



Welcome to the

2019 Annual Conference Educational Sessions



Session: Venting. Reinvented, UL 1738 Fuel Gas Venting Systems

UL 1738 Flue Gas Venting Systems

Venting. ReInvented.

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IPEX
by aliaxis

IPEX Group

Mechanical / Plumbing



Industrial



Municipal / Irrigation



Electrical / Telecom



Agenda

1. **What is Flue Gas?**
2. **Venting History**
3. **Model Codes and Standards**
4. **UL 1738**
5. **System 1738**
6. **Design Considerations**
7. **Installation Requirements**

What is Flue Gas?

- Flue Gas is a by-product of incomplete combustion often coming from sources such as a fireplace, oven, furnace, boiler, water heater or steam generator.



Natural Gas + Oxygen → Carbon Monoxide + Water Vapor + Carbon (Soot)

- It consists mainly of carbon monoxide and water vapor and is required to be vented safely to avoid injury.

What is Flue Gas?

Gas-Fired Appliances are divided into 4 venting categories:

1. Category I – Negative Pressure, Non-Condensing
2. Category II – Negative Pressure, Condensing
3. Category III – Positive Pressure, Non-Condensing
4. Category IV – Positive Pressure, Condensing

Today, we will be speaking about venting Category II and IV Appliances

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1. What is Flue Gas?
2. **Venting History**
3. Model Codes and Standards
4. UL 1738
5. System 1738
6. Design Considerations
7. Installation Requirements

Venting History – Conflicting Standards?

- Appliance Manufacturer's currently dictate which materials are approved for venting with their appliance in conjunction with the local codes.
- Since no practical venting standards existed, appliance manufacturer's referenced ASTM plumbing standards in their installation manuals.

- Example:

APPROVED MATERIALS

Approved vent and intake air pipe materials that may be used in the United States:

PVC pipe materials:

- DWV ASTM-D2665 or CSA B181.2
- Schedule 40, 80, 120 ASTM-D1785 or CSA B137.3
- SDR Series ASTM-2241 or CSA B137.3

CPVC pipe materials:

- CPVC 41 ASTM-D2846 or CSA B137.6
- Schedule 40, 80 ASTM-F441 or CSA B137.6
- SDR Series ASTM-F442

Venting History – Conflicting Standards?

- Conversely, manufacturer's of the plumbing pipe and fittings do not endorse, promote or warranty their products for flue gas venting applications.
- **The Reason:**
 - Products manufactured to ASTM Standards are manufactured for fluid handling applications and are not designed or tested for flue gas venting applications

Industry Concerns



CO Statistics

- In 2014, the Consumer Product Protection Association reported 165 unintentional non-fire CO poisoning deaths; an increase of 11% from the average number of reported incidents between 2012–2013.
- Of these reported incidents, heating system fatalities represented the largest percentage at 39% or 65 deaths.
- Some examples of vent failures that exhibit either embrittlement, material degradation or vent separation were reported and documented in Aspen Colorado, Nashua New Hampshire, South Bend Indiana, and Port Mouth Virginia



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Model Codes and Standards

– The following ASTM Plumbing Standards are commonly referenced in appliance manufacture's installation manuals:

- ASTM D2665 – PVC Plastic Drain, Waste and Vent Pipe and Fittings
- ASTM D1785 – PVC Plastic Pipe, Schedules 40, 80 and 120
- ASTM D2241 – PVC Pressure-Rated SDR Pipe
- ASTM D2846 – CPVC Plastic Hot and Cold Water Distribution Systems
- ASTM F441 – CPVC Plastic Pipe Schedule 40 and 80
- ASTM F442 – CPVC Plastic Pipe SDR
- ASTM D2661 – ABS Schedule 40 Plastic Drain, Waste and Vent Pipe and Fittings

These standards are all intended for fluid handling applications

Model Codes and Standards

- As a result of plumbing products being used for flue gas venting applications and appliance manufacturer's referencing these standards, the following note has been added to the ASTM D1785 standard scope:
- **NOTE:** This standard specifies dimensional, performance and test requirements for plumbing and fluid handling applications only. It does not include provisions for the use of these products for venting of combustion gases. **UL 1738 is a standard that does include specific testing and marking requirements for flue gas venting products, including PVC.**
- This note or something similar has been added to each of the ASTM plumbing standards previously shown.

Model Code and Standards - Update

2018 National Fire Protection Association (NFPA) Code 54 – National Fuel Gas Code

– NFPA 54 – Chapter 12, Section 5: Venting Appliances, Type of Venting Systems to Be Used, states:

12.5.2 Plastic Piping.

Where plastic piping is used to vent an appliance, the appliance shall be listed for use with such venting materials and the appliance manufacturer's installation instructions shall identify the specific plastic piping material. The plastic pipe venting materials shall be labeled in accordance with the product standards specified by the appliance manufacturer **or shall be listed and labeled in accordance with ANSI/UL 1738: *Venting Systems for Gas-Burning Appliances, Categories II, III, and IV.***

12.5.3 Plastic Vent Joints.

Plastic pipe and fittings used to vent appliances shall be installed in accordance with the appliance manufacturer's installation instructions. **Plastic pipe venting materials listed and labeled in accordance with ANSI/UL 1738, *Venting Systems for Gas-Burning Appliances, Categories II, III, and IV*, shall be installed in accordance with the vent manufacturer's installation instructions.** Where primer is required it shall be of contrasting color.

Model Code and Standards - Update

2018 International Fuel Gas Code (IFGC)

– IFGC Chapter 5, Section 3: - Chimneys and Vents, Venting of Appliances:

503.4.1 Plastic Piping.

Where plastic piping is used to vent an appliance, the appliance shall be listed for use with such venting materials and the appliance manufacturer's installation instructions shall identify the specific plastic piping material. The plastic pipe venting materials shall be labeled in accordance with the product standards specified by the appliance manufacturer **or shall be listed and labeled in accordance with ANSI/UL 1738.**

503.4.1.1 Plastic Vent Joints.

Plastic pipe and fittings used to vent appliances shall be installed in accordance with the *appliance* manufacturer's instructions. **Plastic pipe venting materials *listed* and labeled in accordance with UL 1738 shall be installed in accordance with the vent manufacturer's installation instructions.** Where primer is required it shall be of contrasting color.

Model Code and Standards - Update

What Does this Mean?

- I. Appliance manufacture's will still dictate suitable materials for venting their appliances
- II. Installers now have a choice:
 1. Use products listed to ASTM plumbing standards
 2. Use products certified to UL 1738

The ASTM plumbing standards state they are not suitable for venting poisonous flue gasses.

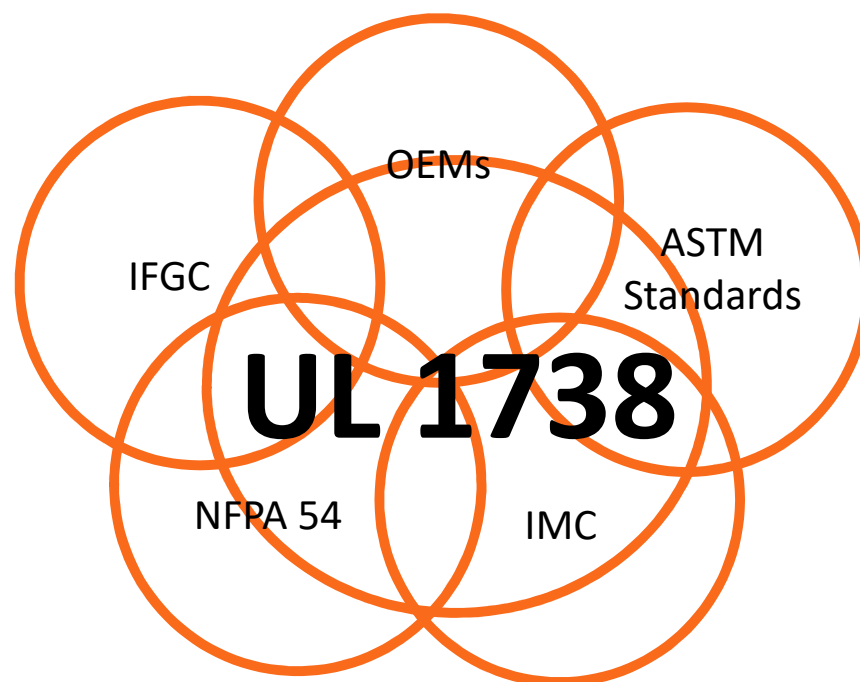
Therefore, utilizing materials listed to UL 1738 is something designers, manufacturer's and installers should be **considering** and **recommending** until it becomes enforced.

Appliance Standards – ANSI Z21

Maximum allowable temperatures of
typical non-metallic vent material used in water heaters

Material	Heat deflection temperature*, ° F (° C)	Pipe nomenclature	Standard
PVC	158 (70)	DWV	ASTM-D2665 or CSA B181.2
PVC	158 (70)	Sch 40, 80, 120	ASTM-D1785 or CSA B137.3
PVC	158 (70)	SDR Series	ASTM-D2241 or CSA B137.3
CPVC	212 (100)	CPVC 41	ASTM-D2846 or CSA B137.6
CPVC	212 (100)	Sch 40, 80	ASTM-F441 or CSA B137.3
CPVC	212 (100)	SDR Series	ASTM-F442
ABS	180 (82)	Sch 40 DWV	ASTM-D2661 or CSA B181.1

Paradox of Rules?

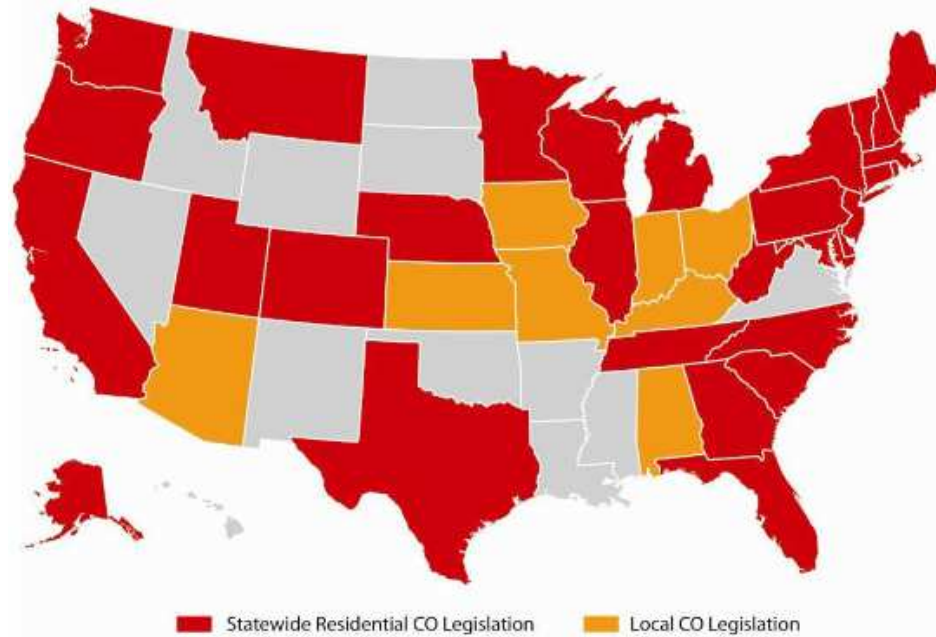


Model Codes and Standards

- There is a clear disconnect between appliance manufacturer's, vent manufacturer's and model codes and standards.
- **The Solution is simple – UL 1738.**
- UL 1738 allows for:
 - The appliance manufacturer's to continue dictating their preferred venting material.
 - Certified venting materials to replace plumbing products which are not intended for the application or warranted by their manufacturer's.
 - A uniform standard that eliminates the disorganization and confusion that comes with each jurisdiction using their adopted codes and standards

Make it Law

**Carbon Monoxide Alarms are required in 30 states.
These states are highlighted in red.**



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UL 1738

- UL 1738 is a standard for Venting Systems for Gas-Burning Appliances, Categories II, III, and IV.
- It covers both metallic and non-metallic materials and includes over 50 material and system performance tests.
- Using products listed to UL 1738 provides the **highest possible chance of success** for flue gas venting applications.



UL 1738 Key Test Requirements

Section	System Performance Test Requirements	UL 1738	Section	Material Conditioning & Test Requirements	UL 1738
19	Temperature Structure	✓	40.2	Elevated temperature conditioning	✓
22.4	Joint Load	✓	40.3	Light and Water conditioning	✓
28	Vent Sag	✓	40.4	Condensate conditioning	✓
29	Puncture	✓	42.2	Tensile	✓
35	Joint Tightness	✓	42.3	Impact	✓
37	Low Temperature Handling	✓	42.5	Flammability	✓
42.4	Crush Resistance and Stiffness	✓	43.1	Heat deflection Temperature	✓

UL 1738 – Additional Requirements

- Products certified to UL 1738 require listed print lines on pipe and labels on fittings that allow for identification regardless of orientation.
- Manufacturer's of UL 1738 products are required to provide installation instructions for their products.
- UL 1738 states **NO mixing of components** from different manufacturer's in a single vent system.
- Using UL 1738 certified products provides the **greatest possible chance of success** in flue gas venting applications

Codes and Standards – Precedent

- Adopting a venting standard is not without precedent...
- In 2007, CSA B149.1 was mandated in Canada and required that all vent material/systems be certified to ULC S636. This included PVC, CPVC, PP and SS.
- This covered all new and retrofit installations and required all installations use one brand for pipe, fittings, cements and transitions.
- Appliance manufacturer's still dictate which vent material is approved to vent their appliance.

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System 1738

The First Engineered PVC Flue Gas Venting System certified to UL 1738

- Permanent Solvent Welded Joints
- Sizes include 2", 3" and 4"
- OD Dimensions in accordance with ASTM D1785
- Pipe, fittings, terminations and cements from a single manufacturer




System 1738 – Pipe

Pipe is Black with 2 **Orange** print lines 180° apart

- **Line A:** System 1738 ® Gas Vent Categories II, IV 149°F / 65°C PVC Ⓢ UL 1738 Min. Clearance to combustible construction 0mm – manufacture's installation instruction must be followed / [<Date Code>](#) Made in USA by IPEX USA LLC
- **Line B:** Ⓢ System 1738 ® Gas Vent Categories II, IV 149°F / 65°C Ⓢ System 1738 Gas Vent Categories II, IV 149°F / 65°C



 **WARNING / ADVERTANCIA**

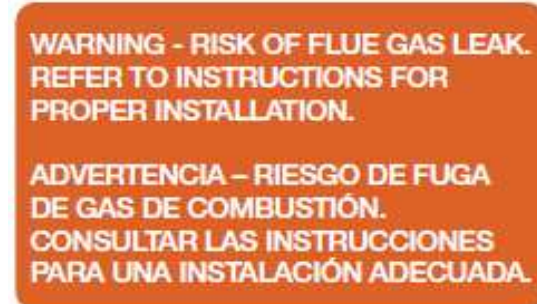
RISK OF CARBON MONOXIDE (CO) POISONING AND RISK OF FIRE IF IMPROPERLY INSTALLED. FOLLOW ALL CAUTIONS, WARNINGS, AND INSTRUCTIONS REGARDING INSTALLATION OF THE VENT PIPE SYSTEM.

RIESGO DE INTOXICACIÓN POR MONÓXIDO DE CARBONO (CO) Y RIESGO DE INCENDIO SI SE INSTALA INCORRECTAMENTE. SIGA TODAS LAS PRECAUCIONES, ADVERTENCIAS E INSTRUCCIONES RELACIONADAS CON LA INSTALACIÓN DEL SISTEMA DE TUBERÍA DE VENTILACIÓN.

System 1738 – Fittings

Fittings are Black with 2 Orange labels 180° apart on the fitting hub

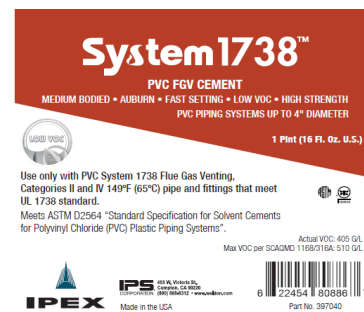
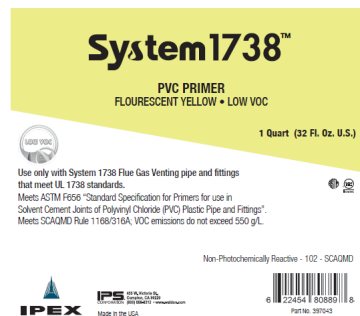
- **Label A:** System 1738 ®
- **Label B:** Carbon Monoxide Warning (only used with tee-wye fitting)



System 1738 – Primer & Cement

IPEX System 1738 Labelled Primer & Cement

- Primer is fluorescent yellow to provide contrasting color per UL 1738
- Cement is auburn to match the pipe print line color
- Low VOC
- Optical Brightener for Compliance Verification
- Pint and Quart Sizes



System 1738 – Concentric Terminations



- Sizes include 2", 3" and 4"
- Single termination hole
- Various lengths up to 44"
- Solvent Weld or Mechanically Fastened Cap
- Can be painted to match building exterior
- Bird Screen, Face Plate & Roof Flashing Accessories available
- Must be approved by the appliance manufacturer

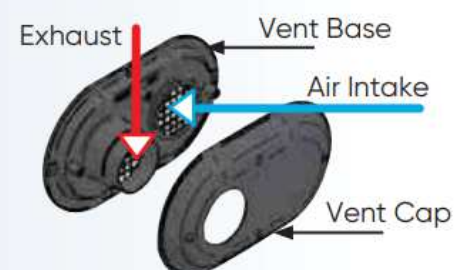
System 1738 – Low Profile Terminations

- Sizes include 2", 3" and 4"
- Two hole termination
- Can be painted to match building exterior
- Must be approved by the appliance manufacturer



Low Profile Side Wall Vent Kit

Offers a lower profile alternative to the typical two pipe side wall snorkel termination. They include integrally molded vent screens, and the design neatly disguises both the intake and exhaust.



System 1738 – Specialty Fittings

Access Tee

- Drilling of System 1738 is prohibited
- Drilling compromises system integrity and can result in stress cracking
- Caulking or metal tape are not permanent solutions
- The System 1738 Access Tee provides a safe method for testing appliance combustion gasses.



System 1738 - Accessories

- Pipe Cutter
- Deburring Tool

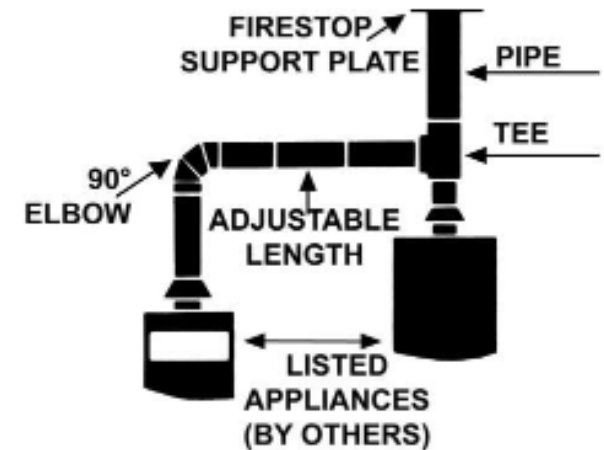


System 1738 – Design & Installation

Vent Sizing

- What material should be used to vent?
- What should the vent size be?
- What is the maximum vent length allowed with the appliance?
- What is the equivalent vent length of each fitting?

✓ Consult the appliance manufacturer's installation instructions



System 1738 – Design & Installation

IPEX offers a comprehensive Installation Guide that outlines best practices covering:

- Terminations – Side Wall, Pitched and Flat Roof
- Chimney Installations
- Support and Restraint Spacing
- Expansion and Contraction
- Firestops
- Appliance Vent Connections

While you must always follow local codes, IPEX offers support when you need it.

System 1738 – Training

In addition to the comprehensive Installation Guide, IPEX offers training to **engineers, inspectors, distributors** and **contractors**.

- Training can be done:
 - Online
 - Through distributors
 - On site



- Following successful training, a training card will be issued to successful participants.

System 1738 – Product Warranty

System 1738 offers a **10 year** product warranty

- Products must be installed in accordance with the System 1738 Installation Guide

IPEX is the only PVC manufacturer to offer a warranty for flue gas venting applications



System 1738 – Additional Listings

System 1738 products carry the UMC Shield and are certified by IAPMO to be in compliance with UL 1738 and the following codes:

- Uniform Mechanical Code (UMC®)
- International Mechanical Code (IMC®)
- International Fuel Gas Code (IFGC®)
- National Fuel Gas Code (NFPA 54)

UL 1738 Benefits

UL 1738	
A.H.J	<ul style="list-style-type: none">• Risk and liability mitigation• Education and awareness• Unique identification markers with pipe, fittings and cements
OEM	<ul style="list-style-type: none">• Risk and liability is shifted to vent manufacturer• Certified vent solution• A one source trusted vent partner with a drive to innovate
Contractor	<ul style="list-style-type: none">• Installation resources and training• Product certified for the application• Solvent weld joining system

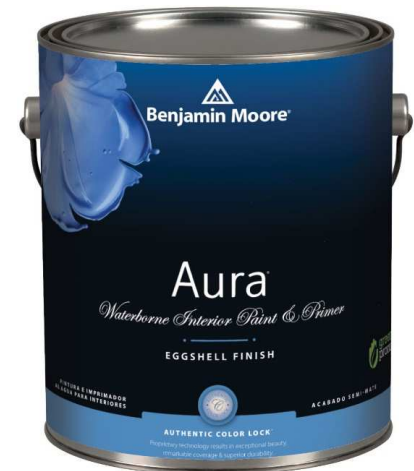
Summary

- In Flue Gas Venting applications, where failure can result in injury, using products that provide the best chance for success is the clear choice and right thing to do.
- NFPA 54 and IFGC Model Codes now recognize UL 1738 as the appropriate flue gas venting standard and have included it in their 2018 model codes.
- ASTM Plumbing Standards now include a note stating they are intended for fluid handling applications only and refer to UL 1738 as the appropriate flue gas venting standard.
- UL 1738 certified products still provide appliance manufacturers the freedom to dictate venting materials, while giving installers and end-users the confidence of a certified system that has been tested for the application

Summary

- System 1738 is the first Engineered PVC System that is certified to UL 1738 for Flue Gas Venting Applications
- IPEX offers a comprehensive installation guide and training to inspectors, engineers, distributors and contractors to provide users with the highest chance of success.
- System 1738 products come with a 10 year product warranty making System 1738 the only PVC system that is warrantied in flue gas venting applications.

Is Good Enough, Enough?



Is Good Enough, Enough?





**Thank You For
Attending**





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