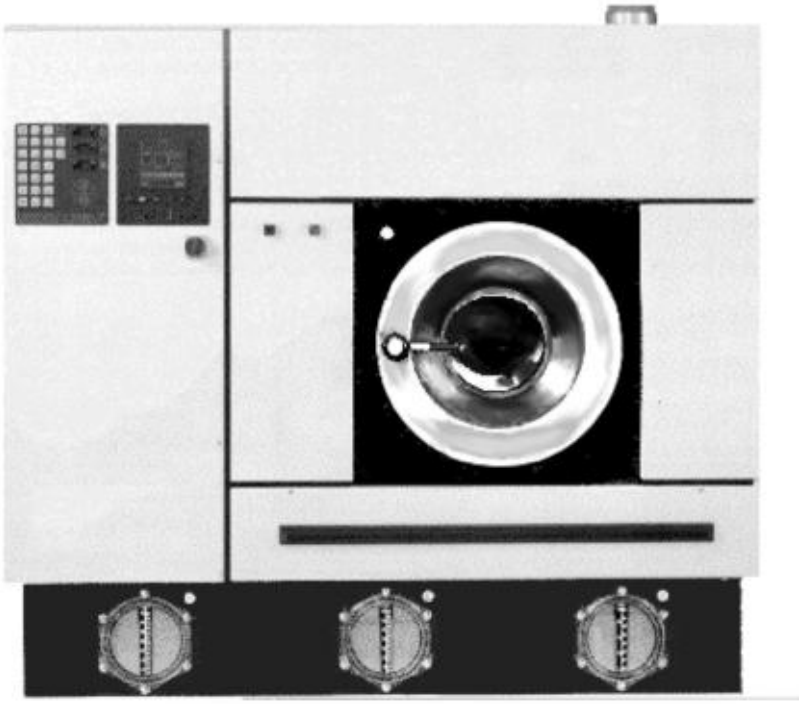
California Environmental Protection Agency

Air Resources Board

CURRICULUM FOR THE ENVIRONMENTAL TRAINING PROGRAM FOR PERCHLOROETHYLENE DRY CLEANING OPERATIONS



State of California
California Environmental Protection Agency

Air Resources Board
Stationary Source Division
April 1996

[Blank Page]

State of California
California Environmental Protection Agency

Air Resources Board
Stationary Source Division
P.O. Box 2815
Sacramento, California 95812

CURRICULUM FOR THE ENVIRONMENTAL TRAINING PROGRAM FOR PERCHLOROETHYLENE DRY CLEANING OPERATIONS

April 1996

Primary Authors

Tina Najjar
Mark Williams

Contributors

Richard Boyd
Victor Douglas
Kelly Hughes

Reviewed and Approved By

Robert D. Fletcher, Chief, Emissions Assessment Branch
Todd S. Wong, Manager, Emissions Evaluation Section

[Blank Page]

Acknowledgments

We wish to acknowledge the participation and assistance of the dry cleaning industry and allied trade representatives, district and State agency staff, and others. We thank the many dry cleaners who have taken the time to show us their operations, participate in meetings, and respond to our requests for information. We wish to express a special appreciation to the dry cleaners who reviewed this document and provided constructive comments.

Disclaimer

This curriculum has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and polices of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

[Blank Page]

TABLE OF CONTENTS

Chapter			Page
	Information for Instructors		v
1	Introduction		
	A.	Summary	1-1
	B.	The Regulations	1-1
	C.	Purpose of the Program	1-2
	D.	History of Dry Cleaning Solvents	1-3
2	Health Effects of Perchloroethylene		
	A.	Summary	2-1
	B.	ARB's Identification of Perc as a Toxic Air Contaminant	2-1
	C.	Perc Threshold Level	2-2
	D.	Potential Health Effects Associated with Perc Exposure	2-3
	E.	Potential Health Risks from Perc Dry Cleaning Operations	2-3
3	Perchloroethylene Usage and Emissions		
	A.	Summary	3-1
	B.	Properties of Perc	3-1
	C.	Perc Usage in California	3-2
	D.	Existing Emissions from Perc Dry Cleaning Operations	3-2
	E.	ARB's Survey of Dry Cleaners	3-4
	F.	Post-Implementation Emissions Reduction	3-5
4	Working with Perchloroethylene		
	A.	Summary	4-1
	B.	Material Safety Data Sheet	4-1
	C.	Signs of Excessive Exposure to Perc	4-3
	D.	Ventilation	4-5
	E.	Personal Protective Equipment	4-6
5	Dry Cleaning Equipment and Operations		
	A.	Summary	5-1
	B.	Dry Cleaning Process	5-2
	C.	Machine Types	5-2
	D.	Primary Control Devices	5-5
	E.	Secondary Control Devices	5-7

5 Dry Cleaning Equipment and Operations (cont.)
F. Solvent Filtration 5-8
G. Distillation: Stills and Muck Cookers 5-10
H. Miscellaneous Equipment and Operations 5-11

6 The ARB's Dry Cleaning ATCM
A. Summary 6-2
B. BACT for Dry Cleaning Equipment 6-2
C. Dry Cleaning ATCM Requirements 6-3
D. Equipment Requirements 6-3
E. Good Operating Practices 6-6
F. Recordkeeping and Reporting Requirements 6-8
G. District Requirements 6-16
H. Differences Between the Federal Dry Cleaning MACT Standard and the Dry Cleaning ATCM 6-16

7 Operations And Maintenance Practices
A. Summary 7-1
B. General Operations 7-2
C. Required Routine Maintenance 7-2
D. Recommended Routine Maintenance 7-5
E. Waste Handling 7-10
F. Operations and Maintenance Checklist 7-11

8 Leaks and Leak Detection
A. Summary 8-1
B. Leaks 8-2
C. Halogenated-hydrocarbon Detector 8-6
D. Leak Checklist 8-8
E. Service and Repair Log 8-12

9 Spills and Emergency Response
A. Summary 9-1
B. Spills 9-2
C. Spill Prevention Techniques 9-3
D. Emergency Action and Contingency Plans 9-4

10 Other State and Local Regulations
A. Summary 10-2
B. Department of Toxic Substances Control Requirements 10-2
C. StateWater Board Requirements 10-4

10 Other State and Local Regulations (cont.)

D. State Occupational Safety and Health Administration Requirements 10-4

E. California Trade and Commerce Agency Requirements 10-6

APPENDICES

Appendix A - Air Resources Board's Final Regulation Order, Airborne Toxic Control Measure for Emissions of Perchloroethylene from Dry Cleaning Operations

Appendix B - Air Resources Board's Final Regulation Order, Environmental Training Program for Perchloroethylene Dry Cleaning Operations

Appendix C - Perchloroethylene Material Safety Data Sheet

Appendix D - Sample Recordkeeping and Reporting Forms

Appendix E - Department of Toxic Substances Control Fact Sheet on Contingency Plans

Appendix F - Publicly Owned Treatment Works Arranged by Zip Code

Appendix G - California Occupational Safety and Health Administration's General Industry Safety Orders - Article 67

Appendix H - California Trade and Commerce Agency's Office of Small Business Plant Registration and Assistance Programs

Appendix I - Bibliography

LIST OF TABLES

Table	Title	Page
1-1	Dry Cleaning Solvent Characteristics	1-7
1-2	Technical Suitability of Alternative Dry Cleaning Solvents	1-7
3-1	Properties of Perchloroethylene	3-2
3-2	1991 Statewide Distribution of Machines and Perc Emissions by Machine Type	3-4
4-1	Exposure Limits for Perchloroethylene	4-4
4-2	Inhalation Response to Perchloroethylene	4-5
8-1	Probable Areas Where Leaks Can Occur	8-4

LIST OF FIGURES

Figure	Title	Page
1-1	Solvent Usage by Type	1-5
3-1	Perc Usage by Industry	3-3
5-1	Back of a Closed-Loop Dry-to-Dry Machine	5-4
5-2	Diagram of a Still	5-10
5-3	Diagram of a Water Separator	5-11
6-1	Pounds of Clothes/Load	6-10
6-2	Completed Sample Pounds of Clothes/Load	6-11
6-3	Annual Report	6-14
6-4	Completed Sample Annual Report	6-15
7-1	Operations and Maintenance Checklist	7-13
7-2	Completed Sample Operations and Maintenance Checklist	7-14
8-1	Halogenated-hydrocarbon Leak Detectors	8-7
8-2	Checking for Leaks Around a Loading Door	8-8
8-3	Weekly Leak Inspection Checklist	8-10
8-4	Completed Sample Weekly Leak Inspection Checklist	8-11
8-5	Service and Repair Log	8-13
8-6	Completed Sample Service and Repair Log	8-15

INFORMATION FOR INSTRUCTORS

PURPOSE

The Environmental Training Program course was developed to provide dry cleaners with a good understanding of the benefits and requirements of the Airborne Toxic Control Measure for Emissions of Perchloroethylene from Dry Cleaning Operations (the Dry Cleaning ATCM). The Air Resources Board (ARB) staff developed this instructor manual to aid instructors in presenting a standardized curriculum to those attending the training course. The instructor manual will ensure that the information presented at Environmental Training Program course is consistent statewide.

COURSE ORGANIZATION

The curriculum for the Environmental Training Program consists of a reference manual and training slides. The reference manual will include instructional objectives, key points, summaries, discussion questions, and additional technical information. The manual is divided into ten chapters as follows:

Chapter	Subject
1	Introduction
2	Health Effects of Perchloroethylene
3	Perchloroethylene Usage and Emissions
4	Working with Perchloroethylene
5	Dry Cleaning Equipment and Operations
6	The ARB's Dry Cleaning ATCM
7	Operations And Maintenance Practices
8	Leaks and Leak Detection
9	Spills and Emergency Response
10	Other State and Local Regulations

INSTRUCTOR PREPARATION

Instructors shall have demonstrated a background in, and knowledge of, the following: operation and maintenance of dry cleaning systems, pollution prevention procedures, and environmental regulations pertaining to dry cleaning operations in California. The instructor must

also be able to effectively communicate this knowledge to dry cleaning personnel.

This course is designed to minimize the time required to prepare for instruction. The instructor should identify the objectives of each chapter and then go over the contents of the chapter in class. When the review of the chapter is completed, the instructor should lead a discussion using the discussion questions provided in the reference manual. Upon completion of the training course, the ARB staff recommends that the instructor give a voluntary exam which will allow students to judge their knowledge of the information that has been presented. The instructor should focus on:

- posing the suggested questions for discussion;
- pointing out how the recommended practices can be applied in dry cleaning plants; and
- seeing that the key points for each chapter are covered in discussion and understood by all the students.

Each instructor should read this manual and the student manual thoroughly before the course giving attention to the objectives and discussion questions for each chapter. Instructors are encouraged to make notes in the margins as reminders of instructional strategies, points to make, and examples to use. Instructors are also encouraged to have the following materials:

- A copy of the Dry Cleaning ATCM and Environmental Training Program Regulation
- A copy of this reference manual and slides for each student
- A copy of a voluntary exam based on the questions listed in this reference manual for each student
- Visual aids such as portable leak detectors, overheads, slide projectors, etc.

STUDENT PREPARATION

Students are expected to read the reference manual before attending the course. It is best to go over the chapters one at a time. The students will be given the objectives of the chapter, and will complete the discussion questions at the end of the chapter. The instructor will lead a discussion at the end of each chapter to ensure that students have the knowledge to answer the questions provided in the manual.

CHAPTER 1

INTRODUCTION

INSTRUCTIONAL OBJECTIVES

Upon completion of this chapter, students will be able to:

- ❒ Understand the purpose of the Environmental Training Program;
- ❒ Have a background on the history of dry cleaning; and
- ❒ Identify the advantages and disadvantages of the solvents used in dry cleaning.

KEY POINTS

1. The Air Resources Board has adopted two regulations that affect the dry cleaning industry. The Dry Cleaning ATCM sets forth the equipment, operations and maintenance, recordkeeping, and reporting requirements for dry cleaning operations. The Environmental Training Regulation sets forth the criteria for the ARB to approve persons or organizations to provide training.
2. The Environmental Training Program provides information on good operating practices and the requirements of the Dry Cleaning ATCM and other regulations.
3. Compliance with these requirements will result in more efficient operations and reduced costs, emissions, and worker exposure.
4. Over 80 percent of dry cleaners use perchloroethylene.

A. SUMMARY

This chapter provides a brief background of the Dry Cleaning ATCM adopted by the Air Resources Board (ARB or Board) and discusses the purpose of the Environmental Training Program. It also provides a brief history of dry cleaning solvents, including the advantages and disadvantages of each solvent.

B. THE REGULATIONS

THE DRY CLEANING ATCM

On October 14, 1993, the Board adopted two regulations that affect dry cleaners in California. Those regulations are codified in Title 17 of the California Code of Regulations (CCR), sections 93109 and 93110. Section 93109, the Airborne Toxic Control Measure for Emissions of Perchloroethylene from Dry Cleaning Operations (the Dry

Cleaning ATCM), sets forth the equipment, operations and maintenance, recordkeeping, and reporting requirements for dry cleaning operations. Section 93110, the Environmental Training Program for Perchloroethylene Dry Cleaning Operations (the Environmental Training Regulation), sets forth the criteria for the ARB to approve persons or organizations to provide the training programs. These two regulations are discussed in more detail in Chapter 6, The ARB's Dry Cleaning ATCM. Appendices A and B contain copies of the Dry Cleaning ATCM and the Environmental Training Regulation, respectively.

DISTRICT OPTIONS

The Dry Cleaning ATCM and the Environmental Training Regulation became State law on June 3, 1994. As required in Health and Safety Code Section 39666(d), the air pollution control and air quality management districts (districts) have 120 days to implement and enforce the ATCMs adopted by the Board once they have become State law. Therefore, the Dry Cleaning ATCM became effective October 1, 1994. The districts also have the option to adopt a regulation that is at least as stringent as an ATCM adopted by the Board. If the district chooses this option, they have six months to adopt and enforce an equally effective or more stringent regulation than the one adopted by the Board. Therefore, districts adopting their own dry cleaning regulations were required to have them adopted by December 3, 1994. The Bay Area Air Quality Management District (BAAQMD) and the South Coast Air Quality Management District (SCAQMD) are two of the districts that adopted their own regulations.

C. PURPOSE OF THE PROGRAM

The Environmental Training Program course was designed to help dry cleaners understand and comply with the Dry Cleaning ATCM and other regulations that affect the dry cleaning industry. Complying with these requirements will allow dry cleaners to operate their facilities more efficiently, thereby reducing costs, Perc emissions to the air, and worker exposure to Perc. The course is also intended to provide dry cleaners with information on other regulations from agencies involved with water, worker exposure, emergency response, and hazardous waste disposal. Some of these regulations are compiled in the appendices to this manual. There may be other regulations not discussed in the training course that affect dry cleaners. It is the responsibility of the dry cleaner to be aware of all regulatory requirements, as well as any subsequent changes to them. This manual also contains telephone numbers for the appropriate contacts at each agency that can provide additional information.

D. HISTORY OF DRY CLEANING SOLVENTS

Petroleum Solvents

EARLY PETROLEUM SOLVENTS

In the early 1700's, references were made to removing grease and oil spots from silk materials using turpentine. By the late 1700's, the first solvent immersion system was used in Paris, France. From this time until the mid-1800s, the practice of immersing garments in turpentine for cleaning spread throughout Europe and the United States. A succession of solvents followed turpentine. They included benzole (distilled from coal tar), kerosene, and gasoline. While all had excellent solvent properties, they all left objectionable odors, and were extremely flammable.

STODDARD SOLVENT

In the 1920's, W. J. Stoddard and other members of the National Institute of Cleaners and Dyers developed a petroleum based solvent incorporating a mixture of paraffins and aromatic hydrocarbons. This solvent became known as Stoddard solvent. Stoddard solvent was able to remove grease, oils, and other contaminants from the clothing and left no objectionable odors. However, it has many drawbacks. Because of its low flashpoint (103°F), fire ordinances require strict building codes, non-residential locations, and transfer equipment to minimize the possibility of explosion. Additional disadvantages include low mileage due to the required use of transfer equipment, high energy demands for distillation because of its high boiling point (310°F), and its photochemical reactivity. (ARB, 1993) Additionally, the toxicity of Stoddard solvent is an unresolved issue because it may contain benzene. (ARB, 1993) Benzene has been identified by the ARB as a toxic air contaminant.

140°F SOLVENT

Another petroleum solvent called 140°F was commercially introduced at about the same time as Stoddard. It received its name because it has a flash point of 140°F compared with the 103°F flash point of Stoddard solvent. This solvent is safer to use (less flammable) than Stoddard solvent, and because of its higher flash point, it is allowed in some places where Stoddard is not. However, 140°F requires longer drying times and is more expensive. Additionally, 140°F may contain benzene.

NEW PETROLEUM SOLVENTS

Recently, Exxon introduced a new petroleum-based solvent called Drycleaning Fluid-2000 (DF-2000). It has a higher flash point (147°F) than Stoddard Solvent, very little odor, and a relatively high occupational exposure limit (300ppm). Initial solvent cost and mileage estimates are comparable to Perc. Disadvantages include requirements for specially designed dry cleaning machines and facilities to prevent

fires or explosions, a lower Kauri-Butanol value (cleaning ability), and longer cycle times.

Non-Petroleum Solvents

TCE AND CARBON TETRACHLORIDE

In the 1920's, two chlorinated solvents, trichloroethylene (TCE) and carbon tetrachloride, were developed. Used as dry cleaning solvents, these solvents had two advantages over Stoddard Solvent in that they are non-flammable and fast-drying. However, because of toxicity and photochemical reactivity issues associated with TCE and carbon tetrachloride, they are no longer used in dry cleaning operations.

PERC

In the 1930s, another chlorinated solvent, perchloroethylene (Perc), was developed, and has become the solvent of choice of the dry cleaning industry today. Perc is non-flammable, does not break down readily under relatively high temperatures, and is stable in the presence of water and other chemicals. Perc has a low boiling point so that it is easy to distill, and dries rapidly. Perc has excellent soil removal properties (a Kauri-Butanol value of 92), and is comparatively safe to most textiles.

TCA AND CFC-113

Two other synthetic solvents have been introduced to the dry cleaning industry - 1,1,1-trichloroethane (TCA) and CFC-113. TCA is a more aggressive solvent than Perc, and may damage some delicate fabrics. It also breaks down in the presence of water to form acidic compounds that will corrode typical dry cleaning machines, requiring the use of stainless steel components or stabilizers. CFC-113 is a non-flammable gentle cleaner with low toxicity. However, both TCA and CFC-113 have been identified as harmful to the atmospheric ozone layer, and are scheduled to be phased out by 1996 under terms of the Montreal Protocol.

HCFCs

Three HCFCs (hydrochlorofluorocarbons) - HCFC-123, HCFC-141b and HCFC-225 have been suggested as a replacement for CFC-113. However, potential toxicity and low workplace exposure levels make it unlikely that the chemicals will be marketed to the dry cleaning industry. Additionally, HCFCs are only transitional compounds since they can still deplete the ozone and are slated to be phased out under the federal Clean Air Act. HCFC-141b will be phased out by the year 2003. After the year 2015, HCFC-123 and HCFC-225 will only be available for use in limited amounts as refrigerants or in medical devices, with both being completely phased out by the year 2030. (CEC, 1992; PPR, 1992; U.S. EPA, 1993; U.S. EPA, 1995)

HFCs

Another suggested alternative to Perc are the hydrofluorocarbons (HFCs). These chemicals do not contain chlorine so they do not deplete the ozone layer. One hydrofluorocarbon, HFC-43-10 is being investigated by its manufacturer as a potential dry cleaning solvent. (PPR, 1992; Wolf, 1996a)

Based on a 1991 survey, the ARB staff estimated that in California 83 percent of the dry cleaning industry uses Perc, compared with 15 percent for petroleum solvents, and 1 percent each for TCA and CFC-113. See Figure 1-1.

FIGURE 1-1.

Solvent Usage by Type

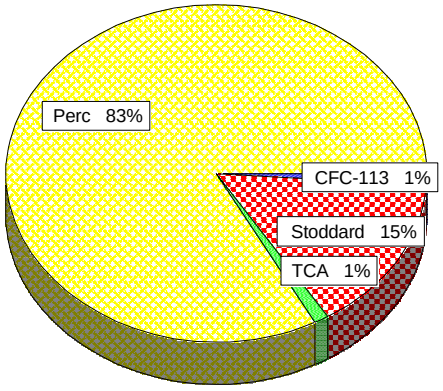


Table 1-1 lists the physical and chemical characteristics of Perc and other dry cleaning solvents. Table 1-2 lists the advantages and disadvantages of non-Perc dry cleaning solvents.

DISCUSSION QUESTIONS

1. What are the two ARB regulations affecting dry cleaners?
2. What types of requirements are prescribed by the Dry Cleaning ATCM?
3. What is the intent of the Environmental Training Program?
4. What are the benefits of operating more efficiently?
5. What other solvents are currently used in dry cleaning?
6. What are some disadvantages of Stoddard, TCA, and CFC-113 solvents?
7. What are some disadvantages of Perc?

Table 1-1. Dry Cleaning Solvent Characteristics

NAME OF SOLVENT	CHEMICAL FORMULA	MOLECULAR WEIGHT	FLASH POINT °C (°F)	BOILING POINT °C (°F)	KAURI-BUTANOL VALUE	HEAT OF VAPORIZA-TION (BTU)	OZONE DEPLETION POTENTIAL [a]
PERC	CCl_2CCl_2	166	none	121 (250°F)	92	90	--
CFC-113	CCl_2FCClF_2	188	none	48 (118°F)	31	63	0.80
TCA	CCl_3CH_3	134	none	75 (167°F)	124	104	0.10
STODDARD	Mixture	--	39 (103°F)	154 (310°F)	32 - 36	118	--
140°F	Mixture	--	60 (138°F)	185 (365°F)	34 - 39	N/A	--
EXXON DF-2000	Mixture	--	64 (147°F)	191-205 (376-401°F)	27	--	--
HCFC-141b	CCl_2FCH_3	117	none	32 (89°F)	57	95	0.12
HCFC-123	CCl_2HCF_3	153	none	29 (84°F)	60-70 est	75	0.02
HCFC-225	Mixture of Isomers	165	none	52-56 (124-133°F)	30-34	N/A	N/A

Source: ARB, 1993; Exxon, 1994; Exxon, 1995; PPR, 1992; U.S. EPA, 1995

a. Comparison based on CFC-11 with a value of 1.0. Estimates are based on preliminary data, except for CFC-113 and TCA.

Table 1-2. Technical Suitability of Alternative Dry Cleaning Solvents

NAME OF SOLVENT	TECHNICAL SUITABILITY	
	ADVANTAGES	DISADVANTAGES
CFC-113	• Good cleaning ability for delicate clothes • Non-flammable	• Not as strong as Perc • More expensive than Perc • Will be phased out by 1996
TCA	• Low cost • Non-flammable	• Agressive solvent causes dye bleeding and attacks plastics • Needs stabilizers • On-site recovery is complicated because of the stabilizers • Will be phased out by 1996
STODDARD	• Good cleaning ability	• Leaves trace odor on cleaned materials • Flammable • Expensive machine replacement • Long drying time
140° F	• Good cleaning ability • Less flammable than Stoddard solvent	• Long drying time • More expensive than Perc
EXXON'S DF-2000	• Good cleaning ability • Less flammable than Stoddard solvent • Low odor	• Flammable • Expensive machine replacement • Long drying time • Cleaning ability less than Perc
HCFC's	• Good cleaning ability • No flash point	• More expensive than Perc • Use will be banned worldwide

Source: Engineering Research Institute, California State University, Fresno, 1994; Wolf, 1996b

References

ARB, 1993. Technical Support Document to the Staff Report Proposed Airborne Toxic Control Measure for Emissions of Perchloroethylene and Proposed Environmental Training Program for Perchloroethylene Dry Cleaning Operations. State of California Air Resources Board Stationary Source Division, August 27, 1993.

CEC, 1992. Dry Cleaning: An Assessment of Emission Control Options. Center for Emissions Control, 1025 Connecticut Avenue N.W., Suite 712, Washington, D.C., 20036, September 1992.

Engineering Research Institute at California State University, Fresno. California Dry Cleaning Industry Task Force Final Report, February 1994.

Exxon, 1994. "Comparison of Typical Properties of Dry Cleaning Solvents." Exxon Chemical Company, P.O. Box 3272, Houston Texas, 77253-3272, March 1994.

Exxon, 1995. Material Safety Data Sheet for Exxon Chemical Dry Cleaning Fluid 2000, Exxon Chemical Company, P.O. Box 3272, Houston Texas, 77253-3272, March 13, 1995.

PPR, 1992. "Case Study: Pollution Prevention in the Dry Cleaning Industry: A Small Business Challenge for the 1990s". Pollution Prevention Review, Summer 1992.

U.S. EPA, 1993a. Federal Register, December 10, 1993, Protection of Stratospheric Ozone. 40 CFR Part 82, Volume 58, No. 236, Pg. 65018.

U.S. EPA, 1995. Federal Register, May 10, 1995, Protection of Stratospheric Ozone: Administrative Changes to Final Rule to Phase Out Ozone Depleting Chemicals. 40 CFR Part 82, Volume 60, No. 90, Pg. 25002-25003.

Wolf, 1996a. Letter to Robert Fletcher from Dr. Katy Wolf, Institute for Research and Technical Assistance, January 30, 1996.

Wolf, 1996b. Telephone conversation with Dr. Katy Wolf, Institute for Research and Technical Assistance, and Tina Najjar, on April 18, 1996.

CHAPTER 2

HEALTH EFFECTS OF PERCHLOROETHYLENE

INSTRUCTIONAL OBJECTIVES

Upon completion of this chapter, students will be able to:

- ❒ Understand that Perc is a toxic air contaminant;
- ❒ Know the health effects associated with exposure to Perc; and
- ❒ Better understand the health risks from dry cleaning operations.

KEY POINTS

1. Exposure to elevated levels of Perc can pose a potential public health hazard.
2. Perc is listed as a hazardous air pollutant (HAP) by the United States Environmental Protection Agency (U.S. EPA) and as a toxic air contaminant (TAC) by the Air Resources Board (ARB or Board).
3. Besides cancer, Perc can cause acute and chronic toxic health effects including: irritation of the respiratory tract, skin, and eyes, dizziness and diminished cognitive abilities, and liver and kidney damage.
4. The potential cancer risk from a particular dry cleaning facility depends primarily on the amount of Perc emitted, the type of dry cleaning machine used, the ventilation system, and the proximity of the facility to the nearest receptor.

A. SUMMARY

This chapter summarizes the identification of Perc as a TAC by the ARB and the listing of Perc as a HAP by the U.S. EPA. It also covers the health effects associated with exposure to Perc and the health risks to the public from dry cleaning operations.

B. ARB'S IDENTIFICATION OF PERC AS A TOXIC AIR CONTAMINANT

WHAT IS A TAC?

California Health and Safety Code section 39655(a) defines a TAC as "an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health."

AIR TOXICS PROGRAM HISTORY

In 1983, the California Legislature adopted Assembly Bill 1807 (AB 1807). AB 1807 mandated a program to identify and control toxic air contaminants. The program requires the Office of Environmental Health Hazard Assessment (OEHHA) to evaluate the health effects of a substance through the review of all available scientific studies to assess the health risks posed by that substance. The program also requires that, concurrent with the OEHHA evaluation, the ARB assess exposure to a substance based on its usage, emissions, and potential public exposure. The ARB and OEHHA compile this information into a report. This report is reviewed by the nine-member Scientific Review Panel (SRP), an independent scientific committee. For each substance they review, the SRP then prepares a recommendation for consideration by the Board. The Board makes the final decision regarding the listing of a candidate substance as a TAC at a public hearing. If the Board concurs with the findings that a substance is a toxic compound and poses a health risk, then the substance is listed by regulation as a TAC.

OEHHA EVALUATION

The OEHHA staff has performed an extensive assessment of the potential health effects of Perc, reviewing all available carcinogenicity data. This included two previous assessments by the International Agency for Research on Cancer (IARC) and the U.S. EPA. The conclusions for each of these studies is that Perc is a possible human carcinogen. OEHHA also concluded that Perc is a possible human carcinogen.

ARB EVALUATION

The ARB staff assessed the exposure to Perc based on its usage, emissions, and potential public exposure. The ARB staff concluded that the pubic's potential exposure to Perc could be relatively high. This is because of the significant number of Perc sources in the State, the close proximity to residences, and Perc's persistence in the atmosphere.

TAC ID HAP LISTING

The Board accepted the findings of the OEHHA and the ARB and identified Perc as a TAC in October 1991. At about the same time, the U.S. EPA listed Perc as a hazardous air pollutant (HAP) pursuant to section 7412 of Title 42 of the United States Code. If Perc had not gone through the ARB's formal identification process, it still would have been identified by the Board as a TAC because State law requires that the Board identify all federal HAPs as TACs.

C. PERC THRESHOLD LEVEL

A threshold level can be defined as a level of pollutant exposure below which no adverse health effects are likely to occur. In their evaluation of Perc, the OEHHA staff recommended that Perc be treated

as having no threshold exposure level because: (1) Perc is an animal carcinogen and a potential human carcinogen, and (2) presently, there is insufficient evidence available to designate an exposure level below which no significant adverse health impacts are anticipated.

D. POTENTIAL HEALTH EFFECTS ASSOCIATED WITH PERC EXPOSURE

PERC POTENCY VALUE

Exposure to Perc may result in both cancer and non-cancer health effects. OEHHA developed a cancer potency value to estimate the potential increased cancer risk to the public health as a result of exposure to a particular substance. Potency value can be expressed as a unit risk factor for inhalation exposures. A unit risk factor is defined as the estimated probability of a person contracting cancer as a result of constant exposure to an ambient concentration of one microgram per cubic meter ($\mu g/m^3$) over a 70 year lifetime. OEHHA's best estimate of the potency value for Perc is 5.9 chances in a million when exposed to one microgram per cubic meter. (CAPCOA, 1993) One microgram per cubic meter of Perc is approximately 0.15 parts per billion (ppb) of Perc at 25 degrees Celsius. This would make the potency value for Perc approximately 40 chances in a million when exposed to one ppb of Perc. In other words, if you had a million people exposed to one ppb of Perc over 70 years, potentially 40 people would get cancer. This risk or potency value represents the upper range of plausible risk; the actual cancer risk may be significantly lower.

NON-CANCER HEALTH EFFECTS

Short-term (acute) and long-term (chronic) exposure to Perc may result in non-cancer health effects. Acute toxic health effects resulting from relatively prolonged exposure to high levels of Perc may include headaches, dizziness, rapid heartbeat, and irritation or burns on the skin, eyes, or respiratory tract. Massive acute doses can induce central nervous system depression resulting in respiratory failure. Chronic exposure to lower Perc levels may result in dizziness, impaired judgement and perception, and damage to the liver and kidneys over a longer period of time.

E. POTENTIAL HEALTH RISKS FROM PERC DRY CLEANING OPERATIONS

HEALTH RISKS

Using the cancer potency factor discussed above, the potential risk of harm to public health from Perc dry cleaning operations can be estimated. The potential cancer risks from dry cleaning can be viewed using two approaches: the impact from a single cleaner and the impact from all dry cleaners statewide. The first approach uses the maximum increased cancer risk to an individual living near a dry cleaner, called the

maximum individual risk. Maximum individual risk is determined by measuring or estimating the emissions of substances from a facility, calculating the downwind concentration of that substance using an air dispersion model, and applying (multiplying) the potency value. The second approach uses the total potential cancer impact from dry cleaning on all people in the state, called the cancer burden.

INDIVIDUAL CANCER RISK

At the time that the Dry Cleaning ATCM was adopted, the ARB staff estimated that the maximum individual risk near most dry cleaners generally ranges from about 50 to 500 chances in a million. The potential risk near existing dry cleaners with the highest emissions is estimated to be approximately 1,000 to 2,000 chances in a million. The potential risk from a particular dry cleaner depends primarily on the amount of Perc emitted, the ventilation system used, and the proximity of the dry cleaner to the nearest receptor. The potential risk to people living in the same building as a dry cleaning facility (co-located) may be significantly higher than the risk to people living near the same facility.

STATEWIDE CANCER RISK

Based on actual air monitoring data from around the state, the ARB staff estimated the existing statewide potential cancer burden from Perc dry cleaning operations is estimated to be about 250 cases over 70 years.

NON-CANCER RISK

The potential for non-cancer health effects from Perc levels near dry cleaners was also evaluated by the ARB staff. It was estimated in 1993 that approximately four percent of the state's cleaners had Perc concentrations outside the facility that exceed the reference level of 1000 ppb for short-term (1-hour) acute exposure. About 12 percent of the cleaners may exceed the reference level of 5 ppb for long-term (annual) chronic exposure.

DISCUSSION QUESTIONS

1. What is a Toxic Air Contaminant (TAC)?
2. Why did the ARB list Perc as a TAC?
3. What is the role of the Office of Environmental Health Hazard Assessment (OEHHA)?
4. Why were OEHHA and the ARB concerned with Perc in dry cleaning operations?
5. What are the acute (short-term) effects of Perc?
6. What are the chronic (long-term) effects of Perc?
7. What is the potential individual cancer risk?
8. What is the potential statewide cancer risk?

References

CAPCOA, 1993. CAPCOA Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines. Toxics Committee of the California Air Pollution Control Officers Association (CAPCOA), October 1993.

[Blank Page]

CHAPTER 3

PERCHLOROETHYLENE USAGE AND EMISSIONS

INSTRUCTIONAL OBJECTIVES

Upon completion of this chapter, students will be able to:

- ❒ Know the chemical and physical properties of Perc;
- ❒ Know the difference between vented and fugitive emissions; and
- ❒ Identify the dry cleaning machines that minimize Perc emissions.

KEY POINTS

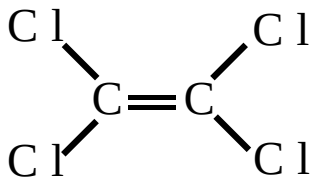
1. Perc is a non-flammable, colorless, dense liquid with a sweet, sharp odor. As a liquid, it is heavier than water. In the vapor phase, Perc vapors are heavier than air.
2. Dry cleaning operations use 60 percent of the Perc consumed in California.
3. Perc is emitted to the atmosphere from both vented and fugitive emissions. Sources of vented emissions include washer and dryer vents, inductive door fans, stills and muck cookers. Sources of fugitive emissions include liquid and vapor leaks around the dry cleaning machine, from the opening of the drum door, and residual Perc that remains in the clothes.
4. Closed-loop machines have no vented emissions and lower fugitive Perc emissions than vented and transfer machines.
5. The Dry Cleaning ATCM will result in a 78 percent reduction in statewide Perc emissions from Perc dry cleaning operations.

A. SUMMARY

This chapter covers the chemical and physical properties of Perc, the different emissions from dry cleaning operations, the ARB's survey of dry cleaners, and the emissions reductions expected with the implementation of the Dry Cleaning ATCM.

B. PROPERTIES OF PERC

Perc is a chlorinated aliphatic hydrocarbon compound with the chemical structure seen here. At room temperature, Perc is a non-flammable,



PERC PROPERTIES

colorless, dense liquid with a sweet, sharp odor. It does not dissolve easily in water and when mixed together, the Perc and water will form two distinct layers. This is because Perc is much heavier than water (13.6 pounds per gallon vs. 8.4 pounds per gallon) and it settles to the bottom. Perc will mix with some other solvents such as alcohol, ether, and benzene. In vapor form, Perc is heavier than the surrounding air and, in an environment without mixing, will tend to settle in a layer just above the floor. In most facilities, however, air movement mixes the different layers so that the Perc vapors will be dispersed throughout the room. Table 3-1 lists the chemical and physical properties of Perc.

TABLE 3-1.
Properties of Perchloroethylene

Chemical Formula	$CCl_2 = CCl_2$
Physical State	Liquid (@ room temperature)
Molecular Weight	165.8
Weight per Gallon (@ 60°F)	13.6 pounds
Specific Gravity (@ 60°F)	1.63
Boiling Point (760 mm Hg)	250°F
Vapor Pressure (@ 60°F)	12mm Hg
Vapor Density (Air = 1)	5.8
Freezing Point	-9°F
Flash Point	none

Source: CEC, 1993.

C. PERC USAGE IN CALIFORNIA

PERC USAGE

Based on a survey of California Perc distributors, the ARB staff estimated that in 1991, California industries used a total of 1,870,000 gallons of Perc. Figure 3-1 lists the consumption of Perc in the following uses: dry cleaning, degreasing, paints and coatings, adhesives, aerosols, specialty chemical production, printing inks, silicones, rug shampoos, laboratory solvents, and other miscellaneous uses. Dry cleaning operations accounted for about 1,100,000 gallons (or approximately 60 percent) of the 1,870,000 gallons of Perc used in California.

D. EXISTING EMISSIONS FROM PERC DRY CLEANING OPERATIONS

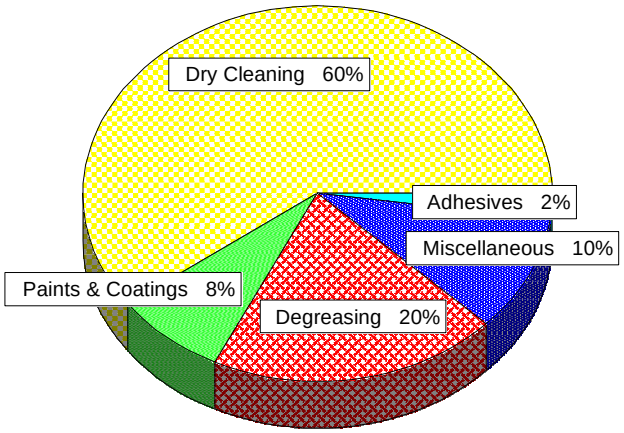
VENTED EMISSIONS

Perc emissions from dry cleaning operations can be categorized as vented emissions and fugitive emissions. Vented emissions include the venting of Perc-containing air (1) from vents in the washer or dryer

units, (2) by inductive fans when machine doors are opened, and (3) from the operation of distillation and muck cooker units. The most significant

FIGURE 3-1.

Perc Usage by Industry



VENTING DURING AERATION

source of vented emissions is from the dryer vent where Perc-containing air is exhausted during the aeration step of the drying cycle. During aeration, fresh air is introduced into the dryer to evaporate residual Perc remaining in the clothes. The Perc-containing air is then vented through a control device or directly to the outside air. The washer vent in the washer unit of a transfer machine is also a source of vented emissions. Closed-loop and converted machines continually recirculate the Perc-containing air through a refrigerated condenser during the entire drying cycle and do not vent or exhaust this air to the atmosphere; therefore, these machines have no vented emissions.

DOOR FAN, STILL, AND MUCK COOKER EMISSIONS

Vented emissions also occur from machines with inductive door fans, still operations, and muck cooker operations. When a washer door (for a transfer machine) or dryer door is opened to either unload or load a machine, a fan turns on to route the Perc-containing air in the drum away from the machine operator. This air stream is vented to the outside air either directly or through a small carbon adsorber. During the operation of stills and muck cookers, dirty solvent or filter muck is heated and the resulting Perc vapors are passed through a condenser for solvent recovery. The remaining vapors are vented to the outside air through a stack or through a control device.

FUGITIVE EMISSIONS

The greatest source of fugitive emissions results from the process of transferring clothing from a washer to a dryer in a transfer machine.

In addition, liquid and vapor fugitive emissions leaks occur around pumps, valves, flanges, seals, gaskets, and hose couplings. They also occur as a result of open doors or access areas, spotting and pressing operations, water-proofing treatments, waste distillation and recovery operation of stills and muck cookers, evaporation losses from spent filters, and residual Perc remaining in clothing.

E. ARB'S SURVEY OF DRY CLEANERS

EQUIPMENT SURVEY

In 1991, the ARB staff sent out survey questionnaires to over 6,000 potential Perc dry cleaning facilities in the State. Based on extrapolation of survey data from over 2,000 respondents, the ARB estimated the following:

- 4,800 Perc dry cleaning facilities in California;
- 5,300 Perc dry cleaning machines;
- 247 million pounds of materials dry cleaned annually;
- 1.1 million gallons (7,425 tons) of Perc used annually; and
- 742,000 gallons (5,008 tons) of Perc emitted annually.

From the survey, the ARB estimated that about 60 percent of the existing dry cleaning machines are closed-loop machines, followed by vented machines (33 percent), and transfer machines (8 percent). Closed-loop machines are the newest technological design and are the most efficient. Table 3-2 summarizes the statewide distribution of dry cleaning machines and Perc emissions by machine type in 1991.

TABLE 3-2.
1991 STATEWIDE DISTRIBUTION OF MACHINES AND PERC EMISSIONS BY MACHINE TYPE

MACHINE TYPE	PERCENT OF MACHINES	EMISSIONS (GAL/YR)	PERCENT OF EMISSIONS
Transfer	8	134,000	18
Vented	35	331,400	45
Converted	4	30,100	4
Closed-Loop	53	246,500	33

Source: ARB, 1993

F. POST-IMPLEMENTATION EMISSIONS REDUCTION

PERC EMISSIONS REDUCTION

The information in Table 3-2 was used as the basis for the equipment requirements of the Dry Cleaning ATCM. When fully implemented, the Dry Cleaning ATCM will result in a 78 percent reduction in statewide Perc emissions from Perc dry cleaning operations. This equates to a reduction of almost 600,000 gallons of Perc per year.

DISCUSSION QUESTIONS

1. What is Perc?
2. What industry uses 60 percent of all Perc distributed in the State?
3. What types of machines have vented emissions?
4. Where would fugitive emissions occur?
5. Which type of dry cleaning machine is the most efficient?
6. How much will statewide emissions of Perc be reduced by the Dry Cleaning ATCM?

References

ARB, 1993. Technical Support Document to the Staff Report Proposed Airborne Toxic Control Measure for Emissions of Perchloroethylene and Proposed Environmental Training Program for Perchloroethylene Dry Cleaning Operations. State of California Air Resources Board Stationary Source Division, August 27, 1993.

CEC, 1993. The Safe Handling of Perchloroethylene Dry Cleaning Solvent. Center for Emissions Control, 1025 Connecticut Avenue N.W., Suite 712, Washington, D.C., 20036. September 1992.

CHAPTER 4

WORKING WITH PERCHLOROETHYLENE

INSTRUCTIONAL OBJECTIVES

Upon completion of this chapter, students will be able to:

- ❒ Understand a Material Safety Data Sheet (MSDS);
- ❒ Know the signs of excessive exposure; and
- ❒ Identify required personal protective equipment.

KEY POINTS

1. An MSDS provides physical data, precautionary labeling, health hazard data, and handling procedures.
2. Excessive exposure to Perc can be a health hazard. Initial effects of overexposure to Perc include nose and eye irritation, dizziness, light-headedness, mental dullness, and loss of coordination.
3. Workplace exposure can be minimized through a combination of proper ventilation, good equipment, and good operating practices.
4. Workers should take special precautions and wear special equipment when handling Perc.

A. SUMMARY

When proper safety precautions are observed, Perc can be stored, handled, and used safely. If not, Perc can present a health hazard. The hazard can be minimized by promoting a safe working environment and limiting exposure to Perc. This is done through the use of engineering controls, an understanding of the chemical being used, personal protective equipment, and ventilation equipment.

One way to learn about Perc is to familiarize yourself with the Material Safety Data Sheet (MSDS). An important section of the MSDS covers the signs of excessive exposure. Finally, you need to know the personal protective equipment that you can wear to minimize your exposure. Each of these three items is covered in further detail below.

B. MATERIAL SAFETY DATA SHEET

THE MSDS

The MSDS is required by the federal Occupational Safety and Health Administration (OSHA) Hazard Communications Standard

(often referred to as the "employee right-to-know"). MSDSs are available from solvent manufacturers and suppliers, and provide product information, hazard data, and handling procedures at a minimum. Although the formats vary, the contents are generally similar. Each MSDS contains the items listed below. Some of the specifics for Perc are also included. (See Appendix C for a sample of the MSDS for Perc.)

INFORMATION IN THE MSDS

- Letterhead - provides the name of the manufacturer, vendor or supplier.

- Product Identification - provides the manufacturer's trade name for a chemical, its generic name, and the Chemical Abstract Service (CAS) number. CAS is a cataloging system used for chemical identification.

  Perchloroethylene and tetrachloroethylene are two generic names. The CAS number for Perc is #000127-18-4.

- Precautionary Labeling - provides health, flammability, reactivity, and contact numbers; a pictogram of required equipment; and a warning label.

  The J.T. Baker MSDS SAF-T-DATA* System for chemicals uses a numerical ranking to indicate risk. For Perc, this company's MSDS indicates a severe health risk (three), a moderate contact risk (two), a slight reactivity risk (one), and no flammability risk (zero). The pictogram indicates that gloves, goggles, an apron and good ventilation are required when handling Perc. (J.T. Baker, 1994) (* Trademark of J.T. Baker)

- Physical Data - provides information such as the boiling point, vapor pressure, solubility, appearance, and odors.

- Fire and Explosion Hazard Data - provides data on flashpoint, extinguishing media, and fire-fighting equipment.

  Perc is not flammable, but closed containers exposed to heat may explode. Firefighters need to wear positive pressure self-contained respiratory equipment.

- Health Hazard Data - discusses carcinogenicity and non-cancer effects of overexposure on internal organs, skin and eyes through either physical contact, inhalation, or ingestion. It also discusses medical conditions generally aggravated by exposure, primary

routes of entry, state and federal hazard catagories and lists (SARA/TITLE III), and emergency and first aid procedures.

- Reactivity Data - discusses stability, incompatibility (materials to avoid contact with Perc), and hazardous products of decomposition.

  Perc is generally stable, but open flames or other high temperature sources will induce thermal decomposition. Products of decomposition include hydrochloric acid and small amounts of phosgene and chlorine. Contact with strong acids and oxidizing materials will cause Perc to decompose.

- Handling Procedures - discusses transportation, storage and handling precautions, spill actions and disposal practices, ventilation, and use of personal protective equipment.

C. SIGNS OF EXCESSIVE EXPOSURE TO PERC

EXCESSIVE EXPOSURE

One of the areas covered in the MSDS health hazard data is exposure. The initial effects of overexposure to Perc include nose and eye irritation, dizziness, light-headedness, mental dullness, and loss of coordination. These effects can combine to cause accidents. If the symptoms occur, the person should move to a fresh air environment. This will usually result in a rapid recovery. However, daily overexposure to higher concentrations over a long term may cause dizziness or other more serious side effects such as liver damage.

Exposure to continual and extremely high vapor concentrations in confined or inadequately ventilated areas can cause severe depression of mental functions, respiratory failure, and at concentrations of 1500 ppmv or higher, unconsciousness. Table 4-1 lists the exposure limits for Perc established by State and Federal OSHAs and the American Conference of Governmental Industrial Hygienists (ACGIH).

TABLE 4-1.
EXPOSURE LIMITS FOR PERCHLOROETHYLENE

Type of Limit	Vapor Concentration (ppmv)
ACGIH TLV[a]; State OSHA PEL[b]	25
ACGIH STEL[c]; Federal OSHA PEL[b]	100
Federal OSHA Ceiling[d]	200
State OSHA Ceiling[e]; Federal OSHA Peak[f]	300

Sources: CEC, 1993 and Cal/OSHA General Industry Safety Orders - Section 5155.

Footnotes:

a. Threshold Limit Value (TLV) - The 8-hour Time-Weighted-Average (TWA) airborne concentration of Perc to which nearly all workers may be repeatedly exposed to day after day without adverse effects.

b. Permissible Exposure Level (PEL) - The maximum permitted 8-hour TWA concentration of Perc.

c., d. Short Term Exposure Level (STEL); Ceiling (Federal definition) A 15-minute TWA exposure that should not be exceeded at any time during the workday.

e. Ceiling (State definition) - The maximum concentration of Perc to which an employee may be exposed at any time.

f. Peak - The maximum allowable peak (5 minute average) above the Federal Ceiling in any 3-hour period.

Table 4-2 lists some of the physical reactions due to exposure to various concentrations of Perc.

REACTIONS TO PERC EXPOSURE

TABLE 4-2.
INHALATION RESPONSE TO PERCHLOROETHYLENE

Parts Per Million by Volume	Typical Physiological Responses
50	• Odor threshold to unacclimated persons
100	• Faint odor definitely apparent to unacclimated persons
200	• Moderate to faint odor upon exposure • Faint to moderate eye irritation • Minimal light-headedness • Eye irritation threshold -- 100-200ppm
400	• Strong and unpleasant odor • Definite eye irritation • Slight nose irritation • Definite lack of coordination (2 hours)
600	• Strong odor, very unpleasant but tolerable • Definite eye and nose irritation • Dizziness, loss of inhibitions (10 minutes)
1000	• Very strong, intense, and irritating odor • Marked irritation to eyes and respiratory tract • Considerable dizziness, not likely to be tolerated voluntarily (2 minutes)
1500	• Almost intolerable odor, "gagging" • Intolerable irritation to eyes and nose • Complete lack of coordination in minutes to unconsciousness within 30 minutes

Source: VIC Manufacturing Installation Manual, 1992

D. VENTILATION

WORKPLACE VENTILATION

The best way to ensure that indoor concentrations of Perc remain below established exposure limits is through good ventilation in the workplace, along with a combination of good equipment, and good operating and maintenance practices. A general ventilation and exhaust system draws fugitive Perc emissions from the workroom to the outside

of the building. The ventilation system should provide one or more air changes every five minutes in all areas with solvent emissions, including the machine area, waste handling and storage areas, spotting and pressing areas, and clothes storage areas. The exhaust vent should be located away from air intakes so that no exhaust is likely to re-enter the building.

E. PERSONAL PROTECTIVE EQUIPMENT

Workers should take special precautions and wear special equipment to avoid contact with Perc. This includes:

Protecting the Eyes

SAFETY GLASSES AND GOGGLES

Eye contact with Perc will cause discomfort, pain and redness. Operators should wear safety glasses. In cases where liquid splash contact is likely, chemical splash goggles should be worn. Each operator should have their own face-fitting goggles with splash-proof sides and fog-free lenses. Goggles should be stored in an easily accessible area and cleaned with a mild detergent after each use.

Operators should also wear goggles during dip tank operations for applying water repellents, while using bleach, ammonia, or fluoride salt baths, and during draining of the still or muck cooker. Goggles are also suggested for spotting operations.

Eyewash Stations

Eyewash stations are required when substances are being used that are harmful to the eyes. They should provide a soft stream or spray of water for a continuous flow of at least 15 minutes. If chemical contact has occurred, you should flush the eyes for a period of at least fifteen minutes.

Protecting the Skin

Prolonged and/or repeated contact with Perc can cause rough and dry skin which is more susceptible to infection. Perc can penetrate the human skin and be detected in the blood stream.

1. Protective Gloves

GLOVES

Chemical-resistant gloves should be worn when the skin is exposed to contact with various chemicals. Gloves should be worn when transferring clothing, changing filter cartridges, cleaning lint filters

and button traps, removing still or cooker residues, and during any type of water-repellent dip-tank operations.

Glove materials differ in their resistance to chemicals. Gloves made of Viton™ are the most resistent to Perc. Other types such as nitrile and Silver Shield™ are satisfactory, but not as resistant to Perc. Butyl, latex, rubber, and vinyl gloves are not recommended because of their rapid rate of chemical degradation when in contact with Perc.

2. Protective Clothing

OSHA regulations do not require protective clothing, and no precautions other than clean body-covering clothing are needed for brief contact with Perc. However, for prolonged or frequent contact such as transfer operations, you should guard against contact by using clothing inpervious to Perc. Necessary items of clothing may include aprons (made of neoprene) or full body suits. These items should meet strength, chemical resistance, and flexibility requirements, and be easy to clean.

3. Protective Footwear

Shoes should be worn at all times in buildings where chemicals are stored or used. Since Perc will easily penetrate normal footwear, OSHA regulations require protective footwear, such as neoprene overboots, to be available for use in the case of a Perc spill.

Respiratory Protection

RESPIRATORS

In some situations, such as Perc spills or the cleaning of stills and muck cookers, respiratory protection should be used. The half-face air purifying (organic-vapor cartridge) type respirator, approved by the National Institute of Occupational Safety and Health (NIOSH), is usually sufficient for concentrations encountered during most routine operations. This respirator is suitable for activities including changing filter cartridges, removing still or cooker residues, or performing a large number of clothing transfers each day (transfer operations).

DISCUSSION QUESTIONS

1. What is the federal OSHA Hazard Communication Standard also known as?
2. What are the initial effects of exposure to Perc?
3. What are some of the effects of over-exposure to Perc?
4. What is California's permissible exposure level for Perc?

5. What is the best way to keep indoor Perc concentrations below established exposure limits?
6. What types of operations are most likely to result in the highest exposure?
7. What kinds of personal protective equipment should be worn during operations where Perc exposure is high?
8. When should you wear a respirator?

References

Cal/OSHA, 1980. Title 8, California Code of Regulations, General Industry Safety Orders - Section 5155, October 1993.

CEC, 1993. The Safe Handling of Perchloroethylene Dry Cleaning Solvent. Center for Emissions Control, 1025 Connecticut Avenue N.W., Suite 712, Washington, D.C., 20036. September 1992.

J.T. Baker, 1994. Material Safety Data Sheet for Tetrachloroethylene (Perc), J.T. Baker Inc., 222 Red School Lane, Phillipsburg NJ 08865, July 13, 1994.

VIC, 1992. "Installation, Operation, and Maintenance Instructions for VIC 1200F/S and 1200 Advanced Series Drycleaning Machines", VIC Manufacturing, July 1992.

[Blank Page]

CHAPTER 5

DRY CLEANING EQUIPMENT AND OPERATIONS

INSTRUCTIONAL OBJECTIVES

Upon completion of this chapter, students should be able to:

- ❒ Identify the major steps of the dry cleaning process;
- ❒ Identify the different types of dry cleaning machines;
- ❒ Know what types of machines are required by the Dry Cleaning ATCM;
- ❒ Identify major components of the dry cleaning machine; and
- ❒ Identify primary, secondary, and fugitive control devices.

KEY POINTS

1. There are two types of dry cleaning machines: transfer and dry-to-dry.
2. Dry-to-dry machines can be further classified as vented, closed-loop and converted machines.
3. Transfer machines are generally the highest emitters with closed-loop machines being the lowest emitters.
4. Equipment meeting the Dry Cleaning ATCM requirements can also benefit the dry cleaner with higher mileage and lower disposal and operating costs.
5. Secondary control systems can reduce both fugitive emissions and operator exposure to Perc.
6. Improper operations of filters, muck cookers, stills and other miscellaneous dry cleaning equipment can result in significant Perc emissions.
7. A properly operated waste water treatment units can be an effective way to reduce waste water disposal costs.

A. SUMMARY

This chapter briefly summarizes the dry cleaning process, the different types of dry cleaning machines, the recovery devices, and the miscellaneous equipment associated with dry cleaning operations. It is important to understand this information in order to properly operate and maintain the equipment. Dry cleaners are knowledgeable about the operations of a dry cleaning plant and the equipment; however, this chapter will reinforce what they may already know.

B. DRY CLEANING PROCESS

CLEANING PROCESS

The major cycles in the Perc dry cleaning process are the same as home laundering except that the fabric is cleaned with Perc instead of water. Those cycles are: the wash cycle, in which a small amount of detergent and Perc are added to the materials and then agitated; an extraction cycle during which the materials are spun in order to recover excess Perc; and a drying cycle where the materials are tumble dried in heated air. The last step in the drying cycle is called an aeration or deodorization step in a vented machine and a cool-down step for a closed-loop machine. In these steps, cool air is used to remove any residual solvents within the drum and to reduce the temperature of the materials.

The Perc is purified during the wash and extraction cycles by passing the solvent through filters which trap insoluble residues and solids. After extraction, the filtered solvent is either routed to the charged solvent tank or to the still. During the drying cycle, the Perc-laden air stream leaving the drum is chilled to condense both Perc and water vapor. The resulting liquid is routed to the water separator. The water separator allows the Perc to settle out and return to the solvent tank, while the remaining water is treated as a hazardous waste.

C. MACHINE TYPES

The two basic types of dry cleaning machines are transfer and dry-to-dry machines. Dry-to-dry machines can further be broken down into three machine categories: vented, converted, and closed-loop machines.

Transfer Machines

TRANSFER MACHINES

Transfer machines clean and dry materials in separate units. The operation of a transfer machine is very similar to the operation of a typical home water-laundering machine or dryer. The materials are cleaned in a washing unit. Once the wash cycle ends, most of the Perc is extracted during the spin cycle. The materials are then manually transferred from the washing unit to a separate drying (reclaimer) unit. The reclaimers can be either vented or non-vented. One of the advantages of a transfer machine is that you can clean more materials over time because the washer and dryer may be operated at the same time.

The drawback to transfer machines is their high emission of Perc. After the extraction cycle, the load of materials can contain

2 to 3 gallons of Perc per 100 pounds of materials cleaned. (SRRP, 1992) Materials wet with Perc must be physically transferred from the washer to the dryer; thereby, exposing the operator to high levels of Perc, and emitting Perc to the atmosphere. The longer it takes to complete the transfer of the wet materials to the dryer, the higher the Perc emissions to the atmosphere. The ARB staff estimated that transfer machines produce approximately four times the emissions compared to well operated closed-loop dry-to-dry machines, and are the highest emitters of any dry cleaning machine. Higher emissions correlate to lower Perc mileage[1] and higher operating costs.

Dry-to-Dry Machines

DRY-TO-DRY MACHINES

Dry-to-dry machines clean and dry materials within the same cylinder (or drum, or basket). Dry-to-dry units generally have higher mileages than transfer machines. This is because the transfer of Perc-soaked materials from the washer to the dryer is eliminated.

There are three types of dry-to-dry machines: vented, converted, and closed-loop machines. Of the dry-to-dry machines a well operated closed-loop machine has the lowest emissions in comparison to a well-operated vented or converted machine.

Vented machines have an aeration (or deodorizing) step during the drying cycle, in which cool outside air is introduced to the machine's cylinder. This air strips away most of the Perc solvent vapors remaining within the machine and materials. The air is then usually vented through a carbon adsorber, or similar emission control device, before being released to the atmosphere.

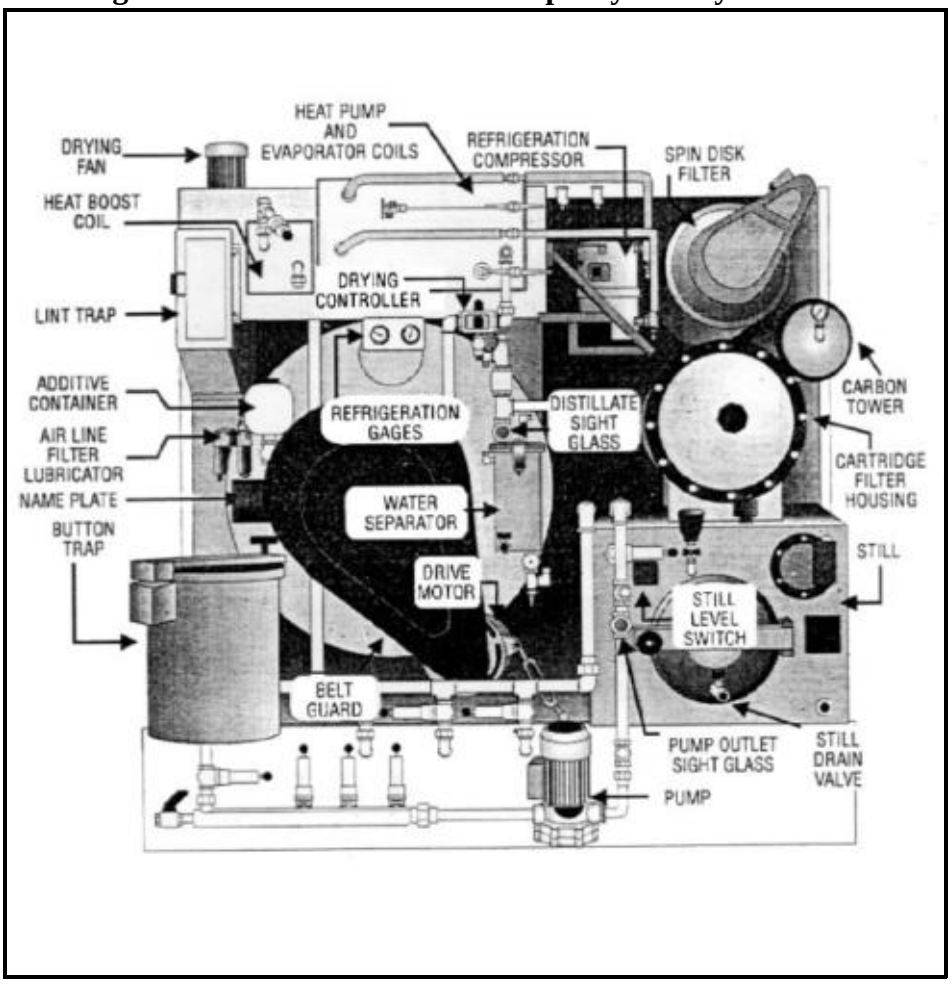
In the cool-down step of both closed-loop and converted machines, the heating coils are turned off, and the refrigerated condenser continually cools the Perc-containing air stream, and recirculates it back to the drum. Most of the Perc vapor is removed by condensation, since the cooler air is unable to retain as much Perc as warm air. At the end of the cool-down step, the temperature of the air exiting the condenser should be less than or equal to 45°F. Figure 5-1 shows the back of a closed-loop dry to dry machine.

Closed-loop machines have been improved with the incorporation of secondary control systems. The secondary control systems are usually

[1]Mileage is the gallons of Perc consumed per pound of materials cleaned. Machines with high mileage consume less Perc per pound of materials cleaned than machines with low mileage.

activated at the cool down step of the drying cycle by routing the Perc vapor from the drum through a vapor adsorber, which strips the Perc vapors from the air stream. The air is then recirculated back through the drum to pick up more residual Perc vapors. At the end of the drying cycle, the Perc concentration in the drum should be less than 300 parts per million by volume (ppmv).

Figure 5-1. Back of a Closed-Loop Dry-to-Dry Machine



Grossman, 1994

Converted Machines

CONVERTED MACHINES

A converted machine is a dry-to-dry vented machine that has been modified by eliminating the aeration step with the installation of a refrigerated condenser. This provides for the recirculation of Perc-laden air through the refrigerated condenser and results in no exhaust to the atmosphere during the drying cycle. The Dry Cleaning ATCM contains specifications for converted machines. Refer to Chapter 6 for the specifications.

The major benefit of converting a vented machine is that it costs less to convert than buy a new machine. The drawback is that it is not as efficient as a factory closed-loop machine. Some machines could be too old to convert because the remaining life would not warrant the investment a dry cleaner would have to make.

D. PRIMARY CONTROL DEVICES

Over the years, the use of Perc recovery devices is common in the dry cleaning industry because of economic considerations, environmental concerns, concerns about worker exposure, and regulatory actions. Primary control devices such as refrigerated condensers and carbon adsorbers, are the most commonly used control devices. A third type of primary control device is the polymeric vapor adsorber, which is a relatively new and unproven technology.

Refrigerated Condensers

REFRIGERATED CONDENSERS

Refrigerated condensers have been used on all types of dry cleaning machines as a primary control system. They are efficient at removing Perc from an air stream, while being relatively easy to maintain. Vented machines with one-pass refrigerated condensers may achieve up to 70 percent collection efficiency, while closed-loop machines are capable of achieving greater than 95 percent collection efficiency. (SRRP, 1990)

Refrigerated condensers operate throughout the drying cycle, in which Perc-laden air is continually recirculated through the condenser. The condenser recovers both Perc and water vapors from the air stream, sending a liquid Perc and water mixture to a water separator. The Perc recovered by the water separator then goes to the solvent storage tank. During the drying cycle, the air stream circulates past the refrigerated condenser, is reheated by the heating coils, circulates through the drum evaporating more Perc from the materials, and then flows through the condenser again where the Perc is recovered.

During the cool-down step of the drying cycle, the air stream is no longer reheated, leaving the refrigerated condenser to cool the air stream further and recover more Perc. At the end of the cool-down step, the temperature of the air exiting the refrigerated condenser should be less than or equal to 45°F. At 45°F, the Perc concentration in the drum is approximately 8,600 parts per million volume (ppmv).

Vapor Adsorbers

Vapor adsorbers are control devices that use activated carbon, synthetic polymer adsorbent, or other substances, to trap Perc vapors and allow the solvent to be recovered later. The two types of vapor adsorbers are discussed below:

1. Carbon Adsorbers

CARBON ADSORBERS

A carbon adsorber is the most common vapor adsorber used as primary control devices on both transfer and vented dry-to-dry machines. During the drying cycle for these machines, the Perc-laden air is passed through water-cooled coils to condense Perc and water vapors from the machine. The Perc and water mixture is sent to a water separator where the Perc is recovered and returned to the solvent tank.

For a dry cleaning machine with a carbon adsorber, the final step in the drying cycle is the aeration step. During the aeration step, outside air is forced through the machine to drive off remaining Perc vapors. This air is then exhausted through the carbon adsorber.

A carbon adsorber consists of an activated carbon bed contained in a housing. A fan draws air containing Perc vapors through the carbon bed, where the Perc is adsorbed. The Perc adsorbed in the bed is later removed by desorbing, or stripping, the carbon with steam or hot air. The solvent vaporized by the steam or hot air is recovered by a condenser downstream.

Carbon adsorbers must be diligently maintained by the facility operators to be an effective control device. If not properly monitored and maintained, the Perc vapors will saturate the carbon bed preventing more Perc from being recovered. At this point, Perc vapors will be emitted directly into the air. One reason that carbon adsorbers are being phased out as primary control devices is because of the extensive maintenance needed to ensure the effectiveness of the carbon bed.

The predominant waste stream associated with carbon adsorbers is the waste water from steam desorption (stripping) of the carbon bed. The waste water is contaminated with Perc; therefore, it is a hazardous waste and must be either hauled away by a registered hazardous waste hauler, or treated in a waste water treatment unit. Carbon beds desorbed by hot air would eliminate this waste stream.

2. Polymeric Vapor Adsorber

TVS

Dow Chemical has a system under development called Temporary Vapor Storage, or TVS. This involves a new adsorption technology which uses a synthetic polymeric adsorbent bed. During the drying cycle, the bed adsorbs the Perc vapors and stores the Perc while the cool-down step finishes and the materials are unloaded. The polymeric bed is desorbed by heating when the next load is being placed into the machine. The resulting Perc vapors are suspended in recirculating hot air during machine loading, then the Perc vapors are routed to the wash wheel as the next wash cycle begins. The main advantage of this technology is that it does not use steam to desorb the polymeric adsorbent bed, so it does not generate waste water containing Perc.

E. SECONDARY CONTROL DEVICES

SECONDARY CONTROL DEVICES

Generally, a major source of Perc emissions from closed-loop machines is from opening the cylinder door at the end of the drying cycle to remove materials. The concentration of Perc in the drum at the end of the drying cycle can be as high as 8500 to 8600 ppmv. (ARB, 1993). The operation of secondary control devices can significantly reduce Perc concentrations in the drum and, therefore, reduce fugitive emissions and Perc consumption. Some manufacturers of the secondary control devices claim that their devices can reduce the concentration of Perc in the drum to between 40 and 100 ppmv. The Dry Cleaning ATCM requires that closed-loop machines with secondary control systems reduce the concentration of Perc in the drum to less than 300 ppmv at the end of the drying cycle.

A secondary control device is a type of vapor adsorber, which generally operates in series after the refrigerated condenser on a closed-loop machine. Secondary control devices are activated at the end of the cool down step, before the machine door is opened. These devices normally route Perc vapors from the drum and button and lint traps through a vapor adsorber, which strips the Perc vapors from the air. The air is then recirculated back through the drum and traps to pick up more residual Perc vapors. After the Perc is adsorbed, it must eventually be desorbed from the vapor adsorber or breakthrough will occur. Most secondary devices use electrically- or steam-heated air or heating coils to strip the Perc from the vapor adsorber. The resulting Perc vapors are then routed through a condenser where they are condensed and routed to a Perc-water separator. Steam does not come into direct contact with the vapor adsorbent bed. Thus, no additional waste water is generated from the desorption step.

F. SOLVENT FILTRATION

Solvent filters remove insoluble soils, such as dirt, sand, dust, lint, ashes, and hair, and prevent these materials from redepositing onto the materials during the wash cycle. A button trap can be considered a solvent pre-filter in that it removes larger objects, such as pins and buttons, from the solvent stream before they can reach and damage the pump. There are three main types of filter devices used in dry cleaning: cartridge filters, spin disk filters, and regenerative (or flex-tube) filters.

Cartridge Filtration

CARTRIDGE FILTERS

Cartridge filters are among the most popular and widely used filter medium in the industry. Cartridge filters are available in regular, large or jumbo sizes. They use a combination of paper and carbon to remove soil, particulates, dyes, and odor from the solvent. The jumbo cartridges often contain an adsorptive clay layer. These larger carbon/clay units last longer than standard size cartridges and have the ability to adsorb small amounts of solvent-soluble impurities and detergents. Other types of cartridge filters are all-carbon and carbonless filters. As soil accumulates in the cartridges, back pressure on the filter builds. When the back pressure reaches a predetermined level, the used cartridges are removed and new cartridges are installed in the filter unit.

The main advantage of cartridge filters is that they are easy to use and convenient. They do not require the use of filter powders or other additives. The disadvantage of cartridge filters is the cost of cartridge filter replacement and the hazardous waste disposal cost of the spent filters.

The Dry Cleaning ATCM requires draining of the cartridges for 24 hours, (48 hours for adsorptive cartridges). This can result in about one-eighth to one-quarter gallon remaining in a standard filter. Some dry cleaners use steam stripping to remove as much Perc as possible from the spent cartridges before disposal.

Spin Disk Filtration

SPIN DISK FILTERS

Spin disk filters utilize a series of finely woven circular polyester disks mounted on a perforated hollow shaft to filter the solvent. Depending on the size of the pores in the filter medium, there are two types of spin disk filtration systems: powder and powderless. Powder disk filtration systems have pores in the disks of around 60 microns and require a coating of diatomaceous earth. Powderless systems have a smaller pore size of 30 microns or less and do not require powder. Both

powder and powderless spin disk filtration systems may use activated carbon cartridges to improve filtration.

As soil accumulates on the disks, back pressure on the filter builds, and when it reaches a predetermined level, the caked soil is removed by spinning the disks at a high rate of speed. The caked soil is transferred to the still where the solvent is recovered. Spin disk systems produce less waste than cartridge systems. Spin disk filtration systems do need skilled labor and frequent maintenance to operate properly. Distillation is performed at a rate of 12 to 15 gallons per 100 pounds cleaned. Powder spin disk systems have a higher waste disposal cost than powderless systems since the used diatomaceous earth increases still residues. (Douglas, 1996)

Regenerative Filters

REGENERATIVE FILTERS

The regenerative filter system uses braided tubes coated with a combination of diatomaceous earth and activated carbon. The filter is cleaned by resuspending the powder and dirt in solution by air bumping, or back washing, creating a mixture which is redeposited back on the filter. The process of bumping and redepositing creates a highly porous "cake" when it is redeposited on the filter tubes, resulting in a more uniform filter media and better removal of contaminants.

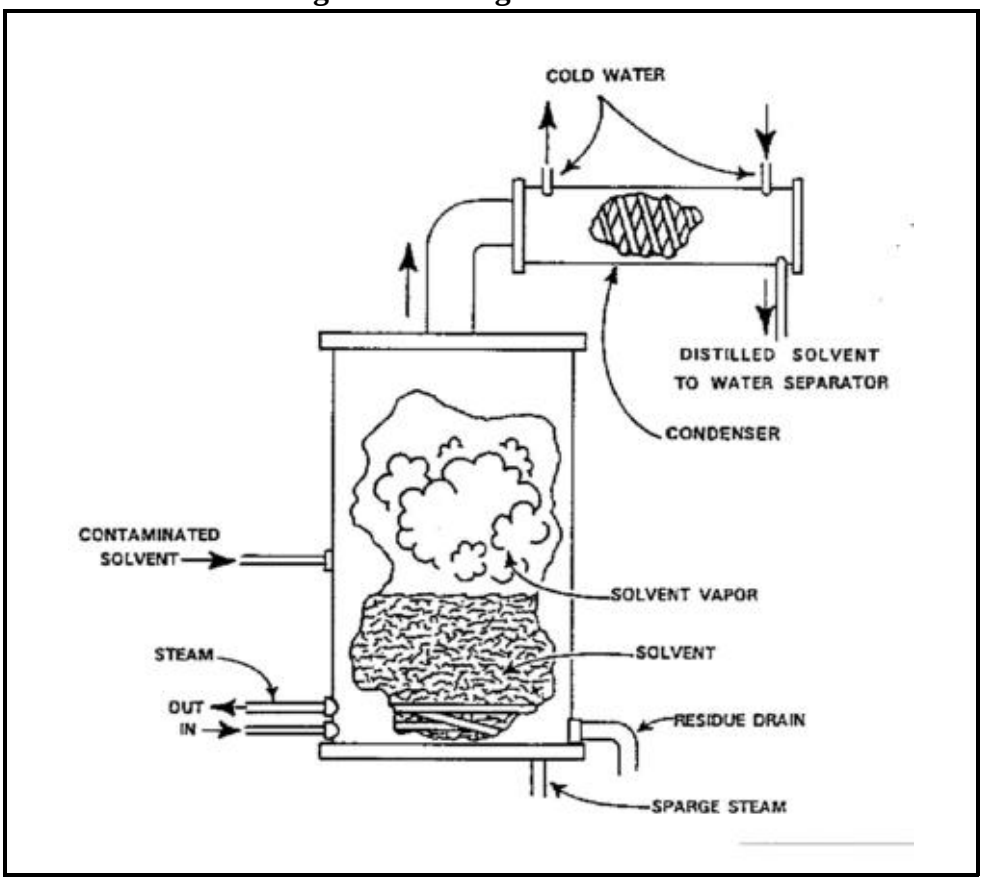
The regeneration action is repeated with each cycle. When the pressure reaches a limit and solvent flow is unacceptable, the mixture of diatomaceous earth and activated carbon is sent to the still, and the filter is recoated. This filtration system has a higher initial purchase cost than spin disk or cartridge filters, and it takes some experience to operate properly.

G. DISTILLATION: STILLS AND MUCK COOKERS

STILLS AND MUCK COOKERS

Stills are used to remove contaminants from solvent that cannot be removed by filtering. In the still, the contaminated solvent is raised to its boiling point, about 250° F, causing relatively pure solvent and water to vaporize. The Perc/water vapors are then condensed on cooling coils and routed to a water separator where the Perc is recovered and sent back to the clean solvent tank. A typical distillation system is shown in Figure 5-2.

Figure 5-2. Diagram of a Still



The distillation rate is dependent upon steam pressure or temperature. During the distillation process, the impurity level of the boiling chamber increases, slowing down the distillation rate until it ceases altogether. The resulting still residue may contain 20 to 50 percent Perc. At this point, azeotropic distillation can be used to further recover most of the remaining Perc. Azeotropic distillation involves cooling the still contents and adding water, or by percolating steam through the still residue to further volatilize Perc from the still wastes. Both methods form an azeotrope between Perc and water that boils at 189°F which is lower than the normal boiling temperature of Perc. This lower boiling temperature means more solvent can be recovered at a lower steam pressure or temperature.

Muck cookers are used to recover solvent from the filter muck and the associated solvent from a regenerative or spin disk filter. Muck cookers operate in the same manner as a still. A muck cooker incorporates an agitator to turn the muck during the distillation process. In most cases the still and muck cooker are housed in the same unit, and are referred to as still/cookers.

H. MISCELLANEOUS EQUIPMENT AND OPERATIONS

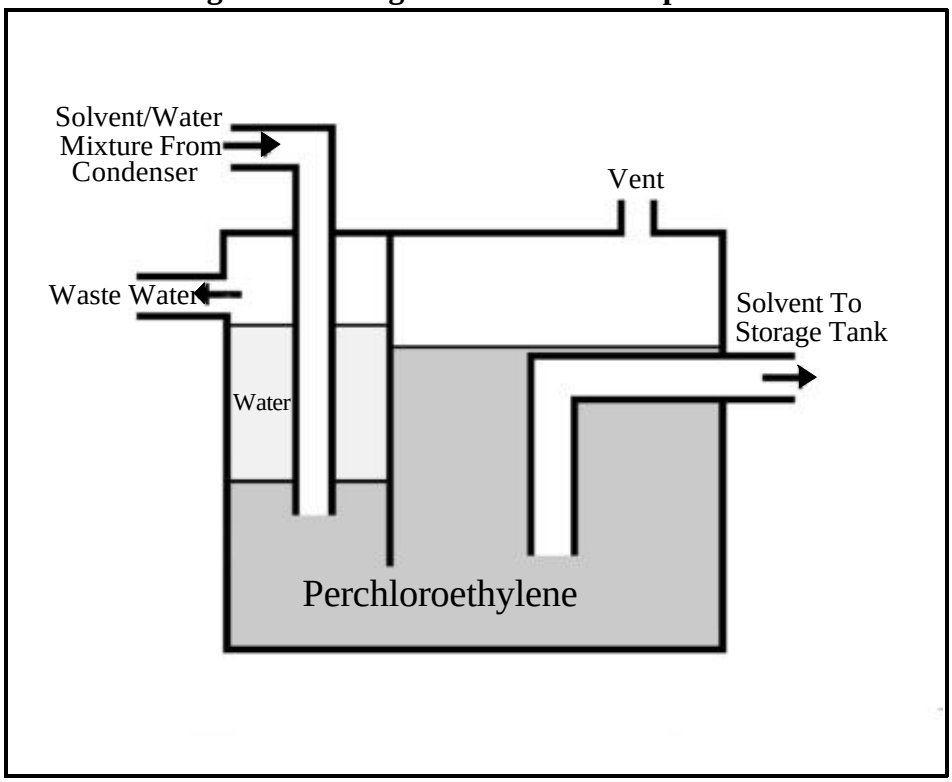
Water Separators

WATER SEPARATORS

Water separators are used to separate liquid Perc from waste water produced in various steps of the dry cleaning process. A water separator is a device that uses gravity to separate water and Perc (Figure 5-3).

Waste water is piped into the separator reservoir where the Perc settles to the bottom and the lighter water floats to the top. The water is drawn from the top and sent to a storage container for processing in a waste water processor or disposed of as a hazardous waste. The Perc is drawn from the bottom and routed either to the pure solvent storage tank or directly into the wash wheel or drum.

Figure 5-3. Diagram of a Water Separator



Inductive Door Fans

INDUCTIVE DOOR FANS

An inductive door fan is a fugitive collection device that draws residual Perc vapors away from the operator during loading and unloading the machine. The resulting air stream is then vented to the outside air either directly or through a control device. These systems

differ from secondary control devices in that they normally operate after the drum door is opened and they usually vent the Perc exhaust to the atmosphere. Secondary control systems operate to reduce the Perc concentration in the drum before the door opens and do not vent to the atmosphere. Besides the drum door, some machines have inductive door fans for the lint trap and button trap doors as well.

Spill Containment Systems

SPILL CONTAINMENT

Perc, as a liquid, can migrate through concrete floors and cause contamination of the soil and groundwater underneath the dry cleaning plant. To minimize the chances of this occurring, liquid leaks from normal wear and tear of the machine or from spills can be effectively contained by the use of troughs and floor sealants.

A trough (or pan) is a safety device that contains liquid Perc leaks and spills that occur at dry cleaning facilities. The dry cleaning machine sits in the trough, which is designed to contain the entire contents of the largest of the storage tanks. Troughs are typically constructed from corrosion resistant steel. Many manufacturers recommend installing containment troughs with new machines.

A second method of containing Perc leaks is to apply a floor sealant to the concrete floor. There are a number of floor sealants available, including epoxy-based sealants, phenolic floor toppings, and vinyl ester products. However, the effectiveness of some floor sealants to contain Perc has yet to be demonstrated. Since liquid Perc will gravitate toward the lowest point of the floor, a floor sealant system needs to contain a spill with a retaining berm which should be able to hold at least 110% the solvent capacity of the largest tank.

Vapor Barriers and Ventilation/Exhaust Systems

VAPOR BARRIERS

Dry cleaning plants that are co-located (share a common wall, floor, or ceiling) with businesses or residences have the potential to expose occupants of the building to high levels of Perc. The use of a vapor barrier with an exhaust and ventilation system is a way to reduce the occupants' exposure to Perc.

Vapor barriers and ventilation/exhaust systems isolate the dry cleaning equipment from the remainder of the facility with Perc-proof walls under negative pressure. Vapor barriers seal off the ceiling, walls and floor, thereby containing any Perc vapors within the room. The ventilation/exhaust system then draws fresh (make-up) air in, while venting the contaminated air out of the dry cleaning plant away from

occupants within the building. A good ventilation system will also allow the air within the enclosure to meet Cal/OSHA's indoor exposure level of 25 ppm.

Drying Cabinet

DRYING CABINETS

Drying cabinets are used for fabrics that are too delicate for the tumbling or the high temperatures of drying in the machine. The materials are transferred to the drying cabinet after solvent extraction, where gentle heat evaporates the solvent and dries the materials. To minimize Perc emissions, the transfer of the materials should be performed as quickly as possible.

The Dry Cleaning ATCM requires that the drying cabinet be fully enclosed and have its exhaust routed to an emission control system. If an adsorber type device is used, a concentration of 100 ppmv or less measured at the outlet of the exhaust must be achieved. A drying cabinet can also be vented to a system that reduces the concentration of Perc in a closed system with no exhaust to the atmosphere or workroom.

Water-Repelling Operations

WATER-REPELLING

Perc is emitted from waterproofing or water-repelling operations. These operations consist of applying a water-repelling solution onto the surface of a fabric after it has been cleaned. The primary ways to apply the water repelling solutions are in the dry cleaning machine drum, with a hand-pumped sprayer, or in a dip tank. A less effective method that may be used is an aerosol water repellent, similar to those available commercially at retail stores.

The dip tank method involves placing cleaned materials into a wire basket, which is then completely immersed into a tank containing a Perc/water-repellent mixture. Perc helps the water repellent penetrate the fabric.

Waste Water Treatment Units

WASTE WATER TREATMENT UNITS

Waste water treatment units are devices that reduce the Perc concentration in the waste water prior to treatment or disposal. Perc-contaminated waste water is classified as a hazardous waste, which must be disposed of properly. Treating this waste water on-site may reduce the cost of disposal by a registered hazardous waste hauler to haul the water away.

Waste water treatment units should have their own water separator to allow any excess Perc to settle out. This provides a safeguard in case pure Perc escapes the water separator in the dry cleaning machine and prevents it from being processed with the waste water. Some treatment units are often equipped with sensors and alarms which alert the operator that excess Perc has accumulated in the treatment unit. At this point, the Perc is drained and recycled to the still to be purified and re-used.

The Perc in the waste water can be reduced further by processing the waste water through a carbon filtration system. This filtration system usually consists of carbon cartridges or bags of granular activated carbon. Carbon filtration can reduce the Perc concentration in the waste water by greater than 95 percent if properly operated and maintained. Dry cleaners using waste water treatment units should operate units with Perc sensors and carbon filtration systems.

Currently, there are two types of waste water treatment units on the market. One type of treatment device treats the waste water by evaporation through heating coils or atomizers. The other type effectively reduces the Perc concentration of the waste water through carbon filtration. However, the facility may be required to dispose the treated waste water by a registered hazardous waste hauler.

DISCUSSION QUESTIONS

1. What are the main differences between transfer, dry-to-dry, and closed-loop dry cleaning systems?
2. What type of machine(s) is used at your facility?
3. A secondary control device must reduce the concentration of Perc below what ppmv, according to the Dry Cleaning ATCM?
    a. 8600
    b. 1000
    c. 300
4. The Dry Cleaning ATCM requires standard cartridge and adsorptive cartridges to be drained in their housings for how many hours?
5. How may a dry cleaner co-located with a business or residence reduce the occupants' exposure to Perc?
6. What is the difference between secondary control devices and inductive door fans?

References

ARB, 1993. Technical Support Document to the Staff Report Proposed Airborne Toxic Control Measure and Proposed Environmental Training Program for Perchloroethylene Dry Cleaning Operations. State of California Air Resources Board, Stationary Source Division, August 27, 1993.

Douglas, 1996. Meeting with Jim Douglas of Swansons Cleaners and ARB staff. February 27, 1996.

SRRP, 1990. "Dry Cleaning of Fabrics", Source Reduction Research Partnership, June, 1990.

SRRP, 1992. "Source Reduction and Recycling of Halogenated Solvents in the Dry Cleaning Industry," Source Reduction Research Partnership, 1992.

Grossman, 1994. Diagram of the back of a dry-to-dry closed-loop machine, Lindus West.

[Blank Page]

CHAPTER 6

THE ARB'S DRY CLEANING ATCM

INSTRUCTIONAL OBJECTIVES

Upon completion of this chapter, students will be able to:

- ❒ Understand the relationship between the United States Environmental Protection Agency (U.S. EPA) Dry Cleaning MACT Standard and the ARB's Dry Cleaning ATCM;
- ❒ Understand what Best Available Control Technology (BACT) is;
- ❒ Identify the Dry Cleaning ATCM's equipment requirements, good operating practices, and recordkeeping and reporting requirements; and
- ❒ Know the compliance dates specified in the Dry Cleaning ATCM.

KEY POINTS

1. The U.S. EPA and the ARB developed their respective dry cleaning regulations in the same time frame. The ARB adopted a more comprehensive regulation to reflect the need to protect public health in California.
2. The ARB staff incorporated Best Available Control Technology (BACT) into the development of the Dry Cleaning ATCM. For existing sources, BACT is a closed-loop machine with a primary control system; BACT for new sources is a closed-loop machine with both a primary and a secondary control system. Transfer and vented machines will be phased out in California.
3. The ATCM allows converted machines if they meet the specifications in the Dry Cleaning ATCM.
4. If a dry cleaner chose to convert a vented machine, the conversion should have been completed by April 1, 1996. Otherwise, the dry cleaner must replace the vented machine with a closed-loop machine by October 1, 1998.
5. Dry cleaners must maintain records of Perc usage, volume of clothes cleaned, leak inspections, operations and maintenance, and operator training.
6. The leak checklist, operation and maintenance checklist, and the recordkeeping forms contained in this chapter are only examples. Check with your air pollution control or air quality management district (district) to find out the forms they require.

7. Solvent mileage is a useful diagnostic tool for a dry cleaner to measure the overall performance and efficiency of equipment, and effectiveness of procedures.
8. The U.S. EPA has granted equivalency to the ARB to implement and enforce the Dry Cleaning ATCM for facilities using less than 2,100 gallons of Perc per year; therefore, California dry cleaners, except those considered major sources by the U.S. EPA, are only subject to the Dry Cleaning ATCM.
9. Sources using more than 2,100 gallons of Perc per year will have to comply with both the federal Dry Cleaning MACT Standard and the Dry Cleaning ATCM. However, there are very few, if any, facilities in California that use more than 2,100 gallons of Perc per year.

A. SUMMARY

This chapter summarizes the Dry Cleaning ATCM and BACT for the dry cleaning industry. It briefly discusses the differences between the federal Dry Cleaning MACT standard, developed by the U.S. EPA, and the Dry Cleaning ATCM. It also provides an overview of the Dry Cleaning ATCM's equipment, leak check, operations and maintenance, recordkeeping and reporting, and other miscellaneous requirements.

B. BACT FOR DRY CLEANING EQUIPMENT

BACT REQUIREMENTS

Health and Safety Code section 39666 requires that the ARB staff design ATCMs to reduce emissions to the lowest achievable level through application of Best Available Control Technology (BACT). The control measures must be technology-based, in consideration of risk, cost, and environmental impacts.

BACT for Existing Sources

EXISTING SOURCES

The ARB staff established that BACT for existing dry cleaning facilities is a closed-loop machine equipped with a refrigerated condenser (or an equivalent primary control system) and operated using good operating practices. Closed-loop machines eliminate the vented emissions associated with transfer and vented machines significantly reducing fugitive emissions.

BACT for New Sources

NEW SOURCES

The ARB staff established that BACT for new dry cleaning facilities is a new closed-loop machine equipped with both primary and secondary control systems, and operated using good operating practices.

A properly operated, closed-loop machine equipped with both a refrigerated condenser and a secondary control system results in the lowest emissions from dry cleaning equipment available today.

C. DRY CLEANING ATCM REQUIREMENTS

DRY CLEANING ATCM REQUIREMENTS

To minimize Perc emissions, dry cleaners must use the best equipment, have the knowledge to reduce emissions, and periodically measure their equipment's performance. These three elements are the foundation for each of the main sections of the Dry Cleaning ATCM. The need to have the best machines and control devices underscored the equipment, water-repelling and dip tank operations requirements. Using the knowledge to reduce emissions is the basis for good operating practices, leak check and repair requirements, and the requirement for the environmental training program. Finally, dry cleaners must be able to accurately determine how well their equipment is operating. The best way to accomplish this is through the use of recordkeeping and reporting requirements. Each of these three general areas is discussed below. For more information, a copy of the Dry Cleaning ATCM is in Appendix A.

D. EQUIPMENT REQUIREMENTS

This section identifies specifications for the machines and control devices required by the Dry Cleaning ATCM. Information on the equipment and operations was discussed in detail in Chapter 5.

Equipment Requirements - Existing Dry Cleaning Facilities

EQUIPMENT REQUIREMENTS - EXISTING FACILITIES

The Dry Cleaning ATCM requires all existing dry cleaning facilities to use closed-loop machines with refrigerated condensers or equivalent primary control systems by October 1, 1998. Transfer and vented machines will be phased out in California.

As an option, dry cleaners may choose to convert their existing vented machines to closed-loop machines. Converted machines are not as efficient as closed-loop machines, but in consideration of cost and risk, existing dry cleaners will be allowed to use them for two reasons: (1) emissions from converted machines still represent a substantial reduction from the baseline emission level with transfer or vented machines, and (2) the cost of conversion is significantly lower, mitigating the economic impact on existing facilities.

1. Specifications for Converted Machines

CONVERTED MACHINE SPECIFICATIONS

Converted machines must have all process vents that exhaust to the air or room sealed, and must have no liquid or vapor leaks. The primary control system, if a refrigerated condensor, must have the water-cooled condensing coils replaced with refrigerant-cooled condensing coils. Also, the horsepower rating of the compressor of the refrigerated condensor must be greater than or equal to the capacity of the machine in pounds divided by 12.

To be equivalent to a refrigerated condensor, an alternative primary control system must reduce the Perc concentration in the drum to 8,600 ppmv or less at the end of the drying cycle. The alternative primary control system, if installed on a converted machine, must achieve this concentration without extending the total drying time by more than five minutes. Additionally, the alternative primary control system must include a device that monitors the Perc concentration or another measurable alternative in the drum at the end of each drying cycle before the door is opened.

2. Specifications for Primary Control Systems

PRIMARY CONTROL SPECIFICATIONS

Both converted and closed-loop machines must be equipped with a refrigerated condenser or equivalent primary control system to recover Perc. The refrigerated condensor or primary control system must: (1) operate during both the heated and cool-down portions of the drying cycle, (2) not exhaust to the workroom or atmosphere, and (3) not require the addition of water for desorption. The refrigerated condenser must be capable of achieving an outlet temperature of 45°F or less at the end of the drying cycle for every load.

As discussed above, an alternative primary control system must reduce the Perc concentration in the drum to 8,600 ppmv or less and contain an acceptable device that monitors compliance with the 8,600 ppmv level.

3. Compliance Dates

COMPLIANCE DATES

The different compliance dates associated with the two equipment options for existing equipment are designed to provide: (1) extra time for dry cleaners who choose to install the more efficient closed-loop machines and (2) more timely emission reductions for the less-efficient converted machines. The compliance dates were also designed to allow most existing transfer and vented machines to reach or exceed the end of their useful life prior to replacement.

Facility owners were required to notify the districts by October 1, 1995 if they were planning to convert their existing vented machine. If this notification was completed, the owner has until April 1, 1996 to complete the conversion. Otherwise, the owner is required to install an original equipment closed-loop machine by October 1, 1998.

Equipment Requirements - New Dry Cleaning Facilities

EQUIPMENT REQUIREMENTS - NEW FACILITIES

Before April 1, 1996, the Dry Cleaning ATCM requires new dry cleaning facilities to use a closed-loop machine equipped with a primary control system. New dry cleaning facilities which commence operations after April 1, 1996 will be required to use a closed-loop machine with both a primary control system and a secondary control system[1]. The secondary control system must: (1) not exhaust to the workroom or atmosphere, (2) not require the addition of water for desorption, to avoid the creation of a new hazardous waste stream, and (3) in combination with the primary control system, reduce the Perc concentration in the drum at the end of the drying cycle to 300 ppmv or less. The secondary control system must additionally have a holding capacity equal to or greater than 200 percent of the maximum quantity of Perc expected in the drum prior to activation of the system. An add-on secondary control system must be sized so as to reduce the Perc concentration in the drum and all contiguous piping to 300 ppmv or less.

Miscellaneous Equipment Requirements

1. Water-Repelling and Dip Tank Operations

The Dry Cleaning ATCM requires that Perc water-repelling operations be done in a closed-loop machine or a dip tank. Dip tanks are required to be fitted with a cover that prevents Perc vapors from escaping. They must remain covered except when materials are being placed in or removed from the tank or while the basket is moved into position for draining. After immersion, the materials are required to be drained within the covered tank until dripping ceases and then the materials must be dried in a closed-loop machine.

[1]The Dry Cleaning ATCM differentiates between an integral secondary control and an add-on secondary control. Add-on secondary control systems are for closed-loop machines that were not designed by the original equipment manufacturers to operate with their closed-loop machines.

2. Drying Cabinets

The Dry Cleaning ATCM requires that a drying cabinet be fully enclosed and exhausted to either a control system demonstrated to reduce the Perc concentration to 100 ppmv measured at the outlet without dilution, or to a control system that reduces the Perc concentration in a closed system with no exhaust to the atmosphere or workroom.

E. GOOD OPERATING PRACTICES

GOOD OPERATING PRACTICES

Proper equipment is the first step in reducing emissions; however, significant emission reductions can also be achieved through the proper operation and maintenance of the control system, leak checks, and use of pollution prevention techniques. Thus, the Dry Cleaning ATCM includes requirements for maintaining the control systems in accordance with the manufacturer's recommendations, checking for leaks and repairing them promptly, and operating the waste recovery equipment with minimal emissions. These practices and requirements are essential to achieving optimum performance and the lowest emissions.

This section discusses the specific operation and maintenance practices, leak check and repair requirements, and environmental training requirements outlined in the Dry Cleaning ATCM. Leak check and repair requirements are discussed in detail in Chapter 7. Operating practices and other maintenance tips are discussed in detail in Chapter 8.

Operation and Maintenance Requirements

OPERATION AND MAINTENANCE REQUIREMENTS OF THE DRY CLEANING ATCM

Beginning on October 1, 1994, dry cleaning equipment must be operated in accordance with the requirements contained in the Dry Cleaning ATCM, the district permit, and the equipment manufacturer's recommendations. In addition, dry cleaners are required to maintain an operation and maintenance checklist, which will be provided by the districts. The operation and maintenance checklist will help ensure that primary and secondary control systems, stills, and muck cookers are maintained properly. Specifically, the Dry Cleaning ATCM contains the following operation and maintenance requirements:

- Refrigerated condensors must recirculate exhaust gases until the temperature on the outlet side of the refrigerated condensor, downstream of any bypass, is less than or equal to 45°F;
- Alternative primary control systems must recirculate exhaust gases until the Perc concentration in the drum is less than or equal to 8,600 ppmv at the end of the drying cycle;

- Vapor adsorbers used as either a primary or secondary control system must recirculate exhaust gases at the temperature specified by the district for optimum adsorption, and be desorbed as required by the district permit;
- Operators of existing facilities with transfer or vented machines (until they are phased out) must (1) desorb existing carbon adsorbers that function during the drying cycle, (2) dry the carbon bed, and (3) prevent vented Perc vapors from bypassing the carbon adsorber to the atmosphere;
- Cartridge filters must be drained in the filter housing for 24 hours or 48 hours (adsorptive cartridge filters). Any device used to further reduce the Perc volume in the filters must route any vapor to a primary control system with no exhaust to the atmosphere or workroom;
- Stills and muck cookers must not exceed 75 percent of capacity, and must cool to 100°F or less before emptying or cleaning;
- Traps must be cleaned daily, with the lint being placed in a sealed container and disposed of as a hazardous waste; and
- All equipment openings must remain closed except when required for proper operation and maintenance.

Chapter 8 presents additional information on performing operations and maintenance checks and completing a sample checklist.

Leak Check and Repair Requirements

LEAK CHECK AND REPAIR REQUIREMENTS

Prior to April 1, 1996, the Dry Cleaning ATCM requires dry cleaners to inspect for perceptible vapor and liquid leaks weekly using ones' sight, smell, or feel. After April 1, 1996, the dry cleaning equipment must be inspected at least once a week using a portable hydrocarbon detector. The district will provide the facility operator with a leak checklist to record the status of each component of the dry cleaning system that is inspected. Additional information on performing leak checks, using a halogenated leak detector, and completing a sample leak checklist is contained in Chapter 8. The leak checklist must document that:

- The trained operator inspects the dry cleaning system at least once a week for liquid and vapor leaks using either a halogenated-hydrocarbon detector[2] or a portable gas analyzer;

[2]A halogenated-hydrocarbon detector is a portable device capable of detecting vapor concentrations of Perc of 25 ppmv or less, and indicating an increasing concentration by emitting an audible signal or visual indicator that varies as the concentration changes.

- Leaks are noted on the checklist and repaired within 24 hours of detection;
- Leaks not repaired at the time of detection are tagged so they are readily observable to a district inspector (otherwise, it may constitute a violation);
- If the parts are not available at the facility, they must be ordered within two working days of detection and installed within five working days of receipt; and
- A facility that has not repaired a leak within 15 working days does not operate the equipment until repaired without a leak-repair extension from the district.

Environmental Training Requirements

ENVIRONMENTAL TRAINING

The Dry Cleaning ATCM requires each facility to have at least one person who attends an initial environmental training course (that is why dry cleaners are attending this course) and a refresher course every three years. The initial training course focuses on understanding the operations and maintenance, leak inspection and repair, and the recordkeeping and reporting requirements of the Dry Cleaning ATCM.

If a trained operator leaves a facility, the facility must: (1) notify the district within 30 days of departure of the trained operator; (2) obtain certification for a replacement trained operator within three months, or one month after the district determines the course is reasonably available. (A trained operator who owns or operates multiple facilities may serve as the interim trained operator at two facilities simultaneously for a maximum of four months.)

F. RECORDKEEPING AND REPORTING REQUIREMENTS

RECORDKEEPING REQUIREMENTS

The recordkeeping and reporting requirements of the Dry Cleaning ATCM are necessary to provide the districts and the dry cleaners with a tool to evaluate overall system performance, and to ensure that the dry cleaners are complying with the trained operator requirements. Specifically, the Dry Cleaning ATCM requires that the operator maintain the following records for at least two years or until the next district inspection, whichever is longer:

- A log with the date and pounds of materials cleaned per load;
- Purchase and delivery receipts for Perc, and for those facilities with solvent tanks not directly filled by the supplier, the date and gallons of Perc added to the solvent tank of each machine;
- Completed leak inspection and operation and maintenance checklists; and

- A record of leaking components and the actions taken to complete repair.

Additional recordkeeping requirements include maintaining the manufacturer's operating manuals for the life of the equipment, copies of the record of completion for each trained operator during the person's employment, and for an additional two years beyond the separation of that person from the facility.

REPORTING REQUIREMENTS

The Dry Cleaning ATCM requires each facility operator to submit an annual report to the district which lists the amount of clothes cleaned, Perc purchases, a facility's mileage, and copies of the record of completion of the trained operator. To assist the dry cleaners, the following sections discuss the use of a poundage chart, solvent mileage, and the annual report to the district. The leak inspection, operation and maintenance, and service and repair log forms will be discussed in Chapters 7 and 8.

POUNDAGE CHART

Amount of Clothes Cleaned

The use of a poundage chart will greatly simplify the tracking of the amounts of clothes cleaned by a facility. Figure 6-1 and Appendix D show an example of a poundage chart form, which tracks the daily and monthly total of pounds of clothes cleaned. The form provides for a 31 day month, and up to 12 loads per day. Each horizontal row represents one calendar day. At the end of the row, the facility operator can total the pounds of clothes for that day. To complete the form:

- ❒ Beginning on the first of the month, fill out the date (month and year), facility name, machine type, and district permit number on the top of the form. For a plant with more than one machine, each machine should have a separate form.
- ❒ On day 1, weigh each load of clothes on a scale before putting the clothes in the drum. Record the weight of each load on the form.
- ❒ At the end of the day, add together the weights of each load. Record the total at the end right hand column.
- ❒ At the end of the month, the operator can add the totals on the right hand column to get the pounds of clothes washed for the full month. This number is recorded in the bottom box, and also on the annual report form.

Figure 6-2 is an example of the completed poundage chart for Squeaky Clean Cleaners, a fictional dry cleaning facility.

Figure 6-1. Pounds of Clothes/Load

MONTH/YEAR: _____ **FACILITY ID:** _____ **MACHINE ID:** _____

LOAD	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	10TH	11TH	12TH	TOTAL
DAY 1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
TOTAL TO DATE									TOTAL THIS MONTH				

Figure 6-2. Sample Pounds of Clothes/Load

MONTH/YEAR: December 1995 **FACILITY ID:** Squeaky Clean **MACHINE ID:** from district

LOAD	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	10TH	11TH	12TH	TOTAL
DAY 1	30	24	22	27	21	18	-----						142
2	27	25	18	15	-----								85
3	-----												
4	30	25	27	24	20	24	-----						150
5	35	33	30	26	23	21	19	-----					187
6	28	25	25	21	20	-----							119
7	31	34	28	18	12	-----							123
8	29	26	24	25	20	19	-----						143
9	27	24	19	17	19	-----							106
10	-----												
11	31	28	26	24	18	16	-----						143
12	35	35	31	28	22	20	17	-----					188
13	32	27	29	26	22	25	-----						161
14	30	35	26	20	16	-----							127
15	24	26	23	27	21	14	10	-----					145
16	34	27	23	17	14	8	-----						123
17	-----												
18	34	35	30	21	22	19	17	-----					178
19	27	29	25	28	20	17	13	-----					159
20	26	23	27	24	21	15	11	-----					147
21	30	29	25	25	17	18	-----						144
22	30	28	27	25	29	29	-----						168
23	28	24	21	22	17	13	-----						125
24	-----												
25	-----												
26	25	24	28	20	-----								97
27	34	30	33	32	27	24	-----						192
28	31	30	26	24	19	16	-----						146
29	35	31	26	25	23	12	13	11	-----				176
30	22	25	26	20	23	22	-----						138
31	-----												
TOTAL TO DATE							OPTION		TOTAL THIS MONTH				3612

Solvent Mileage

SOLVENT MILEAGE

Dry cleaners have a useful diagnostic tool to measure the overall performance of equipment and effectiveness of procedures. This diagnostic tool is solvent mileage, which is the gallons of Perc consumed per pound of materials cleaned. High solvent mileage, indicating good performance, means that Perc is being used efficiently. It also implies that emissions of Perc into the air are minimized. An example of good solvent mileage on a closed-loop machine can be 420 pounds per gallon or more, but if the same machine is operating inefficiently, the solvent mileage can drop to less than 100 pounds per gallon.

Although the Dry Cleaning ATCM requires that solvent mileage be calculated once a year for the annual report, it is recommended that mileages be calculated once a month. Tracking solvent mileages monthly can help the dry cleaner detect potential problems with the dry cleaning system that may not be apparent through other means, including the required good operating practices. These types of problems may include leaks that are not detected during weekly inspections, condenser problems from hard water scaling in the cooling coils or low refrigerant levels, and drying sensor malfunctions that result in removal of clothes before they are completely dry. When a machine's mileage is calculated and recorded regularly, these problems will be revealed by a drop in the machine's mileage.

The Annual Report

ANNUAL REPORT TO THE DISTRICT

The Dry Cleaning ATCM requires that the owner/operator maintain an annual report, and submit it to the district upon district request. The annual report includes:

- A copy of the record of completion for each trained operator;
- A monthly total of pounds of materials cleaned and the solvent additions in the reporting period; and
- Average facility mileage is calculated by dividing the pounds of materials cleaned by the volume of Perc used in gallons.

Figure 6-3 and Appendix D show an example of the Annual Report Form. This form allows the operator to record the monthly pounds of clothes cleaned (from the monthly poundage chart) and the volume of Perc purchased during the year. At the end of the year, the operator calculates facility mileage by dividing the total amount of

clothes cleaned that year by the amount of Perc purchased throughout the year. To complete the form:

- ❒ Fill out the facility name and address, machine type and district permit number, and reporting period on the top of the checklist.
- ❒ For each month, transfer the monthly pounds of clothes cleaned from the bottom of the poundage chart to the appropriate monthly box in the annual report form.
- ❒ Write in the volume of Perc purchased for that machine or delivered to the facility during the reporting period.
- ❒ In the mileage box, divide the total pounds of clothes cleaned by the total Perc purchased during the period.

Figure 6-4 is an example of a completed Annual Report for the fictitious Squeaky Clean Cleaners.

Figure 6-3. Annual Report

FACILITY NAME/ID: _____

STREET ADDRESS: _____

CITY: _____ **STATE:** _____ **ZIP CODE:** _____

MACHINE TYPE/ ID: _____

PERIOD: _____ **TO** _____

POUNDS OF CLOTHES CLEANED PER MONTH	
MONTH	**POUNDS**
TOTAL (A) =	

PERC ADDITIONS (IN GALLONS)	
DATE	**GALLONS**
TOTAL (B) =	

MILEAGE
MILEAGE = A/B (A divided by B)
MILEAGE = _____

Attach a copy of the record of completion for all trained operators.

SUBMITTED BY: _____
PRINTED NAME

TELEPHONE NUMBER: (**)** _____

SIGNATURE: _____

Figure 6-4. Completed Sample Annual Report

FACILITY NAME/ID: Squeaky Clean Cleaners

STREET ADDRESS: 4758 Clearview Rd

CITY: Anytown **STATE:** CA **ZIP CODE:**

MACHINE TYPE/ ID: FROM DISTRICT PERMIT

PERIOD: Jan 1, 1995 **TO** Dec 31, 1995

POUNDS OF CLOTHES CLEANED PER MONTH	
MONTH	**POUNDS**
JAN	3415
FEB	3822
MAR	3311
APR	3747
MAY	3015
JUN	3220
JUL	3449
AUG	3386
SEP	3771
OCT	3223
NOV	3550
DEC	3612
TOTAL (A) =	41521

PERC ADDITIONS (IN GALLONS)	
DATE	**GALLONS**
Feb 21	20
May 16	25
Aug 29	25
Nov 16	20
------	------
TOTAL (B) =	90

MILEAGE
MILEAGE = A/B (A divided by B) (41521/90) **MILEAGE =** 461 pounds/gallon

Attach a copy of the record of completion for all trained operators.

SUBMITTED BY: JOHN DOE
PRINTED NAME

TELEPHONE NUMBER: (916) 555-5555

SIGNATURE:

G. DISTRICT REQUIREMENTS

As required in Health and Safety Code section 39666(d), the air pollution control and air quality management districts (districts) have 120 days to implement and enforce the ATCMs adopted by the Board once they have become State law. The Dry Cleaning ATCM and the Environmental Training Regulation became State law on June 3, 1994; therefore, the Dry Cleaning ATCM became effective on October 1, 1994 in California.

The districts also have the option to adopt a regulation that is at least as stringent as an ATCM that the Board adopts. If the district chooses to propose their own regulation, they have six months to adopt and enforce an equally effective or more stringent regulation than the one the Board adopted. Therefore, districts adopting their own dry cleaning regulations were required to have them adopted by December 1994. The South Coast Air Quality Management District (SCAQMD) and the Bay Area Air Quality Management District (BAAQMD) are two of the districts that adopted their own regulations. These regulations contain requirements that are not in the Dry Cleaning ATCM.

H. DIFFERENCES BETWEEN THE FEDERAL DRY CLEANING MACT STANDARD AND THE DRY CLEANING ATCM

Development of the Federal Dry Cleaning MACT Standard

FEDERAL DRY CLEANING MACT STANDARD

On December 9, 1991, the U.S. EPA released a proposed emission standard for Perc dry cleaners titled "The National Perchloroethylene Air Emission Standard for Dry Cleaning Facilities", also known as the federal Dry Cleaning MACT Standard. The final standard was promulgated on September 22, 1993, and specifies equipment, operation and maintenance, and recordkeeping and reporting requirements.

Equipment Differences between the Two Regulations

DIFFERENCES BETWEEN THE TWO REGULATIONS

The federal Dry Cleaning MACT Standard requires closed-loop dry-to-dry equipment for new facilities, but allows existing facilities to continue using both transfer and vented machines. Transfer machines and vented machines using more than 200 and 140 gallons a year or more of Perc, respectively, would be required to have a Perc recovery device installed. Transfer and vented machines using less than these amounts are exempted from the federal Dry Cleaning MACT Standard equipment requirement. New facilities using more than 1800 gallons of

Perc per year are required to install a closed-loop machine with primary and secondary control systems.

The ARB's Dry Cleaning ATCM requires dry cleaners to use best available control technology or BACT to reduce emissions. BACT provides for the gradual phase out of all transfer and vented machines, regardless of the amount of Perc that is used in those machines. Under the Dry Cleaning ATCM, all dry cleaners in the State will have closed-loop dry-to-dry machines with either primary or primary and secondary control devices.

Application for Equivalency

States have an option to either implement and enforce the federal Dry Cleaning MACT Standard or adopt an equally or more stringent regulation. On October 14, 1993, the ARB adopted the Dry Cleaning ATCM, which provides for greater Perc emissions reductions than the federal Dry Cleaning MACT Standard. The ARB submitted an application to the U.S. EPA to obtain approval to implement the Dry Cleaning ATCM in place of the federal Dry Cleaning MACT standard. This means that the ARB-adopted dry cleaning regulation will be federally enforceable in California and non-major source dry cleaners will be subject to only one set of requirements. Major source requirements are discussed below. On March 1, 1996 the U.S. EPA Region IX Administrator approved the ARB's request to implement and enforce the Dry Cleaning ATCM in lieu of the federal Dry Cleaning MACT standard. The official notice of approval will appear in the Federal Register in late-Spring of 1996.

U.S. EPA Major Source Requirements

Facilities with dry-to-dry machine(s) only and an annual Perc consumption (not emissions) in excess of 2100 gallons per year are defined as major source facilities. Existing facilities in this category are required to have a closed-loop configuration and either a refrigerated condensor or an equivalent control system by September 21, 1996[3].

Facilities with either transfer machine(s) or a combination of transfer and dry-to-dry machines and an annual Perc consumption in excess of 1800 gallons per year are also defined as major source

[3]The Dry Cleaning ATCM requires either a converted closed-loop machine by April 1, 1996 or a new closed-loop machine by October 1, 1998.

facilities. Existing facilities in this category are required to install an enclosure around the transfer machine(s) by September 21, 1996[4].

New facilities with an annual consumption in excess of 2100 gallons per year are defined as major source facilities. These facilities must have closed-loop machine(s) with both a refrigerated condensor or equivalent device, and a secondary control device[5].

DISCUSSION QUESTIONS

1. Why did the ARB choose to adopt their own regulation?
2. What is best available control technology for existing equipment?
3. What is best available control technology for new equipment?
4. Why does the ARB allow converted machines?
5. When must dry cleaners replace phased out equipment by if they choose to use an original equipment closed-loop machine?
6. How long must facility operators maintain records?
7. What type of records need to be maintained?
8. What is the significance of solvent mileage?
9. What does the U.S. EPA require of major source facilities?

[4]These transfer machines will be phased out by October 1, 1998 as required by the Dry Cleaning ATCM.

[5]The Dry Cleaning ATCM requires facilities commencing operations prior to April 1, 1996 to have closed-loop machines. Thereafter, facilities must have closed-loop machines with secondary control systems.

CHAPTER 7

OPERATIONS AND MAINTENANCE PRACTICES

INSTRUCTIONAL OBJECTIVES

Upon completion of this chapter, students will able to:

- ❒ Understand the operation and maintenance techniques outlined in the Dry Cleaning ATCM;
- ❒ Understand how planning, proper maintenance, and good housekeeping can increase mileage, reduce emissions, and save money;
- ❒ Understand how to fill out the operation and maintenance checklist;
- ❒ Identify some common equipment problems that can cause emissions and how to correct them; and
- ❒ Identify proper safety precautions that should be taken during maintenance procedures.

KEY POINTS

1. Good operation and maintenance practices will lower emissions and improve mileage.
2. An operation and maintenance checklist will help ensure that good operation and maintenance practices are followed.
3. The operation and maintenance practices discussed in this chapter are minimum requirements for dry cleaning machines. It may be necessary to supplement additional maintenance requirements outlined in the manufacturer's operating manual.
4. Check with the air pollution control or air quality management district (district) regarding the maintenance checklist they require to be used. (The instructor should have examples of districts' operation and maintenance checklists for the students.)
5. Proper safety procedures and equipment are necessary to avoid Perc exposure hazards from routine maintenance practices.

A. SUMMARY

The Dry Cleaning ATCM specifies certain operation and maintenance practices along with any additional maintenance requirements specified by the manufacturer. This chapter outlines the maintenance requirements and the general maintenance procedures that will maintain, or improve, solvent mileage and reduce emissions. It also

discusses proper safety precautions and safety equipment to reduce an operator's exposure to Perc.

B. GENERAL OPERATIONS

The Dry Cleaning ATCM requires dry cleaners to retain a copy of the manufacturer's operating manual and to perform the necessary maintenance operations in order for the operators to properly maintain the dry cleaning machine. In addition, performing weekly leak inspections are required at a minimum. The following are recommended general operation procedures which will help reduce Perc emissions or increase mileage:

- ❒ Clean full loads during each wash cycle when possible;
- ❒ Maintain proper drying temperatures (120°F to 150°F);
- ❒ Do not remove materials before the end of the drying cycle or before the materials are completely dry;
- ❒ Use adequate drying times for bulky articles such as sleeping bags or jackets;
- ❒ Place lint, still residues, used cartridge filters, and other Perc contaminated waste in sealed waste containers; and
- ❒ Practice good housekeeping.

Good Housekeeping

Housekeeping measures include promptly repairing any worn or cracked gaskets, covering all solvent and waste containers, identifying and correcting any leaking component and removing any lint build-up on the steam or cooling coils. Inspect lint and button traps frequently since dry lint can prevent gaskets from sealing properly and cause leaks. Good housekeeping also includes keeping areas around the machine clean and lint free so liquid leaks would be readily visible.

C. REQUIRED ROUTINE MAINTENANCE

Periodic routine maintenance needs to be performed on any dry cleaning machine. This maintenance will help improve machine efficiency, lower emissions, lower workers exposure to Perc, and improve solvent mileage. The Dry Cleaning ATCM requires general operating and maintenance practices for dry cleaning equipment and emission control devices discussed below. In addition, the Dry Cleaning ATCM requires the operator to perform the manufacturer's recommended maintenance practices not covered in this section. Refer to the manufacturer's operating manual for more specific maintenance practices.

Refrigerated Condensers

REFRIGERATED CONDENSERS

The Dry Cleaning ATCM requires that a refrigerated condenser achieve an outlet vapor temperature less than or equal to 45°F (7.2°C) for each load of clothes cleaned. There must be a graduated thermometer that is easily visible to the operator and measures the temperature of the outlet vapor stream downstream of any bypass of the condenser. The minimum temperature range of the thermometer should be from 0°F (-18°C) to 150°F (66°C).

There are two relatively simple operation and maintenance practices that maintain the efficiency of refrigerated condensers. The first is inspecting the cooling coils for dust and lint build-up. The second is ensuring that the exit air temperature at the end of the cool down cycle reaches 45°F or below with each load. If the exit air temperature is above 45°F, this is an indication that the condenser is not operating properly resulting in higher Perc emissions.

Carbon Adsorbers

CARBON ADSORBERS

Carbon adsorbers used as a primary control device in vented machines will be phased out no later than October 1, 1998. Until then, the operator must adhere to the following maintenance procedures:

- ❒ Desorption of the carbon bed must be performed at a frequency specified by the district. The minimum frequency shall be when three pounds of material have been cleaned for each pound of carbon;
- ❒ Use the minimum steam pressure and air flow capacity that the district specifies to prevent channeling through the carbon bed;
- ❒ Completely dry the carbon bed after desorption according to the manufacturer's specifications; and
- ❒ Do not allow vented Perc vapors to bypass the carbon adsorber and enter the atmosphere.

Alternative Primary Control Systems

ALTERNATIVE CONTROLS

An alternative primary control system is a system other than a refrigerated condenser. Alternative primary control systems must be operated so that the final concentration in the drum is less than or equal to 8,600 ppmv at the end of the drying cycle, before the door is opened and any fugitive control system activates.

Cartridge Filtration Systems

CARTRIDGE FILTRATION

The Dry Cleaning ATCM requires that standard cartridge filters be drained for 24 hours in their canisters, or 48 hours for adsorptive cartridge filters. The reason is that undrained standard cartridges may contain as much as one gallon of solvent. Even after draining, a standard cartridge can still contain from one-fourth to one-half gallon of Perc. If the filters are transfered to a separate device to reduce the Perc within the cartridge, the device must route any vapors to a primary control device and not exhaust to the atmosphere. Some newer machines use steam stripping to further reduce the amount of Perc remaining in the filters by up to 98 % (VIC, 1992). After draining or steam stripping, the filter is required to be placed in a sealed container for disposal as hazardous waste.

Stills and Muck Cookers

STILLS AND MUCK COOKERS

The Dry Cleaning ATCM requires that the still and any muck cooker should not be operated if the contents in the still or cooker reaches 75 percent of its capacity, or an alternative level recommended by the manufacturer. In addition, the still or muck cooker must be cooled to 100°F (38°C) or less before emptying or cleaning the unit. Opening the still or muck cooker before it has cooled properly would expose the operator and the workplace to higher concentrations of Perc.

Button and Lint Traps

BUTTON AND LINT TRAPS

Air filtration is performed by the lint trap during the drying cycle. The lint trap is positioned before the steam and condenser cooling coils where it prevents lint from building up and reducing drying efficiency. Accumulated lint would act as an insulator preventing the steam coils from heating the air to temperatures necessary for solvent vaporization and the cooling coils from condensing the vaporized solvent into a liquid. A clogged lint trap could restrict the air flow to the cylinder reducing the amount of solvent recovered. The Dry Cleaning ATCM requires that the lint trap be cleaned at least once each working day to prevent a build-up of lint. Lint removed from the lint trap is required to be placed in a tightly sealed container.

The button trap removes large debris from the solvent stream, such as buttons and pins, before it reaches the pump. A dirty button trap can cause solvent to back up and, in some machines, overflow onto the floor. The Dry Cleaning ATCM requires that the button trap must be cleaned each working day and the lint placed in a tightly sealed container. While cleaning, it is recommended that the gaskets on the

button and lint trap be inspected for cracks. The button and lint trap doors must be securely closed and remain closed during machine operation.

Machine Doors and Lids

All access doors, lids, or parts of the dry cleaning system where there is Perc must be kept closed at all times except when access is need for proper operation and maintenance.

MACHINE OPENINGS

Waste Water Treatment Units

WASTE WATER TREATMENT UNITS

During some situations such as a still boil-over, Perc can bypass the dry cleaning machine's water separator by being discharged as an emulsion. This can result in either the emulsion or pure solvent separated from the emulsion being transferred into the waste water treatment unit. If the waste water treatment unit being used does not have its own water separator or an alarm to alert the operator that excess Perc has accumulated in the unit, then care must be exercised so that liquid Perc or Perc emulsion is not transferred into the unit and allowed to vaporize.

Waste water after passing through carbon in the waste water treatment unit still contains some Perc. The final concentration of Perc in the waste water can still lead to contamination problems if it enters the sewage system. If a waste water treatment unit does not vaporize or evaporate the waste water after treatment the remaining liquid should not be disposed of anywhere where it could enter the sewer. Using the treated waste water in boilers or cooling towers should be avoided for this reason. The remaining treated waste water should still be disposed of by a hazardous waste hauler or evaporated.

D. RECOMMENDED ROUTINE MAINTENANCE

The following maintenance practices are recommended for the proper operation of the dry cleaning equipment. Performing these maintenance steps will lower emissions, improve solvent mileage, improve machine efficiency and may extend the lifetime of the equipment.

Secondary Control Devices

As with any adsorber, solvent breakthrough can occur in a secondary control device if it is not desorbed or "regenerated". Some secondary control devices are designed to automatically desorb, or

SECONDARY CONTROLS

regenerate, during the next dry cycle, while others must be manually regenerated at the end of the day, or after several days. There is a danger of saturation and breakthrough on the manually regenerated secondary controls if an operator is not careful to keep track of the desorption schedules. If a manually regenerated secondary control device is used, it is suggested that the desorption schedules be tracked on the operation and maintenance checklist so the operator will know when the next regeneration of the secondary control device should occur.

Solvent Filtration Systems

This section covers filtration systems associated with dry cleaning machines. The filtration system removes impurities from the Perc during the wash and extraction steps of the dry cleaning process.

1. Cartridge Filters

CARTRIDGE FILTERS

Cartridge filters are the most commonly used type of filtration used in the dry cleaning industry. Manufacturers of dry cleaning machines recommend that cartridge filters be changed every 700 to 1000 pounds of materials cleaned. A pressure buildup, or difference of 20 to 30 pounds per square inch gauge (psig) across the filter, is also an indication that the filter needs replacing. Another indicator of the need to change the filters is the increased time needed to fill the drum with Perc (which usually takes a minute or less). Using cartridge filters beyond their normal capacity reduces cleaning quality and increases the potential for liquid or vapor leaks due to increased pressure within the dry cleaning machine. It is recommended that the operator performs following steps to maintain the effectiveness of cartridge filters:

- ❒ Install a lint filter upstream of the cartridge filter unit to prevent clogging of the cartridge filters. This will increase the useful life of the cartridge filters;
- ❒ Use a pump that can maintain an adequate flow rate;
- ❒ Change the cartridge filters when either the weight of the clothes cleaned or the back-pressure reading is close to the manufacturer's recommended levels; and
- ❒ Avoid excess moisture in the solvent which can cause a rapid buildup in pressure;

It is recommended that protective equipment, such as goggles, Viton™ gloves and aprons, and National Institute for Occupational Safety and Health (NIOSH) approved respirators be worn when changing cartridge filters.

2. Pre-Lint Filter for Cartridge Filtration System

One way to increase the amount of clothes cleaned between cartridge changes is to use a pre-lint filter. (Dow 1987; VIC 1992) In the solvent flow loop, a pre-lint filter is placed before the cartridge filters to remove large particles of lint and dirt from the solvent before it passes through the cartridge filtration system. The pre-lint filter is intended to reduce the amount of lint and other debris which builds up on cartridge filters, thus extending their useful life. However, the pre-lint filter must be cleaned each day for proper operation and solvent flow. During cleaning, a pre-lint filter may be a source of Perc emissions. With a pre-lint filter and an adequately sized cartridge filtration system, an equipment manufacturer estimated that up to 1,500 pounds of clothes could be cleaned per cartridge filter, instead of the 700 to 1,000 pounds per filter without the pre-lint filter. (VIC 1992)

3. Disk Filtration Systems

DISK FILTRATION

Spin disk filters must be periodically spun to clean and regenerate them. Depending on the manufacturer and whether the disk system uses powder, disks may be spun depending on the pounds of materials cleaned, or when the filter reaches a pressure limit specified by the manufacturer. Some manufacturers recommend that the disks be removed annually to be cleaned and the condition of the disks and gaskets be inspected. (BOEWE 1989; Union) Another manufacturer recommends that any damaged disks or gaskets be replaced if excessive graying or dirty solvent occurs after passing the spin disk filters. (VIC 1992) A sudden increase in solvent flow or a sudden drop in pressure across the filter can also indicate a damaged disk or a breakthrough condition. (Douglas, 1996) If this happens, inspect and replace any damaged disks or gaskets. Consult the manufacturer's operating manual for the specific requirements for regenerating or cleaning of the spin disk filters.

Steam and Cooling Coils

STEAM AND COOLING COILS

It is recommended that the steam and condenser cooling coils be inspected at least annually for lint buildup and corrosion problems to ensure that their performance is not inhibited. Although cleaning the lint trap daily will control most of the lint, some lint can still get by the lint trap and accumulate on the fins surrounding the condensing coils and heating coils.

Accumulated lint will act as an insulator which prevents the steam coils from heating the air necessary to vaporize the solvent and the cooling coils from condensing the vaporized solvent into liquid. Lint build-up can restrict the airflow and reduce the amount of solvent recovered. In addition, dirt and lint buildup on the condensing coil can retain moisture. This moist lint can become acid in nature and cause tiny pin holes to form in the coil.

To clean the coils, brush the coils with a stiff brush or use compressed air to dislodge lint. The lint that is collected contains Perc residue and should be placed in a sealed container and disposed of as a hazardous waste.

Carbon Adsorber on an Inductive Door Fan

INDUCTIVE DOOR FANS

When the loading door is opened at the end of the drying cycle, residual Perc remaining within the drum and materials can expose workers to Perc emissions. One way to reduce this worker exposure is by using an inductive door fan. Since inductive door fans vent to the atmosphere or workroom, a carbon adsorber should be used to reduce Perc emissions. The carbon filter in the carbon adsorber must be replaced regularly to prevent Perc breakthrough. The replacement of the filter depends on the amount of carbon in the adsorber, the machine size, and the amount of clothes cleaned. This time period can range from one to three months. One manufacturer suggests that a canister be changed when 10,000 pounds of clothes are cleaned for every pound of carbon or every month for a two pound cartridge (Kajiwara 1995).

It is recommended that the operator track filter replacement by noting the date the filter was last changed on the operation and maintenance checklist and by adding a reminder on the checklist of when the next change should occur. It is recommended that the cartridge replacement be performed as specified by the manufacturer.

Stills and Muck Cookers

STILLS AND MUCK COOKERS

To properly operate and maintain a still or muck cooker, it is recommended that the operator observe the following:

- ❒ Use steam pressures recommended by the manufacturer;
- ❒ Ensure that the condenser water is on and that the condenser is at the operating temperature when beginning distillation;
- ❒ Ensure that the condenser water flow is countercurrent (the opposite direction) to the solvent vapor flow;

- ❒ Keep the solvent return temperature to 90°F (32°C) or less to minimize evaporative loss through the solvent storage vent;
- ❒ Keep steam coils clean of scale and hardened residues;
- ❒ Always keep solvent over the coils;
- ❒ Check steam coils for build-up and cleaned if necessary; and
- ❒ Follow the manufacturer's instructions for cleaning the still or muck cooker.

Precautions should be taken during still clean-out. The use of the personal protective equipment such as goggles, Viton™ gloves, apron, and a respirator approved by NIOSH for use with organic vapors is recommended. The clean-out of the still should be performed as quickly as possible to reduce worker exposure to Perc. The still bottoms or filter muck are considered to be hazardous waste and are required to be stored in sealed containers, properly labeled, and disposed of by a registered hazardous waste hauler.

Water Separators

WATER SEPARATORS

It is very important that the solvent/water mixture be separated properly. Clogged outlets can cause the separator to overflow or water to be routed into the solvent tank. One of the causes of a clogged separator is when excess lint and dirt from the condenser passes into the separator and plugs the outlet. To avoid this problem, the water separator needs to be inspected and cleaned regularly. It is recommended to inspect the water separator weekly for lint and debris and check the separator's vent visually for clogs once a month (IFI, 1984).

Pump Strainer

PUMP STRAINER

The pump strainer is located directly in front of the pump in the solvent inlet line. The strainer is used to prevent lint and other objects from entering the pump. The frequency of cleaning the strainer depends on the use of the machine. One manufacturer recommends that the strainer be cleaned daily (VIC 1992), while the International Fabricare Institute recommends daily to weekly cleanings (IFI, 1984). To clean the strainer, brush the lint off with a hand brush. When the pump strainer is reassembled, check fittings for Perc leaks.

Gaskets

GASKETS

Gaskets and seals deteriorate over time from every day wear and tear of the dry cleaning machine. Faulty or worn gaskets and seals are a common source of liquid and vapor leaks, and may be a significant

source of Perc emissions if left unrepaired. Because of this, it is required that gaskets must be inspected at least weekly for leaks. Gaskets should be supple and lubricated. The gasket should be replaced when signs of brittleness or hardening, cracks, gouges or splintering appear. Routine maintenance will help prevent leaks, reduce worker exposure to Perc, and maintain solvent mileage. Some maintenance suggestions for different types of gaskets found on most dry cleaning machines are as follows:

- ❒ Visually inspect filter cover gaskets and still-clean-out door gaskets every time it is opened;
- ❒ Use a portable halogenated hydrocarbon detector to check the loading door gasket and lint door gasket for leaks weekly, (daily if possible); and
- ❒ Replace leaking or damaged seals and gaskets immediately and keep an inventory of seals and gaskets on hand.

E. WASTE HANDLING

Care should be exercised whenever solvent or solvent wastes are handled. Improper management of hazardous waste drums can lead to unnecessary spills and leaks and potentially costly fines. According to DTSC, dry cleaners must comply with the following requirements to properly manage the hazardous waste:

- ❒ Store solvent and wastes in tightly sealed containers that are impervious to Perc;
- ❒ Under the Resource Conservation and Recovery Act (RCRA), generators must weekly inspect hazardous waste storage areas for spills and leaks; and
- ❒ Waste drums and containers must be labeled, and stored according to the requirements of the Department of Toxic Substances Control (DTSC).

The following waste handling practices are also recommended:

- ❒ Use funnels when transferring Perc-contaminated wastes to storage containers to reduce the possibility of spills; and
- ❒ Transfer lint and used cartridge filters into sealed containers immediately upon removal from the machine.

Contact your local DTSC office for more information about hazardous waste disposal and storage requirements.

F. OPERATIONS AND MAINTENANCE CHECKLIST

Every good business uses some kind of plan to get things done and to organize plant activities. An operations and maintenance checklist is a plan that outlines and organizes scheduled operation and maintenance tasks. An operation and maintenance checklist puts routine maintenance schedules in a format that can be easily checked off when completed, so an operator can see what has been done at a glance. This assures that routine maintenance is performed, which can reduce downtime for repairs and save money. Figure 7-1 and Appendix D contain an example of an operation and maintenance checklist with time frames common for most dry cleaning machines. This may not be a comprehensive list of the maintenance needs of all dry cleaning machines. The manufacturer's operating manual is a source for all the maintenance operations that need to be performed for a particular machine.

Completing an Operations and Maintenance Checklist

An important element of the training course is for the instructor to go over with the students in detail on how to fill out the operations and maintenance checklist and the service repair log. The discussion must include the steps involved if the repair can not be performed promptly. As required by the Dry Cleaning ATCM, the instructor should go over when the district needs to be notified for a leak extension.

The example checklist is formatted so that maintenance performed for one month can be recorded on one page. Figure 7-1 and Appendix D can be modified to include the additional maintenance operations specific to a particular dry cleaning machine. For example, the change out dates of carbon canisters used in fugitive control devices, or desorption schedules of a carbon adsorber can be added to the operation and maintenance checklist. In discussing the checklist, the instructor needs to explain each section of the checklist:

- ❒ On the top of the checklist fill out the facility name and machine type. If the facility has more than one machine, each machine should have a separate operation and maintenance checklist. Also enter the date of the first working day of the week that the checklist is first used.
- ❒ Operations that need to be performed on a daily basis are listed. These items are to be checked by the operator each day, but are not required to be marked off on the checklist.

- ❒ Use one column for each week to check off the weekly maintenance item. Enter the date when the weekly maintenance operations have been performed and the initials of the person doing the maintenance work.
- ❒ Items that need less frequent maintenance are in the section marked "Other". When the maintenance is completed, enter the date and initials of the person performing the maintenance operation.
- ❒ Keep the maintenance checklist readily available for district inspectors upon request. Placing the completed checklists into a three-ring binder is a good way to organize the forms.

An example of a completed Operations and Maintenance Checklist is given in Figure 7-2.

Figure 7-1. Operations and Maintenance Checklist

Facility Name/ID: _____ **Machine Type/ID:** _____

DATE (MM/DD/YY) (first working day of week one): _____

OPERATIONS AND MAINTENANCE CHECKLIST

	CHECK THE FOLLOWING ITEMS DAILY
DAILY	Check button trap and button trap screen (this may be required more than once a day). Place debris in a sealed container.
	Clean the lint trap (as often as required to avoid clogging fans and condensors), and place lint in a sealed container.
	Clean strainer in pre-lint filter (if applicable); Clean pump strainer. Place debris in a sealed container.
	Check all pressure gauges (ensure proper operating pressures - refer to equipment operating manuals for specific requirements)
	Empty waste water collector into closed containers or waste water processsor (atomizer or evaporator)
	Perform a visual leak inspection; This is a quick inspection - a thorough inspection should be accomplished weekly using the leak inspection checklist and a leak detector
	Check back pressure on cartridge filters, replace when manufacturer's recommended back pressure is reached. Drain the filters for 24 hours (standard) or 48 hours (adsorptive) then place cartridges in sealed containers.
	Check the still to ensure it does not exceed 75 percent of capacity (N/A for continuous stills)

	CHECK THE FOLLOWING ITEMS WEEKLY; CHECK-OFF AND INITIAL THE APPROPRIATE BOXES					
WEEKLY CHECKLIST ITEMS	**WEEK**	**1**	**2**	**3**	**4**	**5**
	USE THE FIVE BOXES TO THE RIGHT TO ANNOTATE INSPECTION DATES					
	INITIALS OF INSPECTOR					
	Check pump for proper lubrication, flow rate and operation (refer to equipment owner's manual)					
	Check air relief and diverter valves to ensure proper operation and closure					
	Test exhaust dampers for air leaks (vented machines)					
	Check water separator for debris; empty into still and clean if necessary					
	Inspect and clean the still					
	Check the operation of waste water treatment unit (if applicable). Replace carbon according to manuafacuturer's recommended frequency.					
	Check to ensure that the air-vapor stream downstream of the condenser is $\leq$ 45°F (7.2°C)					
	Monitor carbon adsorber (if applicable) according to district specifications					

	CHECK THESE ITEMS USING THE SUGGESTED FREQUENCY BELOW	DATE	INITIAL
OTHER*	Check the drive belts for proper tension and condition (Semi-Annual)		
	Clean evaporative water towers to remove dirt and scale (Semi-Annual)		
	Inspect cooling coils (condenser) for lint buildup and proper operating temperatures (Annually)		
	Inspect cooling coils (still) for leaks, corrosion, and buildup (Annually)		
	Check steam coils (heating) for lint buildup and proper drying temperatures (Annually)		
	Check and clean all other machine areas that may collect lint and affect proper operation (e.g., steam traps, fan blades, and air ducts) (Annually)		
	Check disk filters for damage and dry clean them (Annually)		
	Change inductive door fan carbon (if applicable) (Per manufacturer's recommendation)		
	Lubricate (grease) fittings (Per manufacturer's recommendation)		
	Clean and inspect base solvent tanks (Per manufacturer's recommendation)		

* This is a suggested frequency; follow the manufacturer's operating manual in cases where they recommend more frequent schedules.

Revised 4/17/96

Figure 7-2. Completed Sample Operations and Maintenance Checklist

Facility Name/ID: Squeaky Clean Cleaners **Machine Type/ID:** VIC 1200

DATE (MM/DD/YY) (first working day of week one): 9/4/95

OPERATIONS AND MAINTENANCE CHECKLIST

DAILY

CHECK THE FOLLOWING ITEMS DAILY
Check button trap and button trap screen (this may be required more than once a day). Place debris in a sealed container.
Clean the lint trap (as often as required to avoid clogging fans and condensors), and place lint in a sealed container.
Clean strainer in pre-lint filter (if applicable); Clean pump strainer. Place debris in a sealed container.
Check all pressure gauges (ensure proper operating pressures - refer to equipment operating manuals for specific requirements)
Empty waste water collector into closed containers or waste water processsor (atomizer or evaporator)
Perform a visual leak inspection; This is a quick inspection - a thorough inspection should be accomplished weekly using the leak inspection checklist and a leak detector
Check back pressure on cartridge filters, replace when manufacturer's recommended back pressure is reached. Drain the filters for 24 hours (standard) or 48 hours (adsorptive) then place cartridges in sealed containers.
Check the still to ensure it does not exceed 75 percent of capacity (N/A for continuous stills)

WEEKLY CHECKLIST ITEMS

CHECK THE FOLLOWING ITEMS WEEKLY; CHECK-OFF AND INITIAL THE APPROPRIATE BOXES					
WEEK	**1**	**2**	**3**	**4**	**5**
USE THE FIVE BOXES TO THE RIGHT TO ANNOTATE INSPECTION DATES	9/4	9/11			
INITIALS OF INSPECTOR	TN	TN			
Check pump for proper lubrication, flow rate and operation (refer to equipment owner's manual)	✔	✔			
Check air relief and diverter valves to ensure proper operation and closure	✔	✔			
Test exhaust dampers for air leaks (vented machines)	✔	✔			
Check water separator for debris; empty into still and clean if necessary	✔	✔			
Inspect and clean the still	✔	✔			
Check the operation of waste water treatment unit (if applicable). Replace carbon according to manuafacuturer's recommended frequency.	✔	✔			
Check to ensure that the air-vapor stream downstream of the condenser is $\leq$ 45°F (7.2°C)	✔	✔			
Monitor carbon adsorber (if applicable) according to district specifications	N/A	N/A			

OTHER*

CHECK THESE ITEMS USING THE SUGGESTED FREQUENCY BELOW	DATE	INITIAL
Check the drive belts for proper tension and condition (Semi-Annual)		
Clean evaporative water towers to remove dirt and scale (Semi-Annual)		
Inspect cooling coils (condenser) for lint buildup and proper operating temperatures (Annually)		
Inspect cooling coils (still) for leaks, corrosion, and buildup (Annually)		
Check steam coils (heating) for lint buildup and proper drying temperatures (Annually)		
Check and clean all other machine areas that may collect lint and affect proper operation (e.g., steam traps, fan blades, and air ducts) (Annually)		
Check disk filters for damage and dry clean them (Annually)		
Change inductive door fan carbon (if applicable) (Per manufacturer's recommendation)	9/4/95	TN
Lubricate (grease) fittings (Per manufacturer's recommendation)		
Clean and inspect base solvent tanks (Per manufacturer's recommendation)		

* This is a suggested frequency; follow the manufacturer's operating manual in cases where they recommend more frequent schedules.

Revised 4/17/96

DISCUSSION QUESTIONS

1. What are the benefits of operation and maintenance practices?
2. Why is performing regular maintenance on dry cleaning equipment important?
3. What is the required desorption frequency of a carbon adsorber used as a primary control device?
4. What are the two maintenance procedures that can optimize a refrigerated condenser's efficiency?
5. Why should cartridge filters not be used beyond their normal capacity? What are the methods for knowing when a cartridge filter has reached its capacity and needs changing?
6. How long must a standard cartridge filter be drained according to the Dry Cleaning ATCM requirements? How long for an adsorptive cartridge filter?
7. When should steam and cooling coils be inspected for corrosion and lint build-up?
8. Why is it important to regularly change the carbon for an inductive door fan?
9. What are the operating practices required by the Dry Cleaning ATCM for stills and muck cookers? What other maintenance procedures can be done to increase a still or muck cooker's efficiency?
10. When should button and lint traps be cleaned?

References

Boewe, 1989. Photo copy of equipment manual.

Dow, 1987. "Drycleaning A Basic Handbook", Dow Chemical Company 1987.

Douglas, 1996. Meeting with Jim Douglas of Swansons Cleaners and ARB staff. February 27, 1996.

IFI, 1984. "IFI Focus on Drycleaning, An Equipment Handbook", Vol. 8, No. 3, July 1984.

Kajiwara, 1995. Telephone conversation with Arthur Kajiwara on 2/14/95 and 10/12/95, Arthur Kajiwara Equipment Co. Inc.

Union. "Manufacturer's Operating Manual for Union L35, Union L55, and Union L80 Machines", Union Drycleaning Products, USA.

VIC, 1992. "Installation, Operation, and Maintenance Instructions for VIC 1200F/S and 1200 Advanced Series Drycleaning Machines", VIC Manufacturing, July 1992.

CHAPTER 8

LEAKS AND LEAK DETECTION

INSTRUCTIONAL OBJECTIVES

Upon completion of this chapter, students will be able to:

- ❒ Identify what the different types of leaks are;
- ❒ Understand the different requirements and compliance dates for checking vapor, perceptible vapor, and liquid leaks;
- ❒ Understand where and when to check for leaks;
- ❒ Identify the different leak detection methods and devices required by the Dry Cleaning ATCM;
- ❒ Identify what to do in case a leak is detected; and
- ❒ Understand how to complete a leak checklist and repair log.

KEY POINTS

1. The Dry Cleaning ATCM requires leaks to be checked weekly with a portable halogenated hydrocarbon detector.
2. Dry cleaners are responsible for leaks at all times.
3. A leak, if undetected, could emit a substantial amount of Perc to the atmosphere, at a cost to the dry cleaner and the environment.
4. Repairing leaks is important to minimize Perc emissions.
5. Halogenated hydrocarbon detectors have to detect small leaks below the 25 ppmv level.
6. Leaks can occur in many areas and may not be perceptible except with a halogenated hydrocarbon detector.
7. Using a leak inspection checklist insures that listed components are checked and provides a record of when leak inspections were performed.

A. SUMMARY

This chapter identifies the different types of leaks that can occur on different components of the dry cleaning machine. As of April 1, 1996[1], the Dry Cleaning ATCM requires that leak checks be done with a portable halogenated hydrocarbon detector or portable hydrocarbon analyzer rather than by sight, smell, or feel. This chapter

[1]Or June 3, 1996 in the Bay Area Air Quality Management District (BAAQMD) and the South Coast Air Quality Management District (SCAQMD) since those districts adopted "equivalent" dry cleaning regulations.

will cover how to use a portable halogenated hydrocarbon leak detectors, what to do in case a leak is found, how to properly fill out a leak checklist, and what to do when a leak cannot be repaired immediately.

B. LEAKS

Vapor and liquid leaks contribute significantly to Perc emissions to the atmosphere. All of the Perc lost from vapor leaks is emitted directly into the air. The Perc lost from liquid leaks results in air emissions through evaporation. For example, a continual liquid leak of one drop every three minutes over 24 hours results in approximately one-half pound or a little over one-half cup of Perc lost. Performing weekly (daily if possible)[2] leak inspections will also help minimize Perc emissions by locating leaks and then repairing them immediately.

Causes of Leaks

LEAK CAUSES

Leaks result from the use of the dry cleaning machine. Wear, normal expansion and contraction created by variations in temperature, and vibration of the equipment may loosen a pipe connection, duct or joint. Leaks can occur anywhere where parts are connected: gaskets, doors, ducts, pumps, dampers and valves. Seals and gaskets wear out with age. Doors and gaskets may go out of alignment with constant use. Dirt or corrosion may cause parts to leak or not seal properly.

Types of Leaks

1. Liquid Leaks

LIQUID LEAKS

A liquid leak is defined in the Dry Cleaning ATCM as "a leak of liquid containing perchloroethylene of more than one drop every three minutes."

Signs of solvent leaks can be found by looking for solvent puddles on or around the machine and discoloration of any piece of apparatus on the machine. Inspect all gaskets, pipe joints and unions, seals, valves, and hose connections for liquid leaks. To be absolutely sure that there are no leaks, take time to check these components

[2]Even though leaks are required to be checked weekly, dry cleaners will be responsible for leaks at all times. If a district inspector finds a leak during an inspection, the dry cleaner may be subject to enforcement action if the leak has not been tagged for repairs. It is recommended that dry cleaners check for leaks at least daily, if possible, with a halogenated hydrocarbon detector.

throughout the washing, solvent extraction, distillation, and drying processes.

Good housekeeping cannot be overemphasized. It is difficult to locate liquid solvent leaks when the machine is dirty. Many times leaks occurring from the rear of the dry cleaning equipment go completely unnoticed because the drops fall into an oily lint buildup on the back of the machine.

2. Perceptible Vapor Leaks

PERCEPTIBLE VAPOR LEAKS

A perceptible vapor leak is an emission of Perc vapors from an unintended opening in the dry cleaning system that can be perceived or detected by the senses: sight, hearing, smell, or touch. The Dry Cleaning ATCM requires dry cleaners to conduct weekly inspections for perceptible vapor leaks until April 1, 1996 (or June 3, 1996 in the BAAQMD and the SCAQMD).

3. Vapor Leaks

VAPOR LEAKS

As of April 1, 1996 (or June 3, 1996 in the BAAQMD and the SCAQMD), dry cleaners will be required to check for vapor leaks weekly using a halogenated-hydrocarbon detector or portable analyzer. As defined in the Dry Cleaning ATCM:

> "A "vapor leak" means an emission of perchloroethylene vapor from unintended openings in the dry cleaning system as indicated by a rapid audible signal or visual signal from a halogenated-hydrocarbon detector or a concentration of perchloroethylene exceeding 50 ppmv as methane[3] as indicated by a portable analyzer."

[3] 50 ppmv as methane is approximately 44 ppmv as Perc, using a conversion factor of 0.87.

Where to Check for Leaks

The following table lists where leaks can occur:

PROBABLE LEAK AREAS

Table 8-1. Probable Areas Where Leaks Can Occur

Liquid and Vapor Leaks In All Machine Types	
Lint trap lid or cover	Seals and gaskets
Machine door gasket and seating	Pump
Condenser and heating coil door	Distillation unit doors
Solvent base tanks	Sight glasses
Hose couplings & connections	Valves
Filter head gasket and seating	Button trap lids
Machine access doors	Cooker door
Solvent water separator	Fittings
Automatic additive devices	Pipe unions
For Vented Machines Only	
Exhaust damper gasket	Control device ductwork
Inlet damper gasket	Vapor recovery unit
Flanges or connections	
Miscellaneous Liquid Leaks	
Storage containers	

When to Check for Leaks

TIMES TO CHECK FOR LEAKS

Some components are more likely to produce vapor or liquid leaks while the machine is in the wash, extraction, or drying cycles. It makes sense then to check these components when there is the potential for leaks to occur. The operator should perform visual inspection for liquid leaks, and use a halogenated hydrocarbon detector to check for vapor leaks.

Check for vapor leaks during the drying cycle at the lint trap, doors to the condenser and heating coils, loading door, valves, seals and gaskets. Vented machines also need their ductwork, flanges, connections, vapor recovery unit, and dampers checked during the drying cycle. Machines with secondary controls or inductive door fans need these devices checked when they are operating. For vapor leaks during the distillation process, check around the still door and condenser.

Check for liquid leaks during the wash, extraction, and drying cycles, and during distillation operations. During the wash and extraction cycles, check the solvent lines to and from the solvent tanks, pump, filter door, button trap door, solvent hose couplings and connections, automatic additive devices, sight glasses, and the machine drum door. During the drying cycle and distillation operations, the solvent water separator and its hoses and connections are places where liquid leaks could occur. Also, check the distillation sight glasses for leaks during distillation. The storage containers should be checked weekly for leaks.

Vapor Leaks in Vented Machines

LEAKS IN VENTED MACHINES

Leaks in the ductwork and air dampers are exclusive to vented machines. If a vented machine is used, the operator needs to inspect for ductwork and damper leaks until the machine is replaced.

1. Ductwork Leaks

Ductwork in poor condition can be a significant source of vapor leaks from a vented machine. All ducting should be in good condition -- solid and not corroded. The ducts should be firmly supported from the wall or ceiling by brackets or rod hangers. Vibration from the cleaning machine and tumbler can cause the duct to shift and change alignment, allowing seams to open. Duct joints should be securely fastened together, either with pop rivets or sheet metal screws giving mechanical rigidity to the joint. To further reinforce a joint, a good quality duct tape should be wrapped around the joint at least twice. Deteriorating duct joints are one of the most common problems for leaks in vented machines. In addition, ductwork leaks associated with local ventilation, machine enclosure, or an inductive door fan can be an emission source.

2. Air Damper Leaks

For a vented machine, the inlet damper and the outlet damper must be both fully closed during the drying cycle and open during the deodorizing step. An improperly seated air inlet damper on a tumbler will leak a substantial volume of Perc vapor into the cleaning area during the drying cycle. Studies by the International Fabricare Institute (IFI), show that a gap of 0.5 inch thickness during a 20-minute drying cycle will result in a loss of almost two and a half cups (2 pounds) of Perc per 35 pound load. (IFI, 1987) A damper that is not fully closed during the drying cycle can allow high concentrations of Perc to overload the carbon adsorber bed prematurely. If the operator is unaware of this overload, a breakthrough of Perc vapors from the carbon bed will occur.

IFI indicated that leakage at the exhaust damper is easily detected by disconnecting the ducting closest to the damper. The damper is then tested by placing a plastic garbage bag over the exhaust during the recovery cycle. If the bag inflates, the exhaust damper is leaking. Leakage from the inlet damper cannot be detected, so the damper gasket must be periodically checked. (IFI, 1987)

If a leak is found, check to see if accumulations of lint or other particles are preventing the proper closing of both inlet and outlet dampers. Mechanical adjustments to the linkage may be needed to provide sufficient tension for proper seating. If the damper gasket is hard or cracked, it should be replaced. Check the operation of the air cylinder which opens and closes the dampers (on semi- and fully-automatic models). Worn or ruptured cups, washers, or diaphragms can cause the dampers to not close properly.

C. HALOGENATED-HYDROCARBON DETECTOR

HALOGENATED-HYDROCARBON DETECTORS

A halogenated-hydrocarbon detector is a portable electronic device that is powered by either a battery or an AC source (Figure 8-1). Some of the battery powered detectors can resemble small transistor radios and fit in the palm of the hand. These detectors have flexible probes that can be directed across various areas of the dry cleaning machine for leak detection, or focused in on leak sources. They can detect different types of chlorinated compound vapors. Costs for these detectors range from $120 to $400.

For the purpose of the Dry Cleaning ATCM, the detector must be capable of detecting Perc vapor concentrations of 25 ppmv or less. When a leak is detected, the detector makes a beeping sound. Some models include a visual display of lights that indicate changes in Perc concentration.

Many of the portable halogenated-hydrocarbon detectors available on the market are used in the refrigeration industry for detecting refrigerant leaks. These same detectors can also be used by dry cleaners in detecting Perc leaks because they are capable of detecting Perc leaks at the levels specified in the Dry Cleaning ATCM.

Figure 8-1. Halogenated-hydrocarbon Leak Detectors

TIF, 1994a; Spectrex, 1996

Need for a Halogenated-Hydrocarbon Detector

A halogenated-hydrocarbon detector is required for detecting vapor leaks because they can detect Perc well below the 25 ppmv Dry Cleaning ATCM requirement, making the detector more sensitive than the human senses. Often a leak would have to be above a sensory threshold of 50 ppmv before it becomes perceptible by one of the human senses. The detectors also enable one to check areas not readily accessible to a person's sight, smell, or feel. A portable halogenated-hydrocarbon detector can be directed closer to most components of the machine, detecting leaks before they can be diluted by the surrounding air. The sensor should be positioned within one centimeter (half an inch) of the parts to be checked for leaks.

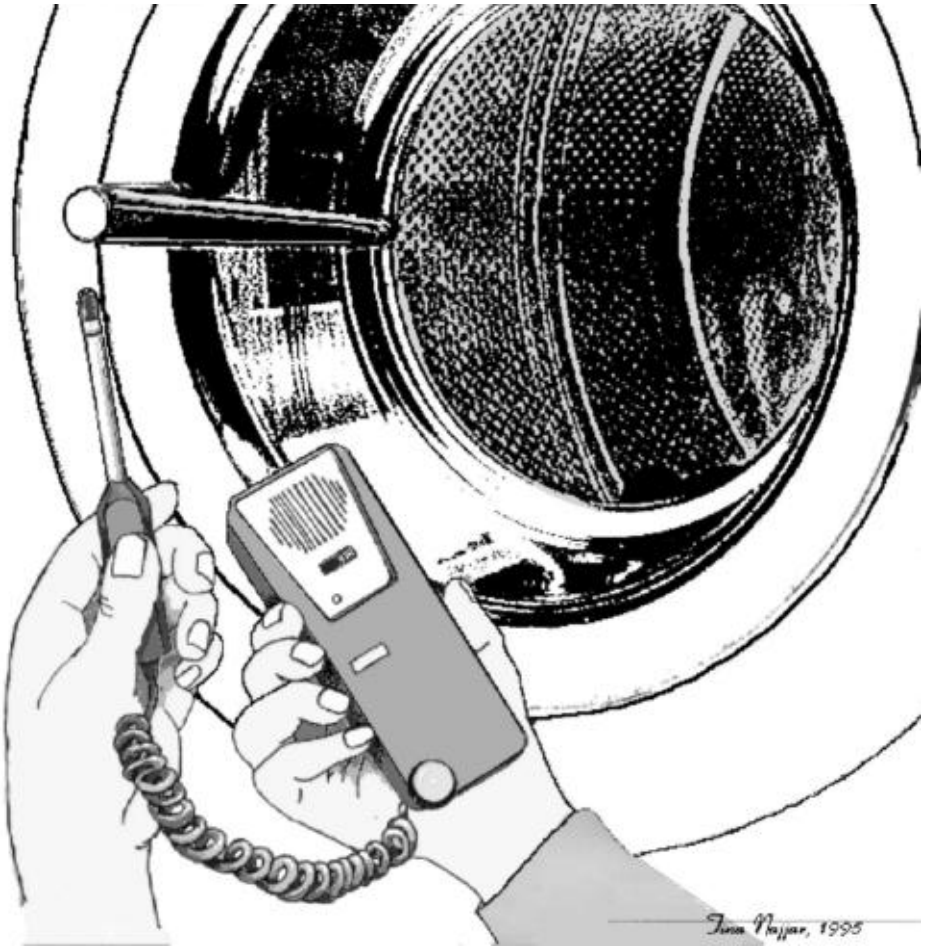
With any leak, early detection is the key in minimizing Perc loss. If a small leak is found, it could be repaired before it became large enough to be perceptible, thus minimizing the loss of Perc. Weekly checks with a halogenated-hydrocarbon detector makes detecting these small leaks possible.

Use of the Portable Halogenated-Hydrocarbon Detector

If a portable halogenated-hydrocarbon detector is used to inspect for leaks, the unit needs to be turned on and calibrated according to manufacturer's directions. Some detectors use the surrounding air to set the baseline Perc concentration when the unit is turned on. It is important to turn these detectors on outside, or in areas without Perc. To use the detector, pass the probe around areas to be checked while maintaining a distance of one centimeter from the end of the probe to the surface of the component being checked for leaks. Figure 8-2 shows an operator checking for leaks around the loading door. The detector should be moved no faster than a rate of two inches a second. An audible or visual alarm will alert the operator if a leak is detected.

USING A HALOGENATED-HYDROCARBON DETECTOR

Figure 8-2. Checking for Leaks Around a Loading Door.



D. LEAK CHECKLIST

If a liquid or vapor leak has been detected, it needs to be noted on the leak checklist and repaired promptly. Figure 8-3 and Appendix D

LEAK CHECKLIST

show an example of a leak checklist. The use of leak checklists insures that listed components are checked each week (or daily). Leak checklists also provide a record of when leak inspections were performed.
A checklist can also help pinpoint problem areas on the equipment that may need to be monitored more frequently, if that area leaks more often than others. Some districts have a specific leak checklist that they require dry cleaners to maintain. Contact the district in your area for a copy of their leak checklist.

How to Use the Leak Checklist

The checklist can be modified by including additional components to be inspected. Dry cleaners are responsible for leaks at all times. The steps for completing the leak checklist are as follows:

- ❒ Fill out the facility name and machine type on top of the checklist. If the facility has more than one machine, each machine will have to have a separate checklist.
- ❒ In the space marked "Date", write the date that a new checklist is first being used.
- ❒ Under "INSPECTION DATES", list the date that the leak inspection was performed for each week.
- ❒ The person who is performing the leak check needs to initial the box directly below the date of the leak inspection.
- ❒ The person performing the leak inspection has to check each item during the wash or dry cycles, or distillation operations in the appropriate column (1-13). If no leak is found, then a"✔" is used. If a leak is found, a "**O**" is marked in the square. Items that are found to be leaking must be repaired immediately, or tagged and recorded on a service and repair log.

Figure 8-4 shows a completed leak checklist for a fictitious cleaner called Squeaky Clean Cleaners. Components not listed can be added, while components that do not apply can be deleted. For example, deodorization and aeration valves are used in vented machines, and do not apply to the closed-loop machine. In addition, a vapor containment system was added to the list in the dry cycle category, which is a unique component for this machine.

Figure 8-3. Weekly Leak Inspection Checklist

Facility Name/ID:_____ **Machine Type/Machine ID:**_____

WEEKLY LEAK INSPECTION CHECKLIST

NOTE: Completion of this form is required by district regulations

DATE (first working day of quarter):_____ **WEEK**		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
INSPECTION DATES														
INITIALS OF THE INSPECTOR														
"✓" SIGNIFIES OKAY; "O" SIGNIFIES THAT A LEAK HAS BEEN FOUND*														
WASH CYCLE	Machine door gasket and seating													
	Hose connections, unions, couplings and valves													
	Pumps													
	Button Trap													
	Filter housings													
DRY CYCLE	Machine door gasket and seating													
	Deodorizing and aeration valves on dryers													
	Air and exhaust ductwork													
	Heating and cooling coil doors													
	Hose connections, unions, couplings and valves													
	Water separators													
	Lint Trap													
DISTILLATION/ MISCELLANEOUS														
	Hose connections, unions, couplings and valves													
	Water separators													
	Distillation unit													
	Base tanks and storage containers													

* If a leak is found, it must be repaired immediately or tagged and recorded on the "Service and Repair Log."

Revised 12/15/95

Figure 8-4. Completed Sample Weekly Leak Inspection Checklist

Facility Name/ID: Squeaky Clean Cleaners **Machine Type/Machine ID:** VIC 1200/ XX-XXXXXX

WEEKLY LEAK INSPECTION CHECKLIST
NOTE: Completion of this form is required by district regulations

		1	2	3	4	5	6	7	8	9	10	11	12	13
DATE (first working day of quarter): 9/1/95 **WEEK**														
INSPECTION DATES		9/4	9/11	9/18	9/25	10/2	10/9	10/16	10/23	10/30	11/6	11/13	11/20	11/27
INITIALS OF THE INSPECTOR		TN	TN	TN	TN	TN	TN	TN	MW	TN	TN	TN	TN	TN
"✓" SIGNIFIES OKAY; "O" SIGNIFIES THAT A LEAK HAS BEEN FOUND*														
WASH CYCLE	Machine door gasket and seating	✔	✔	✔	✔	✔	✔	✔	✔	✔	**O**	✔	✔	**O**
	Hose connections, unions, couplings and valves	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	Pumps	✔	✔	**O**	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	Button Trap	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	Filter housings	**O**	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
DRY CYCLE	Machine door gasket and seating	✔	✔	✔	✔	✔	✔	✔	✔	✔	**O**	✔	✔	**O**
	Deodorizing and aeration valves on dryers	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Air and exhaust ductwork	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Heating and cooling coil doors	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	Hose connections, unions, couplings and valves	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	Water separators	✔	✔	✔	✔	✔	✔	✔	✔	**O**	✔	✔	✔	✔
	Lint Trap	✔	✔	✔	✔	✔	✔	**O**	✔	✔	✔	✔	✔	✔
	Vapor Containment system	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
DISTILLATION/ MISCELLANEOUS														
	Hose connections, unions, couplings and valves	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	Water separators	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	Distillation unit	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
	Base tanks and storage containers	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

* If a leak is found, it must be repaired immediately or tagged and recorded on the "Service and Repair Log."
Revised 12/15/95

E. SERVICE AND REPAIR LOG

SERVICE AND REPAIR LOG

If a leak is found, the date and type of repair needs to be listed on a service and repair log. Figure 8-5 shows an example of a service and repair log. The service and repair log is used to keep track of repairs and is a record of parts that need to be ordered in accordance with the timeframe specified in the Dry Cleaning ATCM and must be available to a district inspector upon request. A full size example of a service and repair log is given in Appendix D.

Unavailability of Parts to Make Repairs

If the repair of a leak can not be done immediately, the leaking component needs to be tagged and the date noted on a service and repair log. If a part has to be ordered, it must be ordered within two working days of when the leak was detected. Record the date that the part was ordered on the service and repair log. Once the part is received, it must be installed within five working days after receipt. If not repaired by the end of the 15th working day, a leaking piece of equipment cannot be operated without a leak repair extension from the district. The dates the parts are received, installed and the repairs are completed must be included on the service and repair log.

Leak Repair Extensions

If the repairs can not be completed in 15 days, the operator needs to apply to the district for a leak-repair extension. The district may grant a leak-repair extension to a facility, for a single period of 30 days or less, if the district makes these findings:

1. The delay in repairing the leak could not have been avoided by action on the part of the facility.
2. The facility used reasonable preventive measures and acted promptly to initiate the repair.
3. The leak would not significantly increase Perc exposure near the facility.
4. The facility is in compliance with all other regulatory requirements and has a history of compliance.

Figure 8-5. Service And Repair Log

FACILITY NAME/ID:_____ **MACHINE TYPE/ID:**_____

SERVICE AND REPAIR LOG

Note: person performing each item to initial within box.

Date	Service/Repair Description	Date Tagged	Parts Ordered[1]/ Date Ordered	Date Received	Parts Installed[2]	Date Repair Completed[3]

1. **Parts shall be ordered within two working days of the detection of a leak.**
2. **Repair parts shall be installed within five working days after receipt of the part.**
3. **A facility with a leak that has not been repaired by the end of the 15th working day after detection shall not operate the dry cleaning equipment, until the leak is repaired, without a leak-repair extension from the district.**

NOTE: All leaks must be repaired within 15 working days or you must contact the district at ( )_____ - _____.

How to Use the Service and Repair Log

The steps for completing a service and repair log are as follows:

- ❒ On the top of the checklist fill out the facility name. If the facility has more than one machine, each machine should have its own service and repair log.
- ❒ Record the date a leak was found and what was needed to repair the leak. List the initials of who detected the leak should also be listed in the boxes. If the leak was repaired immediately, no additional action is needed.
- ❒ If the leak cannot be repaired immediately, the part must be physically marked or tagged in a manner that the district inspector can readily see. On the tag, record the date the leak was tagged and the initials of the person who tagged the component. Also record this information on the service and repair log.
- ❒ If a part must be ordered, record the part, the date the part was ordered, and the initials of the person who ordered the part on the service and repair log. Order the part within two working days of detecting the leak.
- ❒ Record the date the parts are received and the initials of the person who received the parts onto the log upon the parts arrival.
- ❒ Enter the date the parts are installed and the date the repair is completed in the service and repair log, along with the person's initials who performed the repair. Install the repair parts within five working days after receipt.

Figure 8-6 shows a completed service and repair log that accompany the leak checklist in Figure 8-4 for the fictitious Squeaky Clean Cleaners.

Figure 8-6. Completed Sample Service And Repair Log

FACILITY NAME/ID: Squeaky Clean Cleaners **MACHINE TYPE/ID:** VIC 1200/ XX-XXXXXX

SERVICE AND REPAIR LOG

Note: person performing each item to initial within box.

Date	Service/Repair Description	Date Tagged	Parts Ordered[1]/ Date Ordered	Date Received	Parts Installed[2]	Date Repair Completed[3]
9/4/95TN	Replace filter housing O-ring TN	9/4/95TN	9/5/95 MW	9/8/95 MW	9/9/95 TN	9/9/95 TN
9/18/95TN	Replace worn pump seal TN				9/18/95 TN	9/18/95 TN
10/16/95 TN	Lint preventing proper lid closure. TN					10/16/95 TN
10/30/95 TN	Cleaned clogged water separator vent. TN					10/30/95 TN
11/6/95 TN	Reseated machine door gasket. TN					11/6/95 TN
11/27/95 TN	Replace machine door gasket. TN	11/27/95 TN	11/27/95 TN	12/4/95 MW	12/5/95 MW	12/5/95 MW

1. **Parts shall be ordered within two working days of the detection of a leak.**
2. **Repair parts shall be installed within five working days after receipt of the part.**
3. **A facility with a leak that has not been repaired by the end of the 15th working day after detection shall not operate the dry cleaning equipment, until the leak is repaired, without a leak-repair extension from the district.**

NOTE: All leaks must be repaired within 15 working days or you must contact the district at (XXX) XXX - XXXX .

DISCUSSION QUESTIONS:

1. What constitutes a liquid leak according to the Dry Cleaning ATCM?
2. What is the difference between a perceptible vapor leak and a vapor leak?
3. When is it necessary to check for vapor leaks using a halogenated-hydrocarbon detector?
4. Why is it important to check for leaks during the wash or dry cycle, and during distillation?
5. What must a dry cleaner do if a leak can not be repaired within 15 days of detection?
6. What must a dry cleaner do if a leak can not be repaired immediately?
7. Although the Dry Cleaning ATCM requires weekly leak checks, why is it a good idea to perform leak checks more frequently (daily if possible)?
8. A portable halogenated-hydrocarbon leak detector must detect below what concentration?
9. What is the purpose of a leak checklist?
10. What is the purpose of a service and repair log?

References

IFI, 1987. "Focus on Drycleaning, Perchloroethylene Vapor in Drycleaning Plants", International Fabricare Institute, Vol. 11, No.1, March 1987.

Spectrex, 1996. Picture of Spectrex Detector, Spectrex Corporation, March 1996.

TIF, 1994a. TIF Instruments, Inc. Specification Data Catalog, TIF Instruments, Inc. 9101 N.W. 7th Avenue, Miami, Florida 33150.

[Blank Page]

CHAPTER 9

SPILLS AND EMERGENCY RESPONSE

INSTRUCTIONAL OBJECTIVES

Upon completion of this chapter, students will be able to:

- ❒ List different spill prevention techniques.
- ❒ Know how to properly clean small spills.
- ❒ Know what to do in case of a large spill or emergency.
- ❒ Know the proper safety equipment and precautions to use for spills.
- ❒ Know the requirements of an emergency action or contingency plan and agencies to contact for more information.

KEY POINTS

1. Spills and emergencies can happen even if spill prevention techniques are carefully followed. All dry cleaning employees must know in advance how to safely handle spills and emergencies.
2. Agencies such as the Department of Toxic Substances Control (DTSC) and the California Occupational Safety and Health Administration (Cal/OSHA) require some kind of emergency action or on-site contingency plan outlining how a facility will handle an emergency/spill.
3. Proper handling of spills is imperative to the safety of workers, the neighbors, and the environment.
4. DTSC requires that all spills be reported to the county health department if Perc escapes to the sewage system, adjoining properties, soil, or storm drains.

A. SUMMARY

Spills can be a source of fugitive emissions for a dry cleaning plant. It can result in liability problems for a dry cleaning operator if a spill contaminates the groundwater and soil. This section outlines spill prevention, contingency or emergency action plans, spill clean-up and reporting. This chapter provides a brief overview of DTSC and Cal/OSHA requirements. The appropriate agencies need to be contacted for more detailed information.

B. SPILLS

It is important to know what to do in case of a major or minor spill. Knowing how to properly respond to spills will help ensure your safety, and the safety of your employees, customers, and neighbors.

Response to a Major Perc Spill

MAJOR SPILLS

A major spill is one that causes a large puddle of solvent that cannot be cleaned up safely by the operator. A large spill can fill an enclosed area with Perc vapors quickly and put people within the area in danger. If a spill seems too large for a dry cleaner to handle safely, do not risk the health of the employee by attempting to clean it up. Evacuate the building immediately, seal off the area, and call for emergency assistance (911). Contacting 911 will alert the appropriate emergency agency who can safely contain and clean the spill. Have the Material Safety Data Sheet (MSDS) available for emergency personnel to review when they arrive.

Response to a Minor Perc Spill

MINOR SPILLS

A minor spill is one that makes a small puddle of solvent or solvent containing waste that can be cleaned up with a few rags. These spills can be cleaned up safely by the operator using the proper safety precautions. The following response is suggested for minor solvent spills:

1. Evacuate the area. Only persons properly trained in safe clean-up of a spill should re-enter the area wearing a NIOSH approved respirator and gloves. It is important to promptly clean up a spill, but it is more important to do it safely.

2. Start as much air flow through the accident area as possible without having vapors spread to other parts of the plant. Turn on exhaust fans if available and open windows and doors.

3. Always use a "buddy" system when cleaning up a spill. A back-up person with an available respirator, should be standing by outside of the spill area, ready to assist immediately if the clean-up person is overcome by solvent vapors. People responsible for cleaning up spills should be aware of the symptoms of solvent inhalation, (i.e. headaches, dizziness, nausea, etc.), so that they may leave the area before they are overcome by Perc vapors.

4. The clean-up person should throw a blanket, clothes, or rags on the spill to absorb and reduce the surface area available for evaporation. As an alternative, a noncombustible adsorbent material, sold specifically for cleaning up chemical spills, may be used.

5. Throw the solvent-laden blankets, clothes, or rags into an empty dry cleaning machine that is not the source of the leak and close the door. Continue cleaning until all the liquid solvent has been picked up and the floor is dry. Then put the machine on drying cycle to recover the solvent from the blanket, clothes or rags into the base tank. If the only machine is inoperable due to leaking, temporarily collect the articles in an air tight container (drum) until the machine is repaired. If an adsorbent material has been used, it should be shoveled into containers, covered, and disposed of as hazardous waste.

6. In the case of a boil-over of a cooker or still, leave the area immediately and do not return without wearing a respirator. Turn off the steam line to the still or cooker. If it is not already on, start cooling water through the coils. Spills of still residue should be scooped up and placed in the appropriate hazardous waste container.

7. If at any time an odor of Perc is noted through the respirator, leave the area immediately and use a new respirator or fresh cartridges.

8. Separator water spills should be mopped up and returned to the appropriate container. Since there is still a small amount of Perc present in the separator water, do not flush it down the drain.

C. SPILL PREVENTION TECHNIQUES

SPILL PREVENTION

The best protection against uncontrolled solvent spills is to take precautions to prevent them. Here are some actions that operators can take to help prevent spills:

- ❒ Inspect containers and equipment weekly to be sure they are not leaking.
- ❒ Perform regular and preventive maintenance including replacement of gaskets, seals, and other machine components.
- ❒ Always close the separator and button trap cover before operating the dry cleaning machine.

- ❒ Be completely familiar with the operation and maintenance of your dry cleaning machine. Exercise caution when filling the machine, changing filters, during distillation or any solvent handling procedure.
- ❒ Pipe reclaimed solvent from dryers, stills, muck cookers and vapor recovery units directly to the solvent storage tank.
- ❒ Make sure that the filter housing is completely drained before servicing or changing filters.
- ❒ When solvent is delivered, have the solvent supplied directly from the truck into the storage tank of the dry cleaning machine.
- ❒ If Perc is delivered in drums, use spigots and pumps to dispense the Perc into the machine solvent tank. If possible, use a direct coupling device for transferring solvent.[1]
- ❒ Personally supervise each solvent delivery to eliminate overfills, leaking equipment, and other possible discharges.
- ❒ Tightly seal all openings on solvent and waste containers. Do not store or transfer solvents in open or leaking containers.
- ❒ Use funnels when transferring wastes to storage containers.
- ❒ Install a spill containment system.
- ❒ Train personnel in the hazards of spills and how to minimize them.

D. EMERGENCY ACTION AND CONTINGENCY PLANS

EMERGENCY ACTION AND CONTINGENCY PLANS

Allowing Perc from a spill to escape into the sewers, drains or ground can be costly. According to the DTSC, any spill must be reported to the health department if it escapes to the sewerage system, adjoining properties, soil, or storm drains. This makes it important to contain and clean spills at the source. Under Title 22, California Code of Regulations (CCR) section 66265.52, DTSC requires a contingency plan in response to a release of hazardous waste to the air, soil, or surface water at a facility. A fact sheet on DTSC contingency plan requirements is contained in Appendix E. In addition, Cal/OSHA, through Title 8, CCR section 3220, requires a facility to have an emergency action plan. To simplify the plans, one can incorporate the hazardous waste management provisions into the emergency action plan; therefore, a facility will have one comprehensive emergency plan.

[1]Some closed loop machines may be equipped with quick connect fittings for transferring solvent from a container to the cleaning machine.

Purpose of An Emergency Plan

An emergency plan outlines the actions employers and employees must take to ensure employee safety from fire and other emergencies that may occur. A plan will aid in the immediate implementation of evacuations and the contacting of emergency personnel. In California, DTSC requires a written contingency plan for dry cleaners. Copies of the plan needs to be sent to the environmental management or health department of your county. Cal/OSHA also requires a written emergency action plan for facilities with 10 or more employees. (Title 8, CCR section 3220)

Contents of the Comprehensive Emergency Action Plan

EMERGENCY ACTION PLAN CONTENTS

A good plan required by DTSC or Cal/OSHA should answer all employees' questions of what to do, where to go, and who to contact in case of an emergency. Every employee working in a dry cleaning facility should know what to do in the event of an emergency such as a fire, a still boil over, or a solvent spill. An emergency plan must address, at a minimum, the following areas:

1. Emergency evacuation procedures and escape routes.
2. Procedures to be followed by employees for any critical operations before evacuation.
3. Procedures to account for all employees after the emergency evacuation is complete.
4. Rescue and medical duties for those employees who are to perform them.
5. The means of reporting to the fire department and other agencies.
6. The names or job titles of contact people if further information on the plan is needed.
7. Some type of alarm system or internal communication to alert people of the emergency.

To meet the requirements of the DTSC contingency plan, (Title 22, CCR section 66265.52) add the following information:

1. A description of arrangements made with the local fire department or county health services in case of an emergency.
2. Both the home and business address and phone number of the contact people or person.
3. A list of all emergency equipment and their location at the facility such as fire extinguishers, spill control equipment, or communication and alarm systems.

4. Current telephone number of the State Office of Emergency Services.

For more information contact DTSC or your county environmental management or health department. For more information on developing and implementing an emergency action plan for Cal/OSHA, call their Consultation Services at one of the numbers below[2]:

Anaheim:	(714) 935-2750
Fresno:	(209) 454-1295
Sacramento:	(916) 263-2855
San Diego:	(619) 279-3771
Santa Fe Springs:	(310) 944-9366
San Fernando Valley:	(213) 736-2187
San Mateo:	(415) 573-3864

DISCUSSION QUESTIONS:

1. What are a few things that can be done to prevent spills from occurring?
2. What is the recommended method of cleaning a minor spill?
3. At a minimum, what should be included in a comprehensive emergency plan to meet both Cal/OSHA and DTSC requirements?
4. According to DTSC, what size spill must be reported?
5. What should you do when a major spill occurs?
6. Who do you contact when a major spill occurs?

[2]In addition, contact Cal/OSHA Consultation Services for respirator requirements such as fit testing, maintenance, and cleaning.

CHAPTER 10

OTHER STATE AND LOCAL REGULATIONS

INSTRUCTIONAL OBJECTIVES

Upon completion of this chapter, students should be able to:

- ❒ Better understand the requirements of other state and local agencies that regulate the dry cleaning industry;
- ❒ Understand the hazardous waste generator requirements;
- ❒ Understand the requirements that govern the discharge of Perc-contaminated wastewater to the sanitation sewers;
- ❒ Obtain information about worker safety programs and wastewater; and
- ❒ Identify the assets available to dry cleaners through small business programs.

KEY POINTS

10. The Department of Toxic Substances Control (DTSC), State Water Resources Control Board (SWRCB), California Occupational Safety and Health Administration (Cal/OSHA), California Trade and Commerce Agency (CTCA), and the local sanitation districts also regulate dry cleaners.
11. Dry cleaners generate hazardous waste that must be stored and disposed of properly.
12. Many sanitation districts prohibit the direct discharge of Perc-containing wastewater into their systems. Although it is allowed in some areas, the dry cleaner may be liable if the groundwater becomes contaminated with Perc.
13. Cal/OSHA regulates worker safety and exposure to chemicals. It requires an injury and illness prevention program that addresses job safety, safe work practices, and health hazards. It also requires employers to develop a hazard communication plan to inform employees about hazards to chemicals that are used at the facility.
14. Dry cleaners must register their plant with the California Trade and Commerce Agency.

A. SUMMARY

This chapter summarizes some of the regulatory requirements of state and local agencies. Dry cleaners should contact the appropriate agencies for additional information or to answer questions. The agencies include the Department of Toxic Substances Control (DTSC), the Department of Industrial Relations - Division of Occupational Safety and Health (Cal/OSHA), the State Water Resources Control Board (SWRCB), the California Trade and Commerce Agency (CTCA), and the sanitation districts. In some cases, the regulations are compiled in the appendices to this manual.

B. DEPARTMENT OF TOXIC SUBSTANCES CONTROL REQUIREMENTS

In addition to the DTSC's emergency action plans discussed in Chapter 9, the DTSC is delegated the authority to implement the federal Resource Conservation and Recovery Act (RCRA) (40 CFR, section 261.31(F002)) program in California (40 CFR Part 271). RCRA specifies the requirements for the storage, transportation, disposal, recycling, and treatment of hazardous wastes. DTSC enforces the federal RCRA and the state hazardous waste generator requirements. DTSC inspectors visit facilities to inspect tanks and containers, wastes, and facility preparedness and prevention plans. They also review facility waste management records and contingency plans, and look for unauthorized operations.

HAZARDOUS WASTES

Hazardous wastes generated by dry cleaners include used filters and spent carbon, and liquid wastes consisting of separator water, still bottoms, and condensate from steam presses and from the carbon desorption process. Typically, these hazardous wastes are required to be picked up by a registered hazardous waste hauler or Perc recycler for disposal or treatment. The following sections discuss hazardous waste management and onsite treatment of Perc-contaminated wastewater.

Hazardous Waste Management

Dry cleaners may store hazardous waste onsite provided that they comply with the following general hazardous waste management requirements for generators:

- Obtain a Generator ID number. For assistance with obtaining a generator identification number, call 1-800-618-6942.

- Ensure waste containers are in good condition, compatible with the stored waste, and sealed except when waste is being added or removed.
- Inspect the waste containers weekly for leaks.
- Develop a contingency plan and emergency procedures for hazardous waste management in case of an emergency situation.
- Develop a hazardous waste training plan for employees and have emergency equipment available.
- Store hazardous waste onsite for no longer than 90 days without a permit from DTSC. Generators who produce less than 100 kilograms (220 pounds) per month of hazardous waste may store the waste onsite until 100 kilograms of waste has been accumulated. After that, the waste must be shipped offsite within 90 days.

CONTAINER LABELING

- Waste containers shall be labeled with the name and address of the generator of the hazardous waste.
- Annotate containers with the words "Hazardous Waste", the date the waste accumulation begins, and the date the 90 day storage limitation begins.
- Include the composition and physical state of the hazardous waste and the hazardous properties of the waste.

SHIPPING MANIFESTS

- Prepare a hazardous waste shipping manifest for hazardous waste transported or sent off-site.
- Hazardous waste transported offsite must be properly packaged and labeled, transported only by registered haulers with certified vehicles, and tracked using proper manifests.
- Send manifest copies for each shipment of hazardous waste to DTSC within 30 days of receiving the copy from the hazardous waste hauler.
- Maintain copies of the manifest forms for three years.

Exemption from RCRA Permits

Perc-contaminated wastewater is a hazardous waste that must be disposed of properly. However, dry cleaners can treat this wastewater onsite, without a RCRA or DTSC permit, provided they generate less than 180 gallons a month. Treatment must be done in a tank or container within 90 days of the date it was generated. Any residual waste that remains from the treatment process must be handled in accordance with the previous section. Even though a RCRA or DTSC permit is not required, dry cleaners must comply with the hazardous waste requirements discussed above.

Additional Information

For further information on hazardous waste issues and DTSC requirements, contact DTSC at (916) 324-1826.

C. STATE WATER BOARD REQUIREMENTS

WATER BOARDS

The Porter-Cologne Water Quality Control Act designates the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCBs) as the principal State agencies with the responsibility of protecting the quality of the ground and surface waters of the State. RWQCBs have authority to regulate the types of waste that is discharged into State waters by the local sanitation districts. The local sanitation districts in turn specify the wastewater that can be discharged into the sewer systems by industrial sources.

POTWS

In conjunction with the RWQCBs, most publicly owned treatment works (POTWs) are prohibiting the direct discharge of Perc-contaminated wastewater into sewer systems because of the potential for groundwater and soil contamination. Contact the appropriate POTW for information about discharge requirements in your area. Appendix F contains listings of all the POTWs in California sorted by zip code.

For further information on issues of water quality, contact the State Water Resources Control Board at (916) 657-1247.

D. STATE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REQUIREMENTS

Chapter 9 discussed the Cal/OSHA emergency action plan requirements. Cal/OSHA administers a variety of other standards affecting dry cleaners. This section summarizes General Industry Safety Orders from Title 8 California Code of Regulations: Article 67 - Laundry and Dry Cleaning Equipment, Section 5155 - Air Contaminants, Section 5194 - Hazard Communication, and Section 3203 - Injury and Illness Prevention Program.

Article 67 - Laundry and Dry Cleaning Equipment

EQUIPMENT SAFETY

Article 67 indicates the safety equipment required to safely operate dry cleaning and laundering equipment such as marking machines, washing machines, extractors, power wringers, starching machines, drying tumblers, shakers, drying boxes or cabinets, dampening machines, ironers, boilers, and pressure vessels.

Additionally, Article 67 requires specific operating rules, instructions on workplace and work-related hazards, safety practices, and signs to warn employees who handle soiled clothing against touching their eyes, mouth, or any area where the skin has been broken. It also warns against touching or eating food unless the employee has washed his or her hands thoroughly. A copy of Article 67 is in Appendix G.

Section 5155 - Airborne Contaminants

WORKER EXPOSURE

Section 5155 incorporates provisions of the federal Air Contaminants Standard, which established standards for worker exposure to airborne contaminants. It identifies concentration limits to which workers may be exposed to daily during a 40-hour work week for a lifetime without adverse effect. It also defines Threshold Limit Value (TLV), Permissible Exposure Level (PEL), Short-Term Exposure Level (STEL), ceiling exposure limits, and discusses the computation for exposures to more than one contaminant. (Table 4-1 lists actual exposure limits for Perc.)

Section 5194 - Hazard Communications

RIGHT-TO-KNOW REQUIREMENTS

Section 5194 incorporates provisions of the federal Hazard Communication Standard, also known as the Employee Right-to-Know. Similar to the federal standard, it requires employers to develop a hazard communication plan which provides information to employees on the hazards they may be exposed to when using certain chemicals. Elements of the plan include container labeling, Material Safety Data Sheets (MSDSs) for specific substances, and employee training programs. Information must be made available to employees for Perc, some dry cleaning detergents, and various spotting agents.

Section 3203 - Injury and Illness Prevention Program

Section 3203 requires all employers with at least one employee to establish injury and illness prevention plan. The plan must be in writing and address the following elements:

- Designation of an individual to be responsible for implementing the program.
- The designated individual must identify potential workplace hazards and investigate how injuries and illnesses occur.
- The designated individual must implement a periodic inspection program to look for health hazards and correct deficiencies.
- The employer must have a training program which teaches employees job safety, safe work practices, and health hazards.

- The plan must have an explanation of the employer's method for insuring employee compliance with safe work practices, including recognition and disciplinary actions.
- The plan should encourage employees to inform the employer about workplace hazards free from fear of reprisal.

Employers are required to maintain records of their compliance with the Injury and Illness Prevention Program Standard for at least three years.

E. CALIFORNIA TRADE AND COMMERCE AGENCY REQUIREMENTS

The Dry Cleaning Plant Registration Program

Assembly Bill (AB) 495, effective January 1, 1993, transferred the authority for registering dry cleaning plants from the State Consumer Affairs Department to the California Trade and Commerce Agency (CTCA). All dry cleaners must register their facilities with the CTCA. Appendix H contains the steps to register dry cleaning facilities. Penalties for not registering are enforced according to State law. There is also a late fee of $50.00 for late registration.

The Loan Guarantee Program

The Loan Guarantee Program provides loan guarantee financing, up to $500,000, on revolving lines of credit, term loans, and small loans. Appendix H provides additional information on this program.

DISCUSSION QUESTIONS

1. What other State agencies regulate dry cleaners?
2. How long may dry cleaners store hazardous waste onsite?
3. What are the requirements for treating wastewater onsite?
4. What is the purpose of Cal/OSHA's Hazard Communication Safety Order?
5. What other Cal/OSHA Safety Orders affect dry cleaners?
6. What does the California Trade and Commerce Agency require of dry cleaners?

APPENDIX A

Air Resources Board's Final Regulation Order, Airborne Toxic Control Measure for Emissions of Perchloroethylene from Dry Cleaning Operations

[Blank Page]

FINAL REGULATION ORDER

AIRBORNE TOXIC CONTROL MEASURE FOR
EMISSIONS OF PERCHLOROETHYLENE FROM
DRY CLEANING OPERATIONS

APPROVED BY THE OFFICE OF ADMINISTRATIVE LAW ON MAY 4, 1994

CONTENTS

Sub-Section	Topic	Starting Page
(a)	Definitions.	1
(b)	Applicability.	6
(c)	Initial Notification.	6
(d)	Recordkeeping.	6
(e)	Annual Reporting.	7
(f)	Good Operating Practices.	7
(g)	Equipment.	11
(h)	Equipment Testing.	15
(i)	Water-Repelling and Dip Tank Operations.	17
(j)	Compliance.	18
Table 1	Equipment Requirements and Summary of Compliance Times for Existing and New Facilities	20

FINAL REGULATION ORDER

AIRBORNE TOXIC CONTROL MEASURE FOR EMISSIONS OF PERCHLOROETHYLENE FROM DRY CLEANING OPERATIONS

Adopt new section 93109, Titles 17 and 26, California Code of Regulation, to read as follows:

17 CCR, Section 93109. Perchloroethylene Airborne Toxic Control Measure--Dry Cleaning Operations.

(a) Definitions. For the purposes of this section, the following definitions shall apply:

(1) "Adsorptive cartridge filter" means a replaceable cartridge filter that contains diatomaceous earth or activated clay as the filter medium.

(2) "Cartridge filter" means a replaceable cartridge filter that contains one of the following as the filter medium: paper, activated carbon, or paper and activated carbon. A cartridge filter contains no diatomaceous earth or activated clay. Cartridge filters include, but are not limited to: standard filters, split filters, "jumbo" filters, and all carbon polishing filters.

(3) "Closed-loop machine" means dry cleaning equipment in which washing, extraction, and drying are all performed in the same single unit (also known as dry-to-dry) and which recirculates perchloroethylene-laden vapor through a primary control system with no exhaust to the atmosphere during the drying cycle. A closed-loop machine may allow for venting to the ambient air through a fugitive control system after the drying cycle is complete and only while the machine door is open.

(4) "Co-located with a residence" means sharing a common wall, floor, or ceiling with a residence. For the purposes of this definition, "residence" means any dwelling or housing which is owned, rented, or occupied by the same person for a period of 180 days or more, excluding short-term housing such as a motel or hotel room rented and occupied by the same person for a period of less than 180 days.

(5) "Converted machine" means an existing vented machine that has been modified to be a closed-loop machine by eliminating the aeration step, installing a primary control system, and providing for recirculation of the perchloroethylene-laden vapor with no exhaust to the atmosphere or workroom during the drying cycle. A converted machine may allow for venting to the ambient air through a fugitive control system after the drying cycle is complete and only while the machine door is open.

(6) "Cool-down" means the portion of the drying cycle that begins when the heating mechanism deactivates and the refrigerated condenser continues to reduce the temperature of the air recirculating through the drum to reduce the concentration of perchloroethylene in the drum.

(7) "Date of compliance" means the time from the effective date of this control measure in the district until a facility must be in compliance with the specific requirements of this control measure.

(8) "Desorption" means regeneration of an activated carbon bed, or any other type of vapor adsorber by removal of the adsorbed solvent using hot air, steam, or other means.

(9) "Dip tank operations" means the immersion of materials in a solution that contains perchloroethylene, for purposes other than dry cleaning, in a tank or container that is separate from the dry cleaning equipment.

(10) "District" means the local air pollution control district or air quality management district.

(11) "Drum" means the rotating cylinder or wheel of the dry cleaning machine that holds the materials being cleaned.

(12) "Dry cleaning equipment" means any machine, device, or apparatus used to dry clean materials with perchloroethylene or to remove residual perchloroethylene from previously cleaned materials. Dry cleaning equipment may include, but is not limited to, a transfer machine, a vented machine, a converted machine, a closed-loop machine, a reclaimer, or a drying cabinet.

(13) "Dry cleaning system" means all of the following equipment, devices, or apparatus associated with the perchloroethylene dry cleaning process: dry cleaning equipment; filter or purification systems; waste holding, treatment, or disposal systems; perchloroethylene supply systems; dip tanks; pumps; gaskets; piping, ducting, fittings, valves, or flanges that convey perchloroethylene-contaminated air; and control systems.

(14) "Drying cabinet" means a housing in which materials previously cleaned with perchloroethylene are placed to dry and which is used only to dry materials that would otherwise be damaged by the heat and tumbling action of the drying cycle.

(15) "Drying cycle" means the process used to actively remove the perchloroethylene remaining in the materials after washing and extraction. For closed-loop machines, the heated portion of the cycle is followed by cool-down and may be extended beyond cool-down by the activation of a control system. The drying cycle begins when heating coils are activated and ends when the machine ceases rotation of the drum.

(16) "Environmental training program" means an initial course or a refresher course of the environmental training program for perchloroethylene dry cleaning operations that has been authorized by the Air Resources Board according to the requirements of 17 CCR, Section 93110.

(17) "Equivalent closed-loop vapor recovery system" means a device or combination of devices that achieves, in practice, a perchloroethylene recovery performance equal to or exceeding that of refrigerated condensers.

(18) "Existing facility" means any facility that operated dry cleaning equipment prior to the effective date of this control measure in the district. Facility relocations, within the same district, shall be considered existing facilities for the purposes of this control measure.

(19) "Facility" means any entity or entities which: own or operate perchloroethylene dry cleaning equipment, are owned or operated by the same person or persons, and are located on the same parcel or contiguous parcels.

(20) "Facility mileage" means the efficiency of perchloroethylene use at a facility, expressed as the pounds of materials cleaned per gallon of perchloroethylene used, and calculated for all dry cleaning machines at the facility over a specified time period.

(21) "Fugitive control system" means a device or apparatus that collects fugitive perchloroethylene vapors from the machine door, button and lint traps, still, or other intentional openings of the dry cleaning system and routes those vapors to a device that reduces the mass of perchloroethylene prior to exhaust of the vapor to the atmosphere.

(22) "Full-time employee" means any person who is employed at the dry cleaning facility and averages at least 30 hours per week in any 90-day period.

(23) "Gallons of perchloroethylene used" means the volume of perchloroethylene, in gallons, introduced into the dry cleaning equipment, and not recovered at the facility for reuse on-site in the dry cleaning equipment, over a specified time period.

(24) "Halogenated-hydrocarbon detector" means a portable device capable of detecting vapor concentrations of perchloroethylene of 25 ppmv or less and indicating an increasing concentration by emitting an audible signal or visual indicator that varies as the concentration changes.

(25) "Liquid leak" means a leak of liquid containing perchloroethylene of more than 1 drop every 3 minutes.

(26) "Materials" means wearing apparel, draperies, linens, fabrics, textiles, rugs, leather, and other goods that are dry cleaned.

(27) "Muck cooker" means a device for heating perchloroethylene-laden waste material to volatilize and recover perchloroethylene.

(28) "New facility" means a facility that did not operate any dry cleaning equipment prior to the effective date of this control measure in the district. Facility relocations, within the same district, shall not be considered new facilities for the purposes of this control measure.

(29) "Perceptible vapor leak" means an emission of perchloroethylene vapor from unintended openings in the dry cleaning system, as indicated by the odor of perchloroethylene or the detection of gas flow by passing the fingers over the surface of the system. This definition applies for an interim period of 18 months only, beginning on the effective date of this control measure in the district.

(30) "Perchloroethylene (Perc)" means the substance with the chemical formula 'C2Cl4', also known by the name 'tetrachloroethylene', which has been identified by the Air Resources Board and listed as a toxic air contaminant in 17 CCR, Section 93000.

(31) "Perchloroethylene dry cleaning" or "dry cleaning" means the process used to remove soil, greases, paints, and other unwanted substances from materials with perchloroethylene.

(32) "Pounds of materials cleaned per load" means the total dry weight, in pounds, of the materials in each load dry cleaned at the facility, as determined by weighing each load on a scale prior to dry cleaning and recording the value.

(33) "Primary control system" means a refrigerated condenser, or an equivalent closed-loop vapor recovery system approved by the district.

(34) "Reclaimer" means a machine, device, or apparatus used only to remove residual perchloroethylene from materials that have been previously cleaned in a separate piece of dry cleaning equipment.

(35) "Reasonably available", as it applies to an initial course for the environmental training program, means that the course is offered within 200 miles of the district boundaries and that all such courses have a capacity, in the aggregate, that is adequate to accommodate at least one person from each facility in the district required to certify a trained operator at that time.

(36) "Refrigerated condenser" means a closed-loop vapor recovery system into which perchloroethylene vapors are introduced and trapped by cooling below the dew point of the perchloroethylene.

(37) "Secondary control system" means a device or apparatus that reduces the concentration of perchloroethylene in the recirculating air at the end of the drying cycle beyond the level achievable with a refrigerated condenser alone. An "integral" secondary control system is designed and offered as an integral part of a production package with a single make and model of dry cleaning machine and primary control system. An "add-on" secondary control system is designed or offered as a separate retrofit system for use on multiple machine makes and models.

(38) "Self-service dry cleaning machine" means a perchloroethylene dry cleaning machine that is loaded, activated, or unloaded by the customer.

(39) "Separator" means any device used to recover perchloroethylene from a water-perchloroethylene mixture.

(40) "Still" means a device used to volatilize and recover perchloroethylene from contaminated solvent removed from the cleaned materials.

(41) "Trained operator" means the owner, the operator, or an employee of the facility, who holds a record of completion for the initial course of an environmental training program and maintains her/his status by successfully completing the refresher courses as required.

(42) "Transfer machine" means a combination of perchloroethylene dry cleaning equipment in which washing and extraction are performed in one unit and drying is performed in a separate unit.

(43) "Vapor adsorber" means a bed of activated carbon or other adsorbent into which perchloroethylene vapors are introduced and trapped for subsequent desorption.

(44) "Vapor leak" means an emission of perchloroethylene vapor from unintended openings in the dry cleaning system, as indicated by a rapid audible signal or visual signal from a halogenated-hydrocarbon detector or a concentration of perchloroethylene exceeding 50 ppmv as methane as indicated by a portable analyzer. This definition applies beginning 18 months after the effective date of this control measure in the district.

(45) "Vented machine" means dry cleaning equipment in which washing, extraction, and drying are all performed in the same single unit and in which fresh air is introduced into the drum in the last step of the drying cycle and exhausted to the atmosphere, either directly or through a control device.

(46) "Waste water evaporator" means a device that vaporizes perchloroethylene-contaminated waste water through the addition of thermal or chemical energy, or through physical action.

(47) "Water-repelling operations" means the treatment of materials with a water-repellent solution that contains perchloroethylene.

(b) Applicability. Any person who owns or operates perchloroethylene dry cleaning equipment shall comply with Section 93109.

(c) Initial Notification. The owner/operator shall provide the district with all of the following information, in writing:

(1) By the applicable date shown in column 2 of Table 1.

(A) The name(s) of the owner and operator of the facility.

(B) The facility name and location.

(C) Whether or not the facility is co-located with a residence.

(D) The number, types, and capacities of all dry cleaning equipment.

(E) Any control systems for each dry cleaning machine.

(F) For existing facilities only, the gallons of perchloroethylene purchased by the facility during the previous calendar year.

(2) A district may exempt a source from item (1) of this subsection if the district maintains current equivalent information on the facility.

(d) Recordkeeping. The owner/operator shall maintain records for the specified time period, beginning on the applicable date shown in column 3 of Table 1. These records, or copies thereof, shall be accessible at the facility at all times.

(1) All of the following records shall be retained for at least 2 years or until the next district inspection of the facility, whichever period is longer.

(A) For each dry cleaning machine, a log showing the date and the pounds of materials cleaned per load.

(B) Purchase and delivery receipts for perchloroethylene.

1. For only those facilities with solvent tanks that are not directly filled by the perchloroethylene supplier upon delivery, the date(s) and gallons of perchloroethylene added to the solvent tank of each dry cleaning machine.

(C) The completed leak inspection checklists required by subsection (f)(2) and the operation and maintenance checklists required by subsection (f)(1)(A).

(D) For liquid leaks, perceptible vapor leaks, or vapor leaks that were not repaired at the time of detection, a record of the leaking component(s) of the dry cleaning system awaiting repair and the action(s) taken to complete the repair. The record shall include copies of purchase orders or other written records showing when the

repair parts were ordered and/or service was requested.

(2) For dry cleaning equipment installed after the effective date of this control measure in the district, the manufacturer's operating manual for all components of the dry cleaning system shall be retained for the life of the equipment.

(3) The original record of completion for each trained operator shall be retained during the employment of that person. A copy of the record of completion shall be retained for an additional period of two years beyond the separation of that person from employment at the facility.

(e) Annual Reporting. The owner/operator shall maintain an annual report. At the district's discretion, the facility owner or operator shall furnish this annual report to the district by the date specified by the district. The annual report shall include all of the following:

(1) A copy of the record of completion for each trained operator.

(2) The total of the pounds of materials cleaned per load and the gallons of perchloroethylene used for all solvent additions in the reporting period.

(3) The average facility mileage, determined from all solvent additions in the reporting period, as follows:

$$\frac{\text{The Total of the Pounds of Materials Cleaned Per Load}}{\text{The Total of the Gallons of Perchloroethylene Used}}$$

(f) Good Operating Practices. The owner/operator shall not operate dry cleaning equipment after the applicable dates shown in column 5 and column 6 of Table 1, unless all of the following requirements are met:

(1) Operation and maintenance requirements. The trained operator, or his/her designee, shall operate and maintain all components of the dry cleaning system in accordance with the requirements of this section and the conditions specified in the facility's operating permit beginning on the applicable date specified in column 5 of Table 1. For operations not specifically addressed, the components shall be operated and maintained in accordance with the manufacturer's recommendations.

(A) The district shall provide an operation and maintenance checklist to the facility. Each operation and maintenance function and the date performed shall be recorded on the checklist. The operation and maintenance checklist provided by the district shall include, at a minimum, the following requirements:

1. Refrigerated condensers shall be operated to ensure that exhaust gases are recirculated until the air-vapor stream temperature on the outlet side of the refrigerated condenser, downstream of any bypass, is less than or equal to 45^{o} F (7.2^{o} C).

2. Primary control systems, other than refrigerated condensers, shall be operated to ensure that exhaust gases are recirculated until the perchloroethylene concentration in the drum is less than or equal to 8,600 ppmv at the end of the drying cycle, before the machine door is opened and any fugitive control system activates.

3 Vapor adsorbers used as a primary control system or secondary control system shall be operated to ensure that exhaust gases are recirculated at the temperature specified by the district, based on the manufacturer's recommendations for optimum adsorption. These vapor adsorbers shall be desorbed according to the conditions specified by the district in the facility's operating permit, including a requirement that no perchloroethylene vapors shall be routed to the atmosphere during routine operation or desorption.

4. During the interim period between compliance with this subsection and compliance with the requirements of subsection (g), an existing facility with a transfer machine or a vented machine shall operate any existing carbon adsorber, which functions during the drying cycle, to meet the following requirements:

    i. Desorption shall be performed periodically, at the frequency specified by the district. The frequency, at a minimum, shall be each time all dry cleaning equipment exhausted to the device has cleaned a total of three pounds of materials for each pound of activated carbon. Desorption shall be performed with the minimum steam pressure and air flow capacity specified by the district.

    ii. Once desorption is complete, the carbon bed shall be fully dried according to the manufacturer's instructions.

    iii. No vented perchloroethylene vapors shall bypass the carbon adsorber to the atmosphere.

5. Cartridge filters and adsorptive cartridge filters shall be handled using one of the following methods.

i. Drained in the filter housing, before disposal, for no less than: 24 hours for cartridge filters and 48 hours for adsorptive cartridge filters. If the filters are then transferred to a separate device to further reduce the volume of perchloroethylene, this treatment shall be done in a system that routes any vapor to a primary control system, with no exhaust to the atmosphere or workroom.

ii. Dried, stripped, sparged, or otherwise treated, within the sealed filter housing, to reduce the volume of perchloroethylene contained in the filter.

6. A still, and any muck cooker, shall not exceed 75 percent of its capacity, or an alternative level recommended by the manufacturer. A still, and any muck cooker, shall cool to 100^{o} F (38^{o} C) or less before emptying or cleaning.

7. Button and lint traps shall be cleaned each working day and the lint placed in a tightly sealed container.

8. All parts of the dry cleaning system where perchloroethylene may be exposed to the atmosphere or workroom shall be kept closed at all times except when access is required for proper operation and maintenance.

9. Waste water evaporators shall be operated to ensure that no liquid perchloroethylene or visible emulsion is allowed to vaporize.

(2) Leak check and repair requirements. The trained operator, or her/his designee, shall inspect the dry cleaning system for liquid leaks and perceptible vapor leaks beginning on the applicable date shown in column 5 of Table 1. The trained operator, or her/his designee, shall inspect the dry cleaning system for vapor leaks instead of perceptible vapor leaks beginning 18 months after the effective date of this control measure in the district. The district shall provide a leak inspection checklist to the facility. The trained operator, or her/his designee, shall record the status of each component on the checklist.

(A) The dry cleaning system shall be inspected at least once per week for liquid leaks and:

1. For perceptible vapor leaks, beginning on the applicable date shown in column 5 of Table 1 until 18 months after the effective date of this control measure in the district.

2. For vapor leaks, beginning 18 months after the effective date of this control measure in the district, using one of the following techniques:

i. A halogenated-hydrocarbon detector.

ii. A portable gas analyzer or an alternative method approved by the district.

(B) Any liquid leak, perceptible vapor leak, or vapor leak that has been detected by the operator shall be noted on the checklist and repaired according to the requirements of this subsection. If the leak is not repaired at the time of detection, the leaking component shall be physically marked or tagged in a manner that is readily observable by a district inspector.

(C) Any liquid leak, perceptible vapor leak, or vapor leak detected by the district, which has not been so noted on the checklist and marked on the leaking component of the dry cleaning system, shall constitute a violation of this section. For enforcement purposes, the district shall:

1. Identify the presence of a perceptible vapor leak based on the odor of perchloroethylene or the detection of gas flow by passing the fingers over the surface of the system.

2. Identify the presence of a vapor leak by determining the concentration of perchloroethylene with a portable analyzer:

   i. According to ARB Test Method 21 (17 CCR, Section 94124, March 28, 1986).

   ii. Measured 1 cm. away from the dry cleaning system.

(D) Any liquid leak or vapor leak shall be repaired within 24 hours of detection.

1. If repair parts are not available at the facility, the parts shall be ordered within two working days of detecting such a leak. Such repair parts shall be installed within five working days after receipt. A facility with a leak that has not been repaired by the end of the 15th working day after detection shall not operate the dry cleaning equipment, until the leak is repaired, without a leak-repair extension from the district.

2. A district may grant a leak-repair extension to a facility, for a single period of 30 days or less, if the district makes these findings:

   i. The delay in repairing the leak could not have been avoided by action on the part of the facility.

   ii. The facility used reasonable preventive measures and acted promptly to initiate the repair.

   iii. The leak would not significantly increase Perc exposure near the facility.

iv. The facility is in compliance with all other requirements of this section and has a history of compliance.

(3) Environmental training requirements. The facility shall have one or more trained operators beginning on the applicable date shown in column 6 of Table 1.

(A) A trained operator shall be the owner, the operator, or another employee of the facility, who successfully completes the initial course of an environmental training program to become a trained operator. Evidence of successful completion of the initial course shall be the original record of completion issued pursuant to 17 CCR, Section 93110. The trained operator shall be a full-time employee of the facility. Except for the provisions of subsection (f)(3)(C)2., one person cannot serve as the trained operator for two or more facilities simultaneously.

(B) Each trained operator shall successfully complete the refresher course of an environmental training program at least once every three years. Evidence of successful completion of each refresher course shall be the date of the course and the instructor's signature on the original record of completion.

(C) If the facility has only one trained operator and the trained operator leaves the employ of the facility, the facility shall:

1. Notify the district in writing within 30 days of the departure of the trained operator.

2. Obtain certification for a replacement trained operator within 3 months, except that a trained operator who owns or manages multiple facilities may serve as the interim trained operator at two of those facilities simultaneously for a maximum period of 4 months, by which time each facility must have its own trained operator.

3. If the district determines that the initial course of an environmental training program is not reasonably available, the district may extend the certification period for a replacement trained operator until 1 month after the course is reasonably available.

(g) Equipment. The owner/operator shall not operate dry cleaning equipment after the applicable date shown in column 7 of Table 1, unless the following requirements are met:

(1) Prohibited Equipment. The owner/operator shall not operate any of the following types of dry cleaning equipment after the applicable date shown in column 7 of Table 1.

(A) A transfer machine, including any reclaimer or other device in which materials that have been previously dry cleaned with perchloroethylene are placed to dry, except a drying cabinet that meets the requirements of item (4)(A) of this subsection.

(B) A vented machine.

(C) A self-service dry cleaning machine.

(2) Required Equipment. The owner/operator of each new or existing facility shall meet the applicable requirements of Table 1 as follows:

(A) For an existing facility:

1. Within 12 months of the effective date of this control measure in the district, choose either Option 1 or Option 2 of Table 1 and notify the district of her/his choice.

2. Comply with the requirements of Option 2, notwithstanding her/his choice of Option 1, if the facility does not meet the applicable requirements for Option 1 within 18 months of the effective date of this control measure in the district.

3. Install, operate, and maintain the required equipment for the option chosen, as shown in column 1 of Table 1 for existing facilities.

(B) A new facility shall install, operate, and maintain the required equipment shown in column 1 of Table 1 for new facilities. The applicable requirements shall be determined based on the date the facility commences operation of the dry cleaning equipment.

(3) Specifications for Required Equipment. Required equipment shall meet the following specifications:

(A) A primary control system shall:

1. Operate during both the heated and cool-down phases of the drying cycle to reduce the mass of perchloroethylene in the recirculating air stream.

2. Not exhaust to the atmosphere or workroom.

3. Not require the addition of any form of water to the primary control system that results in physical contact between the water and perchloroethylene.

4. For refrigerated condensers only:

    i. Be capable of achieving an outlet vapor temperature, downstream of any bypass, of less than or equal to 45º F (7.2º C) during cool-down; and

    ii. Have a graduated thermometer with a minimum range from 0º F (-18º C) to 150º F (66º C), which measures the temperature of the outlet vapor stream, downstream of any bypass of the condenser, and is easily visible to the operator.

5. For equivalent closed-loop vapor recovery systems:

    i. Use a technology that has been demonstrated, pursuant to the requirements of subsection (h), to achieve a perchloroethylene concentration of 8,600 ppmv or less in each test.

    ii. Have a device that measures the perchloroethylene concentration, or a demonstrated surrogate parameter, in the drum at the end of each drying cycle, before the machine door is opened and any fugitive control system activates, and indicates if the concentration is above or below 8,600 ppmv. This device shall be installed such that the reading is easily visible to the operator.

(B) A converted machine shall meet all of the following requirements, as demonstrated on-site to the district, either upon conversion or prior to compliance with the requirements of subsection (g)(2)(A):

1. All process vents that exhaust to the atmosphere or workroom during washing, extraction, or drying shall be sealed.

2. The converted machine shall use an appropriately-sized primary control system to recover perchloroethylene vapor during the heated and cool-down phases of the drying cycle.

    i. A refrigerated condenser shall be considered appropriately sized, for a machine converted on or after the date that this section is filed with the Secretary of State, if all of the following conditions are met:

        a. The water-cooled condensing coils are replaced with refrigerant-cooled condensing coils.

        b. The compressor of the refrigerated condenser shall have a capacity, in horsepower (hp) that is no less than the minimum capacity, determined as follows:

$$\text{Minimum Capacity (hp)} = \frac{\text{Capacity of the Machine (lbs)}}{12}$$

ii. A refrigerated condenser shall be considered appropriately sized, for a machine converted prior to the date that this section is filed with the Secretary of State, if the conditions a., or b. below are met:

a. The refrigerated condenser shall meet the specifications for new conversions in subsection (g)(3)(B)2.i.

b. The refrigerated condenser shall achieve, and maintain for 3 minutes, an outlet vapor temperature, measured downstream of the condenser and any bypass of the condenser, of less than or equal to 45° F (7.2° C) within 10 minutes of the initiation of cool-down.

iii. An equivalent closed-loop vapor recovery system shall be appropriately sized for the conversion of a vented machine if the system does not extend the total drying time by more than five minutes to meet the specifications of subsection (g)(3)(A)5.

3. The converted machine shall operate with no liquid leaks and no vapor leaks. Any seal, gasket, or connection determined to have a liquid leak or vapor leak shall be replaced.

(C) A secondary control system shall:

1. Be designed to function with a primary control system or be designed to function as a combined primary control system and secondary control system that meets all of the applicable requirements of this section.

2. Not exhaust to the atmosphere or workroom.

3. Not require the addition of any form of water to the secondary control system that results in physical contact between the water and perchloroethylene.

4. Use a technology that has been demonstrated, pursuant to the requirements of subsection (h), to achieve a perchloroethylene concentration in the drum of 300 ppmv or less in each test.

5. Have a holding capacity equal to or greater than 200 percent of the maximum quantity of perchloroethylene vapor expected in the drum prior to activation of the system.

6. For add-on secondary control systems only, the system shall be sized and capable of reducing the perchloroethylene concentration in the drum from 8,600 ppmv or greater to 300 ppmv or less in the maximum volume of recirculating air in the dry cleaning machine and all contiguous piping.

(4) Specifications for Other Equipment.

(A) A drying cabinet shall:

1. Be fully enclosed.

2. Be exhausted via one of the following methods:

i. To a control system that has been demonstrated, pursuant to the requirements of subsection (h), to achieve a perchloroethylene concentration of 100 ppmv or less in each test, measured at the outlet without dilution.

ii. To a control system that reduces the concentration of perchloroethylene in a closed system with no exhaust to the atmosphere or workroom.

(h) Equipment Testing. For a given design, a single test program shall be conducted, in accordance with the following procedures, to meet the specifications in subsections (g)(3) and (g)(4). The person or organization conducting the test program shall prepare a written test plan that describes, in detail, the dry cleaning machine and control systems being tested, the test protocol, and the test method.

(1) Test Program and Scope. A minimum of three tests shall be conducted for each test program on each control system design. All tests for a single test program shall be conducted on a single dry cleaning machine.

(A) Test results for a primary control system design, or an add-on secondary control system design, may be applied to a different make/model of dry cleaning machine if the equipment designer or facility demonstrates, to the satisfaction of the district, that:

1. The test results would be representative of the performance of the control system design on the different make/model of dry cleaning machine.

2. The control system design is properly sized for the maximum volume of recirculating air in the dry cleaning machine during the drying cycle.

(B) Test results for an integral secondary control system design may not be applied to a different make/model of dry cleaning machine.

(2) Test Conditions. Testing shall be conducted under normal operating conditions, unless otherwise specified.

(A) For primary control systems and secondary control systems, each test shall be conducted during the cleaning of one load of materials.

1. The machine shall be filled to no less than 75 percent of its capacity with materials for each test.

2. The weight of materials shall be recorded for each test.

(B) A primary control system shall be tested on a closed-loop machine, or a converted machine, without a secondary control system.

(C) A secondary control system shall be tested on a closed-loop machine.

1. An integral secondary control system shall be tested with the primary control system operating normally.

2. An add-on secondary control system shall be tested independent of a primary control system and the initial perchloroethylene concentration in the drum shall be 8,600 ppmv or greater.

(D) For a control system on the exhaust of a drying cabinet, each test shall be conducted following the placement of materials cleaned with perchloroethylene in the drying cabinet. The materials shall be transferred to the drying cabinet and testing shall begin no later than 15 minutes after the end of the washing and extraction process.

1. The drying cabinet shall be filled to no less than 50 percent of its capacity with materials for each test.

2. The weight of materials shall be recorded for each test.

(3) Test Method. Equipment shall be tested in accordance with the following methods.

(A) For primary control systems and secondary control systems:

1. The temperature of the air in the drum shall be measured and recorded continuously during the entire drying cycle, including the operation of the secondary control system.

2. Sampling shall be conducted as follows:

i. For primary control systems and integral secondary control systems, sampling shall begin at the end of the drying cycle and be completed within 5 minutes.

ii. For add-on secondary control systems, sampling shall be done when the concentration of perchloroethylene is 8,600 ppmv or greater and again when the concentration reaches 300 ppmv or less.

iii. Sampling shall be completed prior to the opening of the machine door and activation of any fugitive control system.

3. The perchloroethylene concentration in the drum shall be determined by one of the following methods:

i. A sampling port and valve shall be appropriately placed to draw a sample from the interior of the drum or the lint filter housing. The sampling port shall be connected to a gas chromatograph by one-quarter (1/4-) inch, outside diameter, Teflon tubing. Any sampling pump shall have Teflon diaphragms. The gas chromatograph shall measure the concentrations of perchloroethylene in accordance with ARB Method 422 (17 CCR, Section 94132, December 31, 1991) or NIOSH Method 1003 (NIOSH Manual of Analytical Methods, U.S. Department of Health and Human Services, August 15, 1987).

ii. A sampling port and valve shall be appropriately placed to draw a sample from the interior of the drum or the lint filter housing. The sampling port shall be connected by one-quarter (1/4-) inch outside diameter Teflon tubing to a Tedlar bag. Any sampling pump shall have Teflon diaphragms. The concentration of perchloroethylene in the air sampled shall be measured in accordance with ARB Method 422 (17 CCR, Section 94132, December 31, 1991) or NIOSH Method 1003 (NIOSH Manual of Analytical Methods, U.S. Department of Health and Human Services, August 15, 1987) within 24 hours of sampling. If an independent laboratory is contracted to perform the analysis of the samples, the chain of custody procedures contained in ARB Method 422 or NIOSH Method 1003 shall be followed.

(B) For a control device on the exhaust of a drying cabinet, sampling and analysis shall be conducted using ARB Method 422 (17 CCR, Section 94132, December 31, 1991) or NIOSH Method 1003 (NIOSH Manual of Analytical Methods, U.S. Department of Health and Human Services, August 15, 1987).

(C) An alternative test method deemed acceptable by the Air Pollution Control Officer or Executive Officer of the district and the Executive Officer of the Air Resources Board.

(4) All test plans and test results shall be made available to the district and the Executive Officer of the California Air Resources Board upon request.

(i) Water-repelling and Dip Tank Operations. No person shall perform water-repelling or dip tank operations, after the applicable date shown in column 8 of Table 1, unless all of the following requirements are met:

(1) All materials to be treated with perchloroethylene water-repelling solutions shall be treated in a closed-loop machine, a converted machine, or a dip tank.

(2) For dip tank operations:

(A) The dip tank shall be fitted with a cover that prevents the escape of perchloroethylene vapors from the tank and shall remain covered at all times, except when materials are placed in and removed from the dip tank or while the basket is moved into position for draining.

(B) After immersion, the materials shall be drained within the covered dip tank until dripping ceases.

(C) All materials removed from a dip tank shall be immediately placed into a closed-loop machine or a converted machine for drying and not removed from the machine until the materials are dry.

(j) Compliance. A facility shall comply with all provisions of this section as follows:

(1) By the applicable dates of compliance specified in column 1 through column 8 of Table 1.

(2) For compliance with subsection (f)(3) "Environmental Training Requirements", an alternative date of compliance shall apply if the district determines that the initial course of an environmental training program for perchloroethylene dry cleaning operations is not reasonably available.

(A) For existing facilities in the district, if the initial course is not reasonably available within 12 months of the effective date of this control measure in the district, the alternative date of compliance for subsection (f)(3) only shall be 6 months from the date the district determines that the initial course is reasonably available.

(B) For each new facility in the district, if the initial course is not reasonably available within the period from 3 months prior to 2 months following commencement of operation, the alternative date of compliance for subsection (f)(3) only shall be 1 month from the date the district determines that the initial course is reasonably available.

Authority cited: Sections 39600, 39601, 39650, 39655, 39656, 39658, 39659, 39665, and 39666, Health and Safety Code; Sections 7412 and 7416, Title 42, United States Code.

Reference: Sections 39650, 39655, 39656, 39658, 39659, and 39666, Health and Safety Code; Sections 7412 and 7414, Title 42, United States Code; Sections 63.320, 63.321, 63.323, and 63.324, Title 40, Code of Federal Regulations.

TABLE 1

Equipment Requirements and Summary of Compliance Times for Existing and New Facilities

Facility Type	EQUIPMENT REQUIREMENTS		**DATE OF COMPLIANCE** (after the effective date of this control measure in the district)						
		Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8
	Compliance Option(s)	Required Dry Cleaning Equipment	Initial Notification	Recordkeeping	Annual Reporting	Leak Check and Repair, Operation & Maintenance Requirements	Environmental Training Requirements	Equipment Requirements	Water-Repelling and Dip Tank Requirements
EXISTING FACILITIES	Option 1 or	Converted Closed-Loop Machine with Primary Control System	60 days	60 days	Specified by district	60 days	18 months	18 months	18 months
	Option 2	Closed-loop Machine with Primary Control System	60 days	60 days	Specified by district	60 days	18 months	48 months	18 months
NEW FACILITIES Commencing Operations prior to 18 months After the Effective Date of This Control Measure in the District									
		Closed-loop Machine with a Primary Control System	On application for permit	Upon commencement of operation	Specified by district	Upon commencement of operation	3 months following commencement of operation	Upon commencement of operation	Upon commencement of operation
NEW FACILITIES Commencing Operations 18 months or Later After the Effective Date of This Control Measure in the District									
		Closed-loop Machine with a Primary Control System and a Secondary Control System	On application for permit	Upon commencement of operation	Specified by district	Upon commencement of operation	3 months following commencement of operation	Upon commencement of operation	Upon commencement of operation

[Blank Page]

APPENDIX B

Air Resources Board's Final Regulation Order,
Environmental Training Program for Perchloroethylene Dry Cleaning Operations

[Blank Page]

FINAL REGULATION ORDER

ENVIRONMENTAL TRAINING PROGRAM FOR
PERCHLOROETHYLENE DRY CLEANING OPERATIONS

APPROVED BY THE OFFICE OF ADMINISTRATIVE LAW ON MAY 4, 1994

Adopt new section 93110, Titles 17 and 26, California Code of Regulations, to read as follows:

17 CCR, Section 93110. Environmental Training Program for Perchloroethylene Dry Cleaning Operations.

(a) Definitions. For the purposes of this section, the definitions in 17 CCR, Section 93109 and the following definitions shall apply:

(1) "Course authorization request" means a written request to present the initial course or refresher course which includes the items specified in subsection (c)(1).

(2) "Identification" means a document that includes a picture and a signature, such as a driver's license, State identification card, or passport.

(3) "Initial course" means training presented in accordance with the requirements of this section for the purpose of achieving the training objectives in subsection (g).

(4) "Instructor" means a person responsible for presenting the curriculum and verifying the identification of trainees.

(5) "Record of completion" means a certificate issued to a trainee who completes the initial course.

(6) "Refresher course" means training presented in accordance with the requirements of this section for the purpose of achieving the training objectives in subsection (h).

(7) "Trainee" means an individual who is taking the initial course or the refresher course.

(b) General Provisions.

(1) The Executive Officer of the ARB may authorize persons or organizations to present courses for individuals seeking to qualify, or maintain their qualification, as trained operators as required in 17 CCR, Section 93109 (f)(3).

(2) Persons or organizations shall apply to ARB for authorization to present the initial course, the refresher course, or both courses. Applicants for authorization to present both courses shall file separate course authorization requests for each course.

(3) Authorization to present the course is granted to the person or organization that completes the authorization process and shall not be sold, traded, or transferred to any other person or organization.

(4) Persons or organizations authorized to offer these courses shall not require membership in an association or purchase of a product as a prerequisite to enrollment or successful completion of the course.

(5) Persons or organizations shall not represent any course as an authorized course unless the course is presented in accordance with the provisions of subsection (d) and the person or organization has been authorized by ARB to present the course.

(6) Failure to comply with the requirements of this section shall be cause for ARB to cancel authorization to present the course. Cancellation shall be effective 10 days following notice of cancellation. Such notice shall state the reasons for cancellation.

(7) Each authorization shall be effective for three years unless cancelled in accordance with the provisions of subsection (b)(6).

(c) Requirements for Authorization to Present Course(s).

(1) All of the following information and related materials shall be included in the course authorization request to be prepared and submitted to the ARB by any person or organization desiring to present an initial or refresher course:

(A) The minimum and maximum number of courses and locations of courses, by city or county, that the applicant will present, and the language in which they will be presented.

(B) A description of the instructional equipment and visual aids to be used.

(C) A statement of each instructor's qualifications. Instructors shall have demonstrated background in, and knowledge of, the following: operation and maintenance of dry cleaning systems, pollution prevention procedures, and environmental regulations pertaining to dry cleaning operations in California.

(D) A summary of topics to be presented, an hourly schedule indicating time to be spent on each topic, and the proposed instructor for each topic (including any special qualifications for that topic, if applicable).

(E) A copy of the proposed curriculum to be used if not using an ARB-developed curriculum.

(F) A written policy regarding refunds of prepaid fees, in the event the course is cancelled, rescheduled, or relocated.

(G) The method to be used to determine the identity of the trainee.

(H) Projected class size and a plan for achieving the trainee/instructor ratio specified in (d)(1)(C). If a greater ratio is proposed, a demonstration that the course objectives can be satisfied with the ratio.

(2) Review of course authorization requests.

(A) Within 30 calendar days of receipt of a course authorization request or receipt of additional information requested by the ARB in accordance with subsection (c)(2)(B), the ARB shall review the course authorization request and shall notify the applicant, in writing, that the request is either complete or incomplete.

(B) If incomplete, the ARB shall inform the applicant of the information which must be submitted to complete the request. If the applicant does not provide the information necessary to complete the request within 90 days of the date of notification, the application shall be automatically denied.

(C) The ARB shall evaluate each complete course authorization request in accordance with the requirements of subsection (c)(2)(D). Within 60 days of notification that the request is complete, the ARB shall notify the applicant in writing that the course is approved or disapproved. Notice of disapproval shall state the reasons for disapproval.

(D) The ARB shall evaluate each request for authorization to present a course in accordance with all of the following factors:

1. Adequacy of the information submitted pursuant to subsection (c)(1). The ARB shall be permitted to conduct an individual interview to verify instructor qualifications.

2. Conformity of course content with the training objectives in subsection (g) for the initial course and in subsection (h) for the refresher course.

3. Incorporation of trainee participation and hands-on training with halogenated-hydrocarbon detectors.

(d) Requirements for Presenting the Course.

(1) The authorized person or organization shall do all of the following:

(A) Ensure that the course incorporates all of the training objectives, specified in subsection (g) for an initial course and in subsection (h) for a refresher course.

(B) Ensure that the course is taught by an instructor whose qualifications have been approved by the ARB.

(C) Ensure that class size does not exceed 30 trainees per instructor or an alternative ratio approved by the ARB.

(D) Provide a copy of the fee refund policy to each trainee prior to registration.

(E) Verify the identity of the trainee.

(F) Provide a copy of the course manual to each trainee to keep.

(G) Distribute records of completion within 10 working days to persons who have completed the course. The records shall bear all the following:

1. The name of the person who completed the course.

2. The identification number and type of document presented to verify identity.

3. The date the initial course was completed.

4. The signature of the instructor who verified the trainee's identity and attendance for the initial course.

5. The date each refresher course was completed and the signature of the instructor for the refresher course.

(2) Within 10 working days after each course presentation, the authorized person or organization shall submit to ARB the information specified in subsection (e)(2) and a certification that the instructor verified the identity and attendance of each trainee.

(e) Records of Completion.

(1) ARB shall provide validated record blanks to the person or organization authorized to present training. Validated record blanks shall bear the seal of the State of California and a unique number. All damaged or unused records shall be returned to the ARB.

(2) ARB shall maintain all of the following information on each trained operator:

(A) The trained operator's full name.

(B) The type and document number of identification provided by the trainee and noted on the record of completion.

(C) The number of the record issued to the trained operator.

(D) The date the initial course was completed and the course instructor.

(E) The date each refresher course was completed and the course instructor.

(3) Replacement of lost records:

(A) A trained operator may request a replacement record from the ARB. The request shall be in writing and shall include all of the following information:

1. The full name and current mailing address of the trained operator.

2. The type and document number of the identification provided at the initial course.

3. The number of the original record issued to the trained operator.

4. The date and instructor of the most recent refresher course.

(B) Within 30 working days after receiving a complete request for a replacement record, ARB shall issue a replacement record or notify the applicant of reasons for not issuing a record.

(f) Appeals Process.

(1) A decision regarding denial of authorization may be appealed to the Executive Officer of the ARB. The appeal and all supporting documentation shall be submitted in writing to the Executive Officer within 30 days of the date of the notice of denial.

(2) Within 30 calendar days of receipt of the appeal, the Executive Officer shall respond to the appellant in writing with a decision and associated reasons upon which the decision is based.

(g) Training Objectives for the Initial Course. The primary objectives of the training course shall be to promote understanding of the airborne toxic control measure for emissions of perchloroethylene from dry cleaning operations (17 CCR, Section 93109), how to comply with that control measure, and the advantages of minimizing releases of perchloroethylene to the environment. The training shall include all of the following topics and shall be designed to help trainees develop the knowledge and ability to do all of the following:

(1) Determine and keep records, according to the requirements of 17 CCR, Section 93109, of:

(A) The pounds of materials cleaned per load,

(B) The gallons of perchloroethylene used,

(C) The facility mileage achieved, and

(D) Repairs made to leaking components of the dry cleaning system.

(2) Check for and recognize liquid leaks and vapor leaks, according to the requirements of 17 CCR, Section 93109.

(3) Complete a leak inspection checklist.

(4) Inspect the components of the dry cleaning system and identify maintenance needs.

(5) Operate and maintain the dry cleaning system, according to the requirements of 17 CCR, Section 93109.

(6) Properly operate waste water evaporators, according to the requirements of 17 CCR, Section 93109.

(7) Complete an operation and maintenance checklist.

(8) Prevent, contain, and properly clean up perchloroethylene spills.

(9) Identify and utilize waste disposal practices that minimize perchloroethylene loss to the environment.

(10) Understand how to achieve and maintain good perchloroethylene mileage.

(11) Distinguish between a transfer machine, a vented machine, a converted machine, and a closed-loop machine.

(12) Identify perchloroethylene health effects, recognize signs of excessive exposure, and know when personal protective equipment may be necessary to meet worker safety regulations.

(13) Use the course manual as a reference tool to determine applicable environmental regulations established by:

(A) ARB,

(B) Districts,

(C) Department of Toxic Substances Control,

(D) Water Resources Control Board and Regional Water Quality Control Boards,

(E) Local sanitation districts, and

(F) Department of Industrial Relations, Division of Occupational Safety and Health (Cal/OSHA regulations in Title 8 CCR).

(14) Recognize the purpose and types of the following:

(A) Refrigerated condensers,

(B) Vapor adsorbers,

(C) Secondary control systems,

(D) Fugitive control systems,

(E) Spill containment systems,

(F) Filtration systems, and

(G) Stills.

(h) Training Objectives for the Refresher Course. The refresher course shall include all of the following topics and activities:

(1) Improvements in dry cleaning equipment.

(2) Improvements in waste handling techniques and equipment.

(3) Improvements in perchloroethylene reclamation processes and equipment.

(4) Improvements in leak detectors.

(5) Updated environmental regulations.

(6) Other topics of interest to dry cleaners.

(7) Updates to the course manual.

Authority cited: Sections 39600, 39601, 39650, 39655, 39656, 39658, 39659, 39665, and 39666, Health and Safety Code; Sections 7412 and 7416, Title 42, United States Code.

Reference: Sections 39650, 39655, 39656, 39658, 39659, and 39666, Health and Safety Code.

Adopted by the Air Resources Board on October 14, 1993

APPENDIX C

Perchloroethylene Material Safety Data Sheet
(This document is provided by The Dow Chemical Company as an educational aid for information purposes only. Contact your perchloroethylene supplier for the most current MSDS.)

[Blank Page]

Material Safety Data Sheet

The Dow Chemical Company
Midland, Michigan 48674
Emergency 517 · 636-4400

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

24-Hour Emergency Phone Number: 517-636-4400

Product: DOWPER (R) SOLVENT

Product Code: 25202

Effective Date: 10/06/95 Date Printed: 12/19/95 MSD: 000190

The Dow Chemical Company, Midland, MI 48674

Customer Information Center: 800-258-2436

2. COMPOSITION/INFORMATION ON INGREDIENTS

Tetrachloroethylene	CAS# 000127-18-4	99.9%

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

****
* Colorless liquid. Irritating odor. Toxic fumes are released in *
* fire situations. Harmful if inhaled. Can cause death if too much *
* is breathed. Clear all personel from area. Wear full protected *
* equipment. Contain liquid to prevent contamination of soil, surface *
* water or ground water. *
****

POTENTIAL HEALTH EFFECTS (See Section 11 for toxicological data.)

EYE: May cause pain. May cause slight transient (temporary) eye irritation. Vapors may irritate the eyes at about 100 ppm perchloroethylene.

SKIN: Short single exposure not likely to cause significant skin irritation. Prolonged or repeated exposure may cause skin irritation, even a burn. Repeated contact may cause drying or flaking of skin. A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful

(Continued on page 2)

amounts.

INGESTION: Single dose oral toxicity is low. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury. If aspirated (liquid enters the lung), may be rapidly absorbed through the lungs and result in injury to other body systems.

INHALATION: In confined or poorly ventilated areas vapors can readily accumulate and can cause unconsciousness and death. Dizziness may occur at 200 ppm; progressively higher levels may also cause nasal irritation, nausea, incoordination, drunkeness; and over 1000 ppm, unconsciousness and death. A single brief (minutes) inhalation exposure to levels above 6000 ppm may be immediately fatal. Based on structural analogy and/or equivocal data in animals, excessive exposure may potentially increase sensitivity to epinephrine and increase myocardial irritability (irregular heartbeats). Alcohol consumed before or after exposure may increase adverse effects.

SYSTEMIC (OTHER TARGET ORGAN) EFFECTS: Signs and symptoms of excessive exposure may be central nervous system effects and anesthetic or narcotic effects. Observations in animals include liver and kidney effects.

CANCER INFORMATION: For hazard communication purposes under OSHA Standard 29 CFR Part 1910.1200, this chemical is listed as a potential carcinogen by IARC and NTP. Perchloroethylene has been shown to increase the rate of spontaneously occurring malignant tumors in certain laboratory rats and mice. Other long-term inhalation studies in rats failed to show tumorigenic response. Epidemiology studies are limited and have not established an association between perchloroethylene exposure and cancer. Perchloroethylene is not believed to pose a measureable carcinogenic risk to man when handled as recommended.

TERATOLOGY (BIRTH DEFECTS): Birth defects are unlikely. Exposures having no effect on the mother should have no effect on the fetus. Did not cause birth defects in animals; other effects were seen in the fetus only at doses which caused toxic

(Continued on page 3)

effects to the mother.

4. FIRST AID

EYES: Flush eyes with plenty of water.

SKIN: Wash off in flowing water or shower.

INGESTION: Do not induce vomiting. Call a physician and/or transport to emergency facility immediately.

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

NOTE TO PHYSICIAN: Because rapid absorption may occur through lungs if aspirated and cause systemic effects, the decision of whether to induce vomiting or not should be made by a physician. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. If burn is present, treat as any thermal burn, after decontamination. Exposure may increase "myocardial irritability". Do not administer sympathomimetic drugs unless absolutely necessary. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
FLASH POINT: None
METHOD USED: TCC, TOC, COC
AUTOIGNITION TEMPERATURE: None available.

FLAMMABLE LIMITS
LFL: None.
UFL: None.

HAZARDOUS COMBUSTION PRODUCTS: Hazardous combustion products may include and are limited to hydrogen chloride. Hazardous

(Continued on page 4)

combustion products may include trace amounts of phosgene, chlorine.

OTHER FLAMMABILITY INFORMATION: This material does not burn. Container may vent and/or rupture due to fire. Vapors are heavier than air and may travel a long distance and accumulate in low lying ares. Violent steam generation or eruption may occur upon application of direct water stream.

EXTINGUISHING MEDIA: This material does not burn. If exposed to fire from another source, use suitable extinguishing agent for that fire.

MEDIA TO BE AVOIDED: Do not use direct water stream.

FIRE FIGHTING INSTRUCTIONS: Keep people away. Isolate fire area and deny unnecessary entry. Contain fire run-off if possible. Fire water run-off, if not contained may cause environmental damage. Do not use direct water stream. This material does not burn. Fight fire for other material that is burning.

PROTECTIVE EQUIPMENT FOR FIRE FIGHTERS: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, pants, boots, and gloves. If protection equipment is not available or not used, fight fire from a protected location or safe distance. For protection equipment in post-fire or non-fire clean up situations, refer to the relevant sections.

6. ACCIDENTAL RELEASE MEASURES (See Section 15 for Regulatory Information)

PROTECT PEOPLE: Clear all personnel from area. Do not breathe vapors. Ventilate area of leak or spill. Wear protective equipment including positive pressure self contained or air supplied breathing apparatus. Follow confined space entry procedures: ASTM D-4276 and OSHA (29 CFR 1910.146).

PROTECT ENVIRONMENT: Contain liquid to prevent contamination of soil, surface water or ground water. Material is heavier than water and has limited water solubility. It will collect on the

(Continued on page 5)

lowest surface.

CLEANUP: For large spills: contain liquid; transfer to properly labeled closed metal containers. For small spills: mop or soak up immediately. Place in properly labeled metal containers.

7. HANDLING AND STORAGE

HANDLING: To avoid uncontrolled emissions vent vapor from container to storage tank. Do not eat, drink, or smoke in working area. Refer to Exposure Controls/Personal Protection, Section 8, of the MSDS. Containers, even those that have been emptied, can contain vapors. Do not cut, drill, grind, weld, or perform similar operations on or near empty containers. Vapors of this product are heavier than air and will collect in low areas such as pits, degreasers, storage tanks, and other confined areas. Do not enter these areas where vapors of this product are suspected unless special breathing apparatus is used and an observer is present for assistance.

STORAGE: Keep containers tightly closed when not in use. For more Storage and Handling information refer to bulletin #100-06170. Store in a dry place. Do not store in aluminum, zinc, aluminum alloys and plastics. Product should not be packaged in aluminum aerosol cans or with finely divided aluminum or its alloys in an aerosol can. Product is denser than water. Design storage containers appropriately.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines. Lethal concentrations may exist in areas with poor ventilation.

PERSONAL PROTECTIVE EQUIPMENT

EYE/FACE PROTECTION: Use safety glasses. If vapor exposure causes eye discomfort, use a full-face respirator.

SKIN PROTECTION: When prolonged or frequently repeated contact could occur, use protective clothing impervious to this material. Selection of specific items such as gloves, boots,

(Continued on page 6)

apron, or full body suit will depend on operation.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required, use an approved air-purifying or positive-pressure supplied-air respirator depending on the potential airborne concentration. For emergency and other conditions where the exposure guideline may be greatly exceeded, use an approved positive-pressure self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply. In confined or poorly ventilated areas, use an approved positive-pressure supplied-air respirator.

EXPOSURE GUIDELINE(S): Perchloroethylene (tetrachoroethylene): ACGIH TLV is 25 ppm TWA, 100 ppm STEL, A3. OSHA PEL is 25 ppm. PELs are in accord with those recommended by OSHA, as in the 1989 revision of PELs.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Colorless liquid.
ODOR: Irritating odor
VAPOR PRESSURE: 13 mmHg @ 20C
VAPOR DENSITY: 5.76
BOILING POINT: 250F (121.1C)
SOLUBILITY IN WATER: 0.015 g/100g 25C
SPECIFIC GRAVITY: 1.619 @ 25/25C

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable under recommended storage conditions. See storage section.

CONDITIONS TO AVOID: Avoid direct sunlight or ultraviolet sources. Avoid open flames, welding arcs, or other high temperature sources which induce thermal decomposition. High energy sources such as welding arcs can cause degradation generating chlorine, hydrogen chloride and possible phosgene, and should be avoided.

INCOMPATIBILITY WITH OTHER MATERIALS: Avoid contact with metals such as: aluminim powders, magnesium powders, potassium,

(Continued on page 7)

sodium, and zinc powder. Avoid unintended contact with amines. Avoid contact with strong based and strong oxidizers. Avoid prolonged contact with or storage in aluminum or its alloys.

HAZARDOUS DECOMPOSITION PRODUCTS: Hazardous decomposition products may include and are not limited to hydrogen chloride and trace amounts of chlorine and phosgene.

HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION (See Section 3 for Potential Health Effects. For detailed toxicological data, write or call the address or non-emergency number shown in Section 1)

SKIN: The LD50 for skin absorption in rabbits is > 10 g/kg.

INGESTION: The oral LD50 for rats is > 5000 mg/kg.

MUTAGENICITY (EFFECTS ON GENETIC MATERIAL): In vitro mutagenicity studies were negative.

12. ECOLOGICAL INFORMATION (For detailed Ecological data, write or call the address or non-emergency number shown in Section 1)

ENVIRONMENTAL FATE

MOVEMENT & PARTITIONING: Bioconcentration potential is low (BCF less than 100 or Log Pow less than 3). Bioconcentration factor (BCF) is 49 in the bluegill. Bioconcentration factor (BCF) is 38.9 in the trout. Log octanol/water partition coefficient (log Pow) is 3.4. Potential for mobility in soil is medium (Koc between 150 and 500). Log soil organic carbon partition coefficient (log Koc) is estimated to be 2.1-3.2. Henry's Law Constant (H) is 1.49E-02 atm-m3/mol. Log air/water partition coefficient (log Kaw) is estimated to be -0.30 tp 0.37.

DEGRADATION & PERSISTENCE: Biodegradation under aerobic conditions is below detectable limits. Theoetical oxygen demand (ThOD) is calculated to be 0.19 p/p. Biodegradation may occur under anaerobic conditions (in the absence of oxygen). Degradation is expected in the atmospheric

(Continued on page 8)

environment within days to weeks. Biodegradation rate may increase in soil and/or water with acclimation.

ECOTOXICOLOGY: Material is moderately toxic to aquatic organisms on an acute basis (LC50 between 1 and 10 mg/L in most sensitive species). Acute LC50 for Japanese medaka or rice fish (Oryzias latipes) is 1.6 mg/L. Acute LC50 for water flea (Daphnia magna) is 3.2-123 mg/L. Acute LC50 for rainbow trout (Oncorhynchus mykiss) is 4.8-5.8 mg/L. Acute LC50 for sheepshead minnow (Cyprinodon variegatus) is 8.0-52.2 mg/L. Acute LC50 for American flagfish Jordenella floridae is 8.4-24 mg/L. Acute LC50 for bluegill (Lepomis macrochirus) is 13 mg/L. Acute LC50 for fathead minnow (Pimephales promelas) is 13.4-23-8 mg/L. Maximum acceptable toxicant concentration (MATC) is 3.1 mg/L in American flagfish.

13. DISPOSAL CONSIDERATIONS (See Section 15 for Regulatory Information)

DISPOSAL: DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal methods must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. THE DOW CHEMICAL COMPANY HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION 2 (Composition/Information On Ingredients).

FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted recycler, reclaimer, incinerator or other thermal destruction device.

For additional information, refer to Dow Technical Bulletin discussing considerations for this product. Bulk Lit No 100-06170.

As a service to its customers, Dow can provide lists of companies which recycle, reprocess or manage chemicals or plastics, and companies that manage used drums. Telephone Dow's Customer Information Center at 800-258-2436 or 517-832-1556

(Continued on page 9)

for further details.

14. TRANSPORT INFORMATION

DEPARTMENT OF TRANSPORTATION (D.O.T.):

For DOT regulatory information, if required, consult transportation regulations, product shipping papers or contact your Dow representative.

CANADIAN TDG INFORMATION:
For TDG regulatory information, if required, consult transportation regulations, product shipping papers, or your Dow representative.

15. REGULATORY INFORMATION (Not meant to be all-inclusive--selected regulations represented)

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations. See other sections for health and safety information.

U.S. REGULATIONS

SARA 313 INFORMATION: This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

CHEMICAL NAME	CAS NUMBER	CONCENTRATION
PERCHLOROETHYLENE	000127-18-4	99.9 %

(Continued on page 10)

Product: DOWPER (R) SOLVENT
Product Code: 25202

Effective Date: 10/06/95 Date Printed: 12/19/95 MSD: 000190

REGULATORY INFORMATION (CONTINUED)

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

An immediate health hazard
A delayed health hazard

CALIFORNIA PROPOSITION 65: The following statement is made in order to comply with the California Safe Drinking Water and Toxic Enforcement Act of 1986:

WARNING: This product contains a chemical known to the State of California to cause cancer.

TOXIC SUBSTANCES CONTROL ACT (TSCA):

All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

STATE RIGHT-TO-KNOW: The following product components are cited on certain state lists as mentioned. Non-listed components may be shown in the composition section of the MSDS.

CHEMICAL NAME	CAS NUMBER	LIST
PERCHLOROETHYLENE	000127-18-4	NJ1 NJ2 NJ3 PA1 PA2 PA3

NJ1=New Jersey Special Health Hazard Substance (present at greater than or equal to 0.1%).

(Continued on page 11)

REGULATORY INFORMATION (CONTINUED)

NJ2=New Jersey Environmental Hazardous Substance (present at greater than or equal to 1.0%).
NJ3=New Jersey Workplace Hazardous Substance (present at greater than or equal to 1.0%).
PA1=Pennsylvania Hazardous Substance (present at greater than or equal to 1.0%).
PA2=Pennsylvania Special Hazardous Substance (present at greater than or equal to 0.01%).
PA3=Pennsylvania Environmental Hazardous Substance (present at greater than or equal to 1.0%).

OSHA HAZARD COMMUNICATION STANDARD:

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT (CERCLA, or SUPERFUND):

This product contains the following substance(s) listed as "Hazardous Substances" under CERCLA which may require reporting of releases:
Category:

Chemical Name	CAS#	RQ	% in Product
Perchloroethylene	000127-18-4	100	99.9

CANADIAN REGULATOINS

WHMIS INFORMATION: The Canadian Workplace Hazardous Materials Information System (WHMIS) Classification for this product is:

D1B - poisonous substance defined by TDG regulations
D2A - possible, probable or known human carcinogen according to classifications by IARC or ACGIH
D2B - eye or skin irritant

(Continued on page 12)

Product: DOWPER (R) SOLVENT
Product Code: 25202

Effective Date: 10/06/95 Date Printed: 12/19/95 MSD: 000190

REGULATORY INFORMATION (CONTINUED)

Refer elsewhere in the MSDS for specific warnings and safe handling information. Refer to the employer's workplace education program.

- - - - -

CPR STATEMENT: This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

- - - - -

HAZARDOUS PRODUCTS ACT INFORMATION: This product contains the following ingredients which are Controlled Products and/or on the Ingredient Disclosure List (Canadian HPA section 13 and 14):

COMPONENTS:	CAS #	AMOUNT (%w/w)
Tetrachloroethylene	CAS# 000127-18-4	99.9%

16. OTHER INFORMATION

HAZARD RATING SYSTEM:

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS:

Health	2
Flammability	0
Reactivity	0

DISPOSAL OF CONTACT WATER:
Process water in contact with solvent and/or water separators of cleaning or distillation equipment should be treated as hazardous waste. Do not discharge water from water separators to drain.

GENERAL APPLICATION GUIDELINES:
Dow does NOT recommend the use of this product in applications where:

- soil or ground water contamination is likely (direct applications to the ground, sink drains, sewers, or septic tanks).
- where over exposure is likely (small rooms or confined space, or where there would be inadequate ventilation).
- where skin contact is likely (adhesive tape removal from skin

(Continued on page 13)

---

or as hand cleaner to remove oils and greases).
- where there is direct food contact.
- where vapor concentrations would be in the flammable range.
- where disposal of waste would pose an environmental or health risk.
- where chemical reactivity poses a danger (contact with strong alkali, or in areas where welding is done).

MSDS STATUS: Revised sections 3, 5, 6, 7, 9, 10, 13, 14, and 15.

[Blank Page]

APPENDIX D

Sample Recordkeeping and Reporting Forms

[Blank Page]

POUNDS OF CLOTHES/LOAD

MONTH/YEAR: _____ **FACILITY ID:** _____ **MACHINE ID:** _____

LOAD	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	10TH	11TH	12TH	TOTAL
DAY 1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
						TOTAL TO DATE			TOTAL THIS MONTH				

[Blank Page]

ANNUAL REPORT

FACILITY NAME/ID: _____

STREET ADDRESS: _____

CITY: _____ **STATE:** _____ **ZIP CODE:** _____

MACHINE TYPE/ ID: _____

PERIOD: _____ **TO** _____

POUNDS OF CLOTHES CLEANED PER MONTH	
MONTH	**POUNDS**
TOTAL (A) =	

PERC ADDITIONS (IN GALLONS)	
DATE	**GALLONS**
TOTAL (B) =	

MILEAGE
MILEAGE = A/B (A divided by B)
MILEAGE = _____

Attach a copy of the record of completion for all trained operators.

SUBMITTED BY: _____
PRINTED NAME

TELEPHONE NUMBER: (_____) _____

SIGNATURE: _____

[Blank Page]

Facility Name/ID: _____ **Machine Type/ID:** _____

DATE (MM/DD/YY) (first working day of week one): _____

OPERATIONS AND MAINTENANCE CHECKLIST

DAILY

CHECK THE FOLLOWING ITEMS DAILY
Check button trap and button trap screen (this may be required more than once a day). Place debris in a sealed container.
Clean the lint trap (as often as required to avoid clogging fans and condensors), and place lint in a sealed container.
Clean strainer in pre-lint filter (if applicable); Clean pump strainer. Place debris in a sealed container.
Check all pressure gauges (ensure proper operating pressures - refer to equipment operating manuals for specific requirements)
Empty waste water collector into closed containers or waste water processsor (atomizer or evaporator)
Perform a visual leak inspection; This is a quick inspection - a thorough inspection should be accomplished weekly using the leak inspection checklist and a leak detector
Check back pressure on cartridge filters, replace when manufacturer's recommended back pressure is reached. Drain the filters for 24 hours (standard) or 48 hours (adsorptive) then place cartridges in sealed containers.
Check the still to ensure it does not exceed 75 percent of capacity (N/A for continuous stills)

WEEKLY CHECKLIST ITEMS

CHECK THE FOLLOWING ITEMS WEEKLY; CHECK-OFF AND INITIAL THE APPROPRIATE BOXES					
WEEK	**1**	**2**	**3**	**4**	**5**
USE THE FIVE BOXES TO THE RIGHT TO ANNOTATE INSPECTION DATES					
INITIALS OF INSPECTOR					
Check pump for proper lubrication, flow rate and operation (refer to equipment owner's manual)					
Check air relief and diverter valves to ensure proper operation and closure					
Test exhaust dampers for air leaks (vented machines)					
Check water separator for debris; empty into still and clean if necessary					
Inspect and clean the still					
Check the operation of waste water treatment unit (if applicable). Replace carbon according to manuafacuturer's recommended frequency.					
Check to ensure that the air-vapor stream downstream of the condenser is $\leq$ 45°F (7.2°C)					
Monitor carbon adsorber (if applicable) according to district specifications					

OTHER*

CHECK THESE ITEMS USING THE SUGGESTED FREQUENCY BELOW	DATE	INITIAL
Check the drive belts for proper tension and condition (Semi-Annual)		
Clean evaporative water towers to remove dirt and scale (Semi-Annual)		
Inspect cooling coils (condenser) for lint buildup and proper operating temperatures (Annually)		
Inspect cooling coils (still) for leaks, corrosion, and buildup (Annually)		
Check steam coils (heating) for lint buildup and proper drying temperatures (Annually)		
Check and clean all other machine areas that may collect lint and affect proper operation (e.g., steam traps, fan blades, and air ducts) (Annually)		
Check disk filters for damage and dry clean them (Annually)		
Change inductive door fan carbon (if applicable) (Per manufacturer's recommendation)		
Lubricate (grease) fittings (Per manufacturer's recommendation)		
Clean and inspect base solvent tanks (Per manufacturer's recommendation)		

* This is a suggested frequency; follow the manufacturer's operating manual in cases where they recommend more frequent schedules.

Revised 4/17/96

[Blank Page]

Facility Name/ID: _____ **Machine Type/Machine ID:** _____

WEEKLY LEAK INSPECTION CHECKLIST

NOTE: Completion of this form is required by district regulations

DATE (first working day of quarter):_____ **WEEK**		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
INSPECTION DATES														
INITIALS OF THE INSPECTOR														
"✓" SIGNIFIES OKAY; "O" SIGNIFIES THAT A LEAK HAS BEEN FOUND*														
WASH CYCLE	Machine door gasket and seating													
	Hose connections, unions, couplings and valves													
	Pumps													
	Button Trap													
	Filter housings													
DRY CYCLE	Machine door gasket and seating													
	Deodorizing and aeration valves on dryers													
	Air and exhaust ductwork													
	Heating and cooling coil doors													
	Hose connections, unions, couplings and valves													
	Water separators													
	Lint Trap													
DISTILLATION/ MISCELLANEOUS														
	Hose connections, unions, couplings and valves													
	Water separators													
	Distillation unit													
	Base tanks and storage containers													

* If a leak is found, it must be repaired immediately or tagged and recorded on the "Service and Repair Log."

Revised 12/15/95

[Blank Page]

FACILITY NAME/ID: _____ **MACHINE TYPE/ID:** _____

SERVICE AND REPAIR LOG

Note: person performing each item to initial within box.

Date	Service/Repair Description	Date Tagged	Parts Ordered[1]/ Date Ordered	Date Received	Parts Installed[2]	Date Repair Completed[3]

1. **Parts shall be ordered within two working days of the detection of a leak.**
2. **Repair parts shall be installed within five working days after receipt of the part.**
3. **A facility with a leak that has not been repaired by the end of the 15th working day after detection shall not operate the dry cleaning equipment, until the leak is repaired, without a leak-repair extension from the district.**

NOTE: All leaks must be repaired within 15 working days or you must contact the district at ( ) _____ - _____.

[Blank Page]

APPENDIX E

Department of Toxic Substances Control Fact Sheet on Contingency Plans

[Blank Page]

CONTINGENCY PLAN

What Is the Contingency Plan and Why Is it Needed?

The contingency plan spells out the actions a generator must take in the event of an emergency or accident involving hazardous wastes. This plan provides a structured list of procedures that allow generators to respond immediately and appropriately to incidents such as fires, explosions and unplanned sudden or non-sudden releases, or spills, of hazardous wastes or hazardous waste constituents to the air, soil or surface water. The generator develops the plan in advance of any incidents and systematically follows its procedures during and after the emergency. This process minimizes the hazards to human health and the environment that may occur as a result of emergencies involving hazardous wastes. The regulations that specify the contingency plan requirements and the plan contents are found in the California Code of Regulations (CCR), Title 22, Chapter 15, Article 4, beginning with §66265.50.

A generator that stores or accumulates hazardous waste on-site is required to complete the contingency plan. The generator keeps one copy of the plan, and any revisions made to the plan, and submits a copy of the plan and its revisions to each of the agencies that may provide emergency response. The plan must be revised whenever the plan fails during an emergency, the facility changes, the contents of the plan change, or the regulations change.

What Is Contained in the Contingency Plan?

As described, the contingency plan contains a number of procedures intended to assist generators and state and local agencies in responding to emergencies. The plan's provisions are listed below:

- **Emergency Coordinator**--The plan shall list, and keep up-to-date, the names, addresses, and phone numbers of all persons qualified to act as emergency coordinator. This list shall indicate the person who is identified as the primary emergency coordinator and list the alternate emergency coordinators in the order in which they shall assume responsibility as alternates. As the title implies, the emergency coordinator, an employee who is either on the premises of the facility or on-call, is responsible for coordinating the facility's emergency response procedures.

  The emergency coordinator must be familiar with all aspects of the facility's operation, its activities, its layout, its contingency plan, the location and characteristics of hazardous wastes managed at the facility, and the location of records at the facility. The emergency coordinator must also have the authority to implement the contingency plan, including the authority to commit the necessary resources to accomplish the provisions of the plan.

- **Emergency Procedures** --The contingency plan shall describe the specific procedures that the facility shall follow if an emergency occurs. If there is an imminent or actualemergency, the emergency coordinator shall notify facility personnel, if applicable, by activating internal alarms or communication systems, and notify the appropriate local and State agencies with emergencyresponse roles.

  If there is a fire, explosion or release of hazardous waste or hazardous waste constituents, the emergency coordinator shall immediately determine the character, source, amount and real extent of the release, using observation, facility records and manifests. Chemical analysis may also be used to characterize the release. In this situation, the emergency coordinator shall also evaluate the possible hazardous impact of the release, fire or explosion on human health and the environment, considering both direct effects (such

as the effect of any toxic or irritating gases that may be generated) and indirect effects (such as the effect of any surface water run-off generated by water or chemical agents used to control fires). If the emergency coordinator determines that the fire, explosion or release could threaten human health or the environment outside of the facility, the coordinator must immediately notify the appropriate local authorities, if surrounding areas require evacuation. In all cases, the emergency coordinator must also notify the State Office of Emergency Services (OES). The report to OES must include the name and phone number of the person making the report, the facility name and address, the time and type of incident, the names and quantities of materials involved, the extent of any injuries and the possible hazards to human health and the environment outside of the facility.

During an emergency, the emergency coordinator must take reasonable measures to ensure that fires, explosions or releases do not occur, recur or spread to other hazardous waste at the facility. For example, if appropriate, the-emergency coordinator shall stop processes and operations, and, if it is safe to do so, collect and contain release waste and remove or isolate containers. If the facility operations are stopped, the emergency coordinator shall, wherever appropriate and when conditions are safe, monitor the facility equipment for leaks, pressure buildup, gas generation, or ruptures in valves, pipes or other equipment.

Immediately after any emergency, the emergency coordinator shall make arrangements for treating, storing and/or disposing of recovered waste, contaminated soil or surface water, or any other material resulting from the incident. Unless the owner/operator of the facility demonstrates that the recovered material is not a hazardous waste, the owner/operator is considered a hazardous waste generator and must comply with all applicable generator requirements. The emergency coordinator must ensure that until the released material is completely cleaned up, no waste that may be incompatible with the released material may be transferred, treated, stored or disposed of in the affected areas. In addition the emergency coordinator must ensure that all emergency equipment listed in the contingency plan is clean and fit for its intended use before facility operations resume. In order to resume operations in the affected areas, the owner/operator of the facility must notify the Department and appropriate state and local authorities that no incompatible wastes are in contact with the affected areas and all emergency equipment listed in the contingency plan is ready for use.

Any time the contingency plan is used, the owner/operator must note in its operating record the time, date and details of the incident. The owner/operator must also submit a report to the Department within 15 days after the incident including the name, address and telephone number of the owner/operator; the name, address and telephone number of the facility; the date, time, and type of incident; the name and quantity of materials involved; the extent of any injuries; an assessment of any actual or potential hazards to human health or the environment; and the estimated quantity and disposition of recovered material that resulted from the incident.

- **Emergency Services** -- The plan shall describe arrangements made with local police departments, fire departments, hospitals, contractors and local and state emergency response teams to provide emergency services. This element is intended to familiarize local fire, police and emergency response teams with the facility layout, the properties of the hazardous waste handled at the facility, locations where facility employees typically work, entrances to and roads within the facility and possible evacuation routes. This provision also familiarizes local hospitals with the properties of the hazardous wastes managed at the facility and the types of injuries or illnesses that could result from emergencies. Finally, this element describes the agreements made with State emergency response teams, emergency response contractors and equipment suppliers. This element also describes the local agency with primary emergency authority and local agencies providing supporting emergency response in those instances where more than one fire or police department may respond. Any arrangements made for emergency services should be appropriate

for the type of hazardous waste managed at the facility and the potential need for the emergency services provided by these agencies.

- **Emergency Equipment** -- The plan should include a current listing, kept up-to-date, of all emergency equipment at the facility, including a physical description of each item, its location and an outline of its capabilities. Typical emergency response equipment includes fire extinguishers and extinguishing systems, spill control equipment, communications and alarm systems, and decontamination equipment.

- **Evacuation Plan** -- If there is a possibility that an emergency could result in the need for evacuation of facility personnel, the plan shall include a description of evacuation procedures. These procedures should describe the alarm that signals evacuation is to begin, the evacuation route, and the alternate evacuation routes.

- **OES Contact** -- The plan shall list the current telephone number for the State Office of Emergency Services so that the emergency coordinator may report to OES, as described in the emergency procedures.

What is the Difference Between the Contingency Plan and the Business Plan?

The contingency plan is similar to the business plan required by state and federal law and regulated by the Office of Emergency Services through local administering agencies. The Department's contingency plan consists primarily of a plan for emergency response. The business plan also contains a plan for emergency response, and includes, in addition, an inventory of information about the business's hazardous materials and an employee training program. Components of the contingency plan *not* included in the business plan are listed below:

- The specific emergency procedures for evaluating the characteristics and impacts of incidents involving a fire, explosion or release; for evaluating the need for and implementing evacuation in surrounding areas; for inspections when the facility operation has been stopped; for cleaning and repairing emergency equipment; and for noting the incident in the facility's operating record and reporting to the Department.
- The address of the emergency coordinator, and the alternates listed in the order in which they shall assume responsibility.
- A description of the arrangements made to familiarize local fire and police departments, emergency response teams, and hospitals with the facility and its wastes; and a description of the arrangements made with State and local emergency response teams and contractors to provide emergency services.
- The specific evacuation routes and alternate evacuation routes in the evacuation plan.
- A list of all emergency equipment located at the facility with a physical description of the equipment, a description of its location, and an outline of its capabilities.

A generator that has completed a business plan may suplement that plan with the information listed above to meet the requirement for a contingency plan.

	Contingency Plan	Business Plan
		Inventory of information required by H&SC §25509 (H&SC §25504(a))
		• business name, facility street address owner/operator name, phone number, mailing address; Dun & Bradstreet number; certification that the info submitted is true
		• chemical name and common names of all hazardous materials handled over a certain amount (19 CCR §2729(a)(1)); CAS number for material
		• federal hazard categories for hazardous chemical including hazardous waste (as defined in 40 CFR §370.2)(19 CCR §2729(a)(2))
		• maximum amount of hazardous material or mixture containing hazardous material handled at any one time over the course of a year (19 CCR §2729(a)(3))
		• description of how and where the hazardous materials are handled (ie, diagrams and annotated site maps)(19 CCR §2729(a)(4))
		• SIC code and nature of the business (19 CCR §2729(a)(5))
	• names, addresses and phone numbers (office and home) of all persons qualified to act as emergency coordinator, pursuant to 22 CCR §66265.55 (22 CCR §66265.52(d))	• name, title and 24-hour phone number of contact person, and alternate, representing the business with technical knowledge, access and authority (19 CCR §2729(a)(6)); emergency planning information (emergency coordinator)
		• California hazardous waste code for wastes (19 CCR §2729(a)(7))
		• maximum capacity of the largest container on site for each hazardous material, mixture or waste (19 CCR §2729(a)(8))
		• total estimated amounts of each hazardous waste handled by the business throughout the course of the year (19 CCR §2729(a)(9))
		• any additional Tier II inventory info required by 42 USC §11022 (1989)(19 CCR §2729(a)(10))
		Emergency response plans and procedures (H&SC §25504(B))
	• description of arrangements made with local police and fire departments, hospitals, contractors and State and local emergency response teams to coordinate emergency services pursuant to 22 CCR §66265.37 (22 CCR §66265.52(c)) • current telephone number for the State Office of Emergency Services (22 CCR §66265.52(g))	• immediate notification to the administering agency, local emergency rescue personnel and OES (H&SC §25504(b)(1) and 19 CCR §2731(a)); also notify persons within the facility who are necessary to respond to an incident (19 CCR §2731(a)(3)) • identification of local emergency medical assistance for potential accident scenarios (19 CCR §2731(b))
		• procedures to mitigate a release or threatened release to minimize potential harm or damage to persons, property or the environment (H&SC §25504(b)(2) and 19 CCR §2731(c))

	Contingency Plan	Business Plan
	• evacuation plan for facility personnel including signals to begin evacuation, evacuation routes and alternate routes (22 CCR §66265.52(f))	• evacuation plans and procedures, including immediate notice, for the business site (H&SC §25504(b)(3) and 19 CCR §2731(d))
		• identification of areas of the facility and mechanical or other systems that require immediate inspection or isolation due to earthquake vulnerability (19 CCR §2731(e))
	• list of all emergency equipment at the facility, including its location and a description of its capabilities (22 CCR §66265.52(e))	
		Employee training program (H&SC §25504(c))
		• new employee training and annual training, including refresher courses, for all employees in safety procedures in the event of a release or threatened release of a hazardous material (H&SC §25504(c) and 19 CCR §2732(b))
		• training includes, but is not limited to familiarity with the emergency response plans and procedures in H&SC §25504(b) (H&SC §25504(c)); the training program also includes methods for handling hazardous materials safely, procedures for coordinating with local emergency response organizations, use of emergency response equipment and supplies, and emergency response procedures required by 19 CCR §2731 (19 CCR §2732(a))
		• the training program may take into consideration the position of each employee (H&SC §25504(c)); the training program is appropriate for the business size and nature of the hazardous materials handled, and takes into consideration the employees undergoing training (19 CCR §2732(a))

[Blank Page]

APPENDIX F

Publicly Owned Treatment Works Arranged by Zip Code

[Blank Page]

POTWs as of June 3, 1994

ZIP CODE	AGENCY NAME	AGENCY STREET ADDRESS	AGENCY CITY	ST	TELEPHONE	AGENCY CONTACT
89410	WASHOE TRIBE OF NV AND CALIF	919 HIGHWAY 395 SOUTH	GARDNERVILLE	NV	7028831446	
90012	LOS ANGELES CITY OF DPW	200 N. MAIN ST. SUITE 1400	LOS ANGELES	CA	2134855112	DELWIN A. BIAGI
90020	LOS ANGELES COUNTY DPW	550 SOUTH VERMONT AVENUE	LOS ANGELES	CA	8187382011	
90020	LOS ANGELES CO DEPT OF PARKS	433 SOUTH VERMONT	LOS ANGELES	CA	2137382961	
90063	LOS ANGELES COUNTY INTERNAL SERV	1100 NORTH EASTERN AVENUE	LOS ANGELES	CA	2132672084	DON SAN ANTONIO
90607	LOS ANGELES COUNTY SAN DIST	P.O.BOX 4998	WHITTIER	CA	7146223654	JOHN EADF
90607	LOS ANGELES COUNTY SAN DIST	P.O.BOX 4998	WHITTIER	CA	3106997411	DAVID SNYDER
90607	LOS ANGELES COUNTY SAN DIST	P.O.BOX 4998	WHITTIER	CA	2136997411	ROBERT HORVATH
90704	AVALON, CITY OF	P.O.BOX 707	AVALON	CA	2135100220	BOB CAUTHEN
90803	LOS ANGELES COUNTY DPW	900 S FREMONT AVE. 9TH FLOOR	ALHAMBRA	CA	2139747281	EFRAIN FERNANDEZ
90803	LOS ANGELES COUNTY DEVELOPMENT	900 S. FREMONT AVE. 9TH FLOOR	ALHAMBRA	CA	8182332016	VINCE FORRINI
90803	LOS ANGELES COUNTY DPW	900 S. FREMONT AVE. 9TH FLOOR	ALHAMBRA	CA	8184583510	DEAN ERSTATHION
91302	LAS VIRGENES MWD	4232 LAS VIRGENES RD	CALABASAS	CA	8188804110	EDWARD MCCOMBS
91320	THOUSAND OAKS UTIL DEPT	2150 W. HILLCREST DR	THOUSAND OAKS	CA	8054978611	DONALD NELSON
91360	GOLDEN HILLS SANITATION COMPANY	101 MOODY COURT, SUITE 100	THOUSAND OAKS	CA	8058223064	JEFF MABRY
91510-6459	BURBANK, CITY OF	275 E. OLIVE AVE.	BURBANK	CA	8189539515	ORA LAMPMAN
91719	LEE LAKE WATER DISTRICT	22646 TEMESCAL CANYON ROAD	CORONA	CA	9092771414	JOHN PASTORE
91720	CORONA, CITY OF	815 WEST SIXTH STREET	CORONA	CA	9097362232	DON WILLIAMS
91720	LEE LAKE WATER DISTRICT	PO BOX 669	CORONA	CA	9097376700	F E WOOD
91720	CORONA, CITY OF	815 WEST SIXTH STREET	CORONA	CA	9097362231	
91729	CHINO BASIN MWD	PO BOX 697	RANCHO CUCAMONGA	CA	9099871712	ROBERT WESTDYKE
91785	UPLAND,CITY OF	P.O. BOX 460	UPLAND	CA	9099852122	FRED BLANCHARD
91803	LOS ANGELES COUNTY DPW	900 S. FREMONT AVE. E	ALHAMBRA	CA	8184585100	BRIAN SCANLON
91977	OTAY MUNICIPAL WATER DISTRICT	10595 JAMACHA BOULEVARD	SPRING VALLEY	CA	6196702222	MR. DON PRZYBYLSKI
92004	BORREGO SPRINGS PK.COMM.S.D.	P.O. BOX 1870	BORREGO SPRINGS	CA	6197675151	CASEY RODRIGUEZ
92008	SAN ELIJO JOINT POWERS AUTH.	1925 PALOMAR OAKS WAY,STE.300	CARLSBAD	CA	6194387755	MS. KELLENE BURN-LUCHT
92009	ENCINA WASTEWATER AUTHORITY	6200 AVENIDA ENCINAS	CARLSBAD	CA	6194383941	MR. RICHARD GRAFF
92024	WHISPERING PALMS COMM SERV DIS	605 THIRD STREET	ENCINITAS	CA	6199425147	MR. JOHN PASTORE
92024	LEUCADIA COUNTY WATER DISTRICT	P.O. BOX 2397	LEUCADIA	CA	6197530155	MS.JOAN R.GEISELHART
92024	FAIR BANKS RANCH COMM SERV DIST	605 THIRD STREET	ENCINITAS	CA	6197564909	JOHN PASTORE
92025-2798	ESCONDIDO, CITY OF	201 N BROADWAY	ESCONDIDO	CA	6197414651	MR. MIKE ADAMS
92028	FALLBROOK SANITARY DISTRICT	431 SOUTH MAIN STREET	FALLBROOK	CA	6197288319	MR. JOEL HOLT
92042	SAN DIEGO, CITY OF, WTR UTIL DEP	5540 KIOWA DRIVE	SAN DIEGO	CA	6194637295	MR. PETE SILVA
92054	OCEANSIDE, CITY OF, WTR UTIL DEP	320 NORTH HORNE STREET	OCEANSIDE	CA	6199664850	MR BARRY MARTIN
92061	PAUMA VALLEY COMMUN. SERV. DT.	P.O. BOX 434	PAUMA VALLEY	CA	6197421909	MR. OGDEN WATSON
92065-1599	RAMONA MUNICIPAL WATER DISTRCT	105 EARLHAM ST.	RAMONA	CA	6195651330	MR. KEVIN WALSH
92069	VALLECITOS WATER DISTRICT	788 SAN MARCOS BLVD	SAN MARCOS	CA	6197440460	MR. WILLIAM R. RUCKER
92071-9003	PADRE DAM MUNICIPAL WATER DIST	10887 WOODSIDE PO BOX 719003	SANTEE	CA	6194483111	MR. AUGUST A. CAIRES
92077	OTAY MUNICIPAL WATER DISTRICT	10595 JAMACHA BOULEVARD	SPRING VALLEY	CA	6196702222	DON PRZYBYLSKI
92082	VALLEY CENTR MUNICIPAL W.D.	P.O. BOX 67	VALLEY CENTER	CA	6197491600	MR. GARY ARANT
92083	BUENA SANITATION DISTRICT	600 EUCALYPTUS AVE.	VISTA	CA	6197261340	PETE NIEBLAS
92088-2500	RAINBOW MUNICIPAL WATER DIST	P.O. BOX 2500	FALLBROOK	CA	6197281178	ARTHUR BULLOCK
92101	SAN DIEGO, CITY OF, WTR UTIL DEP	600 B STREET, SUITE 600	SAN DIEGO	CA	6192216600	DAVID SCHLESINGER
92123	SAN DIEGO, COUNTY OF, PUBLIC WKS	5555 OVERLAND AVE., MS 0384	SAN DIEGO	CA	6195655177	MR. DWIGHT G. SMITH
92134	ENCINA WASTEWATER AUTHORITY	5555 OVERLAND AVE., MS 0384	SAN DIEGO	CA	6195655177	MR. DWIGHT G. SMITH
92201	VALLEY SANITARY DISTRICT	45-500 VAN BUREN STREET	INDIO	CA	6193472356	REX SHARP
92220	BANNING, CITY OF	1434 EAST RAMSEY STREET	BANNING	CA		PAUL TOOR

POTWs as of June 3, 1994

ZIP CODE	AGENCY NAME	AGENCY STREET ADDRESS	AGENCY CITY	ST	TELEPHONE	AGENCY CONTACT
92223	BEAUMONT, CITY OF	P O. BOX 158	BEAUMONT	CA	9098451171	ROBERT BOUNDS
92224	FRANK DUDEK, DUDEK & ASSOC.	605 THIRD STREET	ENCINITAS	CA	6197522257	MR. FRANK DUDEK
92225	BLYTHE, CITY OF	440 S. MAIN STREET	BLYTHE	CA	6199226611	BUTCH HULL
92227	BRAWLEY, CITY OF	400 MAIN ST	BRAWLEY	CA	6193441550	
92231	CALEXICO, CITY OF	408 HEBER AVENUE	CALEXICO	CA	6193573373	LUIS ESTRADA
92233	CALIPATRIA, CITY OF	PO BOX 167	CALIPATRIA	CA	6193482293	ALTON SCOTT
92236	COACHELLA VALLEY WATER DIST.	PO BOX 1058	COACHELLA	CA	6193982651	FRANK ROTARDI
92236	COACHELLA SANITARY DISTRICT	1515 SIXTH STREET	COACHELLA	CA	6193983502	JOE DE LA RIVA
92239	RIVERSIDE CO. SERV. AREA NO. 51	PO BOX 316	DESERT CENTER	CA	6192273203	
92240	MISSION SPRINGS WATER DISTRICT	66-545 SECOND ST	DESERT HOT SPRINGS	CA	6193296448	BRENT GRAY
92244	EL CENTRO, CITY OF	PO BOX 4450	EL CENTRO	CA	6193374505	DANNY BRAMMER
92249	HEBER PUBLIC UTILITY DISTRICT	PO BOX H	HEBER	CA	6193530323	JUAN LOPEZ
92250	HOLTVILLE, CITY OF	121 WEST FIFTH ST	HOLTVILLE	CA	6193562912	
92251	IMPERIAL, CITY OF	420 SOUTH IMPERIAL AVE	IMPERIAL	CA	6193551140	
92257	NILAND SANITARY DISTRICT	PO BOX 40	NILAND	CA	6193590454	HAROLD GASTON
92264	PALM SPRINGS, CITY OF	3200 E. TAHQUITZ WAY	PALM SPRINGS	CA	6193238174	CLIFFORD GRAHAM
92273	SEELEY COUNTY WATER DISTRICT	PO BOX 161	SEELEY	CA	6193526612	MERVYN NAPIER
92274	SALTON COMM SERVICES DISTRICT	PO BOX 5268	SALTON CITY	CA	6193944446	
92275	SALTON COMM SERVICES DISTRICT	PO BOX 5268	SALTON CITY	CA	6193944446	S. JOHNSON
92281	WESTMORLAND, CITY OF	PO BOX 698	WESTMORLAND	CA	6193443411	
92309	BAKER COMM SAN DIST	PO BOX 590	BAKER	CA	6197334402	
92311	BARSTOW, CITY OF	220 E MT VIEW ST	BARSTOW	CA	6192563531	DUANE GREENFIELD
92314	BIG BEAR REGIONAL WSTWTR AGN	PO BOX 517	BIG BEAR CITY	CA	9095855578	STEVE SCHINDLER
92324	COLTON, CITY OF	650 N LA CADENA	COLTON	CA	9093705051	GARY DECKER
92325	CRESTLINE SANITATION DISTRICT	PO BOX 3395	CRESTLINE	CA	9093381751	TOM SUTTON, DALE SCHINDLER
92331-3000	ELSINORE VALLEY MWD	P.O. BOX 3000	LAKE ELSINORE	CA	9096743146	JOHN HOAGLAND
92345	SAN BERNARDINO CO CSA 70	11954-B HESPERIA ROAD	HESPERIA	CA	6199475790	JOEL STRIBLING
92363	NEEDLES, CITY OF	PO BOX 887	NEEDLES	CA	6193265700	DAVID DIAZ
92373	REDLANDS, CITY OF	PO BOX 3005	REDLANDS	CA	9097932641	
92376	RIALTO, CITY OF	150 S PALM	RIALTO	CA	9098753410	VIRGIL FREELS
92382	RUNNING SPRINGS CO WATER DIST	PO BOX 2206	RUNNING SPRINGS	CA	9098672766	JIM TOWNS
92383-1300	EASTERN MUNICIPAL WATER DIST	P.O. BOX 8300	SAN JACINTO	CA	9099257676	MR. J. ANDREW SCHLANGE
92392	VICTOR VALLEY WASTEW REC AUTHO	PO BOX 1481	VICTORVILLE	CA	6192468638	CHUCK WIGLEY
92399-0730	YUCAIPA VALLEY CO. WATER DIST	PO BOX 730	YUCAIPA	CA	9097975117	JOE BOCANEGRA
92408	SAN BERNARDINO, CITY OF	299 BLOODBANK RD.	SAN BERNARDINO	CA	9093835141	DUANE NORTON
92415	SAN BERNARDINO CO DEPT AIRPTS	825 EAST THIRD STREET	SAN BERNARDINO	CA	7143832537	
92415-0450	SAN BERNARDINO CO CSA 82	157 W 5TH STREET	SAN BERNARDINO	CA	7143832566	DON SONGER
92501	RIVERSIDE CO. SERV. AREA NO.62	4080 LEMON ST., 12TH FLOOR	RIVERSIDE	CA	7147876547	
92503	SANTA ANA WATERSHED PROJECT AU	11615 STERLLING AVENUE	RIVERSIDE	CA	9097855411	NEIL CLINE
92504	RIVERSIDE, CITY OF	5950 ACORN ST.	RIVERSIDE	CA	9093516140	GAIL MCPHERSON
92509	JUHUPA COMMUNITY SERVICES DIST	8621 JURUPA ROAD	RIVERSIDE	CA	9096857435	JOHN SCHATZ
92531-3000	ELSINORE VALLEY MWD	PO BOX 3000	LAKE ELSINORE	CA	9096743146	JAMES LAUGHLIN
92544	LAKE HEMET MWD	P.O. BOX 5039	HEMET	CA	9096583141	
92549-0397	IDYLLWILD WATER DISTRICT	P.O. BOX 397	IDYLLWILD	CA	9096592143	
92589-9017	RANCHO CALIFORNIA WATER DIST.	P.O. BOX 9017	TEMECULA	CA	9096764101	MR. JOHN HENNIGER, DIST MGR
92619	IRVINE RANCH WATER DISTRICT	PO BOX 57000	IRVINE	CA	7145440120	KEN THOMPSON
92624	SERRA	PO BOX 2008	CAPISTRANO BEACH	CA	7144969247	MR DENNIS ERDMAN

POTWs as of June 3, 1994

ZIP CODE	AGENCY NAME	AGENCY STREET ADDRESS	AGENCY CITY	ST	TELEPHONE	AGENCY CONTACT
92653	ALISO WATER MANAGEMENT AGENCY	25411 CABOT ROAD, SUITE 209	LAGUNA HILLS	CA	7145864200	MR WILLIAM BECKER
92653	SOUTH ORANGE COUNTY RECL AGCY	25411 CABOT ROAD, SUITE 209	LAGUNA HILLS	CA	7147706296	WILLIAM BECKER
92653	SERRA	25411 CABOT ROAD, SUITE 209	LAGUNA HILLS	CA	7147706296	MR. WILLIAM BECKER
92672	SERRA	100 AVENIDA PRESIDIO	SAN CLEMENTE	CA	7144982533	MR JIM HALLOWAY
92672	SAN CLEMENTE, CITY OF	910 NEGOCIO	SAN CLEMENTE	CA	7144982533	MR JIM HOLLOWAY
92675-1559	ALISO WATER MANAGEMENT AGENCY	30290 RANCHO VIEJO ROAD	SAN JUAN CAPISTRANO	CA	7145864200	MR. WILLIAM P. BECKER
92677-1098	MOULTON NIGUEL W.D.-SOCRA	27500 LA PAZ ROAD	LAGUNA NIGUEL	CA	7146432006	COLONEL JOHN FOLEY
92677-3060	SOUTH COAST W.E.-SOCRA	31592 WEST STREET	SOUTH LAGUNA	CA	7144994555	MR. RAY MILLER
92678	TRABUCO CANYON W.D.-SOCRA	P.O. BOX 500	TRABUCO CANYON	CA	7148580277	MR. FRED SIMMS
92690	SANTA MARGARITA W.D.-SOCRA	P. O. BOX 2279	MISSION VIEJO	CA	7145823204	MR. WILLIAM KNITZ
92691	SERRA	26101 MARGAUERITE PKWY	MISSION VIEJO	CA	7145823406	MR WILLIAM KNITZ
92708	ORANGE COUNTY SANITATION DIST	PO BOX 8127	FOUNTAIN VALLEY	CA	7149622411	BLAKE ANDERSON
93002	VENTURA REGIONAL SAN DISTRICT	1001 PARTRIDGE DR. SUITE 150	VENTURA	CA	8056446874	STEVE WITBECK
93002	SAN BUENA VENTURA CITY OF	P.O BOX 99	VENTURA	CA	8056524544	SHELLEY JONES
93002-2277	VENTURA REGIONAL SAN DISTRICT	1001 PARTRIDGE DR. SUITE 150	VENTURA	CA	8056584604	CHUCK ROGERS
93003	VENTURA R.S.D. & CITY FILLMORE	1001 PARTRIDGE DR. SUITE 150	VENTURA	CA	8056584604	KELLY POLK
93003-5562	VENTURA R.S.D. & CAMROSA C.W.D	1001 PARTRIDGE DR. SUITE 150	VENTURA	CA	8056584604	CHUCK ROGERS
93010	CAMARILLO SANITARY DISTRICT	601 CARMEN DRIVE	CAMARILLO	CA	8053885380	JOHN BRESSAN
93011	CAMARILLO SANITARY DISTRICT	601 CARMEN DRIVE	CAMARILLO	CA	8053885381	JOHN ELWELL
93013	CARPINTERIA SANITARY DISTRICT	P. O. BOX 571	CARPINTERIA	CA	8056847214	BOB PLETCHER
93020	VENTURA CO PUBLIC WORK AGENCY	7150 WALNUT CANYON ROAD	MOORPARK	CA	8055844829	REDDY PAKAIA
93023	OJAI VALLEY SAN DIST	1072 TICO ROAD	OJAI	CA	8056465548	ERIC OLTMAN
93030	OXNARD CITY OF, DPW	305 WEST THIRD ST.	OXNARD	CA	8059844696	TIM NANSON
93063	SIMI VALLEY CO SAN DIST	2929 TAPO CANYON RD.	SIMI VALLEY	CA	8055830393	MICHAEL KLEIMBRODT
93065	SIMI VALLEY CO SAN DIST	3200 COCHRAN ST	SIMI VALLEY	CA	8055830393	JIM BUELL
93067	SUMMERLAND SANITARY DISTRICT	P.O. BOX 314	SUMMERLAND	CA	8059694344	ART CUSTER
93101	SANTA BARBARA CITY DPW	520 EAST YANONALI STREET	SANTA BARBARA	CA	8059631676	VICTOR ACOSTA
93102-1990	SANTA BARBARA DPW / MONTECITO	P.O. BOX 1990 / 630 GARDEN ST	SANTA BARBARA	CA	8055645377	
93105	CACHUMA CO SANITATION DIST	610 MISSION CANYON ROAD	SANTA BARBARA	CA	8055682461	JOSEPH PUERINGER
93108	MONTECITO SANITARY DISTRICT	1042 MONTE CRISTO LANE	SANTA BARBARA	CA	8059694200	JERRY SMITH
93116	GOLETA SANITARY DISTRICT	P. O. BOX 906	GOLETA	CA	8059674519	FELIX MARTINEZ
93116	GOLETA WATER DISTRICT	P. O. BOX 788	GOLETA	CA	8059646761	ROBERT PAUL
93202	ARMONA SANITARY DISTRICT	P. O. BOX 486	ARMONA	CA	2095844542	BOB DOYLE
93203	ARVIN, CITY OF	P. O. BOX 548	ARVIN	CA	8058543134	JOE HANNA
93204	AVENAL, CITY OF	919 SKYLINE BLVD.	AVENAL	CA	2093865766	UNKNOWN
93206	BUTTONWILLOW COUNTY WATER DST	P.O. BOX 274	BUTTONWILLOW	CA	8057645273	AL PACINI
93210	COALINGA, CITY OF	CITY HALL 6TH / ELM ST	COALINGA	CA	2099351534	RENE RAMIREZ
93212	CORCORAN, CITY OF	1033 CHITTENDEN AVE	CORCORAN	CA	2099922151	DON PAULEY
93215	DELANO, CITY OF	1015 11TH AVE	DELANO	CA	8057254961	ED MINO
93219	EARLIMART PUD	P. O. BOX 108	EARLIMART	CA	8058492663	CALVIN RHODES
93221	EXETER, CITY OF	P. O. BOX 237	EXETER	CA	2095929244	HOWARD RICKS
93223	FARMERSVILLE, CITY OF	147 E. FRONT ST.	FARMERSVILLE	CA	2097470458	STEVEN L. THOMPSON
93230	HANFORD, CITY OF	900 S. TENTH AVENUE	HANFORD	CA	2095822511	GARY MISENHIMER
93234	HURON, CITY OF	P. O. BOX 339	HURON	CA	2099452241	JOHN D. LUGHY
93235	IVANHOE PUD	P. O. BOX A	IVANHOE	CA	2097980512	CHARLES MANESS, JR.
93239	KETTLEMAN CITY SANITARY DISTRI	P. O. BOX 177	KETTLEMAN CITY	CA	2093865866	RON BALES
93241	LAMONT PUBLIC UTILITY DISTRICT	8624 SEGRUE RD	LAMONT	CA	8058451213	CARROL BRUCE

POTWs as of June 3, 1994

ZIP CODE	AGENCY NAME	AGENCY STREET ADDRESS	AGENCY CITY	ST	TELEPHONE	AGENCY CONTACT
93242	LATON COMMUNITY SERV. DIST.	P. O. BOX 447	LATON	CA	2099234802	RON ROBBINS
93243	GOLDEN VALLEY MUNI. WATER DIST	P.O BOX 81	GORMAN	CA	8053953113	RUTH RALPH
93244	LEMON COVE SANITARY DIST.	P. O. BOX 74	LEMON COVE	CA	2095972477	WILLIAM PENSAR
93245	LEMOORE, CITY OF	119 FOX STREET	LEMOORE	CA	2099245396	DAVID WLASCHIN
93247	LINDSAY, CITY OF	251 HONOLULU STREET	LINDSAY	CA	2095625945	WILLIAM R. DRENNEN
93249	LOST HILLS SANITARY DISTRICT	P. O. BOX 246	LOST HILLS	CA	8057972596	LOUIS BETTI
93250	MCFARLAND, CITY OF	P. O. BOX 1488	MCFARLAND	CA	8057923091	DON CAMPBELL
93252	MARICOPA, CITY OF	271 CALIFORNIA ST.	MARICOPA	CA	8057690279	TERRY BARTA
93254	CUYAMA COMMUNITY SERVICES DIST	P.O. BOX 253	NEW CUYAMA	CA	8057662584	DON COX
93256	PIXLEY PUBLIC UTITITY DISTRICT	P. O. BOX 535	PIXLEY, CA	CA	2097573878	RANDY MASTERS
93257	WOODVILLE PUD	P. O. BOX 4567	WOODVILLE	CA	2096869649	KEN LAMBERT
93257	POPLAR COMMUNITY SERVICES DIST	P. O. BOX 3849	POPLAR	CA	2097847009	JAMES JANEWAY
93258	PORTERVILLE, CITY OF DPW	P. O. BOX 432	PORTERVILLE	CA	2097827514	EDSELL YOST
93261	RICHGROVE COMMUNITY SERVICES D	P. O. BOX 300	RICHGROVE	CA	8057255632	RAY CASTILLO
93263	SHAFTER, CITY OF	320 JAMES ST	SHAFTER	CA	8057462065	JOHN GUINN
93265	SPRINGVILLE PUD	P. O. BOX 434	SPRINGVILLE	CA	2095392869	DUKE JOHNSON
93266	STRATFORD PUD	P. O. BOX 85	STRATFORD	CA	2099473037	FRED EGGER
93267	STRATHMORE PUD	P. O. BOX 425	STRATHMORE	CA	2095681613	TED ILES
93268	TAFT, CITY OF	209 E. KERN STREET	TAFT	CA	8057633144	BILL KYTOLA
93272	TIPTON COMMUNITY SERVICE DISTR	P. O. BOX 266	TIPTON	CA	2097524182	GLENDA SOUZA
93280	WASCO, CITY OF	P. O. BOX 159	WASCO	CA	8057583003	JOHN F. HENDRICKSON
93286	WOODLAKE, CITY OF	350 N. VALENCIA BLVD.	WOODLAKE	CA	2095648483	JACK JUSTICE
93291	VISALIA, CITY OF	707 W. ACEQUIA	VISALIA	CA	2097383404	LEWIS NELSON
93291	TERRA BELLA SEWER MAINT. DIST.	COUNTY CIVIC CENTER, ROOM 10	VISALIA	CA	2097336291	JAMES BLAIR
93301	KERN CO SANITATION AUTHORITY	2700 -M- STREET, SUITE 500	BAKERSFIELD	CA	8058612481	DON WEBER
93301	BAKERSFIELD, CITY OF	1501 TRUXTUN AVENUE	BAKERSFIELD	CA	8053263724	ED SCHULZ
93302	OLCESE WATER DIST.	P. O. BOX 651	BAKERSFIELD	CA	8058725563	DON WAHL
93308	NORTH OF RIVER SANI DIST NO 1	5001 OLIVE DRIVE	BAKERSFIELD	CA	8053996411	DONALD GLOVER
93401	SAN LUIS OBISPO CITY	35 PRADO ROAD	SAN LUIS OBISPO	CA	8055497220	JOHN MOSS
93408	SAN LUIS OBISPO COUNTY	COUNTY GOVERNMENT CENTER	SAN LUIS OBISPO	CA	8055495252	
93422	ATASCADERO CITY	6500 PALMA	ATASCADERO	CA	8054615074	
93424	AVILA BEACH CO WATER DISTRICT	P. O. BOX 309	AVILA BEACH	CA	8055952664	TOM HARRINGTON
93427	CITY OF BUELLTON	P.O. BOX 1819	BUELLTON	CA	8056885177	
93428	CAMBRIA COMMUNITY SVCS DIST	P.O. BOX 65	CAMBRIA	CA	8059273823	DAVID J. ANDRES
93434	GUADALUPE CITY	918 OBISPO STREET	GUADALUPE	CA	8053431340	BENNY GONZALES
93436	MISSION HILLS CSD	1430 EAST BURTON MESA BLVD	LOMPOC	CA	8057334366	JOHN W. LEWIS
93438-8001	LOMPOC CITY	P. O. BOX 8001	LOMPOC	CA	8057361261	GENE L. WALHERS
93440	LOS ALAMOS COMMUNITY SVCS DIST	P.O. BOX 675	LOS ALAMOS	CA	8053444195	NORMAN ROCK, BOARD VP
93442	MORRO BAY & CAYUCOS S D	695 HARBOR STREET	MORRO BAY	CA	8057721214	DARRELL RICHARDS
93444	NIPOMO COMMUNITY SERVICES DIST	P. O. BOX 326	NIPOMO	CA	8059291133	
93445	SOUTH SLO CO SANITATION DIST.	P.O. BOX 339	OCEANO	CA	8054896666	CHARLES ELLISON
93446	HERITAGE RANCH CSD	4870 HERITAGE ROAD	PASO ROBLES	CA	8052276230	KIT CARTER, MGR.
93448	PISMO BEACH CITY	P.O. BOX 3	PISMO BEACH	CA	8057734656	JIM ASHCRAFT
93450	SAN ARDO WATER DISTRICT	P. O. BOX 238	SAN ARDO	CA	4086272349	
93451	SAN MIGUEL SANITARY DISTRICT	P. O. BOX 87	SAN MIGUEL	CA	8054673834	JOHN WALLACE

POTWs as of June 3, 1994

ZIP CODE	AGENCY NAME	AGENCY STREET ADDRESS	AGENCY CITY	ST	TELEPHONE	AGENCY CONTACT
93454	SANTA MARIA CITY	110 EAST COOK STREET	SANTA MARIA	CA	8059250951	
93455	LAGUNA SANITATION	624 WEST FOSTER ROAD	SANTA MARIA	CA	8059346225	LARRY THOMPSON
93463	SOLVANG CITY	1644 OAK STREET	SOLVANG	CA	8056885575	DAVE SERGE
93501	MOJAVE PUD	15844 K STREET	MOJAVE	CA	8058244161	RICHARD LEDWIDGE
93505	CALIFORNIA CITY	21000 HACIENDA BLVD	CALIFORNIA CITY	CA	6193738661	
93514	LOS ANGELES CITY DWP	300 MANDICH	BISHOP	CA	6198721104	FRED FINKBINDER
93514	EASTERN SIERRA CSD	301 WESTLINE ST SUITE D	BISHOP	CA	6198721415	
93514	BISHOP, CITY OF	377 W LINE ST	BISHOP	CA	6198738458	
93514	BIG PINE COMMUNITY SERV DIST	PO BOX 46868	BIG PINE	CA	6199382677	
93516	BORON COMMUNITY SERVICE DIST	PO DRAWER B	BORON	CA	6197626127	
93516	DESERT LAKE COMM SER DISTRICT	PO BOX 567	BORON	CA	7147625349	
93517	BRIDGEPORT PUD	BOX 91	BRIDGEPORT	CA	9169327251	TOM SQUIRES
93526	INYO COUNTY PARKS & REC DEPT	DRAWER Q	INDEPENDENCE	CA	6198782411	
93527	INYOKERN COMMUNITY SERV DIST	PO BOX 1418, 1429 BROADWAY	INYOKERN	CA	6193775840	MARY LENZ
93529	JUNE LAKE PUBLIC UTILITY DIST	PO BOX 99	JUNE LAKE	CA	6196487778	LEONARD AINSWORTH
93541	LEE VINING PUBLIC UTILIY DIST	PO BOX 266	LEE VINING	CA	6196476543	
93545	LONE PINE COMM SERV DIST	PO BOX 36	LONE PINE	CA	6198765312	
93546	HILTON CREEK CSD	ROUTE 1 BOX 1124	CROWLEY LAKE	CA	6199354500	
93546	MAMMOTH COUNTY WATER DISTRICT	PO BOX 597	MAMMOTH LAKES	CA	6199342596	
93555	RIDGECREST CITY OF, REC	100 WEST CALIFORNIA AVENUE	RIDGECREST	CA	6193713700	BOB ROBERTS
93561	BEAR VALLEY CSD	STAR ROUTE 3, BOX 4800	TEHACHAPI	CA	8058214428	JACK GEARY
93561	TEHACHAPI, CITY OF	115 S. ROBINSON STREET	TEHACHAPI	CA	8058222200	LARRY COOKE
93561	STALLION SPRINGS C.S D.	STAR ROUTE 1, BOX 2800-11	TEHACHAPI	CA	8058223268	JIM LANE
93606	BIOLA COMMUNITY SERVICES DIST	P. O. BOX 57	BIOLA	CA	2098432657	CHERYL BELLUOMINI
93609	CARUTHERS COMMUNITY SERV DIST	P. O. BOX 218	CARUTHERS	CA	2098643226	WHITNEY GALLAGHER
93610	CHOWCHILLA, CITY OF	145 W. ROBERTSON BLVD.	CHOWCHILLA	CA	2096654816	SCOTT LAMBERS
93615	CUTLER-OROSI JT POWERS WW AUTH	40401 ROAD 120	CUTLER	CA	2095282504	MICHAEL MCBRIDE
93616	DEL REY COMMUNITY SERV DIST	P. O. BOX 186	DEL REY	CA	2098882272	LINDA RAMIREZ
93618	DINUBA, CITY OF	405 EAST EL MONTE WAY	DINUBA	CA	2095913725	J. EDWARD TODI
93618	LONDON COMMUNITY SERVICES DST	37835 KATE ROAD	DINUBA	CA	2095915142	LACY BIERMAN
93620	DOS PALOS, CITY OF	1546 GOLDEN GATE AVE.	DOS PALOS	CA	2093926201	PAUL WOODRING
93622	FIREBAUGH, CITY OF	1575 11TH ST	FIREBAUGH	CA	2096592043	PAUL RICHARDS
93630	KERMAN, CITY OF	850 S. MADERA AVE	KERMAN	CA	2098469384	KENNETH MOORE
93631	SELMA-KINGSBURG-FOWLER CO SAN	P. O. BOX 95	KINGSBURG	CA	2098964420	DAVID MICHEL
93635	LOS BANOS, CITY OF	411 MADISON STREET	LOS BANOS	CA	2098260280	MATTHEW BARCELLOS
93635	SAN LUIS PARTNERSHIP	947 6TH STREET	LOS BANOS	CA	2098264043	
93637	MADERA, CITY OF	205 W. FOURTH STREET	MADERA	CA	2096748802	DAVE CHUMLEY
93637	MADERA COUNTY	135 W. YOSEMITE AVE	MADERA	CA	2096757817	DOWE STINSON
93640	MENDOTA, CITY OF	643 QUINCE STREET	MENDOTA	CA	2092666456	ROW CORLISS
93646	PARLIER, CITYOF	1100 E. PARLIER AVE.	PARLIER	CA	2096463545	AL PUENTE
93646	ORANGE COVE, CITY OF	633 SIXTH STREET	ORANGE COVE	CA	2096264488	ALAN BENGYEL
93646	PARLIER, CITY OF	1100 E. PARLIER AVE.	PARLIER	CA	2096463545	AL PUENTE
93648	PARLIER, CITY OF	1100 E. PARLIER AVE.	PARLIER	CA	2096463545	AL PUENTE
93654	REEDLEY, CITY OF	845 -G- STREET	REEDLEY	CA	2096374214	JOHN WANKUM
93656	RIVERDALE PUD	20945 HASLAM	RIVERDALE	CA	2098673838	RON BASS
93657	SANGER, CITY OF	1700 7TH STREET	SANGER	CA	2098756513	EDWARD LARRABEE
93660	SAN JOAQUIN, CITY OF	P. O. BOX 758	SAN JOAQUIN	CA	2096934311	NANCY WALKER

POTWs as of June 3, 1994

ZIP CODE	AGENCY NAME	AGENCY STREET ADDRESS	AGENCY CITY	ST	TELEPHONE	AGENCY CONTACT
93668	TRANQUILITY PUD	P. O. BOX 622	TRANQUILITY	CA	2096987426	JAMES STRICKLIN
93706	FRESNO, CITY OF	5607 W. JENSEN AVENUE	FRESNO	CA	2092669631	MONTY DILL
93721	FRESNO CO. PUBLIC WORKS DEPT.	2220 TULARE ST., STE. 600	FRESNO	CA	2094535059	STEPHEN T. BARILE
93725	MALAGA COUNTY WATER DIST.	3580 S. FRANK ST.	FRESNO	CA	2094857353	ED NOLAN
93901	CARMEL VALLEY CSD	312 EAST ALISAL STREET	SALINAS	CA	4084240991	
93901	MONTEREY COUNTY	312 EAST ALISAL STREET	SALINAS	CA	4084290991	
93902	CHUALAR COUNTY SANITARY DIST.	312 EAST ALISAL STREET	SALINAS	CA		
93915-5279	MONTEREY COUNTY PARKS DEPT.	P. O. BOX 5279	SALINAS	CA	8054722311	
93915-5279	U.S. ARMY, FORT ORD	P. O. BOX 5279	SALINAS	CA	4087554895	
93922	CARMEL AREA WASTEWATER DIST.	P. O. BOX 221428	CARMEL	CA	40B6241248	MARK SCHEIDER
93926	GONZALES CITY	109 FOURTH STREET	GONZALES	CA	4086752321	
93927	GREENFIELD CITY	213 EL CAMINO REAL	GREENFIELD	CA	4086745591	
93930	KING CITY	212 SOUTH VANDERHURST	KING CITY	CA	4083853281	BLAINE MICHAELIS
93933	MARINA COUNTY WATER DISTRICT	11 RESERVATION ROAD	MARINA	CA	4083846131	EVELENA ADLAWAN
93940	MONTEREY REGIONAL WPCA	5 HARRIS COURT, BUILDING D	MONTEREY	CA	4083723367	KEITH ISRAEL
93960	SOLEDAD CITY	P.O. BOX 156	SOLEDAD	CA	4086783963	BLAIR KING
94010	BURLINGAME, CITY OF	501 PRIMROSE ROAD	BURLINGAME	CA	4153428132	RALPH KIRKUP
94015	NORTH SAN MATEO COUNTY SD	153 LAKE MERCED BLVD	DALY CITY	CA	4157556557	MICHAEL ABRAMSON
94019	SEWER AUTHORITY MID-COASTSIDE	PO BOX 3100	HALF MOON BAY	CA	4157260124	WILLIAM HEASLET
94030	MILLBRAE, CITY OF	621 MAGNOLIA AVENUE	MILLBRAE	CA	4152592339	LOIS SAUDRINI
94044	PACIFICA, CITY OF	170 SANTA MARIA AVE	PACIFICA	CA	4157387348	SCOTT HOLMES
94065	SOUTH BAYSIDE SYSTEM AUTHORITY	1400 RADIO ROAD	REDWOOD CITY	CA	4155917121	JIM BEWLEY
94080	SOUTH SAN FRANCISCO	400 GRAND AVE PO BOX 711	SO SAN FRANCISCO	CA	4158778538	RON PARINI
94086	SUNNYVALE, CITY OF	P. O. BOX 3707	SUNNYVALE	CA	4087307441	MARVIN ROSE
94102	SAN FRANCISCO, CITY & COUNTY	ROOM 260 CITY HALL	SAN FRANCISCO	CA	4155546920	RICHARD EVANS
94128	SAN FRANCISCO, CITY & COUNTY	AIRPORTS COMM. PO BOX 8097	SAN FRANCISCO	CA	4158767783	DENNIS BOUEY
94132	SAN FRANCISCO, CITY & COUNTY	3500 GREAT HIGHWAY	SAN FRANCISCO	CA	4152422227	NATHAN BRENNAN
94303	PALO ALTO, CITY OF	2501 EMBARCADERO WAY	PALO ALTO	CA	4153292243	WILLIAM MIKS
94403	SAN MATEO, CITY OF	330 WEST 20TH AVENUE	SAN MATEO	CA	4153773315	ARCH PERRY
94501	ALAMEDA, CITY OF	CITY HALL-SANTA CLARA/OAKS	ALAMEDA	CA	5105224100	BRUCE RUPP
94509	CONTRA COSTA CO.SAN.DIST.NO.19	P. O. BOX 929	ANTIOCH	CA	4156714295	BILL MCDONALD
94509-0092	DELTA DIABLO SANITATION DIST.	P. O. BOX 929	ANTIOCH	CA	5107784040	RONALD TSUQITA
94510	BENICIA, CITY OF	250 EAST L STREET	BENICIA	CA	7077464200	TONI M. BERTOLERO
94513	BRENTWOOD, CITY OF	708 THIRD ST	BRENTWOOD	CA	4156343505	MARK CLARKSON
94514	BYRON SANITARY DIST.	P.O. BOX 309	BYRON	CA	4156344416	
94515	CALISTOGA, CITY OF	1232 WASHINGTON STREET	CALISTOGA	CA	7079425188	STEVE ANDERSON
94530	STEGE SANITARY DISTRICT	7500 SCHMIDT LANE	EL CERRITO	CA		ALFRED G. BAXTER
94536	UNION SANITARY DISTRICT	P.O. BOX 5015	FREMONT	CA	5107900100	STEVE HAYASHI
94545	HAYWARD, CITY OF	3700 ENTERPRISE AVE	HAYWARD	CA	5102935208	ALEX AMERI
94547	HERCULES, CITY OF	111 CIVIC DRIVE	HERCULES	CA	5107584880	DOUGLAS SPINDLER
94550	SAN LEANDRO, CITY OF	835 E 14TH STREET	SAN LEANDRO	CA	5105773434	ROBERT TAYLOR
94550	LIVERMORE, CITY OF	1052 SOUTH LIVERMORE AVENUE	LIVERMORE	CA	5104494000	BILL ADAMS
94553	MT VIEW SANITARY DIST	PO BOX 2757	MARTINEZ	CA	5102285635	DAVID CONTRERAS
94553	CENTRAL CONTRA COSTA SAN DIST	5019 IMHOFF PLACE	MARTINEZ	CA	5106893890	ROGER DOLAN
94553	CONTRA COSTA COUNTY-SAN DIST	255 GLACIER DRIVE	MARTINEZ	CA	4156174295	BOYD D. JEWETT
94558	SPANISH FLAT WATER DISTRICT	4310 KNOXVILLE RD.	NAPA	CA	7079661713	LEON CWICLA
94558	NAPA BERRYESSA IMPVMT DISTRICT	1195 3RD STREET	NAPA	CA	7072534351	

POTWs as of June 3, 1994

ZIP CODE	AGENCY NAME	AGENCY STREET ADDRESS	AGENCY CITY	ST	TELEPHONE	AGENCY CONTACT
94558	LAKE BERRYESSA RESORT IMP. DIST	1195 3RD STREET	NAPA	CA	7072534351	
94558	NAPA SANITATION DISTRICT	P.O. BOX 2480	NAPA	CA	7072586000	JOHN STEWART
94559	CIRCLE OAKS CO. WATER DIST.	P O. BOX 344	NAPA	CA	7072242004	VIC BRUNETO
94561	IRONHOUSE SANITATION DISTRICT	3775 MAIN STREET, SUITE E	OAKLEY	CA	5106252779	DAVID BAUER
94564	PINOLE, CITY OF	2131 PEAR ST	PINOLE	CA	5107248963	JULIAN MISRA
94566	DUBLIN SAN RAMON SERVICES DIST	7051 DUBLIN BLVD	DUBLIN	CA	5108280515	PAUL RYAN
94571	RIO VISTA, CITY OF	P.O. BOX 745	RIO VISTA	CA	7073746451	GEORGE ALPHIN
94572	RODEO SANITARY DISTRICT	PO BOX 97	RODEO	CA	5107992970	
94574	ST. HELENA, CITY OF	1480 MAIN ST.	ST. HELENA	CA	7079632741	GENE ARMSTEAD
94580	EAST BAY DISCHARGERS AUTHORITY	2651 GRANT AVENUE	SAN LORENZO	CA	5102785910	CHARLES WEIR
94580	ORO LOMA SANITARY DISTRICT	2600 GRANT AVE	SAN LORENZO	CA	5102764700	EDWAR HEVER
94583	ERSKINE CREEK SAN. SERVICE CO.	3170 CROW CANYON PLACE, #160	SAN RAMON	CA	4158666720	RICHARD E. DOTY
94585	FAIRFIELD-SUISUN SEWER DIST	1010 CHADBOURNE RD	FAIRFIELD	CA	7074298930	RICHARD F. LUTHY, JR.
94585	TWIN CREEKS	15 FAIRWAY PLACE	SUISUN	CA	7074293233	SAL INIQUEZ
94588	LIVERMORE-AMADOR VALLEY WMA	7399 JOHNSON DRIVE	PLEASANTON	CA	5108244565	ROBERT SWANSON
94590	VALLEJO SAN AND FLOOD CONT DIS	450 RYDER STREET	VALLEJO	CA	7076448949	J MICHAEL HOEHN
94599	YOUNTVILLE, TOWN OF	6550 YOUNT STREET	YOUNTVILLE	CA	7079448851	ROBERT MEYERS
94611	PIEDMONT, CITY OF	120 VISTA AVENUE	PIEDMONT	CA	5106537204	DAVID BERGER
94612	OAKLAND, CITY OF	1421 WASHINGTON ST	OAKLAND	CA	5102733962	HENRY GARDNER
94623	EAST BAY MUD	P.O. BOX 24055	OAKLAND	CA	5108353000	JORGE CARRASCO
94642	EAST BAY MUN UTILITIES DIST.	P.O. BOX 24055	OAKLAND	CA	4154653700	WALTER BISHOP
94704	BERKELEY, CITY OF	CITY HALL-2180 MILVIA ST	BERKELEY	CA	5106446523	BRIAN LEE
94706	ALBANY, CITY OF	1000 SAN PABLO AVE	ALBANY	CA	5106448541	WILLIAM HADEN
94804	RICHMOND, CITY OF	2600 BARRETT AVE.	RICHMOND	CA	5106206969	KEN SMITHWICK
94806	WEST COUNTY AGENCY	2910 HILLTOP DRIVE	RICHMOND	CA	5102226700	WILLIAM BRAGA
94806	WEST COUNTY WASTEWATER DIST	2377 GARDEN TRACT ROAD	RICHMOND	CA	5102376603	JACK FOLEY
94901	CENTRAL MARIN SANITATION AG.	1301 ANDERSON DRIVE	SAN RAFAEL	CA	4154591455	JOSEPH REMLEY
94903	LAS GALLINAS VALLEY S.D.	300 SMITH RANCH RD	SAN RAFAEL	CA	4154721734	JIM EMANUEL
94913	MARIN CO OFFICE OF EDUCATION	1111 LAS GALLINAS AVE/POB 425	SAN RAFAEL	CA	4154995866	BYRON M. MAUZY
94920	MARIN COUNTY SD #5	P. O. BOX 227	TIBURON	CA	4154351501	HENRY KNAUBER
94920	RICHARDSON BAY SD/CITY OF TIB.	500 TIBURON BLVD	TIBURON	CA	4153881345	LOUIS BRUWINIT
94924	BOLINAS COM PUD	270 ELM STREET	BOLINAS	CA	4153835420	PHIL BUCHANAN
94942	SEWERAGE AGENCY OF SO. MARIN	PO BOX 1029	MILL VALLEY	CA	4153882402	DAVID COE
94947	NOVATO SANITARY DISTRICT	500 DAVIDSON STREET	NOVATO	CA	4158921694	CHARLES JOSEPH
94948	NORTH MARIN COUNTY WATER DIST.	P.O.BOX 146	NOVATO	CA	4158974133	JOHN O. NELSON
94952	PETALUMA, CITY OF	P.O. BOX 61	PETALUMA	CA	7077784304	TOM HARGIS, CITY ENGR.
94965	SAUSALITO-MARIN CITY SAN DIST	PO BOX 212	SAUSALITO	CA	4153320244	WILLIAM DABNER
95006	SAN LORENZO VALLEY WATER DIST.	P. O. BOX H	BOULDER CREEK	CA	4083382153	
95020	SOUTH COUNTY REG WW AUTHORITY	7351 ROSANNA STREET	GILROY	CA	4088480400	JAY BAKSA
95023	HOLLISTER CITY	375 FIFTH STREET	HOLLISTER	CA	4086378221	
95023	SAN BENITO COUNTY	498 FIFTH STREET	HOLLISTER	CA	4086376550	PATRICK BATES
95023-9702	SUNNYSLOPE COUNTY WATER DIST.	3416 AIRLINE HIGHWAY	HOLLISTER	CA	4086374670	BRYAN YAMAOKA
95054-1086	SAN JUAN BAUTISTA CITY	P.O. BOX 1086	SAN JUAN BAUTISTA	CA	4086234661	
95060	SANTA CRUZ CITY DPW	809 CENTER STREET	SANTA CRUZ	CA	4084293636	LARRY ERWIN
95060	SANTA CRUZ	701 OCEAN STREET	SANTA CRUZ	CA	4084252133	
95060	DAVENPORT COUNTY SANITARY DIST	701 OCEAN STREET	SANTA CRUZ	CA	4084252133	STEVE JESBERG
95066	SCOTTS VALLEY CITY	ONE CIVIC CENTER DRIVE	SCOTTS VALLEY	CA	4084382324	

POTWs as of June 3, 1994

ZIP CODE	AGENCY NAME	AGENCY STREET ADDRESS	AGENCY CITY	ST	TELEPHONE	AGENCY CONTACT
95075	TRES PINOS COUNTY WATER DIST	P. O. BOX 529	TRES PINOS	CA		
95077	WATSONVILLE CIIY	P.O. BOX 50000	WATSONVILLE	CA	4087286042	ROBERT KETLEY
95134	SAN JOSE/SANTA CLARA WPCP	700 LOS ESTEROS ROAD	SAN JOSE	CA	4089455300	ED BRAATELIEN JR.
95201	SAN JOAQUIN COUNTY, CSA 31	1810 E. HAZELTON AVE.	STOCKTON	CA	2094683000	HENRY HIRATA
95205	SAN JOAOUIN CO., CSA-15	1702 E. SCOTTS AVE.	STOCKTON	CA	2094683090	HENRY HIRATA
95206	STOCKTON-MAIN STP	2500 NAVY DRIVE	STOCKTON	CA	2099448750	GLEN BIRDZELL
95222	ANGELS, CITY OF	P O BOX 667	ANGELS CAMP	CA	2097362181	STEVE COLLINS
95223	BEAR VALLEY WATER DISTRICT	P.O. BOX 5027	BEAR VALLEY	CA	2097532112	BILL VOREYER
95236	LINDEN COUNTY WATER DISTRICT	PO BOX 595	LINDEN	CA	2098873216	GARY FERRILL
95237	LOCKEFORD CSD	P.O. DRAWER Z	LOCKEFORD	CA	2097275035	TOM MCDONALD
95242	LODI, CITY OF	1331 SOUTH HAM LANE	LODI	CA	2093336740	FRAN FORKAS
95245	MOKELUMNE HILL SANITARY DIST.	P.O. BOX 209	MOKELUMNE HILL	CA	2092861389	JACK SMITH
95247	MURPHYS SANITARY DIST.	P O. BOX429	MURPHYS	CA	2097283094	BILL WAKEFIELD
95249	CALAVERAS COUNTY WATER DIST.	P.O. BOX 846	SAN ANDREAS	CA	2097543543	STEVE FELTE
95249	SAN ANDREAS SANITARY DIST.	P O BOX 666	SAN ANDREAS	CA	2097543281	GARY MCGEORGE
95252	VALLEY SPRINGS SD	P.O. BOX 55	VALLEY SPRINGS	CA	2097721434	DIANE PONTE
95258	WOODBRIDGE SANITARY DISTRICT	BOX 299	WOODBRIDGE	CA	2093680900	GEORGE FISKE
95301	ATWATER, CITY OF	750 BELLEVUE ROAD	ATWATER	CA	2093585606	JOHN HAUG
95307	CERES, CITY OF	2720 SECOND ST.	CERES	CA	2095378911	JOE HOLSTEIN
95315	DELHI COUNTY WATER DISTRICT	PO BOX 426	DELHI	CA	2096328777	ANDREW ANDERSON
95321-0350	GROVELAND COMM. SERV. DISTRICT	P.O. BOX 350	GROVELAND	CA	2099627161	BRUCE HILL
95322	SANTA NELLA COUNTY WATER DIST	13193 S. HWY 33, SUITE D	SANTA NELLA	CA	2098260920	DAN NEVILLE
95322-0016	GUSTINE CITY OF	P. O. DRAWER A	GUSTINE	CA	2098546471	MARK MELVILLE
95324	HILMAR COUNTY WATER DISTRICT	P. O. BOX 446	HILMAR	CA	2096323522	JACK WILKEY
95326	HUGHSON, CITY OF	P.O. BOX 9	HUGHSON	CA	2098834054	ROM BREMER
95327	JAMESTOWN, CITY OF	PO BOX 247	JAMESTOWN	CA	2099843536	RON BOYD-SNEE
95329	SNELLING COMMUNITY SERV. DIST.	BARRETT COVE - STAR ROUTE	LEGRANGE	CA	2097222719	DUANE BARTLOW
95330	LATHROP, CITY OF	16775 HOWLAND ROAD	LATHROP	CA	2098585592	JOHN BINGHAM, CITY MGR
95333	LE GRAND COMM SERV DIST	P. O. BOX 82	LEGRAND	CA	2093894173	MOLLIE FULLER
95334	LIVINGSTON, CITY OF	P. O. BOX 308	LIVINGSTON	CA	2093948041	TONY DIAZ
95336	MANTECA, CITY OF	1001 WEST YOSEMITE AVE	MANTECA	CA	2092398400	JIM PODESTA
95338	YOSEMITE WEST SPECIAL DISTRICT	4639 BEN HUR ROAD	MARIPOSA	CA	2099665358	MATT BUMGARDNER
95338	MARIPOSA PUD	P. O BOX 494	MARIPOSA	CA	2099662515	MARK ROWNEY
95340	MERCED, CITY OF	678 W. 18TH STREET	MERCED	CA	2093856892	RON DAVIS
95348	FRANKLIN COUNTY WATER DISTRICT	2126 NO DRAKE AVE	MERCED	CA	2097231353	VIRGINIA CHASE
95353	MODESTO, CITY OF	PO BOX 642	MODESTO	CA	2095775470	MARSHALL ELIZER JR
95356	SALIDA SANITARY DISTRICT	3701 DIX LANE	MODESTO	CA	2095775424	MICHAEL GILTON
95360	NEWMAN, CITY OF	1162 O STREET	NEWMAN	CA	2098623725	STEVE HOLLISTER
95361	OAKDALE, CITY OF	280 N. THIRD AVE.	OAKDALE	CA	2098473031	BRUCE BANNERMAN
95363	PATTERSON, CITY OF	P.O. BOX 667	PATTERSON	CA	2098922041	IGNACIO LOPEZ
95364	LELAND MEADOW WATER DISTRICT	P.O. BOX 1026	PINECREST	CA	2099653745	EDITH MORRISON
95364	PINECREST PERMITTEES ASSOC.	P.O. BOX 1248	PINECREST	CA	2095323234	LEONARD DOTEN
95365	PLANADA COMMUNITY SERV. DIST	P.O. BOX 905, 103 LIVE OAK ST.	PLANADA	CA	2093820213	RUTH WATTS
95366	RIPON, CITY OF	PO BOX 727	RIPON	CA	2095992723	DALE RAINEY
95367	RIVERBANK, CITY OF	6707 THIRD ST	RIVERBANK	CA	2098693671	BRIAN COX / RANDAL DODD
95370	TUOLUMNE UTILITIES DISTRICT	P.O. BOX 3728	SONORA	CA	2095320693	GARY EGGER

POTWs as of June 3, 1994

ZIP CODE	AGENCY NAME	AGENCY STREET ADDRESS	AGENCY CITY	ST	TELEPHONE	AGENCY CONTACT
95376	TRACY, CITY OF	325 EAST 10TH STREET	TRACY	CA	2098362670	
95379	TUOLUMNE CITY SANITARY DIST	P.O. BOX 1238	TUOLUMNE	CA	2099283517	ALICE CALDERA
95380	TURLOCK, CITY OF-WWTF	901 SOUTH WALNUT	TURLOCK	CA	2096685590	CLIFF MARTIN
95386	WATERFORD COMM SERVICES DIST	P O. BOX 199	WATERFORD	CA	2098742328	LES CRIST
95387	GRAYSON COMM. SERVICES DIST.	P.O BOX 98	WESTLEY	CA	2098945675	BILL HARRISON
95387	WESTLEY COMMUNITY SERV. DIST.	P.O. BOX 206	WESTLEY	CA	2095230705	JERRY MATSUNAGA
95401	SONOMA COUNTY DEPT. PUB. WORKS	575 ADMINISTRATION DRIVE	SANTA ROSA	CA	7075247199	WILLARD BENNETT
95401	SANTA ROSA, CITY OF	69 STONY CIRCLE	SANTA ROSA	CA	7075245182	MILES FERRIS
95403	SONOMA VALLEY COUNTY S. D.	575 ADMINISTRATION DR., #11 A	SANTA ROSA	CA	7075265370	
95403	SOMOMA COUNTY DEPT. PUB. WORKS	2173 AIRPORT BOULEVARD	SANTA ROSA	CA	7075463377	WILLARD BENNETT
95418	CALPELLA COUNTY WATER DISTRICT	P.O. BOX 115	CALPELLA	CA	7074622666	DAVID REDDING
95422	LOS BREZ'S PARK	WINDFLOWER POINT	CLEARLAKE	CA	7079945747	RANDY WILLIAMS
95425	CLOVERDALE, CITY OF	P.O. BOX 217	CLOVERDALE	CA	7078942521	BOB PERRAULT
95428	COVELO COMMUNITY SERVICES DIST	P.O. BOX 65	COVELO	CA	7079836888	DOLORES ANN O'FERRALL
95437	FORT BRAGG MUN. IMPR. DIST.#1	416 NORTH FRANKLIN STREET	FORT BRAGG	CA	7079612834	GARY MILLIMAN
95440	GARBERVILLE SANITARY DIST.	P.O. BOX 211	GARBERVILLE	CA	7079239111	MARK BRYANT
95445	GUALALA COMMUNITY SERVICES DIS	P.O. BOX 124	GUALALA	CA	7077852331	RICH HYDEN
95448	HEALDSBURG, CITY OF	P.O. BOX 578	HEALDSBURG	CA	7074313346	RICHARD J. PUSICH
95449	HOPLAND PUBLIC UTILITIES DIST.	P.O. BOX 386	HOPLAND	CA	7074622666	DAVE REDDING
95453	LAKE COUNTY SANITATION DISTRICT	255 NORTH FORBES STREET	LAKEPORT	CA	7072632273	GARY BROWN
95453	LAKEPORT, CITY OF	225 PARK STREET	LAKEPORT	CA	7072635682	
95459	IRISH BEACH WATER DISTRICT	P.O. BOX 67	MANCHESTER	CA	7078822792	PRESIDENT, BD OF DIRECTORS
95460	CASPAR SOUTH WATER DISTRICT	14140 HILMA CIRCLE	MENDOCINO	CA	7079640647	DONNA CHILDS
95460	MENDOCINO CITY CSD	P.O. BOX 1029	MENDOCINO	CA	7079375751	RICHARD GODINEZ
95461	HIDDEN VALLEY LAKE CSD	P.O. BOX 5143	MIDDLETOWN	CA	7079870343	MEL AUST
95468	POINT ARENA, CITY OF	P.O. BOX 67	POINT ARENA	CA	7078822122	FRED PATTEN
95482	UKIAH, CITY OF	300 SEMINARY AVENUE	UKIAH	CA	7074636286	TED GOFORTH
95488	WESTPORT COUNTY WATER DISTRICT	P.O. BOX 82	WESTPORT	CA	7079648249	CHAIRMAN
95489	HCRID #1	9126 SHELTER COVE ROAD	WHITETHORN	CA	7079867447	FLO ANN GHIGLIAZZA
95490	WILLITS, CITY OF	111 EAST COMMERCIAL STREET	WILLITS	CA	7074594601	GORDON LOGAN
95492	WINDSOR WATER DISTRICT	P.O. BOX 100	WINDSOR	CA	7078381000	JOHN JOHNSON
95497	SEA RANCH ASSOCIATION	P.O. BOX 16	SEA RANCH	CA	7077852444	JERRALD GONCE
95501	EUREKA, CITY OF	P.O. BOX 1018	EUREKA	CA	7074437331	DAVE MCGINTY
95521	ARCATA, CITY OF	736 F STREET	ARCATA	CA	7078228184	STEVE TYLER
95521	MANILA COMMUNITY SERVICES DIST	1901 PARK STREET	ARCATA	CA	7074443803	BUANE RIGGE
95521	MCKINLEYVILLE CSD	P.O. BOX 2037	MCKINLEYVILLE	CA	7078393251	BRUCE BUEL
95525	BLUE LAKE, CITY OF	P O. BOX 458	BLUE LAKE	CA	7076685655	SCOTTY HARNDEN
95531	CRESCENT CITY, CITY OF	343 G STREET	CRESCENT CITY	CA	7074649506	STEVE CASEY
95531	KLAMT CSD C/O DEL NORTE ADMIN	450 H STREET	CRESCENT CITY	CA	7074647214	DAVE RIBINOWIRZ
95536	FERNDALE, CITY OF	834 MAIN ST.	FERNDALE	CA	7077864224	RON RICHARDSON
95540	FORTUNA, CITY OF	P.O BOX 545	FORTUNA	CA	7077253300	TOM COOKE
95548-0083	REDWOOD PARK CSD	P.O. BOX 83	KLAMATH	CA	7074822065	EARL MORGAN, SECRETARY
95551	LOLETA COMMUNITY SERVICES DIST	P.O. BOX 236	LOLETA	CA	7077335287	TED WALKER
95553	MIRANDA COMMUNITY SERVICES DIS	P.O. BOX 160	MIRANDA	CA	7079433234	BERT STEVENS
95560	REDWAY COMMUNITY SERVICES	P.O. BOX 40	REDWAY	CA	7079233101	DENNIS ABSHIRE
95562	RIO DELL, CITY OF	675 WILDWOOD AVE	RIO DELL	CA	7077643532	EARL WILSON
95571	WEOTT CSD	P.O. BOX 218	WEOTT	CA	7079462448	ORRIN SCOTT

POTWs as of June 3, 1994

ZIP CODE	AGENCY NAME	AGENCY STREET ADDRESS	AGENCY CITY	ST	TELEPHONE	AGENCY CONTACT
95601	AMADOR, CITY OF	P.O. BOX 200	AMADOR CITY	CA		MARYLOU BRYANT
95603	PLACER CO DEPT OF PUBLIC WORKS	11444 B AVENUE DEWITT CENTER	AUBURN	CA	9168897500	JACK WARREN, DIRECTOR
95603-5004	AUBURN, CITY OF	1225 LINCOLN WAY	AUBURN	CA	9168234250	RICH PLECKAR
95616	DAVIS, CITY OF	23 RUSSELL BLVD	DAVIS	CA	9167563749	
95620	DIXON, CITY OF	600 EAST A STREET	DIXON	CA	9166782326	VIRGIL MUSTAIN
95624	COURTLAND SANITATION DISTRICT	8521 LAGUNA STATION RD.	ELK GROVE	CA	9163662625	
95627	ESPARTO COMM. SERVICE DIST.	P.O. BOX 349	ESPARTO	CA	9167873300	DICK SLOUGH, MANAGER
95632	GALT, CITY OF	PO BOX 97	GALT	CA	2097452961	ROBERT U. KAWASAKI
95634	GEORGETOWN DIVIDE PUD	P.O. BOX 338	GEORGETOWN	CA	9163334356	RICHARD PRINCE
95640	IONE, CITY OF	PO BOX 398	IONE	CA	2092742412	RAY DIEHOBEL
95641	ISLETON, CITY OF	PO BOX 716	ISLETON	CA	9167776082	
95642	AMADOR REG. SAN. AUTHORITY	108 COURT STREET	JACKSON	CA	2092236394	ROD SCHULER
95642	JACKSON, CITY OF	33 BROADWAY	JACKSON	CA	2092231646	JIM BUEL
95645	KNIGHTS LANDING SERVICE DIST.	P.O. BOX 548	KNIGHTS LANDING	CA	9167356337	JACK DAVIES
95648	LINCOLN, CITY OF	517 G STREET	LINCOLN	CA	9166453314	RALPH HITCHCOCK
95653	MADISON SERVICE DIST.	P.O. BOX 40	MADISON	CA	9166668190	BERNADETTE SCRIBNER
95658	NEWCASTLE SANITARY DISTRICT	P.O. BOX 857	NEWCASTLE	CA	9166633173	ERNIE MANGIARACINA
95659	SOUTH SUTTER WATER DISTRICT	2464 PACIFIC AVE	TROWBRIDGE	CA		
95667	EL DORADO IRRIGATION DISTRICT	2890 MOSQUITO RD	PLACERVILLE	CA	9166224513	KEN MEYER
95667	PLACERVILLE, CITY OF	487 MAIN STREET	PLACERVILLE	CA	9166226724	MIKE FOSTER
95669	PLYMOUTH, CITY OF	P.O. BOX 429	PLYMOUTH	CA	2092456941	MIKE LOZEAU
95678	ROSEVILLE, CITY OF	316 VERNON ST	ROSEVILLE	CA	9167810693	DERRICK WHITEHEAD
95683	RANCHO MURIETA C.S.D.	P.O. BOX 1050	RANCHO MURIETA	CA	9169856473	
95685	SUTTER CREEK, CITY OF	P.O. BOX 366	SUTTER CREEK	CA	2092675647	GEORGE CHRISTNER
95688	VACAVILLE, CITY OF	650 MERCHANT STREET	VACAVILLE	CA	7074491871	DAVID TOMPKINS
95691	WEST SACRAMENTO, CITY OF	P.O. BOX 449	WEST SACRAMENTO	CA	9163735800	LARRY GOSSETT
95694	WINTERS, CITY OF	318 FIRST STREET	WINTERS	CA	9167954910	
95695	WOODLAND, CITY OF - DOMESTIC	300 FIRST STREET	WOODLAND	CA	9166615975	RON TRIBBETT
95713	COLFAX, CITY OF	PO BOX 702	COLFAX	CA	9163462313	TOM DUNIPACE
95728	DONNER SUMMIT PUBLIC UTILITY	P.O. BOX 610	SODA SPRINGS	CA	9164263456	MICHAEL BOMMER
95758	WALNUT GROVE SMD	8521 LAGUNA STATION RD	ELK GROVE	CA	9163955320	MIKE MULKERIN
95758	SACRAMENTO COUNTY DPW	8521 LAGUNA STATION RD.	ELK GROVE	CA	9163925320	MARY S. JAMES
95758	SACRAMENTO REGIONAL CO SD	8521 LAGUNA STATION RD.	ELK GROVE	CA	9163662241	ROBERT SHANKS
95814	SACRAMENTO CO. WATER AGENCY	827 7TH STREET, RM 304	SACRAMENTO	CA	9164406851	KEITH DEVORE
95827	SACRAMENTO REGIONAL COUNTY SD	9660 ECOLOGY LANE	SACRAMENTO	CA	9163662241	RAY SANTIN
95901	MARYSVILLE, CITY OF	P.O. BOX 150	MARYSVILLE	CA	9166746677	SHAUN D. CAREY
95901	LINDA COUNTY WATER DISTRICT	1280 SCALES STREET	MARYSVILLE	CA	9167432043	DAVE GOTHROW
95912	ARBUCKLE PUD	308 5TH STREET	ARBUCKLE	CA	9164762054	JAMES SCHEIMER
9S917	BIGGS CITY OF	PO BOX 307	BIGGS	CA	9168685493	DON HOWARD
95927	CHICO CITY OF	PO BOX 3420	CHICO	CA	9168954871	CARL CRAWFORD
95932	COLUSA, CITY OF	425 WEBSTER STREET	COLUSA	CA	9164584941	M C TOTMAN
95936	SIERRA CO SERV AREA 5 ZONE 5A	P.O. BOX 530	DOWNIEVILLE	CA	9162893251	TIM BEALS
95945	NEVADA IRRIGATION DISTRICT	P.O. BOX 1019	GRASS VALLEY	CA	9162736185	ED NEUHARTH
95945	GRASS VALLEY, CITY OF	125 EAST MAIN STREET	GRASS VALLEY	CA	9162730941	DONALD DOUGHERTY
95947	GREENVILLE COMM SERV DIST	PO BOX 899	GREENVILLE	CA	9162847311	JAMES HAM8LIN
95948	GRIDLEY CITY OF	685 KENTUCKY AVE	GRIDLEY	CA	9168465695	RAY ROLLS
95951	HAMILTON CITY COMMUN SERV DIS	P.O. BOX 116	HAMILTON CITY	CA	9168263208	RALPH VIDAURI

POTWs as of June 3, 1994

ZIP CODE	AGENCY NAME	AGENCY STREET ADDRESS	AGENCY CITY	ST	TELEPHONE	AGENCY CONTACT
95953	LIVE OAK, CITY OF	9955 LIVE OAK BLVD	LIVE OAK	CA	9166952112	DONALD DOSSER
95955	MAXWELL P.U.D.	P.O. BOX 294	MAXWELL	CA	9164382505	RICHARD WARREN
95959	NEVADA CO. SANITATION DEPT.	P.O. BOX 6100	NEVADA CITY	CA	9162561770	GORDON PLANTENZA
95959	NEVADA COUNTY SAN. DIST. NO. 1	P.O. BOX 6100	NEVADA CITY	CA	9162651555	JERRY ROBINSON
95959	NEVADA CITY, CITY OF	317 BROAD STREET	NEVADA CITY	CA	9162652496	BERYL ROBINSON
95961	OLIVEHURST P.U.D.	P.O.BOX 670	OLIVEHURST	CA	9167434657	GARY PLASTERER
95962	WHEATLAND, CITY OF	P.O. BOX 306	WHEATLAND	CA	9166332761	MIKE URALOWICH
95963	ORLAND, CITY OF	815 FOURTH STREET	ORLAND	CA	9168654741	ALBERT CALONICO
95965	BUTTE COUNTY	7 COUNTY CENTER DRIVE	OROVILLE	CA	9165387681	RON MCELROY
95965-1350	SEWER COMM - OROVILLE REGION	PO BOX 1350	OROVILLE	CA	9165340353	ROBERT SIMPSON
95965-8399	BUTTE COLLEGE	3536 BUTTE CAMPUS DRIVE	OROVILLE	CA	9168952381	MICHAEL S. MILLER
95970	PRINCETON WATER WORKS DIST.	P.O. BOX 205	PRINCETON	CA	9164392213	GENE MENDEZ
95971	PLUMAS COUNTY SERVICE AREA	PO BOX 10179	QUINCY	CA	9162836222	TOM HUNTER
95971	QUINCY COMM SERV DISTRICT	900 SPANISH CREEK ROAD	QUINCY	CA	9162830836	LARRY SULLIVAN
95971	PLUMAS COUNTY SERVICE AREA 8	PO BOX 10179	QUINCY	CA	9168364113	IVAN GOSSAGE
95974	RICHVALE SANITARY DISTRICT	PO BOX 1	RICHVALE	CA	9168824318	GARY STONE
95979	NEVADACOUNTY SAN. DIST. NO.1	P.O. BOX 6100	NEVADA CITY	CA	9162651555	JERRY ROBINSON
95987	WILLIAMS, CITY OF	P.O. BOX 310	WILLIAMS	CA	9164732519	KIM CHRISTY
95988	WILLOWS, CITY OF	P.O. BOX 864	WILLOWS	CA	9169347041	JON BARKER
95992	SUTTER COUNTY	P.O. BOX 1555	YUBA CITY	CA	9167417450	THOMAS HART
95993	YUBA CITY	1201 CIVIC CENTER BLVD.	YUBA CITY	CA	9167414626	KEITH FINE
95993	SUTTER COUNTY PUBLIC WORKS	1160 CIVIC CENTER BLVD., STE D	YUBA CITY	CA		
96001	SHASTA CO. SERVICES AREA NO.17	1558 WEST STREET	REDDING	CA	9162255571	RANDY O'HERN
96001	REDDING CITY OF	760 PARKVIEW AVENUE	REDDING	CA	9162254428	STEVE CRAIG
96002	SHASTA COLLEGE	1065 N. OLD OREGON TRAIL	REDDING	CA	9162254748	JIM TAYLOR
96006	ADIN COMMUNITY SERVICE DISTRIC	PO BOX 90	ADIN	CA	9162993349	MIKE WILLIAMS
96007	ANDERSON UNION HIGH SCHOOL DIS	1469 FERRY STREET	ANDERSON	CA	9163780568	
96007	ANDERSON CITY OF	1887 HOWARD STREET	ANDERSON	CA	9163652521	GARY LIGHTHALL
96009	LASSEN CO WATER WORKS DIST #1	PO BOX 363	BIEBER	CA	9162942011	STEPHEN JACKSON
96013	BURNEY WATER DISTRICT	PO BOX 247	BURNEY	CA	9163352209	BILL SUPPA
96019	SHASTA LAKE CITY OF	PO BOX 777	CENTRAL VALLEY	CA	9162758827	JOHN PEDRI
96020	CHESTER PUBLIC UTILITY DISTRIC	PO BOX 530	CHESTER	CA	9162582171	ROBERT MERRYFIELD
96021	CORNING CITY OF	794 THIRD STREET	CORNING	CA	9168247020	STEVE KIMBROUGH
96022	RIO ALTO WATER DISTRICT	PO BOX 5068	COTTONWOOD	CA	9163473835	ROGER SHERRILL
96023	DORRIS, CITY OF	P.O. BOX 768	DORRIS	CA	9163974281	RICK BAY
96025	DUNSMUIR CITY OF	5915 DUNSMUIR AVENUE	DUNSMUIR	CA	9162354822	ALAN HARVEY
96027	ETNA, CITY OF	P O BOX 460	ETNA	CA	9164675256	LOUISE THOMAS
96028	FALL RIVER MILLS CSD	PO BOX 427	FALL RIVER MILLS	CA	9163365263	BUZZ SARDAHL
96032	FORT JONES, TOWN OF	P.O. BOX 40	FORT JONES	CA	9164682281	MAYOR KEN SMITH
96035	GERBER-LAS FLORES CSD	PO BOX 195	GERBER	CA	9163851074	AL LEGGS
96035	TEHAMA COUNTY OF	9380 SAN BENITO AVENUE	GERBER	CA	9163851462	HAROLD MAYFIELD
96038	GRENADA SANITARY DISTRICT	P.O. BOX 371	GRENADA	CA	9164362453	GEORGE SWAIN
96039	HAPPY CAMP SANITARY DISTRICT	P.O. BOX 378	HAPPY CAMP	CA	9164935293	DAVE GREENBERG
96052	LEWISTON PARK MUTUAL WATER CO.	P.O. BOX 111	LEWISTON	CA	9167783502	BOB CAIN
96057	MCCLOUD COMM SERV DISTRICT	PO BOX 48	MCCLOUD	CA	9169642017	BRUCE FRENCH
96058	TENNANT COMMUNITY SERVICES DIS	13515 TENNANT ROAD	MACDOEL	CA	9163973139	DOUG DEFILIPPIS

POTWs as of June 3, 1994

ZIP CODE	AGENCY NAME	AGENCY STREET ADDRESS	AGENCY CITY	ST	TELEPHONE	AGENCY CONTACT
96064	MONTAGUE, CITY OF	P.O.BOX 428	MONTAGUE	CA	9164593030	
96067	MT SHASTA CITY OF	305 N MT SHASTA BLVD	MT SHASTA	CA	9169263464	BOB VANCE
96080	RED BLUFF CITY OF	P.O. BOX 400	RED BLUFF	CA	9165272605	GARY ANTONE
96093	WEAVERVILLE SANITARY DIST	P.O. BOX 1269	WEAVERVILLE	CA	9166234102	BOB THOMPSON
96094	WEED, CITY OF-DPW	P.O. BOX 470	WEED	CA	9169384842	DOUG YOST
96094	LAKE SHASTINA CSD	15440 C JUNIPER PEAK ROAD	WEED	CA	9169383281	JAIME LEA
96097	YREKA, CITY OF	701 FOURTH STREET	YREKA	CA	9168424386	BOB BLY
96101	CALIF PINES COMM SERV DIST	HCO 4 BOX 43002	ALTURAS	CA	9162332766	DOUG DAVENPORT
96101	ALTURAS CITY OF	200 NORTH STREET	ALTURAS	CA	9162332512	DAVE MULKEY
96103	WHITEHAWK RANCH MUTUAL WATER	P.O. BOX 800	BLAIRSDEN	CA	9168360364	HUGH & MARCIA WHITE
96111	FLORISTON, COMMUNITY OF	P.O. BOX 48	FLORISTON	CA		
96118	LOYALTON, CITY OF	P.O. BOX 128	LOYALTON	CA	9169934622	
96120	MARKLEEVILLE PUD	MARKLEEVILLE PUD	MARKLEEVILLE	CA	9166942450	JIM FUNGE
96120	ALPINE COUNTY P.U.D.	ROUTE 1 BOX 37	MARKLEEVILLE	CA		DAVE FONTANA
96122	GRIZZLY LAKE RESORT IMP DIST	P.O. BOX 696	PORTOLA	CA	9168325225	RICK GORHAM
96122	PORTOLA CITY OF	P.O. BOX 1225	PORTOLA	CA	9168324321	STACEY MACDONALD
96130	SUSANVILLE CSD	P.O. BOX 152	SUSANVILLE	CA	9162575665	GLEN STRAHAN
96134	TULELAKE, CITY OF	P.O. BOX 847	TULELAKE	CA	9166675522	MARE INGRAM
96134	NEWELL CWD	P.O. BOX 656	TULELAKE	CA	9166643511	DON BROWN
96137	WESTWOOD COMM SERV DIST	319 ASH STREET	WESTWOOD	CA	9162563211	CHUCK ANDERS
96150	SOUTH TAHOE P.U D.	1275 MEADOW CREST DR	SOUTH LAKE TAHOE	CA	9165446474	JAMES R. COFER
56150	SOUTH TAHOE P.U.D.	1275 MEADOW CREST DR	SOUTH LAKE TAHOE	CA	9165446474	JIM HOGGATT
96161	TAHOE TRUCKEE SANITATION AGEN.	13720 JOERGER DR.	TRUCKEE	CA	9165872525	CRAIG WOODS
96161-3312	TRUCKEE SANITARY DISTRICT	12304 JOERGER DR	TRUCKEE	CA	9165873804	JANE TURNER

APPENDIX G

California Occupational Safety and Health Administration's
General Industry Safety Orders - Article 67

[Blank Page]

Article 67. Laundry and Dry Cleaning Equipment

§ **4479. Definitions.**
NOTE: Authority cited: Sections 142 and 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY:
1. New section filed 9-19-75; effective thirtieth day thereafter (Register 75, No.38).
2. Repealer of subsection (a)(5) and numerical renumbering of subsections (a)(6)-(10) filed 10-18-79; effective thirtieth day thereafter (Register 79, No.42).
3. Repealer filed 2-20-80; effective thirtieth day thereafter (Register 80, No. 8).

§ **4480. Marking Machine**

(a) Each power marking machine shall be equipped with a spring compression device of such design as to prevent injury to finger bones should they be caught between the marking plunger and platen, or

(b) The marking machine shall be equipped with a control mechanism which will require the simultaneous action of both hands to operate the machine, or

(c) There shall be a guard which will interpose a barrier in front of the marking plunger.
NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY
1. Amendment of section heading and new NOTE filed 11-20-86; effective thirtieth day thereafter (Register 86, No.47).

§ **4481. Washing Machines.**

(a) Each washing machine shall be equipped with a substantial cover of not less than No. 20 gauge material, or equivalent, to cover the opening in the case or shell.

(b) Each washing machine shall be equipped with an interlock that will disconnect the current to the drive motor and prevent starting rotation of the cylinder when the access door to the machine is open. The interlock shall, however, enable the operator to inch the machine with the access door open.
EXCEPTION: This requirement does not apply to washing machines of 50 pounds capacity or less and which does not rotate more than 100 RPM.

(c) Each washing machine or washer/extractor shall be provided with a means to prevent accidental self-closing of the shell or cylinder doors while loading or unloading the machine.
EXCEPTION: This requirement does not apply to sideward-hinged or over-the-center doors that tend to remain open.

Note: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY
1. Repealer and new section filed 9-19-75; effective thirtieth day thereafter(Register 75, No. 38).

2. Amendment filed 11-20-86; effective thirtieth day thereafter (Register 86, No.47).

§ **4482. Extractors.**

(a) Each extractor shall be equipped with a metal cover of at least No. 20 gauge, or its equivalent. which shall entirely cover the opening of the outer shell.

(b) Each centrifugal extractor or washer/extractor shall be equipped with an interlock that will disconnect the current to the drive motor and prevent starting rotation of the cylinder when the access door to the machine is open. The interlock shall further prevent opening of the access door or cover while the cylinder is rotating . The interlock shall, however, allow the operator to rotate the basket by manual control or inch the basket for loading or unloading while the access door or cover is open.

(c) The exterior of the basket, including hoops or bands, shall be inspected at least every year to determine condition of basket. The extractor shall be dismantled and the bearings, bearing blocks, and basket shall be inspected at least every two years and all necessary repairs or replacements made. A basket that shows signs of weakness shall not be used. A record of the inspection, including the date and name of person who made the inspection, shall be kept on file in the plant.

(d) Each extractor shall be equipped with a mechanically or electrically operated brake to stop the basket when the power driving the basket is shut off.

(e) Each squeeze extractor shall be provided with a cover operated by two-hand controls, and an interlock to prevent unloading the machine unless the pressure has been released and also to prevent applying pressure unless the cover has been properly closed. Gages in front of the machine shall indicate the applied pressure . A steam, hydraulic- or pneumatic-operated device shall be provided with a pressure relief valve set to open if the applied pressure exceeds by 10 percent the maximum operating pressure which shall be shown on the machine nameplate.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Repealer and new subsection (b) and new subsections (f) and (g) filed 9-19-75; effective thirtieth day thereafter (Register 75, No. 38).
2. Repealer of subsections (c) and (e) and relettering of existing subsections filed 2-20-80; effective thirtieth day thereafter (Register 80, No. 8).
3. Amendment of section heading and subsection (c) filed 11-20-86. effective thirtieth day thereafter (Register 86. No.47).

§ **4483. Power Wringer.**

Each power wringer shall be equipped with a guard across the entire front of the feed or first pressure rolls, so arranged that when struck the machine will immediately stop.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Amendment of section heading and new NOTE filed 11-20-86; effective thirtieth day thereafter (Register 86, No. 47).

§ **4484. Starching Machine (Cylinder or Box Type) (Class A).**
NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY
1. Repealer filed 2-20-80; effective thirtieth day thereafter (Register 80, No. 8).

§ **4485. Drying Tumbler, End Loading.**

(a) Each tumbler shall be equipped with a device that will prevent energizing the drive motor which rotates the cylinder unless the shell door is closed. The device shall, however, allow for the momentary inching of the tumbler to facilitate loading and unloading.

(b) Each tumbler shall be provided with means to prevent accidental self-closing of the shell door during loading and unloading of the machine. This requirement does not apply to sideward-hinged doors that tend to remain open.

EXCEPTION:
1. This requirement does not apply to sideward-hinged doors that tend to remain open.
2. Tumblers designed without doors where the work is continuously loaded and discharged.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY
1. Repealer and new section filed 9-19-75; effective thirtieth day thereafter (Register 75, No. 38).
2. Amendment of subsection (a) filed 11-18-76; effective thirtieth day thereafter (Register 76, No. 47).
3. Amendment of subsection (b) filed 11-20-86; effective thirtieth day thereafter (Register 86, No. 47).

§ **4486. Shaker (Clothes Tumbler, Batch Type).**

(a) Each shaker or clothes tumbler shall be equipped with:

(1) A device that will prevent the tumbler from moving while the door is open. The tumbler shall be enclosed or guarded so as to prevent accidental contact.

(2) Brakes or other positive locking devices to prevent the inside cylinder from moving when the machine is being loaded or unloaded.

NOTE: "Inching devices" are permitted.
NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY
1. Amendment filed 9-19-75; effective thirtieth day thereafter (Register 75, No.38).
2. Amendment filed 11-20-86; effective thirtieth day thereafter (Register 86, No.47).

§ **4487. Drying Box or Cabinets.**
Access doors to drying boxes or cabinets shall have door latches or locks that will enable an operator to open the doors readily from the inside and the outside. Doors that cannot be opened from the inside without a key, wrench, or tool shall not be used on drying boxes or cabinets.
NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New section filed 9-19-75; effective thirtieth day thereafter (Register 75, No.38).
2. Amendment of NOTE filed 11-20-86; effective thirtieth day thereafter(Register 86, No. 47).

§ **4488. Dampening Machine (Class A).**

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Renumbering of Section 4487 to Section 4488 filed 9-19-75 (Register 75, No.38).
2. Repealer filed 2-20-80; effective thirtieth day thereafter (Register 80, No. 8).

§ **4489. Ironer (Flatwork Type).**

(a) Each flatwork and collar ironer shall be equipped with a guard across the entire front of the feed or first pressure rolls, so arranged that when struck the machine will immediately stop.

(b) The pressure rolls shall be guarded or covered so that an employee cannot reach into the rolls.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

l. Renumbering of Section 4488 to Section 4489 filed 9-19-75 (Register 75, No.38).
2. Amendment of section heading and new NOTE filed 11-20-86. effective thirtieth day thereafter (Register 86, No. 47).

§ **4490. Ironer (Body Type).**

Each body ironer, roll or shoe type, including sleeve and band ironers, shall be equipped with a guard across the entire length of the feed roll or shoe, so designed that when struck the machine will immediately stop.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Renumbering of Section 4489 to Section 4490 filed 9-19-75 (Register 75, No.38).
2. Amendment filed 11-20-86; effective thirtieth day thereafter (Register 86, No.47).

§ **4491. Ironer (Rotary-Body Type).**

Each combined rotary bosom and coat-ironer shall be equipped with a guard across the entire length of the feed roll or shoe, so designed that when struck the machine will immediately stop.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Renumbering of Section 4490 to Section 4491 filed 9-19-75 (Register 75, No.38).
2. Amendment filed 11-20-86; effective thirtieth day thereafter (Register 86, No.47).

§ **4492. Ironer (Press Type).**

Every ironing press (except hand- or foot-power presses) used in the ironing or finishing of

textiles and/or other materials shall be equipped with a guard or controls of such design, construction, and installation that will prevent the operator, or other person, from being caught between the ironing surfaces.
NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY
1. Renumbering of Section 4491 to Section 4492 filed 9-19-75 (Register 75, No.38).
2. Amendment of section heading and new NOTE filed 11-20-86; effective thirtieth day thereafter (Register 86, No. 47).

§ **4493. Boilers and Pressure Vessels.**

(a) Boilers and pressure vessels shall comply with the Boiler and Fired Pressure Vessel Safety Orders and the Unfired Pressure Vessel Safety Orders.

(b) Where pressure-reducing valves are used, a safety relief valve shall be provided on the low-pressure side of the reducing valve to prevent pressure build-up in excess of the maximum allowable working pressure. The safety relief valve shall be located as close as possible to the reducing valve, and it shall be vented to the atmosphere in a manner to avoid injury or damage caused by escaping fluid. The relief valve and vent system discharge capacity shall be sized so that the pressure rating of the low-pressure piping and equipment are not exceeded if the reducing valve sticks or fails to close.
NOTE: The relief valve may be omitted if the pressure before the reducing valve does not exceed the maximum working pressure of the equipment.
NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY
1. New Sections 4493 and 4494 filed 9-19-75; effective thirtieth day thereafter (Register 75, No. 38).
2. Amendment filed 11-20-86; effective thirtieth day thereafter (Register 86, No.47).

§ **4494. Operating Rules.**

(a) Employees shall be properly instructed on the hazards of their work and on safe practices by either bulletins, printed rules, verbal instructions, or periodic safety meetings.

(b) Markers, sorters, and other persons handling soiled clothes shall be warned by signs in their work area against touching eyes, mouth, or any part of the body on which the skin has been broken, abrased, or injured, and against touching or eating food unless their hands have been thoroughly washed.
NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY
1. Repealer of subsections (c) and (d) filed 2-20-80; effective thirtieth day thereafter (Register 80, No. 8).

[Blank Page]

APPENDIX H

California Trade and Commerce Agency's Office of Small Business
Plant Registration and Assistance Programs

[Blank Page]

STEPS TO REGISTER YOUR DRY CLEANING PLANT

1. Determine if you are classified as a Dry Cleaning Plant. A Dry Cleaning Plant is any premise, building, room or cleaning plant or cleaning and dyeing plant, equipped to perform the service of dry cleaning by immersion and agitation, or immersion only, in a volatile, commercially moisture-free solvent.

2. If you have not registered since January 1, 1993, please call or write to the California Trade and Commerce Agency to ascertain how to register with the state. Registration fee is $75.00 every two years and requires a $5,000.00 surety bond.

3. Once you have been notified by the State to register, complete the forms with the necessary documentation and mail them to:

Ms. Shoron Robinson
Manager of the Dry Cleaning Plant Registration Program
California Trade and Commerce Agency, Office of Small Business
801 K Street, Suite 1700
Sacramento, California 95814

AVAILABLE SMALL BUSINESS PROGRAMS

1. Two Business Environmental Assistance Centers (BEAC) provide environmental compliance assistance. The toll-free numbers are: 1-800-662-BEAC for southern California and 1-800-799-BEAC for northern California.

2. 30 Small Business Development Centers assist small businesses in: finding resources to finance business operations; business counseling, planning or marketing; or in referring you to what you may be seeking. Contact the Office of Small Business at (916) 445-6546.

3. The Loan Guarantee Program provides loan guarantee financing, up to $500,000.00, on revolving lines of credit, term loans, small loans, and agricultural loans. A two percent guarantee fee will be assessed.

WHO TO CONTACT

Northern/Central California:

SAFE BIDCO Small Business Development Corporation
145 Wikiup Drive
Santa Rosa, CA 95403
(707) 577-8621

California Capital Small Business Development Corporation
926 J Street, Suite 1500
Sacramento, CA 95814
(916) 442-1729

Bay Area Small Business Development Corporation
3932 Harrison Street
Oakland, CA 94611
(510) 652-5262

California Coastal Small Business Development Corporation
Five East Gabilan Street, Suite 218
Salinas, CA 93901
(408) 424-1099

Valley Small Business Development Corporation
955 N Street
Fresno, CA 93721
(209) 268-0166

Southern California:

Hancock Urban Development Corporation
3600 Wilshire Boulevard, Suite 926
Los Angeles, CA 90010
(213) 382-4300

The Santa Ana Economic Development Corporation
20 Civic Center Plaza, M35
(P.O. Box 1988)
Santa Ana, CA 92702
(714) 647-6987

The La Habra Local Development Company, Inc.
145 East La Habra Boulevard, 2nd Floor
(P.O. Box 337)
La Habra, CA 90633-0337
(310) 905-9741

Pacific Coast Regional Small Business Development Corporation
3255 Wilshire Boulevard, Suite 1501
Los Angeles, CA 90010
(213) 739-2999

California Small Business Development Corporation
600 B Street, Suite 2450
San Diego, CA 92101
(619) 232-7771

Valley Economic Development Center, Inc.
14540 Victory Boulevard, Suite 200
Van Nuys, CA 91411-1618
(818) 989-4377

Riverside County Economic Development Corporation
3499 10th Street
(P.O. Box 413)
Riverside, CA 92501-0413
(909) 788-9811

Inquiries may also be directed to:

California Trade and Commerce Agency
Office of Small Business
801 K Street, Suite 1700
Sacramento, CA 95814
(916) 324-1295

APPENDIX I

Bibliography

[Blank Page]

Bibliography

ARB, 1991a. Technical Support Document Part A Proposed Identification of Perchloroethylene as a Toxic Air Contaminant, August 1991.

ARB, 1991b. Staff Report Proposed Identification of Perchloroethylene as a Toxic Air Contaminant, August 1991.

ARB, 1993a. Title 17 California Code of Regulations, section 93109, Air Resources Board's Final Regulation Order, Airborne Toxic Control Measure for Emissions of Perchloroethylene from Dry Cleaning Operations.

ARB, 1993b. Title 17 California Code of Regulations, section 93110, Air Resources Board's Final Regulation Order, Environmental Training Program for Perchloroethylene Dry Cleaning Operations.

ARB, 1993c. Staff Report Proposed Airborne Toxic Control Measure for Emissions of Perchloroethylene and Proposed Environmental Training Program for Perchloroethylene Dry Cleaning Operations.

ARB, 1993d. Technical Support Document to the Staff Report Proposed Airborne Toxic Control Measure and Proposed Environmental Training Program for Perchloroethylene Dry Cleaning Operations. State of California Air Resources Board Stationary Source Division, August 27, 1993.

Boewe, 1989. Photo copy of equipment manual.

Cal/OSHA, 1980a. Title 8, California Code of Regulations, General Industry Safety Orders - Article 67, September 1975.

Cal/OSHA, 1980b. Title 8, California Code of Regulations, General Industry Safety Orders - Section 5155, October 1993.

Cal/OSHA, 1980c. Title 8, California Code of Regulations, General Industry Safety Orders - Section 5194, May 1993.

Cal/OSHA, 1995a. Fax recieved October 17, 1995 from Cal/OSHA Consultation Service Office in Sacramento.

Cal/OSHA, 1995b. Title 8, California Code of Regulations, Sections 5192 and 3220.

CAPCOA, 1993. CAPCOA Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines. Toxics Committee of the California Air Pollution Control Officers Association (CAPCOA), October 1993.

CEC, 1992. Dry Cleaning an Assessment of Emission Control Options, 1025 Connecticut Avenue N.W., Suite 712, Washington, D.C. 20036, September 1992.

CEC, 1993. "The Safe Handling of Perchloroethylene Dry Cleaning Solvent", Center for Emissions Control, 200 L Street, N.W. Suite 730, Washington D.C. 20036.

CIS, 1994. "Clearing the Air on Clean Air, Strategies for Perc Drycleaners", The University of Tenessee Center for Industrial Services, 1994.

Dow, 1987. "Drycleaning A Basic Handbook", Dow Chemical Company 1987.

Dow, 1990. "Dowper and the Environment, Drycleaning Equipment", Dow Chemical Company.

Dow, 1991. Specialty Chlorinated Solvents Product Stewardship Manual.

Dow, 1992. "A Basic Handbook for Drycleaners", Dow Chemical Company, November 1992.

Douglas, 1996. Meeting with Jim Douglas of Swansons Cleaners and ARB staff, February 27, 1996.

DTSC, 1994b. Permits/Generator Requirements for Dry Cleaners.

DTSC, 1995. Title 22, California Code of Regulations, Chapter 15, Article 4.

DTSC, 1996. "Contingency Plan ", Department of Toxic Substances Control, January 29, 1996.

Engineering Research Institute at California State University, Fresno. California Dry Cleaning Industry Task Force Final Report, February 1994.

Environment Canada. "The Green Team, The Environmental Code of Practice for Drycleaners", Environment Canada

Exxon, 1994. "Comparison of Typical Properties of Dry Cleaning Solvents." Exxon Chemical Company, P.O. Box 3272, Houston Texas, 77253-3272, March 1994.

Exxon, 1995. Material Safety Data Sheet for Exxon Chemical Dry Cleaning Fluid 2000, Exxon Chemical Company, P.O. Box 3272, Houston Texas, 77253-3272, March 13, 1995.

Grossman, 1994. Diagram of the back of dry-to-dry closed-loop machine, Lindus West.

HSIA, 1989. "The Safe Handling of Perchloroethylene Dry Cleaning Solvent", Halogenated Solvents Industry Alliance, March 1989.

IFI, 1984. "IFI Focus on Drycleaning, An Equipment Handbook", Vol. 8, No. 3, July 1984.

IFI, 1987. "Focus on Drycleaning, Perchloroethylene Vapor in Drycleaning Plants", International Fabricare Institute, Vol. 11, No.1, March 1987.

IFI, 1988. Fundamentals of Dry Cleaning Correspondence Course.

IFI, 1989. "Focus on Drycleaning, Reducing Vapor Exposure: OSHA Compliance", International Fabricare Institute, Vol. 13, No. 5, November 1989.

IFI, 1990. "Focus on Drycleaning, Principles of Drycleaning", International Fabricare Institute, Vol. 14, No. 4, November 1990.

IFI, 1991. "Focus On Drycleaning, Effecive Solvent Reclamation, Causes of Poor Solvent Recovery", International Fabricare Institute, Vol 15 No. 1, March 1991.

IFI, 1993. Drycleaning and the Environment, December 1993.

Information from the Vocational Dry Cleaning Workshop, June 13, 1994, California Department of Corrections.

J.T. Baker, 1993. J.T. Baker, 1993/94 Catalog, pages 237 and 257, J.T. Baker Inc., 222 Red School Lane, Phillipsburg NJ 08865, July 13, 1994.

J.T. Baker, 1994. Material Safety Data Sheet for Tetrachloroethylene (Perc), J.T. Baker Inc., 222 Red School Lane, Phillipsburg NJ 08865, July 13, 1994.

Kajiwara, 1995. Telephone conversation with Arthur Kajiwara on 2/14/95 and 10/12/95, Arthur Kajiwara Equipment Co. Inc.

Omega, 1995. "Filtration Systems Available to the D.C. Industry", Omega Cleaning Systems 1995.

PPR, 1992. "Case Study: Pollution Prevention in the Dry Cleaning Industry: A Small Business Challenge for the 1990s". Pollution Prevention Review, Summer 1992.

Safety-Kleen, 1989. "Drycleaning, Laundry Hazardous Materials Program, Employee Training Manual", American Hazmat Inc. 1989.

SCEMD, 1995. Telephone conversation with Gloria Luna on 12/19/95, Sacramento County Environmental Management Department, Hazardous Materials Branch.

Southern California Edison, 1990. "Reduction of Perchloroethylene Emissions Using Refrigerated Condensers in Ventless Dry Cleaning Systems", TEM Associates, Inc., Dec. 1990.

Spectrex, 1996. Picture of Spectrex Detector, Spectrex Corporation, March 1996.

SRCSD, 1994. "Sewer Use Requirements and Waste Minimization for Dry Cleaners", Sacramento Regional County Sanitation District, Waste Minimization Program, 8521 Laguna Station Road, Elk Grove CA 95758.

SRRP, 1990. "Dry Cleaning of Fabrics", Source Reduction Research Partnership, June, 1990.

SRRP, 1992. "Source Reduction and Recycling of Halogenated Solvents in the Dry Cleaning Industry," Source Reduction Research Partnership, 1992.

TIF, 1994a. TIF Instruments, Inc. Specification Data Catalog, TIF Instruments, Inc. 9101 N.W. 7th Avenue, Miami, Florida 33150.

TIF, 1994b. Telephone conversation with Roger Seymore, TIF Instruments, Inc. and Tina Najjar on September 23, 1994.

Union. "Manufacturer's Operating Manual for Union L35, Union L55, and Union L80 Machines", Union Drycleaning Products, USA.

U.S. EPA, 1993a. Federal Register, December 10, 1993, Protection of Stratospheric Ozone. 40 CFR Part 82, Volume 58, No. 236, Pg. 65018.

U.S. EPA, 1993b. Federal Code of Regulations, National Emission Standards for Hazardous Air Pollutants for Source Categories: National Perchloroethylene Air Emission Standards for Dry Cleaning Facilities; 40CFR Part 63, Subpart M, Volume 58, No. 182, page 49376.

U.S. EPA, 1994. Perchloroethylene Dry Cleaning Facilities -- General Recommended Operating and Maintenance Practices for Dry Cleaning Equipment EPA-4531R-94-073 Oct, 1994.

U.S. EPA, 1995. Federal Register, May 10, 1995, Protection of Stratospheric Ozone: Administrative Changes to Final Rule to Phase Out Ozone Depleting Chemicals. 40 CFR Part 82, Volume 60, No. 90, Pg. 25002-25003.

VIC, 1992. "Installation, Operation, and Maintenance Instructions for VIC 1200F/S and 1200 Advanced Series Drycleaning Machines", VIC Manufacturing, July 1992.

Wolf, 1996a. Letter to Robert Fletcher from Dr. Katy Wolf, Institute for Research and Technical Assistance, January 30, 1996.

Wolf, 1996b. Telephone conversation with Dr. Katy Wolf, Institute for Research and Technical Assistance, and Tina Najjar, on April 18, 1996.

Yokogowa, 1994. Telephone conversation with Mark Waldrip, Yokogawa Corporation of America, and Tina Najjar, on September 23, 1994.