PROPOSED

NATIONAL EMISSION STANDARDS FOR ASBESTOS

COMMENTS AND SUGGESTIONS

FROM

ASBESTOS INFORMATION ASSOCIATION/NORTH AMERICA

AUGUST 11, 1971

ASBESTOS MINING AND MILLING

1.1 Asbestos Mining

1.1.2 Blasting

This standard is considered unnecessary and unworkable for the following reasons:

(1) The ore bodies in their natural state are wet. The California ores of the Coalinga type contain approximately 20% moisture. The U.S. chrysotile ores of the Jeffrey type contain about 8% moisture. In addition, the subsurface open pit mines are naturally surface wetted by water seepage from the pit walls, and by rain and snow.

(2) It could be impossible to schedule blasting operations to conform to the low wind velocity and rain requirement.

1.1.4 Ore Hauling

1.1.4.1 Dust Covers

Vehicles used to haul dry asbestos on all mine owned property shall be equipped with suitable covers.

1.1.4.2 Wetting

Where sufficient water is available dry ore shall be wetted thoroughly during transportation.

1.1.4.3 Public Roads

Vehicles used to haul asbestos ores on public roads shall be equipped with suitable covers.

1.2 Asbestos Milling

1.2.1 Ore Dumping

Asbestos emissions resulting from dumping of asbestos ore shall be minimized by wetting prior to or during dumping and/or by enclosure of the dumping area.

1.2.2 Ore Dumps

Ore dumps open to the atmosphere must be maintained in a wet state.

1.2.3 Conveyors

All external conveyors used to transport ore must be so constructed as to prevent spillage of the ore to the ground. All external conveyors used to transport tailings or loose asbestos containing materials must be of the totally enclosed type.

1.2.7 Product Packaging

1.2.7.1 Individual Packaging

We wish to reserve comment on the packaging portion of this standard until a program investigating packaging and shipping methods that is presently underway is completed.

We suggest that the bags be printed with the label presently being used by the member companies of the Quebec Asbestos Mining Association.

1.2.8 Tailings Dumps

Asbestos mill tailings dumps shall be stabilized, wetted or otherwise treated in order to control dust emissions.

ASBESTOS PROCESSING AND PRODUCT USE

FMSI 03061

We suggest, in order to simplify the wording of the standards, that asbestos using products be divided into three categories and these categories be referred to in the standards.

These categories are:

(1) locked in

Asbestos containing products where the asbestos is firmly bound in a matrix of polymeric, cementitious or other binding materials.

Examples of such products would be:

vinyl asbestos floor tile
asbestos reinforced plastics
asbestos reinforced gaskets and packings
asbestos cement pipe
asbestos cement sheets and shingles
asbestos reinforced brake linings and clutch facings
asbestos reinforced paper and roofing felts.

(2) unlocked

Products where the asbestos fiber is loosely bound and could pose an emission problem.

Examples of such products would be:

calcium silicate insulation
asbestos containing insulating cements

(3) asbestos textiles

Our suggested modifications to this section of the standards utilizes these categories and are as follows:

1.3 Asbestos Processing

1.3.3 Product Shipment

1.3.3.1 Labeling

All Category 2 (unlocked) asbestos fiber containing products must be labeled as to asbestos content.

1.3.3.2 Packaging

All Category 2 (unlocked) asbestos containing products must be packaged in dust-tight containers.

1.3.3.3 Special Products

Special products in the group 2 category (unlocked) such as dry, powdery, asbestos cement mixes containing loose asbestos must be packaged according to Section 1.2.7.

1.4 Product Use

1.4.1 Block Insulation

1.4.1.1 Premolded or Prefabricated Insulation

To the maximum extent possible, contractors installing asbestos containing block insulation in areas open to the atmosphere shall utilize premolded or prefabricated shapes which require a minimum of cutting or grinding.

1.4.1.2 Field Fabrication

Where field fabrication is unavoidable, properly designed hoods exhausting to fabric filters or devices of equivalent efficiency as described in Section 2.1 shall be installed on power tools used for cutting and grinding.

1.4.2 Asbestos Containing Powders

Asbestos containing powders shall be wetted immediately upon opening shipping container prior to removal of contents.

1.5 Waste Disposal and Demolition

1.5.2 Waste Disposal

Asbestos bearing waste materials shall be disposed of by methods which prevent release of asbestos into the atmosphere during all phases of the disposal.

1.6 Specific Prohibitions

1.6.1 Sprayed Asbestos Fireproofing

The application of asbestos containing fireproofing on buildings by means of spraying is prohibited.

EQUIPMENT SPECIFICATIONS AND MAINTENANCE

2.1 Equipment Specifications

2.1.1 Fabric Filters

2.1.1.2 Bypasses

No control system shall employ bypasses unless such devices are clearly required for start-up purposes or are required to prevent damage to the filters in high temperature applications.

2.1.2.1 Scrubbers

We suggest that the following sentence be added to this paragraph:

"Low energy scrubbers may be used when it can be demonstrated that their efficiency is equal to that of the high energy Venturi type specified in the previous sentence."

2.2 Equipment Maintenance

We suggest that the wording of the unannounced maintenance inspections included in the first paragraph of this heading be modified to be identical to that in the Occupational Safety and Health Act Record Form.

2.2.2 Scrubbers

We suggest that the following phrase be added to this paragraph:

"Unless it can be demonstrated that the required efficiency of the unit can be maintained with a lower pressure drop."

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NOT FOR PUBLICATION

NATIONAL EMISSION STANDARD FOR ASBESTOS

FMSI 03066

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I. Introduction

As empowered by Section 112 of the Clean Air Act as Amended 1970, the Administrator of the Environmental Protection Agency issues the following proposed standard for asbestos emission sources. This action is taken subsequent to naming asbestos as a hazardous air pollutant on March 31, 1971. It is the intent of this standard to reduce the level of asbestos emissions through the application of required control practices. This standard establishes minimum requirements for emission control and should not be construed as limiting more stringent measures.

The scope of uses of asbestos and asbestos containing products is extremely large in the United States. New uses are being developed continually; many without regard to atmospheric emissions. Some uses have been determined by air pollution control officials to generate a degree of atmospheric emissions unwarranted by the value of those uses, and prohibition of such uses is proposed.

II. Emission Standards

1.1 Asbestos Mining

1.1.1 Drilling

1.1.1.1 Dry Drilling - All air swept or dry drills shall be equipped with fabric filter devices for collection of drilling debris.

1.1.1.2 Wet Drilling - Wet drills shall be equipped with cyclone collectors for collecting entrained mists.

1.1.2 Blasting - Surface blasting of ore deposits shall always be preceded by surface wetting and be limited to the following atmospheric conditions.

or
1. low surface wind velocity (0-3 mph)
2. rain

1.1.3 Road Treatment - Mine roads surfaced with asbestos tailings shall be treated with water or chemical agents to control dust from vehicle traffic.

1.1.4 Ore Hauling

1.1.4.1 Dust Covers - Vehicles used to haul asbestos ore on mine owned property shall be equipped with dust covers.

1.1.4.2 Wetting - Where sufficient water is available the ore shall be wetted thoroughly during transportation.

1.1.4.3 Public Roads - Vehicles used to haul asbestos ores on public roads must be of dust tight construction.

1.2 Asbestos Milling

1.2.1 Ore Dumping - Asbestos emissions resulting from dumping of asbestos ore shall be minimized by wetting prior to dumping or enclosure of the dumping area.

1.2.2 Ore Dumps - Ore dumps open to the atmosphere must be maintained in a wet state through the use of permanent sprinkler systems.

1.2.3 Conveyors - All external conveyors used to transport ore, tailings or loose asbestos containing materials must be of the totally enclosed type.

1.2.4 Ore Dryers - Asbestos ore dryer exhaust must be treated in fabric filter installations or by devices of equivalent efficiency as described in Section 2.1.

1.2.5 Ore Crushers - All dust emissions from ore crushers shall be ventilated to fabric filters or devices of equivalent efficiency as described in Section 2.1 prior to discharge into the atmosphere.

1.2.6 Mill Air - All forced exhaust gases from asbestos mills must be treated in fabric filters or devices of equivalent efficiency as described in Section 2.1.

1.2.7 Product Packaging -

1.2.7.1 Individual Packaging - All forms of asbestos fiber must be packaged in dust tight containers, capable of withstanding 4 drops, one each on front, back and ends from a height of four feet without leakage, and labelled as to their asbestos content.

1.2.7.2 Bulk Shipment - Bulk shipment shall be in dust tight vehicles labelled as to their asbestos content. Loading and unloading must be accomplished in a manner which does not exhaust asbestos to the atmosphere without the control equivalent of fabric filters as described in Section 2.1.

1.2.8 Tailings Dumps - Asbestos mill tailings dumps shall be stabilized, wetted, or otherwise treated to prevent dust emissions.

1.3 Asbestos Processing

1.3.1 Manufacturing - Manufacturers of products containing asbestos must control all atmospheric discharges of gas streams used for manufacture or dust removal by fabric filtration devices or devices of equivalent efficiency, as described in Section 2.1, except where explosion hazards or materials problems exist, in which case wet collectors, as described in Section 2.1.2 may be used.

1.3.2 Ventilation Air - In operations where in-plant conditions result in the emission of significant amounts of asbestos from general ventilation air, evidenced by presence of visible accumulations of asbestos on surfaces adjacent to the place of ventilation, the ventilation air must be treated by fabric filtration or devices of equivalent efficiency as described in Section 2.1.

1.3.3 Product Shipment

1.3.3.1 Labelling - All products containing asbestos must be labelled as to content.

1.3.3.2 Packaging - Asbestos products must be packaged in dust tight containers except those products such as filled plastics which do not readily dust.

1.3.3.3 Special Products - Those products such as asbestos cement mixes containing loosely bound asbestos must be packaged according to Section 1.2.7.

1.4 Product Use

1.4.1 Block Insulation

1.4.1.1 Pre-molded Insulation - To the maximum extent possible contractors installing asbestos containing block insulation in areas open to the atmosphere shall utilize pre-molded shapes which do not require cutting or grinding.

1.4.1.2 Field Fabrication - Where field fabrication is unavoidable, high velocity hoods exhausting to fabric filters or devices of equivalent efficiency as described in Section 2.1 shall be installed on tools used for cutting and grinding.

1.4.2 Asbestos Containing Powders - Asbestos containing powders shall be wetted prior to exposure to the atmosphere when used in areas without air pollution controls as described in Section 2.1.

1.5 Waste Disposal and Demolition

1.5.1 Removal of Asbestos Containing Insulation - When removing asbestos insulation from structures containing in excess of 50 lbs. of insulation or fireproofing, or when such structures are demolished contractors shall utilize the best available means to limit dust emissions from the operation. Such means may include but not be limited to:

A. Enclosure
B. Wetting

1.5.2 Waste Disposal - Asbestos bearing waste materials shall be segregated from other solid waste and disposed of by a method which prevents release of asbestos into the atmosphere during all phases of the disposal.

1.6 Specific Prohibitions

1.6.1 Sprayed Asbestos Insulation and Fireproofing - The application of asbestos containing insulation and fireproofing by means of spraying is prohibited.

1.6.2 Dispersive Uses - Any use of asbestos or asbestos containing materials in powder form which involves dispersing the material in the environment is prohibited.

2.1 Equipment Specifications

2.1.1 Fabric Filters - Fabric filters specified by this regulation shall consist of the following.

2.1.1.1 Construction - The inlet side of fabric filters shall be of leakproof construction or maintained under negative pressure.

2.1.1.2 Bypasses - No control system shall employ bypasses unless such devices are clearly required for start-up purposes.

2.1.1.3 Hoppers - Provisions shall be included for emptying dust hoppers without release of asbestos to the atmosphere.

2.1.1.4 Fabrics

2.1.1.4.1 Natural Fabrics - Natural fiber filter fabrics shall have a maximum flow permeability of 20 cfm/ft^2 at 1/2 in. H_2O.

2.1.1.4.2 Synthetic Fabrics - Synthetic fabrics in high temperature applications shall have a maximum permeability of 30 cfm/ft^2 in. H_2O.

2.1.2 Alternative Devices

2.1.2.1 Scrubbers - Scrubbers used where fabric filters cannot be installed shall be of the high energy venturi type operated with above 40 in. w.g. pressure drop.

2.1.2.2 Other Devices - Alternative devices used where fabric filters can be installed must be demonstrated by the user to have control performance equivalent or superior to fabric filters.

2.2 Equipment Maintenance

Control equipment required by this regulation shall be regularly maintained to insure high efficiency. Unannounced maintenance inspections will be performed by authorized personnel and the finding of any of the following conditions will be considered a violation of this regulation.

2.2.1 Fabric Filters

2.2.1.1 External Leaks - The presence of external leaking of untreated asbestos containing gases from duct work, hoppers, discharge valves, seal faces, etc. will be a violation.

2.2.1.2 Ruptured Bags - The presence of torn or ruptured bags in an operating system will be a violation.

2.2.1.3 Improperly Positioned Bags - The presence of any bag not properly positioned to prevent leakage will be a violation.

2.2.1.4 Holes - The presence of any bag containing a hole larger than ¼" diameter will be a violation.

2.2.1.5 Worn Bags - The presence of any bag with more than one pinhole or being badly worn or threadbare will be a violation.

2.2.1.6 Housekeeping - The presence of accumulations of asbestos particles in the clean air side of baghouses after repair or replacement will constitute a violation.

2.2.2 Scrubbers

2.2.2.1 Pressure drop - Any scrubber operating with less than 40" H_2O pressure drop will be a violation.

2.2.2.2 Leaks - Any external leaks of untreated asbestos containing gas from ductwork, flanges, etc. will be a violation.

2.2.2.3 Scrubbing Medium - Any scrubber operating with less scrubbing fluid flow rate than its design requirement will be a violation.

2.2.3 Alternative Devices - Inspection criteria for alternative devices will be established at the time of their certification.

FMI - General Bulletins

Friction Materials Standards Institute, Inc., 370 Lexington Avenue, New York, N. Y.

BULLETIN

NO. 411

September 9, 1971

ASBESTOS STUDY COMMITTEE FORMATION

Mr. J. W. Greenen, wishes to announce the formation of a new Committee, the Asbestos Study Committee within the Friction Materials Standards Institute, Inc.

The members of this Committee are as follows:

Asbestos Study Committee

Dr. E. P. Stefl, Chairman	Raybestos-Manhattan, Inc.
M . J. C. Henning	World Bestos Company
Dr. W. Spurgeon	Bendix Corporation
Mr. W. B. Reitze	Johns-Manville Corporation
Mr. J. B. Graham	Carlisle Corporation

E. H. Zeierabend

E. W. DRISLANE
Executive Secretary

Distribution: General Active Members
" Regional Members

R 71-16
Asbestos and Spray Insulation

EXPLANATION OF PROPOSED REGULATIONS

Science is pointing its medical finger at asbestos and describing the "miracle fiber" as a mineral whose commercial blessings can exact a rather costly toll. Asbestos insulation and factory workers exposed to heavy concentrations of asbestos fiber over prolonged periods have suffered devastating consequences. They are visited with an alarmingly high incidence of asbestosis, which produces a diffuse fibrosis of the lower lung, of lung cancer and of an extremely rare cancer of the lining of the lung and abdomen, mesothelioma. The rates of lung cancer are extraordinarly high especially among asbestos workers who are smokers, indicating the synergistic potential of the mineral fiber.

The medical evidence is indefinite as to why asbestos is carcinogenic, with three theories in vogue: (1) The fibers once ingested or inhaled act as a continous physical irritant, inducing a tumor after 20 to 30 years; (2) The fibers contain carcinogens such as benzo(a)pyrene; (3) Fibers accumulate in the lung and remain immobilized as "asbestos bodies" which cause cancer upon disintegration.

Similarly, while the adverse effect of prolonged exposure to heavy concentrations of asbestos is clearly documented, the medical data is disturbingly vague as to the results of long-term exposure to low and moderate concentrations. Nor is there a clear dose-time relationship for exposure to heavy concentrations. In short, as with many other environmental contaminants, the public has discovered too late that asbestos is potentially dangerous and too little of the extent of that threat.

But two depressing facts are agreed upon: That millions of Americans are likely to contain "asbestos bodies" in their lungs and that asbestos fiber once released is relatively indestructible. That is, the qualities of durability and of resistance to normal chemical and physical stress, which make asbestos such a commercial success, render it potentially dangerous to present and future generations because of the tendency of the fibers to accumulate in the atmosphere and in the lungs.

In light of these facts, the PCB has proposed the nation's most comprehensive set of asbestos controls. To ban all uses of asbestos would be "alarmism" at its most clamorous. But ignoring

the need to explore and, perhaps, to adopt controls for the significant contributors to a swelling volume of asbestos fiber in our air would constitute a foolish complacency.

To this end, the suggested regulations would identify these "significant contributors" as the commercial use of asbestos in construction work; the demolition of asbestos-containing structures; the manufacturing and processing of asbestos-containing products; the transportation of certain asbestos-containing products; the disposal of asbestos-containing waste; and the use of asbestos in the brakes of millions of vehicles.

Part II would impose several general requirements upon all commercial construction, repair, alteration, demolition, manufacturing or processing activity from which asbestos fiber is discharged into the environment. The persons responsible for such activity must obtain a permit from the EPA. The permit system will serve to produce the advanced assurrance of compliance with the applicable control regulations and will thus reduce the cost and burden of in-the-field enforcement.

In addition these commercial activities would have to provide facilities to prevent the removal of asbestos fibers from the site of such activity on the clothing of employees. Indeed, this poses a rather new concept of air pollution control. Those who have died from lung ailments induced by long, close association to an asbestos worker may be powerful proof of the need for novelty.

Finally, Part II would provide for careful waste disposal procedures, as wind-blown refuse heaps and scrap piles contribute to the volume of asbestos fiber in our air. The simple steps for control eliminate any excuse for such dangerously sloppy housework.

Part III would prohibit the spraying of asbestos-containing insulation and fireproofing. Experience has indicated that procedural safeguards are inadequate and their enforcement is an overtaxing burden. Chicago has banned spray asbestos, and New York city and Philadelphia are considering doing so.

Procedural safeguards designed to reduce fiber emissions would be required to spray non-asbestos insulation. The biological effects of these fibers is unknown. Prudence would seem to dictate reasonable efforts to soften the potential future blow from spray fiber aspiring to asbestos' status.

Part IV suggests that various asbestos-related activities at construction sites be done within an enclosure. It would also require that asbestos construction products be so installed as to preclude the emission of fiber into the circulating air.

Part V expresses, ironically, what may be a key reason for banning spray asbestos. It would require that procedural safeguards be pursued in order to demolish a structure whose destruction would otherwise expose members of the public to asbestos fiber. Clouds of dust are often raised by demolition work. The facts that great numbers of persons may be exposed to this dust in urban areas and that the post-war generation of high-rises were the first buildings to use asbestos insulation extensively speak in favor of some such regulation.

Part VI suggests an emission standard for manufacturers of asbestos products. The standard is believed to be within the capture efficiency of baghouse filtration. The proposed boundary standard is thought to be a method for preventing dilution of exhaust gases.

The standard would measure only fibers longer than five microns. The justification for this seems to be the administrative convenience of avoiding difficulties in measuring fibers from .5 to five microns in length. Medical evidence has indicated that the very small fibers may be the most dangerous. And the Board will seek extensive evidence on this point.

Part VII would prohibit the use of brake lining in vehicles manufactured after January 1, 1975 and sold for use in Illinois.

If brake lining decomposition emits asbestos fiber, then the tremendous number of vehicles using asbestos, and the impracticality of controlling these numerous small emission sources would appear to speak to the need for a product ban. The prohibition is carefully worded to avoid the necessity of fitting vehicles produced prior to 1975 with non-asbestos brakes. It is contemplated that the ban will necessitate design changes, probably to disc brakes, and it is thought that requiring the invidual vehicle owner to undergo this expense is unreasonable. The time lag of over three years is thought to be sufficient for vehicle manufacturers to accomplish any necessary design changes.

Proposed Regulation Only
June 9, 1971

CHAPTER V: TOXIC SUBSTANCES
ASBESTOS: SPRAY INSULATION

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PART I: INTRODUCTION

101. Authority

Pursuant to the authority in Sections 9, 10 and 13 of the Environmental Protection Act which empower the Board to adopt regulations forbidding the "sale, offer, or use for reasons of air pollution control" of any article, and to set "standards specifying the maximum amounts or concentrations of various contaminants that may be discharged into the atmosphere"; and to set standards for the issuance of permits for the operation of any equipment or facility capable of causing or contributing to air pollution; and to promulgate "conditions regarding the... use of any....article determined by the Board to constitute an air pollution hazard"; and to adopt effluent standards limiting the amounts of contaminants that may be discharged into the water of Illinois, the Board adopts the following rules and regulations:

102. Policy

It is the purpose of the General Assembly in adopting the Environmental Protection Act to maintain and enhance the purity of the air and water of Illinois in order to protect health, welfare and the quality of life. Accordingly, it is hereby determined that the uncontrolled discharge of asbestos fiber into the environment tends to severely endanger the public health and welfare and that the uncontrolled spraying of fiber-containing materials unreasonably interferes with the enjoyment of life and property.

It is the purpose of these regulations to control the amount of asbestos fiber released into the environment from the major sources of emission. Such control is necessary not only to protect those members of the public who are in proximity to heavy concentrations of asbestos fiber but also to safeguard the health of future generations endangered by the continuous discharge of asbestos fiber which can be toxic and which tends to be cumulative both in the atmosphere and in the human body.

Where health can be protected by the adoption of an emission standard or of procedural safeguards, such a course has been pursued. In those instances where restriction is unfeasible because of the tremendous number of small, uncontrollable emission sources (automotive)or because of the unusual nature of the emission source (spray asbestos at construction sites) a product ban has been resorted to. These prohibitions have been made with full consideration given to the available alternative materials.

It is also the purpose of these regulations to reduce the emission of non-asbestos particulate from spray-fireproofing and

insulation. To protect against these emissions, the biological effects of which are unknown, procedural safeguards have been enacted.

103. Definitions

Agency	- The Illinois Environmental Protection Agency
Asbestos	- Any fiber or any mixture containing fiber of hydrated silicate mineral, which, on the basis of its crystalline structure, falls into one of two categories: (1) pyroxenes - chrysotile fiber; (2) amphiboles - crocidolite, amosite, tremolite, actinolyte or anthophylite fiber.
Board	- The Pollution Control Board of Illinois.
Commercial Activity	- Any activity done for hire or having financial profit as a primary aim.
Debris	- Asbestos-containing waste produced by the demolition of a structure.
Spraying	- The pneumatic application of material used for fireproofing or insulation.
Waste	- Any asbestos-containing matter which has been or is intended to be discarded.

PART II: General Requirements

No commercial activity, not otherwise hereinafter prohibited, involving the discharge of asbestos fiber into the environment from the construction, alteration, repair or demolition of a structure or from the processing or manufacturing of asbestos-containing products, shall be conducted unless the person or entity in charge of such activity complies with the following regulations:

201. A permit shall be obtained from the Agency to engage in such activity. Before obtaining such permit, the applicant shall demonstrate compliance with the following safeguards:

(a) The designation of personnel to exercise full-time supervisory authority over all aspects of the activity from which the release of asbestos fiber into the environment could result, in such a manner as to insure compliance

with the pertinent asbestos control regulations.

(b) That each employee engaged in such activity has completed or will complete a satisfactory course of instruction on the potential hazards of exposure to asbestos fiber including the precautions that must be observed to prevent or restrict the dispersion of asbestos fiber into the environment.

(c) That such additional safeguards as are hereinafter specifically required and such precautions consistent with the purpose of these regulations as the Agency deems necessary under the circumstances shall be complied with.

202. Facilities shall be provided and procedures instituted and supervised that prevent the removal of asbestos-containing material from the site on the clothing of employees.

203. Asbestos-containing wastes shall be immediately vacuumed or otherwise collected where vacuming is impossible, and shall be placed in a container resistant to tearing or breaking under normal handling conditions, which shall be tightly sealed and clearly marked as containing asbestos waste. Such containers shall be placed directly upon a vehicle for disposal by burial at an approved site.

Section 203 shall not apply to the demolition of a structure, except as provided in Section 501(a), (d) and (e) or to the disposal of sludge waste except as provided in Section 603.

PART III: SPRAY FIREPROOFING AND INSULATION

301. The spraying of asbestos-containing material is prohibited.

302. Non-asbestos particulate matter used for insulation or fireproofing shall not be sprayed unless the following procedures are taken:

(a) Before the start of spraying operations, all floor areas shall be swept clean and cleared of all objects, material and equipment other than that employed in the application of the fiber-containing material, or, in the alternative, all such objects, material and equipment shall be covered with plastic or plastic-coated tarpaulins.

(b) The entire floor or area to be sprayed shall be enclosed with plastic or plastic-coated tarpaulins in a manner which shall preclude the escape of fiber-containing material from the enclosure. All interior open areas such as elevator shafts and stairwells shall be enclosed in a manner which shall prevent the escape of fiber-containing

material from the working area. "Stack effect" of the shafts, stairwells and comparable spaces shall be considered in providing proper enclosures.

(c) Regardless of adherence to the stated control practices, any visible emission of fiber-containing materials beyond the building perimeter will be considered a violation.

(d) In case of visible emission of fibrous material from the construction site, immediate steps shall be taken to cause the cessation of such emissions by either effective control measures or work stoppage at the source of the emissions. There shall then be immediate and complete cleanup of all material that has escaped the construction site, and measures shall be taken that will insure that no further dispersal of any fibrous material into the atmosphere can occur.

(e) The entire sprayed area, all ledges and surfaces including tarpaulins within the enclosure shall be thoroughly vacuumed upon completion of the spraying operation and immediately before the enclosure is dismantled. The vacuum cleaner shall contain a strong, single-service, disposable inner bag of durable material which shall be removed from the vacuum cleaner and tightly sealed. The bag shall then be placed in a container and disposed of at an approved site in accordance with Section 203.

(f) All areas used for opening bags containing fibrous material or the changing of hoppers shall be enclosed so as to prevent the escape of such material from the immediate area in which such activity occurs.

(g) Any plenum or other structure coated with or containing fibrous insulation and used in the circulation of air in a building shall be thoroughly cleaned of all debris and waste insulation. All applied fiber-containing insulation within a plenum or duct shall be coated with a sealant which precludes exposure of the fiber-containing material to the circulating air.

PART IV: CONSTRUCTION, ALTERATION AND REPAIR OF STRUCTURE

401. (a) The cutting, trimming, fitting or stripping of asbestos-containing material in the construction, alteration or repair of a structure which is done at the site of such structure shall be conducted within a special enclosure designed to preclude the escape of asbestos fiber from the immediate area of such enclosure.

(b) The mechanical exhaustion of dust from such enclosure to the ambient air is prohibited unless such exhaust system is equipped with a fabric filter for dust collection.

402. Asbestos-containing material applied in the construction, alteration or repair of a structure shall be coated with a sealant, provided with a cover or installed in some other manner so as to preclude exposure of the asbestos fiber to the circulating air.

PART V: DEMOLITION

501. Where the risk of public exposure to asbestos fiber from the dislodging of asbestos-containing materials is present, no demolition of a structure shall be initiated unless all safeguards necessary and practicable to reduce the emission of dust are taken.

Such procedures shall include, but are not necessarily limited to:

(a) Boilers and pipes insulated with asbestos-containing material shall be wetted and stripped before toppling of walls is begun. This procedure shall be followed, where practicable, as to all other asbestos-lined surfaces. Such asbestos waste shall be immediately bagged and disposed of in accordance with Section 203.

(b) Demolition by toppling of walls is prohibited except within an enclosure approved by the Agency as part of the permit granted for demolition of that structure.

(c) Before the demolition of any section of the structure, adequate wetting to suppress the dust shall be employed.

(d) Asbestos-containing debris shall not be dropped or thrown from any floor but shall be transported by dust-tight chutes or buckets. Asbestos-containing debris in chutes or buckets shall be sufficiently wetted to preclude dust dispersion at the point of discharge.

(e) All asbestos-containing debris shall be thoroughly wetted before loading into trucks, other vehicles or containers. During transport such waste shallbe enclosed or covered so as to prevent dust dispersion. Asbestos-containing debris shall be disposed by burial at an approved site.

502. In the event asbestos-containing matter becomes air-borne beyond the property boundaries or in the event freezing temperatures preclude the use of water for dust suppression, demoliton work shall cease until adequate alternate measures can be taken.

PART VI: MANUFACTURING

601. (a) No factory, plant or enterprise which engages in the processing or manufacturing of any asbestos-containing product shall emit asbestos fiber into the ambient air in excess of .5 fiber per cubic centimeter of air. The ambient

air quality at the boundary of such factory, plant or enterprise shall not exceed .05 fiber per cubic centimeter of air.

(b) Only fibers of 5 microns or greater in length with a length to breadth ratio of 3 to 1 shall be counted.

(c) Sampling shall be determined by the membrane filter method with phase contrast microscopy at 430 X magnification.

602. No water used in processing or manufacturing which contains concentrations of asbestos fiber shall be discharged into sewage systems or to the waters of Illinois.

603. Waste sludge containing asbestos collected from settling ponds shall be enclosed during transport and shall be disposed by burial at an approved site.

PART VII: ASBESTOS-CONTAINING PRODUCTS

701. No product which may emit asbestos-fiber during its transportation shall be transported unless such product is enclosed in such a manner as to preclude the emission of asbestos fiber into the ambient air.

702. The use of asbestos in the brake lining of vehicles manufactured after January 1, 1975, and sold for use in Illinois is prohibited.

III. Justification

This section was developed to explain the rationale for the standards presented in Section II of this report. It will not be presented in the official publication of the regulations. The justification is given for this type of standard and for each specific standard in the order they are presented in Section II.

Ideally, national emission standards for asbestos would be established on a concentration basis related to health effects and would provide an ample margin of protection to the public health regardless of the number of sources in a given geographic area. There are many practical considerations which prohibit the establishment of a numerical standard in the time frame established by the Clean Air Act of 1970. Foremost of these problems is the lack of data base. This base is lacking from both the health-effects standpoint for non-occupational exposure and the emissions standpoint.

The hazards of exposure to asbestos have been determined sufficient to warrant establishment of a national standard relating to control of exposure. Determination of the level of exposure to be considered safe has been complicated by many factors, not the least of which has been the time periods between exposure and onset of pathogenic effects. The majority of data available on asbestos health effects is related to occupational exposure and cannot be readily extrapolated to non-occupational levels.

Because of the large emphasis on occupational levels of exposure and a lack of simple analytical techniques, emission data is equally as uncertain for using engineering considerations to establish a numerical

dard. Difficulties in sampling and identifying asbestos particles could be overcome, source testing efforts would have to be placed in a position of establishing, rather than verifying a data base. This would be a formidable task even with contracted source tests and is unlikely to generate a sufficient base prior to promulgation of the standard.

A control practice approach to reducing asbestos exposure levels offers a practical alternative to numerical emission limits. The mainstay of an asbestos control practice standard is the fabric filter which on the basis of semi-quantitative data appears to provide acceptable control at reasonable cost.

While fabric filtration would be a key point in a national emission standard for asbestos, other devices or practices can be required in cases where fabric filters are not practical. Where no effective controls are available, the standard can be extended to ban the use of asbestos, provided a suitable substitute is available.

A major advantage of a control practice standard would be realized in enforcement. Inspectors could be easily trained to certify compliance with control practice regulations. Problems of certifying a numerical standard are enormous. The complexity can be illustrated by examining the state of the art in asbestos sampling and analytical techniques.

Sampling to date has been almost entirely occupational exposure tests without regard to air pollution in the general sense. The most common technique in U. S. testing has been a membrane type sampler with light microscopy used to analyze "fibrous particles". Samples are not taken isokinetically as recommended by OAP source testing methodology.

Johns-Manville has reported that attempts at isokinetic sampling of asbestos dust were unsuccessful. It is believed that a considerable amount of work would be necessary to develop an isokinetic procedure with proper nozzle dimensions to permit meaningful sampling of asbestos emission sources.

The fibrous particles" reported by industrial hygienists are by no means specifically asbestos. It is assumed that they are asbestos from the nature of the source of the sample. Specific identification of asbestos requires the use of x-ray diffraction techniques coupled with visual representation by electron microscopy. Analysis of samples collected by membrane techniques and counted by electron microscopy is an involved and costly procedure. Each sample requires about 20 man hours at a cost of about $30 per man-hour for analysis.

Even these sophisticated techniques tend to distort the actual asbestos content of the sample by increasing the number count of fibers during preparation. Thus the analysis is not meaningful in reporting total numbers of particles present in the original sample.

1.1 Asbestos Mining - Asbestos mining was determined by Davis (ref. 1) to be one of the largest sources of asbestos emissions in the U. S. Mining is predominently surface type which is extremely difficult to control or quantitate emissions. Specific areas requiring control are drilling, blasting, and ore handling.

1.1.1 Drilling - Drilling occurs predominately in hard rock asbestos mining for the purpose of placing blasting charges. It has received considerable attention from persons interested in controlling occupational exposures. Air swept drills are the most common owing to a fast drilling rate, less bit wear, and lack of freezing problems encountered with wet sweeping methods. Emissions from air swept drills have been visibly reduced through the use of fabric filters (ref. 2). Where wet drilling is used a mist is generated which consists of fine asbestos particles and water. Cyclone collectors can collect this type of emission more readily than fabrics which plug when wet gas streams are filtered (ref. 3).

1.1.2 Blasting - The largest instantaneous emission source of asbestos known is ore blasting. Containment of dust emissions from blasting would be economically unfeasible. Present emission control is limited to minimizing dust generation during blasting. Experienced blasting crews know how to limit and place charges to minimize dust. Wetting of the surface prior to blast provides limited control (ref. 4). As blasting is not a daily occurrence at asbestos mines and most mines stockpile ore, limiting blasting to atmospheric conditions which would not be conductive to dispersion of the involved dust would not be restrictive to the total operation.

1.1.3 Road Treatment - Many mine roads are surfaced with asbestos mill tailings containing about 1% asbestos by weight. Vehicular traffic, some vehicles carrying up to 200 tons, grinds and abrades the tailings releasing considerable quantities of asbestos bearing dust. Many treatments have been tried, with water being one of the simplest (ref. 5). In some areas road treatment would produce hazardous driving conditions; however, it is the mining company's option not to surface roads with asbestos mill tailings.

1.1.4 Vehicles - Vehicles hauling asbestos ore are a controllable source of asbestos emissions. Hauling ore results in emissions through the jostling and air attrition of exposed ore. Where hauling is only over company property, dust covers for the ore would be sufficient in reducing hazards. Wetting is also very helpful in lowering emissions but water is not always available in arid regions. Where transportation of asbestos ore over public roads is involved, the hazard presented to the general population warrants more stringent control measures. Special dust tight vehicles are available (ref. 6).

1.2 Asbestos Milling - Asbestos mills were reported by Davis (ref. 7) as the most significant source of asbestos emissions. Mills have numerous points of asbestos emissions including: ore storage, ore drying, ore handling, ore processing, and tailing dumps. Wet milling offers advantages in many areas but is not applicable to all ores. There is one wet mill in the U. S.

1.2.1 Ore Dumping - Dumping of asbestos ores which are not wet results in emission of asbestos to atmosphere. Other industries have adopted special dumping enclosures (ref. 8). The option is open to utilize water sprays or enclosures for dumping.

1.2.2 Ore Dumps - Open ore dumps can be emission sources especially during extremely dry, windy weather. Other industries employ permanent sprinkler systems to control dust emissions (ref. 9). The option is available to provided enclosed storage.

1.2.3 Conveyors - Totally enclosed conveyors can readily prevent these systems from becoming emission sources during periods of high winds (ref. 10).

1.2.4 Ore Dryers - Numerous types of asbestos ore dryers are found. Some types result in more dust emissions than others owing to the degree of agitation and air velocity encountered by the ore during drying. Johns-Manville has tried several devices in the Canadian operations and have found insulated baghouses to be the most efficient and not economically prohibitive (ref. 11).

1.2.5 Ore Crushers - Ore crushers are a continuous source of dust emissions. In some operations primary crushing may be separate from the main operation and uncontrolled. The operation can be controlled by enclosure and hooding (ref. 12).

1.2.6 Mill Air - In both wet and dry milling air is used to control dust levels. Dry milling uses air as the separating medium for asbestos fibers from its lost rock. Fabric filter installations are found on all well controlled mills, some handling as much as 4.5 million cfm (ref. 13).

1.2.7 Product Packaging - Many of the containers used to ship asbestos fiber are not dust tight or sufficiently durable to prevent spillage during shipment. As emissions occurring during shipping cannot readily be controlled by capture, a more positive approach to emission control is to prevent leaks from occurring. Some asbestos companies are using extremely strong bags at little cost penalty. Drop tests are commonly used to measure the durability of loaded packages.

Bulk shipments present different problems. Some loading and unloading systems employ air conveying of the material. After separation of the large fibers, the exhausting air must be controlled by fabric filtration to eliminate the invisible sub-micron particles. Dust tight vehicles are a must to prevent emissions during transit.

Labelling as to asbestos content is an important aspect of emission control. In the event of accident, clean-up crews can be advised to use dustless methods to remove spilled material. Shippers and handlers will be aware of the need to avoid rough handling and to minimize spills.

1.2.8 Tailings Dumps - Tailings dumps are most often extensive areas of exposed spent ore. Asbestos content still exceeds that of normal surface materials. Emissions occur during conveying, bulldozing or other distrubances and by natural forces. No clearly superior method has been developed for all tailing dumps. Each operator must decide which method will be best at his location. Wetting, chemical treatment, and reforestation have been used.

1.3 Asbestos Processing - The impact of asbestos processing on asbestos emissions to the atmosphere has not been thoroughly evaluated. Over 3000 uses for asbestos have been documented. An estimated 150 [illegible] engaged in [illegible] asbestos products. As emission sources are varied and often diffuse, the regulations are limited to emission sources common to most processes.

1.3.1 Manufacturing - Sources of emissions include gas streams used to control dust levels inside plants or as part of the process itself, such as air conveying of material. Fabric filters have been utilized extensively where recirculation of air streams is desired (ref. 14). Low occupational exposures have been maintained by fabric filtration and air recirculation (ref. 15).

Some manufacturing operations generate explosive or fire hazard dusts. Others such as asbestos paper manufacturing ventilate extremely wet gas streams. Such operations are best controlled by high efficiency scrubbers.

1.3.2 Ventilation Air - In general most plants maintain occupationally safe levels within the working areas and where such levels are maintained exhaust of in-plant air to the atmosphere would not constitute a significant emission source. However, some operators prefer to equip personnel with respirators rather than control dust levels and ventilation air from these operations can be significant emission sources. Such sources are readily evident by the accumulation of fibrous particles around exhaust points. It would benefit operators to maintain safe implant levels rather than be faced with the prospect of filtering large amounts of ventilation air.

1.3.3 Product Shipment - The large variety of asbestos products require different degrees of packaging to limit emissions during shiping. Some products may not require any special packing, such as filled plastics or vinyl tiles. Others, such as asbestos cement, require dust tight packages equivalent to fiber shipping bags. More important is the requirement of labelling to instruct users to handle with care and to utilize proper disposal methods.

1.4 Product Use - Products containing asbestos are used extensively in the construction industry. Many users never generate dust from the product. This is especially true of products where the asbestos is firmly bound in a matrix of polymeric or cementatious material. Other users generate significant quantities of asbestos emissions from asbestos containing products where the asbestos is not firmly bound. Regulation and enforcement will be difficult and successful control will depend upon public awareness and concern. Emission controls have been developed for two useful types of products.

1.4.1 Block Insulation - Calcium silicate block insulation is used extensively in thermal insulation applications. This [illegible] is 15 asbestos in a soft but rigid matrix. Insulation unions have resisted efforts by manufacturers to introduce premolded block for bends and joints which the unions claim will be detrimental to their trade. Premolded insulation would greatly reduce emissions from field shaping of these products. Where cutting is essential special saws have been developed which have fabric filtration of exhausted dust (ref. 15).

1.4.2 Asbestos Containing Powders - Powderous asbestos products are often used in the construction industry. Some such as a plaster cement contain 15 to 90 percent asbestos. They are usually mixed in open troughs or buckets, releasing large quantities of asbestos. Special packages have been developed which permit introduction of water and mixing prior to opening (ref. 16).

1.5 Waste Disposal and Demolition - Disposal of asbestos containing wastes is a very dispersed emission problem. Wastes containing asbestos include shipping containers, manufacturing rejects, used products, and collected dusts. There is little or no treatment given to waste materials containing asbestos with respect to minimizing emissions during disposal. Much material is discarded on open dumps and becomes a continual source of emissions.

1.5.1 Removal of Asbestos Containing Insulation - As almost every building contains some asbestos, the regulation is limited to structures containing over 50 lbs. The regulation also applied to industrial and ship building operations where large amounts of insulation are being used. British engineers have pioneered in the use of water and special injection nozzles to wet insulation prior to removal (ref. 17). Enclosure has also been used to limit atmospheric contamination. This standard has been left relatively unrestrictive to permit freedom in development of new and improved removal methods.

1.5.2 Waste Disposal - The method of ultimate disposal which minimizes asbestos emission to the atmosphere is subsurface disposal. A well operated disposal program will have to be established in which asbestos wastes are segregated and buried. These programs can be cooperatives between manufacturers, construction contractors, demolition contractors and disposal area managers. This program must include provisions to minimize emissions during all phases, including transportation to disposal sites (ref. 18).

1.6 Specific Prohibition - In establishing rigorous emission standards, consideration must be given to the recommendation of prohibition of those uses of hazardous materials where adequate controls have not been demonstrated or where the hazard presented exceeds the value achieved.

1.6.1 Sprayed Asbestos Insulation and Fireproofing - Spray application of asbestos fireproofing has been the most controversial source of asbestos emissions; largely generated by its use in densely [illegible] buildings. [illegible] officials in Chicago, New York, Philadelphia, and San Francisco are considering regulations to prohibit the use of asbestos containing spray fireproofing. Some have already instituted prohibition through permit control. Many unproven control systems for spraying have been proposed. Some have been proven inadequate (ref. 19).

Spray fireproofing manufacturers have responded rapidly to the cities objections by introducing non-asbestos containing substitutes which are economically competitive. Substitute materials being used such as expanded vermiculite, fiber glass and other minerals can be applied using the same equipment as used for asbestos containing compositions. No additional operator training is required.

Cities are also concerned with asbestos emissions which will be generated when asbestos fireproofed buildings are demolished. Asbestos fireproofing of structural steel was not introduced until the late 1940's and few building treated in this manner have been demolished. Officials estimate the year 2000 will be the beginning of demolition problems.

The presence of suitable substitutes at little or no increase in cost and difficulty of emissions control during both application and demolition indicate that prohibition is warranted.

1.6.2 Miscellaneous Uses - The finely divided nature of asbestos floats and shorts combined with the absorbitivity and chemical inactivity make these forms likely candidates for absorbing system and dispersing mediums. Other inert materials are available for such purposes, the use of asbestos is highly unwarranted in view of its hazardous nature. This prohibits such uses as insecticide dispersants and oil absorbants (ref. 20).

2.1 Equipment Specifications - Specifications on required control equipment are intended to insure equivalent asbestos removal efficiency. Most of the specifications are based upon best current installations.

2.1.1 Fabric Filters - Fabric filters are the primary control device required by this regulation. They have been reported to be better than 99.99 percent efficient on a mass basis collecting asbestos mill dust (ref. 21). Many reports of tests on return air from fabric filters show that the devices can control dust below occupational threshold values.

Baghouses have many years of demonstrated performance including over 30 years of use in the asbestos industry. The devices are reliable and economical. Market availability is excellent with over 50 manufacturers selling some 7500 units per year. Over 115,000 units are in use today (ref. 22).

2.1.1.1 Construction - Construction is specified to prevent emissions of untreated dust.

2.1.1.2 Bypasses - The prohibition of bypasses insures that plants will not operate in an uncontrolled manner.

2.1.1.3 Hoppers - Many filter users have no provisions for emptying hoppers without re-releasing the dust to the atmosphere. Fabric filter manufactures have developed many systems to handle collected dust.

2.1.1.4 Fabrics - Fabric efficiency is highly dependent upon air flow permeability. Low air permeability implies that the fabric will have high collection efficiency. The rating 20 cfm/ft^2 at 1/2 in. H_2O is equivalent to standard cotton bags which have attained 99.09 percent efficiency. The rating of 30 cfm/ft^2 at 1/2 in. H_2O is an equivalent rating for orlon fabrics used successfully by industry. Fabrics having higher permeabilities will not be permitted.

2.1.2 Alternative Devices - There are certain conditions where fabric filters are not applicable. These include very humid ambient temperature gas streams and explosive or flamable dust loads. Scrubbers are better suited for these cases but must be specified to guarantee equivalent efficiency. In addition, other devices installed at the option of the manufacturer must be certified for compliance.

2.1.2.1 Scrubbers - High energy venturi scrubbers are the most efficient type of scrubber for submicron particles. The pressure drops necessary for good efficiency are high and vary somewhat with scrubber design. Forty inches of pressure drop will obtain 95% efficiency for .25u particles in well designed units (ref. 23).

2.1.2.2 Other Devices - Alternative devices installed where fabric filters are applicable must be certified to be at least equivalent to fabric filters. This regulation is not intended to prevent development of improved devices but is designed to provide equivalent control of emissions.

It is not possible at this time to clearly define equivalency because of the long standing lack of performance data for fabric filters in the asbestos industry. Through the years the fabric filter has developed a

position of unchallenged superiority for control of asbestos emissions. [illegible] are often purchased and installed with no written guarantee of performance and no performance testing. Therefore, the presentation of equivalency data will have to incorporate data from both fabric filters and the intended alternative device under similar operating conditions.

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