# SECTION 01820

# DEMONSTRATION AND TRAINING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and general provisions of the Contract, including Contract General Conditions and Supplementary General Conditions and other Division 1 Specification Sections, apply to this Section.

### 1.2 SECTION INCLUDES

A. Administrative and procedural requirements for instructing University's personnel, including the following:
   1. Demonstration of operation of systems, subsystems and equipment.
   2. Training in proper operation and maintenance of systems, subsystems, and equipment installed under the Contract.

### 1.3 RELATED SECTIONS

A. Section 01783 - Operation and Maintenance Data: Operating and maintenance instructions to be used during training and demonstration.

### 1.4 SUBMITTALS

A. Instruction Program: Contractor shall submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Contractor shall include learning objective and outline for each training module. Contractor shall:
   1. Make the operations and procedures manuals available for use during the training sessions.
   2. Schedule submission of instruction program to allow sufficient time for receipt, review and acceptance of instruction program by the Architect and the University's Representative and shall be not less than three weeks prior to proposed date of first training session.
   3. Submit, at completion of training, three complete training manuals for University's use.

B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Contractor shall include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. Attendance Record: For each training module, Contractor shall submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, Contractor shall submit results and documentation of performance-based test.

E. Demonstration and Training Video Record: Contractor shall submit two copies at end of each training session.

### 1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: Contractor shall engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and University's Representative for number of participants, instruction times, and location. Facilitator shall be firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with

a record of successful learning performance.

B. Instructor Qualifications: Contractor shall engage qualified instructors to instruct University's personnel how to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Instructors shall be factory-authorized service representatives, complying with requirements in Section 01450 - Quality Control, experienced in operation and maintenance procedures and training.
   1. System manufacturers shall provide qualified instructor to describe system design, operational requirements, criteria, and regulatory requirements.
   2. University's Representative will furnish Contractor with names and positions of participants.

C. Pre-Instruction Conference: Contractor shall conduct conference at Project site to comply with requirements in Section 01310 - Coordination. Contractor shall review methods and procedures related to demonstration and training including, but not limited to, the following:
   1. Inspect and discuss locations and other facilities required for instruction.
   2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
   3. Review required content of instruction.
   4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

## 1.6 COORDINATION

A. Coordination of Instruction Schedule: Contractor shall coordinate instruction schedule with University's operations. Contractor shall adjust schedule as required to minimize disrupting University's operations.

B. Coordination of Instructors: Contractor shall coordinate instructors, including providing notification of dates, times, length of instruction time, and course content. Contractor shall allow for 30 days written notice to University's Representative.

C. Coordination with Operation and Maintenance Data: Contractor shall coordinate content of training modules with content of approved emergency, operation, and maintenance manuals.
   1. Contractor shall not submit instruction program until operation and maintenance data have been reviewed and accepted by Architect and copies given to University's Representative.
   2. Contractor shall coordinate review of operation and maintenance data to make operation and maintenance data available at least two weeks prior to date scheduled for initial training session.

# PART 2 - PRODUCTS

## 2.1 INSTRUCTION PROGRAM

A. Program Structure: Contractor shall develop an instruction program that includes individual training sessions for each system and operating products not part of a system, as required by Division 2 through 17 Specification Sections. Contractor shall include instruction on operational interfaces between systems.

B. Schedule of Training Sessions: Contractor shall arrange to have training conducted on consecutive days, with no more than six hours of training scheduled for any one day. Concurrent classes will not be acceptable.

C. Training Sessions, General: Contractor shall develop a learning objective and teaching outline for each session. Contractor shall include a description of specific skills and knowledge that participant is expected to master. Training sessions shall progress logically. Each training session shall be comprised of time spent both in the classroom and at specific location of subject equipment or system. As a minimum, Contractor shall ensure that each training session covers the following subjects for each item of equipment and system:

   1. Familiarization:
      a. Review catalog, parts lists, drawings, etc., which have been previously provided for the plant files and operation and maintenance manuals.

b. Check out the installation of the specific equipment items.
c. Demonstrate the unit and indicate how all parts of the specifications are met.
d. Answer questions.

2. Safety:
   a. Using material previously provided, review safety references.
   b. Discuss proper precautions around equipment.

3. Operation:
   a. Using material previously provided, review reference literature.
   b. Explain all modes of operation (including emergency).
   c. Check out University's personnel on proper use of the equipment.

4. Preventive Maintenance:
   a. Using material previously provided, review preventive maintenance (PM) lists including:
      1) Reference material.
      2) Daily, weekly, monthly, quarterly, semiannual, and annual jobs.
   b. Demonstrate how to perform Preventive Maintenance tasks.
   c. Demonstrate to University's personnel what to look for as indicators of equipment problems.

5. Corrective Maintenance:
   a. List possible problems.
   b. Discuss repairs--point out special problems.
   c. Open up equipment and demonstrate procedures, where practical.

6. Parts:
   a. Show how to use previously provided parts list and order parts.
   b. Check over spare parts on hand. Make recommendations regarding additional parts that should be available.

7. Local Representatives:
   a. Where to order parts: Name, address, telephone.
   b. Service problems:
      1) Who to call.
      2) How to get emergency help.

8. Operation and Maintenance Manuals:
   a. Review any other material submitted.
   b. Update material, as required.

D. Classroom Training for Operations Personnel:
1. Using projected drawings and photographs, describe and discuss equipment locations in plant and present operational overview of systems. Thoroughly discuss operating and maintenance manuals.
2. Describe purpose and plant function of equipment and systems.
3. Describe operating theory of equipment.
4. Describe start-up, shutdown, normal operation and emergency operating procedures, including discussion of system integration and electrical interlocks, if any.
5. Identify and discuss safety items and procedures.
6. Describe routine preventive maintenance, including specific details on lubrication and maintenance of corrosion protection of the equipment and ancillary components.
7. Describe operator detection, without test instruments, of specific equipment trouble symptoms.
8. Describe required equipment performance test procedures and intervals.
9. Describe routine disassembly and assembly of equipment if applicable (as determined by University's Representative on case-by-case basis) for purposes such as operator inspection of equipment.

E. Classroom Training for Maintenance and Repair Personnel:
1. Theory of operation.

2. Description and function of equipment.
3. Start-up and shutdown procedures.
4. Normal and major repair procedures.
5. Equipment inspection and troubleshooting procedures including the use of applicable test instruments and the "pass" and "no pass" test instrument readings.
6. Routine and long-term calibration procedures.
7. Safety procedures.
8. Preventive maintenance such as lubrication; normal maintenance such as belt, seal, and bearing replacement; and up to major repairs such as replacement of major equipment part(s) with the use of special tools, bridge cranes, welding jigs, etc.

F. Field Training for Operations Personnel:
1. Identify locations of equipment components and controls.
2. Review of component functions and theory of operation.
3. Identifying piping and flow options.
4. Identifying valves and explain their functions at various settings.
5. Identifying instrumentation:
   a. Location of primary element.
   b. Location of instrument readout.
   c. Discuss purpose, basic operation, and information interpretation.
6. Discuss, demonstrate, and perform standard operating procedures and round checks, including system start-up and shutdown procedures.
7. Review and perform safety procedures.
8. Perform the required equipment exercise procedures.
9. Discuss and perform preventive maintenance activities.
10. Identify and review safety items and perform safety procedures, if feasible.

G. Field Training for Maintenance and Repair Personnel: In addition to field training specified above for operations personnel, include the following:
1. Describe normal repair procedures.
2. Perform routine disassembly and assembly of equipment, if applicable, for inspections and tests.
3. Perform routine maintenance and repair tasks, including mechanical and electrical operations for troubleshooting, adjustments and calibration.

H. Presentation Media:
1. Presentations shall utilize computer-generated, projected graphics utilizing Microsoft PowerPoint software, including animation as appropriate to enhanced presentation and viewer interest. Graphics shall include text and still and moving images. PowerPoint presentation shall be suitable for incorporation into video record of instruction.
2. Each session shall include mock-ups, samples and other visual aids as appropriate.
3. Each session shall include printed handouts and notes for each participant.
4. Produce sufficient printed materials to provide minimum of five unused copies for University's use in subsequent training programs.

I. Video Record: Each training session shall be recorded and reproduced on both VHS tape and DVD compact disk. Video media shall be labeled with permanent computer-printed labels.

## PART 3 - EXECUTION

### 3.1 INSTRUCTION

A. Preparation. Contractor shall:
1. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
2. Set up instructional equipment at instruction location.

B. Scheduling: Contractor shall provide instruction at mutually agreed on times. For equipment that requires seasonal operation, Contractor shall provide similar instruction at start of each season. Contractor shall:
   1. Schedule training through University's Representative.
   2. Schedule training at time and location convenient to University, with at least 14 calendar days' advance written notice to University's Representative.

C. Training Sessions: Contractor shall conduct classroom and field training sessions presenting content specified in Article 2.1, titled "Instruction Program," above.

D. Evaluation: At conclusion of each training session, Contractor shall assess and document each participant's mastery of module by use of written examination or performance-based demonstration test.

E. Demonstration and Training Video Tapes: Contractor shall retain services of commercial videotaping and production service to record each training session. After taping, video material shall be edited and supplemented with professionally-produced graphics, animation and narration to provide a permanent record for use by University's for continuing training of personnel. Contractor shall:
   1. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
   2. At the beginning of each training module, record each chart containing learning objective and lesson outline.
   3. Contractor shall advise all manufacturers providing training sessions that training session and material will be videotaped and shall make available to videotaping service such utility services and accommodation as may be required to facilitate the production of videotape record.

   4. Demonstration and training videotapes shall incorporate PowerPoint graphic notes.

F. Cleanup. Contractor shall:
   1. Collect used and leftover educational materials and deliver to University as directed by University's Representative.
   2. Remove instructional equipment.
   3. Restore systems and equipment to condition existing before initial training use.

**END OF SECTION**