



O&M Training & Documentation Program

Global Resource Efficiency Services
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O&M Training and Documentation Program Overview

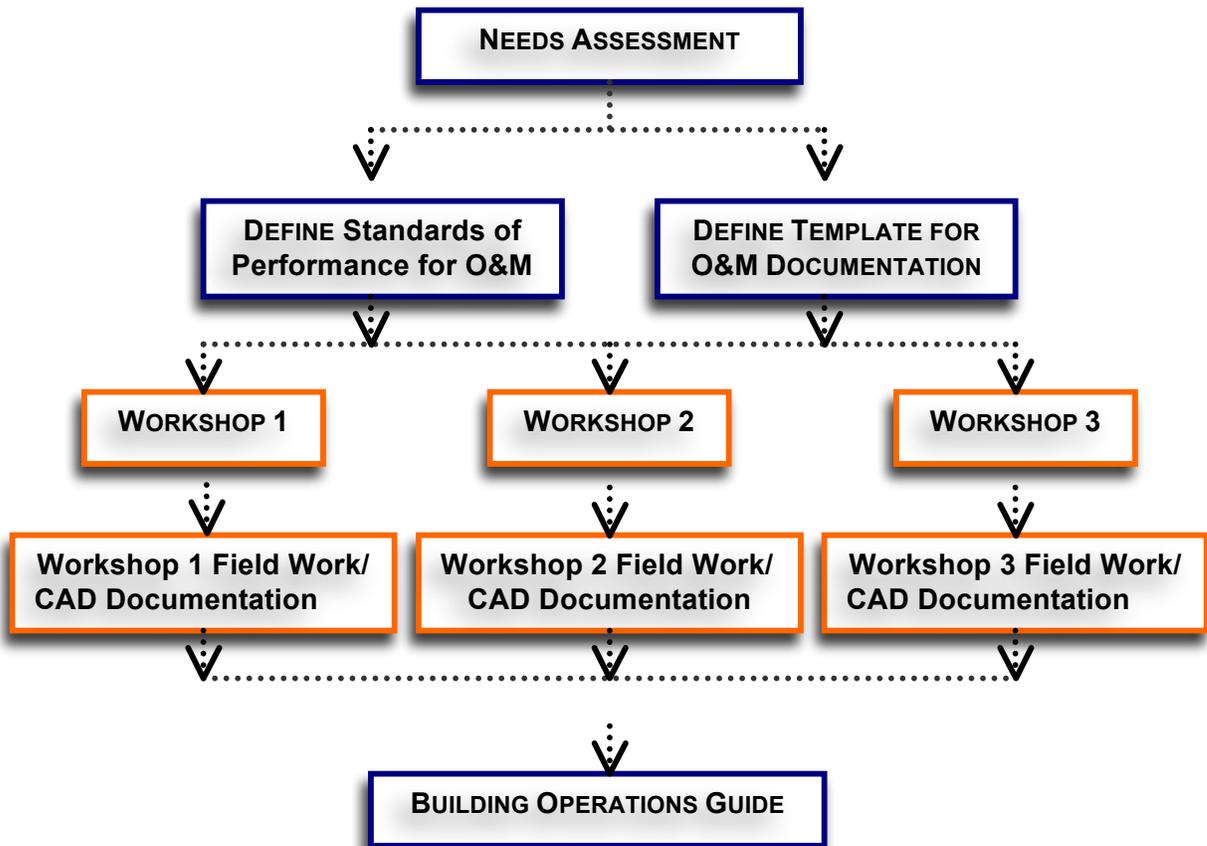
An O&M training program has been designed to integrate the development of Standards of Performance for building operations, for presentation in 3 workshops sessions.

Standards of Performance for building operation are needed to benchmark building performance against optimum efficient operation. The standards must be measurable and quantifiable and understood by building operation personnel.

A Workshop format for training has been selected for several key reasons:

- Focus group findings have indicated that facilitator-led sessions are preferred.
- Workshops are best suited to adult learning where job-relevant case studies are used.
- Workshops provide better cost/benefit than classroom sessions.
- Workshops promote better morale amongst trainees and foster a team approach subsequent workplace resource efficiency activities.

The specific components that make up the O&M training program are:



1. Building Operation Workshops

Concerns over the environment in which we live and work is placing much more emphasis on how building systems provide our indoor environment. The quality of the indoor environment is dependant upon the interaction of many aspects of building systems, their operation and maintenance. Ignoring this interaction through neglect in any of these areas can result in uncomfortable space conditions.

Problems associated with current building practices are:

- Incomplete commissioning at the time of construction.
- Building operations staff that have not been provided adequate training to understand the building systems.
- Poorly maintained systems and equipment.
- Changes in the use of part of the buildings without proper environmental systems adjustments.

In addition, modern buildings are becoming increasingly more sophisticated and complex to operate and maintain. As existing buildings are retrofitted, these new technologies also affect the building operation and maintenance. Building system operators have a particular need to continue their education in order to operate these complex systems under tighter operational constraints, while saving energy and enhancing building performance.

The Building Operation Training Workshops have been developed specifically to assist in this Continuing Education process, and have been designed for delivery in workshop format to facility operation and maintenance staff. The workshop process usually involves forming a group of Primary Building Operator, along with representatives from other areas of the organization operations team (Maintenance, Administration) if available.

Because of the interactive nature of the sessions, along with the workshop tasking, a peer-performance dynamic develops within the workshops which helps move the attendees into participation, as well as fostering healthy dialogue around the real-world application of the lessons learned.

The overall objectives of the training system are to:

- Enable the Building Operator to understand the energy and environmental impacts of their operating decisions.
- Enable specific tasking to be assigned that will support initiatives in energy and resource management and to save operation costs.
- Provide the groundwork for operations and maintenance (O&M) documentation, leading toward the development of standards of performance in building operations.

Overview of the Building Operations Workshop Training System

To achieve the training objectives, the Building Operations Training System is structured as follows:

- The course material is designed for delivery in 3 full-day workshops, with up to approximately 20 attendees.
- The workshop facilitator brings to the workshop both a significant amount of experience and expertise in Building Operation, as well as the people and facilitation skills necessary to enable the best outcomes from the interactive sessions.
- Workshop tasking is assigned to reinforce the workshop outcomes and provide the basis for a Building Operation Guide to be produced by the participants.
- Workshop activities include brief lectures, interactive exercises, individual table-work, and the use of case studies in energy and environmental system operations.
- Workshop handouts including both personal and group exercises, case studies, and selected reference texts to support the Learning Outcomes.

Workshop Curriculum

Workshop One Energy Management and Lighting

Introduction to the Training Program

- Brief review of energy and operation initiatives within the Building District
- Barriers to energy management & efficient operation
- Fundamentals of the energy management process
- Energy use in buildings
- Fundamentals of electricity and metering
- Fundamentals of energy monitoring
- Introduction to lighting
- Lighting concepts
- Sources and fixtures
- Efficiency
- Application
- Maintenance
- Case Study in lighting systems and energy savings
- Overview of tasking exercise one (Lighting Systems Layout)

Workshop Two Air Handling, Indoor Air Quality and Controls

- Review of Workshop One Tasking
- Review of Energy Monitor reports
- Air Handling Systems Fundamentals
- Outside Air – its use and cost
- Case Study in Air Handling Systems
- Comfort and IAQ: Overview
- IAQ factors
- Office worker productivity
- Case Study: Diagnosis of IAQ problem
- Overview of Tasking Exercise Two (Air Systems Layout)

Workshop Three Heating, Cooling Systems and Standards of Performance

Review of Workshop Two Tasking

- Heating Systems Fundamentals
- Heating system types
- Heating Energy Efficiency
- Cooling Systems Fundamentals
- Chillers & DX systems
- Cooling Energy Efficiency
- Case Study: Heating and Cooling Systems
- Overview of Tasking Exercise 3 (Thermal Systems Layout)
- Fundamentals of Control Systems
- Building Control Systems
- Standards of Performance for Building Operation
- Final Tasking Exercise (Building SOPs)

2. Building Operation Guide Preparation and Deployment

A Building Operation Guide (BOG) will be constructed for facilities identified in the project. These *unique and customized* documents will outline the O&M documentation and standards of performance needed to operate each facility efficiently. Specifically the BOG will outline the purpose and procedures for the efficient operation of a facility. The BOG provides the same information as the Quick Reference Schedules of Equipment, but with greater detail. This guide serves as a tool to document facility specific operation guidelines and procedures in accordance within institutions policies and objectives.

The Building Operation Guides will incorporate input received during the 3 workshops to ensure O&M commitment to the documentation and standards of performance. The BOG is a critical part of managing accountability for energy management.

O&M Template Information Needs for Guide

The use of a CAD standard for drawings is only part of the O&M documentation. Assuming that we have defined the necessary CAD layers and the CAD schematics for building systems, we still need to define the nomenclature for building components.

The nomenclature becomes the hub of any asset management system. For example, the name and/or number of a boiler on CAD documentation must be the same as the number used in Maintenance Management software and the

same as the number used in capital projections for asset management systems.

Buildings may not have any common naming system for Operation and Maintenance. We cannot easily summarize the capital expenditure and maintenance history of a specific boiler since we have no system designed to track information by a unique numbering system.

A review of the CAD drawings may show that most historical file drawings are scanned images of hard copy drawings from the files. More recent drawings are likely to be in AutoCAD vector format.

The drawing files provide a record of original building design drawings and drawings for retrofit projects. Up to date “as built” drawings are possible, however, they will be very costly to maintain in as built condition.

Typical floor plan drawings can be prepared using various layers. Examples are shown below:

- Base floor plan layout
- Numbers and names of rooms
- Fire and Safety layer
- Lighting layer
- Fan area served maps
- HVAC Equipment location layer
- Single line duct/diffuser layout
- HVAC controls layer
- Utility meters and shutdown valves
- Office furniture layouts