

GENERAL TECHNICAL REQUIREMENTS

SECTION 01010
SUMMARY OF WORK AND DELIVERY SCHEDULE

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Work under this Contract consists of design, fabrication and delivery to the McKenzie Reservoir Hydroelectric Project jobsite located near Sisters, Oregon, USA, of two Hydroelectric Turbines, Induction Generators, Controls, Auxiliary Equipment, Training, and after sales Field Engineering Services covered by the Contract Price (subject to certain unit price adjustments as more fully specified in the Proposal Forms), as specified below and as shown on the Drawings.

NOTE:

Throughout this document, the word "SUPPLIER" or "Supplier" refers to obligee of this Contract. Terms such as civil works, powerhouse SUPPLIER, and installation SUPPLIER, refer to work by others.

1.02 WORK INCLUDED

A. The scope of work includes but shall not be limited to the design, manufacture, delivery to site, commissioning, start-up and testing, and required training for one (2) turbine generator sets and appurtenant equipment to provide a complete "water to wire" generating system as follows:

1. Francis 250 kW:

- i. One horizontal-shaft, single-runner, Francis turbine including turbine inlet valve, valve operators, and lubrication system.
- ii. One induction generator.
- iii. All required anchor bolts and foundation plates for mounting of turbine, valves, generator, and ancillary equipment.
- iv. Hydraulic Pressure Unit (HPU) and turbine controls and instrumentation panel.
- v. Generator switchgear assembly, including generator breaker and instrument transformers.
- vi. Neutral grounding equipment.
- vii. Generator circuit switcher and disconnect switches.
- viii. Station service equipment, including circuit breaker, AC and DC panel boards, station battery system, and inverter (if needed).
- ix. Motor control center.
- x. Diesel or propane back-up generator with instruments and controls.
- xi. Generator and turbine control system, including protective relays, RTU for utility communication, meters, instruments, synchronizing equipment, programmable logic controller (PLC), a panel mounted Human Machine Interface (HMI), and desktop SCADA PC based operator's terminal and monitor.
- xii. Communications equipment for monitoring and remote control of the intake using the existing intake control panel.
- xiii. RTU and communications equipment to connect new plant to

- DISTRICT'S system.
- xiv. Shop set-up and assembly of mechanical components prior to shipping.
- xv. Factory acceptance testing of turbine, generator, and control panel prior to shipment.
- xvi. All other related equipment to provide a complete "water to wire" generating system.
- xvii. Integration and coordination of all equipment and controls to provide a complete system.
- xviii. On site supervision of installation of all above equipment.
- xix. Commissioning and start-up services including field testing per Specifications.
- xx. Operation and troubleshooting of the completed project during a 10-day test period.
- xxi. Performance testing of the installed turbine/generator, (initial test by DISTRICT).
- xxii. Turbine/Generator closed loop water cooling system. (If necessary, see Specifications.)

2. Turgo or Pelton 50 kW:

- i. One horizontal-shaft, single-runner, Francis turbine including turbine inlet valve, valve operators, and lubrication system.
- ii. One induction generator.
- iii. All required anchor bolts and foundation plates for mounting of turbine, valves, generator, and ancillary equipment.
- iv. Hydraulic Pressure Unit (HPU) and turbine controls and instrumentation panel.
- v. Generator switchgear assembly, including generator breaker and instrument transformers.
- vi. Neutral grounding equipment.
- vii. Generator circuit switcher and disconnect switches.
- viii. Station service equipment, including circuit breaker, AC and DC panel boards, station battery system, and inverter (if needed).
- ix. Motor control center.
- x. Diesel or propane back-up generator with instruments and controls.
- xi. Generator and turbine control system, including protective relays, RTU for utility communication, meters, instruments, synchronizing equipment, programmable logic controller (PLC), a panel mounted Human Machine Interface (HMI), and desktop SCADA PC based operator's terminal and monitor.
- xii. Communications equipment for monitoring and remote control of the intake using the existing intake control panel.
- xiii. RTU and communications equipment to connect new plant to DISTRICT'S system.
- xiv. Shop set-up and assembly of mechanical components prior to shipping.
- xv. Factory acceptance testing of turbine, generator, and control panel prior to shipment.
- xvi. All other related equipment to provide a complete "water to wire" generating system.

- xvii. Integration and coordination of all equipment and controls to provide a complete system.
 - xviii. On site supervision of installation of all above equipment.
 - xix. Commissioning and start-up services including field testing per Specifications.
 - xx. Operation and troubleshooting of the completed project during a 10-day test period.
 - xxi. Performance testing of the installed turbine/generator, (initial test by DISTRICT).
 - xxii. Turbine/Generator closed loop water cooling system. (If necessary, see Specifications.)
- B. The design of the equipment listed in A. above shall include the following design activities:
- 1. Determination of all equipment weights, loads and stresses due to both normal and possible abnormal operating conditions.
 - 2. Design and preparation of shop drawings detailing all interconnecting electrical wiring between equipment components supplied under this Contract. Interconnecting wiring drawings shall include conductor type and size, terminal strip and conductor connection details and designations. A conduit routing drawing and schedule shall be provided that shows all required conduits, their size, starting and ending points, and number and size of conductors required in each conduit. All wiring inside all SUPPLIER supplied equipment shall be by SUPPLIER. Actual installation of the equipment and the wire and wiring between them will be provided and installed by others in raceways and conduit installed by others. Drawings shall be prepared using, no earlier than, AutoCAD 2016. A complete instrument list with function, control wiring, and set-points shall be provided. Detailed logic diagrams illustrating the control logic of plant start- up, operation and shutdown logic shall be provided.
- C. Programming of all plant control, PLC, and remote communications systems.
- D. Testing of PLC programming and remote system operation prior to shipment.
- E. Calculation of protective relay settings through performance of a relay coordination study. All protective relays shall then be pre-set at the factory before shipment. All protective relays shall be double-checked for proper setting and operation in the field by SUPPLIER prior to plant start-up using test equipment supplied by SUPPLIER. DISTRICT may also perform a duplicate relay coordination study and recommend relay settings to SUPPLIER, but this shall not relieve SUPPLIER from responsibility for all relay settings.
- F. Calculation of unit stability and frequency control stability parameters, including water hammer analysis, water starting time, unit inertia (including flywheel, if required), pipeline pressure rise, integral and derivative settings, as applicable, to keep penstock pressure rise under all load rejection and system operating scenarios to 10% or less. This is a critical item and pressure rise must be guaranteed by SUPPLIER as part of the Proposal.
- G. Seismic Requirements:

1. Equipment and supports shall be designed to resist the design lateral seismic force and remain in place.
2. Stresses shall be calculated as the effect of the lateral force applied at the center of gravity of the equipment from any horizontal direction.
3. Equipment and supports shall be designed for lateral forces in accordance with the following:
 - a. $F_p = 0.355 g W_p$
 - b. Where:
 - F_p = Lateral force on the equipment
 - W_p = Total weight of the equipment supplied by SUPPLIER

1.03 RELATED WORK

- A. Section 01040: Quality Assurance.
- B. Section 01080: Operation and Maintenance Data.
- C. Section 01090: Equipment Warranties.
- D. Section 01100: Spare Parts and Maintenance Information.
- E. Section 01300: Submittals.
- F. Section 01450: Erection Supervision.

1.04 WORK BY OTHERS

- A. The following work will be performed by the DISTRICT or under separate contract(s) by others:
 1. Powerhouse construction, including:
 - a. The foundation, structure, and building envelope, including first and second stage concrete as required. This includes the powerhouse building, tailrace channel and the penstock/pipeline.
 - b. HVAC system.
 - c. Powerhouse lighting and drainage systems.
 - d. General site work.
 - e. Switchyard construction, and installation of equipment supplied under this contract.
 2. Installation of intake structures and penstock.
 3. Installation of communications lines.
 4. 12.47-kV transmission line and interconnections.
- B. A separate installation SUPPLIER will install all equipment furnished under this Contract, under the supervision of the erection supervisor(s) provided under this Contract.
- C. It shall be the responsibility of the SUPPLIER to supervise the installation of the turbine-generator and associated electrical, control, and mechanical equipment. Should it be necessary to modify or reinstall any part of the equipment after initial installation due to SUPPLIER'S design errors or deficient materials, the cost of all such modifications shall be borne by the SUPPLIER.

1.05 CONTRACT DOCUMENTS

- A. Drawings: The work shall conform to the Drawings listed in the Table of Contents, all of which form a part of the Contract Reference Documents and are provided to give the SUPPLIER a general overview of the project, its location, and the arrangement and relationship of the proposed project parts.
- B. The Drawings issued with the Contract Documents shall not be considered as defining the design of the equipment to be furnished, but rather to illustrate the general scope of supply, and the desired equipment arrangement.
- C. All design and detailing of the Work furnished under this Contract shall be done by the SUPPLIER in accordance with specified standards.
- D. Shop Drawings and Product Data submitted by SUPPLIER and reviewed and accepted by the DISTRICT shall be considered supplementary to the Contract Documents. Time and scope of submittal requirements for outline, detailed, final, and installation Shop Drawings are specified in Section 01300.

1.06 DELIVERY SCHEDULE

- A. SUPPLIER shall complete designated portions of the Work required under these Contract Documents within the number of days as stated in the Proposal Form. Time shall be computed starting with the effective date of the Notice to Proceed.
- B. Submit Shop Drawings, Product Data, schedules, storage and handling information, and other specified data in accordance with Section 01300. Foundation data and equipment loads are critical to the powerhouse foundation design being performed by others and shall be submitted as soon as practical.
- C. Point of delivery shall be the designated Project site. A 2 week advance notice of shipping from the factory and a 48-hour confirming notice of arrival at site acceptable to DISTRICT shall be given to the DISTRICT or DISTRICT'S representative. At this time the DISTRICT or DISTRICT'S representative has the right to inspect all delivered items, and the option to determine if the equipment must be offloaded and delivered to a staging area for further inspection. The location of the staging area will be determined by the DISTRICT or the DISTRICT'S representative.
- D. Spare parts and maintenance materials shipped after equipment deliveries shall be delivered to the job site prior to start of start-up and commissioning.
- E. Submittals of Manufacturer's Instructions, Operation and Maintenance Manuals, and Record Drawings shall be provided to meet the following schedule. Each submittal shall be complete; partial submittals are not acceptable.
 - 1. Manufacturer's instructions for erection and installation: Submit not later than forty five (45) days before the scheduled date for delivery of first stage concrete embedded parts.
 - 2. Operation and Maintenance Manuals: Submit not later than the scheduled date for delivery of turbine stationary parts.
 - 3. Record Drawings: Submit not later than the scheduled date for delivery of spare parts and maintenance materials.

1.07 COORDINATION MEETINGS

- A. SUPPLIER shall attend up to four (4) coordination meetings with the DISTRICT at the District office to discuss problem areas and to review progress. A kick-off meeting at the start of the project is currently planned to be held at the District office within two weeks of Contract award. For subsequent meeting dates, a place and time, mutually acceptable to SUPPLIER and the DISTRICT, shall be established.
- B. Representatives of the SUPPLIER and SUBSUPPLIERS attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
- C. The Engineer will record all meetings to include:
 - 1. Participants and affiliation.
 - 2. Date and agenda.
 - 3. Significant proceedings, conclusions, and decisions.
Minutes of the pre-construction meetings will be sent to the SUPPLIER and all meeting attendees. Recipients of the pre-construction meeting minutes will be required to direct any comments or changes to these minutes to the DISTRICT within seven (7) days from the date of receipt. If no changes or comments are received within the seven (7) days, the meeting minutes will be kept by the DISTRICT and become part of the project file.
- D. SUPPLIER shall distribute copies of the meeting record to other parties that he considers may be affected by decisions made at the meeting.

1.08 SYSTEM INTEGRATION

- A. The integration of all equipment being supplied under this Contract to provide a complete and smoothly functioning package shall be performed by a single person designated by the SUPPLIER, who is part of the SUPPLIER'S team. The system integrator shall have successful experience with at least 3 hydroelectric projects within the past five years.
- B. The system integrator shall be given authority on behalf of the SUPPLIER to communicate directly with the Engineer, DISTRICT, SUPPLIER and all SUBSUPPLIERS in all matters concerning approvals, coordination, start-up, testing and final acceptance, and shall have the authority to speak for and make commitments on behalf of the SUPPLIER.
- C. The system integrator shall provide the following:
 - 1. Coordination of design details and interconnecting wiring between the generator, turbine, voltage regulator, pumps, inlet valves and actuators, switchgear, PLC, SCADA (remote operator's terminal) system, and UPSS.
 - 2. Coordination between all suppliers and sub-suppliers on the production of all project drawings, including one lines, three lines, control schematics, logic diagrams, interconnection drawings, and panel wiring drawings.
 - 3. Coordination between all of SUPPLIER'S suppliers and sub-suppliers for preparation of the PLC program.
 - 4. Coordination of preparation of the operations and maintenance manuals.

END OF SECTION

**SECTION 01040
QUALITY ASSURANCE**

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Reference Standards and Codes.
- B. Qualifications of Manufacturers.
- C. Manufacturer's Quality Control.
- D. Inspections.

1.02 REFERENCE STANDARDS AND CODES

- A. Where references are made in these specifications to ASME, ASTM, ANSI, IEEE, NEMA, or other recognized agency standards, it is understood that references pertain to editions current at the date of advertisement, except where specific editions are cited. These specifications shall govern over referenced standards where discrepancies occur.
- B. No requirement of these specifications shall be waived because of any provision of, or omission from, referenced standards or codes.
- C. Alternative standards: SUPPLIER may request that for products manufactured outside the United States alternative technical standards in force in the country of origin shall apply.
 - 1. Requests will be considered by the DISTRICT/Engineer upon receipt of written application by SUPPLIER.
 - 2. Requests for application of alternative standards shall include the following information:
 - a. Reason for requested change.
 - b. Parts of work affected and specific discrepancy noted.
 - c. Complete details of alternative standard expressed in English language and U.S. customary units of measurement.
 - 3. The DISTRICT will make final determination on suitability of any proposed alternate.

1.03 QUALIFICATIONS OF MANUFACTURERS

- A. Before placing orders or beginning fabrication, all manufacturers furnishing material or equipment shall have submitted to the DISTRICT/Engineer information required by the Proposal Form demonstrating the ability to begin promptly and complete the work within specified schedules.

1.04 MANUFACTURER'S QUALITY CONTROL

- A. Provide and maintain a quality control system for inspections, tests, and retesting all items of equipment, including that of SUBSUPPLIERS.

1. Before start of manufacture and in accordance with Section 01300, submit to DISTRICT/Engineer a Quality Control plan detailing organization, procedures and reporting methods that completely lay out SUPPLIER'S quality control plan and procedures.
 2. Approve and certify all Shop Drawing, Product Data, Samples and testing submittals in accordance with requirements of Section 01300 before submitting for DISTRICT/Engineer's review.
- B. Perform all material, mechanical and electrical assembly, dimensional and operational tests to confirm that equipment meets requirements of these Specifications and all applicable codes, standards, and regulations.
1. Rectify all defects revealed as a result of tests to the satisfaction of the DISTRICT/Engineer.
 2. The waiver of any test, or the witnessing thereof by DISTRICT/Engineer, shall not constitute a release of SUPPLIER'S responsibility to meet fully the requirements of the Specifications.
- C. Witnessing tests: The DISTRICT'S authorized representatives shall have free entry at all times to the SUPPLIER'S manufacturing facility to ascertain that materials being furnished are in accordance with Contract Documents. SUPPLIER shall notify DISTRICT and Engineer a minimum of thirty (30) days in advance of each test so that DISTRICT/Engineer may, at their option, witness the tests.
1. If scheduled tests are delayed or changed, SUPPLIER shall notify DISTRICT'S authorized representatives as soon as the change is determined, but not less than 2 weeks before the scheduled date.
 2. If DISTRICT'S authorized representatives travels to a manufacturer's plant for SUPPLIER'S scheduled inspections or tests and the inspecting or testing is delayed, SUPPLIER shall pay all direct costs to DISTRICT for the trip, including transportation, salary, per diem, and all other expenses for the trip if DISTRICT'S representatives return home, or shall pay all direct labor and travel expense costs to the DISTRICT if, due to short delays, DISTRICT'S representatives remain at the manufacturing facilities extra time beyond that originally scheduled to conduct inspections and observe tests.
 3. If the tests are performed and are unsatisfactory and equipment must be retested at a later date, SUPPLIER shall pay all costs to DISTRICT, including transportation, salary, per diem, and all other expenses for the trip if DISTRICT'S representatives must return home; or shall pay all costs if, due to short delays, DISTRICT'S representatives must remain at the manufacturing facilities extra time beyond that originally scheduled to conduct inspections and observe tests.
- D. Material tests: Retain on file certified copies of all material tests for chemical analysis and mechanical properties of plates and castings and make available for inspection by DISTRICT upon request.

1.05 INSPECTIONS

- A. All work of this Contract is subject to inspection by the DISTRICT/Engineer, and appointed inspectors to insure compliance.
- B. Inform DISTRICT/ Engineer as to progress of the Work in accordance with the

General Conditions of the Contract and Section 01300.

- C. Unless waived in writing by the DISTRICT/ Engineer, perform all tests and trials in the presence of an inspector as provided above; provide test reports and certified test reports in accordance with Section 01300.

1.06 INSTALLATION REQUIREMENTS

Provide manufacturer's instructions in accordance with Sections 01300 and 01450.

END OF SECTION

SECTION 01050
**PROJECT SCHEDULE/FAILURE TO MEET GUARANTEED DELIVERY DATES/
LIQUIDATED DAMAGES**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work under this section will include the preparation and submittal of fabrication and delivery schedules to be used by the SUPPLIER and DISTRICT to effectively plan and track the course of work and also to be used to establish progress payments for the SUPPLIER. The SUPPLIER shall prepare schedules as per the requirements listed herein, and shall make every effort for their prompt submittal. Failure to submit the required schedule with the Proposal will result in an incomplete Proposal and periodic progress schedules which are late will likely delay the associated progress payment to the SUPPLIER.
- B. A minimum of four (4) copies of the prepared schedules are to be submitted to the DISTRICT. Schedule shall be provided in electronic format (either MS Word or MS Excel). Schedules shall be legibly typed and copied or printed on at least 11" X 17" bond paper, capable of being reproduced if needed. The schedule shall include as a minimum the following information:
1. SUPPLIER'S Name, address and phone number
 2. Project Name
 3. Date of the schedule
 4. A block for the DISTRICT/Engineer to designate their review and approval of the schedule.
 5. An itemized breakdown of project tasks.
 6. 250 kW Milestones and critical dates as well as completion dates for a minimum of 15 (Bid Items on Proposal Forms 1 & 2) separate tasks comprising the work.
 7. 50 kW Milestones and critical dates as well as completion dates for a minimum of 15 (Bid Items on Proposal Forms 3 & 4) separate tasks comprising the work.
 8. The critical path for the project which will alert both the DISTRICT and SUPPLIER to crucial dates and delivery or activity milestones for the project.
 9. A listing of items that must be prepared or installed by DISTRICT prior to any SUPPLIER milestones, so that DISTRICT knows the schedule necessary to get these items completed.
- C. Timing of Schedule Submittals
- D. Schedule to Accompany Proposal - A schedule is to be submitted with the Proposal Form to be used by the DISTRICT in evaluating Proposals and to ensure the SUPPLIER'S understanding of the Work required to complete this project.
- E. Periodic Schedules - An updated progress schedule shall be submitted with each payment request to assist the Engineer and DISTRICT in accurately determining the percentage of work completed to date on the project; provided that in no event will the acceptance by the DISTRICT of any such updated progress schedule affect the SUPPLIER'S obligation to complete the applicable portions of the WORK in accordance with the Guaranteed Delivery Dates set forth in the Proposal Form, unless

such acceptance specifically states in writing that such Guaranteed Delivery Periods will be so extended. These periodic schedules may be in the form of a bar or "Gantt" chart.

1.02 REQUIRED COMPLETION DATES

- A. Submittals: Required number of days following Notice to Proceed for delivery of submittals are set forth in the Proposal Form and in Section 01300 of this document, and other sections of the specifications.
- B. Final Completion: The date of final completion shall be the date all equipment is installed, successfully tested and operating, punch list items are all 100% complete, and the DISTRICT/Engineer certifies that the goods furnished under this Contract conform to Contract requirements for Final Completion as specified in General Conditions.

1.03 LIQUIDATED DAMAGES

- A. Schedule: In case of failure on the part of the SUPPLIER to complete the applicable portions of the Work within the applicable Guaranteed Delivery Periods set forth in the Proposal Form, the SUPPLIER shall pay to the DISTRICT liquidated damages as described in Paragraph 15 of the General Conditions.
- B. Performance: In case of failure of the equipment supplied under this Agreement to achieve guaranteed efficiencies as guaranteed in the Proposal Form, liquidated damages for failure to achieve guaranteed performance will be assessed in accordance with Section 00800, Supplemental General Conditions, Paragraph 14.

END OF SECTION

SECTION 01080
OPERATION AND MAINTENANCE INFORMATION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Prepare operating and maintenance data as specified in this Section and as referenced in other sections of Specification. Compile Product Data and related information appropriate for the DISTRICT'S maintenance and operation of equipment furnished under these Contract Documents.
- B. Instruct the DISTRICT'S personnel during the start-up and testing period in maintenance of materials and equipment and in operation of equipment and systems.

1.02 QUALITY ASSURANCE

- A. Preparation of data shall be done by personnel:
 - 1. Trained and experienced in maintenance and operation of described products.
 - 2. Familiar with requirements of this Section.
 - 3. Skilled as technical writers to the extent required to communicate essential data.
 - 4. Skilled as drafters competent to prepare required drawings.
 - 5. Fluent in the English language.

1.03 FORM OF SUBMITTALS

- A. Prepare data in the form of an Operation and Maintenance instruction manual for use by the DISTRICT'S personnel.
- B. Format: Both hard copy and electronic versions are required. Electronic copies must be submitted on a CDROM. Catalog and product data may be in Adobe .PDF format. Maintenance procedures and schedules **MUST BE** submitted in Microsoft WORD format so that DISTRICT may import them into DISTRICT'S electronic maintenance planning software. Hard copies shall have the following format:
 - 1. Size: 8-1/2 inches by 11 inches.
 - 2. Paper: Manufacturer's printed data, or neatly typewritten, minimum 20 pound stock.
 - 3. Drawings numbered and indexed:
 - a. Provide reinforced punched binder tabs and bind with text.
 - b. Fold larger drawings to size of text pages.
 - 2. Provide fly-leaf for each separate product, or each piece of operating equipment.
 - a. Provide typed description of product, and major component parts of equipment.
 - b. Provide indexed tabs.
 - 3. Cover: Identify each volume with typed or printed title "OPERATION AND MAINTENANCE MANUAL". List:
 - a. Title of Contract.
 - b. Identity of separate equipment as applicable.
 - c. Identity of general subject matter covered in the manual.

C. Binders:

1. Commercial quality three-ring binders with durable and cleanable plastic covers. McBee swing-hinge binders or equal. Minimum ring size: 1 inch; maximum ring size: 3 inches.
2. When multiple volumes are used, correlate the data into related consistent groupings and provide Master Index.

1.04 CONTENTS OF MANUAL

A. Neatly typewritten table of contents for each volume, arranged in systematic order.

1. SUPPLIER, name of responsible principal, address, and telephone number.
2. A list of each product required to be included, indexed to content of the volume.
3. List, with each product, name, address, and telephone number of:
 - a. SUPPLIER, manufacturer, and installer.
 - b. Manufacturers' nearest service representative.
 - c. Identify area of responsibility of each.
 - d. Local source of supply for parts and replacement.
4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

B. Product data:

1. Include only those sheets pertinent to the specific product.
2. Annotate each sheet to:
 - a. Clearly identify specific product or part installed.
 - b. Clearly identify data applicable to installation.
 - c. Delete references to inapplicable information.
3. If catalog cut sheets are included that show multiple parts or models, clearly indicate which part of model pertains to this project.

C. Drawings:

1. Supplement product data with drawings as necessary to clearly illustrate:
 - a. Relations of component parts of equipment and systems.
 - b. Control and flow diagrams.
2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
 - a. Include a final set of the Project Record Drawings and Documents as a section of the O&M manual.

D. Written text, as required to supplement product data for the particular installation:

1. Organize in consistent format under separate headings for different procedures.
2. Provide logical sequence of instructions for each procedure.

- E. Parts lists:
 1. Cross reference between product data and drawings to facilitate identification and location of parts.
 2. Identify local source of parts not of special manufacture.
 3. Include only actual parts and spare parts and components supplied.
- F. Copy of each warranty issued to and executed in the name of the DISTRICT in accordance with Section 01090 and the Supplemental Conditions, paragraph 13.
 1. Provide information sheet for the DISTRICT'S personnel, listing:
 - a. Proper procedures in event of failure.
 - b. Instances which might affect validity of warranties or bonds.

1.05 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Contents, for each unit of equipment and each system, as appropriate:
 1. Description of unit and component parts:
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 2. Operating procedures:
 - a. Start-up, break-in, routine, and normal operating instructions.
 - b. Regulation, control, stopping, shut-down, and emergency instructions.
 - c. Summer, winter, and other seasonal operating instructions.
 - d. Special operating instructions.
 3. Maintenance procedures: (MUST BE SUBMITTED IN "WORD" FORMAT)
 - a. Routine operations.
 - b. Guide to "trouble-shooting".
 - c. Disassembly, repair and reassembly.
 - d. Alignment, adjusting and checking.
 4. Servicing and lubrication schedule and a list of lubricants recommended or required and quantities required. (MUST BE SUBMITTED IN "WORD" FORMAT)
 5. Manufacturer's printed operating and maintenance instructions. (MUST BE SUBMITTED IN "WORD" FORMAT)
 6. Description of sequence of operation by controls manufacturer.
 7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance:
 - a. Predicted life of parts subject to wear.
 - b. Items recommended to be stocked as spare parts.
 8. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
 9. Other data as required under pertinent sections of Specifications.
- B. Prepare and include additional data when the need for such data becomes apparent during instruction of the DISTRICT'S personnel.
- C. Additional requirements for operating and maintenance data: See respective technical sections of Specifications.

D. Provide complete information for all products specified in technical sections of the Specification.

1.06 SUBMITTAL SCHEDULE

A. Schedule: Submit four (4) copies of the draft manuals at least 45 days prior to the completion of delivery of the turbine and generator to the jobsite. Revise and resubmit the final manuals before the start of the SUPPLIER's field tests on the installed equipment.

B. Quantity: In accordance with Section 01300, submit six complete sets of O&M Manuals in hard copy and one CDROM electronic copy.

1.07 INSTRUCTION OF THE DISTRICT'S PERSONNEL

A. Before final inspection or acceptance, fully instruct the DISTRICT'S designated operating and maintenance personnel in operation, adjustment, and maintenance of all products, equipment, and systems. Training shall consist of a minimum of 40 hours of face-to-face training activities at the power plant site.

B. Operating and maintenance manual shall constitute the basis of instruction. Review contents of manual with the DISTRICT'S personnel in full detail to explain all aspects of operations and maintenance.

END OF SECTION

**SECTION 01090
EQUIPMENT WARRANTIES**

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Compile specified warranties.
- B. Review submittals to verify compliance with Contract Documents.
- C. Submit to the DISTRICT for review.
- D. Minimum acceptable Equipment warranty is 30 months after completion of 100% of the delivery of all equipment to the Project site, or 24 months after issuance of FINAL COMPLETION CERTIFICATE, whichever is shorter.

1.02 SUBMITTAL REQUIREMENTS

- A. Assemble warranties and guarantees executed by each of the respective manufacturers, suppliers, and SUBSUPPLIERS.
- B. Number of original signed copies required: Two (2) each.
- C. Table of Contents: Neatly typed, with numbered sequence. Provide complete information for each Product or Work item.
 - 1. Manufacturer, with name of principal, address and telephone number.
 - 2. Scope.
 - 3. Date of beginning of warranties and guarantee.
 - 4. Duration of warranty or guarantee.
 - 5. Provide the following information for the DISTRICT'S personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity of warranty.
 - 6. SUPPLIER, name of responsible principal, address and telephone number.

1.03 SUBMITTALS

- A. Prepare in duplicate using the following format:
 - 1. Size 8-1/2 inches by 11 inches; punch sheets for standard commercial quality 3-ring binder; fold larger sheets to fit binders.
 - 2. Identify binder with typed or printed title "WARRANTIES" and list the Project title along with the name of SUPPLIER. Warranties may be included as a separate section in the O&M Manual.
- B. Time of Submittals:
 - 1. For equipment or component parts of equipment put into service during progress of construction: Submit documents within 10 days after inspection and acceptance.
 - 2. Otherwise make submittals prior to final request for payment.
 - 3. For items of work, where acceptance is delayed materially beyond shipment and delivery of goods, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

4. Submit warranties as follows:
 - a. Manufacturer's warranties: When warranties are valid for a period longer than the SUPPLIER'S warranties are required by the Specifications, SUPPLIER shall provide such warranties to the DISTRICT.

1.04 CORRECTION OF DEFECTS

Repairs of alterations required of SUPPLIER shall be made by the SUPPLIER at such times as directed, in a manner as will effect a minimum interruption of service to the DISTRICT.

1.05 RIGHT TO OPERATE UNSATISFACTORY EQUIPMENT

The DISTRICT shall have the right to operate any and all equipment as soon as, and as long as it is in operating condition, whether or not such equipment has been accepted as complete and satisfactory, except that this shall not be construed to permit operation of any equipment which may be materially damaged by such operation.

1.06 REQUIRED WARRANTY TERMS

All warranties shall include warranty terms and conditions as described in Supplemental General Conditions, Paragraph 13, as a minimum.

END OF SECTION

SECTION 01100
TOOLS USED FOR INSTALLATION, SPARE PARTS, AND MAINTENANCE
MATERIALS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Spare parts and accessories.
- B. Tools used for installation, maintenance, and repair
- C. Lubricating and insulating materials.

1.02 RELATED REQUIREMENTS

- A. Each technical section of Specifications which specifies spare parts, accessories, lubricants, insulating oil or like products, and maintenance tools.
- B. Section 01010: Summary of Work and Delivery Schedule.
- C. Section 01090: Equipment Warranties.

1.03 SUBMITTAL REQUIREMENTS

- A. Provide manufacturer's recommended spare parts and maintenance tools lists and submit to the DISTRICT with Product Data submittals in accordance with Section 1300.
- B. Submittal information shall include quantities, unit prices, "useful life" properties, storage, and protection requirements.
- C. Products with limited "useful life" properties shall have prominently displayed manufacturing date.

PART 3 - EXECUTION

3.01 SPARE PARTS TO BE PROVIDED

- A. SUPPLIER shall prepare a list of all recommended spare parts for all the equipment being supplied under this Agreement. Recommended spare part lists shall include:
 - 1. A supply of all consumable supplies such as chart paper, graph paper, computer log paper, ink or printer ribbons, etc.
 - 2. All parts that need routine replacement such as indicator lamps and small relays.
 - 3. Critical equipment replacement parts with long lead delivery times that are critical to monitoring plant operations. This should include spare computer input and output modules of each type, critical printed circuit boards, two complete sets of replacement fuses, spare lube oil filters, and governor oil filters as listed below, and one complete set of main turbine and generator bearings.
- B. SUPPLIER shall then supply one complete set of the recommended spare parts at the time of delivery of the equipment under this Contract. Spare parts shall be identical in design and manufacture and interchangeable with corresponding parts in original equipment supply, boxed and packaged in waterproof packing for storage. Each box shall be marked or tagged and contain a list and identification numbers of the parts supplied.
- C. For the following components SUPPLIER will list all necessary spare parts for

uninterrupted repairs and maintenance of the each (some items have been listed as an example):

1. For the turbine inlet valve:
 - a. One complete actuator assembly.
 - b. One replacement set of ball seals.
2. For the turbine and actuator:
3. For the PLC control system:
4. For Lube Oil, HPU and Cooling Water Systems
 - a. One complete spare lube oil pump.
 - b. One complete spare HPU AC pump.
 - c. One complete spare cooling water pump.
 - d. Five spare filters of each type in each system.
5. Spare miscellaneous electrical devices shall be provided as follows:
 - a. Two fuses of each type and rating used.
 - b. One bulb of each type used.
 - c. One switch of each type used.
 - d. Five control relays of each type used, including AGASTAT timers.
6. One gallon of each color and type of paint used for each type of equipment to be used for on-site touch-up.
7. One lot of consumables sufficient for six months plant operation, including chart and graph paper, computer printer paper, printer ribbons, etc.

3.02 TOOLS TO BE PROVIDED

- A. SUPPLIER shall provide one each of any special tools required for assembly or disassembly of the turbine inlet valves and turbine-generator, such as special or non-standard torque-wrenches, measuring devices, assembly installation or alignment jigs or fixtures, lifting lugs, devices or spreader beams, or bolt stretching or torqueing devices. SUPPLIER shall issue a list of the required special tools to DISTRICT.

END OF SECTION

**SECTION 01150
MEASUREMENT AND PAYMENT**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section covers the method of measurement and basis for payment for all of the Work done under this Contract. Work performed and the materials installed shall be in accordance with the Contract Documents.

1.02 SUBSTITUTIONS

- A. The SUPPLIER may, at his option, propose in writing substitutions of materials or equipment for review and approval by the DISTRICT and the Engineer. Proposed substitutions will be accepted for use only upon written authorization from the DISTRICT. Costs of modifications to the project's structures or its design required to allow use of a substitution and additional engineering costs associated with such modifications shall be borne by the SUPPLIER.

1.03 DETAILS FOR PAYMENT OF PROPOSAL ITEMS

A. General:

1. It is the intent of the DISTRICT to make periodic payments to SUPPLIER based on the Payment Schedule in the Supplemental General Conditions:

B. Inclusions:

1. Unit prices or lump sum amounts quoted shall include full compensation including direct and indirect costs, overhead, profit, taxes, fees, duties, and permits for furnishing all materials, labor, equipment, tools and completing all Work as shown on the project drawings, defined in the specifications and as stipulated herein. Proposal prices shall include all protective and remedial measures to bring work into compliance with these Contract Documents.

END OF SECTION

SECTION 1300 SUBMITTALS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. At a minimum, the following submittals shall be provided:

1. Submittals schedule.
2. Production schedule.
3. Quality control plan.
4. Shop drawings and product data, including design foundation load information and equipment dimensional drawings.
5. Manufacturer's major components list including an instrument list.
6. Factory acceptance test plans and reports.
7. Operation and maintenance manuals.
8. Spare parts list.
9. Installation instructions.
10. Interconnecting wiring diagrams.
11. Conduit routing schematics and schedule.
12. Control schematic diagrams.
13. Plant control and SCADA (remote operator's terminal) system programming.
14. Commissioning plan, instructions and sign-off procedures.
15. Other submittals as called for in various sections of these specifications.

1.02 RELATED REQUIREMENTS

- A. Section 01010: Summary of Work and Delivery Schedule
- B. Section 01040: Quality Assurance
- C. Section 01080: Operation and Maintenance Data
- D. Section 01090: Equipment Warranties
- E. Section 01100: Spare Parts and Maintenance Information
- F. Section 01450: Erection Supervision. .

1.03 GENERAL

- A. All written information on Shop Drawings, Product Data, and Samples shall be in the English language, and all numerical data shall use English units of measurement.
- B. Notify DISTRICT/Engineer in writing, at time of submission, of any deviations in each submittal from requirements of the Contract Documents.
- C. Begin no fabrication or work which requires review of submittals until return of submittals with DISTRICT/Engineer's review comments. Any manufacturing work or fabrication performed before the DISTRICT/Engineer's review and acceptance shall be at SUPPLIER'S risk.

- D. Changes or revisions to submittals made by the SUPPLIER after DISTRICT'S/Engineer review which require redesign of the powerhouse will be subject to back-charges to SUPPLIER.

1.04 SCHEDULE OF SUBMITTALS

- A. With Proposal submit: Schedule: paper copy and MS Word or Excel file, and equipment preliminary outline drawings: paper copy and AutoCAD.
- B. Within 30 days after Notice to Proceed submit:
1. Submittals schedule incorporating data from DISTRICT'S suggested submittal list revised to show all Shop Drawings, calculations, and Product Data to be submitted along with scheduled submittal dates. This shall become the Submittals Schedule which shall include, but not be limited to, submittals required in other specification sections.
 2. Turbine inlet valve, turbine, generator, switchgear, control panels, and HV breaker: assembly plans, elevation drawings, and foundation plans and elevations. Foundation drawings shall be provided both as drawings and in electronic format on CDROM compatible with AutoCAD 2016 (or more recent version) electronic drafting system.
 3. Design load and stress calculations on principal load carrying parts including foundation loadings.
 4. Erection and maintenance clearances.
 5. Complete Bill of Material and all major component material lists with material specification and certification requirements, heat treatment requirements, test requirements, welding details and procedures, dimensional tolerance requirements, and all other tests and inspections required of principal parts both for shop and field work.
 6. Production schedule.
 7. Quality control plan.
 8. Factory acceptance test and inspection schedule.
 9. Proposed plant control logic diagrams.
 10. Final electrical one line and three line diagrams.
- C. Within 60 days after Notice to Proceed, submit:
1. All electrical interconnection wiring diagrams.
 2. Plant control and SCADA (remote operator's terminal) system program.
 3. Plant control schematic diagram.
 4. Final plant control logic diagram.
 5. Conduit routing schematic and schedule showing conduit sizes, start and end points, and number and size of conductor for all circuits.
 6. Catalog cuts and product data for all purchased parts.
- D. Within 90 days after Notice to Proceed, submit:
1. Field installation and erection instructions specified in Section 01450.
 2. Plan and elevation drawings of assembled units.
 3. Turbine-generator field test requirements.
 4. Commissioning and start-up test plan.

- E. Within 180 days after Notice to Proceed, submit complete Operation and Maintenance Manuals. Submittal requirements for Operation and Maintenance Manuals and Record Drawings are specified in Section 01080, Operation and Maintenance Information.
- F. Upon completion of delivery of all Work under this Contract, provide one reproducible copy of each record drawing, revised to show actual as-constructed conditions.

1.05 FORM AND CONTENT OF SUBMITTALS SCHEDULE

- A. Provide Submittals Schedule, in MS Word or Excel format, showing the dates for submission of Shop Drawings, Product Data, Samples, and other specified data.
- B. Submittals Schedule shall list each submittal in order. Identify all listings by specification section number, component name and description.
 - 1. Show the date SUPPLIER will deliver to DISTRICT/Engineer each proposed submittal item.
 - 2. Identify dates Engineer's reviews are scheduled to be returned. DISTRICT/Engineer will complete and return review comments within 15 working days of receipt at DISTRICT/Engineer's office.
- C. Provide updated electronic copy of Submittals Schedule and current status of each submittal monthly.

1.06 FORM AND CONTENT OF PRODUCTION SCHEDULE

- A. Prepare production schedule in format of DISTRICT'S option.
- B. Format of listings: The chronological order of the start of manufacture for each item of equipment. Identify all listings by specification section number.
- C. Production schedule:
 - 1. Show the complete sequence of design and fabrication by activity.
 - 2. Show the dates for the beginning and completion of each major element of manufacture. Specifically list dates of:
 - a. Design and submittals phase.
 - b. Items affecting work embedded in concrete.
 - c. Materials orders.
 - d. Fabrication and machining.
 - e. Shop testing.
 - f. Shipping.
 - g. Completion of delivery.
 - 3. Show projected percentage of completion for each item, as of the first day of each month.
- D. Production schedule revisions: Update monthly.
- E. Provide electronic copy of schedule in Microsoft Word or Excel compatible file.

1.07 DISTRIBUTION OF SCHEDULES

- A. Distribute copies of the revised schedules to:
 - 1. DISTRICT.
 - 2. Engineer.
 - 3. All Sub-suppliers.

B. Instruct recipients to report promptly to the SUPPLIER, in writing, any problems anticipated by the projections shown in the Schedules.

1.08 FORM OF SHOP DRAWING, PRODUCT DATA, SAMPLE AND OTHER SUBMITTALS

A. Make submittals promptly in accordance with Submittals Schedule, and in such sequence as to cause no delay in production or in the work of any other SUPPLIER.

B. Provide with each submittal a transmittal letter which includes DISTRICT'S contract number and project title.

C. Submittal shall contain:

1. The project title.
2. The current date of the submitted item and an indication of previous versions by a numbered revision symbol and notation with dates.
3. Job file number and SUPPLIERS' identifying number, if different.
4. Identification of the product or category of work shown.
5. The names of manufacturers and suppliers.
6. Principal dimensions, with the controlling features and required clearances clearly identified. Give particular attention to the interface points with the general construction contract.
7. Applicable standards, such as ASTM or ANSI numbers.
8. Identification of revisions on re-submittals by cloud and numbered revision symbol.
9. A 5-inch by 3-inch blank space for DISTRICT/Engineer's review stamp.
10. SUPPLIER'S stamp, initialed or signed, certifying he has completed his review of the submittal as follows:

<p>SUPPLIER'S NAME</p> <p>This certifies that this submittal has been reviewed and that the information presented has been coordinated with, and conforms to, all requirements of the Contract Documents.</p> <p>Comments: _____</p> <p>By: _____ Date: _____</p>

D. Preparation of submittals:

1. Clearly identify products, including model numbers where applicable. Identify details by reference to drawing sheet number and detail, schedule, or location.
2. Show performance characteristics and capacities.
3. Show dimensions and clearances required, including:

- a. Materials in accordance with ASTM or other recognized United States standards.
 - b. Location of welded seams and welding details in accordance with AWS A2.4 welding symbols.
 - c. Machined surface finishes, dimensions, tolerances and clearances in accordance with values of ANSI B46.1.
 - d. Assembly drawings indicating each component by part number.
4. Provide wiring or piping and controls diagrams, including:
 - a. Electrical diagrams, including connection diagrams and terminal blocks.
 - b. Factory certification tests for electrical equipment in accordance with NEMA and IEEE.
 - c. Piping and fitting dimensions and materials.
- E. Present Shop Drawings in a clear and thorough manner. Identify details by reference to sheet number and detail, schedule, or location shown on the Drawings; minimum sheet size: 11x17 inches.
1. Outline and assembly drawings shall include overall dimensions, arrangement, assembly, piping, wiring and controls for equipment to be furnished under Contract.
 2. Include construction details and materials: loads and forces to be resisted by foundations or structure: locations and size of lifting connections or lugs, anchor bolts, base plates, equipment pads, or other anchoring methods of installation.
- F. Manufacturer's Standard Product Data, schematic drawings and diagrams:
1. Modify drawings and diagrams to delete information not applicable to the equipment. Clearly identify product part number and all options selected for materials, trim, finishes, switch development, operating range, etc.
 2. Supplement standard information to provide information specifically applicable to the equipment.
 3. Provide specific data as required in technical sections of Specifications.
- G. Number of copies required (Numbers of copies below refer to a system where all submittals are handled as hard paper copies. If SUPPLIER proposes to use electronic filing of ALL submittals, an alternative submittals procedure may be negotiated with DISTRICT and Engineer):
1. Production schedule: Provide three copies.
 2. Submittals schedule: Provide three copies.
 3. Quality control plan: Provide three copies.
 4. Shop Drawings, Product Data and Samples:
 - a. Shop drawings review: Provide three copies. One electronic copy shall be acceptable as an alternate.
 - b. Product Data, including materials lists and catalogs: Provide minimum five copies.
 - c. Samples: Submit minimum two samples, plus the number the SUPPLIER requires returned.
 5. Manufacturer's certified shop tests: Provide three copies.
 6. Manufacturer's instructions for erection and installation and commissioning and start-up:

- a. Preliminary submittal: Before scheduled final submittal and allowing sufficient time for DISTRICT/Engineer's review. Provide three copies.
 - b. Final submittal: Provide six copies of instructions incorporating DISTRICT/Engineer's review comments.
7. Record Drawings: Provide as specified herein, including one hard copy set of original reproducible complete with index of drawing numbers and titles, and one complete set of drawings in electronic format, delivered on a CDROM.
 8. Operation and maintenance manuals: Provide six (6) copies. One hard copy and one CDROM is an acceptable alternative.

1.09 RESUBMITTAL REQUIREMENTS

- A. Make all corrections or changes in the submittals required by the DISTRICT/Engineer and resubmit until accepted.
- B. Shop Drawings, Product Data, and calculations:
 1. Revise initial drawings or data, and resubmit as specified for the initial submittal.
 2. Indicate all corrections and changes which have been made in addition to those requested by the DISTRICT/Engineer.

1.10 DISTRICT/ENGINEER'S REVIEW

- A. DISTRICT/Engineer will review submittals with reasonable promptness and in accordance with accepted submittal schedule, but not to exceed 15 working days from date of receipt. DISTRICT/Engineer will review first submittals and first re- submittals. Engineering costs for additional reviews of 2 or more re-submittals for the same item will be back-charged to the SUPPLIER at a rate of \$100/hr for engineering review time.
- B. DISTRICT/Engineer will affix his review stamp and initials or signature, and indicate status of the submittal.
- C. DISTRICT/Engineer will return submittals to SUPPLIER for action in accordance with the status defined as follows:
 1. No Exceptions Taken - Revision of the submittal is not required. SUPPLIER shall apply a stamp saying "Final" or wording of similar intent, shall transmit copies as specified, and is authorized to proceed with the work covered by the submittal.
 2. Exceptions Taken as Noted:
 - a. If SUPPLIER agrees with DISTRICT/Engineer's comments, re- submittal for review is not required. SUPPLIER shall revise the submittal, incorporating DISTRICT/Engineer's comments, shall stamp the revised submittal and transmit copies as provided above under "No Exceptions Taken" and is authorized to proceed with the work covered by the submittal.
 - b. If the SUPPLIER does not agree with the DISTRICT/Engineer's comments, SUPPLIER shall not proceed and shall immediately inform the DISTRICT/Engineer.
 3. Revise and Resubmit - SUPPLIER shall revise the submittal and resubmit for DISTRICT/Engineer's review and shall not proceed with the work covered by the submittal.
 4. Rejected - The submittal is inadequate. DISTRICT/Engineer will not review but will comment, in general, to explain the reason for rejection. SUPPLIER shall correct the deficiency and submit as an original submittal. SUPPLIER is not authorized to

proceed with the work covered by the submittal.

1.11 RECORD DRAWINGS

- A. Submit in accordance with Schedule of Submittals specified in paragraph 1.04.
- B. Before acceptance of the Work under this Contract, provide complete set of all drawings:
 - 1. Drawings shall be sent electronically.
 - 2. Include all changes and revisions made during design, fabrication, and assembly as accepted by the DISTRICT up to delivery and acceptance of the Work. Record Drawings shall be numbered, titled, and indexed sets, complete in one submittal: partial submittals are not acceptable.

END OF SECTION

SECTION 1450
ERECTION SUPERVISION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Submit installation and erection instructions to the DISTRICT/Engineer.
- B. Furnish Erection Supervisor(s) at the job site during erection and installation of generating machinery and equipment as proposed on the Proposal Schedule at the times as requested by the DISTRICT/Engineer.
- C. Maintain logs during erection and installation work.
- D. Report to the DISTRICT at regular intervals on progress of erection and installation work.
- E. Consult, interpret, and assist with the interpretation of the erection instructions submitted.
- F. Because the erection work is being performed under the supervision of the Erection Supervisor(s), SUPPLIER shall not make any claims that the equipment was not properly installed.

1.02 RELATED REQUIREMENTS

- A. Divisions 15 and 16 of the Specifications.
- B. Section 01500, Commissioning, Start-up and Testing

1.03 QUALIFICATIONS OF ERECTION SUPERVISORS

- A. Erection Supervisors shall have special skills and knowledge of erection and installation procedures of the equipment. Each Erection Supervisor shall have special knowledge of the particularities of the specific item of equipment or machinery he is to represent or oversee.
- B. Each Erection Supervisor shall have prior erection and installation experience with the particular item of generating machinery and equipment of similar design and capacity he is to represent.
- C. Erection Supervisors shall be fluent in English language, both spoken and written.
- D. Erection Supervisors shall be employees of manufacturers of the equipment supplied under this Contract, and shall be directly responsible to the SUPPLIER.
- E. If any Erection Supervisor or other person employed by the SUPPLIER shall appear to the DISTRICT to be incompetent or to act in a disorderly or improper manner, his services in connection with the Work shall be immediately terminated upon request by the DISTRICT and he shall not again be employed for this project. Any Erection Supervisor so removed from the Work shall be replaced as required at no additional cost to the DISTRICT.

1.04 SUBMITTALS

- A. Submit complete erections instructions in accordance with Section 01300.

- B. Submit names and experience record of each Erection Supervisor, and equipment manufacturer's estimated number of trips and number of days each visit is expected to be required at job site.
- C. Submit schedule of planned job site visits, updating when changes are anticipated.
- D. At completion of installation, submit in form of a daily log, a complete documentation summary of methods and procedures observed.
- E. Keep records of all changes to permanent equipment and materials in the field to assure that they get incorporated in the Record Drawings.

1.05 MANUFACTURER'S INSTRUCTIONS FOR ERECTION AND INSTALLATION

- A. Provide installation instructions including all necessary information on transportation and handling, storage and protection, and the following:
 - 1. Drawings and specifications covering embedment of equipment items during construction of the power plant and equipment installation to be performed by others under separate contract.
 - 2. Methods and procedures for technical phases of installation.
 - 3. Initial startup, testing, and acceptance.
- B. Erection instructions shall be comprehensive and complete giving all necessary directions for unloading, storing, handling, and erecting all the equipment provided. The SUPPLIER shall be responsible for the accuracy and completeness of the erection instructions.
- C. Erection instructions shall give reasonable directions for tolerances, alignment, sequences and scheduling of the work.
- D. Thickness of all material to be field welded and lengths of welds shall be given for each thickness.
- E. All special handling requirements shall be noted.
- F. Provide a list of all special tools or equipment that may be required in the installation.

1.07 RESPONSIBILITIES OF ERECTION SUPERVISORS

- A. The Erection Supervision Services provided under this Agreement shall fall under the following two categories, as follows:
 - 1. Erection, installation and adjustment services; consisting of erection supervision of all the equipment supplied under this Agreement, checking and verifying that installation is both correct and complete, and making all initial adjustments, wiring checks, instrument settings and all other necessary tasks to prepare the equipment for start-up. Services in this category will be completed when the Erection Supervisor certifies that installation of all equipment is complete and start-up and testing is ready to begin.
 - 2. Start-up, testing, and operation services; consisting of start-up and testing of each electrical, instrument and mechanical sub- system, start-up and testing of the turbine and generator, making all necessary adjustments to all equipment supplied under this Agreement necessary before long term operation of the turbine and generator may begin, and performing the 10 day test run of the turbine and generator set as described in Section 01500, Commissioning, Start-up and Testing. Services under

this category will be considered complete at the completion of the 10-day test and the performance testing.

B. Responsibilities During Erection and Installation shall include but not be limited to:

1. Observe and verify installation SUPPLIER'S work for concurrence with manufacturer's erection and installation, and start-up and performance testing methods, procedures, and instructions.
2. Report to the DISTRICT/Engineer immediately all procedures not in compliance with manufacturer's instructions and any other discrepancies which might result in inadequate performance or delay.
3. Perform their duties to avoid delays and interference with installation SUPPLIER's progress schedule.
4. Notify DISTRICT/Engineer when installation is complete and commissioning and start-up may begin.
5. Document final alignment and settings of all rotating equipment.

C. Responsibilities During Commissioning, Start-up and Testing shall include but not be limited to:

1. Be present at the job site when start-up and testing of generating machinery and equipment is in progress, and to conduct start-up and testing. Equipment may not be operated by Erection Supervisor unless DISTRICT'S/Engineer's representative is present at all times or unless this requirement is specifically waived in writing. DISTRICT will notify SUPPLIER 14 days in advance of when Erection Supervisor is required on site to begin start-up activities.
2. Approve putting the unit in operation for the particular test to be performed.
3. Approve and conduct or oversee the testing procedures to be used.
4. Conduct the testing and immediately report problems or irregularities directly to the DISTRICT/Engineer.
5. All work as specified in Section 01500, Commissioning, Start-up and Testing
6. Document all start-up activities, equipment settings, all field adjusted alarm and trip set points, etc.

D. Other Responsibilities

1. Erection Supervisors shall not direct or supervise the Work or issue any instructions which might relieve the SUPPLIER or civil works SUPPLIER of any responsibilities.

1.08 OPERATION AND MAINTENANCE TRAINING

- A. Provide instruction to the DISTRICT'S personnel in the operation, adjustment, and maintenance of products, equipment and systems. The operation and maintenance manuals specified in Section 01080 shall constitute the basis of instruction. This instruction may be carried out during equipment erection or commissioning and start-up, or both, at the Supplier's option. Instruction shall be per Paragraph 1.07, Section 01080. This training is in addition to the number of days stated in the Proposal Form for the erection and start-up, and shall not be counted toward those days.
- B. Sixty days prior to start of scheduled training, submit course outline for the DISTRICT'S/Engineer's approval.

END OF SECTION

SECTION 01500
COMMISSIONING, START-UP AND TESTING

PART 1 - GENERAL

- A. The SUPPLIER shall be responsible for providing an Erection Supervisor as stated in Section 01450. The Erection Supervisor shall perform the following commissioning start-up and testing services with incidental assistance of DISTRICT and Engineer.

1.01 WORK INCLUDED

- A. Calibration and testing of all control and alarm instrumentation.
- B. Protective relay testing and trip checks, including MCC.
- C. Start up of the turbine, generator, and auxiliary equipment.
- D. Full functional tests, performance and reliability tests of the turbine, generator, and auxiliary equipment shall be conducted for the continuous period of at least ten (10) days.

1.02 SUBMITTALS

- A. Before scheduling field tests, SUPPLIER shall submit manufacturer's certified plant and prototype test data, calculations, curves, charts, and published field test requirements, methods and procedures.
- B. The SUPPLIER will prepare a schedule of field tests, start-up and performance test dates and a testing program for the Engineer's and DISTRICT'S review 30 days in advance of the first scheduled test. Tests shall include, but not be limited to, the following:
 - 1. Calibration tests of all level, pressure, flow, temperature, vibration monitoring instrumentation, and all required settings of the integrated power plant controller.
 - 2. Operational tests for all valves, operators, starters and motors.
 - 3. Dielectric tests and point-to-point circuit continuity tests for all cable, wire, and electrical equipment.
 - 4. On/off control, limit switches, indicating lamps in-service tests, and position indication meters.
 - 5. Flange and bolt torque and stress tension data.
 - 6. Leak tests of pipe and fittings, gaskets, and seals.
 - 7. Tests of all alarms, signals, and fail-safe or system shut-down controls.
 - 8. All installation tests required in the technical sections of the specification.
 - 9. Tests of control logic programming, HMI, and SCADA (desktop operator's terminal) systems.
 - 10. Protective relay testing and trip checks.
 - 11. Complete field testing of Intake control panel
- C. Within ten (10) days after completion of start up and performance testing, SUPPLIER'S Erection Supervisor shall provide one copy of test reports in conformance with requirements of this section and Section 01300. Reports shall include list of calibrated instruments used and certified calibration data for all testing and recording equipment.
- D. Prepare a procedure for turning over tested equipment to the DISTRICT'S operating

personnel, including locking and tagging the tested and accepted equipment.

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

- A. SUPPLIER'S Field Engineer shall provide all testing, setting, and recording devices which may be required for specified start up and performance tests. Obtain the DISTRICT'S acceptance of high potential test set, oscilloscope, relay test set and test equipment calibration certifications before their use.
- B. SUPPLIER shall provide all oil, grease, packing, and insulating and lubricating fluids and filters required to clean, flush and initially charge equipment systems.

PART 3 - EXECUTION

3.01 GENERAL

- A. After completed erection, installation, initial adjustment and servicing, perform insulation and continuity tests of all circuits.
- B. Adjust, check and test in-service operation of all systems and equipment.
- C. All tests, adjustments and measurements shall be performed by specialized test engineers experienced in hydro-generation. The test engineers shall be experienced in start-up and testing of generation plants of similar type and capacity. Submit resumes for approval by the DISTRICT. It is anticipated that SUPPLIER'S Erection Supervisor may not be qualified to perform testing of some equipment supplied by SubSUPPLIERS. In this case, SUPPLIER shall provide qualified test engineers from SubSUPPLIERS after approval by DISTRICT. Each full day that subSUPPLIER test engineers are on the Project site shall be payable at the daily rate shown in Bid Item 13 on the Proposal Form.
- D. All tests shall be performed in the presence of the Engineer and DISTRICT'S personnel unless such presence is expressly waived in writing. Results of all tests shall be documented as a part of the test plan and procedures.
- E. Tests involving utility transmission lines and system loads require coordination with the DISTRICT'S operating personnel and with Central Electric Coop (CEC) System Operator. DISTRICT, at SUPPLIER'S request and under SUPPLIER'S responsibility, can coordinate these items with the CEC System Operator to obtain the required authorizations. The SUPPLIER shall assure the stability of the unit from no-load to full-load when connected to the utility grid.
- F. Additional tests required by manufacturer's modifications to meet specified requirements shall be at SUPPLIER'S expense.

3.02 PREPARATION

- A. Before water is admitted to the turbine, check instrumentation, pumps and piping, oil levels and strainers for proper installation and freedom from obstruction.
- B. Inspect, adjust and operate the turbine inlet valve and auxiliary equipment including,

but not limited to:

1. Actuator alarms and shutdown.
 2. Manual and automatic controls and remote controls.
 3. Hydraulic circuits and equipment.
 4. Electronic circuits, including amplifiers.
 5. Inlet valve limit switches and movement timing.
 6. Electrical operation of auxiliaries including:
 - a. Solenoids
 - b. Split-field motors
 - c. Over speed and under speed switches
 - d. Limit switches
 - e. Remote indicating devices
- C. The penstock will be filled as required by the DISTRICT. Forty-eight (48) hours' notice is required.
- D. Watering the Unit: At completion of turbine, generator inspections and tests, proceed with additional inspections. Open turbine inlet valve when ready for testing.
- E. Turbine/Generator Balance: SUPPLIER test engineers shall be responsible for verifying Turbine/generator balancing and alignment under the direction of the manufacturer's Erection Supervisor. Run out tolerance shall meet rotation and operational testing levels in accordance with NEMA and IEEE standards.
- F. SUPPLIER test engineers shall be responsible for setting up the controller upon DISTRICT approval.

3.03 UNIT START-UP

Operation of the unit by the SUPPLIER'S personnel, under observation by DISTRICT and Engineer, shall begin at a time mutually agreed upon by the SUPPLIER, and the DISTRICT. Manufacturer's Erection Supervisors for turbine, generator and actuator shall recommend start up time, speed of rotation, and shutdown time. SUPPLIER shall direct the unit start-up. The DISTRICT shall witness all testing.

3.04 MECHANICAL RUN

- A. Start-up of the unit shall proceed with speed increased in increments as recommended by manufacturers.
- B. Observe and record data including, but not limited to:
1. Shaft run-out.
 2. Bearing temperatures.
 3. Time required for bearing temperature stabilization (at normal speed operation).
 4. Vibration.

No other testing shall be conducted until the bearing temperatures have stabilized at acceptable levels.

- C. Should rated head be unattainable, revisions to power output guarantees shall be mutually agreed upon by SUPPLIER, equipment manufacturers and the DISTRICT using adjustments according to the Code.
- D. Any manufacturer's Erection Supervisor can request the immediate shutdown of the unit

during the mechanical run.

- E. Tests and adjustments shall include, but not be limited to, the following:
 - 1. Shutdown solenoid operation.
 - 3. Speed indicator settings.
 - 4. Speed switch calibration and adjustment.
 - 5. Speed control testing and adjustment.
- F. After the mechanical run on the unit is completed, dewater the unit and inspect all internal turbine parts and water passages.

3.05 ON-LINE OPERATION

After the unit is synchronized and on-line, test and adjust the following:

- 1. Load rejection in incremental stages to unit maximum.
- 2. Verify that there are no unacceptable penstock pressure changes at each load rejection and corresponding rpm rise.
- 3. Penstock pressure rise and drop shall not exceed the limits specified in Mechanical Requirements, Paragraph 1.08.
- 4. Other tests and adjustments as directed by manufacturer's Erection Supervisors.
- 5. Measurements of shaft run out at guide bearings at two places 90 degrees apart and one place along axis of shaft shall be made during all load rejection tests. Maximum run out shall not exceed 75 percent of generator guide or turbine thrust bearing dimensional clearances.
- 6. Measurements of generator stator temperatures shall not exceed required limits.

3.06 GENERAL PERFORMANCE TESTS

- A. In accordance with ANSI, where applicable, perform the following tests on the unit under the direction and supervision of SUPPLIER and with participation of the turbine and generator manufacturer's Erection Supervisor.
 - 1. Armature and field windings dielectric tests.
 - 2. Armature and field windings resistance tests.
 - 3. Voltage regulation operational tests.
 - 4. Operational tests of all auxiliary equipment including hydraulic, lubrication and cooling water systems.
 - 5. Running tests from no-load to full-load to establish tolerances and inspections for final adjustment of bearings, shaft run-outs and clearances, rotor balance, air gap, and all other components.
 - 6. Megger test for insulation resistance. ANSI/IEEE No. 62.
 - 7. Heat runs to determine the temperature rise of various parts of the generator when operating continuously at rated output.
- B. Confirm the accuracy of turbine-generator balance by measurement of vibration amplitudes of the installed unit.
- C. Excitation equipment tests: the excitation response and general adequacy of the voltage regulating system will be observed in conjunction with rejection tests, forming a part of the generator tests.
- D. Control system test: Control system shall be tested to verify programming accuracy. All inputs, outputs, alarm and trip points shall be tested. Full automatic and manual

operating modes shall be fully tested to verify all features are operational. Auto synchronizer shall be adjusted and test operated to assure specified performance. Desktop SCADA (operator's terminal) system shall be fully tested to verify acceptable operation. Each shutdown mode shall be tested, including shutdowns at various stream flows to test flow continuation and unit shutdown slow ramping rates, as well as ability to restart unit while unit is still rolling.

3.07 TEN DAY TEST

After all testing and calibration described is satisfactorily completed, SUPPLIER shall request approval for DISTRICT to begin the 10 day test. Upon approval by DISTRICT, SUPPLIER shall continuously operate the completed project such that the unit operates for 10 continuous days with no more than a cumulative total of four hours of shutdown time for any reason. SUPPLIER shall coordinate with DISTRICT'S operating personnel to man the plant continuously for 24-hours per day during this test. SUPPLIER may, in addition to DISTRICT'S Operating Personnel, use his own or locally hired qualified staff. Should the unit be shutdown for more than four hours during this test, except due to causes beyond the SUPPLIER'S control, the entire test must be re-started for a new 10 day continuous period, with the same four hour shutdown limitation. At the completion of the ten day test, all responsibility for plant operations passes to the DISTRICT.

3.08 CODE PERFORMANCE TEST

After the completion of the 10-day tests, and within the next 60 days, the DISTRICT may perform a full IEC Code turbine efficiency test on the turbine per the Supplemental General Conditions, paragraph 14, using the thermodynamic method. The turbine efficiencies resulting from any such test will be compiled with generator efficiency test data and step-up transformer test data obtained from factory tests into an actual as-tested efficiency chart similar to the guaranteed efficiency chart in the Proposal Form. Comparison of actual to guaranteed efficiency will then be made in accordance with the terms of the performance guarantee in the Supplemental General Conditions.

END OF SECTION

SECTION 01600
PRODUCT DELIVERY, STORAGE, AND HANDLING

PART 1 - GENERAL

1.01 PACKAGING, SHIPPING AND STORAGE

A. General

1. All equipment shall be adequately prepared for shipment and for a 30-day minimum period of outdoor storage.
2. Prior to shipment, equipment shall be completely drained and thoroughly dried. When such drainage requires the removal of plugs, drain valves, etc. SUPPLIER shall be responsible that these parts are reinstalled or reassembled prior to shipment.
3. All openings and machined surfaces shall be provided with protection to prevent damage, corrosion, and entrance of foreign matter during shipment and storage.
4. Flanged connections shall be protected by a ½-inch or thicker plywood disc, or suitable alternate, bolted to the face of the flange.
5. Threaded or socket weld connections shall be protected with screwed or snap-in (snap-on) type, securely held, plastic protectors. Cast iron plugs are not acceptable for protection unless part of the permanent assembly.
6. Butt weld connections shall be protected by wooden disks that cover the entire weld end area, and are secured by metal straps and fasteners.
7. Covers, straps, or fasteners shall not be welded to equipment.
8. Equipment shall be adequately supported for shipment. All loose parts shall be crated or boxed for shipment and appropriately identified. Where shipment is braced internally, it shall be marked conspicuously, "Remove internal braces before testing and operation."
9. To facilitate rapid installation, all equipment shall be shop assembled to the maximum extent practicable before shipment to site. Field welding should not be required.
10. All large and heavy shipping units shall have suitable skids for moving. Crating shall also be adequate for lifting with slings. If location of slings is critical, these locations shall be marked accordingly. Lifting lugs, if required, shall be provided and installed by SUPPLIER.
11. Shipping to the site and storage facilities may be in a marine environment with weather extremes of hot and/or cold temperatures, wind and rain common. Items to be shipped shall be packaged and protected from moisture with this in consideration.

B. Site Handling and Storage of Materials and Equipment

1. SUPPLIER shall be responsible for delivery of all materials at the Project site or a location nearby designated by the DISTRICT, for unloading by the DISTRICT. SUPPLIER'S Erection Supervisor shall inventory all deliveries immediately upon arrival at the project site to verify complete and damage free delivery.
2. Maintenance of the storage location at the jobsite will be the responsibility of the DISTRICT. Where required to protect against condensation and humidity, sufficient desiccant for the prescribed storage conditions shall be provided by the

SUPPLIER and its presence with the need of periodic removal, dry-out or replacement shall be so marked. When electric space heaters are provided for that purpose, these shall be wired by the SUPPLIER such that the space heaters can be energized immediately upon receipt and shall be possible without disassembly of crates, etc. This also requires that no combustible material be left in the inside of the equipment or crate.

3. SUPPLIER shall provide one copy of storage and handling instructions to DISTRICT, including descriptions for periodic inspection and/or storage maintenance to enable DISTRICT to ascertain that no deterioration will occur during storage. One set of these instructions shall also be fastened securely to the outside of each shipping unit to aid SUPPLIER personnel in storage and handling.
4. All material and equipment shall be protected against loss, damage by corrosion, weather, overstressed components, or contamination by foreign materials. SUPPLIER shall repair or replace any material or equipment damaged during delivery, at no cost to the DISTRICT, and without impact to the erection schedule.
5. The shafts, runners, rotors, housings, and all parts critical to alignment and running clearances of the turbine-generator shall be adequately supported to distribute their weight and prevent deformation.

PART 3 – EXECUTION

- 3.01 All products shall be delivered to

Three Sisters Irrigation District
68000 Hwy 20 West

Bend, OR (refer to site location map in Reference Drawings)
and clearly marked: "For McKenzie Reservoir Hydroelectric Project"

- 3.02 Transportation to the McKenzie Reservoir Hydroelectric Project:

Project is located about 4 miles southeast of the City of Sisters, Oregon, and about 20 miles from Bend, OR. Refer to site location maps in reference drawings.

END OF SECTION

**SECTION 01700
PROJECT CLOSEOUT**

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. Definitions: Closeout is hereby defined to include general requirements near the end of the contract time, in preparation for final acceptance, final payment, normal termination of Contract, transfer of ownership to the DISTRICT and similar actions evidencing completion of Work. Specific requirements for individual units of work are specified in sections of Divisions 15 and 16.

1.02 PREREQUISITES TO PROVISIONAL COMPLETION:

- A. General: Prior to requesting DISTRICT/Engineer's inspection for certification of Provisional completion (for either entire Work or portions thereof), complete the following and list known exceptions in the request:

1. Progress payment request, showing either 100% completion for portion of Work claimed as "substantially complete", or list incomplete items, value of incompleteness, and reasons for being incomplete.
2. Include supporting documentation for completion as indicated in these Contract Documents.
3. Submit statement showing accounting of changes to the Contract Total Price.
4. Advise DISTRICT of pending insurance change-over requirements.
5. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
6. Obtain and submit releases enabling DISTRICT'S full and unrestricted use of the Work and access to services and utilities, including (where required) occupancy permits, operating certificates, and similar releases.
7. Complete start-up testing of systems, and instructions of DISTRICT'S operating/maintenance personnel. Discontinue (or change over) and remove from project site temporary facilities and services, along with construction tools and facilities.
8. Complete final cleaning up requirements, including touch-up painting of marred surfaces.
9. 10 day test operation period has been successfully completed.

- B. Inspection Procedures: Upon receipt of SUPPLIER'S request, DISTRICT/Engineer will either proceed with inspection or advise SUPPLIER of prerequisites not fulfilled. Following initial inspection, DISTRICT/Engineer will either prepare certificate of Provisional completion, or advise SUPPLIER of Work which must be performed prior to issuance of certificate; and repeat inspection when requested and assured that Work has been substantially completed. Results of completed inspection will form initial "punch-list" for final acceptance.

1.03 PREREQUISITES TO FINAL ACCEPTANCE

- A. General: Prior to requesting DISTRICT/Engineer's final inspection for certification of final acceptance and final payment, as set forth in the General Conditions, SUPPLIER

shall complete the following and list known exceptions (if any) in request:

1. Submit final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 2. Submit updated final statement, accounting for additional (final) changes to Contract Total Price, for approval by the DISTRICT.
 3. Submit copy of DISTRICT/Engineer's final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, endorsed and dated by DISTRICT/Engineer.
 4. Submit consent of surety.
 5. Submit final liquidated damages settlement statement, acceptable to DISTRICT.
 6. Revise and submit evidence of final, continuing insurance coverage complying with insurance requirements.
 7. Submit evidence in the form of Lien Releases from all subSUPPLIERS as evidence that they have received payment.
- B. Re-inspection Procedure: Upon receipt of SUPPLIER'S notice that the Work has been completed, including punch-list items resulting from earlier inspections, and accepting incomplete items delayed because of acceptable circumstances, DISTRICT/Engineer will re-inspect the Work. Upon completion of re-inspection, DISTRICT/Engineer will either prepare a notice of final acceptance or advise SUPPLIER of Work not completed or obligations not fulfilled as required for final acceptance. If necessary, procedure will be repeated.

1.04 RECORD DOCUMENT SUBMITTALS

- A. General: Specific requirements for record documents are indicated in individual sections of these specifications. Other requirements are indicated in General Conditions. General submittal requirements are indicated in "Submittals" Section 01300. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, weather and fire-resistive location; provide access to record documents for DISTRICT/Engineer's reference during normal working hours.
- B. Record Documents and Drawings: SUPPLIER shall maintain a white-print set (blue-line or black-line) of Contract Drawings and Shop Drawings in clean, undamaged condition, with mark-up of actual installations which vary substantially from the work as initially shown. Mark whichever drawing is most capable of showing "field" condition fully and accurately; however, where Shop Drawings are used for mark-up, record a cross-reference at corresponding location on working drawings. Mark with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work. Mark-up new information which is recognized to be of importance to DISTRICT, but was for some reason not shown on either Contract Drawings or Shop Drawings. Give particular attention to concealed work, which would be difficult to measure and record at a later date. Note related change-order numbers where applicable. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on cover of each set.
- C. Record Specifications: SUPPLIER shall maintain one copy of specifications, including addenda, change orders and similar modifications issued in printed form during

construction, and mark-up variations (of substance in actual work in comparison with text of specifications and modifications as issued). Give particular attention to substitutions, selection of options, and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable. Upon completion of mark-up, submit to DISTRICT/Engineer for DISTRICT'S records.

- D. Record Product Data: SUPPLIER shall maintain one copy of each product data submittal, and mark-up significant variations in actual work in comparison with submitted information. Include both variations in product as delivered to site, and variations from manufacturer's instructions and recommendations for installation. Give particular attention to concealed product and portions of the Work which cannot otherwise be readily discerned at a later date by direct observation. Note related change orders and mark-up of record drawings and specifications. Upon completion of mark-up, submit complete set to DISTRICT/Engineer for DISTRICT'S records.

PART 3 -- EXECUTION

3.01 CLOSEOUT PROCEDURES

General Operating/Maintenance Instructions: SUPPLIER shall arrange for each provider of equipment requiring continuing maintenance or operation, to meet with DISTRICT'S personnel, at project site, to provide basic instructions needed for proper operation and maintenance of entire Work. Include instruction by Manufacturer's representatives where installers are not expert in the required procedures. Review maintenance manuals, record documentation, tools, spare parts and materials, lubricants, lubricant quantities, fuels, identification system, control sequences, hazards, cleaning and similar procedures and facilities. For operational equipment, demonstrate start-up, shut-down, emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, energy effectiveness, and similar operations. Review maintenance and operations in relation with applicable warranties, agreements to maintain, bonds and similar continuing commitments.

END OF SECTION