SECTION 01820
DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.

2. Training in operation and maintenance of systems, subsystems, and equipment.

3. Demonstration and training videotapes and DVD videos.

B. Related Sections include the following:
1. Division 1 Section "Project Management and Coordination" for requirements for preinstruction conferences.
2. Divisions 2 through 16 Sections for specific requirements for demonstration and training for products in those Sections.

1.02 SUBMITTALS

A. Instruction Program: 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. Include learning objective and outline for each training module.

1. At completion of training, submit one complete training manual and one CD-ROM for Owner's use.

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

C. Demonstration and Training Video: Submit one DVD within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:
a. Name of Project.
b. Name of Architect.
c. Name of Contractor.
d. Date video was recorded.

1.03 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

B. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." 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.

1.04 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.01 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Fire-protection systems, including fire alarm and sprinkler systems..

2. Intrusion detection systems.

3. Laboratory equipment, including hoods and service piping.

4. Heat generation equipment and distribution piping.

5. Refrigeration systems, including chillers, condensers, pumps and distribution piping.

6. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.

7. HVAC instrumentation and controls.

8. Electrical service and distribution, including transformers, switchboards, panelboards, and motor controls.

9. Packaged engine generators, including transfer switches.

10. Lighting equipment and controls.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.

2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project Record Documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.

5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.

7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.

8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.01 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.02 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

   1. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

   1. Schedule training with Owner, with at least fifteen days' advance notice.

C. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.03 DEMONSTRATION AND TRAINING VIDEO

A. General: Engage a qualified commercial photographer to record demonstration and training video. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Recording Format: Provide high-quality DVD color video.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.

SECTION CONTINUES WITH SAMPLE TRAINING AND ORIENTATION AGENDA

Sample

(Modify objectives and agenda subjects for systems and equipment being covered.)

TRAINING AND ORIENTATION AGENDA

Project: _____ Date: _____

Equipment/System: _____ Spec Section: _____

Section 1. Audience and General Scope

Intended audience type (enter number of staff): ___facility manager, ___facility engineer, ___ facility technician, ___ project manager, ____tenant, ____ other: _____

General Objectives and scope of training: (check all that apply)

___ A. Provide an overview of the purpose and operation of this equipment, including required interactions of trainees with the equipment.

___ B. Provide technical information regarding the purpose, operation and maintenance of this equipment at an intermediate level, expecting that serious malfunctions will be addressed by factory reps.

___ C. Provide technical information regarding the purpose, operation, and troubleshooting and maintenance of this equipment at a very detailed level, expecting that almost all operation, service and repair will be provided by the trainees.

Section 2. Instructors

ID	Trainer	Company	Postion/Qualifications
1)	_____	_____	
2)	_____	_____	
3)	_____	_____	

Section 3. Agenda *[The responsible contractors have their trainers fill out this section and submit to Owner and Commissioning Agent for review and approval prior to conducting training.]*

Location: ____site _____ Date _____

____classroom (location) _____ Date _____

Agenda of general subjects covered (√ all that will be covered)	Duration (min.)	Instructor (ID)	Completed (√ when completed)
___ General purpose of this system or equipment (design intent)	_____	_____	_____
___ Review of control drawings and schematics (have copies for attendees)	_____	_____	_____
___ Startup, loading, normal operation, unloading, shutdown, unoccupied operation, seasonal changeover, etc., as applicable	_____	_____	_____
___ Integral controls (packaged): Programming, troubleshooting, alarms, manual operation	_____	_____	_____
___ Building automation controls (BAS): programming, troubleshooting, alarms, manual operation, interface with integral controls.	_____	_____	_____
___ Interactions with other systems, operation during power outage and fire	_____	_____	_____
___ Relevant health and safety issues and concerns and special safety features	_____	_____	_____

___ Energy conserving operation and strategies.	_____	_____	_____
___ Any special issues to maintain warranty	_____	_____	_____
___ Common troubleshooting issues and methods, control system warnings and error messages, including using the control system for diagnostics	_____	_____	_____
___ Special requirements for tenants for this equipment's function	_____	_____	_____
___ Service, maintenance and preventative maintenance (sources, spare parts inventory, special tools, etc.)	_____	_____	_____
___ Question and answer period	_____	_____	_____

Other subject covered, specific to the equipment	**Duration**	**Instructor**	**Completed**
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Total duration of training (hours) ----------	_____		_____

Training methods that will be included (clarify as needed): (Trainer checks all that apply)

___ use of the O&M manuals, illustrating where the verbal training information is found in writing.

___ each attendee will be provided: 1) the control drawing schematic and sequence of operations:
2) a copy of this agenda

___ discussion/lecture at site _____

___ demonstration of equipment _____

___ written handouts _____

___ manufacturer's teaching manuals _____

___ classroom lecture _____

___ classroom hands-on equipment _____

___ video presentation _____

___ question and answer period _____

Section 4. Approvals and Use *[Once the Agenda has been filled out by the Trainer, the Owner and Commissioning Agent review, make edits, sign and return to Contractor who provides to the Trainer for use during training. Copies of Agenda shall be provided to trainees.]*

This plan has been approved by the following individuals, subject to the additions and clarifications noted in the left columns marked "add." *(This is not an approval of training completion.)*

_____ _____
Owner's Representative Date

_____ _____
Commissioning Agent Date