



HARRISON

MACHINE & PLASTIC CORPORATION

SUPERDUCT®

FUME EXHAUST SYSTEMS

PVC (POLY VINYL CHLORIDE)

PP (POLYPROPYLENE)

CPVC (CHLORINATED POLY VINYL CHLORIDE)

SPECIFICATIONS CATALOG



HARRISON

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An Introduction to **HARRISON**

Harrison Machine and Plastic Corporation, currently has two major fabrication and distribution facilities: Garrettsville, OH, and Clover SC.

At these manufacturing plants, plastic materials in the form of pipe, duct, sheet and profile are cut, bent, drilled, machined, heat formed and welded into products for corrosion resistant fume and fluid handling systems. In the case of corrosive fume handling systems Harrison fabricates and supplies complete systems consisting of tanks, fume collection hoods, scrubbers, mist eliminators, fans and the duct and duct fittings required to interconnect these components.

For many years Harrison has also been a large supplier of fabricated fittings, both pressure and non-pressure for use in DWV (drain-waste-vent) water systems and in demanding chemical waste, service and process lines of industry. All Harrison facilities maintain significant inventories of PVC, CPVC and PP (Polypropylene) pipe and duct. Relative to PVC, Harrison specializes in furnishing immediate availability of large diameter pipe and fittings.

Harrison takes pride in its long term reputation as an innovator and service oriented manufacturer of quality plastic fabrications as well as its role as a distributor of plastic pipe, duct and fittings.

This catalog refers specifically to the Harrison SUPERDUCT® product line (duct and duct fittings).

HARRISON SUPERDUCT®

Harrison Superduct® offers a complete range of fittings for the installation of venting and fume scrubbing systems. The product line is comprised of process tanks, fume collectors and scrubbers, mist eliminators, duct and associated duct fittings (available with either socket (bell) ends or plain end).

While Harrison is the fabricator of these fittings, the intent of this catalog is to provide a basic understanding of the methods by which items are selected and assembled to provide a controlled pathway from fume collection to processing at the scrubber and on through to the exhaust rain cap.

Harrison can also provide PVC & CPVC rectangular duct systems, as well as those fabricated in Polypropylene which are considered "custom" systems. Please contact us for specific details. Fittings conforming to SMACNA thermoplastic construction specifications are also available on a custom basis.

Harrison Superduct® is a time-proven system that requires fewer fittings and connections resulting in reduced installation cost and complexity. Most components are supplied from stock to speed delivery.

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SUPERDUCT®

PVC DUCT PHYSICAL PROPERTIES

Standard specifications for Harrison rigid PVC duct, pipe, fittings and fabrication.

PIPE/DUCT & FITTINGS: PVC ASTM-D-1784, Cell Class 12454-B

<u>PROPERTY</u>	<u>VALUE</u>	<u>ASTM TEST METHOD</u>
<u>General</u>		
Cell Classification	12454	ASTM D1784
Maximum Service Temp.	140°F	
Color	Dark Gray	
Specific Gravity, (g/cu.cm @73°F)	1.40 ±.02	ASTM D792
Water Absorption % Increase 24 hrs @ 25°C	0.05	ASTM D570
Hardness, Rockwell	110-120	ASTM D785
Poisson's Ratio @ 73°F	0.41	
Hazen-Williams Factor	C=150	
<u>Mechanical</u>		
Tensile Strength, psi @73°F	7,450	ASTM D638
Tensile Modulus of Elasticity, psi @ 73°F	420,000	ASTM D638
Flexural Strength, psi @ 73°F	14,450	ASTM D790
Flexural Modulus, psi @ 73°F	360,000	ASTM D790
Compressive Strength, psi @ 73°F	9,600	ASTM D695
Izod Impact, notched ft-lb/in @ 73°F	0.75	ASTM D256
<u>Thermal</u>		
Coefficient of Linear Expansion (in/in/°F)	2.9×10^{-5}	ASTM D696
Coefficient of Thermal Conductivity (Cal.)(cm)/(cm ²)(Sec.)(°C)	3.5×10^{-4}	
BTU/in/hr/ft ² /°F	1.02	ASTM C177
Watt/m/°K	0.147	
Heat Deflection Temp. Under Load (264 psi, annealed)	170	ASTM D648
Specific Heat, Cal./°C/gm (BTU/lb/°F)	0.25	ASTM D2766
<u>Electrical</u>		
Dielectric Strength, volts/mil	1,413	ASTM D149
Dielectric Constant, 60HZ, 30°F	3.7	ASTM D150
Volume Resistivity, ohm/cm @ 95°C	1.2×10^{-12}	ASTM D257

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Pipe is non-electrolytic

Fire Performance

Flammability Rating	V-0	UL-94
Flame Spread Index	<10	ASTM E162
Flame Spread	0-25	ULC
Smoke Generation	80-225	ULC
Flash Ignition Temp.	730°F	
Average Time of Burning (sec.)	<5	ASTM D635
Average Extent of Burning (mm)	<10	ASTM D635
	Self	
Burning Rate (in/min)	Extinguishing	
Softening Starts (approx.)	250°F	
Material Becomes Viscous	350°F	
Material Carbonizes	425°F	

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PVC SHEET PHYSICAL PROPERTIES

Standard specifications for Harrison PVC duct, pipe, fittings, and fabrication.

**FABRICATED DUCT & DUCT FITTINGS: PVC ASTM D1784, Cell Class 12454-B.
APPLIES TO SHEET IF USED.**

<u>PROPERTY</u>	<u>VALUE</u>	<u>ASTM TEST METHOD</u>	<u>UNITS</u>
<u>Physical</u>			
Density	1.42	D792	g/cm ³
Water Absorption	.15-.30	D570	%
Rockwell Hardness	115	D785	R Scale
Shore Durometer	89	D2240	D
Cell Class	12454-B	1784	
<u>Mechanical</u>			
Tensile Modulus	411,000	D638	psi
Yield Strength	12,800	D790	psi
Flexural Modulus	481,000	D790	psi
Izod Impact Strength	1	D256	ft-lb/in
<u>Thermal</u>			
Vicat Softening Point	83/181	D1525	°C/°F
Heat Deflection Temp (66 psi)	82/179	D648	°C/°F
Heat Deflection Temp (264 psi)	80/176	D648	°C/°F
Coefficient of Linear Expansion	5.8×10^{-5}	D696	in/in/°C
Coefficient of Linear Expansion	3.2×10^{-6}	D696	in/in/°F
<u>Flammability Ratings</u>			
Flame Spread Index	20	E84	
Vertical Burn Test	5-V	UL94	
Foam Fire Test	Passed/Classified	UL1975	
<u>Chemical</u>			
Chemical Resistance	Class B	D1784	
<u>Electrical</u>			
Electrical Volume Resistivity	5.4×10^{-15}	D257	Ohm/cm
Dielectric Constant	3.9	D150	60 Hz
Dissipation Factor	0.0096	D150	60 Hz
Loss Index	0.03	D150	60 Hz
Dielectric Strength	544	D149	Volts/mil

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CPVC DUCT PHYSICAL PROPERTIES

CPVC duct is extruded from Corzan® CPVC compounds as provided by Noveon, Inc. Fittings are fabricated from Corzan® CPVC duct and/or sheet stock material manufactured with Corzan® compounds.

Standard specifications for Harrison rigid CPVC duct, pipe, fittings and fabrication.

PIPE/DUCT & FITTINGS: CPVC, ASTM-D-1784, Cell Class 23437-B

<u>PROPERTY</u>	<u>VALUE</u>	<u>ASTM TEST METHOD</u>
<u>General</u>		
Cell Classification	23437	ASTM D1784
Maximum Service Temp.	200°F	
Color	Medium Gray	
Specific Gravity, (g/cu.cm @73°F)	1.52 ±.02	ASTM D792
Water Absorption % Increase 24 hrs @ 25°C	0.03	ASTM D570
Hardness, Rockwell	118	ASTM D785
Poisson's Ratio @ 73°F	0.43	
Hazen-Williams Factor	C=150	
<u>Mechanical</u>		
Tensile Strength, psi @73°F	7,400	ASTM D638
Tensile Modulus of Elasticity, psi @ 73°F	340,000	ASTM D638
Flexural Strength, psi @ 73°F	13,000	ASTM D790
Flexural Modulus, psi @ 73°F	350,000	ASTM D790
Compressive Strength, psi @ 73°F	10,100	ASTM D695
Compressive Modulus, psi @ 73°F	196,000	ASTM D695
Izod Impact, notched ft-lb/in @ 73°F	2	ASTM D256
<u>Thermal</u>		
Coefficient of Linear Expansion (in/in/°F)	3.9×10^{-5}	ASTM D696
Coefficient of Thermal Conductivity (Cal.)(cm)/(cm ²)(Sec.)(°C)	3.27×10^{-4}	
BTU/in/hr/ft ² /°F	0.95	ASTM C177
Watt/m°K	0.137	

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Heat Deflection Temp. Under Load (264 psi, annealed)	225	ASTM D648
Specific Heat, Cal./°C/gm (BTU/lb/°F)	0.26	ASTM D2766

Electrical

Dielectric Strength, volts/mil	1,250	ASTM D149
Dielectric Constant, 60HZ, 30°F	3.7	ASTM D150
Volume Resistivity, ohm/cm @ 95°C	3.4×10^{-15}	ASTM D257
Power Factor, 1,000 Hz	0.007%	ASTM D150
Pipe is non-electrolytic		

Fire Performance

Flammability Rating	V-0	UL-94
Flame Spread	5	ULC
Smoke Generation	15-25	ULC
	Self	
Burning Rate (in/min)	Extinguishing	
Softening Starts (approx.)	295°F	
Material Becomes Viscous	395°F	
Material Carbonizes	450°F	
Limiting Oxygen Index (LOI)	55	ASTM D2863

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CPVC SHEET PHYSICAL PROPERTIES

Standard specifications for Harrison CPVC duct, pipe, fittings, and fabrication.

FABRICATED DUCT & DUCT FITTINGS: CPVC ASTM D1784, Cell Class 24446-B.

APPLIES TO SHEET IF USED.

<u>PROPERTY</u>	<u>VALUE</u>	<u>ASTM TEST METHOD</u>	<u>UNITS</u>
<u>Physical</u>			
Density	1.42	D792	g/cm ³
Water Absorption	0.03	D570	%
Rockwell Hardness	116	D785	R Scale
Cell Class	24446-B	1784	
<u>Mechanical</u>			
Tensile Strength	7,300	D638	psi
Flexural Strength	14,300	D790	psi
Flexural Modulus	361,000	D790	psi
Compressive Strength	10,100	D695	psi
Compressive Modulus	196,000	D695	psi
Izod Impact (Notched)	9	D256	ft-lb/in
<u>Thermal</u>			
Heat Deflection Temp (264 psi)	198	D648	°F
Coefficient of Linear Expansion	3.86 x 10 ⁻⁵	D696	in/in/°F
Thermal Conductivity	0.95	C177	BTU/in/hr/ft ³ /°F
<u>Flammability Ratings</u>			
Flammability	.062"	UL94	V-O, 5VB, 5VA
Flame Spread Index	15	E84	
Limiting Oxygen Index	60	D2863	%
<u>Electrical</u>			
Volume Resistivity	3.4 x 10 ¹⁵	D257	Ohm/cm
Dielectric Constant	3.7	D150	60 Hz
Dielectric Strength	1250	D147	Volts/mil
Power Factor	0.007%	D150	1000Hz

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SUPERDUCT® INSTALLATION (PVC)

As fittings described in our catalog are built to Harrison specifications, Harrison can also provide systems to SMACNA specifications upon request. The SMACNA manual (Thermoplastics Duct (PVC) Construction Manual), is a good source of information for those involved in the specification and installation of PVC duct systems.

Another excellent information resource publication, used extensively by Harrison, is the "Industrial-Ventilation Manual of Recommended Practice". This book covers all phases of designing and sizing of an industrial ventilation system. It is an excellent educational tool.

Beyond these two resources, Harrison offers the following recommendations, relative to system installation, based on years of field experience.

Superduct® duct systems are easily assembled since they basically consist of fittings that are bell-end to receive plain-end duct, or in the case of plain-end fittings and pipe they are assembled using sleeve couplings.

In the case of square and rectangular Superduct™ systems, these are always either welded together or connected by bolted flanges. Solvent cement is never used.

Reference Material

Thermoplastic Duct Construction Manual, Published by the Sheet Metal & Air Conditioning National Association, Inc., 4201 Lafayette Center Drive, Chantilly, VA 22021

Industrial Ventilation Manual, Published by the American Conference of Governmental Industrial Hygienists, Cincinnati, OH

GENERAL

In diameters thru 18", Harrison has found that Superduct® systems can be readily joined via the solvent cement method. Beyond 18", the actual cementing and drying times become so protracted that sections of large duct cannot be maneuvered into position quickly enough to effect a good solvent fusion before the cement hardens and dries.

It is our experience that with systems above 18", they should be joined via the hot-air welding method, using PVC welding rod and welding guns available thru Harrison on either a rental or purchase basis.

SOLVENT CEMENT WELDING

Solvent cement welding is by far the most widely used process for joining PVC pipe & duct. Properly assembled, it is certainly the easiest way to make quality sealed joints.

To avoid the needless expense of repairing, perhaps back-welding a faulty joint, the following key points are emphasized to ensure quality joints:

1. Solvent cementing should not be attempted at temperatures below 40° F or much above 90° F. Joints should not be made in hot, direct sunlight.
2. Remove all burrs and chips from any duct that has been cut. With a clean, dry, cotton rag wipe away any surface contamination on the surfaces that are to be joined. If the surfaces are wet i.e. condensation, **DO NOT ATTEMPT TO JOIN THEM**- they will fail.
3. Using an applicator, approximately half the size of the duct diameter, apply **PRIMER**. The function of primer, in making quality joints, is to penetrate and soften the hard surfaces of extruded PVC duct. This must be done on **BOTH** surfaces to be joined. A simple

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SOLVENT CEMENT WELDING (CONT'D)

rule of thumb, in checking the adequacy of surface priming, is the ability to scrape a few thousandths of the softened PVC surface.

4. **DO NOT ALLOW THE PRIMER TO DRY** before applying the solvent. Once the two surfaces to be joined have been fitted together, give the joint a quarter twist to thoroughly mix the two solvent reduced surfaces.

There are several sources of primer and PVC solvent cement on the market. Before starting an installation, consult with your supplier of primer and solvent cement for advice on the best product to use for your application and work environment.

HOT AIR WELDING

Above 18" diameters, it is Harrison's experience that duct and fitting connections should be hot-air welded using PVC welding rod and welding guns that are available from Harrison.

Harrison usually welds each joint using three passes of 5/32" PVC welding rod.

Before welding, each joint should be prepared by cleaning the duct & fitting surfaces of any dirt, oil or other contaminant. This will ensure good fusion conditions.

Once the duct and belled-end fitting or coupling are securely seated, the fit should be secured by "tacking" the joint with a hot-air welding gun. The process of "tacking" creates a PVC fusion between the two components, holding them in a position for the actual welding. Another benefit of "tacking" is that it seals the gap between the two components, so that during the actual hot-air welding, the PVC welding rod and the two

HOT AIR WELDING (CONT'D)

surfaces being joined are adequately heated to the point of a strong weld. If the joint were not

first tacked then the hot air from the welding gun would pass through the gap resulting in the surfaces to be welded receiving heat inadequate for fusion with the welding rod. This would result in "cold joints" that are brittle and subject to failure under stress.

HANGERS AND SUPPORTS

Duct Diameter	Min. Clamp	Rod Max. Center	Material Dia. Spacing
18" and below	1¼ x 1/8"	¼"	8 feet
19" thru 32"	1½ x 3/16"	3/8"	8 feet
33" and above	2 x 3/16"	3/8"	5 feet

Maximum distance between vertical supports should be no more than 16 feet.

APPLICATION GUIDELINES

The primary limitation of PVC material is the recommended environmental temperature limit of 140° F (60° C). This limit is not only a structural strength limitation but also a corrosion resistance limitation. Both can decrease rapidly as the temperature increases.

Based on laboratory testing results, Superduct™ systems thru 16", do not require reinforcement and are recommended for round duct systems operating at temperatures up to 100° F with internal static pressure of 10" W.G. (Positive) and 2" W.G. (Negative) thru 10" W.G. (Negative).

Testing performed @ 120° F, indicates that the

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APPLICATION GUIDELINES (CONT'D)

instantaneous collapsing pressure does not change significantly, however there is insufficient test data at this temperature.

Although Type I PVC can be satisfactorily used for many applications at temperatures of up to 140° F, its strength and creep characteristics are altered.

CPVC shall carry a maximum operating temperature of 200° F and has the same self-extinguishing and low conductivity features as PVC.

SUGGESTED STANDARD PRODUCT SPECIFICATION FOR PVC and CPVC (CORZAN®) ROUND DUCTING

- PVC material compounds used in the manufacture of Superduct® pipe and the fabrication of Superduct® fittings shall conform to Type 1 Grade 1 PVC, Cell Class 12454B, as described in ASTM D-1784.
- CPVC (Corzan®) material compounds used in the manufacture of duct pipe and the fabrication of fittings shall conform to Type IV, Grade 1 CPVC, Cell Class 23447, as described in ASTM D-1784.
- Duct diameters thru 20" & 24" will be extruded and of seamless construction. Sizes thru 18" will have a .187" wall thickness. 20" diameter will be @ 0.219" and 24" @ 0.250" thickness.

SUGGESTED STANDARD PRODUCT SPECIFICATION FOR PVC and CPVC (CORZAN®) ROUND DUCTING (CONT'D)

- Fabricated (heat formed) duct diameters 22" and 26" thru 30" will have a 0.187" wall while 32", 34" and 36" & larger diameters will have a 0.250" wall.
- Fabricated duct shall consist of a singular butt welded seam, thermally fused under computer controlled temperature and pressure, without the use of PVC welding/filler rod.
- All extruded duct shall be furnished in 10 or 20 foot lengths, plain end; fabricated duct will be furnished in standard 4 foot lengths with coupling attached on one end.
- Three piece 90° elbows and two piece 45° elbows are considered standard and are furnished with a centerline radius of approximately 1½ times the duct diameter. Five piece 90° elbows and 3 piece 45° elbows, per SMACNA specifications, can be provided, on specific project requirements.
- All couplings will be "Sleeve" type style having an over-all length of 4½".
- All belled end sockets (5" and above) shall have a minimum socket depth of 2" or more. 2", 3" & 4" belled socket depths will be @ 1¾".
- Branch fittings are designed to enter the main duct, at an angle not exceeding 45°. Branch 90° tees are available where systems allow.

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SUGGESTED STANDARD PRODUCT SPECIFICATION FOR PVC and CPVC (CORZAN®) ROUND DUCTING (CONT'D)

- Transition fittings shall have formed corners where practical. They will be of concentric design (unless otherwise requested) with a tapered cone-type body.
- Reducer couplings, having a size reduction greater than "two-step", shall be formed with cone-type body having an over-all length generally calculated @ 4" per 1" size reduction, where space allows. One-step and two-step reducers will have a smooth-flow concentric design.
- Blastgate Dampers shall be furnished with a 3- position locking pin. (open, half-open, closed)
- Butterfly (Balancing) Dampers shall be furnished with a locking quadrant, to permanently position. Motorized dampers are available on request.
- Rain Caps shall be of "Zero Pressure Loss" design, commonly known as Style "B". Style "A" Rain Caps are also available on request.

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