

NOTICE:

Bids to be opened at 2:00 P.M.
15 SEP 1981 at the office of
Officer in Charge of Construction
Jacksonville, North Carolina Area
Building 1005, Marine Corps Base
Camp Lejeune, North Carolina 28542

CONTRACT NO. N62470-81-B-3554

SPECIFICATION NO. 05-81-3554

Appropriation: O&MMC

26 AUG 81

FOR REVIEW & RETURN TO INSPECTION

UTILITIES

ROICE
LT. ELLIOT

REPAIRS TO WATER PLANT EQUIPMENT

at the

MARINE CORPS BASE, CAMP LEJEUNE
and
MARINE CORPS AIR STATION (HELICOPTER), NEW RIVER
JACKSONVILLE, NORTH CAROLINA

AS-110
TT-38
HP 20

DESIGN BY:

Design Division, Public Works Department
Marine Corps Base, Camp Lejeune, North Carolina

SPECIFICATION
PREPARED BY:

John H. P. Cressman, P.E.

APPROVED BY:

R. E. Carlson, Commander, CEC, U. S. Navy
for Commander, Naval Facilities Engineering Command

05-81-3554

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SECTION 00101. BIDDING INFORMATION

1. CONTENTS: This Invitation for Bids, IFB NO. N62470-8--B-3554, consists of the following documents:

(a) Bid Instruction Documents

- (i) Invitation for Bids (Standard Form 20, Jan 1961 Ed.)
- (ii) Bidding Information
- (iii) Instructions to Bidders, dated March 1979

(b) Bid Submittal Documents

- (i) Bid Form (Standard Form 21, December 1965 Ed.)
- (ii) Representations and Certifications, Standard Form 19-B, June 1976 Ed. (REV 1980 AUG), including Appendix "A", dated August 1980
- (iii) Bid Guaranty (Standard Form 24, June 1964 Ed.)
(See Instructions to Bidders)

(c) Contract Documents

- (i) Construction Contract (Standard Form 23, Jan 1961 Ed.)
- (ii) Performance Bond (Standard Form 25, June 1967 Ed.)
- (iii) Payment Bond (Standard Form 25A, June 1964 Ed.)
- (iv) Labor Standards Provisions, dated November 1979
- (v) General Provisions dated Nov 1979 (REV. 8-80)
- (vi) NAVFAC Specification No. 05-81-3554
- (vii) Drawings identified in Section 01011, Division 1 of the specifications
- (viii) Wage Determination Decision No. NC81-1201 for Building Construction

2. BIDS:

2.1 Instruction to Bidders: Instructions to Bidders and Invitation for Bids, Standard Form 20, January 1961 edition, shall be observed in the preparation of bids. Bidders shall affix their names and return addresses in the upper left corner of bid envelope. Envelopes containing bids must be sealed.

2.2 Bid Guaranty: A bid guaranty will be required as stipulated in the Instructions to Bidders.

2.3 Items of Bids: Bids shall be submitted, in duplicate, on Standard Form 21, Bid Form, and shall be accompanied by Standard Form 19B, Representations and Certifications, with Appendix "A" and by Bid Guaranty, all in accordance with the Bid Instruction Documents listed in paragraph 1(a) hereinbefore upon the following item(s):

BASE BID: Price for the entire work, complete in accordance with the drawings and specifications.

2.4 TELEGRAPHIC MODIFICATIONS OF BIDS in accordance with the instructions to Bidders may be made. Two signed copies of the telegram in a sealed envelope marked "Copies of telegraphic modification of bid for REPAIRS TO WATER PLANT EQUIPMENT Specification No. 05-81-3554" should be forwarded immediately to the office to which written bids were submitted.

2.5 TELEGRAPHIC MODIFICATIONS OR WITHDRAWAL OF BIDS will be considered as specified herein. TELEPHONIC RECEIPT OF TELEGRAPHIC MODIFICATIONS OR WITHDRAWAL OF BIDS WILL NOT QUALIFY THE TELEGRAM AS TIMELY. The telegram must be received at the place specified for receipt of bids prior to the exact time set for receipt of bids.

2.6 HAND DELIVERED BIDS: All hand delivered bids must be deposited with personnel in the Contract Branch, Room No. 26, Building 1005, Marine Corps Base, Camp Lejeune, North Carolina 28542, prior to the time and date set for bid opening. Any bids submitted by hand after the time set for receipt will not be accepted.

3. PRE-BID SITE VISITATION: To inspect the site of the work prior to bid opening, prior appointment must be made with the Officer in Charge of Construction, Jacksonville, North Carolina Area, telephone 919-451-2581. Bidders are urged and expected to inspect the site where services are to be performed and to satisfy themselves as to all general and local conditions that may affect the cost of performance of the contract to the extent such information is reasonably obtainable. In no event will a failure to inspect the site constitute grounds for withdrawal of a bid after opening or for a claim after award of the contract.

4. CONTROLLED MATERIALS DATA: The Contracting Officer will issue a DO-C2 priority rating for procurement of critical materials. See General Provision 46, "PRIORITIES, ALLOCATIONS AND ALLOTMENTS".

5. INQUIRIES:

5.1 Plans and Specifications: Questions regarding the plans and specifications occurring prior to bid opening shall be presented to the Public Works Design Division, Building 1005, Marine Corps Base, Camp Lejeune, North Carolina, 28542, telephone 919-451-5507. Questions requiring interpretation of drawings and specifications must be submitted at least 10 days before bid opening. Interpretations or modifications to specifications made as a result of questions will be made by amendment only, and unless so done, all bidders should base their bids on the plans and specifications as issued.

5.2 Bidding Procedures: All questions concerning the bidding procedures shall be presented to OICC-ROICC Contract Branch, Room 26, Building 1005, Marine Corps Base, Camp Lejeune, North Carolina, telephone 919-451-2581.

6. AVAILABILITY OF SPECIFICATIONS, STANDARDS AND DESCRIPTIONS
(1977 JUN): Specifications, standards and descriptions cited in this solicitation are available as indicated below:

a. Unclassified Federal, Military and Other Specifications and Standards (Excluding Commercial), and Data Item Descriptions: Submit request on DD Form 1425 (Specifications and Standards Requisition) to:

Commanding Officer
U. S. Naval Publications and Forms Center
5801 Tabor Avenue, Philadelphia, Pennsylvania 19120

The Acquisition Management Systems and Data Requirements Control List: DOD Directive 5000.19L, Volume II, may be ordered on the DD Form 1425. The Department of Defense Index of Specifications and Standards (DODISS) may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. When requesting a specification or standard, the request shall indicate the title, number, date and any applicable amendment thereto by number and date. When requesting a data item description, the request shall cite the solicitation. When DD Form 1425 is not available, the request may be submitted in letter form, giving the same information as listed above, and the solicitation or contract number involved. Such request may also be made to the activity by TELEX No. 834295, Western Union No. 710-670-1685, or telephone 215-697-3321 in case of urgency.

b. Commercial Specifications, Standards and Descriptions: These specifications, standards and descriptions are not available from Government sources. They may be obtained from the publishers.

c. Availability for Examination of Specifications, Standards, Plans, Drawings, and Other Pertinent Documents: The specifications, standards, plans, drawings, and other pertinent documents cited in this solicitation may be examined at the following location:

Public Works Department
Specifications and Estimates Branch
Building 1005, Marine Corps Base
Camp Lejeune, North Carolina

7. RECOVERED MATERIAL: The Contractor certifies by signing this bid/proposal/quotation that recovered materials as defined in DAR 1-2500.4 will be used as required by the applicable specifications.

8. REFERENCE TO AMENDMENTS: Each bidder shall refer in his bid to all amendments to this specification; failure to do so may constitute an informality in the bid.

9. CERTIFICATE OF CURRENT COST OR PRICING DATA: (This paragraph applies to negotiated contracts of \$100,000 or more, except where the price is based on adequate competition, and to change orders of \$100,000 or more, to any contract.) The Contractor shall submit to the Contracting Officer a certificate in the form set forth below as soon as practicable after agreement is reached on the contract price:

This is to certify that, to the best of my knowledge and belief, cost or pricing data as defined in DAR 3-807.1(a)(1) submitted, either actually or by specific identification in writing (see DAR 3-807.3(a)) to the Contracting Officer or his representative in support of _____* are accurate, complete, and current as of _____**
day month year

This certification includes the cost or pricing data supporting any advance agreement(s) and forward pricing rate agreements between the offeror and the Government which are part of the proposal.

Firm _____
Name _____
Title _____

Date of Execution

*Describe the proposal, quotation, request for price adjustment or other submission involved, giving appropriate identifying number (e.g. RFP No. _____).

**The effective date shall be the date when price negotiations were concluded and the contract price was agreed to. The responsibility of the Contractor is not limited by the personal knowledge of the Contractor's negotiator if the Contractor had information reasonably available at the time of agreement, showing that the negotiated price is not based on accurate, complete and current data.

***This date should be as close as practicable to the date when the price negotiations were concluded and the contract price was agreed to.

END

DIVISION 1. GENERAL REQUIREMENTS

SECTION 01011. GENERAL PARAGRAPHS

1. GENERAL INTENTION: It is the declared and acknowledged intention and meaning to provide and secure repairs to water plant equipment, complete and ready for use.

✓^M 2. GENERAL DESCRIPTION: The work includes the removal of existing line feeder and mixing system and flow measuring equipment and the replacement with new equipment and incidental related work.

3. LOCATION: The work shall be located at the Marine Corps Base, Camp Lejeune and Marine Corps Air Station (Helicopter), New River, approximately as shown. The exact location will be indicated by the Contracting Officer. "Officer in Charge of Construction (OICC)" and "Contracting Officer" are used interchangeably in this specification and have the same meaning.

3. COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK: The Contractor will be required to commence work under the contract 15 calendar days after the date of receipt of Notice of Award, to prosecute said work diligently and to complete the entire work ready for use within 180 calendar days. The time stated for completion shall include final cleanup of the premises. The contract completion date will be computed starting 15 calendar days after the date of the Notice of Award. This 15-day period is to allow for mailing of the Notice of Award and the Contractor's submission of required bonds.

5. LIQUIDATED DAMAGES: In case of failure on the part of the Contractor to complete the work within the time fixed in the contract or any extensions thereof, the Contractor shall pay to the Government as liquidated damages pursuant to General Provisions clauses entitled "Termination for Default - Damages for Delay - Time Extensions" and "Damages for Delay - Defense Materials System and Priorities", the sum of \$25 for each day of delay.

6. DRAWINGS ACCOMPANYING SPECIFICATION: The following drawings accompany this specification and are a part thereof. The drawings are the property of the Government and shall not be used for any purpose other than that contemplated by the specification.

| <u>NAVFAC</u> <u>DWG. NO.</u> | <u>SHEET</u> <u>NO.</u> | <u>TITLE</u> |
|----------------------------------|----------------------------|---|
| 4068723 | | Vicinity and Site Locations |
| 4068724 | | Plans and Details, New River Water Plant |
| 4068725 | | Plans and Details, Tarawa Terrace Water Plant |
| 4068726 | | Building 20 - Meters |
| 4068727 | | Building 20 - Controllers and Valves |

7. FACTORY INSPECTION: Factory inspection of material and equipment for which tests at the place of manufacture are required in referenced specifications will be waived if notarized copies of factory reports are furnished that show compliance with the specification requirements. Factory inspection will be required only where specified herein or in the technical sections of this specification. The Government reserves the right to charge to the Contractor any additional cost of Government inspection and tests when materials and equipment are not ready at the time inspection and tests are requested by the Contractor.

8. NORTH CAROLINA SALES AND USE TAX IS REQUIRED. (See also section entitled "Additional General Paragraphs").

9. SCHEDULING THE WORK:

9.1 General Scheduling Requirements: Notwithstanding the requirements of clause entitled "Progress Charts and Requirements for Overtime Work" of the General Provisions, immediately after award the Contractor shall meet with the Contracting Officer and present a schedule of work, prepared in accordance with said clause, for review by the Contracting Officer. The Schedule will be reviewed at this meeting and will be retained by the Contracting Officer for final review and approval.

✓ 9.2 Work Outside Regular Hours: If the Contractor desires to carry on work outside regular hours or on Saturdays, Sundays, or holidays, he shall submit application to the Officer in Charge of Construction, but shall allow ample time to enable satisfactory arrangements to be made by the Government for inspecting the work in progress. At night, he shall light the different parts of the work in an approved manner. All utility cutovers shall be made after normal working hours or on weekends. Anticipated costs shall be included in the bid. Working hours are 7:45 A.M. to 4:15 P.M., Monday through Friday, excluding holidays.

✓ 9.3 The water systems will remain in operation during the entire construction period and the Contractor shall conduct his operations so as to cause the least possible interference with the normal operations of the activity.

✓ 9.3.1 Each spiractor at the Hadnot Point Water Treatment Plant shall be useably complete and ready for operations as approved by the Contracting Officer before any work is started on any other spiractor which would interfere with normal operation.

✓ 9.3.2 The existing buildings and their contents shall be kept secure at all times and the Contractor shall provide all temporary closures as required to maintain security as directed by the Contracting Officer. The Contractor shall removal all debris from all spaces being used by the activity at the end of each shift or more frequently if required to keep the space useable.

✓ 9.3.3 Permission to interrupt any utility service shall be requested in writing at least 15 days in advance and approval of the Contracting Officer shall be received before any service is interrupted. Interruptions of utility services will be allowed only when they will cause no interference with the operations of the activity.

10. SAFETY PROGRAM: The Contractor shall implement a safety program conforming to the requirements of Federal, State and Local laws, rules and regulations. The program shall include, but is not limited to, the following:

a. "Occupational Safety and Health Standards" which can be examined at the office of the Contracting Officer or be ordered from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

b. Department of the Army, Corps of Engineers, "General Safety Requirements", which may be examined at the office where bids are being received or may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Stock No. 008-022-00106-9.

c. General Provisions clause entitled "Accident Prevention".

✓ 11. TECHNICAL PUBLICATIONS: The Contractor shall furnish to the Contracting Officer three copies each of installation, operation maintenance manuals and parts list for all Contractor-furnished mechanical and electrical equipment.

11.1 Operating instructions for the principal plant mechanical and electrical components, for use by operating personnel, shall be provided. They shall be laminated between thermoplastic sheets and affixed where directed. The instructions shall describe the function of the equipment, its most economical operation, start-up and shut-down procedures, procedures to follow in the event of failure, normal maintenance practices, and caution and warning notices.

11.2 Maintenance and operation manual shall be furnished to the Contracting Officer for approval. The manual shall be mounted in flexible binders with oil-resistant covers and shall contain, but not be limited to, installation and operating instructions, maintenance procedures, illustrations, drawings, detailed descriptions, tests, adjustments, safety precautions, and parts list.

11.3 Parts list, giving part numbers and prices for the equipment furnished, shall be submitted to the Contracting Officer as soon as practicable after the award of the contract, but not later than 90 days after notice of award has been received.

12. AS-BUILT RECORD OF MATERIALS USED IN BUILDINGS: A record of materials used, in accordance with the clause entitled "As-Built Record of Materials Used in Buildings" of the General Provisions shall be furnished in the following format:

| Material | Specification Designation | Manufacturer | Material Used Mfg. Designation | Where Used |
|----------|---------------------------|--------------|--------------------------------|------------|
| _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ |

✓ 13. MATERIALS AND EQUIPMENT TO BE SALVAGED: Existing materials and equipment to be removed shall be salvaged and shall remain the property of the Government. Work to be salvaged shall be carefully removed and handled in such a manner as to avoid damage and shall be delivered to storage on the station at a location designated by the Contracting Officer.

14. TRAILER OR STORAGE BUILDINGS will be permitted on the job site, where space is available, subject to the approval of the Contracting Officer. The trailers or buildings shall be suitably painted and kept in a good state of repair. Failure of the Contractor to maintain his trailers or storage buildings in good condition will be considered sufficient reason to require their removal from the job site.

15. SCHEDULE OF PRICES: The original and seven copies of the schedule of prices shall be submitted to the Contracting Officer for approval. Payments will not be made until the schedule of prices has been submitted and approved.

16. CONTRACTOR'S INVOICE AND CONTRACT PERFORMANCE STATEMENT: Requests for payment in accordance with the terms of the contract shall consist of:

- a. Contractor's Invoice on Form NAVFAC 10-7300/30 (4/68), which shall show, in summary form, the basis for arriving at the amount of the invoice
- b. Contractor's Monthly Estimate for Voucher (5ND GEN 5265/1)
- c. Affidavit to Accompany Invoice (5ND LANTDIV 4-4235/4)(Rev 1/68)

Forms will be furnished by the Contracting Officer. Monthly invoices and supporting forms for work performed through the 15th of the month shall be submitted to the Officer in Charge of Construction by the 20th of the month in the following quantities:

- a. Contractor's Invoice - Original and five copies
- b. Contractor's Monthly Estimate for Voucher - Original and two copies
- c. Affidavit - Original

17. GOVERNMENT-FURNISHED UTILITIES: The Government will furnish water and electricity from the nearest outlet free of charge for pursuance of work under this contract.

18. OPTIONAL REQUIREMENTS: Where a choice of materials or methods is permitted herein, the Contractor will be given the right to exercise the option unless stated specifically otherwise.

19. WRITTEN GUARANTEES AND GUARANTOR'S LOCAL REPRESENTATIVE: Prior to completion of the contract, the Contractor shall obtain and furnish to the Contracting Officer's designated representative, written guarantees for all equipment and/or appliances furnished under the contract. The Contractor shall furnish with each guarantee the name, address, and telephone number of the guarantor's representative nearest to the location where the equipment and/or appliances are installed, who, upon request of the using service's representative, will honor the guarantee during the guaranty period and will provide the services prescribed by the terms of the guarantee. At the time of installation, the Contractor shall tag each item of warranted equipment with a durable oil and water resistant tag approved by the Contracting Officer. Leave the date of acceptance and inspector's signature blank until the project is accepted for beneficial occupancy. The tag shall show the following information:

EQUIPMENT WARRANTY TAG

Type of Equipment _____

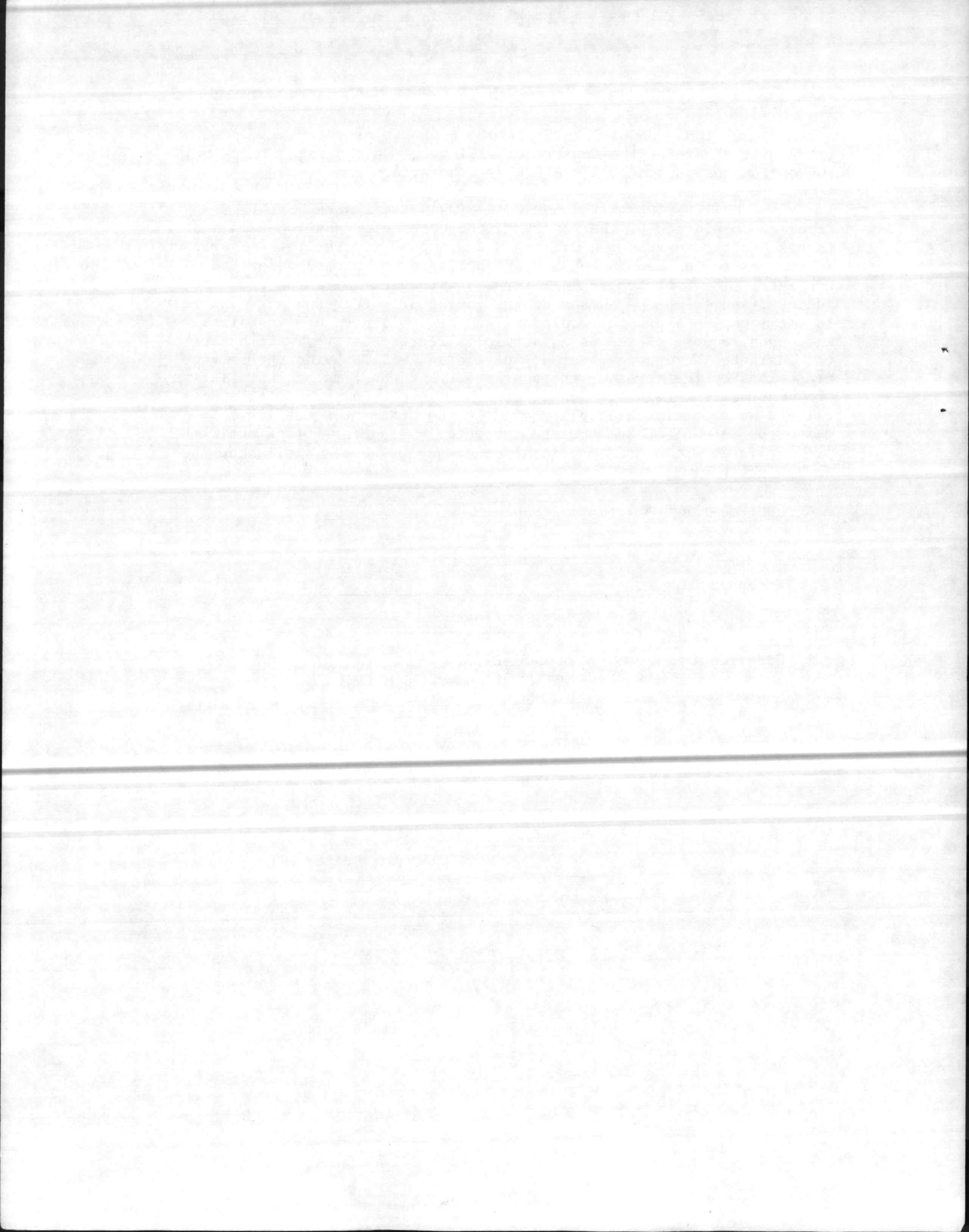
Accepted Date _____

Warranted Until _____

Under Contract No. N62470-81-C-3554

Inspector's Signature _____

STATION PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE



SECTION 01012. ADDITIONAL GENERAL PARAGRAPHS

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

✓ 2. OPERATION OF STATION UTILITIES: The Contractor shall not operate nor disturb the setting of any control devices in the station utilities system, including water, sewer, electrical and steam services. The Government will operate the control devices as required for normal conduct of the work. The Contractor shall notify the Contracting Officer giving reasonable advance notice when such operation is required.

3. CHANGED CONDITIONS: Wherever changed conditions as defined in Clause 4 of the General Provisions are encountered, and wherever conditions exposed during the course of the work necessitate a change from quantities indicated or specified as either estimated quantities or as a basis for bids, whether or not provision for a change in price for such variation is specified, the Contracting Officer must be notified in writing and written directions to do so must be obtained before quantities stated in the contract documents are exceeded.

4. SUBCONTRACTORS AND PERSONNEL: Promptly after the award of the contract, the Contractor shall submit to the Contracting Officer in triplicate, a list of his subcontractors and the work each is to perform. On this form shall appear the names of the key personnel of the Contractor and subcontractors, together with their home addresses and telephone numbers, for use in event of any emergency. From time to time as changes occur and additional information becomes available, the Contractor shall amplify, correct, and change the information contained in previous lists.

5. AS-BUILT DRAWINGS: During the progress of the work, one full-size print of each of the drawings accompanying this specification shall be neatly and clearly marked in red to show all variations between the construction actually provided and that indicated or specified in the contract documents. The as-built drawings shall be kept up-to-date at the work site at all times during the contract, and shall be available for inspection by the Contracting Officer upon request. The Contractor shall also mark the drawings to indicate the exact location of any underground utility lines discovered in the course of the work. Where a choice of materials and/or methods is permitted herein, and where variations in the scope or character of the work indicated or specified are permitted either by award on bidding items specified for that purpose or by subsequent change to the contract, the as-built drawings shall define the construction actually provided. The representation of such variations shall conform to standard drafting practice and shall include such supplementary notes, legends, and details as may be necessary for legibility and clear portrayal of the as-built construction; the marked prints shall be subject to approval of the Contracting Officer before acceptance. Upon completion of the work, the completed as-built drawings shall be presented to the Contracting Officer.

6. PRINTS FURNISHED TO CONTRACTOR: Six copies of the project specification, and six sets of the drawings accompanying the specification, will be furnished the Contractor. Additional sets of the specifications and drawings can be obtained, if required, by application to the Contracting Officer, providing that the need therefor is justified to the satisfaction of the Contracting Officer.

7. LOCATION OF UNDERGROUND UTILITIES: Where existing piping, utilities, and underground obstructions of any type are indicated in locations to be traversed by new piping, ducts, and other work provided hereunder, and are not indicated or specified to be removed, the elevations of the existing utilities and obstructions shall be determined before the new work is laid closer than the nearest manhole or other structure at which an adjustment in grade could be made. For any additional work required by reason of conflict between the new and existing work, an adjustment in contract price will be made in accordance with Clause 4 of the General Provisions. The Base Telephone Officer, phone 451-2531, will show the Contractor approximate locations of all buried telephone cables after receiving 10 days' notice. The locations of underground utilities shown is only approximate and the information is incomplete.

8. QUARANTINE FOR IMPORTED FIRE ANT (7/76). All of Onslow, Jones and Carteret Counties and portions of Duplin and Craven Counties have been declared a generally infested area by the United States Department of Agriculture for the imported fire ant. Compliance with the quarantine regulations established by this authority as set forth in USDA Quarantine No. 81 dated 9 October 1970, and USDA Publication 301.81-2A of 23 July 1976, is required for operations hereunder. Pertinent requirements of the quarantine for materials, originating on the Camp Lejeune reservation and the Marine Corps Air Station (Helicopter), New River, which are to be

transported outside the Onslow County or adjacent suppression areas include the following:

(a) Certification is required for the following articles, and they shall not be moved from the reservation to any point outside the Onslow County and adjacent designated areas unless accompanied by a valid inspection certificate issued by an authorized imported fire ant inspector:

(1) Bulk soil,

(2) Used mechanized soil-moving equipment.

(3) Any other products, articles, or means of conveyance if it is determined by an inspector that they present a hazard of spread of the imported fire ant and the person in possession thereof has been so notified.

(b) Authorization for movement of equipment shall be obtained from the Officer in Charge of Construction (OICC), and requests for inspection shall be made sufficiently in advance of the date of movement to permit arrangements for the services of authorized inspectors. The equipment shall be prepared and assembled so that it may be readily inspected. All soil on or attached to equipment, supplies and materials shall be removed by washing with water and/or such other means as necessary to accomplish complete removal. Resulting spoil shall be wasted as directed.

9. EMERGENCY MEDICAL CARE. Only emergency medical care is available by Government facilities at Marine Corps Base, Camp Lejeune to Contractor employees who suffer on-the-job injury or disease. Emergency care will be rendered at the prevailing rates established in BUMEDINST 6320.4 series. Reimbursement will be made by the Contractor to the Naval Regional Medical Center Collection Agent upon receipt of a monthly statement.

10. NORTH CAROLINA SALES AND USE TAX.

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

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

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

(1) The Contractor shall furnish the Contracting Officer a certified statement setting forth the cost of the materials purchased from each vendor and the amount of North Carolian sales and use taxes

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

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

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

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

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

END

SECTION 01401. QUALITY CONTROL

1. APPLICABLE PUBLICATION: The following publication of the issue listed below, but referred to thereafter by basic designation only, forms a part of this specification to the extent indicated by the references thereto:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

ASTM E329-77 Standard Recommended Practices for Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.

2. QUALITY CONTROL of this contract will be administered under the General Provisions Clause entitled "Contractor Inspection System".

3. DEFINITIONS:

3.1 Factory Tests: Tests made on various products and component parts prior to shipment to the job site, including but not limited to such items as transformers, boilers, air conditioning equipment, electrical equipment, and precast concrete.

3.2 Field Tests: Tests or analyses made at, or in the vicinity of, the job site in connection with the actual construction.

3.3 Product: The term "product" includes the plural thereof and means a type or a category of manufactured goods, construction, installations and natural and processed materials or those associated services whose characterization, classification or functional performance determination is specified by standards.

3.4 Person: The term "person" means associations, companies, corporations, educational institutions, firms, government agencies at the Federal, State and Local level, partnerships, and societies, as well as divisions thereof, and individuals.

3.5 Testing Laboratory: The term "testing laboratory" means any "person", as defined above, whose functions include testing, analyzing, or inspecting "products", as defined above, and/or evaluating the designs or specifications of such "products" according to the requirements of applicable standards.

3.6 Certified Test Reports: Reports of tests signed by a qualified professional attesting that the test results reported are accurate and that items tested either meet or fail to meet the stated minimum requirements. These test reports include those performed by Factory Mutual, Underwriters' Laboratories, Inc., and others.

3.7 Certified Inspection Reports: Reports signed by approved inspectors attesting that the items inspected meet the specification requirements other than any exceptions included in the report.

3.8 Manufacturer's Certificate of Conformance or Compliance: A certificate signed by an authorized manufacturer's official attesting that the material or equipment delivered meets the specification requirements.

4. SUBMITTALS shall be prepared in accordance with this specification and the General Provisions and submitted to the Contracting Officer for approval. Each submittal shall be accompanied with a cover letter signed by the Contractor. Each item proposed to be incorporated into the contract shall be clearly marked and identified in the submittals, and shall be cross-referenced to the contract drawings and specifications so as to identify clearly the use for which it is intended. Each sheet of submittal shall be stamped with the Contractor's certification stamp. Data submitted in a bound volume or on one sheet printed on two sides, may be stamped on the front of the first sheet only. The Contractor's certification stamp shall be worded as follows:

"It is hereby certified that the (equipment)(materials) shown and marked in this submittal is that proposed to be incorporated into Contract Number N62470-81-C-3554 is in compliance with the contract drawings and specifications, can be installed in the allocated spaces, and is submitted for Government approval. Certified by _____
Date _____"

The person signing the certification shall be one designated in writing by the Contractor as having that authority. The signature shall be in original ink. Stamped signatures are not acceptable.

4.1 Submittal Status Logs: The Contractor shall maintain at the job site an up-to-date submittal status log showing the status of all submittals required by the contract. A sample format of an acceptable log is attached at the end of this section. While the use of this sample format is not required, any other format must contain the same information as shown on the sample.

4.2 Samples, shop drawings, manufacturer's data, certifications and data required of the Contractor: Specification MIL-D-1000 shall be used as a guide and its use is encouraged, for all drawings and data submitted by the Contractor. Conformance to the provisions of Specification MIL-D-1000 is not mandatory for maps, sketches, presentation drawings, perspectives, renderings, and all other drawings not requiring Naval Facilities Engineering Command drawing numbers. Before starting the fabrication or installation of any of this work, the Contractor shall submit to the Contracting Officer for, and receive approval of, in accordance with the General Provisions, such drawings as may be required, including all items specified in the applicable paragraphs of the technical sections of this specification. Seven copies of all submittals to be approved by the Contracting Officer shall be forwarded.

4.3 Identification: All catalog cuts, shop drawings, samples and other data submitted for approval shall specifically identify the specification paragraph or contract drawing by number where each item submitted is required to be provided. All submittals shall be clearly marked in

ink to indicate the specific item(s) submitted for approval. Samples shall be clearly labeled with strong tags, firmly affixed, or indelible markings to identify the contract number, contractor, manufacturer, and item name.

4.4 Certified Test Reports: Before delivery of materials and equipment, four certified copies of the reports of all tests listed in the technical sections and referenced publications shall be submitted and approved. The testing shall have been performed in a laboratory meeting the requirements specified herein. The tests shall have been performed within three years of submittal of the reports for approval. Test reports shall be accompanied by certificates from the manufacturer certifying that the material and equipment proposed to be supplied is of the same type, quality, manufacture, and make as that tested.

4.5 Manufacturer's Certificates of Conformance or Compliance: Manufacturer's certification furnished by the Contractor on items of materials and equipment incorporated into the work will be accepted only when this method will assure full compliance with the provisions of the contract, as determined by the Contracting Officer. Preprinted certifications will not be acceptable. All certifications shall be in the original. The original of all manufacturer's certifications shall name the appropriate item of equipment or material, specification, standard, or other document specified as controlling the quality of that item and shall have attached thereto certified copies of test reports upon which the certifications are based. All certificates shall be signed by the manufacturer's official authorized to sign certificates of conformance or compliance.

4.6 Laboratory Reports shall cite the contract requirements, the test or analysis procedures used, the actual test results, and include a statement that the item tested or analyzed conforms or fails to conform to the specification requirements. Each report shall be conspicuously stamped on the cover sheet in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements as the case may be. All test reports shall be signed by the representative of the testing laboratory authorized to sign certified test reports. The Contractor shall arrange for immediate and direct delivery of the signed original of all reports, certifications, and other documentation to the Contracting Officer.

4.7 Tabulation of Tests: In addition to the General Provisions requirements for CQC test reports, prior to final payment the Contractor shall obtain from each laboratory a tabulation of all tests it has performed in connection with the construction contract, including conforming or nonconforming, and repeated test results. The tabulation(s) shall be certified as complete, and signed by the authorized representative of the laboratory, and shall be delivered to the Contracting Officer.

5. QUALITY CONTROL REQUIREMENTS: In accordance with the General Provisions Clause entitled "Contractor Inspection System", the Contractor shall inspect and test all work under the contract and maintain records of the inspections and tests. Approvals, except those required for field

installations, field applications, and field tests, shall be obtained before delivery of materials and equipment to the project site. Surveillance of the inspection system will be performed by the Contracting Officer.

5.1 Factory Tests: Unless otherwise specified, the Contractor will arrange for factory tests when they are required under the contract.

5.2 Factory Inspection: Unless otherwise specified, the Contractor will arrange for factory inspection when required under the contract.

5.3 Field Inspections and Tests by the Contractor: The Contractor shall furnish all equipment, instruments, qualified personnel, and facilities necessary to inspect all work and perform all tests required by the contract. All inspections and tests performed and test results received each day shall be included in the Daily Report to Inspector.

5.5 Approval of Testing Laboratories: All laboratory work under this contract shall be performed by a laboratory approved by the Government, whether the laboratory is employed by the Contractor, or is owned and operated by the Contractor. The basis of approval includes the following:

a. Testing laboratories performing work in connection with concrete, steel, and bituminous materials shall comply with ASTM E329, except that the Contracting Officer will perform the function of paragraphs 3.4 and 3.5 therein in the absence of other Government approval.

b. Testing laboratories performing work not in connection with concrete, steel, or bituminous materials shall comply with sections 3 and 4 of ASTM E329, except that the Contracting Officer will perform the functions of paragraphs 3.4 and 3.5 therein in the absence of other Government approval.

5.6 Repeated Tests and Inspections: The Contractor shall repeat tests and inspections after each correction made to nonconforming materials and workmanship until tests and inspections indicate the materials, equipment, and workmanship conform to the contract requirements. The retesting and reinspections shall be performed at no additional cost to the Government.

5.7 Daily Report to Inspector: The Daily Report to the Inspector Form NAVFAC 4330/34 shall be submitted to the Contracting Officer by 10:00 A.M. on the working day following the day the work was performed.

INSTRUCTIONS

1. This form may be used by the contractor for listing all material submittals that require action by either the contractor or the government.
2. Columns (a) through (e) should be completed by the contractor and must include all submissions that are required by the specifications.
3. As submittals are received and processed, the remaining columns are to be completed by the contractor.
4. In those instances where the contractor has approved the submittal under his contract responsibility, there may be a dual Action Code under column (f); e.g., "A/E", indicating approved as submitted and forwarded to the MOICC for record purposes.
5. In column (f) for those items requiring MOICC action (Action Code "D"), the reason for forwarding to the MOICC should be entered in the column (l), the Remarks column; e.g., gov't approval required; waiver requested because of variance, substitution, etc.
6. Where no government action is required, (for contractor review/approval items), there need be no entry in columns (h) and (i).
7. Column (j) is completed when material or equipment is delivered to the project. Column (k) is completed only after verification that the delivered item is that represented by the approved submittal.

ACTION CODE: To be used when completing columns (f) and (h)

- A - Approved as submitted
- B - Approved as noted
- C - Disapproved
- D - Forwarded to MOICC for action
- E - Forwarded to MOICC for record purposes

END

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SECTION 01507. ENVIRONMENTAL PROTECTION

1. ENVIRONMENTAL PROTECTION PLAN: The Contractor may be responsible for the preparation and submission of an Environmental Protection Plan. After the contract is awarded, but prior to the commencement of the work, the Contractor shall meet with the Contracting Officer, or his representative, and discuss the proposed Environmental Protection Plan. The meeting shall develop mutual understanding relative to details of environmental protection, including required reports and measures to be taken should the Contractor fail to provide adequate protection in an adequate and timely manner. Not more than 14 days after the meeting, the Contractor shall submit for approval his proposed Environmental Protection Plan, if so required.

2. GENERAL REQUIREMENTS: The Contractor shall provide and maintain environmental protection during the life of the contract as defined herein. The Contractor's operations shall comply with all Federal, State and Local regulations pertaining to water, air, solid waste, and noise pollution.

3. DEFINITIONS OF POLLUTANTS:

3.1 Non-Hazardous Wastes: Solid or liquid substances that are to be discarded by the Contractor and that normally do not constitute a hazard to man or to the environment. This includes, but is not limited to, paper, metal (other than toxic metals such as lead and mercury), masonry, wood, brick, stone, asphaltic concrete, plastics, rubber, rubbish and concrete.

3.2 Hazardous Wastes: Solid and liquid substances that are to be discarded by the Contractor and that constitute a significant active or potential hazard to man and/or to the remainder of the environment. This includes, but is not limited to, asbestos, glass, lead, mercury, pesticides, herbicides, other toxic chemicals and waste, liquid petroleum products, human excrement, garbage, sediment and radioactive materials.

4. PROTECTION OF NATURAL RESOURCES: It is intended that the natural resources within the limits of permanent work performed under this contract be preserved in their existing condition or be restored to an equivalent or improved condition upon completion of the work. The Contractor shall confine his construction activities to areas defined by the work schedule, plans, and specifications.

5. CONTROL AND DISPOSAL OF HAZARDOUS AND NON-HAZARDOUS WASTES:

5.1 Non-hazardous wastes, except rubble, shall be picked up and disposed of daily or placed in containers which are emptied on a weekly schedule. All handling and disposal shall be so conducted as to prevent contamination of the site and any other areas. The Contractor shall transport all such waste and dispose of it in the Base Sanitary Landfill, unless otherwise approved. If transporting any material off Government property, the Contractor shall provide the Contracting Officer a copy of State and/or local permit which reflects the responsible agency's approval of the disposal area and proposed waste disposal methods. Rubble such as masonry, stone, concrete without reinforcing steel, and brick shall be deposited as directed. Upon completion, the work and disposal

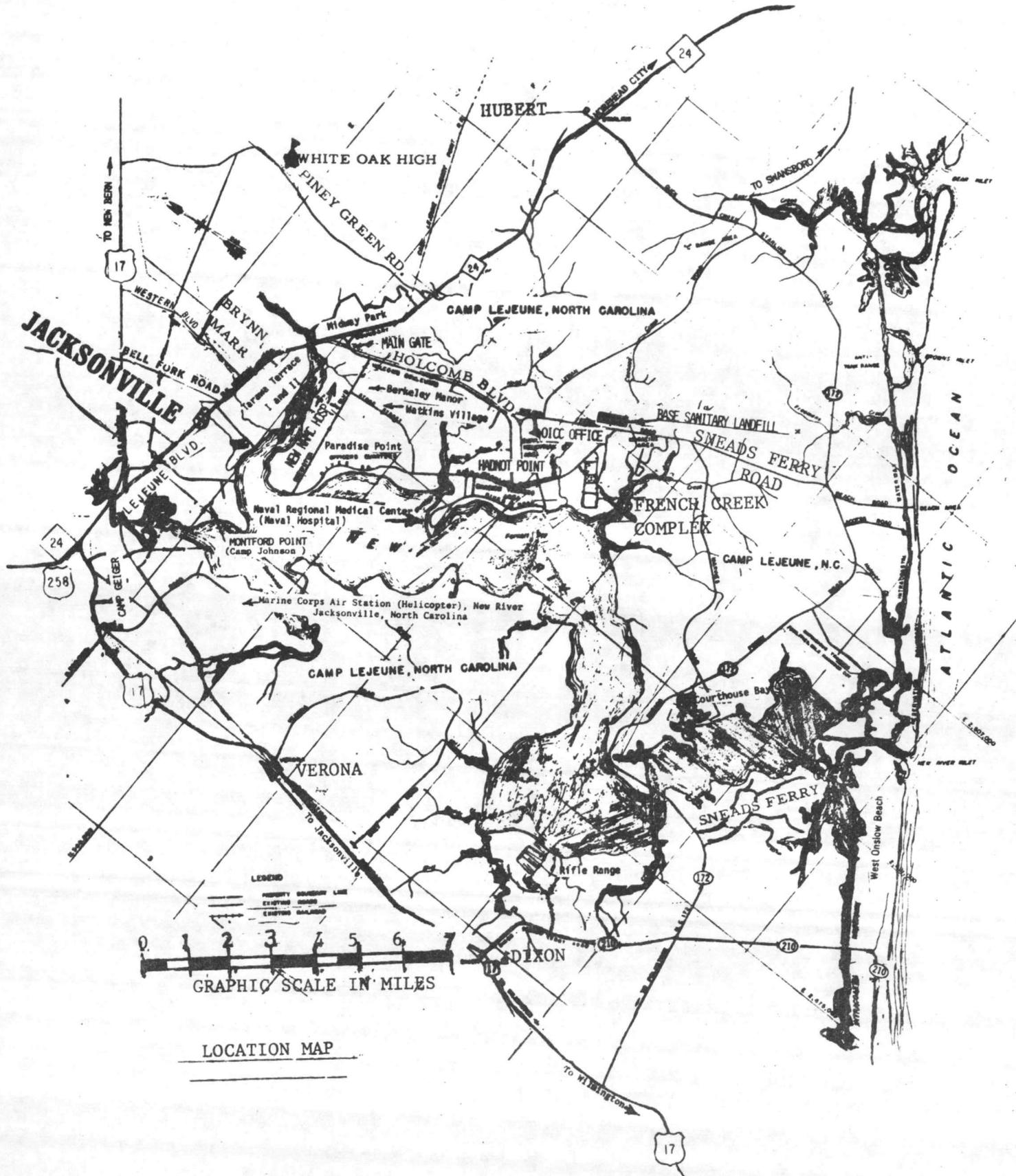
area shall be left clean and natural looking. All signs of temporary construction and activities incidental to construction of the required permanent work in place shall be obliterated.

5.2 Hazardous Wastes:

5.2.1 Garbage Disposal: The Contractor shall transport his garbage to the Base Sanitary Landfill. However, the preparation, cooking and disposing of food are strictly prohibited on the project site.

5.2.2 Liquid wastes shall be stored in corrosion-resistant containers, removed from the project site, and disposed of not less frequently than monthly unless directed otherwise. Disposal of liquid waste shall be in accordance with Federal, State and Local regulations. Fueling and lubricating of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spills and evaporation. For oil and hazardous material spills which may be large enough to violate Federal, State and Local regulations, the Contracting Officer shall be notified immediately.

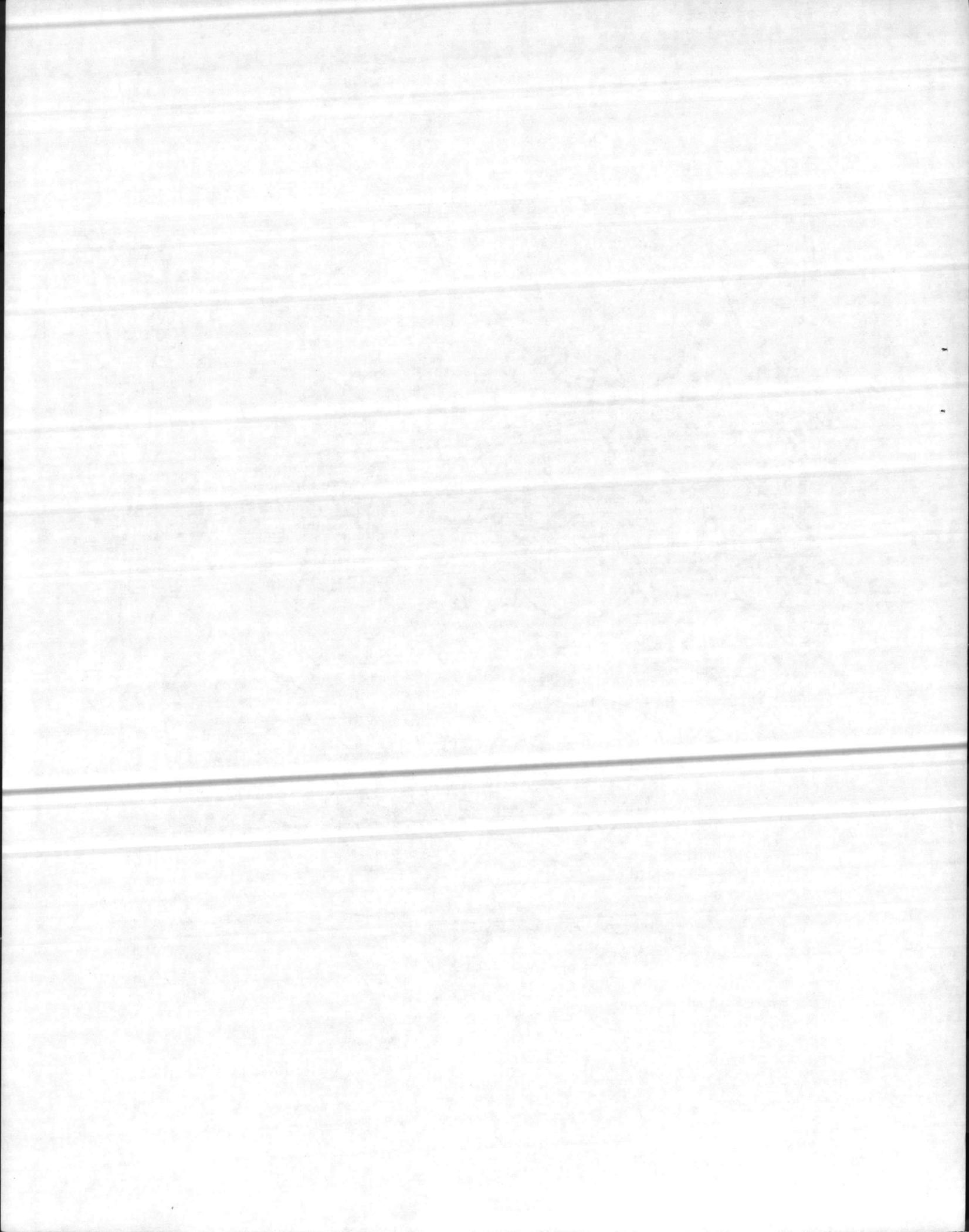
6. ATTACHED PLATE shows the interrelationship between the construction site and the Base Sanitary Landfill.



LOCATION MAP

END OF SECTION 01507

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SECTION 02200. EARTHWORK

1. APPLICABLE PUBLICATIONS: The following publications form a part of this specification to the extent referenced. Publications are referred to in the text by basic designation only

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

C136-76 Test for Sieve Analysis of Fine and Coarse Aggregates
D698-70 Moisture-Density Relationship of Soils using 5.5-pound
(2.5 kg) Rammer and 12-inch (304.8 mm) Drop

2. QUALITY CONTROL: Approvals, except those required for field installation, field applications, and field tests shall be obtained before delivery of materials or equipment to the project site.

3. GENERAL REQUIREMENTS: Bids shall be based on the following:

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

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

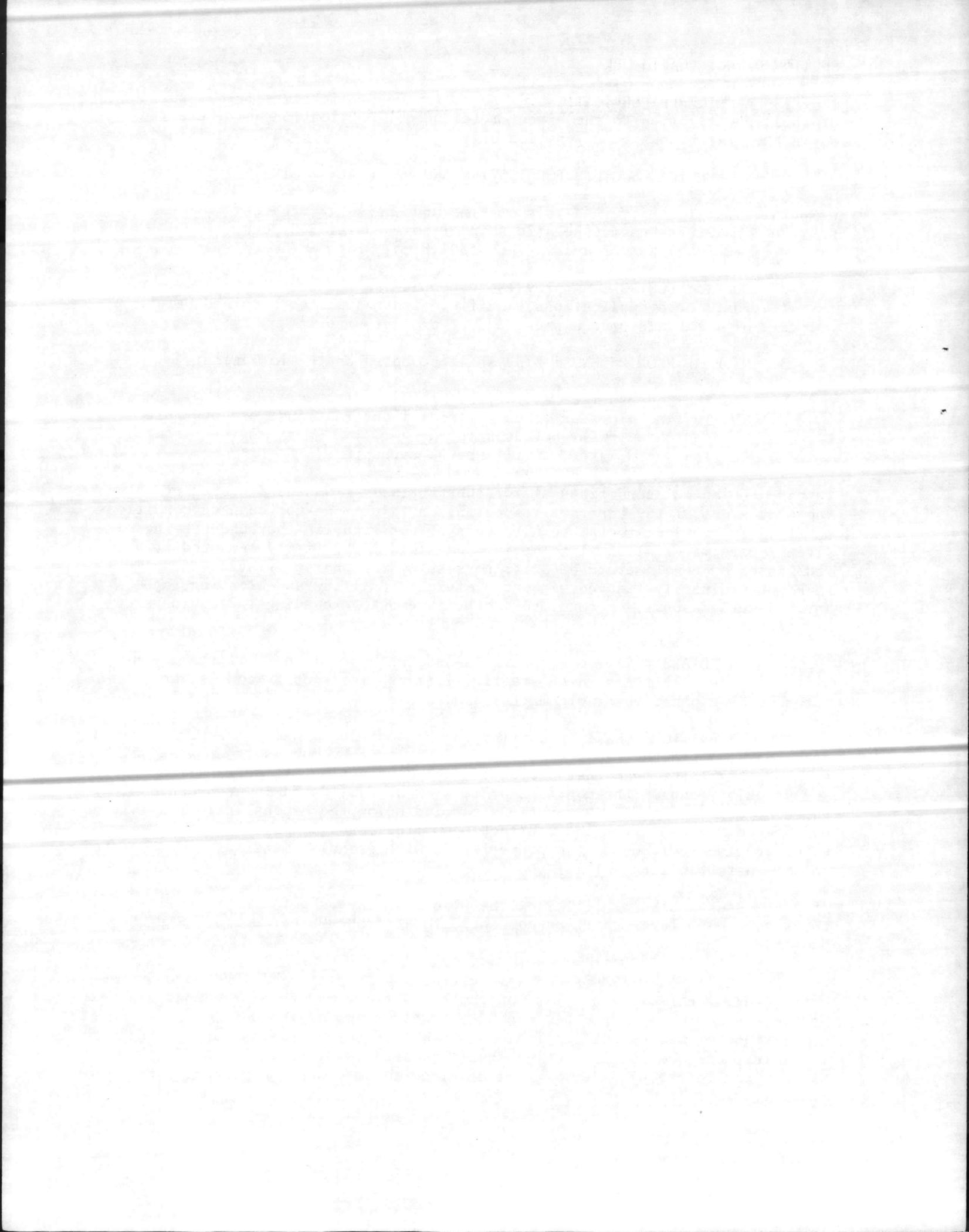
4. MATERIALS: All soil materials used as backfill or fill shall consist of native materials which are free from debris, roots, wood, scrap materials and other vegetable matter and refuse.

5. EXCAVATIONS shall be carried to the contours and dimensions indicated or necessary. In the event that it is necessary to remove soft or weak soil to a depth greater than that indicated, the Contracting Officer shall be notified and an adjustment in the contract price will be considered in accordance with the General Provisions. Excavations carried below the depths indicated, without specific directions from the Contracting Officer, shall, except as otherwise specified, be refilled to the proper grade with granular material and compacted to at least 95 percent of ASTM D698 density.

6. BACKFILLING or fill shall be placed in layers not more than 16 inches thick, and each layer shall be compacted to at least 95 percent of ASTM D698 density.

7. TESTING AND SAMPLING: All testing and sampling shall be done by the Contractor at his expense. The Contracting Officer may require compaction test on fill on a random sample basis not to exceed five samples per job site, unless samples do not meet specifications. In event of tests results not meeting specifications, corrective action shall be taken as directed by the Contracting Officer and retesting undertaken as required to determine compliance with specifications.

END



SECTION 03300. CAST-IN-PLACE CONCRETE

1. APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI):

| | |
|--------------------|--|
| ACI 211.1-77 | Selecting Proportions for Normal Weight Concrete |
| ACI 308-71 | Curing Concrete |
| ACI 315-65 | Detailing Reinforced Concrete Structures |
| ACI 318-71&71C SUP | Building Code Requirements for Reinforced Concrete |
| ACI 347-68 | Recommended Practice for Concrete Formwork |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

| | |
|------------|---|
| A90-69(78) | Weight of Coating on Zinc-Coated Iron or Steel Articles |
| A185-73 | Welded Steel Wire Fabric for Concrete Reinforcement |
| A615-78 | Deformed and Plain Billet-Steel Bars for Concrete Reinforcement |
| C94-78A | Ready-Mixed Concrete |

2. MATERIALS:

2.1 Concrete shall be ready-mixed concrete conforming to ACI 211.1 or ASTM C94, 3000 psi.

2.2 Reinforcement shall be in accordance with ACI 315.

2.2.1 Reinforcing steel shall conform to ASTM A615, Grade 40.

2.2.2 Welded wire fabric shall conform to ASTM A185, No. 10 gage, 6 by 6-inch mesh if not otherwise indicated.

2.3 Formwork shall conform to ACI 347.

2.4 Curing concrete shall be in accordance with ACI 308.

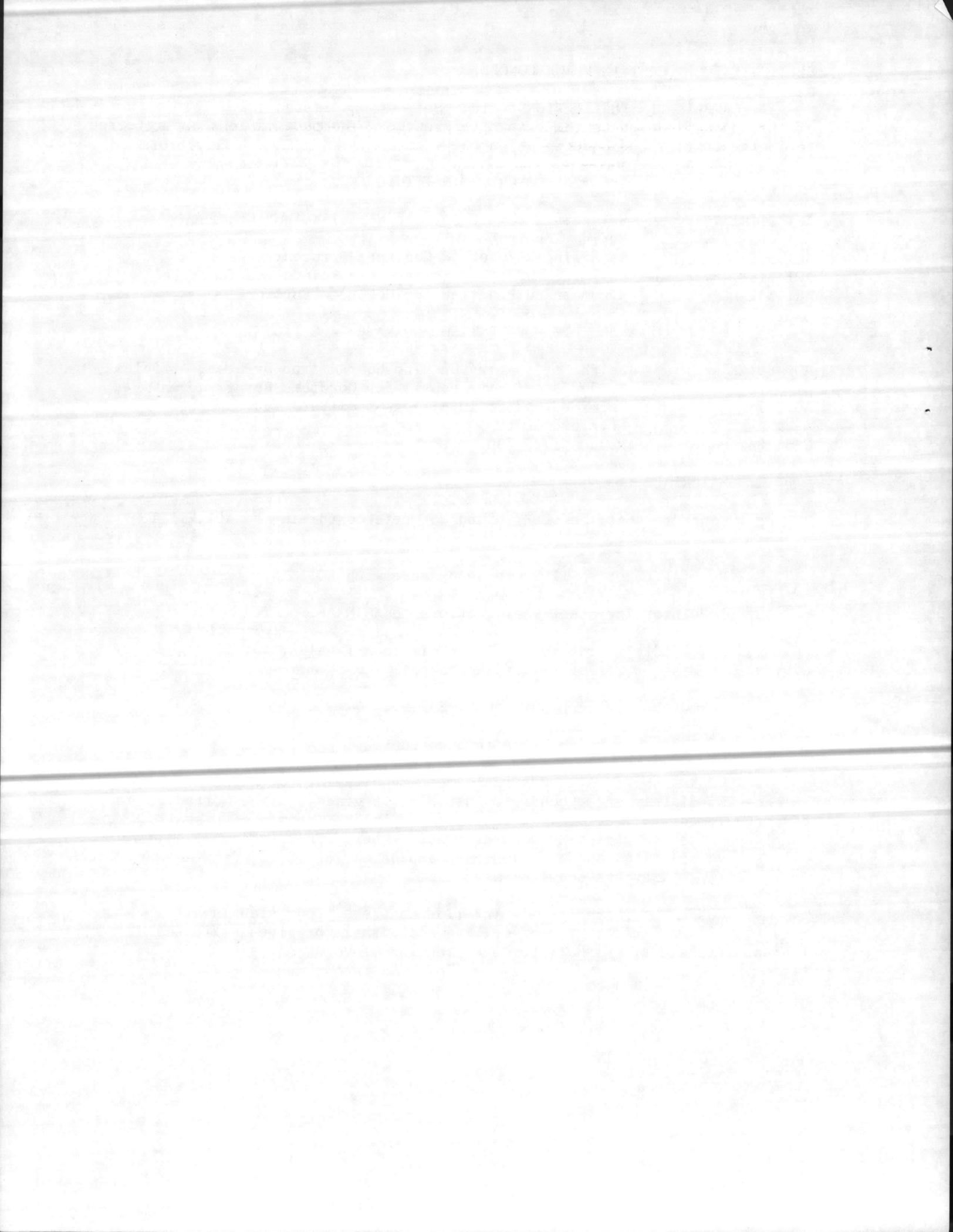
3. WORKMANSHIP: All work shall meet requirements of ACI 318. The surface immediately under concrete installed on grade shall be wetted as directed immediately before the concrete is placed. Reinforcing shall be placed prior to beginning concrete pour. Where concrete abuts, adjoins, or overlays existing concrete, approved expansion joints, bonding agents, or surface preparations shall be used.

4. CONCRETE FINISHES: All interior concrete floor slabs shall receive a float finish. Top of ceiling slabs shall be given a floated finish. Exposed sides shall receive grouting of voids and a rubbed finish.

END

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SECTION 11335 FEEDER-SOLUTION TANK SYSTEM

1. APPLICABLE PUBLICATIONS: The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of the specification to the extent indicated by the references thereto:

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

29 CFR 1910.212 Central requirements for machines
29 CFR 1910.219 Mechanical power-transmission apparatus

2. DESCRIPTION: The lime feed system shall consist of a packaged volumetric feeder mounted on a solution tank. The system shall be a pre-engineered, wired and connected system.

3. GENERAL REQUIREMENTS: Section 15011, General Requirement, Mechanical, with the following modification applies: For proper protection, one copy of all instruction sheets giving the proper field handling and installation requirements of the manufacturer shall be attached to, or accompanied, each device.

4. MATERIALS AND EQUIPMENT: AS-110

4.1 General: Unless otherwise specified, all materials, and equipment shall be standard commercial products in regular production by the manufacturer and suitable for the required service.

4.2 Volumetric Feeder: The shall be a high capacity volumetric feeder with electric variable speed control. Capacity shall be 0.03 to 50 cubic feet per hour with an operating range of 20:1 extendable to 60:1 by repositioning of drive belt on the pulley. Accuracy of the feed system shall be plus or minus 5 percent. The feed screw, discharge spout and hopper bottom trough shall be stainless steel with a molded fiber glass hopper and base. The feeder shall have a rotary or slide type shut-off gate and rubberized fabric flexible connection to the lime feeder. The feed screw shall be 2½ inches in diameter, shall be self-cleaning and shall be powered by a totally enclosed electric motor not smaller than 1/6 H.P. The feeder assembly shall meet the requirements of 29 CFR 1910.212 and .219.

4.2.1 Controls shall be enclosed in a NEMA 12 enclosure mounted on the feed system assembly. Controls shall provide for manual control with adjustable feed rate with the feed control knob having a dial calibrated from 0 to 100 percent of feeder capacity and for automatic control from a 4 to 20 mADC control signal.

4.3 Slurry Tanks: Slurry tanks shall have a capacity of 35 gallons and shall be constructed of fiber glass. The tank shall have a 1/4 H.P., 120 volt, single phase, 60 hertz mechanical mixer type agitator, float valve and piping connections. The mixer motor shall be totally enclosed.

5. INSTALLATION: The Contractor shall have the manufacturer provide the services of a factory trained representative to start-up, adjust and check the operation of the system for two days after installation of equipment and before placing the equipment in service. The factory representative shall instruct personnel in equipment maintenance and operation.

END

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SECTION 13140. MANHOLE AND ACCESSORIES

1. APPLICABLE PUBLICATIONS: The following publications form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

FEDERAL SPECIFICATIONS:

RR-F-621C Frame, Covers, Gratings, Sump and Catch Basin, Manhole

AMERICAN ASSN. OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO):

H-20 Loading on Highways

M-198 Joints with Rubber Gaskets

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

C309 Liquid Membrane Compounds for Curing Concrete

2. MATERIALS:

2.1 Manhole frame and cover shall conform to RR-F-621 as indicated

2.2 Curing compound shall conform to ASTM C309 for cast-in-place concrete.

2.3 Cast-in-place concrete shall conform to Section 03300 hereinbefore.

3. CONSTRUCTION OF VENTURI PIT shall be either poured-in-place or precast construction as specified hereinafter. Concrete shall be cured by applying two coats of white pigmented membrane forming curing compound in strict accordance with the manufacturer's printed instructions, except that precast concrete may be steam cured. Curing compound shall conform to ASTM C309. Pipe entrances shall be located as indicated. Covers shall fit the frames without undue play. Steel and iron shall be formed to shape and size with sharp lines and angles. Castings shall be free from warp and blow holes that may impair their strength or appearance. Exposed metal shall have a smooth finish and sharp lines and arrises. Provide all necessary lugs, rabbets and brackets.

3.1 Concrete shall conform to Section 03300 hereinbefore.

3.2 Precast concrete structures shall have the same accessories and facilities as required for poured-in-place structures. Likewise, they shall have plan area and clear heights not less than those of poured-in-place structures. Concrete materials and methods of construction shall be the same as for poured-in-place concrete construction, as modified herein. Slope in floor may be omitted provided precast sections are poured in reinforced steel forms. Concrete for precast work shall have an ultimate 28-day comprehensive strength of not less than 4,000 pounds per square inch. Structures may be precast monolithically and placed as a unit; or, they be of assembled sections, designed and produced by the manufacturer in accordance with the requirements specified. All structures shall be identified with the manufacturer's name embedded in, or otherwise permanently attached to, an interior wall face.

3.2.1 Design for Assembled Units: Precast structures shall be designed in accordance with ACI 318 and shall be based on the following properties:

Angle of Internal Friction (ϕ) = 30 Degrees
Unit Weight of Soil = 110 pcf
Lateral at Rest Earth Pressure Coefficient = 0.50

Structure top and bottom shall be designed for full dead, superimposed dead and live load including impact. Structure sidewalls shall be designed for lateral earth and hydrostatic pressures plus live load (H2O Truck) adjacent to structure. Tops and walls of structures shall be designed for AASHTO standard H2O highway loading, with 30 percent loading added for impact, and with design load being that which produces maximum shear and moment. All dead and live loads, as well as impact loading shall be considered in design. Walls shall be designed to withstand all soil pressures, taking into consideration the soil to be encountered and ground water level present at the site, and assuming that the H2O design vehicle will operate on surfaces adjacent to the structure. Ground water level shall be assumed to be three feet below ground surface unless a higher water table is indicated in the boring logs. Design shall also take into consideration stresses induced in handling units. Calculatins and shop drawings shall be submitted covering the design and manufacture of precast units, and shall bear the seal of a registered professional engineer.

3.2.2 Joints: Mating edges of precast components shall be provided with tongue and grooved joints. Joints shall be designed to firmly interlock adjoining components and to provide waterproof junctions. Joints shall be sealed watertight using preformed plastic strip conforming to AASHTO M198, Type B. Sealing material shall be installed in strict accordance with the sealant manufacturer's printed instructions. Provisions shall be made for waterproofing pipe entrances into structures, and at covers in the top slab.

3.2.3 Precast Manhole Installation: Commercial precast assembly shall be set on 6 inches of level, 90 percent compacted granular fill, 3/4-inch to one-inch size, extending 12 inches beyond the manhole on each side. Granular fill shall be compacted by a minimum of four passes with a plate type vibrator. Drain sumps shall be provided for precast structures as required for poured-in-place structures.

END

SECTION 13625. MEASURING AND CONTROL EQUIPMENT

1. APPLICABLE PUBLICATIONS: The following publications form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Where a number in parenthesis is suffixed to the publication number, it denotes the effective amendment to the publication.

WW-V-1967 FEDERAL SPECIFICATION:
Valve, Butterfly (threaded ends), Brass or Bronze

MIL-P-2441(3) MILITARY SPECIFICATION:
Paint, Epoxy-Polyamide

B16.1-1975 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):
Cast Iron Pipe Flanges and Flanged Fittings 23, 125, 250,
and 800 Pounds

Fluid Meters: AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME):
Their Theory and Application (latest edition)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

A126-73 Gray Iron Castings for Valves, Flanges, and Pipe
Fittings

B61-80 Steam or Valve Bronze Castings

AMERICAN WATER WORKS ASSOCIATION (AWWA):

C504-80 Rubber-seated butterfly valves

2. DESCRIPTION: The flow measuring equipment shall be the variable head meter type for closed channel. The design shall permit ease of installation and shall not have any features hazardous to personnel or detrimental to the equipment. Moving parts shall be properly aligned and adequately lubricated. Interior parts shall be easily accessible for adjustment, repair, and replacement.

3. GENERAL REQUIREMENTS: SECTION 15011, General Requirements, Mechanical, with the following modification, applies: For proper protection, one copy of all instruction sheets giving the proper field handling and installation requirements of the manufacturer shall be attached to, or accompany, each device.

4. MATERIALS AND EQUIPMENT:

4.1 General: Unless otherwise specified, all materials and equipment shall be standard commercial products in regular production by the manufacturer and suitable for the required service.

4.2 Variable Head Meter for Closed Channel: The meter shall include an orifice plate or Venturi tube as indicated on the drawings as differential head producer, a diaphragm meter as differential measurement, and recorder with intergators as read-out devices. Remote transmission also shall be included. Meters shall be provided where indicated.

4.2.1 Orifice Plate: The orifice plate shall be of the differential producing type with circular hole and designed for insertion in a 13-inch pipe where indicated. The orifice plate shall measure the flow of 0 to 6,000 gpm graduated in 100 gpm increments. The orifice plate shall be provided with a flange union to hold the plate perpendicular to the axis of the pipe. The flange shall have a pressure rating of 125 psi and shall have threaded ends. The orifice plate shall be of stainless steel and shall be furnished with a tab designating line size, orifice size, and flow direction. The orifice plate shall be in accordance with recommendations of the ASME publication, Fluid Meters, except as modified herein. The pressure taps shall be sized in accordance with recommendations of the ASME publication, Fluid Meters. The manufacturer shall furnish a certified dimensional inspection report and certified flow versus differential curve. Accuracy shall be plus or minus 1.0 percent over a 10 to 1 flow range.

4.2.2 Venturi: The Venturi tube shall be of the differential producing type and designed for water service with at least 90 percent head recovery in accordance with recommendations of the ASME publication, Fluid Meters for use in a 10-inch pipe where indicated. The Venturi shall measure the flow of 0 to 2500 gpm. The Venturi shall have 125 psi flanged ends conforming to ANSI B16.1. The laying length shall be approximately that indicated. The body shall be constructed of cast iron conforming to ASTM A126, Grade B. The throat section and vent busing shall be bronze conforming to ASTM B61. The manufacturer shall furnish a certified dimensional inspection report and certified flow versus differential head curve. Accuracy shall be plus or minus 1.0 percent of actual rate over a 10 to 1 flow range.

4.2.3 Diaphragm Meter: The diaphragm differential meter shall have a range of 500 to 4,000 gpm and a minimum differential of not less than one inch. The maximum differential shall be equal to the range squared but shall not exceed 100 inches water column. It shall have stainless steel bellows with built-in overrange protection to prohibit deformation of the bellows. The bellows shall be contained in a forged brass or cadmium-plated forged carbon steel housing to withstand a working pressure of at least 500 psi. The output motion of the bellows shall be transmitted to the local read-out device. There shall be zero adjustment in the diaphragm meter. Accuracy shall be plus or minus 0.5 percent of full scale over a 3 to 1 flow range.

4.3 Reservoir Water Depth Metering: The contractor shall provide a float operated transmitter complete with float, float cage and all appurtenances. The transmitter shall continually dispatch signals on electrical transmission lines to a receiver to be provided. The system shall be designed to measure and record the depth of water in the reservoir at all times and the equipment shall operate on 120 volts, 60 hertz, single phase electrical service. The operating range shall be 0 to 12 feet.

4.3.1 Transmitter: The transmitter shall be a pedestal mounted, float-operated, depth differential type. The instrument shall use the time impulse transmission method with time impulse signal being directly proportional to a depth of water. The unit shall be provided with a direct reading, uniformly graduated, concentric scale approximately 12 inches in diameter and indicating depth in feet. The transmitter shall indicate the depth at all times. The equipment shall be housed in a dust tight, moisture-proof case and all working parts shall be corrosion resistant.

4.3.2 Receiver. The receiver shall be an indicating and recording meter register housed in a dust tight, moisture-proof case and designed for mounting on a panelboard (single pen with totalizer). All working parts shall be corrosion resistant. The instrument shall indicate the instantaneous depth at all times on a uniformly graduated direct reading scale having a diameter of approximately 12 inches and depicting depth in feet. The depth shall be recorded on a 12-inch diameter evenly spaced circular and concentrically graduated chart designed for daily removal. The recorder and chart elements shall be actuated by electric clock drives. There shall be included with the receiver a year's supply of charts, pens, ink, usual tools and accessories, together with a setting device for checking the accuracy of the meter at any time.

4.4 Elevated Tank Water Depth Metering: The Contractor shall provide an elevated tank water depth metering system consisting of a level transmitter, telemetry system, and receiver. The system shall be designed to measure and record the depth of the water in the elevated tank within an accuracy of 16 inches at all times. The equipment shall operate on 120 volts, 60 hertz, single phase.

4.4.1 Transmitter. The transmitter shall be housed in a suitable metal wall mounted, moisture proof case and shall incorporate an adjustable pressure measuring element which shall be subjected to a total head of 142 feet which includes a suppression head of 113 feet and an operating range of 29 feet. The transmitter shall send out mechanically timed direct current electrical impulses, the duration of which shall be proportional to the measured pressure or a tone transmission with the frequency proportional to the measured pressure. This telemetry system shall be designed to transmit signals relating to the water level in the elevated tank to the receiver in a manner that will not interrupt or interfere with transmission on adjacent telephone lines.

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4.4.2 Receiver. The receiver shall be an indicating and recording meter and shall have a circular recording chart approximately 12 inches in diameter for 24 hour rotation with graduations uniformly spaced from 0 to 30 feet. The receiver shall operate on signals telemetered on leased telephone lines converting them to levels for use by the recorder and indicating meter. The receiver shall have an auxiliary switch suitable for the control of four pumps and to indicate a high water level alarm and any telemetry reception outage. The receiver shall be housed in a panelboard mounted metal case and shall have doors providing easy access to all parts with glass in front of the recording chart, and in front of the indicator. The recorder and chart elements shall be actuated by electric clock drives. There shall be included with the receiver, a year's supply of charts, pens, ink, usual tools and accessories, together with a setting device for checking the accuracy of the meter at any time.

4.5 Service Water Flow Metering: The Contractor shall provide a flow measuring system consisting of a rate of flow transmitter and indicating recorder. The transmitter shall continually dispatch signals on electrical transmission lines to the receiver containing the indicating recorders. The system shall be designed to measure and record the flow of water at all times and shall operate on 120 volts, 60 hertz, single phase electrical service. The operating range shall be 0 to 6,000 gpm at Hadnot Point and 500 to 2,500 gpm at Tarawa Terrace in hundred gallon per minute increments. The system shall be compatible with existing Venturi tubes and shall have an accuracy of plus or minus 2 percent.

4.5.1 Transmitter. Rate of flow transmitter shall be compatible with existing Venturi tubes and shall be suitable for wall mounting. The transmitters shall connect to existing measuring lines from the Venturi tube. The transmitter shall convert these hydraulic to electrical signals and transmit them to the receiver.

4.5.2 Receiver: The receiver shall be the indicating totalizing and recording type and shall have circular recording charts approximately 12 inches in diameter for 24 hour rotation with graduations uniformly spaced. The signal shall operate on electrical signals from the rate of flow transmitters. The Tarawa Terrace receiver shall be housed in a panelboard mounted metal case and shall have doors providing easy access to all components with glass in front of the recording chart, indicator and totalizer. The Hadnot Point receiver shall meet these same requirements except that the enclosure shall be suitable for wall mounting. The recorder and chart elements shall be actuated by electric clock drives. There shall be included with the receiver a year's supply of charts, pens, ink, usual tools and accessories, together with a setting device for checking the accuracy of the meter at any time.

4.6 Raw Water Flow Metering: The contractor shall provide a flow measuring system consisting of a rate of flow transmitter and indicating recorder. The transmitter shall continually dispatch signals via electrical transmission lines to the receiver containing the indicating recorder. The system shall be designed to measure and record the flow of water at all times and shall operate on 120 volts, 60 hertz, single phase electrical

TT
0-1200 GPM

services. The operating range shall be 0 to 6,000 gpm at Hadnot Point and 500 to 2,500 gpm at Tarawa Terrace in hundred gallon per minute increments. The Tarawa Terrace system shall be compatible with the existing Venturi tube and the Hadnot Point system shall be compatible with the Venturi Tube to be provided. System accuracy shall be plus or minus two percent.

4.6.1 Transmitter: Rate of flow transmitters shall be compatible with the Venturi tubes and shall be suitable for wall mounting. The transmitters shall connect to existing measuring lines from the Venturi tube. The transmitter shall convert these hydraulic to electrical signals and transmit them to the receiver.

4.6.2 Receiver: The receiver shall be the indicating, totalizing and recording type and shall have circular recording charts approximately 12 inches in diameter for 24 hour rotation with graduations uniformly spaced. The signal shall operate on electrical signals from the rate of flow transmitters. The Tarawa Terrace receiver shall be housed in a panel-board mounted metal case and shall have doors providing easy access to all components with glass in front of the recording chart, indicator and totalizer. The Hadnot Point receiver shall meet these same requirements except that the enclosure shall be suitable for wall mounting. The recorder and chart elements shall be actuated by electric clock drives. There shall be included with the receiver a year's supply of charts, pens, ink, usual tools and accessories, together with a setting device for checking the accuracy of the meter at any time.

4.7 Rate of Flow Controllers: The controller shall be an 8-inch, globe type, with flanged ends. The controller shall be of cast iron meeting the requirements of ASTM A-126 and stainless steel shaft and spring. The controller shall be rated for 700 gpm at 125 psi.

4.8 Motor Operated Butterfly Valves: Valves shall meet the requirements of Federal Specification WW-V-1967, type B; except sizes 2½-inches and larger shall conform to AWWA C504 with wafer body designed for installation between ANSI B16.1 Class 125 flanges. Valve shall be electrical actuators designed to operate on 120 volts, 60 hertz, single phase electrical service.

4.9 Electrical Requirements: Unless indicated or specified otherwise, the electrical components of the meters such as chart drives and electrical disconnecting means are included under this section. Wiring for signal circuit shall be provided and shall be as recommended by the equipment manufacturer. The interconnecting conduit and wire and the electrical connection of the meters to the electrical power circuit are specified in Section 16402.

4.10 Spare Parts: All standard recommended spare parts shall be provided as indicated in the manufacturer's instruction manuals for each component in the system. One year's supply of charts and ink shall be furnished for each recording device.

5. MATERIALS PROTECTION: The entire tube, except the throat section of the Venturi, shall receive a four-coat system conforming to MIL-P-24441. The system shall be applied in the following order: one coat of Formula 150, one coat of Formula 151, one coat of Formula 156, and one coat of Formula 152. The final total dry film thickness shall be not less than 10 mils. All other items shall be finished in accordance with the manufacturer's standard practice suitable for end use environment.

6. INSTALLATION: The Contractor shall furnish the services of an engineer representative of the manufacturer of the flow measuring equipment for checking the installation, making the necessary adjustments, placing the equipment in operation, and during acceptance tests. The representative also shall be available for no less than one day to instruct operating personnel in the use, operation, and maintenance of the equipment during the initial operating period. All flow measuring equipment shall be installed in accordance with the recommendations of the manufacturer. Variable head meters for closed channels shall be installed in accordance with the ASME publication, Fluid Meters. Disinfection shall be as specified in Section 15401.

7. FIELD TESTS AND INSPECTIONS:

7.1 General: The Contractor shall perform all field tests (calibrations). The Contractor shall provide all labor, equipment and incidentals required for the tests, except that the Government will provide electric power and water required for tests when available. The Contracting Officer will witness all field tests and conduct all field inspections. The Contractor shall give the Contracting Officer ample notice of the dates and times scheduled for tests. Any deficiencies found shall be rectified and work affected by such deficiencies shall be completely retested at the Contractor's expense.

7.2 Tests: The flow measuring equipment shall be tested (calibrated) in place by the Contractor and the manufacturer's representative to demonstrate that it meets the accuracy requirements, for the full range of flows, set forth in this section.

END

SECTION 15011. MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Where a number in parenthesis is suffixed to the publication number, it denotes the effective amendment to the publication.

FEDERAL SPECIFICATIONS:

| | |
|--------------|---|
| TT-E-489F(1) | Enamel, Alkyd, Gloss (for Exterior and Interior Surfaces) |
| TT-E-496B(2) | Enamel, Heat-Resisting (400 Degree Fahrenheit), Black |
| TT-P-28F | Paint, Aluminum, Heat Resisting (1200 Degrees Fahrenheit) |
| TT-P-645A | Primer, Paint, Zinc-Chromate, Alkyd Type |

MILITARY SPECIFICATIONS

DOD-P-15328D(1) Primer (Wash), Pretreatment (Formula No. 117 for Metals)
(Metric)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

B117-73 Salt Spray (Fog) Testing, Method of

1.2 APPLICATION: This section applies to Sections 11335 and 13625 and mechanical sections as indicated therein or except as specified otherwise in each individual section.

1.3 SUBMITTALS: Submit shop drawings, manufacturers data and certificates for equipment, materials and finish, and pertinent details for each system where specified in each individual section, and have them approved before procurement, fabrication or delivery of the items to the job site. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable Federal, Military, industry and technical society publication reference, and other information necessary to establish contract compliance or each item the Contractor proposes to furnish.

1.3.1 Shop Drawings: Drawings shall be a minimum of 8.5-inches by 11-inches in size, except as specified otherwise. Drawings shall include floor plans, sectional views, wiring diagrams, and installation details of equipment; and equipment spaces identifying and indicating proposed location, layout and arrangement of items of equipment, control panels, accessories, piping, ductwork, and other items that must be shown to assure a coordinated installation. Wiring diagrams shall identify circuit terminals, and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance and replacement of operating equipment devices. If equipment is disapproved, drawings shall be revised to show acceptable equipment and to be resubmitted.

1.3.2 Manufacturer's Data: Submittals for each manufactured item shall be manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams performance and characteristic curves, and catalog cuts.

1.3.3 Publication Compliance: Where equipment or materials are specified to conform to industry and technical society publications of organizations such as American National Standard Institute (ANSI), American Society for Testing and Materials (ASTM), and Underwriters Laboratories, Inc. (UL), proof of such compliance shall be submitted. The label or listing by the specified organization will be acceptable evidence of compliance. Submit a certificate from an independent testing organization adequately equipped and competent to perform such services, and approved by the Contracting Officer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's publication.

1.3.4 Certified Test Reports: The testing requirements in referenced publications for materials will be waived provided the manufacturer's original certificates are submitted stating that previously manufactured materials have been tested by approved laboratories, that such materials meet testing requirements specified, and that the materials furnished for this project are of the same type, quality, manufacture, and make as that specifically requested by the Contracting Officer.

1.3.5 Certificates of Compliance: Submit certification attesting that materials and equipment to be furnished for this project comply with the requirements of this specification and of the reference publications. Pre-printed certifications will not be acceptable; certifications shall be the manufacturer's original. The certification shall not contain statements that could be interpreted to imply that the product does not meet all requirements specified, such as "as good as", "achieve the same end use and result as materials formulated in accordance with the referenced publications"; "equal or exceed the service and performance of the specified material". The certification shall simply state that the product conforms to the requirements specified.

1.4 OPERATION AND MAINTENANCE MANUAL: Furnish an operation and maintenance manual for each item of equipment. Furnish three copies of the manual bound in hardback binders or an approved equivalent. Furnish one complete manual prior to the time that equipment test are performed, and furnish the remaining manuals before the contract is completed. Inscribe the following identification on the cover: the words OPERATION AND MAINTENANCE MANUAL, the name and location of the equipment or the building, the name of the Contractor, and the contract number. The manual shall include the names, addresses, and telephone numbers of each subcontractor installing equipment and of the local representatives for each item of equipment. The manual shall have a table of contents and be assembled to conform to the table of contents with the tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in. The manual shall include: wiring and control diagrams with data to explain detailed operation and control of each item of equipment; a control sequence describing start-up, operation and shut-down; description of the function

of each principal item of equipment; the procedure for starting; the procedure for operating; shut-down instructions; installation instructions; maintenance instructions; lubrication schedule including type, grade, temperature range, and frequency; safety precautions, diagrams, and illustrations; test procedures; performance data; and parts list. The parts lists for equipment shall indicate the sources of supply, recommended spare parts, and the service organization which is reasonably convenient to the project site. The manual shall be complete in all respects for equipment, controls, accessories, and associated appurtenances provided.

1.5 DELIVERY AND STORAGE: Properly store, adequately protect and carefully handle equipment and materials to prevent damage before and during installation. Handle, store, and protect equipment and materials in accordance with the manufacturer's recommendations. Replace damaged or defective items.

1.6 CATALOGED PRODUCTS: Materials and equipment shall be cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest design that complies with the specification requirements. Materials and equipment shall duplicate items that have been in satisfactory commercial or industrial use. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the items need not be the products of the same manufacturer. Each item of equipment shall have the manufacturer's name, address, model number and serial number on the nameplate securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.7 VERIFICATION OF DIMENSIONS: Coordinate the proper relation of the work to the building structure and to the work of all trades. Visit the premises and become familiar with the dimensions in the field, and advise the Contracting Officer of the discrepancy before performing any work.

1.8 MANUFACTURER'S RECOMMENDATIONS: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Contracting Officer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

1.9 ELECTRICAL REQUIREMENTS: Furnish motors, controllers, contractors, and disconnects with their respective pieces of equipment except controllers indicated as part of the motor control centers shall be provided under Section 16402, "Interior Wiring Systems". Motors, controllers, contractors, and disconnects shall conform to and shall have electrical connections provided under Section 16402, "Interior Wiring Systems". Furnish internal wiring for components of packaged equipment as an integral part of the equipment. Extended voltage range motors will not be permitted. Controllers and contractors shall have a maximum of 120 volt control circuits. When motors and equipment furnished are larger than sizes indicated, the cost of additional electrical service and

related work shall be included under the section that specified that motor or equipment. Power wiring and conduit for field installed equipment, and motor control equipment forming part of motor control centers or switchgear assemblies, and conduit and wiring connecting such centers, assemblies or other power sources to equipment shall be provided under and conform to the requirements of Section 16402, "Interior Wiring Systems".

PART 2 - EXECUTION

2.1 PAINTING OF EQUIPMENT: Equipment painting, factory applied or shop applied, shall be as specified herein, and provided under each individual section of this specification.

2.1.1 Factory Painting Systems: Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors shall withstand 500 hours in a salt spray fog test. Salt spray fog test shall be in accordance with ASTM B117. Immediately after completion of the test, the paint shall show no signs of blistering, wrinkling or cracking; and no loss of adhesion; and the specimen shall show no signs of rust creepage beyond 0.125 inch on either side of the scratch mark. The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use in lieu of the shop painting systems using TT-E-496 or TT-P-28, certifications that the manufacturer's standard factory painting system will conform to the heat resistance requirement of TT-E-496 or TT-P-28 as applicable, shall be submitted in addition to other certifications.

2.1.2 Shop Painting Systems: Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces shall not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 120 degrees Fahrenheit shall be cleaned to bare metal. Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damage painting and retouch before applying the succeeding coat.

2.1.2.1 Metal Surfaces Subject to Temperatures Less Than 120 Degrees Fahrenheit: Immediately after cleaning, the metal surfaces shall receive one coat of DOD-P-15328 pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of TT-P-645 primer applied to a minimum dry film thickness of one mil; and two coats of TT-E-489 enamel applied to a minimum dry film thickness of one mil per coat.

END

05-81-3554

15011-4

SECTION 15401. PLUMBING

1. GENERAL

1.1 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Where a number in parenthesis is suffixed to the publication number, it denotes the effective amendment to the publication.

FEDERAL SPECIFICATIONS (FED. SPEC.):

| | |
|--------------|---|
| GG-G-76D | Gages, Pressure and Vacuum, dial |
| WW-N-351C(1) | Nipples, Pipe, Threaded |
| UU-U-516C | Unions, Brass or Bronze, Threaded Pipe Connections, and Solder Joint Tube Connections |
| WW-U-531E | Unions, Pipe, Steel or Malleable Iron (Threaded Connection) |
| WW-V-51F | Valves, Angle, Check and Globe, Bronze (125, 150 and 200 pound) Threaded Ends, Flanged Ends, Solder Ends, and Brazed Ends |
| WW-V-54D | Valves, Gate, Bronze (125, 150 and 200 pound) Threaded Ends, Flanged Ends, Solder Ends, and Brazed Ends |
| WW-V-58B | Valves, Butterfly (Threaded Ends and Soldered Ends) |

MILITARY SPECIFICATIONS (MIL.SPEC):

| | |
|--------------|------------------------------------|
| MIL-G-1086E | Gasket Material, Synthetic Rubber |
| MIL-V-18826B | Valves, Globe and Angle, Cast Iron |

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

| | |
|-----------|--|
| B16.1-77 | Cast Iron Pipe Flanges and Flanged Fittings |
| B16.18-73 | Cast Bronze Solder-Joint Fittings |
| B16.22-80 | Wrought Copper and Bronze Solder-Joint Pressure Fittings |
| B16.24-79 | Bronze Pipe Flanges and Flanged Fittings |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

| | |
|---------|----------------------------|
| B 32-76 | Solder Metal |
| B 88-80 | Seamless Copper Water Tube |

AMERICAN WATER WORKS ASSOCIATION (AWWA):

| | |
|---------|--------------------------|
| C500-80 | Gate Valves |
| C601-68 | Disinfecting Water Mains |

MANUFACTURERS' STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS):

| | |
|----------|---|
| SP-58-75 | Pipe Hangers and Supports - Materials, Design and Manufacture |
| SP-69-76 | Pipe Hangers and Supports - Selection and Application |

SOUTHERN BUILDING CODE CONGRESS (SBCC):

1979 & Am 80 Standard Plumbing Code

1.2 GENERAL REQUIREMENTS: Section 15011, "Mechanical General Requirements", applies to this section with the additions and modifications specified herein.

1.2.1 Description of Work: The work includes modifying existing plumbing systems and related work. The work also includes providing roughing-in and making final plumbing connections to equipment furnished under other sections of this specification. Provide each system complete and ready for operation. Plumbing systems including fixtures, equipment, materials, installation and workmanship shall be in accordance with the SBCC Standard Plumbing Code, except as modified herein. In the publications referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" had been substituted for the word "should" wherever it appears; reference to the "authority having jurisdiction", the Administration Authority, the Plumbing Official, and the Design Engineer shall be interpreted to mean the Contracting Officer. Capacity of equipment shall be not less than that indicated. Plumbing systems shall include all piping buried and above ground

1.2.2 Submittals Required:

1.2.2.1 Manufacturer's Data:

- a. Pipe and Fittings
- b. Valves

1.2.2.2 Certificates of Compliance:

- a. Pipe and Fittings
- b. Valves

PART 2 - PRODUCTS

2.1 WATER PIPING:

2.1.1 Buried Piping and Above Ground Piping:

2.1.1.1 Copper Tubing: ASTM B 88, Type K, hard drawn copper tubing; with ANSI B16.18 or B16.22 solder joint fittings using ASTM B 32, 50-50 tin-lead solder; or with ANSI B16.26 flared joint fittings. ASTM B 88, Type L, hard drawn copper tubing may be used for above ground piping.

2.1.1.2 Gate Valves: WW-V-54, Class 125; except sizes 2.5 inches and larger shall conform to WW-V-58, Class 125.

2.1.1.3 Globe and Angle Valves: WW-V-51, Class 125; except sizes 2.5 inches and larger shall conform to MIL-V-18826, Class 125.

2.1.2 Gages: GG-G-76, single style pressure gage for water with 4.5 inch dial, brass or aluminum case, bronze tube, gage cock, pressure snubber, and syphone. Provide scale range suitable for the intended service.

2.2 MISCELLANEOUS PIPING MATERIALS:

2.2.1 Piping Nipples: WW-N-351, copper alloy for use in copper tubing and zinc-coated Schedule 80 steel pipe for use in steel piping.

2.2.2 Unions: WW-U-516 for use in copper tubing; WW-U-531 zinc-coated steel for use in steel piping.

2.2.3 Flanges: ANSI B16.1 Class 125 for use in ferrous piping; ANSI B16.22 or B16.24 for use in copper tubing; with MIL-G-1086 full face flat type synthetic rubber gaskets.

2.2.4 Pipe Hangers (Supports): Provide MSS SP-58 and SP-69, Type 1 or 6, of the adjustable type, except as indicated or specified herein. Provide steel support rods. Provide steel support rods. Provide non-metallic, hair felt or plastic piping isolators between copper tubing and the hangers.

PART 3 - EXECUTION

3.1 INSTALLATION: Installation of plumbing systems including fixtures, equipment, materials, and workmanship shall be in accordance with the SBCC Standard Plumbing Code, except as modified in this specification.

3.1.1 Threaded Connections: Jointing compound for pipe threads shall be polytetrafluoroethylene (PTFE) pipe thread tape, pipe cement and oil, or PTFE powder and oil; apply only on male threads. Provide exposed ferrous pipe threads with one coat of TT-P-645 primer applied to a minimum dry film thickness of one mil.

3.1.2 Pipe Hangers (Supports): Provide additional hangers to support the concentrated loads in piping between hangers, such as for inline water pumps and flanged valves.

3.1.2.1 Maximum Spacing Between Hangers:

a. Vertical Piping: Support metal piping at each floor, but at not more than 10 foot intervals.

b. Horizontal Piping: Support cast iron piping at 5 foot intervals, except for pipe exceeding 5 foot length, provide supports at intervals equal to the pipe length but not exceeding 10 feet. Support plastic and glass piping at 4 foot intervals. Support steel piping and copper tubing as follows:

MAXIMUM SPACING (FEET)

| Nominal Pipe Size (inches) | One and under | 1.25 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 5 | 6 |
|----------------------------|---------------|------|-----|----|-----|----|-----|----|----|----|
| Steel Pipe | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 16 | 17 |
| Copper Tube | 6 | 7 | 8 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |

3.3 DISINFECTION: Disinfect the new water piping and existing water piping affected by Contractor's operations in accordance with AWWA C601. Fill the piping systems with solution containing minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Flush the solution from the system with clean water until maximum residual chlorine content is not greater than 0.2 parts per million.

3.4 FIELD TESTING: Before final acceptance of the work, test each system as in service to demonstrate compliance with the contract requirements. Perform the following tests in addition to the test specified in the SBCC Standard Plumbing Code, except as modified herein. Correct all defects in the work provided by the Contractor at no cost to the Government, and repeat the tests until the work is in compliance with contract requirements. Furnish water, electricity, instruments, connecting devices and personnel for the tests. Subject the water piping to a hydrostatic pressure test of system working pressure for two hours.

3.5 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS: Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure. Bolt sleeves around mains; bolt valve conforming to AWWA C500 to the branch. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, all without interruption of service. Notify the Contracting Officer in writing at least 15 days prior to the date the connections are required; receive approval before any service is interrupted. Furnish all materials required to make connections into the existing water supply systems and perform all excavating, back-filling, and other incidental labor as required. Furnish the labor and the tapping or drilling machine for making the actual connections to the existing systems.

END

SECTION 16011: ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Where a number in parenthesis is suffixed to the publication number, it denotes the effective amendment to the publication.

FEDERAL SPECIFICATIONS:

TT-E-496B(2) Enamel, Heat-Resisting (400 Degrees Fahrenheit), Black
TT-P-28F Paint, Aluminum, Heat Resisting (1200 Degrees Fahrenheit)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

B117-73 Salt Spray (Fog) Testing, Method of

1.2 APPLICATION: This section applies to all electrical sections of this project except as specified otherwise in each individual section.

1.3 SUBMITTALS: Submit shop drawings, manufacturers data and certificates for equipment, materials and finish, and pertinent details for each system where specified in each individual section, and have them approved before procurement, fabrication or delivery of the items to the job site. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and paragraph reference, applicable Federal, Military, industry and technical society publication references, and other information necessary to establish contract compliance of each item the Contractor proposes to furnish.

1.3.1 Shop Drawings: Drawings shall be a minimum of 8.5-inches by 11-inches in size, except as specified otherwise. Drawings shall include floor plans, sectional views, wiring diagrams, and installation details of equipment; and equipment spaces identifying and indicating proposed location, layout and arrangement of items of equipment, control panels, accessories, piping, ductwork, and other items that must be shown to assure a coordinated installation. Wiring diagrams shall identify circuit terminals, and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance and replacement of operating equipment devices. If equipment is disapproved, drawings shall be revised to show acceptable equipment and be resubmitted.

1.3.2 Manufacturer's Data: Submittals for each manufactured item shall be manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts.

1.3.3 Publication Compliance: Where equipment or materials are specified to conform to industry and technical society publications of organizations such as American National Standard Institute (ANSI), American Society for Testing and Materials (ASTM), and Underwriters Laboratories, Inc. (UL), proof of such compliance shall be submitted. The label or listing by the specified organization will be acceptable evidence of compliance. Submit a certificate from an independent testing organization adequately equipped and competent to perform such services, and approved by the Contracting Officer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's publication.

1.3.4 Certified Test Reports: The testing requirements in referenced publications for materials will be waived provided the manufacturer's original certificates are submitted stating that previously manufactured materials have been tested by approved laboratories, that such materials meet testing requirements specified, and that the materials furnished for this project are of the same type, quality, manufacture, and make as that tested; copies of the test reports need not be submitted except as specifically requested by the Contracting Officer.

1.3.5 Certificates of Compliance: Submit certification attesting that materials and equipment to be furnished for this project comply with the requirements of this specification and of the reference publications. Pre-printed certifications will not be acceptable; certifications shall be the manufacturer's original. The certification shall not contain statements that could be interpreted to imply that the product does not meet all requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; "equal or exceed the service and performance of the specified material". The certification shall simply state that the product conforms to the requirements specified.

1.4 OPERATION AND MAINTENANCE MANUAL: Furnish an operation and maintenance manual for each item of equipment. Furnish three copies of the manual bound in hardback binders or an approved equivalent. Furnish one complete manual prior to the time that equipment tests are performed, and furnish the remaining manuals before the contract is completed. Inscribe the following identification on the cover: the words OPERATION AND MAINTENANCE MANUAL, the name and location of the equipment or the building, the name of the Contractor, and the contract number. The manual shall include the names, addresses, and telephone numbers of each subcontractor installing equipment, and of the local representatives for each item of equipment. The manual shall have a table of contents and be assembled to conform to the table of contents with the tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in. The manual shall include: wiring and control diagrams with data to explain detailed operation and control of each item of equipment; a control sequence describing start-up, operation and shut-down; description of the function of each principal item of equipment; the procedure for starting; the procedure for operating; shut-down instructions; installation instructions; maintenance instructions; lubrication schedule including type, grade, temperature range, and frequency; safety precautions,

diagrams, and illustrations; test procedures; performance data; and parts list. The parts lists for equipment shall indicate the sources of supply, recommended spare parts, and the service organization which is reasonably convenient to the project site. The manual shall be complete in all respects for equipment, controls, accessories, and associated appurtenances provided.

1.5 POSTED OPERATING INSTRUCTIONS: Furnish approved operating instructions for each principal item of equipment for the use of the operation and maintenance personnel. The operating instructions shall include wiring diagrams, control diagrams, and control sequence for each principal item of equipment. Operating instructions shall be printed or engraved, and shall be framed under glass or in approved laminated plastic and posted where directed by the Contracting Officer. Operating instructions shall be attached to or posted adjacent to each principal item of equipment including start up, proper adjustment, operating, lubrication, shut-down, safety-precautions, procedure in the event of equipment failure, and other items of instruction as recommended by the manufacturer of each item of equipment. Operating instructions exposed to the weather shall be made of weather-resisting materials or shall be suitably enclosed to be weather protected. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.6 INSTRUCTION TO GOVERNMENT PERSONNEL: Furnish the services of competent instructors to give full instruction to the Government personnel in the adjustment, operation and maintenance, including pertinent safety requirements of each item of equipment and each system. Each instructor shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of mandays (8-hours) of instruction furnished shall be as specified in each individual section.

1.7 DELIVERY AND STORAGE: Property store, adequately protect and carefully handle equipment and materials to prevent damage before and during installation. Handle, store, and protect equipment and materials in accordance with the manufacturer's recommendations. Replace damage or defective items.

1.8 CATALOGED PRODUCTS: Materials and equipment shall be cataloged products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest design that complies with the specification requirements. Materials and equipment shall duplicate items that have been in satisfactory commercial or industrial use. Where two or more items of the same class of equipment are required these items shall be products of a single manufacturer; however, the component parts of the items need not be the products of the same manufacturer. Each item of equipment shall have the manufacturer's name, address, model number and serial number on the nameplate securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.9 VERIFICATION OF DIMENSIONS: Coordinate the proper relation of the work to the building structure and to the work of all trades. Visit the premises and become familiar with the dimensions in the field, and advise the Contracting Officer of the discrepancy before performing any work.

1.10 MANUFACTURER'S RECOMMENDATIONS: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Contracting Officer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

1.11 ELECTRICAL REQUIREMENTS: Furnish motors, controllers, contractors, and disconnects with their respective pieces of equipment except controllers indicated as part of the motor control centers shall be provided under Section 16402, "Interior Wiring Systems". Motors, controllers, contractors, and disconnects shall conform to and shall have electrical connections provided under Section 16402, "Interior Wiring Systems". Furnish internal wiring for components of packaged equipment as an integral part of the equipment. Extended voltage range motors will not be permitted. Controllers and contractors shall have a maximum of 120 volt control circuits. When motors and equipment furnished are larger than sizes indicated, the cost of additional electrical service and related work shall be included under the section that specified that motor or equipment. Power wiring and conduit for field installed equipment, and motor control equipment forming part of motor control centers or switchgear assemblies, and conduit and wiring connecting such centers, assemblies or other power sources to equipment shall be provided under and conform to the requirements of Section 16402, "Interior Wiring Systems".

PART 2 - EXECUTION

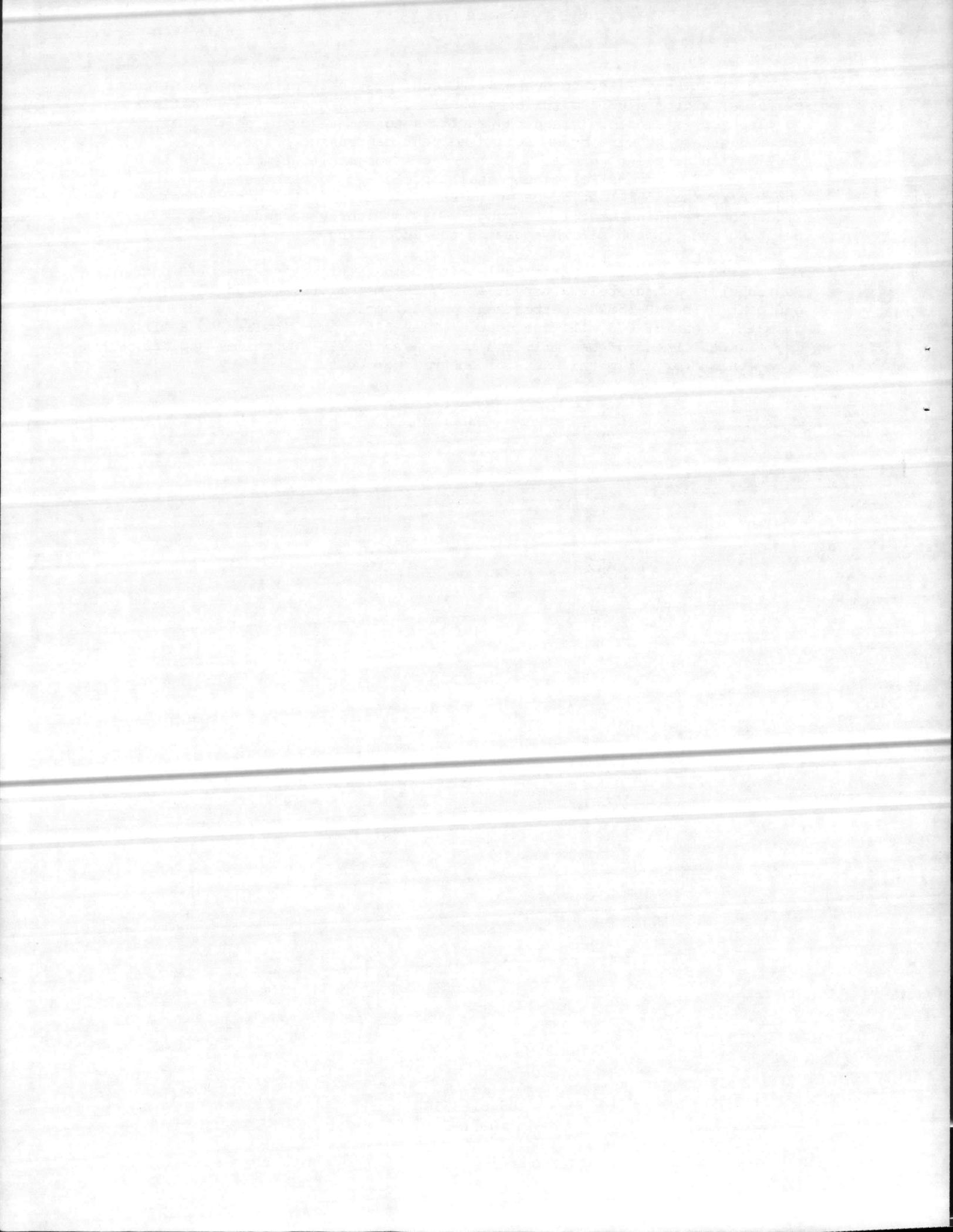
2.1 PAINTING OF EQUIPMENT: Equipment painting, factory applied or shop applied, shall be as specified herein, and provided under each individual section of this specification.

2.1.1 Factory Painting Systems: Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors shall withstand 500 hours in a salt spray fog test. Salt spray fog test shall be in accordance with ASTM B117. Immediately after completion of the test, the paint shall show no signs of blistering, wrinkling or cracking; and no loss of adhesion; and the specimen shall show no signs of rust creepage beyond 0.125 inch on either side of the scratch mark. The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use in lieu of the shop painting system using TT-E-496 or TT-P-28, certifications that the manufacturer's standard factory painting system will conform to the heat resistance requirement of TT-E-496 or TT-P-28 as applicable, shall be submitted in addition to other certifications.

2.1.2 Shop Painting Systems: Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces shall not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 120 degrees Fahrenheit shall be cleaned to bare metal. Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat.

2.1.2.1 Metal Surfaces Subject to Temperatures Less than 120 Degrees Fahrenheit: Immediately after cleaning, the metal surfaces shall receive one coat of DOD-P-15328 pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of TT-P-645 primer applied to a minimum dry film thickness of one mil; and two coats of TT-E-489 enamel applied to a minimum dry film thickness of one mil per coat.

END



SECTION 16402. INTERIOR WIRING SYSTEMS

1. APPLICABLE PUBLICATIONS: The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

FEDERAL SPECIFICATIONS:

W-C-375B Circuit Breaker, Molded Case, Branch-Circuit and Service
CC-M-1807 Motor, Alternating Current, Fractional and Integral Horsepower

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

C80.1-1977 Specification for Rigid Steel Conduit, Zinc-coated

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

B1-1970 Hard Drawn Copper Wire
(R-1976)

B8-1977 Concentric Lay Stranded Copper Conductors; Hard, Medium-Hard
or Soft

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

BUI-1978 Busways
ICS-1973 Industrial Controls and Systems
ST20-1972 Dry-Type Transformers for General Applications

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

70-1981 National Electrical Code (NEC)

UNDERWRITERS' LABORATORS, INC. (UL)

1-1979 Flexible Metal Conduit
50-1977 Cabinets and Boxes
67-1979 Panelboards, Electric
83-1979 Thermoplastic-Insulated Wires
98-1974 Enclosed Switches
(R-1979)
1933-1975 High-interrupting Capacity Class K Fuses
510-1976 Insulating Tape
514-1978 Outlet Boxes and Fittings
1242-1977 Intermediate Metal Conduit

2. GENERAL REQUIREMENTS: General requirements shall be as specified in Section 16011 "GENERAL REQUIREMENTS, ELECTRICAL", and as specified herein.

2.1 Submittals:

2.1.1 Manufacturers' data shall be submitted for the following:

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Circuit Breakers Disconnect Switches Fuses Load Center

2.1.2 Shop drawings shall be submitted for the following:

Transformers Motor Starters

2.1.3 Certificates of conformance or compliance are required for the following:

Conduit Connectors Tapes

3. MATERIALS AND EQUIPMENT: All materials, equipment, and devices shall, as a minimum, meet the requirements of UL where UL Standards are established for those items, and the requirements of the National Electrical Code (NEC). Further, each item shall meet the requirements of these specifications and of the specifications and publications referenced herein. All items shall be new unless specified or indicated otherwise.

3.1 Conduit and Fittings:

3.1.1 Rigid Steel Conduit (Zinc-Coated): ANSI Standard C80-1.

3.1.2 Intermediate Metal Conduit (IMC): UL Standard No. 1242, zinc-coated steel only.

3.1.3 Flexible Metal Conduit: UL Standard No. 1, zinc-coated steel with an extruded moisture and oil-proof PVC jacket. Watertight connectors shall be used with PVC covered conduit.

3.1.4 Fittings for Metal Conduit and Flexible Metal Conduit: UL Standard No. 514. All ferrous fittings shall be cadmium- or zinc-coated per UL 514.

3.1.5 Fittings for rigid metal conduit and IMC shall be the threaded type. Split couplings are not acceptable.

3.2 Wires and Cables: Wires and cables shall meet all the applicable requirements of the NEC and UL 83 for the type of insulation, jacket, and conductor specified or indicated. Unless indicated or specified otherwise, conductor sizes are based on copper. All conductors No. 6 AWG and smaller shall be copper. Except where copper, or aluminum is specifically indicated, conductors No. 4 AWG and larger shall be either copper or aluminum, at the Contractor's option; should the Contractor opt to use aluminum, he shall be responsible for meeting the requirements of the following paragraph "Aluminum Conductors". Wires and cables manufactured more than six months prior to date of delivery to the site shall not be used.

3.2.1 Aluminum Conductors: All aluminum conductors shall be of an aluminum alloy that is acceptable to UL as "component aluminum-wire stock (conductor material)". Should the Contractor choose to use the aluminum option for conductors No. 4 AWG and larger, the Contractor shall be responsible for: increasing the wire size to have the same ampacity as the

copper size indicated; increasing the conduit and pull box sizes to accommodate the larger size aluminum conductors in accordance with the NEC insuring that the pulling tension rating of the aluminum cable is sufficient; relocating equipment, modifying equipment terminations, resizing equipment, and resolving, to the satisfaction of the Contracting Officer, all interference problems that are direct results of the use of aluminum conductors in lieu of copper.

3.2.2 Color coding is required for all service feeder, branch, control, and signalling circuit conductors. Insulation color shall be white for neutrals and green for grounding conductors. The color of the insulation of the ungrounded conductors in different voltage systems shall be as follows:

- a. 480 volt, 3-phase: yellow, brown, and orange.
- b. 120/240 volt, single phase: red and black.

All ungrounded conductors of the same color shall be connected to the same ungrounded feeder conductor.

3.2.3 Connectors and terminals shall be designed and UL approved for use with the associated conductor material, and shall provide a uniform compression over the entire contact surface. Solderless terminal lugs shall be used on all stranded conductors.

3.2.4 Conductor sizes shall be not less than indicated. Minimum size for branch circuits shall be No. 12 AWG; for Class 1 remote-control and signal-circuits - No. 14 AWG; for Class 2 low-energy remote control and signal-circuits - No.16 AWG.

3.2.5 Insulation: Unless specified or indicated otherwise, or required to be otherwise by the NEC: all power and lighting wires shall be 600-volt, Type THWN or XHHW, except that ground wire may be Type TW; remote-control and signal circuits shall be Type TW, THW or TF.

3.2.6 Bare Wire: ASTM B1, solid copper wire for sizes N.8 AWG and smaller; ASTM B8, Class B. stranded bare copper wire for sizes N.6 AWG and larger.

3.3 Tapes: UL standard 510.

3.4 Disconnect Switches: UL Standard No. 98, zinc-coated if of sheet steel, ratings as indicated. Switches in motor circuits shall be rated in horsepower.

3.5 Panelboards: UL 67 and UL 50, as applicable. Circuit breakers shall conform to W-C-375, Type II ambient-compensated thermal magnetic type and shall have a minimum interrupting capacity of 10,000 amperes symmetrical. Single-pole breakers shall be full module size; two poles shall not be installed in a single module. Multi-pole breakers shall be of the common-trip

type having a single operating handle, and for 50 amperes or less may consist of single-pole breakers permanently assembled at the factory into a multi-pole unit. Breakers shall be the bolt-in type (that is, bolted to the current-carrying bus); plug-in units are not acceptable. Panelboard assembly shall be so designed that any individual breaker can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as a means of obtaining clearances and other requirements of UL.

3.6 Fuses: A complete set of fuses for all switches shall be furnished. Fuses shall have a voltage rating not less than the circuit voltage.

3.6.1 Cartridge Fuses, Current-limiting type (Class K): UL Standard No. 198.3, Class K-1 (time-delay type). Ratings shall be 600 volts, and 50,000 amps rms symmetrical interrupting.

3.7 Transformers: NEMA Standard No. ST20, general-purpose dry-type, NEMA standard taps, ratings as indicated. Temperature rise classification shall be 115 degrees Centigrade. Transformers shall be the quiet type with an average sound level of at least 3 decibels lower than NEMA Standard level for the transformer size indicated.

3.8 Motors: Fed. Spec. CC-M-1807. Motors shall be designed to operate at full capacity with a voltage variation of plus or minus 10 percent of the motor voltage rating. Motors shall be of sufficient size for the duty to be performed and shall not exceed their full load nameplate current rating when driven equipment is operated at specified capacity under the most severe conditions likely to be encountered.

3.9 Motor Controllers: NEMA Standard No. ICS. All controllers shall have thermal overload protection in each phase and short circuit protection. Magnetic type motor controllers shall have under voltage protection when used with momentary-contact push-button stations or switches and shall have under voltage release when used with maintained-contact pushbutton stations or switches.

4. INSTALLATION:

4.1 General Requirements: All electrical installations shall, as a minimum, meet the requirements of the NEC, and shall meet the requirements specified herein.

4.2 Wiring Methods: Wiring method shall be insulated conductors installed in conduit, except where specifically indicated or specified otherwise, or required by the NEC to be installed otherwise. Conduit shall be rigid metal conduit or intermediate metal conduit (IMC).

4.3 Conduit Installation: Keep conduit at least 6-inches away from parallel runs of flues and steam or hot-water pipes. Conduit that will be visible after completion of project shall be installed parallel with or at right angles to ceilings, walls and structural members.

4. 4.3.1 Conduit shall be supported by pipe straps, wall brackets, hangers or ceiling trapeze. Fastenings shall be by wood screws or screw type nails to wood; by toggle bolts on hollow masonry units; by concrete inserts, or expansion bolts on concrete or brick; by machine screws, welded threaded studs, or spring-tension clamps on steel work. Threaded C-clamps may be used on rigid steel conduit only. Conduits or pipe straps shall not be welded to steel structures. The load applied to fasteners shall not exceed one-fourth of the proof test load. Fasteners attached to concrete ceiling shall be vibration and shock resistant. Holes cut to a depth of more than 1-1/2 inches in reinforced concrete beams or to a depth of more than 3/4-inches in concrete joints shall not cut the main reinforcing bars. Holes not used shall be filled. In partitions of light steel construction, sheetmetal screws shall be used. In suspended-ceiling construction, conduit shall be run above the ceiling and only lighting system branch circuit conduits may be fastened to the ceiling supports. Spring steel fasteners may be used for lighting branch circuit conduit supports in suspended ceiling in dry locations.

4.3.2 Changes in direction of runs shall be made with symmetrical bends or cast-metal fittings. Field-made bends and offsets shall be made with a hickey or conduit-bending machine. Crushed or deformed conduits shall not be installed. Trapped conduits shall be avoided. Plaster, dirt or trash shall be prevented from lodging in conduits, boxes, fittings and equipment during construction. Clogged conduits shall be freed of all obstructions.

4.3.3 Conduits shall be fastened to all sheet metal boxes and cabinets with two locknuts where required by the NEC, where insulated bushings are used and where bushings cannot be brought into firm contact with the box; otherwise, at least a single locknut and busing shall be used. Locknuts shall be the type with sharp edges for digging into the wall of metal enclosures. Busings shall be installed on the ends of all conduits and shall be of the insulting type where required by the NEC.

4.3.4 Flexible connections of short length shall be provided for equipment subject to vibration, noise transmission, or movement and for all motors. Liquid-tight flexible conduit shall be used in wet locations. A separate ground conductor shall be provided across all flexible connections.

4.4 Boxes, Outlets and Supports: Boxes shall be provided in the wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be of the cast-metal hub type when located in normally wet locations, when surface mounted on outside of exterior surfaces, in hazardous areas, and when installed exposed up to 7 feet above interior floors and walkways. Boxes in other locations shall be sheet steel. Each box shall have the volume required by the NEC for the number of conductors enclosed in the box. Cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Separate boxes shall be provided for flush or recessed fixtures when required by the fixture terminal operating temperature, and fixtures shall be readily removable for access to the boxes unless ceiling access panels are provided. Boxes and supports shall be fastened to wood with wood screws or screw-type nails of equal holding strength, with bolts and expansion sheilds on concrete or brick, with toggle bolts on hollow masonry

units, and with machine screws or welded studs on steel work. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; cast metal boxes having threadless connectors and sheet metal boxes shall be supported directly from the building structure or by bar hangers. Where bar hangers are used, the bar shall be attached to raceways on opposite sides of the box and the raceway shall be supported with an approved type fastener not more than 24 inches from the box. Penetration into reinforced-concrete members shall avoid cutting any reinforcing steel.

4.4.1 Boxes for use with raceway systems shall not be less than 1½ inches deep except where shallower boxes required by structural conditions are approved. Boxes shall not be less than 4-inches square except that 4-inch by 2-inch boxes may be used where only one raceway enters the outlet.

4.4.2 Pull boxes of not less than the minimum size required by the NEC shall be constructed of code-gage galvanized sheet steel except where cast-metal boxes are required in locations specified above. Boxes shall be furnished with screw-fastened covers. Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly the electrical characteristics, circuit number, and panel designation.

4.5 Mounting Heights: Panelboards shall be mounted so the height of the top operating handle will not exceed 78 inches from the floor. Lighting switches, receptables and other devices shall be mounted as indicated.

4.6 Conductor Identification: Provide conductor identification within each enclosure where a tap, splice or termination is made. Identification shall be by color-coded insulated conductors, plastic-coated self-sticking printed markers, colored nylon cable ties and plates, or heat shrink type sleeves. Control circuit terminations shall be properly identified.

4.7 Splices: All splices shall be in accessible locations. Splices in wires No. 10 AWG and smaller shall be made with an insulated pressure type connector. Splices for wires No. 8 AWG and larger shall be made with a solderless connector and shall be covered with an insulation material equivalent to the conductor insulation.

4.7.1 Splices involving aluminum conductors shall be made with solderless circumferential compression type, aluminum bodied connectors UL listed for AL/CU. Remove all surface oxides from aluminum conductors by wire brushing, and immediately apply an oxide inhibiting joint compound and insulate splice.

4.8 Terminating Aluminum Conductors:

4.8.1 Terminate aluminum conductors to copper bus either by: (a) In-line splicing a copper pigtail to the aluminum conductor; copper pigtail shall have an ampacity at least that of the aluminum conductor; or (b) Utilizing a circumferential compression type, aluminum bodied terminal lug U.L. listed for AL/CU, and steel Belleville spring washers, flat washers bolts, and nuts. Belleville spring washers shall be of cadmium-plated hardened steel. Care should be taken to install the Belleville spring washers with the crown up toward the nut or bolt head, with the concave side of the Belleville bearing on a heavy-duty, wide series flat washer of larger

diameter than the Belleville. Tighten nuts sufficient to flatten Belleville and leave in that position. Lubricate all hardware with joint compound prior to making connection. Wire brush and apply joint compound to conductor prior to inserting in lug.

4.8.2 Terminate aluminum conductors to aluminum bus by utilizing ALL-ALUMINUM nuts, bolts, washers and lugs. Wire brush and apply joint compound to conductor prior to inserting in lug. Lubricate all hardware with joint compound prior to making connection; if bus contact surface is unplated, scratch-brush and coat with joint compound (WITHOUT grit).

4.9 Grounding and Bonding: Grounding and bonding shall, as a minimum, be in accordance with the NEC. All exposed non-current-carrying metallic parts of electrical equipment, metallic raceway systems, and neutral conductor of wiring systems shall be grounded. All grounding conductors shall be of copper.

4.10 Repair of Existing Work: The work shall be carefully laid out in advance, and where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for the proper installation, support, or anchorage of the conduit, raceways, or other electrical work, this work shall be carefully done, and any damage to buildings, piping, equipment shall be repaired by skilled mechanics of the trades involved, at no additional cost to the Government.

5. FIELD TESTS AND INSPECTION:

5.1 General: The Contractor shall show by demonstration in service that all circuits and devices are in operating condition. Tests shall be such that each item of control equipment will function not less than five times.

5.2 Test on 600-Volt Wiring: Test all 600-volt wiring to verify that no short circuits or accidental grounds exist. Tests shall be made using an instrument which applies a voltage of approximately 500 volts to provide a direct reading of resistance.

5.3 Grounding System Test: Test the grounding system to assure continuity and that the resistance to ground is not excessive. Each ground rod shall be tested for resistance to ground. Resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground rod under test isolated from other grounds. Written results of each test shall be submitted to the Contracting Officer, and shall indicate the location of the rod as well as the resistance and soil conditions at the time the measurements were made.

5.4 Tests and Inspections: The Contractor shall perform all field tests and inspections in accordance with Division 1, except that the Government will provide electric power required for the tests at no charge when available.

END

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