

SECTION 16020

D.C. POWER GENERAL PROVISIONS – U.P.S. BATTERY REPLACEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Conditions of the Contract for Construction, the applicable portion of Division One, Supplementary Conditions shall apply to all work under this section of the specifications.

1.2 SCOPE:

- A. Provide all labor, materials, equipment, fixtures, services and perform all operations required for complete D.C Power Systems and related work as indicated on the drawings and specified herein.
- B. It is the intention of the specifications and drawings to call for finished work, tested and ready for operation. Whenever the word "Provide" is used, it shall mean "Provide and install complete and ready for use".
- C. Any apparatus, appliance, material or work not indicated but mentioned in the specification, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered and installed by the Contractor without additional expense to NASA.
- D. Minor details not usually shown or specified, but necessary for the proper installation and operation shall be included in the work and in the Contractor's estimate, the same as if herein specified or shown.
- E. With submission of bid, the Contractor shall give written notice to the Engineer of any materials or apparatus believed inadequate or unsuitable, in violation of Federal and State and Local Laws, Codes, Ordinances, including Local Electrical Inspection Official's rules or regulations, and any necessary items of the work omitted. In the absence of such written notice, it is mutually agreed the Contractor has included the cost of all required items in his proposal and that he will be responsible for the approved satisfactory functioning of the entire system without extra compensation.
- F. The term "NASA" shall mean "National Aeronautics and Space Administration".

1.3 APPLICABLE SPECIFICATIONS, CODES, STANDARDS AND PERMITS:

- A. Material, equipment, and installation shall be in accordance with the requirements of all state and local Building and Electrical Codes and the following codes and standards:

National Electrical Code - Latest Edition

- B. All Electrical material and equipment shall be new, listed by the Underwriters' Laboratories, Inc., and bear the U.L. label. This applies to all equipment for which U.L. Standards have been established and label service is regularly finished. Equipment for which U.L. listing is not approved shall be assembled with U.L. approved components.
- C. Workmanship shall conform to the "Standard of Installation" published by the National Electrical Contractor's Association, USA.
- D. Contractor shall give all necessary notice, obtain all permits and pay all Government taxes, fees and other costs, including costs for Electrical Services in connection with his work, file all necessary plans, prepare all documents and obtain required certificates of inspection for work and deliver same to Engineer before request for acceptance and final payment for the work.

1.4 APPROVALS AND SHOP DRAWINGS:

- A. The materials and workmanship, design and arrangement for all work, installed under the contract shall be subject to the approval of the Engineer.
- B. Where any specified materials, process or method of construction, or manufactured article is specified by name or by reference to the catalog number of a manufacturer, the specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the drawings.
- C. In all cases, the Contractor shall verify the duty and electric characteristics with the specific characteristics of the equipment offered for approval.
- D. All components parts of each item of equipment or device shall bear the manufacturer's nameplate giving name of manufacturer, description, size, type, serial or model number, electrical characteristics, etc., in order to facilitate maintenance or replacement. The nameplate of a Contractor will not be acceptable.
- E. If materials or equipment are installed before it is approved, Contractor shall be liable for its removal and replacement at no extra charge to NASA, if in the opinion of the Engineer, material or equipment does not meet the intent of the drawings and specifications.

- F. The Contractor shall call to the attention of the Engineer by letter or on shop drawing submission any instance in which the shop drawings differ from requirements of Contract Documents.
- G. After receiving approval of equipment manufacturer and prior to delivery of any material to job site, and sufficiently in advance of requirements to allow Engineer ample time for checking, submit for approval six (6) copies each of detailed, dimensioned, drawings, or cuts showing construction size arrangements, operating clearances, performance characteristics, capacity, material, etc., of equipment. Each item of equipment, proposed shall be a standard catalog product of an established manufacturer and of equal quality, finish and durability to that specified.
- H. Samples, drawings, specifications, catalogs, etc., submitted for approval, shall be properly labeled and shall indicate specified service for which material or equipment is to be used, section and article number of specifications governing Contractor's name and name of job.
- I. Catalogs, pamphlets, or other documents submitted to describe items for which approval is being requested shall be as specified and identification catalog, pamphlets, etc., of item submitted shall be clearly named in ink. Data of a general nature will not be accepted.
- J. Contractor shall furnish all necessary templates, patterns, etc., for installing work for the purpose of making adjoining work conform. Furnish setting plans and shop drawings for other trades as required.
- K. Approval rendered on shop drawings shall not be considered as a guarantee of measurements of building condition. Where drawings are approved, said approval does not mean that drawings have been checked in detail and said approval does not in any way relieve the Contractor from his responsibility, nor the necessity of furnishing the material or performing the work as required by the contract drawings and specifications.
- L. Failure by the Contractor to submit shop drawings in ample time for checking shall not entitle him to an extension of contract time, and no claim for extension by reason of such default will be allowed.
- M. Notwithstanding any reference in the specification to any article, device, product, material, fixture, form or type of construction by name, make or catalog number, such reference shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may at his option, use any article, device, product, material, fixture, forms or type of construction which in the judgment of the Engineer expressed in writing is equal to that specified.

1.5 EQUIPMENT DEVIATIONS:

- A. Where the Contractor proposed to use an item of equipment other than that specified or detailed on the drawings, which required any redesign of the structure, partitions, foundations, piping, wiring, or any other part of the electrical, plumbing, mechanical or architectural layout, all such redesign, and all new drawings and detailing required therefore, shall be prepared by the subcontractor at his own expense and approved by the Engineer.
- B. Where such approved deviation required a different quantity and arrangement of wiring conduit and equipment, the Contractor shall furnish and install any such electrical wiring and conduit and any other additional equipment required by the system at no additional cost to NASA.

1.6 QUALIFICATIONS FOR BIDDERS:

- A. Examine drawings and specifications relating to work of all trades and become fully informed as to the extent and character of work required and its relation to all other work in the project prior to submission of bid or prior to start of any construction covered by these specifications and accompanying drawings.
- B. Before submitting bid, the Contractor shall visit the site and examine all adjoining existing building, equipment and space conditions on which his work is any way dependent, for the best workmanship and operation according to the intent of the specifications and drawings. Contractor shall verify dimensions and fully inform himself as to the nature and scope of the proposed work and also the conditions under which it is to be conducted. Ten (10) days prior to bid, he shall report to the Engineer any conditions which in his estimation might preclude him from installing his equipment and work in the manner as intended and noted on the drawings and in this specification. Failure to take the above precaution will in no way relieve the Contractor from his obligations to provide the material and work as indicated and as specified without additional cost or in completion time to NASA.
- C. No consideration or allowance will be granted for failure to visit the site, or for any alleged misunderstanding of materials to be furnished or work to be done, it being agreed that tender of proposal carried with it agreement to items and conditions referred to herein or indicated in the aforementioned drawings.

1.7 DRAWINGS:

- A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the contract. Do not scale the drawings. Consult the Architectural drawings and details for exact location equipment; where same are not definitely located. Obtain this information from the Engineer.

- B. Follow drawings in laying out work and check drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, notify Engineer before proceeding.
- C. If directed by the Engineer, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with other trades for proper execution.
- D. Decisions regarding any and all substitutions and options permitted by the specification shall be submitted for approval to the Engineer. Approval will only be recognized when in writing. Submit all requests for substitutions and/or options within 30 calendar days after the award of the contract. No requests for substitutions and/or options will be allowed, if submitted more than 30 days after the contract is awarded to the General Contractor.
- E. In finished spaces, all conduit and wiring shall be concealed or run behind furring unless shown otherwise. Where concealing is not possible, conduit and wire may be exposed after obtaining the Engineer's written approval.

1.8 INTENT OF DRAWINGS:

- A. It is the intention of these drawings, specification and conditions to fully cover all required work and apparatus not specifically excepted for a complete D.C. power installation as indicated on the drawings and specified hereinafter. The project, when turned over to NASA, will be complete and in first-class condition for the purpose intended.

1.9 CONTRACTOR'S WARRANTY:

- A. Contractor shall warrant the workmanship, materials and equipment against defects, leaks or non-operation for a period of one (1) year from the day of final acceptance or beneficial occupancy, whichever occurs first.

1.10 COOPERATION WITH OTHER TRADES:

- A. Contractor shall give full cooperation to other trades and shall furnish (in writing, with copies to the Engineer) any information necessary to permit the work of all trades to be installed satisfactorily with least possible interference or delay.
- B. Where the work of Contractor will be installed in close proximity to work of other trades, or where there is evidence that work will interfere with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. If so desired by the Engineer, the Subcontractor shall prepare composite working drawings at a scale not less than 1/4" equals 1'-0", clearly

showing how his work is to be installed in relation to the work of their trades. If the Contractor installs his work before coordinating with other trades or as to cause any interference with work of other trades he shall make necessary changes to his work to correct the conditions at no extra charge.

- C. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of the work and for the purpose of coordinating adjacent work.

PART 2 - PRODUCTS

2.1 STANDARD PRODUCTS:

- A. Unless otherwise shown on the contract drawings or specified, each item of equipment furnished by this Contractor shall be essentially the standard product of the manufacturer. Where two or more units of the same kind or class of equipment are required, they shall be the product of a single manufacturer.
- B. For equipment consisting of an assembly of multiple components such multiple components do not have to be the products of a single manufacturer.

2.2 PERFORMANCE DATA:

- A. All performance data specified herein shall be considered actual performance of equipment as installed. If installation details are such that actual operating conditions unfavorably affect performance as compared to conditions under which the equipment was rated, suitable allowance shall be made by the Contractor.

PART 3 - EXECUTION

3.1 INSTALLATION OF WORK:

- A. Examine the site and all drawings before proceeding with the layout and installation of this work.
- B. Arrange the work essentially as shown, exact layout to be made on the job to suit actual conditions. Confer and cooperate with other trades on the job so all work will be installed in proper relationship. Precise location of parts to coordinate with other work is the responsibility of the Contractor.
- C. Arrange for required sleeves and openings. Contractor is liable for cutting or patching made necessary by his failure to make proper arrangements in this respect.

- D. Install all work in a neat and workmanlike manner, using only workmen thoroughly qualified in the trade or duties they are to perform. Non-workmanlike work will be rejected by the Project Manager and/or Engineer.
- E. Provide a full time foreman who shall oversee and coordinate the work with other trades, receive instruction from the Engineer and make proper layout of the work to suit the job conditions and to satisfy the general requirements of the contract.

3.2 DELIVERY AND STORAGE:

- A. All material and equipment shall be delivered in manufacturer's original packages with seals unbroken, and with manufacturer's name and contents legibly marked thereon. Store materials off the ground, under cover, and protected from the weather and construction.

3.3 SCAFFOLDING, RIGGING AND HOISTING:

- A. Unless otherwise specified, Contractor shall furnish all scaffolding, rigging, hoisting, shoring and services necessary for erection and delivery into the premises for any equipment and apparatus furnished and removal of same from premises when no longer required.

3.4 ACCESSIBILITY:

- A. Contractor shall be responsible for the adequacy of the size of shafts and chases, the adequate thickness of partitions and the adequate clearance in double partitions and hung ceilings for the proper installation of his work. He shall cooperate with the Contractor and all other Subcontractors whose work is in the same space, and shall advise the Contractor of his requirements. Such spaces and clearances shall, however, be kept to the minimum size required.
- B. Locate all equipment which must be serviced, operated, or maintained in fully accessible positions. This equipment shall include, but not be limited to, junction boxes and pull boxes, etc. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility, and any change shall be approved.
- C. The Contractor shall provide the General Contractor the exact locations of access panels for each concealed electrical junction box. Access panels shall be provided and installed by the Contractor and as specified in the Architectural sections of the specifications. Locations of these panels shall be submitted in sufficient time to be installed in the normal course of work.

3.5 CUTTING AND PATCHING:

- A. Unless otherwise specified in another section of the specifications, cutting and patching for his work will be done by the Contractor. Furnish sketches showing the locations and sizes of all openings, chases, etc., required for installation.
- B. The Contractor shall furnish and locate all sleeves and inserts required before the floors and walls are built, or shall be responsible for the cost of cutting and patching required for conduits where sleeves and inserts were not installed or where incorrectly located. The Contractor shall do all drilling required for the installation of his hangers.
- C. All holes through concrete slabs or arches shall be punched or drilled from underside. No structural members shall be cut without the written approval of the Engineer, and all cutting shall be done in a manner directed by him.

3.6 PERSONNEL INSTRUCTION AND OPERATING INSTRUCTION:

- A. Furnish to the Engineer for delivery to NASA, two (2) bound and indexed copies of an approved operations and maintenance instruction booklet along with a copy of the submittal data for each item of equipment installed under this contract.
- B. After all tests are conducted and approved as specified below, furnish a competent operation engineer for a period of two days to instruct and demonstrate to NASA or his authorized representative, the operation of the systems. Notify the Engineer in writing of person to whom this instruction was given and the date given. Give at least one week's notice to the Engineer in writing and NASA when conducting tests or demonstrations of equipment.
- C. The Contractor shall furnish the Engineer, as part of NASA's operating and personnel instruction package, one set of sepia mylar drawings, mechanically drafted indicating any changes made during construction to the original contract drawings, and shall be clearly labeled, "As Built Plans", and one set of AutoCAD 14 "As Builts" on disk.

3.7 EQUIPMENT SUPPLIERS INSPECTION:

- A. The equipment and systems shall not be placed in operation until a competent installation and service representative of the manufacturer has made on the job inspection of the installation, has certified that the equipment is properly installed, that preliminary operating instructions have been given, and this equipment is ready for operation.
 - 1. Battery String
 - 2. D.C Grounding System

3.8 TESTS:

- A. The Contractor shall, at his expense, conduct load bank testing and general operating test on each system. The DC Contractor shall provide a 600 amp load bank for an 4 hour load bank test. The test shall demonstrate the specified capacities of the various pieces of equipment, and shall be conducted in the presence of NASA or his authorized representative. The general operating tests shall demonstrate that the entire equipment is functioning in accordance with the contract documents. Furnish all instructions and test equipment.
- B. After all systems are completely tested, submit three (3) copies of the test results to the Engineer for approval. Final inspection by Engineer will not be made until test results are approved.

3.9 CLEANING:

- A. The Contractor shall thoroughly clean all D.C. electrical equipment installed under this section of the work, after the system has been completed or used for temporary service, but in any case prior to final inspection by NASA's representatives.
- B. Cleaning shall include, but not be limited to lighting fixtures, coverplates, special systems, equipment, etc.

3.10 GUARANTEE:

- A. The Contractor guarantees by his acceptance of the contract that all work installed will be free from any and all defect in workmanship and/or materials, and that all apparatus will develop capacities and characteristics specified, and that if during the period of one year, from date of certificate of completion and acceptance of work, any such defects in workmanship, materials or performance appear, he will without cost to NASA, remedy such defects within a reasonable time. In default thereof, NASA may have such work done and charge the cost to the Contractor.

3.11 IDENTIFICATION:

- A. All battery disconnect switches shall be provided with phenolic engraved identification plates. All panels, safety switches, and starters shall be identified as called for in the general notes on the drawings. Identification of switches and starters shall indicate name of apparatus controlled.
- B. Provide one (1) "As-Built" riser diagram of the entire U.P.S. Power Plant. Diagrams shall be neatly drawn, using mechanical drafting method, at least 24"

x 36" and framed under glass or plastic and mounted adjacent to U.P.S. switchboard in U.P.S. room.

C. Definition of Power Source:

1. Non-Essential Power: Commercial power from utility source.
2. Essential Power: Commercial power source backed up by a diesel generator.
3. Critical Power: Essential power source backed up by an Uninterruptible Power System (UPS) System, D.C. Power Plant.

3.12 CONNECTING INTO EXISTING UTILITIES:

- A. Procedures: The procedures used for the accomplishment of connecting into existing work shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services.
- B. Scheduling of Work: Work shall be performed in the sequence, locations and time period agreed to by NASA prior to commencement of work as outlined in the D.C Power Method of Procedure.
- C. Dust Control: The amount of dust resulting from connecting existing utilities shall be controlled to avoid creation of a nuisance in the surrounding area. Masks shall be worn for protection against dust inhalation by all persons in the vicinity of work involving removal of masonry, dry wall, etc.
- D. Protection of Existing Work:
 1. Existing work and furnishings to remain shall be protected from damage. Work damaged by the Contractor shall be repaired to match existing work without any additional cost to NASA.
 2. Cover equipment with insulated blankets to protect it from dust and physical damage.
 3. Floors shall be protected from damage.
 4. At the end of each work day and during inclement weather, close exterior openings with weatherproof cover (when applicable).
- E. Environmental Protection: Contractor shall comply with all Federal, State and Local regulations pertaining to Environmental Protection.

- F. Removal of Existing Equipment and Materials: Existing equipment and materials shall be dismantled and/or cut-up so as to be removable through existing building's access passages. No alterations to the building shall be made for the purpose of removing existing equipment and material. All hazardous material must be disposed of in strict accordance with all federal and local hazardous material regulation.

3.13 DOWNTIME:

- A. The Contractor shall so arrange his work that normal and emergency electrical service, communication, fire alarm systems, etc. shall be maintained at all times other than those periods prior arranged with NASA.
- B. The Contractor shall submit written requests to disconnect any existing utility services and to obtain equipment downtime. Only after receiving NASA's Representative=s approval of these requests shall work be allowed to proceed. The Contractor shall be responsible for restoring the existing utilities.

END OF SECTION 16020