BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Regulation 11, Rule 16 Perchloroethylene and Synthetic Solvent Dry Cleaning Operations

---

Workshop Report

Prepared by

Marc Nash
Toxic Evaluation Section
Engineering Division

June 2009

Workshop Report outlining the proposed amendments to the District's Dry Cleaning Regulations. This report has been prepared by the staff of the Bay Area Air Quality Management District. Publication does not signify that the mention of trade names or commercial products constitute endorsement or recommendation for use.

(This page intentionally left blank)

Contents

APPENDICES

TABLES

FIGURES

I. INTRODUCTION

The staff of the Bay Area Air Quality Management District (District), guided by the Board of Directors' concerns to limit Perchloroethylene exposure and associated potential adverse health effects to Bay Area residents, is proposing minor revisions to Regulation 11, Rule 16 Perchloroethylene and Synthetic Solvent Dry Cleaning Operations (Rule 11-16).

As a general matter, many synthetic solvents have chemical properties that produce negative health effects over long-term exposure. This is true of one of the most widely used dry cleaning solvents today, a synthetic solvent named Perchloroethylene. Also known as Tetrachloroethylene or Perc, this solvent is classified as a Group IIA, "probably carcinogenic" by the International Agency for Research on Cancer (IARC).

The current proposal is to accelerate the phase out of Perc solvent dry cleaning and equipment. Perc equipment is already scheduled to be phased out starting in July 1, 2010, under State law and District Rule 11-16. On and after that date, all Perc machines must cease operation and be removed from service once the machine reaches 15 years of age. According to this schedule, Perc dry cleaning will be phased out entirely by January 1, 2023.

Staff is proposing to present three options to the District Board of Directors (Board), as shown in Table 1. The District Board would select one of the three options as the new phase out schedule for all Perc solvent equipment located within the Bay Area. Perc equipment would be required to cease operation and be removed from service once the machine reaches 8, 10 or 12 years of age, depending on which option the Board selects, instead of 15 years of age as under the current rule. The start date of the phase out will remain July 1, 2010, regardless of which option is selected.

All three of the options that will be presented to the Board are more stringent than the previous regulatory amendments set by the United States, Environmental Protection Agency (USEPA) to the National Perchloroethylene Air Emission Standards for Dry Cleaning Facilities, and by the California Air Resources Boards (CARB) to the Airborne Toxics Control Measure (ATCM) for Emissions of Perchloroethylene from Dry Cleaning Operations. They are also more stringent than any existing air district regulation in California. Accordingly, any of the three options would be more effective at limiting lifetime Perc solvent exposure to Bay Area residents than any existing law or regulation within the State of California. The adoption of control strategies that are more stringent than state or federal law is within the discretional authority of the Board.

The District began regulating Perc dry cleaning in 1980 by adopting District Rule 8-27, in advance of any federal or state regulation. Later, in 1994, the District adopted Rule 11-16, which supplanted Rule 8-27. The District rules set emission standards for synthetic solvents used in textile cleaning by limiting air emissions of these compounds, with the goal of reducing exposure levels and potential harmful health impacts to the Public. The District Board, by selecting an option in this proposal and approving it for implementation, will protect the health of the general public by controlling harmful air pollutants.

Table 1. Major Provisions of Proposed Regulation 11, Rule 16

- 8 year equipment phase out.
- 10 year equipment phase out.
- 12 year equipment phase out.

See Appendix A for more detail.

II. BACKGROUND

A. Impact Summary[1]

At present, there are approximately 490 Perc dry cleaning machines (equipment) in operation within the District. Of these, about 273 machines, or 56%, will be 15 years of age or older by July 1, 2010. Almost all (464 machines, or 95%) will be 8 years of age or older by July 1, 2010. New Perc equipment has been prohibited under State law since January 1, 2008 (and is also now prohibited under current Rule 11-16),

Under current Rule 11-16, as amended on March 4, 2009, all existing Perc machines will be phased out starting on July 1, 2010. The phase out schedule is based on the age of the equipment: all Perc equipment must cease operation and be removed from service ("retired") on July 1, 2010, or once the equipment reaches 15 years of age, whichever is later. As shown in Table 2, 273 machines (which will be 15 years of age or older by the start date of the phase out), will be retired on July 1, 2010. Each year after that, a portion of the remainder will be retired, until the newest Perc machines that are now in operation reach 15 years of age and are retired, on or before January 1, 2023.

The proposed change is to accelerate this phase out schedule and require Perc dry cleaning equipment to be retired prior to reaching 15 years of age. District staff proposes presenting three different options to the Board. At the Board's discretion, one of the three options will be selected, incorporated into Rule 11-16 and approved as part of the regulation. All of the proposed options would completely eliminate emissions from Perc solvent dry cleaning operations earlier than under the current rule (i.e., by 2020, 2018 or 2016 rather than 2023). This proposed change would affect only Perc dry cleaning equipment, and not any other synthetic solvent or non-halogenated solvent dry cleaning equipment.

Table 2 shows the projected number of machines that will need to be phased out each year under the current rule, as compared to under each of the proposed options. A graphic comparison of the phase out impacts of the three proposed options is provided in Figure I-A.[2]

Option A allows an effective lifespan of 12 years for Perc solvent equipment, instead of 15 years. In other words, all Perc equipment must cease operation and be removed from service ("retired") on July 1, 2010, or once the equipment reaches 12 years of age, whichever is later. Instead of 273 Perc machines (56% of existing Perc equipment) being retired on July 1, 2010, as under the current rule, 323 machines (66%) would be, with the remaining 34% (167 machines) phased out over a ten year period. Under this option all Perc solvent dry cleaning would be eliminated by January 1, 2020. This is the least effective of the three options.

Option B allows an effective lifespan of 10 years for Perc solvent equipment. Instead of 273 Perc machines (56% of existing Perc equipment) being retired on July 1, 2010, as under the current rule, 396 machines (81%) would be, with the remaining 19% (94 machines) phased out over an eight year period. Under this option all Perc solvent dry cleaning would be eliminated by January 1, 2018.

Option C allows for an effective lifespan of 8 years for Perc solvent equipment. Instead of 273 Perc machines (56% of existing Perc equipment) being retired on July 1, 2010, as under the current rule, 464 machines (95%) would be, with the remaining 5% (26 machines) phased out over a six year period.

[1] The District's discussion in this section of the numbers of Perc machines in operation and their projected retirement dates is based on the best information available to the District at the present time, including District permitting information. The actual numbers of machines that will be retired on any given date may vary from current projections.

[2] The numbers are grouped in Table 2 and Figure 1-A for ease of reference only; after the initial mass phase out on July 1, 2010, machines will be phased out individually, not in groups. Thus, if a Perc machine was manufactured on May 15, 2000, under the current rule, it would need to be retired on or before May 15, 2015 (not January 1, 2015 or January 1, 2016).

Under this option all Perc solvent dry cleaning would be eliminated on January 1, 2016. This is the most effective of the three options.

District staff expects that some facilities will replace their retired Perc equipment with alternative solvent technology. Other facilities are expected to become "drop shops" that no longer conduct dry cleaning on the premises, but rather: (1) contract with other facilities that operate newer Perc equipment (until those facilities must phase out their Perc equipment); and/or (2) contract with facilities that operate alternative solvent technology.

Table 2. Projected Equipment Impacted by Proposed Regulation 11, Rule 16 Changes

Date	Current **15 Year**	Option A **12 Year**	Option B **10 Year**	Option C **8 Year**
July 1, 2010	273	323	396	464
January 1, 2011	7	40	44	7
January 1, 2012	24	33	24	8
January 1, 2013	19	44	7	4
January 1, 2014	40	24	8	2
January 1, 2015	33	7	4	1
January 1, 2016	44	8	2	4
January 1, 2017	24	4	1	0
January 1, 2018	7	2	4	0
January 1, 2019	8	1	0	0
January 1, 2020	4	4	0	0
January 1, 2021	2	0	0	0
January 1, 2022	1	0	0	0
January 1, 2023	4	0	0	0
Total	490	490	490	490

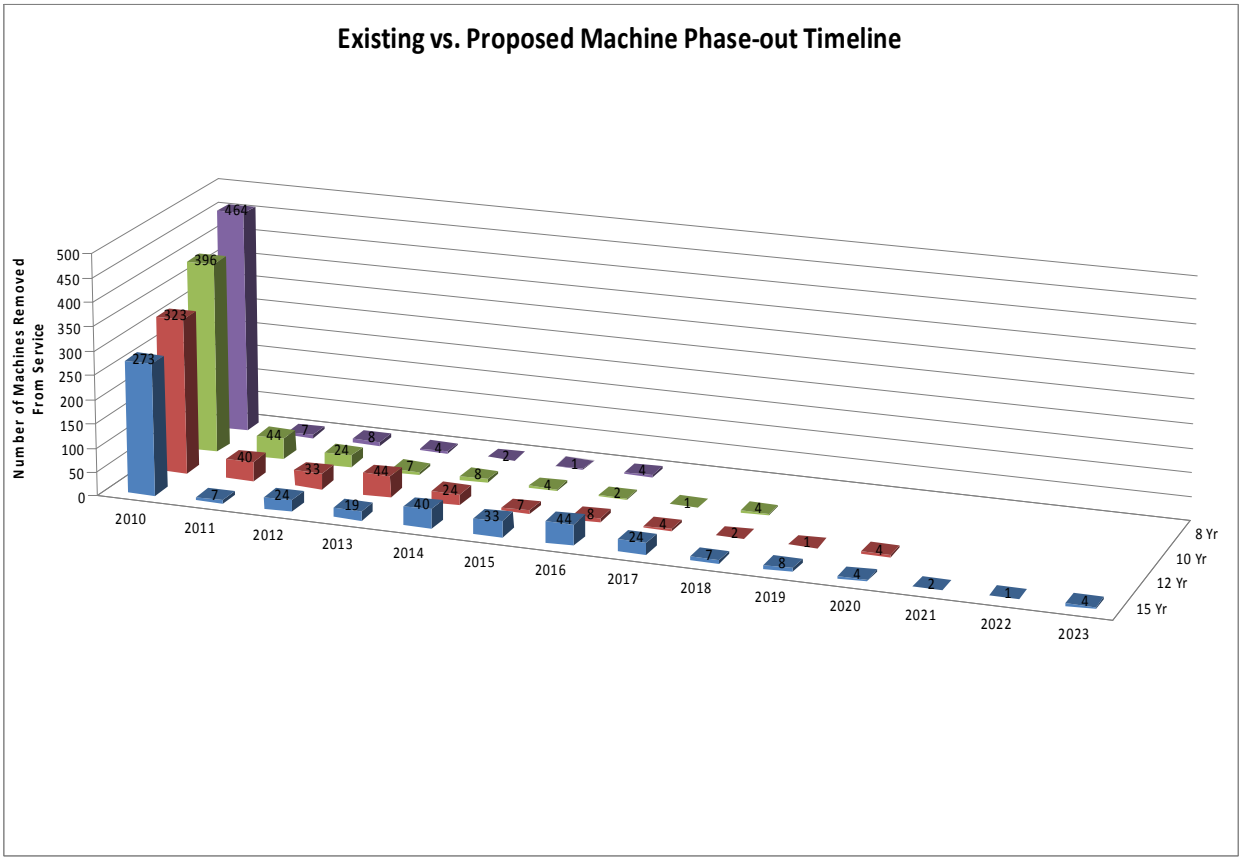

Figure I–A, Projected Bay Area Perc Solvent Equipment Phase-out by Year Under Current Rule and Each Proposed Option.

B. Regulatory History

The District has a history of implementing regulatory requirements in advance of state or federal government agencies and this is reflected in part, by the history of dry cleaning regulations. For example, Rule 8-27 was the first District rule to regulate Perc solvent dry cleaning. It was adopted by the District's Board of Directors on March 5, 1980. The last modification to Rule 8-27 took place on September 5, 1990 and expanded the scope of the regulation to include all synthetic solvents. The requirements of the USEPA and CARB did not begin until after 1990 (10 years after the District's adoption of Rule 8-27), when those agencies identified Perc as potentially harmful.

a) Perc Identification as a Hazardous Air Pollutant

Although USEPA had recommended that Perc be reclassified as negligible to ground level ozone formation since 1983, Perc became one of 189 chemicals classified as a hazardous air pollutant (HAP) by the 1990 Clean Air Act amendments. This HAP designation meant that a federal control standard for Perc would have to be identified and adopted.

b) Perc Identification as a Toxic Air Contaminant

The California Air Resources Board (CARB) identified Perchloroethylene (Perc) as a toxic air contaminant (TAC) under California's Toxic Air Contaminant Identification and Control Program (Health and Safety Code section 39650 et. seq.) in October 1991, prompting the state to review Perc solvent dry cleaning equipment emissions and adopt appropriate action.

c) Perc NESHAP Standard

In September 1993, USEPA adopted a new NESHAP standard to address the Perc regulatory deficiency and it became known as the "National Perchloroethylene Air Emissions Standards for Dry Cleaning Facilities." The NESHAP established three source categories: small, large and major. Equipment types (dry-to-dry, transfer) were also identified. Maintenance (leak check and repair schedules) and recordkeeping provisions were also established. It also specified air emissions control based on the type of equipment used, the installation date and the amount of Perc purchased per year.

d) Perc ATCM Standard

On October 14, 1993, one month after the Perc NESHAP standard was approved, CARB adopted the ATCM for Emissions of Perc from Dry Cleaning Operations and the Environmental Training Program for Perchloroethylene Dry Cleaning Operations (Perc Certification Program). Similar in scope to the Perc NESHAP but more stringent, the Dry Cleaning Operations ATCM identified the equipment, operation, maintenance, recordkeeping, and reporting requirements for Perc solvent dry cleaning operations. Further, the Environmental Training Program set forth the guidelines and criteria for CARB to train and approve instructors who then teach dry cleaning operators the proper operational standards and maintenance procedures for their Perc solvent dry cleaning equipment.

e) District Hazardous Pollutant Standard

Based on the new regulatory standards at both the Federal and State level, District staff proposed a new regulation. Regulation 8, Rule 27, Synthetic Solvent Dry Cleaners would be replaced with a rule that would conform to the new legislative and regulatory changes. This new rule would incorporate the federal requirements, the state requirements, and the risk reduction measures outlined in SB1731[3] and implement the risk reduction objectives outlined in the District's Toxic Air Contaminant Risk Reduction Plan. The rule would contain additional exposure reduction requirements for high density population areas in the Bay Area that typically contain dry cleaning facilities in buildings co-located with residences and other commercial businesses. The District Board of Directors approved this new regulation, Regulation 11, Rule 16, Perchloroethylene and Synthetic Dry Cleaning Operations, on December 12, 1994.

Rule 11-16 had a four-year implementation schedule. However, as the control equipment requirement milestones approached over the years, the cost for the required additional controls became controversial with many owners of Perc solvent dry cleaning equipment. The owners expressed their concerns at several District Board meetings and lobbied for a permanent exemption or a multi-year variance. A one year variance was granted. At the end of the fifth year, all Perc solvent dry cleaning facilities were in compliance. Alternative solvent dry cleaning technologies existed at this time, but no incentive existed for Perc solvent facilities to adopt alternative solvent equipment until October 2003, when the California's State Legislature's passed AB998 (Assembly Bill 998).

f) AB998

AB998 established a Non-Toxic Dry Cleaning Incentive Program to provide financial grants for the dry cleaning industry to switch from equipment using Perc solvent to non-toxic, non-smog forming alternatives. These grants are financed by a three-dollar ($3) per gallon tax on California Perc Solvent Distributors. This fee, starting in 2004, increases one-dollar ($1) per gallon per year from 2005 through 2013. CARB administers the collected funds via a grant program, providing up to $10,000 financial assistance in the form of grants, to assist dry cleaners in switching to alternative cleaning technologies such as wet cleaning and carbon dioxide (CO_2) cleaning. The balance of funds is to be used to establish demonstration programs that showcase and promote acceptable alternative solvent technologies.

[3] Senate Bill 1731, Facility Toxic Air Contaminant Risk Reduction Audit and Plan -- Section 44390 et al of the California Health and Safety Code.

The tax requirement from this state law acted like a catalyst of change: Perc equipment owners in reaction to the increase in solvent prices and the projected solvent price increases began to investigate non-Perc solvent technologies. The additional incentives of lower permit fees and fewer regulatory requirements also supported their decision. The media focus on environmentally responsible dry cleaning also helped to distinguish these new technologies and galvanize public support. Dry cleaning facilities began to adopt alternative cleaning technologies to keep overhead costs low and to demonstrate environmental good will.

g) Amended District Standard

Rule 11-16 was updated in 2005 to incorporate the new provisions of Regulation 2, Rule 5, Toxics New Source Review.

h) Amended Perc NESHAP Standard

The original NESHAP update was proposed in 2006, but USEPA has released several updates with the most recent on July 11, 2008. The updated Perc NESHAP identified three source categories: major, area and co-residential. Fortunately, there are no facilities with Perc equipment within the District that qualify for the NESHAP definition of a major source. Accordingly, by default, the District is in compliance with all provisions for this source category. The District's current rule also meets or exceeds all Federal requirements for area and co-residential sources.

i) Amended Perc ATCM Standard

The amended CARB ATCM became State law on January 25, 2007. It includes a Perc equipment phase out provision that requires existing facilities to remove from service all Perc machines by July 1, 2010, or 15 years after the date of manufacture, whichever comes later. The ATCM also prohibits new Perc solvent facilities as of January 1, 2008, and all Perc converted machines and Perc machines at co-residential facilities as of July 1, 2010. The elimination of all Perc solvent dry cleaning equipment will be achieved by January 1, 2023. The ATCM also included more stringent operational and maintenance procedures for all Perc solvent equipment.

The ATCM is more stringent than the new NESHAP is several respects. For example, the ATCM phase out applies to all Perc equipment, as opposed to only Co-Residential facilities, as under the new NESHAP. Also, the ATCM begins phasing out Perc equipment beginning July 1, 2010, which is ten years earlier than the NESHAP.

j) Recently Amended District Standard

Rule 11-16 was amended on March 4, 2009 to ensure consistency with the Perc NESHAP and to incorporate the stricter provisions of the Perc ATCM. This District regulation is applicable to both Perc and synthetic solvents, whereas, the ATCM is specific to Perc only. Simply adopting the ATCM by reference would have relaxed the Districts' current standard for all of the existing and potential non-Perc synthetic solvents currently governed by this rule. Existing provisions that were already stricter than the ATCM changes were retained, such as the standards for secondary control and enhanced ventilation. Additionally, halogenated solvent based spotting solutions were also placed on a phase-out schedule, effective July 1, 2010.

Rule 11-16 incorporated the Perc phase out schedule in the ATCM. Thus, it prohibits new Perc solvent facilities as of January 1, 2008, and all Perc converted machines and Perc machines at co-residential facilities as of July 1, 2010. Furthermore, as discussed above, it requires existing facilities to cease operation and remove from service all Perc machines by July 1, 2010, or 15 years after the date of manufacture, whichever comes later

III. TECHNICAL REVIEW

A. Emission Control Technologies

Several factors influenced the development of Dry cleaning technology using Perc, however two major factors may have been from economic and regulatory issues. Historically, most Perc dry cleaning equipment in the US has been designed and built in Europe. Additionally, the European Union (EU), has been defining stricter environmental standards since 1975.[4] Equipment that would be more solvent stringent, saving money and more environmentally sound could create a marketing advantage that might further promote sales. The process has developed similarly for other solvent types. From a regulatory perspective, the evolution of these equipment types has been consolidated into four groups or generations:

1. First Generation

The first generation of equipment is known as Transfer Machines. The distinguishing characteristics of this generation are a separate washer and dryer. Solvent laden clothes are passed or transferred from washer to dryer by hand. The dryer reclaims the solvent using a water condenser that cools the recirculating air and recovers some of the solvent during the deodorizing part of the dryer cycle. The remaining air is exhausted into a carbon adsorber or a refrigerated condenser in later models. If the dryer is equipped with an adsorber, it is replaced or regenerated during routine maintenance of the machine. A typical solvent emissions profile ranges from 500 to 1000 gallons per year (see Figure III-A1). This equipment type is now prohibited in California.

2. Second Generation

The second generation of equipment is known as Vented Machines. The distinguishing characteristics of this generation are that it is dry-to-dry[5] and that it exhausts solvent into the atmosphere. This machine is one unit and equipped with a water-cooled condenser used to recover solvent during the deodorizing part of the drying cycle. During this time, fresh air is drawn into the machine and exhausted through an external carbon adsorber at the end of the cycle. The adsorber is replaced or regenerated during routine maintenance of the machine. Improper maintenance caused excess emissions because of breakthrough issues that would negate the abatement effectiveness of the adsorber. A typical solvent emissions profile ranges from 200 to 400 gallons per year (see Figure III-A1). This equipment type is now prohibited in California

3. Third Generation

The third generation of equipment is known as Closed Loop Machines. The distinguishing characteristics of this generation are that they are dry-to-dry, ventless, and do not exhaust to the atmosphere. Hot air from the drying cycle is passed through a refrigerated condenser, recovering solvent, sending the recovered liquid solvent and water mixture to a water separator, reheating the remaining airstream by the heating coils and recirculating this remainder back into the drum. The solvent recovered by the water separator then goes to the solvent storage tank. Unlike second-generation machines that inject fresh air, deodorization transpires as the vapor pressure of the solvent is lowered by temperature reduction via repeated passes through the refrigerated condenser (30-45 degrees F). Some machine designs use an inductive door fan that draws air through the loading door and drum when the door is ajar to further reduce worker exposure from residual solvent vapor. Other models have a more formalized fugitive control system comprised of an inductive door fan with a carbon adsorber to further reduce solvent emissions. The adsorber is replaced or regenerated during routine maintenance. A typical solvent emissions profile ranges from 60 to 120 gallons per year (see Figure III-A1). This equipment type currently operates in California.

---

[4] Conference on Security and Co-Operation in Europe, Helsinki 1975.

[5] Clothes go into the machine dry and come out of the machine dry.

Additionally, as a cost savings measure to extend the lifespan of the equipment, some vented machines (2nd gen) were retrofitted with a refrigerated condenser and converted to closed loop. These converted closed loop machines, although not as efficient limiting solvent emissions as a true closed loop machine, meet the minimum definition of a closed loop machine. This modified equipment type currently operates in California.

4. Fourth Generation

The fourth generation of equipment is known as Secondary Control Machines. The distinguishing characteristic of this generation is the addition of an integrated carbon adsorber to a closed loop machine. The primary control device on a closed loop machines is the Refrigerated Condenser. The addition of the carbon adsorber, typically an activated carbon bed contained in a metal housing, is the Secondary control device. The two emission control devices work in tandem at the end of the cool down phase of the deodorizing cycle to further reduce fugitive emissions. Solvent vapors from the drum, button and lint traps are routed through the adsorber, reducing the drum concentration of the solvent to 300 ppmv or lower. The carbon is periodically regenerated; using heat and the adsorbed solvent is recovered, further reducing solvent consumption. The regeneration is automatically scheduled and occurs, according to manufacturer's recommendation or after a specific number of wash loads. Other machine designs have retrofitted an external secondary control device onto a closed loop machine. These external adsorbers have not been able to meet the same control efficiencies as the closed loop machines with the integral design. . A typical solvent emissions profile ranges from 30 to 75 gallons per year. This equipment type currently operates in California.

B. Ventilation Technologies

Ventilation has been used as a risk mitigating measure at dry cleaning facilities and is implemented in several different ways. Ventilation is important as it affects the dispersion of fugitive solvent vapors and other airborne compounds within the facility. Most Dry Cleaners do not have adequate ventilation systems for good capture or dispersion. Dispersion is typically based on building dimensions, stack dimensions, airflow rate, and capture efficiency of the ventilation system. Dispersion helps to determine the persistence or length of exposure to the solvent vapor, which impacts the potential health risk to nearby residences and businesses. The types of ventilation[6], in order of increasing effectiveness are:

1. Natural Ventilation

Natural ventilation is the most passive form of ventilation and solely depends upon wind and convective forces to move air in and around the facility. Solvent vapors from windows, doors, roof vents or other openings tend to remain trapped and entrained around the facility for longer periods of time, resulting in a greater exposure to workers and nearby residents. Natural ventilation is adequate if the facility is a stand-alone facility with a reasonable buffer zone. It is the least effective form of ventilation.

2. Window Fans

Window fans, or wall fans, are high flow propeller-type fans installed vertically in an external wall or exterior window type opening in the facility. Solvent vapors are exhausted horizontally and near ground level with the vertical component completely dependent on metrological conditions. Window fans typically exhaust into other co-located businesses or nearby residences increasing exposure to nearby workers and residents.

[6] BAAQMD 2001.

3. General Ventilation

General ventilation configurations typically have one or more large capacity fans on the roof of the facility that exhaust horizontally by design or because of rain caps. Capture efficiency depends on the air exchange rate inside the building and is a function of facility size and the fan air-flow rate. Solvent vapors are released at roof level producing better dispersion at ground level. Although the effects of building downwash tend to trap emissions into nearby empty space or cavity zones located around and near the facility. These zones concentrate the emissions increasing exposure to nearby workers and residents.

4. Local Ventilation

Local Ventilation is a descriptor used to define a ventilation system with a high capacity fan, exhaust stack and physical apparatus/structures (fume hoods, shrouds, flexible walls, vertical plastic strips) enclosing the dry cleaning machine and designed to capture fugitive emissions. A ventilation fan captures and exhausts solvent emissions vertically through a stack on the roof of the facility. A combination of walls, plastic curtains and/or plastic strips completely surrounds the equipment with three feet of clearance in front and behind the machine for operation and maintenance.

5. Partial Vapor Rooms

Partial Vapor Rooms (PVR) is a descriptor used to define a ventilation system that encloses the back of the dry cleaning machine in a small room with the front panel and loading door exposed for operational convenience (loading/unloading). Maintenance doors are designed to be self-closing and kept closed during routine operation of the machine. PVRs more effectively capture fugitive emissions from leaks and maintenance activities when compared to local or general ventilation systems. A ventilation fan captures and exhausts solvent emissions vertically through a stack on the roof of the facility. The loading door fugitive emissions are captured by one of the follow controls: a shroud, an inductive door fan, a fugitive control system or secondary control system.

6. Vapor Barrier Rooms

Vapor Barrier Rooms (VBR) is a descriptor used to define a ventilation system that encloses the entire machine in a small room and is the most health protective vapor capture system. A VBR is constructed with diffusion resistant material (such as metal foil-faced insulation sheets, plastic sheeting between drywall sheets or steel sheeting) with seams and gaps sealed with metalized tape. A ventilation fan captures and exhausts solvent emissions vertically through a stack on the roof of the facility. Maintenance doors are designed to be self-closing and kept closed during routine operation of the machine. VBRs are required for all co-residential dry cleaning facilities in the Bay Area and recommended for non-residential facilities that are located in high-density population areas. Some non-residential facilities can appropriately construct total enclosures without the barrier material and these are known as Vapor Capture Rooms (VCR).

C. BACT and Toxics NSR

The District describes Best Available Control Technology (BACT) as the most effective emission control device or technique successfully utilized for the type of equipment, or the most stringent emission limitation achieved by an emissions control device determined to be technologically feasible and cost effective. For any new or modified source emitting TACs, Rule 2-5 Toxics New Source Review (NSR) also can apply. This rule can require a more stringent control standard for projects producing a chronic hazard Index (HI) of 0.20 and/or a cancer risk greater than 1.0 in a million (10^{-6}) called Toxics Best Available Control Technology (TBACT). Projects with a chronic or acute hazard index greater or equal to 1.0 or a cancer risk of more than 10 in a million are denied (Rule 2-5, Section 302).

1. Halogenated Solvent

The existing BACT standard for halogenated solvent dry cleaning equipment is a Secondary Control Machine. If the cancer risk and/or hazard indexes are elevated, effective ventilation is also required to lower these numbers and reduce the exposure to nearby workers and residences. For example, all co-residential facilities require a secondary control machine enclosed in a vapor barrier room (VBR). This is the most effective form of ventilation. Other types of facilities may use other forms of ventilation provided the overall project risk stays below the maximum project risk requirements levels mandated by Rule 2-5, Section 302.

2. Petroleum Solvent

The existing BACT standard for petroleum solvent (and similar solvent types) is a Closed Loop Machine.

D. Solvent Emissions

1. Emissions

Solvent emissions are typically determined by material balance. Most of the solvent purchased throughout the year is used to make up the amount that is emitted into the air. Approximately 20-30% of the annual solvent emitted is recaptured and disposed as hazardous waste. A residual amount of solvent is retained by each garment cleaned and slowly evaporates over a several week period. A secondary control system used at the end of each drying cycle, and/or a fugitive control system with an inductive door fan both use a regenerating carbon adsorber to further reduce emissions. One of the largest sources of emissions comes from gasket leaks around the tanks, service maintenance ports, and around the loading door. Good operating practices (weekly leak checks, proper maintenance, and regular adsorber regeneration, if applicable) can further reduce solvent emissions.

2. Emission calculations

The following equations are used to determine net solvent emitted from equipment at a dry cleaning facility:

Solvent Emissions = (Solvent Consumption) – (Solvent Waste Credit)
Solvent Consumption = (Solvent Purchases) + (Initial Solvent Inventory) – (Final Solvent Inventory)
Solvent Waste Credit = (Still Oil) (% solvent in Sitill Oil) + (No. of Filter Cartridges)(solvent/Cartridge)
Default values in lieu of waste test data: 50% volume for still residue; 0.5 gal/cartridge standard or split filters (1 gal/cartridge for Jumbo filters).

E. Solvent Characteristics

1. Toxicity

Perc is the only dry cleaning solvent that has been carefully studied and researched for a long period of time. It has been designated a Hazardous Air Pollutant (HAP) at the federal level and a Toxic Air Contaminant (TAC) at the State level. Perc is known to cause acute[7] non-cancer health effects such as skin and eye irritation, irregular heart rhythm, respiratory irritation and central nervous system effects (headaches, intoxication, drowsiness and dizziness). Chronic[8] exposure may cause liver and kidney

[7] Short-term
[8] Long-term

dysfunction, and more serious central nervous system effects (diminished cognitive ability. The Office of Environmental Health Hazard Assessment has determined the URV[9] for Perc to be 5.9 E-06 $(\mu g/m^3)^{-1}$, and the chronic non-cancer reference exposure level to be 35 $\mu g/m^3$. The odor threshold is approximately 50 ppm, which is higher than the chronic threshold. The acute non-cancer reference exposure level is 20,000 $\mu g/m^3$. Rule 2-5, Table 2-5-1 lists information specifics on all TACs regulated by the District.

Reference exposure levels (REL) are used as indicators of potential non-cancer effects. A concentration below the REL would not be expected to exhibit adverse non-carcinogenic health effects. The acute REL is compared to the expected one-hour maximum concentration and the chronic REL is compared to the expected annual average concentration to determine the potential for non-carcinogenic health effects. The District lists all regulated TACs and their associated RELs and URVs in Rule 2-5, Toxics NSR, Table 2-5-1. Dispersion modeling using local meteorological data, facility dimensions, nearby building characteristics, ambient monitoring near dry cleaning facilities and source tests are used in conjunction with the engineering analysis to determine exposure levels to nearby residences and workers. Emission levels, proximity and dispersion can significantly factor into exposure determination.

Another significant synthetic solvent used in dry cleaning is Trichloroethylene (TCE), a halogenated solvent that has been used in spotting formulations to remove stains from fabrics and is listed in Table 2-5-1. Additionally, 1-bromopropane, also known as n-propyl bromide, a new halogenated solvent, and a California Proposition 65 listed compound with reproductive effects, is currently being marketed as a spotting solvent.

There are concerns that some of the newer halogenated solvent formulations may include potential health effects and toxic issues that still have to be identified and addressed from a regulatory standpoint. These will be addressed as new data about these newer compounds become known.

F. Halogenated Solvents[10]

1. Perchloroethylene

Despite potential health issues, most dry cleaners in the District currently use Perc, but its classification by CARB as a probable carcinogen has limited its use in recent years and encouraged increasing regulatory restrictions.

The solvent known as Perchloroethylene or Tetrachloroethylene, otherwise more commonly known as Perc, does not naturally occur in the environment. The English scientist Michael Faraday, using a thermal decomposition of hexachloroethane, first formally synthesized Perc in 1821. It is a chlorinated aliphatic hydrocarbon containing a double carbon bond. It is a colorless liquid at room temperature, nonflammable (no flash point) and has a boiling point of 250 degrees F. Perc is relatively insoluble in water and the combination of all of these properties make it an ideal industrial solvent. Perc is also used as a starting material for making other products such as: adhesives, fabric finishers, metal degreasing, silicon lubricants, spot removers, water repellants and wood cleaners. However historically, the largest application has been associated with the cleaning of textiles, known as dry cleaning.

The dry cleaning process uses non-water-based solvents to remove soil and stains from textiles and clothes. Commercial dry cleaning in the United States became more prominent in the early 20th century and the early solvents were petroleum based such as kerosene, gasoline and Stoddard. However, Perc had much greater stability than petroleum solvents and had better cleaning properties. By the mid-1930s the US dry cleaning industry had essentially adopted Perc as the preferred solvent.

[9] Unit Risk Value is the estimated probability of a person contracting cancer from an ambient exposure to 1 $\mu g/m^3$ over a 70 yr lifetime.

[10] Halogenated solvents are subject to Rule 11-16.

2. 1-Bromopropane (n-propyl bromide)

1-Bromopropane (n-propyl bromide or n-PB or DrySolv™), a VOC, is a solvent being developed as a drop-in alternative solvent for Perc secondary control machines. The solvent is more volatile than Perc and is known to have a strong odor. The District requires all halogenated solvent dry cleaning to be completed in a fourth generation machine and operated according to the manufacturer's recommendations. Environtech International, Inc, the solvent manufacturer, additionally recommends the replacement of all existing rubber gaskets and seals with Viton equivalents. The California Department of Health Services identified n-PB as a neurotoxin and a reproductive toxin and it is listed under Proposition 65. The compound has not yet undergone formal evaluation for TAC identification. The USEPA is currently reviewing for n-PB for inclusion in several HAP standards and confirms the harmful health effects, however, USEPA has proposed allowing limited use of n-PB, under the Significant New Alternatives Policy program (SNAP), as a replacement for halogenated compounds and ozone depleting compounds (ODC) such as methyl chloroform, 1,1,1-trichloroethane, CFC 113, HCFC 141b and most recently (2007), TCE and Perc in vapor degreasing, circuit board cleaning and other misc applications not related to dry cleaning. Since n-PB is a relatively new solvent to the US markets, replacing higher prioritized ODC compounds, new data regarding potential toxicity are still unfolding. The District has recently received information about corrosion problems with nPB and equipment failures that result in increased emissions and increased risk from exposure to nPB.

IV. PROPOSED AMENDMENTS

Regulation 11, Rule 16

The proposed amendments are intended to accelerate the phase out schedule in Rule 11-16 for Perc dry cleaning equipment. As discussed in Section II.B, above, the phase out schedule in current Rule 11-16 was derived from State law (the amended CARB ATCM). Under the proposal, instead of ceasing operation and being removed from service ("retired") on July 1, 2010 or when a Perc machine reaches 15 years of age, whichever comes later, a machine would be retired on July 1, 2010 or when it reaches 8, 10 or 12 years of age, whichever comes later, depending on the option selected by the Board. Staff recommends incorporating one of the three proposed options into the current rule. The draft amendments to the proposed Rule 11-16 are in Appendix A.

1. Accelerated Equipment Phase-out Provisions

The existing Rule 11-16 mandates an equipment phase-out starting on July 1, 2010. It:

- Eliminates the use of existing Perc machines at co-residential facilities by July 1, 2010;
- Requires all Perc converted machines to cease operation by July 1, 2010.[11]
- Requires that Perc machines that are 15 years or older be removed from service beginning on July 1, 2010;
- Phases out all Perc solvent equipment by January 1, 2023.

Once the equipment has been retired on/after July 2010, then the equipment may not be retained after that date for continued water repelling operations. The age of the equipment is calculated using the equipment's date of manufacture. If the date of manufacture cannot be determined, the equipment must be retired on July 1, 2010.

[11] converted to close loop, these once vented machines use an external water-cooled "chiller" for primary control.

Staff recommends incorporating one of the proposed Perc solvent phase out provisions into the current rule:

- Option A: 12 year equipment lifespan.
- Option B: 10 year equipment lifespan.
- Option C: 8 year equipment lifespan.

2. District requirements

The District retains the regulatory authority to adopt requirements that are more stringent than state or federal specifications. These control and/or abatement mandates can be exercised in a variety of methods, such as by pollutant, process, equipment type, or even on a case by case basis. The adoption of stricter standards assures implicit compliance with all associated statutes. Often these "standards" are associated with recommended guidelines such as BACT, or TBACT. The District Board of Directors and/or the Executive Officer reserve the right to grant the final authorization of these standards.

a) Existing Standards

Rule 11-16 currently has six standards that are more stringent than state or federal provisions.

i) Enhanced Ventilation

The District requires enhanced ventilation to promote dispersion of fugitive solvent vapors and reduce overall solvent exposure to nearby receptors working and living near a dry cleaning facility. Enhanced ventilation is primarily used as a risk mitigating measure, lowering the potential cancer risk to acceptable levels.

ii) Secondary Control

The process for dry cleaning is very similar in most mechanical and design applications, regardless of solvent type, making the type of emission controls almost universal. The BACT standard for synthetic solvent equipment has been a 4th generation secondary control machine. The TBACT NSR standard for synthetic solvent equipment also requires secondary control. Carbon adsorption is currently the most effective form of secondary control available for dry cleaning technology. The solvent emissions concentrations from the drum at the end of a typical Perc solvent cleaning cycle have been measured at less than 300 ppmv, an effective implementation of this equipment standard.

iii) Synthetic Solvent Applicability

The strict operational, maintenance, recordkeeping and reporting requirements of Rule 11-16 specific to Perc solvent equipment extend to all synthetic solvent equipment.[12] All synthetic solvents are then subject to the same standards as Perc solvent such as secondary control for all new sources, regular leak checks, proper equipment maintenance, solvent inventory, maintenance records, hazardous waste manifests and annual reporting. This extension of BACT standards to all synthetic solvents is one of the most comprehensive and effective regulatory methods for this solvent type. This maintains a uniform standard for compliance determination, and simplified regulatory requirements for all synthetic solvent equipment.

[12] unless the section or subsection is specifically worded for Perc solvent.

iv) Spotting Solution Formulation Prohibition

Spotting Solutions are commonly used by all dry cleaning facilities to remove localized spots or stains on fabrics such as drapes, clothing or other textiles, and are typically applied before or after the dry cleaning process. Although newer effective spotting solution formulations currently exist that are soy or water based, most formulations contain mixtures of more volatile VOCs; however, halogenated solvents, such as Perc, trichloroethylene (TCE) or methylene chloride are often used, either as a component or in pure form, during more difficult spot removal circumstances.

v) Reporting Requirement

The Perc ATCM and Rule 11-16 mandate all Perc equipment older than 15 years from date of manufacture to cease operation on July 01, 2010. Additionally, Rule 11-16 currently requires all facilities using Perc to declare their intent by December 31, 2009 either to install alternative solvent equipment or to retire their existing equipment. The objective is to obtain advanced confirmation for scheduling a final inspection by enforcement staff or to encourage submission of all applicable paperwork for the alternative solvent equipment in advance of the deadline. The reporting requirement will facilitate an orderly transition in advance of the initial Perc solvent equipment prohibition date.

vi) Synthetic Solvents

All synthetic solvent equipment subject to Rule 11-16 are required to comply with the stricter operational, maintenance, recordkeeping and reporting requirements mandated for Perc solvent. These stricter standards reduce potential exposure to a specific toxic air contaminant, but are generalized to all potential toxic air contaminants. Synthetic solvent equipment would not be subject to Perc operator certification or Perc solvent phase out requirements.

b) Proposed Standards

The current proposal is to add one of three standards to Rule 11-16 that are more stringent than state or federal provisions:

- Option A: 12 year Perc solvent equipment lifespan.
- Option B: 10 year Perc solvent equipment lifespan.
- Option C: 8 year Perc solvent equipment lifespan.

Staff recommends incorporating one of the proposed Perc solvent ATCM phase out provisions into the current rule

3. Specific Rule Changes

The proposed changes to Rule 11-16 are listed by section in Appendix A.

V. RULE DEVELOPMENT / PUBLIC PROCESS

This report and the associated Public Workshop constitute the most recent step in the District's rule development process for revising the rules regulating dry cleaning equipment. The purpose of the Public Workshop is to solicit comments from the public on the propose amendments to Rule 11-16. During the workshop, staff will also respond to questions about information presented in the workshop report. Based on the input received at the end of the workshop and during the associated public comment period, staff will assess whether changes to the proposal are necessary prior to preparing final proposed amendments for consideration at a public hearing before the District's Board of Directors. For informational purposes, some of the information used in this report came from the following methods:

A. Outreach Efforts

The District sent out a preliminary informational request May 2008 to inform Perc solvent facilities about the new state dry cleaning standards and to request specific equipment information as required by the Rule 11-16.

B. Public Involvement

District staff attended several public meetings as part of the outreach efforts to provide information about the changes all cleaning regulations. The most recent occurred on March 18, 2009 to a Bay Area wet cleaning organization and on May 21, 2009 for a Petaluma Dry Cleaning Association.

C. Industry Involvement

District staff maintains industry involvement by keeping an on-going workgroup, meeting quarterly, that comprises dry cleaning operators, cleaners associations, machine manufacturers, solvent manufacturers and environmental groups. Most of these workgroup members also actively participated in the development of the ATCM amendment process. They also have previewed earlier drafts of the proposals for the dry cleaning rule update and provided technical information. The most recent meeting was on April 1, 2009 to present recent changes to District dry cleaning regulations and to discuss the additional proposed changes.

VI. CONCLUSION

This report describes proposed revisions to District regulations regarding dry cleaning operations. These revisions incorporate recent ideas from the District's March 4, 2009 Board of Director's Meeting. Staff will conduct a workshop on June 10, 2009 to present these proposed rule revisions and to receive public comment. The proposed rule revisions are expected to be presented to the Board of Directors for adoption in September 2009.

References:

ARB, 1991, Initial Statement of Reasons for Rulemaking, Staff Report/Executive Summary, and Part B, Proposed Identification of Perchloroethylene as a Toxic Air Contaminant, California Air Resources Board, August 1991.

ARB, 1993, Airborne Toxics Control Measure (ATCM) for Emissions of Perchloroethylene from Dry Cleaning Operations, California Air Resources Board, October 14, 1993.

ARB, 2007, Airborne Toxics Control Measure (ATCM) for Emissions of Perchloroethylene from Dry Cleaning Operations, California Air Resources Board, January 25, 2007.

USEPA, 1993, National Perchloroethylene Air Emission Standards for Dry Cleaning Facilities, Subpart M, United States Environmental Protection Agency (U.S. EPA), 40 CFR Part 63, September 22, 1993.

USEPA, 1996, Air Quality; Revision to Definition of Volatile Organic Compounds—Exclusion of Perchloroethylene, United States Environmental Protection Agency (U.S. EPA), 40 CFR Part 51, March 08, 1996.

USEPA, 2006, National Perchloroethylene Air Emission Standards for Dry Cleaning Facilities, Subpart M, United States Environmental Protection Agency (U.S. EPA), 40 CFR Part 63, July 27, 2006.

USEPA, 2008, National Perchloroethylene Air Emission Standards for Dry Cleaning Facilities, Subpart M, United States Environmental Protection Agency (U.S. EPA), 40 CFR Part 63, July 11, 2008.

Appendix A

Under current District Rule 11-16 (as amended on March 4, 2009), existing dry cleaning equipment using Perchloroethylene (Perc) will be phased out (i.e., be required to cease operation and be removed from service) between July 1, 2010 and January 1, 2023, depending on the age of the equipment. The proposed amendments would accelerate the schedule so that all existing Perc equipment will be phased out earlier than January 1, 2023. The beginning of the phase-out period, July 1, 2010, would remain unchanged. District staff is considering three options for the accelerated Perc phase-out.

Regulation 11, Rule 16 Rule Change Summary

Section	Comments
	STANDARDS
304.15	Number of years from date of manufacture – TBD.
304.16	Final date of Prohibition for Perc solvent equipment. – TBD.
	ADMINISTRATIVE REQUIREMENTS
403.1.5d	Date of manufacture date - TBD.
403.1.5e	Age limit for Perc solvent equipment. –TBD.
403.1.6	Final Date of operation for Perc solvent equipment – TBD.
	Table 11-16-1
7.1.2010	Dates - TBD
1.1.20xx	Date - TBD.

The following excerpt from Table 11-16-1 shows in underline/strikeout format the proposed changes to Rule 11-16.

Perc Dry Cleaning Phase-out	
Date	*Milestone*
July 1, 2010	a. Prohibition against use of spotting solvent and/or solution containing halogens including, but not limited to trichloroethylene (TCE) and/or perchloroethylene. b. All Co-Residential Perchloroethylene solvent facilities must cease operation and retire their Perc equipment; c. All converted machines must cease operation and be retired; d. All Perchloroethylene solvent machines with a date of manufacture prior to July 1, YYYY ~~1995~~ must cease operation and be retired; e. All Perchloroethylene solvent machines with an unknown date of manufacture must cease operation and be retired; and f. After this date, all Perchloroethylene solvent equipment with a date of manufacture after July 1, YYYY ~~1995~~ must cease operation when the equipment reaches XX ~~15 fifteen~~ years of age.
January 1, ZZZZ ~~2023~~	All Perchloroethylene dry cleaning operations are prohibited.

YYYY: initial date of manufacture for phase-out is currently 1995; options include a) 1998, b) 2000, & c) 2002.

XX: maximum age of machine is currently 15 years; options include a) 12, b) 10, & c) 8 years.

ZZZZ: final prohibition date is currently 2023; options include a) 2020, b) 2018, & c) 2016.

(This page intentionally left blank)