

Volume III: Acid Waste Piping Systems

Industrial Technical
Manual Series



FIFTH EDITION

IPEX ACID WASTE PIPING SYSTEMS

Enfield® Electrofusion Acid Waste System
Labline® Mechanical Joint Acid Waste System
Floway™ Acid Resistant Floor Drains
Neutratan® Neutralization Tanks



IPEX

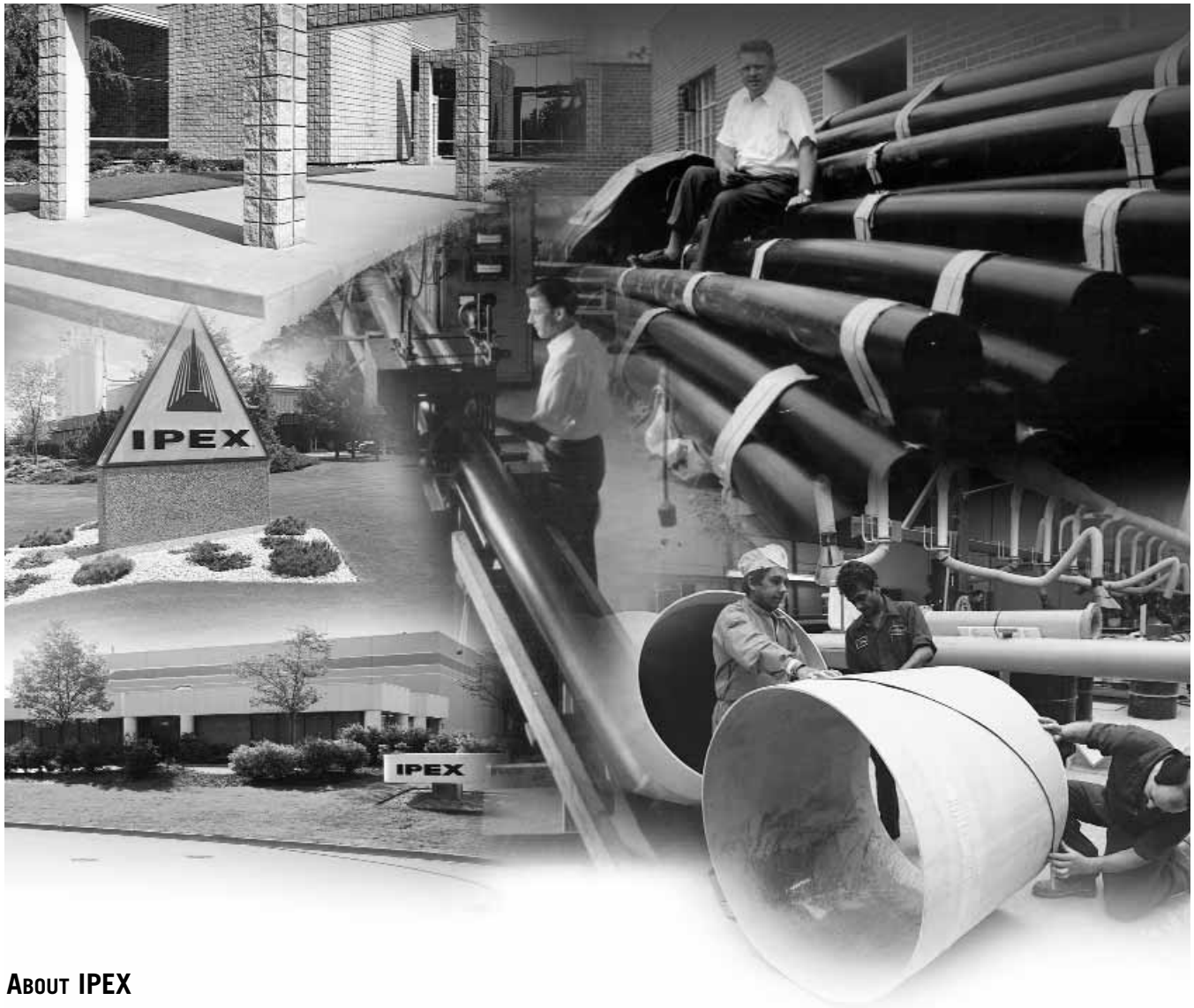
www.ipexinc.com

IPEX Acid Waste Piping Systems

Industrial Technical Manual Series

Vol. III, 5th Edition

© 2006 by IPEX. All rights reserved. No part of this book may be used or reproduced in any manner whatsoever without prior written permission. For information contact: IPEX, Marketing, 2441 Royal Windsor Drive, Mississauga, Ontario, Canada, L5J 4C7.



ABOUT IPEX

At IPEX, we have been manufacturing non-metallic pipe and fittings since 1951. We formulate our own compounds and maintain strict quality control during production. Our products are made available for customers thanks to a network of regional stocking locations throughout North America. We offer a wide variety of systems including complete lines of piping, fittings, valves and custom-fabricated items.

More importantly, we are committed to meeting our customers' needs. As a leader in the plastic piping industry, IPEX continually develops new products, modernizes manufacturing facilities and acquires innovative process technology. In addition, our staff take pride in their work, making available to customers their extensive thermoplastic knowledge and field experience. IPEX personnel are committed to improving the safety, reliability and performance of thermoplastic materials. We are involved in several standards committees and are members of and/or comply with the organizations listed on this page.

For specific details about any IPEX product, contact our customer service department.



Engineered thermoplastics are safe inert materials that do not pose any significant safety or environmental hazards during handling or installation. However, improper installation or use can result in personal injury and/or property damage. It is important to be aware of and to recognize safety alert messages as they appear in this manual.

The types of safety alert messages are described below.



This safety alert symbol indicates important safety messages in this manual. When you see this symbol be alert to the possibility of personal injury and carefully read and fully understand the message that follows.



WARNING

“WARNING” identifies hazards or unsafe practices which can result in severe personal injury or death if instructions, including recommended precautions, are not followed.



CAUTION

“CAUTION” identifies hazards or unsafe practices which can result in minor injury or product or property damage if instructions, including recommended precautions, are not followed.

Note: The use of the word “NOTE” signifies special instructions which are important but not related to hazards.

For the materials described in this manual in acid waste applications, the following warning applies.



WARNING



Use of compressed air or gas in PP or PVDF pipe and fittings can result in explosive failures and cause severe injury or death.

- NEVER use compressed air or gas in Enfield, Labline, or Plenumline pipes, fittings, or accessories.
- NEVER test Enfield, Labline, or Plenumline systems with compressed air or gas, or air-over-water boosters.
- ONLY use Enfield, Labline, or Plenumline systems for approved chemicals.

This page intentionally
left blank

CONTENTS

Acid Waste Piping Systems Manual

About IPEX

Safety Alerts *i*

Section One: General Information

Overview 1

IPEX Acid Waste Systems 2

Benefits 4

Material Description 7

Section Two: Dimensions

Pipe Dimensions 9

Enfield Fitting Dimensions 10

Labline and Plenumline Fitting Dimensions 24

Accessories 33

Floway Polypropylene Drain Dimensions 35

Standard Bolt Pattern and Dimensions 39

Section Three: Design Considerations

Expansion and Contraction 41

System Sizing 45

Thermal Conductivity 45

Pipe Supports and Support Spacing 46

Pipe Clips and Hangers 48

Handling and Storage 51

Below Ground Installation 52

Section Four: Installation

Introduction 53

Standard Enfield Electrofusion 53

Multiple Joint Fusion 56

Cold Weather Fusion 57

Enfield Testing 58

Enfield Pipe Repair 59

Labline and Plenumline Joints 60

Labline and Plenumline Testing 62

Section Five:	Additional Engineering Considerations	
	Return Air Plenum Guidelines . . . . .	.63
	Return Air Plenum Options . . . . .	.64
	Adapting to Other Drainline Materials . . . . .	.65
	Typical Underbench Configurations . . . . .	.66
Section Six:	Dilution and Neutralization	
	Dilution Traps . . . . .	.69
	Neutralization . . . . .	.70
	Cylindrical Tanks . . . . .	.71
	Rectangular Tanks . . . . .	.73
	Options and Accessories . . . . .	.75
	Solids Interception . . . . .	.76
	Neutrasystem 2 . . . . .	.77
	Neutralization, Tank Sizing and Maintenance . . . . .	.78
	Installation . . . . .	.80
Section Seven:	Acid Waste System Specifications	
	Enfield Specifications . . . . .	.81
	Labline Specifications . . . . .	.82
	Plenumline Specifications . . . . .	.83
	Neutratank Neutralization Tank Specifications . . . . .	.84
	Monitoring System Specifications . . . . .	.84
	Encase Double Containment Acid Waste Systems . . . . .	.85
Appendix:	Conversion Charts . . . . .	.86
	Information Order Form . . . . .	.88

SECTION ONE: GENERAL INFORMATION

OVERVIEW

For more than 30 years, IPEX has provided laboratories throughout North America with complete acid waste systems designed to handle a variety of chemicals. Our **Enfield**[®] electrofusion and **Labline**[®] mechanical-joint systems rank among the most widely specified systems on the continent. Constructed from flame-retardant polypropylene, these systems offer a comprehensive solution for virtually all chemical waste situations. IPEX **Plenumline**[™] is a robust acid waste system, made from flame-retardant PVDF thermoplastic, designed for challenging conditions, including highly restrictive return air plenum applications, and high-temperature corrosive chemical waste situations. In addition, each system features advantages of its own:

- **Enfield**[®] offers polypro fittings, constructed with a heavy gauge resistance wire that is integrally molded into the socket. These are considered to be the premier fittings on the market.
- Both **Labline**[®] and **Plenumline**[™] contain no-heat **Elastolives**[™] for quick installation and high performance.

According to standards ASTM E84 and UL 723, piping installed in spaces used as return air plenums must have a flame spread index of 25 or less, and a smoke development index of 50 or less. **Plenumline**[™] not only meets these requirements, but also provides designers and contractors with all the traditional benefits associated with thermoplastic systems, including high impact resistance, flexibility, low cost installations, long-term reliability, and exceptional chemical resistance.

Third-party testing reveals that Flame Retardant PVDF exhibits a flame spread index of 5 and a smoke development index of 35, making it particularly well suited to plenum applications.

Where design parameters allow, Flame Retardant PVDF **Plenumline**[™] components are standard Flame Retardant PP **Enfield**[®] and **Labline**[®] components can be easily integrated into a single comprehensive acid waste system.

Our complete range of products for acid waste includes **Neutratan**[®] neutralization tanks, **Neutrasystem2**[™] pH monitoring equipment and **Floway**[™] drains as well as **Encase**[™] double containment systems (contact IPEX for more information on double containment).

This design and installation manual provides up-to-date comprehensive information about IPEX's acid waste systems. By combining laboratory test results with decades of field experience, IPEX has produced a manual suited to engineers, contractors and distributors alike. All aspects of our acid waste systems are described here — from dimensional data through to installation and testing procedures.



IPEX ACID WASTE SYSTEMS

The IPEX Solution

Changing government regulations and increasing public desire to minimize environmental pollution has necessitated changes in the way chemicals are discharged from industrial and commercial facilities.

IPEX has long been recognized for having the highest quality, most reliable and most comprehensive chemical waste systems available. Whether the problem at hand has necessitated the fast and versatile **Labline®** or **Plenumline™** Mechanical Joint piping systems, or the microprocessor-controlled **Enfield®** jointed system, the end result has been repeatable, trouble-free installations. From an environmental perspective, IPEX manufactures a patented, modular construction double containment piping system, (Encase™, for more information, see Double Containment Piping Systems Manual, Volume VI), that can be used above and below ground to eliminate the possibility of chemical spillage into the environment.

Neutratan® is used for limestone neutralization of chemical waste prior to discharge into the sewer.

While this method of neutralization is very effective, there is a growing need to verify that the chemical discharge is continuously within acceptable pH levels. Neutrasystem 2 meets this need by analyzing the pH of liquid flow, permanently recording the pH levels encountered, and giving visual and audible alarms to warn maintenance personnel when the pH level is outside of the acceptable range.

Maintenance personnel can then address the situation usually by inserting additional

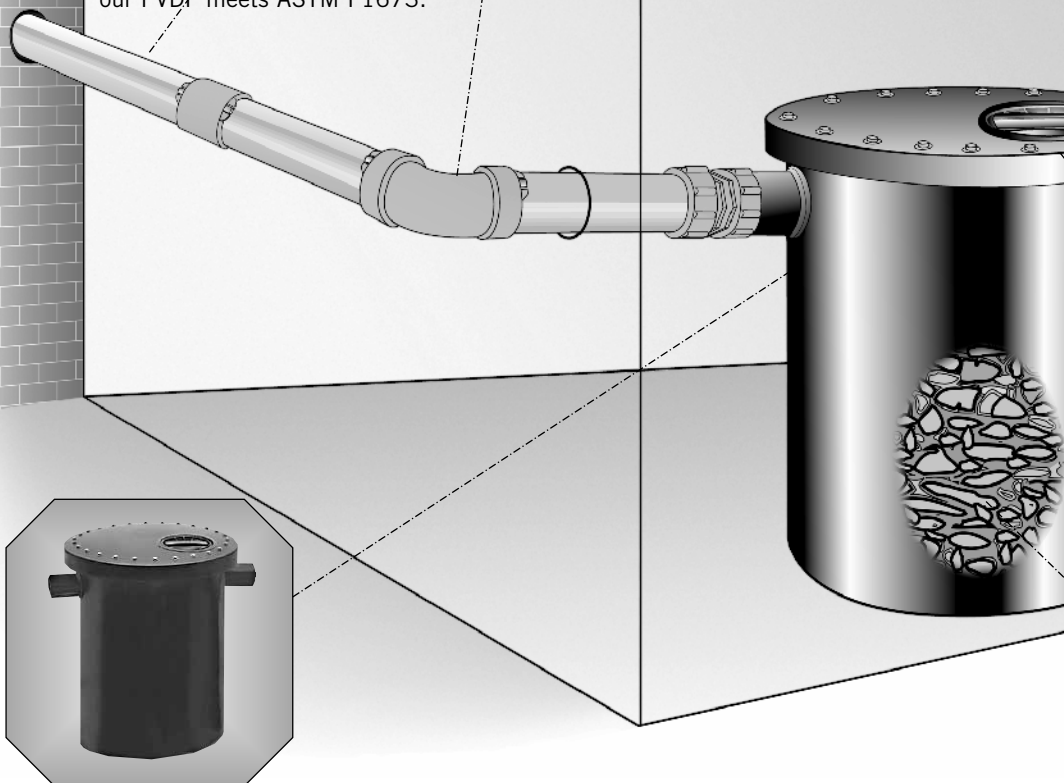
Enfield Fittings (1½" to 12")

Enfield Fittings utilize the latest in joining technology. The NSF-listed fittings have a nickel chrome electrical resistance wire integrally molded in place. Joining is completed by energizing the nickel/chrome wire with a self-diagnostic, microprocessor-controlled, Enfusion control unit which fuses the pipe/fitting surfaces together.



FRPP & NFRPP Pipe (1½" to 12") FR-PVDF Pipe (1½" to 4")

Our flame retardant PP (green) and PVDF (blue) and non-flame retardant PP (black) Schedule 40 piping is NSF-listed and CSA-certified. Our PP meets ASTM F1412 and D4101 and our PVDF meets ASTM F1673.



Neutratan®

Neutratan® are made of high-density polyethylene or polypropylene material with one-piece rotationally molded, seamless construction, bolt-down flanged top and combination EZ Access cover. Neutratan® are available in sizes from 5 gallons to 2,000 gallons to suit most potential design conditions.

Labline and Plenumline Fittings (1½" to 4")

NSF listed, all-plastic construction Labline and Plenumline Fittings allow for rapid (30 second) installation and ensure trouble-free service. The joints can be easily made with our new no-heat Elastolive, even in difficult areas, and can be disassembled and re-used at a later date without spoiling the fittings.



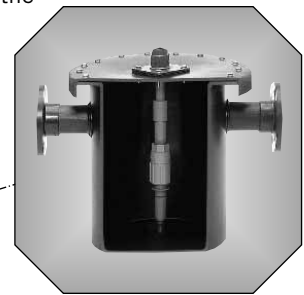
pH Monitor

The UL-listed, NEMA 4X, pH Monitor measures the pH level of the chemical waste, visually shows pH levels on an analog display and permanently records the results on a 62-day strip chart recorder. The monitor will audibly and visually alarm maintenance personnel when unacceptable pH levels are sensed.



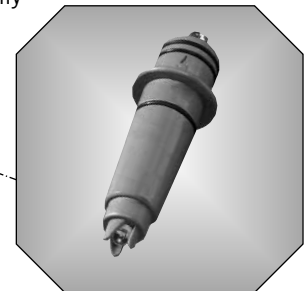
Sampling Tank

5-gallon, high-density polyethylene Sampling Tank incorporates a bolt down cover and a series 2714, extended life, removable pH probe which measures the pH level of the chemical waste before it is discharged into the sewer system.



Removable pH Probe

The pH Probe is encapsulated in a chemically resistant CPVC body with viton O-rings. Its twist-lock design ensures quick, easy removal and installation of the probe. The probe is fast responding, highly efficient and ensures that pH variations are continuously and accurately measured.



EZ Access Cover

Neutratanks are fitted with covers that incorporate quick-start threads to enable rapid inspection of the tank contents. The EZ Access feature eliminates the time consuming task of bolt removal and re-assembly associated with conventional tank covers.

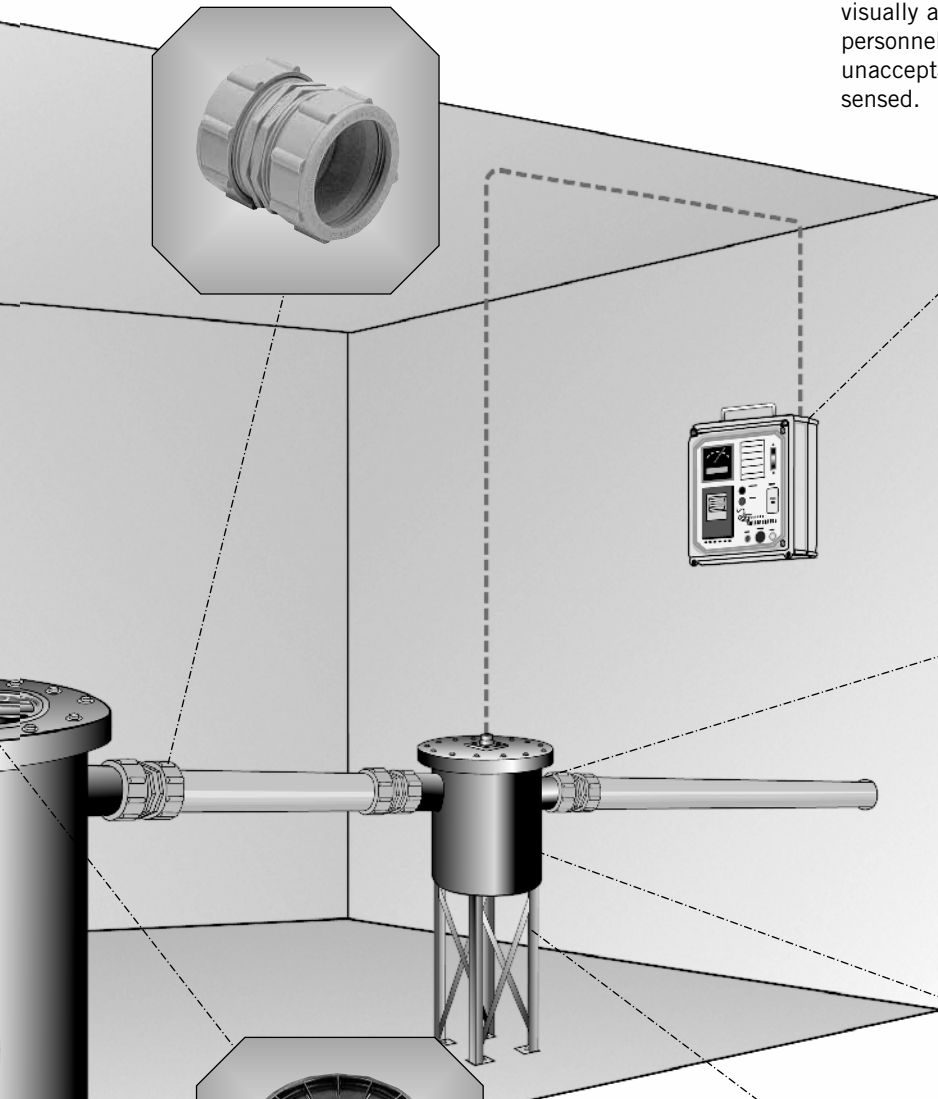


Limestone/Marble Chips

Neutratanks should be filled with an approved neutralization agent such as limestone or marble chips, one to three inches in size, to a level just below the tank outlet. Water should then be added to the tank after placement of the neutralization agent. During the course of neutralization, the limestone chips will naturally be exhausted and require replenishment.

Sampling Tank Support

All sampling tanks must be independently supported to avoid undue stressing of the components (support supplied by others).



BENEFITS

ENFIELD®

Enfield electrofusion fittings are molded with an integral resistance wire in the socket, with jointing completed by energizing the resistance wire via a microprocessor controlled Enfusion Control Unit. The result of these innovations is an unparalleled level of joint reliability and repeatability. Enfield has proven over time that it produces the optimum level of performance where it matters most - at the joint interface. It offers unprecedented control of jointing - controlled fit, controlled temperature and controlled time.

- Positive reliable joints made in 2 minutes
- installation time reduced
- Several joints can be made at one time
- Proven reliability for over a decade
- Enfield is manufactured from polypropylene which has an operating temperature range from -10°F (-23°C) to 212°F (100°C).* This allows systems to be flushed with boiling water
- Heavy gauge resistance wire molded into sockets
- no loose components, controlled fusion of joints
- Easy connecting heavy duty socket terminal posts complete with protection ears
- Microprocessor controlled Enfusion unit ensures secure joints and joint repeatability
- Matched system
- high quality pipe and fittings are matched to give ease of installation and long term reliability
- Easy to install
- even in difficult areas
- Installed cost 50% less than glass
- Breakage factor eliminated
- Maintenance free
- NSF-approved, IAPMO-listed & CSA-certified, meets ASTM F1412, D4101 and CSA B181.3



ENFUSION CONTROL UNIT

- Voltage sensing process will not start, (or will halt), unless connections are secure and input/output voltages are in the correct range
- Electronic stabilization of output from a wide range of input voltages
- The Enfusion system is an 18 amp constant current system that will generate a voltage ranging from 3.3 volts to 45 volts
- Automatic adjustment of fusion time for varying ambient temperature conditions
- Self Diagnostic Unit, self monitors and automatically reads current conditions
- Automatic alarm for cycle interruption
- May be able to re-start unit at cut-off time after fusion cycle interruption
- Proven ruggedness, impact resistant construction, shock absorbers and crash bars
- Light-weight and easy to handle
- Proven reliability in service
- UL and CSA approved control units



* Recommended constant operating temperature is 180°F with intermittent 212°F service.

LABLINE®

Labline (Mechanical Joint) has displaced the more expensive and difficult to install glass and metal systems. Gone is the need for fusing, caulking or welding of joints. *Joining of the Labline System is complete in just 30 seconds* and once the nut is locked into place, the end-user is assured of many years of trouble-free service. Yet, because it is a mechanical joint, the system can be easily dismantled and re-used, making it ideal for modular designs and for systems that may require re-modeling in the future.

- 30 second jointing
 - save on installation time
- Proven reliability for over 30 years
- Labline is manufactured from polypropylene which has an operating temperature range from -10°F (-23°C) to 212°F (100°C).* This allows systems to be flushed with boiling water
- All plastic construction
 - no galvanic action, electrolysis or corrosion in the joint
- Simple, inexpensive, non-temperamental tools
- Easy to install, even in difficult areas
- Mastered by plumbers in minutes. No pre-heating required to install olive
- System changes during installation can be done without spoiling fittings
- Can be disassembled and re-used
- Ideal for modular systems
- Ideal for remodeling
- Matched system
 - high quality pipe and fittings are matched to give ease of installation and long term reliability
- NSF-approved, IAPMO-listed & CSA-certified, meets ASTM F1412, D4101 and CSA B181.3



PLENUMLINE™

Plenumline mechanical joint acid waste systems easily displace costly and difficult-to-install glass and metal systems. With Plenumline, time-consuming methods associated with conventional heavy and brittle systems are replaced by a time proven mechanical joint that takes only 30 seconds to complete. Once the Plenumline nut is locked in place, the end-user is assured of many years of trouble-free service. In addition, mechanical joint systems can easily be dismantled and re-used, making Plenumline ideal for modular designs and future expansions.

- Ideally suited to plenum applications
- 30-second joints shorten installation time
- Manufactured from Flame Retardant PVDF, which has an operating temperature range from -40°F (-40°C) to 285°F (140°C). With this high upper limit, Plenumline systems can be flushed with boiling water.
- All-plastic construction eliminates galvanic action, electrolysis and corrosion in the joint.
- Easy to install, even in tight areas, by using simple, inexpensive tools. Mechanical joints are mastered by plumbers in minutes; no pre-heating is required to install the new blue elastolive.
- Modularized design means Plenumline components can be disassembled and re-used. In addition, system modifications during installation can be performed without damaging fittings.
- High-quality pipe and fittings are matched to simplify installation and extend long-term reliability.
- Flame Retardant PVDF material exhibits a flame spread index of 5 and smoke development index of 35 as tested in accordance with ASTM E84 and UL723.
- IAPMO-listed, meets ASTM F1673, Standard specification for Polyvinylidene Fluoride (PVDF) Corrosive Waste Drainage Systems.



* Recommended constant operating temperature is 180°F with intermittent 212°F service.

ENCASE™ DOUBLE CONTAINMENT

In certain industries there is little margin for error; all potential for accidents must be eliminated. This is particularly important where radioactive fluid wastes or particularly dangerous chemicals are being conveyed through the waste drainage system.

While Enfield/Labline is the ideal material, our double containment Encase system eliminates problems which may arise from leakage, while at the same time giving a warning that leakage is present in the system.

Encase Double Containment is part of a total integrated single and dual containment approach to above and below ground chemical waste drainage.

In below ground drainage work where the legislative responsibility, environmental impact, and cost of contamination of ground water supplies is of growing concern, Encase Double Containment provides the highest level of safety and integrity possible in handling such materials.

Proven System

Encase double containment utilizes the proven Enfield chemical waste drainage system as the primary and secondary pipework carrier. The secondary pipework is a larger diameter pipe which, holding the primary pipework central with a series of spacers, is also fully sealed by the electrofusion process.

The Enfield electrofusion jointing process has been proved over the last 15 years in many installations throughout the world. It has been confirmed to be superior to butt fusion and other electrofusion methods.

Encase Double Containment systems are available with our Centra-Guard detection system.



To order a Double Containment manual, complete and fax the Information Order Form at the back of this manual.

MATERIAL DESCRIPTION

IPEX's flame retardant polypropylene (FRPP) material used to manufacture Enfield pipe exceeds the requirements of PP110 (pipe). Flame retardant polypropylene material used to manufacture Enfield and Labline fittings exceed the requirements of PP210 (fittings) material as described in ASTM D4101. ASTM D4101 lists the following properties for both pipe and fittings.

IPEX also offers our Acid Waste system in a non-fire retardant polypro material. Enfield NFRPP pipe complies with ASTM F1412 and the material used in the manufacturing of the pipe complies with material requirements of ASTM D4101.

Plenumline™ acid waste systems are constructed from flame-retardant PVDF (polyvinylidene fluoride), a strong, abrasion-resistant thermoplastic with excellent heat stability and chemical resistance typical of fluorocarbon polymers. Plenumline™ can be used in temperatures up to 285°F (140°C) with a wide variety of acids, bases and organic solvents, and is ideally suited for handling wet or dry chlorine, bromine and other halogens.

No other thermoplastic piping material can approach the combination of strength, chemical resistance and operating temperature that FR-PVDF piping systems can offer.

ASTM D4101 Properties

Property	Value	Standard
Specific Gravity	.94	D1505
Tensile Yield Strength @ 2"/Min., psi	4400	D638
Flexural Modulus, psi	215,000	D790
Hardness, Rockwell R	100	D1706
Izod Impact, Notched, ft-lb/in.	1.0	D256
Coefficient of Linear Expansion, in/in/°F	6x10 ⁻⁵	D696
Heat Deflection Temperature @ 66 psi load, °F	220-240	D648
Heat Deflection Temperature @ 264 psi load, °F	195	D648
Water Absorption. 24 hrs., %	.01	D570
Time of Burning (sec.)	<5	D635
Extent of Burning (mm)	<5	
Burning Class	V2	UL94
Maximum Smoke Density	62.0	D2843
Smoke Density Rating	40.1	
Oxygen Index, %	28	D2863

Physical Properties of FR-PVDF

Property	FR-PVDF	Standard
Specific Gravity	1.77 – 1.79	-
Water Absorption, %, 24 hrs. @ 73°F	0.01 – 0.03	ASTM D570
Flexural modulus, psi	240,000 - 335,000	ASTM D790
Tensile yield elongation, %	5 – 10	ASTM D638
Tensile break elongation, %	50 – 200	ASTM D638
Tensile modulus, psi	200,000 - 335,000	ASTM D638
Deflection temperature @ 264 psi, °F	221 – 239	ASTM D648
Deflection temperature @ 66 psi, °F	257 – 284	ASTM D648
Impact strength (notched Izod), ft-lb/in.	2 – 4	ASTM D256
Hardness, shore D	76 – 80	
Melting temperature, °F	329 – 338	
Coefficient of thermal expansion, 10 ⁻⁵ °F	6.6 – 8.0	ASTM D696
Thermal conductivity, BTU-in/hr per ft ² °F	1.18 – 1.32	ASTM D433
Burning rate	V-0	UL/Bulletin 94
Limiting oxygen index	60	ASTM D2868
Flame spread rating	5	UL723 / ASTM E84
Smoke development classification	35	UL723 / ASTM E84



Chemical Resistance

Thermoplastics have outstanding resistance to a wide range of chemical reagents. Such resistance is a function of both temperature and concentration, and there are many reagents which can be handled for limited temperature ranges and concentrations.

Chemical resistance is often affected (and frequently reduced) when handling a number of chemicals or compounds containing impurities. When specific applications are being considered, therefore, it is often worthwhile to conduct tests using the actual fluid that will be used in service.

PP is generally high in chemical resistance. It is capable of handling a pH ranging from 1 to 13 being resistant to organic solvents as well as acids and alkalies. Due to its general sensitivity to oxidizing agents, special care must be taken when using it with strong acids and hydrocarbons containing helides and aromatic groups.

Many factors can affect the chemical resistance of materials. These include, but are not limited to, exposure time, concentration of chemical, extremes of temperature, frequency of temperature cycling, attrition due to abrasive particles, and the type of mechanical stress imposed. The fact that certain combinations of chemicals and mechanical load can induce stress cracking in many otherwise chemically resistant materials, both metallic and nonmetallic, is of particular significance. In general, the broader molecular weight distribution of Plenumline FR-PVDF resin will result in greater resistance to stress cracking.

In borderline cases, there may be limited attack, generally resulting in some swelling due to absorption. There are also many cases where some attack will occur under specific conditions. For such applications, the use of plastic is often justified on economic grounds when considered against alternative materials.



To order a Chemical Resistance Guide or obtain more information, complete and fax the order form at the back of this manual.

SECTION TWO: DIMENSIONS

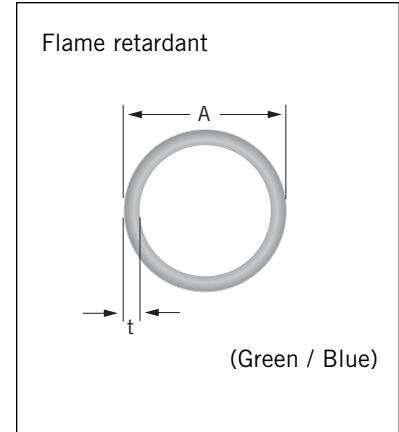
PIPE DIMENSIONS

Dimensional data in this manual is subject to change without notice.

The following dimensions are given as a guide to engineers and installers. They are subject to change and to manufacturing tolerances. Prior to utilizing these dimensions in a CAD system, or in the preparation of prefabricated pipe sections, consult IPEX to verify the appropriate tolerances and dimensions are current.

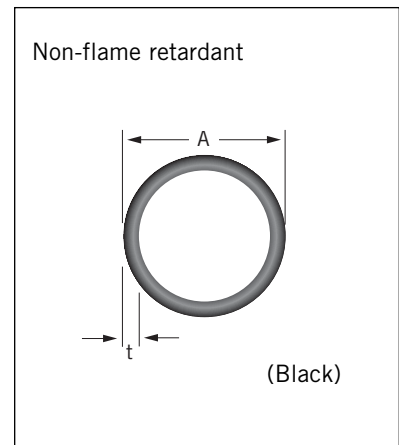
Pipe Schedule 40, 10ft Standard Lengths

Cat. No.	Size(in)	t min.	A(in)
W001 / W001P	1½	0.145	1.900
W002 / W002P	2	0.154	2.375
W003 / W003P	3	0.216	3.500
W004 / W004P	4	0.237	4.500
W006	6	0.280	6.625
W008	8	0.322	8.625
W010	10	0.365	10.750
W012	12	0.406	12.750



Pipe Schedule 40 & 80, 20ft Standard Lengths

Sch. 40 Cat. No.	Sch. 80 Cat. No.	Size(in)	t min.(Sch 40)	t min.(Sch 80)	A(in)
WB01	WB1106	1½	0.145	0.200	1.900
WB02	WB1107	2	0.154	0.218	2.375
WB03	WB1108	3	0.216	0.300	3.500
WB04	WB1109	4	0.237	0.337	4.500
WB06	WB1110	6	0.280	0.432	6.625
WB08	WB1111	8	0.322	0.500	8.625
WB10	WB1112	10	0.365	0.593	10.750
WB12	WB1113	12	0.406	0.687	12.750



Fitting End Abbreviations

EJ - Enfield Joint

MPT - Male Pipe Thread

FPT - Female Pipe Thread

FST - Female Straight Thread

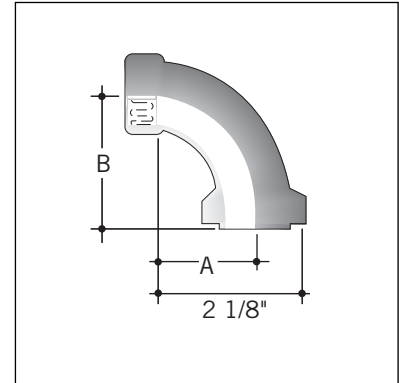
MST - Male Straight Thread

LN - Loose Nut (mates with EJ male thread)

ENFIELD FITTING DIMENSIONS

90° Sweep Socket x Loose Nut

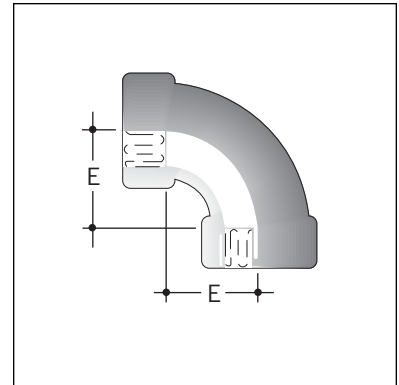
Cat. No.	Size(in)	A(in)	B(in)
L291A	1½	1¾	3



DIMENSIONS

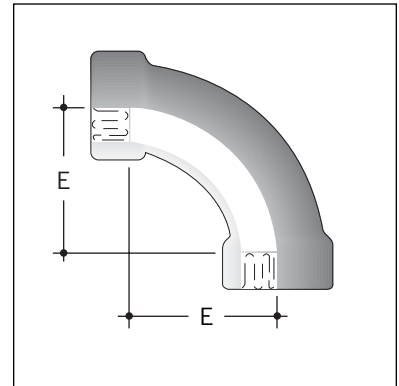
1/4 Bend Socket x Socket

Cat. No.	Size(in)	E(in)
L181	1½	1¾
L182	2	2 ⁵ / ₁₆



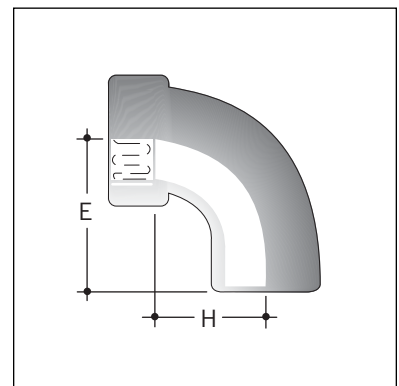
90° Sweep Socket x Socket

Cat. No.	Size(in)	E(in)
L171	1½	2¾
L172	2	3¾
L173	3	4 ¹ / ₁₆
L174	4	4 ¹⁵ / ₁₆
L176	6	7¾



1/4 Bend Socket x Spigot

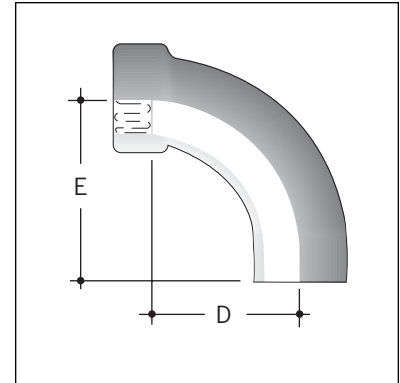
Cat. No.	Size(in)	E(in)	H(in)
L291	1½	3	1¾
L292	2	3 ¹³ / ₁₆	2 ⁵ / ₁₆



ENFIELD FITTING DIMENSIONS

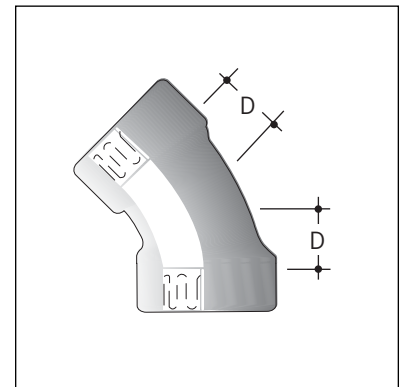
90° Sweep Socket x Spigot

Cat. No.	Size(in)	D(in)	E(in)
L281	1½	2¾	4
L282	2	3¼	4⅝
L283	3	4⅛	5¾
L284	4	4⅝ ₁₆	6¾
L286	6	7¾	9¾



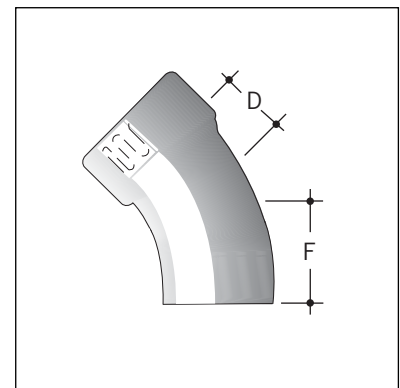
1/8 Bend Socket x Socket

Cat. No.	Size(in)	D(in)
L191	1½	1⅛
L192	2	1½
L193	3	2
L194	4	2
L196	6	1⅞ ₁₆



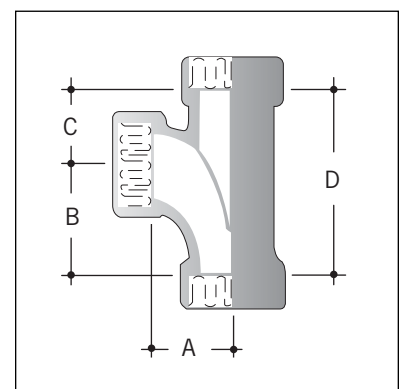
1/8 Bend Socket x Spigot

Cat. No.	Size(in)	D(in)	F(in)
L211	1½	1⅛	2¼
L212	2	1½	3
L213	3	2	3¾
L214	4	2	3⅝ ₁₆
L216	6	1⅞ ₁₆	4⅝



Sanitary Tee Socket

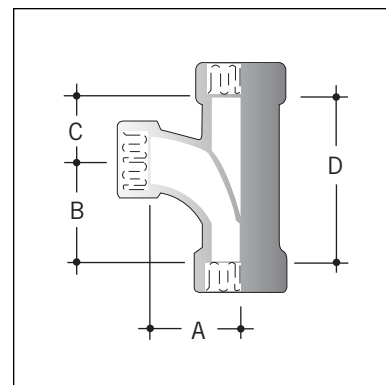
Cat. No.	Size(in)	A(in)	B(in)	C(in)	D(in)
L201	1½	2¼	2¾	2	4¾
L202	2	2⅝ ₁₆	2⅝ ₁₆	1⅜	3⅞ ₁₆
L203	3	3⅛ ₁₆	3⅛ ₁₆	1⅜ ₁₆	4⅞
L204	4	3⅞ ₈	3⅞ ₈	2¼	6⅞



ENFIELD FITTING DIMENSIONS

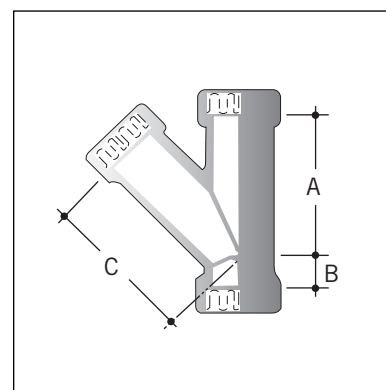
Reducing Tee Socket

Cat. No.	Size(in)	A(in)	B(in)	C(in)	D(in)
L2021	2 x 2 x 1½	2¼	2¾	2	4¾
L2031	3 x 3 x 1½	4½	3½	2 ⁹ / ₁₆	6 ¹ / ₁₆
L2032	3 x 3 x 2	3¼	3½	2 ⁵ / ₈	6 ¹ / ₈
L2042	4 x 4 x 2	3 ⁵ / ₁₆	2 ¹ / ₁₆	1 ¹ / ₈	3 ³ / ₁₆
L2043	4 x 4 x 3	3½	3 ³ / ₁₆	2 ³ / ₈	5 ⁹ / ₁₆



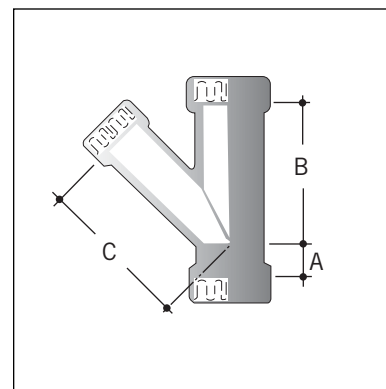
45° Wye Socket

Cat. No.	Size(in)	A(in)	B(in)	C(in)
L371	1½	3¼	1 ¹ / ₈	3¼
L372	2	3 ⁵ / ₈	1 ³ / ₈	3 ⁵ / ₈
L373	3	5	1½	5
L374	4	8 ³ / ₈	1 ¹³ / ₁₆	7 ³ / ₈
L376	6	8 ⁷ / ₁₆	1¾	8 ⁷ / ₁₆



Reducing Wye Socket

Cat. No.	Size(in)	A(in)	B(in)	C(in)
L3721	2 x 2 x 1½	1 ¹ / ₁₆	3 ⁵ / ₁₆	3 ⁷ / ₁₆
L3731	3 x 3 x 1½	⁷ / ₈	5 ¹¹ / ₁₆	7
L3732	3 x 3 x 2	⁷ / ₈	5 ¹¹ / ₁₆	5¾
L3741*	4 x 4 x 1½	½	6½	7 ⁵ / ₈
L3742	4 x 4 x 2	½	6½	6 ³ / ₈
L3743	4 x 4 x 3	1 ¹³ / ₁₆	8 ⁵ / ₁₆	9¼
L3761*	6 x 6 x 1½	³ / ₈	6 ⁷ / ₈	10
L3762	6 x 6 x 2	³ / ₈	6 ⁷ / ₈	9½
L3763	6 x 6 x 3	³ / ₈	6 ⁷ / ₈	9¾
L3764	6 x 6 x 4	³ / ₈	6 ⁷ / ₈	7¾

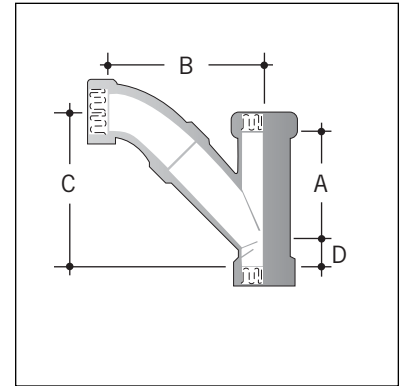


* assembled from multiple components

ENFIELD FITTING DIMENSIONS

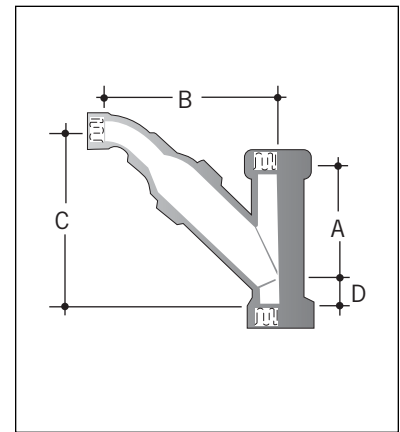
Combination Wye & 1/8 Bend Socket Bend supplied loose

Cat. No.	Size(in)	A(in)	B(in)	C(in)	D(in)
L3715	1½	3¼	5¼	5	1⅛
L3725	2	3⅝	6⅜ ₁₆	6⅜ ₁₆	1⅜
L3735	3	5	8⅛	7⅞	1½
L3745	4	8⅜	9 ¹⁵ / ₁₆	9 ¹¹ / ₁₆	1 ¹³ / ₁₆
L3765	6	8 ⁷ / ₁₆	11	11 ⁵ / ₁₆	1¾



Red. Combination Wye & 1/8 Bend Socket Bend supplied loose

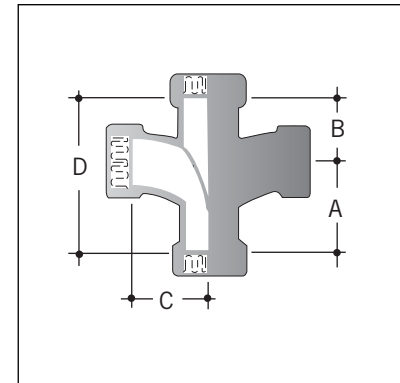
Cat No	Size(in)	A(in)	B(in)	C(in)	D(in)
L37251	2 x 1½	3 ⁵ / ₁₆	3 ³ / ₁₆	5 ⁷ / ₁₆	1 ¹ / ₁₆
L37351	3 x 1½	5 ¹¹ / ₁₆	7 ⁵ / ₈	8	7 ⁷ / ₈
L37352	3 x 2	5 ¹¹ / ₁₆	7 ⁵ / ₈	7 ¹ / ₁₆	7 ⁷ / ₈
L37451*	4 x 1½	6 ³ / ₈	8 ¹ / ₈	7 ³ / ₄	½
L37452	4 x 2	6 ³ / ₈	8 ³ / ₁₆	7 ¹ / ₄	½
L37453	4 x 3	8 ⁵ / ₁₆	11 ¹ / ₈	10 ¹³ / ₁₆	1 ¹³ / ₁₆
L37651*	6 x 1½	9	9 ⁵ / ₈	8	2¼
L37652	6 x 2	8 ⁷ / ₁₆	11 ³ / ₁₆	11	1¾
L37653	6 x 3	8 ⁷ / ₁₆	12 ⁵ / ₈	12	1¾
L37654	6 x 4	8 ⁷ / ₁₆	10 ¹³ / ₁₆	10 ¹¹ / ₁₆	1¾



* assembled from multiple components

Double Sanitary Tee Socket

Cat. No.	Size(in)	A(in)	B(in)	C(in)	D(in)
L351	1½	2¾	2	2¼	4¾
L352	2	2 ⁵ / ₁₆	1 ³ / ₈	2 ⁵ / ₁₆	3 ¹¹ / ₁₆
L353	3	3 ¹ / ₁₆	1 ¹³ / ₁₆	3 ¹ / ₁₆	4 ⁷ / ₈
L354	4	3 ⁷ / ₈	2¼	3 ⁷ / ₈	6 ¹ / ₈

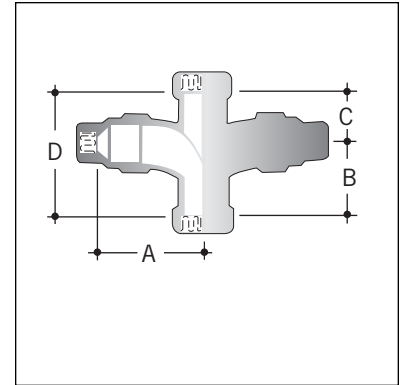


DIMENSIONS

ENFIELD FITTING DIMENSIONS

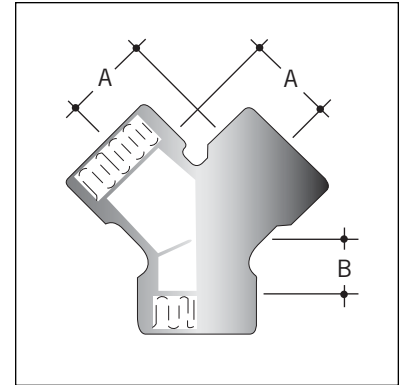
Reducing Double Sanitary Tee Socket

Cat. No.	Size(in)	A(in)	B(in)	C(in)	D(in)
L3521	2 x 1½	3 ⁵ / ₈	2 ⁵ / ₁₆	1 ³ / ₈	3 ¹¹ / ₁₆
L3531	3 x 1½	5	3 ¹ / ₁₆	1 ¹³ / ₁₆	4 ⁷ / ₈
L3542	4 x 2	3 ⁵ / ₁₆	2 ¹ / ₁₆	1 ¹ / ₈	3 ³ / ₁₆
L3543	4 x 3	5 ¹⁵ / ₁₆	3 ⁷ / ₈	2 ¹ / ₄	6 ¹ / ₈



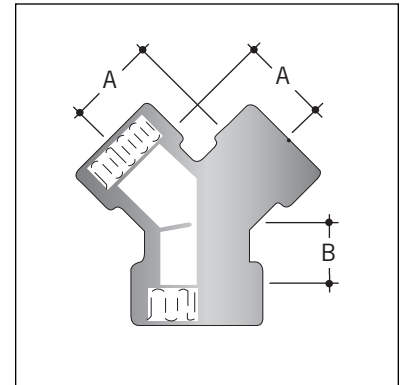
True Wye Socket

Cat. No.	Size(in)	A(in)	B(in)
L341	1½	2 ³ / ₁₆	⁷ / ₈
L342	2	2½	1



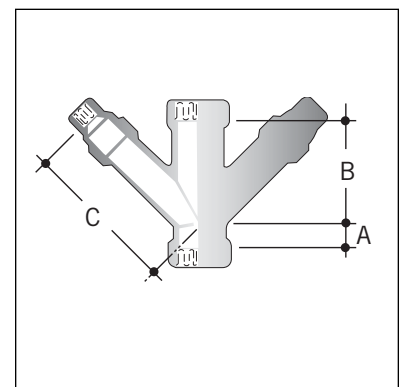
Reducing True Wye Socket

Cat. No.	Size(in)	A(in)	B(in)
L3421	2 x 1½	2¼	³ / ₄
L3432	3 x 2	2 ³ / ₈	⁵ / ₁₆
L3443	4 x 3	3 ¹ / ₈	¹³ / ₁₆



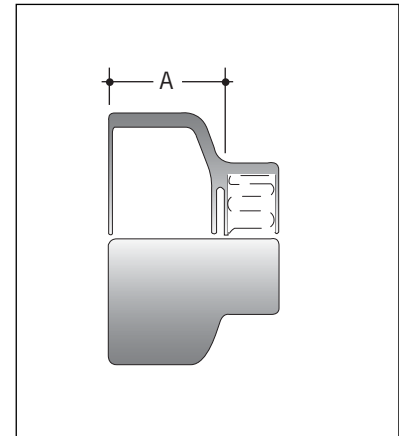
Reducing Double Wye Socket

Cat. No.	Size(in)	A(in)	B(in)	C(in)
L3821	2 x 1½	1 ¹ / ₁₆	5½	4 ⁹ / ₁₆
L3864	6 x 4	1 ³ / ₄	8 ⁷ / ₁₆	8 ⁷ / ₁₆



Reducing Bushing Spigot x Socket

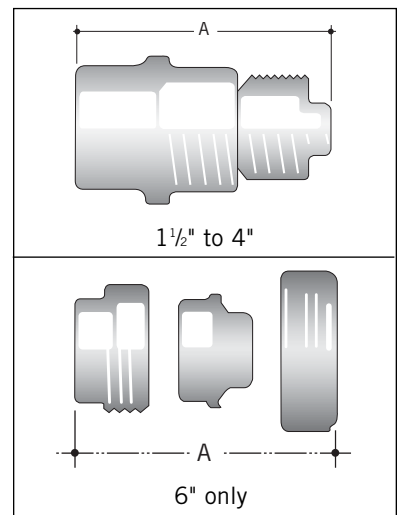
Cat. No.	Size(in)	A(in)
L3912	2 x 1½	1¼
L3913	3 x 1½	1 ¹¹ / ₁₆
L3923	3 x 2	1 ¹¹ / ₁₆
L3914	4 x 1½	2
L3924	4 x 2	2
L3934	4 x 3	1 ⁷ / ₈
L3916	6 x 1½	2½
L3926	6 x 2	2½
L3936	6 x 3	2½
L3946	6 x 4	2½



DIMENSIONS

Cleanout Disassembled Length

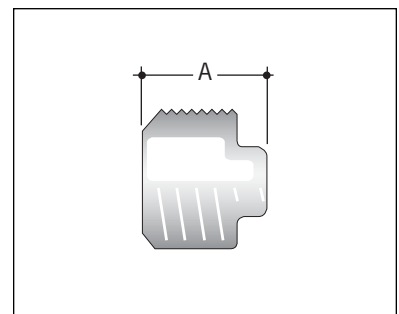
Cat. No.	Size(in)	A(in)
L241	1½	6 ⁵ / ₁₆
L242	2	7 ⁵ / ₁₆
L243	3	7 ⁵ / ₁₆
L244	4	8 ¹ / ₄
L246	6	11 ⁵ / ₈



Note: L246 gasket material is nitrile unless otherwise specified.

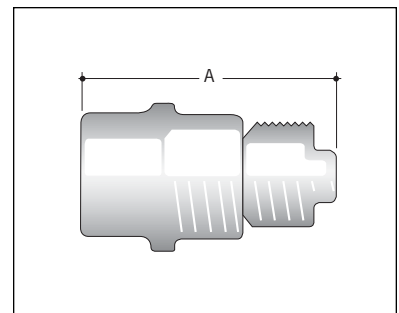
Cleanout Plug MPT

Cat. No.	Size(in)	A(in)
L241A	1½	2¼
L242A	2	2 ³ / ₈
L243A	3	2 ³ / ₈
L244A	4	3



Cleanout w/ Brass Plug Disassembled Length

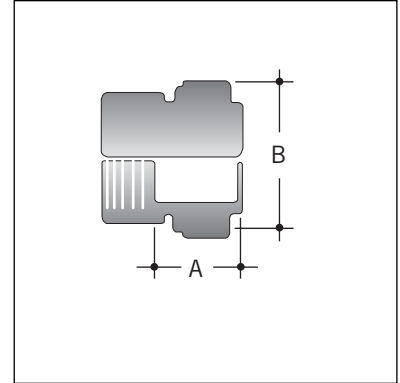
Cat. No.	Size(in)	A(in)
L2401	1½	4
L2402	2	4½
L2403	3	4½
L2404	4	5



ENFIELD FITTING DIMENSIONS

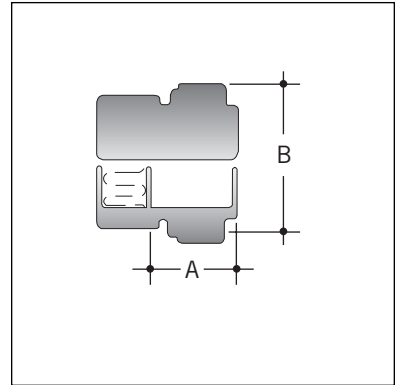
Adapter FPT x Loose Nut

Cat. No.	Size(in)	A(in)	B(in)
L101	1½	1¾	2 ⁹ / ₁₆



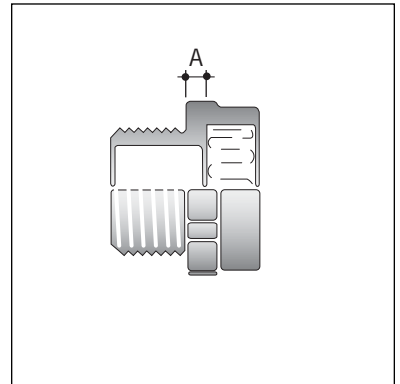
Adapter Socket x Loose Nut

Cat. No.	Size(in)	A(in)	B(in)
L111	1½	1¾	2 ⁹ / ₁₆



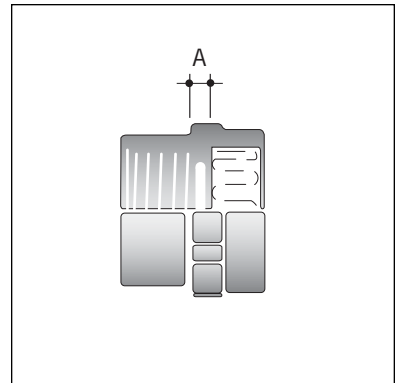
Male Adapter MPT x Socket

Cat. No.	Size(in)	A(in)
L141	1½	¼
L142	2	¼



Female Adapter FPT x Socket

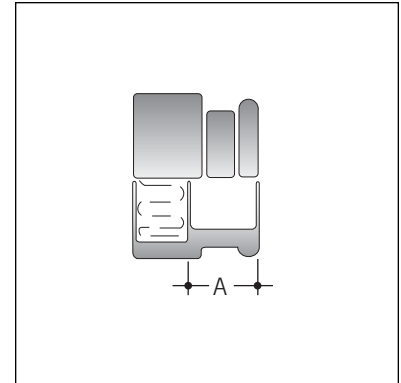
Cat. No.	Size(in)	A(in)
L151	1½	5/16
L152	2	5/16



ENFIELD FITTING DIMENSIONS

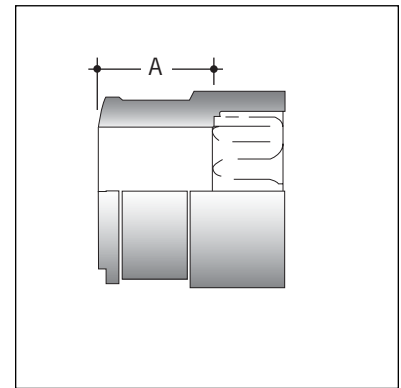
Glass Adapter Socket x Bead

Cat. No.	Size(in)	A(in)
L451	1½	1 ³ / ₃₂
L452	2	1 ¹ / ₄
L453	3	1 ⁵ / ₈
L454	4	1 ¹³ / ₁₆



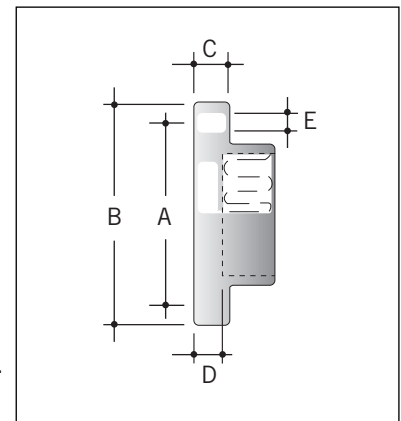
No Hub Adapter Spigot x Socket

Cat. No.	Size(in)	A(in)
L461	1½	1 ⁷ / ₃₂
L462	2	1 ³ / ₈
L463	3	1 ¹³ / ₁₆
L464	4	1 ³ / ₄



Flange Socket, ANSI 150 bolt pattern

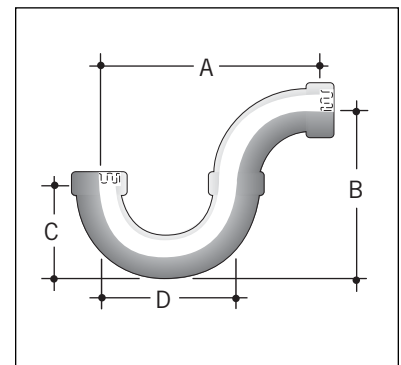
Cat. No.	Size(in)	A(in)	B(in)	C(in)	Lay Length D(in)	E(in)
L361	1½	3 ⁷ / ₈	5	1 ¹ / ₈	⁵ / ₈	⁹ / ₁₆
L362	2	4 ³ / ₄	5 ¹⁵ / ₁₆	¹⁵ / ₁₆	¹¹ / ₁₆	¹¹ / ₁₆
L363	3	6	7 ⁷ / ₁₆	1 ¹ / ₄	⁷ / ₈	¹¹ / ₁₆
L364	4	7 ¹ / ₂	9	1 ⁷ / ₁₆	1 ¹ / ₈	¹¹ / ₁₆
L366	6	9 ¹ / ₂	10 ¹⁵ / ₁₆	1 ⁷ / ₁₆	1	¹³ / ₁₆



Note: Backing plates, bolts and gaskets should be ordered as separate items. See Standard Bolt Dimensions at end of section. A suitable gasket material must be selected.

P Trap 2-piece, Socket x Socket

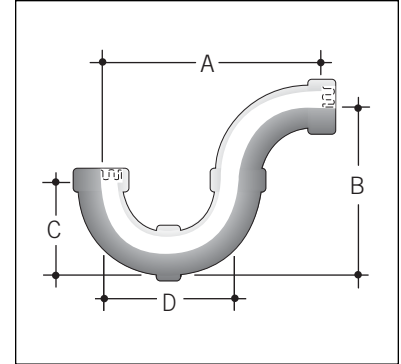
Cat. No.	Size(in)	A(in)	B(in)	C(in)	D(in)
L1021	1½	5	5 ¹ / ₄	2 ¹ / ₄	3 ¹ / ₄
L1022	2	7 ⁵ / ₁₆	6 ¹³ / ₁₆	3 ⁷ / ₁₆	4 ¹⁵ / ₁₆



ENFIELD FITTING DIMENSIONS

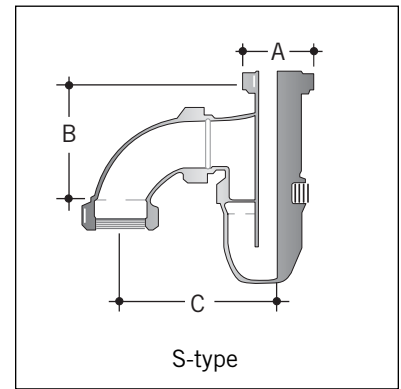
P Trap 3-piece, Socket x Socket

Cat. No.	Size(in)	A(in)	B(in)	C(in)	D(in)
LT13	3	14 ^{13/16}	11 ^{3/8}	6 ^{5/16}	10 ^{1/4}
LT14	4	17 ^{1/2}	14 ^{3/16}	7 ^{11/16}	12 ^{5/16}
LT16	6	25 ^{5/8}	21	11 ^{1/2}	17 ^{3/4}

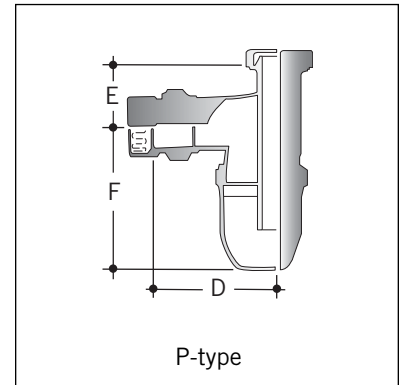


Universal Traps

Cat. No.	Type	Size(in)	Outlet	Base
L501	'P'	1 ^{1/2}	Socket	Solid
L5011	'P'	1 ^{1/2}	FPT	Solid
L511*	'P'	1 ^{1/2}	Socket	Clear
L5111*	'P'	1 ^{1/2}	FPT	Clear
L5015	'S'	1 ^{1/2}	Socket	Solid
L5115*	'S'	1 ^{1/2}	Socket	Clear



A(in)	B(in)	C(in)	D(in)	E(in)	F(in)
2 ^{9/16}	3 ^{7/8}	6 ^{3/16}	4	2	5 ^{1/4}

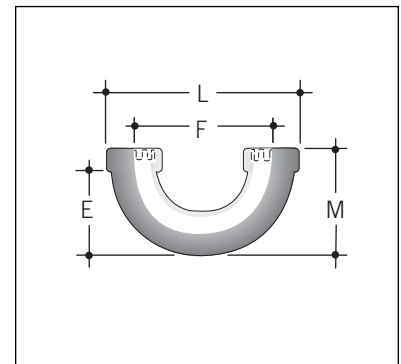


* Clear Base made from TPX (Methylpentene Copolymer)

Note: 3" deep seal Universal Traps have a 1^{1/2}" loose nut inlet which connects directly to Enfield cup sinks and sink outlets or can be adapted to other brands by means of adapters W121 and W131. All universal trap adapters contain nitrile gaskets. Other special chemical resistance gaskets are available upon request.

Vent Loop / U Bend

Cat. No.	Size(in)	E(in)	F(in)	L(in)	M(in)
L1011	1 ^{1/2}	2 ^{3/8}	3 ^{1/4}	5 ^{5/8}	3 ^{1/8}
L1012	2	3 ^{3/8}	5	7 ^{7/8}	4 ^{3/8}



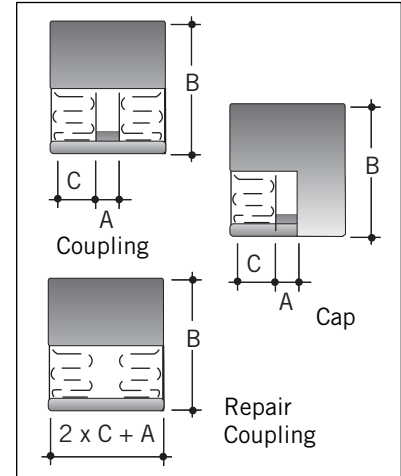
ENFIELD FITTING DIMENSIONS

Note: Enfield fabricated fittings are custom made from pipe, couplings and molded fittings. Due to manufacturing constraints, some fittings may not be exactly symmetrical or appear as sketched. **The dimensions provided are approximate and should not be used to create precise layouts.**

Coupling & Fabricated Cap Socket

Coupling Cat. No.	Cap Cat. No.	Repair Coupling Cat. No.	Size(in)	A(in)	B(in)	C(in)
L161	L641	L161R	1½	¼	2 ³ / ₁₆	¾
L162 / L162B	L642	L162R	2	5 ⁵ / ₁₆	2 ¹¹ / ₁₆	1
L163 / L163B	L643	L163R	3	7 ⁷ / ₁₆	3 ¹⁵ / ₁₆	1 ³ / ₈
L164 / L164B	L644	L164R	4	7 ⁷ / ₁₆	5	1½
L166 / L166B	L646	L166R	6	½	7 ³ / ₁₆	2

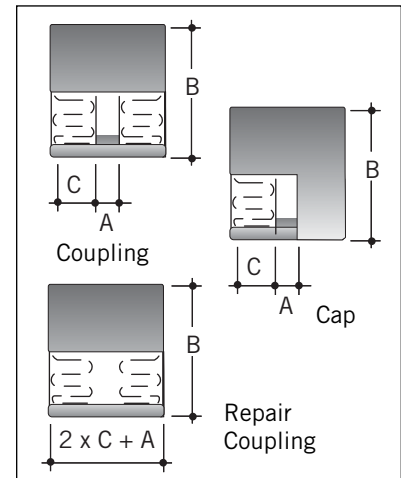
Suffix 'B' indicates Black Non-Flame Retardant PP
 'B' is the fitting OD dimension
 'C' is the socket depth



Large Diameter Coupling & Fabricated Cap Socket

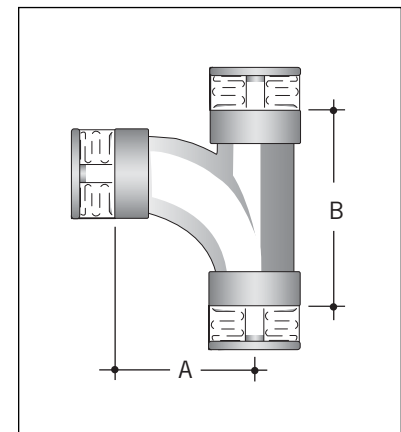
Coupling Cat. No.	Cap Cat. No.	Repair Coupling Cat. No.	Size(in)	A(in)	B(in)	C(in)
L168 / L168B	L648	L168R	8	½	9 ³ / ₈	2¼
L1610 / L1610B	L6410	--	10	½	11 ⁹ / ₁₆	2 ⁹ / ₁₆
L1612 / L1612B	L6412	--	12	5 ⁵ / ₁₆	13 ¹¹ / ₁₆	2 ¹³ / ₁₆

Suffix 'B' indicates Black Non-Flame Retardant PP



Fabricated Sanitary Tee Socket

Cat. No.	Size(in)	A(in)	B(in)
L2062	6 x 2	8¼	11¼
L2064	6 x 4	9¾	14¼
L206	6 x 6	10 ⁵ / ₈	17 ³ / ₈
L2083	8 x 3	10	13½
L2084	8 x 4	10½	15
L2086	8 x 6	11½	18
L208	8 x 8	12½	20
L20103	10 x 3	11 ⁷ / ₈	13 ¹ / ₈
L20104	10 x 4	11	15
L20106	10 x 6	12½	18
L20108	10 x 8	14	20½
L2010	10 x 10	15	24
L20124	12 x 4	12½	15
L20126	12 x 6	13½	18
L20128	12 x 8	15	20½
L201210	12 x 10	16	24
L2012	12 x 12	17	26½

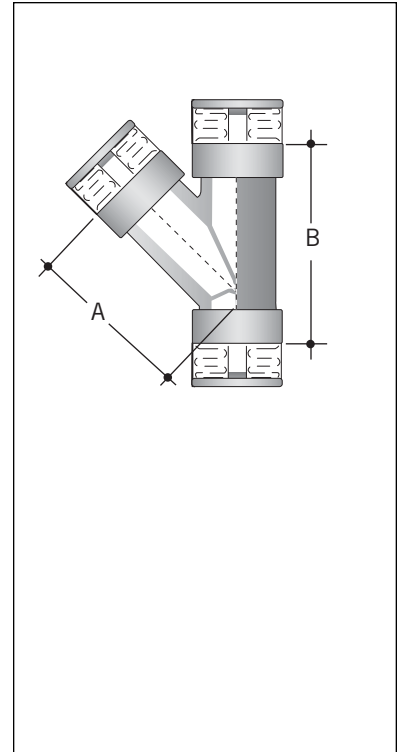


DIMENSIONS

ENFIELD FITTING DIMENSIONS

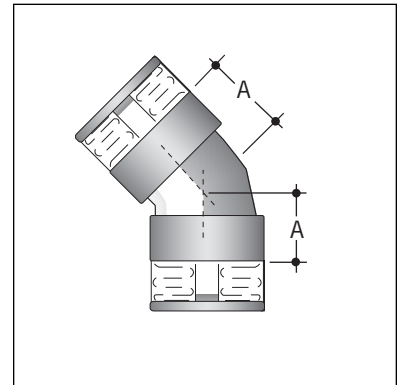
Fabricated 45° Wye Socket

Cat. No.	Size(in)	A(in)	B(in)
L3782	8 x 2	9 ¹ / ₈	12 ¹ / ₈
L3783	8 x 3	10 ¹ / ₂	13 ¹ / ₂
L3784	8 x 4	11	15
L3786	8 x 6	13	18
L378	8 x 8	14 ¹ / ₂	20 ¹ / ₂
L37103	10 x 3	12	13 ¹ / ₂
L37104	10 x 4	12 ¹ / ₂	15
L37106	10 x 6	13 ¹ / ₂	18
L37108	10 x 8	15	20 ¹ / ₂
L3710	10 x 10	17 ¹ / ₂	24
L37123	12 x 3	13 ¹ / ₂	13 ¹ / ₂
L37124	12 x 4	14	15
L37126	12 x 6	16	18
L37128	12 x 8	16 ¹ / ₂	20 ¹ / ₂
L371210	12 x 10	18 ¹ / ₂	24
L3712	12 x 12	19 ¹ / ₂	26 ¹ / ₂



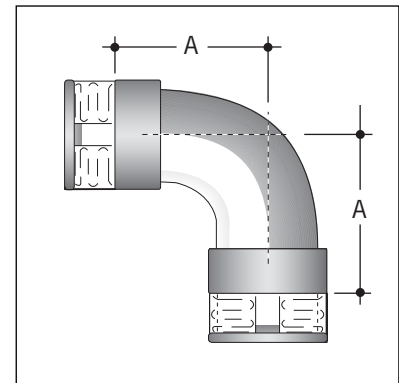
Fabricated 1/8 Bend Socket x Socket

Cat. No.	Size(in)	A(in)
L198	8	6
L1910	10	6 ¹ / ₂
L1912	12	7 ¹ / ₂



Fabricated 1/4 Bend Socket x Socket

Cat. No.	Size(in)	A(in)
L188	8	12
L1810	10	12 ¹ / ₂
L1812	12	13 ¹ / ₂

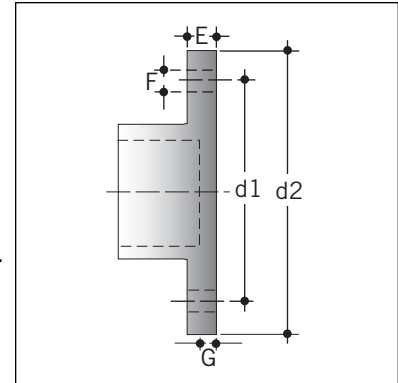


ENFIELD FITTING DIMENSIONS

Fabricated Socket Flange Socket, ANSI 150 bolt pattern

Cat. No.	Size(in)	d1(in)	d2(in)	E(in)	F(in)	G(in)
L368	8	11 ³ / ₄	13 ¹ / ₂	³ / ₄	⁷ / ₈	¹ / ₄
L3610	10	14 ¹ / ₄	16	³ / ₄	1	¹ / ₄
L3612	12	17	19	³ / ₄	1	¹ / ₄

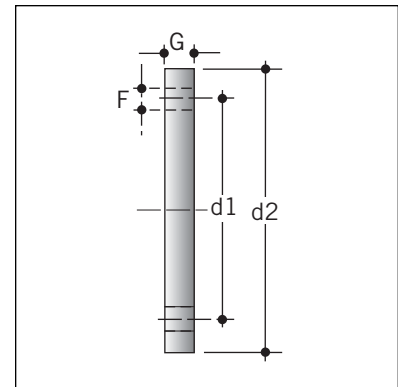
Note: Backing plates, bolts and gaskets should be ordered as separate items. See Standard Bolt Dimensions at end of section. A suitable gasket material must be selected.



Fabricated Blind Flange

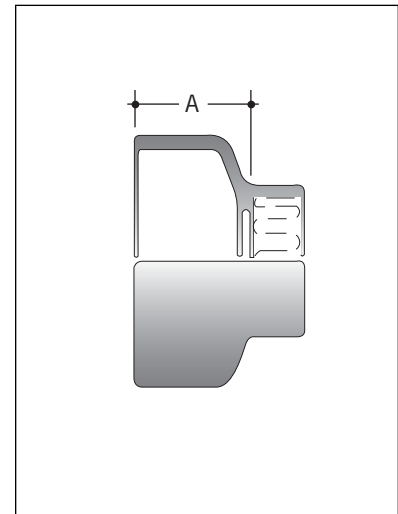
Cat. No.	Size(in)	d1(in)	d2(in)	G(in)	F(in)
L3688	8	11 ³ / ₄	13 ¹ / ₂	³ / ₄	⁷ / ₈
L361010	10	14 ¹ / ₄	16	³ / ₄	1
L361212	12	17	19	³ / ₄	1

Note: Backing plates, bolts and gaskets should be ordered as separate items. See Standard Bolt Dimensions at end of section. A suitable gasket material must be selected.



Fabricated Reducing Bushing Spigot x Socket

Cat. No.	Size(in)	A(in)
L3938*	8 x 3	6
L3948*	8 x 4	2 ¹³ / ₁₆
L3968*	8 x 6	2 ¹³ / ₁₆
L39410	10 x 4	7
L39610	10 x 6	7
L39810*	10 x 8	4
L39412	12 x 4	8
L39612	12 x 6	8
L39812	12 x 8	8
L391012*	12 x 10	4 ¹ / ₈

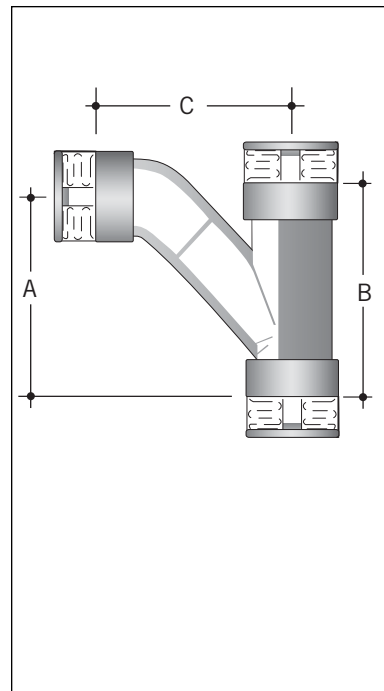


*molded

ENFIELD FITTING DIMENSIONS

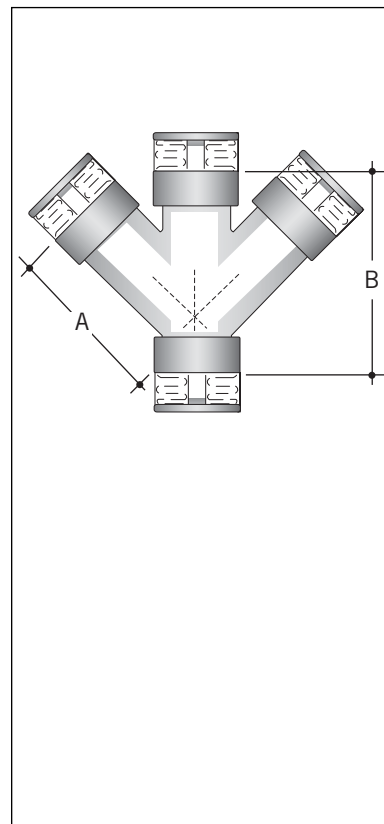
Fabricated Combination Wye & 1/8 Bend Socket

Cat. No.	Size(in)	A(in)	B(in)	C(in)
L37853	8 x 3	14 ¹ / ₄	15 ¹ / ₄	13
L37854	8 x 4	15	16 ¹ / ₂	15
L37856	8 x 6	18	18 ¹ / ₂	18
L3785	8 x 8	20 ¹ / ₂	20 ¹ / ₂	20 ¹ / ₂
L371053	10 x 3	15 ⁵ / ₈	17	15
L371054	10 x 4	15	18	15
L371056	10 x 6	18	20	18
L371058	10 x 8	20 ¹ / ₂	22	20 ¹ / ₂
L37105	10 x 10	24	24	24
L371253	12 x 3	17	18 ³ / ₄	16 ⁵ / ₈
L371254	12 x 4	21	20	16 ⁵ / ₈
L371256	12 x 6	18	21	18
L371258	12 x 8	20 ¹ / ₂	22 ¹ / ₂	20 ¹ / ₂
L3712510	12 x 10	24	25	24
L37125	12 x 12	26 ¹ / ₂	26 ¹ / ₂	26 ¹ / ₂



Fabricated Double 45° Wye Socket

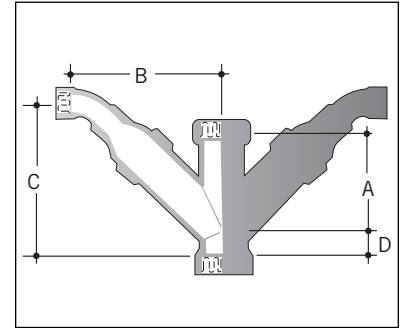
Cat. No.	Size(in)	A(in) MAX	B(in)
L382	2 x 2	4 ³ / ₈	5
L3832	3 x 2	5 ¹ / ₂	6 ³ / ₄
L383	3 x 3	6 ¹ / ₈	6 ³ / ₄
L3842	4 x 2	7 ¹ / ₂	7
L3843	4 x 3	10 ¹ / ₈	10 ¹ / ₄
L384	4 x 4	7 ³ / ₈	10 ¹ / ₄
L386	6 x 6	13	17 ³ / ₈
L3886	8 x 6	13	18
L388	8 x 8	14 ¹ / ₂	20 ¹ / ₂
L38104	10 x 4	12 ¹ / ₂	15
L38106	10 x 6	13 ¹ / ₂	18
L38108	10 x 8	15	20 ¹ / ₂
L3810	10 x 10	17 ¹ / ₂	24
L38124	12 x 4	14	15
L38126	12 x 6	16	18
L38128	12 x 8	16 ¹ / ₂	20 ¹ / ₂
L381210	12 x 10	18 ¹ / ₂	24
L3812	12 x 12	19 ¹ / ₂	26 ¹ / ₂



ENFIELD FITTING DIMENSIONS

Fabricated Double Combination Wye & 1/8 Bend Socket

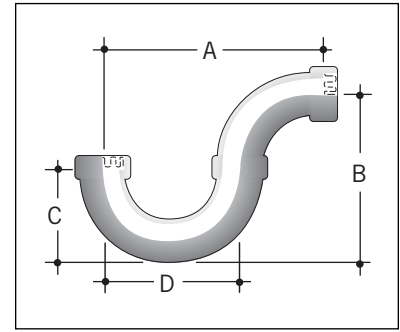
Cat No	Size(in)	A(in)	B(in) MAX	C(in) MAX	D(in)
L3825	2 x 2	3 ⁵ / ₈	6 ¹ / ₄	6 ¹ / ₄	1 ³ / ₈
L38352	3 x 2	5 ⁷ / ₈	7 ³ / ₄	7	7 ⁷ / ₈
L3835	3 x 3	5	9 ³ / ₈	7 ⁷ / ₈	1 ³ / ₄
L38452	4 x 2	6 ³ / ₈	8 ¹ / ₄	7 ¹ / ₄	1 ¹ / ₂
L3845	4 x 4	8 ³ / ₈	10	10	1 ⁷ / ₈
L3865	6 x 6	11 ⁵ / ₈	14	13	5 ¹ / ₄



DIMENSIONS

Fabricated P Trap Socket

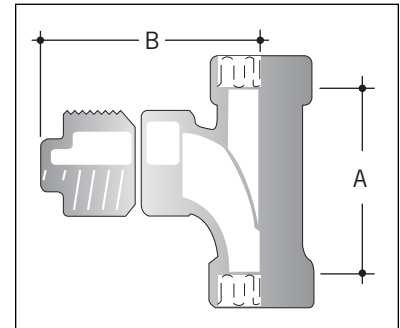
Cat No	Size(in)	A(in)	B(in)	C(in)	D(in)
LT18	8	35	27 ¹ / ₄	17	22 ³ / ₈
LT110	10	40	35	17 ¹ / ₂	28



Fabricated Cleanout Tee Disassembled Length

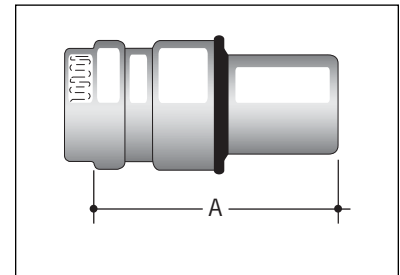
Cat No	Size(in)	A(in)	B(in)
L901	1 ¹ / ₂	7 ¹ / ₄	3 ¹ / ₈
L902*	2	4 ⁵ / ₈	3 ¹ / ₈
L903	3	10	6 ¹ / ₂
L904	4	10	7 ⁷ / ₈
L906	6	13 ¹ / ₂	13 ¹ / ₄

* molded



Fabricated Expansion Joint

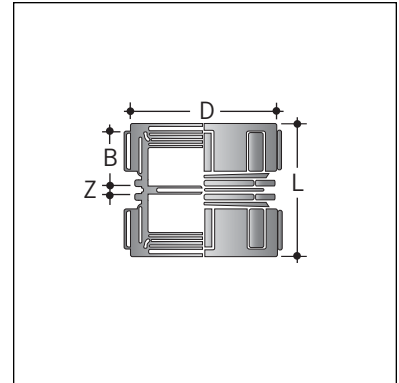
Cat No	Size(in)	A(in)
L803	3	13 ¹ / ₂
L804	4	13 ⁵ / ₈
L806	6	18



LABLINE AND PLENUMLINE FITTING DIMENSIONS

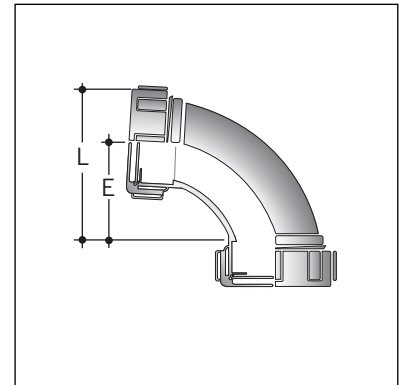
Coupling

Cat No	Size(in)	B(in)	D(in)	L(in)	Z(in)
W161 / W161P	1½	¾	2 ⁷ / ₁₆	2 ³ / ₁₆	¾ ₃₂
W162 / W162P	2	1 ³ / ₃₂	3 ¹ / ₁₆	2½	¾ ₃₂
W163 / W163P	3	1¾	4 ²⁹ / ₃₂	4¼	¾ ₁₆
W164 / W164P	4	2¼	6	5½	¾ ₁₆



1/4 Bend

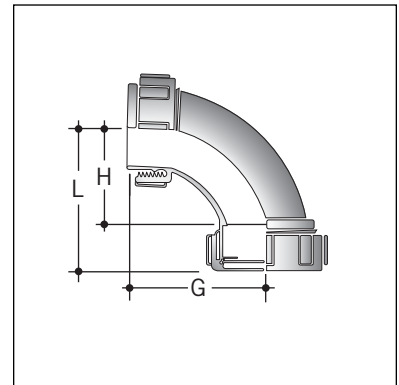
Cat. No.	Size(in)	E(in)	L(in)
W181 / W181P	1½	2 ³ / ₃₂	3 ¹³ / ₃₂
W182 / W182P	2	2½	4 ¹ / ₈
W183 / W183P	3	3 ³ / ₈	5 ⁵ / ₈
W184 / W184P	4	3 ¹⁵ / ₁₆	7 ³ / ₁₆



Loose Nut 1/4 Bend MJ X LN

Cat. No.	Size(in)	G(in)	H(in)	L(in)
W291 / W291P	1½	3	2 ¹ / ₈	3 ¹ / ₈
W292 / W292P	2	3 ¹³ / ₁₆	2½	3 ¹¹ / ₁₆
W293 / W293P	3	5 ³ / ₈	3 ⁷ / ₁₆	4 ¹⁵ / ₁₆
W294 / W294P	4	6 ¹⁵ / ₁₆	4 ¹ / ₈	6 ⁷ / ₁₆

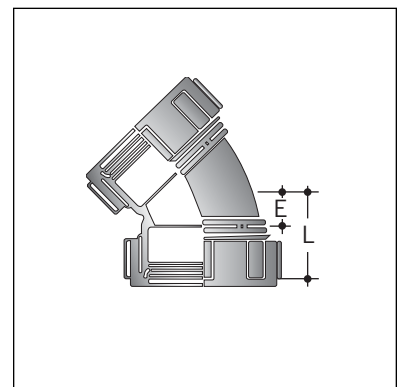
Use to convert universal traps to "S" type making up tubular traps.



1/8 Bend

Cat. No.	Size(in)	E(in)	L(in)
W191 / W191P	1½	5 ⁵ / ₈	1 ⁹ / ₁₆
W192 / W192P	2	1 ³ / ₁₆	1 ⁷ / ₈
W193 / W193P	3	2	3½
W194 / W194P	4	1 ⁷ / ₈	4

Combined with loose nut, 1/8 bend provides a useful offset.

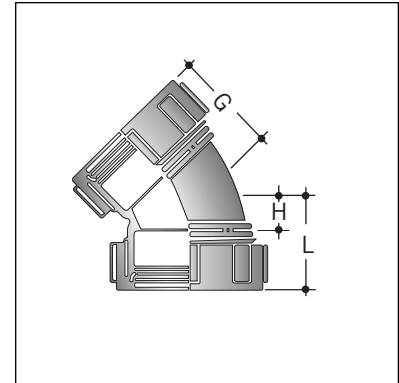


LABLINE AND PLENUMLINE FITTING DIMENSIONS

Loose Nut 1/8 Bend MJ X LN

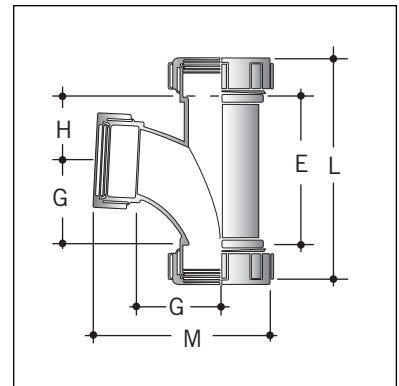
Cat. No.	Size(in)	G(in)	H(in)	L(in)
W211 / W211P	1½	1 ⁹ / ₁₆	⁵ / ₈	1 ³ / ₈
W212 / W212P	2	1 ⁷ / ₈	¹¹ / ₁₆	1 ¹¹ / ₁₆
W213 / W213P	3	4	2	3½
W214 / W214P	4	4½	1¾	4

When used with W151 female adapter and screwed directly to sink, outlet provides a compact assembly for turning drainline back to wall.



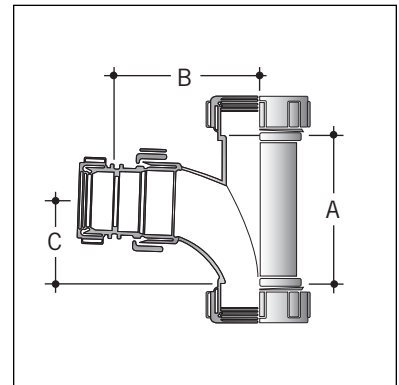
Sanitary Tee

Cat. No.	Size(in)	G(in)	H(in)	E(in)	L(in)	M(in)
W201 / W201P	1½	2 ⁵ / ₁₆	1½	3 ¹³ / ₁₆	6	4¼
W202 / W202P	2	2½	2 ³ / ₁₆	4½	7	5 ⁵ / ₁₆
W203 / W203P	3	3¼	1 ⁹ / ₁₆	4¾	9	7 ¹³ / ₁₆
W204 / W204P	4	3 ⁷ / ₈	3	6 ¹⁵ / ₁₆	12 ¹ / ₁₆	10



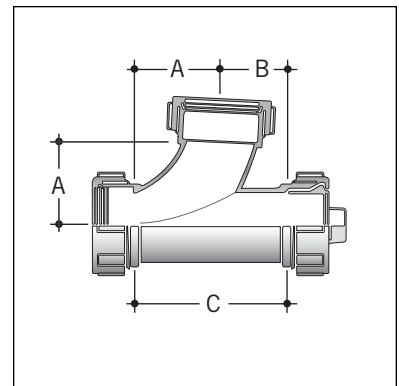
Reducing Sanitary Tee

Cat. No.	Size(in)	A(in)	B(in)	C(in)
W2021 / W2021P	2 x 1½	4 ⁹ / ₁₆	2½	2½
W2031 / W2031P	3 x 1½	4 ⁷ / ₈	5½	3 ³ / ₈
W2032 / W2032P	3 x 2	6	3 ¹³ / ₃₂	3 ¹³ / ₃₂
W2041	4 x 1½	6 ¹⁵ / ₁₆	4¾	4 ¹ / ₈
W2042 / W2042P	4 x 2	6 ¹⁵ / ₁₆	7 ³ / ₈	3 ⁷ / ₈
W2043 / W2043P	4 x 3	6 ¹⁵ / ₁₆	6 ⁵ / ₈	3 ⁷ / ₈



Cleanout Tee

Cat. No.	Size(in)	A(in)	B(in)	C(in)
W2015 / W2015P	1½	2 ⁵ / ₁₆	1½	3 ¹³ / ₁₆
W2025 / W2025P	2	2½	2 ³ / ₁₆	4½
W2035 / W2035P	3	3¼	1 ⁹ / ₁₆	4¾
W2045 / W2045P	4	3 ⁷ / ₈	3	6 ¹⁵ / ₁₆

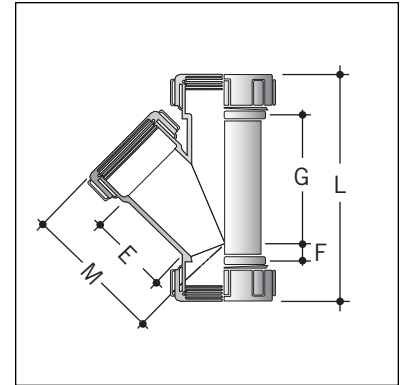


LABLINE AND PLENUMLINE FITTING DIMENSIONS

45° Wye

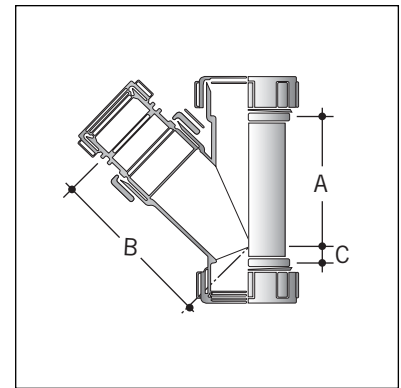
Cat. No.	Size(in)	E(in)	F(in)	G(in)	L(in)	M(in)
W371 / W371P	1½	2 ¹³ / ₁₆	⁵ / ₁₆	3 ⁷ / ₁₆	5 ¹³ / ₁₆	3 ¹³ / ₁₆
W372 / W372P	2	3	¹¹ / ₁₆	3 ⁹ / ₁₆	6 ⁵ / ₈	4½
W373 / W373P	3	6	1¾	7	12 ¹¹ / ₁₆	7 ¹⁹ / ₃₂
W374 / W374P	4	7	1¾	8½	15¾	9 ⁵ / ₁₆

Combined with loose nut 1/8 bend can provide two parallel inlets to a single pipe.



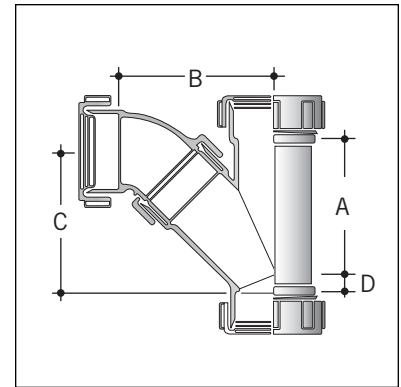
Reducing 45° Wye

Cat. No.	Size(in)	A(in)	B(in)	C(in)
W3721 / W3721P	2 x 1½	3 ¹ / ₁₆	4 ¹³ / ₁₆	¹¹ / ₁₆
W3731 / W3731P	3 x 1½	7	8½	1¾
W3732 / W3732P	3 x 2	7	8½	1¾
W3741	4 x 1½	8½	11 ¹ / ₈	1¾
W3742 / W3742P	4 x 2	8½	10 ⁵ / ₁₆	1¾
W3743 / W3743P	4 x 3	8½	9 ¹¹ / ₁₆	1¾



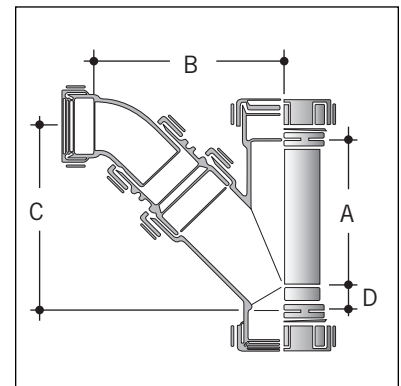
Combination Wye & 1/8 Bend

Cat. No.	Size(in)	A(in)	B(in)	C(in)	D(in)
W3715 / W3715P	1½	3 ⁷ / ₁₆	3 ⁵ / ₈	3 ¹¹ / ₁₆	²¹ / ₆₄
W3725 / W3725P	2	3 ⁵ / ₈	4¼	4 ¹ / ₁₆	¹¹ / ₁₆
W3735 / W3735P	3	7	8½	8 ¹³ / ₃₂	1¾
W3745 / W3745P	4	8½	10¼	10	1¾



Red. Combination Wye & 1/8 Bend

Cat. No.	Size(in)	A(in)	B(in)	C(in)	D(in)
W37251 / W37251P	2 x 1½	3 ¹⁹ / ₃₂	6 ¹³ / ₆₄	4 ⁵ / ₃₂	¹¹ / ₁₆
W37351 / W37351P	3 x 1½	7	11 ³ / ₈	8 ¹³ / ₃₂	1¾
W37352 / W37352P	3 x 2	7	11 ³ / ₈	8½	1¾
W37451	4 x 1½	8½	9½	10 ³ / ₈	1¾
W37452 / W37452P	4 x 2	8½	13 ³ / ₈	10	1¾
W37453 / W37453P	4 x 3	8½	12 ¹⁹ / ₃₂	10	1¾

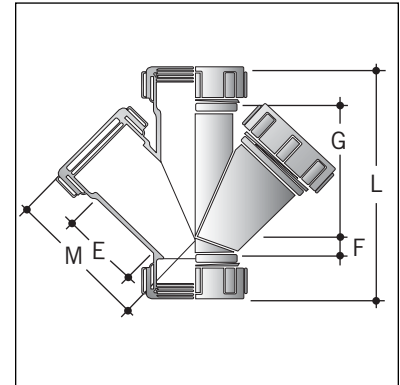


LABLINE AND PLENUMLINE FITTING DIMENSIONS

Double Wye

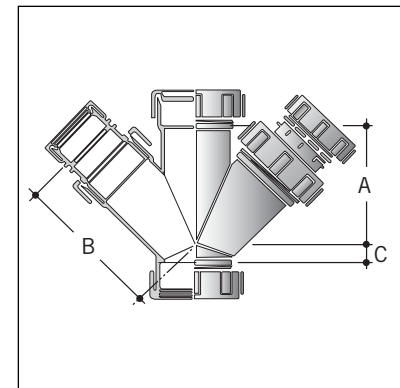
Cat. No.	Size(in)	E(in)	F(in)	G(in)	L(in)	M(in)
W381 / W381P*	1½	2 ¹³ / ₁₆	⁵ / ₁₆	3 ⁷ / ₁₆	5 ¹³ / ₁₆	3 ¹⁵ / ₁₆
W382 / W382P*	2	3	¹¹ / ₁₆	3 ⁹ / ₁₆	6 ³ / ₄	4 ¹³ / ₃₂
W383 / W383P*	3	6	1¾	7	12 ¹¹ / ₁₆	7 ¹⁹ / ₃₂
W384 / W384P*	4	7	1¾	8½	15¾	9 ⁵ / ₁₆

* fabricated



Reducing Double Wye

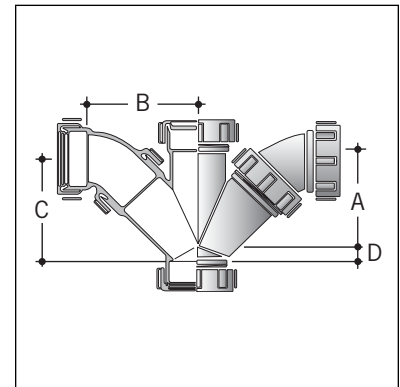
Cat. No.	Size(in)	A(in)	B(in) MAX	C(in)
W3821 / W3821P	2 x 1½	3 ¹⁹ / ₃₂	4 ¹³ / ₁₆	¹¹ / ₁₆
W3831 / W3831P	3 x 1½	7	8½	1¾
W3832 / W3832P	3 x 2	7	8½	1¾
W3841 / W3841P	4 x 1½	8½	14¼	2
W3842 / W3842P	4 x 2	8½	10 ⁵ / ₁₆	2
W3843 / W3843P	4 x 3	8½	9 ¹¹ / ₁₆	2



Double Wye & 1/8 Bend

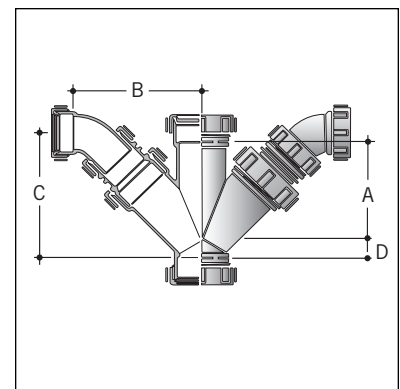
Cat. No.	Size(in)	A(in)	B(in)	C(in)	D(in)
W3815 / W3815P	1½	3½	3 ¹⁹ / ₃₂	3 ¹¹ / ₁₆	⁵ / ₁₆
W3825 / W3825P	2	3 ¹⁹ / ₃₂	4¼	4 ¹ / ₁₆	¹¹ / ₁₆
W3835 / W3835P	3	7	8½	8 ¹³ / ₃₂	1¾
W3845 / W3845P	4	8½	10¼	10	2

Ends may be reduced by adding reducing couplings.



Reducing Double Wye & 1/8 Bend

Cat. No.	Size(in)	A(in)	B(in)	C(in) MAX	D(in)
W38251	2 x 1½	3¾	5½	5 ⁷ / ₈	½
W38351	3 x 1½	7 ¹ / ₈	7 ⁵ / ₈	11 ¹ / ₈	1½
W38352	3 x 2	7 ¹ / ₈	7 ⁷ / ₈	8 ⁷ / ₈	1½
W38451	4 x 1½	8 ⁷ / ₈	9¼	10½	1½
W38452	4 x 2	8 ⁵ / ₈	9¼	10 ³ / ₈	1¾
W38453	4 x 3	8 ⁵ / ₈	11 ⁵ / ₈	14 ⁵ / ₈	1¾



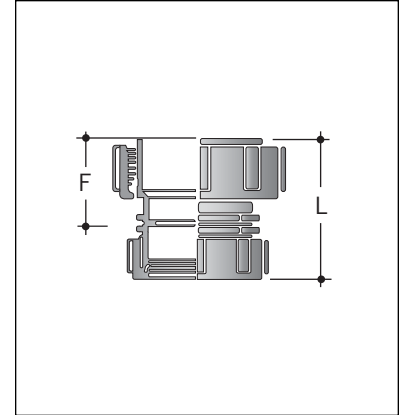
LABLINE AND PLENUMLINE FITTING DIMENSIONS

Reducing Coupling

Cat. No.	Size(in)	F(in)	L(in)
W3921 / W3921P	2 x 1½	1¾	2 ¹³ / ₁₆
W3931* / W3931P	3 x 1½	2 ¹⁵ / ₃₂	3 ¹⁵ / ₃₂
W3932* / W3932P	3 x 2	2¼	3 ⁵ / ₁₆
W3941*	4 x 1½	3 ¹³ / ₁₆	4¾
W3942* / W3942P	4 x 2	3½	4 ⁹ / ₁₆
W3943 / W3943P	4 x 3	2 ⁷ / ₈	4 ⁷ / ₈

* Loose nut not included.

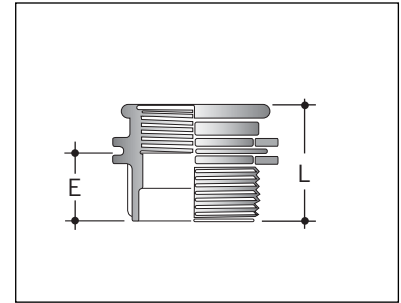
Loose nut permits direct connection to any Enfield fitting to provide reduction of pipe size.



Threaded Adapters MST x FST

Cat. No.	Size(in)	E(in)	L(in)
W121	1½ x 1¼	1 ³ / ₁₆	1 ⁷ / ₈
W131	1½ x 1½	1 ³ / ₁₆	1 ⁷ / ₈

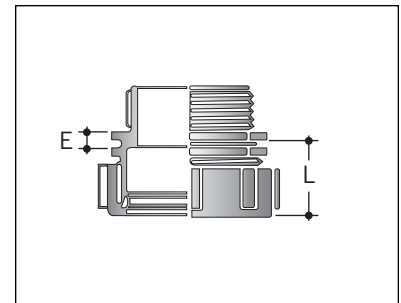
These fittings adapt Enfield Universal Traps to other brands of threaded 1¼" and 1½" sink outlets.



Male Adapter EJ x MPT

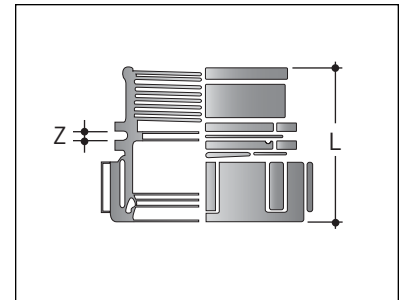
Cat. No.	Size(in)	E(in)	L(in)
W141T / W141P	1½	¼	¾
W142 / W142P	2	¼	7/8
W143	3	¼	1 ¹¹ / ₁₆
W144	4	¼	2 ⁷ / ₃₂

W141T adapts Enfield Universal Trap inlet to pipe.



Female Adapter EJ x FPT

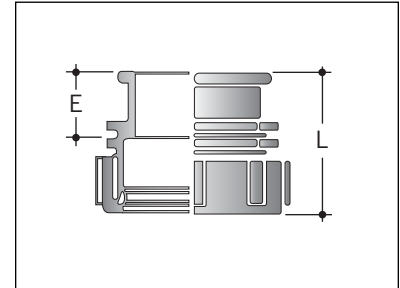
Cat. No.	Size(in)	Z(in)	L(in)
W151 / W151P	1½	⅛	2
W152 / W151P	2	⅛	2 ⁵ / ₁₆



LABLINE AND PLENUMLINE FITTING DIMENSIONS

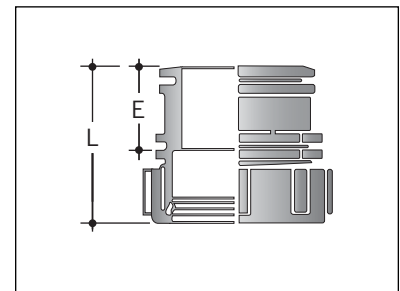
Glass Adapter EJ x Bead

Cat. No.	Size(in)	E(in)	L(in)
W451	1½	1⅛	1⅞
W452	2	1¼	2¼
W453	3	1¾	3⅞
W454	4	1¾	3¾



No Hub Adapter EJ x Spigot

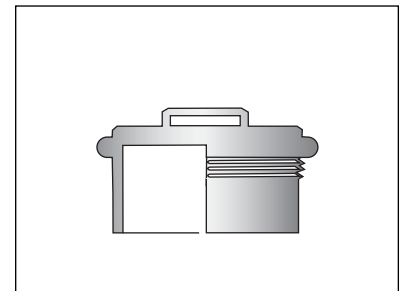
Cat. No.	Size(in)	E(in)	L(in)
W461	1½	1⅞	2⅜
W462	2	1⅝	2⅜
W463	3	1¾	3½
W464	4	1¾	4



Cleanout Plug

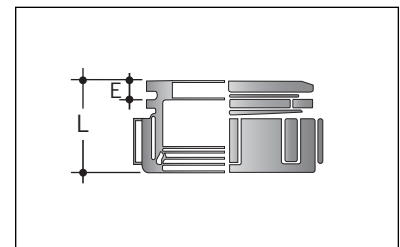
Cat. No.	Size(in)
W241 / W241P	1½
W242 / W242P	2
W243 / W243P	3
W244 / W244P	4

Molded with integral sealing surface, and is locked into fittings using standard nut. Also used as test plug.



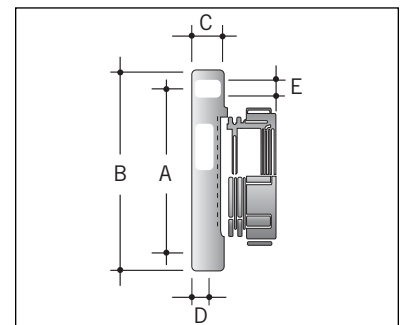
Fabricated Cap

Cat. No.	Size(in)	E(in)	L(in)
W641P	1½	⅝	1¾
W642P	2	½	1¾
W643P	3	⅝	2¾
W644P	4	¾	2½



Fabricated Flanges

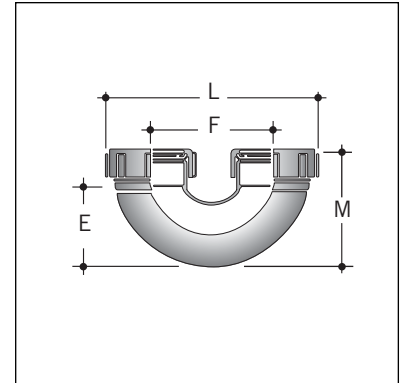
Cat. No.	Size(in)	A(in)	B(in)	C(in)	D(in)	E(in)
W361P	1½	3⅞	5	¾	1½	⅑
W362P	2	4¾	5⅝	¾	1⅝	⅑
W363P	3	6	7⅝	¾	2⅝	⅑
W364P	4	7½	9	¾	2⅝	⅑



LABLINE AND PLENUMLINE FITTING DIMENSIONS

Vent Loop / U Bend

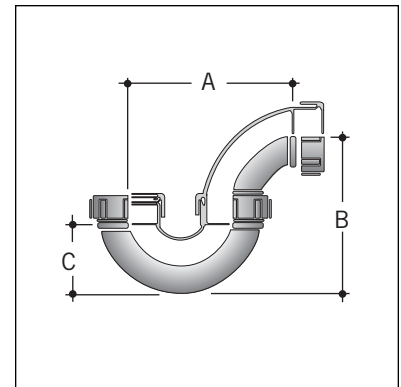
Cat. No.	Size(in)	E(in)	F(in)	L(in)	M(in)
W1011 / W1011P	1½	2 ⁹ / ₁₆	3½	5¾	3 ¹ / ₂
W1012 / W1012P	2	2 ⁷ / ₈	4 ³ / ₁₆	6 ¹³ / ₁₆	3 ⁷ / ₈



P Trap 2-piece

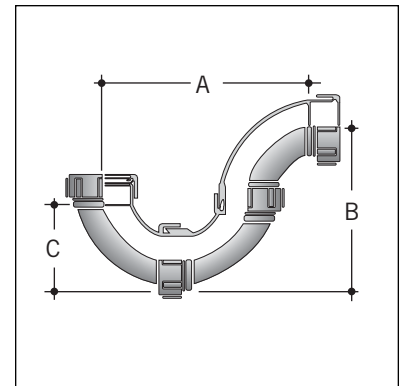
Cat. No.	Size(in)	A(in)	B(in)	C(in)
W1021 / W1021P	1½	5 ⁷ / ₈	5 ³ / ₈	2 ⁹ / ₁₆
W1022 / W1022P	2	6 ¹⁵ / ₁₆	6¾	2 ⁷ / ₈

Configuration may be changed to suit by simply pivoting the ell.



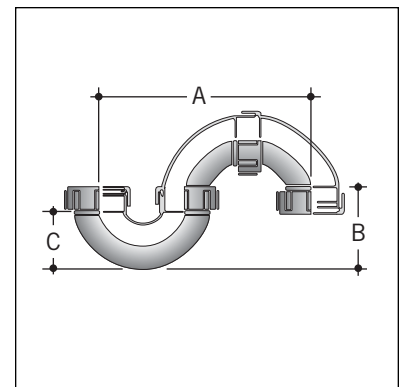
P Trap 3-piece

Cat. No.	Size(in)	A(in)	B(in)	C(in)
WT11 / WT11P	1½	8	6 ¹³ / ₁₆	3½
WT12 / WT12P	2	9¼	8	4¼
WT13 / WT13P	3	12	11	6
WT14 / WT14P	4	15 ⁹ / ₁₆	15 ⁷ / ₈	7 ¹³ / ₁₆



S Trap 3-piece

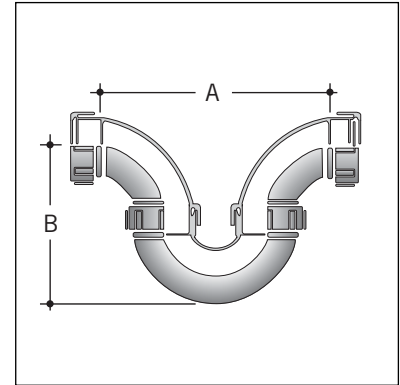
Cat. No.	Size(in)	A(in)	B(in)	C(in)
W1031	1½	9¼	3 ¹ / ₈	2½
W1032	2	10¾	3 ¹³ / ₁₆	2 ⁷ / ₈



LABLINE AND PLENUMLINE FITTING DIMENSIONS

Running Trap 3-piece

Cat. No.	Size(in)	A(in)	B(in)
W1041 / W1041P	1½	7 ⁷ / ₈	5 ³ / ₈
W1042 / W1042P	2	9 ⁷ / ₆₄	6 ³ / ₄

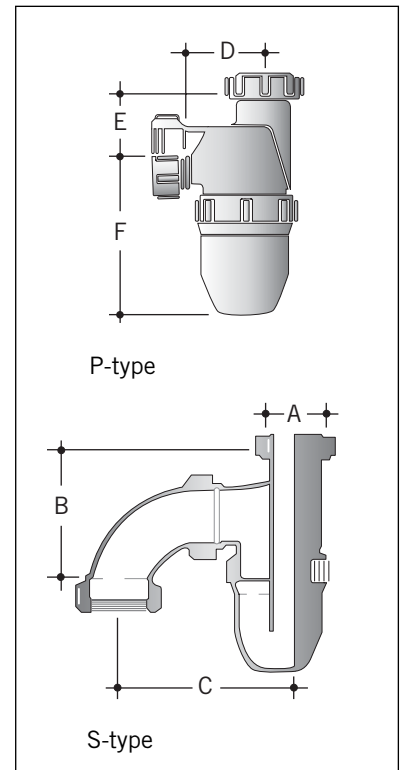


Universal Trap

Type	Cat. No.	Size(in)	D(in)	E(in)	F(in)
"P"	W501	1½	2 ⁷ / ₈	2	5¼
"P"	W511*	1½	2 ⁷ / ₈	2	5¼
Type	Cat. No.	Size (in)	A(in)	B(in)	C(in)
"S"	W5015	1½	1½	4 ⁵ / ₈	5½
"S"	W5115*	1½	1½	4 ⁵ / ₈	5½

* Clear Base made from TPX (Methylpentene Copolymer)

Note: Three inch deep seal Universal Traps have 1½" female threaded inlet which connects directly to Enfield cup sinks and sink outlets or can be adapted to other brands by means of adapters W121 and W131. All universal traps contain nitrile gaskets. Other special chemical resistance gaskets are available upon request.

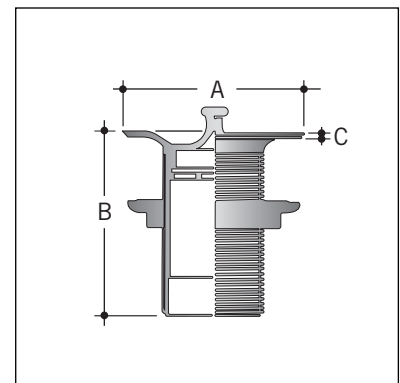


Sink Outlets & Standing Overflows

Cat. No.	Size(in)	A(in)	*B(in)	C(in)
W301 (outlet)	1½	3 ³ / ₈	4 ³ / ₈	³ / ₃₂
W311 (outlet)	1½	2 ⁷ / ₈	4 ³ / ₈	³ / ₃₂
W321 (overflow)	1½ x 7	-	-	-

Sink outlets include integral strainer and removable plug.
Overflows like sink outlets are available in black or white materials.

***B Dimension of white models is 3½".**

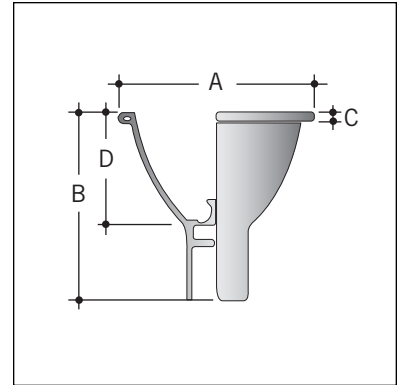


LABLINE AND PLENUMLINE FITTING DIMENSIONS

Cup Sink - Round

Cat. No.	Size(in)	A(in)	B(in)	C(in)	D(in)
W401	6 x 4 deep	6 $\frac{1}{2}$	6 $\frac{1}{2}$	$\frac{5}{16}$	4
W402	4 x 4 deep	4 $\frac{1}{16}$	5 $\frac{9}{32}$	$\frac{5}{32}$	2 $\frac{11}{16}$

Round cup sink with 1 $\frac{1}{2}$ " outlet is only available in black.

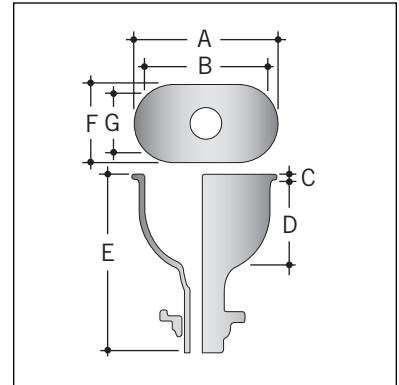


Cup Sink - Oval

Cat. No.	Size(in)	A(in)	B(in)	C(in)	D(in)	E(in)	F(in)	G(in)
W497	6 x 3 deep	7 $\frac{1}{16}$	5 $\frac{7}{8}$	$\frac{1}{4}$	4 $\frac{1}{4}$	8 $\frac{1}{2}$	4	2 $\frac{7}{8}$

Cat. No.	Size(in)	A(in)	B(in)	C(in)	D(in)	E(in)	F(in)	G(in)
W498	9 x 3 deep	10 $\frac{3}{8}$	9	$\frac{1}{4}$	5 $\frac{1}{4}$	8 $\frac{15}{16}$	4 $\frac{7}{16}$	2 $\frac{15}{16}$

Oval cup sink with 1 $\frac{1}{2}$ " outlet is only available in black.

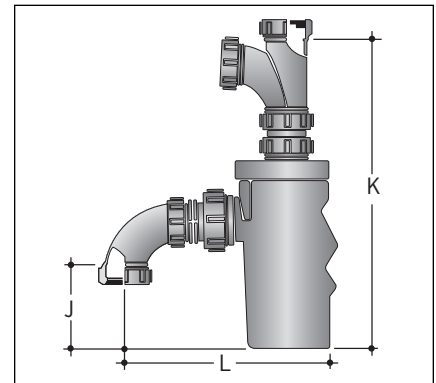
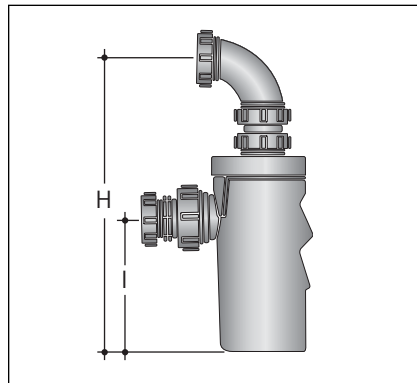
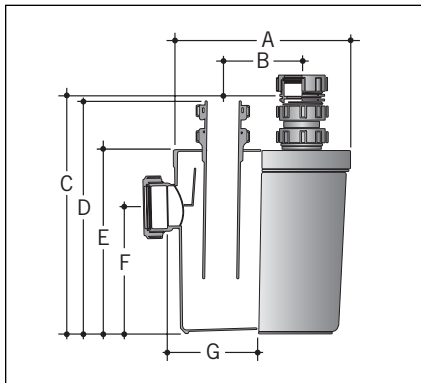


ACCESSORIES

Dilution Traps

Cat No	Size(in)	A(in)	B(in)	C(in)	D(in)	E(in)	F(in)	G(in)	H(in)	I(in)	J(in)	K(in)	L(in)
W601	1½	9	4	12½	12¾	9⅝	6⅝	4¾	14	6⅝	4⅜	16	9¾
W611*	1½	9	4	12½	12¾	9⅝	6⅝	4¾	14	6⅝	4⅜	16	9¾
clear base upon request	2	9	4	12½	12¾	9⅝	6⅝	4¾	14¾	6⅝	4⅜	17	9⅞

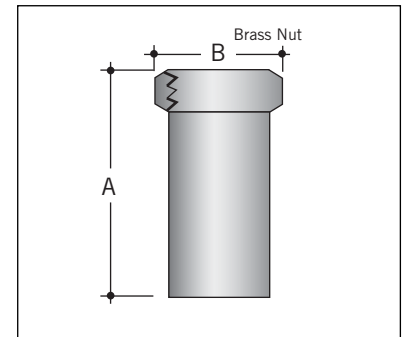
* Clear base is made of TPX (Methylpentene Copolymer)



Note: Dilution traps should not be used as neutralization tanks.

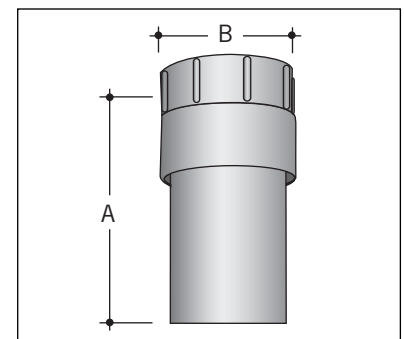
Tailpiece Adapter

Cat. No.	Size(in)	A(in)	B(in)
W303	1½	3	1.7
W3012 / W3012P	1½	12	1.7



Swivel Sink Strainer Adapter

Cat. No.	Size(in)	A(in)	B(in)
W551	1½	1⅝	2¼
W5512	1½	12	2¼

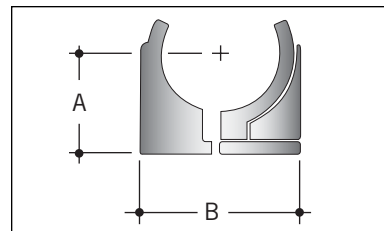


ACCESSORIES

Pipe Clip

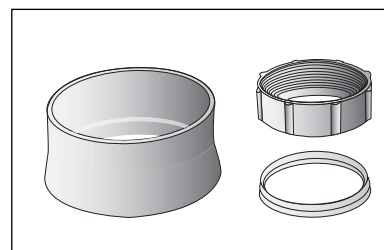
Cat. No.	Size(in)	A(in)	B(in)
W251	1½	1⅝	2⅜
W252	2	1¾	3¼

This “snap-in” type clip permits thermal movement of the pipe. It is installed using a single screw or bolt.



Elastolive™ / Nut

Elastolive* Cat. No.	Size(in)	Nut Cat. No.	Size(in)
W221NH / W221NHP	1½	W231 / W231P	1½
W222NH / W222NHP	2	W232 / W232P	2
W223NH / W223NHP	3	W233 / W233P	3
W224NH / W224NHP	4	W234 / W234P	4

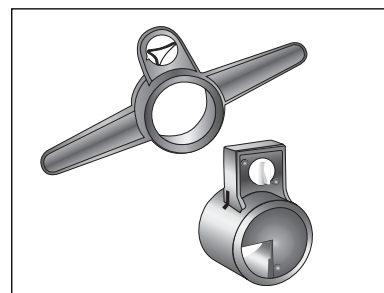


* No-heat olive.

Grooving Tool

Cat. No.	Size(in)
W261	1½
W262	2
W263	3
W264	4

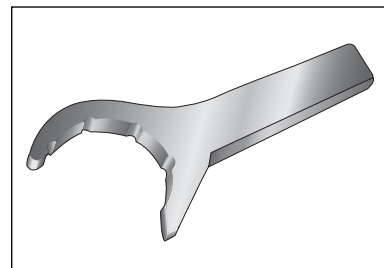
3" and 4" grooving tools have integral handles which facilitate efficient and easy groove cutting.



Spanner

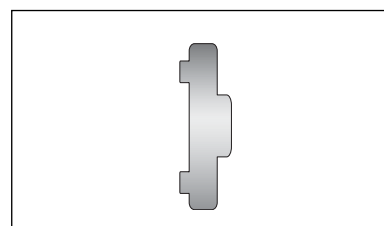
Spanner only Cat. No.	Grooving/Spanner Wrench Set Cat. No.	Size(in)
W2611	W261CS	1½
W2622	W262CS	2
W2633	W263CS	3
W2644	W264CS	4

Spanners are supplied with each grooving tool, but can also be purchased separately.



Spanner for Brass Plug

Cat. No.	Size(in)
L2611	1½
L2622	2
L2633	3
L2644	4



FLOWAY™ POLYPROPYLENE DRAIN DIMENSIONS - ADJUSTABLE

SPECIFICATION: Floway series F1000 polypropylene adjustable floor drain with 6" diameter strainer and plain end outlet. Body with 14½" diameter flange, and non-puncturing style flashing collar with weep holes.

SERIES F1000 ADJUSTABLE FLOOR DRAIN

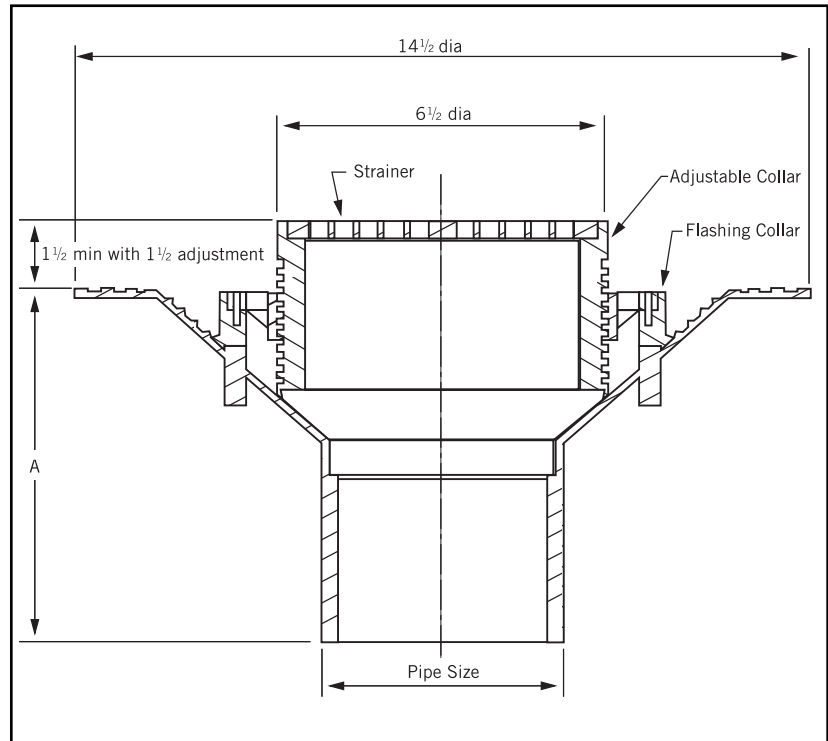
Cat No.	Outlet Size(in)	A (inches)	Wgt. (lbs)
F1201	2*	10 ⁵ / ₈	3.2
F1301P	3	7	2.7
F1401P	4	7	2.8
F1601P	6	7	3.1

All drains are minimum 3" diameter.

* For 2" drains, use the appropriate Enfield or Labline reducer.

OPTIONS

- Gas tight plug
- Allenhead vandal-proof screws
- Male iron pipe thread outlet



DIMENSIONS

SPECIFICATION: Floway series F1000 polypropylene adjustable floor drain with 6" diameter strainer, sediment basket, and plain end outlet. Body with 14½" diameter flange, and non-puncturing style flashing collar with weep holes.

SERIES F1000 ADJUSTABLE FLOOR DRAIN WITH SEDIMENT BASKET

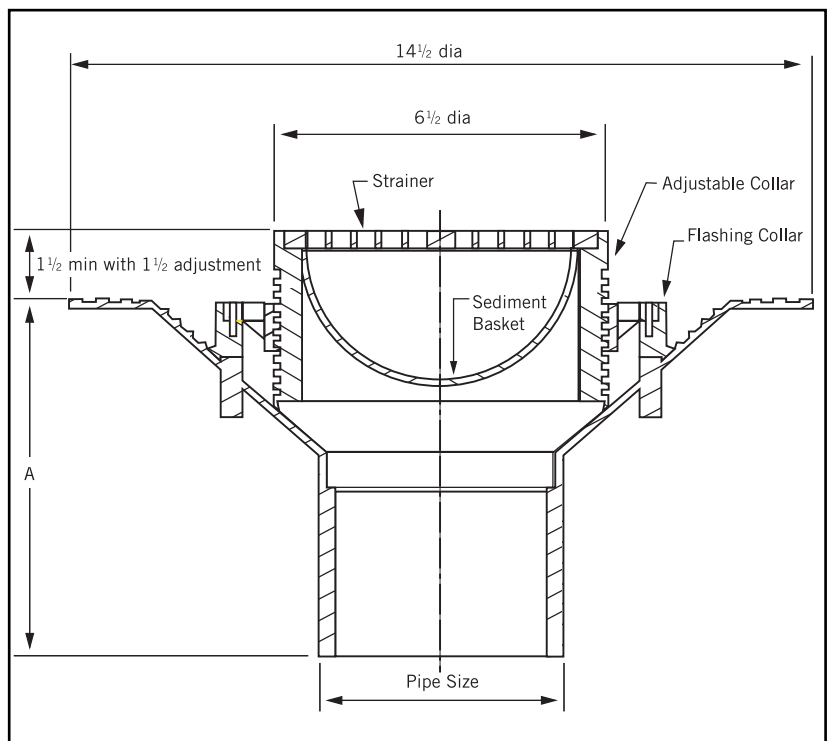
Cat No.	Outlet Size(in)	A (inches)	Wgt. (lbs)
F1202	2*	10 ⁵ / ₈	3.2
F1302P	3	7	2.7
F1402P	4	7	2.8
F1602P	6	7	3.1

All drains are minimum 3" diameter.

* For 2" drains, use the appropriate Enfield or Labline reducer.

OPTIONS

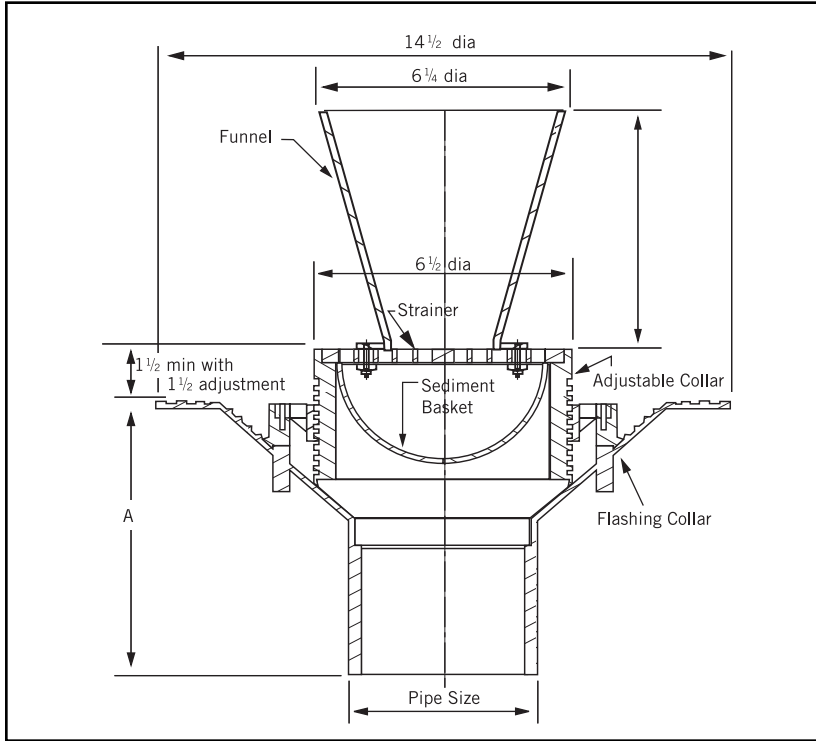
- Gas tight plug
- Allenhead vandal-proof screws
- Male iron pipe thread outlet



FLOWAY™ POLYPROPYLENE DRAIN DIMENSIONS - ADJUSTABLE

SPECIFICATION: Floway series F1000 polypropylene adjustable floor drain with 6" diameter strainer, sediment basket, 6" diameter funnel and plain end outlet. Body with 14½" diameter flange, and non-puncturing style flashing collar with weep holes.

DIMENSIONS



**SERIES F1000
ADJUSTABLE FLOOR DRAIN
WITH SEDIMENT BASKET
AND 6" ROUND FUNNEL**

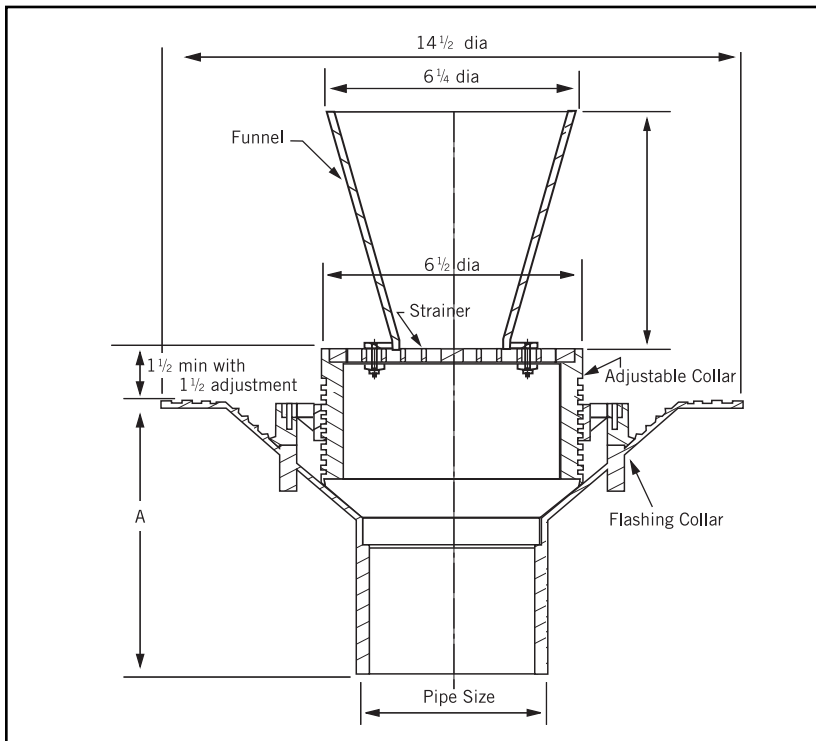
Cat No.	Outlet Size(in)	A (inches)	Wgt. (lbs)
F1203	2*	10 ⁵ / ₈	3.2
F1303P	3	7	2.7
F1403P	4	7	2.8
F1603P	6	7	3.1

All drains are minimum 3" diameter.
* For 2" drains, use the appropriate Enfield or Labline reducer.

OPTIONS

- Gas tight plug
- Allenhead vandal-proof screws
- Male iron pipe thread outlet

SPECIFICATION: Floway series F1000 polypropylene adjustable floor drain with 6" diameter strainer, 6" diameter funnel and plain end outlet. Body with 14½" diameter flange, and non-puncturing style flashing collar with weep holes.



**SERIES F1000
ADJUSTABLE FLOOR DRAIN WITH
6" ROUND FUNNEL**

Cat No.	Outlet Size(in)	A (inches)	Wgt. (lbs)
F1204	2*	10 ⁵ / ₈	3.2
F1304P	3	7	2.7
F1404P	4	7	2.8
F1604P	6	7	3.1

All drains are minimum 3" diameter.
* For 2" drains, use the appropriate Enfield or Labline reducer.

OPTIONS

- Gas tight plug
- Allenhead vandal-proof screws
- Male iron pipe thread outlet

FLOWAY™ POLYPROPYLENE DRAIN DIMENSIONS - NON-ADJUSTABLE

SPECIFICATION: Floway series F4000 polypropylene non-adjustable floor drain with 8½" diameter strainer and plain end outlet. Body with 14½" diameter flange, and non-puncturing style flashing collar with weep holes.

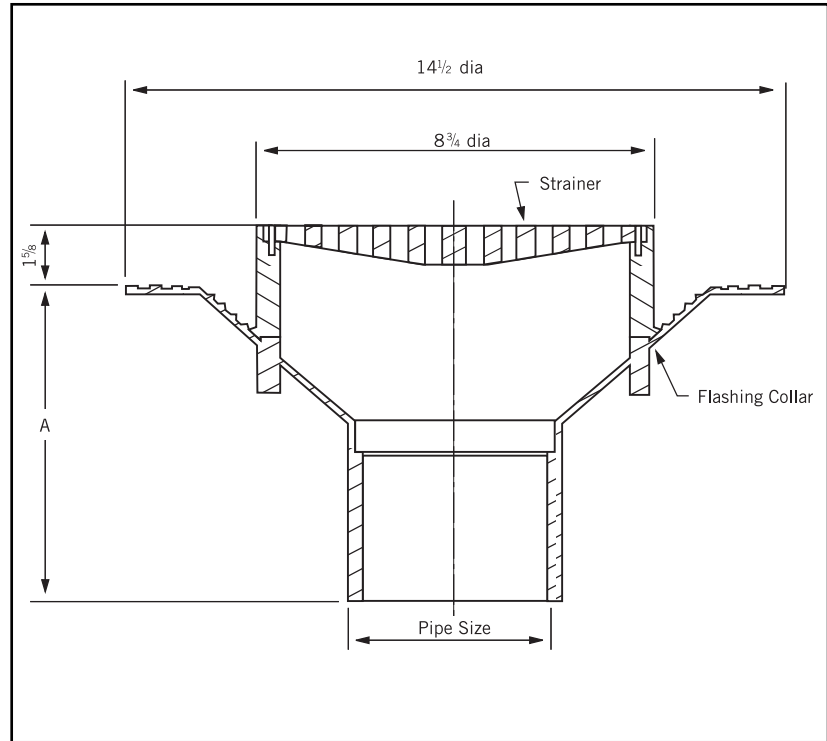
SERIES F4000 NON-ADJUSTABLE FLOOR DRAIN

Cat No.	Outlet Size (in)	A (inches)	Wgt. (lbs)
F4201	2*	10 ⁵ / ₈	2.8
F4301P	3	7	2.3
F4401P	4	7	2.5
F4601P	6	7	2.7

All drains are minimum 3" diameter.
* For 2" drains, use the appropriate Enfield or Labline reducer.

OPTIONS

- Gas tight plug
- Allenhead vandal-proof screws
- Male iron pipe thread outlet



DIMENSIONS

SPECIFICATION: Floway series F4000 polypropylene non-adjustable floor drain with 8½" diameter strainer, sediment basket, and plain end outlet. Body with 14½" diameter flange, and non-puncturing style flashing collar with weep holes.

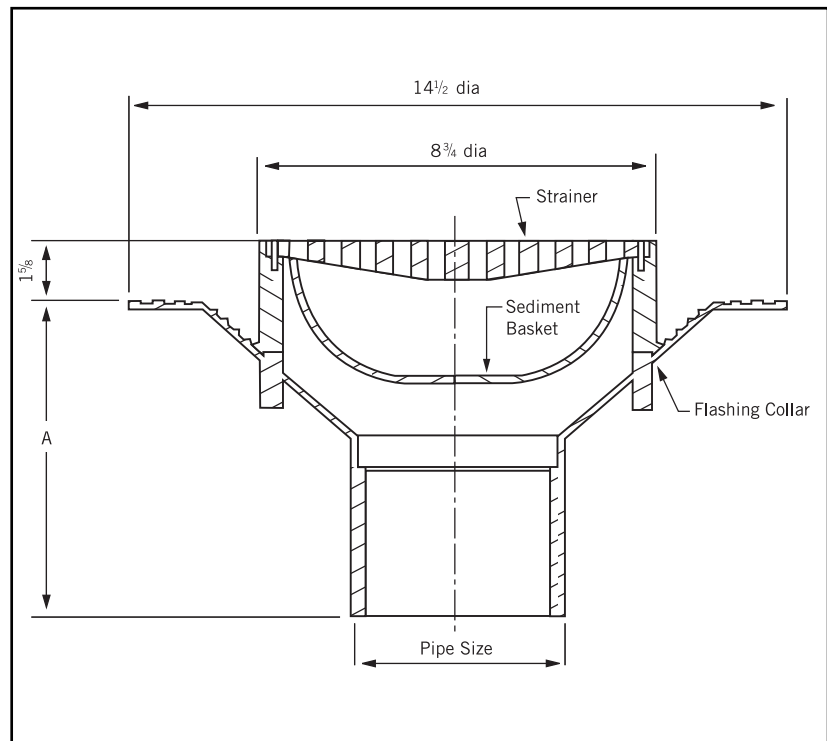
SERIES F4000 NON-ADJUSTABLE FLOOR DRAIN WITH SEDIMENT BASKET

Cat No.	Outlet Size (in)	A (inches)	Wgt. (lbs)
F4202	2*	10 ⁵ / ₈	2.8
F4302P	3	7	2.3
F4402P	4	7	2.5
F4602P	6	7	2.7

All drains are minimum 3" diameter.
* For 2" drains, use the appropriate Enfield or Labline reducer.

OPTIONS

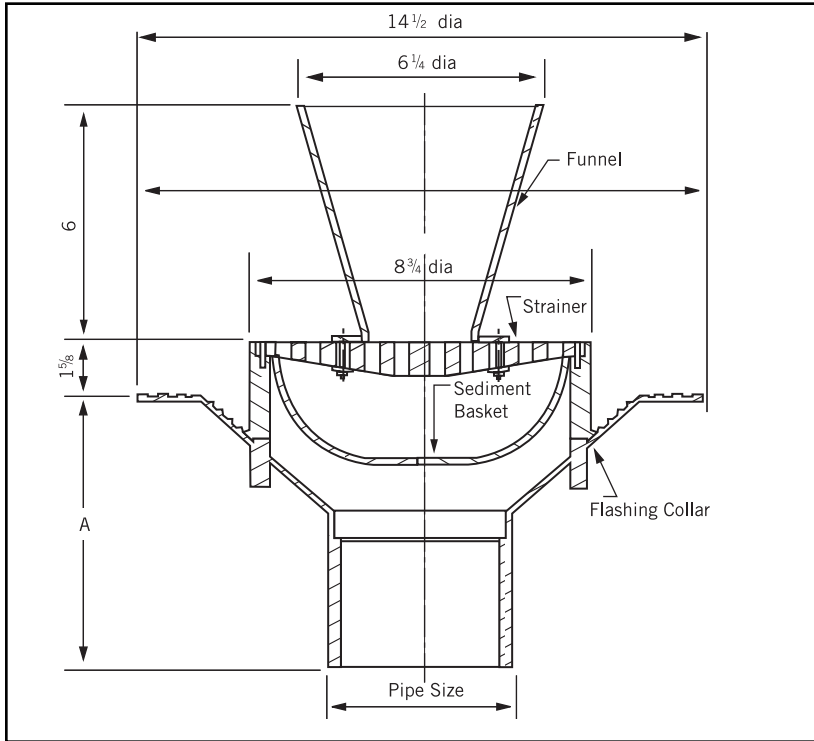
- Gas tight plug
- Allenhead vandal-proof screws
- Male iron pipe thread outlet



FLOWAY™ POLYPROPYLENE DRAIN DIMENSIONS - NON-ADJUSTABLE

SPECIFICATION: Floway series F4000 polypropylene non-adjustable floor drain with 8½" diameter strainer, sediment basket, 6" diameter funnel and plain end outlet. Body with 14½" diameter flange, and non-puncturing style flashing collar with weep holes.

DIMENSIONS



SERIES F4000 NON-ADJUSTABLE FLOOR DRAIN WITH SEDIMENT BASKET AND FUNNEL

Cat No.	Outlet Size(in)	A (inches)	Wgt. (lbs)
F4203	2*	10 ⁵ / ₈	2.8
F4303P	3	7	2.3
F4403P	4	7	2.5
F4603P	6	7	2.7

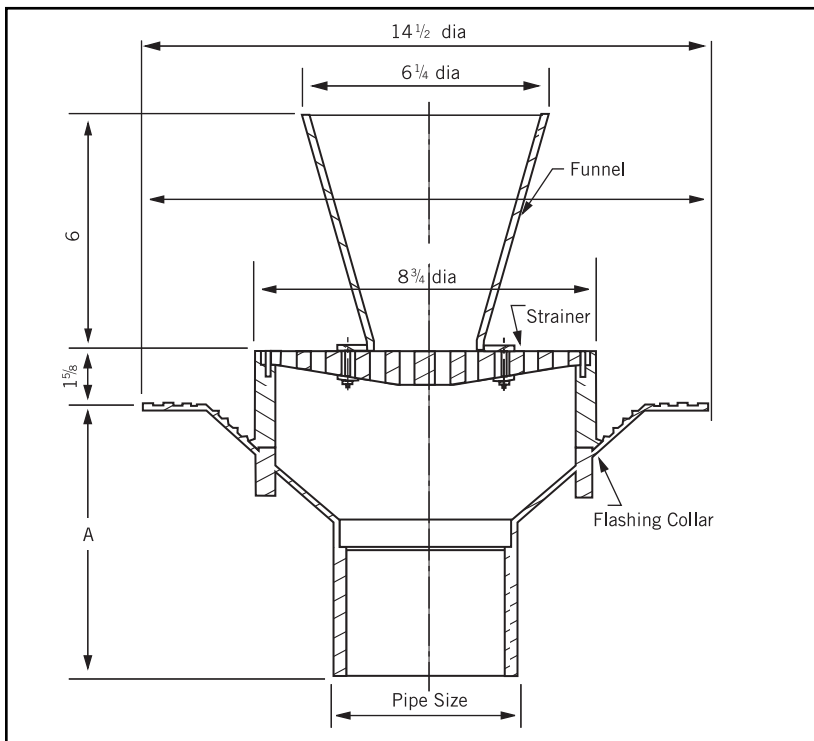
All drains are minimum 3" diameter.

* For 2" drains, use the appropriate Enfield or Labline reducer.

OPTIONS

- Gas tight plug
- Allenhead vandal-proof screws
- Male iron pipe thread outlet

SPECIFICATION: Floway series F4000 polypropylene non-adjustable floor drain with 8½" diameter strainer, 6" diameter funnel and plain end outlet. Body with 14½" diameter flange, and non-puncturing style flashing collar with weep holes.



SERIES F4000 NON-ADJUSTABLE FLOOR DRAIN WITH FUNNEL

Cat No.	Outlet Size(in)	A (inches)	Wgt. (lbs)
F4204	2*	10 ⁵ / ₈	2.8
F4304P	3	7	2.3
F4404P	4	7	2.5
F4604P	6	7	2.7

All drains are minimum 3" diameter.

* For 2" drains, use the appropriate Enfield or Labline reducer.

OPTIONS

- Gas tight plug
- Allenhead vandal-proof screws
- Male iron pipe thread outlet

FLOWAY™ POLYPROPYLENE DRAIN OPERATIONAL NOTES

Maximum allowable loading on IPEX Floway PP drains was determined using the following test method. This test was performed on both non-adjustable and adjustable floor drains with an 8.5" surface load.

Test Results for Grate Loading

Test	Test Standard	Conditions	Unit	Safe Load
Static Load Test (a)	Adjustable	72°F / full face loading	lbf	2750
Static Load Test (a)	Non-Adjustable	72°F / full face loading	lbf	11000

The maximum safe live load was calculated by dividing the load at failure by two.

- Note:**
- i) The press test simulates (under laboratory conditions) the resistance to buckling of floor drains under given loadings and surface area considerations.
 - ii) It is not meant to simulate every type of wheel design loading as this will vary according to the equipment supplier.
 - iii) The larger the wheel diameter, the more likely it is that the full face loading result can be used as an indication of resistance to load.
 - iv) Polypropylene will normally recover to near its original dimensions after the load is removed.

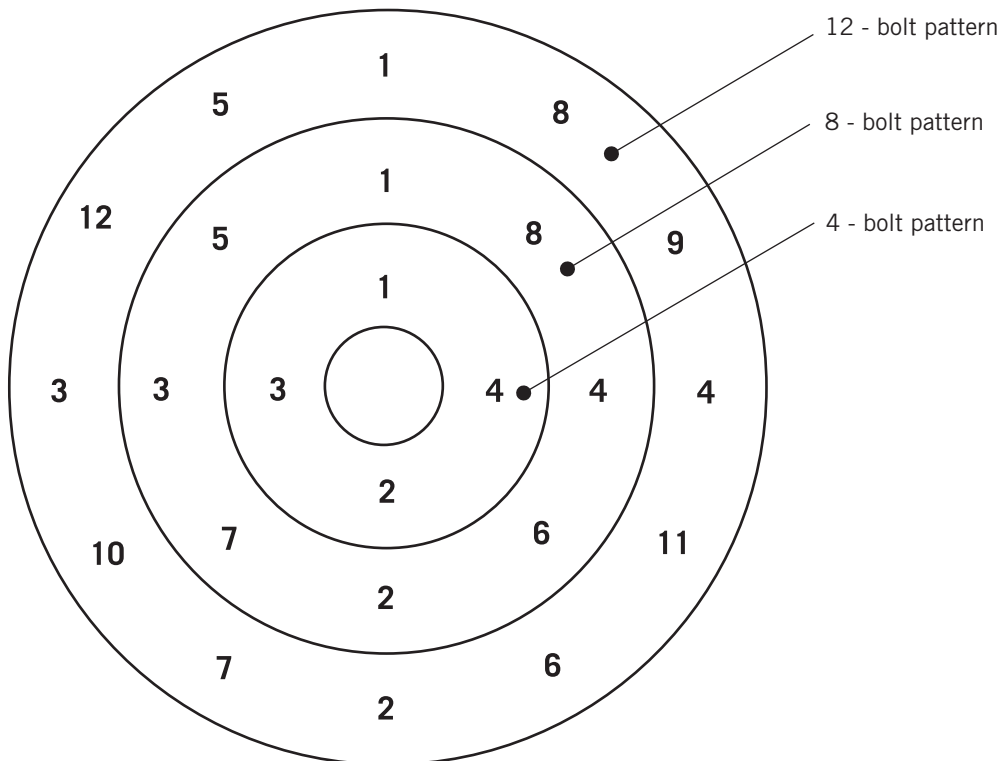
STANDARD BOLT PATTERN AND DIMENSIONS

ANSI B15.5

Size (in)	Bolt Diameter (in)	Bolt Length (in)	Torque (ft. lb)	Number of Bolt Holes
1½	½	2½	13	4
2	5/8	2½	22	4
3	5/8	2½	30	4
4	5/8	2¾	33	8
6	¾	3½	33 - 50	8
8	¾	4	33 - 50	8
10	7/8	5	53 - 75	12
12	7/8	5½	53 - 75	12

Flange Bolt Tightening Sequence

Tighten bolts equally following numerical sequence.



SECTION THREE: DESIGN CONSIDERATIONS

EXPANSION AND CONTRACTION

All piping products expand and contract with changes in temperature. Linear expansion and contraction of any pipe on the longitudinal axis relates to the coefficient of thermal expansion (e) for the specific material used in the manufacturing of the product. Variation in pipe length due to thermal expansion or contraction depends on the linear expansion factor (Y) and the variation in temperature (ΔT). It should be noted that change in pipe diameter or wall thickness does not effect a change in rates of thermal expansion or contraction.

In general, acid waste piping systems are not normally subjected to large temperature variations. Inherent flexibility of the system is usually sufficient to accommodate anticipated expansion or contraction. However, consideration must be given in situations where substantial temperature variations may exist.

Approximate coefficients of thermal expansion for different pipe materials are presented below.

Coefficient of Thermal Expansion

Piping Material	"e" Coefficient in./in./°F	"Y" Expansion Factor in./10°F/100 ft.
FRPP	6.0×10^{-5}	.456
NFRPP	8.3×10^{-5}	.600
FR-PVDF	8.0×10^{-5}	.960

The degree of thermal expansion or contraction also depends on the system temperature differential, as well as the length of pipe run between changes in direction. It can be calculated using the following formula:

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

- where:
- ΔL = expansion rate (in)
 - Y = expansion factor expressed in inches of expansion per 10°F temperature change per 100 ft. of pipe
 - T = maximum temperature (°F)
 - F = minimum temperature (°F)
 - L = length of pipe run (ft)

Note: Remember to allow for contraction when piping is to be exposed to temperatures substantially below installation temperature.

Example 1:

How much expansion can be expected in 215 feet of 3" diameter FRPP pipe installed at 75°F and operating at 135°F?

$$Y = 0.456$$

Solution:

$$\Delta L = 0.456 \times \frac{60}{10} \times \frac{215}{100} = 0.456 \times 6 \times 2.15 = 5.88 \text{ inches}$$

Thermal Expansion (ΔL) in inches of FRPP

Temp. Change T °F	Length of Run in Feet									
	10	20	30	40	50	60	70	80	90	100
10	0.05	0.09	0.14	0.18	0.23	0.27	0.32	0.36	0.41	0.46
20	0.09	0.18	0.27	0.36	0.46	0.55	0.64	0.73	0.82	0.91
30	0.14	0.27	0.41	0.55	0.68	0.82	0.96	1.09	1.23	1.37
40	0.18	0.36	0.55	0.73	0.91	1.09	1.28	1.46	1.64	1.82
50	0.23	0.46	0.68	0.91	1.14	1.37	1.60	1.82	2.05	2.28
60	0.27	0.55	0.82	1.09	1.37	1.64	1.92	2.19	2.46	2.74
70	0.32	0.64	0.96	1.28	1.60	1.92	2.23	2.55	2.87	3.19
80	0.36	0.73	1.09	1.46	1.82	2.19	2.55	2.92	3.28	3.65
90	0.41	0.82	1.23	1.64	2.05	2.46	2.87	3.28	3.69	4.10
100	0.46	0.91	1.37	1.82	2.28	2.74	3.19	3.65	4.10	4.56

Thermal Expansion (ΔL) in inches of NFRPP

Temp. Change T °F	Length of Run in Feet									
	10	20	30	40	50	60	70	80	90	100
10	0.06	0.12	0.18	0.24	0.30	0.36	0.42	0.48	0.54	0.60
20	0.12	0.24	0.36	0.48	0.60	0.72	0.84	0.96	1.08	1.20
30	0.18	0.36	0.54	0.72	0.90	1.08	1.26	1.44	1.62	1.80
40	0.24	0.48	0.72	0.96	1.20	1.44	1.68	1.92	2.16	2.40
50	0.30	0.60	0.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00
60	0.36	0.72	1.08	1.44	1.80	2.16	2.52	2.88	3.24	3.60
70	0.42	0.84	1.26	1.68	2.10	2.52	2.94	3.36	3.78	4.20
80	0.48	0.96	1.44	1.92	2.40	2.88	3.36	3.84	4.32	4.80
90	0.54	1.08	1.62	2.16	2.70	3.24	3.78	4.32	4.86	5.40
100	0.60	1.20	1.80	2.40	3.00	3.60	4.20	4.80	5.40	6.00

Thermal Expansion (ΔL) in inches of FR-PVDF

Temp. Change T °F	Length of Run in Feet									
	10	20	30	40	50	60	70	80	90	100
10	0.10	0.19	0.29	0.38	0.48	0.58	0.67	0.77	0.86	0.96
20	0.19	0.38	0.58	0.77	0.96	1.15	1.34	1.54	1.73	1.92
30	0.29	0.58	0.86	1.15	1.44	1.73	2.02	2.30	2.59	2.88
40	0.38	0.77	1.15	1.54	1.92	2.30	2.69	3.07	3.46	3.84
50	0.48	0.96	1.44	1.92	2.40	2.88	3.36	3.84	4.32	4.80
60	0.58	1.15	1.73	2.30	2.88	3.46	4.03	4.61	5.18	5.76
70	0.67	1.34	2.02	2.69	3.36	4.03	4.70	5.38	6.05	6.72
80	0.77	1.54	2.30	3.07	3.84	4.61	5.38	6.14	6.91	7.68
90	0.86	1.73	2.59	3.46	4.32	5.18	6.05	6.91	7.78	8.64
100	0.96	1.92	2.88	3.84	4.80	5.76	6.72	7.68	8.64	9.60

Thermal Movement

There are various ways to accommodate expansion and contraction in acid waste systems.

They are:

- Expansion Offsets
- Expansion Loops
- Expansion Joints

Expansion Offset

Flame retardant polypropylene expands at a unit rate of .456 in. per 10°F (-12.2°C) change per 100 ft of pipe. This can be accommodated by using the flexibility of polypropylene pipe at changes in pipe direction. Install the system free of strain using loose fitting pipe clips allowing the pipe to float.

When total temperature change is less than 30°F (-1.1°C), special provisions for accommodating thermal expansion are not generally required, especially when the line includes several directional changes and thus provides considerable inherent flexibility. Caution should be exercised with threaded connections, as they are more vulnerable to failure by bending stresses. Where such conditions exist, it is advisable to use a flanged connection.

Expansion Loops

Normally, piping systems are designed with sufficient directional changes providing inherent flexibility to compensate for expansion and contraction. However, when this is not the case or when there is reasonable doubt as to adequate flexibility of the system, expansion loops or expansion joints should be designed into the system. If an expansion loop (fabricated with 90° elbows and straight pipe as depicted) is used, the length R should be determined by using the following formula to ensure it is of sufficient length to absorb expansion and contraction movement without damage.

$$R = K \sqrt{D \Delta L}$$

K = Material constant: 1.44 for PP, 1.85 for PVDF

R = Expansion loop leg length (ft.)

D = Nominal outside diameter of pipe (in.)

ΔL = Dimensional change due to thermal expansion or contraction (in.)

A = $\frac{1}{2}$ R

Example 3:

For 3" SCH 40 FRPP pipe, $\Delta T = 70^\circ\text{F}$, run = 100', $\Delta L = 3.19$

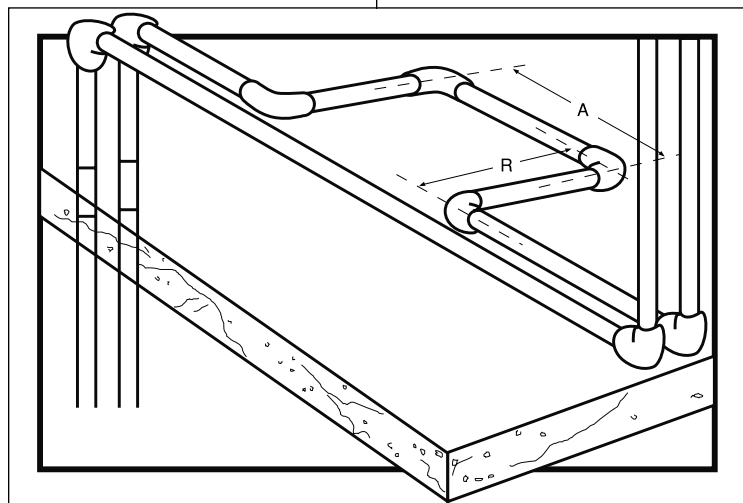
How long should the expansion loop legs be in order to compensate for the expansion?

$$R = 1.44 \sqrt{3.50 \times 3.19} = 1.44 \sqrt{11.17} = 4.81 \text{ ft.}$$

$$A = \frac{1}{2} R$$

$$A = 2.405 \text{ ft}$$

In situations where straight runs of pipe are long or the ends of a straight run are restricted from movement or where the system is restrained, flexibility must be inserted into a pipe system through the introduction of flexural offsets. An example of a method for inserting flexibility in these situations is graphically presented. In each case, rigid supports or restraints should not be placed within the leg length of an expansion loop, offset or bend.



Expansion Joints

Enfield Polypropylene pipe systems are installed in several different climates across North America. As a result, these systems must contend with expansion and contraction brought about by temperature change. To overcome this problem and avoid possible damage to the installation, Enfield Expansion Joints are specifically designed to eliminate the stresses and strains caused by thermal movement.

When an expansion joint is installed, care should be taken in the fixing of the pipe to ensure an accurate linear “thrust and pull” movement. Any pipe clamp should allow the pipe to slide freely. The housing of the expansion joint on the other hand should always be firmly anchored to allow the sliding member to accept any movement.

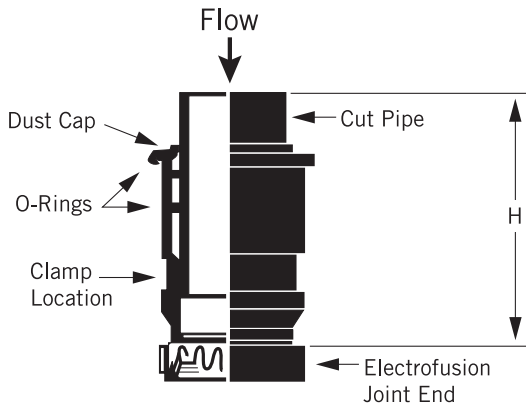
On stack installations, where expansion and contraction are a concern, an expansion joint should be installed at every floor level where the stack is connected. If there are no connections, an expansion joint should be installed at every second floor level.

In vertical applications, cut-off access must be designed to ensure hydrostatic test pressure does not exceed 4.33 psi. A common method to achieve this is to install a cleanout every 10 feet in the stack.

Correct “piston-in” and “piston-out” position at the time of installation is critical and can be calculated by the formula:

$$P = \frac{M - A}{T} \times L$$

- where: P = “out” position of inner tube in inches
 M = maximum temperature
 A = installation temperature
 T = total temperature change
 L = length of traverse in expansion joint in inches



Example 2:

Assume that a pipeline will be installed in an unheated, exposed building with a metal roof where temperatures range from 10°F in the winter, to 110°F in the summer. If installation temperature is 70°F, the pipe will contract over a 60° temperature range during cold weather and will expand over a 40° temperature range during the summer. Consequently, three-fifths of the line movement will be on the contraction side or “piston-in” position, while the remainder will be expansion. The expansion joint provides for various lengths of movement. As a result, the inner tube should be pulled out approximately half of the total movement expected when the joint is installed.

Highest temperature expected: 110°F

Lowest temperature expected: 40°F

Total Change (ΔT): 70°F

Length of run: 100 feet

A 70°F ΔT on the Thermal Expansion chart (previous page) corresponds to a 3.19" change in length (ΔL).

Installing Expansion Joints

1. The direction of fluid flow through the expansion joint shall be from the dust cap end to the electrofusion or mechanical joint end. For example, if the expansion joint is being installed on a vertical system, the dust cap will be on the top.
2. Ensure the pipe and expansion joint are clean and free of debris.
3. The pipe is marked to show the maximum limit of travel.
4. Withdraw the pipe per the table below for the given temperature during installation.
5. Reinstall the dust cap on the expansion joint.
6. Securely anchor the expansion joint with a metal clamp. The diameter and the maximum width of the clamp are shown in the table below. See the anchor placement noted on the drawing. The expansion joint only becomes functional when it is securely mounted.

Expansion Joint Size (in)	Clamp Dia. (in)	Max. Clamp Width (in)	Fully Inserted H (in)	Total Max. Allowable Travel (in)
3	4.29	1.30	13.50	2.00
4	5.28	1.30	13.50	2.00
6	7.40	1.30	18.25	2.00

Temperature	Distance to Withdraw (in)
Less than 32°F	1¾
32 - 85°F	1½
More than 85°F	1¼

SYSTEM SIZING

Manning Roughness Factor

Piping systems for drainage applications usually consist of minimal to half pipe capacity flow. These discharge systems are designed to be horizontal or slightly sloping. Friction loss for open channel flow can be determined by the Manning formula as follows:

$$V = \left(\frac{1.49}{n}\right) R^{2/3} S^{1/2}$$

where: V = the average velocity at a cross section (ft./sec.)
 R = the hydraulic radius (ft.)
 S = slope (ft./ft.)
 n = the coefficient of roughness

The Manning formula is used for liquids in a steady flow at constant depth. Values of the coefficient n, determined by many tests on actual pipes, are given in the following table.

Average Values of the Manning Roughness Factor	
Material	Manning n
PP / PVDF	.009
Glazed surface	.010
Concrete	.013
Cast iron	.015
Corrugated metal	.022

The high carrying capacity of plastic piping often results in the use of flatter grades or in the use of smaller diameter pipe.

THERMAL CONDUCTIVITY

Compared to traditional pipe materials, the thermal conductivity of thermoplastic is low and acts as an insulator. This insulating property of plastic provides a distinct advantage over traditional materials to retard or prevent “sweating” or formation of condensation. The need for insulation may, in certain instances, be completely eliminated by using plastic. Thermal conductivity is expressed as BTU/hr./sq.ft./°F/in. where BTU/hr. or British Thermal Unit per hour is defined as energy required to raise the temperature of one pound of water (12 gallons x specific gravity) one Fahrenheit degree in one hour. Square feet refers to one square foot where heat is being transferred. Inch refers to one inch of pipe wall thickness. As pipe wall thickness increases, thermal conductivity decreases.

The coefficients of thermal conductivity of some materials used in drainage piping are:

Material	BTU/hr./sq.ft./°F/in.
PP	1.2
PVDF	1.18 to 1.32
Glass	8
Cast Iron / Carbon Steel	360
Aluminum	1,000
Copper	2,700

Copper, a good conductor of heat, will lose 2,700 BTU per hour per square foot of surface area with a wall thickness of 1" while PP will lose only 1.2 BTU/hr.

PIPE SUPPORTS AND SUPPORT SPACING

General Principles of Design and Support

Thermoplastics have very different mechanical and physical properties compared to metals. Special attention should be given to ways of dealing with their inherent higher thermal expansion rates and lower pipe stiffness.

If the principles used for design and support of metal pipe systems are applied directly to thermoplastic pipes, severe problems may arise. Therefore, all warranties are contingent upon adopting the following support procedures and recommendations.

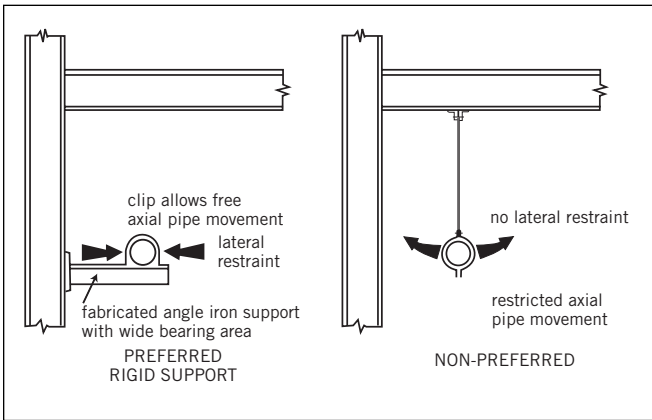
Supporting Pipes

The high coefficient of thermal expansion of plastic compared with metals may result in considerable expansion and contraction of the pipe runs as the temperature changes.

The principle is to control expansion by restraining the pipe in the lateral direction while allowing free axial movement.

A hanger-type support does not provide lateral restraint to the pipe, but it does encourage snaking and should be avoided whenever possible.

The diagram below illustrates preferred and non-preferred support arrangements.



In some cases, it may be physically impossible or impractical to install a rigid support in between two widely spaced columns. In this event hanger rods with loose fitting clips should be used.

The frequency of supports for plastic pipes is greater than for metal pipes. The recommended maximum distance between supports for pipes filled with water is given in the table (See Recommended Maximum Support Spacing) and applies to pipes and contents at the temperature stated.

Pipe supports should be installed so that the horizontal piping is in uniform alignment and with a uniform slope of at least 1/8" per foot, or in accordance with the local plumbing codes or authority having jurisdiction.

Calculation of Support Spacing

$$L = [(SL \times E \times I) / (1.302 \times Wt)]^{0.33}$$

or

$$L = [(16 \times I \times BSL) / (OD \times Wt)]^{0.5}$$

where:

L = Length between supports, 'Span Length', ft.
 SL = Sag Limit, the maximum permitted vertical deflection allowed across a span, expressed as a percentage of the span length

E = Modulus of elasticity of the pipe material, psi

OD = Outside Diameter of the pipe, in.

BSL = Bending Stress Limit on a span of pipe under a given load, psi

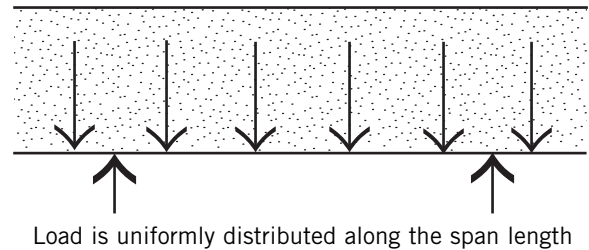
I = Moment of Inertia, in⁴
 = 0.04909 x (OD⁴ - ID⁴)

Wt = Unit Weight, lb/in.
 = $\frac{\pi}{4} \times [\delta\text{-pipe} \times (OD^2 - ID^2) + \delta\text{-fluid} \times ID^2]$

$\delta\text{-pipe}$ = Density of pipe material, lb/in³

$\delta\text{-fluid}$ = Density of the fluid, lb/in³

ID = Inside diameter of the pipe, in.



Modulus of Elasticity (E)

PP		PVDF	
Temperature (°F)	psi	Temperature (°F)	psi
73	200,000	-40°F (-40°C)	509,000
90	130,000	14°F (-10°C)	312,000
110	97,000	68°F (20°C)	245,000
140	74,000	122°F (50°C)	162,000
170	61,000	176°F (80°C)	86,000
200	55,000	212°F (100°C)	61,000
210	53,000		

Recommended Maximum Support Spacing for PP (ft.)

Pipe Size (in)	Horizontal Pipe (ft)				Vertical Pipe (ft)
	73°F	110°F	170°F	210°F	
1½	3.5	3.0	2.5	2.5	10
2	4.0	3.0	2.5	2.5	10
3	5.0	4.0	3.5	3.5	10
4	6.0	4.5	4.0	4.0	10
6	7.5	5.5	5.0	4.5	10
8	8.5	6.5	5.5	5.5	10
10	9.5	7.5	6.5	6.0	10
12	10.5	8.0	7.0	6.5	10

Recommended Maximum Support Spacing for PVDF (ft.)

Pipe Size (in)	Horizontal Pipe (ft)				Vertical Pipe (ft)
	73°F	110°F	170°F	210°F	
1½	3.5	3.0	2.5	2.5	10
2	4.0	3.0	2.5	2.5	10
3	5.0	4.0	3.5	3.5	10
4	6.0	4.5	4.0	4.0	10

Note 1: Support spacing based on sag limit of 0.2%

Note 2: Bearing surface of support should be at least 2" wide

Support Spacing Correction Factors

When the fluid has a specific gravity greater than water (1.0) the hanging distance of PP must be decreased by dividing the recommended support distance by the fluid's specific gravity.

For PVDF, use the correction factors in the table below.

Support Spacing Correction Factors - PVDF

Specific Gravity	Correction Factor
1.0	1.00
1.1	0.98
1.2	0.96
1.4	0.93
1.6	0.90
2.0	0.85
2.5	0.80

PIPE CLIPS AND HANGERS

Pipe Clips

All pipe clips should permit free axial pipe movement at all temperatures and should provide adequate bearing support to the pipe.

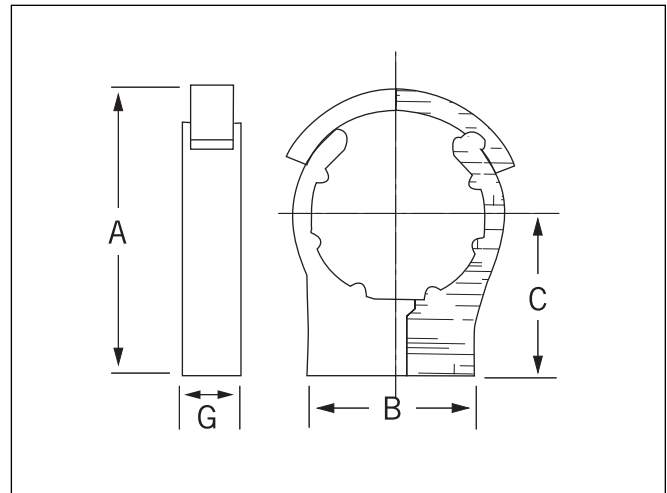
Metal clips and supports should be free of sharp edges to prevent damaging the pipe.

Cobra Pipe Clips

Good installation of plastic piping is largely dependent on the types of support and pipe clips selected. Clips should not grip the pipe tightly; but allow free axial pipe movement as the pipe expands and contracts. Correctly placed anchors, expansion loops and free pipe lengths at changes in direction, can then control expansion, thereby avoiding unsightly pipe snaking.

The Cobra clip allows this free pipe movement by minimizing friction between pipe and clip.

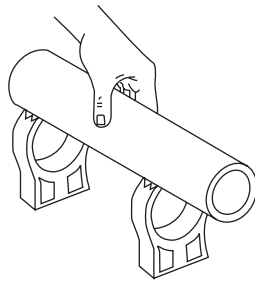
Also, the Cobra clip has an efficient single point fixing, with a snap-in design that allows for rapid installation. Several Cobra clips can be fixed in place and full lengths of pipe snapped easily into position.



DESIGN
CONSIDERATIONS

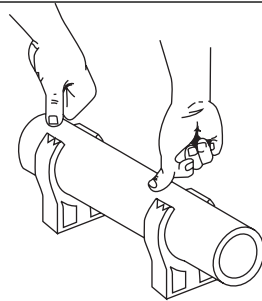
Locate

Insert pipe into the open Cobra clip until it seats on the open jaws.



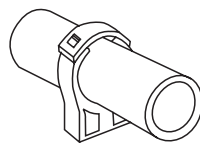
Snap In

Apply slight pressure to snap in pipe and force jaws to close and lock.



Retain

Fit retaining strap on clip sizes 1" and above.



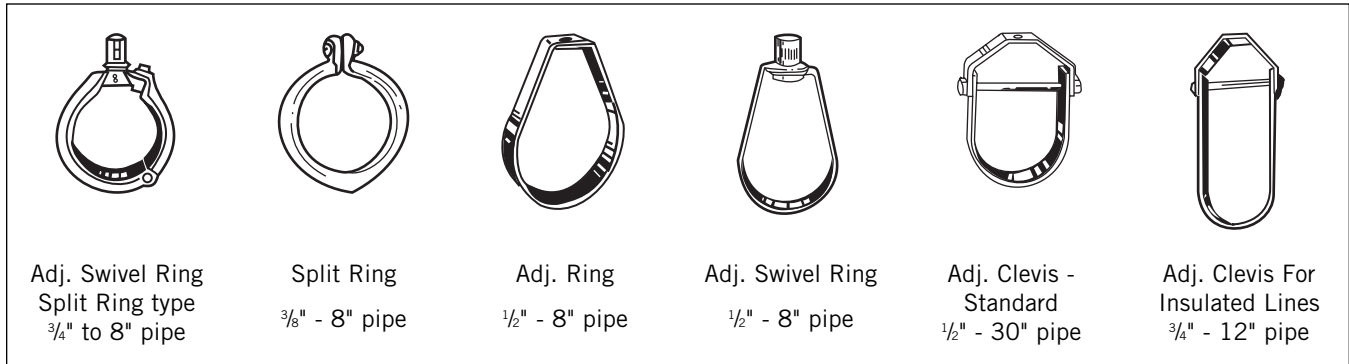
Size (in)	A	B	C	G	Screw / Bolt Size	Wgt (oz)
3/8	-	1.38	0.98	0.63	#8 / 5/32 / M4	0.25
1/2	-	1.38	1.18	0.63	#10 / 1/4 / M5	0.28
3/4	-	1.38	1.38	0.69	#10 / 1/4 / M5	0.39
1*	-	1.57	1.57	0.69	#10 / 1/4 / M5	0.49
1 1/4*	-	1.77	1.77	0.79	#10 / 1/4 / M5	0.74
1 1/2*	3.35	1.97	1.97	0.83	#10 / 1/4 / M6	1.06
2*	4.02	2.36	2.36	0.83	#10 / 1/4 / M6	1.48
2 1/2*	4.80	2.76	2.76	1.22	5/16 / M8	3.31
3*	5.83	3.15	3.54	1.22	5/16 / M8	4.27
4*	6.18	3.54	3.77	1.37	5/16 / M8	5.23

1. Clips of size 1" and above are fitted with retaining strap.
2. Use machine, tapping or wood screws with flat or oval head. Use bolts to suit clip recess.

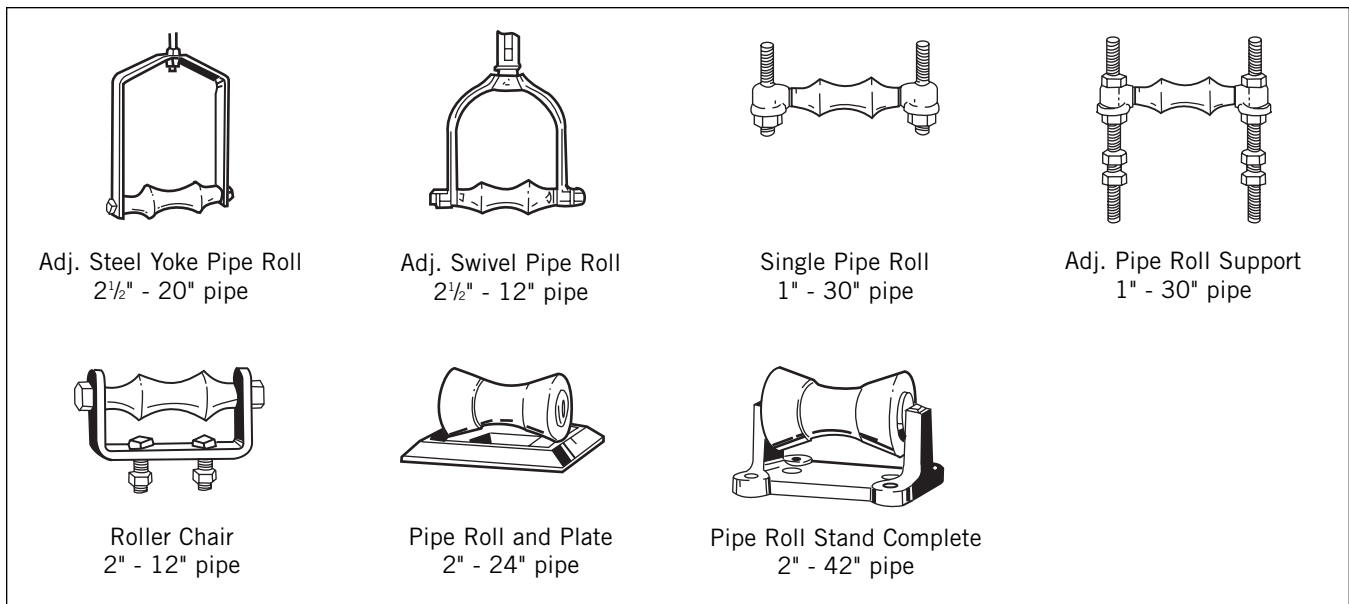
Recommended Pipe Hangers

Clamps used as anchors (such as U-bolts, etc.), if over-tightened, can produce a point-of-load stress on the pipe. This can result in cracking or premature burst failure. If U-bolts must be used, then a metal shield should be placed between the U-bolt and pipe surface. When anchoring plastic pipe, it is always desirable to spread the load over a wide area of contact.

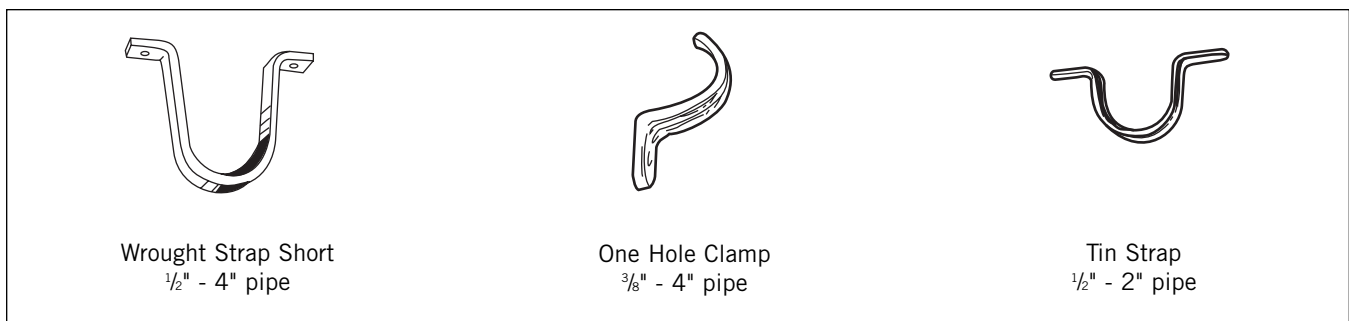
Pipe Rings



Pipe Rolls



Pipe Straps and Hooks

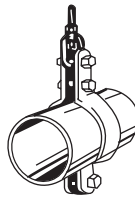


DESIGN CONSIDERATIONS

Pipe Clamps

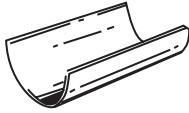


Pipe Clamp Medium
 $\frac{1}{2}$ " - 24" pipe



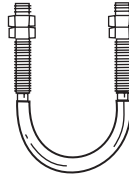
Double Bolt Pipe Clamp
 $\frac{3}{4}$ " - 36" pipe

Pipe Covering



Insulation Protection Shield
 $\frac{1}{2}$ " - 24" pipe

Bolt



U Bolt*
Standard: $\frac{1}{2}$ " - 30" pipe
Light Weight: $\frac{1}{2}$ " - 10" pipe

*Also available
plastic coated.

HANDLING AND STORAGE

Thermoplastics are strong, lightweight materials, about one fifth the weight of steel or cast iron. Piping made of this material is easily handled and, as a result, there is a tendency for it to be thrown about on the jobsite. Care should be taken in handling and storage to prevent damage to the pipe. Some general guidelines are as follows:

- Make sure the pipe is adequately supported at all times. Avoid stacking pipe in large piles, since the pipe at the bottom may incur high loads.
- For long-term storage, use pipe racks to support the pipe continuously along its length. If this is not possible, supports of at least 3 in. bearing width, at spacings not greater than 3 ft centers, are recommended. Pipe should not be stored more than seven layers high. Sharp corners on metal racks should be avoided.
- Pipe is often supplied in crates. Take care when unloading crates, and avoid using metal slings or wire ropes. Crates may be stacked four high in the field.
- Exercise care while handling pipe. Damage may occur if pipe collides with sharp corners, or is dropped. Prolonged exposure of Enfield and Labline FRPP and NFRPP to the direct rays of the sun will not damage the pipe. However, some mild discoloration may take place in the form of a milky film on the exposed surfaces. This change in color merely indicates that there has been a harmless chemical transformation at the surface of the pipe. A small reduction in impact strength could occur at the discolored surfaces; but it is of a very small order and not enough to cause problems in field installation.

Prolonged Outdoor Exposure

Prolonged exposure of Enfield and Labline FRPP and NFRPP to the direct rays of the sun will not damage the pipe. However, some mild discoloration may take place in the form of a milky film on the exposed surfaces. This change in color merely indicates that there has been a harmless chemical transformation at the surface of the pipe. A small reduction in impact strength could occur at the discolored surfaces; but it is of a very small order and not enough to cause problems in field installation.

Unlike many other thermoplastic materials, FR-PVDF is not susceptible to degradation due to UV exposure. Therefore, prolonged exposure of FR-PVDF pipe to the direct rays of the sun will not damage the pipe. For purposes of cleanliness however, it is good practice to keep pipe and fittings under a protective cover when stored outdoors.

Painting

PP pipe and fittings can be easily protected from ultraviolet oxidation by painting with a heavily pigmented, exterior water-based latex paint. The color of the paint is not important; the pigment merely acts as an ultraviolet screen and prevents sunlight discoloration. White or some other light color is recommended since it helps reduce pipe temperature. The latex paint must be thickly applied as an opaque coating on pipe and fittings that have been cleaned well, very lightly sanded, and primed with a latex base primer.

BELOW GROUND INSTALLATION

Trenching

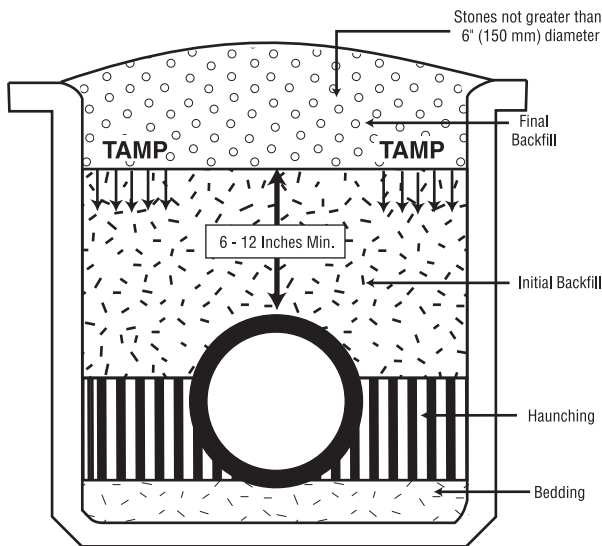
The trench bottom should be continuous, relatively smooth, and free of rocks. Where ledge rock, hardpan or boulders are encountered, the trench bottom should be padded using a minimum of 4" of tamped earth or sand beneath the pipe.

Trenches under slabs should allow for a 12" depth of cover over the pipe. In open locations, the trench depth should allow for the top of the pipe to be at least 12" below the maximum expected depth of frost penetration.

Pipe installed beneath surfaces which could be subjected to extremely heavy static weight or constant traffic should be shielded within a metal or concrete casing.

Backfilling

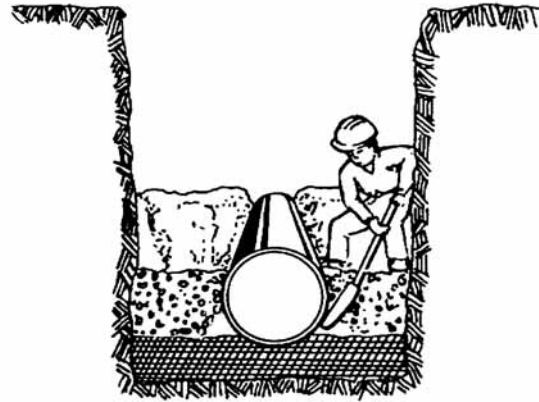
Fill piping with water of an ambient soil temperature and check joints. Cover to a depth of 6" to 8" with dirt which is free from rocks, debris or particles larger than 1/2". At this point in the proceedings, all joints should remain exposed for inspection. Leave piping to settle and normalize dimensionally, then check all joints for tightness and tamp soil layer which will act as a cushion for subsequent backfill. While tamping, see that pipe alignment, both vertical and horizontal, is not disturbed.



Compacting the Backfill

Compact the haunching, initial backfill and final backfill using manual equipment in accordance with the job drawings. Observe the following precautions.

- 1 When a "self-compacting" material is used, such as crushed stone, ensure that the material does not arch or bridge beneath the haunch of the pipe. Remove such voids with the tip of a spade.



- 2 When compacting the material underneath and at either side of the pipe do not allow the tool or the machine to strike the pipe.
- 3 When compaction in excess of 85% standard proctor density is required in the haunching area ensure that the compacting effort does not dislodge the pipe from the correct grade. If the compacting effort dislodges the pipe, re-lay the pipe to the correct grade.
- 4 It is not necessary to compact the initial backfill directly over the top of the pipe for the sake of the pipe's structural strength. However, it may be necessary for the sake of building/roadway integrity.

When laying long runs of piping in elevated air temperatures, it is advisable to begin working from a fixed point — such as the entry or exit from a building, and work away from that point, testing and backfilling in accordance with preceding paragraphs. This procedure should then allow the piping to assume soil temperature progressively as work proceeds.

Final Backfill

Thoroughly test the system for leaks. When satisfied, cover all joints with soil and finally proceed with the remainder of backfill. Large sharp rocks which could penetrate the initial layer and damage the pipe should be removed prior to the final backfill.

SECTION FOUR: INSTALLATION

Introduction

Proper installation is key to producing a stable and robust system. If installation is not done correctly, the system will not perform well and may actually fail.

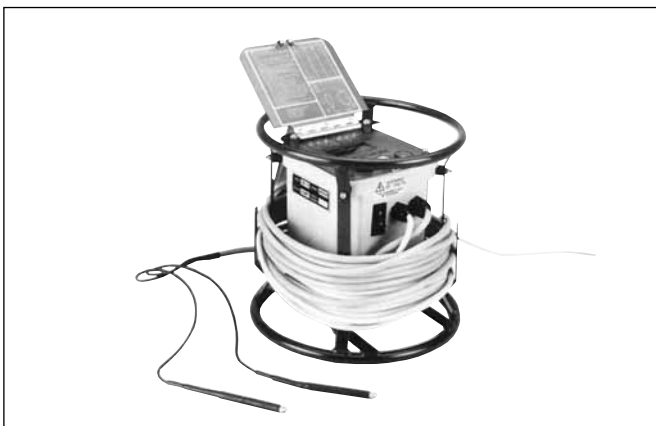
Standard Enfield Electrofusion

To ensure professional installation, make sure all installers have undergone training by IPEX in the correct handling, joining and installation methods of IPEX thermoplastic products.

Enfield fittings are manufactured with an integral resistance wire, molded in place using a proprietary manufacturing process. The wire is electrically heated by means of a microprocessor controlled Enfusion Control Unit. This results in fusion and bonding of the pipe to the fitting. Jointing is achieved within minutes.



The Enfield joint achieves the optimum level of performance where it matters most — at the fitting socket / pipe spigot interface. There is a controlled fit, controlled temperature and controlled time. All of this is achieved by means of the Enfusion Control Unit, which ensures proper electrical connections, joint timing and input/output current levels. The combination of these features provides both simplicity of jointing and perfect control. The result is an unparalleled level of joint repeatability.



Job Site Precautions

- 1 Do not test the system using compressed air or gases. Only use a hydrostatic test on the system. **Testing with air is dangerous.**
- 2 Store pipe and fittings out of direct sunlight. If material is stored outside, it should be covered with a black tarp. If the ambient temperature exceeds 100°F (37.8°C), make provisions to allow air to circulate beneath the tarp.
- 3 Handle the Enfusion machine carefully. **Do not tamper!** Call your IPEX representative for machine service.
- 4 **Do not mix brands.** Good joints can only be made using Enfield pipe, fittings and clamps. Mixing brands voids all warranties.

Installation

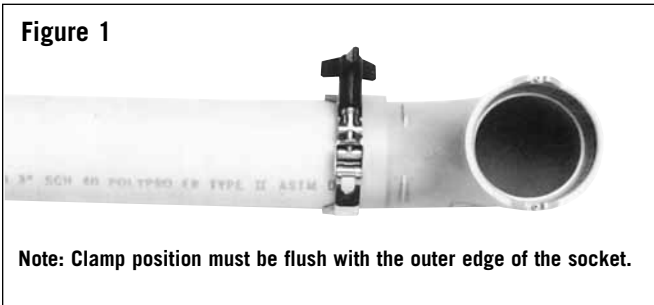
For installation in cold weather, refer to the 'Cold Weather Fusion' procedure described later in this section.

Before making the Enfield joint, it is important to check with an RMS meter, that the power source is providing between 104 and 126 volts @ 45 to 65 cycles with 16-amp capacity. The Enfusion machine provides for normal power variations, however generators should be checked to assure the correct output is being provided.

- 1 Using a tube cutter with a wheel designed for plastic (saw and miter box can also be used as an alternative), cut the pipe square making sure to remove all burrs and loose material. **Do not chamfer.**
- 2 Using 60-grit emery cloth, prepare the end of the pipe by removing dirt and oil (important to obtain a good bonding) and roughing up an area equal to 1.5 times the fitting's socket depth. Clean the roughed up area with ethyl or isopropyl alcohol to ensure complete removal of grease and residue. **Once treated do not handle this area of the pipe or allow it to get dirty.**
- 3 Completely unwind all cables from the Enfusion machine's frame before use.
- 4 Insert the pipe all the way to the stop at the bottom of the socket.
- 5 Decide whether single or multiple joints are being made. In case of multiple joints consult the "Multiple Joints Fusion" table that follows for cable connections and maximum allowable number of simultaneous joints.

- Loosely fit IPEX-supplied clamp(s) only over the hub(s) of the socket(s) to be fused. See page 57 for new joint hub clamp.

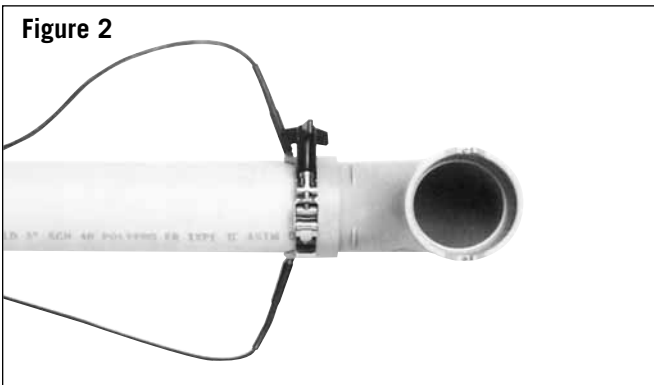
Figure 1



Note: Clamp position must be flush with the outer edge of the socket.

- Tighten the clamp(s). A tight clamp is essential to the quality of the joint. It should not be possible to rotate the pipe inside the fitting.
- Turn the Enfusion machine on and observe the copyright message being displayed as the machine runs a self-diagnostic test.
- Following the “CONNECT OUTPUT LEAD” instruction on the display, connect the output leads (Figure 2). If required, connect link cable for multiple fusions.

Figure 2



- Following the “SELECT PIPE SIZE” instructions on the display, select the size of the joint being fused by using the “SELECT” button (Figure 3).

Figure 3



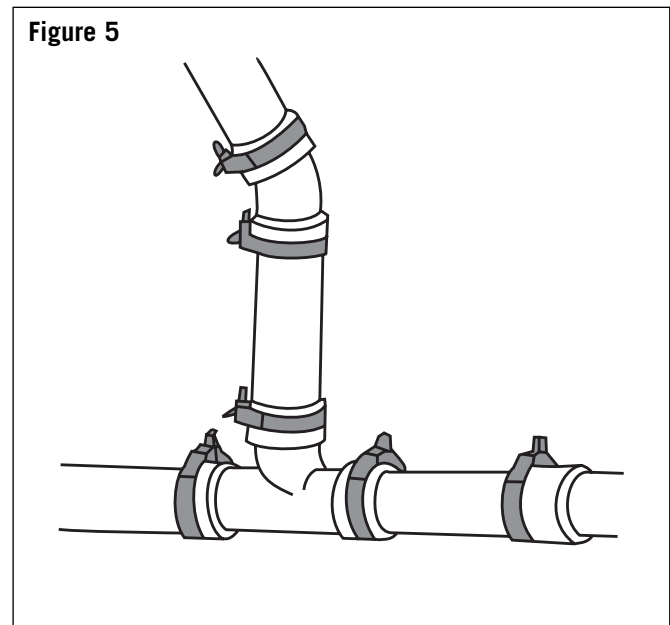
This will automatically set the fusion time (Figure 4).

Figure 4



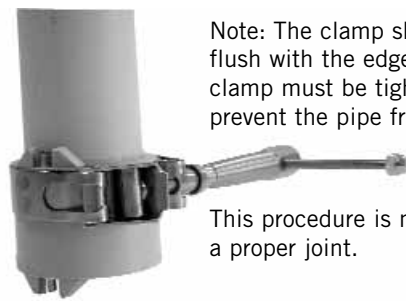
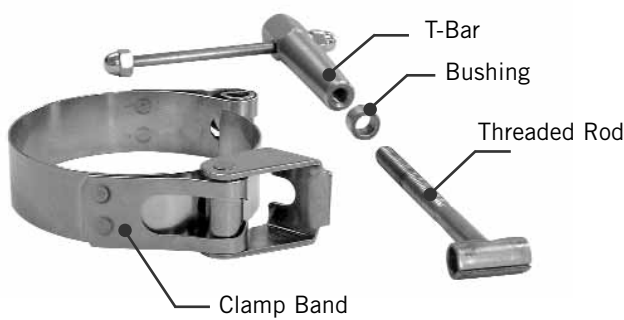
- Once the correct size is displayed, press the START button. Temperature and welding time will be displayed. Time will count down to zero.
- Upon completion of the fusion cycle an audible alarm will sound and the message ‘DISCONNECT INPUT LEAD’ will be displayed.
- A 30 second rest period must be observed to allow the joint(s) to cool before disconnecting the leads. The Enfusion machine will automatically reset, ready for the next operation.
- Allow five additional minutes before removing the clamps so that the joint can sufficiently cool and properly cure (Figure 5).

Figure 5



SS T-Bar Handle Joint Hub Clamp for use during fusion of Enfield® electrofusion joints

- Redesigned T-bar handle for greater ease of use. (more efficient transfer of torque)
- Reduces the torque required to tighten the fitting on the pipe.
- Oil impregnated bushing reduces friction and resulting worker fatigue from repetitive tightening.
- Easy replacement of friction reducing bushings.
- Part of the IPEX Enfield® corrosive waste system of pipe, fittings and accessories.
- Replacement oil impregnated bushings available.
- Enfield® components should only be joined using Enfield® Electrofusion Control Units.
- IPEX components are dimensionally matched; do not install system of mixed brands without our express written consent.



Note: The clamp should be positioned flush with the edge of the fitting. The clamp must be tightened sufficiently to prevent the pipe from rotating inside the fitting.

This procedure is necessary to complete a proper joint.

INSTALLATION

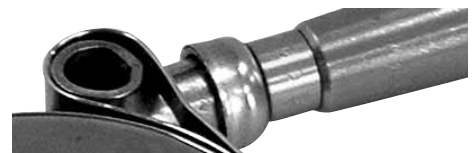
Enfield® Electrofusion Joint Hub Clamp with New SS T-Bar Handle

Size (in)	Product Codes	Significant No.
1½	257254	L26101
2	257256	L26102
3	257257	L26103
4	257258	L26104
6	257259	L26106
8	257260	L26108
10	257255	L261010
12	257262	L261012



Replacement Oil Impregnated Brass Bushings

Clamp Size (in)	Product Code	Significant No.
1½ - 12	257094	L2610B



Stainless Steel T-Bar Handle for Hub Clamp*

Clamp Size (in)	Product Code	Significant No.
1½ - 12	257125	L2610T

* To retrofit previously available black plastic wheel handles supplied on Enfield® Hub Clamps

Installation Troubleshooting

Problem	Action	Display
Stop the welding process.	Press the "STOP" button. Use the "SELECT" button to reset.	INTERRUPTED WELD - SELECT RESETS.
Fault with the output current.	Press the "SELECT" button to reset.	OUTPUT FAULT - SELECT RESETS.
Lead disconnected during cycle.	Reconnect cable and press "START" button. Joint will be welded for the remaining time. If the joint has been in a fault condition for more than two minutes, the complete cycle will be run again.	CONNECTION FAULT - RECONNECT LEAD.

MULTIPLE JOINT FUSION

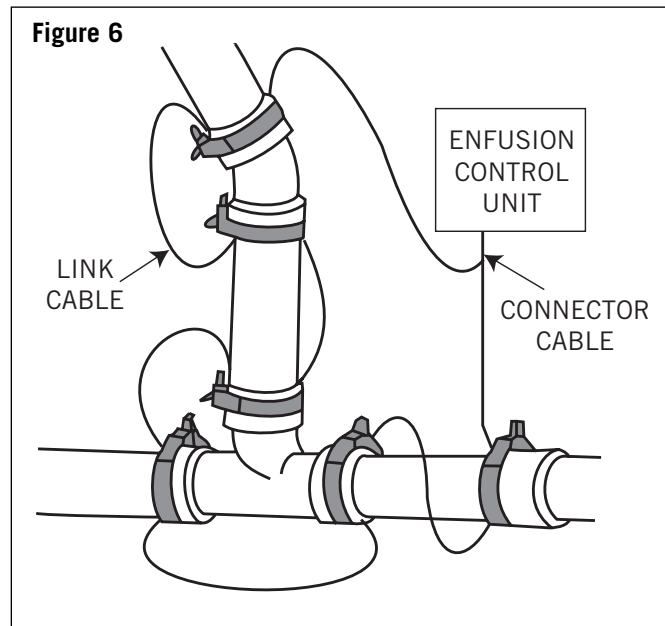
The chart indicates the number of joints that can be fused at one time. Remember, multiple fusions can only be done with the same size fittings. **Do not attempt multiple fusions of different size fittings.**

Maximum Allowable Joints Per Size

Pipe Size (inches)	1½	2	3	4	6	8	10	12
Max # of joints	10	8	4	3	2	1	1	1

Attach the connector leads and link cable leads to fitting terminals as shown in Figure 6. **The link cables should be connected in series.** Follow the fusion procedure, as outlined in steps 1-14, to complete the multiple fusion.

Note: Each joint being fused must have an IPEX clamp flush with the other edge of the socket.



COLD WEATHER FUSION

Whenever possible pipe and fittings should be stored indoors. It is always preferable to perform pipe preparation and welding in a protected environment. However, should that not be possible, during cold weather (particularly at freezing or below) it is recommended that both pipe and fittings be stored in similar ambient temperature and conditions.

In addition, when the actual welding takes place in freezing or sub-freezing environments, this cold weather pre-fusion procedure must be followed.

- 1 Follow steps 1 through 9 of Standard Enfield Electrofusion Installation.
- 2 When the "SELECT PIPE SIZE" prompt appears on the screen keep pushing the select button until all pipe sizes have been displayed.
- 3 Next will appear the first flash cycle: 1½" to 2".
- 4 If the fitting(s) being welded is within this flash range, press START.
- 5 If the fitting(s) being welded is not included in this flash range, press the SELECT button one more time to display the second flash cycle: 3" through 12".
- 6 Press START.
- 7 Upon completion of the flash cycle, the display will show the "DISCONNECT INPUT LEAD" message. Do not disconnect the leads.
- 8 Tighten clamps if necessary (see notes below).
- 9 Allow the joints to cool for 5 minutes before beginning the fusion cycle.
- 10 After 5 minutes, continue with steps 10 through 14 of the Standard Enfield Electrofusion Installation procedure.

NOTES


Screen the joints being fused from the wind in very cold conditions to prevent heat loss.

Particular care must be taken to adequately tighten the clamps during extremely cold weather because of increased stiffness of the materials. One or two additional turns of the tightening screw might be required, above and beyond what is commonly sufficient in fair weather conditions. This is particularly true when welding large diameters.


The additional tightening of the clamps, designed to eliminate any gap between the pipe and the fitting, should be performed towards the end of the flash cycle. However, care must be taken not to overtighten to avoid distorting or crushing the fitting joint.

Marking of the pipe (indicating socket depth) is also recommended to assure that the pipe remains fully seated in the socket during the fusion cycle.

ENFIELD TESTING



WARNING



Use of compressed air or gas in PP or PVDF pipe and fittings can result in explosive failures and cause severe injury or death.

- NEVER use compressed air or gas in Enfield, Labline, or Plenumline pipes, fittings, or accessories.
- NEVER test Enfield, Labline, or Plenumline systems with compressed air or gas, or air-over-water boosters.
- ONLY use Enfield, Labline, or Plenumline systems for approved chemicals.

The purpose of a site pressure test is to establish that all joints have been correctly made.

Hydro test in accordance with local plumbing code or with authority having jurisdiction or with a maximum of 10 ft of head pressure. After making the first 20 or 30 joints, it is recommended that a test be applied to ensure that the joint-making technique is satisfactory. If a leak is discovered, follow the appropriate procedure below.

Hydrostatic testing of the joints can be performed 10 minutes after the final joint has been completed. The low pressure testing procedure detailed below should be strictly followed.

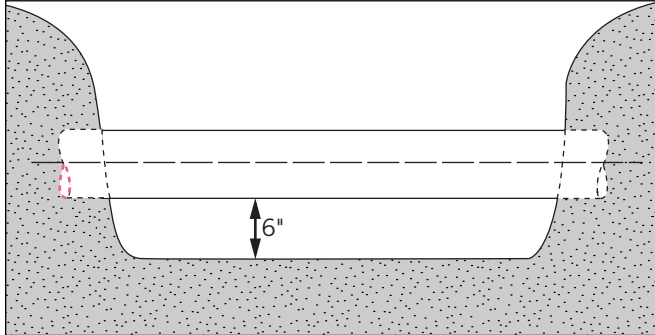
1. Fully inspect the installed piping for evidence of mechanical abuse and suspect joints.
2. Split the system into convenient test sections, not exceeding 1,000 feet. The piping should be capped off with an expandable plug at the end of the pipe section to be tested.
3. Prior to starting the test in below grade applications, straight lengths of pipe should be backfilled between fittings that are tested.
4. Slowly fill the pipe section with water, taking care to evaluate all trapped air in the process. Use air release valves in any high spots in the system. Do not pressurize at this stage.
5. Leave the pipe for at least one hour to allow an equilibrium temperature to be achieved.
6. Visually check the system for leaks.
7. Pressurize the system to a suggested maximum of 10 feet of head by means of a standard 10' standing water test using a 10' vertical riser, or a low-pressure hand pump.
8. Leave the line at 10 feet of head for a period of 2 hours, during which time the water level should not change (standing water test), nor should the pressure gauge reading change (hand pump test).
9. If there is a significant drop in pressure, or extended times are required to achieve the desired pressure, either joint leakage has occurred or air is still entrapped in the line. In this event inspect for joint leaks. If none are found, check for entrapped air – these air pockets must be removed prior to continuing the test.
10. If joints are found to be leaking, the system must be fully drained and the joints repaired. Dry, or marginal Enfield joints can be simply re-fused by following steps 5 through 14 in the Standard Enfield Electrofusion Installation procedure.
 - To remove moisture from the joint, use the flash cycle for the appropriate fitting size.
 - Wait 5 minutes to allow the joint to cool.
 - Now re-fuse using the correct Enfusion machine settings for the size of pipe being joined following steps 5-14 of the Standard Enfield Electrofusion Installation procedure.
 - Should any of the re-welded fitting(s) fail the second hydro-test, the leaking joint(s) can be back-welded with a hot-air gun and welding rod. Should the back-welded joint(s) fail a third hydro-test, they will need to be cut out of the system and substituted with new fittings.
 - If a joint has to be cut out and replaced, the procedure for pipe modification detailed in this manual should be strictly followed.
11. Repeat the 10 feet head test after repairing any leaking joints, following the procedure described above.

ENFIELD PIPE REPAIR

In the unlikely event of a leak, Enfield piping systems can be easily repaired.

Procedure:

1. Determine exact location of leak. For below grade installation excavate the ground near the pipe leak, taking care not to cause damage to the piping system in the process. Hand digging is suggested. The ground should be excavated to a depth of at least 6" below the bottom of the pipe.

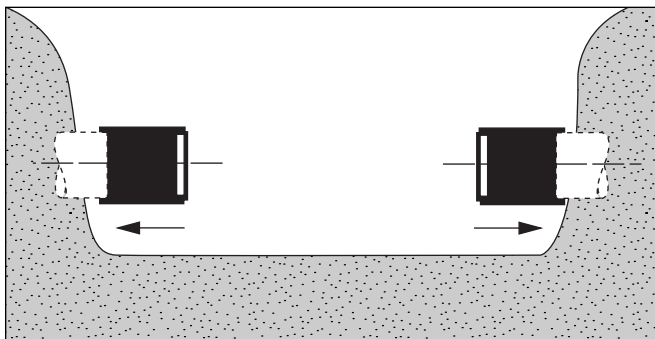


2. Measure the length of pipe to be removed then cut completely and SQUARELY through the pipe sections. Remove the damaged section of pipe.

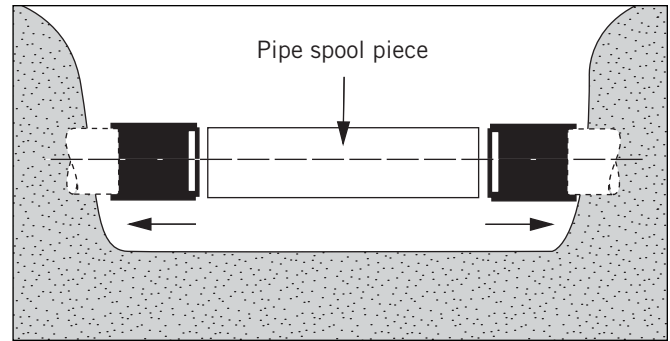
PipeSize (in)	Pencil Mark (in)
1½	¾
2	1
3	1⅜
4	1½
6	2
8	2¼

3. Mark a pencil line on the end of both open ends of the pipe to locate the joining position for the repair couplings. The pencil line should be at the following distance from the pipe ends.

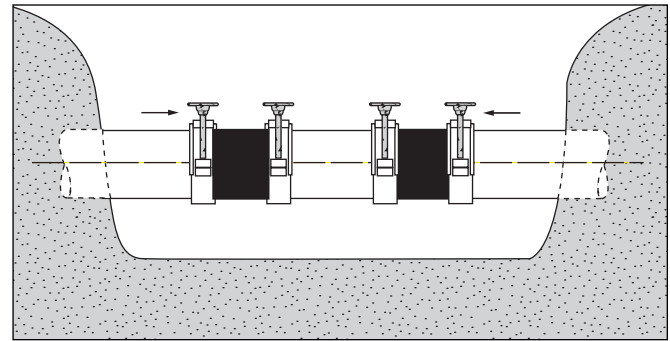
4. Slide one repair coupling over the exposed spigots of the two pipe sections.



5. Measure, prepare and insert a pipe spool piece into the line to be repaired.

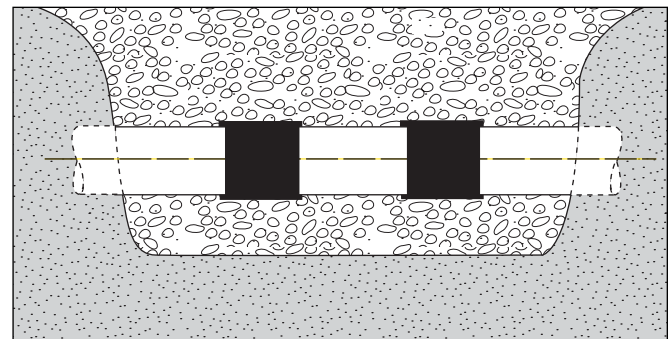


6. Slide the repair couplings into position between the pencil lines previously drawn on the pipe ends. Place the clamps over the repair couplings. Tighten the clamps and fuse the joints using the correct Enfusion machine settings.



7. Remove the hub clamps after allowing the joint to cool for 10 minutes.

8. If buried below ground, surround the pipe with pea gravel, then backfill and consolidate.



INSTALLATION

LABLINE AND PLENUMLINE JOINTS

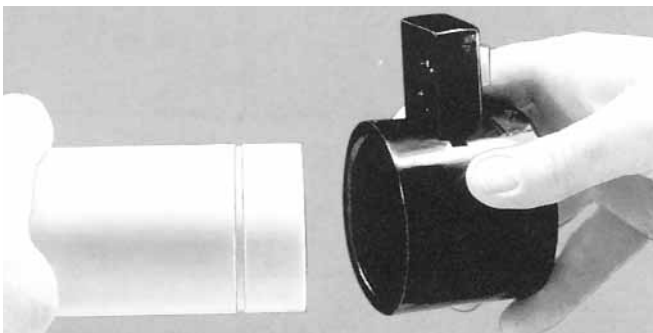
To ensure professional installation, make sure all installers have undergone training by IPEX in the correct handling, joining and installation methods of IPEX thermoplastic products.

Points to Remember

- a. **YELLOW AND BLUE ELASTOLIVES DO NOT REQUIRE PRE-HEATING.**
If heated, maximum temperature should not exceed 175°F. (79°C)
- b. **YELLOW LABLINE AND BLUE PLENUMLINE ELASTOLIVES ARE NOT INTERCHANGEABLE**
- c. The pipe end should be clean and there should be no deep longitudinal grooves in it.
- d. It is desirable to use a chain vise to hold 3" and 4" pipe firmly during cutting and grooving operations. When grooving 3" and 4" pipe, a strap wrench should be used to hold the pipe, to prevent its rotation, while the groove is being cut.
- e. After grooving, the pipe should be kept clean so that foreign material is not introduced into the groove.
- f. The cutting blade should always be fully retracted whenever the tool is put on or taken off the pipe. If any resistance is felt when putting the tool onto the pipe or taking it off, the blade position should be checked.
- g. Each nut must be fully tightened as the installation progresses. Do not assemble the system loosely and tighten nuts last, as layout length errors will go undiscovered until such time as the nuts are finally tightened. Avoid misalignment.
- h. Ensure the grooving tool has a sharp blade to make a clean-shouldered groove.

Procedure

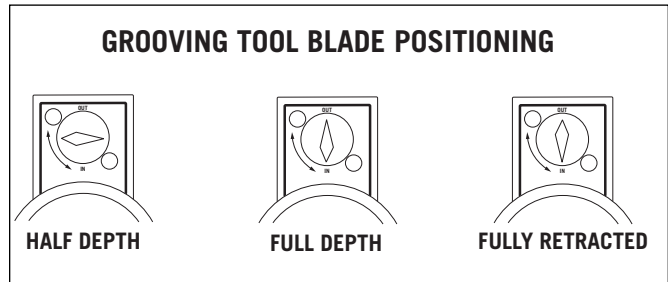
- 1 Ensure each fitting is supplied with the correct number of elastolive® (sealing rings) and nuts.



- 2 Verify the grooving tool is sharp.

Cut the pipe to the desired length using a tubing cutter fitted with a wheel designed for plastic pipe. A handsaw and miter box may also be used. **Ensure pipe ends are square and trimmed free of burrs.**

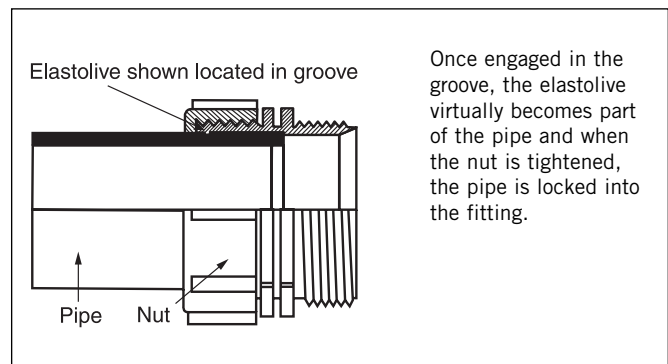
- 3 Examine the grooving tool to ensure that the cutting blade is fully retracted. Insert the pipe into the grooving tool.



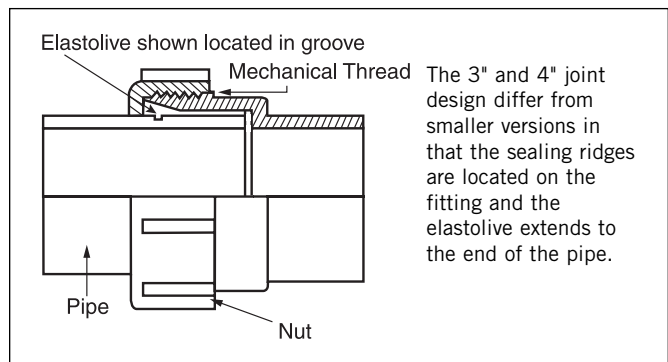
- 4 Set the grooving blade at the half-depth position and rotate the tool in a counter-clockwise direction. After one complete turn, set the blade at the full-depth position and again rotate the tool one full turn counter-clockwise. Fully retract the blade and remove the tool from the pipe. A shallow groove has now been formed around the pipe. Any material left as a feather edge in the groove should be removed. Care should be taken not to damage the square edge (shoulder) of the groove, particularly at the edge near the spigot end of the pipe as this is the primary sealing surface.

Feathered or rounded edges may indicate a worn tool and possible leakage. Make sure the groove shoulders are sharp.

1½" and 2" Joint Details

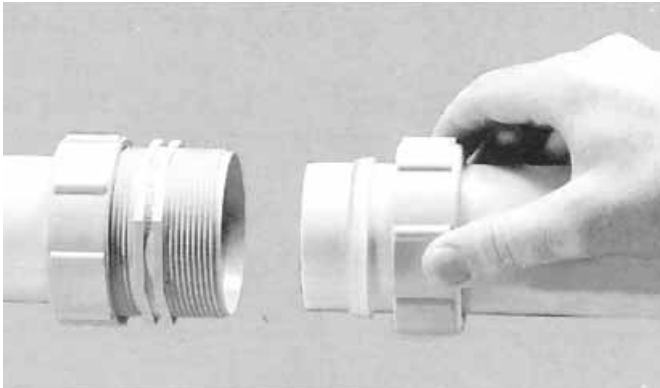


3" and 4" Joint Details



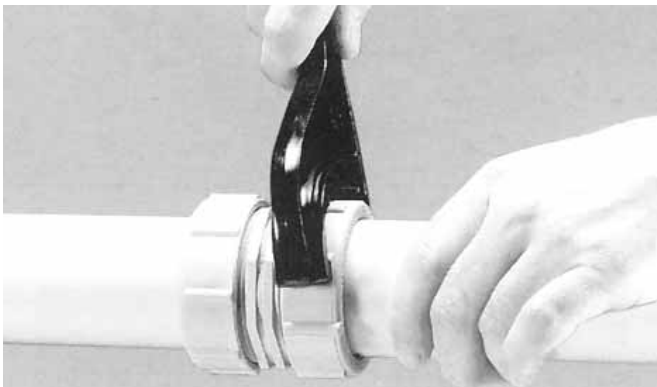
- 5 Place the nut onto the pipe with the threaded side to the spigot end of the pipe. Take the elastolive, stretch it and pull it over the pipe with the thick edge first and the taper pointing to the spigot end of the pipe. Slide it down the pipe and onto the groove. Once on the groove “work it” a bit to make sure that the rib on the underside of the elastolive engages the full circumference of the groove.

*If you are working on a job that has the old translucent non-elastic olives, consult your “heat olive” Technical Bulletin or call IPEX Customer Services for technical information.




- 6 Apply a non-hydrocarbon base lubricant to both the thread and the elastolive, then push the pipe squarely into the fitting. The lubrication permits easy take up of the nuts and allows the pipe with the elastolive to glide smoothly into position against the fitting sealing area. Hand-tighten the nut, then tighten, $\frac{1}{4}$ to $\frac{1}{2}$ turn using a spanner wrench.


The joint is now ready for testing.



LABLINE AND PLENUMLINE TESTING



WARNING



Use of compressed air or gas in PP or PVDF pipe and fittings can result in explosive failures and cause severe injury or death.

- NEVER use compressed air or gas in Enfield, Labline, or Plenumline pipes, fittings, or accessories.
- NEVER test Enfield, Labline, or Plenumline systems with compressed air or gas, or air-over-water boosters.
- ONLY use Enfield, Labline, or Plenumline systems for approved chemicals.

The purpose of a site pressure test is to establish that all joints have been correctly made.

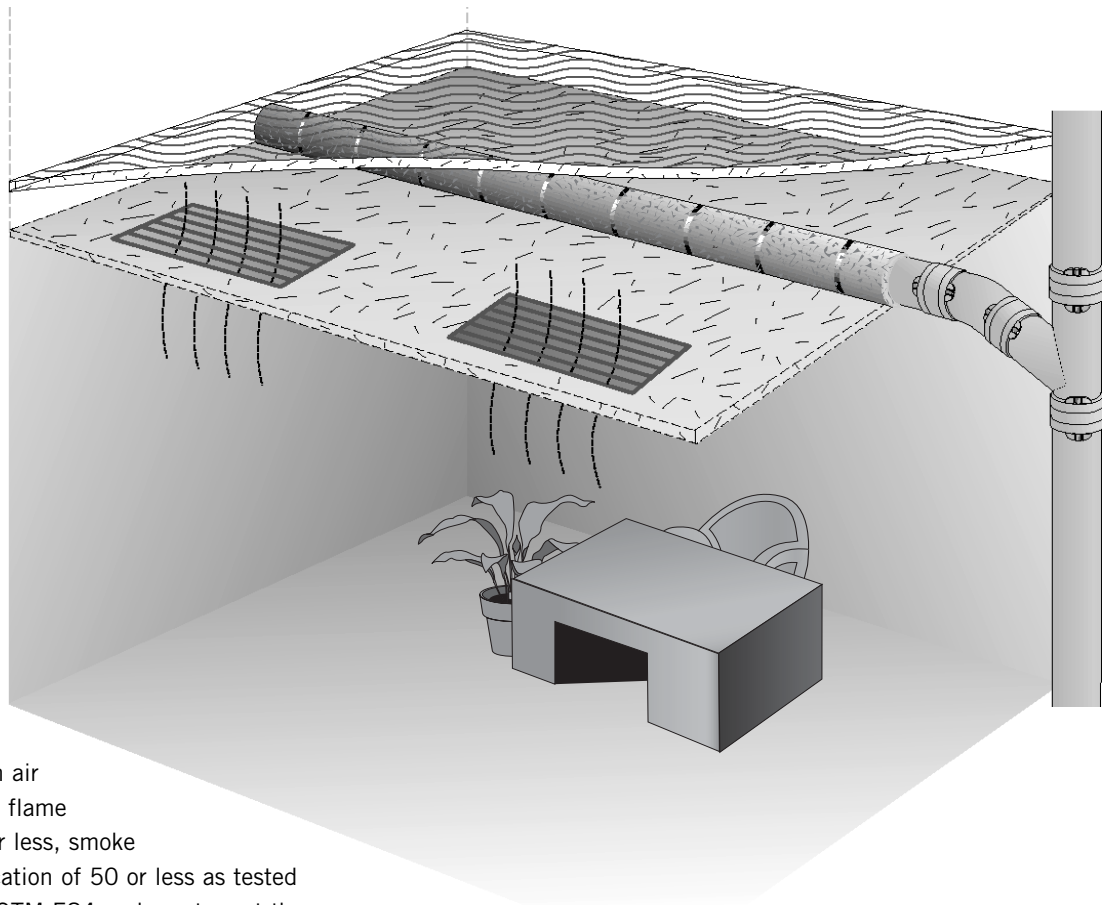
Hydro test in accordance with local plumbing code or with authority having jurisdiction or with a maximum of 10 ft of head pressure. After making the first 20 or 30 joints, it is recommended that a test be applied to prove that the joint-making technique is satisfactory. If a leak is discovered, follow the appropriate procedure below.

Hydrostatic testing of the joints can be performed immediately after the final joint has been completed. The low pressure testing procedure detailed below should be strictly followed.

1. Fully inspect the installed piping for evidence of mechanical abuse and suspect joints.
2. Split the system into convenient test sections, not exceeding 1,000 feet. The piping should be capped off with an expandable plug at the end of the pipe section to be tested.
3. Prior to starting the test in below grade applications, straight lengths of pipe should be backfilled between fittings that are tested.
4. Slowly fill the pipe section with water, taking care to evaluate all trapped air in the process. Use air release valves in any high spots in the system. Do not pressurize at this stage.
5. Leave the pipe for at least one hour to allow an equilibrium temperature to be achieved.
6. Visually check the system for leaks.
7. Pressurize the system to a suggested maximum of 10 feet of head by means of a standard 10' standing water test using a 10' vertical riser, or a low-pressure hand pump.
8. Leave the line at 10 feet of head for a period of 2 hours, during which time the water level should not change (standing water test), nor should the pressure gauge reading change (hand pump test).
9. If there is a significant drop in pressure, or extended times are required to achieve the desired pressure, either joint leakage has occurred or air is still entrapped in the line. In this event inspect for joint leaks. If none are found, check for entrapped air – these air pockets must be removed prior to continuing the test.
10. If joints are leaking, tighten the nut 1/8 to 1/4 turn and wipe the fitting to remove excess water. This should normally cure the problem. If it does not, then the grooving or setting of the elastolive should be investigated. Drain the system and undo the suspect fitting. Test first that the elastolive feels tight on the pipe by attempting to turn it with reasonable pressure such as you might use to unscrew the cap of a bottle. The elastolive should not easily move around the pipe. If it does, it should be replaced. If the elastolive is tight, examine it, particularly at the front, for signs of bad grooving or shavings between the elastolive and the groove. If the front edge of the groove is damaged, the joint must be re-made and the piece of pipe replaced. When examining a leaking 3" or 4" joint, particular attention should be paid to possible misalignment, as this is the most likely cause of such a leak. Make sure any misalignment is corrected before re-testing.
11. Repeat the 10 feet head test after repairing any leaking joints, following the procedure described above.

SECTION FIVE: ADDITIONAL ENGINEERING CONSIDERATIONS

RETURN AIR PLENUM GUIDELINES



Piping installed in spaces used as return air plenums must have a flame spread rating of 25 or less, smoke development classification of 50 or less as tested in accordance with ASTM E84 and must meet the requirements of UL723. While glass piping has been the traditional choice for acid waste piping in plenums, IPEX's flame retardant polypropylene piping installed with either a special fiberglass insulation, or with a ceramic fiber plenum wrap, meets these requirements. Third party testing by ITS labs, was completed on IPEX PP pipe protected with 3M Fire Barrier Plenum wrap. The test results revealed a flame spread rate of 5 and a smoke development classification of 5. **(Plenumline FR-PVDF meets the requirements of ASTM E84 and UL723 without the use of over-wrap or insulation.)**

Features and Benefits:

- **Tested in accordance with ASTM E84** requirements for flame spread and smoke development as tested by ITS labs.
- **Meets UL723** designation Fire Hazard Classification 25/50
- **Meets ASTM E136** for noncombustibility
- **Saves cost** on material and installation
- **Meets the intent of nationally recognized plumbing and mechanical codes.***
- **Single source for acid waste piping.** Specify and install Enfield, Labline and Plenumline below ground, above ground, in wall chases, under the bench, and in plenum spaces.

* *Note: Always check local fire and mechanical codes to ensure compliance.*

RETURN AIR PLENUM OPTIONS

Plenumline PVDF

To meet a flame spread index of 25 or less and a smoke development index of 50 or less when tested in accordance with ASTM E84.

The Plenumline flame retardant PVDF piping system does not require any over-wrap or insulation.

Plenumline PVDF utilizes the same joining method as Labline polypropylene.

Non-Combustible Ceramic Fiber Pipe Wrap

To meet a flame spread index of 25 or less and a smoke development index of 50 or less when tested in accordance with ASTM E84 – use Labline or Enfield with 3M Fire Barrier ceramic fiber Plenum Wrap. (Complete test results available upon request.)

Example Specifications

System Description: Sch 40 FRPP Labline or Enfield acid waste piping manufactured by IPEX complies with ASTM E84 and UL723 when covered with Fire Barrier Plenum Wrap, manufactured by 3M Co., consisting of a patented inorganic blanket encapsulated with a scrim-reinforced foil, sealed and secured with aluminum tape and 1/2" wide stainless steel banding.

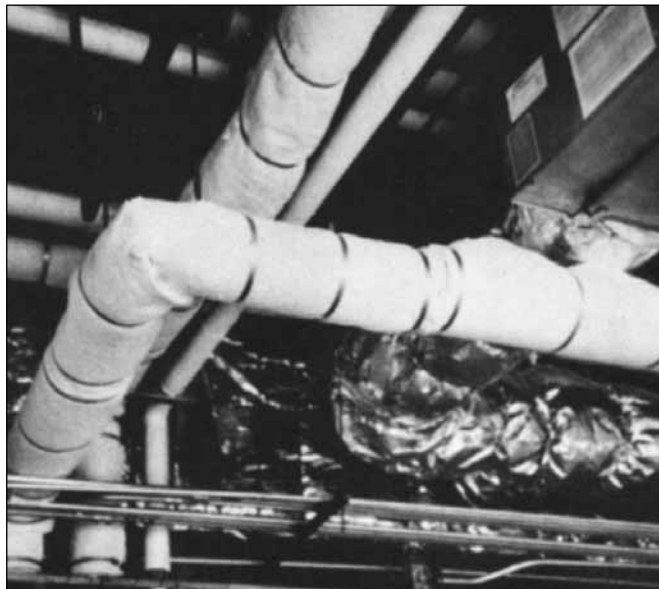
Fireproof Fiberglass Insulation

To meet a flame spread index of 25 or less and a smoke development index of 50 or less when tested in accordance with ASTM E84 – use Labline or Enfield with John Mansville Micro-Lok flame-attenuated fiberglass pipe insulation.

Example Specifications

System Description: Sch 40 FRPP Labline or Enfield acid waste piping manufactured by IPEX complies with ASTM E84 and UL723 when covered with one-piece Micro-Lok AP-T Plus fiberglass insulation, manufactured by John Mansville. This insulation is a high-density, white kraft bonded to an aluminized polyester, reinforced with fiberglass yarn. The kraft paper is chemically treated to enhance fire safety.

Note: Methods for installing pipe through firewalls should follow the applicable building and plumbing codes and be approved by the local authority having jurisdiction. A pipe sleeve should be used and the space around the pipe completely sealed with an approved fire-resistive material. **The use of caulk or sealant against the surface of the pipe is cautioned as some types may not be compatible with the pipe material.**

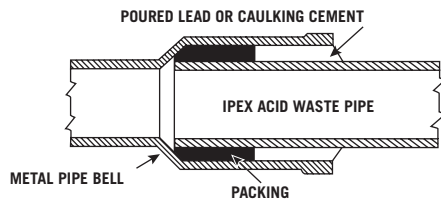


ADAPTING TO OTHER DRAINLINE MATERIALS

The methods depicted below are recommended only as a means of adapting to other drainline materials. Enfield and Labline components are dimensionally matched to assure installation success. Do not install a system of mixed brands.

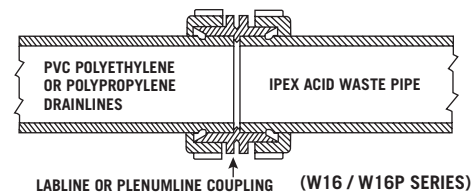
Metal Pipe-Caulked

1. Roughen or score pipe end with suitable tool or coarse file to provide a "key".
2. Insert Enfield pipe until it bottoms at the stop.
3. Pack hub half full with asbestos rope, or acid resistant oakum.
4. Caulk with hot lead, lead wool or caulking cement.



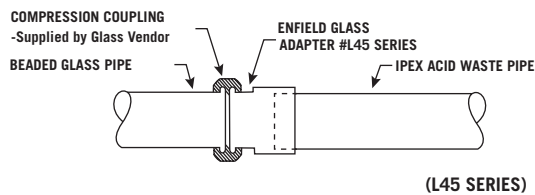
Plastic Pipe

Groove both sections and use **Labline** coupling.

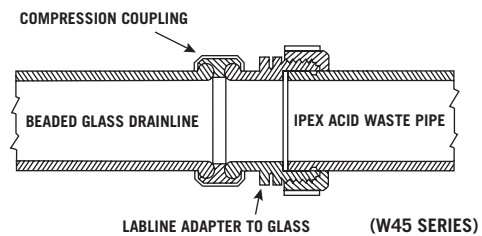


Glass

Use an **Enfield** glass adapter and a compression coupling available from glass drainline vendors.

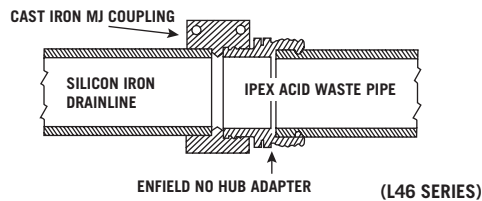


Use a **Labline** glass adapter and compression coupling available from glass drainline vendors.

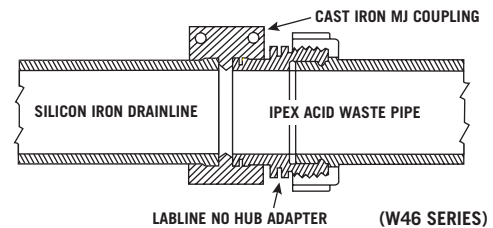


Silicon Iron

Use an **Enfield** adapter and an MJ Cast Iron coupling available from silicon iron pipe manufacturer.

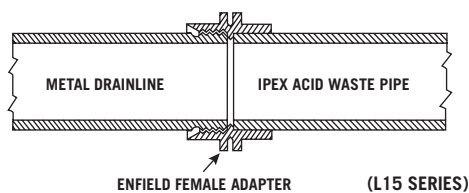


Use a **Labline** No Hub adapter and a Cast Iron MJ coupling available from silicon iron pipe manufacturer.

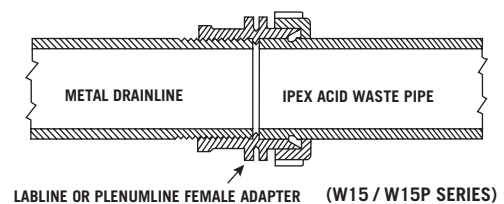


Metal Pipe-Threaded

Use an **Enfield** Female adapter and Teflon tape.



Use a **Labline** Female adapter and Teflon tape.

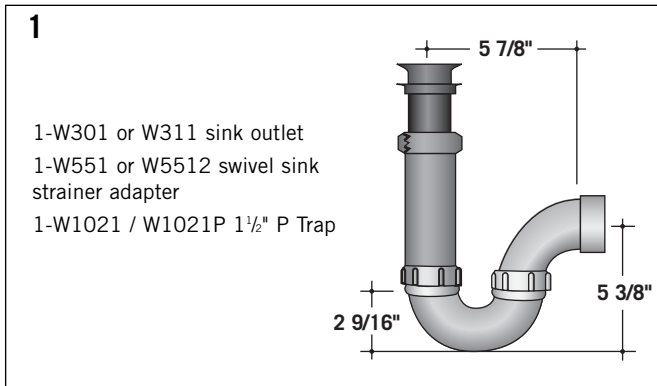


TYPICAL UNDERBENCH CONFIGURATIONS

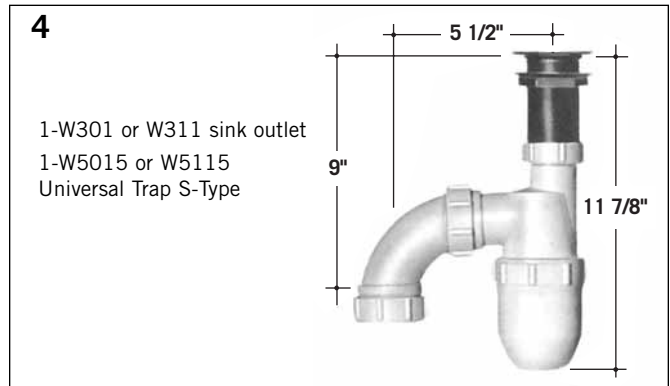
The following configurations are meant to be a guide for installers on the proper assembly of IPEX acid waste systems. They are acceptable in most applications and allow the product to function in its intended manner. However, one should check with local authorities having jurisdiction to ensure that the configuration is assembled according to code.

If joints should need pipe thread sealant, IPEX recommends the use of Teflon® pipe tape.

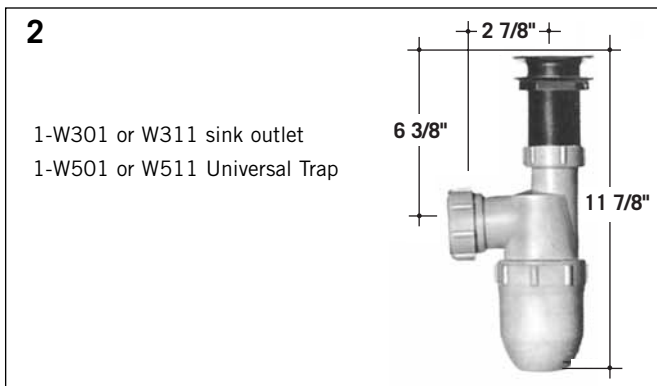
Tailpiece adapter with P Trap



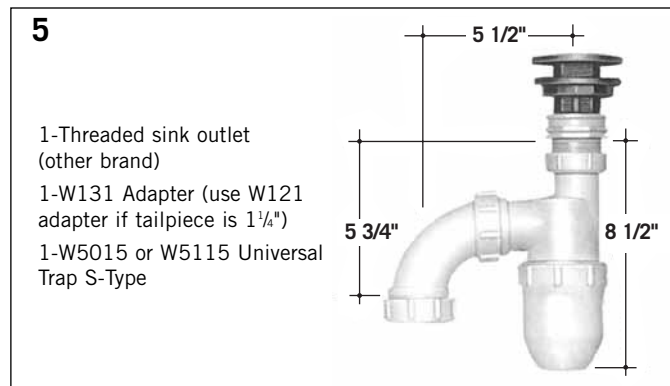
W301 or W311 sink outlet to W5015 Universal trap



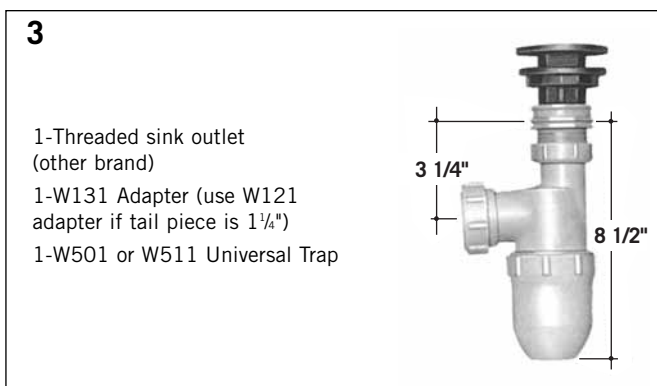
W301 or W311 sink outlet to W501 or W511 Universal trap



Other brand threaded sink outlet to W5015 or W5115 Universal trap



Other brand threaded sink outlet to W501 or W511 Universal trap



W401 6" round cup sink to W501 or W511 Universal trap



**W497 6" x 3" oval cup sink to W501 or W511
Universal trap**

7

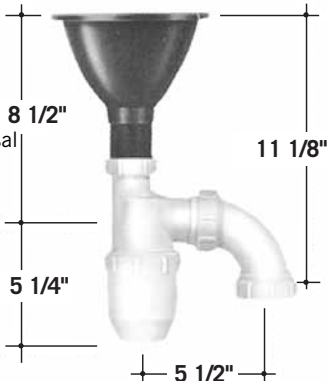
1-W497 6" x 3" Oval cup sink
1-W501 or W511 Universal Trap



**W401 6" round cup sink to W5015 or W5115
Universal trap**

8

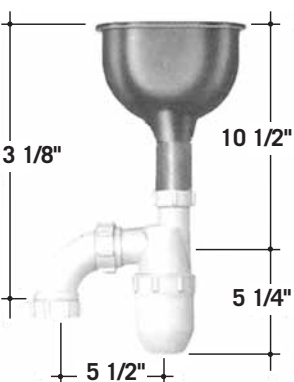
1-W401 6" Round cup sink
1-W5015 or W5115 Universal Trap S-Type



**W497 6" x 3" oval cup sink to W5015 or W5115
Universal trap**

9

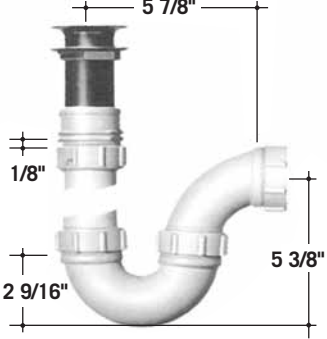
1-W497 6" x 3" Oval cup sink
1-W5015 or W5115 Universal Trap S-Type



W1021 P trap to threaded sink outlet

10


1-Threaded sink outlet
1-W151 Female Adapter
1 pc. W001 pipe to length
1-W1021 1 1/2" P Trap



Long connection of Universal trap to threaded sink outlet

11

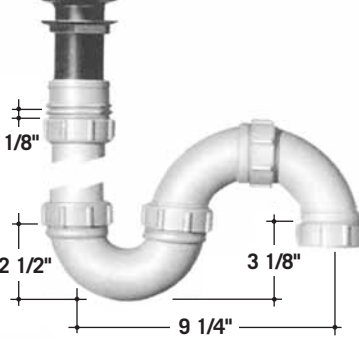
1-Threaded sink outlet
1-W151 Female Adapter
1 pc. W001 pipe cut to length
1-W141T Male Adapter
1-W501 or W511 Universal Trap
Note: Same assembly also used for long connections to sinks.



Connecting W1031 S trap to threaded sink outlet

12

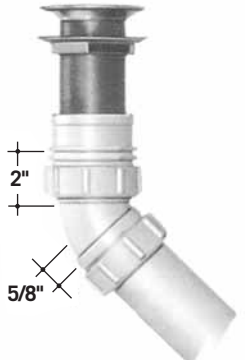
1-Threaded sink outlet
1-W151 Female Adapter
1 pc. W001 pipe to length
1-W1031 1 1/2" S Trap



Compact assembly for turning drainline back to wall

13

1-Threaded sink outlet
1-W151 Female Adapter
1-W211 Loose Nut 1/8 Bend



ENGINEERING
CONSIDERATIONS

This page intentionally
left blank

Our complete range of tanks, dilution traps, solids interceptors and accessories are designed to neutralize chemicals found in laboratory, industrial and institutional wastes.

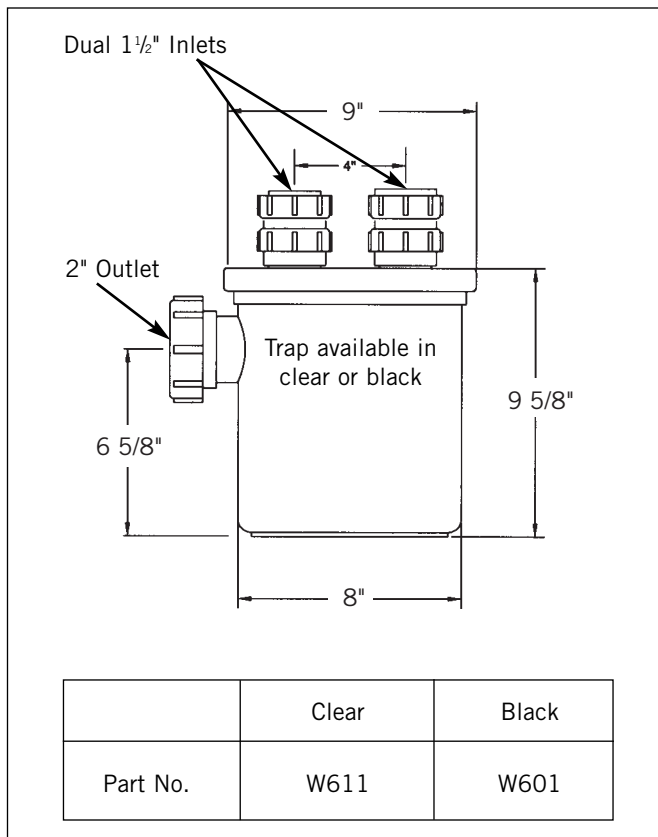
Dilution Traps

It is often necessary to dilute waste from individual sinks or small groups of sinks before discharging into the system. Our one-, two- and five-gallon dilution traps allow for convenient point-of-use dilution of this sink waste.

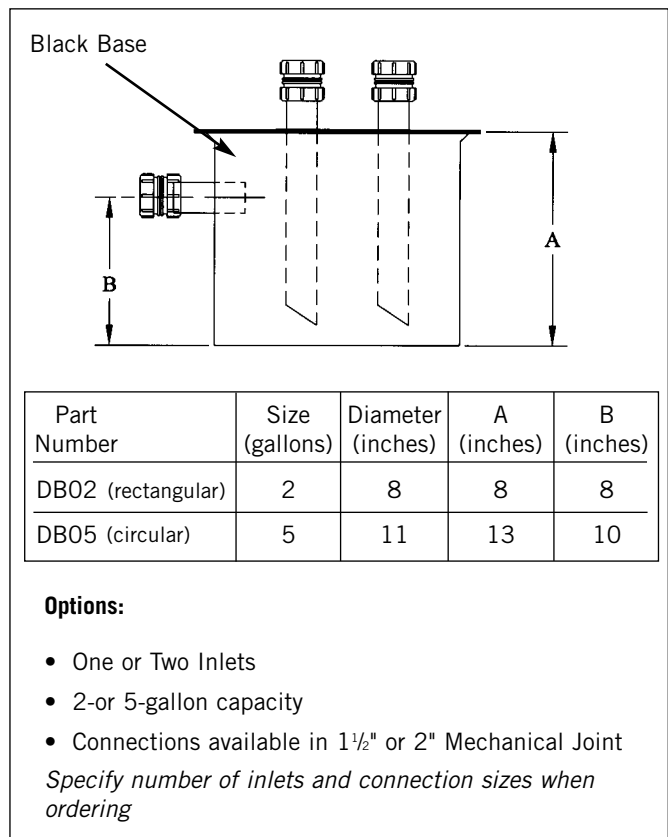
One-gallon capacity dilution traps have two 1½" loose nut inlets and one 2" outlet. Various inlet configurations are possible and some are illustrated below. Dilution traps may serve several sinks or be used as a trap under a particular sink where more than usual dilution is desirable. Dilution traps may also be used as means of dilution, by cutting dip tubes short—see instruction label attached to each unit.



One-Gallon Dilution Trap



Two and Five-Gallon HDPE Dilution Basin



Dilution Trap / Basin Installation Procedure

- The dilution traps / basins should be situated close to or under the sinks.
- There are 2 x 1½" mechanical joint inlet connections mounted on top of the trap / basin. This allows for up to 2 sinks to be connected to one dilution trap / basin. One inlet can be blanked off using cap (catalogue number: L641) if only one sink is connected.
- The 2" mechanical joint located on the side of the trap / basin is the outlet.
- The trap / basin must be suitably supported from the base, this is required to prevent any undue stress being exerted on the fittings. Support can also be achieved by situating the trap / basin on the ground.
- The dilution trap / basin must NOT be filled with limestone chips. Limestone chips are only to be used in Neutralization Tanks.

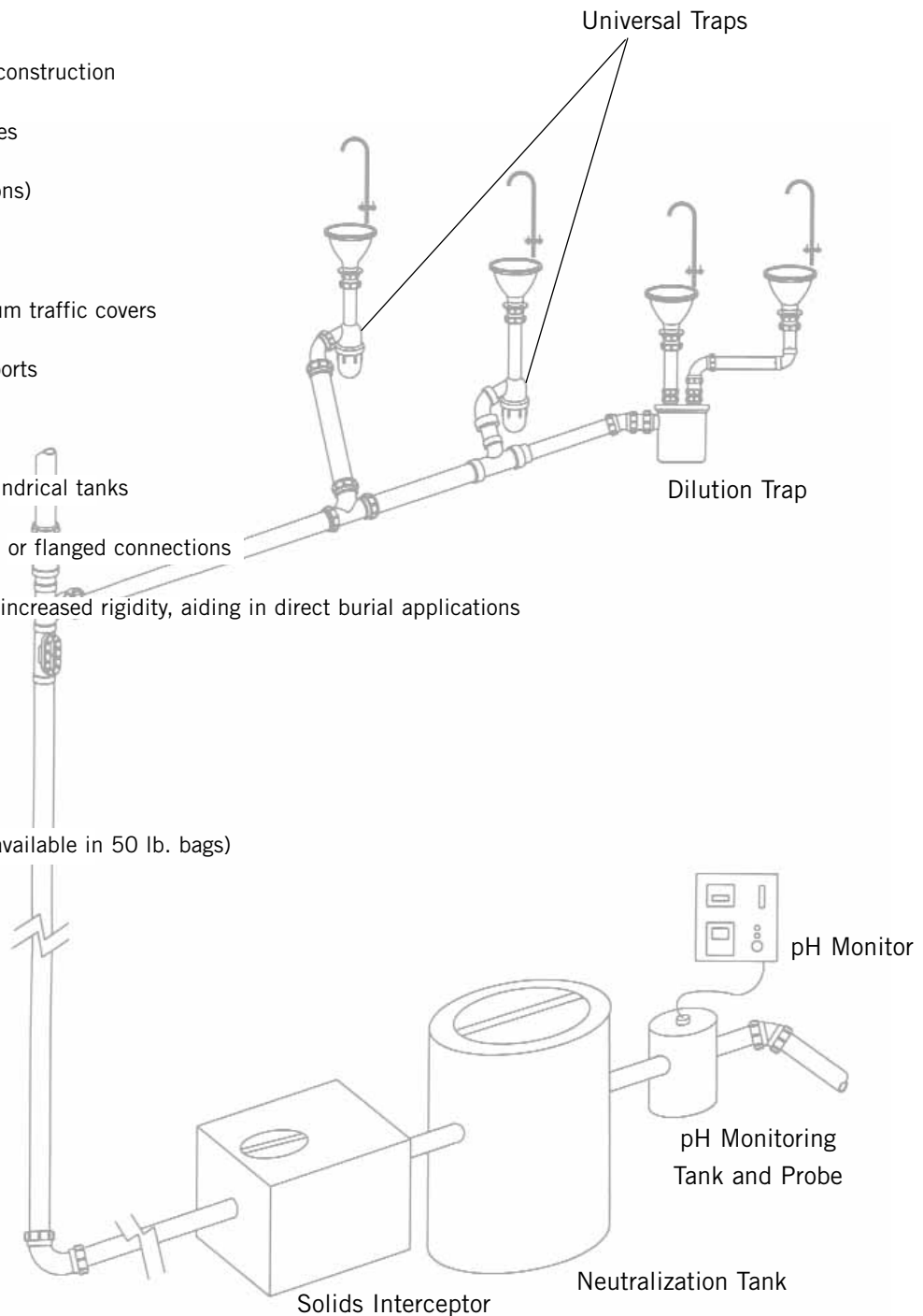
NEUTRALIZATION

Neutralization of waste is necessary to protect the environment as well as attached piping systems. Ideally suited for this application, polyethylene tanks are a lightweight, durable and cost effective means of neutralizing this waste and offers advantages not found in tanks made from steel or molded stone. Polyethylene and polypropylene tanks are easier to handle, corrosion-free and easy to maintain.

IPEX offers a wide variety of tanks (2 to 2000 U.S. gallons) to neutralize harmful chemical waste. IPEX also offers a variety of equipment to keep tanks free of solids and insure proper flow of liquids through the system. To complete the neutralization system, equipment can be supplied that will monitor the waste exiting the tanks to ensure equipment is performing as intended, and alert personnel if there are system problems, such as improper neutralization or flow problems.

Neutraltank options:

- Polypropylene or polyethylene construction
- Cylindrical or rectangular shapes
- Variety of sizes (2 - 2000 gallons)
- Bolted or welded covers
- Standard, light traffic or medium traffic covers
- 8", 18", 25" threaded access ports
- "EZ Access" port
- Custom tank extensions on cylindrical tanks
- Plain, male or female threaded or flanged connections
- Fiberglass wrapped tanks - for increased rigidity, aiding in direct burial applications
- Solids interceptors
- High/low liquid level alarms
- Inlet flow distributor
- Neutralizing limestone chips (available in 50 lb. bags)
- pH monitoring system



CYLINDRICAL TANKS - OPTIONS

ACCESS PORT OPTIONS

- EZ Access Port

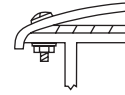


- Threaded Access Port



TANK COVER OPTIONS

- Bolted Cover



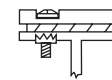
- Welded Cover



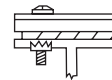
NOTE: EZ Access and threaded ports can be attached to either welded or bolted covers.

OPTIONAL COVERS

- Standard Cover



- Typical Pedestrian Traffic Cover

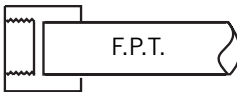


- Custom Tank Extensions

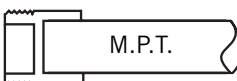
Contact IPEX Customer Service for details

CONNECTIONS INLET/OUTLET/VENT

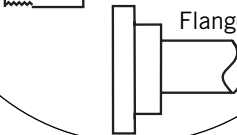
Plain End



F.P.T.



M.P.T.



Flanged

- Flow Inlet Distributor

- Limestone Chips (50 lb. bags)

OPTIONAL TANK REINFORCEMENT

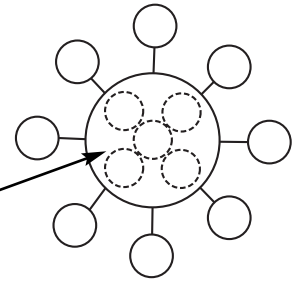
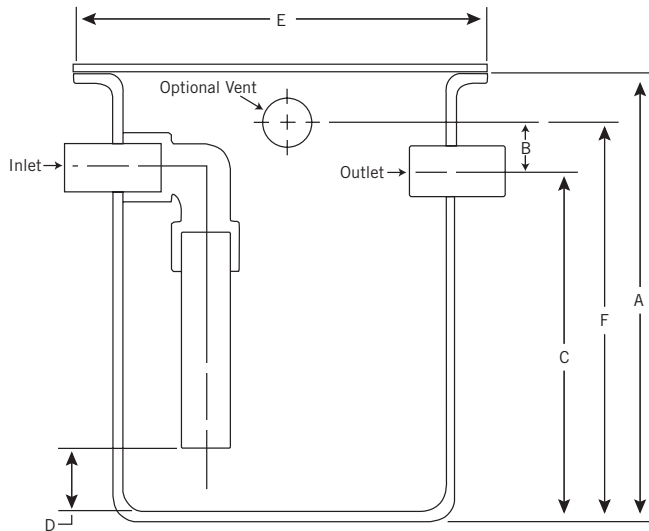
- Fiberglass Overwrap 15 gal.-2000 gal.

TANK MATERIALS

- High Density Polyethylene
- Polypropylene

For details, see 'Options and Accessories' page in this section.

(see back cover for contact information)



Threaded cover location, if applicable. Cover is centered on 100 gallon and smaller tanks

Mark desired location of connections by inserting an "I" for inlet, "O" for outlet and "V" for vent in the diagram.
 Also indicate an "X" at the approximate location of threaded cover (if applicable).

TANK SPECIFICATIONS

MATERIAL

- Polyethylene
- Polypropylene
- FRP Wrap

TANK COVERS

Non-load Bearing

- EZ
- Standard Domed
- HD Flat
- Pedestrian Traffic Cover

EXTENSION OPTIONS

- Non-Adjustable Extension™
- Variable Extension™

TANK EXTENSION

- "A" Dimension _____" High

ACCESS PORTS

- 11" EZ Access Port
- 8" Threaded Access Port
- 16" Threaded Access Port
- 22" Threaded Access Port

PIPE CONNECTIONS

- | | | | |
|-------------------------------------|--------------------------|--------------------------|--------------------------|
| | Inlet/Outlet/Vent | | |
| <input type="checkbox"/> Plain End | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Female Thd | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Male Thd | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| <input type="checkbox"/> Flanged | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

ACCESSORIES

- Inlet Flow Distributor
- High/Low Level Alarm
 - Top Mount
 - Side Mount
- Limestone Chips, qty of bags _____

Gal.	Dia. (in)	A (in)	B (in)	C (in)	D (in)	E (in)	F (in)	Specify Inlet/Outlet size (in)	Specify Vent size (in)
* 5	11	14	2	10.5	2	15.5	12		
** 7	11	21	2	16	2	12	18		
15	18	15	2	10	2	21.5	12		
30	18	29	2	22	3	23	24		
55	22	36	2	27	3	24.25	29		
100	28	42	2	36	4	32	38		
150	31	48	2	38	6	36.5	40		
200	36	48	2	38	6	40.5	40		
275	42	48	2	38	6	47	40		
360	48	48	2	38	6	51	40		
500	52	60	2	52	6	56	54		
700	55	70	2	60	6	60	62		
1000	66	72	2	62	6	72	64		
1250	69	84	2	72	8	76	74		
2000	84	84	2	72	8	91	74		

Other size tanks available upon request

* Available only in HDPE

** Available only in PP

<p>Company Name _____</p> <p>Job Name _____</p> <p>Date _____</p>
--

Note: For vehicular traffic applications, IPEX recommends that tanks are installed below grade with access to the tank vault via DOT approved manhole covers.

DILUTION AND NEUTRALIZATION

RECTANGULAR TANKS - OPTIONS

ACCESS PORT OPTIONS

- EZ Access Port

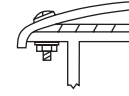


- Threaded Access Port



TANK COVER OPTIONS

- Bolted Cover



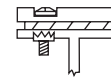
- Welded Cover



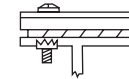
NOTE: EZ Access and threaded parts can be attached to either welded or bolted covers.

OPTIONAL COVERS

- Standard Cover



- Typical Pedestrian Traffic Cover



OPTIONAL TANK REINFORCEMENT

- Fiberglass Overwrap
15 gal.-2000 gal.

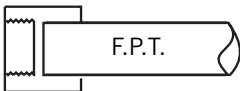
TANK MATERIALS

- High Density Polyethylene
- Polypropylene

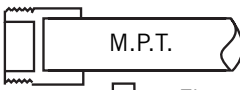
- Custom Tank Extensions
Contact IPEX Customer Service for details

CONNECTIONS INLET/OUTLET/VENT

Plain End



F.P.T.



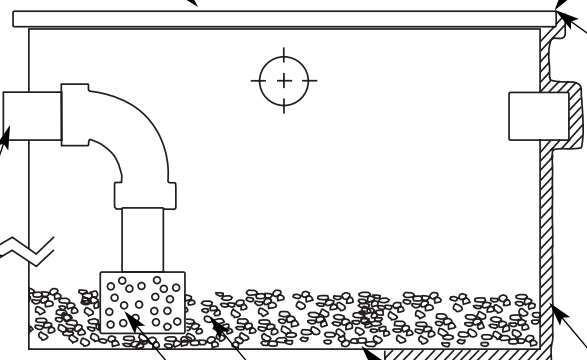
M.P.T.



Flanged

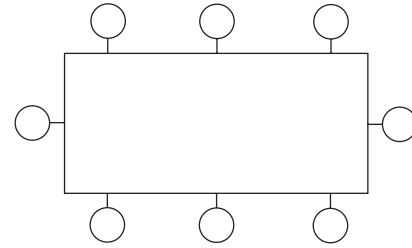
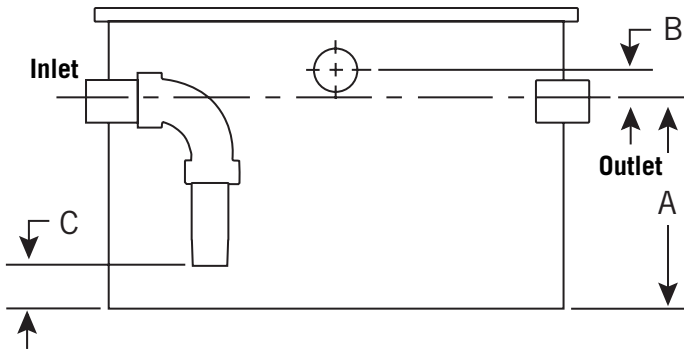
- Flow Inlet Distributor

- Limestone Chips
(50 lb. bags)



For details, see 'Options and Accessories' page in this section.

DILUTION AND NEUTRALIZATION


TANK SPECIFICATIONS
MATERIAL

- Polypropylene
w/no re-inforcement
- Polyethylene
w/no re-inforcement
- Polypropylene
w/FRP Wrap (15 gal. & >)
- Polyethylene
w/FRP Wrap (15 gal. & >)

TANK COVERS
Non-load Bearing

- Bolted Domed
- Bolted Flat
- Welded

Load Bearing

- Pedestrian Traffic Cover
- Vehicular Traffic Cover
(see note below)

ACCESS PORTS

- 11" EZ Access Port
- 8" Threaded Access Port
- 18" Threaded Access Port
- 25" Threaded Access Port

TANK EXTENSION

- "A" Dimension _____" High

PIPE CONNECTIONS

- | | |
|-------------------------------------|--|
| | Inlet/Outlet/Vent |
| <input type="checkbox"/> Plain End | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| <input type="checkbox"/> Female Thd | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| <input type="checkbox"/> Male Thd | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| <input type="checkbox"/> Flanged | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |

ACCESSORIES

- Inlet Flow Distributor
- High/Low Level Alarm
 - Top Mount
 - Side Mount
- Limestone Chips,
qty of bags _____

Mark desired location of connections by inserting an "I" for inlet, "O" for outlet and "V" for vent in the diagram. Also indicate an "X" at the approximate location of threaded cover (if applicable).

Part Number	Gal.	LxWxH (in)	A (in)	B (in)	C (in)	Max. Ext. Height (in)	Specify Inlet/Outlet size (in)	Specify Vent size (in)
* RT0002	2*	8x8x8	5	1.5	2	n/a	1½	
RT0005	5	10x16x8	5	1.5	2	4		
RT0015	15	12x24x12	7	2	4	8		
RT0030	30	12x24x24	18	2	4	20		
RT0055	55	24x30x18	12	2	4	12		
RT0115	115	30x30x30	24	2	4	24		
RT0150	150	24x48x30	24	2	4	24		
RT0215	215	36x36x42	36	2	4	36		
RT0265	265	36x72x24	18	2	4	20		
RT0400	400	36x72x36	30	2	4	30		
RT0540	540	36x72x48	42	2	4	42		
RT0670	670	36x72x60	54	2	4	54		

* Available only in HDPE.

Company Name _____

Job Name _____

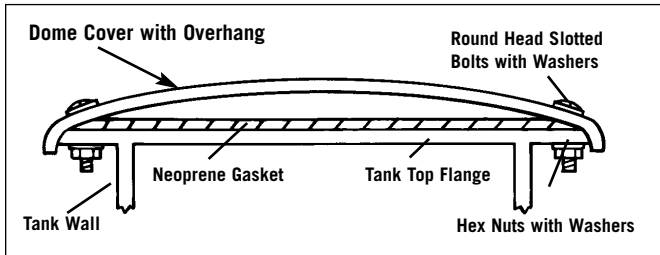
Date _____

Note: For vehicular traffic applications, IPEX strongly recommends that tanks are installed below grade with access to the tank vault via DOT approved manhole covers.

OPTIONS AND ACCESSORIES

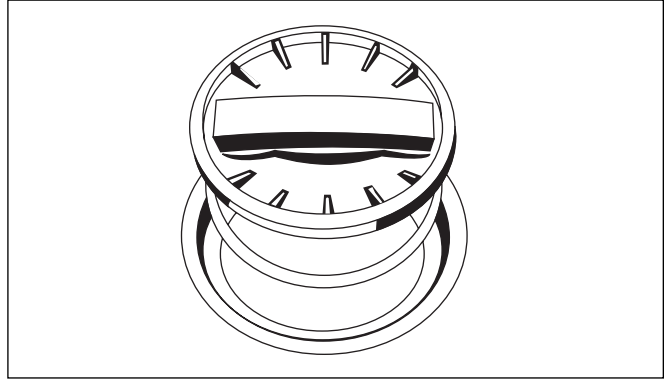
Standard Domed HDPE Cover

Slightly domed - NO Traffic - Non Load Bearing



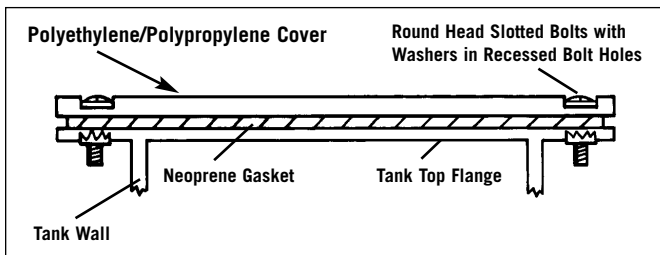
EZ Access Port

Can be incorporated into standard cover for rapid inspection of tank contents. Available in 11" diameter.



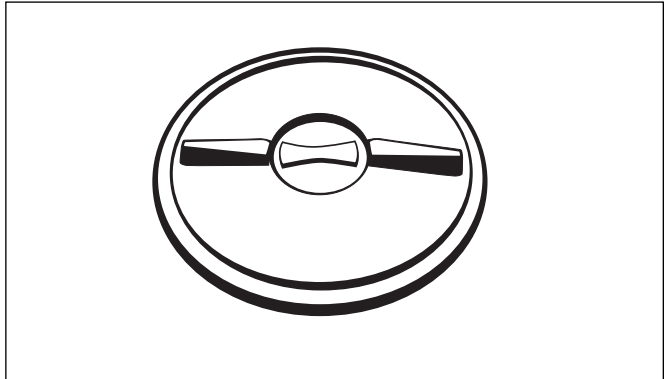
HD Bolted Flat Cover

NO traffic - Non load bearing for Flush Floor Installations



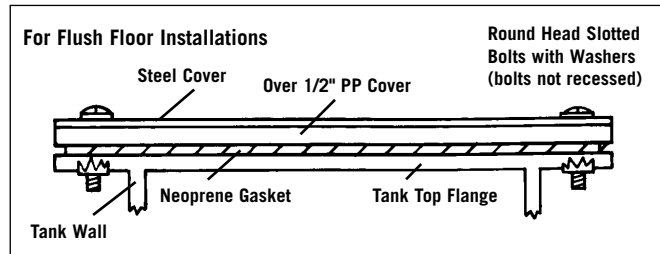
Threaded Manway

Threaded ports can be incorporated into all non traffic - non load bearing covers. They are available in three sizes: 8", 16" and 22" diameter.



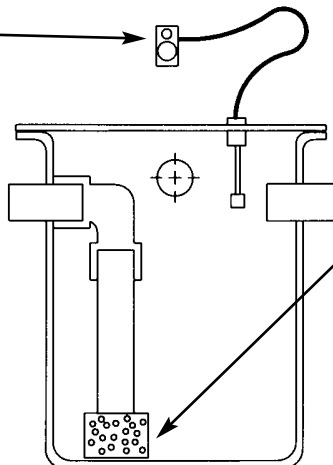
Steel Pedestrian Traffic Cover - Walking Only

Typical configuration for pedestrian traffic cover



Level Alarm

Poor flow through a tank can often indicate a clogging problem in the piping or in the tank itself. Our Hi/Low level alarms sense when the liquid level in the tank is above or below the desired level and then sound an alarm to indicate there is a problem. These alarms can be installed in most any tank and can be fitted with either an audio or visual alarm indicator.



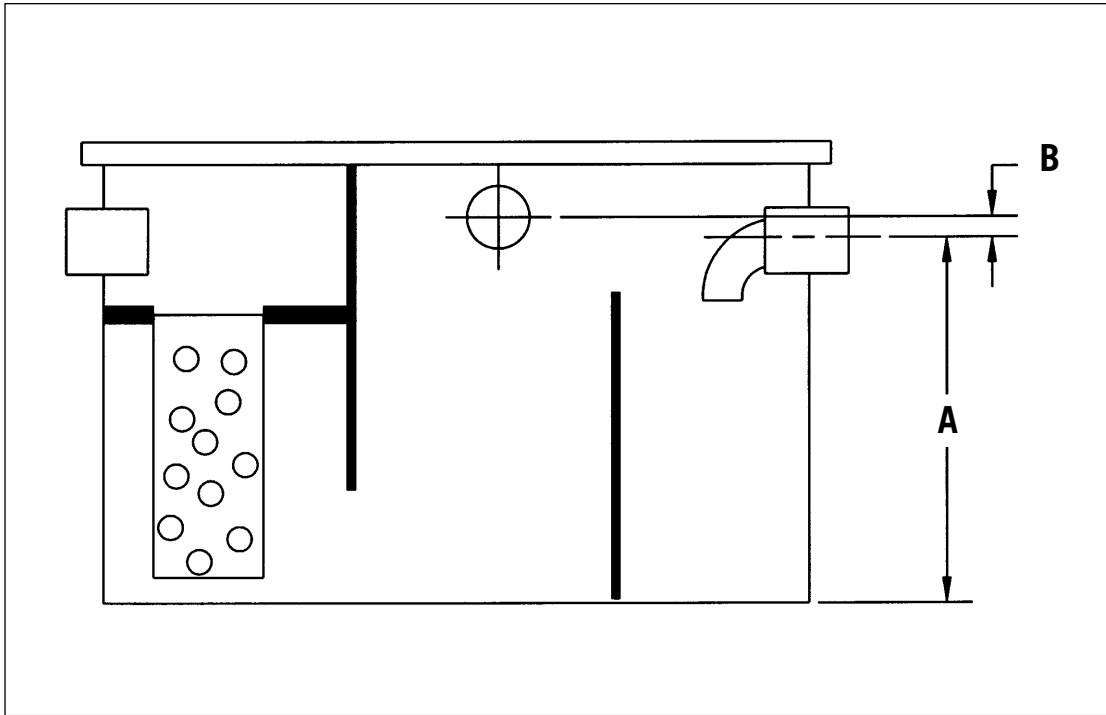
Inlet Flow Distributor

The Inlet Flow Distributor provides the following functions:

- even distribution of waste from the inlet
- greater efficiency of the limestone bed
- prevents limestone chip backup into inlet

SOLIDS INTERCEPTION

Grease, hair, lint and other laboratory debris can enter the waste system and often cause clogging and system back-ups. Solid waste can build up in the system which can lead to flooding and damage to the piping. If the solids are not removed from the system at the source, they can lead to permanent stoppages in the piping. The stoppages in the system will lead to costly and inconvenient cleanings and possible replacement of the piping. IPEX manufactures a line of solids interceptors which will filter out these solid waste products prior to entering the main piping system. Standard units are manufactured from high-density polyethylene. Propylene units are available upon request.



Options:

- Inlet Filter Basket
- Bolted or Welded Cover
- “EZ Access” Port
- Optional Vent

Part Number	Size (gallons)	Diameter (inches)	A (inches)	B (inches)
SI14	14	12 x 12 x 24	18	1½
SI44	44	18 x 24 x 24	18	1½
SI75	75	24 x 24 x 30	24	1½

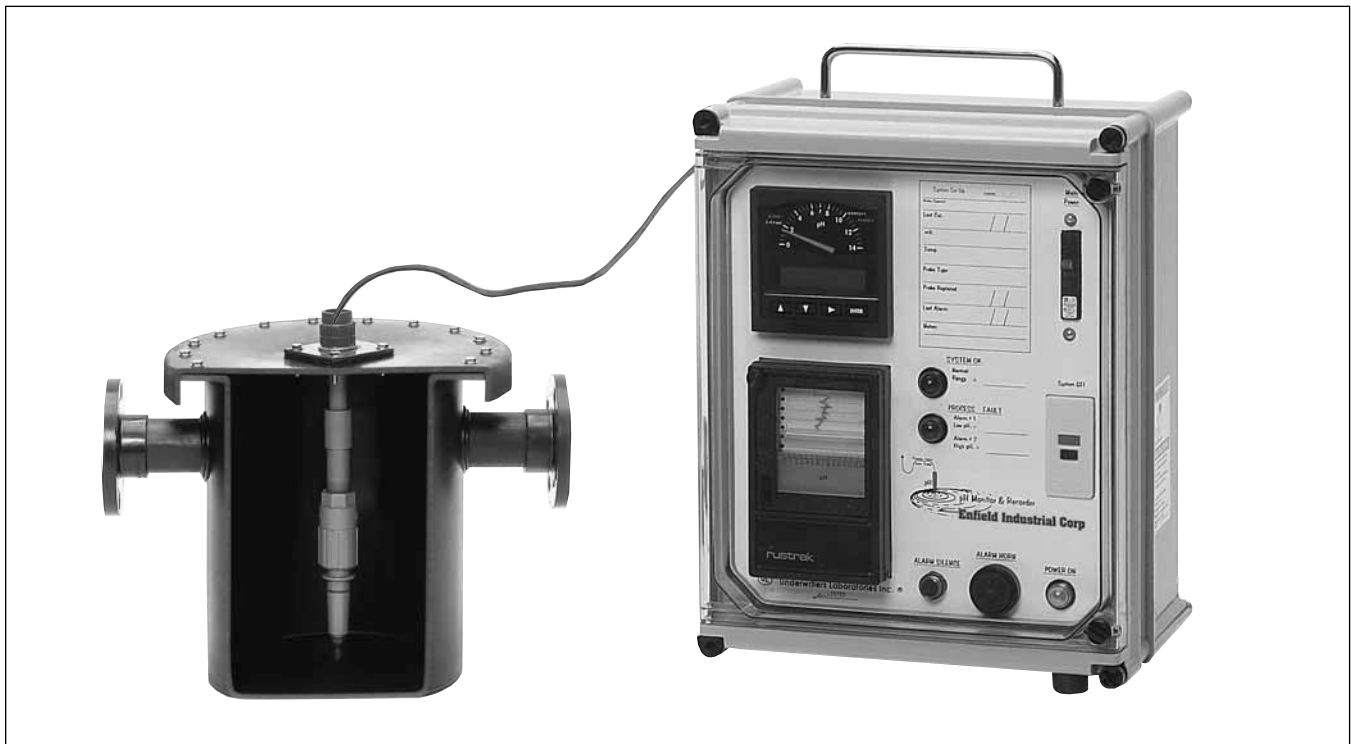
NEUTRASYSTEM 2™

pH Monitoring, Recording, and Alarm System

Neutrasystem 2 ensures that discharges into the sewer are maintained within acceptable pH parameters by neutralizing the acidic waste with limestone chips. The system continuously samples the downstream flow while keeping an accurate, permanent record of pH discharge levels. The monitoring device will warn maintenance personnel, (visually and audibly), when pH discharges outside acceptable parameters are sensed. Once alerted, maintenance personnel can quickly and easily recharge the main IPEX Neutratanke with limestone chips through the EZ Access cover incorporated into the tank's design.

The system incorporates the following features:

- UL 508 listed, NEMA 4X enclosure with hinged clear front cover for easy reading and access.
- 110V input power supply with GFI power cord protection and 24V DC operating voltage — provides stabilized operating current for panel instrumentation and allows the use of low voltage cable for quick, easy installation in the field.
- Control power circuit breaker, re-set protection (no fuses).
- Continuous soft internal alarm horn, (sonalert type), and alarm silencing button. The alarm horn is activated when the probe senses a pH above or below the set parameters, and will remain on until the alarm silence button is pressed.
- 62-day strip chart and single pen recorder — maintains a permanent record of pH levels.
- “Power On” yellow light indicates that incoming 110V power and the 24V DC system are functional.
- “pH Alarm” red light indicates when the measured pH is outside acceptable parameters. The light will remain illuminated until the fault is cleared and the “system OK” green light is re-illuminated.
- “System OK” green light indicates that the system is on-line and not in a default condition.
- 0-14 pH, series 5500 probe/monitor — fast responding, 97% measuring efficiency.
- Series 2714 bulb, 5 second response, pH probe with chemically resistant CPVC body, viton O-rings and twist-lock connection providing easy maintenance.
- 5-gallon high density polyethylene, one-piece construction, rotationally molded sample tank.



NEUTRALIZATION, TANK SIZING AND MAINTENANCE

The size of the neutralization tank is a function of the number of sinks and drains that are discharged into the system. According to ASPE, tanks are sized to provide a minimum “dwell time” of 2½ to 3 hours. Based on this dwell time, ASPE has developed a sizing table which is summarized and can be used as a guide in selecting the proper size tank. Tanks should not be sized based on the number of sinks or drains alone. Certain types of waste may require particular needs and may not fall within the standard sink to tank ratio. Other factors that can affect the tank size are not limited to, but inclusive of: the amount of flow through the system, the type of chemicals and the size of the system piping. A qualified engineer should make the final determination of the tank size.

Maintenance

The limestone chips supplied by IPEX are 1" to 3" in diameter and have a calcium carbonate content certified to be in excess of 90%. Water should always be added to the tank to help facilitate dilution. Limestone replacement should be performed at regular intervals. Typically, once every one to three months is sufficient, however, these intervals can be increased or decreased based upon application needs and performance. Factors affecting limestone replacement are waste flow rates, pH levels, and operating temperatures.

Note

There are many variables that affect neutralization and dilution of chemicals discharged through a system. Professional assistance should be employed in analyzing the effluent and the necessary maintenance service frequency.

Tank Size and Limestone Loading Chart

Number of sinks	Tank size in gallons	Limestone Loading for Neutralization (lbs)
2	5	50
4	15	125
8	30	250
16	55	500
30	100	1000
40	150	1500
60	200	2000
75	275	2500
110	360	3500
150	500	5250
215	700	8000
275	1000	10000
315	1250	12000
500	2000	18000

Neutralization Tank Sizing Example

A manufacturing process has a discharge cycle that activates a discharge pump for 5 minutes every 30 minutes. The pump capacity is 10 gpm. The acid waste is then directed into the acid waste drainage pipe system. The piping system must therefore be capable of conveying 100 gallons/hour. What size neutratan tank would be necessary to neutralize this discharged acid waste?

Design Requirements:

- Pump capacity 10 gpm
- Pump operates for 5 minutes every 30 minutes
- Flow rate max 100 gallons/hour

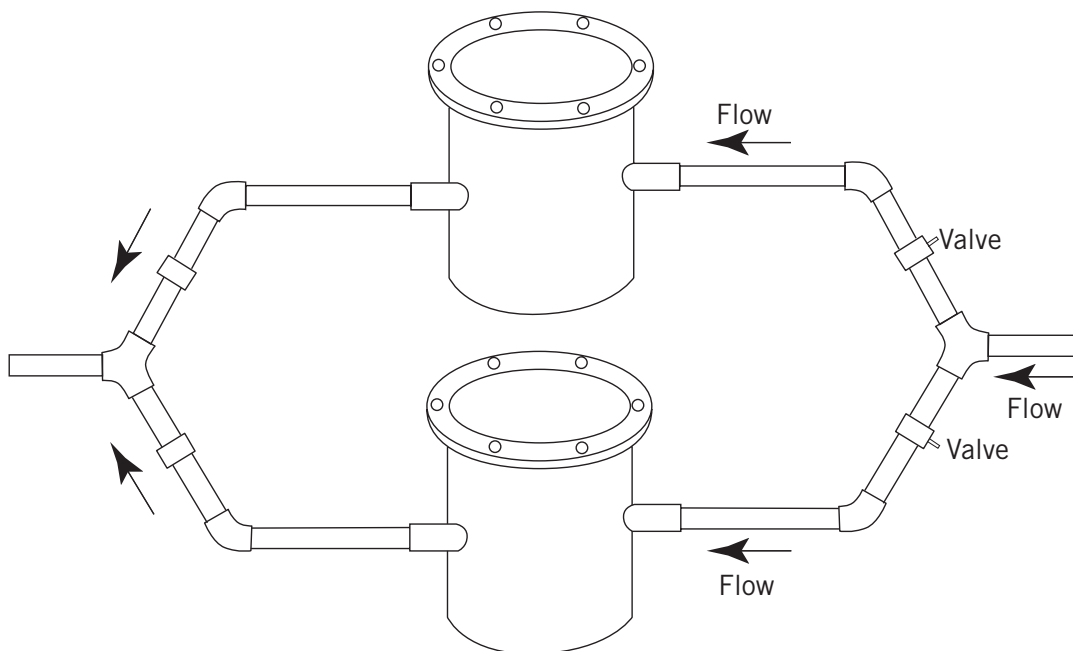
Assumptions:

1. Nameplate tank capacity is reduced by 20% due to position of inlet and outlet.
2. Limestone distribution further reduces available liquid volume by 65%. This may vary by random mixture or stone sizes, settling or dissolving of the stones.
3. Dwell time design for a pH1 is between 2.5 and 3 hours to result in an effluent between a pH of 4 and 7.5.

Solution:

- require tank to have a liquid capacity of 250 gallons (100 gal/hr x 2.5 hrs)
- Tank total liquid volume capacity is 250 gallon/.35 = 714 gallons
- Nameplate capacity due to inlet and outlet is $714/.80 = 892$ gallons
- Recommendation is 1000 gallon tank or 2 - 500 gallon tanks in parallel

Piping Tanks in Parallel



INSTALLATION

Neutratan Installation and Application Advice

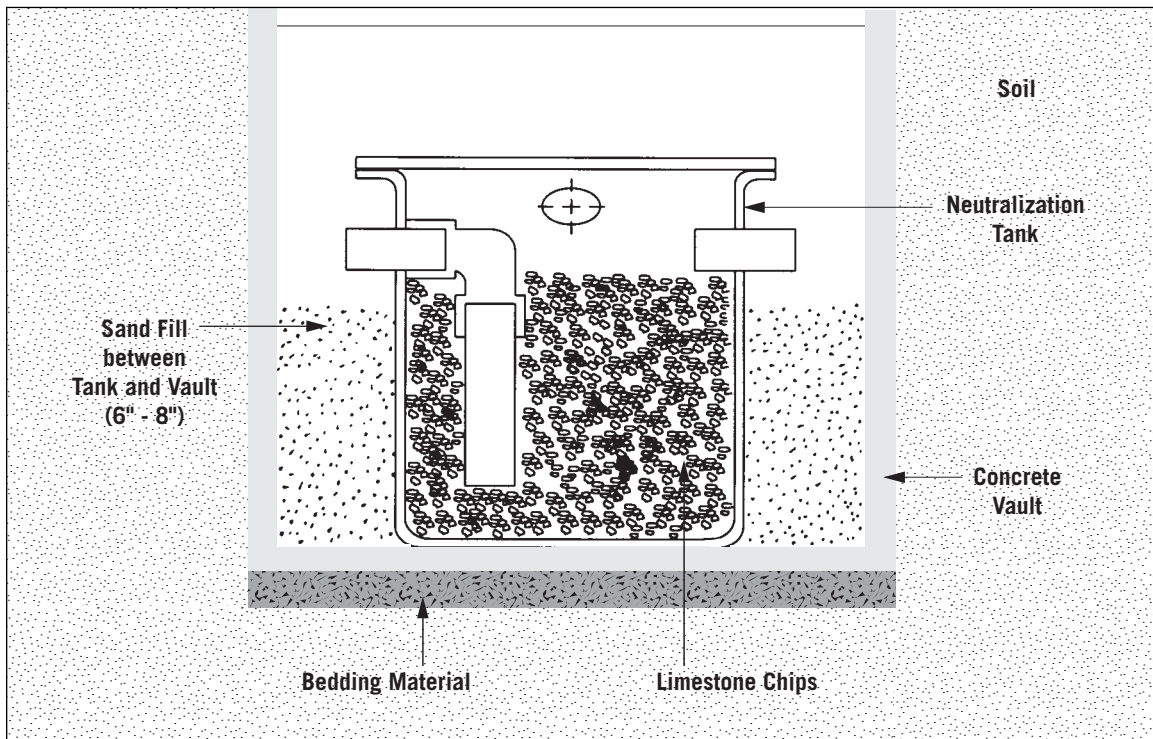
- 1 Tanks must be placed on a flat, solid surface allowing uniform, full support to the tank bottom. Such surfaces may be basement floors, concrete pads or compact, stone-free sand beds.
- 2 When installed below ground, tanks should be placed in a concrete vault. Tanks should never be buried directly in the ground unless they are wrapped in Fiberglass. IPEX can supply fiberglass wrapped tanks upon request.
- 3 The tank itself must not be used to support manhole covers, traffic of any kind or heavy equipment.
- 4 Do not support the tank by inlet, outlet, vent or any connecting piping.
- 5 Do not place any weight on tank fittings or connecting piping.
- 6 Tanks must NOT be subjected to pressure or vacuum including hydro-testing.
- 7 Depending upon effluent content, HDPE tanks may be used at temperatures up to 140°F (60°C). Polypropylene tanks may be used at temperatures up to 212°F (100°C).
8. Where possible, fill the tank with water prior to introducing the limestone and media.
9. Tank insulation may be considered for outdoor installation in cold environments.

Tanks for Direct Burial

When buried in the ground, standard polyethylene and polypropylene tanks should be placed in a concrete vault. The 6" to 8" open space between the tank and vault should be filled with sand or a similar type of backfill that is free of sharp objects.

Buried, tanks must be filled with water prior to backfilling. The backfill material must be free of stones and foreign matter. Mechanical tamping is not recommended. Care must be used during the backfilling procedure to prevent tank buckling.

When concrete vaults are not possible or desirable, IPEX can manufacture tanks that are wrapped with fiberglass, eliminating the need for a concrete vault. Cylindrical and rectangular tanks larger than 5-gallon sizes can be fiberglass wrapped for direct burial applications.



SECTION SEVEN: ACID WASTE SPECIFICATIONS

ENFIELD® SPECIFICATIONS

Enfield Long Form**General**

Acid waste drain and vent system, as shown on drawings, shall be NSF listed and CSA certified Schedule 40, polypropylene as manufactured by IPEX. System to include pipe supplied in 10 ft. lengths (or 20 ft lengths if NFRPP is specified), fittings, traps and neutralization tanks from the same manufacturer. It shall also include recommended adapters to connect to other piping materials, where applicable.

Material

Pipe shall be made from NSF listed Type 1, flame retardant polypropylene conforming to ASTM D4101, with a maximum average flame spread of zero seconds and a maximum extent of burning of 13 mm, in accordance with ASTM D635. Matched fittings shall be made from NSF listed flame retardant polypropylene with average maximum burn time of 80 seconds and maximum extent of burning of 20 mm in accordance with ASTM D635.

If NFRPP pipe is specified, it shall be made from NSF 14 listed and CSA certified Schedule 40 PP as manufactured by IPEX. Pipe shall comply with ASTM F1412 and material used shall comply with the material requirements of ASTM D4101.

Fittings

Fittings shall be NSF listed and have an integral heavy gauge, nickel/chrome electrical resistance wire molded in place in the fitting body. Copper wire elements, loose wire or other loose joint components, are prohibited. Fittings shall be Enfield or approved equal.

Joints

Connections between polypropylene pipe and fittings shall be made using the Enfield joint. All joints shall have a fusion cycle controlled by a microprocessor operated, waterproof, Enfusion control unit equipped with input and output voltage sensors, ambient temperature sensors to automatically adjust fusion time and audible alarms to indicate cycle interruptions and completion of the joining process. The unit shall be capable of fusing multiple joints and with a minimum capability of eight 2" joints with the same fusion time as a single joint.

Connections between polypropylene and other piping materials shall be made using Enfield adapters according to manufacturer's (IPEX) recommendations. All electrofusion machines shall be third party certified by UL and CSA.

Installation and Testing

Installation and testing shall be in accordance with the contract drawings, the manufacturer's recommendations and the local plumbing codes. Testing with compressed air is prohibited. The entire system shall be installed free of stress and in proper alignment. Horizontal supports shall provide a wide bearing area and be free of burrs or sharp edges. Support spacings shall be in accordance with the manufacturer's recommendations and local plumbing codes. Vertical piping shall have riser clamps at each floor. Pipe supports should be installed so that horizontal piping is in uniform alignment and with a uniform slope of at least 1/8" per foot, or in accordance with the local plumbing codes.

Enfield Short Form

Acid waste drainage and vent system shall be NSF listed and CSA certified Schedule 40, flame retardant polypropylene joined by Enfield resistance wire, as manufactured by IPEX. All fittings shall have molded in place nickel/chrome resistance wire with no loose components. Jointing shall be controlled using a UL and CSA certified microprocessor operated Enfusion Control Unit incorporating self diagnostics and automatic audible alarms to indicate circuit defaults and joint completion, plus allow multiple jointing of fittings as the same fusion time as a single joint. Installation and testing shall be in accordance with the contract drawings, the manufacturer's recommendations and the local plumbing codes.

LABLINE™ SPECIFICATIONS

Labline Long Form

General

Acid waste drain and vent system, as shown on drawings, shall be NSF listed, Schedule 40, polypropylene as manufactured by IPEX to include pipe supplied in 10 ft. lengths (or 20 ft lengths if NFRPP is specified), and matched fittings, traps and neutralization tanks from the same manufacturer. It shall also include recommended adapters to connect to other piping materials, where applicable.

Material

Pipe shall be made from NSF listed Type 1, flame retardant polypropylene conforming to ASTM D4101, with a maximum average flame spread of zero seconds and a maximum extent of burning of 13 mm, in accordance with ASTM D635. Matched fittings shall be made from NSF listed flame retardant polypropylene with average maximum burn time of 80 seconds and maximum extent of burning of 20 mm in accordance with ASTM D635.

If NFRPP pipe is specified, it shall be made from NSF 14 listed and CSA certified Schedule 40 PP as manufactured by IPEX. Pipe shall comply with ASTM F1412 and material used shall comply with the material requirements of ASTM D4101.

Fittings

Fittings shall be NSF listed, be of all plastic construction and be designed to lock into a machined groove on the mating piping. All fittings shall have integrally molded union connections. No metallic grab rings or clamps shall be allowed. Fittings containing EVA (ethylene vinyl acetate) are strictly prohibited. Couplings shall not be added to make mechanical joint fittings. Fittings shall be Labline or approved equivalent.

Joints

Connections between polypropylene pipe and matched fittings shall be made using the Labline Joint.

Installation and Testing

Installation and testing shall be in accordance with the contract drawings, the manufacturer's recommendations and the local plumbing codes. Testing with compressed air is prohibited. The entire system shall be installed free of stress and in proper alignment. Horizontal supports shall provide a wide bearing area and be free of burrs or sharp edges. Support spacings shall be in accordance with the manufacturer's recommendations and local plumbing codes. Vertical piping shall have riser clamps at each floor. Pipe supports shall be installed so that horizontal piping is in uniform alignment and with a uniform slope of at least 1/8" per foot, or in accordance with the local plumbing codes.

Labline Short Form

Acid waste drainage and vent system comprising pipe, matched fittings, neutralization tanks and adapter fittings shall be from a single source. Pipe shall be NSF listed, flame retardant, schedule 40 polypropylene and be joined by Labline fittings. All fittings shall be NSF listed and be of an all plastic construction, but must not contain components made from EVA, (ethylene vinyl acetate). Installation and testing shall be in accordance with the contract drawings, the manufacturer's recommendations and the local plumbing codes.

Plenumline Long Form

General

Acid waste drain and vent system, as shown on drawings, shall be IAPMO listed, Schedule 40, FR-PVDF as manufactured by IPEX to include pipe supplied in 10 ft. lengths and matched fittings, traps and neutralization tanks from the same manufacturer. It shall also include recommended adapters to connect to other piping materials, where applicable.

Material

Pipe and fittings shall be made from Kynar 740-02, flame retardant PVDF conforming to ASTM F 1673, with a limiting oxygen index (LOI) of 60, Resin must have a vertical burn rating of 94 V-0. Kynar 740-02 resin based on testing to ASTM E84 (UL 723) must have surface burning characteristics greater than or equal to a flame spread 5 and smoke development 35.

Fittings

Fittings shall be third party certified to ASTM F 1673 and ASTM E84, and IAPMO approved, be of all plastic construction and a tapered elastic retaining ring shall be

designed to lock into a machined groove on the mating piping. All fittings shall have integrally molded union connections. No metallic grab rings or clamps shall be allowed. Fittings shall be Plenumline™ or approved equal.

Installation and Testing

Installation and testing shall be in accordance with the contract drawings, the manufacturer's recommendations and the local plumbing codes. Testing with compressed air including air booster over water is prohibited. The entire system shall be installed free of stress and in proper alignment. Horizontal supports shall provide a wide bearing area and be free of burrs or sharp edges. Support spacings shall be in accordance with the manufacturer's recommendations and local plumbing codes. Vertical piping shall have riser clamps at each floor. Pipe supports shall be installed so that horizontal piping is in uniform alignment and with a uniform slope of at least 1/8" per foot, or in accordance with the local plumbing code requirements.

Plenumline Short Form

Acid waste drainage and vent system comprising pipe, matched fittings, neutralization tanks and adapter fittings shall be from a single source. Pipe shall be NSF listed, flame retardant, schedule 40 PVDF and be joined by Plenumline fittings. All fittings shall be NSF listed and be of an all plastic construction, but must not contain components made from EVA, (ethylene vinyl acetate). Installation and testing shall be in accordance with the contract drawings, the manufacturer's recommendations and the local plumbing codes.

NEUTRATANK™ NEUTRALIZATION TANKS SPECIFICATIONS

Neutralization Tank

Contractor shall furnish and install HDPE (Polypropylene) Neutralization Tank. Tank shall be rotationally molded, seamless construction with flanged top and welded or bolt down cover, as supplied by IPEX. Tank shall be NeutratanK No. CT0100, having 100-gallon capacity complete with 3" inlet and outlet, and 1½" vent connection. Tank to be 32" diameter x 42" high. Tank shall be installed in accordance with manufacturer's recommendations.

Contractor shall furnish and fill the tank prior to installation with limestone chips, as supplied by IPEX, to a level just below the tank outlet. Water should be added to the tank prior to placement of the limestone chips.

Monitoring Systems

Acid waste monitoring system shall be the Neutrasystem 2 pH Monitoring System as supplied by IPEX Industrial Systems, comprising a UL 508-listed, NEMA 4X, electrical pH monitoring panel, a 5-gallon high density polyethylene, one piece construction, rotationally molded sampling tank and a 0-14 pH series 5700 probe/monitor. The control panel shall incorporate a sonalert soft internal alarm horn with silencing button, pH alarm, power on, and "system OK" lights; a 62-day strip chart with single pen recorder; and 5700 pH probe and analog monitor. The controller shall link to a double junction combination 2714 extended-use electrode pH probe encapsulated in a chemically resistant CPVC body with viton O-rings. The probe will have a bulb pH electrode and the probe body shall incorporate a twist lock connection to facilitate easy removal and replacement of electrodes. The probe must be chemically resistant to hydrofluoric acid and shall have a response time of less than 5 seconds for pH changes. The 5 gallon pH sampling tank shall be installed downstream of a rotationally molded construction, high density polyethylene NeutratanK with a flanged top, and combination bolt down and EZ Access cover. Connecting piping for the acid waste drainage and vent system shall be NSF-listed Schedule 40 polypropylene conforming to ASTM F1412 as manufactured by IPEX. Connecting fittings shall be NSF-listed and joined by the Enfield Enfusion method incorporating molded-in-place nickel chrome wire, or all plastic construction mechanical joint fittings incorporating anti pull-out collars (olives) to ensure against accidental pipe-fitting separation during and after installation. Installation and testing of the Neutrasystem 2 shall be in accordance with the contract drawings, the manufacturer's recommendations and the local plumbing codes.

ENCASE™ DOUBLE CONTAINMENT ACID WASTE SYSTEMS

Encase Long Form

General

Acid waste double containment drain lines, as shown on drawings, shall be Encase, manufactured by IPEX, with no substitutions. Pipe and fittings shall be manufactured from Schedule 40 polypropylene and joined by the Enfusion method.

Material

Pipe, fittings, internal pipe supports and anchor plates shall be manufactured from Type 1 homopolymer or Type 2 copolymer polypropylene material as described in ASTM D 4101.

Pipe and Fittings – Construction

All pipe fittings shall be factory assembled and of unitized construction, with the primary and secondary components integrally anchored together to prevent movement of the primary pipe/fitting within the containment pipe/fitting. All piping components shall be manufactured to Schedule 40 dimensions. The primary pipe shall be adequately supported by means of support plates welded to the primary pipe. Anchor plates shall be provided at each end of the pipe/fitting section to restrain pipe expansion. All anchor plates must be mechanically located in a machined recess on the inside of each secondary pipe/fitting and welded to both the primary and secondary pipe/fitting sections.

Factory Welded Joints

All factory joints shall be made either by butt fusion or Enfusion. Joining by means of fillet welding is expressly forbidden.

Site Joints

All site joints shall be made using Enfusion couplings, manufactured from polypropylene with a nickel/chrome

resistance wire, molded in place. Components with copper wire elements are prohibited. Solvent, butt-welded or fillet-welded site joints are also prohibited.

Installation

Installation shall be in accordance with the contract drawings, the manufacturer's recommendations and the local plumbing code. The entire installation shall be installed in proper alignment and free of stress.

Testing

The system shall be tested in accordance with the manufacturer's recommendations and the local plumbing code. The primary pipe shall be tested prior to making the secondary joints.

If Secondary pipe cannot be hydro-tested, as determined by the engineer or authority having jurisdiction, then the use of nitrogen or air at a MAXIMUM 5 psi (gauge) shall be allowed. It is imperative that a working-pressure regulator be used during the pneumatic test to ensure that over-pressurization of the PVC, beyond 5 psi, cannot occur. The following must also be noted: Air or nitrogen under pressure is compressed and therefore poses a potential hazard. If a failure of the pipe or fitting occurs during such test, the air exits at the failure point and expands rapidly. This increase in velocity can cause the system to fail in a catastrophic mode. Therefore during such air test all personnel involved in the test or present in the test surrounding area must be aware of such a possibility and take all necessary precautions. Precautions include, but are not limited to, taking extreme care not to impact or damage the system in any way.

Such procedure is a limited exception to IPEX standard policy which forbids the use of its rigid systems with any compressed gases.

Encase Short Form

Acid waste double containment drain lines shall be Encase, as manufactured by IPEX, with no substitutions. Pipe and fittings shall be manufactured from Schedule 40, ASTM D 4101 Type 1 homopolymer or Type 2 Copolymer polypropylene. Joining shall be made using Enfusion couplings and a nickel/chrome wire molded in place. All pipe fittings shall be factory assembled, with Enfusion, or butt fusion welds, and be of unitized construction, with primary and secondary components integrally anchored together to control expansion and contraction. All primary joints shall be pressure tested and inspected, in accordance with the manufacturer's instructions and any local plumbing codes, prior to making any secondary joints.

Contents of Pipe - Capacity per Foot of Pipe Length

Dia. in.	Dia. ft.	For 1 Foot Length	
		ft. ³	U.S. Gal.
1½	.1250	.0123	.0918
2	.1667	.0218	.1632
3	.2500	.0491	.3673
4	.3333	.0873	.6528
6	.5000	.1963	1.469
8	.6667	.3490	2.611
10	.8333	.5455	4.081
12	1.000	.7854	5.876

Volume

Volume of a pipe is computed by: $V = \frac{1}{4} ID^2 \times \pi \times L \times 12$

Where: V = volume (in cubic inches)
 ID = inside diameter (in inches)
 π = 3.14159
 L = length of pipe (in feet)

Pressure

1 psi = 2.31 ft of H₂O
 1 ft of H₂O = 0.43 psi

Decimal and Millimeter Equivalents of Fractions

Inches	Decimals	Millimeters	Inches	Decimals	Millimeters
1/64	.015625	.397	33/64	.515625	13.097
1/32	.03125	.794	17/32	.53125	13.494
3/64	.046875	1.191	35/64	.546875	13.891
1/16	.0625	1.588	9/16	.5625	14.288
5/64	.078125	1.984	37/64	.578125	14.684
3/32	.09375	2.381	19/32	.59375	15.081
7/64	.109375	2.778	39/64	.609375	15.478
1/8	.125	3.175	5/8	.625	15.875
9/64	.140625	3.572	41/64	.640625	16.272
5/32	.15625	3.969	21/32	.65625	16.669
11/64	.171875	4.366	43/64	.671875	17.066
3/16	.1875	4.763	11/16	.6875	17.463
13/64	.203125	5.159	45/64	.703125	17.859
7/32	.21875	5.556	23/32	.71875	18.256
15/64	.234375	5.953	47/64	.734375	18.653
1/4	.250	6.350	3/4	.750	19.050
17/64	.265625	6.747	49/64	.765625	19.447
9/32	.28125	7.144	25/32	.78125	19.844
19/64	.296875	7.541	51/64	.796875	20.241
5/16	.3125	7.938	13/16	.8125	20.638
21/64	.328125	8.334	53/64	.828125	21.034
11/32	.34375	8.731	27/32	.84375	21.431
23/64	.359375	9.128	55/64	.859375	21.828
3/8	.375	9.525	7/8	.875	22.225
25/64	.390625	9.922	57/64	.890625	22.622
13/32	.40625	10.319	29/32	.90625	23.019
27/64	.421875	10.716	59/64	.921875	23.416
7/16	.4375	11.113	15/16	.9375	23.813
29/64	.453125	11.509	61/64	.953125	24.209
15/32	.46875	11.906	31/32	.96875	24.606
31/64	.484375	12.303	63/64	.984375	25.003
1/2	.500	12.700	1	1.000	25.400

CONVERSION CHARTS

Temperature Conversion

°F	°C	°F	°C	°F	°C	°F	°C	°F	°C
-459.4	-273	1	-17.2	61	16.1	300	149	900	482
-450	-268	2	-16.7	62	16.7	310	154	910	488
-440	-262	3	-16.1	63	17.2	320	160	920	493
-430	-257	4	-15.6	64	17.8	330	166	930	499
-420	-251	5	-15.0	65	18.3	340	171	940	504
-410	-246	6	-14.4	66	18.9	350	177	950	510
-400	-240	7	-13.9	67	19.4	360	182	960	516
-390	-234	8	-13.3	68	20.0	370	188	970	521
-380	-229	9	-12.8	69	20.6	380	193	980	527
-370	-223	10	-12.2	70	21.1	390	199	990	532
-360	-218	11	-11.7	71	21.7	400	204	1000	538
-350	-212	12	-11.1	72	22.2	410	210	1020	549
-340	-207	13	-10.6	73	22.8	420	215	1040	560
-330	-201	14	-10.0	74	23.3	430	221	1060	571
-320	-196	15	-9.4	75	23.9	440	227	1080	582
-310	-190	16	-8.9	76	24.4	450	232	1100	593
-300	-184	17	-8.3	77	25.0	460	238	1120	604
-290	-179	18	-7.8	78	25.6	470	243	1140	616
-280	-173	19	-7.2	79	26.1	480	249	1160	627
-273	-169	20	-6.7	80	26.7	490	254	1180	638
-270	-168	21	-6.1	81	27.2	500	260	1200	649
-260	-162	22	-5.6	82	27.8	510	266	1220	660
-250	-157	23	-5.0	83	28.3	520	271	1240	671
-240	-151	24	-4.4	84	28.9	530	277	1260	682
-230	-146	25	-3.9	85	29.4	540	282	1280	693
-220	-140	26	-3.3	86	30.0	550	288	1300	704
-210	-134	27	-2.8	87	30.6	560	293	1350	732
-200	-129	28	-2.2	88	31.1	570	299	1400	760
-190	-123	29	-1.7	89	31.7	580	304	1450	788
-180	-118	30	-1.1	90	32.2	590	310	1500	816
-170	-112	31	-0.6	91	32.8	600	316	1550	843
-160	-107	32	0.0	92	33.3	610	321	1600	871
-150	-101	33	0.6	93	33.9	620	327	1650	899
-140	-96	34	1.1	94	34.4	630	332	1700	927
-130	-90	35	1.7	95	35.0	640	338	1750	954
-120	-84	36	2.2	96	35.6	650	343	1800	982
-110	-79	37	2.8	97	36.1	660	349	1850	1010
-100	-73	38	3.3	98	36.7	670	354	1900	1038
-90	-68	39	3.9	99	37.2	680	360	1950	1066
-80	-62	40	4.4	100	37.8	690	366	2000	1093
-70	-57	41	5.0	110	43	700	371	2050	1121
-60	-51	42	5.6	120	49	710	377	2100	1149
-50	-46	43	6.1	130	54	720	382	2150	1177
-40	-40	44	6.7	140	60	730	388	2200	1204
-30	-34	45	7.2	150	66	740	393	2250	1232
-20	-29	46	7.8	160	71	750	399	2300	1260
-10	-23	47	8.3	170	77	760	404	2350	1288
0	-17.8	48	8.9	180	82	770	410	2400	1316
		49	9.4	190	88	780	416	2450	1343
		50	10.0	200	92	790	421	2500	1371
		51	10.6	210	99	800	427	2550	1399
		52	11.1	212	100	810	432	2600	1427
		53	11.7	220	104	820	438	2650	1454
		54	12.2	230	110	830	443	2700	1482
		55	12.8	240	116	840	449	2750	1510
		56	13.3	250	121	850	454	2800	1538
		57	13.9	260	127	860	460	2850	1566
		58	14.4	270	132	870	466	2900	1593
		59	15.0	280	138	880	471	2950	1621
		60	15.6	290	143	890	477	3000	1649

The following formulas may also be used for converting Celsius or Fahrenheit degrees into the other scales.

Degrees Celsius °C = $\frac{5}{9}$ (°F - 32)

Degrees Fahr. °F = $\frac{9}{5}$ °C + 32

Degrees Kelvin °T = °C + 273.2

Degrees Rankine °R = °F + 459.7

IPEX continually expands and updates its library of Industrial Technical Publications.

To reserve a complimentary copy of one of our Industrial Technical Manuals or Guides listed below, fax this completed form to (905) 403-1124.

Name	
Title	Dept.
Company	
Address	
City	State/Province
ZIP/Postal code	Phone
Fax	E-mail

Company classification

- Distributor
- Consulting Engineer
- Contractor
- OEM – Products manufactured: _____
- Inspector
- Government

SIC or industry sector: _____

In addition to our Acid Waste Piping Systems manual, IPEX produces a number of other technical manuals. Please select the items you would like to receive.

- Volume I: Vinyl Process Piping Systems
- Volume II: Corzan® CPVC & Xirtec®140 PVC Dimensional Data & Weights
- Volume IV: Duraplus ABS Industrial Piping System
- Volume V: Duraplus Air-Line Product Manual
- Volume VI: Double Containment Piping Systems
- Volume VII: Compressed Air and Inert Gas Piping Systems
- Volume VIII: Enpure™ High Purity Polypropylene System
- Volume IX: Quarter Turn Automation
- Volume X: Socket Fusion Polypropylene System
- Volume XI: Thermoplastic Valves
- Chemical Resistance Guide

Please add me to the mailing list for IPEX's Pipeline Newsletter and other new Industrial product announcements.

NOTES

NOTES

SALES AND CUSTOMER SERVICE

Canadian Customers call

Toll free: (866) 473-9462

U.S. Customers call

Toll free: (800) 463-9572

www.ipexinc.com

About IPEX

IPEX is a leading supplier of thermoplastic piping systems. We provide our customers with one of the world's largest and most comprehensive product lines. All IPEX products are backed by over 50 years of experience. With state-of-the-art manufacturing facilities and distribution centers across North America, the IPEX name is synonymous with quality and performance.

Our products and systems have been designed for a broad range of customers and markets. Contact us for information on:

- PVC, CPVC, PP, ABS, PEX, FR-PVDF and PE pipe and fittings (1/4" to 48")
- Industrial process piping systems
- Double containment systems
- Acid waste systems
- High purity systems
- Industrial, plumbing and electrical cements
- Municipal pressure and gravity piping systems
- PE Electrofusion systems for gas and water
- Plumbing and mechanical pipe systems
- Electrical systems
- Telecommunication systems
- Irrigation systems
- Radiant heating systems

WARRANTY: All of the Company's Products are guaranteed against defects resulting from faulty workmanship or materials. The Company will replace, free of charge, including shipping charges for the replacement Products, any Products which are found to be defective in workmanship or material, provided that the following conditions are met:

- a) the Company is promptly notified in writing of such defect immediately upon discovery of same, and the defective Product is promptly returned to the Company;
- b) the defect is not due, without limitation, to faulty installation, misalignment of Products, vibration, ordinary wear and tear, corrosion, erosion, U.V. degradation, incompatible lubricants, pastes and thread sealants, unusual pressure surges or pulsation, water hammer, temperature shocking, or fouling; and
- c) the Products have not been altered or modified after leaving the Company's premises.

The warranty period can be specifically limited for certain Products as stated in writing in the Company's literature.

The Company will not allow claims for labor, materials and/or other expenses required to replace the defective Product, or to repair any damage resulting from the use thereof. The Company disclaims any responsibility for the Purchaser's calculations, product drawings or engineering design specifications. The Company's liability is limited to the purchase price applicable to the product.

It is agreed and understood that the Company's liability in respect to the sale is strictly limited to the replacement of Products as hereinbefore specified and that the Company shall not, in any event, be liable for any damages whether for the loss of use or business interruption or any other claim for incidental, consequential, special or punitive damages. There is no warranty, condition or representation of any nature whatsoever, expressed or implied, by statute or otherwise, except as herein contained, and the Company disclaims any implied warranties of merchantability and/or fitness of its Products for a special purpose.

This literature is published in good faith and is believed to be reliable. However, IPEX does not represent and/or warrant in any manner the information and suggestions contained in this brochure. Data presented is the result of laboratory tests and field experience.

IPEX maintains a policy of ongoing product improvement. This may result in modification of features and/or specifications without notice.



IPEX

MNINAWIP060502 © 2006 IPEX IND003UC