facilities and stockpile area will be provided by the Contractor. The Contractor may, with prior approval of the Contracting Officer, erect structures, install utilities and establish storage areas as may be necessary to prosecute the work under the contract, all to remain the property of the Contractor and to be removed and the sites cleaned up to the satisfaction of the Contracting Officer upon completion of construction unless otherwise provided in writing. Government premises will be made available for use by the Contractor without cost whenever such use will not interfere with other Government uses.

b. All operations of the Contractor, including storage of materials, upon Government premises shall be confined to areas authorized or approved by the Contracting Officer. No unauthorized or unwarranted entry upon or passage through, or storage or disposal of materials shall be made upon the Government premises. The Contractor shall be liable for any and all damage caused by him to such Government premises. The Contractor shall hold and save the Government, its officers and agents free and harmless from liability of any nature or kind.

c. Should the performance of the work require that the right of ingress and egress on properties not owned or controlled by the Government be secured, the Contractor shall secure such license or easement and the costs incurred, if any, shall be borne by the Government.

### I-4 PRESERVATION OF EXISTING VEGETATION:

a. The Contractor will preserve and protect all existing vegetation such as trees, shrubs and grass on or adjacent to the site which does not unreasonably interfere with construction as may be determined by the

Contracting Officer. The Contractor will be responsible for all unauthorized cutting or damaging of trees and shrubs, including damage due to careless or negligent operation of equipment, stockpiling of materials, or tracking of grass areas by equipment.

b. Care will be taken by the Contractor in felling trees authorized for removal to avoid any unnecessary damage to vegetation that is to remain in place. Any limbs or branches of trees broken during such operations shall be trimmed with a clean cut and painted with an approved tree pruning compound if required by the Contracting Officer. The Contractor will be liable for or may be required to replace or restore at his own expense all vegetation that may be destroyed or damaged which has not been protected or preserved as required herein.

I-5 LIABILITY FOR DAMAGES - The Contractor shall be responsible for all damages to persons or property, including damages to underground property or underground utilities, which are indicated in the specifications or drawings or the existence of which are otherwise made known to the Contractor; that occur as a result of his fault or negligence in connection with the prosecution of the work, and shall be responsible for all materials delivered and work performed until completion and final acceptance of the construction.

## GC-II CONDITIONS OF WORK - ADMINISTRATION

II-1 BONDS AND INSURANCE - The Contractor shall procure and thereafter maintain only such bonds and insurance in such forms and in such amounts and for such periods of time as the U. S. Atomic Energy Commission may require in writing; all as set forth in Article XIX of the contract.

II-2 IDENTIFICATION OF EMPLOYEES - All employees of the Contractor or any of his subcontractors must be cleared by the Contracting Officer before being allowed entrance to the Project Site. After such clearance, each employee will be furnished with an identification badge or card which the employee must display at all times while within the limits of the area. The identification badges or cards will be furnished by the Government at no cost to the Contractor, but the Contractor shall be responsible for their immediate return to the Contracting Officer upon release of an employee.

GC-III ACCOMPLISHMENT OF WORK - CONSTRUCTION

III-1 CHARACTER OF WORK AND MECHANICS - This work shall be executed in the best and most workmanlike manner by qualified, careful and efficient mechanics in strict accordance with the drawings and specifications.

III-2 BASE LINES AND GRADES - The Contractor shall make all necessary field surveys required to adapt construction to terrain conditions; furnish all grades which are essential to the construction of the various items, and stake out the base lines of all items of construction at the construction site. The Contractor shall furnish all stakes, templates, platforms, equipment, ranges and labor that may be required in setting and cutting, or laying out any part of the work. The Contractor will be held responsible for the proper execution of work to such lines and grades, and all stakes or other marks shall be preserved by him until their removal is authorized by the Contracting Officer.

III-3 DRAWINGS AND SPECIFICATIONS - Where no figures or memoranda are given, the drawings shall be accurately followed according to scale. In any case of discrepancy in the figures on the drawings, the matter shall be immediately submitted to the Contracting Officer without whose decision said discrepancy shall not be adjusted by the Contractor, save only at his risk; and in the settlement of any complications arising from such adjustment, the Contractor shall bear all expense involved. In case of differences between the drawings and specifications, the specifications shall govern. Where specifications or standards of the Federal Government, technical societies or testing organizations are included in these specifications by reference the latest revision to such specifications or standards shall govern.

III-4 INSPECTION - As set forth in Article III of the contract, the work shall be conducted under the general directions of a responsible representative of the Contractor and is subject to inspection by his appointed inspectors to insure strict compliance with the terms of the contract, and with the provisions of the drawings and specifications as approved by the Commission. No inspector is authorized to change any provision of the drawings or specifications without authorization of the Commission, or its authorized representative, nor shall the presence or absence of an inspector relieve the Contractor from any requirements of the contract.

III-5 CONNECTIONS INTO UTILITY SYSTEMS AND CLOSING STREETS - All operations of the Contractor requiring connection into or disconnection from the existing utility distribution or collection systems, fire alarm or other alarm systems or closing of streets shall be performed in accordance with instructions obtained from the Contracting Officer.

III-6 REQUIREMENTS FOR SUNDAY, HOLIDAY AND NIGHT WORK:

a. The Contractor shall furnish sufficient forces, construction plant and equipment, and shall work such hours, including night shifts, overtime operations and Sunday and holiday work, as may be necessary to insure prosecution of the work in accordance with the approved progress schedule. If, in the opinion of the Contracting Officer, the Contractor falls behind the progress schedule, the Contractor shall take such steps as may be necessary to improve his progress and the Contracting Officer may require him to increase the number of shifts, and/or overtime operations, day or work and/or the amount of construction plant.

b. Failure of the Contractor to supply the requirements of the Contracting Officer under this provision shall be grounds for determination by the Contracting Officer that the Contractor is not prosecuting the work with such diligence as will insure completion within the time specified. Upon such determination, the Contracting Officer may terminate the Contractor's right to proceed with the work or any separable part thereof, in accordance with the termination Article of the contract.

III-7 SUSPENSION OF WORK - The Contracting Officer may order the Contractor to suspend all or any part of the work for such period of time as may be determined by him to be necessary or desirable for the convenience of the Government. Unless such suspension unreasonably delays the progress of the work and causes additional expense or loss to the Contractor, no increase in contract price will be allowed. In the case of suspension of all or any part of the work for an unreasonable length of time causing additional expense or loss, not due to the fault or negligence of the Contractor, the Contracting Officer shall make an equitable adjustment in the contract price and modify the contract accordingly. An equitable extension of time for the completion of the work in the event of any such suspension will be allowed the Contractor, provided, however, that the suspension was not due to the fault or negligence of the Contractor.

III-8 SAFETY AND FIRE PROTECTION:

a. The Contractor shall take all steps and all precautions to protect health and to minimize danger from all hazards to life and property, and shall make all reports and permit all safety inspections of work being performed under the contract as are/or may be provided for in safety regulations entitled "Atomic Energy Commission - Safety Regulations," as same may be hereinafter revised (on file in the office of the Commission), or as the Commission may direct pursuant thereto. In the event the Contractor fails to comply with said "Atomic Energy Commission - Safety Regulations" or with said directions of the Commission, the Commission, without prejudice to any other rights of the Government, may issue an order stopping all or any part of the work; thereafter, a start order for resumption of work may be issued at the discretion of the Commission. The Contractor shall make no claim for compensation or damages by reason of, or in connection with, such work stoppage.

b. First-Aid Field Stations - On all projects employing up to 300 persons, in a concentrated area, a first-aid field station shall be established. First-aid field stations shall provide a minimum of 100 square feet of floor space with provisions for adequate light, heat, and water; walls and ceilings, except for aluminum buildings, shall be covered with nontoxic white or off-white paint, the floor shall be of impervious construction and the exterior shall display appropriate insignia. Adequate directional signs shall be established on the project. First-aid field stations may be of the portable type so that they may be moved from one location to another to meet the needs of various working groups. At least one station shall be located at each work site and shall be adequately equipped as determined by the supervising physician.

c. First-Aid Attendants - All first-aid shall be administered and all field stations manned by competent and adequately trained first-aid attendants subject to the approval of the supervising physician. First-aid attendants will be limited to such first-aid field treatments as may be directed by the supervising physician. First-aid attendants shall promptly and properly transfer to a hospital all persons suffering other than minor injuries. First-aid attendants shall promptly arrange to have all persons suffering from other than minor injuries placed under the care and treatment of a qualified physician.

d. Operation of Stations - Each first-aid station shall be under the supervision of a qualified physician, who will issue instructions regarding operating practices, procedure and equipment for stations under his supervision. Ambulance service or facilities as well as adequate means of communication as determined by the supervising physician shall be provided.

III-9 TESTS OF PRESSURE VESSELS - Any boilers or other pressure vessels furnished by the Contractor under these specifications which will be operated at pressure of 15 pounds per square inch or greater shall be delivered bearing a certificate of shop inspection by a reputable testing agency. After installation and prior to acceptance by the Government such boilers and pressure vessels will be tested in a manner which is the standard practice for such tests.

All boilers or pressure vessels which will be operated at pressures of 15 pounds per square inch or greater and will be used by the Contractor in his operations in the project area will be similarly tested, approved and certified before being brought on the project and shall be tested annually thereafter.

III-10 TESTS OF INSTALLATIONS - All work on the Project involving utilities or other installations will be tested as required to assure conformance with the drawings and specifications as approved by the Commission. Operating units shall be tested as required to assure proper operation. Rough-in tests of utilities shall be performed before the installation is concealed in the walls, floors, or otherwise and before the service is connected into the distribution or collection systems. All such preliminary tests shall be performed in the presence of a responsible representative of the Contractor as provided for in the Contract. Final tests of the installations will be made in connection with the inspection for acceptance of the construction and shall be performed in the presence of representatives of the Contracting Officer. The final tests will govern and deficiencies which may develop between the time of the rough-in test and the final test will be corrected prior to final acceptance.

GC-IV ACCOMPLISHMENT OF WORK - ADMINISTRATION

IV-1 MATERIALS AND EQUIPMENT:

a. Shop Drawings - The Contractor shall check and approve all shop and working drawings in connection

with construction work to assure conformance with approved drawings and specifications. If approved, approval shall be indicated on each copy by appropriate stamp and date. Copies of all approved shop or working drawings shall be made available to the Contracting Officer.

b. Fixtures and Equipment Data - On completion of the construction, the Contractor shall deliver to the Contracting Officer copies of manufacturers' catalog data covering all fixtures and mechanical equipment installed in the buildings. The manufacturer's catalog data shall include full identification of the equipment or fixture, capacities, current characteristics, dimensions, and identification of replacement parts. Operating instructions for installed equipment shall be furnished and conspicuously mounted by the Contractor at places designated by the Contracting Officer.

c. Samples - If the Contracting Officer requires that the Contractor submit for prior approval samples of materials proposed for use in the work covered by the contract, the Contractor shall make no commitments for such materials until the submitted samples has been approved by the Contracting Officer.

d. Standard Stock Articles - All materials, supplies and articles furnished shall, wherever practicable, be standard products of recognized, reputable manufacturers. Any changes required in the details and dimensions indicated on the drawings, for the substitution of standard products other than those provided for, shall be properly made as approved by the Contracting Officer.

e. Standard Tests, Qualities and Guarantees:

(1) All materials, supplies and parts and assemblies thereof entering into the work to be done under these specifications shall be tested as specified herein, or, if not specified, in conformity with Article III of the contract and according to the best modern approved method for the particular type and class of work.

(2) Unless otherwise authorized or directed, where standard published specifications of recognized authorities or organizations are specified, the latest revisions of such specifications current at the time the work is executed shall govern.

(3) In accordance with Article XXXIII of the contract, all materials, supplies and articles incorporated in the permanent structures shall be of the highest grade, free from defects and imperfections, of recent manufacture, and unused (unless used articles are furnished by the Government). Workmanship shall be of the highest grade and in accordance with the best modern standard practice.

(4) The Contractor shall cause to be furnished guarantees against any failure, in proper use or operation, caused by omissions of material, defective material, workmanship or design, for a period of one year from the date of final acceptance of the completed work, all machinery and equipment, parts and assemblies thereof (except equipment and for machinery furnished by the Government) for which guarantees are customarily furnished in the trade, or for machinery and equipment of special design, for which detail designs or requirements are not prescribed in the specifications.

f. Preference for Domestic Articles - Because the materials listed below or the materials from which they are manufactured, are not mined, produced, or manufactured, as the case may be, in the United States in sufficient and reasonable available commercial quantities and of a satisfactory quality, their use in the work herein specified (subject to the requirements of the specifications) is authorized without regard to the country of origin:

Asbestos	Jute	Rubber
Chromium	Kaurigum	Silk
Clay, English ball	Lac	Sisal
Clay, English china	Nickel	Tin
Copper, natural - nickel alloy	Oil, chinawood (tung oil)	Wood, Balsa Wood, Teak
Cork	Platinum	

Articles, materials, or supplies manufactured in the United States and containing mercury, antimony, tungsten, or mica of foreign origin may be used (subject to the requirements of the specifications) in the work herein specified because such manufactured articles, materials, or supplies, have been manufactured in the United States substantially all from articles, or supplies mined, produced, or manufactured, as the case may be, in the United States.

IV-2 REPORTS:

a. Progress Charts - The Contractor shall within five (5) days after date of commencement of work prepare and submit to the Contracting Officer for approval a practicable schedule, showing the order in which he proposes to carry on the work, the date on which he will start the several salient features (including procurement of materials, plant and equipment) and the contemplated dates for completing the same. The schedule shall be in the form of a progress chart to indicate the percentage completed at any time. The chart shall be corrected at the end of each month and delivered to the Contracting Officer.

b. Records and Books of Account - The Contractor shall keep records and books of accounts at a place mutually agreeable, showing the actual cost to it of all items of labor, materials, equipment, supplies, services, and other expenditures of whatever nature of which reimbursement is authorized under the provisions of this contract and as prescribed in Article VIII of the contract. As further prescribed in Article VIII, the Commission shall at all reasonable times be afforded access to such records and books of account.

c. Fiscal Reports - The Contractor shall make such fiscal reports to the Commission with respect to activities under this contract as the Commission may require from time to time, such reports to be in the form prescribed by the Commission.

d. Breakdown Estimate:

(1) Prior to the execution of the contract or modifications thereto, the Contractor shall submit to and obtain approval of the Contracting Officer or his duly authorized representative a breakdown estimate in duplicate. This breakdown estimate shall include individual items and shall be in sufficient detail to show approximate quantities and type, kind, character of work, material and equipment involved. The individual quantities and cost estimates are approximate only and changes may be requested in the work items by means of directives without formal modification of the contract, except that for changes which materially increase or decrease the scope of the work to be performed, there will be an adjustment in the payments to be made to the Contractor in accordance with Article XIII of the contract.

(2) Each item of the breakdown estimate shall include all overhead, profit and other costs pertaining thereto; such costs are not to be itemized or priced separately.

(3) The Contracting Officer or his authorized representative shall have the right to revise the breakdown estimate submitted as in his judgment may be required to make the several items included in the detailed estimate conform to their true value.

e. Purchase Orders - The Contractor shall furnish the Contracting Officer with copies of all purchase orders for equipment and materials to be incorporated in the permanent construction. Each purchase order shall indicate clearly the promised date (3) of shipment, point (s) of shipment, articles to be furnished, and unit prices. Shipping times specified on purchase orders such as, "soon as possible," "at once," "immediately" and "rush," will not be acceptable to the Contracting Officer. In the event that any delivery shown is not acceptable to the Contracting Officer, the Contractor will be required to take immediate steps to obtain the articles from a source offering suitable delivery.

f. Equipment and Operating Systems - At the request of the Contracting Officer, the Contractor will provide information relative to description and costs of equipment and operating systems furnished and/or installed under this contract.

IV-3 PAYMENTS - Payments will be made as provided in Article VI of the contract. Unless otherwise authorized in writing by the Contracting Officer the items of work for which payments will be made shall be limited to those listed and enumerated in the contract.

IV-4 SUBCONTRACTORS - The Contractor shall not subcontract any of the work he is obligated to perform under this contract except as authorized in writing by the Commission. The Contractor will provide the Contracting Officer, in writing with names of all subcontractors authorized for the work, together with the extent and character of the work to be done by each subcontractor. The Contractor or subcontractor shall, within seven (7) days after the executing of any subcontract, deliver to the Contracting Officer an affidavit setting forth the name and address of his subcontractor and a summary description of the precise work subcontracted. If, for sufficient reason,

at any time during the progress of the work the Contracting Officer determines that any subcontractor is incompetent or undesirable, he will notify the Contractor accordingly and immediate steps will be taken for cancellation of such subcontract. Subletting by subcontractors shall be subject to the same regulations. Nothing contained in this contract shall create any contractual relationship between any subcontractor and the Government.

#### GC-V COMPLETION OF WORK

V-1 POSSESSION PRIOR TO COMPLETION - The Government shall have the right to take possession of or use any completed or partially completed part of the work. Such possession or use shall not be deemed an acceptance of any work not completed in accordance with the contract. If such prior possession or use by the Government delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment in the payments to be made to the Contractor and/or the time of completion will be made and the contract shall be modified in writing accordingly.

V-2 CLEANING UP - The Contractor shall at all times keep the construction area, including storage areas used by him, free from accumulations of waste material, slash or rubbish and prior to completion of work, remove any rubbish from and about the premises and all tools, scaffolding, equipment, and materials not the property of the Government. Upon completion of the construction, the Contractor shall leave the work and premises in a condition satisfactory to the Contracting Officer.

V-3 FINAL EXAMINATION AND ACCEPTANCE - As soon as practicable after the completion of the entire work or any divisible part thereof as may be designated in the specifications, a thorough examination thereof will be made by the Contracting Officer at the site of the work. If such work is found to comply fully with the requirements of the contract, it will be accepted and final payment therefor will be made in accordance with Article VI of the contract.

PART II  
SPECIAL CONDITIONS

SC-1 SCOPE OF THE WORK: The work and services to be performed under this contract, as set forth in Article III of the contract, shall include the following:

a. Reconnaissance, Study and Report of Project: The Contractor shall make a preliminary field reconnaissance and study of the Proving Ground site and shall prepare a resultant report covering development plans, utilities, structures, and comprehensive recommendations for a definite construction program with a time schedule and cost estimates coordinated with the program.

b. Engineering, Design and Inspection:

1. The Contractor shall make all necessary topographical and other surveys (except real estate or boundary surveys) and maps and make or have caused to be made all necessary subsurface investigations. The Contractor shall prepare for the approval of the Commission preliminary studies, sketches, layout plans, investigations, recommendations and reports; and estimate of cost of proposed construction items and utilities and appurtenances thereto.

2. After approval by the Commission of preliminary plans, sketches or drawings, the Contractor shall prepare detailed working drawings and specifications in accordance with Commission or Governmental standards.

3. The Contractor shall prepare cost and material estimates based on the approved drawings and specifications.

4. The Contractor shall provide a Resident Engineer and other necessary personnel to supervise and inspect the construction work to see that all work is performed in accordance with the approved plans and specifications.

5. The Contractor shall prepare record drawings to show construction as actually accomplished. These drawings shall be prepared by revising construction drawings, or where drawings cannot be satisfactorily revised, by preparation of new drawings.

6. The Contractor shall maintain at his central office a complete and adequate staff for the engineering and design of the project, together with the necessary procurement, purchasing, expediting and other special services required.

7. The Contractor shall prepare a Completion Report for the Project within 90 days after completion of test operations.

c. Construction Work: The work to be performed under this contract consists of furnishing all plant, materials, equipment, supplies, labor and transportation, including fuel, power, and water (except any materials, equipment, utility or service, if any, specified herein to be furnished by the Government), and performing all work as required by Article III of the contract and all modifications thereof in strict accordance with the specifications, schedules and drawings, all of which are made a part hereof, and including such detail drawings as may be furnished from time to time during the construction in explanation of said drawings. The principal features of the work are as follows:

1. Ground improvements, including roads, area paving, airfields, earth stabilizing, surface drainage, dust control and field work.
2. P. O. L. (Fuel) facilities.
3. Fresh and salt water facilities and distribution systems.
4. Sanitary sewage systems.
5. Electric generating and distribution systems.
6. Communication systems.
7. Control and signal systems.
8. Piers, approaches and causeways.
9. Scientific structures and appurtenances.
10. Buildings and other structures and appurtenances other than scientific structures or military structures.

a. Work for structures (including Scientific Structures) under these specifications shall be complete in all details as shown on the drawings, including earth work, concrete, masonry, steel, miscellaneous metalwork, insulation, roofing, electrical, carpentry and related work, painting, dehumidification, ventilation, refrigeration, plumbing, machinery and equipment, and all other work shown or required to complete the project.

SC-2. WORK NOT INCLUDED: The following items of work are not included in the work to be performed under these specifications and the accompanying drawings.

a. Military Structures: Plans and specifications for Military Structures, as so defined in the contract and as distinguished from Scientific Structures and structures other than Military or Scientific, have been or will be prepared by or for the U. S. Army, U. S. Navy and U. S. Air Forces respectively.

b. Facilities on Island "A": Plans and specifications for facilities on Island "A" exclusive of Scientific structures and the Loran building, are contained in "Specifications for Construction of Facilities on Island "A" for The United States Atomic Energy Commission" dated March 15, 1950, as amended, and drawings accompanying that specification.

SC-3. LOCATION: The site of the work contemplated under these specifications is located on the Eniwetok Atoll of the Marshall Islands in the Pacific Ocean.

SC-4. COMMENCEMENT AND COMPLETION: Commencement and completion of the various work items shall be in accordance with the schedules contained in the appendices to the contract.

SC-5. CONTRACT DRAWINGS AND SPECIFICATIONS:

a. The drawings accompanying these specifications are to be found in Appendix "A" to these specifications. 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.

b. In addition, work shall conform to supplemental sheets which may be issued to approved shop drawings and to approved manufacturer's erection and/or detail drawings, insofar as they do not conflict with the above mentioned contract drawings.

c. 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 instructions obtained before the work proceeds.

SC-6. AUTHORITY OF ENGINEER:

a. The Engineer shall have the authority to establish lines, grades and controls for construction, and to inspect all work for quality and for compliance with plans and specifications.

b. The Engineer shall decide, within the provisions of the contract, 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.

c. 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.

SC-7. GOVERNMENT FURNISHED MATERIALS OR EQUIPMENT:

a. Under the terms of Article XXIX of the contract, the Contractor may procure from the Armed Forces for use in the work such items of equipment, supplies and material as he deems practical and feasible; and may utilize in the work military aircraft, ships, boats and vehicles of the Armed Forces where he judges the use of such transportation to be practical and feasible. Items of equipment to be furnished by the Armed Forces shall be so noted on the drawings.

b. The Commission reserves the right to furnish any materials, equipment, tools or services necessary for the completion of the work.

SC-8. CHANGES IN WORK: The Commission may at any time by a written order, require changes be made to the specifications and/or drawings, change the location of the work, omit certain work and/or require additional work.

SC-9. DISPOSAL OF EXISTING INSTALLATIONS: Construction covered by these specifications involves demolition, removal or salvage of existing construction. Structures, including Quonset buildings, concrete slabs on earth, and all other existing installations shall be demolished and removed as required by the new construction, and waste materials therefrom disposed of in a manner approved by the Contracting Officer. Existing Quonset buildings, at the Contractor's option, may be removed, repaired as required and relocated for warehousing uses or other uses approved by the Contracting Officer; and such buildings shall remain the property of the Government. The work shall include renovating and repairing certain other installations; the number and location of such installations and the extent of the repairs thereto to be determined by the Contracting Officer.

SC-10. SECURITY MEASURES:

a. Work in Classified Areas: All Contractor's employees shall require a clearance and identification badge or card as provided in paragraph GC-II-2 of the General Conditions.

b. Safeguarding Classified Property, Materials and Documents: Special measures shall be taken by the Contractor in the protection of an accounting for classified materials, in accordance with applicable regulations and policies of the Commission.

SC-11. RATES OF WAGES: The wages or salaries to be paid employees on this project, as determined by the Secretary of Labor to be prevailing for the corresponding classes of employees employed on projects of a character similar to the contract work in the pertinent locality, shall be as set forth in Exhibits A, B and C below. Rates of wages shall be subject to revision as determined by the Secretary of Labor to conform to changes in prevailing conditions, subject to subsequent approval of the Contracting Officer.

EXHIBIT AWAGE SCHEDULE FOR MANUAL WORKERS - OVERSEAS CONSTRUCTIONCLASSIFICATION AND RATES - MANUAL - OVERSEAS

Weekly rates shown are for a 48-hour work week based on hourly rates with premium of time and one-half for hours worked over 40 per week and 8 per day.

<u>Classification</u>	<u>Hourly Rates</u>	<u>48-hour Weekly Rates</u>
Laborer, General or Construction (not otherwise classified)	\$1.20	\$62.40
Helper, Trades not specified	1.30	67.60
Pipe Layer, Utility	1.375	71.50
Asphalt Workers	1.40	72.80
Marine Deckhand	1.40	72.80
Truckdriver, Dump-Truck (4-8 Cubic Yard)	1.40	72.80
Warehouseman	1.40	72.80
Air Compressor Operator	1.50	78.00
Apprentice Engineer	1.50	78.00
Carpenter Helper	1.50	78.00
General Helper	1.50	78.00
Jackhammer Operator	1.50	78.00
Rigger Helper	1.50	78.00
Tire and Lube Man	1.50	78.00
Concrete Mixer Operator (Under 1 Cubic Yard)	1.60	83.20
Marine Operator, Small Craft	1.60	83.20
Mechanic, Helper	1.60	83.20
Piledriver, Helper	1.60	83.20
Powderman	1.60	83.20
Pump Operator	1.60	83.20
Truck Driver, Dump Truck (Over 8 Cubic Yards)	1.60	83.20
Fork Lift Operator	1.625	84.50
Distributor, Bituminous Surface	1.65	85.80
Electrician, Helper	1.70	88.40
Plumber Helper	1.70	88.40
Steamfitter Helper	1.70	88.40
Asbestos Worker	1.75	91.00
Blacksmith	1.75	91.00
Carpenter	1.75	91.00
Cement Finisher	1.75	91.00
Concrete Mixer Operator 1 Cubic Yard and Over	1.75	91.00

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<u>Classification</u>	<u>Hourly Rates</u>	<u>48-hour Weekly Rates</u>
Glazier	\$1.75	\$91.00
Gunite Operator	1.75	91.00
Ironworker, Reinforcing	1.75	91.00
Painter, Brush	1.75	91.00
Roller Operator	1.75	91.00
Sheet Metal Worker	1.75	91.00
Marine Engineman	1.775	92.30
Rigger	1.80	93.60
Trenching Machine Operator	1.80	93.60
Asphalt Crusher and Plant Operator	1.85	96.20
Driller	1.85	96.20
Generating Plants	1.85	96.20
Hoist Operator, 1 and 2 Drums	1.85	96.20
Machinist	1.85	96.20
Mechanic	1.85	96.20
Mechanic, Heavy Equipment	1.85	96.20
Operator, Asphalt Road Mixer	1.85	96.20
Piledriverman	1.85	96.20
Tractor Operator, over 40 H.P.	1.85	96.20
Welder	1.85	96.20
Operator, Distilling Equipment	1.85	96.20
Cement Floor Finishing Machine Operator	1.875	97.50
Marine Operator, Large Craft	1.875	97.50
Scraper Operator, Carryall	1.875	97.50
Boilermaker	1.95	101.40
Ironworkers, Structural	1.95	101.40
Motor Grader, Patrol (any type blade)	1.95	101.40
Painter, Spray	1.95	101.40
Painter, Structural Steel Erected Swing Stage	1.95	101.40
Piledriver Operator	1.95	101.40
Roofer	1.95	101.40
Welder, Certified	1.95	101.40
Electrician, General	2.00	104.00
Hoist Operator, 3 or more drums	2.00	104.00
Lineman	2.00	104.00
Operator, Heavy Equipment (3/4 Cubic Yards and <u>Under</u> )	2.00	104.00
Plasterer	2.00	104.00
Plumber	2.10	109.20
Steamfitter	2.10	109.20
Operator, Heavy Equipment (Over 3/4 Cubic Yards)	2.15	111.80
Bricklayer	2.20	114.40
Tile Setter	2.20	114.40

<u>Classification</u>	<u>Hourly Rates</u>	<u>48-hour Weekly Rates</u>
Electrician, Cable Splicer	\$2.50	\$130.00
Diver	3.00	156.00

FOREMAN'S DIFFERENTIALS

Sub-Foreman (Lead Man)	.125¢ per hour over Journeyman
Foreman	.25¢ per hour over Journeyman
General Foreman	.50¢ per hour over Journeyman

Contract Completion Payment - Upon satisfactory completion of an agreed period of employment an amount, at the rate of \$25.00 per week will be paid to all overseas manual workers.

EXHIBIT B

SALARY AND WAGE SCHEDULES FOR NON-MANUAL WORKERS - OVERSEAS

Salary and Wage Schedules - Overseas

Weekly rates shown for employees in Groups I through X are based on a forty-eight (48) hour week with time and one-half premium for hours in excess of eight (8) worked per day, or in excess of forty (40) worked each week. The weekly rate for employees in Groups XI through XIX is based on a forty-eight (48) hour work week. Employees in Groups XI through XVII will be paid premium pay for hours worked in excess of eight (8) per day or forty-eight (48) per week in accordance with the following table:

Groups XI through XIII . . .	1-1/4 times the basic hourly rate
Groups XIV . . . . .	1 times the basic hourly rate
Group XV . . . . .	3/4 times the basic hourly rate

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Group No.	Job Classifications	Hourly Rates		48 Hr. Minimum	Weekly Rates Maximum
		Minimum	Maximum		
I	Bus Boy Dish Washer Housekeeper Janitor Kitchen Helper Waiter Washer, Laundry	\$1.10	\$1.20	\$57.20	\$62.40
II	Head Dish Washer Office Machine Operator	1.15	1.35	59.80	70.20
III	Barber Cobbler Firefighter Guard	1.20	1.40	62.40	72.80
IV	Clerk Material Checker Messenger-Driver Stenographer Telephone Operator	1.25	1.45	65.00	75.40
V	Chainman Head Waiter Second Cook	1.35	1.55	70.20	80.60
VI	Blueprint Operator Bookkeeper Chief Telephone Operator Dietician Secretary Senior Clerk Storekeeper Timekeeper Guard Seargent	1.45	1.65	75.40	85.80
VII	Baker Butcher First Cook Fire Chief	1.50	1.80	78.00	93.60
VIII	Chief Clerk First Aid Man Nurse Steward	1.55	1.85	80.60	96.20

I	Group No.	Job Classifications	Hourly Rates		48 Hr. Rates	
			Minimum	Maximum	Minimum	Maximum
	IX	Instrumentman	\$1.60	\$1.85	\$83.20	\$96.20
	X	Laundry Foreman	1.65	1.90	85.80	98.80
	XI	Assistant Safety Engineer			91.00	104.00
	XII	Accountant Assistant Auditor Assistant Personnel Manager Assistant Recreation Director Assistant Security Officer Guard Captain Head Nurse Inspector Reproduction Engineer Store Manager Draftsman			93.60	109.20
	XIII	Assistant Office Manager Chef Test-Inspector Engineer Recreation Director Assistant Camp Manager Club Manager			104.00	119.60
	XIV	Computer Auditor Chief Timekeeper Safety Engineer Senior Accountant Senior Draftsman Assistant Engineer Engineering Area Supervisor Chief of Party Security Officer			119.60	139.88
	XV	Senior Engineer Assistant Controller Camp Manager Chief Auditor Office Manager Personnel Manager Superintendent a. Marine Equipment b. Transportation c. Warehouse Assistant Service Operations Manager			135.20	156.00

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Group No.	Job Classifications	Hourly Rates		48-Hour Rates		Weekly Rates	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
XVI	Assistant Resident Manager Principal Engineer (Technical) Port Captain Superintendent a. Building and Maintenance b. Excavation and Grading c. Mechanical d. Surfacing Plants e. Utilities - Construction f. Utilities (Operations) g. Distillation Plants h. Power Plants			\$150.00		\$180.00	
XVII	Controller Principal Engineer (Department Head) Service Operations Manager Assistant Engineering Manager Assistant Construction Manager			160.00		190.00	

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Professional, Executive, Administrative Personnel receive no overtime compensation.

Group No.	Job Classification	Hourly Rates		48-Hour Rates		Weekly Rates	
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
XVIII	Dentist Doctor			\$175.00		\$ 205.00	
XIX	Area Superintendent			180.00		210.00	
XX	Chief Medical Officer			230.00		230.00	
XXI	Construction Manager Engineering Manager Resident Manager			220.00		250.00	

EXHIBIT CSALARY AND WAGE SCHEDULES - LOS ANGELES AREA

Classification	Rate Range 40-Hour Week	
	Minimum Per Week	Maximum Per Week
<u>Weekly Rated Employees</u>		
Messenger - Office	\$ 40.40	\$ 46.00
Messenger - Outside - Driver	46.00	54.20
File Clerk	46.00	54.20
Typist Clerk	46.00	54.20
Receptionist - Operator	46.00	57.70
Stenographer	46.00	57.70
Clerk	46.00	57.70
Bookkeeper	52.00	63.50
Secretary	52.00	63.50
Senior Clerk	52.00	63.50
Accountant	58.40	75.00
Secretary to Executive	58.40	75.00
Store Clerk (Property)	58.40	75.00
Receiving Clerk	58.40	75.00
Chief Clerk	58.40	80.00
Expeditor	66.00	92.30
Chief Payroll Clerk	66.00	92.30
Auditor- Assistant	66.00	92.30
Buyer	75.00	100.00
Auditor	75.00	100.00
Senior Accountant	75.00	100.00
Employment Interviewer	75.00	100.00
Recruiter	75.00	100.00
Security Assistant	75.00	100.00
Chief Warehouseman	92.30	115.40
Chief Auditor	92.30	115.40
Chief Expeditor	92.30	115.40
Safety Engineer	92.30	115.40
Assistant Engineer	92.30	115.40
Instrument Engineer	92.30	115.40
Inspectors	92.30	115.40
Assistant Personnel Manager	92.30	115.40
Computer	92.30	115.40
Testing Engineer	92.30	115.40
Assistant Purchasing Agent	92.30	115.40
Senior Security Assistant	92.30	115.40
Office Manager	115.40	138.50
Chief Inspector	115.40	138.50
Field Engineer	115.40	138.50
Office Engineer	115.40	138.50
Purchasing Agent	115.40	138.50

Classification Weekly Rated Employees	Rate Range 40-Hour Week	
	Minimum Per Week	Maximum Per Week
Assistant Controller	\$ 115.40	138.50
Assistant Security Officer	115.40	138.50
Personnel Manager (Honolulu, T.H.)	115.40	138.50
Personnel Manager, L.A.	115.40	138.50
Administrative Assistant	127.00	138.50
Chief Specification Engineer	127.00	138.50
Chief Estimator	127.00	138.50
Senior Arch. Designer	127.00	138.50
Chief Instrument Service Controller	127.00	138.50
Security Officer	127.50	150.00
Site Planner	138.50	161.50
Chief Industrial Engineer	138.50	161.50
Chief Sanitary Engineer	138.50	161.50
Chief Civil Engineer	138.50	161.50
Chief Electrical Engineer	138.50	161.50
Chief Mechanical Engineer	138.50	161.50
Chief Architect	138.50	161.50
Assistant Gen. Supt. of Construction	138.50	161.50
Special Administrative Assistant	138.50	161.50
Chief Structural Engineer	138.50	161.50
Supervisor of Design	161.50	-
Assistant Chief of Operations	161.50	-
Assistant Project Engineer	161.50	-
Assistant Chief Engineer	161.50	215.00
Chief Fiscal Officer	161.50	215.00
General Supt. of Con- struction	161.50	175.00
Director of Procurement	161.50	175.00
Chief Engineer	190.00	250.00
Axesman	1.00	1.25
Rodmen	1.25	1.50
Blueprinter	1.25	1.75
Warehousemen	1.4875	1.4875
Laborer	1.4875	1.4875
Chainmen	1.50	1.75
Levelmen	1.65	2.15
Transitmen	1.75	2.25
Draftsmen (all departments)	1.75	2.25
Warehouse Foreman	1.75	2.25
Carpenter	1.90	2.0375

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Classification <u>Weekly Rated Employees</u>	<u>Rate Range 40-Hour Week</u>	
	<u>Minimum</u> <u>Per Week</u>	<u>Maximum</u> <u>Per Week</u>
Assistant Engineer	\$ 2.00	\$ 2.50
Chief of Survey Party	2.25	2.75
Estimator	2.25	2.75
Senior Draftsmen (all Depart- ments)	2.25	2.75
Engineers (all Departments)	2.25	2.75
Statistical Engineer	2.25	2.75
Rigger	2.38	-
Specification Engineer	2.50	3.00
Architectural Designer	2.50	3.00
Senior Engineers (all Departments)	2.50	3.00
Principal Engineers (all Depart- ments)	3.00	3.50

SC-12. DEFINITIONS: For the purpose of these specifications the following terms shall apply:

a. Government: The term "Government" shall mean the United States of America and the U.S. Atomic Energy Commission, as agency thereof.

b. Commission shall mean the U. S. Atomic Energy Commission.

c. Contracting Officer: The "Contracting Officer" is the duly authorized representative of the U.S. Atomic Energy Commission.

d. A-E-C-M- or Contractor: These terms refer to Holmes & Narver who is designated in the contract to perform the Architect-Engineer-Construction-Management services stated therein.

e. Engineer shall refer to the authorized representative of the "A-E-C-M".

f. Contract: The terms "the contract" or "this contract" or similar reference to Contract No. AT-(29-1)-507 and all appendices thereto and modifications thereof, as executed by and between the United States of America and Holmes & Narver.

g. Work or Project: The work and services in whole or part as outlined under heading SC-1, "Scope of the Work".

h. Plan, Plans or Drawings: Drawings as defined under heading SC-5.

SC-13. STANDARD CODES AND SPECIFICATIONS: The work to be performed on the project shall conform to applicable provisions of all standard codes and specifications (as latest revised) as called for in the various sections of these specifications. In event of conflicts between provisions of the various governing regulations, the most stringent regulation, as determined by the Engineer, shall govern.

SC-14. APPENDIX A: Appendix A to these specifications is hereby incorporated into and made a part of these specifications. Appendix A contains the list of drawings which accompany these specifications and also specifications contained in invitations to bid covering various structures and items of furnishings and equipment procured for the project and referred to in the appropriate sections of these specifications.

SC-15. TECHNICAL PROVISIONS OF THE SPECIFICATIONS: Part II Technical Provisions, which follows is arranged by divisions for convenient reference. Such separation shall not be construed as prescribing the limits of the work required of any specific trade. The terms of such limitations are wholly between the Contractor and the craftsmen.

PART III

TECHNICAL PROVISIONS

SECTION 1

SITE PREPARATION AND DEMOLITION

1-01. GENERAL REQUIREMENTS: 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.

1-02. CLEARING: 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.

1-03. GRUBBING: 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.

1-04. DEMOLITION: 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.

1-05. DISPOSAL OF CLEARED MATERIAL:

a. All timbers, stumps, roots, brush and other refuse shall be burned or otherwise disposed of as directed by the Engineer.

b. Salvable materials, as designated by the Engineer, shall be separated and stored as directed. Suitable salvable materials may be used in the new construction if approved for use by the Engineer. Materials not designated as salvable shall be disposed of as directed.

c. When so directed by the Engineer, concrete slabs or other concrete to be removed shall be broken into fragments for use as fill material.

SECTION 2EARTHWORK FOR ROADS, AIRFIELDS, PARKING AREAS, ZERO AREA  
HELIOMATS, CAUSEWAYS, DIKES & DRAINAGE DITCHES

2-01. LOCATIONS: The areas to be graded and the finish elevations thereof are as shown on the working drawings or as required for the work.

2-02. GENERAL REQUIREMENTS:

a. The Work of this Section includes the furnishing of all labor, equipment, transportation and materials required to complete the grading for roads, airfields, parking areas, zero areas, heliomats, causeways, dikes and drainage ditches in the locations as shown on the Road, Paving, and Building Location Plans.

b. Roads: Areas for 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 Engineer.

c. On All Areas to be Paved, the subgrade shall be brought to proper elevation by filling and blading. Fill shall be suitable native 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 sheepfoot 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.

d. Roads, airfields, heliomats, and parking areas, shown on the plans as not to be paved shall be constructed in the manner outlined for subgrade under paved areas as specified above in paragraph "C" under heading 2-02.

e. Drainage Ditches shall be excavated in the locations and to the dimensions shown on the working drawings. Surplus material shall be spread evenly on adjacent areas or used in required embankments if suitable.

f. Earth Fill for Causeways shall be sound, native coral from excavations or borrow, and free of debris and organic matter. The fill above water level, or from a height at which compaction equipment can be operated

economically and efficiently, shall be made in conformity to the method outlined in paragraph "C", under heading 2-02 of these specifications. The side slopes of the fill shall be protected from wave and tide action by placing a layer of selected coral-rocks on the slope, which rock shall have a minimum size of one-half (1/2) cubic foot, and shall be so placed as to provide a minimum of voids, with the larger rock on the ocean side of the fill. The rock may be dumped from hauling equipment and spread into layers by bulldozers or other adequate equipment.

SECTION 3

EARTHWORK FOR STRUCTURES

3-01. GENERAL REQUIREMENTS:

a. 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.

b. Earthwork for utility lines outside structures is specified in Section 4 of the specifications, and for roads and airfield is specified in Section 2.

3-02. EXCAVATION:

a. 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.

b. 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.

c. 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.

d. When foundation excavations are erroneously made deeper than required, the extra depth shall be filled with concrete as specified for foundations.

e. 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.

f. Bottoms of trenches shall be trimmed to true level, all loose materials removed, and bottoms moistened and tamped firm before concrete is placed.

g. The Engineer shall inspect and approve all earth work before earth fill and/or concrete is placed thereon.

3-03. WATER AND SHORING:

a. Water shall be removed from excavations as soon as it accumulates. Ground surfaces near excavations shall be sloped to drain away when possible.

b. 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.

3-04. BACKFILL:

a. 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.

b. 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.

c. Placing of backfill shall be in layers of 6-inch maximum thickness. Compaction shall be by hand tools or mechanical equipment approved by the Engineer. Puddling with water shall be done only when approved by the Engineer.

3-05. FILL:

a. Material for fill and manner of placing shall be as hereinbefore specified for backfill, except where otherwise provided.

b. Areas to receive fill shall be stripped and cleared and soil scarified and loosened to a depth of 3 inches before fill is placed.

3-06. EARTH UNDER CONCRETE SLABS:

a. Earth to receive concrete slabs shall be brought to required grades, dampened to optimum moisture content and compacted to 90% of maximum density.

b. On natural or cut grades, the areas shall be scarified and loosened to a depth of 3 inches before compaction.

3-07. GRADING: 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.

3-08. CLEANUP: 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.

SECTION 4EARTHWORK FOR UTILITIES4-01. GENERAL REQUIREMENTS:

a. 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.

b. 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.

4-02. WATER AND SHORING: Excavations shall be kept free of standing water and protected as required to prevent surface water run-off into them. All shoring required to protect the work shall be provided and maintained in approved manner.

4-03. EXCAVATION:

a. 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.

b. 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 on either side of the pipe, and except as otherwise directed, shall have a minimum width at the bottom of 18 inches. Where sheathing is required, the trench widths shall be increased correspondingly.

c. 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 one-third of

the circumference of the pipe will rest firmly on undisturbed soil.

d. 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.

e. 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".

f. 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.

4-04. BACKFILL:

a. No backfilling of excavations shall proceed until work therein has been inspected and approved by the Engineer.

b. 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.

c. Backfilling of trenches prior to testing of pipe therein shall be the minimum required to maintain position. Pipe joints shall remain uncovered until testing is completed.

d. 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 placed in a symmetrical manner and care shall be taken to prevent any wedging action or eccentric loading on or against the pipe or structure. Water settling will be permitted and may be required.

e. Surface finish shall conform to natural ground contours as approved by the Engineer. Additional back-

fill shall be placed on all trench work that settles below adjacent ground levels.

4-05. CLEANUP: Excess excavated materials shall be deposited where directed, and shall be leveled and graded to suit ground contours in the vicinity.

## SECTION 5

### CONCRETE WORK

5-01. SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with concrete work and cement finish for all structures and appurtenances as shown on the drawings or required for the work.

5-02. APPLICABLE SPECIFICATIONS: The following specifications form a part of this specification:

a. Federal Specifications:

- HH-F-334 Filler, Expansion-Joint, Preformed; Non-extruding Bituminous-fiber Type (for concrete).
- TT-C-598 Compound, Caulking, Plastic (for masonry and other structures).
- UU-P-264 Paper, Kraft, Concrete-curing, Water-proofed.
- DDD-M-148 Mat; Cotton, for Concrete-curing.
- LLL-F-311 Fiber-board; Hard-pressed, Structural.

b. U. S. Commercial Standard:

- CS-45-48 Douglas Fir Plywood.

c. American Society for Testing Materials, Standard Designations:

- A-15-39 Specifications for Billet Steel Bars for Concrete Reinforcement.
- A-82-34 Specifications for Cold-drawn Steel Wire for Concrete Reinforcement.
- A-185-37 Specifications for Welded Steel Wire Fabric for Concrete Reinforcement.
- C-114-46 Methods of Chemical Analysis of Portland Cement.
- C-114-46T Tentative Methods of Chemical Analysis of Portland Cement
- C-143-39 Method of Slump Test for Consistency of Portland Cement Concrete.

5-03. UNIFORM BUILDING CODE: All concrete work shall conform to Chapter 26 of the Uniform Building Code, 1949 Edition, where applicable.

5-04. GENERAL: Ample opportunity and full cooperation shall be given the various trades to install their required embedded items. Suitable templates or instructions, or both, will be provided for setting such items as are not placed in the forms by the trades themselves. All embedded items shall have been inspected, and the required tests for concrete and other materials, or for mechanical operations, shall have been completed and approved by the Engineer before concrete is placed.

5-05. MATERIALS:

a. Coral Aggregates: Coral aggregates shall be graded in the field to suit the various conditions at the sites and to meet with the requirements of the different types of concrete needed. These gradations must be approved by the Engineer before the aggregates are incorporated in the concrete mix.

b. Iron Ore and Scrap Steel Aggregates: Iron ore and scrap steel aggregates for limonite aggregate concrete shall be

1. Iron ore for fine aggregate.
2. Scrap steel for coarse aggregate.

Gradations for limonite concrete aggregates must be approved by the Engineer before the aggregates are incorporated in the limonite concrete mix.

c. Cement: Only one brand of each type of cement shall be used for the exposed concrete in any individual structure. Cement reclaimed from cleaning bags or leaking containers shall not be used. Cement shall be used in the sequence of shipments received unless otherwise directed by the Engineer.

1. Portland Cement: Portland cement, except highearly-strength Portland cement, shall conform to the requirements of A.S.T.M. Designation C-150-47, Type I.

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2. High-Early-Strength Portland Cement: High-early-strength Portland Cement shall conform to the requirements of A.S.T.M. Designation C-150-47, Type III.

d. Curing Materials:

1. Kraft Paper: Kraft paper shall conform to the requirements of Federal Specification UU-P-264, and shall be treated so as to possess a strength when wet that will afford good resistance to scuffing and shrinkage.

2. Quilts: Quilts shall conform to the requirements of Federal Specification DDD-M-148.

3. Burlap: Burlap shall be of commercial quality. Burlap may be used only for unexposed concrete surfaces and when used shall be in not less than 2 layers.

4. Membrane Curing Compounds: Membrane curing compounds shall be used as specified in paragraph 5-26b, 2.

e. Premolded Joint Filler Strips: Premolded joint filler strips shall conform to the requirements of Federal Specification HH-F-334, of sizes indicated on the drawings.

f. Forms: Forms shall be of wood, metal or other material as approved by the Engineer.

1. Wood Forms:

(a) Unexposed Concrete Surfaces: Wood forms for unexposed concrete surfaces shall be No. 2 Common or better lumber.

(b) Exposed Concrete Surfaces: Wood forms for exposed surfaces shall be dressed-and-matched boards of uniform thickness, and width not exceeding 10 inches.

(c) Smooth Surfaces: Wood forms for smooth concrete surfaces shall be of plywood or shall have a form lining as specified below.

2. Plywood: Plywood for forms shall conform to the requirements of U. S. Commercial Standard

CS-45-48 Douglas Fir Plywood, and shall be EXT-DFPA-CONCRETE FORM grade not less than 5-ply and at least 9/16 inch thick.

3. Form Lining: Form linings shall be one of the following:

(a) Plywood: Plywood for form lining shall conform to the requirements of the U. S. Commercial Standard CS-45-48 Douglas Fir Plywood, and shall be EXT-DFPA-CONCRETE FORM grade, 3 ply, not less than 1/4 inch thick.

(b) Fiber-Board: Fiber-board for form lining shall conform to the requirements of Federal Specification LLL-F-311, Class B, not less than 3/16 inch thick.

4. Metal Forms: Metal forms shall be of a type approved by the Engineer that will produce surfaces equal to those specified for wood forms.

5. Form Oil: Form oil shall be a nonstaining mineral oil.

6. Form Ties: Form ties shall be of a design approved by the Engineer. Ties shall be adjustable in length and free of devices which will leave a hole or depression back of the exposed surface of the concrete larger than 7/8 inch in diameter. Ties shall be such that when forms are removed, no metal shall be within one inch of the finished surface.

g. Hardeners and Dustproofers: Hardeners and dustproofing material shall be a colorless aqueous solution of zinc or magnesium fluosilicate. Each gallon of the solution shall contain not less than 2 pounds of the crystals. A proprietary hardener approved by the Engineer may be used provided the hardener is delivered ready for use in the manufacturer's original containers.

h. Reinforcement Bars: Reinforcement bars for concrete shall conform to the requirements of A.S.T.M. Designation A-15-39. Types and grades of steel for specific purposes shall be as specified below"

1. Ties and Stirrups: Ties and Stirrups shall conform to A.S.T.M. Designation A-15-39 for billet steel bars, deformed class intermediate grade.

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2. Mill Reports: Certified copies of mill reports shall accompany all deliveries of reinforcing steel on work utilizing 15 tons or more.

i. Mesh Reinforcement: Mesh reinforcement for slabs shall conform to the requirements of American Society for Testing Materials Standard Specification A-185-37, and shall be of sizes shown on the drawings.

j. Water: Water shall be clean, fresh and free from oil, acids, alkali, vegetable sewage, organic, or other deleterious matter. Sea water for mixing concrete shall be used only as approved by the Engineer.

5-06. ADMIXTURES:

a. Use: The use of admixtures, including air-entraining agents, shall conform to the requirements of the Uniform Building Code. Admixtures shall be used only with the written approval of the Engineer.

b. Tests: Tests of admixtures will be made in accordance with applicable Federal or American Society for Testing Materials Specifications or as otherwise prescribed by the Engineer.

5-07. SAMPLES AND TESTING:

a. General: All tests will be made by or under the supervision of the Engineer at the expense of the Contractor. All test samples required shall be supplied by the Contractor and unless otherwise specified shall be taken under the supervision of the Engineer. No materials shall be used until notice has been given by the Engineer that the test results are satisfactory.

b. Cement: Cement shall be tested as prescribed in the applicable referenced specification under which it is furnished.

c. Aggregates: Aggregates shall be tested as prescribed by the Engineer, employing standard testing procedure as applicable to coral aggregate.

d. Reinforcement: Reinforcement shall be tested as prescribed under the applicable referenced A.S.T.M. Designations under which it is furnished.

e. Concrete: One set of three to six cylinders for test purposes shall be taken from each 100 cubic yards or fraction thereof, or each day's pour, whichever is less. Test specimens shall be made in accordance with American Society for Testing Materials Standard Method C 31-44 and

shall be tested in accordance with American Society for Testing Materials Standard Method C 39-44. Of the three cylinders taken, one will be tested for strength at 7 days and one will be tested for strength at 28 days; the third will be tested for strength at an elapsed time interval to be determined by the Engineer. If six cylinders are taken, three shall be tested at 7-days and three at 28 days. Concrete made with high-early-strength cement shall have a 7-day compressive strength equal to the specified minimum 28-day compressive strength for concrete of the type specified made with ordinary Portland cement.

5-08. STORAGE: Storage accommodations shall be subject to the approval of the Engineer, and shall be such as to permit easy access for inspection and definite identification of each shipment in accordance with the report of tests.

a. Cement: Immediately upon receipt at the site of the work, cement shall be stored with adequate provision for the prevention of absorption of moisture.

b. Aggregate: Aggregate shall be stored to avoid the inclusion of any foreign matter in the aggregate and resulting concrete. Storage piles shall be maintained in a manner that will afford good drainage, prevent segregation of particle size and preserve the aggregate gradation. Sufficient live storage shall be maintained at all times to allow placement of concrete at the required rate and permit application of such procedures as identification and inspection.

5-09. TYPES OF CONCRETE AND USAGE:

a. Coral Aggregate Concrete: Coral aggregate concrete of the various types required shall be proportioned and mixed for the strength as called for on the drawings or as prescribed by the Engineer. All concrete for structural use not called for on the drawings, in these specifications or prescribed by the Engineer shall be 2000 p.s.i. at 28 days. A minimum of 1500 p.s.i. concrete may be used for non structural work. Coral aggregate concrete shall be used for all general concrete work unless otherwise directed by the Engineer.

b. Limonite Aggregate Concrete: Limonite aggregate concrete of the types required shall be proportioned and mixed for the necessary strength as called for on the drawings, in these specifications, or as prescribed by the Engineer. Limonite aggregate concrete shall be used in the scientific structures stations as called for on the drawing

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5-10. PROPORTIONING OF CONCRETE:

a. Coral Aggregate Concrete: Shall be proportioned to yield the strengths for the various types to the satisfaction of the Engineer. Prior to placing any concrete in the structures, a sufficient number of trial design batches shall be prepared and tested to determine the mix to be used for each type of concrete.

b. Limonite Aggregate Concrete: Limonite aggregate concrete shall be proportioned to yield a minimum strength of 3500 p.s.i. at 28 days. Proportions not to exceed the following per cubic yard:

1. Cement: 940 pounds.
2. Graded Scrap Steel: 4100 pounds.
3. Iron Ore: 1880 pounds.
4. Water: 55 gallons.

Resulting unit weight per cubic foot - 273 pounds

c. Measurements:

1. Cement: A one-cubic foot bag of Portland cement will be considered as 94 pounds in weight.

2. Water: One gallon of water will be considered as 8.33 pounds. No increase in the maximum water content as determined in the approved trial mixes will be permitted.

3. Aggregate: The maximum amount of the maximum size of coarse aggregate economically available and placeable, as compatible with the type and character of the structure, shall be used. The exact ratio of the aggregate shall be determined and modified as required by the Engineer. Ingredients shall be measured separately for each batch.

d. Corrective Additions: Corrective additions, to remedy the deficiencies in the aggregate gradations, may be used, subject to approval by the Engineer.

e. Control: The proportions and exact amounts of

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all material entering into the concrete shall be as determined in the approved trial mixes. All necessary equipment shall be provided to determine and control the actual amount of materials entering into each concrete mix. The proportions will be changed whenever, in the opinion of the Engineer, such changes become necessary to overcome deficiencies and obtain the specified strength, the desired durability, density, workability or consistency. Consistency in the field shall be measured by the slump test in accordance with the American Society for Testing Materials Standard C 143-39. The slump shall fall within the following tabulation:

Type of Structures	Slumps in Inches			
	For Concrete without an Admixture		For Concrete Containing an Admixture	
	Minimum	Maximum	Minimum	Maximum
Massive sections, pavements & slabs on the ground	1-1/2	4	1-1/2	3-1/2
Thin walls & columns, ordinary slabs or beams	3-1/2	6	3	5

5-11. BATCHING AND MIXING CONCRETE: Concrete shall be mixed by a mechanical batch-type mixing plant. Mixers shall be provided with adequate facilities for accurate measurement and control of each of the materials entering the mixer and for changing the proportions to conform to varying conditions of the work. The mixing-plant assembly shall include adequate provisions for the inspection of operations at all times. The plant and its location shall be subject to approval by the Engineer.

a. Batching Unit: Each batching unit shall be supplied with the following item:

1. Weighing Unit: A weighing unit shall be provided for each type of material to indicate the scale load at convenient stages of the weighing operation. The weighing units shall be checked at such times as directed by and in the presence of the Engineer and required adjustments shall be made before further use of the device.

b. Mixing Unit:

1. Operations: Mixers shall not be charged in

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excess of the rated capacity, nor be operated in excess of the rated speed. Excessive mixing, requiring the addition of water to preserve the required consistency, will not be permitted. The entire batch shall be discharged before recharging.

2. Mixing Time: Mixing time shall be measured from the instant when the water is introduced into the drum containing all solids. All mixing water shall be introduced before  $1/4$  of the mixing time has elapsed. Mixing time for mixer of 1 cubic yard or less shall be 1- $1/4$  minutes; for mixers larger than 1 cubic yard, the mixing time shall be increased 15 seconds for each additional half cubic yard or fraction thereof. If an air-entraining agent is used, mixing time shall be such as will provide the specified air content.

5-12. READY MIXED CONCRETE: Ready-mixed concrete in conformity with A.S.T.M. Designation C 94-48 may be used, subject to approval by the Engineer. Ready-mixed concrete shall be plant-mixed or truck-mixed as specified below. Concrete delivered in an atmospheric temperature lower than 40 degrees F. shall have a temperature of not less than 60 degrees F. The storing, weighing, batching and mixing at the site, except as hereinafter modified, shall apply to ready-mixed concrete. The Engineer shall have free access to the mixing plant at all times.

a. Plant Mixed Concrete: The plant shall be equipped for the accurate proportioning, mixing, and delivery of the concrete and have sufficient capacity and transportation facilities to deliver the concrete at the rate required. Concrete shall have an initial mixing at the plant of not less than one minute after all materials are in the mixer. The time elapsing between the discharge of the concrete from the mixer to its final position shall not exceed one (1) hour unless otherwise approved by the Contracting Officer. Transportation of concrete from the plant to the job shall be in clean watertight receptacles equipped with an agitation device which shall operate until the concrete is discharged. Maximum size of batch carried shall not be more than 70 per cent of the rated capacity of the container (for agitation) and the agitating speed shall not be less than 2 revolutions per minute or more than 8 revolutions per minute of the drum or revolving agitating device.

b. Transit-Mixed Concrete: Material shall be batched and discharged into the truck-mixer and agitator which shall be capable of transporting and mixing the separate ingredients into a thoroughly mixed and uniform mass

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while in transit. The quality and characteristics of the mix shall conform in every respect to the requirements for concrete mixed at the site. Concrete shall be delivered to the site within 1 hour after the addition of mixing water. The number of revolutions of the mixer shall be not less than 4 revolutions of the drum per minute nor greater than a peripheral velocity of 22 feet per minute. Any additional mixing shall be not more than 250 revolutions at mixing and agitating speed combined. The agitating speed for any type of transit mixer shall be not less than 2 nor more than 8 revolutions per minute. Truck mixers generally shall be operated within the limits of the capacity and speed of rotation designated by the manufacturer.

5-13. PREPARATION FOR PLACING: Water shall be removed from excavations before concrete is deposited. Any flow of water shall be diverted through proper side drain and shall be removed by methods which will avoid washing over the freshly deposited concrete. Hardened concrete, wood chips and shavings and other debris, shall be removed from the interior of the forms, and all hardened concrete and foreign materials from the inner surfaces of the mixing and conveying equipment. Wood forms, unless lined, shall be oiled or, except in freezing weather, wetted with water in advance of pouring so that joints will tighten and prevent seepage of cement grout from the mix. Reinforcement shall be secured in position, inspected and approved by the Engineer before starting the pouring of concrete. Runways, or other means approved by the Engineer, shall be provided for wheeled equipment to convey the concrete to the points of deposit. The equipment used to deposit concrete shall not be wheeled over the reinforcement, nor the runways be supported on reinforcement.

5-14. EXPANSION AND CONTRACTION JOINTS: Expansion and contraction joints shall be constructed at such points and of such design as are indicated on the drawing. The expansion joint materials, as specified in other sections of the specifications, shall be installed as indicated on drawings and subject to the approval of the Engineer. In no case shall the reinforcement, corner protection angles, or other fixed metal items, embedded in or bonded into the concrete, be run continuous through an expansion joint, except as shown on the drawings. Reinforcement steel shall continue through contraction joints as shown on the drawings.

a. Joints Between Slabs on Earth and Vertical Surfaces: Joints between slabs on earth and vertical surfaces shall be of premolded expansion-joint-filler strips. Unless otherwise noted, or specified, such joints shall be

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1/2 inch thick and the full depth of slab.

b. Edges of Joints: The edge of cement floors or concrete slabs along all expansion joints, and around walls of finished spaces, shall be neatly finished along the edge of the premolded joint-filler strips with a slightly rounded edging tool.

5-15. CONSTRUCTION JOINTS: Concrete shall be deposited continuously between the limits of the construction and expansion joints shown on the drawings so that the unit of operation will be monolithic in construction. At least 48 hours shall elapse between the casting of adjoining units, unless this requirement is waived by the Engineer. Construction joints in floors shall be located near the midpoint of spans for the slabs, beams, or girders, unless a beam intersects a girder at the center, in which case the joints in the girder shall be offset a distance equal to twice the width of the beam. Provision against shear shall be made by the use of inclined reinforcement. Joints in columns or piers shall be made at the underside of the deepest beam or girder framing thereto. Columns having a free height of more than 12 feet, shall be poured in two or more stages. Joints not shown or specified shall be so located as to least impair the strength and appearance of the work. Vertical joints in wall footings shall be reduced to a minimum. Except where indicated on the drawings, no jointing shall be made in footings or foundation work without written approval from the Engineer. The placement of concrete shall be carried on at such a rate that the surfaces of concrete which have not been carried to joint levels will not have attained initial set before additional concrete is placed thereon. Girders, beams, and slabs shall be placed in one operation. In walls of buildings having door and window openings, the lifts of individual pours shall terminate at the top and bottom of the opening. Other lifts shall terminate at such levels as are indicated on the drawings, or will conform to structural requirements or architectural details, or both, as directed by the Engineer. To insure a level, straight joint in exposed vertical surfaces, a strip of dressed lumber may be tacked to the inside of the forms at the construction joint. The concrete shall be poured to a point 1 inch above the underside of the strip. The strip shall be removed one hour after the concrete has been placed, and any irregularities in the joint-line leveled off with a wood float, and all laitance removed.

5-16. CONVEYING: Concrete shall be conveyed from mixed to forms as rapidly as practicable by a method which will prevent segregation or loss of ingredients.

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5-17. PLACING CONCRETE: Concrete shall be handled from the mixer or transport vehicle to the place of final deposit in a continuous manner, and as rapidly as practicable, until the given unit of operation, approved by the Engineer, is completed. Concrete that has attained its initial set, or has contained its water content for more than 1 hour, shall not be deposited in the work. The concrete shall be deposited in the forms as nearly as practicable in its final position, so as to avoid rehandling. Special care shall be exercised to prevent splashing the forms or reinforcement with concrete in advance of pouring. Immediately after depositing, the concrete shall be compacted by thoroughly agitating the plastic mass in a manner approved by the Engineer, that will force out all air pockets and work the mixture into corners, around reinforcements and inserts, and prevent the formation of voids. Concrete shall not be placed on concrete which has hardened sufficiently to cause the formation of seams and planes of weakness within the section. Concrete shall not be allowed to drop freely more than 8 feet in unexposed work, nor more than 5 feet in exposed work. Where greater drops are required, a tremie or other method approved by the Engineer shall be employed. The discharge of the tremie shall be controlled so that the concrete may be effectively compacted into horizontal layers not exceeding 12 inches in thickness with a minimum of lateral movement.

a. Earth-Foundation Placement: Concrete footings shall be placed upon undisturbed, clean surfaces, free from mud, standing or running water. When the foundation is on dry soil, waterproof sheathing paper shall be laid over the earth surfaces to receive the concrete.

b. Chute Placement: When concrete is conveyed by chute, the plant and equipment shall be of such size and design as will ensure a continuous flow of concrete in the chute. The chute shall be of metal or metal-lined wood and the different portions shall be set at approximately the same slope, which shall be not less than 1 vertical to 3 horizontal, nor more than 1 vertical to 2 horizontal. The discharge end of the chute shall be provided with a baffle to prevent segregation. If the height of the discharge end of the chute is more than 3 times the thickness of the layer being deposited, but not more than 5 feet above the surface of the concrete in the forms, a spout shall be used, and the lower end maintained as near the surface of deposit as practicable. When the pouring operation is intermittent, the chute shall discharge into a hopper. The chute shall be thoroughly cleaned before and after each run. All waste material and the flushing water shall be discharged outside of the forms.

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5-18. COMPACTION: Concrete, except when placed and compacted by pneumatic means, by pumping or other specified method, shall be placed in layers not over 12 inches deep and each layer shall be compacted with the aid of mechanical internal-vibrating equipment supplemented by hand-spading, rodding and tamping as directed by the Engineer. Vibrators shall in no case be used to transport concrete inside the forms. The use of form vibrators will not be permitted. Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the concrete. At least one spare vibrator shall be maintained as a relief. The duration of vibration shall be limited to that necessary to produce satisfactory consolidation without causing objectionable segregation. The vibrator shall not be inserted into lower courses that have begin to set. Vibrators shall be applied at uniformly spaced points not farther apart than the visible effectiveness of the machine.

5-19. BONDING AND GROUTING: Before depositing new concrete on or against concrete which has set, the existing surfaces shall be thoroughly roughened and cleaned of all laitance, foreign matter and loose particles. Forms shall be retightened and the existing surfaces slushed with a grout coat of neat cement. The new concrete shall be placed before the grout has attained its initial set. Grout for horizontal construction joints shall be of cement and fine aggregate in the same proportion as the concrete to be placed, and shall be from 1/2 to 1 inch thickness. Grout for setting column bases, wall plates, and other metal items, shall be composed of equal parts of sand and cement, with water sufficient to produce the required consistency.

5-20. FINISHES OF CONCRETE OTHER THAN FLOORS AND SLABS: All concrete shall have any slight honeycomb and minor defects patched, using cement mortar composed of 1 part of cement and 2 parts of fine aggregate. Exposed surfaces shall be given one of the following finishes, as indicated on the drawing or specified:

a. Rough Finish: Concrete for which no other finish is indicated or specified shall have all fins and rough edges removed. Undressed boards may be used for the forms where this finish is to occur.

b. Smooth Finish: Smooth finish shall be given to all exposed concrete surfaces unless otherwise indicated on the drawings. Smooth finish shall be obtained by use of plywood forms or form linings. Sheets shall be as large as practicable, with smooth, even edges and shall be

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installed with close joints. Joint marks shall be smoothed off and all blemishes removed, leaving finished surfaces smooth and unmarred, subject to approval by the Engineer.

5-21. CONCRETE FLOOR FINISHES: Concrete floor slabs shall be finished as hereinafter described. The dusting of wearing surfaces with dry cement will not be permitted. In preparing base slabs for the various finishes, the slabs shall be struck off true at the required level below the elevation or grade of the finished floors, as shown on the drawings. Floors shall be level except that where drains occur the floors shall be pitched thereto. Finishes as below specified are called for in Finish Schedules or in notes on the drawings.

a. Smooth Integral Cement Finish: All cement finish floors shall have a smooth integral cement finish applied as follows: The finish coat shall be not less than 1/2 inch thick, applied after screeding while the concrete is still green, but after all surface water has disappeared (not more than 30 to 45 minutes). The mix shall be 1 part Portland cement, 1 part fine aggregate and 2 parts coarse aggregate. The fine aggregate shall pass a 1/4 inch mesh sieve, not more than 5 per cent shall pass a 100-mesh sieve and not more than 10 per cent shall pass a 50-mesh sieve. The coarse aggregate shall be graded from 1/8 inch to 3/8 inch, with at least 95 per cent passing a 3/8 inch sieve and not over 10 per cent passing a No. 8 sieve. The water shall not exceed 5 gallon per sack of cement. The finish shall be screeded to a true and even surface, then floated and troweled smooth. No floating or troweling of the surface shall be done while the finish coat is wet or sloppy. After having set sufficiently to ring the trowel, the work shall be given a second troweling and burnishing.

b. Wood Float Finish: Exterior slabs so noted shall be finished by tamping with special tools to force aggregate away from the surface, then screeding with straightedges to bring the surface to required line as shown on the drawings. While the concrete is still green, but has hardened sufficiently to bear the cement finisher's weight, the surface shall be floated with a wood float to a true and uniform plane with no coarse aggregate visible. Dusting, to absorb surface water, will not be permitted.

c. Floors Receiving Asphalt-Tile Flooring: Floors receiving asphalt-tile flooring shall be as specified in paragraph a. above, except that the finish coat may be composed of 1:1-1/2:3 mix of cement, fine and coarse aggregate, and the surface left after the first troweling, omitting the second troweling and burnishing.

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d. Power Machine Finishing: In lieu of hand finishing, the Contractor has the option of using a power machine for finishing concrete floors, provided the machine is approved by the Engineer. The preparation of slab surfaces, or mixing and application of applied top coating, for finishing by machine shall in general be as hereinbefore required for hand finishing. The method of finishing by machine shall conform with the directions of the manufacture of the power machine.

5-22. TOOLING:

a. General Requirements: All tooling shall be accurately run to true line and square without undue marking of plane surfaces and be left clean cut and burr free.

b. Cement Base: Cement base not otherwise shown, shall be run with  $3/4$  inch radius cove at floor and  $1/8$  inch radius bullnose at top edge.

c. Exposed Edges of Platforms: Exposed edges of platforms shall be finished with  $3/8$  inch radius bullnose.

d. Curbs, Machinery Foundations and like work shall be finished with  $3/8$  inch radius outside angles and  $3/8$  inch radius cove at floors, except as otherwise shown.

e. Stairs, except as otherwise indicated, shall have treads pitched forward  $1/8$  inch, risers pitched forward 1 inch and  $3/8$  inch radius interior and exterior angles (and treads including landing treads marked with 5-groove marking tool to within 6 inches of sides).

f. Scoring: The top surfaces of exterior ramps and stairs shall be lightly scored as detailed on the drawings.

g. Marking: Walks, platforms and other surfaces indicated and all cold joints in finished floors shall be marked to true line and square, and to pattern indicated with  $1/8$  inch radius marking tool.

5-23. CONCRETE FINISH FOR ROOFS:

a. Interior surfaces for roofs shall be given a smooth finish as specified under 5-20b.

b. Exterior surfaces of roofs to receive roofing shall be tamped, screeded and floated to a reasonably true and smooth surface, and shall then be lightly steel-troweled.

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5-24. SLABS ON EARTH: Before proceeding to construct concrete slabs on earth, all pipes under concrete floors on earth shall have received the required tests. The earth fill shall be compacted as approved by the Engineer, and any drainage fill required under the slabs on earth, as indicated on the drawings or specified, shall be deposited and compacted by rolling and tamping. In compacting the earth under the slabs or drainage fill, any unsuitable material encountered in the subgrade shall be removed and replaced with material approved by the Engineer. The subgrade shall be brought to a true even plane, and compacted to a solid bearing. Gravel drainage fill, where indicated, shall be installed to the thickness shown and shall be properly leveled to a reasonably true and even surface. The gravel fill shall be covered with draft paper, lapped at least 4 inches at the edges and ends. The concrete shall be of comparatively dry consistency and shall be screeded level or to the required grades. After compacting, the surface shall be prepared to receive the required type of finish treatment specified.

5-25. PROTECTION AND CURING:

a. Protection Against Moisture Loss: Immediately after placing of finishing, concrete surfaces not covered by forms shall be protected from the loss of surface moisture for a period of not less than 7 days where a normal Portland cement has been used, or 3 days where a high-early-strength Portland cement has been used by using membrane curing compounds or by covering with kraft paper, quilts or burlap, lapped 4 inches at edges and ends. Kraft paper, if used, shall be sealed. Materials for curing shall be as specified under heading 5-05 above. Surfaces from which forms are removed before the curing period has elapsed shall be protected as specified for surfaces not covered by forms. Membrane curing shall not be used on surfaces that are to receive additional concrete or concrete fill, nor on cement finish coats that are to receive dust-proofing and hardening treatments.

b. Curing: Curing may be accomplished by effective protection of all exposed surfaces against moisture loss as specified above, or by either method specified below.

1. Water Curing: Water curing shall be effected by keeping the forms sufficiently wetted with clean water to reduce cracks and to prevent the joints in forms from opening and, by keeping the other protective material thoroughly wet, prevent hair cracks from occurring in surface of the concrete. During damp periods, this water curing routine

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shall be maintained, except the amount of water used shall be sufficient to keep only the forms or covering moist.

2. Membrane-Compound Curing: At the Contractor's option, curing compound may be used in lieu of the water-curing method. The curing compound shall be applied as soon as surface water has disappeared from concrete surfaces, strictly in accordance with the manufacturer's directions, in sufficient thickness to form an effective water seal. Membrane Curing Compounds shall be similar and equal to Horncure of the A. C. Horn Company, Long Island City, New York; Mastercure of the Master Buildings Company, Cleveland 3, Ohio; or Trucure of the Truscon Laboratories, Inc., Detroit 11, Michigan.

c. Protection Against Mechanical Injury: All concrete surfaces exposed to the danger of mechanical injury shall be suitably protected during construction operations. Kraft paper covering, planking and other methods shall be employed as required. If floor slabs are poured prior to roofs, particular care shall be taken to protect these slabs from injury during the roof construction operations. Floor protection methods shall be subject to the approval of the Engineer, and all damaged concrete shall be replaced or repaired to the satisfaction of the Engineer.

5-26. FORMS: Forms, complete with centering, cores, and molds, shall be constructed to conform to the shape, form line and grade required, and shall be maintained sufficiently rigid to prevent deformation under load.

a. Design: Joints shall be tight and leakproof and shall be arranged vertically or horizontally to conform to the pattern of the design. Where forms are placed in successive units for continuous surfaces, they shall be fitted to accurate alignment so that the completed surface will be smooth and free from irregularities. In long spans, where intermediate supports are not possible, the anticipated deflection in the forms due to the weight of the fresh concrete shall be accurately figured and taken into account in the design of forms, so that the finished concrete members will have true surfaces conforming accurately to the desired lines, planes and elevations. If adequate foundation for shores cannot be secured, trussed supports shall be provided. Temporary openings shall be arranged in wall and column forms and where otherwise required, to facilitate cleaning and inspection. Lumber once used in forms shall have nails withdrawn, and the surfaces to be exposed to concrete carefully cleaned before reuse. All forms shall be so constructed that they can be removed readily without hammering or prying against the concrete.

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b. Form Ties: Bolts and rods used for internal ties which are to be removed shall be coated with grease and so arranged that when the forms are removed, all metal will be not less than 1 inch from any concrete surface. Wire ties will not be permitted where the concrete surface will be exposed to weathering, or at any point where discoloration will be objectionable. The design of form ties shall be subject to the approval of the Engineer.

c. Joints: All corners of columns, girders and beams and other exposed joints in more than one plane unless otherwise indicated on the drawings, or directed by the Engineer, shall be beveled, rounded or chamfered by moldings placed in the forms.

d. Coating: Forms for exposed surfaces shall be coated with oil, applied before the reinforcement is placed. After oiling, any surplus oil on the form surfaces and any oil on the reinforcing steel, shall be removed. Forms for unexposed surfaces may be thoroughly wetted with water in lieu of oiling, immediately before the placing of concrete.

e. Removal: Forms shall not be disturbed until the concrete has adequately hardened. Shoring shall not be removed until the member supported has acquired sufficient strength to safely support its own weight and the load imposed on the shored member. Care shall be taken to avoid spalling the concrete surface. Wood forms shall be completely removed from under porches, steps and similar spaces (through temporary openings if necessary) in order that no material will be left for termite infestation.

1. Clamps: Tie-rod clamps that are to be entirely removed from the wall shall be loosened 24 hours after the concrete is placed and form ties, except for a sufficient number to hold the forms in place, may be removed at that time. Ties that are wholly withdrawn from the wall shall be pulled toward the inside face. The cutting of form ties back from the face of the wall will not be permitted.

2. Timing: Under normal conditions, after placing concrete, the minimum waiting period before the forms may be stripped shall be governed by the following schedule, but the use of this schedule shall not operate to relieve the contractor of responsibility for the safety of the structure.

<u>Stripping of Forms</u>			
<u>(Minimum Waiting Period After Placing Concrete)</u>			
Structural Member	Average Temperatures		
	Above 60°F.	50°-60°F,	Less than 40°F.
*Bottom forms of slabs spanning 6 feet or less	5 days	9 days	14 days
Bottom forms of girders and beams	14 days	18 days	21 days

\*For slab spans more than 6 feet add 12 hours for each additional foot over 6 feet. (Except roof slabs - see paragraph 3. below.)

3. Stripping Roof Forms: Roof section forms shall not be stripped until concrete has developed a compressive strength of not less than 2000 pounds per square inch. One or more test cylinders, as desired, shall be taken of each roof section poured. Cylinders shall be tested in compliance with paragraph 5-07 e. preceding, or as specified by the Engineer.

4. Filling Tie-Rod or Bolt Holes: Holes remaining from bolts or the tie rods shall be filled solid with cement mortar. Holes passing entirely through the wall shall be filled from inside face with a device that will force the mortar through to the outside face using a stop held at the outside wall surface to ensure complete filling. Holes which do not pass entirely through the walls shall be packed thoroughly full. All excess mortar at the face of filled holes shall be struck off flush.

#### 5-27. REINFORCING STEEL:

a. General: The reinforcing, fabricated to shapes and dimensions shown, shall be placed where indicated on drawings or reasonably required to carry out the intent of the drawings and specifications. Before placing, all reinforcement shall be thoroughly cleaned of rust, mill scale or coatings, which would reduce or destroy the bond. Reinforcement appreciably reduced in section shall not be used. Following any substantial delay in the work, previously placed reinforcement, left for future bonding, shall be

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reinspected and cleaned. Reinforcement shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on drawings shall not be placed. The heating of reinforcement for bending or straightening will be permitted only if the entire operation is approved by the Engineer. In slabs, beams and girders, reinforcement shall not be spliced at points of maximum stress. At all points where bars lap or splice, including distribution steel, wire-tied minimum lap of 40 bar diameter shall be provided, unless otherwise shown. Splices in columns and piers shall be lapped sufficiently to transfer the full stress by bond. Splices in adjacent bars shall be staggered.

b. Design: Reinforcing details, shown on the drawings, shall govern the furnishing, fabrication, and placing of reinforcement insofar as they apply. Except as otherwise shown on the drawings or specified, construction shall conform to the following requirements:

1. Concrete Covering Over Steel Reinforcement:

The concrete covering over steel reinforcement shall be as follows:

(a) Beams & girders	3" to 1-1/2"	} outside of main steel
(b) Solid Slabs	2-1/2"	
(c) Tied Columns	3"	outside of main steel
(d) Walls	3" to 1-1/2"	} outside of steel
(e) Footings	3"	

2. Minimum Bar Size: Unless otherwise shown on the drawings, bars less than 3/8" diameter shall not be used in the work, except for stirrups, ties, spirals, and distribution steel.

3. Steel in Walls: Unless otherwise shown steel in walls shall be continuous throughout the length of the various members. Splices shall not occur at critical sections.

4. Wire-Mesh Reinforcement: Wire-mesh reinforcement where shown in slabs, shall be secured in position by spacer bars and chairs. Spacer bars

I shall be lapped not less than 5 inches. In slabs on ground, precast concrete blocks may be substituted for chairs.

c. Supports: Reinforcement shall be accurately placed and securely tied at all intersections and splices with 18-gage black annealed wire, and shall be securely held in position during the placing of concrete by spacers, chairs or other approved supports. Wire tie ends shall point away from the form. For reinforcement in the bottoms of slabs and beams, the supports shall be sufficiently heavy and sufficient in number to properly carry the steel reinforcement.

## SECTION 6

### STRUCTURAL STEEL

6-01. SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with the installation of structural steel, complete, in strict accordance with this section of the specifications and the applicable drawings.

6-02. APPLICABLE SPECIFICATIONS: The following specifications form a part of this specification.

a. American Institute of Steel Construction Publications:

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:

1. Arc and Gas Welding in Building Construction.

6-03. UNIFORM BUILDING CODE: All structural steel and iron work shall conform to Chapter 27 of the Uniform Building Code, 1949 Edition.

6-04. GENERAL: The current rules and practices set forth in the Code of Standard Practice for Steel Buildings and Bridges, and the Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings of the American Institute of Steel Construction, shall govern this work, except as otherwise noted on the drawings or as otherwise specified. Welding shall be in accordance with the current Code for Arc and Gas Welding in Building Construction of the American Welding Society.

a. Shop Drawings: All shop drawings shall be handled in compliance with General Conditions, Section IV, paragraph (a), marked Shop Drawings.

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b. Substitutions: Substitutions of sections, or modifications of details, or both, shall be made only when approved.

c. Responsibility for Errors: The Contractor alone shall be responsible for all errors of fabrication and for the correct fitting of the structural members shown on the shop drawings.

d. Templates: Templates shall be furnished where called for on the drawings. The Engineer shall furnish instructions for the setting of anchors and bearing plates and shall ascertain that the items are properly set during the progress of the work.

6-05. MATERIALS: Structural steel shall conform to the requirements of A.S.T.M. Designation A 7-46. All other materials shall conform to applicable specifications as set forth in Chapter 27 of the Uniform Building Code.

6-06. INSPECTION AND TESTS: The material to be furnished under this specification shall be subject to inspection and tests in the mill, shop and field by inspectors authorized by the Engineer. However, inspection in the mill or shop shall not relieve the Contractor of his responsibility to furnish satisfactory materials, and the Engineer reserves the right to reject any material at any time before final acceptance when, in the opinion of the Engineer, the materials and workmanship do not conform to the specification requirements.

6-07. DESIGN: The design of members and connections for any portions of the structure not indicated in the design drawings shall conform to the requirements of the current issue of the Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings of the American Institute of Steel Construction. Shop Drawings showing such designs shall be comparable in extent of information and detail to those issued by the Engineer.

6-08. WORKMANSHIP:

a. Connections: All connections shall be as shown on the drawings. When details are not shown, the connections shall conform to the requirements for series B, A.I.S.C. standard connections. One-sided or other types of eccentric connections shall not be permitted except when shown in detail on the drawings.

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Unless otherwise indicated on the drawings, field connections shall be in accordance with the requirements of the A.I.S.C. Specification.

b. Holes: Holes shall not be made or enlarged by burning nor will the burning of unfair holes in the shop or field be acceptable. Holes in base or bearing plates shall be drilled. Grout holes shall be provided in column bearing plates where shown on drawings. Holes shall be provided in members to permit connecting the work of other trades who will furnish the necessary templates or such information as may be required.

c. Bolts: Bolts, other than field erection bolts, shall be "Dardelet" or approved equal.

d. Welding: All welding, unless otherwise specified, shall conform to the provisions of the current "Standard Code for Arc and Gas Welding in Building Construction" specifications of the American Welding Society.

6-09. ERECTION:

a. All work shall be rigidly and accurately erected to true line, level, plumb, plane and square under the continuous direction of a capable and responsible foreman and with the aid of accurate instruments in the hands of competent engineers. Tolerances shall not exceed those of the Specification for Design, Fabrication and Erection of Structural Steel for Buildings and Bridges, of the A.I.S.C. All shoring, bracing, etc., required for temporary support shall be provided and maintained and shall be removed by this Contractor when no longer required.

b. Drift Pins: Drift pins may be used only to bring together the several parts; they shall not be used in such manner as to distort or damage the metal.

c. Gas Cutting: The use of a gas cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. Its use will be permitted on minor members when the member is not under stress, and then only after approval has been obtained.

6-10. PAINTING: All work shall after fabrication, have all millscale, oil, dust, dirt, grease, rust,

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spatter, slag, flux and other deleterious substances removed, and receive two thorough shop coats of "Zinc Chromate Primer", color green, and a field touch-up of all marred surfaces and field connections with the same material after erection and proper cleaning as above specified. Surfaces inaccessible to painting after fabrication shall be painted before fabrication, except machined contact surfaces, or surfaces to be riveted or welded together, or other surfaces to retain bond to concrete shall be protected with an approved coating, as specified below, in lieu of paint. Paint shall be applied only to thoroughly dry surfaces under dry atmospheric conditions and with approved equipment in the hands of skilled workmen. Coverage shall be even, full and without runs or sags. Where it is required to retain unpainted surfaces until erection, fabrication, or installation in the field, steel shall be given one coat of "Keystone Rust Preventative" medium grade, or equal, primer which can be removed with solvent in field.

6-11. PACKING AND SHIPPING: All material and assembled units shall be boxed, crated or bundled securely and so loaded as to suffer no damage in transit. Maximum weight of bundles shall be 2500 lbs., except packaged unit assemblies which may exceed this weight. Gross weight shall be marked on each bundle. All rivets, bolts, clips, and other devices for use in field erection shall be separately packed, suitably marked, coded and indexed and shall be securely boxed in packing boxes of 2" material reinforced with metal strap bindings. 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.

6-12. DAMP PROOFING: Interiors of all boxes, crates, and bundles for shipping shall be lined with doubled layers of "Sisalkraft" or similar tear-resistant water-proof paper with overlapped joints. All metal items not galvanized or coated with rust preventative paint shall be coated with heavy grease or Cosmoline before packing. All fabricated units shall be securely blocked, cleated and strapped or lagged to the inside of crates or boxes so that there will be no movement or shifting in transit. Silica Gel dessicants will be inserted in all crates, boxes or sealed packages.

SECTION 7MISCELLANEOUS METAL WORK

7-01. SCOPE: The work covered by this section of the specification consists of furnishing all labor, materials, equipment, and transportation required to complete the miscellaneous metal work as indicated on the drawings or required for the work.

7-02. 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 Design, Fabrication and Erection of Structural Steel for Buildings.

b. American Welding Society Code (latest edition).

1. Arc and Gas Welding in Building Construction.

7-03. INSPECTION AND TESTS: Mill inspection and tests will be waived if certified mill test reports accompany deliveries and all heat marks are legible.

7-04. PAINTING: Refer to paragraph "C", sub 4 of Section 10 on Painting. Paint shall be applied only to thoroughly dry surfaces and coverages shall be even, full, and without runs or sags.

7-05. GENERAL: Supplementary parts necessary to complete each item, though such work is not definitely shown or specified, shall be included. Standard commercial products which meet the general requirements of the drawings and specifications and vary only in non-essential detail will be acceptable, subject to the approval of the Contractor.

7-06. GUARD BARS: Shall be provided for openings in locations shown and as detailed. Bars with

I threaded ends shall pass through framing girts and be secured at top and bottom by nuts welded on after assembly.

7-07. GRILLES: Grilled openings at Building No. 204, Location "B" shall be of sizes to fit openings shown. Grilles shall be constructed of flattened expanded aluminum diamond mesh with opening size approximately 1 inch by 2-3/4 inches equal to expanded aluminum as manufactured by the United States Gypsum Company. Mesh strands shall have a thickness of .080 inches and shall be .194 inches wide. Mesh shall be welded to 1 inch aluminum "U" edging. Grilles shall be arranged to slide vertically in the openings.

7-08. BINS: Mesh bins at Building No. 302, Location "B", shall be constructed of flattened expanded aluminum equal to those specified in paragraph 7-07 preceding, except that mesh shall be nominal 1/2 inch diamond mesh. Mesh shall be welded to aluminum as frames as detailed.

7-09. PIPE RAILS: Pipe rails shall be provided as indicated and shall be fabricated of aluminum alloy pipe unless otherwise directed by the Engineer. Railings shall be of design, materials and anchorage as detailed on the drawings; shall be of welded construction, and shall have an alumilite finish. Discolorations due to welding shall be touched up with aluminum paint.

7-10. LADDERS: Ladders shall be furnished and installed where indicated on the drawings. Ladders shall be of aluminum construction unless otherwise specified consisting of round rod rungs let into and welded in rectangular bar stringers. Details of construction and anchorage are indicated on the drawings

SECTION 8CARPENTRY AND RELATED WORK8-01. SCOPE OF WORK:

a. The work covered by this section of the specifications includes the furnishing of all labor, materials, and equipment necessary for the complete installation of all rough and finish carpentry and related work as shown on the drawings or required for the work.

b. The quality and design of all wood members used for load-supporting purposes in buildings or other structures shall conform to all applicable provisions of Chapter 25 of the Uniform Building Code 1949 Edition.

8-02. MATERIALS:

a. General Requirements: Except as otherwise shown on the drawings, all framing wood shall be of kinds and grades here specified and contain not more than 19 percent moisture. Sizes given are "nominal" unless noted "net". Each length of wood shall be grade and kind marked in accordance with the following Associations' last 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.

b. Framing and Structural Lumber shall conform to the following minimum standards unless otherwise shown on the drawings or hereinafter specified.

1. 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

2. 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.

3. Studs, Caps and Bucks less than 4" in thickness shall be D. F. Stress grade 1100f No. 2.

4. Beams and Stringers 5" and thicker shall be D. F. Stress grade 1450f No. 1.

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5. Post and Timbers 5" and thicker shall be Stress grade No. 1

6. Bottom Plates, where noted on plans to be redwood shall be Foundation Grade Redwood pressure treated Douglas Fir, when so directed.

7. Walers, uprights and rails for double roofed aluminum buildings shall be Construction Heart Grade Redwood.

8. All exposed surfaces of framing lumber shall be surfaced. Concealed work may be S1E, except plates shall be S4S.

c. Finish Lumber, not otherwise shown or specified shall be of the following grades in accordance with the grading rules of the Associations listed in paragraph 8-02 a, preceding. Sizes shown are "nominal" unless noted "net".

1. Finish wood shall be D. F. "B and Better" V. G. finish.

2. Window and door frames shall be D. F. No. 1 common.

3. Plywood finish and cabinet work shall be "Plyshield EXT-DFPA-UTILITY-B-C" with "B" side exposed.

4. Flooring shall be D. F. No. 1 common - T & G.

5. All finish lumber shall be S4S.

d. Rough Hardware items shall be of approved standard design, and within the limits of practical availability, shall be of corrosion-resistant materials or be suitably processed to resist corrosion. Nails for framing shall be "common" not "box" type nails, and where not specifically shown or noted, shall be in accordance with the Uniform Building Code. Bolt heads and nuts shall be provided with cut steel or malleable iron washers. Rawl-plugs and screws of recommended sizes shall be used for attaching wood to concrete or masonry, unless otherwise shown on drawings. Framing anchors and nails shall be of approved design. Nails and spikes shall conform to applicable provisions of Federal Specification No. FF-N-101.

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8-03. STORAGE: Contractor 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. Plywood and other panel material shall be separated for 24 hours prior to installation and shall be thoroughly dry.

8-04. FASTENINGS:

a. 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.

b. Schedule: Fastenings, except as otherwise shown on drawings or otherwise required, shall be:

1. 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"

2. 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"

3. Studs on Concrete: (type of fastenings 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"
4. Studs to Bearings:  
Toe nails - - - - - 3-16d
5. Joists or Rafters to Bearings:  
Toe nail - - - - - 3-16d
6. Built-up Beams 8" or less deep; 12"  
centers staggered - - - - - 16d
7. Built-up Beams over 8" Deep:  
Bolts on 24" centers staggered - - 1/2"
8. Double Joists Under Partitions:  
Where not blocked apart 12" centers  
staggered - - - - - 16d  
Where blocked apart - at each block 2-20d
9. Tail Joists to Headers, except when in  
hangers;  
Toe nail - - - - - 16d
10. Tail Joists to Headers in Hangers:  
Through header into tail joists on  
4" centers - - - - - 20d  
Toe nails 4" centers - - - - - 16d
11. Double Tail Joists Over 4 Feet Long:  
6" centers staggered - - - - - 16d
12. Solid Blocking Between Joists and Rafters:  
Toe nails each side, each end - - 2-10d  
Toe nails to bearings, each open  
side - - - - - 2-10d
13. Cross-bridging Between Joists or Rafters:  
Toe nails each end - - - - - 2-8d
14. Joists or Rafters to sides of Studs:  
8" joists or less - - - - - 3-16d  
For each additional 4" of depth - 1-16d

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15. Double Top Plates:  
Lower plate to top of stud - - - 2-20d  
Upper plate to lower plate, 12"  
centers staggered - - - - - 16d
16. Herringbone or Fire Blocking, each  
end - - - - - 2-10d
17. Sheathing and Sub-flooring at all Bearings:  
1" x 6" - - - - - 2-8d  
1" x 8" - - - - - 3-8d
18. Diagonal Sheathing and Sub-flooring:  
As above, with one additional nail at  
ends, including intermediate butt and joinings.
19. Ribbons to Studs:  
1" ribbons - - - - - 2-8d  
2" ribbons - - - - - 2-16d
20. Joist Anchors across interrupting beams  
and/or trusses  $\frac{3}{16}$ " x 1-1/2" steel, 24" longer than  
breadth of beam. Centers to be 72".

8-05. WORKMANSHIP AND ERECTION, ROUGH CARPENTRY:

a. General Requirements: 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

b. 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.

c. 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. Plate splices shall be lapped a minimum of

24 inches. Walls shall be herringbone braced or fire stopped with one row of 2" by stud deep blocking so that the maximum concealed space is not over 7'-0". Where so indicated, install two rows of horizontal blocking of stud thickness cut in between studs, for securing corrugated metal siding. Lintels, not otherwise shown, shall be not less than two - 2" x 4" members on edge. Solid blocking for support of plumbing fixtures, case work, etc., shall be installed as required for proper support thereof.

d. Sheathing, unless otherwise shown, shall be laid diagonally with driven sides and ends, and nailed as shown or hereinbefore specified. Tongue-and-grooved and ship-lapped joints shall be placed so as to provide natural weathering. Two bearings shall intervene between splices in the same board, and two boards shall intervene between splices over the same bearing. Prior to application of composition roofing over roof sheathing, damaged work shall be replaced, loose or cupped boards renailed and all sheathing swept broom clean.

e. 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. Wall framing shall be furred as required to conceal all pipe, conduit, ducts, etc. in finish areas.

f. 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.

g. Stairs, walkways, handrailings, etc., shall be constructed to size and detail shown on the drawings. Stair 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. The front edges of treads shall be beveled slightly. Hand and wall railings shall be in one piece for each run. All framing and finish shall be rigidly secured.

h. Ladders and catwalks shall be constructed of wood selected from lumber delivered to the jobsite 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 (1) inch in twelve )12). Ladder rungs shall be dapped into side rails.

8-06. FINISH CARPENTRY: Unless otherwise shown on drawings or directed by Engineers, finish carpentry work shall conform to the following standards:

a. General Requirements: All work shall be accurately and skillfully worked and set true to line, level and plumb. All work shall be substantially reinforced and secured and shall be properly sanded.

b. 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.

c. Outside trim angles shall be mitred, and inside angles coped.

d. Butt end joints shall be beveled, exposed ends of aprons, rails, etc., returned on themselves and outside arris rounded off.

e. Glue joints, where indicated, shall be glued up with waterproof glue and held with clamps until set.

f. Fastenings shall be blind where possible and when not shall be set for putty.

g. Rough Hardware, including bolts, washers, nails, screws, angles, plates, etc., shall, within the limits of practical availability, 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.

8-07. PLYWOOD PANELS:

a. Plywood panels, of thicknesses noted shall be installed at walls, ceilings and elsewhere as shown. Panels shall be installed in as large sections as possible, butt jointed, and face nailed over bearings. Nailing shall be at 6 inches on centers for outer edges of panels and 12 inches on centers at intermediate bearings. 1/4 inch panels shall be secured with 4d nails, 3/8 inch and 1/2 inch panels with 6d nails and 3/4 inch panels with 8d nails. Nails shall be set for putty in areas scheduled for paint finish. At interior angles and at intersections of walls

I with floors and ceilings install 1/4 round mouldings. Plywood wainscots, where shown, shall be provided with cap moulding. Sliding plywood panels shall travel in rabbetted guides and be provided with wood pulls. Plywood for panels and finish moulding shall conform to paragraph 8-02c, preceding.

b. Fire resistant plywood panels of thicknesses noted shall be installed at walls, ceilings, and elsewhere as indicated on the drawings for the Building No. 116 on Location "A." Panels shall be installed as specified in paragraph 8-07 sub 1. Fire resistant plywood for panels and finish moulding shall be exterior grade Douglas Fir fire retardant treated, and shall conform to the requirements of Navy Specification No. 51C40 for Type "M," class "1," "Fire Retardant Chemicals for Lumber."

8-08. CABINETS, COUNTERS, BENCHES, ETC.:

a. General Requirements: All cabinets, counters, benches, shelf units, and similar items shall be built to the designs and dimensions shown, and shall be of the materials hereinbefore specified unless otherwise noted. Dimensions shown are nominal. Contractor shall take off his own measurements and make such adjustments as are required by working conditions. Where details are not shown or where so noted, these items shall be constructed on the job to meet the requirements and conditions of use. In these instances construction methods and material shall be suitable to the use intended, shall be similar to like detailed items, and subject to the approval of the Engineer.

b. Workmanship: All cabinet and case work, shelving, tables, benches, etc., shall be constructed in accordance with the best joinery practice. Work shall be housed, doweled, blocked, and glued together and nailed, screwed or bolted, as shown. Nails shall be set and screws concealed wherever possible. Miters shall be accurately made. Butt joints shall be made with approved fastenings to prevent separation. All work shall be sandpapered smooth and left in proper condition to receive painter's finish.

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c. Anchors: Work shall be secured to building construction with anchor bolts, bent plates, or angles as indicated or required.

d. Hardware: Contractor shall furnish and install all hardware shown or required for proper operation, including hinges, pulls, shelf supports, and brackets, catches, etc., of types hereinafter specified.

8-09. COUNTERS AND BENCH TOPS: Tops for counters, benches or similar items shall be of the materials shown, and except where otherwise noted, shall conform to the following standards:

a. Linoleum shall conform to Federal Specification LLL-L-367, for Jaspe type, standard grade; color gray or as selected. Linoleum paste shall conform to Federal Specification O-P-106, except that paste shall be waterproof. Standard weight linoleum lining felt shall first be cemented to the top, linoleum shall then be cemented to the felt and joints and edges weighted with sand sacks until paste has set.

b. Hardboard, where called for on the drawings, shall be hard-pressed, structural fiber-board, of the thicknesses shown, and shall be in accordance with Federal Specification No. LLL-F-311, for Class B. Material shall be bedded in waterproof paste and shall be applied to the wooden sub-surfaces under pressure.

c. Asbestos-cement Board backing for metal tops shall be of the thicknesses shown and shall comply with Federal Specification No. SS-S-283 for Type I sheets. Sheets shall be securely nailed to bench tops and back rails before application of metal surfacing.

d. Plastic Tops and back rails where called for shall be mill fabricated of plywood with a glazed surface of the weight called for. Unless otherwise shown, plywood backing shall be 3/4 inch thick, with face veneer of V. G. Douglas Fir, birch or equal close-grained, non-resinous wood. 180-180 glaze shall consist

I of three laminations of clear synthetic resin weighing 60 pounds per 1000 square feet, bonded to the plywood under heat and pressure and providing a glazed surface approximately 1/16 inch thick.

e. Stainless Steel top and back rail surfacing shall be of the gauge called for and shall comply with Army-Navy Specification No. AN-QQ-S-772A for Class 2, Composition G, Physical Condition All Annealed Temper, Surface Condition 2B, steel sheets, be turned down at edges and secured with countersunk wood screws.

f. Wood Finish: Wood finish for tops, where so indicated, shall be Douglas Fir No. 1 Common tongued and grooved of dimensions shown, and shall be laid with driven fit and blind nailed with aluminum nails.

g. Mouldings: Wooden nosings, cap mouldings, etc., shall be to the dimensions shown and of materials hereinbefore specified. Metal edging shall be of the designs indicated and shall be of aluminum or stainless steel, secured with countersunk screws of like material.

h. Fixtures: Counter and bench tops shall be accurately cut and reinforced to receive the plumbing fixtures called for. Sinks shall be secured in place by clamps as detailed, and finished with aluminum or stainless steel sink frames screwed to the tops and set in waterproof cement; or where so indicated for shop sinks, shall be secured with wooden hangers and finished with wooden trim mouldings sealed with waterproof mastic.

#### 8-10. DOORS AND DOOR FRAMES:

a. Job-built doors, half doors and gates shall be constructed of plywood and/or finish lumber as hereinbefore specified to the details and dimensions shown.

b. Stock doors shall be of the types and sizes shown and shall be manufacturer's stock Douglas Fir

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doors fabricated in accordance with Commercial Standard CS 73-48 as published by the United States Department of Commerce. Doors shall be of panel-and-frame construction including those indicated as flush. Doors shall be mortised-and-tenoned or doweled, and glued; water-proof glue shall be used. Double doors shall be furnished with astragal attached. All doors shall be furnished smoothly sanded and shall be factory sealed on all ends, edges and faces with a resin sealer-prime coat.

c. Screen doors shall be furnished and installed where indicated or directed. Screen doors shall comply with all applicable provisions of paragraph b, preceding and shall be covered with plastic mesh screening. Plastic mesh screening shall be of a type that has successfully met tests for accelerated weathering, salt spray, tropical chamber and water absorption as made by a reputable laboratory; shall have a softening point of not less than 240 degrees F., a tensile strength of 40,000 pounds per square inch and shall be 18 x 14 mesh, color gray.

d. Louvers shall be of types and materials detailed and shall be set in suitable frames. Louvers shall be screened on interior faces where directed with plastic mesh screen as hereinbefore specified. Metal louvers as specified in "Miscellaneous Equipment and Furnishings" section of these specifications shall be installed as indicated.

e. Insulation shall be provided for doors at Building 221, Location "B" as detailed. Insulation shall conform to paragraph 8-18 that follows.

f. 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.

g. Erection: Unless otherwise shown or directed, doors shall be hung and fitted to a 1/8 inch clearance at top and sides, and 3/8-inch clearance at the bottom and shall have 1-1/2 pair of hinges per door. Door hardware shall be as hereinafter specified.

8-11. WINDOW SASH: All sash, unless otherwise noted, shall be job-built to the designs and dimensions shown from material specified in paragraph 8-02c. Screen

frames as hereinafter specified, shall where so noted, be glazed with plastic glass.

8-12. WINDOW SCREENS: Window screens shall conform to Specification No. HW-2H-105 as contained in Appendix A of these specifications. Screens shall be furnished complete with hardware including hangers and button fasteners, as well as the required rubber closure plugs. Screens shall be installed insect-proof with all hardware in proper working order. In general, screens shall be installed at hospital infirmary and mess hall buildings and at certain other buildings as directed; the exact location of screens shall be as determined by the Engineer.

8-13. PLASTIC COVERED SCREENS: Where so noted, screen frames shall be glazed with a flexible, translucent, wire reinforced fabric equal to Dupont "Cel-O-Glass". Fabric shall be attached to screen frames by means of splines driven into grooves in the screen members in a manner similar to that specified for the attachment of plastic mesh screening.

8-14. FLOORING: Finish flooring, not otherwise noted, shall be as specified in paragraph 8-02c, 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.

8-15. CORRUGATED ALUMINUM: Contractor shall furnish and install corrugated aluminum roofing and siding over wood framed structures where called for on the drawings.

a. Materials unless otherwise shown, shall be as follows:

1. Corrugated Aluminum Sheet shall be industrial type .032 inch thick weighing not less than .56 pounds per square foot and shall be 3S aluminum alloy or equal, corrosion-resistant alloy approved by the Engineer. Corrugations shall have a pitch of 2.67 inches and a depth of 7/8 inches. Ridge caps and other special shapes shall be provided where required and aluminum flashings .020 inches thick minimum shall be installed where shown or as required to provide a weather-tight installation.

2. Fastenings, including nails, screws,

rivets, etc., shall be of aluminum alloy. Nails shall be barbed and etched. Neoprene or aluminum backed fiber washers shall be provided for all holes for fasteners.

b. Workmanship:

1. Application shall be started true to line and care shall be taken to keep the horizontal and vertical lines of the sheets straight and plumb. Work shall start at the end of the building opposite the prevailing winds and shall proceed across the roof one course at a time, or if preferred, all courses shall be carried across the roof simultaneously, keeping the adjacent lower course at least one sheet ahead of the next upper course. The first sheet shall be applied with the edge turned down at the gable and side and with the edge turned up at the opposite side to be lapped by the next sheet. Roofing shall be laid with corrugations parallel to the roof slope, siding sheets shall be attached with corrugations vertical. Sheets shall be bent along corrugations only.

2. Sidelaps for roofing shall be 1-1/2 corrugations, minimum, and for siding 1 corrugation. End laps shall be 8 inches for roofing and 4 inches for siding.

3. Holes for Fastenings shall be drilled or punched and all holes sealed with washers. Side laps shall be fastened with machine screws or sheet metal screws approximately 15 inches on centers. Sheets shall be secured to sheathing or framing at end laps and intermediate bearings with nails through washers at the crown of alternate corrugations.

4. Protection: Where aluminum overlaps dissimilar metals or masonry, the overlap shall be painted with aluminum pigmented asphalt paint.

8-16. PICTURE SCREENS: Motion picture screens where shown on the drawings shall be constructed of asbestos-cement sheets complying with Federal Specification No. SS-S-283 for Type I sheets. Sheets shall be of thicknesses called for in as large sizes as practical. Joints shall be butted and shall occur only over solid bearings. Nails shall be countersunk and nail holes and joints filled with an approved cold water type putty, sanded smooth. All holes for nails through

asbestos-cement panels shall be drilled. Wood screen frame, supports, stairs, etc., shall be as detailed.

8-17. GLASS AND GLAZING: Openings, for the most part, will not be glazed. Where glazed opening are called for on the drawings, install glass types noted in accordance with details shown. Sizes for glass shall be taken from the actual frames and sash; sizes shown are nominal. Except as otherwise shown or hereinafter specified, flat glass shall conform to the requirements of Federal Specification No. DD-G-451a, of types as noted, or directed by the Engineer.

a. Polished Plate Glass: Polished plate glass shall be Type A, glazing quality. Nominal thickness, except where otherwise indicated on the drawings, shall be 1/4-inch.

b. Clear Window Glass: Clear window glass, except where specified otherwise, shall be Type B, double strength, "A" quality.

c. Wire Glass: Wire glass shall be Type E, and shall be 1/4-inch thick, clear, polished both sides.

All glass, except as otherwise indicated, shall be set in putty. Wooden stops shall be bradded and metal stops secured with screws. All glass shall be back-puttied and have excess putty cut off flush with top of stophead.

8-18. INSULATION: Contractor shall furnish and install all insulating materials in the areas so scheduled. Except as otherwise shown or herein specified insulation shall be as follows:

a. Insulating batts shall conform to Federal Specification HH-I-52c for Type I, Class B.

b. Insulating Roll Blankets shall be as specified in paragraph "a" preceding except that insulation shall be in the form of a continuous roll. Batts and blankets shall be of the thicknesses shown and shall 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. (Refer to "Painting" section for vapor-seal insulation).

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8-19 ACOUSTIC TILE: Contractor shall furnish and install acoustic tile on walls and/or ceilings in the areas shown. Tile shall be prefabricated acoustical units conforming to Federal Specification No. SS-A-118. Units shall be manufactured from either wood or mineral fibers. Unless otherwise shown, tile shall be 3/4 inch in thickness and have a noise reduction coefficient of not less than .70. Tile shall be plain or perforated as noted, shall be 12" x 12" or scored in 12" blocks, shall have beveled butt edges and shall be of the color selected. Units shall be nailed to furring strips as indicated, perforated units to be blind nailed through the corner holes.

8-20. TACKBOARDS: Tackboards or bulletin boards shall be of sizes and at locations shown and shall consist of a cork field or approved color, if available, cemented on plywood backing. Joints shall be flush and shall be concealed as far as practicable; where exposed nailing is necessary, the nails shall be set and the holes filled. The edges of the tack boards shall be finished with a wood trim as detailed.

8-21. MAP BOARDS called for at Building No. 221, location "B" shall be of similar construction to the tackboards specified in paragraph 8-20 preceding. Map boards shall move on an overhead track, two boards to each track. Arrangement of operating hardware shall be as detailed. Hardware shall include aluminum alloy tracks installed with cadmium plated screws, pressed fiber hanger rollers with roller bearings, other hanger parts to be of plywood; and aluminum door guide angles. Hardware shall be "Har-vey" or approved equal.

8-22. WEATHERSTRIPPING: Contractor shall furnish and install weatherstripping at all openings where called for. Except as otherwise shown, methods and materials shall be similar to those detailed for Buildings 329 and 330 at Location "B". Rubber stripping for door gaskets shall be 40 to 50 shore synthetic rubber. Sponge rubber shall be neoprene or equal synthetic rubber. All metal and angles used for weatherstripping shall be aluminum. All rough hardware shall be of aluminum or shall be cadmium plated ferrous metal. All rubber weatherstripping shall be coated with cement on contact surfaces before being screwed or otherwise secured in place. In locations where vapor-seal coating is called for to be sprayed over interior surfaces, all openings formed by corrugated metal

contacting flat surfaces shall be closed by shaped sponge rubber plugs cemented in place prior to spraying. Refer to "Painting" section for vapor-seal coating.

8-23. TENT FRAMES:

a. General Requirements: Contractor shall fabricate and erect at the locations shown all tent frames shown or required for the work. Concrete floor slabs, including anchor bolts, for personnel tents, and concrete piers for refreshment tent posts shall conform to the "Concrete and Form Work" section of these specifications.

b. Materials:

1. Lumber, not otherwise called for, shall conform to paragraph 8-02b.

2. Plywood shall be "Plyshield EXT-DFPA-UTILITY".

3. Rough Hardware: Ferrous metal items including bolts, nuts, plates, washers, etc., shall be hot dipped galvanized. Nails shall be spiral shank, flat head, 61S-T aluminum alloy or approved equal aluminum alloy, or substitute as approved by the Engineer

4. Screening where required, shall be plastic mesh as specified in paragraph 8-10c preceding.

5. Canvas shall be 12.29 ounces per square yard, dark olive drab, cotton duck conforming to Type III, Table II, of U. S. Army Specification No. 6-342. Canvas for refreshment tents shall have triple sewed seams and hems with 9/16 inch brass grommets and washers spaced 12 inches on centers at the perimeter. Unless otherwise shown, canvas for personnel tents will be furnished by the Government.

c. Workmanship: All members shall be accurately cut and fitted, securely fixed and rigidly braced to the true line, plane and plumb, with bolt holes accurately drilled. Splicing of members will not be permitted.

8-24. CURTAINS: Canvas curtains shall be provided where indicated at Building No. 200, Location "B". Canvas shall conform to paragraph 8-23 b. preceding. Seams and lengthwise hems shall be triple sewed and

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ends shall be pinked. Curtains shall be provided with ropes and pulleys for pull-up operation.

8-25. FINISH HARDWARE:

a. General Requirements: Contractor shall furnish and install all hardware shown on the drawings, herein specified or required to complete the finish hardware installation for the project. Except where otherwise called for, all finish hardware shall, within the limits of practical availability, be of corrosion-resistant materials or of materials processed to resist corrosion. 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.

b. Hardware Elsewhere Specified: Certain finish hardware items, including hardware for the following installations, are specified under the section of specifications pertaining to those installations:

1. Pre-fabricated metal buildings
2. Vault doors
3. Steel plate or other special doors
4. Window screens
5. Movable curtains and sliding panels

c. Keying: All cylinder locks and padlocks shall be keyed, master keyed and grand master keyed in a manner to be determined by the Contracting Officer.

d. Hardware List: Except as otherwise noted, finish hardware shall conform to the following list:

1. Latch Sets: Latch sets where called for on the drawings or required shall be "Parlyn" Door Latches as manufactured by Parlyn Ltd., Los Angeles, California or approved equal; of the types indicated. Case and pulls shall be of aluminum; operating mechanism, except for bronze pins and chromium plated steel springs shall also be of aluminum.

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2. Lock Sets: Cylinder lock sets where called for shall be Schlage or equal. All exposed trim shall be aluminum with satin finish, alumilited. Mechanism shall be all bronze with heavy zinc dichromate plating on all parts. All cylinder locks shall be master-keyed for each location. Provide individual keys for all locks.

3. Exit Bolts: (Refer to Building No. 330, Location "B"). Exit bolts shall be equal to Sargent Nos. 5391L and 5344 L (install as directed), and shall be complete including sectional entrance door handle for outside, wrought brass cylinder bases, forged brass grip, cylinder mortise lock No. 993; finish U. S. 4. Locks shall be master-keyed.

4. Hinges: Except where otherwise called for on the drawings, all door, gate and cabinet hinges shall be surface type aluminum hinges. Hinges shall be welded to doors and door frames or drilled for screw or rivet attachment as called for on the drawings. Unless otherwise shown, 1-1/2 pairs of hinges shall be installed on each door. Hinges shall be similar to the following typical examples:

Door Hinges: In accordance with sketch numbered SK-171 for extruded hinge, 63ST 5 aluminum alloy, with stainless steel pin.

Cabinet Hinges: In accordance with SK-174, SK-175 and SK-176 for different sizes for #19 gauge aluminum sheet hinges, 52S-H34 aluminum alloy anodized, with stainless steel pin.

Hinge Hasps: In accordance with sketch SK-177, and SK-179 for different sizes for sheet aluminum hinges hasps and staples, 52S-H34 aluminum, with stainless steel pins.

Bolt Hook Hinges shall be California Hardware Catalogue No. 952 or equal, wrought steel galvanized.

Spring Hinges for screen doors shall be of the adjustable coil type finish U.S.4 of sizes shown or appropriate for the use. For each door furnish roller catch with rubber roller and door pull; finish to match hinges.

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5. Barrel Bolts and surface strikes shall be in accordance with SK-180 and SK-181 for different sizes, to the details shown, sheet aluminum to be 52S-H34, aluminum tubing to be 61S-T6 alloy; barrels to be stainless steel.

6. Shelf Brackets shall be 24 ST-4 aluminum alloy to the details shown on SK-164.

7. Adjustable Shelf Supports, where called for shall consist of approved type aluminum shelf brackets supported on aluminum standards, with bracket slots in the standards approximately one inch apart.

8. Paper Holders: Toilet paper holders shall be as detailed on SK-165, with frame of 24ST-4 aluminum alloy and roller of hardwood. A paper holder shall be installed at each water closet.

9. Clothes Hooks shall be to the details shown on SK-163 and shall be fabricated of 24ST-4 aluminum alloy rectangular rod.

10. Padlocks shall be of sizes shown or appropriate to the use intended and shall be brass or bronze, with pin tumbler mechanism, key operated or combination as available, equipped with shackle and chain as required; and shall conform to Federal Specification No. FF-P-101b. Keyed padlocks shall be master-keyed.

11. Miscellaneous items of hardware including gate hooks and eyes, chains and snaps, door and drawer pulls, catches and all other items shown or required, shall be of suitable approved types and shall be on non-metallic materials, non-ferrous materials or ferrous materials processed for corrosion resistance.

8-26. ASPHALT TILE: Contractor shall furnish and install asphalt tile in Building No. 120 on Location "B" and where otherwise indicated on the drawings. Asphalt tile shall be 9" x 9" x 3/16" thick complying with Federal Specification SS-T-306a. Surface shall be thoroughly dry, absolutely clean, even and true to line, level and plane; primer and cement shall be first quality with protective coating consisting of one coat of water emulsion floor wax conforming to Federal Specification No. P-W-151a. Asphalt tile shall be installed with closely butted, in line, flush joints

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and edges to be sanded smooth and true; excess cement to be removed in an approved manner followed by thoroughly washing and rinsing with neutral soap and water to remove all traces of soap, etc. before applying to protective coating.

8-27. MIRRORS: A glass mirror, size 12" x 18", in a white lacquered wooden frame shall be furnished and installed over each lavatory shown on the drawings.

8-28. DRAPES: Drapes called for at Building No. 221, Location "B" shall be of size shown and shall be of flame-proofed cotton material, basket weave, color, light cream. Samples of drape material shall be submitted to Engineer for approval. Drapes shall be of the bi-parting type complete with Kirsch or equal heavy duty ceiling track, traverse with cords and pulleys.

8-29. HARDWARE CLOTH: Hardware cloth for Greenhouse, Location "L" or as otherwise indicated on the drawings shall be Type G, aluminum alloy, 14 mesh, conforming to Federal Specification RR-C-45/a.

## SECTION 9

### METAL DOORS, DOOR FRAMES & WINDOWS

9-01. SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with the installation of metal doors and metal door frames, complete, in strict accordance with this section of the specifications and the applicable drawings.

9-02. SHOP DRAWINGS: The Contractor or manufacturer shall prepare and submit complete shop drawings for all fabricated work in accordance with the "General Conditions" Section of these specifications and shall obtain the Engineer's approval thereof before proceeding with the work.

9-03. SAMPLES: Samples of all materials, except rolled plates and shapes, shall be submitted to the Engineer for approval when so required.

9-04. MATERIALS: Materials not specified in detail shall meet required grade and class of applicable Federal or A. S. T. M. Specifications as amended to date.

9-05. WORKMANSHIP: All work shall be fabricated by experienced workmen in accordance with the best shop practice. All exposed edges of plates, stops, frames, etc., shall be cut true and square and with the exposed corners smooth and slightly rounded. All mitres shall be accurately cut, fitted close, flush and smooth. All joints shall be brazed or welded. All exposed joints, or welds, shall be ground or otherwise finished flush and smooth. All rivets or screws shall be countersunk flush and smooth. Welds, not otherwise indicated, shall extend the entire length of the joint of the welded member. All work shall be erected to true line, level and plane with operating hardware in perfect order.

9-06. STEEL EXPLOSION DOORS:

a. General: Where indicated on the Drawings, Contractor is to furnish and install steel explosion doors as called for on the drawings and according to these specifications.

b. Construction: Doors shall be made of steel all welded construction as manufactured by the "Jumbo Steel Products Company", or equal. Shall withstand test pressures

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c. Hardware: Doors shall be equipped with neoprene gaskets all around between closing edge of door and door frame; also Refrigerator Type, Cam and Handle Door Locking Devices, hasp and hinge.

d. Frames: Each door shall have its respective steel door frame all welded construction as manufactured by the "Jumbo Steel Door Products Company", or equal, and shall be considered as an integral part of the door assembly.

e. Paint: All doors and frames shall, after fabrication, have all millscale, oil, dust, dirt, grease, rust, spatter, slag, flux and other deleterious substances removed after which they shall receive two(2) thorough shop coats of "Zinc-Chromate" oil base rust preventive primer -- color green.

9-07. SPECIAL STEEL BLAST DOORS:

a. General: Where indicated on the drawings, Contractor is to furnish and install special blast proof doors and frames as detailed on the drawings and according to these specifications.

b. Construction: Doors shall be made of steel all welded construction consisting of angle stiffener frame welded to door panel. Welding at all joints shall be continuous. Door plate thickness shall be as indicated on drawings.

c. Hardware: All doors shall be equipped with one pair of hinges and one pair of latches and keepers. Hinges shall be fabricated from 3/8" thick bar stock. Latches and keepers shall be fabricated from 1/2" thick bar stock. All hinges, latches and keepers shall be welded to doors and door frames and be considered as an integral part of the door assembly.

d. Frames: Each door shall have its respective steel door frame all welded construction with angle frame tightly fitted and welded together at corners. Continuous bars, acting as door jambs, heads and sill, shall be plug welded to angle frame. All frames shall be considered as an integral part of the door assembly.

e. Paint: All doors, frames and hardware shall after fabrication be painted as per paragraph 9-06 e. of

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of this specification.

9-08. LEAD DOOR AND STEEL FRAMES:

a. General: Where indicated on the drawings, Contractor is to furnish and install lead door and steel frames as detailed on H & N Drawing 3C-5628 Details D. E. F. and G. and according to these specifications.

b. Construction: Door shall consist of steel frame capable of holding lead sheets and shall swing on fabricated steel pipe hinge all welded construction. Frame shall be fabricated from angles welded together at all corners. This frame shall be braced with angles welded as shown on drawings. Lead sheets shall be supported by 4-3/4 round bars spaced horizontally through door frame as shown on drawings. Lead sheets will be furnished by user.

c. Hinges: Shall consist of one 5 inch round schedule No. 40 x 6" long pipe sleeve welded to top of door frame and one 5 inch round schedule No. 40 x 12 inch long pipe sleeve welded to bottom of door frame and become an integral part thereof. Complete door assembly shall swing on a fixed pivot consisting of a 4 inch round schedule No. 40 pipe welded to a 10" x 1" x 10" base plate at the bottom and penetrating a 16" x 1" x 1'-6" plate at the top. Both top and bottom plates shall be embedded in concrete as shown on the drawings.

d. Paint: All doors and hinges including all fabricated parts shall after fabrication be painted as per paragraph 9-06 e. of this specification.

9-09. VAULT DOORS:

a. General: Where indicated on the drawings, Contractor shall furnish and install insulated flat sill fire-resistive vault door bearing Underwriters' Laboratories four-hour fire-resistive label, Underwriters' Laboratories relocking device label and Safe Manufacturers' National Association label for four-hour door. Relocking device shall be designed to function under mechanical explosive or torch attack. This door shall be as manufactured by the Mosler Safe Company, or its equal.

b. Construction: Clear door opening shall be 78" high by 32" wide. The door shall have 1/8" outer door plate welded to jambs and shall be insulated with monolithic fire-resistive material. Baffles in door designed to prevent penetration of heat. In addition, the door shall

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be equipped with at least 1/2" insulation over bolt work, mounted on fusible studs, thermostatically controlled, designed to automatically seal opening at door frame when temperature reaches approximately 165° F. The door shall be equipped with five 3/4" diameter bolts, operating four to the front, and one to the top, with interlocking tongue and groove at top, front and rear, checked by three-tumbler, hand changed, bronze case combination lock, with spindle shouldered against lock plate to prevent driving, and two hard pins in spindle to prevent drilling. Entire locking mechanism to be guarded by 1/4" drill-resisting plate. The door shall be equipped with "Emergency Escape Device", having auxiliary inside handle, a turn of which will permit immediate escape of anyone locked in the vault.

c. Finish: The door shall be finished in wrinkle green, ornamented with gold striping. Jams smooth green. Hinge tips, combination dial knob, rim and exposed portion of bolt handle, heavily nickel-plated. Numbers on combination dial in white against black enamel surface. Door shall be finished as specified above or shall have an equivalent factory finish.

9-10. STEEL PLATE DOOR:

a. Where so indicated in the Administration Building at Location "B", the vault door shall be steel plate hung in a steel frame with hinges and handle hasp in accordance with the details as indicated on the drawings.

b. Frames, not otherwise detailed shall be constructed of hot rolled steel shapes provided with a strap anchor welded to the back of angles. Corners shall be mitred, fitted close and welded.

c. Where door contacts door stop provide mask felt strip secured to door with brass machine screws.

d. Door frame and hardware shall be provided as indicated in paragraph 9-06 e. of this specification.

9-11. ALUMINUM WINDOWS AND FRAMES:

a. General: Contractor shall furnish and install fixed aluminum windows and frames where indicated on the drawings.

b. Materials: Unless otherwise indicated shall be as follows:

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1. All window members, including muntin bars and glazing beads shall be extruded aluminum alloy 63S-T5, not less than 1 inch deep, 5/32" thick and weighing not less than .461 pounds per linear foot.

2. Fasteners: Screws, nuts, washers, bolts, and rivets and other miscellaneous fastening devices incorporated in the windows shall be of aluminum. All anchoring devices in the erection of the windows shall be of aluminum. Steel anchors may be used provided that they be properly isolated from the aluminum.

c. Erection: Aluminum windows shall be erected in a secure and workmanlike manner to assure weathertight construction and a permanent watertight joint shall be made at the junction of the sill and side frame members. Where welding flux is used, it shall be completely removed immediately upon completion of the welding operation.

SECTION 10PAINTING10-01. GENERAL REQUIREMENTS:

a. 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:

b. Interior Painting:1. 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.

2. Aluminum walls and ceilings where called for on the drawings.

3. Piping - steel and iron pipe and fittings.

4. Piping - insulated pipe and fittings.

5. Equipment not furnished with finish coat.

6. Ferrous Sheet Metal Work.

c. Exterior Painting:

1. 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.
- 2. Asbestos-cement screens.
  - 3. Structural steel work and miscellaneous ferrous metal work.
  - 4. Gasoline and oil tanks (Exterior sides).
  - 5. Water tanks (Exterior and interior sides).
  - 6. Piping - steel and iron pipe and fittings.
  - 7. Piping - insulated pipe and fittings.
  - 8. Equipment not furnished with finish coat.
  - 9. Fire hydrants.
  - 10. Airstrip centerline.
- d. Interior:
    - 1. Aluminum walls and ceilings.
    - 2. Concrete floors.
    - 3. Tempered hardboard.
    - 4. Linoleum.
    - 5. "Plyglaze".
    - 6. Stainless steel.
    - 7. Aluminum or chrome trim.
    - 8. Finish equipment and machinery.

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9. Aluminum or plated piping.

10. Chain link gates and partitions.

e. Exterior:

1. Aluminum roofing and siding.

2. Concrete work.

3. Composition roofing.

4. Chain link fencing and gates.

5. Timber piers.

6. Cast iron manholes and valve covers.

f. Definition: The term paint, as used herein, includes paints, enamels, varnishes, lacquer, stains, emulsions and sealers.

g. 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).

10-02. MATERIALS:

a. 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 as directed by the Engineer. Finish paints will contain mold and fungi resisting agents.

b. Aluminum paint shall be linseed oil modified Alkyd vehicle containing not less than 1-1/2 pounds of aluminum paste per gallon of vehicle, and shall be Dutch Boy No. 1005 Ready Mixed Aluminum as manufactured by the National Lead Company, or approved equal and shall also conform to Federal Specifications Nos. TT-A-468a and TT-V-816 for pigment and vehicle respectively.

c. Rust preventative for structural steel shall be Keystone Rust Preventative, medium grade, as manufactured by the Keystone Lubricating Company or approved equal.

d. Tallow shall conform to Federal Specification No. C-T-91.

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e. White Lead, basic carbonate shall conform to Federal Specification No. TT-W-251a.

f. Zinc Chromate shall conform to Navy Specification No. 52P18.

g. Primer Paint:

1. Exterior Primer Paint: Exterior primer paint shall conform to the requirements of Federal Specifications TT-P-86a Type III.

2. Interior Primer Sealer Paint: Interior Primer Sealer Paint shall comply with Federal Specification No. TT-P-56a.

h. Vapor Seal Coating: R. M. Hollingshead Corporation "Cocoon" surface preparation, number of coats and application methods shall conform to the detailed instructions of the material manufactured, and no deviation from these instructions shall be made without prior approval of the Engineer.

i. Miscellaneous Paint Materials:

1. Color pigments.
2. Drier, liquid.
3. Flatting and Mixing Oil.
4. Linseed Oil.
5. Thinner.
6. Titanium Dioxide.
7. Turpentine.
8. White Lead.
9. Zinc Oxide.

10-03. 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.

10-04. COLORS shall be as hereinafter specified in

I "Painting Schedules". Successive coats of paint shall, where practicable, be of a slightly different color.

10-05. PREPARATION OF SURFACES:

a. General: All surfaces to be painted shall be thoroughly dry and shall be free of oil, dirt, dust, rust, or cement.

b. Finish Woodwork including doors and frames, window 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 sealed with shellac and corners of finish woodwork shall be sanded 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 putty and sand papered smooth. Putty shall be dry before subsequent painting

c. 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.

d. 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.

e. Galvanized Metal not bonderized shall be cleaned of any grease or oil by use of an approved solvent.

f. Asbestos-Cement Screens shall be carefully cleaned of dirt or stains by the use of suitable solvents. Screens shall not be wire-brushed.

10-06. APPLICATION:

a. 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.

b. Painting Conditions: Paint shall be applied

I only under dry and dust-free atmospheric conditions.

c. 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.

10-07. PAINTING SCHEDULES:

a. Scope: 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.

b. Interior Painting Schedule:

1. Finish Woodwork:

- (a) Doors and door frames.
- (b) Wood sash.
- (c) Plywood wall, ceiling panels and partitions.
- (d) Moulding and trim.
- (e) Exposed studs and sheathing.
- (f) Exposed roof construction.
- (g) Benches, shelves, counters, cabinets, etc.

First coat shall be Dutch Boy No. 600 Interior and sealer or approved equal.

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Second coat shall be "Nalco Synthetic Finish" color No. 5269 Silver Gray, reduced by adding 10% of mineral thinner (Dutch Boy "Tex-Thin") or approved equal.

Third coat shall be as second coat except apply unreduced.

2. Finish Floors shall be first coat, Dutch Boy No. 4662 "Clear Resin Sealer" reduced by adding 10% of mineral thinner, or approved equal. Second coat shall be Dutch Boy "4 Hour Floor and Interior Varnish" (clear) or approved equal.

3. Aluminum Walls and Ceilings (where vapor seal coating is required) shall be of "Cocoon" surface preparation applied by air brush, and should result in a plastic film over all interior of walls and ceilings indicated to be so insulated. Care shall be taken that all holes, cracks and other openings to be completely filled and sealed to form a complete vapor barrier, to the satisfaction of the Engineer.

4. Dark Room: Over unfinished wood surfaces apply a first coat of Dutch Boy No. 600 interior primer and sealer and a second coat of Dutch Boy No. 320 flat black quick drying enamel or approved equal. Over surfaces covered with "Cocoon" insulation apply one coat of Dutch Boy No. 320 flat black quick drying enamel or approved equal.

5. Wainscote: Where shown on plans or so directed, wainscote to be painted to a height of 5'-0" above floor level. Paint shall be as specified in item (1) of this paragraph except second and third coats which are to be Dutch Boy "Nalco Synthetic Finish" color No. 387 gray or approved equal.

6. Insulated Pipe & Fittings: First coat shall be Dutch Boy "Lead Mixing Oil" reduced 20% by adding mineral thinner or approved equal. Second and third coats shall be aluminum paint as specified in paragraph 2b of this section.

7. Uninsulated Iron and Steel Pipe and Fittings shall be the same as item (5) in "Exterior Painting Schedule" below.

8. Ferrous Metalwork: First coat shall be Dutch Boy No. 1001 "Zinc Chromate Primer" or approved equal as specified in paragraph 2f of this section. Second and third coats shall be as specified in item (1) of this paragraph.

c. Exterior Painting Schedule:

1. 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 shall be Dutch Boy No. 25 "Exterior Wood Primer" reduced 10% with mineral thinner or approved equal. Second coat shall be aluminum paint as specified in paragraph 2b of this section.

2. Woodwork including theatre benches, platforms, landings, ladders, catwalks and railings. First coat shall be Dutch Boy No. 25 "Exterior Wood Primer" reduced 10% with mineral thinner or approved equal. Second coat shall be Dutch Boy "Nalco Synthetic Finish" color No. 5269, silver gray, reduced 10% with metal thinner or approved equal. Third coat shall be same as second coat, except apply unreduced.

3. Theatre Screen (asbestos-cement): First coat shall be "Exterior Masonry Primer" as manufactured by Wesco Water Paints, Inc., or approved equal. Second coat shall be "Durasite" as manufactured by Wesco Paints, Inc., or approved equal with the colors, black and white, as indicated on the drawings.

4. Structural Steel and Miscellaneous Metal Work: First coat shall be Dutch Boy No. 1001 Zinc Chromate Primer or approved equal. Second coat shall be Dutch Boy No. 1005 "Ready Mixed" Aluminum or approved equal. Except where specified second coat shall be the same as first coat. For Keystone Rust Preventative application and removal see 6-10 of these specifications.

5. Exterior Surfaces of all Steel Tanks, Steel and Iron Pipe, Valves and Fittings (uninsulated) and Equipment:

(a) First coat shall be "Coro-Gard #9" zinc chromate base primer, or approved equal.

(b) Second coat shall be "Coro-Gard #14" corrosion resisting coat, or approved equal.

(c) Third coat shall be "Coro-Gard #24" corrosion resisting top coat, flat aluminum color (except valves or equipment to be color coded), or approved equal.

6. 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.

7. Insulated Pipe, Valves and Fittings:

(a) First coat shall be Dutch Boy "Lead Mixing Oil" reduced 20% with mineral thinner, or approved equal.

(b) Second and third coats shall be Dutch Boy #1005 "Ready Mixed Aluminum," or approved equal.

8. 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:

(a) 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.

(b) Painting: After interiors are thoroughly clean and dry apply two (2) coats of Dutch Boy #5668 "Zinc Dust Zinc Oxide Interior Water Tank Coating," or approved equal.

9. Fire Hydrants:

(a) First coat shall be touch up shop coat as required.

(b) Second coat shall be Dutch Boy "Nalco Synthetic Finish" color #382, Red, reduced 10% with mineral thinner, or approved equal.

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(c) Third coat shall be same as second coat, except apply unreduced, or approved equal.

10. Airfield Center Line: Center lines and/or cross marks shall be provided for Airfield runways as called for on the drawings.

(a) Paint to be used shall be spraying grade traffic line lacquer of the color furnished by the Owner.

(b) 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 square feet (120 sq. ft.) of surface.

(c) 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.

10-08. DRYING TIME: A minimum of three (3) days 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.

10-09. PROTECTION AND CLEANING: 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.

SECTION 11ROOFING AND SHEET METAL WORK

11-01. SCOPE: The work covered by this section of the specifications consists of furnishing all labor, tools and equipment required for the installation of all mineral surfaced roofing and sheet metal work as indicated on the drawings or required for the work.

a. Refer to section 13, "Metal Buildings" for prefabricated metal roofs over metal buildings.

b. Refer to section 8, "Carpentry and Related Work" for corrugated aluminum roofing over framed structures.

11-02. ROOFING:

a. Materials, as furnished by the Contractor, will include 90# mineral surfaced roofing, roofing cement, plastic cement, flashing fabric, and large head aluminum roofing nails.

b. Preparation of Surfaces: 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 for all rough edges at eaves where roofing is to be turned down.

c. Application of Roofing: Mineral surfaced roofing shall be applied as follows:

1. 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:

2. 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.

3. Nail all laps through both layers of roof-

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ing, 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.

4. Fill all breaks or holes in roofing and caulk flashings as required with plastic cement, troweled on.

11-03. SHEET METAL WORK: Surfaces to which sheet metal is to be applied shall be even, smooth, sound, thoroughly clean and dry, and free from all defects that might affect the application. All cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades, shall be performed under this section. All accessories or other items essential to the completeness of the sheet metal installation, though not specifically shown or specified, shall also be provided under this section. All such items, except as otherwise specified, shall be non-ferrous where employed in conjunction with copper or lead, and shall be zinc coated ferrous metal where employed with zinc coated iron or steel. Where sheet metal abuts or members into adjacent materials, the juncture shall be executed as indicated on the drawings or in a satisfactory manner. Flashings, gravel stops, reglets, and other sheet metal work in conjunction with roofing shall be of aluminum. All nails and other fastenings used with aluminum shall be of aluminum alloy or shall be cadmium plated.

a. Materials: As furnished by the Contractor:

1. Calking Compound: Calking compound shall conform to the requirements of Federal Specification TT-C-598.

2. Aluminum: Aluminum sheet shall be of the gage or thickness called for on the drawings. Unless otherwise shown on the drawings, sheet shall be 3S alloy not less than 0.020 inches thick.

3. Nails: Nails shall conform to the requirements of Federal Specification FF-N-101 and shall be not less than 0.109 inch diameter. Nails shall be of the large head type and shall be of sufficient length to firmly secure the materials in place. Non-ferrous nails for use with aluminum shall be 56S aluminum or similar hard aluminum alloy, and for use with copper shall be hard copper or

copper alloy. Ferrous nails shall be hot-dip galvanized steel.

4. Plastic Cement: Plastic cement shall conform to the requirements of Federal Specification SS-C-153.

5. Screws: Screws shall conform to the requirements of Federal Specification FF-S-111 and shall be of the type hereinafter specified or required to properly secure the work. Non-ferrous screws shall be hard copper or copper alloy, or hard aluminum alloy as required, ferrous screws shall be of steel, galvanized.

6. Solder: Solder shall conform to the requirements of Federal Specification QQ-S-571b, Class A. Flux shall be rosin except where prohibited by unusual conditions of application, in which event soldering flux paste conforming to the requirements of Federal Specification O-F-506, or muriatic acid properly killed with zinc may be used.

7. Soldering Flux: Soldering flux shall conform to the requirements of Federal Specification O-F-506.

b. Soldering: All edges of sheet metal to be soldered shall be pretinned before soldering is begun. Soldering shall be done slowly with well-heated coppers so as to thoroughly heat the seam and completely sweat the solder through the full width of the seam. Ample solder shall be used and the seam shall show not less than one full inch of evenly flowed solder. Where soldering paste or killed acid is employed as a flux, soldering shall follow immediately after application of the flux. Upon completion of soldering, surfaces shall be thoroughly cleaned.

c. Seams:

1. Flat lock seams shall finish not less than  $3/4$  inch wide.

2. Solder lap seams shall finish not less than one inch wide.

3. Unsoldered plain lap seams shall not lap less than 3 inches.

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4. All seams shall be made in the direction of the flow.

11-04. METAL FLASHINGS: Metal cap flashings shall be installed at all intersections of roofs with vertical surfaces, except at plumbing vents, over all base flashings and elsewhere as indicated on the drawings or required to provide watertight protection. Exposed edges of all flashings shall be folded back 1/2 inch to provide stiffness. Metal cap flashings shall turn down over base flashings not less than 4 inches. The upper edge of cap flashing inserted in concrete having open-type reglets shall be secured with coiled-copper strips or lead plugs spaced approximately 12 inches on centers. The cap flashing shall be formed to provide spring action against the base flashing. Reglets shall be pointed with plastic cement.

11-05. LOUVERS: Metal louvers shall conform to the size and design indicated on the drawings. Blades shall be accurately fitted, firmly secured, and soldered or riveted to the frames. Louvers shall be constructed of aluminum where possible, and if constructed of ferrous metal shall be suitable processed to resist corrosion. Insect screens shall be provided on inside face of louvers where shown or directed; screening to be plastic mesh as specified in the "Carpentry and Related Work" section. Sight proof door louvers where called for shall have chevron, inverted "V" type blades. Dark room door louvers where indicated shall have "N" shaped blades finished with a special non-reflective type black lacquer.

11-06. MISCELLANEOUS SHEET METAL WORK: Sheet metal items not covered elsewhere in this section shall be as indicated on the drawings and as required to provide a watertight installation. Formed sheet metal for metal-covered work shall accurately reproduce the details and design shown, and profiles, bends, and intersections shall be sharp, even, and true. Joints shall be locked, or lapped, and soldered, as applicable. Reinforcement shall be provided as required.

11-07. REGLETS: Reglets for flashing to concrete shall be provided and shall be set in the forms where and as shown on the drawings, or required to provide watertight connections. Reglets shall be a manufactured product constructed of sheet aluminum of approved design and shall be complete with all fittings and special shapes as may be required so as to be watertight. Reglets of all types

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shall have edges bent to an angle of at least 45 degrees, of sufficient width to provide firm and secure anchorage into the wall construction. Open-type reglets shall be fitted into fiberboard or other suitable separators to prevent crushing or filling of the slot during placing of concrete. Reglets shall be secured in the concrete forms with aluminum nails spaced not over 12 inches on centers. Metal flashing shall be secured in open-type reglets by means of lead plugs spaced not over 12 inches on centers, with the groove filled with calking compound and calked smooth after application. Friction or slot-type reglets shall have metal flashings inserted the full depth of slot and be lightly punched every 12 inches to crimp the reglet and metal flashing together.

SECTION 12FENCING AND GATES

12-01. SCOPE OF WORK: The work covered by this section of the specifications includes the furnishing of all labor, materials, equipment and tools necessary for the complete installation of all fencing and gates as indicated on the drawings or required for the work.

12-02. WORK NOT INCLUDED: The following items of work shall be as elsewhere called for in the specifications.

a. Concrete footings and floor slabs for fencing and gates shall conform to the "Concrete and Form Work" section of these specifications.

12-03. MATERIALS:

a. General Requirements: Contractor shall furnish and erect fencing and gates as indicated by design on the drawings, and shall comply with Federal Specifications Nos. RR-F-183, RR-F-191 (as amended) and RR-F-221 unless as otherwise indicated or herein specified.

1. Chain link fabric shall be No. 9 gage, 2 in mesh zinc coated chain link with top and bottom selvages twisted and barbed. Weight of fabric shall be approximately 0.33 pounds per square foot.

2. Barbed wire shall be four (4) point regular type wire, zinc coated, consisting of three (3) strands (unless otherwise indicated on the drawings) of twelve (12) gage wire twisted with thirteen (13) gage barbs spaced six (6) inches apart and shall conform to Federal Specifications RR-F-221. The wire shall be stretched taut and secured to each post with No. 14 gage wire bands twisted.

3. Line posts shall be 2-3/8 inch O. D. zinc coated steel pipe, weighing 3.65 pounds per lineal foot spaced not to exceed ten (10) feet on centers.

4. Corner and end posts shall be three (3) inch O. D. zinc coated steel pipe weighing 5.79 pounds per lineal foot.

5. Pedestrian gate posts (for openings less than 8'-0") shall be as above specified for corner posts.

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6. Vehicle gate posts (for openings 8'-0" and longer) shall be four (4) inch O. D. zinc coated steel pipe weighing 9.1 pounds per lineal foot.

12-04. CONSTRUCTION AND ERECTION:

a. 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.

b. 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.

c. RAILS & 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.

d. GATES: The Contractor 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.

SECTION 13METAL BUILDINGS

13-01. SCOPE OF WORK: The work covered by this section of the specifications includes the furnishing of all labor, materials, equipment and tools necessary for the complete installation of all metal buildings shown on the drawings. Metal buildings as stipulated in this section shall consist of all-aluminum buildings and steel-framed buildings with aluminum roofing and siding.

13-02. WORK NOT INCLUDED: The following items of work shall be as elsewhere called for in the specifications.

a. Concrete foundations and floor slabs for metal buildings shall conform to the "Concrete and Form Work" section of these specifications.

b. Interior partitions, doors and similar items not standard with the metal building manufacturers, are covered in the sections of these specifications pertinent to such items.

c. Wood framed buildings with aluminum roofing and siding are included in the "Carpentry and Related Work" section.

13-03. ALL-ALUMINUM BUILDINGS:

a. General Requirements: Contractor shall furnish and erect aluminum buildings to the sizes and designs and in the locations shown on the drawings. At the direction of the Engineer, accessory structures (those adjacent to and whose function is closely related to a primary structure) may be relocated about the primary structure so as to meet field conditions. The various building parts shall be completely pre-fabricated and shall be standard products as manufactured by the Pacific Iron and Steel Company of Los Angeles, or approved equal.

b. Drawings: The Contractor shall check and approve building manufacturer's shop drawings as provided in paragraph IV-1a. of Part I, General Conditions. Manufacturer's approved drawings shall include erection diagrams showing methods of assembly and procedure in erecting the buildings, as well as details of parts and assemblies. The contract drawings accompanying these

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specifications show the nominal dimensions, arrangements and additional details, as well as modifications to and adaptations of manufacturer's parts or assemblies required by the work.

c. Materials shall be as below specified except where otherwise called for on the drawings.

1. Extruded structural members shall be as detailed on manufacturer's approved drawings and shall be 63S-T5 aluminum alloy.

2. Bent plate members shall be as detailed, and formed of 4S3/4 H aluminum alloy of the following thicknesses:

End columns	.051
Side columns	.051
Rafters	.040
Knee braces	.091
Ridge rafters	.051
Wall corrugation	.032
Roof corrugation	.025
Corner sheet	.032
Gable sheet	.032
Gable cap	.091

3. Rough hardware, except sill anchors, and including bolts, nuts, screws, nails, splice plates, etc. shall be of aluminum alloys as called for on detailed drawings, and shall be of sizes shown. Bolt heads and nuts shall be provided with fiber or synthetic rubber washers.

4. Sill anchors shall be explosive driven steel studs, or steel anchor bolts and shall be treated for corrosion resistance. Explosive driven studs and guns therefor shall be "Drive-It" as manufactured by the Powder-Power Tool Corporation or approved equal. Size and type of studs and weight of explosive charges shall be as recommended by the manufacturer. Studs shall have a minimum penetration into concrete of 1-3/4 inches.

5. Wooden walers, uprights, and rails for double roofed buildings and blocking or other wood members used in erecting metal buildings shall be as specified in the "Carpentry and Related Work" section.

6. Finish hardware for aluminum swinging and

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sliding doors, (except padlocks) and window shutters shall be metal building manufacturer's standard hardware of approved types. Padlocks, special hardware, and hardware for items not furnished by the building manufacturer, shall be as specified in the "Carpentry and Related Work" section of these specifications. Cylinder locks and padlocks shall be keyed as specified in that section.

7. Flashings for roofs and openings shall be building manufacturer's standard as detailed on manufacturer's shop drawings. Special flashings required by building modifications shall be as specified in the "Roofing and Sheet Metal" section.

8. Rubber Plugs required for closing openings between corrugated sheets and flat surfaces shall be of synthetic sponge rubber of an approved type as furnished by the building manufacturer, shall be shaped to fit the openings, and shall, where required, be cemented in place with waterproof cement.

d. Nominal Dimensions: Buildings shall have a nominal width of 24 feet, an eave height of 8 feet, a ridge height to lower roof of 12 feet, and a length in modules of 4 feet.

e. Framing: Building shall be rigidly framed, with bolted connections. Rigid bents consisting of wall columns, knee braces and rafters shall be assembled as a unit and erected on 4 foot centers and bolted to the longitudinal members consisting of sill angle, girts, eave struts and purlins. Columns, knee braces and rafters shall be bent plates; sill angles, girts, eave struts and purlins shall be extrusions. Roofing and siding shall be corrugated sheet bolted to the framing. Bolt holes for structural members shall be dimpled, with bolts and nuts provided with gaskets. Roofs shall be, in general, double roofs, the upper roofing sheets to be attached to Redwood walers bearing on the lower roof rafters. Walers shall be attached to lower roof rafters by clip angles with upper roofing attached to walers by spiral shank nails. A curved vent cap approximately 5 feet in width shall run longitudinally the full length of the ridge and shall consist of roofing sheets supported on Redwood rails and uprights at a distance of 6 inches above the second roof. End wall panels shall consist of columns, eave struts, corrugated gable sections and filler panels. Eave struts for end walls shall be braced horizontally at

I third points by diagonal extruded struts extending to third rafter from end. Sill angles shall be anchored to the concrete floor slab by explosive driven coated steel studs or anchor bolts; as shown or directed.

f. Erection:

1. Workmanship: All work shall be rigidly and accurately erected to true line, level, plumb, plane and square in accordance with building manufacturer's directions. Rigid bents shall be assembled as completely as practicable in a horizontal position before being raised into position.

2. Blocks and tackle shall be used as require to pull framed structure into square for installation of roofing sheets. Blocks and tackle shall be strung diagonally across structure approximately every third or fourth frame, with ends secured by passing completely around knees. Tackle ends shall not be secured to knee straps.

3. Sheeting: Drift pins may be employed, but not to the extent that elongated holes result from their use. All holes through sheeting shall be completely covered by washers. Contractor shall provide catwalks or planking when installing roofing sheets to avoid walking upon roof surfaces.

g. Doors: Doors as furnished by the building manufacturer shall be of sliding or swing type, and shall consist of extruded frames with corrugated panels riveted to frames. Swing doors shall have aluminum hinges and aluminum cam type latch or cylinder locks. Sliding door operating hardware shall be of aluminum with lintle type trolley tracks, intermediate rub rail and roller guides at the sill. Sliding doors shall be secured by padlocks. Swing and sliding door frames shall consist of extruded sections at jambs only. 2" x 4" blocking of suitable length shall be placed at the top and bottom of door openings between door posts to insure proper clearance before bolting posts to eave strut foundation angles.

h. Vented Openings: Manufacturer's standard vented openings shall be of the shutter type unglazed. Upper and lower shutters approximately 38 inches by 40 inches shall be provided in each 4 foot bay where vented openings are required by design use. Shutter panels shall be outswinging, hinged at the top and supported each side by collapsible shutter arms. Shutters shall shade or close

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openings as desired and shall be secured in closed position by loose pin fastening. When installing hinge clevises care shall be taken to see that clevis and bolts 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. Where called for, openings shall be provided with frames covered with plastic mesh screening or plastic glass, as specified in "Carpentry and Related Work" section.

i. Interior Partitions: Interior partitions as furnished by the building manufacturer shall be 6 feet 9 inches in height and shall consist of corrugated panels set in extruded posts and rails. Full height posts, at intervals shown shall be connected to roof purlins. Partitions shall normally be open for lower 15 inches; where required, special filler panels shall be provided to close to floor. Partition posts shall be secured to floor slab by shot bolts through aluminum foot castings. Partitions, partition caps, full height posts, etc. shall be saw-cut to size in the field where required. Wooden partition panels, where called for on the drawings or directed by the Engineer, shall conform to the provisions of the "Carpentry and Related Work" section.

j. Fixture Supports: Supports for mechanical and electrical fixtures shall consist of aluminum plates bolted or clipped to the building construction and shall be installed where shown or required. Cooperate with mechanical and electrical tradesmen to install support plates in proper locations for the work. Supports where wooden partition panels are used shall be in accordance with the provisions of the "Carpentry and Related Work" section.

k. Weatherproofing: Openings between roof construction and eave struts shall be filled with shaped sponge rubber plugs. Where required for air conditioning purposes similar plugs shall be installed in wall construction.

l. Special Details: Building manufacturer shall furnish special connecting and gutter sections for "L" and "T" shaped building design and for parallel connections in accordance with details shown on the drawings. Manufacturer's standard weather hoods for pedestrian doors and canopies built up of manufacturer's standard sections shall be

I installed in locations and to details shown. The covered passage connecting Buildings Nos. 208 and 209 on Location "B" shall likewise be of standard sections, and as detailed.

m. Loading: The buildings shall be designed to withstand a wind pressure of 25 pounds per square foot on their projected areas, or a live load only of 25 pounds per square foot on the roof.

13-04. BUILDING NO. 330 ON LOCATION "B":

a. General: Building No. 330 on Location "B" shall be a steel framed building with corrugated aluminum roofing and siding similar and equal to that manufactured by the Butler Manufacturing Company. All parts shall be fully prefabricated, including special ridge and eaves sections shown or required. Building manufacturer shall submit for Engineer's approval shop drawings, including erection drawing. All applicable provisions contained under heading 13-03 preceding shall here apply. Interior wood partitions and doors therein are specified in the "Carpentry and Related Work" section.

b. Description: Building shall have a rigid steel frame, bent type with tie-rod-bracing, shall be nominally 40 feet wide, 80 feet 8 inches long with 14 foot eaves; and shall comprise 2 - 20 foot end bays and 2 - 20 foot intermediate bays. Building shall have a 10 foot wide steel framed canopy the full length of the west side with closed ends, and a 10 foot wide 60 feet 6 inch long open canopy along the east side. Slide and swing exterior doors shall be located as shown.

c. Steel Framing members shall include 10 inch I-beam columns, 8 inch I-beam rafters, 5 inch channel purlins, 4 inch channel girts, 1/2 inch sag rods and 5/8 inch brace rods. Bents shall have two bolted connections, other bent connections shall be shop welded. Assembly and erection shall conform to approved manufacturer's drawings.

d. Roofing and Siding shall be .026 guage corrugated aluminum as noted, and shall be secured to frame with aluminum bolts through synthetic rubber gaskets. No straw nails will be permitted.

e. Doors:

1. Sliding doors shall consist of corrugat-

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ed aluminum facing bolted to a steel frame. Sliding door hardware shall be manufacturer's standard, Richard-Wilcox or equal.

2. Swing doors shall be manufacturer's standard tubular steel doors and shall be furnished complete with hardware, including cylinder locks and astragals. Upper door panels shall be glazed with wire glass.

f. Hardware:

1. Rough hardware, including all bolts, nuts, metal washers and miscellaneous shall be either (1) hot dipped zinc coated, (2) zinc dichromate plated or (3) aluminum. Building manufacturer shall furnish anchor bolt setting drawing.

2. Finish hardware for building and manufacturer's items shall be as hereinbefore described and for wood doors and other items not furnished by building manufacturer shall be as specified in the "Carpentry and Related Work" section.

g. Painting: All structural steel shall be shop prime painted with one coat of a red lead paint standard with the building manufacture. After erection abraded surfaces shall be touch up with a similar prime paint. Finish painting shall be as specified in the "Painting" section.

h. Weatherproofing: After installation of equipment, the sliding doors at the north and south ends of the building shall be permanently secured and weatherproofed. Voids at perimeter of openings shall be filled with wooden blocking or filled in other approved manner in preparation for application of vapor-seal coating (Refer to "Painting" section). Refer also to "Carpentry and Related Work" for further weatherproofing provisions.

13-05. EQUIPMENT: The following is a partial list of equipment required for the erection of metal buildings. Contractor shall furnish all equipment and tools required for the work.

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 tackle, 1/2" line.

13-06. PROTECTION: Where aluminum overlaps dissimilar metal or masonry, apply one coat of aluminum pigmented asphalt paint to overlapped portion.

13-07. STORING MATERIALS: Contractor shall maintain all materials in dry storage until used. Aluminum sheets shall be stored edgewise or endwise off the ground.

SECTION 14TIMBER PIERS AND APPROACHES

14-01. GENERAL REQUIREMENTS: Timber piers and approaches will 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.

14-02. MATERIAL: The material for timber piers and approaches shall include the following; creosoted structural timber, creosoted piles, Port Orford cedar decking, timber guard rails, fender logs and galvanized hardware.

14-03. KINDS AND GRADES: The various kinds and grades of timber, piling and hardware used in the structures shall be as indicated on the plans or as herein specified, or as directed by the Engineer.

a. Piling shall be Douglas Fir as per Federal Specifications MM-P-371 grade A with any revisions and supplements thereto. Creosoting to comply with Federal Specifications TT-W-571b with 16# treatment using coal tar creosote Federal Specification TT-W-556 (AWPA) Specification 4.

b. Caps, Stringers and Bracing timber shall be given 8# creosoting treatment as per Federal Specifications TT-M-566 (A.W.P.A.) Specification 4. Timbers shall be graded in accordance with W. C. L. A. rules of the sizes and dimensions shown on the plans. Caps shall #1 Common Rough Douglass Fir. Stringers shall be S1E Douglas Fir. Braces shall be #1 Common Rough Douglas Fir.

c. Decking on Docks shall be Port Orford Cedar #2 Common or better, S1S to uniform thickness of 4", stock of random widths 6" to 12" and random lengths 8' to 20', mostly 20' lengths.

d. Guard Rails shall be Douglas Fir #1 Common or better 6" x 8" random lengths 16' or longer.

e. All zinc-coated hardware, including bolts, drift pins, spikes, nails, pipe sleeves, chains and plates shall be zinc-coated in accordance with A. S. T. M. Specification A-123-33.

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f. Washers shall be flat steel, or malleable iron O. G. type washers according to designations on the plans.

14-04. 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.

14-05. 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.

14-06. CONSTRUCTION:

a. 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.

b. 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.

c. Bolt Heads and Nuts shall be countersunk where smooth surfaces are required and at such other places as are shown on the plans.

d. 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.

e. 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.

f. 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.

14-07. DECKING: Decking shall be Port Orford cedar laid

I diagonally at thirty degrees ( $30^{\circ}$ ) to a line normal to the longitudinal axis of the stringers, and nailing shall be as indicated on the drawings.

14-08. 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.

a. A Minimum Penetration of ten feet in the ground shall be obtained for bearing piles when a greater penetration is not required to obtain a safe bearing value.

b. 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.

c. 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.

14-09. 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 (2) heavy coats of Creosote oil, allowing time for penetration between coats.

a. 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 sleeve; then each end of the two (2) inch pipe is to be swaged to hold sleeve in place.

b. 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.

SECTION 15ELECTRICAL GENERATION AND DISTRIBUTIONGENERAL CONDITIONS:

15-01. See Section 1 of these specifications for General Requirements, Definition of Terms, Authority of Engineer, Changes, Work to be Performed by the Government, Work to be Performed by the Contractor, 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 for Overhead Line Construction, General Order No. 95 of the California Utilities Commission.

15-04. The Engineer shall prepare "as built" drawings showing electrical facilities as installed. The Contractor shall cooperate with the Engineer to the end that all required and approved changes shall be indicated on the drawings.

15-05. The work to be done under this Section of these specifications shall include the furnishing of all materials, 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. 2400 volt power plants at Sites "B", "C", "D", "E" and "L".

b. 120/208 volt power plants at Sites "N", "P", and "Q".

c. Overhead and Underground Distribution Systems at Sites "B", "C", "D", "E", "L", "M", "N", "P", "Q", "R", "S" and "T".

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POWER PLANTS:

15-06. 2400 volt Diesel Engine Generator Units for Sites "B", "C", "D", "E", and "L" shall be Fairbanks-Morse Model 31A6-1/4, or equal, shall be complete with control cubicles and all auxilliary equipment as shown on the plans and shall comply with the requirements of "OUTLINE SPECIFICATIONS FOR DIESEL ENGINE GENERATOR UNITS, JOB 640". and Addendum #1.

15-07. Power Plant "4B" shall have six 210 horsepower, 178 KVA, 142 KW units.

15-08. Power Plant "4C" shall have three 175 horsepower, 147 KVA, 118 KW units.

15-09. Power Plants "4D" and "4E" shall each have two 175 horsepower, 147 KVA, 118 KW units and one 280 horsepower, 244 KVA, 195 KW unit.

15-10. Power Plant "4L" shall have one 175 horsepower, 147 KVA, 118 KW unit. This plant shall also be provided with one 112 horsepower, 93.8 KVA, 75 KW, 220 volt, skid mounted, self-regulating emergency standby unit powered by a Caterpillar engine Model E-1300 Diesel, or equal.

15-11. Power Plants "4N", "4P", and "4Q" shall each have two 50 KW 120/208 volt, 3 phase, 4 wire Diesel driven portable generator units, Palmer Electric Manufacturing Company or equal. A speed regulation of 4% between no load and full load is required. A voltage regulator shall be installed in the control panel to guarantee a maximum of plus or minus 3 percent voltage regulation. The following shall be provided on the control panel of each unit:

1. A. C. Voltmeter
2. A. C. Ammeter with phase selector switch
3. Frequency meter
4. Main Circuit Breaker

All material shall be suitable for installation in a tropical climate.

15-12. The following equipment and wiring shall also be

I installed in power plants in accordance with the plans:

a. Primary Distribution switchgear for Plant "4B" shall consist of three oil circuit breaker feeder cubicles and a ground detector in accordance with Specification HN-6B-303, and primary wiring shall be provided as shown.

b. Primary Feeders originating in Plants "4C", "4D", "4E", and "4L" shall be provided with fused protection.

c. Station service transformer banks for plants "4B", "4C", "4E", and "4L".

d. Secondary Feeders in all plants.

e. Secondary switchboards, panelboards, and all branch circuit wiring to motors, heaters, all miscellaneous power equipment, lights, and receptacles. The secondary switchboard for plant "4B" shall be in accordance with Specification No. HN-6B-303.

f. Control wiring.

15-13. See applicable portion of Section 16 of these specifications for interior wiring.

15-14. The trades foremen and other supervisory personnel which the Government, through its representative, the Engineer, furnishes, shall be experienced in constructing similar plants with similar equipment.

#### OVERHEAD AND UNDERGROUND DISTRIBUTION SYSTEMS:

15-15. The primary system to be used will be three wire, 2300 volts, 60 cycles.

15-16. The secondary systems to be used will be one of the following; as indicated on the plans:

- a. Four wire, three phase, 210/208 volt wye, 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.

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POLES:

15-17. All poles must be roofed.

15-18. Set poles "back to back" or "gain to gain" on straight lines. On curves, gains face apex of the angle.

15-19. Poles shall be set to the following depths unless otherwise approved by the Engineer.

<u>Length of pole in feet</u>	<u>Setting depth in soil</u>	<u>Setting depth in rock</u>
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

15-20. Cut gains for arms as required 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.

15-21. Where more than one gain is required, the gains shall be parallel and all holes shall be squared with the axis of the pole.

15-22. When the pole has sweep or curvatures, the gains shall be made on the concave side.

15-23. Keep all poles free from posters, banners, nails, radio antennas, signs, or other devices that might interfere with safe climbing of the pole.

15-24. All operating poles, such as transformer poles and cable poles shall be stepped from a point ten (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.

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15-25. Poles which have to be stored for more than two (2) 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:

15-26. For overhead distribution, unless otherwise approved, bare copper conductors shall be used for primary service, copper conductors with weatherproof covering shall be used for secondary service.

15-27. Taps shall be made with solderless connectors.

15-28. When facing the direction the power is coming from the primary conductors from right to left will be Phase A, Phase B and Phase C.

15-29. 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".

15-30. The following sag tables are intended as a 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.	Sag in Inches			
		Span in Feet 125	Span in Feet 150	Span in Feet 175	Span in Feet 200
4	90	13	18	24	28
	60	9	13	18	18
0	90	13	18	24	23.5
	60	9	13	18	18
0	90	13	18	24	23.5
	60	9	13	18	18

15-31. For required clearance and minimum separation of conductors, see regulations referred to in paragraph 15-03.

15-32. UNDERGROUND PRIMARY CABLE shall be suitable for direct burial in wet or dry coral aggregate. Cable shall be installed in conduit at entry to buildings or structures or other points indicated on the drawings.

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a. Conductors of primary cables shall be in accord with the following specifications:

1. IPCEA General Specifications, Part 4 for Class C stranding of power cables.

2. Conductors shall be tin, lead or lead alloy coated.

3. Insulation shall be for 5,000 volts in accord with the following specifications (Ozone and heat resisting compound 75 degrees C.).

(a) ASTM Specifications D574-46T.

(b) IPCEA General Specifications on rubber cables, Appendix "D".

(c) Insulation thickness shall be in accord with IPCEA General Specifications, table II, Part 5 for 5000 volt ungrounded cables.

(d) Physical properties, 5000 volt cables.

(1) Tensile strength min. 500 p.s.i.

(2) Tensile strength after 168 hour oven test at 100°C - 400 p.s.i.

(3) Elongation at rupture after 168 hour oven test at 100°C - 250%.

(4) Tensile strength after 168 hour oxygen pressure test at 80°C - 400 p.s.i. min.

(5) Elongation at rupture after 168 hour oxygen pressure test at 80°C - 250% min.

(6) Ozone resistance - .030% concentration 4 hours.

(7) Insulation resistance K valve min. 15,840 ohms.

(8) Power factor - max. % 4.0

(9) Copper operating temp. 80°C.

(e) Jacket shall be in accordance with the following specifications (Palychloroprene).

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(1) ASTM D752-44T except original tensile strength to be 2,500 p.s.i.

(2) ASTM Specifications D624-44 Tear Test to be 50 p.s.i. thickness per IPCEA General Specifications, Part 7, Table XIV for Direct Burial Cables.

15-33. UNDERGROUND SECONDARY CABLE shall be suitable for direct burial in wet or dry coral aggregate. Cable shall be installed in conduit at entry to buildings or structures or other points indicated on the drawings.

a. At point where cable enters conduit suitably pack space around cable to prevent entrance of moisture into conduit.

b. Cable shall be non-metallic armored type in accord with IPCEA Specification for Rubber Insulated Parkway Cables for 600 volt insulation.

15-34. UNDERGROUND CONDUIT shall be painted with an asphalt base paint before laying.

15-35. Where direct burial of primary cable in a trench is indicated, cable shall be laid on 6 inches of fine smooth sand and covered by 3 inches of fine smooth sand. It shall be covered with a 2 inch fully treated plank.

15-36. Minimum cover for underground primary cable shall be three feet zero inches unless otherwise approved. Minimum cover for underground secondary cable shall be two (2) feet zero inches unless otherwise approved. Trench depths shall be increased as required at cross-overs with coaxial cable to provide a minimum separation of one foot zero inches between underground primary and for secondary cables and coaxial cables. In addition to this separation, primary cables must be enclosed in a grounded conduit at least ten (10) feet long at points of crossover with coaxial cables. Trenching, backfill, etc., shall conform to applicable provisions of "Earthwork for Utilities" section of these specifications.

15-37. UNDERGROUND PRIMARY AND SECONDARY CABLE shall be adequately identified by signs warning of the presence of underground power lines.

15-38. TRANSFORMERS: All transformers shall be single phase, 60 cycles, primary 2400 volts with four 2-1/2% taps below rated voltage, secondary 240/120 volts. Indoor

I station service transformers shall be dry type, equal to Westinghouse Type AVR. Outdoor distribution transformers shall be oil immersed, self-cooled, equal to Line Material Type "RW".

15-39. TRANSFORMERS: Before installing transformers, check oil for moisture, core for loose connections and excess heating, and insulators for tightness.

15-40. 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".

15-41. Unless otherwise indicated on the plans, primary fuse size for single phase transformers shall be as follows

<u>Transformer Size in KVA</u>	<u>Fuse Size in Amperes</u>
3	5
5	5
7.5	5
10	10
15	15
25	25
37.5	25
50	40
75	50
100	75
150	100

SAFETY:

15-42. 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.

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15-43. REFERENCES: Any of the following publications which are available can be used for further reference on this subject.

- a. American Electrician's Handbook, by Terrel Croft, published by McGraw Hill.
- b. Safety Rules for the Installation and Maintenance of Electric Communication Lines, Handbook No. 32, from Superintendent of Documents, Government Printing Office, Washington, D. C.
- c. War Department Technical Manual T M 5-6800, Overhead Distribution Systems, Repairs and Utilities, Electrical Facilities.

SECTION 16

INTERIOR WIRING FOR LIGHT AND POWER

GENERAL CONDITIONS:

16-01. REFERENCES: The following paragraphs of Section 15 of these specifications shall apply to this section: 15-01, 15-02, and 15-04.

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 section of these specifications shall include the furnishing of all materials, 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. Wiring for light and power in buildings.
- b. Wiring for light and power in and on stations.

16-04. ELECTRICAL CHARACTERISTICS of equipment shall be checked in the field. If necessary, make connections and reschedule panel wiring to suit in field. Rerouting of cable or conduit runs to suit conditions in the field will be permissible.

16-05. APPLICABLE SPECIFICATIONS: The following specifications and standards form a part of this specification:

a. Federal Specifications:

J-C-103	Cable and Wire; Rubber-Insulated, Building-Type (0 to 5,000-volt service)
W-B-616	Boxes and Outlet-Fittings, Floor (for) Rigid-Steel-Conduit and Electric-Metallic-Tubing (Steel)
W-F-406	Fittings; Cable and Conduit.
W-L-131	Lamp Auxiliaries; Fluorescent.
W-O-806	Outlet-Bodies; Iron (Cast or Malleable) Cadmium- or Zinc-Coated, with Covers and Accessories (For Shore Use).

W-O-821a Outlet-Boxes; Steel, Cadmium-  
or Zinc-Coated, with Covers  
and Accessories.

W-P-131a Panelboards; Equipped With Auto-  
matic Circuit-Breakers

W-R-36 Raceways and Fittings; Metallic,  
Underfloor

W-R-151a Receptacles (Convenience-Outlets),  
Adapters, Attachment-Plug-Caps,  
Cord-Connector-Bodies, Current-  
Taps, Motor-Base-Plugs, and Plug-  
Bodies; 250-volts

W-S-893 Switches; Snap, Multiple-Type and  
Combination Devices, Flush-Type  
With Wall Plates

W-S-896 Switches; Snap, Single-Unit, Inter-  
changeable Flush-Type With Wall  
Plates

HH-T-101a Tape; Friction

HH-T-111c Tape; Rubber (Natural and Synthetic)  
Insulating

WW-C-581a Conduit; Steel, Rigid, Zinc-Coated

b. Underwriters' Laboratories, Inc.:

Standard for Cabinets and Boxes

Standard for Industrial Control Equipment

Standard for Thermoplastic-Insulated Wires

Standard for Rubber-Covered Wires and Cables

c. National Board of Fire Underwriters:

National Electrical Code, Standard for Electric  
Wiring and Apparatus

d. National Electrical Manufacturers Association:

Industrial Control Standards

## Power Switchgear Assemblies Standards

## Transformer Standards

- 16-06. TO PREVENT LEAKAGE in the roof structure of aluminum buildings, penetration of roofing panels for cable or conduit support bolts is not permissible.
- 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.
- 16-10. LAMPS: All lamps will be furnished and installed by this Contractor.
- 16-11. SYSTEMS: Interior light and power system characteristics shall be as specified under Section 15-16 of these specifications.
- 16-12. ORDINANCES AND REGULATIONS: All apparatus and material installed under this specification shall be designed to comply with and shall be installed in accordance with all of the legally constituted authorities having jurisdiction, including all rules and regulations of the National Board of Fire Underwriters.
- 16-13. STANDARD PRODUCTS: Unless otherwise indicated in writing by the Engineer, the materials to be furnished under this specification shall be the standard products of the manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design.
- 16-14. MATERIALS AND EQUIPMENT SCHEDULES: As soon as practicable and within thirty (30) days after the date of award of Contract and before any material or equipment is purchased, the Contractor shall submit to the Engineer for approval a complete list, in triplicate, of materials, fixtures, and equipment to be incorporated in the work. The list shall include catalog numbers, cuts, diagrams, drawings

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and such other descriptive data as may be required by the Engineer. No consideration will be given to partial lists submitted from time to time. Approval of materials will be based on manufacturers' published ratings. Any materials, fixtures, and equipment listed which are not in accordance with the specifications requirements may be rejected.

16-15. MATERIAL SCHEDULES - OPTIONS OF THE GOVERNMENT: If the Contractor fails to submit for approval within the specified time, a list of materials, fixtures, and equipment in accordance with the preceding paragraph, the Engineer will select a complete line of materials, fixtures, and equipment. The selection thus made by the Engineer shall be final and binding, and the items shall be furnished by the Contractor without change in contract price or time of completion.

16-16. APPROVALS AND DRAWINGS: Each manufacturer providing unit substations, transformers, panelboards, switchboards, intercommunication equipment, and other electrical equipment for approval shall submit drawings showing the equipment in its final form to the Engineer for approval. All such equipment thereafter delivered shall be in accord with print of drawings as approved by the Engineer. The number of prints required shall be as designated in the General Conditions of this specification.

16-17. GUARANTEES: All material furnished and installed under this contract shall be new and free from all defects, and shall be guaranteed for a period of one (1) year from date of acceptance of the work. Should any trouble develop during this period, due to defective material or faulty workmanship, this Contractor shall furnish all necessary material and labor to correct the trouble without any cost to the Government. Any defective material or inferior workmanship noticed at the time of installation shall be corrected immediately to the entire satisfaction of the Engineer.

16-18. PRELIMINARY OPERATIONS: Should the Government desire and demand that any portion of the system or equipment be operated previously to the final completion and acceptance of the work, this Contractor shall consent and such operation shall be under the supervision and direction of the Engineer. Any additional cost incurred by the demand for preliminary operation of any part of the system or equipment shall be submitted to the Engineer for approval. If the additional cost, if any, is warranted, this Contractor shall be paid by the Government as separate and distinct from any

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money paid on account of the contract. Such preliminary operation or the payment therefor, shall not be construed as an acceptance of any work of this contract.

16-19. TESTS: After the interior-wiring system installation is completed, and at such time as the Engineer may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. Before any oil-filled transformer is energized an oil-flash test shall be performed. All 15 kv. cable shall be subjected to a "high-pot" or kynatron test. The test shall be performed in the presence of the Engineer or his authorized representative. The Contractor shall furnish all instruments and personnel required for the tests, and the Government will furnish the necessary electric power.

16-20. LOCATIONS: The locations as indicated on the drawings show the arrangements desired for the principal apparatus, fixtures, etc., and shall be followed as closely as possible. Proper judgment must be exercised in carrying on the work to secure the best possible head room and space conditions throughout, to secure a neat arrangement of the electrical systems and to overcome local difficulties and interferences of structural conditions wherever encountered.

16-21. GROUNDING: The conduit systems neutral conductor of wiring systems, lead cable sheaths, motor frames, switchgear and all metal enclosed equipment shall be securely grounded in accord with the Code.

16-22. WIRING: Branch circuit conductors shall not be smaller than No. 12 A.W.G. except that conductors for signal and pilot control circuits may be No. 14, A.W.G., unless otherwise specified on the drawings. Conductors shall be continuous from outlet to outlet, and no splices shall be made except within outlet or junction boxes. Junction boxes may be utilized where required. Soldered joints insulated with tape shall be used unless otherwise approved. Rubber friction tape shall conform to the requirements of Federal Specifications HHT-111c and HH-T-101a, respectively. Vinyl plastic tape will be acceptable in lieu of rubber and friction tape.

a. Conduit System: Conduit systems shall be installed in accordance with the applicable provisions of the National Electrical Code and shall have all of the characteristics specified in the standards of the Rigid Steel Conduit Industry. Rigid steel conduit shall be zinc-coated and shall conform to the requirements of Federal Specification

WW-C-581a. Conduit fittings shall conform to the requirements of Federal Specification W-F-406. All conduit shall be 1/2-inch trade size or larger.

1. Installation: Conduits shall be concealed within the walls, ceilings, and floors, where possible, unless conduit runs are shown exposed on the drawings. Exposed runs of conduit or tubing shall have supports spaced not more than 5 feet apart and shall be installed with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings, with right-angle turns consisting of cast-metal fittings or symmetrical bends. Bends and offsets shall be avoided where possible, but where necessary shall be made with an approved hickey or conduit-bending machine. The use of pipe tee or vise for bending conduit or tubing will not be permitted. Conduit or tubing which has been crushed or deformed in any way shall not be installed. Expansion fittings or other approved devices shall be used to provide for expansion and contraction where conduit or tubing crosses expansion joints. Wooden plugs inserted in masonry or concrete shall not be used as a base to secure conduit supports. Conduit and tubing shall be supported on approved types of galvanized wall brackets, ceiling trapeze, strap hangers, or pipe straps, secured by means of toggle bolts on hollow masonry units, expansion bolts in concrete or brick, machine screws on metal surfaces, and wood screws on wood construction. Nails shall not be used as the means of fastening boxes or conduits. Conduit and tubing risers exposed in wire shafts shall be supported at each floor level by means of approved U-clamp hangers. Conduit and tubing shall be installed in such manner as to insure against trouble from the collection of trapped condensation, and all runs of conduit shall be arranged so as to be devoid of traps wherever possible. The Contractor shall exercise the necessary precautions to prevent the lodgment of dirt, plaster, or trash in conduit, tubing, fittings, and boxes during the course of installation. A run of conduit or tubing which has become clogged shall be entirely freed of these accumulations or shall be replaced. Conduit shall be securely fastened to all sheet-metal outlet, junction, and pull boxes with galvanized locknuts and one bushing installed in accordance with standard practice, care being observed to see that the full number of threads project through to permit bushing to be drawn tight against the end of conduit, after which the locknut shall be made up sufficiently tight to draw the bushing into firm electrical contact with the conduits unless otherwise specified.

(a) Running threads shall not be used.

I (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.

(b) 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.

(c) 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.

(d) Conduit shall be reamed after cutting.

(e) Rigid galvanized conduit coated with an asphaltic base paint shall be used for underground conduit runs where indicated on the plans.

(f) Where exposed overhead conduit is indicated on plans for buildings, aluminum conduit shall be used if available. If it is not available, galvanized conduit may be substituted.

(g) Where conduit is indicated on plans for stations, rigid galvanized conduit shall be used.

(h) 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.

(i) 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.

2. Conductors for Building Wiring: A complete system of copper conductors shall be installed in the raceway systems. Conductors smaller than No. 2 A.W.G. installed in ordinarily dry locations shall be rubber-insulated, type

I R or RU, or thermo-plastic-insulated, Type T. Conductors smaller than No. 2 A.W.G. installed in wet locations such as in underground raceways, in raceways installed in concrete or masonry floor slabs in direct contact with earth, or in raceways regularly subject to moisture or condensation shall be rubber-insulated and lead-covered, Type RL, or thermoplastic-insulated specifically designed for such applications, Type TW. Conductors No. 2 A.W.G. and larger shall be heat-resistant grade, rubber-insulated, Type RH, for use in dry locations, or lead-covered, Type RHL, for use in wet locations. Rubber-insulated conductors, Types R, RL, RH, RW, and RHL, shall conform to the requirements of Federal Specification J-C-103. Rubber-insulated conductors, Type RU, shall conform to the Underwriters' Laboratories, Inc., Standard for Rubber-Covered Wires and Cables. Thermoplastic-insulated conductors, Type T and TW, shall conform to the requirements of the Underwriters' Laboratories, Inc., Standard for Thermoplastic-Insulated Wires. Home runs may be combined in one conduit, provided all connections are in accordance with National Electrical Code requirements and the maximum unbalanced current in the neutral does not exceed the capacity of the conductor.

3. Where indicated on the plans non-metallic sheathed cable shall be installed for branch wiring.

(a) Installation of Non-Metallic Sheathed Cable: Cable shall be secured in place at intervals not exceeding 4-1/2 feet and within 12 inches from every outlet box or fitting.

(b) 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.

(c) 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.

(d) 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.

16-23. OUTLETS: Outlets shall be installed in the location shown on the drawings. The Contractor shall study the general building plan in relation to the spaces surrounding each outlet in order that his work may fit the other work require

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by these specifications. When necessary, the Contractor shall relocate outlets so that, when fixtures or other fittings are installed, they will be symmetrically located according to room layout and will not interfere with other work or equipment. Only zinc-coated or cadmium plated sheet-steel boxes conforming to the requirements of Federal Specification W-0-821a, of a class to satisfy the condition for each outlet, shall be used in concealed work. Boxes shall be installed in a rigid and satisfactory manner, either by wood screws on wood, expansion shields on masonry, or machine screws on steel work. Fixture outlet boxes on ceilings shall be not less than 4-inch octagonal. Fixture outlet boxes in concrete ceilings shall be of the 4-inch octagonal concrete type, set flush with the finished surface. Fixture outlet boxes on plastered ceilings shall be fitted with open covers set to come flush with the finished surface. Switch, telephone, and receptacle outlet boxes shall be not less than 4-inches square, fitted with appropriate plaster covers, where necessary, to set flush with the finished surface. One-piece gang boxes not less than 2 inches deep shall be utilized where necessary. Outlets in exposed work shall be of cast steel or alloy fitted with appropriate covers. Cast-metal fittings shall conform to the requirements of Federal Specification W-0-806.

a. Outlet Devices shall be type specified on the drawings and shall be standard vapor-proof, watertight or explosion-proof as noted.

16-24. PULL BOXES AND CABINETS: The following requirements shall apply for pull boxes and telephone and signal system cabinets:

a. Pull Boxes: Pull boxes shall be constructed of code-gage galvanized sheet metal, of not less than the minimum size recommended by the National Electrical Code. Boxes shall be furnished with screw-fastened covers. Where several feeders pass through a common pull box, they shall be tagged to indicate clearly their electrical characteristics circuit number, and panel designation.

b. Telephone and Signal System Cabinets: Each cabinet box shall be constructed with interior dimensions not less than those indicated on the drawings. Each trim shall be fitted with hinged door and flush catch. Doors shall provide maximum-size openings to the box interiors. Boxes shall be provided with a 5/8 inch weatherproof-grade-plywood backboard having a two-coat insulating varnish finish.

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16-25. WALL RECEPTACLES: Wall receptacles shall conform to the requirements of Federal Specification W-R-151a, type and style as specified. Heavy-duty receptacles shall be of the single type having capacity to carry the rated load continuously without damage and shall be furnished with a suitable cord-grip cap.

a. Duplex Convenience Receptacles: Duplex convenience receptacles shall be Type II, Style No. 102, rated 10 amperes at 250 volts and 15 amperes at 125 volts. Bases shall be constructed of brown phenolic composition. Terminals shall be mounted on the sides of the base with two screws per terminal. Not more than one conductor will be installed under one screw-head. Duplex convenience receptacles installed in damp or wet locations and where specified shall be Type II, Style No. 130, 3-pole type designed for grounding, rated 10 amperes at 250 volts and 15 amperes at 125 volts. Mounting straps shall have plaster ears.

b. Single Flush, 3-Pole, 3-Wire, 20-Ampere, 250-Volt Receptacles: Single Flush, 20-ampere, 250-volt receptacles shall be Type II, Style No. 153.

c. 3-Phase, 4-Pole, 4-Wire, 20-Ampere, 250-Volt Receptacles: Receptacles for 20-ampere, 250-volt, 3-phase service shall be Type II, Style No. 165.

1. Junction boxes shall be National Electric Products Corporation #7525-5S, or approved equal, equipped with #7565 standard tops.

2. Receptacle outlets shall be National Electric Products Corporation #7903-L or equal equipped with duplex receptacles.

3. Telephone outlets shall be National Electric Products Corporation #7904-L or equal.

16-26. WALL SWITCHES: Wall switches shall be of the totally enclosed tumbler type and shall conform to the requirements of Federal Specification W-S-896 or W-S-893. In addition to the spring actuating the switch, the operating mechanism shall include a positive mechanical means to initiate motion tending to close and/or open the circuit. Enclosures shall be phenolic composition. Not more than two switches shall be installed in a single gang position of a switch box. Single-pole three-way and four-way switches shall be of the tumbler type, rated 10 amperes at 125 volts. All switches shall be suitable for the control of tungsten-

filament lamp loads and shall carry the "T" marking of the Underwriters' Laboratories, Inc. Where switches with pilot lights are indicated on the drawings, the combinations shall consist of a switch, as specified above, with a yoke-mounted and candelabra-base socket rated at 75 watts, 125 volts, and fitted with a glass or plastic jewel. A clear 6-watt lamp shall be furnished and installed in each pilot switch. Jewels for use with switches controlling motors shall be colored green and for other purposes red. The capacity ratings of toggle switches for various circuit loads shall be as follows:

- a. For loads up to 800 watts - 10 amperes.
- b. For loads from 800 to 1500 watts - 20 amperes.

16-27. MOUNTING HEIGHT OF EQUIPMENT: No equipment or appliances of any nature shall be so installed that the top-most operating part shall be over 6 feet 6 inches above the floor or platform from which it is to be operated or worked upon, unless instructed otherwise by Engineer.

16-28. LIGHTING FIXTURES: This Contractor shall furnish and install all lighting fixtures as described on the drawings. All fluorescent fixtures shall be equipped with high power factor ballasts.

16-29. LIGHTING PANELS: This Contractor shall furnish, install and completely connect all lighting panels as shown on the drawings. Panels shall be flush mounted, front operated, single door safety type. All panelboard cabinets shall be constructed of standard code gauge steel and shall be formed as to prevent any buckling or weaving. A minimum of a 4-inch wiring gutter shall be provided at sides and ends with additional 2-inch gutter space for feeder conductors 2-1/2 inch or larger. Trim shall be formed in one piece of code gage steel, all edges and corners being cut true and smooth and securely fastened to the cabinet. Door shall be equipped with card (and with a typewritten card installed therein), snap catch, lock and two keys and shall have no appreciable crack around either sides or ends. Hinges shall be riveted to door and trim.

a. Lighting panelboards shall be Square D Company Type NAB-4 or NAB-4AB, Trumbull Electric Manufacturing Company Type NAB, or equal. This Contractor shall refer to the Single Line Diagram and the Panel Schedules on the drawings for sizes of main breakers, where required in panelboards, and the sizes of branch circuit breakers. All panelboards

shall bear the manufacturer's nameplate and the underwriters' inspection label.

16-30. POWER WIRING: This Contractor shall furnish and install all wiring and shall completely connect all motors on pumps, fans, compressors and similar equipment. All motors will be furnished and set by others. Motor starters will be furnished by others but shall be installed and completely connected by this Contractor. All line voltage wiring required for the control of motor driven equipment will be furnished and installed by this Contractor.

a. Power Switchboards: All power switchboards shall be equipped with circuit breaker units and shall be of dead front, unit type, formed steel construction. Individual cubicles shall be die-formed and equipped with standard closing plates. The finish shall be one coat of primer and two coats of grey synthetic enamel. Circuit breaker units shall be 3-pole, 600-volt, Square D Company, Type ML or WL, as required, or equal.

b. Power Panelboards: Power panelboards shall be equipped with circuit breaker units housed in code gauge galvanized steel boxes providing wiring gutters four (4) inches wide or larger, as required. The finish shall be one coat of primer and two coats of gray synthetic enamel. Circuit breaker units shall be 3-pole, 600-volt, Square D Company Type ML or WL, as required, or equal.

c. Separately mounted circuit breakers where shown on the drawings shall be 3-pole, 600-volt breakers in NEMA 1, Sheet steel enclosures, Square D Company Type ML or WL as required, or equal.

d. Motor-Disconnect Means: Each motor shall be provided with a disconnecting means when required by the National Electrical Code even though not indicated on the drawings. A circuit breaker or horsepower-rated switch in a panelboard will be acceptable as a disconnecting means, if located in the same room or within sight of the motor controller. A quick-make and quick-break general-use tumbler or snap switch will be acceptable for capacities less than 30 amperes, provided the ampere rating of the switch is at least double the rating of the controlled equipment. Switches of 30- to 400-ampere capacity shall be of the enclosed, quick-make and quick-break type, horsepower-rated. Switches shall disconnect all ungrounded conductors.

e. This Contractor shall refer to the single line

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diagrams and schedules on the drawings for the sizes of all circuit breaker units.

f. Every effort will be made to check stub-ups and power outlet locations with available equipment which is provided and installed.

16-31. MISCELLANEOUS WIRING: All miscellaneous equipment installation and wiring called for on the plans shall be provided.

16-32. REFERENCE PUBLICATIONS: Any of the following publications which are available can be used for further reference on this subject:

a. American Electrician's Handbook by Terrell Croft published by McGraw-Hill.

b. War Department Technical Manual TM-5-680B, Interior Electric Systems, Repairs and Utilities, Electrical Facilities.

16-33. SHIELDED ROOMS:

a. Furnish and install double shielding for areas indicated on the drawings including Building No. 116 at Location "A."

b. Zinc-coated steel mesh, 8 x 8 size, 0.0173 inch diameter steel, weighing not less than 23.5 pounds per 100 square feet shall be applied to floor, ceiling and all four walls, on both the inside and outside face of studs. Sixteen (16) ounce sheet copper shall be installed at door openings.

c. All joints between sections of mesh, between sections of mesh and copper, and between sections of copper shall be continuously and solidly soldered.

d. Details of connections to ground and at doors and windows shall be completed in accord with details on the drawings.

## SECTION 17

### COMMUNICATIONS SYSTEMS

#### GENERAL CONDITIONS:

17-01. The following paragraphs of Section 15 of these specifications shall apply to this section: 15-01, 15-02, 15-03 and 15-04.

17-02. The work to be done under this section of these specifications shall include the furnishing of all materials, 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. Telephone System on and between Sites B, C, D, E, L, M, N, P, Q, R, S, and T.
- b. Public Address System on Sites C, D, and E.
- c. Intercommunication System on Site B.

17-03. The work to be done under this section of these specifications shall also include the furnishing of all labor, equipment, and tools required to install radio transmitters and receivers.

#### TELEPHONE SWITCHBOARDS AND INSTRUMENTS:

17-04. All Telephone Switchboards and Instruments shall comply with the requirements of Specification No. HN-7H-304 and Addendum #1.

17-05. The Switchboard for Site "B" shall be a two-position Kellogg Masterbuilt Junior Switchboard, or equal wired and equipped for 220 common battery and 30 magneto lines. It shall be complete with power equipment, main distributing frame, and wire chief's testing equipment.

17-06. The Switchboards for Sites C, D, and E shall each be a single-position Kellogg Masterbuilt Junior Switchboard, or equal, wired and equipped for 45 common battery and 5 magneto lines. Each shall be complete with power equipment, main distributing frame and test set.

17-07. Wall Type Instruments shall be Kellogg #1100 BA Master-phones, or equal, moisture and fungus proofed.

17-08. Desk Type Instruments shall be Kellogg #1000 BA Masterphones or equal, moisture and fungus proofed.

17-09. Field Type Instruments shall be Signal Corps Type EE-8A, or equal.

17-10. This equipment shall be installed as shown on the plans.

SUBMARINE TELEPHONE CABLE:

17-11. The Submarine Telephone Cable shall comply with the requirements of Specifications No. HN-7H-302, as manufactured by Western Electric Company or equal.

17-12. It shall be installed as shown on the drawings.

17-13. A Cable Laying Barge shall be equipped with stern guide plate, cable brake units, winches and blocks for this laying operation.

17-14. Tests shall be performed and a record kept of the electrical characteristics of these cables.

SUBSCRIBERS LOOPS:

17-15. Subscribers Loops shall consist of overhead or underground cable or pairs as indicated on the drawings.

17-16. Overhead Telephone Cable, unless otherwise indicated, shall comply with the following specifications:

a. Number of pairs of #22 A.W.G. with double dry paper tape insulation shown on the plans.

b. Lead Antimony Sheath.

c. Mutual Capacitance A. C. test not to exceed .095 mfd. per mile of cable at 60°F.

d. Maximum conductor resistance, .92 ohms per pair mile.

e. Minimum insulation resistance, 500 megohm miles at 60°F.

f. Dielectric Strength: Insulation between conductors capable of withstanding 700 volt instantaneous A.C. test potential for two seconds. Insulation between conductors and sheath capable of withstanding 1400 volt maximum instantaneous A.C. test potential.

g. It shall be equal and similar to Western Electric Type D.S.A.

17-17. It shall be spun to messenger with .091" O.D. lashing wire.

17-18. Underground telephone pairs, unless otherwise indicated, shall be #17 A.W.G. duplex, similar and equal to Whitney Blake #17TBPR.

17-19. Minimum cover for underground telephone pairs shall be two feet zero inches unless otherwise approved. Trench depths shall be increased as required at cross-overs to provide a minimum separation between telephones and power or coaxial cables of one foot zero inches. Underground telephone pairs shall be installed in same trench with underground control and signal cable where closely adjacent parallel runs are indicated on the plans. Trenching, backfilling, etc., shall conform to applicable provisions of "Earthwork for Utilities" Section of these specifications.

17-20. The location of all underground telephone cable shall be adequately identified by posts marking the presence of these lines.

#### PUBLIC ADDRESS SYSTEMS:

17-21. Outside voice paging systems shall be provided in accordance with the following specifications and installed as shown on the drawings.

17-22. The equipment shall operate from 115 volt, 60 cycle power source. It shall be designed to withstand tropical weather and ruggedly constructed.

17-23. Each Control Console shall be housed in an aluminum turret (RCA type MI-14909 or equal) approximately 22" wide, 11" high, and 16" deep. The panel shall contain a volume indicator meter, a volume control device, and an on-and-off switch with a red bulls eye. It shall have five lever action four pole switches; one each to handle the switching of relay current

and speech input to four remote locations. One shall be used for an all-call key. A 24 volt relay power supply rectifier, a preamplifier, and a terminal block shall be installed and wired within the turret.

17-24. The Relay Power Supply shall be RCA type MI-12501 or equal, and have the following characteristics: Rated output, one ampere; Ripple, less than 0.5 volts at rated output; Maximum zero load voltage, 33 V.D.C.; full load voltage, 24 V.D.C.; Power supply 105 to 125 V.A.C.; 50/60 cycles; Power consumption, 1.3 amperes A.C.

17-25. The preamplifier or voltage amplifier shall be RCA type MI-12242 or equal. It shall have a low impedance input. It shall have flat characteristics from 30 to 10,000 C.P.S. Its rated output shall be plus 18 db with less than 1.5% distortion at 1000 C.P.S. It shall have an overall gain of 77 db.

17-26. A Cannon Type XL Plug or equal shall be supplied in the console to accommodate microphone input.

17-27. Each Microphone shall be RCA MI-12004 or equal. It shall be of the dynamic type with 250 ohm output. Output level shall be minus 57 db; frequency response 75 to 9,000 cycles. It shall be equipped with a desk stand and a 15 ft. cord terminated with a Cannon or equal plug.

17-28. Each of the Power Amplifiers shall be RCA type MI-12188 or equal in an RCA type MI-12666 x 1/2 or equal cabinet. It shall be of the bridging type, capable of 70 watts output with less than 5% distortion, 100 to 7,500 C.P.S. It shall have a frequency response flat from 30 to 15,000 C.P.S. within 1 db. It shall employ four 807 type tubes in a parallel push-pull power output circuit. It shall have an overall gain of 41 db. It shall have a 24 volt relay interrupting its plate circuit. It shall have a volume control. It shall be mounted and wired in a steel cabinet with a hinged locking door. A terminal block, terminating all input and output circuits of the net work shall be installed within the cabinet.

17-29. Each of the loudspeakers shall consist of an RCA type MI-6303 speaker, type MI-6306 driver, type MI-12371 transformer, and type MI-6399 cover or equal. Loudspeakers shall be 5-1/2' re-entrant trumpets flared from an exponential formula equipped with 60 watt

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drivers and necessary line transformers. Driver and transformer must be covered with weatherproof cover. Each unit shall be equipped with 30 feet of outdoor speaker cable. The assembled unit shall have a guaranteed frequency response of 125 to 7000 C.P.S. and must have a guaranteed efficiency rating of 112.5 db. acoustical output of 4 feet from axis of horn with one watt output. It shall have a mounting bracket, complete with hardware for attachment to a wood pole.

INTERCOMMUNICATION SYSTEM:

17-30. An Intercommunication System shall be provided in accordance with the following specifications and installed as shown on the drawings.

17-31. Each of the installed units shall be RCA MI-12589 or equal. It must be suitable for installation as an All-Master System of seven units. It must be equipped with an earphone receiver, in addition to a loudspeaker. It shall be housed in a Matte black cabinet approximately 10-3/8" x 7-1/8" x 5-7/8" with a satin chrome grill. It shall be suitable for operation on a power source of 105/125 volts A.C., 50/60 cycles, 25 watts. The output impedance shall be 15 ohms. The tubes used shall be 6 SL7GT, 6V6GT, 6X5GT. Each unit shall be fungus proofed.

17-32. Each of the installed sound-powered telephones shall be U.S. Instrument A-257-4 or equal complete with U.S. Instrument mount A-281 or equal.

RADIO:

17-33. This Contractor shall install and operate tactical radio equipment (furnished by others) in marine office, marine craft, and warehouses as required to make his operations safe and speedy.

## SECTION 18

### CONTROL AND SIGNAL SYSTEM

18-01. GENERAL CONDITIONS: The following paragraphs of Section 15 of these specifications shall apply to this section: 15-01, 15-02, and 15-04.

18-02. SCOPE: The work to be done under this section of these specifications shall include the furnishing of all materials, 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. Extensions and Additions to the existing control and signal submarine cable trunking system.

b. The Installation of Underground Control and Signal Cables.

18-03. SUBMARINE CONTROL AND SIGNAL CABLE: The submarine control and signal cable shall comply with Navy Department United States Coast Guard Specification No. S-254-42, Ten-Conductor Armored Control Cable Issue (October 1, 1942) including Master Specifications Nos. S-219 Inspection and Testing of Rubber-Insulated Cables, S-235 Galvanized Armor Wire for Submarine Cable, and S-255 Synthetic Insulation for Submarine Cables. This specification is copied herewith.

#### GENERAL:

a. These specifications cover the manufacture of submarine control cable, consisting of ten No. 14 AWG stranded copper conductors, with 3/64" colored plastic insulation, type, 5/64" plastic jacket, tape, 50 pound cutched jute serve, No. 10 BWG armor, and 16/3 ply impregnated jute outer serve.

b. This cable shall be designated Type 115-P cable.

#### CONDUCTORS:

a. Each conductor shall consist of 7 strands of untinned copper wire 0.0253 inch in diameter. Samples of the conductor selected by the inspector

after stranding shall meet all requirements of A.S.T.M. Standard Specifications for Soft Annealed Copper Wire (B-3) and Bare Concentric-Lay Copper Cable (B-8).

INSULATION:

a. Each conductor shall be insulated with a colored, thermoplastic, synthetic insulating compound that meets all requirements of the latest issue of U.S.C.G. Master Specifications No. S-255, and the electrical requirements of this specification.

b. The insulation shall have an average diameter of not less than 0.176 inch and a minimum wall thickness of 0.045 inch. The colors used shall be in accordance with Table I.

CABLING:

a. Two insulated conductors shall be laid up spirally with a suitable right hand lay to form a core over which eight additional insulated conductors shall be laid up spirally with a suitable left hand lay. All intersplices shall be filled with cutched jute to form a smooth round cable, over which shall be applied a suitable cotton tape containing not more than 30% by volume of reclaimed rubber and no crude rubber. The tape shall be frictioned on one side only, applied with the plain side in, with an overlap of approximately 20% of the width of the tape.

b. The colors of the individual conductors shall be in the order indicated in Table I. When placed on reels for final delivery, the colors as tabulated when viewed facing the outer end of the cable on the reel, shall appear in a clockwise order.

Table I

Core - - - - -	White, black
Outer Layer - - - - -	Red, black, green, black, blue, black, orange, black.

JACKET:

a. A jacket of thermoplastic, synthetic compound shall be applied over the taped core. The compound employed shall meet all requirements of the latest issue of U.S.C.G. Master Specifications No. S--255. The jacket shall have an average outside diameter of 0.906 inch

(5/8" or 5/16"), plus or minus 0.015 inch and a minimum wall thickness of 0.078 inch (5/64").

b. A Rubber filled tape, similar to that specified in cabling (a) shall be applied over the jacket, with the plain side out, with an overlap of approximately 20% of the width of the tape.

INNER JUTE SERVE:

a. A single layer of 50 pound cutched jute shall be applied spirally, with a suitable right hand lay, over the taped jacket.

ARMORING:

a. An armor of galvanized steel wire 0.134 inch in diameter (No. 10 BWG) shall be applied spirally over the inner jute serving, with uniform tension and a left hand lay, at an angle of approximately 20 degrees. The armor wire shall meet all requirements of the latest issue of U.S.C.G. Master Specifications No. S--235.

b. All joints in the armor wire shall be welded, and no weld shall be within twelve feet of another weld. All joints shall be thoroughly cleaned after welding by immersion in an acid bath, followed by immersion in molten zinc (not tin). Joints so treated shall be capable of meeting all requirements for uniformity of coating specified for the original armor wire, as shall be determined by testing sample joints.

OUTER JUTE SERVING:

a. A single layer of 16/3 ply vacuum impregnated jute shall be applied spirally over the armor with a right hand lay. The angle of lay shall not exceed 45 degrees. An application of hot compound composed of coal tar blended with a natural asphalt shall be applied over the armor and jute serve. The melting point of this compound shall be not less than 120°F as determined by the ball and ring test. The completed cable shall be treated with whitewash to prevent sticking.

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ELECTRICAL TESTS:

a. All insulated conductors, after 24 hours immersion in water at room temperature, when tested in accordance with the latest issue of Master Specifications No. S-219, shall conform to the following limits per 1000 feet of conductor:

Voltage Test, 5 minutes, minimum volts AC 3,000

Insulation resistance 60°F minimum megohms 182

b. All lengths of jacketed core before taping and before armoring, and all completed cable shall be immersed in water at room temperature for a period of not less than 24 hours after which period of time and while so immersed they shall be tested and shall conform to the following limits, per 1,000 feet of cable:

Voltage test, 5 minutes, minimum volts D.C.	18,000
Insulation resistance, 60° F. minimum megohms	182
Copper resistance, 60° F. maximum ohms	2.45

c. In making the voltage and insulation tests specified in (b) two tests shall be made. In the first test alternate conductors (all black conductors) shall be grounded and the voltage applied and insulation resistance measured between the remaining conductors and ground. In the second test the colored conductors shall be grounded and the voltage applied and insulation resistance measured between the black conductors and ground.

DELIVERY, ETC.:

a. The insulated conductor and jacketed core shall be manufactured and inspected in lengths of not less than 2,500 feet.

b. The completed cable shall be delivered in lengths of 10,000 feet on 90 inch reels, and 5,000 foot lengths of 84 inch reels, as specified in the order.

c. All soldered joints necessary in the copper conductors shall be made with solder containing not less than 50 per cent by weight of tin.

1

18-04. This cable shall be installed as shown on the drawings. The equipment for laying this cable is identical with and the method similar to that used for laying submarine telephone cable.

18-05. The existing and the new submarine control and signal cable shall be grouped in trenches to below low tide at the cable landings and protected from damage.

18-06. Cables shall be installed underground to new terminal cabinets located as shown on drawings.

18-07. Terminal cabinets shall be hot dipped galvanized of 12 gauge metal with a weather proof gasket on the door, wing nuts, and two hasps on opposite sides. Terminal strips shall be Burke Series 1000 or equal.

UNDERGROUND CONTROL AND SIGNAL CABLES:

18-08. Non-metallic sheathed cable, #14/2, parallel, solid copper with 600 volt moisture resisting type TW or equal insulation shall be used for direct burial underground control and signal cable installation. Cable shall be furnished on 5000 foot and 10,000 foot reels as specified.

18-09. This cable shall be buried directly in a trench as shown on the plans. Minimum cover for underground control and signal cable shall be two feet zero inches unless otherwise approved. Underground control and signal pairs shall be installed in same trench with underground telephone pairs where closely adjacent parallel runs are indicated on the plans. Trenching, backfilling, etc., shall conform to applicable provisions of "Earthwork for Utilities" section of these specifications.

18-10. The location of all underground control and signal cable shall be adequately identified by posts marking the presence of these lines.

18-11. Cables shall be installed from reels supported on trailers in such a manner as to keep to a minimum the number of splices required.

18-12. COAXIAL CABLE INSTALLATION: The work to be done under this section of these specifications shall include the furnishing of:

a. All Labor and Equipment required to complete the trenches for coaxial cable installation in accordance with the applicable drawings and paragraphs 15-01, 15-02 and 15-04 of Section 15 of these specificatio

b. Labor to assist in the installation of coaxial cable.

SECTION 19

PLUMBING

19-01. SCOPE OF THE WORK: Under this section of the specifications and the accompanying drawings the Contractor shall furnish all labor, materials, equipment, tools and transportation required to complete all plumbing work indicated on the drawings and as hereinafter called for. This work shall consist of all sanitary drainage, vents, floor and shower drains, floor sinks, plumbing fixtures, water heaters, pumps, all piping, valves, and fittings, pipe covering, and all other miscellaneous items of material and labor as may be required for the proper operation and maintenance of the systems.

19-02. APPLICABLE SPECIFICATIONS: The following specifications form a part of this specification:

a. Federal Specifications:

- HH-C-536 COMPOUND: PLUMBING-FIXTURE-SETTING
- HH-G-116 GASKETS: PLUMBING-FIXTURE-SETTING
- HH-P-117 PACKING: JUTE. TWISTED
- QQ-L-156 LEAD: CAULKING
- QQ-S-571b SOLDER: SOFT (tin, tin-lead, and lead-silver)
- WW-N-351 NIPPLES, PIPE: BRASS, STEEL AND WROUGHT IRON
- WW-P-351 PIPE: BRASS, SEAMLESS: IRON-PIPE-SIZE, STANDARD AND EXTRA-STRONG
- WW-P-401 PIPE AND PIPE FITTINGS: SOIL, CAST-IRON
- WW-P-406 PIPE: STEEL AND FERROUS ALLOY (for) ORDINARY USES (IRON-PIPE-SIZE)
- WW-P-460 PIPE FITTINGS: BRONZE (Screwed), 125- and 250 pound.
- WW-P-491a PIPE FITTINGS: CAST-IRON, DRAINAGE

- WW-P-501b PIPE-FITTINGS: CAST-IRON (Screwed) 125-and 250 Pounds
- WW-P-521b PIPE FITTINGS: MALLEABLE IRON (Screwed) 150 Pound
- WW-P-541a PLUMBING FIXTURES: (for) LAND USE
- WW-T-799a TUBING, COPPER, SEAMLESS (For use with Solder-Joint or Flared-Tube Fittings)
- WW-V-51a VALVES, BRONZE: ANGLE, CHECK AND GLOBE, 125 and 150 LB., SCREWED AND FLANGED (FOR LAND USE)
- WW-V-54 VALVES, BRONZE, GATE: 125 and 150 POUND SCREWED AND FLANGED (For land use)
- GGG-P-351a PIPE-THREADS, TAPER (AMERICAN NATIONAL)

b. American Standards Association Standards:

- A 40 2-1936 FLARED FITTINGS FOR COPPER WATER TUBE
- A 40 3-1941 SOLDER FITTINGS FOR COPPER WATER TUBE

19-03. TRENCHING AND BACKFILLING - Shall conform to the "Earthwork for Utilities" section of these specifications.

19-04. CONCRETE WORK: All concrete work in this section shall conform to the provisions of the "Concrete and Form Work" section of these specifications.

19-05. LOCATIONS: 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.

19-06. SANITARY SYSTEMS: Extend house sewer or sewers five (5) feet out from the building line and connect to sanitary sewer brought to these points under Section 24 of these specifications. 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.

19-07. FRESH WATER SYSTEMS: Make connections to fresh water services brought to a point or points five (5) feet outside the building line under Section 25 of these specifications. Run distributing mains with branches to supply all fixtures and equipment as indicated on the drawings. Water closets, urinals, and hose bibs will be supplied with salt water; all other fixtures and equipment with fresh water.

19-08. SALT WATER SYSTEMS: Make connections to salt water services brought to a point or points five (5) feet outside the building line under Section 25 of these specifications. Run distributing mains with branches to supply all water closets, urinals, and hose bibs as indicated on the drawings.

19-09. HOT WATER SYSTEMS:

a. Hot water systems are shown for Mess Hall - Sheet No. 2B-400 and Bakery - Sheet No. 2B-408; Dentist and Infirmary - Sheet No. 2B-407; Laundry - Sheet No. 2B-409; P. X., Barber Shop and Post Office - Sheet No. 2B-432; Mess Hall - Sheet No. 2E-450; Mess Hall - Sheet No. 2C-452 and Infirmary - Sheet No. 2E-5419.

b. Infirmary - Sheet No. 2B-407. Hot water for the Infirmary shall be supplied from an electric water heater. Run main with branches from the heater to supply all fixtures indicated on the drawings. A return line from the end of the hot water main shall be run to a hot water circulator, near the water heater, and from the circulator to the water heater as shown on the drawings.

c. Dentist - Sheet No. 2B-407. An electric water heater shall be located adjacent to the lavatory in the Dentist Office to supply hot water for this lavatory.

d. Mess Hall and Bakery; Laundry. Hot water for these buildings shall be supplied from steam heated storage water heaters. Mains with branches shall supply all fixtures and equipment requiring hot water, as indicated on the drawings. These will be dead-end systems without returns to the heaters.

e. P. X., Barber Shop and Post Office - Sheet No. 2B-432. Hot water for this building will be supplied from an electric water heater. A dead-end system will supply fixtures as indicated on the drawings.

f. Infirmary - Sheet No. 2E-5419. Hot water for this building will be supplied from an oil fired water heater. A dead-end system will supply fixtures as indicated on the drawings.

19-10. FUEL OIL SYSTEMS:

a. Fuel oil systems consisting of oil tanks and piping will be installed for the following buildings:

- (1) Mess Hall Sheets Nos. 2B-405 and 2B-406 for kitchen equipment.
- (2) Bakery Sheet No. 2B-408 for oven.
- (3) Boiler House Sheet No. 2B-408 for boiler.
- (4) Laundry Boiler House Sheet No. 2B-409 for boiler.
- (5) Mess Hall Sheet No. 2E-450 for boiler and kitchen equipment.
- (6) Mess Hall Sheet No. 2B-452 for boiler and kitchen equipment.
- (7) Infirmary Sheet No. 2E-5419 for water heater.
- (8) Quarters Sheet No. 2L-440 for boiler.

b. Furnish and install oil tanks, make pipe connections, and run oil piping to all equipment requiring fuel oil in the above buildings, all as indicated on the drawings.

19-11. AIR SYSTEM: Furnish and install air compressor and storage tank in Laundry Boiler House. Run piping from tank to presses and equipment in Laundry as indicated on the drawings.

19-12. GAS SYSTEM: Building No. 231, Sheet No. 2B-5411. Furnish and install Butane gas cylinders, make connections, run gas piping and connect to laboratory tables and fume hoods as indicated on the drawings.

19-13. PIPE:

a. All Soil and Waste lines shall be standard weight, cast iron, bell-and-spigot soil pipe, conforming to Federal Specification VW-P-401.

b. All Vent lines above ground shall be 63S-T6 aluminum pipe, anodized. See details showing connections from cast iron to aluminum pipe.

c. All Hot Water, Cold Water and Gas lines, above

ground, shall be "Alcoa", or equal, iron pipe size standard aluminum pipe, 63S-T6 anodized. All connections from aluminum pipe or fittings to brass, iron or steel pipe or fittings shall be made with plastic nipples or fittings when plastic nipples or fittings are available. When plastic nipples and fittings are not available direct connections between lines, or lines and fittings of dissimilar metals may be made upon direction of the Engineer. "Parmelee" pipe wrenches shall be used in making-up aluminum pipe.

d. All Oil Lines and Water Service lines shall be type K soft copper tubing, conforming to Federal Specification WW-T-799a.

e. All Air lines shall be Class A standard weight black steel pipe, conforming to Federal Specification WW-P-406.

f. All Plastic Pipe and Nipples shall be I.P.S. Mills plastic made of Saran.

g. Substitution of Materials: Aluminum pipe may be substituted for plastic pipe, upon direction of the Engineer, when plastic pipe is not available.

h. Relocation of Lines; Water lines within the structures may be relocated where deemed necessary or expedient by the Engineer, in order to economically use available lengths of pipe.

#### 19-14. FITTINGS:

a. All fittings in Cast Iron lines shall be of the same material, weight and quality as the pipe, and conform to Federal Specification WW-P-401.

b. All Fittings in Steel Waste lines shall be standard weight, black, beaded, recessed, screwed drainage fittings, conforming to Federal Specification WW-P-491a.

c. All Fittings in Aluminum lines shall be I.P.S. cast aluminum, anodized.

d. All Fittings in Steel Air lines shall be standard weight, galvanized, beaded, screwed malleable iron fittings, conforming to Federal Specification WW-P-521b.

e. All Fittings in Copper Oil lines shall be Streamline, or equal, brass soldered fittings, conforming to American Standard Association Standards A 40.3-1941. Solder and

flux used for making joints shall be #50 Streamline solder and flux or equal.

f. All Fittings in Copper Water Service lines shall be red brass compression type fittings, conforming to American Standards Association Standards - A 40.2-1936.

g. All Brass fittings shall be 125#, 85% cast red brass, conforming to Federal Specification WW-P-406.

h. All Plastic fittings shall be I.P.S. Mills Plastic made of Saran.

i. Substitutions. Aluminum fittings may be substituted for plastic pipe fittings, upon direction of the Engineer, when plastic fittings are not available.

19-15. VALVES: Provide shut-off valves in all main water services. Each water closet shall be provided with a straight stop. Valves shall conform to Federal Specification WW-V-51a or WW-V-54.

19-16. MAKING UP PIPE:

a. Cleaning: All pipe shall be carefully cleaned and all scale, sand, dirt, etc., removed before installation.

b. 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.

c. 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.

d. Joints in Aluminum piping shall be made with "Alcoa" thread lubricant used on the male thread.

e. 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 full circumference.

19-17. PITCH OF PIPES:

a. 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.

b. All Hot Water, Cold Water, Air and Gas lines shall be laid to drain, and runs shall be free from sags or traps.

19-18. PIPE SUPPORTS: 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 ten (10) feet.

19-19. CLEANOUTS: 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.

19-20. PIPE CONNECTIONS: 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. 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.

19-21. COVERING:

a. 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 ounce canvas neatly pasted on.

b. Hot Water Storage Heaters shall be covered with poultry wire mesh and plastered with  $1-1/2$ " thick 85% Magnesia insulating cement troweled smooth.

19-22. CLEANING EQUIPMENT: 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.

19-23. TESTS:

a. All Water Lines shall be tested to a water pressure of 50 pounds per square inch.

b. All Soil, Waste and Vent lines shall be tested by filling with water to the highest point in the system.

c. All Air Lines shall be tested to an air pressure of 100 pounds per square inch.

d. All Oil and Gas Lines shall be tested to an air pressure of 25 pounds per square inch.

19-24. FINAL INSPECTION: 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.

19-25. FIXTURES AND EQUIPMENT: The following fixtures and equipment shall be furnished and installed under this Division of the specification:

a. Lavatories - according to specification No. HN-2B-403, dated July 12, 1949.

b. Water Closets - according to specification No. HN-2B-403, dated July 12, 1949.

c. Urinals - according to specification No. Hn-2B-403, dated July 12, 1949.

d. Gang Showers - according to specification No. HN-2B-403, dated July 12, 1949.

e. Service Sinks - according to specification No. HN-2B-403, dated July 12, 1949.

f. Sinks - according to specification No. HN-2B-403, dated July 12, 1949.

g. Hose Bibbs - according to specification No. HN-2B-403, dated July 12, 1949.

h. Laundry Tub - according to specification No. HN-2B-403, dated July 12, 1949.

i. Cabinet Showers - according to specification No. HN-2B-404, dated July 12, 1949.

j. Electric Water Coolers - according to specification No. HN-2B-405, dated July 12, 1949.

k. Electric Water Heaters - according to specification No. HN-2B-406, dated July 12, 1949.

l. Floor Drains and Floor Sinks - according to specification No. HN-2B-407, dated July 12, 1949.

m. Oil Fired Water Heater for Infirmary Building No. 112, Sheet No. 2E-5419 - Day and Night size No. 0-3, or equal, having a storage capacity of 30 gallons and recovery capacity of 42 gallons per hour at 60° F. rise. Burner shall be designed for the use of diesel oil, thermostatically controlled and equipped with pilot. Tank shall be galvanized steel insulated with fiberglass, or equal. Case shall be steel with baked enamel finish. Burner motor shall be for 110 volt, single phase, 60 cycle current.

n. Hot Water Circulator for Infirmary Sheet No. 2B-407, circulator shall be Bell and Gossett Figure No. H1, or equal, complete with 1/6 H.P., 110 volt, single phase, 60 cycle motor.

o. Grease Traps:

(1) Mess Hall Sheet No. 2B-405. Two Josam J-2, or equal, having a rating of 14 G.P.M. and grease capacity of 28 pounds. One Josam J-4, or equal, having a rating of 25 G.P.M. and grease capacity of 50 pounds. Traps shall be cast iron with removable baffles and gasketed covers. Each trap shall be provided with a flow control.

(2) Mess Hall, Sheet No. 2E-450 and Mess Hall, Sheet No. 2E-452. Josam J-3, or equal, cast iron traps having a rating of 20 G.P.M. and grease capacity of 40 pounds. Traps shall be provided with removable baffles, gasketed covers, air intakes and flow controls.

p. Sand Trap for Materials Testing Shop, Sheet No. 2B-429. Construct sand trap as shown in detail on drawing.

q. Oil Tanks:

(1) Mess Hall, Sheet No. 2B-406. 300 gallon tank as per drawing No. SK-406.

(2) Bakery and Mess Hall Boiler House, Sheet No. 2B-408. 300 gallon tank as per drawing SK-406. 1200 gallon tank as per drawing No. SK-417.

(3) Laundry and Boiler House Sheet No. 2B-409 - 1200 gallon tank as per drawing No. SK-417.

(4) Mess Hall - Sheet No. 2E-450 - 1200 gallon tank as per drawing SK-417.

(5) Mess Hall - Sheet No. 2B-454 - 1200 gallon tank as per drawing SK-417.

(6) Infirmery - Sheet No. 2E-5419. Standard 55 gallon oil drum.

(7) Quarters - Sheet No. 2L-440. 300 gallon tank as per drawing SK-406.

r. Sump Pumps for Stations No. 131 and 143 - Sheet No. 3G-5437. Chicago Pump Company's Little Giant, Style A, or equal with 1/4 H. P., single phase, 60 cycle, 110 volt motor, bronze or open type impeller and copper float controlling switch.

s. Stainless Steel Sinks: Sinks shall be constructed of #18 gauge 18-8 stainless steel, polished inside, with flat rims for mounting in counters. Sinks shall have center drain plugs with removable grids, and 1-1/2" tail-pieces. Size 24" x 18" x 6".

(1) Sinks as specified above and equipped with Standard HB-16031, or equal, double laboratory faucets shall be provided and installed in Building No. 210, Sheet No. 2B-449.

(2) Sinks as specified above and equipped with Standard HB-16002, or equal, single laboratory faucets shall be provided and installed in Laboratory Building - Sheet No. 2L-489.

(3) Sink as specified above and equipped with Standard B-1344, or equal, faucet shall be provided and installed in Building No. 1, Sheet No. 2L-958.

t. Stainless Steel Pans: Stainless steel pans for examination tables in Building - Sheet No. 2L-493 shall be built of #20 gauge 18-8 stainless steel in accordance with drawing on Sheet No. SK-421. Faucets for examination tables shall be Standard B-1302, or equal, plain faucets with 1/2" outside threads.

u. Galvanized Iron Sinks:

(1) Building - Sheet No. 2L-493. Furnish and install 30" x 16" x 10" #16 gauge galvanized iron sinks in accordance with drawing on Sheet No. SK-421. Faucets for sinks shall be Standard B-1302, or equal, with 1/2" outside threads.

(2) Quarters - Sheet No. 2L-410. Furnish and install 30" x 24" x 18" sinks with 30" drain board on right hand and 12" high splash back on sink and drainboard. Bottom of sink shall pitch toward a Standard 1-1/2" drain with tail-piece. Splash back shall have holes provided for installation of two hose bibbs. Sink and drain board shall be mounted on a sturdy angle or pipe legs. Sink, splash back and drain board shall be constructed of No. 16 gauge galvanized iron. Sink legs shall be galvanized. Provide and install two hose bibbs for each sink.

SECTION 20

INSTALLATION OF EQUIPMENT AND PIPING  
FOR  
POWER AND WATER DISTILLATION PLANT

20-01. GENERAL REQUIREMENTS:

a. The work covered by this section of the specifications consists of furnishing all labor, materials, tools and equipment required, and in performing all operations in connection with the installation of the power and water distillation plant as indicated on the drawings.

b. Excavation and backfilling shall conform to the "Earthwork for Utilities" section of these specifications.

c. Concrete Work, in this section, shall conform to the provisions of the "Concrete and Form Work" section of these specifications.

d. Fresh and Salt Water piping in this section shall conform to the provisions of the "Fresh and Salt Water Distribution System" section of these specifications.

e. Plumbing in this section shall conform to the provisions of the "plumbing" section of these specifications.

20-02. WORKMANSHIP: All work shall be executed in a workmanlike manner and shall present a neat appearance when completed.

20-03. APPLICABLE SPECIFICATIONS:

a. Federal Specifications:

WW-P-406 Pipe; Steel and Ferrous Alloy (for Ordinary uses (Iron-Pipe-size) with Amendment #1.

WW-P-421 Pipe; Water, Cast-Iron (Bell and Spigot and Bolted Joint) with Amendment #3.

WW-P-441a Pipe; Wrought Iron, Welded, Black and Zinc-coated with Amendment #2.

WW-P-521b Pipe-Fittings; Malleable-Iron (screwed). 150-pound.

WW-T-799a	Tubing, Copper, Seamless (for use with solder or flared-fittings) with Amendment #1.
WW-V-512	Valves, brass or bronze, angle and globe, 150-pound SW.P.
HH-M-61a	Magnesia; Block, Cement and pipe covering (Molded)

20-04. MATERIALS: Except as otherwise called for on the drawings or hereinafter otherwise specified, materials shall be as follows:

a. Cast Iron Fittings. All cast iron fittings including elbows, tees, wyes, reducers, etc. for salt and fresh water system shall conform to the American Water Works Standard Specification for Class 150-pound and shall be all-bell type.

b. Cast Iron Flanged fittings, including elbows, tees, reducers, etc., shall conform to American Standard (B-16,1-1948) for Class 125-pound including drilling.

c. Flanges. All flanges shall be forged steel welded, slip-on type with flat face and shall be in accordance with American Standard (B-16.1-1948) for Class 150-pound, drilled. Flanges shall be similar to Crane No. 554.

d. Joint Compound. All joints for fittings on salt or fresh water pressure lines shall be compound sulphur joints. Joint compound shall be "Hydro-Tite" or approved equal.

e. Flanged Couplings for Pressure Lines:

(1) Flanged couplings for fresh or salt water pressure lines shall consist of two steel flanges, a middle ring of specified thickness and length, two rubber gaskets, and necessary bolts and nuts. The coupling shall insure permanently tight joints under reasonable conditions of expansion, contraction and shifting of couplings and shall be similar to Dresser Style No. 38, or Baker Company, or approved equal.

(2) Single Flanged couplings for fresh or salt water pressure lines shall consist of two malleable iron half-housings, two bolts and a leak-proof ring. The pipe or fitting ends shall be grooved to match coupling. The couplings shall be Victaulic, or approved equal.

f. Threaded Adapter Nipples for Victaulic couplings or equal shall have one end threaded and the other end grooved for the coupling.

g. Screwed fittings shall conform to American Screw Association (hereinafter referred to as A.S.A.) specifications for standard 125-pound fittings, pipe threads to be American Standard.

h. Special Unions. Unions for coupling copper tubing to threaded fittings shall be brass, copper pipe to male I.P.S. threads, and shall be similar to Jones No. J-1531, or approved equal.

i. Machine Bolts and Nuts: Machine bolts shall be threaded American Standard, and shall conform to A.S.A. B1 specification for cold rolled steel. Nuts shall be hex nuts, machined, and threaded to suit bolts.

j. Gaskets shall be 1/16" thick full face sheet asbestos and suitable for use with flat face cast iron flanges and shall be "Durabla", or approved equal.

k. Hook Plate. The hook plate shall be the single hook type Crane #168-G, or approved equal, for line size indicated.

l. Asbestos Mill board shall be 1-inch thick Corey, or approved equal.

m. Insulating Cement shall be Corey MW 50, or approved equal.

n. Bitrified Clay pipe shall be in accordance with specification A.S.T.M. C-13-44T.

o. Cinch Anchors for securing equipment and pipe supports to concrete shall be National Lead Company's "Cinch" anchors, or approved equal.

#### 20-05. EQUIPMENT:

a. Flow Rate Indicator. The flow rate indicator shall be a Fischer & Porter "Flowrator" Series 700, or approved equal.

b. Salinity Tester. The Salinity testing equipment shall be "Solv-Bridge" Model RD-44 Salinity tester with rubber dip cell, double dispenser with P. Hydrion PH paper or approved equal.

c. Adapter Flange. Adapter flanges shall be as indicated on H & N Sketch No. SK405.

d. Liquid Level Controller. The liquid level controller shall be Fisher Type 227c direct operated with type 120-1/2 bronze screwed globe body and standard pressure float cage, or approved equal.

e. Steam Trap. Steam traps shall be Yarway Impulse Steam Trap type No. 60, or approved equal of the line size indicated on the drawings.

f. Strainer:

(1) The Steam Strainer shall be Yarway strainer for steam, or approved equal of the line size indicated.

(2) The Water Strainer shall be Sarcco Type SB, bronze body, screwed, "Y" branch type, or approved equal of the size indicated on the drawings.

(3) The Air strainer shall be Crane No. 990-1/2, or approved equal.

g. Vibration Eliminators. The vibration eliminators as indicated on the drawing shall be flexible metal hose and fittings. The flexible hose and fittings shall be American Brass Company, type S1 seamless flexible tubing with a single braid, type HMR Heatproof Reattachable Male fitting and HFR Heatproof Reattachable female union, or approved equal. The fittings shall mate the pipe sizes shown on the drawings.

h. Liquid level gage shall be Jerguson Gage Valve Company No. 215-R-5 gage, or approved equal, of pipe size indicated on the drawings.

i. Water blender temperature controller shall be a double-ported, fully balanced piston type. The temperature control range shall be between 40° F to 200° F, and shall be set at temperature indicated on the drawings. The water blender shall be designed for a maximum working pressure of 150-pound per square inch. The water blender temperature controller shall be Sarcco type EE or approved equal. Water blender shall be located as indicated on the drawings.

j. Condensate Pumping Unit. The condensate pumping unit shall be Duplex Automatic Electric condensation pumping unit complete with two Type N pumps with electric motors; one (1) Armco rust resisting iron receiver; two (2) heat switches and two (2) gate valves. All shall be mounted on

j. one subbase. Each pump capacity shall be 3 G.P.M. against 20 p.s.i. discharge pressure. Motors shall be 1/2 HP., 220 volt, 1 phase, 60 cycle pumping unit shall not exceed 1750 R.P.M. Float switches shall have automatic alternator to alternate operation of pumps and to start second pump if first pump fails to handle the load. Pumping unit shall be Chicago Pump Company, Fig. 3027 using type "N" pumps with gate valves or approved equal.

k. Thermometer. The thermometers shall be the Angle Mercury Bulb type. The temperature range shall be from 30<sup>0</sup> F to 300<sup>0</sup> F. The thermometers shall be Gotham Type A-S-2635-12 inch, Tag 3402-1/2-12 inch or approved equal.

l. Tank. The 3000 gallon fuel oil storage tank shall be as indicated on H & N Sketch No. SK-416.

m. Flexible Connection. The flexible connection for engine exhaust shall be as indicated on H & N Sketches Nos. SK-412-1, SK-428, SK-429-1 and SK-429-2.

n. Butterfly Valves. The butterfly valves shall be suitable for exhaust gas at 450<sup>0</sup> F., working pressure 25 p.s.i., leakage not over 1/2 of 1%. Valve flange drilling shall be 125-pounds American Standard. Valves shall be installed in vertical line. Valves at top of silencer shall have chain wheel control with chain to hand down ten (10) feet below wheel standard hand lever control for valves at bottom of silencer. Valves shall be W.S. Rockwell Company Bulletin No. 502, or approved equal and shall be of the sizes indicated on the drawings.

#### 20-06. INSTALLATION OF EQUIPMENT:

a. General. All pieces of equipment shall be mounted on their respective foundations or supports. Foundations for equipment shall be as shown on structural drawings or as indicated on Power and Distilled Water Plant drawings. Those which are mounted on concrete foundations shall be accurately leveled with suitable wedges or jacks, and shall be bedded in grout consisting of one part cement and two parts sand to a minimum thickness of 1/2 inch. 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.

b. Diesel Engine Generator Sets shall be located and all connecting piping installed as shown on the Power and Distilled Water Plant drawings for each location. The sizes for each location shall be as shown on electrical drawings. The foundations shall be as indicated on the structural drawings and in accordance with the manufacturers recommendation.

c. Diesel Engine Auxiliary Equipment shall be attached to engine foundation with machine bolts and two unit cinch anchors.

d. Heat Recovery Silencer shall be installed and located as shown on the drawing. The silencer support shall be as detailed on the drawings and field fabricated of materials indicated or approved equal. The connecting piping shall be as shown and in accordance with best steam piping practice.

e. Distillation Units shall be installed and piped as indicated on the drawings and shall be in accordance with manufacturer's recommended practice.

f. Expansion Tanks shall be located on structural supports as shown on the drawings.

g. Equipment not specifically called out in these specifications, but indicated on the drawings shall be installed in accordance with best recommended practice for that particular item of equipment.

20-07. PIPING: All piping shall be installed as shown on the drawings.

a. Salt Water header shall be made of schedule 40 steel pipe with 150-pound flat faced, forged steel slip-on flanges, and gaskets shall be as hereinbefore specified. Nozzles shall be schedule 40 steel pipe nipples, threaded one end, welded to headers.

b. Steam Header shall be made of schedule 40 steel pipe with 150-pound flat faced, forged steel slip on flanges with 1/16" thick sheet asbestos gaskets. Nozzles shall be schedule 40 steel pipe, threaded one end and welded to the header. The Header shall have a steam trap at each end or, with the approval of the Engineer, other means of draining condensate from the header may be provided. An atmospheric relief valve, as indicated on the drawings, set to relieve at  $3\frac{1}{2}$  p.s.i.g. steam pressure shall be provided unless in the opinion of the Engineer, its use is not required. In which case it may be eliminated.

c. All other headers shall be made up with standard screwed fittings.

d. Compressed Air Piping:

(1) Engine Starting Air piping shall be schedule 80 steel pipe.

(2) Instrument Air piping for 20 p.s.i.g. shall be standard IPS red brass pipe.

e. Piping for Fresh Water Pumps and Chemical Feeder shall be schedule 40 steel pipe with screwed or flanged connections. Plastic tubing shall be provided for handling Hyperchlorite solutions to a point of injection in the fresh water line.

f. Fuel Oil piping between oil tanks and engines shall be 1/2-inch O.D. soft copper tubing. Fuel oil tank filler, vent, and gauge piping shall be schedule 40 steel pipe.

g. All other piping inside of the building above the floor shall be standard IPS red brass pipe and fittings.

h. All Pipe Fittings and Valves shall be screwed unless otherwise shown or noted on the drawings or in these specifications.

i. 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" section provisions of these specifications applicable to this type of work. All piping which runs under the floor shall be installed before concrete is poured.

j. Connections. All screwed, welded and flanged piping connections shall be installed in accordance with "P.O.L. Facilities" section of these specifications.

k. All Underground Fresh Water piping to and from fresh water pumps shall be installed in accordance with "Fresh and Salt Water Distribution System" section of these specifications.

l. All Copper Tubing and connections shall be installed in accordance with "P.O.L. Facilities" section of these specifications.

20-08. PIPE SUPPORTS: Pipe supports shall be fabricated and installed as detailed on applicable drawings. Steam lines and headers shall be supported in such a manner that temperature expansion will not impose excessive stresses on the installed piping. At point of support, insulated lines shall be provided with sliding bases extending thru the insulation and of design approved by the Engineer. All other piping shall be supported according to best practices established for piping installations and subject to the approval of the Engineer.

a. 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.

20-09. VALVES:

a. All Steam Line valves shall be 150-pound rising stem, wedge disc gate valves, Crane No. 431, or approved equal, except by-pass valves around traps, which shall be Crane No. 14-1/2P, or approved equal, brass globe valves.

b. All Fresh Water Pump valves shall be Crane No. 465-1/2, or approved equal, standard iron body, flanged O.S. & Y. wedge gate valves with brass trim. Fresh water pump check valves shall be Crane No. 373, or approved equal, iron body flanged swing check with brass trim.

c. Compressed Air valves shall be Ohio Injector Company No. 262, or approved equal, 300-pound brass globe valves, for air. Compressed air check valves shall be Ohio Injector Company No. 203, or approved equal, 300-pound brass check valve, for air.

d. Compressed Air Pressure Reducing valve shall be Crane No. 950, or approved equal, set for 250 p.s.i.g. and 25 p.s.i.g. outlet.

e. Compressed Air Relief valves shall be Crane No. 2560, or approved equal, set at 260 p.s.i.g. and Crane No. 2550, or approved equal, set at 25 p.s.i.g.

f. Atmospheric Relief valve shall be Kieley & Mueller No. 520, or approved equal, set at 3-1/2 p.s.i.g..

g. Fuel Oil valves shall be Buckeye No. 658, or approved equal, self closing loading valve and Nordstrom 150-pound No. 1925 lubricated plug valve (with wrenches).

h. All Other Valves, unless otherwise noted or shown shall be Crane No. 438, or approved equal, standard brass gate valves and Crane No. 27, or approved equal, brass check valves.

20-10. EXPANSION TANKS: One expansion tank with liquid level controller shall be provided for each engine. They shall be mounted on supports as indicated on the drawings. The liquid level controller shall be Fisher Type 227C direct operated liquid level controller with type 120-1/2 bronze globe body valve, or approved equal.

20-11. WOOD TANK: The open top wood tank shall be 36-inches high and the diameter shall be in accordance with the capacities on the drawings. This tank is to hold acid solution which is used for cleaning scale out of the distillation units. Install two 1-inch 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.

20-12. INSULATION:

a. All Steam piping shall be covered with 85% magnesia standard thickness sectional pipe covering with metal bands. All fittings and valves in steam lines shall be plastered flush with 85% magnesia insulating cement-Corey MW-50, or approved equal. Do not cover steam line vibration eliminators.

b. All Distillation Unit Evaporators, hot wells, and steam ducts, and diesel engine exhaust silencers shall be covered with 1-1/2-inch thick 85% magnesia insulating cement-Corey MW-50, or approved 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.

c. All Distillation Unit Exchangers shall be entirely enclosed with 1-inch thick asbestos millboard, or approved equal, and No. 16 gauge aluminum as shown on the drawings.

20-13. TEST: Such tests as are required by the Contracting Officer to insure the satisfactory installation of the equipment shall be conducted by the Contractor. These tests may be conducted simultaneously with operational tests of the same equipment.

SECTION 21

P. O. L. FACILITIES

21-01. GENERAL REQUIREMENTS:

a. The work covered by this section of the specifications consists of furnishing all labor, materials, tools and equipment required for the construction of P. O. L. Facilities equipment and piping, as indicated on the drawings and as specified herein.

b. Excavation and backfilling shall conform to the "Earthwork for Utilities" section of these specifications.

c. All concrete work in this section shall conform to the provisions of the "Concrete and Form Work" section of these specifications.

21-02. APPLICABLE SPECIFICATIONS: The following specifications as latest amended form a part of this specification.

a. Federal Specifications:

WW-N-351	Nipples, Pipe; Brass, Steel and Wrought Iron
WW-P-406	Pipe; Steel and Ferrous Alloy (for Ordinary Use (Iron pipe size)
WW-P-521b	Pipe-Fittings; Malleable Iron (screwed) 150-pound
WW-V-531	Unions; Malleable-Iron or Steel, 250-pound
GGG-P-351a	Pipe-threads; taper (American National)

b. National Board of Fire Underwriters Pamphlets:

No. 30 Containers for Storing and Handling Flammable Liquids.  
No. 70 National Electrical Code

c. Underwriters Laboratories, Inc. Publications.

List of Inspected Gas, Oil and Miscellaneous Appliances.

Standard for Electrical Fittings for Use in Hazardous Locations, Class I, Group D.

Standard for Industrial Control Equipment for use in Hazardous Locations, Class I, Group D.

Standard for Electric Motors and Generators for use in Hazardous Locations, Class I, Group D.

21-03. MATERIALS: Except as otherwise called for on the drawings or hereinafter otherwise specified, materials shall be as follows:

a. Joint Compound. Gasoline-resistant cement joint compound for use in threaded pipe connections shall be of a type approved and listed by the Underwriters' Laboratories, Inc.

b. Pipe. Steel pipe shall conform to the requirements of Federal Specification WW-P-406, Type 1, Class A.

c. Pipe Fittings.

(1) Malleable-Iron Pipe Fittings. Malleable-Iron pipe fittings shall conform to the requirements of Federal Specifications WW-P-521b, Type 1.

(2) Nipples. Steel pipe nipples shall conform to the requirements of Federal Specification WW-N-351, Type A.

(3) Unions. Steel pipe unions shall conform to the requirements of Federal Specification WW-V-531, Type A.

d. Machine Bolts and Nuts. Machine bolts shall be threaded American Standard, and shall conform to A.S.A. B1 specification for cold rolled steel. Nuts shall be hex nuts, machined, and threaded to suit bolts.

e. Gaskets. Gaskets shall be ring gaskets suitable for use with 250-pound forged steel joints and similar and equal to "Cranite".

21-04. MECHANICAL EQUIPMENT:

a. General. All items of mechanical equipment shall be of the best quality used for the purpose in commercial practice and shall be the product of reputable manufacturers. All belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts located so that any person may come in close proximity thereto shall be fully enclosed or properly guarded.

b. Workmanship. Equipment shall be installed in accordance with the recommendations of the manufacturer and the best standard practice for this type of work.

21-05. PIPING:

a. General. All piping in the gasoline and diesel oil system shall be steel. Materials shall be new and unused unless otherwise approved. Pipe shall be cut accurately to measurements established and shall be worked into place without springing or forcing, properly cleaning all building openings. All pipes extending through the roof of buildings shall be properly flashed. Piping connections to equipment shall be in accordance with details shown on the drawings, or as directed, by the Engineer. All open ends of pipe lines or equipment shall be properly capped or plugged during the installation to keep dirt or other foreign material out of the system. All pipe joints 1-1/2-inches and smaller shall be threaded joints. All pipe joints in pipe 2-inches and larger shall be welded.

b. Welding. (Optional). All steel piping 2-inches and larger shall be put together with welded joints, except at locations where other types of joints are called for or required. All welding in connection with the installation of the piping shall be done by welders licensed to weld work of the class involved and shall be in accordance with the standards of the American Welding Society. All changes in direction and intersections of lines shall be made with welding fittings. Mitering of pipe to form elbows, notching straight runs to form tees, or any similar construction shall not be permitted. Welding fittings shall be installed on all welded lines. Surfaces for welding shall be cleaned and shall be free from paint, oil, rust, or scale before welding, except that a light coat of rust preventative will not be detrimental to the finished weld.

c. Weld Neck Flanges. Weld neck 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.

d. Slip On Flanges. Slip on flanges shall be welded with a full pipe thickness plus 1/16-inch fillet on exterior joint and a 1/8-inch 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.

e. Threaded Pipe Joints. All joints shall be made with tapered pipe threads and shall conform to the requirements of Federal Specification GGG-P-351a. After cutting and before threading, all pipe shall be reamed and shall have burrs removed. Threads shall be full cut, and not more than 3 threads on the pipe shall remain exposed. The joints shall be made perfectly tight with a gasoline-resistant compound applied to the pipe threads only and in no case to the fittings. All fittings, couplings, unions, etc., on threaded pipe shall be 300-pound malleable iron fittings, except that standard fittings shall be used on vent lines.

f. Flanged Joints. All connections to flanged equipment valves, meters, etc., shall be made with steel flanges of the proper size and pressure rating. Unless otherwise noted on the drawings, all flanges shown except companion flanges to 250-pound C.I. valves or equipment shall be 150-pound F.S. weld neck flanges of line size. All companion flanges for 250-pound C.I. flanged valves or equipment shall be 300-pound F.S. weld neck flanges of line size. All flanged connections shall have standard asbestos ring gaskets of proper size and rating. All flanged connections shall be made in such manner that bending stresses shall not be transmitted to the flanges in bolting up, particularly in the case of mating cast iron with steel flanges. In no case shall the use of bars or drift pins be used to align flange bolt holes.

g. Flared Tube Connections. Flared tube connections on instrument lines, etc. shall be located as shown on drawings. Tubing shall be 3/8 inch O.D. x .035 wall soft annealed copper tubing. Tubing connections to I.P.S. threaded connections shall be made with Triple Type Compression fittings. Tubing shall be cut square and shall be free from burrs, before flaring. 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.

h. Pipe Supports. Pipe supports in buildings and on horizontal storage tanks shall be installed as located and detailed on drawings.

(1) Pipe supports shall be not less than 12-feet 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-inches above normal grade.

21-06. SUBMARINE FUEL LINES:

a. General. Submarine fuel lines shall be located as shown on the drawings. Pipe on ocean bottom shall be installed as detailed on drawings.

b. Flexible hose connection between buoy and submarine pipe shall be 25-foot lengths, 4-inch rough bore submarine oil suction and discharge hose, complete with steel nipples, built into hose without exterior clamps. Nipples shall have vulcanized rubber coverings and be equipped with a 4-inch 300-pound F.S. Flange. The length of the submarine hose shall be at least one and one-half times the depth of water at the buoy.

c. Buoy. The 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.

21-07. VALVES:

a. General. Valves of size and type as indicated on the drawings shall be located as nearly as possible where shown. Variations in location for ease of operation shall be approved by the Engineer before installation.

b. Block Valves.

(1) Block valves - 2-inch and larger shall be Flanged Lubricated Plug Valves and shall be checked for lubricant at time of installation.

(2) Block Valves - 1-1/2-inches and smaller are standard screwed Brass Gate Valves, except that block valves on instrument lines, pressure gages, etc., are 1/2 inch - 600-pound steel gate valves and shall be installed as detailed on drawings.

c. Check Valves. Check valves shall be swing check type with brass bodies and screwed ends for the line sizes indicated.

d. Pressure Reducing Valve. The pressure reducing valves shall be spring loaded diaphragm operated type suitable for gasoline or diesel oil. The valves shall be 250-pound flanged semi-steel or high tensile iron bodies, with stainless steel trim and double seated valve. The pressure reducing valves shall be installed as indicated on the drawings.

21-08. PRESSURE GAUGES: Pressure gauges of an approved Bourdon spring type, using alloy steel tubing, shall be installed at locations and at pressure ratings called for on the drawings. The gauges shall have a black finished phenol plastic turret case. The gauges shall be designed for severe and critical services. The entire system consisting of socket, Bourdon tube, tip, movement, dial and pointer shall be easily removed from the case as a unit. The connection shall be 1/4-inch N.P.T. below 1,000 pounds and 1/2-inch N.P.T. for 1,000 pounds and over.

21-09. LIQUID LEVEL CONTROLLER: The liquid level control unit shall be a self-contained unit with 250-pound flanged semi-steel body and bronze trim and copper float. The unit shall be suitable for gasoline and diesel oil service, and be installed as indicated on the drawing with the float cage installed below the valve body.

21-10. TRUCK LOADING ARM: The truck loading arm assembly shall consist of a ball bearing double swing joint, ball bearing single swing joint, counterweight, fill stem complete with coupling, ferrule and static wire, line loading valve, vacuum breaker and static ground cables around swing joints. The assembly shall be installed and color coded as indicated on the drawings.

21-11. PUMP HOUSE EQUIPMENT:

a. Dehydrator. The dehydrator shall consist of a horizontal tank fitted with a filter pack, water level gauge, inlet and outlet pressure gauges, automatic safety control valve and steel supports. The capacity shall be 300 G.P.M. for gasoline or diesel fuel.

b. Pump - Self Priming Centrifugal. The pumps shall be self priming centrifugal type with a 50 G.P.M. capacity @ 60-foot head. They shall be complete with welded steel base, flexible coupling, coupling guard and a 2 H.P., 60 Cycle, 3 Phase, 250 Volt, Class 1, Group "D" explosion proof induction motor. The pump shall be so mounted that it can be replaced with a minimum disturbance of pipe connections.

c. Air Eliminator-Vertical. The air eliminator shall be installed ahead of the meter to thoroughly extract air or vapor before it reaches the meter. The volumetric capacity of the unit shall be such that the unit will handle 300 G.P.M. The air release shall be outside of the pump house. The connectors shall be 4-inch - 150 pound A.S.A. forged steel flanged.

d. Meter. The meter shall have a capacity of 300 G.P.M. and be equipped with large reset register. The meter body and manifold shall be high grade cast semi-steel with a maximum working pressure of 250 P.S.I.. The manifold connections shall be 4-inch 250-pound standard flanged.

e. Rate Limit Valve. The rate limit valve shall have 4-inch 250-pound standard flanged semi-steel body. The valve shall be spring loaded diaphragm type for control between 200 and 500 G.P.M..

f. Line Strainer. The line strainers shall have a 250-pound flanged body with a 50 mesh monel screen basket having a flow rate of 3 to 1 at 30% open.

g. Equipment Foundations. Pump and equipment foundations shall be sized to suit by field, and foundations shall be poured on and dowelled to floor slab.

21-12. MACHINERY AND EQUIPMENT SETTINGS: 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 pads may be poured and drilled for cinch anchors, pending conditions at jobsite, and with the approval of the Engineer. A minimum of 1/2-inch 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.

21-13. TANKS:

a. Horizontal Tanks. The horizontal storage tanks shall be of the capacities and size indicated on the drawings, allowance being made for manufacturer's fabrication. The storage tanks shall be constructed in accordance with the standards of the National Board of Fire Underwriters.

b. Underground Tank. An underground tank shall be installed at the gasoline service station as shown on the drawings. Care shall be taken not to damage the asphalt coating of this tank and any damage shall be repaired before cementing in.

c. Vertical Tanks.

(1) General. All vertical tanks for gasoline and diesel oil storage (capacity 100 to 1000 bbl) shall be of bolted steel construction in accordance with U.S. Navy Bureau of

Yards and Docks No. 2871-59. The bolted steel storage tanks of capacity as shown on the drawings shall be installed on concrete pads as located on drawings.

(2) 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-foot-8-5/8-inch Dia.), a copy of which is furnished with each tank.

#### 21-14. BOAT FUELING FACILITIES:

a. General. The boat fueling facilities shall consist of a fuel oil storage tank, two fueling pumps and two marine fuelers. All equipment valves and connecting piping shall be located as indicated on the drawings. Variations in location for ease of operation shall be approved by the Engineer before installation.

b. Fuel Oil Storage Tank. The diesel fuel oil storage tank shall be Underwriters' approved and have a capacity of 5,000 gallons and shall be mounted horizontally above grade as detailed on the drawings.

c. Fueling Pumps. The fueling pumps shall be self-priming centrifugal pumps having a capacity of 50 G.P.M. @ 40-foot head, complete with base and explosion-proof motor.

d. Marine Fueler. The Marine Fueler shall be inclosed in a weather-proof steel cabinet painted a bright yellow and complete with spring rewind hose reel, 50-feet of 1-1/2-inch fuel oil hose, 1-1/4-inch aluminum nozzle, self closing swing gate valve, air eliminator and meter with large reset register, and explosion-proof switch.

#### 21-15. SERVICE STATION:

a. General. The gasoline-fueling type service station shall consist of a storage tank cemented in, and two gasoline pumps. All equipment, valves and connecting piping and vent lines shall be located as indicated on the drawings.

b. Gasoline Storage Tank. The gasoline storage tank shall be 2,000 gallon capacity, non-pressure-type, horizontal, welded steel tank suitable for underground installation. The storage tank shall be constructed in accordance with the standards of the National Board of Fire Underwriters. The tank shall be of the size indicated, allowance being made for manufacturer's fabrication. The tank shall be tested and proved tight against leakage under a test pressure of not less than five (5) nor more than ten (10) pounds per square inch.

c. Tank Installation. The top of the tank shall be set at a minimum depth of 3-feet. The tank shall be set level and encased in 6-inches of concrete as indicated on the drawing.

d. Tank Equipment.

(1) Atmospheric Vent. The underground storage tank shall be provided with a separate atmospheric vent equipped with a screened vertical vent. The vent pipe shall be 1-1/2-inches minimum size and shall terminate at least 12-feet above grade. The top of the vent shall extend not less than 1-foot above the top of the tank truck. The vent shall be installed in accordance with the standards of the National Board of Fire Underwriters.

(2) Fill Connection. The fill line to the underground storage tank shall be 3-inches and shall enter at the top of the tank. The fill line shall extend to within 6-inches of the tank bottom. An antispash deflector shall be connected to the end of the fill line in the tank. From the top of the tank, the fill line shall extend vertically or shall slope upward on a uniform grade and shall be connected to a 3-inch cast-iron combination fill box installed flush with the finished grade or pavement. The outside body shall be heavy cast iron and shall be deep enough to set firmly in the pavement and to permit sufficient space around the fill pipe for the entry of a wrench. The quick-opening top lid and the wrench for removing the lid shall be of malleable iron, with a brass lock lid being screwed on the brass body.

(3) Suction Connection. The 1-1/2-inch suction lines shall be located on the tank as indicated on the drawing. The suction lines extending inside the tank shall have a double poppet foot valve extended to within 4-inches of the tank bottom. The suction connection to the tank shall be through a foot valve extractor assembly. The foot valve extractor assembly shall be complete with flush box unit and wrench. The suction line shall slope upward on a uniform grade to the pump. The pipe connection to the pump shall be by means of a swing-joint arrangement to prevent undue strain on the pipe and fittings in case settlement of the tank occurs. The final connection between the suction pipe and pump shall be by means of a union. The horizontal run between the tank suction connection and the pump shall not exceed 50-feet. Each pump installed shall have a separate connection and suction line from the tank.

e. Gasoline Pump. The gasoline pump shall be the non-computing type with a non-computing register, positive reciprocating piston displacement meter, belt driven pump unit having a maximum capacity of 15-gallons per minute, atmospheric float type air eliminator, 1/3 H.P. explosion proof motor, 11-foot length of 3/4-inch all synthetic gasoline hose and a 1-inch hose nozzle. The pump shall bear the Underwriters' label approving the unit for indoor or outdoor use.

21-16. FIRE PROTECTION: The P.O.L. storage area shall be fenced with a 6'-0" high wire mesh fence completely isolating it from unauthorized Personnel.

Dikes of more than 100% retention capacity shall be installed around all tanks.

All tanks shall be provided with vent valves, set to maintain the gaseous mixture in the tanks above the explosive range for the type of fuel stored therein.

A manual water-fog system shall be provided for the P.O.L. Storage area. It shall consist of a centrifugal pump capable of pumping 125 G.P.M. against 100 P.S.I., four standpipes and hydrants so located as to cover the entire storage area with 100-feet of hose at each hydrant, and 1-1/2-inch hose lines equipped with 1-1/2-inch fog nozzles and 20-foot extension play pipes with 1-inch fog-head.

Foam type fire extinguishers of 2-1/2-gallon capacity shall be provided for use in the P.O.L. pump house and at the loading rack and dispensing stations.

21-17. PAINTING: All painting and finishing for the P.O.L. facilities shall be in accordance with the section on painting included in these specifications.

21-18. TEST: Upon completion and prior to acceptance of the installation the Contractor shall subject the P.O.L. system to such operation tests as may be required by the Contracting Officer to demonstrate satisfactory functional and operation efficiency.

SECTION 22  
STEAM SYSTEMS

22-01. SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with the installation of the steam system, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

22-02. APPLICABLE SPECIFICATIONS: The following specifications form a part of this specification.

a. Federal Specifications:

HH-B-671c	Brick; Fire-Clay.
HH-C-451b	Clay; Fire, Ground.
HH-I-556	Insulation (Glass Fiber); semirigid.
HH-M-61a	Magnesia; Block, Cement, and Pipe-Covering (Molded).
HH-P-46a	Packing; Asbestos, Sheet, Compressed.
QQ-S-636	Steel; Carbon (low-carbon), Sheets and Strips, with Amendment 1.
TT-V-51a	Varnish; Asphalt
WW-N-351	Nipples; Pipe; Brass, Steel and Wrought-Iron, with Amendment 1.
WW-P-406	Pipe; Steel and Ferrous Alloy (for) Ordinary Uses (Iron-Pipe-Size) with Amendment 1.
WW-P-501b	Pipe Fittings; Cast-Iron (screwed) 125- and 250- pounds.
WW-P-521b	Pipe Fittings; Malleable-Iron (screwed) 150 pound.
WW-U-531	Unions; Malleable-Iron or Steel.

- WW-V-51a Valves, Bronze; Angle, Check and Globe, 125- and 150- pound, screwed and flanged (for land use).
- WV-V-54 Valves, Bronze, Gate; 125- and 150- pound screwed and flanged (for land use).
- WV-V-58 Valves, Cast-Iron, Gate; 125- and 250- pound, screwed and flanged (for land use) with Amendment 1.

b. U.S. Department of Commerce Commercial Standards:

CS 75-42 Automatic Mechanical-Draft Oil Burners  
Designed for Domestic Installations.

c. U.S. Department of Commerce Simplified Practice Recommendation:

R 157-37 Steel Horizontal Firebox Heating Boilers.

d. American Society for Testing Materials, Serial Designations:

A 53-44 Welded and Seamless Steel Pipe.

A-72-39 Welded Wrought Iron Pipe.

e. American Society of Mechanical Engineers Code:

Boiler Construction Code.

f. American Standard:

B 16a-1939 Cast Iron Pipe Flanges and Flanged fittings, Class, 125.

g. Heating, Piping and Air Conditioning Contractors National Association Publication:

Net Load Recommendations for Heating Boilers.

h. National Board of Fire Underwriters Pamphlet:

No. 31 Standards of the National Board of Fire Underwriters for the Installation of Oil Burning Equipment.

22-03. GENERAL: The contract drawings indicate the extent and general arrangement of the steam system. If any departures from the contract drawings are deemed necessary by the Contractor, details of such departures and the reasons therefor shall be submitted as soon as practicable to the Engineer for approval. No such departures shall be made without prior written approval of the Engineer

a. Standard Products: The equipment to be furnished under this specification shall be essentially the standard product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be the products of the same manufacturer.

b. Material and Equipment Schedule: As soon as practicable and within 30 days after the date of award of contract and before commencement of installation of any materials or equipment, a complete schedule of the materials and equipment proposed for installation shall be submitted for the approval of the Contracting Officer. The schedule shall include catalogs, cuts, diagrams, drawings, and such other descriptive data as may be required by the Contracting Officer. In the event any items of material or equipment contained in the schedule fail to comply with the specification requirements, such items may be rejected.

22-04. WORK DESCRIBED IN OTHER SECTIONS: Any work not specifically described in this section of the specifications but required to complete the steam distribution system shall be performed in accordance with the applicable provisions of the sections of these specifications covering such work.

22-05. MATERIALS AND EQUIPMENT:

a. Asphalt Varnish: Asphalt varnish shall conform to the requirements of Federal Specification TT-V-51.

b. Boiler Covering:

(1) Glass-Fiber Insulation: Glass-fiber insulation shall conform to the requirements of Federal Specification No. HH-I-556, types as required for use intended.

(2) Magnesia Insulation: Magnesia insulation shall conform to the requirements of Federal Specification HH-M-61, types as required for use intended.

c. Electrical Materials and Appliances: Electrical materials and appliances shall conform to the applicable requirements of Section 16 Electrical Work; Interior, of these specifications.

d. Fire Brick: Fire brick shall conform to the requirements of Federal Specification HH-B-671, intermediate heat duty.

e. Fire Clay: Fire clay shall conform to the requirements of Federal Specification HH-C-451, Class C.

f. Steel Sheets (uncoated): Uncoated (black) steel sheets shall conform to the requirements of Federal Specification QQ-S-636, composition, condition, and finish best suited to the end use.

g. Mechanical Equipment: All major items of mechanical equipment shall be of the best quality normally used for the purpose in good commercial practice and shall be the products of reputable manufacturers. Each major component of equipment shall have the manufacturer's name, and address on a nameplate securely affixed in a conspicuous place. The nameplate of a distributing agent will not be acceptable. All belts, pulleys, chains, gears, couplings, projecting set screws, keys and other rotating parts located so that any person may come in close proximity thereto shall be fully enclosed or properly guarded.

h. Pipe and Pipe Fittings:

(1) Asbestos Packing: Asbestos packing shall conform to the requirements of Federal Specification No. HH-P-46.

(2) Cast Iron Pipe Fittings: Cast-iron pipe fittings shall conform to the requirements of Federal Specification WW-P-501, Class A, type as required to match adjacent piping.

(3) Flanges and Flanges Fittings: Cast-iron flanges and flanged fittings shall conform to the requirements of American Standard B-16a-1939.

(4) Malleable-Iron Pipe Fittings: Malleable-iron pipe fittings shall conform to the applicable requirements of Federal Specification WW-P-521, except they shall be tested for 300 pound service.

(5) Nipples: Nipples shall conform to the requirements of Federal Specification No. WW-N-351, Type A.

(6) Pipe: Pipe shall conform to the requirements of Federal Specification WW-P-406, type I, Class A.

(7) Unions: Unions shall conform to the applicable requirements of Federal Specification WW-U-531, except they shall be tested for 300 pound service.

i. Pipe Covering:

(1) Magnesia Pipe Covering: Magnesia pipe covering shall conform to the requirements of Federal Specification No. HH-M-61, type I.

(2) Insulation thickness for service requirements shall be listed in the following schedule:

<u>Service</u>	<u>Temperature</u>	<u>Thickness</u>
Steam Under 100-lb.ga.	Under 338°	Standard
Steam 101 to 200-lb.ga.	339° to 388°	2"
Condensate Return	Under 268° F.	Standard

j. Valves:

(1) Gate valves of sizes of 1-1/2 inch or less shall conform to the requirements of Federal Specification No. WW-V-54, Class A. Gate valves of 2-inch size shall conform to the requirements of Federal Specification No. WW-V-58, Class A, designation NS. Gate valves of over 2-inch size shall conform to the requirements of Federal Specification No. WW-V-58, Class A, designation OS or OF as required.

(2) Globe Valves: Globe valves shall conform to the requirements of Federal Specification No. WW-V-51, Type I, Class A.

(3) Check Valves: Check valves shall conform to the requirements of Federal Specification No. WW-V-51, Type III, or Type IV, Class A.

(4) Angle Valves: Angle valves shall conform to the requirements of Federal Specification No. WW-V-51, Type II, Class A.

k. Welding Fittings: Welding fittings shall conform in physical and chemical properties to the requirements of the American Society for Testing Materials Specification No. A 53-44 for steel fittings and No. A 72-39 for wrought-iron fittings.

22-06. WORKMANSHIP: Equipment shall be installed in accordance with the recommendations of the manufacturer and the best standard practice for this type of work.

22-07. BOILERS AND STEAM GENERATORS: Boilers shall be completely automatic packaged type and shall be designed for a steam operating pressure of 15 pounds per square inch gage. Steam generators shall be completely automatic packaged type and shall be designed for a steam working pressure of 40 and 150 pounds per square inch gage. Boilers and steam generators shall be designed for firing fuel oil and shall be constructed in accordance with the requirements of the current American Society of Mechanical Engineers Boiler Construction Code. Boilers and steam generators shall be provided with all necessary connections, including those for steam, condensate return, blowdown, pressure gage, safety valve, and water column, and shall be equipped with a water column with gage glass, not less than 2 compression gage cocks, and water-column and gage-glass drain valves of the straight-through type. Boilers and steam generators shall have a standard name plate bearing the manufacturer's name, address, trade name, and catalog number securely affixed to the boiler in a conspicuous place. Boilers and steam generators shall have the required capacity when fired with #3 oil, (Diesel Oil) or lighter.

22-08. OIL BURNING EQUIPMENT: Oil-burning equipment shall include the oil burner, motor, ignition equipment, controls, oil-storage tank, oil pipe and fittings, and all other items necessary for the complete installation of a fully automatic oil-burning system. All oil-burning equipment shall be approved by the Underwriters' Laboratories, Inc., and shall be installed in accordance with the Standards of the National Board of Fire Underwriters for the installation of Oil Burning Equipments, Pamphlet No. 31.

a. Oil Burner: The oil burner shall be an integral-pump, mechanical-atomization type, suitable for handling #3, oil (Diesel oil) or lighter without preheating the oil. The burner shall be quiet in operation, and shall operate with a balanced flame so as not to localize heat in any part of the combustion chamber. The burner shall be capable of completely atomizing and effectively mixing the oil with air so as to ensure complete combustion. The air admitted shall be of sufficient quantity for complete combustion, but not of such quantity as to produce an undue percentage of excess air with attendant high stack loss. The oil burner shall operate without clogging or failure, and shall have sufficient capacity to develop not less than the specified boiler capacity. The oil burner shall conform to the requirements of U.S. Department

of Commerce Commercial Standards No. CS 75-42 when within the scope thereof. Each burner shall be secured while in firing position by means of a latch or other approved device. Each burner shall be provided with synchronized control of the quantity of oil, primary air, and secondary air supplied.

b. Motor: The oil-burner motor shall be of the totally enclosed type and shall be provided with thermal-overload protection. The motor shall suit the current characteristics (of the available electric service) and shall conform to the applicable requirements of Section 16 Electrical Work; Interior, of these specifications. The motor shall have sufficient capacity to operate the oil pump and fan so as to develop the specified boiler rating.

c. Fuel-Oil Storage Tanks: Fuel-oil storage tanks shall have a capacity as indicated on the drawings. Each tank shall be constructed and installed in accordance with Standards of the National Board of Fire Underwriters for the Installation of Oil Burning Equipment, Pamphlet No. 31, and shall be approved and labeled of the Underwriters Laboratories, Inc.. The tank shall be provided with welded, reinforced threaded openings or flanges for all pipe connections, including oil-fill, vent, and oil-burner connections. Each storage tank shall be given a coat of approved rust paint. The fuel-oil storage tanks shall be installed above ground as indicated on drawings. Each tank shall be provided with a direct reading gage (liquidometer).

d. Oil Pipe and Fittings: Fuel oil piping shall be type "L" hard copper tubing with solder fittings.

22-09. SMOKE CONNECTION: Each boiler shall be connected to the stack or flue by means of a smoke connection constructed of black iron or steel sheets not less than 0.0478 inch in thickness (18 gage). No part of the smoke connections shall come closer than 12-inches to the ceiling, or walls of the building. Suitable cleanouts shall be provided which will permit cleaning the entire smoke connection without dismantling.

22-10. PRESSURE GAGES: Pressure gages of an approved Bourdon spring type shall be installed on the boiler, the discharge line from each condensate pump, and elsewhere as indicated on the drawings. Gages shall be installed in such manner as to be accessible and easily read. Gage dials shall be set in the iron cases with baked enamel finish. Gages shall be equipped with integral or separate siphons, and shall be connected by brass pipe and fittings with shut-off cocks.

22-11. SAFETY VALVES: Suitable pop safety valves shall be installed on the boiler and elsewhere as indicated on the drawings. The valves shall be set to open automatically and to relieve steam at manufacturer's recommended pressure for boilers and steam generators used. Safety valves shall conform to the requirements of the American Society of Mechanical Engineers Boiler Construction Code.

22-12. DRAIN: A drain consisting of a hose bib or a hose gate valve, as required, shall be installed at the lowest point in the return main near the boiler and at locations indicated on the drawings, or as required by the Engineer for the convenient and thorough draining of the system.

22-13. CONTROLS:

a. General:

(1) Steam-pressure Control: A fairly constant steam pressure shall be maintained within the boiler by means of a pressurestat which will cause the oil burner to start or stop automatically as the steam pressure drops below or rises above predetermined points.

(2) Safety Controls: A safety stack switch or an equivalent device shall automatically shut off oil burner in case the oil fails to ignite on starting. A low-water cutout shall prevent the operation of the oil burner whenever the water level within the boiler drops below a predetermined point.

b. Pressurestat: The pressurestat shall be of sturdy construction and shall be protected from dust or dampness. The pressure elements shall be in direct contact with the steam. The pressurestat shall operate on a one-pound differential.

22-14. COLD WATER CONNECTIONS: Cold-water connections shall be made to the water-supply system as approved by the Contracting Officer. Connections shall be made with galvanized steel pipe and galvanized malleable-iron fittings and shall include gate valve, strainer, check valve, and float-actuated valve. The float-actuated valve shall be located nearest the tank.

22-15. CONDENSATE PUMPING UNIT:

A. General: The condensate pumping unit shall be of the single (horizontal) shaft type, as shown on the drawings. The unit shall consist of one pump and one motor and a single

receiver, all mounted on a suitable cast-iron or steel base. The pump shall be of the centrifugal or turbine type, bronze-fitted throughout, with impellers of bronze or other corrosion-resistant metal as approved by the Contracting Officer. The pump shall be free from air-binding when handling condensate with temperatures up to 200 degrees F.. The pump shall be direct-connected to (a) suitable drip-proof or equally protected motor. The receiver shall be of cast iron or of not less than 3/16-inch-thick black iron or steel and shall be provided with all the necessary reinforced thread openings, including condensate return, vent, overflow, and pump-suction connections. Black iron or steel tanks shall have an approved rust-resistant coating on the inside. The vent pipe shall be galvanized steel, and the fittings shall be galvanized malleable iron. The vent pipe shall be extended through the roof as directed by the Engineer and shall be properly flashed. The pump, motor, and receiving tank preferably shall be mounted on a single base with the receiver piped to the pump suction.

b. Capacity: The condensate pumping units shall be capable of handling the load imposed on them by the boiler or steam generating units they supply.

c. Controls: The condensate pumps shall be provided with an approved float-actuated valve or water-feeder in the cold water make-up connection to the tank. The valve shall automatically open when the water drops to a predetermined level near the center of the tank. The condensate pumping unit shall be controlled automatically by a feed-water regulator on the boiler. The regulator shall contain one float and 2 float-actuated switches, and shall be provided with relays if necessary. One switch shall control the operation of the condensate pump by starting the pump when the water in the boiler reaches a predetermined low level, and by stopping the pump when the water reaches a predetermined high level. A second switch shall stop operation of the oil burner when the water level reaches the low danger point. A gate valve and a check valve shall be installed in the feed line between the boiler and the pump. The motor shall be provided with a magnetic across-the-line starter equipped with thermal-overload protection, and shall conform to the applicable requirements of Section 16 Electrical Work; Interior, of these specifications. The pumping unit shall be tested before shipment, and a certified copy of the test data for each pump shall be submitted to the Contracting Officer.

22-16. DEAERATING FEEDWATER HEATERS: Deaerating feedwater heaters shall be as per specification HN-2B-408.

22-17. HOT WATER STORAGE HEATERS:

a. Vertical: Furnish and install where shown on the drawings, vertical hot water storage heaters for operation with forty (40) pounds steam, complete with nonferrous steam coil, thermostatic steam valve, drip trap, thermometer, relief valve and drain valve. Each heater shall have storage capacity and water heating capacity called for on the drawings. The steam valves shall not be less than 1/2 inch for operation with forty (40) pounds steam.

b. Horizontal: Furnish and install where shown on the drawings, horizontal hot water storage heaters for operation with forty (40) and one-hundred (100) P.S.I. steam. The heaters shall have the storage capacity and water heating capacity called for on the drawings. The vessels shall be constructed in accordance with A.S.M.E. Code for unfired pressure vessels, and manufacturer's certificate to be furnished. The heaters shall have everdur metal shell, heads, and head port, welded to withstand a working water pressure of fifty (50) pounds. The heating section shall be of seamless drawn copper tubing with everdur metal or bronze tube sheet. Heater to be furnished complete with necessary appurtenances, i.e., relief valve, thermometer and temperature control valve, and standard cradles for mounting.

22-18. PIPING:

a. General: Pipe shall be cut accurately to measurements established at the building, and shall be worked into place without springing or forcing, properly clearing all windows, doors, and other openings. Excessive cutting or other weakening of the building structure to facilitate piping installation will not be permitted. All pipes shall have burrs removed by reaming and shall be so installed as to permit free expansion and contraction without damage to joints or hangers. All changes in direction shall be made with fittings except that bending of pipe up to and including 2 inches nominal diameter will be permitted provided a hydraulic pipe bender is used. Bent pipe showing kinks, wrinkles, or other malformations will not be acceptable. All boiler outlets shall be run full size to the main or header. All pipes extending through the roof shall be properly flashed. All horizontal mains shall pitch down in the direction of flow with a grade of not less than one inch in forty (40) feet. Piping connections to equipment shall be in accordance with details shown

on the drawings, or as directed by the Contracting Officer. All open ends of pipe lines or equipment shall be properly capped or plugged during installation to keep dirt or other foreign material out of the system. All pipe not otherwise specified shall be uncoated.

b. Connections to Equipment: All steam supply and return connections as required for equipment shall be provided by the Contractor unless otherwise shown on the drawings. Connections shall be made with malleable-iron unions. All valves and traps shall be installed in accordance with the manufacturer's recommendations, and in a manner acceptable to the Engineer. The size of the supply and return pipes to each piece of equipment shall not be smaller than the outlets on the equipment.

c. Welding (Option): All joints between sections of pipe and between pipe and fittings 1-1/2-inches and larger may be fusion-welded. The welding shall be in accordance with the recommendations of the American Welding Society. All changes in direction and intersections of lines shall be made with welding fittings except as otherwise specifically permitted hereinbefore. Mitering of pipe to form elbows, notching straight runs to form tees, or any similar construction will not be permitted. Welding fittings shall be installed on all welded lines.

d. Gaskets: Gaskets for flanged connections shall be of 1/16-inch-thick sheet asbestos.

e. Branch Connections: All branches shall be taken from the top of the supply mains at an angle of 45 degrees above the horizontal, unless otherwise indicated on the drawings. Branches from the return mains shall be taken from the top or side, unless otherwise indicated on the drawings. Branches shall pitch up from the mains toward the undrilled risers or utility connections with a grade of not less than one inch in ten (10) feet. All connections shall be carefully made to insure unrestricted circulation, eliminate air-pockets, and permit the complete drainage of the system. Any change in supply-main sizes shall be made through eccentric reducing fittings.

f. Risers: The locations of all risers shown on the drawings are approximate. The exact locations of the risers shall be as approved by the Contracting Officer.

g. Joints: All screw joints shall be made with tapered threads properly cut. Screw joints shall be made perfectly tight with a stiff mixture of graphite and oil, applied with a brush to the pipe threads only, and in no case to the fittings. All flanged joints shall be faced true, gasketed, and made up perfectly square and tight.

h. Anchors: Pipe anchors shall consist of heavy steel collars with lugs and bolts for clamping and attaching anchor braces unless otherwise shown on the drawings. Anchor braces shall be installed in the most effective manner to secure the desired results, using turnbuckles where required. No supports, anchors, and stays shall be attached in places where they will injure the construction either in installing or by weight or expansion of the pipe line.

i. Expansion Joints: Slip type, double-guided expansion joints shall be installed where indicated on the drawings or where directed by the Engineer. The joints shall be single or double slip joints, as required, and shall be designed to carry the weight of the expansion tubes by means of machined guides at both ends of the tubes. A gland will not be considered as a guiding element. The expansion tubes shall be fitted at one end with piston guides that are so designed as to prevent the wearing of grooves in the bearing surfaces. The body of each joint shall be of fine-grained gray cast iron. The expansion tubes shall be accurately machined and provided with a suitable protective plating. Each expansion joint shall have a traverse suitable for the application, but not less than four (4) inches for each slip. All joints shall be designed for a working pressure of 125 pounds per square inch gage.

22-19. STEAM TRAPS: Steam traps of the impulse type, of size as noted on drawings, shall be installed in locations as shown on the drawings and at any low point in steam mains that may be caused by field arrangement of piping. Trap stations shall be as detailed on drawings.

22-20. INSTALLATION OF VALVES:

a. General. Valves shall be installed at the locations shown on the drawings, where specified, and elsewhere as required for the proper functioning of the systems as directed by the Engineer. Gate valves shall be used unless otherwise shown, specified, or directed.

b. Thermostatic Regulating Valves: A thermostatic regulating valve, which will control the temperature of the

domestic hot water within the generator by regulating the steam supplied to the heating coil, shall be installed in the steam-supply line to each domestic hot-water generator. The regulating valves shall be designed for a working pressure of 125 pounds per square inch gage and shall operate at a pressure of approximately 40 and 100 pounds per square inch gage. The valves shall be adjustable, with an operating range of approximately 130 degrees F. to 190 degrees F. and shall be guaranteed to maintain the desired water temperature within plus or minus 5 degrees F.

22-21. STRAINERS: Baskets or "Y" type strainers shall be of same size as the pipe lines in which they are installed. The strainer bodies shall be heavy and durable, of the best-grade gray cast iron, with bottoms drilled and plugged. The bodies shall have arrows clearly cast on the sides to indicate the direction of flow. Each strainer shall be equipped with an easily removable cover and sediment basket. The basket shall be of not less than 0.025-inch-thick (22 gage) sheet brass, having perforations to provide a net free area through the basket of at least 4 times that of the entering pipe. The flow shall be into the basket and out through the perforations.

22-22. EXPANSION TANK, FLASH TANK AND HOT WATER STORAGE HEATER INSULATION: Unjacketed equipment shall be covered with 1-1/2-inch 85% magnesia blocks securely wired in place. The magnesia blocks shall be covered with 1/2-inch plastic troweled to a smooth finish and recovered with 8-ounce canvas neatly pasted on.

22-23. PIPE COVERING: Pipe covering for steam lines shall be of standard-thickness magnesia. All covering shall be held in place with brass strips not less than 3/4 inch wide. Strips shall be spaced to hold the center and ends of each section, and in no case shall the spacing exceed 18 inches. Valves and fittings, except unions and flanges, shall be covered with magnesia cement of the same thickness as the pipe covering. All plastic insulation shall be protected by means of cotton sheeting, weighing not less than 3.5 ounces per yard per 37-1/2-inch width, pasted neatly over the material.

22-24. ELECTRICAL WORK: All electrical control, signal, and protective devices required for the operation of equipment herein specified, shall be furnished under this section and shall be installed and connected as specified in Section 16 Electrical Work; Interior, of these specifications. Wiring diagrams indicating all required connections shall be furnished with the equipment and shall be approved by the Contracting Officer.

22-25. PAINTING AND FINISHING: All tanks and piping underground shall be protected with a heavy coating of approved gilsonite bearing enamel. Ferrous metal work not specified to receive finish painting shall be thoroughly cleaned and given one coat of asphalt varnish. Ferrous metal specified to receive finish painting shall be thoroughly cleaned and given one coat of asphalt varnish. Ferrous metal specified to receive finish painting shall be primed as specified in the "Painting" section of these specifications.

22-26. TOOLS: All tools necessary for the proper operation and maintenance of the boilers, pumps, and other equipment shall be installed in the boiler room in a manner acceptable to the Contracting Officer. Boilers shall be provided with a complete set of wrenches for the equipment, a steel brush for cleaning flue passes or tubes, and a smoke-pipe cleaner with a jointed handle of sufficient length to clean the entire breeching and smoke connections without dismantling the boiler. The wrenches shall be packed in a hardwood container.

22-27. OPERATION AND MAINTENANCE INSTRUCTIONS: Printed instructions covering the operation and maintenance of each item of equipment shall be posted at locations designated by the Contracting Officer. Upon completion of the work and at a time designated by the Contracting Officer, the services of a competent Engineer shall be provided for a period of not less than one day to instruct a representative of the Government in the operation and maintenance of the heating system.

22-28. TESTS: Before any covering is installed, the steam systems, including boilers and steam generators and fittings, shall be tested hydrostatically and proved tight under the following gauge pressure:

Medium-pressure lines	60 psi
Steam boiler and generators	150 psi

Upon completion and prior to acceptance of the installation, the Contractor shall subject the steam system to such operating tests as may be required by the Contracting Officer to demonstrate satisfactory functional and operating efficiency. Operating test shall cover a period of not less than 6 hours for each system, and all tests shall be conducted at such times as the Contracting Officer may direct. All instruments, facilities, and labor required to properly conduct the test shall be provided by the Contractor. Upon the satisfactory completion of the tests, a signed certificate of approval for the boiler shall be delivered to the Contracting Officer.

SECTION 23

DEHUMIDIFICATION, VENTILATION, AND REFRIGERATION

23-01. SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with the installation of the dehumidification, ventilation and refrigeration systems, complete, in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the contract.

23-02. APPLICABLE SPECIFICATIONS: The following specifications as latest amended form a part of this specification:

a. Federal Specifications:

T-T-911	Twine; Jute
AA-R- 211A	Refrigerators, Electric, Portable
HH-I-556	Insulation (Glass Fiber); Semirigid
HH-I-571a	Insulation (Vegetable or Wood-fiber); Blanket, Felt and Loose-fill
HH- T-101a	Tape; Friction
QQ-I-716	Iron and Steel; Sheet, Zinc-coated Galvanized
QQ-A- 356b	Aluminum-Alloy (AL-3) (Aluminum-Manganese); Bars, Rods, Shapes, and Wire
QQ-A-359a	Aluminum-Alloy (AL-3) Aluminum Manganese); Plates and Sheets
QQ-S-571b	Solder; Soft (Tin, Tin Lead and Lead Silver)
QQ-S-636	Steel; Carbon (Low Carbon), Sheets and Strips
SS-A-118	Acoustical-Units; Prefabricated
TT-V-51a	Varnish; Asphalt

- WW-N -351 Nipples, Pipe; Brass; Steel, and Wrought-Iron
- WW-P-460 Pipe Fittings; Bronze (Screwed), 125-and 250-pound
- WW-T-797 Tubing; Copper, Seamless (For general use with I.P.S. Flanged Fittings)
- WW-T-789 Tubing, Aluminum-Alloy (AL-61), (Aluminum-Magnesium-Silicon); Round, Seamless
- WW-T-799a Tubing; Copper, seamless (for use with Solder-joint or Flared Tube Fittings)

b. National Association of Fan Manufacturer's Code:

Standard Test Code for Centrifugal and Axial Fans

c. Air Conditioning and Refrigerating Machinery Association, Inc., Publication:

Equipment Standards

d. American Society of Refrigerating Engineers Circulars:

No. 14 Safety Code for Mechanical Refrigeration

No. 23 Standard Methods of Rating and Testing Refrigerant Compressors.

e. American Society of Mechanical Engineer's Code:

Unfired Pressure Vessels

23-03. GENERAL: The contract drawings indicate the extent and general arrangements of the Dehumidification, Ventilation, and refrigeration systems. If any departures from the contract drawings are deemed necessary by the Contractor, details of such departures and the reasons therefor shall be submitted as soon as practicable to the Engineer for approval. No such departures shall be made without the prior approval

of the Engineer.

a. Standard Products: The equipment to be furnished under this specification shall be essentially the standard product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the equipment need not be the products of the same manufacturer.

23-04. WORKMANSHIP: All labor shall be performed in a workmanlike manner by skilled mechanics, under supervision of a competent foreman.

23-05. PROTECTION: Materials and equipment used in this contract shall be protected from the weather. All material shall be protected against damage during erection. The open ends of all pipes, ducts, etc., when in place, shall be covered so as to exclude all dirt or foreign materials.

23-06. MATERIALS - GENERAL: When not otherwise definitely specified, or approved by the Engineer, materials shall conform to the applicable Federal Specifications and shall in general, and preferably, be the product of one manufacturer. When required by the Contracting Officer, a complete list of materials, fixtures and equipment, including manufacturer's names, addresses and catalog numbers shall be submitted.

23-07. MATERIALS AND EQUIPMENT:

a. Electrical Materials and Appliances: Electrical materials and appliances shall conform to the applicable specifications of section "Electrical Work; Interior", of these specifications.

b. Steel Sheets: Galvanized iron and steel sheets shall conform to the requirements of Federal Specification QQ-I-716, Class D-1.

c. Aluminum Sheets shall conform to the requirements of Federal Specification QQ-A-359a.

d. Mechanical Equipment: All items of mechanical equipment shall be of the best quality used in commercial practice, and shall be the products of a reputable manufacturer. Each major component of the equipment shall have the manufacturer's name on a plate securely affixed in a conspicuous place. Belts, pulleys, couplings, projecting set screws, keys, and other rotating parts, located so that any person may come in close proximity thereto, shall be fully

enclosed or properly guarded.

e. Pipe and Pipe Fittings:

(1) Copper tubing: Copper tubing shall conform to the requirements of Federal Specification WW-T-799a, Types "K" and "L" as hereinafter specified.

(2) Refrigerant Valves and Fittings: Refrigerant valves and fittings shall be of the standard Soldered-joint pattern and shall be designed for a working pressure of 300 p.s.i.

(3) Unions (300 pound): Unions for refrigerant lines shall be of cast or wrought bronze or of wrought copper, shall be soldered-joint as hereinafter specified.

(4) Aluminum tubing: Aluminum tubing shall conform to the requirements of Federal Specification WW-T-789, and as hereinafter specified (63S-T6).

(5) Aluminum Fittings: Aluminum fittings shall be of standard pattern and shall be made of 63S-T6 aluminum.

f. Pipe Covering:

(1) Glass-Fiber Pipe Covering: Glass-fiber pipe covering shall conform to the requirements of Federal Specification HH-I-556, Type 1.

(2) Hair Felt: Hair felt blanket for pipe covering shall conform to the requirements of Federal Specification No. HH-I-571a.

g. Duct Lining: Duct lining shall conform to the requirements of Federal Specification SS-A-118, type VIII, Class HH, and shall be odorless, vermin-proof and fire-retardant.

h. Insulation: Insulation shall be semi-rigid glass fibre blocks conforming in the requirements of Federal Specification HH-1-556, Type Iv.

23-08 PIPING-GENERAL: All piping shall be cut accurately to measurements established at the jobsites and shall be worked into place without forcing or springing. All piping shall follow the general arrangement indicated on the drawings, care being taken to avoid interference with all other

trades. All exposed piping shall be run parallel with the lines of the building unless otherwise indicated on the drawings.

23-09. CONNECTIONS TO EQUIPMENT: All refrigerant connections required for equipment shall be provided by the contractor unless otherwise shown on the drawings. Connections shall be made with wrought-copper unions. All valves shall be installed in accordance with the manufacturer's recommendations, and in a manner acceptable to the Engineer. The size of the supply and return pipes to each piece of equipment shall not be smaller than the outlets on the equipment.

23-10. FREON PIPING AND VALVES: Piping shall be type "L" hard drawn copper tubing conforming to Federal Specification WW-T-799. Shut-off valves, up to and including 1-1/8 inches O. D. shall be diaphragm packless type with metal back seat, having sweat tube connectors. Valves 1-3/8 inches O.D. and larger shall be similar to Henry type No. 2000, with seal cap.

a. Joints in Copper Tubing. Tubing shall be cut squarely and all burrs removed. The tubing shall be thoroughly cleaned with sand paper, sand cloth, or steel wool after which a thorough coating of paste flux shall be applied. Joints shall be made with soft solder which shall completely fill the joint.

b. Fittings for Copper Tubing. shall be socket pattern, solder joint fittings. The solder used shall be of the composition recommended by the tubing and fitting manufacturers for the service and the flux used shall be of not less than 300-pound class.

c. Drain Piping from dehumidification units shall conform to paragraph 13 of plumbing, section 18 of these specifications.

d. Provision for Expansion: All piping shall be so installed as to provide for expansion and contraction and so as to be free from pockets caused by sagging.

e. Screwed Joints: All threaded joints shall be made tight, aluminum to aluminum, using, for lubricant, "Alcoa" thread lubricant used on the male thread.

f. Reaming: Ream out all pipe ends, up-end pipe and rattle before installing.

g. Running of Pipes: Risers of vertical pipes shall

be plumb, straight and have no unnecessary fittings or offsets. All mains and branches, not otherwise shown, shall be installed parallel or at right angles to building walls or partitions.

(1) Headroom: All refrigerant piping suspended from ceilings shall be kept as close to the ceilings as possible.

h. Interference: No piping shall be installed in a manner that will interfere with the necessary passage or headroom or with the operation of any doors. Where pipes interfere with ducts said pipes shall be removed where practicable. Where such removal is not practicable, the Engineer may suggest other methods of avoiding the interference.

i. Pipe Sleeves: At points where pipes pass through walls, ceilings, etc., provide and install sleeves as follows:

For pipes passing through masonry or concrete, construction sleeves shall be wrought pipe. For pipes 3-1/2 inches and smaller, sleeves shall be two pipe sizes larger than the pipe enclosed; for 4-inch and larger pipes, sleeves shall be one pipe size larger than the pipe.

The Contractor shall set all sleeves in place and he shall cooperate with the Mason Contractor so that in the case of sleeves set in concrete work, they shall be set in place at the proper time.

Note that where so called for on the drawings the pipe covering shall be run continuous through the sleeve and sleeve shall be proper size to permit the pipe covering to pass through.

j. Sleeve Packing: Unless otherwise noted, sleeves around pipes shall be packed from end to end with asbestos rope, after pipes are in place.

k. Pipe Hangers and Supports: This work comprises all necessary pipe hangers and supports, together with plumbers tape, bolts, nuts, washers, shot bolts and other accessories required.

(1) 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 ten (10) feet.

23-11. PIPE COVERING: Pipe covering shall be applied after the refrigerating systems have been tested and proved tight and after the piping has been thoroughly cleaned and dried. Refrigerant suction lines within the refrigerated space and refrigerant suction lines outside the refrigerated space, shall be covered in accordance with the diagrams shown on the drawings.

23-12. FAN EQUIPMENT: General: The fan equipment shall consist of all fans, together with accessories for same, fan motors, motor starting equipment and drives.

Unless otherwise specified or called for on the drawings, housings, wheels, etc., shall be of the material standard with the fan manufacturer and apparatus shall be as described below:

a. Centrifugal Fans: Multiblade or multivane types of fans shall be of the direction of rotation and angle of discharge required and shall be full housed, single width, unless otherwise scheduled on the drawings. They shall be of sturdy construction and quiet in operation.

Side plates shall be properly braced and reinforced, wheels shall be perfectly balanced and the fans must operate without vibration.

Unless otherwise called for, fans shall be of the two bearing, overhung pulley design, arranged for and provided with belt drives.

Fan bearings shall be of the babbitted, sleeve type, and shall be provided with the necessary oiling or greasing cups located in easily accessible locations. Where required by Code, lubricating cups shall be outside fan casings and shall be piped to the bearings.

b. Disc or Propeller Fans: Disc or propeller fans shall be complete and shall be directly connected to electric motors unless otherwise called for. They shall be complete with all necessary fan and motor supports, wall ring and other accessories, and shall be quiet in operation and free from vibration.

c. Power Roof Exhaust Fans: Roof exhaust fans shall be of aluminum construction, complete with weather-proof cap. Capacity of fans shall be as shown on the drawings, and all fans shall be driven by an adequate electric motor, through V-belt drive of 50% over motor rating. Motor

shall be mounted outside air stream and protected by weather hood easily removable for servicing and inspection. Fan shaft to be stainless steel, mounted on ball bearing pillow blocks. Fan blade to be of heavy gauge aluminum, adequately reinforced for maximum rigidity.

d. Fan Motors: Unless otherwise called for on the drawings, fan motors shall be of the constant speed type, fungus and moisture proof.

e. Non-Sparking Wheel: Fans shall be provided with the wheel shell (blades, rims, backplate) constructed of aluminum and the hub of bronze, as shown on the drawings.

23-13. AIR FILTERS: Unless otherwise called for on the drawings, air filters shall be of the cell type, assembled in the number of cells and arrangement indicated on the drawings. They shall be of non-combustible construction and shall be approved by Underwriters for the service for which they are to be used.

Cells shall be of the cleanable type, as required. Filters shall be of the type using Herringbone-Crimped-Aluminum Screen as a filtering medium and aluminum frame.

23-14. DEHUMIDIFICATION UNITS: General: Furnish and install in the locations shown on the drawings a self-contained dehumidification unit complete with compressor, reheat coil, cooling coil, automatic control, fan motor drive, filters, casing, dry coil condenser and accessories, all in demonstrated operating condition. The units shall be as specified in Specification No. HN-2H-411 and in Specification No. HN-2H-413 or equal as approved by the Engineer.

23-15. MULTIPLE BELTS AND BELT GUARDS:

a. Multiple Belts: Multiple belts shall be of the V-belt type and the belts shall have the proper number of adequate size belts for the service. Belt drives for motors shall have a rated capacity of not less than 150% of the motor rating.

Sheaves shall, unless otherwise specified, be cast iron of the size and type required by the speed ratio, the horsepower and the type of belt.

b. Belt Guards: Each belt drive, not otherwise provided for, shall be provided with a guard completely housing in all belts and pulleys. Unless otherwise called

for, belt guards shall be 3/8-1/2 H Aluminum.

Belt guards shall be constructed with an aluminum angle or channel frame, shall be properly reinforced and shall be adequately supported and securely fastened in place to prevent vibration.

Opposite the end of each of the driving and the driven shaft, provide a suitable opening with swing flap cover.

23-16. ELECTRIC MOTORS AND STARTERS - General: All motor starting equipment furnished by this contractor shall be delivered by him to the Electric Wiring Contractor, who will install same and will also install all electric wiring to and between starters and motors and make the necessary electrical connections thereto.

a. Electric Motors: All motors shall be of ample capacity to drive the apparatus to which they are connected without overload. They shall be of the speed and type required and shall be provided with the proper sized sheaves, pulleys or flexible couplings, as required. Motors shall, unless otherwise called for, be designed and constructed in accordance with the N.E.M.A. specifications for 40°C. temperature rise, continuous duty rating.

Motors of 1/3 HP and less rating shall be suitable for operation on 120-volt, single phase, 60 cycle current; larger sizes shall be suitable for operation on 3 phase, 220 volt, 60 cycle, unless otherwise called for on the drawings.

Each motor shall be provided with suitable starter.

Motors equipped with belt drive shall have slide rails and adjusting screws.

b. Explosion Proof Apparatus: In all locations where so called for on the drawings, motors and starters shall be of the explosion-proof type.

c. Starters shall be provided with thermal overload relay protection. This includes toggle switches.

Starters for motors 1/3 HP and smaller shall consist of a toggle type switch, unless automatic starters are called for on the drawings.

Starters for motors over 1/3 HP, not requiring automatic operation, shall consist of magnetic switch of the proper number of poles and shall be arranged for push-button oper-

ation. Push-buttons shall be of the type required and shall be either mounted in the cover of the starter or separate, as required.

For automatic operation, starters shall be actuated by suitable regulators, float switches, etc., with or without auxiliary push-buttons, as required.

Unless otherwise required or specifically called for, starters shall be similar to G.E. CR7006 Series, of the type called for, and of equal standard of construction.

23-17. VIBRATION INSULATION: General: Vibration insulation shall be of the type called for on the drawings and shall be fabricated and installed in accordance with the recommendations of the manufacturers.

a. Vibration Insulating Bases: For fan units, and other similar apparatus, vibration insulation shall be effected by means of bases or pads using rubber in shear as the insulating medium. In the case of belt-driven fan units, and other similar apparatus, the insulating bases shall be so designed and of sufficient size as to accommodate both the fan, or other driven apparatus and the driving motor.

Special insulation against transmission of noise and vibration shall be provided as called for on the drawings.

23-18. SHEET METAL WORK: General: The sheet metal work shall comprise the duct work, filter casings, fan inlet chambers, and all other incidental work from the fresh air inlets of the supply fans to the various openings for admission of air into the various rooms or portions of buildings, in the case of supply systems, and, in the case of exhaust systems, from the exhaust hoods or other inlets to the discharge openings from the building. This work shall also include metal roof ventilators, together with all manually operated dampers required and all registers, grills, diffusers, bird screens, louvers and all necessary supports, hangers, and other accessories incidental thereto.

Sheet metal work shall be of aluminum or galvanized sheet steel. Unless otherwise called for on the drawings, aluminum shall be used.

23-19. WORKMANSHIP: All sheet metal work shall be so installed as to be commercially tight, unless called for to be in excess of this requirement, and shall be put together with Pittsburg joints.

Rectangular ducts larger than 16-inch by 12-inch shall be stiffened by paneling and by joining sections together with standing seams. The sections of smaller ducts shall be bent back at the ends and shall be jointed together with drive cleats. Drive cleats shall be flattened after installation and shall have the ends bent over around the side of the duct.

In all cases, corner pieces are to be installed at all joints between duct sections.

All ducts and other sheet metal work shall be so fabricated and installed as to entirely eliminate noise and vibration.

In all cases where aluminum strap hangers are used for support of ducts, they shall be of sufficient length to extend beyond the bottom of the duct, not less than two (2) inches for ducts not over twelve (12) inches wide, and not less than three (3) inches for larger ducts, and these extended ends shall be bent horizontally around the duct, underneath, and hangers shall be securely fastened to sides and bottom of duct by bolts or metal screws.

Where shown on the drawings, ducts supported by means of trapeze hangers made of aluminum, structural angles or channels, as required, with the necessary suspension rods, spaced as required. Bottoms of ducts shall be securely fastened to angles.

Offsets, turns or branches in ducts of circular cross section shall be made with a minimum "inside" radius of not less than the diameter or width of the duct unless otherwise shown on the drawings. In the case of rectangular ducts, elbows are to be square and branches shall be taken off at 45° angles to the width of the duct, using prefabricated, factory-made deflecting vane units, with vanes of proper thickness to compensate for difference in areas so as to maintain substantially constant air velocities.

Note that rivets, bolts, reinforcing angles, corner pieces, etc., shall be of aluminum for aluminum duct work, etc. Hangers and supports, if of different material, shall be protected against contact with the duct, as hereinafter provided for.

For all registers and/or grilles attached to sheet metal work or set in unplastered masonry walls or partitions, provide and install the necessary channel, or aluminum angle frames, of suitable design. In the case of walls or partitions,

frames shall be fastened by means of suitable screens with water-proofed fiber expansion shields, or plugs, and shall be so installed that grille or register is held tight against the face of the walls, or partition, and covers the joint between the frame and masonry.

Registers or grilles shall be securely attached to frames by means of countersunk head cadmium plated machine screws.

23-20. VENTS: Where indicated on the drawings oil-fired Mess Hall and Bakery equipment shall be provided with a separate vent pipe of size and height recommended by the manufacturer, but in no case shall the top of vent be less than two (2) feet above the roof. Each vent shall be constructed of 16-gauge 260 aluminum and shall be complete with roof jack, cap, braces, and guy wires. The roof jack shall be fitted to the smokepipe and made watertight.

23-21. PROTECTION AGAINST ELECTROLYSIS: Wherever two dissimilar metals are joined together, as for example, aluminum and galvanized iron, they shall be adequately and permanently protected against contact from each other in an approved manner. In such cases, the bolts, rivets, etc., shall be as used for the metal which would frame the positive terminal of the couple, i.e., for the aluminum-galvanized steel combination of the bolts, rivets, etc., shall be of aluminum or cadmium plated.

23-22. GAUGES OF Metal: The gauges of all 3S-1/2 H sheet aluminum used in connection with sheet metal work shall be as indicated on the drawings.

23-23. VOLUME DAMPERS: Volume dampers shall be installed at each branch of the duct system and elsewhere where shown on the drawings and where required for the proper control of the flow of the air in both the supply and the exhaust systems.

Where shown on the plans and otherwise where required, these dampers shall be in the form of deflecting dampers, or splitters. Splitters are to be of such size as to completely close the branch duct, if necessary. Dampers shall be firmly and securely attached to spindles.

Each of the dampers, except where special devices are required or called for on the drawings, shall be provided with an approved damper adjusting device. All adjusters shall be properly and securely fastened to the duct or wall surface, as required, and to the damper. They shall be of such size and construction as to firmly hold the damper in position without permitting it to vibrate or rattle.

23-24. AUTOMATIC RELIEF OR BACKDRAFT DAMPERS shall be self-closing, arranged so that air may be exhausted to the outside, but air cannot be drawn in or blown in. Dampers shall consist of aluminum louver blades having axis near the top of blade, all mounted in heavy aluminum frame. Louver shall not exceed 36-inches in length and not more than 6-inches high. Where damper width is greater than 36-inches the damper shall have intermediate blade supporting member.

23-25. FUSIBLE LINK DAMPERS: At each location where required by the Codes and regulations of the National Board of Fire Underwriters and/or by any other competent authority having jurisdiction, there shall be installed a fusible link damper of approved type. Adjacent to each such damper there shall be provided a proper access door with substantial hinges and catch.

23-26. SCREENS: Screens shall be installed in each location indicated on the drawings and at each supply or return air, or vent, opening in connection with the supply or the exhaust systems of ventilation which is not otherwise provided for.

Screens shall be of 1/2-inch mesh, and if ferrous, of No. 12-gauge steel wire set in a substantial channel frame. Screens shall be fastened in place by means of substantial hinges and positive-acting, substantial catches.

23-27. ACCESS DOORS: All necessary access doors shall be provided in fan casings, etc. Doors shall be constructed of aluminum sheet, braced with aluminum angle, set in aluminum angle frames, complete with hinges and double latch fastenings capable of being operated from inside as well as outside. All joints shall be close fitting and airtight. Sizes of doors shall be as called for on the plans.

23-28. METAL ROOF VENTILATORS:

a. Gravity Roof Ventilators; Shall be of the sizes indicated on the drawings. Ventilators shall be 20-gauge (.032) aluminum. They shall be complete with roof jacks which shall be adapted to the conditions required.

23-29. FLEXIBLE CONNECTION: At inlet and outlet of each fan or unless otherwise shown on the drawings, provide and install a flexible connection of heavy asbestos cloth. Connections shall be at least six (6) inches long and shall be attached to aluminum angle frames on inlet and outlet of each fan and to similar frames on duct or casing, by means of

aluminum band, or collar, fitting over the end of the flexible connection and bolted through aluminum angle frame so as to clamp the asbestos cloth securely between the aluminum band and the angle frame.

23-30. DUCT INSULATION: All dehumidification air supply insulation ducts, if called for on plans or ordered by the Engineer, shall be covered with fibrous glass semi-rigid insulating board, applied to the duct with #10x1-1/2-inch cadmium plated sheet metal screws with 1-1/2 inch diameter aluminum washer. Screws and washers shall be attached close to the edge of duct for greatest support and not more than one screw per square foot of insulation shall be used. 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 shall be used without thinner added.

23-31. FLASHINGS shall be furnished and installed for all ducts and vents passing through roofs. Flashing and counter flashing shall be 24-gauge aluminum. Joints in each flashing shall be made waterproof by soldering but there shall be no soldering between the two flashings.

23- 32 AIR OUTLETS:

a. Grilles and Registers: Supply and exhaust grilles and registers of the sizes indicated on the drawings shall be installed. Unless otherwise indicated or specified, supply grilles shall have 1/2-inch wide vertical adjustable bars in front and horizontal adjustable louvers behind. Where indicated or specified, supply grilles shall also be provided with adjustable extractors or volume controls. These shall be key operated, unless otherwise indicated. Exhaust or return grilles shall be of the plain lattice design. All grilles and registers shall be substantially constructed of steel or aluminum and shall have angle frames with felt gaskets as called for on the drawings. All grilles and registers shall be painted with factory applied aluminum paint.

b. Ceiling Diffusers of the sizes indicated shall be installed. They shall be factory made and of a type causing diffusion of small streams of air set at opposing angles. There shall be no objectionable noise in a quiet room with outlet velocities as high as 1200 feet per minute. Where indicated the diffusers shall be combination supply and return. Each diffuser shall be provided with a ceiling flange and unless otherwise specified the finish shall be aluminum. All diffusers shall include an adjustable volume control.

23-33. SPECIAL MATERIAL FOR DUCT CONSTRUCTION FOR SCIENTIFIC STRUCTURES:

a. Flexible Metal Tubing shall be air tight under moderate pressure. Tubing shall be constructed of galvanized steel and shall have asbestos packed joints. Tubing size shall be as indicated on the drawings.

b. Light wall Steel Pipe where indicated on the drawings shall be constructed of 10 gauge galvanized steel.

c. Seamless and Welded Steel Pipe shall conform to American Standard specifications for seamless and welded steel pipe and shall be the size and schedule as indicated on the drawings.

d. Slip on Flanges shall be forged steel with 125 pound or 150 pound American Standard drilling. Size and flange drilling shall be as indicated on the drawing.

e. Welding Neck Flanges shall be 300 pound forged steel of the size indicated on the drawing.

f. Blind Flanges shall be the proper size and rating to match the mating flanges as indicated on the drawings.

g. Wall Fittings shall be cast iron flange and flange or flange and spigot of the size and type indicated on the drawings. Flanges shall be American Standard 125 pound drilling.

h. Butterfly Valves shall be W.S. Rockwell, or approved equal, normally open, with solenoid trip valve for operation on 110 Volt, 60 cycle current. Valves shall be constructed of cast iron suitable for high humidity salt air at atmospheric temperature, but not to exceed 150°F. Leakage shall not be over 1/2 of 1%. Valve flange drillings shall be 125 pound or 150 pound American Standard as indicated on the drawings. Working pressures shall be as indicated on the drawing and shall be legibly marked on each valve.

23-34. CLEANING: 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.

23-35. OPERATION AND MAINTENANCE INSTRUCTIONS: Printed instructions covering the operation and maintenance of each item of equipment shall be posted at locations designated by the Contracting Officer, the services of a competent engineer shall be provided for a period of not less than one day to instruct a representative of the Government in the operation and maintenance of the dehumidification and refrigeration systems.

23-36. TESTING AND CHARGING: Testing: The Contractor shall test all refrigerant piping for leaks with 150 pound air pressure. After all leaks have been eliminated, the system shall be thoroughly blown out and all scale and foreign material removed. The air shall be evacuated and the piping dehydrated after which it shall be tested with "Freon-12" gas. The tests shall conform to A.S.R.E. Test Code for refrigerating systems, and to the satisfaction of the Contracting Officer.

a. Charging. The refrigerating system shall be charged with a full operating charge of "Freon-12", as indicated or specified. Should any or all of the initial charge be lost through leaks, defective materials or workmanship, the system shall be fully recharged.

23-37. REGULATING AND ADJUSTING: The Contractor shall regulate all apparatus and equipment so as to accomplish the results set forth herein. The Contractor shall also adjust all dampers and volume controls so as to proportion the air distribution in accordance with the air quantities shown on the drawings. The static resistance set forth in this specification have been carefully computed but may not be the same as the resistances actually developed on the job. Therefore, if it becomes necessary to change the fan speeds in order to get the required air quantities, the Contractor shall make such changes, in the presence of the Contracting Officer and with his approval.

SECTION 24

SANITARY SEWERS

24.01. GENERAL REQUIREMENTS:

a. The work covered by this section of the specifications consists in furnishing all labor, materials, 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.

b. Excavation and backfilling shall conform to the "Earthwork for Utilities" section of these specifications.

24-02. MATERIALS: Except as otherwise shown on the drawings or hereinafter specified, materials shall be as follows:

a. Vitrified clay pipe and fittings shall be bell and spigot type standard strength clay sewer pipe of sizes and types of fittings called for, and shall be in accordance with A.S.T.M. Designation C 15-44T "Standard Strength Clay Sewer Pipe."

b. Corrugated metal pipe and fittings where shown for sanitary drainage or sewage disposal, shall be of sizes and types called for, and shall be 16 gauge, galvanized iron, asbestos bonded double asphalt dipped, similar and equal to "Armco".

c. Cast iron soil pipe and fittings shall be of sizes and types called for and shall be in accordance with Federal Specification No. WW-P-401.

d. Prefabricated sewer manholes shall be fabricated of corrugated galvanized iron, asbestos bonded double asphalt dipped, and shall be of sizes called for. Each manhole shall be equipped with a cast iron ring and cover, a galvanized iron ladder, and all required clips, bolts, nuts, etc., required for installing manhole and accessories. Manholes, covers and ladders shall conform to Specification No. HN-9B-503 as contained in Appendix "A" to these specifications.

e. Floor drains shall be cast iron with spigot type outlet and brass strainer, and shall be similar and equal to "Josam No. 304".

f. Plugs and caps shall be of sizes shown or required and shall be cast iron. Plugs and caps shall conform to the American Water Works Association Standard Specifications and shall be similar to "Clow" Type F-600.

g. Joint packing shall be jute, oakum or hemp of suitable approved types.

h. Mortar, concrete and forms used in the work shall conform to the provisions of the "Concrete and Form Work" section of these specifications. Concrete and mortar proportioning shall be as directed by the Engineer.

#### 24-03. PIPE LAYING:

a. 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. Note stipulations regarding bottom of trench for clay pipe as contained in the "Earthwork for Utilities" section of these specifications.

b. 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.

c. 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.

24-04. ALIGNMENT :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.

#### 24-05. BRANCH CONNECTIONS:

a. "Branch connections" shall be interpreted to mean branch sewers laid from main sewers to points indicated on the drawings to which sewer service is to be connected.

b. 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.

c. "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 eighth bends. Upper end of branch connection sewers shall be tightly closed with a suitable stopper.

d. Cutting into pipe for connections shall not be done except in special cases approved by the Engineer.

24-06. JOINTING:

a. 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.

b. 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.

c. 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.

24-07 MANHOLES:

a. 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. Ladders, as hereinbefore specified, shall be securely attached to the manhole frame, shall be not less than 14 inches wide and of sufficient length to provide easy access to the manhole.

b. 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.

c. 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.

24-08. 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.

24-09. CORRUGATED METAL PIPE:

a. Material: Corrugated metal pipe shall be as specified in paragraph 24-02 b, preceding.

b. 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.

c. Pipe Laying: The stipulations regarding excavating, backfilling and shaping of trench bottom for clay pipe as contained in the "Earthwork for Utilities" section of these specifications, shall here apply.

d. Pipe shall be laid with longitudinal seams at the sides or quarter points, never at the top and bottom.

e. 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 shall then be brought to within an inch of the first length so that pipe and band corrugations match. The band shall then be opened, and slid over the joint, and tightened; being tapped lightly at the same time. Caulking material shall be placed between bands and pipe.

24-10. OUTFALL SEWERS: Outfall sewer sections required to be placed under water shall be made up in the required length with the discharge end tightly capped. The section shall then be floated into the designated position, the cap removed, and the pipe allowed to sink into place.

24-11. TESTS: Every precaution shall be taken to insure that completed sewer lines are leak-proof. Contractor 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.

24-12. RECORD DRAWINGS: As provided in Part II, Special Conditions, the Contractor shall maintain 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.

## SECTION 25

### FRESH AND SALT WATER DISTRIBUTION SYSTEMS

#### 25-01. GENERAL REQUIREMENTS:

a. The work covered by this section of the specifications consists in furnishing all labor, materials, 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.

b. Excavation and backfilling shall conform to the "Earthwork for Utilities" section of these specifications.

25.02 MATERIALS: Except as otherwise called for on the drawings or hereinafter otherwise specified, materials shall be as follows:

a. Asbestos-cement pipe and couplings shall be in accordance with Federal Specification No. SS-P-351 for Class 150. Couplings shall be pipe manufacturer's standard with rubber ring type gaskets. The pipe shall be finished with plain ends machined to receive the couplings.

b. Cast iron pipe shall be in accordance with Federal Specification No. WW-P-421; Pipe; Water, Cast-Iron (Bell and Spigot) Class 150.

c. Cast iron fittings. All cast iron fittings including elbows, tees, wyes, reducers, etc., for salt and fresh water distribution shall conform to the American Water Works Standard specification for Class 150#, and shall be all-bell type.

d. Steel pipe shall be in accordance with Federal Specification No. WW-P-406; Pipe; Steel and Ferrous Alloy (For) Ordinary Uses (Iron-Pipe Size), Class A. Pipe shall be black or zinc-coated as called for.

e. Concrete pipe used to form salt water wells at the salt water pumping stations shall conform to A.S.T.M. Designation C 75-41; Reinforced Concrete Sewer Pipe. Pipe shall have steel longitudinal and circumferential reinforcement and shall successfully withstand a "D" test load of 1,000 under the (3) edged bearing test prescribed in the foregoing Specification.

f. Corrugated metal pipe and fittings forming salt water intake lines to salt water wells shall be 16 gauge galvanized iron, asbestos bonded double asphalt dipped, and shall be similar and equal to "Armco".

g. Plugs and caps shall be of cast iron, shall conform to the American Water Works Association Standard specifications, and shall be similar to "Clow" Type F-600.

h. Valve box caps and casings. Valve box caps shall be of cast iron, heavy duty, street type, long body, with cover designated "F.W." for fresh water and "S.W." for salt water; and shall be similar and equal to Alhambra Foundry Company Series No. 29600. Casings shall be 10 gauge galvanized iron.

i. Cast iron flanged fittings, including elbows, tees, reducers, etc., shall conform to American Standard (B-16.1-1948) for Class 125# including drilling.

j. Flanges: All flanges shall be forged steel welded, slip-on type with flat face and shall be in accordance with American Standard (B-16.1-1948 for Class 150#, drilled. Flanges shall be similar to Crane No. 554.

k. Joint Compound: All joints for fittings on salt or fresh water pressure lines shall be compounded sulphur joints. Joint compound shall be "Hydro-Tite" or approved equal.

l. Flanged Couplings for pressure lines. Flanged couplings for fresh or salt water pressure lines shall consist of two (2) steel flanges, a middle ring of specified thickness and length, two (2) rubber gaskets, and the necessary bolts and nuts. The coupling shall insure permanently tight joints under reasonable conditions of expansion, contraction, shifting and other trench conditions. Couplings shall be similar and equal to Dresser Style No. 38 or Baker Company.

m. Screwed fittings shall conform to American Standards Association (hereinafter referred to A. S. A.) specifications for standard 125# fittings, pipe threads to be American Standard.

n. Copper pipe and fittings. Copper service pipe shall be seamless copper pipe suitable for use as underground service connections. Pipe and fittings shall conform to Federal Specification No. WW-T-799 for Type "K". Fittings shall have I.P.S. threads.

o. Special unions. Unions for coupling copper tubing to threaded fittings shall be brass, copper pipe to male I.P.S. threads, and shall be similar and equal to Jones No. J-1531.

p. Machine bolts and nuts: Machine bolts shall be threaded American standard and shall conform to A.S.A. B 1 specification for cold rolled steel. Nuts shall be hex nuts, machined, and threaded to suit bolts.

q. Gaskets shall be 1/16 inch thick sheet asbestos, full faced gaskets suitable for use with 125# flat faced flanges and shall be "Durabla" or approved equal.

r. Service clamps: All service clamps shall be brass service saddles, tapped with standard pipe size threads to sizes designated or required, with two (2) flat bronze straps and rubber gasket. Clamps shall be designed to fit on asbestos-cement pipe, Class 150#.

s. Branch water connections: All branches for salt and fresh water connections shall be brass, with inlets and outlets of sizes designated; and shall be similar and equal to Jones James Compaany, Type J-1601.

t. Corporation stops: All corporation stops shall be brass with I.P.S. threaded inlets and copper to copper outlets of sizes designated; and shall be similar and equal to Jones Type J-1505.

#### 25.03. VALVES:

a. Gate Valves: All gate valves, flanged or hub ends, shall be iron body, double disc, brass trimmed, conforming to the American Water Works Association (A.W.W.A) Standard specifications for 150# Class.

b. Check Valves: All check valves, flanged, or hub ends, shall be cast iron body, swing check valves, brass trimmed. Hub end valves shall be Class "D" and flanged end valves shall be American Cast Iron flange, conforming to the Code for Pressure Piping, American Standard specifications (B-16.1-1948) for Class 125#. (Hereinafter referred to as "American Standard").

c. Foot Valves shall be cast iron body, brass disc, brass trimmed, with basket shaped brass strainers, flanges drilled for American Standard Vertical Type; and shall be similar and equal to "Clow" F-3044 or Crane No.395-1/2.

d. Air Release Valves: All air release valves shall be screwed type, without vacuum breaker, heavy cast iron body, extra heavy copper float, bronze trimmed, similar and equal to Renssler #371.

e. Magnetic Valves: All magnetic valves shall operate in cold salt water at a maximum pressure of 40 p.s.i.; valves normally closed with electric contacts normally open. Shall be for pipe size (1" I.P.S.), coil voltage 115, coil size 300, and similar and equal to Mercoid (K-15-3).

f. Globe and Needle Valves: All globe and needle valves shall be screwed brass valves conforming to American Standard specifications for Classes 125# and 150#.

25-04. FLOATROLS: All floatrols shall be single float operated, with sequence control for pumping into and out of tanks. Parts shall be similar and equal to the following:

a. Case shall be machined cast aluminum inclosure, rustless and non-corrosive.

b. Shaft shall be stainless steel.

c. Bearings shall be Chrysler oilet bearings.

d. Gears shall be totally inclosed dustproof, cut gears of the correct ratio for operation of float within limits described herein.

e. Cams shall be duraluminum tripping cams with stainless steel rollers and hardened set screws.

f. Float shall be (4-1/2" diameter) ceramic float suspended from a stainless steel tape, float to have sufficient weight to prevent tape from sticking due to accumulation of salt water impurities.

g. Travel: The total float travel between high and low level shall be (3'-0"), switch shall be moisture-proof and fungus-proof for operation at two (2) levels. Switch shall be similar and equal to Automatic Control Company Type SW-2.

25-05. AUTOMATIC AND PROPORTIONAL FEED APPARATUS: Automatic and proportional feed apparatus shall be in accordance with specification No. HN-9B-504, as contained in Appendix "A" to these specifications.

25-06. TANKS: All elevated water tanks for salt and fresh water storage (capacities 100 to 1000 bbl) shall be of bolted steel construction in accordance with U. S. Navy, Bureau of Yards and Docks Stock No. 2871-59. The engineer may approve the use of available tanks located at the jobsite if they are suitable for the use intended.

25.07. WATER SUPPLY PUMPS: Water supply pumps shall be of types and capacities as called for in specification No. HN-9B-502 as contained in Appendix "A" to these specifications.

25.08. CENTRIFUGAL PUMPS shall conform to specification No. HN-9F-505 as contained in Appendix "A" to these specifications.

25.09. FIRE PUMPS shall be in accordance with specification No. HN-9CDE-506 for "Semi-Portable Gasoline Engine Driven Fire Pumps" as contained in Appendix "A" to these specifications.

25.10. FIRE HYDRANTS: All fire hydrants shall be California type with one - 2-1/2" and one - 4-1/2" hose outlet, with 6 inch inlet, and 30 inch "bury" for cast iron pipe. All threads shall be National Standard threads. Hydrants shall be tapped for 2" pipe connection in top with plug. Hydrants shall be similar and equal to Greenberg #75.

25.11. PRESSURE GAUGE DIAL: All pressure gauge dials shall be standard 4-1/2" diameter with dial readings from 0 to 60 lbs. Dials shall be similar and equal to Crane #160.

25.12. PRESSURE CONTROL SWITCHES: All pressure control switches shall have an operating range from 0 to 35 p. s. i., a pipe size of 1/4" I.P.S., with electric contacts normally closed. Unit shall be in a moisture and fungus-proof case for operation in tropical locations, and shall be similar and equal to Mercoid No. DA-21.

25.13. WATER DISTILLATION UNITS shall be of designs and capacities as specified under specification No. HN-9H-501 contained in Appendix "A" to these specifications.

25.14. TURBO-FLO PUMP (For Location "L" only). The turbo-flo pump shall be a 13.5 G.P.M. capacity, complete unit. It shall have a horizontal self-priming 125 foot head mounted on a suitable channel iron base, with flexible coupling to a 1-1/2 H.P. electric motor (Squirrel cage type), 220/440-volt, 3 phase, 60 cycle, 1750 R.P.M.: 220-volt double pole automatic pressure switch, check valve, cleanout strainer, pressure gauge, automatic air pump and water level control. Unit shall have a galvanized steel welded tank 36" diameter x 72" high, designed for 75# working pressure. Pipe and fittings to connect between pump and tank, with pressure switch set for 35# cut-in and 50# maximum cut-out. Tank capacity shall be 315 gallons, shall be vertical type tank complete with inlet, outlet, pressure gauge and air control connections. Unit shall be similar and equal to Series 9000- Fig. 9100 - Deming.

25.15. COMBINATION MAGNETIC STARTER (LOCATION "L" ONLY): Combination magnetic starter shall be line voltage type, with

a circuit breaker 220-volts, 3 pole, size "0", shall be bi-polar metallic type with thermal elements NEMA - 1A and gasketed inclosure. Starter shall be Square "D" Company Class 8538, type QRAS-1, or equal.

25-16. SIZES AND TYPES: The sizes and types of the foregoing materials and equipment shall be as shown on the drawings for the several locations. If types and sizes of materials are not shown, the Contractor shall furnish and install at such locations materials and equipment equal to that provided for similar installations.

25-17. MORTAR, CONCRETE AND FORMS used in the work shall conform to the provisions of the "Concrete and Form Work" section of these specifications. Concrete and mortar proportioning shall be as directed by the Engineer.

25-18. SALT WATER DISTRIBUTION SYSTEMS: Except as otherwise shown on the drawings for the several locations, the portion of the Salt Water Distribution System covered by this section of the specifications shall include in general, for each location, (1) the installation of the salt water intake line from the source of supply 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 tanks, 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 and as hereinbefore specified.

25-19. FRESH WATER DISTRIBUTION SYSTEMS:

a. Except as otherwise shown on the drawings for the several locations, the portion of the Fresh Water Distribution System covered by this section of the specifications shall include in general, for each location, (1) the installation of the line for the Power and Water Distillation Plant to the adjacent reservoirs, and 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 tanks 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, and as hereinbefore specified.

b. The installation of piping and equipment at the

Power and Water Distillation Plant is described under Section 20 of these specifications.

25-20. PIPE LAYING - GENERAL:

a. 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" section of these specifications.

b. Any section of pipe that is disturbed in any way after laying shall be taken up and relaid.

c. The interior of the pipe shall be thoroughly cleaned 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.

d. 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.

25-21. CORRUGATED METAL PIPE:

a. All relevant provisions contained under the heading "Corrugated Metal Pipe" of the "Sanitary Sewers" section of these specifications shall here apply.

b. The salt water intake line shall be incased in rip rap material or otherwise secured and protected as directed by the Engineer.

25-22. ASBESTOS-CEMENT PIPE:

a. Material: Asbestos-cement pipe, shall be as specified under heading 25-02. Pipe couplings shall be pipe manufacturer's standard or steel flanged as called for. Fittings shall be cast iron.

b. Handling: Care shall be taken to avoid dropping pipe when unloading or placing in trenches. In transporting pipe, boards shall 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.

c. 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 supports 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.

d. Manufacturer's standard couplings: Rubber rings and cement sleeves shall be placed on the pipe end in accordance with the manufacturer's direction, 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.

e. Cutting of pipe shall 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.

f. Fittings: Pipe shall be furnished in straight lengths only and fittings therefor, as hereinbefore specified, shall be cast iron. Joints at fittings shall be made up with packing and sulphur jointing compound.

g. 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 be staggered.

25-23. CAST IRON PIPE: 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.

25-24. STEEL PIPE: Steel pipe shall be galvanized or black as called for, with size of pipe and size of type of fittings as shown on the drawings.

25-25. COPPER PIPE: Copper pipe for services or elsewhere as called for shall be of sizes shown with flared joints.

Service connections to house lines shall be properly capped.

25-26. JOINTS: Unless otherwise called for on the 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 cleansed 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 pipe connections shall conform to all applicable provisions of Section 21 of these specifications.

25-27. HYDRANTS, VALVES AND VALVE BOXES: 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.

25-28. VALVE ASSEMBLIES: 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.

25-29. THRUST BLOCKS: 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.

25-30. ELEVATED TANKS AND RESERVOIRS: Pipe line connections to elevated tanks and reservoirs shall be as shown on the drawings. Installation of tanks shall conform to Section 21 of these specifications where applicable. Foundations and towers shall be as stipulated in the pertinent sections of these specifications. Interior surfaces of reservoirs and tanks shall be painted as called for in the "Painting" section.

25-31. SALT WATER PUMPING STATIONS: Piping and equipment at the Salt Water Pumping Stations shall be installed as shown on the drawings for each of the several locations. The installation of equipment shall conform to applicable provisions contained in Section 21 of these specifications.

25-32. RECORD DRAWINGS: As provided in Part II, Special Conditions, the Contractor shall maintain 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.

25-33. STERILIZATION:

a. General: Each unit of each of the completed fresh water distribution systems shall be sterilized with an approved chlorine solution before being placed in service.

b. 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 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.

25-34. TESTING:

a. Backfilling: When a section of work is ready for testing, pipe trenches shall be partially backfilled as specified in the "Earthwork for Utilities" section of these specifications. Backfill shall be placed to a depth of one foot over the top of pipe with joints exposed, or as directed.

b. 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 eighty (80) gallons shall be repaired and retested until the leakage is within the specified limit.

## SECTION 26

### MISCELLANEOUS MECHANICAL EQUIPMENT

26-01. SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with furnishing and installing special equipment, complete, in strict accordance with this section of the specifications and the applicable drawings.

a. Standard Products. The equipment to be furnished under this specification shall be essentially the standard product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the equipment need not be the products of the same manufacturer.

b. Equipment. All major items of equipment as specified in this section of the specifications shall be of the best quality normally used for the purpose in good commercial practice and shall be the products of reputable manufacturers. Each major component of equipment shall have the manufacturer's name, address, and catalog number on a name plate securely affixed in a conspicuous place. Manufacturer's names as used herein are intended to indicate quality and type of materials and design of equipment only; equal products of other manufacturers may be substituted if approved.

26-02. PROTECTION OF WORK: All work, materials, and equipment shall be fully protected at all times against dirt, water, chemical, or mechanical injury.

26-03. CONNECTIONS:

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 Contractor to or from the designated locations, and the equipment connected thereto by the Contractor in correct and complete working order and ready for operation. All equipment shall be installed as hereinafter specified, and as indicated on the drawings.

b. Piping. All piping indicated or required shall be installed and shall conform to the requirements of the "Plumbing" section. 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 "Electrical Work - Interior" section of these specifications.

26-04. ASSEMBLY: All equipment which arrives at the job sites knocked down for shipment and is to be assembled in the field will be accompanied by the manufacturers' information. The Contractor shall be guided by this information in assembling such pieces of equipment.

26-05. ROUGHING-IN: For roughing-in dimensions of equipment, the Contractor shall consult manufacturers' data and/or field measurements of the actual equipment. In particular, no underground services shall be brought to equipment until the sizes and locations are accurately established with field measurements.

26-06. LEVELING: 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.

26-07. LOCATIONS: The locations of equipment on drawings are indicative and may be changed only upon recommendation of the Engineer. The Contractor shall cooperate with the Engineer in maintaining a record set of prints incorporating such changes as may be deemed necessary.

26-08. EQUIPMENT:

a. Building 201, South Wing and Addition to South Wing. Drawings No. 2B-406, 2B-455 and 2B-5444. Furnish and install:

(1) Peeler, potato and vegetable shall have 50-pounds capacity complete with peel basket and base connection to sink. Unit shall be driven by a 3/4 H.P., single phase, 60 cycle electric motor. One (1) complete unit required.

(2) Chopper, with 21-inch diameter, non-removable bowl with a fresh meat capacity of 20 to 25 pounds. Electrically driven by a 2 H. P., 220 volt, 60 cycle, 3 phase motor. Chopper shall have an attachment hub floor pedestal and shall include the following accessories:

- (a) Vegetable, Fruit and Nut Slicer - 9-inch
- (b) Shredder Plates 5/64-inch and 3/16-inch

(c) Julienne Plates

(d) Grater Plate

One (1) complete unit required.

(3) Meat Grinder, gravity feed type with stainless steel pan. Capacity 20 to 25 pounds of meat. Unit driven by a 3/4 H. P., 220 volt, single phase, 60 cycle motor. One (1) complete unit required.

(4) Meat Saw, "Band Saw" type to take cuts up to 16-inches high and 13-1/2-inches wide. Powered by a 1-1/2 H. P. motor, 220 volts, 3 phase, 60 cycle. Six (6) extra blades shall be furnished with saw. One (1) complete unit required.

(5) Refrigerator, three compartment walk-in type, according to Specification HN-5B-409. One (1) complete unit required.

(6) Refrigerator, 80 cubic feet, 8 compartment solid door, reach-in type. Unit shall be self-contained including a compressor, air cooled condenser, coil, and all necessary operating accessories. Interior and exterior shall be stainless steel with 3-inches of high density fiber-glass insulation installed in two layers with offset joints. The compressor shall be driven by a 1/2 H. P., 220 volt, 3 phase, 60 cycle motor. One (1) complete unit required.

(7) Refrigerator, 40 cubic feet, 4 compartment solid door, reach-in type. Balance of specification similar to Item 6, except compressor shall be driven by a 1/3 H. P., 220 volt, single phase, 60 cycle motor. One (1) complete unit required.

(8) Oven, Roasting and Baking. Two compartment oven with thermometers. Oil burner shall be of the motor driven pressure type for diesel fuel. Burner motor shall operate on 110 volts, single phase, 60 cycle current. One (1) complete unit required.

(9) Griddle, electric type with 34-11/16 inch by 17-13/16 inch grid area. Heating capacity shall be 6,000 watts on 220 volt, 3 phase power. Two (2) complete units required.

a. A stand 1-1/2 x 1-1/2 x 1/8 inch shall be provided for the griddles. The construction shall be stainless steel angles with top and bottom shelves of 16-gauge number four (4) finish 18-8 stainless steel sheets. Two (2) complete units required.

(10) Ranges shall be oil burning type with two (2) ovens and polished end plate, single deck high shelf and removable grease trough. Oil burner shall be forced feed motor driven type for use with number three (#3) Diesel fuel or lighter, motor to operate on 110 volt, single phase, 60 cycle current. Two (2) complete units required. Ranges shall be left or right hand front fired model as required.

(11) Deep Fat Fryer, shall have a fat capacity of 90 pounds and be heated by a six (6) element electrical heating unit of 18 kilowatts rating wired for 220 volt, 3 phase, 60 cycle current. Each fryer shall be complete with two (2) 17-1/2 x 11 x 6 inches deep frying baskets. One (1) complete unit required.

(12) Deep Fat Fryer. Similar to Item 11, except fat capacity shall be 25-pounds. One (1) complete unit required.

(13) Mixer shall be 80-quart capacity all purpose type with variable speed drive and 2 H. P. motor operating on 220 volt, 3 phase, 60 cycle current. Standard equipment shall consist of one 80-quart stainless steel bowl, one batter beater, and one wire whip. Auxiliary equipment shall consist of 60 and 30-quart stainless steel bowls, bowl adapters, beaters and whips to suit. One (1) complete unit required.

(14) Steamer shall be four compartment type of eight bushel capacity with synchronized thermostatic control for direct steam operation. Interior and exterior shall be stainless steel; shelving of the automatic sliding type, and steaming baskets of the tall narrow and tall wide perforated types of number 24-gauge stainless steel. One (1) complete unit required.

(15) Steam Kettles shall be of 60 and 80-gallon capacities, two thirds jacketed of full stainless steel construction. One (1) complete unit of each capacity required.

(16) "Bain Marie" shall be of 14-gauge stainless steel 84 x 36 x 34-inches high with 12-inch deep body. The table shall be heated through four-way 3/4-inch copper steam coils in water pan. The table body shall be of 18-gauge stainless steel number four finish other than pan and false bottom which shall be 14-gauge, the false bottom to have 1/2 inch round holes on 4-inch centers. Table shall be supported on adjustable pear shaped iron pipe legs. One (1) complete unit required.

(17) Steak Tenderizer equipped with 1/3 H. P. motor, 110-volts, single phase, 60 cycle; to accommodate steaks up to 7-3/4-inches wide x 1-1/8-inches in thickness. One (1) complete unit required.

(18) Meat Slicer shall have a cutting capacity up to 10-1/2-inches wide x 3-1/2-inches high or 8-inch diameter with slices up to 3/4-inch thick. Driving motor shall be 1/3 H. P., 110 volt, single phase, 60 cycle. Three (3) complete units required.

(19) Ice Cream Dispensing Cabinet shall have 40-gallon bulk capacity, eight holes, double row. Construction shall be all steel with white enamel sides and stainless steel top. Unit shall be self-contained having a 1/3 H. P. air-cooled compressor operating on 110 volt, single phase, 60 cycle current. One (1) complete unit required.

(20) Refrigerated Cold Pans shall be self-contained units. Cabinet construction of 20-gauge number 2B finish stainless steel, pans of 16-gauge number 2B finish stainless steel with inside depth of four (4) inches. Pans shall be provided with drains. Cabinet shall be 48 x 36 x 34-inches high, with two inches of cork insulation. The cabinet below shall be insulated with 2-inches of cork and have one door. The door interior of enclosed refrigerated area shall be finished in 18-gauge number 2B finish stainless steel and furnished complete with one (1) adjustable wire shelf, and with proper refrigeration coils. Coils shall be bonded to sides and bottom of pan and set in cork with hot asphalt. Lower compartment shall have a blower coil unit. Compressor unit shall be air-cooled driven by 1/4 H. P. motor, 110 volts, single phase, 60 cycle current. Two (2) complete units required.

(21) Fake Ice Machine shall be self-contained unit with a capacity of one ton of ice per day. Unit shall have an air-cooled condenser, a 2 H.P. compressor running on 220 volt, 3 phase, 60 cycle current, and a 1/8 H.P. freezing cylinder motor operating on 220 volt, single phase, 60 cycle current. Cabinet shall be bonderized steel. One (1) complete unit required.

(22) Coffee Urns shall be a three battery unit consisting of two (2) ten gallon coffee urns and one (1) 20-gallon water urn. Unit shall be stainless steel construction complete with steam coils and four (4) stainless steel baskets. A stand, size 72 x 30 x 34-inches high, of stainless steel with removable full length drip pan shall be provided, the body and shelves of 18-gauge stainless steel.

Two (2) shelves enclosed on three sides shall be provided. One shelf 10-inches above the floor and one intermediate from top. Stand shall have pipe legs with adjustable feet. Two (2) complete units required.

(23) Toaster shall be rotary type with capacity of 9 to 12 slices per minute; stainless steel exterior, maximum electrical input of 3600 watts to heater; and a motor driven conveyor operating on 110-volts, single phase, 60 cycle current, maximum load on motor of 40 watts at full load. Two (2) complete units required.

(24) Salvajor, prewash and dish scraping machine, shall have a scraping tray, silverware trap, scrap basket, and recirculating pump. Unit shall require two gallons of fresh water per minute while draining an equal amount of soiled water per minute. Water temperature shall be maintained constant by a thermostatic valve. Circulating pump shall be electrically driven, centrifugal type recirculating 20 gallons per minute with 1/6 H. P. motor operating on 110-volts, single phase, 60 cycle current. One (1) complete unit required.

(25) Dishwasher shall be right hand, fully automatic type made of stainless steel throughout with brass valves and drains and overflows of corrosion resisting material. A steam booster with necessary electrical controls shall be furnished to raise the hot water supply temperature to 180 degrees for final rinse. Wash and rinse tanks shall have thermostatically controlled steam coils to maintain desired water temperatures. Wash and rinse waters shall be circulated separately by circulating pumps driven by a 3 H. P. Motor operating on 220 volt, 3 phase, 60 cycle current. Dishwasher shall be equipped with twelve (12) assorted chromium plated, open type, wire racks, size 20 x 20-inches and a steel wire brush for cleaning pumped wash and rinse spray pipes. Nominal dimensions of machine shall be 64-inches long at table height x 31-inches wide. One (1) complete unit required.

(26) Soiled Dish Table shall be "L" shaped, approximately 16-feet 6-inches and 6-foot x 34-inches high with dishport landing shelf 6-feet 12-inches wide and a 10-inch high backsplash the full length of fixture. Front and end of table top shall have 1-1/4-inch diameter raised edge, die rolled, mitred, welded, and ground smooth. Table top and landing shelf shall be made of 14-gauge 2B stainless steel. Table top shall have two scrapper holes and an opening located as per plan, Drawing No. 2B-406, to receive Item 24, Salvajor. A 12-inch wide x 9-foot 6-inches long shelf of 16-gauge 2B stainless steel shall be furnished over back portion of the table with 1-inch turned up front, back and ends of shelf to

be perforated with 1/2-inch holes on 12-inch centers. Table shall be made to fit against Item 25, dishwasher, and shall have a quick drain with strainer the full width of the table installed in the table top immediately adjacent to point of connection of Item 25, dishwasher. One (1) complete unit required.

(27) Clean Dish Table shall be "L" shaped, approximately 10-feet 6-inches and 6-foot lengths x 30-inches wide x 34-inches high with a full length shelf 10-inches above floor construction from 16-gauge 2B stainless steel and a 10-inch high backsplash the full length of the table. Front and end of table top shall have a 1-1/4-inch diameter raised edge die rolled, mitred, welded, and ground smooth. Table top and shelf to be made of 14-gauge 2B stainless steel. Table shall be made to fit against Item 25, dishwasher, and shall have a quick drain with strainer the full width of the table installed in the table top immediately adjacent to point of connection to Item 25, dishwasher. One (1) complete unit required.

(28) Work Table shall be of stainless steel construction with pipe legs, adjustable pear feet, removable patented slide drawer, all rounded corners, metal shelf below, stainless steel top. Table shall be 68 x 30 x 34-inches high. Gauge of table top shall be 14-gauge, shelf 16-gauge, and drawer 20-gauge. One (1) complete unit required.

(29) Work Table shall be similar to Item 28, except dimensions shall be 92 x 30 x 34-inches. Two (2) complete units required.

(30) Work Tables shall be similar to Item 28, except dimensions shall be 96 x 30 x 34-inches high and tables shall have removable 3-inch laminated maple hardwood top. Three (3) complete units required.

(31) Work Tables shall be similar to Item 28, except dimensions shall be 56 x 30 x 34-inches high. Three (3) complete units required.

(32) Work Tables shall be similar to Item 30, except dimensions shall be 56 x 30 x 34-inches high. Three (3) complete units required.

(33) Canopy shall be 24-feet x 10-feet x 27-inches high, pitched four ways with grease trough on all sides. Construction shall be all 18-gauge 2B stainless steel complete with 1-1/2 x 1-1/2 x 1/8-inch framing members. One (1) complete unit required.

(34) Steam Table 9-feet x 3-feet x 34-inches high. Top shall be 14-gauge 4B finish stainless steel with cutouts for eight number 10-1/2 insets and three number 2000 hotel pans. Water pan shall be of 18-gauge 2B stainless steel with 3/4-inch 4-way copper steam coils. A 9-inch hardwood cutting board shall run the full length of table top. The steam table shall be enclosed on three (3) sides with 20-gauge 2B finish stainless steel and shall have one (1) full length shelf of 18-gauge 2B finish stainless steel 10-inches above floor, one full length plate shelf of 18-gauge 2B finish stainless steel 10-inches below top. Table shall have 1-1/4-inch galvanized pipe legs with adjustable feet. Two (2) complete units required.

(35) Platform Scale shall be a single beam portable platform type. All bearings shall be selfaligning. Loops, bearings, nose irons, and weights shall be rust resistant for sustained accuracy. The platform area shall be 18x27-inches. Capacity of scale shall be 1,000 pounds. One (1) complete unit required.

(36) Standard Single Compartment All Welded Sink shall be 24 x 24 x 14-inches deep, 14-gauge 2B finish stainless steel sink with die rolled rim, integral 10-inch high back, and a right-hand 24-inch drain board, supported on 1-1/4-inch galvanized pipe legs with pear-shaped adjustable feet. Sink shall be fitted with copper drain, overflow, and a 14-gauge stainless steel strainer, tail piece for drain and overflow shall be brass. Height of sink shall be 34-inches. One (1) complete unit required.

(37) Standard Single Compartment All Welded Sink shall be 36 x 24 x 14-inches deep, 14-gauge 2B finish stainless steel sink with die rolled rim, supported on 1-1/4-inch galvanized pipe legs with pear-shaped adjustable feet. Sink shall be fitted with copper corner drain, and a 14-gauge stainless steel strainer, tail piece for drain and overflow shall be brass. Height of sink shall be 34-inches. Two (2) complete units required.

(38) Standard Double Compartment All Welded Sink, shall have two (2) sink compartments 30 x 28 x 14-inches deep, 14-gauge, 2B finish, stainless steel sinks with die rolled rim, and two (2) 30-inch drain boards, supported on 1-1/4-inch galvanized pipe legs with adjustable pear-shaped feet. Sink shall be fitted with copper corner drain, overflow and a 14-gauge stainless steel strainer, tailpiece for drain and overflow shall be brass. Overall dimensions shall be 120 x 30 x 34-inches high. Two (2) complete units required.

(39) Standard Double Compartment All Welded Sink, shall have two (2) sink compartments 24 x 24 x 14-inches deep, 14-gauge, 2B finish, stainless steel sink with die rolled rim and two (2) 24-inch drain boards, supported on 1-1/4-inch galvanized pipe legs, with pear-shaped adjustable feet. Sink shall be fitted with copper corner drain, overflow and a 14-gauge stainless steel strainer, tailpiece for drain and overflow shall be brass. Overall dimensions shall be 98 x 24 x 34-inches high. Two (2) complete units required.

b. Building No. 202 - Drawing No. 2B-408 -  
Furnish and install:

(1) Refrigerator, 60-cubic feet, with six (6) compartments, solid door type. Balance of specifications similar to Item #6, paragraph a, Section 26 of these specifications. One (1) complete unit required.

(2) Refrigerator, 80-cubic feet, with four (4) compartments, solid door type. Balance of specifications similar to Item #6, paragraph a of Section #26 of these specifications, except bake trayslides shall be furnished. Shelves shall slide on 4-inch centers. One (1) complete unit required.

(3) Ice Cream Freezer, 20-quart capacity, horizontal, direct expansion flooded shell type. Unit shall have a 2 H. P. compressor operating on 220-volts, 3 phase, 60 cycle current with an air cooled condenser. Beater shall be of stainless steel construction driven by a 1 H. P., 220-volt, 60-cycle motor. One (1) complete unit required.

(4) Ice Cream Dispensing Cabinet: Similar to Item #19, paragraph a of Section 26 of these specifications. One (1) complete unit required.

(5) Ice Cream Hardening Cabinet, 80-gallon capacity, stainless steel top with baked enamel finished panels, 65 x 44 x 35-inches high. Cooling unit shall be remote with 3/4 H. P., 220-volt, single phase, 60 cycle compressor and air-cooler condenser. One (1) complete unit required.

(6) Dough Mixer, shall have a 15-quart capacity, floor model with stainless steel bowl, one (1) "W" cream whip, One (1) "B" batter beater, and one "H" dough hook as set attachments. Mixer shall be all purpose type with variable speed drive and 1/3 H.P. motor operating on 220-volt, single phase, 60 cycle current. Accessories shall include Blakeslee Model C-80 or approved equal bowl trucks, Model "H" dough hook, P. K. pastry knife, 6-gauge oil dropper

and soup strainer - colander, beater for 30-quart bowl, 1/16 perforated. One (1) complete unit required.

(7) Proof Boxes, one rack box, overall size 74 x 78-inches high. Two (2) complete units required.

(8) Wire racks shall be used with Item #7 proof boxes. Length 69 x 71-inches high ten wire shelves. Rack shall be of angle iron construction galvanized throughout with handles on each end and #4-inch ball bearing casters. Two (2) complete units required.

(9) Donut Fryer, 72-pound fat capacity, kettle diameter, 24-inch, equipped with drain shelf and donut screen. Fryer shall be equipped with two (2) kilowatt immersion type electric heating elements to operate on 220-volts, 3 phase current. One (1) complete unit required.

(10) Revolving Tray Bake Oven, capacity 8 trays 22 x 35-inches each on twenty-four (24) bun pans 18 x 26-inches each. Bread capacity 256 and 288 one pound loaves. Oven shall have approximately 7-inches of rock wool insulation in walls and shall have a thermostatic temperature control, heat indicator, automatic time clock, tray position indicator and other necessary devices for operation. Heating shall be by means of blower type oil burner. Fuel consumption of burner shall be 2-1/2 to 3 gallons of oil per hour. Horsepower of motors shall be 1/6 H.P. on burner blower and 1/3 H. P. on revolving tray mechanism drive; both motors shall operate on 110-volt, single phase, 60 cycle current. One (1) complete unit required.

(11) Tilting Steam Kettle shall be of 40-gallon capacity, 2/3 jacketed, trunion type of full stainless steel construction. Kettle shall be furnished with cover. One (1) complete unit required.

(12) Bakers Roller Bins, 24 x 16 x 25-inches high overall with 3-inch rubber tired heavy duty ball bearing swivel casters. Bins shall have hinged removable tops; construction shall be of 16-gauge 2B finish stainless steel. Six (6) complete units required.

(13) Standard Single Compartment All Welded Sink, shall be similar to Item #36, paragraph a of Section 26 of these specifications, except furnished with left hand drain board. One (1) complete unit required.

(14) Standard Double Compartment All Welded Sink, shall be similar to Item #38, paragraph a of Section #26 of these specifications. One (1) complete unit required.

c. Building No. 302 - Drawing No. 2B-409: Furnish and install:

(1) Washer 42 x 54-inches, shall have monel metal tub and cylinder sheets. Cylinder shall have one vertical and one horizontal partition dividing it into four compartments each shall have a door. Tub support shall be one piece cast Meehanite end frames to which the tub heads shall be securely bolted. End frames shall be braced by a steel tie rod below the tub, a formed steel support across the top of tub and a steel channel at the rear of the tub. Monel metal guards shall be provided at both ends of washer completely enclosing drives. Machine shall be single speed, motor driven, and equipped with 2 x 2 x 2-1/2-inch American Yates or approved equal float type inlet water valves and an air operated outlet valve. Motor shall be 3 H.P., for 220 volt, 3 phase, 60 cycle current. One (1) complete unit required.

(2) Washer 36 x 18-inches, from loading type with monel metal tub, cylinder and exterior. Machine shall be equipped with glass door, water level gauge, automatic inlet water valves and self-cleaning outlet valve. Driving motor shall be 3/4 H. P., for 220 volt, 3 phase, 60 cycle current. One (1) complete unit required.

(3) Extractor shall have 30-inch monel metal basket, monel metal solid curb, and safety locking cover. Extractor shall be "Vee" belt driven by a 3 H. P. motor operating on 220 volt, 3 phase, 60 cycle current. One complete unit required.

(4) Extractor similar to Item #3, except shall have 17-inch monel metal basket and 3/4 H. P. motor. One (1) complete unit required.

(5) Soap Cooker shall have 60 gallon capacity with heavy galvanized iron tank. One (1) complete unit required.

(6) Starch Cooker shall have 15 gallon capacity with all copper tank and built-in measuring gauge. One (1) complete unit required.

(7) Tumblers shall have 36-inch diameter x 30 inches deep tumbling baskets of all welded galvanized steel construction, lint box and dryness indicator. Drying air shall be heated by two (2) copper finned steam coils with dampered by-pass. Fan shall be close coupled to a single motor which shall also drive the basket. Drive shall be non-reversible; motor 1/2 H. P., 220 volt, 3 phase, 60 cycle. Four (4) complete units required.

(8) Roll Ironer shall be two (2) roll return apron flat work ironer with Hixon or approved equal steam valve, steam pressure gauge, receiving table, and padding set. Ironer shall have a 1-1/2 H. P., 220 volt, 3 phase, 60 cycle, four speed motor. One (1) complete unit required.

(9) Presses shall all be steam heated, air operated and American Laundry Machinery Company, or approved equal as follows:

(a) American Super-zarmo #5138 general purpose garment press. Two (2) complete units required.

(b) American Super-zarmotte #107-A intricate or small piece press. One (1) complete unit required.

(c) American Super-zarmo #40-C shirt body and front press. One (1) complete unit required.

(d) American Super-zarmo #33-7 shirt collar and cuff press. One (1) complete unit required.

(e) American Super-zarmotte #113-A shirt sleeve press. One (1) complete unit required.

(f) American Super-zarmotte #111-A shirt yoke press. One (1) complete unit required.

(10) Air Compressor shall be for operating laundry presses. Compressor shall have a piston displacement of 30.5 cubic feet per minute, 70-pounds per square inch discharge pressure, and 20-inch diameter x 48-inch long receiver. Compressor shall be single staged, air-cooled, tank-mounted and equipped with necessary pressure gauges, safety valves, air filter and muffler. Unit shall have a 5 H. P. motor operating on 220-volts, 3 phase, 60 cycle. One (1) complete unit required.

d. Building No. 231 - Drawing 2B-5411. Furnish and install:

(1) Laboratory Tables shall be E. H. Sheldon and Company, Catalog No. C-108S provided with one D-204s and one D-208s base cabinets on each side of tables; one F-162s soap-stone sink across one end of table; one lead lined trough; service for cold water, gas, and electricity; and one L-109 flanged bibb cock for cold water above sink. Services above counter top shall be four cold water outlets, eight gas outlets and four duplex 110 volt A. C. electrical outlets. Sink shall be provided with an L-201-1-1/2-inch lead "S" trap, L-211 stopper and L-229-1-1/2-inch lead adapter to I.P.S. fitting. Provide one L-128-1/2-inch water shut-off valve and one L-130-1/2-inch gas shut-off cock. Two (2) complete units required.

(2) Refrigerator shall be 7.7 cubic feet capacity domestic type with porcelain exterior and interior finish and special acid-resisting finish on compartment floor. Refrigerator shall be equipped with cold-control, rust-resisting shelves. Refrigerator shall have a 1/8 H. P. compressor motor to operate on 110 volts, single phase, 60 cycle current. Condenser coil shall be air-cooled type. One (1) complete unit required.

(3) Fume Hoods shall be E. H. Sheldon and Company, Catalog No. G-124s. Hood shall be provided with one cold water gooseneck, one lead cup sink and trap, one gas outlet, one duplex electrical receptacle and one incandescent light with switch in apron rail. Gas and water outlets shall be remote controlled. Base cabinets shall be G-204s metal cabinets and superstructures shall be G-304 soapstone hoods. Cup sinks shall be provided with L-201-1-1/2-inch lead "S" traps and L-229-1-1/2-inch lead adapters to I.P.S. fittings. Provide one L-128-1/2-inch water shut-off valve and one L-130-1/2-inch gas shut-off cock. Two (2) complete units required.

(4) Butane Gas Cylinders shall contain 100-pounds by weight of butane gas per each cylinder. Manifolding with all necessary piping, valves and regulating equipment shall be provided to connect two gas cylinders to 1/2-inch building piping. Four (4) cylinders required.

(5) Water Still Apparatus shall be Barnstead Still no equal. The unit shall consist of a catalog number ELH 1/2 electrically heated still and a catalog number MT-5 storage tank with interconnecting piping and full automatic controls. The still shall have a distillation capacity of 1/2 gallon per hour; heating shall be through two electrical immersion elements of 650 watts each. The storage tank shall have a capacity of 5-gallons and shall be constructed of copper with a plating of tin on all interior surfaces. One (1) complete unit required.

e. Building No. 210 Laboratory - Drawing No. 2B-449: Furnish and install:

(1) Chilled Water Storage Tank shall be constructed in accordance with drawing #SK-418. Capacity shall be 1,000 gallons when filled to within 12-inches to top. Construction shall be of galvanized steel. One (1) complete unit required.

(2) Refrigeration Unit shall consist of one compressor and one dry coil (finned type) condenser built into one unit. Maximum dimensions shall be 60 x 33-inches

with a top vertical discharge. Unit shall be complete with all integral refrigerant piping, liquid receiver, angle type drier, strainer, liquid line indicator, high and low pressure cutout, etc., less expansion valve. The liquid and suction refrigerant pipes shall be brought to the outside of the unit and capped allowing for one point connections. The compressor shall have a capacity of 60,000 B.T.U./HR. based on 50 degrees F. and 46.7 pound suction temperature and pressure. The dry coil (finned type) condenser shall have a capacity equal to or greater than the compressor while operating in 100 degree F. ambient air temperature. Unit shall be completely internally wired, with the wiring brought to a single control panel, and requiring power connection to be made at only one point on the unit. Motors shall be fungus and moisture-proof and all wiring shall be covered with a fungus and moisture proof covering. One (1) complete unit required.

(3) Water Chilling Coil shall be direct expansion type for chilling water in above item #1 Chilled Water Storage Tank. Coil shall be direct expansion type with Freon-12 refrigerant; 8 row and 106 square foot face area. Construction shall be of 3/8-inch O.D. No. 18 gauge copper tubes spaced 3-inches c. to c. across coil. Coil shall be equipped with one (1) 16 port expansion valve with capillary tubes. One (1) complete unit required.

(4) Circulating Pump shall be single stage, close coupled, centrifugal type with enclosed impeller and a capacity of 15 C.F.M. at 45 foot head of water. Motor shall be 1/2 H. P., 220 volt, 3 phase, 60 cycle. One (1) complete unit required.

(5) Film Processing Sink shall be equipped with temperature control. Sink body shall be constructed of No. 18 gauge stainless steel, welded with syphon drain and 1-1/4 inch tailpiece. Sink shall be 48 x 26 x 9-1/2-inches deep with a 10-inch high back and roll rim. Sink shall be supplied with No. 14 gauge stainless steel legs and braces without cabinet. One (1) complete unit required.

(6) Water Filter shall consist of a filter tank, filter media, main control valve and accessories.

(a) Filter Tank shall be constructed of heavy Class A steel, 28-inches in diameter with a shell height of 60-inches and an overall height of 84-inches including the screw leg supports. The top distributor shall be a deflector plate and the under drain system shall be a orifice-controlled multiple disc collector-distributor. Pipe connections shall be 1-1/4 inches screwed. Tank shall have a working pressure of 100-pounds and a test pressure of 150-pounds. Tank access shall be a hand hole. Tank interior shall be galvanized after

fabrication and exterior shall have two (2) coats aluminum paint.

(b) Filter Media shall be selected and graded gravel in the bottom, coarse sand above and fine sand on top.

(c) Main Control Valve shall be a lift-swing action multiport valve.

(d) Accessories shall be a test cock, pressure gauges, relief valve and sight glass. One (1) complete unit required.

(7) Film Storage Reefer shall be a single-compartment, pre-fabricated, portable, knock-down, walk-in, storage refrigerator, complete with unit cooler and air-cooled condensing unit. Inside dimensions shall be 20 x 7 x 7-1/2-feet high. Materials and construction shall be similar to the refrigerator furnished on specification No. HN-5B-409, using wood framing with 4-inch Fiberglas insulation and aluminum sheathing inside and outside. Roof shall be gabled with ridge 2-inches higher than eaves. Door shall be located in center of one end, refrigeration unit plug-in in center of opposite end. Refrigerator shall be provided with a dial thermometer and two (2) vapor-proof lights with one switch and pilot light located adjacent to door. Refrigerating equipment shall be designed to maintain a temperature of 50° F. inside refrigerator when the outdoor temperature is 90° F. Unit cooler shall have a rating of 12,750 B.T.U./HR. at 15° T.D. Condensing unit shall have a capacity of 12,000 B.T.U./HR at 30° F. evaporating temperature. Condensing unit, controls, and other parts of the refrigerator assembly which are exposed on the exterior of the refrigerator shall be enclosed in a weather-tight enclosure, constructed of aluminum sheets to match the refrigerator and provided with suitable access panels. Enclosure shall be provided with means for adequate ventilation. One (1) complete unit required.

(8) Water Chilling Equipment shall consist of a vertical type water cooler and a refrigeration unit.

(a) Vertical Type Water Cooler shall be of the dry expansion type using Freon-12 as the refrigerant and shall be designed to comply with the A.S.M.E. Code for Unfired Pressure Vessels. Refrigerant space shall be in tubes and heads. Tubes shall be seamless copper 3/4-inch O.D. x 0.049 wall thickness. Shell shall be seamless steel tubing. Heads shall be close grain gray iron castings suitable for pressure parts. Gasket surfaces shall be ground to a fine

finish. Tube sheets shall be flanged quality carbon steel. Water baffles shall be hot rolled steel, electro-tin plated. Water baffles shall be extra heavy pipe couplings. Design working pressure for tube and shell side shall be 150 p.s.i.g. Test pressure for tube side shall be 190 p.s.i.g. and 300 p.s.i.g. for shell side. Insulation shall be 3-inch fiber glass laid in hot asphalt and covered with 20 gauge aluminum jacket. Head covers insulated with fiber glass shall be removable. Controls shall be thermostatic expansion valve and liquid line solenoid valve actuated by mercoid, type DA-35 temperature control, with range No. 4 and bulb Style No. 2 located in the water line leaving the cooler. Cooler shall have a capacity to cool 15 gallons per minute of brackish water from 82° F. to 70° F. with refrigerant temperature of 50° F. The cooler shall be mounted at one end of the refrigeration unit complete with all interconnecting refrigeration piping, and aluminum weather cover extended from the unit. The supply and return water pipes shall be brought to the outside of the weather cover, valved and capped for future connections.

b. Refrigeration Unit shall be made up of one compressor and one dry coil (finned type) condenser built into one unit. Unit shall be complete with all internal refrigerant piping, liquid receiver, angle type dryer, strainer, liquid line indicator, high and low pressure cutout expansion valve, oil separator, line valves, etc. The compressor shall have a capacity of not less than 90,000 B.T.U./HR. based on 50° F. and 46.7-pound suction temperature and pressure. The dry coil (copper tubing with aluminum fins) condenser shall have a capacity equal to or greater than the compressor while operating in 85° F. ambient air temperature. Casing for the unit shall be of aluminum construction, using a structural steel welded frame Bonderized after fabrication, painted with zinc chromate primer, and then finished with aluminum pigmented paint. Aluminum panels (3S-1/2 H) shall be secured to frame by means of corner members suitably rounded to hold panels without the use of screws or bolts. Frame shall be equipped with access panels for access to all coil connections. Casing shall be set upon suitable legs 6-inches high. Cleanable type filters shall be provided over fresh air intakes. Filters shall be made of aluminum media and frame. All motors shall be moisture proof and shall be for 3 phase, 60 cycle, 208 volt service. Unit shall be designed for complete automatic control, with all controls located in a control box built into the unit. Unit shall be completely factory assembled, piped and wired. Unit shall require only field connection of power and water piping to make it operable.

f. Buildings No. 329, 330, and 333 - Drawing No. 2B-5427 and 2B-5428: Furnish and install

(1) Water Cooling Unit shall have the capacity to cool 30 G.P.M. of water from 105° F. to 85° F. using ambient air at an entering dry bulb temperature of 82° F. Unit shall consist of a fan section and a coil section.

(a) The Fan Section shall be the forced air, draw-through type consisting of three (3) 18-inch diameter double width, double inlet fans on a common shaft driver by a 7-1/2 H.P., 220 volt, 3 phase, 60 cycle motor through a 15 H.P. rated "V Belt" drive. Total capacity of fan unit shall be 20,000 CFM against an external static pressure of 1/8 inch. Fan scrolls and wheels shall be of aluminum construction.

(b) The Coil shall be constructed of copper tubing with aluminum fins spaced not less than seven (7) per one (1) inch. The coil shall be not less than ten (10) rows deep and have a minimum face area of 28-square feet. Maximum head loss of water passing through coil shall not exceed 4.5 feet.

(c) The Unit Casing shall consist of aluminum panels (3S-1/2H) on a welded aluminum frame secured by means of rounded corner members. Entire unit shall be set upon suitable legs 6-inches high.

(d) Filters of the cleanable type, two inches thick, with aluminum media and frames shall be provided over air intakes. One (1) complete unit required.

(2) Water Cooling Unit shall consist of two units in parallel operation. Each of the two units shall be of similar capacities and specifications as the above Item #1 Water Cooling Unit.

(3) Circulating Pump shall be close coupled centrifugal type with open impeller and shall have a capacity of 30 G.P.M. of water against a 40 foot head. Motor shall be one (1) H. P. operated at 1750 R.P.M. on 220 volt, 3 phase, 60 cycle current. One (1) complete unit required.

(4) Circulating Pump shall be close coupled centrifugal type with closed impeller and shall have a capacity of 40 G.P.M. of water against a 44 Foot head. Motor shall be One (1) H. P. to operate at 1750 R.P.M. on 220 volt, 3 phase, 60 cycle current. One (1) complete unit required.

(5) Water Storage Tank shall have a capacity of 100 gallons and construction of 12 gauge steel, galvanized after construction. Tank shall have a tight fitting removable cover and a 1-1/2-inch screwed connection in bottom, 2-inch screwed connection in top, and a 1-1/2 inch and a 1/2 inch screwed connection in side near top. One (1) complete unit required.

(6) House Air Compressor shall be an Ingersoll-Rand No. 244HC5 unit, no equal. The capacity shall be 24.2 CFM at delivery pressure of 50 p.s.i.g. The unit shall be complete with a 60 gallon tank, inlet filter, and 5 H.P., 220 volt, 5 phase, 60 cycle explosion-proof electric motor and static resistant V-belts. One (1) complete unit required.

(7) Air Dryer shall be manually operated eight hour electric reactivated Silica Gel Drier with capacity of 25 CFM of standard air at saturated air pressure and temperature of 50 p.s.i.g. and 85° F. Unit shall be the twin tower type providing for continuous drying in one tower with re-activation in the other. Equipment shall be explosion-proof. Included with the air dryer shall be a pipe line absorbant type vapor filter using activated beauxite as an agent. One (1) complete unit required.

(8) Vacuum Pump shall be Ingersoll-Rand No. V-244X2- no equal. Unit shall be complete with 2 H.P., 220 volt, 3 phase, 60 cycle, explosion-proof motor and static resistant V-belts. One (1) complete unit required.

(9) Fume Hood shall be Kewaunee Manufacturing Company catalog No. 2781 - no equal. Hood shall be provided with one cold water gooseneck, one lead 6 x 3-inch bowl with trap. One gas outlet, one air vacuum cock, one electric receptacle explosion-proof, and one incandescent explosion-proof light with explosion-proof switch in apron rail. Water, gas, air outlets and vacuum inlet shall be remote control.

(a) Base Cabinet shall be No. 38, with a 1-1/4-inch Kemstone asbestos top. Cup sink shall be provided with No. 394, 1-1/2-inch lead "S" trap complete with No. 420, 1-1/2-inch lead adapter to I.P.S. fitting. Provide all piping to rough-in including all shut-off valves. Two (2) complete units required.

(10) Fume Hood shall be Kewaunee Manufacturing Company catalog number 2763, no equal. Hood shall be provided with one cold water gooseneck, one lead 6 x 3-inch bowl with trap, two gas cocks, and two incandescent explosion-proof

lights with explosion-proof switches. Water and gas outlets shall be remote controlled.

(a) Base Cabinets shall be No. 38, with a 1-1/4 inch Kemstone asbestos top. Cup sink shall be provided with No. 394, 1-1/2-inch lead "S" trap complete with No. 420, 1-1/2-inch lead adapter to I.P.S. fitting. Provide all piping to rough-in including all shut-off valves. One (1) complete unit required.

(11) Laboratory Wall Sinks shall be Kewaunee Manufacturing Company catalog No. 214, no equal. The sink proper, drainboards, ledge, and backsplash shall be constructed of Kemrock. Sink shall be fitted with one cold water cock with swing spout, one lead sink plug, overflow and lead "S" trap complete with No. 420, 1-1/2 inch lead adapter to I.P.S. fitting. Provide all piping to roughing-in, including all shut-off valves. Three (3) complete units required.

(12) Laboratory Wall Sink shall be Kewaunee Manufacturing Company, Catalog No. 211, no equal. The sink proper, drainboards, ledge, and backsplash shall be constructed of 1-1/4-inch Kemrock. Sink shall be fitted with one cold water cock with swing spout, one lead sink plug, overflow, and lead "S" trap complete with No. 420, 1-1/2-inch lead adapter to I.P.S. fitting. Provide all piping to roughing-in, including all shut-off valves. One (1) complete unit required.

(13) Standard Metal Units shall be Kewaunee Manufacturing Company, Catalog No. 56, no equal. Units shall consist of two full-width and five half-width drawers. Two of the half-width drawers are also half-depth, providing storage for small articles. All units shall be furnished with Kemweld tops with 6-inch high Kemweld curling at the wall line, tops to cover pairs and one single unit. Nine (9) complete units required.

(14) Laboratory Cases shall be Kewaunee Manufacturing Company, Catalog No. 124, no equal. Case shall be provided with glassed sliding door storage display. Unit shall be used as an upper section of the Standard Metal Units. All cases, shall be equipped for wall mounting. Nine (9) complete units required.

(15) Butane Gas Cylinders shall be similar to Item 4, paragraph d, section 26, of these specifications. Six (6) complete units required.

(16) Butane Piping Manifold shall be complete with all necessary piping, valves and regulating equipment

shall be provided to connect two gas cylinders to 1-1/4-inch building supply connection. One (1) complete unit required.

(17) Oxygen cylinders shall contain 220 cubic feet of oxygen per each cylinder. Six (6) cylinders required.

(18) Oxygen Piping Manifold shall be complete with all necessary piping, valves and regulating equipment shall be provided to connect two (2) oxygen cylinders to 1-inch building supply connection. One (1) complete unit required.

g. Building No. 217 - Drawing No. 2B-431:  
Furnish and install:

(1) Reefer - According to specification No. HN-5B-402 dated July 8, 1949. Two (2) complete units required.

(2) One Ton Pak Icer, complete with one-ton bin and 3 H.P. air-cooled condensing unit. Bin shall be constructed of redwood treated with linseed oil and shall be especially equipped with stainless steel liners, stainless steel drain plates, aluminum tie bolts and stainless steel hardware. Pak Icer shall be completely piped for refrigeration, including thermal expansion valve, heat exchanger, liquid dehydrator, liquid strainer, solenoid stop valve, water pump and water float valve. Motors shall be fungus and moisture proof. Each motor shall be provided with a suitable magnetic starter. Motors, starters, and all controls shall be suitable for operation on 220 volt, 3 phase, 60 cycle current. Capacity of Pak Icer shall be not less than 1700-pounds of ice per 24-hours at an ambient air temperature of 90° F. and an entering water temperature of 80° F. Two (2) complete units required.

(3) One-Ton Pak Icer shall be similar to that described in Item 2, except opposite; i.e., condensing unit shall be mounted on opposite end of Pak Icer from that furnished under Item 2. Two (2) complete units required.

h. Building No. 117 & 118 - Drawing No. 2B-407 -  
Furnish and install:

(1) Refrigerated Developing Unit shall consist of a thermo-insulated 3-compartment tank with moulded light tight cover, beneath which a water cooled refrigerating unit with the necessary controls and piping connections, all contained in a metal cabinet of welded construction. The compressor unit shall be 1/4 H. P. with a capacity to cool ten (10) gallons of water per hour from 85° F. to 65° F. with a

room temperature of 90° F. Tank shall have two-compartments with a capacity of 5-gallons each, and one compartment having a capacity of ten (10) gallons. One (1) complete unit required.

(2) Sterilizer shall be a steam jacketed autoclave, for dressing and utensil sterilizing. The inside dimensions shall be 16-inches in diameter and 24-inches long, and constructed entirely of brass, bronze and copper, with extra heavy fittings. Sterilizer shall be free standing having pipe supports with adjustable feet. Sterilizer shall be electrically heated and shall be complete with low water cut-off, generator, regulator, control box with mercury switches, fuses and neon pilot light, unit shall be wired to operate on 220 volts, 1 phase, 60 cycle current. One (1) complete unit required.

i. Building 409, - Drawing No. 2B-431 -  
Furnish and install:

(1) Beverage Reefer - According to specification IN-5B-410 dated September 27, 1949. One (1) complete unit required.

j. P. X., Barber Shop and Post Office Site "B" -  
Drawing No. 2B-432. Furnish and install:

(1) Flakice Machine shall be similar to Item 21, paragraph a, Section 26 of these specifications. One (1) complete unit required.

k. Building No. 212, Drawing No. 2B-433. Furnish and install:

(1) Pressureized Fume Hood shall be constructed of shelstone with sash and weight boxes of the same material. The dimensions of the hood shall not exceed the following: Length 71-inches, width 30-inches and height with sash up 67-inches. Hood shall have one incandescent light with surface mounted switch on the exterior left hand side panel of hood and a 9-inch diameter exhaust connection. One (1) complete unit required.

l. Building No. 318, Drawing No. 2B-439 - Furnish and install:

(1) Paint Spray Booth shall be floor type with back exhaust and distributing plates. Top of booth shall be equipped with 24 x 24-inch wire glass window and frame. Fan shall be 24-inch diameter, 1400 R.P.M., and a capacity of 5850 C.F.M. free air delivery. Motor shall be 1/2 H.P., 115/230 volt, single phase, 60 cycle. Motor shall be mounted outside the exhaust duct on adjustable base and connected to fan by "Vee-belts" passing thru dust tight housing. One (1) complete unit required.

m. Building - Drawing No. 2C-452: Furnish and install:

(1) Steam table shall be approximately 84 x 30 x 34 inches high. Top shall be 14-gauge with 2B finish

stainless steel and shall have six (6) openings for No. 2000 hotel pans. Body shall be 18 gauge galvanized steel, with shelf under of 14-gauge galvanized steel. The steam table shall be furnished with a 32-ounce copper pan and 3/4-inch copper steam coil. Legs shall be 1-1/4-inch galvanized pipe with adjustable feet. A 1-1/2-inch thick hardwood cutting board shall be furnished with the cook's side to bring the fixture to 30-inches overall height. Corners of table shall be squared for assembly to adjoining unit. Three (3) complete units required.

(2) Pick-Up Counter and Dish Storage shall be approximately 216 x 15 x 42-inches high. Top shall be 16-gauge with No.2B finish stainless steel. Body including front sliding doors shall be 18-gauge galvanized steel. Bottom and two intermediate shelves shall be of 14-gauge galvanized steel well braced. Bottom shelf shall be 6-inches above floor while the other two shelves shall divide the remaining space equally. Unit shall have galvanized pipe legs with adjustable feet. Cut from right corner which faces dining area at an angle as shown on drawing. This unit shall be designed to fasten onto steam table, cold pan and ice cream cabinet to form pass counter. Three (3) complete units required.

(3) Cold Pan shall be approximately 54 x 30 x 34-inches high. The entire top area shall be 6-inches deep cold pan of 16-gauge with No. 2B finish stainless steel, with perforated false bottom of the same material. The pan compartment shall be insulated with 2-inches of cork. A full length 14-gauge galvanized steel shelf, 10-inches above the floor shall be provided with the unit; also, included shall be galvanized pipe legs with adjustable feet. All corners shall be squared for assembly to adjoining units. Three (3) complete units required.

(4) Ice Cream Cabinet shall be of a self-contained unit approximately 53 x 30 x 34-inches high all metal cabinet. Entire top shall be stainless steel with six double row holes for ice cream containers; balance of cabinet shall be white Dulux finish. Cooling unit shall be open-type, air-cooled condenser compressor unit powered by a 1/3 H.P. 110/220 volt, 60 cycle, single phase motor. Three (3) complete units required.

(5) Work Table. Work table shall be 60 x 30 x 34-inches high. Top shall be 12-gauge galvanized steel with a 6-inch 18-gauge galvanized steel apron on all sides, and galvanized pipe legs with adjustable feet. Shelf under top shall be 14-gauge galvanized steel. Shelf above top shall be full length, 12-inches wide and 20-inches above table top

mounted with galvanized supports on back portion of table. Three (3) complete units required.

(6) Toasters shall be stainless steel rotary type with capacity of 9 to 12 slices per minute, maximum electrical input of 3500 watts to heaters, and a motor driven conveyor operating on 220 volts, single phase, 60 cycle current, maximum full load on motor of 40 watts. Three (3) complete units required.

(7) Bread Slicer shall be gravity feed chute type to handle 16 loaves, 1/2 inch slices with 1/3 H.P., 110 volt, 60 cycle, single phase motor. Three (3) complete units required.

(8) Reach-In Refrigerator shall be 90 cu.ft. self-contained model with 20-gauge aluminum exterior and 22-gauge aluminum interior. Insulation shall be 4-inches of fiberglass insulation. Refrigerator shall be approximately 104 x 34 x 78-inches high with two (2) long doors having six hinges each, four small doors having three hinges each, and all hardware heavily chrome-plated case brass or bronze. Twenty-four adjustable wire shelves shall be provided. Cooling unit shall be self-contained including compressor, air-cooled condenser, and all necessary accessories and controls. Compressor motor shall be 3/4 H.P., operating on 220 volt, 3 phase, 60 cycle current. Thermic coil balanced to compressor, unit shall have magnetic starter, and overload, underload protection. Three (3) complete units required.

(9) Bain Marie shall be 36 x 30 x 34-inches high, with 16-inch deep 12-gauge galvanized steel pan and 12-gauge galvanized steel 2-inch high perforated false bottom for pan. Provide a pan with drain and 3/4-inch copper steam coil. Top edges shall be die rolled 1-1/4-inch. Leg shall be 1-1/4-inch galvanized pipe with adjustable feet. Legs shall be fastened to pan with gussets. Three (3) complete units required.

(10) Cooks Sink shall be 24 x 24 x 14-inches deep. Top of sink shall be 34-inches from floor, with no back splash. Sink shall be 12-gauge galvanized steel with center drain and top edges die rolled, 1-1/4-inches. Galvanized pipe legs having adjustable feet shall be fastened to sink with gussets. Three (3) complete units required.

(11) Cook's Work Table shall be 84 x 30 x 34-inches high with top of 12-gauge galvanized steel, and body enclosed on back and both ends with 18-gauge galvanized steel. Cook's side shall be open with a bottom shelf of 14-gauge galvanized steel and two galvanized die stamped tool drawers on patented

slides. Legs shall be 1-1/4 inch galvanized pipe with adjustable feet. Three (3) complete units required.

(12) Mixer shall be sixty quart size with standard equipment, driven by a 1 H.P. 220 volt, 3-phase, 60 cycle motor. Three (3) complete units required.

(13) Work Table shall be 34 x 30 x 34-inches high with 12-gauge galvanized steel top, 18-gauge galvanized steel apron all around, two galvanized die stamped tool drawers on patented slide, shelf under of 14-gauge galvanized steel, and well braced galvanized pipe legs with adjustable feet. Table shall also have a full length 12-inch 16-gauge galvanized steel shelf across back with top 20-inches above table height and fastened to table with galvanized brackets. Three (3) complete units required.

(14) Food Cutter shall be pedestal type with hub attachment. Cutter shall be driven by a 3/4 H.P., 220 volt 60 cycle, 3 phase motor. Three (3) complete units required.

(15) Meat Grinder shall be gravity feed type with stainless steel pan and a capacity of 20 to 25-pounds of meat. The unit shall be driven by a 1/2 H.P., 115/230 volt, 60 cycle, single phase motor. Three (3) complete units required.

(16) Butcher's Work Table shall be 72 x 30 x 34-inches inches with a 3-inch laminated maple top, 18-gauge galvanized steel apron all around, and one galvanized die stamped tool drawer on patented slides at tight end of table. Provide a shelf below of 14-gauge galvanized steel and heavily braced galvanized pipe legs with adjustable feet. Three (3) complete units required.

(17) Work Table shall be 48 x 24 x 34-inches high with 14-gauge galvanized steel top, shelf under of 14-gauge galvanized pipe legs mounted on rubber tired, ball bearing, heavy duty 4-inch all-swivel casters. Three (3) complete units required.

(18) Vegetable Preparation Table shall be 84 x 30 x 34-inches high with a 12-gauge galvanized steel top, shelf under of 14-gauge galvanized steel 16-gauge galvanized steel apron all around table, two galvanized die stamped tool drawers on patented slides and galvanized pipe legs with adjustable feet. A full table length 16-gauge galvanized steel shelf 12-inches wide with open back shall be provided 20-inches above top of table. Three (3) complete units required.

(19) Vegetable Work Table shall be 84 x 30 x 34-inches high with 12-gauge galvanized steel top, shelf under of 14-gauge galvanized steel, 16-gauge galvanized steel apron all around table, and galvanized pipe legs with adjustable feet. Back of table top and right hand end shall be turned up 1-inch and then down to finish at same level as bottom of table top in front. Full table length 16-gauge galvanized steel shelf 12-inches wide shall be provided 20-inches above and over the back portion of the table. Galvanized steel brackets shall support shelf above table. Three (3) complete units required.

(20) Potatoe Peeler shall have a 50-pound capacity and be complete with peel basket and hose connection to sink. Unit shall be driven by a 1/4 H.P., 110 volt, 60 cycle, single phase motor. Three (3) complete units required.

(21) Soiled and Clean Dish Table:

(a) Soiled Side: Shall be a 84 x 28-inch table with 1-1/4-inch die roll on work side. Front right hand end cut on a 45° angle. Top shall have a dish scrapping hole, rubber scrapping block, and 10-inch back splash with 2-inch return to wall. Top shall drain toward dishwasher. A full length 12-inch wide 16-gauge galvanized steel shelf shall be provided over table at back portion 22-inches above the table top. Edges of the shelf shall be turned up 1/2 inch and down to eliminate rough edges. Shelf shall be supported by dish table. A 14-gauge galvanized steel shelf shall be provided under top from left hand end up to approximately 18-inches of garbage hole. A quick drain with strainer the full width of the table shall be installed in the table 6-inches from point of connection to the dishwashers.

(b) Clean Side: Shall be a 150 x 28-inches table with 1-1/4-inch die roll on work side and 10-inch back-splash with 2-inch return to wall. At end away from dishwasher, provide a two compartment sink (each compartment 24 x 24 x 14-inch deep) with corner drains and overflow. Drain dish table towards sinks and provide shelf of 14-gauge galvanized steel under drain board.

(c) Both Sides: Top and backplash of both tabled and sinks shall be 12-gauge galvanized steel with shelves above of 16-gauge and below of 14-gauge galvanized steel. Tables shall have galvanized pipe legs with adjustable feet. Three (3) complete units required.

(22) Dishwasher shall be single tank hydraulic drive conveyor model of galvanized construction with built-in ventilating cowls and hood. The unit shall be equipped with thermostatically controlled steam coils and steam booster for raising 140°F. water to 180°F. for final rinse, all necessary thermometers, six dish baskets, four combination cup, glass and silverware baskets of chrome plated metal. Dishwasher shall be approximately 45 x 25-inches and the motor shall be 1-1/2 H.P. 220 volt, 60 cycle, 3 phase. Three (3) complete units required

(23) Range specifications shall be similar to Item #10, paragraph a, Section 26 of these specifications. Three (3) complete units required.

(24) Steam Cooker shall have three compartments with automatic sliding shelves, interior and exterior construction of galvanized steel. Cooker shall be direct steam operated through synchronized thermostatic control. Eight tall, narrow, seamless drawn, perforated stainless steel baskets shall be furnished with the cooker. Three (3) complete units required.

(25) Deep Fat Fryers shall be automatic electric fry kettles with capacity of 37 to 40-pounds and operating on 220 volts, 3 phase, 60 cycle current. Each fryer shall have two half-size frying baskets. Six (6) complete units required.

(26) Griddle: Specifications shall be similar to Item #9, paragraph a, Section 26 of these specifications. Three (3) complete units required.

(a) Griddle Stand shall be 38 x 23 x 25-inches high. Top shall be heavily reinforced 14-gauge galvanized steel with back and both ends to be turned up 1-inch and front to be turned down 1-inch, and galvanized pipe legs with adjustable feet. Shelf under top shall be 16-gauge galvanized steel 6-inches above floor. Three (3) complete units required.

(27) Ice Bin shall be approximately 24 x 30 x 42-inches high with bottom 8-inches above floor and standing on galvanized pipe legs with adjustable feet. Construction shall include interior and perforated false bottom of 18-gauge 2B stainless steel, exterior of 18-gauge galvanized steel, all sides and bottoms insulated with 2-inches of cork and removable uninsulated top of 14-gauge 2B stainless steel. Top shall be hinged in center with chrome plated piano hinge and

shall have stainless steel legs in each corner on under side to prevent slippage. Top shall be flush with exterior body of bin and edges shall be hemmed to eliminate sharp edges. Three (3) complete units required.

(28) Coffee Urn shall have square twin five gallon stainless steel urns with stainless steel liners; 5/8-inch steam coils, thermostatically controlled; and 1-inch faucets, outlets of which are to be 10-1/2-inch above stand. Urn shall be furnished with two, five-gallon stainless steel french drip baskets, 2000 filter papers, and a one gallon measure. Three (3) complete units required.

(a) Coffee Urn Stand shall be 36 x 30 x 34-inches high. Top shall be heavily reinforced 14-gauge, 2B finish stainless steel with built-in removable splash and drain. Two ends and back shall be 16-gauge galvanized steel; front to be open. Bottom and intermediate shelf shall be 16-gauge galvanized steel and legs shall be galvanized pipe with adjustable feet. Three (3) complete units required.

(29) Reefer shall be 675 cu. ft. pre-fabricated, portable, knock-down, walk-in storage refrigerator with pre-fabricated, panel-mounted, refrigeration equipment assemblies. Refrigerator box shall be U.S. Navy Stock No. Y-66-R-345-600 constructed of steel and complying with the following description. Overall outside dimensions of box shall be 154-inches long by 108-inches wide by 90-inches high. Refrigerator unit shall be U.S. Navy Stock No. Y-66-R-353 with Freon-12 as the refrigerant charge, and complying with the following description. Overall outside dimensions of unit shall be 36-inches long by 46-inches wide by 81-inches high. Reefer box and refrigeration unit shall be equipped with all necessary appurtenances. Six (6) complete units required.

n. Building Drawing No. 2E-450, Furnish and install:

(1) Steam Table shall be approximately 96 x 30 x 34-inches high. Top shall be of 14-gauge with 2B finish stainless steel, and shall have seven (7) openings for No. 2000 hotel pans. Body shall be of 18-gauge galvanized steel with shelf under 14-gauge galvanized steel. The steam table shall be furnished with a 32-ounce copper pan and a 3/4-inch copper steam coil. Legs shall be 1-1/4-inch galvanized pipe with adjustable feet. A 1-1/2-inch thick hardwood cutting board shall be furnished on the cook's side to bring the fixture to 30-inches overall height.

(2) Pick-Up Counter and Dish Storage shall be approximately 228 x 16 x 42-inches high. Balance of specifi-

cation shall be similar to Item #2, paragraph m Section 26 of these specifications. One (1) complete unit required.

(3) Cold Pan shall be approximately 72 x 30 x 34-inches high. The balance of the specification shall be similar to Item #3, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(4) Ice Cream Cabinet shall be a self-contained unit approximately 65 x 30 x 34-inches high all metal cabinet. Entire top shall be stainless steel with eight (8) double row holes for ice cream containers; balance of cabinet shall be white Dulux finish. Cooling unit shall be open type air-cooled condenser compressor unit powered by a 1/3 H.P., 110/220 volt, 60 cycle, single phase motor. One (1) complete unit required

(5) Work Table shall be 48 x 30 x 34-inches high. Balance of specification shall be similar to Item #5, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(6) Toaster specifications shall be similar to Item #6, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(7) Bread Slicer specifications shall be similar to Item #7, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(8) Reach-In Refrigerator specifications shall be similar to Item #8, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(9) Bain Marie specifications shall be similar to Item #9, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(10) Cook's Sink specification shall be similar to Item #10, paragraph g, Section 26 of these specifications. One (1) complete unit required.

(11) Cook's Work Table specification shall be similar to Item #11, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(12) Mixer specifications shall be similar to Item #12, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(13) Work Table shall be 84 x 30 x 34-inches high with 3-inch laminated maple top. Balance of specification shall be similar to Item #13, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(14) Food Cutter specification shall be similar to Item #14, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(15) Meat Grinder specification shall be similar to Item #15, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(16) Meat Block specifications shall be similar to Item #16, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(17) Vegetable Preparation Table shall be 96 x 30 x 34-inches high with 12-gauge galvanized steel top, shelf under of 14-gauge galvanized steel, apron all around of 18-gauge galvanized steel, two galvanized die stamped tool drawers on patented slides, table shall be supported by galvanized pipe legs with adjustable feet. One (1) complete unit required.

(18) Work Table shall be 90 x 24 x 34-inches high with 12-gauge galvanized steel top, shelf under of 14-gauge galvanized steel, 18-gauge galvanized steel apron around. Table shall be supported by galvanized pipe legs with adjustable feet. One (1) complete unit required.

(19) Vegetable Preparation Sink shall be a 150 x 28-inch table with 1-1/4-inch die roll on front and left hand end, and 10-inch back splash with 2-inch return to wall. Center shall be provided with a two-compartment sink (each 24 x 24 x 14-inches deep) with corner drain and overflow. Area under drain board shall have a 14-gauge galvanized steel shelf, well braced. Top, sinks, and back splash shall be 12-gauge galvanized steel. Unit shall have eight galvanized pipe legs with adjustable feet. One (1) complete unit required.

(20) Pot Washing Sink shall have L-shaped sink table 120-inches plus 66-inches long by 28-inches wide. Height at ends adjoining Item #18 and #21 shall be the same as respective items for bolting together and soldering when assembled in field. Two compartment sink shall be built in 120-inch leg of L-shaped table. Each sink compartment shall be 30 x 24 x 14-inches deep, with corner drains and overflow. Top, sinks, and 10-inch back splash shall be 12-gauge galvanized steel. Back splash shall have 2-inch return to wall. Die roll top on front only. Unit shall be supported by galvanized pipe legs with adjustable feet. One (1) complete unit required.

(21) Potato Peeler specifications shall be similar to Item 20, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(22) Soiled and Clean Dish Table:

(a) Soiled Side shall be 11 $\frac{1}{4}$  x 28-inches with balance of specification similar to Item 21 (a), paragraph m, Section 26 of these specifications. One (1) complete unit required.

(b) Clean Side shall be 96 x 28-inches table with 1-1 $\frac{1}{4}$ -inch die roll on work side and 10-inch back splash with 2-inch return to wall. The end away from dishwasher shall match with pot washing sink in order to be bolted together when assembled at jobsite. Drain dish table toward sink and provide shelf of 1 $\frac{1}{4}$ -gauge galvanized steel under drain board. One (1) complete unit required.

(c) Both Sides shall have top and back splash of 12-gauge galvanized steel, shelves under of 1 $\frac{1}{4}$ -gauge galvanized, shelves over of 16-gauge galvanized, and galvanized pipe legs with adjustable feet. Dish tables shall be designed to fit dish washer. One (1) complete unit required.

(23) Dishwasher specifications shall be similar to Item #22, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(24) Range specifications shall be similar to Item #10, paragraph a, Section 26 of these specifications. One (1) complete unit required.

(25) Steam Cooker specifications shall be similar to Item #24, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(26) Deep Fat Fryer specification shall be similar to Item #25, paragraph m, Section 26 of these specifications. Two (2) complete units required.

(27) Griddle specifications shall be similar to Item #9, paragraph a, Section 26 of these specifications. One (1) complete unit required.

(a) Griddle Stand specifications shall be similar to Item 26 a, paragraph g, Section 26 of these specifications. One (1) complete unit required.

(28) Ice Bin specifications shall be similar to Item #27, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(29) Coffee Urn shall have square twin ten gallon stainless steel urns with balance of specification similar to Item #28, paragraph m, Section 26 of these specifications. One (1) complete unit required.

(a) Coffee Urn Stand shall be 40 x 30 x 34-inches high with balance of specification similar to Item #28(a), paragraph g, Section 26 of these specifications. One (1) complete unit required.

(30) Bake and Roast Oven shall be portable three deck heavy duty oven with one 12-inch high roasting deck and two baking decks each 8-inches high. Each deck shall have a gravity feed oil burner for No. 3 or lighter Diesel oil and a motor driven blower to operate on 110, volt, 60 cycle, single phase current. The oil burner shall be located on the right-hand end of oven. One (1) complete unit required.

(31) Steam Kettle shall have 60 gallon capacity with fuel jacketed, seamless drawn, stainless steel kettle; one piece hinged cover; stainless steel strainer; safety valve; and stainless steel tubular legs with adjustable floor flanges. Kettle shall be for direct steam operation and equipped with a tangent type outlet. One (1) complete unit required.

(32) Reefer specifications shall be similar to Item #29, paragraph m, Section 26 of these specifications. Two (20) complete units required.

o. Building 13, Drawing No. 2L-440. Furnish and install:

(1) Cage Sterilizer shall be 66 x 44 x 40-inches deep inside with construction of 3/16-inch steel plate, 2-inch steel angles, and hot dipped galvanized after fabrication. The hinged cover shall be made of 1/16-inch galvanized steel, properly braced with galvanized steel angles. The cover shall be provided with a substantial handle and counter weights. Heating shall be by a steam coil in the bottom of unit. Threaded opening, vented overflow, water inlet and drain shall be provided; the latter shall be equipped with suitable drain valve. A removable tray shall be provided of such size as to cover the entire bottom of sterilizer; so that, when tray is used with a twin hoist or overhead track and

trolley arrangement, handling of cages in and out of the sterilizer by one operator will be facilitated. One (1) complete unit required.

p. Building 12, Drawing No. 2L-489. Furnish and install:

(1) Sterilizer specification shall be similar to Item #2, paragraph h, Section 26 of these specifications. One (1) complete unit required.

q. Building Drawing No. 2G-926. Furnish and install:

(1) Portable Refrigerator shall be 150 cu. ft. and shall consist of two major parts, the cold storage room and refrigerating machine. Both shall be within a common structural steel frame enclosure forming a self-contained unit. It shall be so designed to use an electric motor as a source of power to drive the condensing unit with a gasoline engine as a standby. Refrigerator shall be U.S. Navy Stock No. Y-66-R-345-50 complying with the following description: Inside clear dimensions of refrigerated compartment shall be 67-1/8-inches long by 59-1/8-inches wide by 67-1/8-inches high. The refrigerator unit shall be equipped with all necessary appurtenances. Six (6) complete units required.

r. Plumbing and Machine Shop, Building No. 314, Drawing No. 2B-156: Furnish and install:

(1) Hack Saw shall be 8" x 8", Model No. 2M-1, "Marvel" make.

(2) Pipe Cutter and Threader shall be 1"-4", Model No. 1-2-4, "Toledo" make.

(3) Mill shall be "Kemp Smith" make.

(4) Shaper shall be "Stephens" make.

(5) Anvil shall be 17" x 29" x 11 $\frac{1}{4}$ ", "Trenton" make.

(6) Hydraulic Press shall be 60 ton, "Manley" make.

(7) Drill shall be 21" Floor type, "Cannedy-Otto" make.

44, "Excello" make. (8) Grinder shall be 3/4 HP, Model No,

(9) Engine Lathe shall be 36" swing and 16 foot bed, Model "Pacemaker" and "American" make.

(10) Compressor shall be Model No. T-94-T, "Gardner-Denver" make.

s. Materials Testing, Building No. 309, Drawing No. 2B-163: Furnish and install:

(1) Concrete Breaking Machine shall be 300,000 p.s.i., "Southwork-Emery" make.

(2) Scale shall be 200 pound, "Fairbanks-Morse" make.

(3) Shaker shall be 1/4 HP, "Porter" make.

(4) Sink shall be 22" x 36" x 10", Cast Iron enameled, Model 2 comp.

(5) Water Cure Tank shall be 36" x 72" x 20", galvanized iron.

(6) Oven shall be 18" x 11" x 14", Precision Scientific Company make.

t. Building No. 232, Drawing No. 2B-5133: Furnish and install:

(1) Drill Press shall be Model "Royal 16", "Cannedy-Otto" make.

u. Building No. 211, Drawing No. 2B-188: Furnish and install:

(1) Drill Press shall be 1/2 HP, Bench Type, Model 16, "Royal" Make.

(2) Grinder shall be 7", bench type, Model 1B, "Queen City" make.

(3) Lathe shall be 10-1/8" swing and 56" Bed, Bench type, Model No. L-S6, "Sheldon" make.

(4) Lathe shall be 12 1/2" swing, Model No. 1020-S, "Rivett" make.

(5) Shaper shall be 12" stroke, Model No. 1C, "Sheldon" make.

(6) Do-All Saw shall be 3/4" HP, Band Type, Model No. ML, "Do-All" make.

(7) Milling Machine shall be 1/2 HP, Turret type, Model No. 11497, "Bridgeport" make.

(8) Cut-Off Saw shall be 10" x 13", cut-off type, Model No. J. "Johnson" make.

(9) Drill Press shall be 3/16" to 3/4", Model No. 13N, "Buffalo" make.

(10) Tool Grinder shall be 3/4 HP, Model No. 44, "Excello" make.

v. Boat Repair Shop, Building No. 406, Drawing No. 2B-154: Furnish and install.

(1) Bench Grinder shall be 7" Wheel, Model No. 85, "Blue Point" make.

(2) Compressor shall be Model No. HBC-1, "Ingersoll-Rand".

(3) Drill Press shall be 68" Height, Model No. 1060, "Atlas" make.

w. Paint & Sign Shop, Building No. 406, Drawing No. 2B-162: Furnish and install:

(1) Compressor shall be Model No. 33,1135, "Binks" make.

x. Motor & Dukw Repair Shop, Building No. 322, Drawing No. 2B-150: Furnish and install:

(1) Brake Lining Machine shall be Model No. B-51, "Barrett" make.

(2) Battery Charger shall be Model No. 2B-232, "LST Mfg. Co."

(3) Compressor shall be Model No. 51-63-HG, "Wayne" make.

y. Electric Refrigeration & Air Conditioning Shop, Building No. 315, Drawing No. 2B-161: Furnish and install:

(1) Coil Winder shall be 1½ HP, Model No. Ace #1, "Armstrong Coil Equipment" make.

(2) Dispatch Oven shall be 24" x 24" x 36", Model No. RS-0, "Dispatch" make.

(3) Arbor Press shall be Model No. NA-3, "Framco" make.

(4) Grinder shall be 1/2 HP, Model No. 5685, "Thor" make.

z. Carpentry Shop, Building No. 317, Drawing No. 2B-159: Furnish and install.

(1) Drill Press shall be Model No. P-16, "Cannedy-Otto" make.

(2) Bench Lathe shall be 10-1/8" swing and 56" bed, Model No. L-56, "Sheldon" make.

(3) Jointer shall be 6", Model No. 3031, "Durco" make.

(4) Circular Saw shall be 46 1/2" x 30", Model No. G-3013, "Durco" make.

(5) Grinder shall be 7" Diameter, Model No. 1B, "Queen City" make.

(6) Band Saw shall be 16", Model No. F-3023, "Durco" make.

(7) Swing Arm Saw shall be "DeWalt" make.

(8) Lathe shall be 10-1/8" swing and 56" bed, Model No. L-56, "Sheldon" make.

aa. Shop, Drawing No. 2G-903: Furnish and install:

(1) Battery Charger shall be 75 amp. Model No. P-75, "Franklin" make.

(2) Battery Charger shall be 144 amp., Model No. 107, "Marquette" make.

(3) Machine Lathe shall be 10-1/8" swing and 56" Bed, Model No. L-56, "Sheldon" make.

(4) Electric Drill shall be 5/16" capacity, Model No. 250, "Ski-Drill" make.

(5) Electric Drill shall be 1/4" capacity, Model No. 3765, "Thor" make.

(6) Electric Drill shall be 1/2" capacity, Model No. 6349, "Thor" make.

(7) Arbor Press shall be Model No. 3, "Famco" make.

(8) Grinder shall be 6" diameter, Model No. MU-65, "Black & Decker" make.

bb. Sheet Metal Shop, Building No. 36, Drawing No.  
2B-158: Furnish and install:

- (1) Drill Press shall be Model No. 73, "Cannedy-Otto" make.
- (2) Grinder shall be Model No. 855, "Blue Point" make.
- (3) Soldering Furnace shall be one gallon capacity, gasoline type, "Clayton" make.
- (4) Square Shear shall be Model No. 18-52, "Famco" make.
- (5) Press Brake shall be 8 feet long, Model No. 16-8, "Whitney-Jensen" make.

26-09. TEST OF COMPLETED SYSTEMS: After the installation is completed, the Contractor 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 in the presence of the Contracting Officer for his approval and satisfaction.

## SECTION 27

### ASPHALTIC CONCRETE PAVING & EMULSIFIED ASPHALT DUST PALLIATIVE

27-01. LOCATIONS: The areas to be paved with asphaltic concrete, and thickness of pavement and the elevations thereof, and the areas to be treated with Emulsified Asphalt Dust Palliative, are shown on the working drawings.

27-02. THE WORK OF THIS SECTION: Includes the furnishing of all labor, equipment, transportation and materials, exclusive of Bitumuls HRM, required to complete the paving and dust palliative treatment, of all areas shown on the working drawings to be paved or dust treated.

#### 27-03. ASPHALTIC CONCRETE PAVEMENT:

a. 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.

b. 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.

c. Equipment for Mixing: Equipment for making the Bitumuls mixes can be concrete mixers, paddle type plaster mixers, pug 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.

d. Aggregate: Aggregate shall consist of crushed ledge coral or coral beach sand or a combination of both. Crushed coral aggregate may be obtained from loose reef rock or pits without the necessity of shooting or quarrying. Where possible, the aggregate shall fall within the gradation listed below:

(1)	Percent passing	1-1/2" screen		100%
(2)	" "	3/4" "	30 to	100%
(3)	" "	1/2" "	60 to	80%
(4)	" "	1/4" "	40 to	60%
(5)	" "	#10 Sieve	35 to	50%
(6)	" "	#40 "	15 to	30%
(7)	" "	#80 "	10 to	15%
(8)	" "	#200 "	2 to	7%

e. Proportioning: Approximately 6% to 14% Bitumuls shall be used in the mix, which equals 0.65 to 1.5 gallons per cubic foot loose of the coral aggregate. The percentage of bitumuls shall be as ordered by the engineer. For coral sand alone, and in cases where it is impracticable or uneconomical to approximate the exact gradation specified, the quantity of Bitumuls in the mixture should be increased. The method of measuring the materials and the exact proportions shall be determined by either volumetric or weight control. 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 over wet 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.

f. Cement Admixture; To prevent wash-off of Bitumuls in cases of imminent rainfall and to accelerate drying of the mix, approximately one percent of Portland cement by weight of aggregate shall be added to the mix. Broken bags in which the cement has not hardened into large chunks may be used for this purpose. Cement should be added after the emulsified asphalt has been mixed with the aggregate, and mixing then continued until the cement is uniformly dispersed in the mixture. The cement should be added only on the advice of the Engineer.

g. Preparation of Base: The grade shall be brought up to the required cross-section and shall be thoroughly compacted until firm and unyielding. Stabilizing material shall be used if necessary.

h. 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-Green, 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. If rubber-tired rollers are not available a steel wheel roller may be used and rolling started as soon as possible.

(1) Paving Plant Inspection: The Engineer or his authorized representative shall have access at any time to all parts of the paving plant.

i. Seal Coat: After the pavement has been compacted and the moisture content has decreased to a value of 5% or less, the surface of airstrips and roads subject to heavy traffic shall be sealed, if ordered by the Engineer, with an application of Bitumuls applied at the rate of 0.15 to 0.20 gallons per square yard. Sealing shall be done only during dry weather and only at times when traffic can be kept off the pavement. Immediately following the application of the Bitumuls seal coat, the surface shall be broom-dragged once over, to mix any dust on the surface with the Bitumuls. Traffic shall be kept off until the surface is not sticky. Broom-drag may be pulled by the distributor truck. On sealing coral-sand pavements dilute three parts of Bitumuls to one part water and apply at the rate of 0.3 to 0.4 gallons of dilution per square yard of paving.

27-04. EMULSIFIED ASPHALT DUST PALLIATIVE:

a. 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.

b. Materials: The material to be treated consists of coral surfacing in place on the areas to be treated. The only additional materials required for the treatment are emulsified asphalt, Grade HRA, and water.

c. Construction: 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 and replaced with coarser material prior to treatment.

(1) 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.

(2) The rate of dilution will depend on the quantity of fine dusty material in 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 asphaltic skin.

(3) 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 0.15 and 0.25 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 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 earth roads, a preliminary application of water will improve the uniformity of the results. Re-treatments may usually be somewhat lighter than the original treatment.

d. Helicopter Landing Mats and Airfields: After dust palliative treatment has been applied to Airfields and Helicopter Landing Mats as above specified, the areas shall be rolled with a steel roller. If the surface seems tacky during rolling, water shall be applied to the wheels of the roller to prevent pick-up. Not earlier than the following day an additional application of Bitumuls on heliomats and airfields shall be made in the following manner:

(1) The Bitumuls shall be diluted with equal parts of water, and spread at the rate of three-tenths (0.3) gallons per square yard. Should the surface of the airfield or mat be dry and dusty at the time the first application is made, it shall be lightly sprinkled with water to wet any free dust.

## SECTION 28

### SCIENTIFIC STRUCTURES

28-01. GENERAL REQUIREMENTS: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with the construction of the scientific structures herein listed and described, complete, in strict accordance with the specifications and the applicable drawings. The work shall conform to all provisions of this section of the specification, and all work not specifically mentioned in this section shall be performed in accordance with applicable provisions contained in other sections of the specifications.

28-02. STATION NO. 2, LOCATION C, E, E+, AND V:

a. Reference Drawings: 3E-660, 3E-5689.

b. Type: Wood structure, banked earth over.

c. Construction: Structure 9' x 8' x 7' high, inside, erected on 8" concrete slab with slab bottom 4'-6" below grade. All lumber shall be 1200f grade Douglas Fir, of sizes and spacing shown. Roof and sides of structure shall be covered with mineral cap sheet with side and end laps set in roof cement and properly nailed as shown. After wood structure is completed, a 4" concrete slab shall be poured over entire floor. Door shall be wood frame, diagonally sheathed both sides and covered on outside with .032 flat aluminum sheet. Building shall be covered with banked earth to height and slope indicated. All clip angles and bolts, except anchor bolts shall be galvanized after fabrication.

d. Electrical Work: Electrical work includes direct burial cable services, power and light wiring, telephone wiring, etc., in accord with sections 16, 17 and 18 of the electrical specifications.

28-03. STATION NOS. 3, 4 & 5:

a. Reference Drawing: 2H-056

b. Electrical work includes wood post, plywood enclosure with hinged door, provisions for direct burial cable entrance and equipment as follows:

(1) Power post - fused switch and receptacles.

(2) Telephone post - field telephone.

c. Stations shall be installed at locations as listed in schedule on drawing No. 2H-056 and as covered by the various location plans.

d. Work shall be in accord with sections 16, 17 and 18 of electrical specifications.

28-04. STATION NO. 6, (BLDGS. #6a and #6b), LOCATIONS C,D,E & E+

a. Reference Drawings: Structural, 3G-630, 3E-5690, Electrical, 3G-035; Dehumidification, 3G-483.

b. Type: Concrete Structures, banked earth to roof line.

c. Construction: Building #6a is existing and shall be altered as shown on drawings. Alteration shall include the installation of new pipe sleeves and wall fittings in existing concrete, new electrical and mechanical installations and all other work as indicated.

Building No. 6b shall be a new reinforced concrete structure 13' x 23' x 7'-6" high inside, with top of floor slab at grade level. All pipe sleeves, wall fittings, bolts, tee-slot channels, conical instrument assemblies in roof, etc., shall be located and installed as indicated on drawings. Steel explosion-proof doors shall be size and type specified and installed as shown in details. For door specification see Section 9-06.

d. Conical Instrument Openings: Provide and install six (6) steel Conical Instrument Opening Assemblies, 2 each in Building 6b of Station #6, Location C,D, and E. Assemblies shall be fabricated as shown on Sheet 3G-630, Detail G. Steel plate material shall be 1/4 inch and 1/2 inch thick as noted. All welds shall be of sizes and types indicated and shall be continuous. Welds occurring at gasket seats shall be ground square. All studs shall be 1/2 inch diameter, lengths as noted, threaded two ends, all nuts hexagonal. Gaskets and Glass will be furnished by others. Each of the six units shall consist of one (1) complete steel assembly, less gasket and glass, and four (4) 1/2 inch diameter by 18 inches long studs each with two hex nuts and cut steel washers. All stud bolts, nuts and washers shall be galvanized. Steel assembly shall be given one shop coat "Keystone" Rust Preventative as specified under Section 6-10. Installation shall conform to location and method shown on plans. Provide a pocket for each assembly stud bolt by forming out or greasing and burlap wrapping each inserted stud bolt.

Electrical: Electrical work includes direct burial cable services, power and light wiring, instrumentation panels and wiring, ground wiring, etc., in accord with Sections 16,17 and 18 of the electrical specifications.

f. Mechanical: Dehumidification system shall conform to applicable provisions of Sections 19 and 23 of these specifications.

28-05. STATION NO. 7, LOCATION N, P AND M:

a. Reference Drawings: Structural, 2N-639, 3M-5636, Electrical, 3N-049.

b. Type: Frame Structures.

c. Construction: All concrete foundations shall be of types and sizes shown on the drawings and all concrete shall be 2000 p.s.i reinforced concrete. All lumber for framing and sheathing shall be 1200f grade Douglas Fir, all sills shall be foundation grade Redwood or pressure treated Douglas Fir. All framing members shall be of sizes and spacing indicated and shall be fastened at all connections with aluminum clip angles, bolts and lag bolts, alloy 61 S-T6. Sheathing at sides and roof shall be 2" thick, laid diagonally, and covered with .032 flat aluminum sheet, applied as shown in detail. Wood frame door shall be sheathed as shown and the exterior shall be covered with flat aluminum sheet, applied same as at sides. Wood shelf shall be built of Douglas Fir planks, doweled together at edges with steel pins.

d. Pipe Sleeve Assemblies: Provide and install twenty-four (24) 4" pipe sleeve assemblies, 8 each at Locations N, P, and M, shown on Sheet #2N-639, Detail H and three (3) 2" pipe sleeve assemblies, one each at Locations N, P, and M, as shown on Sheet #2N-639, Detail J. The 4" diameter standard pipe, 13 inches long, shall be welded to a 7-1/2 inch square x 3/16" plate collar flange. Four 7/16" round holes shall be provided in each flange for attachment to building with 3/8" round lag bolts. The 2 inch pipe sleeve assemblies shall each consist of eight (8) 2 inch diameter standard pipe sleeves 15-1/2 inches long threaded one end, welded to a common collar flange fabricated from 6" x 1/4" x 3'-0", 1/2" steel plate. Sleeves shall be spaced as shown and each sleeve shall be provided with 2" standard pipe cap. Ten 7/16" diameter holes shall be provided in each flange for attachment. All welds shall be continuous 3/16" fillets. All assemblies shall be galvanized after fabrication. All lag bolts shall be 3/8" diameter x 2 inches long, galvanized.

e. Heavy Duty Hinge and Latch:

(1) Provide and install one pair each per door, heavy duty hinge and heavy duty latch and keeper, all assemblies as shown on Sheet #2N-639, Details F and G.

(2) Assemblies shall be fabricated from steel plate

and bar stock of thickness and size shown, and, after fabrication, all assemblies shall be galvanized. Bolts for attaching hinges and latches to doors and frames not furnished by the fabricator.

(3) Installation shall be as shown on Sheet #2N-639 Detail M. Attaching assemblies directly to aluminum sheet shall not be permitted. Cut steel washers shall be used wherever bolts are in contact with wood.

f. Electrical: Electrical work includes underground service in conduit, power and light wiring, ground rod and connections and signal equipment and wiring. All work shall be in accord with Sections 16, 17 and 18 of the electrical specifications and with the following:

(1) Station at Location N will be on piling or as directed by Engineer, and conduit construction will be subject to changes in the field to suit conditions.

28-06. STATIONS NO. 8 AND 9, LOCATION E AND V:

a. Reference Drawings: 3E-5673, 3E-5674.

b. For Specification, see following paragraph 28-07.

28-07. STATION NO. 8+ AND 9+, LOCATION E+:

a. Reference Drawings: 3E-5691, 3E-5692.

b. Type: Structural Steel Assemblies on concrete foundations.

c. Construction: The steel for the collimator block supports shall consist of a base assembly, anchors and "U" bolt clamps and plates, or a combination of a base assembly, anchors and "U" bolt clamps and plates together with a backing frame, (field welded to the base) equipped with steel adjusting wedges. Each base and backing frame shall be shop assembled and welded together as a separate unit. The various assemblies are shown on the drawings. The fabricator shall furnish all the adjusting set screws required for the bases. All Collimating blocks shall be furnished by the Government and installed by the Engineer under Government's supervision.

d. Protective Coatings: All anchors shall be given one shop coat of "Keystone" Rust Preventative primer, or approved equal. This coating to be removed with solvent in the field before concreting in. All other steel shall be given two shop coats of zinc-chromate rust preventative primer, color green. All threads for set screws and "U" bolts shall be coated with heavy waterproof grease.

e. Locations of the stations are as per schedules tabulated on the drawings. Strength of concrete for foundations of the various stations is as follows:

<u>3500#</u>	<u>2000#</u>
Station E-8 and V-8	Station E-9 and V-9
E-8+	E-9+
E-11	E-10, E-12, E-14, and E-15
C-10 and V-10	C-14 and V-14
C-11 and V-11	C-15 and V-15
C-12 and V-12	C-19 and V-19
E-10+, E-11+ and E-12+	E-14+, E-15+ and E-19+

The collimator steel supports shall be accurately set and held securely in place while the concrete is being poured. Anchors for the "U" bolt clamps shall be held securely at the required angle.

f. Final Field Alignment of the Collimator blocks shall be made by the use of screws and wedges furnished with the blocks and the block supporting bases and frames. Final alignment shall be supervised by the Government. After collimator blocks are properly aligned and secured in position, compacted earth fill shall be banked to elevations shown on drawings. All fill shall be streamlined, hand-tamped.

28-08. STATION NO. 18, LOCATIONS C,D,E, AND E+:

a. Reference Drawings: Structural and Electrical, 3G-628.

b. Type: Reinforced Concrete.

c. Construction: Structures shall be 2000 p.s.i. reinforced concrete, 4' x 6' x 6'-6" high. All tee-slot inserts, pipe sleeves, bolts and one explosion proof door shall be located and installed as shown on drawings. Finish floor shall be at grade line.

d. Electrical: Electrical work includes direct burial cable service, light and telephone wiring and ground rod connections. Wiring shall be installed in rigid conduit. All work shall be in accord with Sections 16 and 17 of the electrical specifications.

23-09. STATIONS NO. 20 and 21, LOCATIONS E AND C:

a. Reference Drawings: Structural, 3E-5614, Mechanical, 17G-801.

b. Type: Concrete and Fabricated Steel panel.

c. Construction: Foundations and panel supporting walls shall be 2000 p.s.i. reinforced concrete. Steel panels shall be properly set on foundations and all foundation recesses grouted in before pouring supporting walls. The inside steel panel shall be filled with concrete. Outside ends of all supporting walls shall have a radius of 6 inches. Structures shall be located according to Schedule on drawings. Fifteen (15) stations required. Each field panel shall consist of two (2) parallel rectangular 1/4" steel plates held apart from each other by a series of 1/2" diameter steel spacers welded to each plate. Each assembly shall have three (3) cylindrical steel chambers and one (1) rectangular steel chamber mounted between the steel plates and located by machined openings in the plates. Both ends of the steel chambers shall be open and machined to receive the various closure plates shown on drawings 17G-802 to 17G-805 inclusive. The closure plates shall be held in place in the chambers by means of machine screws as shown on the drawings. Each assembly shall have two (2) three inch steel pipe assemblies attached to the steel plates and cylindrical chambers as shown on drawing 17G-801.

d. Electrical: Electrical work includes direct burial cable for telephone and two phone plugs installed in accord with Sections 16 and 17 of the electrical specifications.

28-10. STATIONS 22 and 24, LOCATIONS C, V, E, AND E+:

a. Reference Drawing: 3G-082.

b. Electrical: Electrical work includes direct burial cable service, light and receptacle wiring and ground rod and connections in accord with Sections 16 and 17 of electrical specifications.

28-11. STATIONS 23a (EXISTING), LOCATIONS C,D, & E:  
23b (NEW), LOCATION E:

a. Reference Drawings: Structural, 3G-698; Electrical 3G-073; Ventilation 3G-5425.

b. Type: Reinforced Concrete.

c. Construction:

(1) Stations 23a, Location C & D. Existing concrete

structures shall be altered as shown on drawings. Structural alterations shall include installation of pipe sleeves, wall fittings, surface mounted Tee-slots. (Unistrut or equal) and other work not specifically called for. Station 23a, Location E shall be altered same as on Location C and D and shall also include cutting new opening in existing wall for access to new addition, Station 23b, and new duct opening for ventilation. Joining work shall include chipping out existing concrete footing for keying in new wall and installation of cinch anchors at floor and roof slab lines as well as at new construction key, all as indicated.

(2) Station 23b, Location E: Structure shall be constructed of 2000 p.s.i. reinforced concrete and shall be 8' x 15' x 7' high, inside dimensions. New work shall be properly keyed and anchored to existing station (23a) with threaded rods and cinch anchors as shown on drawing. "Unistrut" concrete insert or approved equal shall be flush mounted type, spaced as shown. Earth shall be banked to roof line as indicated.

d. Electrical: Electrical work includes direct burial cable services, power and light wiring, telephone instrument and wiring and special outlets as detailed. Work shall be in accord with Sections 16, 17 and 18 of the electrical specifications.

e. Mechanical: Ventilation system shall conform to applicable provisions of Section 23 of these specifications.

28-12. STATION NO. 25, LOCATION E:

a. Reference Drawings: Structural, 3E-689; Electrical 3E-074; Ventilation, 3E-5420.

b. Type: Reinforced concrete, banked earth to roof line.

c. Construction: Building shall be 14' x 15' x 7' high, inside dimensions and shall be of construction as specified for Station No. 6b, Locations C, D, and E.

d. Electrical: (Same as Station No. 23) Electrical work includes direct burial cable service, power and light wiring telephone instrument and wiring and special outlets as detailed. Work shall be in accord with Sections 15, 16, 17 and 18 of the electrical specifications.

e. Mechanical: Ventilation system shall conform to applicable provisions of Section 23 of these specifications.

28-13. STATION 26a, 26b, LOCATION E:  
STATION 26c, LOCATION C:

a. Reference Drawing: Structural, 3G-627.

b. Type: Concrete footing for baloon winch.

c. Construction: Reinforced concrete slab, 2'-0" thick 5'-0" x 5'-0" with 4" thick concrete pad on top and above grade (2'-1-3/4" x 5'-0") with 1-1/2" dia. x 2'-3" long anchor bolts with square nuts and cut steel washers, all galvanized after fabrication. Concrete shall develop a minimum strength of 2000 p.s.i. at 28 days.

28-14. STATION NO. 27, LOCATION C AND E:

a. Reference Drawing: 17G-811.

b. Type: Steel Assembly.

c. Description: All assemblies shall be cast in concrete as shown on plan. Each concrete gauge mount assembly shall consist of two (2) steel plates which are held in assembly with two (2) positive latching devices as shown on Drawing 17G-811. The larger of the plates is machine grooved to receive the smaller plate. The underside of the large plate shall be provided with twenty-four (24) 3/8" dia. anchors for anchoring it into a concrete foundation. Four (4) sheet metal cans shall be tack welded to the large plate as indicated. The small plate shall be machined to fit into the machined groove in the large plate, as indicated, and shall be drilled and counter bored as shown, to fit over the upper ends of the sheet metal cans. Both plates shall have integral projections at each end machined to accommodate the latching devices. The latches shall be as detailed on the drawing and shall work freely and at the same time hold the two (2) plates firmly together. Each assembly shall have two (2) removable dowels to guide the plates in assembling.

28-15. STATION NO 28, LOCATIONS C, D, AND E:  
STATION NO. 29, LOCATION E:

a. Reference Drawings: 17G-812, 17G-809.

b. Type: Pipe Assembly.

c. Description: Pipe assembly shall be cast in 2000 p.s.i. concrete block as shown on drawing. Each instrument post shall consist of 3" standard steel pipe, pipe bend, union, and pipe caps assembled as shown on drawing 17G-812 and installed in concrete block in field. Concrete shall be 2000 p.s.i.

28-16. STATIONS 30a, 30b, 30c, LOCATIONS E, C, & V:

a. Reference Drawing: Structural, 3G-5644.

b. Type: Wood Structure, banked earth over.

c. Construction:

(1) Structure 6'-0" x 6'-0" x 6'-0" high, inside, erected on 12" thick concrete slab, concrete shall develop a minimum strength of 2000 p.s.i at 28 days. Bottom of slab 4'-0" below grade.

(2) All lumber shall be 1200f grade Douglas Fir, of sizes and spacing shown, roof and sides covered with 2" sheathing laid diagonally. Door shall be wood frame, diagonally sheathed both sides.

(3) All framing clips, bolts and lag bolts shall be aluminum 61S-T6 as detailed on Drawing 3P-5634 Detail L. Hinges and Latches for door shall be steel, galvanized after fabrication, as per details H and J, Drawing 3P-5634.

(4) All foundation bolts to be steel, with hex nuts and cut washers, galvanized.

(5) The sides and roofs of the buildings, including the doors shall be covered with two layers of 15 lb. roofing felt mopped in hot asphalt. Building shall be covered with banked earth to height and slope indicated.

28-17. STATIONS NO. 33 and NO. 34, LOCATION C AND E:

a. Reference Drawing: 17G-810.

b. Type: Steel Stake Assembly.

c. Description: Each steel stake gauge mount shall consist of a 2" diameter steel bar 6'-0" long and tapered for a distance of 6" at one end. The other 2" diameter end shall be threaded to receive a threaded steel cap. The threaded end of the stake shall also be turned to 3/4" diameter by 1/2" long and threaded. Each stake shall be provided with a 3" diameter threaded steel cap and gasket as shown on the drawing. Each stake and cap shall be drilled as shown to accommodate spanner wrenches. Assemblies shall be installed by driving into ground.

28-18. STATION NO. 35, LOCATION C AND E:

a. Reference Drawing: 3G-5658.

b. Type: Pipe Boom on towers.

c. Construction: Booms shall be fabricated as shown in detail and shall be galvanized after fabrication. All pipe, fittings, wire rope, turnbuckles and appurtenances shall be as indicated. Booms shall be adjusted to a true horizontal line and all hinged joints shall be free of all binding, allowing boom to be easily raised to a vertical position.

28-19. STATION NO 36, LOCATIONS D & E:

- a. Reference Drawing: 17G-813.
- b. Type: Mounting Plate Assemblies.
- c. Description:

(1) Excavation for anchorage of assemblies shall be to a depth of 12 inches, minimum, into bed rock. Concrete block shall be grout mix by weight.

1 part Master Builders Co. "Embeco"  
1 part Portland Cement  
1-1/2 parts Coral Aggregate, 1/2" size max.  
1 part sand  
Minimum fresh water.

(2) Assemblies shall be cast in this mixture with tolerance as indicated on drawing. Corrugated pipe and wood cover, and all back-filling shall be installed and completed as shown.

(3) Each gauge mounting plate shall consist of a single one (1) inch thick, rectangular steel plate provided with eight (8) one-half inch diameter anchor bolts screwed into the underside of the plate. The top surface of the plate shall be ground flat and true and tapped as shown. Center punch mark top of plate in two (2) places as indicated. Each plate shall be provided with 36" diameter corrugated steel galvanized pipe and wood cover, to be installed in the field.

28-20. STATION NO. 37, LOCATION E:

- a. Reference Drawings: (Sta. 37a, b, c) 17G-815, 17G-818  
17G-802. (Sta. 37d, e, f)  
17G-816, 17G-803.
- b. Type: Steel Assemblies, Concrete foundations.
- c. Description:

(1) Station #37 a, b, and c assemblies shall be bolted to reinforced concrete footing at elevation shown on footing. When completely aligned and installed a concrete pad, size and thickness indicated, shall be poured to grade line, finished smooth. The inside of each pylon assembly shall be filled with concrete.

(2) Station #37 d, e, and f assemblies shall be cast in concrete block, top of assembly shall be at grade line.

Concrete for all stations shall be 2000 p.s.i.

(3) Each pylon assembly shall consist of 1/4" thick flat and bent steel plates bolted to structural I sections as indicated on Drawing 17G-815. Each assembly shall have four (4) cylindrical chambers installed in the center panel as indicated. One end of each chamber shall be open to receive a removable cover plate. Cover plates shall be as shown on drawing 17G-818. Each assembly shall be provided with piping to each chamber as indicated on the drawing. Each ground pylon auxiliary shall consist of a cylindrical steel chamber closed at one end and machined at the opposite end to receive a cover plate as indicated on Drawing 17G-816. Anchor rods and 2" steel pipe nipple shall be welded to the outside of the steel chamber as shown. Cover shall be machined as shown on Drawing 17G-803, Detail F.

28-21. STATIONS 39a, 39b, LOCATION E:  
STATION 39c, LOCATION C:

a. Reference Drawing: Structural 3E-691.

b. Type: Concrete beams.

c. Construction: Two (2) reinforced steel concrete beams or curbs 1'-6" x 1'-6" x 36'-0" long, laid in ground 20'-0" on centers, one face 6" above finish grade.

Each beam or curb shall have 5-1/2" dia. galvanized steel hooked "U" bolts 18" long, projecting 3" from top of concrete. Concrete 2000 p.s.i. at 28 days.

The area between these curbs shall have compacted coral fill, graded as indicated.

28-22. STATION 40, LOCATION E:  
STATION 41, LOCATION S:  
STATION 42, LOCATION C:

a. Reference Drawing: Structural, 3E-692.

b. Type: Concrete pit with structural steel cover and steel pipe frame over.

c. Construction:

(1) Pit 5'-2" x 3'-0" x 3'-6" deep inside, 6" thick walls and bottom slab of reinforced concrete. All concrete shall develop a minimum strength of 2000 p.s.i. at 28 days.

(2) Grade at top of pit shall be paved with 3" thick macadam, 25'-0" x 30'-0" area.

(3) Steel checkered cover plates 1/2" thick shall be in sections and shall be removable and bolted in place. The plates shall be supported on 3 structural I beams, fastened to a steel angle frame anchored to the top of the pit concrete walls.

(4) Pipe frames of 2" - Schedule 40 steel pipe, M.I. threaded elbows and fittings and with 1/2" thick steel base plates welded on. Base plates shall be fastened to four concrete piers with four (4) 3/4" diameter galvanized anchor bolts. 2" diameter galvanized pipe conduit with standard M.I. galvanized cap at one end, shall be installed under paving as indicated.

(5) All structural steel shall conform to A.S.T.M. Standard Specification A7-46.

(6) All welding shall conform to the code for ARC and gas welding in building construction of the "American Welding Society", of the 1941 Edition.

(7) All steel shall be painted two (2) shop coats of zinc-chromate rust preventative primer, color green.

(8) Lead brick shown on drawing shall be furnished by the Government, and installed by the Contractor.

28-23. STATIONS NO. 50 AND 51, LOCATIONS C, V AND E:

a. Reference Drawings: 3G-651, 3G-676, 3E-695.

b. Type: Concrete Pits.

c. Construction: All limonite aggregate and coral aggregate concrete used in these structures shall be minimum 3000 p.s.i. and shall not be steel reinforced. Coral concrete pits and limonite concrete slabs shall be of sizes shown, poured to indicate depths. Pipe conduits, manhole frame and eye-bolts shall be located and installed as shown on drawings. Top of limonite slabs shall be at grade line and shall have a smooth trowel finish. Adjoining wood battery shelters shall be constructed of 1200f grade Douglas Fir and shall be located where indicated.

Pit covers shall be final-assembled in field as shown on drawings.

d. Electrical: Electrical work includes direct burial cable services, where indicated on drawings, for light, telephone and signal and 4 inch interconnecting conduit, all in accord with Sections 16,17 and 18 of electrical specifications.

28-24. STATION NO. 52, LOCATION C AND E:

- a. Reference Drawings: 3E-677, 3E-678, 3E-679, 3E-5631, 3E-68C.
- b. For specifications, see paragraph 28-30.

28-25. STATION NO. 53, LOCATION C & E:

- a. Reference Drawings: 3E-699, 3E-5601, 3E-5602, 3E-680.
- b. Type: Structural steel assemblies on concrete foundations.
- c. Construction: Foundations shall be coral aggregate reinforced concrete, 3500 p.s.i. and shall be of sizes and depths shown on plans. Structural steel Block Bearing Plate, Grillage Bearing Plate and Front Jack Bearing Plate assemblies shall be properly supported and secured to forms, level and true and to indicate angles before concrete pouring is begun. Forms for all top recessing shall be plywood or hardboard lined for a true smooth surface.

d. Structural Steel Fabrication: All work in fabrication of assemblies for these stations shall conform to the Structural Steel specification, Section 6. Before assembly all interior frames, basic tubes and the inside faces of the collimator block plates shall be thoroughly cleaned and then given one shop coat of "Keystone" rust preventative, medium grade, or approved equal. Before shipment the interior surfaces of the basic collimator tubes shall be thoroughly cleaned and then given one shop coat of "Keystone" rust preventative, medium grade, or approved equal. After assembly all bearing plates and anchors shall be given one shop coat of "Keystone" rust preventative, medium grade, or approved equal. This coating must be removed with solvent before installation.

e. Shop Fabrication Tolerances:

(1) The basic collimator tubes Nos. 16a, to 21a inclusive must be installed in the shell of the block so that their axis is with + or -  $0^{\circ} 15'$  in vertical angle from that specified on the drawings, and their axis shall be  $0^{\circ} 07'$  from a plane perpendicular to the front face of the shell.

(2) All other basic collimator tubes must be installed in the shell of the block so that their axis is within + or -  $0^{\circ} 30'$  in vertical angle from that specified, and their axis shall be within 0 degrees 15' from a plane perpendicular to the face of the shell. The location of the intersection of the axis of all tubes and the front face of the

shell shall be within 1/8 of an inch of the locations specified for the front face of the shell.

f. Screw Jacks: The number of screw jacks for each station shall be as shown on the drawings, and shall be size 2-1/2 x 12, 24 ton capacity, with Simplex malleable base, and ball bearings, or equal.

g. Gaskets:

(1) Between both ends of the basic collimator tubes and the tube cover plates, there shall be installed 1/2" thick asphalt impregnated celotex gaskets to fit the size of the cover plates.

(2) 1/2" thick x 4" wide asphalt impregnated celotex gaskets shall be installed between the top and bottom of collimator block and their respective cover plates.

h. Block Field Aligning Instructions:

(1) By the use of steel wedges and 24 ton screw jacks (furnished with the collimator block) placed at its base, the block shell shall be properly aligned with its face perpendicular in plan to a line through zero and its sides vertical. The faces of the block shell shall be set at the desired angle to the horizontal by means of the 24 ton screw jacks on the upper backstay grillage. After the block is poured and all foundation settlement, if any, has taken place, a final adjustment of the face angle with the horizontal shall be made with the screw jacks on the upper backstay grillage.

(2) After this final adjustment for block alignment is made, the block base and the backstay bearings against the block and foundations shall be grouted in.

(3) A final check of the basic collimator tube alignment in foregoing (final tube alignment) shall be made before this grouting is done.

i. Limonite Concrete: After alignment is completed the collimator block shell shall be filled in with limonite aggregate concrete.

j. Final Field Alignment: After the collimator block is aligned, filled with concrete, and grouted in place, the axis of basic collimator tubes Nos. 16a to 21a inclusive, must be within + or - 0 degrees 30' in vertical angle to that specified, and their axis shall not vary over 0 degrees 15' in azimuth. All other basic collimator tubes shall not vary over 1 degree 00' in vertical angle or 0 degree 30' in azimuth.

k. Final Collimator Tubes, Sheet No. 3E-680:

(1) Final collimator tubes shall be fabricated as shown on detail drawings and no deviation from details by the fabricator shall be made without permission of the Contractor. All material shall be stainless steel, of quality and hardness as approved by Contractor. Cold finished stainless steel tubing and all pertinent tolerances shall be as indicated. Tolerance on spherical surface of Final Tube plate shall be + or - 0.005". No paint or rust preventative required on stainless steel. Assemblies shall be properly and carefully crated for shipment.

(2) Installation of final tube assemblies in Basic Collimator Tubes shall be done by the Engineer under supervision of the Government. After final alignment, the Engineer shall carefully apply limonite drypack inside large end of Basic Tubes.

28-26. STATION NO. 54, LOCATIONS C & E:

a. Reference Drawings: 3E-656, 2E-681, 3E-666.

b. Type: Reinforced Concrete buildings with wood frame tunnels, banked earth as indicated.

c. Construction:

(1) All coral aggregate and limonite aggregate concrete shall be 3500 p.s.i. and shall conform to Concrete specification, Section 5. The foundations for the buildings and tunnels shall be coral aggregate and shall be formed with keyed construction joints and poured to the depth indicated on drawings. The upper part of the building including a portion of the tunnel shall be limonite aggregate. Steel assemblies and all other inserts shall be carefully located and securely fastened to forms and/or other supporting members all as shown in detail on drawings. The tolerance on the structure shall conform to normal construction practices excepting all control dimensions shall be accurate to the dimensions indicated.

(2) All lumber for wood tunnels shall be foundation grade redwood, with members of size and spacing shown on drawings. Frames shall be cut for tight fit and frame members shall be joined with steel drift pins, sizes indicated. Frames shall be square and true before plywood gussets are nailed in place and shall be spaced with stud centers as shown. Sheathing at roof and sides and flooring shall be 2" thick shiplap laid at right angle across bearings. Shelving in tunnel shall be spaced and installed as shown. Tunnel door

shall be wood frame, sheathed two sides as detailed and all special door hardware, similar to Station No. 7, shall be installed as shown.

d. Steel Fabrications and Assemblies:

(1) Ventilation Ducts: Ducts shall be fabricated as detailed on Sheet No. 3E-666. Steel plates shall be 3/16" thick, all welds 3/16" continuous fillets. Holes for bolting ducts to concrete forms shall be of sizes and spacing indicated. All units shall be given one shop coat of "Keystone" rust preventative.

(2) Basic Collimator: All basic collimator assemblies shall be fabricated as shown on Sheet 3E-666, Details A and B and any variance from these details shall not be made by the fabricator without approval of the Contractor. Telescopic tube shall be fabricated from standard steel pipe, 8" I. D., 10" I. D. and 12" I. D., welded with continuous 1/4" fillets as shown on Details L, M and N. Front flange shall be 1/4" plate with hole sizes and spacing as indicated and welded to 12" I. D. pipe with continuous 1/4" fillet. Drill and tap three holes in 12" pipe where indicated for 1/4 - 20 thread. Tolerance on telescopic sub-assembly shall be + or - 1/16". Sub-assembly, Detail B shall be fabricated to within tolerances indicated. Location of dowel and stud holes on face shall be accomplished by use of steel template furnished the Fabricator. Sub-assemblies Details A and B shall be shop welded together into one unit, tolerance indicated. Assemblies shall receive one shop coat of "Keystone" Rust Preventative.

(3) Collimator Traps: All collimator traps shall be fabricated as shown on Sheet #3E-666, Details O and P. Holes in steel flange and lead adjustable cover plate shall be of sizes and spacing indicated. Lead plate plug shall be cut to fit snugly inside 6" pipe cap and shop assembled. Lead cover plates may be shipped separately and shall be properly protected against damage in shipment. All steel shall receive one shop coat "Keystone" rust preventative.

(4) Final Collimator Tubes: Sheets No. 3E-666 and 3E-680. All final collimating tubes shall be fabricated as shown on drawings above mentioned in a manner similar to that specified for Stations #52 and #53. Installation, alignment and grouting shall also be similar.

e. Electrical: Drawing 3E-055.

(1) Electrical work includes power, light, telephone and signal wiring in conduit as indicated on the drawings.

(2) Work shall be in accord with Sections 16, 17 and 18 of the electrical specifications and with the following:

(a) Conduits and method of stubbing up shall be in accordance with details on the drawings. Conduits shall be capped until wires or cables are pulled at which time bushings shall be installed as indicated.

(b) All lighting units shall be vapor proof except the special fixtures which are to be flush-mounted, watertight units, Marine Mfg. Co. #84, or approved equal.

f. Mechanical: Drawing No. 3C-5416 - Ventilation system shall conform to applicable provisions of Section 23 of these specifications.

28-27. STATION NO. 55, LOCATIONS C AND E:

a. Reference Drawing: Structural, 2G-634; Electrical 3G-047; Ventilation 3G-5407.

b. Type: Reinforced concrete.

c. Construction: All concrete shall be 3500 p.s.i., reinforced as detailed. Structure shall be 11' x 28'-5" x 6'-6" inside dimension. All Tee-slots in ceiling and walls shall be located and installed to dimensions shown on plans. Two (2) steel explosion-proof doors as specified under Section 9-06 shall be properly installed and shall be of size and type specified. Finish floor of buildings shall be at grade line.

d. Electrical:

(1) Electrical work includes power, light, telephone and signal wiring in conduit, as indicated on the drawings

(2) Work shall be in accordance with Sections 16, 17 and 18 of the electrical specifications and with the following:

(a) Conduits shall be installed, stubbed up and capped as indicated on the drawings.

e. Mechanical: Ventilation system shall conform to applicable provisions of Section 23 of these specifications.

28-28. SECTION NO. 56, LOCATION V:

a. Reference Drawings: Structural 3V-655; Electrical 3D-053; Ventilation 3D-5414.

- b. Type: Reinforced concrete.
  - c. Construction: All concrete shall be 3500 p.s.i. and construction shall be similar to Station No. 55. Size of structure, 11' x 12'-6" x 6'-6" inside dimensions.
  - d. Electrical: Same as Station No. 55.
  - e. Mechanical: Same as Station No. 55.
- 28-29. STATION NO 57, LOCATION C AND E:
- a. Reference Drawings: 3E-664, 3E-665, 3E-666.
  - b. Type: Similar to Station No. 54.
  - c. Construction: Similar to Station No. 54.
  - d. Electrical: Same as Station No. 54.
  - e. Mechanical: Same as Station No. 54.
- 28-30. STATIONS NO. 60 AND 62:
- a. See 75' Tower specifications.
- 28-31. STATION 61 - LOCATIONS M, N, P AND Q:  
STATION 63 - LOCATIONS N AND Q:
- a. Reference Drawings: Structural 2P-629; Electrical 3P-050.
  - b. Type: Wood structure, on concrete slab.
  - c. Construction: Structure 6'-0" x 8'-0" x 7'-1-1/2" high inside, erected on 12" concrete slab, top of slab 4" above grade. Construction shall be same as for Station 7 except inside of walls and ceilings lined with 1/2" exterior grade Douglas Fir Plywood.
  - d. Steel Shutter: Furnish and install six (6) steel shutters at locations shown on sheet #2P-629. Shutter shall be hinged at top and shall swing outward, with locking devices both inside and outside. Each shutter shall be equipped with two (2) folding brackets to hold shutter in open position. Units shall be galvanized after fabrication. All steel shutters shall be installed in wood frames as indicated and shall be properly flashed at top.
  - e. Electrical:
    - (1) Electrical work includes direct burial cable

services, power and light wiring, hoist control wiring (at Site M only), ground wiring and conduit sleeves as detailed.

(2) Work shall be in accord with Sections 16 and 17 of electrical specifications.

28-32. STATION 64 - LOCATIONS N, P AND Q:

a. Reference Drawings: Structural, 3N-5620; Electrical 3P-069.

b. Type: Wood structure.

c. Construction:

(1) Structure 14'-0" x 15'-0" x 8'-11" high inside, with Annex 8'-0" x 6'-0" x 8'-11" high inside, erected on concrete foundations with 6" floor slab. All concrete shall develop a minimum strength of 2000 p.s.i. at 28 days. Top of floor slab 6" above grade. All lumber shall be 1200f grade Douglas Fir, of sizes and spacing shown. Roof and sides covered with 1" Tongue and Grooved Sheathing laid diagonally.

(2) Construct six louvers of 3/4" lumber in outside walls of building as indicated.

(3) Furnish and install 2 single 2'-8" x 6'-8" x 1-3/8" - 3 panel wood Douglas Fir Stock Doors, with three 3" x 3-1/4" Butt hinges and one 6" safety hasp, and a double door of two 2'-6" x 7'-0" x 1-3/8" - 3 panel Douglas Fir wood Stock Doors, each door to have three 3" x 3-1/4" Butt hinges, the pair to have one 6" safety hasp, and two 6" barrel bolts, all hardware to be aluminum. All framing clips, bolts and lag bolts shall be aluminum 61S-T6 as per typical detail H and J shown on drawing.

(4) All foundation bolts to be steel, with hex nuts and cut washers.

(5) Sides and roof of buildings shall be covered with .032" thick 52S-1/2H aluminum and applied in manner shown on Detail L of the drawing.

d. Electrical:

(1) Electrical work includes two - 50 KW Diesel generators, power and light wiring, generator transfer switch, feeder distributor circuit breakers and direct burial cables, telephone wiring, grounding, etc.

(2) Work shall be in accord with Sections 15, 16, 17 and 18 of the electrical specifications.

28-33. STATION NO. 65 - ALL LOCATIONS:

a. See electrical Specifications, Section 16.

28-34. STATION NO. 68 - ALL LOCATIONS:

a. See Electrical Specifications for Towers.

28-35. STATION NO. 69 - LOCATIONS C, D, AND E:

a. Drawing: Structural, 2G-622

b. Type: Steel reinforced concrete structure with banked earth over roof, compacted to 90% relative compaction.

c. Construction: Structure 15'-0" x 15'-0" x 8'-0" high inside. Top of floor slab 1'-0" below natural grade. Construction similar to Station 6b.

d. Electrical: Drawing 2G-366:

(1) Electrical work includes direct burial cable services for power, light, and signal, power and light wiring, telephone wiring, high frequency radio wiring, etc.

(2) Conduit shall be concealed where indicated on drawings and stubbed up as required.

(3) The work includes sleeves and/or cased openings for radio antenna lead-ins, mounting and connecting of the various power, signal, timing, telephone and radio equipment.

(4) Work shall be in accord with Sections 16, 17 and 18 of the Electrical Specifications.

e. Mechanical: Drawing No. 2G-475: Ventilation system shall conform to applicable provisions of Section 23 of these specifications.

28-36. STATIONS NO. 70A through 70W - LOCATION E:

STATIONS 70A - through Z - LOCATION V:

STATIONS 71A, B, C and D - LOCATION E:

STATIONS 71A - through G - LOCATION V:

a. Reference Drawing: Structural, 2E-5619.

b. Type: Steel reinforced concrete slab.

c. Construction:

(1) Slab 8'-0" x 10'-0" x 1'-0" thick. Concrete shall develop a minimum strength of 2000 p.s.i. at 28 days. Top of slab 1" above grade. One slab per Station.

(2) Cylinders, legs and construction jigs supported on the slabs, furnished by the Government and installed by the Contractor.

(3) Locations of the various stations as tabulated on the drawing.

28-37. STATIONS 72 A, B, C, D, E, F, G and H - LOCATION E:

a. Reference Drawing: Structural, 3E-5616.

b. Type: Steel reinforced concrete slab.

c. Construction:

(1) Slab 10'-0" x 13'-0" x 1'-0" thick. Concrete shall develop a minimum strength of 2000 p.s.i. at 28 days. Top of slab 1" above grade. 9 slabs per station.

(2) Cylinders, legs and construction jigs supported on the slabs, furnished by the Government and installed by the Contractor.

(3) Locations of the various stations as tabulated on the drawing.

28-38. STATION No. 72i - LOCATION G (3 STATIONS):

a. Reference Drawing: 3G-6616.

b. Type: Rafts, steel and wood.

c. Construction:

(1) All raft beds shall consist of four steel-clad wood skids joined, at right angle, by steel angles bolted to skids with 2 flat head bolts as shown on Detail "D" skid timbers shall be cut out as shown to receive oil drum pontoons. All drums shall be nearest size shown and shall be held in position with continuous wedge-cut wood chocks. Deck platform framing shall be well nailed to chocks and bolted to vertical flat steel bars welded, opposite end, to bed angles. Deck shall be diagonally sheathed with 2" thick planks, nailed to bearings as indicated on plans. Rafts shall be braced with

flat steel bars bolted in place as indicated. Steel channels shall be bolted to deck as directed by the Government.

(2) All lumber shall be 1200f grade Douglas Fir of size and length shown.

(3) The oil drums shall be standard 55 gallon drums, approximately 24" diameter x 36" long. The end of the drums at the sides of the raft shall be equipped with two (2) welded-in plugged openings as indicated on the drawing.

d. Testing: The oil drums shall be water tight. Before assembly, apply two pounds internal air pressure and subject exterior surfaces to soapy water to test the leaks.

e. Painting, Steel: All steel, including oil drums shall be given two (2) coats of zinc-chromate rust preventive primer, color green. The steel oil drums shall be thoroughly cleaned, all oil or grease removed from outside surfaces with solvent before painting.

28-39. STATIONS 73 a, b, c, d, e, f, g and h - LOCATIONS E, V and C:

a. Reference Drawing: Structural 3G-5665.

b. For specification, see following paragraph 40.

28-40. STATIONS 74 a, b, c, d, e, f, g and h - LOCATIONS E, D & C:

a. Reference Drawing: Structural, 3G-5663.

b. Type: Concrete footing - one per station.

c. Construction:

(1) Concrete cylinder 4'-0" dia. x 4'-0" deep, top of cylinder flush with grade. Concrete shall develop a minimum strength of 2000 p.s.i. at 7 days.

(2) Hemisphere and pipe supports, mounted on the footings, furnished by the Government and set by the Contractor, under Government supervision. Locations of the various stations as tabulated on the drawings.

28-41. STATION No. 75, LOCATIONS E AND R:

3E-038. a. Reference Drawings: Structural, 2E-641, Electrical

b. Type: Steel reinforced concrete structure.

c. Construction:

(1) Structure 4'-7-1/2" wide at top floor slab, by 19'-10" long x 5'-6" high inside, front wall to slope 7-1/2" inward at top. Top of floor slab 2'-3" below grade. Concrete to develop a minimum strength of 2000 p.s.i. at 28 days. Steel frames in front and rear walls furnished by the Government supervision.

(2) End and rear walls and ceiling shall be insulated with 3" thick "Fiberglas" board insulation. Supported by 2" x 3" Douglas Fir wood studs, spaced 2'-0" face to face, and fastened to concrete as indicated. Cover the insulation with 1/4" thick Douglas Fir Plywood nailed to studs.

Install 6-1/2" diameter anchor bolts in floor slab where indicated on the drawing.

Construction similar to Station 6b.

d. Electrical:

(1) Electrical work includes direct burial cable service, light and receptacle wiring, conduit sleeves for future use, ground rod and wiring, etc.

(2) Work shall be in accord with Sections 16 and 17 of electrical specifications.

28-42. STATION NO. 76, LOCATIONS S AND N:

a. Reference Drawings: Structural, 2S-642; Electrical, 3E-038.

b. Type: Steel reinforced concrete structure supported on concrete slab.

c. Construction:

(1) Structure 4'-0" x 19'-10" x 5'-6" high inside, top of floor slab 2'-1" below grade. All concrete shall develop a minimum strength of 2000 p.s.i. at 28 days. Steel frames in front and rear walls furnished by the Government and installed by the Contractor, under Government supervision.

(2) End and rear walls and ceilings shall be insulated with 3" thick "Fiberglas" board, supported by 2" x 3" Douglas Fir wood studs, spaced 2'-0" face to face, and fastened to concrete as indicated. Cover the insulation with 1/4" thick Douglas Fir plywood nailed to studs.

(3) Install 6-1/2" diameter anchor bolts in floor slab where indicated on the drawings. Construction similar to Station No. 6b.

d. Electrical: Same as Station No. 75 except omit incoming feeder and provide for local power source at Site S.

28-43. STATIONS NO. 77a and 77b.

a. Reference Drawings: Structural, 3T-6608.

b. Type: Wood structure, on raft deck.

c. Construction:

(1) Structures 4'-0" x 13'-6" x 5'-6" high inside, and shall be fastened to decks of 16'-0" lg. raft as shown in detail on Drawing 3C-5699.

(2) Spaces between wall studs, ceiling joists, and door sheathing shall be filled with "Fiberglas" roll blanket insulation.

(3) Inside walls and ceiling shall be lined with 1/2" exterior grade Douglas Fir plywood.

(4) Construction similar to Station 7.

d. Electrical: Drawing 3E-038 - Same as Station No. 75 except omit incoming feeder and provide for local power source.

e. Note: Stations 77a and 77b replace Station 77, Location T, Drawing 3T-644.

28-44. STATIONS 77 AND 78 - LOCATION T:  
STATIONS 78 AND 79 - LOCATION C:  
STATIONS 79 - LOCATION P:

a. Reference Drawing: Structural, 3T-644.

b. Type: Wood Structure, on concrete slab.

c. Construction:

(1) Structures 4'-0" x 19'-10" x 5'-6" high inside, erected on 12" concrete slab, top of slab 2'-3" below grade. Concrete shall develop a minimum strength of 2000 p.s.i. at 28 days.

(2) Spaces between wall studs, ceiling joists, and

door sheathing shall be filled with "Fiberglas" roll blanket insulation. Inside walls and ceiling shall be lined with 1/2 inch exterior grade Douglas Fir plywood.

(3) Construction similar to Station No. 7.

28-45. STATION NO. 78, LOCATION T:

a. Reference Drawing: 3E-038 - Same as Station No. 77.

b. Note: Station No. 77, Location T replaced by Station No. 77a and 77b, Drawing 3T-6608. Station No. 78 Location T, Drawing 3T-644 shall be moved and mounted on the 21'-5-1/4" long raft, shown on drawing 3C-5699.

28-46. RAFTS FOR STATIONS 77a, 77b and 78:

a. Reference Drawing: 3C-5699.

b. Construction:

(1) Rafts shall be built of 2" plank Douglas Fir wood deck nailed to wood sills and timbers supported on three (3) rows of steel pontoons and two (2) rows of steel oil drums.

(2) The pontoons shall be fabricated and assembled as shown on the drawing.

(3) The oil drums shall be arranged and fastened to the timbers with steel "U" straps bolted on as shown on the drawing. The exposed top part of the deck shall have .032" sheet aluminum fire proofing applied as shown and noted on drawing 3T-6608. The oil drums shall be standard 55 gallon drums, approximately 24" diameter x 36" long in size, and shall be fitted with 2 new plugged openings where shown on the drawing.

c. Painting, Steel:

(1) All steel for the pontoons and oil drums shall be given two coats of zinc-chromate rust preventive, primer, color green.

(2) Steel oil drums shall be thoroughly cleaned, all oil or grease removed from outside surfaces with solvent before painting.

d. Testing:

(1) Pontoons and oil drums shall be water tight.

After assembly, apply two pounds internal air pressure and subject exterior surfaces to soapy water bath to test for leaks.

(2) Note: Station No. 78, Drawing 3T-644 shall be moved and mounted on 21'-5-1/4" long raft. Stations No. 77a and 77b, Drawing 3T-6608 shall be mounted on the 16'-0" long rafts.

(3) The buildings shall be bolted to the decks of the rafts as indicated on the drawing.

(4) Stations No. 77a and 77b, replace Station No. 77, Site T.

28-47. STATIONS 80A, B, C and D, LOCATION E:  
STATION 80E, LOCATION S:  
STATIONS 80A, B, C, D and E; LOCATION V:

- a. Reference Drawing: Structural, 3E-5618.
- b. Type: Steel reinforced concrete slab.
- c. Construction:

(1) Slab 4'-0" x 12'-0" x 1'-0" thick. Concrete shall develop a minimum strength of 2000 p.s.i. at 28 days. One slab per station.

(2) Top of slab 1" above grade.

(3) Fixtures to be supported on the slabs, furnished by the Government and installed by the Contractor.

(4) Locations of the various stations as tabulated on the drawing.

28-48. STATION 81, LOCATION E:  
STATION 82, LOCATION S:

- a. Reference Drawing: Structural, 3E-5643.
- b. Type: Steel reinforced concrete slab.
- c. Construction:

(1) Slab 10'-0" x 13'-0" x 1'-0" thick, with an extension slab on 4'-0" x 12'-0" x 1'-0" thick.

(2) Concrete shall develop a minimum strength of 2000 p.s.i. at 28 days. One slab per station.

(3) Top of slab 1" above grade.

(4) Fixtures, cylinders, legs and construction jigs supported on the slabs, furnished by the Government, and installed by the Contractor.

Locations of the Stations as tabulated on the drawing.

28-49. STATION 83A AND B, LOCATION E:

a. Reference Drawing: Structural 3E-5617.

b. Type: Steel reinforced concrete slab.

c. Construction: Slab 10'-0" x 13'-0" x 1'-0" thick. Concrete shall develop a minimum strength of 2000 p.s.i. at 28 days. Top of slab 1" above grade. 12 slabs per station. Cylinders, legs and construction jigs supported on the slabs, furnished by the Government and installed by the Contractor. Locations of the various stations as tabulated on the drawing.

28-50. STATIONS NO. 84 A, B, C, D, E AND F, LOCATION E:

a. Reference Drawing: Structural, 3E-5642.

b. Type: Concrete slab, with aluminum pipe insert.

c. Construction:

(1) Slab shall be 1'-6" x 5'-0" x 1'-0" thick, with 4" I.P.S. aluminum alloy pipe 4'-0" long with standard M. I. galvanized pipe cap each end, cast in the slab and protruding 6" at one end of slab. Top of slab flush with grade.

(2) Concrete shall develop a minimum strength of 2000 p.s.i. at 28 days.

(3) One slab per station.

(4) Locations of the stations as tabulated on the drawing.

28-51. STATIONS 85 a,b,c,d,e and f, LOCATION E:

a. Reference Drawing: Structural, 3G-5665.

b. Type: Concrete footing, one per station.

c. Construction: Concrete cylinder 4'-0" diameter x 4'-0" deep, top of cylinder flush with grade. Concrete shall develop a minimum strength of 2000 p.s.i. at 7 days. Hemisphere and pipe supports, mounted on the footings, furnished by the Government and set by the Contractor, under Government supervision. Locations of the various stations as tabulated on the drawings.

28-52. STATIONS NO. 90 a THROUGH 93 d and 421 THROUGH 4226:

a. Reference Drawing: 17G-814.

b. Type: Box Assembly.

c. Description: Basic steel boxes shall consist of rectangular steel boxes with removable covers, expanded metal grilles, gaskets, pipe and fittings, and lids. They shall be of the various thicknesses and types as indicated on Drawing 17G-814 and shall be installed where and as directed. See Sheet No. 17G-820 for lead shielding at Stations 90 a through j and 91 a through f.

28-53. STATIONS 90 a THROUGH j:  
STATIONS 91 a THROUGH f:

a. Reference Drawings: 17G-814, Structural, 17G-820.

b. Type: Lead shielding for instrument boxes.

c. Construction:

(1) Lead bricks shall be placed about the embedded instrument boxes, top of the bricks flush with box tops and finish grade. Backfill against bricks after installation to finish grade, all as indicated on the drawing.

(2) Lead bricks shall be removed from Stations 6A, Sites E, V and C and shall be reused on these Stations.

(3) Brick arrangements for the various stations are as shown on the drawing.

28-54. STATION 100, LOCATION C, D, & E:

a. Reference Drawings: Structural, 4E-613, 4E-614,  
4G-615, 4C-616, 4C-617, 4G-5648.  
Electrical, 8G-361, 4G-365,  
2G-373, 4C-377, 4D-378, 4E-364.  
Mechanical, 4G-445 thru 4G-448,  
4G-5438

b. Type: Concrete structure.

c. Construction:

(1) Concrete for buildings shall be 3,500 p.s.i. concrete for equipment foundations shall be 2000 p.s.i. Excavation for footings shall be to depths shown on plans. Finish concrete floors shall be to elevations indicated. Inside dimensions of structures shall be 42' x 51' x 15' high. The reinforced concrete mezzanine shall be of size and height called for on drawings. Equipment footings and anchor bolts shall be accurately located and properly installed to depths and elevations shown and all exposed surfaces shall be finished as specified under Concrete Section. All mechanical and electrical drawings shall be carefully checked for the proper location and installation of all piping, pipe sleeves and inserts, conduit and all other items shown or called for by those trades.

(2) Waterproof membrane consisting of two layers of rag felt mopped in with hot asphalt shall be applied to the roof and three exterior sides of the completed building. This membrane shall be carried to a depth of 12 inches minimum below finish floor line and shall be applied to back and top of concrete parapet at front of building.

(3) Earth fill shall be banked to heights and slopes, indicated on the drawings, over roof and three sides of building.

d. Electrical:

(1) Electrical work includes power, light and signal and control wiring for diesel generator plant as indicated on the drawing.

(2) Power wiring shall include all work required to completely connect the generators, switchgear, pumps compressors, water heaters, distillation units, etc. including the automatic control circuits.

(3) Work shall be in accord with Sections 15, 16, 17 and 18 of the Electrical Specifications.

e. Mechanical: Installation of equipment, piping, plumbing and ventilation shall conform to applicable provisions of Sections 19, 20 and 23 of these specifications.

28-55. STATION NO. 101 - LOCATIONS F, S, T, AND U:

a. Reference Drawing: 3G-5149.

b. Type: Frame structure, sizes as indicated.

c. Description: Wood frames shall be covered with corrugated aluminum, sides and roof, and shall be erected on continuous concrete footing, no floor slab required. Door shall be 3 panel stock wood door with aluminum hinges and hasp. All concrete shall be 2000 p.s.i., all lumber 1200f grade Douglas Fir.

d. Electrical:

(1) Electrical work includes conduit, telephone and signal wiring for all stations, lights and receptacles for locations F and S and 5,000 volt junction box with incoming and outgoing 5000 volt cables.

(2) Work shall be in accord with Sections 15, 16, 17 and 18 of the Electrical Specifications.

28-56. STATION NO. 120, LOCATIONS E AND V:

a. Reference Drawing: 3E-5682; Electrical, 3E-5155.

b. Type: Steel assembly embedded in reinforced concrete top of station at grade line. Ten stations required.

c. Construction:

(1) All concrete shall be coral aggregate of 3500 p.s.i. The setting of the steel assembly shall be true and accurate before concrete is poured. All assemblies shall be supported to forms by using fabricated steel support frame at top and bolt arrangement at back of lower section of assembly. Special stucco shall be applied before removal of top support frame. Four inch thick cover plate, concrete blocks and back cover plate of bottom outer cavity shall be installed when instructed by Government. Stations shall be backfilled and all fill shall be well tamped to receive paving. For specifications on Special Stucco see 5-29 of these specifications.

(2) The steel form shall be fabricated of steel plate, 4" and 8" diameter Schedule-40 steel pipe, 1/2" steel lower cover plate, and 4" thick steel top cover plate, with anchor bolts, including the steel form support frame. The steel form shall be of shop welded construction, the lower

cover plate bolted on, and the top cover plate fastened down to the steel form with anchor bolts. This top cover plate is to be drilled for the anchor bolts and bored and finished for the orifice as shown on the drawing. The steel form support frame to be of steel angle welded construction. The 1" galvanized pipe and fittings shall be fabricated and shipped loose.

(3) All steel shall be given two shop coats of zinc-chromate rust preventative primer on inside surfaces, and one coat "Keystone" rust preventative primer on all surfaces in contact with concrete; to be removed with solvent in field before concreting in place. Coat all threads for cap screws, bolts, pipe and anchor bolts with heavy waterproof grease.

d. Gaskets: Provide 1/8" thick sheet packing "Cranite", or approved equal, gasket for lower cover plate.

e. Electrical:

(1) Electrical work includes direct burial cable services, installation of terminal boxes furnished by the Government and connections including conduit, to the air and ground battle stations.

(2) Work shall be in accord with Sections 16 and 17 of the Electrical Specifications.

28-57. STATION NO. 121 - LOCATIONS E AND V (10 STATIONS):

a. Reference Drawings: 3E-5678, 3E-5679, 3E-5681; Electrical 3E-5155.

b. Type: Steel castings mounted on concrete foundation.

c. Construction:

(1) All concrete shall be coral aggregate of 3500 p.s.i. The setting of the steel assembly to be embedded in the concrete shall be similar to method specified for Stations #120, except steel support frame is omitted. Anchor bolt assemblies shall be set true and accurate, and shall be firmly supported before pouring concrete. Steel castings shall be properly and accurately aligned on foundation, set level and true and shall be filled in solidly under leveling plate and around casting with special grout mix by weight:

1 part Master Builders Co. "EMBECO"  
1 part Portland Cement  
1 part Sand  
1-1/2 parts rock, 1/4" to 1/2" size  
Minimum of fresh water.

(2) When directed by Government, wire mesh and special stucco, as specified under 5-29 of these specifications, shall be applied to steel castings as shown on drawings. Upon completion of all special installations by the Government, and as directed by Government, all concrete blocks shall be placed in lower steel form cavity and cover plate fastened in place. Backfill as specified for Station 120.

d. Steel Castings: Patterns for the castings shall be approved before proceeding with fabrication. Before fabricating the castings the Contractor shall submit for approval a complete quantitative chemical analysis of the metal proposed. The castings are to be made in two parts and shall be equipped with steel keys, eye bolts, and fastenings, as shown on the drawing.

e. Stucco Supports: Fabricate and weld to steel castings, miscellaneous steel plate and materials for the support of special stucco as shown on drawing 3E-5681. Machined surfaces marked "f" shall be 100f finish where not otherwise noted on the drawing.

f. Structural Steel Forms, Leveling Plate and Anchor Bolts:

(1) The steel form shall be fabricated of steel plate to be of welded construction and shipped in two parts, and includes 1-1/4" thick steel cover plate bolted on. The two parts shall be fastened together with cap screws when assembling in field.

(2) The leveling plate and anchor bolt assembly to be as detailed on the drawing. The leveling plate to be straight and true over its entire top surface.

(3) The threaded portion of the anchor bolts are to protrude above the leveling plate at 90° from the top of the plate and are to be straight and true.

(4) The top of steel forms shall be fastened to the under side of the leveling plate with cap screws in the field, and at the lower part by cover plate bolts to the wood forms.

(5) The 1" galvanized pipe and fittings to be fabricated and shipped loose.

g. Gasket: Provide 1/8" thick sheet packing "Cranite" or approved equal, gasket for cover plate.

h. Protective Coatings:

(1) All surfaces of the castings, except the machined contact surfaces between the castings and parts, shall be given one shop coat of "Keystone" rust preventative primer, or approved equal. This coating to be removed in the field with solvent before plaster work is done.

(2) The machined contact surfaces between the castings including all bolt threads, shall be given a heavy coat of waterproof grease.

(3) Paint all other steel one shop coat of "Keystone" rust preventative primer, or approved equal. This coating to be removed with solvent in the field before concreting in place.

(4) Coat all threads for cap screws, bolts, pipe and anchor bolts with heavy waterproof grease.

i. Electrical: Same as Station No. 120.

28-58. STATION NO. 123, LOCATIONS E AND V:

a. Reference Drawing: 3E-5155.

b. Type: Frame structure, 4' x 4' x 6'.

c. Description: Wood frame shall be covered with 1/2" exterior grade plywood, sides and roof. Structure shall be anchored to wood stakes driven into form soil. Roof shall be covered with 90 pound mineral surface cap sheet properly nailed and battened at all edges. Door shall be wood frame and plywood.

d. Electrical: Same as Station No. 120.

28-59. STATION NO. 125 - LOCATION D:

a. Reference Drawing: 3E-6611.

b. Type: Concrete platform with anchor assemblies.

c. Description: Concrete platform shall be 4' x 230' x 4" thick and shall have contraction joints at 20' intervals. Concrete shall be 2000 p.s.i., mesh reinforcement. Anchor assemblies shall be set to a true line in each direction,

spaced 10 feet center to center along centerline of platform.

Assemblies shall be fabricated of 3/8" plate with 4 welded-in bolts spaced as shown on drawing. All anchor assemblies shall be galvanized after fabrication. Top of slab is at grade level.

28-60. STATION No. 131 - LOCATION V:

a. Reference Drawings: Structural 3G-5651, 3G-5653, 3G-5654 and 3G-5656; Electrical, 3E-5319; Plumbing and Dehumidification 3G-5437.

b. Type: Reinforced concrete structure.

c. Construction: Similar to station No. 131a except that the foundation of this structure is incorporated in the 200 ft. steel tower foundation. Structure shall be 5'-2" x 8'-0" x 6'-4" high inside dimensions and 12'-6" x 15'-8" x 10'-11" high, outside dimensions. This structure shall be built of limonite aggregate concrete. When directed by the Government entrance opening shall be closed in with limonite aggregate concrete cubes, same mix as for structure.

d. Provisions for Installation of Equipment: Inside walls of structure shall have "Unistrut" concrete inserts embedded in concrete as shown on the drawings. Structure shall have 4-12" I. D. x 6'-0" long standard pipe sleeves set in concrete floor and 4-14" I. D. steel tubes set in concrete roof all capped with temporary plugs as shown on drawings. Dehumidification piping shall be provided and set in concrete as shown on the drawings. Ducts from connection pit to station structure shall be furnished by the Government and installed by the Contractor under Government supervision.

e. Electrical:

(1) Electrical work includes direct burial cable services, power and light wiring, conduit for signal and instrumentation circuits, ground rod and wiring.

(2) Work shall be in accord with Sections 16, 17 and 18 of Electrical Specifications.

f. Mechanical: Plumbing and dehumidification system shall conform to applicable provisions of Sections 19 and 23 of these specifications.

28-61. STATION NO. 131a - LOCATION E:

a. Reference Drawings: Structural 3E-5661; Plumbing and Dehumidification, 3E-5440; Electrical, 3E-5319.

b. Type: Reinforced limonite aggregate concrete and reinforcing coral aggregate concrete.

c. Construction: Structure shall be 40'-0" x 4'-6" x 6'-4" high inside dimension and 14'-0" x 14'-0" x 10'-11" high, outside dimensions. This structure shall be built of limonite aggregate concrete and shall be supported on a 3'-6" thick coral aggregate concrete slab. When directed by the Government opening shall be closed in with limonite aggregate concrete cubes, same mix as for structure as shown on drawings. In connection with this structure there shall be a 9'-0" x 9'-0" x 6'-0" deep pit having 8" thick coral aggregate walls and bottom slab finished at 6'-0" below elevation "T". A 10'-9" x 14'-0" x 2'-6" thick limonite aggregate concrete slab shall be installed between pit and station structure. Also a 4" thick coral aggregate concrete slab shall be provided for dehumidification equipment. All coral aggregate concrete shall develop a minimum strength of 2000 p.s.i. at 28 days.

d. Provisions for Installation of Equipment: Structure and pit shall be equipped with "Unistrut" concrete inserts. Pit shall be equipped with 2" round pipe sleeve for sump pump outlet. Structure shall be equipped with 14" I. D. steel tubes set in limonite concrete roof and 12" standard pipes set in coral concrete floor slab, both capped with temporary plugs as shown on drawings. Dehumidification piping shall be set in coral concrete as shown on drawings. Ducts from pit to station structure, as shown on the drawings, shall be furnished by the Government and installed by the Contractor under Government supervision. Connection pit shall be backfilled and covered as directed by the Government.

e. Electrical and Mechanical: Same as Station No. 131, Location V.

28-62. STATIONS NO. 132 A and B - LOCATION C:

a. Reference Drawings: Structural, 2C-5608.

b. Type: Steel reinforced concrete structure with banked earth cover.

c. Construction:

(1) Structure 25'-6" x 28'-0" x 8'-0" high inside, with two wing walls, and parapet wall at entrance of building, and concrete apron between wing walls, and inside dividing wall front to rear of the structure. All concrete shall develop a minimum strength of 3500 p.s.i. at 28 days. Grating and C. I. soil pipe drains shall be provided and installed where shown for the concrete apron. Furnish and install all pipe sleeves, conduits and wall fittings, capped as shown, in the walls.

(2) Provide and install all concrete inserts and anchor bolts, in apron, ceiling, floor slab and walls, where indicated on the drawing.

(3) Provide a black cloth curtain and hanger, where shown, for opening in dividing wall.

(4) Height of banked fill over structure shall be as indicated on the drawing, and sloped as directed by the Engineer.

(5) Top of floor slab shall be 3'-0" below grade.

(6) Construction similar to Station 132c, and d, Location V, for Station 132 a and b, Location C.

(7) Provide and install 2 explosion doors and 2 lead doors in wall, where shown on the drawing. For steel explosion door see Section 9-06 of these specifications. For lead door, see Section 9-08 of these specifications.

28-63. STATION NO. 132a, LOCATION E:

a. Reference Drawing: Structural, 3E-5664.

b. Type: Steel reinforced concrete structure, with banked earth cover, and temporary wood shelter. Remove shelter after final fill is made.

c. Construction:

(1) Structure 12'-0" x 16'-0" x 8'-0" high inside, with two wing walls, and parapet wall at entrance of building, and concrete apron between wing walls. Top of floor slab 3'-0" below grade. All concrete shall develop a minimum strength of 3500 p.s.i. at 28 days.

C. I. soil pipe drains with gratings shall be

provided where shown for the concrete apron. Furnish and install all pipe sleeves, conduits and wall fittings, capped as shown, in the walls. Provide and install all concrete inserts and anchor bolts, in apron, ceiling, floor slab and walls, where indicated on the drawing. C. I. soil pipe drains with gratings shall be provided where shown for the concrete apron. Furnish and install all pipe sleeves, conduits and wall fittings, capped as shown, in the walls. Provide and install all concrete inserts and anchor bolts, in apron, ceiling, floor slab and walls, where indicated on the drawing.

(2) Height of banked fill over structure shall be as indicated on the drawing, and sloped as directed by the Engineer. Provide and install one steel explosion door and one lead door in front wall, where shown on the drawing.

(3) For steel explosion door, see 9-06 of these specifications.

(4) For lead doors, see 9-08 of these specifications.

d. Temporary wood shelter shall consist of wood posts, plates, wall plates and rafters. Roof covered with 1/2" exterior grade Douglas Fir plywood, and one ply 15 pound roofing felt, 4" laps, mopped in hot asphalt, flashed as indicated. Furnish all steel anchor bolts, bolts, steel angle clips and plates for fastening posts and wall plates to concrete as indicated. Wall plate shall be anchor bolted to parapet wall, and posts to concrete apron between wing walls. All lumber shall be 1200f grade Douglas Fir.

28-64. STATIONS NOS. 132 b, c, and d, LOCATION E:

a. Reference Drawing: Structural, 3E-5645, 3G-5628

b. Type: Steel reinforced concrete structure with banked earth cover (Station 132b).

c. Construction:

(1) Structure 12'-0" x 28'-0" x 8'-0" high inside, with two wing walls, and parapet wall at entrance of building, and concrete apron between wing walls. All concrete shall develop a minimum strength of 3500 p.s.i. at 28 days. Top of floor slab shall be 3'-0" below grade. One C. I. soil pipe drain with grating shall be provided where shown for the concrete apron. Furnish and install all pipe sleeves, conduits and wall fittings, capped as shown, in the walls. Provide and install all concrete inserts and anchor bolts, in apron, ceiling,

floor slab and walls, where indicated on the drawing.

(2) Height of bank fill over structure shall be as indicated on the drawing, and sloped as directed by the Engineer.

(3) For Station 132c and d, Location E; construction similar to 132 c and d Location V.

(4) Provide and install one steel explosion door and one lead door in front wall, where shown, on the drawing. For steel explosion door, see 9-06 of these specifications. For lead doors, see 9-08 of these specifications.

28-65. STATIONS NOS. 132 a,b,c and d LOCATION V:

a. Reference Drawings: Structural, 3D-5629, 3C-5628.

b. Type: Steel reinforced concrete structure with banked earth over (Station 132 a and b).

c. Construction: Structure 25'-6" x 32'-0" x 8'-0" high.

Specifications similar to 132 a and b Location C.

d. Special Steel Reinforcement:

(1) Furnish and install 31 steel I-beams each, in floor slab and roof slab, and two steel beams at top of dividing wall, spaced and placed as shown on the drawing. Paint all steel with one shop coat of "Keystone" rust preventative primer, medium grade, or approved equal. This coating shall be removed before placing steel in forms.

(2) Structures 132 c and d Location V shall be fastened to concrete walls and apron of Stations 132 a and b, Location V. Construction similar to 132 c and d, Location V.

(3) For explosion door, see 9-06 of these specifications.

(4) For lead doors, see 9-08 of these specifications.

28-66. STATION 132 c and 132 d, LOCATION V:

a. Reference Drawings: Structural, 3C-5628.

b. Type: Temporary wood structures, to be removed when final fill is made.

c. Construction:

(1) Structure 132 d to rest on concrete piers of number size and spacing indicated. Concrete shall develop a minimum strength of 2000 p.s.i. at 28 days. Structures shall consist of wood posts, plates, wall plates, and rafters. Roof covered with 1/2" exterior grade Douglas Fir plywood, and one ply 15 pound roofing felt, 4" laps, mopped in hot asphalt, flashed as indicated. Furnish all steel anchor bolts, bolts, steel angle clips and plates for fastening posts and wall plates to concrete as indicated.

(2) All lumber shall be 1200f grade Douglas Fir.

(3) Structures shall be fastened to concrete walls and apron of stations 132 a and b, Location V, stations 132 A and B, Location C, Stations 132 b,c,d, Location E.

28-67. STATION 132 h, LOCATIONS D AND E:

a. Reference Drawing: 3D-5176.

b. Type: Frame structure, 20' x 28' x 9'.

c. Description: Wood frame shall be sheathed, diagonally, at roof and front of structure. Entire building, except opening in front, shall be covered with waterproof canvas, batten down with wood strips as shown on drawing. Structure shall be properly anchored to concrete foundation. Wood benches shall be constructed along three inside walls as indicated on plan. Work surface shall be 2" thick planking with plywood back-board.

All lumber shall be 1200f grade Douglas Fir and all concrete shall be 2000 p.s.i. Finish concrete floor shall be 5" above grade.

d. Electrical: Station 132, Locations C,D,E, E+, V, drawings 3C-078, 3G-082, 3D-5176.

(1) Electrical work includes direct burial cable services, ground rod and wiring, power and light wiring, conduit and wiring for instrumentation circuits including installation of equipment furnished by the Government, telephone wiring, etc.

(2) Work shall be in accord with Sections 16, 17 and 18 of the electrical specifications.

28-68. STATION NO 132 A and B, LOCATION V:

a. Reference Drawing: 2C-5426. Dehumidification system shall conform to applicable provisions of Sections 19 and 23 of these specifications.

28-69. STATION NO 132 a, LOCATION E:

a. Reference Drawing: 3E-5441. Dehumidification system shall conform to applicable provisions of Sections 19 and 23 of these specifications.

28-70. STATION NO 132 B, C, and D, LOCATION E:

a. Reference Drawing No. 3E-5439: Dehumidification system shall conform to applicable provisions of Sections 19 and 23 of these specifications.

28-71. STATIONS 133 and 134, LOCATIONS E AND V:

a. Reference Drawing: 3G-082.

b. Type: Tent.

c. Description: Electrical work. Same as station #132

28-72. STATION NO. 135, LOCATION E AND V:

a. Reference Drawings: 3E-5172, 3V-5173.

b. Type: Frame structures, 7-1/2'x8-1/2'x7-1/2'.

c. Description:

(1) Wood frame shall be covered sides and roof, with corrugated aluminum and interior walls and ceiling shall be lined with 3/8" plywood. Duct openings shall be provided where indicated. Door shall be 3 panel wood, weather-stripped as detailed. All hardware shall be aluminum. Structure at Location E shall be anchored to 2000 p.s.i. concrete footing and slab. Structure at Location V shall be erected on 200 ft. tower foundation slab.

(2) All wood sills and aluminum flashing shall be set in mastic.

(3) All lumber shall be 1200f grade Douglas Fir.

d. Electrical: Drawing No 3E-5319, same as Station #131.

28-73. STATION NO. 141 a and b, LOCATIONS E, V, AND Et:  
STATIONS No. 142 a and b, LOCATION V:

a. Reference Drawing: 3G-5143, 3E-5169.

b. Type: Frame structure, #141 - 14-1/2' x 36' x 8'  
minimum.  
#142 - 14-1/2' x 41' x 8'  
minimum.

c. Description:

(1) Wood frames of all stations shall be covered with corrugated aluminum siding. Roof shall be diagonally sheathed and covered with mineral surfaced cap-sheet. Where indicated interior walls shall be sheathed with 3/8" plywood. Wood doors and sash shall be as specified under Section 8. Structures shall be anchored to concrete foundations with finish floor slab at 5" above grade. Concrete ramp from Station 141a to connection pit shall be constructed as shown on Structural Drawing No. 3G-5651.

(2) All lumber shall be 1200f grade Douglas Fir.

(3) All concrete shall be 2000 p.s.i.

d. Electrical:

(1) Drawings 3E-081, 3G-5333.

(2) Electrical work includes direct burial cable services, power and light wiring, instrumentation wiring including installation of equipment furnished by the Government, ground rod and wiring, etc., in accord with Sections 16, 17 and 18 of the Electrical Specifications.

e. Mechanical: Sheet #3G-5447 - Dehumidification system shall conform to applicable provisions of Sections 19 and 23 of these specifications.

28-74. STATION No. 143, LOCATION V:

a. Reference Drawings: Structural 3G-5651, 3G-5653, 3G-5654 and 3G-5656.

b. Type: Reinforced concrete pit.

c. Construction: Pit shall be built of 2500 p.s.i. coral aggregate concrete with steel reinforcement as shown on drawings 11'-0" x 16'-9" x 5'-3" deep, inside dimensions. Walls and pit bottom slab shall be 8" thick. Pit shall be fitted with T-slot concrete inserts. Pipe sleeves and all other items as shown on the drawings or called for in the specifications. Connection pit and trench shall be backfilled and covered as directed by the Government. A 2'-6" thick limonite aggregate concrete slab shall be provided between pit and station #131 as shown on the drawings.

28-75. STATION NO. 143, LOCATION E:

a. Reference Drawing: Pit size, 10' square. Similar to Station No. 143, Location V. See Sheet 3E-5670.

b. Mechanical: See Station No. 131.

c. Electrical:

(1) Electrical work includes direct burial cable service, power and light wiring, instrumentation wiring including installation of equipment furnished by the Government, ground rod and wiring, etc.

(2) Work shall be in accord with Sections 16, 17 and 18 of the Electrical Specification.

28-76. STATION NO. 143+, LOCATION E+:

a. Reference Drawings: Structural, 3E-6602, 3E-6603, 3E-6604, 3E-6605, 3E-6606, 3E-6607; Electrical, 3G-5335, 3G-5331.

b. Type: Reinforced concrete pit.

c. Construction:

(1) Connection pit shall be built of 2500 p.s.i.

coral aggregate concrete with steel reinforcement as shown on drawings. 8'-0" x 11'-0" x 6'-0" deep, inside dimensions. Walls and pit bottom slab shall be 8" thick. Pit shall be fitted with T-slot concrete inserts, pipe sleeves and all other items as shown on the drawings or called for in the specifications.

(2) Connection pit and trench shall be back-filled and covered as directed by the Government.

d. Electrical and Mechanical similar to Location V.

28-77. STATION NO. 144 A, LOCATIONS E, Et, and V:

a. Reference Drawing: Structural, 3E-5684; Electrical 3G-5325; Mechanical, 3E-5448.

b. Type: Reinforced concrete structures.

c. Construction:

(1) Foundation shall be of coral aggregate reinforced concrete, 14'-0" x 14'-6" x 2'-6" thick, top of footing shall be at elevation "T". All Schedule 40 steel pipe shall be furnished and installed in the footing as shown. Trench with sectional steel removable cover plates, supported on steel angles shall be furnished and installed.

(2) The superstructure shall be of limonite aggregate reinforced concrete, 12'-0" x 12'-6" x 11'-6" high, outside dimensions. Furnish and install all "Unistrut" concrete insert in walls and ceilings and at front wall, where indicated. Tube alignment rack in front wall shall be installed as shown on drawing.

(3) Entrance shall be closed with limonite aggregate concrete cubes, same mix as for structure, this closure to be made when directed by the Government. All coral aggregate concrete and limonite aggregate concrete, shall develop a minimum strength of 3500 p.s.i. at 28 days.

(4) All steel shall be given 2 shop coats of zinc-chromate rust preventative primer, color green.

(5) Provide and install a wood frame and 3' x 6'-8" wood door barricade at entrance to the cavity. The barricade shall be removable. The frame shall be anchor bolted around the perimeter of the cavity entrance as noted.

(6) Lumber and plywood shall be of sizes shown and shall be 1200f grade Douglas Fir.

(7) Three galvanized steel butts, and one galvanized steel hasp, shall be provided for the door.

(8) Construct barricade as detailed on the drawing.

d. Electrical: Electrical work includes direct burial cable service, power, light and telephone wiring, instrumentation wiring, ground rod and wiring in accord with Sections 16, 17, and 18 of the Electrical Specifications.

e. Mechanical: Dehumidification system shall conform to applicable provisions of Sections 19 and 23 of these specifications.

f. Tube alignment racks, Station No. 144a: Furnish and install three complete Tube Alignment Rack Assemblies, one each at Sites E, E+, and V, all as shown on Sheets #3E-5684, 3E-5687 and 3E-5688. All racks shall be fabricated of 1/2" steel plate welded together to support 16 - 3" I. D. Schedule 40 steel tubes, through elipical holes at the lower end of rack, and turnbuckles at the upper end of rack for final adjustment of tubes in field. The flanges of rack shall be drilled and tapped with holes as indicated on the drawing.

g. Painting: All steel shall be painted two shop coats of zinc-chromate rust preventative primer, color green. Installation of racks in the wood concrete forms shall be true and accurate and to be bolted in place through holes provided in flanges of the racks. Ends of form bolts shall be burned off after removal of wood forms. Protection of the tapped holes in plates of tube alignment rack, while pouring concrete, to be made according to detail on Drawing 3E-5684.1. After final alignment of the tubes in the racks in field (See Drawing 3E-5697 for alignment data) the tubes shall be tack welded at their lower end to the face plate of the rack. After this alignment has been made, fill in the space between the outside of the tubes and the inside of the rack plates with limonite drypack.

28-78. STATION NO. 144b, LOCATIONS E, E+, AND V:

a. Reference Drawing: 3E-5163.

b. Type: Frame Structures, 10-1/2' x 17' x 8' minimum.

c. Description: All structures similar to Stations No. 141 and 142.

d. Exception: Omit wood sash and install corrugated aluminum shutters as shown in detail on drawings.

e. Electrical: See Station #144 a.

f. Mechanical: See Station #144 a.

28-79. STATIONS NO 145 and 146, LOCATIONS E, E+ AND V:

a. Reference Drawings: Structural 3E-5695 and 3E-5696.

b. Type: Steel towers on concrete foundations and with timber decks. (6 towers).

c. Construction:

(1) Steel towers, 10'-10" square back to back of angle legs. Towers vary in height to timber deck, but are identical in construction above the deck. Steel details are typical for all towers. All towers shall be equipped with a steel ladder of length to suit as shown, and a trolley beam at top of tower, with 1000 pound capacity trolley and chain block. All towers also to be equipped with 4 - 1-1/4 x 10, ten ton adjusting screw jacks for adjustment of lead shields. Lead shields and stays shall be furnished by the Government, and installed by the Contractor, under Government supervision.

(2) All anchor bolts shall be furnished by the steel fabricator. All steel shop connections shall be riveted, and all field connections, unless otherwise noted, shall be "Dardalett" rivet bolts.

(3) All steel shall be painted two shop coats of zinc-chromate rust preventative primer, color green.

(4) Timber deck shall be of 2" Douglas Fir plank bolted to steel members as shown, posts and railings shall be of wood of sizes indicated, and bolted together, lower part of posts shall be bolted to steel of the tower. All lumber shall be 1200f grade Douglas Fir.

(5) Foundations shall be four concrete piers on footings, tied at grade level with concrete beams. Concrete shall be steel reinforced, and shall develop a minimum strength of 2000 p.s.i. at 28 days. Concrete pad for ladder shall not be steel reinforced. Install all anchor bolts as shown, and leveling

plates grouted in on each pier. Top of leveling plates is elevation "T". Stations located as per tabulated schedule on the drawing.

28-80. STATION NO. 190 and 191, LOCATION A:  
STATION NO. 192, LOCATION X:

- a. Reference Drawing: 3A-5162.
- b. Type: Frame structure, 8' x 9' x 8' minimum.
- c. Description: Structures similar to Stations No. 141 and 142 except one side of building shall be open. No doors or windows shall be required.

Electrical work includes direct burial cable services, light and receptacle wiring, ground rod and wiring in accord with Section 16 and 17 of Electrical Specification.

<u>SHELTER</u>	<u>LOCATION</u>	<u>STRUCTURAL REFERENCE DRAWINGS</u>
301 A and E	E	3E-662
301 B and C	E	3E-669
301 I	E	3E-673
301 J	E	3E-672
301 K	E	3E-663
301 D and G	S	3S-674
301 F and H	S	3S-668

- d. Type: Steel reinforced concrete structures.
- e. Construction:

(1) All structures are similar but vary in size, all have two compartments, each with ladder rungs in the walls and overhead manhole and cover. Sizes and thicknesses of walls and slabs as shown on the drawings. Top of floor slab approximately 4'-0" below grade. Concrete for shelter 301-K shall develop a minimum strength of 3500 p.s.i. at 28 days, concrete for all other shelters shall develop a minimum strength of 2000 p.s.i. at 28 days. Sand bags and banked fill cover over structures shall be of heights and slopes as indicated on the drawings. Furnish and install all pipe wall fittings, "Unistrut" concrete inserts, steel brackets for wire supports, steel ladder rungs, shelf anchor bolts and eye bolts, as detailed and located on the drawings. Furnish wood plank for wire supports.

(2) Furnish and erect wood plank shelving, supported on wood cleats, anchor bolted to walls where indicated. All lumber shall be 1200f grade Douglas Fir.

(3) Furnish and install 2-fabricated steel manhole frames and covers for each shelter. Angle frames of welded construction, provided with concrete anchors. Covers shall be of steel plate, reinforced with steel bars welded on underneath. Top to have four (4) steel handles welded on. Provide four (4) bent steel cover hold down bars with each manhole. Paint all steel two shop coats of zinc-chromate rust preventative primer, color green.

(4) Manhole frames and covers for shelter 301-K, detailed on Drawing 3E-663. Manhole frames for all other shelters detailed on Drawing 3S-668.

f. Electrical: Drawing 3E-057.

(1) Electrical installation includes direct burial cables for light, pier and telephone services. Wiring for light, receptacles, pier and telephone.

(2) Work shall be in accordance with Sections 16 and 17 of Electrical Specifications.

g. Mechanical: Drawing 3E-5418: Ventilation system shall conform to applicable provisions of Section 23 of these specifications.

28-31. STATION NO. 302, LOCATIONS E AND S:

a. Reference Drawings: 3E-5637, 3E-5638, 2E-5662.

b. Type: Reinforced concrete.

c. Description: All concrete shall be 2000 p.s.i. All concrete mounts and battery boxes shall conform to sizes and shapes as shown in detail on drawings. All steel frames, inserts and bolts shall be carefully located and installed in accordance with dimensions shown on plans. All completed structures shall be streamline with earth, covered with sand bags. All stations shall be protected with canvas covered frame shelters as shown on Sheet #3E-5170.

d. Electrical installation shall consist of conduit entrance and exit from Battery Box into Stations.

e. Steel Hoods: Steel hoods at camera mounts shall be fabricated from  $3/8$ " thick plate, welded to conform to size and shape as shown on the drawings. Holes shall be of sizes and spacing shown. Welds shall be continuous fillets, sizes as indicated. Hoods shall be painted with two (2) coats of zinc-chromate.

f. Steelwell Covers: Built-up steel plate covers for camera wells shall be fabricated as shown on sheet 3E-5637, Detail "K". All plates shall be ground free of rough edges and corners, plates to fit flush, square and trim when assembled. Holes shall be of sizes and spacing indicated and all roughness at edges removed. After assembly of each complete unit, paint with two (2) shop coats of zinc-chromate.

g. Camera Window Assembly:

(1) Assemblies to be fabricated as shown in detail on Sheet #2E-5662. Steel plate shall be  $1/2$ " thick, welds shall be  $3/16$ " double butt continuous, ground only to permit tolerances specified. All stud-bolts shall be secured by plug welding, anchors secured to external frame with  $1/4$ " fillets. All machine bolts and stud-bolts shall be  $1/2$ " diameter, lengths indicated, cadmium plated, bolt heads and nuts shall be hexagonal.

(2) Lead shielding assembly shall be fabricated in keyed sections as detailed. All lead shall be five (5%) percent Antimony. Glass shall be furnished by others. Shop painting as specified on drawing.

(3) All parts of assemblies shall be fabricated to the nearest  $1/32$ " and shall be assembled in shop to assure ease of assembly. Units shall be shipped completely assembled.

h. Hoists (Stations No. 302 a, b, c, and d): Hoist assemblies for camera stations shall be fabricated as shown on Sheet #3E-5638, Detail "H". All welds shall be  $1/4$ " fillets as indicated. Hoist assembly shall be Hot-dip galvanized (A.S.T.M. Designation 123) and 6" diameter pipe insert shall be coated with "Keystone" rust preventative or White Lead and Tallow.

i. Cover Plates and Frames: Materials for all steel cover plates and frames shall be of sizes and weights indicated on drawings, rust preventative application as specified. Cover plates and frames shall be assembled and bolted into separate units for shipment.

28-82. STATIONS NOS. 421, 423, THROUGH 429, 4210 THROUGH 4226,  
LOCATIONS C, D, E, N, P, Q, R, S AND T:

a. Reference Drawing: 3G-5671

b. Type: Concrete mast anchors.

c. Description: Stations shall consist of four concrete anchor blocks with centerlines equally spaced along the perimeter of a 24' diameter stabilized area. A concrete mast base with cast-in pipe assembly shall be located at center point of area facing at angle described on plan. The anchor blocks shall have cast-in ring bolts as detailed. The mast base pipe assembly shall be fabricated of standard 4" pipe and fittings. The stabilized area shall be hand tamped.

28-83. STATIONS NOS. 511, 512, 513, 5142, 5141, 5151, 5152, 5161,  
5162, 5163, LOCATION E:

STATIONS NO. 5171 THROUGH 5174, 518, 5182, LOCATION S:  
STATIONS NOS. 519, 5192, LOCATION W:

a. Reference Drawing: 3E-5660.

b. Description: Stations shall consist of 4' diameter by 4' deep excavation to be filled with 2000 p.s.i. High-Early-Portland Cement concrete when directed by the Government. Top of concrete shall be at grade line. For locations of all stations see schedule on plan.

28-84. STATION NO. 591 a and 591 b, LOCATIONS C & E:

a. Reference Drawing: 3G-5137.

b. Type: Frame structure, 6' x 10' x 8'.

c. Description: Wood frame shall be sheathed inside and outside of walls with 1/2" plywood. Roof shall be diagonally sheathed and covered with 90 pound cap sheet joints cemented. Plywood shutters, sizes indicated shall be provided at each end, top hinged and door shall be 3 panel wood. All hardware shall be aluminum as shown. All lumber shall be 1200f grade Douglas Fir. Plywood outside structure shall be exterior grade. All concrete shall be 2000 p.s.i. finish floor 5" above grade. Exterior wood surfaces shall be given one coat primer and two coats aluminum paint.

d. Electrical: Electrical work shall consist of 3/c #8 Direct Burial service cable, driven ground rod and bare copper ground cable. Enters structure in conduit to Pull Box Feeder Circuit Breaker 3W-SN and load center for lights and receptacles.

28-85. STATIONS NO. 593 a, b, c, and d, LOCATIONS C AND E:

a. Reference Drawing: 3G-5136.

b. Type: Frame Shelters, 5-1/2' x 14' x 2-1/2'.

c. Description:

(1) Wood frame shall be sheathed, inside and outside, walls and roof, with 1/2" plywood. Shelter shall be equipped one end with hinged top opening, complete width of structure. Opposite end shall be equipped with pipe sleeve assemblies as shown in detail on drawing. Concrete pad shall have cast-in wood skids. Top of skids shall be minimum 3/4" above top of concrete.

(2) All plywood shall be set in mastic and all exterior wood surfaces shall be given one coat primer and two coats aluminum paint.

(3) All lumber shall be 1200f grade Douglas Fir. Outside plywood shall be exterior grade. All concrete shall be 2000 p.s.i. All pipe assemblies shall be of sizes and quantity shown on drawing and shall be galvanized after fabrication.

28-86. STATIONS NOS. 6101 THROUGH 6104, LOCATION E:  
STATION NO. 6105, LOCATION S:

a. Reference Drawing: 3E-694

b. Description: 3' x 3' x 3' hole with 4" thick scored slab shall be completed as directed by the Government. All concrete shall be 2000 p.s.i. High-Early Portland Cement Mix.

28-87. STATIONS NOS. 623b and 624b, LOCATION S:  
STATIONS NOS. 625b, c and 626 b, and c, LOCATION T:

a. Reference Drawing: 3S-5686.

b. Description: Similar to Station 302 e.

28-88 STATION NO. 623, LOCATION S:  
STATIONS NOS. 625 and 626a, LOCATION T:

a. Reference Drawing: 3T-5680.

b. Type: Reinforced concrete 5' x 8' x 6-1/2'.

c. Construction: All concrete shall be 2000 p.s.i.

All pipe inserts steel sleeves and pipe vents in roof shall be located and installed as indicated on drawings. When instructed by Government, the building shall be closed at back with metal covered wood door, bolted in place as shown. Building shall then be banked with earth fill at back and two sides to roof line. A wood slat grating shall be provided and installed on concrete floor. Shelves and brackets shall be fabricated of #10 gauge galvanized iron. Electrical work shall be similar to Station No. 302.

28-89. STATION NO. 771, LOCATION E:  
STATION NO. 772, LOCATION V:  
STATION NO. 773, LOCATION C:

a. Reference Drawing: Structural, 3G-685.

b. Type: Reinforced concrete structure, with banked fill to top of concrete.

c. Construction:

(1) Structure shall be of two compartments, 5'-6" x 5'-6" x 7'-3" high inside, and 6'-0" x 6'-0" x 6'-6" high, with steel explosion door in the dividing wall.

(2) Footings under walls of the structure shall rest on compacted coral sand, the smaller compartment shall have 3" floor slab, the larger compartment shall have no floor slab, but shall have an isolated block of concrete, 5'-0" square. The bottom of the block shall extend to coral bed rock. Rock shall be cleaned thoroughly and brush coated with special mortar before pouring block. Elevation of top of block shall be 1'-0" minimum above high ground water level. This will determine the elevation of the structure. Concrete for the block shall be mixed as follows: 1-part portland cement Type I, 25 pounds "Embeco" to the sack of cement, 2-1/2-parts fine aggregate, 3-1/2-parts coarse aggregate, fresh water for 2" maximum slump.

(3) Special mortar shall be of mix as follows: One sack Type I Portland Cement, 50 pounds "Embeco", 3/4 sack of sand passing 20 mesh screen and fresh water.

(4) All other concrete shall develop a minimum strength of 2000 p.s.i. at 28 days. Fill in with banked earth to top of structure, sloped as indicated on the drawings.

(5) Furnish and install in walls of the structure all steel galvanized ladder rungs. "Unistrut"

concrete inserts for 3/8" bolts, and 3" conduit, capped both ends. All as shown and located on the drawing.

(6) Furnish and install, over the smaller compartment, a pair of hinged covers, with handles and locking device. The covers shall be of 3/8" steel plate, reinforced with 6" channel 8.2 covers shall be supported on 4 x 4 x 3/8 slt. angle frames, provided with 1/2" diameter concrete anchors. Covers and frames shall be of welded construction. As detailed on Drawing 3G-685 all steel shall conform to A.S.T.M. standard specification A7-46. All welding shall conform to the Code for Arc and Gas Welding for Building Construction of the A.W.S. 1941 Edition.

(7) Furnish and install 2'-2" x 5'-6" standard steel explosion door in dividing wall (See 9-06 of these specifications).

(8) All steel shall be painted two shop coats of zinc-chromate rust preventative primer, color green.

d. Electric Work: Drawing 36-077: The electrical work shall consist of 3/c #8 Direct Burial Service Cable, driven ground rod and bare copper ground cable. Enters structure in Conduit to Pull Box Feeder Circuit Breaker 3W-SN and Load Center for lights and receptacles.

28-90. STATION NO. 775 - LOCATION A:

a. Reference Drawing: Structural, 3A-690.

b. Type: Wood frame structure, on reinforced concrete footings.

c. Construction:

(1) Structure 6'-2" x 6'-2" x 6'-10-3/8" high inside, with hinged wood door. Footings under walls of the structure shall rest on compacted coral sand. Top of footing shall be at grade level. Provide and install all steel, galvanized anchor bolts required to anchor structure to footing as indicated. There shall be no floor slab, but a block of concrete 5'-0" square, the bottom of the block shall extend to coral bed rock. The top of the block shall be at grade level, forming the floor of the structure. Roughen surface of the rock, clean thoroughly and brush coat immediately before pouring block, with mortar of mix as follows: One sack Type I Portland cement, 50 pounds "Embeco", 3/4 sack of sand passing 20 mesh screen, and fresh water.

(2) Concrete for the block shall be as follows: One part Type I Portland Cement, 25 pounds "Embeco" to the sack of cement, 2-1/2 parts fine aggregate, 3-1/2 parts coarse aggregate, fresh water for 2" maximum slump. All other concrete shall develop a minimum strength of 2000 p.s.i. at 28 days.

(3) Fill in around structure, level with top of footing with compacted sand. All lumber for sides and roof shall be spaced and of sizes shown on the drawing. Sides and roof of 1" Tongue and Grooved sheathing laid diagonally. Door of 1" x 6" frame shall be diagonally sheathed both sides with 1" Tongue and Grooved boards. Inside of walls, and ceiling shall be lined with 1/2" exterior grade Douglas Fir plywood. Wood sills shall be foundation grade Redwood. All other lumber shall be 1200f grade Douglas Fir.

(4) Bolts, lag screws and washers for the door shall be galvanized steel and sizes as shown on the drawing. Two hinges and two latches shall be installed and fabricated of galvanized steel as shown on Details "H" and "G" Drawing 3T-644.

(5) Stud and rafter framing shall be made with 61S-26 aluminum angle clips, bolts, lag screws and washers as shown. Clips as per Detail "K" Drawing 3T-644.

(6) Outside of building walls and roof (including door) shall be covered with two (2) layers of 15 pound roofing felt, mopped in hot asphalt.

Building must be sealed so that it will be light proof.

d. Electrical Work: Shall be similar to stations #771-3 except that local switch for lights shall be provided and installed.

28-91.	<u>STATIONS</u>	<u>SITES</u>
	821	E
	822	S
	823	Q
	824	P

a. Reference Drawings: 3H-250, General Layout  
3H-251, Foundations B1 & B6  
3H-252, " B2 & B5  
3H-253, " B3 \*  
3H-254, " B4  
3G-088 Electrical

b. Type: Steel reinforced concrete foundations.

c. Construction:

(1) Concrete foundations or slabs varying in size for the different stations. All concrete shall develop a minimum strength of 3000 p.s.i. at 28 days.

(2) Top of footings shall be flush with grade. Two 8 WF 67 steel beams shall be mounted on top of all footings, (except as otherwise noted), these beams shall be fastened to concrete with 3/4" diameter "J"-anchor bolts. All bolts to have one hex nut. Beams shall be drilled for these bolts in lower flange and shall be drilled same pattern in top flange. Fabrication of the beams and anchors as per details and tabulations on the drawings.

(3) \*Foundations B3 at all stations shall not have steel beams mounted on top, but will have anchor bolts, installed as shown on Drawing 3H-253.

(4) All stations shall have two (2) concrete deadmen, 3'-8" x 3'-8" x 3'-0" thick, top flush with grade, each to have four (4) 7/8" diameter "J" anchor bolts with hex nuts, set with 2" diameter x 12" sleeves in concrete. All as detailed on Drawing 3H-253. All steel shall conform to A.S.T.M. Standard Specification A7-46.

(5) Paint all steel beams two (2) shop coats of zinc-chromate rust preventative primer, color green. Paint all anchor bolts and sleeves one shop coat "Keystone" rust preventative primer, medium grade or approved equal. This coating shall be removed in the field with solvent, before placing in the forms. Coat all anchor bolt threads with heavy waterproof grease. Locations and arrangement of stations shall be as shown on Drawing 3H-250.

(6) Steel junction box shall consist of a rectangular welded steel box with a removable steel cover, and pipe nipples and conduit flange as shown on Drawing 17G-817. The cover shall be attached to the box by a series of wing nuts and studs. A rubber gasket shall be provided under each cover. The cover studs and the pipe nipples shall be welded to the outside of the box and the conduit flange shall be bolted to the bottom of the box, with a rubber gasket between the box and flange as indicated.

d. Electrical: Electrical work consists of 2 junction boxes a 6" conduit to one and a 3" conduit to the other, both 21" below grade. Conduits to Instrument Base as required. Also required is a Post Station feeder 3/c #8 Direct Burial Cable.

28-92. STATION NO. 825, LOCATION E:

a. Reference Drawing: Structural 3E-5632; Electrical 3E-076.

b. Type: Reinforced concrete, 8' x 10' x 6-1/2'.

c. Construction: Excavation shall be to depth of 5' below grade. Concrete shall be 2000 p.s.i. All pipe sleeves and wall fittings shall be of size and location indicated. One explosion proof door, 2'-2" x 5'-6" shall be installed. One wood work bench and one wood rack shall be furnished as shown on details. The stations shall be banked with earth fill on three sides to roof line. For steel explosion-proof door see Section 9-06.

d. Electrical: Electrical work shall consist of Direct Burial Service Cable 3/c #6 and driven ground rod with #6 bare copper ground wire. Enter through 2" C to Pull Box. Provide tap for fused disc switch 30 A 3 W SN 120 volt for instrumentation. Main circuit breaker 40A 2 P 3W SN 250 volt lighting panel and local switches for interior and exterior light. Receptacles and ventilating electric equipment as required. Telephone service enters in conduit to outlet and instrument. 6" - 3" and 1-1/2" wall sleeves capped both ends as required.

e. Mechanical: Drawing No. 3E-5431: Ventilation system shall conform to applicable provisions of Section 23 of these specifications.

28-93. STATION NO. 826, LOCATION S:

a. Reference Drawings: 3S-5633, 3E-076, 3E-5431.

b. Type: Reinforced concrete, 8' x 10' x 6'-6".

c. Construction: Excavation shall be to a depth 4'-6" below grade. Building similar to Station No. 825 excepting see Section 9-07 for special steel blast proof door.

Electrical and ventilating work shall be same as Station No. 825.

28-94. STATIONS NO. 827 - LOCATION Q AND  
STATION NO. 828 - LOCATION P :

a. Reference Drawings: 3P-5634 and 3E-076, 3E-5431.

b. Type: Frame structures, 8' x 10' x 6'-6".

c. Construction:

(1) Excavation for concrete pad shall be 4'-6" below grade. Concrete pad shall be 12" thick, outside dimensions as indicated. Anchor bolts shall be cast-in concrete pad and shall be spaced as shown on Foundation Plan.

(2) All wood connections shall be made with clip angles bolted securely. Frame shall be covered four sides and roof with 2" diagonal sheathing. Roof and exposed portions of sides shall be covered with .032 flat aluminum sheet. Portions below grade shall be covered with 2 ply 15 pound asphalt felt mopped in with hot asphalt.

(3) Interior walls and ceiling shall be covered with 1/2" exterior grade plywood, bottom to be set in mastic.

(4) Door shall be sheathed wood frame type, aluminum clad at outside only. All door hardware shall be fabricated and installed as shown in detail on drawing and shall be similar to Station No. 7. Concrete shall be 2000 p.s.i, all sills, studs and sheathing shall be foundation grade Redwood, all other lumber 1200f grade Douglas Fir. All clips and bolts shall be aluminum, anchor bolts shall be steel.

d. Electrical and Ventilating work shall be similar to Station No. 825.

28-95. SPECIAL STUCCO: I Stations 121 a,b,c,d, (no stucco on 121 e) Sites E and V; (Steel Mounts above ground):

a. Mix: The dry mix is comprised of 1-part by weight of High-Early cement, 1.5-parts of special aggregate (enamel frits) and 0.5-parts of coral sand. Use minimum amount of fresh water (approximately 0.37-parts by weight) to give proper consistency for good cohesion. If necessary, the proportion of cement may be increased slightly to give good plasticity. Mix should not be retempered and batch size should be limited to that amount which can be entirely used in one-half hour. Parts by volume calculated for dry mix are: 1-part HE cement, 1.83-parts special aggregate and 0.69-parts of coral sand on the basis of sp. gr. of 3.15, 2.7 and 2.4 respectively. Special aggregate will have been graded so that 100% will pass the No. 30 mesh sieve, and grading specification for fine

aggregate will be suitable for the coral sand.

### Typical Test Results

<u>Mix by Weight</u>	<u>7 Day Compressive Strength (p.s.i)</u>
1-part HE cement 1.5-part special aggregate 0.5-parts sand	6100
1-part HE Cement 1.2-parts special aggregate 0.8-parts sand	7400
1-part HE Cement 1-part special aggregate 0.5-parts sand	7800
Water/cement ration - 0.380 for all mixes (Standard 2x4 cylinders used for testing)	

#### b. Application:

(1) The steel surface of the mount shall have rust preservative removed with distillate and shall then be sand blasted to obtain clean steel surface. (Except for 121 e) steel surface of mounts shall previously have had 1/2" long x 3/8" diameter ribbed steel pegs spot-welded to them on 6" centers as indicated on Drawing No. 3E-5681 revised. Immediately following sand blasting, the surface shall be washed with a standard HE cement-water slurry by brush and wash allowed to dry to thin hard coat for approximately one-half hour.

(2) Slurry coat shall be followed by six 1/2" layers as above "Special Mix" stucco (reinforced with three layers of welded wire mesh reinforcing placed according to B-3) using standard application techniques for curing and good interlayer bonding. Damp curing should be used (burlap) between coats. Exposure of the fresh stucco to heat of direct sunlight must be avoided. The final coat shall be steel-troweled to as smooth a finish as possible and carefully moist-cured for approximately seven days to avoid formation of cracks and faults. It should be possible to apply a succeeding coat five hours after the previous coat so that a schedule of two coats a day followed by one night of moist-curing could be achieved.

(3) Welded wire reinforcing shall be applied to 1/4" away from the first 1/4" coat of stucco and be covered by the second 1/2" coat so that it lies 1/4" under the surface of the second coat (i.e, it lies in the middle of the second coat). The third 1/2" stucco coat shall then be applied, cured at least five hours and a second layer of welded wire mesh placed and covered with stucco as above by the fourth 1/2" coat. In the same way a fifth 1/2" layer shall be applied followed by the 6th and the final 1/2" layer with wire mesh reinforcing lying 1/4" under the surface. The spacing of the wire mesh is 1" O. C. The bottom edge of the mesh should lie next to the pedestal of the mount below the surface of the base layer. The final surface layer shall be finished as specified in Paragraph b-2 above. Each layer of wire mesh shall be secured to tie-bolts on the leading edges of the mount as shown in Drawing No. 3E-5681 revised. It is suggested that the stucco layers be led to a convenient distance from the tie-bolts and underlying tie wires be covered in the placing of the final coat. Care should be taken to secure a good joint. In case of the leading edge of the mount below the hollow compartment, the steel facing can be bolted in place and stucco mix poured between it and the mount after the sides of the mount have been stuccoed in such a way that the edges of the facing rest on the side stucco. The stucco around the vertical edges of the steel facing should be trimmed so that the steel and stucco surfaces are smoothly flush with no cracks or holes. Stucco should be blended smoothly to bottle contour between top of steel facing and bottle front. In the case of the upper hollow section of the mount where the tie bolts are hidden behind a flange, the space between bolts and flange can be filled with the final stucco coat as above. Stucco should be placed in front of the flange over the clean surface of the nose portion of the mount to blend smoothly with mount contours toward the nose as shown in Drawing No. 3E-5681 revised. No reinforcing wire is necessary here.

(4) After moist-curing the final finish coat seven days out of direct sunlight, allow surface to dry, smooth off or fill in any irregularities, wash cement surface with neutralizing solution of zinc-sulphate, dry, and apply two coats of aluminum heat-resistant paint. Spray or brush as convenient. If brush is used, stroke as much in horizontal direction as possible. It is suggested that an aluminum heat-resistant paint manufactured by the Vita-Var Corporation, Newark, New York, be used with twice the normal amount of aluminum pigment.

II Stations 121 a,b,c,d,e, Sites E and V (Base of Steel Mounts).

a. Drawing No. 3E-5681.2, Detail E, shows 5" layer of special stucco to be placed around base of mount. This stucco need not be so rich in the special aggregate as that used on the vertical portions of the mount. The following dry mix proportions by weight are recommended: 1-part HE cement, 1-part special aggregate, 1-part coral sand. Grading specifications for coral aggregates are same as in IA. Minimum fresh water should be used.

b. Base layer stucco can be laid in one layer of welded wire reinforcing located 1-1/2" under the surface. Surface of stucco should be steel troweled to as smooth a finish as possible, avoiding air holes, faults, etc.

c. Base layer stucco should be moist-cured for seven days and surface painted as in I b--4.

### III Stations 120 a,b,c,d and e

a. Drawing No. 3E-5682.1, Sections a, b, shows stucco to be laid on surface of concrete emplacement. The mix for this stucco should be the same as in I a (1-part HE cement, 1.5-parts special aggregate, 0.5-parts coral sand).

b. The stucco should be laid and finished as in II b, with the reinforcing wire one inch below the surface.

c. The stucco should be cured and painted as in II c.

SECTION 29

STEEL TOWERS

29-01. SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with the fabrication and erection of steel towers, complete, in strict accordance with this section of the specifications and the applicable drawings.

29-02. REQUIREMENTS: The work shall conform to all provisions of this section and shall also conform to all provisions of the specifications accompanying the Invitations For Bids below listed and which are contained in Appendix "A" to this specification:

a. Specifications For 75-Foot Steel Tower and Appurtenances- Invitation No. HN-3H-603 dated 12-9-49, including Amendment No. 1.

b. Specifications For 200-Foot Steel Tower dated 6-7-50, including Amendments Nos. 1 and 2.

c. Specifications For 300-Foot Steel Tower dated 5-3-49, including Amendments Nos. 2,3 and 4.

29-03. 75 FT. STEEL TOWER FOUNDATION - LOC. "P", "Q", "M", "N".

a. REFERENCE DRAWINGS: Structural 3H-610, 3H-605  
Electrical 3H-370, 3H-603  
Mechanical 3H-436

b. TYPE: Reinforced concrete footings.

c. CONSTRUCTION: 75-Foot steel tower shall be supported on four steel reinforced coral aggregate concrete footings tied together with a continuous reinforced concrete tie beam, below grade, between footing pedestals as indicated on drawings. Tower footings shall be 7'-0" square by 1'-4" thick at a depth of 5'-6" below elevation "T". If tower footings rest on rock a 3'-6" square minimum footing at a depth of 3'-0" minimum into rock shall be constructed. Where rock is within 2'-0" of grade tie beams shall be omitted. Tower legs shall be supported on 2'-0" square steel reinforced concrete pedestals which are located in the center of the footings and are an integral part thereof. Stub angles for connecting tower legs to foundation shall be set in concrete pedestals, in true

alignment, with a template furnished for this purpose. Tie beams shall be 1'-0" wide x 1'-2" deep, bottoms of which shall be 2'-2" below elevation "T". 1/2" thick asphalt impregnated "Celotex" shall be provided at bottom of tie beams between earth and concrete as shown on the drawings. Dumbwaiter pit shall be built of steel reinforced coral aggregate concrete having walls and bottom slab 8" thick equipped with all fittings as shown on drawings. Hoisting machine foundation shall consist of coral aggregate concrete not reinforced. Top of foundation shall be 4'-8" x 6'-0" battered to 5'-8" x 7'-0" at bottom. This foundation shall go to a depth of 2'-0" below grade elevation "T" and project 6" above grade and shall be equipped with anchor bolts set with a template furnished for this purpose as shown on the drawings. Stair platform footing and hoist sheave anchor footing shall be incorporated in 75' steel tower foundation with all fittings as indicated on drawings. All concrete shall have a minimum strength of 2000 p.s.i. at 28 days.

d. GUY CABLE ANCHOR FOOTINGS FOR 75 FT. STEEL TOWER: All guy cable anchor footings shall consist of 2000 p.s.i. steel reinforced coral aggregate concrete together with their respective fabricated steel anchors or other fittings set in concrete as shown on the drawings. Size of footings shall be as indicated on schedules on drawings, or as directed by the Engineer.

e. ELECTRICAL: DRAWING 3H-370:

(1) Electrical work for this structure consists primarily of stairway and cab lighting, obstruction lights, conduit risers, 4'-0" x 7'-0" x 1/2" aluminum backboard for mounting circuit breakers, fuse panels, telephone and signal equipment, etc., lighting rod, ground connections and network, etc.

(2) Work shall be in accord with Sections 16, 17 and 18 and of the electrical specifications and with the following:

(a) Vertical conduits shall be properly supported to leg of tower. Battery and power conduits shall be on different leg than telephone and signal conduits. Wires shall be supported by suitable means at point where they enter cab.

(b) All conduit and conduit fittings shall be aluminum, wherever possible and where not possible such equipment shall be insulated from the aluminum tower structure by means of non-ferrous materials.

f. MECHANICAL: All mechanical work shall conform to applicable provisions of Sections 19 and 23 of these specifications.

29-04. 200 FT. STEEL TOWER FOUNDATION

a. REFERENCE DRAWINGS: Structural - 3G-5641, 3G-5647, 3G-5651, 3G-5653, 3G-5654, 3G-5656, 3E-6602, 3E-6603, 3E-6604, 3E-6605, 3E-6606, and 3E-6607.

(1) Plumbing and Dehumidification 3G-5437.

(2) Electrical 3G-5331, 3G-5332, 3G-5335, 3V-041, 3G-062, 3G-063.

b. TYPE: Reinforced concrete and steel piles.

c. CONSTRUCTION:

(1) Except as otherwise shown on the drawings, a 200-ft. steel tower foundation shall be constructed of steel reinforced coral aggregate concrete having a minimum strength of 2500 p.s.i. at 28 days and steel piles to develop a minimum safe bearing value of 85 tons. Piles shall be driven to a depth of approximately 50 feet so that their tops shall be within 3 inches of the locations shown on the drawings. This foundation shall support the 200 foot steel tower, Station #131, the 200 foot column and all appurtenances. Refer to paragraph 29-04 j; which follows:

(2) Where called for on the drawings, a trench, 4'-9" deep at 200 foot column base sloping to 5'-0" deep at connection pit, shall be provided with concrete walls and floor slab as indicated on drawings. Generally this foundation shall be equipped with pipe sleeves and other fittings for the various trades as shown on the drawings or as called for in the specifications. Ducts from the connection pit Station #143 to Station #131 shall be furnished by the Government and installed by the Contractor as directed by the Engineer. Skip Hoist pit shall be built of reinforced coral aggregate concrete having walls and bottom slab 8" thick with all fittings as shown on the drawings.

d. GUY AND MESSENGER CABLE ANCHOR FOOTINGS FOR 200 FT. STEEL

e. TOWER: All guy and messenger cable anchor footings shall consist of 2000 p.s.i. reinforced coral aggregate concrete together with their respective fabricated steel anchors or other fittings set in concrete as indicated on the drawings, as directed by the Engineer. Size of footings shall be as indicated in schedules on drawings, or as directed by the Engineer.

f. EQUIPMENT FOUNDATIONS FOR 200 FT. STEEL TOWER:  
Equipment foundations shall consist of 2000 p.s.i. reinforced coral aggregate concrete together with all necessary bolts and fittings as shown on the drawings or called for in the specifications.

g. ELECTRICAL:

(1) Electrical work for this structure consists primarily of power and light wiring, steel conduit and fittings, two lightning rods, ground wiring and network, elevator power signal and light wiring, telephone and signal wiring, hoisting controls and wiring, etc.

(2) Work shall be in accord with Sections 16, 17 and 18 of electrical specifications and with the following:

(a) Vertical wires in conduit shall be properly supported in sectionalizing pull boxes at distances not greater than 100 feet.

(b) Power and control conduits shall be on different leg of tower than telephone and signal conduits.

h. MECHANICAL: All mechanical work shall conform to applicable provisions of Sections 19 and 23 of these specifications.

i. 200 FT. COLUMN:

(1) SCOPE: Furnish and install on Tower Foundation, Location V, all steel sections, pipes, connections, erection ties, permanent ties, equipment and all other items to complete the 200 ft. column shown on Sheets 3V-5668, 3V-5669, and 3G-5672.

Exceptions: The Government shall furnish all lead sections and coax cables required, to be installed by the Contractor under Government supervision. Basic parts of the Column as furnished by the Contractor shall consist of the Grillage Assembly, 6" dia. pipe assembly, outer steel shell assembly and all ties.

(2) Fabrication:

(a) Steel grillage shall be fabricated as shown on Sheet #3G-5672 and shall be shipped unassembled. Shipment to include steel billets, plates, wedges and all required cap screws.

(b) All 6" diameter pipe sections and split sections, outer steel shell sections, erection ties and permanent ties shall be fabricated as detailed on Sheets #3V-5668 and #3V-5669, as directed by the Engineer. All steel shells and pipe shall be fabricated in the shop and shipped in sections as shown on the drawings, and are to be match marked in the shop. The fabricator shall furnish all steel bolts required for field bolting, plus 20% extra. All bolts shall be American Standard. The erection ties for the column shell shall be galvanized steel rope with galvanized steel turnbuckles and end fastenings, as shown and assembled on the drawing. The permanent ties at each 25 feet levels and the 6" pipe erection ties shall be structural steel as detailed and assembled on the drawing.

(c) The exterior surfaces of the steel column shells, except the beveled edges for field welding, shall be given two shop coats of zinc chromate rust preventative primer, color green. The interior surfaces of the steel shells and all grillage parts shall be given one shop coat of "Keystone" rust preventative primer, medium grade or approved equal. This coating to be removed with solvent in the field before grouting in place.

(d) All exterior surfaces of the 6" pipe except those receiving weld metal shall be given two coats of the zinc chromate primer. Welding edges to be coated with "Keystone". All tapped holes shall be packed with heavy waterproof grease before shipment.

(3) Erection: The 6" pipe, excepting the lower 31 foot split section, shall be installed in position and suspended from the 200 ft. tower cab floor framing.

The cables shall then be installed in the pipe section by section at the bottom and raised into position, all under Government direction. After the cables are in place, the column base grillage shall be installed and grouted in place. See Dwg. 3G-5672.

(4) Grouting in Base Grillage of Column:

(a) After assembly and alignment of base, grout grillage in place with mix by weight as follows:

1 part Portland Cement  
1 part Master Builders Co. "EMBECO"  
1 part sand  
Minimum of Fresh water

The lower 31 ft. section of split pipe shall be bound together with galv. steel straps, welded to the top sections, and secured to the base plate.

(b) Lead blocks shall then be placed in sections to the nearest height just above the height of its retaining shell section. The lead section shall then be bound with the steel strapping and the 3/8" space between the lead and the 6" pipe filled with water deposited sand. The steel retaining shell shall then be installed. The one inch space between the lead and the shell shall then be grouted with a mixture same as for grillage. After the column is erected section by section in this manner all temporary stays or ties are to be removed and permanent ties installed at each 25 foot level. See Drawing #F.S. 461.

(c) Strapping material to be used in the foregoing operations shall be 1-1/4 x .035" galvanized steel strap, placed 18" on center, with No. 1032 seals. One strapping machine, one #810-1 stretcher and one #1010-D sealer. (Acme Steel Co., or approved equal).

J. Piling Foundation:

(1) Piling: The piling for this project shall be steel bearing piles, 12" H @ 53#, 50 feet long.

(2) Driving Equipment:

(a) The driving hammer furnished for this project shall be a single-acting Vulcan No. 1 hammer, having a rated striking energy of 15,000 foot pounds at the normal stroke of 3 feet. This hammer requires 565 cubic feet per minute of free air at 80 pounds per square inch for its operation. Any other equipment capable of driving the piling may be used.

(b) The driving leads furnished shall be 65 feet in length and shall be firmly supported in such a manner as to guide the hammer in a straight line from the highest point to the lowest point which it must travel.

(3) File Driving:

(a) All piles shall be driven within 3 inches of the locations defined on the drawings. The piles shall be driven not more than 1/8 inch per foot from vertical, and the tops shall be driven to within 2 inches of the indicated elevations.

(b) All piles shall be driven their full 50-foot length below cut-off grade.

(c) The embedment of this piling has been chosen, based on an analysis of the properties of the soil, so as to provide the desired design capacity. It is not intended that a dynamic formula be used in the field to select or modify the desired depths of penetration of the piling.

(d) In event that either refusal is met before the piling is driven to grade, or the average driving resistance during the last 5 feet of driving is less than 25 blows per foot, this fact and all pertinent observations of driving behavior, including the complete driving record, shall be immediately communicated to the Engineer.

(e) Jetting may be employed if necessary to secure the desired tip elevations. However, the jet shall be withdrawn and the piles driven with the hammer alone for the final 5 feet of penetration.

(4) Records:

(a) The tip elevation for each pile driven shall be recorded.

(b) The blows per foot of penetration shall be recorded for all piling during the last 5 feet of penetration; for 20 percent of the piling these data shall be recorded during the entire period of driving.

29-05. 300 Ft. Steel Tower Foundation:

a. Reference Drawings: Structural, 3G-608, 3G-623; Electrical, E-1A, E-3.

b. Type: Reinforced concrete footings and lift pit.

c. Construction:

(1) 300 Ft. steel tower shall be supported on three steel reinforced coral aggregate concrete footings tied together with a continuous reinforced concrete tie beam, below grade, between footing pedestals, as indicated on drawings. Tower footings shall be 7'9" square x 1'3" thick at a depth of 5'-1-3/8" below elevation "T". If tower footings rests on rock use a 4'0" square min. footing at a depth of 3'0" min. into rock. Where rock is within 2'0" of grade tie beams shall be omitted. Tower legs shall be supported on 2'6" square steel

reinforced concrete pedestals which are located in the center of the footings and are an integral part thereof. Top of pedestals shall have 1" of grout under a 3/8" thick steel leveling plate, as shown on drawings.

(2) Tie beams shall be 1'-0" wide x 1'-2" deep, bottoms of which shall be 2'2" below elevation "T". 1/2" thick asphalt impregnated "celotex" shall be provided at bottom of tie beams between earth and concrete as shown on the drawings. Skip hoist pit shall be built of steel reinforced coral aggregate concrete having walls and bottom slab 8" thick with all fittings as shown on drawings. A 4" thick concrete slab shall be provided within the perimeter of the complete tower foundation at elevation "T", poured after tower is completely erected. All concrete shall have a minimum strength of 2000 p.s.i. at 28 days.

d. Guy and Messenger Cable Anchor Footings for 300 Ft. Steel Tower: All guy and messenger cable anchor footings shall consist of 2000 p.s.i. steel reinforced coral aggregate concrete together with their respective fabricated steel anchors or other fittings set in concrete as shown on the drawings. Size of footings shall be as indicated in schedules on drawings, or as directed by the Engineer.

e. Equipment Foundations for 300 Ft. Steel Tower: Equipment foundations shall consist of 2000 p.s.i. steel reinforced coral aggregate concrete together with all necessary bolts and fittings as shown on the drawings or called for in the specifications.

f. Electrical:

(1) Electrical work in this structure consists primarily of power and light wiring, steel conduit and fittings, two lightning rods, ground wiring and network, elevator power, signal and light wiring, hoisting controls and wiring, telephone and signal wiring, etc.

(2) Work shall be in accord with sections 16, 17 and 18 of electrical specifications and with the following:

(a) Vertical wires in conduit shall be properly supported in sectionalizing pull boxes at distances not greater than 100 ft.

(b) All pull boxes shall be specially constructed with barriers to separate a.c. power and lighting, d.c. controls, a.c. controls and telephone wiring.

g. Mechanical: All mechanical work shall conform to applicable provisions of Sections 19 and 23 of these specifications.

## SECTION 30

### MISCELLANEOUS EQUIPMENT AND FURNISHINGS

30-01. SCOPE: The work covered by this section of the specifications includes the furnishing of all labor, materials, and equipment required to provide and install the miscellaneous furnishings and equipment, in strict accordance with this section of the specification and the applicable drawings.

a. Descriptive Data: All items of equipment and furnishings as specified in this section shall include such data as is required to fully describe each item, including catalogue descriptive sheets, photographs and specifications and shall be standard products of reputable manufacturers. Manufacturer's names as used herein are intended to indicate quality and type of materials and design of equipment only; equal products of other manufacturers may be substituted if approved.

30-02. PROTECTION OF WORK: All work, materials, equipment and furnishings shall be fully protected at all times against dirt, water, chemical or mechanical injury.

30-03. ASSEMBLY: All equipment and furnishings which arrive at the job site knocked down will be accompanied by the manufacturers' assembly instructions. The contractor shall be guided by this information in assembling such pieces of equipment and furnishings.

30-04. LOCATIONS: The locations of equipment and furnishings shown on the drawings are indicative and may be changed only upon approval of the Engineer. The contractor shall cooperate with the Engineer in maintaining a record set of prints incorporating such changes as may be approved.

30-05. EQUIPMENT AND FURNISHINGS: INFIRMARY BLDG. #112, DRAWING NO. 2B-5411: The items listed in paragraphs a to n inclusive shall be products of the manufacturers indicated or the approved equals. The catalogue numbers mentioned are taken from the A. S. Aloe Hospital Catalogue No. 185 published in the year 1949.

a. AUTOCLAVE shall be an 8" x 16" pressure autoclave with an automatic air ejector, steam gage, safety valve, cord and switches as manufactured by Castle Company, Rochester, N. Y., Catalogue No. 85P-C66, or approved equal.

b. INSTRUMENT AND SUPPLY CABINET shall be Catalogue No. Oxford 85P6288, 36" wide x 16" deep x 66" high of white enameled steel, glass doors and shelves, steel doors and drawers and equipped with casters.

c. Combination Instrument and Supply Cabinet shall be Catalogue No. St. Joseph 85P6271 20" wide x 15" deep x 65" high of white enameled steel, glass doors and shelves, steel drawers and doors and equipped with casters.

d. Treatment Table and Supply Stand shall be Catalogue No. Gradwohl-85P6636, 32" wide x 18" deep x 33" high of white enameled steel, glass top, steel doors and drawers and equipped with casters.

e. Adjustable Tray Instrument Stand shall be Catalogue No. Mayo 85P6421 adjustable from 33" to 55 with 13" x 19" porcelain enameled tray, finished in silver lustre and equipped with casters.

f. Operators Stool shall be Catalogue No. Std 85P6329 adjustable in height from 19" to 25" made of steel tubing with white enamel finish and equipped with rubber floor tips.

g. Telescoping gooseneck lamp shall be Catalogue No. 85P6413, adjustable in length from 34" to 64" equipped with a parabolic shade and finished in white enamel.

h. Treatment Table shall be Catalogue No. 85P9266, made of wood in walnut finish with a pillow and table top to be padded plastic.

i. Chair shall be Catalogue No. 85P6327A, made of steel finished in white enamel, 15" diameter, 35" overall height and 18" seat height.

j. Bed shall be Catalogue No. 85PH803-L146, two crank posture type, made of steel, finished in brown enamel with round end pieces and equipped with casters.

k. Mattress shall be Catalogue No. 85P-MB194c, 36" wide x 86" long innerspringed.

l. Bedside Stand shall be Catalogue No. F 431-F, 20" wide x 16" deep, made of steel finished in brown enamel with open compartment and shelf space and equipped with four legs.

m. Narcotics Safe shall be Catalogue No. "Cole" 2906, made of steel, painted green equipped with a Yale screw wedged combination lock and interlocking bolts.

n. Filing Cabinet shall be Catalogue No. "Shaw-Walker"

85CV1070F, 15" wide x 27" deep x 42" high made of steel, painted olive green having three drawers and equipped with lock controlling all drawers.

30-05. EQUIPMENT AND FURNISHINGS; INFIRMARY AND NURSES QUARTERS BUILDING NO. 117 AND 118 - DRAWING #2B-127:

Furnish and install:

a. Description: The kitchen type cabinets shall have the following features: Cabinets shall have backs and be of all aluminum construction, shall have drawers with stops and ball bearing rollers, shall have shelves adjustable at one-inch intervals, shall have semi-concealed hinges with chromium finish, shall have base cabinets with the toe space approximately three (3) inches deep and four (4) inches high in black enamel, and shall have two (2) coats baked white enamel finish.

b. Equipment: Room No. 5 of Building No. 117:

(1) Base Storage Cabinets shall be 18" wide x 24-1/2" deep x 34-1/2" high with Formica on plywood tops and 6" splash equipped with one door (one with right hand door and one with left hand door), also one drawer and one shelf.

(2) Base Storage Cabinet shall be 24" wide x 24-1/2" deep x 34-1/2" high with Formica on plywood tops and 6" splash equipped with two doors, one drawer and one shelf.

(3) Sink Cabinet shall be 24" wide x 24-1/2" deep x 34-1/2" high with two doors, equipped with stainless steel sink as specified in Section 19 "Plumbing" of these specifications.

(4) Wall Cabinets shall be 24" wide x 13" deep x 30" high with two doors and two shelves.

(5) Base Storage Cabinets shall be 30" wide x 24-1/2" deep x 34-1/2" high with Formica on plywood tops and 6" splash, equipped with two doors, one drawer and one shelf.

(6) Base Drawer Cabinet shall be 18" wide x 24-1/2" deep and 34-1/2" high with Formica on plywood tops and 6" splash equipped with three drawers.

(7) Wall Cabinets shall be 30" wide x 13" deep x 30" high with two doors and two shelves.

(8) Wall Cabinets shall be 18" wide x 13" deep x 30" high with one left hand door and two shelves.

c. Equipment: Room No. 11 of Bldg. No. 117:

(1) Base Storage Cabinet shall be 30" wide x 24-1/2" deep x 34-1/2" high with linoleum on plywood tops equipped with two doors, one drawer, and one shelf.

(2) Base Drawer Cabinets shall be 18" wide x 24-1/2" deep and 34-1/2" high with linoleum on plywood tops, equipped with three drawers.

(3) Wall Cabinets shall be 24" wide x 13" deep x 30" high equipped with two doors and two shelves.

d. Equipment: Room No. 16 of Bldg. No. 117:

(1) Base Storage Cabinets: Shall be 21" wide x 24-1/2" deep x 34-1/2" high with Formica on plywood tops and 6" splash equipped with two doors, one drawer and one shelf.

(2) Base Drawer Cabinets shall be 18" wide x 24-1/2" deep x 34-1/2" high with Formica plywood tops and 6" splash equipped with three drawers.

(3) Sink Cabinet shall be 36" wide x 24-1/2" deep x 34-1/2" high with two doors equipped with stainless steel sink as specified in Section 19 "Plumbing" of these specifications.

(4) Wall Cabinets shall be 21" wide x 13" deep x 30" high with two doors and two shelves.

(5) Wall Cabinets shall be 18" wide x 13" deep x 30" high with one door (one right hand one left hand) and two drawers.

(6) Wall Cabinets shall be 18" wide x 13" deep x 18" high with one door (one right hand and one left hand) and one shelf.

30-07. EQUIPMENT AND FURNISHINGS: LABORATORY BUILDING NO. 232, DRAWING NO. 2B-5133:

a. Steel Parts Storage Units shall be Lyon Metal Products Incorporated, Catalogue No. 3830, or equal. Units shall consist of 36" wide x 12" deep x 78" high, bins each containing 90 shelf boxes, 5-1/2" wide x 11-7/8" deep x 3-1/8" high with 3 adjustable dividers each box. All units shall be finished in green baked-on enamel.

[REDACTED]

b. Steel Shelving Units shall be Lyon Metal Products Incorporated, Catalogue No. #092, or equal. Units shall consist of 36" wide x 24" deep x 64" high sections each containing six adjustable shelves. All units shall be finished in green baked-on enamel.

30-08. EQUIPMENT AND FURNISHINGS: ALL MESS HALLS AS COVERED BY THESE SPECIFICATIONS:

a. Mess Hall Table shall be as indicated on Holmes & Narver drawing No. SK-309. Table shall be wood construction 4'-2" wide x 2'-6" high x 8'-0" long with tempered masonite top finished with three coats of clear lacquer and constructed for "Knocked Down" shipment and assembly at job. Shop drawings shall be submitted for approval showing methods for "knock down" assembly and packaging for shipment.

30-09. EQUIPMENT: SHOP BUILDING, DRAWING NO. 2G-903:

a. Machinists Vise shall be Model No. 625, "Athol" make or approved equal.

30-10. P.X., BARBER SHOP & POST OFFICE, BUILDING NO. 204, DRAWING NO. 2B-176; FURNISH AND INSTALL:

a. Barber Chairs shall be "Koch's" make.

b. Cabinets shall be all aluminum construction with two doors and two adjustable shelves and dimensioned 21" high x 30" wide x 13" deep.

30-11. FIRE AND FIRST AID, BUILDING, DRAWING NO. 2G-928; FURNISH AND INSTALL:

a. Medical Supply Cabinet shall be all aluminum construction with two doors and two adjustable shelves and dimensioned 21" high x 30" wide x 13" deep.

b. Treatment Table shall be Catalogue No. 85P9266, or approved equal, made of wood in walnut finish with a pillow and table top to be padded plastic. The catalogue number used is taken from the A.S. Aloe Hospital Catalogue No. 185 published in the year 1949.