PLAINTIFF'S EXHIBIT

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Part IV

Department of Transportation

Research and Special Programs Administration

49 CFR Parts 171 and 172
Hazardous Substances; Final Rule

DEPARTMENT OF TRANSPORTATION

Research and Special Programs Administration

49 CFR Parts 171 and 172

[Docket No. HM-145F, Amdt. Nos. 171-90, 172-108]

Hazardous Substances

AGENCY: Research and Special Programs Administration (RSPA), Department of Transportation (DOT).

ACTION: Final rule.

SUMMARY: This final rule amends the Hazardous Materials Regulations (HMR) by incorporating into these regulations, as hazardous materials, substances designated as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA); Pub. L. 96-510). This action is necessary to comply with the Superfund Amendments and Reauthorization Act of 1986. The intended effect of this action is to enable carriers of hazardous materials to specifically identify CERCLA hazardous substances and to make the required notification if a discharge occurs.

EFFECTIVE DATE: This regulation is effective January 1, 1987. Under this final rule, the exceptions provided in 49 CFR 172.101(j) will apply only to a hazardous substance that is subject to an entry in the 49 CFR 172.101 Table prior to January 1, 1987, unless there is a difference in its reportable quantity as specified in the Appendix adopted herein.

FOR FURTHER INFORMATION CONTACT: Lee Jackson (202) 366-4488 or George Cushmac (202) 366-4545, Office of Hazardous Materials Transportation, RSPA, Washington, DC 20590. Questions about hazardous substance designations or reportable quantities should be directed to the EPA. Call the RCRA/Superfund hotline at (800) 424-9346 or, in Washington, DC (202) 382-3000.

SUPPLEMENTARY INFORMATION:

I. Background

On October 17, 1986, the President signed into law the Superfund Amendments and Reauthorization Act of 1986 (Pub. L. 99-499), which made several important changes to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Section 202 of Pub. L. 99-499 amended section 306 of CERCLA to require that the Secretary list *and regulate* hazardous substances listed or designated under section 101(14) of CERCLA as hazardous materials within thirty days of enactment of the Amendments. RSPA is today publishing a final rule under Docket HM-145F to fulfill this requirement.

RSPA has been considering incorporating CERCLA hazardous substances into the Hazardous Materials Regulations (HMR, 49 CFR Parts 171-179) under Docket HM-145E, and published both an advance notice of proposed rulemaking (ANPRM, 49 FR 35965, August 8, 1983) and a notice of proposed rulemaking (NPRM, 51 FR 22902, June 23, 1986) dealing with these issues. The Superfund Amendments of 1986 have overtaken most of the issues presented in these two notices. In this final rule, RSPA has selected the most practical method of listing and regulating hazardous substances in order to comply with the statutory deadline. A few issues remain, such as whether or not to remove the hazardous substance discharge notification requirement found at 49 CFR 171.17 from the HMR. These issues will be dealt with in the future under Docket HM-145E. Issues raised in HM-145E which are dealt with in this final rule will not be raised again under Docket HM-145E.

Today's rule includes a list of current hazardous substances with their reportable quantities (RQs), funished by the U.S. Environmental Protection Agency (EPA). This list appears in an Appendix to § 172.101 (Appendix) which replaces the CERCLA List. In addition, the rule contains amendments which apply the HMR to these hazardous substances. It is RSPA's intention to make changes from time to time to the list of hazardous substances or their RQs in the Appendix as adjustments are made by EPA.

The listing of hazardous substances and application of the HMR to them in this rule is being done differently from procedures which have been required until now. Formerly, hazardous substances were integrated into the Hazardous Materials Table (Table) found at 49 CFR 172.101. This listing of hazardous substances in the Table contained the normal complement of entries (i.e., proper shipping name, hazard class, identification number, required labels, packaging requirements, quantity limitations aboard aircraft, and entries for water shipments), and in addition, for each hazardous substance, the notation "E" was placed in column 1 with an italicized "RQ" notation in column 2 following the proper shipping name which in turn was followed by two numbers: the reportable quantity in both pounds and kilograms. When a hazardous substance was shipped (and by definition, at least a reportable quantity of the material had to be present in the package), both the shipping paper and the package (unless it was a bulk package (greater than 110 gallons)) had to bear the notation "RQ". This was to alert persons that a reportable quantity of a hazardous substance was present, and, should a spill occur, require the spill to be reported to the National Response Center (NRC).

In this final rule, RSPA is not integrating hazardous substances into the Table, but is placing them in a separate list, along with the reportable quantity for each substance, in the Appendix. In fact, this rule removes the special notations ("E" in column 1 and "RQ" and quantities in column 2) for hazardous substances presently in the Table. Where the hazard class for the hazardous substance is "ORM-E" (Other Regulated Material, category E), which means that that material does not meet any DOT hazard class definition except ORM-E, and is regulated only because it is a hazardous substance, the entire entry is removed from the Table. All specified hazardous substances listed and regulated under the HMTA are now found in the separate list in the Appendix. The only generic hazardous substance entry now present in the Table is "Hazardous substance, liquid or solid, n.o.s." The hazard class is ORM-E and the identification (ID) number is NA9188. One other ORM-E entry remains in the table, i.e., "Hazardous waste, liquid *or* solid, n.o.s."; ID number NA 9189. Materials which are designated hazardous substances and which satisfy a DOT hazard class other than ORM-E will be listed in both the Table and the Appendix, but the special notations no longer appear in the Table. This rule also removes the "CERCLA List" that appears after the Table and replaces that list with the Appendix.

RSPA has chosen this approach because of the great difficulty RSPA has with classing these materials. In order to place them in the Table, RSPA must determine their proper hazard class, using the hazard class definitions found in the HMR. RSPA has not been able to do this in a timely fashion due to the inherent differences in the technical and programmatic approach to these materials taken by RSPA and EPA on whose initial determinations RSPA relies.

EPA adjusted the reportable quantities of a number of hazardous substances in a final rule published on April 4, 1985 (50 FR 13456). Following this rule, RSPA published the notice of proposed rulemaking (NPRM) under Docket HM-145E. In the NPRM, RSPA

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proposed to integrate approximately 200 of these hazardous substances into the Table. Although RSPA has information from EPA on the physical, chemical, and toxicological properties of those materials, this NPRM was not published until June 23, 1986. This was due to the difficulty in determining the proper hazard class for the materials because they were either not suited to the established process for hazardous materials classification or because many of them were relatively obscure materials. In some cases DOT was not even able to establish the physical state (solid, liquid, or gas) for the materials designated by EPA. Given the size of this problem and the short time available to issue regulations in accordance with Pub. L. 99-499, RSPA has decided to abandon this approach and let shippers, who should know the properties of their materials, determine their proper shipping names, hazard classes, and the correct identification numbers. To do this, a shipper has the Table with its specific and generic entries, the hazard class definitions contained in Part 173, and the list of hazardous substances, including their RQ's, as designated by EPA in the Appendix. Under the HMR it has always been the responsibility of the shipper to class each material for shipment (except for explosives which require prior laboratory testing), and that responsibility remains in this final rule.

RSPA is aware that this approach will create some inconsistencies in the application of the regulations. For example, asbestos is presently regulated as an ORM-C, but the regulations only apply to asbestos that has commercial value, not waste asbestos. The packaging for commercial asbestos is specified at § 173.1090. However, asbestos is on the EPA list of hazardous substances at a reportable quantity of one pound, and this applies to all asbestos, commercial and waste, provided it is in a friable (loose) form. Therefore, under this rule commercial asbestos is regulated as an ORM-C, with packaging specified at § 173.1090, and waste asbestos is regulated as an ORM-E, with packaging specified at § 173.1300. This inconsistency occurs because of the statutory mandate in the Superfund Amendments to regulate all hazardous substances. RSPA will undertake regulatory action in the near future to correct this and other inconsistencies. Because the determination of the appropriate degree of regulation is discretionary, unlike today's action which is based on a statutory mandate, the future rulemaking will provide for notice and comment. Interested persons should withhold their comments until that notice is published.

Other than the expanded list of hazardous substances and the relocation of hazardous substances from the table to the Appendix, the regulatory requirements remain essentially the same. The shipper will have to determine the hazard class and proper shipping name for the material and the authorized packaging for the material using the Table and the packing authorizations contained in Part 173. When a hazardous substance is present in a shipment (i.e., there is a reportable quantity or more of the designated material in the package), the shipping paper entry must contain the notation "RQ". This requirement is unchanged. When the proper shipping name does not contain the name of the constituents which make the material a hazardous substance, that information must be added in association with the basic description. This requirement is also unchanged. In the case of waste streams, RSPA is requiring the use of the EPA waste number instead of the entire narrative waste stream description. The EPA waste number for the waste stream must be entered in association with the proper shipping name. In the case of a hazardous substance which satisfies one of the EPA "ICRE" hazardous waste characteristics of ignitibility, corrosivity, reactivity, or extraction procedure toxicity (EP toxicity), the requirement for additional information must be satisfied by using the letters, "EPA" followed by the word "ignitibility", or "corrosivity", or "reactivity", or "EP toxicity", as appropriate, in association with the basic description.

Procedures for marking non-bulk packagings (those of 110 gallons or less) also remain essentially the same. The "RQ" notation is required when a hazardous substance is present and if the proper shipping name does not include the constituent or constituents which make the material a hazardous substance, that information must be added in association with the proper shipping name. As is the case with shipping papers, when the hazardous substance is a waste stream or a waste material exhibiting an EPA "ICRE" characteristic, the additional identifying information required in the marking in association with the proper shipping name must be the waste stream number or, for the ICRE materials, the letters "EPA" and the word "ignitibility", or "corrosivity", or "reactivity", or "EP toxicity" as appropriate.

The regulatory action in this final rule is mandated by statute, and, for this reason, with one exception, RSPA is not affording persons affected by this rule the relief afforded by § 172.101(j) which allows up to one year after a change in the Table to use up stocks of preprinted shipping papers and to ship packages that were marked prior to the change. The exception is that RSPA is allowing preprinted shipping papers to be used and previously marked packages of hazardous substances to be transported if prepared in conformance with the requirements for hazardous substances prior to January 1, 1987. For example, shipping papers for a hazardous substance which read: "RQ, Adipic acid, ORM-E, NA9077", may be used until exhausted or until January 1, 1988, whichever comes first. After exhaustion or one year, such a shipment would have to be described as: "RQ, Hazardous substance, solid, n.o.s., ORM-E, NA9188, (adipic acid)". This also applies to marked packages. However, if the reportable quantity for the material has changed and the shipping paper entry or package marking does not reflect the reportable quantity as it appears in the Appendix in this rule, the shipment does not qualify for the exception in § 172.101(j) and must comply with the new requirements after January 1, 1987.

II. Review by Sections

Section 171.8. The definition of a hazardous material is revised to specifically include hazardous substances. The definition of a hazardous substance is revised to reference a new Appendix to § 172.101 which follows the Hazardous Materials Table (Table) at § 172.101. This Appendix replaces the CERCLA List currently shown and contains all hazardous substances and their reportable quantities. Reference to petroleum products has been removed from the hazardous substance definition since the determination of what materials should be designated as hazardous substances rests with EPA. Reference to "or in one transport vehicle if not packaged" has been removed since RSPA considers vehicles to be packagings when they are the primary means of containment (i.e., are used to transport materials in bulk).

Section 171.11. The wording of (d)(1)(i) of this section is amended to require the display of the waste stream number or "EPA" and the applicable ICRE characteristic on shipping papers.

Section 171.12a. The wording of (a)(3)(i) of this section is amended to require the display of the waste stream

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number or "EPA" and the applicable ICRE characteristic on shipping papers.

Section 172.101, Preamble. Paragraph (b) is revised to eliminate all references to the letter "E" in the Table. Subparagraph (c)(9) is revised to remove reference to "E" and "reportable quantity" and to add provisions for selecting proper shipping names for hazardous substances.

Section 172.101, Hazardous Materials Table. The Table is revised by removing the letter "E" from Column 1 of the Title heading and all places where it appears in Column 1 of the Table. All RQ designations and quantities are removed from the descriptions in Column 2 of the Table (for example, *"(RQ-1000/454)"*). The Table is revised by removing all entries for hazardous substances which only meet the definition of the ORM-E hazard class, with the exception of the generic entry "Hazardous substance, liquid *or* solid, n.o.s.". This includes removing the following five entries with *"See"* references to certain hazardous substances classed as ORM-E:

(1) 2,4-D ester. *See* 2,4-Dichlorophenoxyacetic acid ester;

(2) EDTA. *See* Ethylenediaminetetraacetic acid;

(3) PCB. *See* Polychlorinated biphenyls;

(4) 2,4,5-T amine, ester, *or* salt. *See* 2,4,5-Trichlorophenoxyacetic acid, amine, ester, *or* salt;

(5) 2,4,5-TP ester. *See* 2,4,5-Trichlorophenoxypropionic acid ester.

The entry "Hazardous waste, liquid *or* solid, n.o.s." remains in the Table and continues to bear the ORM-E hazard class designation. Hazardous substances meeting only the DOT hazard class definition for ORM-E appear in the new Appendix to § 172.101, along with all of the other CERCLA hazardous substances. Certain hazardous substances which satisfy the definition of a DOT hazard class other than ORM-E remain in the Table and also appear in the new Appendix. However, the "E" symbol, "RQ", and quantities no longer appear in the Table for these materials.

Section 172.101, Appendix. The CERCLA List is removed and replaced by an Appendix entitled "List of Hazardous Substances and Reportable Quantities." The appendix lists those materials which are hazardous substances as listed or designated under Section 101(14) of CERCLA.

Section 171.102. Paragraph (e) of this section is amended to require display of the waste stream number or "EPA" and the applicable ICRE characteristic on shipping papers.

Section 172.203. Paragraph (c) is amended to reference the new Appendix of hazardous substances which follows the Table and to require that hazardous substance constituents be shown in parentheses in association with the basic description, if the proper shipping name does not identify the hazardous substance constituents as shown in Appendix A to § 172.101. A new sentence is added to this section to require that a waste stream number or "EPA" and the applicable ICRE characteristic be shown, instead of the name of the constituent from the Appendix, in parentheses on the shipping paper in association with the basic description for those waste materials which are either waste streams or exhibit an ICRE characteristic.

Section 172.324. Paragraph (a) is revised to require the name of a hazardous substance constituent to be shown as a package marking, if the proper shipping name does not identify the hazardous substance constituent, as shown in the Appendix to § 172.101. Paragraph (b) is revised to require that all packages of 110 gallons or less that contain waste streams or wastes exhibiting ICRE characteristics, be marked in association with the proper shipping name with the waste stream number or "EPA" and the appropriate ICRE characteristic in parentheses. Existing paragraph (b) is redesignated as paragraph (c).

III. Administrative Notices

1. Because the amendments adopted herein are mandated by the Superfund Amendments and Reauthorization Act of 1986 (Pub. L. 99-499, October 17, 1986), and are to be adopted within 30 days of enactment, I find under 5 U.S.C. 553, that notice and public procedure are contrary to the public interest. In addition, due to the limited time available to prepare this final rule, no determinations have been made under the Regulatory Flexibility Act (5 U.S.C. 601, *et seq.*).

2. Under the terms of "DOT Regulatory Policies and Procedures" (44 FR 11034, February 26, 1979), I have determined that this rulemaking is an emergency rulemaking because it is governed by a short-term statutory deadline, therefore, no determination is made as to whether it is "significant".

3. I certify that this rulemaking does not require an environmental impact statement under the National Environmental Policy Act (49 U.S.C. 4321, *et seq.*).

Although the provisions of Pub. L. 99-499 provide insufficient time for RSPA to perform required analyses and make required findings under the statutory, regulatory, and executive authorities noted above, the agency is aware that a rulemaking of such broad and immediate applicability may produce significant impacts on industry segments, a substantial number of which may be small enterprises. In order to comply with the mandate of Pub. L. 99-499, RSPA has chosen a regulatory approach which both complies with the purpose of the Congress and presents the least possible disruption to the regulatory scheme of the HMR.

Because RSPA's role in regulating hazardous substances is directly tied to EPA's ongoing hazardous substances responsibility, primarily through the agency's determination of reportable quantities, there will be a mechanism for RSPA's oversight of the transportation impacts of these amendments as the agency conducts rulemaking to provide concordance with EPA requirements. As the need for adjustments to these amendments is demonstrated, RSPA will modify the requirements to the extent consistent with the intent of Congress expressed in Pub. L. 99-499.

List of Subjects

49 CFR Part 171

Hazardous materials transportation, Definitions.

49 CFR Part 172

Hazardous materials transportation, Hazardous substances.

In consideration of the foregoing Parts 171 and 172 of Title 49, Code of Federal Regulations are amended as follows:

PART 171—GENERAL INFORMATION, REGULATIONS, AND DEFINITIONS

1. The authority citation for Part 171 is revised to read as follows:

Authority: 49 U.S.C. 1802, 1803, 1804, and 1808; Pub. L. 99-499; and 49 CFR Part 1, unless otherwise noted.

2. In § 171.8, the definitions for "Hazardous material" and "Hazardous substances" are revised to read as follows:

§ 171.8 Definitions and abbreviations.

* * * * *

"Hazardous material" means a substance or material, including a hazardous substance, which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated.

"Hazardous substance" for the purposes of this subchapter, means a

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material, including its mixtures and solutions, that—

(1) Is listed in the Appendix to § 172.101 of this subchapter;

(2) Is in a quantity, in one package, which equals or exceeds the reportable quantity (RQ) listed in the Appendix to § 172.101 of this subchapter; and

(3) When in a mixture or solution, is in a concentration by weight which equals or exceeds the concentration corresponding to the RQ of the material, as shown in the following table:

RQ pounds (kilograms)	Concentration by weight	
	Percent	PPM
5000 (2270)	10	100,000
1000 (454)	2	20,000
100 (45.4)	0.2	2,000
10 (4.54)	0.02	200
1 (0.454)	0.002	20

* * * * *

3. In § 171.11 paragraph (d)(1)(i) is revised to read as follows:

§ 171.11 Use of ICAO Technical Instructions.

* * * * *

(d) * * *

(1) * * *

(i) The name of the hazardous substance shall be entered on shipping papers in parentheses in association with the basic description, and in association with the proper shipping name required to be marked on the package, unless the proper shipping name required by the ICAO Technical Instructions already includes the name of the hazardous substance. For waste streams or for wastes which exhibit an EPA characteristic of ignitibility, corrosivity, reactivity, or EP toxicity, the basic description shall be followed by the waste stream number in parentheses or by the letters "EPA" and the word "ignitibility" or "corrosivity" or "reactivity", or "EP toxicity", in parentheses, as appropriate; and

4. In § 171.12a, paragraph (a)(3)(i) is revised to read as follows:

§ 171.12a Canadian shipments and packagings.

* * * *

(a) * * *

(3) * * *

(i) The name of the hazardous substance shall be entered on shipping papers and in association with the proper shipping name required to be marked on the package, in parentheses, unless the proper shipping name required by the TDG regulations already includes the name of the hazardous substance. For waste streams or for wastes which exhibit an EPA characteristic of ignitibility, corrosivity, reactivity, or EP toxicity, the basic description shall be followed by the waste stream number in parentheses or by the letters "EPA" and the word "ignitibility" or "corrosivity" or "reactivity", or "EP toxicity", in parentheses, as appropriate; and

* * * * *

PART 172—HAZARDOUS MATERIALS TABLE AND HAZARDOUS MATERIALS COMMUNICATIONS REGULATIONS

5. The authority citation for Part 172 is revised to read as follows:

Authority: 49 U.S.C. 1803, 1804, 1805, and 1808; Pub. L. 99-499; and 49 CFR Part 1, unless otherwise noted.

6. In § 172.101, paragraphs (b) and (c)(9) are revised to read as follows:

§ 172.101 Purpose and use of hazardous materials table.

* * * * *

(b) Column 1 contains the three symbols as appropriate: Plus (+) and the letters "A" and "W".

(1) The plus (+) fixes the proper shipping name and the hazard class for that entry without regard to whether the material meets the definition of that class. An alternate proper shipping name and hazard class may be authorized by the Director, Office of Hazardous Materials Transportation, RSPA.

(2) A letter "A" restricts the application of this subchapter to materials offered or intended for transportation by aircraft, unless the material is a hazardous substance or a hazardous waste.

(3) The letter "W" restricts the application of this subchapter to materials offered or intended for transportation by vessel, unless the material is a hazardous substance or a hazardous waste.

(c) * * *

(9) *Hazardous substance.* The Appendix to this section lists materials which are listed or designated as hazardous substances under section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Proper shipping names for hazardous substances (See Appendix and § 171.8 of this subchapter) shall be determined as follows:

(i) If the hazardous substance appears in the table by technical name, then the technical name is the proper shipping name.

(ii) If the hazardous substance does not appear in the table and is not a forbidden material (See §§ 173.21, 173.51, 173.86, and 173.114a of this subchapter), then an appropriate generic shipping name must be selected corresponding to the hazard class of the material as determined by the defining criteria of this subchapter and the hazard precedence prescribed in § 173.2 of this subchapter. For example, a hazardous substance which meets the definition of a flammable liquid might be described as "Flammable liquid, n.o.s." or other appropriate shipping name corresponding to the flammable liquid hazard class.

* * * * *

7. In § 172.101, the Hazardous Materials Table is amended as follows:

a. "E/" is removed from the heading of Column 1;

b. The symbol "E" is removed from Column 1;

c. All reportable quantity (RQ) designations and quantities are removed from the descriptions in Column 2 (e.g., *"(RQ-1000/454))"*;

d. The phrase *"(these materials may contain various hazardous substances for which the appropriate RQ applies)"* is removed from the Column 2 entry for "Motor fuel antiknock compound";

e. All entries in the table that are classed "ORM-E" as shown in Column 3 are removed from the table, except for the following two generic entries: "Hazardous substance, liquid *or* solid, n.o.s." and "Hazardous waste, liquid *or* solid, n.o.s", and

f. The following five *"See"* references to certain materials classed ORM-E are removed from the table:

(a) "2,4-D ester. *See* 2,4-Dichlorophenoxyacetic acid ester";

(b) "EDTA. *See* Ethylenediaminetetraacetic acid";

(c) "PCB. *See* Polychlorinated biphenyls";

(d) "2,4,5-T amine, ester, *or* salt. *See* 2,4,5-Trichlorophenoxyacetic acid, amine, ester, *or* salt"; and

(e) "2,4,5-TP ester. *See* 2,4,5-Trichlorophenoxypropionic acid ester".

8. The CERCLA list which follows the Table is removed and an Appendix to § 172.101 is added to read as follows:

Appendix to § 172.101—List of Hazardous Substances and Reportable Quantities

1. This Appendix lists materials and their corresponding reportable quantities (RQs) which are listed or designated as "hazardous substances" under section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; Pub. L. 96-510). A material in this list is regulated as a hazardous material under this subchapter if it meets the definition of a hazardous substance in § 171.8 of this subchapter.

2. Column 1 of the list, entitled *"Hazardous substances"*, contains the names of

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hazardous substances. Elements and compounds are listed first, in alphabetical sequence. Following the listing of elements and compounds is a listing of waste streams and their corresponding "F numbers". They are listed in numerical sequence by "F number". Column 2 of the list, entitled *"Synonyms"*, contains the names of synonyms for certain of the elements and are listed for waste streams. Synonyms are useful in identifying hazardous substances and in selecting proper shipping names. Column 3 of the list, entitled *"Reportable quantity (RQ)"*, contains the reportable quantity (RQ), in pounds and kilograms, for each hazardous substance listed in Column 1.

3. The procedure for selecting a proper compounds listed in Column 1. No synonyms shipping name for a hazardous substance is set forth in § 172.101(c)(9).

4. A series of notes is used throughout the list to provide additional information concerning certain hazardous materials. These notes are explained at the end of the list.

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LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES

Hazardous Substance	Synonyms	Reportable Quantity(RQ) Pounds(Kilograms)
Acenaphthene		100 (45.4)
Acenaphthylene		5000 (2270)
Acetaldehyde *	Ethanal	1000 (454)
Acetaldehyde, chloro-	Chloroacetaldehyde	1000 (454)
Acetaldehyde, trichloro-	Chloral	1 (0.454)
Acetamide, N-(aminothioxomethyl)-	1-Acetyl-2-thiourea	1000 (454)
Acetamide, N-(4-ethoxyphenyl)-	Phenacetin	1 (0.454)
Acetamide, N-fluoren-2-yl-	2-Acetylaminofluorene	1 (0.454)
Acetamide, 2-fluoro-	Fluoroacetamide	100 (45.4)
Acetic acid *		5000 (2270)
Acetic acid, ethyl ester	Ethyl acetate	5000 (2270)
Acetic acid, fluoro-, sodium salt	Fluoroacetic acid, sodium salt	10 (4.54)
Acetic acid, lead salt	Lead acetate	5000 (2270)
Acetic acid, thallium(I) salt	Thallium(I) acetate	100 (45.4)
Acetic anhydride *		5000 (2270)
Acetimidic acid, N-[(methylcarbamoyl)oxy]thio-methyl ester	Methomyl	100 (45.4)
Acetone *	2-Propanone	5000 (2270)
Acetone cyanohydrin *	Propanenitrile, 2-hydroxy-2-methyl-	10 (4.54)
	2-Methyllactonitrile	
Acetonitrile *	Ethanenitrile	5000 (2270)
3-(alpha-Acetonylbenzyl)-4-hydroxycoumarin and salts	Warfarin	100 (45.4)
Acetophenone	Ethanone, 1-phenyl-	5000 (2270)
2-Acetylaminofluorene	Acetamide, N-fluoren-2-yl-	1 (0.454)
Acetyl bromide *		5000 (2270)
Acetyl chloride *	Ethanoyl chloride	5000 (2270)
1-Acetyl-2-thiourea	Acetamide, N-(aminothioxomethyl)-	1000 (454)
Acrolein *	2-Propenal	1 (0.454)
Acrylamide	2-Propenamide	5000 (2270)
Acrylic acid *	2-Propenoic acid	5000 (2270)
Acrylonitrile *	2-Propenenitrile	100 (45.4)
Adipic acid		5000 (2270)
Alanine, 3-[p-bis(2-chloroethyl)amino]phenyl-, L-	Melphalan	1 (0.454)
Aldicarb	Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl] oxime	1 (0.454)
Aldrin *	1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-endo,exo-dimethanonaphthalene	1 (0.454)
Allyl alcohol *	2-Propen-1-ol	100 (45.4)
Allyl chloride *		1000 (454)
Aluminum phosphide *		100 (45.4)
Aluminum sulfate *		5000 (2270)
2-Amino-1-methyl benzene	o-Toluidine	1 (0.454)
4-Amino-1-methyl benzene	p-Toluidine	1 (0.454)
5-(Aminomethyl)-3-isoxazolol	3(2H)-Isoxazolone, 5-(aminomethyl)-	1000 (454)
4-Aminopyridine	4-Pyridinamine	1000 (454)
Amitrole	1H-1,2,4-Triazol-3-amine	1 (0.454)
Ammonia *		100 (45.4)
Ammonium acetate		5000 (2270)
Ammonium benzoate		5000 (2270)
Ammonium bicarbonate		5000 (2270)
Ammonium bichromate	Ammonium dichromate ●	1000 (454)
Ammonium bifluoride *		100 (45.4)
Ammonium bisulfite *		5000 (2270)
Ammonium carbamate *		5000 (2270)
Ammonium carbonate *		5000 (2270)
Ammonium chloride		5000 (2270)
Ammonium chromate		1000 (454)
Ammonium citrate, dibasic		5000 (2270)
Ammonium dichromate ●	Ammonium bichromate	1000 (454)
Ammonium fluoborate *		5000 (2270)
Ammonium fluoride *		100 (45.4)
Ammonium hydroxide *		1000 (454)
Ammonium oxalate *		5000 (2270)
Ammonium picrate *	Phenol, 2,4,6-trinitro-, ammonium salt	10 (4.54)
Ammonium sulfamate		1000 (454)
Ammonium sulfide *		5000 (2270)
Ammonium sulfite		100 (45.4)
Ammonium tartrate		5000 (2270)
Ammonium thiocyanate		5000 (2270)
Ammonium thiosulfate		5000 (2270)
Ammonium vanadate	Vanadic acid ammonium salt	5000 (2270)
Amyl acetate *		1000 (454)
iso-Amyl acetate		5000 (2270)
sec-Amyl acetate		
tert-Amyl acetate		
Aniline *	Benzenamine	5000 (2270)
Anthracene		5000 (2270)

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LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES—Continued

Hazardous Substance	Synonyms	Reportable Quantity (RQ) Pounds (Kilograms)
Antimony 6		5000 (2270)
ANTIMONY AND COMPOUNDS		**
Antimony pentachloride *		1000 (454)
Antimony potassium tartrate *		100 (45.4)
Antimony tribromide *		1000 (454)
Antimony trichloride *		1000 (454)
Antimony trifluoride *		1000 (454)
Antimony trioxide		1000 (454)
Aroclor 1016	POLYCHLORINATED BIPHENYLS (PCBs)	10 (4.54)
Aroclor 1221	POLYCHLORINATED BIPHENYLS (PCBs)	10 (4.54)
Aroclor 1232	POLYCHLORINATED BIPHENYLS (PCBs)	10 (4.54)
Aroclor 1242	POLYCHLORINATED BIPHENYLS (PCBs)	10 (4.54)
Aroclor 1248	POLYCHLORINATED BIPHENYLS (PCBs)	10 (4.54)
Aroclor 1254	POLYCHLORINATED BIPHENYLS (PCBs)	10 (4.54)
Aroclor 1260	POLYCHLORINATED BIPHENYLS (PCBs)	10 (4.54)
Arsenic * ¢		1 (0.454)
Arsenic acid *		1 (0.454)
ARSENIC AND COMPOUNDS		**
Arsenic bromide *		5000 (2270)
Arsenic(III) oxide	Arsenic bromide *	5000 (2270)
Arsenic(V) oxide	Arsenic pentoxide *	5000 (2270)
Arsenic pentoxide *	Arsenic(V) oxide	5000 (2270)
Arsenic trichloride *		5000 (2270)
Arsenic trioxide *	Arsenic(III) oxide	5000 (2270)
Arsenic trisulfide *		5000 (2270)
Arsine, diethyl-	Diethylarsine	1 (0.454)
Asbestos * ¢¢		1 (0.454)
Auramine	Benzenamine, 4,4'-carbonimidoylbis [N,N-dimethyl-	1 (0.454)
Azaserine	L-Serine, diazoacetate (ester)	1 (0.454)
Aziridine	Ethylenimine	1 (0.454)
Azinphos-methyl ◆	Guthion *	1 (0.454)
Azirino[2',3':3,4]pyrrolo[1,2-a]indole-4,7-dione,6-amino-8-[((aminocarbonyl)oxy)methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl-	Mitomycin C	1 (0.454)
Barium cyanide *		10 (4.54)
Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-	3-Methylcholanthrene	1 (0.454)
Benz[c]acridine	3,4-Benzacridine	1 (0.454)
3,4-Benzacridine	Benz[c]acridine	1 (0.454)
Benzal chloride	Benzene, dichloromethyl-	5000 (2270)
Benz[a]anthracene	Benzo[a]anthracene	1 (0.454)
1,2-Benzanthracene	1,2-Benzanthracene Benz[a]anthracene Benzo[a]anthracene	1 (0.454)
1,2-Benzanthracene, 7,12-dimethyl-	7,12-Dimethylbenz[a]anthracene	1 (0.454)
Benzenamine	Aniline *	5000 (2270)
Benzenamine, 4,4'-carbonimidoylbis [N,N-dimethyl-	Auramine	1 (0.454)
Benzenamine, 4-chloro-	p-Chloroaniline	1000 (454)
Benzenamine, 4-chloro-2-methyl-, hydrochloride	4-Chloro-o-toluidine, hydrochloride	1 (0.454)
Benzenamine, N,N-dimethyl-4-phenylazo-	Dimethylaminoazobenzene	1 (0.454)
Benzenamine, 4,4'-methylenebis[2-chloro-	4,4'-Methylenebis(2-chloroaniline)	1 (0.454)
Benzenamine, 2-methyl-, hydrochloride	o-Toluidine hydrochloride	1 (0.454)
Benzenamine, 2-methyl-5-nitro-	5-Nitro-o-toluidine	1 (0.454)
Benzenamine, 4-nitro-	p-Nitroaniline	5000 (2270)
Benzene *		1000 (454)
Benzene, 1-bromo-4-phenoxy-	4-Bromophenyl phenyl ether	100 (45.4)
Benzene, chloro-	Chlorobenzene *	100 (45.4)
Benzene, chloromethyl-	Benzyl chloride *	100 (45.4)
Benzene, 1,2-dichloro-	o-Dichlorobenzene * 1,2-Dichlorobenzene	100 (45.4)
Benzene, 1,3-dichloro-	m-Dichlorobenzene 1,3-Dichlorobenzene	100 (45.4)
Benzene, 1,4-dichloro-	p-Dichlorobenzene * 1,4-Dichlorobenzene	100 (45.4)
Benzene, dichloromethyl-	Benzal chloride	5000 (2270)
Benzene, 2,4-diisocyanatomethyl-	Toluene diisocyanate *	100 (45.4)
Benzene, dimethyl-	Xylene * (mixed)	1000 (454)
m-Benzene, dimethyl-	m-Xylene	
o-Benzene, dimethyl-	o-Xylene	
p-Benzene, dimethyl-	p-Xylene	
Benzene, hexachloro-	Hexachlorobenzene	1 (0.454)
Benzene, hexahydro-	Cyclohexane *	1000 (454)
Benzene, hydroxy-	Phenol *	1000 (454)
Benzene, methyl-	Toluene *	1000 (454)
Benzene, 1-methyl-2,4-dinitro-	2,4-Dinitrotoluene *	1000 (454)
Benzene, 1-methyl-2,6-dinitro-	2,6-Dinitrotoluene *	1000 (454)
Benzene, 1,2-methylenedioxy-4-allyl-	Safrole	1 (0.454)
Benzene, 1,2-methylenedioxy-4-propenyl-	Isosafrole	1 (0.454)
Benzene, 1,2-methylenedioxy-4-propyl-	Dihydrosafrole	1 (0.454)
Benzene, 1-methylethyl-	Cumene	5000 (2270)
Benzene, nitro-	Nitrobenzene *	1000 (454)
Benzene, pentachloro-	Pentachlorobenzene	10 (4.54)
Benzene, pentachloronitro-	Pentachloronitrobenzene	1 (0.454)
Benzene, 1,2,4,5-tetrachloro-	1,2,4,5-Tetrachlorobenzene	5000 (2270)
Benzene, trichloromethyl-	Benzotrichloride	1 (0.454)
Benzene, 1,3,5-trinitro-	sym-Trinitrobenzene *	10 (4.54)
Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy-, ethyl ester	Ethyl 4,4'-dichlorobenzilate	1 (0.454)
1,2-Benzenedicarboxylic acid anhydride	Phthalic anhydride	5000 (2270)
1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester	Bis(2-ethylhexyl)phthalate	1 (0.454)
1,2-Benzenedicarboxylic acid, dibutyl ester	Di-n-butyl phthalate Dibutyl phthalate n-Butyl phthalate *	10 (4.54)
1,2-Benzenedicarboxylic acid, diethyl ester	Diethyl phthalate	1000 (454)

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Appendix J. Recommended Specifications and Operating Procedures for the Use of Negative Pressure Systems for Asbestos Abatement

J.1 Introduction

This appendix provides guidelines for the use of negative pressure systems in removing asbestos-containing materials from buildings. A negative pressure system is one in which static pressure in an enclosed work area is lower than that of the environment outside the containment barriers.

The pressure gradient is maintained by moving air from the work area to the environment outside the area via powered exhaust equipment at a rate that will support the desired air flow and pressure differential. Thus, the air moves into the work area through designated access spaces and any other barrier openings. Exhaust air is filtered by a high-efficiency particulate air (HEPA) filter to remove asbestos fibers.

The use of negative pressure during asbestos removal protects against large-scale release of fibers to the surrounding area in case of a breach in the containment barrier. A negative pressure system also can reduce the concentration of airborne asbestos in the work area by increasing the dilution ventilation rate (i.e., diluting contaminated air in the work area with uncontaminated air from outside) and exhausting contaminated air through HEPA filters. The circulation of fresh air through the work area reportedly also improves worker comfort, which may aid the removal process by increasing job productivity.

J.2 Materials and Equipment

J.2.1 The Portable, HEPA-Filtered, Powered Exhaust Unit

The exhaust unit establishes lower pressure inside than outside the enclosed work area during asbestos abatement. Basically, a unit (see Figure J-1) consists of a cabinet with an opening at each end, one for air intake and one for exhaust. A fan and a series of filters are arranged inside the cabinet between the openings. The fan draws contaminated air through the intake and filters and discharges clean air through the exhaust.

Portable exhaust units used for negative pressure systems in asbestos abatement projects should meet the following specifications.

J.2.1.1 Structural Specifications

The cabinet should be ruggedly constructed and made of durable materials to withstand damage from rough handling and transportation. The width of the cabinet should be less than 30 inches to fit through standard-size doorways. The cabinet must be appropriately sealed to prevent asbestos-containing dust from being emitted during use, transport, or maintenance. There should be easy access to all air filters from the intake end, and the filters must be easy

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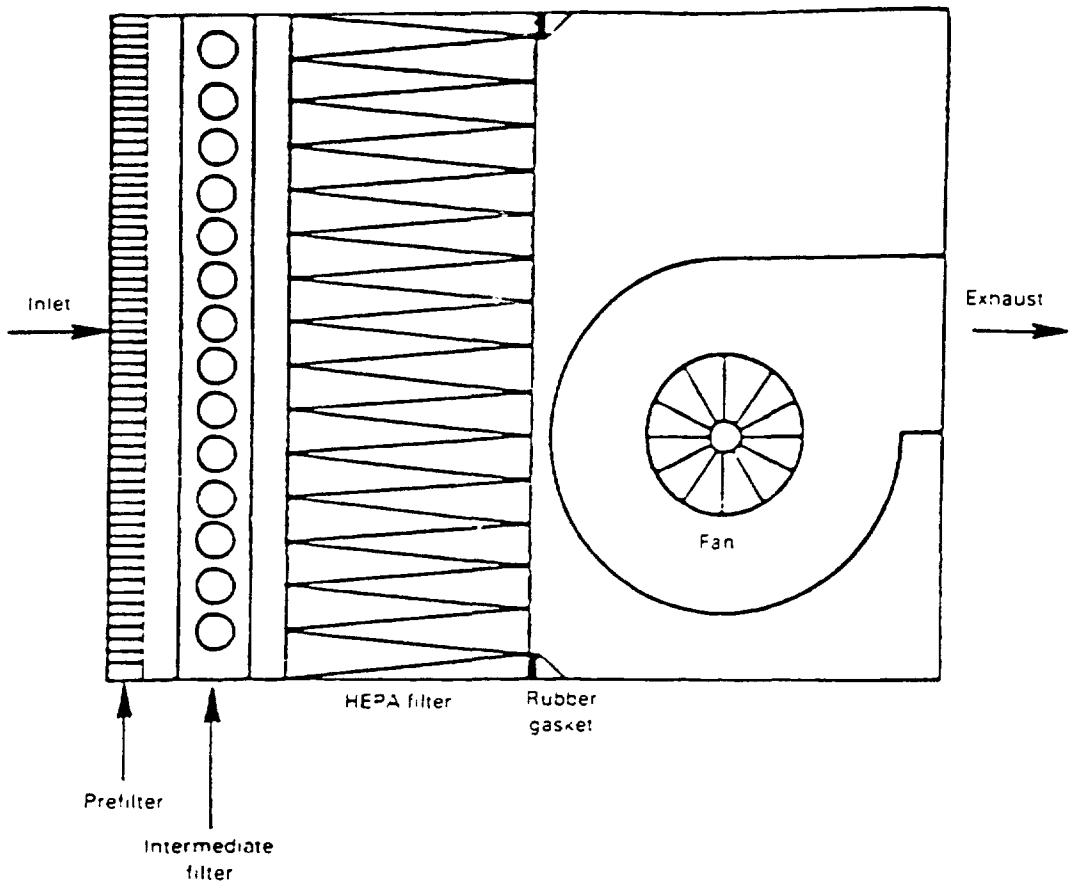

Figure J-1 An example of a HEPA-filtered exhaust unit. This scheme is one of several possible designs.

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to replace. The unit should be mounted on casters or wheels so it can be easily moved. It also should be accessible for easy cleaning.

J.2.1.2 Mechanical Specifications

J.2.1.2.1 Fans

The fan for each unit should be sized to draw a desired air flow through the filters in the unit at a specified static pressure drop. The unit should have an air-handling capacity of 1,000 to 2,000 ft^3/ min (under "clean" filter conditions) The fan should be of the centrifugal type.

For large-scale abatement projects, where the use of a larger capacity, specially designed exhaust system may be more practical than several smaller units, the fan should be appropriately sized according to the proper load capacity established for the application, i.e.,

$$\text{Total } ft^3 \text{ min (load)} = \frac{\text{Volume of air in } ft^3 \times \text{air changes/hour}}{60 \text{ min/hour}}$$

Smaller-capacity units (e.g., 1,000 ft^3/min) equipped with appropriately sized fans and filters may be used to ventilate smaller work areas. The desired air flow could be achieved with several units.

J.2.1.2.2 Filters

The final filter must be the HEPA type. Each filter should have a standard nominal rating of at least 1,100 ft^3/min with a maximum pressure drop of 1 inch H_2O clean resistance. The filter media (folded into closely pleated panels) must be completely sealed on all edges with a structurally rigid frame and cross-braced as required. The exact dimensions of the filter should correspond with the dimensions of the filter housing inside the cabinet or the dimensions of the filter-holding frame. The recommended standard size HEPA filter is 24 inches high x 24 inches wide x 11-1/2 inches deep. The overall dimensions and squareness should be within 1/8 inch.

A continuous rubber gasket must be located between the filter and the filter housing to form a tight seal. The gasket material should be 1/4 inch thick and 3/4 inch wide.

Each filter should be individually tested and certified by the manufacturer to have an efficiency of not less than 99.97 percent when challenged with 0.3-μm dioctylphthalate (DOP) particles. Testing should be in accordance with Military Standard Number 282 and Army Instruction Manual 136-300-175A. Each filter should bear a UL586 label to indicate ability to perform under specified conditions.

Each filter should be marked with: the name of the manufacturer, serial number, air flow rating, efficiency and resistance, and the direction of test air flow.

Prefilters, which protect the final filter by removing the larger particles, are recommended to prolong the operating life of the HEPA filter. Prefilters prevent the premature loading of the HEPA filter. They can also save energy and cost. One (minimum) or two (preferred) stages of prefiltration may be used. The first-stage prefilter should be a low-efficiency type (e.g., for particles 10 μm and larger). The second-stage (or intermediate) filter should have a medium efficiency (e.g., effective for particles down to 5 μm). Various types of filters and filter media for prefiltration applications are available from many manufacturers. Prefilters and intermediate filters should be installed either on or in the intake grid of the unit and held in place with special housings or clamps.

J.2.1.2.3 Instrumentation

Each unit should be equipped with a Magnehelic gauge or manometer to measure the pressure drop across the filters and indicate when filters have become loaded and need to be changed. The static pressure across the filters (resistance) increases as they become loaded with dust, affecting the ability of the unit to move air at its rated capacity.

J.2.1.3 Electrical

J.2.1.3.1 General

The electrical system should have a remote fuse disconnect. The fan motor should be totally enclosed, fan-cooled, and the nonoverloading type. The unit must use a standard 115-V,

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single-phase, 60-cycle service. All electrical components must be approved by the National Electrical Manufacturers Association (NEMA) and Underwriter's Laboratories (UL)

J.2.1.3.2 Fans

The motor, fan, fan housing, and cabinet should be grounded. The unit should have an electrical (or mechanical) lockout to prevent the fan from operating without a HEPA filter.

J.2.1.3.3 Instrumentation

An automatic shutdown system that would stop the fan in the event of a major rupture in the HEPA filter or blocked air discharge is recommended. Optional warning lights are recommended to indicate normal operation, too high of a pressure drop across the filters (i.e., filter overloading), and too low of a pressure drop (i.e., major rupture in HEPA filter or obstructed discharge). Other optional instruments include a timer and automatic shut-off and an elapsed time meter to show the total accumulated hours of operation.

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J.3 Setup and Use of a Negative Pressure System

J.3.1 Preparation of the Work Area

J.3.1.1 Determining the Ventilation Requirements for a Work Area

Experience with negative pressure systems on asbestos abatement projects indicates a recommended rate of one air change every 15 minutes. The volume (in ft^3) of the work area is determined by multiplying the floor area by the ceiling height. The total air flow requirement (in ft^3/min) for the work area is determined by dividing this volume by the recommended air change rate (i.e., one air change every 15 minutes).*

$$\text{Total } ft^3/\text{min} = \text{Volume of work area (in } ft^3)/15 \text{ min}$$

The number of units needed for the application is determined by dividing the total ft^3/min by the rated capacity of the exhaust unit.

$$\text{Number of units needed} = [\text{Total } ft^3/\text{min}]/[\text{Capacity of unit (in } ft^3)]$$

J.3.1.2 Location of Exhaust Units

The exhaust unit(s) should be located so that makeup air enters the work area primarily through the decontamination facility and traverses the work area as much as possible. This may be accomplished by positioning the exhaust unit(s) at a maximum distance from the worker access opening or other makeup air sources.

Wherever practical, work area exhaust units can be located on the floor in or near unused doorways or windows. The end of the unit or its exhaust duct should be placed through an opening in the plastic barrier or wall covering. The plastic around the unit or duct should then be sealed with tape.

*The recommended air exchange rate is based on engineering judgment.

Each unit must have temporary electrical power (115V AC). If necessary, three-wire extension cords can supply power to a unit. The cords must be in continuous lengths (without splice), in good condition, and should not be more than 100 feet long. They must not be fastened with staples, hung from nails, or suspended by wire. Extension cords should be suspended off the floor and out of workers' way to protect the cords from damage from traffic, sharp objects, and pinching.

Wherever possible, exhaust units should be vented to the outside of the building. This may involve the use of additional lengths of flexible or rigid duct connected to the air outlet and routed to the nearest outside opening. Windowpanes may have to be removed temporarily.

If exhaust air cannot be vented to the outside of the building or if cold temperatures necessitate measures to conserve heat and minimize cold air infiltration, filtered air that has been exhausted through the barrier may be recirculated into an adjacent area. However, this is not recommended.

Additional makeup air may be necessary to avoid creating too high of a pressure differential, which could cause the plastic coverings and temporary barriers to "blow in." Additional makeup air also may be needed to move air most effectively through the work area. Supplemental makeup air inlets may be made by making openings in the plastic sheeting that allow air from outside the building into the work area. Auxiliary makeup air inlets should be as far as possible from the exhaust unit(s) (e.g., on an opposite wall), off the floor (preferably near the ceiling), and away from barriers that separate the work area from occupied clean areas. They should be resealed whenever the negative pressure system is turned off after removal has started. Because the pressure differential (and ultimately the effectiveness of the system) is affected by the adequacy of makeup air, the number of auxiliary air inlets should be kept to a minimum to maintain negative pressure. Figure J-2 presents examples of negative pressure systems denoting the location of HEPA-filtered exhaust units and the direction of air flow.

J.3.2 Use of the Negative Pressure System

J.3.2.1 Testing the System

The negative pressure system should be tested before any asbestos-containing material is wetted or removed. After the work area has been prepared, the decontamination facility set up, and the exhaust unit(s) installed, the unit(s) should be started (one at a time). Observe the barriers and plastic sheeting. The plastic curtains of the decontamination facility should move slightly in toward the work area. The use of ventilation smoke tubes and a rubber bulb is another easy and inexpensive way to visually check system performance and direction of air flow through openings in the barrier. Another test is to use a Magnehelic gauge (or other instrument) to measure the static pressure differential across the barrier. The measuring device must be sensitive enough to detect a relatively low pressure drop. A Magnehelic gauge with a scale of 0 to 0.25 or 0.50 inch of H_2O and 0.005 or 0.01 inch graduations is generally adequate. The pressure drop across the barrier is measured from the outside by punching a small hole in the plastic barrier and inserting one end of a piece of rubber or Tygon tubing. The other end of the tubing is connected to the "low pressure" tap of the instrument. The "high pressure" tap must be open to the atmosphere. The pressure is read directly from the scale. After the test is completed, the hole in the barrier must be patched.

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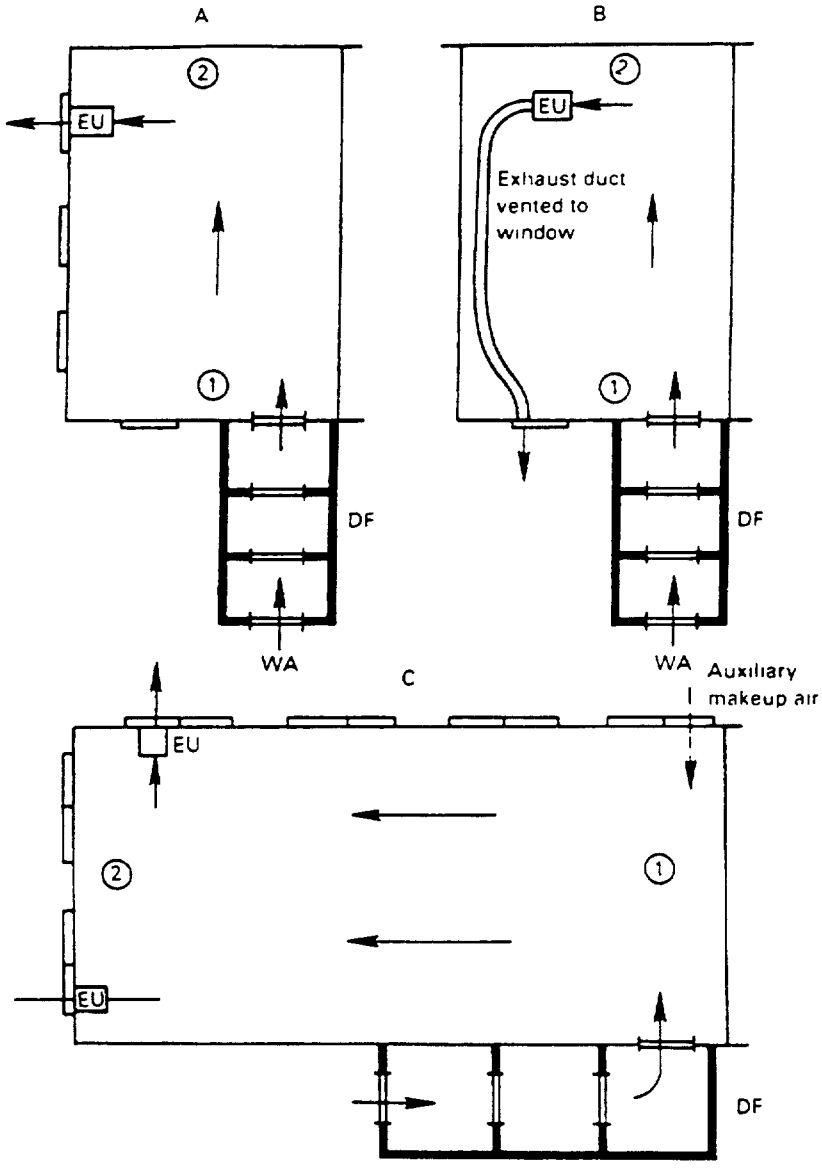

Figure J-2. Examples of negative pressure systems DF, Decontamination Facility, EU, Exhaust Unit, WA, Worker Access; A, Single-room work area with multiple windows, B, Single-room work area with single window near entrance, C, Large single-room work area with windows and auxiliary makeup air source (dotted arrow) Arrows denote direction of air flow Circled numbers indicate progression of removal sequence.

J.3.2.2 Use of System During Removal Operations

The exhaust units should be started just before beginning removal (i.e., before any asbestos-containing material is disturbed). After removal has begun, the units should run continuously to maintain a constant negative pressure until decontamination of the work area is complete. The units should not be turned off at the end of the work shift or when removal operations temporarily stop.

Employees should start removing the asbestos material at a location farthest from the exhaust units and work toward them. If an electric power failure occurs, removal must stop immediately and should not resume until power is restored and exhaust units are operating again.

Because airborne asbestos fibers are microscopic in size and tend to remain in suspension for a long time, the exhaust units must keep operating throughout the entire removal and decontamination processes. To ensure continuous operation, a spare unit should be available.

After asbestos removal equipment has been moved from the work area, the plastic sheeting has been cleaned, and all surfaces in the work area have been wet-cleaned, the exhaust units can be allowed to run for at least another 4 hours to remove airborne fibers that may have been generated during wet removal and cleanup and to purge the work area with clean makeup air. The units may be allowed to run for a longer time after decontamination, particularly if dry or only partially wetted asbestos material was encountered during removal.

J.3.2.2.1 Filter Replacement

All filters must be accessible from the work area or "contaminated" side of the barrier. Thus, personnel responsible for changing filters while the negative pressure system is in use should wear approved respirators and other protective equipment. The operating life of a HEPA filter depends on the level of particulate contamination in the environment in which it is used. During use, filters will become loaded with dust, which increases resistance to air flow and diminishes the air-handling capacity of the unit. The difference in pressure drop across the filters between "clean" and "loaded" conditions (ΔP) is a convenient means of estimating the extent of air-flow resistance and determining when the filters should be replaced.

When ΔP across the filters (as determined by the Magnehelic gauge or manometer on the unit) exceeds 1.0 inch of H_2O, the prefilter should be replaced first. The prefilter, which fan suction will generally hold in place on the intake grill, should be removed with the unit running by carefully rolling or folding in its sides. Any dust dislodged from the prefilter during removal will be collected on the intermediate filter. The used prefilter should be placed inside a plastic bag, sealed and labeled, and disposed of as asbestos waste. A new prefilter is then placed on the intake grill. Filters for prefiltration applications may be purchased as individual precut panels or in a roll of specified width that must be cut to size.

If the ΔP still exceeds 1.0 inch of H_2O after the prefilter has been replaced, the intermediate filter is replaced. With the unit operating, the prefilter should be removed, the intake grill or filter access opened, and the intermediate filter removed. Any dust dislodged from the intermediate filter during removal will be collected on the HEPA filter. The used intermediate filter should be placed in a sealable plastic bag (appropriately labeled) and disposed of as asbestos waste. A new replacement filter is then installed and the grill or access closed. Finally, the prefilter on the intake grill should be replaced.

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The HEPA filter should be replaced if prefilter and/or intermediate filter replacement does not restore the pressure drop across the filters to its original clean resistance reading or if the HEPA filter becomes damaged. The exhaust unit is shut off to replace the HEPA filter, which requires removing the prefilter first, then opening the intake grill or filter access, and finally removing the HEPA filter from the unit. Used HEPA filters should be placed in a sealable plastic bag (appropriately labeled) and disposed of as asbestos waste. A new HEPA filter (structurally identical to the original filter) should then be installed. The intake grill and intermediate filter should be put back in place, the unit turned on, and the prefilter positioned on the intake grill. Whenever the HEPA filter is replaced, the prefilter and intermediate filter should also be replaced.

When several exhaust units are used to ventilate a work area, any air movement through an inactive unit during the HEPA filter replacement will be into the work area. Thus, the risk of asbestos fiber release to the outside environment is controlled.

Any filters used in the system may be replaced more frequently than the pressure drop across the filters indicates is necessary. Prefilters, for example, may be replaced two to four times a day or when accumulations of particulate matter become visible. Intermediate filters must be replaced once every day or so, and the HEPA filter may be replaced at the beginning of each new project. (Used HEPA filters must be disposed of as asbestos-containing waste.) Conditions in the work area dictate the frequency of filter changes. In a work area where fiber release is effectively controlled by thorough wetting and good work practices, fewer filter changes may be required than in work areas where the removal process is not well controlled. It should also be noted that the collection efficiency of a filter generally improves as particulate accumulates on it. Thus, filters can be used effectively until resistance (as a result of excessive particulate loading) diminishes the exhaust capacity of the unit.

J.3.2.3 Dismantling the System

When a final inspection and the results of final air tests indicate that the area has been decontaminated, all filters of the exhaust units should be removed and disposed of properly and the units shut off. The remaining barriers between contaminated and clean areas and all seals on openings into the work area and fixtures may be removed and disposed of as contaminated waste. A final check should be made to be sure that no dust or debris remain on surfaces as a result of dismantling operations.

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