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INSPECTION MANUAL FOR ENFORCEMENT OF NEW SOURCE PERFORMANCE STANDARDS

ASPHALT CONCRETE PLANTS

U.S. ENVIRONMENTAL PROTECTION AGENCY
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INSPECTION MANUAL FOR ENFORCEMENT OF NEW SOURCE PERFORMANCE STANDARDS: ASPHALT CONCRETE PLANTS

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SECTION 1

INTRODUCTION

Pursuant to Section 111 of the Clean Air Act, (42 USC §1857 et seq.) the Administrator of the Environmental Protection Agency must from time to time promulgate standards of performance for new stationary sources which are considered to contribute significantly to air pollution. Proposed standards for new asphalt concrete plants were issued in the Federal Register of June 11, 1973, including standards of performance for particulate matter and opacity. Final standards (40 CFR 60.92) are effective February 28, 1974, and apply to all sources whose construction or modification commenced after June 11, 1973. By "commenced" is meant that an owner or operator has undertaken a continuous program of construction or modification or that an owner or operator has entered into a contractual obligation to undertake and complete within a reasonable time a continuous program of construction or modification. (40 CFR 60.2)

Applicable law permits EPA to delegate implementation and enforcement authority on such new or modified sources, except those owned by the U.S. government, to the states if the state plan is deemed adequate. Furthermore, a state can adopt and enforce an emission standard or limitation of its own provided that it is not less stringent than the federal standards of performance for new sources.

Regulations for existing plants vary from state to state, and are frequently written in different terms--either as a function of process weight, as a percentage of potential emission, or as particulate concentration. Sometimes provision is made for one or the other of these requirements to be met based on which one provides either the larger or smaller allowable emission. Methods of testing also vary: for example Pennsylvania requires only one test but specifies that condensibles be included, whereas federal standards of performance for new sources require three tests but condensibles are not included.

Because of differences such as these in regulations and in permit procedures it is important that coordination of activities between the state agency and EPA Regional Office be current and complete. EPA has established guidelines for administrative procedures states should adopt to effectively implement and enforce the program for standards of performance for new sources.

This manual contains guidelines for the conduct of field inspections which, together with monitoring of performance tests, constitute the basic enforcement tools of the new source program. Successful operation of the program depends in large degree on how effective the monitoring and field inspection function are conducted.

This manual is essentially divided into two parts. The first part comprising Sections 1 through 7 present the federal inspector with background information on the regulations, industry, process, raw materials, emissions, and control approaches. The second part covers a step-by-step procedure for conducting a field inspection and for monitoring a performance test.

Three forms are included in Section 8, and these may be photo-copied and used by the inspector in monitoring tests and conducting field inspection. Their use is described in the text. These forms are:

- Performance Test Observation Form
- Parametric Evaluation Form
- Inspection Data Form for Asphalt Concrete Plants

It is estimated that the function of monitoring a performance test will require the inspector to spend between one and one and a half days in the field depending on the production schedule of the plant and the efficiency of the test crew. Subsequent field inspection visits should take between two and four hours after arriving at the site. Neither of these estimates include preparation time or time after the visits for any follow through action necessary.

SECTION 2

REGULATIONS

Air pollution control regulations applicable to the asphalt concrete industry are described here.

2.1 Authority for Promulgation of Standard of Performance for New or Modified Sources

Authority for promulgation of the Standards of Performance for new sources is contained in Section 111 of the Clean Air Act (42 U.S.C.§1857 et seq.) which directs the administrator of EPA to publish and update a list of categories of stationary sources which are considered significant sources which contribute to the endangerment of public health or welfare. From this list standards of performance for new and modified sources within each category must be promulgated.

2.2 Standards of Performance for New or Modified Asphalt Concrete Plants

The standards for asphalt concrete plants were proposed on June 11, 1973, (38 FR 15406) along with several other source categories. The final version of the standards was published on March 8, 1974, (39 FR 9308) effective February 28, 1974, for plants whose construction on modification is undertaken after June 11, 1973.

The following are the final promulgated standards for asphalt concrete plants (40 CFR 60.92). A reprint of the Standards of Performance for new sources (40 CFR 60) is contained in the Appendix.

1. No more than 90 mg/dscm (0.04 gr./scf).
2. Less than 20% opacity.

"The concentration standard applies to emission of particulate matter from the control system, as evidenced by the test methods required for determining compliance with this standard."[1]

The opacity standard is to insure that emissions of particulate matter are properly collected and vented to a control

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[1] Background Information for New Source Performance Standards Volume 3, pg. 9, APTD-1352c.

system.[2] This applies to "dryers; systems for screening, handling, storing, and weighing hot aggregate; systems for loading, transferring and storing mineral filler; systems for mixing asphalt concrete; and the loading, transfer, and storage systems associated with emission control systems." (40 CFR 60.90) Therefore the opacity regulation covers all of the aforementioned sources and is not limited to stack emissions. The opacity limit is designed to insure proper operation and maintenance of process and control equipment.

2.3 Applicability

In the process of promulgating these standards there was some debate and misunderstanding as to what constitutes a new or modified source and therefore subject to the Standards of Performance for new sources.

The latest clarification on applicability was incorporated in the Standards of Performance for new sources (40 CFR 60.1) which read: "The provisions of this part apply to the owner or operator of any stationary source which contains an affected facility the construction or modification of which is commenced after the date of publication in this part of any standard (or, if earlier, the date of publication of any proposed standard) applicable to such facility." For the asphalt concrete industry the standards were first proposed on June 11, 1973, (39 FR 15406) and that would therefore be the cutoff date establishing applicability.

The term "commenced" also raised problems as to what exact point, in time, construction or modification would be considered by the administrator to have commenced. That point, as clarified in the Background Information for New Source Performance Standards regarding asphalt concrete and as defined in the standards (40 CFR 60.2), is when a "contractual obligation" for construction or modification is made to undertake and complete, within a reasonable time, a continuous program of construction or modification.

As to what constitutes a "modification", the regulation (40 CFR 60.2) goes into some detail on that point. In general a modification is construed to be "any physical change in, or change in method of operation of, an existing facility which increases the amount of any air pollutant (to which a standard applies) emitted into the atmosphere by that facility or which results in the emission of any air pollutant (to which a standard applies) into the atmosphere not previously emitted."

With respect to an existing portable asphalt concrete plant, Standards of Performance for new sources do not apply to such a plant following a change in its location unless such a change is accompanied by an increase in its emissions rate as determined by 40 CFR 60.14.

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[2] Background Information for NSPS, Vol. 3, pg.9.

2.4 Performance Test Requirements

As required by the Standards an operator shall submit the results of a performance test performed "within 60 days after achieving maximum production rate at which the affected facility will be operated, but not later than 180 days after initial start-up." (40 CFR 60.8)

Tests should be in accordance with EPA method 5 using only the front half on the train to determine compliance. Three separate test runs should be made with their arithmetic mean determining the emission rate.

2.5 State Regulations

The inspector should be familiar with all applicable state regulations before an inspection. He is therefore not only inspecting for new source violations, but also for violations of state regulations as well. In this connection it is stressed that the details of the state emission regulation and testing rules be examined since they vary from one jurisdiction to the other, sometimes in a major recognizable way, but also sometimes in subtle, easily overlooked details such as the definition of "condensible" particulate matter.

2.6 Emission of Hazardous Air Pollutants

Asphalt concrete plants using asbestos are subject to the National Emission Standards for Hazardous Air Pollutants (40 CFR 61.22 (c) (11)). These standards contain a prohibition on visible emissions to the outside air. Alternatively, the owner or operator of an asphalt concrete plant using asbestos may elect to use the air cleaning methods specified by 40 CFR 61.23.

SECTION 3

THE ASPHALT INDUSTRY

In dealing with asphalt concrete plants it is important to consider those attributes of their operation which bear on plant inspections. The industry can be classified as a widespread jobbing industry with a highly controlled product whose single largest customers are state and local governments. Except for one general type of product, all products have a technical restriction on use which precludes inventorying of the product except for very short periods. Thus the industry has the product characteristics of other jobbing activities such as machine shops and gray iron jobbing foundries, but in addition it has a unique restriction in that its main product cannot be stored for extended periods of time and generally cannot be transported more than two hours trucking distance.

The product of asphalt concrete plants is used for surfacing roads, airport runways, parking lots and driveways. It has other smaller uses such a liners in sanitary landfills, extruded curbs, and impoundment liners. About 70% of the product is used in state and county roads. In 1970 1,846 firms operated an estimated 4500 plants distributed nationally.[1] The widespread nature of the industry is a result of the national demand coupled with the fact that the product must be used hot and most often under strict state quality inspection. It is difficult to store in heated silos, and state regulations often limit the storage time. These limits are usually on the order of 24 hours. This also accounts for the selected use of portable asphalt plants where the plant moves to the job site, which is generally a large project. Except for size restrictions for road hauling there are few significant differences between portable and fixed plants. Most plants (about 75%) are permanent plants and are primarily located in urban areas, where there is a constant market for their product.[2]

The technical requirement for hot product has its counterpart in the temperature at the construction site. Not only must

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[1] Background Information for New Source Performance Standards, U.S. Environmental Protection Agency, APTD-1352c (Feb., 1974), pg. 77.

[2] Group Buying to Reduce Air Pollution Costs for Small Plants, J. A. Commins and Associates (August, 1972), pg. 2-3.

the product be at a certain temperature, but many states also will not permit laying operations when the ambient temperature at the job site is less than a specified minimum. The jobbing nature of the work together with the technical restrictions on use confront the inspector with the following:

- Depending on location some plants shut down in winter
- Product varies by job so that raw material content which may bear on potential emissions also varies
- Plant operation is sporadic because it "follows" work at a field site, and it is therefore difficult to plan an inspection when the plant is operating at maximum potential emission.

Approximately 300 million tons of asphalt concrete are produced in plants that range from 50 tons per hour to about 400 tons per hour. A 150 ton per hour plant is considered average, although, as in many industries, newly constructed plants tend to have larger capacities. Although plants have rated capacities, they frequently will operate below this figure due to the paving type produced, aggregate moisture content, and other factors that will be covered later in this manual.

With shipments in excess of three billion dollars per year, the asphalt batching industry is in the top 10% of manufacturing businesses. Growth trends depend on the amount of state and county road building and general commercial building. The price of asphalt paving mixture varies as to grade, size of job, etc., but is usually very competitive.

Several important trends may affect the industry. One involves the raw material, another the customer, and the third the process. Asphalt cement is produced from refining crude petroleum, a by-product of the refining process. In 1970 and early 1971 a combination of supply problems ascribed to a number of factors, such as lower domestic production of petroleum coupled with higher prices for other product uses, including low sulfur fuel derivatives, created a critical shortage. This situation was relieved by mid-1971, but could again become troublesome.

Since most of the product manufactured by asphalt concrete plants is used in the construction of state and county roads (most federal roads are concrete) the health of the industry is critically dependent on such government spending.

A process change, actually requiring the modification of much of a plant, is the "Drum Mix Process." The use of this process, also known as the turbulent mass process, is growing rapidly in the industry. It will not be described in this manual, but will be covered by a separate addendum, which should be available during the summer of 1976.

Another expected new trend is the increase in the use of slag in wearing surface mixes to comply with skid resistance regulations now being established in many states. This material trend will also be treated in the addendum.

SECTION 4

PROCESS DESCRIPTION

The process flow in an asphalt concrete plant can best be thought of in terms of the finished product. Asphalt concrete is basically a combination of aggregate that is dried, heated and then evenly coated with hot asphalt cement.

4.1 Batch Plant

The process can be followed from Figure 4-1. This diagram satisfactorily shows process flow, but does not adequately represent the air pollution control equipment. Section 7 has a diagram more representative of the pollution control flow.

The process begins with the loading of different sized aggregate from stockpiles, usually into four "cold" bins as shown at the far left. From these cold bins calibrated vibratory feeders control the amounts of each aggregate falling onto a conveyor that leads, either directly or by means of a bucket elevator, to the inlet of the dryer. The function of the dryer is to remove surface moisture and heat the aggregate to between 250 and 350^{o}F in order to be coated with asphalt cement in the pugmill.[1]

The dryer is an inclined rotary drum, typically on the order of 9 feet in diameter and about 40 feet long, in which the aggregate is dried and heated by an oil or gas burner. The dryer is designed with 'flights' on the inside that tumble the aggregate and increase exposure to the hot gases. The burner is generally located at the aggregate discharge or low end of the dryer; therefore, the combustion gases flow counter current to aggregate flow. Some dryers, however, are fired from both ends with a center outlet for exhaust gases.

Dryer capacities are often rated as a function of aggregate surface moisture content. This is frequently 5% and often at a specified fines content (particles less than 200 mesh or 74 microns). Unusually wet aggregate, or aggregate containing

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[1] Air Pollution Engineering Manual, 2nd Edition, U.S. Environmental Protection Agency, AP-40 (May,1973), pg. 326.

large percentages of fines, requires either increasing fuel to the burner or decreasing aggregate cold feed rates to insure proper drying. Thus a plant's capacity is not a single point, but a range dependant on the characteristics of the cold aggregate. The effluent gases from the dryer are almost always directed to a primary collector if a wet secondary is used. In the case of a fabric filter secondary, the primary cyclone is often used, although there are instances where a cyclone is not used. The dry collected material is either stored to be partially metered back into the weigh hopper or transported directly to the hot elevator.

From the discharge end of the dryer the heated aggregate is transported by the "hot elevator" to a set of vibrating screens located over the hot bins in the batching tower. These screens sort the aggregate according to size and drop it into the appropriate hot bin. Oversize material and material from overfilled bins is discharged via a reject chute. It is from these hot bins that each size aggregate is weighed in the weigh hopper according to mix specifications and dropped into the pugmill. Additional mineral filler, when necessary, is added either from a control device discharging collected material onto the hot elevator or onto the weigh hopper. The aggregate is then mixed dry for a few seconds before a fixed percentage of asphalt cement is pumped in from heated storage. Mixing then lasts an additional thirty to forty seconds after which the completed batch of asphalt is dropped into waiting trucks. Some plants convey the finished batch to a product storage silo from which the trucks are loaded.

The hot elevator, screen area, weigh hopper and pugmill are often connected by "scavenger" ductwork back to the primary collector. There are isolated instances where the scavenger air has its own separate control.

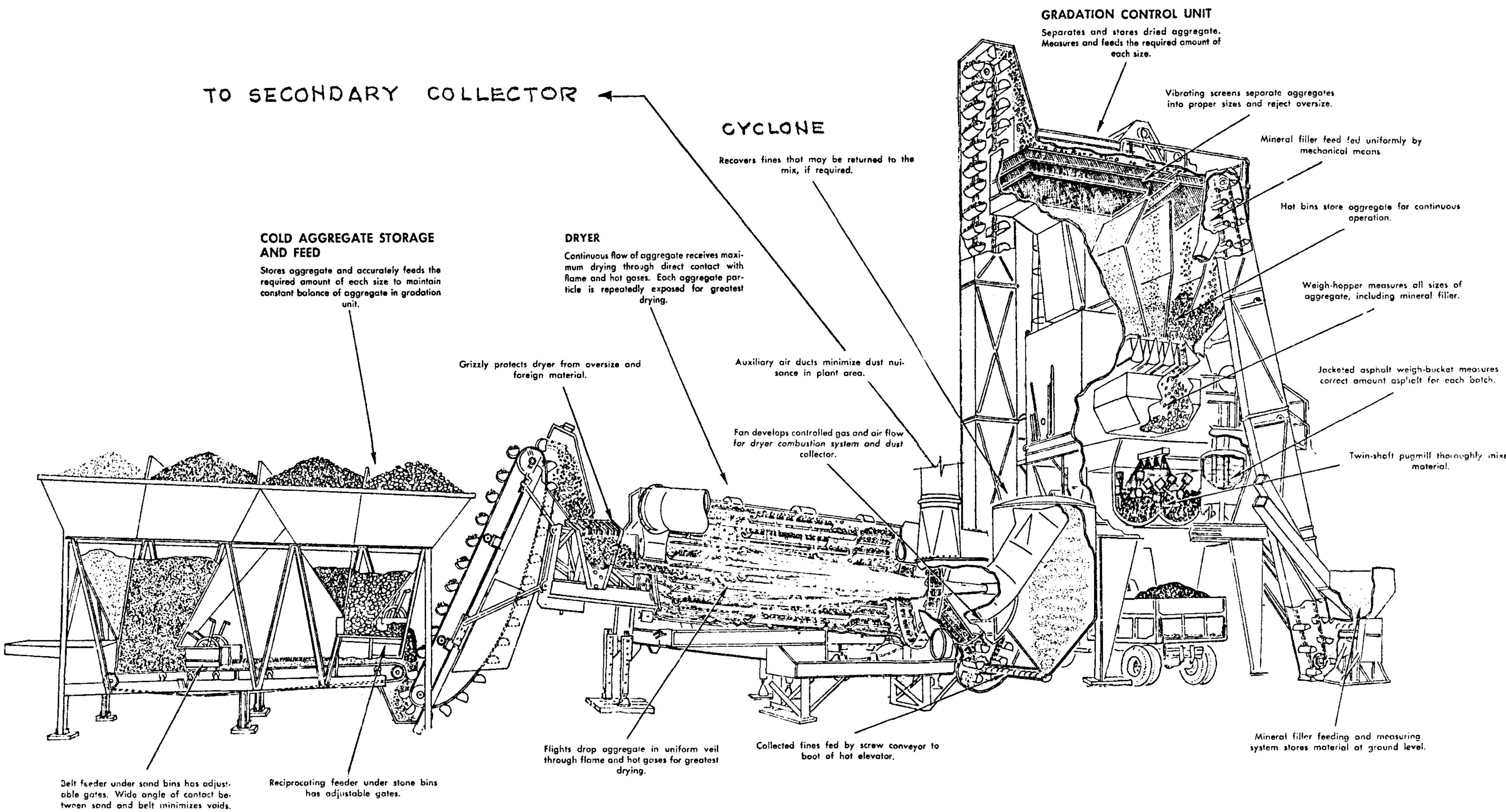
Figure 4-2 is a picture of an asphalt batch plant. An identification sketch accompanies, as Figure 4-3.

4.2 Continuous Plant

The basic operation (as shown in Figure 4-4) is similar to its counterpart in the batch plant, except in the method of feed to the pugmill (mixer), and in the pugmill itself. The hot aggregate drops from the sorting screens into hot bins that are sized smaller than those in the batch plant process. From these bins continuous flow is metered according to specifications; the aggregate mixture is then conveyed to the pugmill inlet, into which hot asphalt cement is metered simultaneously. The feeder systems for aggregate and asphalt are mechanically interconnected to insure proper proportions in the mix. The mixture is then conveyed by mixing paddles to the outlet end

Figure 4-1

ASPHALT BATCH MIX PLANT - AN EXPLODED VIEW



Source: Asphalt Plant Manual, The Asphalt Institute, 1967

of the pugmill where the mix is discharged continually into a holding hopper. The time for the mixing cycle and some surge capacity is controlled by an adjustable dam at the end of the pugmill. Mixing time can be changed without varying hourly tonnage output simply by changing the height of the adjustable dam, and consequently the rate of outlet flow.

Many plants are completely automated (some state Departments of Transportation require this) so that all of the operations except loading the cold aggregate into the cold storage bins are controlled from a cental control center by manual pushbuttons or digital card controlled sequence.

4.3 Cold Patch

Cold patch or liquid asphalt mixes can often be produced in both continuous and batch plants. Some varieties of cold patch can be made in a simple open pugmill or revolving drum.[2]

Cold patch differs from regular asphalt in that the asphalt cement used, called cut-back asphalt, has mineral oils or solvents added which give it better aggregate coating properties and extend curing times. The increased coating properties associated with cut-back asphalt cement reduce aggregate temperature requirements considerably, therefore allowing the dryer to run at lower temperatures.

Cold patch is used for low traffic volume paving, small patch work, and hand spreading in small areas. It does not possess the strength properties of hot mix, but its long cure time results in a more workable product which is desirable in some situations.

4.4 Automation

There are many aspects of production in asphalt concrete plants that lend themselves to automation. A trend toward some degree of automation is currently noticeable in the industry.

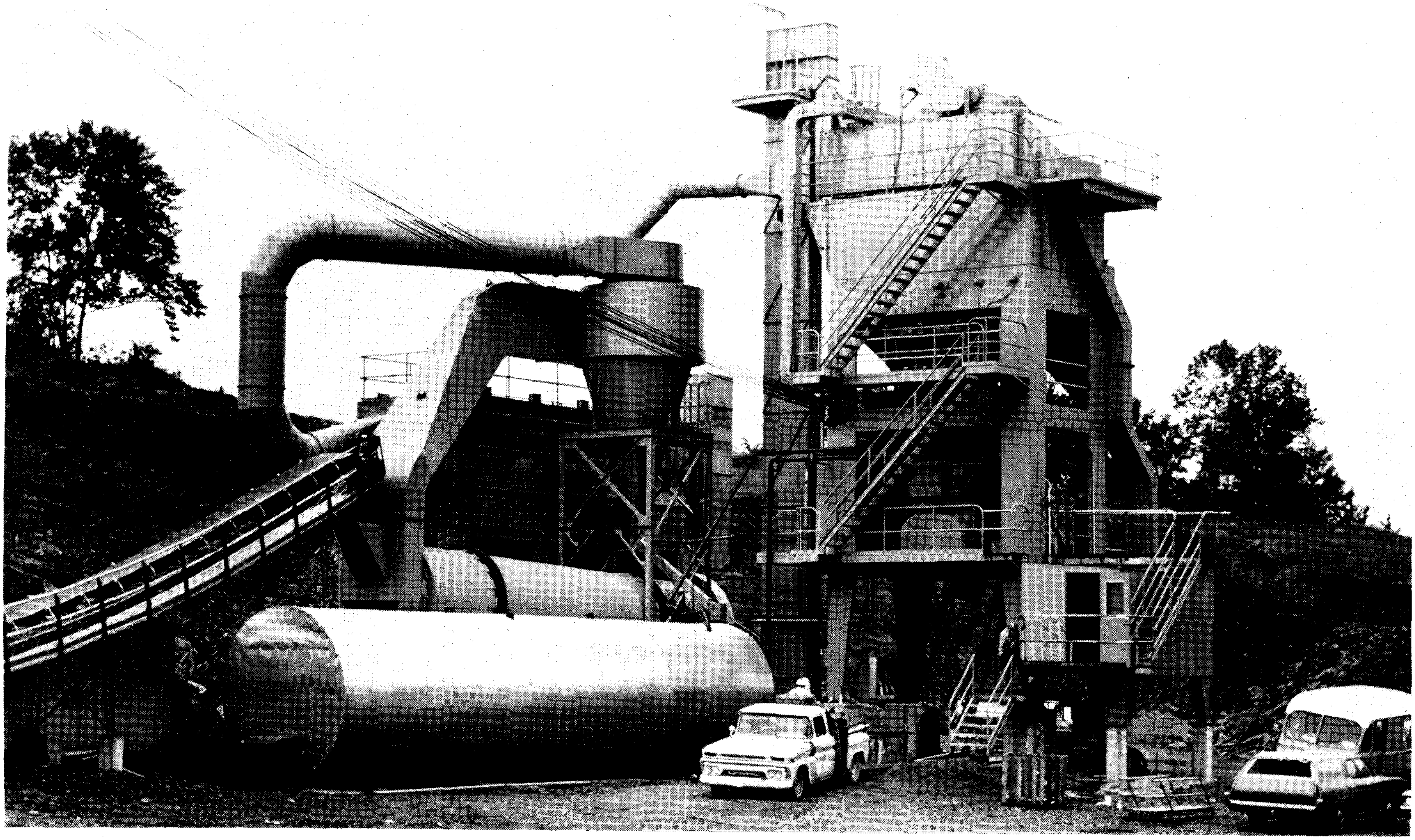
Various automatic functions include burner and damper settings for consistent drying and heating of the aggregate, safety sensors and controls for protection of control equipment, weighing of fines captured in the control system as they are reintroduced in the mixing tower, and recording of all mix parameters for process control and instant billing of customers.

Such automatic functions are desirable from an emission stand-point because they tend to stabilize the process conditions amd minimize shutdowns.

[2] Asphalt Plant Manual, 3rd Edition, The Asphalt Institute, March,1967, pg. 65.

Figure 4-2

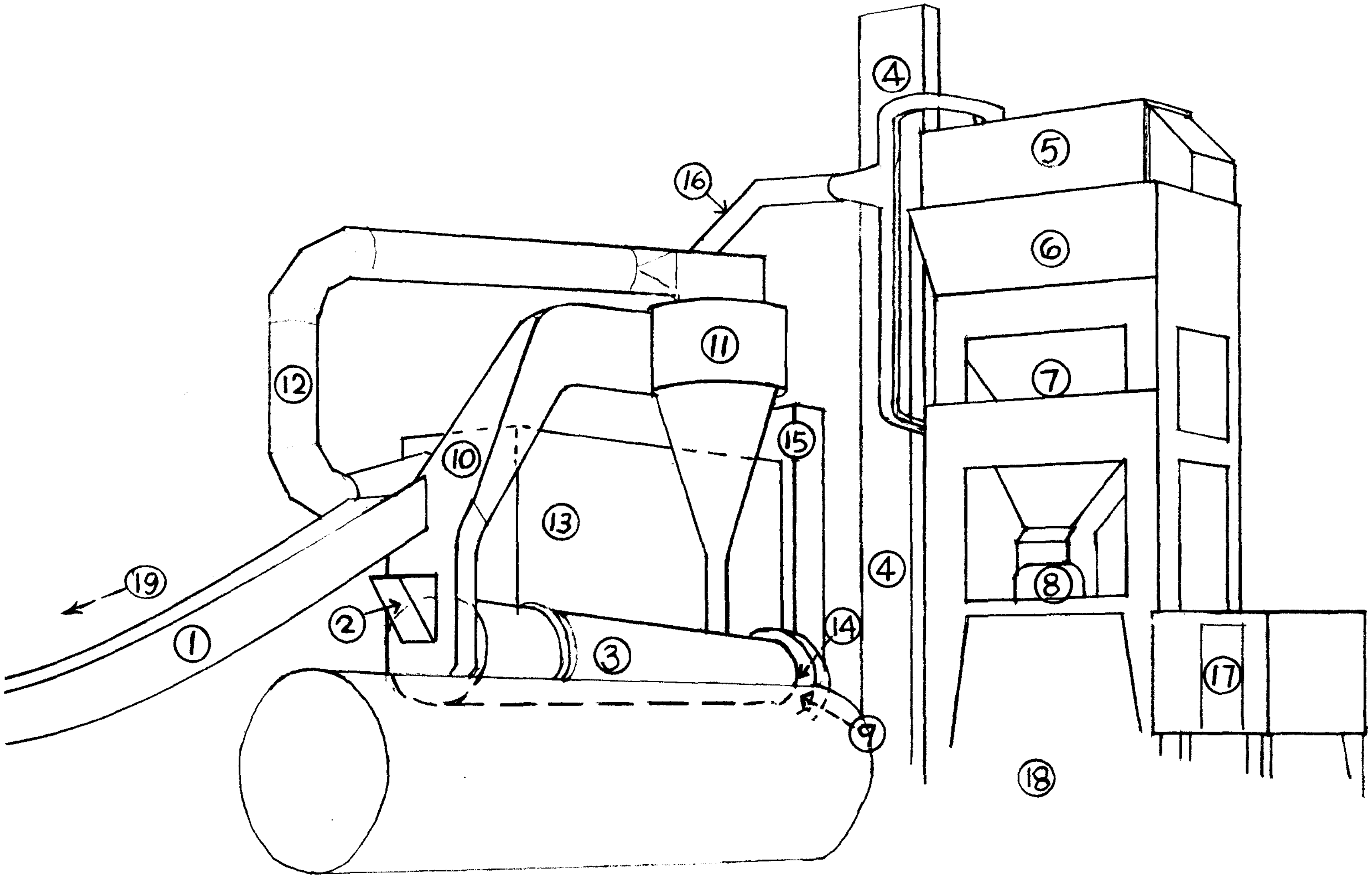
AN ASPHALT BATCH PLANT



Source: The McCarter Corporation

Figure 4-3

DIAGRAM OF AN ASPHALT BATCH PLANT

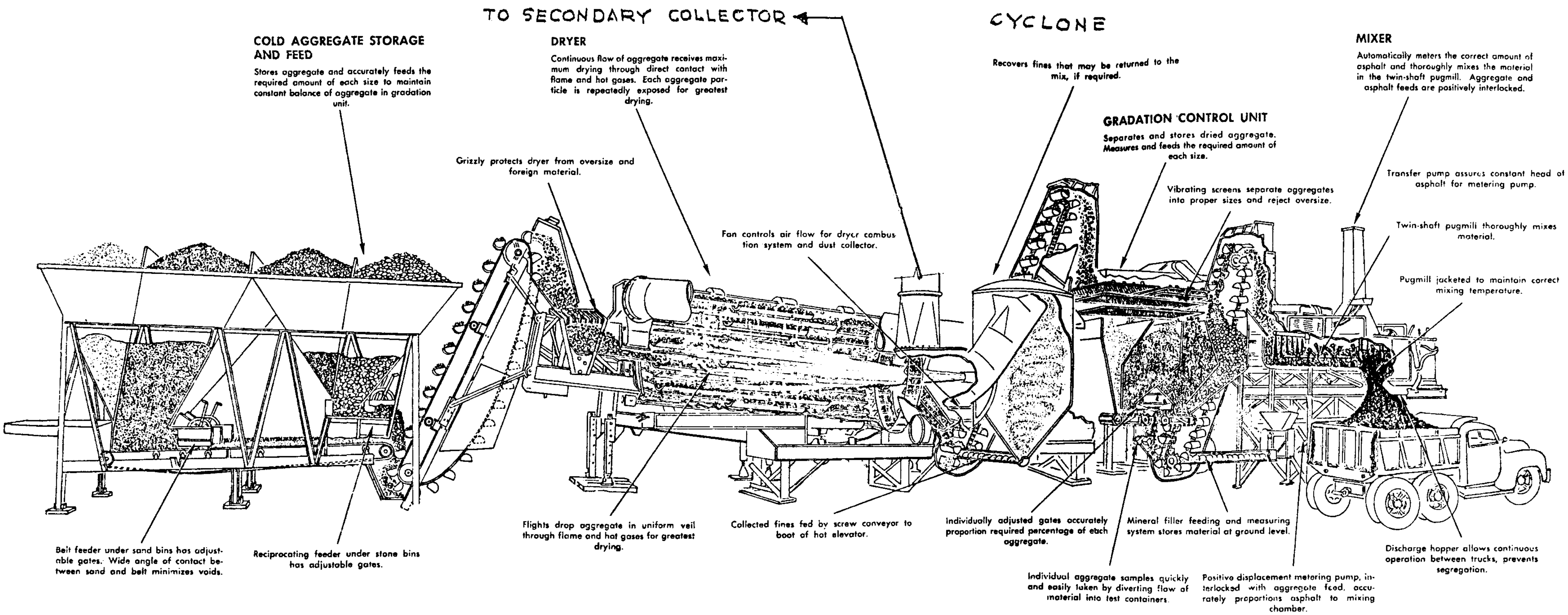


LEGEND

(19)	Cold Feed Bins
1	Cold Feed Conveyor
2	Dryer Feed Chute
3	Rotary Dryer
4	Hot Elevator
5	Hot Screens Area
6	Hot Bins Area
7	Weigh Hopper
8	Pugmill
(9)	Burner
10	Exhaust Duct to Primary Collector
11	Primary Collector (Cyclone)
12	Duct: Primary to Secondary Collector
13	Secondary Collector (baghouse)
(14)	Fan
15	Stack
16	Scavenger Ductwork
17	Control Cabin
18	Truck Loading Area

Figure 4-4

ASPHALT CONTINUOUS MIX PLANT - AN EXPLODED VIEW



Source: Asphalt Plant Manual, The Asphalt Institute, 1967

SECTION 5

RAW MATERIALS

The basic raw materials used in the product of asphalt concrete are: various types and sizes of aggregate, asphalt cement and fuel for the dryer. A general discussion of each of these materials follows.

5.1 Aggregate

The term aggregate refers to the various sizes and types of gravel, crushed stone, slag, sand and mineral filler used in the production of asphalt concrete.

Asphalt concrete is classified into various mix types according to the particular blend of aggregate used. Basic aggregate size ranges are: coarse aggregate, larger sized stone, which can range up to 2 1/2" in diameter; fine aggregate,which consists of natural sand and finely crushed stone, slag or gravel; and mineral filler generally consisting of very fine crushed stone, hydrated lime, Portland cement or any other suitable non-plastic mineral filler. The material recovered from any dry air cleaning device is often used as mineral filler in the mix.

The transportation department in each state has mix specifications for each type of asphalt produced. These specifications will dictate the percentages of each size aggregate to be used in the mix. Aggregate properties such as skid resistance, friability and soundness are also specified by some states. Mix specifications are generaly monitored by state inspectors when the asphalt is being used for state work. This involves an extraction and sieve analysis to determine whether the asphalt being produced is within specification.

5.2 Asbestos

The addition of small percentages of asbestos to the mix produces an "improved pavement overlay with increased cohesion and abrasion resistance and decreased water permeability and material embrittlement."[1]

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[1] Control Techniques for Asbestos Air Pollution, U.S. Environmental Protection Agency, AP117 (Feb., 1973), pg. 3-40, 41.

Asbestos is generally added directly into the pugmill during mixing. Sealed poly-bags are often used to prevent hazards during material handling. When asbestos is added in these bags little or no emission of asbestos would be expected.

5.3 Asphalt Cement

Asphalt cement is a residual by-product of the petroleum cracking process. It is very viscous at ambient temperatures; therefore it must be heated to 275°-325°F so that it can be pumped and mixed easily in the pubmill. Various types and grades of asphalt cement are available for various mix types. Asphalt cement is added, usually around 5% by weight of the asphalt concrete produced.

5.4 Cut-Back Asphalt

Cut-back asphalt is a less viscous binding agent used in the production of "cold patch" asphalt mixes (described in Section 4-3).

It is produced by the addition of mineral oils or solvent to regular asphalt cement. The added mineral oils in this asphalt cement are responsible for the longer curing times and better coating properties associated with cold patch asphalt.

5.5 Fuel

Natural Gas, LPG, or #2 oil are the fuels most commonly used for the burner. Lower grades of oil (#5;#6) can be used; however, it is necessary to preheat these oils prior to combustion.

SECTION 6

EMISSIONS

Air pollution emissions from asphalt concrete manufacturing plants are both gaseous and particulate in nature. The new source regulations 40 CFR 60.92 apply only to particulate matter and opacity. The other emissions are not under standards of performance for new sources.

Several of the emissions from hot mix plants shown in Table 6-1 are emitted in negligible quantities and do not warrant special gas cleaning considerations. Combustion products, for instance, including sulfur dioxide, carbon monoxide, soot and unburned fuel droplets pose no problem quantitatively; such emissions can be minimized through proper combustion equipment maintenance and through the use of cleaner fuels.[1] The common pollutants from an asphalt batching plant are briefly described below.

6.1 Sulfur Compounds

These are emitted from asphalt plants when fuels which contain sulfur are burned to dry the aggregate. The amount of sulfur oxides formed may be calculated from the sulfur content and usage rate of the fuel.* The amount actually released into the atmosphere may be controlled by wet scrubbers.

* $\frac{\text{lbs. } SO_2}{\text{gal. fuel oil}}$ = .142 (%S) (Distillate oil)
= .157 (%S) (Residual oil)

The weight of sulfur dioxide emitted expressed in lbs. per gal. of fuel oil burned equals .157 times the percentage. It should be expressed as such in the equation rather than as a decimal fraction. (For 1%, enter "1" rather than "0.01.")

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1 Air Pollution Control Technology and Costs in Nine Selected Areas, Industrial Gas Cleaning Institute, Inc., (Sept., 1972), pg. 122.

TABLE 6-1

TABLE OF EMISSIONS AND SOURCES

Major Emissions - Particulates

1. Stone dust - primary pollutant from hot mix asphalt: main source is the dryer; secondary sources are screening, conveying and handling of aggregate, and storage piles and access roads.

2. Unburned fuel oil droplets - result from poor combustion due to improper component maintenance.

3. Soot - unburned carbon particles emitted due to insufficient oxygen at the dryer or heater burners.

4. Asbestos - hopper loading; discharge of dry fiber while loading into the pugmill. This additive occurs for specific mixes. Use of pre-weighed poly bags loaded directly into pugmill will minimize or eliminate these emissions.

Lesser Emissions - Gases

1. Combustion

   a. SO_2 - results from combustion of high sulfur fuel oil in burners and heaters

   b. CO - poor combustion maintenance of burners, dryer and heaters

2. Mixer

   Hydrocarbon emissions result from mixing of asphalt and from dryer combustion gases.

3. Hot-mix trucks

   Odors primarily attributable to oxidation of liquid asphalt after encountering hot aggregate; odors may also be generated from oil that is sometimes sprayed on truck bodies to prevent the product from sticking

4. Asphalt Tanks

   Hydrocarbon vapors and associated odors from heated asphalt, and sometimes fuel storage tanks.

Adapted from: Air Pollution Control Technology and Costs in Nine Selected Areas, Industrial Gas Cleaning Institute, Inc., Sept., 1972.

The use of slag as aggregate is suspected to emit small quantities of hydrogen sulfide but little data is available on this.

6.2 Odors

These may evolve from four potential sources: from the hot asphalt, from inefficient burner operation, from the fuel oil that is sprayed on truck bodies to prevent the asphalt from sticking and under some conditions when slag is used in the aggregate. Odors are increased if mixes are run hot and highly volatile asphalt is used. Further, inefficient burner operation could generate aldehydes and organic acids which have a pungent, acrid odor.

6.3 Hydrocarbons

Asphalt is a heavy residue from the refinery process. As such, it contains various polynuclear hydrocarbons, including anthracene, 3, 4-benzopyrene, phenanthrene and pyrene.[2] Because of their high boiling points these compounds vaporize readily only at elevated temperatures. (They are suspended in the air as condensed particles or by adsorption to airborne particles.) A wet scrubber has been shown to reduce hydrocarbon emissions effectively.[3] Emissions from asphalt storage tanks along with emissions from loading asphalt concrete into trucks can be vented into the dryer as part of the combustion gases. This, however, is not commonly done.

6.4 Particulates

Although regulations are nearly always aimed at stack emissions, complaints frequently arise from fugitive particulate emissions from truck traffic and aggregate stockpiles as well. Such sources notwithstanding, particulate emissions from drying and handling of aggregate are the chief air pollution problems.

In the process, particulates derive from fines purposely introduced into the material to meet the state specifications and from breakup of the material in the drying, conveying, screening and weighing operations. In an uncontrolled plant over 50% of all particles less than 74 microns introduced into the dryer become airborne.[4] This could represent as much as 10% of the

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[2] "Polynuclear Hydrocarbon Emissions from Selected Industrial Processes," Van Lehmden, Hangelrauk and Meeker, JAPCA 15, No. 7 July, 1965, pg.307.

[3] Ibid, pg. 309

[4] Air Pollution Engineering Manual, U.S. Environmental Protection Agency, AP-40, May, 1973, pg. 328.

process weight. Table 6-2 lists typical dust discharge from asphalt batch plants.

A plant producing 150 tons of paving material per hour, for instance, will have uncontolled particulate emissions on the order of 6,000 lbs. per hour.[5] Approximately 70-80% of that amount is from fine aggregate material that becomes entrained in the gas stream of the dryer; the remaining portion is contributed from elevators, screens, pugmill and other aggregate handling points. Collection of dust from these secondary sources is accomplished by what is known as a scavenger or fugitive dust system. The particulates collected in the hooding and ductwork of the scavenger system are usually routed to the inlet of the primary collection device; in some instances, however, the scavenger collector may have a separate gas cleaning system.

Several operational variables can significantly affect particulate emissions. Emission rates from the dryer will be proportional to increases in gas velocity in the dryer, rate of rotation of the dryer and feed rate. Balancing these variables for maximum drying efficiency and minimum emissions is important to both process and control. All of these variables are dependent on the properties of the aggregate being dried. Particle size distribution of feed, for example, has an appreciable affect on discharge of dust. Therefore, mixes containing large percentages of fine aggregate will produce greater uncontrolled dust emissions from the dryer.

Also, when wet aggregate is being dried the fuel rate to the burner is often increased, thereby requiring additional draft air and consequently greater velocities in the dryer. This will increase the amount of material entrained in the gas stream of the dryer.

The friability of the aggregate and coatings of clay and silt will also affect emission.

6.5 Asbestos

When asbestos is added in the form of poly bags directly into the pugmill little or no emission of asbestos would be expected if proper operating techniques are followed. Proper operating techniques require that the pugmill be enclosed as soon as possible after the sealed poly bags are placed in it. No visible emission of asbestos dust should emanate from the mill after the poly bags have been added. If significant visible emission of asbestos does occur, violation of the applicable National Emission Standards for Hazardous Air Pollutants is indicated.

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[5] Ibid., pg. 325.

TABLE 6-2

DUST DISCHARGE FROM ASPHALT BATCH PLANTS

Batch Plant Data				
Mixer capacity, lb.	6,000		6,000	
Process weight, lb/hr.	364,000		346,000	
Dryer fuel	Oil, PS 300		Oil, PS 300	
Type of Mix	City street, surface		Highway, surface	
Aggregate feed to dryer, wt. %				
+10 mesh	70.8		68.1	
-10 to +100 mesh	24.7		28.9	
-100 to +200 mesh	1.7		1.4	
-200 mesh	2.8		1.6	
Dust and fume data	Vent line*	Dryer	Vent line*	Dryer
Gas volume, scfm	2,800	21,000	3,175	22,050
Gas temperature, °F.	215	180	200	430
Dust Loading, lb/hr.	2,000	6,700	740	4,720
Dust loading, grains/scf	81.8	37.2	23.29	24.98
Sieve analysis of dust, wt. %				
+100 mesh	4.3	17.0	0.5	18.9
-100 to +200 mesh	6.5	25.2	4.6	32.2
- 200 mesh	89.2	57.8	94.9	48.9
Particle Size of -200 mesh				
0 to 5u, wt. %	19.3	10.1	18.8	9.2
5 to 10u, wt. %	20.4	11.0	27.6	12.3
10 to 20u, wt. %	21.0	11.0	40.4	22.7
20 to 50u, wt. %	25.0	21.4	12.1	49.3
50u, wt. %	14.2	46.5	1.1	6.5

* Vent line (scavenger air) serves hot elevator, screens, bin, weigh hopper, and pugmill.

Source: Air Pollution Engineering Manual,, 2nd edition, p. 328.

SECTION 7

CONTROL OF PARTICULATE EMISSIONS

To attain particulate emission levels prescribed by federal performance standards, 90 mg/scm (0.04 gr./dscf), new asphalt concrete manufacturing plants will have to reduce their uncontrolled emissions by at least 99%. Figure 7-1 is a flow diagram showing the route of emissions through a control system using a baghouse. Emissions from the dryer and the scavenger (fugitive dust) system are routed to the inlet of the primary collector (in Fig. 7-1, a cyclone), when used, where the greater percentage of large particles is collected. The particulate matter collected in the primary collector is generally reintroduced into the mix at the hot elevator. Such capture and recycling is desirable for bringing the fines content of the mix to specifications. Primary collectors are often unnecessary with baghouses. The effluent gas from the primary collector or precleaner then goes to the secondary collector, which may be any high efficiency wet or dry collector capable of achieving the grain loading limitations (in Fig. 7-1, a baghouse).

Control units and strategy will be discussed for both primary and secondary collectors in the following sections.

7.1 Primary Collectors

The function of the primary collector is to remove most of the entrained dust (50 to 90% by weight), predominantly the large size particles. The most common primary device is a large diameter cyclone. Twin and multiple cyclones are also used. The cyclone operates on the centrifugal force principle and can be quite efficient for particles greater than 20 microns. The overall efficiency of the cyclone depends upon particle size and pressure drop across the device, which is usually 2 to 4 inches of water. Table 7-1 shows a typical particle size distribution before and after the primary collector. Figure 7-2 shows a typical cold feed gradation and primary dust collector inlet gradation. Note that while most of the particles entering the collector are between 10 and 100 microns, approximately 50% are below 30 microns. The dust leaving a primary collector, of course, depends on the input loading, size distribution and efficiency of the collector, but is usually in the range of 5 to 12 lbs./ton of feed.

FIGURE 7-1

EMISSIONS ROUTE THROUGH TYPICAL CONTROL SYSTEM

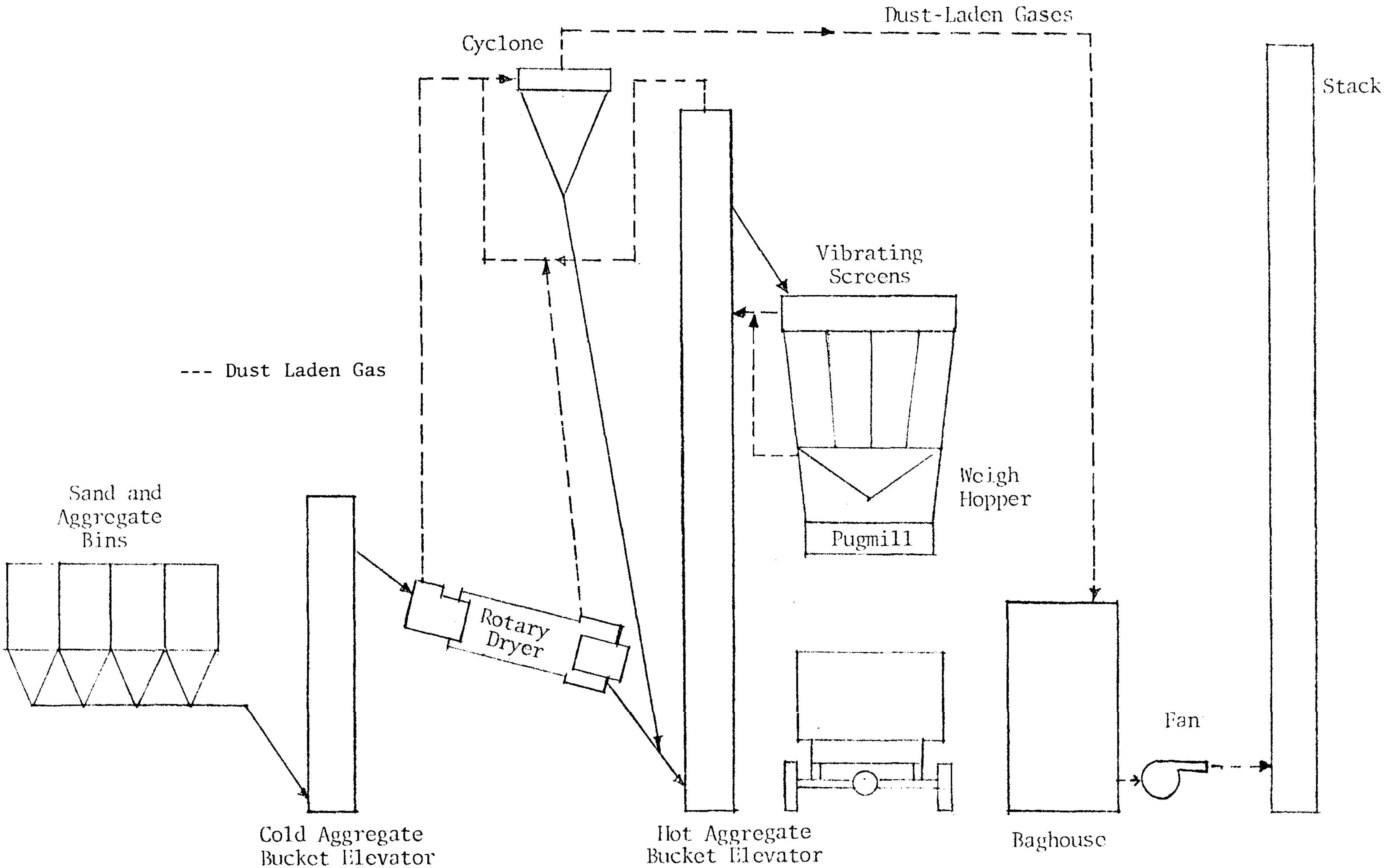
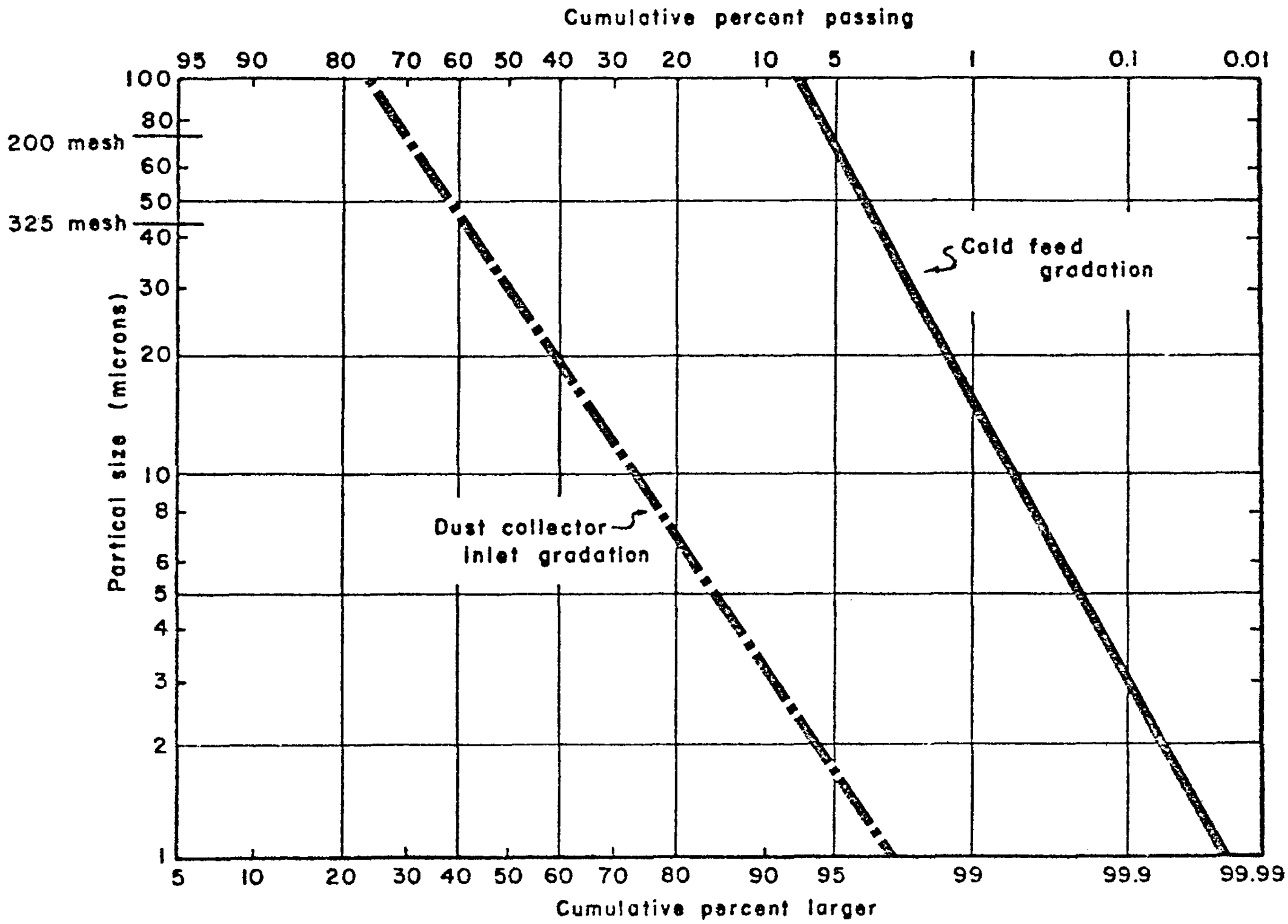


FIGURE 7-2

TYPICAL COLD FEED GRADATION AND PRIMARY DUST COLLECTOR INLET GRADATION



Source: <u>Guide for Air Pollution Control of Hot Mix Asphalt Plants</u>, National Asphalt Pavement Association

TABLE 7-1

PARTICLE SIZE DISTRIBUTION

BEFORE AND AFTER PRIMARY COLLECTION

FROM DRYER AND VENT		FROM PRIMARY COLLECTOR	
Size μ	% Less Than	Size μ	% Less Than
5	19.5	5	78.00
10	30.5	10	96.40
15	38.2	15	97.50
20	45.1	20	97.80
25	50.1	25	97.90
30	55.5	30	98.03
35	60.0	35	98.20
40	64.0	40	98.28
45	67.5	45	98.40

Source: Air Pollution Control Technology And Costs In Nine Selected Areas Industrial Gas Cleaning Institute

7.2 Secondary Collectors

For an average size plant using a primary collector grain loadings entering the secondary collector range between 2.9 and 6.0 gr./dscf. In order to reduce such grain loadings to the specified standard (90 mg/scm or 0.04 gr./dscf), the secondary collector must have a collection efficiency of 99% or better.

Other factors influencing the selection of a secondary control device include plant mobility, space and power availability, water supply and waste water considerations, and the desirability of -#200 mesh material for use as mineral filler either in production or for commercial sale.

Hi-Energy Venturi Scrubbers. Several different designs of venturi scrubbers exist, three of which are shown in Figure 7-3. Nevertheless, their operating principles are essentially similar. These scrubbers, with pressure drops in the range of 20 inches of water, or greater, generally are capable of reducing emissions to below the required 90 mg/scm (0.04 gr./dscf) level prescribed in the federal standard.

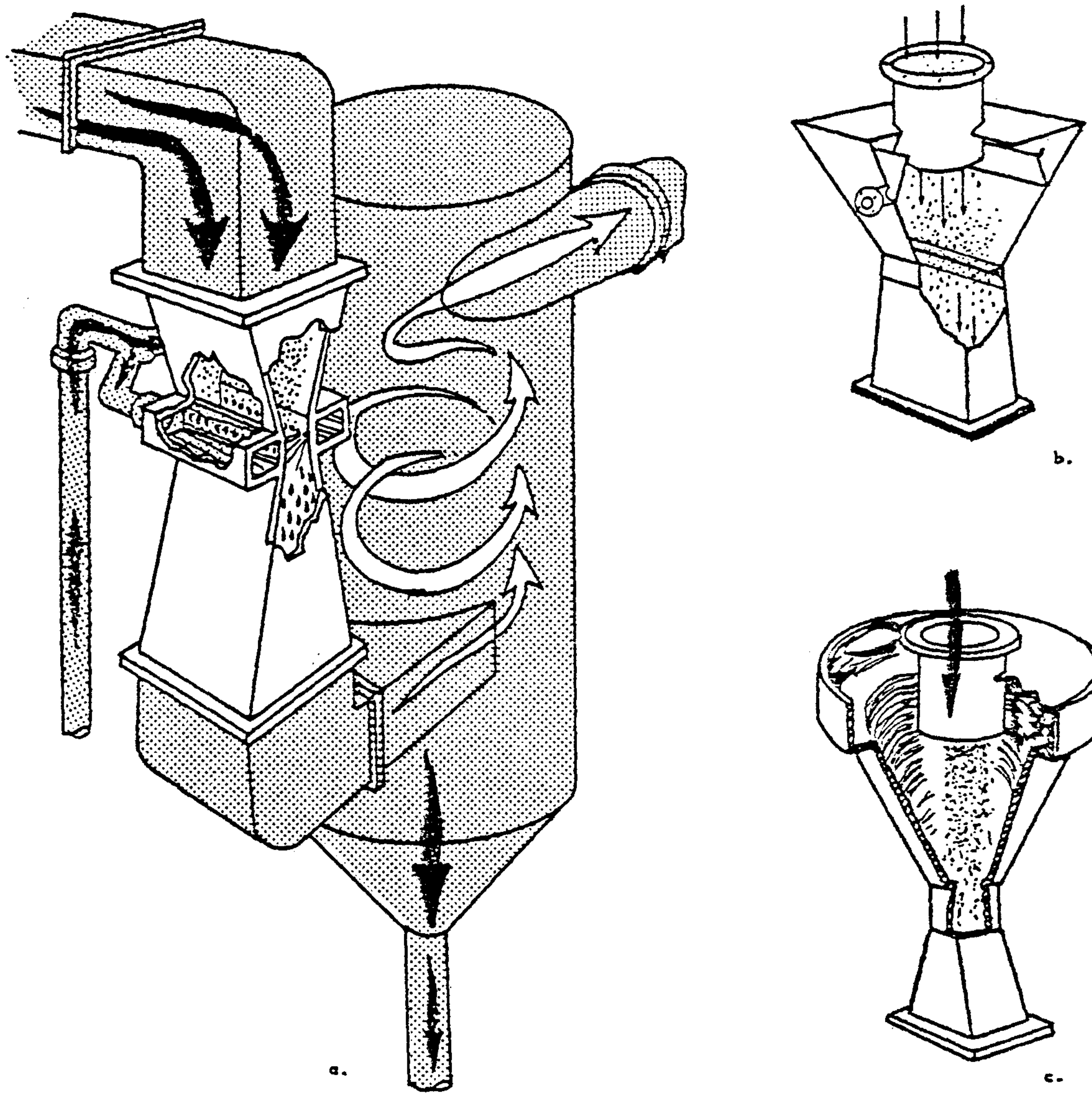
The venturi scrubber is a high efficiency wet collector that operates by impinging particulates on atomized water droplets. The effective mass of the particle thus increased, cyclonic separation is then possible.

As the particle laden gas enters the device a constriction reduces the cross-sectional area of the gas stream, thereby increasing the stream velocity. This correspondingly increases the velocity of the particles relative to the formerly stationary water droplets that were introduced at the apex of the constriction. Increasing the relative speeds heightens the probability that a particle will impinge upon the water droplet. As the dust-laden water droplets leave the venturi constriction they further agglomerate due to deceleration. The gas stream then passes through a cyclonic separator, which removes the larger, heavier particles formed during the agglomeration phase.

Venturi scrubbers can achieve collection efficiencies in excess of 99%. Variables affecting efficiency include pressure drop, water injection rates, venturi design, and particle concentration and size. Collection efficiencies improve with higher pressure drop, attainable by increasing the throat velocity by constricting the throat and, to a lesser extent, by increasing the water injection rate. Pressure drops will probably be 20" or more for most venturies, while water injection rates normally encountered will nominally be 6 and 10 gallons of water per

FIGURE 7-3

VENTURI SCRUBBER



Venturi scrubber may feed liquid through jets (a), over a weir (b), or swirl them on a shelf (c).

Source: Control Techniques for Particulate Air Pollutants, USDHEW 1969 minute per 1000 acf of gas. Efficiencies fall rapidly at injection rates below this range; rates in excess of 10 gallons of water per minute per 1000 acf of gas produce lesser increases in collection efficiencies.[1]

Greater particle concentration also improves collection efficiency. Assuming the number of water droplets formed in the system is constant, the frequency of particle collisions is increased when more particles are introduced into the system. Figure 7-4 shows a nominal collection efficiency and particle size relationship for a typical wet scrubber. Note that the efficiency is greater than 97% for particles large than 1.5 microns; note too that the efficiency falls sharplv for particles less than one micron for a fixed set of conditions.

Disadvantages of venturi scrubbers include high operation costs associated with producing high pressure drops and also the need for large quantities of water, which entails elaborate recycling of alkaline, acidic or odoriferous water. This would require the use of settling basins, which also present a problem of solid waste disposal when they must be dredged.

Advantages of venturi scrubbers include their relatively low initial cost, their ability to partially control the hydrocarbon emissions[2] received from the pugmill, and the lack of need for pre-conditioning the input gas.

Low Energy Wet Scrubbers. These commonly used devices include spray towers, wet fans or any other wet collector with a pressure drop less than 15 inches of water. The major parameters affecting the performance of these scrubbers are water injection rates and pressure drops. They are generally not effective in light of the efficiencies necessary to achieve 90 mg/dscm (0.04 gr.scf). It is, however, possible to achieve grain loadings less than 90 mg/dscm (.04 gr/dscf) using two or more of these devices in series following a primary collector.[3]

Small Diameter Cyclones. Banks of small diameter cyclones (multi-cyclones), have the advantage of collecting dust in a usable form which is usually returned to the process.

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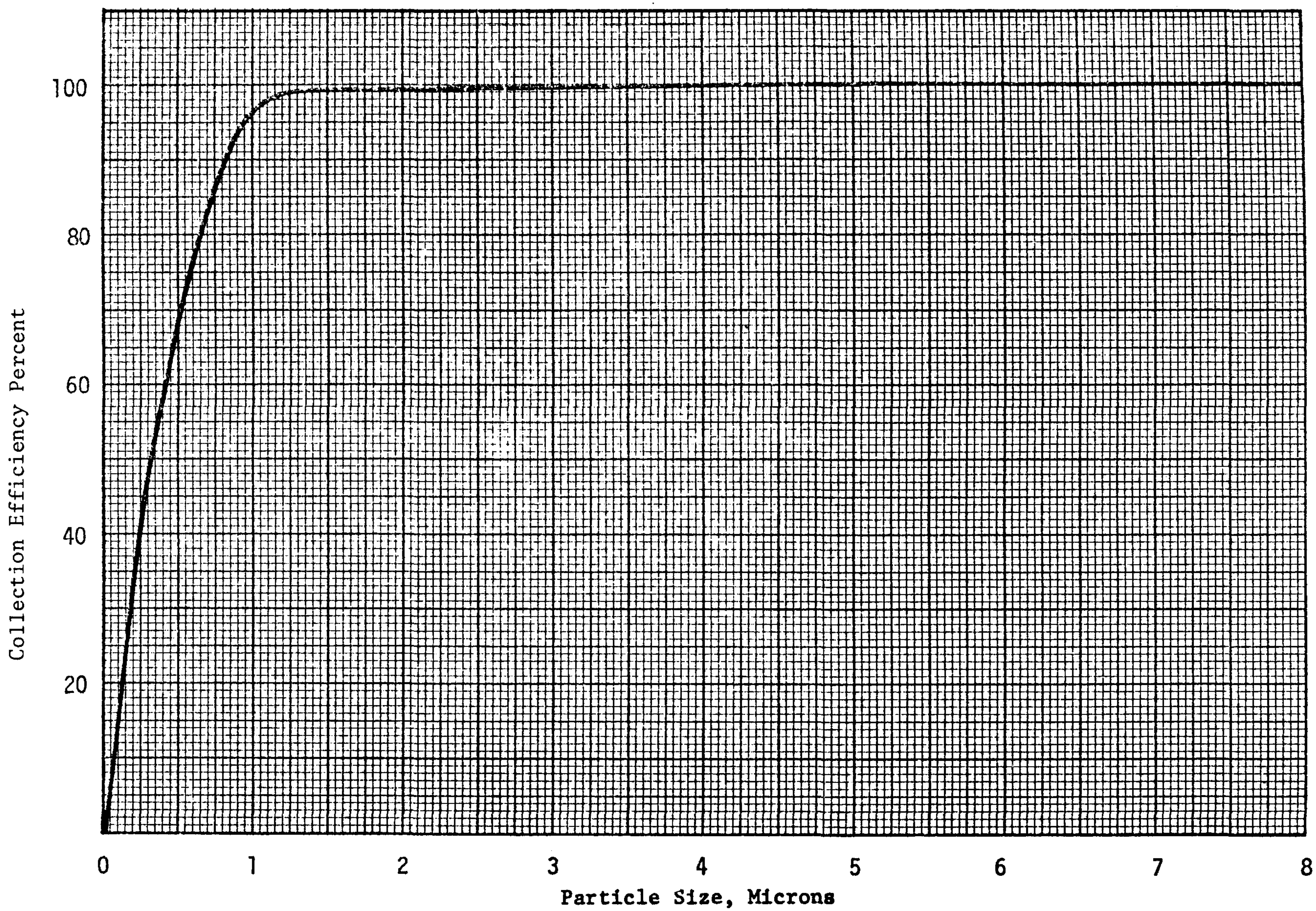
1 Air Pollution Engineering Manual, 2nd Edition, U.S. E.P.A., AP40, May, 1973, p.331.

2 Von Lehmden, Hangebrauk and Meeker, "Polynuclear Hydrocarbon Emissions from Selected Industrial Processes", JAPCA 15, no. 7, p. 309.

3 Background Information for New Source Performance Standards, U.S. E.P.A., (APTD-1352c), February, 1974, p.10.

FIGURE 7-4

EFFICIENCY vs. SIZE FOR TYPICAL VENTURI



Source: Control of Particulate Emissions, USDHEW

The high velocities demanded by these small cyclones can cause failure due to abrasion; furthermore, these devices do not perform well when overloaded.

With tube diameters of from six to nine inches and pressure drop of from 3 to 6 inches of water, the efficiency should be between 80 and 90% -- generally not sufficient to achieve 90 mg/dscm (0.04 gr./dscf).[4]

Fabric Filters. Fabric filters, commonly referred to as baghouses, readily attain collection efficiencies in excess of 99% if they are properly operated and maintained.[5] Operation basically consists of directing particle laden air through an appropriate fabric, which is chosen for its heat resistance capabilities as well as its filtering capabilities. The fabric design often encountered in asphalt plants is 14 oz. Nomex* felt or woven construction.

As dust particles accumulate on the fabric, pressure drop across the device increases. The filters are generally cleaned on a time cycle that is correlated to this pressure drop increase. Various types of cleaning mechanisms are encountered in asphalt plant operation and they seem to be indigenous to the particular manufacturer. The only common operational technique is that the cleaning operation does not require stopping the process, and hence is called continuous cleaning. There is the reverse flush type where a single compartment is flushed from time to time by a series of valves which close off a given compartment while outside air or pressured air is used to "flush" all the bags in that compartment. Another approach is to use blow down pipes located above the rows of bags. Compressed air is directed into a number of these pipes simultaneously on staggered rows and escapes through small holes above each bag sometimes entering the bag through a small cast venturi (see Fig. 7-5). This air cleans the dust from the bag, the automatic process being repeated sequentially. The frequency of blow down, the duration and the amount of air pressure can frequently be adjusted by the operator, and sometimes the cleaning frequency is automatically controlled by a pressure sensing device. As the bags are subjected to wear the no load permeability of the cloth will change and appropriate adjustments should be made to the blow down frequency.

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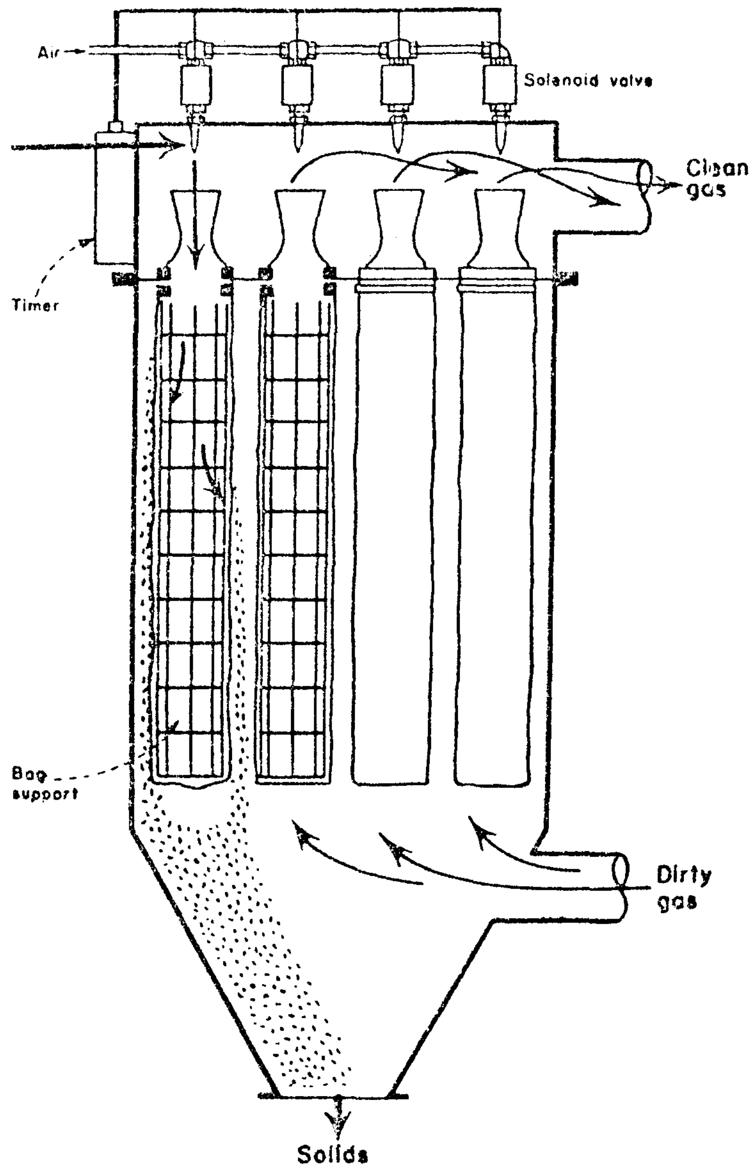
4 Control of Particulate Emissions, USDHEW Section V, pg. 20

5 Handbook of Fabric Filter Technology, C. Billings and J. Welder for U.S. Department of Health, Education and Welfare, December 1970, pp. 1-4.

* Trade Name - The DuPont Company

FIGURE 7-5

TYPICAL PULSE-JET CONFIGURATION



Source: Handbook of Fabric Filter Technology, GCA Corp., Dec. 1970

Air-to-cloth ratio or superficial face velocity refers to the ratio between the volumetric flow rate and the effective filter area. The air-to-cloth ratio for the reverse pulse and/ or jet pulse cleaning baghouses is nominally 6 acfm per square foot of filter area. The reduced bag area required for such baghouses has made them the most widely used in asphalt plants.

There are several design considerations in using baghouses on hot mix asphalt plants; both the major problems are associated with temperature and moisture. Temperatures must not exceed limits dictated by the fabric used, while at the same time, they must be kept high enough to prevent condensation of any moisture in the gas stream. Failure to maintain temperatures above the dew point results in blinding or clogging of the filter fabric.

In many instances special temperature regulating systems are employed. These may include insulation of the baghouse, introduction of tempered air (either hot or cold), and special alarm or override systems to prevent damage to the baghouse. Proper operational techniques are also called for. The burner and fan should be operating for a short time at start up without introducing cold aggregate to the dryer, and the burner and fan should also be run for several minutes after the feed is stopped. This is to clean out the system of collected materials and to make sure the baghouse is above the dew point before introducing moisture laden gas.

Advantages of baghouse filters are: high collection efficiencies, the ability to recycle collected material; relatively compact unit size; no water usage and low power consumption. However, baghouse filters are generally not applicable to the control of drum-mix plants.

Electrostatic Precipitators. The low gas volumes associated with asphalt concrete plants and the high capital investment required generally make electrostatic precipitators impractical. They can, however, attain collection efficiencies of over 99% and can reduce emissions to the levels required by the standards of performance.[6] Equally important is the fact that they use little electric energy.

The precipitator very basically consists of two electrodes, a discharge electrode (usually a vertical wire) and a collecting electrode (usually a plate on the side of the unit), between which a unidirectional high potential field is created. The potential difference is approximately 70,000 volts. The exhaust gas is then passed between these electrodes and ionization of the air takes place at, or near, the surface of the discharge (negative) electrode. The negative ions move toward the positive collection surface and the positive ions move toward the negative collection surface, or discharge

[6] Stack Test Performance by JACA Corp. for compliance with Pennsylvania Regulations.

electrode. As these ions move they impinge upon the neutral particles in the gas stream; these charged particles then migrate toward the appropriate electrode. Charging of the neutral particles takes place in the first few inches of the field.[7]

The negative ions have a greater distance to travel than the positive ions, which are formed near and move toward the negative electrode. Therefore, the negative ions have a much greater chance to contact particles, resulting in the greatest possible collection at the positive electrode or collecting plate.

When the charged particles contact the electrodes they become neutral, and their removal can be accomplished by rapping (mechanical vibrating), washing or gravity. It is important to vibrate or rap at a magnitude and rate such that re-entrainment will be minimized.

The high costs of electrostatic precipitators, their complexity and the comparatively specialized technology required for their maintenance (e.g., special treatment is necessary for resistant particles, etc.) makes their common installation impractical.

Table 7-2 is a brief and simplified presentation of comparative control device characteristics.

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7 "Control of Particulate Emissions," Course Manual, U.S. Department of Health, Education and Welfare, p. E.S.P. 1.

Table 7- 2

CONTROL DEVICE CHARACTERISTICS

Control Device	Principle of Operation	Principal Design Variables	Typical Overall Efficiencies, Percent	Typical Pressure Drops, inches of water	Operating* Temperature Limitation, °F	Particle Removal in the Form of	Other Limitations
Cyclone	Separation of particles by imparting centrifugal force	1. Length of cyclone tube/s 2. Diameter of cyclone tube/s 3. Fan horsepower	45-80	2-5	1,200	Dry dust	Inefficient particle removal under 20 microns
Wet Scrubber	Centrifugal force: effective particle size increased by agglomeration with liquid droplets	1. Throat velocity of gas 2. Liquid injection rate 3. Fan horsepower	85-99	5-40	250	Wet slurry	Corrosive action of wet gases affects operation. Possible water pollution problem may be encountered.**
Baghouse (Fabric Filter)	Through-flow separation as in a vacuum cleaner, operation based on cake filtration	1. Fabric material 2. Air-to-cloth ratio 3. Cleaning time and sequence 4. Fan horsepower	95-99+	5-10	550	Dry dust	Possible cake build up at operation below dew point.
Electrostatic Precipitator	Attraction of electrically charged particles to opposite-charged plates	1. Space between electrodes 2. Voltage across plates 3. Fan horsepower	95-99+	3-8	1,000	Dry dust	Application limited to a certain range of dust resistivity

* Gas conditioning must be used at higher temperatures

**This aspect will be treated in greater detail in the "drum-mix" addendum to this manual

Source: Group Buying to Reduce Air Pollution Costs for Small Plants, J. A. Commins and Associates (Aug. '72).

SECTION 8

INSPECTIONS

Previous sections of this manual provided background information on regulations, industry, process description, potential emissions and control techniques. This section sets forth detailed methodology to be employed for field visits in monitoring performance tests on new sources and in performing field inspections in the period subsequent to performance testing.

8.1 General Inspection Background

The purpose of monitoring a stack performance test is to help assure three items:

1. That the test is conducted in accordance with the methods specified in the Standards of Performance for new or modified asphalt concrete plants. (40 CFR 60.93)
2. That the test is conducted under such process conditions as the Administrator shall specify to the plant operator based on representative performance of the affected facility.
3. That pertinent process data is complete and accurate for the period under test.

The purpose of field inspections is to examine the plant for these items:

1. Plant opacity compliance.
2. Comparison of readily identifiable key process and control parameters with the same parameters contained in the initial permit application or reported during a successful performance test.
3. State of maintenance.
4. Proper operation procedures and settings for the air pollution control devices.
5. Determination of whether the Standards of Performance are applicable to the plant.

8.2 Setting Up The Visits

Performance Test Monitoring. The new source standards (40 CFR 60.8) require that the owner or operator of an affected facility shall provide the administrator 30 days prior notice of the performance test. In case of asphalt concrete plants the precise date may be extremely difficult to pin-point exactly in time. This is because the plant operates intermittently, not storing material, but following the needs of field construction. Many state officials require that tests be run with top or wearing courses of asphalt concrete, since this type of product has the largest emission potential. The federal government may also require this (40 CFR 60.8). It will therefore be necessary to get an approximate planned date, refining the specific time as that date draws closer. It would be unusual for a plant operator to positively specify that exactly thirty days hence he will be running production of top course in the quantity needed to complete three tests.

While the date for the performance test is being finalized, the Enforcement Officer should review any data furnished by the operator. He should also request the operator to provide the following items by the time of the performance test:*

1. 3/8" holes, for static pressure determination, in the ductwork

   - before and after the secondary collector
   - before and after the fan

2. A suitable hole in the belt guard at fan axis for fan speed determination
3. A suitable water flow rate meter in the inlet piping if either

   - a wet scrubber secondary collector is used, or
   - a gas conditioning system is used in conjunction with an electrostatic precipitator.

Field Inspections. Field inspections after the performance test is completed might be made on a routine basis or in response to complaints. A visit might also be prompted if an enforcement officer happening to drive past the plant sees a suspect emission. It is not necessary for the enforcement officer to give notice of his visits. A more accurate appraisal of routine operating procedures is probably afforded from unannounced visits. Deciding whether to advise the plant of a pending visit or to make an unannounced visit depends on the judgment of the enforcement officer. Because of the uncertain nature of the production schedule the inspector could arrive at a plant to find no production scheduled for that day, or production in the A.M. when the officer visits in the P.M., etc. In that instance, production and any malfunction data could be reviewed, but the operating plant could not be examined. Asphalt concrete plants located in northern states often cease production from early January to early March. Plants will seldom operate when it is raining or if it has rained extensively for several days previously because field conditions are not conducive to laying the material. Plants most often have their greatest production in the morning hours, slackening off in late

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* The need for these items will be described in Section 8.6

afternoon.

The inspector must decide whether the unannounced visit advantages outweigh potential ineffective time and potential inability to make directly relatable comparisons with performance test data and previous visits.

8.3 Pre-Inspection Preparation -- Data

Performance Tests Monitoring. If the inspection function is to monitor a performance test the enforcement officer should obtain this data:

- A copy of the owner's test notification to the Administrator
- A copy of the owner's permit to construct (obtain from state)
- A copy of the state's performance test requirements including emission regulations and methods of performing the tests.

The enforcement officer should then prepare from these documents as much of the data called for on the Inspection Data Form for Asphalt Concrete Plants (see page 72) as possible prior to monitoring the performance test.

Field Inspections. If the purpose of the visit is a field inspection the enforcement officer should fill in as much data as is available from the permit application and the performance tests data on the Inspection Data Form for Asphalt Concrete Plants. This data will be obtained from:

- Owner's Permits to Construct and Operate (obtain from state)
- Findings from the performance test.

8.4 Pre-Inspection Preparation -- Equipment

The previous section 8.3 dealt with the data that should be prepared and analyzed prior to a field visit. This section deals with the equipment which must be taken to the field to facilitate the inspector's functions.

Safety Equipment. The necessary safety equipment are hard hats and ear plugs. It may also be advisable to wear safety shoes and safety glasses. Almost all plants will require hard hats. It must be remembered that these are small plants and they may not have extra safety equipment for visitors.

Inspection Equipment. The inspector will have the need for some equipment in his field visits to asphalt concrete plants. The equipment is not extensive, but will be necessary for the proper performance of the job:

- Watch, either stop watch or one with sweep second hand
- Thermometer, 5" stem or longer, nominally 50-500°F (10-260°C)
- Flashlight
- Tachometer, hand tachometer capable of reading nominally 100 to 4000 rpm and with two contact tips, one for center hole and the other for flat shafts
- Camera, a self-developing type
- Manometer or differential pressure gage (0-30"H_2O)
- Steel tape, 50 or 100 foot spool
- Brush
- Plastic bags.

8.5 Initial Procedures for Inspections

Upon arrival at the facility the enforcement officer should meet with the highest ranking company official at the plant. If no "ranking official" is present (usually the responsible party named on the Permit to Construct or Operate) attempts should be made to notify him by phone of the enforcement officer's presence and purpose. If the purpose of the visit is a performance test advance notice will have been made, and the plant and state personnel will be expecting the visit. If it is an unannounced visit it will be necessary to present credentials and detail the purpose and extent of the inspection with the person in charge. If the person in charge readily agrees with the inspection skip the next section and proceed to the plant meeting -- monitoring performance test section which follows. If the person in charge refuses entry for inspection purposes proceed to the next section.

Refusal of Entry. The right of entry to an emission source together with the right to examine and copy any required information is contained in section 114 of the Clean Air Act.

The reporting requirements are specified in 40 CFR 60.7. Briefly this section requires reporting of anticipated and actual start up, a record of startups, shutdowns or malfunction kept for two years, reports of excess emission submitted to the administrator quarterly and a file of all tests and measurements required by NSPS regulations. The enforcement officer also has the right to examine any records required by the state implementation plan.

Should any of these rights be refused, the enforcement officer should inform the official at the site of the civil action and injunctive relief that are provided in section 113 of the Clean Air Act (42 USC 1857 et seq.). If the official persists in his refusal, the enforcement officer should record his name and the situation, leave the site and forthwith report the incident to the regional attorney. The enforcement officer should not take any further action at the site.

Plant Meeting for Performance Tests Monitoring. This will be a brief informal coordinating meeting with all parties to the test. The test may be conducted by the state or a private contractor. Generally the tests will be performed by a private contractor, and often it will be witnessed by a state official. The federal inspector should state that he is there to monitor the tests and that he will do so as unobtrusively as possible. He should further state that in the event he sees techniques or equipment used not conforming with the test requirements set forth in the Standards of Performance for new sources that he will note same and advise the person in charge of conducting the test. He should make it clear that he will not interfere with or preempt any contract arrangement between owner and test company, but that he will make his observations known and note them. If the purpose of the visit is to monitor performance tests the inspector should proceed next to section 8.6 following; if the purpose is to conduct a field inspection to section 8.7.

8.6 Performance Tests Monitoring

This section will describe in detail the methodology in gathering key parameters and in observing certain details of the test procedure during a performance test.

8.6.1 System, Production, and Control Device Parameters

In order to define the "representative conditions" of the plant operation during a stack test, several parameters specific to the asphalt concrete process should be measured and recorded during the stack test by the inspector. Alternatively, the inspector may require the operator to measure them during a performance test. There are two reasons for doing this:

1. The set of parametric values will aid in reviewing the stack test data which will subsequently be submitted.
2. These values will provide a baseline measure of the specific operation, and can be used to determine the extent of changes in operation observed during subsequent field inspections.

The parameters to be recorded during the stack test and to be compared during subsequent field inspections are listed below. These should be recorded on the Parametric Evaluation Form shown on page 52 of this manual.

SYSTEM PARAMETERS:

1. System Pressure Drop
2. Fan Speed

PRODUCTION PARAMETERS:

3. Cold Feed Size Gradation
4. Percent Surface Moisture
5. Process Weight Rate

CONTROL DEVICE PARAMETERS:

6. Pressure drop across secondary collector
7. Water injection rate (if wet scrubber)
8. Pulse cycle time (if fabric filter)
9. Secondary Power Input (if electrostatic precipitator)

The need for measuring and the method of measuring the above parameters is described below:

System Pressure Drop. As air moves through a restriction, such as an elbow in the ductwork, a venturi in a wet scrubber, etc., the resistance to the movement of the air is reflected by a drop in the static pressure of the air, known as pressure drop (Δ P). System pressure drop is the sum of all pressure drops due to the individual components in the air handling system:

$$\Delta P \text{ System} = \Delta P \text{ Dryer} + \Delta P \text{ Ductwork} + \Delta P \text{ Primary Collector}$$

$$+ \Delta P \text{ Secondary Collector} + \Delta P \text{ Damper}$$

Since pressure drop is a measure of the resistance to air flow, an increase in the system pressure drop results in a decrease in the air flow rate, if the fan speed is constant. Thus, if the system pressure drop is increased the capacity of the system to handle the air flow has decreased and if the air requirement for the process has not changed, (i.e. by a corresponding decrease in the production rate) then a "puff-back" of dust-laden air may result at the burner end of the dryer. Also, an increase in the system pressure drop may increase the static pressure at the point where the main flow and the scavenger air flow combine, resulting in insufficient handling of scavenger dust. This may be compensated for by adjustment of the damper, if one is present.

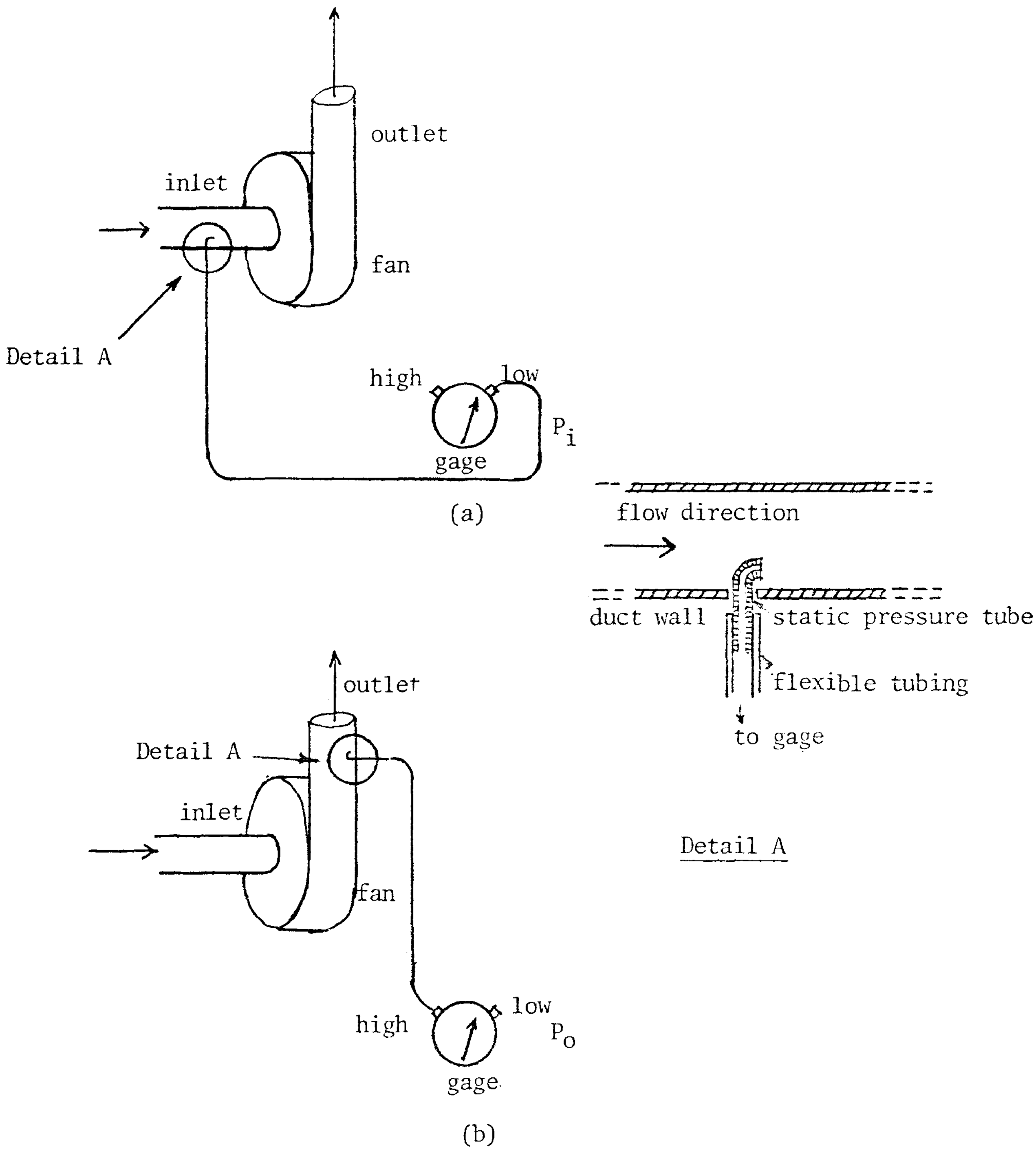
Since the air handling system is open to atmosphere at both ends, the system pressure drop is numerically equal to the static pressure rise in the main fan. It is much easier to measure the static pressure rise across the fan than to measure all the individual pressure drops that make up the system pressure drop. This is not dependent on the location of the fan in the system, although the fan is generally the last component in the system.

The system pressure drop can therefore be determined as follows:

1. Select the correct range for the differential pressure gage (or manometer).
2. Make the connection between the static pressure tube at fan inlet and the low pressure end of the gage (or manometer) as shown in Figure 8-1 (a), with the other (high pressure) end open to atmosphere.

FIGURE 8-1

DETERMINATION OF SYSTEM PRESSURE DROP



$\Delta P_{system} = P_i + P_o$, inches of water

3. The gage static pressure at fan inlet, P_i, (negative) with reference to the atmospheric pressure will be registered on the gage (manometer), in inches of water.
4. Make the connection between the static pressure tap at fan outlet and the high pressure end of the gage (or manometer) as shown in Figure (b), with the other (low pressure) end open to atmosphere.
5. The gage static pressure at fan outlet, P_o, (positive) with reference to the atmospheric pressure will be registered on the gage (or manometer), in inches of water.
6. ΔP_{system} = static pressure rise across fan

   $= P_i + P_o$, inches of water.

This simple procedure is applicable in all cases except when the air pollution control device is a wet-fan scrubber. In that case, care should be taken not to entrain water droplets in the tubing by disconnecting the tubing at the gage and blowing through the tubing to force the droplets out of the pressure taps immediately prior to taking a reading.

Fan Speed. Fans used to move air in asphalt concrete plants are positive displacement devices. Thus, the amount of air handled is directly proportional to the rotational speed of the fan. Any decrease in the fan speed (such as due to operational wear or stretch of the belts used in the drive) will result in a decrease in the air handling capacity of the system, and may cause "puffback" at the dryer or inefficient collection in the scavenger system.

The fan speed is determined as follows:

1. Select the proper stem tip attachment for the tachometer and insert the stem of the tachometer through a hole in the belt guard (this should be provided for the purpose of this measurement) at the axis of rotation of the fan.
2. Press the tip of the tachometer stem against the center of the fan shaft while the plant is in operation
3. Read the rotational speed of the fan in rpm on the correct scale after the pointer is steady.

Cold Feed Size Gradation. The stack emissions are related to the amount of fine particles introduced in the dryer, especially in the case of inertial control devices such as cyclones and wet scrubbers. It has been explained in Section 5 that the amount of fine particles introduced into the dryer varies with the desired product: for example, wearing or top course will have a greater amount of fine particles than a binder or a base course. Although most asphalt concrete plants produce all of the above types of courses, many states require a production run of top course during a compliance test (and EPA may require the same condition under Section 60.8c).

Cold feed size gradation is obtained by first collecting a representative sample of the cold feed and then subjecting the dried sample to a sieve analysis. Percent surface moisture can also be determined from the same sample. The gradation and moisture tests can be done by an outside laboratory or by a Lab Technician at the plant in the laboratory usually located at the site.

A representative sample of the cold feed is best taken from a conveyor belt at the cold feed end of the dryer in the following fashion:

1. Observe the flow of different aggregate materials from the cold feed bins on the conveyor belt while the plant is operating. For best results, the flow should be uniform. If the aggregate contains excessive moisture, or if the surface moisture is frozen, the aggregate on the belt will be in a non-uniform, lump form, not directly susceptible to sieve analysis.
2. Coordinate the stoppage of the belt with the plant operator (he may want to temporarily shut off the fuel supply during this procedure).
3. Select and mark off a nominal 1-foot length of the stationary conveyor belt with the cold feed on it.
4. Carefully scoop out the aggregate from the nominal 1-foot length into a plastic bag, taking care to get the finer particles with a brush, if necessary.
5. Repeat the above process two more times in 15-30 minute intervals, and collect the samples in the same plastic bag.
6. Seal the plastic bag.

The cold feed sample collected by the above method can be used to determine the gradation as well as the moisture content. The inspector may choose to send the sample to an outside laboratory with the instructions on the required reporting of the results, or he may decide to let the plant operator arrange to have the analysis done at the plant laboratory, perhaps even while the performance test or field inspection is going on.

The size gradation should be reported as shown in the Form 8-1 entitled Parametric Evaluation Form.

Percent Surface Moisture. The dryer in the asphalt concrete plant is used for the purpose of driving surface moisture

FORM 8-1

PARAMETRIC EVALUATION FORM

Company Name ______________________________ Location ______________________________

PARAMETER, (units)	DATE	DATE	DATE	DATE	DATE
1. System Pressure Drop (in. H_2O					
2. Fan Speed (rpm)					
3. Cold Feed Size Gradation:					
Cumulative % by weight passing:					
1 1/2"					
1"					
1/2"					
3/8"					
MESH # 4					
8					
16					
32					
50					
100					
200					

FORM 8-1 (cont'd)

PARAMETRIC EVALUATION FORM

	DATE	DATE	DATE	DATE	DATE
4. Percent Surface Moisture (%)					
5. Process Weight Rate (tons per hour)					
6. Pressure Drop Across Secondary (in. H_2O)					
7. Water (Injection ☐/ Discharge ☐) Rate, (gpm)					
8. Pulse Cycle Time (Seconds)					
9. Secondary Power Input, (Watts)					
Secondary Current (mA) Secondary Voltage (kV)					
10. Other (Specify)					

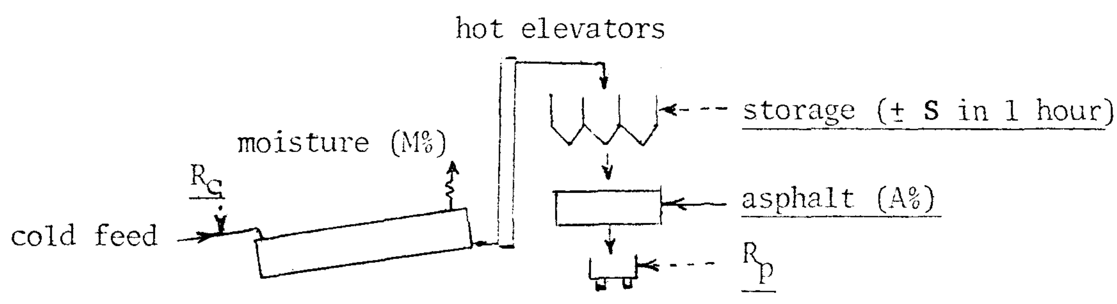
from the aggregate and heating it for better bonding of the asphalt with the aggregate. Fuel is required to provide the heat necessary to evaporate the surface moisture. Because the air handling capacity of the system has a maximum limit, an increase in the percent surface moisture of the cold feed reduces the production rate of the plant, since both the fuel, through the products of combustion, and surface moisture, through the water vapor, would increase the air handling demand at a given production rate. Most dryer manufacturers rate the dryer capacity at 5% surface moisture. The practical upper limit on surface moisture is approximately 8%, after which the aggregate is saturated.

The cold feed sample is taken as described on page 51 and then analyzed for percent surface moisture by drying a known weight of the sample at about 100°C. The percent surface moisture is $100 \times \frac{\text{loss in weight}}{\text{dry weight}}$.

Process Weight Rate. The amount of fine particles introduced into the dryer is a function of the size gradation as well as the dryer input rate. Many states have emission regulations based on process weight rate, defined as the sum of all process input weights divided by the corresponding time duration. The product of the asphalt concrete plant is monitored as to weight because the price is based on this weight. Thus there are three different weight rates associated with the plant:

- Cold feed rate at dryer input, R_c
- Process Weight Rate, R
- Production Rate, R_p

The following diagram shows how these three rates are related:



Let all the rates be expressed in tons per hour. Then:

$$\left[R_C\left(\frac{100-M}{100}\right)+\left(\frac{S}{1\text{ hour}}\right)\times\left(\frac{100}{100-A}\right)\right]=R_p,$$

where S is the increase or decrease in the material in the system (dryer, hot screens, hot bins) in one hour.

In steady state, there will be no appreciable build-up or drawdown of material in the system, and $S \approx 0$. Then:

$$R_C\left(\frac{100-M}{100}\right)\times\left(\frac{100}{100-A}\right)=R_p$$

Typically, both moisture content M and asphalt percentage A are = 5%, and the above equation reduces to:

$R_C = R_p, \approx R$ under the above simplications.

In practice it is a lot simpler to obtain R_p, the production rate, by the method outlined below. The error made in determining either R_C or R by measuring R_p and equating the three rates is approximately $\pm$ 5%, i.e., well within tolerable limits. The following procedure is used:

1. Make sure the plant has been running for at least 1/2 hour after startup. (Usually, at the end of the day, the hot bins and the dryer material are completely emptied). Thus, after startup, material starts building up in the system. Steady state is reached after about 1/2 hour's continuous operation, and $S \approx 0$).
2. Get the weight of product shipped at the weigh scale in one hour, or count the number of batches produced by the plant in one hour if it is a batch plant. (Knowing the capacity of the pug mill in tons, the total weight can be calculated).
3. Calculate $R_p = \frac{\text{Weight of Product}}{\text{1 Hour}}$
4. Repeat above procedure for one or two more times if possible.

<u>Pressure Drop Across Secondary Collector</u>. Due to impaction and agglomeration characteristics of a wet scrubber, efficiency increases with pressure drop. For a fabric filter, the buildup of a layer of dust which aids in the filtration process also creates a resistance which shows up as a pressure drop across the fabric filter. If the layer becomes too thick the pressure drop increases and the air flow rate decreases, possibly causing puffback at the dryer and possible damage to the fabric. On the other hand, a low pressure drop is indicative of a leak. For these reasons pressure drop across the collector is an important parameter. Pressure drop is measured as follows:

FOR SYSTEMS WITH SECONDARY COLLECTOR UPSTREAM OF FAN

1. Select the correct range of differential pressure gage (or manometer).

2. Make the connection between the static pressure tube at the collector inlet and the low pressure tap of the gage (or manometer) as shown in Figure 8-2(a), leaving the high pressure tap open to the atmosphere.

3. The static pressure, P_i (negative with reference to atmospheric pressure), can then be read from the gage (or manometer) in inches of water.

4. Make the connection between the static pressure tap at the collector outlet and the low pressure tap in the gage (or manometer) as shown in Figure 8-2 (b), leaving the high pressure tap open to the atmosphere.

5. The static pressure, P_o, (negative with respect to atmospheric pressure) can then be read from the gage (or manometer) in inches of water.

6. ΔP Collector = $P_i - P_o$, inches of water.

FOR SYSTEMS WITH SECONDARY COLLECTOR DOWNSTREAM OF FAN

1. Select the correct range of differential pressure gage (or manometer)

2. Make the connection between the static pressure tube at the collector inlet and the high pressure tap of the gage (or manometer) as shown dotted in Figure 8-2(a), leaving the low pressure tap open to the atmosphere.

3. The static pressure, P_i (positive with reference to atmospheric pressure), can then be read from the gage (or manometer) in inches of water.

4. Make the connection between the static pressure tap at the collector outlet and the high pressure tap on the gage (or manometer) as shown in Figure 8-2(b), leaving the low pressure tap open to the atmosphere.

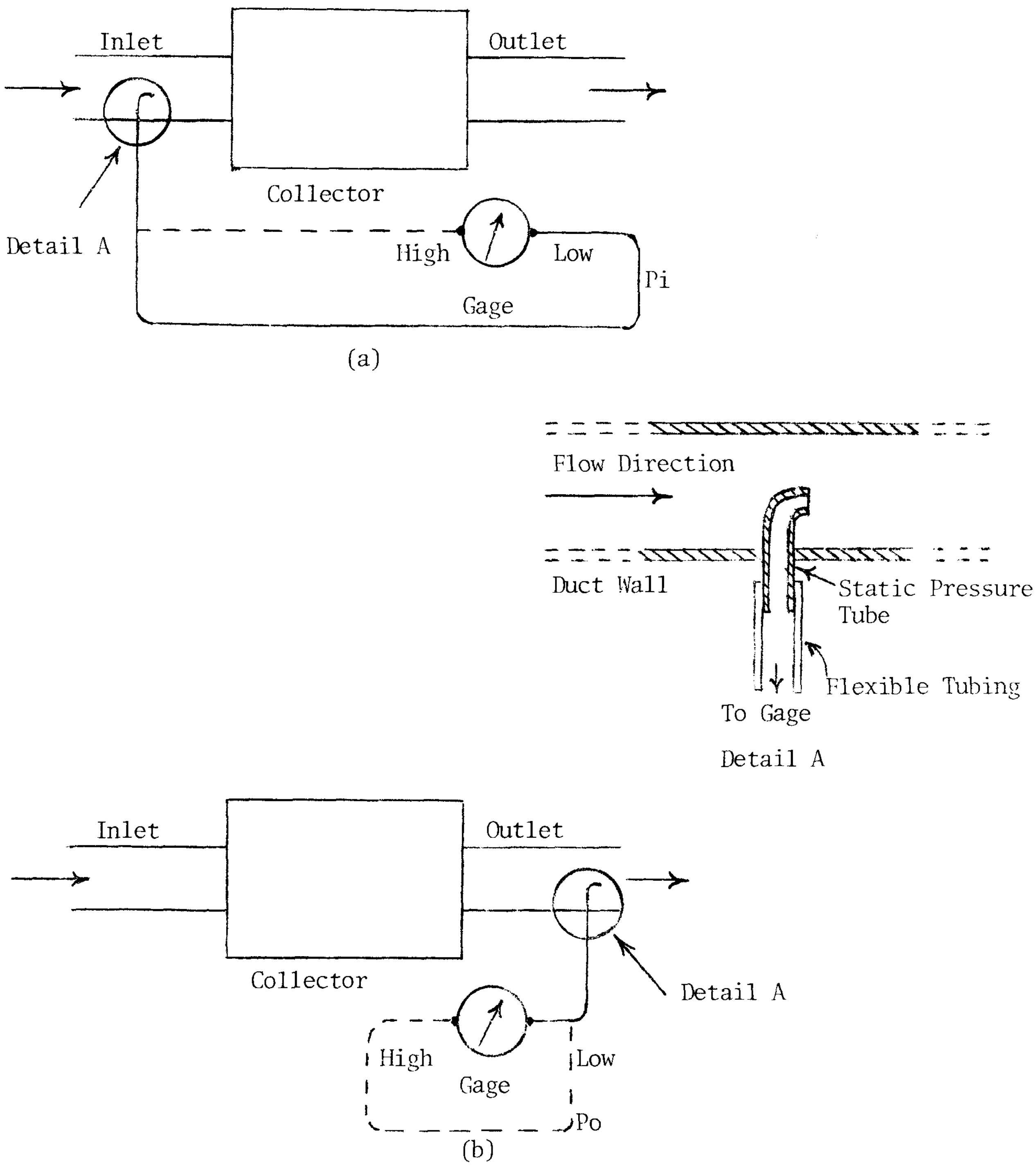
5. The static pressure, P_o (positive with respect to atmospheric pressure), can then be read from the gage (or manometer) in inches of water.

6. ΔP collector = $P_i - P_o$

Note: In situations where there is a short stack and little ductwork after the fan the static pressure at the collector outlet will essentially be zero.

FIGURE 8-2

DETERMINATION OF PRESSURE DROP ACROSS COLLECTOR

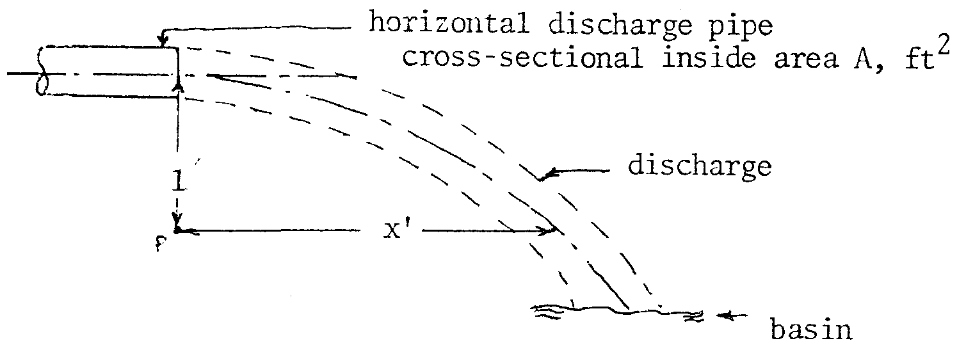


Δ P collector = Pi - Po

If the collector is a wet scrubber care should be taken to keep the tubing free of any water droplets, as indicated on page 50.

Water Injection Rate. Water injection rate is related to the collection efficiency of a wet scrubber. If the water injection rate goes down, the efficiency is also reduced. Clogged nozzles, a faulty pump, or leakage could reduce the flow and change the operating characteristics of the wet scrubber.

Water injection rate can be determined with ease if there is a water meter in the inlet line to the scrubber. If such a water meter is not present, the inspector may require the plant operator to install one (under 40 CFR 60.8e) or he may obtain a measure of the water flow rate by recording the rate at which the waste water leaves the scrubber. This can be done by the method outlined below if the discharge is free-flowing and if the discharge pipe is horizontal.



(i) Referring to above diagram, locate a point P which is one foot vertically below the center line at the end of the discharge pipe.

(ii) Measure horizontal distance x (in feet) between point P and the middle of the discharge water jet.

(iii) Calculate the water discharge rate in gallons per minute by using the formula:

Water Discharge Rate = $1800\ A \cdot x$, gpm
where x = distance shown above, feet
and A = pipe cross-sectional area, square feet.

The method described above is applicable only if the discharge pipe is horizontal.

Pulse Cycle Time. Fabric filtration mechanism consists of the build up of a layer of dust on the dirty side of each bag. As the layer builds up pressure drop increases and, therefore, the layer is periodically depleted either by mechanical shaking or by the introduction of a pulse of air. In asphalt plants air is almost exclusively used. This cyclical process goes on continuously while the fabric filter is operating. The cycle time is critical in the sense that if it is too long a large layer is built up, causing excessive pressure drops at the end of the cycle, and if it is too short it prevents the filter from operating over the most efficient part of its build-up cycle.

The pulse cycle time should be read from the setting on the timer which is either attached directly to the baghouse or located in the control room near the operator, and the operator should be able to point it out to the enforcement officer.

Secondary Power Input. The amount of power input to the electrostatic precipitator is related directly to its operating efficiency. Thus checking the delivered power to the unit by reading the secondary current and voltage (power = current x voltage) is an easy check on the performance of the precipitator:

1. Read the secondary current (in mA) and voltage (in kV) from the meters, which are usually located near the transformer section of the precipitator.
2. Secondary power input = current x voltage (in watts)

Summary. The above are key parameters which establish production rates and operating conditions for future comparisons. The Parametric Evaluation Form should be used to record information gathered above.

As will be shown in Section 8.7.1 there are ranges of the above parameters which can be used as a guide to determine whether the process, including the control devices, as observed during a field inspection, has significantly changed from its operation during which the performance test was taken. Changes in some of these parameters may suggest malfunctions that should be brought to the attention of the plant operator and may call for another performance test.

8.6.2. Observation of a Performance Test

The use of EPA approved methods for performance testing of particulate matter is required by 40 CFR 60.8 and 40 CFR 60.11. Specific test requirements of asphalt concrete plants are listed in 40 CFR 60.93. General procedures describing EPA-approved methods for stack testing and the witnessing by a federal Enforcement Officer of stack tests are covered in detail in "Emission Testing Compliance Manual" prepared by Pedco Environmental Specialists, Inc. for EPA. The inspector should familarize himself with this manual, especially chapters 1 and 2.

The enforcement officer, while monitoring a stack test on an asphalt concrete plant, should limit his observations to a few major items. The data should be recorded on Form 8-2 entitled, Performance Test Observation Form. The following numbered paragraphs refer to data identification numbers on the form.

1. Cross-sectional dimensions of the flow duct at the sampling location should be recorded (both inside and outside).
2. Number of sampling points to be chosen for the stack sampling depends upon where the nearest upstream and downstream obstructions (such as an elbow, a change in the flow area, end of the stack, etc.) are located. Check with the crew leader on the total number of points to be traversed, and compare it to Figure 1.1, 40 CFR 60, Appendix A, to determine whether the flow will be properly sampled.
3. In many cases an assumption of the moisture content is acceptable, based on the prior experience of the sampling crew on other asphalt concrete plants. If the crew is in doubt, then check to insure that the moisture content of the gas (for nomograph setting) is determined using method 4.
4. Note the inside diameter of the nozzle the testing crew selected for sampling.
5. Immediately prior to starting each run, the crew must test the assembled sampling train for leaks. Observe the following points during this leak test:

    a. The vacuum gage in the sampling circuit should register a steady reading of 15 inches of mercury during the leak test.
    b. The leakage rate is determined by observing the movement of the dry gas meter in one minute (a stopwatch should be used for this purpose).
    c. The leakage rate at 15 in. Hg vacuum should not be greater than 0.02 cfm (the maximum limit set forth in Method 5).

    Because of the high vacuum created through the sampling train while leak testing, there is a possibility of some of the water in one of the impingers being sucked into the next impinger. For this reason, the leak test duration is usually kept to the minimum.

6. Observe the impingers containing water during the course of sampling. If no bubbles are seen the sampling train is either disconnected from the pump or plugged.
7. Observe the gas analysis procedure (methods). At least three samples should be analyzed before averaging readings for the purpose of determining the dry molecular weight of these gases. (Because of the high excess air combustion practiced in asphalt plants, the dry molecular weight is usually 29. Deviations in the molecular weight of more than 5% indicate a significantly different combustion process than is normal in asphalt concrete plants).

8. Observe the method of cleaning and sample recovery between runs. Careless removal of filters, or inadequate cleaning of probes will result in a loss of collected particulate matter for emission calculation purposes.
9. Determine approximately when the following parts of the sampling train were last calibrated, or measured.

- Pitot tube
- Thermocouple/thermometer
- Dry gas meter
- Orifice diameter
- Nozzle diameter.

When the emission testing firm submits a test report the results should be carefully checked and compared with the data recorded by the inspector for points 1-9 above. Thus, the Performance Test Observation Form provides both a verification of proper test procedures as well as baseline data for the acceptance of stack test results.

8.7 Field Inspections

The previous section dealt with performance test monitoring. This section deals with field inspections.

Once plant entry for inspection purposes is assured and access to documents is gained the inspector should proceed with examination of the records and a briefing of the official in charge. The inspector should review the operating conditions and shutdown procedures. Copies of applicable regulations should be briefly reviewed and given to the official in charge if he does not have copies. The inspector should also review any logs, recording charts and records of operation with the plant foreman to determine any changes from the last visit in operating procedures the control process or other factors that could influence emissions. This will also help the inspector determine "normal operating procedures" so that he can recognize any abnormal or changing conditions. A brief itinerary of the visit should be outlined. At this point the official in charge can outline his production for the next several hours so the inspector can best schedule his duties. When he knows the plant conditions and production type and quantity of material the inspector is in a position to proceed with the inspection.

8.7.1 Plant Inspections

Plant inspections will essentially involve three areas of activity:

1. Opacity Readings
2. Acquisition of key plant data
3. An evaluation of plant maintenance and operational characteristics.

FORM 8-2

PERFORMANCE TEST OBSERVATION FORM

Company Name: ______________________________ Date: ____________

Plant Identification and Address: ____________________________

____

____

Performance Test By: ____________________________

____

____

Plant Official: ____________________ Crew Leader: ____________

1) Cross-sectional duct dimensions at sampling location

(i) inside circular ☐ , rectangular ☐

(ii) outside

2.1) Flow obstructions

(a) upstream from the sampling location ____________

(b) downstream from the sampling location ____________

2.2) Total no. of sampling points chosen ____________

3) Moisture content

☐ assumed ______% moisture

☐ method 4

4) Inside nozzle diameter

5) Leak test

(i) Vacuum gage reading ________in Hg

(ii) Dry gas meter reading ______cf in ______sec

6) Impinger bubbles, yes_____ no_____

7) Gas Analysis Procedure No. of samples analyzed _______

8) Cleaning and Sample Recovery, Adequate _____ Careless ______

9) Calibration check Date calibrated

(i) pitot tube ____________

(ii) thermometer/thermocouple ____________

(iii) dry gas meter ____________

(iv) orifice diameter ____________

(v) nozzle diameter ____________

Opacity Readings. The inspector should conduct opacity readings of the main stack and any fugitive sources he observes from the cold aggregate input to the terminus of the system. The number of readings and the technique of taking the readings shall be as specified in Method 9. Form 8-3 a and b are the recommended forms for recording a visual determination of opacity. A synopsis of this data is to be recorded as data item 8 on the Inspection Data Form for Asphalt concrete Plants, Form 8-4 at the end of this section.

Acquisition of Key Plant Data. This is the same type of data as recorded on Parametric Evaluation Form described in detail in Section 8.6. The purpose of again gathering this data is to compare the system operation at this point in time against that of the performance test or previous field inspection.

Because of the innumerable process and material variations possible it would be impossible to fully describe all the changes that could result in a previously acceptable facility being out of compliance. It is, however, possible to outline the extent and direction of certain key changes which are significant, that should indicate to the inspector that the source may no longer be in compliance. If further inspection does not satisfactorily explain the change in operating conditions the inspector could require another stack test at the conditions then prevailing. The following list will serve as a guide along these lines.

1. System Pressure Drop: Change significant if observed change $>$ 20% in either direction.
2. Fan Speed: Change significant if observed decrease is $>$ 20%.
3. Cold Feed Size Gradation: This defines the material being produced. If the gradation during a field inspection shows that a much finer aggregate is being produced than during the stack test (an increase of 50% or more of -200 mesh) it may indicate that the performance test was not run under the proper conditions.

4&5. Process Weight and Percent Surface Moisture: Change significant if observed increase in Process Weight Rate at the same moisture content as observed during the performance test is $>$20%. (For other moisture contents the inspector should use his discretion, keeping in mind that the process weight rate drops by approximately 10% for every 1% increase in surface moisture).

6. Pressure Drop Across Secondary Collector:
    a. Wet Scrubber: Change is significant if observed decrease is $>$ 10%.
    b. Fabric Filter: Change is significant if:
        1. Observed decrease is $>$ 20% (indicative of a leak)
        2. Observed increase is $>$ 20% (indicative of cake build-up change)

FORM 8-3 a

OBSERVATION RECORD

COMPANY ____________
LOCATION ____________
TEST NUMBER ____________
DATE ____________

OBSERVER ____________
TYPE FACILITY ____________
POINT OF EMISSIONS ____________

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	0							
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

COMPANY ____________
LOCATION ____________
TEST NUMBER ____________
DATE ____________

OBSERVER ____________
TYPE FACILITY ____________
POINT OF EMISSIONS ____________

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
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	51							
	52							
	53							
	54							
	55							
	56							
	57							
	58							
	59							

FORM 8-3 b

RECORD OF VISUAL DETERMINATION OF OPACITY

COMPANY ____________________

LOCATION ____________________

TEST NUMBER ____________________

DATE ____________________

TYPE FACILITY ____________________

CONTROL DEVICE ____________________

HOURS OF OBSERVATION ____________________

OBSERVER ____________________

OBSERVER CERTIFICATION DATE ____________________

OBSERVER AFFILIATION ____________________

POINT OF EMISSIONS ____________________

HEIGHT OF DISCHARGE POINT ____________________

	Initial			Final
CLOCK TIME				
OBSERVER LOCATION Distance to Discharge				
Direction from Discharge				
Height of Observation Point				
BACKGROUND DESCRIPTION				
WEATHER CONDITIONS Wind Direction				
Wind Speed				
Ambient Temperature				
SKY CONDITIONS (clear, overcast, % clouds, etc.)				
PLUME DESCRIPTION Color				
Distance Visible				
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time	Opacity	
	Start--End	Sum	Average

Readings ranged from ____ to ____ % opacity

The source was/was not in compliance with ____ at the time evaluation was made.

7. Water Injection Rate: Change is significant if observed decrease is $> 20\%$.
8. Pulse Cycle Time: Change is significant if observed decrease is $> 50\%$.
9. Secondary Power (Electrostatic Precipitator) significant if the power decreased by $> 20\%$.

It is estimated that an inspector who has experience in inspecting asphalt concrete plants can gather the data in steps 1-9, except the cold feed gradation in step 3 above, in one hour if the plant is running, and make the comparison with previous data in fifteen minutes. They should be summarized in data item 6.

The next step in the inspection procedure is to evaluate plant maintenance and operation practices. Data obtained here should be recorded in data items 7 and 8 on the Inspection Data Form for Asphalt Concrete Plants.

Maintenance and Operational Practices. This section involves the inspection of the various components that make up the system for proper maintenance and operational practices. Poor practices result in fugitive dust and improper functioning.

Dryer and Burner. The function of the dryer is to heat the aggregate to between 250^{o} and $375^{o}F$.

The inspector should record the dryer outlet temperature. There is generally a gage in the control room monitoring that temperature.

The balance between the combustion air (draft) and rate of fuel fired is very important and can affect emissions significantly. Improper combustion balance may cause incomplete combustion and subsequent emission of black smoke.

The inspector should check for this imbalance. Indications are a smoky flame in the dryer or a symptom called "puff back". Puff back occurs when the draft created by the fan (or blower) is not sufficient to accommodate the air pressure being introduced by the burner blower and some fugitive dust is blown out around the dryer inlet.

This causes serious dust and smoke emissions at the dryer, probably in excess of opacity regulations. Puff back can be remedied either by increasing primary draft air or decreasing fuel firing rates.

The opposite case where there is an excess of draft for the fuel firing rate can also occur, leading to underheated aggregate and increased hydrocarbon emissions. This cannot be determined by the inspector.

Proper plant operations call for the operator to reduce the draft (close the damper) until puff-back appears, and then gradually increase draft until puff-back is eliminated. This procedure not only is a good system balance, but it is an excellent method of conserving energy. Proper practice, however, requires that the damper be readjusted each time the feed rate, moisture content, or burner setting is changed.

In conducting this part of the inspection the inspector should wear hearing protection as the noise level close to the burner is high.

Mixing Tower. After the dryer the heated aggregate is generally transported via bucket elevator to the mixing tower. The inspector should check the hot elevator and all points in the tower where fugitive emissions could result. This includes physical inspection of all system components for leaks, bad seals in ductwork, and general condition. Specific points to check are the hot screens, bins, weigh hopper, pugmill and rock reject chute (designed to discharge overflow or oversize from the screens).

Notes should be taken or sketches made of the fugitive (scavenger) system if not available from performance test reports. Opacity regulations apply to all of the points on the fugitive system and batch tower. (See data item 8)

8.7.2 Control Device Inspection

Control device inspection begins with dryer exhaust duct and scavenger system ductwork and ends at the stack outlet.

All ducts leading to the primary control device or to whatever control is used in the absence of a primary should be checked for leaks, rust and general condition. A sketch and description of the control layout may prove valuable at a later date if not contained in the Performance Test Record. (See data item 8)

Primary Control. The most common primary control system is a cyclone. The cyclone may be single or multiple unit (usually single).

The cyclone should first be checked for leaks and general condition. The routing of collected material should be noted and if necessary a sketch drawn. (See data item 8)

The pressure drop across the cyclone should also be determined if leaks are evident and compared with previous data if available.

Secondary Control. As discussed earlier the only controls likely to be encountered as final controls are baghouses, venturi scrubbers, two or more wet scrubbers in series, and, to a lesser degree, electrostatic precipitators.

Generally they should be inspected for physical condition and any leaks. The final control device should be included in any sketches and photographs made.

Fabric filters are becoming increasingly popular in controlling particulate emissions from asphalt plants and will probably be on the bulk of plants inspected.

The inspector should determine the design air to cloth ratio and also that of the normal flow at the facility or online air to cloth ratio. Information for this should be on the plant's operating permit Performance Test.

Pressure drop across the baghouse is also important for the inspector to determine. Often plants will have a gage or manometer permanently installed in the system to monitor pressure drop.

The type and frequency of the cleaning mechanism should be noted. To determine the cleaning cycle it is best to locate the timer and check the setting with the plant foreman.

Usually an inspection of the interior of the baghouse is not necessary, however, if puffs of dust or opacity problems are noted in the course of the inspection the enforcement officer may elect to inspect the interior of the baghouse. Bag compartment access doors or inspection door can be used for this purpose. The enforcement officer should look for dust in the clean plenum. In top opening baghouse compartments there may be actual dust rings on the compartment cover directly above the faulty bag or surrounding the open section of the bag where it pierces the plenum separator. This indicates leakage.

Wet scrubber efficiency is primarily dependant on pressure drop and water injection rates. These parameters should be recorded for all wet collectors.

Water injection rates are often monitored by gages in the line,and these readings should be recorded. The inspector should also note the disposal procedure for the scrubber effluent, especially whether or not water is recycled. If so, the visual condition of the water before it is reused should be noted (if it is muddy, oil streaked, odorous etc.).

Many venturies have adjustable throats (variable venturi restrictions). If this is the case note the position of the control setting and compare it to the conditions noted during previous inspections or during the performing tests.

Electrostatic precipitators are not commonly found on asphalt plants. However,they can achieve the necessary efficiencies.

The enforcement officer should locate and record the readings of both the voltage and current to the plates of the precipitator. These meters are on all electrostatic precipitators.

In applications to asphalt plants electrostatic precipitators may require gas pre-conditioning to attain proper particle resistivity. Such preconditioning generally involves humidity control. If a gas conditioning device is present the inspector should note whether it is operating and the liquid flow rate.

A sketch or photo and notes on the layout of the electrostatic precipitator and ancillary devices may be helpful.

Fan or blower. The blower is important to both the process and control of emissions from asphalt plants.

Its inspection should include obtaining nameplate data, checking its general condition and using a tachometer to measure the r.p.m. Determining the static pressure drop across the fan is important.

The temperature of the exhaust gas should be recorded at the stack at a convenient point as close to the stack as possible.

8.7.3 Scavenger Systems

The scavenger system usually consists of pick up hoods and ductwork from the hot screens, pugmill and weigh hopper area and from the hot elevator. These generally are two or three ducts which merge and are then carried to the primary collector. Fugitive dust at any of these points is an indication that the scavenger system is not functioning properly. This can be attributable to poor design where flow rates and fan capacity were not properly engineered, leaks, or stoppages in the scavenger ductwork caused by insufficient maintenance of the system.

8.7.4 Materials Handling Systems

Many plants, using controls that collect material in a dry form, have storage silos to store recovered material either for future use in the plant or as a salable product.

These systems generally involve taking the collected material from the control device (usually a baghouse) and pneumatically conveying it to storage silos mounted so that trucks can pull under them for loading. Inspection of these systems should involve a check for system leaks and general condition.

As material is conveyed to the silo, the air displaced by the material and the air introduced by the pneumatic system must be vented. These vents should be controlled either with a small fabric filter on the vent or by routing the displaced air back to the control system. Collected materials are often loaded into a truck from the silo or control device. These sources are also subject to opacity regulations.

8.8 Startup, Shutdown, Malfunction

The enforcement officer should be aware of all the reporting requirements regarding startups, shutdowns and malfunctions. This includes SIP as well as NSPS requirements.

NSPS regulations require the operator to maintain records of startups and shutdowns or malfunctions for a period of two years. Additionally, if the startups, shutdowns or malfunction result in emissions in excess of normal rates the operator must report these emissions quarterly as described in the NSPS regulations (40 CFR 60.7). As prescribed in the regulations, opacity standards and concentration standards do not apply during periods of startup, shutdown or malfunction.

Due to the operational nature of asphalt plants, startups and shutdowns are common occurrences. Proper operating procedures during these times will minimize any excess emissions that may result. Some things that the inspector should check for are: that the air in the control equipment is permitted to warm up sufficiently before production is started - this is vital for baghouses; and that the blower or fan is always running before the burner is fired and after the cold feed or burner and dryer are turned off.

Malfunction as defined in the NSPS regulation means "any sudden and unavoidable failure of air pollution control equipment or process equipment or of a process to operate in a normal or usual manner. Failures that are caused entirely or in part by poor maintenance, careless operation, or any other preventable equipment breakdown shall not be considered malfunctions". (40 CFR 60.2)

Because of the series connection of components of production in asphalt plants, most process malfunctions will necessitate shutdown.

Control malfunctions then will be of most interest to the inspector. Should a malfunction be discovered or claimed at any point during the inspection, the inspector should record its nature and cause (if possible). The inspector should try to determine whether the malfunction is unavoidable or preventable in light of the definition set forth in the regulations. If preventable the violation, if one exists, should be recorded. Maintenance records, receipts, purchase orders for replacement parts, etc. should be reviewed to assist in the evaluation of the malfunction. In the case of an unavoidable malfunction the inspector should check on the corrective measures that will be taken to prevent a repetition.

Finally, a follow up inspection is recommended to see that the malfunction is remedied in a reasonable amount of time. This inspection need be concerned only with the malfunction, unless some other significant event happens.

FORM 8-4

INSPECTION DATA FORM FOR ASPHALT CONCRETE PLANTS

Data Item 1: Location Information

Company Name & Address	Plant Identification & Location
______________________	______________________
______________________	______________________
______________________	______________________
Company Official & Phone No.	Plant Official & Phone No.
______________________	______________________

Data Item 2: Reason for Inspection (check one or more)

☐ Routine

☐ In response to complaint : Complainant ____________

☐ Suspected violation Date of Complaint ____________

Data Item 3: State/Local Agency Action

Data Item 4: General Plant Data

Type Plant: New ☐, Modified ☐

Type Plant: Continuous ☐ , Batch ☐ , Portable ☐ , Permanent ☐

Production: Rated Capacity at 5% surface moisture ______ ton/hr.,

Normal Rate ______ ton/hr.

Annual Production: ________________ tons

Type Fuel: Gas ☐ , Oil ☐ , Grade of Oil ____________________

Fuel Consumption: Gas _____ cu.ft./hr. Oil ________ gal./hr.

Raw Materials:

(1) Aggregate Source ______________________________________

(2) Maximum %-#200 mesh (wearing course) __________________

Date of sieve analysis ___________________________________

(3) Asphalt Consumption _________ gal./yr. Grade _______________

Supplier ____________________ Storage Temp. _______________

Nearest Building or Structure Off the Plant Site:

Approximate distance from exhaust stack ______

Use: Industrial ☐ , Commercial ☐ , Residential ☐

Normal Operating Schedule: Permanent Plants

1. ___________ hrs./day ___________ days/wk. ___________ weeks/yr.

2. % of Total Annual Production: Jan.-May ____________________

May-Aug. _____________ Sept.-Oct. _____________ Nov.-Dec. _________

Normal Operating Schedule: Portable Plants

1. Start Date ________________________ End Date ________________

2. ___________________________ hrs./day ________________ days/wk.

Data Item 5: Performance Test Abstract

Date of Last Source Test _____________ No. of Runs _______________

Test Performed by ____

Particulate Emissions _____________ gr./dscf _____________ lbs./hr.

Visual Emissions During Test: % Opacity __________________________

%-#200 Mesh in Dryer Feed During Test ______________________

Production Rate During Test ______________________

Data Item 6: System, Production & Control Device Parameters
(Summarize information from Parametric Evaluation Form here)

	Previous Reading	Significant Change*
1) System Pressure Drop ________ in H_2O		
2) Fan Speed ________ rpm		
3) Cold Feed Size Gradation		
Percent by weight passing #200 mesh _____ %		
4) Percent Surface Moisture _____ %		
5) Process Weight Rate _____ tph		
6) Pressure Drop Across Secondary _______ H_2O		
7) Water (injection ☐/discharge ☐) Rate ______ gpm		
8) Pulse Cycle Time ______ sec.		
9) Secondary Power Input _______ w.		
10) Other: specify		

(* Identify any significant changes in Parameters here, if reported or observed: see Section 8.8.2 for details)

Data Item 7: Field Inspection Data

1) Dryer: Manufacturer & Model No. ______________________
Size - diameter ____ ft., length _____ ft.
Type of exhaust outlet - end ☐ , center ☐

2) Burner: No. of burners - one ☐ , two ☐
Manufacturer & Model No. ______________________
Fuel used ______________________

3) Pugmill: Batch size ____________ lbs./batch
Batch cycle time ____________ sec.
Controlled by scavenger ________________________

4) Storage Silo: (aggregate, mineral filler) type ______________
Controlled by scavenger ________________________

5) Primary Collector: type ____________
Manufacturer & Model No. ______________________

6) Secondary Collector: type ____________
Manufacturer & Model No. ______________________

7) Scavenger System: areas controlled

Hot elevator	________	screens	________
Hot bins	________	weigh hopper	________
Pugmill	________	storage silo	________
Mineral filler system	________		

If scavenger system has separate controls, give details:

8) Fan & Motor:

Fan: Manufacturer & Model No. ________________

Motor: Manufacturer & Model No. ________________
rated horsepower ____________________ hp
rated speed ________________________ rpm

Data Item 8: Maintenance & Operational Practices

1) Dryer & Burner

dryer outlet temperature ______ °F
puffback ☐
smoky flame ☐

2) Mixing Tower

fugitive emissions ☐ opacity ____%
source/s: ____________________
scavenger ductwork (sketch)

3) Control Device

a. dryer exhaust ductwork:

leaks ☐
rust ☐
general condition: good ☐ , poor ☐

b. primary control device:

leaks ☐
rust ☐
general condition: good ☐ , poor ☐

(sketch)

c. secondary control device (fabric filter):

air-to-cloth ratio: design _____, actual __________
pressure drop __________ in H_2O
pulse cycle time _______ sec.
disposal of collected dust ____________________

d. secondary control device (wet scrubber):

water (injection ☐ /discharge ☐) rate _____gpm
waste disposal procedure

color: ________, oil ☐ , odor ☐
throat control setting (if venturi) ______________
pressure drop __________ in H_2O

e. secondary controldevice (electrostatic precipitator):

gas conditioning
liquid injection rate ______ gpm
disposal of collected dust ______________

4) Fan or Blower

static pressure rise __________ in H_2O
fan speed ______________________ rpm
general condition: good ☐ , poor ☐

5) Materials Handling System

leaks ___
general condition: good ☐ , poor ☐
vent line: controlled ☐ , uncontrolled ☐
vent line opacity ___________

6) Stack Plume Opacity ______________

Data Item 9: Administrative Action Checklist

(This space may be used to list any administrative action)

SECTION 9

POST-INSPECTION ACTION

The inspector's findings during his inspection of the plant should be briefly conveyed to the plant official at the site before leaving the premises. Specific violation decisions should neither be made nor discussed in the field.

The inspector should, within 48 hours after the inspection, complete his report on the inspection. This report will consist of updated forms and recommended action and should be forwarded to the supervisor.

Decisions for subsequent action should be made in a conference with the supervisor. If the inspection revealed that the plant was operating normally and if the decision requires no further action, then the report should be filed in the source file for future reference.

If the inspection revealed a significant change in plant operation and if the decision is to require a new performance test, the plant official should be so informed in writing.

If the inspection revealed a violation of the opacity standard then the decision may be to issue an order requiring compliance with the standard.

If the inspection revealed a violation of the opacity standard and if the plant official has claimed an unavoidable malfunction as a reason, then the decision should be to remind the plant operator of the recordkeeping requirements of 40 CFR 60.7, and followup inspection should be planned, prior to any other action.

APPENDIX

PART 60—STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES

Subpart A—General Provisions

§ 60.1 Applicability.

Except as provided in Subparts B and C, the provisions of this part apply to the owner or operator of any stationary source which contains an affected facility, the construction or modification of which is commenced after the date of publication in this part of any standard (or, if earlier, the date of publication of any proposed standard) applicable to that facility.

[39 FR 20790, June 14, 1974]
[40 FR 46250, October 6, 1975]

§ 60.2 Definitions.

As used in this part, all terms not defined herein shall have the meaning given them in the Act:

(a) "Act" means the Clean Air Act (42 U.S.C. 1857 et seq., as amended by Public Law 91-604, 84 Stat. 1676).

(b) "Administrator" means the Administrator of the Environmental Protection Agency or his authorized representative.

(c) "Standard" means a standard of performance proposed or promulgated under this part.

(d) "Stationary source" means any building, structure, facility, or installation which emits or may emit any air pollutant and which contains any one or combination of the following:

(1) Affected facilities.

(2) Existing facilities.

(3) Facilities of the type for which no standards have been promulgated in this part.

[40 FR 58415, December 16, 1975]

(e) "Affected facility" means, with reference to a stationary source, any apparatus to which a standard is applicable.

(f) "Owner or operator" means any person who owns, leases, operates, controls, or supervises an affected facility or a stationary source of which an affected facility is a part.

(g) "Construction" means fabrication, erection, or installation of an affected facility.

(h) "Modification" means any physical change in, or change in the method of operation of, an existing facility which increases the amount of any air pollutant (to which a standard applies) emitted into the atmosphere by that facility or which results in the emission of any air pollutant (to which a standard applies) into the atmosphere not previously emitted.

[40 FR 58415, December 16, 1975]

(i) "Commenced" means, with respect to the definition of "new source" in section 111(a)(2) of the Act, that an owner or operator has undertaken a continuous program of construction or modification or that an owner or operator has entered into a contractual obligation to undertake and complete, within a reasonable time, a continuous program of construction or modification.

(j) "Opacity" means the degree to which emissions reduce the transmission of light and obscure the view of an object in the background.

(k) "Nitrogen oxides" means all oxides of nitrogen except nitrous oxide, as measured by test methods set forth in this part.

(l) "Standard conditions" means a temperature of 20°C (68°F) and a pressure of 760 mm of Hg (29.92 in. of Hg).

(m) "Proportional sampling" means sampling at a rate that produces a constant ratio of sampling rate to stack gas flow rate.

(n) "Isokinetic sampling" means sampling in which the linear velocity of the gas entering the sampling nozzle is equal to that of the undisturbed gas stream at the sample point.

(o) "Startup" means the setting in operation of an affected facility for any purpose.

(p) "Shutdown" means the cessation of operation of an affected facility for any purpose.

(q) "Malfunction" means any sudden and unavoidable failure of air pollution control equipment or process equipment or of a process to operate in a normal or usual manner. Failures that are caused entirely or in part by poor maintenance, careless operation, or any other preventable upset condition or preventable equipment breakdown shall not be considered malfunctions.

(r) "One-hour period" means any 60 minute period commencing on the hour.

[40 FR 46250, October 6, 1975]

(s) "Reference method" means any method of sampling and analyzing for an air pollutant as described in Appendix A to this part.

[39 FR 20790, June 14, 1974]

(t) "Equivalent method" means any method of sampling and analyzing for an air pollutant which have been demonstrated to the Administrator's satisfaction to have a consistent and quantitatively known relationship to the reference method, under specified conditions.

(u) "Alternative method" means any method of sampling and analyzing for an air pollutant which is not a reference or equivalent method but which has been demonstrated to the Administrator's satisfaction to, in specific cases, produce results adequate for his determination of compliance.

(v) "Particulate matter" means any finely divided solid or liquid material, other than uncombined water, as measured by Method 5 of Appendix A to this part or an equivalent or alternative method.

[39 FR 20790, June 14, 1974]

(w) "Run" means the net period of time during which an emission sample is collected. Unless otherwise specified, a run may be either intermittent or continuous within the limits of good engineering practice.

(x) "Six-minute period" means any one of the 10 equal parts of a one-hour period.

(y) "Continuous monitoring system" means the total equipment, required under the emission monitoring sections in applicable subparts, used to sample and condition (if applicable), to analyze, and to provide a permanent record of emissions or process parameters.

(z) "Monitoring device" means the total equipment, required under the monitoring of operations sections in applicable subparts, used to measure and record (if applicable) process parameters.

[40 FR 46250, October 6, 1975]

(aa) "Existing facility" means, with reference to a stationary source, any apparatus of the type for which a standard is promulgated in this part, and the construction or modification of which was commenced before the date of proposal of that standard; or any apparatus which could be altered in such a way as to be of that type.

(bb) "Capital expenditure" means an expenditure for a physical or operational change to an existing facility which exceeds the product of the applicable "annual asset guideline repair allowance percentage" specified in the latest edition of Internal Revenue Service Publication 534 and the existing facility's basis, as defined by section 1012 of the Internal Revenue Code.

[40 FR 58415, December 16, 1975]

APPENDIX

PART 60—STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES

Subpart A—General Provisions

§ 60.1 Applicability.

Except as provided in Subparts B and C, the provisions of this part apply to the owner or operator of any stationary source which contains an affected facility, the construction or modification of which is commenced after the date of publication in this part of any standard (or, if earlier, the date of publication of any proposed standard) applicable to that facility.

[39 FR 20790, June 14, 1974]

[40 FR 46250, October 6, 1975]

§ 60.2 Definitions.

As used in this part, all terms not defined herein shall have the meaning given them in the Act:

(a) "Act" means the Clean Air Act (42 U.S.C. 1857 et seq., as amended by Public Law 91-604, 84 Stat. 1676).

(b) "Administrator" means the Administrator of the Environmental Protection Agency or his authorized representative.

(c) "Standard" means a standard of performance proposed or promulgated under this part.

(d) "Stationary source" means any building, structure, facility, or installation which emits or may emit any air pollutant and which contains any one or combination of the following:

(1) Affected facilities.

(2) Existing facilities.

(3) Facilities of the type for which no standards have been promulgated in this part.

[40 FR 58415, December 16, 1975]

(e) "Affected facility" means, with reference to a stationary source, any apparatus to which a standard is applicable.

(f) "Owner or operator" means any person who owns, leases, operates, controls, or supervises an affected facility or a stationary source of which an affected facility is a part.

(g) "Construction" means fabrication, erection, or installation of an affected facility.

(h) "Modification" means any physical change in, or change in the method of operation of, an existing facility which increases the amount of any air pollutant (to which a standard applies) emitted into the atmosphere by that facility or which results in the emission of any air pollutant (to which a standard applies) into the atmosphere not previously emitted.

[40 FR 58415, December 16, 1975]

(i) "Commenced" means, with respect to the definition of "new source" in section 111(a)(2) of the Act, that an owner or operator has undertaken a continuous program of construction or modification or that an owner or operator has entered into a contractual obligation to undertake and complete, within a reasonable time, a continuous program of construction or modification.

(j) "Opacity" means the degree to which emissions reduce the transmission of light and obscure the view of an object in the background.

(k) "Nitrogen oxides" means all oxides of nitrogen except nitrous oxide, as measured by test methods set forth in this part.

(l) "Standard conditions" means a temperature of 20°C (68°F) and a pressure of 760 mm of Hg (29.92 in. of Hg).

(m) "Proportional sampling" means sampling at a rate that produces a constant ratio of sampling rate to stack gas flow rate.

(n) "Isokinetic sampling" means sampling in which the linear velocity of the gas entering the sampling nozzle is equal to that of the undisturbed gas stream at the sample point.

(o) "Startup" means the setting in operation of an affected facility for any purpose.

(p) "Shutdown" means the cessation of operation of an affected facility for any purpose.

(q) "Malfunction" means any sudden and unavoidable failure of air pollution control equipment or process equipment or of a process to operate in a normal or usual manner. Failures that are caused entirely or in part by poor maintenance, careless operation, or any other preventable upset condition or preventable equipment breakdown shall not be considered malfunctions.

(r) "One-hour period" means any 60 minute period commencing on the hour.

[40 FR 46250, October 6, 1975]

(s) "Reference method" means any method of sampling and analyzing for an air pollutant as described in Appendix A to this part.

[39 FR 20790, June 14, 1974]

(t) "Equivalent method" means any method of sampling and analyzing for an air pollutant which have been demonstrated to the Administrator's satisfaction to have a consistent and quantitatively known relationship to the reference method, under specified conditions.

(u) "Alternative method" means any method of sampling and analyzing for an air pollutant which is not a reference or equivalent method but which has been demonstrated to the Administrator's satisfaction to, in specific cases, produce results adequate for his determination of compliance.

(v) "Particulate matter" means any finely divided solid or liquid material, other than uncombined water, as measured by Method 5 of Appendix A to this part or an equivalent or alternative method.

[39 FR 20790, June 14, 1974]

(w) "Run" means the net period of time during which an emission sample is collected. Unless otherwise specified, a run may be either intermittent or continuous within the limits of good engineering practice.

(x) "Six-minute period" means any one of the 10 equal parts of a one-hour period.

(y) "Continuous monitoring system" means the total equipment, required under the emission monitoring sections in applicable subparts, used to sample and condition (if applicable), to analyze, and to provide a permanent record of emissions or process parameters.

(z) "Monitoring device" means the total equipment, required under the monitoring of operations sections in applicable subparts, used to measure and record (if applicable) process parameters.

[40 FR 46250, October 6, 1975]

(aa) "Existing facility" means, with reference to a stationary source, any apparatus of the type for which a standard is promulgated in this part, and the construction or modification of which was commenced before the date of proposal of that standard; or any apparatus which could be altered in such a way as to be of that type.

(bb) "Capital expenditure" means an expenditure for a physical or operational change to an existing facility which exceeds the product of the applicable "annual asset guideline repair allowance percentage" specified in the latest edition of Internal Revenue Service Publication 534 and the existing facility's basis, as defined by section 1012 of the Internal Revenue Code.

[40 FR 58415, December 16, 1975]

§ 60.3 Abbreviations.

The abbreviations used in this part have the following meanings:

A.S.T.M.—American Society for Testing and Materials
Btu—British thermal unit
°C—degree Celsius (centigrade)
cal—calorie
CdS—cadmium sulfide
cfm—cubic feet per minute
CO—carbon monoxide
CO_2—carbon dioxide
dscm—dry cubic meter(s) at standard conditions
dscf—dry cubic feet at standard conditions
eq—equivalents
°F—degree Fahrenheit
g—gram(s)
gal—gallon(s)
g eq—gram equivalents
gr—grain(s)
hr—hour(s)
HCl—hydrochloric acid
Hg—mercury
H_2O—water
H_2S—hydrogen sulfide
H_2SO_4—sulfuric acid
in.—inch(es)
°K—degree Kelvin
k—1,000
kg—kilogram(s)
l—liter(s)
lpm—liter(s) per minute
lb—pound(s)
m—meter(s)
meq—milliequivalent(s)
min—minute(s)
mg—milligram(s)
ml—milliliter(s)
mm—millimeter(s)
mol. wt.—molecular weight
mV—millivolt
N_2—nitrogen
nm—nanometer(s)—10^{-9} meter
NO—nitric oxide
NO_2—nitrogen dioxide
NO_x—nitrogen oxides
O_2—oxygen
ppb—parts per billion
ppm—parts per million
psia—pounds per square inch absolute
°R—degree Rankine
s—at standard conditions
sec—second
SO_2—sulfur dioxide
SO_3—sulfur trioxide
μg—microgram(s)—10^{-6} gram

§ 60.4 Address.

(a) All requests, reports, applications, submittals, and other communications to the Administrator pursuant to this part shall be submitted in duplicate and addressed to the appropriate Regional Office of the Environmental Protection Agency, to the attention of the Director, Enforcement Division. The regional offices are as follows:

Region I (Connecticut, Maine, New Hampshire, Massachusetts, Rhode Island, Vermont), John F. Kennedy Federal Building, Boston, Massachusetts 02203.

Region II (New York, New Jersey, Puerto Rico, Virgin Islands), Federal Office Building, 26 Federal Plaza (Foley Square), New York, N.Y. 10007.

Region III (Delaware, District of Columbia, Pennsylvania, Maryland, Virginia, West Virginia), Curtis Building, Sixth and Walnut Streets, Philadelphia, Pennsylvania 19106.

Region IV (Alabama, Florida, Georgia, Mississippi, Kentucky, North Carolina, South Carolina, Tennessee), Suite 300, 1421 Peachtree Street, Atlanta, Georgia 30309.

Region V (Illinois, Indiana, Minnesota, Michigan, Ohio, Wisconsin), 1 North Wacker Drive, Chicago, Illinois 60606.

Region VI (Arkansas, Louisiana, New Mexico, Oklahoma, Texas), 1600 Patterson Street, Dallas, Texas 75201.

Region VII (Iowa, Kansas, Missouri, Nebraska), 1735 Baltimore Street, Kansas City, Missouri 63108.

Region VIII (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming), 196 Lincoln Towers, 1860 Lincoln Street, Denver, Colorado 80203.

Region IX (Arizona, California, Hawaii, Nevada, Guam, American Samoa), 100 California Street, San Francisco, California 94111.

Region X (Washington, Oregon, Idaho, Alaska), 1200 Sixth Avenue, Seattle, Washington 98101.

(b) Section 111(c) directs the Administrator to delegate to each State, when appropriate, the authority to implement and enforce standards of performance for new stationary sources located in such State. All information required to be submitted to EPA under paragraph (a) of this section, must also be submitted to the appropriate State Agency of any State to which this authority has been delegated (provided, that each specific delegation may except sources from a certain Federal or State reporting requirement). The appropriate mailing address for those States whose delegation request has been approved is as follows:

(A)-(E) [reserved].

(F) California

Bay Area Air Pollution Control District, 939 Ellis St., San Francisco, CA 94109.

Del Norte County Air Pollution Control District, 5600 S. Broadway, Eureka, CA 95501.

Humboldt County Air Pollution Control District, 5600 S. Broadway. Eureka, CA 95501.

Kern County Air Pollution Control District, 1700 Flower St. (P.O. Box 997), Bakersfield, CA 93302.

Monterey Bay Unified Air Pollution Control District, 420 Church St. (P.O. Box 487), Salinas, CA 93901.

(G)—State of Colorado, Colorado Air Pollution Control Division, 4210 East 11th Avenue, Denver, Colorado 80220.

[40 FR 50718, October 31, 1975]

(H-M) [reserved].

(N) State of Idaho, Department of Health and Welfare, Statehouse, Boise, Idaho. 83701. [40 FR 26677, June 25, 1975]

(O)-(Z) [reserved].

(AA-GG) [reserved].

(HH)—New York: New York State Department of Environmental Conservation, 50 Wolf Road, New York 12233, attention: Division of Air Resources.

[40 FR 48347, October 15, 1975]

(II)-(VV) [reserved].

WW-Washington: State of Washington, Department of Ecology, Olympia, Washington 98504.

(XX)-(ZZ) [reserved].

(AAA)-(DDD) [reserved].

[39 FR 37987, October 25, 1974; 40 FR 18169, April 25, 1975; 40 FR 42194, September 11, 1975; 40 FR 45170, October 1, 1975]

§ 60.5 Determination of construction or modification.

(a) When requested to do so by an owner or operator, the Administrator will make a determination of whether action taken or intended to be taken by such owner or operator constitutes construction (including reconstruction) or modification or the commencement thereof within the meaning of this part.

(b) The Administrator will respond to any request for a determination under paragraph (a) of this section within 30 days of receipt of such request.

[40 FR 58415, December 16, 1975]

§ 60.6 Review of plans.

(a) When requested to do so by an owner or operator, the Administrator will review plans for construction or modification for the purpose of providing technical advice to the owner or operator.

(b)(1) A separate request shall be submitted for each construction or modification project.

(2) Each request shall identify the location of such project, and be accompanied by technical information describing the proposed nature, size, design, and method of operation of each affected facility involved in such project, including information on any equipment to be used for measurement or control of emissions.

(c) Neither a request for plans review nor advice furnished by the Administrator in response to such request shall (1) relieve an owner or operator of legal responsibility for compliance with any provision of this part or of any applicable State or local requirement, or (2) prevent the Administrator from implementing or enforcing any provision of this part or taking any other action authorized by the Act.

§ 60.7 Notification and recordkeeping.

(a) Any owner or operator subject to the provisions of this part shall furnish the Administrator written notification as follows:

(1) A notification of the date construction (or reconstruction as defined under § 60.15) of an affected facility is commenced postmarked no later than 30 days after such date. This requirement shall not apply in the case of mass-produced facilities which are purchased in completed form.

(2) A notification of the anticipated date of initial startup of an affected facility postmarked not more than 60 days nor less than 30 days prior to such date.

(3) A notification of the actual date of initial startup of an affected facility postmarked within 15 days after such date.

(4) A notification of any physical or operational change to an existing facility which may increase the emission rate of any air pollutant to which a standard applies, unless that change is specifically exempted under an applicable subpart or in § 60.14(e) and the exemption is not denied under § 60.14(d)(4). This notice shall be postmarked 60 days or as soon as practicable before the change is commenced and shall include information describing the precise nature of the change, present and proposed emission control systems, productive capacity of the facility before and after the change, and the expected comple-

tion date of the change. The Administrator may request additional relevant information subsequent to this notice.

[40 FR 58415, December 16, 1975]

(d) Any owner or operator subject to the provisions of this part shall maintain a file of all measurements, including continuous monitoring system, monitoring device, and performance testing measurements; all continuous monitoring system performance evaluations; all continuous monitoring system or monitoring device calibration checks; adjustments and maintenance performed on these systems or devices; and all other information required by this part recorded in a permanent form suitable for inspection. The file shall be retained for at least two years following the date of such measurements, maintenance, reports, and records.

[40 FR 46250, October 6, 1975]

(e) If notification substantially similar to that in paragraph (a) of this section is required by any other State or local agency, sending the Administrator a copy of that notification will satisfy the requirements of paragraph (a) of this section.

[40 FR 58415, December 16, 1975]

(5) A notification of the date upon which demonstration of the continuous monitoring system performance commences in accordance with § 60.13(c). Notification shall be postmarked not less than 30 days prior to such date.

(b) Any owner or operator subject to the provisions of this part shall maintain records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of an affected facility; any malfunction of the air pollution control equipment; or any periods during which a continuous monitoring system or monitoring device is inoperative.

(c) Each owner or operator required to install a continuous monitoring system shall submit a written report of excess emissions (as defined in applicable subparts) to the Administrator for every calendar quarter. All quarterly reports shall be postmarked by the 30th day following the end of each calendar quarter and shall include the following information:

(1) The magnitude of excess emissions computed in accordance with § 60.13(h), any conversion factor(s) used, and the date and time of commencement and completion of each time period of excess emissions.

(2) Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the affected facility. The nature and cause of any malfunction (if known), the corrective action taken or preventative measures adopted.

§ 60.8 Performance tests.

(a) Within 60 days after achieving the maximum production rate at which the affected facility will be operated, but not later than 180 days after initial startup of such facility and at such other times as may be required by the Administrator under section 114 of the Act, the owner or operator of such facility shall conduct performance test(s) and furnish the Administrator a written report of the results of such performance test(s).

(b) Performance tests shall be conducted and data reduced in accordance with the test methods and procedures contained in each applicable subpart unless the Administrator (1) specifies or approves, in specific cases, the use of a reference method with minor changes in methodology, (2) approves the use of an equivalent method, (3) approves the use of an alternative method the results of which he has determined to be adequate for indicating whether a specific source is in compliance, or (4) waives the requirement for performance tests because the owner or operator of a source has demonstrated by other means to the Administrator's satisfaction that the affected facility is in compliance with the standard. Nothing in this paragraph shall be construed to abrogate the Administrator's authority to require testing under section 114 of the Act.

(c) Performance tests shall be conducted under such conditions as the Administrator shall specify to the plant operator based on representative performance of the affected facility. The owner or operator shall make available to the Administrator such records as may be necessary to determine the conditions of the performance tests. Operations during periods of startup, shutdown, and malfunction shall not constitute representative conditions of performance tests unless otherwise specified in the applicable standard.

(d) The owner or operator of an affected facility shall provide the Administrator 30 days prior notice of the performance test to afford the Administrator the opportunity to have an observer present.

(e) The owner or operator of an affected facility shall provide, or cause to be provided, performance testing facilities as follows:

(1) Sampling ports adequate for test methods applicable to such facility.

(2) Safe sampling platform(s).

(3) Safe access to sampling platform (s).

(4) Utilities for sampling and testing equipment.

(f) Each performance test shall consist of three separate runs using the applicable test method. Each run shall be conducted for the time and under the conditions specified in the applicable standard. For the purpose of determining compliance with an applicable standard, the arithmetic means of results of the three runs shall apply. In the event that a sample is accidentally lost or conditions occur in which one of the three runs must be discontinued because of forced shutdown, failure of an irreplaceable portion of the sample train, extreme meteorological conditions, or other circumstances, beyond the owner or operator's control, compliance may, upon the Administrator's approval, be determined using the arithmetic mean of the results of the two other runs.

§ 60.9 Availability of information.

(a) Emission data provided to, or otherwise obtained by, the Administrator in accordance with the provisions of this part shall be available to the public.

(b) Except as provided in paragraph (a) of this section, any records, reports, or information provided to, or otherwise obtained by, the Administrator in accordance with the provisions of this part shall be available to the public, except that (1) upon a showing satisfactory to the Administrator by any person that such records, reports, or information, or particular part thereof (other than emission data), if made public, would divulge methods or processes entitled to protection as trade secrets of such person, the Administrator shall consider such records, reports, or information, or particular part thereof, confidential in accordance with the purposes of section 1905 of title 18 of the United States Code, except that such records, reports, or information, or particular part thereof, may be disclosed to other officers, employees, or authorized representatives of the United States concerned with carrying out the provisions of the Act or when relevant in any proceeding under the Act; and (2) information received by the Administrator solely for the purposes of §§ 60.5 and 60.6 shall not be disclosed if it is identified by the owner or operator as being a trade secret or commercial or financial information which such owner or operator considers confidential.

§ 60.10 State authority.

The provisions of this part shall not be construed in any manner to preclude any State or political subdivision thereof from:

(a) Adopting and enforcing any emission standard or limitation applicable to an affected facility, provided that such emission standard or limitation is not less stringent than the standard applicable to such facility.

(b) Requiring the owner or operator of an affected facility to obtain permits, licenses, or approvals prior to initiating construction, modification, or operation of such facility.

§ 60.11 Compliance with standards and maintenance requirements.

(a) Compliance with standards in this part, other than opacity standards, shall be determined only by performance tests established by § 60.8.

(b) Compliance with opacity standards in this part shall be determined by conducting observations in accordance with Reference Method 9 in Appendix A of this part. Opacity readings of portions of plumes which contain condensed, uncombined water vapor shall not be used for purposes of determining compliance with opacity standards. The results of continuous monitoring by transmissometer which indicate that the opacity at the time visual observations were made was not in excess of the standard are probative but not conclusive evidence of the actual opacity of an emission, provided that the source shall meet the burden of proving that the instrument used meets (at the time of the alleged violation) Performance Specification 1 in Appendix B of this part, has been properly maintained and (at the time of the alleged violation) calibrated, and that the resulting data have not been tampered with in any way.

[39 FR 39872, November 12, 1974]

(d) At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Administrator which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.

(e) (1) An owner or operator of an affected facility may request the Administrator to determine opacity of emissions from the affected facility during the initial performance tests required by § 60.8.

(2) Upon receipt from such owner or operator of the written report of the results of the performance tests required by § 60.8, the Administrator will make a finding concerning compliance with opacity and other applicable standards. If the Administrator finds that an affected facility is in compliance with all applicable standards for which performance tests are conducted in accordance with § 60.8 of this part but during the time such performance tests are being conducted fails to meet any applicable opacity standard, he shall notify the owner or operator and advise him that he may petition the Administrator within 10 days of receipt of notification to make appropriate adjustment to the opacity standard for the affected facility.

(3) The Administrator will grant such a petition upon a demonstration by the owner or operator that the affected facility and associated air pollution control equipment was operated and maintained in a manner to minimize the opacity of emissions during the performance tests; that the performance tests were performed under the conditions established by the Administrator; and that the affected facility and associated air pollution control equipment were incapable of being adjusted or operated to meet the applicable opacity standard.

(4) The Administrator will establish an opacity standard for the affected facility meeting the above requirements at a level at which the source will be able, as indicated by the performance and opacity tests, to meet the opacity standard at all times during which the source is meeting the mass or concentration emission standard. The Administrator will promulgate the new opacity standard in the FEDERAL REGISTER.

[39 FR 39872, November 12, 1974]

§ 60.12 Circumvention.

No owner or operator subject to the provisions of this part shall build, erect, install, or use any article, machine, equipment or process, the use of which conceals an emission which would otherwise constitute a violation of an applicable standard. Such concealment includes, but is not limited to, the use of gaseous diluents to achieve compliance with an opacity standard or with a standard which is based on the concentration of a pollutant in the gases discharged to the atmosphere.

§ 60.14 Modification.

(a) Except as provided under paragraphs (d), (e) and (f) of this section, any physical or operational change to an existing facility which results in an increase in the emission rate to the atmosphere of any pollutant to which a standard applies shall be considered a modification within the meaning of section 111 of the Act. Upon modification, an existing facility shall become an affected facility for each pollutant to which a standard applies and for which there is an increase in the emission rate to the atmosphere.

(b) Emission rate shall be expressed as kg/hr of any pollutant discharged into the atmosphere for which a standard is applicable. The Administrator shall use the following to determine emission rate:

(1) Emission factors as specified in the latest issue of "Compilation of Air Pollutant Emission Factors," EPA Publication No. AP-42, or other emission factors determined by the Administrator to be superior to AP-42 emission factors, in cases where utilization of emission factors demonstrate that the emission level resulting from the physical or operational change will either clearly increase or clearly not increase.

(2) Material balances, continuous monitor data, or manual emission tests in cases where utilization of emission factors as referenced in paragraph (b) (1) of this section does not demonstrate to the Administrator's satisfaction whether the emission level resulting from the physical or operational change will either clearly increase or clearly not increase, or where an owner or operator demonstrates to the Administrator's satisfaction that there are reasonable grounds to dispute the result obtained by the Administrator utilizing emission factors as referenced in paragraph (b) (1) of this section. When the emission rate is based on results from manual emission tests or continuous monitoring systems, the procedures specified in Appendix C of this part shall be used to determine whether an increase in emission rate has occurred. Tests shall be conducted under such conditions as the Administrator shall specify to the owner or operator based on representative performance of the facility. At least three valid test runs must be conducted before and at least three after the physical or operational change. All operating parameters which may affect emissions must be held constant to the maximum feasible degree for all test runs.

(c) The addition of an affected facility to a stationary source as an expansion to that source or as a replacement for an existing facility shall not by itself bring within the applicability of this part any other facility within that source.

(d) A modification shall not be deemed to occur if an existing facility undergoes a physical or operational change where the owner or operator demonstrates to the Administrator's satisfaction (by any of the procedures prescribed under paragraph (b) of this section) that the total emission rate of any pollutant has not increased from all facilities within the stationary source to which appropriate reference, equivalent, or alternative methods, as defined in § 60.2 (s), (t) and (u), can be applied. An owner or operator may completely and permanently close any facility within a stationary source to prevent an increase in the total emission rate regardless of whether such reference, equivalent or alternative method can be applied, if the decrease in emission rate from such closure can be adequately determined by any of the procedures prescribed under paragraph (b) of this section. The owner or operator of the source shall have the burden of demonstrating compliance with this section.

(1) Such demonstration shall be in writing and shall include: (i) The name and address of the owner or operator.

(ii) The location of the stationary source.

(iii) A complete description of the existing facility undergoing the physical or operational change resulting in an increase in emission rate, any applicable control system, and the physical or operational change to such facility.

(iv) The emission rates into the atmosphere from the existing facility of each pollutant to which a standard applies determined before and after the physical or operational change takes place, to the extent such information is known or can be predicted.

(v) A complete description of each facility and the control systems, if any, for those facilities within the stationary source where the emission rate of each pollutant in question will be decreased to compensate for the increase in emission rate from the existing facility undergoing the physical or operational change.

(vi) The emission rates into the atmosphere of the pollutants in question from each facility described under paragraph (d) (1) (v) of this section both before and after the improvement or installation of any applicable control system or any physical or operational changes to such facilities to reduce emission rate.

(vii) A complete description of the procedures and methods used to determine the emission rates.

(2) Compliance with paragraph (d) of this section may be demonstrated by the methods listed in paragraph (b) of this section, where appropriate. Decreases in emissions resulting from requirements of a State implementation plan approved or promulgated under Part 52 of this chapter will not be acceptable. The required reduction in emission rate may be accomplished through the installation or improvement of a control system or through physical or operational changes to facilities including reducing the production of a facility or closing a facility.

(3) Emission rates established for the existing facility which is undergoing a physical or operational change resulting in an increase in the emission rate, and established for the facilities described under paragraph (d)(1)(v) of this section shall become the baseline for determining whether such facilities undergo a modification or are in compliance with standards.

(4) Any emission rate in excess of that rate established under paragraph (d)(3) of this section shall be a violation of these regulations except as otherwise provided in paragraph (e) of this section. However, any owner or operator electing to demonstrate compliance under this paragraph (d) must apply to the Administrator to obtain the use of any exemptions under paragraphs (e)(2), (e)(3), and (e)(4) of this section. The Administrator will grant such exemption only if, in his judgment, the compliance originally demonstrated under this paragraph will not be circumvented or nullified by the utilization of the exemption.

(5) The Administrator may require the use of continuous monitoring devices and compliance with necessary reporting procedures for each facility described in paragraph (d)(1)(iii) and (d)(1)(v) of this section.

(e) The following shall not, by themselves, be considered modifications under this part:

(1) Maintenance, repair, and replacement which the Administrator determines to be routine for a source category, subject to the provisions of paragraph (c) of this section and § 60.15.

(2) An increase in production rate of an existing facility, if that increase can be accomplished without a capital expenditure on the stationary source containing that facility.

(3) An increase in the hours of operation.

(4) Use of an alternative fuel or raw material if, prior to the date any standard under this part becomes applicable to that source type, as provided by § 60.1, the existing facility was designed to accommodate that alternative use. A facility shall be considered to be designed to accommodate an alternative fuel or raw material if that use could be accomplished under the facility's construction specifications, as amended, prior to the change. Conversion to coal required for energy considerations, as specified in section 119(d)(5) of the Act, shall not be considered a modification.

(5) The addition or use of any system or device whose primary function is the reduction of air pollutants, except when an emission control system is removed or is replaced by a system which the Administrator determines to be less environmentally beneficial.

(6) The relocation or change in ownership of an existing facility.

(f) Special provisions set forth under an applicable subpart of this part shall supersede any conflicting provisions of this section.

(g) Within 180 days of the completion of any physical or operational change subject to the control measures specified in paragraphs (a) or (d) of this section, compliance with all applicable standards must be achieved.

§ 60.15 Reconstruction.

(a) An existing facility, upon reconstruction, becomes an affected facility, irrespective of any change in emission rate.

(b) "Reconstruction" means the replacement of components of an existing facility to such an extent that:

(1) The fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable entirely new facility, and

(2) It is technologically and economically feasible to meet the applicable standards set forth in this part.

(c) "Fixed capital cost" means the capital needed to provide all the depreciable components.

(d) If an owner or operator of an existing facility proposes to replace components, and the fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable entirely new facility, he shall notify the Administrator of the proposed replacements. The notice must be postmarked 60 days (or as soon as practicable) before construction of the replacements is commenced and must include the following information:

(1) Name and address of the owner or operator.

(2) The location of the existing facility.

(3) A brief description of the existing facility and the components which are to be replaced.

(4) A description of the existing air pollution control equipment and the proposed air pollution control equipment.

(5) An estimate of the fixed capital cost of the replacements and of constructing a comparable entirely new facility.

(6) The estimated life of the existing facility after the replacements.

(7) A discussion of any economic or technical limitations the facility may have in complying with the applicable standards of performance after the proposed replacements.

(e) The Administrator will determine, within 30 days of the receipt of the notice required by paragraph (d) of this section and any additional information he may reasonably require, whether the proposed replacement constitutes reconstruction.

(f) The Administrator's determination under paragraph (e) shall be based on:

(1) The fixed capital cost of the replacements in comparison to the fixed capital cost that would be required to construct a comparable entirely new facility;

(2) The estimated life of the facility after the replacements compared to the life of a comparable entirely new facility;

(3) The extent to which the components being replaced cause or contribute to the emissions from the facility; and

(4) Any economic or technical limitations on compliance with applicable standards of performance which are inherent in the proposed replacements.

(g) Individual subparts of this part may include specific provisions which refine and delimit the concept of reconstruction set forth in this section.

6. Part 60 is amended by adding Appendix C as follows:

APPENDIX C—DETERMINATION OF EMISSION RATE CHANGE

1. *Introduction.*

1.1 The following method shall be used to determine whether a physical or operational change to an existing facility resulted in an increase in the emission rate to the atmosphere. The method used is the Student's t test, commonly used to make inferences from small samples.

2. *Data.*

2.1 Each emission test shall consist of n runs (usually three) which produce n emission rates. Thus two sets of emission rates are generated, one before and one after the change, the two sets being of equal size.

2.2 When using manual emission tests, except as provided in § 60.8(b) of this part, the reference methods of Appendix A to this part shall be used in accordance with the procedures specified in the applicable subpart both before and after the change to obtain the data.

2.3 When using continuous monitors, the facility shall be operated as if a manual emission test were being performed. Valid data using the averaging time which would be required if a manual emission test were being conducted shall be used.

3. *Procedure.*

3.1 Subscripts a and b denote prechange and postchange respectively.

3.2 Calculate the arithmetic mean emission rate, $\overline{E}$, for each set of data using Equation 1.

$$\overline{E}=\frac{\sum_{i=1}^{n} E_i}{n}=\frac{E_1+E_2 \ldots +E_n}{n} \qquad (1)$$

where:
E_i=Emission rate for the i th run.
n=number of runs

3.3 Calculate the sample variance, S^2, for each set of data using Equation 2.

$$S^2=\frac{\sum_{i=1}^{n}(E_i-\overline{E})^2}{n-1}=\frac{\sum_{i=1}^{n}E_i^2-\left(\sum_{i=1}^{n}E_i\right)^2\Big/n}{n-1} \qquad (2)$$

3.4 Calculate the pooled estimate, S_p, using Equation 3.

$$S_p=\left[\frac{(n_a-1)\,S_a^2+(n_b-1)\,S_b^2}{n_a+n_b-2}\right]^{1/2} \qquad (3)$$

3.5 Calculate the test statistic, t, using Equation 4.

$$t=\frac{\overline{E}_b-\overline{E}_a}{S_p\left[\frac{1}{n_a}+\frac{1}{n_b}\right]^{1/2}} \qquad (4)$$

4. *Results.*

4.1 If $\overline{E}_b>\overline{E}_a$ and $t>t'$, where t' is the critical value of t obtained from Table 1, then with 95% confidence the difference between $\overline{E}_b$ and $\overline{E}_a$ is significant, and an increase in emission rate to the atmosphere has occurred.

TABLE 1

Degree of freedom (n_a+n_b-2):	t' (95 percent confidence level)
2	2.920
3	2.353
4	2.132
5	2.015
6	1.943
7	1.895
8	1.860

For greater than 8 degrees of freedom, see any standard statistical handbook or text.

5.1 Assume the two performance tests produced the following set of data:

Test a:	Test b
Run 1. 100	115
Run 2. 95	120
Run 3. 110	125

5.2 Using Equation 1—

$$\bar{E}_a = \frac{100+95+110}{3} = 102$$

$$\bar{E}_b = \frac{115+120+125}{3} = 120$$

5.3 Using Equation 2—

$$S_a^2 = \frac{(100-102)^2+(95-102)^2+(110-102)^2}{3-1} = 58.5$$

$$S_b^2 = \frac{(115-120)^2+(120-120)^2+(125-120)^2}{3-1} = 25$$

5.4 Using Equation 3—

$$S_p = \left[\frac{(3-1)\ (58.5)+(3-1)\ (25)}{3+3-2}\right]^{1/2} = 6.46$$

5.5 Using Equation 4—

$$t = \frac{120-102}{6.46\left[\frac{1}{3}+\frac{1}{3}\right]^{1/2}} = 3.412$$

5.6 Since $(n_1+n_2-2)=4$, $t'=2.132$ (from Table 1). Thus since $t>t'$ the difference in the values of $\bar{E}_a$ and $\bar{E}_b$ is significant, and there has been an increase in emission rate to the atmosphere.

6. *Continuous Monitoring Data.*

6.1 Hourly averages from continuous monitoring devices, where available, should be used as data points and the above procedure followed.

Subpart I—Standards of Performance for Asphalt Concrete Plants

§ 60.90 Applicability and designation of affected facility.

The affected facility to which the provisions of this subpart apply is each asphalt concrete plant. For the purpose of this subpart, an asphalt concrete plant is comprised only of any combination of the following: Dryers; systems for screening, handling, storing, and weighing hot aggregate; systems for loading, transferring, and storing mineral filler; systems for mixing asphalt concrete; and the loading, transfer, and storage systems associated with emission control systems.

§ 60.91 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and in subpart A of this part.

(a) "Asphalt concrete plant" means any facility, as described in § 60.90, used to manufacture asphalt concrete by heating and drying aggregate and mixing with asphalt cements.

§ 60.92 Standard for particulate matter.

(a) On and after the date on which the performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall discharge or cause the discharge into the atmosphere from any affected facility any gases which:

(1) Contain particulate matter in excess of 90 mg/dscm (0.04 gr/dscf).

(2) Exhibit 20 percent opacity, or greater.

[40 FR 46250, October 6, 1975]

§ 60.93 Test methods and procedures.

(a) The reference methods appended to this part, except as provided for in § 60.8(b), shall be used to determine compliance with the standards prescribed in § 60.92 as follows:

(1) Method 5 for the concentration of particulate matter and the associated moisture content,

(2) Method 1 for sample and velocity traverses,

(3) Method 2 for velocity and volumetric flow rate, and

(4) Method 3 for gas analysis.

(b) For Method 5, the sampling time for each run shall be at least 60 minutes and the sampling rate shall be at least 0.9 dscm/hr (0.53 dscf/min) except that shorter sampling times, when necessitated by process variables or other factors, may be approved by the Administrator.

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

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4. TITLE AND SUBTITLE Inspection Manual for Enforcement of New Source Performance Standards: Asphalt Concrete Plants		5. REPORT DATE June, 1975 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS JACA Corp. 506 Bethlehem Pike Fort Washington, PA 19034		10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO. 68-02-1356 Task 2
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15. SUPPLEMENTARY NOTES

One of a series of NSPS enforcement inspection manuals

16. ABSTRACT

This manual presents guidelines for federal enforcement personnel in determining whether new or modified asphalt concrete plants are in compliance with New Source Performance Standards (NSPS). The manual includes: detailed process information, characterization of atmospheric emissions from these sources, control methods employed, instruction in obtaining key process parameters for use in source evaluation, and detailed procedures for monitoring emission tests and performing routine inspections.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
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