

TOPIC: Stainless Steel vs. PVC/CPVC Flue For Condensing Boilers/Water Heaters

When designing a condensing boiler or water heater system, one important consideration is what material should be used to vent the appliance. For some appliances, the Manufacture will only allow AL29-4C grade of stainless steel. But some Manufactures will also allow CPVC and PVC, under strict guidelines.

Let's look at some questions and answers addressing Stainless Steel vs. PVC/CPVC

1. What are the operating temperatures that each material can handle?

FLUE MATERIAL MAXIMUM OPERATING TEMPERATURES

Material Flue	Maximum Operating Temperatures
PVC	149°F
CPVC	194°F
PPE	230°F
AL-29-4C	550°F

Did you know that PVC/CPVC is not UL listed to be used as venting material? No Fire Rating.

There is also no flue warranty.

Many cities are adding codes that disallows PVC to be used for venting appliances.

See Heat Fab's Stainless Steel vs. PVC/CPVC for a comparison between the two.

2. Based on the chart above, how does this relate to Appliance Operating Water Temperatures?

The chart below provides a guideline of when PVC and CPVC can be used as it relates to Entering Water Temperature for a Boiler or Water Heater. This chart is for Camus Appliances Only. **AL29-4C** is not affected by EWT.

Camus Model	Boiler Category	Boiler Flue Gas Temperature Rise Above the Entering (Return) Water °F	Maximum Allowable Boiler Entering (Return) Water Temperature °F for use with PVC	Maximum Allowable Boiler Entering (Return) Water Temperature °F for use with CPVC
DynaFlame DF	1	NA use AL-29-4C	NA	NA
DynaFlame DFX	2 or 4	NA use AL-29-4C	NA	NA
DynaFlame DFH	2 or 4	NA use AL-29-4C	NA	NA
DynaMax	2 or 4	15 to 30°F	119°F	164°F
DynaForce	2 or 4	10 TO 15°F	134°F	179°F
Advantus	2 or 4	10 TO 25°F	124°F	169°F

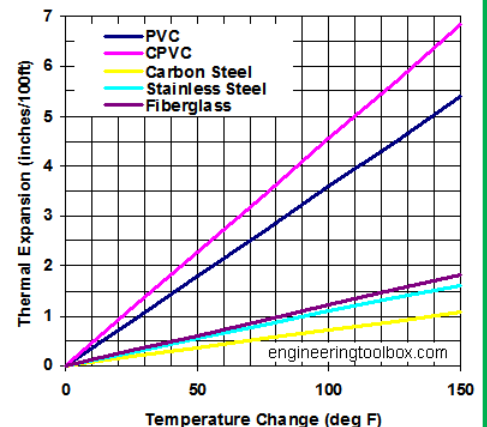
Stainless Steel Boilers Controls: Maximum Operating Water Temperature = 190°F Maximum High Limit Setting = 200°F

3. How long can CPVC systems be exposed to sunlight?

If CPVC is used in above-ground, outdoor applications, protection from ultraviolet attack should be done shortly have the project is completed. Typically by shielding or by painting the system with an exterior grade latex paint.

4. What is the thermal expansion rate for Stainless Steel, CPVC and PVC?

The chart to the right shows the expansion rates of each product. Because of the expansion rate of CPVC, an Engineer should provide installation guidelines for the Installer to follow.



Stainless Steel *V/S.* PVC/CPVC

Topic	UL 1738 Stainless Steel	PVC/CPVC
Performance and Safety	<ul style="list-style-type: none"> • Large overall Factor of Safety • No thermal expansion issues • Not susceptible to environmental stress cracking • Long history of proven reliable performance • Superior strength, no loss of structural integrity • Designed for positive pressure 	<ul style="list-style-type: none"> • Minimal overall Factor of Safety • No provision for thermal expansion (2-3 times greater expansion rate than stainless steel) • Susceptible to environmental stress cracking (aging and embrittlement process results in leakage potential) • Cracking and/or failure of solvent welds may cause leakage • Possible degradation from UV light exposure • Toxic odors if severely overheated
Temperature Limitations and Concerns	<ul style="list-style-type: none"> • Maximum normal use temperature of 600°F but can withstand much higher temperatures 	<ul style="list-style-type: none"> • Flue gas temperatures may cause PVC & CPVC to reach their “Heat Deflection Temperature” (HDT) limits: approximately 149°F (PVC) and 194°F (CPVC) • Plastics begin to soften/lose strength when HDT is exceeded. Some boilers/water heaters barely qualify to use PVC/CPVC, yet are known to produce higher flue temperatures as they age, resulting in HDT’s being exceeded & possible product failure, including stress cracking.
Available Technical Support	<ul style="list-style-type: none"> • Extensive technical support available from the manufacturer 	<ul style="list-style-type: none"> • Little or no technical support available (for use as a vent system)
Installation	<ul style="list-style-type: none"> • Fast, safe and easy product installation • Complete instructions provided • Laser welded seams and factory installed gaskets 	<ul style="list-style-type: none"> • Field preparation required (cutting, cleaning, priming, solvent welds and curing) • PVC/CPVC manufacturers do not provide installation instructions for flue gas venting applications
Codes /Test/Standards	<ul style="list-style-type: none"> • UL 1738 tested, listed and labeled for the application • Meets all code requirements (including fire codes) 	<ul style="list-style-type: none"> • Not listed to UL 1738 for gas appliance venting • Performance concerns with through penetrations (firestop locations) • Defined as a combustible and has no flame/smoke rating • Must be fire wrapped within a plenum space (adds material/labor costs)
Application Versatility	<ul style="list-style-type: none"> • Wide range of applications • Long term proven performance with Cat II, III, & IV appliances 	<ul style="list-style-type: none"> • Limited applications due to temperature limitations • No double wall option • Not designed or endorsed by PVC/CPVC pipe manufacturers for venting flue gases
“Green” Contributions	<ul style="list-style-type: none"> • Recycleable and made from recycled steel 	<ul style="list-style-type: none"> • Possibility of chloride leaching and long term leakage • PVC, when utilized in inappropriate applications, can be very damaging to the environment and human health
Warranty	<ul style="list-style-type: none"> • Factory Warranty 	<ul style="list-style-type: none"> • No Warranty