Risk Management Program (RMP) Rule (40 CFR 68) Developments: June 1998 to June 1999

Since the American Petroleum Institute (API) published its second editions of *Model Risk Management Plan Guidance for Petroleum Refineries* and *Model Risk Management Plan Guidance for Exploration and Production Facilities* in June/July 1998, the U.S. Environmental Protection Agency (EPA) has issued several proposed and final amendments to the RMP rule. In addition, lawsuits have resulted in the courts issuing a temporary stay of some of the provisions of the RMP rule. The following paragraphs summarize the RMP rule developments that have occurred from June 1998 to June 1999 and how these developments may affect RMP compliance at refineries and exploration and production (E&P) facilities.

EPA Decision on Posting of Offsite Consequence Analysis (OCA) Data on the Internet and the Chemical Safety Information and Site Security Act of 1999

On November 15, 1998, Jim Makris of EPA's Chemical Emergency Preparedness and Prevention Office (CEPPO) issued a memorandum indicating that the OCA information (i.e., worst-case scenario and alternative release scenario data such as the endpoint distances) in the risk management plans (RMPlans) will not be posted on the Internet. The information must, however, be submitted in the RMPlan. EPA has subsequently issued a question and answer (Q&A) in its Q&A database to provide guidance on how to present the OCA information in the executive summary (see Question VII.A.6 in the current Q&A database at the following Internet address: http://www.epa.gov/swercepp/pubs/caa-faqs.html). EPA states that facilities may satisfy the executive summary OCA requirements by "indicating the chemical, the size of the vessel, the type of release event (e.g., vapor cloud explosion in the case of flammables) and any administrative controls or mitigation measures involved in the scenario, and whether the release would have off-site consequences. Beyond that, each facility may decide what, if any, additional information to include in its executive summary."

On May 13, 1999, a bill called the Chemical Safety Information and Site Security Act of 1999 was introduced in the U.S. House of Representatives. The main provisions of this bill would:

- Restrict widespread distribution of OCA data in electronic form to the general public under the Freedom of Information Act;
- Permit EPA to provide OCA data in paper or electronic form to state and local authorities for official use only;
- Prohibit federal, state, and local authorities from disseminating OCA data with facility identifiers in electronic form to the public;
- Permit EPA to provide OCA data in paper form to the public with limitations to minimize the potential for compiling a national database;
- Require EPA, in consultation with other federal agencies, to determine the appropriate limitations and develop guidelines on providing OCA data to the public in paper form;
- Provide public access for reviewing, not copying, OCA data at the more than 1,300 federal depository libraries throughout the nation;
- Permit EPA to make OCA data available electronically for trend analysis, without facility identifiers or location information;
- Include criminal penalties for violating the provisions of the bill; and
- Authorize the Attorney General to study current industry security practices and make appropriate recommendations to Congress to enhance site security.

The Chemical Safety Information and Site Security Act of 1999 may be obtained at the following Internet address: http://thomas.loc.gov/cgi-bin/query/z?c106:H.R.1790:.

Implications for API member companies: The distances to the toxic and/or flammable endpoints for the worst-case and alternative release scenarios are not required to be reported in the executive summary of the RMPlan. Each facility should review the contents of its RMPlan executive summary to determine how much additional information, beyond the guidance provided by EPA, should be presented in the executive summary. It may also be prudent for a facility to wait until close to the June 21 deadline to submit its RMPlan in the event that Congress or EPA decides to delay the submission deadline for RMPlans.

EPA Amendments to the RMP Rule (January 6, 1999)

On January 6, 1999, EPA published in the *Federal Register* (Vol. 64, No. 3, pp. 964-980) final amendments to the RMP rule based on comments received from the April 17, 1998, proposed amendments (Vol. 63, No. 74, pp. 19216-19226). The final amendments:

- Adopted the North American Industry Classification System (NAICS) codes to replace the Standard Industrial Classification (SIC) codes;
- Added four mandatory data elements to the RMPlan: latitude/longitude method and description, CAA Title V permit number, weight% of a toxic substance in a liquid mixture in the 5-year accident history, and the NAICS code for each process that has had an accidental release in the 5-year accident history;
- Added five optional data elements to the RMPlan: local emergency planning committee (LEPC) name, source or parent company e-mail address, source home page address, phone number at the source for public inquiries, and status under OSHA's Voluntary Protection Program (VPP);
- Rejected the April 17, 1998, proposal to require facilities to provide in the RMPlan a prevention program data element set for each portion of a process for which a separate process hazard analysis (PHA) has been conducted;
- Specified how confidential business information (CBI) should be addressed in the RMPlan.

RMP*Submit™, EPA's software for RMPlan submission issued in January 1999, incorporates all of the above changes. More information on the above amendments may be obtained from the following Internet address: http://www.epa.gov/fedrgstr/EPA-AIR/1999/January/Day-06/.

Implications for API member companies: Each facility should decide if it will provide information for the optional data elements in the RMPlan. If a facility decides to provide the source or parent company e-mail address, source home page address, and/or phone number at the source for public inquiries, then adequate support should be provided for addressing public inquiries through these modes of communication. Failure to provide timely responses to public inquiries could adversely affect the facility's relationship with the community.

EPA Final OCA Guidance Document (April 19, 1999)

On April 19, 1999, EPA posted on its website the final OCA document entitled *Risk Management Program Guidance for Offsite Consequence Analysis*, EPA 550-B-99-009. This document replaces the draft OCA guidance issued in May 1996. The new OCA guidance contains revised atmospheric dispersion look-up tables for ammonia, chlorine, and sulfur dioxide. These new look-up tables give much shorter toxic endpoint distances than the draft OCA guidance. EPA has stated on its web site that

"Although [the April 1999 final OCA guidance] replaces the previous [May 1996] Offsite Consequence Analysis Guidance, if you have prepared your [risk management plan] using the previous guidance, you do not need to revise it based on this new guidance." Therefore, if you have already prepared your risk management plan using the old guidance, there is no need to revise your OCA. The new OCA guidance document may be obtained from the following Internet address: http://www.epa.gov/swercepp/ap-ocgu.htm.

Implications for API member companies: Each facility that has RMP-covered processes containing ammonia, chlorine, or sulfur dioxide, should review its worst-case and alternative release scenarios to determine if the use of the April 1999 final OCA guidance provides distances to the toxic endpoints that better meet the facility's objectives for RMP compliance.

U.S. Court of Appeals Stay of RMP Rule Requirements for Propane (April 27, 1999)

On April 27, 1999, the U.S. Court of Appeals granted a stay of the RMP rule requirements as they apply to facilities having more than 10,000 pounds of propane in a process, pending further action by the court (oral arguments are scheduled for fall 1999). While the court's stay is in effect, facilities are not required to file RMPlans for processes that contain only propane. More information may be obtained from the following Internet address: http://www.epa.gov/swercepp/pubs/rmp-imp/propcrt.htm.

Implications for API member companies: EPA has indicated that it interprets the U.S. Court of Appeals stay to apply to liquefied petroleum gas (LPG) as well as propane. A facility that currently has RMP-covered processes containing only propane or LPG, and no other RMP-regulated substances or mixtures, is not required to submit an RMPlan by June 21, 1999. Each facility should review its covered processes to determine if it has any processes that are eligible for the court's stay and if so, decide if any information concerning the eligible processes should be included in the RMPlan submitted by June 21, 1999.

API/EPA Settlement Agreement for Regulated Flammable Substances (May 26, 1999)

On May 26, 1999, EPA published in the *Federal Register* (Vol. 64, No. 101, pp. 28695-28705) a direct final rule amendment of the RMP rule based on a settlement agreement between API, the Chlorine Institute, and EPA. The amendment allows facilities to account for pooling of refrigerated flammables or flammable liquids when evaluating the worst-case scenario for the RMPlan:

- For flammable gases handled as refrigerated liquids at ambient pressure, if the released substance is contained by a passive mitigation system such that the pool depth is greater than 1 centimeter, then (1) the released material may be assumed to instantaneously spill and form a liquid pool, (2) the volatilization rate of the pool is calculated at the boiling point of the material, and (3) the quantity that becomes vapor during the first 10 minutes is assumed to be involved in the vapor cloud explosion. If the pool that forms has a depth of 1 centimeter or less, then the total quantity released is assumed to be involved in a vapor cloud explosion.
- For flammable substances that are normally liquids at ambient temperature, then (1) the released material may be assumed to instantaneously spill and form a liquid pool, (2) the volatilization rate of the pool is calculated based on the same approach as for toxic liquids in the RMP rule (see §68.25.d of the RMP rule), and (3) the quantity that becomes vapor during the first 10 minutes is assumed to be involved in the vapor cloud explosion.

The RMP rule requirements for regulated flammable substances that are normally gases at ambient temperature and that are handled as a gas or as a pressurized liquefied gas remain unchanged. For

facilities that currently have worst-case scenarios based on vessels containing refrigerated flammables or flammable liquids, the endpoint distances for a vapor cloud explosion may be significantly reduced under the new amendment. Facilities are not required to use this added assumption and can still use the quantity determined under Sec. 68.25(b) as the quantity released. Facilities that have already submitted their RMPlan may choose to use this revised approach, but are not required to do so. Facilities that choose to use this revised approach, must revise and resubmit their RMPlans to EPA by June 21, 1999. Currently, EPA is not modifying RMP*Submit as a result of this rule amendment. Instead, facilities reporting worst-case scenarios for refrigerated flammables or flammable liquids would need to calculate the total quantity of the gas generated (taking the volatilization rate into account) from the pool in a 10-minute period. This value would be reported as "Quantity released" in section 4.4 of RMP*Submit. The passive mitigation (dikes, berms, etc.) considered would be specified as "Other" in section 4.10. EPA also suggests that facilities use the executive summary of the RMPlan to explain how they calculated the quantity released for refrigerated flammables or flammable liquids. This rule amendment goes into effect on June 21, 1999, unless EPA receives adverse comments by June 16, 1999. More information may be obtained from the following Internet address:
http://www.epa.gov/fedrgstr/EPA-AIR/1999/May/Day-26/.

Implications for API member companies: If the worst-case scenario for a facility is currently based on a storage vessel containing a refrigerated flammable substance or a flammable liquid, then the facility may consider reevaluating the worst-case scenario using the amended approach. If the revised analysis leads to a different worst-case scenario for inclusion in the RMPlan, then the facility should determine if it is advantageous to include the revised analysis results or keep the existing worst-case scenario results in the RMPlan submitted by June 21, 1999.

EPA Stay of RMP Rule and Proposed Exemption for Hydrocarbon Fuels (May 28, 1999)

On May 28, 1999, EPA published in the *Federal Register* (Vol. 64, No. 103, pp. 29167-29179) a proposed amendment to the RMP rule to exempt processes containing up to 67,000 pounds of listed flammable hydrocarbon fuels (e.g., propane, butane, ethane) from the requirements of the RMP rule. The proposed ***exemption does not apply*** if (1) the process also contains another listed substance over the threshold quantity, (2) the process is manufacturing the hydrocarbon fuel, or (3) the process containing the hydrocarbon fuel is colocated or interconnected to another (nonfuel) RMP-covered process. The requirements of the RMP rule are temporarily stayed until December 21, 1999, for processes that qualify for the proposed exemption, and therefore, facilities are not required to include such processes in their RMPlans submitted on or before June 21, 1999. More information may be obtained from the following Internet address: http://www.epa.gov/fedrgstr/EPA-AIR/1999/May/Day-28/.

Implications for API member companies: A facility that currently has RMP-covered processes containing no more than 67,000 pounds of flammable hydrocarbon fuels (satisfying the above requirements), and no other RMP-regulated substances or mixtures, is not required to submit an RMPlan by June 21, 1999. Each facility should review its covered processes to determine if it has any processes that are eligible for EPA's proposed exemption and, if so, decide if any information concerning the eligible processes should be included in the RMPlan submitted by June 21, 1999.

If you have any questions concerning the recent RMP rule developments, contact Steve Arendt at (423) 671-5812 or Mike Roberts at (423) 671-5852 of ABS Group Inc. Risk & Reliability Division (formerly JBF Associates, Inc.).

Model Risk Management Plan Guidance for Exploration and Production (E&P) Facilities

Guidance in Complying with EPA's RMP Rule (40 Code of Federal Regulations, Part 68)

API Publication 761
Second Edition, June 1998

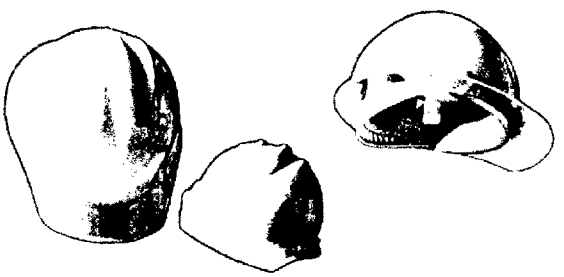
STEP
Strategies for Today's Environmental Partnership

American Petroleum Institute

Helping You Get The Job Done Right.℠

Model Risk Management Plan Guidance for Exploration and Production (E&P) Facilities

Guidance in Complying with EPA's RMP Rule (40 Code of Federal Regulations, Part 68)



Health and Environmental Affairs Department
Safety and Fire Protection Subcommittee

API Publication 761
Second Edition, June 1998

American Petroleum Institute

Helping You Get The Job Done Right.℠

One of the most significant long-term trends affecting the future vitality of the petroleum industry is the public's concerns about the environment. Recognizing this trend, API member companies have developed a positive, forward looking strategy called STEP: Strategies for Today's Environmental Partnership. This program aims to address public concerns by improving our industry's environmental, health and safety performance; documenting performance improvements; and communicating them to the public. The foundation of STEP is the API Environmental Mission and Guiding Environmental Principles.

API ENVIRONMENTAL MISSION AND GUIDING ENVIRONMENTAL PRINCIPLES

The members of the American Petroleum Institute are dedicated to continuous efforts to improve the compatibility of our operations with the environment while economically developing energy resources and supplying high quality products and services to consumers. The members recognize the importance of efficiently meeting society's needs and our responsibility to work with the public, the government, and others to develop and to use natural resources in an environmentally sound manner while protecting the health and safety of our employees and the public. To meet these responsibilities, API members pledge to manage our businesses according to these principles:

- To recognize and to respond to community concerns about our raw materials, products and operations.
- To operate our plants and facilities, and to handle our raw materials and products in a manner that protects the environment, and the safety and health of our employees and the public.
- To make safety, health and environmental considerations a priority in our planning, and our development of new products and processes.
- To advise promptly, appropriate officials, employees, customers and the public of information on significant industry-related safety, health and environmental hazards, and to recommend protective measures.
- To counsel customers, transporters and others in the safe use, transportation, and disposal of our raw materials, products, and waste materials.
- To economically develop and produce natural resources and to conserve those resources by using energy efficiently.
- To extend knowledge by conducting or supporting research on the safety, health, and environmental effects of our raw materials, products, processes, and waste materials.
- To commit to reduce overall emission and waste generation.
- To work with others to resolve problems created by handling and disposal of hazardous substances from our operations.
- To participate with government and others in creating responsible laws, regulations, and standards to safeguard the community, workplace, and environment.
- To promote these principles and practices by sharing experiences and offering assistance to others who produce, handle, use, transport, or dispose of similar raw materials, petroleum products and wastes.

SPECIAL NOTES

This Guide was prepared by JBF Associates, Inc., (JBFA) as an account of work sponsored by the American Petroleum Institute (API). Neither JBFA, API, nor any of their employees, subcontractors, consultants, or other assigns make any warranty, expressed or implied, or assume any liability or responsibility for any use, or the results of such use, of any information, product, or process disclosed in this Guide or represent that its use would not infringe upon privately owned rights. This Guide is not intended to be used as a cookbook, but rather as a general guide for preparing risk management plans associated with complying with EPA's risk management program (RMP) rule (40 *CFR* 68). The Guide is necessarily general in nature and leaves dealing with site-specific circumstances to individual companies. The manual is not designed or intended to define or create legal rights or obligations. Users are, of course, expected to comply with federal, state, and local laws and regulations and should consult with legal counsel concerning such matters. Furthermore, this is not intended to be, nor should it be considered, a consensus standard or an absolute roadmap for compliance with the RMP rule. Users of the Guide must determine how and to what extent the Guide will be used at their facilities.

PREFACE

Section 112(r) of the Clean Air Act (CAA) required the Environmental Protection Agency (EPA) to promulgate regulations to address the prevention of accidental releases from facilities handling extremely hazardous substances.[1] On June 20, 1996, EPA published its risk management program (RMP) rule entitled *Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)*, (40 *CFR* 68).[2] This rule requires affected facilities to develop RMPs and to submit risk management plans (RMPlans) to a central point by June 21, 1999. The RMPlans summarize the accident prevention efforts of a facility's RMP and are provided to regulators and local emergency planners and made available to the public.

The RMP rule places a new and substantial regulatory compliance burden on industry. It should be noted, however, that RMPlans will aid Local Emergency Planning Committees (LEPCs) in planning appropriate responses to accidental releases. Anticipating this in the CAA, Congress also required EPA to develop model RMPlans to help companies comply with the rule. EPA has embarked on several model RMPlan development efforts with affected industry groups and other interested parties.

American Petroleum Institute (API) member companies have a long history of promoting accident prevention activities. API member facilities have been involved in related process safety management (PSM) activities for many years. In 1989, API released *Management of Process Hazards*, API Recommended Practice 750.[3] API has also published *Safety and Environmental Management Programs for Outer Continental Shelf (OCS) Operations and Facilities*, API Recommended Practice 75.[4] In 1992, API established its Strategies for Today's Environmental Partnership (STEP) program, which is a set of guiding principles for oil and gas industry companies to use in operating their facilities in an environmentally responsible manner.[5] Additional process safety-related API publications are listed at the end of this Guide.

In 1992, the Occupational Safety and Health Administration (OSHA) adopted its PSM standard (29 *CFR* 1910.119), which affects some exploration and production (E&P) facilities and petroleum refineries.[6] Based on this experience and through its participation in the RMP rulemaking process, API investigated the relative compliance burden for its member companies and decided to prepare model RMPlan guidance to aid its member companies that operate refineries and E&P facilities.

The purpose of this document is to provide a model RMPlan and guidance that E&P facilities can use to prepare site-specific RMPlans, thus reducing the compliance burden associated with the RMP rule. A companion document entitled *Model Risk Management Plan Guidance for Petroleum Refineries* provides guidance to refineries.[7]

The first edition of this Guide was issued in August 1997. The second edition of this Guide reflects the following:

- revisions and proposed revisions that EPA has made to the RMP rule from August 1997 through April 1998[8-10]
- interpretations from EPA's Question and Answer Database, maintained by the Chemical Emergency Preparedness and Prevention Office (CEPPO)[11]
- interpretations from a draft version of EPA's *General Guidance on Risk Management Programs (40 CFR 68)*[12]

- interpretations from the *1996 RMP Compliance Workshop Q&A* published by CMA[13]
- additional guidance based on feedback received from users of this Guide and attendees of the model RMP workshops offered by API during 1997

Substantive changes to the first edition of this Guide are indicated by a vertical line in the outside margin adjacent to the revised or added text.

In a related effort, API collaborated with the Chemical Manufacturers Association (CMA) to develop a document entitled *A Compliance Guideline for EPA's Risk Management Program Rule.*[14] API intends to keep these documents evergreen—as changes are realized in the RMP rule, improvements will be made to the Guides. Further, API hopes that widespread use of these Guides will promote efficiency and consistency in the way that RMPlans are developed and communicated.

ACKNOWLEDGMENTS

The American Petroleum Institute (API) thanks all of the members of the Model RMP Working Group (MRWG) and RMP Task Force for providing technical guidance in the preparation of this document. The current co-chairs of the MRWG are John Lee of Exxon Company, U.S.A., and Bob Sandiolos of Chevron USA Production. Tom Gale of Ashland Petroleum and Chuck Fryman of FMC Corporation, formerly with BP Oil Company, have also served as chairs during the work group's efforts. At this Guide's publication, the MRWG had the following membership:

Andrews, David, **Shell Oil Products Company**
Boulet, Ted, **Mobil Chemical Company**
Broadribb, Mike, **BP Oil**
Burnett, Gary, **Exxon Company U.S.A.**
Canfield, Stan, **Warren Petroleum**
Easley, Larry, **Phillips Petroleum Company**
Ericson, Connie, **Mitchell Energy & Development Corporation**
Gale, Thomas, **Ashland Petroleum Company**
Hamilton, Wayne, **Shell Exploration & Production Company**
Harrington, Ken, **Battelle Memorial Institute**
Hethershaw, Ron, **Exxon Company, U.S.A.**
Jackson, Ronnie, **Texaco, Inc.**
Lee, John, **Exxon Company, U.S.A.**
Leonard, Ken, **American Petroleum Institute**
Nagayama, Aaron, **ARCO Products Co**
Newsom, Vic, **AMOCO Production**
Norton, Dee, **Warren Petroleum**
Sandilos, Bob, **Chevron USA Production**
Schwartz, Michael, **Shell Oil Products Company**
Shah, Andy, **Conoco, Inc.**
Shanker, A. S., **Warren Petroleum**
Shetty, Pradeep, **Fina**
Simpson, David, **Mobil Corporation**
Smorch, Matt, **Amoco Corporation**
Trinker, Dave, **Oxy USA, Inc.**
Turnbull, Ken, **Texaco, Inc.**
Uptegraph, Kara, **Shell Oil Products Company**
Walker, Gerald, **Chevron Companies**
Young, Wil, **Marathon Oil Company**

Their technical insights, experiences, and suggestions were essential to the development of this Guide.

JBF Associates, Inc. (JBFA) prepared this Guide for API. Steve Arendt was JBFA's Project Manager and lead author for the first edition of this Guide. Mike Roberts was JBFA's Project Manager for the second edition of this Guide. The other principal authors on JBFA's team were Dale Crumpler, Mike Roberts, and Dave Whittle. Bobby Haas and Thomas Taylor also contributed to this Guide. The authors of this Guide at JBFA are also indebted to the reviewers of this Guide at JBFA: Myron Casada, John Leonard, Joel McDuffee, Karen Gantt, and Maureen Hafford. We thank Angie Nicely, Sheila Ross, Mary Tinnel, Candice Brasel, and Nicole Lepoutre-Baldocchi for their skill and craftsmanship in preparing this document.

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EXECUTIVE SUMMARY

The EPA RMP rule affects facilities engaged in the exploration for and production of natural gas and crude oil. Natural gas processing plants are considered a part of exploration and production (E&P) operations. The RMP rule covers facilities that handle greater than a threshold quantity (TQ) of regulated toxic or flammable substances, some of which may be present in oil and natural gas. Some aspects of E&P operations are excluded from coverage (e.g., naturally occurring hydrocarbon reservoirs, transportation pipelines, storage incident to transportation, and transportation containers that remain connected to the motive power that delivered them to the site). In addition, E&P operations involving regulated flammable substances prior to initial processing in a gas plant or refinery are exempt from the RMP rule. However, upstream surface facilities (e.g., production field separation equipment) handling regulated toxic substances (e.g., hydrogen sulfide) may be covered by the RMP rule. In addition, regulated flammable substances that are not a part of the naturally occurring hydrocarbon stream from the production field (e.g., propane used as a fuel for heating) may also be covered.

E&P gas plants are the most likely operations to be covered because of the large amounts of regulated flammable substances that exist in the plants. They may also be covered because of the presence of hydrogen sulfide if the inlet oil/gas stream is very sour or the gas processing equipment capacity is very large. Other E&P facilities upstream of the gas plant or refinery may be covered by the RMP rule if they exceed the TQ for a regulated toxic substance at any time. For example, field operations involving sour gas or oil production may be covered if the surface equipment contains ≥10,000 lb of hydrogen sulfide; however, because of their relatively small confined volumes and the low concentration of hydrogen sulfide in most oil/gas streams, these facilities are unlikely to be covered.

Although EPA has published its final RMP rule, several industry groups have filed legal petitions regarding certain aspects of the rule. Moreover, the U.S. Department of Transportation (DOT) is undertaking rulemaking that may affect how EPA interprets the definition of stationary source and the coverage of transport vehicles containing regulated substances. API intends to revise this Guide whenever conditions warrant, but users should independently verify the current status of the RMP rule and related rulemakings.

Covered E&P facilities must implement RMPs containing three major components:

- Hazard assessments consisting of offsite consequence analyses (OCAs) of worst-case and alternative release scenarios and a 5-year history of accidental releases of covered substances

- Prevention programs consisting of ways to prevent, control, and mitigate the effects of accidental releases from covered processes (i.e., a program nearly identical to the OSHA PSM rule)

- Emergency response programs consisting of an emergency response plan and a means of notifying the public in the event of an accidental release.

EPA has also defined three RMP Program Levels with different compliance requirements for the above components to address the range of hazards and complexity of covered processes. Program 1 is called the "no impact" tier. E&P facilities with RMP-covered processes that are relatively distant from the public could qualify for this level's reduced compliance requirements. RMP-covered E&P processes that do **not** qualify for Program 1 and are subject to OSHA PSM must comply with the full requirements of the RMP rule (Program 3). Program 2 is the "streamlined" tier incorporating a 7-element "mini-PSM" program for the prevention program. RMP-covered E&P processes **not** eligible for Program 1 and **not** subject to OSHA PSM qualify for this level and its reduced compliance burden.

Facilities with Program 2 and 3 processes must implement a management system to integrate the components of the RMP. This Guide gives some suggestions targeted at E&P facilities on how to determine coverage, assess program levels, and organize and conduct a hazard assessment.

The Guide does not address how to implement prevention programs (i.e., PSM) because many E&P facilities subject to the RMP rule are already covered by the PSM rule. The Guide also does not address emergency response programs (ERPs) because they are already required by OSHA 1910.38(a) and 1910.120(a), (p), and (q). Rather, the Guide gives an example for preparing the prevention program and ERP portions of an RMPlan.

Operators of covered E&P facilities must also prepare and submit RMPlans to a central location from which the plans will be available to regulators, the state, local emergency planners, and the public. The purpose of this Guide is to demonstrate how to create a site-specific RMPlan using a generic template for an RMPlan. Some of the guidance in this document is focused on helping facilities communicate RMP information to key stakeholders in their communities. However, such communication activities **are not** required by the RMP rule; any such activities are done purely at the facility's discretion.

Using this Guide should reduce the compliance effort for an E&P facility. However, even using this Guide efficiently, E&P facilities will still have many tasks to complete to achieve compliance (e.g., OCAs of site-specific scenarios, compilation of 5-year accident history data, and preparation of the RMPlan). However, API hopes that this Guide will significantly reduce the compliance cost of preparing an RMPlan and help improve the consistency in the way that the plans are created and communicated.

HOW TO USE THIS GUIDE

This Guide is primarily intended for use by E&P personnel who will be performing RMP compliance activities. It presumes that such personnel have a basic familiarity with the OSHA PSM and EPA RMP rules. However, this Guide may also be of interest to management personnel who need to know the basic contents of an RMPlan and the type of effort required to achieve compliance.

Section 1 is an introduction that outlines the purpose of the Guide, provides an overview of the RMP rule, and briefly describes typical E&P operations. Readers familiar with this type of information may decide to skip this section. Section 2 gives examples of determining whether E&P processes are covered by the RMP rule. Appendix A presents a simplified approach for determining the quantity of regulated flammable substances in distillation columns or towers. Assessing the appropriate program level for each covered E&P process is described in Section 3.

Section 4 deals with performing an OCA and compiling a 5-year history of accidental releases. Detailed advice focused on E&P processes is provided regarding how to organize and perform the analyses of worst-case and alternative release scenarios. This section would be important for anyone performing such RMP compliance work. Appendix B gives an example of vapor cloud explosion modeling using EPA's lookup table approach.

Section 5 describes the information needed in the prevention program portion of the RMPlan, and Section 6 describes the information needed in the ERP portion of the plan. Section 7 provides suggestions on how to use the model RMPlan executive summary contained in Appendix C. Section 7 also discusses the current version of EPA's RMP data elements checklist (presented in Appendix D) that is to be submitted as a part of the RMPlan.

Appendix E presents a glossary of RMP-related terminology. Appendix F presents a consolidated version of the RMP rule, including all rule amendments and proposed amendments as of April 17, 1998. Finally, Appendix G provides several worksheets for facilitating compliance with the RMP rule.

Because (1) the RMP rule is a performance-based rule, (2) the rule is under litigation, and (3) EPA, DOT, and OSHA are undertaking rulemakings that could affect some of the RMP rule's provisions, some of the suggestions in this Guide may change. To help users recognize the variety of types of advice, all suggestions are placed in the text using the following format conventions:

Notes	are simply expanded explanations of the rule's provisions or are suggestions related to performance-based interpretations that may be helpful to some companies. However, each company must assess its own site-specific needs to determine how or whether to apply a specific suggestion.

Issues	are used to indicate an interpretation that API believes is correct, but may not be explicitly endorsed by EPA, or is associated with an issue that is under litigation or further rulemaking.

E&P facilities may also consider obtaining a copy of the CMA/API *A Compliance Guideline for EPA's Risk Management Program Rule* (hereinafter referred to as the *RMP Compliance Guideline*).[14] The *RMP Compliance Guideline* document provides greater detail and more examples on RMP compliance activities, complete with compliance decision logic flow charts.

ACRONYMS

AEGL	Acute Exposure Guideline Limit
AIHA	American Industrial Hygiene Association
API	American Petroleum Institute
ARS	Alternative release scenario
ATSU	Amine Treatment/Sweetening Unit
BLEVE	Boiling liquid expanding vapor explosion
CAA	Clean Air Act
CAS	Chemical Abstract Service
CCPS	Center for Chemical Process Safety
CMA	Chemical Manufacturers Association
CFR	Code of Federal Regulations
DOT	Department of Transportation
E&P	Exploration and production
EHS	Extremely hazardous substance
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
EP&R	Emergency Planning and Response
ERP	Emergency response program
ERPG	Emergency Response Planning Guideline
FR	*Federal Register*
HAZCOM	Hazard communication
HAZOP	Hazard and operability
HAZWOPER	Hazardous waste and emergency operations
LFL	Lower flammability limit
IDLH	Immediately dangerous to life and health
JBFA	JBF Associates, Inc.
LEPC	Local emergency planning committee
LOC	Level of concern
LPG	Liquefied petroleum gas
MOC	Management of change
MRWG	Model RMP Working Group
MSDS	Material safety data sheet
NAICS	North American Industrial Classification System
NCDC	National Climatic Data Center
NFPA	National Fire Protection Association
NGL	Natural gas liquid
NIOSH	National Institute for Occupational Safety and Health
NRT	National Response Team
NWS	National Weather Service
OAQPS	Office of Air Quality and Planning Standards
OCA	Offsite consequence analysis
OCS	Outer continental shelf
OPA	Oil Pollution Act
OSHA	Occupational Safety and Health Administration
PHA	Process hazard analysis
PSM	Process safety management
PSSR	Pre-startup safety review

ACRONYMS (cont'd)

RCRA	Resource Conservation and Recovery Act
RMP	Risk management program
RMP rule	Risk management program rule
RMPP	Risk management and prevention program
RMPlan	Risk management plan
RP	Recommended Practice
RTK	Right-to-Know
SCRAM	Support Center for Regulatory Air Modeling
SERC	State Emergency Response Commission
SIC	Standard industrial classification
SPCC	Spill prevention, containment, and control
STEP	Strategies for Today's Environmental Partnership
TNO	The Netherlands Organization
TNT	Trinitrotoluene
TTN	Technology Transfer Network
TQ	Threshold quantity
UFL	Upper flammability limit
USC	United States Code
USGS	U.S. Geological Survey
VCE	Vapor cloud explosion
WCS	Worst-case scenario

1 Introduction

1.1 PURPOSE AND SCOPE

The Environmental Protection Agency's (EPA's) risk management program (RMP) rule (40 *CFR* 68) requires affected facilities to implement a risk management program (RMP) and develop a risk management plan (RMPlan). An RMP consists of three components: hazard assessment, prevention program, and emergency response program. Implementing these activities requires a facility to establish management systems to execute the necessary work to comply with the rule.

The RMPlan, on the other hand, is simply a description of the RMP activities carried out in the facility. A facility must submit its RMPlan to a central location from which the RMPlan will be available to regulators, local emergency planners, and the public.

The purpose of this Guide is to provide some information on how an oil and gas exploration and production (E&P) facility can prepare an RMPlan. A "model" or an example of an RMPlan executive summary is provided in Appendix C. The main sections of the Guide provide suggestions on how E&P facilities can perform some of the underlying work necessary to comply with the RPM rule; some of this information must be summarized in the RMPlan.

This Guide presumes that E&P facilities are in compliance with relevant codes, standards, and regulations. Thus, the Guide focuses on areas of work required by the RMP rule that extend beyond existing compliance activities. For example, the Guide provides detailed information on how to perform hazard assessments. On the other hand, the Guide does not go into great detail on how to implement a process safety management (PSM) program. Rather, it focuses on strategies for summarizing the results of the prevention program activities for use in the RMPlan.

Finally, this Guide is not a rigid standard that must be followed by everyone. Site-specific needs may demand an RMPlan development approach that differs from the information provided in this Guide. However, it is hoped that the ideas in this Guide will be generally useful to all E&P facility operators so that the RMPlans can be prepared in an efficient way that reduces compliance costs and promotes consistency and understanding.

Note: Section 112(r)(1) of the CAA entitled "Purpose and General Duty" (often referred to as the general duty clause) states the following:

> It shall be the objective of the regulations and programs authorized under this subsection to prevent the accidental release and to minimize the consequences of any such release of any substance listed... [in Subpart F of 40 *CFR* 68]..or any other extremely hazardous substance. The owners and operators of stationary sources producing, processing, handling, or storing such substances have a general duty in the same manner and to the same extent as Section 654 of Title 29 to identify hazards which may result from such releases using appropriate hazard assessment techniques, to design and maintain a safe facility taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which do occur.

This "general duty clause" has been in effect since the 1990 CAA Amendments were enacted. This Guide discusses compliance with the RMP rule only, and not the general duty clause of the CAA. Companies should use their own judgment to determine how best to comply with the general duty clause.

1.2 OVERVIEW OF THE RMP RULE

The RMP rule was published on June 20, 1996, in the *Federal Register* (FR). It consists of the preamble language that explains EPA's reasoning behind the rule and the regulatory text. Previously, EPA published its RMP list rule on January 31, 1994,[15] and published additional changes to the list rule on August 25, 1997,[8] and January 6, 1998.[9] In addition, EPA has published proposed changes to the RMP rule on April 17, 1998.[10] EPA has also published several guidance documents that are under various stages of peer review. In addition, the American Petroleum Institute (API) has collaborated with the Chemical Manufacturers Association (CMA) on an overall RMP compliance guide that focuses on all provisions of the RMP rule.[14] E&P facilities should consider all of these documents as important resources while developing compliance strategies and implementation plans. The following is a brief summary of the RMP rule.

The RMP rule has eight subparts and an appendix that lists the toxic endpoints to be used in hazard assessments:

- Subpart A—General
- Subpart B—Hazard Assessment
- Subpart C—Program 2 Prevention Program
- Subpart D—Program 3 Prevention Program
- Subpart E—Emergency Response
- Subpart F—Regulated Substances
- Subpart G—Risk Management Plan
- Subpart H—Other Requirements

Subpart A addresses the applicability requirements of the RMP rule. It establishes the 3-year compliance deadline; defines three RMP program levels, including eligibility criteria and necessary work; and specifies that facilities have a management system to oversee the implementation of the RMP. Program 1 is a minimal RMP for "lower hazard" processes. A process can qualify for Program 1 if (a) it has not had an accident with an offsite effect in the past 5 years, (b) the worst-case scenario (WCS) endpoint distance does not reach the nearest public receptor of concern, and (c) emergency response activities have been coordinated with local agencies.

A process is in Program 3 if it does not qualify for Program 1 and it is either (a) covered by the Occupational Safety and Health Administration's (OSHA's) PSM standard or (b) associated with one of nine "targeted" standard industrial classification (SIC) codes. (Note: The SIC codes for E&P facilities are not in the specified SIC codes.) If a covered process is not in Program 1 or Program 3, then it is eligible for Program 2.

Note: EPA has published proposed amendments to the RMP rule[10] to replace SIC codes with the North America Industrial Classification System (NAICS) codes. For example, the NAICS code for a natural gas processing plant is 211112.

Subpart B divides the hazard assessment requirements into two main parts: performance of an offsite consequence analysis (OCA) of potential accidental releases and compilation of a 5-year history of accidental releases. The OCA focuses on estimating the distance that a toxic vapor cloud or fire/explosion effects could be experienced off site from WCSs and alternative release scenarios (ARSs). Definitions of WCS release conditions and modeling parameters are prescribed. Analysts have more flexibility in the parameters and assumptions used to prepare ARSs.

A facility must estimate the residential population (i.e., using U.S. census data) within a circle that is defined by the distance calculated to the appropriate hazard endpoint centered at the assumed point of release. The presence of institutions, parks, recreational areas, major commercial areas, and sensitive environmental receptors must also be noted.

The OCA must be updated at least once every 5 years or more often if facility changes could potentially change the endpoint distance by a factor of 2 or more.

Subpart C specifies the prevention program requirements for Program 2 processes, including seven elements:

- Safety information
- Hazard review
- Operating procedures
- Training
- Maintenance
- Compliance audits
- Incident investigation

Each of these elements has specific requirements; however, they are generally less detailed than the associated OSHA PSM counterparts.

Subpart D specifies the prevention program requirements for Program 3 processes, including twelve elements:

- Process safety information
- Process hazard analysis
- Operating procedures
- Training
- Mechanical integrity
- Management of change
- Pre-startup safety review
- Compliance audits
- Incident investigation
- Employee participation
- Hot work permits
- Contractors

The specific requirements are, in almost all cases, the same as the OSHA PSM counterparts; however, EPA has made some terminology changes to ensure that facilities understand that EPA expects the prevention program to protect the public and the environment as well as workers. EPA states that any modifications to PSM work products that are necessary to account for protection of the public and environment may be made during the natural updating cycle under the OSHA PSM standard.

Subpart E contains the emergency response requirements. Facilities whose employees plan to respond to accidental releases of regulated substances must develop an emergency response plan for protecting the public and the environment and coordinate their activities with the community emergency planners/responders. Facilities whose employees will not have to respond to accidental releases do not have to prepare an emergency response plan; however, they must have an appropriate mechanism in place for notifying emergency responders in case of an accident. In all cases, covered facilities must respond to requests from local emergency planners or responders for more information to support preparation of the community emergency response plan.

Subpart F contains the EPA list of regulated substances, threshold quantities, and exemptions. The EPA list contains 77 toxic substances and 63 flammable substances. Most of the EPA threshold quantities are greater than the respective OSHA PSM thresholds. EPA specifies a technical approach for evaluating whether mixtures of regulated and nonregulated substances are covered. EPA has provided several exemptions that are important to E&P facility operators. First, the RMP rule applies only to "stationary sources"; transportation activities such as DOT-regulated pipelines and storage incident to transportation are **not** stationary sources and are **not** covered by the RMP rule. Moreover, EPA's amendments to the Subpart F list rule[9] contain several additional exclusions that are important for E&P facilities:

1. A stationary source does not include pipelines subject to DOT oversight or regulation (the RMP rule excludes transmission lines and gathering lines whether regulated by DOT or an authorized state).

2. A stationary source does not include storage incident to transportation, including storage fields for natural gas where natural gas taken from pipelines is stored during nonpeak periods. Such storage fields include, but are not limited to, depleted oil and gas reservoirs, aquifers, mines, and caverns (e.g., salt dome caverns).

3. A stationary source does not include transportation containers that remain connected to the motive power that delivered them to the site (e.g., tanker trucks)

4. A stationary source does not include E&P facilities on the outer continental shelf (OCS).

5. A stationary source does not include naturally occurring hydrocarbon reservoirs.

6. The threshold quantity determination for regulated flammable substances present at a stationary source does not include the following:

   — naturally occurring hydrocarbon mixtures, prior to initial processing in a natural gas processing plant or a petroleum refining process unit
   — gasoline used in internal combustion engines
   — mixtures that are not NFPA 4 mixtures

The August 25, 1997, amendment to the RMP list rule[8] increased the threshold concentration for hydrochloric acid from 30 to 37 wt%.

Subpart G specifies the submission, updating, and content requirements of an RMPlan. The RMPlan must contain an executive summary; a certification that the information is true, accurate, and complete; and a detailed list of almost 100 data elements broken down into these five categories:

- Registration information
- Offsite consequence analysis
- Five-year accident history
- Prevention program
- Emergency response program

The first RMPlan for a facility must be submitted by the latest of the following dates: June 21, 1999; 3 years after the date in which a new regulated substance is listed and is present in threshold quantity amounts; or the date on which a process is first covered.

The RMPlan must be updated at least every 5 years or within 6 months if certain changes occur that affect the basis of the RMP. EPA intends that facilities submit the RMPlan to a central point for access by regulators, local emergency planners, and the public. EPA has not yet determined the specific details on where and how the plan is to be submitted, but EPA is considering electronic submission.

Subpart H specifies the EPA requirements for recordkeeping, availability of information to the public, the relationship of the RMP to air permits, and audits. Facilities must keep RMP records for at least 5 years. The RMPlan is to be made available to the public; however, government classified information is protected under law. For facilities with a Title V Part 70 or 71 air permit, the RMP rule is an "applicable requirement" under the air permit. However, coverage alone by the RMP rule does not mean that you must obtain an air permit. Moreover, the RMPlan is not a part of the air permit itself. Facilities with air permits must revise them to include either a certification that a complete RMPlan has been submitted or a compliance schedule has been set.

Note: Confidential business information is protected under CAA §114(c) and 40 *CFR* 2. EPA has published proposed amendments to the RMP rule[10] that discuss how confidential business information will be addressed in the RMPlan. See Appendix F of this Guide, §§ 68.151 and 68.152.

Note: Under CAA Section 112(l) and 40 *CFR* 63 Subpart E, a state or local agency may seek and be granted delegation as the implementing agency for the RMP rule. The implementing agency will review the RMPlans, select some RMPlans for audits, conduct onsite inspections, and initiate enforcement activities. The implementing agency may also promulgate requirements that are more stringent than the federal RMP rule requirements. If your state has been granted delegation, it is important that you contact them to determine if the state has requirements other than those presented in 40 *CFR* 68. The following states have indicated that they are interested in delegation:

California	Delaware	Florida	Georgia	Hawaii	Louisiana
Mississippi	Nevada	New Jersey	Ohio	Rhode Island	South Carolina

Check with your EPA Regional contacts for a current list of states granted or seeking delegation.

Note: CAA Section 113 specifies the penalties for noncompliance with and inaccurate reporting of information required by the RMP rule (40 *CFR* 68). Section 113 provides for both civil and criminal actions. EPA may assess civil penalties of not more than $25,000 per day per violation. Anyone who knowingly violates the RMP rule may also be subject to no more than 5 years in prison; anyone who knowingly files false information may be subject to no more than 2 years in prison. Additional civil and criminal penalties are discussed in the statute.

1.3 DESCRIPTION OF A TYPICAL E&P FACILITY

To provide a context for this guidance, the following is a brief narrative description of the processes and activities found in typical E&P facilities. This is not meant to be an exhaustive compilation of E&P technology and operating configurations. Rather, the various classes of processes in which toxic and flammable substances are present are used to form the basis for the compliance examples and advice found in the remaining chapters.

E&P operations involve the extraction of naturally occurring hydrocarbons (i.e., crude oil and natural gas) from underground reservoirs, the separation of the liquid and gas hydrocarbons from produced water, and the conveying of the liquid and gas streams to downstream gas and liquid processing facilities (i.e., gas plants and refineries). Typical E&P facilities consist of the following activities:

- Hydrocarbon reservoir
- Well bore, casing, production tubing, and well site facilities
- Flow lines to field separation equipment and storage
- Field separation equipment and storage
- Gathering line and transmission pipeline networks
- Gas plants

Well tubing conveys liquids and gases from the reservoir to the surface. Reservoir pressure sometimes pushes the crude oil and natural gas from the reservoir through the well bore to the surface. When natural reservoir energy is not enough, producers use a number of methods to raise the oil and gas to the surface or to enhance recovery. Some of these methods include using gas or liquids produced at the well site, but they also may use gas or liquids returned to the well site from the natural gas processing plant.

In a technique called gas lift, oil and gas are helped to rise through the well bore by injection of natural gas into the well itself, but not the reservoir. Other operations may inject natural gas, natural gas liquids, or produced water into the reservoir to maintain or increase reservoir pressure. Finally, some operations may inject natural gas liquids in a miscible fluid to enhance recovery of oil and gas from the reservoir.

Once the produced gas and fluids reach the surface, a variety of hydrocarbon separation and treatment technology is used in field production operations to separate the fluids. Crude oil and natural gas condensate (i.e., oil from gas wells) are separated and treated at the production field for transportation by truck and pipeline to refineries for processing into products. Natural gas is also separated and treated in production field operations to prepare it for transportation by gathering lines either to transmission pipelines or to processing at gas plants. Natural gas processing plants process natural gas into natural gas liquid streams and residue natural gas and sometimes fractionate the natural gas liquid stream into natural gas liquid products (e.g., propane, butane). Some of the same treatment technologies used in the production field may also be used at gas plants (e.g., gravity separation, dehydration, treatment to remove impurities).

Note: When defining the boundaries of a stationary source consisting of a gas plant, the upstream boundary (i.e., the beginning of the gas plant) is assumed to be the inlet separation equipment receiving the field stream.

The following are several categories of liquid and gas separation and treatment technology employed both in production fields and in gas plants:

- Gas/oil/water separation
- Dehydration
- Amine treatment/sweetening
- Gas compression
- Atmospheric storage of separated liquids
- Utilities

The following categories of treatment and processing technology typically take place only at gas plants:

- Natural gas liquid separation/extraction
- Fractionation/stabilization
- Pressurized storage of natural gas liquids
- Loading and shipping of natural gas liquids

These E&P processes will be described in more detail in Section 2 and will form the basis for understanding how to assess coverage at E&P facilities.

2 Determining RMP Coverage at an E&P Facility

The EPA RMP rule affects facilities engaged in the exploration for and production of naturally occurring hydrocarbons. The RMP rule addresses facilities that have greater than a TQ of a regulated toxic or flammable substance. Regulated flammable substances (e.g., methane, ethane, propane) and at least one regulated toxic substance (i.e., hydrogen sulfide [H_2S]) can be present in naturally occurring hydrocarbon streams. However, many aspects of E&P facility operations may be exempt from coverage. Because of EPA's various exemptions and exclusions of substances from the calculation of TQ for a process, owners/operators of E&P facilities can expect the RMP rule to apply **only** to the following situations:

- For regulated flammable substances, at E&P gas plants involved with processing naturally occurring hydrocarbons. At other E&P stationary sources (i.e., well site and field equipment) RMP coverage for flammables is limited to hydrocarbons being used as fuel, independent of the naturally occurring hydrocarbon streams (e.g., propane used to fire heaters)
- For regulated toxic substances, at well sites (including the well bore), field equipment sites, and E&P gas plants (e.g., H_2S in the naturally occurring hydrocarbon stream, chlorine or ammonia for water/waste treatment, ammonia in refrigeration systems)

The following are steps that an E&P facility should consider using in determining RMP-covered processes:

1. Determine whether the subject E&P operations constitute a stationary source.
2. Determine whether any processes at the facility contain RMP-regulated substances.
3. Estimate the inventory of regulated substances in each potentially covered process. Some substances/uses in a facility are exempted by EPA from the TQ determination.
4. Compare the estimated process inventory to the TQ for the substance to establish which processes are covered by the RMP rule.

The following sections outline each of these steps. For more information on RMP coverage assessment, consult the CMA/API *RMP Compliance Guideline.*[14]

Note:	EPA has previously made several changes to the regulatory language concerning exemptions and certain definitions that affect coverage assessment at E&P facilities. Before finalizing your assessment of RMP coverage, check with EPA to make sure that you have the latest information on the EPA RMP list rule and other regulatory developments that could affect E&P facilities. API intends to revise this Guide as conditions warrant.

2.1 IDENTIFYING E&P FACILITIES SUBJECT TO THE RMP RULE

E&P operations extend from the well bore that penetrates the hydrocarbon reservoir to well site equipment, flow lines and field equipment used to separate hydrocarbon liquids and gas from water and inert gases, gathering lines, transport pipelines, and gas plants. Many of these facilities and operations may be exempt from the RMP rule because of two types of exemptions: (1) exemptions from consideration as a stationary source covered under the RMP rule and (2) exemptions from considering regulated flammable

substances in TQ calculations. EPA exempts naturally occurring hydrocarbon reservoirs, transportation pipelines, and E&P operations that take place on the OCS. Other provisions exclude certain regulated flammable substances from the TQ determination.

The effects of the exemptions are illustrated in the two schematics in Figure 2-1. Dashed lines indicate E&P operations that are exempt from the RMP rule. As shown in the schematic for flammable substances, naturally occurring hydrocarbon reservoirs, transportation pipelines subject to DOT regulation or oversight, and storage incident to transportation are exempt from the RMP rule. E&P operations involving regulated flammable substances in naturally occurring hydrocarbon streams prior to processing in a gas plant or refinery are exempt from the RMP rule.

Note: On January 6, 1998, EPA published amendments to the RMP list rule[9] providing exemptions for naturally occurring hydrocarbon reservoirs and OCS facilities. The amendments also broaden the current transportation exclusion for all DOT-regulated pipelines so that it covers jurisdictional state-regulated pipelines and pipelines that DOT has authority to regulate but chooses not to regulate (such as some field gathering lines). Flow lines are usually not considered "excluded transportation," but the regulated flammable substances they contain may not count toward the TQ determination.

Issue: EPA's "naturally occurring hydrocarbon mixture" exclusion from flammable TQ determination extends from the reservoir to the natural gas processing plant or refinery inlet. The January 6, 1998, list rule amendments[9] do not, however, specifically exclude natural gas/hydrocarbon reinjection/pressure maintenance streams when injected from **downstream outlets of the gas processing plant**. Such pipelines should be evaluated to determine if they may qualify for the transportation exemption.

For regulated flammable substances, the only E&P operations that could be RMP-covered are gas plants unless well site/field equipment use processed hydrocarbons for fuel (e.g., propane).

Other E&P facilities may be covered by the RMP rule if they exceed the TQ for a regulated toxic substance at any time. The amount of a regulated toxic substance in naturally occurring hydrocarbon reservoirs is excluded. Therefore, an E&P operator should review well site and field equipment that is **not** considered to be storage incident to transportation for RMP coverage for regulated toxics. For example, field operations involving sour gas/liquid separation and heater-treater equipment may be covered if the equipment contains ≥10,000 lb of H_2S. However, because of the relatively small confined volumes and the low concentration of H_2S in most oil/gas streams, these facilities are unlikely to be affected. Gathering lines containing sour gas/liquids are not covered by the RMP rule because they are exempted transportation activities.

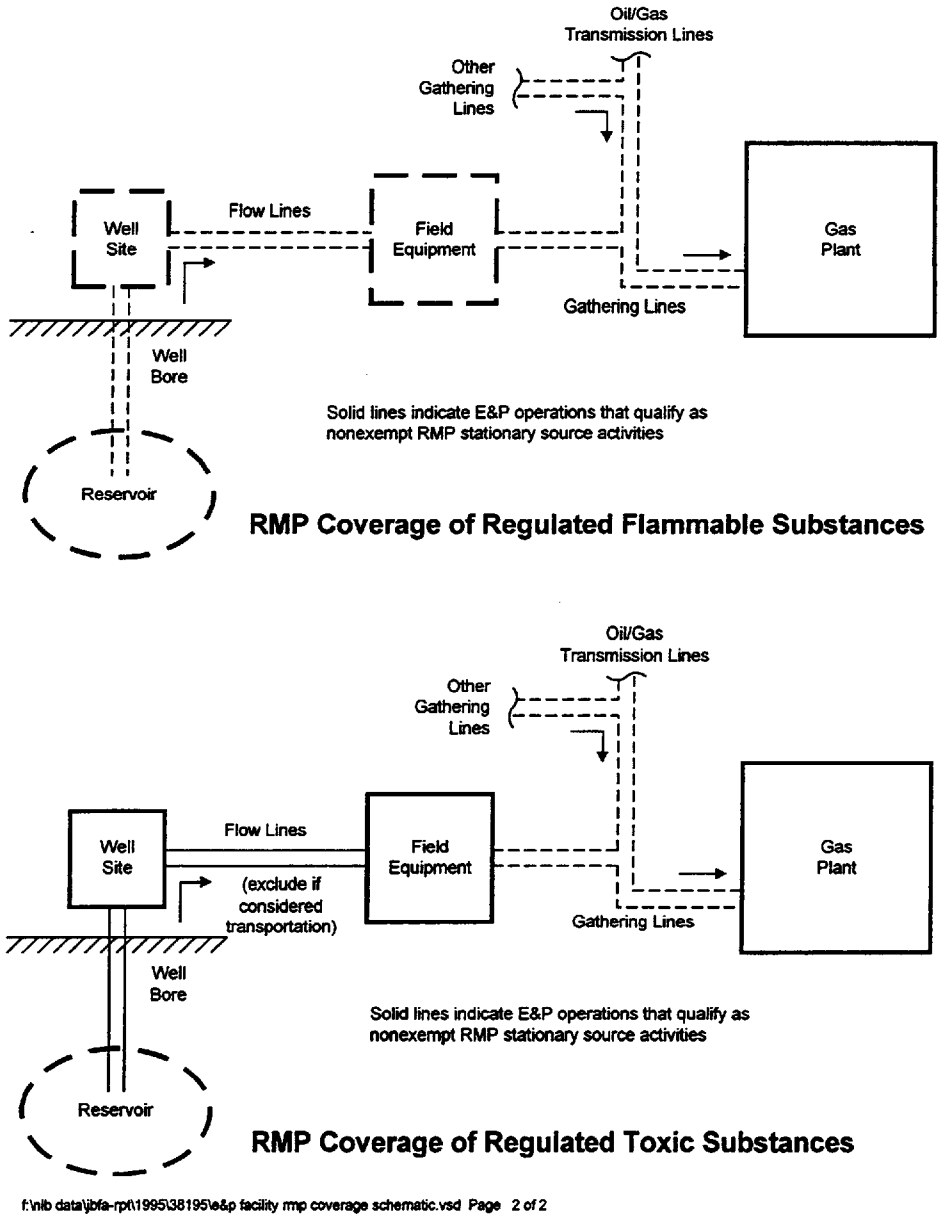


Figure 2-1
E&P Facility Coverage Schematic

E&P gas plants processing sour gas could be affected. E&P gas plant operators should consider the gas plant from the inlet lines to the outlet lines for RMP coverage; however, many gas plants are unlikely to be covered due to the presence of H_2S, unless the inlet oil/gas stream is very sour and the gas processing equipment capacity is very large.

Note: Transportation and storage incident to transportation are not covered by the RMP rule. DOT is presently undertaking rulemaking to clarify what activities it considers to be "in the transportation process." The DOT proposal may affect the interpretation of EPA's proposed exemption for transportation pipelines. EPA excludes pipelines that are DOT-regulated, regulated under related state programs, or subject to DOT oversight authority. DOT has authority to regulate, or to choose not to regulate, gathering lines, so EPA's January 6, 1998, amendments to the RMP rule[9] should exclude those pipelines from RMP coverage; however, oil and gas fields may have pipelines that are **not** subject to DOT jurisdiction or oversight. Generally, DOT and state pipeline regulatory authorities consider production facility lines (flow lines) as outside of DOT oversight authority.

Potential oil and gas drilling and workover sources are not specifically excluded under the proposed list rule amendments. Although well bore amounts of H_2S and completion/ workover fluids containing listed substances may be present, it is unlikely that a TQ will exist in most drilling or workover processes. These activities may also be excluded if the regulated substances are handled in transportation containers or storage incident to transportation.

Ultimately, E&P gas plants are the most likely E&P operations to be covered because of the large amounts of regulated flammable substances that exist in the plants. E&P sour oil or gas field operations could be covered, but it is unlikely that a TQ of regulated toxics resides in this equipment. An E&P gas plant may also be covered because of regulated toxics (e.g., ammonia, chlorine, hydrochloric acid, H_2S).

Note: Some facilities may also use regulated materials (e.g., ammonia or propane) as refrigerants in refrigeration systems associated with other processing units (e.g., hydrogen or CO_2 plants). The quantity of regulated materials in the refrigeration systems may need to be considered in the TQ determination.

2.2 IDENTIFYING REGULATED SUBSTANCES IN E&P PROCESSES

Once candidate E&P facilities that represent stationary sources are determined, the next step is to identify regulated substances in the E&P processes at these facilities. E&P facilities operate a variety of processes involving flammables and some regulated toxic substances. The E&P facility should develop a list of regulated substances used in each process area and determine a rough estimate of the inventory of the substance in the process. If the E&P facility documented its technical basis for coverage under OSHA's PSM regulation, then this information may already exist. The E&P facility should then examine the regulated substances it has and compare the process inventory estimates to the EPA TQs.

Describing all of the various well site, field operation, and gas plant configurations used is not necessary, but describing the various types of processing activities that take place in these facilities is useful for determining the basis for coverage examples used in subsequent sections of this Guide. The following categories of equipment and processing technology are typically used both in production fields and gas processing plants.

Gas/Oil/Water Separation

Well streams containing crude oil, natural gas, water, and inert gases are conveyed through flow lines to areas containing separation equipment. Oil/water separation vessels remove most of the water from the hydrocarbon liquid stream. Three-phase separators may also be used to separate the natural gas, oil, and produced water streams. Gas/oil separator vessels remove most of the gas from the liquid stream. The liquid is typically transported to storage tanks, in some cases passing through additional equipment called "heater-treaters." The heater-treaters provide further separation of oil and produced water through the addition of heat to the stream. Gas streams at sufficient pressure are conveyed directly to sales pipelines or to E&P gas plants. Lower pressure gas streams or long distance pipeline transfers may require gas compression prior to transmission.

Dehydration

Gas streams are treated to remove water vapor. Gas dehydration is accomplished through stripping the water vapor from the gas using glycol or solid desiccants. These dehydration processes will contain regulated flammable gases and, perhaps, regulated toxics (e.g., H_2S).

Amine Treatment/Sweetening

These systems typically consist of a packed column with amine absorption of H_2S, carbon dioxide, and other substances from gas and hydrocarbon liquid streams. These systems will contain regulated flammable gases and liquids and be a likely location for regulated toxics (i.e., H_2S).

Gas Compression

Gas compression increases the pressure of the gas stream. These systems of compressors, gas scrubbers, and knockout drums contain regulated flammables and, possibly, regulated toxics. Many of these compressors operate at high pressures; however, the gas volume contained in the equipment is usually small.

Atmospheric Storage of Separated Liquids

Well site and field facilities may have atmospheric tanks that temporarily store separated liquid hydrocarbons and water. Some of this equipment may contain H_2S.

Natural Gas Liquid (NGL) Separation/Extraction

Hydrocarbon liquid streams in gas processing plants are separated in vessels and columns. Some systems use columns to extract dissolved NGLs from gas streams. This equipment contains regulated flammables.

Fractionation/Stabilization

These systems consist of fractionation columns containing regulated flammable liquids and gas. They typically will not contain any regulated toxics because these will have been removed by prior treatment steps. Some of these systems include fractionation towers operated at low temperatures (i.e., cryogenic). Propane is the typical refrigerant.

This equipment contains regulated flammables, but is unlikely to contain significant amounts of regulated toxics.

Pressurized Storage, Loading, and Transmission Pipelines

Various pressure tanks are used to store liquids in an E&P gas plant. These vessels are likely to be the largest inventories of regulated flammables. Loading facilities (e.g., railcars) could be covered by the RMP rule if they contain a TQ of flammables. Pipelines are exempt from coverage because they are transportation activities. It would be rare that inlet gas tanks contain enough sour gas to have a TQ of H_2S.

Note: EPA has specifically exempted transportation containers that remain connected to the motive power that delivered them to the plant site. For example, a tanker truck delivering ammonia to the plant site is exempt from the RMP rule, provided that the truck remains connected to the tank trailer while at the plant site. However, railcars are typically disconnected from the train engine following delivery and may be subject to the TQ determination.

Note: EPA has indicated, based on informal conversations with API, that transportation containers that have been unhooked from the motive power that delivered them to the site (e.g., truck or locomotive) and left on the site for temporary storage may or may not be considered as part of the stationary source. Owners/operators should make a reasonable determination based on site-specific circumstances. For example, if the railcars are parked on a private siding where they are used as storage tanks until they are connected to a process, then the railcars should be considered part of the stationary source. On the other hand, if your site is serving as a short-term waystation for railcars that are never connected to a process, then the railcars should probably not be considered part of the stationary source.

The rule does not say that you *must* consider all transportation containers unhooked from motive power to be part of the stationary source. It actually says the converse: transportation containers still hooked to motive power are not considered part of the stationary source. This does not necessarily imply that all transportation containers unhooked from motive power automatically become part of the source. Note that the preamble to the January 6, 1998, FR rule amendment states: "EPA believes that a railroad tank car containing a regulated substance *could* be considered a stationary source or part of a stationary source, even though the tank car is 'suitable for transportation'." Since the statement uses the word *could*, instead of *shall, must, or should*, it implies that in some circumstances, a railroad tank car (not hooked to motive power), and therefore other transportation containers, may or may not be considered part of the stationary source. If it is hooked to motive power, the answer is clear - it is not part of the source. If it is *not* hooked to motive power, then the owner/operator of the facility must make a reasonable determination as to whether or not it is part of the stationary source.

Note: API intends to work with EPA to determine how the RMP prevention program requirements may be implemented on transportation containers (i.e., railcars disconnected from motive power) that may be subject to the RMP rule.

Utilities

Depending upon the location, some E&P facilities may have their own dedicated water/waste treatment systems. These systems could contain chlorine, sulfur dioxide, hydrochloric acid, H_2S, or ammonia. Some facilities may have cooling towers to which they add chlorine to the cooling water system to control biological growth in the cooling water system.

2.3 DETERMINING PROCESS INVENTORY OF REGULATED SUBSTANCES

Based on the information regarding which regulated substances exist in E&P processes at stationary sources, the next step is to estimate the process inventory for each regulated substance. In most cases, E&P facilities may use the definition for processes that they

used in determining coverage under OSHA's PSM regulation as a starting point. Other E&P facilities will typically consist of only one process. Many E&P gas plant processes will likely contain greater than a TQ of a regulated flammable.

Note: EPA and OSHA both interpret the definition of process to mean that separate vessels that are not interconnected and that are located sufficiently far from each other and other covered processes, such that a failure in one vessel is unlikely to affect the other(s), may be treated as separate processes.

Note: EPA has indicated, based on informal conversations with API, that determining interconnection of vessels is not necessarily straightforward and will often depend on site-specific factors. The rule is driven by a concern for the potential to release at least a threshold quantity of a regulated substance. For a large refinery or multi-unit chemical plant, determining whether an interconnection exists and defining the boundaries of a process will require engineering judgment. For example, if vessels containing regulated substances are connected by only utility lines (e.g., piping carrying cooling water), you will have to determine whether the vessels could be involved in a single release. Or, even if the vessels are connected by piping containing the regulated substance but are far enough apart so that they are not co-located (see the discussion below) and a failure of the connecting piping would not lead to a release of either or both vessels, then you may consider the vessels as separate processes.

In cases where you have a series of connected vessels, some with regulated substances and others without regulated substances, the question you will need to answer is whether there is a credible scenario involving any of the vessels or piping that do not hold a regulated substance that could result in a release of the regulated substances from vessels containing them. If an explosion of a vessel without regulated substances could lead to such a release, then the entire series of vessels is considered a single process. If a fire or explosion of the vessels without regulated substances would not lead to a release from all the vessels with regulated substances (e.g., because they are widely separated), then the vessels with the regulated substance may be considered separate processes. Again, you should use engineering judgment to make a reasonable determination of the boundaries of such processes.

Issue: Some factors that have been used by companies for establishing a technical basis for defining separate processes for implementing OSHA PSM include:

- The process is under different management and/or supervision from other processes
- The process is operated by different personnel who have substantively different job tasks
- The process involves different feeds/products that represent different types or levels of hazard
- Limited physical "coupling" exists between equipment in one plant area to equipment in another plant area
- The physical proximity of equipment in a process area is such that a failure is unlikely to affect the equipment in another area
- Well-designed, reliable physical protection (passive is best) exists against interactions of the inventory of a regulated substance in one area with a regulated substance in another area in case of a fire or explosion. The "boundaries" created by these protection features are often convenient dividing lines between processes
- The function of the process equipment in one area is different from that in another area

The basis for any exemption involving toxic or flammable mixtures must be documented. The following is a thought process that E&P facility personnel can use to quickly evaluate whether a process contains a TQ of a regulated flammable substance (i.e., a single substance or a mixture):

Regulated Flammable Liquids in Vessels

1. Look at the largest liquid-filled vessel in the process. (If it involves a pure substance, skip steps 2 through 4.)

2. Determine if the mixture contains a regulated flammable substance in a concentration greater than 1 wt%. If not, then the mixture does not count toward the TQ determination.

3. Determine if the mixture meets the NFPA 4 criteria. If it does, proceed to step 4. If it does not meet the NFPA 4 criteria, then the mixture does not count toward the TQ determination. (Note: Listed regulated flammable substances meet NFPA 4 criteria. See Section 2.4 of this Guide for a discussion of the NFPA 4 criteria.)

4. Determine the quantity of flammables in the vessel. As a first cut, assume the vessel is 100% full. Or, determine the level based on administrative controls.

5. Compare the total quantity to the TQ (i.e., 10,000 lb).

6. If the amount of mixture in the vessel is greater than 10,000 lb and the mixture meets NFPA 4 criteria, the process is covered. If the vessel contains less than 10,000 lb, record the amount of the NFPA 4 mixture and proceed to the next largest vessel containing the regulated substance.

7. Repeat these steps for all vessels containing flammable liquids in the process. If the total amounts in the vessels are less than 10,000 lb, consider adding in the amount in pipes if thought to be significant. Consider using a rule of thumb for the incremental amount contained in piping without having to do detailed calculations (e.g., add 20% of the total vessel inventory). Tables 2-1 and 2-2 give examples of the length of piping that will contain 10,000 lb of methane gas and liquid propane at various pressures. An example illustrating the calculation procedure follows the tables. This procedure can be adapted for use with other substances and other types of equipment (e.g., drums, tanks).

8. Repeat steps 1 through 7 for each of the regulated flammables in the process (see Appendix A for the procedure for estimating the quantity of regulated flammable materials in columns/towers).

Table 2-1
Pipe Length to Contain a Threshold Quantity (10,000 lb) of Methane Gas

		Nominal Pipe Size (Inside Diameter)						
Pressure	Density	1 inch 1.05 inch	2 inch 2.07 inch	3 inch 3.07 inch	6 inch 6.07 inch	12 inch 12.00 inch	24 inch 22.62 inch	36 inch 34.50 inch
100 psig	0.33 lb/ft³	5,100,000 ft 960 miles	1,300,000 ft 250 miles	590,000 ft 110 miles	150,000 ft 29 miles	39,000 ft 7.3 miles	11,000 ft 2.1 miles	4,700 ft 0.89 miles
500 psig	1.55 lb/ft³	1,100,000 ft 200 miles	280,000 ft 52 miles	130,000 ft 24 miles	32,000 ft 6.1 miles	8,200 ft 1.6 miles	2,300 ft 0.44 miles	990 ft 0.19 miles
1,000 psig	3.30 lb/ft³	500,000 ft 96 miles	130,000 ft 25 miles	59,000 ft 11 miles	15,000 ft 2.9 miles	3,900 ft 0.73 miles	1,100 ft 0.21 miles	470 ft 0.09 miles

Table 2-2
Pipe Length to Contain a Threshold Quantity (10,000 lb) of Liquid Propane

Pressure	Density	Nominal Pipe Size (Inside Diameter) 1 inch 1.05 inch	2 inch 2.07 inch	3 inch 3.07 inch	6 inch 6.07 inch	12 inch 12.00 inch	24 inch 22.62 inch	36 inch 34.50 inch
200 psig	31.3 lb/ft³	53,000 ft 10 miles	14,000 ft 2.6 miles	6,200 ft 1.2 miles	1,600 ft 0.30 miles	410 ft 0.077 miles	110 ft 0.022 miles	49 ft 0.0093 miles
500 psig	31.6 lb/ft³	53,000 ft 10 miles	14,000 ft 2.6 miles	6,200 ft 1.2 miles	1,600 ft 0.30 miles	400 ft 0.076 miles	110 ft 0.021 miles	49 ft 0.0092 miles
1,000 psig	32.2 lb/ft³	52,000 ft 9.8 miles	13,000 ft 2.5 miles	6,100 ft 1.1 miles	1,500 ft 0.29 miles	400 ft 0.075 miles	110 ft 0.021 miles	48 ft 0.0091 miles

Continue the coverage determination process until you determine whether the process contains a TQ amount involving each regulated substance. If the process contains a TQ, consider continuing the calculation procedure to determine an appropriate total process inventory (i.e., to two significant figures) of the regulated substance. This value is a required item in the RMP data elements.

Note: For regulated flammable substances in an NFPA 4 mixture, the RMP data elements will require an owner/operator to specify the total quantity (in lb) of the NFPA 4 mixture in the process and the specific regulated flammable materials that are in the mixture. However, the mass fractions of the regulated materials in the mixture will not be required in the RMP data elements.

Note: The inventories of regulated flammable materials or mixtures and toxic substances in each vessel will be needed when determining the worst-case scenarios for the offsite consequence analyses for the covered processes (see Section 4 of this Guide).

Most of the situations in an E&P gas plant will involve flammable gases (i.e., liquefied petroleum gas [LPG]). For these situations, consider using an ideal gas law approximation to estimate the vessel/pipe inventory assuming the lowest temperature and highest pressure that exists in the process and a molecular weight that is representative of the gas stream.

Example: Given 10,000 lb of pure methane at 68°F and 1000 psig, determine the length of 1-in. piping (nominal diameter) required to contain the TQ of 10,000 lb.

Methane Calculations

Threshold Quantity (*TQ*) 10,000 lb

Molecular Weight (*MW*) $16.043 \frac{\text{lb}}{\text{lb - mole}}$

Compressibility (*Z*)

Pressure / Temperature	986.1 psig	1319.7 psig
55.9°F	0.8700	0.8342
227.7°F	0.9010	0.8752

$Z = 0.8707$ at 68°F and 1000 psig (by interpolation)

Density (ρ)

$$\rho = \frac{MW \cdot P}{10.73 \cdot Z \cdot T}$$

$$= \frac{16.043 \dfrac{\text{lb}}{\text{lb - mole}} \cdot (1000 + 14.7)\text{psia}}{10.73 \dfrac{\text{ft}^3 \cdot \text{psia}}{\text{lb - mole} \cdot {}^{\circ}\text{R}} \cdot 0.8707 \cdot (68 + 459.7){}^{\circ}\text{R}}$$

$$= 3.30 \frac{\text{lb}}{\text{ft}^3}$$

Volume to TQ (V)

$$V = \frac{TQ}{\rho} = \frac{10{,}000 \text{ lb}}{3.30 \dfrac{\text{lb}}{\text{ft}^3}} = 3{,}030 \text{ft}^3$$

Piping Calculations

Internal Diameter (ID) 1.05 in.

Cross-sectional Area (A)

$$A = \frac{\pi \cdot D^2}{4} = \frac{3.14 \cdot \left(\dfrac{1.05 \text{ in}}{12 \dfrac{\text{in}}{\text{ft}}} \right)^2}{4} = 0.006013 \text{ ft}^2$$

Length to TQ (L)

$$L = \frac{V}{A} = \frac{3{,}030 \text{ ft}^3}{0.00601 \text{ ft}^2} = 504{,}000 \text{ ft}$$

L = 500,000 ft (two significant digits)

Note: In EPA's Question and Answer Database,[11] EPA has stated that if a stationary source contains two interconnected vessels, one containing 6,000 lb of pure butane and another containing 6,000 lb of pure propane, then the process comprising only the two vessels is not covered by the RMP rule. The amounts of different regulated substances present in a single process need not be aggregated to determine if the 10,000-lb TQ is exceeded.

However, if butane and propane are present in a mixture in the process, then the TQ determination must be calculated differently. Because a mixture of propane and butane would meet the NFPA 4 flammability criteria, the entire weight of the mixture needs to be treated as the regulated substance and added up to account for the TQ determination. If there are additional vessels in the process that contain pure butane and/or propane, the weight of the mixture should be added to both the weight of the remaining butane and the weight of the remaining propane to determine whether either the threshold for propane or butane has been exceeded [see §68.115(b)(2) of the RMP rule].

For example, if 1,000 lb of the 6,000 lb of propane are mixed with the 6,000 lb of butane to make a 7,000-lb mixture, then that 7,000-lb mixture would be treated as the regulated substance (both butane and propane) for threshold calculations. The 7,000-lb mixture would have to be added to the remaining 5,000 lb of pure propane, and the threshold for propane would be exceeded.

Regulated Toxic Substances

E&P processes involving regulated toxic substances should be examined in a similar manner. For many regulated toxic substances, determining if the process is covered is straightforward. If the substance is in a mixture, then some analysis will be necessary to determine if the mixture containing the substance meets the EPA mixture rule threshold (i.e., the partial pressure evaluated at operating conditions is greater than 10 mm Hg). In contrast to regulated flammables, the TQs for regulated toxics range from 500 lb to 20,000 lb.

For toxics that are not stored anywhere in the E&P facility, but that are present in some E&P process streams (e.g., H_2S), the TQ evaluation is more difficult. Field operation processes such as oil/water separators and sweetening units will likely not be large enough to have a TQ of H_2S. However, it is possible that E&P gas plant processes may have enough H_2S in process equipment to be covered.

E&P gas plant operators should look for TQ amounts of H_2S in the following process areas: amine treating units, sulfur units, and long or high volume pipelines within the plant property boundary. E&P gas plants typically use amine solutions (MEA, DEA, MDEA, etc.) to absorb acid gases, including H_2S and carbon dioxide (CO_2) from various processes. H_2S and CO_2 are acid gases because when dissolved in an aqueous medium, they dissociate to form a weak acid. The amines are weak organic bases. The acid gas and the amine base will combine chemically to form an acid-base salt complex, thus removing the acid gas from the process stream. The amine containing the acid gases is called rich or fat amine. Since the salts formed are easily dissociated in a thermal regeneration process, the rich amine is typically sent to a regenerator to remove H_2S and CO_2. The H_2S and CO_2 that are liberated after the addition of heat in the regenerator are sent for further processing. The lean amine (essentially acid-free gas) is returned to the process.

The oil and gas industry has traditionally characterized the H_2S (acid gas) loading in an amine stream as a weight percentage of the total stream mass (e.g., 2.5% H_2S in MEA). However, this does not mean that the amine stream contains 2.5 wt% of molecular H_2S. The weight percentage refers to the amount of molecular H_2S gas relative to the amine in the feed stream prior to contact and chemical absorption by the amine. The H_2S absorbed by the amine stream is no longer molecular H_2S, but rather forms an acid-base salt complex. The acid-base salt complex is not included in the TQ determination for H_2S.

Note: The first edition of this Guide suggested that amine streams contain molecular H_2S. Since the first edition of this Guide was published, numerous sources of literature[16-19] have been identified that indicate that molecular H_2S is not present in amine solutions, since the acid gas (H_2S) and the amine base combine chemically to form an acid-base salt complex. However, any unabsorbed molecular H_2S gas that may be present in the vapor spaces of vessels or pipes in amine treatment and regeneration systems should be included in the TQ determination. Other locations in an E&P facility where gaseous H_2S may be present include process streams upstream of the amine contactors, flare systems, and sulfur recovery units.

The absorption of molecular H_2S gas in sour water is analogous to the absorption of H_2S in amine. The molecular H_2S gas chemically binds with the NH_3 to produce ammonium sulfate. Therefore, molecular H_2S is not present in sour water. However, any unabsorbed H_2S gas that may be present in the vapor spaces of vessels or pipes in sour water systems should be included in the TQ determination.

Table 2-3 gives examples of piping lengths at different operating pressures and line sizes that would contain a TQ (i.e., 10,000 lb) of H_2S in a natural gas stream containing 10% H_2S. This table can be used as a rule of thumb in determining whether a process is covered because of H_2S.

Table 2-3
Pipe Length to Contain a Threshold Quantity (10,000 lb)
of Hydrogen Sulfide Gas (10 wt%) in a Natural Gas Stream

		Nominal Pipe Size (Inside Diameter)						
Pressure	Density	1 inch 1.05 inch	2 inch 2.07 inch	3 inch 3.07 inch	6 inch 6.07 inch	12 inch 12.00 inch	24 inch 22.62 inch	36 inch 34.50 inch
100 psig	0.343 lb/ft³	49,000,000 ft 9,200 miles	13,000,000 ft 2,400 miles	5,700,000 ft 1,100 miles	1,500,000 ft 280 miles	370,000 ft 70 miles	100,000 ft 20 miles	45,000 ft 9 miles
500 psig	1.540 lb/ft³	11,000,000 ft 2,000 miles	2,800,000 ft 530 miles	1,300,000 ft 240 miles	320,000 ft 61 miles	83,000 ft 16 miles	23,000 ft 4 miles	10,000 ft 2 miles
1,000 psig	3.036 lb/ft³	5,500,000 ft 1,000 miles	1,400,000 ft 270 miles	640,000 ft 120 miles	160,000 ft 31 miles	42,000 ft 8 miles	12,000 ft 2 miles	5,100 ft < 1 mile
1,500 psig	4.531 lb/ft³	3,700,000 ft 700 miles	950,000 ft 180 miles	430,000 ft 81 miles	110,000 ft 21 miles	28,000 ft 5 miles	7,900 ft 2 miles	3,400 ft < 1 mile

Note: E&P facilities should look at the piping from the time it enters the property and is no longer in a transportation activity all the way through the sweetening and sulfur recovery processes to determine whether a TQ of H_2S exists. This estimate should be an "at any one time" analysis, and not be based on total throughput.

E&P facilities should not forget to consider other utility systems that could contain regulated toxics (e.g., ammonia, hydrochloric acid, and chlorine).

2.4 CONSIDERING OTHER EXEMPTIONS

In addition to the RMP list rule contained in Subpart F of the RMP rule, other sections of the RMP rule offer a number of exemptions dealing with the form/use of the regulated substance. Most of these are not relevant to E&P operations (e.g., janitorial service items, structural components, laboratory activities under qualified supervision). See the CMA/API *RMP Compliance Guideline*[14] for a detailed discussion of all of the RMP exemptions.

One type of exemption that is relevant to E&P facilities is the way EPA addresses flammable mixtures. EPA's mixture rule for flammables states that processes containing a mixture with at least 1 wt% of a regulated substance may be covered if the entire mixture meets the criteria for NFPA 4 flammables. The definition for an NFPA 4 flammable substance given in 1996 NFPA publication 704[20] is:

Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air, and that will burn readily. This includes:

- *Flammable gases*
- *Flammable cryogenic materials*

- *Any liquid or gaseous material that is liquid while under pressure and has a flash point below 7°F (22.8°C) and a boiling point below 100°F (37.8°C) (i.e., Class IA liquids)*
- *Materials that will spontaneously ignite when exposed to air.*

Note:	EPA states in an amendment to the RMP list rule[9] that the boiling point and flash point should be defined and determined in accordance with NFPA 30 *Flammable and Combustible Liquids Code*.[21] In NFPA 30, the boiling point is defined as the 20% evaporated point of a distillation performed in accordance with ASTM D 86.

Note:	Material safety data sheets (MSDSs) generally list the NFPA flammability category for a hazardous material and can, therefore, be useful in determining if a flammable substance meets the NFPA 4 criteria.

Another exemption of possible significance to E&P facilities is the exemption for regulated substances in gasoline stored in a gasoline storage tank for use in internal combustion engines.

2.5 ESTABLISHING COVERED PROCESSES

Once stationary source processes have been identified, process inventories of regulated substances have been estimated, and substance- and use-specific exemptions have been considered, facilities should compare the process inventories of the regulated substances to the TQ for each substance. Processes that exceed the TQ for a regulated substance at any time are subject to the RMP rule.

Note:	Although not required by the rule, consider documenting the technical basis for all covered processes. In addition, consider documenting (1) the process inventory estimates that show a process does not exceed the TQ for RMP-regulated substances and (2) the reasons that a process/activity is exempt from the rule.
Note:	E&P operators should be aware that TQs of regulated substances can exist during maintenance and shutdown activities in otherwise uncovered process equipment. For example, a contractor could bring into an E&P facility a regulated toxic for use in cleaning or maintaining equipment. If a TQ exists during these times then the process equipment is covered under the RMP rule.

3 RMP Program Levels and Management System

The RMP rule requires facilities to assign covered processes to one of three RMP Program Levels (§68.10). EPA specifies eligibility criteria and compliance requirements for each Program Level. EPA also requires, for Program 2 and 3 processes, that the facility establish a management system to oversee the implementation of the RMP. The following sections discuss EPA's RMP Program Level and management system requirements.

3.1 PROGRAM LEVEL ELIGIBILITY CRITERIA

EPA has established three RMP Program Levels. Each covered process should be assigned to a particular Program Level. Program 1 is a less detailed RMP for those processes that have a low potential for offsite effects. Program 3 is the "full RMP" level for processes that are not eligible for Program 1 but that are (1) covered by OSHA's PSM regulation or (2) associated with one of nine "targeted" SIC codes. Program 2 is a "streamlined" RMP for all other processes not assigned to Program 1 or 3.

Program 1 eligibility criteria are as follows:

- The process has not had an accident in the past 5 years involving a regulated substance that resulted in an offsite death or injury or involved an offsite environmental response or restoration activity of an environmental receptor

Note:	Only accidents with qualifying effects involving the regulated substance(s) that caused the process to be covered are considered for Program 1 eligibility.

Note:	The RMP rule defines an "environmental receptor" as a natural area such as a national or state park, forest, or monument; an officially designated wildlife sanctuary, preserve, refuge, or area; and a Federal wilderness area. All of these areas can be identified on U.S. Geological Survey maps.

Note:	According to EPA's general RMP guidance document,[12] response or restoration activities may include the following: — collection and disposal of dead animals and contaminated plant life — collection, treatment, and disposal of soil — shutoff of drinking water — replacement of damaged vegetation — isolation of a natural area due to contamination associated with an accidental release

Note:	The accident history criteria for satisfying the Program 1 requirements are a subset of the criteria for reporting accidents in the 5-year accident history. The Program 1 criteria are limited to accidents resulting in offsite deaths or injuries or response or restoration of an environmental receptor. The 5-year accident history reporting requirements include a broader spectrum of events (see Section 4.7 of this Guide). Therefore, a Program 1 process may have incidents that satisfy the 5-year accident history reporting criteria.

- The WCS endpoint distance for the process does not reach the nearest public receptor.

Note: EPA has indicated, based on informal conversations with API, that for most facilities, the meaning of the definition of public receptor is straightforward. If you restrict access to your property at all times, public receptors are any occupied buildings or public gathering areas beyond your boundaries. Access restrictions include precautions such as a fully fenced site, security guards on duty at a reception area, or ID badges necessary to gain entry. If you have unrestricted sections of your site that are predictively used as a public gathering area (e.g., ball fields or picnic areas), then these would also be considered public receptors. Neighboring businesses, whether commercial or industrial, are considered public receptors, as are marinas and airport terminals, public and private parking lots, golf courses, transit stations, and toll booth plazas for roads and bridges.

Just because an area is off site does not necessarily mean it is automatically a public receptor. Some offsite areas such as public roads and bridges are definitely not considered public receptors. For other areas, you need to make a reasonable determination as to whether the public is known or likely to inhabit or occupy an offsite area. For example, a facility located in a remote mountainous area surrounded by unimproved forest might reasonably determine that the surrounding land is not a public receptor, even if it is infrequently traversed by hunters or fishermen. On the other hand, if your remote facility borders a state or national park, public gathering areas on that park such as the campground, picnic area, or pavilion would be considered public receptors. If you are in doubt about whether or not to consider certain areas around your facility as public receptors, you may want to consult with local emergency planning officials, local or state authorities, or your implementing agency for guidance on whether or not such areas should be considered as public receptors.

- The facility must have coordinated emergency response procedures with the local emergency planning and response organizations.

Processes that are not eligible for Program 1 are either in Program 2 or Program 3. A covered process is in Program 3 if it does not qualify for Program 1 and either (1) it is covered by OSHA's PSM regulation or (2) it is associated with one of the nine "targeted" SIC codes. SIC codes associated with E&P facilities are not among this list of codes. Thus, if an E&P facility process was not covered under OSHA's PSM standard, then the facility would have the option of assigning it a Program 2 status.

Note: EPA has published proposed amendments to the RMP rule[10] to replace SIC codes with NAICS codes. The NAICS codes associated with E&P facilities are not among the list of "targeted" NAICS codes being proposed as replacements for the SIC codes in §68.10(d)(1) of the RMP rule. As an example, the NAICS code for a natural gas processing plant is 211112.

Note: RMP-covered E&P facilities that are exempt under OSHA PSM are candidates for RMP Program 2. For example, E&P facilities that are normally unoccupied, remote facilities, or those that use regulated flammable substances solely as hydrocarbon fuels in the facility (e.g., propane for comfort heating), are exempt from OSHA. Covered E&P facilities could choose to implement the streamlined requirements of RMP Program 2 for these types of processes.

3.2 ASSESSING PROGRAM LEVEL STATUS FOR E&P PROCESSES

Based on an assessment of RMP coverage at an E&P facility, the company should assign each RMP-covered process to an RMP program level. Some E&P processes may be eligible for Program 1 status. Program 1 requirements are significantly less detailed than Program 2 or 3 requirements. For facilities that are starting from scratch, the cost of setting up a prevention program is significant. E&P facilities covered under OSHA's PSM standard will already have a prevention program in place. Others not covered by OSHA PSM typically adhere to consensus codes and standards and have many, if not all, of the Program 2 requirements already in place. Therefore, facilities should carefully evaluate the advantages and costs of achieving Program 1 eligibility for these situations. Table 3-1 compares the advantages and disadvantages of Program 1 versus Program 2 or 3.

Table 3-1
Program Level Considerations

Applying Program 1	Applying Program 2 or 3
– Must submit a worst-case release scenario	+ May not require a worst-case release scenario for this process because of scenarios for other processes
+ Does not require alternative release scenarios	– May require an alternative release scenario
+ No additional prevention program requirement beyond a general duty to operate safely	+ If covered by OSHA PSM, no additional prevention program requirements
+ No management system requirements	+ If there are other Program 2 or 3 processes, additional management system burden is minimal
+ Decreased data element requirements in the RMPlan	– Increased data element requirements in the RMPlan
– Requires certification that no additional measures are necessary to prevent offsite impacts from accidental releases	+ No additional certification required
– Must revise and update the RMPlan if changes make the process ineligible for Program 1	+ No requirement to revise and update the RMPlan if Program 1 eligibility changes
+ No additional state requirements associated with higher program levels	– Increased state requirements in some states (e.g., required seismic impact study for Program 2 or 3 processes in California)
+ Decreased regulatory liability (liable only for Program 1 requirements)	– Increased regulatory liability (fines related to Program 2 or 3 requirements could be imposed)

Positive factors are indicated by a "+" sign, and negative factors are indicated by a "–" sign.

Note: One effective strategy is to classify and register processes in the lowest program level for which they are eligible. However, because a facility may have processes under different program levels, administration of multiple RMP programs may be difficult. To facilitate administration, the facility may choose to implement and manage all processes under the most stringent program level for internal purposes only. Applying consistent policies and procedures to all covered processes may reduce the administrative burden as well as enhance the effectiveness of these programs. Registering processes under the lowest eligible program level limits the regulatory compliance burden for the facility.

E&P facilities that judge the benefits of Program 1 status outweigh the costs will be able to minimize their regulatory compliance effort. The following are some steps that should be considered when assessing program level status:

1. Look at the accident history for the covered process. If the process has had an offsite-effect accident in the last 5 years and waiting until the 5-year period elapses before submitting the RMPlan is not an option, then the process cannot qualify for Program 1 status for the initial submission of the RMPlan.

2. Examine the largest vessels and piping inventories in the process unit. If the process uses only regulated flammable substances, the WCS endpoint distance may likely not extend far beyond the property boundary and may not affect a public receptor. However, if an E&P facility has more than a TQ of a regulated toxic in a covered process, the WCS endpoint distance is more likely to reach public receptors unless the plant is very distant from the community.

Note: E&P facilities that do not have more volatile toxics or that have relatively small quantities above the TQ should strongly consider performing a WCS analysis to verify Program 1 status.

3. As required by Program 1, the facility should ensure that response actions have been coordinated with local emergency planning and response personnel.

Facilities should monitor the RMP Program Level status of covered processes. If a change occurs that alters the Program Level of the process, then the facility must update and resubmit its RMPlan within 6 months. (See Section 7 for additional requirements.)

Note:	E&P facilities with RMP-covered processes should consider modifying their management of change and, where relevant, their capital project review systems to identify potential facility changes that could affect the RMP program levels of existing covered processes.

3.3 ESTABLISHING AN RMP MANAGEMENT SYSTEM

EPA requires the owner or operator of a stationary source with processes subject to Program 2 or Program 3 to develop a management system to oversee the implementation of the RMP elements (§68.15). Specifically, a facility must assign a qualified person or position that has the overall responsibility for the development, implementation, and integration of the RMP. When responsibility for implementing individual requirements of this part is assigned to more than one person, then the facility must document the names or positions of these people and the lines of authority through an organization chart or similar document.

Note:	EPA does not specify the level of detail of the RMP management system. Facilities should consider the essential features of management systems as outlined in appropriate industry guidelines (e.g., Center for Chemical Process Safety's [CCPS's] *Technical Management of Chemical Process Safety*). Another option is for companies to consider using the system already in place for OSHA PSM implementation. In any case, EPA allows facilities to base the specific details of their RMP management systems on site-specific conditions.
Note:	EPA does not specify criteria for what a "qualified" person is who could be in charge of the RMP management system. Each facility should decide who the best individual is for the job.
Note:	EPA does not require facilities to have a management system for Program 1 processes. However, if an E&P facility has both Program 1 and Program 2/3 processes, then the facility may want to consider including the Program 1 process in its RMP management system. This would be an efficient way to "manage" the process and ensure that it continues to meet the Program 1 eligibility criteria.

4 RMP Rule— Hazard Assessment

This section focuses on the process of performing a hazard assessment (as required in Subpart B of the RMP rule) for covered processes at a typical E&P facility and the hazard assessment information that must be provided in the RMPlan. A hazard assessment consists of (1) performing an offsite consequence analysis (OCA) and (2) compiling a 5-year accident history.

Performing an OCA involves selecting candidate accident scenarios (i.e., toxic releases, fires, and/or explosions) and using consequence analysis methods or models to estimate the potential impact on the public. The methods or models used to perform the OCA can vary from simple, inexpensive approaches (e.g., EPA's *RMP Offsite Consequence Analysis Guidance* document)[22] to refined, more costly commercially available software. Owners/operators have the flexibility to select the consequence analysis methods or models that will help them most effectively comply with the RMP rule.

The process of performing a hazard assessment is illustrated in Figure 4-1. The major steps illustrated in Figure 4-1 are discussed in more detail in the following sections. The hazard assessment requirements of the RMP rule are discussed, and an example hazard assessment for a typical E&P facility is also presented.

4.1 IDENTIFYING THE OBJECTIVES OF THE HAZARD ASSESSMENT

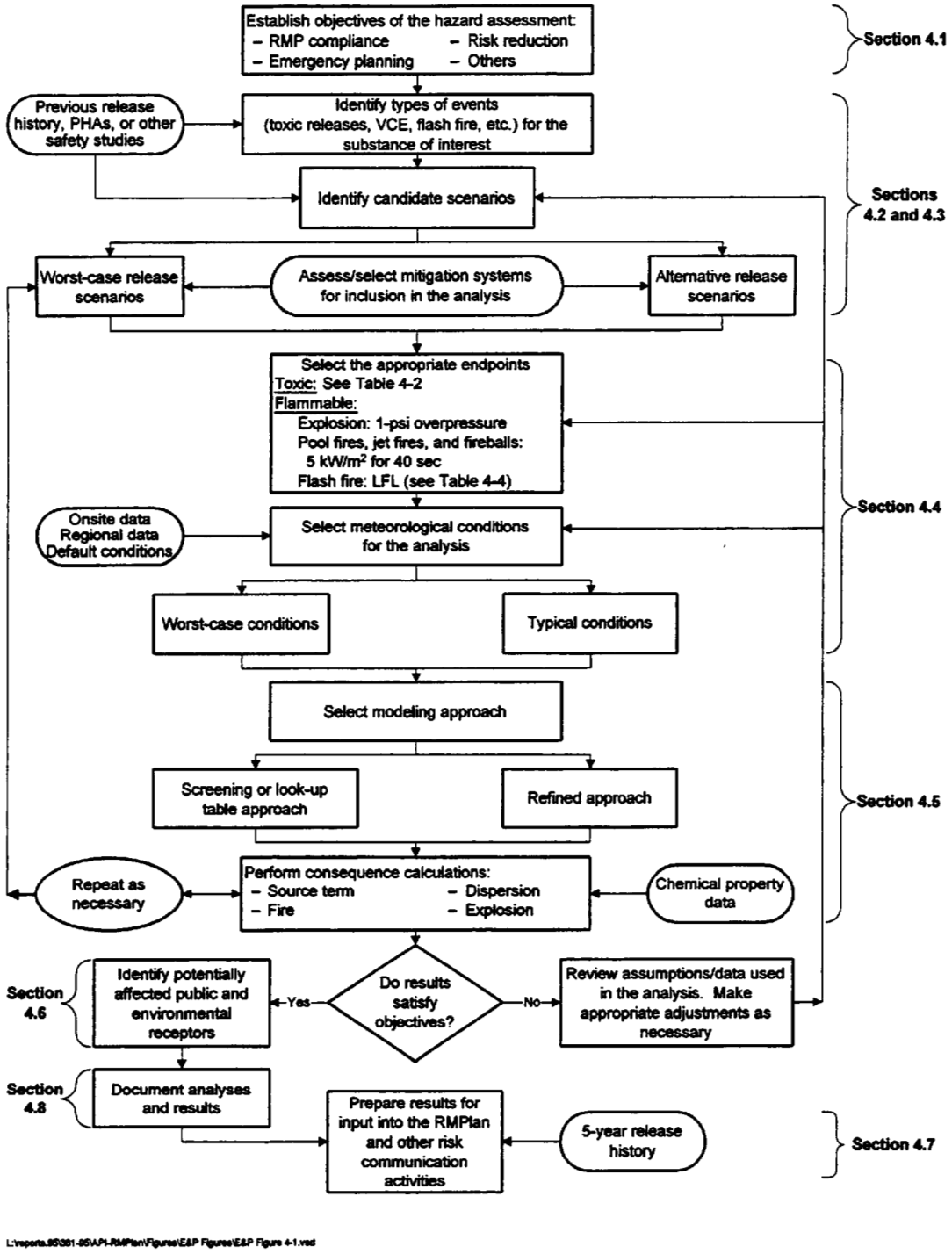
The objectives of the hazard assessment will influence the candidate accident scenarios that are analyzed in the OCA, the modeling parameters that are used in the OCA, the format of the OCA results, and the level of effort required to perform the OCA. In this model RMPlan document, the objectives of the hazard assessment are (1) to satisfy the requirements of the RMP rule and (2) to provide OCA information that will help the local emergency planning committee (LEPC) improve the community emergency response plan.

Note:	Owners/operators of E&P facilities may have objectives other than RMP rule compliance, such as enhancing public risk communication, reducing process risk, illustrating the effectiveness of mitigation systems, or complying with other regulatory initiatives. These objectives may increase the number and type of accident scenarios considered.

The process of performing a hazard assessment can be an iterative process, particularly in the selection of the scenarios for the OCA. For some community environments, early involvement of the stakeholders (e.g., LEPC members or other emergency responders) who will be using the results of the hazard assessment (i.e., the OCA and the release history) may help minimize the effort necessary to perform the analyses and compile the appropriate information.

4.2 SELECTING CANDIDATE WORST-CASE RELEASE SCENARIOS

The RMP rule requires that the WCS for each class of regulated substances (i.e., toxic and/or flammable) at an E&P facility be reported in the RMPlan for all of the Program 2 and 3 processes [§68.25(a)(2)(i) and (ii)]. Additional WCSs must be reported for Program 2 and 3 processes if the scenarios would affect different public receptors [§68.25(a)(2)(iii)]. A WCS must also be reported for each Program 1 process at an E&P facility to support the process's eligibility for Program 1 [§68.25(a)(1)].



L:\reports.95\381-95\API-RMPlan\Figures\E&P Figures\E&P Figure 4-1.vsd

Figure 4-1
Major Steps in Performing a Hazard Assessment

The RMP rule requires that the quantity of a regulated substance released in a WCS be the largest inventory contained in a vessel or in piping between vessels that gives the greatest distance to an endpoint, accounting for administrative controls that may limit the maximum quantity released [§68.25(b)]. An administrative control is a ***written*** procedural mechanism for controlling the material inventory. For regulated flammable substances, the RMP rule states that the WCS must be assumed to be a vapor cloud explosion (VCE) involving the quantity released from the largest vessel or pipe [§68.25(e)].

Note: During the 1996 RMP Workshops,[13] EPA gave, as an example of an administrative control, a written operating procedure that requires an operator to check the level of a tank every 2 hours and record the level in a logbook. In this example, an administrative control is a written procedure for controlling level that is supported by records.

The WCS associated with the largest vessel or pipe inventory at an E&P facility may not actually result in the longest distance to an endpoint. The WCS associated with a smaller quantity of a regulated substance at a higher process temperature or pressure [§68.25(h)(1)] or located closer to the E&P facility boundary [§68.25(h)(2)] may potentially affect public receptors at longer distances beyond the facility fenceline. In these cases, the release of the smaller quantity would be considered the WCS.

The RMP rule allows credit for passive mitigation systems (e.g., a containment dike) in analyzing the WCS, provided that (1) these systems are capable of withstanding the event that causes the release and (2) the systems would still function as designed [§68.25(g)].

Note: In the preamble to the RMP rule, EPA states that reservoirs or vessels sufficiently buried underground are passively mitigated and are, thus, prevented from failing catastrophically. The WCS for underground storage may be evaluated by (1) assuming the failure of the piping connected to the underground reservoirs or vessels, (2) estimating the release rate from the pipe, and (3) assuming a release duration of 10 minutes.

In light of the above RMP rule requirements, the identification of candidate WCSs for an E&P facility should begin by collecting the following information:

- A site plot plan or aerial photograph of the facility that shows the locations of the largest process vessels and pipes
- The maximum inventory of regulated substances or mixtures (in pounds) in the largest process vessels and piping segments associated with (1) **EACH** candidate Program 1 process and (2) all of the Program 2 and 3 processes as a group
- A list of administrative controls, if any, that would limit the quantity of the regulated substance in the identified process vessels and pipes to some quantity less than the maximum; if such controls exist, determine the limiting quantity (in pounds)
- The maximum pressure and temperature conditions for the identified process vessels and pipes in covered processes
- A list of passive mitigation systems (e.g., containment dikes) associated with the identified process vessels and pipes in covered processes, including the characteristics of the mitigation systems (e.g., earthen containment berm that is 4 feet deep with a surface area of 2,500 ft^2)

In collecting the above information, keep in mind that a WCS event must be identified for **EACH** Program 1 process. For all of the Program 2 and 3 processes, only the WCS events that result in the greatest distance to the endpoints for the regulated toxics (as a class) and flammables (as a class) need to be identified.

4.2.1 Candidate Toxic Substance Release Scenarios

The largest inventories of regulated toxic substances at an E&P facility are often found in the amine treatment/sweetening processes (i.e., H_2S) and the process water or waste treatment systems (i.e., ammonia and chlorine). Particular attention should be focused on (1) high pressure and high temperature processes and (2) processes located near the facility boundary, even though they may not contain the largest vessels. Smaller inventories at higher pressures or temperatures may result in greater distances to the toxic endpoint.

Note: Determining appropriate candidates for H_2S releases may present a challenge. Usually H_2S is not stored in a vessel; rather it exists in piping networks at an E&P facility. Thus, the appropriate release quantity may be the greatest amount in a piping segment between vessels. This scenario will likely be different in every facility.

4.2.2 Candidate Flammable Substance Release Scenarios

The largest inventories of regulated flammable substances at an E&P facility will generally be areas in which liquefied products (e.g., propane, pentane, butane) are stored. For product storage areas that have several storage tanks close together, a VCE involving the largest tank will, in most cases, result in the WCS event. Analysis of the remaining tanks may not be necessary. Railcars or onsite pipelines (i.e., loading areas) that are connected to a covered process may be located closer to the E&P facility boundary than other equipment and may consequently result in longer distances to the flammable endpoint than the storage tanks.

Note: According to the January 6, 1998, amendments to the RMP list rule,[9] transportation containers that remain connected to the motive power that delivered them to the facility are not covered by the RMP rule. Railcars, however, are typically disconnected from the train engine following delivery and may be subject to the RMP rule (i.e., may be considered part of a covered process).

4.2.3 Candidate Flammable Mixture Release Scenarios

In most cases, regulated flammable substances will not be processed or stored as pure substances, but rather as mixtures of regulated substances (e.g., butane, pentane). In some cases, process vessels (e.g., separators) may contain a mixture of regulated and nonregulated flammable substances (e.g., propane and butane mixed with heavier hydrocarbons such as hexane). Process vessels in fractionation systems in various E&P processes may have mixtures of regulated and nonregulated flammable substances. These processes may also be eligible for Program 1 status if the WCS VCE does not reach an offsite public receptor.

Note: In covered processes *containing mixtures involving only regulated flammable substances*, the total mixture flammable mass in the vessel or pipe must be included in the scenario release quantity for the OCA. (See the procedures in Section 2.3 and Appendix A of this Guide for estimating the quantity of regulated flammable substances in vessels and columns.)

Note: In covered processes *containing mixtures involving regulated and nonregulated flammable substances*, if the nonregulated flammable substance would contribute to a WCS VCE (i.e., will ignite and burn), then the total mixture flammable mass in the largest vessel or pipe should be included in the scenario release quantity for the OCA.

Note: Based on the mandatory conditions in the RMP rule, for WCS events involving *regulated flammable substances*, the storage conditions (temperature and pressure) and meteorological conditions (stability and wind speed) associated with releases of the largest inventories are **NOT** considered when performing the OCA. By specifying the worst case to be a VCE, the RMP rule focuses selection of the worst case only on the inventory and the proximity of the vessels or pipes to the nearest public receptor.

Issue: EPA's definition of a VCE for WCS events involving regulated flammable substances can lead to overly conservative and misleading OCA results, because the RMP rule does not allow consideration of storage conditions (pressure and temperature) and meteorological conditions (stability and wind speed) when evaluating such events.

The storage conditions associated with a WCS event involving a release of a *regulated flammable substance* **CAN** strongly influence the flammable mass in a VCE, which subsequently affects the distance to a 1-psi overpressure. The flammable mass is a function of the relative amount of liquid pooling, self-refrigeration, and flashing that occurs, as well as the atmospheric dispersion of the resulting vapor cloud. This is particularly true for refrigerated liquefied flammable gases (e.g., propane) and for flammable liquids with normal boiling points near or above the ambient temperature (e.g., pentane). For these types of releases, owners/operators may choose, but are not required, to analyze an additional scenario that accounts for these conditions if preparing information for presentation to local stakeholders (e.g., emergency planners or the public).

API and EPA have tentatively agreed upon changes to the RMP rule that will affect the estimation of the flammable mass for flammable materials stored under refrigerated conditions and flammable substances that are normally liquids at ambient temperature. Consult EPA's RMP Internet home page (http://www.epa.gov/swercepp) for future *Federal Register* notices concerning this issue.

When taking credit for administrative controls in limiting the maximum quantity released from a vessel or pipe, the owner/operator should be sure that the administrative control is reliable. According to the preamble of the RMP rule, failure to maintain an administrative control such that it could lead to a larger inventory being released in a WCS event would be considered a violation of the RMP rule. The preamble further indicates that the facility would remain in violation of the rule until (1) the administrative control is revised to reflect the new maximum inventory, (2) the WCS OCA is updated to reflect the revised practice, and (3) a revised RMPlan is submitted to EPA or the implementing agency.

Note: For *releases of regulated toxic substances*, the passive mitigation systems that may be of benefit in evaluating the WCS events are (1) buildings, if the release of the material occurs inside a building (gases or liquids), or (2) dikes or containment berms (liquids only).

For *releases of regulated flammable substances*, the RMP rule requires that the WCS event assumes that the largest vessel or pipe inventory is released and vaporizes, resulting in a VCE. Under this mandatory assumption, no passive mitigation systems have been identified (with the exception of underground or buried storage) that would (1) minimize the consequences of a WCS VCE and (2) satisfy the requirements of the RMP rule.

Issue:	For *releases of regulated flammable substances*, the RMP rule requirements preclude consideration of passive mitigation systems (with the exception of underground or buried storage) when evaluating a WCS event. However, for releases of regulated flammable substances, particularly substances that may form liquid pools upon release (e.g., pentane or refrigerated propane), passive mitigation systems such as dikes can strongly influence the flammable mass for a WCS VCE. Therefore, owners/operators may choose, but are not required, to analyze additional scenarios that consider passive mitigation systems in the OCA if preparing information for presentation to local stakeholders (e.g., emergency planners or the public). API and EPA have tentatively agreed upon changes to the RMP rule that will allow facilities to account for containment berms for WCS events involving releases of refrigerated flammable materials and flammable substances that are normally liquids at ambient temperature. Consult EPA's RMP Internet home page (http://www.epa.gov/swercepp) for future *Federal Register* notices concerning this issue.

The process of determining the WCS events that will be reported in the RMPlan may involve performing several OCA calculations for the inventory information collected during this hazard assessment task. This may require that additional candidate scenarios be explored, based on a review of preliminary modeling results. Modeling parameters and approaches for performing the OCA for the WCS events are discussed in Sections 4.4 and 4.5, respectively.

4.3 SELECTING CANDIDATE ALTERNATIVE RELEASE SCENARIOS

For Program 2 and 3 processes, the RMP rule [§68.28(a)] requires that one ARS be reported in the RMPlan for each regulated toxic substance and one ARS be reported for regulated flammable substances as a class. No ARS is required for a Program 1 process.

The RMP rule requires that an ARS (1) be more likely to occur than the WCS and (2) reach an endpoint (toxic or flammable, as applicable to the substance released) off site, unless no such scenario exists [§68.28(b)(1)]. The 5-year accident history and failure scenarios identified in the process hazard analysis (PHA) (Program 3 process) or HR (Program 2 process) are factors that should be considered when selecting ARSs [§68.28(e)].

Note:	EPA states in the preamble to the RMP rule, that sources should have flexibility to select the alternative release scenarios that are the most useful for communication with the public and first responders and for emergency response preparedness and planning.

Note:	If the distance to an endpoint for the WCS for a Program 2 or 3 process just barely exceeds beyond the facility boundary, identifying an ARS that reaches an endpoint off site may be impossible; nonetheless, the RMP rule requires submittal of an ARS, even if it does not reach an endpoint off site.

The RMP rule allows credit for both passive and active mitigation systems in analyzing the ARSs, provided that (1) these systems are capable of withstanding the event that causes the release and (2) the systems would still function as designed [§68.28(d)]. Therefore, active mitigation systems, such as automatic shutoff valves, manual isolation valves, and remote interlocks, may be assumed to function to limit the duration of the releases. However, if the limited duration yields results that would not affect an offsite public receptor, the release scenario may not qualify as a useful ARS.

Note: For ARS events involving releases of regulated flammable substances, particularly substances that may form liquid pools upon release (e.g., pentane or refrigerated propane), passive mitigation systems such as dikes can strongly influence the flammable mass for a VCE. However, dikes or berms will generally not influence the flammable mass associated with releases of pressurized, liquefied flammable substances (e.g., butane and propane) because these substances tend to flash and quickly evaporate upon release.

In light of the above RMP rule requirements, the identification of candidate ARSs for an E&P facility should begin by reviewing the results of the analyses of the WCS events. Then, analysts should consider "smaller," more likely equipment failures that are typical of certain types of processing, storing, and handling situations (e.g., propane loading line failure). Several examples of ARS events are provided in Table 4-1, including those presented in the RMP rule [§68.28(b)(2)] and additional examples for regulated toxic and flammable substances at a typical E&P facility.

Note: No ARS events are required for Program 1 processes. Therefore, only the Program 2 and 3 processes need to be considered when identifying candidate ARS events.

Note: According to EPA's *RMP Offsite Consequence Analysis Guidance* document,[22] for regulated flammable substances, an ARS may be a VCE, flash fire, boiling liquid expanding vapor explosion (BLEVE), fireball, jet fire, or pool fire. Additional information on these events may be found in *Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs* published by CCPS.[23]

Note: A BLEVE and/or a fireball resulting from a BLEVE may be appropriate ARS events to consider for regulated flammable substances such as liquefied petroleum gases (LPGs) (e.g., propane and butane) in storage tanks that could be subjected to direct flame contact under accident conditions.

Note: The distances to the flammable endpoints for VCE, flash fire, or fireball events are generally greater than the distances associated with BLEVE, jet fire, or pool fire events. In many cases, overpressures generated from a BLEVE or thermal exposures from a jet fire or pool fire event will not exceed the flammable endpoints at offsite locations and may, therefore, not be considered useful ARS events. BLEVEs may, however, generate large vessel fragments that may be propelled away from the facility.

A *quantitative* evaluation of missile hazards is NOT required by the RMP rule. However, EPA's *RMP Offsite Consequence Analysis Guidance* document[22] states that you "may also want to consider models or calculation methods to estimate effects of vessel fragmentation" for BLEVE events. A *qualitative* discussion of missile hazards may be useful if communicating with the local stakeholders to show that you have considered all of the potential consequences of a BLEVE. A qualitative discussion of missile hazards from BLEVEs can be found in *Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs* published by CCPS.[23]

Issue: The RMP rule requires that a VCE be considered the WCS event for a regulated flammable substance. However, other fire or explosion mechanisms (e.g., thermal radiation from a BLEVE fireball) may result in greater distances to the endpoint of concern. Owners/operators may choose, but are not required, to evaluate additional scenarios that consider other fire and/or explosion mechanisms (such as a fireball event), as appropriate, if preparing information for presentation to local stakeholders (e.g., emergency planners or the public).

The data that must be collected to perform an OCA of an ARS event depend upon the specific type of event selected for analysis and the specific model or method used to evaluate the consequences of the event. For example, the input data requirements for analyzing a leaking hose will differ from the input data requirements associated with a relief valve discharge. The data requirements for a simple modeling approach will be different from those for a refined model. Owners/operators will need to review the input data requirements for the specific model or method that they will use in evaluating the selected ARS event to know what information is needed.

Table 4-1
Examples of Alternative Release Scenario (ARS) Events

Example ARS Events from the RMP Rule [§68.28(b)(2)]	Example ARS Events for Regulated Toxic Substances at an E&P Facility	Example ARS Events for Regulated Flammable Substances at an E&P Facility
• Releases from transfer hoses resulting from splits or uncoupling events	• Leak in an acid gas line to the sulfur recovery unit resulting in a release of H_2S	• Failure of a propane transfer line (with subsequent ignition), resulting in a VCE or flash fire
• Releases from process piping flanges, joints, welds, valves, valve seals, or drains or bleeds	• Leak in a transfer line containing a rich liquid amine stream resulting in a release of H_2S	• Storage tank leak that releases pentane (with subsequent ignition), resulting in a pool fire
• Releases from vessels or pumps resulting from cracks, seal failure, or drain, bleed, or plug failure	• Leak in a cylinder valve, feed line, or manifold from a 1-ton chlorine cylinder to a water treatment system	• Relief valve discharge on a butane storage tank (with subsequent ignition), resulting in a jet fire
• Releases from vessels resulting from overfilling, overpressurization, or relief valve or rupture disk venting	• Leak in a valve or pipe, releasing ammonia from a refrigeration system	• BLEVE/fireball of a butane storage tank engulfed in flames
• Releases from shipping container mishandling, breakage, or puncturing	• Release of unignited H_2S through a flare	

4.4 MODELING PARAMETERS

The RMP rule contains several mandatory assumptions and modeling parameters that must be used when performing the hazard assessments. These requirements can be classified into one of the following categories:

- Endpoints
- Release parameters
- Meteorological/surface data.

These requirements are discussed briefly in the following paragraphs.

4.4.1 Endpoints

Appendix A of the RMP rule presents the endpoints that must be used when performing a hazard assessment for toxic releases. Exposure to a toxic concentration may cause serious injury to members of the public. Table 4-2 presents the endpoints for the toxic regulated substances that may be present at E&P facilities. According to the preamble to the RMP rule, EPA is currently working with other agencies to develop Acute Exposure Guideline Limits (AEGLs) that will eventually be adopted as the toxic endpoints for the regulated substances subject to the RMP rule. Proposed AEGLs will undergo a public comment period as part of the rulemaking process.

Table 4-2
Toxic Endpoints for RMP Regulated Toxic Substances that May Be Present at E&P Facilities

Regulated Substance[1]	CAS Number	Molecular Weight[2]	Toxic Endpoint[3]	
			mg/liter	ppm
Ammonia (≥ 20% by weight)	7664-41-7	17.03	0.14	200
Ammonia (anhydrous)	7664-41-7	17.03	0.14	200
Chlorine	7782-50-5	70.91	0.0087	3
Hydrogen chloride (≥ 37% by weight)	7647-01-0	36.46	0.030	20
Hydrogen sulfide	7783-06-4	34.08	0.042	30

[1] These toxic substances may not be present at all E&P facilities.
[2] These values were taken from EPA's *RMP Offsite Consequence Analysis Guidance* document (May 24, 1996).[22]
[3] These mg/liter values were taken from Appendix A of the RMP rule (40 *CFR* 68). The conversion from mg/liter to ppm assumes ideal gas behavior, a 25°C ambient temperature, and a standard atmospheric pressure of 101,325 N/m². Under these assumptions, the following equation was used:
C(ppm) =[24,464×C(mg/liter)]÷Molecular Weight.

The endpoints required by the RMP rule for regulated flammable substances depend upon the type of event. Table 4-3 presents the endpoints that must be used for the various types of events associated with releases of regulated flammable substances. Table 4-4 provides lower flammability limit (LFL) data for regulated flammable substances that may be present at E&P facilities.

Table 4-3
Endpoints for Events Involving Regulated Flammable Substances

Event Type	Endpoint
VCE and BLEVE	Overpressure of 1 psi [§68.22(a)(2)(i)]. This can knock individuals off their feet, shatter window panes, and damage houses
Fireball, pool fire, and jet fire	Thermal radiation of 5 kW/m^2 for an exposure time of 40 seconds [§68.22(a)(2)(ii)]. This exposure may cause second-degree burns to exposed individuals
Flash fire	Lower flammability limit (LFL) [§68.22(a)(2)(iii)]. The LFL represents the minimum concentration at which a flammable vapor cloud will ignite and burn in ambient air. Individuals located within a flammable vapor cloud that subsequently ignites may suffer serious injuries from burns. Table 4-4 provides LFL data for regulated flammable substances that may be present at E&P facilities

Table 4-4
LFL Endpoints for RMP Regulated Flammable Substances that May Be Present at E&P Facilities

Regulated Substance[1]	CAS Number	Lower Flammability Limit (LFL)[2]	
		mg/liter	vol%
i-Butane	75-28-5	43	1.8
n-Butane	106-97-8	36	1.5
Ethane	74-84-0	36	2.9
Methane	74-82-8	33	5.0
i-Pentane	78-78-4	41	1.4
n-Pentane	109-66-0	38	1.3
Propane	74-98-6	36	2.0

[1] These flammable substances may not be present at all E&P facilities.
[2] These values were taken from EPA's *RMP Offsite Consequence Analysis Guidance* document (May 24, 1996).[22]

Note: Fireball events usually have durations that are significantly less than 40 seconds. For shorter duration exposures, the thermal flux that would result in the same effect (i.e., second-degree burns) would have to be greater than 5 kW/m^2. The equivalent thermal exposure endpoint (i.e., to cause second-degree burns) for a fireball event that has a duration of less than 40 seconds can be estimated from the following relationship:

$$\text{Fireball Thermal Endpoint (kW/m}^2\text{)} = \frac{79.53}{(t_{\text{fireball}})^{0.75}}$$

where t_{fireball} is the duration of the fireball (in seconds). As an example, the appropriate thermal endpoint for a fireball with a duration of 10 seconds is given by the following:

$$\text{Fireball Thermal Endpoint (kW/m}^2\text{)} = \frac{79.53}{(10\ \text{seconds})^{0.75}} = 14\ \text{kW / m}^2$$

The above relationships are used in EPA's *RMP Offsite Consequence Analysis Guidance* document.[22]

4.4.2 Release Parameters

The RMP rule has specific requirements for release height and release temperature for modeling WCS and ARS events. ***For WCS events***, the following assumptions must be made:

- The release is assumed to occur at ground level [§68.22(d)]
- For toxic liquid releases that are not gases liquefied by refrigeration, the release temperature is the higher of (1) the highest daily maximum temperature in the past 3 years or (2) the process temperature [§68.22 (g)]
- For toxic liquid releases that are gases liquefied by refrigeration, the release temperature is the normal boiling point of the substance [§68.25(c)(2)(ii)].

Issue:	For WCS events, EPA does not allow releases of flammable liquids (e.g., pentane) and releases of flammable gases liquefied by refrigeration (e.g., propane) to be treated as evaporating pools upon release. However, owners/operators may choose, but are not required, to analyze additional scenarios that account for these conditions in the OCA if preparing information for presentation to local stakeholders (e.g., emergency planners or the public). In this case, the pool temperature would be selected following the same approach as for toxic liquid releases. API and EPA have tentatively agreed upon changes to the RMP rule that will allow refrigerated flammable materials released into containment dikes and flammable substances that are normally liquids at ambient temperature to be treated as evaporating pools upon release. Consult EPA's RMP Internet home page (http://www.epa.gov/swercepp) for future *Federal Register* notices concerning this issue.

For ARS events, the release height may be selected based on the actual release location [§68.22(d)], and the release temperature may be based on the typical process or ambient temperature, whichever is most appropriate [§68.22(g)].

Note:	Flare and piping releases are examples of ARS events that occur at elevated locations. Discharges from a fractionator or a separator are examples of high temperature releases that also occur at elevated locations.

4.4.3 Meteorological/Surface Data

The RMP rule specifies the meteorological conditions (i.e., atmospheric stability, wind speed, ambient temperature, and relative humidity) that must be used when performing the OCA [§68.22(b) and (c)]. These conditions are summarized in Table 4-5 for both WCS and ARS events.

Note:	Most E&P facility locations in the continental United States will experience an F stability condition and a wind speed ≤ 1.5 m/sec at least once in a 3-year period.
Note:	The typical meteorological conditions at a given E&P facility may be quite different from the default D stability and 3 m/sec wind speed conditions assumed in EPA's *RMP Offsite Consequence Analysis Guidance* document.[22] Owners/operators may want to consider analyzing onsite or regional data to determine the most appropriate typical meteorological conditions for the E&P facility.
Note:	The National Climatic Data Center (NCDC) in Asheville, NC, collects and maintains a database of meteorological data for all National Weather Service (NWS) meteorological stations in the United States. Information on the available meteorological data may be obtained by contacting NCDC at (704) 271-4800. Meteorological data and software for processing the data may also be obtained through the Support Center for Regulatory Air Modeling (SCRAM) area on EPA's Office of Air Quality and Planning Standards Technology Transfer Network (OAQPS TTN) electronic bulletin board: Modem—(919) 541-5742, System Operator—(919) 541-5384. The TTN and SCRAM may also be accessed through the Internet at the following address: http://ttnwww.rtpnc.epa.gov.

For both WCS and ARS events, the surrounding terrain must be characterized in the dispersion calculations as urban or rural [§68.22(e)]. ***Urban*** terrain means that many obstacles are located in the immediate area, such as buildings or trees. ***Rural*** terrain means that no buildings or trees are located in the immediate area and that the terrain is generally flat and unobstructed. Some E&P facility locations can be characterized as urban terrain, particularly when other industrial facilities (e.g., other E&P facilities) or urban structures (e.g., office complexes) are located nearby. E&P facilities that are located in flat rural areas with few trees and no other industrial facilities located nearby can typically be characterized as rural terrain.

Note:	Consider selecting meteorological conditions and surface roughness values in consultation with neighboring industrial facilities that are also subject to the RMP rule. This will help ensure consistency in the OCAs that are performed by facilities in the same location.

Table 4-5
Meteorological Conditions Specified by the RMP Rule

Parameter	WCS Required Value	ARS Required Value
Atmospheric stability	F stability, unless it can be shown that the atmosphere was less stable at all times during the previous 3 years	The typical or average stability at the stationary source. (D stability is assumed if using EPA's *RMP Offsite Consequence Analysis Guidance* document[22] approach)
Wind speed	1.5 m/sec, unless it can be shown that the local wind speed was higher at all times during the previous 3 years	The typical or average wind speed at the stationary source. (A value of 3 m/sec is assumed if using EPA's *RMP Offsite Consequence Analysis Guidance* document[22] approach)
Ambient temperature	The highest daily maximum temperature that occurred at the stationary source in the last 3 years. (A value of 25°C is assumed if using EPA's *RMP Offsite Consequence Analysis Guidance* document[22] approach)	The typical or average ambient temperature at the stationary source. (A value of 25°C is assumed if using EPA's *RMP Offsite Consequence Analysis Guidance* document[22] approach)
Relative humidity	The typical relative humidity at the stationary source. (A value of 50% is assumed if using EPA's *RMP Offsite Consequence Analysis Guidance* document[22] approach)	The typical relative humidity at the stationary source. (A value of 50% is assumed if using EPA's *RMP Offsite Consequence Analysis Guidance* document[22] approach)

4.5 PERFORMING MODELING CALCULATIONS

The RMP rule imposes several mandatory modeling assumptions that analysts must adhere to when performing the OCA of the WCS events. The mandatory assumptions for regulated toxic and flammable substances are presented in Table 4-6.

Table 4-6
Mandatory Modeling Assumptions for WCS Events as Specified in the RMP Rule

Regulated Toxic Substances	Regulated Flammable Substances
• **Toxic gases or pressurized liquefied gases:** The WCS inventory is assumed to be released as a gas over a 10-minute period, unless passive mitigation systems (e.g., a building) would result in a lower release rate to the environment [§68.25(c)(1)]	• The quantity released from the vessel or pipeline is assumed to completely vaporize and be involved in a VCE [§68.25(e)]*
• **Toxic refrigerated liquefied gases:** The WCS inventory is assumed to be released instantaneously to form a liquid pool at the normal boiling point of the released substance. If the resulting pool spreads to a minimum depth of ≤1 cm, then the liquid must be assumed to be released as a gas over a 10-minute period. If the resulting pool depth is >1 cm because of passive mitigation or the surrounding surface contours, then the evaporation rate and release duration may be calculated using an appropriate modeling technique that accounts for the underlying surface characteristics (soil, concrete, etc.) [§68.25(c)(2)]	• A 10% yield factor must be used in conjunction with the release quantity if the TNT equivalency model is used to determine the distance to a 1-psi overpressure
• **Toxic liquids:** The WCS inventory is assumed to be released instantaneously to form a liquid pool at the higher of (1) the highest daily maximum temperature in the past 3 years or (2) the storage/process temperature. The resulting pool is assumed to spread to a 1-cm depth unless passive mitigation or the surrounding surface contours would limit the spread to a smaller area. The evaporation rate and release duration may be calculated using an appropriate modeling technique that accounts for the underlying surface characteristics [§68.25(d)]	

*API and EPA have tentatively agreed upon changes to the RMP rule that will affect the estimation of the flammable mass for flammable materials stored under refrigerated conditions and flammable substances that are normally liquids at ambient temperature. Consult EPA's RMP Internet home page (http://www.epa.gov/swercepp) for future *Federal Register* notices concerning this issue.

Note: The 10% yield factor requirement applies only to TNT equivalency methods. The RMP rule does not specifically prohibit the use of other VCE methodologies in evaluating the WCS events.

For ***ARS events*** involving regulated ***toxic or flammable substances,*** no mandatory modeling assumptions are specified in the RMP rule, which gives the owner/operator the maximum flexibility in selecting a modeling approach that is most applicable for a specific ARS.

With the exceptions noted above, the RMP rule [§68.25(f) and §68.28(c)] allows the use of a variety of modeling approaches for performing the OCA for WCS and ARS events. Analysts may use any of the following methods:

- The lookup table approach presented in EPA's *RMP Offsite Consequence Analysis Guidance* document[22]
- Any other publicly available techniques that account for the mandatory modeling conditions in the rule and that are recognized by industry as part of current practices
- Proprietary models that account for the mandatory modeling conditions in the rule, provided the owner/operator (1) allows the implementing agency access to the model and (2) describes the model features and differences from publicly available models to local emergency planners upon request

According to the RMP rule, the method selected must appropriately account for the density (neutrally buoyant or dense behavior) of the released vapor cloud (for releases of

gases and evaporating liquid pools) and the mandatory modeling parameters specified in the RMP rule (see Section 4.4) [§68.22(f)].

The methods or models used to perform the OCA can vary from simple, inexpensive approaches (e.g., EPA's *RMP Offsite Consequence Analysis Guidance* document[22]) to refined, expensive commercially available software. Owners/operators have the flexibility to select the consequence analysis methods or models that will help them most cost-effectively comply with the RMP rule.

Use of the simplified, step-by-step modeling approach presented in EPA's *RMP Offsite Consequence Analysis Guidance* document[22] provides a convenient method for performing program level screening of WCS events, particularly for covered processes containing regulated flammable substances. Appendix B presents the methodology in EPA's OCA guidance document for evaluating WCS events for regulated flammable substances and provides an example of how to apply the methodology. Appendix B also provides a lookup table for estimating the distance to a 1-psi overpressure for a VCE involving various quantities of regulated flammable substances at an E&P facility. If EPA's simple OCA methodology provides satisfactory results for WCS and/or ARS events, then more detailed modeling may not be necessary.

Note: The May 24, 1996, version of EPA's *RMP Offsite Consequence Analysis Guidance*[22] is a draft document that is currently undergoing a peer review. EPA's OCA guidance document will likely be revised as a result of the peer reviewer comments and comments received from other stakeholders. The final version of the OCA document is expected to be available in the late summer or early fall of 1998. EPA is currently developing a program called RMP*Comp that will perform the distance calculations using EPA's OCA guidance approach. To track the progress of EPA guidance documents and RMP software, consult EPA's RMP Internet home page at the following address: http://www.epa.gov/swercepp. Look under the "RMP Implementation: EPA Product Development" link.

If the EPA's simple OCA approach provides overly conservative results, then a more detailed modeling approach may be necessary. In particular, more refined modeling of ARS events may be beneficial, since EPA has suggested that ARS events provide useful information for emergency planning and response. Several publicly available computer models can provide more refined and realistic OCA results for toxic and/or flammable releases. These models are generally more difficult to apply and usually require an experienced analyst to facilitate their use. Examples of such models and their practical use in analyzing releases of toxic and flammable substances are presented in API's *A Guidance Manual for Modeling Hypothetical Accidental Releases to the Atmosphere.*[24]

A variety of more refined modeling approaches for assessing VCEs for ARS events (e.g., The Netherlands Organization [TNO] multienergy and the Baker-Strehlow methods) may be found in a text published by CCPS entitled *Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs.*[23] These refined VCE approaches take into account such factors as confinement, the presence of obstacles and structures, and the reactivity of the flammable substance, all of which affect the strength of a VCE. The CCPS book also provides alternative approaches for using the simple TNT equivalency method to more realistically model VCEs for ARS events and presents methods for analyzing flash fires, BLEVEs, and fireballs. Methods for assessing pool fires, jet fires, and fireballs can be found in *The SFPE Handbook of Fire Protection Engineering (Second Edition).*[25]

Note:	Consider using EPA's *RMP Offsite Consequence Analysis Guidance* approach[22] to perform Program Level screening of covered processes or preliminary screening of candidate WCS events. More refined modeling approaches can be used on the candidate WCS events that survive the screening process or on ARS events that will be used for emergency planning and response.

4.6 IDENTIFYING PUBLIC AND ENVIRONMENTAL RECEPTORS

The RMP rule requires the owner/operator to determine (1) the residential population and other public receptors and (2) the environmental receptors within the circles defined by the distances (i.e., the radii) to the endpoints for the WCS and ARS events [§68.30(a) and (b) and §68.33(a)]. The residential population must be estimated to two significant figures [§68.30(d)] and may be determined using the most recent census data or other updated information [§68.30(c)].

Note:	EPA has developed CD ROM software called LandView™ III that can be used to estimate the residential population within a circle of a specified radius. LandView™ III is a geographic information system that has demographic and economic information from the 1990 census data for the United States. Information on LandView™ III can be obtained (1) by calling (301) 457-4100 or (2) through EPA's Right-to-Know (RTK) Internet site at the following address: http://rtk.net/landview. *LandView™ III may incorrectly identify residential populations within small radii and sparsely populated areas around a plant site. In these instances, owners/operators may have to use other resources (e.g., their own knowledge of the surrounding community) to determine the residential populations.*

The presence of the following public receptors must also be determined [§68.30(b)]:

- Institutions (e.g., schools, hospitals, and prisons)
- Parks and recreational areas
- Major commercial, office, and industrial buildings

Note:	You are not required to estimate the number of people located at the public receptors listed above or provide a detailed listing of all the public receptors of the types listed above. You must only note the existence of such public receptor types in the RMPlan.
Note:	Public receptors include recreational areas such as public swimming pools, public parks, and other areas that are used on a regular basis for recreational activities (e.g., baseball fields). Commercial and industrial areas include shopping malls, strip malls, downtown business areas, and industrial parks. Public roads are NOT considered public receptors. According to the preamble to the final rule: *EPA decided that inclusion of public roads was unwarranted. EPA recognizes that people on public roads may be exposed during a release. In most cases, however, vehicles on public roads will be able to leave the area quickly and further access can be blocked, especially in isolated areas.*
Note:	Neighboring industrial complexes owned by different companies are considered public receptors for each other. For example, suppose that a fertilizer manufacturer is located just outside the fenceline of an E&P facility. These two facilities are considered public receptors for each other.
Note:	Neighboring facilities that belong to the same industrial group and are under common control by a parent company may not be considered public receptors for each other if, for RMP compliance purposes, they are designated as a single stationary source, have fully coordinated emergency response programs, and submit a single RMPlan.

The rule also requires noting in the RMPlan the presence of the following environmental receptors [§68.33(a)]:

- Natural areas such as national parks, forests, or monuments
- Officially designated wildlife sanctuaries, preserves, or areas
- Federal wilderness areas

The above receptors can be found on local U.S. Geological Survey (USGS) maps or on maps based on USGS data [§68.33(b)].

Note: You are not required to provide a detailed listing of all the environmental receptors of the types listed above. You must only note the existence of such environmental receptor types in the RMPlan.

Note: In order to identify the environmental receptors encompassed by the WCS and ARS events, one or more county maps may be required, as well as several smaller (7.5 minute series) maps. Information on USGS maps may be obtained by contacting USGS Information Services at 1-800-HELPMAP. USGS map dealers in your area may be identified through the Internet at the following address: http://www-nmd.usgs.gov/esic/usimage/dealers.html.

4.7 COMPILING A 5-YEAR ACCIDENT HISTORY

The RMP rule requires the compilation of a 5-year accident history for all RMP regulated substances in covered processes (for ALL Program 1, 2, and 3 processes) at an E&P facility that have resulted in any of the following [§68.20 and §68.42(a)]:

- Onsite deaths, injuries, or significant property damage
- Offsite deaths, injuries, property damage, evacuations, sheltering in place, or environmental damage

Note: According to EPA's general RMP guidance document,[12] any onsite property damage that exceeds $50,000 would be considered significant. Depending upon the specific circumstances, lesser levels of damage may also be significant. Owners/operators should make a reasonable judgment as to what level of damage is significant at their facility.

Note: According to EPA's general RMP guidance document,[12] any level of known offsite property damage would trigger reporting of an accident in the 5-year accident history. An owner/operator is not required to conduct a survey to determine if such damage occurred. However, if the owner/operator knows, or should have known (e.g., it was reported in the newspapers) that offsite damage occurred, then the accident must be included in the 5-year accident history.

Note: Following are some factors that you may wish to consider in selecting the definition of significant onsite property damage:

- Consider dollar thresholds based on your internal policies and a reasonable judgment as to what level of damage is significant for your operations and your industry sector
- Note existing dollar thresholds used for other purposes (e.g., company thresholds for loss reporting). Such thresholds may or may not be appropriate values to use for identifying accidents to include in the accident history, but may be included in data that a facility is already tracking and could provide information about what is considered significant for other purposes
- If consistency with a local industry group is important, it may be necessary to negotiate a consensus

Note: EPA states that the 5-year accident history should include events with major offsite environmental impacts such as soil, groundwater, or drinking water contamination, fish kills, and vegetation damage. EPA intends that environmental damage should not be limited to environmental receptors.

The accident history must include all applicable events that have occurred in the 5-year period prior to the submittal date of the RMPlan. If the RMPlan is submitted on June

21, 1999, then applicable accidental releases occurring at the E&P facility on or after June 21, 1994, must be included in the accident history.

Note: According to EPA's general RMP guidance document,[12] if a facility changes ownership, then the new facility owner must include any accidents that occurred prior to the ownership transfer in the 5-year accident history. The owner/operator may wish to explain that ownership has changed in the executive summary of the risk management plan.

Note: Consider using the incident investigation tracking system in your PSM program to identify and compile the 5-year history. Simply modify the incident reporting form to include a check box that indicates whether the incident has qualifying effects of interest, and make sure that the reporting form includes data entry fields for the additional accident data required by the RMP rule (e.g., meteorological conditions).

Note: If participating with other facilities in communicating release history information to local stakeholders, consider establishing consistent definitions for onsite and offsite property damage when selecting accidents to be included in the release history.

Note: EPA requires reporting accidental releases only of covered substances (i.e., substances that cause a process to be covered by the RMP rule). Therefore, accidents in covered processes that do not release a covered chemical do not have to be reported.

However, you may consider developing a release history for releases of nonregulated substances that have occurred in the past, particularly if the releases (1) affected the community, (2) caused significant offsite environmental damage, or (3) received media coverage. This release history may be communicated to the local community, but would not necessarily be included in the RMPlan.

The RMP rule requires that the information listed in Table 4-7 be provided for each accident scenario in the 5-year history [§68.42(b)]. The numerical data required (e.g., quantity released) in the accident history must be provided to two significant figures [§68.42(c)].

Table 4-7
Information Required for Each Accident Reported in the 5-year History

- The date, time, and approximate duration of the release
- The chemical(s) released
- The estimated quantity released (in pounds), and, for mixtures of regulated toxic substances, the percentage concentration by weight* of the released regulated substance in the mixture
- The NAICS code for the process*
- The type of release event and its source
- Weather conditions, if known
- Onsite impacts
- Known offsite impacts
- Initiating event and contributing factors, if known
- Whether offsite responders were notified, if known
- Operational or process changes that resulted from investigation of the release

*These items have been proposed to be included in the 5-year accident history based on the April 17, 1998,[10] proposed amendments to the RMP rule.

Note: Consult EPA's general RMP guidance document[12] for a listing of NAICS codes.

4.8 DOCUMENTATION AND UPDATING OF THE OFFSITE CONSEQUENCE ANALYSIS

The RMP rule requires two types of documentation for the OCA: (1) onsite documentation and (2) the information required to be in the RMPlan. The ***onsite documentation*** must include the OCA information listed in Table 4-8 for the WCS and the ARS events [§68.39].

Table 4-8
OCA Information that Must Be Retained in Onsite Documentation

- A description of the release scenario and the regulated substance(s) involved in the release, and the rationale for selection of the scenario
- The assumptions and parameters used in the analysis
- A description of any administrative controls and mitigation systems assumed to limit the quantity that could be released
- A description of the anticipated effects of controls and mitigation systems on the total quantity released and the release rate
- The estimated quantity released, the release rate, and the release duration
- A description of the methodology used to determine the distance to the endpoint (toxic or flammable, as applicable)
- The data used to estimate the population and environmental receptors potentially affected

No specific format for the above information is specified by the RMP rule, so owners/operators may elect to use whatever format they choose.

The RMP rule requires that the WCS be reported in the RMPlan for each class of regulated substances (toxic and/or flammable) for all of the Program 2 and 3 processes [§68.25(a)(2)(i) and (ii)]. Additional WCSs must be reported for Program 2 and 3 processes if the scenarios would affect different public receptors [§68.25(a)(2)(iii)]. A WCS must also be reported for each Program 1 process [§68.25(a)(1)]. For all of the Program 2 and 3 processes, the rule also requires that one ARS be reported in the RMPlan for each regulated toxic substance and one ARS be reported for regulated flammable substances as a class [§68.28(a)]. No ARS is required for a Program 1 process.

The ***RMPlan documentation*** must include (1) an executive summary and (2) a data element checklist of OCA information. The executive summary must contain a brief description of the WCSs and the ARSs, including administrative controls and mitigation measures assumed to limit the distances for each reported scenario. In addition, the OCA information listed in Table 4-9 for the WCS and ARS events must be included in the RMPlan in the form of a data element checklist [§68.165(b)].

Note: You may choose, but are not required, to communicate to the local community more information than is required by the RMP rule, based on the needs of local stakeholders.

According to the RMP rule [§68.36(a)], the OCA must be reviewed and updated at least ***once every 5 years.*** In addition, the OCA information in the RMPlan must be updated and resubmitted ***within 6 months*** of any changes in processes, quantities stored or handled, or any other aspect of the stationary source (i.e., the covered processes at an E&P facility) that would cause the distance to the endpoint to increase or decrease by a factor of two or more [§68.36(b)]. An example RMPlan executive summary containing the appropriate OCA information for a typical E&P facility (i.e., a gas plant) is provided in Appendix C.

Table 4-9
OCA Information that Must Be Included in the RMPlan

- The name of the regulated substance involved in the release
- The physical state (for toxics only)
- The methodology used to determine the distance to the endpoint (give model name)
- The type of release event (explosion, fire, toxic gas release, or liquid spill and vaporization)
- The quantity released (in pounds)
- The release rate
- The release duration
- The wind speed and atmospheric stability condition (for toxics only)
- The topography (urban or rural, for toxics only)
- The distance to the endpoint (toxic or flammable, as applicable)
- The public and environmental receptors with the distance to the endpoint (a checklist, not a detailed listing of all receptors)
- Passive mitigation accounted for in the OCA
- Active mitigation accounted for in the OCA (for ARSs only)

Note: You may want to inform the LEPC or other appropriate responders of any change that may affect the community emergency response plan, even if the change is not significant enough to warrant resubmitting the RMPlan. For a change that does require resubmittal of the RMPlan, the change should be communicated to the LEPC or other appropriate responders prior to resubmittal of the RMPlan.

4.9 EXAMPLE OF AN E&P FACILITY (GAS PLANT) HAZARD ASSESSMENT

This section presents an example of a hazard assessment for a typical E&P facility (gas plant). This example hazard assessment does not include consideration of all potential covered processes at a gas plant, but illustrates the major steps (i.e., thought processes) associated with performing a hazard assessment on selected processes at a gas plant. Furthermore, detailed consequence analysis calculations are not provided in this example; several resources for performing consequence analyses are discussed in Section 4.5. This example hazard assessment is performed in accordance with the requirements of the RMP rule published in the *Federal Register* on June 20, 1996.[2]

4.9.1 Example: Selecting Candidate Worst-case Release Scenarios

A plot plan for a typical gas plant is shown in Figure 4-2. The only covered process containing a regulated toxic substance (H_2S) in this example plant is the Amine Treatment/Sweetening Unit (ATSU).

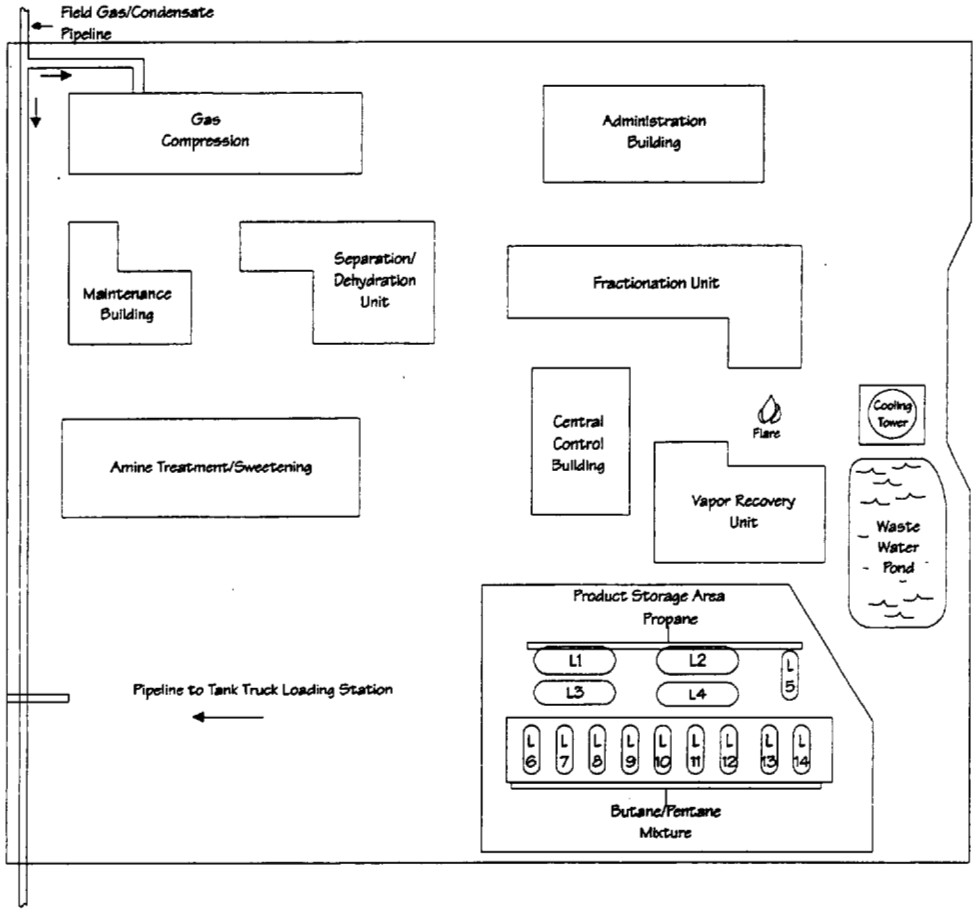


Figure 4-2
Example Gas Plant Plot Plan

Note:	This example assumes that the ATSU contains more than a TQ (i.e., greater than 10,000 pounds) of H_2S. This is a hypothetical assumption used for illustrative purposes only. Your gas plant may not contain more than 10,000 pounds of H_2S in the ATSU or any other process at your plant site. However, your gas plant may have other regulated toxic substances (e.g., chlorine) that exceed the TQ in a covered process. For this example gas plant, only one process containing a TQ of a regulated toxic substance was identified.

The largest inventories of regulated flammable substances are found in the product storage area.

Following a review of the plot plan and other process data for the gas plant, the candidate WCS information presented in Table 4-10 for several regulated toxic and flammable substances was compiled. The candidate WCSs were selected because they represent the largest inventories in a piping segment or vessel. Credit for administrative controls was accounted for in determining the maximum quantity of flammable substance released from the largest propane storage tank. No other administrative controls or passive mitigation systems were accounted for in selecting the candidate scenarios. The WCS events to be reported in the RMPlan, as required by the RMP rule, will be selected based on the OCA results of the WCS events in Table 4-10.

4.9.2 Example: Selecting Candidate Alternative Release Scenarios

The candidate ARS events for this example hazard assessment are presented in Table 4-11. For the regulated toxic substance, a more realistic release of H_2S involving a leak in a pipe containing liquid amine is assumed. This event was selected because releases from flanges in the liquid amine piping system have occurred at this gas plant in the recent past. Therefore, a pipe leak is selected as a practical scenario that would be useful for emergency response planning. Operator action to isolate the leaking pipe within 30 minutes is accounted for as an active mitigation system.

For the regulated flammable substances, several candidate ARS events based on the RMP rule requirements are identified in Table 4-11. A pool fire (liquid spill from a butane-pentane mixture tank with subsequent ignition) and a propane VCE (resulting from a transfer line failure) were selected as ARSs because these types of accidents have been known to occur at other E&P facilities and are considered to be events useful for emergency response planning.

4.9.3 Example: Additional Accidental Release Scenarios

For this example gas plant, additional scenarios, presented in Table 4-12, involving propane were also chosen to be analyzed. BLEVE and fireball events involving the largest storage vessel of propane were selected for analysis because these events have occurred at similar facilities (e.g., the series of BLEVE and fireball events that occurred in Mexico City in 1984 at an LPG storage facility). These additional events may be of use in communicating RMP information to the stakeholders. However, these events are not required to be reported in the RMPlan. The events in Table 4-12 would provide stakeholders with more realistic information about the potential consequences of worst-case events.

Table 4-10
Candidate Worst-case Scenario Information for Regulated Substances at an Example Gas Plant

Regulated Substance	Process Description	Vessel/Pipe Inventory	Administrative Controls (AC) and/or Passive Mitigation (PM)	Maximum Temperature and Pressure
Regulated Toxic Substances				
Hydrogen sulfide	Amine Treatment Unit	1,100 pounds in the largest pipe	No AC or PM credit assumed	120°F and 1,200 psia
Regulated Flammable Substances				
Mixture of i-butane, n-butane, i-pentane, n-pentane, and heavier hydrocarbons	Product storage area	VCE involving 160,000 pounds in the largest storage vessel (L6)	No AC or PM credit assumed	Not applicable for WCS VCE
Mixture of i-butane, n-butane, i-pentane, n-pentane, and heavier hydrocarbons	Tank truck loading area	VCE involving 17,000 pounds in the largest tank truck	No AC or PM credit assumed	Not applicable for WCS VCE
Propane	Product storage area	VCE involving 220,000 pounds in the largest storage vessel (L3)	Written procedure in place to limit the inventory to 75% of its maximum possible inventory of 290,000 pounds. No PM credit assumed	Not applicable for WCS VCE
Propane	Tank truck loading area	VCE involving 42,000 pounds in the largest tank truck	No AC or PM credit assumed	Not applicable for WCS VCE

Note: The information contained in this table is based on a hypothetical gas plant and is presented for illustrative purposes only. The information should not be used directly to satisfy the requirements of the RMP rule.

Table 4-11
Candidate Alternative Release Scenario Information for Regulated Substances at an Example Gas Plant

Regulated Substance	Scenario Description	Release Rate and Duration	Active and/or Passive Mitigation	Temperature and Pressure
Regulated Toxic Substances				
Hydrogen sulfide	Pipe leak in the Amine Treatment Unit	43 pounds/minutes for 30 minutes	The 30-minute release duration is the approximate time necessary to detect and isolate the release	100°F and 750 psia
Regulated Flammable Substances				
Propane	Failure of transfer line to the loading area resulting in a VCE	2,070 pounds/minutes for 15 minutes	Operator isolates the release within 15 min	Storage temperature assumed to be equal to the typical ambient temperature of 63°F
Mixture of i-butane, n-butane, i-pentane, n-pentane, and heavier hydrocarbons	Pool fire resulting from ignition of a large release from a storage tank	Not applicable	Pool fire is contained in an earthen berm with a floor area of 8,050 ft²	Not applicable

Note: The information contained in this table is based on a hypothetical gas plant and is presented for illustrative purposes only. The information should not be used directly to satisfy the requirements of the RMP rule.

Table 4-12
Additional Release Scenario Information for Regulated Substances at an Example Gas Plant

Regulated Substance	Scenario Description	Release Rate and Duration	Active and/or Passive Mitigation	Temperature and Pressure
		Regulated Flammable Substances		
Propane	BLEVE of storage vessel L3	220,000 pounds in the largest process vessel (L3)	No active or passive mitigation system credit assumed	Maximum vessel pressure assumed to be 1.2 × 248 psig (the relief valve set point)
Propane	Fireball involving contents of storage vessel L3	220,000 pounds in the largest process vessel (L3)	No active or passive mitigation system credit assumed	Not applicable

Note: The information contained in this table is based on a hypothetical gas plant and is presented for illustrative purposes only. The information should not be used directly to satisfy the requirements of the RMP rule.

4.9.4 Example: Modeling Parameters— Endpoints

The toxic endpoint for H_2S is 0.042 mg/liter (30 ppm) from Table 4-1. The explosion endpoint for VCEs and BLEVEs is 1-psi overpressure. The thermal endpoint for a pool fire is 5 kW/m^2 for a 40-second exposure time or an equivalent second-degree burn exposure. The thermal endpoints for the propane fireball is calculated using the approach discussed in Section 4.4.

4.9.5 Example: Modeling Parameters— Release Parameters

All of the events in Tables 4-10 and 4-12 are assumed to occur at ground level. The temperature of the released H_2S in the WCS event is the maximum process temperature of 120°F. No other mandatory release parameters are applicable to the WCS events.

The release temperature for the ARS event involving a release of H_2S in Table 4-11 is assumed to be 100°F, based on the typical process temperature. The ARS event in Table 4-11 involving a propane VCE assumes a typical ambient storage condition as opposed to the maximum ambient temperature.

4.9.6 Example: Modeling Parameters— Meteorological/Surface Data

Worst-case and more typical meteorological conditions were determined based on a review of data collected at a nearby NWS station. Based on data for the most recent 3-year period available at the example gas plant location, the following meteorological conditions were selected:

- ***Worst-case:*** F stability condition, 1.5 m/sec wind speed, 106°F maximum ambient temperature, and 60% average relative humidity. Since F stability and a 1.5 m/sec wind speed were observed to occur on several occasions during the 3-year period, more unstable conditions and a higher wind speed could not be justified

- ***Typical or average:*** D stability condition, 5.8 m/sec average wind speed, 63°F average ambient temperature, and 60% average relative humidity

The worst-case meteorological conditions were used in assessing the WCS for the toxic release of H_2S, and the typical or average conditions were used in evaluating the ARS for H_2S. In evaluating the WCS VCEs for the flammable releases in Table 4-10, no specific meteorological conditions are required. However, meteorological conditions can be accounted for in evaluating ARS events for flammable releases. The VCE involving the propane transfer line failure in Table 4-11 was evaluated using the typical or average meteorological conditions listed above. The example gas plant is located on relatively flat terrain with no appreciable obstacles (i.e., buildings or trees) in the vicinity of the facility. Therefore, the surrounding terrain is assumed to be rural when performing the dispersion calculations. The pool fire ARS event in Table 4-11 is assessed using the typical meteorological conditions listed above. The BLEVE and fireball events in Table 4-12 are not significantly affected by meteorological conditions used in the OCA.

4.9.7 Example: Performing Modeling Calculations

For the WCS and ARS events involving releases of H_2S, the released vapor cloud behaves as a dense gas because of the relatively low initial temperature associated with the releases. The sudden depressurization of the H_2S from 1,200 psia (or 750 psia for the

ARS event) to atmospheric pressure causes a drop in the temperature of the released gas. This temperature drop was accounted for in the determination of the cloud density and the subsequent determination of the appropriate modeling approach. Both the WCS and ARS events were analyzed using a dense gas modeling approach.

The WCS VCEs for the regulated flammable substances were analyzed using the TNT-equivalency approach suggested in EPA's OCA guidance document. A 10% yield factor was assumed as required by the RMP rule when using the TNT-equivalency approach for the WCS VCE. The BLEVE and fireball events were analyzed using methodologies documented in *Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs.*[23]

The ARS VCE in Table 4-11 was analyzed using the TNT-equivalency approach with a 3% yield factor. The 3% yield factor was judged to be more appropriate, based on site-specific factors (i.e., confinement and congestion) at the example gas plant. The pool fire in Table 4-11 was analyzed using methodologies presented in *The SFPE Handbook of Fire Protection Engineering (Second Edition).*[25]

The OCA results for the WCS and ARS events are presented in Tables 4-13 and 4-14, respectively. The results for the additional BLEVE and fireball events are presented in Table 4-15.

4.9.8 Example: Identifying Public and Environmental Receptors

The public and environmental receptors located within the distances to the endpoints for the OCA events are provided in Tables 4-13 through 4-15. The residential populations were determined using the LandView™ III software available from EPA. The presence of other public receptors was determined by reviewing local street maps and touring local neighborhoods and surrounding areas. The presence of RMP environmental receptors was identified from USGS maps of the surrounding area.

4.9.9 Example: Compiling a 5-year Accident History

The 5-year accident history for the regulated substances at the gas plant is presented in Table 4-16. These data were taken from the gas plant release history database that is used to document all releases including those that exceed the reportable quantities under Section 304 of the Emergency Planning and Community Right-to-Know Act (EPCRA).[26]

4.9.10 Example: Selection of OCA Results for Inclusion in the RMPlan

The events selected for presentation in the RMPlan are indicated by asterisks (*) in Tables 4-13 and 4-14. The H_2S release must be presented in the RMPlan because it is the WCS with the greatest distance to the toxic endpoint for the regulated toxic substances (as a class) in Program 2 and 3 processes at the gas plant. The propane WCS VCE must be presented in the RMPlan because it is the WCS with the greatest distance to the explosion endpoint for the regulated flammable substances (as a class) in Program 2 and 3 processes at the gas plant.

Table 4-13
Worst-case Scenarios: Offsite Consequence Analysis Results for the Events Identified at an Example Gas Plant

Regulated Substance	Scenario Description	Endpoint	Distance to the Endpoint (miles)	Public Receptors Within the Distance to the Endpoint	Environmental Receptors Within the Distance to the Endpoint
			Regulated Toxic Substances		
Hydrogen sulfide*	Release of 1,100 pounds over a 10-minute period from the largest pipe in the Amine Treatment Unit	0.042 mg/liter (30 ppm)	1.9	15,000 residents, a recreational park, a lake marina, a school, and a community college	National park
			Regulated Flammable Substances		
Mixture of i-butane, n-butane, i-pentane, n-pentane, and heavier hydrocarbons	VCE involving 160,000 pounds in the largest storage vessel (L6)	1 psi	0.43	310 residents and a recreational park	None
Mixture of i-butane, n-butane, i-pentane, n-pentane, and heavier hydrocarbons	VCE involving 17,000 pounds in the largest tank truck	1 psi	0.20	110 residents and a recreational park	None
Propane*	VCE involving 220,000 pounds in the largest storage vessel (L3)	1 psi	0.48	350 residents and a recreational park	None
Propane	VCE involving 42,000 pounds in the largest tank truck	1 psi	0.28	130 residents and a recreational park	None

Note: The information contained in this table is based on a hypothetical gas plant and is presented for illustrative purposes only. The information should not be used directly to satisfy the requirements of the RMP rule.

* Indicates scenarios to be presented in the RMPlan.

Table 4-14
Alternative Release Scenarios: Offsite Consequence Analysis Results for the Events Identified at an Example Gas Plant

Regulated Substance	Scenario Description	Endpoint	Distance to the Endpoint (miles)	Public Receptors Within the Distance to the Endpoint	Environmental Receptors Within the Distance to the Endpoint
			Regulated Toxic Substances		
Hydrogen sulfide*	Release of 1,300 pounds over a 30-minute period from a pipe leak in the Amine Treatment Unit	0.042 mg/liter (30 ppm)	0.20	110 residents and a recreational park	None
			Regulated Flammable Substances		
Propane*	VCE involving a release of 31,000 pounds from a transfer line over a 15-minute period	1 psi	0.071	4 residents	None
Mixture of i-butane, n-butane, i-pentane, n-pentane, and heavier hydrocarbons	Pool fire resulting from ignition of a large release from a storage tank	5 kW/m^2 for 40 seconds	0.064	5 residents	None

Note: The information contained in this table is based on a hypothetical gas plant and is presented for illustrative purposes only. The information should not be used directly to satisfy the requirements of the RMP rule.

* Indicates scenarios to be presented in the RMPlan.

Table 4-15
Additional Release Scenarios: Offsite Consequence Analysis Results for the Events Identified at an Example Gas Plant

Regulated Substance	Scenario Description	Endpoint	Distance to the Endpoint (miles)	Public Receptors Within the Distance to the Endpoint	Environmental Receptors Within the Distance to the Endpoint
Regulated Flammable Substances					
Propane	BLEVE involving 220,000 pounds in the largest storage vessel (L3)	1 psi	0.091	10 residents	None
Propane	Fireball involving 220,000 pounds in the largest storage vessel (L3)	9.1 kW/m^2 for 18 seconds*	0.40	280 residents and a recreational park	None

Note: The information contained in this table is based on a hypothetical gas plant and is presented for illustrative purposes only. The information should not be used directly to satisfy the requirements of the RMP rule.

* The 9.1 kW/m^2 thermal flux value was determined to be the equivalent thermal flux to cause second-degree burns for an 18-second exposure based on the method presented in Section 4.4.1.

Table 4-16
Five-year Release History of RMP Regulated Substances at an Example Gas Plant

Regulated Substance	Date, Time, and Duration of the Release	Quantity Released (pounds) and Conc. (wt%)**	NAICS Code**	Type of Release Event and Source	Weather Conditions	Onsite Impacts	Offsite Impacts	Initiating Event/ Contributing Factors*	Were Offsite Responders Notified?	Operational or Process Changes
Incidents 5 years prior to June 21, 1999 (RMPlan submittal date)										
Hydrogen sulfide and assorted flammable gases	11/18/95, time and duration unknown	> 100 (3%)	211112	Unburned emergency release from elevated flare stack	Overcast, winter conditions	None	Several homes were evacuated	Process design	Yes	Improved pilot detection and alarm
Methane through pentane	2/29/96, 1:14 p.m., ~25 minutes	> 10,000	211112	Overhead line leak and subsequent explosion	Unknown	$500,000 fire damage, $100,000 cleanup cost	None	Maintenance activity	Yes	Improved mix point piping and equipment
Incidents after publication of the RMP rule (June 20, 1996)										
Hydrogen sulfide	1/3/97, 11:58 a.m., ~10 minutes	~50 (3%)	211112	Pump seal failure	5 mph wind, B stability, 35°F	Worker injury—loss of consciousness	None	Unsuitable equipment	No	Replaced pump seal with improved seal
Propane	7/10/98, 1:50 p.m., 43 minutes	~28,000	211112	Safety valve spring failure, no fire or explosion	20 mph wind, A stability, 72°F	None	City Fire Chief ordered shelter in place	Unsuitable equipment	Yes	Replaced safety valve with proper part

Note: The information contained in this table is based on a hypothetical gas plant and is presented for illustrative purposes only. It should not be used directly to satisfy the requirements of the RMP rule.

* The initiating event and contributing factors were taken from EPA's *RMP Data Elements Checklist.*[27]
** The weight% of the toxic substance released and the NAICS code of the process are proposed additions to the five-year accident history as published on April 17, 1998.[10]

The ARS events from Table 4-14 selected for inclusion in the RMPlan are (1) a release of H_2S from a pipe leak and (2) a propane VCE resulting from a transfer line failure. The H_2S release and the propane VCE are practical ARSs that would be useful for emergency response planning.

4.9.11 Example: Additional Events

The additional events presented in Table 4-15 illustrate that the overpressure effects from a BLEVE of the propane storage tank are significantly less than for the WCS VCE involving a release of propane. The distance (0.40 miles) to the thermal endpoint from a fireball involving the full contents of the propane storage tank is only slightly less than the distance (0.43 miles) to a 1-psi overpressure for the WCS VCE involving a release of propane. Because of the prescriptive nature of the RMP rule, none of the events in Table 4-15 would be presented in the RMPlan for the gas plant. However, communicating these events to the local stakeholders may help demonstrate that you have considered all of the events that could potentially affect the public.

4.10 DISCUSSION OF HAZARD ASSESSMENT ISSUES

Several issues are presented in this section that are viewed by API as deficiencies and/or inconsistencies in the current RMP rule. The following issues are the subject of litigation and are currently being reviewed by EPA:

- Consideration of storage/process conditions, meteorological conditions, and passive mitigation systems in the analysis of VCEs for WCS events for regulated flammable substances. These factors can strongly influence the flammable mass associated with a VCE. The RMP rule does not currently allow consideration of these factors. API and EPA have tentatively agreed upon changes to the RMP rule that will allow refrigerated flammable materials released into containment dikes and flammable substances that are normally liquids at ambient temperature to be treated as evaporating pools upon release for estimation of the flammable mass for WCS events. Consult EPA's RMP Internet home page (http://www.epa.gov/swercepp) for future *Federal Register* notices concerning this issue.
- Proper consideration of appropriate fire/explosion mechanisms when determining the WCS for regulated flammable substances. The RMP rule specifies that a VCE must be the WCS event for regulated flammable substances. Other fire/explosion mechanisms (e.g., fireball following a BLEVE) may, in some cases, yield greater distances to the endpoint of concern

This section discusses and illustrates how some of these issues could influence the example hazard assessment presented in Section 4.9.

API has supported the contention that, when evaluating WCSs for flammable releases, analysts should be allowed to reasonably account for (1) the actual storage and/or processing conditions and (2) the chemical, physical, and thermodynamic properties of the substances when determining the vapor source term and the flammable mass for a VCE. For example, a release of propane stored at refrigerated conditions will typically form an evaporating pool with minimal flashing of the released substance. The actual airborne flammable mass will be significantly less than the full inventory of the storage vessel. The resulting distance to a 1-psi overpressure for a VCE will consequently be less.

In written comments submitted to EPA during the RMP rulemaking process, API has supported giving analysts the flexibility to consider the appropriate types of fire/explosion mechanisms (VCE, fireballs, etc.) for releases of regulated flammable substances. As illustrated in Table 4-15, a fireball has the potential to exceed the thermal endpoint at a distance that is comparable to the 1-psi overpressure distance for a VCE. Owners/operators may choose, but are not required, to communicate this additional scenario to local stakeholders to demonstrate that they have considered all of the fire/explosion mechanisms that could affect the public.

5 RMP Rule—Prevention Program

Many E&P gas plant processes are subject to Program 3 prevention program requirements (OSHA PSM requirements). This chapter does not go into detail on how to develop a Program 3 prevention program; rather, it highlights the prevention activities that differ between EPA RMP and OSHA PSM and focuses on the types of information that may be included in a facility RMPlan executive summary (see Appendix C for a sample executive summary). Readers needing more detail concerning modifying an existing OSHA PSM program to satisfy EPA Program 3 requirements or conforming to EPA's Program 2 requirements should consult the CMA/API *RMP Compliance Guideline.*[14]

The accident prevention program summary should highlight the fundamental activities that are in place to prevent, control, and/or mitigate accidental releases of regulated substances. Many of these activities are not new to E&P facilities, particularly gas plants, and the summary should convey this message where applicable. In addition, the summary should provide enough information to the reader to instill confidence in the E&P facility's ability to manage the hazards associated with the regulated substances.

The text for each prevention program element should address (1) the fundamental characteristics of the element and what is in place at the facility, (2) the significance of the activities or element, and (3) how the activity and/or supporting documentation is maintained. The text need not address *all* specific requirements; however, it should provide a basic description of the element and its role in the accident prevention program.

An example prevention program summary is included in Appendix C. This summary can be used "as is" (if all statements are true for the facility) or can be customized to more accurately and descriptively summarize E&P facility activities. For example, an E&P facility may want to highlight exemplary practices.

Note:	EPA expects the summary to describe the prevention program information for each covered process as concisely as possible. If the information is the same for several covered processes, include that information only once and note for which processes it applies.

The following sections provide general guidance on the suggested content of each prevention program element as well as ideas regarding additional information that an E&P facility may want to include for each specific prevention program element.

5.1 EMPLOYEE PARTICIPATION

This section should describe the employee participation program and provide examples of how employees are involved in developing, implementing, and maintaining the accident prevention program. Permitting employee access to prevention program information and referencing the existence of a written employee participation plan is suggested. Examples of other information that an E&P facility might incorporate into a site-specific plan include:

- The written plan for employee participation
- An example of participation in each prevention program element
- A list of safety teams and their functions
- A list of typical safety meetings and the scheduled frequency.

Note:	EPA does not require that facilities involve employees in all aspects of the RMP beyond the prevention program. However, facilities may want to extend employee involvement to other RMP areas (e.g., compilation of the 5-year accident history and selection of alternative release scenarios). Employees can provide valuable insights into these efforts, and they will be a valuable resource for supporting the communication of RMPlan information to the community.

5.2 PROCESS SAFETY INFORMATION

This section should address the three basic types of documentation maintained (i.e., chemical hazards, process technology, and equipment information) and how this information is used to support the accident prevention program. Interactions with other prevention program elements, such as training, mechanical integrity, and management of change, can also be addressed. This helps demonstrate that the accident prevention program is highly integrated and that individual elements complement one another to provide an effective system for accident prevention. Other information that an E&P facility might choose to incorporate into its site-specific plan includes:

- Names of any specialty documents that have been developed
- A list of specific documentation that is maintained, with a description of the purpose or content of the documentation
- A list of the codes and standards used for design and maintenance of equipment

5.3 PROCESS HAZARD ANALYSIS (PHA)

This section should identify the hazard evaluation technique(s) utilized for initial PHAs. The purpose of a PHA should also be stated, along with a general description of who participates in PHAs. The system for resolving recommendations should be described. The text should also address PHA updates and revalidations to demonstrate that this is an ongoing practice. Other information that an E&P facility may choose to incorporate into its site-specific plan includes:

- A description of any specific training provided to PHA team members or team leaders
- A list of process units and when the PHA was completed
- A list of process deviations and human errors considered during the PHAs
- The resolution status for PHA team findings

Note:	According to EPA's general RMP guidance document,[12] any new PHAs completed or existing PHAs updated for OSHA PSM after August 19, 1996 (the effective date of the RMP rule) must consider offsite consequences.

Note:	Consider highlighting how your PHAs deal with the potential offsite effects of accident scenarios, since EPA expects you to make any necessary modifications to existing PHAs performed for OSHA PSM compliance purposes to deal with this issue.
Note:	The RMP rule does not require that the Executive Summary contain specific information about the PHAs of all covered processes. Rather, the rule requires that a facility provide a general summary of chemical-specific prevention steps. This information can be summarized from PHA reports. Consider providing a more detailed picture of the extensive efforts a facility makes to evaluating and controlling process hazards.
Note	The RMP rule does not require that the executive summary contain a complete list of all PHA action items for covered processes. Rather, the rule requires that a facility provide a general summary of planned changes to improve safety. This information can be summarized from PHA reports. Consider providing a more detailed picture of the extensive efforts a facility makes to evaluate potential safety improvements.

5.4 OPERATING PROCEDURES

This section should identify the types of written operating procedures that have been developed and how they are used to support accident prevention. A brief summary of how procedures are maintained is recommended. Also, the existence of troubleshooting guides or similar documents should be addressed. The fact that procedures are readily available should be included. Other information that an E&P facility may choose to incorporate into its site-specific plan includes:

- An example procedure
- A description of how hourly personnel are involved in developing and maintaining written procedures
- A copy of a procedure template that describes what information should be in the procedure
- A matrix that illustrates how each of the PSM-related procedure requirements is addressed
- A list of procedures (e.g., table of contents from an operating manual)

5.5 TRAINING

This section should provide an overview of the training program for operating personnel. The text should address both new employee training and refresher training. The text should also address verification of employee understanding of the training. The required training documentation should also be addressed. Other information that an E&P facility may choose to incorporate into a site-specific plan includes:

- An overview of additional safety training that is provided (e.g., hazard communication [HAZCOM])
- Added detail regarding employee comprehension verification (e.g., criteria for acceptance, type of test)
- A list of topics addressed during initial and refresher training
- An overview of any emergency drill program
- An overview of any special emergency response training (e.g., hazardous waste and emergency operations [HAZWOPER])

5.6 CONTRACTORS

This section should describe the basic types and functions of contractors utilized at the site (e.g., supplemental work force during outages, specialty work, day-to-day operations, or maintenance). Also, the text should provide an overview of the information that the E&P facility provides to contractors or contract employees. Furthermore, the E&P facility should address the evaluation of contractors prior to selection and the system for monitoring of contractors to ensure that they are fulfilling their PSM obligations. Some E&P facilities may have contract employees who are treated almost identically to their own workers with respect to training. Additional information that an E&P facility may choose to incorporate into a site-specific plan includes:

- Specific criteria that are used as part of the contractor selection process
- An example checklist that is used as part of the bid process and/or for periodic evaluation of contractors
- An indication of the number of contract firms or contract employees on site during various operating modes (e.g., normal operation, turnarounds)

5.7 PRE-STARTUP SAFETY REVIEWS

This section should describe when a pre-startup safety review (PSSR) is performed and the purpose of the review. The E&P facility should also describe salient features of the PSSR program (e.g., the use of checklists, team composition, or expertise requirements). Additional information that an E&P facility may choose to incorporate into a site-specific plan includes:

- An example PSSR checklist
- An overview of the startup authorization requirements

5.8 MECHANICAL INTEGRITY

This section should provide an overview of the scope of the mechanical integrity program, including the equipment addressed and the basic components (e.g., training, inspections and tests, quality assurance). The E&P facility should consider addressing the purpose of each of the basic components to help readers understand the significance of the activities and how these activities provide a comprehensive system to manage the integrity of process equipment and controls. Additional information that an E&P facility may choose to incorporate into a site-specific plan includes:

- A list of the codes and standards followed for inspections and tests
- An overview of training or qualification requirements for specialized activities (e.g., welding on code vessels, performing inspections)
- A reference to the use of special alloys when appropriate to help control corrosion rates in specific services

5.9 HOT WORK PERMITS (SAFE WORK PRACTICES)

This section should identify the hot work permit procedure and other safe work practices required by §68.69(d) and describe the purpose for these written practices. The E&P facility should consider including a reference to any training that is provided

regarding these work practices. Additional information that an E&P facility may choose to incorporate into a site-specific plan includes:

- Other safe work practices that are in place (e.g., lifting permits, excavation permits)
- Example permits

5.10 MANAGEMENT OF CHANGE (MOC)

This section should refer to written procedures that are in place to manage change and should describe the basic purpose of the MOC program, including the reason for the MOC system. Also, the text should address the fact that process safety information and procedures are updated to reflect modifications, and personnel are trained as necessary. Additional information that an E&P facility may choose to incorporate into a site-specific plan includes:

- An example of an MOC form
- Training that has been provided to workers to help them identify when the MOC system should be utilized (i.e., what is a change and specifics regarding the MOC procedure)
- A description of how temporary changes are managed
- An overview of authorization requirements

5.11 INCIDENT INVESTIGATION

This section should provide an overview of the incident investigation program, including the scope of the program. The text should describe the purpose for the program and the overall goal of preventing recurrences. The E&P facility should also describe how incident investigation results and findings are tracked until they are resolved, including documenting the resolution and communicating actions to affected personnel (including contractors). The summary should refer to the practice of retaining incident investigation reports so that PHA and PHA revalidation teams can review these reports as part of their activities. Additional information that an E&P facility may choose to incorporate into a site-specific plan includes:

- An example incident investigation form
- An overview of training provided to personnel who investigate incidents
- A description of OSHA incident rates (for lost-time incidents and other reportable incidents) for the past 5 years

5.12 COMPLIANCE AUDITS

This section should describe the purpose of prevention program compliance audits and their frequency. The text should also refer to the system for responding to compliance audit findings, including documenting the resolution of findings. Additional information that an E&P facility may choose to incorporate into a site-specific plan includes:

- An overview of training provided to audit team members
- An overview of the system to resolve audit findings so that readers understand that management is involved and interested in the audit process
- An indication of the extensiveness of the audit, either by the resources utilized or the number of questions asked or a combination of the two

Note:	Although the RMP requirement for compliance audits deals only with the RMP prevention program, E&P facilities may find it useful to assess the status of all RMP compliance activities at the same time that the OSHA PSM/EPA prevention program compliance audit is conducted.

6 RMP Rule— Emergency Response Program

The emergency response program summary should describe the basic elements of your ERP for Program 2 and 3 processes. The summary should address the required elements of an ERP, as specified in §68.95(a):

- An emergency response plan
- Procedures for the use, inspection, testing, and maintenance of emergency response equipment
- Training for all employees in relevant procedures
- Procedures to review and update the emergency response plan

Note: The RMP rule does not require the development of an emergency response program if the employees of the stationary source will not respond to releases of accidental releases of regulated substances and certain other requirements are satisfied [see §68.90(b) of the RMP rule in Appendix F].

According to EPA's general RMP guidance document,[12] response is defined as specified in OSHA's HAZWOPER Standard (29 *CFR* §1910.120). OSHA defines emergency response as "a response effort by employees from outside the immediate release area or by other designated responders... to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance." The key factor is whether the responders have been designated for such tasks by their employer. This definition excludes "responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area, or by maintenance personnel" as well as "responses to releases of hazardous substances where there is no potential safety or health hazard (i.e., fire, explosion, or chemical exposure)." Thus, if you expect your employees to take action to end a small leak (e.g., shutting a valve) or clean up a spill that does not pose an immediate safety or health hazard, this action could be considered an incidental response, and you would not need to develop an emergency response program if your employees are limited to such activities.

Most, if not all, of the requirements have likely been part of your ERP for an extended time. The summary does not need to contain exhaustive details about your emergency response program; however, a facility may want to highlight exemplary emergency response equipment or training. This section should refer to written plans that address emergency response and identify some salient features of these plans. An E&P facility considering an effort to develop, revise, or consolidate response and contingency plans may want to consider using the National Response Team's (NRT's) "One Plan" guidance document to focus its efforts.[28]

Note: Since the RMP ERP provisions require facilities to test, inspect, and maintain emergency response equipment, consider adding these items to the preventive maintenance program checklist and maintain records of when these activities are conducted. Also, consider maintaining these procedures using the same management system used for maintaining the operating procedures for the facility.

The ERP summary also needs to contain a description of the coordination between the site ERP and the local community emergency response plan. The summary should describe how the site interacts with local emergency response organizations (e.g., LEPC, fire department). The summary should also describe some of the activities that the E&P facility promotes and/or supports, such as emergency drills, and LEPC meeting attendance. Additional information to consider putting in the summary includes:

- A description of mutual aid participation
- A list of the types of emergency response equipment on site
- A list of other related contingency plans (e.g., Oil Pollution Act [OPA] 90, spill prevention, containment, and control [SPCC])

Note:	Consider focusing the ERP RMPlan summary on how the facility interacts with the LEPC and the community. Highlight specific ways that the facility has done this in the past or is planning to do so in the future.
Note:	Some facilities may need only one effective means to alert the community, but other facilities may want to consider using a variety of means to notify the public in the event of a potential catastrophic release (e.g., 911 call, direct dial phone numbers, pager alert systems). Highlight these in the RMPlan.
Note:	Consider providing a complete set of material safety data sheets (MSDSs) to local emergency planning, response, and medical care organizations.

7 RMP Rule— Risk Management Plan

Section 68.150 of the RMP rule requires the owner or operator of covered processes to submit a single RMPlan that includes an executive summary and specific data involving RMP implementation activities. The information must be submitted in a method and format to a central point as specified by EPA. The owner or operator must submit the first RMPlan no later than the latest of the following dates:

- June 21, 1999
- Three years after the date on which a regulated substance is first listed by EPA
- The date on which a regulated substance is first present above a TQ in a process

Note:	EPA will require most facilities to submit their RMPlans electronically (i.e., on a diskette). An "electronic waiver" is available for facilities that are unable to comply with the electronic submission approach. EPA is currently developing a Windows®-based program called RMP*Submit that will be made available to companies subject to the RMP rule. EPA expects to have the RMP*Submit diskettes and paper forms available by January 4, 1999.

Subsequent submissions of RMPlans shall be provided according to the following RMPlan update criteria listed in §68.190:

- Within 5 years of its initial submission or most recent update
- No later than 3 years after a newly regulated substance is first listed by EPA
- No later than the date on which a new regulated substance is first present in an already covered process above a threshold quantity
- No later than the date on which a new regulated substance is first present above a threshold quantity in a process
- Within 6 months of a change that requires a revised PHA or hazard review
- Within 6 months of a change that requires a revised offsite consequence analysis
- Within 6 months of a change that alters the program level of any covered process

If a stationary source is no longer subject to this part, the owner or operator shall submit a revised registration to EPA within 6 months indicating that the stationary source is no longer covered.

Issue:	EPA requires that an RMPlan be updated within 6 months of a change that requires a revised PHA. Preamble language states that PHA revisions are **not** expected to occur frequently. A literal interpretation of the regulatory text might indicate that RMPlan updates be done whenever an MOC review is done or a simple update/revalidation of a PHA is completed [61 *Federal Register* 31695]. Companies should decide for themselves what conditions constitute "revising" a PHA. EPA has indicated an interpretation letter or database Q&A will be prepared to clarify that an updated RMPlan is required when there is a major change at the facility.

The following is a brief description of the required information for the RMPlan executive summary and the detailed RMP data.

7.1 DEVELOPING AN EXECUTIVE SUMMARY

The owner or operator must provide in the RMP an executive summary that includes a brief description of the following elements:

- The accidental release prevention and emergency response policies at the stationary source
- The stationary source and regulated substances handled
- The WCSs and the ARSs, including administrative controls and mitigation measures, to limit the distances for each reported scenario
- General accidental release prevention program and chemical-specific prevention steps
- The 5-year accident history
- The emergency response program
- Planned changes to improve safety

The RMP rule allows considerable leeway in the level of detail to include in the RMPlan executive summary. The RMP rule requirements and the data element guidelines for the executive summary are described in Table 7-1.

Table 7-1
Elements of the RMPlan Executive Summary

RMP Rule Requirement	Data Element Guideline
Briefly describe the accidental release prevention and emergency response policies	No additional guidance
Briefly describe the stationary source and the regulated substances handled	Include primary activities, use of regulated substances, and quantities handled or stored
Briefly describe the worst-case and alternative release scenarios, including administrative controls and mitigation measures that limit the endpoint distances	Include the scenario and the endpoint distance
Briefly describe the general prevention program and chemical-specific prevention steps	State that the facility complies with applicable rules; can highlight specific steps key to the facility prevention program
Briefly describe the 5-year accident history	Should be a summary, not a list of accidental releases
Briefly describe the emergency response program	Mention public notification and alert systems
Briefly describe planned changes to improve safety	No additional guidance

In addition to the RMP rule requirements and the data element guidelines, a facility may want to consider such factors as the following when developing its RMPlan executive summary:

- Whether the RMPlan will be the primary means of communicating RMP information to the public and, if so, the communication expectations of the public
- The extent of the hazards at the facility and the program levels of the processes

Appendix C contains a model of an executive summary for a typical E&P gas plant. Facilities should consider adapting this model for use in compliance and communication activities. Local conditions may dictate that the summary be more or less detailed than the model. In communities in which the facility is likely to present RMP information in a public forum, owners/operators should consider developing a "public information summary" of the executive summary that conveys the essential RMPlan information in a graphical and easy-to-understand fashion. Such formats have been effective in the Kanawha Valley, West Virginia, and Calhoun/Victoria, Texas.

7.2 COMPLETING THE RMP DATA ELEMENTS CHECKLIST

The RMP rule also requires a variety of specific RMP implementation data. The following is a summary of the required items:

- Registration data
- Offsite consequence analysis data
- Five-year accident history
- Prevention program data for each covered process
- Emergency response program information

In addition, the owner/operator must certify that "... to the best of the signer's knowledge, information, and belief formed after reasonable inquiry, the information submitted is true, accurate, and complete." [68.185]

EPA has developed a draft of its RMP data elements checklist and a brief description of the data elements.[27, 29] This information is not a part of the rule and is subject to change. Appendix D contains the March 13, 1998, version of the RMP data elements checklist. The current version of the checklist can be downloaded from EPA's bulletin board or web site: http://www.epa.gov/swercepp/.

Note:	Most of the data elements listed in Appendix D of this Guide are mandatory. According to EPA, the following data elements are optional: – LEPC name – Facility (or Parent Company) E-mail address – Facility Internet home page address – Phone number at the facility for public inquiries – Graphical representations of the OCA footprints

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APPENDIX A

An Approach for Determining the Quantity of Regulated Flammable Substances in Distillation Columns/Towers

Regulated Flammable Substances in Distillation Towers/Columns

Determining the quantity of regulated flammable substances in a distillation tower or column presents a special problem because the composition of the liquid and vapor streams varies at different locations within the column. Furthermore, there are two distinct phases within a typical distillation column—liquid and vapor. The following approach may be applied to estimate the quantity of regulated flammable substances in a column:

1. Determine if the vapor mixture exiting the top of the column contains any regulated flammable substances and satisfies the NFPA 4 criteria (see Section 2.4 of this Guide for a discussion of the NFPA 4 criteria). If it does, proceed to step 2. If it does not, then the inventory of regulated flammable substances in the column as a whole is exempt from the TQ determination. (**Note**: In most cases, the vapor mixture exiting the top of the column will meet the NFPA 4 criteria.)
2. Determine if the liquid mixture exiting the bottom of the column contains greater than 1 wt% of a regulated flammable substance. If it does, proceed to step 3. If it does not, then the bottoms liquid in the column is exempt from the TQ determination. Proceed to step 5.
3. Determine if the bottoms liquid mixture satisfies the NFPA 4 criteria. If it does, proceed to step 4. If it does not, then the bottoms liquid is exempt from the TQ determination. Proceed to step 5.
4. Determine the maximum bottoms liquid inventory, based on previous experience. For example, if the column has been completely filled at some point in the past (e.g., under abnormal operating conditions), then assume the full inventory. If the column has never been filled and its design would preclude completely filling it, then use the maximum expected inventory of bottoms liquid in the column.
5. Determine the point in the column where the liquid on the trays satisfies the NFPA 4 criteria. (**Note**: If the bottoms material satisfies the NFPA 4 criteria, then all of the trays in the column will as well.) Add the liquid inventory on each of the trays above this point to the bottoms inventory (if not exempt). Typically, 3 to 4 inches of liquid may be contained on a tray in a column. Therefore, every 3 to 4 trays constitute approximately 1 foot of liquid, which could be a significant quantity. The liquid quantity may be conservatively estimated by multiplying the liquid volume by the component in the mixture that has the highest density. If this approach is deemed too conservative, then the average liquid density may be used.
6. If the inventory calculation does not assume the column is liquid full, then multiply the liquid inventory (in lb) estimated in step 5 by 1.05 to conservatively account for the regulated flammable vapor inventory that may be present in the column. (**Note:** A comparison of the liquid and vapor densities for typical hydrocarbons indicates that the ratio of the densities of the vapor and liquid phases is less than 5% and, in many cases, is much less than 5%. Therefore, 1.05 is suggested as a reasonably conservative factor to use to account for any regulated flammable vapor mass that may be present in the column.)
7. If the amount of the regulated flammable mixture in the column is greater than 10,000 lb, the process is covered. If the column contains less than 10,000 lb, record the amount of the flammable mixture and proceed to the next largest column in the process.
8. Repeat these steps for regulated flammable mixtures in the process. (See Section 2.3 of this Guide for the procedure for estimating the quantity of regulated flammable materials in vessels.)

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Example 1: Consider a simple column that is 4 ft in diameter, 12 ft tall, and has 24 trays. The liquid mixture in the bottoms of the column contains more than 1 wt% of pentane and meets the NFPA 4 criteria. The maximum liquid level is 5 ft, based on design features that preclude completely filling the column. The depth of liquid on the trays is approximately 3 in. The maximum density of the heaviest component in the mixture is 50 lb/ft^3. Estimate the quantity of regulated flammable substances in the column.

Calculations

Bottoms liquid volume	$V_{bot} = \pi \times R^2 \times L$ $V_{bot} = \pi \times (2\text{ ft})^2 \times 5\text{ ft} = 62.83\text{ ft}^3$
Trays liquid volume	$V_{tray} = \pi \times R^2 \times \text{Depth} \times \text{Number of trays}$ $V_{tray} = \pi \times (2\text{ ft})^2 \times 0.25\text{ ft} \times 24\text{ trays} = 75.40\text{ ft}^3$
Total liquid volume	$V_{total} = V_{bot} + V_{tray}$ $V_{total} = 62.83 + 75.40 = 138.23\text{ ft}^3$
Total liquid mass	$M_{liquid} = V_{total} \times \rho_{liquid}$ $M_{liquid} = 138.23\text{ ft}^3 \times 50\text{ lb/ft}^3 = 6{,}912\text{ lb}$
Total mass (accounting for vapor)	$M_{total} = 1.05 \times M_{liquid}$ $M_{total} = 1.05 \times 6{,}912\text{ lb} = 7{,}258\text{ lb}$

Example 2: Consider a column that is 4 ft in diameter, 12 ft tall, and has 24 trays. The vapor stream exiting the top of the column contains greater than 1 wt% propane and meets the NFPA 4 criteria, but the liquid mixture in the bottoms of the column does not meet the NFPA 4 criteria. The typical depth of liquid in the bottoms of the column is 3 ft. It is estimated that approximately 12 trays of liquid (the top 4 ft of the column) meet the NFPA 4 criteria. The depth of liquid on the individual trays (meeting the NFPA 4 criteria) is approximately 3 in. The maximum density of the heaviest liquid component on the trays is 50 lb/ft^3. The density of the heaviest vapor component is 0.3 lb/ft^3. Estimate the quantity of regulated flammable substances in the column.

Calculations

Trays liquid volume	$V_{tray} = \pi \times R^2 \times \text{Depth} \times \text{Number of trays}$ $V_{tray} = \pi \times (2\text{ ft})^2 \times 0.25\text{ ft} \times 12\text{ trays} = 37.70\text{ ft}^3$
Total liquid mass	$M_{liquid} = V_{tray} \times \rho_{liquid}$ $M_{liquid} = 37.70\text{ ft}^3 \times 50\text{ lb/ft}^3 = 1{,}885\text{ lb}$
Total vapor volume (ignoring the liquid on the trays)	$V_{vapor} = \pi \times R^2 \times [\text{Column Height} - \text{Bottoms Depth}]$ $V_{vapor} = \pi \times (2\text{ ft})^2 \times [12\text{ ft} - 3\text{ ft}] = 113.10\text{ ft}^3$
Total vapor mass	$M_{vapor} = V_{vapor} \times \rho_{vapor}$ $M_{vapor} = 113.10\text{ ft}^3 \times 0.3\text{ lb/ft}^3 = 34\text{ lb}$ (< 2% of liquid mass)

Total mass $M_{total} = M_{liquid} + M_{vapor}$
$M_{total} = 1{,}885 \text{ lb} + 34 \text{ lb} = 1{,}919 \text{ lb}$

or using the 5% approximation,

Total mass $M_{total} = 1.05 \times M_{liquid}$
$M_{total} = 1.05 \times 1{,}885 \text{ lb} = 1{,}979 \text{ lb}$

APPENDIX B

Vapor Cloud Explosion Modeling Using EPA'S *RMP Offsite Consequence Analysis Guidance* Document Approach

DESCRIPTION OF VAPOR CLOUD EXPLOSION METHODOLOGY

EPA's *RMP Offsite Consequence Analysis Guidance* document[22] presents a simple VCE methodology referred to as the TNT equivalency method. This VCE method can be used to perform simple screening calculations for assessing Program 1 eligibility. The TNT method assumes that the consequences (i.e., the overpressures) of a VCE are similar to the consequences of a TNT explosion involving an equivalent amount of energy. For WCS events, the fundamental equation for estimating the distance to a 1-psi overpressure for a VCE using the TNT equivalency approach is given as follows:

$$D = 42.9 \times \left(0.1 \times W_f \times \frac{HC_f}{HC_{TNT}} \right)^{\frac{1}{3}} \qquad \text{(B-1)}$$

where D is the distance (in ft) to a 1-psi overpressure, W_f is the mass (in lb) of the flammable substance involved in the VCE, HC_f is the net heat of combustion (BTU/lb) of the flammable substance, and HC_{TNT} is the net heat of combustion (2,012 BTU/lb) of TNT. Table B-1 gives heat of combustion data for regulated flammable substances at a typical E&P facility.

Table B-1
Heat of Combustion Data for Regulated Flammable Substances at a Typical E&P Facility

Regulated Substance[1]	CAS Number	Net Heat of Combustion[2] (BTU/lb)
i-Butane	75-28-5	19,594
n-Butane	106-97-8	19,656
Ethane	74-84-0	20,425
Methane	74-82-8	21,509
i-Pentane	78-78-4	19,308
n-Pentane	109-66-0	19,216
Propane	74-98-6	19,920

[1] These flammable substances may not be present at all E&P facilities.
[2] These values were taken from EPA's *RMP Offsite Consequence Analysis Guidance* document[22] (May 24, 1996) and converted from kJ/kg to BTU/lb.

DEVELOPMENT OF MATERIAL-SPECIFIC VCE RELATIONSHIPS

By substituting the appropriate heat of combustion values into the TNT equivalency method, material-specific relationships can be developed for estimating the distance to a 1-psi overpressure for a VCE involving a WCS event. Table B-2 presents these relationships for regulated flammable substances at a typical E&P facility. To use the relationships, simply input the flammable mass (W_f) into the appropriate relationship and calculate the distance D. For a WCS event, the flammable mass is taken as the maximum mass in the largest vessel or pipe, accounting for administrative controls (see Section 4.2). Table B-3 presents the distances to a 1-psi overpressure (using the relationships in Table B-2) for a range of flammable masses for regulated flammable substances at a typical E&P facility.

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Table B-2
Distance to 1-psi Relationships for a VCE Involving a WCS Event for Regulated Flammable Substances at a Typical E&P Facility

Regulated Substance[1]	CAS Number	Distance (ft) to 1-psi Overpressure Equation[2] Based on Flammable Mass W_f (lb)
i-Butane	75-28-5	$D = 42.5 \times W_f^{1/3}$
n-Butane	106-97-8	$D = 42.6 \times W_f^{1/3}$
Ethane	74-84-0	$D = 43.1 \times W_f^{1/3}$
Methane	74-82-8	$D = 43.9 \times W_f^{1/3}$
i-Pentane	78-78-4	$D = 42.3 \times W_f^{1/3}$
n-Pentane	109-66-0	$D = 42.2 \times W_f^{1/3}$
Propane	74-98-6	$D = 42.8 \times W_f^{1/3}$

[1] These flammable substances may not be present at all E&P facilities.
[2] These equations give the distance (in ft) to a 1-psi overpressure based on a flammable mass given in lb. To obtain the distance in miles, divide the distance in ft by 5,280.

For a mixture of regulated flammable substances, determine the distance based on the predominant flammable substance in the mixture (using an equation from Table B-2 for the predominant component and using the total weight of the flammable mixture) or use the following equation to calculate the net heat of combustion for the mixture:

$$HC_{mix} = \sum_{i=1}^{N} \frac{W_{fi}}{W_f} HC_i \qquad \text{(B-2)}$$

where HC_{mix} is the net heat of combustion (in BTU/lb) for the mixture, N is the number of regulated flammable substances in the mixture, W_{fi} is the flammable mass (in lb) of substance i in the mixture, W_f is the total mass (in lb) of the flammable mixture, and HC_i is the net heat of combustion (BTU/lb) of substance i in the mixture. The net heat of combustion for the mixture (HC_{mix}) is then used in Equation B-1 to calculate the distance to a 1-psi overpressure for a VCE involving a WCS event.

EXAMPLE APPLICATION OF VCE RELATIONSHIPS

As an example application of the VCE relationships in Table B-2, consider a storage vessel containing 42,000 lb of propane. The distance to a 1-psi overpressure for a VCE involving a WCS event is given by the following relationship for propane from Table B-2:

$$D = 42.8 \times (42{,}000 \text{ lb})^{1/3} = 1{,}488 \text{ ft or } 0.28 \text{ miles}$$

Using Table B-3, the distance to a 1-psi overpressure for the propane VCE is between 0.25 mile (for 30,000 lb) and 0.30 miles (for 50,000 lb). Linear interpolation for a flammable mass of 42,000 lb yields a distance of 0.28 miles.

Table B-3
Distance to 1-psi Overpressure for a VCE Involving a WCS Event for RMP Regulated Flammable Substances at a Typical E&P Facility[1]

Flammable Mass (lb)		10,000	20,000	30,000	50,000	100,000	150,000	200,000	300,000	500,000
Regulated Substance[2]	CAS No.	Distance (miles) to 1-psi Overpressure								
i-Butane	75-28-5	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
n-Butane	106-97-8	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
Ethane	74-84-0	0.18	0.22	0.25	0.30	0.38	0.43	0.48	0.55	0.65
Methane	74-82-8	0.18	0.23	0.26	0.31	0.39	0.44	0.49	0.56	0.66
i-Pentane	78-78-4	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
n-Pentane	109-66-0	0.17	0.22	0.25	0.29	0.37	0.42	0.47	0.54	0.63
Propane	74-98-6	0.17	0.22	0.25	0.30	0.38	0.43	0.47	0.54	0.64

[1] This table was taken from EPA's *RMP Offsite Consequence Analysis Guidance* document[22] (May 24, 1996).
[2] Note: These flammable substances may not be present at all E&P facilities. There may also be other RMP regulated flammable substances at a given E&P facility that are not listed in this table. Consult EPA's *RMP Offsite Consequence Analysis Guidance* document[22] (May 24, 1996) for data on other regulated flammable substances.

APPENDIX C

E&P Gas Plant Model Risk Management Plan Executive Summary

The RMP rule requires an executive summary in the RMPlan. The summary must include a brief description of the following items:

- Accidental release prevention and response policies
- Description of the stationary source and regulated substances
- Offsite consequence analysis results
- General accidental release prevention program and chemical-specific prevention steps
- Five-year accident history
- Emergency response program
- Planned changes to improve safety

Use the following text as an example of language that may be appropriate for an RMPlan executive summary. The level of detail in the RMPlan should reflect site-specific needs.

If your facility chooses to do additional (voluntary) RMP communication activities within the community, this executive summary may be helpful in developing specific RMP communication tools. Consider developing such communication tools with assistance from community outreach and risk communication specialists. The *CMA*/API *RMP Compliance Guideline*[14] addresses basic RMP communication issues.

Model E&P Gas Plant Risk Management Plan: Executive Summary

ACCIDENTAL RELEASE PREVENTION AND RESPONSE POLICIES

The ABC gas plant has a long-standing commitment to worker and public safety. This commitment is demonstrated by the resources invested in accident prevention, such as training personnel and considering safety in the design, installation, operation, and maintenance of our processes. Our policy is to implement reasonable controls to prevent foreseeable releases of regulated substances. However, if a release does occur, gas plant trained personnel will respond to control and contain the release.

DESCRIPTION OF THE STATIONARY SOURCE AND REGULATED SUBSTANCES

The ABC gas plant, located in Anywhere, U.S.A., operates a variety of processes to produce petroleum products (e.g., natural gas, propane, butane, condensate) from natural gas. The ABC gas plant has several regulated flammables, such as propane and butane. In addition, the ABC gas plant uses and/or processes chlorine, ammonia, and hydrogen sulfide (H_2S), which are also regulated substances.

OFFSITE CONSEQUENCE ANALYSIS RESULTS

The worst-case scenario (WCS) associated with toxic substances in Program Level 2 and 3 processes at the gas plant is a catastrophic pipe failure in the amine treatment/sweetening unit (ATSU), resulting in a release of 1,100 lb of H_2S gas over a 10-minute period. Although we have numerous controls to prevent such releases and to manage their consequences, no credit for administrative controls or passive mitigation measures was taken into account in evaluating this scenario. The maximum distance to the toxic endpoint of 30 ppm (0.042 milligrams per liter) for this WCS is 1.9 miles. No Program Level 1 processes containing regulated toxic substances were identified at the gas plant.

The alternative release scenario (ARS) for H_2S is a pipe leak in the ATSU, resulting in a release of 1,300 lb of H_2S gas over a 30-minute period. The 30-minute release duration is the approximate time necessary for operators to detect and stop the release. No other mitigation measures were taken into account in evaluating this scenario. The maximum distance to the toxic endpoint of 30 ppm (0.042 milligrams per liter) for this ARS is 0.20 mile.

The WCS associated with a release of flammable substances in Program Level 2 and 3 processes at the gas plant is a vapor cloud explosion (VCE) involving the full inventory of the largest storage tank containing propane. A written procedure is in place to limit the storage inventory to 220,000 lb (75% of the maximum tank capacity); therefore, the reduced inventory is assumed to release and ignite, resulting in a VCE. The maximum distance to the 1-psi endpoint for this WCS is 0.48 mile. Although we have numerous controls to prevent such releases and to manage their consequences, no credit for passive mitigation measures was taken into account in evaluating this WCS.

The ARS for flammable substances at the gas plant is a VCE resulting from the release of propane from a transfer line (31,000 lb released in 15 minutes). The release is expected to be isolated by the operators within 15 minutes (active mitigation). The maximum distance to the 1-psi endpoint for this event is 0.071 mile. This event was selected as being a practical scenario for use in emergency planning and response. Figures C-1 and C-2 graphically present the hazard assessment results for the toxic and flammable WCS and ARS events, respectively.

Note: Graphical depiction of the hazard assessment results is NOT required in the RMPlan but may be useful in communicating the information to the local stakeholders. These "plume maps" could include the following items or features:

- The location of the hypothetical release within the plant
- The shape/area affected by the scenario
- The most likely wind direction
- The location of particular public or environmental receptors

GENERAL ACCIDENTAL RELEASE PREVENTION PROGRAM

The following is a summary of the accident prevention program in place at the plant. Because processes at the gas plant that are regulated by the Environmental Protection Agency's (EPA's) risk management program (RMP) regulation are also subject to the Occupational Safety and Health Administration's (OSHA's) process safety management (PSM) standard, this summary addresses each of the OSHA PSM elements and describes the management system in place to implement the accident prevention program.

Employee Participation

The ABC gas plant encourages employees to participate in all facets of process safety management and accident prevention. Examples of employee participation range from updating and compiling technical documents and chemical information to participating as a member of a process hazard analysis (PHA) team. Employees have access to all information created as part of the gas plant accident prevention program. Specific ways that employees can be involved in the accident prevention program are documented in an employee participation plan that is maintained at the gas plant and addresses each accident prevention program element. In addition, the gas plant has a number of initiatives under way that address process safety and employee safety issues. These initiatives include forming teams to promote both process and personal safety. The teams typically have members from various areas of the plant, including operations, maintenance, engineering, and plant management.

Process Safety Information

The ABC gas plant keeps a variety of technical documents that are used to help maintain safe operation of the processes. These documents address chemical properties and associated hazards, limits for key process parameters and specific chemical inventories, and equipment design basis/configuration information. Specific departments within the gas plant are assigned responsibility for maintaining up-to-date process safety information. A table summarizing the reference documents and their location is readily available as part of the written employee participation plan to help employees locate any necessary process safety information.

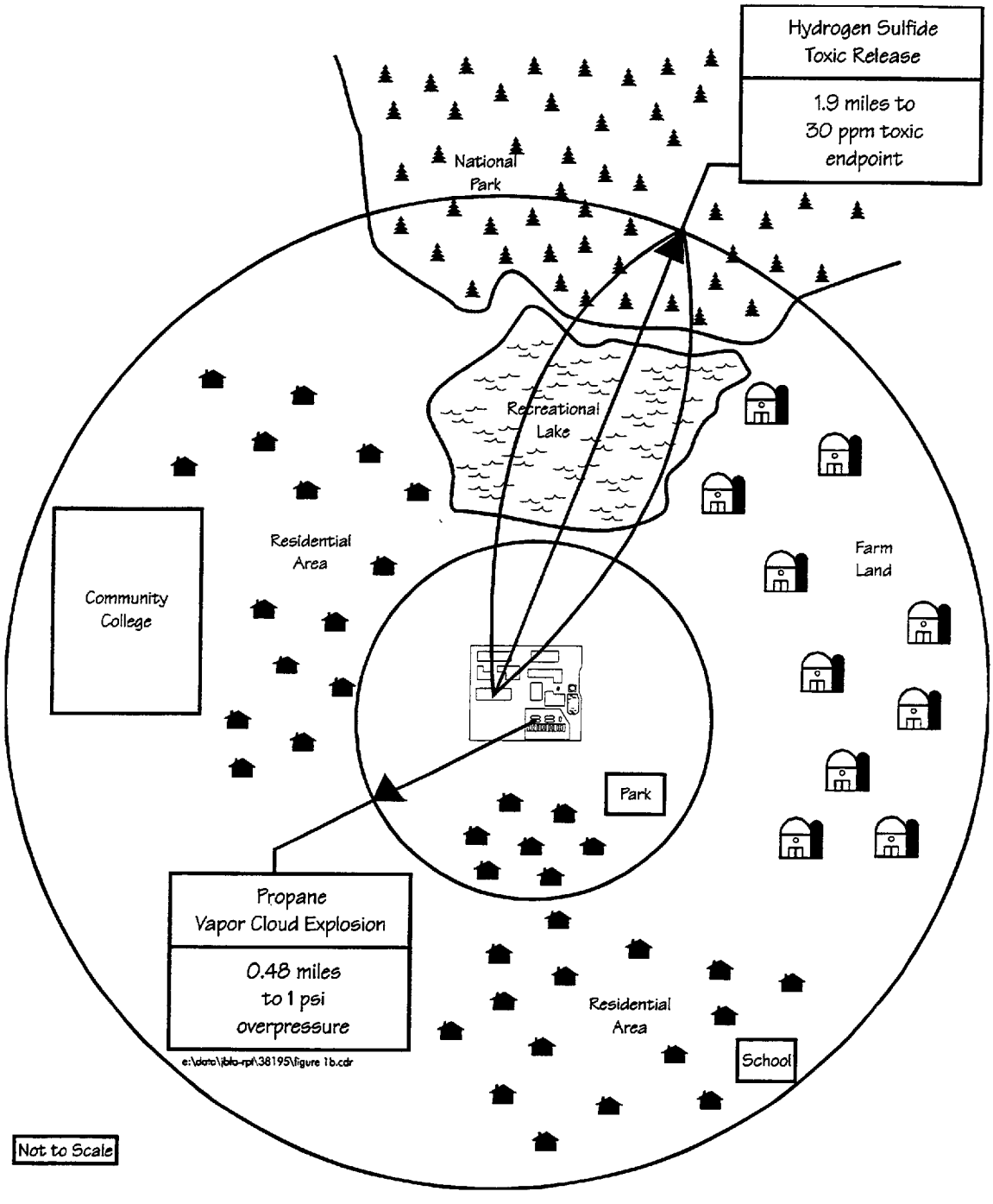

Figure C-1
Hazard Assessment Results for the Worst-case Scenarios at the Example Gas Plant

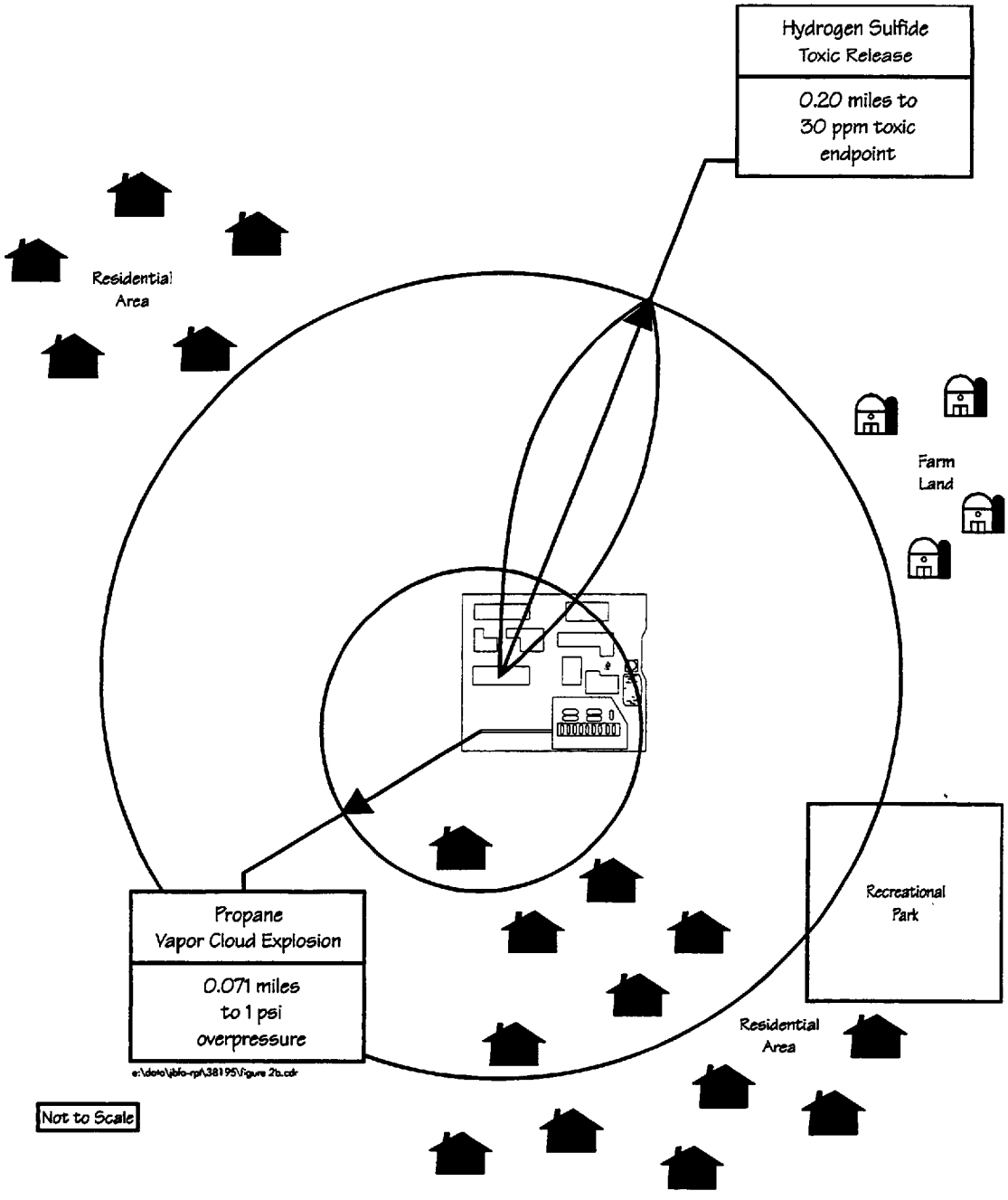

Figure C-2
Hazard Assessment Results for the Alternative Release Scenarios at the Example Gas Plant

Chemical-specific information, including exposure hazards and emergency response/ exposure treatment considerations, is provided in material safety data sheets (MSDSs). This information is supplemented by documents that specifically address known corrosion concerns and any known hazards associated with the inadvertent mixing of chemicals. For specific process areas, the gas plant has documented safety-related limits for specific process parameters (e.g., temperature, level, composition) in a Key Process Parameter Document. The gas plant ensures that the process is maintained within these limits using process controls and monitoring instruments, highly trained personnel, and protective instrument systems (e.g., automated shutdown systems).

The gas plant also maintains numerous technical documents that provide information about the design and construction of process equipment. This information includes materials of construction, design pressure and temperature ratings, and electrical rating of equipment. This information, in combination with written procedures and trained personnel, provides a basis for establishing inspection and maintenance activities, as well as for evaluating proposed process and facility changes to ensure that safety features in the process are not compromised.

Process Hazard Analysis (PHA)

The ABC gas plant has a comprehensive program to help ensure that hazards associated with the various processes are identified and controlled. Within this program, each process is systematically examined to identify hazards and ensure that adequate controls are in place to manage these hazards.

The ABC gas plant primarily uses the hazard and operability (HAZOP) analysis technique to perform these evaluations. HAZOP analysis is recognized as one of the most systematic and thorough hazard evaluation techniques. The analyses are conducted using a team of people who have operating and maintenance experience as well as engineering expertise. This team identifies and evaluates hazards of the process as well as accident prevention and mitigation measures, and the team makes suggestions for additional prevention and/or mitigation measures when the team believes such measures are necessary.

The PHA team findings are forwarded to local and corporate management for resolution. Implementation of mitigation options in response to PHA findings is based on a relative risk ranking assigned by the PHA team. This ranking helps ensure that potential accident scenarios assigned the highest risk receive immediate attention. All approved mitigation options in response to PHA team findings are tracked until they are completed. The final resolution of each finding is documented and retained.

To help ensure that the process controls and/or process hazards do not eventually deviate significantly from the original design safety features, the plant periodically updates and revalidates the hazard analysis results. These periodic reviews are conducted at least every 5 years and will be conducted at this frequency until the process is no longer operating. The results and findings from these updates are documented and retained. Once again, the team findings are forwarded to management for consideration, and the final resolution of the findings is documented and retained.

Operating Procedures

The ABC gas plant maintains written procedures that address various modes of process operations, such as (1) unit startup, (2) normal operations, (3) temporary operations, (4) emergency shutdown, (5) normal shutdown, and (6) initial startup of a new process. These procedures can be used as a reference by experienced operators and provide a basis for consistent training of new operators. These procedures are periodically reviewed and annually certified as current and accurate. The procedures are kept current and accurate by revising them as necessary to reflect changes made through the management of change process.

In addition, the ABC gas plant maintains a Key Process Parameter Document that provides guidance on how to respond to upper or lower limit exceedances for specific process or equipment parameters. This information, along with written operating procedures, is readily available to operators in the process unit and for other personnel to use as necessary to safely perform their job tasks.

Training

To complement the written procedures for process operations, the ABC gas plant has implemented a comprehensive training program for all employees involved in operating a process. New employees receive basic training in gas plant operations if they are not already familiar with such operations. After successfully completing this training, a new operator is paired with a senior operator to learn process-specific duties and tasks. After operators demonstrate (e.g., through tests, skills demonstration) having adequate knowledge to perform the duties and tasks in a safe manner on their own, they can work independently. In addition, all operators periodically receive refresher training on the operating procedures to ensure that their skills and knowledge are maintained at an acceptable level. This refresher training is conducted at least every 3 years. All of this training is documented for each operator, including the means used to verify that the operator understood the training.

Contractors

The ABC gas plant uses contractors to supplement its work force during periods of increased maintenance or construction activities. Because some contractors work on or near process equipment, the gas plant has procedures in place to ensure that contractors (1) perform their work in a safe manner, (2) have the appropriate knowledge and skills, (3) are aware of the hazards in their workplace, (4) understand what they should do in the event of an emergency, (5) understand and follow site safety rules, and (6) inform gas plant personnel of any hazards that they find during their work. This is accomplished by providing contractors with (1) a process overview, (2) information about safety and health hazards, (3) emergency response plan requirements, and (4) safe work practices prior to their beginning work. In addition, the ABC gas plant evaluates contractor safety programs and performance during the selection of a contractor. Gas plant personnel periodically monitor contractor performance to ensure that contractors are fulfilling their safety obligations.

Pre-startup Safety Reviews (PSSRs)

The ABC gas plant conducts a PSSR for any new facility or facility modification that requires a change in the process safety information. The purpose of the PSSR is to ensure that safety features, procedures, personnel, and equipment are appropriately prepared for startup prior to placing the equipment into service. This review provides one additional check to make sure construction is in accordance with the design specifications and that all supporting systems are operationally ready. The PSSR review team uses checklists to verify all aspects of readiness. A PSSR involves field verification of the construction and serves a quality assurance function by requiring verification that accident prevention program requirements are properly implemented.

Mechanical Integrity

The ABC gas plant has well-established practices and procedures to maintain pressure vessels, piping systems, relief and vent systems, controls, pumps and compressors, and emergency shutdown systems in a safe operating condition. The basic aspects of this program include: (1) conducting training, (2) developing written procedures, (3) performing inspections and tests, (4) correcting identified deficiencies, and (5) applying quality assurance measures. In combination, these activities form a system that maintains the mechanical integrity of the process.

Maintenance personnel receive training on (1) an overview of the process, (2) safety and health hazards, (3) applicable maintenance procedures, (4) emergency response plans, and (5) applicable safe work practices to help ensure that they can perform their jobs in a safe manner. Written procedures help ensure that work is performed in a consistent manner and provide a basis for training. Inspections and tests are performed to help ensure that equipment functions as intended and to verify that equipment is within acceptable limits (e.g., adequate wall thickness for pressure vessels). If a deficiency is identified, employees will correct the deficiency before placing the equipment back into service (if possible), or a management of change team will review the use of the equipment and determine what actions are necessary to ensure the safe operation of the equipment.

Another integral part of the mechanical integrity program is quality assurance. The ABC gas plant incorporates quality assurance measures into equipment purchases and repairs. This helps ensure that new equipment is suitable for its intended use and that proper materials and spare parts are used when repairs are made.

Safe Work Practices

The ABC gas plant has long-standing safe work practices in place to help ensure worker and process safety. Examples of these include (1) control of the entry/presence/exit of support personnel, (2) a lockout/tagout procedure to ensure isolation of energy sources for equipment undergoing maintenance, (3) a procedure for safe removal of hazardous substances before process piping or equipment is opened, (4) a permit and procedure to control spark-producing activities (i.e., hot work), and (5) a permit and procedure to ensure that adequate precautions are in place before entry into a confined space. These procedures (and others), along with training of affected personnel, form a system to help ensure that operations and maintenance activities are performed safely.

Management of Change

The ABC gas plant has a comprehensive system to manage changes to all covered processes. This system requires that changes to items such as process equipment, chemicals, technology (including process operating conditions), procedures, and other facility changes be properly reviewed and authorized before being implemented. Changes are reviewed to (1) ensure that adequate controls are in place to manage any new hazards and (2) verify that existing controls have not been compromised by the change. Affected chemical hazard information, process operating limits, and equipment information, as well as procedures, are updated to incorporate these changes. In addition, operating and maintenance personnel are provided any necessary training on the change.

Incident Investigation

The ABC gas plant promptly investigates all incidents that resulted in, or reasonably could have resulted in, a fire/explosion, toxic gas release, major property damage, environmental loss, or personal injury. The goal of each investigation is to determine the facts and develop corrective actions to prevent a recurrence of the incident or a similar incident. The investigation team documents its findings, develops recommendations to prevent a recurrence, and forwards these results to gas plant management for resolution. Corrective actions taken in response to the investigation team's findings and recommendations are tracked until they are complete. The final resolution of each finding or recommendation is documented, and the investigation results are reviewed with all employees (including contractors) who could be affected by the findings. Incident investigation reports are retained for at least 5 years so that the reports can be reviewed during future PHAs and PHA revalidations.

Compliance Audits

To help ensure that the accident prevention program is functioning properly, the ABC gas plant periodically conducts an audit to determine whether the procedures and practices required by the accident prevention program are being implemented. Compliance audits are conducted at least every 3 years. Both hourly and staff personnel participate as audit team members. The audit team develops findings that are forwarded to gas plant management for resolution. Corrective actions taken in response to the audit team's findings are tracked until they are complete. The final resolution of each finding is documented, and the two most recent audit reports are retained.

CHEMICAL-SPECIFIC PREVENTION STEPS

The processes at the ABC gas plant have hazards that must be managed to ensure continued safe operation. The following is a description of existing safety features applicable to prevention of accidental releases of regulated substances in the facility.

Universal Prevention Activities

The accident prevention program summarized previously is applied to all RMP-covered processes at the ABC gas plant. Collectively, these prevention program activities help prevent potential accident scenarios that could be caused by equipment failures and human errors.

Specialized Safety Features

The ABC gas plant has safety features on many units to help (1) contain/control a release, (2) quickly detect a release, and (3) reduce the consequences of (mitigate) a release. The following types of safety features are used in the covered processes:

Release Detection

- Hydrocarbon detectors with alarms

Release Containment/Control

- Process relief valves that discharge to a flare to capture and incinerate episodic releases
- Valves to permit isolation of the process (manual or automated)
- Automated shutdown systems for specific process parameters (e.g., high temperature)
- Curbing or diking to contain liquid releases
- Redundant equipment and instrumentation (e.g., uninterruptible power supply for process control system, backup firewater pump)
- Atmospheric relief devices.

Release Mitigation

- Fire suppression and extinguishing systems
- Deluge system for specific equipment
- Trained emergency response personnel
- Personal protective equipment (e.g., chemical protective clothing, self-contained breathing apparatus)
- Blast-resistant buildings to help protect control systems and personnel

FIVE-YEAR ACCIDENT HISTORY

The ABC gas plant has an excellent record of accident prevention over the past 5 years. There has been a decreasing trend in the frequency of accidental releases. Except for an incident involving a release of H_2S in 1995 (resulting in evacuation of several homes), none of the incidents that have occurred in the past 5 years resulted in offsite effects. We investigate every incident very carefully to determine ways to prevent similar incidents from recurring. The following table is a summary of the number of incidents that have occurred during the past 5 years.

	1995	1996	1997	1998	1999
Number of RMP Events with Onsite Effects	5	3	4	2	0
Number of RMP Events with Offsite Effects	1	0	0	0	0

EMERGENCY RESPONSE PROGRAM INFORMATION

The ABC gas plant maintains a written emergency response program, which is in place to protect worker and public safety as well as the environment. The program consists of procedures for responding to a release of a regulated substance, including the possibility of a fire or explosion if a flammable substance is accidentally released. The procedures address all aspects of emergency response, including proper first aid and medical treatment for exposures, evacuation plans and accounting for personnel after an evacuation, notification of local emergency response agencies and the public if a release occurs, and postincident cleanup and decontamination requirements. In addition, the plant has procedures that address maintenance, inspection, and testing of emergency response equipment, as well as instructions that address the use of emergency response equipment. Employees receive training in these procedures as necessary to perform their specific emergency response duties. The emergency response program is updated when necessary based on modifications made to gas plant processes or other ABC gas plant facilities. The emergency response program changes are administered through the MOC process, which includes informing and/or training affected personnel in the changes.

The overall emergency response program for the ABC gas plant is coordinated with the Anywhere, U.S.A., local emergency planning committee (LEPC). This coordination includes periodic meetings of the committee, which includes local emergency response officials, local government officials, and industry representatives. The ABC gas plant has around-the-clock communications capability with appropriate LEPC officials and emergency response organizations (e.g., fire department). This provides a means of notifying the public of an incident, if necessary, as well as facilitating quick response to an incident. In addition to periodic LEPC meetings, the ABC gas plant conducts periodic emergency drills that involve the LEPC and emergency response organizations, and the gas plant provides annual refresher training to local emergency responders regarding the hazards of regulated substances in the gas plant.

PLANNED CHANGES TO IMPROVE SAFETY

The ABC gas plant resolves all findings from PHAs, some of which result in modifications to the process. The following types of changes are planned over the next few years in response to PHA, safety audit, and incident investigation findings:

- Decrease in the amount of chlorine stored on site for cooling water chemical treatment
- Upgraded process control system to use distributed computerized control system
- Hydrocarbon release detection system in the liquefied petroleum gas (LPG) loading rack area
- Revisions to personnel training programs
- Revised written operating procedures in the amine treatment area
- Upgraded fire protection system in the separation/dehydration area
- New vibration monitoring program for gas compressors

APPENDIX D

RMP Data Elements Checklist

Note: The following is a draft checklist made available by EPA on March 13, 1998. A set of instructions for completing the checklist is also available. Data elements that are shown in bold and italic font are optional, according to EPA. To stay abreast of these issues or to get the most up-to-date version of the data elements checklist and instructions, visit EPA's web site at http://www.epa.gov/swercepp/.

List of RMP Data Elements

1. REGISTRATION

1.1 Source Identification

1.1.a. Facility Name:

1.1.b. Parent Company #1 Name:

1.1.c. Parent Company #2 Name:

1.2 RMP Facility Identifier:

1.3 EPA Identifier:

1.4 Dun and Bradstreet Numbers (DUNS)

1.4.a. Facility DUNS:

1.4.b. Parent Company #1 DUNS:

1.4.c. Parent Company #2 DUNS:

1.5 Facility Location

1.5.a. Street – Line 1:

1.5.b. Street – Line 2:

1.5.c. City:

1.5.d. State:

1.5.e. Zip Code:

Zip +4 Code:

1.5.f. County:

1.5.g. Facility Latitude (decimal degrees or degrees, minutes, and seconds):

1.5.h. Facility Longitude (decimal degrees or degrees, minutes, and seconds):

1.5.i. Method:

1.5.j. Description:

1.6 Owner/Operator

1.6.a. Name:

1.6.b. Phone:

1.6.c. Street – Line 1:

1.6.d. Street – Line 2:

1.6.e. City:

1.6.f. State:

Previous page is blank

1.6.g. Zip Code:

1.6.h. Zip +4 Code:

1.7 Name and title of person responsible for part 68 implementation

1.7.a. RMP contact name:

1.7.b. RMP contact title:

1.8 Emergency Contact

1.8.a. Name:

1.8.b. Title:

1.8.c. Phone:

1.8.d. 24-Hour Phone:

1.8.e. 24-Hour Phone Extension/PIN #:

1.9 Other Points of Contact

1.9.a. Facility or Parent Company E-mail Address:

1.9.b. Facility Public Contact Phone Number:

1.9.c Facility or Parent Company WWW Homepage Address:

1.10 LEPC:

1.11 Number of full-time employees (FTEs):

1.12 Covered by (select all that apply)

1.12.a. OSHA PSM:

1.12.b. EPCRA 302:

1.12.c. Air Operating Permit ID:

1.13 OSHA Star or Merit Ranking:

1.14 Last Safety Inspection Date:

1.15 Last Safety Inspection Performed by (select one)

1.15.a. OSHA

1.15.b. State OSHA

1.15.c. EPA

1.15.d. State EPA

1.15.e. Fire department

1.15.f. Not applicable

1.15.g. Other (specify)

1.16 For each covered process fill in the following chart. Use a separate sheet for each process.

Process Number: (optional to help you track)			
Process Description: (optional to help you track)			
1.16.a. Program Level:			
1.16.b. NAICS Code(s):			
1.16.c. Chemical	1.16.c.1. Name:	1.16.c.2. CAS Number:	1.16.c.3. Quantity (lbs):

If you need more space to list NAICS codes or chemicals, please use a separate sheet of paper or make a photo copy of this sheet.

2. TOXICS: WORST CASE

2.1 Chemical Name

2.1.a. Name

2.1.b. Percent weight of chemical in mixture

2.2 Physical state (select one)

2.2.a. Gas

2.2.b. Liquid

2.3 Results based on (select one)

2.3.a. EPA's Offsite Consequence Analysis Reference Tables

2.3.b. Tables in RMP Guidance for Ammonia Refrigeration

2.3.d. Tables in RMP Guidance for Drinking Water Systems

2.3.e. Tables in RMP Guidance for POTWs (Waste Water)

2.3.f. Tables in RMP Guidance for Warehouses

2.3.g. Tables in RMP Guidance for Chemical Distributors

2.3.h. EPA's RMP Calculator

2.3.i. ALOHA

2.3.z. Other model (specify)

2.4 Scenario (select one)

2.4.a. Gas Release

2.4.b. Liquid Spill and Vaporization

2.5 Quantity released (lbs)

2.6 Release rate (lbs/minute)

2.7 Release duration (minutes)

2.8 Wind speed (meters/second)

2.9 Stability class

2.10 Topography (select one)

2.10.a. Urban

2.10.b. Rural

2.11 Distance to endpoint (miles)

2.12 Residential population within distance to endpoint

2.13 Public receptors within distance to endpoint (select all that apply)

2.13.a. Schools

2.13.b. Residences

2.13.c. Hospitals

2.13.d. Prisons

2.13.e. Public recreational areas

2.13.f. Commercial/industrial areas

2.14 Environmental receptors within distance to endpoint (select all that apply)

2.14.a. National/state parks

2.14.b. Wildlife sanctuary

2.14.c. Federal wilderness

2.15 Passive mitigation considered (select all that apply)

2.15.a. Dikes

2.15.b. Enclosures

2.15.c. Berms

2.15.d. Drains

2.15.e. Sumps

2.15.f. Other (specify)

2.16 Graphics file name

3. TOXICS: ALTERNATIVE RELEASES

3.1 Chemical Name

3.1.a. Name

3.1.b. Percent weight of chemical in mixture

3.2 Physical State (select one)

3.2.a. Gas

3.2.b. Liquid

3.2.c. Both gas and liquid

3.3 Results based on (select one)

3.3.a. EPA's Offsite Consequence Analysis Reference Tables

3.3.b. Tables in RMP Guidance for Ammonia Refrigeration

3.3.d. Tables in RMP Guidance for Drinking Water Systems

3.3.e. Tables in RMP Guidance for POTWs (Waste Water)

3.3.f. Tables in RMP Guidance for Warehouses

3.3.g. Tables in RMP Guidance for Chemical Distributors

3.3.h. EPA's RMP Calculator

3.3.i. ALOHA

3.3.z. Other model (specify)

3.4 Scenario (select one)

3.4.a. Transfer hose failure

3.4.b. Pipe leak

3.4.c. Vessel leak

3.4.d. Overfilling

3.4.e. Rupture disk/relief valve failure

3.4.f. Excess flow device failure

3.4.g. Other (specify)

3.5 Quantity released (lbs)

3.6 Release rate (lbs/minute)

3.7 Release duration (minutes)

3.8 Wind speed (meters/second)

3.9 Stability class

3.10 Topography (select one)

3.10.a. Urban

3.10.b. Rural

3.11 Distance to endpoint (miles)

3.12 Residential population within distance to endpoint

3.13 Public receptors within distance to endpoint (select all that apply)

3.13.a. Schools

3.13.b. Residences

3.13.c. Hospitals

3.13.d. Prisons

3.13.e. Public recreation areas

3.13.f. Commercial/industrial areas

3.14 Environmental receptors within distance to endpoint (select all that apply)

3.14.a. National/state parks

3.14.b. Wildlife sanctuary

3.14.c. Federal wilderness

3.15 Passive mitigation considered (select all that apply)

3.15.a. Dikes

3.15.b. Enclosures

3.15.c. Berms

3.15.d. Drains

3.15.e. Sumps

3.15.f. Other (specify)

3.16 Active mitigation considered (select all that apply)

3.16.a. Sprinkler systems

3.16.b. Deluge systems

3.16.c. Water curtain

3.16.d. Neutralization

3.16.e. Excess flow valve

3.16.f. Flares

3.16.g. Scrubbers

3.16.h. Emergency shutdown

3.16.i. Other (specify)

3.17 Graphics file name

4. FLAMMABLES: WORST CASE

4.1 Chemical Name

4.2 Results based on (select one)

4.2.a. EPA's Offsite Consequence Analysis Reference Tables

4.2.c. Tables in RMP Guidance for Propane Storage Facilities

4.2.e. Tables in RMP Guidance for POTWs (Waste Water)

4.2.f. Tables in RMP Guidance for Warehouses

4.2.g. Tables in RMP Guidance for Chemical Distributors

4.2.h. EPA's RMP Calculator

4.2.z. Other model (specify)

4.3 Scenario [Vapor Cloud Explosion]

4.4 Quantity released (lbs)

4.5 Endpoint Used [1 PSI]

4.6 Distance to endpoint (miles)

4.7 Residential population within distance to endpoint

4.8 Public receptors within distance to endpoint (select all that apply)

4.8.a. Schools

4.8.b. Residences

4.8.c. Hospitals

4.8.d. Prisons

4.8.e. Public recreation

4.8.f. Commercial/industrial areas

4.9 Environmental receptors within distance to endpoint (select all that apply)

4.9.a. National/state parks

4.9.b. Wildlife sanctuary

4.9.c. Federal wilderness

4.10 Passive mitigation considered (select all that apply)

4.10.a. Dikes

4.10.b. Fire walls

4.10.c. Blast walls

4.10.d. Enclosures

4.10.e. Other (specify)

4.11 Graphics file name

5. FLAMMABLES: ALTERNATIVE RELEASES

5.1 Chemical Name

5.2 Results based on (select one)

5.2.a. EPA's Offsite Consequence Analysis Reference Tables

5.2.c. Tables in RMP Guidance for Propane Storage Facilities

5.2.e. Tables in RMP Guidance for POTWs (Waste Water)

5.2.f. Tables in RMP Guidance for Warehouses

5.2.g. Tables in RMP Guidance for Chemical Distributors

5.2.h. EPA's RMP Calculator

5.2.z. Other model (specify)

5.3. Scenario (select one)

5.3.a. Vapor cloud explosion

5.3.b. Fireball

5.3.c. BLEVE

5.3.d. Pool fire

5.3.e. Jet fire

5.3.f. Vapor cloud fire

5.3.g. Other (specify)

5.4 Quantity released (lbs)

5.5 Endpoint used (select one)

5.5.a. 1 PSI

5.5.b. 5 kw/m^2 for 40 seconds

5.5.c. Lower flammability limit (specify)

5.6 Distance to endpoint (miles)

5.7 Residential population within distance to endpoint

5.8 Public receptors within distance to endpoint (select all that apply)

5.8.a. Schools

5.8.b. Residences

5.8.c. Hospitals

5.8.d. Prisons

5.8.e. Public recreation

5.8.f. Commercial/industrial areas

5.9 Environmental receptors within distance to endpoint (select all that apply)

5.9.a. National/state parks

5.9.b. Wildlife sanctuary

5.9.c. Federal wilderness

5.10 Passive mitigation considered (select all that apply)

5.10.a. Dikes

5.10.b. Fire walls

5.10.c. Blast walls

5.10.d Enclosures

5.10.e. Other (specify)

5.11 Active mitigation considered (select all that apply)

5.11.a. Sprinkler system

5.11.b. Deluge system

5.11.c. Water curtain

5.11.d. Excess flow valve

5.11.e. Other (specify)

5.12 Graphics file name

6. FIVE-YEAR ACCIDENT HISTORY

6.1 Date

6.2 Time

6.3 NAICS code of process

6.4 Release duration (hours and minutes, format: HHH:MM)

6.5 Chemical(s) released	6.5.a. Chemical name:	6.5.b. Percent weight of chemical in mixture (toxics only):	6.5.c. Quantity released (lbs):

If you need more space to list chemicals, please use a separate sheet of paper or make a photo copy of this sheet.

6.6 Release event (select at least one)

6.6.a. Gas release

6.6.b. Liquid spill/evaporation

6.6.c. Fire

6.6.d. Explosion

6.7 Release source (select at least one)

6.7.a. Storage vessel

6.7.b. Piping

6.7.c. Process vessel

6.7.d. Transfer hose

6.7.e. Valve

6.7.f. Pump

6.7.g. Joint

6.7.h. Other (specify)

6.8 Weather conditions at time of event

6.8.a.i. Wind speed (numerical):

6.8.a.ii. Wind speed unit:

6.8.a.iii. Wind direction:

6.8.b. Temperature (°F):

6.8.c. Stability class:

6.8.d. Precipitation present:

6.8.e. Unknown

6.9 Onsite Impacts

6.9.a. Deaths

6.9.a.i. Workers/contractors:

6.9.a.ii. Public responders:

6.9.a.iii. Public:

6.9.b. Injuries

6.9.b.i. Workers/contractors:

6.9.b.ii. Public responders:

6.9.b.iii. Public:

6.9.c. Property damage ($):

6.10 Known offsite impacts

6.10.a. Deaths:

6.10.b. Hospitalizations:

6.10.c. Other medical treatment:

6.10.d. Evacuated:

6.10.e. Sheltered-in-place:

6.10.f. Property damage ($):

6.10.g. Environmental damage (select all that apply)

6.10.g.1. Fish or animal kills:

6.10.g.2. Lawn, shrub, or crop damage – minor defoliation:

6.10.g.3. Lawn ,shrub, or crop damage – major defoliation:

6.10.g.4. Water contamination:

6.10.g.5. Other (specify):

6.11 Initiating event (select one)

6.11.a. Equipment failure

6.11.b. Human error

6.11.c. Natural (weather conditions, earthquake)

6.11.d. Unknown

6.12 Contributing factors (select all that apply)

6.12.a. Equipment failure:

6.12.b. Human error:

6.12.c. Improper procedure:

6.12.d. Overpressurization:

6.12.e. Upset condition:

6.12.f. By-pass condition:

6.12.g. Maintenance activity/inactivity:

6.12.h. Process design failure:

6.12.i. Unsuitable equipment:

6.12.j. Unusual weather conditions:

6.12.k. Management error:

6.12.l. Other (specify):

6.13 Offsite responders notified:

6.14 Changes introduced as a result of the accident (select at least one)

6.14.a. Improved/upgraded equipment

6.14.b. Revised maintenance

6.14.c. Revised training

6.14.d. Revised operating procedures

6.14.e. New process controls

6.14.f. New mitigation systems

6.14.g. Revised emergency response plan

6.14.h. Changed process

6.14.i. Reduced inventory

6.14.j. None

6.14.k. Other (specify)

7. PREVENTION PROGRAM—PROGRAM 3

For each process or process unit:

7.1 NAICS code for process

7.2 Chemical name(s):	

If you need more space to list chemicals, please use a separate sheet of paper or make a photo copy of this sheet.

7.3 Date on which safety information was last reviewed/revised.

7.4 Process Hazards Analysis (PHA)

7.4.a. Date last PHA/update

7.4.b. Technique used (select one)

7.4.b.1. What-if

7.4.b.2. Checklist

7.4.b.3. What-if/Checklist (combined)

7.4.b.4. HAZOP

7.4.b.5. Failure Modes & Effects Analysis

7.4.b.6. Fault Tree Analysis

7.4.b.7. Other (Specify)

7.4.c. Expected date of completion of any changes resulting from PHA

7.4.d. Major hazards identified (select all that apply)

7.4.d.1. Toxic release

7.4.d.2. Fire

7.4.d.3. Explosion

7.4.d.4. Runaway reaction

7.4.d.5. Polymerization

7.4.d.6. Overpressurization

7.4.d.7. Corrosion

7.4.d.8. Overfilling

7.4.d.9. Contamination

7.4.d.10. Equipment failure

7.4.d.11. Loss of cooling, heating, electricity, instrument air

7.4.d.12. Earthquake

7.4.d.13. Floods (flood plain)

7.4.d.14. Tornado

7.4.d.15. Hurricanes

7.4.d.16. Other (specify)

7.4.e. Process controls in use (select all that apply)

7.4.e.1. Vents

7.4.e.2. Relief valves

7.4.e.3. Check valves

7.4.e.4. Scrubbers

7.4.e.5. Flares

7.4.e.6. Manual shutoffs

7.4.e.7. Automatic shutoffs

7.4.e.8. Interlocks

7.4.e.9. Alarms and procedures

7.4.e.10. Keyed bypass

7.4.e.11. Emergency air supply

7.4.e.12. Emergency power

7.4.e.13. Backup pump

7.4.e.14. Grounding equipment

7.4.e.15. Inhibitor addition

7.4.e.16. Rupture disks

7.4.e.17. Excess flow device

7.4.e.18. Quench system

7.4.e.19. Purge system

7.4.e.20. Other (specify)

7.4.f. Mitigation systems (select all that apply)

7.4.f.1. Sprinkler system

7.4.f.2. Dikes

7.4.f.3. Fire walls

7.4.f.4. Blast walls

7.4.f.5. Deluge system

7.4.f.6. Water curtain

7.4.f.7. Enclosure

7.4.f.8. Neutralization

7.4.f.9. Other (specify)

7.4.g. Monitoring/detection systems (select all that apply)

7.4.g.1. Process area detectors

7.4.g.2. Perimeter monitors

7.4.g.3. Other (specify)

7.4.h. Changes since last PHA update (select all that apply)

7.4.h.1 Reduction in chemical inventory

7.4.h.2. Increase in chemical inventory

7.4.h.3. Change in process parameters

7.4.h.4. Installation of process controls

7.4.h.5. Installation of process detection systems

7.4.h.6. Installation of perimeter monitoring systems

7.4.h.7. Installation of mitigation systems

7.4.h.8. None required/recommended

7.4.h.9. Other (specify)

7.5 Date of most recent review of operating procedures

7.6 Training

7.6.a. Date of most recent review/revision of training programs

7.6.b. Type of training provided (select all that apply)

7.6.b.1. Classroom

7.6.b.2. On the job

7.6.b.3. Other (specify)

7.6.c. Type of competency testing used (select all that apply)

7.6.c.1. Written test

7.6.c.2. Oral test

7.6.c.3. Demonstration

7.6.c.4. Observation

7.6.c.5. Other (specify)

7.7 Maintenance

7.7.a. Date of most recent review/revision of maintenance procedures

7.7.b. Date of most recent equipment inspection/test

7.7.c. What equipment inspected/tested

7.8 Management of Change

7.8.a. Date of most recent change that triggered management of change procedures

7.8.b. Date of most recent review/revision of management of change procedures

7.9 Date of most recent pre-startup review

7.10 Compliance audits:

7.10.a. Date of most recent compliance audit

7.10.b. Expected date of completion of any changes resulting from compliance audit

7.11 Incident investigation:

7.11.a. Date of most recent incident investigation

7.11.b. Expected date of completion of any changes resulting from investigation

7.12 Date of most recent review/revision of employee participation plans

7.13 Date of most recent review/revision of hot work permit procedures

7.14 Date of most recent review/revision of contractor safety procedures

7.15 Date of most recent evaluation of contractor safety performance

8. PREVENTION PROGRAM—PROGRAM 2

For each process or process unit:

8.1 NAICS Code for process

8.2 Chemical name(s):	

If you need more space to list chemicals, please use a separate sheet of paper or make a photo copy of this sheet.

8.3 Safety information

8.3.a. Date of most recent review/revision of safety information

8.3.b. Federal/state regulations or industry-specific design codes and standards used to demonstrate compliance with the safety information requirement (select all that apply)

8.3.b.1. NFPA 58 (or state law based on NFPA 58)

8.3.b.2. OSHA (29 CFR 1910.111)

8.3.b.3. ASTM Standards

8.3.b.4. ANSI Standards

8.3.b.5. ASME Standards

8.3.b.6. None

8.3.b.7. Other (specify)

8.3.b.8. Comments

8.4 Hazard review

8.4.a. Date of completion of most recent hazard review/update

8.4.b. Expected date of completion of any changes resulting from the hazard review

8.4.c. Major hazards identified (select all that apply)

8.4.c.1. Toxic release

8.4.c.2. Fire

8.4.c.3. Explosion

8.4.c.4. Runaway reaction

8.4.c.5. Polymerization

8.4.c.6. Overpressurization

8.4.c.7. Corrosion

8.4.c.8. Overfilling

8.4.c.9. Contamination

8.4.c.10. Equipment failure

8.4.c.11. Loss of cooling, heating, electricity, instrument air

8.4.c.12. Earthquake

8.4.c.13. Floods (flood plain)

8.4.c.14. Tornado

8.4.c.15. Hurricanes

8.4.c.16. Other (specify)

8.4.d. Process controls in use (select all that apply)

8.4.d.1. Vents

8.4.d.2. Relief valves

8.4.d.3. Check valves

8.4.d.4. Scrubbers

8.4.d.5. Flares

8.4.d.6. Manual shutoffs

8.4.d.7. Automatic shutoffs

8.4.d.8. Interlocks

8.4.d.9. Alarms and procedures

8.4.d.10. Keyed bypass

8.4.d.11. Emergency air supply

8.4.d.12. Emergency power

8.4.d.13. Backup pump

8.4.d.14. Grounding equipment

8.4.d.15. Inhibitor addition

8.4.d.16. Rupture disks

8.4.d.17. Excess flow device

8.4.d.18. Quench system

8.4.d.19. Purge system

8.4.d.20. Other (specify)

8.4.e. Mitigation systems (select all that apply)

8.4.e.1. Sprinkler system

8.4.e.2. Dikes

8.4.e.3. Fire walls

8.4.e.4. Blast walls

8.4.e.5. Deluge system

8.4.e.6. Water curtain

8.4.e.7. Enclosure

8.4.e.8. Neutralization

8.4.e.9. Other (specify)

8.4.f. Monitoring/detection systems (select all that apply)

8.4.f.1. Process area detectors

8.4.f.2. Perimeter monitors

8.4.f.3. Other (specify)

8.4.g. Changes since last PHA update (select all that apply)

8.4.g.1. Reduction in chemical inventory

8.4.g.2. Increase in chemical inventory

8.4.g.3. Change in process parameters

8.4.g.4. Installation of process controls

8.4.g.5. Installation of process detection systems

8.4.g.6. Installation of perimeter monitoring systems

8.4.g.7. Installation of mitigation systems

8.4.g.8. None required/recommended

8.4.g.9. Other (specify)

8.5 Date of most recent review/revision of operating procedures

8.6 Training

8.6.a. Date of most recent review/revision of training programs

8.6.b. Type of training provided (select all that apply)

8.6.b.1. Classroom

8.6.b.2. On the job

8.6.b.3. Other (specify)

8.6.c. Type of competency test used (select all that apply)

8.6.c.1. Written test

8.6.c.2. Oral test

8.6.c.3. Demonstration

8.6.c.4. Observation

8.6.c.5. Other (specify)

8.7 Maintenance

8.7.a. Date of most recent review/revision of maintenance procedures

8.7.b. Date of most recent equipment inspection/test

8.7.c. What equipment inspected/tested

8.8 Compliance audits

8.8.a. Date of most recent compliance audit

8.8.b. Expected date of completion of any changes resulting from the compliance audit

8.9 Incident investigation

8.9.a. Date of most recent incident investigation

8.9.b. Expected date of completion of any changes resulting from the investigation

8.10 Date of most recent change that triggered review/revision of safety information, hazard review, operating or maintenance procedures or training

9. EMERGENCY RESPONSE

9.1 Emergency response (ER) plan

9.1.a. Is facility included in the written community emergency response plan?

9.1.b. Does facility have its own written emergency response plan?

9.2 Does facility ER plan include specific actions to be taken in response to accidental releases of regulated substance(s)?

9.3 Does facility ER plan include procedures for informing public and local agencies responding to accidental release?

9.4 Does facility ER plan include information on emergency health care?

9.5 Date of most recent review/update of facility ER plan

9.6 Date of most recent emergency response training for facility's employees

9.7 Local agency with which the facility ER plan or response activities are coordinated

9.7.a. Name of agency

9.7.b. Phone number

9.8 Subject to (select all that apply)

9.8.a. OSHA 1910.38

9.8.b. OSHA 1910.120

9.8.c. Clean Water Act/SPCC (40 CFR 112)

9.8.d. RCRA (40 CFR 264, 265, 279.52)

9.8.e. OPA-90 (40 CFR 112, 33 CFR 154, 49 CFR 194, 30 CFR 254)

9.8.f. State EPCRA rules/law

9.8.g. Other (specify)

APPENDIX E

Glossary

GLOSSARY

Italicized terms and their definitions are taken from the RMP rule and the RMP list rule.

Term	Definition
Accidental release	An unanticipated emission of a regulated substance or other extremely hazardous substance into the ambient air from a stationary source.
Acute exposure	Refers to a single exposure that occurs over a relatively short period of time (e.g., during exposure to a vapor cloud resulting from an accidental release).
Administrative controls	Written procedural mechanisms used for hazard control.
Aerosol entrainment	When small liquid droplets remain suspended in a vapor cloud instead of falling to the ground.
Alternate release scenarios	The scenarios other than worst case provided in the hazard assessment. For alternative scenarios, sources may consider the effects of both passive and active mitigation systems.
Article	A manufactured item, as defined under 29 *CFR* 1910.1200(b), that is formed to a specific shape or design during manufacture, that has end use functions dependent in whole or in part upon the shape or design during end use, and that does not release or otherwise result in exposure to a regulated substance under normal conditions of processing and use.
Atmospheric dispersion	The dilution of a vapor or gas as it mixes with the surrounding air and moves downwind.

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Term	Definition
Atmospheric stability	A classification of the amount of turbulence (horizontal and vertical movement of the surrounding air) that exists in the atmosphere at any given time. Levels of atmospheric stability are identified with a letter (A–F). Unstable conditions (A–C) generally occur during mid-day with clear skies and light winds; these conditions cause considerable horizontal and vertical turbulence and result in rapid dispersion of a vapor cloud as it moves downwind. Neutral conditions (D) can occur during the day or night with cloudy skies and moderate-to-strong winds; these conditions cause less turbulence in the horizontal and vertical directions than unstable conditions and result in less rapid dispersion of the vapor cloud as it moves downwind. Stable conditions (E–F) generally occur at night or early morning with clear skies and light winds; there is very little horizontal or vertical turbulence, which results in very slow dispersion of the vapor cloud as it moves downwind.
Average concentration	The time-weighted concentration at a given downwind location over a specified period of time or duration of exposure (i.e., the averaging time).
Averaging time	The time interval over which the instantaneous concentration of the hazardous material within the vapor cloud is averaged to assess the effects of the exposure.
Boiling liquid expanding vapor explosion (BLEVE)	The explosive vaporization of a superheated liquid when it is rapidly (instantaneously) released from a storage container or transportation vessel. The resulting release of energy generates an overpressure, and a fireball often occurs if the material is combustible and the container/vessel failure is caused by an external fire. The primary consequences of a BLEVE are (1) the overpressure that may be generated, (2) large vessel fragments that may be propelled away from the explosion, and (3) when applicable, thermal radiation from the fireball.
Boiling point	The 20% evaporated point of a distillation performed in accordance with ASTM D 86. This definition comes from NFPA 30 Flammable and Combustible Liquids Code.

Term	Definition
Catastrophic release	A major uncontrolled emission, fire, or explosion, involving one or more regulated substances that presents imminent and substantial endangerment to public health and the environment.
Chronic exposure	Refers to multiple or continuous exposures occurring over a long period of time (i.e., months or years).
Classified information	Defined in the Classified Information Procedures Act, 18 U.S.C. App. 3, Section 1(a) as "any information or material that has been determined by the United States Government pursuant to an executive order, statute, or regulation, to require protection against unauthorized disclosure for reasons of national security."
Concentration in air, parts per million (ppm), % by volume (vol%)	The relative amount (volume) of a material that is contained within a vapor cloud in the air, often expressed in parts per million (ppm) or % by volume (vol%). A concentration of 1,000,000 ppm (or 100 vol%) means that the vapor cloud volume consists only of the material with no air. A concentration of 500,000 ppm (or 50 vol%) means that the vapor cloud volume is one-half material and one-half air.
Condensate	Hydrocarbon liquid separated from natural gas that condenses due to changes in temperature, pressure, or both, and remains liquid at standard conditions.
Consequence analysis	The prediction of the effects of accidental releases using mathematical models, historical experience of accident effects, and/or experimental results. Includes estimating a source term, predicting the transport of energy or the release of material through the environment, and/or estimating the effects of the release.
Covered process	A process that has a regulated substance present in more than a threshold quantity as determined under §68.115 of 40 *CFR* 68.
Crude oil	Any naturally occurring, unrefined petroleum product.
Delayed ignition	The ignition of a flammable vapor cloud, several minutes following its release, usually associated with a point distant from the release.

Term	Definition
Dense gas, heavy gas	A vapor cloud that is more dense (or heavier) than the surrounding air. Such a cloud has a tendency to hug the ground following the release. The atmospheric dispersion of a heavy gas cloud is driven primarily by the difference in density between the vapor cloud and the surrounding air rather than by the surrounding atmospheric turbulence.
Designated agency	Any state or local agency designated by the air permitting authority as the agency responsible for the review of an RMP for completeness.
Dispersion model	Any method used to predict (based on release information and meteorological data) the characteristics (e.g., concentration and dimensions) of a vapor cloud as it moves downwind. The method may be based on experimental data, theoretical data, or a combination of the two. In many cases, the method is often put into a computer program for easy use.
Dose	A measure of total exposure to a specific hazard (toxic concentration, thermal radiation, etc.) that occurs during the duration of a release event (passage time of a toxic cloud, duration of a burning fireball, etc.). For example, exposure to a constant, toxic vapor cloud concentration of 1,000 ppm for 10 minutes results in a toxic dose of 10,000 ppm-min. Exposure to a constant thermal radiation intensity of 5,000 W/m^2 for 10 seconds results in a thermal dose of 50,000 W-sec/m^2 or 50,000 J/m^2.
Endpoint	A toxic substance's Emergency Response Planning Guideline level 2 (ERPG 2) developed by the American Industrial Hygiene Association (AIHA). If a substance has no ERPG 2, then the endpoint is the level of concern (LOC) from the Technical Guidance for Hazards Analysis, updated where necessary to reflect new toxicity data. For vapor cloud fires and jet fires, the lower flammability limit provided by the NFPA or other sources shall be used.
Emergency response planning guideline (ERPG)	The concentration of a hazardous material in air above which some members of the public may begin to experience adverse effects. The AIHA approves and publishes three levels (ERPG 1, ERPG 2, and ERPG 3, defined below), each related to the severity of effect.

Term	Definition
Environmental receptor	Natural areas such as national or state parks, forests, or monuments; officially designated wildlife sanctuaries, preserves, refuges, or areas; and federal wilderness areas, that could be exposed at any time to toxic concentrations, radiant heat, or overpressure greater than or equal to the endpoints provided in §68.22(a) of this part, as a result of an accidental release and that can be identified on local USGS maps.
ERPG 1	The maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor.
ERPG 2	The maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action.
ERPG 3	The maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to 1 hour without experiencing or developing life-threatening health effects.
Explosion	A release of energy that causes a transient change in the density, pressure, and velocity of the air surrounding the source of energy. This release of energy may generate a damaging pressure wave. If the source of energy originates from rapid depressurization of a vessel (high pressure vessel rupture or BLEVE), this is referred to as a ***physical explosion***. If the source of energy originates from combustion of flammable material (vapor cloud explosion), it is called a ***chemical explosion***.
Exposure time	The total time interval over which an individual is actually exposed to a hazardous condition (material in a vapor cloud, fire, etc.).
Field gas	Gas extracted from a production well before the gas enters a natural gas processing plant.

Term	Definition
Fireball	A fireball results following the immediate ignition of a rapid (instantaneous) release of a flammable vapor or superheated liquid or liquid/vapor mixture. The burning cloud tends to rise, expand, and assume a spherical shape. A fireball usually exists for only 10 to 20 seconds; however, it may present thermal radiation effects and severely burn individuals hundreds of feet from the source of the fireball. A fireball often accompanies a BLEVE if the released liquid is flammable and the release results from vessel failure caused by an external fire.
Flammability limits, upper and lower	Represent the range of concentration in air of a flammable vapor or mist that will undergo self-sustaining combustion (i.e., will burn). For example, the flammability limits for propane are 21,000–95,000 ppm (often represented as percentage: 2.1–9.5% by volume). Outside these limits, a propane vapor cloud will not undergo self-sustaining combustion. ***The upper flammability limit (UFL)*** is the maximum concentration of a hazardous material in air that can be ignited or burn (e.g., for propane the UFL is 95,000 ppm or 9.5% by volume). The ***LFL*** is the minimum concentration of a hazardous material in air that can be ignited or burn (e.g., for propane, the LFL is 21,000 ppm or 2.1% by volume).
Flash fire	Results when a flammable vapor-air or vapor/mist-air mixture is ignited. A flash fire usually exists for only a few seconds; however, individuals located within or near the vapor cloud when it ignites may suffer severe burns.
Footprint	The area potentially affected by an accidental release of hazardous material in which the level of concern is exceeded. For example, the footprint for a toxic release could represent the area covered by the toxic cloud in which the average concentration of the material in the cloud exceeded the ERPG 3 value. For an explosion, the footprint would be the area in which the level of concern for overpressure would be exceeded (see "vulnerability zone").
Hazard assessment	As used in connection with EPA's RMP rule, an analysis to estimate the potential consequences of accidental releases of hazardous materials on the public and on the environment when such impacts provide a direct pathway to acute human health effects.

Term	Definition
Immediately dangerous to life and health (IDLH)	The maximum concentration in air to which a healthy worker may be exposed for 30 minutes without experiencing any escape-impairing symptoms or permanent health effects. IDLH values are published by the National Institute for Occupational Safety and Health (NIOSH). The IDLH concentration is intended to be used for respirator selection for workers and is not applicable for assessing health effects to the general public.
Implementing agency	The state or local agency that obtains delegation for an accidental release prevention program under subpart E of part 63 under section 112(l) of the CAA. The implementing agency may, but is not required to, be the state or local air permitting agency. If a state or local agency does not take delegation, EPA will be the implementing agency for the state.
Injury	Any effect on a human that results either from direct exposure to toxic concentrations; radiant heat; or overpressures from accidental releases or from the direct consequences of a vapor cloud explosion (such as flying glass, debris, and other projectiles) from an accidental release and that requires medical treatment or hospitalization.
Jet fire	Results from the ignition of a flammable vapor or liquid/vapor mixture that is being continuously discharged from an orifice, leak, or rupture. The resulting flame has a torch-like appearance and may pose thermal radiation hazards to nearby individuals.
Level of concern (LOC)	Refers to the criteria that are used to determine the extent of a footprint predicted in a hazard assessment (see "footprint"). LOCs can be specified for toxic exposure (e.g., ERPGs), exposure to fires/flames (thermal exposure criteria), and explosions (overpressure). LOCs are selected based on the objectives of the hazard assessment. For example, ERPG 2 is often used in consequence analyses directed at improving emergency planning activities. The footprint for ERPG 2 indicates the areas where people may need to take protection or perform other emergency actions to avoid serious health effects.

Term	Definition
Local emergency planning committee (LEPC)	A local interdisciplinary group appointed by the State Emergency Response Commission (SERC) to develop a comprehensive emergency plan for responding to accidental releases of hazardous materials that could affect the public. Individual plants/facilities have the primary responsibility of responding to onsite (i.e., within the fenceline) emergencies, while the LEPC is responsible for developing plans for safeguarding the public if hazardous materials migrate off site (i.e., over the fenceline). The membership of the LEPC must include local citizens, emergency responders, members of law enforcement, local media, as well as industry representatives.
Major change	Introduction of a new process, process equipment, or regulated substance, an alteration of process chemistry that results in any change to safe operating limits, or other alteration that introduces a new hazard.
Medical treatment	Treatment, other than first aid, administered by a physician or registered professional personnel under standing orders from a physician.
Mitigation system, active, passive	Specific activities, technologies, or equipment designed or deployed to capture or control substances upon loss of containment to minimize exposure of the public or the environment. ***Passive mitigation*** Equipment, devices, or technologies that function without human, mechanical, or other energy input. An example of a passive mitigation system is a dike surrounding a storage tank that limits the spread and vaporization of a spilled hazardous material. ***Active mitigation*** Equipment, devices, or technologies that need human, mechanical, or other energy input to function. An example of an active mitigation system is an automatic shutoff valve that limits the duration of a hazardous material release.

Term	Definition
Mixing layer, mixing height	The layer of air closest to the earth's surface into which materials will disperse when released. The top or depth of the layer, referred to as the ***mixing height***, varies from location to location, time of day, and time of year. The top of the mixing layer acts as a "ceiling" to restrict vertical spreading of a vapor cloud. Therefore, a thin (shallow) mixing layer results in less rapid dispersion of a vapor cloud as it moves downwind, possibly resulting in a larger footprint compared to the same situation having a thicker (deeper) mixing layer.
Model accuracy	The ability of a model to produce results that match the experimental (or known) data.
Model uncertainty	The statistical confidence limits (upper and/or lower bounds) associated with a model prediction compared to the actual, unknown outcome. For example, a model may predict that the concentration in a vapor cloud is 500 ppm with an uncertainty of 50% (i.e., 500 ppm, ±50%). This means the actual value of the concentration (which is not known) is expected to fall somewhere between 250 ppm and 750 ppm.
Natural gas processing plant (gas plant)	Any processing site engaged in the extraction of natural gas liquids from field gas, fractionation of mixed natural gas liquids to natural products, or both, classified as NAICS code 211112 (previously SIC code 1321). A separator, dehydration unit, heater treater, sweetening unit, compressor, or similar equipment shall not be considered a "processing site" unless such equipment is physically located within a natural gas processing plant (gas plant) site.
Off site	Areas beyond the property boundary of the stationary source or areas within the property boundary to which the public has routine and unrestricted access during or outside business hours.
Overpressure	The sudden increase in the local atmospheric pressure that may result from an explosion. The standard pressure in the atmosphere is approximately 14.7 pounds per square inch at sea level. An explosion that causes a 3 pound per square inch overpressure means that the local atmospheric pressure suddenly increased from 14.7 to 17.7 lb per square inch. Significant overpressure may cause severe injury to exposed individuals and damage to property.

Term	Definition
Passive gas	A vapor cloud that is buoyant (i.e., light) or neutrally buoyant compared to the surrounding air. The atmospheric dispersion of such a cloud is completely dominated by turbulence (horizontal and vertical movement of air) in the atmosphere. A passive gas does not have a tendency to hug the ground like a heavy or dense gas.
Peak concentration	The maximum, instantaneous (i.e., zero averaging time) concentration that occurs at a given downwind location as a vapor cloud passes the location.
Petroleum refining process unit	A process unit used in an establishment primarily engaged in petroleum refining as defined in NAICS code 32411 for petroleum refining (formerly SIC code 2911) and used for the following: (1) Producing transportation fuels (such as gasoline, diesel fuels, and jet fuels), heating fuels (such as kerosene, fuel gas distillate, and fuel oils), or lubricants; (2) Separating petroleum; or (3) Separating, cracking, reacting, or reforming intermediate petroleum streams. Examples of such units include, but are not limited to, petroleum based solvent units, alkylation units, catalytic hydrotreating, catalytic hydrorefining, catalytic hydrocracking, catalytic reforming, catalytic cracking, crude distillation, lube oil processing, hydrogen production, isomerization, polymerization, thermal processes, and blending, sweetening, and treating processes. Petroleum refining process units include sulfur plants.
Plume	The appearance of a vapor cloud that is being released over a prolonged period of time from a stack, pipe, vessel, or evaporating pool. The resulting vapor cloud is elongated and spreads out as it moves downwind, having a cigar-shaped appearance.
Pool depth	The thickness of a liquid pool that is spilled onto a given surface (concrete, gravel, soil, water, etc.). The minimum pool depth that a liquid spill may attain as it spreads out depends on such factors as the roughness and contour of the surface, the liquid viscosity, and the liquid pour point temperature.
Pool fire	Results from the ignition of flammable vapors that evaporate from a flammable liquid spill. The flames associated with the pool fire may produce thermal radiation effects to individuals located near the fire.

Term	Definition
Population	The public.
Pressure wave	A moving disturbance that emanates from an explosion and causes a localized increase in atmospheric pressure (overpressure) as it traverses the atmosphere.
Process	Any activity involving a regulated substance, includ-ing any use, storage, manufacturing, handling, or the onsite movement of such chemicals or combination of these activities. For purposes of this definition, any group of vessels that are interconnected and separate vessels that are located such that a highly hazardous chemical could be involved in a potential release shall be considered a single process.
Produced water	Water extracted from the earth from an oil or natural gas production well, or that is separated from oil or natural gas after extraction.
Public	Any person except employees or contractors at the stationary source.
Public receptor	Offsite residences, institutions (e.g., schools, hospitals), industrial, commercial, and office buildings, parks, or recreational areas inhabited or occupied by the public at any time without restriction by the stationary source where members of the public could be exposed to toxic concentrations, radiant heat, or overpressure, as a result of an accidental release.
Rainout	When liquid droplets fall to the ground instead of remaining in a vapor cloud.
Regulated substance	Any substance listed pursuant to section 112(r)(3) of the Clean Air Act as amended in §68.130 of 40 *CFR* 68.
Release duration	The total time interval over which a hazardous material is being released to the surrounding air.
Release rate	Refers to the quantity (in pounds, kilograms, gallons, etc.) of a hazardous material that is released per unit time (per second, per minute, per hour, etc.) from a tank, pipe, or other piece of equipment.

Term	Definition
Shelter-in-place	A method of protecting oneself from exposure to a toxic vapor cloud by remaining inside an enclosure (building or house) until the concentration within the vapor cloud (outside of the enclosure) has decreased to a safe level.
Solar radiation	The amount of thermal radiation from the sun that reaches the earth's surface. The solar radiation varies at different locations, hours of the day, times of the year, and cloudiness.
Source term	Defines the quantity or release rate, the duration of the release, and the form (liquid, vapor, or liquid and vapor) for an accidental release of a hazardous material.
Stationary source	Any buildings, structures, equipment, installations, or substance emitting stationary activities which belong to the same industrial group, which are located on one or more contiguous properties, which are under the control of the same person (or persons under common control), and from which an accidental release may occur. The term stationary source does not apply to transportation, including the storage incident to transportation, of any regulated substance or any other extremely hazardous substance under the provisions of this part. A stationary source includes transportation containers used for storage not incident to transportation and transportation containers connected to equipment at a stationary course for loading or unloading. Transportation includes, but is not limited to, transportation subject to oversight or regulation under 49 *CFR* Parts 192, 193, or 195, or a state natural gas or hazardous liquid program for which the state has in effect a certification to DOT under 49 U.S.C. section 601005. A stationary source does not include naturally occurring hydrocarbon reservoirs. Properties shall not be considered contiguous solely because of a railroad or pipeline right-of-way.
Stoichiometric concentration	The concentration of a flammable material in air with the precise amount of oxygen needed to burn all of the flammable material, assuming complete combustion (i.e., if combustion were complete, no excess fuel or oxygen would be present following the combustion process).

Term	Definition
Surface roughness	A measure of the weighted-average height of surface objects (grass, trees, buildings, etc.) in the vicinity (upwind and downwind) of the released hazardous material. The surface roughness influences the atmospheric dispersion of a released hazardous material by increasing turbulence (horizontal and/or vertical movement) of the surrounding air. Small values of surface roughness create less turbulence and result in less rapid dilution of the cloud as it moves downwind, while larger values of surface roughness create more turbulence and result in more rapid dilution of the cloud as it moves downwind.
Thermal radiation	Energy produced by sources of heat (sun, electric heater, fireball, jet fire, pool fire, etc.) that is subsequently transmitted through the air. Thermal radiation may cause severe burns to individuals located near the source of heat; the severity of health effects from thermal radiation depends upon a variety of factors (e.g., thermal flux intensity, exposure duration, angle of exposure, protective clothing).
Threshold quantity	The quantity specified for regulated substances pursuant to section 112(r)(5) of the Clean Air Act as amended, listed in §68.130 and determined to be present at a stationary source as specified in §68.115 of 40 *CFR* 68.
Typical meteorological conditions	The temperature, wind speed, cloud cover, and atmospheric stability class prevailing at the site, based on data gathered at or near the site or from a local meteorological station.
Vapor cloud explosion (VCE)	Results from the ignition of a cloud of flammable vapor or vapor/mist. The burning cloud generates expanding gases so quickly that a damaging pressure wave is produced. Partial confinement and/or significant congestion, resulting in increased turbulence in the burning cloud, are usually required for high velocity flame propagation (which generates damaging overpressures). The overpressure produced by the VCE can cause severe injuries and damage at significant distances from the point of release and/or the point of ignition.
Vessel	Any reactor, tank, drum, barrel, cylinder, vat, kettle, boiler, pipe, hose, or other container.

Term	Definition
Vulnerability zone	The vulnerability zone is the overlay of all footprints associated with a hypothetical accidental release of hazardous material, accounting for the variation in the wind direction at the time of the release. For a toxic release, the vulnerability zone is obtained by rotating the footprint to include all possible wind directions, which results in a circular area.
Wind persistence	The tendency of the wind to blow in a given direction, within some angular range, for several consecutive hours. A wind persistence value of 5 hours means that the wind blows in approximately the same direction for 5 consecutive hours.
Wind speed	The velocity of the wind as it moves through the atmosphere, generally measured by the NWS at a height of 10 meters (33 ft) from the ground and reported based on the direction the wind is originating (e.g., winds from the southeast). The wind speed is most often reported as being within some range of values (i.e., 5 - 10 mph). The wind speed influences the atmospheric dispersion of hazardous vapor clouds. While the NWS reports wind speeds at a height of 10 meters from the ground, the wind speed does vary as a function of elevation. Wind speeds used in dispersion models should represent values that are consistent with the actual height of the release or the depth of the vapor cloud, as appropriate.
Worst-case release	The release of the largest quantity of a regulated substance from a vessel or process line failure that results in the greatest distance to an endpoint defined in §68.22(a) of 40 *CFR* 68.
Worst-case scenario	An accidental release involving a hazardous material that would result in the worst (most severe) off-site consequences.

APPENDIX F

Consolidated Version of the RMP Rule (40 *CFR* 68)

This copy of the RMP rule consolidates the rule language published in the *Federal Register* on January 31, 1994 (59 *FR* 4477), June 20, 1996 (61 *FR* 31667), August 25, 1997 (62 *FR* 45130), and January 6, 1998 (63 *FR* 639). It also includes the proposed amendments to the RMP rule published on April 17, 1998 (63 *FR* 19216). The proposed amendments are indicated by using ~~strikeout~~ and ***bold and italic*** fonts. API, its employees, officers, directors, and other assigns accept no liability for any regulatory impact that may occur at any facility as a result of any differences between this copy of the rule and the final rule as published and amended by the EPA.

PART 68—CHEMICAL ACCIDENT PREVENTION PROVISIONS

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PART 68—CHEMICAL ACCIDENT PREVENTION PROVISIONS (cont'd)

Subpart G—Risk Management Plan

Subpart H—Other Requirements

Subpart A—General

§68.1 Scope.

This Part sets forth the list of regulated substances and thresholds, the petition process for adding or deleting substances to the list of regulated substances, the requirements for owners or operators of stationary sources concerning the prevention of accidental releases, and the State accidental release prevention programs approved under section 112(r). The list of substances, threshold quantities, and accident prevention regulations promulgated under this part do not limit in any way the general duty provisions under section 112(r)(1).

§68.2 Stayed Provisions.

(No stayed provisions currently exist.)

§68.3 Definitions.

For the purposes of this Part:

Accidental release means an unanticipated emission of a regulated substance or other extremely hazardous substance into the ambient air from a stationary source.

Act means the Clean Air Act as amended (42 U.S.C. 7401 et seq.)

Administrative controls mean written procedural mechanisms used for hazard control.

Administrator means the administrator of the U.S. Environmental Protection Agency.

AIChE/CCPS means the American Institute of Chemical Engineers/ Center for Chemical Process Safety.

API means the American Petroleum Institute.

Article means a manufactured item, as defined under 29 *CFR* 1910.1200(b), that is formed to a specific shape or design during manufacture, that has end use functions dependent in whole or in part upon the shape or design during end use, and that does not release or otherwise result in exposure to a regulated substance under normal conditions of processing and use.

ASME means the American Society of Mechanical Engineers.

CAS means the Chemical Abstracts Service.

Catastrophic release means a major uncontrolled emission, fire, or explosion, involving one or more regulated substances that presents imminent and substantial endangerment to public health and the environment.

Classified information means "classified information" as defined in the Classified Information Procedures Act, 18 U.S.C. App. 3, section 1(a) as "any information or material that has been determined by the United States Government pursuant to an executive order, statute, or regulation, to require protection against unauthorized disclosure for reasons of national security."

Condensate means hydrocarbon liquid separated from natural gas that condenses due to changes in temperature, pressure, or both, and remains liquid at standard conditions.

Covered process means a process that has a regulated substance present in more than a threshold quantity as determined under §68.115.

Crude oil means any naturally occurring, unrefined petroleum liquid.

Designated agency means the state, local, or Federal agency designated by the state under the provisions of §68.215(d).

DOT means the United States Department of Transportation.

Environmental receptor means natural areas such as national or state parks, forests, or monuments; officially designated wildlife sanctuaries, preserves, refuges, or areas; and Federal wilderness areas, that could be exposed at any time to toxic concentrations, radiant heat, or overpressure greater than or equal to the endpoints provided in §68.22(a), as a result of an accidental release and that can be identified on local U. S. Geological Survey maps.

Field gas means gas extracted from a production well before the gas enters a natural gas processing plant.

Hot work means work involving electric or gas welding, cutting, brazing, or similar flame or spark-producing operations.

Subpart A—General (cont'd)

Implementing agency means the state or local agency that obtains delegation for an accidental release prevention program under subpart E, 40 *CFR* part 63. The implementing agency may, but is not required to, be the state or local air permitting agency. If no state or local agency is granted delegation, EPA will be the implementing agency for that state.

Injury means any effect on a human that results either from direct exposure to toxic concentrations; radiant heat; or overpressures from accidental releases or from the direct consequences of a vapor cloud explosion (such as flying glass, debris, and other projectiles) from an accidental release and that requires medical treatment or hospitalization.

Major change means introduction of a new process, process equipment, or regulated substance, an alteration of process chemistry that results in any change to safe operating limits, or other alteration that introduces a new hazard.

Mechanical integrity means the process of ensuring that process equipment is fabricated from the proper materials of construction and is properly installed, maintained, and replaced to prevent failures and accidental releases.

Medical treatment means treatment, other than first aid, administered by a physician or registered professional personnel under standing orders from a physician.

Mitigation or mitigation system means specific activities, technologies, or equipment designed or deployed to capture or control substances upon loss of containment to minimize exposure of the public or the environment. Passive mitigation means equipment, devices, or technologies that function without human, mechanical, or other energy input. Active mitigation means equipment, devices, or technologies that need human, mechanical, or other energy input to function.

NAICS means North American Industrial Classification System.

Natural gas processing plant (gas plant) means any processing site engaged in the extraction of natural gas liquids from field gas, fractionation of mixed natural gas liquids to natural gas products, or both, classified as North American Industrial Classification System (NAICS) code 211112 (previously Standard Industrial Classification [SIC] code 1321).

NFPA means the National Fire Protection Association.

Offsite means areas beyond the property boundary of the stationary source, and areas within the property boundary to which the public has routine and unrestricted access during or outside business hours.

OSHA means the U.S. Occupational Safety and Health Administration. Owner or operator means any person who owns, leases, operates, controls, or supervises a stationary source.

Petroleum refining process unit means a process unit used in an establishment primarily engaged in petroleum refining as defined in NAICS code 32411 for petroleum refining (formerly SIC code 2911) and used for the following: (1) Producing transportation fuels (such as gasoline, diesel fuels, and jet fuels), heating fuels (such as kerosene, fuel gas distillate, and fuel oils), or lubricants; (2) Separating petroleum; or (3) Separating, cracking, reacting, or reforming intermediate petroleum streams.

Examples of such units include, but are not limited to, petroleum based solvent units, alkylation units, catalytic hydrotreating, catalytic hydrorefining, catalytic hydrocracking, catalytic reforming, catalytic cracking, crude distillation, lube oil processing, hydrogen production, isomerization, polymerization, thermal processes, and blending, sweetening, and treating processes. Petroleum refining process units include sulfur plants.

Population means the public.

Process means any activity involving a regulated substance including any use, storage, manufacturing, handling, or on-site movement of such substances, or combination of these activities. For the purposes of this definition, any group of vessels that are interconnected, or separate vessels that are located such that a regulated substance could be involved in a potential release, shall be considered a single process.

Produced water means water extracted from the earth from an oil or natural gas production well, or that is separated from oil or natural gas after extraction.

Public means any person except employees or contractors at the stationary source.

Public receptor means offsite residences, institutions (e.g., schools, hospitals), industrial, commercial, and office buildings, parks, or recreational areas inhabited or occupied by the public at any time without restriction by the stationary source where members of the public could be exposed to toxic concentrations, radiant heat, or overpressure, as a result of an accidental release.

Subpart A—General (cont'd)

Regulated substance is any substance listed pursuant to section 112(r)(3) of the Clean Air Act as amended, in *§68.130.*

Replacement in kind means a replacement that satisfies the design specifications.

RMP means the risk management plan required under subpart G of this part.

~~*SIC* means Standard Industrial Classification.~~

Stationary source means any buildings, structures, equipment, installations, or substance emitting stationary activities which belong to the same industrial group, which are located on one or more contiguous properties, which are under the control of the same person (or persons under common control), and from which an accidental release may occur. The term stationary source does not apply to transportation, including the storage incident to transportation, of any regulated substance or any other extremely hazardous substance under the provisions of this part. A stationary source includes transportation containers used for storage not incident to transportation and transportation containers connected to equipment at a stationary course for loading or unloading. Transportation includes, but is not limited to, transportation subject to oversight or regulation under 49 *CFR* Parts 192, 193, or 195, or a state natural gas or hazardous liquid program for which the state has in effect a certification to DOT under 49 U.S.C. section 601005. A stationary source does not include naturally occurring hydrocarbon reservoirs. Properties shall not be considered contiguous solely because of a railroad or pipeline right-of-way.

Threshold quantity means the quantity specified for regulated substances pursuant to section 112(r)(5) of the Clean Air Act as amended, listed in §68.130 and determined to be present at a stationary source as specified in §68.115 of this Part.

Typical meteorological conditions means the temperature, wind speed, cloud cover, and atmospheric stability class, prevailing at the site based on data gathered at or near the site or from a local meteorological station.

Vessel means any reactor, tank, drum, barrel, cylinder, vat, kettle, boiler, pipe, hose, or other container.

Worst-case release means the release of the largest quantity of a regulated substance from a vessel or process line failure that results in the greatest distance to an endpoint defined in §68.22(a).

§68.10 Applicability.

(a) An owner or operator of a stationary source that has more than a threshold quantity of a regulated substance in a process, as determined under §68.115, shall comply with the requirements of this part no later than the latest of the following dates:
  (1) June 21, 1999;
  (2) Three years after the date on which a regulated substance is first listed under §68.130; or
  (3) The date on which a regulated substance is first present above a threshold quantity in a process.

(b) Program 1 eligibility requirements. A covered process is eligible for Program 1 requirements as provided in §68.12(b) if it meets all of the following requirements:
  (1) For the five years prior to the submission of an RMP, the process has not had an accidental release of a regulated substance where exposure to the substance, its reaction products, overpressure generated by an explosion involving the substance, or radiant heat generated by a fire involving the substance led to any of the following offsite:
    (i) Death;
    (ii) Injury; or
    (iii) Response or restoration activities for an exposure of an environmental receptor;
  (2) The distance to a toxic or flammable endpoint for a worst-case release assessment conducted under Subpart B and §68.25 is less than the distance to any public receptor, as defined in §68.30; and
  (3) Emergency response procedures have been coordinated between the stationary source and local emergency planning and response organizations.

(c) Program 2 eligibility requirements. A covered process is subject to Program 2 requirements if it does not meet the eligibility requirements of either paragraph (b) or paragraph (d) of this section.

(d) Program 3 eligibility requirements. A covered process is subject to Program 3 if the process does not meet the requirements of paragraph (b) of this section, and if either of the following conditions is met:
  ~~(1) The process is in SIC code 2611, 2812, 2819, 2821, 2865, 2869, 2873, 2879, or 2911; or~~
  (1) The process is in NAICS code 32211, 32411, 32511, 325181, 325188, 325192, 325199, 325211, 325311, or 32532; or

Subpart A—General (cont'd)

(2) The process is subject to the OSHA process safety management standard, 29 *CFR* 1910.119.

(e) If at any time a covered process no longer meets the eligibility criteria of its Program level, the owner or operator shall comply with the requirements of the new Program level that applies to the process and update the RMP as provided in §68.190.

(f) The provisions of this part shall not apply to any Outer Continental Shelf (OCS) source, as defined in 40 *CFR* 55.2.

§68.12 General requirements.

(a) General requirements. The owner or operator of a stationary source subject to this part shall submit a single RMP, as provided in §§68.150 to 68.185. The RMP shall include a registration that reflects all covered processes.

(b) Program 1 requirements. In addition to meeting the requirements of paragraph (a) of this section, the owner or operator of a stationary source with a process eligible for Program 1, as provided in §68.10(b), shall:

(1) Analyze the worst-case release scenario for the process(es), as provided in §68.25; document that the nearest public receptor is beyond the distance to a toxic or flammable endpoint defined in §68.22(a); and submit in the RMP the worst-case release scenario as provided in §68.165;

(2) Complete the five-year accident history for the process as provided in §68.42 of this part and submit it in the RMP as provided in §68.168;

(3) Ensure that response actions have been coordinated with local emergency planning and response agencies; and

(4) Certify in the RMP the following: ``Based on the criteria in 40 *CFR* 68.10, the distance to the specified endpoint for the worst-case accidental release scenario for the following process(es) is less than the distance to the nearest public receptor: [list process(es)]. Within the past five years, the process(es) has (have) had no accidental release that caused offsite impacts provided in the risk management program rule (40 *CFR* 68.10(b)(1)). No additional measures are necessary to prevent offsite impacts from accidental releases. In the event of fire, explosion, or a release of a regulated substance from the process(es), entry within the distance to the specified endpoints may pose a danger to public emergency responders. Therefore, public emergency responders should not enter this area except as arranged with the emergency contact indicated in the RMP. The undersigned certifies that, to the best of my knowledge, information, and belief, formed after reasonable inquiry, the information submitted is true, accurate, and complete. [Signature, title, date signed].''

(c) Program 2 requirements. In addition to meeting the requirements of paragraph (a) of this section, the owner or operator of a stationary source with a process subject to Program 2, as provided in §68.10(c), shall:

(1) Develop and implement a management system as provided in §68.15;

(2) Conduct a hazard assessment as provided in §§68.20 through 68.42;

(3) Implement the Program 2 prevention steps provided in §§68.48 through 68.60 or implement the Program 3 prevention steps provided in §§68.65 through 68.87;

(4) Develop and implement an emergency response program as provided in §§68.90 to 68.95; and

(5) Submit as part of the RMP the data on prevention program elements for Program 2 processes as provided in §68.170.

(d) Program 3 requirements. In addition to meeting the requirements of paragraph (a) of this section, the owner or operator of a stationary source with a process subject to Program 3, as provided in §68.10(d) shall:

(1) Develop and implement a management system as provided in §68.15;

(2) Conduct a hazard assessment as provided in §§68.20 through 68.42;

(3) Implement the prevention requirements of §§68.65 through 68.87;

(4) Develop and implement an emergency response program as provided in §§68.90 to 68.95 of this part; and

(5) Submit as part of the RMP the data on prevention program elements for Program 3 processes as provided in §68.175.

§68.15 Management.

(a) The owner or operator of a stationary source with processes subject to Program 2 or Program 3 shall develop a management system to oversee the implementation of the risk management program elements.

Subpart A—General (cont'd)

(b) The owner or operator shall assign a qualified person or position that has the overall responsibility for the development, implementation, and integration of the risk management program elements.

(c) When responsibility for implementing individual requirements of this part is assigned to persons other than the person identified under paragraph (b) of this section, the names or positions of these people shall be documented and the lines of authority defined through an organization chart or similar document.

Subpart B—Hazard Assessment

§68.20 Applicability.

The owner or operator of a stationary source subject to this part shall prepare a worst-case release scenario analysis as provided in §68.25 of this part and complete the five-year accident history as provided in §68.42. The owner or operator of a Program 2 and 3 process must comply with all sections in this subpart for these processes.

§68.22 Offsite consequence analysis parameters.

(a) Endpoints. For analyses of offsite consequences, the following endpoints shall be used:
  (1) Toxics. The toxic endpoints provided in Appendix A of this part.
  (2) Flammables. The endpoints for flammables vary according to the scenarios studied:
    (i) Explosion. An overpressure of 1 psi.
    (ii) Radiant heat/exposure time. A radiant heat of 5 kw/m<SUP>2 for 40 seconds.
    (iii) Lower flammability limit. A lower flammability limit as provided in NFPA documents or other generally recognized sources.

(b) Wind speed/atmospheric stability class. For the worst-case release analysis, the owner or operator shall use a wind speed of 1.5 meters per second and F atmospheric stability class. If the owner or operator can demonstrate that local meteorological data applicable to the stationary source show a higher minimum wind speed or less stable atmosphere at all times during the previous three years, these minimums may be used. For analysis of alternative scenarios, the owner or operator may use the typical meteorological conditions for the stationary source.

(c) Ambient temperature/humidity. For worst-case release analysis of a regulated toxic substance, the owner or operator shall use the highest daily maximum temperature in the previous three years and average humidity for the site, based on temperature/humidity data gathered at the stationary source or at a local meteorological station; an owner or operator using the RMP Offsite Consequence Analysis Guidance may use 25 deg.C and 50 percent humidity as values for these variables. For analysis of alternative scenarios, the owner or operator may use typical temperature/humidity data gathered at the stationary source or at a local meteorological station.

(d) Height of release. The worst-case release of a regulated toxic substance shall be analyzed assuming a ground level (0 feet) release. For an alternative scenario analysis of a regulated toxic substance, release height may be determined by the release scenario.

(e) Surface roughness. The owner or operator shall use either urban or rural topography, as appropriate. Urban means that there are many obstacles in the immediate area; obstacles include buildings or trees. Rural means there are no buildings in the immediate area and the terrain is generally flat and unobstructed.

(f) Dense or neutrally buoyant gases. The owner or operator shall ensure that tables or models used for dispersion analysis of regulated toxic substances appropriately account for gas density.

Subpart B—Hazard Assessment (cont'd)

(g) Temperature of released substance. For worst case, liquids other than gases liquified by refrigeration only shall be considered to be released at the highest daily maximum temperature, based on data for the previous three years appropriate for the stationary source, or at process temperature, whichever is higher. For alternative scenarios, substances may be considered to be released at a process or ambient temperature that is appropriate for the scenario.

§68.25 Worst-case release scenario analysis.

(a) The owner or operator shall analyze and report in the RMP:
  (1) For Program 1 processes, one worst-case release scenario for each Program 1 process;
  (2) For Program 2 and 3 processes:
    (i) One worst-case release scenario that is estimated to create the greatest distance in any direction to an endpoint provided in Appendix A of this part resulting from an accidental release of regulated toxic substances from covered processes under worst-case conditions defined in §68.22;
    (ii) One worst-case release scenario that is estimated to create the greatest distance in any direction to an endpoint defined in §68.22(a) resulting from an accidental release of regulated flammable substances from covered processes under worst-case conditions defined in §68.22; and
    (iii) Additional worst-case release scenarios for a hazard class if a worst-case release from another covered process at the stationary source potentially affects public receptors different from those potentially affected by the worst-case release scenario developed under paragraphs (a)(2)(i) or (a)(2)(ii) of this section.

(b) Determination of worst-case release quantity. The worst-case release quantity shall be the greater of the following:
  (1) For substances in a vessel, the greatest amount held in a single vessel, taking into account administrative controls that limit the maximum quantity; or
  (2) For substances in pipes, the greatest amount in a pipe, taking into account administrative controls that limit the maximum quantity.

(c) Worst-case release scenario—toxic gases.
  (1) For regulated toxic substances that are normally gases at ambient temperature and handled as a gas or as a liquid under pressure, the owner or operator shall assume that the quantity in the vessel or pipe, as determined under paragraph (b) of this section, is released as a gas over 10 minutes. The release rate shall be assumed to be the total quantity divided by 10 unless passive mitigation systems are in place.
  (2) For gases handled as refrigerated liquids at ambient pressure:
    (i) If the released substance is not contained by passive mitigation systems or if the contained pool would have a depth of 1 cm or less, the owner or operator shall assume that the substance is released as a gas in 10 minutes;
    (ii) If the released substance is contained by passive mitigation systems in a pool with a depth greater than 1 cm, the owner or operator may assume that the quantity in the vessel or pipe, as determined under paragraph (b) of this section, is spilled instantaneously to form a liquid pool. The volatilization rate (release rate) shall be calculated at the boiling point of the substance and at the conditions specified in paragraph (d) of this section.

(d) Worst-case release scenario—toxic liquids.
  (1) For regulated toxic substances that are normally liquids at ambient temperature, the owner or operator shall assume that the quantity in the vessel or pipe, as determined under paragraph (b) of this section, is spilled instantaneously to form a liquid pool.
    (i) The surface area of the pool shall be determined by assuming that the liquid spreads to 1 centimeter deep unless passive mitigation systems are in place that serve to contain the spill and limit the surface area. Where passive mitigation is in place, the surface area of the contained liquid shall be used to calculate the volatilization rate.
    (ii) If the release would occur onto a surface that is not paved or smooth, the owner or operator may take into account the actual surface characteristics.
  (2) The volatilization rate shall account for the highest daily maximum temperature occurring in the past three years, the temperature of the substance in the vessel, and the concentration of the substance if the liquid spilled is a mixture or solution.

Subpart B—Hazard Assessment (cont'd)

(3) The rate of release to air shall be determined from the volatilization rate of the liquid pool. The owner or operator may use the methodology in the RMP Offsite Consequence Analysis Guidance or any other publicly available techniques that account for the modeling conditions and are recognized by industry as applicable as part of current practices. Proprietary models that account for the modeling conditions may be used provided the owner or operator allows the implementing agency access to the model and describes model features and differences from publicly available models to local emergency planners upon request.

(e) Worst-case release scenario—flammables. The owner or operator shall assume that the quantity of the substance, as determined under paragraph (b) of this section, vaporizes resulting in a vapor cloud explosion. A yield factor of 10 percent of the available energy released in the explosion shall be used to determine the distance to the explosion endpoint if the model used is based on TNT-equivalent methods.

(f) Parameters to be applied. The owner or operator shall use the parameters defined in §68.22 to determine distance to the endpoints. The owner or operator may use the methodology provided in the RMP Offsite Consequence Analysis Guidance or any commercially or publicly available air dispersion modeling techniques, provided the techniques account for the modeling conditions and are recognized by industry as applicable as part of current practices. Proprietary models that account for the modeling conditions may be used provided the owner or operator allows the implementing agency access to the model and describes model features and differences from publicly available models to local emergency planners upon request.

(g) Consideration of passive mitigation. Passive mitigation systems may be considered for the analysis of worst case provided that the mitigation system is capable of withstanding the release event triggering the scenario and would still function as intended.

(h) Factors in selecting a worst-case scenario. Notwithstanding the provisions of paragraph (b) of this section, the owner or operator shall select as the worst case for flammable regulated substances or the worst case for regulated toxic substances, a scenario based on the following factors if such a scenario would result in a greater distance to an endpoint defined in §68.22(a) beyond the stationary source boundary than the scenario provided under paragraph (b) of this section:

(1) Smaller quantities handled at higher process temperature or pressure; and

(2) Proximity to the boundary of the stationary source.

§68.28 Alternative release scenario analysis.

(a) The number of scenarios. The owner or operator shall identify and analyze at least one alternative release scenario for each regulated toxic substance held in a covered process(es) and at least one alternative release scenario to represent all flammable substances held in covered processes.

(b) Scenarios to consider.

(1) For each scenario required under paragraph (a) of this section, the owner or operator shall select a scenario:

(i) That is more likely to occur than the worst-case release scenario under §68.25; and

(ii) That will reach an endpoint offsite, unless no such scenario exists.

(2) Release scenarios considered should include, but are not limited to, the following, where applicable:

(i) Transfer hose releases due to splits or sudden hose uncoupling;

(ii) Process piping releases from failures at flanges, joints, welds, valves and valve seals, and drains or bleeds;

(iii) Process vessel or pump releases due to cracks, seal failure, or drain, bleed, or plug failure;

(iv) Vessel overfilling and spill, or overpressurization and venting through relief valves or rupture disks; and

(v) Shipping container mishandling and breakage or puncturing leading to a spill.

Subpart B—Hazard Assessment (cont'd)

(c) Parameters to be applied. The owner or operator shall use the appropriate parameters defined in §68.22 to determine distance to the endpoints. The owner or operator may use either the methodology provided in the RMP Offsite Consequence Analysis Guidance or any commercially or publicly available air dispersion modeling techniques, provided the techniques account for the specified modeling conditions and are recognized by industry as applicable as part of current practices. Proprietary models that account for the modeling conditions may be used provided the owner or operator allows the implementing agency access to the model and describes model features and differences from publicly available models to local emergency planners upon request.

(d) Consideration of mitigation. Active and passive mitigation systems may be considered provided they are capable of withstanding the event that triggered the release and would still be functional.

(e) Factors in selecting scenarios. The owner or operator shall consider the following in selecting alternative release scenarios:

(1) The five-year accident history provided in §68.42; and

(2) Failure scenarios identified under §§68.50 or 68.67.

§68.30 Defining offsite impacts—population.

(a) The owner or operator shall estimate in the RMP the population within a circle with its center at the point of the release and a radius determined by the distance to the endpoint defined in §68.22(a).

(b) Population to be defined. Population shall include residential population. The presence of institutions (schools, hospitals, prisons), parks and recreational areas, and major commercial, office, and industrial buildings shall be noted in the RMP.

(c) Data sources acceptable. The owner or operator may use the most recent Census data, or other updated information, to estimate the population potentially affected.

(d) Level of accuracy. Population shall be estimated to two significant digits.

§68.33 Defining offsite impacts—environment.

(a) The owner or operator shall list in the RMP environmental receptors within a circle with its center at the point of the release and a radius determined by the distance to the endpoint defined in §68.22(a) of this part.

(b) Data sources acceptable. The owner or operator may rely on information provided on local U.S. Geological Survey maps or on any data source containing U.S.G.S. data to identify environmental receptors.

§68.36 Review and update.

(a) The owner or operator shall review and update the offsite consequence analyses at least once every five years.

(b) If changes in processes, quantities stored or handled, or any other aspect of the stationary source might reasonably be expected to increase or decrease the distance to the endpoint by a factor of two or more, the owner or operator shall complete a revised analysis within six months of the change and submit a revised risk management plan as provided in §68.190.

§68.39 Documentation

The owner or operator shall maintain the following records on the offsite consequence analyses:

(a) For worst-case scenarios, a description of the vessel or pipeline and substance selected as worst case, assumptions and parameters used, and the rationale for selection; assumptions shall include use of any administrative controls and any passive mitigation that were assumed to limit the quantity that could be released. Documentation shall include the anticipated effect of the controls and mitigation on the release quantity and rate.

(b) For alternative release scenarios, a description of the scenarios identified, assumptions and parameters used, and the rationale for the selection of specific scenarios; assumptions shall include use of any administrative controls and any mitigation that were assumed to limit the quantity that could be released. Documentation shall include the effect of the controls and mitigation on the release quantity and rate.

(c) Documentation of estimated quantity released, release rate, and duration of release.

(d) Methodology used to determine distance to endpoints.

(e) Data used to estimate population and environmental receptors potentially affected.

Subpart B—Hazard Assessment (cont'd)

§68.42 Five-year accident history.

(a) The owner or operator shall include in the five-year accident history all accidental releases from covered processes that resulted in deaths, injuries, or significant property damage on site, or known offsite deaths, injuries, evacuations, sheltering in place, property damage, or environmental damage.

(b) Data required. For each accidental release included, the owner or operator shall report the following information:

(1) Date, time, and approximate duration of the release;

(2) Chemical(s) released;

(3) Estimated quantity released in pounds ***and, for mixtures of regulated toxic substances, percentage concentration by weight of the released regulated substance in the mixture***;

(4) NAICS code for the process;

(~~4~~5) The type of release event and its source;

(~~5~~6) Weather conditions, if known;

(~~6~~7) On-site impacts;

(~~7~~8) Known offsite impacts;

(~~8~~9) Initiating event and contributing factors if known;

(~~9~~10) Whether offsite responders were notified if known; and

(~~10~~11) Operational or process changes that resulted from investigation of the release.

(c) Level of accuracy. Numerical estimates may be provided to two significant digits.

Subpart C—Program 2 Prevention Program

68.48 Safety information.
68.50 Hazard review.
68.52 Operating procedures.
68.54 Training.
68.56 Maintenance.
68.58 Compliance audits.
68.60 Incident investigation.

§68.48 Safety information.

(a) The owner or operator shall compile and maintain the following up-to-date safety information related to the regulated substances, processes, and equipment:

(1) Material Safety Data Sheets that meet the requirements of 29 *CFR* 1910.1200(g);

(2) Maximum intended inventory of equipment in which the regulated substances are stored or processed;

(3) Safe upper and lower temperatures, pressures, flows, and compositions;

(4) Equipment specifications; and

(5) Codes and standards used to design, build, and operate the process.

(b) The owner or operator shall ensure that the process is designed in compliance with recognized and generally accepted good engineering practices. Compliance with Federal or state regulations that address industry-specific safe design or with industry-specific design codes and standards may be used to demonstrate compliance with this paragraph.

(c) The owner or operator shall update the safety information if a major change occurs that makes the information inaccurate.

§68.50 Hazard review.

(a) The owner or operator shall conduct a review of the hazards associated with the regulated substances, process, and procedures. The review shall identify the following:

(1) The hazards associated with the process and regulated substances;

(2) Opportunities for equipment malfunctions or human errors that could cause an accidental release;

(3) The safeguards used or needed to control the hazards or prevent equipment malfunction or human error; and

(4) Any steps used or needed to detect or monitor releases.

Subpart C—Program 2 Prevention Program (cont'd)

(b) The owner or operator may use checklists developed by persons or organizations knowledgeable about the process and equipment as a guide to conducting the review. For processes designed to meet industry standards or Federal or state design rules, the hazard review shall, by inspecting all equipment, determine whether the process is designed, fabricated, and operated in accordance with the applicable standards or rules.
(c) The owner or operator shall document the results of the review and ensure that problems identified are resolved in a timely manner.
(d) The review shall be updated at least once every five years. The owner or operator shall also conduct reviews whenever a major change in the process occurs; all issues identified in the review shall be resolved before startup of the changed process.

§68.52 Operating procedures.

(a) The owner or operator shall prepare written operating procedures that provide clear instructions or steps for safely conducting activities associated with each covered process consistent with the safety information for that process. Operating procedures or instructions provided by equipment manufacturers or developed by persons or organizations knowledgeable about the process and equipment may be used as a basis for a stationary source's operating procedures.
(b) The procedures shall address the following:
  (1) Initial startup;
  (2) Normal operations;
  (3) Temporary operations;
  (4) Emergency shutdown and operations;
  (5) Normal shutdown;
  (6) Startup following a normal or emergency shutdown or a major change that requires a hazard review;
  (7) Consequences of deviations and steps required to correct or avoid deviations; and
  (8) Equipment inspections.
(c) The owner or operator shall ensure that the operating procedures are updated, if necessary, whenever a major change occurs and prior to startup of the changed process.

§68.54 Training.

(a) The owner or operator shall ensure that each employee presently operating a process, and each employee newly assigned to a covered process have been trained or tested competent in the operating procedures provided in §68.52 that pertain to their duties. For those employees already operating a process on June 21, 1999, the owner or operator may certify in writing that the employee has the required knowledge, skills, and abilities to safely carry out the duties and responsibilities as provided in the operating procedures.
(b) Refresher training. Refresher training shall be provided at least every three years, and more often if necessary, to each employee operating a process to ensure that the employee understands and adheres to the current operating procedures of the process. The owner or operator, in consultation with the employees operating the process, shall determine the appropriate frequency of refresher training.
(c) The owner or operator may use training conducted under Federal or state regulations or under industry-specific standards or codes or training conducted by covered process equipment vendors to demonstrate compliance with this section to the extent that the training meets the requirements of this section.
(d) The owner or operator shall ensure that operators are trained in any updated or new procedures prior to startup of a process after a major change.

§68.56 Maintenance.

(a) The owner or operator shall prepare and implement procedures to maintain the on-going mechanical integrity of the process equipment. The owner or operator may use procedures or instructions provided by covered process equipment vendors or procedures in Federal or state regulations or industry codes as the basis for stationary source maintenance procedures.

Subpart C—Program 2 Prevention Program (cont'd)

(b) The owner or operator shall train or cause to be trained each employee involved in maintaining the on-going mechanical integrity of the process. To ensure that the employee can perform the job tasks in a safe manner, each such employee shall be trained in the hazards of the process, in how to avoid or correct unsafe conditions, and in the procedures applicable to the employee's job tasks.
(c) Any maintenance contractor shall ensure that each contract maintenance employee is trained to perform the maintenance procedures developed under paragraph (a) of this section.
(d) The owner or operator shall perform or cause to be performed inspections and tests on process equipment. Inspection and testing procedures shall follow recognized and generally accepted good engineering practices. The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations, industry standards or codes, good engineering practices, and prior operating experience.

§68.58 Compliance audits.

(a) The owner or operator shall certify that they have evaluated compliance with the provisions of this subpart at least every three years to verify that the procedures and practices developed under the rule are adequate and are being followed.
(b) The compliance audit shall be conducted by at least one person knowledgeable in the process.
(c) The owner or operator shall develop a report of the audit findings.
(d) The owner or operator shall promptly determine and document an appropriate response to each of the findings of the compliance audit and document that deficiencies have been corrected.
(e) The owner or operator shall retain the two (2) most recent compliance audit reports. This requirement does not apply to any compliance audit report that is more than five years old.

§68.60 Incident investigation.

(a) The owner or operator shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release.
(b) An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.
(c) A summary shall be prepared at the conclusion of the investigation which includes at a minimum:
  (1) Date of incident;
  (2) Date investigation began;
  (3) A description of the incident;
  (4) The factors that contributed to the incident; and,
  (5) Any recommendations resulting from the investigation.
(d) The owner or operator shall promptly address and resolve the investigation findings and recommendations. Resolutions and corrective actions shall be documented.
(e) The findings shall be reviewed with all affected personnel whose job tasks are affected by the findings.
(f) Investigation summaries shall be retained for five years.

Subpart D—Program 3 Prevention Program

68.65 Process safety information.
68.67 Process hazard analysis.
68.69 Operating procedures.
68.71 Training.
68.73 Mechanical integrity.
68.75 Management of change.
68.77 Pre-startup review.
68.79 Compliance audits.
68.81 Incident investigation.
68.83 Employee participation.
68.85 Hot work permit.
68.87 Contractors.

Subpart D—Program 3 Prevention Program (cont'd)

§68.65 Process safety information.

(a) In accordance with the schedule set forth in §68.67, the owner or operator shall complete a compilation of written process safety information before conducting any process hazard analysis required by the rule. The compilation of written process safety information is to enable the owner or operator and the employees involved in operating the process to identify and understand the hazards posed by those processes involving regulated substances. This process safety information shall include information pertaining to the hazards of the regulated substances used or produced by the process, information pertaining to the technology of the process, and information pertaining to the equipment in the process.

(b) Information pertaining to the hazards of the regulated substances in the process. This information shall consist of at least the following:
- (1) Toxicity information;
- (2) Permissible exposure limits;
- (3) Physical data;
- (4) Reactivity data:
- (5) Corrosivity data;
- (6) Thermal and chemical stability data; and
- (7) Hazardous effects of inadvertent mixing of different materials that could foreseeably occur.

Note to paragraph (b): Material Safety Data Sheets meeting the requirements of 29 *CFR* 1910.1200(g) may be used to comply with this requirement to the extent they contain the information required by this subparagraph.

(c) Information pertaining to the technology of the process.
- (1) Information concerning the technology of the process shall include at least the following:
  - (i) A block flow diagram or simplified process flow diagram;
  - (ii) Process chemistry;
  - (iii) Maximum intended inventory;
  - (iv) Safe upper and lower limits for such items as temperatures, pressures, flows or compositions; and,
  - (v) An evaluation of the consequences of deviations.
- (2) Where the original technical information no longer exists, such information may be developed in conjunction with the process hazard analysis in sufficient detail to support the analysis.

(d) Information pertaining to the equipment in the process.
- (1) Information pertaining to the equipment in the process shall include:
  - (i) Materials of construction;
  - (ii) Piping and instrument diagrams (P&IDs);
  - (iii) Electrical classification;
  - (iv) Relief system design and design basis;
  - (v) Ventilation system design;
  - (vi) Design codes and standards employed;
  - (vii) Material and energy balances for processes built after June 21, 1999; and
  - (viii) Safety systems (e.g. interlocks, detection or suppression systems).
- (2) The owner or operator shall document that equipment complies with recognized and generally accepted good engineering practices.
- (3) For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the owner or operator shall determine and document that the equipment is designed, maintained, inspected, tested, and operating in a safe manner.

Subpart D—Program 3 Prevention Program (cont'd)

§68.67 Process hazard analysis.

(a) The owner or operator shall perform an initial process hazard analysis (hazard evaluation) on processes covered by this part. The process hazard analysis shall be appropriate to the complexity of the process and shall identify, evaluate, and control the hazards involved in the process. The owner or operator shall determine and document the priority order for conducting process hazard analyses based on a rationale which includes such considerations as extent of the process hazards, number of potentially affected employees, age of the process, and operating history of the process. The process hazard analysis shall be conducted as soon as possible, but not later than June 21, 1999. Process hazards analyses completed to comply with 29 *CFR* 1910.119(e) are acceptable as initial process hazards analyses. These process hazard analyses shall be updated and revalidated, based on their completion date.

(b) The owner or operator shall use one or more of the following methodologies that are appropriate to determine and evaluate the hazards of the process being analyzed.
  (1) What-If;
  (2) Checklist;
  (3) What-If/Checklist;
  (4) Hazard and Operability Study (HAZOP);
  (5) Failure Mode and Effects Analysis (FMEA);
  (6) Fault Tree Analysis; or
  (7) An appropriate equivalent methodology.

(c) The process hazard analysis shall address:
  (1) The hazards of the process;
  (2) The identification of any previous incident which had a likely potential for catastrophic consequences.
  (3) Engineering and administrative controls applicable to the hazards and their interrelationships such as appropriate application of detection methodologies to provide early warning of releases. (Acceptable detection methods might include process monitoring and control instrumentation with alarms, and detection hardware such as hydrocarbon sensors.);
  (4) Consequences of failure of engineering and administrative controls;
  (5) Stationary source siting;
  (6) Human factors; and
  (7) A qualitative evaluation of a range of the possible safety and health effects of failure of controls.

(d) The process hazard analysis shall be performed by a team with expertise in engineering and process operations, and the team shall include at least one employee who has experience and knowledge specific to the process being evaluated. Also, one member of the team must be knowledgeable in the specific process hazard analysis methodology being used.

(e) The owner or operator shall establish a system to promptly address the team's findings and recommendations; assure that the recommendations are resolved in a timely manner and that the resolution is documented; document what actions are to be taken; complete actions as soon as possible; develop a written schedule of when these actions are to be completed; communicate the actions to operating, maintenance and other employees whose work assignments are in the process and who may be affected by the recommendations or actions.

(f) At least every five (5) years after the completion of the initial process hazard analysis, the process hazard analysis shall be updated and revalidated by a team meeting the requirements in paragraph (d) of this section, to assure that the process hazard analysis is consistent with the current process. Updated and revalidated process hazard analyses completed to comply with 29 *CFR* 1910.119(e) are acceptable to meet the requirements of this paragraph.

(g) The owner or operator shall retain process hazards analyses and updates or revalidations for each process covered by this section, as well as the documented resolution of recommendations described in paragraph (e) of this section for the life of the process.

Subpart D—Program 3 Prevention Program (cont'd)

§68.69 Operating procedures.

(a) The owner or operator shall develop and implement written operating procedures that provide clear instructions for safely conducting activities involved in each covered process consistent with the process safety information and shall address at least the following elements.
  (1) Steps for each operating phase:
    (i) Initial startup;
    (ii) Normal operations;
    (iii) Temporary operations;
    (iv) Emergency shutdown including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner.
    (v) Emergency operations;
    (vi) Normal shutdown; and,
    (vii) Startup following a turnaround, or after an emergency shutdown.
  (2) Operating limits:
    (i) Consequences of deviation; and
    (ii) Steps required to correct or avoid deviation.
  (3) Safety and health considerations:
    (i) Properties of, and hazards presented by, the chemicals used in the process;
    (ii) Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment;
    (iii) Control measures to be taken if physical contact or airborne exposure occurs;
    (iv) Quality control for raw materials and control of hazardous chemical inventory levels; and,
    (v) Any special or unique hazards.
  (4) Safety systems and their functions.

(b) Operating procedures shall be readily accessible to employees who work in or maintain a process.

(c) The operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to stationary sources. The owner or operator shall certify annually that these operating procedures are current and accurate.

(d) The owner or operator shall develop and implement safe work practices to provide for the control of hazards during operations such as lockout/tagout; confined space entry; opening process equipment or piping; and control over entrance into a stationary source by maintenance, contractor, laboratory, or other support personnel. These safe work practices shall apply to employees and contractor employees.

§68.71 Training.

(a) Initial training.
  (1) Each employee presently involved in operating a process, and each employee before being involved in operating a newly assigned process, shall be trained in an overview of the process and in the operating procedures as specified in §68.69. The training shall include emphasis on the specific safety and health hazards, emergency operations including shutdown, and safe work practices applicable to the employee's job tasks.
  (2) In lieu of initial training for those employees already involved in operating a process on June 21, 1999 an owner or operator may certify in writing that the employee has the required knowledge, skills, and abilities to safely carry out the duties and responsibilities as specified in the operating procedures.

(b) Refresher training. Refresher training shall be provided at least every three years, and more often if necessary, to each employee involved in operating a process to assure that the employee understands and adheres to the current operating procedures of the process. The owner or operator, in consultation with the employees involved in operating the process, shall determine the appropriate frequency of refresher training.

Subpart D—Program 3 Prevention Program (cont'd)

(c) Training documentation. The owner or operator shall ascertain that each employee involved in operating a process has received and understood the training required by this paragraph. The owner or operator shall prepare a record which contains the identity of the employee, the date of training, and the means used to verify that the employee understood the training.

§68.73 Mechanical integrity.

(a) Application. Paragraphs (b) through (f) of this section apply to the following process equipment:
  (1) Pressure vessels and storage tanks;
  (2) Piping systems (including piping components such as valves);
  (3) Relief and vent systems and devices;
  (4) Emergency shutdown systems;
  (5) Controls (including monitoring devices and sensors, alarms, and interlocks) and,
  (6) Pumps.

(b) Written procedures. The owner or operator shall establish and implement written procedures to maintain the on-going integrity of process equipment.

(c) Training for process maintenance activities. The owner or operator shall train each employee involved in maintaining the on-going integrity of process equipment in an overview of that process and its hazards and in the procedures applicable to the employee's job tasks to assure that the employee can perform the job tasks in a safe manner.

(d) Inspection and testing.
  (1) Inspections and tests shall be performed on process equipment.
  (2) Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.
  (3) The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations and good engineering practices, and more frequently if determined to be necessary by prior operating experience.
  (4) The owner or operator shall document each inspection and test that has been performed on process equipment. The documentation shall identify the date of the inspection or test, the name of the person who performed the inspection or test, the serial number or other identifier of the equipment on which the inspection or test was performed, a description of the inspection or test performed, and the results of the inspection or test.

(e) Equipment deficiencies. The owner or operator shall correct deficiencies in equipment that are outside acceptable limits (defined by the process safety information in §68.65) before further use or in a safe and timely manner when necessary means are taken to assure safe operation.

(f) Quality assurance.
  (1) In the construction of new plants and equipment, the owner or operator shall assure that equipment as it is fabricated is suitable for the process application for which they will be used.
  (2) Appropriate checks and inspections shall be performed to assure that equipment is installed properly and consistent with design specifications and the manufacturer's instructions.
  (3) The owner or operator shall assure that maintenance materials, spare parts and equipment are suitable for the process application for which they will be used.

§68.75 Management of change.

(a) The owner or operator shall establish and implement written procedures to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures; and, changes to stationary sources that affect a covered process.

(b) The procedures shall assure that the following considerations are addressed prior to any change:
  (1) The technical basis for the proposed change;
  (2) Impact of change on safety and health;
  (3) Modifications to operating procedures;

Subpart D—Program 3 Prevention Program (cont'd)

(4) Necessary time period for the change; and,
(5) Authorization requirements for the proposed change.

(c) Employees involved in operating a process and maintenance and contract employees whose job tasks will be affected by a change in the process shall be informed of, and trained in, the change prior to start-up of the process or affected part of the process.

(d) If a change covered by this paragraph results in a change in the process safety information required by §68.65 of this part, such information shall be updated accordingly.

(e) If a change covered by this paragraph results in a change in the operating procedures or practices required by §68.69, such procedures or practices shall be updated accordingly.

§68.77 Pre-startup review.

(a) The owner or operator shall perform a pre-startup safety review for new stationary sources and for modified stationary sources when the modification is significant enough to require a change in the process safety information.

(b) The pre-startup safety review shall confirm that prior to the introduction of regulated substances to a process:
(1) Construction and equipment is in accordance with design specifications;
(2) Safety, operating, maintenance, and emergency procedures are in place and are adequate;
(3) For new stationary sources, a process hazard analysis has been performed and recommendations have been resolved or implemented before startup; and modified stationary sources meet the requirements contained in management of change, §68.75.
(4) Training of each employee involved in operating a process has been completed.

§68.79 Compliance audits.

(a) The owner or operator shall certify that they have evaluated compliance with the provisions of this ~~section~~ ***subpart*** at least every three years to verify that ~~the~~ procedures and practices developed under the ~~standard~~ ***subpart*** are adequate and are being followed.

(b) The compliance audit shall be conducted by at least one person knowledgeable in the process.

(c) A report of the findings of the audit shall be developed.

(d) The owner or operator shall promptly determine and document an appropriate response to each of the findings of the compliance audit, and document that deficiencies have been corrected.

(e) The owner or operator shall retain the two (2) most recent compliance audit reports.

§68.81 Incident investigation.

(a) The owner or operator shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release of a regulated substance.

(b) An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.

(c) An incident investigation team shall be established and consist of at least one person knowledgeable in the process involved, including a contract employee if the incident involved work of the contractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident.

(d) A report shall be prepared at the conclusion of the investigation which includes at a minimum:
(1) Date of incident;
(2) Date investigation began;
(3) A description of the incident;
(4) The factors that contributed to the incident; and,
(5) Any recommendations resulting from the investigation.

(e) The owner or operator shall establish a system to promptly address and resolve the incident report findings and recommendations. Resolutions and corrective actions shall be documented.

(f) The report shall be reviewed with all affected personnel whose job tasks are relevant to the incident findings including contract employees where applicable.

(g) Incident investigation reports shall be retained for five years.

Subpart D—Program 3 Prevention Program (cont'd)

§68.83 Employee participation.

(a) The owner or operator shall develop a written plan of action regarding the implementation of the employee participation required by this section.

(b) The owner or operator shall consult with employees and their representatives on the conduct and development of process hazards analyses and on the development of the other elements of process safety management in this rule.

(c) The owner or operator shall provide to employees and their representatives access to process hazard analyses and to all other information required to be developed under this rule.

§68.85 Hot work permit.

(a) The owner or operator shall issue a hot work permit for hot work operations conducted on or near a covered process.

(b) The permit shall document that the fire prevention and protection requirements in 29 *CFR* 1910.252(a) have been implemented prior to beginning the hot work operations; it shall indicate the date(s) authorized for hot work; and identify the object on which hot work is to be performed. The permit shall be kept on file until completion of the hot work operations.

§68.87 Contractors.

(a) Application. This section applies to contractors performing maintenance or repair, turnaround, major renovation, or specialty work on or adjacent to a covered process. It does not apply to contractors providing incidental services which do not influence process safety, such as janitorial work, food and drink services, laundry, delivery or other supply services.

(b) Owner or operator responsibilities.

(1) The owner or operator, when selecting a contractor, shall obtain and evaluate information regarding the contract owner or operator's safety performance and programs.

(2) The owner or operator shall inform contract owner or operator of the known potential fire, explosion, or toxic release hazards related to the contractor's work and the process.

(3) The owner or operator shall explain to the contract owner or operator the applicable provisions of subpart E of this part.

(4) The owner or operator shall develop and implement safe work practices consistent with §68.69(d), to control the entrance, presence, and exit of the contract owner or operator and contract employees in covered process areas.

(5) The owner or operator shall periodically evaluate the performance of the contract owner or operator in fulfilling their obligations as specified in paragraph (c) of this section.

(c) Contract owner or operator responsibilities.

(1) The contract owner or operator shall assure that each contract employee is trained in the work practices necessary to safely perform his/her job.

(2) The contract owner or operator shall assure that each contract employee is instructed in the known potential fire, explosion, or toxic release hazards related to his/her job and the process, and the applicable provisions of the emergency action plan.

(3) The contract owner or operator shall document that each contract employee has received and understood the training required by this section. The contract owner or operator shall prepare a record which contains the identity of the contract employee, the date of training, and the means used to verify that the employee understood the training.

(4) The contract owner or operator shall assure that each contract employee follows the safety rules of the stationary source including the safe work practices required by §68.69(d).

(5) The contract owner or operator shall advise the owner or operator of any unique hazards presented by the contract owner or operator's work, or of any hazards found by the contract owner or operator's work.

Subpart E—Emergency Response

§68.90 Applicability.

(a) Except as provided in paragraph (b) of this section, the owner or operator of a stationary source with Program 2 and Program 3 processes shall comply with the requirements of §68.95.

(b) The owner or operator of stationary source whose employees will not respond to accidental releases of regulated substances need not comply with §68.95 of this part provided that they meet the following:

(1) For stationary sources with any regulated toxic substance held in a process above the threshold quantity, the stationary source is included in the community emergency response plan developed under 42 U.S.C. 11003;

(2) For stationary sources with only regulated flammable substances held in a process above the threshold quantity, the owner or operator has coordinated response actions with the local fire department; and

(3) Appropriate mechanisms are in place to notify emergency responders when there is a need for a response.

§68.95 Emergency response program.

(a) The owner or operator shall develop and implement an emergency response program for the purpose of protecting public health and the environment. Such program shall include the following elements:

(1) An emergency response plan, which shall be maintained at the stationary source and contain at least the following elements:

(i) Procedures for informing the public and local emergency response agencies about accidental releases;

(ii) Documentation of proper first-aid and emergency medical treatment necessary to treat accidental human exposures; and

(iii) Procedures and measures for emergency response after an accidental release of a regulated substance;

(2) Procedures for the use of emergency response equipment and for its inspection, testing, and maintenance;

(3) Training for all employees in relevant procedures; and

(4) Procedures to review and update, as appropriate, the emergency response plan to reflect changes at the stationary source and ensure that employees are informed of changes.

(b) A written plan that complies with other Federal contingency plan regulations or is consistent with the approach in the National Response Team's Integrated Contingency Plan Guidance ("One Plan") and that, among other matters, includes the elements provided in paragraph (a) of this section, shall satisfy the requirements of this section if the owner or operator also complies with paragraph (c) of this section.

(c) The emergency response plan developed under paragraph (a)(1) of this section shall be coordinated with the community emergency response plan developed under 42 U.S.C. 11003. Upon request of the local emergency planning committee or emergency response officials, the owner or operator shall promptly provide to the local emergency response officials information necessary for developing and implementing the community emergency response plan.

Subpart F—Regulated Substances for Accidental Release Prevention

§68.100 Purpose.

This subpart designates substances to be listed under section 112(r)(3), (4), and (5) of the Clean Air Act, as amended, identifies their threshold quantities, and establishes the requirements for petitioning to add or delete substances from the list.

§68.115 Threshold determination.

(a) A threshold quantity of a regulated substance listed in §68.130 is present at a stationary source if the total quantity of the regulated substance contained in a process exceeds the threshold.

(b) For the purposes of determining whether more than a threshold quantity of a regulated substance is present at the stationary source, the following exemptions apply:

(1) *Concentrations of a regulated toxic substance in a mixture.* If a regulated substance is present in a mixture and the concentration of the substance is below one percent by weight of the mixture, the amount of the substance in the mixture need not be considered when determining whether more than a threshold quantity is present at the stationary source. Except for oleum, toluene 2,4-diisocyanate, toluene 2,6-diisocyanate, and toluene diisocyanate (unspecified isomer), if the concentration of the regulated substance in the mixture is one percent or greater by weight, but the owner or operator can demonstrate that the partial pressure of the regulated substance in the mixture (solution) under handling or storage conditions in any portion of the process is less than 10 millimeters of mercury (mm Hg), the amount of the substance in the mixture in that portion of the process need not be considered when determining whether more than a threshold quantity is present at the stationary source. The owner or operator shall document this partial pressure measurement or estimate.

(2) *Concentrations of a regulated flammable substance in a mixture.*

(i) *General provision.* If a regulated substance is present in a mixture and the concentration of the substance is below one percent by weight of the mixture, the mixture need not be considered when determining whether more than a threshold quantity of the regulated substance is present at the stationary source. Except as provided in paragraph (b)(2)(ii) and (iii) of this section, if the concentration of the substance is one percent or greater by weight of the mixture, then, for purposes of determining whether a threshold quantity is present at the stationary source, the entire weight of the mixture shall be treated as the regulated substance unless the owner or operator can demonstrate that the mixture itself does not have a National Fire Protection Association flammability hazard rating of 4. The demonstration shall be in accordance with the definition of flammability hazard rating 4 in the NFPA 704, Standard System for the Identification of the Hazards of Materials for Emergency Response, National Fire Protection Association, Quincy, MA, 1996. Available from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-9101. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 *CFR* part 51. Copies may be inspected at the Environmental Protection Agency Air Docket (6102), Attn: Docket No. A-96-08, Waterside Mall, 401 M St. SW, Washington D.C.; or at the Office of Federal Register at 800 North Capitol St., NW Suite 700, Washington, D.C. Boiling point and flash points shall be defined and determined in accordance with NFPA 30, Flammable and Combustible Liquids Code, National Fire Protection Association, Quincy, MA, 1996. Available from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-9101. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 *CFR* part 51. Copies may be inspected at the Environmental Protection Agency Air Docket (6102), Attn: Docket No. A-96-08, Waterside Mall, 401 M St. SW, Washington D.C.; or at the Office of Federal Register at 800 North Capitol St., NW Suite 700, Washington, D.C. The owner or operator shall document the National Fire Protection Association flammability hazard rating.

Subpart F—Regulated Substances for Accidental Release Prevention (cont'd)

(ii) *Gasoline.* Regulated substances in gasoline, when in distribution or related storage for use as fuel for internal combustion engines, need not be considered when determining whether more than a threshold quantity is present at a stationary source.

(iii) *Naturally occurring hydrocarbon mixtures.* Prior to entry into a natural gas processing plant or a petroleum refining process unit, regulated substances in naturally occurring hydrocarbon mixtures need not be considered when determining whether more than a threshold quantity is present at a stationary source. Naturally occurring hydrocarbon mixtures include any combination of the following: condensate, crude oil, field gas, and produced water, each as defined in §68.3 of this part.

(3) *Articles.* Regulated substances contained in articles need not be considered when determining whether more than a threshold quantity is present at the stationary source.

(4) *Uses.* Regulated substances, when in use for the following purposes, need not be included in determining whether more than a threshold quantity is present at the stationary source:

(i) Use as a structural component of the stationary source;

(ii) Use of products for routine janitorial maintenance;

(iii) Use by employees of foods, drugs, cosmetics, or other personal items containing the regulated substance; and

(iv) Use of regulated substances present in process water or non-contact cooling water as drawn from the environment or municipal sources, or use of regulated substances present in air used either as compressed air or as part of combustion.

(5) *Activities in Laboratories.* If a regulated substance is manufactured, processed, or used in a laboratory at a stationary source under the supervision of a technically qualified individual as defined in §720.3(ee) of this chapter, the quantity of the substance need not be considered in determining whether a threshold quantity is present. This exemption does not apply to:

(i) Specialty chemical production;

(ii) Manufacture, processing, or use of substances in pilot plant scale operations; and

(iii) Activities conducted outside the laboratory.

§68.120 Petition process.

(a) Any person may petition the Administrator to modify, by addition or deletion, the list of regulated substances identified in §68.130. Based on the information presented by the petitioner, the Administrator may grant or deny a petition.

(b) A substance may be added to the list if, in the case of an accidental release, it is known to cause or may be reasonably anticipated to cause death, injury, or serious adverse effects to human health or the environment.

(c) A substance may be deleted from the list if adequate data on the health and environmental effects of the substance are available to determine that the substance, in the case of an accidental release, is not known to cause and may not be reasonably anticipated to cause death, injury, or serious adverse effects to human health or the environment.

(d) No substance for which a national primary ambient air quality standard has been established shall be added to the list. No substance regulated under Title VI of the Clean Air Act, as amended, shall be added to the list.

(e) The burden of proof is on the petitioner to demonstrate that the criteria for addition and deletion are met. A petition will be denied if this demonstration is not made.

(f) The Administrator will not accept additional petitions on the same substance following publication of a final notice of the decision to grant or deny a petition, unless new data becomes available that could significantly affect the basis for the decision.

(g) Petitions to modify the list of regulated substances must contain the following:

(1) Name and address of the petitioner and a brief description of the organization(s) that the petitioner represents, if applicable;

(2) Name, address, and telephone number of a contact person for the petition;

(3) Common chemical name(s), common synonym(s), Chemical Abstracts Service number, and chemical formula and structure;

Subpart F—Regulated Substances for Accidental Release Prevention (cont'd)

(4) Action requested (add or delete a substance);
(5) Rationale supporting the petitioner's position; that is, how the substance meets the criteria for addition and deletion. A short summary of the rationale must be submitted along with a more detailed narrative; and
(6) Supporting data; that is, the petition must include sufficient information to scientifically support the request to modify the list. Such information shall include:
  (i) A list of all support documents;
  (ii) Documentation of literature searches conducted, including, but not limited to, identification of the database(s) searched, the search strategy, dates covered, and printed results;
  (iii) Effects data (animal, human, and environmental test data) indicating the potential for death, injury, or serious adverse human and environmental impacts from acute exposure following an accidental release; printed copies of the data sources, in English, should be provided; and
  (iv) Exposure data or previous accident history data, indicating the potential for serious adverse human health or environmental effects from an accidental release. These data may include, but are not limited to, physical and chemical properties of the substance, such as vapor pressure; modeling results, including data and assumptions used and model documentation; and historical accident data, citing data sources.

(h) Within 18 months of receipt of a petition, the Administrator shall publish in the Federal Register a notice either denying the petition or granting the petition and proposing a listing.

§68.125 Exemptions.

Agricultural nutrients. Ammonia used as an agricultural nutrient, when held by farmers, is exempt from all provisions of this part.

§68.130 List of substances.

(a) Regulated toxic and flammable substances under section 112(r) of the Clean Air Act are the substances listed in Tables 1, 2, 3, and 4. Threshold quantities for listed toxic and flammable substances are specified in the tables.
(b) The basis for placing toxic and flammable substances on the list of regulated substances are explained in the notes to the list.

Subpart G—Risk Management Plan

68.150 Submission.
68.151 Assertion of claims of confidential business information.
68.152 Substantiating claims of confidential business information.
68.155 Executive summary.
68.160 Registration.
68.165 Offsite consequence analysis.
68.168 Five-year accident history.
68.170 Prevention program/Program 2.
68.175 Prevention program/Program 3.
68.180 Emergency response program.
68.185 Certification.
68.190 Updates.

§68.150 Submission.

(a) The owner or operator shall submit a single RMP that includes the information required by §§68.155 through 68.185 for all covered processes. The RMP shall be submitted in a method and format to a central point as specified by EPA prior to June 21, 1999.
(b) The owner or operator shall submit the first RMP no later than the latest of the following dates:
  (1) June 21, 1999;
  (2) Three years after the date on which a regulated substance is first listed under §68.130; or

Subpart G—Risk Management Plan (cont'd)

(3) The date on which a regulated substance is first present above a threshold quantity in a process.

(c) Subsequent submissions of RMPs shall be in accordance with §68.190.

(d) Notwithstanding the provisions of §§68.155 to 68.190, the RMP shall exclude classified information. Subject to appropriate procedures to protect such information from public disclosure, classified data or information excluded from the RMP may be made available in a classified annex to the RMP for review by Federal and state representatives who have received the appropriate security clearances.

(e) Procedures for asserting and determining that some of the information submitted in the RMP is entitled to protection as confidential business information are set forth in §§68.151 and 68.152 and in part 2 of this Title.

§68.151 Assertion of claims of confidential business information.

(a) Except as provided in paragraph (b), a claim of confidential business information may be made for any data elements that meet the criteria provided in 40 CFR 2.301.

(b) Notwithstanding the procedures specified in 40 CFR part 2, the following data elements shall not be claimed as confidential business information for the purposes of complying with this part:

(1) Registration data set forth in §68.160(b)(1) through (b)(6) and 68.160(b)(8) through (b)(13) and NAICS code and Program level of the process set forth in §68.160(b)(7);

(2) Offsite consequence analysis set forth in §68.165(b)(3), (b)(9), (b)(10) and (b)(11);

(3) Accident history data set forth in §68.168;

(4) Prevention program data set forth in §170(b), (d), (e)(1), (f) through (k);

(5) Prevention program data set forth in §175(b), (d), (e)(1), (f) through (p);

(6) Emergency response program data set forth in §68.180.

(c) Notwithstanding the procedures specified in 40 CFR part 2, to assert a claim that one or more data elements are entitled to protection as confidential business information, the owner or operator shall submit to EPA the following:

(1) An unsanitized (unredacted) paper copy of the RMP that clearly identifies each data element that is being claimed as confidential business information;

(2) A sanitized (redacted) copy of the RMP that shall be identical to the unsanitized copy of the RMP except that the submitter shall replace each data element, except chemical identity, claimed as confidential business information with the notation "CBI" or a blank field. For chemical identities claimed as CBI, the submitter shall substitute a generic category or class name; and

(3) At the time of submission of the RMP, a sanitized and unsanitized document substantiating each claim of confidential business information.

§68.152 Substantiating claims of confidential business information.

(a) Claims of confidential business information must be substantiated by providing documentation that demonstrates that the information meets the substantive criteria set forth in 40 CFR 2.301.

(b) The submitter may claim as confidential information submitted as part of the substantiation. To claim materials as confidential, the submitter shall clearly designate those portions of the substantiation to be claimed as confidential by marking them as confidential business information. Information not so marked will be treated as public and may be disclosed without notice to the submitter.

(c) The owner, operator, or senior official with management responsibility shall sign a certification that the signer has personally examined the information submitted and that based on inquiry of the persons who compiled the information, the information is true, accurate, and complete, and that those portions of substantiation claimed as confidential business information would, if disclosed, reveal trade secrets or other confidential business information.

§68.155 Executive summary.

The owner or operator shall provide in the RMP an executive summary that includes a brief description of the following elements:

(a) The accidental release prevention and emergency response policies at the stationary source;

(b) The stationary source and regulated substances handled;

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(c) The worst-case release scenario(s) and the alternative release scenario(s), including administrative controls and mitigation measures to limit the distances for each reported scenario;
(d) The general accidental release prevention program and chemical-specific prevention steps;
(e) The five-year accident history;
(f) The emergency response program; and
(g) Planned changes to improve safety.

§68.160 Registration.

(a) The owner or operator shall complete a single registration form and include it in the RMP. The form shall cover all regulated substances handled in covered processes.
(b) The registration shall include the following data:
  (1) Stationary source name, street, city, county, state, zip code, latitude, and longitude, ***method for obtaining latitude and longitude, and description of location that latitude and longitude represent;***
  (2) The stationary source Dun and Bradstreet number;
  (3) Name and Dun and Bradstreet number of the corporate parent company;
  (4) The name, telephone number, and mailing address of the owner or operator;
  (5) The name and title of the person or position with overall responsibility for RMP elements and implementation;
  (6) The name, title, telephone number, and 24-hour telephone number of the emergency contact;
  (7) For each covered process, the name and CAS number of each regulated substance held above the threshold quantity in the process, the maximum quantity of each regulated substance or mixture in the process (in pounds) to two significant digits, the ~~SIC~~ ***NAICS*** code ***of the process***, and the Program level of the process;
  (8) The stationary source EPA identifier;
  (9) The number of full-time employees at the stationary source;
  (10) Whether the stationary source is subject to 29 *CFR* 1910.119;
  (11) Whether the stationary source is subject to 40 *CFR* part 355;
  (12) ~~Whether~~ ***If*** the stationary source has a CAA Title V operating permit, ***the permit number***; and
  (13) The date of the last safety inspection of the stationary source by a Federal, state, or local government agency and the identity of the inspecting entity.

§68.165 Offsite consequence analysis.

(a) The owner or operator shall submit in the RMP information:
  (1) One worst-case release scenario for each Program 1 process; and
  (2) For Program 2 and 3 processes, one worst-case release scenario to represent all regulated toxic substances held above the threshold quantity and one worst-case release scenario to represent all regulated flammable substances held above the threshold quantity. If additional worst-case scenarios for toxics or flammables are required by §68.25(a)(2)(iii), the owner or operator shall submit the same information on the additional scenario(s). The owner or operator of Program 2 and 3 processes shall also submit information on one alternative release scenario for each regulated toxic substance held above the threshold quantity and one alternative release scenario to represent all regulated flammable substances held above the threshold quantity.
(b) The owner or operator shall submit the following data:
  (1) Chemical name;
  (2) Percentage weight of the chemical in a mixture (toxics only);
  (~~2~~***3***) Physical state (toxics only);
  (~~3~~***4***) Basis of results (give model name ~~if used~~);
  (~~4~~***5***) Scenario (explosion, fire, toxic gas release, or liquid spill and ***evaporation***);
  (~~5~~***6***) Quantity released in pounds;
  (~~6~~***7***) Release rate;
  (~~7~~***8***) Release duration;
  (~~8~~***9***) Wind speed and atmospheric stability class (toxics only);
  (~~9~~***10***) Topography (toxics only);

Subpart G—Risk Management Plan (cont'd)

(~~10~~*11*) Distance to endpoint;
(~~11~~*12*) Public and environmental receptors within the distance;
(~~12~~*13*) Passive mitigation considered; and
(~~13~~*14*) Active mitigation considered. ~~(alternative releases only);~~

§68.168 Five-year accident history.
The owner or operator shall submit in the RMP the information provided in §68.42(b) on each accident covered by §68.42(a).

§68.170 Prevention program/Program 2.
(a) For each Program 2 process ***for which a separate hazard review was conducted***, the owner or operator shall provide in the RMP the information indicated in paragraphs (b) through (k) of this section. ~~If the same information applies to more than one covered process, the owner or operator may provide the information only once, but shall indicate to which processes the information applies.~~
(b) The ~~SIC~~ ***NAICS*** code for the ***part of the*** process.
(c) The name(s) of the chemical(s) covered.
(d) The date of the most recent review or revision of the safety information and a list of Federal or state regulations or industry-specific design codes and standards used to demonstrate compliance with the safety information requirement.
(e) The date of completion of the most recent hazard review or update.
  (1) The expected date of completion of any changes resulting from the hazard review;
  (2) Major hazards identified;
  (3) Process controls in use;
  (4) Mitigation systems in use;
  (5) Monitoring and detection systems in use; and
  (6) Changes since the last hazard review.
(f) The date of the most recent review or revision of operating procedures.
(g) The date of the most recent review or revision of training programs;
  (1) The type of training provided—classroom, classroom plus on the job, on the job; and
  (2) The type of competency testing used.
(h) The date of the most recent review or revision of maintenance procedures and the date of the most recent equipment inspection or test and the equipment inspected or tested.
(i) The date of the most recent compliance audit and the expected date of completion of any changes resulting from the compliance audit.
(j) The date of the most recent incident investigation and the expected date of completion of any changes resulting from the investigation.
(k) The date of the most recent change that triggered a review or revision of safety information, the hazard review, operating or maintenance procedures, or training.

§68.175 Prevention program/Program 3.
(a) For each ***part of a*** Program 3 process ***for which a separate process hazard analysis was conducted***, the owner or operator shall provide ***in the RMP*** the information indicated in paragraphs (b) through (p) of this section. ~~If the same information applies to more than one covered process, the owner or operator may provide the information only once, but shall indicate to which processes the information applies.~~
(b) The ~~SIC~~ ***NAICS*** code for the ***part of the*** process.
(c) The name(s) of the substance(s) covered.
(d) The date on which the safety information was last reviewed or revised.
(e) The date of completion of the most recent PHA or update and the technique used.
  (1) The expected date of completion of any changes resulting from the PHA;
  (2) Major hazards identified;
  (3) Process controls in use;
  (4) Mitigation systems in use;
  (5) Monitoring and detection systems in use; and

Subpart G—Risk Management Plan (cont'd)

(6) Changes since the last PHA.

(f) The date of the most recent review or revision of operating procedures.

(g) The date of the most recent review or revision of training programs;

(1) The type of training provided—classroom,classroom plus on the job, on the job; and

(2) The type of competency testing used.

(h) The date of the most recent review or revision of maintenance procedures and the date of the most recent equipment inspection or test and the equipment inspected or tested.

(i) The date of the most recent change that triggered management of change procedures and the date of the most recent review or revision of management of change procedures.

(j) The date of the most recent pre-startup review.

(k) The date of the most recent compliance audit and the expected date of completion of any changes resulting from the compliance audit;

(l) The date of the most recent incident investigation and the expected date of completion of any changes resulting from the investigation;

(m) The date of the most recent review or revision of employee participation plans;

(n) The date of the most recent review or revision of hot work permit procedures;

(o) The date of the most recent review or revision of contractor safety procedures; and

(p) The date of the most recent evaluation of contractor safety performance.

§68.180 Emergency response program.

(a) The owner or operator shall provide in the RMP the following information:

(1) Do you have a written emergency response plan?

(2) Does the plan include specific actions to be taken in response to an accidental releases of a regulated substance?

(3) Does the plan include procedures for informing the public and local agencies responsible for responding to accidental releases?

(4) Does the plan include information on emergency health care?

(5) The date of the most recent review or update of the emergency response plan;

(6) The date of the most recent emergency response training for employees.

(b) The owner or operator shall provide the name and telephone number of the local agency with which ***emergency response activities or*** the ***emergency response*** plan is coordinated.

(c) The owner or operator shall list other Federal or state emergency plan requirements to which the stationary source is subject.

§68.185 Certification.

(a) For Program 1 processes, the owner or operator shall submit in the RMP the certification statement provided in §68.12(b)(4).

(b) For all other covered processes, the owner or operator shall submit in the RMP a single certification that, to the best of the signer's knowledge, information, and belief formed after reasonable inquiry, the information submitted is true, accurate, and complete.

§68.190 Updates.

(a) The owner or operator shall review and update the RMP as specified in paragraph (b) of this section and submit it in a method and format to a central point specified by EPA prior to June 21, 1999

(b) The owner or operator of a stationary source shall revise and update the RMP submitted under §68.150 as follows:

(1) Within five years of its initial submission or most recent update required by paragraphs (b)(2) through (b)(7) of this section, whichever is later.

(2) No later than three years after a newly regulated substance is first listed by EPA;

(3) No later than the date on which a new regulated substance is first present in an already covered process above a threshold quantity;

Subpart G—Risk Management Plan (cont'd)

(4) No later than the date on which a regulated substance is first present above a threshold quantity in a new process;
(5) Within six months of a change that requires a revised PHA or hazard review;
(6) Within six months of a change that requires a revised offsite consequence analysis as provided in §68.36; and
(7) Within six months of a change that alters the Program level that applied to any covered process.

(c) If a stationary source is no longer subject to this part, the owner or operator shall submit a revised registration to EPA within six months indicating that the stationary source is no longer covered.

Subpart H—Other Requirements

§68.200 Recordkeeping.

The owner or operator shall maintain records supporting the implementation of this part for five years unless otherwise provided in Subpart D of this part.

§68.210 Availability of information to the public.

(a) The RMP required under subpart G of this part shall be available to the public ***except as provided in §§68.150 through 68.152 and 40 CFR part 2.*** ~~under 42 U.S.C. 7414(c).~~
(b) The disclosure of classified information by the Department of Defense or other Federal agencies or contractors of such agencies shall be controlled by applicable laws, regulations, or executive orders concerning the release of classified information.

§68.215 Permit content and air permitting authority or designated agency requirements.

(a) These requirements apply to any stationary source subject to this part 68 and parts 70 or 71 of this Chapter. The 40 *CFR* part 70 or part 71 permit for the stationary source shall contain:
(1) A statement listing this part as an applicable requirement;
(2) Conditions that require the source owner or operator to submit:
(i) A compliance schedule for meeting the requirements of this part by the date provided in Sec. 68.10(a) or;
(ii) As part of the compliance certification submitted under 40 *CFR* 70.6(c)(5), a certification statement that the source is in compliance with all requirements of this part, including the registration and submission of the RMP.
(b) The owner or operator shall submit any additional relevant information requested by the air permitting authority or designated agency.
(c) For 40 *CFR* part 70 or part 71 permits issued prior to the deadline for registering and submitting the RMP and which do not contain permit conditions described in paragraph (a) of this section, the owner or operator or air permitting authority shall initiate permit revision or reopening according to the procedures of 40 *CFR* 70.7 or 71.7 to incorporate the terms and conditions consistent with paragraph (a) of this section.
(d) The state may delegate the authority to implement and enforce the requirements of paragraph (e) of this section to a state or local agency or agencies other than the air permitting authority. An up-to-date copy of any delegation instrument shall be maintained by the air permitting authority. The state may enter a written agreement with the Administrator under which EPA will implement and enforce the requirements of paragraph (e) of this section.
(e) The air permitting authority or the agency designated by delegation or agreement under paragraph (d) of this section shall, at a minimum:
(1) Verify that the source owner or operator has registered and submitted an RMP or a revised plan when required by this part;

Subpart H—Other Requirements (cont'd)

(2) Verify that the source owner or operator has submitted a source certification or in its absence has submitted a compliance schedule consistent with paragraph (a)(2) of this section;
(3) For some or all of the sources subject to this section, use one or more mechanisms such as, but not limited to, a completeness check, source audits, record reviews, or facility inspections to ensure that permitted sources are in compliance with the requirements of this part; and
(4) Initiate enforcement action based on paragraphs (e)(1) and (e)(2) of this section as appropriate.

§68.220 Audits.

(a) In addition to inspections for the purpose of regulatory development and enforcement of the Act, the implementing agency shall periodically audit RMPs submitted under subpart G of this part to review the adequacy of such RMPs and require revisions of RMPs when necessary to ensure compliance with subpart G of this part.
(b) The implementing agency shall select stationary sources for audits based on any of the following criteria:
(1) Accident history of the stationary source;
(2) Accident history of other stationary sources in the same industry;
(3) Quantity of regulated substances present at the stationary source;
(4) Location of the stationary source and its proximity to the public and environmental receptors;
(5) The presence of specific regulated substances;
(6) The hazards identified in the RMP; and
(7) A plan providing for neutral, random oversight.
(c) Exemption from audits. A stationary source with a Star or Merit ranking under OSHA's voluntary protection program shall be exempt from audits under paragraph (b)(2) and (b)(7) of this section.
(d) The implementing agency shall have access to the stationary source, supporting documentation, and any area where an accidental release could occur.
(e) Based on the audit, the implementing agency may issue the owner or operator of a stationary source a written preliminary determination of necessary revisions to the stationary source's RMP to ensure that the RMP meets the criteria of subpart G of this part. The preliminary determination shall include an explanation for the basis for the revisions, reflecting industry standards and guidelines (such as AIChE/ CCPS guidelines and ASME and API standards) to the extent that such standards and guidelines are applicable, and shall include a timetable for their implementation.
(f) Written response to a preliminary determination.
(1) The owner or operator shall respond in writing to a preliminary determination made in accordance with paragraph (e) of this section. The response shall state the owner or operator will implement the revisions contained in the preliminary determination in accordance with the timetable included in the preliminary determination or shall state that the owner or operator rejects the revisions in whole or in part. For each rejected revision, the owner or operator shall explain the basis for rejecting such revision. Such explanation may include substitute revisions.
(2) The written response under paragraph (f)(1) of this section shall be received by the implementing agency within 90 days of the issue of the preliminary determination or a shorter period of time as the implementing agency specifies in the preliminary determination as necessary to protect public health and the environment. Prior to the written response being due and upon written request from the owner or operator, the implementing agency may provide in writing additional time for the response to be received.
(g) After providing the owner or operator an opportunity to respond under paragraph (f) of this section, the implementing agency may issue the owner or operator a written final determination of necessary revisions to the stationary source's RMP. The final determination may adopt or modify the revisions contained in the preliminary determination under paragraph (e) of this section or may adopt or modify the substitute revisions provided in the response under paragraph (f) of this section. A final determination that adopts a revision rejected by the owner or operator shall include an explanation of the basis for the revision. A final determination that fails to adopt a substitute revision provided under paragraph (f) of this section shall include an explanation of the basis for finding such substitute revision unreasonable.

Subpart H—Other Requirements (cont'd)

(h) Thirty days after completion of the actions detailed in the implementation schedule set in the final determination under paragraph (g) of this section, the owner or operator shall be in violation of subpart G of this part and this section unless the owner or operator revises the RMP prepared under subpart G of this part as required by the final determination, and submits the revised RMP as required under §68.150.

(i) The public shall have access to the preliminary determinations, responses, and final determinations under this section in a manner consistent with §68.210.

(j) Nothing in this section shall preclude, limit, or interfere in any way with the authority of EPA or the state to exercise its enforcement, investigatory, and information gathering authorities concerning this part under the Act.

APPENDIX A
TABLE OF TOXIC ENDPOINTS
(as defined in §68.22 of this part)

CAS No.	Chemical Name	Toxic Endpoint (mg/L)
107-02-8	Acrolein [2-Propenal]	0.0011
107-13-1	Acrylonitrile [2-Propenenitrile]	0.076
814-68-6	Acrylyl chloride [2-Propenoyl chloride]	0.00090
107-18-6	Allyl alcohol [2-Propen-1-ol]	0.036
107-11-9	Allylamine [2-Propen-1-amine]	0.0032
7664-41-7	Ammonia (anhydrous)	0.14
7664-41-7	Ammonia (conc 20% or greater)	0.14
7784-34-1	Arsenous trichloride	0.010
7784-42-1	Arsine	0.0019
10294-34-5	Boron trichloride [Borane, trichloro-]	0.010
7637-07-2	Boron trifluoride [Borane, trifluoro-]	0.028
353-42-4	Boron trifluoride compound with methyl ether (1:1) [Boron, trifluoro[oxybis[methane]]-, T-4	0.023
7726-95-6	Bromine	0.0065
75-15-0	Carbon disulfide	0.16
7782-50-5	Chlorine	0.0087
10049-04-4	Chlorine dioxide [Chlorine oxide (ClO2)]	0.0028
67-66-3	Chloroform [Methane, trichloro-]	0.49
542-88-1	Chloromethyl ether [Methane, oxybis[chloro-]	0.00025
107-30-2	Chloromethyl methyl ether [Methane, chloromethoxy-]	0.0018
4170-30-3	Crotonaldehyde [2-Butenal]	0.029
123-73-9	Crotonaldehyde, (E)- [2-Butenal, (E)-]	0.029
506-77-4	Cyanogen chloride	0.030
108-91-8	Cyclohexylamine [Cyclohexanamine]	0.16
19287-45-7	Diborane	0.0011
75-78-5	Dimethyldichlorosilane [Silane, dichlorodimethyl-]	0.026
57-14-7	1,1-Dimethylhydrazine [Hydrazine, 1,1-dimethyl-]	0.012
106-89-8	Epichlorohydrin [Oxirane, (chloromethyl)-]	0.076
107-15-3	Ethylenediamine [1,2-Ethanediamine]	0.49
151-56-4	Ethyleneimine [Aziridine]	0.018

APPENDIX A (cont'd)

CAS No.	Chemical Name	Toxic Endpoint (mg/L)
75-21-8	Ethylene oxide [Oxirane]	0.090
7782-41-4	Fluorine	0.0039
50-00-0	Formaldehyde (solution)	0.012
110-00-9	Furan	0.0012
302-01-2	Hydrazine	0.011
7647-01-0	Hydrochloric acid (conc 37% or greater)	0.030
74-90-8	Hydrocyanic acid	0.011
7647-01-0	Hydrogen chloride (anhydrous) [Hydrochloric acid]	0.030
7664-39-3	Hydrogen fluoride/Hydrofluoric acid (conc 50% or greater) [Hydrofluoric acid]	0.016
7783-07-5	Hydrogen selenide	0.00066
7783-06-4	Hydrogen sulfide	0.042
13463-40-6	Iron, pentacarbonyl- [Iron carbonyl (Fe(CO)5), (TB-5-11)-]	0.00044
78-82-0	Isobutyronitrile [Propanenitrile, 2-methyl-]	0.14
108-23-6	Isopropyl chloroformate [Carbonochloridic acid, 1-methylethyl ester]	0.10
126-98-7	Methacrylonitrile [2-Propenenitrile, 2-methyl-]	0.0027
74-87-3	Methyl chloride [Methane, chloro-]	0.82
79-22-1	Methyl chloroformate [Carbonochloridic acid, methylester]	0.0019
60-34-4	Methyl hydrazine [Hydrazine, methyl-]	0.0094
624-83-9	Methyl isocyanate [Methane, isocyanato-]	0.0012
74-93-1	Methyl mercaptan [Methanethiol]	0.049
556-64-9	Methyl thiocyanate [Thiocyanic acid, methyl ester]	0.085
75-79-6	Methyltrichlorosilane [Silane, trichloromethyl-]	0.018
13463-39-3	Nickel carbonyl	0.00067
7697-37-2	Nitric acid (conc 80% or greater)	0.026
10102-43-9	Nitric oxide [Nitrogen oxide (NO)]	0.031
8014-95-7	Oleum (Fuming Sulfuric acid) [Sulfuric acid, mixture with sulfur trioxide]	0.010
79-21-0	Peracetic acid [Ethaneperoxoic acid]	0.0045
594-42-3	Perchloromethylmercaptan [Methanesulfenyl chloride, trichloro-]	0.0076
75-44-5	Phosgene [Carbonic dichloride]	0.00081
7803-51-2	Phosphine	0.0035
10025-87-3	Phosphorus oxychloride [Phosphoryl chloride]	0.0030

APPENDIX A (cont'd)

CAS No.	Chemical Name	Toxic Endpoint (mg/L)
7719-12-2	Phosphorus trichloride [Phosphorous trichloride]	0.028
110-89-4	Piperidine	0.022
107-12-0	Propionitrile [Propanenitrile]	0.0037
109-61-5	Propyl chloroformate [Carbonochloridic acid, propylester]	0.010
75-55-8	Propyleneimine [Aziridine, 2-methyl-]	0.12
75-56-9	Propylene oxide [Oxirane, methyl-]	0.59
7446-09-5	Sulfur dioxide (anhydrous)	0.0078
7783-60-0	Sulfur tetrafluoride [Sulfur fluoride (SF4), (T-4)-]	0.0092
7446-11-9	Sulfur trioxide	0.010
75-74-1	Tetramethyllead [Plumbane, tetramethyl-]	0.0040
509-14-8	Tetranitromethane [Methane, tetranitro-]	0.0040
7550-45-0	Titanium tetrachloride [Titanium chloride (TiCl4) (T-4)-]	0.020
584-84-9	Toluene 2,4-diisocyanate [Benzene, 2,4-diisocyanato-1-methyl-]	0.0070
91-08-7	Toluene 2,6-diisocyanate [Benzene, 1,3-diisocyanato-2-methyl-]	0.0070
26471-62-5	Toluene diisocyanate (unspecified isomer) [Benzene, 1,3-diisocyanatomethyl-]	0.0070
75-77-4	Trimethylchlorosilane [Silane, chlorotrimethyl-]	0.050
108-05-4	Vinyl acetate monomer [Acetic acid ethenyl ester]	0.26

TABLE 1 TO §68.130 – LIST OF REGULATED TOXIC SUBSTANCES AND THRESHOLD QUANTITIES FOR ACCIDENTAL RELEASE PREVENTION [ALPHABETICAL ORDER – 77 SUBSTANCES]

Chemical Name	CAS No	Threshold Quantity (lbs)	Basis for Listing
Acrolein [2-Propenal]	107-02-8	5,000	b
Acrylonitrile [2-Propenenitrile]	107-13-1	20,000	b
Acrylyl chloride [2-Propenoyl chloride]	814-68-6	5,000	b
Allyl alcohol [2-Propen-1-ol]	107-18-6	15,000	b
Allylamine [2-Propen-1-amine]	107-11-9	10,000	b
Ammonia (anhydrous)	7664-41-7	10,000	a, b
Ammonia (conc 20% or greater)	7664-41-7	20,000	a, b
Arsenous trichloride	7784-34-1	15,000	b
Arsine	7784-42-1	1,000	b
Boron trichloride [Borane, trichloro-]	10294-34-5	5,000	b
Boron trifluoride [Borane, trifluoro-]	7637-07-2	5,000	b
Boron trifluoride compound with methyl ether (1:1) [Boron, trifluoro[oxybis[metane]]-, T-4-	353-42-4	15,000	b
Bromine	7726-95-6	10,000	a, b
Carbon disulfide	75-15-0	20,000	b
Chlorine	7782-50-5	2,500	a, b
Chlorine dioxide [Chlorine oxide (ClO2)]	10049-04-4	1,000	c
Chloroform [Methane, trichloro-]	67-66-3	20,000	b
Chloromethyl ether [Methane, oxybis[chloro-]	542-88-1	1,000	b
Chloromethyl methyl ether [Methane, chloromethoxy-]	107-30-2	5,000	b
Crotonaldehyde [2-Butenal]	4170-30-3	20,000	b
Crotonaldehyde, (E)- [2-Butenal, (E)-]	123-73-9	20,000	b
Cyanogen chloride	506-77-4	10,000	c
Cyclohexylamine [Cyclohexanamine]	108-91-8	15,000	b
Diborane	19287-45-7	2,500	b
Dimethyldichlorosilane [Silane, dichlorodimethyl-]	75-78-5	5,000	b
1,1-Dimethylhydrazine [Hydrazine, 1,1-dimethyl-]	57-14-7	15,000	b
Epichlorohydrin [Oxirane, (chloromethyl)-]	106-89-8	20,000	b
Ethylenediamine [1,2-Ethanediamine]	107-15-3	20,000	b
Ethyleneimine [Aziridine]	151-56-4	10,000	b
Ethylene oxide [Oxirane]	75-21-8	10,000	a, b
Fluorine	7782-41-4	1,000	b
Formaldehyde (solution)	50-00-0	15,000	b
Furan	110-00-9	5,000	b
Hydrazine	302-01-2	15,000	b
Hydrochloric acid (conc 37% or greater)	7647-01-0	15,000	d
Hydrocyanic acid	74-90-8	2,500	a, b
Hydrogen chloride (anhydrous) [Hydrochloric acid]	7647-01-0	5,000	a

TABLE 1 TO §68.130 (cont'd)

Chemical Name	CAS No	Threshold Quantity (lbs)	Basis for Listing
Hydrogen fluoride/Hydrofluoricacid (conc 50% or greater) [Hydrofluoric acid]	7664-39-3	1,000	a, b
Hydrogen selenide	7783-07-5	500	b
Hydrogen sulfide	7783-06-4	10,000	a, b
Iron, pentacarbonyl- [Iron carbonyl (Fe(CO)5), (TB-5-11)-]	13463-40-6	2,500	b
Isobutyronitrile [Propanenitrile,2-methyl-]	78-82-0	20,000	b
Isopropyl chloroformate [Carbonochloridic acid, 1-methylethyl ester]	108-23-6	15,000	b
Methacrylonitrile [2-Propenenitrile,2-methyl-]	126-98-7	10,000	b
Methyl chloride [Methane, chloro-]	74-87-3	10,000	a
Methyl chloroformate [Carbonochloridic acid, methylester]	79-22-1	5,000	b
Methyl hydrazine [Hydrazine, methyl-]	60-34-4	15,000	b
Methyl isocyanate [Methane, isocyanato-]	624-83-9	10,000	a, b
Methyl mercaptan [Methanethiol]	74-93-1	10,000	b
Methyl thiocyanate [Thiocyanic acid, methyl ester]	556-64-9	20,000	b
Methyltrichlorosilane [Silane, trichloromethyl-]	75-79-6	5,000	b
Nickel carbonyl	13463-39-3	1,000	b
Nitric acid (conc 80% or greater)	7697-37-2	15,000	b
Nitric oxide [Nitrogen oxide (NO)]	10102-43-9	10,000	b
Oleum (Fuming Sulfuric acid) [Sulfuric acid, mixture with sulfur trioxide][1]	8014-95-7	10,000	e
Peracetic acid [Ethaneperoxoic acid]	79-21-0	10,000	b
Perchloromethylmercaptan [Methanesulfenylchloride, trichloro-]	594-42-3	10,000	b
Phosgene [Carbonic dichloride]	75-44-5	500	a, b
Phosphine	7803-51-2	5,000	b
Phosphorus oxychloride [Phosphoryl chloride]	10025-87-3	5,000	b
Phosphorus trichloride [Phosphorous trichloride]	7719-12-2	15,000	b
Piperidine	110-89-4	15,000	b
Propionitrile [Propanenitrile]	107-12-0	10,000	b
Propyl chloroformate [Carbonochloridic acid, propylester]	109-61-5	15,000	b
Propyleneimine [Aziridine, 2-methyl-]	75-55-8	10,000	b
Propylene oxide [Oxirane, methyl-]	75-56-9	10,000	b
Sulfur dioxide (anhydrous)	7446-09-5	5,000	a, b
Sulfur tetrafluoride [Sulfur fluoride (SF4), (T-4)-]	7783-60-0	2,500	b
Sulfur trioxide	7446-11-9	10,000	a, b

TABLE 1 TO §68.130 (cont'd)

Chemical Name	CAS No	Threshold Quantity (lbs)	Basis for Listing
Tetramethyllead [Plumbane, tetramethyl-]	75-74-1	10,000	b
Tetranitromethane [Methane, tetranitro-]	509-14-8	10,000	b
Titanium tetrachloride [Titanium chloride (TiCl4) (T-4)-]	7550-45-0	2,500	b
Toluene 2,4-diisocyanate [Benzene, 2,4-diisocyanato-1-methyl-][1]	584-84-9	10,000	a
Toluene 2,6-diisocyanate [Benzene, 1,3-diisocyanato-2-methyl-][1]	91-08-7	10,000	a
Toluene diisocyanate (unspecified isomer) [Benzene, 1,3-diisocyanatomethyl-][1]	26471-62-5	10,000	a
Trimethylchlorosilane [Silane, chlorotrimethyl-]	75-77-4	10,000	b
Vinyl acetate monomer [Acetic acid ethenyl ester]	108-05-4	15,000	b

[1]The mixture exemption in §68.115(b)(1) does not apply to the substance.

Basis for Listing:

[a]Mandated for listing by Congress.
[b]On EHS list, vapor pressure 10 mmHg or greater.
[c]Toxic gas.
[d]Toxicity of hydrogen chloride, potential to release hydrogen chloride, and history of accidents.
[e]Toxicity of sulfur trioxide and sulfuric acid, potential to release sulfur trioxide, and history of accidents.

TABLE 2 TO §68.130 - LIST OF REGULATED TOXIC SUBSTANCES AND THRESHOLD QUANTITIES FOR ACCIDENTAL RELEASE PREVENTION [CAS NUMBER ORDER - 77 SUBSTANCES]

CAS No.	Chemical Name	Threshold Quantity (lbs)	Basis for Listing
50-00-0	Formaldehyde (solution)	15,000	b
57-14-7	1,1-Dimethylhydrazine [Hydrazine, 1,1-dimethyl-]	15,000	b
60-34-4	Methyl hydrazine [Hydrazine, methyl-]	15,000	b
67-66-3	Chloroform [Methane, trichloro-]	20,000	b
74-87-3	Methyl chloride [Methane, chloro-]	10,000	a
74-90-8	Hydrocyanic acid	2,500	a, b
74-93-1	Methyl mercaptan [Methanethiol]	10,000	b
75-15-0	Carbon disulfide	20,000	b
75-21-8	Ethylene oxide [Oxirane]	10,000	a, b
75-44-5	Phosgene [Carbonic dichloride]	500	a, b
75-55-8	Propyleneimine [Aziridine, 2-methyl-]	10,000	b
75-56-9	Propylene oxide [Oxirane, methyl-]	10,000	b
75-74-1	Tetramethyllead [Plumbane, tetramethyl-]	10,000	b
75-77-4	Trimethylchlorosilane [Silane, chlorotrimethyl-]	10,000	b
75-78-5	Dimethyldichlorosilane [Silane, dichlorodimethyl-]	5,000	b
75-79-6	Methyltrichlorosilane [Silane, trichloromethyl-]	5,000	b
78-82-0	Isobutyronitrile [Propanenitrile, 2-methyl-]	20,000	b
79-21-0	Peracetic acid [Ethaneperoxoic acid]	10,000	b
79-22-1	Methyl chloroformate [Carbonochloridic acid, methylester]	5,000	b
91-08-7	Toluene 2,6-diisocyanate [Benzene, 1,3-diisocyanato-2-methyl-][1]	10,000	a
106-89-8	Epichlorohydrin [Oxirane, (chloromethyl)-]	20,000	b
107-02-8	Acrolein [2-Propenal]	5,000	b
107-11-9	Allylamine [2-Propen-1-amine]	10,000	b
107-12-0	Propionitrile [Propanenitrile]	10,000	b
107-13-1	Acrylonitrile [2-Propenenitrile]	20,000	b
107-15-3	Ethylenediamine [1,2-Ethanediamine]	20,000	b
107-18-6	Allyl alcohol [2-Propen-1-ol]	15,000	b
107-30-2	Chloromethyl methyl ether [Methane, chloromethoxy-]	5,000	b
108-05-4	Vinyl acetate monomer [Acetic acid ethenyl ester]	15,000	b
108-23-6	Isopropyl chloroformate [Carbonochloridic acid, 1-methylethyl ester]	15,000	b
108-91-8	Cyclohexylamine [Cyclohexanamine]	15,000	b
109-61-5	Propyl chloroformate [Carbonochloridic acid, propylester]	15,000	b
110-00-9	Furan	5,000	b
110-89-4	Piperidine	15,000	b
123-73-9	Crotonaldehyde, (E)- [2-Butenal, (E)-]	20,000	b
126-98-7	Methacrylonitrile [2-Propenenitrile, 2-methyl-]	10,000	b
151-56-4	Ethyleneimine [Aziridine]	10,000	b

TABLE 2 TO §68.130 (cont'd)

CAS No.	Chemical Name	Threshold Quantity (lbs)	Basis for Listing
302-01-2	Hydrazine	15,000	b
353-42-4	Boron trifluoride compound with methyl ether (1:1) [Boron, trifluoro[oxybis[metane]]-, T-4-	15,000	b
506-77-4	Cyanogen chloride	10,000	c
509-14-8	Tetranitromethane[Methane, tetranitro-]	10,000	b
542-88-1	Chloromethyl ether [Methane, oxybis[chloro-]	1,000	b
556-64-9	Methyl thiocyanate [Thiocyanic acid, methyl ester]	20,000	b
584-84-9	Toluene 2,4-diisocyanate [Benzene, 2,4-diisocyanato-1-methyl-][1]	10,000	a
594-42-3	Perchloromethylmercaptan[Methanesulfenylchloride, trichloro-]	10,000	b
624-83-9	Methyl isocyanate [Methane, isocyanato-]	10,000	a, b
814-68-6	Acrylyl chloride [2-Propenoyl chloride]	5,000	b
4170-30-3	Crotonaldehyde [2-Butenal]	20,000	b
7446-09-5	Sulfur dioxide (anhydrous)	5,000	a, b
7446-11-9	Sulfur trioxide	10,000	a, b
7550-45-0	Titanium tetrachloride [Titanium chloride (TiCl4) (T-4)-]	2,500	b
7637-07-2	Boron trifluoride [Borane, trifluoro-]	5,000	b
7647-01-0	Hydrochloric acid (conc 37% or greater)	15,000	d
7647-01-0	Hydrogen chloride (anhydrous) [Hydrochloric acid]	5,000	a
7664-39-3	Hydrogen fluoride/Hydrofluoricacid (conc 50% or greater) [Hydrofluoric acid]	1,000	a, b
7664-41-7	Ammonia (anhydrous)	10,000	a, b
7664-41-7	Ammonia (conc 20% or greater)	20,000	a, b
7697-37-2	Nitric acid (conc 80% or greater)	15,000	b
7719-12-2	Phosphorus trichloride [Phosphorous trichloride]	15,000	b
7726-95-6	Bromine	10,000	a, b
7782-41-4	Fluorine	1,000	b
7782-50-5	Chlorine	2,500	a, b
7783-06-4	Hydrogen sulfide	10,000	a, b
7783-07-5	Hydrogen selenide	500	b
7783-60-0	Sulfur tetrafluoride [Sulfur fluoride (SF4), (T-4)-]	2,500	b
7784-34-1	Arsenous trichloride	15,000	b
7784-42-1	Arsine	1,000	b
7803-51-2	Phosphine	5,000	b
8014-95-7	Oleum (Fuming Sulfuric acid) [Sulfuric acid, mixture with sulfur trioxide][1]	10,000	e
10025-87-3	Phosphorus oxychloride [Phosphoryl chloride]	5,000	b
10049-04-4	Chlorine dioxide [Chlorine oxide (ClO2)]	1,000	c
10102-43-9	Nitric oxide [Nitrogen oxide (NO)]	10,000	b
10294-34-5	Boron trichloride [Borane, trichloro-]	5,000	b
13463-39-3	Nickel carbonyl	1,000	b

TABLE 2 TO §68.130 (cont'd)

CAS No.	Chemical Name	Threshold Quantity (lbs)	Basis for Listing
13463-40-6	Iron, pentacarbonyl- [Iron carbonyl (Fe(CO)5), (TB-5-11)-]	2,500	b
19287-45-7	Diborane	2,500	b
26471-62-5	Toluene diisocyanate (unspecified isomer) [Benzene, 1,3-diisocyanatomethyl-][1]	10,000	a

[1]The mixture exemption in §68.115(b)(1) does not apply to the substance.

Basis for Listing:

[a]Mandated for listing by Congress.
[b]On EHS list, vapor pressure 10 mmHg or greater.
[c]Toxic gas.
[d]Toxicity of hydrogen chloride, potential to release hydrogen chloride, and history of accidents.
[e]Toxicity of sulfur trioxide and sulfuric acid, potential to release sulfur trioxide, and history of accidents.

TABLE 3 TO §68.130 - LIST OF REGULATED FLAMMABLE SUBSTANCES AND THRESHOLD QUANTITIES FOR ACCIDENTAL RELEASE PREVENTION [ALPHABETICAL ORDER - 63 SUBSTANCES]

Chemical Name	CAS No.	Threshold Quantity (lbs)	Basis for Listing
Acetaldehyde	75-07-0	10,000	g
Acetylene [Ethyne]	74-86-2	10,000	f
Bromotrifluorethylene[Ethene, bromotrifluoro-]	598-73-2	10,000	f
1,3-Butadiene	106-99-0	10,000	f
Butane	106-97-8	10,000	f
1-Butene	106-98-9	10,000	f
2-Butene	107-01-7	10,000	f
Butene	25167-67-3	10,000	f
2-Butene-cis	590-18-1	10,000	f
2-Butene-trans [2-Butene, (E)]	624-64-6	10,000	f
Carbon oxysulfide [Carbon oxide sulfide (COS)]	463-58-1	10,000	f
Chlorine monoxide [Chlorine oxide]	7791-21-1	10,000	f
2-Chloropropylene[1-Propene, 2-chloro-]	557-98-2	10,000	g
1-Chloropropylene[1-Propene, 1-chloro-]	590-21-6	10,000	g
Cyanogen [Ethanedinitrile]	460-19-5	10,000	f
Cyclopropane	75-19-4	10,000	f
Dichlorosilane[Silane, dichloro-]	4109-96-0	10,000	f
Difluoroethane[Ethane, 1,1-difluoro-]	75-37-6	10,000	f
Dimethylamine[Methanamine,N-methyl-]	124-40-3	10,000	f
2,2-Dimethylpropane[Propane, 2,2-dimethyl-]	463-82-1	10,000	f
Ethane	74-84-0	10,000	f
Ethyl acetylene [1-Butyne]	107-00-6	10,000	f
Ethylamine [Ethanamine]	75-04-7	10,000	f
Ethyl chloride [Ethane, chloro-]	75-00-3	10,000	f
Ethylene [Ethene]	74-85-1	10,000	f
Ethyl ether [Ethane, 1,1'-oxybis-]	60-29-7	10,000	g
Ethyl mercaptan [Ethanethiol]	75-08-1	10,000	g
Ethyl nitrite [Nitrous acid, ethyl ester]	109-95-5	10,000	f
Hydrogen	1333-74-0	10,000	f
Isobutane [Propane, 2-methyl]	75-28-5	10,000	f
Isopentane [Butane, 2-methyl-]	78-78-4	10,000	g
Isoprene [1,3-Butadiene, 2-methyl-]	78-79-5	10,000	g
Isopropylamine [2-Propanamine]	75-31-0	10,000	g
Isopropyl chloride [Propane, 2-chloro-]	75-29-6	10,000	g
Methane	74-82-8	10,000	f
Methylamine [Methanamine]	74-89-5	10,000	f
3-Methyl-1-butene	563-45-1	10,000	f
2-Methyl-1-butene	563-46-2	10,000	g
Methyl ether [Methane, oxybis-]	115-10-6	10,000	f
Methyl formate [Formic acid, methyl ester]	107-31-3	10,000	g

TABLE 3 TO §68.130 (cont'd)

Chemical Name	CAS No.	Threshold Quantity (lbs)	Basis for Listing
2-Methylpropene [1-Propene, 2-methyl-]	115-11-7	10,000	f
1,3-Pentadiene	504-60-9	10,000	f
Pentane	109-66-0	10,000	g
1-Pentene	109-67-1	10,000	g
2-Pentene, (E)-	646-04-8	10,000	g
2-Pentene, (Z)-	627-20-3	10,000	g
Propadiene [1,2-Propadiene]	463-49-0	10,000	f
Propane	74-98-6	10,000	f
Propylene [1-Propene]	115-07-1	10,000	f
Propyne [1-Propyne]	74-99-7	10,000	f
Silane	7803-62-5	10,000	f
Tetrafluoroethylene [Ethene, tetrafluoro-]	116-14-3	10,000	f
Tetramethylsilane [Silane, tetramethyl-]	75-76-3	10,000	g
Trichlorosilane [Silane, trichloro-]	10025-78-2	10,000	g
Trifluorochloroethylene [Ethene, chlorotrifluoro-]	79-38-9	10,000	f
Trimethylamine [Methanamine, N,N-dimethyl-]	75-50-3	10,000	f
Vinyl acetylene [1-Buten-3-yne]	689-97-4	10,000	f
Vinyl chloride [Ethene, chloro-]	75-01-4	10,000	a, f
Vinyl ethyl ether [Ethene, ethoxy-]	109-92-2	10,000	g
Vinyl fluoride [Ethene, fluoro-]	75-02-5	10,000	f
Vinylidene chloride [Ethene, 1,1-dichloro-]	75-35-4	10,000	g
Vinylidene fluoride [Ethene, 1,1-difluoro-]	75-38-7	10,000	f
Vinyl methyl ether [Ethene, methoxy-]	107-25-5	10,000	f

Basis for Listing:

[a]Mandated for listing by Congress.
[f]Flammable gas.
[g]Volatile flammable liquid.

TABLE 4 TO §68.130 - LIST OF REGULATED FLAMMABLE SUBSTANCES AND THRESHOLD QUANTITIES FOR ACCIDENTAL RELEASE PREVENTION
[CAS NUMBER ORDER - 63 SUBSTANCES]

CAS No.	Chemical Name	Threshold Quantity (lbs)	Basis for Listing
60-29-7	Ethyl ether [Ethane, 1,1'-oxybis-]	10,000	g
74-82-8	Methane	10,000	f
74-84-0	Ethane	10,000	f
74-85-1	Ethylene [Ethene]	10,000	f
74-86-2	Acetylene [Ethyne]	10,000	f
74-89-5	Methylamine [Methanamine]	10,000	f
74-98-6	Propane	10,000	f
74-99-7	Propyne [1-Propyne]	10,000	f
75-00-3	Ethyl chloride [Ethane, chloro-]	10,000	f
75-01-4	Vinyl chloride [Ethene, chloro-]	10,000	a, f
75-02-5	Vinyl fluoride [Ethene, fluoro-]	10,000	f
75-04-7	Ethylamine [Ethanamine]	10,000	f
75-07-0	Acetaldehyde	10,000	g
75-08-1	Ethyl mercaptan [Ethanethiol]	10,000	g
75-19-4	Cyclopropane	10,000	f
75-28-5	Isobutane [Propane, 2-methyl]	10,000	f
75-29-6	Isopropyl chloride [Propane, 2-chloro-]	10,000	g
75-31-0	Isopropylamine [2-Propanamine]	10,000	g
75-35-4	Vinylidene chloride [Ethene, 1,1-dichloro-]	10,000	g
75-37-6	Difluoroethane [Ethane, 1,1-difluoro-]	10,000	f
75-38-7	Vinylidene fluoride [Ethene, 1,1-difluoro-]	10,000	f
75-50-3	Trimethylamine [Methanamine, N,N-dimethyl-]	10,000	f
75-76-3	Tetramethylsilane [Silane, tetramethyl-]	10,000	g
78-78-4	Isopentane [Butane, 2-methyl-]	10,000	g
78-79-5	Isoprene [1,3-Butadiene, 2-methyl-]	10,000	g
79-38-9	Trifluorochloroethylene [Ethene, chlorotrifluoro-]	10,000	f
106-97-8	Butane	10,000	f
106-98-9	1-Butene	10,000	f
106-99-0	1,3-Butadiene	10,000	f
107-00-6	Ethyl acetylene [1-Butyne]	10,000	f
107-01-7	2-Butene	10,000	f
107-25-5	Vinyl methyl ether [Ethene, methoxy-]	10,000	f
107-31-3	Methyl formate [Formic acid, methyl ester]	10,000	g
109-66-0	Pentane	10,000	g
109-67-1	1-Pentene	10,000	g
109-92-2	Vinyl ethyl ether [Ethene, ethoxy-]	10,000	g
109-95-5	Ethyl nitrite [Nitrous acid, ethyl ester]	10,000	f
115-07-1	Propylene [1-Propene]	10,000	f
115-10-6	Methyl ether [Methane, oxybis-]	10,000	f
115-11-7	2-Methylpropene [1-Propene, 2-methyl-]	10,000	f

TABLE 4 TO §68.130 (cont'd)

CAS No.	Chemical Name	Threshold Quantity (lbs)	Basis for Listing
116-14-3	Tetrafluoroethylene[Ethene, tetrafluoro-]	10,000	f
124-40-3	Dimethylamine [Methanamine, N-methyl-]	10,000	f
460-19-5	Cyanogen [Ethanedinitrile]	10,000	f
463-49-0	Propadiene [1,2-Propadiene]	10,000	f
463-58-1	Carbon oxysulfide [Carbon oxide sulfide (COS)]	10,000	f
463-82-1	2,2-Dimethylpropane [Propane, 2,2-dimethyl-]	10,000	f
504-60-9	1,3-Pentadiene	10,000	f
557-98-2	2-Chloropropylene [1-Propene, 2-chloro-]	10,000	g
563-45-1	3-Methyl-1-butene	10,000	f
563-46-2	2-Methyl-1-butene	10,000	g
590-18-1	2-Butene-cis	10,000	f
590-21-6	1-Chloropropylene [1-Propene, 1-chloro-]	10,000	g
598-73-2	Bromotrifluorethylene[Ethene, bromotrifluoro-]	10,000	f
624-64-6	2-Butene-trans [2-Butene, (E)]	10,000	f
627-20-3	2-Pentene, (Z)-	10,000	g
646-04-8	2-Pentene, (E)-	10,000	g
689-97-4	Vinyl acetylene [1-Buten-3-yne]	10,000	f
1333-74-0	Hydrogen	10,000	f
4109-96-0	Dichlorosilane [Silane, dichloro-]	10,000	f
7791-21-1	Chlorine monoxide [Chlorine oxide]	10,000	f
7803-62-5	Silane	10,000	f
10025-78-2	Trichlorosilane [Silane, trichloro-]	10,000	g
25167-67-3	Butene	10,000	f

Basis for Listing:

[a]Mandated for listing by Congress.
[f]Flammable gas.
[g]Volatile flammable liquid.

APPENDIX G

Worksheets for Facilitating Compliance with the RMP Rule

This appendix contains several worksheets to help companies document compliance with the RMP rule. Specifically, this appendix contains the following:

- A worksheet for documenting the calculation of the quantities of regulated substances or mixtures in RMP-covered processes
- A worksheet for documenting the program level of a covered process
- Worksheets for documenting candidate worst-case and alternative release scenarios for the offsite consequence analyses
- A worksheet for documenting accidents satisfying the 5-year accident history criteria

Threshold Quantity Determination Worksheet

Chemical or Mixture Name _____

Vapor Density

Parameters	Components 1	2	3	4
Total Pressure (psia)				
Temperature				
Molecular Wt. (lb/lbmole)				
Mole Fraction				
Vapor Density (lb/ft³)				

Liquid Mixture Density

Substance	Mass Fraction	Liquid density (lb/ft³)
Mixture	1.0	

Storage Tank Calculations

Vessel/Column	Volume (ft³)	Density (lb/ft³)	Total Quantity (lb)	Mass Fraction	Quantity of Substance (lb)	Quantity Applied to the TQ (lb)	Comments

Piping Calculation

Piping	Internal Diameter (ft)	Length (ft)	Density (lb/ft³)	Mass Fraction	Quantity of Substance (lb)	Quantity Applied to the TQ (lb)	Comments

Threshold Quantity Calculation

Vessel/Column/Pipe	Quantity (lb)
TOTAL	

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PROGRAM LEVEL ELIGIBILITY WORKSHEET

PROCESS INFORMATION

- Company name:_____ Date:_____
- Facility name:_____
- Name of the individual(s) who completed this form:_____
- Process name:_____
- Process description:_____
- RMP-regulated substance(s) contained in the process:_____

PROGRAM 1 ELIGIBILITY ASSESSMENT

1. No accidental releases of the above regulated substances (in the past 5 years) resulted in offsite death, injury, or response or restoration activities to an environmental receptor. ❑ True ❑ False
   List the date of the most recent accident meeting the above criterion:_____
2. All worst-case release scenario endpoint distances for this process are less than the distance to the nearest receptor. ❑ True ❑ False
   Worst-case endpoint distance(s) (miles):_____
   Distance to the nearest public receptor (miles):_____
3. Emergency response procedures have been coordinated with local emergency planning and response organizations. ❑ True ❑ False
   List organizations that the procedures are coordinated with:_____

If the responses to ALL THREE statements above are "True", then this process is eligible for Program 1. Otherwise, proceed to the Program 3 Eligibility Assessment below.

PROGRAM 3 ELIGIBILITY ASSESSMENT

1. Is the process covered by the OSHA PSM rule (29 *CFR* 1910.119)? ❑ Yes ❑ No
2. Is the process NAICS code one of the targeted NAICS codes? ❑ Yes ❑ No
   If "Yes", then indicate the NAICS code assigned to the process:

❑ 32211 (pulp mills)	❑ 325199 (other organics)
❑ 325181 (chlor-alkali)	❑ 325311 (nitrogen fertilizers)
❑ 325188 (industrial inorganics)	❑ 32532 (agricultural chemicals)
❑ 325211 (plastics and resins)	❑ 32411 (petroleum refineries)
❑ 32511 (petrochemicals)	❑ 325192 (other cyclic crude and intermediate manufacturing)

If the answer to EITHER of the above questions is "Yes", then this process must be considered a Program 3 process. Otherwise, this process is eligible for Program 2.

FINAL PROGRAM LEVEL ASSIGNMENT

- Program level that the process is eligible for: ❑ Program 1 ❑ Program 2 ❑ Program 3
- Program level assigned to the process: ❑ Program 1 ❑ Program 2 ❑ Program 3
- If assigned program level is greater than the eligible program level, then document the rationale for the program level assignment:_____

WORST-CASE RELEASE SCENARIO WORKSHEET

COMPANY/FACILITY DATA

1. Company name:_____ 2. Date:_____
3. Facility name:_____
4. Name of the individual(s) who completed this form:_____
5. Latitude of the facility:_____ 6. Longitude of the facility:_____
7. Street address of the facility:_____

CHEMICAL INFORMATION

8. Chemical name:_____ 9. Is the chemical contained in a mixture? ❑ Yes ❑ No
10. If the chemical is contained in a mixture, indicate its mass fraction:_____
11. If the chemical is contained in a mixture, list the other chemicals in the mixture:_____

WORST-CASE RELEASE SCENARIO DESCRIPTION

12. Narrative description of the release:_____
13. Total quantity assumed to be released (lb):_____
14. Administrative controls (if any) assumed to limit the total quantity released:_____
15. Duration of the release from the vessel or pipe: ❑ 10 minutes OR ❑ instantaneous
16. Physical state of the chemical: ❑ Gas ❑ Pressurized liquefied gas ❑ Refrigerated liquid ❑ Nonrefrigerated liquid
17. Storage/process conditions Pressure_____ psig OR ❑ ambient pressure
    Temperature_____ °F OR ❑ ambient temperature

PASSIVE MITIGATION SYSTEMS

18. Passive mitigation systems to be accounted for in the analysis:_____

MODELING APPROACHES

19. List modeling approaches that will be used:_____

RESULTS

20. Endpoint:_____ 21. Distance to endpoint:_____

ALTERNATIVE RELEASE SCENARIO WORKSHEET

COMPANY/FACILITY DATA

1. Company name:_____ 2. Date:_____
3. Facility name:_____
4. Name of the individual(s) who completed this form:_____
5. Latitude of the facility:_____ 6. Longitude of the facility:_____
7. Street address of the facility:_____

CHEMICAL INFORMATION

8. Chemical name:_____ 9. Is the chemical contained in a mixture? ❑ Yes ❑ No
10. If the chemical is contained in a mixture, indicate its mass fraction:_____
11. If the chemical is contained in a mixture, list the other chemicals in the mixture:_____

ALTERNATIVE RELEASE SCENARIO DESCRIPTION

12. Narrative description of the release:_____
13. Rationale for selection of the release event: accident history PHA or hazard review Other_____
14. Total quantity assumed to be released (lb) or the release rate (lb/min):_____
15. Duration of the release (min) and the basis for the release duration:_____
16. Physical state of the chemical: ❑ Gas ❑ Pressurized liquefied gas
    ❑ Refrigerated liquid ❑ Nonrefrigerated liquid
17. Storage/process conditions Pressure_____ psig OR ❑ ambient pressure
    Temperature_____ °F OR ❑ ambient temperature

PASSIVE/ACTIVE MITIGATION SYSTEMS

18. Passive and/or active mitigation systems to be accounted for in the analysis:_____

MODELING APPROACHES

19. List modeling approaches that will be used:_____

RESULTS

20. Endpoint:_____ 21. Distance to endpoint:_____

ACCIDENT HISTORY WORKSHEET

Release Time

Release date _____
Release start time _____
NAICS code for the process _____
Release duration (hr and min) _____

Release Event (choose one)

☐ Gas release ☐ Fire
☐ Liquid spill / evaporation ☐ Explosion

Release Source

Source	*Equipment Number(s)*
☐ Storage vessel	_____
☐ Transfer hose	_____
☐ Piping	_____
☐ Valve	_____
☐ Process vessel	_____
☐ Pump	_____
☐ Joint	_____
☐ Other	_____

Initiating Event (choose one)

☐ Equipment failure ☐ Natural (weather conditions, earthquake, etc.)
☐ Human error ☐ Unknown

Chemical(s) Released

CAS No.	Chemical name	Weight. % (toxics only)	Quantity (lb)

Weather Conditions

Stability class _____ (A - F)
Wind speed _____ meters / second
Wind direction _____ degrees
Ambient temperature _____ °F
Cloud cover _____ %
☐ Precipitation present
☐ Weather conditions unknown

Contributing Factors (choose all that apply)

☐ Equipment failure ☐ Upset condition ☐ Management error
☐ Human error ☐ By-pass condition ☐ Maintenance activity/inactivity
☐ Improper procedure ☐ Unsuitable equipment ☐ Process design
☐ Overpressurization ☐ Unusual weather ☐ Other (specify))_____

Changes Introduced as a Result of the Accident

☐ Improved/upgraded equipment
☐ Revised maintenance procedures
☐ Revised operating procedures
☐ New process controls
☐ Revised emergency response plan
☐ New mitigation system
☐ Revised training
☐ Reduced inventory
☐ Changed process
☐ None
☐ Other (specify)_____

ACCIDENT HISTORY WORKSHEET (cont'd)

Onsite Impacts

Number of deaths: workers/contractors _____
public responders _____
public _____
Number of injuries: workers/contractors _____
public responders _____
public _____
Property damage: $_____

Offsite Impacts

Number of deaths _____
Number of individuals hospitalized _____
Number of individuals receiving other treatment _____
Number of individuals evacuated _____
Number of individuals sheltered-in-place _____
Property damage $_____
Environmental damage (select all that apply)

☐ Fish or animal kills
☐ Lawn, shrub, or crop damage - minor defoliation
☐ Lawn, shrub, or crop damage - major defoliation
☐ Water contamination
☐ Other (specify)

☐ Offsite responders notified

☐ Accident requires Program level change for the process (Program 1 no longer applies)

Response or Restoration Activities for Environmental Receptors (Violation of Program Level 1 Criteria)

☐ No response or restoration activities were conducted on environmental receptors

Response or restoration activities were conducted for (select all that apply):

☐ Natural areas such as national or state parks, forests, or monuments
☐ Officially designated wildlife sanctuaries, preserves, refuges, or areas
☐ Federal wilderness areas
☐ Accident requires program level change for the process (Program 1 no longer applies)

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• Monogram Licensing Program	Ph: 202-962-4791 Fax: 202-682-8070
• Engine Oil Licensing and Certification System	Ph: 202-682-8233 Fax: 202-962-4739
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