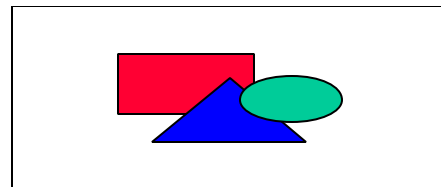


Industrial Ventilation

Student Manual

Ohio Bureau of Worker's Compensation
Division of Safety and Hygiene



Industrial Ventilation Course

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Course Objectives

Upon completion, participants will be able to:

- Know elementary physics of air.
- Comfortably discuss technical topics related to industrial ventilation such as local exhaust systems, dilution ventilation, etc.
- Participate in identification and elimination of health problems by the use of industrial ventilation.
- Perform routine evaluations to maintain ventilation systems.
- Participate in simple design of industrial ventilation systems and its components.
- Expand your expertise in this field through self-study.

DAY ONE AGENDA

INDUSTRIAL HYGIENE VENTILATION

8:30AM – 10:30AM	INTRODUCTION AND ORIENTATION AIR SUPPLY AND EXHAUST INDUSTRIAL HYGIENE ROUTES OF ENTRY EXPOSURE LIMITS
10:30AM – 10:40AM	BREAK
10:40AM – 11:30AM	PROBLEM CHARACTERIZATION AIR CAPTURE CHARACTERISTICS INTERACTION WITH EMPLOYEES GROUP EXERCISE
11:30AM – 12:30PM	LUNCH
12:30PM-1:00PM	AIR BEHAVIOR STATIC PRESSURE VELOCITY PRESSURE
1:00PM – 1:45PM 1:45PM – 2:20PM	USE OF THE SCIENTIFIC CALCULATOR INSTRUMENTATION
2:20PM – 2:30PM	BREAK
2:30PM – 4:30PM	LAB

DISMISS

DAY TWO AGENDA

INDUSTRIAL HYGIENE VENTILATION

8:30AM – 10:20AM	BURTON CHAPTER 4 – DILUTION VENTILATION
10:20AM – 10:30AM	BREAK
10:30AM – 11:00AM	BURTON CHAPTER 11 – MAKE UP AIR REENTRAINMENT
11:00AM – 11:10AM	BURTON CHAPTER 14 – STACK HEIGHT
11:10AM – 11:30AM	BURTON CHAPTER 12 – RECIRCULATING EXHAUST AIR
11:30AM – 12:30PM	LUNCH
12:30PM – 2:30PM	BURTON CHAPTER 5 – LOCAL EXHAUST VENTILATION SYSTEM COMPONENTS TYPES OF LOSSES
2:30PM – 2:40PM	BREAK
2:40PM – 4:30PM	BURTON CHAPTER 6 – HOOD SELECTION AND DESIGN HOOD EFFICIENCY TYPES OF HOODS HOOD ENTRY LOSS

DISMISS

DAY THREE AGENDA

INDUSTRIAL HYGIENE VENTILATION

8:30AM – 10:25AM	BURTON CHAPTER 6 – HOOD EVALUATION BURTON CHAPTER 7 – DUCTWORK FRICTION LOSSES STATIC PRESSURE LOSSES
10:25AM – 10:35AM	BREAK
10:35AM – 11:30AM	TYPES OF DUCTWORK EXPANSION AND CONTRACTION LOSSES BURTON CHAPTER 8 – FAN SELECTION AND OPERATION FAN TOTAL PRESSURE FAN STATIC PRESSURE
11:30AM – 12:30PM	LUNCH
12:30PM – 1:30PM	EXERCISES POWER NEEDS
1:30 – 1:40PM	BREAK
1:40PM – 3:30PM	DESIGN EXERCISES
DISMISS	

Instructors

Don Bentley, PE, CIH is the Industrial Hygiene Technical Advisor for the Division of Safety and Hygiene. Don has been with the Division since 1982. During that time Don has worked as an industrial hygienist, an ergonomist, and as an industrial hygiene supervisor. His area of specialization is occupational exposure control assessment. Don has a Bachelor of Science Degree in civil engineering from Ohio University. He has worked in private industry and consulting from which he has established a solid foundation of practical experience. He is a Professional Engineer (PE), registered by the Ohio Board of Registration for Professional Engineers and Surveyors, and a Certified Industrial Hygienist (CIH), certified by the American Board of Industrial Hygienists (ABIH) in 1990.

Roger Aber, CIH, CSP is a Loss Prevention Manager with the Division of Safety and Hygiene in the Cincinnati Area Service Office. Roger has been with the Division since 1987. During that time Roger has worked as an industrial hygienist, and as an industrial hygiene supervisor. Roger has a Bachelor of Science Degree in Environmental Health from Bowling Green State University, a Bachelor of Science Degree in Industrial Engineering from The Ohio State University, and Masters of Science Degree in Industrial Health from the University of Michigan. Roger is a Certified Industrial Hygienist (CIH), certified by the American Board of Industrial Hygienists (ABIH) in 1992 and a Certified Safety Professional (CSP), certified by the Board of Certified Safety Professionals (BCSP) in 1992.

Jim Scholl is a Field Consultant with the Division of Safety and Hygiene with our Columbus South office. He has been with the Division since 1993. Jim received a Bachelor of Science degree from Bowling Green State University. This was followed by a Master of Business Administration degree from Xavier University. In 1997, the American Board of Industrial Hygiene certified Jim in the Comprehensive Practice of Industrial Hygiene.

Participant Introduction

1. Name?
2. What is your position with the company? How long?
3. What type of product or service does your company provide?
4. How many employees are there in your company?
5. What involvement do you have with industrial ventilation at your facility?
6. Specifically what do you hope to gain by attending this seminar?
7. What are your expectations of this class?
8. Describe an air quality problem you may have had in your facility. What part did ventilation play?

Introduction to Industrial Ventilation

Industrial Ventilation (IV) is the supply and exhaust of air to control airborne contaminants. The theory is to bring clean air into the facility and exhaust bad air from the location where it is generated.

Heating ventilating and air-conditioning (HVAC) can also be called general ventilation. General ventilation is used for comfort or for dilution. For dilution we call it general ventilation or dilution ventilation. For comfort we call it HVAC. HVAC systems provide indoor comfort by:

- A. Heating, cooling/dehumidifying, and filtering air to maintain comfortable temperature and humidity conditions
- B. Circulating air to reduce temperature and humidity stratification and reduce drafts and the feeling of stuffiness.
- C. By introducing a sufficient amount of outside air into a building and exhausting an equal amount of indoor air, thus reducing air contaminants.

Due to conservation of mass, ventilation flow rate into a building must equal the flow rate out of a building.

Ventilation Control in HVAC is a means of diluting and exchanging the air in the occupied space with outside air. ASHRAE Standard 62-1989, Ventilation for Acceptable Indoor Air Quality, specifies both minimum and recommended outside air flow rates to obtain acceptable IAQ for a variety of indoor spaces. Since humans give off carbon dioxide (CO₂) when exhaling, its concentration in the air provides a good indication of the quality of air circulation and how effective the ventilation system is in diluting and removing contaminants from the air. Standard 62-1989 establishes 1000 ppm of CO₂ as the acceptable limit correlation to 15 cfm of outside air per person for occupied spaces. Carbon dioxide sensing is particularly effective when used as a surrogate “indicator” of indoor air quality to determine whether or not the building’s ventilation system is properly removing the indoor air pollutants.

Indoor Air Quality (IAQ) has become a big problem in the last few years. Since the majority of IAQ problems are due to the HVAC system, solving IAQ problems generally requires an understanding of HVAC. For more information on HVAC and IAQ we offer a class on IAQ for the non-industrial environment.

Industrial Ventilation is used to control indoor air quality problems in the industrial setting. The IAQ problem involves controlling particulates, gases and vapors to keep employee exposures at safe levels. It is also used to keep concentration of dust or vapor from exploding or causing fire.

Episodes of poor indoor air quality in the industrial setting abound. What situations have you faced? What part did ventilation play?

Industrial Hygiene

The field of industrial hygiene involves the anticipation, recognition, evaluation and control of workplace problems. Exposures to chemical contaminants, and physical contaminants abound in the workplace. The determination of whether the exposures are excessive is the job of the industrial hygienist. There is a safe level of exposure to almost every contaminant. The industrial hygienist can monitor to determine the extent of exposure. If an overexposure occurs this will be identified by the IH and will probably be supported by health effects that workers are starting to recognize to some extent.

Routes of entry. Chemical exposures in the workplace get into the body by ingestion, absorption, or inhalation. Inhalation is the primary route of entry for most chemicals and so it becomes the main route for evaluation purposes.

There are acceptable exposures to many chemicals. The acceptable exposures can be found in a booklet, which contains Threshold Limit Values (TLV's). These values are established by the American Conference of Governmental Industrial Hygienists (ACGIH). Another control limit would be those enforced by the Occupational Safety and Health Administration (OSHA). These limits are called the Permissible Exposure Limits (PEL's). These values while not as protective as the TLV's, do carry the weight of the law. The TLV's do carry more weight with regard to injuries or illnesses the worker sustains as a result of being overexposed to workplace hazards.

The PEL's and the TLV's are in terms of parts per million (ppm) and milligrams per cubic meter (mg/M^3). They are also exposures for an entire workday. This is called a time-weighted-average exposure. This exposure assumes that the worker works 8 hours and gets a 16-hour break before required to work another 8 hours.

Industrial Hygiene aspects of industrial ventilation

Industrial hygienist's know that if a problem with airborne contaminants is identified, industrial ventilation is just one of many options that need to be considered to reduce employee exposure.

How does an industrial hygienist know? Sampling is performed using pumps, filters, and other instrumentation. We offer a class on this entitled Industrial Hygiene Monitoring. Once the extent of the problem is identified, then control options need to be considered.

There are six types of controls that we will take a look at. These options are considered following a priority order. If changing the process is possible, that is the most desirable option. In order of priority type types of control includes:

- 1) Process change
- 2) Substitution -- <http://clean.rti.org>
- 3) Isolation
- 4) Ventilation
- 5) Administrative controls
- 6) Personal Protection

Note that ventilation, while not the first option, is not the last either. When talking on an exposure problem, start at the top of the list and try to come up with the best exposure control means for the situation that presents itself.

As an example, solve this problem using the priority list from above.

Exercise 1-3 (Burton's manual Chapter 1-3): Suppose a worker is cleaning metal parts by hand with perchloroethylene and a small rag. Sampling suggests overexposure. You are called upon to suggest potential controls. What alternatives can you think of?

Teamwork is required for effective control of industrial hygiene problems.

Teamwork is required for effective control of industrial hygiene problems. To get the best control option the team needs to understand the extent of the problem. They must also know about the physical properties, toxicity, and the behavior of the chemical hazards to be controlled.

Problem Characterization

Emission Source

Air Movement

Worker Interaction

Calculator Exercise

If you will be performing industrial ventilation system design calculations in the future you will want to either have a programmable calculator or a computer program. However, for this class any scientific calculator will work just fine.

The following functions on your scientific calculator will be needed:

Arithmetic's + , - , x , / , ÷ , +/- , 1/x

Log & Ln

(()))

EE

Y^X , X^2 , X^3 , $\sqrt[3]{Y}$, $\sqrt{\quad}$, $\sqrt[3]{\quad}$

Math Review

1) Order of performing calculations:

$$3 \times 2 + (8 \div (9 - (2 - 3))) = 1.9?$$
$$= 6.8?$$

2) $\log 25 =$ $10^{1.4} =$

$$\ln 326 = e^{5.786} =$$

3) STO RCL SUM clear STO

4) $3.2^{8.6} =$

$$16^2 =$$

$$8^3 =$$

$$\sqrt[2]{256} =$$

$$\sqrt[3]{512} =$$

$$\sqrt[5]{8679} =$$

5) $A = B + C$ $TP = SP + VP$ $8 = 6 + 2$

$$A - C = B$$
 $TP - VP = SP$ $8 - 2 = 6$

$$A - B = C$$
 $TP - SP = VP$ $8 - 6 = 2$

$$A \times B = C \quad V \times A = Q \quad 3 \times 4 = 12$$

$$A = C / B \quad V = Q / A \quad 3 = 12 / 4$$

$$B = C / A \quad A = Q / V \quad 4 = 12 / 3$$

6) Area of a circle

$$A = \pi \times D^2/4 \text{ or } \pi \times r^2$$

$$D = 14''$$

$$A = ? \text{ (in square feet)}$$

Area of a rectangle

$$A = a \times b$$

$$a = 8'' ; b = 5''$$

$$A = ? \text{ (in square feet)}$$

Answer Sheet

1) $3 \times 2 + (8 \div (9 - (2 - 3))) = 6.8$

2) $\text{Log } 25 = 1.4$ $10^{1.4} = 25$
 $\ln 326 = 5.8$ $e^{5.786} = 326$

3) STO RCL SUM clear STO

4) $3.2^{8.6} = 22,100$

$$16^2 = 256$$

$$8^3 = 512$$

$$\sqrt[2]{256} = 16$$

$$\sqrt[3]{512} = 8$$

$$\sqrt[5.3]{8679} = 5.535$$

5) $A = B + C$ $TP = SP + VP$ $8 = 6 + 2$

$A - C = B$ $TP - VP = SP$ $8 - 2 = 6$

$A - B = C$ $TP - SP = VP$ $8 - 6 = 2$

$$A \times B = C \qquad V \times A = Q \qquad 3 \times 4 = 12$$

$$A = C / B \qquad V = Q / A \qquad 3 = 12 / 4$$

$$B = C / A \qquad A = Q / V \qquad 4 = 12 / 3$$

6) Area of a circle

$$A = \pi \times D^2/4 \text{ or } \pi \times r^2$$

$$D = 14''$$

A = ? (in square feet)

$$A = \pi \times D^2 / 4 = 3.14 \times (14/12)^2 / 4$$

$$A = 3.14 \times 1.361 / 4 = 1.069 \text{ ft}^2$$

Area of a rectangle

$$A = a \times b$$

$$a = 8'' ; b = 5''$$

A = ? (in square feet)

$$A = a \times b = (8/12) \times (5/12)$$

$$A = 0.667 \times 0.417 = 0.278 \text{ ft}^2$$

Industrial Ventilation Exercises

MEASUREMENT LOCATION:

Option 1- At least 4 duct diameters from hood. If possible, 6 duct diameters is ideal. Pitot traverse normally performed (6 and 10 point traverses are common.)

Option 2 - Take 90% of centerline velocity or .81 of centerline VP.

The first thing you must do is to determine the area of the duct.

A) Area

1) Measure circumference $C = 2 * \pi * r$

Then $A = C * C / 4 * \pi$

2) Area 3" diameter duct $A = \pi * r^2 = \pi * d^2 / 4 = \underline{\hspace{2cm}}$
Area 4" diameter duct $A = \underline{\hspace{2cm}}$

After you have the area you can start to take measurements. Depending on the instrument you have you will be able to take readings in velocity or velocity pressure.

- 1) Velocity: This is easy, just read off the instrument
- 2) Velocity Pressure: This is also read off the instrument. However, it must now be converted to velocity to work with it.

$$\text{Calculate velocity: } V = 4005 * \sqrt{VP}$$

Once you have the area and the velocity, you can calculate how much air is moved by the blower. This is called volumetric flow rate, and is given the term Q.

1) Calculate Volumetric flow rate: $Q = V * A$

With this information we can now begin to take measurements of a duct system in various arrangements and see how the system (ductwork) affects the ability of the blower to do it's job.

Say according to the Industrial Ventilation Manual, we needed 500 cfm to exhaust a process. We must run duct from the process to the blower will the 532 cfm blower be sufficient to do the job?

Let's look at different arrangements and see the effect on the blower.

- | | | |
|----|-----------------------------------|--|
| 1) | Blower with 3' of 3" duct | VP - _____ => _____ fpm => _____ cfm
SP - _____ |
| 2) | 7' of 3" duct | VP - _____ => _____ fpm => _____ cfm
SP - _____ |
| 3) | Add flanged hood to plain opening | VP - _____ => _____ fpm => _____ cfm
SP - _____ |
| 4) | 3" straight duct | What is the capture velocity => _____ fpm |
| 5) | With flange | What is the capture velocity => _____ fpm |
| 6) | Blower with 3' of 4" duct | VP - _____ => _____ fpm => _____ cfm
SP - _____ |
| 7) | 7.5' of 4" duct | VP - _____ => _____ fpm => _____ cfm
SP - _____ |
| 8) | 13' of 4" PVC duct | VP - _____ => _____ fpm => _____ cfm
SP - _____ |

- 9) 4" straight duct What is the capture velocity => _____ fpm
- 10) Down draft table What is the capture velocity => _____ fpm
- 11) 3' of 4" PVC and VP - _____ => _____ fpm => _____ cfm
 10' of 4" flex duct SP - _____
- 12) Bend 4" flex duct VP - _____ => _____ fpm => _____ cfm
 one sharp turn (90°) SP - _____
- 13) Bend 4" flex duct VP - _____ => _____ fpm => _____ cfm
 several times (8-90's) SP - _____
- 14) Suction VS. Push Velocity on suction side => _____ fpm
 Velocity on Push side => _____ fpm



Crossing the bridge to a safer workplace

BWC's Division of Safety & Hygiene Training Center

The Division of Safety & Hygiene wants Ohio workplaces to be safer and healthier by reducing occupational injuries and illnesses. To accomplish this goal, the Training Center emphasizes the importance of applying what you learn in class to your workplace.

Effective July 1, 2003, class participants will have a list of follow-up activities to review as possible steps to take when they return to work. During or at the end of a class, you may choose from among these follow-up activities or customize your own activity as appropriate for your workplace.

When you complete a follow-up activity in your workplace, notify the Training Center. Following notification, a certificate with continuing education credits for the class will be sent to you. You must complete this notification process from your first class in order to be eligible to enroll in a second class.

(Please see details on reverse side.)



Examples of follow-up activities

- Develop or improve a training program on the class topic;
- Organize a new or improve an existing safety team;
- Conduct a safety audit on one or more machines at work;
- Analyze illness/injury trends;
- Find and document hazardous chemicals to add to Hazard Communication program.

Notification process

Provide the following information when notifying the Training Center of your completed activity:

1. Please describe the activity you completed at your workplace as a result of taking the class;
2. Who at your company was involved in this activity;
3. The impact of this activity on your company;
4. What barriers, if any, you encountered;
5. How you would like your certificate sent to you (e-mail, fax, or no certificate needed);
6. Please estimate the amount of time you spent on this activity.

Methods of notifying the Training Center will be provided when you attend the class.

Summary

1. Enroll in one class at a time;
2. Attend class;
3. Select a follow-up activity that is reasonable and manageable at your workplace;
4. Complete the activity;
5. Notify the Training Center;
6. Receive certificate with continuing education credits;
7. Enroll in another class.

Exceptions

- Safety Works for You, Modules 1-7 (See Division Services catalog for course description)
- Safety Works for Kids (See Division Services catalog for course description)
- Students who are unemployed

Industrial Ventilation

Follow-up Activities

- Analyzed the ventilation system in the workplace and offered suggestions for low-cost modifications.
- Incorporated this knowledge into a monitoring interval for the operation of such equipment.
- Explained to the staff, the operation of the equipment to include limitations and safeguards.

Activity Plan

	Activity	Other people involved	Target Deadline
☐			
☐			
☐			
☐			
☐			
☐			
☐			
☐			

Notification of Completed Activity

Your name (please print) _____ Locator number of class _____ Date of class _____

PIN* _____ Class title _____ Location of class _____

* PIN: First letter of your last name, four digits representing your day & month of birth, the last four digits of your SSN. Example: G03059784

1. Please describe the activity you completed at your workplace as a result of taking the class.

1a. What category fits your activity most accurately? Check more than one, if it applies.

- Personal protective equipment
- Policies, procedures
- Management directive
- Training
- Housekeeping
- Inspections/audits/assessments
- Tools & equipment
- Recordkeeping
- Written program
- Injury/illness trends
- Safety team
- Safety culture
- Other _____

2. Who at your company was involved in this activity?

3. What impact did this activity have on your company?

4. What barriers, if any, did you encounter?

5. How would you like your certificate to be sent to you?

- E-mail (If so, please print on line below.) _____
- Fax (If so, please list on line below.) _____
- No thanks. I don't need one.

6. Please estimate the amount of time you spent on this activity.

- Less than 1 hour
- 1-3 hours
- 3-5 hours
- Over 5 hours

See reverse side for methods of notifying the Training Center of your completed activity.

Methods of notifying the Training Center of your completed activity

Internet: www.ohiobwc.com
Safety Services
Training Services

Training Center, scroll down to:
Reporting follow-up activity
Notification form

You can enter your information directly on the electronic Notification form.

E-mail: safety@bwc.state.oh.us

Fax: 614-365-4974

Call: 1-800-OHIOBWC (1-800-644-6292), follow the prompts for employer services, then safety services.

Mail: Ohio BWC Division of Safety & Hygiene Training Center
Attention: Contact Center
13430 Yarmouth Drive
Pickerington OH 43147

Statement of Attendance

(Student name)_____ attended the

(Class title)_____ class on

(Date)_____ at (Location) _____.

Instructor's signature

Note to student:

Please enter the class information above prior to asking the instructor to sign it.

After you notify the Training Center of your completed follow-up activity, a certificate with continuing education credits will be sent to you.

Training Center New Direction Student Questions & Answers

- Question: Several of us from our company attended this class. May we work on one follow-up activity together back at our workplace?
Answer: Yes, but each person needs to individually notify the Training Center of the completed activity.
- Question: If I am not sure what activity I will do back at the workplace, what should I write on the sign-in sheet?
Answer: Please write your most likely activity. It is OK to change your mind or modify the activity when you return to the workplace.
- Question: Do I have to do an activity on the list?
Answer: No, you can customize an activity that will benefit your workplace.
- Question: May I enroll in a second class if the follow-up activity from the first class is not complete?
Answer: Sorry, no.
- Question: Why are you restricting us to enrollment in one class at a time?
Answer: The DSH mission is to prevent injuries & illnesses. DSH is willing to invest resources in those students who contribute to that mission by improving the workplace through meaningful activities.
- Question: When I am limited to enrollment in one class at a time, how can I plan out my year of classes? Won't all the classes be full?
Answer: Plan out your classes with at least 4-6 weeks between them, pencil them on your calendar. Promptly after completing a class, begin your follow-up activity back at the workplace. When you notify the Training Center of your completed activity, send in your registration for your next class. Starting July 1, everyone will be "in the same boat;" that is, no one can sign up for more than one class at a time.
- Question: Do web-based classes have follow-up activities?
Answer: Yes, but you may enroll in a web-based class and a regular class simultaneously.
- Question: Can I be on a wait list for one class and be enrolled in another class?
Answer: No, you will have to choose whether to be on a wait list or to be enrolled in another class.
- Question: Is "one class at a time" by individual or by company?
Answer: By individual.

Question: Some activities may take longer than others, so it may take months to complete an activity.

Answer: Here's a suggestion: break down the activity into smaller, but nonetheless significant, steps. Report to the Training Center the first completed step.

Question: What about PDP companies? All PDP requires them to do is attend a class to meet their Step 6 requirement.

Answer: For Step 6 credit, BWC will accept the "Statement of Attendance" signed by your instructor.

Question: What is the fastest method to report my completed activity and get my updated status, so I may enroll in a future class?

Answer: All methods of reporting will take 1-2 days for updating your status, but you may send in your registration form for the future class along with your notification form. Within two weeks, you should receive a confirmation notice of your enrollment in the future class.

Question: Why do I have to write the intended follow-up activity on the sign-in sheet?

Answer: What you have written on the sign-in sheet will be reviewed by BWC staff members who are responsible for assuring high-quality classes.

Question: What is the purpose behind the new direction?

Answer: It is a way of measuring the effectiveness of the Training Center in reducing occupational injuries and illnesses.

Resources Available from the Division of Safety & Hygiene (DSH) Libraries

(800) 644-6292 (614) 466-7388

library@bwc.state.oh.us

www.ohiobwc.com

Safety training:

- Safety talks, outlines and scripts - DSH Safety leader's discussion guide, Training Center's One-hour safety presentations, reference books, web resources
- Videos – hundreds of safety and health topics
- Books and articles on training techniques

Machine and equipment safety:

- Safety standards (ANSI, NFPA, CGA)
- Books and articles on power presses, material handling equipment, lockout/tagout, etc.

Sample written programs:

- DSH program profiles and sample written programs
- Reference books
- Internet resources

Illness and injury statistics:

- Statistics from the U.S. Bureau of Labor Statistics
- National Safety Council's *Injury Facts*
- National Institute of Occupational Safety & Health (NIOSH) studies

Hazard communication and chemical safety:

- Chemical safety information
- Material safety data sheets (MSDSs)
- Sample written programs
- Videos
- Internet resources

Safety standards

- American National Standards Institute (ANSI) standards (including standards for construction, machinery and equipment, personal protective equipment)
- National Fire Protection Association (NFPA) fire codes (including the Life Safety Code and the National Electrical Code)
- Compressed Gas Association (CGA) standards

Other topics of interest (books, articles, magazines, videos and standards):

- Confined spaces
- Electrical safety
- Job safety analysis
- New employee orientation
- Powered industrial trucks
- Respiratory protection
- Scaffolds
- Spill response

Directories and lists of vendors of safety equipment

Occupational Safety & Health Administration (OSHA) regulations

Manual of Uniform Traffic Control Devices (MUTCD)

Recommendations of useful Internet sites

BWC publications

Saving You Time and Research

Requests for copies of OSHA standards, information on starting a safety committee, a video on accident investigation techniques -- these are some of the thousands of inquiries BWC's Division of Safety & Hygiene (DSH) libraries receive each year.

DSH has two libraries to serve you:

- The central library in the William Green Building in downtown Columbus;
- The resource center and video library located at the Ohio Center for Occupational Safety and Health (OCOSH) in Pickerington.

Both libraries are open 8 a.m. to 4:45 p.m., Monday through Friday. Your need for information does not require a visit to the library. You can phone, fax, or e-mail your requests and receive a quick response.

The central library provides free information services on the topics of occupational safety and health, workers' compensation and rehabilitation.

The OCOSH resource center provides similar services for those who visit OCOSH for meetings and training center classes.

Students from the DSH training center can use the services and collections of the libraries to assist with the completion of their course **follow-up activities**. The librarians have recommended a variety of resources for the follow-up activities and are available to answer questions and provide assistance.

The video library offers an extensive collection of videotapes to supplement your organization's safety and health training program. It is a convenient and popular source for Ohio employers to borrow quality occupational safety- and health-related training aids.

Visit our Web site at **www.ohiobwc.com**.

Central library
30 W. Spring St., Third Floor
Columbus OH 43215-2256
1-800-OHIOBWC
(614) 466-7388
(614) 644-9634 (fax)
library@bwc.state.oh.us

OCOSH resource center
13430 Yarmouth Drive
Pickerington OH 43147
1-800-OHIOBWC
Resource center (614) 728-6464
Video library (614) 644-0018