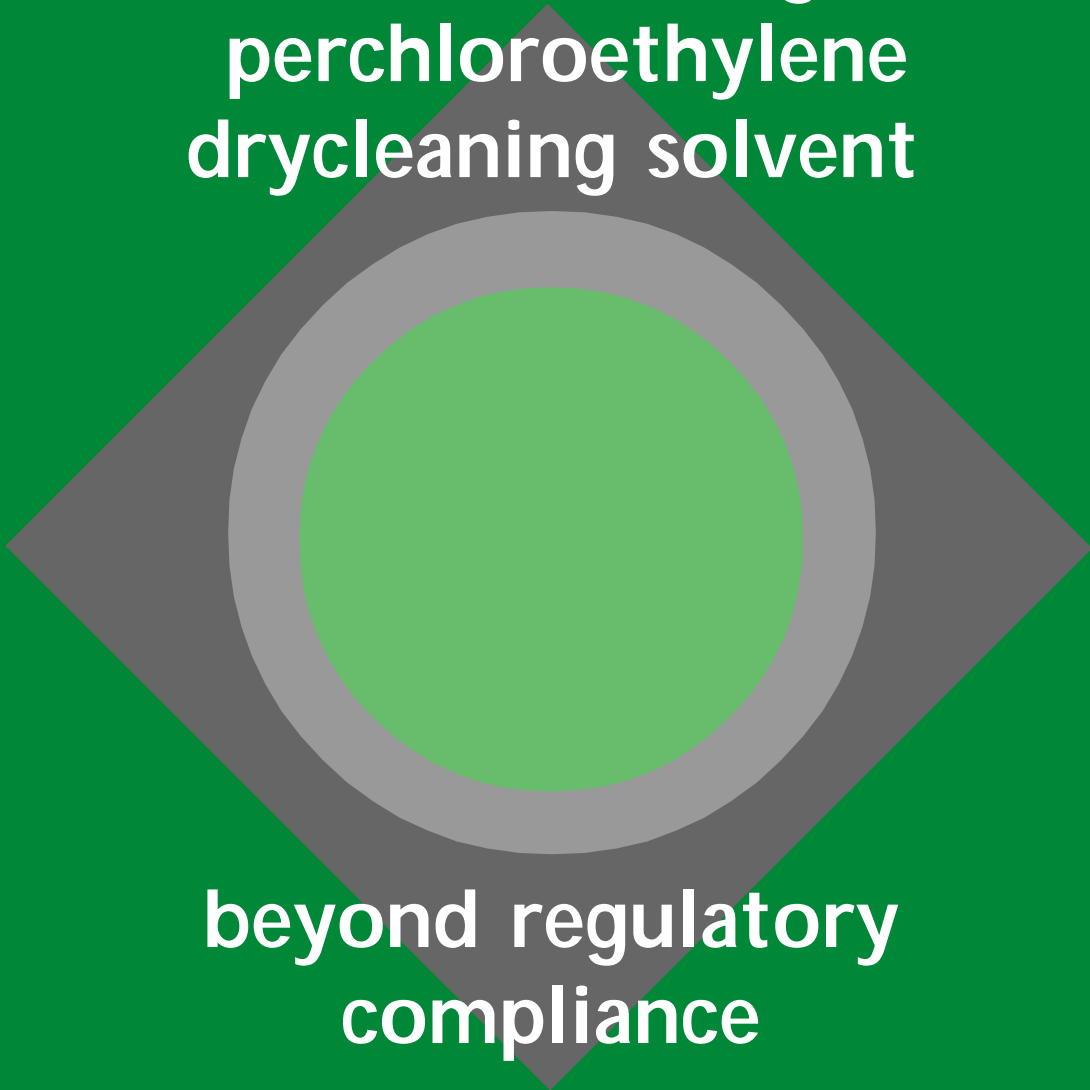


**the safe handling of
perchloroethylene
drycleaning solvent**



**beyond regulatory
compliance**

October 1999

This booklet has been prepared to review the safe handling methods that have enabled commercial drycleaning establishments to achieve an outstanding safety record in the use of perchloroethylene as a drycleaning solvent. This information is provided to drycleaners to assist them in their efforts to ensure that perchloroethylene is safely handled, used, and recycled, and that wastes containing perchloroethylene are handled and disposed of properly.

It is the responsibility of the individual drycleaner to pass this information along to his/her employees. Copies of this booklet may be obtained free of charge from the Halogenated Solvents Industry Alliance, perchloroethylene suppliers, and industry trade associations. A Korean translation of this information also may be available from these organizations.

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INTRODUCTION



Perchloroethylene (tetrachloroethylene), or perc, as it is generally called, is the principal solvent of the dry-cleaning industry.

The quantity used for garment cleaning steadily expanded for almost four decades, as it replaced other solvents, but has declined by more than half in recent years as cleaners have improved the efficiency of their operations.

Purpose

This booklet has been prepared to acquaint owners, managers, and employees of perc drycleaning establishments with the essential characteristics of the solvent. It also can provide useful information for the guidance of public health, labor, fire, and other authorities.

The booklet is provided by the Halogenated Solvents Industry Alliance, Inc., in cooperation with the organizations listed on the inside front cover, as a service to the industry for informational purposes only. In so doing, the sponsoring organizations have not assumed, and do not assume, any duty to, or on behalf of, readers who might rely upon information contained in the booklet. Similarly, they can not guarantee the completeness or current accuracy of recommendations or the bibliography.



The booklet summarizes health and safety information regarding perc, but

is not intended to be an exclusive source. There is ongoing research and regulatory activity, and readers are encouraged to consult other resources. Compliance with the recommendations contained in this booklet does not give rise to an implied endorsement of conditions at any facility.

A Long Record of Safe Use

Widespread use of perc over an extended period of time has demonstrated that the solvent can be stored, handled, and used safely in normal drycleaning practice when proper safety precautions are observed. Perc has made a substantial contribution to safety in the operation of drycleaning establishments because it is nonflammable and nonexplosive. It is generally used in drycleaning facilities operating combined washer-extractor-dryer (dry-to-dry) machines that reclaim a significant amount of solvent for reuse. The use of perc has permitted installation of drycleaning establishments throughout urban and suburban America.

Perc is chemically and thermally stable under normal conditions of use -- but it does require proper use and handling for safety. It is generally described as a clear, colorless, nonflammable liquid with a distinctive, somewhat ether-like odor. Odor thresholds ranging from 5 to 50 parts per million (ppm) have been reported. Typical chemical and physical properties of perc are listed in **Table 1**.

 Table 1. Properties of Perchloroethylene 	
Chemical Formula	C ₂ Cl ₄
Physical State	Liquid (@ room temp.)
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)	12 mm Hg
Vapor Density (Air = 1)	5.8
Freezing Point	-9°F
Flash Point	none
Solubility (@77°F)	
• perc in water	150 ppm
• water in perc	105 ppm

POTENTIAL HEALTH HAZARDS¹



Perc can be used safely when proper precautions are observed. The user must guard against certain harmful properties of the

solvent. Users should avoid inhalation of excessive concentrations of perc vapor, prolonged or repeated contact of the liquid with the skin, swallowing the liquid, or splashing it into the eyes.

Manufacturers of drycleaning equipment design their cleaning systems with these precautions in mind. When such equipment is operated and maintained in an appropriate manner in facilities that comply with applicable regulations, perc can be safely used.

Inhalation of Vapor

The initial effects of overexposure to perc include: nose and eye irritation,

light-headedness, dizziness, mental dullness, and loss of coordination. The principal hazard with such overexposure lies with mental dullness and lack of muscular coordination that may result in an accident.

Exposure to continual and extremely high vapor concentrations can cause severe depression of mental functions, respiratory failure, and even death. Concentrations capable of causing serious acute effects (e.g., unconsciousness) may be expected only in exceptional circumstances, such as working in confined or inadequately ventilated areas or bending over spilled solvent without the proper protective equipment. Upon removal of the person to fresh air, recovery is usually rapid and complete.

Daily overexposure, whether voluntary or accidental, to concentrations causing dizziness or other more serious side effects -- that is, disregard of good

¹ This section is a summary of results from various toxicological reports. See the **Selected Bibliography** for reference sources.

practices and common sense -- might produce some degree of liver injury in susceptible individuals. Although reports of cases are few in spite of extensive experience with the use of perc, care must be taken to avoid overexposure.

Skin

Perc can penetrate the human skin and be detected in the blood stream although it is unlikely to penetrate the skin in harmful amounts. Prolonged and/or repeated contact with liquid perc will produce rough and dry skin which is more susceptible to infection. For these reasons, protective equipment must be worn to prevent skin contact with perc (See **Prevention** section).

Eyes

The danger of serious injury from splashing perc into the eyes is small. A great deal of pain and redness may result, however, and protective eyewear must be worn when handling the solvent.

Internal

Perc, if swallowed, may cause serious liver effects and possibly death.

Carcinogenicity

Results of laboratory tests of perc, conducted by the National Cancer Institute (NCI) and the National Toxicology Program (NTP), have shown an increase in liver tumors in one strain of mouse. Although scientific questions have been raised as to the relevance of these particular liver tumors to human health, such information has traditionally been viewed by regulatory agencies as indicating a potential for risk in humans.

While NTP also reported an increase of

certain tumors in the rat strain tested, other reviewers have concluded that the effects were not associated with perc exposure. The relevance to humans of this finding, moreover, is uncertain. Other studies in rats have not shown an increase in cancer incidence.

Epidemiology studies of drycleaner workers exposed to perc and a variety of other drycleaning solvents show some increase in certain cancers over the general U.S. population. A study by the National Institute of Occupational Safety and Health (NIOSH) of those workers known to be exposed only to perc found no overall increase of cancer over the general population, although the incidence of esophageal cancer was increased. Incidence of esophageal cancer, however, is closely associated with cigarette and alcohol consumption.

Based on the available data, perc is considered by the International Agency for Research on Cancer (IARC) to be "probably carcinogenic to humans" (Group 2A). It is considered "reasonably anticipated" to be a human carcinogen by the NTP. According to the American Conference of Governmental Industrial Hygienists (ACGIH), however, the available animal and human evidence suggests that perc "is not likely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure." The U.S. Environmental Protection Agency has not finalized its assessment of the carcinogenic potential of perc.

Reproductive Effects

Studies of female drycleaning workers have found that fertility rates are not different from those found in the general population, although one report suggests that the time to become pregnant might

be somewhat longer. A recent study of a small group of drycleaning operators found an increase in miscarriage, but did not attribute the increase to perc exposure. Several studies indicate that physical activity, such as the lifting of clothes associated with operating drycleaning machinery, may be a risk factor for miscarriage. Employers should advise equipment operators who become pregnant to consult

their physician. Studies among wives of drycleaning workers found a slight increase in fertility rates compared to national averages and no increase in miscarriages.

Studies conducted with laboratory animals of the effects of perc on fetal development indicate that perc is not likely to cause developmental effects.

FIRST AID & MEDICAL TREATMENT



Inhalation

Response to inhalation of perc vapor at various concentrations

varies among different individuals, and even in the same individual depending upon his/her physical condition. Mild side effects due to brief overexposure to perc may be manifested by light-headedness, incoordination, dizziness, headache, mental dullness, sleepiness, and possibly nausea. Perc is capable of producing an anesthetic effect if massive concentrations are inhaled.

The most important action following overexposure is to quickly remove the patient from the contaminated atmosphere into fresh air. If breathing has ceased, start artificial respiration. Oxygen may be administered by qualified personnel. Keep patient quiet and warm and get medical attention at once.

Skin Contact

All contaminated clothing and footwear should be removed at once and not worn until thoroughly dry. Wash affected skin areas with large amounts of warm water and soap. Consult a physician if irritation persists.

Contact with Eyes

If liquid perc has entered the eyes, wash them promptly with large quantities of water for at least 15 minutes. Consult a physician as soon as possible.

Oral Intake

If perc has been swallowed, **do NOT induce vomiting**. Never give anything by mouth to an unconscious person. Seek medical attention immediately at the nearest hospital emergency room or from a physician.

Diagnosis of Perc Exposure

The diagnosis of perc exposure can be established by breath or urine analysis up to several weeks after exposure, depending on the amount absorbed. Analysis may allow estimation of the magnitude of the exposure, and the likelihood that poisoning will develop. The technique of breath analysis is rapid and easy to perform with the proper equipment.

Note to Physician: *Overexposure will cause symptoms of narcosis and may temporarily increase cardiac sensitization. Maintain adequate oxygenation until recovery. Epinephrine, and other sympathomimetic*

amines, may cause serious or fatal arrhythmia. Use only after careful consideration.

PREVENTION OF POTENTIAL HEALTH HAZARDS



The major potential hazard in the use of perc in drycleaning is the inhalation of vapors at concentrations above those prescribed for safe operation. Therefore, **the single most important factor** for safe operation is the adoption of effective means for limiting the concentration of perc vapors in the work area by proper maintenance and adequate ventilation. Additionally, be certain that you have read -- and understand -- all of the precautions on the container label. If you have questions, please contact your employer, perc supplier, or trade association.

Guidelines

The following are guidelines for control of perc vapors:

1. Workplace standards and local building codes must be observed.
2. Equipment must be functioning properly and maintained to avoid leaks. A routine inspection program to detect both liquid and vapor leaks must be followed.² Employees should be properly trained in equipment operation.
3. Spills and leaks must be cleaned up immediately. Cleanup personnel should be properly trained, and should wear proper protective equipment.
4. Product and waste materials, in-

cluding spent cartridges containing perc, must be kept in closed containers.

5. An adequate supply of fresh air should always be moving through the area.
6. All equipment ventilation, especially exhaust ventilation, should function properly and be kept in good condition. When the loading door of a washer/dryer is open, air should be drawn into the machine to prevent vapor from escaping.
7. An air analysis of the breathing zone around equipment should be conducted whenever doubt exists about vapor concentration.

Personal (passive) sampling badges and/or sampling pumps are often used to measure vapor concentration (see below). Direct reading indicator tubes also may be used to detect leaks.

Exposure to Open Flames

Although perc is nonflammable and will not burn, exposure of perc to high temperatures (above 700°F), including those that occur in open flames of steam boilers, open electric heaters, gas-fired dryers, and gas-fired room heaters can cause the material to decompose and form toxic and corrosive gases. Those gases can lead to corrosion of heating elements or other parts of equipment used in drycleaning operations and damage to fabrics. However, the gases are usually formed in trace amounts only.

² Weekly leak detection is a requirement of the national emission standard for new and existing perc drycleaning facilities. (See page 10 and the inside back cover).

Permissible Workplace Limits

Exposure to perc, like exposure to other agents in the workplace, should be kept as low as practical, as recommended by ACGIH. The threshold limit values (TLVs) recommended by ACGIH are an 8-hour time-weighted average (TWA) of 25 ppm and a 15-minute short-term exposure limit (STEL) of 100 ppm.

The Occupational Safety and Health Administration (OSHA) requires that workplace levels not exceed 100 ppm (8-hour TWA), 200 ppm (acceptable ceiling), and 300 ppm (acceptable maximum peak). From March 1989 until March 1993, the OSHA limit for perc was 25 ppm for an 8-hour TWA. This limit was overturned by a federal court at the same time the court vacated the limits OSHA had updated for over 400 other air contaminants. Several states that adopted the lower 1989 federal limit, however, have not adopted a higher limit.

The current ACGIH and OSHA limits are summarized in **Table 2**. OSHA has recently indicated its intent to establish a workplace standard for perc that will include revised exposure limits.

Exposure Measurement

In order to evaluate the extent of exposure by inhalation, it is important to know not only the concentration of vapor in the air breathed by workers, but the duration and frequency of exposure to various concentrations as well. Monitoring of inhalation exposure is usually accomplished by air sampling with a vapor badge, detector tube, or charcoal tubes.

Agencies such as state and local public health groups, insurance companies, and consulting laboratories are available to make such measurements. You also

may wish to contact your perc supplier or industry association.

Several types of air sampling instruments can be used to measure the vapor concentrations of perc. They range in style and cost from inexpensive electronic leak detectors to automatic instruments costing considerably more. Information on methods available for determining perc vapors may be obtained from your solvent supplier, industry association, and others.

If leaks develop in the equipment of a drycleaning system, the perc lost to the air can contribute to higher exposure levels. Electronic leak detectors can be used to search for the sources of these leaks. The instruments can be adjusted while standing outside of the plant so that they are just barely giving off an infrequent ticking sound. Higher vapor levels will cause a very fast ticking, while a serious leak will usually produce a continuous squeal.

Direct reading color indicating tubes are available from several manufacturers. These tubes are inexpensive and utilize a simple hand-operated pump. They can be used for leak detection and workplace monitoring.

Use of Protective Equipment

It is recommended that the drycleaning room or area contain emergency ventilation per National Fire Prevention Association (NFPA) standard No. 32. Additionally, the operator should have available respiratory equipment with NIOSH/Mine Safety and Health Administration approval for use with organic vapors and protective clothing, such as Viton™ gloves and apron. This protective equipment should be worn when changing filter cartridges and removing still or cooker residues. (For emergency situations, see **Spill Cleanup**

Table 2. Exposure Limits for Perchloroethylene		
Type of Limit	Vapor Conc. (ppm)	Notes
ACGIH TLVs		
• 8-hour TWA	25	8 hrs/day (40 hrs/week)
• 15-minute STEL	100	Should not be exceeded; exposures above the 8-hour TWA up to the STEL should be no longer than 15 minutes and should not occur more than 4 times/day.
OSHA PELs		
• 8-hour TWA ³	100	8 hrs/day (40 hrs/week)
• Ceiling	200	Shall not be exceeded except for peak exposures, as described below
• Peak	300	Maximum acceptable concentration above the ceiling limit for an 8-hour shift, limited to 5 minutes in any 3-hour period

section on page 9.)

For plants still using transfer equipment, protective gloves and aprons must be worn to prevent skin contact with perc while transferring clothes between the washer/extractor and the dryer. Any person doing a large number of transfers each day should wear an approved respirator during each transfer operation. Proper design of ventilation systems can significantly reduce the concentrations in the breathing zone during the transfer.

Respirators

Use of respirators may be necessary in some instances to achieve a 25-ppm workplace level for perc. Employers must follow existing OSHA requirements for a respirator program, including compliance with the following procedures:

- annual fit testing for employees and yearly retraining on mask use;
- filter cartridges ("organic vapor" type), if used, must be equipped with an end-of-service indicator or

3 An 8-hour TWA of 25 ppm was in effect from March 1989 until March 1993. This 25-ppm limit was vacated by a federal court (see text).

must be changed according to a schedule that will ensure that their capacity has not been exhausted; and

- cartridges must be changed immediately if there is evidence of filter breakthrough (the employee detects the odor of perc while wearing the respirator).

The frequency with which a cartridge must be changed depends on the type of cartridge and the exposure level. It can be calculated by a qualified individual using any of a number of formulas available in the published literature. Employers may wish to contact the cartridge manufacturer or their industry association for assistance in performing these calculations. OSHA also offers free consultation services to small businesses through the states or through contractors.

Personnel Selection

No one should be permitted to work in an area where a health hazard from overexposure to perc exists. Particular attention should be paid to individuals who are alcoholics, or who have diseases of the liver, kidney, or the nervous system. Their condition may be aggravated by perc exposure.

If such individuals are already employed and any doubt exists concerning the degree of potentially hazardous exposure, periodic medical examinations are advisable. Any apparent deterioration in health should be the basis for either a temporary or permanent transfer to work involving reduced exposure to perc, based on the advice of a physician.

Employee Training

Safety in handling perc requires

instruction of employees. This is the responsibility of the plant owner. An up-to-date Material Safety Data Sheet (MSDS) and container labels for perc must be available to employees.

New employees should be thoroughly instructed and required to read the MSDS and other available printed material on safe handling. They should be shown how to perform their duties with minimum exposure. They should be cautioned not to remove perc from the plant for personal use.

Each employee should know the location of drinking fountains, faucets, or eyewash stations for flushing the eyes, and should be trained to report any suspected equipment leaks, signs of illness, or skin irritations. Each employee should know what to do in an emergency and understand the importance of prompt administration of first aid in any overexposure.

Plant owners and managers may use this drycleaning solvent booklet as part of their training program for employees under OSHA's hazard communication standard, but it is not a substitute for the MSDS. Additional booklets for distribution to employees are available from HSIA, solvent suppliers, and your industry association.

Spill Cleanup

Spills should be reported to a supervisor immediately by any employee observing them, but should be cleaned up only by employees properly equipped and instructed in safe procedures. Vent as much of the solvent vapors as possible outside the building without having vapors spread to other parts of the establishment or to adjacent buildings. Each drycleaning facility should develop an emergency spill cleanup plan so that controls and ventilation procedures can

be immediately implemented. In some states, formal emergency response plans are required under state right-to-know laws.

The NFPA standards for perc plants require manually operated emergency ventilation for spills or leaks sufficient to provide a complete air change every 5 minutes within 15 feet of the drycleaning equipment.

Only properly trained personnel, familiar with spill cleanup procedures and wearing gloves and a respirator approved for use with organic vapors, should attempt to cleanup a spill. All other persons should evacuate the area.

Blankets, clothes, and rags should be used to absorb the spilled solvent and to reduce the surface area available for evaporation. These absorbent materials should then be thrown into an empty tumbler and the door closed. Cleanup should continue until all liquid solvent is removed and the floor is dry.

Cleanup personnel **should never** stay in an area if the odor of perc is detected through the respirator. They should leave the area immediately and replace the filter cartridge before reentering.

A buddy system is imperative when cleaning up a spill. A backup person,

also wearing a respirator, should be standing by outside of the spill area, ready to assist immediately if the cleanup person is overcome.

In the case of boil-over of a cooker or still, employees should immediately leave the area until a respirator is worn. The steam line to the still or cooker should be turned off from a remote location (if possible) and, if not already on, the flow of cooling water through the coils should be started.

Solvent Storage and Transfer

Drums of perc and perc-containing wastes must be stored in sealed containers approved by the U.S. Department of Transportation (DOT). The containers should be kept tightly closed to avoid evaporation and must be inspected at least weekly for leaks or deterioration. They should be stored in a secure, covered area to prevent tampering and rusting and should not be exposed to extreme heat or cold. Solvent should be transferred from a properly vented drum to the drycleaning machine by pumping through piping connected directly to the small opening of the drum. Transferring by hand, using open buckets, should be avoided because of the possibility of overexposure to vapors.

Additional restrictions on perc storage may apply in some jurisdictions.

MANAGING ENVIRONMENTAL IMPACTS



Air Emissions

Perc is designated as a hazardous air pollutant under Section 112 of the federal Clean Air Act and under many state "air toxics" regulations. A national emission

standard for new and existing perc drycleaning facilities was issued on September 1993 and became fully effective in September 1996. (See summary on inside back cover.) The standard includes work practice, monitoring, reporting, and recordkeeping requirements, as well as requirements for controlling fugitive

and process emissions. In some areas, these provisions may be supplemented by state and/or local requirements.

In February 1996, EPA added perc to the list of compounds exempt from control as a smog precursor under ozone non-attainment provisions of the federal Clean Air Act. Most of the states have subsequently exempted perc from state smog controls.

Disposal of Solvent Wastes

Spent (used) perc and other waste materials containing perc are regulated as hazardous waste under the federal Resource Conservation and Recovery Act (RCRA) and state hazardous waste regulations. Storage, transportation, and disposal of all waste material, including spent cartridge filters and old equipment, must be conducted in accordance with the applicable federal and state health and environmental regulations.

Under federal RCRA regulations, a drycleaner generating between 100 and 1,000 kilograms (220 and 2,200 pounds) of hazardous waste per month, may store the waste on-site for up to 180 days before its removal by a licensed waste hauler.⁴ Significantly more stringent requirements apply to temporary storage of wastes generated in quantities greater than 1,000 kilograms (2,200 pounds) in a given month.

Each waste container must be clearly marked as hazardous waste, and must be labeled with the proper accumulation date -- the date on which waste was first placed in the container. The waste storage area should include containment to facilitate clean up of any spills that may occur and to prevent spills from entering floor drains.

Drycleaners are required to obtain an EPA identification number in order to ship their wastes off-site for recycling and

disposal. Transportation and disposal of waste from cleaners must be handled by a licensed hazardous waste transporter registered with DOT and possessing an EPA identification number. Cleaners must ensure that the waste is properly manifested and should retain copies of the manifest. Off-site recycling of perc-containing waste must take place at a RCRA permitted hazardous waste treatment, storage, and disposal facility.

Less stringent requirements apply to facilities that generate no more than 100 kilograms (220 pounds) of hazardous wastes during a month.⁵ Such operations, known as Conditionally Exempt Small Quantity Generators (CESQGs), still must:

- identify their waste as hazardous,
- store no more than 1,000 kilograms (2,200 pounds) of hazardous waste on-site, and
- ensure delivery to a facility that is (1) permitted as a hazardous waste management facility, (2) licensed to manage municipal or industrial solid waste, or (3) that uses, reuses, or legitimately recycles or reclaims the waste.

The drycleaning establishment must have adequate internal and external alarms, communication equipment, fire extinguishers, and decontamination and spill control equipment, and must make appropriate arrangements to familiarize local emergency responders with the facility and the hazardous wastes stored there. At all times there must be an employee on the premises, or on call, who is responsible for coordinating emergency response measures. Emergency numbers must be posted next to the telephones and personnel must be thoroughly familiar with proper waste handling and emergency procedures.

In the event of a release of perc that

⁴ Waste may be stored for up to 270 days if off-site management facilities are more than 200 miles away.

exceeds the federal reportable quantity (RQ) of 100 pounds (about 7 gallons),⁵ facilities must notify the local emergency planning committee and the state emergency response commission. (Cleaners must have already submitted a copy of the MSDS to the local planning committee, the state commission, and the local fire department.)

Wastewater

The drycleaning process produces a certain amount of wastewater that generally contains very low concentrations of perc. The amount of perc in the wastewater can be minimized by using a properly sized and properly functioning water separator. Water separators may be connected to condensers, carbon adsorbers, cartridge stripping cabinets, stills, and muck cookers in drycleaning operations. The total amount of wastewater generated by a drycleaning facility, therefore, will depend on the equipment used. According to industry estimates, this quantity is typically about 50 gallons a year.

Because of the very low solubility of perc in water, the wastewater from a properly functioning separator should contain no more than 150 ppm (0.015 percent) of the solvent. This wastewater containing perc is classified as a hazardous waste under regulations of the U.S. Environmental Protection Agency (EPA).

Some commercial drycleaners in the past discharged this water to the sanitary sewer, as authorized by EPA's "domestic sewage exclusion." Under this exclusion, material is not considered hazardous waste if it is discharged to a sewer where it will mix with sanitary wastes and be treated in a publicly owned treatment works (POTW).

Sewer discharge of drycleaning waste-

water is prohibited by some jurisdictions, however, and is not recommended by drycleaning industry associations. Drycleaners, therefore, must find other appropriate ways to dispose of this water.

Drycleaning wastewater can be given to a licensed hazardous waste hauler for handling and treatment or disposal as hazardous waste. Alternatively, equipment is available that evaporates such water after it exits the separator. EPA has determined that, while such evaporation of wastewater constitutes "treatment" of a hazardous waste, evaporation devices qualify as "wastewater treatment units" under EPA regulations. They are exempt, therefore, from permit and other requirements that would otherwise apply to a hazardous waste treatment facility.

Requirements for the design and operation of drycleaning wastewater treatment units vary. A few jurisdictions require that separator water be passed through carbon filtration, to minimize or eliminate solvent from the wastewater, before it can be evaporated. Local requirements also may restrict any reuse of this treated wastewater.

Exposures in Adjacent Spaces

Recent studies by the drycleaning industry suggest that problems with the ventilation system, accumulation of perc over suspended ceilings, and the location of buildings in relation to wind currents may affect perc levels in adjacent building areas. Another contributing factor may be the location of exhaust stacks relative to adjacent spaces and buildings. Resulting perc concentrations in adjacent food establishments and residences could be an issue for some drycleaners.

While lowering perc emissions is the best way to reduce the potential for

5 Cleaners should review state and local regulations to determine whether different limits apply to their operation.

concentrations in adjacent areas, additional steps can be effective in many cases. Such steps, including vapor barriers and additional ventilation, have been considered or adopted in certain jurisdictions as requirements for drycleaners adjacent to residences and food establishments.

Potential Consumer Exposures

Available data suggest that trace levels of perc may remain in clothes after the drycleaning process. A study conducted in conjunction with EPA suggests that these residual solvent levels can be minimized by conducting the drycleaning and finishing operations according to the specifications of the equipment manufacturers.

Soil & Groundwater Contamination

A few states have imposed requirements on perc drycleaning operations to prevent release of perc and perc-containing wastes to the surrounding soil and groundwater. These requirements may include installation of spill containment structures around drycleaning equipment and storage areas, sealing of floor drains in containment areas, application of floor sealants, and the use of closed, direct-coupled systems for the delivery of solvent. Cleaners are encouraged to check with their state regulatory agency, local trade association, or distributor to determine if such requirements apply. Cleaners are further encouraged to take the necessary precautions to prevent soil and groundwater contamination.

BEYOND COMPLIANCE



Many prudent operators of drycleaning establishments have elected to adopt practices and standards for the use, management, and disposal of perc and perc-containing wastes that go beyond the strict legal requirements. These operators recognize that environmental protection is their responsibility. They also understand that they are potentially liable for environmental contamination that can be traced to their perc or perc wastes, whether at their own plant or elsewhere, regardless of the fact that they may have complied with the letter of the law. These operators recognize that additional measures that go “Beyond Compliance” make good business sense because they minimize the risks of liability that arise when perc is released to the environment.

One of the most widely adopted “Beyond Compliance” measures is ending sewer

discharge of separator water. Drycleaners in some parts of the country have found it necessary to defend such sewer discharge and, as noted above, drycleaning industry associations now recommend against this practice.

Other common pollution prevention steps include installation of dikes and containment structures around drycleaning machines. Pans or other impermeable containers should be placed beneath equipment, as under certain conditions perc can penetrate concrete. Sealing floor drains and using perc-resistant floor coatings in areas where spills are most likely to occur can provide additional protection. These kinds of improvements can give the drycleaner extra assurance that an unforeseen in-plant spill will not be likely to result in contamination.

New closed delivery systems are available to minimize leaks and spills and to eliminate vapor loss during delivery. Informa-

tion on closed delivery systems may be obtained from your distributor.

Finally, with the encouragement of dry-cleaning industry associations, many drycleaners who qualify as conditionally exempt small quantity generators under EPA regulations (discussed earlier) have chosen to forego the exemption. These operators now handle their perc wastes as hazardous in their plants until they are picked up by an authorized solvent recycler or a permitted hazardous waste

disposal service. Drycleaners who have decided to forego the exemption protect the environment and minimize their risk of liability.

HSIA and the other sponsors of this booklet believe that support of the "Beyond Compliance" movement is the only responsible option available to environmentally conscious drycleaners. Cleaners who do not follow these practices jeopardize their businesses and the future of their industry.

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NATIONAL EMISSION STANDARDS

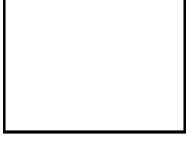
The national emission standards for perchloroethylene drycleaning, referenced on page 9, were adopted on September 22, 1993. The process vent and fugitive emission control requirements of these regulations are summarized in the table below.

In addition, the standards include monitoring, reporting, and recordkeeping requirements.

	TYPE OF SOURCE		
	Small Area	Large Area	Major
Definitions			
Dry-to-dry machines consuming:	< 140 gals/yr	140-2100 gals/yr	> 2100 gals/yr
Transfer machines consuming:	< 200 gals/yr	200-1800 gals/yr	> 1800 gals/yr
Facilities with both machine types consuming:	< 140 gals/yr	140-1800 gals/yr	> 1800 gals/yr
Process Vent Emission Controls¹			
Existing machines	o None	o RC; or o CA (installed before 9/22/93)	
New machines	o RC		o RC + secondary CA
Fugitive Emission Controls			
Existing machines	o Leak detection & repair o Solvent/waste stored in sealed containers		o Same as area sources, plus o Room encl. (with CA) for transfer equip
New machines	o Same as existing sources, except no new transfer machines allowed		
1 RC - refrigerated condenser; CA - carbon adsorber.			
Source: Code of Federal Regulations, Title 40, Sections 63.320 to 63.325			



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IMPORTANT INFORMATION FOR DRYCLEANERS