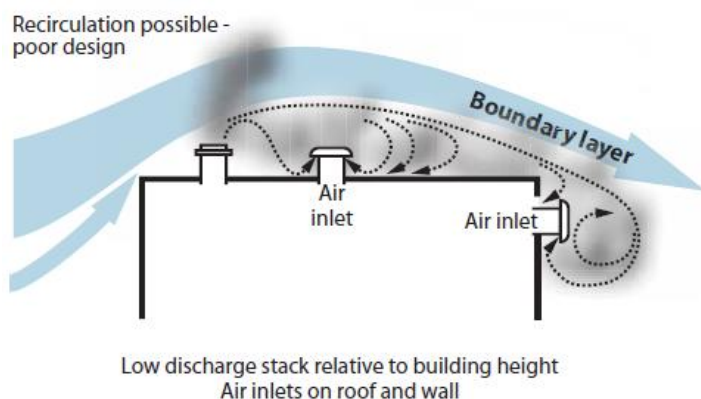


Proper Location for Fresh Air Intake

Compressed breathing air systems draw air from the outside to provide fresh clean air to a worker. It is important that the source of the air intake be fresh outside air and not contaminated with chemicals, dust or odour. Care should be taken to ensure that exhaust from heating, bathrooms and industrial processes is not recaptured by the fresh air intake of the compressed breathing air system.



The diagram shows how air that is exhausted from a chimney, exhaust stack, bathroom stack, etc. can be captured by the wind envelope of the building and be drawn in the fresh air intake of the compressed breathing air system. The CSA standard (2013) provides the following criteria for proper location of a fresh air intake for a compressed breathing air system.

A.11 Air intake installation

A.11.1 General

The location of the compressor air intake is critical to the purity of the air supplied to the respirator user. The compressor air intake assembly shall be located in an area that will minimize the intake of contaminants.

The air intake shall be

- identified as a source for breathing air by a sign or placard that also states that sources of contamination are not to be located nearby;
- located in an area free from potential sources of contamination;
- located, where practical, outside, with the intake filter assembly not less than 3 m (10 ft) above grade, and at least 15 m (50 ft) upwind from potential sources of contamination;
- protected so as not to allow entry by pests or vermin;
- periodically inspected (filters and screens shall be replaced if contaminated or damaged); and
- equipped with a wind direction indicator.

The CSA standard requires the intake to be “located in an area free of potential sources of contamination. ASHRAE Guidelines provide additional insight with complying with that goal – including providing specific distance recommendations.

Cooling Towers, Evaporative Condensers, and Fluid Coolers

According to Table 5.1 of ASHRAE Standard 62.1, outdoor air intakes need to be located at least 25 ft (7.6 m) from plume discharges and upwind (prevailing wind) of cooling towers, evaporative condensers, and fluid coolers. In addition, outdoor air intakes need to be located at least 15 ft (4.6 m) away from intakes or basins of cooling towers, evaporative condensers, and fluid coolers. Buildings designed with smaller separation distances can increase the risk of occupant exposure to *Legionella* and other contaminants, such as the chemicals used to treat the cooling tower water. See [Strategy 4.4 - Control Legionella in Water Systems](#) for more information.

TABLE 5.5.1 Air Intake Minimum Separation Distance

Object	Minimum Distance, ft (m)
Class 2 air exhaust/relief outlet (Note 1)	10 (3)
Class 3 air exhaust/relief outlet (Note 1)	15 (5)
Class 4 air exhaust/relief outlet (Note 2)	30 (10)
Plumbing vents terminating less than 3 ft (1 m) above the level of the outdoor air intake	10 (3)
Plumbing vents terminating at least 3 ft (1 m) above the level of the outdoor air intake	3 (1)
Vents, chimneys, and flues from combustion appliances and equipment (Note 3)	15 (5)
Garage entry, automobile loading area, or drive-in queue (Note 4)	15 (5)
Truck loading area or dock, bus parking/idling area (Note 4)	25 (7.5)
Driveway, street, or parking place (Note 4)	5 (1.5)
Thoroughfare with high traffic volume	25 (7.5)
Roof, landscaped grade, or other surface directly below intake (Notes 5 and 6)	1 (0.30)
Garbage storage/pick-up area, dumpsters	15 (5)
Cooling tower intake or basin	15 (5)
Cooling tower exhaust	25 (7.5)

Note 1: This requirement applies to the distance from the outdoor air intakes for one ventilation system to the exhaust/relief outlets for any other ventilation system.

Note 2: Minimum distance listed does not apply to laboratory fume hood exhaust air outlets. Separation criteria for fume hood exhaust shall be in compliance with NFPA 45⁵ and ANSI/AIHA Z9.5.⁶ Information on separation criteria for industrial environments can be found in the *ACGIH Industrial Ventilation Manual*⁷ and in *ASHRAE Handbook—HVAC Applications*.⁸

Note 3: Shorter separation distances shall be permitted when determined in accordance with (a) ANSI Z223.1/NFPA 54⁹ for fuel gas burning appliances and equipment, (b) NFPA 31¹⁰ for oil burning appliances and equipment, or (c) NFPA 211¹¹ for other combustion appliances and equipment.

Note 4: Distance measured to closest place that vehicle exhaust is likely to be located

Note 5: Shorter separation distance shall be permitted where outdoor surfaces are sloped more than 45 degrees from horizontal or that are less than 1 in. (30 mm) wide.

Note 6: Where snow accumulation is expected, the surface of the snow at the expected average snow depth constitutes the "other surface directly below intake."

ASHRAE uses the following definitions of Class of Air Exhausts

- **Class 1:** Low contaminant concentration
- **Class 2:** Moderate concentration
- **Class 3:** Significant concentration
- **Class 4:** Highly objectionable or potentially harmful concentration

ASHRAE also provides examples of the various air classes

Description	Class	Distance
Printing Equipment Exhaust	4	30 feet
Commercial Kitchen Grease Hoods	4	30 feet
Commercial Kitchen hoods other than grease	3	15 feet
Residential kitchen vent hoods	2	10 feet
Laboratory Hoods	4	30 feet
Hydraulic elevator machine room	2	10 feet

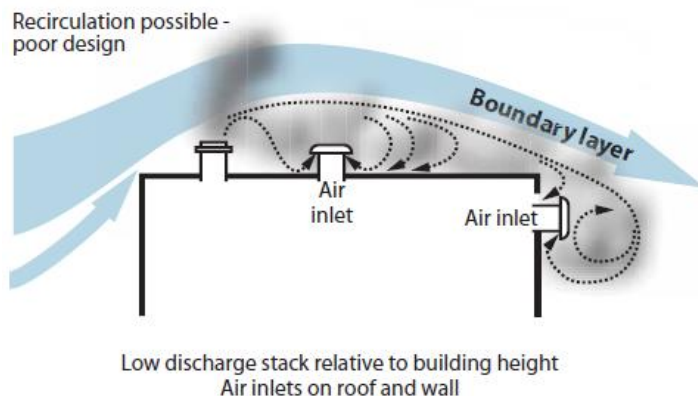
Other Sources of Contamination

All nearby potential odor or contaminant sources (such as restaurant exhausts, emergency generators, etc.) and prevailing wind conditions need to be evaluated. Locations of plumbing vents in relationship to outdoor air intakes in high-rise buildings may require additional analysis. Model codes such as *IMC* and *UMC* require a 3–10 ft (0.9–3.0 m) separation distance between building air intakes and terminations of vents carrying non-explosive or flammable vapors, fumes, or dusts. In the case of plumbing vents, *IPC* and *UPC* require a 2–10 ft (0.6–3.0 m) separation distance. For the health-care industry, *Guidelines for Design and Construction of Health Care Facilities* (AIA 2006) requires separation distances of 25 ft (7.6 m) between building intakes and plumbing vents, exhaust outlets of ventilating systems, combustion equipment stacks, and areas that may collect vehicular exhaust or other noxious fumes. However, these guidelines allow the 25 ft (7.6 m) separation distance to be reduced to 10 ft (3 m) if plumbing vents are terminated at a level above the top of the air intake.

The most common issues that affect fresh air intake locations

Too Close to Ventilation exhaust:

CBAs are often used in spray booths. These spray booths exhaust significant volumes of air. It is important that the fresh air intake not be located so as to draw in the exhaust air from the booth itself.



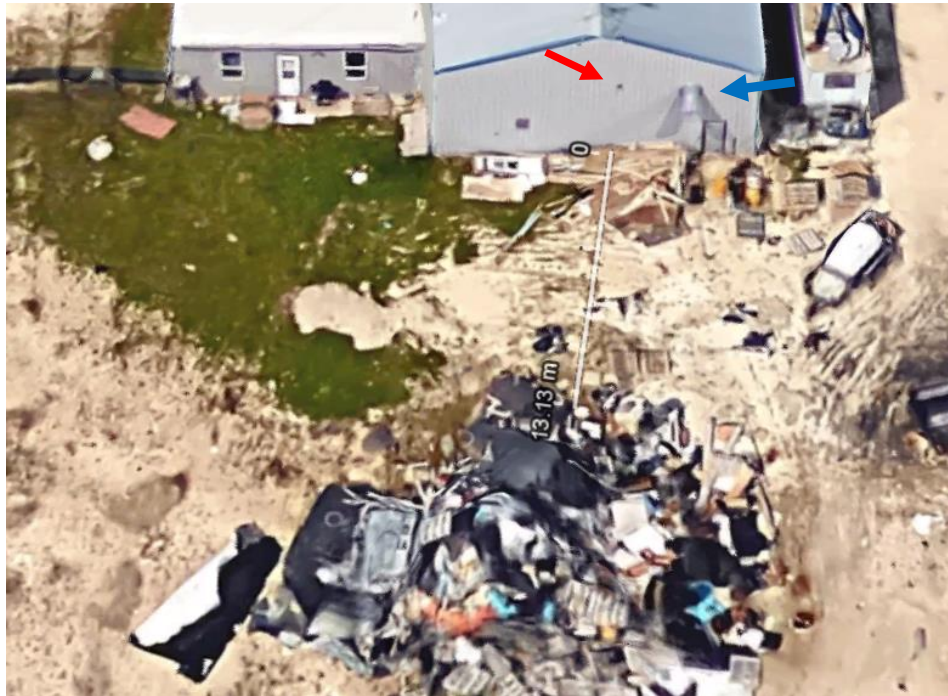
The image on the left shows how exhausted air can be captured by nearby intakes. The image on the right shows a fresh air intake very close to an exhaust. Which one is the intake and which one is the exhaust? It doesn't matter. They are too close!

Examples of Nearby Sources of Odour and Contaminants

Care should be taken to ensure that the area near the fresh air intake is clear of materials or processes that can emit odour or chemicals. This includes open storage of chemicals, sources of dust or even garbage containers.

In the image below, the fresh air intake (shown by **red arrow**) is about 13 meters from a garbage pile. The garbage is also on the company's own property. The fresh air intake is also close the exhaust vent from the companies spray booth (**blue arrow**).

Garbage Pile 13 meters from Fresh Air Intake



Intake Located Near Combustion Source

In some cases, fresh air intakes are located where car or forklift exhaust can easily be drawn into the fresh air intake. This results in combustion exhaust being directed into the breathing hood or respirator of the worker. This can occur when the intake is located adjacent to a parking lot or idling zone for forklifts, delivery vehicles, etc.

In the case below, the exhaust is located only a few feet above the ground where cars park against the building. The intake should be extended upwards. In addition, there should be a sign indicating the presence of a fresh air intake.

Fresh Air Intake (see red arrow) located at Ground Level in Parking Lot



The space between the fresh intake and the exhaust is about 5 feet when it should be 15 – 30 feet.



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In this case, the fresh airtake is near where air is exhausted from the plant. There are two vents where air from inside the plant is exhausted. Testing of the air shows that the air being blown out contains 41 ppm of VOCs. You can see that an attempt has been made to extend the location of the fresh air intake (it used to be where the bottom of the hose is shown in the image). Even at this higher location, wind blowing and swirling around the building makes it difficult to comply with the 5 ppm of VOCs allowed by the CSA standard.

