EPA/450/2-81/017i

U.S. Environmental Protection Agency

Air Pollution Training Institute

COURSE SI:422

3rd Edition

AIR POLLUTION CONTROL ORIENTATION COURSE

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Unit 9

Air Quality Management

EPA/450/2-81/017i

United States
Environmental Protection
Agency

Air Pollution Training Institute
MD 20
Environmental Research Center
Research Triangle Park NC 27711

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Air Pollution Control Orientation Course

Unit 9
Air Quality Management

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Office of Air, Noise, and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, NC 27711

This is one of nine self-instructional units in the Air Pollution Control Orientation Course SI:422.

This unit consists of a cassette tape and this flip-book, which you will use simultaneously.

Turn the page and read the tips on effective use of this material.

Tips for Effective Use of This Material

1. Listen to the recorded script while you go through this flipbook. The recorded portion is coordinated with the flipbook. Wait for the tape to finish the details of one point before studying the next point on the page.
2. When you hear a "beep" on the tape, direct your attention to the next page in the flipbook.
3. Pay attention to both words and pictures—they both convey important information. The flipbook will usually summarize main points or give examples.
4. Stop the tape at any point if you wish to spend more time reading a page in the flipbook. Rewind the tape if you wish to review a portion of the script.
5. Review the lesson objectives before answering the questions at the end of each lesson. Ask yourself whether you have mastered the information indicated in the objectives.
6. Answer the questions. They will help you assess your progress in mastering the course materials.
7. Check your answers. The correct responses can be found on the page(s) following the question page(s).
8. If you answer a question incorrectly, review the flipbook material covering the subject matter. **Now Turn On the Tape Recorder and Begin Lesson I.**

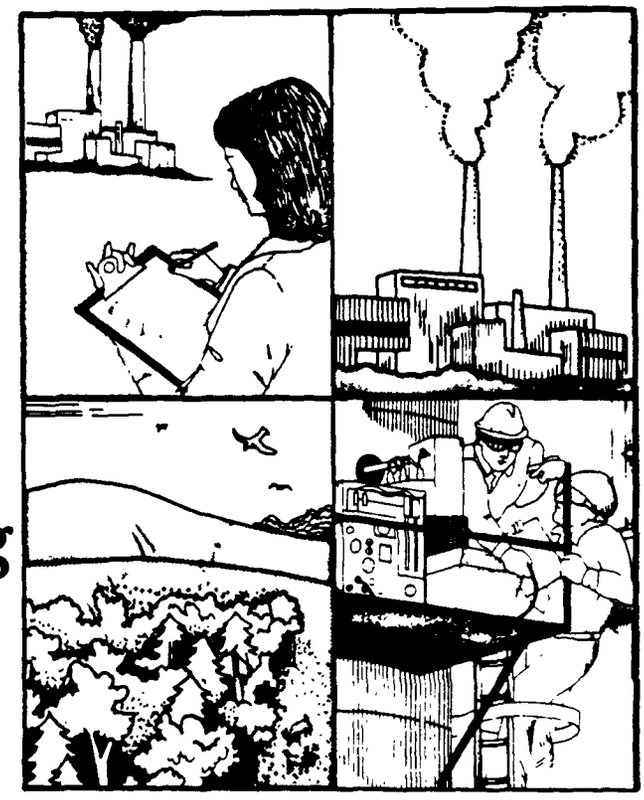
Lesson I: Introduction to Air Quality Management

Objectives

1. Define "air quality management" in general terms.
2. Name and describe the two most common approaches to air quality management.
3. Name and describe the three types of standards applied in air pollution control and state whether primary responsibility for their enforcement belongs to federal or State government.

Air Quality Management

All activities directed toward **making** our air clean—and **keeping** it that way



Air Pollution Control "Air Quality Management" Approach

- preparing criteria documents and establishing ambient air quality standards
- establishing emission limitations for specific pollutant sources
- setting up and operating enforcement systems

Air Pollution Control "Best Available Technology" Approach

- source owner or operator must use the best control techniques available for the control of emissions of pollutants

Types of Standards In the National Program

- National Ambient Air Quality Standards
- New Source Performance Standards
- National Emission Standards for Hazardous Air Pollutants

NAAQS National Ambient Air Quality Standards

- specify maximum pollutant levels allowed in the air surrounding a city, community or region
- set to protect public from adverse effects of pollutants on public health and welfare

NSPS New Source Performance Standards

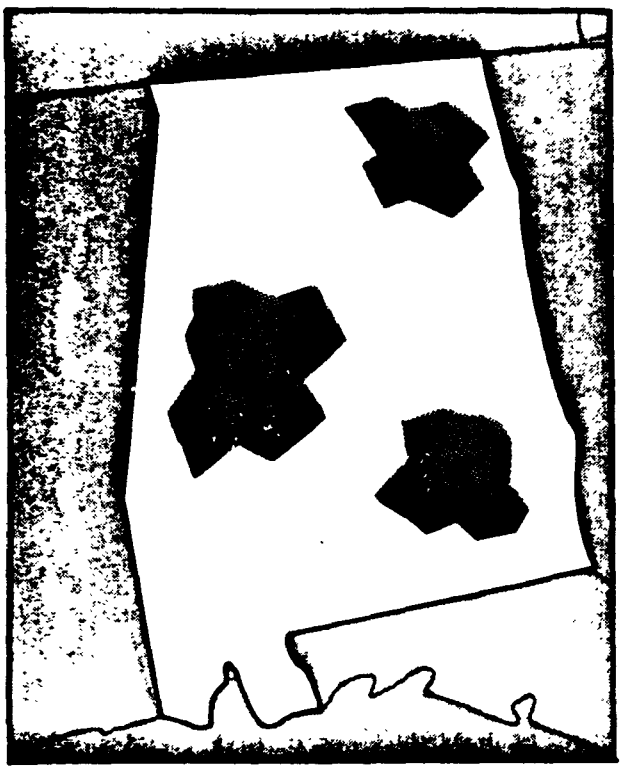
- reflect the degree of emission limitation that can be achieved by using the best available technological system of continuous emission reductions
- cost and other factors taken into account

NESHAPS National Emission Standards for Hazardous Air Pollutants

- set to control pollutants for which no NAAQS have been set, and which may reasonably be expected to cause or contribute to an increase in deaths, serious irreversible illness, or incapacitating reversible illness

Primary Enforcer	Types of Air Quality Standards That Programs are Designed to Achieve
State	NAAQS National Ambient Air Quality Standards
Federal	NSPS New Source Performance Standards
Federal	NESHAPs National Emission Standards for Hazardous Air Pollutants

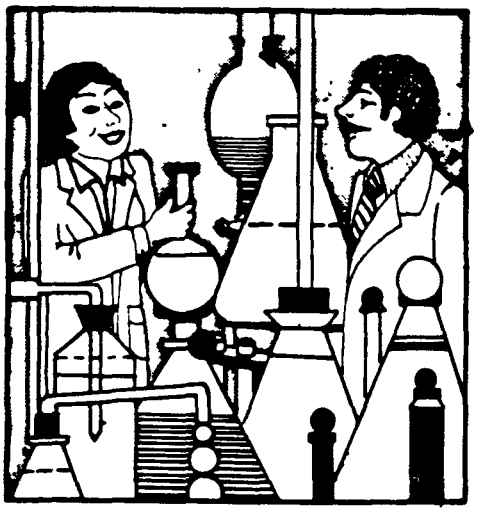
State responsibilities can be delegated to counties, municipalities, or regional groups.

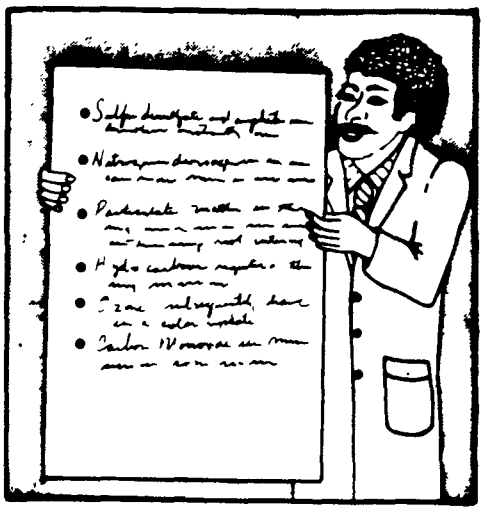


- When a State government has responsibility for a control function or program, it may delegate authority to local governmental bodies; however, the State is still ultimately responsible for the control functions.
- Federal authority can be delegated to State and local agencies.

NAAQS National Ambient Air Quality Standards

The Clean Air Act requires EPA to collect and analyze data on effects of pollutants.





Criteria Pollutants

- If a pollutant is detrimental to public health or welfare, and arises from many diverse sources, that pollutant is classified as a criteria pollutant.
- Criteria must be published and standards set for these pollutants.

Documents

- Air quality criteria documents contain information on the effects of air pollutants on health and welfare.
- Control technique documents describe the "state of the art" for controlling emissions.

Use of Documents

- Air quality criteria documents are used to derive National Ambient Air Quality Standards.

- Control technique documents are used by states in development of emission control regulations for State Implementation Plans.

Criteria Pollutants

- Sulfur Oxides
- Nitrogen Oxides
- Particulate Matter
- Hydrocarbons
- Ozone
- Carbon Monoxide
- Lead

This list is revised or updated as necessary.

Types of NAAQS

Primary

- set to protect public health

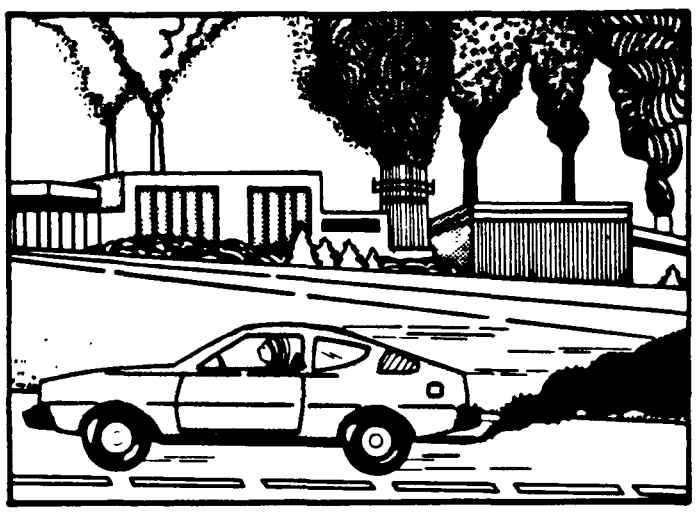
Secondary

- set to protect public welfare

State Implementation Plans

Since **direct** control of pollutants in the ambient air is not possible...

Strategies must be developed for controlling emissions from pollutant sources.



NAAQS

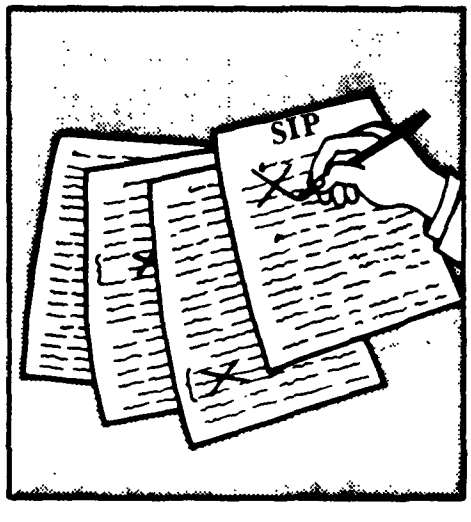
Whenever a new National Ambient Air Quality Standard is adopted, each state

- has 9 months to adopt and submit a SIP
- must provide for implementation, maintenance, and enforcement of the standard
- must provide for the review of new sources

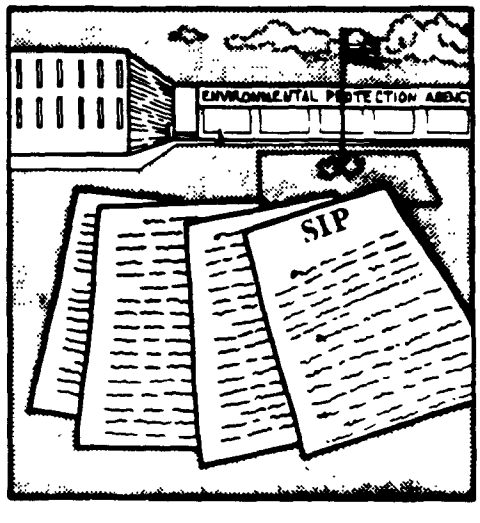
NAAQS

If a state fails to produce all or part of an implementation plan

or the EPA Administrator disapproves all or part of a submitted plan

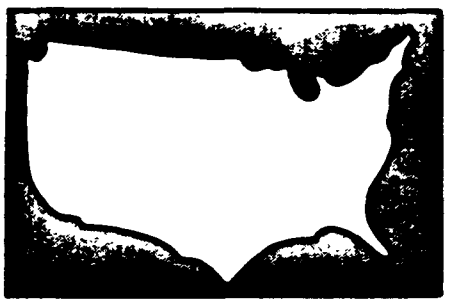


Then EPA has six months to supply the necessary parts or to develop an implementation plan for the state.

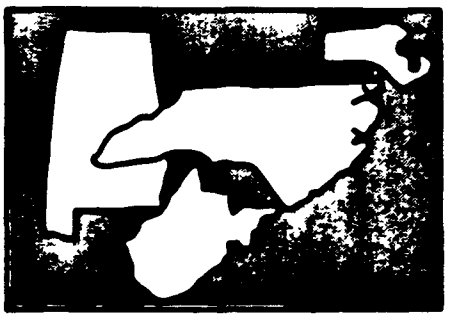


New Source Performance Standards

- Performance standards for certain **categories** of large new stationary sources of pollutants



Federal New Source Performance Standards apply uniformly nationwide. . .



but states may use their own standards if they are at least as stringent as the EPA standards.

NSPS

NSPS also apply to modification of sources if the modified source will emit more of a pollutant or emit a pollutant that was not previously emitted.

NSPS

- apply to sources which contribute significantly to air pollution which causes or contributes to the endangerment of public health or welfare
- state the degree of emission limitations that can be achieved through the application of the best technological system for continuously reducing emissions—taking into account cost and other environmental, health, and energy impacts.

NSPS

While states must review and approve construction plans for proposed new facilities, **EPA** is authorized to review construction plans only upon request from the source owner or operator.

NSPS

If emissions from a proposed new facility will violate emission standards or interfere with the attainment or maintenance of National Ambient Air Quality Standards or cause significant deterioration of existing air quality, the state should deny the new facility a permit to construct.

NSPS

Additions or Changes

- appear in Federal Register
  - first, as proposals for public comment
  - later, as EPA legal declarations
- included in Code of Federal Regulations,
  - Title 40, Part 60

NSPS

Enforcement Responsibility

Primary responsibility for ensuring compliance rests with EPA (which may delegate this authority to State or local agencies—see SI:422 Enforcement Systems).

NSPS

Owner or Operator must:

1. notify EPA within 30 days after beginning construction or modification,
2. notify EPA 30 to 60 days before the anticipated start-up of operations,
3. notify EPA of the actual start-up date within 15 days after starting,
4. conduct performance tests according to methods approved by EPA within 6 months of the start-up date,
5. notify EPA of the test date at least 30 days in advance so that an EPA observer can be present, and must demonstrate to EPA that the facility operates in compliance with Federal emission standards,
6. provide some of the performance test facilities, such as sampling ports, platforms, and other structures,
7. permit EPA officials to conduct tests at any reasonable time, and
8. conduct continuous emission monitoring on certain source types.

NSPS

- State must review construction plans for any new facility subject to emission performance standards. This includes all sources subject to NSPS, and usually other sources as well.
- State must assess potential interference with the attainment and maintenance of NAAQS or other air pollution control requirements.
- State must deny permit to construct if proposed source would violate any requirements.

NESHAPS National Emission Standards for Hazardous Air Pollutants

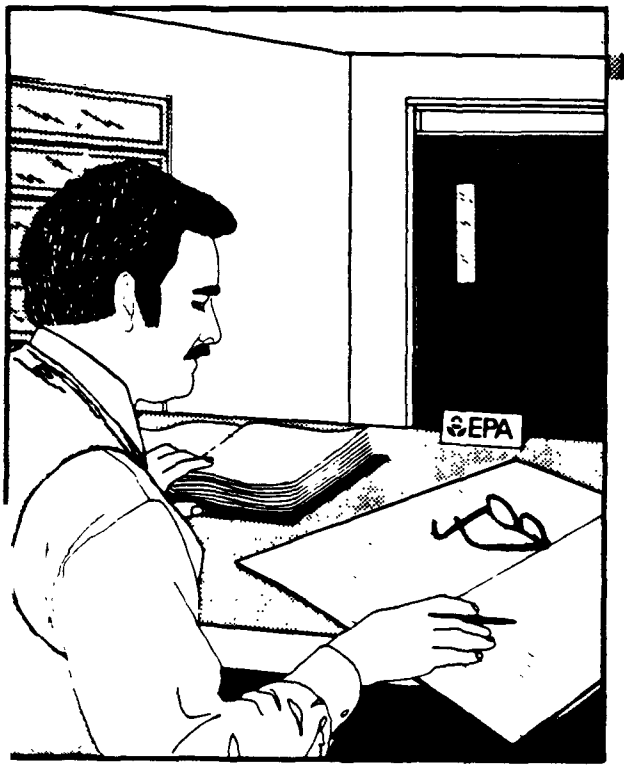
- set for air pollutants for which no NAAQS have been set and which may reasonably be anticipated to cause or contribute to an increase in deaths, serious irreversible illness, or incapacitating reversible illness

NESHAPS

Hazardous Pollutants

- Asbestos
- Benzene
- Beryllium
- Mercury
- Vinyl Chloride

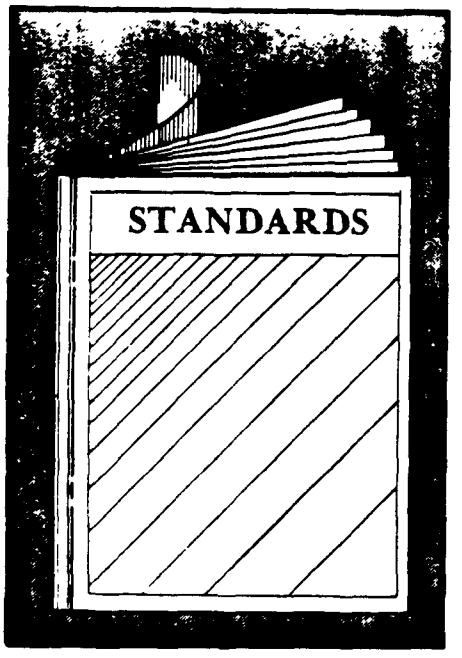
Newly designated hazardous pollutants will be listed in the Federal Register and become part of the Code of Federal Regulations.



NESHAPS

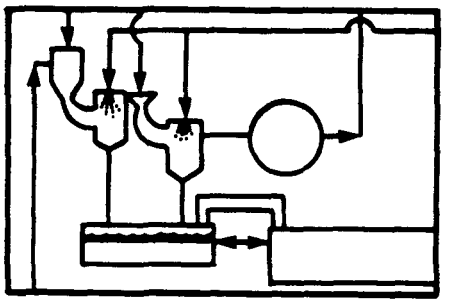
The EPA Administrator must propose nationwide emission limitations for both new and existing sources that emit hazardous pollutants.

NESHAPS

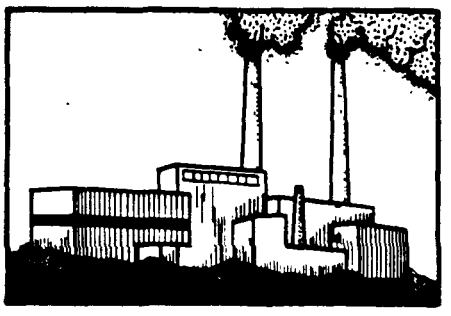


EPA must publish the standards after public hearings, unless information presented at the hearings shows that the pollutant is not really hazardous.

NESHAPS

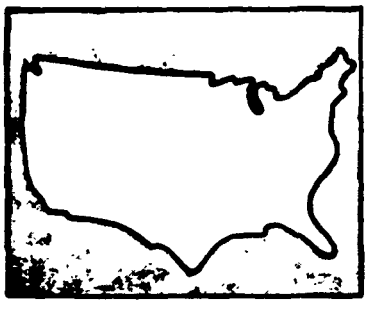


Owner or operator must obtain EPA approval before construction or modification begins.

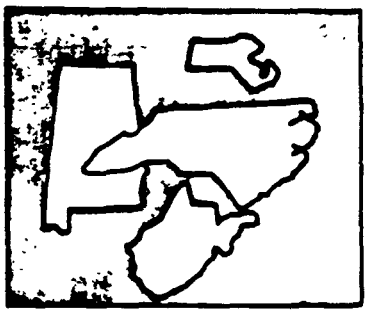


Existing sources must comply with NESHAPS within 90 days after a standard is set, unless they obtain a waiver from EPA.

NESHAPS



Ensuring attainment of NESHAPS is the responsibility of the federal government.



Authority has been delegated to some state or local agencies—but the federal government still has primary responsibility, should the state or local agency fail to require compliance.

EPA may promulgate a standard regulating design, equipment, work practices, or operations if it is not feasible to specify numerical emission limits.

If a State's air pollution control requirements are not as strict as the Clean Air Act requires, then EPA's standards preempt the State's standards.

Lesson I
Questions

1. Give the term generally used to refer to all activities used to make our air clean and keep it that way.
2. Which of the following are common approaches to air quality management?
   a. national pollution control approach
   b. PQSAD approach
   c. best available control technology approach
   d. air quality management approach
   e. SLAM approach
   f. air and water maintenance approach

3. Match each type of standard listed on the left with its description.

i. National Ambient Air Quality Standards	a. reflect the degree of emission limitation that can be achieved by using the best available technological system of continuous emissions reduction—taking cost and other factors into account
ii. National Emissions Standards for Hazardous Air Pollutants	b. specify the maximum pollutant levels which are allowed in the air surrounding a city, community, or

(ii continued)

region—set to protect the public from the adverse effects of air pollutants

iii. New Source Performance Standards

c. set to control pollutants for which no other standards have been set, and which may reasonably be expected to cause an increase in deaths, serious irreversible illness, and incapacitating reversible illness

Answers on the next page.

Lesson I
Answers

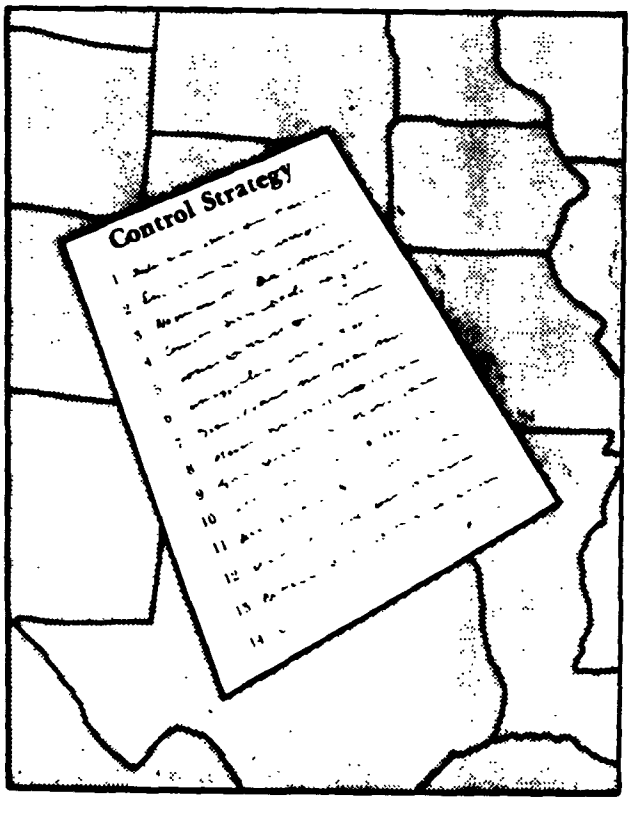
1. air quality management
2. c,d. BACT approach and AQM approach
3. i. b
   ii. c
   iii. a

After checking your responses, please turn on the tape recorder.

Lesson II: Air Pollution Control Strategies

Objectives

1. Describe what is meant by the term "air pollution control strategy".
2. List in sequence the ten steps in control strategy development and describe each step.



Control Strategy

A list of actions which must be carried out in order to control air pollution

Objectives of Control Strategies

- To attain and maintain NAAQS
- To prevent significant deterioration of air quality

Development of Control Strategies

Ten basic steps:

1. measurement of present ambient air quality and estimation of future ambient air quality,
2. estimation of emission levels of existing stationary and mobile sources and projection of future emission levels,
3. determination of the degree of improvement needed to meet standards,
4. adoption of emission control regulations for various source categories,
5. development of emergency air pollution episode contingency plans,
6. negotiation to establish a legally enforceable compliance plan for air pollution emergency episodes,
7. development of plans for long-term maintenance of air quality,
8. development of plans to prevent the significant deterioration of air quality,
9. implementation of air quality monitoring, and
10. initiation of enforcement action against violators of emission standards.

Step 1

Measurement of present ambient air quality; estimation of future ambient air quality

- measurement of present air quality is obtained by ambient air monitoring
- estimation of future air quality is based upon projections of growth in population, industry, transportation, and the economy and upon results of dispersion modeling

Step 2

Estimation of emission levels for existing sources; projection of future emission levels

- estimations and projections based upon emission inventories
- two types of stationary sources
  - point source—one concentrated source
  - area source—large number of small, diffuse sources

Step 3

Determination of the degree of improvement needed to meet Federal standards

- accomplished by comparing existing and projected air quality
- reduction needed usually estimated by using modeling techniques

Step 4

Adoption of emission control regulations for various source categories

- takes into account control technology currently available
- establishment of registration/permit systems

Step 5

Development of an emergency air pollution episode contingency plan

- air pollution episode—adverse meteorological conditions cause the concentration of pollutants in the atmosphere to approach or exceed a level that would endanger human health

Step 6

Negotiation to establish legally enforceable compliance schedules for air pollution episodes

- applies to all source categories affected by emission control regulations and air pollution episode contingency plan requirements
- local agencies negotiate with local source owners or operators

Step 7

Development of plans for long-term maintenance of air quality after attainment of NAAQS.

includes

- projection of population growth
- projection of industrial growth
- calculation of expected emissions
- development of ways to allocate authorized emissions for expected needs
- development of ways to remain in compliance with air quality standards

Step 8

Development of a plan to prevent significant deterioration of air quality

- concerned with the prevention of significant deterioration in areas where the air is already purer than required by NAAQS
- high-priority areas where population and industrial development are either non-existant or minimal and dispersed

Step 9

Implementation of air quality monitoring

- an air quality management feedback step
- continued surveillance of air quality and emissions
  - —used to determine whether sources are complying with standards
  - —used to determine whether the control strategies are appropriate for improving and maintaining air quality

Step 10

Initiation of enforcement action against violators of emission standards

- violation notices
- court injunctions
- permit revocations
- administrative orders

- Adoption of an effective control strategy is necessary to achieve NAAQS
- Type of control strategy helps determine the laws, regulations, manpower, and organizational structure required

Air quality management is a feedback process. Information from one part of the system is used in another part of the system.

Lesson II
Questions

1. Briefly describe what is meant by the term "air pollution control strategy".

2. List in sequence the ten steps in control strategy development.

Answers on the next page.

Lesson II
Answers

1. An air pollution control strategy is a list of actions which must be carried out in order to control air pollution in a specific area.

2.
   1. measurement of present ambient air quality and estimation of future ambient air quality
   2. estimation of emission levels of existing stationary and mobile sources and projection of future emission levels
   3. determination of the degree of improvement needed to meet standards
   4. adoption of emission control regulations for various source categories

5. development of emergency air pollution episode contingency plans
6. negotiation to establish a legally enforceable compliance plan for air pollution emergency episodes
7. development of plans for long-term maintenance of air quality
8. development of plans to prevent the significant deterioration of air quality
9. implementation of air quality monitoring
10. initiation of enforcement action against violators of emission standards

After checking your responses, please turn on the tape recorder.

Lesson III: Implementation Plans and Control Regulations

Objectives

1. Define "State Implementation Plan".
2. List and describe eight types of authority that a State must have in order for EPA to accept its State Implementation Plan.
3. Describe Federal treatment of disapproved implementation plans.
4. Name the five basic types of source regulations often found in State Implementation Plans.

SIP State Implementation Plan

- legal document, formally adopted, committing state to carry out its air pollution control strategy
- includes control regulations that are both specific and enforceable

State Implementation Plans

1970 — each state required to submit an SIP by early 1972

1972 — all SIPs were disapproved to the extent that they did not contain adequate provisions for prevention of significant deterioration of air quality

1973 — all states had submitted some sort of plan. Twenty state plans approved. Defective parts of others replaced by regulations issued by EPA.

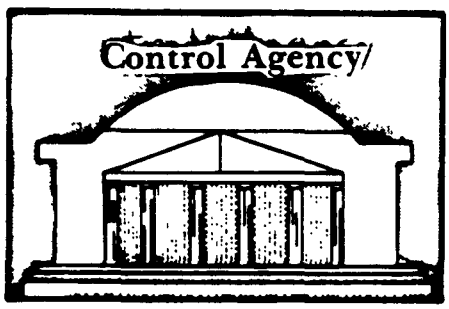
1975 — parts of all SIPs were disapproved because of their lack of adequate provisions for long term air quality maintenance

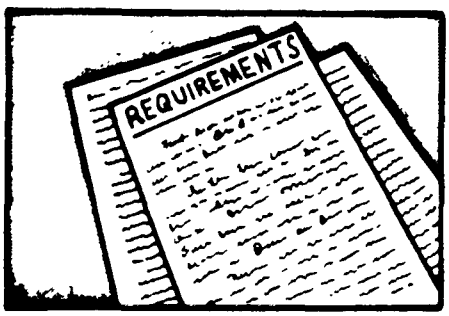
1977 — specific updates and revisions required by amendment to the Clean Air Act; to have been completed by January 1, 1979

State implementation plans must give the state air pollution control agency authority to

1. Adopt and amend emission control regulations and other control measures needed.
2. Enforce applicable laws, regulations, and standards—including those which provide for operation of a construction permit program with a fee system, and those which authorize abatement actions on an emergency basis.
3. Prevent construction, modification, or operation of sources which would violate air quality standards.
4. Require sources to keep records, and make inspections and tests to assess compliance with emission standards.
5. Require sources to install and use monitoring devices and report on emissions.
6. Make pollutant emission data available to the public.
7. Prevent significant deterioration of air quality.
8. Operate a motor vehicle emission inspection/maintenance program in areas where such is required.

Authority to Adopt Emission Control Regulations



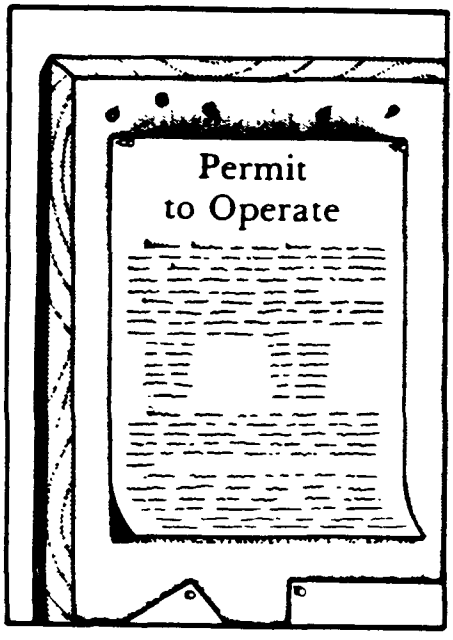


- varies from state to state
- varies in terms of which agencies or persons hold authority, and degree of detail in requirements

Authority to enforce applicable laws, regulations, and standards and to require implementation of episode control plans

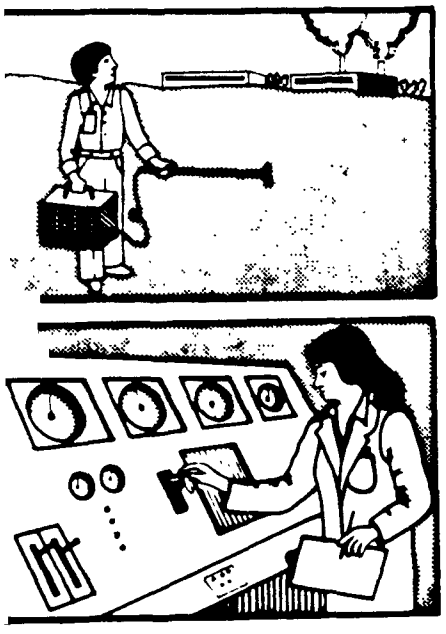
- includes authority to seek injunctive relief from the courts if a source refuses to comply

Authority to prevent construction, modification, or operation of stationary sources which would cause violation of air quality standards



- defines the need for a permit or registration system
- provides authority to obtain information to evaluate potential threat to air quality
- may include authority to set operating permit requirements for existing sources

Authority to gather information about sources to assess compliance with emission standards, laws, and regulations



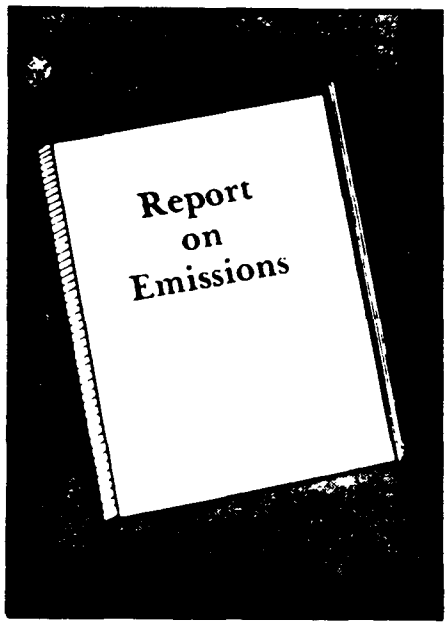
- includes authority to require recordkeeping by sources, make inspections, and conduct source tests

Authority to require sources to install pollutant monitoring devices and to report the data to the control agency

Examples of monitoring devices are
- opacity monitor
- continuous sulfur dioxide monitor

Authority to operate a motor vehicle inspection/maintenance program
- must determine whether emission controls are installed and working properly
- must require correction of malfunctioning control devices

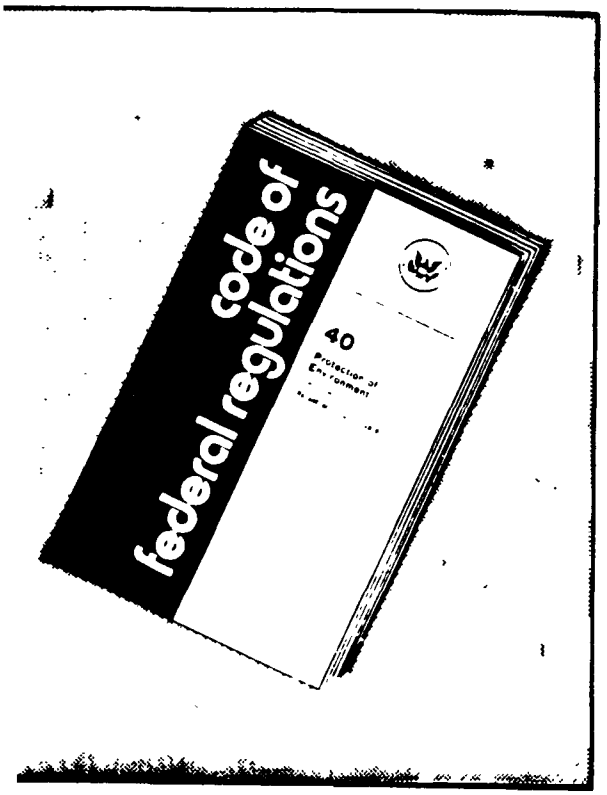
Authority to make emissions data available to the public.



- Control agency may make data available in periodic reports or in response to the request of an individual or group.

Authority to prevent significant deterioration of air quality which is cleaner than required by the NAAQS

- regulations for classification of PSD area
- provisions for review of "new" sources
- regulations/permits requiring BACT
- system for tracking use of PSD increments



Code of Federal Regulations

Title 40—Part 51

- lists requirements for SIPs

Title 40—Part 52

- lists current SIPs and EPA additions and changes in the plans
- sets out basis for EPA disapproval of SIPs without PSD provisions
- outlines necessary requirements for PSD

Handling of Disapproved Portions of SIPs

- **nonregulatory portions**—EPA provides detailed legal and technical evaluation, but *no substitute provisions*

- **regulatory portions**—EPA issues regulations to replace or fill-in deficient portions

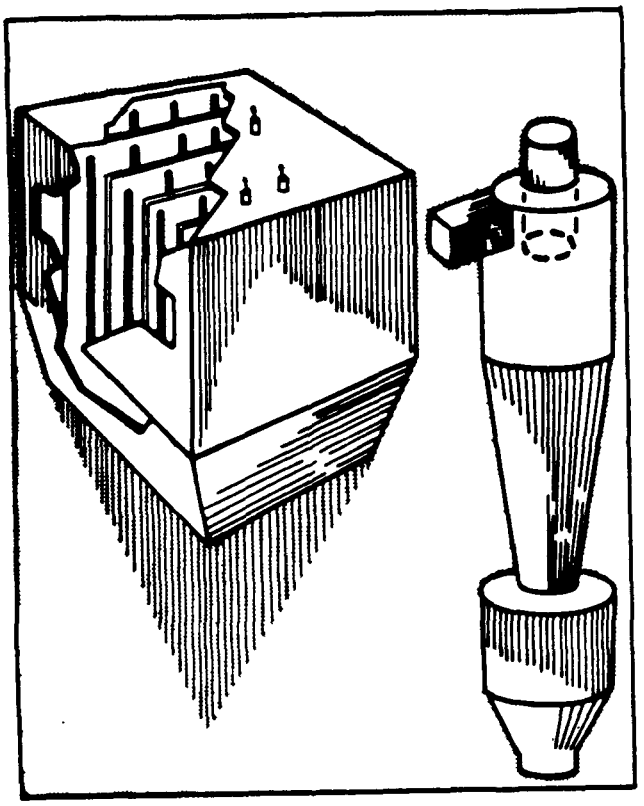
General State Emission Regulation Philosophies

- **air quality management approach** — adopts regulations to attain and maintain air quality standards at a certain level

- **best available control techniques approach** — adopts regulations to require all sources to use the best available control techniques to reduce emissions

Clean Air Act

- requires all states to provide for attainment and maintenance of NAAQS, PSD, and reasonable progress toward attainment in nonattainment areas



States may differ in the stringency of control regulations.

Five Basic Types of Source Regulations

- regulations setting maximum allowable emissions
- operating equipment and control device design regulations
- regulations prohibiting use of certain types of equipment
- regulations banning certain operations
- regulations specifying permissible and non-permissible fuels

Source Regulations

Regulations Setting Maximum Allowable Emission

- some based on the quantity of pollutant emitted (some in relation to the total amount of energy or materials fed into or passing through the process)
- others based on limiting visible emissions in the exhaust plume to a certain degree of opacity

Source Regulations

Operating or Control Equipment Design Regulations

- specify features relating to design use of specified kinds of operating or emission control equipment.

Regulations Prohibiting Use of Certain Types of Equipment

- apply to specified kinds of equipment such as single chamber incinerators and teepee burners

Regulations Banning Certain Operations

- apply to operations such as:
  - open burning in a residential area
  - disposal of solvents by evaporation
  - air-blowing of asphalt without emission control

Source Regulations

Regulations Specifying Permissible and Non-permissible Fuels

- most are intended to limit the sulfur, ash, or volatile material content of fuels

SIPs

- the legal expression of a State air pollution control program
- contain the State's regulations that are specific and enforceable and other material
- Clean Air Act and Federal regulations require States to have specific air pollution control authorities. These are incorporated into the SIP.

Lesson III
Questions

1. Describe what is meant by the term "State Implementation Plan".
2. List eight types of authority that a state must have in order for EPA to accept its State Implementation Plan.
3. Describe what happens when a State Implementation Plan is disapproved.
4. Name the five basic types of source regulations often found in State Implementation Plans.

Answers are on the next page.

Lesson III
Answers

1. A State Implementation Plan is a legal document, formally adopted, committing a State to carry out its air pollution control strategy.
2. Authority to:
   1. adopt emission control regulations.
   2. enforce applicable laws, regulations, standards, and air pollution episode control plans.
   3. prevent construction, modification, or operation of sources violating air quality standards.
   4. monitor sources to assess compliance with emission standards.
   5. require sources to install monitoring devices and report on emissions.

6. make available to the public criteria pollutant data.
7. maintain air quality that meets NAAQS.
8. prevent significant deterioration of air quality.

3. For nonregulatory portions, EPA provides a detailed legal and technical evaluation but no substitute provisions. For regulatory portions, EPA issues regulations to replace or fill-in deficient portions of the plan.
4. 1. emission regulations setting maximum allowable emissions
   2. operating equipment and control device design regulations
   3. regulations prohibiting use of certain types of equipment
   4. regulations banning certain operations
   5. regulations specifying permissible and non-permissible fuels

After checking your responses, please turn on the tape recorder.

Lesson IV: Enforcement of Regulations

Objectives

1. Describe the legal basis for State air pollution control agency enforcement authority.
2. Identify examples of the types of power given to State air pollution control agencies by the legislature.
3. List and describe the basic steps in the enforcement of air quality regulations.
4. List five alternative procedures for dealing with violations of air quality regulations.

State Air Pollution Control Agency Powers

- special powers usually spelled out in an "enabling" act passed by state legislature
- usually consist of powers
  - to adopt emission control regulations
  - to be exercised in day-to-day situations
  - to be exercised during an air pollution episode

Day-to-day Powers

Authority to:

- inspect facilities
- conduct source tests
- require plant owners or operators to submit emission information
- prohibit evasion of regulations
- issue citations
- stop motor vehicles that are operating with excessive visible emissions

Powers During Air Pollution Episodes

Authority or right to:

- adopt emergency emission standards stricter than those normally in effect
- require sources to submit plans for curtailment or shutdown of emissions
- prepare regulations restricting community activities
- establish emergency communication systems between the agency, selected industries, and the public

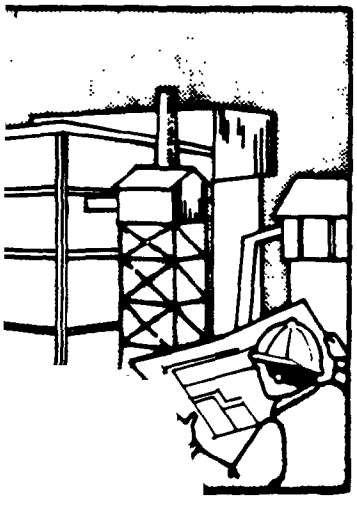
Enforcement of Air Quality Standards

- scheduled inspection of new and existing sources
- patrolling in the field to detect permit evasion or violation
- source emission tests and continuous emission monitoring
- negotiation of compliance schedules
- initiation of legal action
- follow-up inspection to check compliance

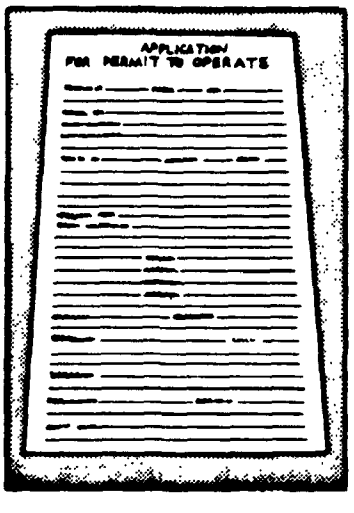
Field inspections scheduled for

- new sources under permit systems
- existing sources under permit or registration systems
- other significant sources

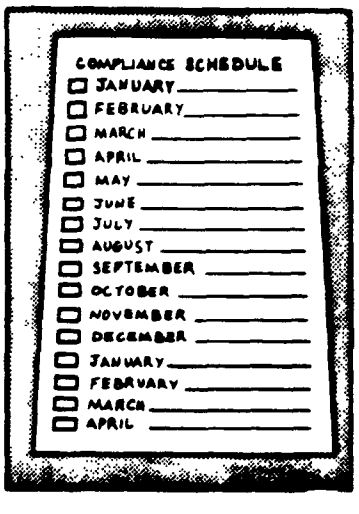
Some sources are inspected more often than others...



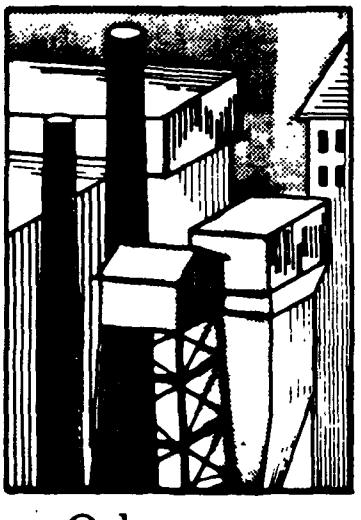
Sources being built under construction permits



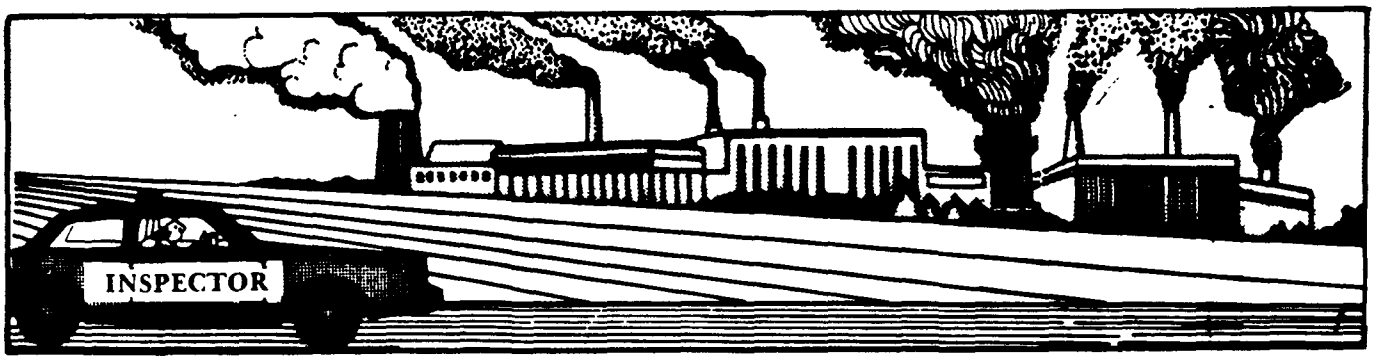
Sources applying for permits to operate



Sources modifying processes according to compliance schedules

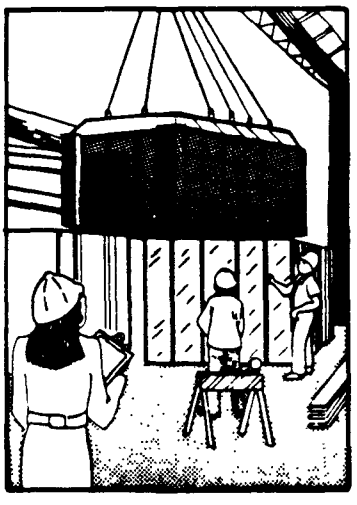
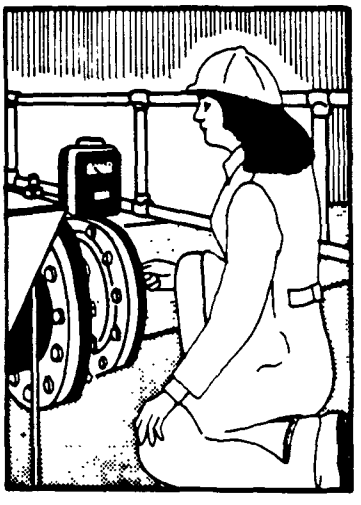


Other sources of significant amounts of pollutants



Field inspectors patrol in the field looking for violations

- excessive visible emissions
- odor problems
- constructing without a permit
- operating without a permit
- open burning
- fugitive dust problems

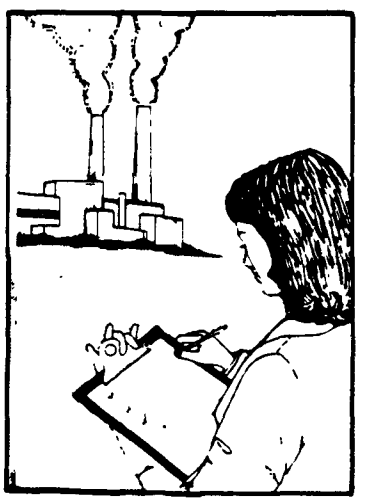
- If a violation of emission regulations is **suspected,** an inspector will often arrange for a source emissions test.

- If a violation is **found,** there will be negotiation.

Inspector informs source owner or manager about regulations

Negotiation takes place

If negotiation fails to bring about compliance, court action may be taken to force compliance



Follow-up inspections are made to determine compliance

Enforcement Management System

- maintains files on all sources
- schedules field inspections and activities supporting enforcement cases
- keeps track of all cases in progress toward abatement

Data systems play an important role in enforcement

- data analysis indicates degree of achievement of emission goals
- data are available for evidence in court cases

Procedures for Dealing With Repeated or Continuing Violations

- vary from State to State
- include:
  - notices of violation
  - administrative hearings or conferences
  - abatement orders
  - revocation of operating permits
  - civil penalties
  - temporary injunctions stopping source operation

Notice of Violation

Formal notice

- to source owner or operator
- indicates alleged violation of regulations
- may be first legal step in process leading to court action

Administrative Hearing/Conference

Discussion between source management and control agency

- quicker, less expensive than court action
- can lead to a compliance schedule
- often effective in gaining compliance
- clarifies issues

Administrative Order

Formal hearing—much like a trial
Leads to administrative order

- directs source to take specific action
- sometimes suspends/revokes operating permit

Court Action

- Generally to seek an injunction to stop source operation or a court order requiring specific actions of source
- Penalties for violations may be assessed
- Contempt of court penalties available

Civil Penalties

- to remove economic benefits from continuing in violation

Remember

- Agency's goal is to obtain compliance
- Agency enforcement actions are prescribed/limited by law

Lesson IV
Questions

1. Describe the legal basis for State air quality pollution control agency enforcement authority.
2. Which of the following are types of power given to State agencies by State legislatures?
   a. right-of-entry to inspect facilities
   b. right to conduct source tests
   c. right to require plant owners or operators to submit information on pollutant emissions
   d. authority to issue citations
   e. authority to stop motor vehicles operating with excessive visible emissions
   f. all of the above

3. List the six basic steps in the enforcement of air quality regulations.
4. List five alternative procedures for dealing with violations of air quality regulations.

Answers are on the next page.

Lesson IV
Answers

1. Powers are given to the air pollution control agency by the State legislature. These are usually spelled out in an "enabling" act passed by the legislature.
2. f.
3. 1. scheduled inspection of new and existing sources
   2. patrolling in the field to detect permit evasion or violation
   3. source emission tests and continuous emission monitoring
   4. negotiation of compliance schedules
   5. initiation of legal action
   6. follow-up inspection to check compliance

4. 1. notices of violation
   2. administrative hearings or conferences
   3. abatement orders
   4. revocation of operating permits
   5. civil penalties
   6. temporary injunctions stopping source operation

After checking your responses, please turn on the tape recorder.

Lesson V: Air Quality Surveillance Networks

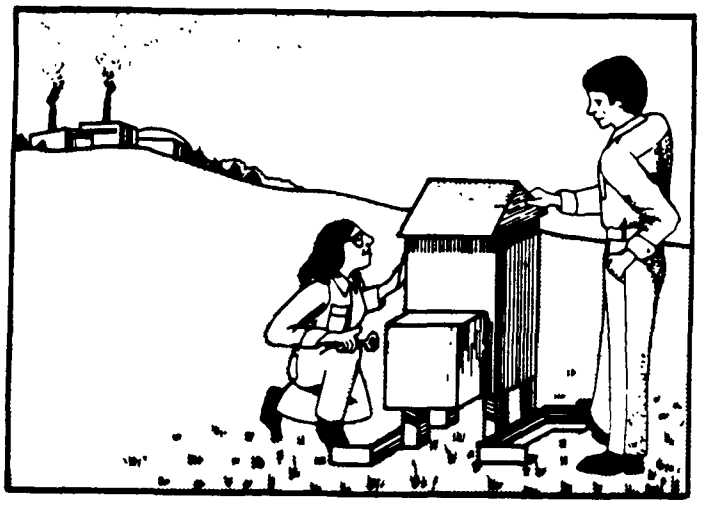
Objectives

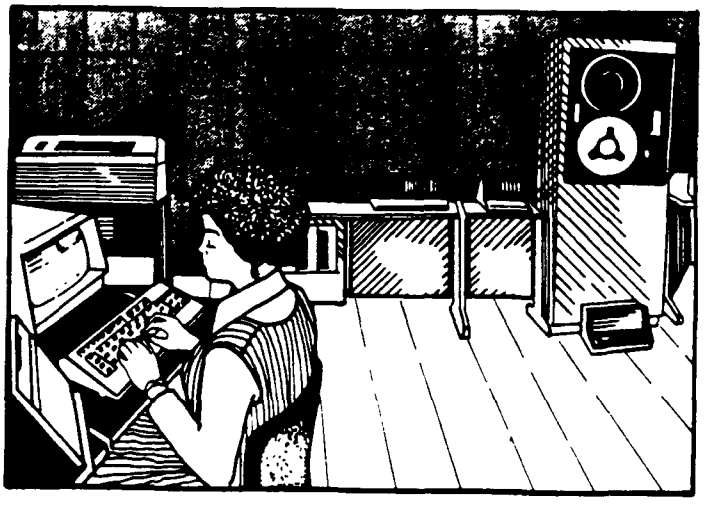
1. Give the full name of and briefly describe the purpose of SLAMS, NAMS, SPM, and PSD air sampling stations.
2. List three ways that a state can use data from an air quality surveillance network.
3. Describe the area covered by each of the five spatial scales of representativeness discussed in this lesson.
4. List the five general steps followed in the design of an air quality surveillance network.
5. List factors that must be taken into consideration when designing the data system for an air quality surveillance network.

Air Quality Surveillance Network

- ultimate means for measuring effectiveness of emission control strategy
- uses variety of monitoring devices at a number of sites
- uses facilities for analyzing and storing the collected data

Two Basic Components





- monitoring sites with measurement devices and personnel
- facilities and personnel for data recording, transmitting, analyzing, storing, and retrieving

Designing Air Quality Surveillance Networks

- define purpose of network
- assemble background materials
- design sensor system
- design data system
- combine sensor and data systems

Define Purpose of Network

- Judging attainment of NAAQS
- Evaluating progress in achieving/maintaining NAAQS
- Developing/revising SIPs
- Reviewing air quality impacts of new sources

- Establishing baseline air quality levels for PSD
- Developing/revising national control policies
- Providing data for atmospheric dispersion model development/validation
- Supporting enforcement actions

- Documenting episodes and initiating episode controls
- Determining pollutant effect on public health and welfare
- Providing air quality information to the public

Assemble Background Materials

- meteorological data, topography and land use data, population distribution data, source location and emission data, and legal and administrative information
- allows characteristics of each pollutant to be considered when network is being designed

Design Sensor System

- What to monitor
- How to monitor
- How often to monitor
- Where to monitor

What to Monitor

- Determined from monitoring objectives
  - Regulated pollutants
  - Non-regulated pollutants

How to Monitor

- Specified by State/local regulations
- Specified by EPA reference and equivalent methods

How Often to Monitor

- Determined from monitoring objectives
  - For example, judging attainment of NAAQS
  - Providing data for atmospheric dispersion model development

Where to Monitor

- Determined from monitoring objectives
- Determined from site characteristics

Microscale

- several meters to 100 meters
- parking lots and unpaved roads

Middle scale

- up to several city blocks
- areas that people pass through but do not remain in to live or work—downtown areas and major highways

Neighborhood scale

- ½ to 4 kilometers
- where people spend a lot of their time living or working

Urban scale

- 4 to 50 kilometers
- a whole urban community

Regional scale

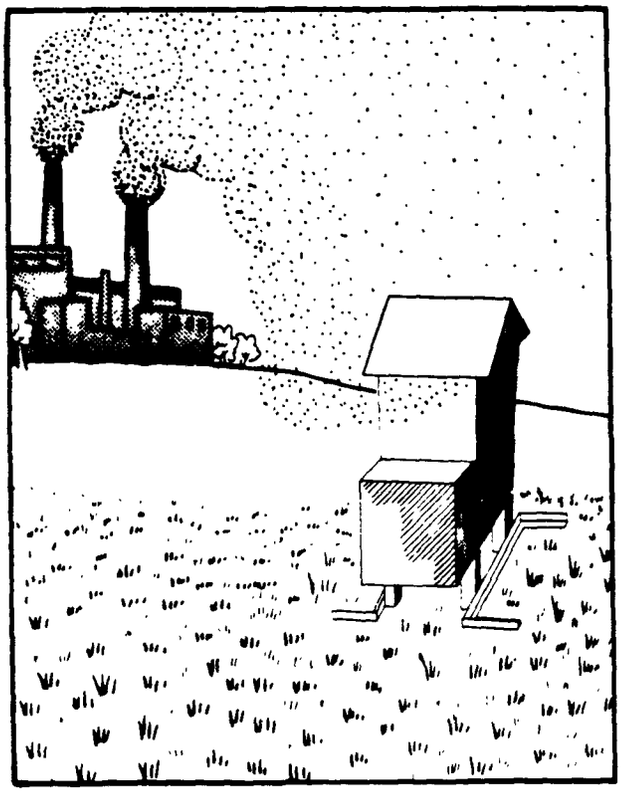
- 10's to 100's of kilometers
- usually rural areas

Factors to consider when selecting a site include

- availability
- representativeness of spatial scale
- accessibility
- security
- effects of topography, meteorology, and nearby structures and sources

Effects of Surrounding Structures on Monitoring of Carbon Monoxide

CO can build up in street canyons. Thus an instrument located near street level would register an entirely different concentration than would an instrument on a nearby roof.

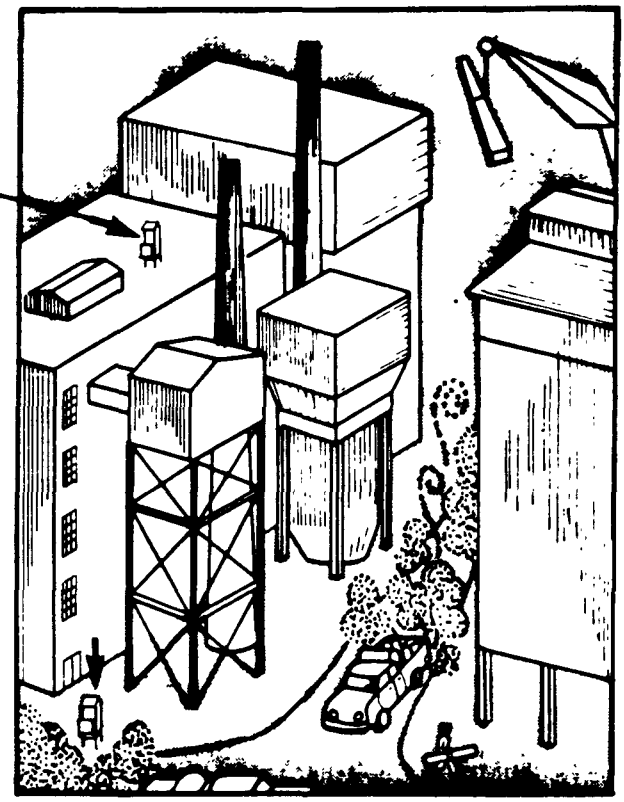


Sampling Probe Placement

Based upon

- monitoring objectives
- type of pollutant monitored
- site conditions

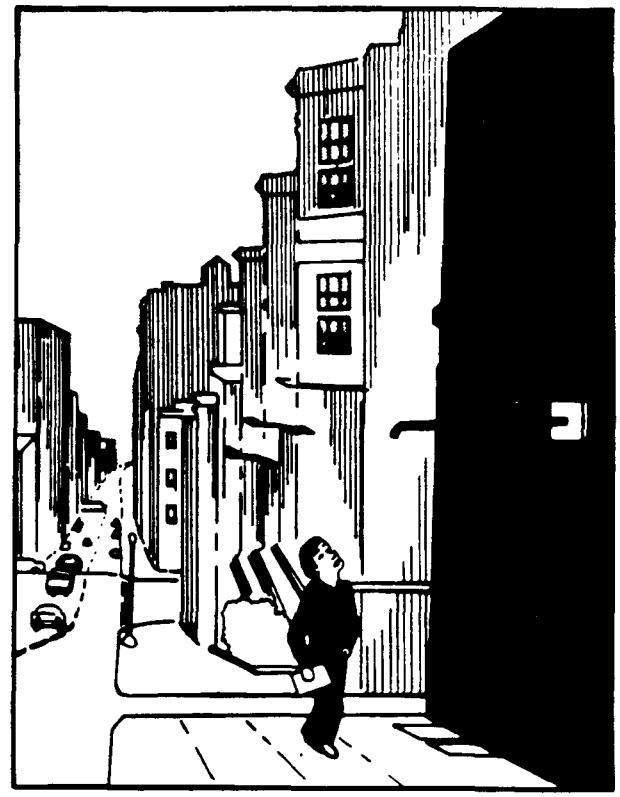
Probe placed to avoid effects of stirred-up dust



Choice of site for probe placement must be based upon surveillance system objectives.

Probe Placement for Most Gaseous Pollutants

- 3 to 15 meters above ground
- 1 to 2 meters vertical/horizontal
- clearance from support structure



Design Data System

Recording

- based on data needs and costs
- often involve choice between manual and automated recording

Transmission

- based on how fast data are needed
- make system as simple, efficient, and inexpensive as possible

Handling

- format—clear, well-documented
- storage—secure, systematic
- retrieval—secure, efficient
- analysis—kinds needed

Combine Sensor & Data Systems

- combine and integrate the sensor and data systems

- Each state monitors pollutants for which NAAQS have been established, following EPA requirements.

- EPA specifications include
  - minimum number of monitoring stations
  - kinds of locations of sampling sites
  - minimum sampling schedules
  - analytical procedures
  - auditing and quality assurance schedules
  - data handling
  - data reporting

Monitoring Stations

State and Local Air Monitoring Stations (SLAMS)

Special Purpose Monitoring stations (SPM)

Prevention of Significant Deterioration stations (PSD)

National Air Monitoring Stations (NAMS)

SLAMS

- number and locations jointly determined by the State and regional EPA office
- Data reported to EPA in form of an annual summary

SPM stations

- not SLAMS
- not subject to any EPA requirements unless monitoring is to support a SIP revision or to demonstrate a control strategy

PSD stations

- SLAMS could serve as PSD stations, but PSD stations otherwise not part of a SLAMS network

NAMS

- locations designated by EPA headquarters
- must report data quarterly to EPA
- must use continuous monitors for gaseous pollutants

SLAMS Network

Must meet 4 objectives

- determine highest concentrations expected to occur
- determine representative concentrations in densely populated areas
- determine effect of significant sources or source categories on ambient pollution levels
- determine general background concentration levels

Appropriate Siting Scales

Monitoring Objectives	micro-scale	middle scale	neighbor-hood scale	urban scale	regional scale
1. determine highest concentrations	■	■	■	◪	□
2. determine representative concentration in high population density area	□	□	■	■	□
3. determine impact of significant sources	■	■	■	□	□
4. determine background concentration levels	□	□	□	□	■

Federal Guidelines for Selecting Spatial Scale

Spatial scale	Scales applicable for SLAMS					Scales required for NAMS				
	TSP	SO_2	CO	O_3	NO_2	TSP	SO_2	CO	O_3	NO_2
Micro			■					■		
Middle	■	■	■	■	■					
Neighborhood	■	■	■	■	■	■	■	■	■	■
Urban	■	■		■	■				■	■
Regional	■	■		■						

For additional information on Federal regulations for State air quality surveillance networks, see the Code of Federal Regulations, Title 40, Part 58.

Lesson V
Questions

1. The following acronyms are used to refer to air monitoring stations. What does each stand for?

i. SLAMS
ii. NAMS
iii. SPM
iv. PSD

2. List three ways that a state can use data from an air surveillance network.

3. Match the spatial scale of representativeness on the left with the description of the area it covers given on the right.

i. microscale	a. from several meters to 100 meters
ii. middle scale	b. from four to fifty kilometers
iii. neighborhood scale	c. from tens to hundreds of kilometers
iv. urban scale	d. from one-half to four kilometers
v. regional scale	e. up to several city blocks

4. List the five general steps followed in the design of a surveillance network.
5. List factors that must be taken into consideration when designing the data system for an air surveillance network.

Answers are on the next page.

Lesson V
Answers

1. i. State and Local Air Monitoring Stations
   ii. National Air Monitoring Stations
   iii. Special Purpose Monitoring
   iv. Prevention of Significant Deterioration
2. Any three of the following:
   - Judging attainment of NAAQS
   - Evaluating progress in achieving/maintaining NAAQS
   - Developing/revising SIPs
   - Reviewing air quality impacts of new sources
   - Establishing baseline air quality levels for PSD
   - Providing data for atmospheric dispersion model development/validation
   - Supporting enforcement actions
   - Documenting episodes and initiating episode controls
   - Determining pollutant effect on public health and welfare
   - Providing air quality information to the public

3. i. a. from several meters to 100 meters
   ii. e. up to several city blocks
   iii. d. from one-half to four kilometers
   iv. b. from four to fifty kilometers
   v. c. from tens to hundreds of kilometers
4. 1. define purpose of network
   2. assemble background materials
   3. design sensor system
   4. design data system
   5. combine sensor and data system
5. data recording, data transmission, and data handling

After checking your responses, please turn on the tape recorder.

Lesson VI: Air Quality Management Personnel

Objectives

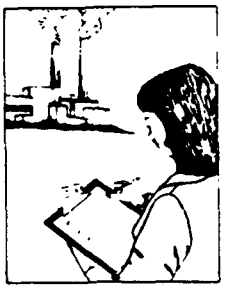
1. List four factors that affect the kind and number of personnel needed in an air quality management agency.
2. List five types of personnel often employed in a comprehe sive air pollution control organization.
3. Briefly describe trends in costs and funding for State and local air pollution control agencies.

Number and kind of personnel needed is dependent upon

- size of area to be managed
- complexity of air pollution problem
- amount and kinds of pollutants
- number and type of emission sources

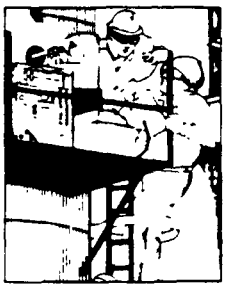
Basic Personnel

Administrative Personnel



Inspectors

Engineers



Air Pollution Specialists

Chemists

Other Specialists

Administrative Personnel

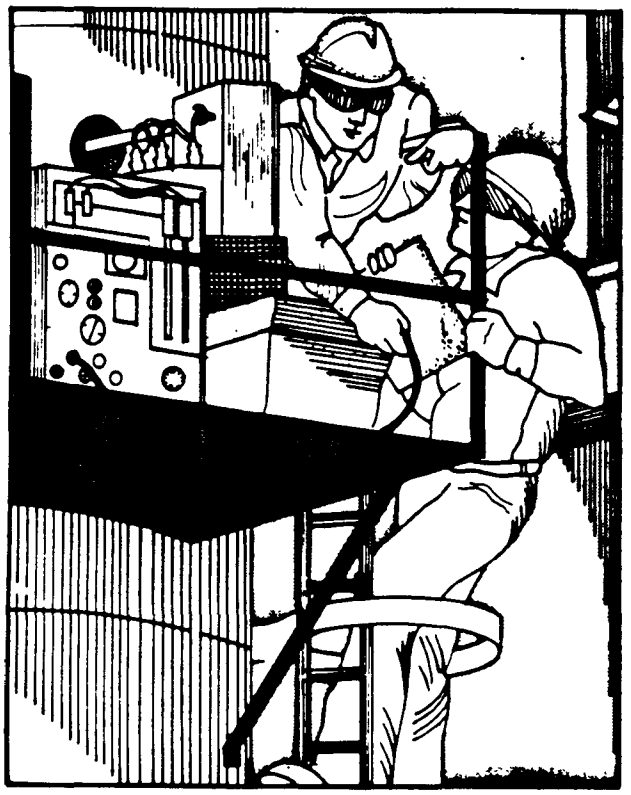
- plan the program
- manage the program
- provide for administrative services
  - transportation
  - personnel
  - purchasing
  - communications
  - office and lab space
  - etc.

Inspectors

- evaluate visible emissions
- investigate complaints
- inspect plants
- assist chemists and engineers
- calibrate and maintain equipment and instruments
- collect samples

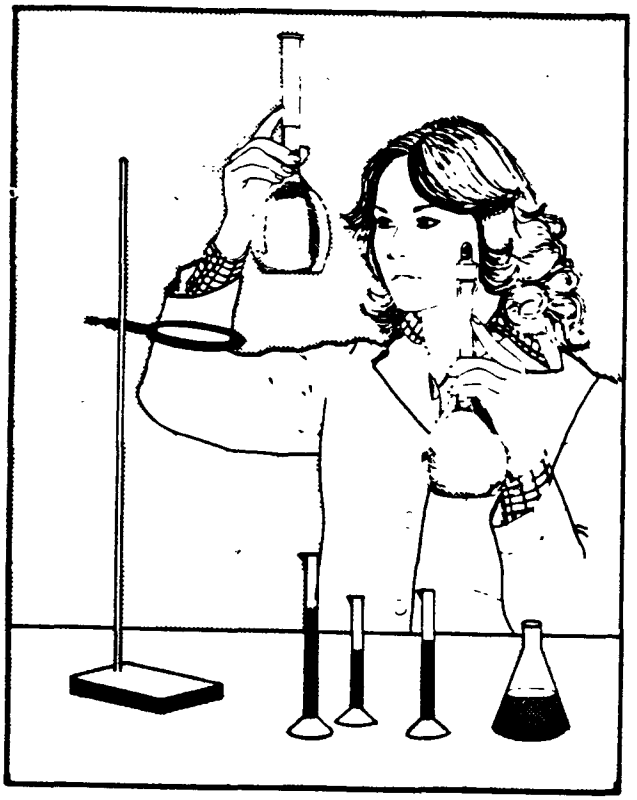
Engineers

- evaluate pollution sources
- review construction plans
- make emission inventory calculations
- develop pollutant emission control strategies



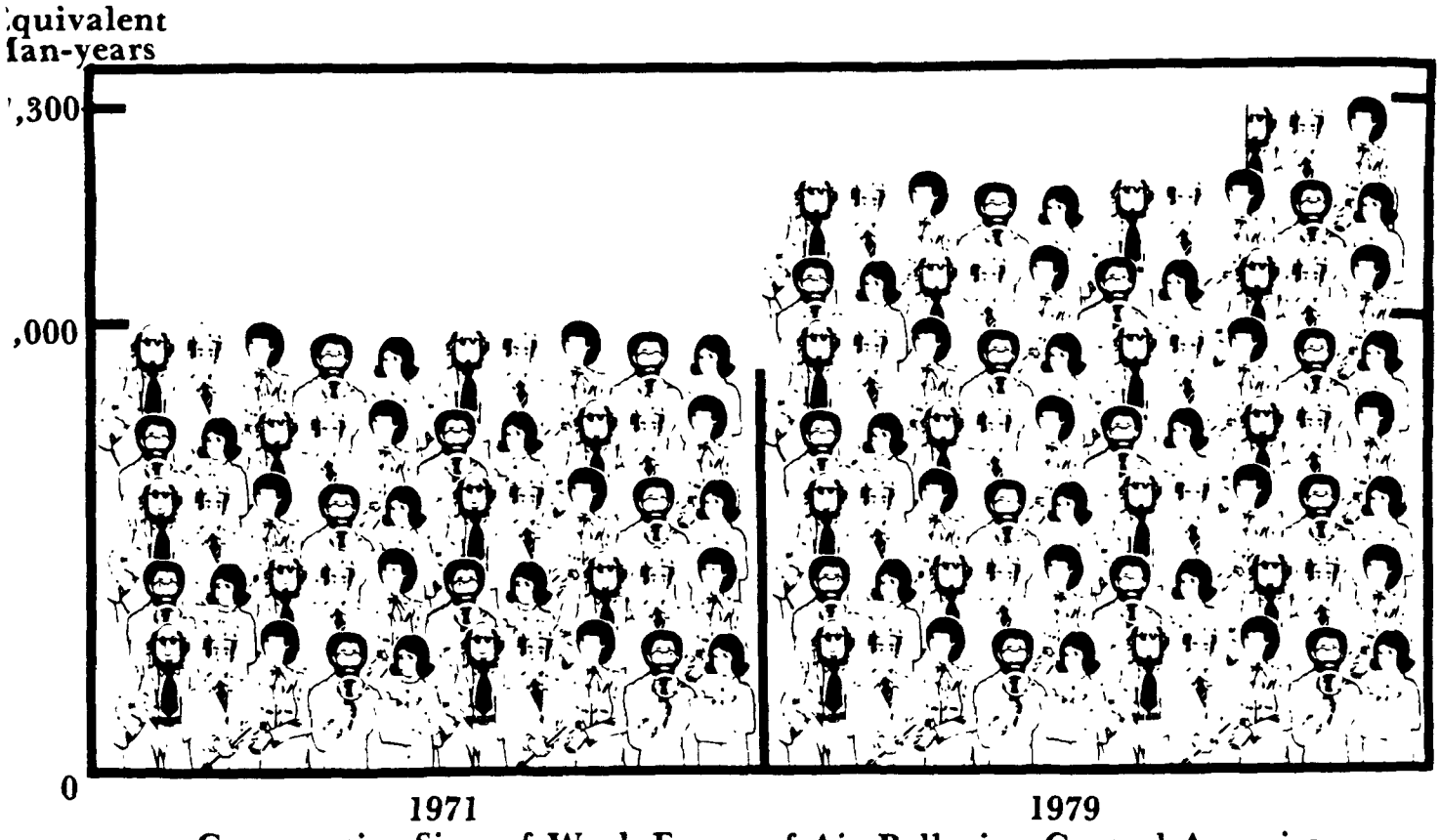
Air Pollution Specialists

- gather and interpret data
- assist in complex surveillance operations
- assist in evaluating permit applications



Chemists

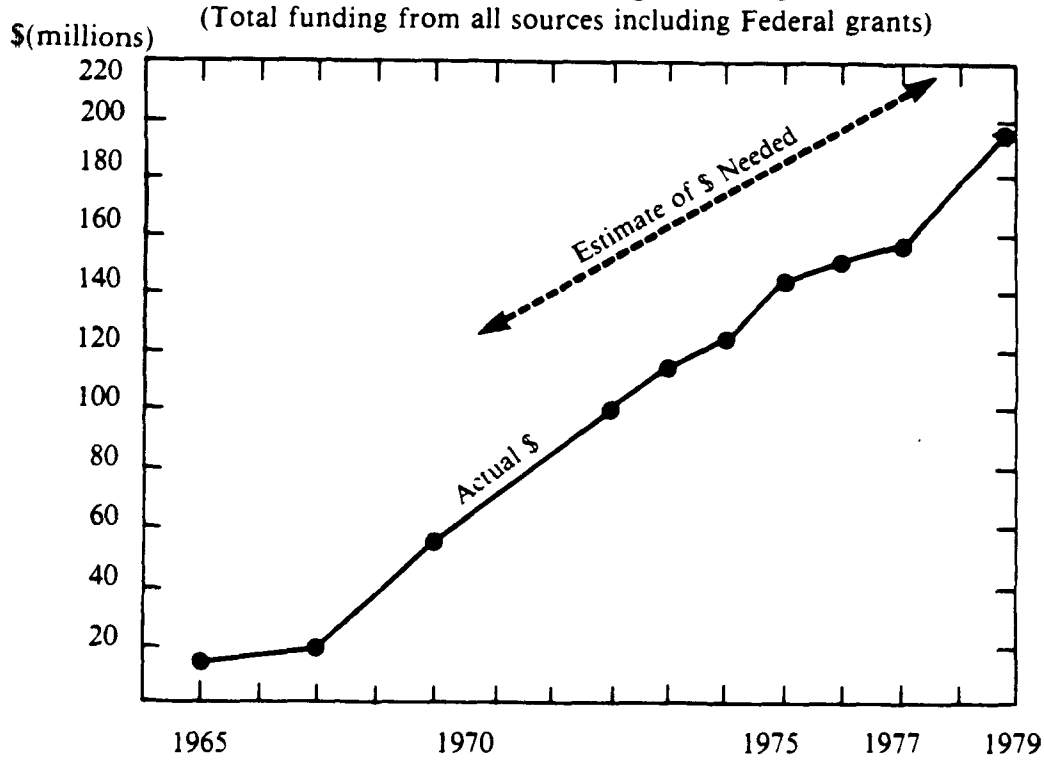
- conduct laboratory analyses
- operate, calibrate, and maintain air quality measurement instruments



Comparative Sizes of Work Forces of Air Pollution Control Agencies

State and Local Control Agency Expenditures

(Total funding from all sources including Federal grants)



A number of socio-economic factors have conflicted with the allocation of funds for air quality management

- inflation
- reduced tax revenue
- pressure for economy in government spending
- claims by industry of hardships caused by pollution control expenditures

Lesson VI
Questions

1. List four factors that affect the kind and number of personnel needed in an air quality management agency.
2. List five types of personnel basic to a comprehensive air control organization.

Answers are on the next page.

Lesson VI
Answers

1. size of the area to be managed
   complexity of the air pollution problem
   amount and kinds of pollutants
   number and types of emission sources in the area
2. administrative personnel
   inspectors
   engineers
   air pollution specialists
   chemists

After checking your responses, review any material that you are not sure of, and then take the Unit Test which begins on page 157.

Unit Test
Questions

1. A term often used to refer to all activities used to make our air clean and keep it that way is:
   a. clean air management
   b. prevention of significant deterioration approach
   c. air quality management
   d. environmental management
   e. lowest achievable emissions approach
2. For each standard on the left, choose its description from the righthand column.

i. NAAQS ii. NESHAPS iii. NSPS	a. These state the degree of emission limitation that can be achieved by using the best available technological system of continuous emission reduction. The Federal government has primary enforcement responsibility. b. These specify the maximum pollutant levels which are allowed in the air surrounding a city, community, or region. The States have primary enforcement responsibility. c. These are set to control emissions for which no other standards have been set, yet which may reasonably be expected to cause or contribute to an increase in deaths, serious irreversible illness, or incapacitating reversible illness. The Federal government has primary enforcement responsiblity.

3. What is meant by "air pollution control strategy"?
4. What are the eight types of authority that a State must have in order for EPA to accept its State Implementation Plan?
5. Which of the following is(are) basic types of source regulations?
   a. Emission regulations setting maximum allowable emissions
   b. Operating equipment and control device design regulations
   c. Regulations prohibiting use of certain types of equipment
   d. Regulations banning certain operations
   e. Regulations specifying permissible and non-permissible fuels
6. What is the legal basis for State air pollution control agency enforcement authority?
7. List the six basic steps usually followed when enforcing air quality regulations.
8. What does the acronym SLAMS stand for?
9. Which of the following is(are) ways that a State can use data from an air surveillance network?
   a. judging attainment of NAAQS
   b. developing/revising SIPs
   c. reviewing air quality impacts of new sources
   d. supporting enforcement actions
   e. documenting episodes and initiating episode controls
10. List four factors that affect the kind and number of personnel needed in an air quality management agency.

Unit Test
Answers

1. c.
2. i. b
   ii. c
   iii. a
3. An air pollution control strategy is a list of actions which must be carried out in order to control air pollution in a specific area.
4. Authority to:
   - adopt and amend emission control regulations and other control measures needed
   - enforce applicable laws, regulations, and standards—including those which provide for operation of a construction permit program with a fee system, and those which authorize abatement on an emergency basis
   - prevent construction, modification, or operation of sources which would violate air quality standards
   - require sources to keep records, and make inspections and tests to assess compliance with emission standards
   - require sources to install and use monitoring devices and report on emissions
   - operate a motor vehicle emission inspection/maintenance program in areas where such is required
   - make pollutant emission data available to the public
   - prevent significant deterioration of air quality

5. a, b, c, d, and e
6. Powers given to the air pollution control agency by a State legislature. They are usually spelled out in an "enabling" act.
7. Scheduled inspection of new and existing sources
   Patrolling in the field to detect permit evasion or violation
   Source emission tests and continuous emission monitoring
   Negotiation of compliance schedules
   Initiation of legal action
   Follow-up inspection to check compliance
8. State and Local Air Monitoring Stations
9. a, b, c, d, and e
10. – size of the area to be managed
    – complexity of the air pollution problem
    – amount and kinds of pollutants
    – numbers and types of emission sources in the area