

SECTION 01 79 23

INSTRUCTION OF OPERATIONS AND MAINTENANCE PERSONNEL

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Scope:
1. CONTRACTOR shall furnish services of Supplier's operation and maintenance training specialists to instruct OWNER's personnel in recommended operation and maintenance procedures for materials and equipment furnished, in accordance with the Contract Documents.
 2. Supplier shall provide a combination of classroom and field training at the Site, unless otherwise required elsewhere in the Contract Documents.
 3. OWNER reserves the right to record training sessions on video for OWNER's later use in instructing OWNER's personnel.
- B. Scheduling of Training Sessions:
1. General:
 - a. CONTRACTOR shall coordinate training services with start-up and initial operation of materials and equipment on days and times, and in manner, acceptable to OWNER, in accordance with the Contract Documents.
 - b. Training may be required outside of normal business hours to accommodate schedules of operations and maintenance personnel. Furnish training services at the required days and times at no additional cost to OWNER.
 2. Prerequisites to Training:
 - a. Training of OWNER'S personnel shall commence after acceptable preliminary operation and maintenance data has been submitted and work required in Section 01 75 11, Checkout and Startup Procedures is complete.
 - b. At option of OWNER or ENGINEER, training may be allowed to take place before, during, or after equipment start-up.
 3. Training Schedule Submittal:
 - a. Training Schedule Required: CONTRACTOR shall prepare and submit proposed training schedule for review and acceptance by ENGINEER and OWNER. Proposed training schedule shall show all training required in the Contract Documents, and shall demonstrate compliance with specified training requirements relative to number of hours of training, number of training sessions, and scheduling.
 - b. Timing of Training Schedule Submittal: Submit initial training schedule at least sixty days before scheduled start of first training session. Submit final training schedule, incorporating revisions in accordance with

- ENGINEER's comments, no later than thirty days prior to starting the first training session.
- c. OWNER reserved the right to modify personnel availability for training in accordance with process or emergency needs at the Site.

1.2 QUALITY ASSURANCE

- A. Qualifications:
 1. Manufacturer's instructors shall be factory-trained by manufacturer of material or equipment.
 2. Manufacturer's instructors shall be proficient and experienced in conducting training of type required.
 3. Qualifications of instructors are subject to acceptance by ENGINEER. If ENGINEER does not accept qualifications of proposed instructor, furnish services of replacement instructor with acceptable qualifications.

1.3 SUBMITTALS

- A. Action Submittals: Submit the following:
 1. Training Schedule: Detailed schedule of training sessions, demonstrating compliance with number of training sessions, hours required in the Contract Documents, and complying with the Contract Times. Submit training schedule submittals in accordance with time frames specified in this Section.
- B. Informational Submittals: Submit the following:
 1. Lesson Plan: Acceptable lesson plan for training on each material or equipment item, in accordance with Table 01 79 23-A and the Contract Documents. Lesson plan shall comply with requirements of this Section. Include with lesson plan copy of handouts that will be used during training sessions. Provide lesson plan submittals in accordance with time frames specified in this Section.
 2. Qualifications: Credentials of manufacturer's proposed operations and maintenance instructor(s). Credentials shall demonstrate compliance with requirements of this Section and shall include brief resume' and specific details of instructor's operating, maintenance, and training experience relative to the specific material and equipment for which instructor will provide training.
- C. Closeout Submittals: Submit the following:
 1. Trainee sign-in sheet for each training session. Submit to OWNER's training coordinator.

1.4 LESSON PLAN

- A. Supplier's lesson plan shall describe specific instruction topics, system components for which training will be furnished, and training procedures. Handouts, if any, to be used in training shall be included with the lesson plan. Describe in lesson plan "hands-on" demonstrations planned for training sessions.

- B. Submit acceptable lesson plan fourteen days prior to starting associated training.
- C. Lesson plan shall include estimated duration of each training segment.
- D. Lesson plan shall include the following:
 - 1. Equipment Overview (required for all types of O&M training):
 - a. Describe equipment's operating (process) function and performance objectives.
 - b. Describe equipment's fundamental operating principles and dynamics.
 - c. Identify equipment's mechanical, electrical, and electronic components and features. Group related components into subsystems and describe function of subsystem and subsystem's interaction with other subsystems.
 - d. Identify all support equipment associated with operation of subject equipment, such as air intake filters, valve actuators, motors, and other appurtenant items and equipment.
 - e. Identify and describe safety precautions and potential hazards related to operation.
 - f. Identify and describe in detail safety and control interlocks.
 - 2. Operations Personnel Training:
 - a. Equipment Overview: As described in Paragraph 1.4.D.1 of this Section.
 - b. Operation:
 - 1) Describe operating principles and practices.
 - 2) Describe routine operating, start-up, and shutdown procedures.
 - 3) Describe abnormal or emergency start-up, operating, and shutdown procedures that may apply.
 - 4) Describe alarm conditions and responses to alarms.
 - 5) Describe routine monitoring and recordkeeping procedures.
 - 6) Describe recommended housekeeping procedures.
 - c. Troubleshooting:
 - 1) Describe how to determine if corrective maintenance or an operating parameter adjustment is required.
 - 3. Mechanical Maintenance Training:
 - a. Equipment Overview: As described in Paragraph 1.4.D.1 of this Section.
 - b. Equipment Preventive Maintenance:
 - 1) Describe preventative maintenance inspection procedures required to:
 - a) Inspect equipment in operation.
 - b) Identify potential trouble symptoms and anticipate breakdowns.
 - c) Forecast maintenance requirements (predictive maintenance).
 - 2) Define recommended preventative maintenance intervals for each component.
 - 3) Describe lubricant and replacement part recommendations and limitations.
 - 4) Describe appropriate cleaning practices and recommend intervals.
 - 5) Identify and describe use of special tools required for maintenance of equipment.

- 6) Describe component removal, installation, and disassembly and assembly procedures.
 - 7) Perform “hands-on” demonstrations of preventive maintenance procedures.
 - 8) Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.
 - 9) Define recommended torquing, mounting, calibrating, and aligning procedures and settings, as appropriate.
 - 10) Describe recommended procedures to check and test equipment following corrective maintenance.
- c. Equipment Troubleshooting:
- 1) Define recommended systematic troubleshooting procedures.
 - 2) Provide component-specific troubleshooting checklists.
 - 3) Describe applicable equipment testing and diagnostic procedures to facilitate troubleshooting.
 - 4) Describe common corrective maintenance procedures with “hands on” demonstrations.
4. Instrumentation/Controls Maintenance Training:
- a. Equipment Overview: As described in Paragraph 1.4.D.1 of this Section.

1.5 TRAINING AIDS

- A. Manufacturer’s instructor shall incorporate training aids as appropriate to assist in the instruction. Provide handouts of text, tables, graphs, and illustrations as required. Other appropriate training aids include:
1. Audio-visual aids, such as videos, Microsoft Powerpoint presentations, overhead transparencies, posters, drawings, diagrams, catalog sheets, or other items.
 2. Equipment cutaways and samples, such as spare parts and damaged equipment.
 3. Tools, such as repair tools, customized tools, and measuring and calibrating instruments.
- B. Handouts:
1. Manufacturer’s instructor shall distribute and use descriptive handouts during training. Customized handouts developed especially for training for the Project are encouraged.
 2. Photocopied handouts shall be good quality and completely legible.
 3. Handouts should be coordinated with the instruction, with frequent references made to the handouts.
 4. Provide at least fifteen copies of handouts for each training session.
- C. Audio-visual Equipment: Training provider shall provide audio-visual equipment required for training sessions. If suitable equipment is available at the Site, OWNER may make available OWNER’s audio-visual equipment; however, do not count on OWNER providing audio-visual equipment. Audio-visual equipment that training provider shall provide, as required, includes:

1. Laptop computer, presentation software, and suitable projector.
2. As required, extension cords and spare bulb for projector.
3. Projection Screen.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 TRAINING DELIVERY

A. General:

1. Instructors shall be fully prepared for the training sessions. Training delivery shall be communicative, clear, and proceed according to lesson plan accepted by ENGINEER, with lesson content appropriate for trainees. If OWNER or ENGINEER deems that training delivery does not to comply with the Contract Documents, training shall be postponed, rescheduled, and re-performed in acceptable manner at no additional cost to OWNER.
2. Trainee Sign-in Sheets: In format acceptable to OWNER, furnish sign-in sheet for trainees for each session. Sign-in sheets shall include the Project name, equipment or system for which training was provided, and type of training (e.g., operations, mechanical maintenance, instrumentation/controls maintenance, or other), and name of each trainee. Upon completion of training, submit copy of each sign-in sheet to OWNER's training coordinator.

B. "Hands-on" Demonstrations:

1. Manufacturer's instructor shall present "hands-on" demonstrations of operations and maintenance of equipment for each training session, in accordance with lesson plan accepted by ENGINEER.
2. CONTRACTOR and manufacturer shall furnish tools necessary for demonstrations.

3.2 TRAINING SCHEDULE

A. Manufacturer shall furnish, at minimum, hours of training and number of sessions indicated in Table 01 79 23-A. Travel time and expenses are responsibility of manufacturer and are excluded from required training time indicated in the Contract Documents.

B. Shifts and Training Sessions Required:

1. Training Sessions:
 - a. Operators: Maximum training per day is eight hours; longer sessions eight hours shall be spread over multiple, preferably consecutive, days.
 - b. Mechanical Maintenance: Maximum training per day is eight hours; sessions longer than eight hours shall be spread over multiple,

- preferably consecutive, days.
- c. Instrument/Controls Maintenance: Maximum training per day is eight hours; sessions longer than eight hours will be spread over multiple, preferably consecutive, days.

TABLE 01 79 23-A, TRAINING SUMMARY TABLE

Equipment	Specification Section	Total Training Time (hours)
Utility Service Load Break Switches	26 05 45	4
Pad Mount Medium Voltage Transformers	26 12 19	4
Medium Voltage Metal Clad Switchgear	26 13 26	8
Medium Voltage Variable Frequency Drives	26 18 39.02	8
Switchboards	26 24 13	4
Motor Control Centers	26 24 19	4
Low Voltage Variable Frequency Drives	26 29 23	4
Static UPS	26 33 53	6
Fire Detection and Alarm System	28 31 00	6
Process Control Descriptions	40 61 96	24
Process Control Computers and Network Hardware	40 62 05	8
Human Machine Interfaces	40 62 53	8
Programmable Logic Controllers	40 64 00	8
Process Control Panels and Enclosures	40 67 17	16
Primary Sensors and Field Instruments	40 70 05	24
Panel Mounted Instruments and Devices	40 78 00	8
Process Valves	40 05 53	12
Conveyors	41 12 13	12
Bridge Crane	41 22 13	6
Rotary Lobe Blowers	43 11 33	8
Centrifugal Magnetic Drive Sealless End Suction Pumps	43 21 13.16	8
Centrifugal Vertical Lineshaft Pumps	43 21 13.33	
GAC Feed Pumps (FE Weirbox/GAC PS)		8
Finished Water Pumps (FWPS)		8
Backwash Supply Pumps (FWPS)		8
Reservoir Intake Pumps		
River Intake Pumps		
Positive Displacement Rotary Lobe Pumps	43 21 36	12
Aluminum Slide Gates	43 26 21	4
Polyethylene Tanks	43 41 00	8
FRP Tanks	43 41 45	8
Chlorine Dioxide Generation System	46 31 33	16
Liquid Lime System	46 33 00	16
Polymer Blending and Feed Equipment	46 33 33	12
Skid Mounted Peristaltic Metering Pumps	46 33 44	8
Rapid Mixers	46 41 11	8
Filter Underdrain Equipment	46 61 24	16
GAC Pressure Vessels	46 61 25	8
Circular Gravity Thickeners	46 71 13	12
DAF Equipment	46 71 22	16
Dewatering Centrifuges	46 76 33	56

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