STANDARD FORM 30, JULY 1966
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.101

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

PAGE 1 OF 1

1. AMENDMENT/MODIFICATION NO.	2. EFFECTIVE DATE	3. REQUISITION/PURCHASE REQUEST NO.	4. PROJECT NO. *(If applicable)*
NO. 1	1 SEP 1981		Spec. No. 05-80-2043

5. ISSUED BY	CODE	6. ADMINISTERED BY *(If other than block 5)*	CODE
Officer in Charge of Construction Jacksonville, North Carolina Area Building 1005, Marine Corps Base Camp Lejeune, North Carolina 28542	406		

7. CONTRACTOR NAME AND ADDRESS — CODE — FACILITY CODE

(Street, city, county, state, and ZIP Code)

8.
[XX] AMENDMENT OF SOLICITATION NO. N62470-80-B-2043,
DATED 14 AUG 81 *(See block 9)*
[ ] MODIFICATION OF CONTRACT/ORDER NO. _____
DATED _____ *(See block 11)*

9. THIS BLOCK APPLIES ONLY TO AMENDMENTS OF SOLICITATIONS

[X] The above numbered solicitation is amended as set forth in block 12. The hour and date specified for receipt of Offers [ ] is extended, [X] is not extended.

Offerors must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation, or as amended, by one of the following methods:

(a) By signing and returning _____ copies of this amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE ISSUING OFFICE PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If, by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided such telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

10. ACCOUNTING AND APPROPRIATION DATA *(If required)*

11. THIS BLOCK APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS

(a) [ ] This Change Order is issued pursuant to _____
The Changes set forth in block 12 are made to the above numbered contract/order.

(b) [ ] The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in block 12.

(c) [ ] This Supplemental Agreement is entered into pursuant to authority of _____
It modifies the above numbered contract as set forth in block 12.

12. DESCRIPTION OF AMENDMENT/MODIFICATION.

REPLACE GENERATOR SYSTEM, BUILDING 20
at the
Marine Corps Base, Camp Lejeune, North Carolina

DIVISION 1. GENERAL REQUIREMENTS
SECTION 01011. General Paragraphs

6. DRAWINGS ACCOMPANYING SPECIFICATION: Add "(Revised 8/31/81)" to titles of NAVFAC DRAWINGS NO. 4049657 and 4049658.

Revised drawings accompany this amendment.

Except as provided herein, all terms and conditions of the document referenced in block 8, as heretofore changed, remain unchanged and in full force and effect.

13. [ ] CONTRACTOR/OFFEROR IS NOT REQUIRED TO SIGN THIS DOCUMENT [ ] CONTRACTOR/OFFEROR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN _____ COPIES TO ISSUING OFFICE

14. NAME OF CONTRACTOR/OFFEROR		17. UNITED STATES OF AMERICA	
BY _____ (Signature of person authorized to sign)		BY M. L. ENNETT By direction (Signature of Contracting Officer)	
15. NAME AND TITLE OF SIGNER *(Type or print)*	16. DATE SIGNED	18. NAME OF CONTRACTING OFFICER *(Type or print)*	19. DATE SIGNED
		R. E. CARLSON, CDR, CEC, USN for COMNAVFACENGCOM	1 SEP 1981

30-101

U.S. GOVERNMENT PRINTING OFFICE: 1974 O—554-534

NOTICE:

Bids to be opened at 2:00 P.M.
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.
N62470-80-B-2043

NAVFAC
SPECIFICATION
NO. 05-80-2043

Appropriation:

REPLACE GENERATOR SYSTEM, BUILDING 20

at the

Marine Corps Base, Camp Lejeune, North Carolina

DESIGN BY: Design Division, Public Works Department
Camp Lejeune, North Carolina

SPECIFICATION
PREPARED BY: K. L. Bearnes, Electrical Engineering Technician

APPROVED BY: J. H. Fitch, P.E., Manager
Specifications and Estimates Branch

John H. P. Cressman, P.E., Director
Design Division

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

CONTENTS

SECTION 00101. BIDDING INFORMATION

1. CONTENTS: This Invitation for Bids, IFB NO. N62470-80-B-2043, 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. 05-80-2043
(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:

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 REPLACE GENERATOR SYSTEM, BUILDING 20 Specification No. 05-80-2043" 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 entitled "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.

DIVISION 1. GENERAL REQUIREMENTS

SECTION 01011. GENERAL PARAGRAPHS

1. GENERAL INTENTION: It is the declared and acknowledged intention and meaning to provide and secure the replacement of an emergency generator system, complete and ready for use.

2. GENERAL DESCRIPTION: The work includes providing a new emergency generator, transformer, transfer switch, interior wiring, and incidental related work.

3. LOCATION: The work shall be located at the Marine Corps Base, Camp Lejeune, North Carolina, 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.

4. 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 $20 for each day of delay.

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

NAVFAC DWG. NO.	TITLE
4049657	Floor Plans and Schematic
4049658	Details

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: Notwithstanding the requirements of the General Provisions, immediately after award, the Contractor shall meet with the Contracting Officer and present a schedule of work. The schedule will be reviewed at this meeting and will be retained by the Contracting Officer for final review and approval.

9.1 The work is to be done in a water treatment plant which 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.

9.2 Permission to interrupt utility service shall be requested in writing at least 10 days in advance and approval of the Contracting Officer shall be received before any service is interrupted.

9.3 The Contractor shall remove all debris from all spaces being used by the activity at the end of each day or more frequently if required to keep the space usabl.

9.4 The normal working hours of Contracting Officer personnel are 7:45 A.M. to 4:15 P.M., Monday through Friday, excluding holidays. The building's normal operation schedule is 24 hours a day.

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. MATERIALS AND EQUIPMENT TO BE SALVAGED: Existing materials and equipment to be removed, and listed below, 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.

a. 15 KW generator

b. 75-ampere transfer switch

c. Control unit

13. 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.

14. 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.

15. 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

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

17. 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.

18. 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.

18.1 WARRANTY: The complete standby electric power system (equipped with set exerciser and running time meter) shall be warranted for a period of five years or 1500 operating hours, whichever occurs first, from the date of initial start-up. The warranty must be provided by the system manufacturer. Multiple warranties for individual components (engine, alternator, controls, etc.) will not be acceptable. Satisfactory warranty documents shall be submitted for approval.

18.2 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. N62470-80-B-2043

Inspector's Signature _____

STATION PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE

END

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-builit 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 issured 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 throughtout 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:

(i) 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.

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 E329-72 Inspection and Testing 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 N62470-80-C-2043 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 requiremtns 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.

SUBMITTAL STATUS LOG

"SEE INSTRUCTIONS ON REVERSE BEFORE FILLING IN"

PAGE ______ OF ______

CONTRACT NUMBER	SHORT TITLE	LOCATION	CONTRACTOR

SUBMIT'L/ TRANSMIT'L NO.	DESCRIPTION OF ITEMS	SPECIFICATION SECTION REQUIRING SUBMITTAL	SUBMITTAL REQUIRES: SHOP DWGS.	CATALOG DATA	SAMPLE	CERTIFICATION	TEST DATA	CONTRACTOR APPV'D	GOV'T APPROVED	CONTRACTOR ACTION: INSERT ACTION CODE	DATE OF ACTION	DATE FORWARDED FROM ROICC	ROICC ACTION: INSERT ACTION CODE	DATE OF ACTION	DATE: RECEIVED FROM ROICC	MAT'L/EQUIP RECEIVED ON SITE	APPROVED BY CONTRACTOR	REMARKS
(a)	(b)	(c)	(d)					(e)		(f)		(g)	(h)		(i)	(j)	(k)	

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. Colums (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 ROICC for record purposes.

5. In column (f) for those items requiring ROICC action (Action Code "D"), the reason for forwarding to the ROICC 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 ROICC for action

E - Forwarded to ROICC for record purposes

SECTION 01501. ENVIRONMENTAL PROTECTION

1. ENVIRONMENTAL PROTECTION PLAN: The Contractor may be responsible for the preparation and submission of an Environmental Protection Plan. If requested, 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 Enviornmental Protection Plan.

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. CONTROL AND DISPOSAL OF WASTES: All waste, 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 areas shall be left clean and natural looking. All signs of temporary construction and activities incidental to the construction of the required permanent work in place shall be obliterated.

DIVISION 2. DETAILED REQUIREMENTS

SECTION 02100. CUTTING, PATCHING AND REMOVAL

1. CUTTING shall be done by sawing along straight lines. The amount cut out shall be the minimum necessary to accommodate the new work. Removal shall be as indicated or required to accommodate new work.

2. HOLES shall be rotary drilled. The size shall be the minimum necessary to accommodate the new work.

3. PATCHING shall be done with materials which match the existing in quality and surface texture when finished.

4. WATERTIGHT INTEGRITY of the building shall be maintained throughout the work.

5. DEBRIS AND RUBBISH shall be removed from the site daily. Debris and rubbish shall not be allowed to accumulate in the building or on the site.

6. DEBRIS CONTROL: Debris shall be removed and transported in a manner that will prevent spillage on streets or adjacent areas.

7. REGULATION: Provisions of Section 01501 regarding hauling and disposal shall be complied with on the Base and all city, county and state regulations applicable shall be complied with off Base.

SECTION 03300. CAST-IN-PLACE CONCRETE

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.

AMERICAN CONCRETE INSTITUTE (ACI):

ACI 211.1-74	Recommended Practice for Selecting Proportions for Normal Weight Concrete.
ACI 308- 71	Curing Concrete.
ACI 315-65	Manual of Standard Practice for Detailing Reinforced Concrete Structures.
ACI 318-71 & 71C Supplement	Building Code Requirements for Reinforced Concrete
ACI 347-68	Recommended Practice for Concrete Formwork.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

C150-78	Portland Cement.

2. MATERIALS shall conform to the requirements and reference documents listed.

2.1 Concrete shall be ready-mixed concrete meeting design requirement of ACI 211, made with cement conforming to ASTM C150, 3,000 psi minimum.

2.2 Reinforcement shall be in accordance with ACI 315.

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: Exterior slabs shall be trowelled and given a broomed finish unless indicated otherwise.

SECTION 16011. GENERAL REQUIREMENTS, ELECTRICAL

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

1.1 Federal Specifications (Fed. Spec.):

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

1.2 Military Specifications (Mil. Spec.):

MIL-T-152B & Am 2	Treatment, Moisture-Fungus-Resistance of Communications, Electronic and Associated Equipment.
MIL-V-173C(1)	Varnish, Moisture and Fungus Resistant (For Treatment of Communication, Electronic, and Associated Equipment).
MIL-P-15328C & Am 1	Primer (Wash), Pretreatment Blue (Formula No. 117-B for Metals).
MIL-I-24092A & Am 2	Insulating Varnish, Electrical Impregnating.

1.3 American Society for Testing and Materials (ASTM) Publications:

B117-73	Salt Spray (Fog) Testing.

1.4 American National Standard Institute (ANSI) Publications:

Z 35.1-1972	Specifications for Accident Prevention Signs.

2. APPLICATION: This section applies to all sections of Division 16 of this project except as specified otherwise in the individual sections.

3. SUBMITTALS: Shop drawings, manufacturers's data and certificates for equipment, materials, finish, and pertinent details for each system shall be submitted and approved before procurement, fabrication or delivery of such items to the job site. Partial submittals are not acceptable and such submittals will be returned without review. Descriptive data shall be annotated to show the specific model, type and size of each item the Contractor proposes to furnish.

3.1 Shop Drawings: The drawings shall be a minimum of 8.5 by 11 inches in size, except as specified otherwise, and shall include plans, elevations, and sections of equipment and control spaces identifying and indicating proposed location, layout, and arrangement of items of equipment, control panels, accessories, one line diagrams, schematic diagrams, elementary diagrams, wiring diagrams, and any other items that must be shown to assure a coordinated installation. Wiring diagrams shall have their terminals identified and shall indicate the internal wiring for each item of equipment and the interconnection between the items. Drawings also shall indicate adequate clearance for operation, maintenance and replacement of operating equipment devices. If any equipment is disapproved, drawings shall be revised to show acceptable equipment resubmitted.

3.2 Manufacturer's Data: Information shall be submitted for all material and equipment as specified in the individual sections that the Contractor proposes to furnish for accomplishment of the contract work. Submittals for each manufactured item shall be manufacturer's descriptive literature, diagrams, performance and characteristic curves, and catalog cuts, and shall include the manufacturer's name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, specification reference, applicable Federal, Military, and Industry publication references and all other information necessary to establish contract compliance.

3.3 Standards Compliance: Where equipment or materials are specified to conform to requirements of the standards of organizations such as Underwriters Laboratories (UL), that use a label or listing as method of indicating compliance, proof of such conformance shall be submitted for approval. The label or listing of the specified organization will be acceptable evidence. In lieu of the label or listing, the Contractor shall 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 oranization's test methods and that the item conforms to the specified organization's standard.

3.4 Certified Test Reports: Where specified in the individual sections and before delivery of materials and equipment, certified copies of the reports of all tests required in referenced publications shall be submitted for approval. For materials for which certified test reports are not required in the individual sections, the testing requirements in referenced publications for materials will be waived provided the manufacturer submits certificates stating that previously manufactured materials have been tested by recognized 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.

3.5 Certificates of Compliance: Where specified in the individual sections, certificates from the manufacturer attesting that materials and equipment to be furnished comply with all requirements of this specification and of the reference publications shall be submitted for approval. The certificate 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 certificate should simply state that the product conforms to all requirements specified.

SAMPLE CERTIFICATE

The manufacturer hereby certifies that the following products being furnished for this project conform to all requirements of the project specifications and of the reference publications listed:

MANUFACTURER AND PRODUCT	REFERENCE PUBLICATIONS
John Doe Company Thermoplastic-Insulated Wire	UL 83-1975 (R JUN 77)

SIGNATURE AND TITLE

4. OPERATION AND MAINTENANCE MANUAL: An operation and maintenance manual for each electrical system, except as otherwise specified herein, and for each piece of equipment shall be furnished by the Contractor. Three copies of the manual bound in hardback binders or an approved equivalent shall be provided to the Contracting Officer. One complete manual shall be furnished prior to the time that system or equipment tests are performed, and the remaining manuals shall be furnished before the contract is completed. The following identification shall be inscribed on the cover: the words "OPERATING AND MAINTENANCE MANUAL", the name and location of the building and 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 systems, and of the local representatives for each item of equipment and each system. 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 instruction sheets shall be legible and easily read, with large sheets of drawings folded in. The manual shall include, but not be limited to, the following: a system layout showing circuits, devices and controls; wiring and control diagrams with data to explain detailed operation and control of each component; a control sequence describing start-up, operation and shut-down; a detailed description of the function of each principal component of the system; the procedure for starting; the procedure for operating; shut-down instructions; installation instructions; maintenance and overhaul 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 building site. The manual shall be complete in all respects for all equipment, controls, and accessories provided.

5. POSTED OPERATING INSTRUCTIONS: Operating instructions approved by the Contracting Officer shall be provided for each system and each principal piece of equipment for the use of operation and maintenance personnel. The operating instructions shall include wiring and control diagrams showing the complete layout of the entire system, including equipment, devices, and control sequence and shall be framed under glass or in approved laminated plastic and posted where directed by the Contracting Officer; printed or engraved operating instructions for each principal piece of equipment including start up, proper adjustment, operating, lubrication, shut-down, safety-precautions, procedure in the event of equipment failure, and any other necessary items of instruction as recommended by the manufacturer of the unit shall be attached to or posted adjacent to the piece 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.

6. INSTRUCTION TO GOVERNMENT PERSONNEL: When specified in other sections, the Contractor shall furnish, without additional expense to the Government, the services of competent instructors who will give full instruction to the designated personnel in the adjustment, operation, and maintenance, including pertinent safety requirements of the equipment or system specified. 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 (eight-hours) of instruction furnished shall be as specified in other sections.

7. DELIVERY AND STORAGE: Equipment and materials shall be properly stored and adequately protected and carefully handled to prevent damage before and during installation. Equipment and materials shall be handled, stored, and protected in accordance with the manufacturer's recommendations and as approved by the Contracting Officer. Electrical conduit shall be stored to provide protection from the weather and accidental damage. Plastic conduit shall be stored on even supports and in locations not subject to direct sun rays or excessive heat. Cables shall be sealed, stored and handled carefully to avoid damage to the outer covering or insulation and damage from moisture and weather. Damaged or defective items, in the opinion of the Contracting Officer, shall be replaced at no cost to the Government.

8. CATALOGED PRODUCTS: Materials and equipment shall be essentially the 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 essentially duplicate items that have been in satisfactory commercial or industrial use at least two years prior to bid opening. Where two or more units of the same class of equipment are required, these units shall, unless otherwise noted, be identical and shall be products of a single manufacturer. Each item of equipment shall have the manufacturer's name and address, and the model and serial number on the nameplate securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable. Nameplate for electrical apparatus shall conform to NEMA standards.

9. UNUSUAL SERVICE CONDITIONS: All items furnished under this Division shall be specifically suitable for the following unusual service conditions:

9.1 Altitude: Less than 30 feet above mean sea level

9.2 Ambient Temperature: 0-120 degrees Fahrenheit

9.3 Other Service Conditions: Marine coastal climate

10. SERVICE INTERRUPTIONS: Where interruption of existing service is necessary, the Contracting Officer shall be notified in writing at least 10 days in advance. The interruption shall not be made unless authorized. The outage shall be as short a duration as possible and will take place at a time that will least interfere with normal station activities. The Government will not be responsible for premium time to perform the work scheduled during the outage. See also paragraph "Scheduling the Work" in Section 01011.

11. WARNING SIGNS: Warning signs for electrical equipment and enclosures shall be provided for the fence, railing, or room enclosing electrical equipment such as substations, transformers, and switchgear having a nominal rating of 500 volts and above; and for the enclosure of metal-enclosed equipment, not so guarded or segregated. Signs shall conform to ANSI Z35.1, shall be of metal, and shall have the legend "DANGER HIGH VOLTAGE" in two lines of letters of nominal 3 inch height. The signs shall be of such number and position as to be readable from all accessible sides, and shall be not more than 30 feet apart.

12. FUNGUS CONTROL: Electrical equipment shall be treated to resist fungus and moisture.

12.1 Electrical Components: Components such as switches, fuses and contacts, shall not be treated. Other materials and components which are inherently fungus resistant or are protected by hermetic sealing need not be treated.

12.2 Circuit Elements: Elements, not covered above and which have a temperature rise of not more than 75 degrees F when operating at full load, shall be coated with a fungus resistant varnish conforming to Mil. Spec. MIL-V-173. The method of treatment shall be in accordance with Mil. Spec. MIL-T-152. Circuit elements include, but are not limited to, cable, wire, switchboards, panelboards, terminal and junction blocks, junction boxes, capacitors and coils.

12.3 Coils and Windings: Circuit elements such as motor coils, generator and dry type transformer windings, and similar electrical components, which have a temperature rise exceeding 75 degrees F when operating at full load, shall not be coated with a fungitoxic compound. Instead, such components shall be given two coats of varnish conforming to type M, class 130 and one sealer coat conforming to type M, class 130 of Mil. Spec. MIL-I-24092. The coats shall be applied by the vacuum-pressure, immersion, centrifugal, pulsating-pressure or built-up method so as to fill all interstices in the coils and preclude the entrapment of air or moisture. The sealer coat may also be applied by brushing or spraying.

13. VERIFICATION OF DIMENSIONS: The Contractor shall be responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The Contractor shall visit the premises and thoroughly familiarize himself with all dimensions in the field, and to advise the Contracting Officer of any discrepancy before performing any work.

14. 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.

15. MECHANICAL REQUIREMENTS: The interconnecting power wiring and conduit, control wiring rated over 120 volts and conduit, the motor-control equipment forming a part of motor-control centers, of switchgear assemblies, and the electrical power circuits are included under this Division. The electrical components of mechanical equipment such as motors, motor starters, control or push-button stations, float- or pressure-switches, solenoid valves, electrical disconnecting (isolating)

means, and other devices functioning to control associated mechanical equipment are specified in the appropriate sections covering such work. Interconnecting wiring for components of packaged equipment shall be provided as an integral part of the equipment as specified elsewhere in the appropriate sections covering such work.

16. COORDINATION: Electrical work shall be coordinated with other trades involved in the construction project. All work shall be carefully laid out in advance coordinating architectural, structural, mechanical, and electrical features of construction.

17. PAINTING OF EQUIPMENT: Equipment painting, both shop and field applied, shall be as specified herein, and provided under the individual sections of this Division. It is desirable that all paint be shop applied; however, if the manufacturer's standard shop painting system does not meet these requirements, field painting shall be provided.

17.1 Field Painting: Aluminum surfaces shall not be painted. Dirt, rust, oil and grease shall be removed 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. Coatings shall be applied to clean and dry surfaces only. Where more than one coat of paint is specified, the second coat shall be applied after the preceding coat is thoroughly dry. Damaged painting shall be retouched before applying the succeeding coat. Shop coats shall be lightly sanded before application of field applied coats.

17.1.1 Metal Surfaces Subject to Temperatures Less Than 120 Degrees Fahrenheit: Surfaces shall receive: one coat of pretreatment primer conforming to Mil. Spec. MIL-P-15328 applied to a dry film thickness of 0.3 to 0.5 mil; one coat of primer conforming to Fed. Spec. TT-P-645 applied to a minimum dry film thickness of 1.0 mil; and two coats of enamel conforming to Fed. Spec. TT-E-489, applied to a minimum dry film thickness of 1.0 mil per coat.

17.1.2 Metal Surfaces Subject to Temperatures Between 120 and 400 Degrees Fahrenheit: Surfaces shall receive two coats of heat resisting enamel conforming to Fed. Spec. TT-E-496, Type II, applied to a total minimum thickness of 2 mils.

17.1.3 Metal Surfaces Subject to Temperatures Greater Than 400 Degrees Fahrenheit: Surfaces shall receive two coats of heat resisting aluminum paint conforming to Fed. Spec. TT-P-28 applied to a total minimum dry film thickness of 2 mils.

17.2 Optional Paint Systems: Manufacturer's standard equipment painting systems may be provided in lieu of the systems specified herein-before provided the Contractor submits certification that the 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, except that a 20 percent sodium chloride solution shall be used for the salt spray. Immediately after completion of the test, the paint shall show no signs of blistering, wrinkling or cracking; 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 paint system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard painting system is being proposed for use in lieu of specified systems using Fed. Spec. TT-E-496 or TT-P-28, certifications that the manufacturer's standard system will conform to the heat resistance requirement of Fed. Spec. TT-E-496 or TT-P-28 as applicable, shall be submitted in addition to other certifications.

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SECTION 16201. DIESEL GENERATORS

1. APPLICABLE PUBLICATIONS: The publications 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:

HH-I-523C	Insulation Blocks and Pipe Covering, Thermal (Calcium Silicate).
HH-P-46E	Packing; Asbestos, Sheet, Compressed.
WW-V-51E & Am 2	Valves, Bronze; Angle, Check and Globe (125, 150 and 200 Pound; Screwed, Flanged and Solder).
WW-V-54D & Am 3	Valves, Gate, Bronze (125, 150 and 200 Pound; Screwed, Flanged and Solder).

MILITARY SPECIFICATIONS:

MIL-F-16081G	Fans, ventilating, propeller.
MIL-I-16165D	Interference Shielding, Engine Electrical Systems.
MIL-G-17713A	Gages, Liquid Level Measuring, Tank.
MIL-L-18145C	Louver, Metal; Exhaust Opening and Gravity Closing Type.
MIL-V-18436C & Am 2	Valves, Check.
MIL-G-19826D	Generator Sets, Diesel Engine, Alternating Current, for Public Works Construction; 10 KW Through 200 KW.
MIL-STD-461A	Electromagnetic Interference Characteristic Requirements for Equipment.

AIR MOVING AND CONDITIONING ASSOCIATION (AMCA):

210-74	Test Code for Air Moving Devices.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

B16.3-71	Malleable-Iron Screwed Fittings, 150 and 300 Pounds.
B16.5-73	Steel Pipe Flanges and Flanged Fittings.
B16.9-71	Wrought Steel Butt-Welding Fittings.
B16.11-73	Forged Steel Fittings, Socket-Welding and Threaded.
B16-18-73	Cast-Bronze Solder-Joint Pressure Fittings.
B16.21-72	Nonmetallic Gaskets for Pipe Flanges.
B16.22-73	Wrought Copper and Bronze Solder-Joint Pressure Fittings.
B31.1-77 & Am 77	Power Piping.

AMERICAN SOCIETY OF HEATING, REFRIGERATING & AIR CONDITIONING ENGINEERS (ASHRAE):

1975	Equipment; Handbook and Product Directory.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

A-53-76	Welded and Seamless Steel Pipe.
A120-76	Black and Hot Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe.
A525-73	Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process.
B88-76	Seamless Copper Water Tube.

DIESEL ENGINE MANUFACTURERS ASSOCIATION (DEMA):

1972	Standard Practices for Stationary Diesel Engines.

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE):

115-1965	Test Procedures for Snychronous Machines.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

30-73	Flammable and Combustible Liquids Code.
37-70	Stationary Combustion Engines and Gas Turbines.
70-78	National Electrical Code.
90A-76	Air Conditioning and Ventilating Systems.

SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION (SMACNA):

1969	Low Velocity Duct Construction Standards.

STEEL STRUCTURES PAINTING COUNCIL (SSPC):

PS 10.02-64T	Coal Tar Coating System No. 10.02 Cold-Applied Coal Tar Enamel.

UNDERWRITERS' LABORATORIES, INC. (UL):

1008-77	Automatic Transfer Switches.

MANUFACTURER'S 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.

2. GENERAL REQUIREMENTS: Section 16011, General Requirements, Electrical, with the following additions and modifications, applies.

2.1 Description of Work: The work includes providing diesel-engine-driven electric generator set, and related work. The system shall be complete and ready for operation. Equipment, materials, installation, and workmanship shall be in accordance with NFPA 37 and 70, except as specified or indicated otherwise. Capacity and efficiency of equipment shall be not less than that specified or indicated. In the NFPA Standards and SMACNA Manuals referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears; reference to the "authority having jurisdiction" shall be interpreted to mean the Contracting Officer.

2.2 Submittals Required: The submittal requirements of Section 16011, General Requirements, Electrical apply to the following lists. Items in the lists which are followed by (CO) shall be approved by the Contracting Officer.

2.2.1 Manufacturer's Data:

a. Diesel Engine Driven Electric Generator Set (CO)
b. Automatic Transfer Switch (CO)
c. Louvers
d. Exhaust Fans
e. Valves
f. Fuel Day Tank (CO)
g. Fuel Transfer Pumps (CO)
h. Fuel Line Strainers
i. Engine Muffler (CO)
j. Insulation
k. Pipe Hangers and Supports
l. Generator Set Weatherproof Enclosure (CO)

2.2.2 Shop Drawings and Calculations: Pertaining to the diesel-generating unit and auxiliary equipment.

a. Certified outline, general arrangement setting plan, and anchor bolt detail drawings. Drawing shall show the total weight and center of gravity of the assembled equipment on mounting skid. (CO)

b. General arrangement and detail piping drawings of the exhaust and air intake piping systems.

c. Dimensional drawings of exhaust silencers

d. General arrangement drawings showing location of all auxiliary equipment in relation to the diesel generating unit (CO)

e. Piping schematics for fuel oil, lubricating oil, jacket water and cooling water

f. BMEP calculations (CO)

g. Battery sizes and cranking time calculations (CO)

h. Critical speed calculations (CO)

i. Drawings for the automatic transfer switch, including certified outline, general arrangement and detail drawings (CO)

j. Electrical elementaries, schematics and wiring diagrams, including details of the safety shutdown systems and main generator circuit breaker trip system

2.2.3 Certified Test Reports:

a. Diesel Engine Shop Tests (CO)
b. Generator Shop Tests (CO)
c. Diesel Engine Driven Electric Generator Set Shop Tests (CO)
d. Automatic Transfer Switch (CO)

2.2.4 Certificates:

a. Diesel Engine Driven Electric Generator Set (CO)
b. Automatic Transfer Switch (CO)
c. Exhaust Louvers
d. Exhaust Fans
e. Piping
f. Valves
g. Motor Driven Fuel Oil Pump
h. Fuel Oil Day Tank
i. Insulation
j. Pipe Hangers and Supports

2.2.5 Operation and Maintenance Manual: Within 30 days after all shop drawings have been approved, a complete set of operation and maintenance instructions shall be submitted for approval. A copy of the first draft shall be acceptable for this submittal. (CO)

2.3 Operating Experience Requirements: The engines installed shall meet all of the operating experience requirements hereinafter and the Contractor shall furnish a certificate within 30 days after award containing supplementary information, all as delineated below.

2.3.1 Certificate: Must certify that not less than two engines of identical number of cylinders and cylinder size, identical rotative speed and identical or higher BMEP, and of the same basic configuration in-line as the engine to be furnished under this contract shall have driven generators which produced in satisfactory operation not less than 1,000 kilowatt hours of electricity for each KW of generator name plate capability within a two year period. In determing this experience:

a. Only stationary electric generation service is considered as equivalent experience. Engines driving pumps or compressors or in marine propulsion or railroad service are not acceptable as such experience.

b. Only experience on the same engine model is acceptable. Engine model is considered to be a given series or class of identical bore and stroke and of the same type of engine such as in-line. In-line engines with identical bore and stroke are considered as two separate models of engines.

c. Only experience at the identical rotative speed as that which is offered is acceptable.

d. Only experience at the identical or higher brake mean effective pressure as that which is offered is acceptable.

e. Only experience with oil and dual fuel engines is acceptable as such experience.

2.3.2 Information to be contained in the certificate shall include:

a. List of at least two engine installations meeting the requirements set forth above.

b. Owner and location of each such installation.

c. Date of initial operation at each such installation.

d. Number of kilowatt hours produced per KW of generator rated capability of each installation.

e. Horsepower rating, kilowatt rating, and rotative speed of each unit.

f. Brake mean effective pressure rating of each engine.

g. Design characteristics of each unit such as bore and stroke, number of cylinders and configuration in-line.

3. DIESEL-ENGINE-DRIVEN ELECTRIC GENERATOR SET: MIL-G-19826, Type I, Style A, Class 1, except as specified otherwise.

Vibration isolation devices standard with the manufacturer shall be provided that will effectively eliminate excessive vibration. Diesel engine shall be water cooled with radiator and outward blow fan. Starting of the diesel generator set shall be automatic on loss of power and manually by push button from a battery power source. Lifting attachments and tie down devices shall be provided. Radio interference suppression shall be provided.

3.1 Capacity: Each electric generator set shall have a net rating of 175 KW, 480 volts, three phase, three-wire, 0.8 power factor, 60 Hertz. Three phase stator windings shall be connected delta.

3.2 Equipment Rating and Capability: The gross kilowatt rating of each diesel generating unit shall be not more than the figure obtained by multiplying the delivered shaft horsepower rating of the engine by 0.746 and by the overall efficiency of the generator at the corresponding load. The overall efficiency of the generator shall allow for power required to operate the exciter, including power consumed in losses and in windage and friction for the generator and the rotating exciter. The rated net capacity of each generating unit is defined as the gross electrical power output of the generator minus the total electrical power requirements of the electric motor driven engine accessories normally constituting part of the "engine assembly", as defined in the DEMA Publication: Standard Practices for Stationary Diesel and Gas Engines.

3.3 Critical Speeds: Each complete diesel-electric generating unit shall be free of critical speeds of either a major or minor order that will endanger the satisfactory operation of the unit or cause undue vibration in any part of the plant equipment or structure. Satisfactory operation will be considered endangered if torsional vibration stresses exceed 5,000 psi within 10 percent above or below rated engine speed. Copies of a summary of computations on critical speeds shall be submitted to the Contracting Officer.

3.4 Engine Preheat System: Each engine shall be provided with a thermostatically controlled engine preheat system capable of maintaining the jacket water at a temperature recommended by the engine manufacturer for starting at zero degrees Fahrenheit ambient temperature. With the engine preheat system in operation for not less than six hours, the engine shall start and accept not less than 75 percent of rated load in not more than 90 seconds at ambient temperatures from 125 to zero degrees F at altitudes from sea level to 1500 feet. Preheat system shall be

electric and designed to operate on 120 volt, 60 Hertz, single phase, A.C. power supply.

3.5 Nonoperating Protection: When the engine is not operating, and without the use of the engine preheat system, the engine shall be protected so as not to be damaged by ambient temperatures from 155 to zero degrees F.

3.6 Cranking System: Electric starting of each diesel shall be provided, including all appurtenances and mechanisms necessary for automatic start-automatic stop operation of the electric generating unit, and other auxiliary control equipment necessary for the automatic transfer of power from the normal line power source to the diesel generator power source. When the normal power source fails, the generating unit shall be capable of assuming full load automatically.

3.6.1 Cranking Cycle: Automatic starting controls shall be provided to crank the engine according to a preset sequence. The starting sequence shall consist of three cranking attempts of approximately 20 seconds each with a rest interval of approximately 10 seconds between each attempt. An overcranking relay shall be provided to stop the cranking cycle if the engine does not start after the third attempt. After the overcranking relay has been activated, manual resetting of a lockout device shall be required before the engine can be started. Whenever overcranking occurs, an audio alarm shall sound and a visual alarm shall indicate the condition.

3.6.2 Storage Batteries: Shall be sized by the manufacturer to provide not less than 5 minutes of total cranking time intermittently applied during a twenty-four minute period at zero degrees F., while retaining a battery voltage of 1.0 volt or more per cell. The specific gravity shall not exceed 1.250. The batteries shall be complete with connectors, connector terminals, acid resistant racks and one filling of electrolyte. A battery charger conforming to MIL-G-19826 shall be provided.

3.7 Overspeed Shutdown System: The overspeed sensing device shall be mounted on the engine, easily accessible, and shall directly measure the engine's speed. Belt connections shall not be allowed. The overspeed system shall operate independently of the engine's speed governing system. When the engine's speed reaches or exceeds 110 percent of synchronous speed, the overspeed sensing device shall react to shut off the engine's air or fuel supplies or both and shall trip the generator's main circuit breaker. Whenever overspeed occurs, an audio alarm shall sound and a visual alarm shall indicate the condition.

3.8 Annunciation and Alarm System: Each engine generator set shall be provided with an annunciation and alarm system. Except as noted

otherwise, the diesel engine battery shall provide power to operate the annunciation and alarm systems. As a minimum, each system shall be provided in accordance with MIL-G-19826. In addition, the systems shall be provided as specified hereinafter.

3.8.1 Visual indicators to annunciate each safety shutdown condition-high coolant temperature, low oil pressure, overcranking and overspeed - shall be provided. Each indicator shall be properly identified. Indicators shall be activated by the shutdown devices.

3.8.2 An audio alarm activated by the shutdown devices specified hereinbefore shall be provided. In addition, pre-shutdown alarm devices sensing the conditions of high coolant temperature, low oil pressure, and low fuel level shall be provided and shall also activate the audio alarm. A silencing switch shall be provided and properly identified.

3.9 Auxiliary Contacts: Upon engine start, auxiliary contacts in the diesel engine-generator control circuitry shall energize the exhaust fan. Upon engine stop, this control circuitry shall maintain the exhaust fan running for an additional cooling period of fifteen minutes.

3.10 Generator: Generator, including all related systems, such as excitation system, voltage regulator, generator control panel and control devices shall conform to MIL-G-19826. Thermostatically controlled strip heaters shall be provided in the generator windings. A pilot light, located on the generator control panel shall be provided to indicate when the strip heaters are operating. The light shall be identified and a "lamp test" switch shall be provided.

4. RADIO-INTERFERENCE SUPPRESSION: The diesel engines shall comply with MIL-I-16165 relative to radiated radio interference. Generators and other devices capable of producing radio interference shall comply with MIL-STD-461 relative to radiated and conducted radio interference.

5. AUTOMATIC TRANSFER SWITCH: Shall conform to UL 1008, except as specified otherwise, and shall be rated 400 amperes for all class of loads 3 pole for 480 volt, 3 phase, 3 wire normal source and 480 volt, 3 phase, 3 wire emergency source. The transfer switch shall be of the mechanically held type so that once it has transferred to either the normal or emergency position, it does not depend on the application of power to hold it in position. The switch shall be a true double throw switch so that when transferring, the normal and emergency poles cannot both be in a sustained closed position at the same time. All moveable and stationary main contacts, arcing contacts and relay contacts, all coils, spring and control elements shall be so constructed that maintenance and repairs can be easily accomplished.

5.1 Manual Operator: Shall be provided to allow for transfer in either direction in the event of an electrical failure in the control circuit. A test switch to simulate normal failure shall be provided.

5.2 Relays: Shall meet NEMA and IEEE standards for industrial type power relays. Relays and controls shall be arranged so that when any phase of the normal source drops to 70 percent or less of rated voltage for an adjustable period of 0 to 3 seconds, the engine-generator shall automatically start. A voltage frequency sensitive relay shall be provided so that the switch will not transfer to the emergency source until the voltage and frequency of this source are within 90 to 95 percent of rated value. The switch shall retransfer to the normal source when all phases have been restored to 90 percent or more of rated voltage for an adjustable period of 0 to 2 minutes. In the event of failure of emergency power during this 0 to 2 minutes period, the switch shall retransfer to normal as soon as all phases of the normal source are restored to 90 percent or more of rated values. The complete transfer time in either direction measured from energization of the operating mechanism to completion of transfer shall not exceed 1/6 second.

5.3 Main Contacts: Shall be silver surfaced or silver alloy and provided with arc chutes on all poles. Each main contact shall be protected by separate arcing contacts or other provisions to minimize errosion of the main current carrying contacts.

5.4 Transfer Switch: Shall have a minimum inrush current rating of 20 times rated current and a minimum interrupting capacity of 6 times rated current.

5.5 Control Circuitry: Shall be provided with necessary contacts to initiate starting controls of the emergency generator.

5.6 Automatic Transfer Switch: Shall be provided in an unventilated NEMA-1 enclosure. Enclosure shall provide adequate space for all wires and connections.

5.7 Certified Test Data from a recognized testing laboratory shall be submitted to establish conformance with the requirements specified herein. The test data shall show that tests as listed below have been conducted on a switch of the same amperage rating, with voltages equal to or greater than the voltage specified. Single pole or single phase data will not be acceptable. During testing, normal and emergency sources shall be separated 120 electrical degrees. The required tests, which shall be as specified in UL 1008, are as follows: overload, temperature rise, endurance, withstand current rating (WCR), dielectric breakdown.

6. Fuel Oil Day Tank shall be provided mounted on the generator and shall conform to NFPA 30 and UL 142. Tank shall be complete with all hangers, brackets, fittings, vents, low fuel level alarm switch and other accessories required for installation. Tank hsll have a minimum storage capacity of 108 gallons.

7. ENGINE EXHAUST SYSTEM EXTERNAL TO ENGINE:

7.1 Exhaust Muffler: Engine exhaust muffler silencer shall be provided with each generator set. Muffler shall have flanged connections and shall be provided in accordance with the engine manufacturer's recommendations for residential class silencing.

7.2 Exhaust Piping: Shall be schedule 80 black steel pipe conforming to ASTM A53 or A120. Piping 2 inches and smaller shall have threaded fittings. Piping 2.5 inches and larger shall have welding fittings. Threaded fittings shall conform to ANSI B16.3, Class 300. Welding fittings shall conform to ANSI B16.9 of the same material and weight as the piping in which they are installed. Welding shall be in accordance with ANSI B31.1, including qualification of welders. Certifications of each welder's qualifications shall be submitted to the Contracting Officer. Flexible piping connectors shall be provided at the exhaust piping connection to diesel engine. Flanges shall be provided for final connections to diesel engines, exhaust mufflers and flexible connections. Gaskets shall be 0.06 inch thick asbestos packing conforming to HH-P-46.

8. PIPE HANGERS AND SUPPORTS: Shall be provided and shall conform to MSS SP-58 and SP-69. Exhaust piping shall have adjustable pipe hangers Type 1 or Type 6, with insulation protector Type 40. Support rods shall be steel. Isolation supports shall be provided for all piping connections to the generator set. The finish of pipe hangers and supports shall be zinc- or cadmium-plated.

9. WEATHERPROOF ENCLOSURE: Provide for each engine generator set and fabricate from zinc-coated or phosphatized and shop primed sheet steel in accordance with the manufacturer's standard design. Provide a complete, weatherproof enclosure for the engine, generator, control panel, excitation equipment, voltage regulator, engine safety control, fuel oil day tank and accessories. The housing shall have sufficient louvered openings to allow entrance of outside air for engine and generator cooling at full load. Louvered openings shall be designed to exclude driving rain and snow. There shall be properly arranged and sized, hinged panels in the enclosure to allow convenient access to the engine, generator and control equipment for maintenance and operational procedures. inged panels shall be provided with spring type latches which shall hold the panels closed securely and will not allow them to vibrate. The housing shall be braced internally to prevent excessive vibration when the set is in operation.

10. SPECIAL WRENCHES AND TOOLS: Wrenches and tools specifically designed and required to work on the new equipment, which are not commercially available as standard mechanic's tools, shall be furnished to the Contracting Officer.

11. INSTRUCTING OPERATING PERSONNEL: Upon completion of the work and at a time designated by the Contracting Officer, the services of a competent engineer regularly employed by the diesel generator set manufacturer shall be provided for a period of not less than one 8-hour working day for the instruction of the Government operating personnel in the proper operation and maintenance of the equipment.

12. IDENTIFICATION TAGS AND PLATES: All unidentified operator controls and indicating devices, gages, thermometers, and controllers shall be provided with tags identifying the equipment usage. Plates and tags shall be of brass with stamped letters, or gloss-finished laminated black plastic with engraved white letters, and shall be securely mounted or attached.

13. SPARE PARTS: The Contractor shall provide to the Contracting Officer a suitable spare parts locker and the following spare parts for each size diesel generator furnished under this contract:

(a) one fuel injection line assembly
(b) one complete set of gaskets
(c) one complete set of bearings
(d) one complete set of piston rings
(e) one exhaust valve
(f) one exhaust valve spring assembly
(g) one exhaust valve retainer
(h) two complete injector assemblies
(i) six fuel oil filters
(j) six lube oil filters
(k) six intake air filters (if of the disposable type)
two intake air filters (if of the cleanable type)
(l) one complete injector assembly
(m) one fuel injection line assembly
(n) one complete set of gaskets
(o) two fuel oil filters
(p) two lube oil filters
(q) two intake air filters

14. ERECTION SUPERVISION: The Contractor shall furnish the services of a qualified erection engineer regularly employed by the diesel generator set manufacturer to supervise the installation and field testing of the diesel generator set, automatic transfer switch, and auxiliaries.

14.1 Installation: The erection engineer shall make periodic inspections as the installation progresses to insure manufacturer's recommendations are followed. He shall provide written reports to the Contracting Officer stating either that the installation is satisfactory or that the installation is unsatisfactory. Unsatisfactory reports shall include a listing of deviations and recommended corrections.

14.2 Initial Start-Up: After the installation is complete, the erection engineer shall conduct a final pre-start check. He shall inspect the diesel generator, fuel supply systems, controls, transfer switch, and all auxiliary equipment. The erection engineer shall conduct the initial start-up and shall check the engine and generator for normal operation.

14.3 Acceptance Test: The erection engineer shall be present for the final acceptance test of the diesel generating unit. During the unit acceptance test, the erection engineer shall conduct the tests specified in the paragraph entitled "Diesel Generating Unit Acceptance Tests" and shall provide the Contracting Officer with a written test report showing the tests performed and the results of each test.

15. TESTS AND INSPECTIONS: Test procedures shall be as specified herein and shall conform to standards of the American Society of Mechanical Engineers, the Institute of Electrical and Electronic Engineers, the American National Standards Institute, and the Diesel Engine Manufacturers Association.

15.1 Shop Tests: Shop tests shall be performed on each complete shop assembled diesel engine driven generator unit prior to shipment. The Contractor shall provide the Contracting Officer with certified copies of all manufacturers' test data and results. The Contractor shall give the Contracting Officer two weeks advance notice of his intention to perform the tests and the right is reserved for a representative of the Contracting Officer to witness all such tests. All equipment necessary for tests shall be provided by the manufacturer performing the tests, and all measuring and indicating devices shall be certified to be within calibration or correction data furnished for the device. Tests shall indicate satisfactory operation and attainment of guarantees and specified performance. If satisfactory in all respects, the quipment so tested will be given a tentative approval. Following the complete installation of all equipment, further tests will be performed to insure satisfactory operation.

15.1.1 Generator Shop Tests: Temperature tests on the generator shall be performed by the manufacturer of that equipment in his own plant prior to installation on the generating unit mounting base. Temperature tests shall be in accordance with IEEE No. 115.

15.1.2 Diesel Engine Shop Tests: Hydrostatic test shall be performed to assure that water seals and water jackets are water tight. Test report shall indicate that test was performed, pressure at which test was made and results.

15.1.3 Diesel-Engine-Driven Generating Unit: Shall be placed in continuous operation without stoppage for a period of not less than four hours. During this period, the diesel generator unit shall be operated one hour at each load point of half, three-quarter, full load and 110 percent of rated load at either 0.80 or 1.0 power factor. If stoppage becomes necessary during this period, the 4-hour run shall be repeated. The following data shall be recorded at the start, at 15 minute intervals and at the end of each load run, except as specified otherwise.

a. Fuel consumption - date recorded at 60 minute intervals.

b. Exhaust temperatures.

c. Jacket water temperatures.

d. Lube oil temperatures and pressures.

e. Crankcase vacuum.

f. Rpm's.

g. Voltage, amperage, frequency.

15.1.4 Shipment of Equipment: Contractor shall not commence shipment of the equipment without having approval of the shop test reports.

15.2 Field Tests and Inspections: All equipment, apparatus and consumables necessary for the tests shall be provided by the Contractor. All defects disclosed by the tests shall be corrected by the Contractor without additional cost to the Government. Tests shall be made under the direction of the erection engineer and subject to the prior approval of the Contracting Officer or his authorized representative.

15.2.1 Piping Tests: Piping systems shall be tested after the lines have been cleaned and before any insulation covering has been applied. The fuel storage tanks and piping system shall be tested at 1.5 times the working pressures, but in no instance less than 50 psig for the piping and 10 psig for the tanks, and shall show no leakage or reduction in gage pressure after 4 hours. In all tests, gages, traps and other apparatus which may be damaged by the test, pressure shall be removed or valved off from the system before the tests are made. A calibrated test pressure gage shall be installed in the system to observe any loss in pressure. All joints in piping systems tested with air shall be brushed with a soapy water solution to check for leaks. The required test pressure shall be maintained for a sufficient length of time to enable an inspection to be made of all joints and connections. All defects which develop during testing shall be corrected, and the piping systems shall be retested until they show no defect or weakness and are tight.

15.2.2 Preliminary Operations: The Contractor shall perform all work of placing in operation all equipment provided or installed by him, except as specifically noted otherwise. All adjustments to equipment that are necessary shall be made to assure proper operation as instructed by the manufacturers of the equipment. Equipment shall be lubricated prior to operation in accordance with the manufacturer's instructions. Lubricants will be provided by the Contractor. All motors shall be

dried out before operation as required to develop and maintain proper and constant insulation resistance. Upon approval by the Contracting Officer or his authorized representative, the diesel generating unit shall be operated under the supervision of the supervising erector at varying loads throughout the load range for a sufficient time to demonstrate that operation is proper and that all pressures and temperatures are normal and within the specified limits. The engine shall be operated for a period of time sufficient to assure that the unit is ready to carry the test loads specified herein without damage to any of the engine parts. During this preliminary operation, the Contractor and erection engineer shall check the operation of all auxiliary equipment furnished under this contract to determine that it is functioning properly, and the Contractor shall make such adjustments to all equipment as are necessary to place it in first class operating condition in conformance with the contract requirements. (Plant electrical system load shall be used for loading the generating unit under test.) (Contractor shall furnish a suitable load bank for the generating unit under test.)

15.2.3 Electrical Tests:

a. Phase Relationship Tests: Connections to all equipment shall be checked for proper phase relationship. During such check, all devices which could be damaged by the application of voltage or reversed phase sequence shall be disconnected.

b. Equipment Tests: Following installation and immediately prior to energization, circuit breakers, transfer switch, meters, relays and controls shall be tested and adjusted in accordance with the applicable referenced specifications. Completed generator control panel shall be tested by operation under simulated service conditions to assure the accuracy of wiring and the proper functioning of the equipment. Copies of test data and results, including test reports on instrument transformers shall be submitted to the Contracting Officer.

c. Insulation Resistance Tests: Shall be performed on cables and equipment as listed herein. Tests shall be made with motor driven or rectifier type insulation resistance testers having ranges of 500 and 2500 volts DC. All solid state and other equipment which may be damaged by such tests shall be disconnected before the tests are made. Tests shall measure insulation resistance from line to ground. Five KV circuits and equipment shall be tested for one minute duration, using the 2500 volt tester range. Cables shall be tested after placement of cables and the completion of the terminations, but before connection to equipment. Six hundred volt class circuits and equipment, including current transformer and potential transformer secondary circuits and equipment, shall be tested with the 500 volt tester range. Minimum acceptable values of insulation resistance of circuits and equipment

shall be as recommended by the manufacturer. The Contractor shall provide for the Contracting Officer or his authorized representative, test reports listing test equipment used, person or persons performing the tests, the date tested, the circuits or equipment tested and the results of the tests.

15.2.4 Diesel Generating Unit Acceptance Tests: When the Contractor considers the installation complete and in first class operating condition, and after preliminary operation has been successfully demonstrated, he shall give two weeks advance notice to the Contracting Officer, in writing, that the generating units and auxiliary equipment are ready for final field tests. The Contracting Officer or his authorized representative will witness final acceptance tests. The erection engineer shall perform tests to make certain that all equipment is functioning properly. These tests shall include the following:

a. Observe and record unit operating parameters including oil temperature and pressure, coolant temperature, rpm, voltage, frequency, and amperage to verify all values are within normal limits.

b. Test to verify generating unit speed regulation under a gradual change from zero to full load.

c. Test to verify generating unit instantaneous speed change with 25 percent load on or off.

d. Test to assure proper functioning of the overspeed trip.

e. Individual test of each alarm and prealarm switch to verify correct operation of the annunciation and alarm system.

f. Simulated power outage.

All auxiliary equipment, including but not limited to pumps, compressors, fans, heat exchangers, radiators, cooling towers, instruments, centrifuges, and special valves shall be inspected to assure proper operation. Any or all auxiliary equipment may be field tested at the option of the Contracting Officer. All diesel generating unit tests shall be performed in accordance with the provisions of the "Field Testing", as set forth in the "Standard Practices" of the Diesel Engine Manufacturers Association, except as modified herein. Upon completion and final approval of the last test, the day tank for the diesel generator shall be filled to capacity with diesel fuel oil.

15.3 Test Report: Upon completion of acceptance testing, the erection engineer shall prepare a test report indicating the tests performed and the results of those tests. If all systems are in proper

operating condition and the installation is satisfactory, the erection engineer shall indicate this on the test report. The report shall be dated, signed and given to the Contracting Officer. This report will not constitute automatic acceptance of the installation by the Government, but will be used only to verify that in the opinion of the erection engineer, as a representative of the diesel generator manufacturer, the installation is in excellent operating condition.

SECTION 16300: ELECTRICAL DISTRIBUTION, EXTERIOR

1. APPLICABLE DOCUMENTS: The following specifications and standards of the issues listed below (including the amendments, addenda, revisions, and errata designated), but referred to hereinafter by basic designation only, form a part of this specification to the extent required by the references thereto:

FEDERAL SPECIFICATIONS:

J-C-30A	Cable and Wire, Electrical (Power Fixed Installation).
J-C-145b(1)	Cable, Power, Electrical and Wire, Electrical (Weather-resistant).
QQ-W-343D	Wire, Electrical (Uninsulated).
SS-S-210A(1)	Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints.
TT-E-489F (Int. AM-1)	Enamel; Alkyd, Gloss (For Exterior and Interior Surfaces).
TT-P-645	Primer, Paint, Zinc Chromate, Alkyd Type.

MILITARY SPECIFICATIONS:

MIL-B-7883B	Brazing of Steels, Copper, Copper Alloys, Nickel Alloys, Aluminum and Aluminum Alloys.
MIL-C-18480A(3)	Coating Compound, Bituminous Solvent, Coal Tar Base.
MIL-I-15126F(2)	Insulation Tape, Electrical, Pressure Sensitive Adhesive and Pressure Sensitive Thermosetting Adhesive.
MIL-P-15328C(1)	Primer, Pretreatment (Formula No. 117 for Metals).

ASSOCIATION OF EDISON ILLUMINATING COMPANIES SPECIFICATIONS (AEIC):

5-74	Specification for Polyethylene and Cross-Linked Polyethylene Insulated Shielded Power Cables Rated 5 Through 69KV; 4th Edition.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

70-1978	National Electrical Code.

UNDERWRITERS' LABORATORIES, INC. STANDARDS (UL):

1	Flexible Steel Conduit, 1973 (R. JUN 76).
467	Grounding and Bonding Equipment, 1972 (R.NOV 76).
510	Insulating Tape, 1976.
514	Outlet Boxes and Fittings, 1974 (R.JAN 77)

AMERICAN NATIONAL STANDARDS INSTITUTE STANDARDS (ANSI):

C2-1973	National Electrical Safety Code.
C29.1 to C29.7 incl. - 1961	Wet Process Porcelain Insulators.
C80.1-1966 (R. 1971)	Rigid Steel Conduit, Zinc Coated.

2. QUALITY CONTROL: All field tests to determine conformance with the specified requirements shall be performed in the presence of the Contracting Officer.

3. SUBMITTALS:

3.1 Shop drawings (SD) and catalog data (CD) for the following items shall be submitted to and approved by the Contracting Officer.

3.1.1 For Contracting Officer Approval:

Circuit Breaker (CD)
Terminators (CD)
Splices (CD)

3.2 Manufacturer's Certifications shall be submitted to the Contracting Officer for the following items:

Conduit, Galv. Rigid Steel
Conduit Fittings
Wires and Cable, 600 Volt and Less

Tapes
Ground Rods

3.3 Test Reports: Certified Laboratory Test Reports are required for the following:

400 Amp Circuit Breaker

4. GENERAL REQUIREMENTS: General requirements include those specified in Section 16011, General Requirements, Electrical and as specified herein. Prevention of corrosion: Metallic materials shall be protected against corrosion. Outdoor equipment shall be given a rust inhibiting treatment and standard finish by the manufacturer. Aluminum shall not be used in contact with the earth, and where connected to dissimilar metal, shall be protected by approved fittings and treatment. Steel conduits installed underground shall be coated with an approved asphaltic paint, plastic coating, or shall be wrapped with a single layer of a pressure sensitive plastic tape, half lapped.

5. SERVICE:

5.1 Overhead Service: Overhead service conductors into buildings shall terminate at the service entrance fittings or weatherhead outside the building. The installation and connection of service entrance equipment to the overhead service conductor is included in Section: INTERIOR ELECTRICAL SYSTEMS.

5.2 Electrical Characteristics: Electrical characteristics for this project shall be 12470 volts primary, three phase, 3 wire, 60 hertz and 480 volts secondary, three phase, and 240/120 volts, 3-phase.

6. MATERIALS, EQUIPMENT, AND ASSEMBLIES:

6.1 Electrical Tapes: Tapes used for electrical insulation and other purposes in wire and cable splices, terminations, repairs and miscellaneous purposes shall conform to UL 510 and shall be UL approved for the specific application.

6.2 Caulking Compound: Compound for the sealing of conduits, ducts, pipes, and sleeves shall be of a putty like consistency workable with the hands at temperatures as low as 35 degrees F, shall not slump at a temperature of 300 degrees F, and shall not harden materially when exposed to air. The compound shall readily calk or adhere to clean surfaces of the materials with which it is designed to be used. The compound shall have no injurious effects upon the hands of workmen or upon the materials.

6.3 Metal Conduit, Fittings and Accessories:

6.3.1 Rigid Metal Conduit: Unless indicated or specified otherwise, rigid metal conduit shall be zinc-coated rigid steel. Rigid steel conduit shall conform to ANSI C80.1. Bushings shall be provided on each end of conduit sleeves which pass through cable vault walls and roofs.

6.3.2 Fittings, Boxes, Covers and Outlets: Fittings and accessories for rigid metal conduit shall conform to UL 467 and UL 514, as applicable, and shall meet the following requirements: Fittings, boxes, covers and outlets for use in outdoor work and in exposed indoor work shall be cast or malleable iron and shall have threaded hubs. Iron or steel fittings, except bar hangers, shall be cadmium or zinc-coated. Junction boxes shall conform to UL 514. Each box shall have the volume required by the National Electrical Code for the number of conductors enclosed in the box and shall meet the requirements of the National Electrical Code for installation of boxes and fittings. Cast metal conduit outlets and entrance caps shall enform to UL 514 and shall be cadmium or zinc-coated if of ferrous metal.

6.3.3 Elbows in standard or special radius shall be coated as above. Separate couplings shall be furnished with sleeves described above on each end.

6.4 Wires and Cables: Conductor sizes are expressed in American Wire Gage (AWG) or in circular mils. Unless otherwise noted, conductor and conduit sizes indicated are for copper conductors. All conductors shall be copper. All grounding conductors shall be copper.

6.4.1 Connectors and Terminals shall be designed and 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.

6.4.2 Colors and Coding: All circuits 600 volts and less, including service entrances, shall be served by type USE cable, rated 600 volts, unless otherwise indicated or specified. Conductors shall be the size and number of conductors in each cable as indicated. Cable shall be color coded. Conductor identification shall be provided within each enclosure where a tap, splice or termination is made. Conductor 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. Colors used in coding shall be:

480-Volt System

Neutral - White
Phase A - Brown
Phase B - Orange
Phase C - Yellow
Grounding Conductor - Green

6.4.3 Bare copper wire for grounding, bonding and other uses, when not specified otherwise, shall conform to QQ-W-343.

6.4.4 Secondary line and service wires and cables of the weather resistant, insulator supported type shall be polyethylene covered and shall conform to J-C-145. Service entrance and service drop wires and cables shall conform to J-C-30.

6.4.5 Control cables for remote control of power and lighting equipment shall have a rating of not less than 600 volts, and shall conform to the IPCEA Standards Publication No. S-19-81, S-61-402, S-66-524.

6.4.6 Wires and cables for locations and uses not specified above shall be suitable for the purpose and in accordance with the National Electrical Code.

6.5 Ground Rods:

6.5.1 Copper Clad Steel Ground Rods: Rods shall be rolled to a commercially round shape from a welded copper clad steel manufactured by the molten-welding process or by the electro-formed process molecularly bonded. They shall have an ultimate tensile strength of 75,000 pounds per square inch (psi) and have an elastic limit of 49,000 psi. The rods shall be not less than 3/4 inch in diameter by 10 feet in length and shall have a hard, clean, smooth, continuous copper surface and the proportion of copper shall be uniform throughout the length of the rod. The copper shall have a minimum wall thickness of 0.013 inch at any point on the rod. Each ground rod shall be die-stamped near the top with the name or trademark of the manufacturer and the length of the rod in feet.

6.6 Emergency Generator shall be as specified in Section 16201.

7. INSTALLATION:

7.1 General Requirements: Electrical installations shall conform to the National Electrical Safety Code, the National Electrical Code, and to the requirements specified herein.

7.2 Splices in Insulated Power and Lighting Wires and Cables Without Metallic Sheath: Conductors shall be joined securely both mechanically and electrically by one of the following methods:

a. twisting the conductors together and soldering,
b. twisting the conductors and forming a "Western Union" joint,
c. exothermic weld process, or
d. by the use of solderless connectors.

Insulating tapes, hotmolded composition covers, or other approved equivalent, having an insulation value equivalent to the conductor insulation may be used for splices in cables rated 600 volts and below. Splices in rubber- or cross-linked polyethylene-insulated, neoprene- or cross-linked polyethylene-jacketed wires and cables shall be the cast type, watertight taped type, tape-overcast type, vulcanized type, or other approved type as indicated or specified. The work shall be in accordance with the recommendations of the manufacturer of the wires, cables, and/or splicing materials. All splices shall be suitable for the rated insulation level of the cable.

7.3 Termination of Insulated Power and Lighting Cables: All insulated power and lighting cables shall be properly terminated. Terminations shall be made by adequately trained personnel, using methods and materials suitable for the work as necessary and as specified hereinafter, and in accordance with the recommendations of the manufacturer of the cable and/or terminating materials or kit. Such recommendations, accompanied by suitable detail drawings, shall be submitted to the Contracting Officer for approval. Terminations of cable for service exceeding 600 volts shall be made b y personnel having not less than 3 years experience as a licensed electrician, including adequate experience in the splicing or terminating of high-voltage insulated cable; the experience shall be certified and approved by the Contracting Officer. Terminations and/or terminating devices shall be capable of withstanding the tests specified for the cable installations, and for service exceeding 600 volts, shall be rated in accordance with, and be capable of withstanding test voltages in accordance with IEEE standard No. 48, as applicable. Terminations of single- and multi-conductor cables shall

include the securing and sealing of the sheath and insulation of the cable conductors, stress relief and grounding of cable shields of shielded cable, and grounding of neutral conductors, metallic sheaths, and armor. Cables and cable terminations shall be adequately supported so as to avoid any excessive strain on the termination and the conductor connection.

7.4 Protection of Wire and Cable Ends: The ends of wires and cables in wet location as defined by the National Electrical Code that are not to be spliced or connected to equipment shall be protected from moisture and other damage by line end caps suitable for the rated insulation level of the cable. (The ends of lead-sheathed wires and cables shall be protected by means of a lead cap wiped to the sheath; the lead cap of wires and cables having a plastic or rubber jacket over the lead shall be covered with plastic or rubber tape.)

7.5 Grounding: Grounding shall be in accordance with the National Electrical Code and the National Electrical Safety Code except that grounds and grounding systems shall have a resistance to solid earth ground not exceeding the following values:

	Ohms
For grounding generating stations of 1 kv and above	1
For grounding main substations, distribution substations, and switching stations on primary distribution systems enclosed by protective fences	
(a) 5000 kva and above	3
(b) 1000 kva to 5000 kva	5
(c) Below 1000 kva	10
For grounding pad mounted transformers without protective fences	5
For grounds in manholes, handholes, and vaults	10
For grounding other metal enclosures of primary voltage electrical and electrically operated equipment	10
For lighting arrester grounds on pole line distribution systems	10

	Ohms
For grounding secondary distribution systems (neutral) non-current carrying metal parts associated with distribution systems	25
For grounds not covered above	25

When work in addition to that indicated and specified is directed, in order to obtain the specified resistance to ground, the provisions of the contract respecting an adjustment for changed conditions shall apply.

7.5.1 Ground Rods: Approved copper-alloy clamp shall be brazed to the upper end of ground rods, and ground wires shall be securely attached thereto by means of a bolted connection. Ground rods shall be driven to a depth of not less than 11 feet and shall have diameters sufficient to permit driving to necessary depth without being damaged, but in no case shall the diameter be less than hereinbefore specified.

7.5.2 Welded or Brazed Connections: Joints in grounding conductors and mats shall be welded or brazed. The welding or brazing processes shall not in any way cause the parts joined to be damaged or weakened and shall join all strands. The welding process shall be an exothermic type, and the completed connection or joint shall be equal or larger in size than the conductors joined. The brazing process shall be in accordance with MIL-B-7883.

7.5.3 Ground Cable Crossing Expansion Joints: Ground cables crossing expansion joints or similar separations in structures and pavements shall be protected from damage by means of suitable approved devices or methods of installation which will provide the necessary slack in the cable across the joint to permit movement. Stranded or other approved flexible copper cable run or jumper shall be used across such separations.

7.5.4 Grounding and Bonding Equipment: Grounding and bonding equipment, except as indicated or specified otherwise, shall conform to UL Publication No. 467.

7.6 Installation of Emergency Generator shall be as indicated and specified in section 16201.

8. FIELD TESTS: The Contractor shall provide all labor, equipment and incidentals required for testing, except that the Government will provide electric power required for the tests. All defective material and workmanship disclosed as the result of the tests given herein shall be corrected by the Contractor at no cost to the Government. The Contractor shall show by demonstration in service that all circuits and devices are in good operating condition. Tests shall be such that each item of control equipment will function not less than five times.

8.1 Insulation Resistance Test for Systems 600 Volts and Less: After all wiring is completed and connected ready for operation, but prior to placing systems in service and before any branch circuit breakers are closed, insulation resistance tests shall be made in all feeder and subfeeder circuits. The insulation resistance between conductors and between each conductor and ground shall be measured. Measurements shall be made with an instrument capable of making measurements at an applied potential of 500 volts. Readings shall be taken after the voltage has been applied for a minimum of one minute. The minimum insulation resistance for circuits of No. 12 AWG conductors shall be 1,000,000 ohms. For circuits of No. 10 AWG or larger conductors, a resistance based on the allowable ampacity of the conductor as fixed by NFPA 70 shall be as follows:

25 through 50 amperes	250,000 ohms
51 through 100 amperes	100,000 ohms
101 through 200 amperes	50,000 ohms
201 through 400 amperes	25,000 ohms
401 through 800 amperes	12,000 ohms
Over 800 amperes	5,000 ohms

8.2 Arc-Proofing Test: The capability of fireproofing (arc-proffing) of withstanding a 200-ampere arc for 30 seconds shall be determined by tests made on a sample assembly consisting of a 3-inch diameter lead tube fireproofed (arc-proofed) as specified hereinbefore. The lead tube shall have a wall thickness of 1/8 inch. The sample assembly shall be tested at three different points. At each point the testing shall consist of an arc current magnetically blown against the test assembly until melting occurs at the point of arc contact. The arc shall be struck between two 7/8-inch electrodes located one inch from the sample assemble. (Note: The electrodes must be squared off after each test run. Failure to do this will result in a weak arc which will extinguish easily.) The arc current shall be between 195 and 210 amperes at 40 volts DC. For each of the three tests, the fireproofing (arc-proofing) shall prevent the arc current from melting the lead tube for at least 25 seconds at any one point and for an average of 30 seconds for the three points. In lieu of the tests specified herein, the manufacturer's certification that his product will successfully meet the requirements of the specification may be submitted to the Contracting Officer for approval.

8.3 Ground Resistance Tests: Grounding system shall be tested to assure continuity and compliance with the requirement that ground resistances not exceed the values hereinbefore specified. Ground resistance measurements of each ground rod shall be taken and certified by the Contractor. Upon completion of the project, the Contractor shall submit in

writing to the Contracting Officer, the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system, as well as the resistance and soil conditions at the time the measurements were made. Ground resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground electrode under test isolated from other grounds. Ground resistance shall also be measured for each piece of equipment to the ground electrode.

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 (FED. SPEC.):

W-C-375B	Circuit Breaker, Molded Case, Branch-Circuit and Service.
W-C-582 & Am 1	Conduit, Raceway, Metal and Fittings, Surface.
W-P-115A & Am 3	Panel, Power Distribution.
CC-M-1807	Motor, Alternating Current, Fractional and Integral Horsepower.
HH-I-510D	Insulation Tape, Electrical, Friction.
QQ-W-343D & Am 1	Wire, Electrical, Copper (Uninsulated).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

C19.5-1973	Standard for Industrial Control Apparatus - Switching or Controlling Devices.
C80.1-1977	Specification for Rigid Steel Conduit, Zinc-coated.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA):

FU1-1978	Low-voltage Cartridge Fuses.
ICS-1970 & Rev. 1-7	Industrial Controls and Systems.
ST20-1972	Dry-Type Transformers for General Applications.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

70-1978	National Electrical Code (NEC).

UNDERWRITERS' LABORATORIES, INC. (UL):

1 -73	Flexible Metal Conduit.
20-74 (R 76)	General-Use Snap Switches.
50-77	Cabinets and Boxes.
98	Enclosed Switches.
198B	Class H Fuses.
198F	Plug Fuses
467-72 (R 78)	Grounding and Bonding Equipment.
510-76	Insulating Tape.
869-74	Service Equipment

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:

112.5 KVA, 480//240/120-Volt - Transformers

Panelboard, Load Center, and Circuit Breakers, and disconnect switch.

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) (NFPA-70). 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 Coordination: The Contractor shall be responsible for coordinating all new equipment fuses, circuit breakers, and other equipments with existing station equipment. The Contracting Officer will provide the necessary information on existing equipment when requested.

3.2 Conduit and Fittings:

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

3.2.2 Flexible Metal Conduit: UL Standard No. 1, zinc-coated steel only.

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

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

3.3 THIS PARAGRAPH NOT USED

3.4 Outlet Boxes and Covers: UL Standard No. 514, cadmium- or zinc-coated if of ferrous metal.

3.5 Cabinets, Junction Boxes, and Pull Boxes. UL Standard No. 50, hot-dip zinc-coated if of sheet steel.

3.6 Wires and Cables: Wires and cables shall meet all the applicable requirements of the NEC and UL for the type of insulation, jacket, and conductor specified or indicated. All conductors shall be copper.

3.6.1 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 conductors in different voltage systems shall be as follows:

a. 277/480 volt, 3-phase: yellow, brown, and orange.

b. 120/240 volt, three-phase: red, black and blue

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

3.2 Conduit and Fittings:

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

3.2.2 Flexible Metal Conduit: UL Standard No. 1, zinc-coated steel only.

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

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

3.3 THIS PARAGRAPH NOT USED

3.4 Outlet Boxes and Covers: UL Standard No. 514, cadmium- or zinc-coated if of ferrous metal.

3.5 Cabinets, Junction Boxes, and Pull Boxes. UL Standard No. 50, hot-dip zinc-coated if of sheet steel.

3.6 Wires and Cables: Wires and cables shall meet all the applicable requirements of the NEC and UL for the type of insulation, jacket. and conductor specified or indicated. All conductors shall be copper.

3.6.1 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 conductors in different voltage systems shall be as follows:

a. 277/480 volt, 3-phase: yellow, brown, and orange.

b. 120/240 volt, three-phase: red, black and blue

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

other requirements of UL. Three keys shall be furnished for each cabinet lock. All panelboard locks included in the project shall be keyed alike. Directories shall be typed to indicate load service by each circuit and mounted in a holder behind transparent protective covering.

3.9.1 Distribution (feeder or power) panelboards shall be Type I circuit breaker equipped. Circuit breakers serving as motor disconnecting means and not in sight of the motor controller shall be capable of being locked in the open position.

3.9.2 Lighting and appliance panelboards shall be Type I Circuit Breaker equipped.

3.10 Fuses: A complete set of fuses for all switches and control centers shall be furnished. Time-current characteristics curves of fuses serving motors or connected in series with circuit breakers for other circuit protective devices shall be coordinated for proper operation. Fuses shall have a voltage rating not less than the circuit voltage. One complete set of spare fuses in the manufacturer's cartons shall be delivered to the Contracting Officer.

3.10.1 Cartridge Fuses, Standard Type Class H: UL Standard No. 198B, non-renewable, rated 600 volts. Fuses shall be dual-element time-delay type.

3.11 Transformers: NEMA Standard No. ST20, general-purpose dry-type, NEMA standard taps, ratings as indicated. Temperature rise classification shall be 150 degrees C. 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.

3.11.1 Rating: The transformer shall be a 112.5 kva, 480 volt primary to a 240/120 volt secondary, 3 phase, 4-wire dry-type transformer. Provide 2 - 2½ percent full capacity above rated primary voltage and 2 - 2½ percent below full capacity rated primary voltage.

3.11.2 Operating and Maintenance Instructions: Furnish copies of "Installation, Operation, and Maintenance " instructions for the transformer.

3.12 Grounding and Bonding Equipment: UL Standard No. 467. Ground rods shall be the sectional type, copper-encased steel, with minimum diameter of 3/4-inch and total length of ten feet.

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, except where specified or indicated otherwise.

4.3 Conduit Installation: Unless indicated otherwise, conduit shall be concealed within finished walls, ceilings and floors where practicable. 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.

4.3.1 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-inch in concrete joints shall not cut the main reinforcing bars. Holes not used shall be filled. In partitions of light steel construction, sheet-metal 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. Exposed risers in wire shafts of multi-story buildings shall be supported by U-clamp hangers at each floor level and at intervals not to exceed 10-feet.

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 Empty conduits in which wire is to be installed by others shall have pull wires installed. The pull wire shall be No. 14 AWG zinc-coated steel, or of plastic having not less than 200-pound tensile strength. Not less than 12 inches of slack shall be left at each end of the pull wire.

4.3.4 THIS PARAGRAPH NOT USED

4.3.5 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 bushing shall be used. Locknuts shall be the type with sharp edges for digging into the wall of metal enclosures. Bushings shall be installed on the ends of all conduits and shall be of the insulating type where required by the NEC.

4.3.6 Conduits stubbed up through concrete floors for connections to free standing equipment shall be provided with a short elbow and an adjustable brass top or coupling of brass or bronze threaded inside for plugs, set flush with the finished floor. Screwdriver-operated, or recessed-square socket type, threaded flush plugs shall be installed in conduits from which no equipment connections are made.

4.3.7 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 systems wherever required for pulling of wires, making connections and mounting of devices or fixtures. Boxes shall be of the cast metal hub type when surface mounted on outside of exterior surfaces and when installed exposed up to 7 feet above interior floors and walkways. Boxes in other locations shall be sheet steel except that aluminum boxes may be used with aluminum conduit, and non-metallic boxes may be used with non-metallic wiring systems. Each box shall have the volume required by the NEC for the number of conductors enclosed in the box. Boxes installed for concealed wiring shall be provided with suitable extension rings or plaster covers, as required. Boxes for use in masonry-block or tile walls shall be square-cornered tile-type, or standard boxes having square-cornered tile-type, covers. Cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Boxes and supports shall be fastened to wood with wood screws or screw-type nails of equal holding strength, with bolts and expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel work. Threaded studs driven in by powder charge and provided with lockwashers and nuts, or nail-type nylon anchors may be used in lieu of wood screws, expansion shields, or machine screws.

4.4.1 Pull boxes of not less than the minimum size required by the NEC shall be constructed of code-gage aluminum or 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, receptacles and other devices shall be mounted as indicated.

4.6 Conductor Identification: Provide conductor identification within each enclosre 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.

4.8 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, grounding conductor of nonmetallic sheathed cables, and neutral conductor of wiring systems shall be grounded. The grounding electrode system shall include made ground rods driven exterior to the building. All grounding conductors shall be of copper.

4.9 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, or other electical 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. The Contractor shall give the Contracting Officer ample notice of time schedules of the tests.

SUPERSEDEAS DECISION

STATE: NORTH CAROLINA
COUNTIES: BRUNSWICK, CARTERET, COLUMBUS, CRAVEN, DUPLIN, JONES, LENOIR, NEW HANOVER, ONSLOW, PAMLICO, AND PENDER
DECISION NUMBER: NC81-1201 DATE: DATE OF PUBLICATION
Supersedes Decisions Number NC81-1181, dated January 23, 1981, 46 FR 7745; Number NC81-1182, dated January 23, 1981, 46 FR 7744; Number NC81-1147, dated December 30, 1980, 45 FR 86200.
DESCRIPTION OF WORK: BUILDING CONSTRUCTION PROJECTS (does not include single family homes and apartments up to and including four stories).

	Basic Hr. Rate	Fringe Benefits Payments			
		H&W	Pensions	Vacation	Edu and/or Appr. Tr.
Asbestos Workers	$7.26				
Bricklayers	7.10				
Carpenters	6.02				
Cement masons	5.68				
Drywall mechanics	7.00				
Electricians	6.22				
Electronic Technicians	4.50				
Glaziers	5.38				
Ironworkers	6.66				
Laborers:					
Laborers - General	3.78				
Pipe layers	4.94				
Millworkers	9.45				
Painters	5.00				
Plasters	6.00				
Plumbers & Pipefitters	6.52				
Roofers	5.91				
Sheet Metal Workers	6.38				
Soft Floor Layers	7.00				
Sprinkler Fitters	7.95				
Tile Setters	6.00				
Truck Drivers	3.90				
Welders - Rate for Craft					
Power Equipment Operators:					
Asphalt Raker	4.27				
Backhoe	5.32				
Bulldozer	5.25				
Crane	6.80				
Distributor	4.70				
Fork lift	6.50				
Front end loader	4.50				
Motor grader	5.36				
Paver - screed	4.25				
Roller	5.00				
Scraper - pan	4.60				
Tractor	5.00				

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clause (29 CFR, 5.5(a)(1)(ii)).