

Dry cleaning is a process of cleaning textiles with solvents, rather than detergent and water. The textiles are cleaned by mechanical agitation in a non-aqueous solvent bath, rinsed, spun to remove excess solvent and then tumbled dry in warm air.

Equipment

Dry cleaning operations may use various types of equipment, such as:

- Boilers
- Compressors
- Spotting boards
- Pre-soaking tanks
- Dry cleaning units
- Extractors
- Tumblers
- Solvent re-claimers
- Solvent storage tanks
- Drying cabinets

Materials

Other materials used with cleaning operations also include:

- Dry cleaning solvents, water based and solvent based spotting agents and bleaches.
- Steam heated presses of various shapes and sizes, steam air forms, puff irons, ironing boards with steam and electric irons.
- Wet cleaning washers.

Types of Operations

The dry cleaning industry includes three types of firms: commercial, industrial, and coin – operated.

There are two distinct types of commercial dry cleaning operations:

- Large plants that do the cleaning for owned or independent receiving stations (i.e. retail store fronts)
- The dry cleaning service operates its own receiving station on the premises

Dry cleaners are further broken down by the solvents they use, including solvents generally classified as “petroleum” such as Stoddard solvent and other combustible hydrocarbon solvents, or “synthetic” such as Perchloroethylene (also known as PERC, tetrachloroethylene, tetrachloroethene, carbon dichloride, and ethylene tetrachloride). Approximately 75% of dry cleaners use PERC and 23% use petroleum solvents. A small number (2%) use an alternate synthetic solvent known as trifluoro-trichloroethane (Fluorocarbon 113).

Dry Cleaning Process or Service

Spotting or selectively applying chemicals, steam, detergent and/or water is used to loosen specific stains from soiled garments. The chemicals typically utilized in spotting are: chlorinated solvents, amyl acetate, bleaching agents, acetic acid, aqueous ammonia, oxalic acid, hydrogen peroxide and dilute hydrogen fluoride solutions. These chemicals are usually applied with plastic spray bottles and are rubbed into the fabric with a brush, a spatula, or by hand; they are then allowed to soak into the fabric, or flushed with steam applied from a steam gun. Spotting is usually done prior to dry cleaning, but may also be necessary following dry cleaning to remove stubborn stains.



Dry Cleaning Operations

In a typical PERC dry cleaning facility, the washer-extractor consists of a perforated, horizontal, rotating drum enclosed in a vapour-tight housing. After the garments are placed in the machine and the washer door is closed, PERC is pumped in and the clothes are agitated in the filtered solvent for 10 to 20 minutes. The PERC is then drained and the excess solvent adhering to the garment is extracted within a few minutes by spinning and subsequent draining.

The clothing is then rinsed with clean PERC and then spun and drained to remove as much PERC as possible. Following this second extraction step, the damp garments are manually transferred to the dryer, where they are tumbled in warm air of 120°F to 140°F to remove the remaining PERC.

Hazards Associated With Dry Cleaning Operations

Fire

- Flammability of petroleum based solvents, like Stoddard solvent.
 - Stoddard solvent is defined as petroleum – based distillate, clear and free from suspended matter, undissolved water, and has a rancid and objectionable odour. Flash point is between 37.8°C (100°F) and 60°C (140°F). This makes it a Class II Combustible Liquid.
- Improper electrical wiring of equipment and plant, and overloading of circuits.
- Failure to maintain solvent temperatures at no less than 11.1°C (20°F) below their flash points.
- Unsafe storage of solvent, chemicals and spotting agents.
- Failure to instruct employees in, and to make routine inspections of, fire prevention practices and the use of fire extinguishing equipment.
- Static electricity, sparking from metal objects and ignition of matches left in clothing can also be hazards in the dry cleaning operations using petroleum – based solvents because of the movement of material within the machinery.
- Heavy fire load consisting of clothing either cleaned or waiting to be cleaned.
- Flammable packaging materials, plastic bags, etc.
- Acceptance of clothing that may be soaked or covered with flammable liquids. Clothing such as coveralls or uniforms typically worn by automobile mechanics or oil field workers may be heavily covered with flammable and combustible liquids. As this clothing is subject to spontaneous combustion when left lying around for even a short period, operators should have a process in place to properly identify, tag and process these items immediately. If it is not possible to begin the cleaning process right away, the clothing should be kept in a metal can with a tight fitting lid. This way if the clothing does ignite, it will self-extinguish in the can.

Toxicity

- Toxicity of chlorinated synthetic solvents, such as PERC.
 - Although it is a non-flammable liquid, it does give off toxic vapours at normal temperatures and, if exposed to excessive heat such as that produced by open flames, hot surfaces, etc., breaks down to form phosgene and other poisonous gases and corrosive gases.
 - Phosgene was used as a chemical weapon in World War one. It is colourless, but can appear as a white or yellowish haze when released into the air due to refraction of light. In low concentrations, its odour resembles recently cut hay.

Other

- Poor housekeeping, lint, and trash accumulation and a lack of general cleanliness.
- Failure to properly operate and maintain equipment, especially steam boilers, compressors, tumblers and finishing equipment.

Safeguards Necessary to Control the Hazards

The class of solvent used governs the location and design, the ventilation, electrical and equipment requirements, the fire control measures required, and the construction of a dry cleaning plant.

The U.S. National Fire Protection Agency (NFPA) has established categories based on the flammability of the solvent used in their Standard for Dry Cleaning Plants (NFPA 32). These are:

Type I	Systems using solvents with a flash point less than 37.8°C such as naphtha (f.p. 10°C). These systems are now prohibited by the “Standard for Dry Cleaning Plants”.
Type II	Systems using solvents with a flash point at or above 37.8°C but below 60°C.
Type III	Systems using solvents with a flash point at or above 60°C but below 93.4°C.
Type IV	Systems using solvents with a flash point at or above 93.4°C.
Type V	Systems using non flammable solvents with cleaning equipment not operated by the general public.
Type VI	Systems using non flammable solvents with cleaning equipment being operated by the general public. Most commonly these would be coin-operated machines.

As Type I is prohibited, the remainder of these safeguards pertain to the second most hazardous type of operation from a fire protection standpoint, the Type II operation. For additional information on Type II and the remaining four types, please refer to the following sources:

- NFPA 32 – Standard for Dry Cleaning Plants.
- NFPA 90A and 91 – Ventilation and Electrical Equipment.
- NFPA 30 – Flammable & Combustible Liquids Code.

Type II Dry Cleaning Plants

Location and construction

- Dry cleaning operations shall not be performed in the same building with other occupancies.
- The building shall be accessible from at least one side for fire fighting and shall not be closer than 3.1m (10 feet); to the adjoining property line. Walls must be non-combustible (at least).
- Dry cleaning and tank storage rooms shall not be located below grade or above any other storey.
- The dry cleaning room shall be separated from other related operations by at least two hour fire partitions.
- Dry cleaning rooms must have at least two doors as a means of exiting; they must be located at the opposite ends of the room, at least one of which leads directly outside.
- Electrical equipment and wiring shall be designed for Class I, Division 2 locations.

Storage tanks

- Solvent storage tanks must be installed and constructed as outlined in NFPA 30, Flammable and Combustible Liquids Code.
- Solvent storage tanks shall be underground or outside above ground, except up to two tanks with a maximum capacity of 5,678 litres may be located inside a dry cleaning room.

Fire Protection

- A building housing a dry cleaning room must be completely protected by a sprinkler system.
- At least two 10BC portable fire extinguishers are required near the doors in a dry cleaning room.

For Full Information

Due to environmental and health risk concerns, the Government of Canada has developed regulations pertaining to the use and handling of PERC. **For additional information, Environment Canada has the complete Compliance Guide for Dry Cleaners available on its web site.**

For more information, please visit www.intactprevention.com

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CHECKLIST FOR DRY CLEANERS USING PERC

Dry Cleaning Facility

- ✓ PERC, waste water, and residue stored in closed containers.
- ✓ No spotting agent that contains PERC.
- ✓ PERC resistant floor drain plugs are readily available.
- ✓ Containers, tanks, or dry cleaning machines containing PERC, waste water, or residue are stored within a secondary containment system.

Dry Cleaning Machines

- ✓ No transfer machine or self-service machine.
- ✓ Must be equipped with an integral refrigerated condenser and an integral PERC water separator.
- ✓ No vent to the atmosphere during the washing, extraction, drying and aeration cycles.
- ✓ No carbon absorbers as the primary vapour control device.
- ✓ Must be a closed direct-coupled delivery system for PERC delivery.
- ✓ The manufacturer’s design rating for PERC consumption is equal to or less than 6.2 L (or 10 kg) PERC/100 kg of clothing cleaned (for machines installed after July 31, 2003).

Secondary Containment System

- ✓ Impermeable to PERC.
- ✓ Encompasses at least the entire surface under each dry cleaning machine, tank, or other containers containing PERC, waste water, or residue.
- ✓ Capable of containing at least 110% of the capacity of the largest tank or container within the containment system.