

Course No. 1526

HVAC Operation & Maintenance Training Course

**HVAC, REFRIGERATION & BUILDING SERVICES
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS**

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The HVAC Operation & Maintenance Training Course provides a comprehensive and practical framework for professionals responsible for operating, maintaining, troubleshooting, and improving heating, ventilation, and air-conditioning systems. The course focuses on the technical and managerial practices required to maintain reliable HVAC performance, protect equipment, control operating costs, and support safe and comfortable working environments across commercial, industrial, institutional, and large-scale facilities.

Effective HVAC operation and maintenance is essential to equipment reliability, energy efficiency, indoor environmental quality, asset longevity, and business continuity. Poor maintenance practices, incorrect operating procedures, inadequate monitoring, and delayed fault diagnosis can contribute to equipment degradation, inefficient operation, unexpected failures, and unnecessary maintenance expenditure. This course enables participants to develop a structured approach to HVAC asset management and operational performance.

The program covers the complete HVAC maintenance cycle, including routine operation, preventive maintenance, predictive maintenance, inspection, troubleshooting, condition monitoring, performance assessment, and corrective actions. Participants will examine major HVAC equipment such as chillers, air handling units, pumps, cooling towers, boilers, fans, compressors, heat exchangers, air distribution systems, control equipment, and associated piping and electrical components.

Particular emphasis is placed on practical troubleshooting and performance optimization. Participants will learn how to interpret operating parameters, identify abnormal conditions, investigate recurring failures, assess system efficiency, and select appropriate maintenance interventions. The course also addresses maintenance planning, work prioritization, spare parts management, documentation, safety considerations, and coordination between operations, maintenance, engineering, and facilities teams.

By completing this HVAC Operation & Maintenance Training Course, professionals will be better prepared to establish effective maintenance strategies, improve equipment availability, reduce avoidable operational problems, support energy-efficient operation, and make informed technical decisions throughout the HVAC asset lifecycle.

Objectives

- Analyze HVAC operating principles and equipment functions to establish appropriate operational and maintenance requirements during the course.
- Develop structured preventive maintenance strategies for major HVAC equipment based on operating conditions, manufacturer recommendations, and asset criticality.
- Evaluate HVAC operating parameters to identify abnormal conditions, performance deterioration, and potential equipment faults.
- Apply systematic troubleshooting techniques to diagnose common mechanical, electrical, refrigeration, airflow, and control-system problems.
- Assess the condition and performance of chillers, air handling units, pumps, cooling towers, fans, compressors, and associated equipment.
- Improve HVAC energy performance by evaluating operating practices, control settings, equipment loading, airflow, water flow, and heat-transfer performance.
- Design practical inspection and maintenance routines that support equipment reliability, safety, and operational continuity.
- Strengthen maintenance planning by applying appropriate scheduling, prioritization, work-order, documentation, and resource-management practices.
- Evaluate HVAC maintenance records and equipment performance data to identify recurring failures and opportunities for improvement.
- Implement appropriate predictive and condition-based maintenance techniques for critical HVAC assets.
- Assess spare parts, tools, technical resources, and contractor requirements needed to support effective HVAC maintenance operations.
- Develop an actionable HVAC operation and maintenance improvement plan based on identified technical, operational, and maintenance priorities.

Who Should Attend

This course is designed for HVAC engineers, mechanical engineers, maintenance engineers, facilities engineers, building services engineers, HVAC technicians, maintenance supervisors, facilities supervisors, plant engineers, operations engineers, and technical specialists responsible for HVAC operation, maintenance, reliability, and performance.

It is particularly relevant to maintenance managers, facilities managers, engineering managers, operations managers, energy managers, property and asset managers, project engineers, reliability professionals, and supervisors responsible for managing HVAC assets across commercial buildings, industrial facilities, manufacturing plants, hospitals, hotels, government facilities, educational institutions, infrastructure projects, and other critical environments.

The course is also suitable for professionals involved in facility management, technical services, maintenance contracting, commissioning, energy management, and engineering support who need to evaluate HVAC operational performance, manage maintenance activities, review contractor work, and make technically informed decisions regarding HVAC system reliability and lifecycle performance.

Learning Outcomes

- Explain the operating principles and functional relationships of major HVAC equipment and systems.
- Identify the principal operating parameters required to monitor HVAC system health and performance.
- Develop preventive maintenance schedules for chillers, air handling units, pumps, cooling towers, fans, compressors, and related equipment.
- Perform structured inspections to identify signs of equipment deterioration, abnormal operation, and maintenance requirements.
- Diagnose common HVAC mechanical, electrical, refrigeration, airflow, hydraulic, and control-system faults using systematic troubleshooting methods.
- Evaluate HVAC operating efficiency using temperature, pressure, flow, electrical, refrigeration, and performance data.
- Identify opportunities to improve HVAC energy efficiency through operational adjustments, maintenance interventions, and control optimization.
- Apply condition-based and predictive maintenance principles to critical HVAC assets.
- Assess the effectiveness of existing HVAC maintenance programs using maintenance records, failure history, inspection results, and performance indicators.
- Improve maintenance planning, work prioritization, documentation, spare parts management, and coordination between technical teams.
- Evaluate HVAC system performance following maintenance, repair, adjustment, or equipment replacement activities.

- Develop a practical HVAC operation and maintenance action plan for improving reliability, efficiency, and lifecycle performance.

Course Outline

DAY 01

HVAC Operations Fundamentals and Equipment Performance

- Fundamentals of HVAC operation and system configurations
- Roles and functions of chillers, air handling units, fan coil units, pumps, cooling towers, boilers, compressors, fans, and heat exchangers
- HVAC operating parameters including temperature, pressure, humidity, airflow, water flow, and electrical consumption
- Normal versus abnormal HVAC operating conditions
- Operating procedures, system start-up, shutdown, changeover, and seasonal operation

PRACTICAL APPLICATION

Review of a representative HVAC system and identification of critical operating parameters and equipment functions

DAY 02

Preventive Maintenance and HVAC Asset Management

- Principles and objectives of preventive HVAC maintenance
- Maintenance requirements for chillers and refrigeration systems
- Air handling unit inspection, cleaning, filter management, coils, fans, belts, bearings, and dampers
- Pumps, motors, valves, piping systems, and cooling tower maintenance
- HVAC electrical components, panels, starters, variable speed drives, and protective devices
- Lubrication, alignment, vibration, cleaning, corrosion control, and component inspection
- Maintenance scheduling, work orders, checklists, records, and maintenance documentation

PRACTICAL APPLICATION

Development of a preventive maintenance program for selected HVAC assets

DAY 03

HVAC Troubleshooting, Diagnostics, and Reliability

- Systematic HVAC troubleshooting methodologies
- Refrigeration system fault diagnosis
- Compressor operating problems and performance indicators
- Chiller troubleshooting and abnormal operating conditions
- Airflow problems, ductwork restrictions, filters, dampers, fans, and air balancing
- Hydronic system problems involving pumps, valves, flow restrictions, and heat-transfer performance
- Electrical and control-system troubleshooting
- Root cause analysis of recurring HVAC failures

PRACTICAL APPLICATION

Troubleshooting scenarios involving multiple HVAC equipment and operational faults

DAY 04

Energy Efficiency, Condition Monitoring, and Performance Optimization

- Fundamentals of HVAC energy consumption and efficiency
- Chiller efficiency, cooling tower performance, and heat-transfer optimization
- Pump and fan efficiency and variable speed operation
- Airflow and water-flow optimization
- Temperature setpoints, scheduling, occupancy control, and operational efficiency
- HVAC controls, sensors, actuators, valves, dampers, and building automation systems
- Condition monitoring and predictive maintenance techniques
- Performance indicators for HVAC equipment and maintenance programs

PRACTICAL APPLICATION

Evaluation of HVAC performance data and identification of energy and reliability improvement opportunities

DAY 05

Maintenance Management, Reliability, and Continuous Improvement

- HVAC maintenance planning and prioritization based on asset criticality
- Reliability-centered maintenance principles for HVAC assets
- Spare parts, tools, resources, and contractor management
- Maintenance safety, isolation procedures, and operational risk considerations
- HVAC testing, inspection, commissioning support, and post-maintenance verification
- Maintenance performance indicators and analysis of recurring equipment failures
- Lifecycle management, equipment replacement, refurbishment, and upgrade considerations
- Continuous improvement of HVAC operation and maintenance programs

FINAL WORKSHOP

Develop an integrated HVAC operation and maintenance improvement plan covering reliability, preventive maintenance, troubleshooting, energy efficiency, and performance monitoring

Register or Request More Information

Course page: <https://quest-training.com/courses/hvac-operation-maintenance-training-course>

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