planning advisory service

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AIR POLLUTION CONTROL*

Air pollution control (or a narrower version, smoke abatement) has been a subject of much popular interest. This was dramatized by the endorsement or proclamation of "Smoke Abatement Week" by the Governors of 23 states for the last week of October 1950. This interest has been manifested more concretely by legislation. It has been estimated that all cities, except four, of over 250,000 population have adopted some type of air pollution control. Recently, at least three states--Illinois, Maryland, and California--have undertaken research on, or adopted legislation on air pollution. The state legislatures of Pennsylvania, New Hampshire and New Jersey have also appointed legislative committees to consider air pollution control and make recommendations as to legislation thereon. The first Federal government sponsored conference on air pollution was held in Washington, D.C., on May 3-4 of this year, under the auspices of the Bureau of Mines, Office of Air and Stream Pollution, Department of the Interior. Stanford Research Institute sponsored its first National Air Pollution symposium in November 1949. National citizens' organizations such as the Smoke Prevention Association of America, have been active in furthering research and legal controls as have local citizens' organizations, such as the Smoke Abatement League of Cincinnati,

Despite the wide interest in air pollution control, there are many aspects of it which require much research and investigation; there is, for example, no unanimity of opinion as to the causes or effects of air pollution or the best methods of its control. This Information Report is a guide to the current types of action so far undertaken on a state and local level, to legal interpretation, to the costs of air pollution, and to the benefits to be achieved from its control.

Definition:

Smoke pollution is generally visible to the eye, and is due to incomplete combustion of coal or other fuels. Three aspects of smoke pollution have been identified as the escaping chimney gases which are of dark color due to unprecipitated carbon or soot, hydro-carbons which have not been burned, and fly ash. In large part, smoke nuisances may be abated by proper firing devices and techniques.

The term "air pollution" sometimes includes smoke pollution and sometimes does not. It generally refers to industrial fumes, gas, noxious acids, dust, and other contaminants. These contaminants are often invisible and may be detected by their irritating effects upon eyes or nasal tract, or by their odors. They become more detectable when combined with water vapor in the air to form "smog."

The United States Technical Conference on Air Pollution held in May 1950 described air pollution in the following terms:

"Air pollution is the emission of harmful or obnoxious contaminants into the atmosphere. Pollutants come from mines, mills, burning refuse piles, open hearth steel furnaces, smelters, oil refineries, incinerators, tanneries, soap factories, trains, boats, automobiles...homes, and from plants that process foods or manufacture fertilizers, lard, varnish, acids, paper, paint and resin, glue, and chemicals.

"Man-made contaminants consist of particulate matter, gases and vapors. Particulate matter includes metallic oxides, sulphur-trioxide, siliceous material, and other dusts, fumes, mists, and fogs. Smoke from the incomplete combustion of burning coal carries with it ash particles, carbon and tar. Aerosols--fine solid or liquid particles suspended in air or gas for an extended period of time, such as smoke, fog or mist--reduce visibility and shut out sunlight.

"Gases and vapors include carbon-monoxide, carbon-dioxide, sulphur-dioxide, hydrogen-sulphide, oxides of nitrogen, hydrofluric acid, hydrochloric acid, ammonia, organic solvents and other compounds. Sulphur-dioxide is probably the most common noxious gas emitted into the atmosphere, and with the addition of oxygen and water, may turn into sulphuric acid, a corrosive, irritating and fog-forming mist."

The Costs of Smoke and Air Pollution

In general terms, the cost to the community of smoke and air pollution may be said to include:

(a) Blackened or corroded buildings
(b) Increased personal laundry and cleaning bills
(c) Increased lighting due to darkness and dust
(d) Increased need for interior and exterior painting
(e) Increased hazard to airplane and motor transportation
(f) Damage to trees and other vegetation
(g) Damage to merchandise
(h) Eye, throat and nose irritations
(i) Increased illnesses such as sinusitis
(j) Possible poor psychological effect on residents resulting from frequent overcast skies and fogs
(k) Depreciation of property in polluted areas

In addition, smoke pollution indicates the waste of fuel which might have been utilized by proper firing devices. The Bureau of Smoke Control in Allegheny County

Pennsylvania, points out this fact with its slogan, "Save Money - Don't Throw Smoke Away." Chemicals, too, are wasted through air pollution; some industries have recaptured valuable chemicals through electric precipitation and other devices.

Although the cost of atmospheric pollution may be stated generally, it is much more difficult to assess the cost of pollution in terms of dollars. A number of such estimates have been made and the following are reproduced here as a rough indication of possible monetary loss.

According to the Chicago-Cook County Health Survey (U.S. Public Health Service, 1949) the estimated damage due to smoke--including invisible pollutants--cost Chicago approximately $35,000,000 a year, or about $10.00 per capita.

Weldon B. Gibson, Chairman of the Department of Business and Industrial Economics of Stanford Research Institute, reported in a paper, "The Economics of Air Pollution" (Proceedings of the First National Air Pollution Symposium, Stanford Research Institute, 1949):

> "Some years ago, the Commerce Department estimated that the cost of damage from smoke in various cities of the United States amounts to from $8.00 to $20.00 per inhabitant annually...The United States Geological Survey has indicated that smoke damage to merchandise and buildings alone in this country reached a figure of at least $5,000,000 per year. This estimate has been confirmed by studies on the subject made by at least three university research groups. Still another estimate places the total national loss from air pollution at over one billion dollars per year. This loss includes damage to fabrics, equipment, buildings, and plants. The Chairman of the National Conference on Sanitation of New York City indicates that the material loss to fabrics, household equipment, and buildings amounts to at least $16.00 per capita per year, or a loss of about $100,000,000 in greater New York City alone."

Other estimates have set an annual cost of five to six million dollars for a city the size of Indianapolis and of approximately $10,000,000 for a city such as Milwaukee.

Mr. Gibson conducted a survey to obtain precise information on the losses borne by individual businesses which was based on actual expenditures, and reported that:

> "Twenty large department stores report annual losses of from $20,000 to $50,000 each; ten hospitals indicate an annual outlay of from $4,000 to $20,000 each. Thirty hotels in these fifteen cities encounter losses from smoke, soot and contaminated air, of from $9,000 to $25,000 each. The annual loss

for the thirty-five large office buildings amounts to between $11,000 and $35,000 per building."

Economic Gain Through Air Pollution Control

Leaving aside the gains to the community from air pollution control, some industries have found economic advantages in recapturing escaping chemicals and other materials. According to Mr. Gibson, Detroit Edison spent several hundred thousand dollars to collect fly ash; now the ash is being sold for a substantial profit. The fly ash may be used in a concrete mix which permits a 50 per cent reduction in cement content.

A chemical company spent $70,000 to recover lead oxide and has been recovering $90,000 per year from resale of the recaptured material. The Pontiac Division of General Motors spent $300,000 to install dust collectors and reports a 50 per cent improvement in foundry production activity. A Canadian smelter, faced with law suits because of the air borne wastes emitting from it, installed devices to recapture sulphuric acid and then developed a profitable fertilizer business from this utilization of former wastes emptied into the air,

However, Mr. Gibson states that "from a dollar-and-cents standpoint, expenditures for air pollution (control) do not normally provide a direct financial return to the person or organization making the expenditure." From data on three hundred air pollution control installations, he found that "less than 25 per cent of these installations are producing or will produce a net financial gain, or at least a recouping of the original investment." He also points out that there may be a point of diminishing returns in installation of equipment to recover all pollutants. A petroleum company reported that 80 per cent of the pollutants could be removed for $2,000,000, but that 95 per cent removal would require an expenditure five times greater. Similarly, in smoke control, it is generally estimated that 60 to 70 per cent of the smoke emission could be corrected without the installation of equipment (through education in proper firing methods, etc.,) an additional 20 to 35 per cent of the smoke emission could be eliminated through installation of equipment at moderate cost, and abatement of the remaining 5 to 20 per cent of the smoke would require very expensive equipment.

Relationship of Air Pollution to Health

It has been suggested that polluted air prevents ultra-violet rays from fully reaching the human body (and thus affects the bone structure). There have also been attempts to link air pollution with cancer. Sinusitis is reported more frequently in industrial areas in the Ohio Valley than in non-industrialized places; presumably a 40 per cent decrease in respiratory infections was reported in St. Louis after the inauguration of atmospheric pollution control. It is difficult to isolate and test the effects of various pollutants, and because there is disagreement as to the causal relationship of air pollution and health, this Information Report does not make any categorical statements of such relationship. However, an annotated bibliography, "Biological Aspects of Air Pollution", was prepared by the Federal

Security Agency, U.S. Public Health Service, Division of Industrial Hygiene, and was printed as a public service by the United Steel Workers of America, C.I.O., in April 1950. The bibliography, among other items, includes references on the effects of specific air borne substances such as chlorides, sulphur-dioxide, etc., and the pathological, psychological and non-specific health effects of air pollution. There is also a section on references which cast doubt on the effects on health of air pollution.

Disasters in which air pollution was a contributing factor have occurred in the Meuse Valley in Belgium in 1930, and more recently in the Monongahela Valley of the United States. The "Donora incident", in which twenty persons died and forty per cent of the residents of the affected areas were ill, is studied in "Air Pollution in Donora, Pennsylvania: Epidemiology of the Unusual Smog Episode of October 1948", Public Health Bulletin No. 306 of the Public Health Service, Federal Security Agency (1949). The study revealed the important role of weather conditions, and indicated that a high degree of atmospheric stability and stagnation was necessary to cause an accumulation of air borne pollutants. The study recommended in addition to a program of reducing air borne wastes, that weather forecasts alert the community to potential adverse weather conditions. The summary of the biological aspects of the study indicated among other items that:

> "Neither incidence nor severity of affection appeared to be influenced by sex, race, occupational status, length of residence in the area, or degree of physical activity at time of onset of affection.....
>
> "Both incidence and severity revealed a direct relationship with increasing age. Over 60 per cent of persons 65 years of age and over reported some affection from the smog, and almost one-half of these were in the severely affected group....
>
> "Although onset of affection began in some cases as early as S-day (the first day of severe smog), the larger number of persons became ill on day No. 2 (the second day after S-day). About 40 per cent of affected persons reported onset of affection between 6 p.m. and midnight of day No. 2....
>
> "Based on data available for 18 of the persons who died, the death rate was significantly higher in the non-white than in the white population....
>
> "The ages of the persons who died ranged from 52 to 84 years with a mean age of 65 years....
>
> "Principal past employment, duration of residence in the community, and sex played no significant part in the occurrence of the fatal illnesses....

"Preexisting disease of the cardiorespiratory system appeared as a single significant factor among the fatally ill, although in four cases, no history of any chronic disease prior to the smog was obtained....

"In spite of the apparent association between cardiorespiratory disease and smog affection, no significant difference appeared in the occurrence of pulmonary emphysema in a group of persons who had been ill during the smog, and in a nonaffected group....

"Some relationship appeared between severity of affection and certain characteristics of housing quality....

"With the exception of such episodes as that of the October 1948 smog, long-term studies of mortality records and plant morbidity records indicate that the health of the people of Donora appeared essentially no different from that of nearby towns....

"Although bronchial asthma and heart disease appeared to be somewhat more prevalent among persons in the Donora area than in the United States as a whole, studies of mortality data, when compared with those of nearby communities, indicated that death due to disease of the heart and respiratory system was not increased in Donora....

"Chronic cardiovascular disease, the origin of which antedated the smog incident, was a prominent feature in the autopsies."

The summary of the atmospheric studies pointed out the important part residences play in air pollution:

"Domestic heating systems and local steam locomotives are significant contributors to the general atmospheric pollution of the valley with special reference to carbon monoxide, sulphur dioxide, and particulate matter."

Donora's two main industries are a steel and wire plant and a zinc plant, the former consists of blast furnaces, open-hearth department, blooming mill, looping-rod mills, wire-drawing department and wire-finishing. The zinc plant is of horizontal-retort construction and produces zinc, cadmium, unrefined lead and sulphuric acid. The Public Health Service report indicates the air borne wastes emitted from these plants; this material is not listed here since the industrial coverage is so limited.

Some Techniques in Measuring and Controlling Air Pollution

There are a number of methods for sampling air pollutants; some of these, such as filtration and centrifugal separation, are also means of eliminating the pollutants. The measuring methods fall into these general categories: visual or photometric identification, sedimentation, impingement (impaction and jet condensation), inertial and centrifugal separation and collection, and filtration. An excellent comparison is made of these methods in "Sampling of Industrial Stacks and Effluents for Atmospheric - Pollution Control" by Leslie Silverman, which appears in the Proceedings of the First National Air Pollution Symposium (Stanford Research Institute, 1949). A few of the more commonly used devices are mentioned below.

The Ringelmann Chart is a visual method designed to identify the shade of smoke emission. The chart is divided into five different shades of smoke, ranging from 20 per cent to 100 per cent black. The observer is supposed to be 50 feet from the smoke stack being tested, and compares the shade of the smoke to the different shades on the chart. A variant of this method is the Umbrascope which is a cylinder through which the observer looks and adjusts smoked glass discs until the disc which most nearly corresponds with the appearance of the smoke is discovered. The American City article, "Air Pollution - And How to Measure It", gives an illustration of the Bailey smoke-density recorder apparatus which gives a permanent record of smoke density. Other recording devices are the Tyndallometer and the photo-electric densitometer.

One of the methods commonly used to determine the total atmospheric pollution is the settling jar method. Jars, usually 6 to 8 inches in diameter and of a little greater depth, are placed in certain locations throughout the city generally for a period of one month. In order to retain the dust particles, the jars contain several inches of water or anti-freeze solution. At the end of the test period, the collected material is analyzed to determine the relative prevalence of such items as water-soluble matter, combustibles, ash and tar substances. Also the amount of dustfall is calculated to indicate the approximate number of tons of dust settled per square mile per month in that vicinity. The chief advantage of this method is that of simplicity, but there are a number of objections to the use of it. It is extremely difficult to choose locations which will give samples that are representative of the dust fall of an area. A great many variables, such as the effects of wind, turbulence, etc., affect the amount of precipitation, and locations which are only a few feet apart might have yielded very different results. Also, it is not at all clear whether all types of dust particles are gathered by this method; even if they are, the most coarse particles would be most emphasized in analysis due to their relatively high mass.

Methods have been devised to measure dust suspended in the air. The Greensburg-Smith impinger samples dust particles by injecting dusty air at high velocity through a small nozzle and impinging the dust particles against a glass surface under water or another liquid. In the Owens jet dust counter, no liquid is used and the particles strike a glass slide which is covered by a temporary thin layer of condensed moisture. When the two methods were used in the same survey, it was

found that the results did not correspond with each other; this does not minimize the results of the testing methods, but is an indication of the need for further research on sampling methods, the effect of weather on particle dispersion, the source of pollutants, etc.

There are also devices for measuring specific pollutants. For example, according to "Some Instrumental Problems in the Analysis of the Atmosphere" (by H.W. Washburn and Robert R. Austin, in the Proceedings of the First National Air Pollution Symposium):

> "There are two instruments which have been used for recording the sulphur dioxide content of the air. The first instrument is known as the Thomas instrument and it continuously records the conductivity of an absorbed sample. The second instrument, known as the Titrilog, continuously titrates the sample and records the amount of titer which is required for reaction with the sample."

In control of air pollution, it has been found that smoke may generally be prevented by proper firing methods. An article addressed to building inspectors in the April 1950 issue of Building Standards Monthly ("Air Pollution" by Charles E. Bacon emphasizes that the input of fuel per unit of time must be reduced to a point where the furnace can digest the fuel fully. Thus, the fuel must be fed in small charges; the fuel must also be of uniform type and size. There must be sufficient oxygen close to the fuel bed so that combustion may take place.

Keeping equipment periodically inspected and cleaned is paramount. Educational campaigns among householders are particularly important since much of the improper combustion takes place in private homes. Electric precipitation, centrifugal fan and gravity separation are some methods of removing suspended materials used by the larger industrial and commercial firms.

Gravity separation can be done through a bend in a duct to deflect dust particles, or through the placing of baffles which knock out the dust particles while the gas flow continues. Discharging gas into a large chamber where the gas velocity is considerably decreased will cause particulate material to settle. Only the larger particles--of approximately 100 microns or over--will settle through this method, while smaller particles (down to approximately 50 microns) may settle through the baffle method mentioned above. Dust collectors using centrifugal or "cyclone" methods force air into a funnel-like duct at high speed. The air whirls in cyclone fashion and the dust flies outward by centrifugal force, and then fall to the bottom of the duct. The cyclone separator is effective with particles down to approximately 10 microns.

For collecting smaller particles, the weight of the particles may be increased. One method is the "wet collection" process by which the particles are moistened in spray towers, cyclonic spray towers, jet scrubbers, venturi scrubbers, etc. Or the particles may be absorbed in the liquid through which the gas is passed. Scrubbers

are generally not effective for particles smaller than 1/10th of a micron.

Electrostatic precipitators or sonic agglomerators are perhaps the most expensive methods of dust collection; but the best, particularly for solids of less than 10 microns in size. The dust is generally ionized and then collected on a charged metal plate. High voltage is required.

Dust may also be prevented from getting into the general atmosphere by filtering the dust-laden air through closely-woven cloth bags or sheets, metallic screens, spun glass or steel wool, which collect the dust. Filters are most useful where the concentration of dust is low, there is no moisture, and temperatures are below 200 degrees Fahrenheit.

According to "Disposal of Waste Gases", by Marcus Sittenfield (Modern Sanitation, September 1950), gases, particularly organic vapors, may be absorbed by use of activated charcoal, silica gel, etc. Inorganic vapors may be dissolved in a solvent. Maximum exposure of gas to the liquid may be provided through packed, bubble plate or perforated columns, and wetted wall or spray towers. Where the gas is very dilute or corrosive, it may be passed over a chemical in granular or lump form which will react with and neutralize it. The resulting product should have economic value so that it will not be dumped (and will not cause another type of pollution problem). Electrostatic precipitators and ultra-sonic agglomerators are effective means of combating persistent fumes and mists. Some chemical gases can be recovered by extraction with water; others may be returned to the combustion process and be burned before they are emitted into the atmosphere.

Local Action

In attempts to control air pollution, localities have adopted a punitive type of ordinance which tries to eliminate smoke or pollutants by punishing offenders, and a preventive type which tries to eliminate pollutants at the source in the process of combustion, etc. An article, "Smog - Can Legislation Clear the Air?" in the Stanford Law Review of April 1949, points out that the punitive ordinance is rarely effective because the fear of a fine is not sufficient to correct poor firing methods or inadequate equipment. Other defects are that an adequate enforcing staff is seldom provided, and that certain industries and private residences are often exempted from the ordinance provisions.

The preventive type of ordinance generally establishes a separate enforcement agency and an appeal board with the single purpose of eliminating air pollution. (See Appendix for a sample air pollution ordinance.) Usually detailed rules are not specified in the ordinance, but are left to the discretion of the enforcement agency. The chief method of enforcing the ordinance provisions is through issuance of permits for the construction, alteration and repair of fuel-consuming devices. Periodic inspection is maintained. All sales of fuel-burning equipment to be used in the locality must be reported. In efforts to eliminate smoke, often smokeless fuels (containing less than a certain percentage of volatile material) are prescribed for hand-fired equipment and certain types of fuel may be sold only if used in mechanical burning equipment.

Most preventive ordinances provide for appeals; generally hearings are held and sometimes variances may be granted or other action suggested. In Birmingham, Alabama, the appeal board is composed of five members, specified to include two combustion engineers, a stoker engineer, a coal operator and a layman. In Providence, Rhode Island, in addition to the appeal agency there is an Advisory Board; and at least one of the five members of each is required to be a doctor. Some ordinances provide that inadequate equipment may be sealed until it complies with the ordinance requirements. Other penalties include fines for each day of violation; Providence provides for a fine of $100 per day.

The number of inspectors varies. In Pittsburgh, about fifteen inspectors cover the rail yards alone and report daily on locomotive smoke. Other large cities employ from five to twenty inspectors. Appropriations, according to the American Municipal Association, in general range from about 7 to 12 cents per capita. Cleveland was reported to have appropriated $103,000 in 1949, and Chicago was reported to have spent $200,000.

While most of the action against air pollution has been conducted by cities, at least three counties have active control agencies: Los Angeles, California, (described in the section on "State Action"), Milwaukee, Wisconsin, and Allegheny County, Pennsylvania. Milwaukee County is reported to have established 70 test points to discover the comparative amount and types of air pollution in the county and how topography, wind and weather influence the pollution. Allegheny County will control air pollution resulting from one and two family residences as well as from industrial and commercial establishments.

Committees have been established to help in the work of air pollution control. For example, in New York City 12 committees were established to assist the Health Commissioner, and represent: (1) real estate and industry, (2) railroads, (3) utilities, (4) harbor craft, (5) automotive transportation, (6) plant operation, (7) city departments, (8) fuel oils, (9) solid fuels, (10) public health, (11) laws and legislation, and (12) public cooperation.

Public cooperation was enlisted in Providence, Rhode Island, where members of the League of Women Voters have operated as volunteer smoke spotters to reinforce the city crew of smoke control inspectors. The movement in Providence to control air pollution was started by the Providence Medical Association which joined with the Chamber of Commerce to draft an ordinance in January 1947. Sometimes, even with citizen assistance, control measures may be instituted slowly. The Chamber of Commerce in Waterloo, Iowa, reported that it took ten years to push through a smoke control program, because of fear of unfair regulations. Three Cincinnati newspapers have devoted 3,000 to 4,000 column inches of space to air pollution control and the subject of cleaner air each year. During Smoke Abatement Week, each classroom in all of the Junior and Senior high schools in Cincinnati received materials on the advantages of air pollution control. The San Francisco Bay Area Council in a 1949 report on air pollution, recommended that voluntary programs be established in the San Francisco area in which industry, commerce and owners of multiple residences, as well as the general public could cooperate with local government

agencies. The Council pointed out that San Francisco's location provided a natural dilution zone for air pollution and that "smog" was not yet a serious problem. However, the Council also recommended the creation of a Bay Area Air Pollution Group which would serve as a clearing house of technical information on the problem. Authorities in the fields of sanitation, industry, government and private or public technical agencies, were recommended for representation in such a group.

Zoning as a Means of Control

Zoning ordinances frequently prohibit from certain districts or the entire community, industries which by reason of emission of smoke, noise, dust etc., are obnoxious. Positive zoning groups permitted industries in relation to the degree of their "nuisance value." However, a different type of ordinance--that in which abatement of smoke, etc., is prescribed by the Board of Adjustment--is illustrated in the Huntsville, Alabama, zoning ordinance adopted July 14, 1950. The preliminary zoning ordinance of September 1950 for Bridgeport, Alabama, contains the same provisions.

> "The Board of Adjustment may require the conduct of any use, conforming or nonconforming, which results in unreasonable noise, smoke, gas, vibration, fumes, dust, fire, radio interference or explosion hazard or nuisance to surrounding property to be modified or changed to abate such hazard to health, comfort, and convenience. The Board of Adjustment may direct the Building Inspector to issue an abatement order, but such order may be directed only after a public hearing by the said Board, notice of which shall be sent by registered mail to the owners and/or operators of the property on which the use is conducted in addition to due notice by advertisement in a newspaper of general circulation. A hearing to consider issuance of an abatement order shall be held by the Board of Adjustment either upon petition signed by any person affected by the hazard or nuisance or upon the initiative of the Board. An abatement order shall be directed by the Board of Adjustment only upon reasonable evidence of hazard or nuisance and such order shall specify the date by which the hazard or nuisance shall be abated."

State Action

Interesting state action to curb air pollution includes the following. In Utah (Laws of Utah, 1941, Chapter 75, Section 19), the State Department of Publicity and Industrial Development was empowered to initiate and assist the elimination of excessive smoke in areas where it is detrimental to the health and happiness of state residents. Instead of regulating industries, their cooperation is sought. York (Thompson's Laws of New York, 1939 - General Corporation Law, Section 230), may revoke the charter of a New York corporation which unreasonably injures or endangers the health or safety of state inhabitants by the emission of dust, smoke, gas, steam or other offensive or noxious odors or fumes from plants outside the

the state, but close enough to the state line to affect New York residents. Corporations chartered elsewhere, but licensed to do business in New York State, may similarly have their certificates to do business revoked. This legislation does not apply to businesses operated by individuals or partnerships, but just to corporations--therefore, it may lend itself to constitutional objections. Also, in New York, there is a statute (Thompson's Laws of New York, 1939, Vehicle and Traffic Law, Section 81 13) which prohibits the operation on a highway of a vehicle which emits unnecessary smoke or offensive vapors. New Jersey gives authority to local health officials to control atmospheric pollution from any source (Sections 26.3--45 to 26.3--63 of the Revised Statutes of New Jersey, 1939).*

California adopted in 1947 (Chapter 632), a statute which provides for the creation of air pollution control districts. The act states: "The legislature finds and declares that the people of the State of California have a primary interest in atmospheric purity and freedom of the air from any contaminants and that there is pollution of the atmosphere in many portions of the State which is detrimental to the public peace, health, safety, and welfare of the people of the State."

The air pollution control district is conterminous with the county in which it is situated. To date, only one such district has been established--that for Los Angeles County. A board is established and the powers given to the board include the following:

> "24262. Whenever the air pollution control board finds that the air in the air pollution control district is so polluted as to cause any discomfort or property damage at intervals to a substantial number of inhabitants of the district, the air pollution control board may make and enforce such orders, rules, and regulations as will reduce the amount of air contaminants released within the district.
>
> "24263. The air pollution control board may require by regulation that before any person builds, erects, alters, replaces, operates, or uses any article, machine, equipment, or other contrivance specified by such regulation the use of which may cause the issuance of air contaminants, such person shall obtain a permit to do so from the air pollution control officer.
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> "Insofar as the regulations do not grant an automatic permit for the operation or use of any article, machine, equipment or

*The material in this paragraph is drawn from Air Pollution Legislation, Illinois Legislative Council Publication 101, Springfield, Illinois; August 1950. This report suggests, among other items, that Illinois might attempt to regulate by interstate compact those areas where pollution crosses state boundaries. The Chicago - East St. Louis - St. Louis and the Rock Island - Moline - Davenport areas are suggested as possible locations in which such action might be effective.

other contrivance in existence upon the effective date of such regulations, a permit shall not be required without first affording the owner, operator, or user thereof a reasonable time within which to apply for such permit, and to furnish the air pollution control officer the information pursuant to Section 24269."

Persons within a functioning air pollution control district are prohibited from the following:

"24242. A person shall not discharge into the atmosphere from any single source of emission whatsoever any air contaminant for a period or periods aggregating more than three minutes in any one hour which is:

(a) As dark or darker in shade as that designated as No. 2 on the Ringelmann Chart, as published by the United States Bureau of Mines, or

(b) Of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in subsection (a) of this section.

"24243. A person shall not discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health or safety of any such persons or the public or which cause or have a natural tendency to cause injury or damage to business or property.

"24245. This article does not apply to smoke from fires set by or permitted by any public officer if such fire is set or permission given in the performance of the official duty of such officer, for the purpose of weed abatement, the prevention of a fire hazard, or the instruction of public employees in the methods of fighting fire, which is, in the opinion of such officer, necessary."

The following are exempted from the provisions of the statute; mobile equipment; residences for not more than four families; an incinerator used for such a structure; barbecue equipment for such a structure; certain agricultural uses; and orchard or citrus grove heaters, if such heaters produce unconsumed solid carbonaceous material at the rate of 1 gram per minute or less.

Although mobile equipment is exempted, there is a provision that the air pollution control officer may stop, detain, and inspect any vehicle designed for and used on a public highway, but which does not run on rails. The air pollution control officer may also during reasonable hours, for the purpose of enforcing or administering

the chapter or any rules and regulations, "enter every building, premises, or other place, except a building designed for and used exclusively as a private residence."

An amendment to the statute provides that two or more counties which have activated air pollution control districts may merge the several districts into one provided that county employees act only in the zone comprising the county in which they are employed. The cost of the unified district is to be paid in proportion to the population of the several counties included in the district.

Some criticisms have been raised on the administration of the California statute. One of the rules of the air pollution district requires that plans of air purification devices must be submitted in detail before the director of air purification control will approve their use by the applicant. A special committee recommended (Report of the Special Smog Committee of 1948, Los Angeles County Grand Jury) that this rule be eliminated because it felt that an inventor or manufacturer would not make new devices so long as he was required to disclose his trade secrets. Another committee, the Interim Fact-Finding Committee on Water Pollution, in its interim report on Air Pollution Research (April 13, 1950) felt that the research provisions of the existing agency were not sufficient and suggested that it would be desirable for an appropriation of $150,000 to be made to establish a comprehensive research project in the State Department of Health. An advisory committee composed of nominees by the directors of state departments concerned and by the presidents of the universities of the state, of the state conference of local health officers, of the Los Angeles County Medical Association, and of the two state-wide industrial organizations--the Chamber of Commerce and the California Manufacturers' Association, was also proposed. This bill has not yet been adopted --it was suggested that it be deferred until Los Angeles officials had had an opportunity to further operate under the existing law.

By February 1949, when hearings were held on the experiences with the statute by the Assembly Interim Committee on Governmental Efficiency and Economy, the Committee was informed by the Los Angeles County Air Pollution Control District that in less than a year, 289 authorizations had been issued to construct air pollution control equipment costing $4,370,000. Over 13,400 inspections had been made and over 2,000 notices were served on violators. Forty-two out of the 57 open rubbish burning dumps in the county had been closed. A major refinery had expended approximately $3,000,000 to correct air pollution through the recovery of sulphur compounds. All the major refineries in the county had prepared plans to recover their sulphur gases and when the recovery equipment was constructed, it was anticipated that more than 70 per cent of the sulphur compounds being released into the air will be recovered. Another plant--a chemical plant costing approximately $1,000,000--was recently put into operation to recover sulphur compounds for three other major refineries. The lumber and furniture industry had installed a number of new incinerators and remodeled others to prevent smog and fly ash. Open hearth steel plants had installed three types of equipment to determine which would remove the greatest amount of dust from their stacks. A plant which reworks and melts old battery plates for lead recovery, had started a bag house installation at a cost of $225,000. Six hundred pounds of dust per day

were to be recovered from that plant.

The Los Angeles air pollution control district revealed that by its measurements, a 30 per cent improvement in visibility and a 25 per cent removal of total contaminants resulted from the activities of the district. However, the Interim Fact-Finding Committee on Water Pollution found that the general belief as revealed by a survey of public opinion in Los Angeles, was that the occurrence of smog during that period was more frequent and more intense than in previous years. Therefore, the public did not feel that there was a substantial reduction in smog. This was perhaps due to the increased awareness of the problem and therefore a more critical notice of the presence of air pollution.

Legal Interpretation of Smoke Abatement and Air Pollution Control

Chicago adopted a smoke abatement ordinance in 1881. This was upheld by the Illinois Supreme Court in the case of Harmon v. City of Chicago, 110 Ill. 400 (1884). Other cases upholding ordinances include City of Chicago v. Dunham Towing and Wrecking Company, 161 Ill. App. 307 (1911); and Glucose Refining Company v. City of Chicago, 138 F 209 (1905). However, in 1944, the Illinois Supreme Court refused to uphold an anti-smoke ordinance of Kankakee in the case of City of Kankakee v. New York Central Railroad Company, 387 Ill. 109. The railroad had maintained a roundhouse in the city for many years, and the city tried to obtain an injunction against the railroad to stop the smoke emitting from the roundhouse. The court voided the ordinance because it would make operations by the railroad prohibitively expensive, and because it provided for an unwarranted delegation of arbitrary power to the building inspector.

A more recent case, however, is that of Board of Health of Weehawken Township v. New York Central Railroad Company, 72 Atl. (2d) 511 (New Jersey, March 27, 1950) in which an ordinance penalizing the emission of smoke of a density greater than that of No. 2 on the Ringelmann Chart was held applicable to a railroad power plant.

In the case of Penn-Dixie Cement Corporation v. City of Kingsport, Supreme Court of Tennessee (December 17, 1949), 225 S.W.(2d) 270, the court held that a smoke abatement ordinance was valid even though there was no specific authorization under the city charter or general laws regarding such control. The court said, 'We think it would be a super-human task, in fact, beyond the ken of mortal man, for the legislature to specifically point out every condition that might be regarded as detrimental to public health and safety..." "When, therefore, the legislature confers upon a municipality authority to safeguard the public health, it is wholly unnecessary that the charter or general law should go further and declare that smoke and dust are detrimental to health. Everybody knows that it is..." (This case is reported in the ZONING DIGEST, Volume 2, February 1950, page 26, published by ASPO).

In 1942, a St. Louis ordinance adopted in 1940 was upheld in the case of Ballentine v. Nestor, 350 Mo. 58, 164 S.W. (2d) 378. A fine had been imposed

for violating a section of the ordinance which provided for the use of "smokeless" fuel for hand-fired or surface-burning types of equipment. The court also found that because all smoke emitting uses were not controlled was not sufficient basis for voiding the ordinance. "The legislative authorities may classify with reference to an evil to be prevented, and legislation designed to prevent one evil is not void because it does not prevent another."

"Legal Aspects of Air Pollution Control" by Harold W. Kennedy, in the Municipalities and the Law and Action, 1947, published by the National Institute of Municipal Law Officers, is a full substantiation of the opinion that the smoke and fumes nuisance can be eliminated in Los Angeles County and vicinity. The following material is drawn from this article. The author states that the leading case on the constitutional limitations on smoke abatement is Northwestern Laundry v. Des Moines, 239 U.S. 486, 60 L. ed. 396, 401 (1915), which upholds the constitutionality of such ordinances. Smoke may be forbidden without reference to the time or quantity of emission or the immediate surroundings. A good statement on the general and prevailing rule in regard to smoke as a public nuisance is that expressed in the case of Bowers v. City of Indianapolis, 162 Ind. 105, 81 N.E. 1097. However the validity of the ordinance or statute need not depend upon whether or not the emission of smoke or fumes is a nuisance. The police powers are adequate to permit the state to control as an act to protect the general welfare and comfort of the people. A leading case on this subject is that of In re Junqua, 10 Cal. App. 602, 605 (1909).

A statute or ordinance is not invalid and unreasonable merely because there is no known appliance to permit compliance. In the case of Moses v. United States, 16, App. D.C. 428, 50 L.R.A. 532, the court said in part: "that there may be no smoke-consuming appliances that will, under all circumstances, prevent the nuisance, is not a matter of relevancy. The facts concerning them were presumably within the knowledge of Congress also when it took action; and no provision has been made for their use. The use of smokeless fuel instead, may have been expressly contemplated."

In the case of People v. Detroit White Lead Works, 82 Mich. 471, 46 N.W. 735 (890), the court said, "Whenever such a business becomes a nuisance, it must give way to the rights of the public, and the owners thereof must either devise some means to avoid the nuisance or must remove or cease the business. It may not be continued to the injury of the health of those living in its vicinity." However, the article cites examples of other cases in which businesses were considered not to be guilty of violations because they were using the best known modern appliances to prevent smoke and fumes.

The courts have also held that it is not necessary to prove impairment to health to control the emission of smoke and fumes. In the case of Judson v. Los Angeles Suburban Gas Company, 157 Cal. 168 (1910), the court said, "In order that a judgment of this character may be upheld, it is not necessary that the health of the plaintiff or of members of his household should have been impaired. It is sufficient if the odors, sounds, and smoke were offensive to the senses..."

The Role of the Planning Commission

The planning commission will be interested in securing effective air pollution control as one part of its program to enhance the attractiveness and liveability of a community. It will want to keep air pollution in mind when advocating such things as sanitation programs (for example, sanitary landfill may be preferable to open dump burning), or the types of industries that may be permitted within a community. Industries which would otherwise be considered obnoxious, might be permitted to locate within certain districts if proper air pollution controls were provided. On this latter subject, the Louisville and Jefferson County Planning and Zoning Commission worked out a contract with a phosphate fertilizer company, in which the company promised to install equipment which would prevent the emission of odors, gases or dust.

A sample contract reads as follows:

Louisville and Jefferson County Planning
and Zoning Commission
Louisville, Kentucky

Gentlemen:

We have heretofore applied for permission to construct and operate a superphosphate plant on our 50 acre tract of land located on the L H & St. L Railroad in the vicinity of Strawberry Lane in Jefferson County, which plant will be new and modern in every respect, employing the latest and approved equipment and in consideration of your granting us permission to erect and operate this plant, we hereby give you assurances and guarantee that the modern equipment we will install will take care of all odors, gasses, or dust eminating therefrom so that said odors, gasses and dust will not, in any way, damage or injure any person, property or business and will at all times keep our equipment in said condition and operate our plant so as to accomplish all of the foregoing.

Should we fail to accomplish this as determined by appropriate legal processes, we will discontinue operation of the plant until the faults are corrected.

Very truly yours,
(Signed by Company)

Approved by
(County Attorney)

The planning commission should take a comprehensive view of the air pollution problem, as of other problems, and should consider, for example, the importance of regulating (or educating) the individual residence or home owner as well as commerce and industry. Since air pollutants are not retained within corporate boundaries, the planning commission should be interestdd in county-wide, inter-county and, possibly, inter-state action.

APPENDIX (A)

SAMPLE AIR POLLUTION CONTROL ORDINANCE

Chapter 1562 -- Ordinance No. 61, Approved January 17, 1947

Be it ordained by the City of Providence:

Section 1. The following definitions are adopted for the purpose of this Ordinance.

1. Dust: Gas-borne particles larger than 1 micron in mean diameter.

2. Dust Separating Equipment: Any device for separating dust from the gas medium in which it is carried.

3. Fuel-Burning Equipment: Any furnace, incinerator, refuse-burning equipment, boiler, apparatus, device, mechanism, stack or structure used in the process of burning fuel or combustible material.

4. Fumes: Gases or vapors that are of such character as to create an uncleanly, destructive, offensive or unhealthful condition.

5. Internal Combustion Engine: An engine in which combustion of a gaseous liquid or pulverized solid fuel takes place within one or more cylinders.

6. Open Fire: Any fire wherein the products of combustion are emitted into the open air and are not directed thereto through a stack or chimney.

7. Person: Any individual, partnership, association, syndicate, company, firm, trust, corporation, government corporation, department, bureau, agency, or any other entity recognized by law as the subject of rights and duties.

8. Residence: A building arranged, intended or designed to be occupied by not more than 4 families living independently of each other and doing cooking upon the premises.

9. Ringelmann-Smoke Chart: The Ringelmann Chart with instructions for use as published by the U.S. Bureau of Mines, 1945.

10. Smoke: Small gas-borne particles consisting essentially of carbonaceous material in sufficient number to be observable.

11. Soot: Agglomerated particles consisting essentially of carbonaceous material.

12. Stack or Chimney: Flue, conduit or opening arranged for emitting gases into the open air.

13. Technical Engineer: A person qualified by law to practice professional engineering.

14. Volatile: The gaseous constituents of solid fuels as determined by the Standard A.S.T.M. Procedure amended or revised to date.

High volatile fuel shall be all fuel containing over 31% volatile matter and low volatile fuel shall be all fuel containing 31 or less per cent volatile matter. The average volatile content shall be computed on a moisture and ash-free basis of each delivery of the fuel correct to within plus or minus 2%.

Section 2. Organization. There is hereby established within the Department of the Public Service Engineer a Division of Air Pollution, the Chief of which shall be known as the Chief Air Pollution Regulation Engineer.

As soon as may be after the passage of this Ordinance, an Advisory Board of five (5) members shall be appointed by the Mayor, at least two of whom shall be Technical Engineers, and at least one a Doctor of Medicine. One member of said Board to serve until the first Monday in January A.D., 1948, a second member to serve until the first Monday in January, A.D. 1949, a third member to serve until the first Monday in January A.D. 1950, a fourth member to serve until the first Monday in January A.D. 1951 and a fifth member to serve until the first Monday in January A.D. 1952; and annually on the first Monday in January thereafter, one such member shall be appointed in like manner for a term of five years.

As soon as may be after the passage of this Ordinance, an Appeal Board of five members shall be appointed by the Mayor at least two of whom shall be technical engineers, and at least one a doctor of medicine; one member of said Board to serve until the first Monday in January A.D. 1948, a second member to serve until the first Monday in January A.D. 1949, a third member to serve until the first Monday in January A.D. 1950, a fourth member to serve until the first Monday in January A.D. 1951 and a fifth member to serve until the first Monday in January A.D. 1952; and annually on the first Monday in January thereafter, one such member shall be appointed in like manner for a term of five years. Members of the Appeal Board may not be members of the Advisory Board.

The Public Service Engineer shall appoint, with the advice and consent of the Mayor, a Chief Air Pollution Regulation Engineer. The engineer so appointed shall be qualified by technical training and experience in the theory and practice of the design, construction and operation of fuel-burning equipment, particularly as affecting smoke regulation; and shall be a licensed professional engineer of the State of Rhode Island.

There shall also be employed three assistants to serve at the pleasure of the Public Service Engineer.

All employees in said division shall be appointed in accordance with the provisions of such laws, Ordinances or Resolutions as may govern the employment,

qualification, classification or compensation of employees of the City.

Section 3. Duties of the Division of Air Pollution Regulation.

A. The duties of the Advisory Board shall include the following:

1. To act as adviser to the Chief Air Pollution Regulation Engineer.

2. To consider and approve or veto such rules and regulations as may be prescribed by the Chief Air Pollution Regulation Engineer.

B. The duties of the Appeal Board are set forth in Section 11 hereof.

C. The duties of the Chief Air Pollution Regulation Engineer, who shall be responsible for the administration of the Division of Air Pollution Regulation for the enforcement of this Ordinance, the rules and regulations issued thereunder, and for other duties pertinent thereto, include:

1. The investigation of complaints and the making of inspections and observations of air pollution conditions.

2. The issuance of permits, certificates and notices; the keeping of applications, plans, permits, certificates, violations, complaints, and other records on file for Division purposes only.

3. The examination of the plans for all new buildings and for the alteration of all existing buildings in order to assure that they are in accordance with the rules and regulations established by air pollution Ordinance.

4. The examination for approval of the application and plans for the construction, installation or alteration of any fuel burning equipment or any equipment pertaining thereto.

5. The inspection for approval of the installation of all equipment pertaining to air pollution.

6. The annual inspection of all equipment pertaining to air pollution under the jurisdiction of this Ordinance.

7. The publication and dissemination of information on methods of smoke and other air pollution reduction.

8. The enlistment of the cooperation of civic, technical, scientific and educational societies.

Section 4. Establishment of Rules and Regulations.

The Chief Air Pollution Regulation Engineer is hereby authorized to prepare

and promulgate, with the advice and approval of the Advisory Board, rules and regulations for the installation and operation of fuel-burning equipment and all other devices susceptible for use in such a manner as to violate the provisions of the Ordinance; as to the grade of fuel to be used for various types of equipment; and as to necessary auxiliary devices that aid in meeting the requirements of this Ordinance.

The Chief Air Pollution Regulation Engineer may from time to time alter, amend, or rescind, with the advice and approval of the Advisory Board, such rules and regulations and promulgate such amended or additional rules and regulations as deemed advisable. Such rules and regulations as may be prepared, revised, amended, or rescinded, shall be made effective 30 days after their publication in a newspaper of general circulation in the City.

Section 5. Installation Permits and Operating Permits.

No person shall construct, install or alter any fuel-burning equipment or any equipment pertaining thereto for use within the City of Providence, excepting internal combustion engines in the propulsion or operation of automobiles, trucks or buses, until an application including suitable plans and specifications of the fuel-burning equipment and structures or buildings used in connection therewith has been filed in duplicate by the person or his agent in the office of, and has been approved by, the Chief Air Pollution Regulation Engineer, and an Installation permit issued by him for such construction, installation or alteration.

The above-mentioned plans and specifications shall show the form and dimensions of the fuel burning equipment, more particularly the proposed boiler, furnace, fuel burner, stack and ducts, together with the description and dimensions of the building or part thereof in which such fuel burning equipment is to be located, including the means provided for admitting the air for combustion. The character of the fuel to be used, the maximum quantity of such fuel to be burned per hour, the operating requirements, and the use to be made of such fuel burning equipment shall be stated.

Provided, however, that the maintenance or minor alterations which do not change the capacity of such fuel burning equipment and which do not involve any change in the method of combustion or adversely affect the emission of smoke, dust, or fumes therefrom, may be made without an installation permit; and further provided that an emergency repair may be made prior to the application for, and the issuance of, a required installation permit in the event an emergency arises and serious consequences would result if the repair were to be deferred. When such repair is made in emergency, application for the installation permit therefor shall be filed in duplicate by the person or his agent in the office of the Chief Air Pollution Regulation Engineer on the first business day following the starting of such work.

Any application shall be approved or rejected within ten (10) days after it is filed in the office of the Chief Air Pollution Regulation Engineer. Upon the approval

of the application and upon the payment of the prescribed fees, the Chief Air Pollution Regulation Engineer shall issue a permit for the construction, installation or alteration of such fuel burning equipment.

Without the approval of the Chief Air Pollution Regulation Engineer no construction, installation or alteration shall be made which is not in accordance with the plans, specifications, and other pertinent information upon which the installation permit was issued.

Violation of the installation permit shall be sufficient cause for the Chief Air Pollution Regulation Engineer to stop all work and he is hereby authorized to seal the installation, and further work shall not proceed until the Chief Air Pollution Regulation Engineer is assured that the violation in question will be corrected and that the work will proceed in accordance with the Installation permit.

No person shall violate the seal on any fuel burning equipment that has been sealed at the direction of the Chief Air Pollution Regulation Engineer unless authorized by him in writing to do so.

Each day of work of such construction, installation, or alteration in violation of this section shall constitute a separate offense.

If construction, installation or alteration is not started within one year of the date of the installation permit, the permit shall become void and all fees paid shall be forfeited.

No person shall use or cause to be used any new or altered fuel burning equipment or any equipment pertaining thereto for which an Installation permit was required or was issued until an Operating permit has been issued by the Chief Air Pollution Regulation Engineer; provided that where emergency repairs have been made without an installation permit, pursuant to paragraph 3 of this section, such equipment may be operated without securing an operating permit, if serious consequences would result if the operation was deferred. The application for an installation permit following such emergency repair and operation shall be accompanied by an application for an operating permit.

The Chief Air Pollution Regulation Engineer is hereby authorized to seal the equipment in operation upon which an operating permit has not been obtained as required in this Ordinance.

Each day of operation previous to obtaining an operating permit shall constitute a separate offense.

The issuance by the Chief Air Pollution Regulation Engineer of any installation permit or operating permit shall not be held to exempt the person to whom the permit has been issued or who is in possession of the same, from prosecution for the emission of smoke, dust and fumes prohibited by this Ordinance.

Section 6. Annual Inspection. An annual inspection of all fuel-burning equipment under the jurisdiction of this Ordinance, excepting internal combustion engines used in the propulsion or operation of automobiles, trucks or buses and equipment used in any residence for heating or cooking, fuel-burning equipment of comparable size or capacity, whether or not a previous operating permit or certificate of operation allowing use of plans has been issued by the Chief Air Pollution Regulation Engineer, shall be made to see that such equipment and plant can be operated within the provisions of the Ordinance. Upon notice that the equipment has been found to comply with the provisions of the Ordinance, and after payment of the prescribed fee, the Chief Air Pollution Regulation Engineer shall issue a Certificate of Operation which shall be posted in a conspicuous place within the plant.

If at the time of the annual inspection, or of any inspection subsequent to the issuance of the Certificate of Operation, it is found that the equipment is in such condition that it cannot be operated within the provisions of the Ordinance, the Chief Air Pollution Regulation Engineer shall give notice in writing to the person owning, operating or in charge of such equipment of the defects found and order to correct, repair, or replace, the defective equipment. Failure to comply with this order within 30 days from its date shall be a violation of this section and the Chief Air Pollution Regulation Engineer is hereby authorized to seal the equipment. No person shall violate the seal on any equipment that has been sealed at the direction of the Chief Air Pollution Regulation Engineer unless authorized by him in writing to do so.

Each day of failure to comply after the 30 days shall constitute a separate offense.

Section 7. Schedule of Fees. The following fees shall apply for the Installation Permit:

One half of existing building permit fee schedule except no fee up to $100 cost, and a minimum fee of $2 for over $100 cost.

A fee of $2 shall be charged for the Operating Permit.

A fee of $5 shall be charged for the Certificate of Operation.

Section 8. Emission Prohibited and Standards of Measurements.

No person shall cause, suffer or allow to be discharged from any fuel-burning equipment, internal combustion engine, premises or open fire excepting railroad locomotives or vehicles, smoke the shade or density of which is equal to No. 2 of the Ringelmann chart for a period aggregating 8 minutes or more in any 30 minutes, or smoke the shade or density of which is greater than No. 2 of the Ringelmann chart except for a period or periods aggregating 3 minutes in any 15 minutes when building a new fire, cleaning a fire, or when breakdown of equipment occurs such as to make it evident that the emission was not reasonably preventable.

No person shall cause, suffer or allow to be discharged from any railroad locomotive or vehicle, smoke the shade or density of which is equal to No. 2 of the Ringelmann chart for a period aggregating 8 minutes or more in any 30 minutes, or smoke the shade or density of which is greater than No. 2 of the Ringelmann chart except for a period or periods aggregating 30 seconds in any 2 1/2 minutes, when building a new fire, cleaning a fire, or when breakdown of equipment occurs such as to make it evident that the emission was not reasonably preventable.

For the purpose of grading the shade or density of smoke, the Ringelmann chart as now published and used by the U.S. Bureau of Mines, which is hereby made a part of the Ordinance by reference, shall be standard.

No person shall cause, suffer or allow to be discharged from any fuel burning equipment or premises or to pass any convenient measuring point in the stack, dust in the gases to exceed 0.85 per 1000 lb. of gases, adjusted to 12 per cent CO_2 content for products of combustion. The amount of solids in the gases shall be determined according to the Test Code for Dust-Separating apparatus of the American Society of Mechanical Engineers, revised and amended to date, which is hereby made a part of this Ordinance by reference.

No person shall cause, suffer or allow to be discharged from any fuel burning equipment, internal combustion engine, railroad locomotive, vehicle, premises, open fire, or stack, fumes that are a detriment to the property of others or that are a nuisance to any person not being therein or thereupon engaged.

After any person owning, operating or in charge or control of any premises has been previously notified of three or more violations of this section within any consecutive 12-month period, in respect to the emission of smoke, dust or fumes, the person owning, operating or in charge of control of these premises shall be notified to show cause before the Chief Air Pollution Regulation Engineer on a day certain, not less than 10 days from the date of notice, why the equipment causing such violations should not be sealed. The notice herein provided for may be given by mail directed to the last known address of the person to be notified, or if the person or his whereabouts is unknown, then by posting a notice on or near the premises at which the violations shall have occurred. Upon this date the person may appear and be heard. Upon such hearing, if the Chief Air Pollution Regulation Engineer finds that adequate corrective means and methods have not been employed to correct the cause of such condition, then it shall be his duty to seal the equipment until such time as an installation permit and operating permit, as provided under this Ordinance, have been applied for and issued for the equipment.

No person shall violate the seal on any fuel burning equipment that has been sealed at the direction of the Chief Air Pollution Regulation Engineer unless authorized by him in writing to do so.

Each day's violation of this provision shall constitute a separate offense.

Section 9. Fuel and Equipment Dealers. No person shall sell or deliver any solid fuel in the City of Providence unless each delivery is accompanied by a certificate or bill of sale left with the buyer, on which is plainly written, printed, or stamped the name of the person making the sale or delivery, the designation of the fuel as high or low volatile.

All persons engaged in the business of retailing fuel-burning equipment shall report in writing to the Chief Air Pollution Regulation Engineer the sale or lease of every such piece of equipment to be installed or used within the City of Providence within 10 days after the date of the sale or lease, together with a statement of the address of the building or buildings in which the equipment is to be installed and used.

Any person violating any of the provisions of this section, or making any false statement or report in connection with the sale or lease of any article mentioned in this section, shall be subjected to fine and penalties as provided in this Ordinance.

Section 10. Entrance to Premises. No person shall in any manner hinder, obstruct, delay, resist, prevent, or in any way interfere or attempt to interfere with the Chief Air Pollution Regulation Engineer or any of the personnel of his Division in the performance of any duty herein enjoined or refuse to permit such inspectors to perform their duty by refusing them or any of them entrance to the premises at reasonable hours.

Section 11. Any person taking exceptions to and affected by any decision, ruling, regulation or order of the Chief Air Pollution Regulation Engineer may within 10 days after receiving notice of such decision, ruling, regulation or order appeal to the Appeal Board by filing with the Chief Air Pollution Regulation Engineer a notice of the appeal, specifying the grounds thereof, and the relief sought. A deposit of $25 shall be posted by the appellant at the time of filing of the appeal to cover the cost of the hearing. The Chief Air Pollution Regulation Engineer shall forthwith furnish to the Appeal Board all the papers relating to the case and the Appeal Board shall set a date not less than 5 days nor more than 10 days after the date of filing the appeal for the hearing, and shall give notice thereof by mail to all interested parties. Such an appeal shall act as a stay of the decision, ruling, regulation or order in question until the decision of the Board has been rendered. The Board shall within a period of 10 days after the hearing affirm, modify or set aside the decision, ruling, regulation or order of the Chief Air Pollution Regulation Engineer. The decision of the Appeal Board shall be binding on the Chief Air Pollution Regulation Engineer. The applicant may appear at the hearing in person or may be represented by an agent or attorney. If the decision of the Chief Air Pollution Regulation Engineer is affirmed by the Board, the deposit shall be forfeited to the city. If the decision is reversed or modified, the cost of the hearing shall be borne by the city and the deposit refunded.

Section 12. Persons Liable. All persons owning, operating, or in charge

or control of any equipment who shall cause or permit or participate in any violation of this Ordinance either as proprietors, owners, lessees, tenants, managers, superintendents, constructors, installers, mechanics, repairmen, captains, janitors, engineers, firemen or otherwise shall be individually and/or collectively liable for any penalties imposed by this Ordinance.

Section 13. Prosecutions and Fines. Prosecutions under this Ordinance shall be instituted by the Chief Air Pollution Regulation Engineer and shall be prosecuted in the name of the City of Providence.

Any person upon conviction of violating any one of the provisions of this Ordinance shall be liable to a fine of not more than $100 for each day's violation of this Ordinance.

Section 14. Coordination of Departments. No permit for the erection, construction or alteration of any building, plant or structure related in any manner to fuel-burning equipment shall be issued by any department of the City Government until the Chief Air Pollution Regulation Engineer has issued an installation permit covering the equipment under his jurisdiction to be used in the building, plant or structure as provided in section 5, or has indicated that in his judgment the plans submitted will permit the installation of facilities adequate for compliance with the provisions of this Ordinance.

Section 15. General Provisions. If any clause, provision or section of this Ordinance shall be declared to be unconstitutional or void, such clause, provision or section shall be excluded from the provisions of this Ordinance but the remainder of the Ordinance shall remain in force, the City Council thereby declaring that it would have passed the remaining portions of this Ordinance notwithstanding such invalidity.

This Ordinance shall take effect upon its passage and all Ordinances and parts of Ordinances inconsistent with the provisions of this Ordinance are hereby repealed.

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The Smoke Prevention Association of America, (reports of which are mentioned above) has been reconstructed and expanded to form the Air Pollution and Smoke Prevention Association of America, Inc., 505 King Avenue, Columbus 1, Ohio. Mr. Charles W. Gruber is President, and Mr. Charles N. Harrison (who is Executive Secretary of the Smoke Abatement League in Cincinnati) was chairman of the National Smoke Abatement Week Committee.

The U.S. Department of the Interior, Washington 5, D.C., released in February 1950, a list of its publications relating to air pollution, and indicated those papers still in print. Mr. Louis C. McCabe is the Chief of the Office of Air and Stream Pollution, Bureau of Mines.

Other agencies and institutions having expressed interest in air pollution control, include the following: The Mellon Institute of Industrial Research (Pittsburgh, Pennsylvania), the University of Illinois (Urbana, Illinois), the American Society of Mechanical Engineers (New York, New York), the American Chemical Society (New York, New York), and the Bituminous Coal Research, Inc. (Washington, D.C.), Stanford Research Institute (Stanford, California).