Plastic Flue Gas Venting

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Agenda

• Different plastic pipe venting options
• Venting background
• ULC S636 Standard
• Building Code issues
• Installation issues
• Training
Plastic Venting Materials
Certified to ULC S636

- **PVC** – Type BH Class II A
  - 65 °C / 149 °F max

- **CPVC** - Type BH Class II B
  - 90 °C / 194 °F max

- **PP** - Type BH Class II C
  - 110 °C / 230 °F max

Not all plastics are the same ...
PVC

- Ethylene (from natural gas) is combined with chlorine component (from salt)
- Composed of approx. 50-50 mixture of ethylene and chlorine
- No direct cost relation to price of oil
- Economical, rigid, dense, & reliable material
CPVC

- Also member of vinyl family, similar rigid properties
- Contains additional chlorine in its molecule
- Has higher temperature capability than PVC
- Both PVC & CPVC are joined by means of solvent welding
Polypropylene

- Member of polyolefin family of plastics
- Derived from ethylene from light crude oil
- Most common pipe application is lab drainage and water supply
- Cannot be solvent welded, venting is joined by mechanical means
- PP is a softer plastic material
PVC vs. ABS

- ABS is unable to pass ULC S636
- PVC is a much superior vent pipe material to ABS due to ...
  - **Exp.-contraction** – PVC 40% lower
  - **Tensile strength** – PVC 40% higher
  - **Chemical Resistance** – PVC is much superior to ABS
  - PVC is **self-extinguishing**, if set on fire and after flame is removed
Venting Background

- Plastics have been used in flue gas venting of water heaters, furnaces and boilers for 20+ yrs.
- Furnaces involved have been high efficiency while hot water heaters have been those with power vents
- Significant failures were occurring prior to 2007
Venting Background Cont’d

• Appliance manufacturers have historically permitted various pipes for venting including:
  – ABS-DWV
  – Sch. 40/80 PVC or CPVC
  – PVC Series pipe
  – Foam-Core/Cell-Core ABS

• Thousands of failures have occurred in Canada with ABS on HW heaters
Venting Background Cont’d

- To address concerns, CSA B149.1 in 2007 began calling for plastic vent pipe certified to ULC S636
- Although the actual standard has been around since the early 1980’s, enforcement is now mandatory
- Performance has been near perfect thus far
Type BH Class IIA

- PVC is most common vent mat’l
- White in color
- Made to Schedule 40 wall thickness
- Sizes 1-1/2” through 4”
- Available in 10ft lengths
Type BH Class IIB

• Most commonly is CPVC
• Grey in color,
• Sizes 1-1/2” – 8”
• Made to Schedule 40 wall thickness
• Pipe is available in convenient 10ft lengths
• Off cuts can be reused reducing waste
Type BH Class IIIC

- Only PP is certified
- Pipe available up to 12”
- Mechanical gasket seals for joining method
- Thinner than S40 wall thickness
- Pipe available in various lengths 1ft, 2ft, 3ft and 6ft
ULC S636 Requirements

- Flammability test (self extinguishing)
- Pull out test
- Certified installation guide
- Impact test
- Environmental testing (wind, rain, UV)
Regulations/Standards

- All **new** installations and **retrofits** must use certified product
- All installations shall use **one** brand of pipe, fittings and cements or joining methods (no mixing)
- **Appliance manufacturer** (in their manual) determines which vent material is appropriate for their units
Regulations/Standards Cont’d

• **Clause 4.7F of ULC-S636-08** does not apply to appliance adapters (see clause 2.1.2) and termination fittings supplied by the appliance manufacturer, provided the appliance adapters & terminations are certified to ULC-S636 & are compatible with vent systems specified by mfg.

• These adapters & termination fittings are permitted to be used with a certified vent system.
Building Code Issues

• All buildings are classified as Combustible (wood) or Non-Combustible (steel/concrete) construction

• In Non-Combustible, all materials that will burn have limits
  – Flame Spread Rating (FS) - measures how fast a material burns
  – Smoke Developed Class. (SD) - how much smoke is generated while it burns
Building Code Issues

• **Part 3** Non-Combustible buildings of **NBC** (or **OBC**) have limits on plastic pipe
• All pipe and fittings require a **FS** rating not greater than **25**
• High Rise buildings and Plenum installations also require **SD** Classification not greater than **50**
• Installers need to be aware and check for this on **commercial installations**
• The plastic venting pipe & fittings must meet F&S on it’s own. According to the Ministry of Housing the use of insulation & wraps in conjunction with the combustible piping is **not** permitted to be installed as an assembly in order to achieve the F&S requirement.
Building Code Issues

Non-Combustible Construction Requirements

- Must have $FS \leq 25$ (ULC S102.2)
- High-rise Buildings also need $SD \leq 50$
  - Defined as over 18m for residential
  - over 36m Industrial and Commercial
  - over 3 stories hospitals (grade to top floor level)
- If pipe is in return air plenums, also need $SD \leq 50$
Building Code Issues

Fire Stopping Rated Wall or Floor Penetrations:

• When penetrating a fire rated floor or wall, the piping system must be firestopped with a device or system listed to ULC CAN4-S115
• There are numerous different mfg’s with approved devices. Ensure that these products have a valid listing
Installation Issues

- Expansion & Contraction
- Pipe Support Spacing
- Pipe grades
- Installation in existing dormant masonry chimneys
- Solvent Cementing Procedures
- Termination Assemblies
Expansion-Contraction

- All plastic pipe materials have different exp/cont rates
- Good practice to not constrain piping and thus allow for movement
- Changes in direction (e.g. 90’s) should be supported as close as possible to avoid stress in the system
- Leave adequate clearance between bends and walls/floors
Horizontal Support Spacing

- For PVC – 1.5 m (5 ft.)
- For CPVC – 1.5 m (5 ft.)
- For PP – 1.0 m (3.3 ft.)
Grade for Vent Pipes

• PVC – ¼” per foot

• CPVC – ¼” per foot

• PP – 1/4” per foot (but some mfg’s require a greater slope) 5/8” per foot
Dormant Chimneys

• Ensure chimney is not used, clean & debris free

• PVC and CPVC – install to max height of 60 ft with only bottom support

• Multiple vent pipes are permitted. Zero clearance

• Fresh air intakes are also permitted within the chimney providing that proper clearance and spacing is obtained at termination

• Use a pipe coupling to support weight of pipe
Solvent Cements / Primers

- PVC Cement is grey
- CPVC cement is orange
- Primer is purple or clear

- **CPVC cement** is also be certified for use on PVC
- **Primer** is optional for most PVC installations but is **mandatory** in some provinces and when installing vent systems at 0°C or less or for **CPVC** over 4” diameter
Solvent Cementing

• Process is actually **welding**
• Cement contains **solvents and resin**
• Solvents **penetrate** and soften surfaces as shown on next slide
• **Primer** is 100% solvent, **pre-softens surface** prior to cement application and liquefies the mating surfaces
• Permanent, leak free solvent welded joints, provide pull out resistance and long term safety
Solvent Weld Surfaces

These areas must be softened and penetrated.
Solvent Cementing Cont’d

- Tapered sockets will give fusion and bonding
- Critical to use cement in proper qty. and sequence, cut pipe squarely
- Front edge must be beveled, dry fit should be $\frac{1}{3}$ to $\frac{2}{3}$ of socket depth
- Rotate pipe $\frac{1}{4}$ turn, hold for 15 sec.
Solvent Welding Areas

• Fittings are made to a tapered socket
• Joint strength is at the bottom half of the socket
• A bottomed out pipe, squarely cut, is crucial for joint integrity
Typical Cutting and Deburring Tools
Poorly Cemented Assemblies

2” PVC with an angle cut

2” PVC that’s been under inserted
Installer Training

• There is no mandatory requirement for solvent welding certification
• We have provided installation training through distributors, HVAC poly technical colleges, gas fitters skilled trades school, local associations, inspectors, utilities and directly to contractors
• This training is provided free of charge
• Issued a “Certificate of Completion”
• This training is now recognized by local TSSA, Direct Energy, Union Gas, & Enbridge inspectors for audit and field inspection purposes
Example of the Certificate

System 636

Certificate of Completion

John Smith

has attended a one hour seminar on
IPEX System 636 Flue Gas Vent Piping,
including instruction on proper solvent welding assembly.

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Doug Purdy
Technical Sales

IPEX
Vent Terminations

- **Concentric Termination Kits**
- Avail in 2”, 3” & 4” (PVC and CPVC)
- Also available in extended lengths, 12” and 24” longer for installations in steep sloped roofs and high snow load conditions
- These kits may be shortened in the field but cannot be extended
Vent Terminations

• **Low profile termination kit:**
  • Available in 2”, 3” & 4” PVC
  • CPVC version soon to be certified
  • PVC & CPVC can be painted with latex based paint to suit outdoor décor.
  • Certification logo must always be visible to inspectors
Vent Terminations

- PVC Wall Termination Kit:
  - Available in 2”, 2-1/2” & 3”
New Flue Gas Testing Tee

• New 1 piece molded tee and MIPT plug assembly
• Available in PVC and CPVC
• Certified & safe solution to drilling holes
Condensate Drain Fittings and Assemblies

- Configurations available for both flexible tube and rigid pipe option, as well as 6” & 8” CPVC venting
Fitting Additions
Summary

• Variety of options available that are certified to ULC S636

• Certified system includes pipe, fittings and cements/primers (or joining devices)

• Following all aspects of proper installation, will ensure successful and trouble-free installations
Thank you!

Questions?