

61st
1958-2018



North Carolina Industrial Ventilation

Course

Receive the
29TH
EDITION
INDUSTRIAL
VENTILATION
MANUAL

April 30 – May 4, 2018

Holiday Inn Downtown Raleigh, NC

OPTIONAL WORKSHOP-MAY 4

Current Issues in Industrial Ventilation

- Combustible Dust 2018
- Ventilation Control Methods for New Silica Dust Standard

Industrial Ventilation Design or Industrial Ventilation System
Diagnosis & Troubleshooting Certificate Programs Included!



North Carolina Industrial Ventilation Course in cooperation with

University of North Carolina-Chapel Hill, School of Public Health
North Carolina Occupational Safety & Health Education & Research Center
NC Department of Labor, Division of Occupational Safety & Health

Visit www.ncindustrialventilation.com

Who should attend?

- Engineers and Designers
- Safety Personnel
- Industrial Hygienists
- Consultants
- Maintenance Personnel



61st Annual North Carolina Industrial Ventilation Course

April 30-May 4, 2018 • Holiday Inn Downtown Raleigh Hotel • Raleigh, NC

ELEMENTS OF THE PROGRAM

CLASSROOM SESSIONS — APRIL 30-MAY 3

The problem sessions present real world situations and are sequenced in a manner to take advantage of skills the students acquire.

In order to facilitate computations in the problem sessions, students are required to bring a calculator.

OPTIONAL WORKSHOP—MAY 4 (8 AM-12 NOON)

Current Issues in Industrial Ventilation

- Ventilation Control Methods for the New Silica Dust Standard
- Basics of Combustible Dust Technologies
- Governmentally Sanctioned Ventilation Designs and VS Plate Designs
- New ASHRAE Bag House Efficiency Standard
- Computational Fluid Dynamics for Dummies

VENTILATION SYSTEM LABS

The Course has several ventilation systems that are used for demonstration purposes. These systems consist of ducts, various hoods, variable speed fans, stackcaps, and sound attenuators. These 'hands-on' exercises to measure flow and pressure are key to the program. Measurement includes: pitot tube traverse to determine flow rate, hood static pressure, duct pressure drop, and simulation of fan and system curves. The Diagnosis and Troubleshooting Section also uses a system to practice basic troubleshooting skills.

FOUNDERS BANQUET

Is held Tuesday evening after classes and is an opportunity to meet people early in the week. Dinner will be served on the 20th floor of the Holiday Inn Downtown Raleigh, overlooking the city.

INDUSTRIAL VENTILATION CERTIFICATE COURSE

The North Carolina Industrial Ventilation Course in collaboration with the University of North Carolina, Occupational Safety and Health Research Center has established two Certificate courses in Industrial Ventilation. Upon completion of the course individuals will be awarded a **Certificate in Industrial Ventilation Design** or **Certificate in Industrial Ventilation System Diagnosis & Troubleshooting**, and a plaque from the University of North Carolina, Occupational Safety and Health Education and Research Center.

Program requirements:

- Successfully complete two levels of courses offered at the North Carolina Industrial Ventilation Course. Each level will be four days in length.
- Step One: Complete the first (Fundamentals) level, a four day course in applied industrial ventilation techniques including Hood & Duct Design, Fan Basics, Introduction to Air Control Devices (Baghouses, Scrubbers, ESP's, etc.) and Fundamental Industrial Hygiene Issues and how they affect exposure and ventilation system design.

- Following the completion of the basic course the student has a choice in the second year to continue with more detailed system design (leading to a **Certificate in Industrial Ventilation Design** or to pursue a course of System Diagnosis and Troubleshooting (leading to a **Certificate in Industrial Ventilation System Diagnosis and Troubleshooting**). Each Certificate will be issued from the University of North Carolina-Chapel Hill).

The certificate program is included in the cost of the program. For more information about the Certificate Program please contact Connie McElroy-Bacon at (919) 233-8400 or go to the North Carolina Industrial Ventilation Course web site at www.ncindustrialventilation.com.

PLAN OF INSTRUCTION

Fundamentals of Industrial Ventilation Course (8 Modules)

Requires basic algebra skills to solve problems.

Ventilation I: Fundamentals of Ventilation and Industrial Hygiene I

Starts the discussion of Industrial Ventilation design with a primer on Industrial Hygiene in a workplace and introduces fundamentals on fluid flow and pressure in ventilation systems. This first module begins illustrating how to measure system conditions and provides an introduction to the effects of air properties on the selection of system components.

Hood Design

The second module expands on the concepts from first module by looking at the fundamental of hood design and performance. This module covers: hood classifications and types, capture velocity, and air pattern control over large hood areas. This module also starts discussions on predicting energy and equipment requirements. The student will perform calculation sets on hood "static pressure / losses", and hood air volume requirements with a goal of predicting requirements for horsepower and energy in a system. The module includes hands-on demonstrations of the principles discussed to help students confirm the foundational concepts.

Duct Component Design

The third module in this series explores the variety of duct components in a system and how they work together. This includes in-depth discussion on elbows, fittings, and ducts that define the system and will provide guidance on predicting the effects of components on energy requirements. The discussion will include influences on static, velocity, and total pressure, as well as further refinement of hood static pressure calculations. These foundational concepts are demonstrated through a hands-on lab activity.

System Design I

This module builds upon the skills introduced in the prior modules. This module explores more complex systems and students will explore how to achieve a balanced systems which achieves desired performance. This module also introduces the ACGIH Calculation Sheet which students will use to practice system design including early predictions of fan and horsepower requirements.

System Design II

This module continues to build on skills from the prior modules, with design considerations for more complex systems involving multiple hoods. The students will explore how to balance complex systems to achieve desired performance at each hood. This module also includes practice on predictions of fan size and horsepower requirements.

System Components - Fans and Collectors

This module provides students with an overview of general Air Control Devices and Fan Designs; including nomenclature and specify parameters students should consider for proper system design.

System Design III

This module combines foundational skills from prior modules with some additional hood design considerations. Students will look at Industrial Ventilation design as a whole and will design detailed practical systems with the ACGIH calculation sheet and Manual.

Industrial Ventilation Design Courses (Eight Modules)

Prerequisite: for certificate program in Industrial Ventilation Design: Completion of Fundamentals Level taken at N.C. Industrial Ventilation Course. Participants should be able to:

- Utilize *ACGIH Industrial Ventilation Manual*
- Understand the Velocity Pressure Method of design
- Utilize the ACGIH calculation sheet

Ventilation II: Review of Fundamentals

An intense review of the Fundamentals (First Year) course, this module does a quick revisit of basic formulae of system design ($Q=VA$, Hood Static Pressure, Effects of Density), sizing of duct, system pressure, and calculation sheet review. This module is intended for attendees who have completed the Fundamentals Course or have over five years ventilation design experience.

Ventilation III: Physics of Non-Standard Conditions

This course covers basic psychrometrics, the perfect gas equation and sample problems explaining both concepts. Subjects include dry bulb and wet bulb temperature, dew point, enthalpy.

System Design IV

This module focuses on using the calculation sheet and techniques to solve problems involving non-standard air and mixing of hot and cold or dry and wet air streams.

Fans 201

This segment is a continuation of information provided in the Fundamentals Course module and focuses on system effects and issues that may improve or impede operation. The module includes demonstration and practical problems to solve.

System Design V

This module adds detailed design issues including the implementation of system effects losses, adiabatic cooling and stack design.

Energy and Cost

Systems use large amounts of horsepower to convey dust and gases. This module provides tools to calculate the initial system costs as well as operating costs (power, maintenance, replacement air, etc.) and includes sample problems.

System Design VI (8 hours - two modules)

Includes "real world" example to combine the techniques in the course. This will use all the tools and techniques taught previously in the week.

Diagnosis and Troubleshooting Courses (Eight Modules)

Prerequisite: for the Certificate Program in Industrial Ventilation System Diagnosis and Troubleshooting: completion of Fundamentals Level taken at N.C. Industrial Ventilation Course

- Utilize System Diagnosis and Troubleshooting Manual
- More practical applications with less math
- Require s calculator and some problem solving

Measuring and Monitoring System Performance I

Provides basic insight into requirements including documentation, use of fan performance curves and system measurements to monitor operations. Minimal math required.

Measuring and Monitoring System Performance II

This module builds on the basic data gathering methods to provide hands on experience on system data comparing baseline information with changes that may occur over the life of the system.

Monitoring & Maintenance I

This module will cover extensive lab procedures to evaluate fan operation (fan and system curves) as well as effects of varied pressures during operation (i.e. baghouse delta-P, etc.) and an introduction to effects of changes in density on results of measurements.

Practical System Troubleshooting I

In this module, the participant will look at comparison data to evaluate the changes to a system over operation.

Practical System Troubleshooting II (8 hours - two modules)

This module is a continuation of the practical problem solving as systems are altered over their operational life.

PROGRAM STAFF

ACKERSON, ROSS, Air Solutions, Inc., St. Louis, MO
BOSTON, KIRT, Donaldson Co., Minneapolis, MN*
CURRAN, PAT, NC Division of Public Health (Retired), Raleigh, NC*
DIESTLER, MATT, IVI North, Greenville, WI
GIGUERE, MARY, NC Division of Public Health (Retired), Raleigh, NC
GUNNELL, DOUGLAS L., Gunnell Engineering Services, Winston-Salem, NC*
GRESHAM, NEIL, Saint-Gobain Corp., Oxford, NC*
GRUBB, GREGG, Grubb Industrial Hygiene Services, LLC, Grand Ledge, MI *
HALE, JONATHAN, Air Systems Corp., Clemmons, NC*
HERRING, ROMIE, RH Consulting LLC, Raleigh, NC*
HOWARTH, BILL, Illinois Blower Company, Cary, IL
LEHNER, LORI, Donaldson Co., Minneapolis, MN
LOWE, ERIC, RL Kunz, Raleigh, NC
MALETICH, DAVID, New York Blower, Willowbrook, IL
MANNING, CHRIS, Materials Processing Solutions, Inc., Boston, MA*
MARSHALL, BRIAN, The Kelly Group, Decatur, IL
MCELROY-BACON, CONNIE, McElroy-Bacon Consulting, Cary, NC*
RAVERT, ED, CLARCOR Industrial Air, Cincinnati, OH
SARTIM, RAFAEL, Arcelormittal, Federal University of Espirito Santo
SHEARER, ROBERT, KBD/Technic, Inc. Cincinnati, OH
STALLINGS, JEFF, Stallings Engineering, Winston-Salem, NC
STROHSCHIEIN, SUSIE, Air Systems Corp., Clemmons, NC
SULLIVAN, PAUL, NC-OSHA, Charlotte, NC*
TRAMM, LEO, TRC Environmental Corp., Milwaukee, WI*

*Planning committee member

Registration/pick up course materials: MONDAY, APRIL 30 | 7:30-8:00 AM | HOTEL LOBBY

LUNCH: MONDAY - THURSDAY | 12:00-1:00 PM

| | Monday* | Tuesday | Wednesday | Thursday |
|---|---|----------------------------------|---|-------------------------------------|
| Fundamental Ventilation Skills | | | | |
| 8:00 –12 noon | Fundamentals of Ventilation & Industrial Hygiene | Duct Component Design | System Components - Fans and Collectors | System Design III |
| 1:00 –5:00 PM | Hood Design | System Design I | System Design II | System Design III |
| Advanced Design | | | | |
| 8:00 –12 noon | Ventilation II: Review of Fundamentals | Fans 201 | Energy & Cost | System Design VI |
| 1:00 –5:00 PM | Ventilation III: Physics at Non-Standard Conditions | System Design IV | System Design V | System Design VI |
| Diagnosis and Troubleshooting | | | | |
| 8:00 –12 noon | Ventilation II: Review of Fundamentals | Measuring & Monitoring System II | Monitoring & Maintenance I | Practical System Troubleshooting II |
| 1:00 –5:00 PM | Measuring & Monitoring System Performance I | The Fan and System | Practical System Troubleshooting I | Practical System Troubleshooting II |
| * 7:00 PM Monday: Math Terminology Update | | | | |

OPTIONAL WORKSHOP — Current Issues in Industrial Ventilation

FRIDAY: 8:00 AM–12 Noon

- Ventilation Control Methods for the New Silica Dust Standard
- Basics of Combustible Dust Technologies
- Governmentally Sanctioned Ventilation Designs and VS Plate Designs
- The New ASHRAE Bag House Efficiency Standard
- Computational Fluid Dynamics for Dummies

Workshop Speakers Include:

Susan Bershad, National Fire Protection Association; Bob Burkhead, Blue Heaven Technologies

Congratulations to those receiving certificates in May 2017:

CERTIFICATE IN INDUSTRIAL VENTILATION DESIGN RECIPIENTS

- Javier Alguindique, Clarcor/UAS
- Kyle Billy, Robo Vent
- Lance Brandt, Anguil Environmental
- Ashton Fillingame, DeBardleban & Associates
- Jonas Burham Gilbert, Air Control Techniques
- Andrew L. Graham, Canadian Nuclear Laboratories
- Nathan Hildebrand, Donaldson Company
- John Keaser, Robo Vent
- Sharok Khabir-Washington River Protection Solutions
- Thomas Brent Porter, BAE Systems
- Philip Rankey, Clarcor/UAS
- Christopher Stewart, Puget Sound Naval Shipyard
- William L. Weingart, Anguil Environmental

CERTIFICATE IN INDUSTRIAL VENTILATION DIAGNOSIS & TROUBLESHOOTING RECIPIENTS

- Buddy Beger, 3M
- Eric L. Hollowell, Nuclear Fuel Services
- Curtis Johnson, Canadian Nuclear Laboratories
- Dele A. Ogundipe, Sun Chemical
- James L. Tilleman, Kimberly Clark
- Jeffrey Alan Zenan, Materion Ceramics, Inc.

GENERAL INFORMATION

This Course was established to promote good ventilation practices and design techniques throughout industry and will help you learn to evaluate and/or design a ventilation system.

Classroom problems solved using the Velocity Pressure Method of calculation.

Classroom sessions and morning registration on April 30, will be held at the Holiday Inn Downtown Raleigh, 320 Hillsborough St., Raleigh, NC. with the first session beginning at 8:00 am. The half day optional workshop will be held on Friday, May 4, 8 AM –12 Noon.

TUITION

The cost for Level I Fundamentals of Ventilation, Level II Advanced Ventilation Design OR Level II System Diagnosis and Troubleshooting is \$1,620 per person. The three levels are taught concurrently April 30 – May 3.

Tuition for the optional half day workshop on Friday, May 4, is \$295 per person.

Please call about company discounts for 3 or more Course registrants.

Course registration fees include the 29th edition ACGIH Industrial Ventilation Manual or System Diagnosis & Troubleshooting Manual, all course materials (problems, calculations sheets), breaks, four continental breakfasts, four lunches, and the Founders Dinner on Tuesday, May 1. The Friday workshop registration fee includes handouts, continental breakfast and break.

The two year Certificate Program is included in the cost of the course.

MAINTENANCE POINTS—The NC Ventilation Course contains 30 hours of technical contact time and is eligible for an estimated 4.0 ABIH CM Points. The optional workshop contains an additional

4 hours of technical contact time and is eligible for an estimated .5 ABIH CM Credit.

PROFESSIONAL DEVELOPMENT HOURS (PDHs)— The Industrial Ventilation Course (S-0213P) is an approved sponsor of continuing competency activities for North Carolina Professional Engineers and Registered Land Surveyors (30 Contact Hours).

ACCOMMODATIONS— Rooms have been set aside at Holiday Inn Downtown Raleigh for participants of this Course, but their availability cannot be guaranteed past March 29. Lodging is NOT included in your registration fee. Please make your own reservation directly with the Holiday Inn Downtown Raleigh. To receive your special rate of \$84/night (plus tax), please state that you will be attending the **Industrial Ventilation Course**.

HOLIDAY INN DOWNTOWN RALEIGH HOTEL
320 Hillsborough St., Raleigh, | NC 27603 919-832-0501

PARKING— On-site parking is available for Holiday Inn Downtown Raleigh overnight guests at \$7.00/night. There is free parking for drive in attendees.

CANCELLATION— The full registration fee or an organization purchase order is due at the time of registration. In the event the participant cancels, a written notice is required. A twenty-five dollar (\$25.00) fee will be charged for cancellation. No reimbursement can be made if cancellation occurs within 7 business days of the program, or if the participant fails to attend.

OTHER VENTILATION COURSES

The 67th Annual Michigan Industrial Ventilation Conference will be held in Michigan in February 11-16, 2018. For information please call **517-204-3687**

The West Coast Industrial Ventilation Conference will be held in November 2018 in Santa Ana, CA. For information, call **909-336-0420**.

61st N.C. Industrial Ventilation Course Registration Form

Holiday Inn Downtown Raleigh Hotel, Raleigh, NC | April 30 – May 4

Register Online: www.ncindustrialventilation.com
OR fill out this form and mail to address below.

Name _____

Job Title _____

Firm/Org. _____

Work Phone _____

Address _____

City _____ State _____ Zip _____

E-mail _____

Please choose one level. Sign me up for:

- Level I-Fundamentals of Industrial Ventilation \$1,620
 Level II Advanced Vent Design \$1,620
 Level II System Diagnosis & Troubleshooting \$1,620

Enroll me in the Friday, May 4 workshop

Current Issues in Industrial Ventilation \$295

Total \$ _____

PLEASE CALL ABOUT PRICE BREAKS FOR 3 OR MORE REGISTRANTS!

Payment must accompany registration

Payment Method:

Visa MasterCard AmericanExpress

Check (Make check(s) payable to: Industrial Ventilation Course) PO

Card Account # _____

Exp. Date _____

Three (or four) Digit Security Code on Back of Card _____

Amount \$ _____

Signature _____

Cardholder's Name (please print) _____

Credit Card Billing Address _____

City _____ State _____ Zip _____

Mail to: Industrial Ventilation

P.O. Box 37492

Raleigh, NC 27627-7492

Attn: Connie McElroy-Bacon

For Information:

Phone 919 233 8400

FAX: 919 852 4594

E-mail: cbacon@mindspring.com

**North Carolina
Industrial Ventilation Course**

PO Box 37492
Raleigh, NC 27627-7492

Visit our Website:
www.ncindustrialventilation.com



April 30 – May 4, 2018

Holiday Inn Downtown Raleigh, NC

Certificate Program Included from University of North Carolina!
Industrial Ventilation Design or
Industrial Ventilation System Diagnosis & Troubleshooting

OPTIONAL WORKSHOP-MAY 4

Current Issues in Industrial Ventilation

- **Combustible Dust 2018**
 - **Ventilation Control Methods for New Silica Dust Standard**
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