Sunshine Act Meetings

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Vol. 59, No. 53
Friday, March 18, 1994

This section of the FEDERAL REGISTER contains notices of meetings published under the "Government in the Sunshine Act" (Pub. L. 94-409) 5 U.S.C. 552b(e)(3).

COMMODITY FUTURES TRADING COMMISSION

TIME AND DATE: 11:00 a.m., Friday, April 1, 1994.

PLACE: 2033 K St., N.W., Washington, D.C., 8th Floor Hearing Room.

STATUS: Closed.

MATTERS TO BE CONSIDERED: Surveillance Matters.

CONTACT PERSON FOR MORE INFORMATION: Jean A. Webb, 254–6314.

Jean A. Webb,

Secretary of the Commission.

[FR Doc. 94–6503 Filed 3–16–94; 11:01 am]

BILLING CODE 6351–01–M

COMMODITY FUTURES TRADING COMMISSION

TIME AND DATE: 11:00 a.m., Friday, April 8, 1994.

PLACE: 2033 K St., NW., Washington, DC., 8th Floor Hearing Room.

STATUS: Closed.

MATTERS TO BE CONSIDERED: Surveillance Matters.

CONTACT PERSON FOR MORE INFORMATION: Jean A. Webb, 254–6314.

Jean A. Webb,

Secretary of the Commission.

[FR Doc. 94–6504 Filed 3–16–94; 11:01 am]

BILLING CODE 6351–01–M

COMMODITY FUTURES TRADING COMMISSION

TIME AND DATE: 11:00 a.m., Friday, April 15, 1994.

PLACE: 2033 K St., N.W., Washington, D.C., 8th Floor Hearing Room.

STATUS: Closed.

MATTERS TO BE CONSIDERED: Surveillance Matters.

CONTACT FOR MORE INFORMATION: Jean A. Webb, 254–6314.

Jean A. Webb,

Secretary of the Commission.

[FR Doc. 94–6505 Filed 3–16–94; 11:01 am]

BILLING CODE 6351–01–M

COMMODITY FUTURES TRADING COMMISSION

TIME AND DATE: 11:00 a.m., Friday, April 22, 1994.

PLACE: 2033 K St., N.W., Washington, D.C., 8th Floor Hearing Room.

STATUS: Closed

MATTER TO BE CONSIDERED: Surveillance Matters.

CONTACT PERSON FOR MORE INFORMATION: Jean A. Webb, 254–6314.

Jean A. Webb,

Secretary of the Commission.

[FR Doc. 94–6506 Filed 3–16–94; 11:01 am]

BILLING CODE 6351–01–M

COMMODITY FUTURES TRADING COMMISSION

TIME AND DATE: 11:00 a.m., Friday, April 29, 1994.

PLACE: 2033 K St., N.W., Washington, DC. 8th Floor Hearing Room.

STATUS: Closed.

MATTERS TO BE CONSIDERED: Surveillance Matters.

CONTACT PERSON FOR MORE INFORMATION: Jean A. Webb, 254–6314.

Jean A. Webb,

Secretary of the Commission.

[FR Doc. 94–6507 Filed 3–16–94; 11:01 am]

BILLING CODE 6351–01–M

FEDERAL DEPOSIT INSURANCE CORPORATION

Notice of Agency Meeting

Pursuant to the provisions of the "Government in the Sunshine Act" (5 U.S.C. 552b), notice is hereby given that at 10:06 a.m. on Tuesday, March 15, 1994, the Board of Directors of the Federal Deposit Insurance Corporation met in closed session to consider matters relating to the Corporation's corporate activities.

In calling the meeting, the Board determined, on motion of Acting Chairman Andrew C. Hove, Jr., seconded by Director Jonathan L. Fiechter (Acting Director, Office of Thrift Supervision), concurred in by Director Eugene A. Ludwig (Comptroller of the Currency), that Corporation business required its consideration of the matters on less than seven days' notice to the public; that no earlier notice of the meeting was practicable; that the public interest did not require consideration of the matters in a meeting open to public observation; and that the matters could be considered in a closed meeting by authority of subsections (c)(4), (c)(6), (c)(9)(B), and (c)(10) of the "Government in the Sunshine Act" (5 U.S.C. 552b(c)(4), (c)(6), (c)(9)(B), and (c)(10)).

The meeting was held in the Board Room of the FDIC Building located at 550—17th Street, NW., Washington, DC.

Dated: March 15, 1994.

Federal Deposit Insurance Corporation.

Patti C. Fox,

Acting Deputy Executive Secretary.

[FR Doc. 94–6485 Filed 3–16–94; 9:08 am]

BILLING CODE 6714–01–M

FEDERAL DEPOSIT INSURANCE CORPORATION

Notice of Agency Meeting

Pursuant to the provisions of the "Government in the Sunshine Act" (5 U.S.C. 552b), notice is hereby given that the Federal Deposit Insurance Corporation's Board of Directors will meet in open session at 10:00 a.m. on Tuesday, March 22, 1994, to consider the following matters:

Summary Agenda

No substantive discussion of the following items is anticipated. These matters will be resolved with a single vote unless a member of the Board of Directors requests that an item be moved to the discussion agenda.

Reports of actions approved by the standing committees of the Corporation and by officers of the Corporation pursuant to authority delegated by the Board of Directors.

Discussion Agenda

Memorandum and resolution re: Report on Use of Alternative Dispute Resolution at the Federal Deposit Insurance Corporation and Statement of Policy on Alternative Dispute Resolution as contemplated by the Administrative Dispute Resolution Act of 1990 to memorialize the Corporation's commitment to the use of Alternative Dispute Resolution and to set forth a framework for the continuing and expanding use of Alternative Dispute Resolution at the Corporation.

Memorandum and resolution re: Recapitalization Schedule for Bank Insurance Fund; Adequacy of Bank and Thrift Assessment Rates.

Memorandum and resolution re: Final amendments to Part 335 of the Corporation's rules and regulations, entitled "Securities of Nonmember Insured Banks," relating to registration and reporting requirements for nonmember insured banks with securities registered under section 12 of the Securities Exchange Act of 1934.

Memorandum and resolution re: Proposed rescission of section 304.6 of Part 304 of the Corporation's rules and regulations, entitled "Forms, Instructions, and Reports," which currently requires all insured banks, with the exception of insured bankers' banks, to give the Corporation prior notice of planned rapid growth as a result of any "special funding plan or arrangement."

The meeting will be held in the Board Room in the sixth floor of the FDIC Building located at 550—17th Street, NW, Washington, DC.

The FDIC will provide attendees with auxiliary aids (e.g., sign language interpretation) required for this meeting. Those attendees needing such assistance should call (202) 942–3132 (Voice); (202) 942–3111 (TTY), to make necessary arrangements.

Requests for further information concerning the meeting may be directed to Mr. Robet E. Feldman, Acting Executive Secretary of the Corporation, at (202) 898–6757.

Dated: March 15, 1994.

Federal Deposit Insurance Corporation.

Robert E. Feldman,

Acting Executive Secretary.

[FR Doc. 94–6486 Filed 3–16–94; 8:45 am]

BILLING CODE 6714–01–M

FEDERAL MARITIME COMMISSION

TIME AND DATE: 2:00 p.m., March 24, 1994.

PLACE: Main Hearing Room, 800 North Capitol Street, N.W., Washington, D.C. 20573–0001.

STATUS: Part of the meeting will be open to the public. The rest of the meeting will be closed to the public.

MATTER(S) TO BE CONSIDERED: Portion open to the public:

1. Proposed Rule on Financial Reporting Requirements and Rate of Return Methodology in the Domestic Offshore Trades.
2. Proposed Rule to Revise Financial Responsibility Requirements for Indemnification of Passengers for Nonperformance of Transportation Pursuant to Section 3, Public Law 89–777

Portion closed to the public:

1. Petition No. P3–94—Petition for Investigation and Relief from Unlawful Actions of the Trans-Atlantic Agreement—Consideration of the Record.

CONTACT PERSON FOR MORE INFORMATION: Joseph C. Polking, Secretary, (202) 523–5725.

Joseph C. Polking,

Secretary.

[FR Doc. 94–6484 Filed 3–16–94; 9:06 am]

BILLING CODE 6730–01–M

FOREIGN CLAIMS SETTLEMENT COMMISSION

F.C.S.C. Meeting Notice No. 6–94

Announcement in Regard to Commission Meetings and Hearings

The Foreign Claims Settlement Commission, pursuant to its regulations (45 CFR Part 504), and the Government in the Sunshine Act (5 U.S.C. 552b), hereby gives notice in regard to the scheduling of open meetings and oral hearings for the transaction of Commission business and other matters specified, as follows:

Date and Time	*Subject Matter*
Tues., Mar., 29, 1994 at:	Oral Hearings on objections to Proposed Decisions issued on claims against Iran:
10:00 a.m ...	IR–2340—William E. Allen.
10:30 a.m ...	IR–2967—Robert Landsman.
11:00 a.m ...	IR–2756—Delta Geotechnical Consultants, Inc.
2:00 p.m	IR–0361—Diversified Impex Corp.
2:30 p.m	IR–2435—Datagraphix, Inc.
3:00 p.m	IR–0945—Farshad Haghi.
	IR–0947—
3:30 p.m	IR–2436—Thomas V. Thomas.
Wed., Mar., 30, 1994 at 10:30 a.m.	Consideration of Proposed Decisions on claims against Iran:
	Hearing on the Record on objection to Proposed Decisions on claims against Iran:
	IR–1479—David L. Olmschenk.

Subject matter listed above, not disposed of at the scheduled meeting, may be carried over to the agenda of the following meeting.

All meetings are held at the Foreign Claims Settlement Commission, 600 E Street, NW., Washington, DC. Requests for information, or advance notices of intention to observe a meeting, may be directed to: Administrative Officer, Foreign Claims Settlement Commission, 600 E Street, NW., Room 6029, Washington, DC 20579. Telephone: (202) 616–6988.

Dated at Washington, DC on March 15, 1994.

Judith H. Lock,

Administrative Officer.

[FR Doc. 94–6542 Filed 3–16–94; 1:03 pm]

BILLING CODE 4410–01–M

HARRY S. TRUMAN SCHOLARSHIP FOUNDATION

Trustees Meeting

United States Capitol Building, Room HC–6–April 12, 1994, 6:00–7:30 p.m.

1. Call to order and welcome, Chairman Staats
2. Approval of the Minutes of 1993 Trustees Meeting
3. Introduction of New Trustees and status of vacancies
4. Overview on Foundation progress
5. Report on the conference "Attracting Young Professionals to the Federal Career Service". This is the half-day event the Foundation and OPM are sponsoring that precedes the Board Meeting
6. Report from William Raiford, Financial Advisor to the Foundation
7. Presentation from William Sternbergh, Senior Fellow of the Center for Creative Leadership on the program being presented for the 1994 Summer Institute participants
8. Consideration to merge the selection of Scholars from Community Colleges with Scholars from four-year institutions
9. Consideration to operate a summer program for graduating cadets from the service academies and military colleges in conjunction with the 1995 Summer Institute
10. Report on the 1994 Summer Institute
11. Report of the Executive Secretary

Elmer B. Staats,

Chairman, Board of Trustees.

[FR Doc. 94–6577 Filed 3–16–94; 1:44 pm]

BILLING CODE 6820–AB–M

federal register

Friday
March 18, 1994

Part II

Environmental Protection Agency

40 CFR Parts 9 and 82
Protection of Stratospheric Ozone; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 9 and 82

[FRL–4839–7]

RIN 2060–AD48

Protection of Stratospheric Ozone

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: This final rule promulgates the U.S. Environmental Protection Agency's (EPA) program for evaluating and regulating substitutes for ozone-depleting chemicals being phased out under the stratospheric ozone protection provisions of the Clean Air Act (CAA). In section 612 of the CAA, the Agency is authorized to identify and restrict the use of substitutes for class I and II ozone-depleting substances where the Administrator has determined that other alternatives exist that reduce overall risk to human health and the environment. EPA is referring to the program that provides these determinations as the Significant New Alternatives Policy (SNAP) program. The intended effect of this final rule is to expedite movement away from ozone-depleting compounds by identifying substitutes that offer lower overall risks to human health and the environment.

In this final rule, EPA is both issuing decisions on the acceptability and unacceptability of substitutes and promulgating its plan for administering the SNAP program. To arrive at determinations on the acceptability of substitutes, the Agency completed a crossmedia analysis of risks to human health and the environment from the use of various substitutes in different industrial end-uses. Results of this analysis are summarized in this final rule, which covers substitutes in the following sectors: Refrigeration and air conditioning, foam blowing, solvents cleaning, fire suppression and explosion protection, tobacco expansion, adhesives, coatings and inks, aerosols, and sterilants. Analysis of substitutes in a ninth sector, pesticides, will be completed, and the resulting decisions will be added to future SNAP determinations published in the **Federal Register**. These sectors comprise the principal United States industrial sectors that historically consumed large volumes of ozone-depleting compounds.

EFFECTIVE DATE: This rule is effective on April 18, 1994.

ADDRESSES: Materials relevant to the rulemaking are contained in Air Docket A–91–42, Central Docket Section, South Conference room 4, U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460. The docket may be inspected between 8 a.m. and 12 noon, and from 1:30 p.m. and 3:30 p.m. on weekdays. As provided in 40 CFR part 2, a reasonable fee may be charged for photocopying.

Notifications, petitions or other materials required by this final rule should be sent to: SNAP Coordinator, U.S Environmental Protection Agency, (6205–J), 401 M Street SW., Washington, DC 20460.

FOR FURTHER INFORMATION CONTACT: The Stratospheric Ozone Information Hotline at 1–800–296–1996 can be contacted for information on weekdays from 10 a.m. to 4 p.m. Eastern Time or contact Sally Rand at (202) 233–9739, Substitutes Analysis and Review Branch, Stratospheric Protection Division, Office of Atmospheric Programs, Office of Air and Radiation (6205–J), 401 M Street SW., Washington, DC 20460.

SUPPLEMENTARY INFORMATION: In this preamble, EPA describes the final SNAP program in sections III through VIII. Although EPA may include responses to certain comments throughout the description of the program, readers should see section III.D. for a discussion of EPA's responses to public comment on major issues. See also the Response to Comment document found in Docket A–91–42 for a detailed response to comments on all issues.

I. Overview of Final Rule

This final rule is divided into eleven sections, including this overview:

I. Overview of Final Rule.
II. Background.
  A. Regulatory History.
  B. Subgroup of the Federal Advisory Committee.
III. Section 612 Program.
  A. Statutory Requirements.
  B. Guiding Principles.
  C. Implementation Strategy.
  D. Response to Public Comment.
IV. Scope of Coverage.
  A. Definition of Substitute.
  B. Who Must Report.
V. Information Submission.
  A. Overview.
  B. Information Required.
  C. Submission of Confidential Business Information.
  D. Display of OMB Control Numbers.
VI. Effective Date of Coverage.
  A. General Provisions.
  B. Grandfathered Use of Unacceptable Substitutes.
VII. Notice, Review, and Decision-Making Procedures.
  A. Substitutes Reviewed under SNAP Only.
  B. Joint Review of New Substitutes under SNAP and the Toxic Substances Control Act Premanufacture Notice (TSCA PMN) Program.
  C. Joint Review of Substitutes under SNAP and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).
  D. Shared Statutory Authority with the Food and Drug Administration (FDA).
VIII. Petitions.
  A. Background.
  B. Content of the Petition.
  C. Sufficiency of Data.
  D. Criteria for Evaluating Petitions.
  E. Petition Review Process.
IX. Listing of Substitutes.
  A. Overview.
  B. Format for SNAP Determinations.
  C. Decisions Universally Applicable.
  D. Refrigeration and Air Conditioning.
  E. Foam Blowing.
  F. Solvents Cleaning.
  G. Fire Suppression and Explosion Protection.
  H. Sterilants.
  I. Aerosols.
  J. Tobacco Expansion.
  K. Adhesives, Coatings and Inks.
X. Additional Information.
XI. References.
Appendix A: Class I and Class II Ozone-Depleting Substances.
Appendix B: Summary of Listing Decisions.
Appendix C: Data Confidentiality Claims.

II. Background

A. Regulatory History

The stratospheric ozone layer protects the earth from dangerous ultraviolet-B (UV–B) radiation. Depletion of stratospheric ozone allows more UV–B radiation to penetrate to the earth's surface. Increased radiation, in turn, has been linked to higher incidence of certain skin cancers and cataracts, suppression of the human immune system, damage to crops and aquatic organisms, and increased formation of ground-level ozone. Further, increased radiation can cause economic losses from materials damage such as more rapid weathering of outdoor plastics. (See 53 FR 30566 (August 12, 1988) for more information on the effects of ozone depletion.)

In response to scientific concerns and findings on ozone depletion, the United States and twenty-three other nations signed the Montreal Protocol on Substances that Deplete the Ozone Layer on September 16, 1987. The original agreement set forth a timetable for reducing the production and consumption of specific ozone-depleting substances, including CFC–11, CFC–12, CFC–113, CFC–114, CFC–115, Halon 1211, Halon 1301, and Halon 2402. EPA implemented the original Protocol through regulations allocating production and consumption allowances equal to the total amount of production and consumption granted to the United States under the Protocol. (See 53 FR 30566.)

The Parties to the Montreal Protocol met in London June 27–29, 1990 to consider amendments to the Protocol. In response to scientific evidence indicating greater than expected stratospheric ozone depletion, the Parties agreed to accelerate the phaseout schedules for the substances already controlled by the Protocol. They also added phaseout requirements for other ozone-depleting chemicals, including methyl chloroform, carbon tetrachloride, and other fully-halogenated chlorofluorocarbons (CFCs).

On November 15, 1990, then-President Bush signed the Clean Air Act Amendments (CAAA) of 1990. Title VI, section 604 of the amended CAA requires a phaseout of CFCs, halons, and carbon tetrachloride by 2000, which is identical to the London Amendments to the Montreal Protocol, but with more stringent interim reductions. Title VI also differs from the London Amendments by mandating a faster phaseout of methyl chloroform (2002 instead of 2005), a restriction on the use of hydrochlorofluorocarbons (HCFCs) after 2015, and a ban on the production of HCFCs after 2030. In Title VI, section 602, the CFCs, halons, carbon tetrachloride, and methyl chloroform are defined as class I substances; HCFCs are referred to as class II substances. Appendix A of this final rule lists the class I and class II substances identified in the CAA.

In addition to the phaseout requirements, Title VI includes provisions to reduce emissions of class I and II substances to the "lowest achievable level" in the refrigeration sector and to maximize the use of recycling and recovery upon disposal (section 608). It also requires EPA to ban certain nonessential products containing ozone-depleting substances (section 610); establish standards and requirements for the servicing of motor vehicle air conditioners (section 609); mandate warning labels on products made with or containing class I or containing class II substances (section 611); and establish a safe alternatives program (section 612). The development and implementation of the safe alternatives program under section 612 is the subject of this final rule.

In October 1991, the National Aeronautics and Space Administration (NASA) announced new findings documenting ozone depletion over the last decade that was more severe than had previously been predicted by atmospheric modeling or measurements. In particular, NASA found 2.9 percent ozone depletion over the northern mid-latitudes over the past decade in summertime—the first time a trend showing ozone depletion had been detected in the U.S. during that time of year, when risks from depletion are greatest.

Partly in response to these findings, on February 11, 1992, then-President Bush announced an accelerated phaseout schedule for class I substances as identified in the CAA, as amended, section 606. This final schedule, published in the **Federal Register** (58 FR 65018; December 10, 1993), implements a January 1, 1996 phaseout of class I chemicals. The President also ordered an accelerated review of substitutes that reduce damage to the ozone layer. The expedited phaseout schedule and the President's directive regarding alternatives added urgency to EPA's effort to review and list substitutes for class I and II substances under section 612.

B. Subgroup of the Federal Advisory Committee

In 1989, EPA organized the Stratospheric Ozone Protection Advisory Committee (STOPAC) in accordance with the requirements of the Federal Advisory Committee Act, 5 U.S.C. app. section 9(c). The STOPAC consisted of members selected on the basis of their professional qualifications and diversity of perspectives and provided representation from industry, academia, federal, state, and local government agencies, non-governmental and environmental groups, as well as international organizations. The purpose of STOPAC was to provide advice to the Agency on policy and technical issues related to the protection of stratospheric ozone.

In 1991, the Agency asked STOPAC members to participate in subgroups to assist in developing regulations under title VI of the CAA. EPA established a subgroup of the standing STOPAC to guide the Agency specifically on development of the safe alternatives program. The subgroup on safe alternatives met twice. At the first meeting in May 1991, subgroup members reviewed a detailed description of EPA's plans for implementing section 612. At this meeting, there was general agreement on the need to issue a request for data to provide the general public with an opportunity to furnish the Agency with information on substitutes. The group also agreed on the need to review substitutes as quickly as possible to avoid any delay in industry's efforts to phase out ozone-depleting substances.

At the second meeting of the subgroup, in July 1991, subgroup members provided EPA with comments on a draft of the Advance Notice of Proposed Rulemaking (ANPRM), which was prepared in response to the conclusions of the first meeting. The comments focused primarily on the draft discussion of EPA's plans for implementing section 612 and refinements to a list of preliminary substitutes that the Agency intended to review. Based on comments received from the subgroup and other offices within EPA, a final ANPRM was prepared and published in the **Federal Register** on January 16, 1992 (57 FR 1984). Because the bulk of regulatory development required under title VI has been completed, the STOPAC has since been disbanded.

III. Section 612 Program

A. Statutory Requirements

Section 612 of the Clean Air Act authorizes EPA to develop a program for evaluating alternatives to ozone-depleting substances. EPA is referring to this new program as the Significant New Alternatives Policy (SNAP) program. The major provisions of section 612 are:

- Rulemaking—Section 612(c) requires EPA to promulgate rules making it unlawful to replace any class I or class II substance with any substitute that the Administrator determines may present adverse effects to human health or the environment where the Administrator has identified an alternative that (1) reduces the overall risk to human health and the environment, and (2) is currently or potentially available.
- Listing of Unacceptable/Acceptable Substitutes—Section 612(c) also requires EPA to publish a list of the substitutes unacceptable for specific uses. EPA must publish a corresponding list of acceptable alternatives for specific uses.
- Petition Process—Section 612(d) grants the right to any person to petition EPA to add a substance to or delete a substance from the lists published in accordance with section 612(c). The Agency has 90 days to grant or deny a petition. Where the Agency grants the petition, EPA must publish the revised lists within an additional 6 months.
- 90-day Notification—Section 612(e) requires EPA to require any person who produces a chemical substitute for a class I substance to notify the Agency not less than 90 days before new or existing chemicals are introduced into interstate commerce for significant new uses as substitutes for a class I substance. The producer must also provide the Agency with the producer's unpublished health and safety studies on such substitutes.

• Outreach—Section 612(b)(1) states that the Administrator shall seek to maximize the use of federal research facilities and resources to assist users of class I and II substances in identifying and developing alternatives to the use of such substances in key commercial applications.

• Clearinghouse—Section 612(b)(4) requires the Agency to set up a public clearinghouse of alternative chemicals, product substitutes, and alternative manufacturing processes that are available for products and manufacturing processes which use class I and II substances.

B. Guiding Principles

EPA has followed several guiding principles in developing the SNAP program:

1. Evaluate Substitutes Within a Comparative Risk Framework

The Agency's risk evaluation compares risks of substitutes to risks from continued use of ozone-depleting compounds as well as to risks associated with other substitutes. This evaluation considers effects due to ozone depletion as well as effects due to direct toxicity of substitutes. Other risk factors considered include effects on water and air quality, the potential for direct and indirect contributions to global warming, and occupational health and safety. Any effects found to pose a concern will be evaluated further to determine if controls are required. EPA does not believe that a numerical scheme producing a single index to rank all substitutes based on risks is appropriate. A strict quantitative index would not allow for sufficient flexibility in making appropriate risk management decisions that consider issues such as the quality of information supporting the decision, the degree of uncertainty in the data, the availability of other substitutes, and economic feasibility.

2. Do Not Require That Substitutes Be Risk-Free To Be Found Acceptable

Section 612(c) requires the Agency to publish a list of acceptable and unacceptable substitutes. The Agency interprets this as a mandate to identify substitutes that reduce risks compared to use of class I or II compounds or to other substitutes for class I or II substances, rather than a mandate to list as acceptable only those substitutes with zero risks. In keeping with this interpretation, the Agency believes that a key goal of the SNAP program is to promote the use of substitutes for class I and II chemicals that minimize risks to human health and the environment relative to other alternatives. In some cases, this approach may involve designating a substitute acceptable even though the compound may be toxic, or pose other environmental risk of some type, provided its use reduces overall risk to human health and the environment as compared to use of class I or class II substances or other potential substitutes.

3. Restrict Only Those Substitutes That are Significantly Worse

As a corollary to the above point, EPA does not intend to restrict a substitute if it poses only marginally greater risk than another substitute. Drawing fine distinctions concerning the acceptability of substitutes would be extremely difficult given the variability in how each substitute can be used within a specific application and the resulting uncertainties surrounding potential health and environmental effects. The Agency also does not want to intercede in the market's choice of available substitutes, unless a substitute has been proposed or is being used that is clearly more harmful to human health and the environment than other alternatives.

4. Evaluate Risks by Use

Section 612 requires that substitutes be evaluated by use. Environmental and human health exposures can vary significantly depending on the particular application of a substitute. Thus, the risk characterizations must be designed to represent differences in the environmental and human health effects associated with diverse uses. This approach cannot, however, imply fundamental tradeoffs with respect to different types of risk to either the environment or to human health. For example, in the Agency's consideration of global warming as a criterion under SNAP, EPA has principally compared different global warming gases among themselves, as opposed to attempting to establish some methodology for comparing directly the effects of global warming and ozone depletion.

5. Provide the Regulated Community With Information as Soon as Possible

The Agency recognizes the need to provide the regulated community with information on the acceptability of various substitutes as soon as possible. Given this need, EPA has decided to expedite the review process by conducting initial risk screens for the major substitutes now known to the Agency and to include them in this final rulemaking. Future determinations on the acceptability of new substitutes will be published in quarterly updates to the SNAP lists.

6. Do Not Endorse Products Manufactured by Specific Companies

While the goal of the SNAP program is to identify acceptable substitutes, the Agency will not issue company-specific product endorsements. In many cases, the Agency may base its analysis on data received on individual products, but the addition of a substitute to the acceptable list based on that analysis does not represent endorsement of that company's products. Generally, placement on the list merely constitutes an acknowledgement that a particular product made by a company has been found to be acceptable under SNAP.

7. Defer to Other Environmental Regulations When Warranted

In some cases, EPA and other federal agencies have developed extensive regulations under other statutes or other parts of the CAA that address any potential cross- or inter-media transfers that may result from the use of alternatives to class I and II substances. For example, ceasing to use an ozone-depleting compound may in some cases entail increased use of chemicals that contribute to tropospheric air pollution. These chemicals, such as volatile organic compounds (VOCs) or hazardous air pollutants (HAPs), are already regulated under other sections of the CAA, and determinations under the SNAP program will take these existing regulations into account. Where necessary, the Office of Air and Radiation will confer with other EPA program offices or federal agencies to ensure that any regulatory overlap is handled efficiently.

C. Implementation Strategy

Implementation of the SNAP program is directed towards fulfilling the general policy contained in section 612 of identifying substitutes that can serve as replacements for ozone depleting substances, evaluating their effects on human health and the environment, and encouraging the use of those substitutes believed to present lower overall risks relative both to the ozone depleting compounds being replaced and to other substitutes available for the same end-use. Implementation of this policy involves four key activities. The first is to develop, promulgate, and administer a regulatory program for identifying and evaluating substitutes. The second activity is to undertake a review of the existing substitutes based on criteria established for the program and then to publish a list of acceptable and unacceptable substitutes by application. The third activity is to review additional substitutes as they are developed to

allow their timely introduction into the marketplace. The fourth is to aggressively disseminate information about those substitutes found to pose lower overall risk through a clearinghouse and outreach program.

To expedite implementation of the SNAP program, EPA has not only developed a screening process for examining the alternatives, as discussed in this final rule, but has also completed an analysis of many key substitutes based on the criteria presented here. Section IX summarizes the results of this assessment. More detail on the steps leading up to this final rule and the implementation of the SNAP program is given below.

1. ANPRM and Request for Data

On January 16, 1992, EPA published in the **Federal Register** an Advance Notice of Proposed Rulemaking (ANPRM) and Request for Data (57 FR 1984). The ANPRM described in general terms EPA's plans for developing the SNAP program and solicited public comment on the Agency's planned approach. The ANPRM also included an appendix listing substitutes that the Agency planned to include in its initial substitute determinations. The ANPRM invited industry to submit information on these substitutes and to identify additional alternatives to be considered in the SNAP program. The Agency received approximately one hundred comments from industry, trade groups, and other federal agencies. These comments contained information on potential substitutes for ozone-depleting chemicals, as well as comments on the SNAP program as described in the ANPRM.

2. Notice of Proposed Rulemaking on SNAP Process and Proposed Determinations

On May 12, 1993 EPA published in the **Federal Register** a Notice of Proposed Rulemaking (NPRM) for SNAP (58 FR 28094). The NPRM described the proposed structure and process for administering the SNAP program and proposed determinations on the acceptability of key substitutes. The Notice also contained the proposed regulatory language that would serve as the legal basis for administering and enforcing the SNAP program.

In the NPRM, EPA recognized that notice-and-comment rulemaking procedures were necessary to establish regulations governing SNAP. EPA further concluded that rulemaking was required to place any substance on the list of unacceptable substances, to list a substance as acceptable only with certain use restrictions, or to remove a substance from either the list of unacceptable or acceptable substitutes. EPA did not believe, however, that rulemaking procedures were required to list alternatives as acceptable with no restrictions. Such listings would not impose any sanction, nor remove any prior license to use a substance.

3. Final Rulemaking

This final rule promulgates the SNAP process and the first set of determinations on SNAP substitutes. The Agency may revise these decisions in the future as it reviews additional substitutes and receives more data on substitutes already covered by the program. However, EPA expects future changes to the SNAP lists to be minor, and thus not to represent an undue burden on the regulated community. The principal changes the Agency expects to make in the future are to add new substitutes or sectors to the lists, rather than to change a substitute's acceptability. Further, once a substitute has been placed on either the acceptable or the unacceptable list, EPA will conduct notice-and-comment rulemaking to subsequently remove a substitute from either list, as described below in section VII. This final rule also addresses comments that the Agency received on the NPRM, and incorporates further data on substitutes received during the comment period.

4. Updates of SNAP Determinations

Three mechanisms exist for revising or expanding the list of SNAP determinations published in this final regulation. First, under section 612(d), the Agency will review and either grant or deny petitions to add or delete substances from the SNAP list of acceptable or unacceptable alternatives. Section VIII of this final rule presents EPA's method for handling petitions.

The second means of revising or expanding the list of SNAP determinations is through the notifications, described below, which must be submitted to EPA 90 days before introduction of a substitute into interstate commerce for significant new use as an alternative to a class I or class II substance. These 90-day notifications are required by section 612(e) of the CAA for producers of alternatives to class I substances for new uses and by EPA regulations issued under sections 114 and 301 of the Act to implement section 612(c) in all other cases. Section VII of this final rule discusses the Agency's approach for processing these notifications, including a strategy for integrating SNAP notifications with other chemical review programs already being implemented by EPA under authorities provided in the Toxic Substances Control Act (TSCA) and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Other parts of this final rule also explain how the Agency addresses the overlap between SNAP regulations and regulations issued under other titles of the CAA.

Finally, the Agency believes that section 612 authorizes it to initiate changes to the SNAP determinations independent of any petitions or notifications received. These amendments can be based on new data on either additional substitutes or on characteristics of substitutes previously reviewed.

5. Outreach and Substitute Clearinghouse

Public outreach and the substitute information clearinghouse comprise the technical assistance component of the SNAP program. The purpose of this effort is to provide information for the public to use in selecting acceptable substitutes. Sections VII.A.3.f. and VII.A.3.g describe the Agency's approach for establishing the clearinghouse and performing outreach.

D. Response to Public Comment

A document summarizing public comment on the NPRM in greater detail is available in the public docket supporting this final rule. The major programmatic issues raised by the commenters and the Agency's response to them are described below. Major comments specific to the eight SNAP industry sectors are addressed in sections IX.D. through IX.K. of this final rule.

1. Scope of the SNAP Rule

a. *Class II substances.* One commenter supported EPA's position that the Agency has the authority to review class II substances under SNAP, particularly EPA's view that where little reduction in ozone depletion potential (ODP) can be gained in going from a class I substance to a class II substance, such as from methyl chloroform to HCFC–141b, the substitution should be disallowed under SNAP. Other commenters criticized this position, arguing that the omission of any reference to class II substitutes in section 612(e) clearly indicated Congressional intent that class II substitutes not be subject to the SNAP program.

For this final rule, the Agency is including class II substances under the scope of SNAP. The Agency disagrees with one commenter's interpretation of the limitation in section 612(e). Section 612(c) specifically mandates that the

Agency list unacceptable and acceptable alternatives for class I or II substances. In addition, the Agency believes that Congressional intent under section 612 is to reduce the overall risk from the continued use of ozone depleting substances (ODSs). The class II substances range in ozone depletion potential (ODP) from 0.11 for HCFC–141b to 0.02 for HCFC–123. In the evaluation of substitutes completed for the NPRM, use of some class II substitutes up to the time of their phaseout was identified as representing significantly greater overall risk than use of other alternatives available for a number of end-uses. Consequently, the Agency believes lower overall risk to human health and the environment can be achieved by including class II substitutes in SNAP. Despite the limitation in section 612(e) to producers of class I substances, EPA believes it has authority under section 114 and section 301(a) to require submission of SNAP notifications with respect to class II substances as necessary to enable EPA to carry out its obligation under section 612 to evaluate both class I and class II substances, as explained in the NPRM.

b. *Review of existing versus new substitutes.* A number of commenters believed that EPA's SNAP program has no authority to restrict existing substitutes, which companies may have switched to in an effort to eliminate the use of CFCs prior to the publication of this final rule. Arguments in support of this position include the prospective language of the statute, which says EPA must make it "unlawful to replace" an ODS with a substitute deemed unacceptable. Many of these commenters recommended grandfathering of these existing uses, so as not to disrupt industry's transition away from ODSs. An extension of this concern appears in several comments, in which commenters expressed the fear that SNAP will revisit prior decisions, removing substitutes previously deemed acceptable as newer and more environmentally benign substitutes are developed.

Under the Agency's interpretation of section 612, in order to fulfill the Congressional mandate to review "any" substitute substance that may present adverse effects to human health and the environment, both new and existing substitutes must be included under SNAP. In addition, section 612(e) specifically requires notifying the Agency before new or existing chemicals are introduced into interstate commerce. EPA believes that class I and II substances are "replaced" within the meaning of section 612(c) each time a substitute is used, so that once EPA identifies an unacceptable substitute, any future use of such substitute is prohibited. Under any other interpretation, EPA could never effectively prohibit the use of any substitute, as some user could always start to use it prior to EPA's completion of the rulemaking required to list it as unacceptable. EPA believes Congress could not have intended such a result, and must therefore have intended to cover future use of existing substitutes.

c. *Grandfathering in SNAP.* Many commenters supported the idea of grandfathering uses of existing substitutes, but felt that the grandfathering should be broadened to include existing uses of all substitutes which companies have invested in prior to the promulgation of the SNAP final rule, and not just HCFC–141b as proposed in the NPRM. Commenters argued that not doing so would delay transition by creating uncertainty about the useful life of alternatives.

One commenter argued that the grandfathering scheme EPA has proposed with respect to HCFC–141b should be extended to existing uses of perfluorocarbons (PFCs). The commenter notes that title VI calls for regulation and elimination of ozone-depleting substances while in the commenter's opinion precluding regulation based on global warming potential. Since PFCs have no ozone depletion potential, the commenter argued that they are a better candidate than HCFC–141b for grandfathering. One commenter proposed two years past the date of an unacceptability determination as the general grandfathering period.

In this final rule, the Agency will not grandfather existing uses except in specifically identified cases. The grandfathering provisions under SNAP do give the Agency flexibility to address unacceptable listings that might disrupt industry's transition away from ODSs. For this final rule, the Agency was not presented with significant evidence from the public comments to believe universal grandfathering of existing substitutes is warranted. The Agency believes that given the diversity of the industries covered under the SNAP program, a case-by-case review of applications using the banned substitute would be necessary to protect human health and the environment. Moreover, EPA must be able to justify any grandfathering on a case-by-case basis under the grandfathering criteria established in the Sierra Club case, as described below in section VI.B.

In the case of HCFC–141b, the Agency has elected to maintain the proposed grandfathering period for existing uses, since many users switched to HCFC–141b when it was believed to offer sufficient risk reduction. In comparison, for perfluorocarbons, the Agency has made clear from the beginning of their suggested use as substitutes that the Agency has concerns about the global warming potential of these chemicals. EPA believes, therefore, that an extended grandfathering period in this case is not warranted.

However, the Agency agrees to grandfather for use, existing supplies of a substitute in the possession of an end-user as of March 18, 1994. Therefore, persons who transitioned to a substitute for an end-use prior to this final rule may continue use of all existing supplies of the substitute purchased prior to March 18, 1994 until that supply is exhausted. As of the effective date of this final rule, only substitutes purchased prior to March 18, 1994 can be used. Under the four-part test to judge the appropriateness of grandfathering (see section VI.B of this final rule), the Agency determined that, on balance, the results of this test favors this action.

Existing inventory of final products manufactured with or containing a substitute designated unacceptable as a result of final EPA rule-making within an end-use covered under SNAP could theoretically be legally sold after listing. Producers should be aware, however, that they will be effectively barred from selling a substitute for use once it has been deemed unacceptable under SNAP, because potential purchasers will not be able to use it. After the effective date of this final rule, users will not be able to use any additional supply of a banned substitute purchased after the publication date of the unacceptable listing.

d. *Exemption for small sectors and small volume uses.* In the NPRM, EPA proposed to exempt small volume use applications requiring less than 10,000 pounds per year of an ODS substitute from SNAP review. This proposal generated substantial confusion. Many commenters pointed out that the 10,000 pounds exemption from reporting and review under SNAP was vague, and asked for additional clarification. Specifically, commenters asked whether EPA intended the 10,000 pound limit to apply at the process, plant, company, or sector level. If applied at the sector level, some commenters noted that an individual end-user might have enormous difficulty compiling volume information related to the behavior of an entire industry sector.

In response to these comments, EPA has decided to maintain the small use exemption but provide the needed

additional clarification of the Agency's intent. The Agency will exempt from the section 612(e) notification requirements substitutes used in quantities of 10,000 pounds or less per year within a major industrial sector covered under SNAP. The responsibility for reporting under the notification requirement for SNAP falls on those introducing substitutes into interstate commerce, not on the individual end-user. Similarly, relief from reporting, if within the bounds of the small use and sector exemption as defined, rests with the same person.

The Agency believes the burden of responsibility for determining whether use of a substitute will be small should reside at the same level as the notification requirement. That is, it should be the responsibility of the introducing agent to determine whether use of a particular substitute in a given sector is likely to remain below 10,000 pounds per year. The Agency continues to believe that focusing the listing decisions on the substitutes sold in the largest volumes will allow the Agency to target its regulatory efforts to those applications that offer the maximum risk reduction potential.

Many commenters generally supported EPA's exemption for small industrial sectors, arguing that the administrative burden imposed by a SNAP review of all possible substitutions is unjustified by the likely risks posed by these uses. For this final rule, the Agency will continue to exempt small sectors and small volume uses within major industrial sectors from reporting responsibilities under SNAP.

e. *Designation of submitters/reporting responsibilities.* Many of the public comments on the NPRM expressed general support for the flexibility of the reporting requirements, noting it is sensible to require notification from the person most suited to have the relevant information. However, some confusion has arisen as to the implementation and enforcement of these requirements.

The Agency agrees with public comment that the designation of submitters or reporting responsibility needed clarification in this final rule. For this final rule then, reporting responsibility rests with the person who introduced the substitute into interstate commerce in its final form. As such, the producer could potentially be a manufacturer, formulator, or an end-user. Identification of designated submitters is further detailed in section IV.B.

f. *Exemption for second-generation substitutes.* Many commenters supported EPA's exemption for second-generation substitutes. However, several asked for clarification of regulatory language setting out this exemption. They note that the definition left plenty of room for advances in the science to calculate increasingly small contributions to ozone depletion added by hitherto unsuspected compounds, thereby constantly broadening the scope of SNAP as new concerns develop. They ask that EPA clarify that SNAP should only apply to substitutes for class I or class II compounds.

EPA agrees with these comments and has clarified in section IV.A.2.f. that the definition of second-generation applies only to substitutes for class I or class II compounds in this final rule.

2. SNAP Determination and Listing Process

a. *Allowing for assured minimum periods of use.* Numerous commenters expressed a need for a minimum assured time period of use for acceptable substitutes in order to facilitate the fastest possible transition away from class I substances. Some commenters suggested that this assured minimum period should be established based on some economic measure, such as the lifetime of equipment in which the compound is to be used, or the overall payback period for investment in modifications to allow the use of a transitional compound. One commenter suggested the use of risk analysis to define the assured minimum period. Other commenters suggested 10 years as the appropriate period.

The Agency believes Congress enacted provisions under section 612 which make a minimum assured time period for use of a substitute neither authorized nor necessary under SNAP As described in section VIII of this final rule, a petition under section 612(d) to change a listing from acceptable to unacceptable or vice versa must include adequate data. In addition, any change will be formally promulgated as a rulemaking, which requires EPA to propose, take public comment, and complete final action for any decision. If the decision is made to change a listing for a substitute from acceptable to unacceptable, the grandfathering provisions of this final rule provide the Agency with the flexibility in appropriate cases to provide time after a substitute is removed from the list of acceptable substitutes to allow persons who are then using the substance, or who have expended considerable efforts in good faith toward its use, to find a different substitute and recover their investment in prior substitutes.

3. SNAP Information Form

a. *Use of global warming potential.* Some commenters argue that EPA has no legal authority under section 612 to regulate substitutes based on global warming. One commenter noted that during the development of title VI, Congress deliberately excised global warming from the statute, and that legislative history of title VI thus argues against reliance on global warming as a regulatory criterion under SNAP. Finally, a commenter asserted that not only the Congress, but the President also believes that ozone depletion and global warming should be treated separately.

The Agency believes that the Congressional mandate to evaluate substitutes based on reducing overall risk to human health and the environment authorizes use of global warming as one of the SNAP evaluation criteria. Public comment failed to identify any definition of overall risk that warranted excluding global warming. Further, in October 1993, the President directed EPA through the Climate Change Action Plan (CCAP) to use its authority under section 612 of the Clean Air Act to narrow the uses allowed for hydrofluorocarbons and perfluorocarbons with high global warming potential.

EPA disagrees with the statutory and legislative history arguments raised by the commenter. The commenter points to language that relates only to the listing of ozone depleting and global warming substances, which is not relevant to EPA's authority under section 612(c) to regulate substitutes based on an assessment of overall risk. The fact that Congress may have deleted authority for EPA to phase out use of substances based solely on their global warming potential without regard to available substitutes certainly imposes no limitation on consideration of global warming potential as a factor in assessing the overall risk of using any class I or II substitute. Especially in light of President Clinton's recent commitment to use section 612 authority specifically to narrow uses of high global warming potential CFC substitutes based on an overall risk assessment, EPA has concluded that it is appropriate to consider global warming potential as one factor in the SNAP analysis. Therefore, in this final rule, the Agency will continue to exercise its statutory authority to review substitutes for listing as unacceptable or acceptable alternatives, using the criteria for evaluation set out in the NPRM, including global warming.

4. Definitions

a. *Definition of potentially available.* Several commenters supported EPA's definition of potentially available because it would speed the review process and encourage innovation in development of new substitutes. Other commenters expressed the concern that EPA's definition of "potentially available" could allow EPA to review and accept a substitute which may be several years from general commercial availability, and on that basis to ban some other commonly used chemical with relatively higher risk. These commenters argued that EPA should at least wait until test marketing has begun to consider an alternative "potentially available" for the purpose of SNAP review. Another commenter argued that a knowledge of the economic viability of a substitute is crucial in assessing its potential availability as a substitute under SNAP.

Under section 612(c) of the CAA, the Agency is specifically required to identify alternatives that are either "currently or potentially available." For this final rule, the Agency is defining as potentially available any alternative for which adequate health, safety, and environmental data, as required for the SNAP notification process, exist to make a determination of acceptability, and which the Agency reasonably believes to be technically feasible, even if not all testing has yet been completed and the alternative is not yet produced or sold. EPA would not prohibit use of a substitute where no substitute that reduces overall risk is currently available, to avoid situations where the only available substitute to allow transition away from ozone-depleting compounds is unacceptable under SNAP.

b. *Definition of a substitute.* Several commenters expressed support for EPA's definition of a substitute as used in the NPRM. One commenter proposed the use of the word "alternative" instead of "substitute," while supporting the Agency's general construction of the statute to allow SNAP's purview to extend beyond chemical substitutes to a broader range of alternative technologies, including process changes. Another commenter, while also generally supporting EPA's definition of a substitute, pointed out that the language "could replace" is overly broad. This commenter noted that this language suggests that someone who is not using a compound as an ODS replacement, but is aware that it could be used in this way, should report to EPA under SNAP.

For the purpose of this final rule the Agency is using the word "substitute" as a synonym for alternative. As discussed in section IV.A, this definition includes chemical substitutes, alternative manufacturing processes, and alternative technologies. In response to the public comment described above, the Agency has also clarified in this final rule that SNAP addresses only those substitutes or alternatives actually replacing the class I and II compounds listed under section 602 of the CAA within the eight industrial sectors identified in sections IX.D. through K.

5. General Comments on Substitutes

a. *Perfluorocarbons.* Under the NPRM for SNAP, EPA proposed perfluorocarbons (PFCs) as acceptable for limited use as replacements for ozone depleting chemicals in the solvent cleaning, and fire suppression and explosion protection sectors. Several commenters supported the Agency's cautious approach toward PFCs, given the high global warming potential of these compounds as well as their extreme atmospheric persistence. Other commenters sought clarification with respect to the scope of the Agency's proposed restrictions on PFCs.

PFCs are fully fluorinated compounds, unlike CFCs, HCFCs, or hydrofluorocarbons (HFCs). These chemicals are nonflammable, have low toxicity, are exempt from federal VOC regulations, and do not contribute to stratospheric ozone depletion. The environmental characteristics of concern for these compounds are high global warming potential (5,000–10,000 times greater than CO_2) and long atmospheric lifetimes (3,000–5,000 years). Although the actual contributions to global warming depend upon the quantities emitted, because of their long atmospheric lifetimes, the warming effects of PFCs are essentially irreversible.

In the proposed rule, EPA identified specific solvent cleaning applications for which PFCs were acceptable. In response to public comment seeking clarification of these limitations, EPA is finding PFC use acceptable in electronics and precision cleaning for only high-performance, precision-engineered applications where no other substitute for CFC–113 or MCF would meet performance or safety requirements. Additional detail on PFC use in the solvent cleaning sector can be found in section IX.F.

In this final rule, EPA has also clarified the limitations placed in its proposed rule on the use of PFCs to replace halons. PFC–410 (C_4F_{10}) and PFC–614 (C_6F_{14}) will be limited to fire suppression and explosion protection applications where other alternatives are not technically feasible to meet safety or performance requirements due to the physical or chemical properties of the agent, or where human exposure to the extinguishing agent may approach cardiosensitization levels or result in other unacceptable health effects under normal operating conditions. Additional detail on PFC use in the fire suppression and explosion protection sector can be found in section IX.G.

Before replacing ozone-depleting compounds with PFCs, users must first investigate whether other alternatives would meet performance or safety standards. This may include contacting vendors or testing using other substitutes and equipment. Although special forms or reporting to EPA is not required, companies must maintain documentation of the review of alternatives on file. Where users must rely on PFCs for lack of other options, they should make every effort to adopt closed systems and recover, recycle and destroy the chemicals where possible. EPA also encourages PFC users to reduce emissions to a minimum through conservation practices that address idling losses and operator variables. Above all, PFC users should continue the search for long-term alternatives.

IV. Scope of Coverage

A. Definition of Substitute

1. Statutory Language

Based on the language of section 612(a) of the CAA, the Agency defines within the SNAP program a "substitute" as any chemical, product substitute, or alternative manufacturing process, existing or new, that could replace a class I or II substance. While subsequent subsections of section 612 refer only to "substitute substances" or "substitute chemicals," EPA interprets these provisions for purposes of the SNAP program as incorporating the general definition of substitute presented in section 612(a). The Agency believes that this definition is consistent with the overall intent of section 612 and is necessary to enable EPA to identify and analyze the universe of substitutes for class I and II substances.

Section 612(c) prohibits users from replacing class I or II substances with any substitute substance which the Administrator determines may present adverse effects to human health and the environment, where the Administrator has identified an alternative to such replacement that: (1) Reduces overall risk to human health and the environment, and (2) is currently or

potentially available. EPA believes that in addition to authorizing the Agency to ban the use of a given substitute substance where other alternatives exist, section 612 confers the legal authority to allow the use of a substance only with certain restrictions—conditions of use or narrowed use limits—while banning its use otherwise. This authority is inherent in the Administrator's authority to totally ban use of the substitute where other acceptable alternatives exist that reduce overall risk. EPA only intends to use this authority where a viable substitute exists that would otherwise have to be disallowed because of risk associated with its uncontrolled use.

a. *Use conditions.* In imposing conditions on use, EPA does not intend to preempt other regulatory authorities, such as those exercised by the Occupational Safety and Health Administration (OSHA) or other government or industrial standard-setting bodies. Rather, EPA hopes to fill existing regulatory gaps during the interim period of substitution away from ozone-depleting compounds and provide the needed margin of protection to human health and the environment until other regulatory controls or standards are developed under appropriate authorities.

EPA anticipates applying use conditions only in the rare instances where clear regulatory gaps exist, and where an unreasonable risk would exist in the absence of any condition. These restrictions will remain in place only until the appropriate standard-setting agency acts. Where appropriate, EPA's use conditions will terminate by their own terms once the appropriate standard-setting Agency takes action. The mechanism for informing the public of this change will be the quarterly **Federal Register** notices updating the status of the SNAP lists. These are discussed further in Section VII.A below.

b. *Narrowed use limits.* In imposing narrowed use limits, the Agency has sought to expand the list of alternatives available to all applications within a sector end-use category. EPA recognizes that certain sector end-uses encompass a broad range of applications, manufacturing processes, and products. Where EPA narrows uses, a substitute will be acceptable for use only in certain applications, as where other alternatives are not technically feasible due to performance or safety requirements. Conditions on use discussed in section IV.A.1.a. above refer to how (under what operating conditions) an otherwise unacceptable substitute may be used; narrowed use limits define where (in which end-uses and applications) an otherwise unacceptable substitute may be used.

c. *Potentially available.* Section 612(e) makes clear that a chemical can be a substitute whether it is existing or new. Also, the language in section 612(c) clearly states that a new substitute may be currently or potentially available. In this final rule, the Agency is defining as potentially available any alternative for which adequate information exists to make a determination of acceptability, and which the Agency reasonably believes to be technically feasible, even if not all testing has yet been completed and the substitute is not yet produced and sold.

2. Additional Clarification

EPA believes that the statutory language included in section 612 is written broadly to allow for a reasonably comprehensive evaluation of substitutes that will be introduced as replacements for ozone-depleting chemicals. However, additional clarification is presented below to further explain the Agency's definition of a "substitute" in specific circumstances based on section 612.

a. *Chemicals already listed under TSCA.* Section 612(e) explicitly requires producers of chemicals, both new and existing, to notify the Agency before introducing such chemicals into interstate commerce for significant new uses as class I alternatives. In addition, section 612(c) requires the Agency to produce lists of acceptable and unacceptable substitutes, without regard to the status of each chemical alternative, whether new or existing.

These interrelated provisions of section 612 serve as the basis for the Agency's belief that all substitutes, whether "new or existing" chemicals, should be subject to SNAP review. This regulatory purview would thus necessarily extend to those chemicals already listed on the TSCA inventory of existing chemicals. EPA believes SNAP review is critical for such chemicals given the differing statutory objectives of TSCA and the CAA, and the new and expanded applications of many existing chemicals as class I and II replacements, which could alter existing release and exposure profiles.

b. *Significant new use of existing alternatives.* There has also been some question regarding whether an existing alternative already being sold commercially within a SNAP sector (e.g., use of semi-aqueous cleaners in the electronics industry) would be subject to review under section 612. The Agency believes that it should be subject to review under SNAP. Because of the phaseout, uses of existing substitutes can reasonably be expected to increase significantly beyond current consumption, which could translate into greater releases and risks from use of a substitute. Existing substitutes are therefore subject to SNAP review because EPA believes that their use can be expected to significantly expand to new users or product lines. Users should note that the SNAP determinations discussed in section IX of this final rule demonstrate that with few exceptions, all substitutes already on the market meet the conditions for acceptability under the SNAP program.

c. *Authority to review substitutes for class II compounds.* Section 612(c) authorizes the Administrator to prohibit the use of substitutes for class II, as well as class I substances, and requires the Agency to compile lists of substitutes for class II as well as class I compounds upon making the requisite findings. EPA believes that this is in part because of the considerable overlap in sectors that use class I and II substances. More importantly, this mirrors the statute's general emphasis on moving away from class I compounds in a way that does not create new and unintended environmental problems. Clearly, for the same reasons class I substitutes require review under the SNAP program, class II substitutes should also be reviewed.

To obtain the data necessary to analyze class II substitutes, the Agency is using statutory authority provided in sections 114 and 301 of the CAA in conjunction with 612(c). As explained in the NPRM, these sections, when read together, authorize the Administrator to promulgate such regulations as needed to require companies to provide information EPA may reasonably need to identify acceptable and unacceptable substitutes for class II substances. EPA is exercising this authority to subject class I and II substitutes to the same information reporting requirements and listing process.

d. *Designation of class I and II chemicals as substitutes.* EPA believes that review authority under section 612 extends also to use of class I and II chemicals as substitutes, even though these chemicals are subject to the phaseout provisions of the CAA. While one comment received by the Agency in response to the NPRM questions EPA's authority under section 612 to review class I and II chemicals as substitutes (e.g., methyl chloroform used to replace CFC–113), it is clear that these compounds can be used as substitutes for other class I and II substances in certain applications. Since section 612 authority extends to "any" substitutes, both class I and II substances are subject

to review under the SNAP program just as any other substitute. Given the potential for the class I and II chemicals used as substitutes for other ozone-depleting chemicals to continue depleting stratospheric ozone and thus affect human health and the environment, a close examination of these alternatives in the context of both their effect on the environment and the availability of other substitutes for particular uses is especially warranted under section 612.

e. *Alternative products and manufacturing processes.* EPA believes that section 612(c) broadly charges EPA to identify alternatives to ozone-depleting substances. For example, EPA believes that alternative products can include no-clean fluxes in electronics manufacturing processes that currently use class I or II compounds as cleaning solvents. EPA believes it appropriate to consider substitute processes and products for review under the SNAP program, since many of these alternatives are viable substitutes and could reduce overall risks to human health and the environment. EPA believes that such alternative products and processes, therefore, fall within the definition of substitutes under section 612.

Similarly, new production techniques and/or processing equipment are important developments that can minimize environmental releases. Accordingly, alternative manufacturing processes will also be examined under section 612 in the context of use and emissions of substitutes. EPA believes that section 612's reference to "alternative," instead of "alternative substance," or "alternative chemical," implies a statutory intent that "alternative" be read broadly. This furthers the statutory desire to shift use to alternatives that reduce overall risk.

EPA will encourage, where appropriate, alternative processes and technologies that reduce environmental and human health effects. In many applications, reliance on alternative processes and/or equipment may be associated with the use of particular substitute chemicals. In these instances, EPA encourages the filing of joint submissions where information is provided by both the chemical manufacturer and, for example, an equipment manufacturer whose equipment makes use of such a substitute. Such joint filings will provide the most comprehensive data on an alternative and its effect on human health and the environment.

f. *Second-generation substitutes.* A key issue is whether there exists a point at which an alternative should no longer be considered a class I or II substitute as defined by section 612. The Agency believes that as long as class I or II chemicals are being used, any substitute designed to replace these chemicals is subject to review under section 612. In this final rule, the Agency has determined that second-generation replacements, if they are non-ozone depleting and are replacing non-ozone depleting first-generation alternatives, are exempt from reporting requirements under section 612. Other regulatory programs (e.g., other sections of the CAA, or section 6 of TSCA) exist to ensure protection of human health and the environment in these situations.

Where second-generation substitutes replace first-generation substitutes that are themselves ozone-depleters (e.g., HCFCs), these second-generation substitutes are bound by the same notification and review requirements under section 612 as first-generation substitutes to ozone-depleting chemicals. For example, if a hydrofluorocarbon (HFC) is introduced as a first-generation refrigerant substitute for either a class I (e.g., CFC–12) or class II chemical (e.g., HCFC–22), it is subject to review and listing under section 612. Future substitutions to replace the HFC would then be exempt from reporting under section 612 because the first-generation alternative did not deplete stratospheric ozone. If, however, a class I or class II chemical is used as a first-generation substitute (e.g., use of HCFC–141b as a transitional replacement in foam blowing), the second-generation substitute is still subject to review under section 612 because it is replacing a class I or class II chemical.

The key to determining whether a substitute is exempt or not as a second-generation substitute is, as discussed above, what it is designed to replace. For example, SNAP reviews are not meant to cover cases in which a technology is designed for use primarily in replacing existing non-ozone depleting evaporative cooling systems. In general, if most intended uses for a possible substitute are to replace a non-OD substitute for a class I or class II substance, then this substance would therefore be a second-generation substitute, and SNAP review is unlikely to be required. In those situations where class I or class II substitutes have already been replaced in most applications, the small use exemption could also eliminate the need for review of next generation substitutes.

g. *Applicability to existing uses.* The prohibition on use of an alternative applies only to substitutions to unacceptable substitutes made after the effective date of any final rulemaking for unacceptability. However, for this final rule, any person who has transitioned to a substitute for an end-use prior to any SNAP final rulemaking designating it as unacceptable may continue to use the substitute until their existing supply of the chemical, as of March 18, 1994, is depleted.

Existing inventory of final products manufactured with or containing a substitute designated unacceptable as a result of final EPA rule-making within an end-use covered under SNAP could theoretically be legally sold after listing. Producers should be aware, however, that they will be effectively barred from selling a substitute for use once it has been deemed unacceptable under SNAP, because potential purchasers will not be able to use it. After the effective date of this final rule, users will not be able to use any additional supply of a banned substitute purchased after the publication date of the unacceptable listing.

h. *Substitutes produced outside of the United States.* Companies manufacturing substitutes outside the U.S. who are producing solely for use by entities outside the U.S. are not subject to the requirements of these section 612 rules. EPA believes that its authority under section 612 extends only to use of substitutes in areas under the jurisdiction of the United States government. This principle does not apply to substitutes introduced as replacements for class I and II chemicals at offshore U.S. installations (e.g., U.S. military bases located in foreign countries) that are subject to the legal provisions of section 612.

Substitutes manufactured within the U.S. exclusively for export are subject to SNAP since the definition of use in the rule includes use in the manufacturing process, which occurs within the United States.

B. Who Must Report

1. General Provisions

As required by section 612(e), anyone who produces a substitute for a class I substance must provide the Agency with that person's unpublished health and safety studies on the substitute, as well as notify the Agency at least 90 days before introducing the substitute into interstate commerce for significant new use as an alternative. Also, as discussed in section IV.A.2.c. of this final rule, pursuant to sections 114, 301 and 612(c) of the CAA, producers of class II substitutes must abide by the same reporting requirements. Under the authority of sections 114, 301(a) and 612(c), EPA has determined that in

certain cases, formulators or end-users of substitutes could be considered to be producers and would therefore be subject to reporting requirements. This approach is discussed below, in section IV.B.2. To analyze substitutes under section 612(c), the Agency finds it necessary under section 301(a) to require that any person who introduces a substitute in its final form into interstate commerce be considered to be a producer of the substitute and required to submit information describing the substitute under section 114. With respect to substitutes for both class I and II substances, EPA needs all of the types of information described below, not just health and safety studies. Such data are needed to allow EPA to fully analyze the overall risks to human health and the environment presented by alternative substitutes, as required by section 612(c).

2. Designated Submitters

Several commenters requested clarification on who has primary responsibility to notify EPA under SNAP. EPA recognizes that a potential substitute can be developed for introduction into one of the SNAP sectors at several points in the manufacture-to-use chain. EPA considers responsibility for notification under SNAP to reside with the person who first introduces a substitute not otherwise exempted from reporting requirements into interstate commerce. Therefore, for example, if a chemical manufacturer introduces a substitute into interstate commerce for sale as a fire extinguishing agent to replace an ODS-based extinguishing method, the manufacturer is a designated submitter under SNAP. If a system manufacturer or a chemical formulator buys an agent from a chemical manufacturer and subsequently formulates or engineers it for introduction into interstate commerce as a substitute for an ozone-depleting means of fire suppression, then in this case, the system manufacturer or formulator is the designated submitter. If an end-user develops a proprietary blend or means of fire suppression using chemical or physical inputs purchased from manufacturers or formulators and then enters that product into interstate commerce as a replacement for ozone-depleting means of fire suppression, then the end-user is in this case the designated submitter.

a. *Chemical manufacturers.* Chemical manufacturers producing a substitute in its final form are required to notify the Agency of the existence of that substitute. For instance, if a chemical manufacturer intends to market a new chemical as a substitute foam blowing agent to companies that manufacture insulation products, the chemical manufacturer would be required to notify the Agency about the existence of the substitute.

b. *Formulators.* A formulator is engaged in the preparation or formulation of a substitute, after chemical manufacture of the substitute or its components, for distribution or use in commerce. Formulators usually only sell substitutes based on existing chemicals, since they do not ordinarily possess chemical manufacturing capabilities. Chemicals used in such substitutes are frequently in common use and have already been accepted for general use through other chemical review programs such as under TSCA or FIFRA.

However, to the extent that these formulators can be considered to be directly responsible for production of the substitute for an end-use, for example by offering a tailored formulation for an industrial cleaning process, these formulators would be subject to reporting requirements as outlined in this final rule. In such cases, the formulator is best suited in the manufacture-to-use chain to present information on how substitutes based on existing chemicals are or could be used. In cases where the manufacturer of a chemical is also the formulator of a blend, the manufacturer would be responsible for meeting reporting requirements on the substitute.

The Agency does not foresee a situation where any person who simply re-packages a substitute, i.e. does not in any way alter the chemical or physical characteristics of the substitute, would be the designated submitter. However, if the act of re-packaging a product is intended solely to allow for the introduction of a substitute into interstate commerce, that person would be the designated submitter under SNAP.

c. *End-users.* In general, end-users of substitutes will not be obligated to meet the reporting requirements discussed in this final rule, except in rare cases where the end-user and the producer of the substitute for commercial introduction in final form are the same person. While the Agency expects that this situation will occur infrequently, several large companies have developed substitutes for their own use and subsequently have notified EPA of their intent to offer those substitutes for commercial sale. Because EPA intends to require end-users to report only on those substitutes they plan to introduce into interstate commerce, evaluating and listing such substitutes will not stifle research and development innovations by end-users.

3. Exemptions From Reporting

The Agency has identified several situations in which notification under the provisions of section 612 will not be required. These exemptions from reporting are discussed below.

a. *Substitutes already listed by EPA.* As part of this final rule, the Agency has already completed the review of numerous class I and II alternatives and has determined that these substitutes are either acceptable or unacceptable. In preparing these determinations, the Agency evaluated information either on file or supplied in response to the NPRM published in the **Federal Register** on May 12, 1993. The substitutes list and supporting risk screens are described in more detail in section IX. No further submission is needed for any of those substitutes already listed as acceptable or unacceptable in this final rule. However, further information may be required for those substitutes listed as pending review in appendix B.

b. *Small sectors.* Most ozone-depleting substances have been or are currently used in large industrial sectors such as refrigeration and air conditioning or foam blowing. However, there are also numerous small uses of class I or II substances that fall outside of these major use sectors. While small use applications for class I and II compounds are varied and numerous, in the aggregate these small uses do not contribute substantially to ozone depletion. The Agency estimates that across all sectors these varied but small sector uses comprise in aggregate at most seven percent of total U.S. consumption of ozone-depleting substances. For more detail on the Agency's analysis and rationale for exempting small sectors, readers should refer to the Notice of Proposed Rulemaking for SNAP (58 FR 28094) published May 12, 1993.

Accordingly, eight major industrial use sectors are covered in this final rule. They are refrigeration and air conditioning, foam blowing, fire suppression and explosion protection, solvents cleaning, adhesives, coatings, and inks, aerosols, sterilization and tobacco expansion. Analysis of substitutes in a ninth sector, pesticides, will be completed, and the resulting decisions will be added to future SNAP determinations published in the **Federal Register** as part of EPA's quarterly updates to the lists of acceptable and unacceptable substitutes. EPA does not plan to add sectors other than the nine principal sectors listed above to the

formal analyses performed under SNAP, unless the Agency receives additional data indicating that inclusion of additional sectors is warranted based on the potential for high risks to human health and the environment due to class I and II alternatives.

c. *Small volume use within SNAP sectors.* As noted above, most ozone-depleting substances have been or are currently used in large industrial sectors such as refrigeration or fire extinguishing. However, even within these sectors, the potential for adverse effects on human health and the environment is related to the aggregate amount of ozone-depleting material consumed in an end-use. Thus, the Agency is focusing the SNAP determinations on large-volume uses in the major industrial sectors. Given the breadth of EPA's required overall risk assessment, the imposition on small volume uses within any sector of a requirement for a full SNAP submission seems unjustified by the potential for risk posed by these small uses.

Moreover, a key policy interest in the SNAP program is promoting the quickest possible shift from the ODSs into alternatives posing lower overall risk. The speed and orderliness of this shift depends in part on clear early determinations from EPA on the acceptability of key substitutes. Focusing the SNAP program on all possible substitutes in every conceivable use could diminish EPA's ability to provide an early and clear message on those substitutes which can contribute most to solving the problem of general reliance on ozone-depleting chemicals.

Further, the small volume use exemption is an exemption from the notification requirement only. It does not, for example, authorize the use in any quantity of a substitute otherwise deemed unacceptable under SNAP. Since the responsibility for meeting the notification requirement resides with the person introducing the substitute into interstate commerce, whether manufacturer, formulator, or end-user, this person is also responsible for ascertaining whether annual use of the substitute in its intended sector will exceed 10,000 pounds per year.

Thus, those introducing substitutes for ozone-depleting compounds in annual quantities of 10,000 pounds per year or less for any given major industrial sector identified in this rule need not notify EPA of their activities under SNAP. The exemption applies regardless of whether the Agency is notified for the same substitute for any conceivable application in the other major sectors covered under SNAP, or whether the introducer's total sales are 10,000 pounds or less for any or all of the other major SNAP sectors.

Those taking advantage of the exemption for small uses must maintain documentation describing the basis for their view that any substitute being used meets this small use definition. This documentation must include annual production and sales information by sector, and could be necessary in the event the Agency receives a petition to add such substitutes to its evaluations under SNAP, or to assure adequate enforcement of the notification requirement.

d. *Research and development.* Substitutes manufactured or imported solely for research and development are exempt from reporting requirements under section 612. Several commenters, including Federal agencies involved in research on CFC-related substitutes, support this exemption. Amounts used in research are assumed to be the minimum necessary for reasonable scientific experimentation. For new chemicals, the provisions of 720.36 of the PMN rule (40 CFR part 720) are in effect.

e. *Test marketing.* Use of alternatives for the sole purpose of test marketing is exempt from any reporting requirements under section 612. Persons taking advantage of this exemption, are, however, required to notify the Agency in writing that they are conducting test marketing prior to the commencement of sale into interstate commerce. Notification must be sent 30 days prior to the test marketing period, and must include the name of the substitute used, the volume used in the test marketing, and the expected duration of the test marketing. Once a company decides to sell an alternative as a class I or II substitute, it must provide the Agency with formal notification at least 90 days prior to the introduction of the substitute into interstate commerce for significant new use as a substitute for a class I or II chemical.

For new substitute chemicals that are being test marketed, the producer must abide by the provisions of section 5(h)(1) of TSCA, which authorizes the EPA, upon application, to grant exemptions from TSCA-reporting requirements, provided that test marketing will not present an unreasonable risk to human health or the environment.

f. *Formulation changes.* In general, the Agency believes that changes in formulation needed to accommodate replacement of class I and II compounds should not be subject to the provisions of section 612. Such changes may be necessary, for example, when a new blowing agent in foam manufacture necessitates the replacement of the catalyst formerly used with the class I blowing agent. The Agency believes that other regulatory mechanisms (e.g., TSCA) are available for examining and controlling, as needed, any adverse environmental and human health effects associated with subsequent formulation modifications. However, the manufacturer overseeing the formulation change is required to notify the Agency if these modifications may significantly influence the environmental and human health risk characteristics associated with the class I or II substitute. Also, the Agency reserves the right to exercise its discretion to examine formulation changes if a problem appears to exist.

g. *Substitutes used as feedstock.* Commenters to the NPRM supported the Agency's proposal to exempt substitutes that could replace class I chemicals used solely as intermediates in the production of other chemicals. To the extent that any feedstock substitutions occur, the Agency believes that they will not contribute substantially to any incremental risk to human health and the environment. This is because intermediates are used as inputs in production of other compounds, and as a result are largely consumed in the chemical manufacturing process.

V. Information Submission

A. Overview

To develop the list of unacceptable and acceptable substitutes for various end-uses as required by section 612(c), the Agency must assess and compare the "overall risks to human health and the environment" posed by use of substitutes, and this assessment must be performed in the context of particular applications. To conduct this overall examination, the Agency must consider a wide range of health and environmental factors. In order to reduce the burden on the regulated community, the Agency will defer to data collection requirements under other regulatory authorities to the maximum extent practicable. In the section that follows, the Agency presents information required by the SNAP program to evaluate class I and II substitutes. A copy of the SNAP Information Notice can be obtained from the SNAP program at the address listed in the beginning of this final rule.

B. Information Required

1. Name and Description of the Substitute

A chemical substitute should be identified by its chemical name, trade

name(s), identification numbers (e.g. Chemical Abstract Service (CAS) registry), chemical formula and chemical structure. If a substitute is a blend, the percentage of each component must also be provided. Alternative technologies or manufacturing processes should be described in sufficient detail as to uniquely identify its use as a class I and II substitute.

2. Physical and Chemical Information

Key properties needed to characterize chemical substitutes include: molecular weight; physical state; melting point; boiling point; density; odor threshold; solubility; partition coefficients (Log K_{ow}, Log K_{oc}); and vapor pressure. For alternative technologies or manufacturing processes, technical details on health, environmental or safety issues associated with use should be provided.

3. Substitute Applications

Identification of the end-use in which the substitute is likely to be used is required. It is essential to provide a complete list of potential end-uses and of applications within those end-uses because section 612(c) requires the Agency to list substitutes by specific uses.

4. Process Description

For each identified end-use application, the Agency requires descriptive data on processing, including in-place pollution controls. Such information will be used to characterize workplace and environmental releases and exposures.

5. Ozone Depletion Potential

The predicted 100-year ozone depletion potential (ODP) of substitute chemicals relative to CFC–11 is required. The submitter should also provide sufficient supporting documentation—either a citation or the background information used to develop the ODP. For purposes of calculating ODP, the Agency recommends the methodology used in the most recent *Scientific Assessment of Ozone Depletion: 1991*, which was prepared for the United Nations Environment Programme. (1)

6. Global Warming Potential

The Agency requires data on the potential total global warming of the substitute in its particular end-use (e.g., as a refrigerant, foam blowing agent, etc.). The total global warming considers both direct and indirect impacts. Direct impacts refer to the direct contribution to global warming of using a substitute. Calculation of the global warming potential (GWP) index for a 100, 500, and 1000 year time horizon, as well as the atmospheric lifetime and infrared adsorption spectrum of the substitute used to calculate the GWP is required. The Agency is requesting that all GWPs be referenced to CO_2 using the methodology recommended by the Intergovernmental Panel for Climate Change (IPCC).(2) Indirect impacts explicitly consider the effect on global warming arising from changes in energy consumption associated with the use of a substitute (e.g., an alternative refrigerant). This latter measure can be identified as changes in energy efficiency resulting from use of the substitute relative to that of the substance being replaced.

7. Toxicity Data

To assess the overall risks to human health and the environment, information is required on the acute and chronic toxicity of a substitute chemical, its impurities, and its degradation products on any organism (e.g., humans and other mammals, fish, wildlife, and plants). To characterize the risk to humans, the Agency is requesting a minimum submission of the following mammalian tests: A rangefinding study that considers the appropriate exposure pathway for the specific use (e.g. inhalation, oral, etc), and a 90-day subchronic repeated dose study in an appropriate rodent species (e.g. rats or mice). For some substitutes, a cardiotoxicity study, usually measuring cardiotoxic effects in the dog, is also required. Additional mammalian toxicity tests will be identified by EPA on a case-by-case basis depending on the particular substitute and application being evaluated. To characterize aquatic toxicity, both acute and chronic toxicity data for a variety of species are required. The Agency requires a minimum aquatic data set to be submitted as described in "Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses," which is available through the National Technical Information Service (#PB 85–227049). All toxicity data in the submitter's possession and any other available hazard information, including Material Safety Data Sheets (MSDS), must also be submitted. Submission of the actual toxicity studies is recommended; however, it is not necessary to submit these reports if they have been supplied to the Agency as part of other regulatory submissions. If studies are not submitted, however, the submitter must provide sufficiently clear references that the Agency can locate the studies without delay. As discussed below in section V.C.3., data concerning the objectives, methodology, results or significance of any toxicity, metabolism, translocation, or persistence test for a substitute and its degradation products cannot be held as CBI where such data are also submitted under TSCA and FIFRA to the extent that confidential treatment is prohibited under those statutes. Submitters providing information on new chemicals for joint review under the TSCA and SNAP programs may be required to supply additional toxicity data under TSCA section 5.

8. Environmental Fate and Transport

Where available, EPA requests information on the environmental fate and transport of substitutes. Such data shall include information on bioaccumulation, biodegradation, adsorption, volatility, transformation, and other data necessary to characterize a substitute's movement and reaction in the environment.

9. Flammability

Data on the flammability of a substitute chemical or mixture is required. Specifically, the flash point and flammability limits are needed, as well as information on the procedures used for determining the flammability limits. Testing of blends should identify the compositions at which the blend itself is flammable, and the changes in the composition of the blend during various leak scenarios. For substitutes that will be used in consumer applications, documentation of testing results conducted by independent laboratories (e.g., Underwriters Laboratories) should be submitted, where available. If a substitute is flammable, the submitter must analyze the risk of fire resulting from the use of such a substitute and suggest measures to minimize these risks.

10. Exposure Data

The submitter must provide available modeling or monitoring data on exposures associated with the manufacture, formulation, transport, and use of a substitute. Descriptive process information for each substitute application, as required above, will be used to develop exposure estimates where exposure data are not readily available. Depending on the end-use, exposure profiles will be needed for workers, consumers, and the general population.

11. Environmental Release Data

Data on emissions from the substitute application and equipment, as well as

pollutant releases or discharge to all environmental media (ambient air, surface and groundwater, hazardous/solid waste) are needed to complete the risk characterization. Submitters should provide information on release locations, if known. Available information on pollution controls that are used or could be used in association with the substitute (e.g., emissions reduction technologies, wastewater treatment, treatment of hazardous waste) and the costs of such technology is also requested.

12. Replacement Ratio for a Chemical Substitute

The Agency requires information on the replacement ratio for a chemical substitute versus the class I or II substances being replaced. The term "replacement ratio" refers to how much more or less of the substitute chemical is needed to substitute for the original ozone-depleting compound being replaced. This ratio will affect the estimated incremental cost and environmental effects associated with use of the substitute.

13. Required Changes in Technology

Data on any changes in technology needed to use the alternative are required. Such information should include a description of whether the substitute can be used in existing equipment—with or without some retrofit—or only in new equipment.

14. Cost of Substitute

The Agency requires data on the expected average cost of the alternative. The cost of the substitute can be expressed, for example, in terms of $/pound (for a chemical substitute) or as incremental capital and operating costs associated with a retrofit or new equipment. In addition, information is needed on the expected equipment life for an alternative technology. Other critical cost considerations should be identified, as appropriate. For example, it is important to understand the incremental costs associated with losses or gains in energy efficiency associated with use of a substitute relative to current experience with existing substances.

15. Availability of Substitute

The Agency needs to understand the extent to which a substitute is already commercially available or the date on which it is expected to become available. The timing of availability is an important factor in assessing the overall health and environmental effects of the substitute.

16. Anticipated Market Share

Data on the anticipated near-term and long-term (over the next ten years) nationwide substitute sales are also required. This information can be presented in several ways, for example: a percentage of existing nationwide use of class I or II chemicals that would be replaced in a particular end-use; number of units/products to be produced; or pounds of substitute to be sold. This information is required to assess the potential effects of a substitute related to total consumption and environmental releases.

17. Applicable Regulations Under Other Environmental Statutes

The submitter is required to provide information on whether the substitute is regulated under other statutory authorities, in particular the Clean Water Act; the Safe Drinking Water Act; the Resource Conservation and Recovery Act; the Federal Insecticide, Fungicide, and Rodenticide Act; the Toxic Substances Control Act; the Comprehensive Environmental Response, Compensation and Liability Act; the Emergency Planning and Community Right-to-Know Act, and other titles of the CAA. The Agency will evaluate substitutes under the SNAP program subject to existing regulatory constraints.

18. Information Already Submitted to the Agency

Individuals may have already submitted information required in the SNAP Information Notice to the Agency as part of past regulatory and information-gathering activities. In this case, to minimize reporting burden, the submitter need not resubmit the data but instead should provide the following information to help EPA locate the data already maintained at EPA: Type of information submitted; the date of submission; the EPA office to which the data were sent; description of the regulatory program under which the data were submitted; and a document-control number, if assigned (e.g., a PMN number). If the submitter cannot provide adequate references for data sent previously to the Agency as described above, all required information should be included in the SNAP notice. To facilitate review under SNAP, reports already submitted to the Agency as part of other regulatory submissions should be resubmitted if the original information was claimed as Confidential Business Information when previously submitted.

19. Information Already Available in the Literature

If any of the data needed to complete the SNAP program notice are available in the literature, the submitter should provide the Agency with references for such information. Failure to provide the Agency with an accurate and complete citation may delay review of the notice. Additionally, submitters are encouraged to provide copies of any literature to expedite review, particularly if the citation is from a source not readily available. Any references from sources in foreign languages should be translated into English prior to submission.

Submissions should be sent to the SNAP Coordinator at the address referenced at the beginning of this final rule. All submissions must be provided in three complete copies. If information is claimed as confidential, all confidential information must be excised from one of the three copies. This copy will be placed in the public docket. The other two copies should include the confidential material. If no claims of confidentiality are made for the submission, all three copies should be identical. (See below, as well as appendix C, for further guidance on handling of confidential information under SNAP.)

C. Submission of Confidential Business Information

1. Clean Air Act Provisions

Anyone submitting information for which Confidential Business Information (CBI) status is requested must assert a claim of confidentiality at the time of submission. Failure to assert a claim of confidentiality at the time of submission may result in disclosure of the information by the Agency without further notice to the submitter. Further, it should be noted that information which is publicly available (e.g., in journals, trade magazines, product literature, etc.) cannot be claimed as CBI. Requesting CBI status for such information could delay review under section 612. All claims of confidentiality will be treated in a manner consistent with 40 CFR part 2, subpart B.

The submitter should be advised that under CAA section 114(c), emissions data may not be claimed as confidential. Moreover, there are further instances in which confidentiality assertions may later be reconsidered by the Agency even when confidentiality claims are originally received. These circumstances are provided in the provisions of 40 CFR part 2, subpart B. The submitter will be contacted as part

of this evaluation process when such a circumstance occurs.

2. Substantiation of Confidentiality Claims

In the NPRM, EPA proposed to require substantiation of any confidentiality claims at the time of submission. In making these claims, the following provisions apply:

—The specific information to which the claim applies must be clearly marked in the body of the study as subject to a claim of confidentiality;

—A Supplemental Statement of Data Confidentiality Claims must be submitted, identifying each section claimed confidential and describing in detail the basis for the claim. (A list of points to address in such a statement is included in appendix C);

—The Supplemental Statement of Data Confidentiality Claims must be signed and dated and must include the typed name and title of the official who signed it.

EPA also stated that if required substantiation is not provided when submitting information claimed as confidential, the complete submitted information may be made available to the public without further notice to the submitter.

Several commenters indicated that EPA should contact the submitter before releasing information marked as confidential to the public even if it does not contain adequate substantiation. One commenter also indicated that complete substantiation should not be required until the end of the 90 day review period and that any issue regarding the adequacy of CBI substantiation should not delay the review process.

EPA agrees with the comment that submitters should be notified prior to disclosure to the public of information marked as confidential where substantiation, although it may be inadequate, has been provided. This will give the submitter opportunity to provide the necessary additional substantiation or withdraw the submission. However, an acceptability determination on a substitute will not be published until all claims of CBI have been fully substantiated under the provisions described above. Additionally, should no substantiation of CBI claims be provided, EPA may make the complete submittal available to the public without further notice to the submitter.

3. Confidentiality Provisions for Toxicity Data

In the event that toxicity or health and safety studies are listed as confidential, the submitter should be advised that this information cannot be maintained as confidential where such data are also submitted under TSCA or FIFRA to the extent that confidential treatment is prohibited under those statutes. However, any information other than emissions data contained in the toxicity study that is not health and safety data and is not relevant to the effects of a substance on human health and the environment (e.g., discussion of process information, proprietary blends) can be maintained as confidential subject to the provisions of 40 CFR part 2, subpart B. The Agency is therefore requesting that submitters not identify the following information as confidential when submitting information under TSCA or FIFRA: All information concerning the objectives, methodology, results, or significance of any toxicity test or experiment performed on or with a substitute or its degradation products; any information concerning the effects of the substitute on any organism (e.g., fish, wildlife, humans and other mammals) or the environment (e.g., studies related to persistence, translocation, and fate); and pharmacokinetics/metabolism studies.

4. Federal Register Requirements

As discussed below in Section VII.A.3.g., the Agency will publish quarterly notices in the **Federal Register** updating the list of acceptable and unacceptable alternatives. If the name of a specific substitute contained in any studies supporting such notices must be maintained as confidential, the submitter and the Agency will together develop a generic name that will protect the proprietary nature of the substitute, but will provide sufficient detail for the public to evaluate the health and safety studies. If appropriate, the submitter may reference any generic names identified for use in the PMN program.

D. Display of OMB Control Numbers

EPA is also amending the table of currently approved information collection request (ICR) control numbers issued by OMB for various regulations. This amendment updates the table to accurately display those information requirements contained in this final rule. This display of the OMB control number and its subsequent codification in the Code of Federal Regulations satisfies the requirements of the Paperwork Reduction Act (44 U.S.C. 3501 *et seq.*) and OMB's implementing regulations at 5 CFR part 1320.

The ICR was subject to public notice and comment prior to OMB approval. As a result, EPA finds that there is "good cause" under section 553(b)(B) of the Administrative Procedures Act (5 U.S.C. 553(b)(B)) to amend this table without prior notice and comment. Due to the technical nature of the table, further notice and comment would be unnecessary. For the same reasons, EPA also finds that there is good cause under 5 U.S.C. 553(d)(3).

VI. Effective Date of Coverage

A. General Provisions

This final rule includes a list of acceptable substitutes and a list of unacceptable substitutes. Unacceptable substitutes cannot be used in manufacturing or in final applications as substitutes for ozone-depleting compounds. The list of unacceptable substitutes and acceptable substitutes subject to use restrictions becomes binding 30 days after March 18, 1994. In contrast, the list of fully acceptable substitutes is furnished for the purpose of assisting users in understanding the full range of available, acceptable substitutes in each application. Many of the substitutes listed as pending or proposed in the NPRM have since been added to the final acceptable or unacceptable lists.

As noted above, the Agency does not believe that determinations on substitutes that are acceptable with no use restrictions need be made through rulemaking. Consequently, EPA believes that it is within its discretion to supplement the list of acceptable substitutes at any time upon making determinations consistent with the criteria established in this rulemaking. Until the Agency reaches a final decision restricting the use of a substitute, vendors are not barred from selling such substitutes once notification is given and the 90 day prior-to-sale notification period expires.

B. Grandfathering of Unacceptable Substitutes

EPA is authorized to permit the continuation of activities otherwise restricted where the balance of equities supports such grandfathering. Consequently, where appropriate, EPA may grandfather the production and use of particular substitutes by setting the effective date of unacceptability listings in the future.

The United States District Court for the District of Columbia Circuit has established a four-part test to judge the appropriateness of Agency grandfathering (see *Sierra Club* v. *EPA*, 719 F.2d 436 (DC Cir. 1983)). This test involves balancing the results of four analyses, including whether the new rule represents an abrupt departure from previously established practice, the

extent to which a party relied on the previous rule, the degree of burden which application of the new rule would impose on the party, and the statutory interest in applying the new rule immediately. In each rulemaking listing a substitute as unacceptable where grandfathering seems appropriate, EPA will conduct these four analyses and weigh their results. Where the balance of equities favors grandfathering, EPA will set a delayed effective date for such listings.

Setting future effective dates to ban the sale and distribution of specific substitutes will allow the Agency to avoid penalizing those who in specific applications may have already invested in good faith in alternatives the SNAP program determines to be unacceptable. For example, the Agency in this final rule finds unacceptable the use of HCFC–141b in solvent applications. New information on stratospheric ozone depletion has increased concern over possible adverse human health and environmental effects, and the Agency's unacceptable determination in the case of HCFC–141b reflects these concerns.

However, the Agency recognizes that some solvent users may have switched to HCFC–141b in good faith, expecting that this substitute would sufficiently lower the risk of ozone depletion relative to earlier materials. To provide for these users, the Agency has extended the effective date for certain end users of HCFC–141b. See the listing determination narrative discussion in section IX.F., as well as the listing tables in appendix B, for a full discussion of HCFC–141b and associated effective dates. Finally, to balance the desire not to penalize those who switched early in good faith with the need to avoid creating an incentive for continued investment in alternatives the Agency wishes to discourage, the longer-term effective dates discussed above will affect only existing uses.

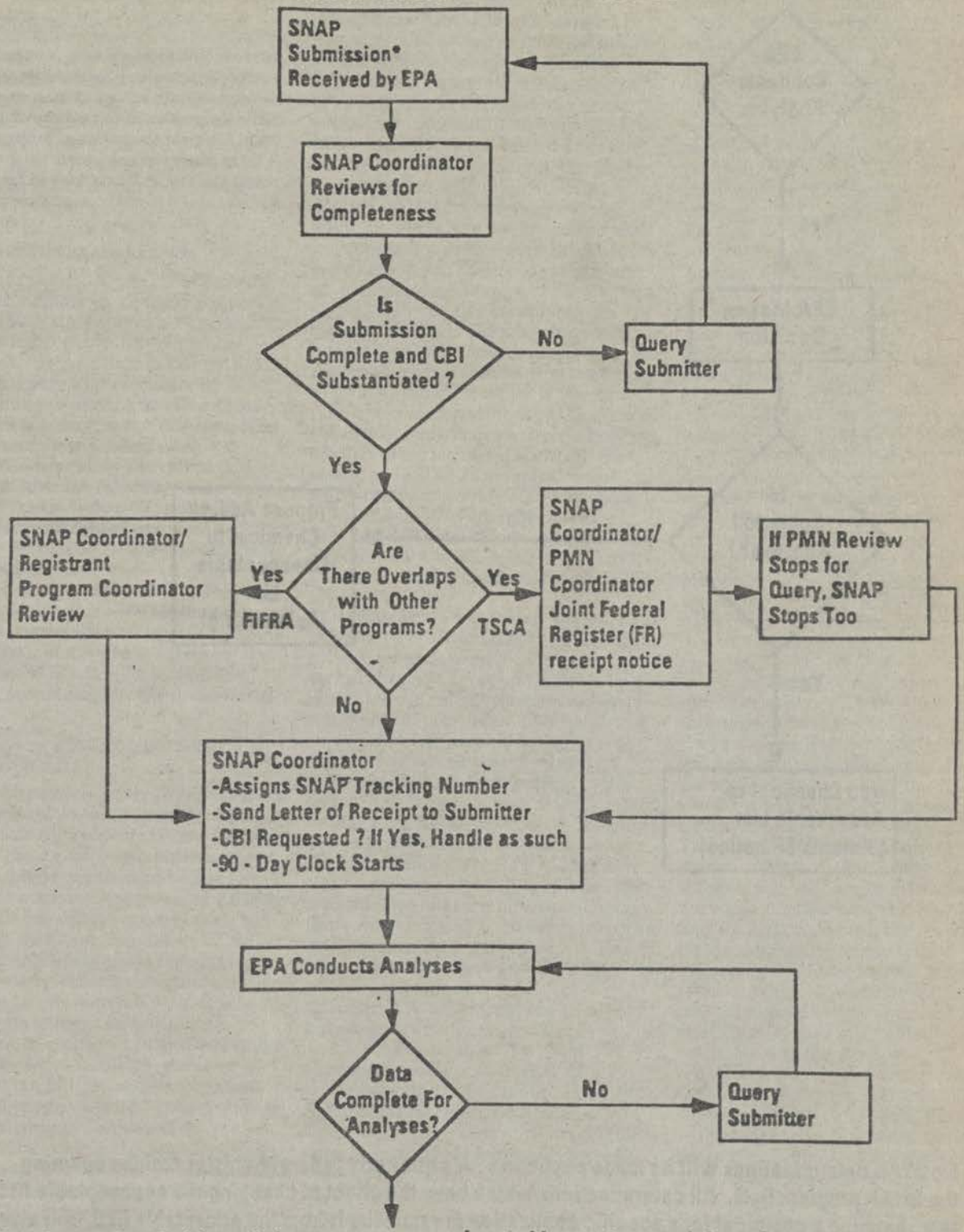
VII. Notice, Review, and Decision-making Procedures

The purpose of this section is to summarize the procedures for submitting the required information to the Agency, the steps EPA will take in reviewing SNAP submissions, and the process of making determinations based on these reviews. This section focuses on three procedures, summarized in Exhibit 1, depending on the nature of the submission received by the Agency. Some substitutes may already be approved or may not need approval under other environmental statutes, especially TSCA and FIFRA. These substitutes, in consequence, would only require review under the SNAP program. Section VII.A. discusses in greater detail the submission and review process for alternatives that fall into this category. In other cases, a substitute will require review under section 612 as well as relevant provisions of TSCA and FIFRA. With respect to any substitute that is a new chemical (i.e., not currently listed on the TSCA inventory), information must be submitted to the Agency for review both under the SNAP program and the PMN program. Section VII.B. describes steps for this review in more detail. For alternatives to class I and II chemicals that will be used in pesticide products, the substitute manufacturer will need to file notification jointly with EPA's Office of Pesticide Programs (OPP) and EPA's SNAP program. Section VII.C. discusses the latter procedure. The SNAP program has coordinated closely with each of these regulatory programs to establish a joint review process that will ensure consistency in the final decisions, while minimizing the time for review, the reporting burden, and the costs for both the submitter and the Agency.

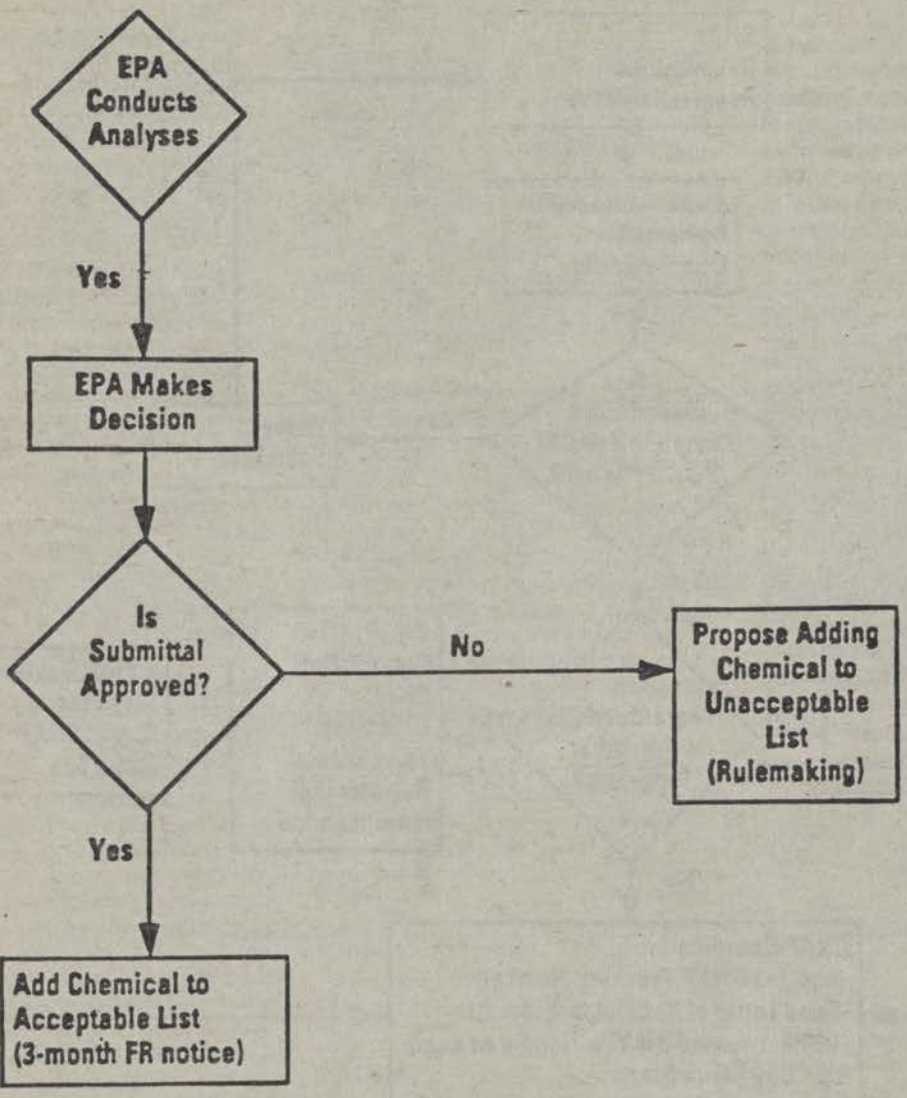
Billing Code 6560–50–P

SNAP Determination Process

EXHIBIT 1



*Petitions are handled through the same process, and are subject to the same information requirements. Please see Section VIII on petitions.



Note: All determinations will be made public in EPA's quarterly Federal Register notices updating the SNAP program lists. All determinations which have the effect of changing the unacceptable list (e.g., banning a chemical for a specific application or removing it from the acceptable list), will also be subject to the rulemaking process.

BILLING CODE 6560-50-C

A. Substitutes Reviewed under SNAP Only

1. Applicability

Sections IV. and V. describe the conditions dictating review under the SNAP program only and the general reporting requirements under section 612. If any of these conditions are met and the substitutes are not exempt as described in section IV.B.3., Exemptions from Reporting, a SNAP notice must be submitted.

2. Pre-Notice Communication

Prior to submitting the SNAP notice, each submitter is encouraged to contact EPA's SNAP Coordinator to discuss the notification process. Among other things, the SNAP Coordinator will: (1) Assist the potential submitter in determining whether a SNAP notice is needed; (2) answer questions regarding how to complete a submission; (3) provide all necessary forms and the guidance manual; (4) serve as the initial point of contact when the notice is submitted; and (5) oversee the assignment of a SNAP program tracking number to the notice once it is received by the Agency. A copy of the SNAP Information Notice and Guidance Manual may be obtained from the SNAP Coordinator at the address listed at the beginning of this final rule. Specific data requested are described in section V.

3. Processing of Completed SNAP Submission

a. *90-Day review process.* As required under section 612(e), a manufacturer of a substitute for a class I chemical must provide the Agency with notification at least 90 days prior to introducing into interstate commerce any new or existing chemicals for significant new uses as class I alternatives. The same requirements apply to manufacturers of substitutes for class II substances, although in this case the Agency is drawing on general authorities contained in sections 114 and 301 of the CAA in order to fulfill the purpose of section 612(c). EPA intends to review these substitutes within a 90-day period to ensure prompt response for manufacturers initiating production of substitutes. EPA's 90-day review period for SNAP submissions begins once EPA receives a submission, as described in section V.B. above. If a submission does not include adequate data, EPA may return the submission to request specific additional information. Section 114 and, in the case of petitions, section 612(d) authorizes EPA to require manufacturers to support their SNAP submissions with data adequate to facilitate EPA's review.

b. *Initial receipt of the SNAP submission.* (1) Initial review of submission. EPA will conclude a completeness review of each submission within fifteen days of receipt of the submission. Within the 15-day period, EPA will inform the submitter of any additional information needed. If EPA makes no such request, then after the 15-day period is concluded, the 90-day review period will automatically commence. If EPA does request any additional data, the 90-day period shall not commence until the additional data are received and themselves reviewed for completeness.

During the 15-day completeness review, the SNAP Coordinator will first review the SNAP Information Notice to ensure that basic information necessary to process the submission is present (i.e., name of company, identification of substitute, etc.). A more detailed review of supporting technical data will then ensue, as well as an examination of substantiation provided for any claim for confidentiality of information. Should additional information be required, EPA will contact the submitter within 15 days of receipt of the original submission.

During the 90-day review period, EPA may ask for additional information from submitters as necessary, although manufacturers of a new substitute may introduce the substitute into interstate commerce 90 days after EPA receives a submission for the product if the Agency has not already rendered an unacceptability determination. In the case of a substitute which already exists in the marketplace prior to the issuance of this final rule, manufacturers must submit a completed SNAP Information Notice as soon as possible, and not later than 90 days after the effective date of this rule. During EPA's review, use of an existing substitute may continue, and need not cease unless and until EPA adds the substitute to the list of unacceptable substitutes as a result of notice-and-comment rulemaking.

(2) Letter of receipt. The SNAP Coordinator will send a letter of confirmation to the submitter once the Agency has received the SNAP Information Notice and reviewed it for completeness. This letter will include the date of advance notification to the Agency, the starting date of EPA's 90-day review period, and the SNAP program tracking number assigned to the submission.

c. *Determination of data adequacy.* As part of the review for a SNAP submission, the Agency will complete a preliminary determination of the adequacy of data supporting the application. The Agency will issue this determination within 15 days after receipt of the application. At any time during the review period, if information is not adequate to allow the Agency to reach a SNAP determination, EPA will contact the submitter and request the missing data. EPA believes it appropriate and authorized under section 114 to require the submitter to provide all data needed to complete the review of the SNAP notice. Depending on the type of information needed and the time necessary to compile and submit the requested data to the Agency, EPA may suspend or extend the review period. This will not affect the ability of a manufacturer to begin marketing a new substitute 90 days after advance notification to the Agency, or in the case of a pre-existing substitute, to continue marketing.

In a few cases, the Agency and the submitter may disagree on a schedule for furnishing additional data EPA deems necessary to determine the acceptability of the substitute. If in these cases EPA has reason to believe that such a substitute may be unacceptable, the Agency may exercise the option of proposing to list the substitute as unacceptable based on existing data until the necessary data are provided, due to the uncertainty of the risks associated with use of the substitute.

d. *Availability of new information during review period.* If critical new information becomes available during the review period that may influence the Agency's evaluation of a substitute, the submitter must notify the Agency about the existence of such information within ten days of receiving such data. The submitter must also inform the Agency of new studies under way, even if the results will not be available within the 90-day review period. The Agency may extend or suspend the review period depending on the type of information at issue and the stage of review. Again, this will not affect a manufacturer's ability to market a substitute 90 days after initial notification to the Agency.

e. *Completion of detailed review.* Once the submission is found to be supported by adequate data, the Agency will commence a detailed evaluation of the notice. As this review proceeds, EPA may contact the submitter for additional scientific and technical information to assist in the evaluation. This will ensure that the review is completed quickly and that it reflects the best available information. Final decisions will be based on detailed analysis completed during this stage of review.

f. *Vendor lists.* As part of EPA s outreach and clearinghouse under SNAP, the Agency will use the SNAP

determinations to compile a list of vendors for the convenience of potential users. Companies could then ask EPA to review their specific substitute, to ensure that it is covered by the listing decisions on acceptable substitutes, and to add the company to the vendor list. The Agency believes that specific information on vendors of acceptable substitutes would be useful to companies switching out of class I and II compounds.

g. *Communication of SNAP determination. (1) SNAP determinations on 90-Day notifications.* EPA's determinations on SNAP submissions that come as a result of the 90-day advance notification requirement will take the form of either adding substances to the list of acceptable substitutes or by proposing to add them to one of the following lists: acceptable subject to use conditions, acceptable subject to narrowed use limits, or unacceptable substitutes.

(2) *Communication of SNAP determination to the submitter.* Once Agency review has been completed, the submitter will be notified in writing of the determination under SNAP. At this time, the submitter will also be informed if any restrictions are attached to the acceptability of a substitute. Following the expiration of 90 days after submitting advance notification to EPA, companies may begin sale or manufacture of a new substitute. They may continue to sell or manufacture an existing substitute through the review period, unless and until the Agency places such substitute on the list of unacceptable substitutes as a result of rulemaking. Sale or manufacture may begin and continue even if the Agency fails to reach a decision or notify the submitter of that decision within 90 days of advance notification of EPA.

(3) *Communication of SNAP determination to the public.* (a) Federal Register notice. To provide the public with updated information on SNAP determinations, the Agency will publish in the **Federal Register** a complete list of the acceptable and unacceptable alternatives reviewed to date. This list will be published four times each year and will include recent decisions made under the SNAP program. In addition to the quarterly publications, the Agency will communicate decisions through a clearinghouse and outreach program, as discussed in the next section, as well as through the Stratospheric Ozone Protection hotline.

(b) *Outreach and clearinghouse.* Section 612(b)(4) requires the Agency to maintain a public clearinghouse of alternative chemicals, product substitutes, and alternative manufacturing processes that are available as replacements for class I and II chemicals. The clearinghouse will distribute information on substitutes that are acceptable under the SNAP program. For the convenience of companies wishing to identify substitutes, the Agency will maintain a list of vendors selling substitutes as discussed in section VII.A.3.f.

In addition, the Agency will enter data on substitutes into the Pollution Prevention Information Exchange System (PPIES) database, which is maintained by EPA's Office of Research and Development. This database contains information on numerous pollution prevention options for a wide variety of industrial sectors and chemicals. PPIES can also be accessed from a variety of other pollution prevention databases maintained by other federal agencies and industry.

4. Decision-Making Framework

a. *Decisions by substitute and use.* As required by section 612(c), the Agency must publish a list of substitutes unacceptable under the SNAP program and a list of acceptable alternatives for specific uses. Given that environmental exposure and risk profiles can change significantly from one end-use to the next, it is essential to evaluate and list substitutes in the context of their intended use. The Agency identified a number of end-uses in each sector by which to list substitutes, and section IX provides risk management decisions for many existing substitutes in each of the principal sectors.

The Agency will be as specific as possible in listing substitutes by providing exact chemical names of substitutes. For most substitutes, a broad chemical classification (e.g., aromatic hydrocarbons, or HCFCs) is not specific enough because of differences among chemicals belonging to each of these groups. Thus, where appropriate, EPA will provide a more specific description of the substitute by application.

The Agency anticipates two possible exceptions to this practice. The first is where release of the chemical identity of a substitute constitutes release of proprietary information. In that event, the Agency will report generic chemical names based on chemical classes as described in section V.C. The other exception would be in cases where the Agency believes that a more general categorization is needed to account for the diversity of possible chemicals used in a particular set of substitutes. For example, in the solvents cleaning sector, many substitutes are formulations composed of compounds drawn from several categories of chemicals. In this case, the toxicity profile of each chemical is similar to those of other chemicals in that class.

b. *Decision categories.* Under section 612, the Agency has considerable discretion in the risk management decisions it can make in SNAP. In this final rule, the Agency has identified five possible decision categories, as described below. Commenters suggested that there was confusion with the Agency's intent to designate some substitutes as acceptable subject to narrowed use limits versus unacceptable except for critical use exemptions. In response to these comments, the Agency has determined that the goal of both categories was to limit the use of a substitute that had generally unacceptable characteristics yet provide relief for specialized applications within an end-use where no other alternatives exist. Given the similarity in goals, the decision categories have been streamlined by eliminating the category listed in the NPRM as "unacceptable except for critical use exemptions." Those substitutes that were listed in the NPRM as proposed unacceptable except for critical use exemptions are listed as unacceptable in this final rule, and the concerns which the critical use exemption petition process was created to address will now be addressed as part of EPA's responsibilities under the section 612(d) petition process.

(1) Acceptable. Where the Agency has reviewed a substitute and found no reason to prohibit its use, it will list the alternative as acceptable in the end-uses for which the submitter provided information. Where appropriate, the Agency may provide some additional comment (e.g., general recommendations encouraging recapture and recycling). However, these comments are not conditions for use of the substitute.

(2) Acceptable subject to use conditions. As proposed in the NPRM, after reviewing a submission, the Agency may determine that a substitute is acceptable if certain conditions on use are adopted. The Agency cannot predict at this time all necessary restrictions, but has imposed some conditions based on substitute reviews already completed for this final rule. Several commenters supported the application of use conditions as necessary in providing important guidance to companies in reviewing alternative replacements for ODSs. While also supporting use conditions generally, other commenters noted that they should be used sparingly, so as to create the minimum uncertainty in the

regulated community and encourage swift transition.

The Agency agrees with these comments. In this final rule, any conditions imposed will depend on the risks involved and the substitute and application in question. For example, the Agency may impose conditions on the use of a substitute and require recycling equipment to limit workplace and ambient releases or require use of other control practices within a certain application. Where a substitute is found acceptable subject to conditions on uses, use without adherence to the conditions in the relevant end-use is prohibited in this final rule. Determinations of acceptability subject to use conditions will only be made pursuant to notice-and-comment rulemaking.

In implementing conditions on use, the Agency has sought to avoid overlap with existing regulatory authorities. EPA has taken a number of steps to mitigate this potential for duplication. First, EPA intends to restrict the use of conditions to cases in which clear regulatory gaps exist. Second, these existing regulatory gaps must render the use of a substitute an unreasonable risk in the absence of any additional controls. Third, in the limited cases in which conditions may be necessary, the Agency will impose them only as a result of formal notice-and-comment rulemaking. Finally, use conditions will be effective only until other appropriate regulatory controls are imposed under other authorities and will be withdrawn by the Agency when they are superseded by such controls.

(3) Acceptable subject to narrowed use limits. The Agency cannot restrict use of a substitute under SNAP if there are no technically feasible alternatives to the use of an ozone-depleting compound. Thus, EPA may approve a compound not for general use within a sector, but for use only within certain specialized applications within a sector end-use. EPA refers to these restrictions as narrowed use limits. For example, the Agency could list a substitute with a generally unfavorable environmental or human health effect as acceptable in certain specific metals cleaning applications in the solvents cleaning sector. This would allow transition away from the damaging ozone-depleting compounds to proceed, by allowing industry the flexibility to use in narrow niche applications a substitute which provides the only means of transition. At the same time, the narrowed use determination prevents a widespread shift of an entire sector to substitutes which overall do not offer the risk reduction available through the use of other alternatives.

Clearly, any limits imposed will depend on the risks involved and the substitute and application in question. To provide adequate opportunity for comment by the regulated community, EPA will complete notice-and-comment rulemaking before promulgating any finding that a substitute is acceptable only subject to a narrowed use limit.

In implementing narrowed use limitations, the Agency has sought to allow agents for specific uses that would otherwise be deemed unacceptable. This policy serves the larger goal of facilitating the fastest possible transition from ozone-depleting compounds by expanding the list of alternatives available to all applications within a sector end-use category. EPA recognizes that certain sector end-uses encompass a broad range of applications, manufacturing processes and products. Under the acceptable for narrow use category, EPA will accept a substitute for use only in certain specialized uses within the broader end-use. The intent of the narrowed use limitation is to restrict the use of a substitute that the Agency deems unacceptable for the full range of applications or products within a sector end-use category. Where a substitute is found acceptable subject to narrowed use limits, general use within the relevant end-use is prohibited.

Before users adopt a restricted agent within the narrowed use limits category, they must make a reasonable effort to ascertain that other substitutes or alternatives are not technically feasible. Users are expected to undertake a thorough technical investigation of alternatives before implementing the otherwise restricted substitute. The Agency expects users to contact vendors of alternatives to explore with experts whether or not other acceptable substitutes are technically feasible for the process, product or system in question. To further assist users in their evaluation, EPA has prepared a list of vendors manufacturing other substitutes. Although users are not required to report the results of their investigation to EPA, companies must document these results, and retain them in company files for the purpose of demonstrating compliance. Both the Vendor List and the Guidance Manual are available from the SNAP program, or through EPA's Stratospheric Ozone Protection Hotline.

In October 1993, the President directed EPA through the Climate Change Action Plan (CCAP) to use its authority under section 612 of the Clean Air Act to narrow the uses of CFC substitutes with high global warming potential. Because EPA is simultaneously also interested in promoting the broader shift away from ozone-depleting compounds, EPA will make every effort to assure that these limits on use will be imposed in ways that preserve as much flexibility as possible for those trying to move to alternatives.

In this final rule, EPA has imposed narrowed use limitations on the acceptability of perfluorocarbon (PFC) substitutes when used in solvent cleaning, and fire suppression. EPA has imposed these limitations because of the high global warming potential and long atmospheric lifetimes of the PFC compounds as compared with other alternatives available for the same end-uses. Comparable limitations on the use of refrigerants and aerosols containing PFCs are also likely to be proposed shortly. In the case of fire suppression and explosion protection, EPA has taken the approach of narrowing uses to prevent or delay emissions of global warming gases. This is preferable to the outright prohibitions EPA would otherwise be authorized to impose where other alternatives are available, because in these limited cases users may have no other feasible alternatives to continued reliance on ozone-depleters.

Through the notice and comment rulemaking process, other companies or vendors will be able to scrutinize the proposed narrowed use limits. This may bring to light new alternatives or processes of which the user and EPA are unaware, and these new alternatives may pose lower overall risks than the substances which have been the subject of the narrowed use designation. If an acceptable listing is revoked based on the availability of a new, lower-risk alternative, companies that have made investments in technology which was earlier deemed as having no alternatives available may be granted permission to extend their use for a limited period of time, consistent with EPA's grandfathering approach described above in section VI.B.

The Agency has prepared guidance describing additional documentation users should include for narrowed use applications. This information includes descriptions of:

- Process or product in which the substitute is needed;
- Substitutes examined and rejected;
- Reason for rejection of other alternatives, e.g., performance, technical or safety standards; and/or
- Anticipated date other substitutes will be available and projected time for switching.

In addition to this basic information, the guidance includes specific data for end-uses in each sector. The guidance is available from the SNAP program.

(4) *Unacceptable.* The Agency has the authority under section 612(c) to prohibit the use of a substitute believed to present adverse effects to human health and the environment where alternatives that reduce overall risk are available. The Agency will only use this provision where it has identified other substitutes that are currently or potentially available and that pose lower overall risks. Substitutes will be listed as unacceptable through the rulemaking process.

(5) *Pending.* The Agency will describe submissions for which the 90-day review period is underway and for which EPA has not yet reached a final decision as pending. For all substitutes in the pending category, the Agency will contact the submitter to determine a schedule for providing the missing information if the Agency needs to extend the 90-day review period. EPA will use the authority under section 114 to gather this information, if necessary. Again, a delay of the review period will not affect a manufacturer's ability to sell a product 90 days after notification of the Agency as described above.

c. *Implications of other regulatory requirements.* In evaluating substitutes, the SNAP program takes into consideration the regulatory requirements of other environmental and health protection statutes (e.g., the Clean Water Act or the Occupational Safety and Health Act). In considering the framework of existing regulatory constraints, the Agency's evaluation of alternatives will assume compliance with their provisions.

However, it will not be possible to factor in regulatory requirements that are still under development (e.g., more stringent requirements to control volatile organic compounds and hazardous air pollutants under title I and title III of the CAA). In these instances, a substitute may be deemed acceptable under SNAP, but is not thereby excused from compliance with any future regulations. The Agency does not believe that it was the intent of Congress to use the authority under section 612 to compromise other regulatory requirements. Should future regulations severely limit the availability of the only acceptable substitute for a specific end-use, EPA would reconsider the advisability of keeping any other alternatives which could be used in that application on the list of unacceptable substitutes.

5. EPA-Generated Review of Substitutes

In addition to SNAP notifications received under section 612 for substitute review, the Agency is authorized by section 612(c) to add or delete alternatives to the list of reviewed substitutes on its own initiative. EPA has many efforts under way to identify and communicate the availability of promising new alternatives. These include support for research efforts to study and focus attention on future substitutes, involvement in the United Nations Environment Programme's biannual assessment of technologies for key sectors currently using ozone-depleting chemicals, and technology transfer projects with industry, other federal agencies, and developing nations. Based on information available through these activities, EPA may initiate review of new substitutes under section 612. In each case, the next planned quarterly **Federal Register** notice updating the status of SNAP determinations will inform the public that EPA is initiating a review, subject to the provisions discussed in this final rule. Similarly, determinations ultimately reached as a result of these internally-generated reviews will be included in these quarterly updates.

B. Joint Review of New Substitutes under SNAP and TSCA PMN

1. Applicability

Any potential SNAP submitter who intends to introduce a new chemical (i.e., a chemical not currently included in the TSCA inventory) as an alternative for a class I or class II chemical must undergo review not only under section 612, but under section 5 of TSCA (the Premanufacture Notice program) as well. Because of the overlap in statutory authority, the Agency has established a joint review process between the SNAP and TSCA Premanufacture Notice (PMN) programs. This process has been structured to minimize reporting burden and to ensure consistency in decisions between the two programs. The following sections describe the joint review and decision-making process in more detail.

2. Data Submission Requirements and Process

a. *SNAP and PMN forms.* The Agency has reviewed the data submission needs for the SNAP and PMN programs and found significant overlap. In general, the Agency has identified only a few additional data elements beyond those already required by the PMN program that should be included for review under the SNAP program. These elements are:

- Ozone depletion potential.
- Global warming potential.
- Cost of using the substitute, including:

—Chemical replacement data.
—Chemical cost data.
—Incremental equipment expenditures (either new or retrofit) needed to use substitute.
—Information on the cost implications of changes in energy consumption (e.g., from the use of a less or more energy-efficient refrigerant).

- Documentation of testing results regarding the flammability of substitutes, especially when proposed for consumer applications.

Given this overlap, a submitter requesting a review under both the SNAP and PMN programs should provide the above information by following these steps:

- Complete the PMN form (EPA Form 7710–25) following the Instructions Manual currently available through the TSCA Assistance Information Service.
- Indicate on page 11 of the PMN form, "Optional Pollution Prevention Information," that the chemical to be reviewed is also to be considered under the SNAP program.
- Complete a SNAP addendum that requests information only on those items listed above. (The addendum can be obtained from the SNAP program, or EPA's Stratospheric Ozone Protection Hotline.)

The completed PMN form (EPA Form 7710–25) will remain the basis for all information needed to complete review of the new chemical under section 5 of TSCA. The completed PMN form and the SNAP addendum together will comprise the data submission for section 612 review and listing decisions for new chemicals. This approach is intended to minimize the reporting burden on submitters.

The Agency will modify the PMN Instructions Manual to provide more explicit direction on how to complete the SNAP addendum. A SNAP submitter may also consult the SNAP Guidance Manual, which is available from the Stratospheric Ozone Protection Hotline. Any questions regarding the completion of these forms can be directed to either the PMN Pre-notice Coordinator or the SNAP program.

b. *Submission of completed forms.* Both the PMN and SNAP programs have a review period of 90 days, subject to suspensions and extensions described in section VII.A. for the SNAP program and in the PMN final rule (40 CFR 720.75). To ensure that new chemical submissions are reviewed and decided on jointly, the Agency encourages submitters to provide both the PMN form and SNAP addendum to the PMN and SNAP coordinators. Failure to provide both programs with the requested information at the same time

could result in delays in the review of a submitter's notice seeking acceptance of a new chemical as a class I or II substitute concurrent with review under the PMN program.

c. *Procedures for handling confidential business information.* The Agency recognizes that, where appropriate, information submitted to the PMN and SNAP programs may need to be held confidential. EPA has determined that all CBI submitted as part of the joint PMN/SNAP review should be maintained and treated in a manner consistent with TSCA security procedures. Confidentiality claims will be processed and reviewed in a manner consistent with 40 CFR part 2, subpart B. This approach was selected because the majority of data provided to SNAP under the joint review process will come from the PMN form. Submitters should note that while TSCA and CAA may have different language describing CBI handling procedures, there is no substantive difference in how CBI is maintained under the two statutes.

3. Agency Review of New Substitutes under PMN and SNAP

a. *Preparation of public docket and Federal Register notices.* Once the letter of receipt has been issued, the PMN program will prepare a public docket and **Federal Register** notice, as described in the final rule for the PMN program (40 CFR 720.75). The PMN program manager will consult with the SNAP program in preparing the notice.

b. *Joint review process.* EPA will complete joint evaluations of new chemicals serving as class I or II substitutes under section 5 of TSCA and section 612 of the CAA. This joint review process will be coordinated to ensure that there is consistency in the final decisions made under the PMN and SNAP programs. To ensure agreement in the decisions, EPA offices will work in concert to develop toxicity, exposure, and risk profiles for those substitutes and applications that come under joint TSCA and CAA review authority. The Agency will also coordinate its review of the completeness of the information supplied and any subsequent data requests to minimize the reporting burden on the submitter. Submitters should note that Agency decisions to restrict production of particular chemicals under TSCA will, in the case of joint PMN/SNAP applications, also have the effect of restricting production of substitutes undergoing review under the SNAP program. However, companies that produce substitutes only being reviewed under the SNAP program are not required to cease production during the SNAP review period in the case of existing substitutes, and in the case of new substitutes, manufacturers may introduce the substitute into interstate commerce 90 days after submitting their complete notification to EPA.

As part of the review, the PMN and SNAP programs will work to arrive at a consistent decision regarding the new chemical under review. Consequently, listing decisions under SNAP will reference any conditions also incorporated into the PMN review (e.g., submission of additional toxicity information, restrictions on use, etc.).

If a substitute meets the conditions for general PMN approval but not for SNAP acceptability, the company may produce and market the substance in question once the 90-day period has elapsed. However, EPA will commence a rulemaking to prohibit the use of the substitute as a class I or II substitute. If the chemical fails to meet the conditions for PMN approval, the submitter is barred from producing the chemical and consequently is effectively barred from marketing the product as a substitute for a class I or II compound. Submitters should note, however, that CAA section 612 places considerable emphasis on identifying and promoting the use of substitutes which, relative to others, reduce overall risks to human health and the environment. To the extent a substitute offers such risk reduction, EPA will make every effort to facilitate production and use of that alternative.

c. *Communication of decision.* The PMN program will use the existing TSCA regulatory framework for communicating decisions on the new substitute to the submitter. The SNAP program will provide public notice of decisions regarding the acceptability or unacceptability of a substitute following the process described in section VII.A.3.g. EPA will contact the submitter to determine how best to list the substitute under the SNAP program if necessary to protect the confidentiality of the alternative.

C. Joint Review of Substitutes under SNAP and FIFRA

1. Background on Use of Ozone-Depleting Chemicals in Pesticides

Certain pesticides are formulated with class I and II chemicals. Examples include the use of methyl chloroform (1,1,1-trichloroethane) as an inert ingredient, or the use of methyl bromide as an active agent. Pesticide products that contain class I and II compounds must be reformulated as these chemicals are phased out of production pursuant to Clean Air Act section 604. This section describes how the Agency will handle reviews of these changes.

2. Applicability

Any new pesticide or amendment of an existing formulation is already subject to Agency approval under current provisions of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), Public Law 100–460, 100–464 to 100–526, and 100–532. However, as of the effective date of the SNAP program, new pesticides or formulation changes based on class I or class II substitutes will also be subject to review under section 612 of the CAA. These authorities apply in all cases where a manufacturer amends a pesticide product to replace chemicals being phased out under CAA section 602 or 604. Similarly, registrations of new pesticide products will also be subject to SNAP review if the new formula contains chemicals functionally replacing class I or class II compounds which would otherwise have been used in the new pesticide formulation.

3. Review Responsibilities Under FIFRA and CAA/SNAP

In general, review responsibilities for pesticide products under the CAA SNAP program will focus on a substance's ozone depletion and global warming potential. The FIFRA reviews will address factors commonly examined during pesticide amendments and registrations. The two program offices responsible for these reviews will coordinate their efforts at critical junctures and share pertinent data to ensure appropriate technical consideration of the substitute.

4. Data Submission Requirements and Process

a. *Preparation of applications.* The Agency has reviewed the data submission needs for the SNAP and FIFRA pesticide amendment/registration process and found no significant overlap. Because there is so little overlap, the Agency requires that a submitter requesting review under both SNAP and the Office of Pesticide Programs' (OPP) pesticide amendment/registration process submit all information ordinarily required for the OPP process as well as a fully completed SNAP information form. A copy of the FIFRA form should be submitted to OPP, and a copy of the SNAP form should be submitted to the SNAP Coordinator. The SNAP form can be obtained from the SNAP program. For further guidance, SNAP submitters may also consult the SNAP Guidance Manual, which is available from the Stratospheric Ozone Protection Hotline.

If a registrant is submitting an amendment to a product registration under FIFRA that currently contains a class I or II substance, he or she should note in section II ("Amendment Information") of the FIFRA form that the amendment was filed in response to the CAA production phase-out. Similarly, if a registrant is submitting an application for a new pesticide registration that would otherwise have been based on a class I or II compound, he or she should note in Section II of the FIFRA form that the registration includes a class I or II substitute.

The submitter should also identify in Section II both the substitute chemical and the class I or II compound it is replacing. Further, if a registrant is aware that a particular chemical intended for use as a class I or II substitute in a pesticide formulation has already been accepted through earlier SNAP/FIFRA determinations, the registrant should also reference the relevant part of the prior review.

b. *Review of applications.* When the Agency receives the FIFRA application and SNAP submission, it will log each into the relevant tracking systems: the OPP's tracking system for the FIFRA application and the SNAP tracking system for SNAP submissions. If the FIFRA application is identified in section II as a Clean Air Act substitution, the FIFRA program coordinator will contact EPA's SNAP program to ask if the substitute has been the subject of any prior SNAP reviews. If the registrant's substitute is already on the list of unacceptable substitutes, EPA will notify the registrant that the amendment request cannot be granted. If the registrant's substitute is already on the list of acceptable substitutes, EPA will proceed with the standard FIFRA application review. If a chemical substitute is not listed under existing SNAP determinations but is a substitute for an ozone-depleting compound, EPA will inform the registrant that a SNAP review must commence.

5. Communication of Decision

Once EPA review is complete, the Agency will notify the registrant whether the new formulation or proposed formulation change is acceptable. At the same time, the Agency will amend the SNAP determinations to reflect these findings and will publish the revised determinations in the next quarterly **Federal Register** notice. Submitters should note that, because of the shared authority to review substitutes under both SNAP and FIFRA, formulators may not sell amended or new formulations subject to FIFRA until they have received FIFRA approval.

D. Shared Statutory Authority with the Food and Drug Administration

The Federal Food, Drug and Cosmetic Act (FDCA), 21 U.S.C. 321, provides for the safety and effectiveness of drugs and therapeutic devices, the purity and wholesomeness of foods, and the harmlessness of cosmetics. Under this statute, the Food and Drug Administration (FDA) regulates the packaging of food products and incidental additives and requires predistribution clearance of medical devices.

As defined in the FDCA, medical devices can include any devices, diagnostic products, drugs, and drug delivery systems. Devices covered under this jurisdiction are subject to review under the FDCA. Some medical devices and food packaging currently contain class I or II compounds. The Agency has determined that such products are exempt from further review for human health effects under the SNAP program where FDA approval of such effects is required before a product can be introduced into commerce. EPA will rely in its SNAP determination on FDA's conclusions regarding health effects. The Agency believes this exemption is justified because of the higher burden of proof placed on submitters under the FDCA. However, the Agency will continue to evaluate all other environmental effects of the proposed substitute, and will consult with the FDA to determine the appropriate course of action.

VIII. Petitions

A. Background

1. Role of Petitions

Section 612(d) of the CAA explicitly states that "any person may petition the Administrator to add a substance * * * or to remove a substance from either of such (prohibited or safe use) lists." The petition provision serves two principal needs. The first is to permit the appeal of existing Agency determinations under the SNAP program. The second is to provide a mechanism for individuals and organizations to bring to the Agency's attention new information on substitutes that could affect existing listing determinations or result in new ones.

The opportunity for outside parties to comment on existing listing decisions is an important aspect of the petition process. As discussed in the section on notifications, companies that produce substitutes must submit specific data on the substitutes to the Agency for review. However, organizations and private citizens other than those required to submit SNAP notices may have additional information about existing substitutes or information on new substitutes not yet reviewed by the Agency. To ensure that the SNAP determinations are based on the best information on substitutes, it is essential that the Agency offer a means for such information to be incorporated into the SNAP analyses on a continuing basis.

Before individuals, organizations, or companies may initiate legal action against EPA for the purpose of changing the lists of acceptable or unacceptable substitutes, they must first exhaust all administrative remedies for receiving such relief, including remedies like the petition process described in this section.

2. Types of Petitions

Five types of petitions exist:

(1) Petitions to add a substitute not previously reviewed under the SNAP program to the acceptable list;

(2) Petitions to add a substitute not previously reviewed under the SNAP program to the unacceptable list;

(3) Petitions to delete a substitute from the acceptable list and add it to the unacceptable list or to delete a substitute from the unacceptable list and add it to the acceptable list;

(4) Petitions to add or delete use restrictions on an acceptability listing, and

(5) Petitions to grandfather general use of an unacceptable or acceptable subject to narrowed use limits in specified applications substitute.

Petitioners should note that the first type of petition is comparable to completing a SNAP submission, except that the latter is submitted by substitute producers prior to the introduction into interstate commerce of the substitute for a significant new use as a class I or II substitute. The first type of petition, by contrast, would generally be initiated by entities other than the company responsible for producing the substitute. Companies that manufacture, formulate, or use a substitute themselves and want to have their substitutes added to the acceptable list should submit information on the substitute under the 90-day advance notification review program.

3. Basis for Petition

A petitioner may submit a petition for several reasons, including:

- Availability of new information on substitutes or applications not covered in the existing SNAP determinations;

- Requests to extend effective date for existing prohibitions on uses of an unacceptable substitute;
- New technologies or practices that reduce exposures to a substitute previously unacceptable under SNAP due to toxicity concerns; or
- Requests for acceptability subject to narrowed use limits listing for specialized applications within a sector end-use for an unacceptable substitute where no other technologically viable substitute can be found.

All of the above are examples of valid justifications for submitting a petition. Other bases for petitioning the Agency may exist as well, and all petitions with adequate supporting data will receive consideration under the SNAP program.

4. Nature of Response

The Agency will only review and grant or deny petitions based on the sector and end-use application identified in the petition. For example, simply because the Agency ultimately deletes a substitute from the list of acceptable substitutes for a particular end-use in the solvents cleaning sector does not mean the substitute is unacceptable for any specific end-use as a refrigerant. A similar caveat applies for petitions on applications within a sector. If a substitute, for instance, is found acceptable for a specific end-use within an application, it will not automatically be deemed acceptable for any other end-use in that sector.

B. Content of the Petition

The Agency requires the following information: A brief statement describing the type of petition, substitute, sector and end-uses to which it applies; and a brief summary of the basis for the petition and the data that support the petition. As with SNAP submissions, the Agency will issue a determination letter on the completeness of the petition to the petitioner within 15 calendar days of its receipt.

Petition types (1) and (2) must contain the information described in section V.B. of this notice, which lists the items to be submitted in a 90-day notification. Information requirements for such petitions and 90-day notifications are the same, since the Agency will be applying the same level of analysis to petitions submitted by outside parties as to notifications received from the producing companies themselves. For petition types (3) and (4), which request a reexamination of a substitute previously reviewed under the SNAP program, the submitter may reference the prior submission rather than submit duplicate information. In this case, the petitioner should provide and submit as appropriate any new or additional data. Petitions to grandfather use of an unacceptable substitute must describe the applicability of the four-part test to judge the appropriateness of Agency grandfathering as described in section VI.B. of this final rule.

C. Sufficiency of Data

Petitioners should be aware that insufficient data may prevent the Agency from reaching a timely decision on whether to grant or deny a petition. EPA will conclude a completeness review of each petition received within fifteen days of receipt of the petition. Within the 15-day period, EPA will inform the petitioner of any additional information needed. If EPA makes no such request, then after the 15-day period is completed, the 90-day review period will automatically commence. If EPA does request any additional data, the 90-day period shall not commence until the additional data are received and themselves reviewed for completeness.

As provided in section 612(d), any petition must "include a showing by the petitioner that there are data on the substance adequate to support the petition." Petitioners may provide citations to scientific literature, where appropriate. However, submitters are advised that furnishing copies of supporting articles, reports, or letters will expedite the review process.

If the Agency receives a petition with insufficient data, EPA will not commence review until the petitioner submits the missing information to the best of the petitioner's ability. EPA will inform the petitioner when the petition is complete for purposes of initiating the 90-day review period. To the extent the petitioner does not have the required information, EPA may also seek data from sources other than the petitioner, including manufacturers or users of products that contain the substitute. In such cases, section 612(d) explicitly provides that "the Administrator shall use any authority available to the Administrator, under any law administered by the Administrator, to acquire such information." These authorities include section 114 of the CAA as well as information collection provisions of other environmental statutes. Where EPA cannot obtain sufficient data within the statutory 90-day review period, the Agency may deny the petition for lack of adequate technical support.

D. Criteria for Evaluating Petitions

In evaluating petitions, the Agency will follow the same criteria as for review of the SNAP Information Notice which notifies EPA of the intent to introduce a substitute into interstate commerce. This will ensure that both petitions and notifications are judged by the same standards.

E. Petition Review Process

1. Petition Submittal

This final rule describes a generic petition process. Petitions should be sent to the docket number listed in the beginning of this final rule as well as to the SNAP Coordinator.

2. Petition Reviews

When the Agency receives a petition, it will log the petition into the SNAP tracking system. If the petition concerns a substitute previously either found acceptable or unacceptable under the SNAP program, the Agency will as a courtesy contact the initial submitter of that substitute.

The Agency will grant or deny the petition within 90 days of receiving a complete application. If the Agency grants a petition to add a substitute to the list of unacceptable substitutes or to remove a substitute from either list, the decision will be made through notice and comment rulemaking. In such cases, the statute requires EPA to propose, take comment on, complete final action, and publish the revised lists within six months of the grant of the petition. Otherwise, responses to petitions, including explanations of petition denials, will be included in the next 3-month **Federal Register** notice updating the SNAP determinations. Regardless of the final determination, the Agency will inform petitioners within 90 days whether their request has been granted or denied.

IX. Listing of Substitutes

A. Overview

This section presents EPA's listing decisions for class I substitutes in the following industrial sectors: Refrigeration and air conditioning, foam blowing, solvents cleaning, fire suppression and explosion protection, sterilants, aerosols, tobacco expansion and adhesives, coatings and inks. Parts D through K below present a detailed discussion of the substitute listing determinations for each of the major use sectors. Tables that summarize listing decisions in this section are included in appendix B. Listings of substitutes within the pesticides sector will be added in future notices, as information on these substitutes becomes available to the Agency. This final rule focuses on substitutes for class I substances, given the accelerated production phaseout

schedule for class I substances. One of the goals of SNAP is to encourage transition away from class I substances as rapidly as possible. SNAP will begin analyzing alternatives to class II substances in the near future. Results of these analyses will appear in quarterly updates to the SNAP lists, which will be published in the **Federal Register** as described in Sections III.C.4. and VII.A.3.g. of this final rule.

To develop the lists of unacceptable and acceptable substitutes, EPA conducted screens of health and environmental risks posed by various substitutes for class I compounds in each use sector. These screens are presented in individual background documents entitled "Risk Screen on the Use of Substitutes for Class I Ozone-Depleting Substances" for each use sector. These background documents are available for review in the public docket supporting this rulemaking. Whenever the initial risk screen indicated a potential risk, the substitute was evaluated further to ascertain whether the potential risk was accurately estimated and if management controls could reduce any risk to acceptable levels.

Based on these analyses, EPA classified as unacceptable only uses of substitutes that pose significantly higher human health and environmental risks than those risks that would accrue through either continued use of the class I substances themselves or through use of other available substitutes.

The assessments presented in the background documents are screens of the comparative risks posed by use of substitutes, not assessments or rankings of the absolute risks associated with use of each substitute. Designating a substitute as acceptable does not imply the absence of risks for that substitute, but rather that the substitute in question is believed to present lower overall risks than both the class I compound it is replacing and other substitutes available for the same end-use. For instance, in some cases, ozone-depleting substances can be replaced by chemicals with known toxicity or ability to contribute to ground-level ozone formation. The Agency's risk screen analyzes these effects, and the SNAP determinations generally describe as acceptable those substitutes for which risks from replacements would be lower on an overall basis compared to risks from other existing alternatives, or for which such risks could be managed by developing and implementing appropriate regulatory controls. Additionally, in cases where the Agency has listed a substitute as unacceptable, it has assessed—as required in section 612—the availability of other substitutes and concluded that alternatives with reduced overall risk are currently or potentially available.

As a rule, the Agency did not evaluate the technical performance of a substitute, since the purpose of the SNAP program is to examine environmental effects of substitutes identified as being of commercial interest regardless of technical acceptability. However, in certain sectors, performance of the substitute does pertain directly to environmental or health effects. For example, in refrigeration, the ability of a refrigerant replacement to serve as a coolant will directly influence the substitute's energy efficiency, which in turn will affect the substitute's environmental effects. Similarly, in fire suppression, the ability of a substitute to put out fires and thereby save human lives will directly affect a substitute's health effects. Further, in the case of narrowed use listings, the Agency's decision to grant or deny a narrowed use petition may hinge on the ability of potential substitutes to meet technical performance criteria. For example, in the case of certain specialized solvents, some substitutes otherwise considered unacceptable may require special consideration because they are the only available substitute offering performance characteristics deemed essential in a certain application. In cases such as these, the SNAP analyses do consider the performance of a substitute as necessary.

EPA's evaluation of each substitute in an end use is based on the following types of information and analyses:

- Atmospheric effects are assessed by predicting ozone depletion and analyzing total global warming potential, including chemical properties relevant to global warming. Ozone depletion is based on market penetration of a substitute and is measured in terms of cumulative Cl_x loadings and its effect in terms of increased incidence of skin cancer cases and skin cancer mortalities. Analysis of total global warming potential includes changes consideration of inherent properties such as atmospheric lifetime and absorption spectra, as measured by the GWP index, and from changes in fossil fuel use due to increases or decreases in energy efficiency resulting from production or use of the substitutes. Atmospheric lifetime is considered as an indicator of the likely persistence of an environmental effect or of the time lag to reverse any known or unknown effect associated with an emission. The model used by the Agency to determine atmospheric effects—the Atmospheric Stabilization Framework model—has been used by the Agency in calculating the benefits from the phase-out of class I substances. The model was peer-reviewed in connection with this earlier analysis.

Although scientific studies have pointed to the possibility of ecological effects due to ozone depletion, such as crop damage, the scope of existing studies is limited and therefore these effects were not part of this analysis.

- Exposure assessments are used to estimate concentration levels of substitutes to which workers, consumers, the general population, and environmental receptors may be exposed, and over what period of time. These assessments are based on personal monitoring data or area sampling data if available. Otherwise, exposures are assessed using measured or estimated releases as inputs to mathematical models. Exposure assessments may be conducted for many types of releases, including releases in the workplace and in homes, releases to ambient air and surface water, and releases from the management of solid wastes.
- Toxicity data are used to assess the possible health and environmental effects from exposure to the substitutes. If Occupational Safety and Health Administration (OSHA)-approved or EPA-wide health-based criteria such as Permissible Exposure Limits (PELs, for occupational exposure), inhalation reference concentrations (RfCs, for noncarcinogenic effects), or cancer slope factors (for carcinogenic risk) are available for a substitute, exposure information is combined with this toxicity information to explore any basis for concern. Otherwise, toxicity data are used with existing EPA guidelines to develop health-based criteria for interim use in these risk characterizations.
- Flammability is examined as a possible safety concern for workers and consumers. EPA assesses flammability risk using data on flash point and flammability limits (e.g., OSHA flammability/combustibility classifications), data on testing of blends with flammable components, test data on flammability in consumer applications conducted by independent laboratories, and information on flammability risk minimization techniques.
- Some of the substitutes are volatile organic compounds (VOCs), chemicals that increase tropospheric air pollution by contributing to ground-level ozone formation. Local and nationwide increases in VOC loadings from the use of substitutes is also evaluated.

In conducting these assessments, EPA made full use of previous analyses performed by the Agency, including EPA's 1990 interim hazard assessments and supporting documentation. These analyses were modified in some cases to incorporate more recent data, such as data received in public comment on the May 12, 1993 NPRM, or to accommodate different analytical approaches as needed. Finally, these analyses assume that the regulated community complies with applicable requirements of other statutes and regulations administered by EPA (e.g., recycling requirements promulgated under the CAA) and other Federal agencies (e.g., any occupational exposure limits set by OSHA).

Acceptable substitutes within specific use sectors may be listed as hazardous wastes or, because of flammability, corrosivity, reactivity or toxicity characteristics, must be managed as hazardous wastes. The regulatory status of three chlorinated hydrocarbons (trichloroethylene, methylene chloride, perchloroethylene) which could serve as substitutes for ODCs are highlighted in section IX. of this final rule. However, other chemicals listed as acceptable substitutes are also RCRA-regulated, and the RCRA regulations should be consulted when application of a specific substitute for an ozone-depleting substance is being considered.

Should additional data become available that would help characterize the risks of substitutes, the Agency will incorporate this data into its risk screens. For example, the risk screen does not at present include assessment of the environmental transformation products of substitutes. Research efforts of the Agency in cooperation with the Alternative Fluorocarbons Environmental Acceptability Study (AFEAS) are in progress and are intended to define the chemical, biological and photochemical sinks for these substances in the biosphere. Ultimately, these research activities will contribute to the development of more complete ecological risk assessments for substitutes. However, the Agency generally does not believe that a more detailed characterization of risks would lead to a different listing decision for individual substitutes unless effects are characterized as highly severe, since the critical comparison for policy purposes remains the adverse effects posed by continued use of a class I compound.

The listing of acceptable and unacceptable substitutes under SNAP will continue. Thus, if a company is not yet able to provide the Agency with the information needed to complete a review of a substitute, a review can be completed in the future, when data become available. Once the data are complete, Agency review will begin, as discussed in sections IV. through IX. of this final rule.

B. Format for SNAP Determinations

Sections IX.D. through IX.K. below present the decisions on acceptability of substitutes that EPA has made based on available information and the evaluation criteria (see Section V of this final rule). These sections describe the sector end-uses (e.g., industrial process refrigeration), the substitutes evaluated, the decision (i.e., acceptable or unacceptable) and associated rationale, any conditions for or limitations on the use of a substitute, and any general comments.

In most cases, the end-use descriptions have been written broadly to encompass numerous industrial applications or uses. Based on discussions with industry, the Agency felt that this approach was preferable to listing substitutes by narrowly-defined applications, which would increase needlessly the number of SNAP notices that would be received by the Agency. The objective of section 612 is to ensure that replacement of class I and II substances with available substitutes will reduce adverse effects on human health and the environment. In general, the Agency can look at exposures from very broad classifications of use (e.g., metals cleaning) and perform the screening analysis to ensure that this statutory objective is being met. It is not necessary or helpful, for example, to list acceptable substitutes by each specific type of metal being cleaned in the solvents cleaning sector. This is especially true when conservative assumptions used in the screening analysis demonstrate the acceptability of an alternative in a wide range of end-uses. Where possible, the substitutes presented in sections D. through K. have been identified by their chemical name. Generally speaking, EPA has not listed substitutes by product or company name in order to avoid implied endorsement of one substitute over another. However, there are two circumstances in which specific chemical names have not been included. First, where proprietary blends have been identified as substitutes, the Agency has worked with the manufacturers to identify generic ways in which the substitute could be listed. Before a user invests in a substitute in these categories, they may wish to contact the SNAP program to confirm that the specific substitute they intend to use has been reviewed and found acceptable by EPA. EPA believes that if a potential user identifies the substitute by a product name that EPA has on record, but was not included on the list for the reasons stated above, EPA can confirm the listing of the substitute without violating safeguards important to protect any proprietary business information provided in confidence to the Agency.

The second situation in which EPA does not anticipate listing specific chemicals arises in the solvents cleaning sector, primarily for aqueous and semi-aqueous cleaners. In this area, numerous cleaning formulations exist and are comprised of a wide variety of chemicals. As discussed in the section below on solvents cleaning alternatives (see section IX.F.), the Agency performed its screening assessment by identifying representative chemicals. These were then used to screen a wide variety of chemicals grouped into categories of solvent-cleaning constituents (e.g., saponifiers, surfactants, etc.). Information on these chemicals presented in the risk screen was used as a basis for determining that aqueous and semi-aqueous cleaners present lower risk than the chemicals they are replacing.

EPA has selected this strategy for listing as acceptable aqueous and semi-aqueous cleaners for several reasons. First, it should minimize the need to submit SNAP notices for blends of compounds that are combinations of the chemicals which have already been approved. Second, it will allow EPA to avoid listing proprietary formulations.

Any conditions for use included in listing decisions are part of the decision to identify a substitute as acceptable. Thus, users would be considered out of compliance if using a substitute listed as acceptable without adhering to the conditions EPA has stipulated for acceptable use of the alternative. Alternatively, where restrictions are set which narrow the acceptable applications within an end-use, a user would be considered out of compliance if using the compound in an end-use application where such use is unacceptable. Conditions, if any, are listed when it is clear that a substitute can only be used safely if certain precautions are maintained. As noted previously, any conditions will be imposed in the listing of substitutes as acceptable through rulemaking.

The comments contained in the table of listing decisions found in summary form in Appendix B provide additional information on a substitute. Since comments are not part of the regulatory decision, they are not mandatory for use of a substitute. Nor should the comments be considered comprehensive

with respect to other legal obligations pertaining to the use of the substitute. However, EPA encourages users of acceptable substitutes to apply any comments in their use of these substitutes. In many instances, the comments simply allude to sound operating practices that have already been identified in existing industry and/or building-code standards. Thus, many of the comments, if adopted, would not require significant changes in existing operating practices for the affected industry.

C. Decisions Universally Applicable

Recently, the Agency has become aware of substitute mixtures that are being marketed as replacements for both class I and II chemicals. In situations where these mixtures are a combination of class I and II chemicals, they may serve as transitional chemicals because they offer environmental advantages in that they have a lower combined ODP than use of a class I compound by itself. However, where EPA has identified a non-ozone depleting alternative that reduces overall risk to human health and the environment, mixtures of class I and II substances shall be unacceptable or subject to use limits.

There have been a few instances in which mixtures of class I and II chemicals have been marketed as replacements for class II chemicals. Because the ODP of such alternatives is clearly higher than the class II substances, the Agency is prohibiting the use of any class I and class II mixture as a replacement for a class II chemical. Where the Agency is aware of specific mixtures falling into this category, they are listed by individual use sector below. The remainder of this section presents the initial listing decisions for each of the following end use sectors:

D. Refrigeration and Air Conditioning
E. Foam Blowing
F. Solvents Cleaning
G. Fire Suppression and Explosion Protection
H. Sterilants
I. Aerosols
J. Tobacco Expansion
K. Adhesives, Coatings and Inks

D. Refrigeration and Air Conditioning

1. Overview

The refrigeration and air conditioning sector includes all uses of Class I and Class II substances to transfer heat. Most end-uses in this sector involve mechanically moving heat from a cool region to a warmer one. For example, a car's air conditioner moves heat from the cooled interior to the hot ambient air.

This sector also includes heat transfer end-uses, i.e. those uses of Class I and Class II substances to move heat from a warm region to a cool one. For example, CFC–114 is currently used to remove excess heat from a very hot uranium enrichment process to cooler ambient air. Hence, the process requires no additional energy, and does not create refrigeration by mechanical means.

Mechanical systems generally use a vapor compression cycle. However, several alternative cycles have been used for decades; these and other alternatives are being re-examined in light of the phaseout of commonly used CFC-based refrigerants in 1996. Substitutes reviewed under SNAP may use alternative cycles; review is not restricted solely to applications based on replacing the working fluid in vapor compression equipment. Similarly, simple heat transfer end-uses will also be included.

The refrigeration and air conditioning sector is divided into the following end-uses:

- Commercial comfort air conditioning;
- Industrial process refrigeration systems;
- Industrial process air conditioning;
- Ice skating rinks;
- Uranium isotope separation processing;
- Cold storage warehouses;
- Refrigerated transport;
- Retail food refrigeration;
- Vending machines;
- Water coolers;
- Commercial ice machines;
- Household refrigerators;
- Household freezers;
- Residential dehumidifiers;
- Motor vehicle air conditioning;
- Residential air conditioning and heat pumps; and
- Heat transfer.

EPA has not necessarily reviewed substitutes in every end-use.

The following discussion provides some distinctions among the various end-uses in the refrigeration and air conditioning sector.

a. *Chillers.* CFCs are used in several different types of mechanical commercial comfort air conditioning systems, known as chillers. These chillers cool water, which is then circulated through a building. They can be classified by compressor type, including centrifugal, reciprocating, scroll, screw, and rotary. The selection of a particular compressor type generally depends on the cooling capacity required. Reciprocating and scroll compressors are used in small capacity applications (less than 200 tons), screw compressors are used in medium capacity applications (50 to 400 tons), and centrifugal compressors are used in large capacity applications (greater than 300 tons). The majority of the chillers used in the United States are centrifugal chillers. Chillers have a lifetime of 23 to 40 years. EPA anticipates that over time, existing cooling capacity will be either retrofitted or replaced by systems using non-CFC refrigerants in a vapor compression cycle or by alternative technologies.

b. *Industrial process refrigeration systems.* Many industrial applications require cooling of process streams. These applications include systems designed to operate in a wide temperature range. Included within this category are industrial ice machines and ice rinks. The choice of substitute for specific applications depends on ambient and required operating temperatures and pressures.

c. *Ice skating rinks.* Skating rinks frequently use secondary refrigeration loops. They are used by the general public for recreational purposes.

d. *Industrial process air conditioning.* Ambient temperatures near 200 degrees Fahrenheit and corrosive conditions make this application distinct from commercial and residential air conditioning. Units in this end-use provide comfort cooling for operators and protect process equipment.

e. *Uranium isotope separation processing.* This end-use includes operation of a heat transfer cycle to cool uranium isotope separation processing. Substitutes must meet an extremely rigorous set of criteria to be applicable in this end-use.

f. *Cold storage warehouses.* Cold storage warehouses are used to store meat, produce, dairy products and other perishable goods. The majority of cold storage warehouses in the United States use ammonia as the refrigerant in a vapor compression cycle.

g. *Refrigerated transport.* Refrigerated transport moves products from one place and climatic condition to another, and include refrigerated ship holds, truck trailers, railway freight cars, and other shipping containers. Refrigerated transport systems are affected by a number of inherent complications not found with other refrigeration and air conditioning end-uses. In route, the refrigerated units may be subject to a broad range of ambient temperatures. Engine-driven transport units suffer power interruptions when either the unit or the vehicle is out of use for brief periods of time (e.g., loading and unloading and fuel stops). Refrigerated units are designed to provide the maximum amount of space available for

containment of the product to be transported. Refrigerated transport equipment must be versatile to allow for the different temperature requirements for the different products (e.g., ice cream versus fresh produce) which may be transported.

h. *Retail Food Refrigeration.* This end-use includes all cold storage cases designed to chill food for commercial sale. Equipment in this end-use is generally designed for two temperature regimes: Low temperature cases operating below freezing and medium temperature units merely chilling food. In addition to grocery cases, the end-use includes convenience store reach-in cases and restaurant walk-in refrigerators. Icemakers in these locations are discussed under commercial ice machines.

i. *Vending machines.* Vending machines are self-contained units which dispense goods that must be kept cold or frozen. Like equipment in other end-uses, the choice of substitute will strongly depend on ambient conditions and the required operating temperature.

j. *Water coolers.* Water coolers are also self-contained and provide chilled water for drinking. They may or may not feature detachable containers of water.

k. *Commercial ice machines.* These units are used in commercial establishments to produce ice for consumer use, e.g., in hotels, restaurants, and convenience stores. Thus, the cleanliness of the ice is important. In addition, the machines are typically smaller in size than industrial equipment. Commercial ice machines are typically connected to a building's water supply.

l. *Household refrigerators.* Household refrigerators are intended primarily for residential use, although they may be used outside the home. Approximately 159 million units exist in the U.S., where the average residential refrigerator is an 18.4 ft^3 automatic defrost unit with a top mounted freezer. Cooling is provided by a conventional single evaporator unit in a vapor compression cycle. The evaporator is located in the freezer compartment, and cooling to both compartments is typically achieved by mechanically driven air exchange between the compartments.

m. *Household freezers.* Household freezers only offer storage space at freezing temperatures, unlike household refrigerators. Two model types, upright and chest, provide a wide range of sizes.

n. *Residential dehumidifiers.* Residential dehumidifiers are primarily used to remove water vapor from ambient air for comfort purposes. While air conditioning systems often combine cooling and dehumidification, this application serves only the latter purpose. Since air is cooled as it flows over the evaporator, it loses moisture through condensation. It is then warmed as it passes over the condenser coil. Dehumidifiers actually slightly warm the surrounding air, since the compressor adds heat to the cycle.

o. *Motor vehicle air conditioning.* Motor vehicle air conditioning systems (MVACS) provide comfort cooling for passengers in cars, buses, planes, trains, and other forms of transportation. MVACS pose risks related to widely varying ambient conditions, accidents, do-it-yourself maintenance, and the location of the evaporator inside the passenger compartment. Given the large number of cars in the nation's fleet, and the variety of designs, new substitutes must be used in accordance with established retrofit procedures.

Flammability is a concern in all applications, but the conditions of use and the potential for accidents in this end-use increase the likelihood of a fire. In addition, the number of car owners who perform their own routine maintenance means that more people will be exposed to potential hazards. Current systems are not designed to use flammable refrigerants.

p. *Residential air conditioning and heat pumps.* HCFC–22, a class II substance, is the dominant working fluid in residential air conditioning and heat pumps. This end-use includes both central units and window air conditioners. SNAP will begin analyzing class II substance substitutes in the near future. Results of these analyses will appear in quarterly updates in the **Federal Register**.

q. *Heat transfer.* This end-use includes all cooling systems that rely on convection to remove heat from an area, rather than relying on mechanical refrigeration. There are, generally speaking, two types of systems: Systems with fluid pumps, referred to as recirculating coolers, and those that rely on natural convection currents, referred to as thermosiphons.

2. Substitutes for Refrigerants

Substitutes fall into eight broad categories. Seven of these categories are chemical substitutes generally used in the same cycle as the ozone-depleting substances they replace. They include hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), hydrocarbons, blends of refrigerants, ammonia, perfluorocarbons (PFCs), and chlorine systems. The eighth category includes alternative technologies that generally do not rely on vapor compression cycles.

a. *Hydrochlorofluorocarbons (HCFCs).* EPA believes that hydrochlorofluorocarbons have an important role to play as transitional refrigerants. HCFCs are chemically similar to CFCs except that they contain hydrogen in addition to chlorine and fluorine. Because their thermophysical properties are, in many cases, similar to CFCs, equipment designed to use CFCs can often be retrofitted to operate with HCFCs. In addition, new equipment can be designed specifically for these compounds.

HCFCs contribute to the destruction of stratospheric ozone, but to a much lesser extent than CFCs. Use of HCFCs as transitional refrigerants will allow industry to move away from CFCs more rapidly and, therefore, will offer significant environmental and health benefits over the continued use of CFCs. Because they contain hydrogen, the HCFCs break down more easily in the atmosphere than do CFCs, and therefore have lower ODPs. Their global warming potentials are also lower than those for the CFCs. Production of HCFCs is controlled under the international agreement set forth in the Montreal Protocol, which is being implemented in the U.S. through the Clean Air Act. HCFCs were initially scheduled to be phased out by 2030. As a result of growing evidence indicating greater risks of ozone depletion, however, the international community agreed in Copenhagen in November 1992 to accelerate the phaseout of the ozone-depleting compounds, including HCFCs. As a result, EPA published an accelerated phaseout of HCFCs on December 10, 1993 (58 FR 65018). The proposed accelerated schedule places production and consumption limits on the most potent ozone-depleting HCFCs first, with the production of HCFCs with lower ozone depletion potentials (ODPs) permitted over a longer period of time. There are clear environmental and health benefits to be gained by allowing near-term use of HCFCs until substitutes with zero ODP are developed.

b. *Hydrofluorocarbons (HFCs).* Hydrofluorocarbons do not contain chlorine and do not contribute to destruction of stratospheric ozone. However, some HFCs do have significant global warming potentials (GWPs). Although a few HFCs have been in use for some time, the potential for HFCs as a replacement for CFCs has grown rapidly over the last several years. EPA is concerned that rapid expansion of the use of some HFCs could contribute to global warming. Nonetheless, HFCs as a class offer lower overall risk than continued use of CFCs,

as well as a near-term option for moving away from CFCs.

c. *Hydrocarbons.* Hydrocarbons do not contain chlorine or bromine; they therefore also have zero ODP. Hydrocarbons degrade in the lower atmosphere, contributing to ground-level pollution such as smog, but they do not contribute directly to global warming. Propane, ethane, propylene, and to some extent butane are used as refrigerants in specialized industrial applications, primarily in oil refineries and chemical plants, where they are frequently available as part of the process stream and where their use contributes only a slight increment to the overall risk of fire or explosion. Because of the overall risks, these systems are designed to meet rigid requirements for reliability, durability, and safety.

Hydrocarbon refrigerants are also used in some home appliances. In general, they are effective refrigerants and may provide some gains in efficiency over CFCs. EPA believes refrigeration end-uses may exist for this class of compounds, but such determinations will require analysis of appropriate controls to address the risk of fire.

d. *Blends.* Blends of refrigerants offer significant opportunities for alternatives to class I substances. The number of single-substance substitutes is limited; combinations greatly expand the number of possible refrigerants. By varying the concentrations of the constituents, manufacturers may design blends for specific end-uses.

Blends generally fall into two categories: azeotropes and zeotropes. Azeotropes behave like single refrigerants under normal conditions. They boil and condense at constant temperature and do not change composition across a phase change. Zeotropes, however, exhibit temperature glide, meaning that as the refrigerant flows across a heat exchanger, the temperature changes in response to differential boiling or condensing of different constituents in the blend. Known as fractionation, this process may pose additional risks if any of the blend's components are flammable, even if the blend as formulated is not. On the other hand, equipment designed to take advantage of zeotropic blends may reap energy efficiency gains. EPA expects blends to play an important role in the transition away from ODSs.

In some cases, the specific components of blends, as well as their proportions, are confidential business information; in others, only the proportions are confidential. With respect to both types of blends, however, listings in this final rule and in future updates will refer to only those blends which have been submitted for review. Although several companies may submit blends with the same components, only those compositions specifically reviewed under SNAP will be listed as acceptable. ASHRAE has issued numerical designations for many blends. All blends will be assigned a generic name for use in public notices. Substitutes that were included in the proposed rule will retain the same generic names, but the listing will include any available ASHRAE designations. Blends submitted since the proposed rule will be listed using the ASHRAE designation when available. If ASHRAE has not issued its designation, they will be assigned new names. In most cases, the discussion in the listings will include the blends' components. Blends that contain HCFCs will be labeled "HCFC Blend Alpha", "HCFC Blend Beta", etc. This designation is intended to ease identification of blends which must be handled in accordance with other regulations described below. Blends that have zero ODP will be given similar names that describe their major components. An information sheet listing the trade names and manufacturers of the blends, along with a vendor list, may be obtained by contacting the SNAP refrigerants sector expert.

e. *Ammonia.* Ammonia has been used as a medium to low temperature refrigerant in vapor compression cycles for more than 100 years. Ammonia has excellent refrigerant properties, a characteristic pungent odor, no long-term atmospheric risks, and low cost. It is, however, moderately flammable and toxic, although it is not a cumulative poison. OSHA standards specify a 15 minute short-term exposure limit of 35 ppm for ammonia.

Ammonia is used as the refrigerant in meat packing, chicken processing, dairy, frozen juice, brewery, cold storage, and other food processing and industrial applications. It is also widely used to refrigerate holds in fishing vessels. Some absorption refrigeration and air conditioning systems use ammonia as well.

f. *Perfluorocarbons.* Unlike CFCs, HCFCs or HFCs, perfluorocarbons (PFCs) are fully fluorinated compounds. The principal environmental characteristic of concern for these compounds is that they have extremely long atmospheric lifetimes, often orders of magnitude longer than those of the CFCs. These long lifetimes cause the PFCs to have very high global warming potentials. Technology for containment and recycling of PFCs is commercially available and is recommended by manufacturers to offset any possible adverse environmental effects.

One advantage of the PFCs is that, like HFCs, they do not contribute to ozone depletion. In addition, these chemicals are nonflammable and exhibit low toxicity, and they are not subject to federal regulations concerning volatile organic compounds (VOCs), since they do not contribute to ground-level ozone formation.

The Agency anticipates that in widespread use, these compounds pose higher overall risk compared to other available alternatives because of their relatively long lifetimes and associated high GWPs. Because of these concerns, the Agency has found acceptable only certain narrowly defined uses of perfluorinated compounds, prohibiting their use where other alternatives with lower overall risk are available. EPA has described these limited acceptable uses as specifically as possible. Further, users should be aware that, because of the environmental concerns detailed above, any proposed uses of PFCs outside those described in this final rule should be submitted for future review under SNAP.

g. *Chlorine.* Chlorine was listed in the proposed regulation as an alternative refrigerant in chlorine liquefaction, a processing step in the manufacture of the chemical. When chilled below its boiling point, chlorine can be stored as a liquid at atmospheric pressure, a method that for safety reasons is preferable to storing the chemical as a pressured gas at ambient temperatures. Although the refrigeration system will generally be physically separate from the actual chlorine process stream, compatibility of the refrigerant with liquid chlorine is critical because of chlorine's high reactivity. CFC–12 has been widely used because it does not react with chlorine.

Systems using chlorine as a refrigerant require specialized compressors designed to resist chemical attack by liquid and gaseous chlorine. EPA has determined that chlorine can be safely used in refrigeration systems associated with chlorine-containing industrial process streams. Such systems must be designed and operated with the same safety considerations that apply to the process stream. In particular, OSHA regulates this use under its standard for Process Safety Management of Highly Hazardous Chemicals (29 CFR 1910.119).

h. *Alternative technologies.* Several technologies already exist as alternatives to equipment using class I substances. As a result of the CFC

phaseout, they are gaining prominence in the transition away from CFCs. Examples of these technologies include evaporative cooling, desiccant cooling, and absorption refrigeration and air conditioning. In addition, several technologies are currently under development. Significant progress has expanded the applicability of these alternatives, and their environmental benefits generally include zero ODP and low direct GWP. In addition, evaporative cooling offers significant energy savings, which results in reduced indirect GWP.

3. Comment Response

a. *Comments on acceptable substitutes.* A commenter opposed listing the use of HCFC–123 as acceptable because of toxicity concerns. EPA has conducted worker exposure studies which indicate that exposure can be limited to 1 ppm, substantially below the industry-established acceptable exposure limit (AEL) of 30 ppm. Based on these studies, EPA remains confident that HCFC–123 can be used safely when standard industrial hygiene practices are followed. It is important to note, too, that the AEL is a long-term exposure limit. Safety measures to limit short-term exposures are important for all refrigerants.

Another commenter informed EPA that chlorine-based refrigeration systems are generally physically separated from chlorine-containing process streams. This separation invalidates the analogy to hydrocarbon-based systems for industrial process refrigeration. Hence, EPA's final determination that chlorine is acceptable for this end-use includes the acknowledgement of OSHA standards dictating safety considerations in the design and operation of such systems.

b. *Other comments.* Several commenters requested additional end-use categories, while others requested greater aggregation. Some aggregation is necessary to minimize confusion and the analysis of small differences among similar applications. Yet EPA also recognizes that certain end-uses are fundamentally different from others. In the NPRM, EPA identified major end-uses within the refrigeration and air conditioning sector. For purposes of the final rule, EPA is reluctant to change the end-use categories from those listed in the proposed rule. Retaining the original end-uses serves the goal of creating the certainty needed to encourage transition away from ozone-depleting substances.

However, this final rule does combine substitute listings for various refrigerants within each end-use. For example, industrial process refrigeration now includes substitutes for CFC–11, CFC–12, and R–502. The risk screens conducted by EPA analyzed the use of substitutes within an end-use; the chemical being replaced was usually not relevant to the analysis. Because it may be important to distinguish among substitutes for certain substances if they exhibit significantly different operational characteristics, such as condensing pressure or typical ambient conditions, the listings do not combine centrifugal chillers into one end-use. Rather, retrofitted CFC–11, CFC–12, CFC–113, and CFC–114 chillers remain separate.

A commenter proposed that all blends consisting of individually acceptable components be deemed acceptable. EPA believes that blends pose analytical difficulties not encountered with single refrigerants. Blends, unlike single compounds, have the potential to separate into components during normal use and during leaks. This process is called fractionation, and it is caused by differences in vapor pressure among the constituents.

For example, as a zeotropic blend enters the evaporator, it is a liquid until it absorbs enough heat to reach the boiling point of the component with the highest vapor pressure. As this portion boils away, the remaining components will have a higher overall boiling point, and the temperature will rise until the second component begins to vaporize. This process may continue until all the refrigerant is in vapor phase, or some may remain a liquid even at the exit from the evaporator. Azeotropes and near-azeotropes, however, exhibit small changes in temperature in these two-phase parts of the system, and do not undergo significant composition changes during normal use.

During normal operation, pressure across the condenser and evaporator remains relatively constant. During a leak, however, system pressure decreases. In addition, the refrigerant is exposed to ambient temperatures. As a result, fractionation is possible during a leak when both vapor and liquid are present, even for azeotropes.

As with all substitutes, flammability and materials compatibility testing are necessary for blends. For azeotropes, these data are necessary for the single composition during normal operation. For zeotropes, such testing is necessary at all compositions occurring during normal operation. In addition, such tests should be conducted during multi-phase leaks for all blends to determine the extent and effects of fractionation. Even if the blend is nonflammable as formulated, enrichment of a flammable component through fractionation could result in a flammable mixture. In addition, materials compatible with the blend as formulated may not retain that compatibility if fractionation results in a substantially different composition. Therefore, EPA believes it is not appropriate to automatically find all blends of acceptable components also acceptable. Only specific compositions will be designated acceptable, as described earlier.

Several commenters believed EPA was unclear in its distinctions between new and retrofit substitutes. In response, EPA has clarified this difference in this final rule. A tension exists between deeming substitutes acceptable for as wide a range of end-uses as possible and providing some guidance to users on effective substitutes.

Several commenters suggested duplicating listings for retrofits and new equipment, but that duplication does not always serve the goal of disseminating information about viable substitutes. Certain substances may not be attractive for long-term use because they contain HCFCs, and thus may only be listed for retrofits. Alternatively, substitutes may not be easily implemented as a retrofit. It should be noted, however, that an acceptability determination for use in new equipment or as a retrofit option does not imply that the alternative is unacceptable for use in the other category.

The retrofit category within each end-use refers to the use of substitutes with some modification to existing equipment but without changing every component. Generally speaking, retrofit refrigerants will not require completely new systems or redesign. Drop-in replacements require minimal retrofitting, as in cases where only the refrigerant needs to be replaced.

The new equipment category within each end-use refers to the use of substitutes in entirely new systems. No existing components will be used. This designation may be used for refrigerants which may require significant design changes. For example, use of a flammable substitute may require some design changes to mitigate potential risk. Submitters must demonstrate how those risks can be addressed in new designs. In addition, alternative technologies often require entirely different systems. For example, evaporative cooling does not use a vapor compression cycle, and therefore cannot be used as a retrofit option.

For purposes of submissions, the retrofit and new use categories should be considered separate end-uses and listed separately on the submission form.

4. Listing Decisions

a. *Acceptable substitutes.* These determinations are based on data submitted to EPA and on the risk screen described in the draft background document entitled "Risk Screen on the Use of Substitutes for Class I Ozone-Depleting Substances: Refrigerants". In accordance with the guiding principles for SNAP, substitutes were compared both to the substance they replace and to each other.

EPA believes the use of all acceptable substitutes presents lower overall risk than the continued use of an ozone-depleting substance. Not all substitutes will necessarily be appropriate choices for all systems within an end-use. Engineering decisions must take into account factors such as operating temperatures and pressures, ambient conditions, and age of equipment, especially during retrofits. For example, under industrial process refrigeration, both HFC–134a and HCFC–22 are listed as acceptable for retrofits. However, these substances exhibit significantly different thermodynamic characteristics, and both may not be appropriate for use within a given system. EPA believes such decisions are most appropriately made by the equipment owner, manager, or contractor.

Users of HCFCs should be aware that an acceptability determination shall not be construed to release any user from compliance with all other regulations pertaining to class II substances. These include: (a) The prohibition against venting during servicing under section 608, which was effective July 1, 1992; (b) recycling requirements under section 608, which were effective July 13, 1993; (c) section 609 regulations regarding MVACS which were effective August 13, 1992; and (d) the revised production phaseout of class II substances under section 606, which was published on December 10, 1993. In addition, users of non-chlorine refrigerants should be aware that an acceptability determination shall not be construed to release any user from conformance with the venting prohibition under section 608(c)(2), which takes effect November 15, 1995, at the latest.

Substitutes are listed as acceptable by end-use. These substitutes have only been found acceptable for use in the specific end-uses for which they have been reviewed, as described in this section. Users of blends should be aware that EPA has evaluated and found acceptable in each case only the specific percentage composition submitted for review; no others have been evaluated. EPA strongly recommends that users of alternative refrigerants adhere to the provisions of ASHRAE Standard 15—Safety Code for Mechanical Refrigeration. ASHRAE Standard 34—Number Designation and Safety Classification of Refrigerants is a useful reference on refrigerant numerical designations. Users are also strongly encouraged to contain, recycle, or reclaim all refrigerants.

(1) *CFC–11 Centrifugal Chillers, Retrofit.* (a) *HCFC–123.* HCFC–123 is acceptable as a substitute for CFC–11 in retrofitted centrifugal chillers. Because HCFC–123 contributes to ozone depletion, it is considered a transitional alternative. Since it poses much lower ozone-depleting risk than continued use of CFCs, EPA has determined that its use is acceptable for these end-uses. In addition, HCFC–123's GWP and atmospheric lifetime are significantly lower than almost any other alternatives. HCFC–123 is not flammable. Since HCFC–123 is classified as a B1 refrigerant pursuant to ASHRAE standard 34, ASHRAE requires that a refrigerant vapor detector be placed in the machinery room. EPA strongly recommends that users of HCFC–123 adhere to this requirement and any other requirements provided in ASHRAE Standards 15 and 34. Worker-monitoring studies conducted by EPA demonstrate that HCFC–123's 8-hour time-weighted average concentration can be maintained at or under 1 ppm (less than the industry-established AEL of 30 ppm), provided that such standards are followed.

(2) *CFC–12 Centrifugal Chillers, Retrofit.* (a) *HFC–134a.* HFC–134a is acceptable as a substitute for CFC–12 in retrofitted centrifugal chillers. HFC–134a does not contribute to ozone depletion. HFC–134a's GWP and atmospheric lifetime are close to those of other alternatives which are acceptable in this end-use. While HFC–134a is compatible with most existing refrigeration and air conditioning equipment parts, it is not compatible with the mineral oils currently used in such systems. An ester-based lubricant should be used rather than mineral oils.

(3) *CFC–113 Centrifugal Chillers, Retrofit.* No substitutes have been identified for CFC–113 in retrofitted centrifugal chillers.

(4) *CFC–114 Centrifugal Chillers, Retrofit.* (a) *HCFC–124.* HCFC–124 is acceptable as a substitute for CFC–114 in retrofitted centrifugal chillers. Because HCFC–124 contributes to ozone depletion, it is considered a transitional alternative. However, it represents a much lower ozone-depleting risk than the continued use of CFCs. In addition, HCFC–124's GWP and atmospheric lifetime are significantly lower than other alternatives. HCFC–124 is not flammable.

(5) *R–500 Centrifugal Chillers, Retrofit.* (a) *HFC–134a.* HFC–134a is acceptable as a substitute for R–500 in retrofitted centrifugal chillers. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(6) *CFC–11, CFC–12, CFC–113, CFC–114, and R–500 Centrifugal Chillers, New.* (a) *HCFC–123.* HCFC–123 is acceptable as a substitute for CFC–11, CFC–12, CFC–113, CFC–114, and R–500 in new centrifugal chillers. See the discussion on HCFC–123 under retrofitted CFC–11 centrifugal chillers.

(b) *HCFC–124.* HCFC–124 is acceptable as a substitute for CFC–114 in new centrifugal chillers. See the discussion on HCFC–124 under retrofitted CFC–114 centrifugal chillers.

(c) *HCFC–22.* HCFC–22 is acceptable as a substitute for CFC–11, CFC–12, CFC–113, CFC–114, and R–500 in new centrifugal chillers. HCFC–22 has been used in a variety of air conditioning and refrigeration applications for many years. Like HCFC–123, HCFC–22 contributes to ozone depletion and is considered a transitional alternative. HCFC–22 exhibits a higher ODP than HCFC–123, and production of it will be phased out according to the accelerated phase out schedule. HCFC–22's GWP and atmospheric lifetime are higher than other HCFCs. HCFC–22 is not flammable and is it compatible with existing oils used in most refrigeration and air conditioning equipment.

(d) *HFC–134a.* HFC–134a is acceptable as a substitute for CFC–11, CFC–12, CFC–113, CFC–114, and R–500 in new centrifugal chillers. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(e) *HFC–227ea.* HFC–227ea is acceptable as a substitute for CFC–11, CFC–12, CFC–113, CFC–114, and R–500 in new centrifugal chillers. HFC–227ea is a new chemical that has not seen widespread use. It contains no chlorine, so it does not contribute to ozone depletion. HFC–227ea's GWP and atmospheric lifetime are higher than those of other alternatives which are acceptable in this end-use. HFC–227ea is also being investigated as a component of several blends.

(f) *Ammonia.* Ammonia is acceptable as a substitute for CFC–11, CFC–12, CFC–113, CFC–114, and R–500 in new centrifugal chillers. Ammonia does not deplete the ozone or contribute to global warming. Ammonia is flammable and toxic, but it may be used safely if existing OSHA and ASHRAE standards are followed. Users should check local building codes related to the use of ammonia.

(g) *Evaporative cooling.* Evaporative Cooling is acceptable as an alternative technology to centrifugal chillers using CFC–11, CFC–12, CFC–113, CFC–114, or R–500. Evaporative cooling does not contribute to ozone depletion or global warming and has the potential to be more energy efficient than current refrigeration and air conditioning systems. Evaporative cooling uses no chemicals, but relies instead on water evaporation as a means of cooling. It is in widespread use in office buildings in the western U.S. Recent design improvements have greatly expanded its applicability to other regions.

(h) *Desiccant cooling.* Desiccant cooling is acceptable as an alternative technology to centrifugal chillers using CFC–11, CFC–12, CFC–113, CFC–114, or R–500. Desiccant cooling systems do not contribute to ozone depletion or global warming. They offer potential energy savings over the use of CFC–11. Desiccant cooling is an alternate technology to the vapor compression cycle.

(i) *Ammonia/water absorption.* Ammonia/water absorption is acceptable as an alternative technology to centrifugal chillers using CFC–11, CFC–12, CFC–113, CFC–114, or R–500. Ammonia/water absorption is an alternative technology to vapor compression cycles. Ammonia is the refrigerant, and water is the absorber. This alternative has zero ODP and GWP. For information on toxicity, see the discussion of ammonia above. Users should check local building codes related to the use of ammonia.

(j) *Water/lithium bromide absorption.* Water/lithium bromide absorption is acceptable as an alternative technology to centrifugal chillers using CFC–11, CFC–12, CFC–113, CFC–114, or R–500. Some absorption systems use water as the refrigerant and lithium bromide as the absorber. Lithium bromide has zero ODP and GWP. It is low in toxicity and is nonflammable.

(k) *Stirling cycle.* Stirling Cycle systems are acceptable as an alternative technology to centrifugal chillers using CFC–11, CFC–12, CFC–113, CFC–114, or R–500. These systems use a different thermodynamic cycle from vapor compression equipment. Helium is frequently used as the refrigerant. The Stirling cycle does not include a phase change. Heat transfer is accomplished through compression and expansion. These systems have been used for several decades, primarily in refrigerated transport and cryogenics.

(7) *CFC–12 Reciprocating Chillers, Retrofit.* (a) *HFC–134a.* HFC–134a is acceptable as a substitute for CFC–12 in retrofitted reciprocating chillers. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(8) *CFC–12 Reciprocating Chillers, New.* (a) *HCFC–22.* HCFC–22 is acceptable as a substitute for CFC–12 in new reciprocating chillers. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) *HFC–134a.* HFC–134a is acceptable as a substitute for CFC–12 in new reciprocating chillers. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) *HFC–227ea.* HFC–227ea is acceptable as a substitute for CFC–12 in new reciprocating chillers. See the discussion on HFC–227ea under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(d) Evaporative cooling. Evaporative Cooling is acceptable as an alternative technology to reciprocating chillers using CFC–12. See the discussion on evaporative cooling under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(e) Desiccant cooling. Desiccant cooling is acceptable as an alternative technology to reciprocating chillers using CFC–12. See the discussion on desiccant cooling under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(f) Stirling cycle. Stirling Cycle systems are acceptable as an alternative technology to reciprocating chillers using CFC–12. See the discussion on the Stirling cycle under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(9) CFC–11, CFC–12, and R–502 Industrial Process Refrigeration, Retrofit. Please note that different temperature regimes may affect the applicability of substitutes within this end-use.

(a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–11, CFC–12, and R–502 in retrofitted industrial process refrigeration. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–11, CFC–12, and R–502 in retrofitted industrial process refrigeration. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) R–401A and R–401B. R–401A and R–401B, which consist of HCFC–22, HFC–152a, and HCFC–124, are acceptable as substitutes for CFC–11, CFC–12, and R–502 in retrofitted industrial process refrigeration. Two of the constituents in these blends are HCFCs and contribute to ozone depletion, and production of these compounds will be phased out according to the accelerated schedule. While the GWP of HCFC–22 is somewhat high, refrigerant leak regulations should reduce its contribution to global warming. The GWPs of the other components are low. Although these blends do contain one flammable constituent, HFC–152a, the blends themselves are not flammable. In addition, each blend is a near azeotrope, and it does not fractionate in normal operation. Finally, leak testing of each blend demonstrated that while the vapor and liquid compositions changed, neither phase became flammable. Testing of these blends with centrifugal compressors is inadequate, and therefore such use is not recommended by the manufacturer. Further testing may resolve this uncertainty.

(d) R–402A and R–402B. R–402A and R–402B, which consist of HCFC–22, propane, and HFC–125, are acceptable as substitutes for CFC–11, CFC–12, and R–502 in retrofitted industrial process refrigeration. HCFC–22 contributes to ozone depletion, and will be phased out according to the accelerated schedule. Although these blends contain one flammable constituent, propane, the blends themselves are not flammable. In addition, the blends are near azeotropes, meaning they do not change composition between the vapor and the liquid phase. Therefore, it is unlikely that the blends would fractionate during normal operation, resulting in an enrichment of the flammable component. Finally, while testing demonstrated that the vapor and liquid compositions changed during leaks, neither phase became flammable. Testing of these blends with centrifugal compressors is inadequate, and therefore such use is not recommended by the manufacturer. Further testing may resolve this uncertainty.

(e) R–404A. R–404A, which consists of HFC–125 and HFC–143a, is acceptable as a substitute for CFC–11, CFC–12, and R–502 in retrofitted industrial process refrigeration. None of this blend's constituents contains chlorine, and thus this blend poses no threat to stratospheric ozone. However, HFC–125 and HFC–143a have very high GWPs. EPA strongly encourages recycling and reclamation of this blend in order to reduce its direct global warming impact. Although HFC–143a is flammable, the blend is not. It is an azeotrope, so it will not fractionate during operation. Leak testing has demonstrated that its composition never becomes flammable.

(f) R–507. R–507, which consists of HFC–125, HFC–143a, and HFC–134a, is acceptable as a substitute for CFC–11,

CFC–12, and R–502 in retrofitted industrial process refrigeration. None of this blend's constituents contains chlorine, and thus this blend poses no threat to stratospheric ozone. However, HFC–125 and HFC–143a have very high GWPs, and the GWP of HFC–134a is somewhat high. EPA strongly encourages recycling and reclamation of this blend in order to reduce its direct global warming impact. Although HFC–143a is flammable, the blend is not. It is a near azeotrope, so it will not fractionate during operation. Leak testing has demonstrated that its composition never becomes flammable.

(g) Ammonia. Ammonia is acceptable as a substitute for CFC–11, CFC–12, and R–502 in retrofitted industrial process refrigeration. See the discussion on ammonia under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(h) Propane. Propane is acceptable as a substitute for CFC–11, CFC–12, and R–502 in retrofitted industrial process refrigeration equipment. Propane does not contribute to ozone depletion and it exhibits a negligible GWP. Propane is flammable, and as such EPA recommends but does not require that it only be used at industrial facilities which manufacture or use hydrocarbons in the process stream. Such facilities are designed to comply with the safety standards required for managing flammable chemicals.

(i) Propylene. Propylene is acceptable as a substitute for CFC–11, CFC–12, and R–502 in retrofitted industrial process refrigeration. Propylene does not contribute to ozone depletion, nor does it contribute significantly to global warming. Propylene is a flammable refrigerant and as such, EPA recommends but does not require that it only be used at industrial facilities which already manufacture or use hydrocarbons in the process stream. Such facilities are designed to comply with the safety standards required for managing flammable chemicals.

(j) Butane. Butane is acceptable as a substitute for CFC–11, CFC–12, and R–502 in retrofitted industrial process refrigeration. Butane does not contribute to ozone depletion, nor does it contribute significantly to global warming. Butane is a flammable refrigerant and as such, EPA recommends but does not require that it only be used at industrial facilities which already manufacture or use hydrocarbons in the process stream. Such facilities are designed to comply with the safety standards required for managing flammable chemicals.

(k) Hydrocarbon Blend A. Hydrocarbon Blend A is acceptable as a substitute for CFC–11, CFC–12, and R–502 in retrofitted industrial process refrigeration equipment. This blend does not contribute to ozone depletion, nor does it contribute significantly to global warming. This blend contains flammable refrigerants and as such, EPA recommends but does not require that it only be used at industrial facilities which already manufacture or use hydrocarbons in the process stream. Such facilities are designed to comply with the safety standards required for managing flammable chemicals.

(l) Chlorine. Chlorine is acceptable as a substitute for CFC–11, CFC–12, and R–502 in retrofitted industrial process refrigeration equipment. Chlorine is a highly reactive chemical and as such, EPA recommends but does not require that chlorine only be used at industrial facilities which manufacture or use chlorine in the process stream. Note, however, that OSHA's Process Safety Management Standards apply to the use of chlorine.

(10) CFC–11, CFC–12, and R–502 Industrial Process Refrigeration, New. Please note that different temperature regimes may affect the applicability of substitutes within this end-use.

(a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–11, CFC–12, and R–502 in new industrial process refrigeration. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–11, CFC–12, and R–502 in new industrial process refrigeration. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) HFC–227ea. HFC–227ea is acceptable as a substitute for CFC–12 in new industrial process refrigeration. See the discussion on HFC–227ea under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(d) R–402A and R–402B. R–402A and R–402B, which consist of HCFC–22, propane, and HFC–125, are acceptable as substitutes for CFC–11, CFC–12, and R–502 in new industrial process refrigeration. See the discussion on these blends under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(e) R–404A. R–404A, which consists of HFC–125 and HFC–143a, is acceptable as a substitute for CFC–11, CFC–12, and R–502 in new industrial process refrigeration. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(f) R–507. R–507, which consists of HFC–125, HFC–143a, and HFC–134a, is acceptable as a substitute for CFC–11, CFC–12, and R–502 in new industrial process refrigeration. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(g) Ammonia. Ammonia is acceptable as a substitute for CFC–11, CFC–12, and R–502 in new industrial process refrigeration. See the discussion on ammonia under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(h) Propane. Propane is acceptable as a substitute for CFC–11, CFC–12, and R–502 in new industrial process refrigeration equipment. See the discussion on propane under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(i) Propylene. Propylene is acceptable as a substitute for CFC–11, CFC–12, and R–502 in new industrial process refrigeration. See the discussion on propylene under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(j) Butane. Butane is acceptable as a substitute for CFC–11, CFC–12, and R–502 in new industrial process refrigeration. See the discussion on butane under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(k) Hydrocarbon Blend A. Hydrocarbon Blend A is acceptable as a substitute for CFC–11, CFC–12, and R–502 in new industrial process refrigeration equipment. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(l) Chlorine. Chlorine is acceptable as a substitute for CFC–11, CFC–12, and R–502 in new industrial process refrigeration equipment. See the discussion on chlorine under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(m) Evaporative cooling. Evaporative cooling is acceptable as an alternative technology to industrial process refrigeration using CFC–11, CFC–12, or R–502. See the discussion on evaporative cooling under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(n) Desiccant cooling. Desiccant cooling is acceptable as an alternative technology to industrial process refrigeration using CFC–11, CFC–12, or R–502. See the discussion on desiccant cooling under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(o) Nitrogen direct gas expansion. Nitrogen direct gas expansion is acceptable as an alternative technology to industrial process refrigeration using

CFC–12, R–500, or R–502. Nitrogen is expanded within an enclosed area to absorb heat. The cycle is open; the nitrogen is released to the atmosphere after absorbing heat from the container. Nitrogen is a common gas that is nontoxic and nonflammable.

(p) Stirling cycle. Stirling cycle systems are acceptable as an alternative technology to industrial process refrigeration using CFC–11, CFC–12, or R–502. See the discussion on the Stirling cycle under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(11) R–400(60/40) and CFC–114 Industrial Process Air Conditioning, Retrofit. (a) HCFC–124. HCFC–124 is acceptable as a substitute for R–400 (60/40) and CFC–114 in industrial process air conditioning. HCFC–124 has a very low ODP and GWP. HCFC–124 is the only refrigerant that has been submitted for this end-use, and EPA invites more submissions and information related to substitutes.

(12) R–400(60/40) and CFC–114 Industrial Process Air Conditioning, New. (a) HCFC–124. HCFC–124 is acceptable as a substitute for R–400 (60/40) and CFC–114 in industrial process air conditioning. HCFC–124 has a very low ODP and GWP. It is nonflammable. HCFC–124 is the only refrigerant that has been submitted for this end-use, and EPA invites more submissions and information related to substitutes.

(13) CFC–12 and R–502 Ice Skating Rinks, Retrofit. Please note that different temperature regimes may affect the applicability of substitutes within this end-use.

(a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 and R–502 in retrofitted ice skating rinks. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 and R–502 in retrofitted ice skating rinks. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) R–401A and R–401B. R–401A and R–401B, which consist of HCFC–22, HFC–152a, and HCFC–124, are acceptable as substitutes for CFC–12 and R–502 in retrofitted ice skating rinks. See the discussion on these blends under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(d) Ammonia. Ammonia is acceptable as a substitute for CFC–11, CFC–12, and R–502 in retrofitted ice skating rinks. See the discussion on ammonia under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(14) CFC–12 and R–502 Ice Skating Rinks, New. Please note that different temperature regimes may affect the applicability of substitutes within this end-use.

(a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 and R–502 in new ice skating rinks. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 and R–502 in new ice skating rinks. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) Ammonia. Ammonia is acceptable as a substitute for CFC–11, CFC–12, and R–502 in new ice skating rinks. See the discussion on ammonia under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(15) CFC–114 Uranium Isotope Separation Processing, Retrofit. (a) Cycloperfluorobutane (C_4F_8). Cycloperfluorobutane (C_4F_8) is acceptable as a substitute for CFC–114 in uranium isotope separation processing. C_4F_8 is a PFC. It has a very long lifetime and a very high GWP. The Department of Energy (DOE) has examined several other substitutes and none meets the requirements for this application. DOE is pursuing a leak reduction program which should further restrict emissions of this refrigerant.

(b) Perfluoro-n-butane (C_4F_{10}). Perfluoro-n-butane (C_4F_{10}) is acceptable as a substitute for CFC–114 in uranium isotope separation processing. C_4F_{10} is a PFC. It has a very long lifetime and a very high GWP. The Department of Energy (DOE) has examined several other substitutes and none meets the requirements for this application. DOE is pursuing a leak reduction program which should further restrict emissions of this refrigerant.

(c) Perfluoropentane (C_5F_{12}). Perfluoropentane (C_5F_{12}) is acceptable as a substitute for CFC–114 in uranium isotope separation processing. C_5F_{12} is a PFC. It has a very long lifetime and a very high GWP. EPA strongly encourages users to pursue leak reduction strategies and to recover the fluid when the unit is retired.

(d) Perfluorohexane (C_6F_{14}). Perfluorohexane (C_6F_{14}) is acceptable as a substitute for CFC–114 in uranium isotope separation processing. C_6F_{14} is a PFC. It has a very long lifetime and a very high GWP. EPA strongly encourages users to pursue leak reduction strategies and to recover the fluid when the unit is retired.

(e) Perfluoro-n-methyl morpholine ($C_5F_{11}NO$). Perfluoro-n-methly morpholine ($C_5F_{11}NO$) is acceptable as a substitute for CFC–114 in uranium isotope separation processing. $C_5F_{11}NO$ is a PFC. It has a very long lifetime and a very high GWP. EPA strongly encourages users to pursue leak reduction strategies and to recover the fluid when the unit is retired.

(16) CFC–12 and R–502 Cold Storage Warehouses, Retrofit. Please note that different temperature regimes may affect the applicability of substitutes within this end-use.

(a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 and R–502 in retrofitted cold storage warehouses. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 and R–502 in retrofitted cold storage warehouses. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) R–401A and R–401B. R–401A and R–401B, which consist of HCFC–22, HFC–152a, and HCFC–124, are acceptable as substitutes for CFC–12 and R–502 in retrofitted cold storage warehouses. Testing of these blends with centrifugal compressors is inadequate, and therefore such use is not recommended by the manufacturer. Further testing may resolve this uncertainty. For further information, see the discussion on these blends under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(d) R–402A and R–402B. R–402A and R–402B, which consist of HCFC–22, propane, and HFC–125, are acceptable as substitutes for CFC–12 and R–502 in retrofitted cold storage warehouses. Testing of these blends with centrifugal compressors is inadequate, and therefore such use is not recommended by the manufacturer. Further testing may resolve this uncertainty. For further information, see the discussion on these blends under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(e) R–404A. R–404A, which consists of HFC–125 and HFC–143a, is acceptable as a substitute for CFC–12 and R–502 in retrofitted cold storage warehouses. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(f) R–507. R–507, which consists of HFC–125, HFC–143a, and HFC–134a, is acceptable as a substitute for CFC–12 and R–502 in retrofitted cold storage warehouses. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(17) CFC–12 and R–502 Cold Storage Warehouses, New. Please note that different temperature regimes may affect the applicability of substitutes within this end-use.

(a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 and R–502 in new cold storage warehouses. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 and R–502 in new cold storage warehouses. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) HFC–227ea. HFC–227ea is acceptable as a substitute for CFC–12 in new cold storage warehouses. See the discussion on HFC–227ea under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(d) R–402A and R–402B. R–402A and R–402B, which consist of HCFC–22, propane, and HFC–125, are acceptable as substitutes for CFC–12 and R–502 in new cold storage warehouses. Testing of these blends with centrifugal compressors is inadequate, and therefore such use is not recommended by the manufacturer. Further testing may resolve this uncertainty. For further information, see the discussion on these blends under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(e) R–404A. R–404A, which consists of HFC–125 and HFC–143a, is acceptable as a substitute for CFC–12 and R–502 in new cold storage warehouses. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(f) R–507. R–507, which consists of HFC–125, HFC–143a, and HFC–134a, is acceptable as a substitute for CFC–12 and R–502 in new cold storage warehouses. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(g) Ammonia. Ammonia is acceptable as a substitute for CFC–12 and R–502 in new cold storage warehouses. See the discussion on ammonia under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(h) Evaporative cooling. Evaporative cooling is acceptable as an alternative technology to cold storage warehouses using CFC–12 or R–502. See the discussion on evaporative cooling under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(i) Desiccant cooling. Desiccant cooling is acceptable as an alternative technology to cold storage warehouses using CFC–12 or R–502. See the discussion on desiccant cooling under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(j) High to low pressure stepdown. High to low pressure stepdown process is acceptable as an alternative technology to cold storage warehouses using CFC–12 or R–502. This process takes advantage of the work potential of pressurized natural gas. As its pressure is reduced from transmission pipes to the distribution system, the gas cools. This refrigeration is then used to cool a transfer medium such as water, which then cools the refrigerated space. It uses very little energy and produces no global warming emissions, since the gas is not burned.

(k) Stirling cycle. Stirling cycle systems are acceptable as an alternative technology to cold storage warehouses using CFC–12 or R–502. See the discussion on the Stirling cycle under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(18) CFC–12, R–500, and R–502 Refrigerated Transport, Retrofit. Please note that different temperature regimes may affect the applicability of substitutes within this end-use.

(a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12, R–500, and R–502 in retrofitted refrigerated transport. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12, R–500, and R–502 in retrofitted refrigerated transport. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) R–401A and R–401B. R–401A and R–401B, which consist of HCFC–22, HFC–152a, and HCFC–124, are acceptable as substitutes for CFC–12, R–500, and R–502 in retrofitted refrigerated transport. See the discussion on these blends under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(d) R–402A and R–402B. R–402A and R–402B, which consist of HCFC–22, propane, and HFC–125, are acceptable as substitutes for CFC–12, R–500, and R–502 in retrofitted refrigerated transport. See the discussion on these blends under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(e) R–404A. R–404A, which consists of HFC–125 and HFC–143a, is acceptable as a substitute for CFC–12, R–500, and R–502 in retrofitted refrigerated transport. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(f) R–507. R–507, which consists of HFC–125, HFC–143a, and HFC–134a, is acceptable as a substitute for CFC–12, R–500, and R–502 in retrofitted refrigerated transport. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(19) CFC–12 and R–502 Refrigerated Transport, New. Please note that different temperature regimes may affect the applicability of substitutes within this end-use.

(a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12, R–500, and R–502 in new refrigerated transport. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12, R–500, and R–502 in new refrigerated transport. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) R–402A and R–402B. R–402A and R–402B, which consist of HCFC–22, propane, and HFC–125, are acceptable as substitutes for CFC–12, R–500, and R–502 in new refrigerated transport. See the discussion on these blends under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(d) R–404A. R–404A, which consists of HFC–125 and HFC–143a, is acceptable as a substitute for CFC–12, R–500, and R–502 in retrofitted new refrigerated transport. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(e) R–507. R–507, which consists of HFC–125, HFC–143a, and HFC–134a, is acceptable as a substitute for CFC–12, R–500, and R–502 in new refrigerated transport. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(f) Stirling cycle. Stirling cycle systems are acceptable as an alternative technology to refrigerated transport using CFC–12, R–500, or R–502. Stirling cycle systems have been in use for many years in this end-use. For further information, see the discussion on the Stirling cycle under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(g) Nitrogen direct gas expansion. Nitrogen direct gas expansion is acceptable as an alternative technology to refrigerated transport using CFC–12, R–500, or R–502. Nitrogen is expanded within a refrigerated transport unit to absorb heat. The cycle is open; the nitrogen is released to the atmosphere

after absorbing heat from the container. Nitrogen is a common gas that is nontoxic and nonflammable. It has been used successfully for many years in this end-use.

(20) CFC–12 and R–502 Retail Food Refrigeration, Retrofit. Please note that different temperature regimes may affect the applicability of substitutes within this end-use.

(a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 and R–502 in retrofitted retail food refrigeration. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 and R–502 in retrofitted retail food refrigeration. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) R–401A and R–401B. R–401A and R–401B, which consist of HCFC–22, HFC–152a, and HCFC–124, are acceptable as substitutes for CFC–12, R–500, and R–502 in retrofitted retail food refrigeration. See the discussion on these blends under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(d) R–402A and R–402B. R–402A and R–402B, which consist of HCFC–22, propane, and HFC–125, are acceptable as substitutes for CFC–12, R–500, and R–502 in retrofitted retail food refrigeration. See the discussion on these blends under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(e) R–404A. R–404A, which consists of HFC–125 and HFC–143a, is acceptable as a substitute for CFC–12, R–500, and R–502 in retrofitted retail food refrigeration. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(f) R–507. R–507, which consists of HFC–125, HFC–143a, and HFC–134a, is acceptable as a substitute for CFC–12, R–500, and R–502 in retrofitted retail food refrigeration. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(21) CFC–12 and R–502 Retail Food Refrigeration, New. Please note that different temperature regimes may affect the applicability of substitutes within this end-use.

(a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 and R–502 in new retail food refrigeration. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 and R–502 in new retail food refrigeration. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) HFC–227ea. HFC–227ea is acceptable as a substitute for CFC–12 in new retail food refrigeration. See the discussion on HFC–227ea under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(d) R–402A and R–402B. R–402A and R–402B, which consist of HCFC–22, propane, and HFC–125, are acceptable as substitutes for CFC–12, R–500, and R–502 in new retail food refrigeration. See the discussion on these blends under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(e) R–404A. R–404A, which consists of HFC–125 and HFC–143a, is acceptable as a substitute for CFC–12, R–500, and R–502 in new retail food refrigeration. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(f) R–507. R–507, which consists of HFC–125, HFC–143a, and HFC–134a, is acceptable as a substitute for CFC–12, R–500, and R–502 in new retail food refrigeration. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(g) Ammonia. Ammonia is acceptable as a substitute for CFC–12 and R–502 in new retail food refrigeration. See the discussion on ammonia under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(h) Stirling Cycle. Stirling cycle systems are acceptable as an alternative technology to retail food refrigeration using CFC–12 or R–502. See the discussion on the Stirling cycle under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(22) CFC–12 and R–502 Commercial Ice Machines, Retrofit. Please note that different temperature regimes may affect the applicability of substitutes within this end-use.

(a) R–401A and R–401B. R–401A and R–401B, which consist of HCFC–22, HFC–152a, and HCFC–124, are acceptable as substitutes for CFC–12 and R–502 in retrofitted commercial ice machines. See the discussion on these blends under retrofitted CFC–11, CFC–12 and R–502 industrial process refrigeration.

(b) R–402A and R–402B. R–402A and R–402B, which consist of HCFC–22, propane, and HFC–125, are acceptable as substitutes for CFC–12 and R–502 in retrofitted commercial ice machines. See the discussion on these blends under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(c) R–404A. R–404A, which consists of HFC–125 and HFC–143a, is acceptable as a substitute for CFC–12, R–500, and R–502 in retrofitted commercial ice machines. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(d) R–507. R–507, which consists of HFC–125, HFC–143a, and HFC–134a, is acceptable as a substitute for CFC–12, R–500, and R–502 in retrofitted commercial ice machines. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(23) CFC–12 and R–502 Commercial Ice Machines, New. Please note that different temperature regimes may affect the applicability of substitutes within this end-use.

(a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 and R–502 in new commercial ice machines. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 and R–502 in new commercial ice machines. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) R–402A and R–402B. R–402A and R–402B, which consist of HCFC–22, propane, and HFC–125, are acceptable as substitutes for CFC–12 and R–502 in new commercial ice machines. See the discussion on these blends under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(d) R–404A. R–404A, which consists of HFC–125 and HFC–143a, is acceptable as a substitute for CFC–12, R–500, and R–502 in new commercial ice machines. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(e) R–507. R–507, which consists of HFC–125, HFC–143a, and HFC–134a, is acceptable as a substitute for CFC–12, R–500, and R–502 in new commercial ice machines. See the discussion on this blend under retrofitted CFC–11, CFC–12, and R–502 industrial process refrigeration.

(f) Ammonia. Ammonia is acceptable as a substitute for CFC–12 and R–502 in new commercial ice machines. See the discussion on ammonia under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(g) Stirling cycle. Stirling cycle systems are acceptable as an alternative technology to commercial ice machines using CFC–12 or R–502. See the discussion on the Stirling cycle under

new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(24) CFC–12 Vending Machines, Retrofit. (a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 in retrofitted vending machines. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 in retrofitted vending machines. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) R–401A and R–401B. R–401A and R–401B, which consist of HCFC–22, HFC–152a, and HCFC–124, are acceptable as substitutes for CFC–12 and R–502 in retrofitted vending machines. See the discussion on these blends under retrofitted CFC–11, CFC–12 and R–502 industrial process refrigeration.

(25) CFC–12 Vending Machines, New. (a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 in new vending machines. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 in new vending machines. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) Stirling cycle. Stirling cycle systems are acceptable as an alternative technology to vending machines using CFC–12. See the discussion on the Stirling cycle under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(26) CFC–12 Water Coolers, Retrofit. (a) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 in retrofitted water coolers. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(b) R–401A and R–401B. R–401A and R–401B, which consist of HCFC–22, HFC–152a, and HCFC–124, are acceptable as substitutes for CFC–12 and R–502 in retrofitted water coolers. See the discussion on these blends under retrofitted CFC–11, CFC–12 and R–502 industrial process refrigeration.

(27) CFC–12 Water Coolers, New. (a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 in new water coolers. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 in new water coolers. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) Stirling cycle. Stirling cycle systems are acceptable as an alternative technology to water coolers using CFC–12. See the discussion on the Stirling cycle under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(28) CFC–12 Household Refrigerators, Retrofit. (a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 and R–502 in retrofitted household refrigerators. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 in retrofitted household refrigerators. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) R–401A and R–401B. R–401A and R–401B, which consist of HCFC–22, HFC–152a, and HCFC–124, are acceptable as substitutes for CFC–12 and R–502 in retrofitted household refrigerators. See the discussion on these blends under retrofitted CFC–11, CFC–12 and R–502 industrial process refrigeration.

(d) HCFC Blend Alpha. HCFC Blend Alpha, which consists of HCFC–22 and HCFC–142b, is acceptable as a substitute for CFC–12 in retrofitted household refrigerators. This blend's components contribute significantly less to ozone depletion than CFC–12. However, the two components have the highest ODPs of all refrigerant alternatives, and will be phased out under the accelerated phaseout schedule. In addition, the GWPs of the components are high compared to most of the other alternatives in this end-use. Although this blend does contain a flammable constituent, testing has shown that the blend itself is not flammable and that it must experience significant fractionation before flammability becomes a risk. Given the small refrigerant charge size and the hermetic nature of refrigerators, it is unlikely for a leak resulting in such fractionation to occur.

(29) CFC–12 Household Refrigerators, New. (a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 and R–502 in new household refrigerators. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 in new household refrigerators. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) HFC–152a. HFC–152a is acceptable as a substitute for CFC–12 in new household refrigerators. HFC–152a does not contribute to ozone depletion. In addition, HFC–152a's GWP and atmospheric lifetime are significantly lower than those of most alternatives. Although HFC–152a is flammable, a risk assessment demonstrated it could be used safely in this end-use.

(d) HCFC Blend Alpha. HCFC Blend Alpha, which consists of HCFC–22 and HCFC–142b, is acceptable as a substitute for CFC–12 in new household refrigerators. See the discussion on this blend under retrofitted CFC–12 household refrigerators.

(e) R200b blend. R200b blend is acceptable as a substitute for CFC–12 in new household refrigerators. R200b does not contribute to ozone depletion. In addition, the GWPs and atmospheric lifetimes of the blend's constituents are less than those of CFC–12. However, the GWP of one component is high compared to those of other alternatives for this end-use. One component of R200b is flammable, but a risk assessment has shown that use of R200b in household refrigerators poses negligible additional risk of fire, given the hermetic nature of the equipment, the small charge, and the low probability of ignition.

(f) Stirling cycle. Stirling cycle systems are acceptable as an alternative technology to household refrigerators using CFC–12. Research and development efforts are underway to produce household refrigerators using this cycle. Further information is discussed under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(30) CFC–12 and R–502 Household Freezers, Retrofit. (a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 and R–502 in retrofitted household freezers. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 and R–502 in retrofitted household freezers. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) R–401A and R–401B. R–401A and R–401B, which consist of HCFC–22, HFC–152a, and HCFC–124, are acceptable as substitutes for CFC–12 and R–502 in retrofitted household freezers. See the discussion on these blends under retrofitted CFC–11, CFC–12 and R–502 industrial process refrigeration.

(31) CFC–12 and R–502 Household Freezers, New. (a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 and R–502 in new household freezers. See the discussion on HCFC–22 under

new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 and R–502 in new household freezers. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) HFC–152a. HFC–152a is acceptable as a substitute for CFC–12 and R–502 in new household refrigerators. HFC–152a does not contribute to ozone depletion. In addition, HFC–152a's GWP and atmospheric lifetime are significantly lower than those of most alternatives. Although HFC–152a is flammable, a risk assessment demonstrated it could be used safely in this end-use.

(d) Stirling cycle. Stirling cycle systems are acceptable as an alternative technology to household freezers using CFC–12 or R–502. See the discussion on the Stirling cycle under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(32) CFC–12 and R–500 Residential Dehumidifiers, Retrofit. Please note that different temperature regimes may affect the applicability of substitutes within this end-use.

(a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 in retrofitted residential dehumidifiers. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 in retrofitted residential dehumidifiers. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(c) R–401A and R–401B. R–401A and R–401B, which consist of HCFC–22, HFC–152a, and HCFC–124, are acceptable as substitutes for CFC–12 and R–502 in retrofitted residential dehumidifiers. See the discussion on these blends under retrofitted CFC–11, CFC–12 and R–502 industrial process refrigeration.

(33) CFC–12 and R–500 Residential Dehumidifiers, New. Please note that different temperature regimes may affect the applicability of substitutes within this end-use.

(a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–12 in new residential dehumidifiers. See the discussion on HCFC–22 under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(b) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 in new residential dehumidifiers. See the discussion on HFC–134a under retrofitted CFC–12 centrifugal chillers.

(34) CFC–12 Motor Vehicle Air Conditioners, Retrofit. (a) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 in retrofitted motor vehicle air conditioners. HFC–134a does not contribute to ozone depletion. HFC–134a's GWP and atmospheric lifetime are close to those of other alternatives which have been determined to be acceptable for this end-use. However, HFC–134a's contribution to global warming could be significant in leaky end-uses such as MVACS. EPA has determined that the use of HFC–134a in these applications is acceptable because industry continues to develop technology to limit emissions. In addition, the number of available substitutes for use in MVACS is currently limited. HFC–134a is not flammable and its toxicity is low. While HFC–134a is compatible with most existing refrigeration and air conditioning equipment parts, it is not compatible with the mineral oils currently used in such systems. An ester-based lubricant should be used rather than mineral oils.

(b) R–401C. R–401C, which consists of HCFC–22, HFC–152a, and HCFC–124, is acceptable as a substitute for CFC–12 in retrofitted motor vehicle air conditioners. HCFC–22 and HCFC–124 contribute to ozone depletion. The production of HCFC–22 will be phased out according to the accelerated phaseout schedule. The GWP of HCFC–22 is somewhat higher than other alternatives for this end-use. Experimental data indicate that HCFC–22 may leak through flexible hosing in mobile air conditioners at a high rate. In order to preserve the blend's composition and to reduce its contribution to global warming, EPA strongly recommends using barrier hoses when hose assemblies need to be replaced during a retrofit procedure. The GWPs of the other components are low. Although this blend does contain one flammable constituent, the blend itself is not flammable. In addition, this blend is a near azeotrope, meaning it does not change composition during evaporation and compression. Finally, although testing demonstrated that the vapor and liquid compositions changed during leaks, neither phase became flammable.

(35) CFC–12 Motor Vehicle Air Conditioners, New. (a) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 in new motor vehicle air conditioners. HFC–134a does not contribute to ozone depletion. HFC–134a's GWP and atmospheric lifetime are close to those of other alternatives which have been determined to be acceptable for this end-use. However, HFC–134a's contribution to global warming could be significant in leaky end-uses such as MVACS. EPA has determined that the use of HFC–134a in these applications is acceptable because industry continues to develop technology to limit emissions. In addition, the number of available substitutes for use in MVACS is currently limited. HFC–134a is not flammable and its toxicity is low. While HFC–134a is compatible with most existing refrigeration and air conditioning equipment parts, it is not compatible with the mineral oils currently used in such systems. An ester-based lubricant should be used rather than mineral oils.

(b) R–401C. R–401C, which consists of HCFC–22, HFC–152a, and HCFC–124, is acceptable as a substitute for CFC–12 in new motor vehicle air conditioners. HCFC–22 and HCFC–124 contribute to ozone depletion. The production of HCFC–22 will be phased out according to the accelerated phaseout schedule. The GWP of HCFC–22 is somewhat higher than other alternatives for this end-use. Experimental data indicate that HCFC–22 may leak through flexible hosing in mobile air conditioners at a high rate. In order to preserve the blend's composition and to reduce its contribution to global warming, EPA strongly recommends using barrier hoses when hose assemblies need to be replaced during a retrofit procedure. The GWPs of the other components are low. Although this blend does contain one flammable constituent, the blend itself is not flammable. In addition, this blend is a near azeotrope, meaning it does not change composition during evaporation and compression. Finally, although testing demonstrated that the vapor and liquid compositions changed during leaks, neither phase became flammable.

(c) Evaporative cooling. Evaporative cooling is acceptable as an alternative technology to motor vehicle air conditioners using CFC–12. Evaporative cooling does not contribute to ozone depletion or global warming and has the potential to be more energy efficient than current refrigeration and air conditioning systems. Evaporative cooling uses no chemicals, but relies instead on water evaporation as a means of cooling. It is in widespread use in transit buses in the western U.S. Recent design improvements have greatly expanded its applicability to other regions.

(d) CO_2 cooling. CO_2 cooling systems are acceptable as an alternative technology to motor vehicle air conditioners using CFC–12. CO_2 systems for motor vehicle air conditioning are currently under development. EPA believes that with continued development, such systems

could be available within 5 years, and thus they are potentially available substitutes. CO_2 was historically used in refrigeration systems. It is a well-known, nontoxic, nonflammable gas. Its GWP is defined as 1, and all other GWPs are indexed to it. Since it is readily available as a waste gas, no additional chemical will need to be produced. Thus, the use of CO_2 as a refrigerant will not contribute to global warming.

(e) Stirling cycle. Stirling cycle systems are acceptable as an alternative technology to motor vehicle air conditioners using CFC–12. A full scale Stirling cycle motor vehicle air conditioning system has been built. Further development is necessary to facilitate practical implementation. For further information see the discussion on the Stirling cycle under new CFC–11, CFC–12, CFC–113, CFC–114, and R–500 centrifugal chillers.

(36) Heat transfer. Although EPA did not originally intend to review this end-use, the Agency reconsidered after reexamining the potential size of annual sales of substitutes. Thus, EPA is currently reviewing submissions for the use of PFCs in heat transfer systems. EPA anticipates including its final determination in the first SNAP update.

b. Unacceptable substitutes. (1) HCFC–22/HCFC–142b/CFC–12 blend. A HCFC–22/HCFC–142b/CFC–12 blend is unacceptable as a substitute for CFC–12 in:

- Commercial comfort air conditioning;
- Industrial process refrigeration systems;
- Ice skating rinks;
- Cold storage warehouses;
- Refrigerated transport;
- Retail food refrigeration;
- Vending machines;
- Water coolers;
- Commercial ice machines;
- Household refrigerators;
- Household freezers;
- Residential dehumidifiers; and
- Motor vehicle air conditioning.

It is also unacceptable as a substitute for HCFC–22 in residential and packaged HCFC–22 air conditioning. Other substitutes for CFC–12 exist which contain no class I substances. In addition, because this blend contains CFC–12 (which has an ODP 20 times that of HCFC–22), it poses a greater risk to stratospheric ozone than the use of HCFC–22 alone.

(2) HCFC–141b. HCFC–141b is unacceptable as a substitute for CFC–11 in new centrifugal chillers. This substance has a high ozone depletion potential. At least one other substitute exists that presents lower overall risk.

(3) Hydrocarbon Blend A. Hydrocarbon Blend A is unacceptable as a substitute for CFC–12 in:

- Commercial comfort air conditioning;
- Ice skating rinks;
- Cold storage warehouses;
- Refrigerated transport;
- Retail food refrigeration;
- Vending machines;
- Water coolers;
- Commercial ice machines;
- Household refrigerators;
- Household freezers;
- Residential dehumidifiers; and
- Motor vehicle air conditioning.

Flammability is the primary concern. EPA believes the use of this substitute in very leaky uses like motor vehicle air conditioning may pose a high risk of fire. EPA requires a risk assessment be conducted to demonstrate this blend may be safely used in any CFC–12 end-uses.

E. Foams

1. Overview

Foam plastics accounted for approximately 18 percent of all U.S. consumption of ozone-depleting chemicals on an ODP-weighted basis in 1990. Five class I chemicals—CFC–11, CFC–12, CFC–113, CFC–114, and methyl chloroform—are used as blowing agents in foam production. These five compounds are used in a wide variety of applications.

Foam plastics manufactured with CFCs fall into four major categories: polyurethane, phenolic, extruded polystyrene, and polyolefin. Historically, CFC–11 and CFC–113, which remain in a liquid state at room temperature, have been used as blowing agents in polyurethane and phenolic foams. CFC–12 and CFC–114, which have lower boiling points than CFC–11 and CFC–113 and are gases at room temperature, are used in polyolefin and polystyrene foams. In addition to CFCs, methyl chloroform is used as a blowing agent in some flexible polyurethane foams.

Due to the wide variety of applications that foams represent, the Agency has divided its analysis of foam plastics into the following ten distinct end-use sectors:

- Rigid polyurethane and polyisocyanurate laminated boardstock;
- Rigid polyurethane appliance;
- Rigid polyurethane spray and commercial refrigeration, and sandwich panels;
- Rigid polyurethane slabstock and other foams;
- Polystyrene extruded insulation boardstock and billet;
- Phenolic insulation board;
- Flexible polyurethane;
- Polyurethane integral skin;
- Polystyrene extruded sheet; and
- Polyolefin.

The SNAP determinations in this final rule distinguish between these ten end-use sectors because the mix of potential alternatives to Class I blowing agents, and potential emission and exposure profiles, differ for each. Appendix B at the end of this preamble lists in tabular form the Agency's determinations on substitutes in the foam sector. These determinations are based on the risk screens described in the background document entitled, "Risk Screen on the Use of Substitutes for Class I Ozone-Depleting Substances: Foam-Blowing Agents" and discussed in supporting memoranda. The table also includes as "pending" substitutes for which the Agency has not yet issued determinations. Vendors or users of substitutes not described in Appendix B should submit information on these uses, so that the Agency can review them and issue a SNAP determination

2. Alternative Blowing Agents

Under the SNAP program, the evaluation of alternatives for CFCs depends on a number of factors. These include toxicity, flammability, environmental concerns, and, in the case of insulating foams, the insulating efficiency of alternatives.

Toxicity concerns associated with the use of alternative chemicals relate to the exposure of workers and consumers to the chemicals or to the decomposition products these chemicals may form slowly over time in foam products. The likely degree of human health risk associated with an alternative depends not only on the nature of a substitute chemical but also on the chemical composition, manufacturing process, and product applications that characterize the foam end-use sector into which that substitute will be introduced.

Flammability concerns, like toxicity concerns, have to do with possible danger to workers and consumers. Such danger includes possible ignition of materials during manufacturing, storage or transportation, and the fire hazard posed by the final product. Alternatives to CFCs have varying degrees of flammability. As in the case of toxicity, however, the composition, production processes, and end-use applications that characterize each foam type dictate the potential risks associated with flammability.

In addition to posing toxicity and flammability risks, alternatives may have deleterious effects on the

environment. Such effects may include stratospheric ozone depletion, global warming, and contribution to smog or tropospheric ozone formation. HCFCs have, in varying degrees, the potential to deplete ozone; both HCFCs and HFCs have global warming potential; and various potential alternatives, especially hydrocarbons, are volatile organic compounds (VOCs) that contribute to the formation of ozone, or smog, in the lower atmosphere.

The use of alternative blowing agents can have an adverse affect on the insulating capacity of foam products due to higher thermal conductivity of the substitute. The overall risk screen for substitutes under SNAP takes into account indirect contributions to global warming.

a. *Hydrochlorofluorocarbons.* Because of their relatively low thermal conductivity, hydrochlorofluorocarbons (HCFCs) are considered necessary transitional alternatives to CFC blowing agents in thermal insulating foams. Two HCFCs, HCFC–123 and HCFC–141b, can serve as replacements for CFC–11 in many end-use applications. Because of limited availability of HCFC–123, HCFC141b represents the more likely short-term possibility for replacing CFC–11 in several of the insulating foam sectors. As a result, the Agency has determined that HCFC–141b, despite its relatively high ODP of 0.11, is an acceptable transitional alternative to CFC–11 for several foam end-uses. Other HCFC alternatives are HCFC–22 and HCFC–142b. Although these compounds are commercially available and have lower ODPs than HCFC–141b, each has a boiling point significantly lower than CFC–11. As a result, conversion to HCFC–22 or HCFC–142b from CFC–11 generally entails significant investment in technical and process modification. HCFC–22 and HCFC–142b do, however, present viable, near-term alternatives to CFC–12 in extruded polystyrene boardstock and billet foams.

Production of HCFCs is controlled by the Clean Air Act and under section 605 is scheduled for phase-out by 2030. However, due to new data concerning greater risks of ozone depletion, EPA promulgated an accelerated phase-out schedule (58 FR 65018, 12/10/93). Given the technical and safety concerns associated with many non-HCFC alternatives, however, disallowing the interim use of HCFCs in insulating foam end-uses, including the use of HCFC–141b and HCFC–22, would have adverse effects on human health and the environment.

Effective January 1, 1994, plastic foam products which contain or are manufactured with HCFCs are banned from sale or distribution into interstate commerce under section 610 of the CAA. Under section 610, thermal insulation foam products are, however, exempted from this ban. Foam insulation product means a product containing or consisting of the following types of foam: (1) Closed cell rigid polyurethane and polyisocyanurate foam; (2) closed cell rigid polystyrene boardstock foam; (3) closed cell rigid phenolic foam; and (4) closed cell rigid polyethylene foam when such foam is suitable in shape, thickness and design to be used as a product that provides thermal insulation around pipes used in heating, plumbing, refrigeration, or industrial process systems. Any use of acceptable HCFC substitutes listed under SNAP must comply with restrictions under the section 610 Non-Essential Ban.

b. *Hydrofluorocarbons.* Hydrofluorocarbons (HFCs) represent a zero-ODP alternative to CFC blowing agents in many sectors. From the standpoint of stratospheric ozone depletion alone, HFCs are preferable to HCFCs as alternative blowing agents. The relatively higher thermal conductivity of HFCs, however, is likely to hamper the insulating capabilities of HFC-blown foams unless significant changes in the foam formulation or process modifications are adopted.

The HFCs hold more promise as near- or intermediate-term alternatives for CFC–12 in extruded polystyrene foams, particularly in extruded polystyrene sheet foams. However, issues such as flammability, global warming potential, cost, and the solubility of HFCs in polystyrene polymer remain of concern for the industry.

Conversion to HFC–152a may entail significant capital investment in order to ensure worker safety against fire hazards. Moreover, in the case of insulating foams, manufacturers will need to guarantee that foams blown with HFC–152a meet the building code requirements that apply to the flammability of building materials.

c. *Saturated light hydrocarbons C3–C6.* Saturated light hydrocarbons C3–C6, most of which are readily available as bulk chemicals, have the advantage of being low cost. These chemicals are also halogen free, thus they are both zero-ODP and zero-GWP. Saturated light hydrocarbons C3–C6 are currently being used in extruded polystyrene, polyurethane, and polyolefin non-insulating foam end-uses.

Hydrocarbons have significantly higher thermal conductivities than do any of the CFCs. Conversion to hydrocarbons could thus lead to the production of foams with lower insulating efficiency and, possibly, to a reduction in the energy efficiency of insulated items. Formulation changes and process modifications have been introduced to increase the thermal insulating efficiency of hydrocarbon-blown foams. Cyclopentane is a leading alternative blowing-agent candidate for insulating foams because of its high boiling point and other physical properties similar to CFC–11.

Conversion to hydrocarbons may entail significant capital investment in order to ensure worker safety against fire hazards. Moreover, in the case of insulating foams, manufacturers will need to guarantee that foams blown with hydrocarbons meet the building code requirements that apply to the flammability of building materials.

Hydrocarbons are VOCs and may contribute to the formation of ground-level ozone, or smog, in the lower atmosphere. Any use of hydrocarbon blowing agents is subject to the federal, state and local restrictions that apply to VOCs, and conversion to hydrocarbons could therefore involve further capital investment to comply with these restrictions.

d. *Other blowing agents.* Two other blowing agents, methylene chloride and acetone, have been identified as substitutes for CFC–11 in flexible polyurethane foams. Methylene chloride, which already serves as an auxiliary blowing agent for most grades of flexible polyurethane foam, is commercially available, and is relatively low cost. Because of its toxicity, it poses a potential risk to workers and residents in nearby communities. However, the Agency's analysis of use of this chemical as a blowing agent indicates risks can be controlled by adhering to existing regulatory standards. Methylene chloride use is further restricted in several states and localities, and is listed as a hazardous waste under RCRA and, thus, users must comply with applicable RCRA waste disposal requirements. The Agency is also in the process of addressing residual risks to the general population through emissions to air under title III section 112 of the CAA. The Agency expects to issue maximum achievable control technology (MACT) rules governing methylene chloride use in the foams sector by 1997. Methylene chloride is not a VOC, and thus, does not contribute to the formation of tropospheric ozone.

When used as a blowing agent, acetone is capable of yielding all grades of flexible polyurethane foam. It can serve as an alternative blowing agent where methylene chloride use is

infeasible. Acetone is a VOC, and must be controlled as such. In addition, plant modifications may be necessary to accommodate acetone's flammability.

Carbon dioxide (CO_2) is an acceptable substitute for all foam end-uses. Any CO_2 blend is acceptable as long as the other constituents of the blend are acceptable under SNAP. CO_2 does contribute to global warming. In addition, CO_2 has the highest thermal conductivity of the SNAP-listed chemical alternatives, and will lower the thermal capacity of insulating foams unless significant foam formulation or process modifications are adopted.

e. *Alternative manufacturing processes.* The AB Technology is a commercially available and technically feasible process for replacing CFCs or other auxiliary blowing agents for most conventional flexible foam grades. AB Technology employs formic acid in conjunction with water as the blowing agent for producing flexible polyurethane foam. The process is based on using the reaction of formic acid with an isocyanate to produce carbon monoxide in addition to the water/isocyanate reaction normally used to generate carbon dioxide gas for the expansion of foam. OSHA has set a permissible exposure level (PEL) for carbon monoxide of 35 ppm of a time weighted average with a ceiling not to exceed 200 ppm.

3. Comment Response

The majority of public comments received on the foams sector in the proposed rule focused on three issues: The viability or availability of substitutes; the need for listing of alternative technologies or manufacturing processes, and the need for notification under SNAP for use of blends or mixture of blowing agents.

a. *Viability or availability of listed substitutes.* Several commenters suggested that the NPRM did not sufficiently address the performance and practicality of use of acceptable substitutes. Commenters were especially concerned about alternative blowing agents used in thermal insulation applications, and whether acceptable substitutes represented existing or experimental use. For example, several commenters stated that if the alternative blowing agent will affect the insulating capacity of a foam it should be part of the SNAP analysis, and the outcome should be discussed as part of the listing decision. Another commenter contended that for many of the end-uses, not all of the listed HCFC substitutes are technically viable, but each should be listed anyway to maximize the breadth of options. This commenter also reported that uses of some of the HFCs and hydrocarbons are still in development and, therefore do not represent actual alternatives.

EPA recognizes that the use of alternative blowing agents in insulation products can affect the energy efficiency of the final product. In this final rule, the overall risk characterization for substitutes under SNAP specifically takes into account indirect contributions to global warming. However, EPA also recognizes that the changes in foam formulation or product thickness can result in products with insulation efficiency equivalent to CFC-blown foam. Therefore, EPA believes it is appropriate to consider and comment on the difference in thermal conductivity of alternative blowing agents as compared to the CFC being replaced, and compared to other acceptable substitutes. However, it would be inappropriate to comment on the expected performance of a foam product using one blowing agent versus another, given that formulations are highly proprietary and can vary significantly from manufacturer-to-manufacturer. Further, EPA believes it is preferable to identify a broad range of alternatives, and let the market determine which alternative produce the best performing insulation products.

Several commenters requested clarification on the definition of hydrocarbons. One commenter suggested a more specific definition for hydrocarbons of "saturated light hydrocarbons, C3–C6."

The Agency agrees with these commenters. Since the broad use of hydrocarbon in the NPRM may be viewed as potentially precluding other viable substitutes, and because the alternate definition suggested by the commenter encompasses those specifically listed hydrocarbons as well as more recently identified materials being tested in foams such as cyclopentane, this definition has been adopted by EPA in the final rule.

b. *Alternative technologies or manufacturing processes.* Several commenters argued that EPA should not issue its seal of approval for substitutes that are alternative products, unless and until the Agency evaluates them with the same degree of detail that HCFCs were evaluated, particularly with regard to toxicity, technical feasibility, flammability, and energy impacts.

The Agency believes that alternative products and alternative manufacturing processes will play an important role in the transition from ODSs in many sectors. In light of public comment, the Agency recognized that the SNAP data requirements and the SNAP evaluation process proposed in the NPRM were biased toward chemical substitutes. The Agency also agrees with public comment that review of non-chemical alternatives must be supported by appropriate analysis. In this final rule, the Agency has made revisions to the SNAP Information Notice to better account for the different information requirements associated with non-chemical alternatives and increased the discussion of the Agency's analysis of non-chemical alternatives in the background documents.

c. *Use of blends.* Several commenters argued that EPA's proposed requirement for notification and review of chemical alternative blends was unnecessary and burdensome for the foams sector. The comments proposed that any combination or blend of individually acceptable blowing agents should be permitted without additional notification to SNAP. One commenter suggested EPA clarify that the term "blend" when used in the SNAP rule does not refer to individual, separately-"acceptable" substitutes, two or more of which may be used in the same manufacturing process.

In light of these public comments, the Agency re-examined the analytical basis for reviewing blends, to determine whether the potential human health and environmental risks would be different for blends or mixtures of chemicals than those of individual chemicals that were determined to be acceptable for use in the foams manufacturing process under SNAP. In particular, the Agency was concerned with potential synergistic effects of the chemical blends, and that the decomposition product profile would differ from that of a single chemical.

The Agency has determined that because of the potential for formation and emission of decomposition products in rigid closed cell foams, notification and review under SNAP is required for blends of chemical alternatives in foam end-uses that encompass residential products where chronic consumer exposure could occur. These end-uses are: Polyurethane rigid laminated boardstock, polystyrene extruded boardstock and billet foams, phenolic foams, and polyolefin foams. This analysis is detailed in the SNAP technical background document, "Risk Screen on the Use of Substitutes for Class I Ozone-Depleting Substances: Foam Blowing Agents." In contrast, for open-celled foams where the blowing agent is fully emitted from the foams within hours or days of manufacture, the formation of decomposition products is not a factor in decisionmaking. For this final rule, use

of blends or mixtures of substitutes listed as acceptable under the SNAP program in open-celled or closed-cell or semi-rigid end-uses not designated above does not require notification.

4. Listing Decisions

a. *Acceptable substitutes. (1) Rigid polyurethane and polyisocyanurate laminated boardstock.* (a) HCFC–123. HCFC–123 is acceptable as an alternative blowing agent to CFC–11 in rigid polyurethane and polyisocyanurate laminated boardstock foam. From the standpoint of technical feasibility, HCFC–123 represents a viable alternative to CFC–11 as a potential blowing agent. More specifically, the physical properties, thermal conductivity, and aging of foams blown with HCFC–123 are similar to those blown with CFC–11. As a result, HCFC–123, which has an ozone depleting potential significantly lower than that of CFC–11, has the potential to replace CFC–11 in many applications. Nonetheless, availability of HCFC–123 is limited at present. The acceptable exposure limit (AEL) for HCFC–123 is 30 ppm.

(b) HCFC–141b. HCFC–141b is acceptable as an alternative to CFC–11 in rigid polyurethane and polyisocyanurate laminated boardstock foam. Although its ODP of 0.11 is relatively high, HCFC–141b offers almost immediate transition out of CFC uses in this sector. Not only does HCFC–141b offer a technically feasible alternative to CFC–11, but it is currently available in quantities sufficient to meet industrial demand. HCFC–141b is scheduled for phase-out from production on January 1, 2003 under the accelerated phase out rule (58 FR 65018) under section 606 of the CAA.

(c) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–11 in rigid polyurethane and polyisocyanurate laminated boardstock foam. HCFC–22 offers an alternative with significantly less potential to deplete ozone than CFC–11. Plant or process modifications may be required to allow use of blowing agents like HCFC–142b that have significantly lower boiling points than CFC–11. HCFC–22 is subject to the accelerated phase out rule (58 FR 65018) under section 606 of the CAA.

(d) HCFC–142b. HCFC–142b is acceptable as a substitute for CFC–11 in rigid polyurethane and polyisocyanurate laminated boardstock foam. HCFC–142b offers an alternative with significantly lower potential to deplete ozone than CFC–11. Plant or process modifications may be required to allow use of blowing agents like HCFC–142b that have significantly lower boiling points than CFC–11. HCFC–142b is subject to the accelerated phase out rule (58 FR 65018).

(e) HCFC–22/HCFC–141b. The HCFC–22/HCFC–142b blend is acceptable as a substitute for CFC–11 in rigid polyurethane and polyisocyanurate laminated boardstock foam. HCFC–22 has an occupational exposure limit (OEL) of 250 ppm, whereas HCFC–141b has an OEL of 1000 ppm.

(f) HCFC–22/HCFC–142b. HCFC–22/HCFC–142b blends are acceptable as a substitute for CFC–11 in rigid polyurethane and polyisocyanurate laminated boardstock foam. This blend offers an alternative with significantly less potential to deplete ozone than CFC–11. Plant or process modifications may be required to allow use of blowing agents like HCFC–22 and HCFC–142b that have low boiling points than CFC–11.

(g) HCFC–141b/HCFC–123. The HCFC–141b/HCFC–123 blend is acceptable as an alternative to CFC–11 in rigid polyurethane and polyisocyanurate laminated boardstock foam. As noted above, HCFC–141b, because of its commercial availability offers an immediate opportunity to replace CFC–11. HCFC–123 has limited availability. However, because the ODP of HCFC–123 is lower than that of HCFC–141b, the blend has a lower ODP than HCFC–141b alone.

(h) HCFC–22/HCFC–141b. The HCFC–22/HCFC–142b blend is acceptable as a substitute for CFC–11 in rigid polyurethane and polyisocyanurate laminated boardstock foam. Because both components of the blend are commercially available in large enough quantities to meet industry demand, it offers a near-term vehicle for replacing CFC–11 in laminated boardstock foams. HCFC–22 has an occupational exposure limit (OEL) of 250 ppm, whereas HCFC–141b has an OEL of 1000 ppm.

(i) HFC–134a. HFC–134a is acceptable as a substitute for CFC–11 in rigid polyurethane and polyisocyanurate laminated boardstock foam. HFC–134a offers the potential for a non-ozonedepleting alternative to CFC–11 blowing agents in rigid polyurethane and polyisocyanurate laminated boardstock foams. Plant modifications may be necessary to accommodate the use of HFC–134a because its boiling point is lower than that of CFC–11. In addition, the cost of HFC–134a is relatively high, and the use of HFC–134a may cause significant increases in thermal conductivity, with a concomitant loss in the insulating capacity of foams blown with HFC–134a. HFC–134a also has a relatively high global warming potential compared with other available alternatives.

(j) HFC–152a. HFC–152a is acceptable as a substitute for CFC–11 in rigid polyurethane and polyisocyanurate laminated boardstock foam. HFC–152a offers the potential for a non-ozonedepleting alternative to CFC–11 blowing agents in rigid polyurethane and polyisocyanurate laminated boardstock. Use of HFC–152a as a blowing agent in rigid polyurethane and polyisocyanurate laminated boardstock foam has raised concern over the potential for significant increases in thermal conductivity. Process changes may be necessary to accommodate the use of HFC–152a, and plant modifications may be necessary to manage its flammability. Also, foams blown with HFC–152a will need to conform with building code requirements that relate to flammable materials.

(k) Saturated light hydrocarbons C3–C6. Saturated Light Hydrocarbons C3–C6 are acceptable as substitutes for CFC–11 in rigid polyurethane and polyisocyanurate laminated boardstock foam. These hydrocarbons have zero-ODP and zero-GWP. Plant or process modifications may be necessary to accommodate the use of saturated light hydrocarbons C3–C6. These materials also pose flammability concerns which may require capital investment to manage. Foams blown with hydrocarbons will need to conform with building code requirements that relate to flammable materials. Finally, the thermal conductivity is greater than CFC–11 blowing agents which may effect the thermal capacity of final products. Saturated light hydrocarbons are VOCs and must be controlled as such under Title I of the CAA.

(l) 2-Chloropropane. 2-Chloropropane is acceptable as a substitute for CFC–11 in rigid polyurethane and polyisocyanurate laminated boardstock foam. At present, because 2-chloropropane is a proprietary process, its commercial availability may be limited. Moreover, 2-chloropropane is flammable and its use may require extensive modification of existing equipment.

(m) Carbon dioxide. Carbon dioxide is acceptable as a substitute for CFC–11 in rigid polyurethane and polyisocyanurate laminated boardstock foam.

(2) Polyurethane, rigid appliance foam. (a) HCFC–123. HCFC–123 (or blends thereof), for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, is acceptable as

an alternative to CFC–11 in rigid polyurethane appliance foam.

(b) HCFC–141b. HCFC–141b (or blends thereof), for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, is acceptable as an alternative to CFC–11 in rigid polyurethane appliance foam. The Appliance Research Consortium (ARC), a subsidiary of the Association of Home Appliance Manufacturers (AHAM), convened an independent panel of toxicologists to evaluate the risk of potential exposure from foods stored in refrigerators manufactured with HCFC–141b as the blowing agent in the insulating foam. The panel evaluated the same toxicological data available to EPA, and concluded that the use of HCFC–141b in this intended application is generally recognized as safe (GRAS) per section 201(s) of the Food, Drug, and Cosmetic Act, 21 USC section 321(s).[1]

(c) HCFC–22. HCFC–22 (or blends thereof), for reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, is acceptable as a substitute for CFC–11 in rigid polyurethane appliance foam.

(d) HCFC–142b. HCFC–142b (or blends thereof) is acceptable as a substitute for CFC–11 in rigid polyurethane appliance foam. HCFC–142b offers an alternative with significantly less potential to deplete stratospheric ozone than CFC–11. Nevertheless, certain technical problems persist. Namely, plant modifications may be required to allow the use of blowing agents like HCFC–142b that have low boiling points.

(e) HFC–134a. HFC–134a (or blends thereof), for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, is acceptable as an alternative to CFC–11 in rigid polyurethane appliance foam.

(f) HFC–152a. HFC–152a (or blends thereof), for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, is acceptable as an alternative to CFC–11 in rigid polyurethane appliance foam.

(g) Saturated light hydrocarbons C3–C6. Saturated light hydrocarbons C3–C6 (or blends thereof) are acceptable as substitutes for CFC–11 in rigid polyurethane appliance foam. Saturated light hydrocarbons C3–C6 offer the potential of a non-ozone-depleting alternative to the use of CFC–11 blowing agents in rigid polyurethane appliance foam. Plant modifications may be necessary to accommodate the flammability of Saturated Light Hydrocarbons C3–C6. In addition, the potential for significant increases in thermal conductivity may reduce insulating capacity. Foams blown with saturated light hydrocarbons C3–C6 must conform with building code requirements that relate to flammable materials. Saturated light hydrocarbons C3–C6 are VOCs and will be subject to control as such under Title I of the CAA.

(h) Carbon dioxide. Carbon dioxide (or blends thereof) is acceptable as a substitute for CFC–11 in rigid polyurethane appliance foam.

(3) Rigid polyurethane commercial refrigeration foam, spray foam, and sandwich panels. (a) HCFC–123. HCFC–123, for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, is acceptable as an alternative to CFC–11 and CFC–12 in rigid polyurethane commercial refrigeration foam, spray foam, and sandwich panels.

(b) HCFC–141b. HCFC–141b (or blends thereof), for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, is acceptable as an alternative to CFC–11 and CFC–12 in rigid polyurethane commercial refrigeration foam, spray foam, and sandwich panels.

(c) HCFC–22. HCFC–22 (or blends thereof) is acceptable as a substitute for CFC–11 and CFC–12 in rigid polyurethane commercial refrigeration foam, spray foam, and sandwich panels. HCFC–22 offers an alternative with significantly less potential to deplete ozone than either CFC–11 or CFC–12. However, significant process changes could be necessary to accommodate the low boiling point of HCFC–22.

(d) HCFC–142b. HCFC–142b (or blends thereof), for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, is acceptable as an alternative to CFC–11 and CFC–12 in rigid polyurethane commercial refrigeration foam, spray foam, and sandwich panels.

(e) HFC–134a. HFC–134a (or blends thereof), for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, is acceptable as an alternative to CFC–11 and CFC–12 in rigid polyurethane commercial refrigeration foam, spray foam, and sandwich panels.

(f) HFC–152a. HFC–152a (or blends thereof), for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, is acceptable as an alternative to CFC–11 and CFC–12 in rigid polyurethane commercial refrigeration foam, spray foam, and sandwich panels.

(g) Saturated light hydrocarbons C3–C6. Saturated light hydrocarbons C3–C6 (or blends thereof), for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, are acceptable alternative blowing agents for CFC–11 and CFC–12 in rigid polyurethane commercial refrigeration foam, spray foam, and sandwich panels.

(h) Carbon dioxide. Carbon dioxide (or blends thereof) is an acceptable alternative blowing agent for CFC–11 in rigid polyurethane commercial refrigeration foam, spray foam, and sandwich panels.

(4) Polyurethane slabstock and other foams. (a) HCFC–123. HCFC–123 (or blends thereof) is acceptable as an alternative to CFC–11 in rigid polyurethane slabstock and other foams. From the standpoint of technical feasibility, HCFC–123 represents a viable alternative to CFC–11 as a potential blowing agent. More specifically, the physical properties, thermal conductivity, and aging of foams blown with HCFC–123 are similar to those blown with CFC–11. As a result, HCFC–123, which has an ozone depleting potential significantly lower than that of CFC–11, has the potential to replace CFC–11 in many applications. Nonetheless, commercial availability of HCFC–123 is limited at present.

(b) HCFC–141b. HCFC–141b (or blends thereof) is acceptable as an alternative to CFC–11 in rigid polyurethane slabstock and other foams. Although its ODP of 0.11 is relatively high, HCFC–141b offers almost immediate transition out of CFCs in this sector. Not only does HCFC–141b offer a technically feasible alternative to CFC–11, it is currently available in sufficient quantities to meet industry demand. The use of HCFCs in polyurethane slabstock and other foams is subject to further restriction under section 610 of the CAA, which banned the use of class II substances in noninsulating foams after January 1, 1994.

(c) HCFC–22. HCFC–22 (or blends thereof) is acceptable as a substitute for CFC–11 in rigid polyurethane slabstock and other foams. HCFC–22 offers an alternative with significantly less potential to deplete ozone than either CFC–11 or CFC–12. However, significant process changes may be necessary to accommodate the low boiling point of HCFC–22.

(d) HFC–134a. HFC–134a (or blends thereof), for the reasons described in the section on rigid polyurethane and

[1] Peter de la Cruz, *Evaluation of HCFC–141b Potential Dietary Exposure*, Keller and Heckman, January, 1994.

polyisocyanurate laminated boardstock, is acceptable as an alternative to CFC–11 and CFC–12 in rigid polyurethane slabstock and other foams.

(e) HFC–152a. HFC–152a (or blends thereof), for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, is acceptable as an alternative to CFC–11 and CFC–12 in rigid polyurethane slabstock and other foams.

(f) Saturated light hydrocarbons C3–C6. Saturated light hydrocarbons C3–C6 (or blends thereof), for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, are acceptable alternative blowing agents for CFC–11 and CFC–12 in rigid polyurethane slabstock and other foams.

(g) Carbon Dioxide. Carbon dioxide (or blends thereof) is an acceptable alternative blowing agent for CFC–11 and CFC–12 in rigid polyurethane slabstock and other foams.

(5) Extruded Polystyrene Boardstock and Billet. (a) HCFC–22. HCFC–22 is an acceptable alternative blowing agent for CFC–12 in extruded polystyrene boardstock and billet foam. HCFC–22 offers an alternative with significantly less potential to deplete ozone than CFC–12. HCFC–22, however, has a relatively high permeation rate out of polystyrene, thus affecting insulation performance. Users must be in compliance with the section 610 Nonessential Products Containing Class II Substances Ban.

(b) HCFC–142b. HCFC–142b is an acceptable alternative blowing agent for CFC–12 in extruded polystyrene boardstock foam. HCFC–142b offers an alternative with significantly less potential to deplete ozone than either CFC–11 or CFC–12. Users must be in compliance with the section 610 Non-essential Products Containing Class II Substances Ban.

(c) HCFC–22/HCFC–142b. The HCFC–22/HCFC–142b blend is acceptable as a substitute for CFC–12 in extruded polystyrene boardstock and billet foam. The blend offers an alternative with significantly less potential to deplete ozone than CFC–12. Users must be in compliance with section 610 Nonessential Products Containing Class II Substances.

(d) HFC–134a. HFC–134a is acceptable as a substitute for CFC–12 in extruded polystyrene boardstock and billet foam. HFC–134a offers the potential for a non-ozone-depleting alternative to CFC–12 blowing agents in extruded polystyrene boardstock and billet foam. HFC–134a, because of its low flammability and encouraging performance in toxicological testing, exhibits definite advantages from the standpoints of environmental risk and worker and consumer safety. However, HFC–134a has relatively high thermal conductivity, is costly, and has the potential to contribute to global warming. In addition, the compound has poor solubility in polystyrene polymer, which could limit its usefulness as an alternative blowing agent from a technical standpoint. HFC–134a also has a relatively high global warming potential compared to other available alternatives.

(e) HFC–152a. HFC–152a is acceptable as a substitute for CFC–12 in extruded polystyrene boardstock and billet foam. HFC–152a offers the potential for a non-ozone-depleting alternative to CFC–12 blowing agents in extruded polystyrene boardstock. However, the high flammability of HFC–152a when combined with its properties of high thermal conductivity, low solubility in polystyrene polymer, and high permeability through polystyrene limit the extent to which HFC–152a is likely to replace CFC–12. Plant modifications may be needed to accommodate the flammability of HFC–152a, and foams blown with HFC–152a will need to conform with building code requirements that relate to flammable materials.

(f) Saturated light hydrocarbons C3–C6. Saturated light hydrocarbons C3–C6 are acceptable as substitutes for CFC–12 in polystyrene boardstock and billet foam. Of the Saturated Light Hydrocarbons C3–C6, pentane, isopentane, butane, and isobutane have been demonstrated as feasible blowing agents in polystyrene. In fact, saturated light hydrocarbons C3–C6 have been used for years in the manufacture of extruded polystyrene sheet products. However, saturated light hydrocarbons C3–C6 have several disadvantages as blowing agents in extruded polystyrene boardstock and billet foam. Replacement of CFC–12 blowing agents with Saturated Light Hydrocarbons C3–C6 may reduce the insulating efficiency in this end-use. Controlling the flammability of saturated light hydrocarbons C3–C6 may entail significant investment in plant conversion to accommodate them as alternatives to CFC–12. Foams blown with saturated light hydrocarbons C3–C6 will need to conform with building code requirements that relate to flammable materials. Finally, saturated light hydrocarbons C3–C6 are VOCs and must be controlled as such under Title I of the CAA.

(g) HCFC–22/Saturated Light Hydrocarbons C3–C6. Blends of HCFC–22/saturated light hydrocarbons C3–C6, for the reasons described and with the caveats outlined above for HCFC–22 and Saturated Light Hydrocarbons C3–C6, are acceptable substitutes for CFC–12 in extruded polystyrene boardstock and billet foam.

(h) Carbon dioxide. Carbon dioxide is an acceptable alternative blowing agent for CFC–12 in extruded polystyrene boardstock and billet foam.

(6) Phenolic insulation board. (a) HCFC–141b. HCFC–141b, for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, is acceptable as an alternative to CFC–11 and CFC–113 in phenolic insulation board.

(b) HCFC–142b. HCFC–142b, for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, is acceptable as an alternative to CFC–11 and CFC–113 in phenolic insulation board.

(c) HCFC–22. HCFC–22, for the reasons described in the section on rigid polyurethane commercial refrigeration foams, spray foams, and sandwich panels, is acceptable as an alternative to CFC–11 and CFC–113 in phenolic insulation board.

(d) HCFC–22/HCFC–142b. Blends of HCFC–22/HCFC–142b, for reasons described above and with the caveats outlined above for HCFC–22 and HCFC–142b, are acceptable as an alternative to CFC–11 and CFC–113 in phenolic insulation board.

(e) Saturated Light Hydrocarbons C3–C6. Saturated light hydrocarbons C3–C6, for the reasons described in the section on rigid polyurethane and polyisocyanurate laminated boardstock, are acceptable alternatives to CFC–11 and CFC–113 in phenolic insulation board.

(f) HCFC–22/Saturated light hydrocarbons C3–C6. HCFC–22/Saturated light hydrocarbon C3–C6 blends are acceptable as substitutes for CFC–11 and CFC–113 in phenolic insulation board. HCFC–22/saturated light hydrocarbon C3–C6 blends offer an alternative with significantly less potential to deplete ozone than either CFC–11 or CFC–113. However, extensive plant modifications may be necessary to accommodate use of these blends. In addition, there are concerns about the potential for significant increases in thermal conductivity resulting from the replacement of CFC–11 and CFC–113 with a blend. Also, foams blown with saturated light hydrocarbons C3–C6 will need to conform with building code requirements that relate to flammable materials. Saturated light hydrocarbons C3–C6 are VOCs and must be controlled as such under Title I of the CAA, and

HCFC–22 is subject to the phase-out of Class II compounds under sections 605 and 606 of the CAA.

(g) HFC–143a. HFC–143a is acceptable as a substitute for CFC–11 and CFC–12 in phenolic insulation board. HFC–143a has a higher global warming potential than other substitutes available.

(h) 2-Chloropropane 2-Chloropropane is acceptable as a substitute for CFC–11 and CFC–12 in phenolic insulation board. At present, because 2-chloropropane is a proprietary technology. Moreover, 2-chloropropane is flammable and its use may require extensive modification of existing equipment.

(i) Carbon dioxide. Carbon dioxide is an acceptable alternative blowing agent for CFC–11 and CFC–12 in phenolic insulation board.

(7) Flexible polyurethane foam. (a) *Methylene chloride.* Methylene chloride (or blends thereof) is acceptable as a blowing agent in flexible polyurethane foams. Methylene chloride is already used as an auxiliary blowing agent in the manufacture of most flexible polyurethane slabstock foams and has proven adequate in yielding foams of many densities and degrees of softness. Replacement of CFC–11 or methyl chloroform blowing agents with methylene chloride can reduce the potential for stratospheric ozone depletion resulting from the production of flexible polyurethane foams.

Nevertheless, there is concern over the potential health and safety issues posed by methylene chloride. In fact, due to these concerns, some local and regional restrictions apply to the use of methylene chloride. To assess these risks in the application under discussion, EPA used data collected by the Occupational Safety and Health Administration (OSHA) for the proposed revision of the permissible exposure level (PEL) for methylene chloride. The Agency's estimate for total population risk for methylene chloride was based on average plant emissions derived from OSHA's analysis, and while not negligible, was within the range of existing Agency decisions on acceptable risk. For further detail, refer to the background document entitled "Risk Screen on the Use of Substitutes for Class I Ozone-Depleting Substances: Foams".

In light of the results of Agency analysis, EPA decided to find acceptable the use of methylene chloride subject to existing or future restrictions because it will allow immediate transition from class I substances in this end-use. Potential users should note that methylene chloride use will be subject to future controls for hazardous air pollutants under Title III section 112 of the CAA. In addition, use of the compound must conform to all relevant workplace safety standards; OSHA has proposed permissible exposure levels (PELs) for methylene chloride of 25 ppm on a time-weighted average (TWA). Once such additional controls have been adopted, use of this substitute must comply with any other applicable requirements, such as state restrictions. Use is also subject to waste disposal requirements under RCRA.

(b) Acetone. Acetone (or blends thereof) is acceptable as a blowing agent for flexible polyurethane foams. In those areas where methylene chloride use is deemed unacceptable, acetone may provide another non-ODP alternative to CFC–11 and methyl chloroform. All grades of flexible polyurethane foam produced with CFCs can be produced using acetone as an auxiliary blowing agent. Acetone does not have an ozone depletion potential, and its global warming potential is negligible. Nevertheless, acetone is highly flammable and its use requires precautions to ensure safety to workers as prescribed by OSHA. In addition, use of this compound is subject to various federal, state, or local controls as a VOC under Title I of the CAA.

(c) HFC–134a. HFC–134a (or blends thereof) is acceptable as a substitute for CFC–11 in flexible polyurethane foam. HFC–134a is a non-ozone-depleting alternative to CFC–11 blowing agents in flexible polyurethane foam. Plant modifications may be necessary to accommodate the use of HFC–134a because its boiling point is lower than that of CFC–11.

(d) HFC–152a. HFC–152a (or use thereof) is acceptable as a substitute for CFC–11 in flexible polyurethane foam. HFC–152a is a non-ozone-depleting alternative to CFC–11 blowing agents in flexible polyurethane foam. Process changes may be necessary to accommodate the use of HFC–152a, and plant modifications may be necessary to manage its flammability.

(e) AB Technology. AB Technology is acceptable as an alternative process in flexible polyurethane foams. The AB Technology generates carbon monoxide as the chemical blowing agent. Precautions should be taken to insure the safety of workers from exposure to elevated levels of carbon monoxide, particularly at the latter phases of production where ventilation is generally not as efficient as on the foam line. OSHA has set a permissible exposure level (PEL) for carbon monoxide of 35 ppm on a time-weighted average (TWA) with a ceiling of 200 ppm.

(f) Carbon dioxide. Carbon dioxide (or blends thereof) is an acceptable alternative process in flexible polyurethane foams.

(8) Polyurethane integral skin foams. (a) HCFC–123. HCFC–123 (or blends thereof) is acceptable as an alternative to CFC–11 in integral skin foams. The physical and chemical properties of HCFC–123 are similar to CFC–11. As a result, HCFC–123, which has an ozone depleting potential significantly lower than that of CFC–11, has the potential to replace CFC–11 in many integral skin applications. Nonetheless, commercial availability of HCFC–123 is limited at present. The use of HCFC–123 in integral skin foams is subject to significant restriction under section 610 of the CAA, which bans the use of class II substances in noninsulating foams after January 1, 1994. The ban exempts only certain integral skin foams used to provide for motor vehicle safety.

(b) HCFC–141b. HCFC–141b (or blends thereof) is acceptable as an alternative to CFC–11 in integral skin foams. Although its ODP of 0.11 is relatively high, HCFC–141b offers an acceptable transition substitute out of CFC–11 in integral skin foams. The use of HCFC–141b in integral skin foams, however, is subject to significant restriction under section 610 of the CAA, which banned the use of class II substances in noninsulating foams after January 1, 1994. The ban exempts only certain integral skin foams used to provide for motor vehicle safety.

(c) HCFC–22. HCFC–22 (or blends thereof) is acceptable as a substitute for CFC–11 in integral skin foam. HCFC–22 offers an alternative with significantly less potential to deplete ozone than CFC–11. However, process changes may be necessary to accommodate the low boiling point of HCFC–22. The use of HCFC–22 in integral skin foams is subject to significant restrictions under section 610 of the CAA, which banned the use of class II substances in noninsulating foams after January 1, 1994. The ban exempts only certain integral skin foams used to provide for motor vehicle safety.

(d) HFC–134a. HFC–134a (or blends thereof) is acceptable as a substitute for CFC–11 in polyurethane integral skin foam. HFC–134a is a non-ozone-depleting alternative to CFC–11 blowing agents in polyurethane integral skin foam. Plant or process modifications may be necessary to accommodate the use of HFC–134a because its boiling point is lower than that of CFC–11.

(e) HFC–152a. HFC–152a (or blends thereof) is acceptable as a substitute for

CFC–11 in polyurethane integral skin foam. HFC–152a is a non-ozone-depleting alternative to CFC–11 blowing agents in polyurethane integral skin. Plant or process changes may be necessary to accommodate the use of HFC–152a, and plant modifications may be necessary to manage its flammability. Also, foams blown with HFC–152a will need to conform with any product safety requirements that relate to flammable materials.

(f) Saturated light hydrocarbons C3–C6. Saturated light hydrocarbons C3–C6 (or blends thereof) are acceptable as substitutes for CFC–11 in integral skin foams. Saturated light hydrocarbons C3–C6 offer the possibility of a non-ODP replacement for CFC–11 in integral skin foams. Plant or process modifications may be necessary to accommodate the flammability of saturated light hydrocarbons C3–C6 and to make the necessary technical and process modifications.

(g) Methylene chloride. Methylene chloride (or blends thereof) is acceptable as a blowing agent in integral skin foam. See methylene chloride discussion under Polyurethane Flexible Foams for additional details on toxicity issues. Use is subject to waste disposal requirements under RCRA.

(h) Carbon dioxide. Carbon dioxide (or blends thereof) is acceptable as a blowing agent in integral skin foams.

(9) Extruded polystyrene sheet foam. (a) HFC–134a. HFC–134a (or blends thereof) is acceptable as a substitute for CFC–12 in extruded polystyrene sheet foam. HFC–134a is a non-ozone-depleting alternative to CFC–12 blowing agents in polystyrene sheet foam.

(b) HFC–152a. HFC–152a (or blends thereof) is acceptable as a substitute for CFC–12 in extruded polystyrene sheet foam. HFC–152a is a non-ozone-depleting alternative to CFC–12 blowing agents in extruded polystyrene sheet foams. The compound is commercially available and its low molecular weight suggests that its blowing efficiency will be double that of CFC–12. Plant or process modifications may be needed to accommodate the flammability of HFC–152a.

(c) Saturated light hydrocarbons C3–C6. Saturated light hydrocarbons C3–C6 (or blends thereof) are acceptable as substitutes for CFC–12 in extruded polystyrene sheet foam. Saturated light hydrocarbons C3–C6 offer the potential of a non-ozone-depleting alternative to the use of CFC–12 blowing agents in extruded polystyrene sheet. At present, pentane and butane are used extensively as blowing agents in extruded polystyrene sheet. These compounds are widely available at low cost and offer excellent solubility with the polystyrene polymer.

(d) Carbon dioxide. Carbon dioxide (or blends thereof) is acceptable as a substitute for CFC–12 in extruded polystyrene sheet foam.

(10) Polyolefin foams. (a) HCFC–22. HCFC–22 is acceptable as a substitute for CFC–11, CFC–12, and CFC–114 in polyolefin foams. HCFC–22 offers an alternative with significantly less potential to deplete ozone than CFC–11, CFC–12, or CFC–114. Under the section 610 Non-Essential Use Ban, HCFC use in polyolefin foams is restricted to thermal insulating applications of polyethylene foams where such foam is suitable in shape, thickness and design to be used as a product that provides thermal insulation around pipes used for heating, plumbing, refrigeration, or industrial process systems.

(b) HCFC–142b. HCFC–142b is acceptable as a substitute for CFC–11, CFC–12, and CFC–114 in polyolefin foams. HCFC–142b offers an alternative with significantly less potential to deplete ozone than CFC–11, CFC–12, or CFC–114. Under the section 610 Non-Essential Use Ban, HCFC use in polyolefin foams is restricted to thermal insulating applications of polyethylene foams where such foam is suitable in shape, thickness and design to be used as a product that provides thermal insulation around pipes used for heating, plumbing, refrigeration, or industrial process systems.

(c) HCFC–22/HCFC–142b. HCFC–22/HCFC–142b blends are acceptable, for reasons described and the caveats outlined above, as a substitute for CFC–11, CFC–12 and CFC–114 in polyolefin foam. Under the section 610 Non-Essential Use Ban, HCFC use in polyolefin foams is restricted to thermal insulating applications of polyethylene foams where such foam is suitable in shape, thickness and design to be used as a product that provides thermal insulation around pipes used for heating, plumbing, refrigeration, or industrial process systems.

(d) HFC–134a. HFC–134a is acceptable as a substitute for CFC–11, CFC–12, and CFC–114 in polyolefin foams. HFC–134a offers the potential for a non-ozone-depleting alternative to CFC–11, CFC–12, and CFC–114 in polyolefin foams. HFC–134a, because of its low flammability and encouraging performance in toxicological testing, exhibits definite advantages from the standpoints of worker and consumer safety. HFC–134a does, however, contribute to global warming.

(e) HFC–143a. HFC–143a is acceptable as a substitute for CFC–11, CFC–12, and CFC–114 in polyolefin foams. HFC–143a has a higher global warming potential than other acceptable substitutes in this end-use.

(f) HFC–152a. HFC–152a, for the reasons described in the section on extruded polystyrene sheet foam, is acceptable as an alternative to CFC–11, CFC–12, and CFC–114 in polyolefin foams. Plant or process modifications may be needed to accommodate the flammability of HFC–152a.

(g) Saturated light hydrocarbons C3–C6. Saturated light hydrocarbons C3–C6 are acceptable as substitutes for CFC–11, CFC–12, and CFC–114 in polyolefin foams.

(h) HCFC–22/Saturated light hydrocarbons C3–C6. HCFC–22/Saturated light hydrocarbons C3–C6 blends, for the reasons described and with the caveats outlined above, are acceptable substitutes for CFC–11, CFC–12 and CFC–114 in polyolefin foams. Under the section 610 Non-Essential Use Ban, HCFC use in polyolefin foams is restricted to thermal insulating applications of polyethylene foams where such foam is suitable in shape, thickness and design to be used as a product that provides thermal insulation around pipes used for heating, plumbing, refrigeration, or industrial process systems.

(i) Carbon dioxide. Carbon dioxide is acceptable as a substitute for CFC–11, CFC–12, and CFC–114 in polyolefin foams.

b. *Unacceptable substitutes.* The final rule listing a foam blowing agent as unacceptable in a specific foam use sector constitutes a ban on the use of that alternative to Class I compounds. This decision will be effective 30 days after publication of this final rule.

(1) Polyolefin foams. The use of HCFC–141b (or blends thereof) is unacceptable as an alternative blowing agent in polyolefin foams. HCFC–141b has an ODP of 0.11, almost equivalent to that of methyl chloroform, a Class I substance. The Agency believes that non-ozone depleting alternatives are sufficiently available to render the use of HCFC–141b unnecessary in this application.

F. Solvent Cleaning

1. Overview

On an ozone-depletion weighted basis, solvents constitute approximately 15 percent of the chemicals targeted for phase-out under the Montreal Protocol. In the U.S., the two class I chemicals used as industrial solvents are CFC–113 (C2F3C13—trifluorotrichloroethane) and methyl chloroform (C2H3C13—1,1,1-trichloroethane). The SNAP determinations issued in the solvent

cleaning sector focus on substitutes for CFC–113 and methyl chloroform (MCF) when used in industrial cleaning equipment, since this application comprises the largest use of ozone-depleting solvents.

Other cleaning applications for ozone-depleting solvents exist as well, such as in dry cleaning of textiles or in hand cleaning or maintenance cleaning as a spray. In addition, these solvents are used as bearer media (such as lubricant carriers), mold release agents, component testing agents, or in other non-cleaning applications. CFC–11 is also occasionally used as a cleaning solvent in specialized applications. For the reasons described earlier in this Preamble, the Agency intends to exclude cleaning substitutes for CFC–113, MCF and CFC–11 in these applications—with the exception of aerosol substitutes—from the SNAP determinations at this time. As a result, the Agency is not at this time issuing any determinations on acceptability of such substitutes, and will neither approve nor restrict their uses. Aerosol substitutes are covered in a separate section of this Preamble.

Appendix B at the end of this Preamble lists in tabular form the Agency's determinations on substitutes in the cleaning sector. These listings are based on the risk screens described in the background document entitled "Risk Screen on the Use of Substitutes for Class I Ozone-Depleting Substances: Solvent Cleaning" and discussed in associated supporting memoranda. The table includes as "pending" a few substitutes for which the Agency has not yet issued determinations. Vendors or users of cleaning substitutes not described in appendix B should submit information on these uses, so that the Agency can review them and issue a SNAP determination.

The three major end uses that in the past employed CFC–113 and MCF are metals cleaning, electronics cleaning, and precision cleaning. Metals cleaning applications usually involve removing cutting oils and residual metal filings. This sector relies principally on MCF as a cleaning solvent. In contrast, the electronics industry uses principally CFC–113, for instance, to remove flux residues left after mounting parts on printed circuit boards. Precision cleaning also uses mostly CFC–113. This last application comprises a broad category of industrial cleaning operations and can cover uses ranging from preparation of pacemakers to manufacture of direct access storage devices (DASDs) for computers. The following sections present substitutes for CFC–113 and MCF in these three end uses and discuss the acceptability listings presented in appendix B.

2. Substitutes in Solvents Cleaning

a. *Hydrochlorofluorocarbons (HCFCs).* HCFC–141b or HCFC–141b blends with alcohols are the principal HCFC alternative solvents to CFC–113/MCF cleaning. These alternatives can be used in vapor degreasing equipment, principally for electronics or precision cleaning, and in some cases existing CFC–113 or MCF equipment can be retrofitted for use with HCFC–141b alternatives. From an environmental standpoint, the critical characteristic of HCFC–141b is that it has a relatively high ODP—0.11—the highest of all the HCFCs.

Another HCFC, HCFC–123, is generally not considered to have widespread application as a cleaner. Although this HCFC has the capacity to remove many soils, it is such an aggressive cleaner that it frequently degrades the surface of the part being cleaned. The company-set AEL for HCFC–123 was recently raised from 10ppm to 30ppm based on new toxicity findings. These new data mean that the exposure limit could be met with existing equipment, and the Agency intends to list HCFC–123 under separate rule-making as acceptable subject to adherence to the exposure limit.

HCFC–225, a third HCFC, is widely viewed as having potential as a cleaning agent, especially for manufacture and maintenance of precision parts and equipment. However, this chemical is not yet in widespread production or use and is only now starting to be commercially available. Preliminary toxicity findings suggest that of the two HCFC–225 isomers, HCFC–225ca and HCFC–225cb, toxicity concerns associated with the ca-isomer may warrant a comparatively low company-set occupational exposure limit. As a result, EPA intends under separate rule-making to propose HCFC–225 as acceptable subject to adherence to this limit. The Agency anticipates that companies will readily be able to meet this requirement since the ca-isomer is sold commercially in a blend with the less toxic cb-isomer. In addition, equipment using HCFC–225 is usually designed for precision operations and has inherently low emissions.

b. *Semi-aqueous cleaners.* Semi-aqueous cleaners are alternatives for cleaning in all three sectors. These cleaners employ hydrocarbons/surfactants either emulsified in water solutions or applied in concentrated form and then rinsed with water. Since both approaches involve water as part of the formulation, the system is commonly referred to as "semi-aqueous." The principal categories of chemicals used in these formulations are terpenes, C6–C20 petroleum hydrocarbons (both naturally or synthetically derived), or oxygenated organic solvents (such as alcohols). An extensive discussion of various semi-aqueous cleaning alternatives may be found in the Industry Cooperative for Ozone Layer Protection (ICOLP) documents on the subject. Users can obtain these documents from the EPA.

c. *Aqueous cleaners.* Aqueous cleaners, unlike semi-aqueous, uses water as the primary solvent. These formulations are used mostly for metals cleaning, but companies are beginning to explore options using these substitutes in other cleaning applications. In aqueous formulations, detergents and surfactants are combined in water with a variety of additives such as organic solvents (e.g., high-boiling point alcohols), builders, saponifiers, inhibitors, emulsifiers, pH buffers and antifoaming agents. The cleaning process is comparable to that used in semiaqueous applications and consists of combinations of a wash phase, a rinse phase, and a drying phase. An important difference is that the wash tank is frequently heated to improve soil removal. The final step, drying, is separate from the cleaning step and can be accomplished by use of heat or a drying agent. These alternatives are discussed extensively in the ICOLP documents.

d. *Straight organic solvent cleaning.* Organic solvents can be used to replace CFC–113 and MCF in certain cleaning operations. This classification is defined to include terpenes, C6–C20 petroleum hydrocarbons (both naturally and synthetically derived), and oxygenated organic solvents such as alcohols, ethers (including propylene glycol ethers), esters and ketones. These compounds are commonly used in solvent tanks at room temperature, although the solvents can also be used in-line cleaning systems or be heated to increase solvency power. If heated, the solvents must be used in equipment designed to control vapor losses.

These solvents, unlike class I and II compounds, do not contribute to stratospheric ozone depletion, and generally have short atmospheric lifetimes. Yet many of the organic solvents are regulated as VOCs because they can contribute to ground-level ozone formation. In addition, certain of the organic solvents are toxic to human health and are subject to waste handling standards under the Resource Conservation and Recovery Act (RCRA) and to workplace standards set by

Occupational Safety and Health Administration (OSHA). For example, xylene and toluene may be used as substitutes but are, once they become wastes, regulated under RCRA as listed or characteristic wastes.

e. *Other chlorinated solvents.* In addition to MCF and CFC–113, the three other commonly used chlorinated solvents are trichloroethylene ("TCE"), methylene chloride ("meth"), and perchloroethylene ("perc"). Unlike MCF and CFC–113, these chlorinated solvents have very short atmospheric lifetimes and are not considered to contribute to ozone depletion. However, all three have known toxicity problems and are regulated as Hazardous Air Pollutants under section 112 of title III of the Clean Air Act. They are also subject to waste handling standards under RCRA and to workplace standards set by OSHA. Additionally, TCE and perc exhibit photochemical reactivity, and are regulated as smog precursors.

The phaseout of CFC–113 and MCF has prompted a renewed interest in meth, TCE, and perc, despite these toxicity concerns. The three solvents are mostly viewed as potential metal cleaning substitutes, especially since they can be used in conventional vapor degreasing equipment. In fact, these three solvents were the preferred industrial solvents until concerns about their toxicity and anticipated lowering of the OSHA Permissible Exposure Limits (PELs) resulted in a switch by some users to MCF.

In response to such concerns, equipment vendors have now developed equipment for using these solvents that significantly limit their emissions. The availability of such equipment has prompted environmental agencies in other western countries, such as Germany, to relax restrictions on the use of these chemicals. Such equipment, although expensive, can now be purchased in the United States.

f. *No-clean alternatives.* No-clean alternatives involve the use of fluxes or cutting oils that need not be removed after the manufactured part is fully formed. It offers an efficient solution to the cleaning problem, since it sidesteps the need for cleaning altogether. This type of substitute represents one of the few process changes possible in the solvents cleaning sector. Water-removable products are products where the soils or fluxes can be removed using water as opposed to other types of chemical solvents. In electronics cleaning, where these two approaches are in more widespread use, no-clean or water-removable alternatives rely either on special fluxes or on a soldering process that eliminates or reduces the residues otherwise removed through the cleaning step.

In metal preparations, an increasing common process change is to use vanishing oils. These oils are refined mineral spirits, usually odorless, that flash off after the metal forming step is completed thus eliminating the need for cleaning. Technically, this process can be referred to as a "no-clean" process, although that term is usually reserved for electronics manufacture.

g. *Perfluorocarbons.* Perfluorocarbons (PFCs) are fully fluorinated compounds, unlike either CFCs, HCFCs or HFCs. Perfluorocarbons presently employed or being investigated for commercial applications for cleaning are C5F12, C6F12, C6F14, C7F16, C8F18, C5F11NO, C6F13NO, C7F15NO, and C8F16.

These compounds are being discussed as part of innovative cleaning and drying systems to replace ozone-depleting solvents used in cleaning. These systems would use an aqueous or solvent cleaner bath with PFCs for rinsing and/or drying. Although the PFCs technically are being used as drying agents in this system, it is due to the replacement of CFC–113 as a cleaner that the PFCs are being used, which is why PFCs are addressed in the solvent cleaning sector. PFCs also have solvent displacement properties (including for displacement of water), that may make their use necessary. Although these systems have the technical potential to meet a number of cleaning needs, the expense of the PFCs may limit widespread commercial interest in systems that use these compounds.

The environmental characteristics of concern for these compounds are high global warming potential (5,000–10,000 times greater than CO_2) and long atmospheric lifetimes (3,000–5,000 years). Although the actual contributions to global warming depend upon the quantities of PFCs emitted, the warming effects of PFCs are essentially irreversible. In other respects, PFCs are benign and are generally nontoxic, nonflammable, and do not contribute to ground-level ozone formation. Environmental concerns associated with use of PFCs are discussed in the comment response section of this preamble, section III.D. Technology for containment and recycling of PFCs is commercially available and is recommended by manufacturers to offset any possible adverse environmental effects.

h. *Monochlorotoluene/benzotrifluorides.* Monochlorotoluene and benzotrifluorides are of commercial interest as solvent substitutes in a variety of cleaning applications. These compounds can be used either in isolation or in various mixtures, depending on desired chemical properties. The Agency is still receiving toxicity and exposure information on these formulations and will issue a SNAP determination for these substitutes when SNAP review is complete.

i. *Volatile methyl siloxanes.* Cyclic and linear volatile methyl siloxanes (VMSs) are currently undergoing investigation for use as substitutes for class I compounds in metals, electronics and precision cleaning. Because of their chemical properties, these compounds show promise as substitutes for cleaning precision guidance equipment in the defense and aerospace industries. In addition, the volatile methyl siloxanes have high purity and are therefore relatively easy to recover and recycle. In the cleaning system using VMSs, the fluids are used to clean parts in a closed header system using a totally enclosed process. The parts are drained and then dried using vacuum baking.

j. *Supercritical fluid cleaning, plasma cleaning, UV-ozone cleaning.* Supercritical fluid cleaning, plasma cleaning and UV-ozone cleaning are all three high-technology methods of cleaning parts. These substitutes are mostly of interest for cleaning electronic parts or for precision cleaning, although supercritical carbon dioxide is being investigated for metal cleaning applications as well.

k. *Dibromomethane.* The Agency has received notification that dibromomethane (also referred to as methylene bromide) can be used as a substitute cleaning agent. This chemical has an ozone depletion potential of .17, although it is not yet listed under the Clean Air Act. In addition, dibromomethane is believed to be more toxic than methylene chloride, although toxicity studies are scarce since industrial applications in the past have been limited. As a result, the Agency intends to propose this substitute as unacceptable in a separate rule-making.

l. *HFC–4310mee.* HFC–4310mee will soon be commercially available as a solvent cleaning agent. The Agency has received preliminary data on this chemical, and anticipates that its use will be limited due to global warming concerns to applications where it can replace longer-lived PFCs or where its special chemical properties make it the only viable substitute for a class I or II compound. This chemical will be undergoing review under the Premanufacture Notice program of the Toxic Substances Control Act.

Other HFCs are also being developed for solvent usage, although their composition is still proprietary.

3. Comment Response

The majority of public comments received on the proposed solvents cleaning SNAP decisions focused on the determinations for perfluorocarbons (PFCs) and for chlorinated solvents. Most commenters on PFCs requested that the Agency expand the acceptability determination for PFCs to parts other than computer components, as stated in the SNAP Notice of Proposed Rule-Making (NPRM). Although many commenters agreed that a measure of control due to global warming effects was necessary, several companies described in detail situations where PFCs are believed to be the only viable alternative to CFC–113 and methyl chloroform. The Agency agrees with these commenters, and the final SNAP determination lists the PFCs as acceptable in all cases where no other alternative meets performance or safety standards. This approach does not diverge significantly from that described in the NPRM, in which EPA noted its intention to examine the possibility that PFCs may be necessary for cleaning other parts in addition to computer components.

Opinions on the chlorinated solvents diverged widely. A number of commenters disagreed with the Agency's decision to list these chemicals as acceptable substitutes for solvents cleaning. This viewpoint was countered by other commenters who strongly agreed with the continuing need to use chlorinated solvents. The Agency has not altered its decision on these chemicals, and remains convinced that with responsible control measures and housekeeping practices, potential risks from these solvents can be significantly reduced and that overall risks to human health and the environment will not increase significantly as a result of substitution.

4. Listing Decisions

a. *Acceptable substitutes.* (1) Metals cleaning. (a) Semi-aqueous/aqueous cleaners. Semi-aqueous and aqueous cleaners are acceptable substitutes for CFC–113 and MCF in metals cleaning. The determinations in this action cover semi-aqueous cleaners using terpenes, petroleum hydrocarbons, and alcohols. To complete its modeling of the ability of aqueous and semi-aqueous substitutes to replace CFC–113 and MCF in existing applications, the Agency examined their ability to meet cleaning requirements in the metals cleaning sector. Each of these alternatives has the potential to service as much as 70 percent of the metals cleaning market. To date, companies have shown the greatest interest in aqueous formulations for metals cleaning, which is why the Agency has reviewed this option in its first round of SNAP determinations.

Concern over the water-based cleaners has historically focussed on the potential for adverse effects on aquatic life following discharge of wastewaters to surface water bodies. Examples of these effects include death to aquatic microorganisms, fish teratogenicity, or ecosystem effects such as inhibition of algal growth or bioconcentration. In this case, the Agency wanted to ensure that, in restricting the use of CFC–113 and methyl chloroform, it would not simply be replacing risks from air emissions with equal risks from contaminated water effluent.

To complete its risk analysis for the aqueous and semi-aqueous formulations, the Agency developed a screening methodology designed to characterize risks presented by typical manufacturing setups using these formulations. The diversity of chemicals used in aqueous and semi-aqueous cleaning complicated this undertaking. To complete its screen, the Agency projected concentrations in water for the most toxic chemical that could be used in the water-based formulations. These concentrations were based on the maximum possible concentration in the formulation and case studies documenting actual release profiles for several sample processes. The predicted concentrations obtained using this approach were then compared with toxicity values for this "worst" chemical.

This analysis suggests that most risks presented by use of water-based cleaners can be controlled by standard process management practices (e.g., planned discard schedules for wash and rinse solutions in cleaner tanks) and by adhering to existing requirements for wastewater treatment imposed by municipal or state authorities. This screening approach, although it does not examine the toxicity of each chemical and mixture or project exposures for each possible formulation, does provide adequate perspective on the risks of these compounds compared with risks from continued use of CFCs.

Although the Agency is listing water-based substitutes as acceptable, it urges companies to install systems that permit re-use and recycling of the formulation wherever possible to limit discharge of these chemicals. This step can offer both important benefits to aquatic systems as well as reduce operating costs of cleaning systems.

Users should also note that EPA is preparing new effluent limitations and standards that will affect metals cleaning under the Clean Water Act for the Metal Products and Machinery sector. These standards, the first portion of which is expected to be issued in November 1994, will address any remaining uncontrolled risks deriving from the use of water-based cleaners in this industry. Phase I covers sectors such as stationary industrial equipment, hardware, and aircraft. Phase II, to be issued later, covers among other sectors manufacture, rebuild, or maintenance of buses, trucks, railroads, and shipbuilding.

(b) *Straight organic solvent cleaning.* Straight organic solvent cleaning is an acceptable substitute for CFC–113 and MCF in the metals cleaning sector. This acceptability determination extends to organic solvents used as individual chemicals as well as in combinations. Although these compounds can be toxic to human health and are considered VOCs, the Agency's risk screen shows that these risks can be addressed through existing regulatory controls. In occupational settings where toxicity is a concern, such as for acetone or for certain ketones, OSHA has set PELs designed to control risks. One class of organic solvents about which there has recently been increased concern for possible health effects is glycol ethers. However, the glycol ethers identified in this case are ethylene glycol ethers, whereas for solvent cleaning purposes companies customarily use propylene glycol ethers. Propylene glycol ethers are generally not believed to exhibit the same degree of toxicity as the ethylene glycol ethers. Controls also exist for sources of VOC emissions and for handling of the organic solvents as hazardous wastes under RCRA.

Regulatory standards are not the only method of mitigating the environmental effects of these chemicals. Many manufacturers and distributors of these solvents have instituted programs or can refer companies to programs that will reclaim and process spent solvent—either on or off-site—for further use. The Agency encourages companies using organic solvents to seek out such programs. In addition, companies should consider the principles of pollution prevention when instituting cleaning with organic solvents and adopt emissions control measures such as appropriate freeboard and automated hoists that will reduce pollution at its source.

(c) *Other chlorinated solvents.* Trichloroethylene (TCE), perchloroethylene (perc) and methylene chloride (meth) are all acceptable

substitutes for CFC–113 and MCF in the metals cleaning sector. These alternatives have the chemical properties to meet the cleaning needs of up to 80 percent of the metals cleaning sector, although the Agency anticipates that the actual market share for the non-ozone-depleting chlorinated solvents will not expand to the maximum extent feasible. Because of the high toxicity of these compounds, they have the potential to pose risks to workers and residents in nearby communities. However, the Agency's analysis of use of these compounds as cleaning agents indicates that these risks can be controlled by adhering to existing regulatory standards. OSHA has determined, for instance, that it is possible to use these solvents in a manner that minimizes risks to workers. To reach this conclusion, OSHA conducted extensive analyses of the toxicity and technical feasibility of using perchloroethylene, trichloroethylene, or methylene chloride (54 FR 2329–2984, January 19, 1989, and 56 FR 57036–57141, November 7, 1991). OSHA found that the new PEL of 50 ppm for trichloroethylene was feasible in metal cleaning operations (54 FR 2433) and after conducting an extensive study of metal degreasing control technologies, the National Institute of Occupational Safety and Health concluded that an exposure limit of 25 ppm for TCE could also be achieved. More recently, in its proposed standard for methylene chloride, OSHA found that a PEL of 25 ppm is technically feasible during metal cleaning operations with the use of appropriate local exhaust ventilation and work practices.

In addition, these solvents are all listed as hazardous wastes under RCRA (F001, U080, U210, U228) and thus must comply with applicable RCRA waste disposal requirements. The SNAP risk screen did note the potential for adverse effects without additional controls. However, the Agency is in the process of addressing residual risks to the general population through releases to air under section 112 of the Clean Air Act. Section 112 requires EPA to establish Maximum Achievable Control Technology (MACT) standards for use of Hazardous Air Pollutants (HAPs). All three non-OD chlorinated solvents are listed as HAPs, and the Agency issued a proposal describing MACT rules governing their use in industrial cleaning in November 1993. The final regulation is expected to be issued by the end of 1994.

Finally, through the voluntary "33/50" pollution prevention program, the EPA is encouraging companies to decrease emissions of TCE, perc, and meth, in addition to 14 other specific chemicals. Companies participating in this program voluntarily commit to decreasing emissions 33 percent by the end of 1992 and 50 percent by the end of 1995, using pollution prevention strategies. The Agency is committed in the long term to urge companies to participate in pollution prevention programs such as 33/50, and to continue to find new ways to use and emit less polluting and lower toxicity compounds. EPA urges even companies not participating in the 33/50 program to explore and adopt housekeeping practices, chemical handling procedures, and equipment configurations that lead to lower chemical consumption.

(d) Supercritical carbon dioxide. Supercritical carbon dioxide is acceptable as a substitute for CFC–113 and MCF in the metals cleaning sector. The Agency's risk screen did not identify any environmental effects with significant concerns for this substitute.

(e) Vanishing oils. Vanishing oils are acceptable substitutes for CFC–113 and MCF in the metals cleaning sector. Although these materials are VOCs, extensive regulations exist at the Federal, state, and local level to control any new VOC uses. In addition, newer vanishing oils often have higher flashpoints, enabling them to be flashed and captured in ovens.

(f) Volatile methyl siloxanes (dodecamethylcyclohexasiloxane, hexamethyldisiloxane, octamethyltrisiloxane, decamethyltetrasiloxane). The volatile methyl siloxanes dodecamethylcyclohexasiloxane, hexamethyldisiloxane, octamethyltrisiloxane, and decamethyltetrasiloxane are acceptable substitutes for CFC–113 and MCF in the metals cleaning sector. The Agency's risk screen for these chemicals indicated that exposure to these substitutes are generally below levels that would raise concern for health risks. Two of the volatile methyl siloxanes, octamethylcyclotetrasiloxane and decamethylcyclopentasiloxane, have low company-set exposure limits, and these chemicals will be handled under a separate rulemaking.

(2) Electronics cleaning. a. (Semi-aqueous/aqueous cleaners).Semi-aqueous and aqueous cleaners are acceptable substitutes for CFC–113 and MCF in electronics cleaning. The justification for this determination is described in the section on metals cleaning. In this case, the Agency estimated that up to 80 percent of the cleaning market could be captured by semi-aqueous cleaners and that up to 60 percent of the market could be served by aqueous cleaners. As in metals cleaning, the Agency urges companies to adopt pollution prevention practices and to select formulations with low overall toxicity.

Effluent limitations and standards that affect use of water-based formulations in the electronics cleaning sector will be proposed under the Clean Water Act for the Phase I Metal Products and Machinery sector by November 1994. Phase I includes electronic equipment along with other manufacturing areas such as aerospace, hardware and mobile industrial equipment. Phase II, to be issued later, covers household and office equipment in addition to sectors such as motor vehicles and shipbuilding.

(b) No-clean substitutes. No-clean processes are acceptable substitutes for CFC–113 and MCF in electronics cleaning. The Agency's analysis estimates that, over time, as much as seventy percent of the electronics cleaning market could switch to no-clean processes—a projection that is borne out by the high degree of interest shown by electronics companies in these substitutes.

Concerns for risks deriving from use of no-clean processes focus primarily on worker safety. To examine these risks, the Agency looked at critical factors that distinguish no-clean processes from conventional electronics assembly. These differences center on changes in the proportions of chemicals used in formulations, rather than on differences in the identity of chemicals selected. The analysis determined that occupational risks deriving from these differences are already well-documented and controlled, for example, through requirements specified on key Materials Safety Data Sheets and existing workplace regulations implemented by OSHA.

Additionally, the shifts in proportions of chemicals used in the formulation result in less waste than is normally generated through the traditional manufacturing process, resulting in a lower probability of overall adverse effects to the general population. The Agency also investigated the production of waste before and after the actual cleaning process and found that waste generation at these points in the production process would not be greater than what is seen with CFC–113 or MCF use.

This acceptability listing also applies to water-removable fluxes and inert gas soldering.

(c) Straight organic solvent cleaning. Straight organic solvent cleaning is an

acceptable substitute for CFC–113 and MCF in the electronics cleaning sector. This acceptability determination extends to organic solvents used as individual chemicals as well as in combinations. The Agency's justification for this decision is described in the section on acceptable substitutes for metals cleaning.

(d) Other chlorinated solvents. Trichloroethylene (TCE), perchloroethylene (perc) and methylene chloride (meth) are all acceptable substitutes for CFC–113 and MCF in the electronics cleaning sector. The reasons for this decision are described in the metals cleaning discussion. Although these solvents have not received as much commercial interest for electronics cleaning as for metals cleaning applications, the Agency did receive a request to review these chemicals for electronics cleaning.

Although the Agency's risk screen focused on use of these chemicals in metals cleaning operations, the screen suggests that release profiles for these chemicals in electronics cleaning will be either the same or lower. As a result, the Agency has reached the same conclusion with respect to electronics cleaning as in the metals cleaning analysis, namely that any risks due to the inherent toxicity of these chemicals could be controlled by existing and future regulatory standards.

(e) Supercritical fluid cleaning, plasma cleaning, UV-ozone cleaning. Supercritical fluid cleaning, plasma cleaning, UV-ozone cleaning are all acceptable as substitutes for CFC–113 and MCF in electronics cleaning. The Agency did not identify any environmental issues associated with use of these substitutes. While ozone is hazardous to human health, OSHA has already set standards for use of this compound in the workplace.

(f) Volatile methyl siloxanes (dodecamethylcyclohexasiloxane, hexamethyldisiloxane, octamethyltrisiloxane, decamethyltetrasiloxane). The volatile methyl siloxanes dodecamethylcyclohexasiloxane, hexamethyldisiloxane, octamethyltrisiloxane, and decamethyltetrasiloxane are acceptable substitutes for CFC–113 and MCF in the electronics cleaning sector. The Agency's risk screen for these chemicals indicated that exposure to these substitutes are generally below levels that would raise concern for health risks. Two of the volatile methyl siloxanes, octamethylcyclotetrasiloxane and decamethylcyclopentasiloxane, have low company-set exposure limits, and these chemicals will be handled under a separate rule-making.

(3) Precision cleaning. (a) *Semi-aqueous/aqueous cleaners.* Semi-aqueous and aqueous cleaners are acceptable substitutes for CFC–113 and MCF in precision cleaning. The reasons for this decision are the same as those described in the metals cleaning section. Each of these alternatives has the potential to service approximately 65 percent of the precision cleaning market. This figure may overestimate the technical potential for water-based cleaners in this sector, since this end use sector faces the greatest technical constraints in implementing new cleaning alternatives.

The Agency did not specifically examine risks from water-based formulations used in precision cleaning since the processes are typically either similar to those used in metals cleaning or have lower throughputs and therefore fewer discharges. Therefore, the analysis assumed that these risks from precision cleaning would be either comparable to or less than risks associated with use of water-based formulations for metals cleaning.

(b) Other chlorinated solvents. Other chlorinated solvents are acceptable substitutes for CFC–113 and MCF in precision cleaning. The reasons for this decision are described in the section on metals cleaning. For the analysis of risks from these substitutes in the precision cleaning end use sector, the Agency made the same assumptions as in its analysis for electronics cleaning applications of water-based formulations, namely that exposures would be equal to or less than exposures in the metals cleaning sector since the processes for precision cleaning are similar or even of lower emissions than those for metals cleaning. Consequently, the Agency believes that risks would also be either equivalent or lower.

(c) Straight organic solvent cleaning. Straight organic solvent cleaning is an acceptable substitute for CFC–113 and MCF in precision cleaning. This acceptability determination extends to organic solvents used as individual chemicals as well as in combinations. The Agency's justification for this decision is described in the section on acceptable substitutes for metals cleaning.

(d) Supercritical fluid cleaning, plasma cleaning, UV-ozone cleaning. Supercritical fluid cleaning, plasma cleaning, UV-ozone cleaning are all acceptable as substitutes for CFC–113 and MCF in precision cleaning. The Agency did not identify any environmental issues associated with use of these substitutes. While ozone is hazardous to human health, OSHA has already set standards for use of this compound in the workplace.

(e) Volatile Methyl Siloxanes (dodecamethylcyclohexasiloxane, hexamethyldisiloxane, octamethyltrisiloxane, decamethyltetrasiloxane). The volatile methyl siloxanes dodecamethylcyclohexasiloxane, hexamethyldisiloxane, octamethyltrisiloxane, and decamethyltetrasiloxane are acceptable substitutes for CFC–113 and MCF in the precision cleaning sector. The Agency's risk screen for these chemicals indicated that exposure to these substitutes are generally below levels that would raise concern for health risks. Two of the volatile methyl siloxanes, octamethylcyclotetrasiloxane and decamethylcyclopentasiloxane, have low company-set exposure limits, and these chemicals will be handled under a separate rule-making.

b. Substitutes acceptable subject to use conditions. (None).

c. *Substitutes acceptable subject to narrowed use limits.* (1) Metals Cleaning. (None). (2) Electronics Cleaning. (a) Perfluorocarbons. Perfluorocarbons (PFCs) are acceptable substitutes for CFC–113 and MCF in the electronics cleaning sector for high-performance, precision-engineering cleaning applications only where reasonable efforts have been made to ascertain that other alternatives are not technically feasible due to performance or safety requirements. PFCs covered by this determination are C5F12, C6F12, C6F14, C7F16, C8F18, C5F11NO, C6F13NO, C7F15NO, and C8F16O. The uses of PFCs in solvent cleaning are restricted due to global warming concerns. PFCs display intrinsic properties that point to their potential to be contributors to global warming. All PFCs, for instance, have very long atmospheric lifetimes. As an example, C5F12 (perfluoropentane) has a lifetime of approximately 4,100 years. This means that for practical purposes, any global warming effects from PFCs are irreversible. In contrast, the lifetime of CFC–113 is, at 110 years, 40 times smaller. Since greenhouse gases come from many diverse sources, even small emissions of PFCs warrant controls if global warming is to be successfully mitigated. The risk screen for the solvent cleaning sector discusses the atmospheric properties of PFCs and provides a more detailed discussion of why PFCs merit being listed as acceptable only for narrowed uses.

Despite concerns about the global warming potential of PFCs, the Agency has listed this niche application as an

acceptable use of perfluorocarbons because, for certain high-performance, precision-engineered components and equipment, a PFC-based cleaning system may be the only viable alternative available to replace use of class I or II compounds.

The characteristics of components or equipment that may require PFC-based cleaning are if the part:

- Requires extremely low levels of remaining particulate and residue for adequate performance (as opposed to cosmetic appearance).
- Possesses complex geometric configurations and or capillary spaces (as small as 1 micron) which greatly hinder cleaning and drying.
- Contains or is made of materials sensitive to corrosion, oxidation or other damage from water (such as ceramics, gallium arsenide, silicon nitride, or magnesium), where that damage would degrade subsequent performance of the product.
- Contains temperature-sensitive materials that cannot maintain their integrity at the high drying temperatures of alternative systems.
- Contains materials that are hydrophilic or otherwise impaired by contact with water.
- Is extremely fragile, requiring the use of a low viscosity, very low surface tension fluid.
- Is contaminated with specialized halogenated lubricants or damping fluids such as perfluoropolyethers.
- Is a low-volume prototype under development for research, testing and evaluation purposes.

Users should note that the presence of one of these parameters alone does not necessarily indicate the need to use a PFC. For instance, a water-sensitive part could potentially also be cleaned using a solvent wash, solvent rinse without PFCs.

Examples of components where PFCs may be necessary are:

- Precision optical and electro-optical systems such as components for highpowered lasers or weapon targeting systems.
- Specialized electrical, semiconductor and electronic components, connectors and assemblies such as precision electronic components used for military and avionics applications.
- Sensitive medical devices and medical equipment components such as electronic circuitry for pacemakers (does not include prosthetic devices).
- Precision telecommunications and communications components such as microwave hybrid components for electronic warfare.
- High-performance computer components and computer electro-mechanical assemblies such as direct access storage devices.

Other examples are listed in the section on precision cleaning. Examples of parts where alternatives other than PFCs exist are electronic parts for low-value, mass-produced consumer or standard machined metal parts.

A specific example under electronics cleaning where PFCs may be necessary exists in manufacture of certain direct access storage devices (DASDs) for computers. To make the technical improvements demanded of the storage devices, such as faster access times and higher recording densities, companies have been required to use magnetically superior materials. These materials are extremely prone to corrosion from water and are vulnerable to any contamination introduced in the manufacturing process, such as organic or particulate matter. Consequently, the storage device itself must be a miniature "clean room" if it is to perform correctly. Manufacturers of some DASDs can use water-based cleaners in much of the production process, but may need to rely on the PFCs as water-displacement agents to achieve the required high degree of cleanliness while protecting the water-sensitive materials in the device.

As the acceptability determination states, before users adopt PFCs as part of a substitute cleaning system, they must ascertain that "other alternatives are not technically feasible due to performance or safety requirements." This statement implies users will undertake a thorough technical investigation of alternatives before implementing the PFCs. A determination, for instance, that PFCs are necessary simply "because my parts cannot tolerate water," is insufficient. Similarly, companies should avoid rejecting an alternative simply because it is flammable or toxic, since equipment now exists which may be feasible for some uses that makes it possible for a broad spectrum of alternatives to meet performance and safety standards.

Users may contact vendors of alternatives to explore with experts on these alternatives whether or not they would work. This effort may involve a detailed discussion of the type of parts, e.g., function, substrate, geometry, and cleanliness standards. A possible approach is to actually arrange for the parts to be tested with other cleaning alternatives. For example, a concern regarding the flammability of isopropyl alcohol is not sufficient reason to reject this alternative, unless the user has contacted vendors and examined the newer styles of equipment and found them insufficiently safe. To assist users in their evaluation, EPA has prepared a list of vendors selling substitutes for cleaning solvents. Although EPA does not require users to report their test results in a certification to the Agency, companies must keep these results on file for future reference.

In cases where users must rely on PFCs due to lack of other options, they should make every effort to:

- Adopt closed systems and recover, recycle and destroy where possible.
- Pre-clean where possible with other alternatives so as to avoid unnecessary use of PFCs.
- Reduce emissions to a minimum through equipment features and conservation practices that address idling losses, liquid dragout, and operator variables (adequate freeboard, chillers, welded piping, programmable hoists, operator training, etc.).
- Continue to search for long-term alternatives.

The Agency believes that it is reasonable to expect users to achieve favorable CFC/PFC replacement ratios since PFCs have relatively higher boiling points. In addition, the high price of PFCs makes additional containment cost-effective. Companies forced to use PFCs due to lack of other alternatives may use the PFC-based equipment to clean and dry other precision parts, but only if the amount of PFCs needed to stock the equipment does not increase.

Prospective users should also note that companies now investigating PFC use contend that within 2–3 years, it will be possible to replace the PFCs in cleaning equipment with HFCs or other options that have zero ozone depletion potential and significantly lower global warming potential. As a result, they view use of the PFCs as an important but transitional solution to their cleaning needs. If PFCs are chosen, it is important for users to begin working with chemical manufacturers to start testing and qualifying these new materials to help speed conversion when alternative chemicals become commercially available.

Users of PFCs should note that if other alternatives such as HFCs or other cleaning substitutes are later found to meet performance or safety standards, the Agency could be subject to a petition requesting it to list PFCs as unacceptable substitutes due to availability of other alternatives. If such claims are determined to be accurate and EPA limits the acceptability listing even further, EPA may grandfather existing uses but only to the extent warranted by cost and timing

considerations associated with testing and retrofitting.

(3) Precision cleaning. (a) Perfluorocarbons. Perfluorocarbons (PFCs) are acceptable substitutes for CFC–113 and MCF in the precision cleaning sector only for high-performance, precision-engineering cleaning applications where reasonable efforts have been made to ascertain that other alternatives are not technically feasible due to performance or safety requirements. PFCs covered by this determination are C5F12, C6F12, C6F14, C7F16, C8F18, C5F11NO, C6F13NO, C7F15NO, and C8F16O. The electronics cleaning section discusses the justification for this narrowed use acceptability listing.

Despite concerns about the global warming potential of PFCs, the Agency has listed this narrowed application as an acceptable use of perfluorocarbons in precision cleaning because, for certain high-performance, precision-engineered components and equipment, a PFC-based system may be the only viable alternative available to replace use of class I or II compounds.

Types of precision components that may require PFC-based cleaning include:

- High-performance guidance, navigation and tracking systems such as gyroscopes and accelerometers.
- High-performance aerospace and avionics components and equipment such as liquid oxygen systems or rotational hand controllers.
- Critical analytical devices and their components used for gas chromatography where low residue levels are essential.
- Optical components made from plastics damaged irreparably by water or other solvents or coated or mounted with specialized materials.

Interested users should review the section on PFCs under electronics cleaning for a full discussion of the considerations, limitations, and requirements associated with selecting this alternative.

d. *Unacceptable substitutes.* (1) Metals cleaning. (a) HCFC–141b and its blends. HCFC–141b and its blends are unacceptable as substitutes for CFC–113 and MCF in metals cleaning, with acceptability subject to narrowed use limitations to be granted by EPA, if necessary, as CFC–113 replacements after the effective date of this listing. The effective date for this listing is 30 days after the date of the final rule for uses of HCFC–141b and its blends in new equipment (including retrofits made after the effective date) and as of January 1, 1996, for uses of HCFC–141b and its blends in existing equipment. For purposes of this SNAP determination, "existing equipment" is defined to include equipment that companies have shown a clear intention to use and have purchased before the effective date of the SNAP determination, even if that equipment has not yet been installed.

As discussed earlier in this action in Section VI.B., the Agency is authorized to grandfather existing uses from a prohibition where appropriate under the four-part test established in *Sierra Club v. EPA*, supra. The Agency has conducted the four analyses required under this test, and has concluded that the balance of equities favors a grandfathering period of two years for uses of HCFC–141b in existing equipment in this application. The prohibition set forth in this action clearly represents a departure from previously established practice, as use of the substitute was allowed previously. Existing users of HCFC–141b who switched from class I substances into this solvent invested in this substitute on the assumption that it would be a sufficient improvement over the class I use. Prohibiting their use of the substitute immediately would impose a severe economic burden on these users. These factors taken together outweigh any statutory interest in applying the new rule immediately to existing users. This is especially true since the restriction applies immediately to new equipment using HCFC–141b, which creates no incentive for continued investment in equipment using HCFC–141b in this application.

The Agency's basis for proposing to restrict use of HCFC–141b is that this compound has a comparatively high ODP—0.11. This is the highest ODP of all the HCFCs; in fact, the ODP for HCFC–141b is nearly equal to the ODP for MCF (0.12). For this reason, the Agency concludes that replacing MCF with HCFC–141b is unacceptable, since using HCFC–141b in place of MCF would not provide the environmental benefits that the phase-out was designed to achieve.

To analyze the impacts from use of HCFC–141b as a CFC–113 replacement, the Agency estimated HCFC–141b use over time in each of the cleaning end uses, and projected health effects due to ozone depletion with the help of the Atmospheric Stabilization Framework model. The modeling period starts in 1990 and measures health effects expected for people born before 2030.

The findings of this modeling show adverse health effects of the magnitude commonly associated with the use of ozone-depleting compounds. For example, in the case of metals cleaning, the Agency projected that use of HCFC–141b to replace MCF where technically feasible could yield approximately 40,000 additional skin cancer cases and approximately 1,000 additional skin cancer fatalities compared to use of non-ozone-depleting substitutes.

The Agency believes that these figures and the availability of superior substitutes as described in the section on acceptable substitutes justify the proposal to list HCFC–141b as an unacceptable substitute. The Agency believes that, in almost all applications, other solvent cleaning substitutes are available that meet industry performance and safety criteria. To reach its decision on HCFC–141b use, the Agency also took into account the cost of other alternatives. The analysis suggested that, although HCFC–141b can be used with modification to existing equipment, the capital costs for the retrofit and the materials costs in combination would be so high as to render other alternatives comparatively affordable, even though they require new equipment.

HCFC–141b will be restricted as a substitute only where other alternatives exist to CFC–113 for the application in question. Several companies have already contacted the Agency, indicating that they have tested available alternatives to CFC–113, and that in some cases only HCFC–141b meets performance or safety criteria. The most commonly cited reasons for needing to use HCFC–141b are either applications where a non-flammable solvent is required or where sensitive parts could be destroyed by use of other cleaning systems.

For these applications of HCFC–141b, the Agency may find that the uses are acceptable subject to limitations if it determines that these critical uses persist beyond the grandfathering period provided in the listing. For EPA to issue a narrowed use acceptability listing, companies who believe they may need to use HCFC–141b past the effective date must first contact EPA, since the Agency has not yet received any indication from users of a technical need to use HCFC–141b past the grandfathering period granted under the unacceptability listing. Narrowed use acceptability listings are described in more detail in section VII. of the Preamble. Companies interested in submitting a SNAP application for a narrowed use are encouraged to contact the Agency at least 90 days in advance of the expiration of the grandfathering period. Companies that intend to use HCFC–141b within the parameters of the final unacceptability listing and who will cease using HCFC–141b after the

expiration of the grandfathering period need not contact the Agency.

The Agency believes that the decision to restrict HCFC–141b use as a CFC–113/MCF substitute for metals cleaning will have little effect on industry since few vendors of HCFC–141b have been selling HCFC–141b as a metals cleaning substitute. Companies in this end use sector that want to replace CFC–113 with HCFC–141b and use it beyond the date described in this SNAP determination should review the section referenced above. The Agency expects to receive few such requests, however, since most metals cleaning is currently performed with MCF.

(2) Electronics cleaning. (a) HCFC–141b and its blends. HCFC–141b and its blends are unacceptable as substitutes for CFC–113 and MCF in electronics cleaning, with acceptability subject to narrowed use limitations to be granted by EPA, if necessary, as CFC–113 replacements after the effective date of this listing. The effective date for this prohibition is 30 days after the date of the final rule for new equipment (including retrofits made after the effective date) and January 1, 1996 for existing equipment. The structure and reasons for this unacceptability listing are the same as those for the decision on HCFC–141b as a metals cleaning substitute. As in the metals cleaning sector, the Agency will grant narrowed use acceptability listings in limited cases for use beyond the grandfathering period of the listing, as necessary. As discussed earlier in this action in section VI.B., the Agency is authorized to grandfather existing uses from a prohibition where appropriate under the four-part test established in *Sierra Club* v. *EPA*, supra.

The Agency has conducted the four analyses required under this test, and it has concluded that the balance of equities favors a grandfathering period of two years for existing equipment in this application. The prohibition set forth in this action clearly represents a departure from previously established practice, as use of the substitute was allowed previously. Existing users of HCFC–141b who switched from class I substances into this solvent invested in this substitute on the assumption that it would be considered an acceptable substitute. It would impose a severe economic burden on these users to prohibit their use of the substitute immediately, with no provision of time to allow them to recover their investment in existing equipment or acquire new equipment in a timely fashion. These factors taken together appear to outweigh any statutory interest in applying the new rule immediately to existing users, especially since the restriction would apply immediately to new equipment using HCFC–141b, which would serve to prevent further ozone depletion from use of HCFC–141b in this application.

As with metals cleaning applications for HCFC–141b, the Agency modeled potential HCFC–141b use in electronics cleaning applications over time, and projected health effects due to ozone depletion with the help of the Atmospheric Stabilization Framework model. For electronics cleaning, the maximum market penetration for HCFC–141b as a replacement for CFC–113 is 90 percent. With this penetration, the model predicted approximately 400 additional skin cancer fatalities and 30,000 additional skin cancer cases compared to uses of non-ozone-depleting substitutes.

(3) Precision cleaning. (a) HCFC–141b. HCFC–141b and its blends are unacceptable as substitutes for CFC–113 and MCF in precision cleaning, with acceptability subject to narrowed use limitations to be granted by EPA, if necessary, as CFC–113 replacements after the effective date of this listing. The effective date for this listing is 30 days after the date of the final rule for new equipment and as of January 1, 1996, for existing equipment. The structure and reasons for this decision are described in the section on metals cleaning. As discussed earlier in this action in section VI.B., the Agency is authorized to grandfather existing uses from a prohibition where appropriate under the four-part test established in *Sierra Club* v. *EPA*, supra.

The Agency has conducted the four analyses required under this test, and it has concluded that the balance of equities favors a grandfathering period of two years for existing equipment in this application. The prohibition set forth in this action clearly represents a departure from previously established practice, as use of the substitute was allowed previously. Existing users of HCFC–141b who switched from class I substances into this solvent invested in this substitute on the assumption that it would be considered an acceptable substitute. It would impose a severe economic burden on these users to prohibit their use of the substitute immediately, with no provision of time to allow them to recover their investment in existing equipment or acquire new equipment in a timely fashion. These factors taken together outweigh any statutory interest in applying the new rule immediately to existing users, especially since the restriction would apply immediately to new equipment using HCFC–141b, which would serve to prevent further ozone depletion from use of HCFC–141b in this application.

In the case of precision cleaning uses of HCFC–141b, the Agency's modeling of HCFC–141b use as a CFC–113 replacement projected approximately 5,000 additional skin cancer cases when compared to use of non-ozone-depleting substitutes.

As in the case of other cleaning applications, the Agency finds unacceptable substitutions of HCFC–141b to replace MCF, since these compounds have nearly identical ODPs. Here again, the Agency will grant, if necessary, a limited narrowed use acceptability listings for CFC–113 past the exemption granted in the grandfathering period. However, the Agency expects only few requests for permission to use HCFC–141b to come from this sector, since most companies who requested exemptions to date to have stated that they view their use of HCFC–141b only as an interim solution. EPA believes that, absent future indications from such companies, all uses of HCFC–141b can be terminated by the effective date of the unacceptability listing.

G. Fire Suppression and Explosion Protection

1. Overview

Halons are gaseous or easily vaporizable halocarbons used primarily for putting out fires, but also for explosion protection. The two halons used most widely in the United States are Halon 1211 (chlorodifluorobromomethane) and Halon 1301 (trifluorobromomethane). Halon 1211 is used primarily in streaming applications and Halon 1301 is typically used in total flooding applications. Some limited use of Halon 2402 also exists in the United States, but only as an extinguishant in engine nacelles (the streamlined enclosure surrounding the engine) on older aircraft and in the guidance system of Minuteman missiles.

Halons are used in a wide range of fire protection applications because they combine five characteristics. First, they are highly effective against solid, liquid/gaseous, and electrical fires (referred to as Class A, B, and C fires, respectively). Second, they are clean agents; that is, they dissipate rapidly, leaving no residue and thereby avoiding secondary damage to the property they are protecting. Third, halons do not conduct electricity and can be used in areas containing live electrical equipment. Fourth, halons are gaseous substances that can penetrate in and around

physical objects to extinguish fires in otherwise inaccessible areas. Finally, halons are generally safe for limited human exposure when used with proper exposure controls.

Despite these advantages, halons are among the most ozone-depleting chemicals in use today. Halon 1301 has an estimated ODP of 10; Halon 1211 has an estimated ODP of 3. Thus, while total halon production (measured in metric tons) comprised just 2 percent of the total production of class I substances in 1986, halons represented 23 percent of the total estimated ozone depletion potential of CFCs and halons combined.

The greatest releases of halon into the atmosphere occur not in extinguishing fires, but during testing and training, service and repair, and accidental discharges. Data generated as part of the Montreal Protocol's technology assessment indicate that only 15 percent of annual Halon 1211 emissions and 18 percent of Halon 1301 emissions occur as a result of use to extinguish actual fires. These figures indicate that significant gains can be made in protecting the ozone layer by revising testing and training procedures and by limiting unnecessary discharges through better detection and dispensing systems for halon and halon alternatives.

Additional information on specific halon uses can be found in the Montreal Protocol 1991 Assessment or in other background material in the public docket. The determinations found in this section are based on the risk screen described in the background document entitled "Risk Screen on the Use of Substitutes for Class I Ozone-Depleting Substances: Fire Extinguishing and Explosion Protection (Halon Substitutes)", and in supplementary assessments included in the public docket.

2. Substitutes for Halons

The fire protection community has made considerable progress in identifying and developing substitutes for halons in fire protection applications. Several manufacturers have submitted information regarding substitute streaming and total flooding agents, and the National Fire Protection Association (NFPA) has initiated efforts to develop standards for their use in total flooding scenarios (NFPA 2001). In addition, manufacturers are seeking Underwriters Laboratories (UL) and Factory Mutual Research Corporation (FMRC) certification for systems employing the new agents. The Agency's review of halon substitutes is intended not to replace, but to complement the guidance of the fire protection community in directing the transition away from halons to substitutes posing lower overall risk.

Many recent efforts to develop substitutes for halon have focused on halocarbon chemicals. These are considered potential "replacements" for halon because they possess halon-like properties (gaseous, non-conducting) and because they can be used on Class A, B, and C fires. Some of the replacement chemicals are chemical action agents which, like halons, suppress fires by interfering with the free radical chain reactions that sustain a fire. Others are physical action agents which cool, dilute, or smother the fire (separating the air and fuel). In general, chemical action agents are much more effective fire suppressants than physical action agents.

Halocarbons represent only a portion of agents available for fire protection, and in fact appear to be a decreasing portion as users more and more are choosing to install "alternative" systems. Water, carbon dioxide, foam, and dry chemical are already in widespread use as fire extinguishants and may capture some of the former halon market. Water mist, powdered aerosols and inert gases are new technologies that are also likely to claim part of the former halon market. EPA encourages users to assess their risk management schemes and, where possible, to minimize reliance on chemical agents. Nonchemical alternatives should be seriously evaluated to determine whether they afford the necessary level of protection in any given application.

In assessing toxicity of a halocarbon, EPA pays special attention to consumer and worker exposure to discharges during fire emergencies and accidental discharges. In these acute, episodic exposures to the halon substitutes, cardiac sensitization is of particular interest. The term cardiac sensitization refers to an increased susceptibility of the heart to adrenaline (or other catecholamines) which may result in potentially fatal heart arrhythmias.

Several studies involving human exposure in a laboratory setting establish the potential significance for human health of animal data on cardiac sensitization. Evaluating the safety of potential halon substitutes requires the measurement of the No Observed Adverse Effect Level (NOAEL) and the Lowest Observed Adverse Effect Level (LOAEL) of cardiac sensitization in an appropriate species, usually the dog. EPA uses the NOAEL value as the basis to ensure protection of the worker population. The protocols used to determine the cardiotoxic NOAEL and LOAEL concentrations for each agent are conservative. The cardiotoxicity effect levels are measured in animals that have been made more sensitive to these effects by the administration of epinephrine concentrations which are just below the concentrations at which epinephrine alone causes cardiotoxicity. The concentration of epinephrine required to cause this heightened sensitivity is approximately ten times greater than the concentration a human being would be likely to secrete under stress.

The determination of the safety of either a flooding or streaming agent substitute is also dependent on a number of other related factors. For total flood systems, the magnitude of exposure will depend on the design concentration of the flooding agent (as determined by the substitute's extinguishing concentration plus 20 percent, as specified by NFPA guidelines) and the length of time it takes a person to evacuate the area in which the agent is released. In assessing exposure and consequent use conditions, the design concentration of a total flood substitute is compared to its cardiotoxic NOAEL and LOAEL levels. Generally, if the design concentration is higher than the agent's LOAEL level, then the agent is not suitable for use in normally occupied areas. EPA is adopting the OSHA standard (29 CFR 1910, subpart L) section 1910.162, which limits the exposure to an agent based upon the length of time it takes to evacuate an area. In addition, EPA makes note that OSHA standard 1910.160 also applies to gaseous total flood systems.

In addition, EPA recognizes that agents should not be used at a concentration that significantly displaces oxygen in the lungs. Most of the CFC and halon substitutes are gaseous, heavier-than-air compounds, which following a leak or catastrophic emission may tend to pool near the ground, i.e. in the breathing zone. Since these agents are, in the main, colorless with minimal odor and little toxicity or irritant effect, they can lead to asphyxiation by oxygen displacement if the unwary inadvertently walk into an area of oxygen depletion. The designer of a total flood system should be particularly alert to this possibility during discharge and subsequent dispersion of the agent in the space. For compounds which do not elicit a cardiotoxic effect until very high concentrations have been reached, care should be taken that sufficient oxygen remains in the room so that asphyxiation will not occur.

In contrast to total flooding agents, exposure to substitute streaming agents

can be expected to vary greatly depending on the amount of agent released, the time needed to extinguish a fire, the size of the room or enclosure in which a fire occurs, the size of the fire, the proximity of the person to the point of discharge of the agent, the rate at which fresh air infiltrates the space, and the air exchange rate near the fire. Assessment of exposure in streaming applications is much more complicated. EPA employs the 'box model' to assess consumer exposure, which has been widely used for many years to estimate probable exposures of workers to hazardous airborne materials, and has been described in detail by the National Institute for Occupational Safety and Health (NIOSH) and is discussed in detail in the background documents. The box model takes into consideration assumptions on volume of the space in which the extinguishant is used, rate at which fresh air infiltrates the space, amount and rate of agent release, area of the fire, location of the worker, and the air exchange rate in the vicinity of the fire. Values obtained through the box model, compared to cardiotoxic NOAEL/LOAEL values, provide a screen for assessing risk. However, EPA has found that the model often overstates the actual exposure to an agent, and therefore, EPA requires personal monitoring tests be conducted in actual use scenarios in order to complete the assessment.

Evaluating halon substitutes also requires assessing the efficacy of substitute agents. The efficacy of a fire protection agent can be compared using a cup burner or full scale test to obtain the extinguishing concentration in a particular fuel. NFPA standards require an additional 20 percent be added to obtain the design concentration. Most values identified in this rule are obtained by cup burner, while some are obtained by full scale testing, and most are in heptane. This measure is included in the discussion of halon substitutes for information and comparative purposes, and EPA does not assert that the efficacy values listed here are appropriate for all fire or explosion hazards. The user community is cautioned to consult the appropriate NFPA standard, relevant OSHA regulations, and professional fire consultants to determine actual requirements.

After concluding the analysis of halon alternatives, EPA in some cases finds acceptable the use of an agent only under certain conditions. In implementing its use of conditions, the Agency has sought to avoid overlap with other existing regulatory authorities. EPA believes that section 612 clearly authorizes imposition of use conditions to ensure safe use of replacement agents. EPA's mandate is to list agents that "reduce the overall risk to human health and the environment" for "specific uses." In light of this authorization, EPA is only intending to set conditions for the safe use of halon substitutes in the workplace until OSHA incorporates specific language addressing gaseous agents into OSHA regulation. Under OSHA Public Law 91–596, section 4(b)(1), OSHA is precluded from regulating an area currently being regulated by another federal agency. EPA is specifically deferring to OSHA, and has no intention to assume responsibility for regulating workplace safety especially with respect to fire protection. EPA's workplace use conditions will not bar OSHA from regulating under its Public Law 91–596 authority. The substitutes for halons in fire protection applications are discussed in the next section by class of chemical.

a. *Brominated hydrofluorocarbons.* Brominated hydrofluorocarbons (HBFCs) are effective halon substitutes. Because these substances contain bromine, they act as chemical action agents in the same manner as the halons. In fact, some HBFCs are more effective than Halons 1211 and 1301 in specific applications. For this reason, HBFCs can replace Halons 1211 and 1301 on nearly a one-to-one basis and appear to have significant applicability in existing systems. However, the presence of bromine also means that these agents have higher ozone-depleting potentials than other halon substitutes.

At this time, only one HBFC, HBFC–22B1, is expected to be commercially available in the near term. HBFC–22B1 can, however, serve only as an interim substitute for halons. The substance has an ODP of 0.74 and has been listed as a class I substances. Under the Montreal Protocol and the Clean Air Act, production of HBFC–22B1 is required to end January 1, 1996.

b. *Hydrochlorofluorocarbons.* A number of hydrochlorofluorocarbons (HCFCs) have also been suggested as halon replacements. These include HCFC–22, HCFC–123, and HCFC–124. These HCFCs will extinguish fires but because they are physical action agents, they are considerably less effective than halons or HBFCs. Thus, high concentrations must be achieved to extinguish fires. Further, although the ozone depletion potential of HCFCs is considerably lower than that of either halons or HBFCs, they are listed as class II chemicals under the Clean Air Act. The production of HCFC–141b will be phased out beginning January 1, 2003; HCFC–22 and HCFC–142b beginning January 1, 2020; and all other HCFCs beginning January 1, 2030 (58 FR 65018, December 10, 1993).

In addition, under section 610(d) of the CAA as amended, HCFCs in pressurized dispensers are banned from sale or distribution after January 1, 1994. Under the final rulemaking for section 610 (58 FR 69637, December 30, 1993) EPA interpreted section 610(d) to exclude HCFCs which are part of an installed 'system.' The final rule exempts total flooding systems and those streaming applications which incorporate fixed, automatic systems. However, section 610(d) only allows the sale of an HCFC in a portable fire extinguisher where other unregulated agents are not suitable for the intended applications. Because alternatives are available for residential uses, EPA intends to publish a proposed rulemaking under section 612 to update the SNAP list of acceptable substitutes and to ban the sale and use of HCFCs in portable fire extinguishers for residential applications. However, in commercial (including industrial and military) settings, the variety of hazards are too broad to create standards through rulemaking, and therefore under section 610(d) EPA has established industry-based mechanisms for controlling the sale of HCFCs.

Generally, while HCFCs can serve only as interim halon substitutes due to their scheduled phaseout as class II substances, EPA believes that they serve an important transitional role in the phaseout of class I substances. HCFC–22 has been suggested as a total flooding agent, but this compound is unlikely to be used as a single agent in normally occupied areas due to its cardiotoxic profile.

HCFC–123 is being proposed as a streaming agent to replace Halon 1211, both in pure form and in blends. HCFC–123 could replace Halon 1211 at a ratio of 1.8 by weight—a ratio considerably better than that of most other streaming substitutes. HCFC–123 has the lowest ODP of all the HCFCs proposed as halon substitutes, and its global warming potential (GWP) is half that of other HCFC substitutes.

HCFC–124 is being proposed as both a total flooding agent and a streaming agent, both alone and in blends. HCFC–124 has relatively low ODP and GWP values. Animal testing indicates that the substance may be lethal to rats at a level greater than 23 percent over a four hour period. Due to its cardiotoxic profile, this agent is not suitable for use in total flooding applications in normally occupied areas. However, pending

personal monitoring tests to assess actual exposure, it is possible that this agent could be used as a streaming agent.

c. *Hydrofluorocarbons.* Hydrofluorocarbons (HFCs) have also been suggested as halon substitutes. HFCs are physical action agents and are less effective than halons or HBFCs. Due to their reduced efficacy, larger storage volumes are required for use in fire protection systems. Their great advantage over halons, HBFCs, and HCFCs is that HFCs have an ozone depletion potential of zero. However, when exposed to fires, HFCs potentially decompose into greater amounts of hydrogen fluoride (HF) than do HCFCs, depending on the number of fluorines in the molecule. Discharge of these chemicals onto a fire must be rapid or early to prevent the buildup of large amounts of these decomposition products.

In addition, HFCs can potentially contribute to global climate change. Because of this potential, HFCs are included in President Clinton's Climate Change Action Plan (CCAP). Under this plan, EPA is directed to limit uses of greenhouse gases as substitutes for ozone-depleting compounds. Because EPA is simultaneously also interested in promoting the broader shift away from ozone-depleting compounds, any limits on use will be imposed wherever possible in ways that preserve as much flexibility for those trying to move to alternatives as possible. To minimize unnecessary emissions of greenhouse gases, EPA is recommending that users limit testing only to that which is essential to meet safety or performance requirements; recover HFCs from the fire protection system in conjunction with testing or servicing; and recycle recovered agent for later use or destruction. Manufacturers of these agents must recognize their responsibility to prevent unnecessary emissions of these gases. Product stewardship programs may be a useful mechanism to help users meet these requirements. EPA will reexamine how to control unnecessary emissions of greenhouse gases in the future.

HFC–23, HFC–32, HFC–125, HFC–134a, and HFC–227ea have all been proposed as total flooding agents. HFC–134a and HFC–227ea have also been proposed as streaming agents. HFCs tend to possess less risk of acute cardiotoxicity than do the HCFCs or HBFC-22B1.

HFC–32 has been determined to be flammable, with a large flammability range, and is therefore inappropriate as a halon substitute. In the next SNAP update, EPA intends to propose listing this agent as unacceptable in total flood applications.

d. *Perfluorocarbons.* Perfluorocarbons (PFCs) are fully fluorinated compounds which do not contribute to ozone depletion. In addition, PFCs are nonflammable, essentially non-toxic, and are not VOCs. PFCs are effective fire protection agents, having the lowest required extinguishing concentration of any of the suggested substitutes other than HBFCs. However, these compounds have high molecular weights, which create weight and storage replacement ratios that are somewhat higher than the HCFCs and many of the HFC candidates. Two PFCs have been submitted as halon replacements: Perfluorobutane (C_4F_{10}) as a total flood replacement for Halon 1301, and perfluorohexane (C_6F_{14}) as a substitute for Halon 1211. In the NPRM, these agents were referred to as FC 3–1–10 and FC 5–1–14, respectively.

The principal environmental characteristic of concern for PFCs is that they have long atmospheric lifetimes and have the potential to contribute to global climate change. PFCs are also included in the CCAP which broadly instructs EPA to use section 612, as well as voluntary programs, to control emissions.

While PFCs are extremely persistent, their favorable toxicity profile makes these agents attractive for use in occupied areas. Thus, EPA believes that there are instances in which PFCs represent the only viable alternative to transition away from the CFCs or halons.

The Agency is finding use of PFCs acceptable only for applications where reasonable efforts have been made to determine that no other alternatives are technically feasible due to performance or safety requirements. However, as with all of the substitutes which are greenhouse gases and ozone-depleting substances, EPA recommends that users limit testing only to that which is essential to meet safety or performance requirements; recover agent from the fire protection system in conjunction with testing or servicing; and recycle or destroy agent that is recovered from a system. In addition, EPA encourages manufacturers to develop aggressive product stewardship programs to help users avoid such unnecessary emissions. EPA will reexamine how to control unnecessary emissions of greenhouse gases in the future.

e. *Chlorofluorocarbons.* Chlorofluorocarbons (CFCs) have also been proposed as halon alternatives, either individually or in blends. These compounds are also class I substances, however, and as a matter of policy EPA will not encourage shifting from one class I substance to another, despite the fact that the ODPs of the CFCs are significantly lower than those of Halons 1211 and 1301. EPA does not believe it is appropriate to encourage shifting to substitutes that are required to be phased out in the near term. In addition, the sale and distribution of CFCs in pressurized dispensers (in this sector, portable fire extinguishers) are controlled under section 610(b) of the CAA.

f. *Blends.* A number of manufacturers have proposed proprietary blends of chemicals for fire protection applications. These blends combine a variety of CFCs, HCFCs, HFCs, PFCs, inert gases, and other additives to achieve desired levels of effectiveness, toxicity, and decomposition products. Most of these blends contain constituents that have non-zero ODPs and GWPs. In assessing the ODP and GWP of such blends, the Agency has examined both the weighted average of the constituents and the individual characteristics of the constituents. Because toxicity varies with the exact composition of the blend, EPA requires cardiotoxicity tests to be conducted on the blend itself, rather than being inferred from the constituents.

g. *Non-halocarbon alternative agents.* Non-halocarbon alternative agents such as CO_2, dry chemical, foams, and water that are currently in widespread use and that are covered in NFPA standards and OSHA regulations may also be used as substitutes for halon. These agents are not as widely applicable as the halocarbon substitutes, and must be used where recommended by the manufacturers and approved by standard-setting entities such as the NFPA.

In addition, several manufacturers have developed new technologies to adapt traditional agents to the halon market. Two manufacturers have developed inert gas blends as Halon 1301 substitutes in total flood systems. One of them, containing CO_2 mixed with inert gases has already been included in the new NFPA 2001 standard.

Water sprinkler systems are capturing part of the halon substitute market, often in conjunction with improved detection systems and risk management programs which isolate the degree of liability in a given fire event. A promising new water technology incorporates fine water droplets to create a water mist or fog. It has been suggested that water mist systems are safe for use on Class A and B fires, and even can be used on Class C electrical fires without causing secondary damage.

Because the environmental, health and safety issues of the various types of water mist systems have not yet been fully addressed, EPA is listing water mist as pending in this rule, and will work with NFPA, manufacturers, and others in order to include it in the next SNAP update.

Again, while dry chemicals are in widespread use, another new technology for both the total flooding and streaming markets involves the use of powdered aerosols, which combine fine powder particulates with gas to achieve a total flood effect.

While foams are also in widespread use, one manufacturer has prepared a blend of etoxylated linear alcohol and sulfonated soap for use in streaming applications. This blend is not a clean agent, but offers another alternative technology where secondary damage can be tolerated. It presents benefits of rapid cool-down, prevention of reignition, and decrease in the quantity of water required to extinguish fires.

3. Response to Comments

Key issues included in the public comment are addressed in this section. For a complete discussion of public comments received, refer to the "Response to Comments" document in the public docket. The issues addressed in this section include: Alternative technologies, efficacy and design, use conditions, narrowed use restrictions, and halon categories and subdivisions.

a. *Alternative technologies.* As halon is being phased out, there is a growing interest in not only clean chemical substitutes but also in reassessing the use of conventional substitutes, adopting new risk management strategies and using alternative technologies. Several commenters expressed the view that alternatives such as water and CO_2 are not clean agent chemical substitutes, but rather conventional suppression system substitutes, and have been in widespread use for many years. Thus, these commenters stated that such alternatives are outside the scope of SNAP and that EPA should only list clean agent chemical substitutes. They indicated that it would be counterproductive to list all acceptable substitutes and alternatives under SNAP, which are better addressed by the entire fire protection community, and that doing so would restrict trade and development of new technology. One commenter said it was unclear what purpose would be served by attempting to list all substitutes and alternatives, including a variety of system technologies.

Section 612 of the Clean Air Act specifies that class I and class II substances shall be replaced by "chemicals, product substitutes, or alternative manufacturing processes that reduce overall risks to human health and the environment" and directs EPA to assist in identifying such substitutes and alternatives, promote their development, maintain a public clearinghouse, and publish lists of acceptable and unacceptable substitutes for specific uses. EPA interprets this language as a broad mandate to include alternative technologies. For the fire suppression and explosion protection sector, EPA is defining alternative technology to be any non-halocarbon substance discharged for the purpose of fire suppression or explosion protection. Thus, water mist, inert gas mixtures, powdered aerosols and any other 'not in kind' alternative to CFCs and halons are alternative technologies. EPA believes that its assessment of potential human health and environmental impacts of these new technologies does, in fact, speed their acceptance and adoption by removing uncertainty about their safe use. In addition, while water sprinklers, carbon dioxide, foam, and dry chemical are currently in use, these substances fall within the definition of alternative technology. EPA will simply list these as acceptable and note their applicable NFPA standards.

EPA will assess each class of alternative technology and determine whether a separate review is prudent due to variations in formulation and design of similar technologies, or whether it is possible to construct a broad listing of acceptability that covers several manufacturers. In this final rule, EPA is listing each water mist technology as well as inert gas blends and powdered aerosols separately due to the unique formulation, design and intended use of each. An acceptable or unacceptable listing of a particular alternative technology is not generalizable to similar technologies from other manufacturers.

b. *Efficacy and design issues.* Many commenters state that in the NPRM, EPA has assumed that a single design concentration (obtained from a cup burner test for heptane) is applicable for all fire hazards and requested that EPA remove all reference to design concentration. However, several commenters noted that listing of the design concentration was useful in comparing the relative efficacy of substitute agents, as long as EPA is clear about the source of the data.

In addition, many commenters feel that while EPA states that the SNAP rule "is intended not to replace, but to complement the guidance of the fire protection community," EPA has "dangerously oversimplified" the many factors that must be taken into consideration in designing a system, and a listing of "acceptability" implies that any alternative will work in a safe and effective manner. One commenter specifically requested that EPA remove all references to design and installation requirements.

Many commenters believe that EPA should not comment on the efficacy of substitutes, as this is outside the scope of the SNAP rule, and that EPA should only comment on environmental and toxicological concerns. The commenters believe EPA should only list the agent name, EPA's decision, NOAEL, and any specific environmental or regulatory concerns (such as ODP, GWP, or future phaseout date.) One commenter is concerned that EPA's involvement in efficacy issues will cause users to select agents that will result in less effective and more expensive protection than is needed, and will make American industry less competitive in world markets.

One commenter summed up the requests of many others, suggesting that, at a minimum, EPA should include cautionary wording that a listing of 'acceptable' does not imply the agent will work in any given application. Further, EPA should point out that the efficacy of an agent is dependent on the application system and should encourage users to consult current consensus fire codes and standards such as those developed by NFPA.

By contrast, EPA believes that efficacy of a substitute agent must be a consideration in decision making, because EPA's charge is to ensure that substitutes are not on balance more risky than the ozone-depleting compounds being replaced. A substitute which is not effective cannot be considered safer than the halon being replaced. In addition, design concentration is germane to a discussion of potential exposure and its consequent effects on human health.

In addition, while most agents submitted under SNAP are relatively effective, the analysis of efficacy assists in the assessment of the availability of substitutes in various niche markets. EPA intends to accept as many viable substitutes as possible. If, due to technical concerns such as weight or storage volume equivalency, there are few or no substitutes available in a given application, EPA must ensure that it does not restrict the few available choices based on other issues, such as environmental concerns. EPA's primary task in SNAP is to facilitate the move

away from ozone-depleting compounds, and this goal cannot be served in the fire extinguishing sector without a full understanding of the characteristics of the available substitutes.

However, the Agency agrees with the commenters that data sources should be clearly identified. EPA does not intend to imply that cup burner data for heptane dictates the proper design concentration for all applications and for all fire hazards, nor does EPA intend to imply that a listing of 'acceptable' means that an agent may be used in any application without professional consultation. In this final rule, EPA reaffirms the need for all potential users to consult NFPA technical standards, OSHA regulations, and fire protection professionals for actual design considerations.

c. *Use conditions.* In response to EPA's request for comment on whether section 612 authorizes the agency to set use conditions, several commenters argued that setting use conditions is not within the purview of section 612. Some commenters stated that EPA has exceeded its scope of authority under the Clean Air Act, and that EPA should defer regulation of workplace safety to OSHA, which is the appropriate entity. Other commenters stated that EPA failed to consult with OSHA and thus overstepped its authority by setting workplace conditions.

Other commenters feel it is proper for EPA to establish exposure limits on new agents as it will ensure public safety until OSHA regulations are complete, especially where there is little historical exposure information to rely on.

EPA believes that section 612 clearly authorizes imposition of use conditions to ensure safe use of replacement agents. EPA's mandate is to list agents that "reduce the overall risk to human health and the environment" for "specific uses." Where use of a substitute without conditions would increase overall risk, EPA is authorized to find the use of such substitutes totally unacceptable. Included in this is the authority to find acceptable the use of the substitute only if used in a manner that reduces overall risk, and to find unacceptable its use in all other cases.

Further, EPA's use conditions on workplace safety for halon substitutes will exist only in the interim, until OSHA incorporates specific language addressing gaseous agents in the OSHA law. Under OSHA Public Law 91–596, section 4(b)(1), OSHA is precluded from regulating an area currently being regulated by other federal agencies. EPA is specifically deferring to OSHA, and has no intention to assume responsibility for regulating workplace safety in regard to fire protection. Consequently, EPA's use conditions are effective only until OSHA acts and will terminate by their own terms once OSHA establishes standards.

OSHA § 1910.162 governs the use of all gaseous agents in fixed extinguishing systems, however EPA finds that the guidance is not sufficiently explicit on the allowable concentrations of the different agents. While paragraph 1910.162(b)(3) stipulates that "[t]he employer shall assure that employees are not exposed to toxic levels of gaseous agent or its decomposition products," it does not define what a 'toxic level' is. In examining paragraph 1910.162 (b)(6)(i) through (b)(6)(iii), EPA concludes that it is OSHA's intent to limit exposure to gaseous agents based upon cardiotoxicity levels. EPA's conclusion was confirmed in discussions with OSHA. EPA therefore concludes that it is appropriate under the SNAP program to stipulate what the cardiotoxic levels for each agent are, and, until OSHA incorporates clarifying language, to impose use conditions that apply OSHA standard 1910.162 in its entirety to these agents.

References in § 1910.162 to a Halon 1301 concentration of 7% imply a cardiotoxic NOAEL, and references to a Halon 1301 concentration of 10% imply a cardiotoxic LOAEL. In this regulation, EPA is clarifying the intent of § 1910.162(b)(3) to allow the use of the substitute gaseous agents only according to paragraph (b)(6)(i) through (b)(6)(iii), using the cardiotoxic NOAEL and LOAEL of each agent as the concentration referenced in each subparagraph. Thus, until OSHA establishes applicable work-place requirements, the use conditions in this final rule on halocarbon substitutes, using the OSHA regulation as a standard, will be as follows:

- Where egress from an area cannot be accomplished within one minute, the employer shall not use this agent in concentrations exceeding its NOAEL.
- Where egress takes longer than 30 seconds but less than one minute, the employer shall not use the agent in a concentration greater than its LOAEL.
- Agent concentrations greater than the LOAEL are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.

These conditions will no longer apply once OSHA establishes applicable workplace requirements.

EPA will adopt the commenters' suggestion that the use conditions be stated once in the beginning of each section and will not repeat them for each agent.

d. *Narrowed use restrictions.* Many commenters requested that EPA remove the narrowed use restrictions placed upon HFC-23, C_4F_{10}, and C_6F_{14}. These commenters argue that narrowed use restrictions are unnecessary, because the fire protection community (including entities such as NFPA, UL, FMRC and others) has successfully regulated fire protection historically and remains better able to determine which agents should be selected based on design and use criteria, including environmental and toxicological acceptability, efficacy, cost, engineering practice and specific risk.

It is not the intent of EPA to interfere with the ability of the fire protection community to use its expertise in selecting agents and designing appropriate and cost-effective systems based upon technical criteria. EPA congratulates the industry on its excellent record of self-regulation, and seeks to work cooperatively with the regulated community in our efforts to address the phaseout of halon. However, use of fire protection agents is, in fact, already regulated under federal law, i.e. OSHA, to ensure their safe use.

Under the Clean Air Act, EPA is mandated to evaluate substitutes to reduce "overall risk to human health and the environment" and to publish lists of acceptable and unacceptable substitutes "for specific uses." EPA interprets section 612 as giving the Agency authority to limit use where there are concerns due to health or environmental factors. Because a primary goal of the SNAP program as a whole is to speed the market's transition away from ozone-depleting substances, conditional acceptances were accorded to many substitutes which might be unacceptable in the absence of any use conditions. EPA believes that, through the setting of narrowed use restrictions in the limited cases where they are warranted, it has actually expanded the list of available options for fire protection experts to choose from.

Many commenters stated that the narrowed use restrictions as written in the NPRM by EPA are vague and confusing, and overly complex, leading to uncertainty. Commenters asked that EPA clarify such vague terms as "high value," "public safety," "national security," "life support," and "critical." They state that ambiguity will cause many users to be reluctant to use the new substitute agents. Concern was expressed that the fire protection community will have to spend an inordinate amount of time interpreting

and deciphering whether a particular system meets EPA's requirements. Some commenters advised that, if EPA retains narrowed use restrictions, these restrictions should be better defined through work with the fire protection industry. One commenter suggested that a more easily enforced method would be to allow use only in applications where toxicity of other substitutes would not be acceptable. Furthermore, some commenters noted that EPA's publicly expressed concern about the environmental acceptability, particularly the global warming impacts, of certain agents has already slowed interest in the development of systems. They state that as a result, there is continued dependence on halon for certain critical applications where no other alternative agent is suitable, such as in explosion inerting applications.

EPA agrees with the commenters that narrowed use restrictions must not contribute to uncertainty and a consequent reluctance to move away from ozone-depleting fire fighting agents. To address this concern, EPA has worked with agent manufacturers, system designers, and members of the regulated community to better clarify the intent and the wording of narrowed use restrictions. In this final rule, EPA is amending the means of controlling unwanted emissions of long-lived agents. In the NPRM, EPA attempted to narrow the scope of uses for the PFCs (C_4F_{10} and C_6F_{14}) and for HFC–23 by listing the use categories that were acceptable. Because the regulated community found this listing ambiguous, and because EPA could not list all possible uses that would require this agent, EPA explored the technical criteria that would define where this agent was best applied, as one commenter suggested. This approach was appealing, but, again, tended to place the task of system design upon the Agency. Therefore, for the PFCs, the Agency has decided to adopt an approach that places the burden of proof upon the end-user for determining that no other alternative was technically feasible for that application.

Users shall self-certify the need to use restricted agents. Before users adopt C_4F_{10} or C_6F_{14}, both restricted agents, they must make reasonable efforts to ascertain that "other substitutes or alternatives are not technically feasible due to performance or safety requirements." Users are expected to evaluate the technical feasibility of other substitutes or alternatives to determine their adequacy to control the particular fire or explosion risk. An example of where no other alternative is available due to the physical or chemical properties of the agent would be where, due to the environmental characteristics of the end-use, other agents would fail to vaporize or would not achieve the dispersion required for effective fire protection. Similarly, use of PFCs due to toxicological concerns would be appropriate where use of other alternative agents would violate the workplace safety use conditions set forth in this final rule. For example, use of a certain agent for explosion suppression in an occupied area might require high concentrations of an agent that exceed its LOAEL, or, in cases where egress is precluded such as in military vehicles during wartime, the required concentration of the alternatives might exceed their NOAEL. EPA intends that PFCs be used only as the agent of last resort.

To assist users in their evaluation, EPA has prepared a list of vendors manufacturing halon substitutes and alternatives. Although users are not required to report the results of their investigation to EPA, companies must retain these results in company files for future reference.

Several commenters requested that narrowed use restrictions on HFC–23 be lifted because its cardiotoxicity profile is favorable compared to its design or inerting concentration and in some cases it may be the only acceptable alternative. As mentioned above, one commenter suggested that it would be more appropriate to qualify acceptability of a particular agent with respect to its technical applicability in defined situations. For example, this commenter identified several areas where HFC–23 is particularly applicable: (a) Where temperatures are likely to go below 0° (b) where pre-inerting is required for occupied areas, and (c) where occupied areas can suffer considerable variation in fire volume.

Most HFC–23 is a by-product of the manufacture of HCFC–22. While HCFC–22 is scheduled for a production phaseout under the Clean Air Act by the year 2020, HCFC–22 is also used as a feedstock for the manufacture of other products, such as Teflon. Thus, it can be expected that HFC–23 will likely be inadvertently produced in the future. As discussed above, Action 40 of the CCAP instructs EPA to limit emissions of greenhouse gases under the SNAP program. However, because this agent is typically a byproduct of HCFC–22 production, it is EPA's position that capture of HFC–23 and use as a fire suppression agent may delay the effects of this agent in the atmosphere while serving a valuable purpose. Thus, EPA is lifting the narrowed use restrictions imposed in the NPRM, and in this FRM EPA is finding acceptable the use of this agent wherever deemed applicable given technical or market considerations. However, to control unnecessary emissions of this agent, EPA recommends that users limit testing only to that which is essential to meet safety or performance requirements; recover HFC–23 from the fire protection system in conjunction with testing or servicing; and recycle or destroy agent that is recovered from a system. EPA is encouraging development of product stewardship programs by the manufacturer and by Original Equipment Manufacturers (OEMs) marketing systems containing this agent.

e. *Halon categories and subdivisions.* Many commenters requested that EPA remove the subdivisions within the use categories. In other words, agents should be classified as either "total flooding" or "streaming" with no further distinction as to their use. This structure, states one commenter, is consistent with the separation addressed by UNEP and NFPA. They state that the proposed subdivisions over-complicate the rule.

For example, in total flood applications, some commenters suggest simply referring to an agent's NOAEL which, along with OSHA regulations and NFPA standards, will determine its suitability for a given application. Thus, there would be no need to distinguish between normally occupied and normally unoccupied spaces.

EPA is adopting the recommendation of the commenters. Two end-use categories are used in this final rule: Streaming Agents and Total Flooding Agents. Explosion inertion is included in the Total Flooding Agent category.

4. Listing Decisions

In order to evaluate the acceptability of proposed halon substitutes, the Agency divided the fire protection sector into two end-uses: (1) Streaming Agents, and (2) Total Flooding Agents. The 'Total Flooding' category includes all total flooding applications, including normally occupied, normally unoccupied, and explosion inertion and suppression applications.

For some substitutes, data required by the Agency to complete a risk assessment is not yet available or has not been submitted to the Agency as requested. As a result, not all candidate substitutes have been fully evaluated by the Agency. Those substitutes which the Agency is currently reviewing, but for which a final determination cannot yet be made, are listed as pending review in the table in Appendix B. The evaluation of these pending submissions will

continue, and the results of these continuing evaluations will be published in the **Federal Register** as part of EPA's quarterly updates to the SNAP lists.

The listing decisions are compiled by type. Thus, for each end-use, an agent may be listed in one or more type of decision, including 'acceptable,' 'acceptable subject to use conditions,' 'acceptable subject to narrowed use limits,' 'unacceptable,' or 'pending completion of review.'

The table in appendix B summarizes EPA's decisions by each type of decision for each end-use.

EPA's finding of acceptability of a halon substitute should be viewed only as a listing based on the criteria briefly set out in this Preamble as governing the SNAP program and described in detail in the background document entitled "Characterization of Risk From the Use of Substitutes for Class I Ozone-Depleting Substances: Fire Extinguishing and Explosion Protection (Halon Substitutes)". EPA's finding of acceptability should not be considered an endorsement of the substitute for the suppression or prevention of any given fire or explosion scenario, for which the user is referred to a fire protection specialist.

a. *Acceptable.* (1) Streaming agents. (a) HCFC–123. HCFC–123 is acceptable as a Halon 1211 substitute. Because of its relatively low weight equivalency, HCFC–123 could replace Halon 1211 at ratio of 1.8 by weight. However, testing has indicated that application of this agent may require special handling or nozzles to successfully extinguish a fire. Its extinguishment concentration based on cup burner tests is 6.3 percent.

With an ODP of 0.02, HCFC–123 has the lowest ODP of all the HCFCs proposed as halon substitutes, and its 100-year GWP of 90 is lower than that of other proposed HCFC substitutes. In addition, it has a short atmospheric lifetime of 2 years. Since HCFC–123 has a cardiotoxic level (LOAEL) of 2.0 percent in the dog, with no effect (NOAEL) apparent at 1.0 percent, potential users have expressed concern about using HCFC–123 or blends containing HCFC–123 as the primary constituent. However, actual exposures were assessed using personal monitoring devices, and the Agency concludes that likely exposure levels from its use as a streaming agent do not exceed safe levels when used with good ventilation. Similar exposure concerns exist with the use of carbon dioxide or Halon 1211 streaming agents. All must be used only in areas with adequate ventilation. The manufacturer of portable extinguishers using these agents should include cautionary language on the label indicating the need for ventilation.

The manufacturer has raised its allowable exposure limit (AEL) for HCFC–123 to 30 parts per million (ppm). The AEL is set at a level believed to protect workers who are regularly exposed from adverse chronic effects. As a practical matter, exposures should not exceed this limit for any working day; this practice is consistent with OSHA's enforcement of its own PELs. If it is likely that exposures may exceed 30 ppm as an 8-hour time-weighted average (TWA), proper protective gear should be worn. For the purposes of determining the proper respiratory protection, the user should consult the manufacturer of the product for their specific recommendations for respirator use of the particular end use.

As discussed in the section on HCFCs generally, this agent is subject to regulations under section 610(d) of the CAA. EPA intends to publish a proposed rulemaking that will ban the use of this agent in residential applications.

(b) (HCFC blend) B. (HCFC blend) B is acceptable as a Halon 1211 substitute. This blend consists largely of HCFC–123, therefore, as with HCFC–123, it has been shown in tests to have a weight equivalency ratio to Halon 1211 of 1.8. While HCFC–123 has a cardiotoxic level of 2.0 percent in the dog, with no effect apparent at 1.0 percent, actual exposures from use of this blend as a streaming agent were assessed using personal monitoring devices. The Agency concludes that likely exposure levels do not exceed safe levels.

The manufacturer of HCFC–123 has raised its allowable exposure limit (AEL) to 30 parts per million (ppm). The AEL is set at a level believed to protect workers who are exposed on a regular basis from chronic adverse effects. As a practical matter, exposures should not exceed this limit for any working day; this practice is consistent with OSHA's enforcement of its own PELs.

If it is likely that exposures may exceed 30 ppm as an 8-hour time-weighted average (TWA), proper protective gear should be worn. To determine proper respiratory protection, the user should consult the manufacturer of the product for any specific recommendations governing respirator use in the particular end-use.

HCFC–123, which is the major component of this blend has an ODP of 0.02, which is the lowest ODP of all the HCFCs proposed as halon substitutes, and its 100-year GWP of 90 is lower than that of other proposed HCFC substitutes. Although this agent contains a very small percentage of PFC, which has a long atmospheric lifetime and which could potentially contribute to global climate change, EPA believes that the quantities of PFC likely to be emitted are small, and that availability of this blend is an important aid in the transition away from ozone-depleting substances. As with any chemical replacement to halon, EPA recommends that unnecessary emissions be controlled by minimizing training and by the use of recycling during maintenance.

As discussed in the section on HCFCs generally, this agent is regulated under section 610(d). Consistent with the intent of section 610(d), EPA intends to publish a proposed rulemaking that will ban the use of this agent in residential applications.

(c) (Surfactant blend) A. (Surfactant blend) A is acceptable as a Halon 1211 substitute. This product is a mixture of organic surfactants and water. In use, this concentrated mixture is diluted to strengths of 1–10 percent with available water. The surfactants appear to enhance the heat absorbing capacity of the water.

(Surfactant Blend) A acts on oil, gasoline, and petroleum based liquid fires (Class B fires) by encapsulating the fuel, thus removing the fuel source from the fire. This encapsulating feature prevents flame propagation and reduces the possibility of reignition.

This blend was designed for use on Class B oil and gasoline fires, but can be used on all Class A and Class B fires, as well as Class D fires. The agent has passed Underwriters' Laboratories (UL) certification for Class A, B, and D fires, and UL testing for Class C fires is underway.

This extinguishant is a blend of complex alcohols, lipids, and proteins, which are diluted in large volumes of water to the final commercial preparation. Each of the substances is biodegradable and in its shipping state the product has been assigned a hazardous materials identification system (HMIS) rating of 0–0–0 for health hazard, reactivity, and flammability, respectively. The HMIS rating was developed by the National Paint and Coatings Association (NPCA) to indicate the hazard potential of chemical substances, with zero representing the lowest hazard potential.

Initial data provided by the manufacturer indicate some ocular irritation in rabbits, and thus EPA is recommending that the manufacturer label the product with a caution about possible eye irritation.

(d) Carbon dioxide. Carbon dioxide is acceptable as a Halon 1211 substitute.

Carbon dioxide can be used as a direct substitute for Halon 1211 in specified applications. Carbon dioxide systems are not rated for Class A fires and so must be used in conjunction with another type of extinguisher to ensure that all possible fires can be extinguished. In addition, discharge of carbon dioxide into confined spaces may result in CO_2 concentrations above the Immediately Dangerous to Life and Health (IDLH) level. Areas into which carbon dioxide is discharged should be immediately evacuated and ventilated. Carbon dioxide extinguishers should be used only in accordance with manufacturer's guidelines and applicable NFPA standards.

(e) Dry chemical. Dry chemical extinguishers are acceptable as Halon 1211 substitutes. Dry chemical extinguishers can be used as a substitute for Halon 1211 in most residential applications. While dry chemical extinguishers can be used on Class A, B, or C fires depending upon the type of powder used, they do not always penetrate well around obstacles, they do not inhibit re-ignition of fires, they do not cool surfaces, they can cause secondary damage, and discharge in confined spaces can result in temporary loss of visibility. Dry chemical extinguishers should be used only in accordance with manufacturer's guidelines and with relevant NFPA standards.

(f) Water. Water is acceptable as a Halon 1211 substitute. Users should be aware, however, that water extinguishers cannot act as a substitute for Halon 1211 in all applications. Water is primarily a Class A fire extinguishant. It can be used on de-energized Class C fires, but should not be used with Class B fires. Water may damage objects onto which it is discharged. Water extinguishers should be used only in accordance with manufacturer's guidelines and with applicable NFPA standards.

(g) Foam. Foam is acceptable as a Halon 1211 substitute. Foam extinguishers cannot be used as a substitute for halon in all applications. Portable foam extinguishers are intended primarily for use on flammable liquid fires and are somewhat effective on Class A fires. Foam can also cause secondary damage on objects onto which it is discharged. Foam extinguishers should be used in accordance with manufacturer's guidelines and with NFPA standards.

(2) Total flooding agents. (a) Carbon dioxide. Carbon dioxide is acceptable as a Halon 1301 substitute. Exposure to carbon dioxide poses an imminent threat to life. However, because it displaces oxygen, it is an effective fire protection agent. As a result, both OSHA and the NFPA address CO_2 systems for occupied areas. OSHA 1910.162(b)5 requires a pre-discharge alarm for systems with a design concentration of 4 percent or greater. NFPA has written a standard (NFPA 12) that explicitly controls how such CO_2 systems may be safely used in occupied areas. To protect life, the standard requires a system design such that no personnel may be present upon system discharge. The EPA recognizes both the OSHA regulation and the NFPA standard as industry practice and therefore defer to them in this rule. CO_2 systems require a storage volume of three times that of Halon 1301.

In the review of proposed substitutes, the Agency looks at a variety of health and environmental factors, including whether the agent contributes to global climate change. While carbon dioxide is a greenhouse gas, it is also a byproduct of many industrial processes and is recaptured and reformulated as a fire fighting agent and thus does not require new production. Therefore, the Agency has determined that its contribution to overall greenhouse gas emissions is low.

(b) Water. Water sprinkler systems are acceptable as a Halon 1301 substitute. Such systems are in widespread use and are governed by NFPA technical standards. EPA encourages adoption of water systems wherever feasible. Care should be taken when using water on Class C electrical fires, and it may not be suitable in instances in which secondary damage is considered unacceptable.

(c) (Inert Gas Blend) B is acceptable for use in unoccupied areas. The decision for use of this agent in occupied areas is pending until the agency completes its review of low oxygen atmospheres, and will be included in a future rulemaking. Use conditions to limit the risk of inadvertent exposure to personnel in normally unoccupied areas may be included in future rulemakings.

(d) (Powdered Aerosol) A is acceptable for use in unoccupied areas. The decision for use of this agent in occupied areas is pending until the agency completes its review of the potential health effects of this agent. In addition, use conditions to limit the risk of inadvertent exposure to personnel in normally unoccupied areas may be included in future rulemakings.

(e) (Powdered Aerosol) B is acceptable for use in unoccupied areas. This SNAP submission included many different formulations. While the formulations pose little risk in a normally unoccupied area, the decision for use of the various formulations in occupied areas is pending further review of their potential health effects. In addition, use conditions to limit the risk of inadvertent exposure to personnel in normally unoccupied areas may be included in future rulemakings.

b. *Acceptable subject to use conditions.* (1) Total flooding agents. In analyzing the acceptability of substitutes for total flooding applications in occupied spaces, the Agency considered cardiotoxicity one of the primary decision variables. Current OSHA limitations on use of Halon 1301 in total flooding applications assure that these uses do not pose a cardiotoxic risk to personnel at the design concentration.

OSHA promulgated a safety and health standard (29 CFR 1910 subpart L) governing fire protection systems used at all workplaces which is designed to limit employee exposures to toxic levels of gaseous agents used in fixed total flood systems. OSHA section 1910.162 governs the use of all gaseous agents in fixed extinguishing systems, however the guidance is not explicit on the allowable concentrations of the different agents. While paragraph 1910.162(b)3 stipulates that "[t]he employer shall assure that employees are not exposed to toxic levels of gaseous agent or its decomposition products," it does not define what a "toxic level" is. In examining paragraph 1910.162(b)(6)(i) through (b)(6)(iii), EPA concludes that it is OSHA's intent to limit exposure to gaseous agents based upon cardiotoxicity levels. EPA's conclusion was confirmed in discussions with OSHA. EPA's assessment is that the use of NOAEL/LOAEL values based on exposure scenarios is the proper method to ensure safe use of gaseous agents, and agrees with OSHA's approach. It is therefore EPA's intention to stipulate the cardiotoxic levels for each agent and, until OSHA incorporates clarifying language for the new agents, to impose use conditions that apply 1910.162 in its entirety to these agents.

References in § 1910.162 to a Halon 1301 concentration of 7 percent imply a cardiotoxic NOAEL, and references to a Halon 1301 concentration of 10 percent imply a cardiotoxic LOAEL. In this regulation, EPA is clarifying the intent of § 1910.162(b)(3) to allow the use of the substitute gaseous agents only according to paragraph (b)(6)(i) through (b)(6)(iii), using the cardiotoxic NOAEL and LOAEL of each agent as the concentration referenced in each subparagraph.

In addition, existing OSHA standard 1910.160 applies certain general controls to the use of fixed

extinguishing systems in occupied workplaces, whether gaseous, dry chemical, water sprinklers, etc., and EPA has not reproduced those. These include, for example, the requirements for discharge and pre-discharge alarms, and availability of Self Contained Breathing Apparatus (SCBA) for emergency entry into an area where agent has been discharged.[2]

In many occupied areas, total flooding halons can be replaced by improved detection equipment and manually operated extinguishing systems. Improved detection systems, if they detect fires in their early stages, can alert occupants to the existence of a fire so they may respond appropriately without discharge of the total flood system. In those cases in which a total flooding system is deemed necessary, improved detection systems can also reduce false alarms that result in the unnecessary discharge of total flooding systems.

In unoccupied areas, human exposure to potentially toxic substitutes or decomposition products are of less concern. The key criterion in the SNAP decision process therefore becomes environmental considerations. At the same time, the Agency must ensure that personnel are not exposed to toxic concentrations of fire protection agents or their decomposition products when the substances are vented or leak out from the extinguishment area. Precautions must also be taken to prevent exposures to personnel entering a normally unoccupied area after a discharge. In addition, if there is a possibility that someone must enter a room while an agent is likely to exceed the NOAEL level, SCBA must be worn.

Design concentrations for explosion inertion must be higher than for fire suppression. In addition, design concentrations vary depending on the combustible material being considered. Thus, the system designer must be careful to ensure that system design precludes unacceptable cardiotoxic or oxygen depletion levels.

Explosion inertion agents are currently regulated by OSHA through the general duty clause [3], but use conditions are not explicitly stated as they are for fire suppression systems. However, since design concentrations for systems protecting against explosion of various gases or flammable liquids may expose personnel to cardiotoxic levels of inertion agents, it is industry practice to adopt standards provided under OSHA 1910.162. EPA is not intending to impose new regulations in this area, but defers to current OSHA practice in this regard, with the stipulation that the NOAEL and LOAEL values identified in this Final Rulemaking are the reference values for exposure limits.

Until OSHA establishes applicable workplace requirements, total flooding agents are acceptable by the Agency for use in occupied areas only under the following conditions:

1. Where egress from an area cannot be accomplished within one minute, the employer shall not use the agent in concentrations exceeding its NOAEL.

2. Where egress takes greater than 30 seconds but less than one minute, the employer shall not use the agent in a concentration greater than its LOAEL.

3. Agent concentrations greater than the LOAEL are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge. These conditions will no longer apply once OSHA establishes applicable workplace requirements.

(a) HBFC–22B1. HBFC–22B1 is acceptable as a Halon 1301 substitute. This agent is subject to the use conditions delineated in the discussion of total flooding agents in this section. HBFC–22B1 can replace Halon 1301 at a ratio of 1.4 by weight and 1.3 by storage volume, making it technically suitable for use in existing total flood systems. Its required extinguishing concentration, based on the cup burner test in heptane, is estimated at 4.4 percent, and its design concentration is 5.3 percent. Its explosion inertion concentration is 8.0 percent. The LOAEL for cardiotoxicity is 1 percent while its NOAEL is 0.3 percent. Its atmospheric lifetime is 7 to 15 years, but its GWP is uncalculated. This compound is unlikely to be feasible as a total flooding agent in occupied areas because its design concentration exceeds its cardiotoxic effect level.

While HBFC–22B1 has an ODP of 0.74 and will be phased out on January 1, 1996, the Agency believes that the substance can serve a useful role in helping users transition away from Halon 1301, which has a much higher ODP, estimated at 10.

This agent was submitted to the Agency as a Premanufacture Notice (PMN) and is presently subject to requirements contained in a Toxic Substance Control Act (TSCA) section 5(e) Consent Order and associated Significant New Use Rule (40 CFR 721.1296).

(b) HCFC–22. HCFC–22 is acceptable as a Halon 1301 substitute. This agent is subject to the use conditions delineated in the discussion of total flooding agents in this section. HCFC–22 has an extinguishment concentration, as determined by cup burner in heptane, of 11.6 percent and a design concentration of 13.9 percent, the highest of the candidate HCFCs. Its estimated explosion inertion concentration is 18.8 percent. Its weight and volume equivalence are 2.4 percent and 3.0 percent, respectively. The cardiotoxic NOAEL is 2.5 percent and its LOAEL is 5.0 percent. This compound is unlikely to be feasible as a pure agent in occupied areas because its design concentration exceeds its cardiotoxic effect level.

The ODP for HCFC–22 is 0.05, the 100 year-GWP is 1600, and the atmospheric lifetime is 16 years. Its ODP and GWP are both higher than those for other candidate HCFCs. This agent is schedule for production phaseout under the CAA for new equipment in the year 2010 and for existing equipment in the year 2020 (58 FR 65018).

(c) HCFC–124. HCFC–124 is acceptable as a Halon 1301 substitute. This agent is subject to the use conditions delineated in the discussion of total flooding agents in this section. HCFC–124 has relatively low ODP of .022, and, compared to other candidate 1301 substitutes for which GWP has been estimated, has a relatively low 100-year GWP value of 440 with an atmospheric lifetime of 7 years. Animal testing indicates that the substance may be lethal to rats at a level greater than 23 percent over a four hour period. The substance has a cardiotoxic LOAEL of 2.5 percent and a NOAEL apparent at 1.0 percent. Its weight and volume equivalence is 2.6 and 2.9 respectively. The extinguishing concentration based on cup burner tests in heptane of HCFC–124 is 7.0 percent and its design concentration is 8.4 percent, while its explosion inertion concentration is 12.0 percent. This compound is unlikely to be feasible as a total flooding agent in normally occupied areas because its design concentration exceeds its cardiotoxic level.

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[2] 29 CFR 459, § 1910.160, paragraph (b) includes general provisions to ensure the safety of all fixed extinguishing systems. Paragraph (c) stipulates requirements for systems with "potential health and safety hazards to employees" such as might be posed by gaseous agents.

[3] Public Law 91–596, (29 U.S.C. 654), section 3, is known as the "general duty clause:"

(1) shall furnish to each of is employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause, death or serious physical harm to his employees;

(2) shall comply with occupational safety and health standards promulgated under this Act.

(d) (HCFC BLEND) A. (HCFC BLEND) A is acceptable as a Halon 1301 substitute. This agent is subject to the use conditions delineated in the discussion of total flooding agents in this section. Based on full-scale testing, the extinguishing concentration of this blend has been determined to be approximately 7.2 percent and therefore the design concentration is approximately 8.6 percent. The cardiotoxic NOAEL of this blend is 10.0 percent, and the LOAEL is at least 10.0 percent. Until further data is supplied, the Agency considers its LOAEL to be 10 percent. The major component of this blend has an ODP of 0.05, higher than other proposed HCFC substitutes, but the blend appears somewhat more effective from a weight and storage volume equivalency basis, which is 1.6 and 2.3 respectively. This compound is a feasible candidate for use in a normally occupied area.

This agent is a blend of different HCFCs. The predominant component of this blend is HCFC–22, which has an ODP of 0.05, an atmospheric lifetime of 16 years, and a GWP of 1600. HCFC–22 is scheduled for production phaseout under the CAA by the year 2020 and all other HCFCs by the year 2030 (58 FR 65018).

(e) HFC–23. HFC–23 is acceptable as a Halon 1301 substitute. This agent is subject to the use conditions delineated in the discussion of total flooding agents in this section.

HFC–23 is attractive for use as a total flooding agent in occupied areas because the cardiotoxic NOAEL is at least 30 percent without added oxygen and over 50 percent with added oxygen, compared to a design concentration of 14.4 percent, based on cup burner tests in heptane. EPA recognizes that no cardiotoxic effect was measured in the tests of HFC–23, and acknowledges that tests were terminated when oxygen levels decreased to a point posing risk of asphyxiation. However, EPA must examine this agent in the light of potential cardiotoxicity because this is a halocarbon which does possess cardiotoxic characteristics. It is an artifact of the test protocol that determines that the NOAEL and LOAEL must be interpreted from the data, and not interpolated. To observe a cardiotoxic effect would require quantities in such high concentration as to pose a risk of asphyxiation before risk of cardiotoxicity. Because testing was stopped at 30 percent without added oxygen and 50 per cent with added oxygen, EPA must use these values as the maximum allowable concentrations. In the NPRM, EPA did not refer to a specific LOAEL for this agent. However, the standard OSHA-derived language was included for all agents. In this rulemaking, EPA is using the values of 30 percent for the NOAEL and 50% for the LOAEL.

Compared to an inerting concentration in methane of 20.5 percent and an inerting design concentration of 22.6 percent in methane, this agent is an excellent candidate for use in explosion inertion.

As mentioned earlier, the risk of using agents in high concentrations poses a risk of asphyxiation by displacing oxygen. With an ambient oxygen level of 21 percent, a design concentration of 22.6 percent will reduce oxygen levels to approximately 16 percent, the minimum oxygen level considered to be required to prevent impaired judgement or other physiological effects. The weight equivalent of HFC–23 is 1.6 while its storage volume equivalent is 2.6. This agent requires a high pressure system for proper discharge and dispersion.

Because this agent has an atmospheric lifetime of about 280 years and a 100-year GWP of 9,000, it is considered a potent greenhouse gas and should be handled accordingly. Since HFC–23 is typically a by-product of manufacturing and is not expressly produced for use as a fire fighting agent, EPA is allowing the use of this agent wherever applicable given technical or market considerations. However, in order to minimize unnecessary emissions of greenhouse gases, EPA recommends that users limit testing only to that which is essential to meet safety or performance requirements; recover HFC 23 from the fire protection system in conjunction with testing or servicing; and destroy or recycle HFC–23 for later use. In addition, EPA encourages manufacturers to develop aggressive product stewardship programs to help users avoid such unnecessary emissions.

(f) HFC–125. HFC–125 is acceptable as a Halon 1301 substitute. This agent is subject to the use conditions delineated in the discussion of total flooding agents in this section. The cardiotoxic NOAEL for HFC–125 is 7.5 percent, and its LOAEL is 10.0 percent compared to a cup burner extinguishment concentration in heptane of 9.4 percent. While this agent would not be appropriate for use in normally occupied areas, it is not expected that human health would be threatened by use of HFC–125 in normally unoccupied areas. This agent has a weight and volume equivalence of 2.6 and 3.2, respectively.

HFC–125 does not deplete stratospheric ozone. Despite its zero ODP, HFC–125 has an atmospheric lifetime of 41 years, and the highest calculated GWP (100-year GWP of 3,400) than any other HFC (except HFC–23) or HCFC currently planned for production as a halon or CFC substitute.

(g) HFC–134a. HFC–134a is acceptable as a Halon 1301 substitute. This agent is subject to the use conditions delineated in the discussion of total flooding agents in this section. HFC–134a has a cardiotoxic NOAEL of 4.0 percent, a LOAEL of 8 percent, and a design concentration of 12.6 percent. This compound is unlikely to be feasible as a total flooding agent in occupied areas because its design concentration exceeds its cardiotoxic level. Like the other HFCs, HFC–134a has an ODP of zero. It also has among the lowest GWP of the candidate 1301 replacements for which GWP has been estimated, with a 100-year GWP of 1,200 and an atmospheric lifetime of 16.

Cup burner tests in heptane indicate that this substance is less effective than 1301. Systems that use HFC–134a will require approximately 2.5 times more extinguishant by weight and 3.1 times more storage volume than 1301 systems.

(h) HFC–227ea. HFC–227ea is acceptable as a Halon 1301 substitute. This agent is subject to the use conditions delineated in the discussion of total flooding agents in this section. The final report on cardiotoxicity of HFC–227ea indicates that its NOAEL is 9.0 percent and that its LOAEL is at least 10.5 percent. EPA is accepting 10.5 percent as its LOAEL. Cup burner tests with heptane indicate that the extinguishment concentration for this agent is 5.8 percent, thus making its calculated design concentration 7.0 percent. These concentrations provide a sufficient margin of safety for use in a normally occupied area. HFC–227ea does not deplete stratospheric ozone. In addition, HFC–227ea is the most effective of the proposed HFC substitutes for Halon 1301. HFC–227ea can replace Halon 1301 at a ratio of 1.7 by weight and 1.4 by volume.

HFC–227ea has a 100-year GWP of about 2,050, with an atmospheric lifetime of 31 years.

(i) C_4F_{10}. C_4F_{10} is acceptable as a Halon 1301 substitute where other alternatives are not technically feasible due to performance or safety requirements: (a) due to their physical or chemical properties or (b) where human exposure to the agents may approach cardiosensitization levels or result in other unacceptable health effects under normal operating conditions. This agent is subject to the use conditions delineated in the preceding discussion. In addition,

because this agent can be used in high concentrations due to its cardiotoxicity profile, the design concentration must result in oxygen levels of at least 16%.

Cup burner tests in heptane indicate that C_4F_{10} can extinguish fires in a total flood application at concentrations of 5.5 percent and therefore has a design concentration of 6.6 percent. The cardiotoxicity NOAEL of 40 percent for this agent is well above its extinguishment concentration and therefore is safe for use in occupied areas. This agent has a weight and volume equivalence of approximately 3.1 and 3.0 respectively.

Using agents in high concentrations poses a risk of asphyxiation by displacing oxygen. With an ambient oxygen level of 21 percent, a design concentration of 22.6 percent may reduce oxygen levels to approximately 16 percent, the minimum level considered to be required to prevent impaired judgment or other physiological effects. Thus, the oxygen level resulting from discharge of this agent must be at least 16 percent.

This agent has an atmospheric lifetime of 2,600 years and a 100-year GWP of 5,500. Due to the long atmospheric lifetime of C_4F_{10}, the Agency is finding this chemical acceptable only in those limited instances where no other alternative is technically feasible due to performance or safety requirements. In most total flooding applications, the Agency believes that alternatives to C_4F_{10} exist. EPA intends that users select C_4F_{10} out of need and that this agent be used as the agent of last resort. Thus, a user must determine that the requirements of the specific end use preclude use of other available alternatives.

Users must observe the limitations on C_4F_{10} acceptability by undertaking the following measures: (i) Conduct an evaluation of foreseeable conditions of end use; (ii) determine that human exposure to the other alternative extinguishing agents may approach or result in cardiosensitization or other unacceptable toxicity effects under normal operating conditions; and (iii) determine that the physical or chemical properties or other technical constraints of the other available agents preclude their use.

Some examples of potential end-uses where toxicity may possibly be of concern are: i. Applications involving confined spaces where egress is difficult, such as in civilian and military transportation applications including aircraft engines, armored vehicles (engine and crew compartments), and ship engines; ii. Applications where public safety or national security necessity may preclude personnel from evacuating, in event of emergency, such as nuclear power plants or guard/security facilities; iii. Explosion and fire protection applications where high suppression or inerting concentrations are required such as processing and pump stations, flammable liquid processing areas, and flammable metal processing areas; iv. Health care facility applications involving impaired populations, such as hospitals and nursing homes where there may be a preference for use of this agent due to the unique concerns within the facility; v. Military mission critical applications which are vital to national security; vi. Other applications where, due to physical or chemical properties, there are no other technically feasible alternatives.

EPA recommends that users minimize unnecessary emissions of this agent by limiting testing of C_4F_{10} to that which is essential to meet safety or performance requirements; recovering C_4F_{10} from the fire protection system in conjunction with testing or servicing; and destroying or recycling C_4F_{10} for later use. EPA encourages manufacturers to develop aggressive product stewardship programs to help users avoid such unnecessary emissions.

(j) IG–541. IG–541 is acceptable as a Halon 1301 substitute. This agent is subject to the use conditions delineated in the discussion of total flooding agents in this section. In the NPRM, this agent was referred to as (Inert Gas Blend) but is now referred to as IG–541, consistent with NFPA 2001. This agent is a non-reactive, non-halocarbon substance, and thus not carcinogenic, mutagenic, or teratogenic; the toxicity and cardiotoxicity tests normally applied to halon substitutes do not apply here. Rather, this agent is a potential asphyxiant, since it is designed to decrease the oxygen to a level at which combustion cannot be supported. This blend is designed to increase breathing rates, thus making the oxygen deficient atmosphere breathable for short periods of time. Data submitted by the manufacturer was peer-reviewed by pulmonary, cardiac, and stroke specialists. All have agreed that the blend does not pose significant risk to the working population and may even pose less risk than does exposure to halocarbon agents. However, to ensure safety, this blend is acceptable under the conditions that the design concentration results in at least 10 percent oxygen and 5 percent carbon dioxide. In addition, if the oxygen concentration of the atmosphere falls below 10 percent, personnel must be evacuated and egress must occur within 30 seconds. Since a fire can be expected to consume oxygen and form decomposition products, personnel should treat any fire situation as an emergency and promptly exit the space.

A fire suppression design concentration of 52 percent and 43 percent would result in oxygen levels of 10 percent and 12 percent, respectively. The inerting concentration for this blend is 44 percent for methane/air mixtures and 50 percent for propane/air mixtures. A 50 percent concentration would result in an atmosphere of only 10.5 percent oxygen content, which is at the lower limit of acceptability of this agent.

Concerns have been raised about the decibel level of this system upon discharge. The manufacturer has submitted a report indicating the decibel level to be 117 decibels for 3 seconds followed by a decay in noise level over 5 minutes, compared to 130 decibels for a typical halon system. The Time Weighted Average (TWA) of this system is 57 decibels. These levels are in compliance with the OSHA workplace maximum allowed peak of 140 decibels and a maximum Time Weighted Average (TWA) of 90 decibels. This acceptability listing for use of IG–541 does not apply to any other inert gas system. A manufacturer with a different formulation must prepare a separate SNAP submission to EPA.

c. *Acceptable subject to narrowed use limits.* (1) Streaming agents. (a) HBFC–22B1. HBFC–22B1 is acceptable as a Halon 1211 substitute in non-residential applications. HBFC–22B1 is unacceptable for use in residential applications.

Extinguishment testing indicates that HBFC–22B1 can replace Halon 1211 at a ratio of 1.1 by weight, making it a viable substitute for use in hand-held extinguishers. Despite its high ODP of 0.74, this chemical can facilitate the shift away from Halon 1211, which has an even higher ODP of 3.0. However, given the potential market penetration and the high ODP of HBFC–22B1, widespread use of HBFC–22B1 in consumer applications was estimated to cause unacceptable damage to the ozone layer and an excessively high number of skin cancer cases and deaths. The total estimated skin cancer cases and fatalities from the use of HBFC–22B1 as a Halon 1211 replacement in all uses including consumer uses is approximately 30,000 and 600, respectively.

In addition to concern about its ODP, use of HBFC–22B1 in residential applications may present risks of cardiosensitization. To assess this risk, the Agency modeled the peak

concentration of HBFC–22B1 that would be expected if such an extinguishant were used to suppress a kitchen fire and estimated the decline from the peak. Such analysis indicated that peak concentrations of HBFC–22B1 would exceed 3300 ppm. This is in excess of NFPA ceilings for exposure. In light of the availability of other fire protection agents with lower associated risks, the Agency determined that the risks posed by HBFC–22B1 were too large to justify widespread use in the consumer sector. Thus, EPA finds HBFC–22B1 unacceptable for use in residential applications since other viable alternatives exist.

Worker exposure may be a concern in small enclosed areas, but in larger areas and outdoors, modeling efforts indicate that HBFC–22B1 can be used safely. In most realistic fire scenarios, proper procedures should be in place regarding the operation of the extinguisher and workers will be properly trained in fire fighting procedures and ventilation of extinguishment areas can be expected after dispensing the extinguishant.

Because it represents one of the few available substitutes in specific end-uses, EPA is finding use of HBFC–22B1 acceptable as a streaming agent except for residential uses. However, it can only be considered a transitional agent, because it will be phased out as a class I substance beginning January 1, 1996, in accordance with the Clean Air Act and with the requirements of the Montreal Protocol.

This agent was submitted to the Agency in a Premanufacture Notice (PMN) and is presently subject to requirements contained in a Toxic Substance Control Act (TSCA) section 5(e) Consent Order and associated Significant New Use Rule (40 CFR 721.1296). Under the terms of the Consent Order, it may be used only for outdoor automotive and marine applications. In addition, to ensure safe use, the sale of this product is restricted to a size discouraging residential use, with a minimum UL rating of 5BC. The unit must be properly labeled. The label must ban residential use, indicate space volume restrictions that would limit exposure to 1 percent, and describe proper evacuation and reentry requirements. In addition, the agent may only be sold in rechargeable units to encourage reuse and recycling and to minimize the potential for the agent to escape to the atmosphere through improper disposal.

(b) (CFC Blend). (CFC Blend) is acceptable as a Halon 1211 substitute in non-residential applications. While this agent was listed in the SNAP NPRM as proposed acceptable, the sale and distribution of CFCs in pressurized dispensers (in this sector, portable fire extinguishers) are controlled under section 610 of the CAA. The section 610 final rulemaking (58 FR 4768, January 15, 1993) bans the use of CFCs in portable fire extinguishers. Therefore, in the upcoming proposed SNAP rulemaking, EPA will list this agent as proposed unacceptable due to section 610 prohibitions.

This agent is unacceptable for use in residential applications since other viable alternatives exist. (CFC-Blend) contains CFCs with ODPs of 1.0. The predominant constituent has a 100-year GWP of 3400, with an atmospheric lifetime of 55 years. The CFC constituent in this blend will be phased out of production on December 31, 1995.

This agent is the most effective of all other halon substitutes except for HBFC–22B1 and HCFC–123, and does not pose the exposure risk of HBFC–22B1 in certain scenarios. (CFC Blend) is generally considered non-toxic and could serve as a transitional substitute in many streaming applications. However, in light of its high ODP relative to other substitute agents and the large potential market for consumer/residential extinguishers, alternative agents such as water and dry chemical are considered sufficient for residential uses.

(c) C_6F_{14}. C_6F_{14} is acceptable as a streaming agent in non-residential applications: Where other alternatives are not technically feasible due to performance or safety requirements: (a) Due to the physical or chemical properties of the agent, or (b) where human exposure to the extinguishing agent may approach cardiosensitization levels or result in other unacceptable health effects under normal operating conditions. This agent is unacceptable for use in residential applications and for uses beyond the limits and conditions stipulated in this action.

The extinguishment concentration of C_6F_{14} is 4.4 percent, and a cardiotoxicity NOAEL of 40 percent. Its weight equivalence is 2.8 and its storage volume equivalence is 3.1. While C_6F_{14} has no ODP, its atmospheric lifetime is 3,000 years, and may potentially contribute to global climate change.

EPA intends that users select C_6F_{14} out of need and that this agent be used as the agent of last resort. Thus, a user must determine that the characteristics of the end-use preclude use of other available alternatives. In most streaming applications, the Agency believes that alternatives to C_6F_{14} exist. These include the halocarbon replacements identified above as well as alternative agents such as water, CO_2, foam, and dry chemicals. Users should attempt to use these other agents before deciding on an C_6F_{14} system. At the time of publication of this rulemaking, EPA is unaware of any data which necessitates the use of any PFC as a streaming agent based on toxicological concerns.

Users must observe the limitations on C_6F_{14} acceptability by undertaking the following measures: (i) Conduct an evaluation of foreseeable conditions of end use; (ii) determine that human exposure to the other alternative extinguishing agents may pose a risk of cardiosensitization or other unacceptable toxicity effects under normal operating conditions; and (iii) determine that the physical or chemical properties or technical constraints of the other available agents preclude their use. Users must maintain documentation on measures taken to justify use of this agent.

Some examples of potential end-uses where toxicity or physical characteristics may possibly be of concern are: i. Confined spaces which are difficult to egress, such as civilian and military transportation applications, including armored vehicles, marine engines, power boats, aircraft cabins, and race cars; ii. Applications where public safety or national security necessity may preclude personnel from evacuating, in event of emergency, such as nuclear power plants or guard/security facilities; iii. Emergency response applications such as crash rescue vehicles and aircraft flightlines; iv. Military applications involving mission critical applications which are vital to national security; v. Other applications where, due to physical or chemical properties, there are no technically feasible alternatives.

EPA recommends that users minimize unnecessary emissions by limiting testing only to that which is essential to meet safety or performance requirements; recovering C_6F_{14} from the fire protection system in conjunction with testing or servicing; and destroying C_6F_{14} or recycling it for later use. EPA encourages manufacturers to develop aggressive product stewardship programs to help users avoid such unnecessary emissions.

(2) Total Flooding Agents. (a) C_4F_{10}. C_4F_{10} is acceptable as a Halon 1301 substitute (i) where other alternatives are not technically feasible due to performance or safety requirements: (a) Due to their physical or chemical properties or (b) where human exposure to the agents may approach cardiosensitization levels or result in other unacceptable health effects under normal operating conditions. This agent

is subject to the use conditions delineated in the preceding discussion concerning use to total flooding agents in the workplace. In addition, because this agent can be used in high concentrations due to its cardiotoxicity profile, the design concentration must result in oxygen levels of at least 16%.

Cup burner tests in heptane indicate that C_4F_{10} can extinguish fires in a total flood application at concentrations of 5.5 percent with a design concentration of 6.6 percent. The cardiotoxicity NOAEL of 40 percent for this agent is well above its extinguishment concentration and therefore is safe for use in occupied areas.

Using agents in high concentrations poses a risk of asphyxiation by displacing oxygen. With an ambient oxygen level of 21 percent, a design concentration of 22.6 percent may reduce oxygen levels to approximately 16 percent, the minimum level considered to be required to prevent impaired judgement or other physiological effects. Thus, the oxygen level resulting from discharge of this agent must be at least 16 percent.

While C_4F_{10} has a no ODP, it has an atmospheric lifetime of 2,600 years. Due to its long atmospheric lifetime, the Agency is finding this chemical acceptable only in those limited instances where no other alternative is technically feasible due to performance or safety requirements. In most total flooding applications, the Agency believes that alternatives to C_4F_{10} exist. It is EPA's intention that users not select C_4F_{10} out of simple preference, but out of need and that this agent be used as the agent of last resort. Thus, a user must determine that the requirements of the specific end-use preclude utilization of other available alternatives.

Users must observe the limitations on PFC use by undertaking the following measures: (i) Conduct an evaluation of foreseeable conditions of end use; (ii) determine that human exposure to the other alternative extinguishing agents may approach or result in cardiosensitization or other unacceptable toxicity effects under normal operating conditions; and (iii) determine that the physical or chemical properties or other technical constraints of the other available agents preclude their use.

Some examples of potential end-uses where toxicity may possibly be of concern are: i. Applications involving confined spaces where egress is difficult, such as in civilian and military transportation applications including aircraft engines, armored vehicles (engine and crew compartments), and ship engines; ii. Applications where public safety or national security necessity may preclude personnel from evacuating, in event of emergency, such as nuclear power plants or guard/security facilities; iii. Explosion and fire protection applications where high suppression or inerting concentrations are required such as processing and pump stations, flammable liquid processing areas, and flammable metal processing areas; iv. Health care facility applications involving impaired populations, such as hospitals and nursing homes where there may be a preference for use of this agent due to the unique concerns within the facility; v. Military mission critical applications which are vital to national security; vi. Other applications where, due to physical or chemical properties, there are no other technically feasible alternatives.

EPA recommends that users minimize unnecessary emissions by limiting testing of C_4F_{10} to that which is essential to meet safety or performance requirements; recovering C_4F_{10} from the fire protection system in conjunction with testing or servicing; and destroying or recycling C_4F_{10} for later use. In addition, EPA encourages manufacturers to develop aggressive product stewardship programs to help users avoid such unnecessary emissions.

b. *Unacceptable substitutes.* (1) Streaming agents. (a) (CFC–11). CFC–11 is unacceptable in its proposed application as a Halon 2402 substitute or for use in controlling large outdoor fires. This agent has been proposed as a substitute for Halon 2402, as well as for use in controlling large outdoor fires, as when dropped from helicopters. Halon 2402 is not used in the U.S. and thus does not require a substitute agent. Other nonozone-depleting methods are already in use in fighting these large outdoor fires and, thus, EPA does not believe that introduction of this substitute is warranted.

(2) Total flooding agents. There are no total flooding agents listed as unacceptable.

H. Sterilants

1. Overview

CFC–12 is widely used in combination with ethylene oxide (EtO) to sterilize medical equipment and devices. The most prevalent combination consists of 12 percent EtO mixed with 88 percent CFC–12; the mixture is therefore referred to as "12/88". EtO serves as the actual sterilant in this mixture and can be used alone as a sterilant, but by itself, EtO is highly flammable. CFC–12 acts as a diluent to form a non-flammable blend.

Sterilants, including 12/88, are used in a variety of applications. These include hospital sterilization, medical equipment sterilization, pharmaceutical production, spice fumigation, commercial research and development, and contract sterilization. Hospitals are by far the most numerous users of sterilants. Within hospitals, 12/88 is the most popular sterilant. Estimates indicate that in 1989, EtO/CFC–12 was used for over 95 percent of all sterilization in hospitals. Other individual users of sterilant such as contract sterilizers and pharmaceutical producers, while less numerous than hospitals, typically consume more sterilant than the average hospital but are more likely to use other alternatives such as pure EtO sterilization.

Despite the varied end uses of sterilants, the Agency did not divide its analysis and regulation of the sterilants sector into distinct end uses. This is because alternatives to 12/88 are consistent across end uses, and the sterilant sector as a whole represents one of the smallest use sectors for Class I substances being considered in the SNAP program. On an ODP-weighted basis, US consumption of CFC–12 for sterilization represented less than 4 percent of the total US consumption of ozone depleting substances in 1990.

Several alternatives to 12/88 are currently in widespread use, but each is limited in applicability by material properties of the devices to be sterilized. These currently available alternatives are unlikely to serve as widespread substitutes for 12/88. Steam sterilizers, for example, are used in many applications and are less expensive to purchase and operate than 12/88 systems. However, steam can only be used to sterilize equipment that can resist high temperatures and high humidity. Pharmaceutical manufacturers already use steam to the maximum extent possible, but hospitals may be able to shift some of their current 12/88 use to steam by separating heat and moisture-resistant devices from sensitive ones. Other alternatives such as radiation, peracetic acid, and glutaraldehyde are also in use, but, like steam, are incompatible with many of the materials now sterilized with 12/88. For example, 30 to 50 percent of new products are initially sterilized with gamma radiation, but it is not possible to re-sterilize hospital surgical equipment with gamma radiation. Rather, 12/88 must be used.

Several other alternatives, such as chlorine dioxide, gaseous ozone, vapor phase hydrogen peroxide, and ionized

gas plasma, are currently under development. Many of these alternatives are also incompatible with materials currently sterilized with 12/88. Those that may be applicable as partial substitutes for 12/88, such as hydrogen peroxide, are not expected to be commercially available in the near term.

Alternatives such as radiation and other currently available technologies should be used wherever applicable, but are not specifically addressed in this rule due to their limited potential to be widespread substitutes for 12/88. Additional information on such alternatives and on specific uses of 12/88 can be found in the supporting documentation retained in the public docket. The determinations in this section are based on the risk screen described in the background document titled "Risk Screen on the Use of Substitutes for Class I Ozone-Depleting Substances: Sterilization." Responses to comments received on the sterilants sector can be found in the "Response to Comment" document, also found in the public docket.

2. Substitutes for Sterilization

a. *Halocarbons.* A number of halocarbon substitutes have been suggested as alternatives to CFC–12 in EtO blends for sterilization. These include HCFC–123, HCFC–124, HFC–125, HCFC–141b, and HFC–134a and HFC–227ea. At present, however, only HCFC–124, a blend of HCFCs, and HFC–227ea have been proposed as near-term candidates. While HCFC–124 has been fully evaluated by the Agency in this rule, final determinations on the HCFC Blend and HFC–227ea will be made as soon as complete data is available and the products are approved under FIFRA. Additional research will be required to determine the suitability of the other agents in EtO blends.

Many of the proposed halocarbons offer good potential as EtO diluents. They demonstrate good flame retardation, low ODPs, low GWPs, low toxicity, materials compatibility, acceptable vapor pressures, and good blending properties. Mixtures of halocarbons with EtO would most likely be at ratios similar to 12/88, or with a slightly lower EtO content. HCFC–124 has been tested with 8.6 percent EtO, for example. Such properties would make halocarbon blends virtual drop-in replacements for 12/88 in existing systems. The blends would also be far less damaging to stratospheric ozone than is 12/88.

b. *Carbon dioxide.* Carbon dioxide is already in widespread use as a sterilant in blends with EtO. Previously, the most common blend contained 10 percent EtO and 90 percent CO_2 and was referred to as "10/90". However, on October 1, 1993 the Department of Transportation (DOT) issued regulations on the transport of hazardous materials which listed EtO/CO_2 mixtures as flammable if they contain more than 9 percent EtO. To avoid changing safety and handling procedures, manufacturers of this blend are changing the formulation of the EtO/CO_2 blend to 8.5/91.5.

While the 8.5/91.5 blend is compatible with most of the materials now sterilized with 12/88, it must be used at higher operating pressures than 12/88 systems and hence is not a direct drop-in replacement for 12/88. Use of CO_2 blends requires that the sterilizing unit be retrofitted to handle higher operating pressures in order to prevent excessive leakages of EtO from the system.

CO_2 and EtO tend to separate while stored in pressurized containers. Thus, initial discharges from the canisters during use may contain excessively high amounts of flammable EtO; final discharges from nearly empty canisters may contain pure CO_2 and may not effectively sterilize equipment. To overcome this problem, single "unit dose" canisters have been developed for use in conjunction with CO_2 sterilizers. For safe operation, these canisters must be connected and disconnected from the sterilizing unit before and after every use, thereby increasing the risk of accidental exposure. Improved training procedures will be required with such systems.

c. *Pure EtO.* Pure EtO systems can also be used in place of current 12/88 sterilizers. By itself, EtO is toxic, carcinogenic, and flammable. It is also explosive at concentrations above 3 percent in air. Thus, additional precautions must be taken to limit occupational exposures and conflagration. Present OSHA standards and proper engineering controls have demonstrated their ability to provide for safe operation of such systems. Pure EtO systems are currently used by many contract sterilizers, large hospitals, and other large users.

3. Listing Decisions

a. *Acceptable substitutes.* (1) HCFC–124. HCFC–124 is acceptable as a substitute for CFC–12 in EtO blends. Initial testing in hospital, industrial, and laboratory settings indicates that an EtO/HCFC–124 blend can serve as a virtual drop-in replacement for 12/88, enabling users to transition away from CFC–12 while still using their existing equipment.

Use of HCFC–124 in sterilizers will allow significant reductions in skin cancer cases and deaths resulting from ozone depletion. HCFC–124 has an ODP of only 0.02. Modeling results indicate that even if HCFC–124 replaces all current use of CFC–12 in sterilization, resulting skin cancer deaths in the total US population born before 2030 will total only 600 more than if a zero ODP substitute were available. In addition, the low GWP of HCFC–124 ensures that use of the chemical in sterilizers will have a negligible effect on global warming.

Under Title III of the Clean Air Act Amendments of 1990, the Agency is required to regulate any of the 189 hazardous air pollutants (HAPs). Ethylene oxide is a HAP, and the user is alerted to follow all upcoming regulations concerning the use of ethylene oxide, whether used alone or in a blend. For example, it is likely in the future that Title III will require a system that prevents venting of EtO into the atmosphere, therefore users installing new HCFC–124/EtO systems may choose to take this into consideration.

(2) Carbon dioxide. Carbon dioxide is acceptable as a substitute for CFC–12 in EtO blends used for sterilization. Carbon dioxide can effectively reduce the flammability of EtO and does not deplete stratospheric ozone. Most CO_2 currently used in sterilant mixtures is the recaptured by-product of other chemical processes, so its manufacture for use in sterilizers should not increase emissions to the atmosphere. Carbon dioxide is an asphyxiant in high concentrations, but engineering controls designed to limit occupational exposures from the more toxic EtO will also serve to prevent potentially lethal exposures to CO_2.

Blends of CO_2 and EtO are commercially available at present, and proven process cycles already exist. Blends of CO_2 and EtO have been in widespread use for years and dominated the market before the development of 12/88. Recent regulations issued by DOT have prompted manufacturers to change the formulation of the blend to 8.5/91.5 EtO/CO_2 due to flammability concerns. As mentioned above, ethylene oxide is a HAP, and the user is alerted to follow all upcoming regulations under Title III of the Clean Air Act Amendments concerning the use of ethylene oxide, whether used alone or in a blend.

(3) Pure EtO. Pure EtO is acceptable as a substitute for 12/88 in sterilization. By itself, EtO is neither an ozone depleting substance nor a contributor to global warming. However, EtO is toxic,

carcinogenic, and flammable. While these factors must be considered in the decision to approve EtO as a substitute for 12/88 and must be considered by users selecting appropriate substitutes for their current use of 12/88, the Agency considers current applicable standards and operating procedures (such as OSHA standards for occupational exposure) sufficient to protect human health and the environment. Thus, pure EtO systems are acceptable substitutes for 12/88. Users are advised to adhere to all existing workplace standards and to train workers in the proper operation of EtO equipment. Historical experience with pure EtO systems indicates that they can be used safely when operated in accordance with such guidelines. Because of the threat posed to the general population by vented EtO, the Agency also recommends that pure EtO systems be used in conjunction with emission control technologies such as catalytic converters or acid water scrubbers to prevent exposures of the general population to dangerous levels of EtO.

As mentioned above, ethylene oxide is a HAP, and the user is alerted to the probability of future regulations under Title III of the Clean Air Act Amendments concerning the use of ethylene oxide, whether used alone or in a blend.

(4) Steam. Steam sterilization is acceptable as a substitute for 12/88 in sterilization. As mentioned above, steam sterilization can be used on devices that can withstand high temperature and very high humidity. The use of steam sterilization can be increased by separating heat and moisture sensitive devices from resistant ones.

b. *Unacceptable substitutes.* (None).

I. Aerosols

1. Overview

To provide perspective on EPA's decisions in the aerosols sector, this section presents first an overview of important related regulations affecting aerosols. Subsequent parts of the section describe the substitutes in the aerosols sector and present EPA's decisions on the substitutes. The decisions are summarized in Appendix B at the end of this notice. The proposed decisions presented in this section are based on the risk screen contained in the draft background document entitled "Risk Screen on the Use of Substitutes for Class I Ozone-Depleting Substances: Aerosols."

Following scientific concerns raised in 1974 regarding possible ozone depletion from CFCs, EPA and the Food and Drug Administration (FDA) acted on March 17, 1978 (43 FR 11301; 43 FR 11318) to ban the use of CFCs as aerosol propellants in all but essential applications. During the mid-1970s, use as aerosol propellants constituted over 50 percent of total CFC consumption in the United States. The 1978 ban reduced aerosol use of CFCs in this country by approximately 95 percent, eliminating nearly half of the then total U.S. consumption of these chemicals.

Some CFC aerosol products were specifically exempted from the ban based on a determination of essentiality. (See reference Essential Use Determinations-Revised, 1978.) The other uses of CFCs in aerosol and pressurized dispenser products (e.g., as an active ingredient, a solvent, or as the sole ingredient) were excluded from the ban because they did not fit the narrow definition of "aerosol propellant." Therefore, prior to the 1990 amendments to the Clean Air Act, the only aerosol products that still contained CFCs were products exempted from the 1978 ban on CFC propellants or products excluded from the 1978 ban.

The Clean Air Act as amended in 1990 includes statutory authorities relevant to use of ozone depleting chemicals used in aerosol applications in several sections of Title VI. In addition to mandating the phaseout of class I and class II substances (sections 604 and 605) and mandating the review of substitutes (section 612), section 610 of title VI prohibits the sale of certain nonessential products made with class I and class II substances. Title VI divides controlled ozone-depleting substances into two distinct classes. Class I is comprised of CFCs, halons, carbon tetrachloride, MCF, hydrobromofluorocarbons, and methyl bromide. Class II is comprised solely of HCFCs. The product bans for class I substances and class II substances are distinct from one another and are addressed in subsections 610(b) and 610(d), respectively. In section 610(b), Congress directed EPA to promulgate regulations that prohibit the sale or distribution of certain "nonessential" products that release class I substances. Under this subsection, Congress specifies particular products as nonessential and directs EPA to identify other nonessential products.

In the final regulations implementing the Class I Nonessential Products ban (58 FR 4767; January 15, 1993), EPA issued regulations that implement the requirements of section 610(b) and ban certain nonessential products that release class I substances. Under this rule, EPA banned, among other products, flexible and packaging foam, and aerosols and other pressurized dispensers using CFCs. The use of methyl chloroform, while a class I substance, is not restricted under this regulation.

As directed by Congress, EPA researched the purpose or intended use of products containing class I substances, the technological availability of substitutes, safety and health considerations, and other relevant factors including the economic effect of banning selected products. EPA then banned the use of CFCs as propellants and solvents in all aerosol products with the following specific exemptions (58 FR 4767; January 15, 1993):

—Medical devices listed in 21 CFR 2.125(c).
—Lubricants for pharmaceutical and tablet manufacture.
—Gauze bandage adhesives and adhesive removers.
—Topical anesthetic and vapocoolant products.
—Lubricants, coatings, or cleaning fluids for electrical and electronic equipment that contain CFC–11, CFC–12 or CFC–113 for solvent purposes, but which contain no other CFC.
—Lubricants, coatings, or cleaning fluids for aircraft maintenance that contain CFC–11 or CFC–113, but which contain no other CFC.
—Release agents for molds using CFC–11 or CFC–113 in the production of plastic or elastomeric materials.
—Spinnerette lubricant/cleaning sprays used in the production of synthetic fibers that contain CFC–114, but contain no other CFCs.
—Containers of CFCs used as halogen ion sources in plasma etching.
—Document preservation sprays that contain CFC–113, but which contain no other CFCs.
—Red pepper bear repellant sprays that contain CFC–113, but which contain no other CFCs.

Exemption from the class I ban does not imply exemption from the phase-out requirements.

HCFCs also have current and potential applications as propellants and as solvents in aerosol products. Until recently, their use has been limited by the aerosol industry because of their high cost relative to traditional options such as CFCs and hydrocarbons. Increased regulation of CFCs, including taxation of these substances and an eventual phase-out, has meant that HCFCs are, for an interim period, economically viable in some applications, particularly where concern about flammability limits the use of cheaper alternatives, such as hydrocarbons.

However, section 610(d) of the CAA prohibits as of January 1, 1994, the sale or distribution of aerosol or foam products that contain or are manufactured with class II substances. All HCFCs are currently listed as class II substances. EPA believes that the ban on certain products containing class II substances is self-executing. Section 610(d)(1) bans the sale of the specified class II products on its own terms, without any reference to required regulations. Thus, EPA is not required to determine which products will be banned.

However, section 610(d)(2) allows EPA to grant exceptions and exclusions from the ban on aerosol and pressurized dispenser products containing class II substances. Specifically, EPA is authorized to grant exceptions from the prohibition where the use of the aerosol product or pressurized dispenser is determined by the Administrator to be essential as a result of flammability or worker safety, and where the only available alternative to the use of a class II substance is the use of a class I substance which legally could be substituted for such class II substance (i.e., use of a class I substance that is still allowed). In addition to these two criteria for exceptions, aerosol products may be excluded from the ban as a result of a third consideration in section 610 (d)(2); namely, that the ban on products containing class II substances shall not apply to any medical device. Reflecting the self-executing nature of the CAA ban, any aerosol product or pressurized dispenser containing a class II substance is banned as of January 1, 1994, unless EPA grants an exception.

EPA published a final rule under 610(d)(2) December 30, 1993 (58 FR 69637). The following products were exempted:

- Medical devices listed in 21 CFR 2.125(e);
- Lubricants, coatings or cleaning fluids for electrical or electronic equipment, which contain class II substances for solvent purposes, but which contain no other class II substances;
- Lubricants, coatings or cleaning fluids used for aircraft maintenance, which contain class II substances for solvent purposes but which contain no other class II substances;
- Mold release agents used in the production of plastic and elastomeric materials, which contain class II substances for solvent purposes but which contain no other class II substances, and/or mold release agents that contain HCFC–22 as a propellant where evidence of good faith efforts to secure alternatives indicates that, other than a class I substance, there are no suitable alternatives;
- Spinnerette lubricants/cleaning sprays used in the production of synthetic fibers, which contain class II substances for solvent purposes and/or contain class II substances for propellant purposes;
- Document preservation sprays which contain HCFC–141b as a solvent, but which contain no other class II substance; and/or which contain HCFC–22 as a propellant, but which contain no other class II substance and which are used solely on thick books, books with coated, dense or paper and tightly bound documents;
- Portable fire extinguishing equipment sold to commercial users, owners of marine vessels or boats, and owners of noncommercial aircraft that contains a class II substance as a fire extinguishant where evidence of good faith efforts to secure alternatives indicate that, other than a class I substance, there are no suitable alternatives; and
- Wasp and hornet sprays for use near high-tension power lines that contain a class II substance for solvent purposes only, but which contain no other class II substances.

EPA did not propose any exceptions for propellant uses of class II substances since sufficient propellant substitutes are available.

Uses of HCFCs granted an exemption under section 610 based on the lack of other alternatives will not face further restrictions under the SNAP program and authority under section 612, since the express purpose of the SNAP program is to restrict substitutes only in cases where other alternatives do exist.

2. Substitutes for Aerosols

The class I substances that are currently being used in aerosol applications include CFC–11, CFC–12, CFC–113, CFC–114, and methyl chloroform (MCF). Class II substances that are currently being used are HCFC–22, HCFC–142b, and HCFC–141b.

The Agency has elected only to discuss alternatives for CFC–11, CFC–113, MCF, HCFC–22, HCFC–142b, and HCFC–141b. The uses for CFC–12 and CFC–114 are as propellants in medical applications and will not be discussed here because the substitutes for these applications are currently being developed and will have to undergo FDA review. Possible substitutes in this application include HFC–134a and HFC–227ea, which both have low toxicity and zero ozone depletion potential. Regulatory approval for these compounds, however, is contingent on FDA approval, which will likely occur over the next several years. EPA's review of these substitutes will focus exclusively on environmental effects.

A variety of chemicals are currently being used or are being considered as substitutes for class I and II controlled substances used in non-inhalation aerosols and pressurized containers. The suitability of alternatives depends upon the product in which they are used. Each of these alternatives has its own physical and chemical characteristics which make it an optimal choice for the product in question, in terms of such factors as solvency properties, propellant characteristics, performance, cost, and environmental considerations. However, the Agency believes that the majority of the substitutes considered to replace the class I and II controlled substances used as propellants or solvents in aerosols and pressurized containers as propellants and solvents are currently available and easily integrated into existing aerosol production facilities.

The primary substitutes for the propellant uses of CFC–11, HCFC–22 and HCFC–142b are as follows:

- Saturated hydrocarbons (C3–C6).
- Dimethyl ether.
- HFCs.
- Compressed gases.
- Alternative processes.

HCFC–22 and HCFC–142b could technically be used as substitutes for CFC–11, but their use is extensively controlled under section 610 of the CAA.

The primary substitutes for the solvent/diluent uses of CFC–11, CFC–113, MCF, and HCFC–141b are as follows:

- Petroleum hydrocarbons (C6–C20).
- Oxygenated organic solvents (ketones, esters, ethers, and alcohols).
- HCFC–141b.
- Terpenes.
- Chlorinated solvents.
- Water-based systems.

Other substitutes, including monochlorotoluenes/benzotrifluorides, hydrofluorocarbons, and perfluorocarbons, are also being investigated. This list of substitutes was compiled with the help of companies that submitted information on substitutes to the Agency in response to the January 16, 1992, Advance Notice of Proposed Rule-Making. Today's decisions on these substitutes are listed in appendix B. The remainder of this section discusses these substitutes, the decision on each substitute, and the Agency's reasoning behind each determination. Vendors or users of substitutes not included on the table for the SNAP determinations on aerosols should provide information on the

substitutes so that the Agency can add these substitutes to the lists.

a. Substitutes for propellants. (1) Saturated light hydrocarbons (C3–C6). Hydrocarbons are promising replacements for nonessential uses of HCFC–22 as a propellant in aerosols and pressurized containers. The specific category of hydrocarbons used as propellants are saturated light hydrocarbons (C3–C6). Examples of these small chain compounds include butane, isobutane, and propane. All have low boiling points, making them excellent propellants. They are used separately or in mixtures, are inexpensive compared to HCFC–22 (HCFC–22 is four times more expensive than hydrocarbons), and are readily available from most chemical distributors.

The Agency believes that the major area of concern with the replacement of hydrocarbons for HCFC–22 is the flammability of hydrocarbons. In applications where a nonflammable propellant is needed, a hydrocarbon could not be used. For example, the use of hydrocarbons around electrical equipment could prove hazardous if sparks from the equipment were to ignite the hydrocarbon propellant.

Saturated light hydrocarbons are adequate substitute propellants where flammability is not a concern. To reduce product flammability, hydrocarbons can be used with water-based formulations in products such as insecticides, where product quality would not be adversely affected. Manufacturers are also hindered from selling hydrocarbon-propelled aerosols in certain jurisdictions. In California, for example, the use of hydrocarbons is restricted because of their classification as volatile organic compounds which contribute to low level ozone or smog.

(2) Dimethyl ether. Dimethyl ether (DME) is a medium pressure, flammable, liquefied propellant. Because of its chemical properties, it can be used as a combination propellant/solvent, although it is typically classified together with other propellants and is used in combination with other propellants. Practices for manufacture and use of aerosol products formulated with DME parallel practices employed with hydrocarbons.

(3) Hydrofluorocarbons. Hydrofluorocarbons (HFCs) such as HFC–134a, HFC–125 and HFC–152a are partially fluorinated hydrocarbons and have been developed relatively recently. These compounds are less dense than HCFC–22, but with minor reformulation adjustments could function equally well as propellants except in products such as noise horns, which require a more dense gas. Because HFCs have only recently been developed, they are only now becoming readily available and are expected to be priced significantly higher than HCFC–22, at least in the near term.

Preliminary studies show that HFC–134a and HFC–125 are nonflammable and have very low toxicity, which would make them good replacements for HCFC–22 as propellants in products where nonflammability is a requirement. Although HFC–152a is slightly flammable, it can be formulated with other materials—such as HFC–125—to control its flammability. HFCs also may be used in conjunction with other flammable chemicals to reduce the flammability of such mixtures. For example, HFCs are being tested for use with dimethyl ether (DME) in safety sprays and animal repellents. Although DME is flammable, the overall product formulation is not. HFC–134a and HFC–125 are also being tested as replacements for CFCs still used in medical applications because of their nonflammable, nontoxic properties.

(4) Compressed gases. Compressed gases such as carbon dioxide, nitrogen, air, and nitrous oxide are common, low molecular weight gases used as propellants in aerosol products but not as drop-in replacements. First, alternative dispensing mechanisms and stronger containers are needed because these gases are under significantly greater pressure. Containers holding compressed gases are, therefore, larger and bulkier. Second, because these chemicals have low molecular weights, they are inadequate as replacements for HCFC–22 in products requiring a dense gas propellant, such as noise horns, or in products requiring fine dispersion of the product, such as surface lubricants and weld inspection developers. Third, compressed gases dispel material faster because they are under higher pressure, which contributes to wasted product.

Compressed gases are readily available from most chemical distributors and are relatively inexpensive. Compressed gases cool upon expansion. Compressed gases are also nonflammable and can serve as propellants in applications where a nonflammable propellant is necessary, but not in applications where a fine even dispersion is required.

(5) HCFC–22 and HCFC–142b. Limited use of these chemicals as substitutes is anticipated since section 610 imposes significant restrictions as of January 1, 1994, on their use as aerosol propellants.

(6) Alternative processes. Alternative processes, such as manually operated pumps and sprays, provide an alternative delivery mechanism in place of the aerosol dispenser. Development of alternative process replacements depends on technological feasibility. Some products, such as aerosol foams, cannot now be easily formed with alternative processes, making the replacement of the propellant difficult. In other products, the alternative process may not provide proper dispersion or accurate application of the product, limiting its use. Persons using manual pumps or sprays (in applications where alternative processes function adequately as replacements) on a continuous basis may become fatigued with the constant pumping motion, thus producing poor product performance. Nonetheless, these substitutes can serve as viable alternatives in certain applications.

b. *Substitutes for solvent/diluents.* (1) Petroleum hydrocarbons (C6–C20). Petroleum hydrocarbons are generally defined as C6–C20 hydrocarbons fractionated from the distillation of petroleum. These compounds are loosely grouped into paraffins (six carbon chains to ten carbon chains—n-hexane, n-heptane, etc.) and light aromatics (toluene and xylene) and come in various grades of purity. Components with up to twenty carbons are now also being used in an effort to reduce flammability. These compounds have good solvent properties, are relatively inexpensive (about half the price of MCF), and are readily available from chemical distributors. When a controlled substance is used only as a diluent, such as in automotive undercoatings, substitution using petroleum hydrocarbons can be achieved with minor reformulation. Many of these products containing petroleum hydrocarbons even outperform their chlorinated counterpart.

Petroleum hydrocarbons are, however, flammable, and thus cannot be used as replacement solvents in applications where the solvent must be nonflammable such as electronic cleaning applications. In addition, pesticide aerosols formulated with certain petroleum hydrocarbons must adhere to requirements imposed under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

(2) Oxygenated organic solvents. Oxygenated organic solvents are compounds based on hydrocarbons containing appendant oxygen (alcohols and ketones), integral oxygens (ethers), or both (esters). These compounds are relatively inexpensive compared to MCF—about half the cost—and are readily available from chemical distributors. These compounds are also

flammable, however, and cannot be used as substitute solvents in applications where the solvent must be nonflammable.

These compounds are currently being blended with class I substances to reduce the amount of class I substances used in a product's formulation. Since the quantity of these compounds is small, the product still remains nonflammable. Some manufacturers, however, are completely reformulating products such as spot removers with ketones, esters, ethers, or alcohols. To continue the safe use of these convenient products, consumers may have to be educated about the product's increased flammability.

(3) Hydrochlorofluorocarbons (HCFCs). HCFC–141b is a potential substitute to replace CFC–11 and CFC–113 used in solvent/diluent applications in aerosols and pressurized dispensers. HCFC–141b's ODP is similar to that of MCF, making it unlikely that aerosol manufacturers would reformulate their products away from MCF towards HCFC–141b.

HCFC–141b has a number of characteristics that make it a suitable alternative solvent, namely: It is nonconductive, nonflammable according to U.S. Department of Transportation specifications, and evaporates quickly. However, HCFC–141b is expensive compared to the pretax price of CFC–113—almost three times the cost. Further, HCFC–141b is slightly corrosive to plastic parts, and could not serve as a drop-in replacement for all the uses of CFC–11 and CFC–113 as a solvent.

(4) Terpenes. Terpenes are unsaturated hydrocarbons based on isoprene subunits. They have good solvent properties and could replace ozone-depleting compounds in some solvent cleaning applications. They are flammable, which limits their use in applications that require nonflammable solvents. Some terpenes have a slight citrus scent while others have stronger, unpleasant odors, making them difficult to use over an extended period of time.

(5) Other chlorinated solvents. Other chlorinated solvents such as perchloroethylene, trichloroethylene, and methylene chloride can be used to replace CFC–11, CFC–113, and MCF in solvent applications in aerosol and pressurized containers. These chlorinated solvents are extremely effective and can dissolve compounds which are difficult to dissolve in other solvents, such as fluorinated polymers used in water and oil repellants. However, due to toxicity concerns associated with these substances, their use is likely to be limited, especially in products sold to the general public or in products used frequently by workers. In addition, pesticide aerosols formulated with these chlorinated solvents must adhere to applicable requirements under FIFRA.

Because they are strong solvents and nonflammable, however, chlorinated solvents are promising substitutes in cleaning applications for electronic equipment or electric motors where safeguards could protect workers from the potentially toxic fumes. These compounds are readily available from chemical distributors at prices comparable to those for MCF.

(6) Water-based formulations. Water-based formulations provide a replacement for the use of CFC–11, CFC–113, and MCF as solvents in aerosols and pressurized dispensers. These reformulated products usually contain new components/active ingredients that are water soluble. The overall function of the reformulated product remains the same, but the product's substituents are changed.

Most formulations are nonflammable, yet may be difficult to use around sources of electricity because they may short out electrical equipment. Such products may also have short shelf-lives because the active ingredient may decompose in an aqueous environment. Also, these products when sprayed do not evaporate quickly, resulting in product accumulation. This may create problems in certain applications, such as where the accumulation of a water-based product contributes to rust or corrosion. The possibility of reformulating products is product-specific, depending on the feasibility of finding active ingredients that are water soluble.

(7) Monochlorotoluene/benzotrifluorides. Monochlorotoluenes and benzotrifluorides are of commercial interest as solvent substitutes for aerosols. These compounds can be used either in isolation or in various mixtures, depending on desired chemical properties. The Agency has not yet completed its review of these formulations, which will be included in the next SNAP update.

(8) HFC–4310. HFC–4310mee will soon be commercially available as a solvent cleaning agent and may be useful in aerosol products. The Agency has not completed review of preliminary data on this chemical. This chemical will be undergoing review under the Premanufacture Notice program of the Toxic substances Control Act.

Other HFCs are also currently in development for solvent usage, although their composition is still proprietary.

(9) Perfluorocarbons (C6F14). The Agency recently received a request to evaluate the perfluorocarbon C_6F_{14} as a substitute solvent in aerosols. While this agent has been reviewed as a substitute for use in solvent cleaning, the Agency has not completed review in this sector.

3. Comment Response

Public comments on the aerosols decisions focused principally on technical issues, such as the flammability of various propellants or the length of hydrocarbons used as propellants. Several commenters noted that chlorinated solvents may be appropriate for use in consumer products where a nonflammable aerosol is necessary, such as for brake cleaners. The Agency recognizes this as a valid concern and has amended the comment made in the Notice of Proposed Rule-Making that stated that chlorinated solvents are not suitable for consumer applications. However, EPA still encourages manufacturers to formulate products with solvents of lower toxicity, where possible.

A number of commenters requested clarification of the relationship between the section 612 SNAP program and the section 610 nonessential use ban. The Agency has added clarification to the relevant discussion of listing decisions.

4. Listing Decisions

a. *Acceptable Substitutes.* (1) Propellants. (a) Saturated light hydrocarbons (C3–C6). Saturated light hydrocarbons (C3–C6) are acceptable substitutes for CFC–11, HCFC–22 and HCFC–142b as propellants in the aerosols sector. These hydrocarbons have several environmental advantages over other substitutes. For example, they have zero ozone depletion potential, and because of their extremely short atmospheric residence times they are estimated to contribute little to global warming. Yet their reactivity contributes to formation of tropospheric ozone. However, use of VOCs is already subject to stringent regulatory controls at the federal, state, and local level, and the Agency's risk screen suggests that these controls preclude the need for additional regulation of aerosols formulated with VOCs.

Saturated light hydrocarbons have a long history of use, and the increase in use due to replacement of CFCs as aerosol propellants represents a fraction of current consumption. Hydrocarbon propellants acquired industrial importance in the U.S. in the early 1950s. By 1978, when the ban on CFC propellants in the U.S. was promulgated, nearly half of all aerosol

units being produced in the U.S were already using hydrocarbon propellants. This percentage grew to nearly 90 percent in 1979 as a result of the CFC ban.

Most of the hydrocarbon propellants are essentially non-toxic. Very high concentrations of hydrocarbons are necessary to alter normal body functions. No temporary or permanent physiological malfunctions are produced by these chemicals; however, very high concentrations of hydrocarbons may result in asphyxiation because of lack of oxygen.

Hydrocarbon propellants are flammable. Precautions should be taken in receiving, unloading, transferring, storing, and filling hydrocarbon aerosol products. The listing of these compounds as acceptable substitutes does not exempt producers or users from other applicable regulatory or industrial standards such as those promulgated by OSHA. However, because of the widespread use of these materials, industry is already familiar with the safety precautions necessary in switching from a CFC filling operation to one using hydrocarbons.

(b) HFC–134a, HFC–125 and HFC–152a. HFC–134a, HFC–125 and HFC–134a are acceptable substitutes for CFC–11, HCFC–22, and HCFC–142b as propellants in the aerosols sector. HFC–152a has both zero ozone depletion potential and a comparatively low global warming potential. However, HFC–152a by itself is flammable, and necessary precautions should be taken when using this chemical. HFC–134a and HFC–125 also have no ozone depletion potential, yet these compounds do have atmospheric lifetimes and could contribute to global warming. Despite these concerns, the Agency has listed these substitutes as acceptable in today's rule-making since they meet the needs of specialized applications where other substitutes do not provide acceptable performance. The use of these HFCs by themselves is acceptable, as are blends of these chemicals with other acceptable substitutes.

(c) Dimethyl ether. Dimethyl ether is an acceptable substitute propellant for CFC–11, HCFC–22 and HCFC–142b in the aerosols sector. The principal environmental concern for the use of DME is its ability to contribute to ground-level ozone formation. However, the Agency's screen of effects from increased use of VOCs in aerosol products suggests that increases in groundlevel ozone formation from use of DME can be controlled through existing VOC regulations.

(d) Compressed gases. Compressed gases are acceptable substitutes for CFC–11, HCFC–22 and HCFC–142b as propellants in the aerosols sector. The Agency believes that although compressed gases such as air, carbon dioxide, and nitrogen are presently only used in about 7–9 percent of the aerosol products, their use will grow in the future. These gases have low toxicity and industrial practices for using these substitutes are well established. Since these gases are under significantly greater pressure than CFCs and HCFCs, containers holding these gases must be larger and bulkier, and safety precautions should be undertaken during filling operations. Carbon dioxide and nitrogen are non-flammable and do not require the use of explosion proof gassing equipment. Nitrous oxide, while non-flammable, can create a moderate explosion risk under certain temperature and pressure conditions.

(e) Alternative processes. Alternative processes are acceptable substitutes for CFC–11, HCFC–22 and HCFC–142b as propellants in the aerosols sector. Alternative processes such as finger and trigger pumps, two-compartment aerosol products, mechanical pressure dispenser systems, and nonspray dispensers (e.g., solid stick dispensers) have found increasing use as replacement for conventional aerosol products. The Agency believes that these products do not pose any significant risks, since they rely on mechanical force to replace the propellant.

(f) HCFC–22, HCFC–142b. HCFC–22 and HCFC–142b are acceptable substitutes for CFC–11 as aerosol propellants. Users should note, however, that under section 610 of the Clean Air Act, extensive restrictions already govern the use of HCFCs as aerosol propellants as of January 1, 1994. Only one exemption for HCFCs used as aerosol propellants was granted under section 610 (58 FR 69637). Today's listing allows the use HCFC–22 and HCFC–142b in the exempted application, but general use restrictions established under section 610 must still be followed. Decisions taken under section 610 are described earlier in this chapter, as are the exemptions under section 610.

The principal problem with HCFC–22 and HCFC–142b is that they have significant ODPs and are therefore classified as class II substances. Yet in limited where flammability is a technical impediment to use of other alternatives, HCFC–22 and HCFC–142b may be the only alternatives to replace other ozone-depleting propellants. The exemption for HCFC–141b use as an aerosol solvent under section 610 reflects these user needs.

(2) Solvents. (a) Petroleum hydrocarbons. C6–C20 petroleum hydrocarbons are acceptable substitutes for CFC–11, CFC–113, methyl chloroform (MCF) and HCFC–141b as solvents in the aerosol sector. Petroleum hydrocarbons, both naturally and synthetically derived, have a long history of safe use, and any risks due to increased tropospheric ozone formation or worker exposure can be controlled by existing regulations. Concerns for risks from these compounds in possible uses as pesticide aerosol solvents have already been addressed under FIFRA authorities.

(b) HCFC–141b. HCFC–141b, either by itself or blended with other compounds, is an acceptable substitute for CFC–11, CFC–113 and MCF as an aerosol solvent. Under section 610 of the Clean Air Act, extensive restrictions already govern the use of HCFC–141b as an aerosol solvent as of January 1, 1994. Limited exemptions for HCFC–141b use as an aerosol solvent were granted under section 610 (58 FR 69637). Today's listing allows the use HCFC–141b in the exempted applications, but general use restrictions established under section 610 must still be followed. Decisions taken under section 610 are described earlier in this chapter, as are the exemptions under section 610.

The principal problem with HCFC–141b is that it has a comparatively high ODP–0.11. This is the highest ODP of all HCFCs; in fact, the ODP of HCFC–141b is about twice as high as HCFC–22. Yet in certain cases, such as where flammability is a technical impediment to use of other alternatives, HCFC–141b may be the only alternative to replace other ozone-depleting solvents. Several companies contacted the Agency under both section 610 and 612 indicating that they have tested alternatives, and that in some cases only HCFC141b meets performance or safety criteria. The exemptions for HCFC–141b use as an aerosol solvent under section 610 reflect these user needs.

(c) Other chlorinated solvents. Trichloroethylene, perchloroethylene, and methylene chloride are acceptable substitutes for CFC–11, CFC–113, MCF and HCFC–141b as solvents in the aerosols sector. These substitutes have the technical capability to meet a large portion of the needs of the aerosols industry. However, the Agency anticipates that, due to toxicity concerns associated with the use of these alternatives, the market share for these other chlorinated solvents will not increase substantially.

The toxicity of these three solvents has been the subject of extensive analysis. Without regulation, their use has the potential to pose high risks to workers as well as to residents in nearby communities or consumers using household products containing such chemicals. However, while the Agency generally discourages the use of these chemicals in aerosol applications, they may be necessary in products where nonflammability is a critical characteristic. The Agency encourages formulators of aerosols to restrict their use of chlorinated solvents to products that must be nonflammable.

Given that the use of chlorinated solvents may be necessary to offset risks of flammability, the Agency has determined chlorinated solvents to be acceptable substitutes since risks to workers can be reduced by adhering to OSHA standards. Residual risks to residents in nearby communities may remain. The Agency is aware of these potential risks and has the authority to address them under section 112 of the CAA. This section of the CAA lists three of these solvents as Hazardous Air Pollutants, and authorizes the Agency to establish controls for their use. EPA will pursue any appropriate regulations under this authority. Any risks arising from use of these compounds as pesticide aerosols in reformulated products can be addressed using FIFRA authorities.

These solvents are occasionally found in consumer products. Consumer risks were not analyzed under the SNAP risk screens since these risks are controlled under authorities implemented by the Consumer Safety Product Commission, which has already established labeling requirements for use of these solvents.

(d) Oxygenated organic solvents. Oxygenated organic solvents (ketones, esters, ethers, and alcohols) are acceptable substitutes for CFC–11, CFC–113, MCF and HCFC–141b as solvents in the aerosols sector. Most of these compounds have a long history of safe use, and regulations to control any risks due to tropospheric ozone formation or worker exposure are already in place under other relevant authorities.

(e) Terpenes. Terpenes are acceptable substitutes for CFC–11, CFC–113, MCF and HCFC–141b as solvents in the aerosols sector. Terpene-based formulations have a long history of safe use as industrial solvents, and any increased risks due to increased tropospheric ozone formation can be controlled through existing regulations. Additionally, many of these chemicals are naturally occurring organic hydrocarbons and exhibit significant biodegradability.

The use history of these chemicals does not negate the toxicity of these compounds to aquatic life. However, the Agency does not believe that in this case significant adverse effects are to be expected, since in aerosol applications the terpenes volatilize during use and would consequently not be discharged to surface or ground water where aquatic species are to be found.

(f) Water-based formulations. Water-based formulations are acceptable substitutes for CFC–11, CFC–113, MCF and HCFC–141b as solvents in the aerosols sector. The Agency did not identify any significant environmental concerns associated with use of these products. They can contain small amounts of VOCs, but these amounts are minor in comparison to products formulated solely with organic solvents.

b. Substitutes acceptable subject to use conditions. (None).

c. Substitutes acceptable subject to narrowed use limits. (None).

d. Unacceptable substitutes. (None).

J. Tobacco Expansion

1. Overview

Tobacco expansion is the process of puffing leaves of tobacco to decrease the volume of tobacco used in cigarette production. Currently, one of the primary technologies used to expand tobacco in the U.S. relies on CFC–11. One and one half million pounds of CFC–11 are used annually in the U.S. in this sector.

In the CFC–11 process, tobacco is saturated with CFC–11 in a stainless steel vessel maintained at 120 degrees Fahrenheit and pressurized to 20 psi. The tobacco is then permeated with hot air (330 F) which expands the tobacco. The CFC–11 is vaporized and recovered by cooling and compressing, and is continually recovered and recycled.

The Agency received notification on two potential substitutes: (1) Carbon dioxide technology, an alternative process substitute, and (2) HFC–227ea. In this final rule, the Agency is listing carbon dioxide as an acceptable substitute for CFC–11 in tobacco expansion. Similarly, HFC–227ea is (currently under review and will be listed in the FRM pending completion of review of the data).

2. Comment Response

The NPRM listed HCFC–123 as pending review for use as a substitute for tobacco expansion. One commenter proposed that HCFC–123 should not be listed as an acceptable substitute in the final rule because the sole U.S. manufacturer will not sell it for use in the tobacco expansion process. The sole U.S. manufacturer of HCFC–123 confirmed via public comment that HCFC–123 will not be sold to the tobacco industry for use in the tobacco expansion process. The manufacturer requested EPA to withdraw this compound from consideration as an alternative for this end-use. Subsequently, EPA terminated the review for HCFC–123 in tobacco expansion, and will not include HCFC–123 in the listing decisions for this sector.

3. Listing Decisions

a. *Carbon dioxide.* The Agency has determined that the use of carbon dioxide as a substitute for CFC–11 in tobacco expansion is acceptable. Carbon dioxide has been successfully used in the tobacco industry for approximately twenty years. It is non-toxic, non-flammable, and it has zero ODP. A permissible exposure level (PEL) has been set at 5,000 ppm, a level that can easily be met during the well contained tobacco expansion process. The carbon dioxide process is similar to the process using CFC–11, though pressure and temperature parameters are different. For this reason carbon dioxide cannot be used as a retrofit for CFC–11 equipment; new equipment must be purchased in order to use carbon dioxide for tobacco expansion.

Although carbon dioxide is a greenhouse gas, increased use of carbon dioxide for tobacco expansion will not increase global warming because the carbon dioxide used in tobacco expansion is a by-product of the production of other gases. The carbon dioxide is captured from a stream of gas that otherwise would be emitted to the ambient air. Additionally, carbon dioxide recycling equipment is available, which will also help limit emissions of carbon dioxide to the atmosphere.

b. *Propane.* The Agency has determined that the use of propane as a substitute for CFC–11 in tobacco expansion is acceptable. Plant modifications may be necessary to control the flammability of this substitute to ensure worker safety. Propane is a VOC and must be controlled as such under Title I of the CAA.

K. Adhesives, Coatings, and Inks

1. Overview

Methyl chloroform (MCF) is used as a solvent in the adhesives, coatings, and inks sector because of its unique and favorable properties: High solvency, non flammability, low toxicity, relative high stability, and low boiling point. For this

section, coatings are defined to be durable and decorative coatings such as paints. Unlike a number of other solvents that are classified as volatile organic compounds (VOCs), MCF does not photochemically degrade in the lower atmosphere to lead to ground-level ozone formation. This key property caused many manufacturers to switch from formulations containing VOC solvents to MCF in the mid 1980s because regulatory pressure increased to reduce VOC emissions in nonattainment areas. Companies achieved compliance by altering their VOC solvent-borne formulations to MCF, thereby avoiding costly capital investment in new equipment, changes in operating procedures, and employee retraining. This trend has now been reversed as companies have begun to respond to the phase-out of MCF under the stratospheric ozone protection provisions of the Clean Air Act.

This section examines substitutes that can be used in place of MCF in this sector, and presents the Agency's proposed decisions and supporting analysis on acceptability of these substitutes. These determinations are summarized in appendix B at the end of the sector discussions.

Of the three uses for MCF in this sector, use of MCF is largest in the adhesives subsector. In 1989, manufacturers of adhesives consumed about 28,000 metric tons (MT) of MCF in their formulations, roughly nine percent of the total MCF produced in the U.S. (HSIA, 1991). Solvent-based adhesive formulations constitute 15 percent of all adhesive types. MCF is desirable as a solvent for adhesives because it evaporates rapidly, is nonflammable, exhibits a relatively high PEL, performs comparably to VOC-formulated products, and does not photochemically degrade in the lower atmosphere. The 1991 consumption of methyl chloroform as a solvent in the adhesives sector was estimated to be 32,000 MT. EPA believes that this consumption has declined since 1991 due to increased excise taxes, the CFC labeling requirement of the CAA and the increasing awareness of the pending 1996 phaseout.

MCF is used in five adhesive types:

- Laminate adhesives;
- Flexible foam adhesives;
- Hardwood floor adhesives;
- Metal to rubber adhesives; and
- Tire patch adhesives.

MCF is no longer commonly used in the following adhesive applications where its use was once widespread:

- Pressure sensitive adhesives (tapes, labels, etc.);
- Flexible packaging adhesives;
- Aerosol-propelled adhesives; and
- Shoe repair glues and other consumer adhesives.

In manufacture of coatings and inks, MCF usage rose steadily throughout the 1980s principally because of the VOC problems with other solvents. It began declining in the early 1990s because of the ozone depletion issue. In 1989, the consumption of MCF used in coatings and inks was 18,480 MT, six percent of the total 310,000 MT of MCF consumed in the U.S. The 1991 consumption in the coatings and inks sector was estimated to be 23,000 MT. This consumption figure has likely declined even more for the same reasons as cited in the adhesives section. MCF is the only ozone-depleting substance currently used in coatings and inks formulations. As with uses in adhesives, MCF has replaced some of the applications in coatings and inks which previously used VOC solvents and now the trend is reversing.

The current use of MCF in coatings and inks applications occurs in four use areas:

- Flexographic and rotogravure printing inks;
- Wood stains;
- Metal coatings; and
- Aerospace coatings.

2. Substitutes in the Adhesives, Coatings, and Inks Sector

Methyl chloroform-based adhesives, coatings, and inks can be replaced by either substitute solvents or alternative application technologies. In most instances, the alternatives are expected to perform as well as products containing MCF. Factors that determine which particular alternative is best in a given situation include physical and chemical properties, replacement chemical costs, capital investment costs, and product performance.

The primary substitutes to replace methyl chloroform in adhesives, coatings, and inks include:

- Petroleum hydrocarbons;
- Oxygenated organic solvents (ketones, esters, ethers, alcohols);
- Chlorinated solvents;
- Terpenes;
- Water-based formulations;
- High-solids formulation; and
- Alternative process alternatives;

—Powder formulations;
—Hot melts;
—Thermoplastic plasma spray coatings;
—Radiation cured;
—Moisture cured;
—Chemical cured;
—Reactive liquids.

These substitutes can be grouped into four basic categories: Solvent substitutes, water-based formulations, high-solids formulations, and alternative processes.

a. *Solvent substitutes.* Petroleum hydrocarbons are hydrocarbons fractionated from the distillation of petroleum. These compounds are loosely grouped into paraffins (six carbon chains to ten carbon chains—hexane, heptane, etc.) and light aromatics (toluene and xylene), and come in various levels of purity. These compounds have good solvent properties, cost about half as much as MCF, and are readily available from chemical distributors.

Oxygenated organic solvents such as alcohols, ketones, ethers, and esters dissolve a wide range of polar and semi-polar substances. These compounds are relatively inexpensive compared to MCF (about half the cost) and are readily available. They function well as solvents and dissolve most resins and binders used in adhesives, coatings, and inks.

Chlorinated solvents such as perchloroethylene and methylene chloride are chlorinated hydrocarbons. These chemicals can be used to replace MCF used in adhesives, coatings and inks. These solvents are commercially available from chemical distributors at prices comparable to those for methyl chloroform.

Chlorinated solvent compounds are chemically similar to MCF and thus are able to substitute directly for MCF with minor changes in the formulation of the product; product quality is expected to remain unchanged. Manufacturers can use chlorinated solvents in existing equipment with minor changes, resulting in low capital costs.

Terpenes are unsaturated hydrocarbons based on isoprene subunits. They have good solvent properties and could replace MCF in some coating and ink products. Terpenes, such as d-limonene, cost about seven times more than MCF, and are commercially available from chemical distributors. Manufacturers can use terpenes in existing equipment with minor changes.

Monochlorotoluene and chlorobenzotrifluorides are also of commercial interest as solvent substitutes for adhesives, coatings, and inks. These compounds can be used either in isolation or in various mixtures, depending on desired chemical properties. The Agency recently received information on these formulations, and will issue a SNAP determination for these substitutes in the next set of listing decisions.

b. *Water-based formulations.* Water-based coatings contain water rather than conventional solvents. Primary uses of

these coatings include coating of furniture, aluminum siding, hardboard, metal containers, appliances, structural steel, and heavy equipment. Water-based coatings are priced roughly 20 to 30 percent more than methyl chloroform-based coatings.

Water-based inks use water and other co-solvents such as alcohols and alkyl acetates to dissolve resins, binders, and pigments instead of conventional solvents. Water-based inks accounted for 55 percent of the flexographic inks and 15 percent of the gravure inks used in the U.S. in 1987. Water-based inks are priced roughly 10 percent less than methyl chloroform-based inks.

Water-based adhesives currently account for about 45 percent of the world adhesive market. Water-based adhesives will likely dominate the market to replace MCF in general consumer uses and in areas where a rigid bond is not needed. Water-based adhesives—especially water-based latexes, which are stable dispersions of solid polymeric material in an essentially aqueous medium—can effectively replace MCF use in the flexible foams sector because of the flexibility of the bond they provide. Water-based latex adhesives have the potential to penetrate 85–90 percent of the MCF-based adhesive market in flexible foams applications. They still pose some problems, however, including:

- Long set and dry times; newer developments seem to be solving this problem;
- Deterioration during storage especially if frozen; and
- The production of bacteria-contaminated waste water.

Water-based replacements have not proven effective in binding high density laminates or hardwood flooring principally because moisture enhances the chances of warping. In cases where MCF is used for door assemblies or sealants, water-based urethane adhesives containing polyisocyanates can be used.

c. *High-solid formulations.* High-solids coatings resemble conventional coatings in appearance and use, except high-solids coatings contain less solvent and a greater percentage of resin. High-solids coatings are currently used on appliances, metal furniture, and farm and road construction equipment. High-solids coatings are priced 20 to 30 percent higher than methyl chloroform-based coatings, yet the buyer receives more usable paint because the coatings contain less solvent, thus reducing the volume of coatings required.

High-solids adhesives can reduce the amount of solvent used in adhesives by increasing the percentage of solids in the formulation. Adhesives formerly containing 30–50 percent solids contain about 80 percent solids after reformulation. High-solids adhesives have good performance characteristics, including initial bond strength, and can be applied using existing equipment at normal line speeds with minimal modification. For bonding rubber assemblies, high solid adhesive films are often too thick, resulting in limited versatility and generally poor performance. High-solids formulations, however, are already used widely in the flexible foams, hardwood flooring, and high-pressure laminates industries. The solvent of choice in these industries remains MCF, but with a decreased portion of solvent in the formulations, so that less solvent is consumed overall. High-solids formulations are only a transitional replacement until adequate substitutes are found that do not contain MCF.

d. *Alternative process substitutes.* Powder adhesives, the first category of alternative process substitutes, are composed of one-part epoxies, urethanes, and natural resins. These adhesives are often supplied as powders that require heat to cure. They are generally applied in one of three ways: (1) By sifting the powder onto preheated substrates, (2) by dipping a preheated substrate into the powder, and (3) by melting the powder into a paste or liquid and applying it by conventional means. Since high temperatures are required to activate and thermoset powder adhesives, their ability to replace MCF-based formulations will depend on the characteristics of the substrates being bonded: If the materials being bonded are heat sensitive, heat-activated powder adhesives cannot be used.

Powder coatings have no solvent, containing only resins and pigments in powder form. Typically, the powder is electrostatically applied and the coated object is heated above the powder's melting point, so that the resin fuses into a continuous film. Powder coating is a mature technology and is used on various types of metal products such as appliances, concrete reinforced bars, automobiles, steel shelving, lawn and farm equipment, and some furniture. The elevated temperatures necessary to melt the coatings, however, restrict the use of powder coatings on plastic and wood products. Powder coatings are priced comparably to methyl chloroform-based coatings.

Hot melt adhesives are 100 percent solid thermoplastic binders that can be used to replace MCF formulations in applications that require a rigid bond. Hot melts currently account for about 20 percent of the adhesives market, and they, along with water-based adhesives, will likely benefit most from the move away from MCF-based adhesive formulations. Hot melts are now used instead of MCF formulations in laminating applications, especially those involving the lamination of flexible foam products. They can also replace MCF-based adhesive formulations in the original equipment manufacturer's (OEM) production of high-pressure laminates and possibly in the installation of hardwood flooring. The potential ability of hot melt adhesives to replace MCF-based formulations in the flexible foams sector is limited to 10–15 percent penetration because of the need for flexible bonds in most furniture and bedding applications.

Thermoplastic plasma spray coatings are powder coatings that melt in transit towards the object to be coated propelled by a pressurized inert gas, such as Argon. An electric arc strips electrons from the plastic particles fusing them together as they move through the applicator gun. Thermoplastic plasma spray coatings can be used to coat large and small objects of metal, wood, plastic, or fiberglass.

Radiation curing is a production technique for drying and curing adhesives with radiant energy in the form of ultraviolet (UV) or infrared (IR) light, electron beams (EB), and gamma or x-rays. The binding agents that can be cured with radiant energy are acrylics, epoxies, urethanes, anaerobic adhesives, and polyester resins. In many cases, if the materials are either heat sensitive or opaque, radiation curing cannot be employed.

Radiation-dried coatings are applied as either a powder or as a high-solids form and dried using the same radiant energy forms as used in radiation-cured adhesives. The binder systems that can be dried with radiant energy are also similar. In cases where the radiant energy is harmful to a component, such as sensitive electronic equipment, radiant-dried coating cannot be employed.

Moisture-cured, chemical-cured, and reactive liquid adhesives are still not widely used because they are still being developed or because performance or application problems still have to be addressed. They will not be widely commercially available for several years.

3. Comment Response

a. *Acceptable substitutes.* It was suggested that the acceptable substitutes cited for MCF could also be extended to

other ozone-depleting solvents, such as CFC–113. Depending on the specific application, EPA believes that it is probable that the same substitutes would apply and has addressed such substitutes as appropriate.

Another commenter noted that some terminology was inconsistent and should be clarified. The use of the collective term "organic solvent" when describing alcohols, ketones and esters was cited. EPA agrees and believes that "Oxygenated organic solvent" is more specific. This phrase was substituted in the final rule.

b. *Unacceptable substitutes—no comments received.* c. *Pending substitutes.* One commenter suggested that other chlorinated solvents, glycol ethers, glycol ether acetates and N-methyl pyrollidone be forbidden as substitutes. EPA believes that when used as directed and within the specified controls, these substances are safe alternative processes.

d. *Other related issues*—One commenter stated that "coatings" needs to be clarified to mean paint type coatings and not other coatings such as lubricants and mold releases. The phrase coatings is defined in the overview section to mean durable and decorative coatings such as paint to clarify this application.

4. Preliminary Listing Decisions

a. *Acceptable substitutes.* (1) Solvent substitutes. (a) Petroleum distillates. Petroleum hydrocarbons are acceptable substitutes for MCF in adhesives, coatings, and inks. The principal concern with these substitutes is over risk to workers during manufacture and use of the alternative solvent. However, the Agency's analysis of these alternatives indicated that risks from use of petroleum hydrocarbons are well understood and already subject to necessary controls. For instance, although these solvents are flammable, industry has a good record of safe use of these substitutes. Additionally, certain of the petroleum hydrocarbons, for example n-hexane, have low Permissible Exposure Limits (PELs), but the Agency's survey of exposures in the workplace found that these levels can successfully be attained if adequate ventilation and appropriate work practices are implemented.

The Agency's analysis of the potential for risks to residents in nearby communities did indicate the potential for adverse effects near a site with industrial use of petroleum hydrocarbons if a relatively toxic petroleum hydrocarbon is used. However, the Agency does not believe that the risk screen describes the true risk presented by these chemicals. First, the agency has determined that petroleum hydrocarbons used in this sector are rarely as toxic as n-hexane. Second, the screen used as past MCF emissions as a proxy for emissions of n-hexane. This approach does not account for other regulatory controls, such as VOC controls, that limit emissions of hydrocarbons from industrial sites, and would consequently also serve to lower any other health risks to the general population from these chemicals.

For this reason, the Agency believes that petroleum hydrocarbons merit use as substitutes, although it encourages manufacturers to formulate products where possible with compounds with lowest inherent toxicity.

(b) Alcohols, ketones, ethers and esters. Alcohols, ketones, ethers and esters are acceptable substitutes for MCF in adhesives, coatings, and inks. The concerns for use of these solvents parallel the concerns associated with petroleum hydrocarbons. In this case, two of the typical oxygenated hydrocarbons examined in the Agency's risk screen, methyl ethyl ketone and methyl isobutyl ketone, also have comparatively low toxicity. For the same reasons described in the section on petroleum distillates, the Agency is approving these compounds as substitutes for MCF. This approval also includes the same guidance to manufacturers—to select chemicals for product formulations with lowest inherent toxicity.

(c) Chlorinated solvents. Perchloroethylene, methylene chloride and trichloroethylene are acceptable substitutes for adhesives, coatings, and inks. Use of these solvents merit special caution, since they are suspected human carcinogens. However, as with other solvents, the Agency's risk screen indicates that proper workplace practices significantly reduce risks in occupational settings. The Agency's examination of risks to the general population determined the highest potential for adverse effects to be associated with use of trichloroethylene, since it has the greatest cancer potency. Clearly there is a need for further assessment of the hazards from use of this chemical, and the Agency notes that authorities exist to address any risks determined from such analyses under Title III of the Clean Air Act. Title III lists all three of the chlorinated solvents as Hazardous Air Pollutants, and mandates development of Maximum Achievable Control Technology standards to control emissions of these chemicals in various industrial settings.

(d) Terpenes. Terpenes are acceptable substitutes for MCF in adhesives, coatings, and inks. The principal environmental concern with terpenes is their toxicity to aquatic life. In applications for terpenes in adhesives, coatings, and inks, however, the terpenes are both used and bound in the product formulation, meaning that there are no discharges of wastewater effluent that could present a risk. Other potential environmental hazards associated with these compounds arise from their flammability and unpleasant odors, but these can be controlled by good workplace practices.

(2) Water-based formulations/high-solid. Formulations. Water-based formulations and high-solid formulations are acceptable substitutes for MCF in adhesives, coatings, and inks. The Agency did not identify any environmental or health concerns associated with use of these products. These formulations do contain small amounts of VOCs, but the increase in VOC loadings from these products is expected to be extremely small in comparison to VOC contributions from other sources.

(3) Alternative processes. Alternative processes, including powder formulations, hot melt, thermoplastic plasma spray, radiation-based formulations, and moisture-cured, chemical-cured, and reactive liquid alternatives, are all acceptable substitutes for MCF in adhesives, coatings, and inks. The Agency did not identify any health or environmental concerns associated with use of these substitutes. Since this grouping includes such a wide variety of products for which it is difficult to complete an in-depth risk screen, the Agency solicits additional detail on any potential environmental or health effects that merit further investigation.

X. Additional Information

A. Executive Order 12866

Under Executive Order 12866, (58 FR 51735 (October 4, 1993)) The Agency must determine whether the regulatory action is "significant" and therefore subject to OMB review and the requirements of the Executive Order. The Order defines "significant regulatory action" as one that is likely to result in a rule that may: (1) Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communitites;

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

It has been determined that this is not a "significant regulatory action" under the terms of Executive Order 12866 and is therefore not subject to OMB review.

B. Regulatory Flexibility Act

The Regulatory Flexibility Act, 5 U.S.C. 601–602, requires that federal agencies examine the effects of their regulations on small entities. Under 5 U.S.C. 604(a), whenever an agency is required to publish a final rule-making, it must prepare a regulatory flexibility analysis (RFA). Such an analysis is not required if the head of the Agency certifies that a rule will not have a significant economic effect on a substantial number of small entities, pursuant to 5 U.S.C. 605(b).

The Agency believes that this final rule will not have a significant effect on a substantial number of small entities and has therefore concluded that a formal RFA is unnecessary. Because costs of the SNAP requirements as a whole are expected to be minor, the rule is unlikely to adversely affect small businesses, particularly as the rule exempts small sectors and end-uses from reporting requirements and formal Agency review. In fact, to the extent that information gathering is more expensive and time-consuming for small companies, this rule may well provide benefits for small businesses anxious to examine potential substitutes to any ozone-depleting class I and II substances they may be using, by requiring manufacturers to make information on such substitutes available.

C. Paperwork Reduction Act

The information collection requirements in this rule have been approved by the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* and have been assigned control number 2060–0226.

This collection of information has an estimated reporting burden averaging 166 hours per response and an estimated annual recordkeeping burden averaging 25 hours per recordkeeper. These estimates include time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Chief, Information Policy Branch; EPA; 401 M Street, SW., (Mail Code 2136); Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503, marked "Attention: Desk Officer for EPA."

XI. References

1. United Nations Environment Programme, World Meteorological Organization, et al. Scientific Assessment of Stratospheric Ozone: 1991 (17 December 1991).

2. Intergovernmental Panel on Climate Change, World Meteorological Organization, United Nations Environment Programme. Climate Change: The IPCC Scientific Assessment (1990).

3. Halogenated Solvents Industry Alliance (HSIA), 1,1,1-Trichloroethane (Methyl Chloroform) White Paper (May 1991).

Appendix A to the Preamble

Class I and Class II Ozone-Depleting Substances

Class I and Class II Ozone-Depleting Substances

Class I

Group I

Chlorofluorocarbon-11 CFC–11 ($CFCl_3$); Trichlorofluoromethane

Chlorofluorocarbon-12 CFC–12 (CF_2Cl_2); Dichlorodifluoromethane

Chlorofluorocarbon-113 CFC–113 ($C_2F_3Cl_3$); Trichlorotrifluoroethane

Chlorofluorocarbon-114 CFC–114 ($C_2F_4Cl_2$); Dichlorotetrafluoroethane

Chlorofluorocarbon-115 CFC–115 (C_2F_5Cl); Monochloropentafluoroethane

Group II

Halon—1211 (CF_2ClBr); Bromochlorodifluoromethane

Halon—1301 (CF_3Br); Bromotrifluoromethane

Halon—2402 ($C_2F_4Br_2$); Dibromotetrafluoroethane

Group III

Chlorofluorocarbon-13 CFC–13 (CF_3Cl); Chlorotrifluoromethane

Chlorofluorocarbon-111 CFC–111 (C_2FCl_5); Pentachlorofluoroethane

Chlorofluorocarbon-112 CFC–112 ($C_2F_2Cl_4$); Tetrachlorodifluoroethane

Chlorofluorocarbon-211 CFC–211 (C_3FCl_7); Heptachlorofluoropropane

Chlorofluorocarbon-212 CFC–212 ($C_3F_2Cl_6$); Hexachlorodifluoropropane

Chlorofluorocarbon-213 CFC–213 ($C_3F_3Cl_5$); Pentachlorotrifluoropropane

Chlorofluorocarbon-214 CFC–214 ($C_3F_4Cl_4$); Tetrachlorotetrafluoropropane

Chlorofluorocarbon-215 CFC–215 ($C_3F_5Cl_3$); Trichloropentafluoropropane

Chlorofluorocarbon-216 CFC–216 ($C_3F_6Cl_2$); Dichlorohexafluoropropane

Chlorofluorocarbon-217 CFC–217 (C_3F_7Cl); Monochloroheptafluoropropane

Group IV

Carbon Tetrachloride (CCl_4)

Group V

Methyl Chloroform ($C_2H_3Cl_3$); 1,1,1 Trichloroethane

Group VI

Methyl Bromide (CH_3Br)

Group VII

Hydrobromofluorocarbons (HBFCs)

Class II

Hydrochlorofluorocarbon-21 HCFC–21 ($CHFCl_2$); Dichlorofluoromethane

Hydrochlorofluorocarbon-22 HCFC–22 (CHF_2Cl); Monochlorodifluoromethane

Hydrochlorofluorocarbon-31 HCFC–31 (CH_2FCl); Monochlorofluoromethane

Hydrochlorofluorocarbon-121 HCFC–121 (C_2HFCl_4); Tetrachlorofluoroethane

Hydrochlorofluorocarbon-122 HCFC–122 ($C_2HF_2Cl_3$); Trichlorodifluoroethane

Hydrochlorofluorocarbon-123 HCFC–123 ($C_2HF_3Cl_2$); Dichlorotrifluoroethane

Hydrochlorofluorocarbon-124 HCFC–124 (C_2HF_4Cl); Monochlorotetrafluoroethane

Hydrochlorofluorocarbon-131 HCFC–131 ($C_2H_2FCl_3$); Trichlorofluoroethane

Hydrochlorofluorocarbon-132B HCFC–132B ($C_2H_2F_2Cl_2$); Dichlorodifluoroethane

Hydrochlorofluorocarbon-133A
HCFC–133A ($C_2H_2F_3Cl$);
Monochlorotrifluoroethane
Hydrochlorofluorocarbon-141B
HCFC–141B ($C_2H_3FCl_2$);
Dichlorofluoroethane
Hydrochlorofluorocarbon-142B
HCFC–142B ($C_2H_3F_2Cl$);
Monochlorodifluoroethane
Hydrochlorofluorocarbon-221
HCFC–221 (C_3HFCl_6);
Hexachlorofluoropropane
Hydrochlorofluorocarbon-222
HCFC–222 ($C_3HF_2Cl_5$);
Pentachlorodifluoropropane
Hydrochlorofluorocarbon-223
HCFC–223 ($C_3HF_3Cl_4$);
Tetrachlorotrifluoropropane
Hydrochlorofluorocarbon-224
HCFC–224 ($C_3HF_4Cl_3$);
Trichlorotetrafluoropropane
Hydrochlorofluorocarbon-225CA
HCFC–225CA ($C_3HF_5Cl_2$);
Dichloropentafluoropropane
Hydrochlorofluorocarbon-225CB
HCFC–225CB ($C_3HF_5Cl_2$);
Dichloropentafluoropropane
Hydrochlorofluorocarbon-226
HCFC–226 (C_3HF_6Cl);
Monochlorohexafluoropropane
Hydrochlorofluorocarbon-231
HCFC–231 ($C_3H_2FCl_5$);
Pentachlorofluoropropane
Hydrochlorofluorocarbon-232
HCFC–232 ($C_3H_2F_2Cl_4$)
Tetrachlorodifluoropropane
Hydrochlorofluorocarbon-233
HCFC–233 ($C_3H_2F_3Cl_3$);
Trichlorotrifluoropropane
Hydrochlorofluorocarbon-234
HCFC–234 ($C_3H_2F_4Cl_2$);
Dichlorotetrafluoropropane
Hydrochlorofluorocarbon-235
HCFC–235 ($C_3H_2F_5Cl$);
Monochloropentafluoropropane
Hydrochlorofluorocarbon-241
HCFC–241 ($C_3H_3FCl_4$);
Tetrachlorofluoropropane
Hydrochlorofluorocarbon-242
HCFC–242 ($C_3H_3F_2Cl_3$);
Trichlorodifluoropropane
Hydrochlorofluorocarbon-243
HCFC–243 ($C_3H_3F_3Cl_2$)
Dichlorotrifluoropropane
Hydrochlorofluorocarbon-244
HCFC–244 ($C_3H_3F_4Cl$);
Monochlorotetrafluoropropane
Hydrochlorofluorocarbon-251
HCFC–251 ($C_3H_4FCl_3$);
Trichlorofluoropropane
Hydrochlorofluorocarbon-252
HCFC–252 ($C_3H_4F_2Cl_2$)
Dichlorodifluoropropane
Hydrochlorofluorocarbon-253
HCFC–253 ($C_3H_4F_3Cl$);
Monochlorotrifluoropentane
Hydrochlorofluorocarbon-261
HCFC–261 ($C_3H_5FCl_2$);
Dichlorofluoropropane
Hydrochlorofluorocarbon-262
HCFC–262 ($C_3H_5F_2Cl$);
Monochlorodifluoropropane
Hydrochlorofluorocarbon-271
HCFC–271 (C_3H_6FCl);
Monochlorofluoropropane

Appendix B to the Preamble

Summary of Listing Decisions

REFRIGERANTS

Acceptable Substitutes

End-use	Substitute	Decision	Comments
CF–11 centrifugal chillers (retrofit).	HCFC–123	Acceptable	EPA worker-monitoring studies of 123 show that 8-hour TWA can be kept within 1 ppm (well under the AEL of 30 ppm) when recycling and ASHRAE standards are followed. This substitute is subject to containment and recovery regulations concerning HCFCs.
CFC–12 centrifugal chillers (retrofit).	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
CFC–113 centrifugal chillers (retrofit).	None	Acceptable	
CFC–114 centrifugal chillers (retrofit).	HCFC–124	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
R–500 centrifugal chillers (retrofit).	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
CFC–11, CFC–12, CFC–113, CFC–114, R–500 centrifugal chillers (new equipment/ NIKs).	HCFC–123	Acceptable	EPA worker-monitoring studies of 123 show that 8-hour TWA can be kept within 1 ppm (well under the AEL of 30 ppm) when recycling and ASHRAE standards are followed. This substitute is subject to containment and recovery regulations concerning HCFCs.
	HCFC–124	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	HFC–227ea	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	Ammonia vapor compression	Acceptable	Users should check local building codes related to the use of ammonia.
	Evaporative cooling	Acceptable	Alternative technology that is currently commercially available; new developments have greatly expanded applicability.
	Desiccant cooling	Acceptable	Alternative technology that is currently commercially available; new developments have greatly expanded applicability.
	Ammonia/water absorption	Acceptable	Alternative technology that is currently commercially available; new developments have greatly expanded applicability.
	Water/lithium bromide absorption.	Acceptable	Alternative technology that is currently commercially available; new developments have greatly expanded applicability.

REFRIGERANTS—Continued

Acceptable Substitutes

End-use	Substitute	Decision	Comments
	Stirling cycle	Acceptable	Alternative technology.
CFC–12 reciprocating chillers (retrofit).	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
CFC–12 reciprocating chillers (new equipment/NIKs).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	HFC–227ea	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	Evaporative cooling	Acceptable	Alternative technology that is currently commercially available; new developments have greatly expanded applicability.
	Desiccant cooling	Acceptable	Alternative technology that is currently commercially available; new developments have greatly expanded applicability.
	Stirling cycle	Acceptable	Alternative technology.
CFC–11, CFC–12, R–502 industrial process refrigeration (retrofit).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–401A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–401B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–404A	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–507	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	Ammonia vapor compression	Acceptable	Users should check local building codes related to the use of ammonia.
	Propane	Acceptable	EPA recommends that this substitute be used only at industrial facilities that manufacture or use hydrocarbons in the process stream.
	Propylene	Acceptable	EPA recommends that this substitute be used only at industrial facilities that manufacture or use hydrocarbons in the process stream.
	Butane	Acceptable	EPA recommends that this substitute be used only at industrial facilities that manufacture or use hydrocarbons in the process stream.
	Hydrocarbon Blend A	Acceptable	EPA recommends that this substitute be used only at industrial facilities that manufacture or use hydrocarbons in the process stream.
	Chlorine	Acceptable	EPA recommends that this substitute be used only at industrial facilities that manufacture or use chlorine in the process stream.
CFC–11, CFC–12, R–502 industrial process refrigeration (new equipment/NIKs).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	HFC–227ea	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–402A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–404A	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–507	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	Ammonia vapor compression	Acceptable	Users should check local building codes related to the use of ammonia.
	Propane	Acceptable	EPA recommends that this substitute be used only at industrial facilities that manufacture or use hydrocarbons in the process stream.

REFRIGERANTS—Continued

Acceptable Substitutes

End-use	Substitute	Decision	Comments
	Propylene	Acceptable	EPA recommends that this substitute be used only at industrial facilities that manufacture or use hydrocarbons in the process stream.
	Butane	Acceptable	EPA recommends that this substitute be used only at industrial facilities that manufacture or use hydrocarbons in the process stream.
	Hydrocarbon Blend A	Acceptable	EPA recommends that this substitute be used only at industrial facilities that manufacture or use hydrocarbons in the process stream.
	Chlorine	Acceptable	EPA recommends that this substitute be used only at industrial facilities that manufacture or use chlorine in the process stream.
	Evaporative cooling	Acceptable	Alternative technology that is currently commercially available; new developments have greatly expanded applicability.
	Desiccant cooling	Acceptable	Alternative technology that is currently commercially available; new developments have greatly expanded applicability.
	Stirling cycle	Acceptable	Alternative technology.
CFC–114 industrial process air conditioning (retrofit).	HCFC–124	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
CFC–114 industrial process air conditioning (new).	HCFC–124	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
CFC–12, R–502 ice skating rinks (retrofit).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–401A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–401B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	Ammonia vapor compression	Acceptable	Users should check local building codes related to the use of ammonia.
CFC–12, R–502 ice skating rinks (new equipment/NIKs).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	Ammonia vapor compression	Acceptable	Users should check local building codes related to the use of ammonia.
CFC–114 uranium isotope separation processing (retrofit).	C_4F_8	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	C_4F_{10}	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	C_5F_{12}	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	C_6F_{14}	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	$C_5F_{11}NO$	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
CFC–12, R–502 cold storage warehouses (retrofit).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–401A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–401B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–404A	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–507	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
CFC–12, R–502 cold storage warehouses (new equipment/NIKs).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.

REFRIGERANTS—Continued

Acceptable Substitutes

End-use	Substitute	Decision	Comments
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	HFC–227ea	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–402A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–404A	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–507	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	Ammonia vapor compression	Acceptable	Users should check local building codes related to the use of ammonia.
	Evaporative cooling	Acceptable	Alternative technology that is currently commercially available; new developments have greatly expanded applicability.
	Desiccant cooling	Acceptable	Alternative technology that is currently commercially available; new developments have greatly expanded applicability.
	High to low pressure step-down	Acceptable	Alternative technology.
	Stirling cycle	Acceptable	Alternative technology.
CFC–12, R–500, R–502 refrigerated transport (retrofit).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–401A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–401B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–404A	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–507	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
CFC–12, R–500, R–502 refrigerated transport (new equipment/NIKs).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–402A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–404A	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–507	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	Stirling cycle	Acceptable	Alternative technology that is currently commercially available.
	Nitrogen direct gas expansion	Acceptable	Alternative technology.
CFC–12, R–502 retail food refrigeration (retrofit).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–401A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–401B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–404A	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.

REFRIGERANTS—Continued

Acceptable Substitutes

End-use	Substitute	Decision	Comments
	R–507	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
CFC–12, R–502, retail food refrigeration (new equipment/NIKs).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	HFC–227ea	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–402A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–404A	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–507	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	Ammonia vapor compression	Acceptable	Users should check local building codes related to the use of ammonia.
	Stirling cycle	Acceptable	Alternative technology.
CFC–12, R–502 commercial ice machines (retrofit).	R–401A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–401B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–404A	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–507	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
CFC–12, R–502 commercial ice machines (new equipment/NIKs).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–402A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–402B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–404A	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–507	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	Ammonia vapor compression	Acceptable	Users should check local building codes related to the use of ammonia.
	Stirling cycle	Acceptable	Alternative technology.
CFC–12 vending machines (retrofit).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–401A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–401B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
CFC–12 vending machines (new equipment/NIKs).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	Stirling cycle	Acceptable	Alternative technology.
CFC–12 water coolers (retrofit).	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–401A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–401B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
CFC–12 water coolers (new equipment/NIKs).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.

REFRIGERANTS—Continued

Acceptable Substitutes

End-use	Substitute	Decision	Comments
	Stirling cycle	Acceptable	Alternative technology.
CFC–12 household refrigerators (retrofit).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–401A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–401B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HCFC blend alpha	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
CFC–12 household refrigerators (new equipment/ NIKs).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	HFC–152a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	HCFC blend alpha	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R200b	Acceptable	This substitute's composition is confidential. Its use may be governed by regulations concerning the use of ozone-depleting substances.
	Stirling cycle	Acceptable	Alternative technology currently under development for this end-use.
CFC–12, R–502 household freezers (retrofit).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–401A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–401B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
CFC–12, R–502 household freezers (new equipment/ NIKs).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	HFC–152a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	Stirling cycle	Acceptable	Alternative technology.
CFC–12, R–500 residential dehumidifiers (retrofit).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–401A	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	R–401B	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
CFC–12, R–500 residential dehumidifiers (new equipment/NIKs).	HCFC–22	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
CFC–12 motor vehicle air conditioners (retrofit).	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–401C	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
CFC–12 motor vehicle air conditioners (new equipment/ NIKs).	HFC–134a	Acceptable	EPA strongly recommends the containment and reclamation of this substitute.
	R–401C	Acceptable	This substitute is subject to containment and recovery regulations covering HCFCs.
	Evaporative cooling	Acceptable	Alternative technology that is currently commercially available; new developments have greatly expanded applicability.
	CO_2	Acceptable	Alternative technology.
	Stirling cycle	Acceptable	Alternative technology currently under development for this end-use.

REFRIGERANTS

Unacceptable Substitutes

End-use	Substitute	Decision	Comments
CFC–11 centrifugal chillers (retrofit).	HCFC–141b	Unacceptable	Has a high ODP relative to other alternatives.
CFC–12 centrifugal chillers (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–11, CFC–12, CFC–113, CFC–114, R–500 centrifugal chillers (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
	HCFC–141b	Unacceptable	Has a high ODP relative to other alternatives.
CFC–12 reciprocating chillers (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12 reciprocating chillers (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–11, CFC–12, R–502 industrial process refrigeration (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
CFC–11, CFC–12, R–502 industrial process refrigeration (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
CFC–12, R–502 ice skating rinks (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–502 ice skating rinks (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–502 cold storage warehouses (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–502 cold storage warehouses (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–500, R–502 refrigerated transport (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–500, R–502 refrigerated transport (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–502 retail food refrigeration (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.

REFRIGERANTS—Continued

Unacceptable Substitutes

End-use	Substitute	Decision	Comments
CFC–12, R–502 retail food refrigeration (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–502 commercial ice machines (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–502 commercial ice machines (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12 vending machines (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12 vending machines (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12 Water coolers (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12 water coolers (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12 household refrigerators (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12 household refrigerators (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–502 household freezers (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–502 household freezers (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–500 residential dehumidifiers (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–500 residential dehumidifiers (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.

REFRIGERANTS—Continued

Unacceptable Substitutes

End-use	Substitute	Decision	Comments
CFC–12 motor vehicle air conditioners (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12 motor vehicle air conditioners (new equipment/ NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon Blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.

REFRIGERANTS

Pending Decisions

Application	Substitute	Comments
CFC–11, CFC–113, CFC–114 recirculating coolers.	Perfluoropropane	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluorobutane	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluoropentane	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluorohexane	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluoroheptane	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluorooctane	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluoro-N-methyl morphine	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluoro-N-ethyl morphine	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluoro-N-isopropyl morphine	EPA requests additional data on the use. of all substitutes for this end-use.
CFC–11, CFC–113, CFC–114 thermosyphons.	Perfluoropropane	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluorobutane	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluoropentane	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluorohexane	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluoroheptane	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluorooctane	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluoro-N-methyl morphine	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluoro-N-ethyl morphine	EPA requests additional data on the use. of all substitutes for this end-use.
	Perfluoro-N-isopropyl morphine	EPA requests additional data on the use. of all substitutes for this end-use.
CFC–12 Motor vehicle air conditioning.	HCFC Blend Beta	EPA has requested additional data.
CFC–12 Cold storage	R200a	EPA has requested additional data.
CFC–12 Chillers, heat pumps and commercial refrigeration systems.	HFC–227ea	EPA has not yet concluded review of the data.
CFC–13, R–503 very low temperature refrigeration.	HFC–23	EPA requests additional data on the use. of all substitutes for this end-use.
	PFC Blend Alpha	EPA has not yet concluded review of the data.
	PFC Blend Beta	EPA has not yet concluded review of the data.
CFC–114 Centrifugal chillers (new equipment/ alternative substances).	R200b	EPA has not yet concluded review of the data.
	R200c	EPA has not yet concluded review of the data.
	R200g	EPA has not yet concluded review of the data.
	R200i	EPA has not yet concluded review of the data.

REFRIGERANTS—Continued

Pending Decisions

Application	Substitute	Comments
	R200j	EPA has not yet concluded review of the data.
CFC–114 chillers, heat pumps and commercial refrigeration systems.	HFC–227ea	EPA has not yet concluded review of the data.
R–502 Cold storage	R200a	EPA has not yet concluded review of the data.
HCFC–22 Heat pumps	HFC–134a	EPA has not yet evaluated Class II substitutes.
	HFC–152a	EPA has not yet evaluated Class II substitutes.
	HFC–32	EPA has not yet evaluated Class II substitutes.
	HFC–125/HFC–134a/HFC–32	EPA has not yet evaluated Class II substitutes.
	R200a	EPA has not yet evaluated Class II substitutes.
HCFC–22 Conventional (house.hold) air conditioning.	HFC–125/HFC–134a/HFC–32	EPA has not yet evaluated Class II substitutes.
	R200a	EPA has not yet evaluated Class II substitutes.

FOAM SECTOR

Acceptable Substitutes

End-use	Substitute	Decision	Comments
CFC–11 Rigid polyurethane and polyisocyanurate laminated boardstock.	HCFC–123	Acceptable	Worker monitoring studies indicate AEL for 123 (30 ppm) can be achieved with increased ventilation, where needed. Availability is limited.
	HCFC–141b	Acceptable	Has highest ODP of HCFCs.
	HCFC–142b	Acceptable.	
	HCFC–22	Acceptable.	
	HCFC–22/HCFC–141b blends	Acceptable	HCFC–141b.
	HCFC–141b/HCFC–123 blends.	Acceptable	Recent worker monitoring studies indicate OEL for 123 (10 ppm) can be achieved with increased ventilation, where needed. Fairly good energy efficiency properties.
	HCFC–22/HCFC–142b blends	Acceptable.	
	HCFC–134a	Acceptable.	
	HCFC–152a	Acceptable	Flammability may be an issue for workers and consumers.
	Saturated light hydrocarbons C3–C6.	Acceptable	Flammability may be an issue for workers and consumers. Major sources of VOC emissions are subject to the New Source Review (NSR) program.
	2-Chloropropane	Acceptable.	
	Carbon dioxide	Acceptable	Has highest thermal conductivity relative to other acceptable substitutes in this end use.
CFC–11 Polyurethane, rigid appliance.	HCFC–22 (for blends thereof)	Acceptable.	
	HCFC–123 (or blends thereof)	Acceptable	Recent worker monitoring studies indicate OEL for 123 (30 ppm) can be achieved with increased ventilation, where needed. Easy to use as a retrofit; energy efficiency close to CFC–11. Current availability is limited.
	HCFC–141b (or blends thereof).	Acceptable	HCFC–141b has an ODP of 0.11, almost equivalent to that of methyl chloroform, a Class I substance. Fairly good energy efficiency properties.
	HCFC–142b (or blends thereof).	Acceptable.	
	HCFC–134a (or blends thereof).	Acceptable.	
	HCFC–152a (or blends thereof).	Acceptable	Flammability may be an issue for workers and consumers.
	Saturated light hydrocarbons C3–C6 (or blends thereof).	Acceptable	Flammability may be an issue for workers and consumers. Major sources of VOC emissions are subject to the New Source Review (NSR) program.
	Carbon dioxide (or blends thereof).	Acceptable.	
CFC–11 Polyurethane, rigid commercial.	HCFC–22 (or blends thereof)	Acceptable	
Refrigeration foams, spray foams and sandwich panel foams.	HCFC–123 (or blends thereof)	Acceptable	Recent worker monitoring studies indicate AEL for 123 (30 ppm) can be achieved with use of increased ventilation, where needed. Easy to use as a retrofit; energy efficiency close to CFC–11. Availability is limited.
	HCFC–141b (or blends thereof).	Acceptable	HCFC–141b has an ODP of 0.11, almost equivalent to that of methyl chloroform, a Class I substance. Fairly good energy efficiency properties.

FOAM SECTOR—Continued

Acceptable Substitutes

End-use	Substitute	Decision	Comments
	HCFC–142b (or blends thereof).	Acceptable	
	HFC–134a (or blends thereof)	Acceptable	
	HFC–152a (or blends thereof)	Acceptable	Flammability may be an issue for workers and consumers.
	Saturated light hydrocarbons C3–C6 (or blends thereof).	Acceptable	Flammability may be an issue for workers and consumers. Major sources of VOC emissions are subject to the New Source Review (NSR) program.
	Carbon dioxide (or blends thereof).	Acceptable	
CFC–11 Polyurethane, rigid slabstock and other.	HCFC–22 (or blends thereof) .	Acceptable	
	HCFC–141b (or blends thereof).	Acceptable	HCFC–141b has an ODP of 0.11, almost equivalent to that of methyl chloroform, a Class I substance.
	HCFC–123 (or blends thereof)	Acceptable	Recent worker monitoring studies indicate AEL for 123 (30 ppm) can be achieved by increased ventilation, where needed. Availability is limited.
	HFC–134a (or blends thereof)	Acceptable	
	HFC–152a (or blends thereof)	Acceptable	
	Saturated light Hydrocarbons C3–C6 (or blends thereof).	Acceptable	Flammability may be an issue for workers and consumers. Major sources of VOC emissions are subject to the New Source Review (NSR) program.
	Carbon dioxide (or blends thereof).	Acceptable	
CFC–12 Polystyrene, extruded boardstock and billet.	HCFC–22	Acceptable	
	HCFC–142b	Acceptable	
	HCFC–22/142b blends	Acceptable	
	HFC–22/142b blends	Acceptable	
	HFC–134a	Acceptable	
	HFC–152a	Acceptable	Flammability may be an issue for workers and consumers.
	Saturated light hydrocarbons C3–C6.	Acceptable	Flammability may be an issue for workers and consumers. Major sources of VOC emissions are subject to the New Source Review (NSR) program.
	HCFC–22/Saturated light hydrocarbons.	Acceptable	Flammability may be an issue for workers and consumers. Major sources of VOC emissions are subject to the New Source Review (NSR) program.
	Carbon dioxide	Acceptable	High thermal conductivity compared to other acceptable substitutes in this end-use.
CFC–11, CFC–113 Phenolic, insulation board.	HCFC–141b	Acceptable	HCFC–141b has an ODP of 0.11, almost equivalent to that of methyl chloroform, a Class I substance. Fairly good energy efficiency properties.
	HCFC–142b	Acceptable.	
	HCFC–22	Acceptable.	
	HCFC–22/142b	Acceptable.	
	HCFC–22/Saturated light hydrocarbons C3–C6.	Acceptable	Flammability may be an issue for workers and consumers.
	Saturated light hydrocarbons C3–C6.	Acceptable	Major sources of VOC emissions are subject to the New Source Review (NSR) program. Flammability may be an issue for workers and consumers.
	HFC–143a	Acceptable	Has relatively high global warming potential compared to other acceptable substitutes in this end-use.
	2-Chloropropane	Acceptable	Proprietary technology. Flammability may be an issue for workers and consumers.
	Carbon dioxide	Acceptable	High thermal conductivity relative to other acceptable substitutes in this end-use.
CFC–11 Polyurethane, flexible	HFC–134a (or blends thereof)	Acceptable	
	HFC–152a (or blends thereof)	Acceptable	Flammability may be an issue for workers and consumers.
	Methylene chloride (or blends thereof).	Acceptable	Revised OSHA PELs have been proposed at 25 ppm (TWA) for methylene chloride (Nov. 7, 1991). Subject to meeting all future ambient air controls for hazardous air pollutants under Title III section 112 of the 1990 CAAA. RCRA standards must be met.
	Acetone (or blends thereof)	Acceptable	Regulated as a VOC under Title I of the Clean Air Act. Major sources of VOC emissions are subject to the New Source Review (NSR) program. Flammability may be an issue for workers and consumers.
	AB technology	Acceptable	AB generates more carbon monoxide (CO) than other blowing agents. OSHA has set a PEL for CO at 35 ppm TWA with a ceiling of 200 ppm.
	Carbon dioxide (or blends thereof).	Acceptable	

FOAM SECTOR—Continued

Acceptable Substitutes

End-use	Substitute	Decision	Comments
CFC–11 Polyurethane, Integral skin.	HCFC–22 (or blends thereof) .	Acceptable	Use restricted by section 610 Non-Essential Use Ban to motor vehicle safety foams. See HCFC discussion in Preamble for detail.
	HCFC–123 (or blends thereof)	Acceptable	Use restricted by section 610 Non-Essential Use Ban to motor vehicle safety foams. See HCFC discussion in Preamble for detail. Worker monitoring studies indicate AEL for HCFC–123 (30 ppm) can be achieved with increased ventilation, where needed. Very easy to use a retrofit; energy efficiency close to CFC–11. Supply is currently limited.
	HCFC–141b (or blends thereof).	Acceptable	Use restricted by section 610 Non-Essential Use Ban to motor vehicle safety foams. See HCFC discussion in Preamble for detail. HCFC–141b has an ODP of 0.11, almost equivalent to that of methyl chloroform, a class I substance.
	HFC–134a (or blends thereof)	Acceptable	
	HFC–152a (or blends thereof)	Acceptable	Flammability may be an issue for workers and consumers.
	Saturated light hydrocarbons C3–C6 (or blends thereof).	Acceptable	Major sources of VOC emissions are subject to the New Source Review (NSR) program. Flammability may be an issue for workers and consumers.
	Methylene chloride (or blends thereof).	Acceptable	Revised OSHA PELs have been proposed at 25 ppm (TWA) for methylene chloride (Nov. 7, 1991). Subject to meeting all future ambient air controls for hazardous air pollutant under Title III section 112 of the 1990 CAA Amendments. RCRA standards must be met.
	Carbon dioxide (or blends thereof).	Acceptable	
CFC–12 Polystyrene, extruded sheet.	HFC–134a (or blends thereof)	Acceptable	
	HFC–152a (or blends thereof)	Acceptable	Flammability may be an issue for workers and consumers.
	Saturated light hydrocarbons C3–C6 (or blends thereof).	Acceptable	Major sources of VOC emissions are subject to the New Source Review (NSR) program. Flammability may be an issue for workers and consumers.
	Carbon dioxide (or blends thereof).	Acceptable	
CFC–12, CFC–114, CFC–11 Polyolefin.	HCFC–22	Acceptable	Use restricted under section 610 Non-Essential Use Ban to polyethylene thermal insulating applications. See HCFC discussion in Preamble for detail.
	HCFC–142b	Acceptable	Use restricted under section 610 Non-Essential Use Ban to polyethylene thermal insulating applications. See HCFC discussion in Preamble for detail.
	HCFC–22/HCFC–142b	Acceptable	Use restricted under section 610 Non-Essential Use Ban to polyethylene thermal insulating applications. See HCFC discussion in Preamble for detail.
	HCFC–22/Saturated light hydrocarbons C3–C6.	Acceptable	HCFC use restricted to thermal insulating applications under section 610 Non-Essential Use Ban. Major sources of VOC emissions are subject to the New Source Review (NSR) program. Flammability may be an issue for workers and consumers.
	HFC–134a	Acceptable	
	HFC–143a	Acceptable	Has relatively high global warming potential compared to other acceptable substitutes in this end-use.
	HFC–152a	Acceptable	Flammability may be an issue for workers and consumers.
	Saturated light hydrocarbons C3–C6.	Acceptable	Major sources of VOC emissions are subject to the New Source Review (NSR) program. Flammability may be an issue for workers and consumers.
	Carbon dioxide	Acceptable	

FOAMS

Unacceptable Substitutes

End-use	Substitute	Decision	Comments
CFC–11 Polyolefin	HCFC–141b (or blends thereof).	Unacceptable	HCFC–141b has an ODP of 0.11, almost equivalent to that of methyl chloroform, a Class I substance. The Agency believes that non-ODP alternatives are sufficiently available to render the use of HCFC–141b unnecessary in polyolefin foams.

FOAMS

Pending Substitutes

End-use	Substitute	Comments
CFC–11, CFC–113 Polyurethane and polyisocyanurate, rigid laminated boardstock.	Alternative products: expanded polystyrene, fiberboard, fiberglass.	Agency has not completed review of data.
CFC–11, CFC–113 Rigid polyurethane, appliance foams.	Alternative products: fiberglass, vacuum panels.	Agency has not completed review of data.
CFC–11 Polyurethane, rigid slabstock and other.	Alternative products: fiberglass, expanded polystyrene.	Agency has not completed review of data.
CFC–11 Polyurethane, rigid spray and commercial refrigeration foams, and sandwich panels.	Alternative products: fiberglass, expanded polystyrene.	Agency has not completed review of data.
CFC–11, CFC–113 Phenolic	Alternative products: fiberglass, expanded polystyrene.	Agency has not completed review of data.
CFC–11 Polyurethane, flexible.	Alternative processes: Enviro-Cure process.	Agency has not completed review of data.
	Alternative products: fiberfill, natural latex foams, polyester batting.	Agency has not completed review of data.
	2-Chloropropane	
Foams, alternative process .	Electroset process	Insufficient data. Also need information on proposed end-use.
CFC–12, CFC–114 Polystyrene, extruded boardstock and billet.	Alternative products: expanded polystyrene, fiberboard.	Agency has not completed review of data.
	HCFC–124	Agency has not completed review of data.
	HCFC–125	Agency has not completed review of data.
	HFC–143a	Agency has not completed review of data.
CFC–11, Polyurethane integral skin.	2-Chloropropane	Agency has not completed review of data.
CFC–12, CFC–114 Polyolefin.	Alternative products: paper, cardboard, expanded polystyrene.	Agency has not completed review of data.
	HFC–152a/Hydrocarbons	Agency has not completed review of data.
	Methylene chloride	Agency has not completed review of data.
Polyurethane, rigid	HFC–356	Insufficient data. Also need information on proposed end-use(s).

SOLVENT CLEANING

Acceptable Substitutes

End-use	Substitute	Decision	Comments
Metals cleaning w/CFC–113, MCF.	Aqueous cleaners	Acceptable	EPA expects to issue effluent guidelines for this industry under the Clean Water Act by as early as 1994.
	Semi-aqueous cleaners	Acceptable	EPA expects to issue effluent guidelines for this industry under the Clean Water Act by as early as 1994.
	Straight organic solvent cleaning (with terpenes, C6–C20 petroleum hydrocarbons, oxygenated organic solvents such as ketones, esters, ethers, alcohols, etc.).	Acceptable	OSHA standards must be met, if applicable.
	Trichloro-ethylene, perchloroethylene, methylene chloride.	Acceptable	OSHA and RCRA standards must be met. EPA expects to issue Maximum Achievable Control Technology requirements under the Clean Air Act for this application by 1994.
	Vanishing oils	Acceptable	Depending on geographic region, may be subject to VOC controls.
	Supercritical fluids	Acceptable.	
	Volatile methyl siloxanes (dodecamethyl cyclohexasiloxane, hexamethyl disiloxane, octamethyltrisiloxane, decamethyltetrasiloxane).	Acceptable	Other siloxanes are being examined for possible workplace standards and will be listed under a separate rulemaking.
Electronics cleaning w/CFC–113, MCF.	Aqueous cleaners	Acceptable	EPA expects to issue effluent guidelines for this industry under the Clean Water Act by as early as 1994.
	Semi-aqueous cleaners	Acceptable	EPA expects to issue effluent guidelines for this industry under the Clean Water Act by 1994.

SOLVENT CLEANING—Continued

Acceptable Substitutes

End-use	Substitute	Decision	Comments
	Straight organic solvent cleaning (with terpenes, C6–C20 petroleum hydrocarbons, oxygenated organic solvents such as ketones, esters, ethers, alcohols, etc.).	Acceptable	OSHA standards must be met, if applicable.
	Trichloro-ethylene, perchloro-ethylene, methylene chloride.	Acceptable	OSHA and RCRA standards must be met. EPA expects to issue Maximum Achievable Control Technology requirements under the Clean Air Act for this application by 1994.
	No-clean alternatives	Acceptable	Substitutes found acceptable include low solids fluxes and inert gas soldering.
	Supercritical fluids, plasma cleaning, UV/Ozone cleaning.	Acceptable	OSHA standards for ozone must be met.
	Volatile methyl siloxanes (dodecamethyl cyclohexasiloxane, hexamethyl disiloxane, octamethyltrisiloxane, decamethyltetrasiloxane).	Acceptable	Other siloxanes are being examined for possible workplace standards and will be listed under a separate rulemaking.
Precision cleaning w/CFC–113, MCF.	Aqueous cleaners	Acceptable	EPA expects to issue effluent guidelines for this industry under the Clean Water Act by as early as 1994.
	Semi-aqueous cleaners	Acceptable	EPA expects to issue effluent guidelines for this industry under the Clean Water Act by as early as 1994.
	Straight organic solvent cleaning (with terpenes, C6–C20 petroleum hydrocarbons, oxygenated organic solvents such as ketones, esters, ethers, alcohols, etc.).	Acceptable	OSHA standards must be met, if applicable.
	Trichloro-ethylene, perchloro-ethylene, methylene chloride.	Acceptable	OSHA and RCRA standards must be met. EPA expects to issue Maximum Achievable Control Technology requirements for this application by 1994.
	Supercritical fluids, plasma cleaning, UV/Ozone cleaning.	Acceptable	OSHA standards for ozone must be met.
	Volatile methyl siloxanes (dodecamethyl cyclohexasiloxane, hexamethyl disiloxane, octamethyltrisiloxane, decamethyltetrasiloxane).	Acceptable	Other siloxanes are being examined for possible workplace standards and will be listed under a separate rulemaking.

SUBSTITUTES ACCEPTABLE SUBJECT TO NARROWED USE LIMITS

End-use	Substitute	Decision	Comments
Electronics cleaning w/ CFC–113, MCF.	Perfluoro carbons (C5F12, C6F12, C6F14, C7F16, C8F18, C5F11NO, C6F13NO, C7F15NO, and C8F16).	Acceptable for high performance, precision-engineered applications only where reasonable efforts have been made to ascertain that other alternatives are not technically feasible due to performance or safety requirements.	The principal environmental characteristic of concern for PFCs is that they have long atmospheric lifetimes and high global warming potentials. Although actual contributions to global warming depend upon the quantities of PFCs emitted, the effects are for practical purposes irreversible. Users must observe this limitation on PFC acceptability by conducting a reasonable evaluation of other substitutes to determine that PFC use is necessary to meet performance or safety requirements. Documentation of this evaluation must be kept on file. For additional guidance regarding applications in which PFCs may be appropriate, users should consult the Preamble for this rulemaking.
Precision cleaning w/CFC–113, MCF.	Perfluorocarbons (C5F12, C6F12, C6F14, C7F16, C8F18, C5F11NO, C6F13NO, C7F15NO, and C8F16).	Acceptable for high performance, precision-engineered applications only where reasonable efforts have been made to ascertain that other alternatives are not technically feasible due to performance or safety requirements.	The principal environmental characteristic of concern for PFCs is that they have long atmospheric lifetimes and high global warming potentials. Although actual contributions to global warming depend upon the quantities of PFCs emitted, the effects are for practical purposes irreversible. Users must observe this limitation on PFC acceptability by conducting a reasonable evaluation of other substitutes to determine that PFC use is necessary to meet performance or safety requirements. Documentation of this evaluation must be kept on file. For additional guidance regarding applications in which PFCs may be appropriate, users should consult the Preamble for this rulemaking.

UNACCEPTABLE SUBSTITUTES

End use	Substitute	Decision	Comments
Metals cleaning w/CFC–113 ..	HCFC 141b and its blends	Unacceptable	High ODP; other alternatives exist. Effective date: As of 30 days after final rule for uses in new equipment (including retrofits made after the effective date); as of January 1, 1996 for uses in existing equipment. EPA will grant, if necessary, narrowed use acceptability listings for CFC–113 past the effective date of the prohibition.
Metals cleaning w/MCF	HCFC 141b and its blends	Unacceptable	High ODP; other alternatives exist. Effective date: As of 30 days after final rule for uses in new equipment (including retrofits made after the effective date); as of January 1, 1996 for uses in existing equipment.
Electronics cleaning w/CFC–113.	HCFC 141b and its blends	Unacceptable	High ODP; other alternatives exist. Effective date: As of 30 days after final rule for uses in new equipment (including retrofits made after the effective date); as of January 1, 1996 for uses in existing equipment. EPA will grant, if necessary, narrowed use acceptability listings for CFC–113 past the effective date of the prohibition.
Electronics cleaning w/MCF ...	HCFC 141b and its blends	Unacceptable	High ODP; other alternatives exist. Effective date: As of 30 days after final rule for uses in new equipment (including retrofits made after the effective date); as of January 1, 1996 for uses in existing equipment.
Precision cleaning w/CFC–113.	HCFC 141b and its blends	Unacceptable	High ODP; other alternatives exist. Effective date: As of 30 days after final rule for uses in new equipment (including retrofits made after the effective date); as of January 1, 1996 for uses in existing equipment. EPA will grant, if necessary, narrowed use acceptability listings for CFC–113 past the effective date of the prohibition.
Precision cleaning w/MCF	HCFC 141b and its blends	Unacceptable	High ODP; other alternatives exist. Effective date: As of 30 days after final rule for uses in new equipment (including retrofits made after the effective date); as of January 1, 1996 for uses in existing equipment.

PENDING SUBSTITUTES

End use	Substitute	Comments
Metals cleaning w/CFC–113, MCF.	Monochloro-toluene/benzotrifluorides	Agency has not completed review of data. Evaluation of exposure and toxicity data still ongoing.
	Dibromomethane	Agency has completed review of data, and intends to propose this chemical as an unacceptable substitute under a separate rule-making.
	Volatile methyl siloxanes (octamethylcyclotetrasiloxane, decamethylcyclopentasiloxane).	Agency has completed review of data, and intends under separate rule-making to propose these chemicals as acceptable with the use condition that the company-set exposure limits must be met.
Electronics cleaning w/ CFC–113, MCF	Monochloro-toluene/benzotrifluorides	Agency has not completed review of data. Evaluation of exposure and toxicity data still ongoing.
	Dibromomethane	Agency has completed review of data, and intends to propose this chemical as an unacceptable substitute under a separate rule-making.
	Volatile methyl siloxanes (octamethylcyclotetrasiloxane, decamethylcyclopentasiloxane).	Agency has completed review of data, and intends under separate rule-making to propose these chemicals as acceptable with the use condition that the company-set exposure limits must be met.
	HFC–4310mee	Agency has not completed review of data. Premanufacture Notice review under the Toxic Substances Control Act not yet completed.
Precision cleaning w/CFC–113, MCF.	Monochloro-toluene/benzotrifluorides	Agency has not completed review of data. Evaluation of exposure and toxicity data still ongoing.
	Dibromomethane	Agency has completed review of data, and intends to propose this chemical as an unacceptable substitute under a separate rule-making.
	Volatile methyl siloxanes (octamethylcyclotetrasiloxane, decamethylcyclopentasiloxane).	Agency has completed review of data, and intends under separate rule-making to propose these chemicals as acceptable with the use condition that the company-set exposure limits must be met.
	HCFC–123	New toxicity data has led to an upward revision of the company-set workplace exposure limit. EPA intends to propose under separate rule-making this chemical as an acceptable substitute subject to the new limit.
	HCFC–225	Toxicity data only recently completed. HCFC–225ca isomer has comparatively low company-set exposure limit; EPA intends to propose HCFC–225 as acceptable subject to this limit under separate rule-making. This limit should be readily achievable since HCFC–225 is sold commercially as a blend of ca- and cb-isomers. In addition, equipment where HCFC–225 is used typically has very low emissions.
	HFC–4310mee	Agency has not completed review of data. Premanufacture Notice review under the Toxic Substances Control Act not yet completed.

FIRE SUPPRESSION AND EXPLOSION PROTECTION—STREAMING AGENTS

Acceptable Substitutes

End-use	Substitute	Decision	Comments
Halon 1211	HCFC–123	Acceptable .	See additional comments 1, 2.
Streaming agents			Use of HCFCs in pressurized dispensers are controlled under CAA section 610(d). EPA intends to publish a proposed rulemaking banning the use of this agent in residential applications.
	[HCFC Blend] B	Acceptable .	Contains small percentage of PFC which has an unusually long atmospheric lifetime, and could potentially contribute to global climate change.
			See additional comments 1, 2.
			Use of HCFCs in pressurized dispensers are controlled under CAA section 610(d). EPA intends to publish a proposed rulemaking banning the use of this agent in residential applications.
	[Surfactant Blend] A	Acceptable .	This blend is not a clean agent, but can reduce the quantity of water required to extinguish a fire.
			EPA recommends that the manufacturer label the canister cautioning the consumer about possible eye irritation.
	Carbon Dioxide	Acceptable.	
	Dry Chemical	Acceptable.	
	Water	Acceptable.	
	Foam	Acceptable.	

Additional Comments:

1—Discharge testing and training should be strictly limited only to that which is essential to meet safety or performance requirements.

2—The agent should be recovered from the fire protection system in conjunction with testing or servicing and recycled for later use or destroyed.

FIRE SUPPRESSION AND EXPLOSION PROTECTION—STREAMING AGENTS

Substitutes Acceptable Subject to Narrowed Use Limits

End-use	Substitute	Decision	Conditions	Comments
Halon 1211	[CFC Blend]	Acceptable in nonresidential uses only.	.....	Use of CFCs are controlled under CAA section 610 which bans use of CFCs in pressurized dispensers, and therefore are not permitted for use in portable fire extinguishers. EPA will list this agent as proposed unacceptable in the next SNAP proposed rulemaking.
Streaming agents				Because CFCs are a Class I substance, production will be phased out by January 1, 1996.
				See additional comments 1, 2.
	HBFC–22B1	Acceptable in nonresidential uses only.	.....	Proper procedures regarding the operation of the extinguisher and ventilation following dispensing the extinguishant is recommended. Worker exposure may be a concern in small office areas.
				HBFC–22B1 is considered an interim substitute for Halon 1211. Because the HBFC–22B1 has an ODP of .74, production will be phased out (except for essential uses) on January 1, 1996.
				This agent was submitted to the Agency as a Premanufacture Notice (PMN) and is presently subject to requirements contained in a Toxic Substance Control Act (TSCA) Consent Order.
				See additional comments 1, 2.
	C_6F_{14}	Acceptable for nonresidential uses where other alternatives are not technically feasible due to performance or safety requirements: a. due to the physical or chemical properties of the agent, or. b. where human exposure to the extinguishing agent may approach cardiosensitization levels or result in other unacceptable health effects under normal operating conditions	.....	Users must observe the limitations on PFC acceptability by making reasonable effort to undertake the following measures: (i) conduct an evaluation of foreseeable conditions of end use; (ii) determine that the physical or chemical properties or other technical constraints of the other available agents preclude their use; and (iii) determine that human exposure to the other alternative extinguishing agents may approach or result in cardiosensitization or other unacceptable toxicity effects under normal operating conditions; Documentation of such measures must be available for review upon request. The principal environmental characteristic of concern for PFCs is that they have high GWPs and long atmospheric lifetimes. Actual contributions to global warming depend upon the quantities of PFCs emitted. For additional guidance regarding applications in which PFCs may be appropriate, users should consult the description of potential uses which is included in the preamble to this rulemaking. See additional comments 1, 2.

Additional Comments:

1—Discharge testing and training should be strictly limited only to that which is essential to meet safety or performance requirements.

2—The agent should be recovered from the fire protection system in conjunction with testing or servicing, and recycled for later use or destroyed.

FIRE SUPPRESSION AND EXPLOSION PROTECTION—STREAMING AGENTS

Unacceptable Substitutes

End-use	Substitute	Decision	Comments
Halon 1211 ..... Streaming agents	[CFC–11]	Unacceptable	This agent has been suggested for use on large outdoor fires for which non-ozone-depleting alternatives are currently used.

Fire Suppression and Explosion Protection—Streaming Agents

Pending Substitutes

End-use	Substitute	Comments
Halon 1211 Streaming agents	HBFC–22B1/HFC–227ea Blend	Cardiotoxicity, decomposition product, and personal monitoring data required. Because the HBFC–22B1 has an ODP of .74, production will be phased out (except for essential uses) on January 1, 1996.
	HCFC–124	Personal monitoring data required.
	HFC–134a	Personal monitoring data required.
	HFC–227ea	Personal monitoring data required.
	[Powdered Aerosol] B	EPA has not completed the review of this agent.
	Water Mist	EPA is continuing to evaluate this new technology.

Fire Suppression and Explosion Protection—Total Flooding Agents

Acceptable Substitutes

End-use	Substitute	Decision	Comments
Halon 1301	[Inert Gas Blend] B	Acceptable in unoccupied areas.	Agency review for occupied areas is incomplete.
Total flooding agents	[Powdered Aerosol] A	Acceptable in unoccupied areas.	For use in occupied areas, additional decomposition product and health effect data are required.
	[Powdered Aerosol] B	Acceptable in unoccupied areas.	Agency review for occupied areas is incomplete.
	Carbon Dioxide	Acceptable	System design must adhere to OSHA 1910.162(b)5 and NFPA Standard 12.
	Water	Acceptable.	

Fire Suppression and Explosion Protection—Total Flooding Agents

Substitutes Acceptable Subject to Use Conditions

End-use	Substitute	Decision	Conditions	Comments
Halon 1301 Total flooding agents	HBFC–22B1	Acceptable	Until OSHA establishes applicable workplace requirements: Where egress from an area cannot be accomplished within one minute, the employer shall not use this agent in concentrations exceeding its cardiotoxic NOAEL of 0.3%.	The comparative design concentration based on cup burner values is approximately 5.3%, while its cardiotoxic LOAEL is 1%. Thus, it is unlikely that this agent will be used in normally occupied areas. HBFC–22B1 can be considered only an interim substitute for Halon 1301. HBFC–22B1 has an ODP of .74; thus, production will be phased out January 1, 1996.
			Where egress takes longer than 30 seconds but less than one minute, the employer shall not use the agent in a concentration greater than its cardiotoxic LOAEL of 1.0%.	This agent was submitted to the Agency as a Premanufacture Notice (PMN) and is presently subject to requirements contained in a Toxic Substance Control Act (TSCA) Consent Order. See additional comments 1, 2, 3, 4.
			HBFC–22B1 concentrations greater than 1.0% are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.	
	HCFC–22	Acceptable	Until OSHA establishes applicable workplace requirements: Where egress from an area cannot be accomplished within one minute, the employer shall not use this agent in concentrations exceeding its cardiotoxic NOAEL of 2.5%.	The comparative design concentration based on cup burner values is approximately 13.9% while its cardiotoxic LOAEL is 5.0%. Thus, it is unlikely that this agent will be used in normally occupied areas. See additional comments 1, 2, 3, 4.

FIRE SUPPRESSION AND EXPLOSION PROTECTION—TOTAL FLOODING AGENTS—Continued

Substitutes Acceptable Subject to Use Conditions

End-use	Substitute	Decision	Conditions	Comments
			Where egress takes longer than 30 seconds but less than one minute, the employer shall not use the agent in a concentration greater than its cardiotoxic LOAEL of 5.0%. HCFC–22 concentrations greater than 5.0% are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.	
	HCFC–124 .	Acceptable	Until OSHA establishes applicable workplace requirements: Where egress from an area cannot be accomplished within one minute, the employer shall not use this agent in concentrations exceeding its cardiotoxic NOAEL of 1.0%. Where egress takes longer than 30 seconds but less than one minute, the employer shall not use the agent in a concentration greater than its cardiotoxic LOAEL of 2.5%. HCFC–123 concentrations greater than 2.5% are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.	The comparative design concentration based on cup burner values is approximately 8.4% while its cardiotoxic LOAEL is 2.5%. Thus, it is unlikely that this agent will be used in normally occupied areas. See additional comments 1, 2, 3, 4.
	[HCFC Blend] A.	Acceptable	Until OSHA establishes applicable workplace requirements: Where egress from an area cannot be accomplished within one minute, the employer shall not use [HCFC Blend] A in concentrations exceeding its cardiotoxic NOAEL of 10.0%. Where egress takes greater than 30 seconds but less than one minute, the employer shall not use [HCFC Blend] A in a concentration greater than its cardiotoxic LOAEL of 10.0%. [HCFC Blend] A concentrations greater than 10 percent are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.	The comparative design concentration based on full scale testing is approximately 8.6%. The agent should be recovered from the fire protection system in conjunction with testing or servicing, and should be recycled for later use or destroyed. See additional comments 1, 2, 3, 4.
	HFC–23	Acceptable	Until OSHA establishes applicable workplace requirements: Where egress from an area cannot be accomplished within one minute, the employer shall not use HFC–23 in concentrations exceeding 30%. Where egress takes greater than 30 seconds but less than one minute, the employer shall not use HFC–23 in a concentration greater than 50.0%.	The comparative design concentration based on cup burner values is approximately 14.4% while data indicates that its cardiotoxicity NOAEL is 30% without added oxygen and 50% with added oxygen. Its LOAEL is likely to exceed 50%. See additional comments 1, 2, 3, 4.

FIRE SUPPRESSION AND EXPLOSION PROTECTION—TOTAL FLOODING AGENTS—Continued

Substitutes Acceptable Subject to Use Conditions

End-use	Substitute	Decision	Conditions	Comments
			HFC–23 concentrations greater than 50 percent are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge. The design concentration must result in an oxygen level of at least 16%.	
	HFC–125	Acceptable.	Until OSHA establishes applicable workplace requirements: Where egress from an area cannot be accomplished within one minute, the employer shall not use this agent in concentrations exceeding its cardiotoxic NOAEL of 7.5%. Where egress takes longer than 30 seconds but less than one minute, the emploer shall not use the agent in a concentration greater than its cardiotoxic LOAEL of 10.0%. HFC–125 concentrations greater than 10.0% are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.	The comparative design concentration based on cup burner values is approximately 11.3% while its cardiotoxic LOAEL is 10.0%. Thus, it is unlikely that this agent will be used in normally occupied areas. See additional comments 1, 2, 3, 4.
	HFC–134a ..	Acceptable	Until OSHA establishes applicable workplace requirements: Where egress from an area cannot be accomplished within one minute, the employer shall not use this agent in concentrations exceeding its cardiotoxic NOAEL of 4.0%. Where egress takes longer than 30 seconds but less than one minute, the employer shall not use the agent in a concentration greater than its cardiotoxic LOAEL of 8.0%. HFC–134a concentrations greater than 8.0% are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.	The comparative design concentration based on cup burner values is approximately 12.6% while its cardiotoxic LOAEL is 8.0%. Thus, it is unlikely that this agent will be used in normally occupied areas. See additional comments 1, 2, 3, 4.
	HFC–227ea	Acceptable	Until OSHA establishes applicable workplace requirements: Where egress from an area cannot be accomplished within one minute, the employer shall not use HFC–227ea in concentrations exceeding its cardiotoxic NOAEL of 9.0%. Where egress takes longer than 30 second but less than one minute, the employer shall not use the agent in a concentration greater than its cardiotoxic LOAEL of 10.5%.	The comparative design concentration based on cup burner values is approximately 7.0% while data indicate that its cardiotoxicity LOAEL is probably greater than 10.5%. EPA is accepting 10.5% as its LOAEL. This agent was submitted to the Agency as a Premanufacture Notice (PMN) agent and is presently subject to requirements contained in a Toxic Substances Control Act (TSCA) Significant New Use Rule (SNUR). See additional comments 1, 2, 3, 4.

FIRE SUPPRESSION AND EXPLOSION PROTECTION—TOTAL FLOODING AGENTS—Continued

Substitutes Acceptable Subject to Use Conditions

End-use	Substitute	Decision	Conditions	Comments
			HFC–227ea concentrations greater than 10.5% are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.	
	C_4F_{10}	Acceptable ..... where other alternatives are not technically feasible due to performance or safety requirements: a. due to their physical or chemical properties, or b. where human exposure to the extinguishing agents may approach cardiosensitization levels or result in other unacceptable health effects under normal operating conditions	Until OSHA establishes applicable workplace requirements: For occupied areas from which personnel cannot be evacuated in one minute, use is permitted only up to concentrations not exceeding the cardiotoxicity NOAEL of 40%. Although no LOAEL has been established for this product, standard OSHA requirements apply, i.e., for occupied areas from which personnel can be evacuated or egress can occur between 30 and 60 seconds, use is permitted up to a concentration not exceeding the LOAEL. All personnel must be evacuated before concentration of C_4F_{10} exceeds 40%. Design concentration must result in oxygen levels of at least 16%.	The comparative design concentration based on cup burner values is approximately 6.6%. Users must observe the limitations on PFC acceptability by making reasonable efforts to undertake the following measures: (i) conduct an evaluation of foreseeable conditions of end use; (ii) determine that human exposure to the other alternative extinguishing agents may approach or result in cardiosensitization or other unacceptable toxicity effects under normal operating conditions; and (iii) determine that the physical or chemical properties or other technical constraints of the other available agents preclude their use. Documentation of such measures must be available for review upon request. The principal environmental characteristic of concern for PFCs is that they have high GWPs and long atmospheric lifetimes. Actual contributions to global warming depend upon the quantities of PFCs emitted. For additional guidance regarding applications in which PFCs may be appropriate, users should consult the description of potential uses which is included in this rulemaking. See additional comments 1, 2, 3, 4.
	[IG–541]	Acceptable	Until OSHA establishes applicable workplace requirements: The design concentration must result in at least 10% oxygen and no more than 5% CO_2. If the oxygen concentration of the atmosphere falls below 10%, personnel must be evacuated and egress must occur within 30 seconds.	Studies have shown that healthy, young individuals can remain in a 10% to 12% oxygen atmosphere for 30 to 40 minutes without impairment. However, in a fire emergency, the oxygen level may be reduced below safe levels, and the combustion products formed by the fire are likely to cause harm. Thus, the Agency does not contemplate personnel remaining in the space after system discharge during a fire without Self Contained Breathing Apparatus (SCBA) as required by OSHA. See additional comments 1, 2.

Additional Comments

1—Must conform with OSHA 29 CFR 1910 Subpart L Section 1910.160 of the U.S. Code.

2—Per OSHA requirements, protective gear (SCBA) must be available in the event personnel must reenter the area.

3—Discharge testing should be strictly limited only to that which is essential to meet safety or performance requirements.

4—The agent should be recovered from the fire protection system in conjunction with testing or servicing, and recycled for later use or destroyed.

Fire Suppression and Explosion Protection

Total Flooding Agents

Substitutes Acceptable Subject To Narrowed Use Limits

End use	Substitute	Decision	Conditions	Comments
Halon 1301 Total Flooding Agents.	C_4F_{10}	Acceptable where other alternatives are not technically feasible due to performance or safety requirements: a. Due to their physical or chemical properties, or. b. Where human exposure to the extinguishing agents may approach cardiosensitization levels or result in other unacceptable health effects under normal operating conditions.	Until OSHA establishes applicable workplace requirements: For occupied areas from which personnel cannot be evacuated in one minute, use is permitted only up to concentrations not exceeding the cardiotoxicity NOAEL of 40%. Although no LOAEL has been established for this product, standard OSHA requirements apply, i.e. for occupied areas from which personnel can be evacuated or egress can occur between 30 and 60 seconds, use is permitted up to a concentration not exceeding the LOAEL. All personnel must be evacuated before concentration of C_4F_{10} exceeds 40%. Design concentration must result in oxygen levels of at least 16%.	The comparative design concentration based on cup burner values is approximately 6.6%. Users must observe the limitations on PFC approval by undertaking the following measures: (i) Conduct an evaluation of foreseeable conditions of end use; (ii) Determine that human exposure to the other alternative extinguishing agents may approach or result in cardiosensitization or other unacceptable toxicity effects under normal operating conditions; and (iii) Determine that the physical or chemical properties or other technical constraints of the other available agents preclude their use; Documentation of such measures must be available for review upon request. The principal environmental characteristic of concern for PFCs is that they have high GWPs and long atmospheric lifetimes. Actual contributions to global warming depend upon the quantities of PFCs emitted. For additional guidance regarding applications in which PFCs may be appropriate, users should consult the description of potential uses which is included in the preamble to this rulemaking. See additional comments 1, 2, 3, 4.

Additional Comments

1—Must conform with OSHA 29 CFR 1910 Subpart L Section 1910.160 of the U.S. Code.

2—Per OSHA requirements, protective gear (SCBA) must be available in the event personnel must reenter the area.

3—Discharge testing should be strictly limited only to that which is essential to meet safety or performance requirements.

4—The agent should be recovered from the fire protection system in conjunction with testing or servicing, and recycled for later use or destroyed.

Fire Suppression and Explosion Protection

Total Flooding Agents

Pending Substitutes

End-use	Substitute	Comments
Halon 1301 Total Flooding	HBFC–22B1/HFC–227ea Blend	Cardiotoxicity and decomposition product data required. Because the HBFC–22B1 has an ODP of .74, production will be phased out (except for essential uses) on January 1, 1996.
	HCFC/HFC Blend	Pending submission.
	[Inert Gas Blend] B	Pending development of peer review on health effects.
	[Powdered Aerosol] A	For use in occupied areas, additional decomposition product and health effect data is required.
	[Powdered Aerosol] B	For use in occupied areas, EPA review of submission incomplete.
	[Water Mist System] A	EPA is continuing to evaluate this new technology.
	[Water Mist System] B	EPA is continuing to evaluate this new technology.
	SF6	This agent has been proposed as an alternative for discharge testing.

STERILANTS

Acceptable Substitutes

Application	Substitute	Decision	Conditions	Comments
12/88 Blend of EtO/CFC–12 Sterilant.	CO_2/ETO	Acceptable		CO_2/EtO blends can serve as drop-in replacements to 12/88 in some but not in all existing equipment because they require a higher operating pressure. As a HAP, use of EtO must comply with Title III of the CAA.
	HCFC–124/ETO	Acceptable		In a blend with EtO, HCFC–124 is the only available drop-in replacement for about half of the equipment now using 12/88. However, HCFC–124 is an ozone depleting substance; it should be used to sterilize only that equipment that cannot be sterilized using other alternatives such as steam or CO_2/EtO blends. Because HCFC–124 is a Class II substance, its use may be subject to future regulation promulgated under Section 608 of the Clean Air Act Amendments of 1990. As a HAP, use of EtO must comply with Title III of the CAA.
12/88 Blend of EtO/CFC–12 Sterilant.	Pure ETO	Acceptable		EtO is a toxic, carcinogenic substance and is considered a hazardous air pollutant. Potential exposures of the general population to EtO releases can be limited either through the use of catalytic converters which convert waste EtO into CO_2 and water, or through the use of acid water scrubbers which convert waste EtO into ethylene glycol. Must be used in accordance with manufacturer recommendations to address flammability concerns. Must be used in accordance with OSHA standards to limit occupational exposures. As a HAP, use of EtO must comply with Title III of the CAA.
	Steam	Acceptable		Applicable only to devices resistant to heat and moisture.

STERILANTS

Pending Decisions

Application	Substitute	Comments
12/88 Blend of EtO/CFC–12 Sterilant.	[HCFC Blend] A	Decision pending completion of FIFRA review.
	HFC–125/EtO	Agency has not completed review of data.
	HFC–227ea/EtO	Need exposure data.

AEROSOLS

Acceptable Substitutes

End-use	Substitute	Decision	Comments
CFC–11, HCFC–22, HCFC–142b as aerosol propellants.	Saturated light hydrocarbons, C3–C6 (e.g., propane, isobutane, n-butane).	Acceptable	Hydrocarbons are flammable materials. Use with the necessary precautions.
	Dimethyl ether	Acceptable	DME is flammable. Use with the necessary precautions. Blends of DME with HCFCs are subject to section 610 restrictions.
	HFC–152a, HFC–134a, HFC–125.	Acceptable	HFC–134a, HFC–125 and HFC–152a are potential greenhouse gases.
	Alternative processes (pumps, mechanical pressure dispensers, non-spray dispensers).	Acceptable	
	Compressed Gases (Carbon dioxide, air, nitrogen, nitrous oxide).	Acceptable	
CFC–11 as aerosol propellant .	HCFC–22, HCFC–142b	Acceptable	All aerosol propellant uses of HCFC–22 and HCFC–142b are already prohibited as of January 1, 1994 under Section 610 (d) of the Clean Air Act. Only one exemption exists. It is described in the section on aerosol substitutes.

AEROSOLS—Continued

Acceptable Substitutes

End-use	Substitute	Decision	Comments
CFC–11, CFC–113, MCF, HCFC–141b as aerosol solvents.	C6–C20 Petroleum hydrocarbons.	Acceptable ...	Petroleum hydrocarbons are flammable. Use with the necessary precautions. Pesticide aerosols must adhere to FIFRA standards.
	Chlorinated solvents (trichloroethylene, perchloroethylene, methylene chloride).	Acceptable ...	Extensive regulations under other statutes govern use of these chemicals, including VOC standards, workplace standards, waste management standards, and pesticide formulation and handling standards. Should be used only for products where nonflammability is a critical feature.
	Oxygenated organic solvents (esters, ethers, alcohols, ketones).	Acceptable ...	These substitutes are flammable. Use with the necessary precautions.
	Terpenes	Acceptable ...	These substitutes are flammable. Use with the necessary precautions.
	Water-based formulations	Acceptable ...	
CFC–11, CFC–113, MCF as aerosol solvents.	HCFC–141b and its blends	Acceptable ...	All aerosol solvent uses of HCFC–141b, either by itself or blended with other compounds, are already prohibited as of January 1, 1994 under Section 610 (d) of the Clean Air Act. Limited exemptions exist. These are described in the section on aerosol substitutes.

AEROSOLS

Pending Substitutes

End-use	Substitute	Comments
CFC–12 as aerosol propellant.	HFC–227	FDA approval still required in metered dose inhalers. Likely to have low environmental impacts.
CFC–11, CFC–113, MCF, HCFC–141b as aerosol solvents.	Monochlorotoluene/benzotrifluorides	Agency has not yet completed review of data.
	HFC–4310mee	Agency has not completed review of data. Premanufacture Notice review under the Toxic Substances Control Act not yet completed.
	Perfluorocarbons (C6F14)	Agency has not completed review of data.

TOBACCO EXPANSION

Acceptable Substitutes

Application	Substitute	Decision	Conditions	Comments
CFC–11 ..... Tobacco Expansion	Carbon Dioxide	Acceptable .	.....	Carbon dioxide cannot be used as a drop-in or a retrofit, but requires new equipment.
	Propane	Acceptable .	.....	Propane tobacco expansion is a patented process. Flammability may be of concern for workers. Major sources of VOC emissions are subject to the New Source Review (NSR) program under the CAA.

TOBACCO EXPANSION

Pending Substitutes

End-Use	Substitute	Comments
CFC–11 ..... Tobacco Expansion	HFC–227ea	Agency has not completed review of data.

ADHESIVES, COATINGS, AND INKS

Acceptable Substitutes

End-use	Substitute	Decision	Comments
Methyl Chloroform Adhesives, Coatings, and Inks.	Petroleum Hydrocarbons	Acceptable .	OSHA standards exist for many of these chemicals. Formulators should use chemicals with lowest toxicity, where possible.
	Oxygenated solvents (Alcohols, Ketones, Ethers, and Esters).	Acceptable .	OSHA standards exist for many of these chemicals. Formulators should use chemicals with lowest toxicity, where possible.

ADHESIVES, COATINGS, AND INKS—Continued

Acceptable Substitutes

End-use	Substitute	Decision	Comments
	Chlorinated solvents (methylene chloride, trichloro-ethylene, perchloro-ethylene).	Acceptable	High inherent toxicity. Use only when necessary. OSHA and RCRA standards must be met.
	Terpenes	Acceptable	
	Water-based formulations	Acceptable	
	High-solid formulations	Acceptable	
	Alternative technologies (e.g., powder, hot melt, thermoplastic plasma spray, radiation-cured, moisture-cured, chemical-cured, and reactive liquid).	Acceptable	

ADHESIVES, COATINGS, AND INKS

Pending Decisions

Application	Substitute	Comments
Methyl Chloroform Adhesives, Coatings and Inks.	Monochloro-toluene/benzo-trifluorides.	Agency has not completed review of data.

Appendix C to the Preamble

Data Confidentiality Claims

Data Confidentiality Claims

1. Special Requirements for Submitting Data to the Docket

Data submissions must be provided in three copies. If information is claimed as confidential, all CBI must be deleted from the third copy which will become part of the public docket. If no claims of confidentiality are made for the submission, the third copy should be identical to the other two. When portions of the submission are claimed as CBI, the first two copies will include the CBI material as provided in section V of this notice, which shall be deleted from the third copy. For the third copy, the following special preparation is required:

—Remove the "Supplemental Statement of Data Confidentiality Claims."

—Excise from the body of the study any information you claim as confidential. Replace with generic information if it is available.

—Mark the third copy plainly on both its cover and its title page with the phrase "Public Docket Material—contains no information claimed as confidential."

2. Supplemental Statement of Data Confidentiality Claims

For any portion of a submission that is claimed as confidential, the following information must be included within a Supplementary Statement of Data Confidentiality Claims:

—Identify specifically by page and line number(s) each portion of the study for which you claim confidentiality.

—Give the reasons why the cited passage qualifies for confidential treatment.

—Indicate the length of time—until a specific date or event, or permanently—for which the information should be treated as confidential.

—Identify the measures taken to guard against undesired disclosure of this information.

—Describe the extent to which the information has been disclosed, and what precautions have been taken in connection with these disclosures.

—Enclose copies of any determinations of confidentiality made by EPA, other Federal agencies, or courts concerning this information.

—If you assert that disclosure of this information would be likely to result in substantial harmful effects to you, describe those harmful effects and explain why they should be viewed as substantial.

—If you assert that the information is voluntarily submitted, indicate whether you believe disclosure of this information might tend to lessen the availability to EPA of similar information in the future, and if so, how.

If required substantiation is not provided along with the submission of information claimed as confidential, EPA may make the complete submitted information available to the public without further notice to the submitter.

List of Subjects

40 CFR Part 9

Environmental protection, Reporting and recordkeeping requirements.

40 CFR Part 82

Environmental protection, Administrative practice and procedure, Air pollution control, Reporting and recordkeeping requirements.

Dated: February 15, 1994.

Carol M. Browner,

Administrator.

For the reasons set out in the preamble, 40 CFR parts 9 and 82 are amended as follows:

PART 9—OMB APPROVALS UNDER THE PAPERWORK REDUCTION ACT

1. The authority citation for part 9 continues to read as follows:

Authority: 7 U.S.C. 135 *et seq.*, 136–136y; 15 U.S.C. 2001, 2003, 2005, 2006, 2601–2671; 21 U.S.C. 331j, 346a, 348; 31 U.S.C. 9701; 33 U.S.C. 1251 *et seq.*, 1311, 1313d, 1314, 1321, 1326, 1330, 1344, 1345 (d) and (e), 1361; E.O. 11735, 38 FR 21243, 3 CFR, 1971–1975 Comp. p. 973; 42 U.S.C. 241, 242b, 243, 246, 300f, 300g, 300g–1, 300g–2, 300g–3, 300g–4, 300g–5, 300g–6, 300j–1, 300j–2, 300j–3, 300j–4, 300j–9, 1857 *et seq.*, 6901–6992k, 7401–7671q, 7542, 9601–9657, 11023, 11048.

2. Section 9.1 is amended by adding the new entries to the table under the indicated heading to read as follows:

§ 9.1 OMB approvals under the Paperwork Reduction Act.

* * * * *

40 CFR citation	OMB control No.
* * * * *	
Protection of Stratospheric Ozone	
* * * * *	
82.176(a)	2060–0226
82.176(c)(3)	2060–0226
82.178	2060–0226
82.180(a)(5)	2060–0226
82.180(b)(3)	2060–0226
82.184(c)	2060–0226
82.184(e)	2060–0226

* * * * *

PART 82—PROTECTION OF STRATOSPHERIC OZONE

1. The authority citation for part 82 continues to read as follows:

Authority: 42 U.S.C. 7414, 7601, 7671–7671q.

2. Part 82 is amended by adding subpart G consisting of §§ 82.170 through 82.184 to read as follows:

Subpart G—Significant New Alternatives Policy Program

Sec.
82.170 Purpose and scope.
82.172 Definitions.
82.174 Prohibitions.
82.176 Applicability.
82.178 Information required to be submitted.
82.180 Agency review of SNAP submissions.
82.182 Confidentiality of data.
82.184 Petitions.
Appendix A to subpart G—Substitutes Subject to Use Restrictions and Unacceptable Substitutes

Subpart G—Significant New Alternatives Policy Program

§ 82.170 Purpose and scope.

(a) The purpose of these regulations in this subpart is to implement section 612 of the Clean Air Act, as amended, regarding the safe alternatives policy on the acceptability of substitutes for ozone-depleting compounds. This program will henceforth be referred to as the "Significant New Alternatives Policy" (SNAP) program. The objectives of this program are to identify substitutes for ozone-depleting compounds, to evaluate the acceptability of those substitutes, to promote the use of those substitutes believed to present lower overall risks to human health and the environment, relative to the class I and class II compounds being replaced, as well as to other substitutes for the same end-use, and to prohibit the use of those substitutes found, based on the same comparisons, to increase overall risks.

(b) The regulations in this subpart describe persons and substitutes subject to reporting requirements under the SNAP program and explain preparation and submission of notices and petitions on substitutes. The regulations also establish Agency procedures for reviewing and processing EPA's determinations regarding notices and petitions on substitutes. Finally, the regulations prohibit the use of alternatives which EPA has determined may have adverse effects on human health or the environment where EPA has identified alternatives in particular industrial use sectors that on an overall basis, reduce risk to human health and the environment and are currently or potentially available. EPA will only prohibit substitutes where it has identified other substitutes for a specific application that are acceptable and are currently or potentially available.

(c) Notifications, petitions and other materials requested shall be sent to: SNAP Document Control Officer, U.S. Environmental Protection Agency (6205–J), 401 M Street, SW., Washington, DC 20460.

§ 82.172 Definitions.

Act means the Clean Air Act, as amended, 42 U.S.C. 7401 *et seq.*

Agency means the U.S. Environmental Protection Agency.

Application means a specific use within a major industrial sector end-use.

Class I or class II means the specific ozone-depleting compounds described in section 602 of the Act.

Decision means any final determination made by the Agency under section 612 of the Act on the acceptability or unacceptability of a substitute for a class I or II compound.

EPA means the U.S. Environmental Protection Agency.

End-use means processes or classes of specific applications within major industrial sectors where a substitute is used to replace an ozone-depleting substance.

Formulator means any person engaged in the preparation or formulation of a substitute, after chemical manufacture of the substitute or its components, for distribution or use in commerce.

Health and safety study or *study* means any study of any effect of a substitute or its components on health and safety, or the environment or both, including underlying data and epidemiological studies, studies of occupational, ambient, and consumer exposure to a substitute, toxicological, clinical, and ecological, or other studies of a substitute and its components, and any other pertinent test. Chemical identity is always part of a health and safety study. Information which arises as a result of a formal, disciplined study is included in the definition. Also included is information relating to the effects of a substitute or its components on health or the environment. Any available data that bear on the effects of a substitute or its components on health or the environment would be included. Examples include:

(1) Long- and short-term tests of mutagenicity, carcinogenicity, or teratogenicity; data on behavioral disorders; dermatoxicity; pharmacological effects; mammalian absorption, distribution, metabolism, and excretion; cumulative, additive, and synergistic effects; acute, subchronic, and chronic effects; and structure/activity analyses;

(2) Tests for ecological or other environmental effects on invertebrates, fish, or other animals, and plants, including: Acute toxicity tests, chronic toxicity tests, critical life stage tests, behavioral tests, algal growth tests, seed germination tests, microbial function tests, bioconcentration or bioaccumulation tests, and model ecosystem (microcosm) studies;

(3) Assessments of human and environmental exposure, including workplace exposure, and effects of a particular substitute on the environment, including surveys, tests, and studies of: Biological, photochemical, and chemical degradation; air, water and soil transport; biomagnification and bioconcentration; and chemical and physical properties, e.g., atmospheric lifetime, boiling point, vapor pressure, evaporation rates from soil and water, octanol/water partition coefficient, and water solubility;

(4) Monitoring data, when they have been aggregated and analyzed to measure the exposure of humans or the environment to a substitute; and

(5) Any assessments of risk to health or the environment resulting from the manufacture, processing, distribution in commerce, use, or disposal of the substitute or its components.

Importer means any person who imports a chemical substitute into the United States. *Importer* includes the person primarily liable for the payment of any duties on the merchandise or an authorized agent acting on his or her behalf. The term also includes, as appropriate:

(1) The consignee;

(2) The importer of record;

(3) The actual owner; and

(4) The transferee, if the right to draw merchandise in a bonded warehouse has been transferred.

Major Industrial Use Sector or Sector means an industrial category which EPA has reviewed under the SNAP program with historically high consumption patterns of ozone-depleting substances, including: Refrigeration and air conditioning; foam-blowing; fire suppression and explosion protection; solvents cleaning; aerosols; sterilants; tobacco expansion; pesticides; and adhesives, coatings and inks sectors.

Manufacturer means any person engaged in the direct manufacture of a substitute.

Mixture means any mixture or blend of two or more compounds.

Person includes an individual, corporation, partnership, association, state, municipality, political subdivision of a state, and any agency, department, or instrumentality of the United States and any officer, agent, or employee of such entities.

Pesticide has the meaning contained in the Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. 136 *et seq.* and the regulations issued under it.

Potentially available is defined as any alternative for which adequate health, safety, and environmental data, as required for the SNAP notification process, exist to make a determination of acceptability, and which the Agency reasonably believes to be technically feasible, even if not all testing has yet been completed and the alternative is not yet produced or sold.

Premanufacture Notice (PMN) Program has the meaning described in 40 CFR part 720, subpart A promulgated under the Toxic Substances Control Act, 15 U.S.C. 2601 *et seq.*

Producer means any person who manufactures, formulates or otherwise creates a substitute in its final form for distribution or use in interstate commerce.

Research and development means quantities of a substitute manufactured, imported, or processed or proposed to be manufactured, imported, or processed solely for research and development.

Residential use means use by a private individual of a chemical substance or any product containing the chemical substance in or around a permanent or temporary household, during recreation, or for any personal use or enjoyment. Use within a household for commercial or medical applications is not included in this definition, nor is use in automobiles, watercraft, or aircraft.

Significant new use means use of a new or existing substitute in a major industrial use sector as a result of the phaseout of ozone-depleting compounds.

Small uses means any use of a substitute in a sector other than a major industrial use sector, or production by any producer for use of a substitute in a major industrial sector of 10,000 lbs. or less per year.

Substitute or alternative means any chemical, product substitute, or alternative manufacturing process, whether existing or new, intended for use as a replacement for a class I or II compound.

Test marketing means the distribution in interstate commerce of a substitute to no more than a limited, defined number of potential customers to explore market viability in a competitive situation. Testing must be restricted to a defined testing period before the broader distribution of that substitute in interstate commerce.

Use means any use of a substitute for a Class I or Class II ozone-depleting compound, including but not limited to use in a manufacturing process or product, in consumption by the end-user, or in intermediate uses, such as formulation or packaging for other subsequent uses.

Use Restrictions means restrictions on the use of a substitute imposing either conditions on how the substitute can be used across a sector end-use or limits on the end-uses or specific applications where it can be used within a sector.

§ 82.174 Prohibitions.

(a) No person may introduce a new substitute into interstate commerce before the expiration of 90 days after a notice is initially submitted to EPA under § 82.176(a).

(b) No person may use a substitute which a person knows or has reason to know was manufactured, processed or imported in violation of the regulations in this subpart, or knows or has reason to know was manufactured, processed or imported in violation of any use restriction in the acceptability determination, after the effective date of any rulemaking imposing such restrictions.

(c) No person may use a substitute without adhering to any use restrictions set by the acceptability decision, after the effective date of any rulemaking imposing such restrictions.

(d) No person may use a substitute after the effective date of any rulemaking adding such substitute to the list of unacceptable substitutes.

§ 82.176 Applicability.

(a) Any producer of a new substitute must submit a notice of intent to introduce a substitute into interstate commerce 90 days prior to such introduction. Any producer of an existing substitute already in interstate commerce must submit a notice as of July 18, 1994 if such substitute has not already been reviewed and approved by the Agency.

(b) With respect to the following substitutes, producers are exempt from notification requirements: (1) *Substitutes already listed as acceptable.* Producers need not submit notices on substitutes that are already listed as acceptable under SNAP.

(2) *Small sectors.* Persons using substitutes in sectors other than the nine principal sectors reviewed under this program are exempt from the notification requirements. This exemption shall not be construed to nullify an unacceptability determination or to allow use of an otherwise unacceptable substitute.

(3) *Small volume use within SNAP sectors.* Within the nine principal SNAP sectors, persons introducing a substitute whose expected volume of use amounts to less than 10,000 lbs. per year within a SNAP sector are exempt from notification requirements. This exemption shall not be construed to allow use of an otherwise unacceptable substitute in any quantity. Persons taking advantage of this exemption for small uses must maintain documentation for each substitute describing how the substitute meets this small use definition. This documentation must include annual production and sales information by sector.

(4) *Research and development.* Production of substitutes for the sole purpose of research and development is exempt from reporting requirements.

(5) *Test marketing.* Use of substitutes for the sole purpose of test marketing is exempt from SNAP notification requirements until 90 days prior to the introduction of such substitutes for full-scale commercial sale in interstate commerce. Persons taking advantage of this exemption are, however, required to notify the Agency in writing that they are conducting test marketing 30 days prior to the commencement of such marketing. Notification shall include the name of the substitute, the volume used in the test marketing, intended sector end-uses, and expected duration of the test marketing period.

(6) *Formulation changes.* In cases where replacement of class I or II compounds causes formulators to change other components in a product, formulators are exempt from reporting with respect to these auxiliary formulation changes. However, the

SNAP submitter is required to notify the Agency if such changes are expected to significantly increase the environmental and human health risk associated with the use of any class I or class II substitute.

(7) *Substitutes used as feedstocks.* Producers of substitutes used as feedstocks which are largely or entirely consumed, transformed or destroyed in the manufacturing or use process are exempt from reporting requirements concerning such substitutes.

(c) Use of a substitute in the possession of an end-user as of March 18, 1994 listed as unacceptable or acceptable subject to narrowed use limits may continue until the individual end-users' existing supply, as of that date, of the substitute is exhausted. Use of substitutes purchased after March 18, 1994 is not permitted subsequent to April 18, 1994.

§ 82.178 Information required to be submitted.

(a) Persons whose substitutes are subject to reporting requirements pursuant to § 82.176 must provide the following information:

(1) *Name and description of the substitute.* The substitute should be identified by its: Chemical name; trade name(s); identification numbers; chemical formula; and chemical structure.

(2) *Physical and chemical information.* The substitute should be characterized by its key properties including but not limited to: Molecular weight; physical state; melting point; boiling point; density; taste and/or odor threshold; solubility; partition coefficients (Log K_{ow}, Log K_{oc}); atmospheric lifetime and vapor pressure.

(3) *Substitute applications.* Identification of the applications within each sector end-use in which the substitutes are likely to be used.

(4) *Process description.* For each application identified, descriptive data on processing, including in-place pollution controls.

(5) *Ozone depletion potential.* The predicted 100-year ozone depletion potential (ODP) of substitute chemicals. The submitter must also provide supporting documentation or references.

(6) *Global warming impacts.* Data on the total global warming potential of the substitute, including information on the GWP index and the indirect contributions to global warming caused by the production or use of the substitute (e.g., changes in energy efficiency). GWP must be calculated over a 100, 500 and 1000-year integrated time horizon.

(7) *Toxicity data.* Health and safety studies on the effects of a substitute, its components, its impurities, and its degradation products on any organism (e.g., humans, mammals, fish, wildlife, and plants). For tests on mammals, the Agency requires a minimum submission of the following tests to characterize substitute risks: A range-finding study that considers the appropriate exposure pathway for the specific use (e.g., oral ingestion, inhalation, etc.), and a 90-day subchronic repeated dose study in an appropriate rodent species. For certain substitutes, a cardiotoxicity study is also required. Additional mammalian toxicity tests may be identified based on the substitute and application in question. To sufficiently characterize aquatic toxicity concerns, both acute and chronic toxicity data for a variety of species are required. For this purpose, the Agency requires a minimum data set as described in "Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and their Uses," which is available through the National Technical Information Service (#PB 85–227049). Other relevant information and data summaries, such as the Material Safety Data Sheets (MSDS), should also be submitted. To assist in locating any studies previously submitted to EPA and referred to, but not included in a SNAP submission, the submitter must provide citations for the date, type of submission, and EPA Office to which they were submitted, to help EPA locate these quickly.

(8) *Environmental Fate and Transport.* Where available, information must be submitted on the environmental fate and transport of substitutes. Such data shall include information on bioaccumulation, biodegradation, adsorption, volatility, transformation, and other data necessary to characterize movement and reaction of substitutes in the environment.

(9) *Flammability.* Data on the flammability of a substitute chemical or mixture are required. Specifically, the flash point and flammability limits are needed, as well as information on the procedures used for determining the flammability limits. Testing of blends should identify the compositions for which the blend itself is flammable and include fractionation data on changes in the composition of the blend during various leak scenarios. For substitutes that will be used in consumer applications, documentation of testing results conducted by independent laboratories should be submitted, where available. If a substitute is flammable, the submitter must analyze the risk of fire resulting from the use of such a substitute and assess the effectiveness of measures to minimize such risk.

(10) *Exposure data.* Available modeling or monitoring data on exposures associated with the manufacture, formulation, transport, use and disposal of a substitute. Descriptive process information for each substitute application, as described above, will be used to develop exposure estimates where exposure data are not readily available. Depending on the application, exposure profiles may be needed for workers, consumers, and the general population.

(11) *Environmental release data.* Data on emissions from the substitute application and equipment, as well as on pollutant releases or discharge to all environmental media. Submitters should provide information on release locations, and data on the quantities, including volume, of anticipated waste associated with the use of the substitute. In addition, information on anticipated waste management practices associated with the use of the substitute. Any available information on any pollution controls used or that could be used in association with the substitute (e.g., emissions reduction technologies, wastewater treatment, treatment of hazardous waste) and the costs of such technology must also be submitted.

(12) *Replacement ratio for a chemical substitute.* Information on the replacement ratio for a chemical substitute versus the class I or II substances being replaced. The term "replacement ratio" means how much of a substitute must be used to replace a given quantity of the class I or II substance being replaced.

(13) *Required changes in use technology.* Detail on the changes in technology needed to use the alternative. Such information should include a description of whether the substitute can be used in existing equipment—with or without some retrofit—or only in new equipment. Data on the cost (capital and operating expenditures) and estimated life of any technology modifications should also be submitted.

(14) *Cost of substitute.* Data on the expected average cost of the alternative. In addition, information is needed on the expected equipment lifetime for an alternative technology. Other critical cost considerations should be identified, as appropriate.

(15) *Availability of substitute.* If the substitute is not currently available, the timing of availability of a substitute should be provided.

(16) *Anticipated market share.* Data on the anticipated near-term and long-term nationwide substitute sales.

(17) *Applicable regulations under other environmental statutes.* Information on whether the substitute is regulated under other statutory authorities, in particular the Clean Water Act, Safe Drinking Water Act, the Resource Conservation and Recovery Act, the Federal Insecticide, Fungicide, and Rodenticide Act, the Toxic Substances Control Act, the Comprehensive Environmental Response, Compensation and Liability Act, the Emergency Planning and Community Right-to-Know Act, or other titles under the Clean Air Act.

(18) *Information already submitted to the Agency.* Information requested in the SNAP program notice that has been previously submitted to the Agency as part of past regulatory and information-gathering activities may be referenced rather than resubmitted. Submitters who cannot provide accurate references to data sent previously to the Agency should include all requested information in the SNAP notice.

(19) *Information already available in the literature.* If any of the data needed to complete the SNAP program notice are available in the public literature, complete references for such information should be provided.

(b) The Significant New Alternatives Policy (SNAP) Information Notice is designed to provide the Agency with the information necessary to reach a decision on the acceptability of a substitute. (1) Submitters requesting review under the SNAP program should send the completed SNAP notice to: SNAP Document Control Officer, U.S. Environmental Protection Agency (6205–J), 401 M Street, SW., Washington, DC 20460.

(2) Submitters filing jointly under SNAP and the Premanufacture Notice Program (PMN) should send the SNAP addendum along with the PMN form to: PMN Document Control Officer, U.S. Environmental Protection Agency (7407), 401 M Street, SW., Washington, DC 20460. Submitters must also send both documents to the SNAP program, with a reference to indicate the notice has been furnished to the Agency under the PMN program. Submitters providing information on new chemicals for joint review under the TSCA and SNAP programs may be required to supply additional toxicity data under TSCA section 5.

(3) Submitters filing jointly under SNAP and under the Federal Insecticide, Fungicide, and Rodenticide Act should send the SNAP form to the Office of Pesticide Programs, Registration Division, (7505C) 401 M Street, SW., Washington, DC, 20460, as well as to the SNAP Document Control Officer.

§ 82.180 Agency review of SNAP submissions.

(a) *Processing of SNAP notices.* (1) *90–day review process.* The 90-day review process will begin once EPA receives a submission and determines that such submission includes data on the substitute that are complete and adequate, as described in § 82.178. The Agency may suspend or extend the review period to allow for submission of additional data needed to complete the review of the notice.

(2) *Initial review of notice.* The SNAP Document Control Officer will review the notice to ensure that basic information necessary to process the submission is present (i.e., name of company, identification of substitute, etc.). The SNAP Document Control Officer will also review substantiation of any claim of confidentiality.

(3) *Determination of data adequacy.* Upon receipt of the SNAP submission, the Agency will review the completeness of the information supporting the application. If additional data are needed, the submitter will be contacted following completion of this review. The 90-day review period will not commence until EPA has received data it judges adequate to support analysis of the submission.

(4) *Letter of receipt.* The SNAP Document Control Officer will send a letter of receipt to the submitter to confirm the date of notification and the beginning of EPA's 90-day review period. The SNAP Document Control Officer will also assign the SNAP notice a tracking number, which will be identified in the letter of receipt.

(5) *Availability of new information during review period.* If critical new information becomes available during the review period that may influence the Agency's evaluation of a substitute, the submitter must notify the Agency about the existence of such information within 10 days of learning of such data. The submitter must also inform the Agency of new studies underway, even if the results will not be available within the 90-day review period. The Agency may contact the submitter to explore extending or suspending the review period depending on the type of information received and the stage of review.

(6) *Completion of detailed review.* Once the initial data review, described in paragraphs (a)(2) and (3) of this section, has been completed, the Agency will complete a detailed evaluation of the notice. If during any time the Agency perceives a lack of information necessary to reach a SNAP determination, it will contact the submitter and request the missing data.

(7) *Criteria for review.* To determine whether a substitute is acceptable or unacceptable as a replacement for class I or II compounds, the Agency will evaluate:

(i) Atmospheric effects and related health and environmental impacts;

(ii) General population risks from ambient exposure to compounds with direct toxicity and to increased ground-level ozone;

(iii) Ecosystem risks;

(iv) Occupational risks;

(v) Consumer risks;

(vi) Flammability; and

(vii) Cost and availability of the substitute.

(8) *Communication of decision.* (i) *Communication of decision to the submitter.* Once the SNAP program review has been completed, the Agency will notify the submitter in writing of the decision. Sale or manufacture of new substitutes may commence after the initial 90-day notification period expires even if the Agency fails to reach a decision within the 90-day review period or fails to communicate that decision or the need for additional data to the submitter. Sale or manufacture of existing substitutes may continue throughout the Agency's 90-day review.

(ii) *Communication of Decision to the Public.* The Agency will publish in the **Federal Register** on a quarterly basis a complete list of the acceptable and unacceptable alternatives that have been reviewed to date. In the case of substitutes proposed as acceptable with use restrictions, proposed as unacceptable or proposed for removal from either list, a rulemaking process will ensue. Upon completion of such rulemaking, EPA will publish revised lists of substitutes acceptable subject to use conditions or narrowed use limits and unacceptable substitutes to be incorporated into the Code of Federal Regulations. (See appendix A of this subpart.)

(b) *Types of listing decisions.* When reviewing substitutes, the Agency will list substitutes in one of five categories:

(1) *Acceptable.* Where the Agency has reviewed a substitute and found no reason to prohibit its use, it will list the alternative as acceptable for the end-uses listed in the notice.

(2) *Acceptable subject to use conditions.* After reviewing a notice, the Agency may make a determination that a substitute is acceptable only if conditions of use are met to minimize risks to human health and the environment. Where users intending to adopt a substitute acceptable subject to

use conditions must make reasonable efforts to ascertain that other alternatives are not feasible due to safety, performance or technical reasons, documentation of this assessment must be retained on file for the purpose of demonstrating compliance. This documentation shall include descriptions of substitutes examined and rejected, processes or products in which the substitute is needed, reason for rejection of other alternatives, e.g., performance, technical or safety standards. Use of such substitutes in ways that are inconsistent with such use conditions renders them unacceptable.

(3) *Acceptable subject to narrowed use limits.* Even though the Agency can restrict the use of a substitute based on the potential for adverse effects, it may be necessary to permit a narrowed range of use within a sector end-use because of the lack of alternatives for specialized applications. Users intending to adopt a substitute acceptable with narrowed use limits must ascertain that other alternatives are not technically feasible. Companies must document the results of their evaluation, and retain the results on file for the purpose of demonstrating compliance. This documentation shall include descriptions of substitutes examined and rejected, processes or products in which the substitute is needed, reason for rejection of other alternatives, e.g., performance, technical or safety standards, and the anticipated date other substitutes will be available and projected time for switching to other available substitutes. Use of such substitutes in applications and end-uses which are not specified as acceptable in the narrowed use limit renders them unacceptable.

(4) *Unacceptable.* This designation will apply to substitutes where the Agency's review indicates that the substitute poses risk of adverse effects to human health and the environment and that other alternatives exist that reduce overall risk.

(5) *Pending.* Submissions for which the Agency has not reached a determination will be described as pending. For all substitutes in this category, the Agency will work with the submitter to obtain any missing information and to determine a schedule for providing the missing information if the Agency wishes to extend the 90-day review period. EPA will use the authority under section 114 of the Clean Air Act to gather this information, if necessary. In some instances, the Agency may also explore using additional statutory provisions (e.g., section 5 of TSCA) to collect the needed data.

(c) *Joint processing under SNAP and TSCA.* The Agency will coordinate reviews of substitutes submitted for evaluation under both the TSCA PMN program and the CAA.

(d) *Joint processing under SNAP and FIFRA.* The Agency will coordinate reviews of substitutes submitted for evaluation under both FIFRA and the CAA.

§ 82.182 Confidentiality of data.

(a) *Clean Air Act provisions.* Anyone submitting information must assert a claim of confidentiality at the time of submission for any data they wish to have treated as confidential business information (CBI) under 40 CFR part 2, subpart B. Failure to assert a claim of confidentiality at the time of submission may result in disclosure of the information by the Agency without further notice to the submitter. The submitter should also be aware that under section 114(c), emissions data may not be claimed as confidential.

(b) *Substantiation of confidentiality claims.* At the time of submission, EPA requires substantiation of any confidentiality claims made. Failure to provide any substantiation may result in disclosure of information without further notice by the Agency. All submissions must include adequate substantiation in order for an acceptability determination on a substitute to be published. Moreover, under 40 CFR part 2, subpart B, there are further instances in which confidentiality assertions may later be reviewed even when confidentiality claims are initially received. The submitter will also be contacted as part of such an evaluation process.

(c) *Confidentiality provisions for toxicity data.* In the event that toxicity or health and safety studies are listed as confidential, this information cannot be maintained as confidential where such data are also submitted under TSCA or FIFRA, to the extent that confidential treatment is prohibited under those statutes. However, information contained in a toxicity study that is not health and safety data and is not relevant to the effects of a substance on human health and the environment (e.g., discussion of process information, proprietary blends) can be maintained as confidential subject to 40 CFR part 2, subpart B.

(d) *Joint submissions under other statutes.* Information submitted as part of a joint submission to either SNAP/TSCA or SNAP/FIFRA must adhere to the security provisions of the program offices implementing these statutes. For such submissions, the SNAP handling of such notices will follow the security provisions under these statutes.

§ 82.184 Petitions.

(a) *Who may petition.* Any person may petition the Agency to amend existing listing decisions under the SNAP program, or to add a new substance to any of the SNAP lists.

(b) *Types of petitions.* Five types of petitions exist: (1) Petitions to add a substitute not previously reviewed under the SNAP program to the acceptable list. This type of petition is comparable to the 90-day notifications, except that it would generally be initiated by entities other than the companies that manufacture, formulate, or otherwise use the substitute. Companies that manufacture, formulate, or use substitutes that want to have their substitutes added to the acceptable list should submit information on the substitute under the 90-day review program;

(2) Petitions to add a substitute not previously reviewed under the SNAP program to the unacceptable list;

(3) Petitions to delete a substitute from the acceptable list and add it to the unacceptable list or to delete a substitute from the unacceptable and add it to the acceptable list;

(4) Petitions to add or delete use restrictions on an acceptability listing.

(5) Petitions to grandfather use of a substitute listed as unacceptable or acceptable subject to use restrictions.

(c) *Content of the petition.* The Agency requires that the petitioner submit information on the type of action requested and the rationale for the petition. Petitions in paragraphs (b)(1) and (2) of this section must contain the information described in § 82.178, which lists the items to be submitted in a 90-day notification. For petitions that request the re-examination of a substitute previously reviewed under the SNAP program, the submitter must also reference the prior submittal or existing listing. Petitions to grandfather use of an unacceptable substitute must describe the applicability of the test to judge the appropriateness of Agency grandfathering as established by the United States District Court for the District of Columbia Circuit (see *Sierra Club* v. *EPA*, 719 F.2d 436 (D.C. Cir. 1983)). This test includes whether the new rule represents an abrupt departure from previously established practice, the extent to which a party relied on the previous rule, the degree of burden which application of the new rule would impose on the party, and the statutory interest in applying the new rule immediately.

(d) *Petition process.* (1) Notification of Affected Companies. If the petition concerns a substitute previously either approved or restricted under the SNAP program, the Agency will contact the original submitter of that substitute.

(2) *Review for data adequacy.* The Agency will review the petition for adequacy of data. As with a 90-day notice, the Agency may suspend review until the petitioner submits the information necessary to evaluate the petition. To reach a timely decision on substitutes, EPA may use collection authorities such as those contained in section 114 of the Clean Air Act as amended, as well as information collection provisions of other environmental statutes.

(3) *Review procedures.* To evaluate the petition, the Agency may submit the petition for review to appropriate experts inside and outside the Agency.

(4) *Timing of determinations.* If data are adequate, as described in § 82.180, the Agency will respond to the petition within 90 days of receiving a complete petition. If the petition is inadequately supported, the Agency will query the petitioner to fill any data gaps before the 90-day review period begins, or may deny the petition because data are inadequate.

(5) *Rulemaking procedures.* EPA will initiate rulemaking whenever EPA grants a petition to add a substance to the list of unacceptable substitutes, remove a substance from any list, or change or create an acceptable listing by imposing or deleting use conditions or use limits.

(6) *Communication of decision.* The Agency will inform petitioners within 90 days of receiving a complete petition whether their request has been granted or denied. If a petition is denied, the Agency will publish in the **Federal Register** an explanation of the determination. If a petition is granted, the Agency will publish the revised SNAP list incorporating the final petition decision within 6 months of reaching a determination or in the next scheduled update, if sooner, provided any required rulemaking has been completed within the shorter period.

Appendix A to Subpart G—Substitutes Subject to Use Restrictions and Unacceptable Substitutes

REFRIGERANTS

Unacceptable Substitutes

End-use	Substitute	Decision	Comments
CFC–11 centrifugal chillers (retrofit).	HCFC–141b	Unacceptable	Has a high ODP relative to other alternatives.
CFC–12 centrifugal chillers (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can used safely in this end-use.
CFC–11, CFC–12, CFC–113, CFC–114, R–500 centrifugal chillers (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocabon blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
	HCFC–141b	Unacceptable	Has a high ODP relative to other alternatives.
CFC–12 reciprocating chillers (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12 reciprocating chillers (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–11, CFC–12, R–502 industrial process refrigeration (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
CFC–11, CFC–12, R–502 industrial process refrigeration (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
CFC–12, R–502 ice skating rinks (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–502 ice skating rinks (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–502 cold storage warehouses (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.

REFRIGERANTS—Continued

Unacceptable Substitutes

End-use	Substitute	Decision	Comments
CFC–12, R–502 cold storage warehouses (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–500, R–502 refrigerated transport (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–500, R–502 refrigerated transport (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–502 retail food refrigeration (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–502 retail food refrigeration (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–502 commercial ice machines (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12, R–502 commercial ice machines (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12 vending machines (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFC–12 vending machines (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFR–12, water coolers (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFR–12, water coolers (New equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFR–12, household refrigerators (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFR–12, household refrigerators (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.

REFRIGERANTS—Continued

Unacceptable Substitutes

End-use	Substitute	Decision	Comments
CFR–12, R–502 household freezers (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFR–12, 502 household freezers (new equipment/ NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFR–12, R–500 residential dehumidifiers (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFR–12, R–500 residential dehumidifiers (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFR–12, motor vehicle air conditioners (retrofit).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be used safely in this end-use.
CFR–12, motor vehicle air conditioners (new equipment/NIKs).	HCFC–22/HFC–142b/CFC–12	Unacceptable ..	As a blend of both Class I and Class II substances, it has a higher ODP than use of Class II substances.
	Hydrocarbon blend A	Unacceptable ..	Flammability is a serious concern. Data have not been submitted to demonstrate it can be sued safely in this end-use.

FOAMS

Unacceptable Substitutes

End-use	Substitute	Decision	Comments
CFC–11 Polyolefin	HCFC–141b (or blends thereof).	Unacceptable	HCFC–141b has an ODP of 0.11, almost equivalent to that of methyl chloroform, a Class I substance. The Agency believes that non-ODP alternatives are sufficiently available to render the use of HCFC–141b unnecessary in polyolefin foams.

SUBSTITUTES ACCEPTABLE SUBJECT TO NARROWED USE LIMITS

End-use	Substitute	Decision	Comments
Electronics cleaning w/ CFC–113, MCF.	Perfluoro-carbons (C5F12, C6F12, C6F14, C7F16, C8F18, C5F11NO, C6F13NO, C7F15NO, and C8F16).	Acceptable for high-performance, precision-engineered applications only where reasonable efforts have been made to ascertain that other alternatives are not technically feasible due to performance or safety requirements.	The principal environmental characteristic of concern for PFCs is that they have long atmospheric lifetimes and high global warming potentials. Although actual contributions to global warming depend upon the quantities of PFCs emitted, the effects are for practical purposes irreversible. Users must observe this limitation on PFC acceptability by conducting a reasonable evaluation of other substitutes to determine that PFC use is necessary to meet performance or safety requirements. Documentation of this evaluation must be kept on file. For additional guidance regarding applications in which PFCs may be appropriate, users should consult the Preamble for this rulemaking.
Precision cleaning w/CFC–113, MCF.	Perfluoro-carbons (C5F12, C6F12, C6F14, C7F16, C8F18, C5F11NO, C6F13NO, C7F15NO, and C8F16).	Acceptable for high-performance, precision-engineered applications only where reasonable efforts have been made to ascertain that other alternatives are not technically feasible due to performance or safety requirements.	The principal environmental characteristic of concern for PFCs is that they have long atmospheric lifetimes and high global warming potentials. Although actual contributions to global warming depend upon the quantities of PFCs emitted, the effects are for practical purposes irreversible. Users must observe this limitation on PFC acceptability by conducting a reasonable evaluation of other substitutes to determine that PFC use is necessary to meet performance or safety requirements. Documentation of this evaluation must be kept on file. For additional guidance regarding applications in which PFCs may be appropriate, users should consult the Preamble for this rulemaking.

UNACCEPTABLE SUBSTITUTES

End-use	Substitute	Decision	Comments
Metals cleaning w/CFC–113 ..	HCFC 141b and its blends	Unacceptable	High ODP; other alternatives exist. Effective date: As of 30 days after final rule for uses in new equipment (including retrofits made after the effective date); as of January 1, 1996 for uses in existing equipment. EPA will grant, if necessary, narrowed use acceptability listings for CFC–113 past the effective date of the prohibition.
Metals cleaning w/MCF	HCFC 141b and its blends	Unacceptable	High ODP; other alternatives exist. Effective date: As of 30 days after final rule for uses in new equipment (including retrofits made after the effective date); as of January 1, 1996 for uses in existing equipment.
Electronics cleaning w/CFC–113.	HCFC 141b and its blends	Unacceptable	High ODP; other alternatives exist. Effective date: As of 30 days after final rule for uses in new equipment (including retrofits made after the effective date); as of January 1, 1996 for uses in existing equipment. EPA will grant, if necessary, narrowed use acceptability listings for CFC–113 past the effective date of the prohibition.
Electronics cleaning w/MCF ...	HCFC 141b and its blends	Unacceptable	High ODP; other alternatives exist. Effective date: As of 30 days after final rule for uses in new equipment (including retrofits made after the effective date); as of January 1, 1996 for uses in existing equipment.
Precision cleaning w/CFC–113.	HCFC 141b and its blends	Unacceptable	High ODP; other alternatives exist. Effective date: As of 30 days after final rule for uses in new equipment (including retrofits made after the effective date); as of January 1, 1996 for uses in existing equipment. EPA will grant, if necessary, narrowed use acceptability listings for CFC–113 past the effective date of the prohibition.
Precision cleaning w/MCF	HCFC 141b and its blends	Unacceptable	High ODP; other alternatives exist. Effective date: As of 30 days after final rule for uses in new equipment (including retrofits made after the effective date); as of January 1, 1996 for uses in existing equipment.

FIRE SUPPRESSION AND EXPLOSION PROTECTION STREAMING AGENTS

Substitutes Acceptable Subject to Narrowed Use Limits

End-use	Substitute	Decision	Conditions	Comments
Halon 1211 Streaming Agents.	[CFC Blend]	Acceptable in nonresidential uses only.	.....	Use of CFCs are controlled under CAA section 610 which bans use of CFCs in pressurized dispensers, and therefore are not permitted for use in portable fire extinguishers. EPA will list this agent as proposed unacceptable in the next SNAP proposed rulemaking. Because CFCs are a Class I substance, production will be phased out by January 1, 1996. See additional comments 1, 2.
	HBFC–22B1	.....	Acceptable in nonresidential uses only.	Proper procedures regarding the operation of the extinguisher and ventilation following dispensing the extinguishant is recommended. Worker exposure may be a concern in small office areas. HBFC–22B1 is considered an interim substitute for Halon 1211. Because the HBFC–22B1 has an ODP of .74, production will be phased out (except for essential uses) on January 1, 1996. This agent was submitted to the Agency as a Premanufacture Notice (PMN) and is presently subject to requirements contained in a Toxic Substance Control Act (TSCA) Consent Order. See additional comments 1, 2.
	C_6F_{14}	Acceptable for nonresidential uses where other alternatives are not technically feasible due to performance or safety requirements:	.....	Users must observe the limitations on PFC acceptability by making reasonable effort to undertake the following measures: (i) conduct an evaluation of foreseeable conditions of end use; (ii) determine that the physical or chemical properties or other technical constraints of the other available agents preclude their use; and
		a. due to the physical or chemical properties of the agent, or.	.....	(iii) determine that human exposure to the other alternative extinguishing agents may approach or result in cardiosensitization or other unacceptable toxicity effects under normal operating conditions; Documentation of such measures must be available for review upon request.
		b. where human exposure to the extinguishing agent may approach cardiosensitization levels or result in other unacceptable health effects under normal operating conditions.	.....	The principal environmental characteristic of concern for PFCs is that they have high GWPs and long atmospheric lifetimes. Actual contributions to global warming depend upon the quantities of PFCs emitted. For additional guidance regarding applications in which PFCs may be appropriate, users should consult the description of potential uses which is included in the preamble to this rulemaking. See additional comments 1, 2.

Additional Comments:

1—Discharge testing and training should be strictly limited only to that which is essential to meet safety or performance requirements.

2—The agent should be recovered from the fire protection system in conjunction with testing or servicing, and recycled for later use or destroyed.

FIRE SUPPRESSION AND EXPLOSION PROTECTION STREAMING AGENTS

Unacceptable Substitutes

End-use	Substitute	Decision	Comments
Halon 1211 Streaming Agents	[CFC–11]	Unacceptable	This agent has been suggested for use on large outdoor fires for which non-ozone depleting alternatives are currently used.

FIRE SUPPRESSION AND EXPLOSION PROTECTION TOTAL FLOODING AGENTS

Substitutes Acceptable Subject To Use Conditions

End-use	Substitute	Decision	Conditions	Comments
Halon 1301 Total Flooding Agents.	HBFC–22B1	Acceptable	Until OSHA establishes applicable workplace requirements:	The comparative design concentration based on cup burner values is approximately 5.3%, while its cardiotoxic LOAEL is 1%. Thus, it is unlikely that this agent will be used in normally occupied areas.
			Where egress from an area cannot be accomplished within one minute, the employer shall not use this agent in concentrations exceeding its cardiotoxic NOAEL of 0.3%	HBFC–22B1 can be considered only an interim substitute for Halon 1301. HBFC–22B1 has an ODP of .74; thus, production will be phased out January 1, 1996.
			Where egress takes longer than 30 seconds but less than one minute, the employer shall not use the agent in a concentration greater than its cardiotoxic LOAEL of 1.0%.	This agent was submitted to the Agency as a Premanufacture Notice (PMN) and is presently subject to requirements contained in a Toxic Substance Control Act (TSCA) Consent Order.
			HBFC–22B1 concentrations greater than 1.0% are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.	See additional comments 1, 2, 3, 4.
	HCFC–22	Acceptable	Until OSHA establishes applicable workplace requirements:	The comparative design concentration based on cup burner values is approximately 13.9% while its cardiotoxic LOAEL is 5.0%. Thus, it is unlikely that this agent will be used in normally occupied areas.
			Where egress from an area cannot be accomplished within one minute, the employer shall not use this agent in concentrations exceeding its cardiotoxic NOAEL of 2.5%.	See additional comments 1, 2, 3, 4.
			Where egress takes longer than 30 seconds but less than one minute, the employer shall not use the agent in a concentration greater than its cardiotoxic LOAEL of 5.0%.	
			HCFC–22 concentrations greater than 5.0% are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.	
	HCFC–124	Acceptable	Until OSHA establishes applicable workplace requirements:	The comparative design concentration based on cup burner values is approximately 8.4% while its cardiotoxic LOAEL is 2.5%. Thus, it is unlikely that this agent will be used in normally occupied areas.
			Where egress from an area cannot be accomplished within one minute, the employer shall not use this agent in concentrations exceeding its cardiotoxic NOAEL of 1.0%.	See additional comments 1, 2, 3, 4.
			Where egress takes longer than 30 seconds but less than one minute, the employer shall not use the agent in a concentration greater than its cardiotoxic LOAEL OF 2.5%.	
			HCFC–123 concentrations greater than 2.5% are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.	

FIRE SUPPRESSION AND EXPLOSION PROTECTION TOTAL FLOODING AGENTS—Continued

Substitutes Acceptable Subject To Use Conditions

End-use	Substitute	Decision	Conditions	Comments
	[HCFC BLEND] A ..	Acceptable	Until OSHA establishes applicable workplace requirements: Where egress from an area cannot be accomplished within one minute, the employer shall not use [HCFC Blend] A in concentrations exceeding its cardiotoxic NOAEL of 10.0%. Where egress takes greater than 30 seconds but less than one minute, the employer shall not use [HCFC Blend] A in a concentration greater than its cardiotoxic LOAEL of 10.0%. [HCFC Blend] A concentrations greater than 10 percent are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.	The comparative design concentration based on full-scale testing is approximately 8.6%. The agent should be recovered from the fire protection system in conjunction with testing or servicing, and should be recycled for later use or destroyed. See additional comments 1, 2, 3, 4.
	HFC–23	Acceptable	Until OSHA establishes applicable workplace requirements: Where egress from an area cannot be accomplished within one minute, the employer shall not use HFC–23 in concentrations exceeding 30%. Where egress takes greater than 30 seconds but less than one minute, the employer shall not use HFC–23 in a concentration greater than 50.0%. HFC–23 concentrations greater than 50 percent are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge. The design concentration must result in an oxygen level of at least 16%.	The comparative design concentration based on cup burner values is approximately 14.4% while data indicates that its cardiotoxicity NOAEL is 30% without added oxygen and 50% with added oxygen. Its LOAEL is likely to exceed 50%. See additional comments 1, 2, 3, 4.
	HFC–125	Acceptable	Until OSHA establishes applicable workplace requirements: Where egress from an area cannot be accomplished within one minute, the employer shall not use this agent in concentrations exceeding its cardiotoxic NOAEL of 7.5%. Where egress takes longer than 30 seconds but less than one minute, the employer shall not use the agent in a concentration greater than its cadiotoxic LOAEL of 10.0%. HFC–125 concentrations greater than 10.0% are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.	The comparative design concentration based on cup burner values is approximately 11.3% while its cardiotoxic LOAEL is 10.0%. Thus, it is unlikely that this agent will be used in normally occupied areas. See additional comments 1, 2, 3, 4.

FIRE SUPPRESSION AND EXPLOSION PROTECTION TOTAL FLOODING AGENTS—Continued

Substitutes Acceptable Subject To Use Conditions

End-use	Substitute	Decision	Conditions	Comments
	HFC–134a	Acceptable	Until OSHA establishes applicable workplace requirements: Where egress from an area cannot be accomplished within one minute, the employer shall not use this agent in concentrations exceeding its cardiotoxic NOAEL of 4.0%. Where egress takes longer than 30 seconds but less than one minute, the employer shall not use the agent in a concentration greater than its cardiotoxic LOAEL of 8.0%. HFC–134a concentrations greater than 8.0% are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.	The comparative design concentration based on cup burner values is approximately 12.6% while its cardiotoxic LOAEL is 8.0%. Thus, it is unlikely that this agent will be used in normally occupied areas. See additional comments 1, 2, 3, 4.
	HFC–227ea	Acceptable	Until OSHA establishes applicable workplace requirements:. Where egress from an area cannot be accomplished within one minute, the employer shall not use HFC–227ea in concentrations exceeding its cardiotoxic NOAEL of 9.0%. Where egress takes longer than 30 seconds but less than one minute, the employer shall not use the agent in a concentration greater than its cardiotoxic LOAEL of 10.5%. HFC–227ea concentrations greater than 10.5% are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.	The comparative design concentration based on cup burner values is approximately 7.0% while data indicate that its cardiotoxicity LOAEL is probably greater than 10.5%. EPA is accepting 10.5% as its LOAEL. This agent was submitted to the Agency as a Premanufacture Notice (PMN) agent and is presently subject to requirements contained in a Toxic Substances Control Act (TSCA) Significant New Use Rule (SNUR). See additional comments 1, 2, 3, 4.
	C_4F_{10}	Acceptable	Until OSHA establishes applicable workplace requirements:	The comparative design concentration based on cup burner values is approximately 6.6%.
		where other alternatives are not technically feasible due to performance or safety requirements:	For occupied areas from which personnel cannot be evacuated in one minute, use is permitted only up to concentrations not exceeding the cardiotoxicity NOAEL of 40%.	Users must observe the limitations on PFC acceptability by making reasonable efforts to undertake the following measures: (i) conduct an evaluation of foreseeable conditions of end use;
		a. due to their physical or chemical properties, or	Although no LOAEL has been established for this product, standard OSHA requirements apply, i.e., for occupied areas from which personnel can be evacuated or egress can occur between 30 and 60 seconds, use is permitted up to a concentration not exceeding the LOAEL.	(ii) determine that human exposure to the other alternative extinguishing agents may approach or result in cardiosensitization or other unacceptable toxicity effects under normal operating conditions; and (iii) determine that the physical or chemical properties or other technical constraints of the other available agents preclude their use.

FIRE SUPPRESSION AND EXPLOSION PROTECTION TOTAL FLOODING AGENTS—Continued

Substitutes Acceptable Subject To Use Conditions

End-use	Substitute	Decision	Conditions	Comments
		b. where human exposure to the extinguishing agents may approach cardiosensitization levels or result in other unacceptable health effects under normal operating conditions.		
			All personnel must be evacuated before concentration of C_4F_{10} exceeds 40%. Design concentration must result in oxygen levels of at least 16%. Documentation of such measures must be available for review upon request.	The principal environmental characteristic of concern for PFCs is that they have high GWPs and long atmospheric lifetimes. Actual contributions to global warming depend upon the quantities of PFCs emitted. For additional guidance regarding applications in which PFCs may be appropriate, users should consult the description of potential uses which is included in this rulemaking. See additional comments 1, 2, 3, 4.
	[IG–541]	Acceptable	Until OSHA establishes applicable workplace requirements: The design concentration must result in at least 10% oxygen and no more than 5% CO_2. If the oxygen concentration of the atmosphere falls below 10%, personnel must be evacuated and egress must occur within 30 seconds.	Studies have shown that healthy, young individuals can remain in a 10% to 12% oxygen atmosphere for 30 to 40 minutes without impairment. However, in a fire emergency, the oxygen level may be reduced below safe levels, and the combustion products formed by the fire are likely to cause harm. Thus, the Agency does not contemplate personnel remaining in the space after system discharge during a fire without Self Contained Breathing Apparatus (SCBA) as required by OSHA. See additional comments 1, 2.

Additional Comments:

1—Must conform with OSHA 29 CFR 1910 Subpart L Section 1910.160 of the U.S. Code.

2—Per OSHA requirements, protective gear (SCBA) must be available in the event personnel must reenter the area.

3—Discharge testing should be strictly limited only to that which is essential to meet safety or performance requirements.

4—The agent should be recovered from the fire protection system in conjunction with testing or servicing, and recycled for later use or destroyed.

FIRE SUPPRESSION AND EXPLOSION PROTECTION TOTAL FLOODING AGENTS

Substitutes Acceptable Subject to Narrowed Use Limits

End-use	Substitute	Decision	Conditions	Comments
Halon 1301 Total Flooding Agents.	C_4F_{10}	Acceptable where other alternatives are not technically feasible due to performance or safety requirements:.	Until OSHA establishes applicable workplace requirements: For occupied areas from which personnel cannot be evacuated in one minute, use is permitted only up to concentrations not exceeding the cardiotoxicity NOAEL of 40%.	The comparative design concentration based on cup burner values is approximately 6.6%. Users must observe the limitations on PFC approval by undertaking the following measures: (i) Conduct an evaluation of foreseeable conditions of end use; (ii) Determine that human exposure to the other alternative extinguishing agents may approach or result in cardiosensitization or other unacceptable toxicity effects under normal operating conditions; and

FIRE SUPPRESSION AND EXPLOSION PROTECTION TOTAL FLOODING AGENTS—Continued

Substitutes Acceptable Subject to Narrowed Use Limits

End-use	Substitute	Decision	Conditions	Comments
		a. Due to their physical or chemical properties, or b. Where human exposure to the extinguishing agents may approach cardiosensitization levels or result in other unacceptable health effects under normal operating conditions.	Although no LOAEL has been established for this product, standard OSHA requirements apply, i.e. for occupied areas from which personnel can be evacuated or egress can occur between 30 and 60 seconds, use is permitted up to a concentration not exceeding the LOAEL. All personnel must be evacuated before concentration of C_4F_{10} exceeds 40%. Design concentration must result in oxygen levels of at least 16%	(iii) Determine that the physical or chemical properties or other technical constraints of the other available agents preclude their use; Documentation of such measures must be available for review upon request. The principal environmental characteristic of concern for PFCs is that they have high GWPs and long atmospheric lifetimes. Actual contributions to global warming depend upon the quantities of PFCs emitted. For additional guidance regarding applications in which PFCs may be appropriate, users should consult the description of potential uses which is included in the preamble to this rulemaking. See additional comments 1, 2, 3, 4.

Additional Comments

1—Must conform with OSHA 29 CFR 1910 Subpart L Section 1910.160 of the U.S. Code.

2—Per OSHA requirements, protective gear (SCBA) must be available in the event personnel must reenter the area.

3—Discharge testing should be strictly limited only to that which is essential to meet safety or performance requirements.

4—The agent should be recovered from the fire protection system in conjunction with testing or servicing, and recycled for later use or destroyed.

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