ZENITH®

SCH 80 PVC&CPVC FITTINGS

CPVC PIPES

VALVES

SCH 40 PVC FITTINGS

DWV FITTINGS

NSF®

National Sanitation Foundation

ANSI

Certification Program Accredited by the American National Standards Institute

Certification Program Accredited by the Standards Council of Canada

ارامكو السعودية
Saudi Aramco

"WE WANT TO GROW WITH YOU"

ZENITH®

INDEX

Version 0610

ZENITH PLASTICS INC.
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FAX: (514) 426-8558
E-MAIL: zenith@cam.org
www.zenithplastic.com

ATTESTATION

Starting from January 1st. 2006, Zenith Plastics Inc. **(ZENITH)** has entered in an agreement with: Quality Supply Plastic Technology Factory Co. **(QSC)**, to provide the expertise, know-how, moulds & parts specification as well as "Zenith" brand name for **(QSC)** to produce PVC & CPVC Pipe Fittings in **(QSC)** factory in Phase 5, Jeddah's Industrial City, the Kingdom of Saudi Arabia.

(ZENITH) sends it is own staff from North America periodically to inspect and make sure that: All the American Standards **(ASTM)** are followed in the production process & product specification.

(ZENITH) guarantees **(QSC)** products and assuring its client and distributors throughout Saudi Arabia and the Middle Eastern Countries that: The productions of **(QSC)** have the same quality, specification & dependency as its own.

Authorized Signature

F. Trudell

CHAMBRE DE COMMERCE DE MONTREAL METROPOLITAIN
BOARD OF TRADE OF METROPOLITAN MONTREAL

NSF International

RECOGNIZES

QUALITY SUPPLY PLASTIC TECHNOLOGY FACTORY COMPANY LTD. (ZENITH)

SAUDI ARABIA

AS COMPLYING WITH NSF/ANSI 61.
PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE AUTHORIZED TO BEAR THE NSF MARK.

Certification Program Accredited by the American National Standards Institute

Certification Program Accredited by the Standards Council of Canada

January 7, 2008
Certificate# 27160 - 02

David Purkiss, General Manager
Water Distribution Systems

Why PVC / CPVC

LOW COST INSTALLATION & MAINTENANCE

Installation costs are minimized through the use of PVC or CPVC Schedule 80 and Schedule 40 PVC, since materials are generally lower cost, light weight and easier to handle. Joining is accomplished through solvent cementing, threading, flanging or victaulic.
Life expectancy of plastic pipe systems far exceeds that of metal systems and requires simpler and less costly maintenance.

CHEMICAL RESISTANCE & BIOLOGICAL RESISTANCE

PVC and CPVC Schedule 40 & 80 have an exceptional resistance to a wide range of chemicals such as most acids, alcohol, alkalis, halogens and many others. However, chemical resistance is a function of concentration, pressure and temperature. Please contact us for specific application.

CORROSION & ABRASION RESISTANCE

PVC or CPVC Schedule 40 & 80 systems are not adversely affected by environmental agents or normal soil contaminants.

LOW THERMAL CONDUCTIVITY

All plastic piping materials have low thermal conductance properties. This feature maintains more uniform temperatures when transporting fluids in plastic than in metal piping. Low thermal conductivity of the wall of plastic piping may eliminate or reduce greatly the need for pipe insulation to control sweating.
PVC & CPVC are self-extinguishing and will not support self combustion in the absence of ignition source.

LOW FRICTION LOSS

Interior walls of plastic piping systems have and remain smooth in virtually any service. This minimizes head pressure loss through friction. Plastic Piping systems generally are impervious to scaling or contaminants buildup.

LIGHT WEIGHT

Most plastic piping systems are on the order of one-sixth the weight of steel piping. This feature means lower costs in many ways: lower freight charges, less manpower, simpler hoisting and rigging equipment, etc. This characteristic has allowed some unique cost-saving installation procedures in several applications.

NONTOXIC

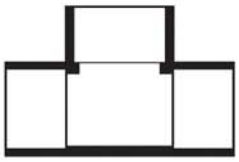
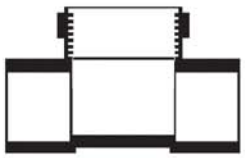
Zenith Plastics Inc. uses NSF® approved compound for the potable water "Lead Free"
PVC (Polyvinyl Chloride) Type 1, Grade I PVC (Cell Classification 12454-B) conforming to ASTM D-1784 is superior. The maximum service temperature for PVC is 140°F. With a design stress of 2000 PSI, PVC has the highest long term hydrostatic strength at 73° F. of any of the major thermoplastics being used for piping.

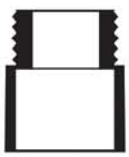
And CPVC (Chlorinated Polyvinyl Chloride) Type 4, Grade I CPVC (Cell Classification 23477-B) conforming to ASTM D-1784 has physical properties at 73° F. similar to those of PVC, and its chemical resistance is similar to or generally better than that of PVC. CPVC, with a design stress of 2000 PSI and maximum service temperature of 210° F. has, over a period of more than 20 years, proven to be an excellent piping material for hot corrosive liquids, hot and cold water distribution and similar applications above the temperature range of PVC.

Market "Application"

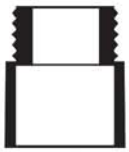
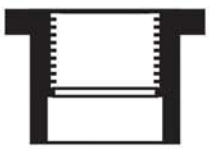
- Acid Handling
- Biotechnical Sciences
- Bottling
- Brewing
- Beverage
- Chemical Processing
- Confectionary
- Control & Instrumentation
- Corrosive Acids
- Commercial Building
- Cosmetics
- Distilled Spirits
- Farming
- Fertilizer Industry
- Hotel & Motel
- Industrial Waste Facilities
- Irrigation
- Laundry & Dry Cleaning
- Lubrification
- Manufacturing / Industrial Equipment (OEM)
- Marine & Maritime Services
- Meat Processing
- Medical & Surgical
- Mobile Homes
- Metal Shops
- Mining
- Oils (Vegetables)
- Paint
- Pulp & Paper Production
- Petrol-Chemical Industry
- Petroleum Products
- Photographic
- Pollution Control (Air & Water)
- Poultry Products
- Power Plants
- Printing Industrial
- Pool & Spa Industrial
- Plating Shops
- Rubber & Synthetic Products
- Residential
- Saline & Alkaline Handling
- Waste Water Treatment Plants
- Water Supply

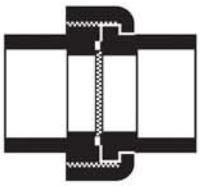
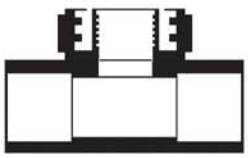
ZENITH®

PRODUCT	SIZE	CPVC SCH 80 Part Number	PVC SCH 80 Part Number
تـــــي  TEE SxSxS	1/2"	9801-005	801-005
	3/4"	9801-007	801-007
	1 "	9801-010	801-010
	1 1/4"	9801-012	801-012
	1 1/2"	9801-015	801-015
	2"	9801-020	801-020
	3"	9801-030	801-030
	4"	9801-040	801-040
تي سن داخلي  TEE SxSxF	1/2"	9802-005	802-005
	3/4"	9802-007	802-007
	1 "	9802-010	802-010
كوع ٩٠°  90° ELBOW SxS	1/2"	9806-005	806-005
	3/4"	9806-007	806-007
	1 "	9806-010	806-010
	1 1/4"	9806-012	806-012
	1 1/2"	9806-015	806-015
	2"	9806-020	806-020
	3"	9806-030	806-030
	4"	9806-040	806-040
كوع ٩٠°بسن داخلي  90° ELBOW SxF	1/2"	9807-005	807-005
	3/4"	9807-007	807-007
	1 "	9807-010	807-010

PRODUCT	SIZE	CPVC SCH 80 Part Number	PVC SCH 80 Part Number
كوع ٤٥°  45° ELBOW SxS	1/2"	9817-005	817-005
	3/4"	9817-007	817-007
	1 "	9817-010	817-010
	1 1/4"	9817-012	817-012
	1 1/2"	9817-015	817-015
	2"	9817-020	817-020
	3"	9817-030	817-030
	4"	9817-040	817-040
جلبة  COUPLING SxS	1/2"	9829-005	829-005
	3/4"	9829-007	829-007
	1 "	9829-010	829-010
	1 1/4"	9829-012	829-012
	1 1/2"	9829-015	829-015
	2"	9829-020	829-020
	3"	9829-030	829-030
	4"	9829-040	829-040
جلبة بسن داخلي  FEMALE ADAPTER SxF	1/2"	9835-005	835-005
	3/4"	9835-007	835-007
	1 "	9835-010	835-010
	1 1/4"	9835-012	835-012
	1 1/2"	9835-015	835-015
	2"	9835-020	835-020
جلبة ذكر  MALE ADAPTER SxM	1/2"	9836-005	836-005
	3/4"	9836-007	836-007
	1 "	9836-010	836-010
	1 1/4"	9836-012	836-012
	1 1/2"	9836-015	836-015
	2"	9836-020	836-020
	3"	9836-030	836-030
	4"	9836-040	836-040

ZENITH®

PRODUCT	SIZE	CPVC SCH 80 Part Number	PVC SCH 80 Part Number
جلبة ذكر سن ناعم  B. S. MALE ADAPTER SxM	3"	9836-030 BS	836-030 BS
	4"	9836-040 BS	836-040 BS
نـقـاص  REDUCER BUSHING SpxS	3/4x1/2	9837-101	837-101
	1x1/2	9837-130	837-130
	1x3/4	9837-131	837-131
	11/4x1/2	9837-166	837-166
	11/4x3/4	9837-167	837-167
	11/4x1	9837-168	837-168
	11/2x1/2	9837-209	837-209
	11/2x3/4	9837-210	837-210
	11/2x1	9837-211	837-211
	11/2x11/4	9837-212	837-212
	2x1/2	9837-247	837-247
	2x3/4	9837-248	837-248
	2x1	9837-249	837-249
	2x11/4	9837-250	837-250
	2x11/2	9837-251	837-251
	3x1	9837-335	837-335
	3x2	9837-338	837-338
	3X21/2	9837-339	837-339
	4x2	9837-420	837-420
	4x3	9837-422	837-422
نقاص بسن داخلي  REDUCER BUSHING SpxF	3/4x1/2	9838-101	838-101
	1x1/2	9838-130	838-130
	1x3/4	9838-131	838-131

PRODUCT	SIZE	CPVC SCH 80 Part Number	PVC SCH 80 Part Number
سـدة  CAP S	1/2 ” 3/4" 1 " 1 1/4" 1 1/2" 2" 3" 4"	9847-005 9847-007 9847-010 9847-012 9847-015 9847-020 9847-030 9847-040	847-005 847-007 847-010 847-012 847-015 847-020 847-030 847-040
سـدة بسن  THREAD PLUG	1/2"	9847-005T	847-005T
فلنجة متحركة  VAN-STONE FLANGE S	3” 4"	9854-030 9854-040	854-030 854-040
شد وصل (مع حلقة مطاطية)  UNION SxS (W/EPDM O RING)	1/2" 3/4" 1 " 1 1/4" 1 1/2" 2" 3"	9897-005 9897-007 9897-010 9897-012 9897-015 9897-020 9897-030	897-005 897-007 897-010 897-012 897-015 897-020 897-030
تي بسن نحاس  BRASS INSERT TEE SxSxF	1/2x1/2 3/4x1/2 3/4x3/4 1x3/4 1 x 1	9801-005B 9801-101B 9801-007B 9801-131B 9801-010B	801-005B 801-101B 801-007B 801-131B 801-010B

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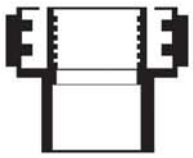
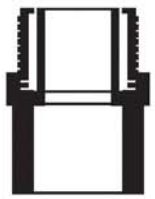
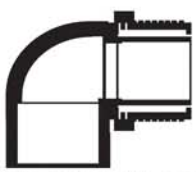
PRODUCT	SIZE	CPVC SCH 80 Part Number	PVC SCH 80 Part Number
كوع بسن نحاس  BRASS INSERT ELBOW SxF	1/2x1/2	9806-005B	806-005B
	3/4x1/2	9806-101B	806-101B
	3/4x3/4	9806-007B	806-007B
	1x3/4	9806-131B	806-131B
	1 x 1	9806-010B	806-010B
	11/4x11/4	9806-012B	806-012B
	11/2x11/2	9806-015B	806-015B
	2 x 2	9806-020B	806-020B
جلبة بسن نحاس  BRASS INSERT F. ADAPTER SxF	1/2x1/2	9835-005B	835-005B
	3/4x1/2	9835-101B	835-101B
	3/4x3/4	9835-007B	835-007B
	1x3/4	9835-131B	835-131B
	1 x 1	9835-010B	835-010B
	11/4x11/4	9835-012B	835-012B
	11/2x11/2	9835-015B	835-015B
	2 x 2	9835-020B	835-020B
	3 x 3	9835-030B	835-030B
جلبة ذكر بسن نحاس  BRASS INSERT M. ADAPTER SxM	1/2x1/2	9836-005B	836-005B
	3/4x1/2	9836-101B	836-101B
	3/4x3/4	9836-007B	836-007B
	1x1/2	9836-130B	836-130B
	1x3/4	9836-131B	836-131B
	1 x 1	9836-010B	836-010B
	11/4x11/4	9836-012B	836-012B
	11/2x11/2	9836-015B	836-015B
	2 x 2	9836-020B	836-020B
	3 x 3	9836-030B	836-030B
كوع ذكر بسن نحاس  BRASS INSERT M. ELBOW SxM	1/2x1/2	9810-005B	810-005B
	3/4x1/2	9810-101B	810-101B
	3/4x3/4	9810-007B	810-007B
	1 x 1	9810-010B	810-010B

مواسير حارة ضغط ٨٠
CPVC SCH 80 IPS PIPES

ASTM Standards F-441

Size	Part No	OD	ID	Nom. Weight lbs/100ft.	Rated Working Pressure @ 73 /F	Rated Working Pressure @ 180 /F
1/2"	9101-005	0.840"	0.538"	22.50	850	210
3/4"	9101-007	1.050"	0.724"	30.50	690	170
1 "	9101-010	1.315"	0.935"	45.00	630	155
1 1/4"	9101-012	1.660"	1.256"	61.80	520	130
1 1/2"	9101-015	1.900"	1.476"	75.00	470	115
2"	9101-020	2.375"	1.913"	104.00	400	100
21/2"	9101-025	2.875"	2.289"	158.40	425	105
3"	9101-030	3.500"	2.864"	212.40	375	90
4"	9101-040	4.500"	3.786"	310.50	320	80

كرنك حـار

CPVC CROSS OVER

SIZE	Part Number
1/2"	9833-005
3/4"	9833-007
1 "	9833-010

Valves المحابس

Our latest development is a stop valve consisting of 4 parts

- Chrome-Plated Brass Handle
- Chrome-Plated Brass Cover, slides on Long Neck
- Brass Interior parts
- CPVC Body

This new build of the Stop Valve combines the strength of Brass and longevity of CPVC material and will contribute a considerable saving in money, installation time and risk of leakage by eliminating extra parts used to be added to the regular All Brass Stop Valve.

AVAILABLE IN 1/2" , 3/4" AND 1" FOR HOT & COLD WATER

PLEASE TRY IT FOR YOUR NEXT PROJECT

WE GUARANTY YOUR SATISFACTION

محبس دفن (كوستا)
Concealed C.P. Valve (Costa)

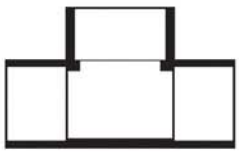
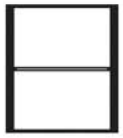
SIZE	CPVC Part Number
1/2"	9801-005BVC
3/4"	9801-007BVC
1 "	9801-010BVC

محبس دفن (كلاسيك)
Concealed C.P. Valve (Classic)

SIZE	CPVC Part Number
1/2"	9801-005
3/4"	9801-007
1 "	9801-010

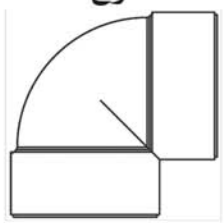
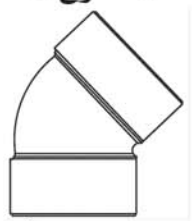
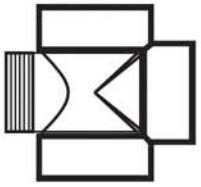
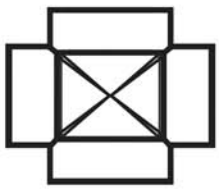
محبس عادي
Stop Valve

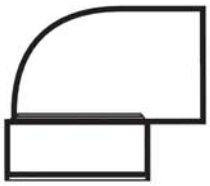
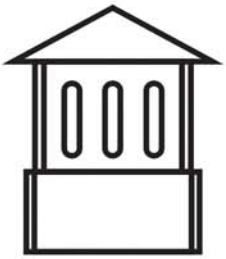
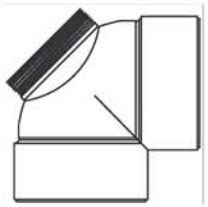
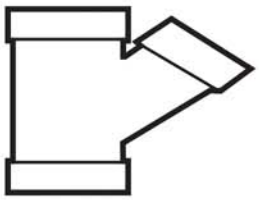
SIZE	CPVC Part Number	PVC Part Number
1/2"	9802-005SV	802-005SV
3/4"	9802-007SV	802-007SV
1 "	9802-010SV	802-010SV

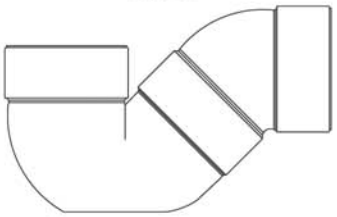
PRODUCT	SIZE	PVC SCH 40 Part Number
تـــي  TEE SxSxS	1/2"	401-005
	3/4"	401-007
	1 "	401-010
	1 1/4"	401-012
	1 1/2"	401-015
	2"	401-020
	3"	401-030
	4"	401-040
كوع ٩٠°  90° ELBOW SxS	1/2"	406-005
	3/4"	406-007
	1 "	406-010
	1 1/4"	406-012
	1 1/2"	406-015
	2"	406-020
	3"	406-030
	4"	406-040
كوع ٤٥°  45° ELBOW SxS	1/2"	417-005
	3/4"	417-007
	1 "	417-010
	1 1/4"	417-012
	1 1/2"	417-015
	2"	417-020
	3"	417-030
	4"	417-040
جلبة  COUPLING SxS	1/2"	429-005
	3/4"	429-007
	1 "	429-010
	1 1/4"	429-012
	1 1/2"	429-015
	2"	429-020
	3"	429-030
	4"	429-040

PRODUCT	SIZE	PVC SCH 40 Part Number
جلبة بسن داخلي  FEMALE ADAPTER SxF	1/2"	435-005
	3/4"	435-007
	1 "	435-010
	1 1/4"	435-012
	1 1/2"	435-015
	2"	435-020
جلبة ذكر  MALE ADAPTER SxM	1/2"	436-005
	3/4"	436-007
	1 "	436-010
	1 1/4"	436-012
	1 1/2"	436-015
	2"	436-020
سدة  CAP S	1/2"	447-005
	3/4"	447-007
	1 "	447-010
	1 1/4"	447-012
	1 1/2 "	447-015
	2"	447-020
	3"	447-030
	4"	447-040
نقاص  REDUCER BUSHING SpxS	3/4 x 1/2	437-101
	1 x 1/2	437-130
	1 x 3/4	437-131
	11/4x1/2	437-166
	11/4x3/4	437-167
	11/4x1	437-168
	11/2x1/2	437-209
	11/2x3/4	437-210
	11/2x1	437-211
	11/2x11/4	437-212
	2x1	437-249
	2x11/4	437-250
	2x11/2	437-251

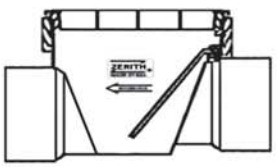
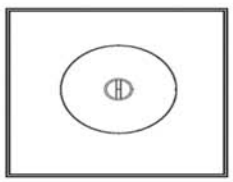
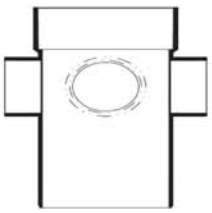
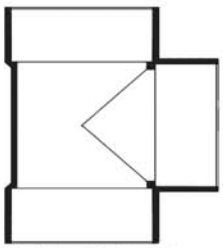
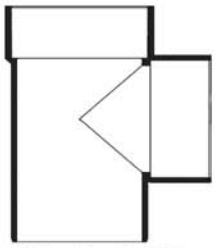
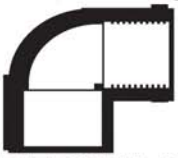
ZENITH®

PRODUCT	SIZE	D W V Part Number
كـــوع ٩٠°  90 ELBOW SxS	4"	506-040
	110MM	506-110
كـــوع ٤٥°  45° ELBOW SxS	4"	517-040
	110MM	517-110
تـي بـاب  TEE W/ ACCESS CAP	4"	501-040C
	110MM	501-110C
صليب  CROSS	4"	583-040
	110MM	583-110

PRODUCT	SIZE	D W V Part Number
كـــوع ٩٠°  90° ELBOW SxSP	4"	506-040SP
	110MM	506-110SP
هـوايـة  AIRVENT COWL	3"	AirVent-003
	4"	AirVent-004
	90MM	AirVent-090
	110MM	AirVent-110
كـــوع بـاب  90° ELBOW W / ACCESS CAP	4"	506-040C
	110MM	506-110C
تي واي  TEE Y	4"	510-040
	110MM	510-110

كـــوع ريحـه  P - TRAP

4"	588-040
110MM	588-110

PRODUCT	SIZE	D W V Part Number
رداد  NON-RETURN VALVE	4" 110MM	501-040F 501-110F
غطاء بلاعة  FLOOR DRAIN COVER	15CM 20CM	FCD-015 FCD-020
بلاعة  FLOOR DRAIN	4"x2" 4"x2"	FDS- 442 FDL- 442
تي  TEE SxSxS	4" 110MM	501-040 501-110
تي  TEE SxSxSP	4" 110MM	501-040SP 501-110SP
جلبة إصلاح  REPAIR COUPLING	2" 3" 4"	RP 529-020 RP 529-030 RP 529-040
كوع ٩٠° بسن داخلي  90° ELBOW SxF	1 1/2 "	507-015

PLASTIC PIPING STANDARDS

MANY COMMERCIAL, INDUSTRIAL AND GOVERNMENTAL STANDARDS OR SPECIFICATIONS are available to assist the design engineer in specifying plastic piping systems. Standards most frequently referred to, and most commonly called out, in plastic piping specifications are ASTM standards. These standards also often form the basis of other standards in existence. Because of their importance, below is a list and description of those standards most typically applied to industrial plastic piping.

ASTM Standard D-1784
This standard covers PVC and CPVC Compounds used in the manufacture of plastic pipe, valves and fittings. It provides a means for selecting and identifying compounds on the basis of a number of physical and chemical criteria. Conformance to a particular material classification in this standard requires meeting a number of minimum physical and chemical properties.

ASTM Standard
D-1785 and F-441
These standards cover the specification and quality of Schedule 40, 80 and 120 PVC (D-1785) and CPVC (F-441) pressure pipe. Outlined in these standards are dimensional specifications, burst, sustained and maximum operating pressure requirements and test procedures for determining pipe quality with respect to workmanship and materials.

ASTM D-2464 and F-437
These standards cover PVC (D-2464) and CPVC (F-437) Schedule 80 threaded pressure fittings. Thread dimensional specifications, wall thickness, leg lengths, burst, material quality and identification requirements are specified.

ASTM Standards
D-2466 and F-438
These standards cover schedule 40 PVC (D-2466) and CPVC (F-438) threaded and socket pressure fittings. Stipulated in the standard are thread and socket specifications, by length, wall thickness, burst, material quality and identification requirements.

ASTM Standards
D-2467 and F-439
Standards D-2467 (PVC) and F-439 (CPVC) cover the specification of Schedule 80 socket type pressure fittings. Socket dimension specifications, wall thickness, leg lengths, burst, material quality and identification requirements are specified.

ASTM Standard
D-2564 and F-493
This standards sets forth requirements for PVC (D-2564) and CPVC (F-493) Solvent Cement including a resin material designation and resin content quality standard. Also included in this standard are test procedures for measuring the cement quality by means of burst and lap hear tests.

The balance are standards of other groups that are commonly encountered in industrial thermoplastic piping design.

ANSI B2.1 (American National Standards Institute)
This specification details the dimensions and tolerances for tapered pipe threads. This standard is referenced in the ASTM Standard for threaded fittings mentioned above.

ANSI B16.1
This specification sets forth standards for both holes, bolt circle, and overall dimensions for flanges.

NSF Standard 14 (National Sanitation Foundation)
This standard provides specifications for toxilogical and organoleptic levels to determine the suitability of plastic piping for potable water use. It additionally requires adherence to appropriate ASTM Standards and specifies minimum quality control programs. To meet this standard a manufacturer must allow third party certification by NSF of the requirements of this standard.

NSF 61 Standard
NSF 61 Standard is for product being acceptable in the transport or containment of potable drinking water: Standards are accepted by the Council of Public Health Consultants. All NSF Certified products are listed in a searchable database on the Internet at http://www.nsf.org

INDUSTRIAL THERMOPLASTICS

PVC

(Polyvinyl Chloride) Type 1, Grade 1 PVC is the most frequently specified of all thermoplastic materials. It has been used successfully for over 40 years in such areas as chemical processing, industrial plating, chilled water distribution, deionized water lines, chemical drainage, and irrigation systems. PVC is characterized by high physical properties and resistance to corrosion and chemical attack by acids, alkalis, salt solutions and many other chemicals. It is attacked, however, by polar solvents such as ketones, some chlorinated hydrocarbons and aromatics. Of the various types and grades of PVC used in plastic piping systems, Type 1, Grade 1, PVC (Cell Classifications 12454-B) conforming to ASTM D-1784 is superior with respect to the above properties. The maximum service temperature of PVC is 140°F. With a design Stress of 2000 PSI, PVC has the highest long term hydrostatic strength at 73°F of any of the major thermoplastics being used for piping systems. PVC is joined by solvent cementing, threading or flanging.

CPVC

(Chlorinated Polyvinyl Chloride) Type 4, Grade 1 CPVC (Cell classifications 23477-B) conforming at 73°F similar to those of PVC, and its chemical resistance is similar to or generally better than that of PVC. CPVC, with a design stress of 2000 PSI and maximum service temperature of 210°F has, over a period of about 25 years, proven to be an excellent material for hot corrosive liquids, hot and cold water distribution and similar applications above the temperature range of PVC, CPVC is joined by solvent cementing, threading or flanging.

POLYPROPYLENE

(PP) Type 1 Polypropylene is a polyolefin which is lightweight and generally high in chemical resistance. Although type 1 polypropylene conforming to ASTM D-2156 is slightly lower in physical properties compared to PVC, it is chemically resistant to organic solvents as well as acids and alkalis. Generally, polypropylene should not be used in contact with strong oxidizing acids, chlorinated hydrocarbons and aromatics. With a design Stress of 1000 PSI at 73°F, polypropylene has gained wide acceptance in the petroleum industry where its resistance to sulphur-bearing compounds is particularly useful in salt water disposal lines, crude oil piping and low pressure gas gathering systems. Polypropylene has also proved to be an excellent material for laboratory and industrial drainage where mixtures of acids, bases and solvents are involved. Polypropylene is joined by the thermo-seal fusion process, threading or flanging.

PVDF

(Polyvinylidene Fluoride) is a strong, tough and abrasive resistant fluorocarbon material. It resists distortion and retains most of its strength to 280°F. It is chemically resistant to most acids, bases, and organic solvents and is ideally suited for handling wet or dry chlorine, bromine and other halogens. No other solid thermoplastic piping components can approach the combination of strength, chemical resistance and working temperatures of PVDF. PVDF is joined by the thermo-seal fusion process, threading or flanging.

INDUSTRIAL ELASTOMERS

VITON

(Fluorocarbon) Viton is inherently compatible with a board spectrum of chemicals. Because of this extensive chemical compatibility which spans considerable concentration and temperature ranges, Viton has gained wide acceptance as a material of construction for butterfly valve O-rings and seats. Viton can be used in most applications involving mineral acids, salt solutions, chlorinated hydrocarbons and petroleum oils

EPDM (EPT)

EPDM is a terpolymer elastomer made from ethylene-propylene diene monomer. EPDM has good abrasion and tear resistance and offers excellent chemical resistance to a variety of acids and alkalis. It is susceptable to attack by oils and is not recommended for applications involving petroleum oils, strong acids, or strong alkalis.

PHYSICAL PROPERTIES OF THERMOPLASTIC PIPING MATERIALS

	ASTM TEST METHODS	PROPERTIES	MATERIAL			
			PVC TYPE 1	CPVC	PVDF	POLYPROPYLENE
GENERAL	D-792	Specific Gravity	1.38	1.55	1.76	0.905
	D-570	Water Absorption %24 Hrs. @ 73°F	0.05	0.05	0.04	0.02
	D-638	Tensile Strength psi @ 73°F	7,940	8,400	6,000	5,000
MECHANICAL	D-638	Modulus of Elasticity in Tension psi @ 73°F	4.2	4.2	2.1	1.7
	D-790	Flexural Strength PSI	14,500	15,600	9,700	7,000
	D-256	Izod Impact Strength @ 73° (Notched)	0.65	3.0	3.8	1.3
	D-696	Coefficient of Thermal Expansion in/in °F x 10^5	3.0	3.8	7.9	5.0
THERMAL	C-177	Thermal Conductivity BTR/HR/Sq. Ft./ °F/in	1.2	0.95	0.79	1.2
	D-648	Heat Distortion Temp. °F @ 66 psi	NA	238	284	220
	D-648	Heat Distortion Temp. °F @ 264 psi	160	221	194	140
		Resistance to Heat °F at Continuous Drainage	140	210	280	180
FLAMMABILITY	D-2863	Limiting Oxygen Index (%)	43	60	44	17
	E-84	Flame Spread	15 -20	15	0	NA
		Underwriters Lab Rating (Sub 94)	94V-O	94V-O	94V-O	94HB

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PRESSURE RATINGS/TEMPERATURE FACTORS

Pipe and Fittings

MAXIMUM OPERATING PRESSURE (PSI) AT 75°F*

NOMINAL PIPE SIZE	SCHEDULE 40 CPVC & PVC	SCHEDULE 80 CPVC & PVC		SCHEDULE 80 POLYPROPYLENE	SCHEDULE 80 PVDF	
	Socket End	Socket End	Threaded End	Thermo Joint**	Thermo Joint	Threaded End
½	600	850	420	410	580	290
¾	480	690	340	330	470	235
1	450	630	320	310	430	215
1 ¼	370	520	260	–	–	–
1 ½	330	470	240	230	320	160
2	280	400	200	200	275	135
2 ½	300	420	210***	185	255	125
3	260	370	190***	185	255	125
4	220	320	160***	160	220	110
6	180	280	N.R.	N.R.	–	–
8	160	250	N.R.	–	–	–
10	140	230	N.R.	–	–	–
12	130	230	N.R.	–	–	–

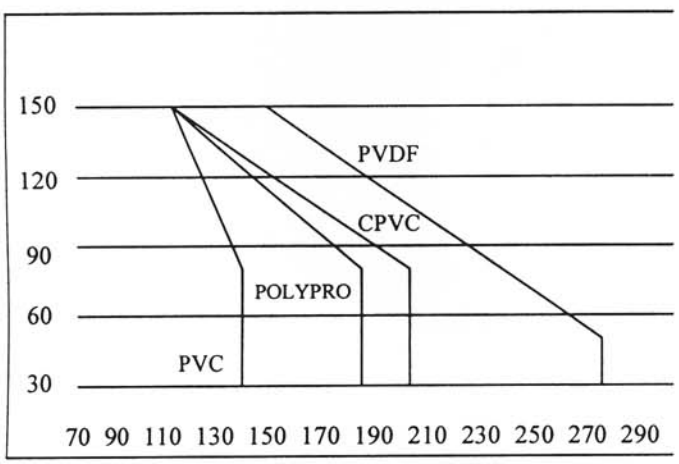
* Based on water service, for more severe service, an additional correction factor may be required.
** Threaded Polypropylene not recommended for pressure service.
*** For threaded and backwelded joints.
N.R. – Not Recommended.
Plastic Piping is not recommended for air or compressed gas service.

Temperature Correction Factors

Operating Temperature (°F)	FACTORS PVC	CPVC	PP	PVDF
70	1.00	1.00	1.00	1.00
80	0.90	0.96	0.97	0.95
90	0.75	0.92	0.91	0.87
100	0.62	0.85	0.85	0.80
110	0.50	0.77	0.80	0.75
115	0.45	0.74	0.77	0.71
120	0.40	0.70	0.75	0.68
125	0.35	0.66	0.71	0.66
130	0.30	0.62	0.68	0.62
140	0.22	0.55	0.65	0.58
150	N.R.	0.47	0.57	0.52
160	N.R.	0.40	0.50	0.49
170	N.R.	0.32	0.26	0.45
180	N.R.	0.25	*	0.42
200	N.R.	0.18	N.R.	0.36
210	N.R.	0.15	N.R.	0.33
240	N.R.	N.R.	N.R.	0.25
280	N.R.	N.R.	N.R.	0.18

Valves

As with all other thermoplastic piping components, the maximum non-shock operating pressure is a function of temperature. To determine the maximum operating pressure for temperatures above 73°F, refer to the graph below.



Flanged Systems

Maximum pressure for any flanged system is 150 psi. At elevated temperature the pressure capability of a flanged system must be derated as follows:

MAXIMUM OPERATING PRESSURE (PSI)

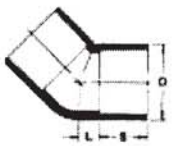
Operating Temp. F.	PVC**	CPVC**	PP***	PVDF
100	150	150	150	150
110	135	145	140	150
120	110	135	130	150
130	75	125	118	150
140	50	110	105	150
150	N.R.	100	93	140
160	N.R.	90	80	133
170	N.R.	80	70	125
180	N.R.	70	50	115
190	N.R.	60	N.R.	106
200	N.R.	50	N.R.	97
210	N.R.	40	N.R.	90
240	N.R.	N.R.	N.R.	60
280	N.R.	N.R.	N.R.	25

NR= Not Recommended
**** PVC and CPVC flanges sizes 2 ½ -3 and 4 inch threaded must be back welded for the above pressure capability to be applicable.**
***** Threaded PP flanges size ½ through 4 inch are not recommended back weld socket flange applications (drainage only).**

PVC & CPVC SCH 80 FITTINGS DIMENSSIONS

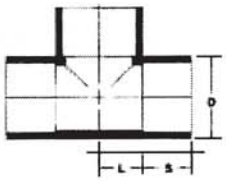
90° Elbow

SIZE	S	D	L
1/2"	29/32	1 5/32	17/32
3/4"	1	1 13/32	5/8
1"	1 5/32	2 11/16	1 25/32
1 1/4"	1 1/4	2 1/16	1 1/32
1 1/2"	1 3/8	2 5/16	2 1/16
2"	1 1/2	2 7/8	1 1/4
3"	1 29/32	4 1/8	1 3/4
4"	2 ¼	5 7/32	2 1/4



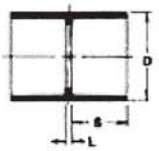
45° Elbow

SIZE	S	D	L
1/2"	7/8	1 5/32	¼
3/4"	1	1 13/22	5/16
1"	1 1/8	1 13/16	3/8
1 1/4"	1 1/4	2 5/32	7/16
1 1/2"	1 3/8	2 15/22	½
2"	1 1/2	3	5/8
3"	1 7/8	3 1/8	1 13/16
4"	2 1/4	5 1/4	1 3/32



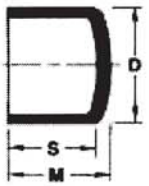
Tee

SIZE	S	D	L
1/2"	7/8	1 5/32	7/16
3/4"	1	1 3/8	11/16
1"	1 5/32	1 23/32	27/32
1 1/4"	1 9/32	2 3/32	15/16
1 1/2"	1 7/16	2 5/16	1 1/32
2"	1 17/32	2 7/8	1 5/16
3"	1 29/32	4 1/8	1 13/16
4"	2 1/4	5 3/16	2 1/4



Coupling

SIZE	S	D	L
1/2"	7/8	1 5/32	3/32
3/4"	1	1 3/8	3/32
1"	1 1/8	1 11/16	3/32
1 1/4"	1 1/4	2 3/32	1/4
1 1/2"	1 3/8	2 11/32	1/4
2"	1 1/2	2 27/32	1/4
3"	2	4 1/8	5/32
4"	2 9/32	5 7/32	5/32



Cap

SIZE	S	D	L
1/2"	29/32	1 9/32	1 5/32
3/4"	1	1 13/32	1 5/16
1"	1 1/8	1 23/32	1 7/16
1 1/4"	1 1/4	2 3/32	1 7/32
1 1/2"	1 3/8	2 3/8	1 3/4
2"	1 1/2	2 27/32	2
3"	1 7/8	4 1/8	2 11/32
4"	2 9/32	5 3/16	2 11/16

Notes:

1. Socket meets ASTM D2467 for PVC and ASTM F437 for CPVC.
2. Threaded meets ASTM D2467 for PVC and ASTM F437 for CPVC.
3. Threaded connections should be back welded. Not recommended for pressure applications.

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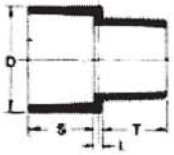
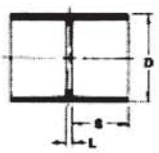


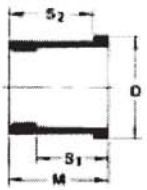
Male Adapter

SIZE	T	S	D	L
1/2"	3/4	7/8	1 1/4	3/16
3/4"	13/16	1 1/32	1 3/8	3/16
1"	15/16	1 1/8	1 23/32	1/4
1 1/4"	1 1/32	1 1/4	2 3/32	9/32
1 1/2"	1 1/32	1 3/8	2 3/8	5/16
2"	1 1/32	1 1/2	2 27/32	5/16
3"	1 5/6	1 29/32	4 1/8	9/32
4"	1 3/4	2 5/16	5 7/32	9/32



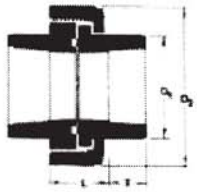
Female Adapter

SIZE	T	S	D	L
1/2"	13/16	7/8	1 7/32	1/8
3/4"	28/32	1	1 7/16	5/32
1"	1 1/32	1 1/8	1 3/4	5/32
1 1/4"	1 3/32	1 1/4	2 5/32	3/16
1 1/2"	1 3/32	1 1/4	2 5/32	3/16
2 1/2"	1 5/32	1 3/8	2 7/16	3/16
2"	1 9/32	1 1/2	2 31/32	7/3



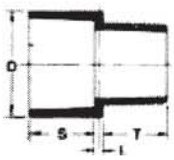
Reducing Bushing

SIZE	S1	S2	D	M
3/4" X 1/2"	7/8	1	1 5/16	1 9/32
1" X 1/2"	7/8	1 1/8	1 1/2	1 3/8
1" X 3/4"	1 1/21	1 1/8	1 1/2	1 13/32
1 1/4" X 3/4"	31/32	1 1/4	1 31/32	1 17/32
1 1/4" X 1"	1 1/8	1 1/4	1 31/32	1 17/32
1 1/2" X 3/4"	1	1 3/8	2 7/32	1 11/16
1 1/2" X 1"	1 1/4	1 3/8	2 7/32	1 11/16
1 1/2" X 1 1/4"	1	1 3/8	2 7/32	1 11/16
2" X 3/4"	1	1 3/8	2 7/32	1 11/16
2" X 1"	1 1/8	1 7/16	2 5/8	1 13/16
2" X 1 1/4"	1 1/4	1 1/2	2 5/8	1 13/16
2" X 1 1/2"	1 3/8	1 1/2	2 5/8	1 13/16
3" X 2"	1 1/2	1 7/8	4	2 3/4
3" X 2 1/2"	1 3/4	1 7/8	4	2 3/4
4" X 2"	1 7/8	2 1/4	5 3/32	2 5/8
4" X 3"	1 17/32	2 1/4	5 3/32	2 5/8



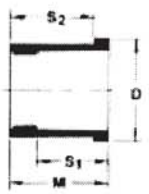
Union

SIZE	T	S	D	L
1/2"	9/32	7/8	1 9/16	1 15/16
3/4"	11/32	63/64	1 1/2	2 15/32
1"	9/32	1 1/8	1 13/16	1 7/8
1 1/4"	5/16	1 1/4	2 1/8	3 1/16
1 1/2"	11/31	1 13/32	2 3/8	3 5/16
2"	11/32	1 15/32	2 29/32	3 7/8



Male Adapter B.S.P. Pipe Thread

SIZE	T	S	D	L
3"	1 5/8	1 29/32	4 1/8	1 9/32
4"	1 ¾	2 5/16	5 7/32	9/32



FPT Red. Bushing

SIZE	T	S	D	L
3/4" X 1/2"	1	13/16	1 9/16	1 9/32
1" X 1/2"	1 1/8	13/16	1 9/16	1 3/8
1" X 3/4"	1 5/32	7/8	1 9/16	1 13/32

BENDING OF PLASTIC PIPE

WHENEVER A CHANGE OF DIRECTION IS REQUIRED IN A PIPELINE, this is best accomplished using straight lengths of pipe and factory made fittings. Bending of pipe leaves residual stresses and consequently bending is not recommended as a normal practice, particularly if the line is intended to operate at or near maximum temperatures and/or pressures. If field bending is required to meet special conditions the following techniques should be employed to give the results.

---

1. To maintain the cross section area of the I.D. of the pipe in the areas of the bend it must be supported during the bending operation. This can be done by sealing both ends of the pipe length with the plumber's test plugs and introducing sufficient air pressure to prevent kinking during bending. **Caution should be used to prevent over pressurizing. As the pipe is heated to be bent, the air will expand. A slight positive pressure is sufficient.)** Alternately, the I.D. can be supported by filling with preheated sand and plugging both ends or inserting a helically wound springs with an outside diameter several mils smaller than the pipe I.D.

2. Heat the pipe uniformly by immersing it in hot oil or water or by rotating in the front of a hot air gun or heat box. And pen flame should never be used. Heating times will range from approximately one to five minutes, depending on pipe size and type of heat sources.

3. When the pipe becomes soft and pliable it should be placed in a forming jig of form and the bend should be made as quickly as possible to prevent Weakening or deforming of the pipe. The minimum radius to which a bend should be made, measured from the inner edge of the curve, should be 8 pipe diameters for ¾" pipe size and below and 6 pipe diameters for larger pipe. The initial forming bend will have to be slightly greater to allow for spring back.

4. The bend should be kept in the forming jig until the pipe cools and becomes rigid enough to be removed without deforming. It should then be immediately immersed in water to complete the cooling process. Air pressure should not be relieved or sand removed until final cooling is completed.

5. A straight section of at least two pipe diameters should be left at either side of the bend to insure a round, low stress section with which to make joints.

6. Highly crystalline thermoplastics such as PVDF should never be formed in this way because of the potential detrimental effect of the process on the molecular structure and properties of the material.

PPFA

INSTALLATION HANDBOOK: CPVC HOT & COLD WATER PIPING

INTRODUCTION

Chlorinated polyvinyl chloride (CPVC) pipe, tube, and fittings have been successfully used in hot and cold water distribution systems since 1960. From 1960 through 2000, enough CPVC tubing was sold to plumb millions of typical, single-family dwelling units and usage is increasing each year.

The product consists of SDR 11 CPVC tube made to the Copper Tube Size (CTS) ODs (outside diameters), and CPVC socket-type fittings. The standard covers sizes ½-inch through 2-inch and both the tube and fittings are tan in color. As hot and cold water piping, the system carries a continuous use rating of 100 psi at 180° F and 400 psi at 73° F. When sizes larger than 2-inch are needed, Sch. 80 CPVC pipe (ASTM F 441) made to iron pipe size (IPS) ODs (outside diameters), and Sch. 80 CPVC fittings (ASTM F 437 and F 439) are used. Some codes require proof testing of assemblies for 48 hours at 150 psi/210° F. Most producers have had these tests performed to qualify their products for use under such codes. CPVC CTS tube and CPVC IPS Sch 80 pipe are sold in straight lengths. Smaller diameter CTS tube is also sold in coils.

GENERAL INFORMATION

This handbook is intended to provide basic information for the installation of CPVC (Chlorinated PolyVinyl Chloride) piping[1] for hot and cold water distribution systems and is published for the benefit of installers, contractors, code officials, distributors, and home owners. The information has been presented as simply and concisely as possible, but the reader should be aware that more detailed information is available from the manufacturer of your CPVC piping or from the supplier of the raw material used in the piping. Some subjects in this handbook are interrelated and may be discussed in more than one section. The authors strongly recommend reading the entire handbook, so the user will be familiar with all aspects of the interrelated items.

The statements and descriptions in this handbook are informational only and are not intended as an endorsement or warranty with respect to any product or system. The Plastic Pipe and Fittings Association (PPFA) and its members make no warranties or representations as to the fitness of any product or system for any particular purpose; the suitability of any product or system for any specific application; or the performance of any product or system in actual construction.

In all cases, the appropriate local authorities should be consulted concerning the requirements covering the use of any particular product or system in any specific application. The manufacturer's label and/or instructions should also be followed. General questions on piping system design or installation described herein may be directed to the Plastic Pipe and Fittings Association.

1 The term piping covers pipe, tube, and fittings, and the terms pipe and tube are used interchangeably.

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How to Identify the Product

In order to comply with the standard, CPVC tube shall have the following information printed on it: (a) manufacturer's name, (b) certification or listing agency mark (e.g. NSF-PW or other acceptable agency's mark), (c) size, (d) ASTM D 2846 CPVC 4120, (e) SDR 11, (f) 100 psi @ 180° F.

In order to comply with the standard, CPVC pipe shall have the following information printed on it: (a) manufacturer's name, (b) certification or listing agency mark, (c) ASTM standard number F 441, (d) size, (e) Sch. 80, (f) pressure rating.

In order to comply with the standard, CPVC fittings shall have molded markings of (a) manufacturer's name, (b) certification or listing agency mark, (c) ASTM standard number (D 2846 or F 439), (d) material designation (CPVC 4120 or CPVC for CPVC 23447).

In order to comply with the standard, CPVC solvent cement shall have on the label (a) CPVC Solvent Cement, (b) ASTM F 493, (c) certification or listing agency mark, (d) manufacturer's name and address.

In order to comply with the standard, primer shall have on the label (a) primer, (b) ASTM F 656 (c) certification or listing agency mark, (d) manufacturer's name and address.

The following standards apply to CPVC and related products:

- ASTM D 2846 — Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot and Cold Water Distribution Systems;
- ASTM F 493 — Standard Specification for Solvent Cements for CPVC Pipe and Fittings;
- ASTM F 656 – Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride)(PVC) Plastic Pipe and Fittings;
- ANSI/NSF Standard 14 — Plastic Piping Components and Related Materials;
- ANSI/NSF Standard 61 — Drinking Water System Components — Health Effects; and
- ASTM F 402 — Standard Practice for Safe Handling of Solvent Cements, Primers and Cleaners* for Joining Thermoplastic Pipe and Fittings.

** Cleaner, chemical – an organic solvent used to remove foreign matter from the surface of plastic pipe or fittings.*

Product that does not have legible marking or has a marking that does not contain all pertinent information may not conform with the applicable standard.

Verify local code approval before installing CPVC piping.

CPVC piping is included in both the International Plumbing Code (Boca, SBCCI, and ICBO) and the Uniform Plumbing Code (IAPMO); plus the CABO One & Two Family Dwelling Code, the National Standard Plumbing Code (NAPHCC) and FHA/HUD Use of Materials Bulletins. State and local government/agencies can adopt these model codes as published or modify them.

Therefore, among the questions to be asked are the following:

Is a model code being used?

If so, which one, and have any modifications been made in regard to CPVC piping?

Basics

Since most of the system design parameters, e.g. minimum pressure, fixture unit or flow sizing of pipe, and limiting velocity, are prescribed in the applicable plumbing code and in ASTM D 2846, CPVC tube is usually used as a direct size-for-size replacement for copper tube. However, because CPVC is a thermoplastic rather than a metal, there are certain differences in handling, cutting, joining, and installation, and these are detailed here.

Identification & Storage

CTS Tube: Check the markings to make sure it is ASTM D 2846 SDR 11 CPVC; IPS Pipe: Markings must be ASTM F 441 Schedule 80 CPVC. All pipe or tube must have a listing agency mark. Look at the pipe to make sure there are no signs of damage or cracked ends. Store straight lengths of pipe flat with full-length support. Cover or store indoors.

Fittings: Check for marking on bag (or box) and on fittings. Store indoors.

Solvent cement, primer and cleaner: Check for markings on cans and store indoors.

Cutting & Chamfering

CPVC pipe is easy to cut with a tubing cutter (photo A), a power saw, handsaw, or a ratchet cutter. When using a ratchet cutter, blades should be sharpened regularly. The tubing cutter should be equipped with a blade made especially for cutting plastic. A roller-type tubing cutter with a cutting blade designed for metal is not satisfactory, even if the blade is new. All cuts should be made so they are square to the tubing.

Chamfer the end of the pipe (photo B) and remove any burrs. Although this can be done with a knife or file, a chamfering tool that produces a 10° to 15° chamfer is ideal. **Use a clean, dry rag**; wipe dirt and moisture from the fitting sockets and tubing ends.

A

B

C

Check Dry Fit

This is done just before a joint is solvent cemented, and it verifies the pipe OD and the fitting socket tolerances (photo C). The pipe should go into the socket 1/3 to 2/3 of the socket depth before it makes contact with the socket wall. This interference is necessary and provides a joint that will quickly attain the desired handling strength and give good, long-term service.

Primer & Cement

CPVC piping and fittings are joined with CPVC cements. The solvent cement process can be a one- or a two-step process. The one-step cement does not require the use of a primer; the cement will be yellow in color. The two-step process does require the use of a primer; the cement will be orange in color. Both types of cements are manufactured under ASTM F 493 for use with CPVC hot and cold water piping (½-inch to 2-inch sizes) that conform with ASTM D 2846. The label on the can will indicate the cement color and whether a primer is required. Before using one-step cement, check to determine if the local code permits its use or if two-step cement with primer is required.

If primer is required, apply it to the outer surface of the pipe end (photo D) and the inner surface of the fitting socket (photo E) using a dauber supplied in the can or a brush which is at least one half the size of the pipe (½-inch min.) but not larger than the size of the pipe.

D

Apply a light coat of CPVC cement to the socket contact surface (photo F) and a full layer to the pipe end contact surface (photo G). Immediately insert the pipe into the socket and bottom it with a ¼ turn (photo H). Hold the pipe in the socket firmly for 10 to 15 seconds. When released, the pipe should not "push out" of the socket. If "push out" occurs, increase the "holding in" time. If the surface dries before the joint is put together, quickly apply another light coat of cement to the pipe end and then assemble.

E

F

G

H

Do not use excessive amounts of primers or cements or allow them to puddle in the socket.

A good job of cementing is evidenced by an even bead or filet of cement all around the pipe at the socket interface. Wipe off any excess cement. At temperatures below 40° F, extended cure cycles may be required. Consult the solvent cement manufacturer's specifications for guidelines. In extremely hot temperatures, above 100° F, make sure both surfaces to be joined are still wet with cement when putting them together.

Solvent set and cure times are a function of pipe size, temperature, and relative humidity. Curing time is shorter for drier environments, smaller sizes, and higher temperatures. Follow the solvent cement manufacturer's recommended drying times. On smaller sizes and with short pieces of pipe, the joint has adequate handling strength almost immediately so that assembly can proceed without delay.

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Safe Handling of Primer, Cleaner & Cement

Solvent cements, primers and cleaners must be handled properly. To do so, refer to ASTM F 402, Standard Practice for Safe Handling of Solvent Cements, Primers and Cleaners, which contains the following directions:

"Avoid prolonged breathing of solvent vapors. When pipe and fittings are being joined in partially enclosed areas, use a ventilating device in such a manner as to maintain a safe level of vapor concentration with respect to toxicity and flammability in the breathing area. Select ventilating devices and locate them so as not to provide a source of ignition to flammable vapor mixtures.

"Keep cements, primers and cleaners away from all sources of ignition, heat, sparks and open flame.

"Keep containers of cements, primers and cleaners tightly closed except when the product is being used. The container type shall be in accordance with Parts 1 to 199, Title 49 — Transportation, Code of Federal Regulations. Container labeling shall conform with the requirements of the Federal Hazardous Substance Act and OSHA Hazard Communication Act.

"Dispose of all rags and other materials used for mopping up spills in an outdoor safety waste receptacle. Empty the receptacle daily with proper consideration for its flammable hazard.

"Most of the solvents used in pipe cements, primers and cleaners can be considered eye irritants and contact with the eye should be avoided as it may cause eye injury. Proper eye protection and the use of chemical goggles or face shields are advisable where the possibility of splashing exists in handling these products. In case of eye contact, flush with plenty of water for 15 minutes and call a physician immediately.

"Avoid contact with the skin. Wear proper gloves impervious to and unaffected by the solvents when contact with the skin is likely. Application of the primers, cleaners, or solvent cements with rags and bare hands is not recommended. Brushes, daubers, and other suitable applicators can be used effectively for applying these products, thus avoiding skin contact. Dispose of used applicators in the same manner as the rags. In the event of contact, remove contaminated clothing immediately and wash skin with soap and water. Wash contaminated clothing before wearing them again."

Expansion & Contraction

CPVC pipe, like all other piping, expands when heated and contracts when cooled. A 100-foot run of CPVC piping will expand about 4 inches with every 100°F-temperature increase. Expansion does not vary with size. Measured expansion of installed piping is typically well below the theoretical values. Although some expansion joints are available, they are hardly ever used in water distribution systems. Thermal expansion in CPVC systems is usually accommodated at changes in direction or by offsets as shown below in the table. Full expansion loops are the least common of the three arrangements shown.

Example: Pipe Size - $^1/_2$"
Length of Run - 60'
L = 38" (From Table)

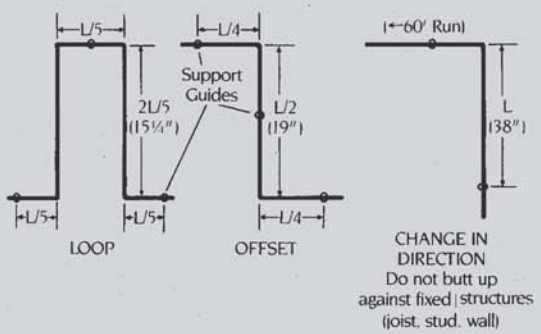

Table 1: Loop Length (inches)

Run length (ft)		20	40	60	80	100
Nom.Size	Avg. OD	Loop length "L" in inches				
½"	0.625	22	31	38	44	50
¾"	0.875	26	37	46	52	58
1"	1.125	30	42	52	60	67
1¼"	1.375	33	47	57	66	74
1½"	1.625	36	51	62	72	80
2"	2.125	41	58	71	82	91

PFA

Supports

Vertical piping should be supported at each floor level or as required by expansion/contraction design. Provide mid-story guides.

Point support must not be used for thermoplastic piping, and in general the wider the bearing surface of the support, the better. Supports should not be clamped in a way that restrains the axial movement of pipe that will normally occur due to thermal expansion and contraction. Concentrated loads, such as valves, must be separately supported.

Where pipes go through wood studs, provide oversize holes to allow pipe to move. When installed through metal studs, provide grommets or some form of insulation to protect the pipe from abrasion and to prevent noise.

Support Spacing

For horizontal spacing, Table 2 (below) shows the maximum spacing of supports based on hot water applications.

Table 2: Maximum Support Spacing

Nominal size	Max. spacing of supports
½" & ¾	36"
1"	40"
1¼"	46"
1½"	52"
2"	58"

Table 3: Support Spacing (per codes)

Nominal size	Support spacing
1" or smaller	3 ft
1¼ or larger	4 ft

Although incremental variations are technically correct, most codes use the simplified version shown in Table 3 (above).

Transition Joints & Fittings

Special transition fittings or joints are used whenever CPVC piping is connected to a metal valve, fitting, or other appurtenance such as a filter, or to parts made of another plastic. These special transition fittings can have many forms (photo I). One common form is the true union with a metal end and a CPVC end held together with a plastic or metal gland nut and having an elastomeric seal between them. Other forms are the flanged joint, the grooved joint, insert molded metal in CPVC fittings, patented push-on type fittings, and finally the CPVC female threaded adapter with an elastomeric seal at the bottom of the thread. The latter fittings are designed so that they have no thread interference and rely entirely on the elastomeric seal for water tightness. They require only minimal torque to attain an adequate seal.

Standard compression fittings that utilize brass or plastic ferrules can be used to assemble CPVC (photo J). However, Teflon® tape should be applied over the brass ferrule to compensate for the dissimilar thermal expansion rates of the brass and CPVC that could possibly otherwise result in a drip leak. Care should be taken not to over-torque the compression connection.

Metal fittings with CPVC socket inserts are also available. The tubing is cemented directly into the socket in the same way as an all-CPVC fitting.

The standard practice is to thread a male thread adapter into the female threaded part, such as a valve or stop, and then solvent cement to the CPVC pipe. However, when using the male thread adapter, there are two limitations that the installer must consider when deciding where and how to use it. First, the male thread adapter may develop a drip leak if the joint is subjected to too broad a temperature range. And second, some thread sealants intended to minimize leak problems may chemically attack the CPVC and cause stress cracking of the adapter (see Thread Sealants section). The preferred method of transitioning between metal and CPVC plumbing components is to use an insert molded metal-in-CPVC fitting or true union with a metal and a CPVC end.

I

J

PFA

Female threaded CPVC adapters without an elastomeric seal should never be used.

If a tapered pipe thread connection between the CPVC and metal components must be made, use a CPVC male thread adapter. Consult the fittings manufacturer for additional limitations.

Thread Sealants

Threaded CPVC fittings with tapered pipe threads (e.g. male thread adapters) must be used with a suitable thread sealant to insure leak-proof joints. Over the years, PTFE (Teflon® or equivalent) tape has been the preferred thread sealant and it is still the most widely accepted and approved sealant.

Some paste sealants can affect CPVC fittings; therefore only sealants recommended for use with CPVC by the thread sealant manufacturer should be used.

Water Heater Connections

Some plumbing codes contain detailed requirements for connections to gas or electric storage type water heaters. Determine whether your code has such requirements and satisfy them.

If no detailed requirements exist, use the following information. On electric water heaters CPVC can be piped directly to the heater with special metal-to-CPVC transition fittings (photo L). On high-efficiency, gas water heaters that use plastic vent piping, CPVC can be connected directly to the heater just like the electric water heater connections (photo L). On all other gas water heaters there should be at least 6 inches of clearance between the exhaust flue and any CPVC piping (photo K). Twelve-inch long metal nipples or appliance connectors should be connected directly to the heater so that the CPVC tubing cannot be damaged by the build-up of excessive radiant heat from the flue.

An approved temperature/pressure (T/P) relief valve should be installed so that the probe or sensing element is in the water at the top of the heater. CPVC is approved by all the model codes for use as relief valve drain line piping. Use a metal-to-CPVC transition fitting to connect to the relief valve and continue the pipe full size to the outlet. For horizontal runs, slope the pipe toward the outlet and support it at three-foot centers or closer. The pipe must discharge to the atmosphere at an approved location.

K

L

Do not use CPVC pipe and fittings with commercial-type, non-storage water heaters.

Pressure Testing (Joint Cure Time)

When pressure testing CPVC piping, the focus is on time required for the solvent-cemented joints to gain sufficient strength to permit pressure testing without affecting the long-term strength and durability of the system. ASTM D 2846 contains pipe OD and socket ID tolerance requirements that are more restrictive than those in most other pressure piping standards. Because of this, the solvent-cemented joints gain strength very quickly after assembly.

Furthermore, it is widely recognized that pipe size is also a factor in the joint setting and curing process.

Joint setting time refers to the time required for the solvent-cement joint to reach handling strength.

While the joint set times are rarely measured or reported, workers very quickly recognize them as being a function of pipe size, temperature, degree of interference, and even length of the pipes being handled.

The joint cure time is the time required before a system containing newly cemented joints can be pressure tested and/or put into service. While minimum joint cure times are usually not a factor in new installations, they may be a factor in repair jobs or minor revisions to piping. The following Table and text taken from ASTM D 2846 Appendix X deal with this subject.

X2.3.3 Pressure Testing — CPVC piping systems made of ½-inch through 2-inch sizes per ASTM D 2846 can be pressure tested (using cold tap water only) at line pressure (150 psi max.) after the solvent cement joints have cured for at least the following amount of time:

Table 4: Minimum Cure Times

Ambient temperature	Pipe sizes ½" to 1"	Pipe sizes 1¼" to 2"
Over 60°F	1 hr.	2 hr.
40-60° F	2 hr.	4 hr.
Below 40° F	4 hr.	8 hr.

Consult solvent cement manufacturers' installation instructions for more detailed cure times.

CPVC must not be used for piping systems intended to convey air or other compressed gases and should not be tested with air or other compressed gases.

Thermal Conductivity, Condensation & Sweating

In general, plastic materials have low coefficients of thermal conductivity when compared with metallic materials (see table below). Because of this, some people ask whether insulation is necessary to prevent heat loss from hot water piping or sweating of cold water piping. Generally, it is not necessary to insulate CPVC piping within heated buildings. Following are some factors to support this:

- 2" Sch. 80 CPVC pipe (2.375" OD - 0.230" wall) would lose about 140 BTU/h/LF while conveying 170° F water in a 70° F air environment.
- 2" Type M copper tube (2.125" OD - 0.060" wall) would lose about 5,000 BTU/h/LF under the same conditions.
- However, both the CPVC and the copper pipe will cool to ambient temperature in a short time when there is no flow.
- CPVC piping carrying 180° F water will have an outside surface temperature of about 150° F in an air-conditioned building.
- Under most use conditions that cause copper tube to sweat and drip, CPVC will remain free of condensation.

Insulation lubricants may cause severe stress cracking of CPVC fittings. Only non-lubricated insulation products (rubber or polyolefin) should be used with CPVC systems.

Thermal conduction is defined as "transfer of heat from one part of a body to another part of the same body, or from one body to another in physical contact with it, without appreciable displacement of the particles of the body." This definition leads us to the commonly used "K" factor, which refers to thermal conductivity.

Table 5: Typical "K" Factors

Material	BTU/h/SF/°F/ft	BTU/h/SF/°F/in
Copper	218.0	2616.0
Cast Iron	26.8 to 30.0	321.6 to 360.0
Steel	26.0	312.0
Concrete	0.54	6.5
Brick	0.4	4.8
Wood	0.06 to 0.12	0.7 to 1.4
PVC	0.11	1.3
CPVC 0.08	1.0	

Freezing & Thawing

One of the most common conditions that can stop the function of the water distribution system is freezing. While this condition immediately stops the flow of water at the fixture, it may or may not have progressed to the point of rupturing the pipe. Therefore, immediate steps should be taken to locate the frozen section and alleviate the problem. As soon as the frozen section is located, close any outside openings with insulation, circulate warm air into the area, or direct heated air onto the piping. Limit the heat source to 180° F or less. If the frozen section is substantially inaccessible, it may be possible to cut open the line at an accessible point and insert a small flexible tube and pump hot water directly to the ice plug. As the hot water is pumped in and the ice is melted, the excess flows back out around the flexible tube.

Once the ice plug has melted, check to see if any pipe or fitting is ruptured, make repairs if necessary, and insulate the area or pipe to prevent future freezing. **Do not use an open flame to heat the frozen pipe.**

Hydraulic Shock (Water Hammer)

Although the peak surge pressure that results from interrupting flow in a CPVC pipe is smaller than the pressure in metal pipe, when the velocity is the same, both can produce "hydraulic shock.

LIMITED WARRANTY

ZENITH/QSC products are carefully inspected for manufacturing defects. Any product proved to have manufacturing defects and provided ZENITH/QSC has been given an opportunity to inspect the product alleged to be defective and proved it is not the faulty installation; ZENITH/QSC will replace, without any further charge product proved to have manufacturing defects.

Any use for other purposes than for transporting liquids or any modification of any product involving changes in the structure void any warranty of the manufacturer. No warranty is included against any expense for removal, reinstallation or other consequential damages arising from any defect. The warranties, set out above are the only warranties made by ZENITH/QSC and are expressly in lieu of all other warranties, expressed or implied, including the warranties or merchantability and fitness for particular purpose.

ضمـــان

منتجات زينت / إمداد الجودة فُحصت بعناية فيما يتعلق بعيوب التصنيع ومع ذلك فإنه من غير الممكن دائماً اكتشاف العيوب المخفية لذلك فإن منتجات زينت / إمداد الجودة مضمونة بحيث يتم إستبدال القطع المعيبة مجاناً بعد إعطاء الشركة الفرصة للتأكد من وجود خلل بالقطعة المعيبة وأن الخلل لم ينتج من طريقة تركيب أو إستخدام القطعة.

أي استخدام للمنتجات لغير نقل السوائل وأي تغيير للمنتج بما قد يؤدي إلى تغيير في هيكل المنتج يلغي هذا الضمان .

لا يغطـــي هـــذا الضـــمان أي تكـــاليف قـــد تنـــتج عـــن إزالـــة أو إعـــادة تركيـــب أو أي تلفيـــات تكـــون قـــد نتجـــت بســـبب القطعـــة المعيبـــه هـــذا هـــو فقـــط نطـــاق الضـــمان الممنـــوح مـــن زينـــت / إمـــداد الجـــودة وهـــو يحل محل أي ضمان آخر.


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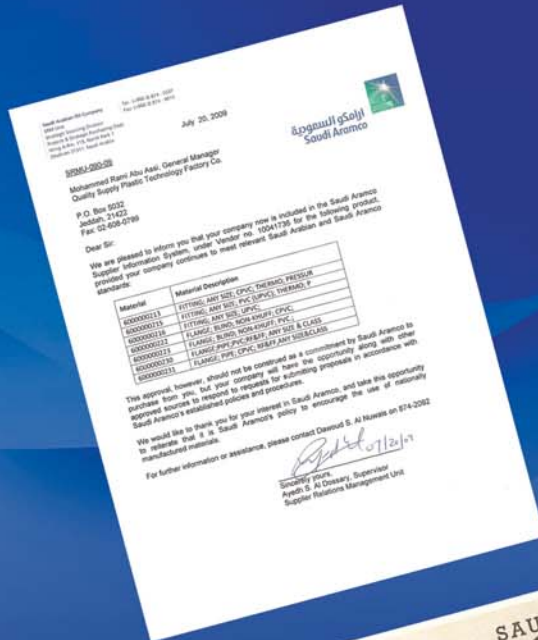
Saudi Arabian General Investment Authority
(SAGIA)


July 20, 2009

ارامكو السعودية
Saudi Aramco

Mohammed Rami Abu Assi, General Manager
Quality Supply Plastic Technology Factory Co.

P.O. Box 5032
Jeddah, 21422
Fax: 02-608-0799

Dear Sir:

We are pleased to inform you that your company now is included in the Saudi Aramco Supplier Information System, under Vendor no. 10041736 for the following product, provided your company continues to meet relevant Saudi Arabian and Saudi Aramco standards:

Material	Material Description
6000000213	FITTING; ANY SIZE; CPVC; THERMO; PRESSUR
6000000215	FITTING; ANY SIZE; PVC (UPVC); THERMO; P
6000000216	FITTING; ANY SIZE; UPVC;
6000000222	FLANGE; BLIND; NON-KHUFF; CPVC;
6000000223	FLANGE; BLIND; NON-KHUFF; PVC;
6000000230	FLANGE;PIPE;PVC;RF&FF; ANY SIZE & CLASS
6000000231	FLANGE; PIPE; CPVC; RF&FF ANY SIZE&CLASS

This approval, however, should not be construed as a commitment by Saudi Aramco to purchase from you, but your company will have the opportunity along with other approved sources to respond to requests for submitting proposals in accordance with Saudi Aramco's established policies and procedures.

We would like to thank you for your interest in Saudi Aramco, and take this opportunity to reiterate that it is Saudi Aramco's policy to encourage the use of nationally manufactured materials.

For further information or assistance, please contact Dawoud S. Al Nuwais on 874-2082

Sincerely yours,
Ayedh S. Al Dossary, Supervisor
Supplier Relations Management Unit


NSF International

RECOGNIZES

QUALITY SUPPLY PLASTIC TECHNOLOGY FACTORY COMPANY LTD. (ZENITH)

Facility: JEDDAH, SAUDI ARABIA

AS COMPLYING WITH NSF/ANSI 61.
PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE AUTHORIZED TO BEAR THE NSF MARK.

NSF

ANSI

David Purkiss, General Manager
Water Distribution Systems

January 7, 2008
Certificate# 27162 - 01


SAUDI RCI

مصنع أمداد الجودة لتقنية البلاستيك

نعمل لتحسين التطور الاجتماعي والتنموي في المملكة

نفخر بمشاركتكم في المؤشر السعودية للتنافسية المسؤولة

يناير ٢٠١٠

SAGIA