

Course No. 1531

VRF & VRV Air Conditioning Systems Training Course

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

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The VRF & VRV Air Conditioning Systems Training Course provides a comprehensive professional program focused on the engineering principles, system configuration, installation considerations, operation, maintenance, troubleshooting, and performance optimization of variable refrigerant flow and variable refrigerant volume air conditioning systems. The course develops a practical understanding of how these advanced air conditioning systems manage variable cooling and heating loads while maintaining effective temperature control across multiple zones and spaces.

VRF and VRV systems are widely used in commercial buildings, hotels, hospitals, residential developments, office complexes, educational facilities, retail environments, and large institutional buildings where flexible zoning, centralized management, and efficient space conditioning are required. Effective system performance depends on appropriate equipment selection, refrigerant piping design, load assessment, indoor and outdoor unit coordination, controls, commissioning, and ongoing maintenance. This course addresses these requirements through an integrated engineering and operational approach.

Participants will explore the architecture of VRF and VRV systems, including outdoor units, indoor units, compressors, electronic expansion devices, refrigerant piping, branch components, communication networks, control systems, and heat recovery configurations. The course also examines refrigerant flow management, capacity modulation, pressure and temperature relationships, oil return considerations, system balancing, and the interaction between system components under different operating conditions.

The program places strong emphasis on practical troubleshooting and maintenance. Participants will learn how to interpret operating parameters, identify abnormal system behavior, investigate common faults, evaluate performance, and establish effective maintenance practices. Energy efficiency, preventive maintenance, system reliability, controls, commissioning, and lifecycle performance are also addressed to help organizations achieve dependable HVAC operation and informed technical decision-making.

Objectives

- Analyze the operating principles and architecture of VRF and VRV air conditioning systems within the context of modern commercial and institutional buildings.
- Evaluate cooling and heating requirements and relate building load characteristics to appropriate VRF and VRV system configurations.
- Assess the functions and operating characteristics of outdoor units, indoor units, compressors, electronic expansion devices, branch components, and control systems.
- Apply appropriate principles for refrigerant piping, system zoning, branch selection, and equipment arrangement during the course.
- Evaluate heat pump and heat recovery VRF/VRV configurations and determine their suitability for different building applications.
- Analyze operating pressures, temperatures, refrigerant flow conditions, and system control parameters to assess equipment performance.
- Develop structured approaches for commissioning and verifying VRF and VRV system performance after installation or major maintenance activities.
- Diagnose common mechanical, electrical, refrigerant, communication, and control-related faults using systematic troubleshooting techniques.
- Evaluate energy performance and identify practical opportunities to improve VRF and VRV system efficiency through operation, controls, and maintenance.
- Design preventive maintenance strategies covering indoor units, outdoor units, filters, heat exchangers, refrigerant circuits, controls, and associated equipment.
- Assess system reliability and identify factors that contribute to repeated faults, reduced capacity, refrigerant imbalance, or unstable operation.
- Develop a practical action plan for improving the operation, maintenance, energy efficiency, and lifecycle performance of a VRF or VRV installation.

Who Should Attend

The VRF & VRV Air Conditioning Systems Training Course is designed for HVAC engineers, mechanical engineers, building services engineers, facilities engineers, maintenance engineers, energy engineers, commissioning engineers, HVAC technicians, maintenance technicians, and technical supervisors responsible for air conditioning systems in commercial, institutional, residential, and industrial facilities.

The course is also suitable for facilities managers, maintenance managers, engineering managers, building services managers, operations managers, project engineers, MEP professionals, contractors, consultants, commissioning personnel, and technical specialists involved in HVAC installation, system design, inspection, operation, maintenance, or performance management. It is particularly relevant to professionals responsible for multi-zone air conditioning installations and complex building HVAC infrastructure.

Senior managers, facilities decision makers, and engineering leaders can benefit from the course when evaluating VRF and VRV system selection, maintenance requirements, modernization projects, energy efficiency initiatives, operational reliability, or lifecycle costs. The program provides sufficient technical depth to support informed decisions while maintaining a practical focus on real-world system performance and facility requirements.

Learning Outcomes

- Explain the operating principles, system architecture, and major components of VRF and VRV air conditioning systems.
- Distinguish between heat pump and heat recovery configurations and identify suitable applications for each system type.
- Identify the functions of compressors, indoor units, outdoor units, electronic expansion devices, branch components, refrigerant piping, and control systems.
- Evaluate the relationship between building cooling and heating loads and VRF/VRV system capacity and configuration.
- Interpret key pressure, temperature, refrigerant flow, and operating data to evaluate system performance.
- Assess refrigerant piping arrangements, system zoning, branch configurations, and installation considerations that influence system reliability.
- Apply appropriate commissioning and performance verification procedures for newly installed or modified VRF and VRV systems.
- Diagnose common refrigeration, electrical, communication, sensor, control, and component-related faults using structured troubleshooting methods.
- Evaluate causes of inadequate cooling or heating capacity, abnormal pressures, refrigerant-related problems, excessive cycling, and uneven zone performance.
- Develop preventive maintenance routines for indoor and outdoor units, heat exchangers, filters, drainage systems, controls, and refrigerant circuits.

- Identify practical opportunities to improve energy efficiency through system settings, zoning, controls, maintenance, and operational practices.
- Prepare a comprehensive VRF/VRV system improvement plan covering performance, reliability, maintenance, energy efficiency, and operational priorities.

Course Outline

DAY 01

VRF & VRV Fundamentals and System Architecture

- Fundamentals of variable refrigerant flow and variable refrigerant volume technology
- Refrigeration cycle principles and variable-capacity operation
- Major system components and their operating functions
- Outdoor units, indoor units, compressors, electronic expansion devices, and refrigerant circuits

PRACTICAL APPLICATION

Identify VRF/VRV components and trace refrigerant flow and system operation through a representative installation

DAY 02

System Design, Zoning, Refrigerant Piping, and Heat Recovery

- Building load considerations and VRF/VRV capacity selection
- System zoning and indoor unit selection for different space requirements
- Refrigerant piping principles, branch components, piping limitations, and installation considerations
- Heat pump and heat recovery configurations and simultaneous heating and cooling applications

PRACTICAL APPLICATION

Develop a conceptual VRF/VRV system arrangement for a multi-zone commercial building

DAY 03

Controls, Commissioning, and Performance Management

- VRF/VRV control architecture and communication systems
- Sensors, thermostats, controllers, electronic expansion devices, and system logic
- Centralized monitoring, building management system integration, alarms, and operating data
- Commissioning procedures, system checks, refrigerant verification, and performance validation

PRACTICAL APPLICATION

Analyze operating parameters and develop a commissioning and performance verification checklist

DAY 04

Operation, Maintenance, and Troubleshooting

- Operating procedures and routine monitoring of VRF/VRV systems
- Preventive and condition-based maintenance strategies
- Inspection and maintenance of indoor units, outdoor units, filters, coils, fans, drainage systems, and refrigerant circuits
- Troubleshooting refrigeration, electrical, communication, sensor, and control faults

PRACTICAL APPLICATION

Diagnose representative VRF/VRV faults involving inadequate cooling, abnormal pressures, communication errors, refrigerant issues, and uneven zone performance

DAY 05

Energy Efficiency, Reliability, and System Optimization

- Energy efficiency principles for VRF and VRV air conditioning systems
- Performance indicators and methods for evaluating system efficiency
- Factors affecting system reliability, capacity, comfort, and lifecycle performance
- Optimization, modernization, maintenance planning, and operational improvement strategies

DAY 05 — CONTINUED

FINAL WORKSHOP, ACTION PLAN, OR IMPLEMENTATION EXERCISE

Develop a comprehensive VRF/VRV system performance and maintenance improvement plan

Register or Request More Information

Course page: <https://quest-training.com/courses/vrf-vrv-air-conditioning-systems-training-course>

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