



Carrier University

TECHNICAL DEVELOPMENT PROGRAMS

TRAINING ON HVAC DESIGN & APPLICATION TOPICS

These programs are for people wishing to develop their skills in an HVAC topic area or prepare to make a presentation of the topic to their consulting engineers. The courses are designed to help HVAC contractors, engineers and designers to effectively design, specify, sell and apply HVAC equipment in commercial applications. Programs in this group cover basic topics that all HVAC system designers need to understand and include: load estimating, duct design, psychrometrics, system selection, water piping and pumps, and controls.

FUNDAMENTALS

Covers basic topics that all HVAC system designers need to understand.

Topics include: Load Estimating, Duct Design, Psychrometrics, System Selection, Water Piping and Pumps, and Controls.

FORMAT KEY: ■ PowerPoint Presentation ■ Video Presentation ■ Online On-Demand

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TDP 101 ■	Industry Overview This training program provides a general overview of the commercial HVAC industry, providing an awareness of: the design process, participants in the design and construction process, documents involved in construction, a typical timeline of activities in the design & construction process, and how these activities are influenced by the different participants in the process including regulatory agencies and legal concerns.
TDP 102 ■	ABCs of Comfort This program deals primarily with the design and operation of comfort air conditioning and is intended to introduce system designers to the parameters that influence human comfort, and how the air system and mechanical refrigeration system work together to control these conditions.
TDP 103 ■	Concepts of Air Conditioning This program deals with the functions an air conditioning system must perform to provide comfort air conditioning. Topics covered include: air conditioning definitions, classification of systems, types of systems, with their components, building zoning considerations and how systems control multiple building zones.
TDP 201 ■ ■	Psychrometrics: Introduction & Fundamentals Psychrometrics is the study of the air and water vapor mixture. Proficiency in the use of the psychrometrics chart is an important tool for designers of air conditioning systems. This program is an introduction to air-vapor mixtures, the information obtained from the chart, and plotting the eight basic air conditioning processes.
TDP 300 ■	Load Estimating Level 1: Overview An overview of commercial load estimating includes: what a load estimate is and how it is used, heat transfer methods, building load components, solar radiant energy and other climatic conditions, and explains how external site-related conditions affect building heat gains and losses.
TDP 301 ■ ■	Load Estimating Level 2: Fundamentals The fundamentals of commercial load estimating are covered in this program. Topics include: understanding the various load components, the data necessary to select heating and cooling equipment, how the load estimate determines cooling capacity and airflow cfm.
TDP 400 ■ ■ ■	Principles of Mechanical Refrigeration: Introduction This module deals with the way heat is moved from a place of lower temperature to a place of higher temperature in a process called mechanical refrigeration. Topics covered include: basic heat transfer, principles of the refrigeration system, mechanical refrigeration cycle, four basic components, heat pumps and refrigerants.
TDP 501 ■ ■	Refrigerant Piping This program covers the layout, sizing, materials, accessories, safety and limit controls and design practices for single and multiple circuit refrigerant piping systems. Topics discussed include oil circulation, refrigerant migration and their effect on design.
TDP 502 ■ ■	Water Piping & Pumps In this module the design of water piping and pumping systems for chilled and hot water are addressed. Topics include: layout, selection, and sizing of the piping system; associated hydronic components required and types, application and selection of pumps.
TDP 504 ■ ■	Duct Design Level 1: Fundamentals This module discusses commercial duct design presenting a step-by-step design process covering such aspects of duct design as zoning, load determination, layout, sizing and determining static pressure losses for system fan selection. After completing the module, participants will be able to manually size ductwork using either a friction chart or a duct calculator.
TDP 507 ■ ■	Room Air Distribution This module covers principles of room air distribution including blow, drop, induction and spread. Presents factors relative to the performance, rating and selection of sidewall, under-window and ceiling diffusers.

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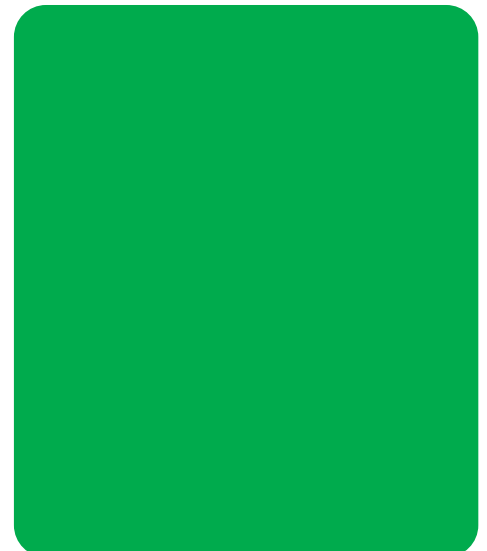
TDP 701 ■	System Selection This module on system selection presents one method that can be used by designers on most commercial projects. Topics include: assembling and documenting all available project data, determining the delivery method, budgets and schedules, running rough heating and cooling loads, developing an initial list of potential HVAC systems, and using a rating method called the Systems Scoresheet.
TDP 801 ■ ■	Controls Level 1: Fundamentals The fundamentals of HVAC controls introduces the basic concepts of control and the vocabulary necessary to understand HVAC controls that are part of the design of HVAC systems. This module will take the basic elements and building blocks of HVAC controls and show how comfort control systems create the desired equipment responses for maintaining room environmental condition set points.

PACKAGED SYSTEMS

Topics on DX (Direct Expansion) Unitary Packaged Equipment.
Products include: Rooftop Units, Split Systems and Water Source Heat Pumps (WSHP).

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TDP 631 ■ ■	Rooftop Units Level 1: Constant Volume Smaller tonnage constant volume rooftop units are the most widely used units in the commercial air conditioning industry. This training module will explain their key features and applications. Topics covered include: components, ratings, control, impact of codes, selection and application tips.
TDP 632 ■	Rooftop Units Level 2: VAV Rooftops A large VAV (Variable Air Volume) rooftop unit with VAV terminals can be used in the place of multiple smaller constant volume units as a way of providing multiple zones of temperature control. This training module discusses their key features and applications. Topics covered include: VAV system description, typical applications, VAV rooftop unit features, options and accessories, VAV terminals, application tips, controls, code considerations, and unit selection.
TDP 633 ■	Indoor Self-Contained Units Indoor self-contained units are a unique segment of the packaged air conditioning industry. They are available in a variety of configurations for both air-cooled and water-cooled applications. This training module covers system types, unit components, applications, controls, code impacts and unit selection.
TDP 634 ■ ■	Split Systems Split systems are classified as a unitary, or packaged unit, and, as such, have many of the benefits of packaged equipment while offering the flexibility associated with applied products. This module will describe what split systems are, the components of the system and accessories frequently used. It will show the designer how systems are applied, explain common installation issues, and describe how to select a system. air conditioning processes.
TDP 704 ■	Variable Volume & Temperature Systems Variable Volume and Temperature systems (VVT) are an all-air zoned system that allows zoning using constant volume rooftops and split systems. VVT systems are a good solution for heating and cooling multiple zone applications in small- to medium-size buildings. This training module will explain what VVT is, basic sequence of operation, system layout and controls.
TDP 706 ■ ■	Water Source Heat Pumps This training module will provide an understanding of the components in water source heat pump systems, configuration options, system benefits, and many applications associated with the overall system.



APPLIED SYSTEMS

Tackles topics on Applied Chilled Water Equipment & Systems, including Air Handlers, Fans, Coils, Cooling Towers, Condensers, Water-Cooled and Air-Cooled Chillers.

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TDP 611 ■ ■ ■	Central Station Air Handlers Air handlers do not just handle air. They also cool, heat, filter and humidify. This module will explain the types of equipment and the sectional components that comprise an air handler, both indoor and outdoor types, discuss the best applications served by central station air handling units and why, as well as the software programs used for selection.
TDP 612 ■ ■	Fans: Features & Analysis The heart of any air handling system is the fan. This module will describe fan characteristics and performance, reading fan curves and other fan related topics in order to provide designers with the knowledge to select the proper fan for various HVAC applications.
TDP 613 ■ ■ ■	Fans in Variable Volume Systems One of the reasons that VAV (Variable Air Volume) systems are popular is because they provide fan energy savings. This module will explain the types of fans that can be used in VAV systems, as well as the controls that may be applied to regulate each.
TDP 614 ■ ■	Coils: DX, Chilled Water & Heating There are many coil applications used in HVAC design; heating coils may use electricity, hot water, or refrigerant hot gas, and cooling coils may use direct expansion of refrigerant (DX) or chilled water. In this module, a design engineer will learn about the components, features and applications for direct expansion and chilled-water cooling, and hot water, steam and electric heating coils.
TDP 614A ■ ■	Coil Optimization There are many coil applications used in HVAC design, heating coils may use electricity, hot water, or refrigerant hot gas and cooling coils may use direct expansion of refrigerant (DX) or chilled water. This module expands on TDP 614 with recommendations on how to optimize coil selection for cost and performance.
TDP 622 ■ ■	Air-Cooled Chillers Air-cooled chillers can range in size from small capacity models to several hundred-ton models. This module will cover both packaged single piece air-cooled chillers as well as split system types. The module will cover the components, application and the available options and accessories, as well as criteria for selecting an air-cooled chiller.
TDP 623 ■ ■	Water-Cooled Chillers Water-cooled chillers range in size from small 20-ton capacity models to several thousand-ton models. This module concentrates on the larger chillers in the range of 200 tons and upward. Topics covered are both screw and centrifugal type compressor water-cooled chillers, their components, function, application, and will discuss the options and accessories available. Also covered is the criteria used when selecting a water-cooled chiller.
TDP 623A ■ ■	Chiller System Optimization This module discusses the procedures to use to optimize water-cooled chiller plants to optimize performance.
TDP 641 ■ ■	Cooling Towers & Condensers This module discusses the most common heat rejection methods: condensers and cooling towers. In order to apply systems to a design, HVAC designers must be aware of the different heat rejection methods. This module discusses total heat of rejection, its derivation, and how it applies to the air conditioning process, as well as the controls that may be used to regulate each.



ADVANCED TOPICS

Focuses on some of the more advanced topics on HVAC systems and applications for HVAC system for designers desiring to enhance their skills. Topics include: Advanced Load Estimating, Filtration, Energy Recovery, Acoustics, Indoor Air Quality (IAQ), Life Cycle Costing and DDC Controls.

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TDP 302 ■	Load Estimating Level 3: Block & Zone Loads Block and zone load estimates provide the data necessary to select heating and cooling equipment that can condition the spaces within a building. Using the outputs for the building block and zone load estimates, the HVAC system equipment selections can be made to complete the design. This module builds on the load estimating modules in the Technical HVAC Fundamentals Design Training and explains the methodology and components that are considered in doing block and zone loads.
TDP 401 ■	Principles of Mechanical Cycle Analysis This second module on mechanical refrigeration develops the pressure-enthalpy diagram and uses it to explain and analyze the mechanical refrigeration process. The pressure-enthalpy diagram is the tool used by designers of HVAC equipment to determine the size and performance of each system component.
TDP 404 ■	Compressor Types An understanding of compressors and how they operate will help the designer better select and apply air-conditioning units. This training module has four major sections describing compressors and their operation and application. Topics covered include: the different refrigeration cycles, positive displacement cycle, dynamic cycle (centrifugal cycle), absorption cycle, terminology associated with compressors and compressor design and operational issues, the five major compressor types with principle of operation, construction, and performance.
TDP 702 ■	Comfort Control Principles This module will discuss various temperature control strategies and HVAC systems that can be employed to maximize comfort provided to the building occupants.
TDP 802 ■	Controls Level 2: DDC Networking This training module includes a refresher of the elements and building blocks of HVAC controls, basic control strategies, the workings of control system networks, the four key management methods available through DDC control networks, and how to specify network configuration and functionality.
TDP 901 ■ ■	Acoustics & Vibration This training module introduces system designers to the principles of acoustics and includes suggestions on how to address acoustic issues early in design. This module has seven sections including: acoustic terms, methods used to establish an acoustic rating both indoors and outdoors, how manufacturer sound data is generated, how to determine the acoustic design goal and how to estimate the sound at the receiver using the source-path-receiver concept.
TDP 902 ■	Indoor Air Quality This training module looks at the importance of Indoor Air Quality (IAQ) to the occupants of a building. An HVAC system may contribute to the problem of poor IAQ or provide means to maintain proper IAQ. Covered in this training are the causes of poor IAQ, the steps in a three-step approach to controlling IAQ and the impact of ASHRAE Standard 62.1 Ventilation for Acceptable Indoor Air Quality.
TDP 903 ■	Lifecycle Costing for HVAC Systems Decisions about the type of HVAC system or decisions related to making HVAC system modifications are often based on financial justification. This training module discusses the life cycle costing method and how it should be applied to HVAC-related decisions. Six sections describe the basic concepts behind the life cycle cost method, a recommended procedure to follow, what data should be included, where to find the data and several techniques to be used in evaluating the data and making a decision.
TDP 909 ■ ■	Filtration Filtration is one part of a good IAQ strategy. This module addresses the methods and products available for removing contaminants from the air. Specifically, the types of mechanical and gas-phase filters, their capabilities, and applications and electronic air cleaners are covered.
TDP 910 ■ ■	Energy Recovery This module deals with the methods and product types that are available for air-to-air recovery of energy in comfort air-conditioning applications. Topics include: the types of energy recovery technology, the best applications for each type, and how to identify recovery opportunities in comfort heating and cooling applications.

These Technical Development Programs qualify for CEU/PDH credits, and cover topics from fundamentals, packaged systems, applied systems, and other advanced topics. If you would like to offer a TDP session to your customers for On-Demand viewing (Video Presentation) click here for [On-Demand Instructions](#) then send the Instructions PDF to your customer. If you would like to present a TDP yourself to your customer and offer credits, please contact [Carrier University](#) for additional instructions.

NOTE: CEUs/PDHs are issued for either method when the participant passes the Knowledge Check.

For any questions relating to these programs, please contact scott.hopkins@carrier.com.