
Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 23 05 00 – Common work results for hvac
- .2 Section 23 05 05 – Installation of pipework
- .3 Section 23 05 17 – Pipe Welding
- .4 Section 23 05 19 – Thermometers and Pressure Gauges – Piping Systems
- .5 Section 23 05 23 – Valves
- .6 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment
- .7 Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment
- .8 Section 23 05 49.01 – Seismic Protection Systems
- .9 Section 23 05 53.01 – Mechanical Equipment and Network Identification

1.2 REFERENCES

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
 - .1 ANSI/AWWA C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .2 American Society of Mechanical Engineers (ASME)
 - .1 ASME B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
 - .2 ASME B16.3, Malleable Iron Threaded Fittings: Classes 150 and 300.
 - .3 ASME B16.5, Pipe Flanges and Flanged Fittings: NPS through NPS 24 Metric/Inch Standard.
 - .4 ASME B16.9, Factory-Made Wrought Buttwelding Fittings.
 - .5 ASME B18.2.1, Square Hex, Heavy Hex and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Loded Head and Lag Screws (Inch Series).
 - .6 ASME B18.2.2, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).
- .3 ASTM International
 - .1 ASTM A47/A47M, Standard Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
 - .3 ASTM A536, Standard Specification for Ductile Iron Castings.

- .4 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .5 ASTM E202, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.
- .4 CSA International
 - .1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.
 - .2 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.
- .5 Manufacturer's Standardization of the Valve and Fittings Industry (MSS)
 - .1 MSS-SP-67, Butterfly Valves.
 - .2 MSS-SP-70, Gray Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71, Gray Iron Swing Check Valves Flanged and Threaded Ends.
 - .4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.
 - .5 MSS-SP-85, Gray Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for hydronic systems and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
 - .2 Indicate on drawings:
 - .1 Components and accessories.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for hydronic systems for incorporation into manual.
 - .1 Include special servicing requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect hydronic systems from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 PIPE

- .1 Heating water to 120 °C (250 °F), 1035 kPa (150 psi)
 - .1 See material specification sheet P23-6 and P-23-6a at the end of this Section.
- .2 Chemical Products Distribution
 - .1 See material specification sheet P23-8 and P-23-8a at the end of this Section.

2.2 PIPE JOINTS

- .1 Heating water to 120 °C (250 °F), 1035 kPa (150 psi)
 - .1 See material specification sheet P23-6 and P-23-6a at the end of this Section.
- .2 Chemical Products Distribution
 - .1 See material specification sheet P23-8 and P-23-8a at the end of this Section.

2.3 FITTINGS

- .1 Heating water to 120 °C (250 °F), 1035 kPa (150 psi)
 - .1 See material specification sheet P23-6 and P-23-6a at the end of this Section.
- .2 Chemical Products Distribution
 - .1 See material specification sheet P23-8 and P-23-8a at the end of this Section.

2.4 VALVES

- .1 Heating water to 120 °C (250 °F), 1035 kPa (150 psi)
 - .1 See material specification sheet P23-6 and P-23-6a at the end of this Section.
- .2 Chemical Products Distribution
 - .1 See material specification sheet P23-8 and P-23-8a at the end of this Section.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hydronic systems installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 PIPING INSTALLATION

- .1 Install pipework in accordance with Section 23 05 05 - Installation of Pipe Work.

3.3 CIRCUIT BALANCING VALVES

- .1 Install flow measuring stations and flow balancing valves as indicated.
- .2 Remove handwheel after installation and when TAB is complete.
- .3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

3.4 CLEANING, FLUSHING AND START-UP

- .1 In accordance with Section 23 08 02 - Cleaning and Start-Up of Mechanical Piping Systems.

3.5 TESTING

- .1 For glycol systems, retest with propylene glycol to ASTM E202, inhibited, for use in building system after cleaning. Repair leaking joints, fittings or valves.

3.6 BALANCING

- .1 Balance water systems to within plus or minus 5 % of design output.
- .2 In accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC for applicable procedures.

3.7 GLYCOL CHARGING

- .1 Include mixing tank and positive displacement pump for glycol charging.
- .2 Retest for concentration to ASTM E202 after cleaning.

3.8 PERFORMANCE VERIFICATION

- .1 In accordance with Section 23 08 01 - Performance Verification Mechanical Piping Systems.

3.9 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.10 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by hydronic systems installation.

SPECIFICATIONS SHEET FOR MATERIALS TO BE USED				
SERVICE	P23-6 Heating water to 120 °C (250 °F), 1035 kPa (150 psi)			
FLUIDS	Use on hot water, ethylene or propylene glycol (with proper packing), chilled water, water from tower or cooling water at maximum operating pressure of 120 °C (250 °F). No mechanical joint is accepted.			
Items	Nominal Dimensions	Description	Standards	Acceptable Products
Pipes	To NPS 50 mm (2")	Schedule 40 carbon steel, electric resistance welded	ASTM A-53 Grade "B" Type "E"	
	NPS 65 mm (2½") to NPS 250 (10")	Black carbon steel, schedule 40, beveled ends, electric resistance welding.	ASTM A-53 Grade "B" Type "E"	
Fittings	To NPS 50 mm (2")	Class 150, malleable iron, threaded	ANSI B16.3	Anvil or equivalent
	NPS 65 to 600 mm (2½" to 24")	Welding seamless carbon steel, beveled ends, standard wall	ANSI A-234 Grade "WPB" ANSI B16.9	Anvil or equivalent
Couplings	To NPS 50 mm (2")	Threaded		
	NPS 65 mm (2½") and over	Welded		
Sleeves	NPS 10 to 50 mm (3/8" to 2")	Class 300, malleable iron threaded	ANSI B16.3	
Nipples	To NPS 50 mm (2")	Seamless carbon steel, standard wall	ASTM A-106	
Unions	To NPS 50 mm (2")	Class 150, malleable iron, threaded with brass to iron coupling	ASTM A-47 ANSI B2.1	

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Items	Nominal Dimensions	Description	Standards	Acceptable Products
Dielectric unions and flanges	All diameters	To use when there is contact between two dissimilar metals		Watts serie 3000 up to 82°C (180°F) for unions, Gruvlok 7089 & Victaulic type 47 up to 110°C (230°F)
Flanges	To NPS 50 mm (2")	Class 150, forged steel, raised face, threaded	ASTM A-105 ASTM A-181 ANSI B36.10	
	NPS 65 (2½") and over	Class 150, forged steel, raised face welding neck	ASTM A-105 ASTM A-181	
	Use flat face flanges only on equipment supplied with flat face flanges.			
Orifice flanges	NPS 25 to 500 mm (1" to 24")	Class 150, forged steel, raised face, welding neck with tightening bolts, gaskets and threaded grooved with gasket	ASTM A-105 ASTM 1-181	
Bolts and nuts		Alloy steel hexagonal nuts	ASTM A-193-GrB7 ASTM A-194-GrZH	
Gaskets		Compressed synthetic fibres with a rubber bonding agent (acrylonitrile butadiene)	SAE-ASTM-R.7 05	John Crane 2160 or equivalent

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Items	Nominal Dimensions	Description	Standards	Acceptable Products
Scellant for threaded connections		Threaded with Teflon tape or Teflon coating		Reco-Seal no. 5, Loctite "PST"
Gate valves	NPS 12 to 50 mm (½" to 2")	Class 150, threaded ends, bronze body, solid wedge disc, rising stem		Crane 431, Toyo 298, Milwaukee 1150, Nibco T-131, Kitz 42T, Jenkins 2810J,
	NPS 12 to 50 mm (½" to 2")	Class 150, threaded ends, bronze body, solid wedge disc, non-rising stem		Crane 437, Toyo 204-A, Milwaukee 1140, Nibco T-133, Jenkins 2310J
Butterfly valves	NPS 50 to 300 mm (2" to 12")	Class 175 for 1205 kPa (175 psig) service pressure, cast iron body, bronze-aluminium wedge, 304 stainless steel stem EPDM seat, support legs 50 mm (2") high		Crane 44-BXZ-L, Toyo 918 BESL, Milwaukee CL223E ou CL323-E, Kitz 6122EL, Jenkins 2232ELJ
Ball valves	NPS 12 to 50 mm (½" to 2")	Class 150 threaded sleeves, brass body, brass ball, chrome finish, brass stem, PTFE reinforced packing.	ASTM B-584 ASTM B-371	Crane 9202, Toyo 5044A, Milwaukee BA475B, Nibco T-585-70, Kitz 58, Jenkins 201J

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Items	Nominal Dimensions	Description	Standards	Acceptable Products
Globe valves	NPS 12 to 50 mm (½" to 2")	Class 150, screwed ends, bronze body, plastic disc for maximum temperature 185 °C (365 °F)		Crane 7-TF, Toyo 221, Milwaukee 590, Nibco 235Y, Kitz 09, Jenkins 106BJ
	NPT 65 to 300 mm (2½" to 12")	Class 150, iron body, bronze disc, trim and seat ring, bolted bonnet, rising stem		Crane 21 –E, Toyo 300SCJS, Milwaukee F-2983-M, Nibco F-768-B, Jenkins 162J
Check valves	NPS 12 to 50 mm (½" to 2")	Class 200, bronze body and disc, threaded ends removable swing disc, screw-in cap		Crane 36, Milwaukee 508, Nibco T-453-B, Kitz 19, Jenkins 4449J
	NPS 65 to 300 mm (2½" to 12")	Class 250, iron body, flanged, swing check, replaceable and rectifiable desk and seat, bolted bonnet		Crane 39-E, Milwaukee F-2970, Nibco F-968-B, Kitz 300SCOS
Swing check valve	NPS 50 to 300 mm (2" to 12")	Class 150, cast iron body, disc, Buna-N seat, stainless steel accessories	ANSI 150	Mueller 103-MAP, Keystone 831, Nibco W960, Centerline R-1*644*D1X, Jenkins 339RJ

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Items	Nominal Dimensions	Description	Standards	Acceptable Products
Lubricated plug valve	NPS 12 to 50 mm (½" to 2")	Class 150, cast iron body, with threaded sleeves	ASTM A-126	Keystone Ball Centric 541, Huber Resun D-125, Homestead 611-612
	NPS 75 to 125 mm (3" to 5")	Class 175, cast iron flanged, fullflow disc, operating lever	ASTM A-150	Keystone Ball Centric F-580, Homestead 611-612
	NPS 150 to 300 mm (6" to 12")	Class 150, cast iron flanged, wormgear and wheel	ASTM A-126	Keystone F-583, Homestead 611-612
N.B.:	All these plug valves shall be delivered to the site lubricated with lubricant suitable for the service intended and clearly identified, or with EPDM covered disc.			
Lubricating gun	Provide a lubricating gun and 6 sealing tubes for each service			

SPECIFICATIONS SHEET FOR MATERIALS TO BE USED				
SERVICE	P23-6a Heating water to 38 °C (100 °F), 1035 kPa (150 psi)			
FLUIDS	Use on cold ethylene or propylene glycol (with proper packing), water from tower or cooling water at maximum operating pressure of 38 °C (100 °F). Use only in mechanical rooms.			
Items	Nominal Dimensions	Description	Standards	Acceptable Products
Pipes	To NPS 50 mm (2")	Schedule 40 carbon steel, electric resistance welded	ASTM A-53 Grade "B" Type "E"	
	NPS 65 mm (2½") to NPS 250 (10")	Schedule 40 carbon steel, electric resistance welded beveled ends	ASTM A-53 Grade "B" Type "E"	
Fittings	To NPS 50 mm (2")	Class 150, malleable iron, threaded	ANSI B16.3	Anvil, Gruvlok, Victaulic up to 100°C (230°F)
	NPS 65 to 600 mm (2½" to 24")	Standard series, carbon steel, seamless, beveled ends	ANSI A-234 Grade "WPB" ANSI B16.9	Anvil, Gruvlok, Victaulic up to 110°C (230°F)
Couplings	To NPS 50 mm (2")	Threaded		
	NPS 65 mm (2½") and over	Welded		
Sleeves	NPS 10 to 50 mm (3/8" to 2")	Class 300, malleable iron threaded	ANSI B16.3	
Nipples	To NPS 50 mm (2")	Seamless carbon steel, standard wall	ASTM A-106	
Unions	To NPS 50 mm (2")	Class 150, malleable iron, threaded with brass to iron coupling	ASTM A-47 ANSI B2.1	

SPECIFICATIONS SHEET FOR MATERIALS TO BE USED				
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FLUIDS	Use on cold ethylene or propylene glycol (with proper packing), water from tower or cooling water at maximum operating pressure of 38 °C (100 °F). Use only in mechanical rooms.			
Items	Nominal Dimensions	Description	Standards	Acceptable Products
Dielectric unions and flanges	All diameters	To use when there is contact between two dissimilar metals		Watts série 3000, jusqu'à 82°C (180°F) pour les unions Gruvlok 7089 et Victaulic style 47 jusqu'à 110°C (230°F)
Flanges	To NPS 50 mm (2")	Class 150, forged steel, raised face, threaded	ASTM A-105 ASTM A-181 ANSI B36.10	Grinnell 1931
	NPS 65 (2½") and over	Class 150, forged steel, raised face welding neck	ASTM A-105 ASTM A-181	Grinnell 1911, Victaulic 741, Gruvlok 7012
	Use flat face flanges only on equipment supplied with flat face flanges.			
Orifice flanges	NPS 25 to 500 mm (1" to 24")	Class 150, forged steel, raised face, welding neck with tightening bolts, gaskets and threaded grooved with gasket	ASTM A-105 ASTM 1-181	Victaulic 743, Gruvlok 7013
Bolts and nuts		Alloy steel hexagonal nuts	ASTM A-193-GrB7 ASTM A-194-GrZH	
Gaskets		Compressed synthetic fibres with a rubber bonding agent (acrylonitrile butadiene)	SAE-ASTM-R.70 5	John Crane 2160 or equivalents

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FLUIDS	Use on cold ethylene or propylene glycol (with proper packing), water from tower or cooling water at maximum operating pressure of 38 °C (100 °F). Use only in mechanical rooms.			
Items	Nominal Dimensions	Description	Standards	Acceptable Products

Scellant for threaded connections		Threaded with Teflon tape or Teflon coating		Reco-Seal no. 5, Loctite "PST"
Mechanical couplings	NPS 40 to 300 mm (1" to 12")	Standard, malleable iron body, EPDM gasket, maximum temp. 110°C (230°F), carbon plated, steel nuts and bolts	ASTM A-47 ASTM D-2000 ASTM A-183	Victaulic 75, Gruvlok 7000, flexible Victaulic 07, Gruvlok Ridgid 7401
	NPS 18 to 760 mm (¾" to 30")	Heavy duty series, malleable iron body, EPDM gasket, plated carbon steel bolts and nuts	ASTM A-47 ASTM D-2000 ASTM A-183	Victaulic 77, Gruvlok 7001
Gate valves	NPS 12 to 50 mm (½" to 2")	Class 150, threaded ends, bronze body, solid wedge disc, rising stem		Crane 431, Toyo 298, Milwaukee 1150, Nibco T-131, Kitz 42T, Jenkins 2810J,
	NPS 12 to 50 mm (½" to 2")	Class 150, threaded ends, bronze body, solid wedge disc, non-rising stem		Crane 437C, Toyo 204-A, Milwaukee 1140, Nibco T-133, Kitz 46

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FLUIDS	Use on cold ethylene or propylene glycol (with proper packing), water from tower or cooling water at maximum operating pressure of 38 °C (100 °F). Use only in mechanical rooms.			
Items	Nominal Dimensions	Description	Standards	Acceptable Products
Butterfly valves	NPS 50 to 300mm (2" to 12")	Class 175 for 1205 kPa (175 psig) service pressure, cast iron body, bronze-aluminium wedge, 304 stainless steel stem EPDM seat, support legs 50 mm (2") high		Crane 44-BXZ-L, Toyo 918 BESL, Milwaukee CL223E or CL323-E, Kitz 6122EL Jenkins 2232ELJ
Ball valves	NPS 12 to 50 mm (½" to 2")	Class 150 threaded sleeves, brass body, brass ball, chrome finish, brass stem, PTFE reinforced packing.	ASTM B-584 ASTM B-371	Crane 9202, Toyo 5044A, Milwaukee BA475B, Nibco T-585-70, Kitz 58, Jenkins 201J
Globe valves	NPS 12 to 50 mm (½" to 2")	Class 150, screwed ends, bronze body, plastic disc for maximum temperature 185 °C (365 °F)		Crane 7-TF, Toyo 221, Milwaukee 590, Nibco 235Y, Kitz 09, Jenkins 106BJ
	NPS 65 to 300 mm (2½" to 12")	Class 150, iron body, bronze disc, trim and seat ring, bolted bonnet, rising stem		Crane 21 –E, Toyo 300SCJS, Milwaukee F-2983-M, Nibco F-768-B, Jenkins 162J
Check valves	NPS 12 to 50 mm (½" to 2")	Class 200, bronze body and disc, threaded ends removable swing disc, screw-in cap		Crane 36, Milwaukee 508, Nibco T-453-B, Kitz 19, Jenkins 4449J
	NPS 65 to 300 mm (2½" to 12")	Class 250, iron body, flanged, swing check, replaceable and rectifiable desk and seat, bolted bonnet		Crane 39-E, Milwaukee F-2970, Nibco F-968-B, Kitz 300SCOS

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FLUIDS	Use on cold ethylene or propylene glycol (with proper packing), water from tower or cooling water at maximum operating pressure of 38 °C (100 °F). Use only in mechanical rooms.			
Items	Nominal Dimensions	Description	Standards	Acceptable Products
Swing check valve	NPS 50 to 300 mm (2" to 12")	Class 150, cast iron body, disc, Buna-N seat, stainless steel accessories	ANSI 150	Mueller 103-MAP, Keystone 831, Nibco W960, Centerline R-1*644*D1X,
Lubricated plug valve	NPS 12 to 50 mm (½" to 2")	Class 150, cast iron body, with threaded sleeves	ASTM A-126	Keystone Ball Centric 541, Huber Resun D-125, Homestead 611-612
	NPS 75 to 125 mm (3" to 5")	Class 175, cast iron flanged, fullflow disc, operating lever	ASTM A-150	Keystone Ball Centric F-580, Homestead 611-612
N.B.:	All these plug valves shall be delivered to the site lubricated with lubricant suitable for the service intended and clearly identified, or with EPDM covered disc.			
Lubricating gun	provide a lubricating gun and 6 sealing tubes for each service			

SPECIFICATIONS SHEET FOR MATERIALS TO BE USED				
SERVICE	P23-8 Chemical Products Distribution			
FLUIDE	For use in the case of elements mounted between the chemicals pump supply and the boiler or other device such as deaerator			
Items	Nominal Dimensions	Description	Standards	Acceptable Products
Piping	Up to NPS 50 mm (2")	Schedule 80 carbon steel, threaded ends	ASTM A-53 Grade "B" Type "E"	
Fittings		Class 300, 2 MPa (300 psi), malleable iron, threaded ends	ANSI B16.3	
Unions		Class 300, 2 MPa (300 psi), malleable iron, threaded ends, copper to iron, ground joint with dielectric couplings at each end	ANSI B16.3	
Gate valves	Up to NPS 50 mm (2")	Class 300, 2 MPa (300 psi), O.S. & Y threaded ends, solid tapered gate		Crane 634 ^E , Toyo 318A, Milwaukee 1184, Nibco T-174-A, Kitz 37, Jenkins 2280UJ
Globe valves	Up to NPS 50 mm (2")	Class 300, 2 MPa (300 psi), union bonnet, bronze renewable seat and disc		Crane 382P, Toyo 335, Milwaukee 570 Nibco T-275-B, Kitz 17, Jenkins 592J
Check valves		Class 300, 2 MPa (300 psig), bronze body, and disc hanger, regrinding type, renewable seat and disc, threaded bonnet		Crane 76E, Milwaukee 507 Nibco T-473-B, Kitz 19, Jenkins 4962J

SPECIFICATIONS SHEET FOR MATERIALS TO BE USED				
SERVICE	P23-8a Chemical Products Distribution for Cooling Towers			
FLUIDE	For use in the case of elements mounted between the chemicals pump supply and the boiler or other device such as deaerator			
Items	Nominal Dimensions	Description	Standards	Acceptable Products
Piping	Up to NPS 50 mm (2")	PVC Serie 80	ASTM D-1785 Grade "1" Type "1"	Ipex, Harvel Plastics, Charlotte pipe, Chemline
Fittings		PVC sch. 80, cement and threaded joints	ASTM D-2467 ASTM D-2464	Ipex, Harvel Plastics, Charlotte pipe, Chemline
Unions and flanges		PVC sch. 80, cement and threaded joints	150 psi (1034 kPa)	Ipex, Harvel Plastics, Charlotte pipe, Chemline
Gate valves and check valves	Up to NPS 50 mm (2")	PVC sch. 80, cement and threaded joints, cement flanged and threaded joint	150 psi (1034 kPa)	Ipex, Harvel Plastics, Charlotte pipe, Chemline
Solvent and cement		As per manufacturer recommendations	BNQ 3751.150	Ipex, Harvel Plastics, Charlotte pipe, Chemline

END OF SECTION