



01820

Demonstration and Training

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A. Summary

This section contains administrative and procedural requirements for conducting system, subsystem, and equipment demonstrations and training.

B. Training Requirements

Before occupying the building, the facilities staff must be trained and fully capable of operating and maintaining building systems, subsystems, and equipment in accordance with the design intent.

C. Submittals

Submit the following demonstration and training documents to Yale University and designers for review and approval.

- Training plan
- Training materials



1. Training Plan

Develop and submit a training plan four weeks before the start of scheduled training that addresses the proposed training content and scope, instructional strategies, scheduling, resource requirements, and contingencies. Yale University will review the plan and discuss it with the training provider during the pre-training conference.

a. Training Content and Scope

- (1) Provide the learning objectives for each classroom and hands-on training session. The learning objectives must describe observable and measurable behaviors (knowledge and skills), written in terms of what the trainees will know and be able to do following training.
- (2) Provide a topic outline identifying all systems and equipment and listing the major topics and sub-topics in the order in which they will be presented during the training session.

b. Instructional Strategies

Describe the instructional methods planned for the training (classroom presentations, hands-on training, operational demonstrations, site walk-throughs, simulations and/or learning activities).

c. Scheduling

Provide a training schedule showing the proposed dates, times, location, and duration of the training session(s); the training session topic; and the name of the instructor.

d. Resource Requirements

Identify training resource needs, such as classroom space and training equipment (projectors, screens, whiteboards).

2. Training Materials

Prepare and submit an electronic version of all instructional materials, in native file format, for future use by Yale University. Develop the documents using Microsoft®-compatible software accessible through Windows-based operating systems.



D. Instructor Qualifications

Provide a qualified instructor for each training session. Qualified instructors must be subject matter experts with demonstrated training competence and recent, similar training experience.

E Instructional Design

1. Develop learner-centered, performance-oriented training based on the life-cycle operation and maintenance requirements of the system, subsystem, or equipment as described in the O&M manuals. Include in the training applicable O&M knowledge and skills listed in Table 1.
2. Design and develop training materials that Yale University can use to train/re-train their personnel in the future. The training materials shall include:
 - an instructional outline that reflects the sequence of instruction and that addresses the approved learning objectives,
 - visual aids or other prepared presentation materials,
 - trainee handouts, include the learning objectives, a topic outline, and appropriate drawings, diagrams, charts, tables, illustrations, and reference material.



Table 1. O&M Knowledge and Skills

<p>System Description</p>	<ul style="list-style-type: none"> • Design intent of new or modified systems, subsystems, equipment, and technology • System, subsystem, equipment, and component locations • Special design characteristics, construction features, and operational requirements • Theory and sequence of operations • Operating parameters, operating standards, regulatory requirements, limiting conditions, and performance curves • Materials and processes • Control systems, including control screens or devices; integrated sensors, switches, and other input devices • Safety hazards and precautions, including lockout/tagout procedures • Design features that mitigate safety hazards, such as guarding or other protective devices • Hazardous waste products and contaminants • Regulatory requirements and limitations, including special waste disposal and/or reclamation needs • Odors and other emissions • System, subsystem, and equipment interactions and interfaces, including utilities
<p>Normal and Emergency Operation</p>	<ul style="list-style-type: none"> • Normal operation, including startup, break-in, control, stopping, and normal shutdown • Automatic and manual control sequences • Routine, normal, seasonal, and weekend operation • Common failure modes and sudden power loss • Emergency operation, including trouble indications (error messages, warnings, alarms), emergency responses, stopping, shutdown, and abnormal or casualty operations • Required sequences for electric or electronic systems
<p>Preventive and Predictive Maintenance</p>	<ul style="list-style-type: none"> • Testing • Inspection • Adjustments, alignments, calibration, and balancing • Cleaning methods, surface care needs, and agents • Preventive and routine maintenance • Use of special tools and test equipment • Performance optimization, including how to maintain high operational reliability, economy, and efficiency; minimize noise and vibration transmission, and conduct seasonal changeover operations



Table 1. O&M Knowledge and Skills—Continued

<p>Corrective Maintenance and Repair</p>	<ul style="list-style-type: none"> • Troubleshooting • Diagnosis • Repair • Disassembly and disassembly
<p>Consumables and Spare Parts</p>	<ul style="list-style-type: none"> • Parts identification • Contractor-furnished spare parts and extra materials • Recommended “attic stock” inventory not furnished by the contractor • Recommended critical spare parts for on-site inventory • Procurement information for replacement parts, repair kits, and materials • Contact information for local suppliers and factory representatives • Lubricants, sealants, adhesives, fuels, filters, media, catalysts, chemicals, resins, desiccants, refrigerants, gases, and other consumable components and materials needing periodic replacement
<p>Documentation</p>	<ul style="list-style-type: none"> • Installation requirements • Identification systems • Format, content, and use of O&M data, manuals, and project record documents • Warranty and bond terms and conditions, points of contact, material return procedures, effective dates, expiration times, and extension options • Maintenance service agreements and other similar continuing commitments, except sales promotions

F. Instructional Delivery

Conduct training as outlined in the approved training plan. Provide an appropriate combination of classroom and hands-on instruction, using instructional methods and training materials that support the learning objectives.

1. General Requirements

- a. State the purpose, and review the learning objectives at the start of each training session. Ensure that the trainees understand what they are expected to know and be able to do after completing the training session.
- b. Promote active trainee involvement in discussions, and encourage them to share relevant knowledge and experiences.
- c. Provide the trainees with opportunities to apply what they have learned.



- d. Review and summarize the content at the conclusion of each training session.

2. Hands-On Demonstrations and Training

- a. State the purpose of each operation and maintenance task; the expected outcome; the consequences of improper task performance; and the circumstances, frequency, and standards of task performance.
- b. Demonstrate and describe each task step, using correct terminology and equipment nomenclature.
- c. Demonstrate and explain proper use of all tools, equipment and materials.
- d. Demonstrate and explain the proper use of all controls and instrumentation.
- e. Provide the trainees with opportunities to learn operation and maintenance tasks by performing them, and to develop the necessary expertise through practice.

3. Safety

- a. Ensure that the area is safe for training. Ensure adequate trainee supervision and strict adherence to all safety precautions to avoid injury to personnel or damage to the equipment.
- b. Limit the size of the group in each training session to the number of trainees that can be safely supervised and who can hear the instructor over the background noise. Conduct additional training sessions, demonstrations, and walk-throughs, as necessary, to accommodate the total number of trainees.
- c. Ensure that the trainees are wearing the appropriate attire and required personal protective equipment.

4. Session Documentation

Document the completion of each training session. Include the following information:

- Date
- Topic
- Instructor's name
- List of trainees
- Sign-off by Yale University or its designated representative



G. Training Coordination Meeting

Training providers may be required to participate in a pre-training coordination meeting to review the training plan, discuss training needs and expectations, and resolve potential problems, scheduling conflicts, and other logistic concerns.