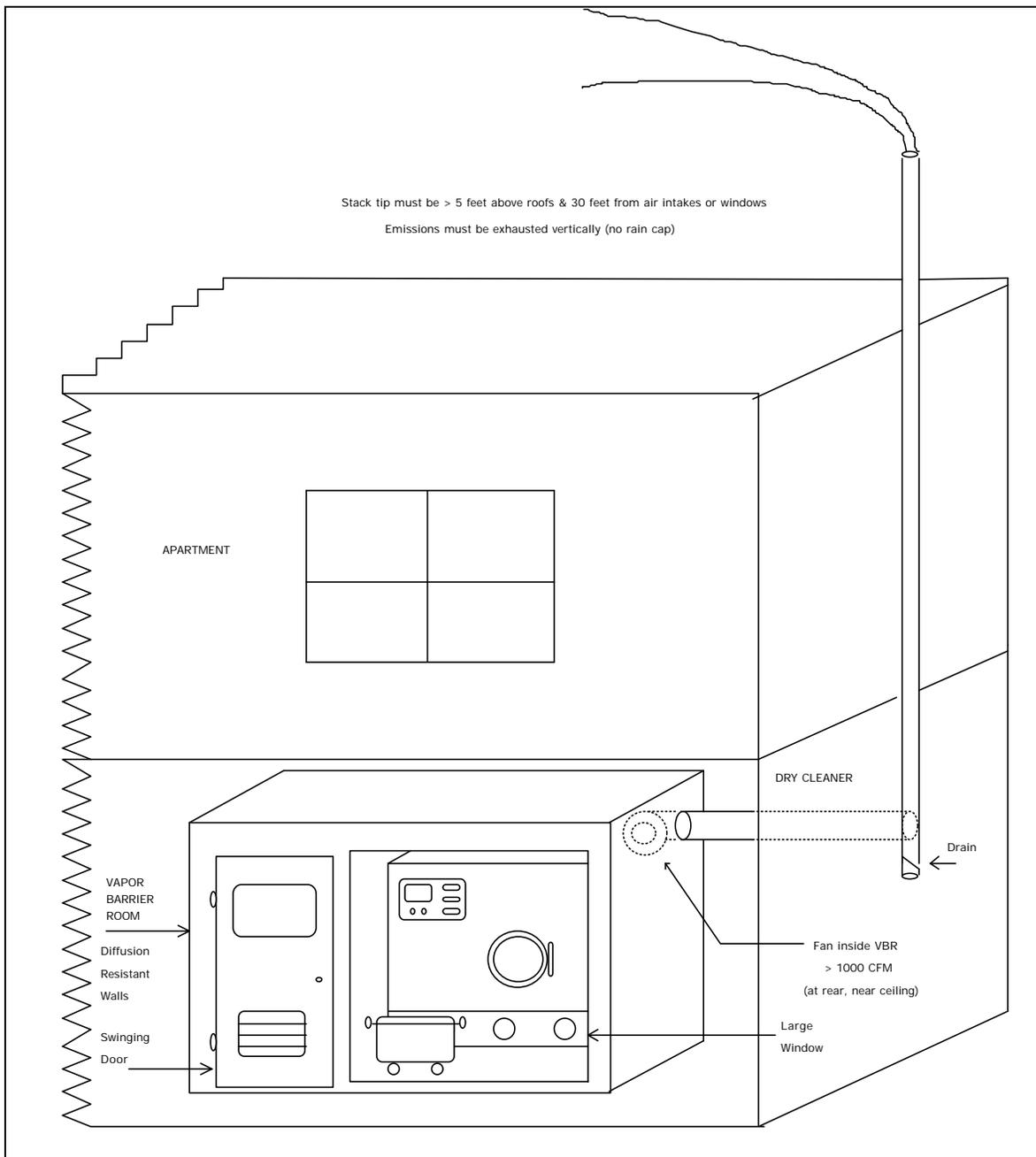


DRY CLEANER VENTILATION GUIDELINES

Vapor Barrier Rooms for Perc Dry Cleaning Facilities

A vapor barrier room restricts diffusion and transport of solvent vapors that escape from a dry cleaning machine; a ventilation fan collects virtually all of these vapors and exhausts them through a stack above the building. Vapor barrier rooms are required by Regulation 11, Rule 16 for co-residential perchloroethylene dry cleaning facilities to minimize the exposure to perchloroethylene and the associated risk to affected residents. VBRs may also be required [pursuant to the Bay Area AQMD Risk Management Policy for Perc Dry Cleaners] for new non-residential dry cleaning facilities that cause high exposures of Perc to adjacent residential or occupational receptors.



DRY CLEANER VENTILATION GUIDELINES

Construction and Operation Guidelines for Vapor Barrier Rooms:

Vapor barrier rooms shall be constructed of material resistant to diffusion of solvent vapors such as sheet metal (recommended), metal foil faced insulation sheets, or heavy plastic sheeting sandwiched between dry wall (gypsum) sheets. Seams should be offset for multiple layers of material. Seams and gaps should be sealed with aluminized tape (not standard duct tape) at each layer -- it is also recommended to caulk with silicon sealant for large gaps prior to taping. *[NOTE: Please contact your city or county building department and obtain a building permit for the construction of the vapor barrier room and electrical work. Some vapor barrier materials may need to be covered with gypsum board to meet fire code and building code requirements. In addition, building codes have minimum dimensions for doors and access aisles -- for example, allow at least 32 inches clear for doors and at least 3 feet clear between new walls and the front or back of a machine. Exceptions may be approved by the building department.]*

The door(s) to the VBR should be normally closed (self-closing devices are recommended); it may be or a sliding door or a "swinging" design. Plastic strips should cover doorway if door is opened for extended periods of operation. Windows may be installed in doors or walls to allow light, for safety reasons, or for make-up air: Plexiglas or tempered glass is recommended.

Fresh make-up air may be supplied from the shop through gaps around the entry door(s) or if necessary with sliding windows or adjustable louvers. It is suggested that make-up air be introduced at the front of the machine and at the same height as the loading door. The ventilation duct or fan intake should be placed near the ceiling directly above the back of the machine or at the rear of the VBR. Warm air rises transporting solvent vapors towards the ceiling -- placing the fan near the ceiling will effectively remove warm air and solvent vapors. The fan should produce an adequate air flow (minimum 1000 CFM) to maintain a capture velocity greater than 100 feet per minute at any intentional gap or opening or about 50 FPM at entry door when temporarily open [plastic strips covering doorway will enhance capture]. An air change rate of once a minute is recommended [for a small 10' X 10' room a 1000 CFM fan has an air change rate of once a minute, for larger rooms a proportionally larger fan should be considered]. Note that additional airflow may be necessary to remove excess heat from the room, particularly if spotting stations are within the VBR or if insulating materials are used as vapor barrier.

The exhaust fan may be installed inside the VBR (near ceiling at back of machine or VBR) or outside the facility on a wall or on the roof; should be of a high pressure (1-3 " H₂O) design with a minimum capacity of 1000 CFM; and should be run continuously (24 hours a day, 365 days a year) in a co-residential facility and whenever the dry cleaning machine is operating or being maintained in a non-residential facility [interlock fan motor to dry cleaning machine]. The stack should extend at least 5 feet (a 10 foot stack is recommended) above the roofline or any adjacent roof and at least 30 feet from any air intake or window. Emissions must be exhausted vertically (no rain caps). Proper stack design (see Figure 6-24, Stackhead Designs, ACGIH) eliminates rain intrusion with offset legs, drains, and internal deflectors. External fans may also have drain holes. The diameter of the stack should generally be 8 to 14 inches with an air flowrate of 1000 to 2500 CFM to provide good dispersion.

Spotting using Perc containing solvents should be done within the VBR for co-residential facilities. Solvent and waste drums may be stored in VBR.

DRY CLEANER VENTILATION GUIDELINES

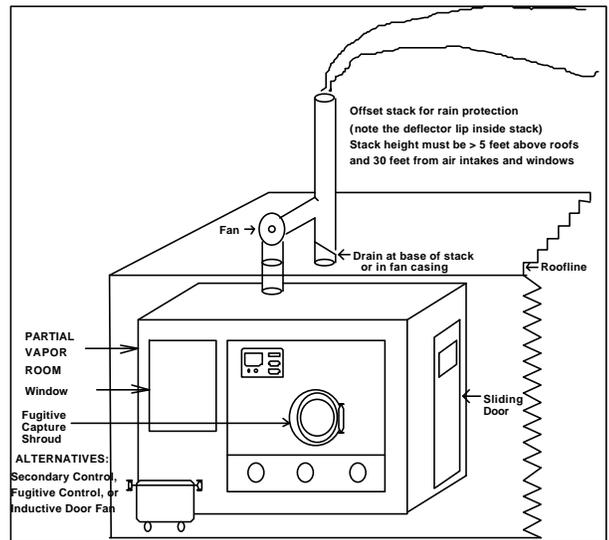
Partial Vapor Rooms and Local Ventilation Systems

A Partial Vapor Room (PVR) or Local Ventilation System (LVS) may be required for existing non-residential facilities that install an additional Perc dry cleaning machine or request an increase in their Perc usage limit [pursuant to the Bay Area AQMD Risk Management Policy for Perc Dry Cleaners]. Vapor Barrier Rooms are more effective for capturing emissions and are highly recommended for co-located situations (multistory buildings & shopping malls).

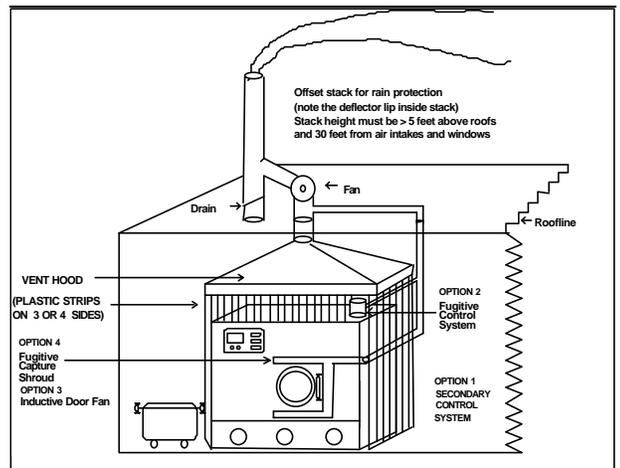
PVRs should be constructed of material resistant to diffusion of solvent vapors, such as metal foil-faced insulation sheeting or heavy (>22 mil) plastic sandwiched between dry wall sheets (offset seams). Seams and gaps should be sealed with aluminized tape (not standard duct tape). Plexiglas may be used as windows to allow light and for safety. The PVR should surround the back of the machine with the face of the machine and loading door accessible to the operator from the outside of the room. Maintenance entry door(s) shall be normally closed (self-closing or alarmed).

Local ventilation systems (fume hoods & shrouds) are necessary to capture fugitive emissions for some facilities. Fume hoods should have plastic strip curtains on the sides (or a combination of walls and curtains) to minimize cross-flow draft and provide better capture velocity. Walls or plastic strip curtains should extend at least 3 feet in front and back of the machine. The exhaust fan should be mounted above or behind the machine near the ceiling. Exhaust point should be at least 5 feet above the building or adjacent building and 30 feet from any window or air intake.

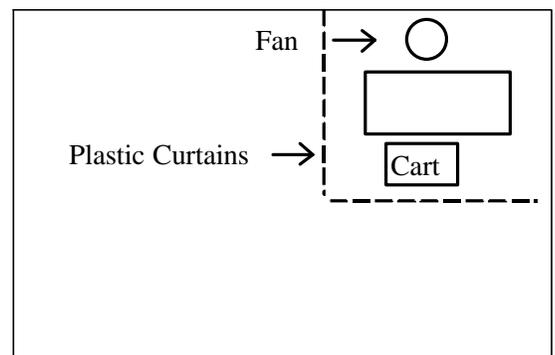
The enhanced ventilation system should have adequate airflow (minimum 1000 CFM but likely much higher: 2,500-10,000 CFM) to maintain a capture velocity greater than 100 feet per minute at any fugitive capture structure (such as a shroud at the loading door and the fume hood). An air change rate of at least once every 10 minutes is generally adequate in a stand-alone building, but greater air change is recommended for mixed-use buildings. The exhaust fan(s) may be installed inside the PVR/LVS or outside the facility on a wall or on the roof; should be a high pressure (1-3 " H₂O) design with a minimum capacity of 1000 CFM and should be run whenever the dry cleaning machine is operating or being maintained. The ventilation duct or fan intake should be placed near the ceiling directly above the back of the machine or at the rear of the PVR or LVS. The stack should extend at least 5 feet above the buildings roofline or any adjacent roof and at least 30 feet from any air intake or window. Emissions must be exhausted vertically (no rain caps). Proper stack design (see Figure 6-24, Stackhead Designs, ACGIH) eliminates rain intrusion with offset legs, drains, and internal ridges. The diameter of the stack is related to the total air flowrate and desired exhaust velocity for good dispersion: generally a diameter of 8 to 14 inches and a flowrate of 1000 to 2500 CFM will provide adequate exhaust velocity (10-20 meters per second).



PARTIAL VAPOR ROOM



LOCAL VENTILATION SYSTEM



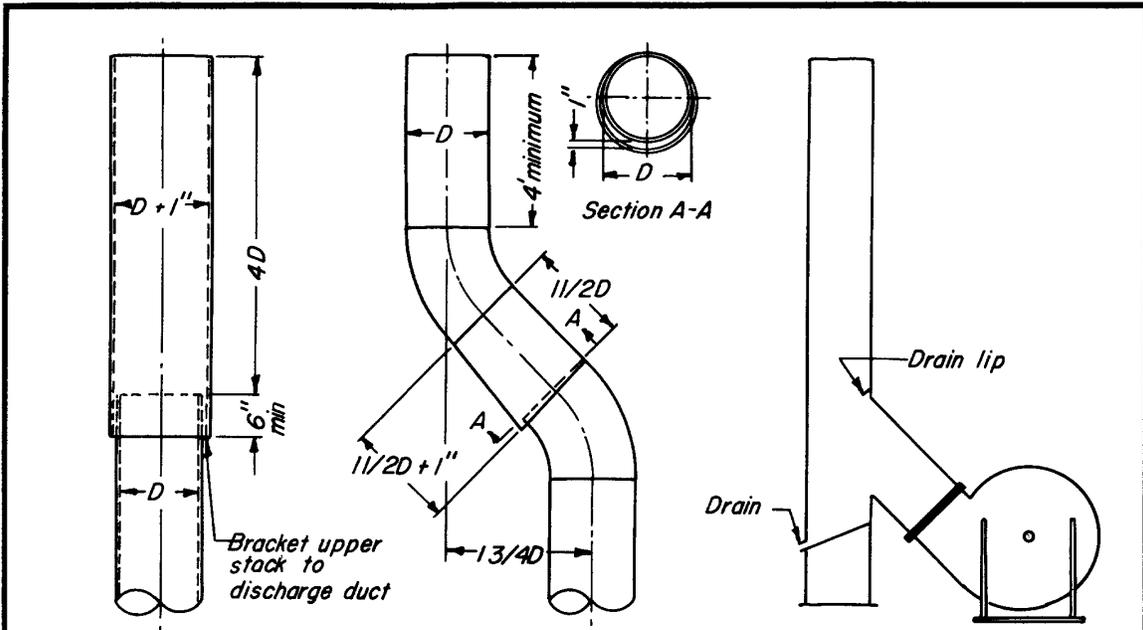
TOPVIEW

LVS ENCLOSING A DRY CLEANING MACHINE

DRY CLEANER VENTILATION GUIDELINES

DESIGN PROCEDURE

6-41



VERTICAL DISCHARGE ⁽⁸⁷⁾⁽¹¹⁶⁾

No loss

OFFSET ELBOWS ⁽¹⁰⁶⁾

Calculate losses due to elbows

OFFSET STACK ⁽¹⁰⁶⁾

1. *Rain protection characteristics of these caps are superior to a deflecting cap located 0.75D from top of stack.*

2. *The length of upper stack is related to rain protection. Excessive additional distance may cause "Blowout" of effluent at the gap between upper and lower sections.* ⁽⁸⁶⁾

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STACKHEAD DESIGNS

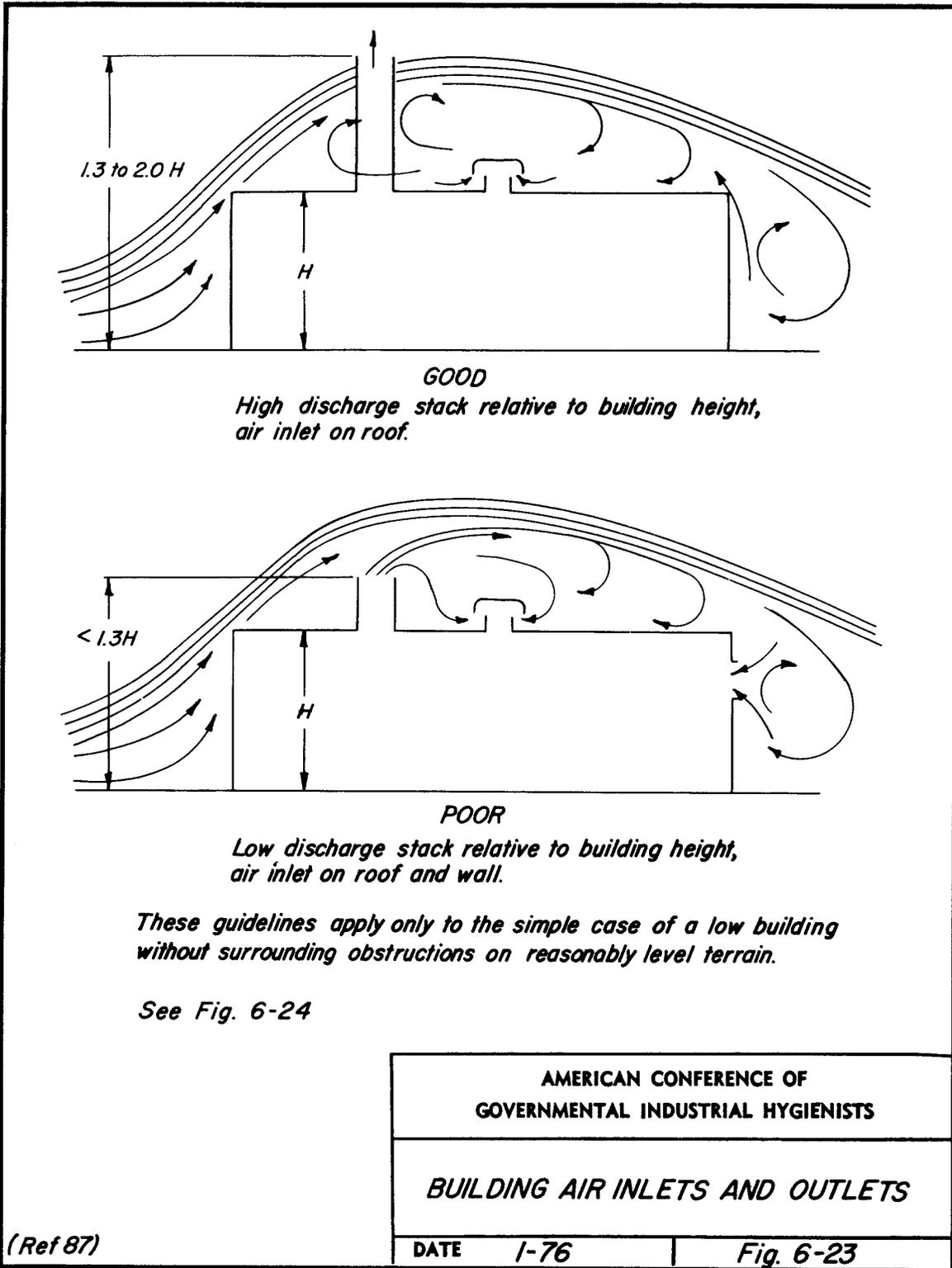
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Fig. 6-24

DRY CLEANER VENTILATION GUIDELINES

6-40

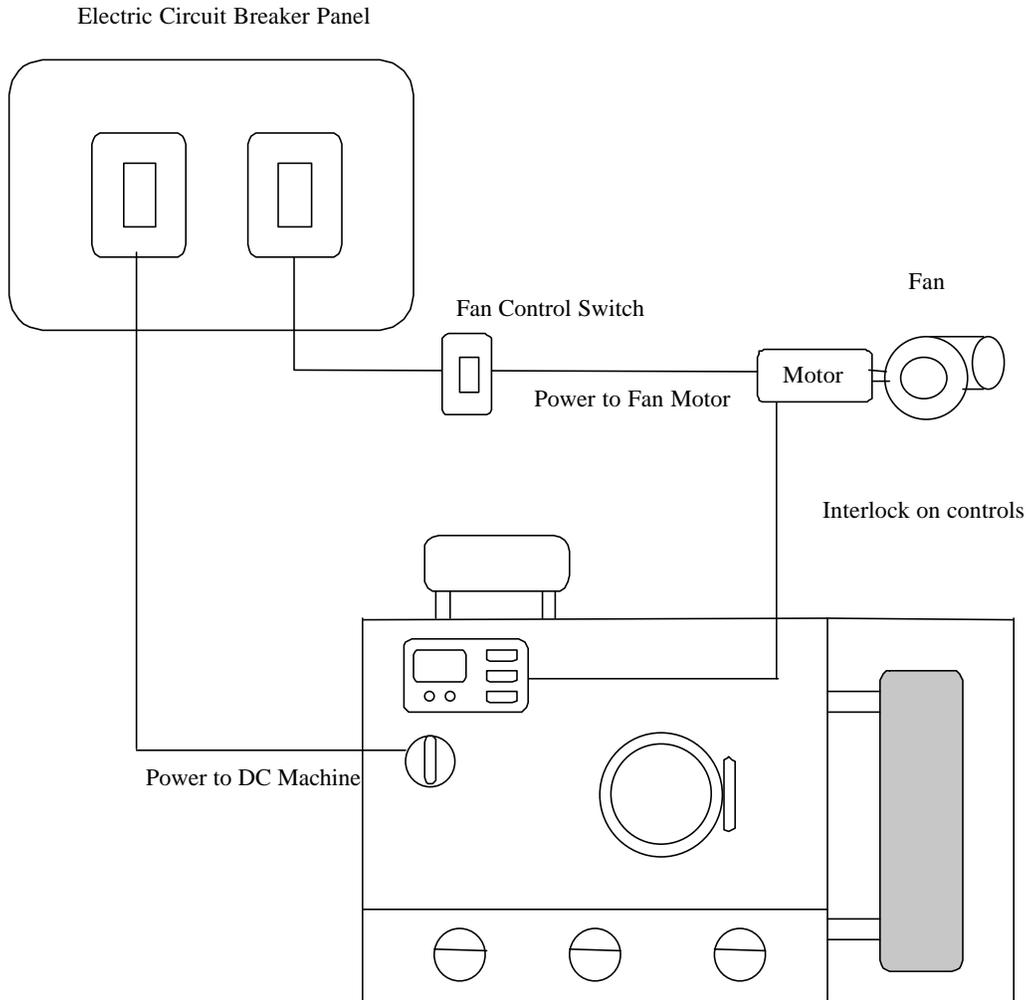
INDUSTRIAL VENTILATION



DRY CLEANER VENTILATION GUIDELINES

Guidance for Wiring Ventilation Fans and Dry Cleaning Machines

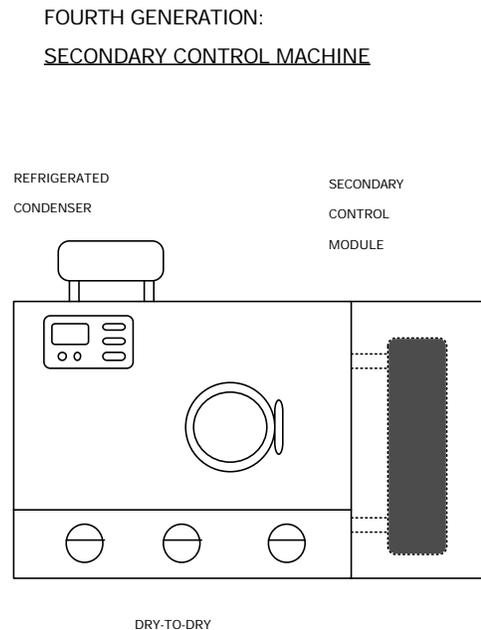
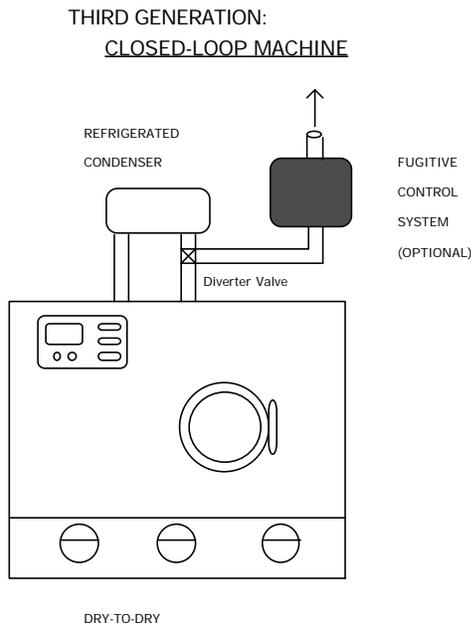
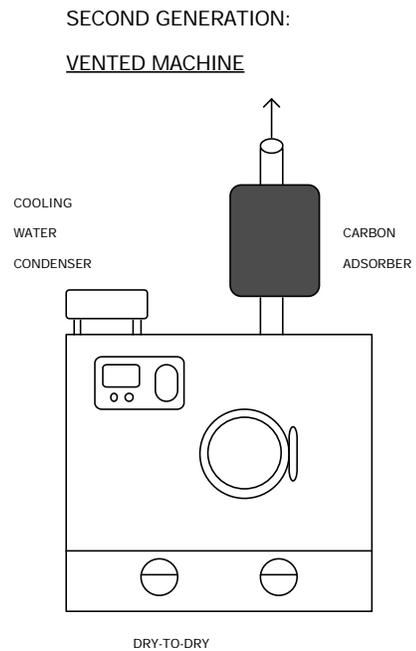
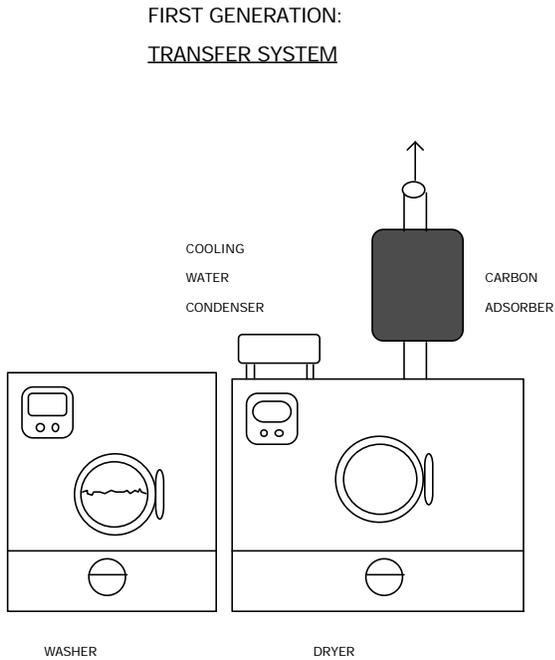
Parallel Circuit Breakers & Control Interlock



Regulation 11, Rule 16, Section 307 requires ventilation systems that operate whenever the dry cleaning machine is operating for non-residential facilities and continuously for co-residential facilities. Therefore, it is necessary to install a control interlock (may be a contactor relay) that will interrupt the power to the control system of the dry cleaning machine when power to the fan is switched off. Thus, a facility operator may operate the ventilation fan during shutdown and maintenance of the dry cleaning machine.

DRY CLEANER VENTILATION GUIDELINES

Four Generations of Dry Cleaning Machines



Note: All new machines must include a Secondary Control System [pursuant to the Bay Area AQMD Risk Management Policy for Perc Dry Cleaners] and meet CARB certification testing criteria [pursuant to the state ATCM]. A Secondary Control System may vent when the loading door is opened and act as Fugitive Control System.