

CPVC Ventilation Duct Pipe

Submittal Data Sheet



Job or Customer:

Engineer:

Contractor:

Submitted by: Date

Approved by: Date

Order No: Date

Specification:

< STANDARDS >



ASTM D1784



CAN/ULC
S102.2

IPEX CPVC Ventilation Duct systems provide effective solutions for industrial ventilation, protecting workers and the environment from corrosive vapors and contaminated air.

CPVC has physical properties similar to those of PVC and chemical resistance similar to or generally better than that of PVC. CPVC has proved to be an excellent piping material for a variety of industrial piping applications above the temperature range of PVC.

CPVC (chlorinated polyvinyl chloride) used in the manufacturing of Ventilation Duct pipe complies with the material requirements of ASTM D1784 and has a cell classification of 23447. Raw materials used in the extrusion shall contain the standard specified amounts of color pigment, stabilizers, and other additives. The CPVC compound used in the manufacturing of CPVC Ventilation Duct pipe exhibits a flame spread rating of 10 and a smoke development classification of 25 when tested in accordance with CAN/ULC S102.2.

The maximum service temperature of IPEX CPVC Ventilation Duct is 200°F (93°C).

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Material Properties

Properties	CPVC	Standards
Cell classification	23447	ASTM D1784
Specific gravity	1.5	ASTM D792
Tensile strength, psi at 73°F	7,500	ASTM D638
Modulus of elasticity tensile, psi at 73°F	380,000	ASTM D638
Flexural strength, psi	11,400	ASTM D790
Izod impact, ft.lbs./in. at 73°F, notched	2.0	ASTM D256
Compressive strength, psi	10,100	ASTM D695
Poisson's ratio	0.33	
Working stress, psi at 73°F	2,000	
Coefficient of thermal expansion in./in./°F (x 10 ⁻⁵)	3.8	ASTM D696
Linear expansion, in./10°F per 100' of pipe	0.44 - 0.46	
Maximum operating temperature under pressure	200°F (93°C)	
Deflection temperature under load, °F at 66 psi	n/a	ASTM D648
Deflection temperature under load, °F at 264 psi	212	ASTM D648
Thermal conductivity, BTU.in./hr.ft ² .°F	0.95	ASTM C177
Burning rate	Self extinguish	ASTM D635
Burning class	V-0	UL-94
Flash ignition, °F	900	
Limited oxygen index (%)	60	ASTM D2863-70
Water absorption, %, (24 hrs. at 73°F)	0.03	ASTM D570



CAUTION

1. A significant charge of static electricity can be generated by the flow of air through plastic duct, particularly under very dry conditions. If combustible particles or gases are being transported, then various electrical ground techniques must be applied. An expert in this area should be consulted during the design phase.
2. The need for closed-head sprinkler systems may be necessary if combustible residues or oxidizable materials are likely to accumulate in the duct work over a period of time.
3. Chemical resistance and operating temperatures must be evaluated in the same manner as for standard CPVC pipe. When in doubt, consult your local IPEX customer service center.

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Pipe Dimensions

Ventilation Duct Pipe Dimensions

Duct Pipe Size (in)	Product Code	Average O.D. (in.)	Average I.D. (in.)	Average Wall Thickness (in.)	CPVC Weight (lbs/ft)
6 x 20	247700	6.625	6.251	0.187	2.519
8 x 20	247702	8.625	8.251	0.187	3.301
10 x 20	247704	10.750	10.376	0.187	4.133
12 x 20	247706	12.750	12.376	0.187	4.916
14 x 20	247707	14.000	13.626	0.187	5.405
16 x 20	247708	16.000	15.626	0.187	6.188

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Handling & Installation Procedures

For detailed handling and installation procedures, refer to IPEX's **Volume I: Vinyl Process Piping Systems Technical Manual**.

Handling & Storage

CPVC Ventilation Duct is a strong, lightweight piping material and, as such, is easily handled. However, because of its light weight there is a tendency for this product to be mishandled on the jobsite.



CAUTION

Use a forklift to unload CPVC Ventilation Duct crates directly from the delivery vehicle. Avoid using wire ropes, chains or slings. Failure to properly handle crates may cause injury.

As is common for most rigid piping materials, impact strength for CPVC Ventilation Duct is reduced in colder weather. Thus, when unloading these components in cold weather, take extra care to minimize impact damage. Since the soundness of any joint depends on the condition of the pipe end, exercise care during storage and handling to avoid damaging these ends.

While in transit, make sure pipe is well secured, so there is no potential for a load to shift.

When storing CPVC Ventilation Duct pipe, bear the following points in mind:

- Treat these products as you would other ventilation piping products: take care during handling and storage to prevent damaging the pipe.
- Store CPVC Ventilation Duct pipe on a level surface. If placed on the ground, make sure the pipe is supported by timbers spaced no more than 3 feet apart.
- When storing pipe on a flat smooth surface place smaller diameter pipe on top of larger pipe.
- Make sure the pipe is not stored close to sources of heat such as boilers, steam lines, engine exhaust outlets, etc.

Prolonged Outdoor Storage and Protection

Prolonged exposure of CPVC Ventilation Duct pipe to direct rays of the sun will not damage the pipe. However, some mild discoloration may take place in the form of a milky film on exposed surfaces. This change in color indicates a harmless chemical transformation at the surface of the pipe. A slight reduction in impact strength may occur at the discolored surfaces, but is not enough to cause problems in field installation or operation.

Discoloration of the pipe can be avoided by shading it from the direct rays of the sun. This can be accomplished by covering the stockpile or the crated pipe with an opaque material such as canvas. If the pipe is covered, always allow for circulation of air through the pipe to avoid heat buildup in hot summer weather. (Refer to the section entitled 'Painting' below for more information.)

Painting

CPVC Ventilation Duct pipe can be easily protected from ultraviolet oxidation by painting with a heavily pigmented, exterior water-based latex paint. White or a similar light color is preferred to minimize heat absorption on the pipe surface. Apply latex paint thickly as an opaque coating on well cleaned and lightly sanded pipe.

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Solvent Welding

To make consistently tight joints, the following points of solvent cementing should be clearly understood:

1. The joining surfaces must be softened and made semi-fluid.
2. Sufficient cement must be applied to fill the gap between pipe and fittings.
3. Assembly of pipe and fittings must be made while the surfaces are still wet and fluid.
4. Joint strength will develop as the cement cures. In the tight part of the joint, surfaces tend to fuse together; in the loose part, the cement bonds to both surfaces.

WARNING

During the curing of the solvent cement joints, vapors may accumulate inside the pipeline, especially should one end of the line be capped. Nearby sparks from welders or torches may inadvertently ignite these vapors and create a hazardous incident. Attention should be given to removing all vapors using air-blowers or water flushing prior to capping one end of an empty pipeline.

As pipe diameter increases so does the difficulty in installing it. For Ventilation Duct pipe, the following recommendations apply.

- Select the proper size of applicator. The use of proper size applicators is even more important for large pipe to ensure that enough cement is applied to fill the larger gap that exists between the pipe and fittings.
- Ensure the proper selection of cement and primer (refer to Xirtec cement product catalog or your supplier of cements and primers).
- The size of the joining crew should be increased
6" – 8" Pipe: 2 – 3 people per joint
10" – 24" Pipe: 3 – 4 people per joint
- The end of the pipe must be chamfered.
- The primer and cement should be applied simultaneously to the pipe and fittings.
- Make sure to apply a second full layer of cement to the pipe.
- Because of the short sockets in many Ventilation Duct fittings, it is very important to have pipe bottomed into the fitting. It is for this reason that above 6" diameter we recommend the use of a "come-a-long".
- Prefabricate as many joints as possible.

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Installation Procedures

Step 1 Preparation

Assemble proper materials for the job. This includes the appropriate cement, primer and applicator for the size of piping system to be assembled.



Step 2 Cut Pipe

Pipe must be cut as square as possible. (A diagonal cut reduces bonding area in the most effective part of the joint.) Use a handsaw and miter box or a mechanical saw.

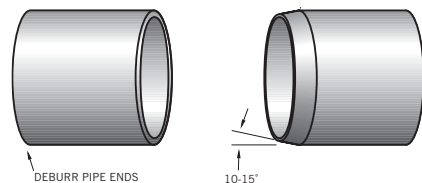


Plastic tubing cutters may also be used for cutting plastic pipe; however, some produce a raised bead at the end of the pipe. This bead must be removed with a file or reamer, as it will wipe the cement away when pipe is inserted into the fitting.



Step 3 Deburr Pipe Ends

Use a knife, plastic pipe deburring tool, or file to remove burrs from the end of small diameter pipe. Be sure to remove all burrs from around the inside as well as the outside of the pipe. A slight chamfer (bevel) of about 15° should be added to the end to permit easier insertion of the pipe into the fitting. Failure to chamfer the edge of the pipe may remove cement from the fitting socket, causing the joint to leak.



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Step 4 Clean Pipe Ends

Remove all dirt, grease and moisture. A thorough wipe with a clean dry rag is usually sufficient. (Moisture will retard cure, dirt or grease can prevent adhesion).



Step 5 Check Fit

Check pipe and fittings for dry fit before cementing together. For proper interference fit, the pipe must go easily into the fitting one quarter to three quarters of the way. Too tight a fit is not desirable; you must be able to fully bottom the pipe in the socket during assembly. If the pipe and fittings are not out of round, a satisfactory joint can be made if there is a "net" fit, that is, the pipe bottoms in the fitting socket with no interference, without slop.

All pipe and fittings must conform to ASTM and other recognized standards.



Step 6 Select Applicator

Ensure that the right applicator is being used for the size of pipe or fittings being joined. The applicator size should be equal to half the pipe diameter. It is important that a proper size applicator be used to help ensure that sufficient layers of cement and primer are applied.



Step 7 Priming

The purpose of a primer is to penetrate and soften pipe surfaces so that they can fuse together. The proper use of a primer provides assurance that the surfaces are prepared for fusion.

Check the penetration or softening on a piece of scrap before you start the installation or if the weather changes during the day. Using a knife or other sharp object, drag the edge over the coated surface. Proper penetration has been made if you can scratch or scrape a few thousandths of an inch of the primed surfaces away.

Weather conditions can affect priming and cementing action, so be aware of the following:

- repeated applications to either or both surfaces may be necessary
- in cold weather, more time may be required for proper penetration
- in hot weather, penetration time may be shortened due to rapid evaporation



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Step 8 Primer Application

Using the correct applicator, aggressively work the primer into the fitting socket, keeping the surface and applicator wet until the surface has been softened. More applications may be needed for hard surfaces and cold weather conditions. Re-dip the applicator in primer as required. When the surface is primed, remove any puddles of primer from the socket.



Step 9 Primer Application

Next, aggressively work the primer on to the end of the pipe to a point 1/2" beyond the depth of the fitting socket.

Immediately and while the surfaces are still wet, apply the appropriate cement. IPEX recommends the use of an extra heavy-bodied CPVC cement when solvent welding CPVC Ventilation Duct.



Step 10 Cement Application

Stir the cement or shake can before using. Using the correct size applicator, aggressively work a full even layer of cement on to the pipe end equal to the depth of the fitting socket. Do not brush it out to a thin paint type layer, as this will dry within a few seconds.



Step 11 Cement Application

Aggressively work a medium layer of cement into the fitting socket.

Avoid puddling the cement in the socket.



Step 12 Cement Application

Apply a second full, even layer of cement on the pipe.



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Step 13 Assembly

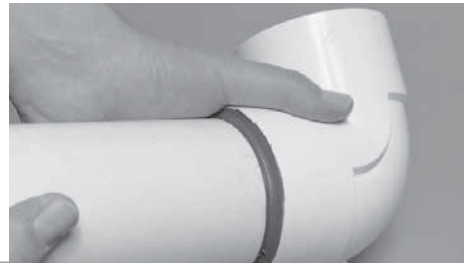
Without delay, while the cement is still wet, assemble the pipe and fittings. Use sufficient force to ensure that the pipe bottoms in the fitting socket. If possible, twist the pipe a quarter turn as you insert it.



Step 14 Assembly

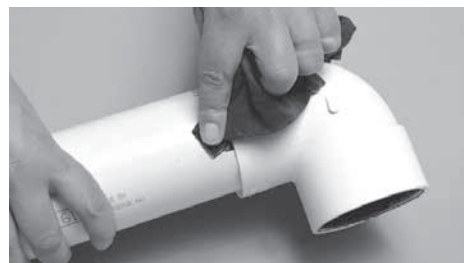
Hold the pipe and fitting together for approximately 30 seconds to avoid push out.

After assembly, a joint should have a ring or bead of cement completely around the juncture of the pipe and fitting. If voids in this ring are present, sufficient cement was not applied and the joint may be defective.



Step 15 Joint Cleaning

Using a rag, remove the excess cement from the pipe and fitting, including the ring or bead, as it will needlessly soften the pipe and fitting and does not add to joint strength. Avoid disturbing or moving the joint.



Step 16 Joint Setting & Curing

Handle newly assembled joints carefully until initial set has taken place. Allow curing to take place before pressurizing the system. (**Note:** in humid weather allow for 50% more curing time.)

For cement cure times, refer to the table on page 11..

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Cold Weather Solvent Welding

Although normal installation temperatures are between 40°F (4°C) and 110°F (43°C), high strength joints have been made at temperatures as low as -15°F (-26°C).

In cold weather, solvents penetrate and soften the plastic pipe and fitting surfaces more slowly than in warm weather. In this situation, the plastic is more resistant to solvent attack and it becomes even more important to pre-soften surfaces with an aggressive primer. Be aware that because of slower evaporation, a longer cure time is necessary.

Tips for solvent cementing in cold weather

- Prefabricate as much of the system as is possible in a heated work area.
- Store cements and primers in a warmer area when not in use and make sure they remain fluid.
- Take special care to remove moisture including ice and snow from the surfaces to be joined.
- Ensure that the temperature of the materials to be joined (re: pipe and fittings) is similar.
- Use an IPEX Primer to soften the joining surfaces before applying cement. More than one application may be necessary.
- Allow a longer cure period before the system is used.
Note: A heat blanket may be used to speed up the set and cure times.

Hot Weather Solvent Welding

There are many occasions when solvent cementing plastic pipe at 95°F (35°C) temperatures and above cannot be avoided. If special precautions are taken, problems can be avoided.

Solvent cements for plastic pipe contain high-strength solvents which evaporate faster at elevated temperatures. This is especially true when there is a hot wind blowing. If the pipe is stored in direct sunlight, the pipe surface temperatures may be 20°F to 30°F (10°C to 15°C) higher than the ambient temperature. In this situation, the plastic is less resistant to attack and the solvents will attack faster and deeper, especially inside a joint. It is therefore very important to avoid puddling the cement inside the fitting socket and to ensure that any excess cement outside the joint is wiped off.

Tips for solvent cementing in hot weather:

- Store solvent cements and primers in a cool or shaded area prior to use.
- If possible, store fittings and pipe or at least the ends to be solvent welded, in a shady area before cementing.
- Try to do the solvent cementing in cooler morning hours.
- Cool surfaces to be joined by wiping with a damp rag.
- Make sure that the surface is dry prior to applying solvent cement.
- Make sure that both surfaces to be joined are still wet with cement when putting them together. With large size pipe, more people on the crew may be necessary.
- Using a primer and a heavier, high-viscosity cement will provide a little more working time.

Note: During hot weather the expansion-contraction factor may increase. Refer to the expansion-contraction design criteria in this submittal.

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Average Joint Cure Schedule for IPEX Recommended CPVC Solvent Cements

Temperature Range (during assembly)	Cure Time Pipe Sizes		
	6" – 8"	10" – 14"	16" +
60° – 100°F (15°C – 38°C)	1-1/2 hours	48 hours	72 hours
40° – 60°F (5°C – 15°C)	4 hours	96 hours	6 hours
0° – 40°F (-18°C – 5°C)	72 hours	8 hours	14hours

* The figures in the table are estimates based on laboratory tests for water applications (chemical applications may require different set times). In damp or humid weather allow 50% more cure time (relative humidity over 60%).

Note 1: Due to the many variables in the field, these figures should be used as a general guideline only.

Note 2: Joint cure schedule is the necessary time needed before leak testing the system.

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Support Spacing

Adequate support for any piping system is a matter of great importance. In practice, support spacing is a function of pipe size, operating temperatures, the location of heavy fittings or components and the mechanical properties of the pipe material.

To ensure satisfactory operation of a thermoplastic piping system, the location and type of hangers should be carefully considered.

1. Concentrated loads (i.e. fans, hoods, scrubbers, dampers, flanges, etc.) should be supported directly to eliminate high stress concentrations on the pipe.
2. The vapors being conveyed in a Ventilation Duct system can cause chemical reactions and create solids. Therefore, it is important to consider the accumulation of solids when addressing system support, as they can cause additional stress loads on the system.
3. In systems where fluctuations in temperature occur, supports should allow for axial pipe movement due to thermal expansion and contraction of the piping system.
4. Hangers should provide as much bearing surface as possible. Sharp supports or sharp edges on supports should not be used since they may cause mechanical damage if the pipe moves.

The following table gives recommended maximum horizontal support spacing for air-filled CPVC Ventilation Duct pipe at various temperatures.

Recommended Maximum Horizontal Support Spacing in feet for CPVC Ventilation Duct Pipe

Duct Pipe Size (in.)	Temperature						
	73°F (23°C)	100°F (38°C)	120°F (49°C)	140°F (60°C)	160°F (71°C)	180°F (82°C)	200°F (93°C)
6	10	10	10	10	10	8	8
8	10	10	10	10	10	8	8
10	10	10	10	10	10	10	10
12	10	10	10	10	10	10	10
14	12	12	12	12	10	10	10
16	12	12	12	12	12	10	10

* For detailed support spacing considerations, refer to IPEX's **Volume I: Vinyl Process Piping Systems Technical Manual**.

Note 1: These maximum recommendations should always be referenced against local plumbing and mechanical codes as well as the local authority having jurisdiction.

Note 2: Pipe supports should be installed so that the horizontal piping is in uniform alignment.

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Thermal Expansion and Contraction

All piping products expand and contract with changes in temperature. Linear expansion and contraction of any pipe on the longitudinal axis relates to the coefficient of thermal expansion (e) for the specific material used in the manufacturing of the product. Variation in pipe length due to thermal expansion or contraction depends on the linear expansion factor (Y) and the variation in temperature irrespective of wall thickness.

Coefficients of Thermal Expansion

Piping Material	e Thermal Exp. Coefficient		Y Linear Exp. Factor	
	in/in/°F	cm/cm/°C	in/10°F/100' of pipe	mm/5°C/10m of pipe
CPVC	3.8 x 10 ⁻⁵	6.8 x 10 ⁻⁵	0.456	3.40

The length change due to thermal expansion or contraction depends on the system temperature differential, as well as the length of the Ventilation Duct pipe run between changes in direction. Expansion can be calculated using the following formula:

$$\Delta L = \frac{Y (T - F)}{10} \times \frac{L}{100}$$

where:

- ΔL = change in length (in.)
- Y = linear expansion factor (inches of expansion per 10°F temperature change per 100 ft. of pipe)
- T = maximum temperature (°F)
- F = minimum temperature (°F)
- L = length of Ventilation Duct pipe run (ft)

For detailed thermal expansion and contraction design considerations and compensation methods, refer to IPEX's **Volume I: Vinyl Process Piping Systems Technical Manual**.

Testing

After a system is installed and all solvent weld joints cured, a leak test should be performed prior to the Ventilation Duct piping system being commissioned. Testing shall be conducted in accordance to the requirements of local plumbing and mechanical codes as well as the local authority having jurisdiction.

During testing, the assembled sections should be visually inspected for joint leaks that may have occurred in the system. If a leak is discovered at a solvent weld joint, the joint must be removed and replaced or alternatively may be back-welded in place by a worker certified or experienced in thermoplastic welding.

Proper safety precautions and protective equipment should be employed during all testing procedures.

WARNING

- NEVER use compressed air or gas in PVC/CPVC/PP/PVDF pipe and fittings.
- NEVER test PVC/CPVC/PP/PVDF pipe and fittings with compressed air or gas, or air-over-water boosters.
- ONLY use PVC/CPVC/PP/PVDF pipe for water and approved chemicals.



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Specifications

CPVC Ventilation Duct Pipe

Scope

This specification sheet covers the manufacturers' requirements for CPVC Ventilation Duct pipe. This pipe meets or exceeds all applicable ASTM and ULC standards.

CPVC Materials

Rigid CPVC (chlorinated polyvinyl chloride) used in the extrusion of Ventilation Duct pipe complies with the material requirements of ASTM D1784 and has a cell classification of 23447.

Raw materials used in the extrusion shall contain the standard specified amounts of color pigment, stabilizers, and other additives. The pipe compound must be Corzan grade. The pipe compound must also exhibit a flame spread rating of 10 and a smoke development classification of 25 when tested in accordance with CAN/ULC S102.2. The Corzan CPVC

compound is listed to FM 4910 "Clean Room Materials Flammability Test Protocol".

Marking

CPVC Ventilation Duct pipe is marked as prescribed in the above applicable standard to indicate size of pipe, material designation, compliance to standard, and manufacturer's name or trademark.

Sample Specification

All extruded CPVC Ventilation Duct pipe shall be manufactured from CPVC compound conforming to ASTM D1784 and have a cell classification of 23447. The compound used to extrude CPVC Ventilation Duct Pipe shall conform to CAN/ULC S102.2 and exhibit a flame spread rating of 10 and a smoke development classification of 25. The Corzan CPVC compound is listed to FM 4910 "Clean Room Materials Flammability Test Protocol".

All pipe shall be produced using Corzan compound and be produced by one manufacturer as supplied by IPEX.

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Markets served by IPEX group products are:

- Electrical
- Telecommunications and utility
- Industrial process piping
- Municipal pressure and gravity flow
- Plumbing and DWV and water supply
- Irrigation
- Electrofusion PE for gas and water
- Industrial, plumbing and electrical cements
- PVC, CPVC, PVCO, ABS, PE, PP and PVDF pipe and fittings

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