BUCKLEY ASSOCIATES

COURSE CATALOG

EFFECTIVE SEPTEMBER 2023

TABLE OF CONTENTS

VE820 - Commercial Kitchen Ventilation Solutions

VE830 - Lab Exhaust Ventilation Systems (4 Part Series)

VE840 - Boiler Ventilation, Chimney Design, and Grease Duct Balancing and Shaft Requirements (3 Part Series)

VE850 - Enhancements in Commercial Factory-Built Exhaust Systems

AIR DISTRIBUTION AD100 SERIES

AD110 - Air Distribution Fundamentals, Strategies, and Advanced Design (3 Parts)

AD110.1 - Part 1: Room Air Distribution Fundamentals

An Introduction and review of air distribution terminology and the different methods of delivering air to a zone. Terminologies and Definitions Throw, Drop Psychometric (wet bulb, dry bulb), Sound (db, Sound Power, Sound Pressure, NC) Applicable Standards Test Method - ASHRAE 70 Thermal Comfort - ASHRAE 55 Indoor Air Quality - ASHRAE 62.1 Introduction to Different Methods

AD110.2 - Part 2: Room Air Distribution Strategies

Strategies applied when designing overhead mixing systems and displacement systems. Common rules of thumb and approaches will be applied using real world examples. Overhead Mixed Air Solutions Design and Layout Considerations for a Typical Space No Ceiling Adjusting Performance for Supply Air Temperature Heating verses Cooling Stratified Solutions - Displacement and Underfloor Design and Layout Considerations for a Typical Space Heating verses Cooling

AD110.3 - Part 3: Advanced Air Distribution Design

Common design challenges and how to properly lay out air distribution for unique spaces through design examples. Discuss Common Approach and Possible Pitfalls to Unique, Complicated, Architectural Spaces Overhead Mixed Air and Stratified Solutions Large Spaces High Ceilings Glass Walls Heating and Cooling Computational Fluid Dynamics (CFD) Describe the Process Information Required

AD120 - Today's Considerations for Selecting Terminal Equipment

Terminal and fan coil units are integral to mixed overhead air distribution systems and are often treated as a commodity product. Evaluating equipment to optimize the building design has become increasingly more difficult.

Technical Syllabus

+Develop an understanding for reheat water coil performance and how the performance varies with entering water temperatures and coil construction.

+Understand the effect of close-coupling terminal units and silencers for sound sensitive spaces.

+Explore DOAS technology and specifically the use of sensible cooling fan powered terminal units to inform a simplified design with improved outcomes.

+Review optimized control strategies for demand control ventilation.

AD130 - Price Terminal Toolkit

Pack the power of Price labs right into your Excel spreadsheet. The Price Engineer Toolkit for Excel is a fully dynamic, cloud-based solution that improves performance accuracy and boosts efficiency. The Excel Toolkit loads performance calculations directly into your schedule, improving accuracy and saving you time.

Technical Syllabus

+ Create Custom Schedules w/ Coil Configurations – calculate accurate product performance based on Price cataloged data and algorithms, including dynamically sizing the terminal box based on your requirements.

+ When the need to customize your own coil selection for selecting low temperature hot water coils, you to easily cycle through all available Price Water Coils options. We've included models, sizes, casing types and coil types.

+ Cross Reference – Easily cross reference other manufacturers against Price model numbers

+ For sound sensitive applications, we provide catalogued performance data for both discharge and radiated sound levels. Calculations are given to you for accurate performance numbers in real-time based on your own product configurations. Catalog published data is tested as one complete assembly, per the terminal unit test method ASHRAE 130. This results in quiet terminal unit assemblies with predictable, repeatable, reliable sound performance.

AIR QUALITY AQ200 SERIES

AQ210 - Sustainable Design for COVID-Ready Spaces

ASHRAE 62 requirements and indoor air quality considerations for office buildings and schools + Defining the pros and cons of increased air change rates + Technologies currently approved by ASHRAE to create clean air + What ASHRAE could look like in the future System Technologies for new construction and retrofit applications + Designing an air distribution systems that reduce the concentration and spread of airborne pathogens + Strategies that focus on improving indoor air quality Products for reducing airborne pathogens + Room Air Purifier + Fan Filter Units + Products with UV and Bi-Polar Ionization integration

AQ220 - Maintaining Healthy Indoor Air Quality

Fresh, filtered outdoor air is essential to maintaining healthy indoor air quality in any building. Measuring, monitoring, filtering and exhausting indoor air is more critical than ever with the spread of the coronavirus. Learn how Buckley can help you keep your building safe with Greenheck ventilation products, Price fan filter units and EBTRON airflow monitoring solutions by watching this short video presentation

The HVAC System's Role in Improving Environmental Air Quality in Buildings of All Types

Join Buckley Associates and Global Plasma Solutions (GPS) for a technical webinar on how to incorporate needlepoint bipolar ionization (NBPI) technology into your designs to ensure a safe and healthy building. Technical Agenda • Learn about the latest guidance on what may be limiting the HVAC systems overall effectiveness • Discover approaches that may help make traditional ventilation and filtration systems more effective • Understand which specific air treatment technologies may help improve the effectiveness of traditional HVAC filtration and ventilation • Learn how building HVAC systems can be cost effectively designed or retrofitted

AQ230 – Airflow Technology for Use with Today's High-Performace Buildings

Join Buckley Associates and Ebron for a technical webinar on how to how to improve indoor air quality in commercial buildings. Technical Agenda • Learn about why you should measure Airflow • Industry updates that need to be addressed with design build or plan and spec projects given Covid-19 • How other ATC contractors leverage Ebtron to get competitive advantage •Information on Ebtron Airflow measurement station • Learn how to improve your demand control ventilation strategies (DCV)

AQ240 – The HVAC Systems Role in Improving Indoor Air Quality in Buildings

Join Buckley Associates and Global Plasma Solutions (GPS) for a technical webinar on how to incorporate needlepoint bipolar ionization (NBPI) technology into your designs to ensure a safe and healthy building. Technical Agenda • Learn about the latest ASHRAE guidance to buildings managers during a pandemic • Discover approaches that may help make traditional ventilation and filtration systems more effective • Learn about product applications • Discover best practices among end users

CONTROLS CO300 SERIES

CO310 - Lab Air Valves, High Accuracy Terminals, and Dynamic Control Sequencing

Join David Enns, Business Development Specialist at Antec Controls for a presentation on advanced HVAC design training for lab spaces. We will focus on conditioning air for comfort and room pressurization. This will be a deep dive on how to properly select the right lab valve for your application and how to specify the proper control sequencing.

CO320 - UL864 Stairwell Pressurization Controls

Join Buckley Associates and LFSystems for a technical webinar on the design of stairwell pressurization systems referencing codes and compliance. By incorporating the Active Compensated Stairwell Pressurization System (ACSP) into your designs this eliminates multiple trades and creates single source responsibility while maintaining UL 864 compliance. Technical Agenda + Goals of stairwell pressurization + Codes, standards, and definitions + NFPA, UL864, ASHRAE + Methods for stairwell containment + Design considerations + System control types, scope, and requirements + Active and Advanced Active Compensated Stairwell Pressurization Systems

CO330 - Specify Refrigerant Detection Technology to Maintain Safety in Occupied Spaces with Sensac

VRF and heat pump systems have grown in popularity in recent years, increasing the need for a cost-effective and reliable refrigerant detection system. Refrigerants ability to displace oxygen within a built environment creates a real risk for building occupants.

Continuously monitoring occupied zones where there is a potential risk of refrigerant gas accumulation coming from high-tonnage, high-volume VRF system leaks is the best way to ensure occupant safety.

CRITICAL SPACES CS400 SERIES

CS410 - Design Strategies for Modern ORs and Patient Care Facilities

This session will discuss the current codes related to operating rooms and other patient rooms (ASHRAE-170) and how to select and apply the appropriate guidelines when designing these spaces. These requirements are often best met through engineered systems with an integrated design approach which saves the project time and money. Webinar will also include a discussion on temporary and permanent solutions for isolations rooms during a pandemic such as COVID-19. Hospital Operating Room Design ASHRAE 170 requirements and how to meet them The challenges of designing Modern OR air distribution Solutions using integrated design approach and meeting unique design challenges in modern ORs Patient Room Design Standard patient space design Isolation room design Pandemic Ready Patient spaces

CS420 - Permanent and Temporary Isolation Room Solutions

Join Colin Dee, Regional Product Specialist for Buckley Associates as he reviews product options available for permanent and temporary isolation rooms from Greeneck Fan, Price Industries, Antec Controls, and TSI. Featuring Room Pressure Control Systems, Laboratory Exhaust Systems, and Fan Filter Units.

ENERGY EFFICIENCY EE500 SERIES

EE510 - Conditioning High and 100% Outdoor Air with Dedicated Outdoor Air Systems (DOAS)

This course discusses common HVAC systems found in commercial and institutional applications and the methods used to condition high percentages of outdoor air with an overview and comparison of single-zone variable air volume (VAV), multi-zone variable air volume (VAV) and dedicated outdoor air systems (DOAS). Technical Agenda + Review applications for outdoor air systems + Energy efficiency ratings for outdoor air systems + Optimizing cooling and heating controls for occupant comfort + Inverter compressors vs. digital compressors + Modulating head pressure control + High turndown indirect gas furnaces + New Greenheck DOAS Features + RV-10 (3-7 tons) + Bi-Polar Ionization and UV Options + Air Source Heat Pumps + Aluminum or Polymer Energy Recovery Media + 15-Day Quick Build Options

EE520 - Changes to AHRI 1060 and ASHRAE 90.1 Standards

Join Richard Taft from Airxchange as he talks about how the changes to AHRI 1060 and ASHRAE 90.1 Standards affect the definition of efficiency and what this means for how you specify Energy Recovery Equipment and verify its performance. Mike Cagle from Buckley Associates will review Buckley's product solutions and recommendations for verifying and ensuring compliance through the use of Ebtron's new Air Flow and RH sensor.

EE530 - Multi-Unit Residential Design Strategies

Massachusetts's adoption of IECC 2018 has created design challenges to how we traditionally approach multi-unit residential buildings such as apartments, condos, hotels, and dormitories. We will discuss why standards are pushing the market towards new design concepts involving demand control ventilation, energy recovery, and compartmentalization of living spaces. Specifically, IMC2015 Section 401.2 states that in buildings where the infiltration rate in a dwelling unit is less than 5 air changes per hour each dwelling unit shall be ventilated by mechanical means. The implication of these changes pose challenges on traditional systems that can be easily overcome by incorporating compartmental energy recovery into your designs. Technical Agenda Review current codes as they relate to multi-unit residential market (IECC 2018, CMR 780, IMC 2015, IBC

2015, and ASHRAE 90.1) Central vs Compartmentalized Mechanical Systems Indoor Air Quality and Demand Control Ventilation (DCV) Code-Compliant Air Distribution for Fire-Rated Floor to Ceiling Assemblies (Wood Truss Construction) Product Solutions Low-Profile Multi-Family Energy Recovery Ventilator for use in decoupled indoor air handling systems Vertical Fan Coils with Integrated Energy Recovery Core Constant Airflow Regulators Zone Register Terminals and their DCV capabilities Fire-Rated Air Distribution and Pre-Fabricated UL-Approved Diffuser/Boot Assemblies

EE540 - Design Strategies for High Bay Applications

Atriums, Airport Terminals, Grocery Stores, Museums, Gymnasiums, Field Houses Buckley will dive into the various design methods and product solutions for High Bay applications. Any space with a high ceiling and potential for high occupancy poses a challenge on the design for saving energy while keeping the space comfortable. Learning Objectives • Define High Bay Application • Jet Theory and Throw • Types of Systems: Mixing Systems vs Displacement • Ventilation Effectiveness and Efficiency Buckley Product Solutions • Jet Nozzles and Punkah Diffusers • Architectural Linear Slot Diffusers • Destratification Fans (HVLS) • Ductwork: Fabric & Underground • Displacement Diffusers

EE550 - Properly Applying Air Curtains in Commercial and Industrial Spaces

Join the Buckley and Powered Aire for a 1-hour virtual session focused on the common challenges associated with building entrances and how to best mitigate air infiltration. Available for use in Commercial or Industrial settings, air curtains (air doors) are a cost-effective solution to help maximize occupant comfort and energy savings. Powered Aire's stainless-steel air curtains with ECM motor technology reach full speed in one second for increased effectiveness. Technical Agenda: • Develop an understanding of how to properly apply air curtains in the appropriate spaces + Commercial - Retail, Restaurants, Hospitals, Offices, Schools + Industrial - Warehouses, Grow Facilities • Understand how you can leverage ASHRAE/IES 90.1-2019 and IECC 2015 to remove vestibules from your designs and free up valuable real estate • New Product Technology + UVC-Aire Germ Control for reduction of airborne viruses including Coronavirus, Influenza (flu) and the common cold + Wind Sensor Air Curtain - An air curtain that reacts intuitively to the wind pushing at the door opening.

HYDRONIC APPLICATIONS HA600 SERIES

HA610 - HVAC Design Workshop for Chilled Beam Systems (2 parts)

Join the Buckley Associates and Price Industries Engineering Teams for a workshop focused on the efficient and effective design of chilled beam systems. This two-part workshop will have a morning and an afternoon session and will be offered on Wednesday, October 27 at the Marriott Boston in Newton and Thursday, October 28, at the Renaissance Boston Waterfront Hotel in the Boston Seaport District. **Each session will offer a concurrent virtual attendance option.** Course Objectives: To provide HVAC design training for chilled beam systems. Focus on the design and selection of chilled beams for an energy efficient and cost effective system. Provide considerations for air handler and chiller plant design. Morning Session Agenda: This session is ideal for those who have HVAC experience but may have limited experience with chilled beams. 1. Introduction to Price Industries and Chilled Beams 2. Identify and understand energy code trends and how chilled beams can be utilized to meet industry standards 3. Chilled beam design 101 – the proper selection of chilled beams for an efficient and cost effective solution

Afternoon Session Agenda: This session is ideal for those who have some experience with chilled beams and are interested in expanding their knowledge. Those who attend the morning session are encouraged to attend the afternoon session as well. 1. Chilled Beam system design considerations – benefits of decoupled air and water systems 2. System level components – Chiller plant and AHU design considerations 3. Guest speaker John Swift, Principal at Buro Happold, discusses real world design approach, implementation, and energy saving considerations.

HA620 - Energy Code Trends and Decoupled Sensible Cooling Systems

This webinar will discuss some of the recent energy standard and code trends (ASHRAE 90.1, Stretch Energy Code) and their implication on how we design our HVAC systems. We will also identify and understand the application of decoupled sensible cooling systems in commercial spaces.

HA630 - Panel Systems: Low Mass and Radiant Heating & Cooling

Join Buckley and TWA Panel Systems for a one-hour webinar that will focus on the introduction of the products, systems and design methodology as well as the advantages and limitations of radiant heating and cooling systems. The presenter will address how to effectively satisfy the heating and/or cooling loads in the

space while promoting a high level of occupant comfort and energy efficiency. • Radiant System Applications • Low Mass Radiant Heating and Cooling • Introduction • How it works • Limitations • Where/where not to use it • Radiant Terminal units • Applied Engineering • General • Airside • Waterside • Capacity and Planning

SOUND ATTENUATION SA700 SERIES

SA710 - Fundamentals of Sound Workshop (2 Parts)

SA710.1 - Part 1: HVAC Acoustics

This session reviews the fundamentals of sound and the corresponding rating methods.

Technical Agenda

• Review Fundamental Sound Concepts and Definitions

• Sound Pressure vs. Sound Power

• Noise Criteria and ASHRAE Recommended background sound levels

• Insertion Loss vs Generated Noise

• Noise Control concepts will also be discussed including the features and benefits of silencers, acoustic enclosures, and terminal units with integral sound attenuators

SA710.2 - Part 2: Acoustic Analysis and Silencer Selection

This session will review Noise Control concepts and demonstrate the Price All-In-One acoustic analysis software.

Technical Agenda

• Modeling Different Types of HVAC-related sound paths

• Estimating rooftop unit noise levels in occupied spaces

• Applying Noise Control Products to Ensure Design Goals are Achieved

• Design Packaged Solutions to solve complex HVAC noise problems

VENTILATION VE800 SERIES

VE810 - Optimizing Car Park Ventilation Systems with Jet Fan Ventilation Solutions

Join Buckley Associates and SystemAir for a webinar on garage ventilation strategies and the use of Jet Fans, Air Flow Measurement and Gas Detection. Systemair designs and manufacturers a comprehensive line of Jet Fans designed to provide maximum performance and efficiencies for enclosed and underground parking garage ventilation needs. Jet Fan ventilation eliminates costly, ineffective and unsightly ducted systems associated with traditional ventilation design and allows sweep / shaft systems to operate more effectively and efficiently. Systemair provides design selection and layout assistance as well as proving our design with CFD analysis for larger, complex projects.

Technical Agenda

• Design Goal & Code Requirement

• Challenges of Traditional Solutions

• Jet and Induction Fan Solutions – How do they work?

• Optimizing Ventilation Design

• Project Analysis and Energy Study

• Summary and What We Offer

• Product Overview and AMCA 250 Certification

VE820 - Commercial Kitchen Ventilation Solutions

Every kitchen differs in the way they are designed and equipped. Buckley will provide you with an understanding of the code requirements and product solutions with an eye towards safety, energy efficiency, functionality, and ease of installation.

Technical Agenda

• Kitchen Ventilation System Overview

• Exhaust Hoods

• Cooking Appliances

• Exhaust/Supply/Make Up Air Fans

• Hood Control Systems + Fire Suppression Codes and Standards

• International Mechanical Code

• International Building Code

• NFPA 96 Grease Ductwork

• UL Listed Rectangular and Round Factory-Built Grease Duct Systems Grease and Odor Control

• Pollution Control Units

• UV/Ozone Solutions The Buckley team can provide you with a complete Kitchen Ventilation solution which includes design information, product selections, and CAD/REVIT content.

VE830 - Lab Exhaust Ventilation Systems (4 Parts)

VE830.1 - Part 1: Precision Airflow Control Devices

- Identify a device as a high accuracy terminal or a venturi valve + Identify the unique differences of different venturi valves and high accuracy terminal units in the market + Identify the design and operational features of different venturi valves and high accuracy terminal units in the market

- Apply venturi valves and high accuracy terminal to critical space design

VE830.2 - Part 2: Lab Fume Exhaust Systems

- System basics including virtual lab demo

- Overview of Exhaust Fan Styles + Nozzle types – Dilution, High Plume, Variable Geometry (Virtual Lab)

- Best Practices to Reduce Sound, Vibration and Energy Usage

VE830.3 - Part 3: Control Theory for Critical Spaces

- Understand the difference between open loop and closed loop controls

- Determine what type of control loop a given air valve technology uses

• Identify the design and operational features of different venturi valves and high accuracy terminal units in the market

• Review applications of each type of control strategy

VE530.4 - Part 4: Lab Exhaust Fan Control Theories

• How the exhaust fan system works with the lab controls

• Sequences of operation for efficient fan operation

• Effective solutions for unique operation conditions

• Lab fan control strategies with packaged factory controls

VE840 - Boiler Ventilation, Chimney Design, and Grease Duct Balancing and Shaft Requirements (3 Parts)

VE840.1 - Part 1: Vent Sizing and Theories

• Overall Review of Boiler Stack Sizing

• ANSI Venting Categories and Vent Types

• NFPA 54 Tables and Common Code Violations

• In-Depth Review of the ASHRAE Chimney Design Equation

VE580.2 - Part 2: Chimney Design Equation

• Common Venting of Condensing Appliances

• Common Venting of Forced Draft Appliances

• Benefits of Fiber Insulated stack and Gas Vent Systems

• ISO 6944 Gas Vent Options to Eliminate Need for a Fire-Rated Shaft

VE840.3 - Part 3: Grease Duct Balancing and Shaft Requirements

• Balancing of Multiple Kitchen Hoods

• Fire-Rated Requirements and Options per UL 2221 and ASTM E 2336

• Eliminating the Need for an Additional Fire-Rated Shaft

• Review of Other Similar Vent Systems (Dryer Ducts, Fume Hood, Dishwasher, etc.)

VE850 - Enhancements in Commercial Factory-Built Exhaust Systems

Join the Buckley and Jeremias team for a virtual presentation to help ensure that you are applying the proper venting material, clearances and vent routing requirements. As equipment manufacturers continue to introduce more energy efficient equipment, venting requirements are more stringent and require more comprehensive design considerations.

Technical Agenda

• Code & Appliance Manufacturers Vent Routing Requirements

• UL Standards and Testing for Grease Ducts, Gas Vents, and Pressure Stacks + ASHRAE Chimney Design Equation, now common venting condensing appliances

• New NFPA-96 clear acceptance of UL-1978 and UL-2221 Grease Ducts and Enclosures

• Conical forming vent pipe joints, no silicone or thermal bridges at joints

• New all-in-one venting products that uses new special stainless steels

• Fiber insulated exhaust systems for man-safe skin temperatures and zero clearance to combustibles

• Real stainless-steel venting replacement for PVC, CPVC, and PP plastics

• Fire Rated shaft enclosures for Grease Duct and Gas Vent systems