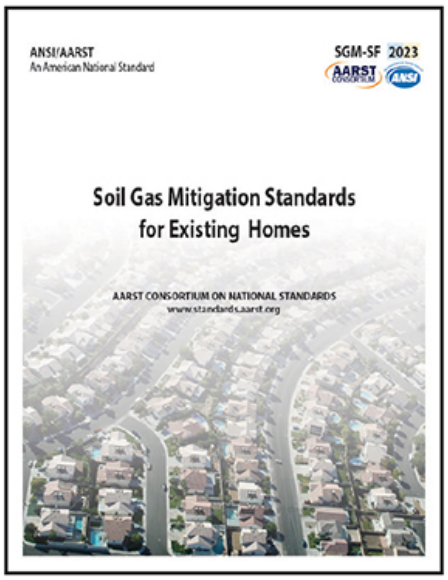
Public Review of More Proposed Addenda Updates to SGM-SF

Proposed addenda revisions to ANSI/AARST SGM-SF are being published for public review:

(Soil Gas Mitigation Standards for Existing Homes)

This standard of practice specifies minimum requirements for methods that mitigate risks to occupants posed by radon gas, chemical vapors or other hazardous soil gases that are present within existing homes.



ANSI/AARST standards are available for review and for purchase at www.standards.aarst.org. A link to ensure you receive future public review notices can be found at www.standards.aarst.org/public-review.

Public Review: SGM-SF Addenda 26-8

COMMENT DEADLINE: **July 27th, 2026**

REQUESTED PROCESS AND FORM FOR FORMAL PUBLIC REVIEW COMMENTS

Submittals (MS Word preferred) may be attached by email to StandardsAssist@gmail.com

1) Do not submit marked-up or highlighted copies of the entire document.

2) If a new provision is proposed, text of the proposed provision must be submitted in writing. If modification of a provision is proposed, the proposed text must be submitted utilizing the strikeout/underline format.

3) For substantiating statements: Be brief. Provide abstract of lengthy substantiation. (If appropriate, full text may be enclosed for project committee reference.)

REQUESTED FORMAT

Public Reviewed Item and Its Date: SGM-SF addenda 26-07

- **Name:** Affiliation:
- **Clause or Subclause**:
- **Comment/Recommendation**:
- **Substantiating Statements**:

Repeat the four bullet items above for each comment.

Intellectual rights

NOTE: Commenters that choose to submit comments shall be deemed to have done so at their sole discretion and acceptance that work product resulting from comments and other participation shall be wholly owned by the publisher (AARST), to include all national and international publishing and intellectual rights associated with the work product creation and publication.

AARST Consortium on National Standards

Website: www.standards.aarst.org Email: standards@aarst.org

527 N Justice Street, Hendersonville, NC 28739

The Consortium Consensus Process

The consensus process developed for the AARST Consortium on National Radon Standards and as accredited to meet essential requirements for American National Standards by the American National Standards Institute (ANSI) has been applied throughout the process of approving this document.

Continuous Maintenance

This standard is under continuous maintenance by the AARST Consortium on National Standards for which the Executive Stakeholder Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard.

Notices

Rights to appeal: All directly and materially interested parties who have been, or will be, adversely affected by a decision made by a Standards Development Committee (SDC) or the Consortium Executive Stakeholder Committee (ESC) in the implementation of AARST Consortium on National Standards procedures have the right to appeal. Such policies and procedures can be found at www.standards.aarst.org/public-review.

TOPIC #1 BUILDNG INFORMATION

This revision clarifies information that is critical when engaging a mitigation project.

4.1 Assemble Building Information

Before providing proposals, the *contractor* shall obtain ~~or attempt to obtain~~ information that includes:

a) The objective of the *mitigation*, be it *radon gas*, *chemicals of concern (COCs)*, flammable gas, or proactive *mitigation* efforts due to suspected hazards;

b) The results of any *radon* or *COC* measurements with information relative to action levels, toxicology, site classification, and any other concurrent remedial actions. Measurement results and any related information shall be recorded and retained in the jobsite records;

c) Building details regarding design and construction practices for each attached foundation area and the approximate age of the building or portion of the building targeted for *mitigation* shall be determined and recorded in the jobsite records; and

d) Any *diagnostic* procedures and measurements that have been conducted for each building or the common portion(s) of the building(s) to be mitigated.

TOPIC #2 GENERAL PRINCIPLES

These revisions clarify conditions not otherwise specifically addressed in the standard.

5.1 Appropriate Systems

5.1.1 *General principles*

The following considerations shall be evaluated when judging appropriate characteristics of a *mitigation* system or method.

a) Safety

The *mitigation* system shall not create health or safety hazards. The building shall not be altered such that it becomes less safe than its existing condition, to include, but not limited to, maintaining the existing level of fire protection and level of protection provided by means of egress.

b) Accessibility

Equipment ~~installed that requires~~ requiring routine inspection and maintenance, such as fans, system controls, and system monitors, shall be installed in ~~a~~ locations *accessible* to individuals responsible for system maintenance without requiring ~~destructive~~ destruction or significant disassembly of building components or finishes.

c) Durability

Materials or methods not specified herein that are used in *mitigation* efforts should be capable of retaining functional integrity for the life of the system. Serviceable mechanical and control equipment should have designed life spans ~~that are~~ comparable to other similar mechanical system equipment.

d) Unnecessary Noise

Choices and actions that minimize objectionable, *unnecessary noise* should be part of the design and installation of each system. Where noise is both objectionable and unnecessary, actions should be taken to reduce ~~*unnecessary noise*~~ it to the extent practicable. *Unnecessary*

noise shall be defined as noise generated by system vibration or air rushing sounds at air intakes or exhausts that can be reduced by:

1. Reducing the transfer of vibration from system components that come in contact with building materials; or
2. Reducing air velocity at the point of exhaust or air intakes, such as those within non-habitable spaces or under membranes.

TOPIC #3 CLARITY ON THINGS NOT TO BE COMPROMISED

These revisions provide additional detail on commonly encountered conditions.

5.1.2 ***Other building systems***

The *mitigation* system shall not:

a) compromise the functionality of mechanical, groundwater control, or drainage systems;

b) compromise the functional integrity of roofs, roof flashing, guttering, siding, or other structural systems;

c) compromise existing insulation and air barriers that block:

1. cold air in winter and warm, humid air in summer from entering a building, and
2. heated and cooled indoor air from exiting the building.

TOPIC #4 SEALING AND OTHER NON-ASD METHODS

These revisions clarify non-ASD methods by providing more detail in a new section

5.3.5 ***Non-ASD methods***

All non-*ASD* systems, methods, and *diagnostic procedures* shall comply with Section 12 of ANSI/AARST SGM-MFLB.

a) Inverted Fan

Where installing soil air pressurization systems with an inverted fan to pressurize rather than depressurize soil air, the design shall comply with ANSI/AARST SGM-MFLB, Section 12.4 (Soil Air Pressurization) to include compliance with Section 12.2 (Sources for Air) and Section 7 (Sealing).

b) Passive mitigation

Where installing passive mitigation, the design shall comply with ANSI/AARST SGM-MFLB, Section 12.7 *(Passive Methods and Systems)*, Requirements also include :

1. Verifying seasonal effectiveness

Verification of effective passive mitigation requires testing indoor radon or soil gas concentrations to include requirements in Section 12.1.6 for verifying seasonal effectiveness;

2. *Sealing alone*

For radon, sealing of gaps and openings between soil and indoor air is not to be regarded as a permanent, stand-alone mitigation method. “EPA does not recommend the use of sealing alone to reduce radon because, by itself, sealing has not been shown to lower radon levels significantly or consistently.” [1]

Note—Sealing alone should be avoided for preventing entry of all types of soil gas and should only be considered for VI sites if other preferred methods are not possible due to site conditions and if approved by the AHJ.

[1] The EPA “Consumer's Guide to Radon Reduction” 402-K92-003, August 1992 and 402/K-10/005, December 2016

3. Passive soil ventilation

Clients shall be informed in proposals, in instruction pamphlets, and in plans for OM&M that passive soil ventilation does not reduce indoor concentrations of radon or other hazardous soil gas at all times.

All soil ventilation air shall comply with ANSI/AARST SGM-MFLB Section 12.2.4 (Adverse effects) to include occupant safety, damaging effects to building components due to temperature or humidity, and unnecessary energy consumption.

Post-construction installation of designs that emulate ANSI/AARST CCAH or CC-1000 are to be considered unreliable where aggregates below the building are not highly permeable and where the design does not include thermal optimization features that aid upward movement of exhaust air for more than 50% of the year.

4. Passive vents

Where mitigation relies on passive vent openings, such as for crawl spaces, to passively or, as induced by exhausted air, actively provide dilution air to interior or non-habitable air spaces, the configuration shall meet requirements in a) and b) of ANSI/AARST SGM-MFLB Section 12.2.6 (Passive vent openings).

a. Vent openings shall be non-closeable when used, installed, or altered for mitigation purposes to maintain ventilation of an interior space, a crawlspace, or other non-habitable air space.
b. Protection of building systems shall be provided where passive vents are open to subfreezing conditions, such as insulating, isolating, or applying heat-tape to exposed water supply and distribution pipes.

TOPIC #5 SUCTION PITS

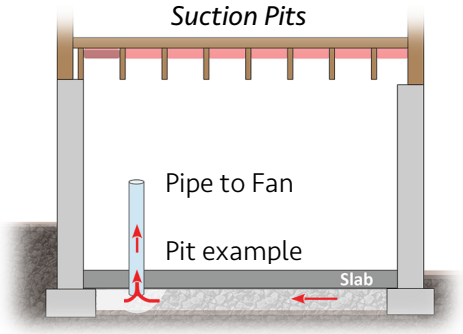
These revisions clarify suction pit sizing

6.1 ASD Suction Points

6.1.1 *Suction pits*

A cleared void space shall exist or be created below all suction points through slab floors and to the side of all *suction points* through walls unless excavation is not practicable. This cleared void space shall be not less than 0.25 ft^3 (7 dm^3), which equates to 2.0 US gallons (8 L) of excavated sub-slab soil/aggregate.

Exception: Where multiple *suction points* are employed, secondary suction pits designed for condensate drainage or airflow balance are permitted to have a smaller cleared void space.



6.1.1.1 Aggregate Layers

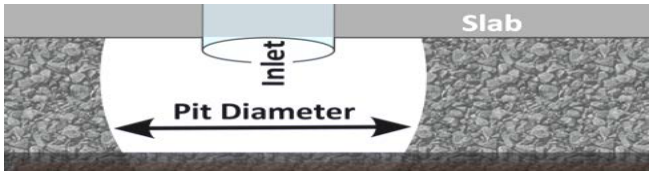
Where a nominally 4-inch-thick layer of gravel or *aggregate* is found below slabs, the suction pit diameter within the 4-inch layer shall comply with a), b), and c) of this Section 6.1.1.1.

a) Where the aggregate is mostly 3/4-inch (2 cm) stones with very little sand and fine rock fragments, the cleared void space shall comply with Table 6.1.1.1.

b) Where the *aggregate* is mostly 3/8-inch (9.5 mm) stones with very little sand and fine rock fragments, the void space shall be nominally two times the diameter specified in Table 6.1.1.1.

Table 6.1.1.1 Pit Size (4 Inch Aggregate Layers)

Suction Pipe Size	Cleared Void Space
≤ 3 inch (75 mm) ID	≥ 12" (300 mm) Pit Diameter
4 inch (100 mm) ID	≥ 16" (400 mm) Pit Diameter



c) Where the *aggregate* contains a high percentage of sand granules that are 0.19-inch (4.75 mm) with little silt and sand fragments, the void space shall be nominally three times the diameter specified in Table 6.1.1.1.

d) Where sub-slab material exhibits poor permeability, diagnostic evaluations shall be conducted to determine:

1. if a different suction pit location is better;
2. if sub-slab materials are impervious, such as are most clays or powdered sand;
3. if multiple suction pits are likely to be required; or
4. if larger pits with a void as large as to 7.5 US gallons (28 L) or more of sub-slab aggregate are likely required.

Informative Exhibit 6.1.1.1 Granular Aggregate Sizes Relative to Degree of Permeability	
3/4-inch (2cm) Aggregate (Gravel) 	Aggregates classified in ASTM C33 as #5, #56, #57, and #6 These aggregates, that are mostly 3/4-inch (2 cm) stones with less than 5% fines, are highly permeable and commonly used in building construction to aid groundwater drainage.
3/8-inch (9.5 mm) Smaller Aggregate 	Aggregates classified in ASTM C33 as #67, #7, and #8 These aggregates are mostly 3/8-inch (9.5mm) stones with less than 5% fines. Though quite permeable, there is more resistance to air movement because the gaps between stones are about ½ the size of those in 3/4-inch (2 cm) aggregates. Hence, pit diameters are to be about double the size compared to pits that are open to 3/4-inch (2 cm) aggregates.
Small Gravel/ Sand Aggregate 	Aggregates classified in ASTM C33 as #8.9 and #9 Due to significant resistance to air movement through small pores between sand granules, pit diameters are to be about three times larger than pits that are open to 3/4-inch (2 cm) aggregates.

TOPIC #6 PITS AND SUMP PIT

These revisions clarify requirements for the difference between existing holes or pits compared to pits containing sump pumps.

6.1.2.2 Accessibility to Sump~~s~~ Pumps

Provisions of Section 7.5 (Sumps and Pits) for sealing pits that contain *sump* pumps shall include a physical access port or equivalent. Flexible coupling disconnects for suction piping, as specified in Section 6.2.6, shall be provided to ease *sump* lid removal.

7.5 Sumps and Pits

~~*Sumps* or other~~ Any *accessible* pit openings in the interior slab(s) that connect to soil air shall be closed to resist air movement between soil and indoor air ~~covered and sealed~~ to the extent possible without compromising the capability of water control systems. ~~capability of the *sump.*~~ The manner of closure shall not compromise safety concerns, such as emergency pressure relief discharge from hydronic heating system water boilers. ~~Covers are~~ Closure is not required for pits that do not connect to soil air.

7.5.1 *Labeling required (Pits)* ~~*sump covers)*~~

All pits open to soil that are closed with a rigid cover or access panel, as described in 7.5.2, shall be labeled in accordance with ~~*Sump* lid labels shall be provided in compliance~~ with Section 8.4.6 a.

7.5.2 ***Sealed Lids***

The lid shall be sealed to resist air movement between soil gas and indoor air with a gasket or with non-permanent caulk such as silicone. Penetrations through the lid, such as gaps around electrical wiring, water ejection pipes, and *ASD* piping, shall be sealed. Sealing methods shall not include simply taping openings and gaps or using foam sealants to seal or affix the lid.

7.5.3 ***Sump ~~Pit~~ Pump Access***

Where work includes installing, modifying, or altering a sump cover for a pit that includes a *sump* pump, the sump cover shall include a removable handhole port or section of the lid no less than 4 inches (10 cm) in diameter that allows physical access for routine verification that pumps are operational. The access port shall achieve open access and reclosure without the use of sealants, as can be achieved by way of friction fit or screw-on caps, rubber grommets, or equivalent methods. *ASD* suction pipe connections shall not be used for access ports.

~~7.5.2 *Labeling Required (sump covers)*~~

~~*Sump* lid labels shall be provided in compliance with Section 8.4.6 a.~~

7.5.4 ***Sump pump water discharge***

If flexible rather than rigid water discharge piping is found, the *contractor* shall recommend in writing that rigid pipe for water discharge from permanent *sump* pumps be installed. This recommendation shall be provided in the OM&M plan when encountered if the client is unavailable or takes no action. *Sump* pumps or piping configurations for water discharge from the sump pump shall have a backflow prevention valve as typically provided to protect against pump failures. Should there be a need for the *contractor* to alter the destination of discharged sump water, the destination shall meet requirements of local authorities.

TOPIC #7 SEALING ASD PIPING

These revisions clarify the needs for sealing

6.2 ASD Piping

6.2.1 ***Air and water-tight***

All duct piping and fittings that transport air shall result in being air- and water-tight.

Exceptions: Soil gas intake and exhaust locations, and system monitoring locations where inserted tubing has a friction-tight closure.

TOPIC #8 PIPE SLOPE

These revisions clarify pipe slope for the important need to drain water

6.2.2 ***Slope required***

Pipe routing configurations that ~~result in obstructed airflow as a result of allowing~~ allow water to collect within duct piping are prohibited. Above-ground duct piping shall have a continuous downward slope ~~toward the *suction point(s)*~~ of not less than 1/8 inch (3.2 mm) per foot (30 cm) such that it ~~to~~ allows condensation or rainwater within the pipes to drain ~~downward~~ into the ground beneath the slab, *soil gas retarder* membrane, or to a condensation uplift pump. ~~When drainage cannot be achieved, other methods for draining collected water shall be provided.~~

TOPIC #9 CLEAN-UP (CONSOLIDATE) PIPE TEXT

These revisions clarify pipe material requirements.

6.2.5 *ASD pipe materials*

All *ASD* duct piping, except piping routed below concrete slabs or under *soil gas retarder* membranes, shall be rigid, non-perforated pipe that is suitable for drainage of condensate water. ASD duct *piping* shall be PVC plastic piping compliant with ASTM D2665, F891, or F1488. Pipe wall thickness shall be Schedule 40 with solid, cellular core, or composite walls. Alternatively, piping materials specified in codes for "Above-Ground Drainage and Vent Pipe" [2] are also permitted. Examples of these alternative piping materials include Schedule 40 ABS plastic, iron, steel, copper, and other plastic materials deemed in codes to be durable for above ground use.

For buildings classified as single-family structures that contain ~~not more than~~ four or fewer attached *dwelling* units on a contiguous foundation, other pipe products not listed in codes for above-ground use are permitted where deemed acceptable by:

a) local state licensing/certifying programs that provide written acceptability for the product; or

b) local code authorities for locations that have no state licensing/certifying program.

~~c) a) ABS plastic piping shall comply with ASTM D2661, F628 or F1488. Pipe wall thickness shall be Schedule 40 with solid, cellular core or composite wall. ABS pipe joints shall be solvent welded in accordance with the pipe manufacturer's instructions, with solvent cement conforming to ASTM D 2235.~~

~~d) b) PVC plastic~~

~~e) c) All *ASD* plastic pipe fittings shall be of the same material as the plastic piping they are joined to, and solvent welded unless:~~

6.2.5.1 Joints

All piping and pipe fittings shall be joined in accordance with the pipe manufacturer's instructions and as required by code. The joint surfaces for plastic pipe and fittings shall be solvent-welded as stipulated in pipe or solvent manufacturer's instructions and shall be:

a) prepared with a primer before applying solvents; or

b) joined with a self-priming product.

All *ASD* plastic pipe fittings shall be of the same material as the plastic piping to which they are joined, and solvent-welded unless:

a) joined with flexible couplings in accordance with Section 6.2.6, or

b) sealed to be watertight and mechanically fastened to withstand forces that may be present.

TOPIC #10 STRAPPING

These revisions clarify requirements for securing duct piping.

6.2.7 *Secure duct piping*

6.2.7.1 Duct piping shall be fastened to the structure of the building with hangers, strapping, or other supports that will withstand forces such as wind, ice, and degradation over time. The fastening system shall comply with requirements in a), b), c), and d) of this Section 6.2.7.1.

[2] As point of reference for alternative piping, see the International Residential Code (IRC) Table P3002.1 (1).

a) Mechanical hardware or fasteners shall be durable for the purpose and weather-rated when employed outdoors;

b) The anchoring method and fastening materials shall be suitable to secure the anchors durably to whatever building surface is chosen for securing the duct piping;

c) Existing plumbing pipes, ducts, or mechanical equipment shall not be used to support or secure duct piping; and

d) Fastening systems that rely only on extending a nail or screw through the duct piping and into a wall or other supporting surface shall not be used to secure duct piping.

6.2.7.2 General Support

Supports for *ASD* plastic piping shall be installed no less than every 10 feet (3 m) on vertical piping and 4 feet (1.2 m) on horizontal piping. Alternate *ASD* duct materials identified in Section 6.2.5, such as iron, steel, or copper, shall be secured in a manner that meets codes [3] and manufacturer recommendations.

6.2.7.3 Additional support

Additional support is not required for exterior fans where short lengths of piping below the fan penetrate joists or other structural components to support the weight of fan and pipe assemblies. Additional supports are, however required:

a. Within 4 feet (1.2 m) on horizontal piping from where piping turns upward to support the weight of fans and where the weight of other vertically mounted pipe is not otherwise supported. This includes within 4 feet (1.2 m) from where the point of exhaust discharge turns upward; and

b. On horizontal piping that exceeds 10 feet (3 m) in length, such that lateral movement is prevented.

TOPIC #11 ICE BUILDUP AND DRIPPING

These revisions address the need in some climate zones to prevent pipe freeze-up

6.2.9 ***Protect ducts from the elements (insulation)***

For wet and cold climate zones 6, 7, and 8, as identified in Exhibit 6.2.9, the proposal in Section 4.2 (Proposals) shall disclose the potential for ASD systems to freeze up due to ice formation. The proposal shall provide options and associated costs for a design that will inhibit systems from being blocked by ice, such as insulation, electrical heat tape, pipe enclosures that are open to heated areas in the home, increased velocity of discharged air, or other methods.

Elsewhere, duct piping shall be provided with thermal insulation or another solution in accordance with the following two requirements:

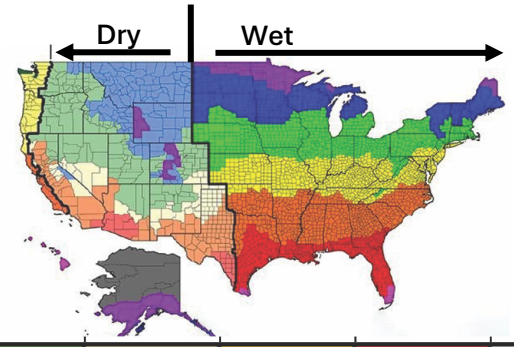
a) Where it is likely on a regular basis (e.g., annually or every few years) that freezing temperatures will result in ice buildup within duct piping that would adversely affect system performance, a solution to inhibit systems ice buildup shall be determined. Where thermal insulation is chosen, the insulation shall be protected from the elements and have an R-value of not less than 4; and

b) Where it is likely that condensation on exterior surfaces of duct piping would damage building materials, the insulation shall have an external vapor barrier and an R-value of not less than 1.8.

Note—For more extreme climates, greater R-values may be appropriate.

[3] As point of reference, the International Mechanical Code (IMC), the International Plumbing Code (IPC) or the International Residential Code (IRC) that are published by the International Code Council.

EXHIBIT 6.2.9 Freeze-up (wet climate zones)



Example Locations								
	Fairbanks	*Caribou ME* *Quebec* *Marquette MI* *Duluth MN* *Winnipeg* *Grand Forks* *Anchorage* *Breckenridge* *Aspen*	*Portland ME* *Buffalo NY* *Burlington NH* *Milwaukee* *Minneapolis* *Bismarck ND* *Pierre SD* *Cheyenne WY* *Billings MT* *Helena MT*					
	Zone 8 Subarctic	**Zone 7 Very Cold**	**Zone 6 Cold**	**Zone 5 Cool**	**Zone 4 Mixed**	**Zone 3 Warm**	**Zone 2 Hot**	**Zone 1 Very Hot**
			Annual Average Outdoor Temperatures					
	27 F (-3 C)	**39 F** (4 C)	**45 F** (7 C)	**49 F** (9 C)	**55 F** (13 C)	**62 F** (17 C)	**69 F** (21 C)	**76 F** (24 C)
% of year	100%	83%	75%	75%	66%	58%	42%	50%
Heating	< Freezing							
Cooling							16%	50%
Neither		16%	25%	25%	16%	25%	42%	
					16%	16%		
Avg. Low Winter Temps	**Zone 8**	**Zone 7**	**Zone 6**	**Zone 5**	**Zone 4**	**Zone 3**	**Zone 2**	**Zone 1**
	Dec/Jan/Feb	*Dec/Jan/Feb*	*Dec/Jan/Feb*	*Dec/Jan/Feb*	*Dec/Jan/Feb*	*Dec/Jan/Feb*	*Dec/Jan/Feb*	*Dec/Jan/Feb*
	-6 F (-21 C)	**2 F** (-17 C)	**9 F** (-12 C)	**17 F** (-8 C)	**26 F** (-3 C)	**35 F** (2 C)	**45 F** (7 C)	**61 F** (16 C)

Climate Zone 8
Includes the utmost northern portions of North America.

Climate Zone 7
Includes many Canadian provinces, mountain tops, and utmost northern locations in the United States

Climate Zone 6
Includes portions of ME, NH, VT, WI, MN, ND, WY, SD, ND and Canada.

Concerns for freeze-up (wet climate zones 6, 7, and 8)

The "average low winter" outdoor temperature across Dec-Jan-Feb, for climate zones 6, 7, and 8 includes cold spells likely to occur each year that are ≥10 degrees F colder than this "average low" temperature. Icing in wet climates typically begins wherever the inner wall surfaces of piping, rain caps, and fans, normally kept above 32 F (0˚ C) by contact with warmer < 50 F (10 C) soil gas, have fallen to below freezing temperatures. Freeze-up is likely in wet climates within days or weeks of exposure to less than ~ 0˚ F (-18 C) outdoor temperatures.

This section is rewritten for more concise clarity.

Note—The primary substantive change for this section is removal of exhaust requirement to be 10 ft to the side of operable openings. Relaxing this requirement to 4 ft does however require that the exhaust air be and pointed away from operable openings.

6.4 Exhaust Design

6.4.1 *Exhaust air and measuring distances*

The destination of exhausted soil gas shall comply with all provisions in this Section 6.4. The *stretched-string method* shall be used to measure all distances specified in Section 6.4.

6.4.1.1 The point of exhaust shall be outdoors with soil gas exhausted upward to not deviate more than 45 degrees from vertically upright, except as allowed in Section 6.4.4.

Fig 6.4.1

6.4.1.2 The direction of exhausted gas determined shall comply with Sections 6.4.3 and 6.4.4.

6.4.2 *Straight-line exhaust (restrictions)*

The *straight-line* path for soil gas exhausted shall be pointed to not encounter any objects or any areas where people could be present within 20 feet (6 m) from the point of exhaust.

6.4.3 *Directional exhaust spread (restrictions)*

For the wider 45-degree *Directional Exhaust Spread*, the *point of exhaust* shall not be less than 4 feet (1.2 m) away and pointed away from all of the following items that are within 10 feet (3 m) of the point of exhaust:

a) *Operable openings* in structures;

b) Fixed openings intended for ventilating *indoor air* with outdoor air;

c) Building materials (except for roof materials that are resilient to damp conditions); and

d) The breathing space where people could be present.

Fig 6.4.3

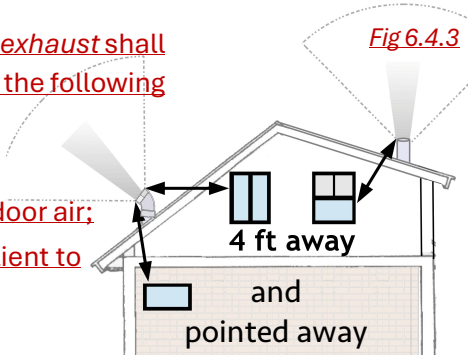
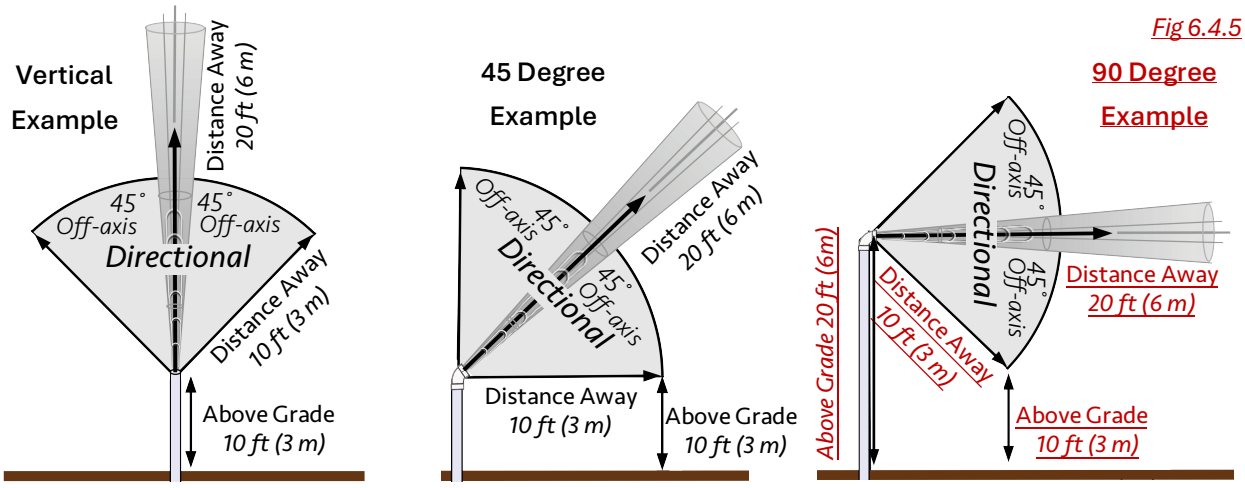


Fig 6.4.5



6.4.4 *Exhaust point elevation*

The *point of exhaust* shall not be less than:

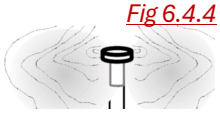
a) 10 feet (3 m) above the nearest grade and 10 feet (3 m) above outdoor flooring surfaces, to include sidewalks, patios, decking, and balconies; and

b) 20 feet (6 m) above the nearest grade for designs that exhaust soil gas, either:

1. horizontally, but not more than 90 degrees from vertically upright; or
2. below the edge of the roof, in accordance with Section 6.4.6.

Exception: Diffused horizontal exhaust designs that exhaust soil gas 360-degrees horizontally in all directions are permitted where not less than:

Fig 6.4.4



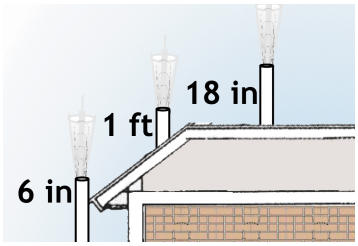
a) 15 feet (4.6 m) above the nearest grade and outdoor flooring surfaces; and

b) 15 feet (4.6 m) away from items listed in Section 6.4.3.

6.4.5 *Roof*

The *point of exhaust* shall not be less than:

Fig 6.4.6



a) 6 inches (15 cm) above the edge of the roof when *ASD* piping at the point of exhaust is attached to the side of a building;

b) 1 foot (30 cm) above a pitched roof at the point penetrated; and

c) 18 inches (46 cm) above a flat roof.

Exception: If compliant with Section 6.4.6.

6.4.6 *Below the roof*

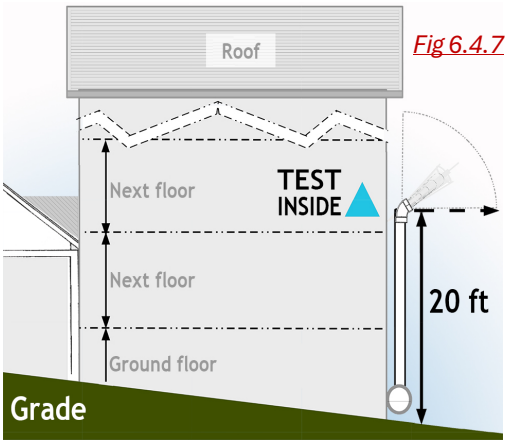
The point of exhaust shall be permitted to be located below the edge of the roof if compliant with all other requirements in Section 6.4 and *both* a) and b) of this Section 6.4.6.

a) The reason for placing the exhaust below the roof edge shall be noted in the informational package or OM&M Manual based on either:

1. the inability to comply with other requirements of Section 6.4 if located above the roof, or
2. the edge of the roof exceeds 20 feet (6 m) above the nearest grade.

b) Post-mitigation testing of ASD systems shall include testing indoor occupiable area(s) that immediately adjoin the point of exhaust outdoors.

Fig 6.4.7



6.4.7 *Increased Distances*

When the *ASD* system is designed for higher airflow capacities with duct piping larger than 4-inch (100-mm), distances shall be increased beyond those required elsewhere to comply with **Table 6.4.7**.

Table 6.4.7 Increased Distances Required Where High-Flow Piping Is Needed

Pipe ID *≤ 4" Pipe (10 cm)*	*Straight-line Exhaust Restrictions* **In Section 6.4.2** = *20 ft (6 m)*	*Directional Exhaust Spread Restrictions* **In Section 6.4.3** = *10 ft (3 m)*	*Point of Exhaust* **In Section 6.4.3** = *4 ft (1.2 m) away* **In Section 6.4.4** *(elevation)* = *10 ft (3 m), 20 ft (6 m), and 15 ft (4.6 m)*
For Larger Pipe ID	**Increase to**	**Increase to**	**Increase distances by**
6" (15 cm)	25 ft (7.6 m)	12 ft (3.6 m)	2 ft (0.6 m)
8" (20 cm)	30 ft (9 m)	18 ft (5.5 m)	4 ft (1.2 m)
Larger than 8" (20 cm)	Shall be increased to meet or exceed ASHRAE 62.1, Appendix B (Separation of Exhaust Outlets and Outdoor Air Intakes)		

14.0 DESCRIPTION OF TERMS

14.x **Exhaust (Straight-line):** The straight-line path for the bulk of exhausted soil gas propelled the furthest distance away by a fan. *Straight-line exhaust* air spreads out from the point of exhaust at a narrow offset-axis angle of 11°. The trajectory of this air is dependent upon the angle of the piping or elbow at the point of exhaust.

14.x **Exhaust spread (Directional):** The smaller portion of exhaust air moving within an area that spreads out from the point of exhaust at a wide offset-axis angle of 45°. The trajectory of this air is dependent upon the angle of the piping or elbow at the point of exhaust.

14.x **Indoor air:** Air within the thermal envelope of the building.

14.x ~~**Openings in a structure:** Openings in structural walls or roofs for mounting windows, skylights, doors, or other assemblies.~~

14.x **Operable openings**: The portion of windows, skylights, doors, and other openings that can be opened or remain open to allow ventilation of indoor air with outdoor air within the thermal envelope. Portions of a window specifically designed to temporarily open for cleaning are not considered readily operable for increasing ventilation with outdoor air.

14.x **Stretched String Method: A method of measuring the shortest distances between two points that may include an uneven pathway or intervening obstacles. Example: The shortest distance air travels between the point of exhaust and openings in a building, as if a string were stretched between them.**

14.x **Thermal envelope:** The basement walls, exterior walls, floors, ceilings, and any other building element or assemblies that enclose conditioned space or provide a boundary between conditioned space and exterior or unconditioned space.

~~6.4 ASD Exhaust Discharge~~

~~6.4.1 *General*~~

~~6.4.1.1 Measuring Distances - Stretched String~~

~~Distances shall be measured between the closest point of the exhaust opening to the closest point of all location requirements specified in Section 6.4 using the shortest distance, as if a string were stretched between them.~~

~~6.4.1.2 Definitions~~

~~Definitions a), b), c) and d) of this Section 6.4.1.2 shall apply to exhaust requirements in Section 6.4:~~

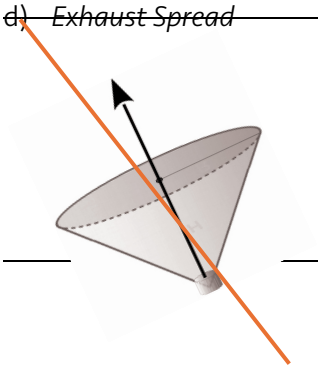
~~a) *Openings In Structure* - The openings created in structural walls or roofs for the purpose of mounting windows, skylights, doors or other assemblies that might open to outdoor air;~~

~~b) *Operable Openings* - The operable or constantly open portion of windows, skylights, doors and other openings designed to readily operate for increasing ventilation with outdoor air. Portions of a window specifically designed to temporarily open for cleaning are not considered readily operable for increasing ventilation with outdoor air;~~

~~c) *Exhaust Trajectory* - The angle of the pipe or elbow at the *point of exhaust*. The angle of the exhaust trajectory from the open end of the pipe or elbow is geometrically defined as~~

the straight or center line axis that extends outward from the geometric center of the exhaust opening and is perpendicular to the plane of the exhaust opening; and

d) *Exhaust Spread* The exhaust spread extends outward from the *point of exhaust* in the shape of a circular cone. The tip or apex of the cone is at the geometric center of the exhaust opening and the cone profile grows larger as distance from the *point of exhaust* increases.



The total directional spread of the exhaust or cone is defined in degrees by the offset axis angle of the cone profile compared to the cone's center line axis. Expanding outward from the *point of exhaust*:

- An exhaust spread radius of 45˚ equals an exhaust spread diameter of 90˚.
- An exhaust spread radius of 11˚ equals an exhaust spread diameter of 22˚.

6.4.2 *Outdoors*

The point of exhaust for all soil gas vent systems shall be located outdoors.

6.4.3 *Directional spread (restrictions)*

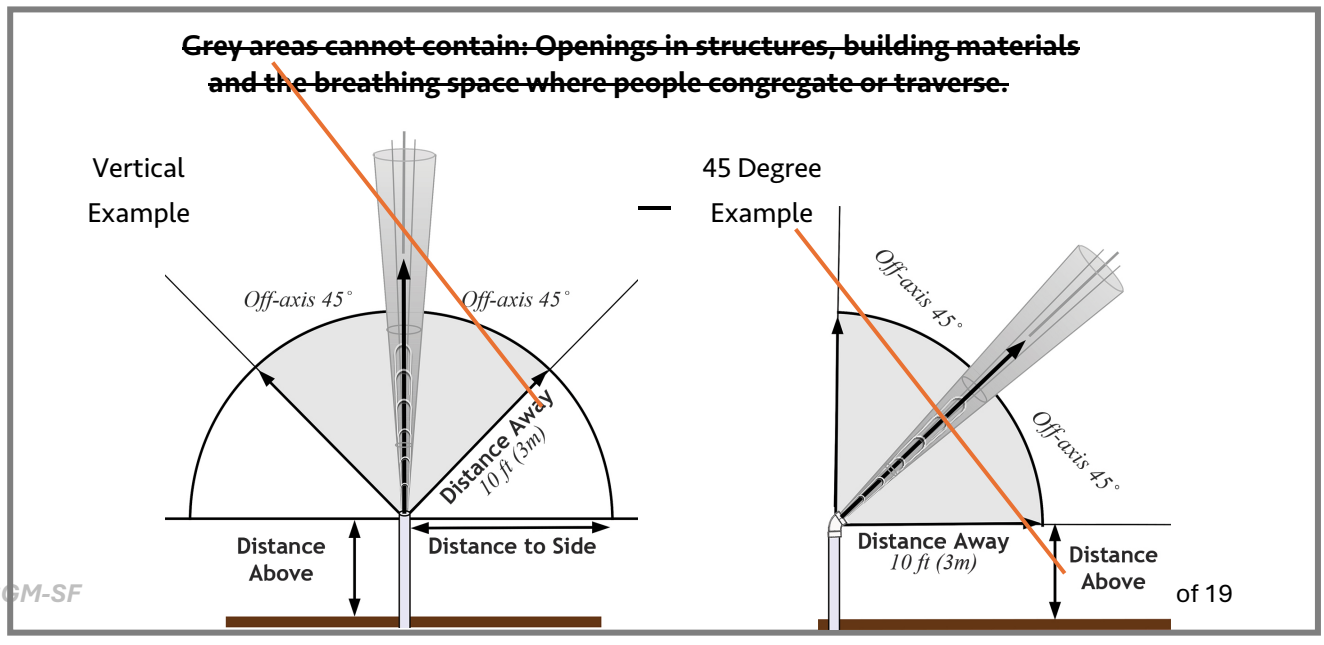
The *exhaust trajectory* with an *exhaust spread* radius of 45˚ shall not encounter openings in any structures, building materials or the breathing space where individuals congregate or traverse within 10 feet (3 m) from the *point of exhaust*.

Exception: EPDM, composite, or otherwise layered water-tight roofing materials.

6.4.4 *Straight-line trajectory (restrictions)*

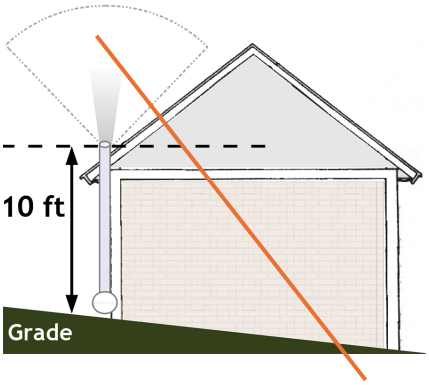
The *straight-line exhaust trajectory* with an *exhaust spread* radius of 11˚ shall not encounter openings in any structures, attic ventilation openings, building materials or the breathing space where individuals congregate or traverse within 20 feet (6 m) from the *point of exhaust*.

Figure 6.4



6.4.5 *Elevation above grade*

The point of exhaust shall be located not less than 10 feet (3 m) above grade nearest to the *point of exhaust* and shall be compliant with Section 6.4.3 (*Directional spread*) and Section 6.4.4 (*Straight-line trajectory*).



6.4.6 *Separation from operable openings in structures*

The point of exhaust shall be compliant with Section 6.4.3 (*Directional spread*) and located:

a) not less than 10 feet (3 m) horizontally to the side operable openings in structures; and

b) not less than 4 feet (120 cm) away from operable openings in structures that are below the point of exhaust.

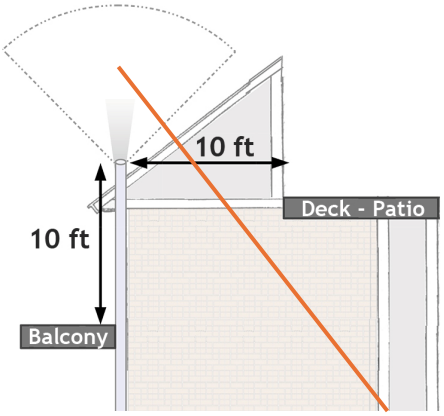
Note

6.4.7 *Separation from people*

In relationship to exterior flooring surfaces such as decking, patios, sidewalks, and exterior corridors where individuals congregate or traverse, the *point of exhaust* shall be:

a) not less than 10 feet (3 m) above or horizontally to the side of exterior flooring surfaces; and

b) compliant with Section 6.4.3 (*Directional spread*) for an elevation of not less than 10 feet (3 m) above exterior flooring surfaces.



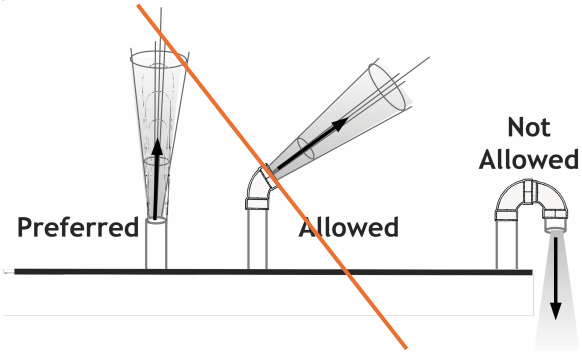
6.4.8 *Equipment wells and parapet roofs*

The point of exhaust relative to open equipment well airspaces or parapet roof construction, where areas are enclosed by more than two walls, shall comply with Section 6.4.3 (*Directional spread*), to include the breathing space where individuals conduct maintenance.

6.4.9 *Angled trajectories*

The point of exhaust shall be directed upward without obstruction at an angle that does not deviate more than 45 degrees from a vertical *exhaust trajectory*. The exhaust discharge shall not exhaust downward.

Exception: 90 degree horizontal exhausts shall comply with requirements in Section 6.4.12.



6.4.10 *Roof*

The *point of exhaust* shall comply with Section 6.4.3 (*Directional spread*) and, unless all requirements of Section 6.4.11 are met, the *point of exhaust* shall be:

d) not less than 1 foot (30 cm) above a pitched roof at the point penetrated;

e) not less than 6 inches (15 cm) above the edge of the roof when *ASD* piping is attached to the side of a building;

f) not less than 18 inches (46 cm) above a flat roof; and

g) not less than 4 feet (120 cm) horizontally away from a vertical wall that extends above the roof edge.

6.4.11 *Below the roof*

The *point of exhaust* shall be permitted to be located below the edge of the roof if the configuration complies with all requirements of Section 6.4 and requirements of a), b), and c) of this Section 6.4.11:

a) The justification for not locating the exhaust above the edge of the roof shall be recorded in the operations and maintenance plan and shall be based upon either:

3. the inability to comply with other requirements of Section 6.4 if the point of exhaust were located above the roof, or

4. the edge of the roof exceeds 20 feet (6 m) above grade nearest to the point of exhaust;

b) The *point of exhaust* shall be: compliant with Section 6.4.3 (*Directional spread*); not less than 20 feet (6 m) above grade nearest to the point of exhaust; and not less than 4 feet (120 cm) away from operable openings that are above the point of exhaust; and

c) Testing shall be conducted within the occupiable area that immediately adjoins the 45˚ (*Directional spread*) required in Section 6.4.3. This testing is required no later than in conjunction with the initial post-*mitigation* test and shall be recommended for inclusion in all future post-*mitigation* tests.

Note

6.4.12 *Horizontal trajectory*

While it is best practice to avoid horizontal trajectories, 90-degree horizontal exhaust trajectories are permitted if compliant with all other distances required in Section 6.4 and Section 6.4.12.1 or Section 6.4.12.2.

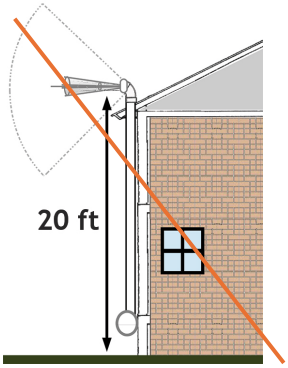
Note

6.4.12.1 90-Degree Horizontal Discharges

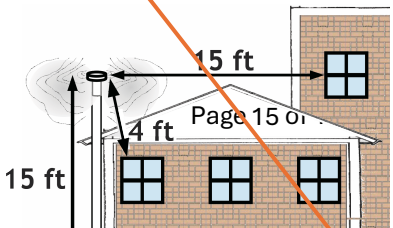
If passing the edge of the roof, the *point of exhaust* for a 90-Degree horizontal discharge shall not be less than 20 feet (7.5 m) above grade nearest to the point of exhaust. The point of exhaust shall comply with Section 6.4.3 (*Directional spread*) including for distances above the breathing space where individuals congregate or traverse as stipulated in Section 6.4.7.

Where "T" style rain caps are configured for 90-Degree horizontal discharge in two directions, both discharge trajectories shall meet these requirements.

Note



6.4.12.2 Diffused Horizontal Discharge/Rain Caps



~~The *point of exhaust* for diffused horizontal discharges shall not be less than 15 feet (4.6 m) above grade nearest to the *point of exhaust* and not less than 4 feet (120 cm) above or 15 feet (4.6 m) away from *operable openings* into the structures, such as windows, skylights and doors.~~

~~6.4.13 *Increased distances for large capacity systems*~~

~~When the *ASD* system is designed for larger airflow capacities with duct piping larger than 4 inch (100 mm), distances shall be increased beyond what is required in Section 6.4 to comply with Table 6.4.13 in the most current publication of ANSI/AARST SGM-MFLB.~~

TOPIC #13 ASD FANS

These revisions clarify acceptable ASD fans

6.5 ASD Fan Installation

6.5.1 ***ASD** Fan design*

~~*ASD* fans chosen shall be~~: For ASD systems, contractors and qualified professionals shall choose fans that are:

a) ~~designed~~ rated for *continuous duty* operation;

b) ~~designed or otherwise~~ sealed and watertight; ~~to reduce the potential for leakage of water and soil gas~~;

c) ~~designed to~~ capable of allowing rainwater or condensation ~~from~~ within *ASD* piping to pass through or around the fan when operating; and

d) ~~represented by the manufacturer as both~~ appropriate for both the class of contaminants being extracted and UL Rated ~~with features that~~ to meet minimum safety standards in accordance with UL 507 (Standard for Safety for Electrical Fans) or other UL standard, to include:

1. thermal overload protection that prevents the fan motor from overheating[4];
2. protection against electrical shock for fans both on the interior and exterior of buildings, that may include a fan installed in a weatherproof protective housing that results in a code-compliant configuration; and
3. other features that result in a safe fan installation, such as those specified by codes[5] where evaluations of chemicals in soil have indicated that gases passing through the fan are corrosive or could result in a fire, explosion, or personal injury.

TOPIC #14 FAN LOCATIONS AND INSTALLATION

[4] As a point of reference, products evaluated by an OSHA Nationally Recognized Testing Laboratory for meeting applicable safety standards, such as UL 507 Standard for Safety for Electrical Fans published by Underwriters Laboratories Inc., Northbrook, Illinois. ulstandards.ul.com

[5] As a point of reference, additional information on code compliant fans rated for hazardous applications such as explosion proof fans are provided in the attached Companion Guidance for Vapor Intrusion.

These revisions consolidate messages to improve clarity.

6.5.2 ***Safe locations required***

To avoid accidents that can result in systems leaking radon and soil gas into *occupied spaces* due to a failed pipe joint or other sealed connection:

a) *ASD* fans shall not be installed in the conditioned (heated/cooled) or otherwise occupiable space of a building; and

b) *ASD* fans shall not be installed ~~directly~~ beneath conditioned or occupiable spaces of a building, such as a fan installation within a basement, *crawl space*, or enclosed garage that lies beneath any portion of occupiable space.

~~6.5.3 *Approved locations*~~

~~In compliance with requirements in Section 6.5.2, *ASD* fans are to be installed in attics, on the exteriors of buildings, or in garages that are not beneath conditioned or otherwise occupiable spaces.~~

Note—Ventilated attics or the exterior of the building are preferred locations. Considerations also include locations that avoid objectionable noise from fan vibration and exhaust air.

6.5.3 ***Fan Installation***

Installation of *ASD* fans shall comply with requirements in a), b), c), d), and e) of this Section 6.5.3.

a) *ASD* fans shall be sized to provide the pressure difference and airflow capacity necessary to achieve the *mitigation* goals;

b) *ASD* fans shall be installed in a configuration that avoids condensation buildup in the fan housing. To achieve this requirement, *ASD* fans shall be installed on vertical runs of *ASD* piping or in accordance with the manufacturer's specifications;

c) *ASD* fans shall be mounted to piping using flexible couplings that comply with ASTM D5926 or ASTM C1173 or using an alternative method specified by the manufacturer that achieves a watertight connection; ~~and~~

d) Piping or hoses installed for condensate bypass the fan shall be watertight and mechanically fastened to the piping system;

e) *ASD* fans subject to extreme climate conditions shall be protected with thermal insulation, as needed, in accordance with Section 6.2.9 (Protect ducts from the elements); and

f) *ASD* fans shall not be installed below ground.

TOPIC #15 SEALING

This revision speaks to clarity on topics in Section 7

~~**7.1 General**~~

~~7.1.1 Sealing is not to be regarded as a permanent, stand-alone *mitigation* method.~~

~~Note—The purpose and viable goal of sealing efforts are limited to achieving a continuous air barrier that resists air movement between soil and indoor air.~~

7.1 Continuous Air Barrier

7.1.1 Sealing efforts shall result in creating a continuous air barrier that resists air movement between soil and indoor air across all *accessible* areas of a building to be mitigated.
For these purposes the term "accessible" shall mean *accessible* without destructive or disassembly of building components or finishes.

Exceptions:

1. Where sealing efforts could compromise the effectiveness of ground water drainage systems.
2. Where the mitigation relies only on non-ASD mitigation methods that, in accordance with Section 12 (Non-ASD Mitigation Methods), do not require a continuous air barrier between soil and indoor air.

TOPIC #16 SUB-MEMBRANE DEPRESSURIZATION

These revisions clarify sub-membrane depressurization requirements

7.7 Sub-Membrane Depressurization (SMD)

7.7.1 ***SMD—Seams***

The seams between adjacent membrane sheets shall be overlapped and sealed with a compatible sealant or a caulk complying with ASTM C920 class 25 or greater. Alternatively, a method such as membrane tape recommended by the manufacturer that results in an equivalent durable bond shall be permitted. Where sealing seams, sealant products shall have adhesive qualities that re effective for gluing pieces of plastic together. Unless this is stated by the manufacturer, expanding foam shall not be an option for sealing membrane seams.

7.7.2 ***SMD—~~Pipe~~ Penetrations***

The openings around penetrations of a *soil gas retarder* for ~~*ASD* duct piping and other~~ utility pipe penetrations and other penetrations shall be fully closed using materials and methods that result in permanent closure

7.7.3 ***SMD—Securing the membrane***

Soil gas retarder membranes shall be *mechanically fastened* to foundation walls or footings and at structural supports. All outer edges of the membrane shall be secured by materials and methods that are capable of withstanding anticipated loads that might pull or tear the membrane away from walls or other surfaces.

Any wood installed as part of a *mitigation* system that directly contacts masonry or soil, such as when employed to secure a membrane, shall be resistant to decay and insects or otherwise protected.

Spray-applied adhesive products or expanding foam products shall not qualify as standalone options for securing a membrane.

These revisions clarify system monitoring requirements

8.2 System Monitors

8.2.1 *Viewable operating range monitors*

All *mitigation* systems that incorporate a fan shall include a system monitoring mechanism to directly indicate if the fan, blowers, or other integral mechanical components are operating within the established operating range. The design and installation of such monitors shall comply with the requirements in both a) and b) of this Section 8.2.1.

Fig 8.2.1

manometer

a) Continuous Display

The monitoring device shall provide a continuous display of a measured value within the established operating range. The monitor shall be located where it is easily seen and protected from damage or degradation.

b) Start up values

Monitoring devices that continuously display a viewable operating range shall be clearly marked or labeled to indicate the measured pressure, airflow volume or amperage readings that existed at the time *mitigation* goals were achieved.

c) Pressure hose connections

The hole drilled into piping for inserting a manometer hose shall be drilled at a downward angle to prevent condensate water in the pipe from entering the hose. The hose shall then be configured to extend upward above the drilled hole before turning downward to connect to the monitor.

Where the pressure monitor is located remotely, such that a drooping flexible hose over time will collect water, rigid pipe shall be configured to achieve an unobstructed air pathway that is pitched to drain back to the ASD piping.

Exception: Fan monitors that provide remote electronic monitoring and notification in the event of *ASD* fan or other mechanical failure, such as to accommodate where occupants are not the responsible party for system maintenance.