



SEALING OF ROOMS FOR CONTAINMENT OF FIRE SUPPRESSION AGENTS

This bulletin has been prepared to assist anyone who must seal a room for a fire suppression gas system. Suppression gas systems are designed to suppress all flame and fire spread, but cannot in every instance extinguish the initial source of ignition (for instance, severe electrical short circuit). Therefore it is critical that the suppression gas remain in the protected area until emergency personnel have a chance to deal with a possible continuing source of ignition.

1. **ALL DOORS** leading from the protected areas or into another protected zone shall have drop seals (1) on the bottoms, weather-stripping(2) around the jams, latching mechanisms and door closer hardware. In addition, double doors shall have a weather-stripped astragal(2) to prevent leakage between doors and a coordinator to assure proper sequence of closure. In general, doors shall be treated as though they are being weatherproofed for outside use with no light possible passing around all sides. Doors, which for any reason cannot be kept normally closed, shall be equipped with electromagnets designed to release on alarm.
2. **ALL WINDOWS** in the zone shall be caulked with silicone around the frame and at the glass-rubber gasket. Particular attention shall be given to the area under the window sill which often has large leakage areas.
3. **ALL DUCTWORK** not in service, leading from or into a protected area shall be permanently sealed off, air tight, with metal plates caulked and screwed in place. Ductwork left in service from the building air handling unit shall have blade type dampers installed with elastomer blade tip and side seals. Dampers shall be spring loaded or motor operated to provide 100% air shut-off.(5) Dampers shall be located at the wall line where the ducts enter and exit the zone. The ducts shall be fitted with inspection ports to allow inspection of the damper blades. It is further recommended that the building air handling units be shut down prior to discharge to prevent the spread of smoke and fire byproducts into other areas of the building and excessive static pressure on the protected zone.
4. **ALL CONDUITS** leading from or into a protected zone shall be sealed with a rated duct seal. All electrical switch boxes and receptacles, including computer LAN connections shall be sealed to prevent leakage from the zone.
5. **SELF-CONTAINED AIR HANDLING UNITS** within the protected zone may be left in service. However subfloor pressurization may accelerate leakage through the subfloor and one must consider the possibility that the air handling unit could be the source of the fire. It is strongly recommended that the air handlers be shut down prior to

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discharge and in particular, systems not manned 24 hours a day should be shutdown.

6. **PROTECTED AREAS** shall be enclosed with wall partitions which extend slab-to-slab. All walls shall be caulked around the inside perimeter of the room where the walls rest on the floor slab and where the walls intersect with the ceiling slab above. Sealing shall take place on the inside surface of the zone to avoid leakage into the partition wall void. Particular attention shall be given to a wall which meets a corrugated overhead pan. The pockets shall be sealed with a properly rated material(3), fiberglass covered with sheet rock mud is an economical method. Unrated, canned foam is not acceptable. Drop ceiling tiles shall be clipped in place within 4 feet of any discharge nozzle.
7. **ALL HOLES, CRACKS OR PENETRATIONS** leading into or out of the protected area shall be sealed. This includes pipe chases, wire troughs and expansion joints. It is recommended that *wire troughs and cable trays* be sealed with reusable, intumescent, rated sealbags *not canned foam*.(4).
8. **IF A RAISED FLOOR** continues out of the protected area into adjoining rooms, bulkheads shall be installed under the floor directly under above-floor border partitions. These bulkheads must be caulked top and bottom. If the bottom of the floor tiles are “waffled” or perforated allowing leakage through the tile, caulked sheet metal may be attached to provide a seal between the bulkhead and the bottom of the tile. If the adjoining rooms share the same underfloor air handlers, then the bulkheads shall have dampers installed the same as required for ductwork. See Item #2.
9. **ALL FLOOR DRAINS** shall have traps and the traps should be designed to have water in them at all times or shall be filled with a non evaporating, approved liquid.
10. **POROUS BLOCK WALLS** must be sealed slab-to-slab to prevent gas from passing through the block. Two or three coats of paint are normally required. Unpainted block walls are totally unacceptable. If an unpainted block wall is covered by sheetrock which stops just above a dropped ceiling, the exposed block wall above the ceiling must be painted and the joint between the sheetrock and wall sealed.
11. **QUALITY OF MATERIALS**, all materials used to seal the zone shall have proper fire rating and must be of a lasting quality. Canned foam generally does not have proper fire rating and is subject to special AHJ approval per NFPA 2001.



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12. **IN GENERAL**, the basic intent is to make the protected areas as air tight as possible during and after discharge. The suppression gases are heavier than air and therefore, openings below floors are usually more critical than those above a ceiling. Small zones with high protected equipment are much harder to seal than large zones with low protected equipment. See attached chart.
13. **ONCE THE GAS IS DISCHARGE**, in most jurisdictions, it must remain in the room at its designed concentration and height for ten minutes. The length of time that the gas will remain is directly proportional to the “air tightness,” “integrity” of the room.
14. If INERGEN is used as the suppression gas, please contact the supplier of INERGEN for pressure relief recommendations.

The above points are based on our testing, observations and experience. However, sealing of these leakage areas does not guarantee “passing” of an enclosure integrity test. A subsequent enclosure integrity test may determine that there are additional leakage areas which prevent “passing” of the test. In some cases it may be impossible to determine the actual location of leakage.

In all cases, Fire Safety Technology a division of Worldwide Trade & Services, Inc. assumes no responsibility for “passing” of an enclosure integrity test, retention of the suppression gas during an emergency or approval of the zone by the authority having jurisdiction.



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Code references:

From NFPA 2001, 2004 Edition Annex C, Enclosure Integrity Procedure:

C.2.8.2 Leakage Alteration.

C.2.8.2.1 Procedure.

C.2.8.2.1.1 Protected areas should be enclosed with wall partitions that extend from the floor slab to ceiling slab or floor slab to roof.

C.2.8.2.1.2 If a raised floor continues out of the protected area into adjoining rooms, partitions should be installed under the floor directly under above-floor border partitions. These partitions should be caulked top and bottom. If the adjoining rooms share the same under-floor air handlers, then the partitions should have dampers installed the same as required for ductwork.

C.2.8.2.1.3 Any holes, cracks, or penetrations leading into or out of the protected area should be sealed. This includes pipe chases and wire troughs. All walls should be caulked around the inside perimeter of the room where the walls rest on the floor slab and where the walls intersect with the ceiling slab or roof above.

C.2.8.2.1.4 Porous block walls should be sealed slab-to-slab to prevent gas from passing through the block. Multiple coats of paint could be required.

C.2.8.2.1.5 All doors should have door sweeps or drop seals on the bottoms, and weather stripping around the jambs, latching mechanisms, and door closer hardware. In addition, double doors should have a weather-stripped astragal to prevent leakage between doors and a coordinator to ensure proper sequence of closure.

C.2.8.2.1.6 Windows should have solid weather stripping around all joints.

C.2.8.2.1.7 All unused and out-of-service ductwork leading into or from a protected area should be permanently sealed off (airtight) with metal plates caulked and screwed in place. Ductwork still in service with the building air-handling unit should have butterfly blade-type dampers installed with neoprene seals. Dampers should be spring-loaded or motor operated to provide 100-percent air shutoff. Alterations to air conditioning, heating, ventilating ductwork, and related equipment should be in accordance with NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, or NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*, as applicable.

C.2.8.2.1.8 All floor drains should have traps, and the traps should be designed to have water or other compatible liquid in them at all times.

C.2.8.2.2 Materials.

C.2.8.2.2.1 All materials used in altering leaks on enclosure envelope boundaries, including walls, floors, partitions, finish, acoustical treatment, raised floors, suspended ceilings, and other construction, should have a flame spread rating that is compatible with the flame spread requirements of the enclosure.

C.2.8.2.2.2 Exposed cellular plastics should not be used for altering leakage unless considered acceptable by the authority having jurisdiction.

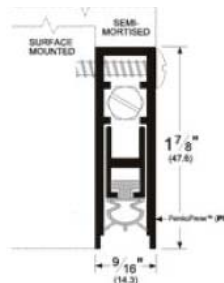
C.2.8.2.2.3 Cable openings or other penetrations into the enclosure envelope should be fire stopped with material that is compatible with the fire rating of the barrier.

Additional References:

1. Drop seals or automatic door bottoms such as PEMCO 4301CPKL with UBC 7.2 rating or equal, from PEMCO, P.O. Box 18966, Memphis, TN 38181 Phone 901-3656-2160, 800-824-3018, FAX 901-365-1354 Available from your local commercial door hardware supplier; they are also stocked by McMaster-Carr, phone 404-346-7000 or www.mcmaster.com listed as "Automatic-Sealing Door Bottoms" see stock number 8403A56 or "google" Pemco 4301CPKL for internet supplier.

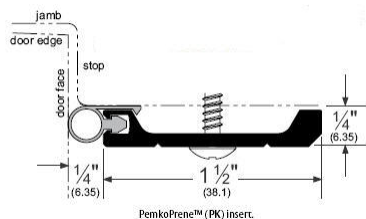


Functioning of an automatic door bottom

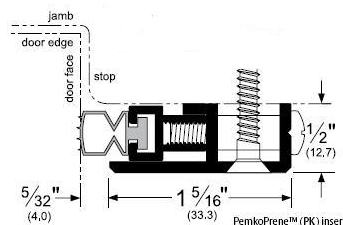


Cross section

2. Rigid jamb mounted weatherstripping such as PEMCO 290APK or even better the adjustable rigid jamb mounted weatherstripping PEMCO 379CPK is recommended for durability and adjustability. Special sealing products for double door astragals also available from PEMCO or others.



Rigid jamb mounted weatherstripping



Adjustable, rigid jamb mounted weatherstripping

3. Fiberglass or mineral wool backing can be sprayed or painted with a fire rated product such as 3M Fire Dam Spray from 3M Fire Protection Products, 800-328-1687 or equal [www.3m.com/firestop].

See also McMaster-Carr item numbers 93455K46, 9340K11 and Grainger item 4MM44. www.grainger.com

4. Fire rated, intumesce Sealbags from International Protective Coatings phone 800-334-8796, 215-362-9020, FAX 888-531-5192 or equal. Also 3M Fire Barrier Pillows and McMaster-Carr stock number 9359K51

5. Fire & smoke dampers with appropriate UL 555S fire rating and AMCA Standard 500-89 Class I leakage rating or better such as Ruskin fire and smoke dampers, Ruskin, 39000 Dr. Graves Rd., Kansas City, MO 64030, 816-761-7476 FAX 816-761-0521 www.ruskin.com or Johnson Controls VD-1330 Class 1 Control Dampers, www.johnsoncontrols.com



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Zone Size, Height of Protected Equipment VS. Allowable Leakage Area
Small zones with high protected equipment are more difficult to meet sealing requirements

Example	Square Footage of Zone	Height of Zone	Height of Protected Equipment	Allowable Leakage Area
A(1)	300 sq. ft.	10 ft.	6 ft.	108 sq. inches .75 sq. feet
A(2)	300 sq. ft.	10 ft.	8 ft.	50 sq. inches .35 sq. feet
B(1)	1210 sq. ft.	10 ft.	6 ft.	436 sq. inches 3 sq. feet
B(2)	1210 sq. ft.	10 ft.	8 ft.	204 sq. inches 1.42 sq. feet
C(1)	6000 sq. ft.	10 ft.	6 ft.	1083 sq. inches 7.52 sq. feet
C (2)	6000 sq. ft.	10 ft.	8 ft.	507 sq. inches 3.52 sq. feet

FM-200, 7% concentration, 68° inside and outside zone

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