



HIGH COUNTRY FUSION C O M P A N Y I N C

Manufacturing & Distribution

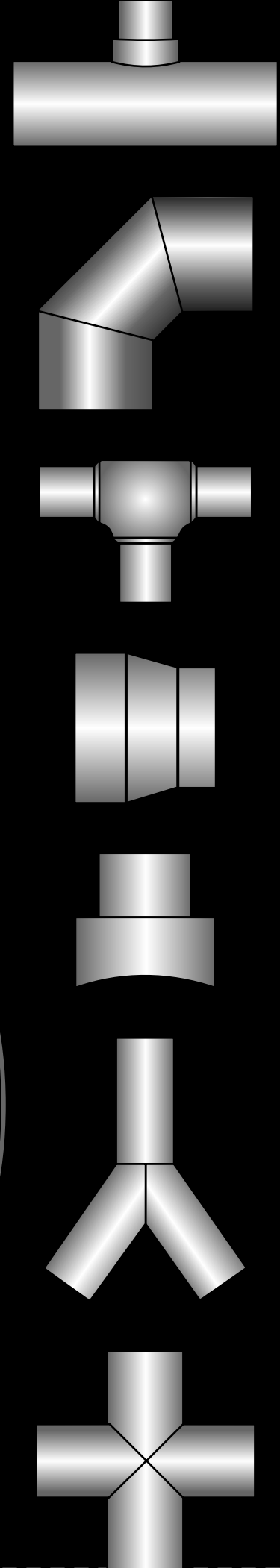
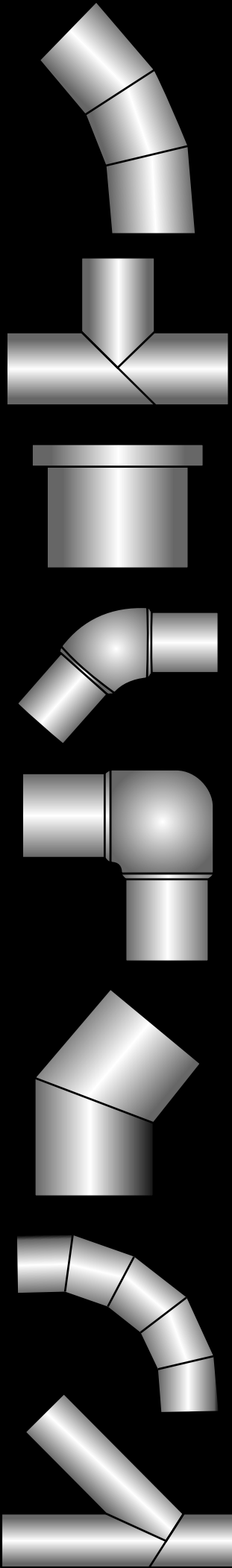
of

Standard & Custom HDPE Fittings & Pipe

**Authorized McElroy Repair Center
Rental & Sales of
Fusion Machines and Parts**

Phone: 800-780-6330 Fax: 208-764-2094

www.hcfusion.com





"The Perfect Fit" Company

HIGH COUNTRY FUSION (HCF), "The Perfect Fit" Company is devoted to fitting your **HDPE** wants and needs.

HCF has total piping system solutions that customers can count on. From design assistance and product selection, to shipping and job-site technical support, **HCF** delivers consistent performance, products and service, with more than 50 years' experience in the industry.

HCF is a leading supplier of High Density Polyethylene Pipe (**PE**), molded and fabricated fittings, and the rental, repair, or sale of fusion equipment to put it all together. Our capabilities range from ½" to 120" in IPS, DIPS or metric sizes. **HDPE** is the world's answer to reducing current environmental impact, it is fully recyclable and a "Green" product.

HCF offers experience backed technical support from engineer to end user, through years of practical shop, field experience and industry involvement.

HCF is actively involved with **PPI (Plastic Pipe Institute)** in promotion and development of **HDPE** pipe products and is a charter member of the Alliance for PE Pipe.

HCF'S FAIRFIELD, ID 26,000 sq. ft. Headquarters and manufacturing facility and 10 acre storage yard is tailored to warehousing, fabrication of **HDPE** fittings, and perforating of pipe. This branch also stocks a full line of McElroy Fusion Machines for Rental or sales, is an Authorized Service Center.

HCF'S SALT LAKE CITY, UT 12,000 sq. ft. warehouse and pipe yard, stocks most fittings you need for any project. This branch also has a full line of McElroy Fusion Machines for rentals or sales and is an Authorized Service Center.

HCF'S DICKINSON, ND 7,500 sq. ft. warehouse and pipe yard, stocks most fittings you need for any project. This branch also has a full line of McElroy Fusion Machines for rentals or sales and is an Authorized Service Center.

HCF'S quality lines include:

- *PE Pipe (PE 3608/3408, PE4710, PE 2708/2406)
- *Special Fabrications & Headers
- *Fabricated Fittings
- *Molded Fittings
- *Dual Containment & Perforated Pipe

- *Manholes
- *Generators
- *Repairs of Fusion Equipment
- *Field Technical Services
- *McElroy Fusion Equipment

Primary Markets served for HDPE Products:

- *Municipal Water & Sewer
- *Industrial Applications
- *Irrigation Water
- *Mining Applications
- *Golf Course
- *Landfill

- *Horizontal and Directional Drilling
- *Pipe Bursting
- *Sliplining-sewer and water
- *Landfill-leachate and methane recovery
- *Gas-collection and distribution
- *Aquaculture

INFORMATION

Terms and Conditions	i
Warranty Info	ii
Credit Application	iii

HDPE PIPE

HDPE Pipe Design & Info section marker	A
Recommended Testing Procedures	A-1
Effects of Temperature	A-3
Converting to Metric Sizes	A-4
De-Rating of Pipe Fittings	A-5
Specifications for Fabricated Fittings	A-7
Hazen-Williams Coefficient	A-9
<i>Gas Pipe Physical Properties P2708/2406</i>	
<i>Physical Properties P3408/3608 & P4710</i>	
<i>Pipe Dimensions, WPR and Weights</i>	
<i>Field Bending of PE Pipe</i>	
<i>FAQ's - Municipal - Water/Wastewater</i>	
<i>MSDS</i>	
<i>Shipping Data</i>	

ELBOWS

Elbow Style and Design section Marker	B
Molded 90 Degree Elbows IPS and DIPS	B-1
Molded 45 Degree Elbows IPS and DIPS	B-3
Long Sweep 90 and 45 Degree Elbows IPS	B-5
Fabricated 90 Degree Sweep Elbows IPS and DIPS	B-6
Fabricated 3 Segment 90 Degree Elbows IPS and DIPS	B-8
Fabricated 45 Degree Sweep Elbows IPS and DIPS	B-10
Fabricated 2 Piece 45 Degree Elbows IPS and DIPS	B-12
Fabricated 22½ Degree Elbows IPS and DIPS	B-14

END CAPS

End Cap Style and Design section marker	C
Molded End Caps IPS	C-1
Machined End Caps IPS and DIPS	C-2

FLANGE ADAPTERS AND STUB ENDS

<u>Flange Adapter</u> Style and Design section marker	D
Molded / Machined Flange Adapters IPS and DIPS	D-1
Stub Ends IPS and DIPS	D-3
MJ Adapters with Kit	D-4
Mechanical Joint Gland and Accessory Pack	D-5
<u>Back Up Rings</u> Style and Design	D-7
Ductile Iron Back Up Rings IPS and DIPS	D-8
Stainless Steel Back Up Rings IPS	D-11
Steel Blind Flanges IPS and DIPS	D-13
HDPE Blind Flanges IPS and DIPS	D-14

BUTTERFLY VALVE SPACERS

Butterfly Valve Spacer Style and Design section marker	E
Butterfly Valve Spacers IPS and DIPS	E-1

REDUCER COMPONENTS

Reducer Components Style and Design section marker	F
Concentric Reducers IPS and DIPS	F-1

WALL ANCHORS AND WATER STOPS

TEES

CROSSES

BRANCH SADDLES

WYES

TRANSITION FITTINGS

PARTNER BROCHURES AND OTHER INFORMATION

FUSION EQUIPMENT

TECHNICAL NOTES

HDPE PIPE & COMPARISON PIPES

Wall Anchor Style and Design section marker	G
Wall Anchor IPS	G-1
Water Stops IPS	G-2
Tee Style and Design section marker	H
Molded Tees IPS and DIPS	H-1
Fabricated Tees IPS and DIPS	H-3
Fabricated Reducing Branch Saddle Tees IPS and DIPS	H-5
Concentric Reducing Tees IPS	H-7
Cross Style and Design section Marker	I
Cross IPS and DIPS	I-1
Branch Saddle Style and Design section marker	J
Branch Saddles IPS and DIPS	J-1
Wye Style and Design section marker	K
Fabricated 45 Degree Wyes IPS and DIPS	K-1
Transition Fittings Style and Design section marker	L
Standard MPT and FPT IPS	L-1
HDPE to PVC Transition IPS	L-2
Standard Cut Groove Coupling IPS	L-3
Reinforced Pulling Head section marker	L-4
Steel Reinforced Pulling Head IPS	L-5
Carbon Steel Pulling Head IPS	L-6
Electrofusion Section Marker	M
<i>Georg Fischer / Central Plastics Brochure</i>	
<i>Iplex Brochure</i>	
Ball Valves & Compression Fittings section marker	N-1
Compression Bolt on Saddles	N-2
<i>Cepex Brochure</i>	
<i>Floplast Brochure</i>	
<i>Lyall Polytec Brochure</i>	
<i>Pigs Unlimited International</i>	
<i>Mustang Squeeze tools</i>	
McElroy Fusion Equipment Section Marker	O
McElroy Fusion Equipment Highlights	O-1
Additional Equipment Accessories	O-3
<i>Fast Fusion</i>	O-5
Equipment Repairs	O-7
Rental Information	O-9
Fusion Technique	O-15
<i>McElroy Certified Rental Equipment Brochure</i>	
<i>McElroy Equipment Brochure</i>	
Technical Notes Section Marker	P
HDPE Pipe & Comparison Pipes Section Marker	Q

TERMS & CONDITIONS OF SALE

F.O.B is point of shipment unless otherwise noted. If F.O.B job site, that job site must be legally and physical accessible to the interstate freight carriers operating under ICC regulations. Method and carrier to be under **HCFC** option. Unloading shall be by consignee upon delivery. Payment terms are net 30 days from date of invoice unless otherwise stated.

ERRORS AND OMISSIONS

Any quote, and any other suggested maintenance and installation instructions are only **SUGGESTIONS FOR CONSIDERATION**, and **HCFC** makes no representation or warranties concerning their use or accuracy. Any of the instructions may not be suitable in some areas because of local trade practices, weather conditions or construction of landscape methods. Therefore, instructions should be used only with the independent approval of technically qualified persons. Clerical errors and omissions are subject to correction, and an independent take off of the bid documents, to verify count and correctness of product is strongly advised.

DELAY IN MANUFACTURING

HCFC will not be held responsible for any loss caused by delays in manufacturing or subsequent shipping delays from our suppliers. The delivery date noted is based on current production schedules. Actual delivery dates must be confirmed at time of order.

ADDITIONAL CHARGES

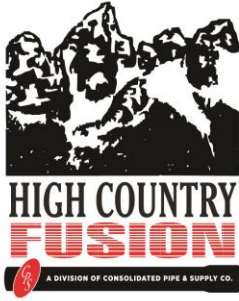
Regardless of Manufacturer, no charges for labor or expenses required to repair defective goods or instances occasioned by them will be allowed. If goods are defective, in the judgment of the manufacturer, the measure of the damage is limited to the price of the defective goods only.

CLAIMS FOR SHORTAGES/RETURN GOODS/WARRANTIES OF PRODUCT

Claims for shortages will not be allowed unless presented within ten (10) days after receipt of shipment.

No goods may be returned without prior approval. A restocking fee may be applied to returned product and will be determined at the point of return. Orders once entered, including those for special goods, cannot be cancelled, except with **HCFC's** written consent and upon terms that will indemnify us against any loss. All special order items/ non-stock items are non returnable.

Any warranties made by the manufacturer of the products sold by **HCFC** are those of the manufacturer only. **HCFC IS NOT A PARTY TO AND WILL NOT BE HELD LIABLE FOR THE MANUFACTURER'S EXPRESSED OR IMPLIED WARRANTIES.**



HIGH COUNTRY FUSION, A DIVISION OF
CONSOLIDATED PIPE & SUPPLY COMPANY, INC.
20 N. POLY FUSION PLACE
PO BOX 509
FAIRFIELD, IDAHO 83327
PHONE: 800-780-6330 FAX: 208-764-2094

2019

Technical data provided on our website and in our catalog is provided in good faith. Every effort has been made to provide accurate and up to date information. Please be aware that our fabrication team and our suppliers change specifications as they deem necessary.

High Country Fusion reserves the right to change specifications without notice. Our processes are under review as we strive to improve our products, lower our costs and improve prices. As our supplier's specifications change, we will make every effort to update our website. The printed catalog reference material will be updated only when major revisions are required. Please view our website (www.HighCountryFusion.com) for the most accurate and up to date information available.

High Country Fusion accepts no responsibility for inaccurate technical information gathered from either our website or printed catalog. For geometrically critical applications, we recommend you contact us with your specification for product verification.

Limited Warranty- HCFC warrants to the Customer (the original purchaser) for a period of one year from the date of purchase of the Materials that the Materials shall be free from defects in materials and workmanship and that the use or sale of the Materials will not infringe on the claims of any United States patent covering the Materials themselves. HCFC does not warrant against infringement by reason of the use thereof in combination with other material or in the process of manufacturing any other product.

Warranty Disclaimer- The warranty stated herein is expressly in lieu of any other expressed or implied warranty, conditional representation or guarantee given by HCFC or any other person on behalf of HCFC with respect to any of the Materials, including any implied warranty or merchantability or fitness for a particular purpose. Any implied warranty of merchantability or fitness covering consumer products is limited to the one year duration of the written warranty. There are no warranties or representations other than those as stated herein.

End User- Technical Advice. The Customer may consult HCFC's Engineering Department for information regarding installation, joining, derating and testing of the Materials. HCFC will furnish such technical advice at no cost and at Customer's risk. The Customer's reliance upon HCFC's advice regarding the Customer's application of the Materials shall in no way be construed to expand HCFC's limited warranty set forth above or limited or otherwise affect its warranty disclaimer set forth above.

Defective Materials- The Customer shall inspect all materials within 10 days from date of delivery to determine if the Materials conform to specifications or are defective in workmanship or materials. Unless the Customer notifies HCFC in writing within said period to the contrary, the Customer shall be deemed to have accepted the Materials for all purposes. Any rejection by the Customer shall be in writing, and HCFC shall have the right to determine whether the Materials are defective; HCFC's decision shall be final. No Materials shall be returned to HCFC without HCFC's permission. Upon a valid rejection of Materials, HCFC shall, at its option, replace or repair such defective Materials.

HCFC Liability- HCFC's liability on every claim of any kind, including negligence, for any loss or damage arising out of, connected with, or resulting from the manufacture, sale, delivery, resale, repair or use of the Materials purchased hereunder shall in no event exceed the price of the defective Material. Under no circumstances shall HCFC be liable for any special or consequential damages, including loss of use, and the remedy herein provided shall be the exclusive and sole remedy of the Customer. The Customer shall indemnify, defend and hold HCFC harmless from and against any claims, losses, expenses, cost, obligations and liabilities arising or resulting from damage to property or injury or death to third parties caused by, or relating to the Customer's installation of the Materials in, or affixing the Materials to, other goods, or the Customer's incorporation of the Materials into any other product.

Specially Manufactured Materials- If the Customer's purchase order is suspended or terminated for any reason, the Customer shall take delivery of and make payment for any specially Manufactured Materials which are completed or in process on the date HCFC receives such notice, provided, however, if the Customer does not accept delivery, such Specially Manufactured Materials shall be stored at the Customer's expense and the Customer shall make payment as though delivery had been made to the Customer. As used in this paragraph, "Specially Manufactured Materials" shall mean any materials ordered by the Customer which are not specifically listed in HCFC sales literature.



High Country Fusion

A Division of Consolidated Pipe & Supply Company

P.O. Box 509

Fairfield, ID 83327

208-764-2000 (main)

800-780-6330

208-764-2094 (main fax)

Accounting department

accounting@highcountryfusion.com

801-433-4840 (accounting fax)

Credit Application

At High Country Fusion we look forward to doing business with you. To make your credit application process quicker please be sure to complete or include the following:

- Reference the High Country Fusion rep with whom you are working
- Include your Accounts payable contact name, Email, & phone if direct is available
- Note the credit limit you are requesting
- Provide at least Four Credit references
- Complete the W9 and return with your application
- If tax exempt, please mark and include your exemption certificate(s)
- Sign and Date all pages where noted
- Email to accounting@highcountryfusion.com



High Country Fusion
A Division of Consolidated Pipe & Supply Co., Inc.
P.O. Box 509 Fairfield, ID 83327
Phone (208)764-2000 Fax (801)433-4840



CUSTOMER APPLICATION FOR CREDIT

Email to: hcfccountinggroup@hcfusion.com

HCF Sales Rep _____

Date: _____

Bill To Name: _____

Physical Address	Billing Address
Street Address: _____	PO Box: _____ City: _____
_____	State: _____ Zip: _____
City: _____ State: _____	Phone (____) _____ Fax: (____) _____
Zip: _____	Do you prefer email invoicing? ____ Yes ____ No
Phone: (____) _____ Fax: (____) _____	Invoicing Email Address: _____

Type of Entity: ____ Corporation ____ LLC ____ Partnership ____ Sole Proprietor ____ Government

If Corporation or LLC: Subsidiary _____ or Division _____ Fed Tax ID # _____

Parent Company: _____ Street Address: _____

City: _____ State: _____ Zip: _____ Phone: (____) _____

Date Incorporated: _____ Company Officer Name & Title: _____

If Partnership:

General Partner: _____ Address: _____
(Home address for individual)

City: _____ State: _____ Zip: _____ Phone: (____) _____

Social Security No. or Federal Tax Identification No.: _____

Name, Address, and Phone No. of Each Additional General Partner:

1. _____

2. _____

3. _____

If Sole Proprietorship:

Owner's Name: _____ Home Address: _____

City: _____ State: _____ Zip: _____ Phone: (____) _____

Social Security No.: _____ Driver License No.: _____

Amount of Time in Business: _____ Sales Tax Status: Taxable ____ Non-Taxable ____
(if Non-Taxable a copy of all applicable sales tax exemption
certificates are required in our files or sales taxes will be added)

Credit Limit Requested \$ _____

Accts. Pay Contact Name: _____ Accts. Pay Email Address: _____

(OVER)

Bank Ref: _____ Street Add: _____ City: _____ State: _____ Zip: _____ Phone: _____ Fax: _____ Contact: _____ Acct. No. : _____	Trade Ref: _____ Street Add: _____ City: _____ State: _____ Zip: _____ Phone: _____ Fax: _____ Contact: _____ Acct. No. : _____
Trade Ref: _____ Street Add: _____ City: _____ State: _____ Zip: _____ Phone: _____ Fax: _____ Contact: _____ Acct. No. : _____	Trade Ref: _____ Street Add: _____ City: _____ State: _____ Zip: _____ Phone: _____ Fax: _____ Contact: _____ Acct. No. : _____

General Provisions

This application and the information contained herein is a request for extension of credit to Buyer. Buyer and each Guarantor hereby authorize Seller to conduct current and ongoing credit inquiries and to investigate the credit history of Buyer and each Guarantor as Seller deems necessary. Buyer and each Guarantor authorize any bank or commercial business with whom Buyer or any Guarantor is doing or has done business to release any credit information to Seller to assist in Seller's credit investigations. Buyer and each Guarantor acknowledge and agree that Seller may refuse future extensions of credit if Buyer fails to comply with the terms or conditions of sale. Buyer agrees that Seller may provide credit information about Buyer or any Guarantor to its lenders.

Service Charges & Returned Check Charge Agreement

Applicant agrees that all accounts shall be due within thirty (30) days after invoice, unless otherwise specified and all past due invoices will bear interest on the unpaid balance at the rate of 1½% per month or the maximum allowed by law, whichever is less. Applicant agrees to pay all costs of collection of any overdue amount including reasonable attorney's fees, expenses, plus any court costs. Interest charges are assessed on the last day of each month. A \$28.00 fee will be added for each returned check.

Unconditional Guaranty

Each Guarantor, unconditionally, jointly, severally and personally, guarantees to Seller the due and punctual payment of all sums due from Buyer, when and as the same shall become due and payable, including, without limitation, interest or service charges, costs of collection, reasonable attorney's fees and expenses, and court costs. This guaranty is an absolute, unconditional, irrevocable and present guaranty of payment (and not of collectability) and is not conditioned on (1) any attempt to collect from the Buyer; or (2) the exercise of any other rights, powers or remedies Seller may have against Buyer or any other Guarantor; or (3) resort to any materials sold; or (4) whether any of the obligations of Buyer are enforceable against Buyer (including whether any interest and charges accruing after the filing of a petition in bankruptcy may be enforceable); or (5) any other action, occurrence or circumstance whatsoever. THIS IS A CONTINUING GUARANTY OF ALL PRESENT AND FUTURE INDEBTEDNESSES OF BUYER TO SELLER INCURRED, CONTRACTED OR ARISING PRIOR TO THE TERMINATION OF THIS GUARANTY BY WRITTEN NOTICE FROM GUARANTOR. Even after any termination, Guarantor shall remain liable as to all indebtedness then outstanding, together with any interest, costs of collection (including reasonable attorney's fees) and other charges with respect to any of the same. Each Guarantor unconditionally waives all notices required by statute, rule of law or otherwise to preserve any rights against Guarantor hereunder, including any demand, proof or notice of non-payment of any obligation by Buyer or any other Guarantor and any requirement that Buyer or any other Guarantor be joined as a party to any proceeding for the enforcement of any provision of an invoice or any credit document or any requirement to mitigate damages on the part of Seller.

AUTHORIZED REPRESENTATIVE

Company: _____

 Print Name: _____
 (Must be Owner, Officer, or Authorized Representative)

 Signature: _____ Date: _____

 Position: _____

GUARANTORS

Print Name: _____

 Signature: _____ Date: _____

 Print Name: _____

 Signature: _____ Date: _____

CONSOLIDATED PIPE & SUPPLY COMPANY, INC.
GENERAL TERMS AND CONDITIONS OF SALE

1. ENTIRE AGREEMENT. Consolidated Pipe & Supply Company, Inc. and each of its divisions and subsidiaries ("Seller"), agrees to sell the goods covered herein and hereby (the "Goods") to Buyer on the following terms and conditions of sale ("Terms and Conditions"). Acceptance of orders, whether oral or written, and/or delivery to Buyer is based on the express condition that Buyer agrees to Seller's General Terms and Conditions of Sale. Terms and conditions contained in the purchase order issued by Seller to Buyer shall supplement and govern over these Terms and Conditions, to the extent that these Terms and Conditions hereunder are silent or inconsistent with the purchase order, and are specifically incorporated by reference herein. Buyer and Seller expressly agree that Seller may modify these Terms and Conditions from time to time without notice, and such modifications shall be binding upon Buyer. Accordingly, each request for quote, order, acceptance of Goods and/or payment to Seller by Buyer shall be deemed an acknowledgment and acceptance by Buyer of these Terms and Conditions as then in effect. These Terms and Conditions, as may be subsequently modified by Seller from time to time without notice, are incorporated by reference into all documents issued by Seller to Buyer in connection with the sale and/or provision of Goods; provided, however, that these Terms and Conditions shall only apply to the sale of Goods by Seller in or to locations within the United States.

2. QUOTATIONS. Where this Agreement is used by Seller to place a bid, the quotation stated herein is for prompt acceptance and Seller may change and/or withdraw without notice. Buyer's prompt acceptance of all quotations, within thirty (30) days of the date of issuance, is a material term of the bid and any subsequent agreement.

3. ACCEPTANCE. The Seller's quote for the sale of goods provided to Buyer, which is subject to these Terms and Conditions, shall not become a contract, or be binding on Seller, unless such quote is agreed upon by the home office of Consolidated Pipe & Supply Company, Inc. in Birmingham, Alabama, through a writing signed by an authorized representative of Seller at such home office.

4. DELIVERY. All prices are based upon shipment using F.O.B. Origin, unless otherwise specified by Seller in writing. Any time period indicated for a shipment will not commence until receipt at Seller's facility of complete shipping and credit information. Acceptance of shipment by designated shipper, allocation of the Goods to Buyer at premises other than Seller's, delivery to Buyer's representative or designee or mailing of an invoice to Buyer, whichever first occurs, will constitute tender of delivery and title will pass to Buyer, subject to Seller's right of stoppage in transit and to any interest of Seller reserved to secure Buyer's payment or performance, irrespective of any freight allowance or prepayment of freight. In the case of Goods held subject to Buyer's instructions, Goods for which Buyer has failed to supply shipping instructions or in any case where Seller, in its sole discretion, determines any part of the Goods should be held for Buyer's account, Seller may invoice the Goods and Buyer agrees to make payment at the maturity of the invoice rendered. Goods invoiced and held at any location for whatever reason will be at Buyer's risk and Seller may charge for (but is not obligated to carry) insurance, storage and other expenses incident to such delay at its prevailing rates. When Buyer has declared or manifested an intention not to accept delivery, no tender will be necessary, but Seller may, at its option, give written notice to Buyer that Seller is ready and willing to deliver and such notice will constitute a valid tender of delivery. Buyer must report any shortages or defects as to a shipment within ten (10) days of receipt of such shipment.

5. LOSS OR DAMAGE IN TRANSIT. Buyer may not make any deduction from any payment due hereunder by reason of loss or damage to the Goods in transit. Upon Buyer's written request, Seller, in its sole discretion, may agree as a service to Buyer to process Buyer's claim against the carrier for any loss or damage in transit, provided that Seller receives such claim within five (5) days of delivery of the Goods. Any such claims must be accompanied by a delivery receipt, signed by carrier's agent at time of delivery, or such claims will be waived. Claims for material damaged during shipment by common carrier must be made within the time for claims specified by the common carrier used, or such claims are waived. If material is delivered by Seller, claims for materials damaged during shipment must be made within ten (10) days of delivery, or such claims are waived.

6. TERMS OF PAYMENT. Unless otherwise agreed, payments are due net thirty (30) days. If, at any time or for any reason, Seller has cause to question Buyer's ability to perform, Seller may demand such assurances of Buyer's performance as Seller deems necessary in its sole discretion, including payment in advance for all shipments. If Buyer fails within ten (10) days of Seller's demand to provide Seller with such assurance, Seller may suspend its performance, cancel any order then outstanding, receive reimbursement for its reasonable and proper cancellation charges and collect, without limitation, any sums due and owing, reasonable cancellation charges and all damages resulting from Buyer's default. In the event of Buyer's bankruptcy or insolvency, or in the event of any proceeding brought against Buyer, voluntarily or involuntarily, under bankruptcy or any insolvency laws, Seller may cancel any order then outstanding at any time and receive reimbursement for its reasonable and proper cancellation charges. If Buyer fails to make payment for the Goods when due, Buyer's account will be deemed delinquent and Buyer will be liable to Seller for a service charge of eighteen percent (18%) per annum or the maximum allowed by law, whichever is less, on any unpaid amount. Buyer will be liable to Seller for all costs and expenses of collection, including court costs and reasonable attorneys' fees. A \$28.00 fee will be added to Buyer's account for each returned check.

CONSOLIDATED PIPE & SUPPLY COMPANY, INC.
GENERAL TERMS AND CONDITIONS OF SALE

7. CANCELLATION, CHANGES AND RETURNS.

A. Changes Required By Governmental Authority. If changes in the design of the Goods, or the method or requirements for transportation of the Goods are required due to changes in governmental (federal, state or local) requirements after the effective date of this Agreement, then an equitable adjustment shall be made in the price, terms of payment, delivery schedule and other pertinent provisions of this Agreement.

B. Changes Requested by Buyer. In the event of a proper cancellation of an order, change or return request from Buyer under this Agreement, Seller may, at its option: (A) charge Buyer for any costs Seller incurred prior to or as a result of such cancellation, change or return; (B) revise its prices and delivery dates to reflect such change; and/or (C) accept returned Goods for credit if, in Seller's sole discretion, it finds such Goods to be standard stock and in good condition. The credit will be, in Seller's sole discretion, either the invoice price less a percentage to be determined by Seller or the scrap value of the Goods, along with shipping and handling charges to be determined by Seller.

C. Return. All returned Goods must be securely packed by Buyer to ensure that the returned material is not damaged during shipment. There will be a twenty-five percent (25%) restocking fee charged to Buyer by Seller for all returned Goods. No credit will be given for returns of discontinued materials or Goods, for materials or Goods specially manufactured for Buyer, or for materials or Goods not purchased directly from Seller.

8. DELAY IN OR PREVENTION OF PERFORMANCE. Seller will not be liable for any expense, loss or damage resulting from delay in delivery or prevention of performance caused by any event beyond Seller's reasonable control (collectively, a "Force Majeure"), including without limitation: fire; flood; storm; act of God; strike, labor dispute or labor shortage; lack of or inability to obtain materials, fuels, supplies or equipment; civil unrest or riots; accident; transportation delay or shortage; act or failure to act of Buyer or any government; or any other cause whatsoever, provided that such cause is beyond Seller's reasonable control. Seller will have such additional time for performance as may be reasonably necessary under the circumstances and may adjust the price to reflect increases occasioned by Force Majeure. Buyer's acceptance of any Goods will constitute Buyer's waiver of any claim for damages on account of any delay in delivery of such Goods. If delivery is delayed or interrupted by Force Majeure, Seller may store the Goods at Buyer's expense and risk and charge Buyer a reasonable storage rate. If Seller is delayed because it is awaiting Buyer's approval or acceptance of designs, drawings, prints or engineering or technical data, or is awaiting Buyer's approval or acceptance of the Goods, Seller will be entitled to an adjustment in price commensurate with any increase in Seller's production costs and any other losses and expenses incurred by Seller attributable to such delays.

9. DEFERRED DELIVERY. If Buyer requests a deferred delivery on any order and Seller approves in writing, Seller may charge Buyer for the completed portion of the order and warehouse all completed Goods at Buyer's expense and risk of loss. As to any uncompleted portion of this Agreement, Seller may, at its option, cancel said uncompleted portion in accordance with Paragraph 7 or revise its prices and delivery schedules on the portion not completed to reflect its increased costs and expenses attributable to the delay.

10. WARRANTY AND BUYER'S REMEDIES. Seller agrees to pass on to Buyer the third-party manufacturer's warranty, if any, for all Goods manufactured by such third-party and sold by Seller, which may be a limited warranty. Seller's SOLE AND EXCLUSIVE WARRANTY to Buyer with respect to such Goods is that such Goods conform to the grade or type, size and quantity specified in the invoice to which these terms and conditions relate. Only with respect to Goods manufactured and/or fabricated by Seller, Seller warrants that the Goods will be of the kind described by Buyer's specifications and free from defects in material and workmanship under conditions of normal use for a period of one (1) year. Seller will not be liable or responsible, however, for (A) any defects attributed to normal wear and tear, corrosion, improper storage, use or maintenance or use of the Goods with incompatible products, (B) defects in or arising from the design and/or specifications provided by Buyer, or (C) any express or implied warranties against infringement of intellectual property rights of third parties. All warranties are void if the Goods are modified or used in conjunction with products or accessories which are incompatible with the Goods. Any claim by Buyer with reference to the Goods for any cause will be deemed waived by Buyer unless submitted to Seller in writing within ten (10) days from the date Buyer discovered any claimed breach. Buyer will give Seller an opportunity to investigate. Provided that Buyer furnishes prompt notice to Seller of any defect and an opportunity to inspect the alleged defect as provided herein, Seller will, at its option and in its sole discretion, either: (i) repair the defective or non-conforming Goods; (ii) replace nonconforming Goods, or part thereof, which are sent to Seller by Buyer within sixty (60) days after receipt of the Goods at Buyer's plant or storage facilities; or (iii) if Seller is unable or chooses not to repair or replace, return the purchase price that has been paid and cancel any obligation to pay unpaid portions of the purchase price of nonconforming Goods. In no event will any obligation to pay or refund exceed the purchase price actually paid. Repair and/or replacement as provided above will be shipped F.O.B Origin as agreed in writing by Seller. Buyer will prepay all transportation charges for return of the Goods or part thereof to Seller, unless otherwise agreed in writing by Seller. Seller will not be responsible for any labor, removal or installation charges that may result from the

CONSOLIDATED PIPE & SUPPLY COMPANY, INC.
GENERAL TERMS AND CONDITIONS OF SALE

above-described repair and/or replacement of any Goods. This warranty does not cover failure of any part or parts from external forces, including without limitation earthquake, installation, vandalism, impact or other Force Majeure. Buyer's exclusive remedy and Seller's sole liability for any loss, damage, injury or expense of any kind arising from the manufacture, delivery, sale, installation, use or shipment of the Goods, and whether based on contract, warranty, tort or any other basis of recovery whatsoever, will be, at Seller's election, the remedies described above. The foregoing is intended as a complete allocation of risks between the parties and Buyer understands that it will not be able to recover consequential damages even though it may suffer such damages in substantial amounts. Because this Agreement and the price paid reflect such allocation, this limitation will not have failed of its essential purpose even if it operates to bar recovery for such consequential damages. Seller assumes no responsibility whatsoever for its interpretation of plans or specifications provided by Buyer as to the Goods. Buyer's acceptance of the Goods must be premised on final approval by its own architects and engineers (and not on Seller's interpretation of plans or specifications).

11. LIMITATION OF LIABILITY. THE WARRANTIES IN PARAGRAPH 10 ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED BY LAW OR STATUTE OR ARISING FROM TRADE USAGE OR COURSE OF DEALING. IN NO EVENT, WHETHER AS A RESULT OF BREACH OF CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE) OR STRICT LIABILITY, WILL SELLER BE LIABLE FOR ANY PUNITIVE, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION LOSS OF PROFIT OR REVENUE, LOSS OF USE OF GOODS OR OTHER PROPERTY OR EQUIPMENT, DAMAGE TO OTHER PROPERTY, COST OF CAPITAL, LOSSES OR DAMAGES CAUSED BY REASON OF UNAVAILABILITY OF THE POWER SYSTEMS, PRODUCTION FACILITIES OR EQUIPMENT, FACILITY SHUTDOWNS OR SERVICE INTERRUPTIONS, COST OF SUBSTITUTE GOODS, DOWNTIME OR CLAIMS OF BUYER'S CUSTOMERS FOR ANY OF THE AFORESAID DAMAGES. SELLER WILL NOT BE LIABLE AND BUYER AGREES TO INDEMNIFY SELLER FOR ALL PERSONAL INJURY, PROPERTY DAMAGE OR OTHER LIABILITY RESULTING IN WHOLE OR IN PART FROM THE GOODS OR THE USE THEREOF (INCLUDING WITHOUT LIMITATION CLAIMS RELATED TO INTELLECTUAL PROPERTY RIGHTS), EXCEPT AS EXPRESSLY WARRANTED BY SELLER IN PARAGRAPH 10. NO CLAIMS OF ANY NATURE, WHETHER BASED ON CONTRACT, TORT, STRICT LIABILITY OR OTHERWISE, MAY BE BROUGHT AGAINST SELLER MORE THAN ONE (1) YEAR AFTER DELIVERY OF GOODS TO BUYER. In any contract by Buyer for resale of the Goods, Buyer effectively disclaims, as against Seller, any implied warranty of merchantability and all liability for property damage or personal injury resulting from the handling, possession or use of the Goods, and excludes, as against Seller, any liability for special or consequential damages.

12. CONTROLLING LAW AND CONSENT TO VENUE. This shall be governed by, and construed in accordance with, by the internal laws of the State of Alabama, without regard to its conflict of laws rules. Except when the dispute is arbitrated, the parties irrevocably agree that the exclusive venue for all disputes between the parties will be the state and federal courts located in Birmingham, Alabama, U.S.A. Buyer hereby irrevocably consents to jurisdiction in the state and federal courts in Birmingham, Alabama, U.S.A. Buyer waives any objection or defense that Buyer is not personally subject to the jurisdiction of the state and federal courts in Birmingham, Alabama, U.S.A.; that venue of the action is improper in the state and federal courts in Birmingham, Alabama, U.S.A.; and/or that the action, suit, or proceeding is brought in an inconvenient forum. In addition to any other mode of service of process authorized by law, Buyer consents to service of process by registered or certified mail.

13. COMPLIANCE WITH LAWS. Buyer represents and warrants, in connection with the transactions contemplated by this Agreement, and any other agreement contemplated by or entered into pursuant to this Agreement, (A) that Buyer will comply with all governmental laws, regulations and orders that may be applicable to Buyer, including without limitation all laws and regulations regarding export controls (including, but not limited to, 15 CFR Parts 730 et seq., 10 CFR Part 110, and 10 CFR Part 810), import controls, economic sanctions and trade embargoes, anti-boycott restrictions, anti-money laundering laws and anti-corruption laws, including without limitation the U.S. Foreign Corrupt Practices Act (as amended) and the United Kingdom Bribery Act, as amended (collectively, "Applicable International Trade and Anti-Corruption Laws"); and (B) to the extent Buyer owns or operates one or more facilities where the Goods will be installed and/or operated, that Buyer has established and implemented a quality assurance program consistent with its safety or quality classification meeting the applicable state or federal requirements related to quality control and quality assurance. Buyer will comply with all applicable Equal Employment Opportunity requirements including those set forth in Executive Order 11246 and the Vietnam Era Veterans Readjustment Assistance Act of 1974, and regulations promulgated thereunder. Buyer acknowledges and confirms that it and its officers, directors, employees, agents, contractors, designees and/or any other party acting on its behalf (collectively "Related Parties") are familiar with the provisions of Applicable International Trade and Anti-Corruption Laws. Buyer agrees to indemnify, defend and hold harmless Seller and its employees from and against any and all claims, demands, costs, penalties and fines arising in connection with any alleged breach by Buyer or any of its Related Parties of this Paragraph 13. Seller may terminate this Agreement in its entirety, without liability to Buyer, if Seller believes in good faith that Buyer or any of its Related Parties has violated or intends to violate this Paragraph 13.

CONSOLIDATED PIPE & SUPPLY COMPANY, INC.
GENERAL TERMS AND CONDITIONS OF SALE

14. ARBITRATION; DISPUTE RESOLUTION; PRESERVATION OF FORECLOSURE REMEDIES. All disputes, claims or controversies (individually or collectively, a "Dispute") between Seller and Buyer arising out of or relating to this Agreement, including without limitation Disputes based on or arising from an alleged tort, will be resolved by binding arbitration in accordance with Title 9 of the U.S. Code and the Commercial Arbitration Rules of the American Arbitration Association ("AAA"). Disputes will be arbitrated in Birmingham, Alabama, U.S.A. Defenses based on statutes of limitation and similar doctrines will be applicable in any such proceeding, and commencement of an arbitration proceeding under this Agreement will be deemed commencement of an action for such purposes. The parties will select arbitrators in accordance with the Commercial Arbitration Rules of the AAA. The AAA will designate a panel of ten potential arbitrators knowledgeable in the subject matter of the Dispute. Seller and Buyer will each designate, within thirty (30) days of receipt of the list of potential arbitrators, one of the potential arbitrators to serve, and the two arbitrators so designated will select a third arbitrator from the eight remaining candidates. Notwithstanding the foregoing, Seller reserves the right to resolve or bring any Dispute in a court of competent jurisdiction in accordance with Paragraph 12.

15. WAIVER. No waiver of any provision, right or remedy contained in this Agreement, including the terms of this Paragraph 15, is binding on, or effective against, Seller unless expressly set forth in writing and signed by Seller's authorized representative. Buyer expressly agrees that no right or remedy provided for in this Agreement can be waived through course of dealing, course of performance or trade usage. Buyer expressly agrees and acknowledges that reliance on any waiver without Seller's written consent is unreasonable. Waiver by Seller of any breach shall be limited to the specific breach so waived and shall not be construed as a waiver of any subsequent breach. Seller's approval or consent to any action proposed by Buyer will not be considered an agreement to the propriety, fitness or usefulness of the proposed action, and will not affect Buyer's obligation to strictly comply with this Agreement and all related orders.

16. ASSIGNMENT. Buyer may not assign this Agreement or any rights or obligations hereunder without Seller's prior written consent. Any attempted assignment in contravention of this Paragraph 16 is void. This Agreement, and the Terms and Conditions contained herein, are enforceable against Buyer's successors and permitted assigns.

17. TAXES. Seller's prices do not include sales, use, excise or other similar taxes. Consequently, in addition to the price specified herein, Buyer will pay the amount of any present or future such tax unless Buyer, at the time of sale, provides Seller with all tax-exemption certificates required by the taxing authorities.

18. CUMULATIVE NATURE OF REMEDIES. Seller's remedies in this Agreement are cumulative and in addition to any other remedies available to Seller, whether at law, equity or otherwise.

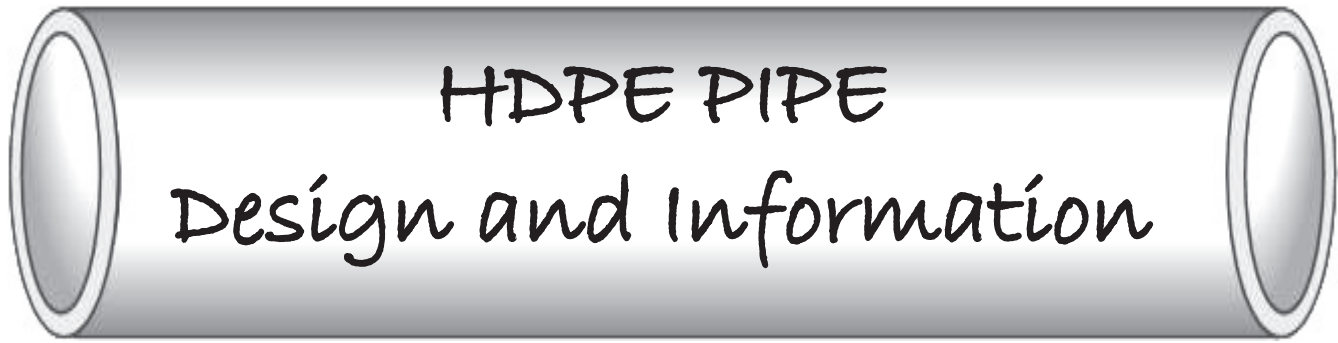
19. SEVERABILITY. If any provision or part of a provision contained in this Agreement is held by a court of competent jurisdiction to be contrary to law or public policy, the remaining provisions of the Agreement will remain in full force and effect.

AGREED TO THIS ____ DAY OF _____, 20 ____:

NAME OF BUYER: _____

SIGNATURE OF AUTHORIZED AGENT: _____

NAME & TITLE OF AUTHORIZED AGENT: _____



HDPE PRODUCTS

PIPE

Pipe Diameters Available*

1/2" - 2" CTS

1/2" - 54" IPS

4" - 36" DIPS

Materials Available*

PE2406 / PE2708

PE3408 / PE3608

PE4710

Pressure Ratings up to 350psi*

*Contact Performance Pipe for availability of specific sizes, materials, and configurations.

HEAT FUSION FITTINGS



Self-Tapping Tees

Service Saddles

Branch Saddles

1/2" - 4" Socket Fittings

1/2" - 8" Ells, Tees, Reducers & Caps

3" - 12" MJ Adapters

1-1/2" - 24" Flange Adapters



HDPE MARKETS

WATER/WASTEWATER

- Potable Water Distribution
- Potable Water Transmission
- Raw & Reclaimed Water
- Sewer Force Main
- Intake & Outfall Piping
- Temporary Bypass Pumping
- Gravity Sewer
- Storm Drainage
- River & Lake Crossings

INDUSTRIAL

- Slurry Lines
- Fly Ash Lines
- Dredging
- Dewatering
- Fire Mains
- Process Piping
- Irrigation
- Aquaculture
- Snow Making

ENERGY

- Gas Gathering
- Brine
- Wet Gas
- Condensate Returns
- Crude Oil
- Produced Water
- Sour Gas
- CO₂ & H₂S

GAS DISTRIBUTION

- MDPE Natural Gas Pipe & Tubing
- HDPE Natural Gas Pipe & Tubing
- Propane & LPG Distribution
- After Meter Gas Piping Applications

MINING

- Slurry & Tailings Lines
- Dewatering

- Process Piping
- Leaching
- PLS Lines
- Cooling Water
- Remediation
- Raw Water

LANDFILL

- Leachate Collection
- Methane Recovery
- Methane Transfer
- Perforated Pipe
- Side Slope Risers

GEO THERMAL

- Ground Source Heat Pump HVAC Systems
- Water Source Heat Pump HVAC Systems
- Unicoil™ - Down hole Loops

- In Field - Supply & Return Header Piping Systems
- In Vault - Pipe & Fittings
- Snow Melting Systems
- Ice Rinks

INTERNATIONAL

- All Markets
- In Plant Container Loading
- Telescoping Various Sizes
- Shipping From Multiple U.S. Ports
- Spanish Literature

TRENCHLESS

- Directional Drilling
- Pipe Bursting
- Sliplining

HDPE ADVANTAGES



ZERO LEAKS

PE Pipe is joined by a heat fusion process that forms joints that are leak-free. This design eliminates the potential leak points every 20 feet which can occur with PVC & ductile iron pipe.



BEST FOR THE ENVIRONMENT

PE is the safest, most environmentally friendly pipe material. The application of PE pipe for water distribution results in energy efficiency through reduced electric consumption. Using less energy results in a lower carbon footprint, & PE's jointless fusion technology means it never releases toxins from sewage into the ground or potable water supply.



BEST FOR CONSUMERS

PE pipe's outstanding performance means that consumers get the very best, cleanest water around. Other pipes leak, which means more electricity is needed to process & pump additional water into households. With PE pipe, there is no leakage. Therefore, less electricity is needed, which means consumers save on rising utility costs.



CORROSION & CHEMICAL RESISTANT

PE pipe is nonconductive polymer & does not rust or corrode, assuring long service & effective use of municipal dollars.



LOWER LIFE CYCLE COSTS

Due to PE's flexibility & jointless construction, installation costs are lower compared to other types of pipe. In addition, PE does not leak, which reduces repair & maintenance costs simultaneously.



PERFECT FOR TRENCHLESS

PE is the number one choice for trenchless installations which reduce restoration & roadway reconstruction costs, & allows for installation under rivers & lakes with less disruption to the environment.



LIGHTWEIGHT & FLEXIBLE

PE is lightweight & does not require the use of heavy lifting equipment for installation. It reduces the need for fittings, is excellent in shifting soils & performs well in earthquake-prone areas. The pipe's flexibility solves many unique problems that cannot be fixed with rigid concrete, PVC or ductile iron pipe.

50's

60's

70's

80's

90's

2000's

1951	1955	1959	1962	1965		1966	1969	1970	1972	1975	1979		1984	1985	1986	1987	1989	1994	1996	1997	1998	2000	2006	2008
Invented HDPE Resin	Developed Butt Fusion joining method for PE pipe	Installed first PE gas distribution system in Caney, KS	Opened Brownwood, TX plant	Introduced HDPE pipe for oil patch & water service tubing	Introduced Driscopipe 7000 for gas distribution	Opened Pryor, OK plant	Developed Sidewall Fusion Tapping Tee	Purchased Knoxville, TN plant	Purchased Fairfield, IA and Bloomfield, IA plants	First to produce 48" (1200mm) pipe	Startex, SC pipe plant opens		First HDPE pipe to receive FM approval	First in North America to Coextrude Striped Pipe	Opened Reno, NV plant	First in North America to coil 4' & 6" HDPE pipe	First to produce 54" pipe	Developed PE MJ Adapter	Opened Hagerstown, MD plant	First North American production of bimodal PE100 resin	Produced DIPS pipes for Water Distribution	Phillips Driscopipe & PLEXCO combine to form Performance Pipe	Expanded Reno, NV plant	Expanded Pryor, OK plant

Recommended Testing Procedure

Leak Testing

The intent of leak testing is to find unacceptable faults in a piping system. If such faults exist, they may manifest themselves by leakage or rupture.

Leakage tests may be performed if required in the Contract Specifications. Testing may be conducted in various ways. Internal pressure testing involves filling the test section with a nonflammable liquid or gas, then pressurizing the medium. Hydrostatic pressure testing with water is the preferred and recommended method. Other test procedures may involve paired internal or end plugs to pressure test individual joints or sections, or an initial service test. Joints may be exposed to allow inspections for leakage.

Liquids such as water are preferred as the test medium because less energy is released if the test section fails catastrophically. During pressure test, energy (internal pressure) is applied to stress the test section. If the test medium is a compressible gas, then the gas is compressed and absorbs energy while applying stress to the pipeline. If a catastrophic failure occurs, both the pipeline stress energy and the gas compression energy are suddenly released. However, with an incompressible liquid such as water as the test medium, the energy release is only the energy required to stress the pipeline.

WARNING: Pipe system pressure testing is performed to discover unacceptable faults in a piping system. Pressure testing may cause such faults to fail by leaking or rupturing. This may result in catastrophic failure. Piping system rupture may result in sudden, forcible, uncontrolled movement of system piping or components, or parts of components.

WARNING: Pipe Restraint. The Pipe system under test and any closures in the test section should be strained against sudden uncontrolled movement from catastrophic failure. Test equipment should be examined before pressure is applied to insure that it is tightly connected. All low pressure filling lines and other items not subject to the test pressure should be disconnected or isolated.

WARNING: Personal Protection. Take suitable precautions to eliminate hazard to personnel near lines being tested. Keep personnel a safe distance away from the test section during testing.

Pressure Testing Precautions

The piping section under test and any closures in the test section should be restrained or otherwise restricted against sudden uncontrolled movement in the event of rupture. Expansion joints and expansion compensators should be temporarily restrained, isolated or removed during the pressure test.

Testing may be conducted on the system, or in sections. The limiting test section size is determined by test equipment capability. If the pressurizing equipment is too small it may not be possible to complete the test within allowable testing time limits. If so, higher capacity test equipment, or a smaller test section may be necessary.

If possible, test medium and test section temperatures should be less than 100° F (38° C). At temperatures above 100° F (38° C), reduced test pressure is required. Before applying test pressure, time may be required for the test medium and the test section to temperature equalize. Contact the pipe manufacturer for technical assistance with elevated temperature pressure testing.

Test Pressure

Valves or other devices may limit test pressure, or lower pressure rated components. Such components may not be able to withstand the required test pressure, and should be either removed from, or isolated from the section being tested to avoid possible damage to, or failure of these devices. Isolated equipment should be vented.

- For Continuous pressure systems where test pressure limiting component or devices have been isolated, or removed, or are not present in the test section, the maximum allowable test pressure is 1.5 times the system design pressure at the lowest elevation in then section under test.
- If the test pressure limiting device or component cannot be removed or isolated, then the limiting section or system test pressure is the maximum allowable test pressure for the device or component.
- For non-pressure, low pressure, or gravity flow systems, consult the piping manufacturer for the maximum allowable test pressure.

Test Duration

For any test pressure from 1.0 to 1.5 times the system design pressure, the total test time including initial pressurization, initial expansion, and time at test pressure, must not exceed eight (8) hours. If the pressure test is not completed due to leakage, equipment failure, etc., the test section should be depressurized, and allowed to “relax” for at least eight (8) hours before bringing the test section up to test pressure again.

Pre – Test Inspection

Test equipment and the pipeline should be examined before pressure is applied to ensure that connections are tight, necessary restraints are in-place and secure, and components that should be isolated or disconnected are isolated or disconnected. All low pressure filled lines and other items not subject to the test pressure should be disconnected or isolated.

Hydrostatic testing

Hydrostatic pressure testing is preferred and is strongly recommended. The preferred testing medium is clean water. The test section should be completely filled with the test medium, taking care to bleed off any trapped air. Venting at high points may be required to purge air pockets while the test section is filling. Venting may be provided by loosening flanges, or by using equipment vents. Re-tighten any loosened flanges before applying test pressure.

Monitored Make-up Water Test

The test procedure consists of initial expansion, and test phases. During the initial expansion phase, the test section is pressurized to the test pressure, and sufficient make-up water added each hour for three (3) hours to return to test pressure.

After the initial expansion phase, about four (4) hours after pressurization, the test phase begins. The test phase may be one (1), two (2), or three (3) hours, after which a measured amount of make-up water is added to return to test pressure. If the amount of make-up water added does not exceed Table F-3 values, Leakage is not indicated.

Table F-3
TEST PHASE MAKE – UP AMOUNT

Nominal Pipe Size Inches	U.S. Gals/100 ft of Pipe			Nominal Pipe Size Inches	U.S. Gals/ 100 ft of Pipe		
	1- Hour	2 - Hour	3 -Hour		1-Hour	2 -Hour	3 - Hour
2	0.07	0.11	0.19	20	2.80	5.50	8.00
3	0.10	0.15	0.25	22	3.50	7.00	10.50
4	0.13	0.25	0.40	24	4.50	8.90	13.30
5	0.19	0.38	0.58	28	5.50	11.10	16.80
6	0.30	0.60	0.90	30	6.30	12.70	19.20
8	0.50	1.00	1.50	32	7.00	14.30	21.50
10	0.80	1.30	2.10	36	9.00	18.00	27.00
12	1.10	2.30	3.40	42	12.00	23.10	35.30
14	1.40	2.80	4.20	48	15.00	27.00	43.00
16	1.70	3.30	5.00	54	18.50	31.40	51.70
18	2.00	4.30	6.50	==	==	==	==

Non-monitored Make-Up Water Test

The test procedure consists of initial expansion, and test phases. For the initial expansion phase, make-up water is added as required to maintain the test pressure for four (4) hours. For the test phase, the test pressure is reduced by 10psi. If the pressure remains steady (within 5% of the target value) for an hour, no leakage is indicated.

The above testing procedures were taken from the Plastic Pipe Institute Engineering Handbook; Inspections, Tests and Safety Concerns.

Pneumatic Testing for Gravity Sewers

For gravity sewer lines, low-pressure air may be used as per ASTM F1417. However, any other pneumatic testing is not recommended. Additional safety precautions may be required.

The piping manufacturer should be consulted before using pressure-testing procedures other than those presented here. Other pressure testing procedures may or may not be applicable depending upon piping products and /or piping applications.

EFFECTS OF TEMPERATURE

THERMAL CONDUCTIVITY

The thermal Conductivity of a material is expressed as the rate at which heat is transferred by conduction through a unit cross – sectional area of a material when a temperature gradient exists perpendicular to the area. The units generally used for expressing this value are BTU – in per hour, per square foot, per °F.

HDPE like many thermoplastic materials, has a low coefficient of thermal conductivity. **HDPE** has an “R” value of 0.3BTU/in. Table D -1 below shows the value of **HDPE** compared to the value of some conventional materials.

Table D-1
THERMAL CONDUCTIVITY OF MATERIALS

Material	BTU – in/ft²/hr/°F
Copper	3027
Aluminum	1457
Steel	411
Cast Iron	302
Glass	7.2
HDPE	2.7
Urethane	.06

Due to its low value of thermal conductivity, **HDPE** is a fairly good insulator.

**CONVERSION TABLE FOR USING IPS AND DIPS PIPING FOR
METRIC SIZED HDPE PIPE - SDR BASED PIPE**

IPS TO METRIC SIZES

PIPE SIZE	IPS TRUE OD / inches	Metric ISO Pipe Sizes/mm	OD in inches	Metric JIS-1, 1U,2,3 Pipe Sizes /mm	OD in inches	PIPE SIZE	IPS TRUE OD / inches	Metric ISO Pipe Sizes/mm	OD in inches	Metric JIS-1, 1U,2,3 Pipe Sizes /mm	OD in inches
1/2"		16	0.630			10"	10.750	280	11.024	250mm	10.51
1/2"	0.840	20	0.787			12"	12.750	315	12.402	300mm	12.52
3/4"	1.050	25	0.984	20mm	1.06	14"	14.000	340	13.386		
1"	1.320	32	1.260	25mm	1.34	14"	14.000	355	13.976	350mm	14.57
1 1/4"	1.660	40	1.575	30mm	1.65	16"	16.000	400	15.748	400mm	16.54
1 1/2"	1.900	50	1.969	40mm	1.89	18"	18.000	450	17.717		
2"	2.375	63	2.480	50mm	2.36	20"	20.000	500	19.685		
3"	3.500	75	2.953			22"	22.000	560	22.047		
3"	3.500	90	3.543	75mm	3.5	24"	24.000	630	24.803		
4"	4.500	100	3.937			26"	26.000	660	25.984		
4"	4.500	110	4.331	100mm	4.49	28"	28.000	710	27.953		
4"	4.500	125	4.921	125mm	5.51	30"	30.000	800	31.496		
5"	5.563	150	5.906			36"	36.000	900	35.433		
6"	6.625	160	6.299	150mm	6.49	40"	40.000	1000	39.370		
6"	6.625	180	7.087			42"	42.000	1067	42.008		
8"	8.625	200	7.874	175mm	7.48	48"	48.000	1200	47.244		
8"	8.625	225	8.858	200mm	8.5	54"	54"	1400	55.118		
10"	10.750	250	9.843			63"	63"	1600	62.992		

RECOMMENDED SIZES ARE ALWAYS EQUAL OR LARGER IN RECOMMENDATION

IPS SIZES ARE STANDARD IN INDUSTRIAL APPLICATIONS AND THE MOST READILY AVAILABLE IN BOTH PIPE AND FITTINGS OPTIONS

DIPS TO METRIC SIZES

PIPE SIZE	DIPS TRUE OD / inches	Metric ISO Pipe Sizes/mm	OD in inches	Metric JIS-1, 1U,2,3 Pipe Sizes /mm	OD in inches	PIPE SIZE	DIPS TRUE OD / inches	Metric ISO Pipe Sizes/mm	OD in inches	Metric JIS-1, 1U,2,3 Pipe Sizes /mm	OD in inches
3"	3.960	100	3.937				13.200	340	13.386		
4"		110	4.331	100mm	4.49	14"	15.300	355	13.976	350mm	14.57
4"	4.800	125	4.921	125mm	5.51	16"	17.400	400	15.748	400mm	16.54
5"		150	5.906			18"	19.500	450	17.717		
6"		160	6.299	150mm	6.49	20"	21.600	500	19.685		
6"	6.900	180	7.087			22"		560	22.047		
		200	7.874	175mm	7.48	24"	25.800	630	24.803		
8"		225	8.858	200mm	8.5	26"					
8"	9.050	250	9.843			28"		710	27.953		
10"	11.100	280	11.024	250mm	10.51	30"	32.000	800	31.496		
12"		315	12.402	300mm	12.52	36"	38.300	900	35.433		

DIPS SIZES ARE NORMALLY FOR WATER WORKS APPLICATIONS AND ARE MUCH LESS AVAILABLE THAN IPS SIZES IN BOTH PIPE AND FITTINGS.

Derating Factors For HDPE P3608/3408 Fittings @73.4° F

Description	Industry Standard Derating	FITTINGS MANUFACTURED WITH THIS SDR HAVE THE WPR LISTED ^{*WPR}						
		7	9	11	17	21	26	32.5
Fabricated 90 degree Ell - Five Segment ^{*A}	ONE (1) SDR	200	160	128	80	65	50	40
Fabricated 90 degree Ell - Three Segment ^{*B}	ONE (1) SDR	200	160	128	80	65	50	40
Fabricated 45 degree Ell - Three Segment ^{*A}	ONE (1) SDR	200	160	128	80	65	50	40
Fabricated 45 degree Ell - Two Segment ^{*B}	ONE (1) SDR	200	160	128	80	65	50	40
Fabricated 22.5 degree Ell - Two Segment ^{*A}	ONE (1) SDR	200	160	128	80	65	50	40
Fabricated Wye, Three piece ^{*B}	ONE (1) SDR	200	160	128	80	65	NA	NA
Fabricated Cross ^{*B}	TWO (2) SDRS	160	128	100	65	50	NA	NA
Reducing Tee - Branch Saddle ^{*C}	NONE ^{*C}	267	200	160	100	80	65	50
Eccentric Reducers	CUSTOM MANUFACTURED TO REQUIRED WPR							
HDPE Blind Flanges	HDPE BLIND FLANGES ARE NOT RATED FOR INTERNAL PRESSURE. FOR INTERNAL PRESSURE THEY MUST BE USED IN COMBINATION WITH STEEL BLIND FLANGES. THEY MAY BE USED IN CERTAIN VACUUM APPLICATIONS.							
FITTINGS LISTED BELOW ARE FULLY PRESSURE RATED AT GIVEN SDR		7	9	11	17	21	26	32.5
Concentric Reducers	NONE	267	200	160	100	80	65	50
Transition Fittings	NONE	267	200	160	100	80	65	50
MJ Adapters	NONE	267	200	160	100	80	65	50
Bell MJ Adapters	NONE	267	200	160	100	80	65	50
Flange Adapters	NONE	267	200	160	100	80	65	50
Stub Ends	NONE	267	200	160	100	80	65	50
Molded and Fabricated Caps	NONE	267	200	160	100	NA	NA	NA
Wall Anchors	NONE	267	200	160	100	80	65	50
Molded 90's,45's Tee's	NONE	267	200	160	100	NA	NA	NA
Forge Bent Elbows	NONE	267	200	160	100	NA	NA	NA
*WPR- WORKING PRESSURE RATING PER INDUSTRY STANDARDS		THESE DERATING SCHEDULES ARE BASED ON STANDARDS IN BOTH AWWA C906 AND ASTM D2206						
*A - 2:1 SAFETY FACTOR ON THESE FITTINGS AT WPR LISTED								
*B - 1.5:1 SAFETY FACTOR ON THESE FITTINGS AT WPR LISTED								
*C - BASED ON MAIN SIZES LESS TWO SIZES, IE 10 X 6, 18 X 14, ETC. MAIN SIZES WITH ONE SIZE REDUCTION WILL BE DERATED ONE (1) SDRS, APPROXIMATELY 20% (IE 10 X 8, 18 X 16)								

Derating Factors For HDPE P4710 Fittings @73.4° F

NOTE: These pressures apply only when used in unison with PE4710 Pipe

Description	Industry Standard Derating	FITTINGS MANUFACTURED WITH THIS SDR HAVE THE WPR LISTED ^{*WPR}						
		7	9	11	17	21	26	32.5
Fabricated 90 degree Ell - Five Segment ^{*A}	ONE (1) SDR	252	200	160	100	80	65	50
Fabricated 90 degree Ell - Three Segment ^{*B}	ONE (1) SDR	252	200	160	100	80	65	50
Fabricated 45 degree Ell - Three Segment ^{*A}	ONE (1) SDR	252	200	160	100	80	65	50
Fabricated 45 degree Ell - Two Segment ^{*B}	ONE (1) SDR	252	200	160	100	80	65	50
Fabricated 22.5 degree Ell - Two Segment ^{*A}	ONE (1) SDR	252	200	160	100	80	65	50
Fabricated Wye, Three piece ^{*B}	ONE (1) SDR	252	200	160	100	80	NA	NA
Fabricated Cross ^{*B}	TWO (2) SDRS	200	160	100	80	65	NA	NA
Reducing Tee - Branch Saddle ^{*C}	NONE ^{*C}	336	252	200	126	100	80	64
Eccentric Reducers	CUSTOM MANUFACTURED TO REQUIRED WPR							
HDPE Blind Flanges	HDPE BLIND FLANGES ARE NOT RATED FOR INTERNAL PRESSURE. FOR INTERNAL PRESSURE THEY MUST BE USED IN COMBINATION WITH STEEL BLIND FLANGES. THEY MAY BE USED IN CERTAIN VACUUM APPLICATIONS.							
FITTINGS LISTED BELOW ARE FULLY PRESSURE RATED AT GIVEN SDR		7	9	11	17	21	26	32.5
Concentric Reducers	NONE	336	252	200	126	100	80	64
Transition Fittings	NONE	336	252	200	126	100	80	64
MJ Adapters	NONE	336	252	200	126	100	80	64
Bell MJ Adapters	NONE	336	252	200	126	100	80	64
Flange Adapters	NONE	336	252	200	126	100	80	64
Stub Ends	NONE	336	252	200	126	100	80	64
Molded or Fabricated Caps	NONE	336	252	200	126	NA	NA	NA
Wall Anchors	NONE	336	252	200	126	100	80	64
Molded 90's,45's Tee's	NONE	336	252	200	126	NA	NA	NA
Forge Bent Elbows	NONE	336	252	200	126	NA	NA	NA
*WPR- WORKING PRESSURE RATING PER INDUSTRY STANDARDS		THESE DERATING SCHEDULES ARE BASED ON STANDARDS IN BOTH AWWA C906 AND ASTM D2206						
*A - 2:1 SAFETY FACTOR ON THESE FITTINGS AT WPR LISTED								
*B - 1.5:1 SAFETY FACTOR ON THESE FITTINGS AT WPR LISTED								
*C - BASED ON MAIN SIZES LESS TWO SIZES, IE 10 X 6, 18 X 14, ETC. MAIN SIZES WITH ONE SIZE REDUCTION WILL BE DERATED ONE (1) SDRS, APPROXIMATELY 20% (IE 10 X 8, 18 X 16)								



HIGH COUNTRY FUSION CO INC.
20 N POLY FUSION PLACE
P.O. BOX 509
FAIRFIELD, ID 83327
208-764-2000 208-764-2094(fax)

**General Specifications and Material Standards for
Fabricated HDPE Fittings Made of PE 3608 / 3408 Material by High Country Fusion Co.**

Materials:

1. The pipe shall be made from polyethylene resin compound with a minimum cell classification of PE 345464C for PE 3408/3608 materials in accordance with ASTM D 3350. This material shall have a Long Term Hydrostatic Strength of 1600 PSI when tested in accordance to ASTM D2837, and shall be a PPI (Plastic Pipe Institute) listed material. Pipe dimensions with be in accordance with ASTM D3035 as a minimum.
2. AWWA C906- NSF Pipe used for AWWA C-906 Fittings.

Reference and testing Specifications:

1. ASTM-F-714: Standard Specification for Polyethylene Plastic Pipe (SDR-PR). Based on outside diameter.
2. ASTM F-2206: Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene Plastic Pipe, Fittings, Sheet Stock, Plate Stock or Block Stock.
3. ASTM D-3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
4. ASTM D-3035: Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR.) Based on Controlled Outside Diameter.
5. ASTM D-3261: Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
6. AWWA C-906: American Water Works Association standard for Polyethylene pressure pipe in sizes 4"-63" for water distribution. Testing done per C-906 guidelines.
7. PPI (Plastic Pipe Institute) TR-33 Butt Fusion Joining Procedures.
8. PPI (Plastic Pipe Institute) TR-41 Saddle Fusion Joining Procedures.
9. ASTM-F-2620 – Standard practice for heat fusion joining of polyethylene pipe and fittings

Organizational References:

Member of PPI (Plastic Pipe Institute) Technical Advisory Board for M & I Division. Member PPI since 2000.



HIGH COUNTRY FUSION CO INC.
P.O. BOX 509
FAIRFIELD, ID 83327
208-764-2000 208-764-2094(fax)

**General Specifications and Material Standards for
Fabricated HDPE Fittings Made of PE 4710 Material by High Country Fusion Co.**

Materials:

1. The pipe shall be made from polyethylene resin compound with a minimum cell classification of PE 445574C for PE 4710 materials in accordance with ASTM D 3350. This material shall have a Long Term Hydrostatic Strength of 2000 PSI when tested in accordance to ASTM D2837, and shall be a PPI (Plastic Pipe Institute) listed material. Pipe dimensions with be in accordance with ASTM D3035 as a minimum.
2. AWWA C906- NSF Pipe used for AWWA C-906 Fittings.

Reference and testing Specifications:

1. ASTM-F-714: Standard Specification for Polyethylene Plastic Pipe (SDR-PR). Based on outside diameter.
2. ASTM F-2206: Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene Plastic Pipe, Fittings, Sheet Stock, Plate Stock or Block Stock.
3. ASTM D-3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
4. ASTM D-3035: Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR.) Based on Controlled Outside Diameter.
5. ASTM D-3261: Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
6. AWWA C-906: American Water Works Association standard for Polyethylene pressure pipe in sizes 4"-63" for water distribution. Testing done per C-906 guidelines.
7. PPI (Plastic Pipe Institute) TR-33 Butt Fusion Joining Procedures.
8. PPI (Plastic Pipe Institute) TR-41 Saddle Fusion Joining Procedures.
9. ASTM-F-2620 – Standard practice for heat fusion joining of polyethylene pipe and fittings

Organizational References:

Member of PPI (Plastic Pipe Institute) Technical Advisory Board for M & I Division. Member PPI since 2000.



HAZEN- WILLIAMS COEFFICIENT (C-FACTOR)

<u>TYPE OF PIPE OR SURFACE</u>	<u>"C" VALUE</u>
HDPE PIPE, PE 4710 / PE 3408 / PE 100	150
PVC	130-140
DUCTILE IRON (NEW)	130
DUCTILE IRON (10 YEARS OLD)	100-110
DUCTILE IRON (20 YEARS OLD)	90-100
DUCTILE IRON (40 YEARS OLD)	60-80
GLASS OR GLASS LINED	130-140
STEEL, WELDED AND SEAMLESS (NEW)	130
CONCRETE (NEW)	120
CAST IRON, PLAIN	130
OLD PIPES, MARGINAL CONDITION	60-80
CORRIGATED STEEL PIPE	60
SMALL PIPES BADLY CORRODED	40-50

Hazen-Williams Formula

$$\Delta P_f = \frac{453 \times Q^{1.85}}{C^{1.85} \times d^{4.86}}$$

Where ΔP_f = friction pressure loss per 100 feet, psi (Mpa \times 145)
 C = pipe coefficient
 Q = flow rate, gpm (m³/min \times 264.86)
 D = inside diameter of pipe, inches (mm \times 0.0394)

DriscoPlex[®] 6500 PE2708 / (PE2406) Pipe Pipe & Fittings Data Sheet

Typical material Physical Properties of DriscoPlex[®] 6500 PE2708 / (PE2406)

Medium Density Polyethylene Materials

Property	Unit	Test Procedure	Typical Value
Material Designation	---	PPI TR-4	PE2708
Cell Classification	---	ASTM D3350	234373E
Pipe Properties			
Density	gms / cm ³	ASTM D11505	0.939
Melt Index (MI) Condition 190 / 2.16	gms / 10 minutes	ASTM D1238	0.18
Hydrostatic Design Basis 73°F (23°C)	psi	ASTM D2837	1250
Hydrostatic Design Basis 140°F (60°C)	psi	ASTM D2837	1000
Minimum Required Strength	Mpa (psi)	ISO 9080	8.0 (116)
Rapid Crack Propagation Full scale test, (Pc) 0°C (32°F)	Bar (psi)	ISO 13478	8.5 (123)
Color; UV Stabilizer	---	ASTM D3350	Yellow: UV stabilized for up to 4 years outdoor storage
Pipe Test Category	---	ASTM D2513	CEE
Material Properties			
Flexural Modulus at 2% strain	psi	ASTM D790	>100,000
Tensile Strength at Yield	psi	ASTM D638 Type IV	2,800
Elongation at Break 2 in / min., Type IV bar	%	ASTM D638	>800
Elastic Modulus at Secant 2% strain (2 in / min., Type IV bar)	psi	ASTM D638	>86,000
Hardness	Shore D	ASTM D2240	63
PENT	hrs	ASTM F1473	>3,500
Thermal Properties			

For more information and technical assistance contact:

Performance Pipe, a division of
Chevron Phillips Chemical Company LP
P.O. Box 269006
Plano, TX 75026-9006
800.527.0662



Vicat Softening Temperature	°F	ASTM D1525	227
Brittleness Temperature	°F	ASTM D746	-180
Thermal Expansion/Contraction	in / in / °F	ASTM D696	1.0×10^{-4}

1. Meets ASTM D2513. Upon request certain sizes and DR;s may also be available to comply with IAPMO and CSA 137.4.
2. Determination made on 6" and 8" DR 11 pipes. Pc calculated in accordance with ISO 13478

Bulletin: PP 103

Revision Date September, 2006

Another quality product from



Before using the piping product, the user is advised and cautioned to make its own determination and assessment of the safety and suitability of the piping product for the specific use in question and is further advised against relying on the information contained herein as it may relate to any specific use or application. It is the ultimate responsibility of the user to ensure that the piping product is suited and the information is applicable to the user's specific application. This data sheet provides typical physical property information for polyethylene resins used to manufacture the piping product. It is intended for comparing polyethylene piping resins. It is not a product specification, and it does not establish minimum or maximum values or manufacturing tolerances for resins or for the piping product. These typical physical property values were determined using compression-molded plaques prepared from resin. Values obtained from tests of specimens taken from the piping product can vary from these typical values. Performance Pipe does not make, and expressly disclaims, all warranties, of merchantability or fitness for a particular purpose, regardless of whether oral or written, express or implied, or allegedly arising from any usage of trade or from any course of dealing in connection with the use of information contained herein or the piping product itself. The user expressly assumes all risk and liability, whether based in contract, tort or otherwise, in connection with the use of the information contained herein or the piping product itself. Further, information contained herein is given without reference to any intellectual property issues, as well as federal, state, or local laws which may be encountered in the use thereof. Such questions should be investigated by the user.

DriscoPlex® PE3608 / (PE3408) Pipe Pipe and Fittings Data Sheet

Typical Material Physical Properties of DriscoPlex® PE3608 / (PE3408)

High Density Polyethylene Materials

Property	Unit	Test Procedure	Typical Value
Material Designation	---	PPI TR-4	PE3608
Cell Classification	---	ASTM D3350	345464C
Pipe Properties			
Density	gms / cm ³	ASTM D1505	0.955 (black)
Melt Index Condition 190 / 2.16	gms / 10 minutes	ASTM D1238	0.08
Hydrostatic Design Basis 73°F (23°C)	psi	ASTM D2837	1600
Hydrostatic Design Basis 140°F (60°C)	psi	ASTM D2837	800
Color: UV Stabilizer [C] [E]	---	ASTM D3350	Min 2% carbon Black Color UV Stabilizer
Material Properties			
Flexural Modulus 2% Secant - 16:1 span; depth, 0.5 in / min	psi	ASTM D790	>110,000
Tensile Strength at Yield	psi	ASTM D638 Type IV	3200
Elongation at Break 2 in / min., Type IV bar	%	ASTM D638	>700
Elastic Modulus	psi	ASTM D638	>150,000
Hardness	Shore D	ASTM D2240	62
PENT	hrs	ASTM F1473	>100
Thermal Properties			
Vicat Softening Temperature	°F	ASTM D1525	256
Brittleness Temperature	°F	ASTM D746	-103
Thermal Expansion	in / in / °F	ASTM D696	1.0 x 10 ⁻⁴

SUGGESTED INDUSTRIES AND APPLICATIONS

<u>Potable Water Mains</u>	<u>Horizontal Directional Drilling (HDD)</u>	<u>Marine Service</u>
<u>Sliplining</u>	<u>Water transmission Lines</u>	<u>Pipe Bursting</u>
<u>Industrial Water Mains</u>	<u>Ash, Tailings & Abrasives</u>	<u>Mining</u>
<u>Municipal Water Utilities</u>	<u>Open-cut and Bury</u>	<u>Culverts</u>
<u>Rural Water Distribution</u>	<u>River Crossings</u>	<u>Plow-in</u>
<u>Mun. & Ind. Sewer</u>	<u>Trenchless Technologies</u>	<u>Crude oil</u>
<u>Fire Main Piping</u>	<u>Rural Water Distribution</u>	<u>Plow-in</u>

Butt Fusion Conditions

- 60-90 psig (4.14-6.21 bar) interfacial fusion pressure.
- 400-450° (204-232°C) heater surface temperature range.
- Please refer to Performance Pipe's PE3608 (PE3408) fusion procedure, Bulletin PP 750.

Available Sizes

- ¾" through 54" IPS
- 4" through 36" DIPS

Specification Data

The resin, pipe and fitting listed may comply with one or more of the standards below.

<u>Applicable Standards</u>	<u>DriscoPlex® Pipe Series</u>	<u>PE3608 (PE3408)</u>	<u>PE4710 (d_f)</u>
<u>ASTM F714, NSF 61, ASTM D3035</u>	4000, 4100, 4200, 4300, 4400, 4500, 4600, 4700	0.5	0.63
<u>AWWA C906, AWWA C901</u>	4000, 4100, 4200, 4300, 4400, 4500, 4600, 4700	0.5	0.63
<u>FMA, AWWA, F714</u>	1500, 1600	0.5	---
<u>API 15LE, ASTM D2513</u>			0.63

For more information and technical assistance contact:

Performance Pipe, a division of
Chevron Phillips Chemical Company LP
P.O. Box 269006
Plano, TX 75026-9006
800.527.0662



	6400	0.5	
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Before using the piping product, the user is advised and cautioned to make its own determination and assessment of the safety and suitability of the piping product for the specific use in question and is further advised against relying on the information contained herein as it may relate to any specific use or application. It is the ultimate responsibility of the user to ensure that the piping product is suited and the information is applicable to the user's specific application. This data sheet provides typical physical property information for polyethylene resins used to manufacture the piping product. It is intended for comparing polyethylene piping resins. It is not a product specification, and it does not establish minimum or maximum values or manufacturing tolerances for resins or for the piping product. These typical physical property values were determined using compression-molded plaques prepared from resin. Values obtained from tests of specimens taken from the piping product can vary from these typical values. Performance Pipe does not make, and expressly disclaims, all warranties, of merchantability or fitness for a particular purpose, regardless of whether oral or written, express or implied, or allegedly arising from any usage of trade or from any course of dealing in connection with the use of information contained herein or the piping product itself. The user expressly assumes all risk and liability, whether based in contract, tort or otherwise, in connection with the use of the information contained herein or the piping product itself. Further, information contained herein is given without reference to any intellectual property issues, as well as federal, state, or local laws which may be encountered in the use thereof. Such questions should be investigated by the user.

DriscoPlex® PE4710 / (PE3408) Pipe and Fittings Data Sheet

Typical material Physical Properties of DriscoPlex® PE4710 / (3408)

High Density Polyethylene Materials

Property	Unit	Test Procedure	Typical Value
Material Designation	---	PPI TR-4	PE4710
Cell Classification	---	ASTM D3350	445474C
Pipe Properties			
Density	gms / cm ³	ASTM D1505	0.960 (black)
Melt Index Condition 190 / 2.16	gms / 10 minutes	ASTM D1238	0.05
Hydrostatic Design Basis 73°F (23°C)	psi	ASTM D2837	1600
Hydrostatic Design Basis 140°F (60°C)	psi	ASTM D2837	1000
Material Properties			
Flexural Modulus 2% Secant - 16:1 span: depth, 0.5 in / min	psi	ASTM D790	>115,000
Tensile Strength at Yield	psi	ASTM D638 Type IV	>3400
Elongation at Break 2 in / min., Type IV bar	%	ASTM D638	>700
Elastic Modulus	psi	ASTM D638	>175,000
Hardness	Shore D	ASTM D2240	62
PENT	hrs	ASTM F1473	>500
Thermal Properties			
Vicat Softening Temperature	°F	ASTM D1525	256
Brittleness Temperature	°F	ASTM D746	-103
Thermal Expansion	in / in / °F	ASTM D696	1.0 x 10 ⁻⁴

DriscoPlex® 6500 Series PE2708 (PE2406) Standard Size and Dimension Sheet

Please visit www.performancepipe.com for the most up-to-date information

NOTE: The sizes and packaging shown represent typical Performance Pipe products. Other sizes and/or packaging may be available. Contact Performance Pipe for additional information. Pipe weights are calculated in accordance with PPI TR-7. Dimensions and weights are subject to change without notice.

CTS = COPPER TUBE SIZE

Part Number	Nominal Size (Inches)	Minimum Wall (Inches)	Nominal Outside Diameter (Inches)	Dimension Ratio	MAOP (psig per CFR Part 192 @ 73.4° F or less)	Weight per 100 ft.	Coil/ Joint (feet)	Nominal Packing Dimensions ID/OD/Width	Number Coils/Joints Per Pallet or Bundle	Pallet / Bundle Footage	Number Pallet / Bundles Per Truck	48 ft. Truck
1002425	1/2"	0.090	0.625	7.0	100	6.5	1,000'	30" / 44" / 6"	12	12,000'	26	312,000'
1002445	1"	0.099	1.125	11.5	76	14.0	500'	30" / 42" / 11"	8	4,000'	26	104,000'

IPS = IRON PIPE SIZE

Part Number	Nominal Size (Inches)	Minimum Wall (Inches)	Nominal Outside Diameter (Inches)	Dimension Ratio	MAOP (psig per CFR Part 192 @ 73.4° F or less)	Weight per 100 ft.	Coil/ Joint (feet)	Nominal Packing Dimensions ID/OD/Width	Number Coils/Joints Per Pallet or Bundle	Pallet / Bundle Footage	Number Pallet / Bundles Per Truck	48 ft. Truck
1002239	3/4"	0.095	1.050	11	80	12	500'	30" / 44" / 10"	7	3,500'	26	91,000'
1002249	1"	0.120	1.315	11	80	19	500'	30" / 44" / 12"	6	3,000'	26	78,000'
1002263	1 1/4"	0.166	1.660	10	89	33	500'	48" / 72" / 7 1/2"	12	6,000'	7	42,000'
1002284	2"	0.216	2.375	11	80	63	500'	52" / 78" / 13"	7	3,500'	7	24,500'
1002323	3"	0.304	3.500	11.5	76	131	40'	soft bundles	50	2,000'	14	28,000'
1002318							500'	70" / 96" / 23 3/4"	4	2,000'	6	12,000'
1002349	4"	0.391	4.500	11.5	76	217	40'	soft bundles	29	1,160'	14	16,240'
1088779							600'	70" / 93" / 49 1/2"	upright		12	7,200'
1010590							1,000'	84" / 116" / 49"	upright		8 coils	8,000'
1002367	6"	0.576	6.625	11.5	76	471	40'	soft bundles	13	520'	14	7,280'
1002363							500'	84" / 120" / 50"	upright		8 coils	4,000'
1002373		0.491	6.625	13.5	64	407	40'	soft bundles	13	520'	14	7,280'
1002368							500'	84" / 120" / 50"	upright		8 coils	4,000'
1002384	8"	0.750	8.625	11.5	76	798	40'	soft bundles	9	360'	10	3,600'
1071013		0.639		13.5	64	690						
1007003	12"	0.944	12.750	13.5	64	1507	40'	bulk packs	8 jts/layer	320'	6	1,920'

NOTE: The August revision was strictly for ease in reading columns for minimum wall and DR. No specific data was changed.



Revised 03-17-2008

IPS Size and Dimension Data

PE3608 (PE3408)

DriscoPlex[®] Municipal & Industrial & Energy Series/IPS Pipe Data

Pressure Ratings are calculated using 0.50 design factor for HDS at 73°F as listed in PPI TR-4 for PE 3608 materials.

Temperature, Chemical, and Environmental use considerations may require use of additional design factors.

Pressure Rating		255 psi DR 7.3			200 psi DR 9.0			160 psi DR 11.0			130 psi DR 13.5			IPS Pipe Size
IPS Pipe Size	Nominal OD (in)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	
1 1/4"	1.660	0.227	1.179	0.44	0.184	1.270	0.37	0.151	1.340	0.31	0.123	1.399	0.26	1 1/4"
1 1/2"	1.900	0.260	1.349	0.58	0.211	1.453	0.49	0.173	1.533	0.41	0.141	1.601	0.34	1 1/2"
2"	2.375	0.325	1.686	0.91	0.264	1.815	0.76	0.216	1.917	0.64	0.176	2.002	0.53	2"
3"	3.500	0.479	2.485	1.98	0.389	2.675	1.66	0.318	2.826	1.39	0.259	2.951	1.15	3"
4"	4.500	0.616	3.194	3.27	0.500	3.440	2.74	0.409	3.633	2.29	0.333	3.794	1.91	4"
6"	6.625	0.908	4.700	7.09	0.736	5.065	5.93	0.602	5.349	4.97	0.491	5.584	4.13	6"
8"	8.625	1.182	6.119	12.01	0.958	6.594	10.05	0.784	6.963	8.43	0.639	7.270	7.00	8"
10"	10.750	1.473	7.627	18.66	1.194	8.219	15.62	0.977	8.679	13.09	0.796	9.062	10.88	10"
12"	12.750	1.747	9.046	26.24	1.417	9.746	21.97	1.159	10.293	18.41	0.944	10.749	15.30	12"
14"	14.000	1.918	9.934	31.64	1.556	10.701	26.49	1.273	11.301	22.20	1.037	11.802	18.45	14"
16"	16.000	2.192	11.353	41.33	1.778	12.231	34.60	1.455	12.915	28.99	1.185	13.488	24.09	16"
18"	18.000	2.466	12.772	52.31	2.000	13.760	43.79	1.636	14.532	36.70	1.333	15.174	30.49	18"
20"	20.000	2.740	14.191	64.58	2.222	15.289	54.06	1.818	16.146	45.30	1.481	16.860	37.64	20"
22"	22.000	3.014	15.610	78.14	2.444	16.819	65.41	2.000	17.760	54.82	1.630	18.544	45.55	22"
24"	24.000	3.288	17.029	92.99	2.667	18.346	77.85	2.182	19.374	65.24	1.778	20.231	54.21	24"
26"	26.000				2.889	19.875	91.36	2.364	20.988	76.56	1.926	21.917	63.62	26"
28"	28.000				3.111	21.405	105.96	2.545	22.605	88.80	2.074	23.603	73.78	28"
30"	30.000				3.333	22.934	121.63	2.727	24.219	101.93	2.222	25.289	84.70	30"
32"	32.000							2.909	25.833	115.98	2.370	26.976	96.37	32"
34"	34.000							3.091	27.447	130.93	2.519	28.660	108.79	34"
36"	36.000							3.273	29.061	146.78	2.667	30.346	121.96	36"
42"	42.000										3.111	35.405	166.01	42"
48"	48.000													48"
54"	54.000													54"

Pipe weights are calculated in accordance with PPI TR-7. Average inside diameter is calculated using nominal OD and Minimum wall plus 6% for use in estimating fluid flows. Actual ID will vary. When designing components to fit the pipe ID, refer to pipe dimensions and tolerances in the applicable pipe manufacturing specification.

Visit www.performancepipe.com for the most current literature.



Revised 03-17-2008

IPS Size and Dimension Data

PE3608 (PE3408)

DriscoPlex[®] Municipal & Industrial & Energy Series/IPS Pipe Data

Pressure Ratings are calculated using 0.50 design factor for HDS at 73°F as listed in PPI TR-4 for PE 3608 materials.

Temperature, Chemical, and Environmental use considerations may require use of additional design factors.

Pressure Rating		100 psi DR 17.0			80 psi DR 21.0			65 psi DR 26.0			50 psi DR 32.5			IPS Pipe Size
IPS Pipe Size	Nominal OD (in)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	
1 1/4"	1.660													1 1/4"
1 1/2"	1.900													1 1/2"
2"	2.375	0.140	2.078	0.43										2"
3"	3.500	0.206	3.063	0.93										3"
4"	4.500	0.265	3.938	1.54	0.214	4.046	1.26							4"
6"	6.625	0.390	5.798	3.34	0.315	5.957	2.74	0.255	6.084	2.23	0.204	6.193	1.80	6"
8"	8.625	0.507	7.550	5.66	0.411	7.754	4.64	0.332	7.921	3.78	0.265	8.063	3.05	8"
10"	10.750	0.632	9.410	8.79	0.512	9.665	7.20	0.413	9.874	5.88	0.331	10.048	4.74	10"
12"	12.750	0.750	11.160	12.36	0.607	11.463	10.13	0.490	11.711	8.27	0.392	11.919	6.67	12"
14"	14.000	0.824	12.253	14.90	0.667	12.586	12.22	0.538	12.859	9.97	0.431	13.086	8.04	14"
16"	16.000	0.941	14.005	19.47	0.762	14.385	15.96	0.615	14.696	13.02	0.492	14.957	10.51	16"
18"	18.000	1.059	15.755	24.64	0.857	16.183	20.20	0.692	16.533	16.48	0.554	16.826	13.30	18"
20"	20.000	1.176	17.507	30.42	0.952	17.982	24.94	0.769	18.370	20.35	0.615	18.696	16.42	20"
22"	22.000	1.294	19.257	36.81	1.048	19.778	30.17	0.846	20.206	24.62	0.677	20.565	19.86	22"
24"	24.000	1.412	21.007	43.80	1.143	21.577	35.91	0.923	22.043	29.30	0.738	22.435	23.64	24"
26"	26.000	1.529	22.759	51.41	1.238	23.375	42.14	1.000	23.880	34.39	0.800	24.304	27.74	26"
28"	28.000	1.647	24.508	59.62	1.333	25.174	48.87	1.077	25.717	39.88	0.862	26.173	32.17	28"
30"	30.000	1.765	26.258	68.44	1.429	26.971	56.11	1.154	27.554	45.78	0.923	28.043	36.93	30"
32"	32.000	1.882	28.010	77.87	1.524	28.769	63.84	1.231	29.390	52.09	0.985	29.912	42.02	32"
34"	34.000	2.000	29.760	87.91	1.619	30.568	72.06	1.308	31.227	58.80	1.046	31.782	47.44	34"
36"	36.000	2.118	31.510	98.55	1.714	32.366	80.79	1.385	33.064	65.92	1.108	33.651	53.19	36"
42"	42.000	2.471	36.761	134.14	2.000	37.760	109.97	1.615	38.576	89.73	1.292	39.261	72.39	42"
48"	48.000	2.824	42.013	175.21	2.286	43.154	143.63	1.846	44.086	117.19	1.477	44.869	94.55	48"
54"	54.000				2.571	48.549	181.78	2.077	49.597	148.32	1.662	50.477	119.67	54"

Performance Pipe can produce to specialized pipe dimensions. Check with your Performance Pipe contact for availability of dimensions not listed.

Visit www.performancepipe.com for the most current literature.



Revised 04-07-2009

IPS Size and Dimension Data

PE4710 (PE3408)

DriscoPlex[®] Municipal & Industrial & Energy Series/IPS Pipe Data

Pressure Ratings are calculated using 0.63 design factor for HDS at 73°F as listed in PPI TR-4 for PE 4710 materials.

Temperature, Chemical, and Environmental use considerations may require use of additional design factors.

Pressure Rating		317 psi DR 7.3			250 psi DR 9.0			200 psi DR 11.0			160 psi DR 13.5			IPS Pipe Size
IPS Pipe Size	Nominal OD (in)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	
1 1/4"	1.660	0.227	1.179	0.45	0.184	1.270	0.37	0.151	1.340	0.31	0.123	1.399	0.26	1 1/4"
1 1/2"	1.900	0.260	1.349	0.59	0.211	1.453	0.49	0.173	1.533	0.41	0.141	1.601	0.34	1 1/2"
2"	2.375	0.325	1.686	0.92	0.264	1.815	0.77	0.216	1.917	0.64	0.176	2.002	0.53	2"
3"	3.500	0.479	2.485	1.99	0.389	2.675	1.66	0.318	2.826	1.39	0.259	2.951	1.16	3"
4"	4.500	0.616	3.194	3.29	0.500	3.440	2.75	0.409	3.633	2.31	0.333	3.794	1.92	4"
6"	6.625	0.908	4.700	7.12	0.736	5.065	5.96	0.602	5.349	5.00	0.491	5.584	4.15	6"
8"	8.625	1.182	6.119	12.07	0.958	6.594	10.11	0.784	6.963	8.47	0.639	7.270	7.04	8"
10"	10.750	1.473	7.627	18.75	1.194	8.219	15.70	0.977	8.679	13.16	0.796	9.062	10.93	10"
12"	12.750	1.747	9.046	26.38	1.417	9.746	22.08	1.159	10.293	18.51	0.944	10.749	15.38	12"
14"	14.000	1.918	9.934	31.81	1.556	10.701	26.63	1.273	11.301	22.32	1.037	11.802	18.54	14"
16"	16.000	2.192	11.353	41.55	1.778	12.231	34.78	1.455	12.915	29.15	1.185	13.488	24.22	16"
18"	18.000	2.466	12.772	52.58	2.000	13.760	44.02	1.636	14.532	36.89	1.333	15.174	30.65	18"
20"	20.000	2.740	14.191	64.91	2.222	15.289	54.34	1.818	16.146	45.54	1.481	16.860	37.84	20"
22"	22.000	3.014	15.610	78.55	2.444	16.819	65.75	2.000	17.760	55.10	1.630	18.544	45.79	22"
24"	24.000	3.288	17.029	93.48	2.667	18.346	78.25	2.182	19.374	65.58	1.778	20.231	54.49	24"
26"	26.000				2.889	19.875	91.84	2.364	20.988	76.96	1.926	21.917	63.95	26"
28"	28.000				3.111	21.405	106.51	2.545	22.605	89.26	2.074	23.603	74.17	28"
30"	30.000				3.333	22.934	122.27	2.727	24.219	102.47	2.222	25.289	85.14	30"
32"	32.000							2.909	25.833	116.58	2.370	26.976	96.87	32"
34"	34.000							3.091	27.447	131.61	2.519	28.660	109.36	34"
36"	36.000							3.273	29.061	147.55	2.667	30.346	122.60	36"
42"	42.000										3.111	35.405	166.88	42"
48"	48.000													48"
54"	54.000													54"

Pipe weights are calculated in accordance with PPI TR-7. Average inside diameter is calculated using nominal OD and Minimum wall plus 6% for use in estimating fluid flows. Actual ID will vary. When designing components to fit the pipe ID, refer to pipe dimension and tolerances in the applicable pipe manufacturing specification.

Visit www.performancepipe.com for the most current literature.



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Pressure Ratings are calculated using 0.63 design factor for HDS at 73°F as listed in PPI TR-4 for PE 4710 materials.

Temperature, Chemical, and Environmental use considerations may require use of additional design factors.

DfYggi fY FUjb[`&` dg] 8 F`%`\$			`\$` dg] 8 F`&`\$, \$` dg] 8 F`&`\$			`*` dg] 8 F`&`)			
IPS Pipe Size	Nominal OD (in)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	IPS Pipe Size
1 1/4"	1.660													1 1/4"
1 1/2"	1.900													1 1/2"
2"	2.375	0.140	2.078	0.43										2"
3"	3.500	0.206	3.063	0.94										3"
4"	4.500	0.265	3.938	1.55	0.214	4.046	1.27							4"
6"	6.625	0.390	5.798	3.36	0.315	5.957	2.75	0.255	6.084	2.24	0.204	6.193	1.81	6"
8"	8.625	0.507	7.550	5.69	0.411	7.754	4.66	0.332	7.921	3.80	0.265	8.063	3.07	8"
10"	10.750	0.632	9.410	8.83	0.512	9.665	7.24	0.413	9.874	5.91	0.331	10.048	4.77	10"
12"	12.750	0.750	11.160	12.43	0.607	11.463	10.19	0.490	11.711	8.31	0.392	11.919	6.71	12"
14"	14.000	0.824	12.253	14.98	0.667	12.586	12.28	0.538	12.859	10.02	0.431	13.086	8.09	14"
16"	16.000	0.941	14.005	19.57	0.762	14.385	16.04	0.615	14.696	13.09	0.492	14.957	10.56	16"
18"	18.000	1.059	15.755	24.77	0.857	16.183	20.30	0.692	16.533	16.57	0.554	16.826	13.37	18"
20"	20.000	1.176	17.507	30.58	0.952	17.982	25.07	0.769	18.370	20.45	0.615	18.696	16.50	20"
22"	22.000	1.294	19.257	37.00	1.048	19.778	30.33	0.846	20.206	24.75	0.677	20.565	19.97	22"
24"	24.000	1.412	21.007	44.03	1.143	21.577	36.10	0.923	22.043	29.45	0.738	22.435	23.76	24"
26"	26.000	1.529	22.759	51.67	1.238	23.375	42.36	1.000	23.880	34.57	0.800	24.304	27.89	26"
28"	28.000	1.647	24.508	59.93	1.333	25.174	49.13	1.077	25.717	40.09	0.862	26.173	32.34	28"
30"	30.000	1.765	26.258	68.80	1.429	26.971	56.40	1.154	27.554	46.02	0.923	28.043	37.13	30"
32"	32.000	1.882	28.010	78.28	1.524	28.769	64.17	1.231	29.390	52.36	0.985	29.912	42.24	32"
34"	34.000	2.000	29.760	88.37	1.619	30.568	72.44	1.308	31.227	59.11	1.046	31.782	47.69	34"
36"	36.000	2.118	31.510	99.07	1.714	32.366	81.21	1.385	33.064	66.27	1.108	33.651	53.46	36"
42"	42.000	2.471	36.761	134.84	2.000	37.760	110.54	1.615	38.576	90.20	1.292	39.261	72.77	42"
48"	48.000	2.824	42.013	176.12	2.286	43.154	144.38	1.846	44.086	117.81	1.477	44.869	95.05	48"
54"	54.000				2.571	48.549	182.73	2.077	49.597	149.10	1.662	50.477	120.29	54"

Pipe weights are calculated in accordance with PPI TR-7. Average inside diameter is calculated using nominal OD and Minimum wall plus 6% for use in estimating fluid flows. Actual ID will vary. When designing components to fit the pipe ID, refer to pipe dimension and tolerances in the applicable pipe manufacturing specification.



Revised 03-17-2008

DIPS Size and Dimension Data

PE3608 (PE3408)

DriscoPlex[®] Municipal & Industrial & Energy Series/DIPS Pipe Data

Pressure Ratings are calculated using 0.50 design factor for HDS at 73°F as listed in PPI TR-4 for PE 3608 materials.

Temperature, Chemical, and Environmental use considerations may require use of additional design factors.

Pressure Rating		255 psi DR 7.3			200 psi DR 9.0			160 psi DR 11.0			130 psi DR 13.5			
DIPS Pipe Size	Nominal OD (in)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	DIPS Pipe Size
4"	4.800	0.658	3.405	3.72	0.533	3.670	3.11	0.436	3.876	2.61	0.356	4.045	2.17	4"
6"	6.900	0.945	4.897	7.69	0.767	5.274	6.43	0.627	5.571	5.39	0.511	5.817	4.48	6"
8"	9.050	1.240	6.421	13.22	1.006	6.917	11.07	0.823	7.305	9.28	0.670	7.630	7.71	8"
10"	11.100	1.521	7.875	19.89	1.233	8.486	16.65	1.009	8.961	13.95	0.822	9.357	11.60	10"
12"	13.200	1.808	9.367	28.13	1.467	10.090	23.55	1.200	10.656	19.73	0.978	11.127	16.40	12"
14"	15.300	2.096	10.856	37.79	1.700	11.696	31.64	1.391	12.351	26.51	1.133	12.898	22.03	14"
16"	17.400	2.384	12.346	48.88	1.933	13.302	40.92	1.582	14.046	34.29	1.289	14.667	28.49	16"
18"	19.500	2.671	13.837	61.39	2.167	14.906	51.39	1.773	15.741	43.07	1.444	16.439	35.78	18"
20"	21.600				2.400	16.512	63.05	1.964	17.436	52.84	1.600	18.208	43.91	20"
24"	25.800				2.867	19.722	89.96	2.345	20.829	75.39	1.911	21.749	62.64	24"
30"	32.000							2.909	25.833	115.98	2.370	26.976	96.37	30"
†36"	38.300							3.482	30.918	166.14	2.837	32.286	138.05	†36"
†42"	44.500										3.296	37.512	186.36	†42"

Pressure Rating		100 psi DR 17.0			80 psi DR 21.0			65 psi DR 26.0			50 psi DR 32.5			
DIPS Pipe Size	Nominal OD (in)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	DIPS Pipe Size
4"	4.800	0.282	4.202	1.75	0.229	4.315	1.44							4"
6"	6.900	0.406	6.039	3.62	0.329	6.203	2.97	0.265	6.338	2.42	0.212	6.451	1.95	6"
8"	9.050	0.532	7.922	6.23	0.431	8.136	5.11	0.348	8.312	4.17	0.278	8.461	3.36	8"
10"	11.100	0.653	9.716	9.37	0.529	9.979	7.68	0.427	10.195	6.27	0.342	10.375	5.06	10"
12"	13.200	0.776	11.555	13.25	0.629	11.867	10.86	0.508	12.123	8.86	0.406	12.339	7.15	12"
14"	15.300	0.900	13.392	17.80	0.729	13.755	14.59	0.588	14.053	11.91	0.471	14.301	9.61	14"
16"	17.400	1.024	15.229	23.02	0.829	15.643	18.87	0.669	15.982	15.40	0.535	16.266	12.42	16"
18"	19.500	1.147	17.068	28.92	0.929	17.531	23.70	0.750	17.910	19.34	0.600	18.228	15.60	18"
20"	21.600	1.271	18.905	35.48	1.029	19.419	29.08	0.831	19.838	23.73	0.665	20.190	19.15	20"
24"	25.800	1.518	22.582	50.62	1.229	23.195	41.50	0.992	23.697	33.86	0.794	24.117	27.32	24"
30"	32.000	1.882	28.010	77.87	1.524	28.769	63.84	1.231	29.390	52.09	0.985	29.912	42.02	30"
†36"	38.300	2.253	33.524	111.55	1.824	34.433	91.44	1.473	35.177	74.61	1.178	35.803	60.20	†36"
†42"	44.500	2.618	38.950	150.59	2.119	40.008	123.45	1.712	40.871	100.73	1.369	41.598	81.27	†42"

Pipe weights are calculated in accordance with PPI TR-7. Average inside diameter is calculated using Nominal OD and Minimum Wall plus 6% for use in estimating fluid flows. Actual ID will vary. When designing components to fit the pipe ID, refer to pipe dimensions and tolerances in the applicable pipe manufacturing specification.

†OD available upon special request -- Check with your Performance Pipe contact for availability of dimensions not listed.

Visit www.performancepipe.com for the most current literature.

Revised 04-07-2009

DIPS Size and Dimension Data

PE4710 (PE3408)

DriscoPlex[®] Municipal & Industrial & Energy Series/DIPS Pipe Data

Pressure Ratings are calculated using 0.63 design factor for HDS at 73°F as listed in PPI TR-4 for PE4710 materials.

Temperature, Chemical, and Environmental use considerations may require use of additional design factors.

Pressure Rating		317 psi DR 7.3			250 psi DR 9.0			200 psi DR 11.0			160 psi DR 13.5			
DIPS Pipe Size	Nominal OD (in)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	DIPS Pipe Size
4"	4.800	0.658	3.405	3.74	0.533	3.670	3.13	0.436	3.876	2.62	0.356	4.045	2.18	4"
6"	6.900	0.945	4.897	7.73	0.767	5.274	6.47	0.627	5.571	5.42	0.511	5.817	4.50	6"
8"	9.050	1.240	6.421	13.29	1.006	6.917	11.13	0.823	7.305	9.32	0.670	7.630	7.75	8"
10"	11.100	1.521	7.875	20.00	1.233	8.486	16.74	1.009	8.961	14.03	0.822	9.357	11.66	10"
12"	13.200	1.808	9.367	28.28	1.467	10.090	23.67	1.200	10.656	19.84	0.978	11.127	16.48	12"
14"	15.300	2.096	10.856	37.99	1.700	11.696	31.80	1.391	12.351	26.65	1.133	12.898	22.15	14"
16"	17.400	2.384	12.346	49.13	1.933	13.302	41.13	1.582	14.046	34.47	1.289	14.667	28.64	16"
18"	19.500	2.671	13.837	61.71	2.167	14.906	51.66	1.773	15.741	43.29	1.444	16.439	35.97	18"
20"	21.600				2.400	16.512	63.38	1.964	17.436	53.12	1.600	18.208	44.14	20"
24"	25.800				2.867	19.722	90.43	2.345	20.829	75.78	1.911	21.749	62.97	24"
30"	32.000							2.909	25.833	116.58	2.370	26.976	96.87	30"
†36"	38.300							3.482	30.918	167.01	2.837	32.286	138.77	†36"
†42"	44.500										3.296	37.512	187.33	†42"

Pressure Rating		125 psi DR 17.0			100 psi DR 21.0			80 psi DR 26.0			63 psi DR 32.5			
DIPS Pipe Size	Nominal OD (in)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)	DIPS Pipe Size
4"	4.800	0.282	4.202	1.76	0.229	4.315	1.45							4"
6"	6.900	0.406	6.039	3.64	0.329	6.203	2.99	0.265	6.338	2.43	0.212	6.451	1.96	6"
8"	9.050	0.532	7.922	6.26	0.431	8.136	5.13	0.348	8.312	4.19	0.278	8.461	3.37	8"
10"	11.100	0.653	9.716	9.42	0.529	9.979	7.73	0.427	10.195	6.30	0.342	10.375	5.09	10"
12"	13.200	0.776	11.555	13.31	0.629	11.867	10.93	0.508	12.123	8.91	0.406	12.339	7.19	12"
14"	15.300	0.900	13.392	17.89	0.729	13.755	14.68	0.588	14.053	11.96	0.471	14.301	9.66	14"
16"	17.400	1.024	15.229	23.15	0.829	15.643	18.98	0.669	15.982	15.48	0.535	16.266	12.48	16"
18"	19.500	1.147	17.068	29.07	0.929	17.531	23.84	0.750	17.910	19.44	0.600	18.228	15.69	18"
20"	21.600	1.271	18.905	35.68	1.029	19.419	29.25	0.831	19.838	23.86	0.665	20.190	19.26	20"
24"	25.800	1.518	22.582	50.89	1.229	23.195	41.73	0.992	23.697	34.03	0.794	24.117	27.46	24"
30"	32.000	1.882	28.010	78.26	1.524	28.769	64.18	1.231	29.390	52.37	0.985	29.912	42.26	30"
†36"	38.300	2.253	33.524	112.13	1.824	34.433	91.93	1.473	35.177	75.00	1.178	35.803	60.49	†36"
†42"	44.500	2.618	38.950	151.39	2.119	40.008	124.09	1.712	40.871	101.28	1.369	41.598	81.68	†42"

Pipe weights are calculated in accordance with PPI TR-7. Average inside diameter is calculated using Nominal OD and Minimum Wall plus 6% for use in estimating fluid flows. Actual ID will vary. When designing components to fit the pipe ID, refer to pipe

†OD available upon special request -- Check with your Performance Pipe contact for availability of dimensions not listed.

Factory Mutual Pipe

DriscoPlex® 1500 IPS and 1600 DIPS Series PE3608 (PE3408)

Size and Dimension Sheet

Iron Pipe Sizes (IPS) DriscoPlex® 1500 Series

Nominal Pipe Size	Average OD (in)	FM Class	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)
2"	2.375	150	0.216	1.917	0.64
		200	0.264	1.815	0.76
3"	3.5	150	0.318	2.826	1.39
		200	0.389	2.675	1.66
4"	4.5	150	0.409	3.633	2.29
		200	0.500	3.44	2.74
6"	6.625	150	0.602	5.349	4.97
		200	0.736	5.065	5.93
8"	8.625	150	0.784	6.963	8.43
		200	0.958	6.594	10.05
10"	10.75	150	0.977	8.679	13.09
		200	1.194	8.219	15.62
12"	12.75	150	1.159	10.293	18.41
		200	1.417	9.746	21.97
14"	14	150	1.273	11.301	22.20
		200	1.556	10.701	26.49
16"	16	150	1.455	12.915	28.99
		200	1.778	12.231	34.60
18"	18	150	1.636	14.532	36.70
		200	2.000	13.76	43.79
20"	20	150	1.818	16.146	45.30
		200	2.222	15.289	54.06
22"	22	150	2.000	17.76	54.82
		200	2.444	16.819	65.41
24"	24	150	2.182	19.374	65.24
		200	2.667	18.346	77.85

Ductile Iron Pipe Sizes (DIPS) DriscoPlex® 1600 Series

Nominal Pipe Size	Average OD (in)	FM Class	Minimum Wall (in)	Average ID (in)	Weight (lbs/ft)
4"	4.8	150	0.436	3.876	2.61
		200	0.533	3.67	3.11
6"	6.9	150	0.627	5.571	5.39
		200	0.767	5.274	6.43
8"	9.05	150	0.823	7.305	9.28
		200	1.006	6.917	11.07
10"	11.1	150	1.009	8.961	13.95
		200	1.233	8.486	16.65
12"	13.2	150	1.200	10.656	19.73
		200	1.467	10.09	23.55
14"	15.3	150	1.700	11.696	26.51
		200	1.700	11.696	31.64
16"	17.4	150	1.582	14.046	34.29
		200	1.933	13.302	40.92
18"	19.5	150	1.773	15.741	43.07
		200	2.167	14.906	51.39
20"	21.6	150	1.964	17.436	52.84
		200	2.400	16.512	63.05
24"	25.8	150	2.345	20.829	75.39
		200	2.867	19.722	89.96

Pipe weights are calculated in accordance with PPI TR-7. Average inside diameter calculated using nominal OD and minimum wall plus 6% for use in estimating fluid flows. Actual ID will vary. When designing components to fit the pipe ID, refer to pipe dimensions and tolerances in applicable pipe specifications.



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Pressure Ratings

Driscoplex® PE 3608¹ Municipal Pipe Pressure Ratings At 80°F

Pipe DR	Working Pressure Rating ² (psi)			Allowable Total Pressure ³ During Recurring Surge (psi)		Allowable Total Pressure During Occasional Surge (psi)	
9	200			300		400	
11	160			240		320	
13.5	125			185		250	
17	100			150		200	
21	80			120		160	
26	65			100		130	

- 1** Previously described as PE3408 in older standards.
- 2** Working Pressure Rating is the Maximum Continuous Pressure Allowed Assuming the Recurring and Occasional Surge Allowances Incorporated above are not exceeded per AWWA C906 and AWWA M55.
- 3** Total Pressure equals the sum of the Pumping pressure and the Repetitive Transient Surge Pressure. PE Pipes have a built-in

Surge Allowance for Repetitive Transient Surge due to their excellent resistance to fatigue. See Performance Pipe Brochure PP402 for additional information on PE pipe's resistance to fatigue.

- 4** The maximum allowable leak test pressure is equal to the allowable total pressure during recurring surge.

When Performance Matters Rely on
Performance Pipe



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Pressure Ratings

Driscoplex® PE 4710¹ Municipal Pipe Pressure Ratings At 80°F

Pipe DR			
	Working Pressure Rating ² (psi)	Allowable Total Pressure ³ During Recurring Surge (psi)	Allowable Total Pressure During Occasional Surge (psi)
9	250	375	500
11	200	300	400
13.5	160	240	320
17	125	185	250
21	100	150	200
26	65	120	160

1 PE4710 pipe materials and Pressure Ratings are described in ASTM F714, ASTM D3035, and AWWA C901

2 Working Pressure Rating is the Maximum Continuous Pressure Allowed Assuming the Recurring and Occasional Surge Allowances Incorporated above are not exceeded per AWWA C906 and AWWA M55.

3 Total Pressure equals the sum of the Pumping pressure and the Repetitive Transient Surge Pressure. PE Pipes have a built-in Surge Allowance for Repetitive Transient Surge due to their excellent resistance to fatigue.

4 The maximum allowable leak test pressure is equal to the allowable total pressure during recurring surge.

When Performance Matters Rely on
Performance Pipe

Technical Note PP 819-TN Field Bending of DriscoPlex® Pipe

Polyethylene pipe's flexibility makes the pipe easy to handle and install. Not only can small diameter (6" and less) pipes be purchased in coils to reduce joining costs but the tight curvature permitted in polyethylene pipelines reduces the need for fittings. All of the major trenchless installation methods rely on the pipe's flexibility for avoiding obstacles and handling curvature in the bore path or misalignment in host pipes. Generally, its great flexibility makes polyethylene pipe the preferred pipe for installation.

Bend Radius

The measure for curvature in a pipeline is the bend radius. See Figure 1.

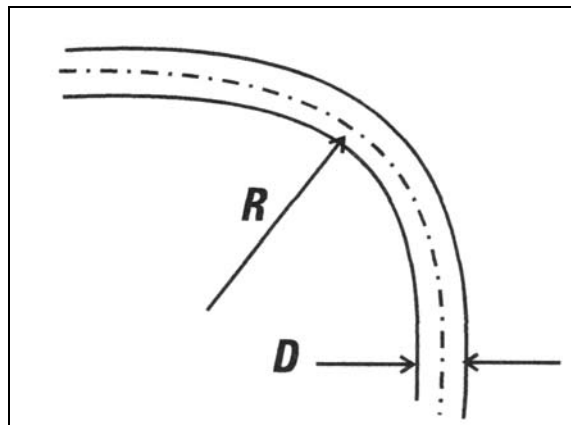


Figure 1. Bend Radius, R

Tightening the curvature of a pipeline results in a smaller (tighter) bend radius. The *minimum bend radius* is defined as the smallest radius to which the pipe may be safely curved.

The *minimum bend radius* for polyethylene pipe is given by Equation 1.

$$R = \alpha(OD) \quad (1)$$

Where

R = *minimum bend radius* for the pipe (in)

α = *minimum bend ratio*

OD = pipe outside diameter (in)

The longitudinal wall strain in a curved pipe is proportional to the bend ratio. Generally, the strain capacity of polyethylene is sufficiently safe for a bend ratio of 20. However, there is another limit to bending. Longitudinal bending induces ovality in the ring direction of the pipe thus reducing the resistance to kinking (local buckling). Thicker wall pipes have higher resistance to kinking and therefore can safely withstand more curvature than thinner wall pipes. Likewise, temporary curvature is less likely to cause kinking than permanent curvature because polyethylene's modulus decreases with time under load. Therefore, the *minimum bend ratio* depends on the DR and the duration of curvature. Table 1 contains *minimum long-term bend ratios* for DriscoPlex® pipe. Because fittings and flanges are rigid compared to pipe, the *minimum bend ratio* must be increased to 100 where fittings or flanges are present in the curve. The *long-term bend ratio* applies to installed pipe but it is also recommended for safely limiting curvature during handling and installation.

Table 1. Minimum Long-Term Bend Ratio for DriscoPlex® Pipe

<i>Dimension Ratio, DR</i>	<i>Minimum Bend Ratio, α^1</i>
7	20
7.3	20
9	20
11	25
13.5	25
17	27
21	27
26	34
32.5	42
41	52
Fitting or flange present in bend	100

Example 1. What is the *minimum bend radius* for a 12" IPS DR17 pipe?

Solution: Find the *minimum bend ratio* in Table 1 for DR17 pipe and solve Equation 1 for the *minimum bend radius*.

$$R = \alpha(OD) = 27(12.75 \text{ in}) = 344.25 \text{ in} = 28.7 \text{ ft}$$

¹ See limitations for horizontal directional drilling.

Installation of Pipe in Curves

Field bending involves excavating the trench to the desired bend radius, then sweeping or pulling the pipe string into the required bend and placing it in the trench. Temporary restraints may be required to bend the pipe, and to maintain the bend while placing the pipe in the trench and placing initial backfill. Temporary blocks or restraints must be removed before installing final backfill, and any voids must be filled with compacted initial backfill material.

Considerable force may be required to field bend the pipe, and the pipe may spring back forcibly if the restraints slip or are inadvertently released while bending. Observe appropriate safety precautions during field bending.

Special Considerations for Horizontal Directional Drilling

Directional drillers prefer polyethylene pipe over other materials as it offers them more options in determining laydown locations. They can string the pipe around roadway curves and intersections that would be impossible to do with other types of pipes. The pipe's flexibility allows installers to string pipe perpendicular to the direction of the bore and then sweep the pipe through a tight curve into the bore for pullback and it allows the driller to locate the break-over section closer to the bore. For large diameter pipe installations drillers can usually get by with a single small crane at the break-over as opposed to steel pipes which need multiply cranes. Even though stringing is a temporary condition, Table 1 is recommended for calculating the *minimum bend radius* as the pipe may remain curved for several hours or even days and be exposed to the sun.

The amount of permissible curvature in the bore itself is generally limited by the drill stem's bending capability and not the polyethylene pipe. **However, due to the increased stress in the pipe during a directional drill, the minimum bend ratio in the bore itself should not be less than two times the value shown in Table 1.** For example, a 36" IPS DR 13.5 pipe has a *minimum bend radius* of 75 feet for an open cut installation. In a bore the same pipe would have a *minimum bend radius* of two times 75 feet or 150 feet. The larger radius is rarely a limitation for the driller as the drill stem used with this size pipe (5") generally has at least a 700 foot bend radius.

Special Considerations for Plowing and Planting

Plowing and planting involve cutting a narrow trench, and feeding the pipe into the trench through a shoe or chute fitted just behind the trench cutting equipment. The shoe or chute feeds the pipe into the bottom of the cut. The *minimum bend radius* of the pipe through the shoe may be tighter than the *minimum bend radius* of the pipe used for a permanent long-term installation, but it must not be so tight that the pipe kinks. Table 2 presents the *minimum short-term bend ratio* for applications such as plowing and planting. The pipe's path through the shoe or chute should be as friction free as practicable to reduce additional outerfiber tensile stresses. Generally plowing and planting is limited to 12" and smaller pipes.

Table 2. Minimum Short-Term Bending Radius

<i>Pipe Dimension Ratio</i>	<i>Minimum Short-Term Bend Ratio, α_{ST}</i>
7.3	10
9	10
11	13
13.5	13
17	17
21	17

Summary

Field bending of polyethylene pipes often eliminates the need for fittings. A prime example is bending the pipe to align it with the curvature in a cul-de-sac. The bending flexibility of polyethylene pipe allows for its installation by trenchless methods, such as sliplining, pipe bursting, and directional drilling and by submerging off shore. To ensure maximum performance of the pipe limit the *minimum long-term bend radius* of pipeline curves to the values given in Table 1.

MUNICIPAL – WATER/WASTEWATER FREQUENTLY ASKED QUESTIONS

A	General	1
B	Engineering Properties	2
C	Manufacturing	3
D	Hydraulics	4
E	Design	5
F	Installation	7
G	Joining	8

A General

A1 What does the acronym HDPE stand for?

1. HDPE stands for High Density Polyethylene.

A2 Is PE pipe safe for drinking water?

1. Yes. DriscoPlex® 4000 and 4100 pipes are made from PE compounds approved by NSF for public drinking water.

A3 How does using PE pipe save my utility money?

1. Aside from the low cost of PE pipe, long term savings may be realized due to PE pipe's fusion joints and corrosion resistance. Leakage rates for fused PE systems are far lower than for gasket jointed DI or PVC systems. PE pipe is resistant to corrosion. It will not undergo tuberculation and is unaffected by "hot" soils or electrogalvanic corrosion, thus PE pipes last longer in the ground. Additional savings may be realized by trenchless installation. Go to www.PEpipe.org for more information.

A4 Is PE pipe a green solution for piping?

1. Yes. It is safe when manufactured, used, or incinerated. It helps preserve water and electricity as there is no loss water through the fused joint. No toxins are released during the creation or disposal of PE pipe.

A5 What do the terms DR and SDR mean?

1. DR stands for Dimension Ratio which is the average outside diameter of a PE pipe divided by its minimum wall thickness. A Standard Dimension Ratio (SDR) is a specific DR based on ANSI preferred number series. The use of SDR's enables manufacturers to produce pipe to a set of standardized DR's. SDR's include 9, 11, 13.5, 17, 21, 26, and 32.5. All SDR's are DR's, but the converse is not true.

A6 How much water is lost in a typical month from a 1/4" diameter leak from a gasket joint?

1. NASSCO reports that a pencil sized hole (1/4" diameter) in an 80 psi main results in approximately 15,000 gals/day or 450,000 gals/month.

A7 Why is a fusion joint better than a gasket joint?

1. A fusion joined pipeline may be thought of as a continuous pipeline without joints. On the other hand, gasket joints are a source of leakage and lost water in many water systems. Leaks may occur if the gasket is improperly installed, if dirt or grit sticks to the gasket, if the gasket is not properly lubricated, if negative pressure (vacuum) occurs in the pipeline, if ground movement or sub trench consolidation occurs, if significant thermal change occurs and if gaskets are blown out due to surge pressures. Fused joints are generally considered superior to gasket joints for leak prevention.

A8 Will trenchless installation save money over open cut trenching?

1. Yes. Everyday more utilities realize the advantages of trenchless technologies. More trenchless projects are being installed than in the past because of cost savings. Savings result from quicker installations, faster permitting and design time, fewer disruptions to business and residents, less damage to parks and trees, and less disturbance to road beds (and subsequent road repair.)

B Engineering Properties

B1 Where can I find engineering properties such as the modulus and tensile strength for PE pipes?

1. Engineering data for HDPE and PE pipes may be found in Chapter 3 of the Plastics Pipe Institute's Handbook of Polyethylene Pipe which may be found at www.plasticpipe.org. Engineering information may also be found in the various Performance Pipe Technical Notes and in the Engineering Manual. Look on the Technical Library page for a link to Technical Notes and to the Engineering Manual.

B2 Does PE pipe tuberculate like DI pipe?

1. No. PE pipe does not tuberculate. Tuberculation is caused by ferrous seeking bacteria in iron, cast iron or ductile iron pipes. PE is immune to this attack.

B3 How does PE pipe's capacity for recurring surge pressures (fatigue) compare to other pipes?

1. PE has exceptional capacity for handling recurring surge pressures. For instance in AWWA standards recurring surge pressure must be subtracted from PVC pipe's Pressure Class whereas PE has resistance up to 150% of its Pressure Class. Marshall and Brogden report on the cyclical fatigue strength of PVC and HDPE and their report shows at a cyclical stress range of 10 Mpa (1450 psi) some PVC pipes failed at approximately 400,000 cycles whereas HDPE pipe reaches 10,000,000 million cycles before failure.

B4 How does the impact strength of PE compare with other pipes?

1. PE is a ductile material and has exceptional impact strength. As an example. AWWA publishes an Izod Impact resistance value of 10-12 ft-lbf/in for HDPE and of 0.65 ft-lbf/in. for PVC. PE superior impact strength provides a piping system that is near impervious to impact damage and to damage from improper tapping.
2. In the real world, engineers understand that pipes must be tough and resist impact and handling damage. PE pipes are field tested and proven to be impact tough.

B5 How do the hydraulic wear characteristics of PE pipe compare to steel?

1. An Army Corp of Engineers study reported that PE pipe wore at a rate of 3 to 5 times less than steel pipe in sand slurry. Best results are obtained with PE when the flow is turbulent to keep particles suspended. See Chapter 6 of the PPI Handbook of PE Pipe for slurry applications.

C Manufacturing

C1 To what specification are DriscoPlex® 4000 and DriscoPlex® 4100, water and sewer pipe manufactured?

1. DriscoPlex® 4100 2" and 3" pipes are manufactured in accordance with ASTM D3035 and AWWA C901. For 4" and larger pipes, DriscoPlex® 4000 and 4100 pipes are manufactured to ASTM F714 and AWWA C906. All Driscoplex® 4000 and 4100 pipes meet NSF 61. NSF 14 is available as an option.

C2 To what specification is DriscoPlex® 1000 pipe manufactured?

1. DriscoPlex® 1000 pipe is made to ASTM F714.

C3 What is the difference between IPS and DIPS sizing?

1. IPS (Iron Pipe Size) pipes have the same outside diameter as black iron pipe. DIPS (Ductile Iron Pipe Size) pipes have the same outside diameter as cast iron pipe.

C4 What diameter pipe is available on a coil?

1. PE coils are available in diameter sizes up to 6". Typical coil lengths are 500 ft. and 1000ft. Availability varies with pipe diameter.

C5 What fittings are available from Performance Pipe?

1. A complete line of molded PE fittings including tees and MJ adapters up to 8" IPS and molded PE flange adapters up to 18" are available from Performance Pipe. For more information, click on the link that says Fittings in the Technical Library. <http://www.performancepipe.com/> Additional fittings and sizes are available through other PE suppliers.

C6 Why are there two material codes (PE3408/3608 or PE3408/4710) printed on the side of my pipe?

1. In 2005 ASTM allowed the introduction of new codes for PE pipes. Prior to that time HDPE had a material designation code of PE3408. Under the new system material with a PE3408 code is classified either as PE3608 or PE4710. To facilitate a smooth transition manufacturers are allowed to dual mark pipe as PE3408/3608 or PE3408/4710. For details on this transition see Technical Note PP816. A link to Technical Notes is found in the Technical Library.

D Hydraulics

D1 How does surge pressure in HDPE pipe compare with DI or PVC pipe?

1. Surge pressures in HDPE pipe are significantly lower than in DI pipe and lower than PVC pipe due to the lower value of dynamic modulus for HDPE. For example in a typical 8" line a velocity change of 5 fps would cause a 51 psi surge in HDPE DR17 pipe, a 87 psi surge in PVC DR18 pipe, and a 262 psi surge in DI Class 350 lined pipe. Lower surge pressures often means longer life for pumps and valves in an HDPE pipeline, as well as lower pressure class pipes.

D2 How does the Hazen-Williams C factor for HDPE compare with DI pipe?

1. The C factor for HDPE butted fused pipe was found experimentally to be about 155. A conservative design value is 150. DI manufacturers publish an initial value of 140 for cement lined DI pipe. Many engineers assume that this value will be reduced over the life of a pipeline due to corrosion and use design values of 120 or 100. Such a reduction is not required for HDPE pipe. AWWA M-55 states that "No allowance for corrosion and therefore, no subsequent lowering of the flow capacity need be considered when using PE pipe."

D3 What is the maximum flow velocity for HDPE?

1. In a pumped system the maximum operating velocity is limited by the surge pressure capacity of the pipe. The Plastics Pipe Institute's Handbook of Polyethylene Pipe states that "if surge is not a consideration, water flow velocities exceeding 25 feet per second may be acceptable."

D4 Does the fusion bead affect flow?

1. No. The Hazen Williams C factor of 155 was determined with pipe that was fused together and thus contained inner fusion beads.

D5 What is the safe peak pressure (surge plus pumping) for HDPE?

1. AWWA C906 defines two types of surge pressure, recurring and occasional. The safe peak pressure or allowed total pressure for HDPE pipe is 1.5 times the pipe's pressure rating for recurring surge and 2.0 times the pipe's pressure rating for occasional surge. For instance a DR17 pipe which has a pressure rating of 100 psi can safely handle total pressure during recurring surge of 150 psi and total pressure during an occasional surge of 200 psi.

E Design

E1 Where can I find design manuals for HDPE pipe?

1. Design information for HDPE pipe is located on the Technical Library Page of Performance Pipe's website. You will find links to Technical Notes, the Engineering Manual, and the Field Handbook. There is also a link to the Plastics Pipe Institute's Handbook of Polyethylene Pipe. Other resources include AWWA Manual M-55 and various ASCE publications including MOP 108 Pipeline Design for Horizontal Directional Drilling and MOP 112 Pipe Bursting Project.

E2 Where do I find the pressure rating for PE pipe?

1. Pressure ratings are given in PP401-3608 and PP401-4710 for Municipal and Industrial pipes as well as on Size and Dimension Sheets for each specific product. The Performance Pipe website Technical Library contains a link to the Size and Dimension sheets.

E3 Where can I find a table of dimensions including inside diameter, outside diameter, and wall thickness for PE pipe?

1. This information is given in the Size and Dimension Sheets. Go to the Technical Library for a link

E4 Is thermal expansion or contraction a concern for HDPE pipelines?

1. Normally it is not a concern for buried municipal water or sewer pipelines. Soil will provide sufficient restraint against movement. However, thermal effects must be considered for above grade or aerial pipelines. The unrestrained expansion/contraction coefficient for PE pipes is approximately 1×10^{-5} in/in/°F. See Technical Note PP814, "Thermal Effects" for more information.

E5 Do I need an expansion joints for HDPE pipe?

1. Generally there are better ways to handle temperature change in an above grade or aerial pipeline than using expansion joints. See Technical Note PP814, "Thermal Effects". If an expansion joint is used, the joint should be specifically manufactured for use with HDPE pipe. Use of an improper expansion joint such as one designed for steel pipe could damage the PE pipe.

E6 What are the safe maximum and minimum burial depths for HDPE pipe?

1. Safe burial depths vary and should be calculated. In lieu of calculations AWWA says that for an embedment soil with an E' of 1000 psi and no surface water, HDPE pipes with DR's ranging from 7.3 to 21 can be safely buried from a depth of 2 ft to 25 ft where no traffic load is present and from 3 ft to 25 ft where H20 live load is present.
2. Most pipes can be buried to deeper depths. Equations for calculating burial depth may be found in the Performance Pipe Engineering Manual, Book 2, Chapter 7 or Chapter 6 of the PPI Handbook of Polyethylene Pipe. Links to both documents are in the Technical Library.

E7 Does Performance Pipe have a pipe calculation program?

1. Yes. PlexCalc II will do many of the calculations that are in the Performance Pipe Engineering Manual and the PPI Handbook of Polyethylene Pipe. To order one, go to Contact Us and request Literature on CD-Rom. The CD contains PlexCalc II.

F Installation

F1 Will a surface scratch hurt my pipe?

1. AWWA M-55 states that "minor scratches or scuffing will not impair serviceability" and that "pipe with gouges or cuts in excess of 10 percent of the product wall should not normally be used."

F2 Can I install HDPE pipe with the same embedment used for PVC and DI pipe?

1. Yes. The same embedment materials are generally suitable. The particulars of the application may influence this somewhat. For instance very high DR pipes at shallow cover subjected to live load may require a higher level of compaction for the embedment material than required by a lower DR PE pipe or stiffer pipe.

F3 Does HDPE pipe require cathodic protection? Can it be installed in "hot" soils that attack metal pipe?

1. HDPE pipe does not undergo galvanic corrosion and therefore it may be safely installed in hot soils that would attack metal pipes without any cathodic protection.

F4 Are thrust blocks required with buried HDPE pipe?

1. No. When transitioning from an HDPE pipeline into a DI or PVC pipeline with unrestrained gasket joints it is necessary to provide restraint. See Performance Pipe Technical Note PP813, "Mechanical Restraint and Poisson Effect".

F5 What is the bending radius of pipe? How does it compare to PVC?

1. PE pipes can be safely bent to a radius about 1/10th that of the same size PVC pipe. See Performance Pipe Technical Note PP819, "Field Bending of DriscoPlex® Pipe".
2. HDPE pipe can be cold bent to the dimensions shown below for a long term application based on the pipe DR. The pipes may be bent to a tighter radius for a short term application, such as during installation.

Pipe DR	Minimum Long Term Cold Bending Radius
9 or less	20 times pipe OD
9 to 13.5	25 times pipe OD
13.5 to 21	27 times pipe OD
Over 21	30 times pipe OD
Fitting or flange present	100 times pipe OD

F6 Where can I find the safe pull strength for HDPE pipe?

1. See Performance Pipe Technical Note PP803, "Pull-in Applications"

F7 How do I stack and store pipe on the job site?

1. See Performance Pipe "Field Handbook" found on the Technical Library page. Information is also given in AWWA Manual M55 and the PPI Handbook of Polyethylene Pipe, Chapter 2.

F8 Are there hazardous vapors or fumes that come off of HDPE pipe when it is cut?

1. There are no hazardous fumes associated with the cutting of HDPE pipe.

F9 Can I pour concrete safely around HDPE pipe?

1. Yes.

F10 What is the recommended test pressure and test procedure for HDPE pipe?

1. See Performance Pipe Technical Note PP802, "Leak Testing".

G Joining

G1 Are heat fused pipe joints safe?

1. Yes. Polyethylene Pipe has been heat fused for almost fifty years in a wide range of service applications. The window of conditions that are acceptable for good quality fusion joints is broad, and the long term performance is documented in actual field applications as well as in long term testing. PE pipe joints are standardized through ASTM fusion procedures as well as recognition in AWWA, PPI, ASME, and other industry standards.
2. There are new technologies that attempt to mimic the advantages of PE fused joints for other pipe materials. However, these materials do not have the history, the proven performance, and the industry peer reviewed standardization of PE pipe fusion joints. The physical chemistry of PVC pipes requires much more precision than is required by HDPE when fusing.

G2 Can I fuse and install HDPE pipe in sub-zero weather?

1. Yes. You have to protect the joint during cold weather fusion from wind, moisture, and blowing snow so that the heater plate uniformly heats the end of the pipes. Guidelines for cold weather fusion are given in PP750, "Heat Fusion Joining Procedures and Qualification Guide" found in the Technical Library.

G3 Where do I find information on fusing HDPE pipe?

1. ASTM F2620 addresses heat fusion of HDPE pipes. Also, see Performance Pipe PP750, "Heat Fusion Joining Procedures and Qualification Guide" for information on fusing DriscoPlex® pipe products. A link to PP750 is located on the Performance Pipe website in the Technical Library. Fusion information on Performance Pipe historical products such as Driscopipe® and Plexco® pipe are there as well.

G4 How many joints can I make in a day?

1. Fusion time depends on the pipe size and DR as well as field conditions. Larger diameter and heavier wall pipes take longer to fuse as more time is required to heat and cool the pipe. For instance, 6" DR11 pipe might take 10 to 12 minutes including the time to allow the joint to cool under pressure. Table 2-2 in Book 3, Chapter 2 of the Performance Pipe Engineering Manual gives approximate butt fusion joining rates.

G5 Can solvent cement or adhesive be used to join HDPE pipe?

1. No. Heat fusion, which includes butt fusion, socket fusion, and electrofusion, and Mechanical joints are the only permitted methods for joining HDPE pipe.

G6 Where do I get the equipment to fuse HDPE pipes?

1. Manufacturers of fusion equipment include McElroy Manufacturing, Connectra Fusion Technologies, Ritmo America and Wegner Welding. The equipment is readily available through distributors.

G7 Mechanical Connections, Maintenance, and Repair

G8 How do I transition from PE pipe to DI valves or pipe?

1. The most common method is to use a PE MJ adapter to connect the PE pipe end in a DI MJ bell using the bolt and gland kit supplied by the PE MJ manufacturer. See Technical Note PP812, "MJ Adapter Connections". Connections may also be made using a flange adapter which is essentially

a HDPE Van Stone style flange with a backup ring. See Technical Note PP811, "PE Flange Adapter". DIPS sizes HDPE pipe may be inserted directly into an MJ bell with a restraint ring and stiffener for the HDPE pipe. When jointing HDPE pipe to a DI pipeline either the DI joints must be restrained or the transition connection must be anchored. See Technical Note PP813, "Mechanical Restraints and Poisson Effects".

G9 How do I repair HDPE pipe is the ditch is full of water?

1. If the ditch can be dewatered and the pipe dried off, fusion repair may be used. Otherwise a mechanical repair is recommended.

G10 Can be HDPE pipe be hot or cold tapped to install service connections with fittings presently available?

1. HDPE pipe can be cold or hot/wet (under pressure) tapped using piping products presently available. Saddle fusion tapping tees, electrofusion tapping tees, Fuse-A-Corps, and branch-saddles are readily available in the industry. There are also bolt-on mechanical connections qualified for use with HDPE pipelines as well. With this variety of fittings, tapping is a straightforward procedure.

G11 Can a fully body tapping saddle be used with HDPE pipe?

1. Generally speaking, many saddle manufacturers have saddles/sleeves specifically made for use with HDPE pipe and they are typically the same as those used with PVC pipe and sometimes the same as those used with Ductile Iron pipe. Service saddles often include double straps or extra wide straps and Belleville (spring) washers for use with HDPE pipe so that the tension on the strap remains constant once the nuts are properly torqued. As for tapping sleeves, some manufacturers such as JCM indicate that as long as it is a full sleeve in accordance with AWWA C110/111, it can be used on HDPE pipe.

2. Can HDPE pipe be threaded using the same tapping tools commonly used to tap PVC or ductile iron pipe?

No. Tapped threads are not recommended for use on PE. The industry standards for service taps to HDPE mains recommend the use of saddle fusion tapping tees, electrofusion tapping tees, Fuse-A-corps, branch-saddles, and certain metal mechanical clamps.

G12 If HDPE pipe is punctured, how is it repaired?

1. When external third-party damage does occur, there are several repair methods. Punctures in PE pipe may be repaired using electrofusion repair saddles or mechanical repair clamps.

If the damage is sufficiently extensive that a pipe section must be removed, the pipe section may be replaced with a spool piece of the pipe connected on each end to the exiting pipe using mechanical fittings, electrofusion couplings, or flanged connections. Refer to the PPI Handbook on HDPE pipe repair and maintenance.

- G13 What are some applications where an insert stiffener is required?
1. Insert stiffeners are normally used when inserting HDPE pipe into a PVC bell or DI MJ bell. The stiffener ensures compression of the gasket to the PE pipe. Stiffeners are also typically used in FM MJ adapters and in some large diameter MJ adapters. Check with the MJ adapter manufacturer for their specific recommendations.
- G14 What type of equipment is used to insert stiffeners into large diameter HDPE Pipe?
1. PE is considered to be a re-roundable pipe and the cold ring clamps of a McElroy fusion machine may be used to reround larger pipe. Where desire, expandable stiffeners are available. They can be inserted into the pipe and then expanded with a triangular wedge. Romac makes these for pipes up to 12". Cascade Waterworks sells these up to 20" DIPS.
- G15 Can I use a butterfly valve on HDPE pipe?
1. Yes. For PE pipe, connections to butterfly valves are usually made with Beveled Flange Adapters. This prevents interference between the valve and the inside diameter of the.
- G16 Can I pig HDPE pipe?
1. Yes, a soft pig should be used.



Material Safety Data Sheet

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

Performance Pipe (PE Pipe and Fittings: Various Colors)

Product Use: Conveyance of liquids, gases and other media.

Synonyms: Polyethylene Plastic DriscoPlex® Pipe and Fittings

Product CAS No.: Mixture

Company Identification:

Performance Pipe, A Division of
Chevron Phillips Chemical Company LP
5085 W Park Blvd, Ste 500
PlanoTX 75093

Product Information:

MSDS Requests: 1 - (800) 852-5530
Technical Information: 1 - (800) 527-0662
Responsible Party: Product Safety Group
Email:msds@cpchem.com

Chevron Phillips Chemicals International N.V.
Brusselsesteenweg 355
B-3090 Overijse
Belgium

24-Hour Emergency Telephone Numbers: HEALTH:Chevron Phillips Emergency Information Center 866.442.9628 (North America) and 1.832.813.4984 (International)

TRANSPORTATION: North America: CHEMTREC 800.424.9300 or 703.527.3887
ASIA: +1.703.527.3887
EUROPE: BIG .32.14.584545 (phone) or .32.14.583516 (telefax)
SOUTH AMERICA SOS-Cotec Inside Brazil: 0800.111.767
Outside Brazil: 55.19.3467.1600

SECTION 2 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Colored plastic (various colors)

NFPA RATINGS: Health: 0 Flammability: 0 Reactivity: 0

GHS Classification and Labeling:

Not hazardous. No hazards have been determined using GHS criteria.

IMMEDIATE HEALTH EFFECTS:

Eye: If this material is heated, thermal burns may result from eye contact. Not expected to cause prolonged or significant eye irritation.

Skin: If this material is heated, thermal burns may result from skin contact. Contact with the skin is not expected to cause prolonged or significant irritation. Contact with the skin is not expected to cause an allergic skin response. Thermal burns to the skin: may include pain or feeling of heat, discoloration, swelling, and blistering.

Ingestion: Not expected to be harmful if swallowed.

Inhalation: Not expected to be harmful if inhaled. If this material is heated, fumes may be unpleasant and produce nausea and irritation of the upper respiratory tract.

SECTION 3 COMPOSITION/ INFORMATION ON INGREDIENTS

COMPONENT	CAS NUMBER	AMOUNT	EINECS / ELINCS	SYM	R-Phrases
Polyethylene	9002-88-4	> 96 % weight	EXEMPT	NA	NA
Polyethylene Hexene Copolymer	25213-02-9	> 96 % weight	EXEMPT	NA	NA
Polyethylene Butene Copolymer	25087-34-7	> 96 % weight	NA	NA	NA
May Include: Carbon Black	1333-86-4	0 - 4 % weight	215-609-9	NA	NA
May Include: Lead Chromate Pigment	1344-37-2	0 - 1 % weight	215-693-7	T, N	R62, R50/53, R40, R33, R61

Occupational Exposure Limits:

Component	Limit	TWA	STEL	Ceiling / Peak	Notation
May Include: Carbon Black	ACGIH	3.5 mg/m3	NA	NA	NA
May Include: Carbon Black	German MAK	6 mg/m3	NA	NA	NA
May Include: Carbon Black	OSHA PEL	3.5 mg/m3	NA	NA	NA
May Include: Lead Chromate Pigment	ACGIH	.01 mg/m3	NA	NA	NA
May Include: Lead Chromate Pigment	German MAK	.1 mg/m3	NA	4	NA
May Include: Lead Chromate Pigment	OSHA SP	.05 mg/m3	NA	NA	NA
Polyethylene	ACGIH	3 mg/m3	NA	NA	NA
Polyethylene	German MAK	6 mg/m3	NA	NA	NA
Polyethylene Butene Copolymer	ACGIH	Not Established	NA	NA	NA
Polyethylene Hexene Copolymer	ACGIH	Not Established	NA	NA	NA

SECTION 4 FIRST AID MEASURES

Eye: If heated material should splash into eyes, flush eyes immediately with fresh water for 15 minutes while holding the eyelids open. Remove contact lenses, if worn. Get immediate medical attention.

Skin: If the hot material gets on skin, quickly cool in water. See a doctor for extensive burns. Do not try to peel the

solidified material from the skin or use solvents or thinners to dissolve it. The use of vegetable oil, mineral oil, or petroleum jelly is recommended for removal of this material from the skin.

Ingestion: If swallowed, do not induce vomiting. Give the person a glass of water or milk to drink and get immediate medical attention. Never give anything by mouth to an unconscious person.

Inhalation: Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if breathing difficulties continue.

SECTION 5 FIRE FIGHTING MEASURES

FIRE CLASSIFICATION:

Classification (29 CFR 1910.1200): Not flammable or combustible. This material will burn although it is not easily ignited.

NFPA RATINGS: Health: 0 Flammability: 0 Reactivity: 0

FLAMMABLE PROPERTIES:

Flashpoint: NA

Autoignition: NA

Flammability (Explosive) Limits (% by volume in air): Lower: NA Upper: NA

EXTINGUISHING MEDIA: Use water fog, foam, dry chemical or carbon dioxide (CO₂) to extinguish flames.

PROTECTION OF FIRE FIGHTERS:

Fire Fighting Instructions: Material will not burn unless preheated. Clear fire area of all non-emergency personnel. Only enter confined fire space with full gear, including a positive pressure, NIOSH-approved, self-contained breathing apparatus. Cool surrounding equipment, fire-exposed containers and structures with water. Container areas exposed to direct flame contact should be cooled with large quantities of water (500 gallons water per minute flame impingement exposure) to prevent weakening of container structure. If possible, water should be applied as a spray from a fogging nozzle since this is a surface burning material. The application of high velocity water will spread the burning surface layer. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

Combustion Products: Incomplete combustion can also produce formaldehyde. Normal combustion forms carbon dioxide, water vapor and may produce carbon monoxide, original monomer, other hydrocarbons and hydrocarbon oxidation products, depending on temperature and air availability. Combustion may form: Carbon Dioxide, Carbon Monoxide

SECTION 6 ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in vicinity of spilled material.

Spill Management: If heated material is spilled, allow it to cool before proceeding with disposal methods.

Reporting: U.S.A. regulations may require reporting spills of this material that could reach any surface waters. Report spills to local authorities and/or the National Response Center at (800) 424-8802 as appropriate or required.

SECTION 7 HANDLING AND STORAGE

READ AND OBSERVE ALL PRECAUTIONS ON PRODUCT LABEL . REFER TO PRODUCT LABEL OR MANUFACTURERS TECHNICAL BULLETINS FOR THE PROPER USE AND HANDLING OF THIS MATERIAL .

Precautionary Measures: Avoid contact of heated material with eyes, skin, and clothing. Avoid breathing vapor or fumes from heated material.

Unusual Handling Hazards: Potentially toxic/irritating fumes may be evolved from heated material. At temperatures (>350°F, >177°C), polyethylenes can release vapors and gases, which are irritating to the mucous membranes of the eyes, mouth, throat, and lungs. These substances may include acetaldehyde, acetone, acetic acid, formic acid,

formaldehyde and acrolein. Based on animal data and limited epidemiological evidence, NTP, IARC (2A), and OSHA have listed formaldehyde as a probable human carcinogen. Following all recommendations within this MSDS should minimize exposure to thermal processing emissions.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS:

If heated material generates vapor or fumes, use process enclosures, local exhaust ventilation, or other engineering controls to control exposure.

PERSONAL PROTECTIVE EQUIPMENT:

Eye/Face Protection: Wear eye protection such as safety glasses, chemical goggles, or faceshields if engineering controls or work practices are not adequate to prevent eye contact. If this material is heated, wear chemical goggles or safety glasses and a face shield.

Skin Protection: If this material is heated, wear insulated clothing to prevent skin contact if engineering controls or work practices are not adequate to prevent skin contact.

Respiratory Protection: If user operations generate harmful levels of airborne material that is not adequately controlled by ventilation, wear a NIOSH approved respirator that provides adequate protection. Use the following elements for air-purifying respirators: Organic Vapor and Formaldehyde.

Occupational Exposure Limits:

Component	Limit	TWA	STEL	Ceiling / Peak	Notation
May Include: Carbon Black	ACGIH	3.5 mg/m ³	NA	NA	NA
May Include: Carbon Black	German MAK	6 mg/m ³	NA	NA	NA
May Include: Carbon Black	OSHA PEL	3.5 mg/m ³	NA	NA	NA
May Include: Lead Chromate Pigment	ACGIH	.01 mg/m ³	NA	NA	NA
May Include: Lead Chromate Pigment	German MAK	.1 mg/m ³	NA	4	NA
May Include: Lead Chromate Pigment	OSHA SP	.05 mg/m ³	NA	NA	NA
Polyethylene	ACGIH	3 mg/m ³	NA	NA	NA
Polyethylene	German MAK	6 mg/m ³	NA	NA	NA
Polyethylene Butene Copolymer	ACGIH	Not Established	NA	NA	NA
Polyethylene Hexene Copolymer	ACGIH	Not Established	NA	NA	NA

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor: Colored plastic (various colors)

Autoignition: NA

Boiling Point: NA

Density: 0.91 - 0.97 g/cm³

Evaporation Rate: NDA

Flammability (Explosive) Limits (% by volume in air): Lower: NA Upper: NA

Flashpoint: NA
Molecular Formula: Mixture
Molecular Weight: NA
Melting Point: 100°C (212°F) - 135°C (275°F)
Octanol / Water Partition Coefficient: log-Kow: NDA
pH: NA
Pour Point: NDA
Solubility (in water): Insoluble in water.
Specific Gravity: 0.91 - 1.02
Vapor Pressure: NA
Vapor Density (AIR=1): NA
Viscosity: NDA
Percent Volatile: NDA

SECTION 10 STABILITY AND REACTIVITY

Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Conditions to Avoid: heating above recommended processing temperature

Incompatibility With Other Materials: None.

Hazardous Decomposition Products: Carbon Oxides.

Hazardous Polymerization: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

IMMEDIATE HEALTH EFFECTS:

Acute Oral Toxicity: LD50 / rat / 7950 mg/kg

Acute Dermal Toxicity: LD50 / not known

Acute Inhalation Toxicity: LC50 / not known

Eye Irritation: Polyethylene: This material is not expected to be irritating to the eyes.

Skin Irritation: This material is not expected to be irritating to the skin.

Sensitization: Dermal - not a sensitizer / human

ADDITIONAL TOXICOLOGY INFORMATION:

This product contains POLYMERIZED OLEFINS.

During thermal processing (>350°F, >177°C) polyolefins can release vapors and gases (aldehydes, ketones and organic acids) which are irritating to the mucous membranes of the eyes, mouth, throat, and lungs. Generally these irritant effects are all transitory. However, prolonged exposure to irritating off-gases can lead to pulmonary edema. Formaldehyde (an aldehyde) has been classified as a probable human carcinogen by NTP, IARC (2A), and OSHA based on animal data and limited epidemiological evidence. Pigments containing carbon black, lead chromate, nickel, antimony, or titanium compounds may have been incorporated into this product. The International Agency for Research on Cancer (IARC) has classified carbon black as a Group 2B carcinogen (possibly carcinogenic to humans) based on sufficient evidence in animals and inadequate evidence in humans. However, the pigments in this product are bound in a polymer matrix which severely limits its extractability, bioavailability and toxicity. The lead chromate pigment is also silica-encapsulated as well as bound in the polymer matrix. None of these pigments is likely to cause adverse health effects under recommended conditions of use.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY:

This material is not expected to be harmful to aquatic organisms.

ENVIRONMENTAL FATE:

This material is not expected to be readily biodegradable.

SECTION 13 DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. This material as manufactured is a non hazardous waste but may be contaminated upon use. If this material must be discarded, depending on its use and application, it may meet the criteria of a hazardous waste as defined by the US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make accurate determinations. If this material is subsequently classified as a hazardous waste, federal law requires disposal at a permitted hazardous waste disposal facility.

SECTION 14 TRANSPORT INFORMATION

The shipping descriptions shown here are for bulk shipments only, and may not apply to shipments in non-bulk packages (see regulatory definition). Consult the appropriate domestic or international mode- specific and quantity- specific Dangerous Goods Regulations for additional shipping description requirements (e.g., technical name or names, etc.) Therefore, the information shown here, may not always agree with the bill of lading shipping description for the material. Flashpoints for the material may vary slightly between the MSDS and the bill of lading.

Shipping Descriptions per regulatory authority.**US DOT**

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION

ICAO / IATA

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION

IMO / IMDG

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION

RID / ADR

NOT REGULATED AS A HAZARDOUS MATERIAL OR DANGEROUS GOODS FOR TRANSPORTATION

SECTION 15 REGULATORY INFORMATION**SARA 311/312 CATEGORIES:**

- | | |
|---------------------------------------|----|
| 1. Immediate (Acute) Health Effects: | NO |
| 2. Delayed (Chronic) Health Effects: | NO |
| 3. Fire Hazard: | NO |
| 4. Sudden Release of Pressure Hazard: | NO |
| 5. Reactivity Hazard: | NO |

REGULATORY LISTS SEARCHED:

01 = CA Prop 65	17 = FDA 178	33 = -
02 = LA RTK	18 = FDA 179	34 = -
03 = MA RTK	19 = FDA 180	35 = -
04 = MN Hazardous Substance	20 = FDA 181	36 = -
05 = NJ RTK	21 = FDA 182	37 = SARA Section 302
06 = PA RTK	22 = FDA 184	38 = SARA Section 313
07 = -	23 = FDA 186	39 = TSCA 12 (b)
08 = -	24 = FDA 189	40 = TSCA Section 4
09 = CWA Section 311	25 = IARC Group 1	41 = TSCA Section 5(a)
10 = DOT Marine Pollutant	26 = IARC Group 2A	42 = TSCA Section 8(a) CAIR
11 = FDA 172	27 = IARC Group 2B	43 = TSCA Section 8(a) PAIR
12 = FDA 173	28 = IARC Group 3	44 = TSCA Section 8(d)
13 = FDA 174	29 = IARC Group 4	45 = WHIMS - IDL
14 = FDA 175	30 = NTP Carcinogen	46 = Germany D TAL
15 = FDA 176	31 = OSHA Carcinogen	47 = Germany WKG
16 = FDA 177	32 = OSHA Highly Hazardous	48 = DEA List 1
		49 = DEA List 2

The following components of this material are found on the regulatory lists indicated.

Polyethylene	4
May Include: Carbon Black	1, 3, 4, 5, 6, 27, 45
May Include: Lead Chromate Pigment	1, 3, 4, 5, 6, 25, 26, 30, 38, 39, 45, 46

WHMIS CLASSIFICATION:

This product is not considered a controlled product according to the criteria of the Canadian Controlled Products Regulations.

CHEMICAL INVENTORY LISTINGS:

AUSTRALIA	YES (AUS)
CANADA	YES (DSL)
CHINA	YES (IECSC)
EUROPEAN UNION	NO - Exempt (EINECS/ELINCS)
JAPAN	YES (ENCS)
KOREA	YES (ECL)
PHILIPPINES	YES (PICCS)
UNITED STATES	YES (TSCA)

EU LABELING:

Symbols:

NA - Not Applicable

SECTION 16 OTHER INFORMATION

NFPA RATINGS: Health: 0 Flammability: 0 Reactivity: 0 Special: NA

(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *-Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA).

REVISION STATEMENT: This revision updates all sections of the MSDS please review.

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV	- Threshold Limit Value	TWA	- Time Weighted Average
STEL	- Short-term Exposure Limit	PEL	- Permissible Exposure Limit
ACGIH	- American Conference of Government Industrial Hygienists	OSHA	- Occupational Safety & Health Administration
NIOSH	- National Institute for Occupational Safety & Health	NFPA	- National Fire Protection Agency
WHMIS	- Workplace Hazardous Materials Information System	IARC	- Intl. Agency for Research on Cancer
EINECS	- European Inventory of existing Commercial Chemical Substances	RCRA	- Resource Conservation Recovery Act
SARA	- Superfund Amendments and Reauthorization Act.	TSCA	- Toxic Substance Control Act
EC50	- Effective Concentration	LC50	- Lethal Concentration
LD50	- Lethal Dose	CAS	- Chemical Abstract Service
NDA	- No Data Available	NA	- Not Applicable
<=	- Less Than or Equal To	>=	- Greater Than or Equal To
CNS	- Central Nervous System	MAK	- Germany Maximum Concentration Values

This data sheet is prepared according to the latest adaptation of the EEC Guideline 67/548.

This data sheet is prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200).

This data sheet is prepared according to the ANSI MSDS Standard (Z400.1).

This data sheet was prepared by EHS Product Stewardship Group, Chevron Phillips Chemical Company LP, 10001 Six Pines Drive, The Woodlands, TX 77380.

This data sheet is prepared according to the Globally Harmonized System (GHS).

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.



Packaging Information – IPS – CTS Coils

PERFORMANCE PIPE IPS PRODUCTS COILS

Size	Length	Standard Coil Size ID-OD-W	Standard Pallet Size	Standard Coil Per Pallet	Feet Per Pallet	Pallets Per 48' Truck	Feet Per 48' Truck	Coils Per Step-deck Trailer	Feet Per Step-deck Trailer	See Notes
1/2"	500	30-44-6	44	14	7,000	26	182,000			
	1,000	30-44-10 1/4	44	7	7,000	26	182,000			
3/4"	150	30-37-6 7/8	44	12	1,800'	26	46,800'			
	250	30-41-5 1/2	44	14	3,500	26	91,000			
	500	30-44-10	44	7	3,500	26	91,000			
1"	150	32-41-6	44	12	1,800	26	46,800			
	250	30-43-7 3/4	44	11	2,750	26	71,500			
	500	30-44-12	44	6	3,000	26	78,000			
	1,000	48-71-9 1/2	78	10	10,000	7	70,000			
1 1/4"	150	32-44-7 1/2	44	10	1,500	26	39,000			
	250	48-63-7	67	12	3,000	8	24,000			
	500	48-72-7 1/2	78	12	6,000	7	42,000			
	1,000	48-74-12 3/4	78	7	7,000	7	49,000			
	1,500	48-76-21	78	4	6,000	7	42,000			
1 1/2"	250	45-65 1/4-7 1/2	67	10	2,500	8	20,000			
	500	48-75-8 1/2	78	8	4,000	7	28,000			
	1,000	48-75-16 1/2	78	5	5,000	7	35,000			
	1,500	48-81-18 1/2	96	4	6,000	7	42,000			
2"	150'	50-69-7.3/8	78	12	1,800'	7	12,600'			
	250	54-74-8	78	10	2,500	7	17,500			
	350	52-77-9 3/4	78	8	2,800	7	19,600			
	500	52-78-13	78	7	3,500	7	24,500			
	600	52-81-13 3/8	78	6	3,600	7	25,200			
	1,000	48-73-28	78	3	3,000	7	21,000			
	1,500	51 1/2-76-38	78	2	3,000	7	21,000			#
	2,000	52-77 3/8-50	78	2	4,000	7	28,000			#
2 1/2"	500	51-77-19	78	5	2,500	7	17,500			
	1,000	61-92-26	96	3	3,000	6	18,000			
3"	220	65-85-16	96	6	1,320	6	7,920			
	250	70-95-12 1/2	96	7	1,750	6	10,500			
	315	70-95-16	96	6	1,890	6	11,340			
	500	70-96-23 3/4	96	4	2,000	6	12,000			#
	700	70-96-32	96	2	1,400	6	8,400			#
	1,000	70-96-46	96	2	2,000	6	12,000			#

Notes: # Can be shipped upright on a 102" flatbed trailer without the use of a platform (Except for 6500, 6800, 8100, and 8300 series product, which requires a platform and therefore may require a drop deck trailer on selected sizes.) Coil dimensions are approximate and may vary slightly due to the equipment available at the manufacturing plant.



Packaging Information – IPS – CTS Coils

Size	Length	Standard Coil Size ID-OD-W	Standard Pallet Size	Standard Coil Per Pallet	Feet Per Pallet	Pallets Per 48' Truck	Feet Per 48' Truck	Coils Per Step-deck Trailer	Feet Per Step-deck Trailer	See Notes
4"	365	68-93-33	96	2	730	6	4,380			#
	450	68-95-37	96	2	900	6	5,400			#
	500	70-93-41	96	2	1,000	6	6,000			#
	550	70-93-44 ½	96	2	1,100	6	6,600			#
	600	70-93-47	96	2	1,200	6	7,200			#
	625	72-93-50	96	2	1,250	6	7,500			#
	800	70-100-49 ½	Upright					12	9,600	#
	1,000	84-116-49	Upright					8	8,000	
	1,050'	84-116-49	Upright					8	8,400	
	1,400	70-116-50	Upright					8	11,200	
6"	400	84-120-40	Upright					8	3,200	
	450	84-120-43	Upright					8	3,600	
	500	84-120-50	Upright					8	4,000	
	525	84-121-48	Upright					8	4,200	

Notes: # Can be shipped upright on a 102" flatbed trailer without the use of a platform (Except for 6500, 6800, 8100, and 8300 series product, which requires a platform and therefore may require a dropdeck trailer on select sizes.) Coil dimensions are approximate and may vary slightly due to the equipment available at the manufacturing plant.

PERFORMANCE PIPE CTS PRODUCTS COILS

Size	Length	Standard Coil Size ID-OD—W	Standard Pallet Size	Standard Coil Per Pallet	Feet Per Pallet	Pallets Per 48' Truck	Feet Per 48' Truck
¼"	500	26-29.5-5.5	36	14	7,000	32	224,000
	1,000	28-33-6	36	14	14,000	57	798,000
	1,500	30-37- 6.25	44	14	21,000	57	1,197,000
½"	500	30-38-6	44	12	6,000	26	156,000
	1,000	30-44-6	44	12	12,000	26	312,000
¾"	500	30-38-11	44	6	3,000	26	78,000
1"	150	31-37-7	44	10	1,500	26	39,000
	250	30-40-7	44	10	2,500	26	65,000
	350	30-42-8	44	11	3,850	26	100,100
	500	30--42-11	44	8	4,000	26	104,000
1 ¼"	175	28-43-6	44	12	2,100	26	54,600
	350	30-42-11	44	8	2,800	26	72,800
	500	32-45-14 1/2	45	6	3,000	24	72,000

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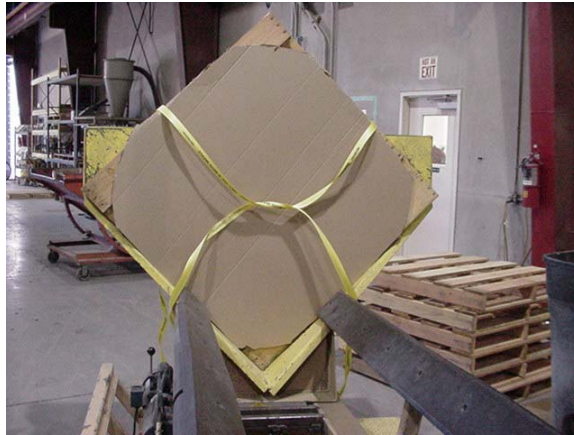
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(CR Packaging Manual B.2)

Page 2 of 7

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Packaging Information – IPS – CTS Coils



Straps at the bottom of the silo pack.



Horizontal Straps



Texband Metal Buckle



Lifting the Silo Pack

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Page 3 of 7

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Packaging Information – IPS – CTS Coils



TABLE 1

Nested Pipe/Tubing Quantities Per Silo

Size	Coil Length	Coils Per Silo	Feet Per Silo	Nested Feet Per Truck	
				2" Coils (7 Silos)	3" Coils (6 Silos)
IPS					
1/2"	500	14	7,000	49,000	42,000
1/2"	1,000	7	7,000	49,000	42,000
3/4"	150	12	1,800	12,600	10,800
3/4"	250	14	3,500	24,500	21,000
3/4"	500	7	3,500	24,500	21,000
1"	150	12	1,800	12,600	10,800
1"	250	11	2,750	19,250	16,500
1"	500	6	3,000	21,000	18,000
CTS					
1/4"	500	14	7,000	49,000	42,000
1/4"	1000	14	14,000	98,000	84,000
1/4"	1,500	14	21,000	147,000	126,000
1/2"	500	12	6,000	42,000	36,000
1/2"	1,000	12	12,000	84,000	72,000
3/4"	500	6	3,000	21,000	18,000
1"	150	10	1,500	10,500	9,000
1"	250	10	2,500	17,500	15,000
1"	350	11	3,850	26,950	23,100
1"	500	8	4,000	28,000	24,000



Packaging Information – IPS – CTS Coils

PERFORMANCE PIPE DriscoPlex® 5100 Ultra-Line® SERIES PRODUCT COILS

IPS – ID (DR-7)

Size	Length	Standard Coil Size ID-OD-W	Standard Pallet Size	Standard Coils Per Pallet	Feet Per Pallet	Pallets Per 48' Truck	Feet Per 48' Truck
¾"	100	27-35-4 1/2	36	18	1,800	32	57,600
	400	27-41-8	44	10	4,000	24	96,000
	500	27-42-8	44	8	4,000	24	96,000
1"	100	28-40-5	44	18	1,800	24	43,200
	300	28-44-10	44	8	2,400	24	57,600
1 ¼"	100	30-43-6	44	15	1,500	24	36,000
	300	28-44-12 1/2	44	7	2,100	24	54,400
1 ½"	100	40-56-5 1/2	67	14	1,400	8	11,200
	300	34-65-13 1/2	67	6	1,800	8	14,400
2"	100	48-64-8 1/2	67	10	1,000	8	8,000
	300	48-72-12 1/2	79	7	2,100	7	14,700

CTS – OD (DR-9)

Size	Length	Standard Coil Size ID-OD-W	Standard Pallet Size	Standard Coils Per Pallet	Feet Per Pallet	Pallets Per 48' Truck	Feet Per 48' Truck
¾"	100	24-30-4 1/2	30	18	1,800	57	102,600
	500	27-44-5 1/2	44	15	7,500	24	180,000
1"	100	28-35-5	36	16	1,600	32	51,200
	300	28-43-5 3/4	44	14	4,200	24	100,800
1 ¼"	100	28-42-6	44	14	1,400	24	33,600
	300	28-42-10 1/2	44	8	2,400	24	57,600
1 ½"	100	34-44-6 1/2	44	13	1,300	24	31,200
	300	34-51-10	67	8	2,400	8	19,200
2"	100	45.25-58-6 1/2	67	13	1,300	8	10,400
	300	48-69-9 3/4	79	9	2,700	7	18,900



Packaging Information – IPS – CTS Coils

DriscoPlex® 5300 Series Climate Guard®

COILED PIPE

Size	Length	Standard Coil Size ID-OD-W Inches	Standard Pallet Size	Standard Coils Per Pallet	Feet Per Pallet	Pallets 48' Truck	Feet Per 48' Truck	Comments
¾"	200'	30-40-5 ¼	44"	15	3,000'	26	78,000'	
	250'	30-41-5 ½	44"	14	3,500'	26	91,000'	
	300'	30-43-5 ½	44"	14	4,200'	26	109,200'	
	350'	30-44-6 ½	44"	13	4,550'	26	118,300'	
	400'	30-43-7	44"	12	4,800'	26	124,800'	
	450'	30-43-8	44"	11	4,950'	26	128,700'	
	500'	30-43-8 ½	44"	10	5,000'	26	130,000'	
	550'	30-43-9 ½	44"	9	4,950'	26	128,700'	
	600'	30-43-10	44"	9	5,400'	26	140,400'	
	650'	30-48-7 ¾	50"	12	7,800'	22	171,600'	102" wide trailer recommended
	700'	30-48.5-8	50"	10	7,000'	22	154,000'	
	800'	30-48.5-9	50"	10	8,000'	22	176,000'	
1"	200'	30-42-7	44"	12	2,400'	26	62,400'	
	250'	30-43-8	44"	11	2,750'	26	71,500'	
	300'	30-42-9 ½	44"	9	2,700'	26	70,200'	
	350'	30-42-11	44"	8	2,800'	26	72,800'	
	400'	30-42-12	44"	7	2,800'	26	72,800'	
	450'	30-48-8 1/2	50"	10	4,500'	22	99,000'	102" wide trailer recommended
	500'	30-48-9	50"	10	5,000'	22	110,000'	
	550'	30-48 3/4-10	50"	8	4,400'	22	96,800'	
	600'	30-48 3/8-11	50"	8	4,800'	22	105,600'	
	650'	30-48 1/2-11 ½	50"	8	5,200'	22	114,400'	
	700'	30-48 1/2-12 ½	50"	7	4,900'	22	107,800'	
	800'	30-60-8	67"	11	8,800'	8	70,400'	
1 ¼"	150'	34- 49 1/4-6	50"	14	2,100'	22	46,200'	102" wide trailer recommended
	200'	34-49-7	50"	12	2,400'	22	52,800'	
	250'	34-49-8 ½	50"	10	2,500'	22	55,000'	
	300'	48-64-8	67"	11	3,300'	8	26,400'	
	500'	48-72-7 ½	78"	12	6,000'	7	42,000'	
1 ½"	150'	48-62-7	67"	12	1,800'	8	14,400'	
	250'	44-65 1/4-7 1/2	67"	12	3,000'	8	24,000'	
	300'	48-65-9 1/2	67"	9	2,700'	8	21,600'	
	500'	48-70-11	78"	8	4,000'	7	28,000'	
2"	150'	50-69-7 3/8	78"	12	1,800'	7	12,600'	
	300'	50-72-11	78"	8	2,400'	7	16,800'	
	350'	50-72-12	78"	7	2,450'	7	17,150'	
	500'	51-78-13 ½	78"	7	3,500'	7	24,500'	
3"	300'	68-96-15	96"	6	1,800'	6	10,800'	
	500'	68-93-23 1/2	96"	4	2,000'	6	12,000'	



Packaging Information – IPS – CTS Coils

DriscoPlex® 5300 Series Climate Guard®

UNICOILS

Size	Length	Standard Coil Size ID-OD-W Inches	Standard Pallet Size	Standard Coils Per Pallet	Feet Per Pallet	Pallets 48' Truck	Feet Per 48' Truck	Comments
¾"	310'	30-44-6	44"	14	4,340'	26	112,840'	
¾"	360'	30-42-7 ½	44"	12	4,320'	26	112,320'	
¾"	410'	30-44-7 ½	44"	12	4,920'	26	127,920'	
¾"	460'	30-44-8 ¼	44"	11	5,060'	26	131,560'	
¾"	510'	30-48.5-6	50"	12	6,120'	22	134,640'	
¾"	560'	30-48.5-6 ½	50"	12	6,720'	22	147,840'	102" wide trailer recommended
¾"	610'	30-48.5-7	50"	12	7,320'	22	161,040'	
¾"	660'	30-48.5-7 ½	50"	12	7,920'	22	174,240'	
¾"	710'	30-48.5-8	50"	10	7,100'	22	156,200'	
¾"	810'	30-48.5-9	50"	9	7,290'	22	160,380'	
1"	310'	30-44-6 ½	50"	13	4,030'	22	88,660'	102" wide trailer recommended
1"	360'	30-44.3 3/8	50"	11	3,960'	22	87,120'	
1"	410'	30-48-9 ¼	50"	10	4,100'	22	90,200'	
1"	460'	30-49-9	50"	9	4,140'	22	91,080'	
1"	510'	30-48 1/2 -9 ½	50"	9	4,590'	22	100,980'	
1"	560'	30-49-10	50"	8	4,480'	22	98,560'	
1"	610'	30-48 1/2-11	50"	8	4,880'	22	107,360'	
1"	660'	30-48.5-12	50"	7	4,620'	22	101,640'	
1"	710'	30-48 1/2-12 ½	50"	7	4,970'	22	109,340'	
1"	810'	30-48 1/2-14	50"	6	4,860'	22	106,920'	
1 ¼"	310'	48-65.5-7	67"	12	3,720'	8	29,760'	
1 ¼"	360'	48-65 1/2-8 ½	67"	10	3,600'	8	28,800'	
1 ¼"	410'	48-69-8	79"	11	4,510'	7	31,570'	
1 ¼"	460'	48-66-10	67"	9	4,140'	8	33,120'	
1 ¼"	510'	48-74-7	78"	12	6,120'	7	42,840'	
1 ¼"	560'	48-71.5-8 ½	78"	10	5,600'	7	39,200'	
1 ¼"	610'	48-74-9	78"	10	6,100'	7	42,700'	
1 ¼"	660'	48-71 1/2-10	78"	9	5,940'	7	41,580'	
1 ¼"	710'	48-76 1/2-9	78"	9	6,390'	7	44,730'	
1 ¼"	810'	48-71 1/2-12	78"	7	5,670'	7	39,690'	

MASTER COILS

Size	Length	Standard Coil Size ID-OD-W Inches	Standard Pallet Size	Standard Coils Per Pallet	Feet Per Pallet	Pallets 48' Truck	Feet Per 48' Truck	Comments
¾"	5,500'	51-79-48	78" – 79"	4	22,000'	7	154,000'	
¾"	11,000'	51-79-48	78" – 79"	2	22,000'	7	154,000'	
¾"	15,000'	51½-90-48	96"	2	30,000'	6	180,000'	
1"	3,600'	51-79-48	78" – 79"	4	14,400'	7	100,800'	
1"	7,200'	51-79-48	78" – 79"	2	14,400'	7	100,800'	
1"	10,000'	51½-90-48	96"	2	20,000'	6	120,000'	
1"	12,500'	51 1/2-94-48	96"	2	24,400'	6	150,000'	
1 ¼"	2,100'	51-78-48	78" – 79"	4	8,400'	7	58,800'	
1 ¼"	4,200'	51-78-48	78" – 79"	2	8,400'	7	58,800'	
1 ¼"	6,000'	51½-90-48	96"	2	12,000'	6	72,000'	
1 ¼"	8,000'	51½-95-48	96"	2	16,000'	6	96,000'	

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Page 7 of 7

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Packaging Information – IPS-DIPS Non-Gas Soft-Sided Bundles

PERFORMANCE PIPE IPS PRODUCTS SOFT-SIDED BUNDLES (20', 40' & 50' Joints)

Size	Bundle Style	Pipe OD	Joints Per Bundle	Bundles Per Truck 20'/40'/50'	Joints Per Truck 20'/40'/50'	DR	Feet Per Truck 20' Joints	Feet Per Truck 40' Joints	Feet Per Truck 50' Joints
3"	Soft	3.500"	54	14 / 7 / NA	756 / 378 / NA	5	15,120'	15,120'	N/A
			54	20 / 10 / NA	1,080 / 540 / NA	7	21,600'	21,600'	N/A
			54	24 / 12 / NA	1,296 / 648 / NA	9	25,920'	25,920'	N/A
			54	28 / 14 / NA	1,512 / 756 / NA	11 – 19	30,240'	30,240'	N/A
4"	Soft	4.500"	32	15 / 7 / 6	480 / 224 / 192	5	9,600'	8,960'	9,600'
			32	21 / 10 / 8	672 / 320 / 256	7	13,440'	12,800'	12,800'
			32	25 / 12 / 10	800 / 384 / 320	9	16,000'	15,360'	16,000'
			32	28 / 14 / 12	896 / 448 / 384	11	17,920'	17,920'	19,200'
			32	28 / 14 / 14	896 / 448 / 448	13.5-19	17,920'	17,920'	22,400'
5"	Soft	5.375"	26	13 / 6 / 5	338 / 156 / 130	5	6,760'	6,240'	6,500'
			26	18 / 9 / 7	468 / 234 / 182	7	9,360'	9,360'	9,100'
			26	22 / 11 / 8	572 / 286 / 208	9	11,440'	11,440'	10,400'
			26	24 / 12 / 10	624 / 312 / 260	11	12,480'	12,480'	13,000'
			26	24 / 12 / 12	624 / 312 / 312	13.5-19	12,480'	12,480'	15,600'
5"	Soft	5.563"	26	12 / 6 / 5	312 / 156 / 130	5	6,240'	6,240'	6,500'
			26	16 / 8 / 6	416 / 208 / 156	7	8,320'	8,320'	7,800'
			26	20 / 10 / 8	520 / 260 / 208	9	10,400'	10,400'	10,400'
			26	24 / 12 / 9	624 / 312 / 234	11	12,480'	12,480'	11,700'
			26	24 / 12 / 11	624 / 312 / 286	13.5	12,480'	12,480'	14,300'
			26	24 / 12 / 12	624 / 312 / 312	17	12,480'	12,480'	15,600'
6"	Soft	6.625"	13	18 / 9 / 7	234 / 117 / 91	5	4,680'	4,680'	4,550'
			13	23 / 11 / 9	299 / 143 / 117	7	5,980'	5,720'	5,850'
			13	28 / 14 / 11	364 / 182 / 143	9	7,280'	7,280'	7,150'
			20	20 / 10 / 9	400 / 200 / 180	11	8,000'	8,000'	9,000'
			20	20 / 10 / 10	400 / 200 / 200	13.5-19	8,000'	8,000'	10,000'
7"	Soft	7.125"	13	15 / 7 / 6	195 / 91 / 78	5	3,900'	3,640'	3,900'
			13	20 / 10 / 8	260 / 130 / 104	7	5,200'	5,200'	5,200'
			13	24 / 12 / 10	312 / 156 / 130	9	6,240'	6,240'	6,500'
			13	24 / 12 / 12	312 / 156 / 156	11-19	6,240'	6,240'	7,800'

Note: the joint lengths listed above are the more common lengths. Other less common joint lengths can be shipped on a flatbed as long as all product within a given column is the same joint length and the resulting load can be safely secured with 16 trucker straps or less in alignment with our trucker strap procedures. Joint lengths of 12' to 16' result in three columns of product on the trailer for which 16 straps limit the number of layers to five or less. Joint lengths of 10' or 11' result in four columns of product on the trailer for which 16 straps limit the number of layers to four or less.

Performance Pipe, a division of
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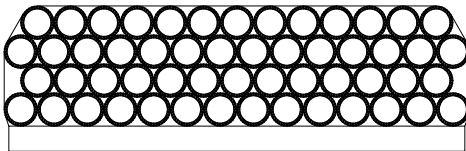


Packaging Information – IPS-DIPS Non-Gas Soft-Sided Bundles

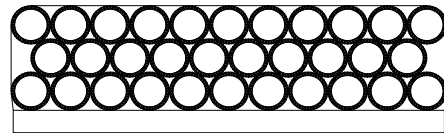
PERFORMANCE PIPE **DIPS** PRODUCTS **SOFT-SIDED BUNDLES** (20', 40' & 50' Joints)

Size	Bundle Style	Pipe OD	Joints Per Bundle	Bundles Per Truck 20'/40'/50'	Joints Per Truck 20'/40'/50'	DR	Feet Per Truck 20' Joints	Feet Per Truck 40' Joints	Feet Per Truck 50' Joints
4"	Soft	4.800"	29	24 / 12 / 9	696 / 348 / 261	9	13,920'	13,920'	13,050'
			29	28 / 14 / 11	812 / 406 / 319	11	16,240'	16,240'	15,950'
			29	28 / 14 / 14	812 / 406 / 406	13.5-21	16,240'	16,240'	20,300'
6"	Soft	6.900"	13	26 / 13 / 10	338 / 169 / 130	9	6,760'	6,760'	6,500'
			20	20 / 10 / 8	400 / 200 / 160	11	8,000'	8,000'	8,000'
			20	20 / 10 / 10	400 / 200 / 200	13.5-21	8,000'	8,000'	10,000'

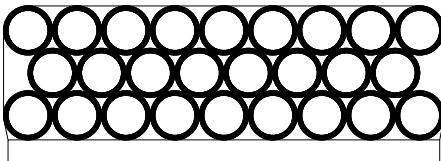
IPS – Soft Sided Bundles (Examples)



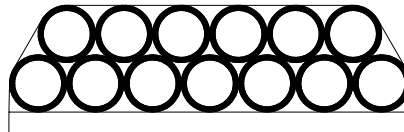
3" IPS
54 Joints Per Bundle



4" IPS
32 Joints Per Bundle



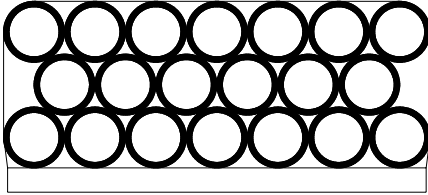
5" IPS
26 Joints Per Bundle



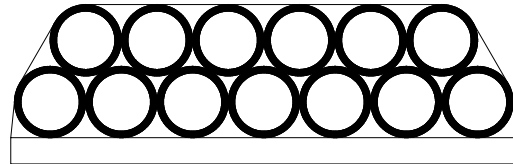
6" IPS (DR 5 - 9)
13 Joints Per Bundle



Packaging Information – IPS-DIPS Non-Gas Soft-Sided Bundles

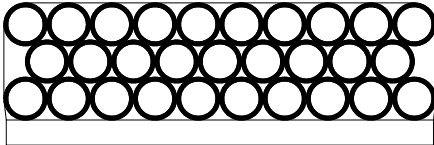


6" IPS (DR 11-19)
20 Joints Per Bundle

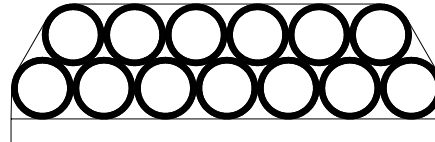


7" IPS
13 Joints Per Bundle

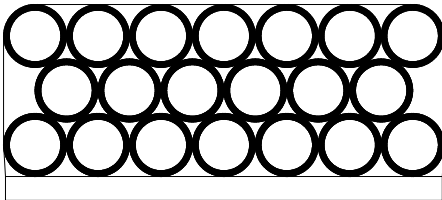
DIPS – Soft Sided Bundles (Examples)



4" DIPS
29 joints Per bundle



6" DIPS (DR 9)
13 joints Per bundle



6" DIPS (DR's 11 – 21)
20 Joints per bundle



Packaging Information – IPS-DIPS Non-Gas Soft-Sided Bundles

Performance Pipe Bundle Packaging Standards

IPS – Soft Sided Bundle Patterns (20, 40' & 50' Joints)

Size	Pipe OD	Bundle Style	Bundle Height (Note 2)	BTM Board Length (Note 1)	Joints Per Bundle	Bundles Per Truck 20'/40'/50'	Bundle pattern	DR	Feet Per 20' Bundle	Feet Per 40' Bundle	Feet Per 50' Bundle
3"	3.500"	Soft	14.093"	48"	54	14 / 7 / NA	14/13/14/13	5	1,080'	2,160'	N/A
			14.093"	48"	54	20 / 10 / NA	14/13/14/13	7	1,080'	2,160'	N/A
			14.093"	48"	54	24 / 12 / NA	14/13/14/13	9	1,080'	2,160'	N/A
			14.093"	48"	54	28 / 14 / NA	14/13/14/13	11-19	1,080'	2,160'	N/A
4"	4.500"	Soft	13.794"	48"	32	15 / 7 / 6	11/10/11	5	640'	1,280'	1,600'
			13.794"	48"	32	21 / 10 / 8	11/10/11	7	640'	1,280'	1,600'
			13.794"	48"	32	25 / 12 / 10	11/10/11	9	640'	1,280'	1,600'
			13.794"	48"	32	28 / 14 / 12	11/10/11	11	640'	1,280'	1,600'
			13.794"	48"	32	28 / 14 / 14	11/10/11	13.5-19	640'	1,280'	1,600'
5"	5.375"	Soft	16.185"	48"	26	13 / 6 / 5	9/8/9	5	520'	1,040'	1,300'
			16.185"	48"	26	18 / 9 / 7	9/8/9	7	520'	1,040'	1,300'
			16.185"	48"	26	22 / 11 / 8	9/8/9	9	520'	1,040'	1,300'
			16.185"	48"	26	24 / 12 / 10	9/8/9	11	520'	1,040'	1,300'
			16.185"	48"	26	24 / 12 / 12	9/8/9	13.5-19	520'	1,040'	1,300'
5"	5.563"	Soft	16.699"	48"	26	12 / 6 / 5	9/8/9	5	520'	1,040'	1,300'
			16.699"	48"	26	16 / 8 / 6	9/8/9	7	520'	1,040'	1,300'
			16.699"	48"	26	20 / 10 / 8	9/8/9	9	520'	1,040'	1,300'
			16.699"	48"	26	24 / 12 / 9	9/8/9	11	520'	1,040'	1,300'
			16.699"	48"	26	24 / 12 / 11	9/8/9	13.5	520'	1,040'	1,300'
			16.699"	48"	26	24 / 12 / 12	9/8/9	17-19	520'	1,040'	1,300'
6"	6.625"	Soft	13.862"	42"	13	18 / 9 / 7	7/6	5	260'	520'	650'
			13.862"	42"	13	23 / 11 / 9	7/6	7	260'	520'	650'
			13.862"	42"	13	28 / 14 / 11	7/6	9	260'	520'	650'
			19.599"	42"	20	20 / 10 / 9	7/6/7	11	400'	800'	1,000'
			19.599"	42"	20	20 / 10 / 10	7/6/7	13.5-19	400'	800'	1,000'
7"	7.125"	Soft	14.795"	48"	13	15 / 7 / 6	7/6	5	260'	520'	650'
			14.795"	48"	13	20 / 10 / 8	7/6	7	260'	520'	650'
			14.795"	48"	13	24 / 12 / 11	7/6	9	260'	520'	650'
			14.795"	48"	13	24 / 12 / 12	7/6	11-19	260'	520'	650'

Note 1 : Figure is also the top board length if one is required.

Note 2 : Bundle height determine using 1 ½" thick boards.

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Packaging Information – IPS-DIPS Non-Gas Soft-Sided Bundles

Performance Pipe Bundle Packaging Standards DIPS – Soft Bundle Patterns (20', 40' & 50' Joints)

Size	Pipe OD	Bundle Style	Bundle Height (Note 2)	BTM Board Length (Note 1)	Side Board Length	Joints Per Bundle	Bundles per Truck 20'/40'/50'	Bundle Pattern	DR	Feet Per 20' Bundle	Feet Per 40' Bundle	Feet Per 50' Bundle
4"	4.800"	Soft	14.614"	46"	N/A	29	24 / 12 / 9	10/9/10	9	580'	1,160'	1,450'
			14.614"	46"	N/A	29	28 / 14 / 11	10/9/10	11	580'	1,160'	1,450'
			14.614"	46"	N/A	29	28 / 14 / 14	10/9/10	13.5	580'	1,160'	1,450'
6"	6.900"	Soft	14.375"	46"	N/A	13'	26 / 13 / 10	7/6	9	260'	520'	650'
			20.360"	46"	N/A	20'	20 / 10 / 8	7/6/7	11	400'	800'	1,000'
			20.360"	46"	N/A	20'	20 / 10 / 10	7/6/7	13.5-21	400'	800'	1,000'

Note 1 : Figure is also top board length if one is required.

Note 2 : Bundle height determine using 1 1/2" boards.

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Page 5 of 5

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Packaging Information – IPS-DIPS Non-Gas Bulk Packs

PERFORMANCE PIPE IPS PRODUCTS BULK PACKS NON-GAS DISTRIBUTION (All series except 6500,6800,8100,8300)

SIZE	TYPE	PIPE OD	LAYER PER TRUCK 40'/50'/53'	JOINTS PER LAYER 40'/50'/53'	JOINTS PER TRUCK 40'/50'/53'	DR	FEET PER TRUCK 40'	FEET PER TRUCK 50'	FEET PER TRUCK 53'
8"	IPS	8.625"	6 / 5 / 5	11 / 11 / 11	66 / 55 / 50	5	2,640	2,750	2,650
			8 / 7 / 6	11 / 11 / 11	88 / 72 / 66	7	3,520	3,600	3,498
			9 / 7 / 6	11 / 11 / 11	93 / 72 / 66	7.3	3,720	3,600	3,498
			10 / 8 / 8	11 / 11 / 11	110 / 88 / 83	9	4,400	4,400	4,399
			10 / 10 / 9	11 / 11 / 11	110 / 105 / 99	11	4,400	5,250	5,247
			10 / 10 / 10	11 / 11 / 11	110 / 110 / 110	13.5 / 19	4,400	5,500	5,830
10"	IPS	10.750"	5 / 5 / 5	9 / 9 / 9	41 / 32 / 32	5	1,640	1,640	1,696
			7 / 5 / 5	9 / 9 / 9	58 / 45 / 41	7	2,320	2,250	2,173
			7 / 5 / 5	9 / 9 / 9	59 / 45 / 45	7.3	2,360	2,250	2,385
			8 / 6 / 6	9 / 9 / 9	72 / 54 / 54	9	2,880	2,700	2,862
			8 / 8 / 7	9 / 9 / 9	72 / 68 / 63	11	2,880	3,400	3,339
			8 / 8 / 8	9 / 9 / 9	72 / 72 / 72	13.5 - 41	2,880	3,600	3,816
12"	IPS	12.750"	4 / 3 / 3	8 / 8 / 8	28 / 24 / 20	5	1,120	1,200	1,060
			5 / 4 / 4	8 / 8 / 8	40 / 32 / 28	7 – 7.3	1,600	1,600	1,484
			6 / 5 / 5	8 / 8 / 8	48 / 40 / 36	9	1,920	2,000	1,908
			7 / 6 / 6	8 / 8 / 8	56 / 48 / 44	11	2,240	2,400	2,332
			7 / 7 / 6	8 / 8 / 8	56 / 56 / 52	13.5	2,800	2,800	2,756
			7 / 7 / 7	8 / 8 / 8	56 / 56 / 56	17 - 41	2,240	2,800	2,968
14"	IPS	14.000"	4 / 3 / 3	7 / 7 / 7	25 / 21 / 18	5	1,000	1,050	954
			5 / 4 / 4	7 / 7 / 7	32 / 25 / 25	7	1,280	1,250	1,325
			5 / 4 / 4	7 / 7 / 7	35 / 28 / 25	7.3	1,400	1,400	1,325
			6 / 5 / 5	7 / 7 / 7	42 / 32 / 32	9	1,680	1,600	1,696
			6 / 6 / 5	7 / 7 / 7	42 / 39 / 35	11	1,680	1,950	1,855
			6 / 6 / 6	7 / 7 / 7	42 / 42 / 42	13.5 - 41	1,680	2,100	2,226
16"	IPS	16.000" (Note 1)	3 / 3 / 3	6 / 6 / 6	18 / 15 / 15	5	720	750	795
			4 / 4 / 3	6 / 6 / 6	24 / 21 / 18	7	960	1,050	954
			5 / 4 / 3	6 / 6 / 6	27 / 21 / 18	7.3	1,080	1,050	954
			5 / 4 / 4	6 / 6 / 6	30 / 24 / 24	9	1,200	1,200	1,272
			5 / 5 / 5	6 / 6 / 6	30 / 30 / 27	11	1,200*	1,500*	1,431
			5 / 5 / 5	6 / 6 / 6	30 / 30 / 30	13.5 - 41	1,200*	1,500*	1,590*

Blue number in joint column indicates top layer will only have one pack.

(Note 1) – * Denotes that one additional layer or pack can be added when shipping via states that allow a trailer / load height of 14 feet. An additional layer can be added to 16" IPS 20' and 40' joints that are DR 11 or thinner, 16" IPS 50' joints that are DR 13.5 or thinner and 16" IPS 53' joints that are DR 17.0 and thinner. 16" DR 13.5 53' joints will allow one extra pack. **The quantity of pipe 29' in length and less shall be limited to a maximum of only seven layers high per truck.**

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Packaging Information – IPS-DIPS Non-Gas Bulk Packs

PERFORMANCE PIPE DIPS PRODUCTS BULK PACKS NON-GAS DISTRIBUTION (All series except 6500,6800,8100,8300)

SIZE	TYPE	PIPE OD	LAYER PER TRUCK 40'/50'/53'	JOINTS PER LAYER 40'/50'/53'	JOINTS PER TRUCK 40'/50'/53'	DR	FEET PER TRUCK K 40'	FEET PER TRUCK 50'	FEET PER TRUCK 53'
8"	DIPS	9.050"	9 / 7 / 7	11 / 11 / 11	99 / 77 / <u>72</u>	9	3,960	3,850	3,816
			9 / 9 / 9	11 / 11 / 11	99 / <u>94</u> / 88	11	3,960	4,700	4,664
			9 / 9 / 9	11 / 11 / 11	99 / 99 / 99	13.5 - 26	3,960	4,950	5,247
10"	DIPS	11.100"	8 / 6 / 6	9 / 9 / 9	<u>67</u> / <u>50</u> / <u>50</u>	9	2,680	2,500	2,650
			8 / 7 / 7	9 / 9 / 9	72 / 63 / <u>59</u>	11	2,880	3,150	3,127
			8 / 8 / 8	9 / 9 / 9	72 / 72 / 72	13.5 - 26	2,880	3,600	3,816
12"	DIPS	13.200"	6 / 6 / 5	7 / 7 / 7	42 / <u>38</u> / 35	9	1,680	1,900	1,855
			6 / 6 / 6	7 / 7 / 7	42 / 42 / 42	11	1,680	2,100	2,226
			6 / 6 / 6	7 / 7 / 7	42 / 42 / 42	13.5 - 26	1,680	2,100	2,226
14"	DIPS	15.300"	6 / 5 / 4	6 / 6 / 6	<u>33</u> / <u>27</u> / 24	9	1,320	1,350	1,272
			6 / 6 / 5	6 / 6 / 6	36 / <u>33</u> / 30	11	1,440	1,650	1,590
			6 / 6 / 6	6 / 6 / 6	36 / 36 / 36	13.5 - 26	1,440	1,800	1,908

Blue number in joint column indicates top layer will only have one pack.

IPS

BULK PACKAGE CONSTRUCTION



8"	10"	12"
6 Joints Per Pack	5 Joints Per Pack	4 Joints Per Pack
5 Joints Per Pack	4 Joints Per Pack	4 Joints Per Pack



14"	16"
3 Joints Per Pack	3 Joints Per Pack
4 Joints Per Pack	3 Joints Per Pack

Note: Joints per layer / load may vary depending on the DR of the pipe being shipped.

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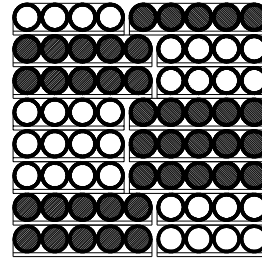
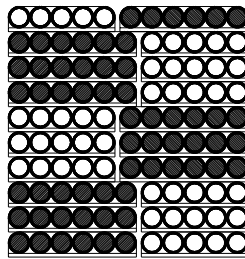
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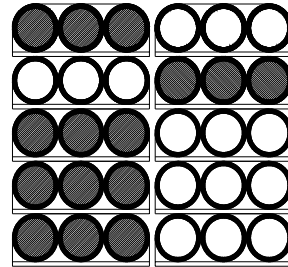
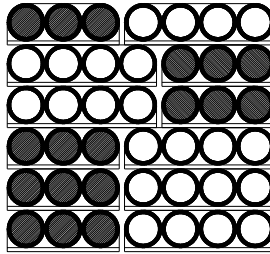
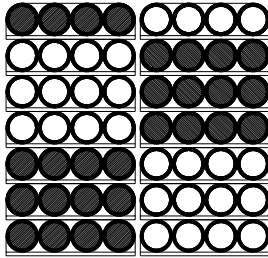


Packaging Information – IPS-DIPS Non-Gas Bulk Packs

IPS BULK PACK TRUCKLOAD PACKAGE STANDARDS



8"	10"
110 Joints	72 Joints



12"	14"	16"
56 Joints	42 Joints	30 Joints

Note: Joints per layer / load may vary depending on the DR of the pipe being shipped.

DIPS BULK PACKAGE CONSTRUCTION



8"
6 Joints Per Pack 5 Joints Per Pack



10"
5 Joints Per Pack 4 Joints Per Pack



Packaging Information – IPS-DIPS Non-Gas Bulk Packs



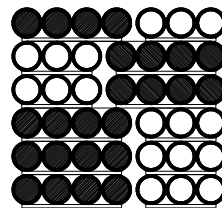
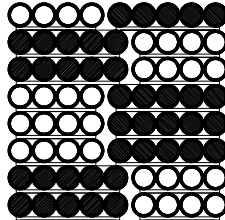
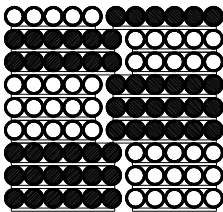
12"
4 Joints Per Pack 3 Joints Per Pack



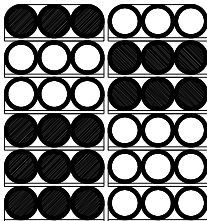
14"
3 Joints Per Pack 3 Joints Per Pack

Note: Joints per layer / load may vary depending on the DR of the pipe being shipped.

DIPS BULK PACK TRUCKLOAD PACKAGE STANDARDS



8"	10"	12"
99 Joints	72 Joints	42 Joints



14"
36 Joints

Note: Joints per layer/ load may vary depending on the DR of the pipe being shipped.



Packaging Information – IPS-DIPS Strip Loads with Chocks

PERFORMANCE PIPE IPS PRODUCTS - STRIP LOADS W / CHOCKS

SIZE	TYPE	PIPE OD	LAYER PER TRUCK 40' / 50'	JOINTS PER LAYER	JOINTS PER TRUCK 40' / 50'	DR	FEET PER TRUCK 40'	FEET PER TRUCK 50'
18" (Note 2)	IPS	18"	4	5	20 / 16	7	800'	800'
			5 / 4	5	21 / 17	7.3	840'	850'
			5 / 4	5	25 / 20	9	1,000'	1,000'
			5	5	25 / 24	11	1,000'	1,200'
			5	5	25	13.5 – 41	1,000'	1,250'
20"	IPS	20"	4 / 3	5	16 / 13	7	640'	650'
			4 / 3	5	17 / 13	7.3	680'	650'
			4	5	20 / 16	9	800'	800'
			4	5	20 / 19	11	800'	950'
			4	5	20	13.5 – 41	800'	1,000'
22"	IPS	22"	4 / 3	4	13 / 11	7	520'	550'
			4 / 3	4	14 / 11	7.3	560'	550'
			4	4	16 / 13	9	640'	650'
			4	4	16	11 – 41	640'	800'
24" (Note 2)	IPS	24"	3	4	11 / 9	7	440'	450'
			3	4	12 / 9	7.3	480'	450'
			4 / 3	4	14 / 11	9	560'	550'
			4	4	16 / 13	11	640'	650'
			4	4	16	13.5 – 41	640'	800'
26"	IPS	26"	3	3	9	9 - 41	360'	450'
28"	IPS	28"	3	3	9 / 8	9	360'	400'
			3	3	9	11 - 41	360'	450'
30"	IPS	30"	3	3	9 / 7	9	360'	350'
			3	3	9 / 8	11	360'	400'
			3	3	9	13.5 - 41	360'	450'
32" (Note 1)	IPS	32"	(Note 1) 3	3	9 / 7	11	360'	350'
			(Note 1) 3	3	9	13.5 - 41	360'	450'
34"	IPS	34"	2	3	6	11 - 41	240'	300'
36"	IPS	36"	2	2	4	11 - 41	160'	200'
42"	IPS	42"	2	2	4	17 - 41	160'	200'
48"	IPS	48"	2	2	4	21 - 41	160'	200'
54"	IPS	54"	1	2	2	21 - 41	80'	100'

(Note 1) - When traveling in states with a 13'6" maximum height restriction, shipments of 32" may exceed the height restrictions unless the trailer height is 55.5" or below (depending on the thickness of the bottom board utilized – see notes in 1. (A). (1). (a). and 1. (A). (2). (a). and (c).). Using a drop deck trailer is also an option for 40' joints.

(Note 2) - On 18" IPS shipments use 2x6 lumber on loads with 5 layers of product. Use the standard 4x4 lumber on loads with 4 layers or less. On 24" IPS shipments use 2x6 lumber on loads with 4 layers of product. Use the standard 4x4 lumber on loads with 3 layers or less. As an option, when shipping 18" or 24" IPS, the combination use of 2x6 and 4x4 lumber is acceptable providing the trailer plus load height does not exceed legal height limits.

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Packaging Information – IPS-DIPS Strip Loads with Chocks

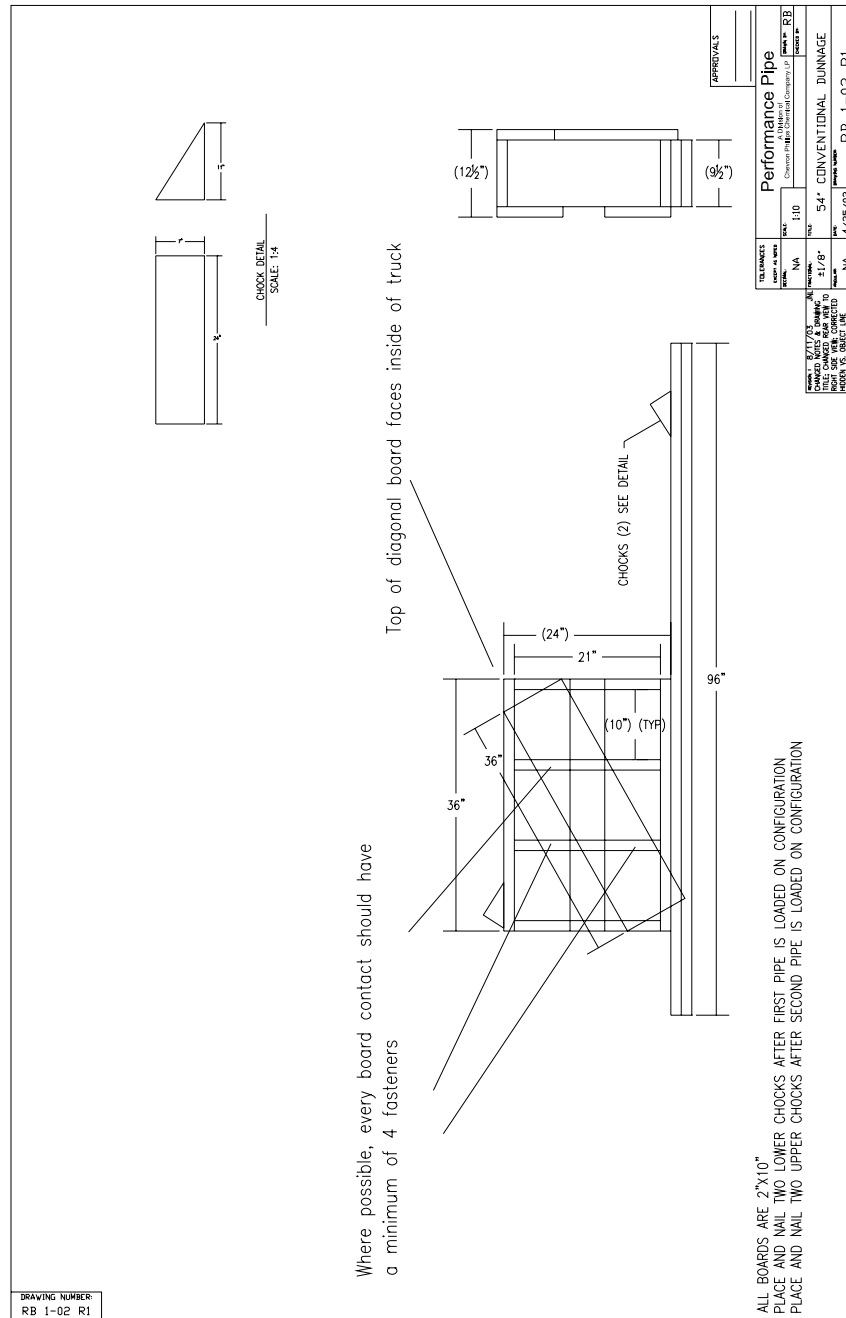
PERFORMANCE PIPE DIPS PRODUCTS - STRIP LOADS W / CHOCKS

SIZE	TYPE	PIPE OD	LAYER PER TRUCK 40' / 50'	JOINTS PER LAYER 40' / 50'	JOINTS PER TRUCK 40' / 50'	DR	FEET PER TRUCK 40'	FEET PER TRUCK 50'
16" (Note 1)	DIPS	17.40"	5	5	25 / 21	9	1,000'	1,050'
			5	5	25	11 - 26	1,000'	1,250'
18"	DIPS	19.50"	4	5	20 / 17	9	800'	850'
			4	5	20	11 - 26	800'	1,000'
20"	DIPS	21.60"	4	4	16 / 14	9	640'	700'
			4	4	16	11 - 26	640'	800'
24"	DIPS	25.80"	3	3	9	9 - 26	360'	450'
30" (Note 2)	DIPS	32.00"	(Note 2) 3	3	9 / 7	11	360'	350'
			(Note 2) 3	3	9	13.5 - 26	360'	450'
36"	DIPS	38.30"	2	2	4	11 - 17	160'	200'

(Note 1) – On 16" DIPS shipments use 2x6 lumber on loads with 5 layers of product. Use the standard 4x4 lumber on loads with 4 layers or less. As an option, when shipping 16" DIPS, the combination use of 2x6 and 4x4 lumber is acceptable providing the trailer plus load height does not exceed legal height limits.

(Note 2) - - When traveling in states with a 13'6" maximum height restriction, shipments of 30 DIPS" may exceed the height restrictions unless the trailer height is 55.5" or below (depending on the thickness of the bottom board utilized – see notes in 1. (A). (1). (a). and 1. (A). (2). (a). and (c).). Using a drop deck trailer is also an option for 40' joints.

Packaging Information – IPS-DIPS Strip Loads with Chocks



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Page 3 of 7

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Packaging Information – IPS-DIPS Strip Loads with Chocks



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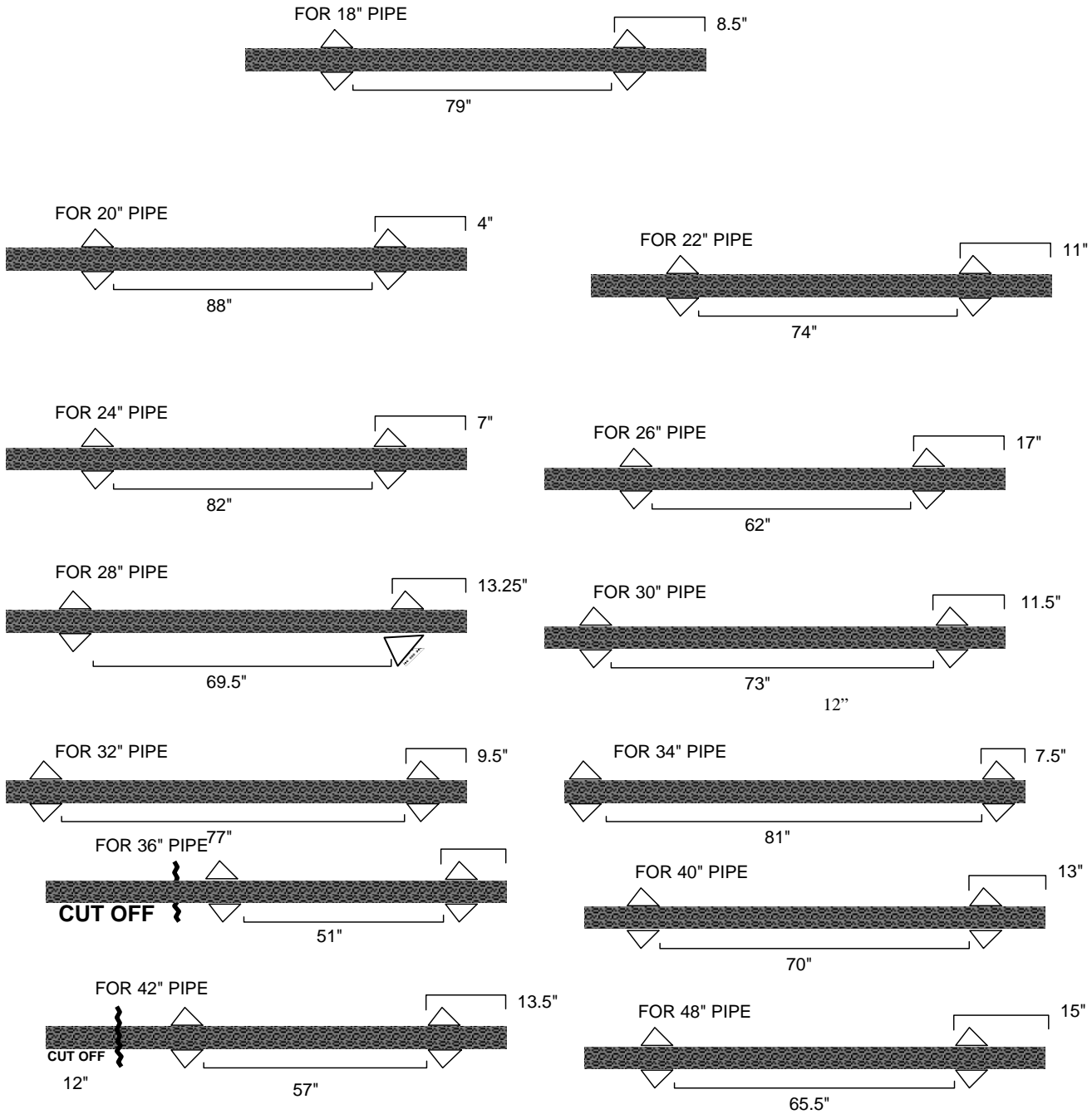
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Page 4 of 7

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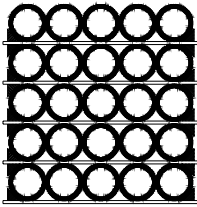
Packaging Information – IPS-DIPS Strip Loads with Chocks

IPS STRIP LOAD SADDLE CONSTRUCTION

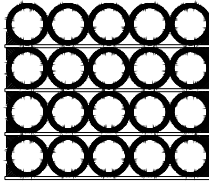


Packaging Information – IPS-DIPS Strip Loads with Chocks

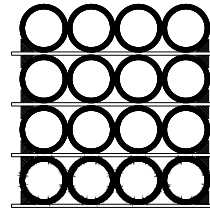
STRIP LOAD PACKAGE STANDARDS



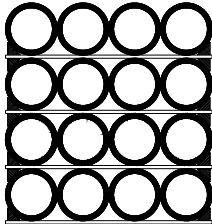
18" – 25 joints
1,000'/40' 1,250'/50'



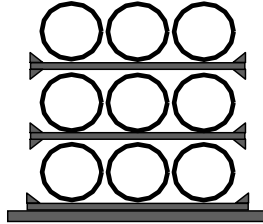
20" – 20 joints
800'/40' 1,000'/50'



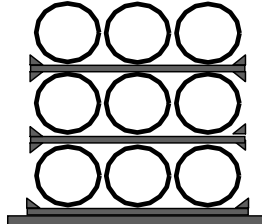
22" – 16 joints
640'/40' 800'/50'



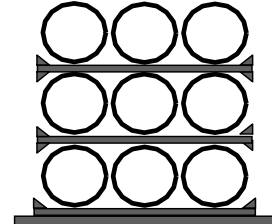
24" – 16 joints
640'/40' 800'/50'



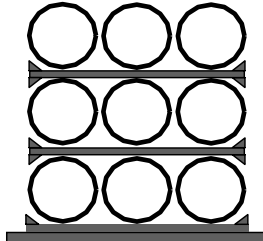
26" – 9 joints
360'/40' 450'/50'



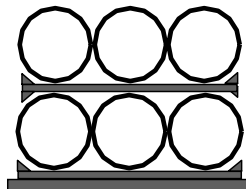
28" – 9 joints
360'/40' 450'/50'



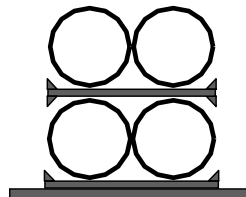
30" – 9 Joints
360'/40' 450'/50'



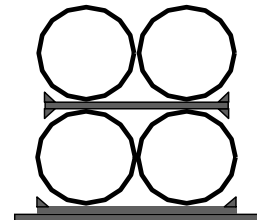
32" – 9 joints
360'/40' 450'/50'
(Bed no more than 55" from ground)



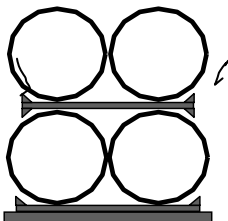
34" – 6 joints
240'/40' 300'/50'



36" – 4 joints
160'/40' 200'/50'

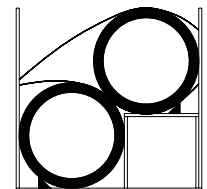


42" – 4 joints
160'/40' 200'/50'



48" – 4 joints
160'/40' 200'/50'
(2x4 stringer on bottom)

Note: Joints per load may vary depending on the DR of the pipe being shipped. Maximum weight per truckload is 45,000 pounds.



54" – 2 joints
80'/40' 100'/50'
102" wide trailer required if using pipe stakes.

DIPS

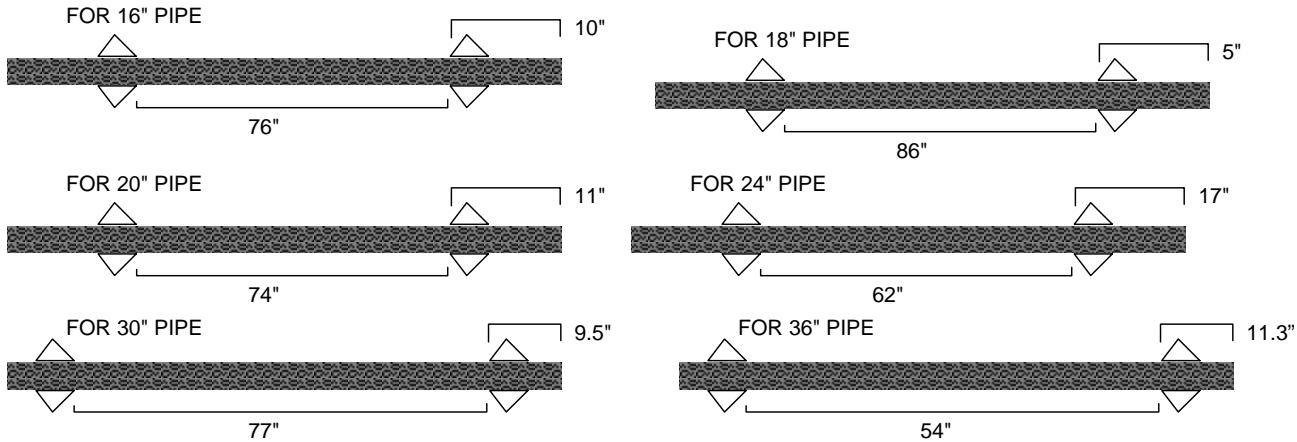
Performance Pipe, a division of
Chevron Phillips Chemical Company LP

PO Box 269006
Plano, TX 75026-9066

Phone: 800-527-0662
Fax: 972-599-7348

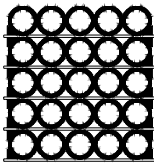
Packaging Information – IPS-DIPS Strip Loads with Chocks

STRIP LOAD SADDLE CONSTRUCTION

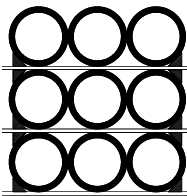


DIPS

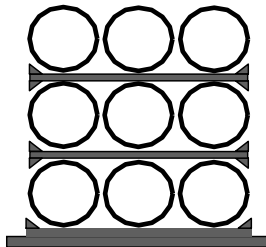
STRIP LOAD PACKAGE STANDARDS



16" DIPS – 25 joints
1,000'/40' 1,250'/50'

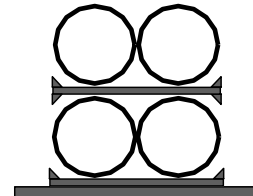


24" DIPS – 9 joints
360'/40' 450'/50'



18" DIPS – 20 joints
800'/40' 1,000'/50'

30" DIPS – 9 joints
360'/40' 450'/50'



20" DIPS – 16 joints
640'/40' 800'/50'

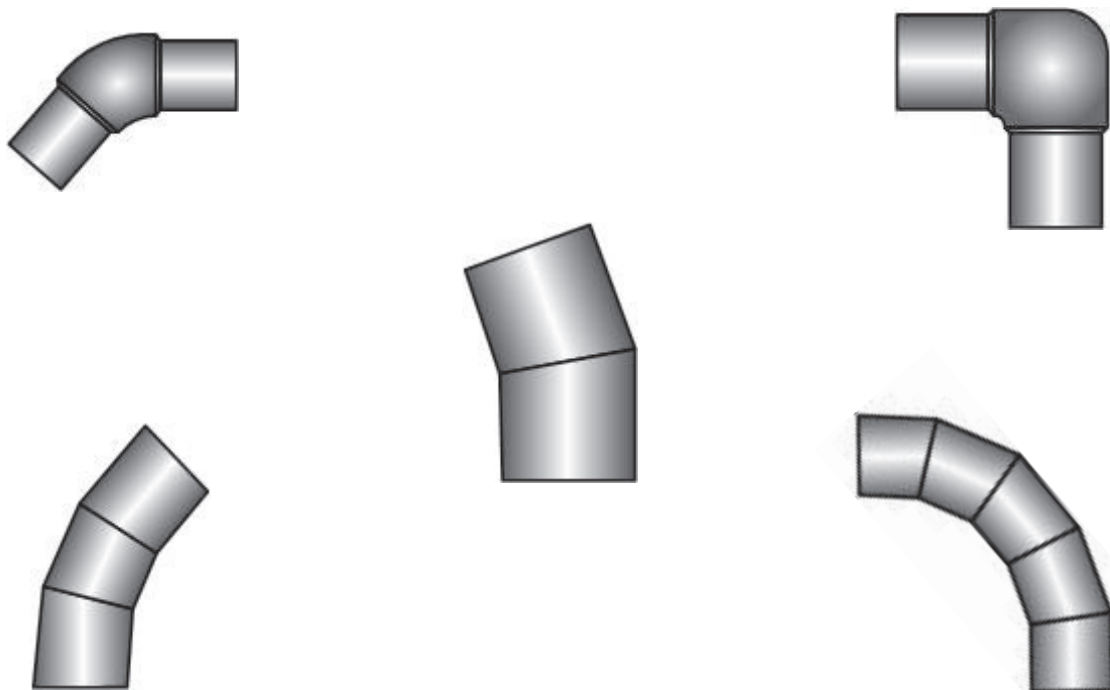
30" DIPS – 9 joints
360'/40' 450'/50'

Elbows

There are several different choices for elbows in HDPE pipe. They include molded up to 12", mitered or fabricated up to 63", and forge bent up to 14". Each choice has positives and negatives to any specific installation. Molded elbows are fully pressure rated but have a tight 1:1 ratio. Fabricated elbows are de-rated but are available in any configuration. Forge molded elbows are very expensive in large sizes but give smooth flow.

Your choice of elbows should be based on your project layout, pressures, and flow considerations. Contact your sales representative for his/her recommendations.

Please note that our catalog only details out the most common sizes and angles. If you have a need for something not listed please call for information.

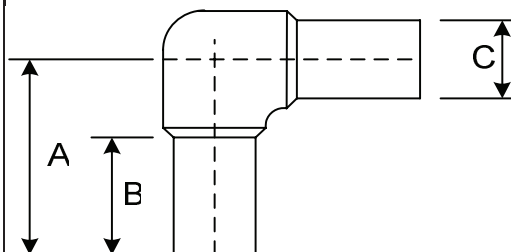


MOLDED IPS 90 DEGREE ELBOWS

1/4 BEND



**HIGH COUNTRY
FUSION**
C O M P A N Y I N C



MOLDED IPS 90 DEGREE ELBOWS

IPS SIZE	A	B	C	SDR	WPR PE3608	WPR PE4710*
3/4"	4.00	2.63	1.050	9,11	200,160	254, 200
1"	4.00	2.63	1.315	9,11	200,160	254, 200
1 1/4"	4.00	2.63	1.660	9,11	200,160	254, 200
1 1/2"	4.00	2.63	1.900	9,11	200,160	254, 200
2"	4.50	2.81	2.375	7,9,11,17	254,200,160,100	336, 254, 200, 128
3"	5.13	3.00	3.500	7,9,11,17	254,200,160,100	336, 254, 200, 128
4"	5.75	3.00	4.500	7,9,11,17	254,200,160,100	336, 254, 200, 128
6"	9.00	4.38	6.625	7,9,11,17	254,200,160,100	336, 254, 200, 128
8"	12.00	6.00	8.625	7,9,11,17	254,200,160,100	336, 254, 200, 128
10"	13.25	6.00	10.750	11,17	160,100	200, 128
12"	15.88	7.50	12.750	11,17	160,100	200, 128

Technical Notes

* Elbows made with PE4710 Material carry these ratings when used in conjunction with PE4710 pipe.

Fully pressure rated for the SDR ordered

Dimensions are in inches

Contact your HCFC representative for a quote

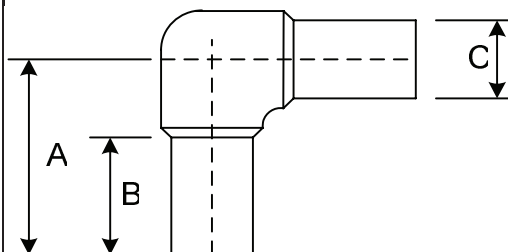
All fittings meet AWWA C906 fitting requirements

MOLDED DIPS 90 DEGREE ELBOWS

1/4 BEND



**HIGH COUNTRY
FUSION**
C O M P A N Y I N C



MOLDED DIPS 90 DEGREE ELBOWS

DIPS SIZE	A	B	C	SDR	WPR PE3608	WPR PE4710*
4"	7.82	4.10	4.800	11	160	200
6"	9.67	5.10	6.900	11	160	200
8"	11.58	5.17	9.050	11	160	200
10"	13.25	6.00	11.100	11	160	200
12"	15.88	7.50	13.200	11	160	200

Technical Notes

* Elbows made with PE4710 Material carry these ratings when used in conjunction with PE4710 pipe.

Fully pressure rated for the SDR ordered

Dimensions are in inches

Contact your HCFC representative for a quote

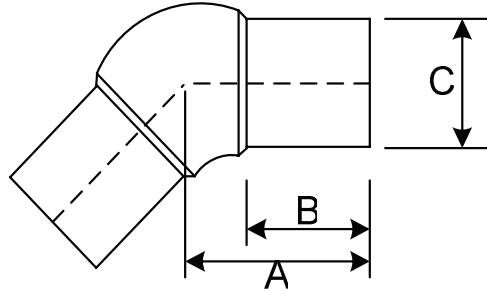
All fittings meet AWWA C906 fitting requirements

MOLDED IPS 45 DEGREE ELBOWS

1/8 BEND



**HIGH COUNTRY
FUSION**
COMPANY INC



MOLDED IPS 45 DEGREE ELBOWS

IPS SIZE	A	B	C	SDR	WPR PE3608	WPR PE4710*
3/4"	2.28	2.05	1.050	9,11	200,160	254, 200
1"	2.48	2.17	1.315	9,11	200,160	254, 200
1 1/4"	2.83	2.44	1.660	9,11	200,160	254, 200
1 1/2"	3.07	2.64	1.900	9,11	200,160	254, 200
2"	3.23	2.64	2.375	7,9,11,17	254,200,160,100	336, 254, 200, 128
3"	5.00	3.00	3.500	7,9,11,17	254,200,160,100	336, 254, 200, 128
4"	5.00	3.00	4.500	7,9,11,17	254,200,160,100	336, 254, 200, 128
6"	7.00	4.38	6.625	7,9,11,17	254,200,160,100	336, 254, 200, 128
8"	11.00	6.00	8.625	7,9,11,17	254,200,160,100	336, 254, 200, 128
10"	13.25	6.00	10.750	11,17	160,100	200, 128
12"	15.75	7.50	12.750	11,17	160,100	200, 128

Technical Notes

* Elbows made with PE4710 Material carry these ratings when used in conjunction with PE4710 pipe.

Fully pressure rated for the SDR ordered

Dimensions are in inches

Contact your HCFC representative for a quote

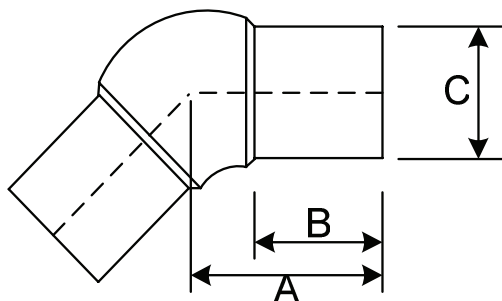
All fittings meet AWWA C906 fitting requirements

MOLDED DIPS 45 DEGREE ELBOWS

1/8 BEND



**HIGH COUNTRY
FUSION**
COMPANY INC



MOLDED DIPS 45 DEGREE ELBOWS

DIPS SIZE	A	B	C	SDR	WPR PE3608	WPR PE4710*
4"	6.05	7.10	4.80	11	160	200
6"	7.16	5.10	6.90	11	160	200
8"	8.32	5.17	9.05	11	160	200
10"	13.25	6.00	11.10	11	160	200
12"	15.88	7.50	13.20	11	160	200

Technical Notes

* Elbows made with PE4710 Material carry these ratings when used in conjunction with PE4710 pipe.

Fully pressure rated for the SDR ordered

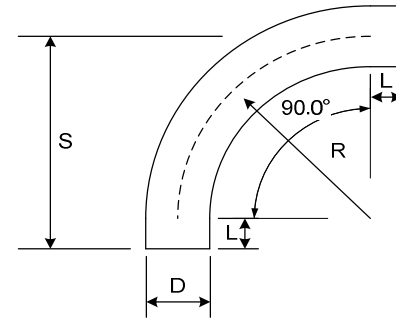
Dimensions are in inches

Contact your HCFC representative for a quote

All fittings meet AWWA C906 fitting requirements

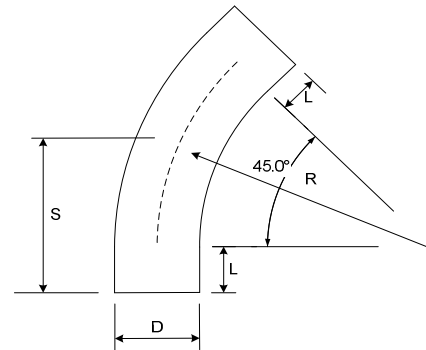
LONG SWEEP FORGED MOLDED ELBOWS

90 AND 45 DEGREE - IPS SIZES



90 DEGREE SWEEP ELBOWS - 1/4 BEND

IPS SIZE	TRUE OD	L	R	S	SDR	WPR PE3608	WPR PE4710*
2"	2.38	6.00	10.50	16.50	7,9,11,17	254,200,160,100	336,250,200,160
3"	3.50	6.00	10.50	16.50	7,9,11,17	254,200,160,100	336,250,200,160
4"	4.50	6.00	13.50	19.50	7,9,11,17	254,200,160,100	336,250,200,160
6"	6.625	7.00	19.90	26.90	7,9,11,17	254,200,160,100	336,250,200,160
8"	8.625	10.00	24.50	34.50	7,9,11,17	254,200,160,100	336,250,200,160
10"	10.75	11.00	32.25	43.20	7,9,11,17	254,200,160,100	336,250,200,160
12"	12.75	13.00	38.30	51.30	7,9,11,17	254,200,160,100	336,250,200,160
14"	14.00	13.00	38.90	51.90	7,9,11,17	254,200,160,100	336,250,200,160



45 DEGREE SWEEP ELBOWS - 1/8 BEND

IPS SIZE	TRUE OD	L	R	S	SDR	WPR PE3608	WPR PE4710*
2"	2.38	6.00	7.13	9.00	7,9,11,17	254,200,160,100	336,250,200,160
3"	3.50	6.00	10.50	10.30	7,9,11,17	254,200,160,100	336,250,200,160
4"	4.50	6.00	13.50	11.60	7,9,11,17	254,200,160,100	336,250,200,160
6"	6.625	7.00	19.90	15.20	7,9,11,17	254,200,160,100	336,250,200,160
8"	8.625	10.00	24.50	20.10	7,9,11,17	254,200,160,100	336,250,200,160
10"	10.75	11.00	32.25	24.30	7,9,11,17	254,200,160,100	336,250,200,160
12"	12.75	13.00	38.30	28.70	7,9,11,17	254,200,160,100	336,250,200,160
14"	14.00	13.00	38.90	29.10	7,9,11,17	254,200,160,100	336,250,200,160

Technical Notes

* Elbows made with PE4710 Material carry these ratings when used in conjunction with PE4710 pipe.

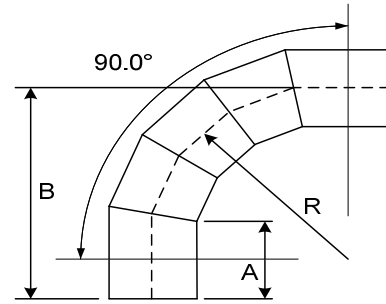
These long sweep bends are seamless and fully pressure rated

They can be manufactured to any angle up to 90 degrees.

Tolerance + / - 2°

FABRICATED IPS 90 DEGREE SWEEP ELBOWS

5 PIECE (1/4 BEND)



FABRICATED IPS 90 DEGREE SWEEP ELBOWS

IPS SIZE	TRUE OD	A	B	R	SDR	WPR PE3608	WPR PE4710 *
2"	2.375	4.0	14.40	12.7	7,9,11	200,160,128	254,200,160
3"	3.500	4.0	15.00	13.2	7,9,11	200,160,128	254,200,160
4"	4.500	4.0	15.50	13.7	7,9,11,17	200,160,128,80	254,200,160,100
6"	6.625	6.0	18.50	14.7	7,9,11,17	200,160,128,80	254,200,160,100
8"	8.625	6.5	20.20	16.0	7,9,11,17	200,160,128,80	254,200,160,100
10"	10.750	6.5	21.20	17.0	7,9,11,17	200,160,128,80	254,200,160,100
12"	12.750	8.0	24.60	19.1	7,9,11,17	200,160,128,80	254,200,160,100
14"	14.000	8.0	26.20	21.0	7,9,11,17	200,160,128,80	254,200,160,100
16"	16.000	8.0	28.80	24.0	7,9,11,17	200,160,128,80	254,200,160,100
18"	18.000	8.0	31.40	27.0	7,9,11,17	200,160,128,80	254,200,160,100
20"	20.000	8.0	34.00	30.0	9,11,17	160,128,80	200,160,100
22"	22.000	8.0	36.60	33.0	9,11,17	160,128,80	200,160,100
24"	24.000	8.0	39.20	36.0	9,11,17	160,128,80	200,160,100
26"	26.000	12.0	43.80	39.0	9,11,17	160,128,80	200,160,100
28"	28.000	12.0	46.40	42.0	9,11,17	160,128,80	200,160,100
30"	30.000	12.0	49.00	45.0	11,17,21,26	128,80,65,50	160,100,80,65
32"	32.000	12.0	51.60	48.0	11,17,21,26	128,80,65,50	160,100,80,65
34"	34.000	12.0	54.30	51.0	11,17,21,26	128,80,65,50	160,100,80,65
36"	36.000	12.0	56.80	54.0	11,17,21,26	128,80,65,50	160,100,80,65
42"	42.000	16.0	68.20	63.0	17,21,26	80,65,50	100,80,65
1200MM	47.250	16.0	78.40	72.0	17,21,26	80,65,50	100,80,65
48"	48.000	16.0	78.40	72.0	17,21,26	80,65,50	100,80,65
54"	54.000	16.0	86.30	81.0	17,21,26	80,65,50	100,80,65

Technical Notes

All Dimensions are in Inches

Other sizes, SDR's and custom radius ell's not listed are available

Per AWWA C-906 the WPR (Working Pressure Rating) included allowance for pressure surge.

The Pressure and surge pressure for HDPE is different than PVC or DI. Refer to AWWA M55 or PPI PE Handbook, Chapter 6. (Plasticpipe.org)

Fittings Manufactured per ASTM F2206, with pipe per ASTM D3350, 345464C (3608) 445474C (4710)

Contact your HCFC representative for a quote

* - Elbows made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

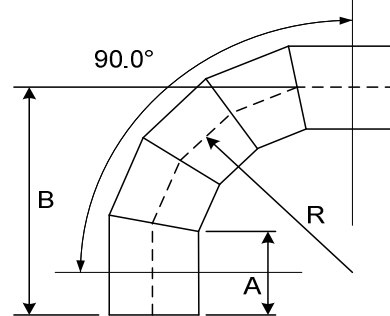
Sizes 24" and smaller meet AWWA C906 fitting requirements

FABRICATED DIPS 90 DEGREE SWEEP ELBOWS

5 PIECE (1/4 BEND)



HIGH COUNTRY
FUSION
COMPANY INC



FABRICATED DIPS 90 DEGREE SWEEP ELBOWS

DIPS SIZE	DIAM	A	R	SDR	WPR PE3608	WPR PE4710 *
4"	4.800	6.00	14.00	9,11,17	160,128,80	200,160,100
6"	6.900	6.00	15.00	9,11,17	160,128,80	200,160,100
8"	9.050	6.50	16.20	9,11,17	160,128,80	200,160,100
10"	11.100	6.50	17.20	9,11,17	160,128,80	200,160,100
12"	13.200	8.00	19.80	9,11,17	160,128,80	200,160,100
14"	15.300	8.00	23.00	9,11,17	160,128,80	200,160,100
16"	17.400	8.00	26.10	9,11,17	160,128,80	200,160,100
18"	19.500	8.00	29.30	9,11,17	160,128,80	200,160,100
20"	21.600	8.00	32.40	9,11,17	160,128,80	200,160,100
24"	25.800	8.00	38.70	9,11,17	160,128,80	200,160,100
30"	32.000	10.00	48.00	11,17,21	128,80,65	160,100,80

Technical Notes

All Dimensions are in Inches

Other sizes, SDR's and custom radius ell's not listed are available

Per AWWA C-906 the WPR (Working Pressure Rating) included allowance for pressure surge.

The Pressure and surge pressure for HDPE is different than PVC or DI. Refer to AWWA M55 or PPI PE Handbook, Chapter 6. (Plasticpipe.org)

Fittings Manufactured per ASTM F2206, with pipe per ASTM D3350, 345464C (3608) 445474C (4710)

Contact your HCFC representative for a quote

* - Elbows made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

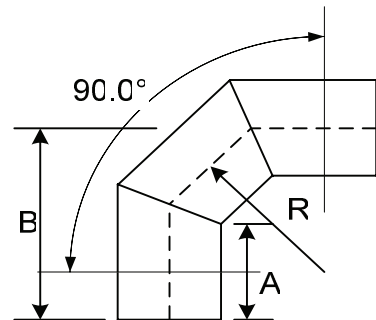
Sizes 24" and smaller meet AWWA C906 fitting requirements

FABRICATED IPS 90 DEGREE ELBOWS

3 SEGMENT (1/4 BEND)



**HIGH COUNTRY
FUSION**
COMPANY INC



FABRICATED IPS 90 DEGREE ELBOWS

IPS SIZE	TRUE OD	A	B	R	SDR	WPR PE3608	WPR PE4710 *
4"	4.500	6.00	10.90	6.80	7,9,11,17	200,160,128,80	254,200,160,100
6"	6.625	6.00	13.20	10.00	7,9,11,17	200,160,128,80	254,200,160,100
8"	8.625	6.50	14.60	10.70	7,9,11,17	200,160,128,80	254,200,160,100
10"	10.750	6.50	16.60	13.50	7,9,11,17	200,160,128,80	254,200,160,100
12"	12.750	8.00	20.00	16.00	7,9,11,17	200,160,128,80	254,200,160,100
14"	14.000	8.00	19.40	14.50	7,9,11,17	200,160,128,80	254,200,160,100
16"	16.000	8.00	21.20	16.80	7,9,11,17	200,160,128,80	254,200,160,100
18"	18.000	8.00	22.50	18.40	7,9,11,17	200,160,128,80	254,200,160,100
20"	20.000	8.00	24.10	20.40	7,9,11,17	200,160,128,80	254,200,160,100
22"	22.000	8.00	25.70	22.40	7,9,11,17	200,160,128,80	254,200,160,100
24"	24.000	8.00	27.30	24.50	7,9,11,17	200,160,128,80	254,200,160,100
26"	26.000	10.00	30.90	26.50	9,11,17	160,128,80	200,160,100
28"	28.000	10.00	32.50	28.50	9,11,17	160,128,80	200,160,100
30"	30.000	10.00	34.10	30.50	11,17,21	128,80,65	160,100,80
32"	32.000	10.00	38.90	38.00	11,17,21	128,80,65	160,100,80
34"	34.000	10.00	41.00	41.00	11,17,21	128,80,65	160,100,80
36"	36.000	10.00	42.60	43.00	11,17,21	128,80,65	160,100,80
42"	42.000	16.00	54.00	50.00	17,21,26	80,65,50	100,80,65
48"	48.000	16.00	59.90	58.00	17,21,26	80,65,50	100,80,65
54"	54.000	16.00	64.70	64.00	21,26,32.5	65,50,40	80,65,50

Technical Notes

All Dimensions are in Inches

Other sizes, SDR's and custom radius ell's not listed are available

Per AWWA C-906 the WPR (Working Pressure Rating) included allowance for pressure surge.

The Pressure and surge pressure for HDPE is different than PVC or DI. Refer to AWWA M55 or PPI PE Handbook, Chapter 6. (Plasticpipe.org)

Fittings Manufactured per ASTM F2206, with pipe per ASTM D3350, 345464C (3608) 445474C (4710)

Contact your HCFC representative for a quote

* - Elbows made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

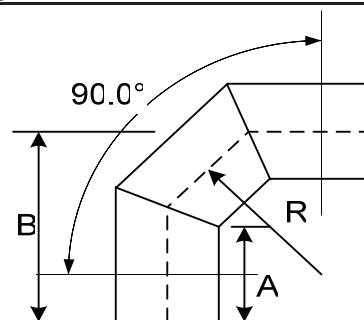
Sizes 24" and smaller meet AWWA C906 fitting requirements

FABRICATED DIPS 90 DEGREE ELBOWS

3 SEGMENT (1/4 BEND)



**HIGH COUNTRY
FUSION**
C O M P A N Y I N C



FABRICATED DIPS 90 DEGREE ELBOWS

DIPS SIZE	TRUE OD	A	B	R	SDR	WPR PE3608	WPR PE4710 *
4"	4.800	6.00	11.20	7.20	9,11,17	160,128,80	200,160,100
6"	6.900	6.00	13.50	10.40	9,11,17	160,128,80	200,160,100
8"	9.050	6.50	15.00	11.30	9,11,17	160,128,80	200,160,100
10"	11.100	6.50	16.90	13.90	9,11,17	160,128,80	200,160,100
12"	13.200	8.00	20.40	16.50	9,11,17	160,128,80	200,160,100
14"	15.300	8.00	20.60	16.10	9,11,17	160,128,80	200,160,100
16"	17.400	8.00	22.30	18.30	9,11,17	160,128,80	200,160,100
18"	19.500	8.00	23.70	19.90	9,11,17	160,128,80	200,160,100
20"	21.600	8.00	25.40	22.00	9,11,17	160,128,80	200,160,100
24"	25.800	8.00	28.80	28.80	9,11,17	160,128,80	200,160,100
30"	32.000	10.00	38.90	38.00	9,11,17	160,128,80	200,160,100

Technical Notes

All Dimensions are in Inches

Other sizes, SDR's and custom radius ell's not listed are available

Per AWWA C-906 the WPR (Working Pressure Rating) included allowance for pressure surge.

The Pressure and surge pressure for HDPE is different than PVC or DI. Refer to AWWA M55 or PPI PE Handbook, Chapter 6. (Plasticpipe.org)

Fittings Manufactured per ASTM F2206, with pipe per ASTM D3350, 345464C (3608) 445474C (4710)

Contact your HCFC representative for a quote

* - Elbows made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

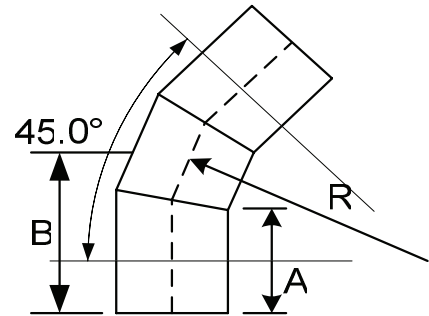
Sizes 24" and smaller meet AWWA C906 fitting requirements

FABRICATED IPS 45 DEGREE SWEEP ELBOWS

3 SEGMENT (1/8 BEND)



**HIGH COUNTRY
FUSION**
COMPANY INC



FABRICATED IPS 45 DEGREE SWEEP ELBOWS

IPS SIZE	TRUE OD	A	B	R	SDR	WPR PE3608	WPR PE4710 *
2"	2.375	4.0	6.60	12.70	7,9,11	200,160,128	254,200,160
3"	3.500	4.0	6.80	13.20	7,9,11	200,160,128	254,200,160
4"	4.500	4.0	7.00	13.70	7,9,11,17	200,160,128	254,200,160
6"	6.625	6.0	9.40	14.70	7,9,11,17	200,160,128,80	254,200,160,100
8"	8.625	6.5	10.30	16.00	7,9,11,17	200,160,128,80	254,200,160,100
10"	10.750	6.5	10.70	17.00	7,9,11,17	200,160,128,80	254,200,160,100
12"	12.750	8.0	12.80	19.10	7,9,11,17	200,160,128,80	254,200,160,100
14"	14.000	8.0	13.20	21.00	7,9,11,17	200,160,128,80	254,200,160,100
16"	16.000	8.0	14.00	24.00	7,9,11,17	200,160,128,80	254,200,160,100
18"	18.000	8.0	14.70	27.00	7,9,11,17	200,160,128,80	254,200,160,100
20"	20.000	8.0	15.50	30.00	9,11,17	160,128,80	200,160,100
22"	22.000	8.0	16.30	33.00	9,11,17	160,128,80	200,160,100
24"	24.000	8.0	17.00	36.00	9,11,17	160,128,80	200,160,100
26"	26.000	12.0	19.70	39.00	9,11,17,21	160,128,80	200,160,100
28"	28.000	12.0	20.50	42.00	9,11,17,21	160,128,80	200,160,100
30"	30.000	12.0	21.20	45.00	11,17,21,26	128,80,65,50	160,100,80,65
32"	32.000	12.0	22.00	48.00	11,17,21,26	128,80,65,50	160,100,80,65
34"	34.000	12.0	22.70	51.00	11,17,21,26	128,80,65,50	160,100,80,65
36"	36.000	12.0	23.50	54.00	11,17,21,26	128,80,65,50	160,100,80,65
42"	42.000	16.0	31.20	63.00	17,21,26	80,65,50	100,80,65
1200MM	47.250	16.0	34.00	72.00	17,21,26	80,65,50	100,80,65
48"	48.000	16.0	34.00	72.00	17,21,26	80,65,50	100,80,65
54"	54.000	16.0	36.20	81.00	17,21,26	80,65,50	100,80,65

Technical Notes

All Dimensions are in Inches

Other sizes, SDR's and custom radius ell's not listed are available

Per AWWA C-906 the WPR (Working Pressure Rating) included allowance for pressure surge.

The Pressure and surge pressure for HDPE is different than PVC or DI. Refer to AWWA M55 or PPI PE Handbook, Chapter 6. (Plasticpipe.org)

Fittings Manufactured per ASTM F2206, with pipe per ASTM D3350, 345464C (3608) 445474C (4710)

Contact your HCFC representative for a quote

* - Elbows made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

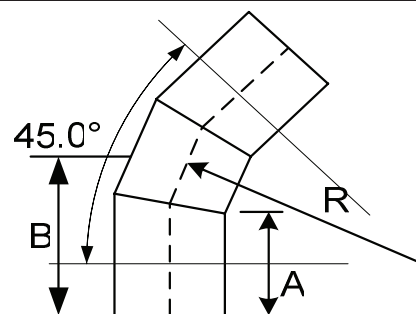
Sizes 24" and smaller meet AWWA C906 fitting requirements

FABRICATED DIPS 45 DEGREE SWEEP ELBOWS

3 SEGMENT (1/8 BEND)



**HIGH COUNTRY
FUSION**
COMPANY INC



FABRICATED DIPS 45 DEGREE SWEEP ELBOWS

DIPS SIZE	TRUE OD	A	B	R	SDR	WPR PE3608	WPR PE4710 *
4"	4.800	6.00	9.10	14.00	9,11,17	160,128,80	200,160,100
6"	6.900	6.00	9.40	15.00	9,11,17	160,128,80	200,160,100
8"	9.050	6.50	9.40	16.20	9,11,17	160,128,80	200,160,100
10"	11.100	6.50	10.80	17.20	9,11,17	160,128,80	200,160,100
12"	13.200	8.00	13.00	19.80	9,11,17	160,128,80	200,160,100
14"	15.300	8.00	13.80	23.00	9,11,17	160,128,80	200,160,100
16"	17.400	8.00	14.50	26.10	9,11,17	160,128,80	200,160,100
18"	19.500	8.00	15.30	29.30	9,11,17	160,128,80	200,160,100
20"	21.600	8.00	16.10	32.40	9,11,17	160,128,80	200,160,100
24"	25.800	8.00	17.70	38.70	9,11,17	160,128,80	200,160,100
30"	32.000	10.00	22.00	48.00	11,17	128,80,65	160,100,80

Technical Notes

All Dimensions are in Inches

Other sizes, SDR's and custom radius ell's not listed are available

Per AWWA C-906 the WPR (Working Pressure Rating) included allowance for pressure surge.

The Pressure and surge pressure for HDPE is different than PVC or DI. Refer to AWWA M55 or PPI PE Handbook, Chapter 6. (Plasticpipe.org)

Fittings Manufactured per ASTM F2206, with pipe per ASTM D3350, 345464C (3608) 445474C (4710)

Contact your HCFC representative for a quote

* - Elbows made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

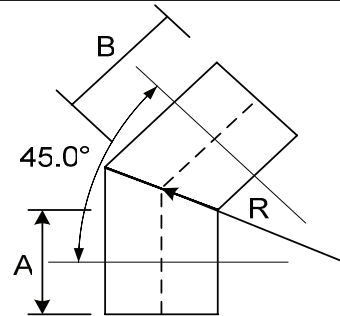
Sizes 24" and smaller meet AWWA C906 fitting requirements

FABRICATED IPS 45 DEGREE ELBOWS

2 SEGMENT (1/8 BEND)



**HIGH COUNTRY
FUSION**
COMPANY INC



FABRICATED IPS 45 DEGREE ELBOWS

IPS SIZE	TRUE OD	A	B	R	SDR	WPR PE3608	WPR PE4710 *
4"	4.500	6.00	6.90	6.80	7,9,11,17	200,160,128,80	254,200,160,100
6"	6.625	6.00	7.40	10.00	7,9,11,17	200,160,128,80	254,200,160,100
8"	8.625	6.50	8.30	10.70	7,9,11,17	200,160,128,80	254,200,160,100
10"	10.750	6.50	8.70	13.50	7,9,11,17	200,160,128,80	254,200,160,100
12"	12.750	8.00	10.60	16.00	7,9,11,17	200,160,128,80	254,200,160,100
14"	14.000	8.00	10.90	14.50	7,9,11,17	200,160,128,80	254,200,160,100
16"	16.000	8.00	11.30	16.80	7,9,11,17	200,160,128,80	254,200,160,100
18"	18.000	8.00	11.70	18.40	7,9,11,17	200,160,128,80	254,200,160,100
20"	20.000	8.00	12.10	20.40	9,11,17	160,128,80	200,160,100
22"	22.000	8.00	12.60	22.40	9,11,17	160,128,80	200,160,100
24"	24.000	8.00	13.00	24.50	9,11,17	160,128,80	200,160,100
26"	26.000	10.00	15.40	26.50	9,11,17	160,128,80	200,160,100
28"	28.000	10.00	15.80	28.50	9,11,17	160,128,80	200,160,100
30"	30.000	10.00	16.20	30.50	11,17,21,26	128,80,65,50	160,100,80,65
32"	32.000	10.00	16.60	38.00	11,17,21,26	128,80,65,50	160,100,80,65
34"	34.000	10.00	17.00	41.00	11,17,21,26	128,80,65,50	160,100,80,65
36"	36.000	10.00	17.50	43.00	11,17,21,26	128,80,65,50	160,100,80,65
42"	42.000	16.00	18.70	50.00	17,21,26	80,65,50	100,80,65
48"	48.000	16.00	19.90	58.00	17,21,26	80,65,50	100,80,65
54"	54.000	16.00	27.20	64.00	17,21,26	80,65,50	100,80,65

Technical Notes

All Dimensions are in Inches

Other sizes, SDR's and custom radius ell's not listed are available

Per AWWA C-906 the WPR (Working Pressure Rating) included allowance for pressure surge.

The Pressure and surge pressure for HDPE is different than PVC or DI. Refer to AWWA M55 or PPI PE Handbook, Chapter 6. (Plasticpipe.org)

Fittings Manufactured per ASTM F2206, with pipe per ASTM D3350, 345464C (3608) 445474C (4710)

Contact your HCFC representative for a quote

* - Elbows made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

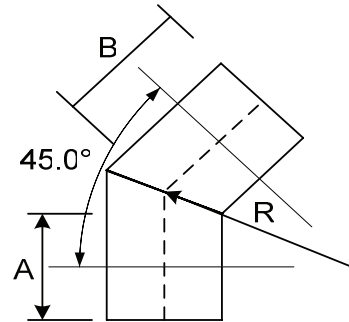
Sizes 24" and smaller meet AWWA C906 fitting requirements

FABRICATED DIPS 45 DEGREE ELBOWS

2 SEGMENT (1/8 BEND)



**HIGH COUNTRY
FUSION**
C O M P A N Y I N C



FABRICATED DIPS 45 DEGREE ELBOWS

DIPS SIZE	TRUE OD	A	B	R	SDR	WPR PE3608	WPR PE4710 *
4"	4.800	6.00	7.00	7.20	9,11,17	160,128,80	200,160,100
6"	6.900	6.00	7.40	10.40	9,11,17	160,128,80	200,160,100
8"	9.050	6.50	8.40	11.30	9,11,17	160,128,80	200,160,100
10"	11.100	6.50	8.80	13.90	9,11,17	160,128,80	200,160,100
12"	13.200	8.00	10.70	16.50	9,11,17	160,128,80	200,160,100
14"	15.300	8.00	11.20	16.10	9,11,17	160,128,80	200,160,100
16"	17.400	8.00	11.60	18.30	9,11,17	160,128,80	200,160,100
18"	19.500	8.00	12.00	19.90	9,11,17	160,128,80	200,160,100
20"	21.600	8.00	12.50	22.00	9,11,17	160,128,80	200,160,100
24"	25.800	8.00	13.30	26.30	9,11,17	160,128,80	200,160,100
30"	32.000	10.00	16.60	38.00	11,17,21	128,80,65	160,100,80

Technical Notes

All Dimensions are in Inches

Other sizes, SDR's and custom radius ell's not listed are available

Per AWWA C-906 the WPR (Working Pressure Rating) included allowance for pressure surge.

The Pressure and surge pressure for HDPE is different than PVC or DI. Refer to AWWA M55 or PPI PE Handbook, Chapter 6. (Plasticpipe.org)

Fittings Manufactured per ASTM F2206, with pipe per ASTM D3350, 345464C (3608) 445474C (4710)

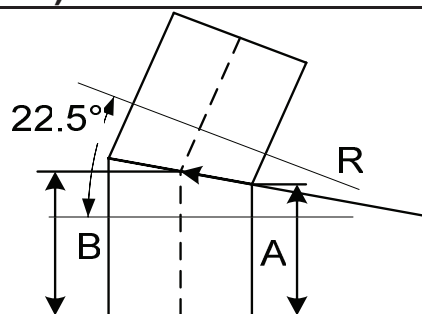
Contact your HCFC representative for a quote

* - Elbows made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

Sizes 24" and smaller meet AWWA C906 fitting requirements

FABRICATED IPS 22.5 DEGREE ELBOWS

2 SEGMENT (1/16 BEND)



FABRICATED IPS 22.5 DEGREE ELBOWS

IPS SIZE	TRUE OD	A	B	R	SDR	WPR PE3608	WPR PE4710 *
2"	2.375	4.00	4.30	12.70	7,9,11	200,160,128	254,200,160
3"	3.500	4.00	4.40	13.20	7,9,11	200,160,128	254,200,160
4"	4.500	6.00	4.50	13.70	7,9,11,17	200,160,128,80	254,200,160,100
5"	4.563	6.00	6.50	14.70	7,9,11,17	200,160,128,80	254,200,160,100
6"	6.625	6.00	6.70	14.70	7,9,11,17	200,160,128,80	254,200,160,100
8"	8.625	8.00	7.40	16.00	7,9,11,17	200,160,128,80	254,200,160,100
10"	10.750	8.00	7.60	17.00	7,9,11,17	200,160,128,80	254,200,160,100
12"	12.750	8.00	9.30	19.10	7,9,11,17	200,160,128,80	254,200,160,100
14"	14.000	8.00	9.40	21.00	7,9,11,17	200,160,128,80	254,200,160,100
16"	16.000	8.00	9.60	24.00	7,9,11,17	200,160,128,80	254,200,160,100
18"	18.000	8.00	9.80	27.00	7,9,11,17	200,160,128,80	254,200,160,100
20"	20.000	10.00	10.00	30.00	9,11,17	160,128,80	200,160,100
22"	22.000	10.00	10.20	33.00	9,11,17	160,128,80	200,160,100
24"	24.000	10.00	10.40	36.00	9,11,17	160,128,80	200,160,100
26"	26.000	10.00	12.60	39.00	9,11,17	160,128,80	200,160,100
28"	28.000	10.00	12.80	42.00	9,11,17	160,128,80	200,160,100
30"	30.000	10.00	13.00	45.00	11,17,21,26	128,80,65,50	160,100,80,65
32"	32.000	10.00	13.20	48.00	11,17,21,26	128,80,65,50	160,100,80,65
34"	34.000	10.00	13.40	51.00	11,17,21,26	128,80,65,50	160,100,80,65
36"	36.000	10.00	13.60	54.00	11,17,21,26	128,80,65,50	160,100,80,65
42"	42.000	16.00	20.20	63.00	17,21,26	80,65,50	100,80,65
1200MM	47.250	16.00	20.80	72.00	17,21,26	80,65,50	100,80,65
48"	48.000	16.00	20.80	72.00	17,21,26	80,65,50	100,80,65
54"	54.000	16.00	21.40	81.00	17,21,26	80,65,50	100,80,65

Technical Notes

All Dimensions are in Inches

Other sizes, SDR's and custom radius ell's not listed are available

Per AWWA C-906 the WPR (Working Pressure Rating) included allowance for pressure surge.

The Pressure and surge pressure for HDPE is different than PVC or DI. Refer to AWWA M55 or PPI PE Handbook, Chapter 6. (Plasticpipe.org)

Fittings Manufactured per ASTM F2206, with pipe per ASTM D3350, 345464C (3608) 445474C (4710)

Contact your HCFC representative for a quote

Sizes 24" and smaller meet AWWA C906 fitting requirements

* - Elbows made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

NOTE: 11 1/4° Bends are similar in dimension.

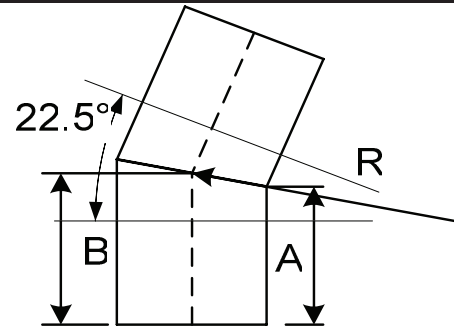
NOTE: 22 1/2° and 11 1/4° Bends are rarely needed because of pipe flexibility.

FABRICATED DIPS 22.5 DEGREE ELBOWS

2 SEGMENT (1/16 BEND)



**HIGH COUNTRY
FUSION**
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FABRICATED DIPS 22.5 DEGREE ELBOWS

DIPS SIZE	TRUE OD	A	B	R	SDR	WPR PE3608	WPR PE4710 *
4"	4.800	6.00	6.50	14.00	7,9,11,17	200,160,128,80	254,200,160,100
6"	6.900	6.50	6.70	15.00	7,9,11,17	200,160,128,80	254,200,160,100
8"	9.050	6.50	7.40	16.20	7,9,11,17	200,160,128,80	254,200,160,100
10"	11.100	8.00	7.60	17.20	7,9,11,17	200,160,128,80	254,200,160,100
12"	13.200	8.00	9.30	19.80	7,9,11,17	200,160,128,80	254,200,160,100
14"	15.300	8.00	9.50	23.00	7,9,11,17	200,160,128,80	254,200,160,100
16"	17.400	8.00	9.70	26.10	7,9,11,17	200,160,128,80	254,200,160,100
18"	19.500	8.00	9.90	29.30	7,9,11,17	200,160,128,80	254,200,160,100
20"	21.600	8.00	10.20	32.40	9,11,17	160,128,80	200,160,100
24"	25.800	8.00	10.60	38.70	9,11,17	160,128,80	200,160,100
30"	32.000	10.00	13.20	48.00	11,17,21	80,65,50	100,80,65

Technical Notes

All Dimensions are in Inches

Other sizes, SDR's and custom radius ell's not listed are available

Per AWWA C-906 the WPR (Working Pressure Rating) included allowance for pressure surge.

The Pressure and surge pressure for HDPE is different than PVC or DI. Refer to AWWA M55 or PPI PE Handbook, Chapter 6. (Plasticpipe.org)

Fittings Manufactured per ASTM F2206, with pipe per ASTM D3350, 345464C (3608) 445474C (4710)

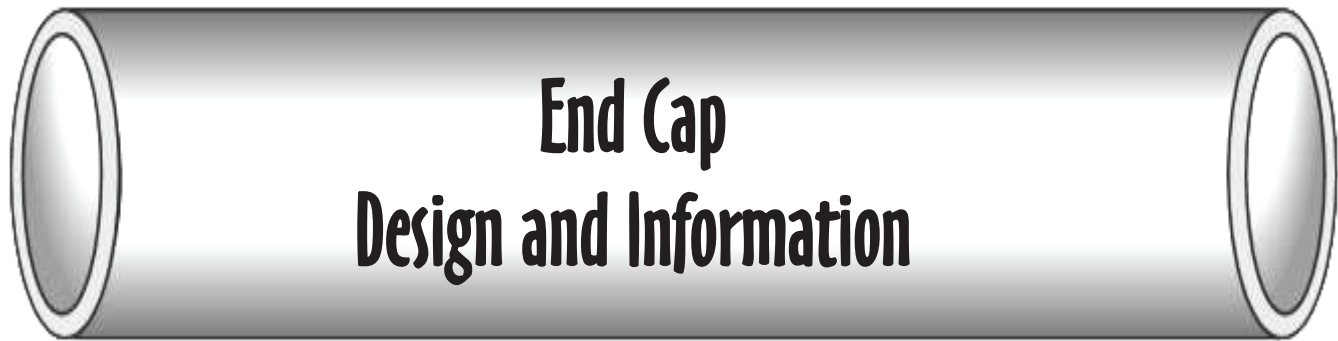
Contact your HCFC representative for a quote

Sizes 24" and smaller meet AWWA C906 fitting requirements

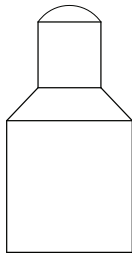
* - Elbows made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

NOTE: 11 1/4° Bends are similar in dimension.

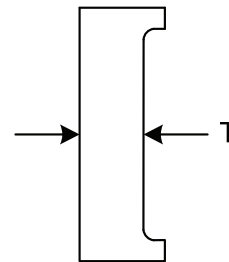
NOTE: 22 1/2° and 11 1/4° Bends are rarely needed because of pipe flexibility.



Molded



Machined

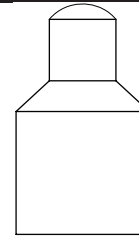


End Caps are available in molded $\frac{3}{4}$ " – 12" and machined 10" – 54". Sizes over 24" are limited in pressure rating. Machined end caps can be modified for specific needs such as test gauges and fill plugs.

IPS MOLDED END CAPS



**HIGH COUNTRY
FUSION**
C O M P A N Y I N C



OD

IPS MOLDED END CAPS

IPS SIZE	TRUE OD	SDR	WPR PE3408	WPR PE4710*
3/4"	1.050	11	160	200
1"	1.615	11	160	200
1 1/4"	1.660	11	160	200
1 1/2"	1.900	9,11	200,160	250, 200
2"	2.375	9,11	200,160	250, 200
3"	3.500	9,11,17	200,160,100	250, 200, 120
4"	4.500	9,11,17	200,160,100	250, 200, 120
6"	6.625	9,11,17	200,160,100	250, 200, 120
8"	8.625	11,17	160,100	200, 120
10"	10.750	11,17	160,100	200, 120
12"	12.750	11,17	160,100	200, 120

Technical Notes

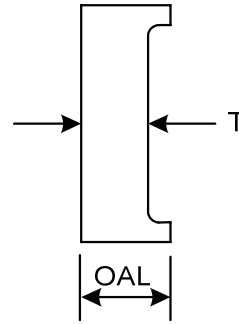
Sizes 24" and smaller meet AWWA C906 Fitting requirements,

Dimensions are in inches

Other sizes and SDR's not listed are available, contact your HCFC representative for a quote

* -Caps made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

IPS MACHINED END CAPS



IPS MACHINED END CAPS

IPS SIZE	TRUE OD	T	OAL	SDR	WPR PE3608	WPR PE4710*
10"	10.750	2.25	3	11	160	200
12"	12.750	2.25	3	17	100	126
		2.75	3.5	9/11	200/160	252 / 200
14"	14.000	3.25	4	9/11	200/160	252/ 200
		2.75	3.5	17	100	126
16"	16.000	3.25	4	11	160	200
		2.75	3.5	17	100	126
18"	18.000	4.25	5	9/11	200/ 160	252/ 200
		3.25	4	17	100	126
20"	20.000	4.25	5	11	160	200
		3.25	4	21	80	100
22"	22.000	5.25	6	9/11	200 /160	252/ 200
		4.25	5	26	64	81
24"	24.000	5.25	6	9/11	200/ 160	252 / 200
		4.25	5	17	100	126
26"	26.000	5.25	6	11	160	200
		4.25	5	21	80	100
28"	28.000	5.25	6	17	100	126
		4.25	5	26	64	81
30"	30.000	5.25	6	17	100	126
		4.25	5	32.5	51	64
32"	32.000	5.25	6	21	80	100
		4.25	5	32.5	51	64
34"	34.000	5.25	6	26	64	81
36"	36.000	5.25	6	26	64	81
40"	40.000	5.25	6	32.5	51	64
42"	42.000	5.25	6	32.5 ^A	45	58
48"	48.000	5.25	6	32.5 ^A	35	45
54"	54.000	5.25	6	32.5 ^A	25	35

Technical Notes

Sizes 24" and smaller meet AWWA C906 Fitting requirements,

A = Minimum Wall

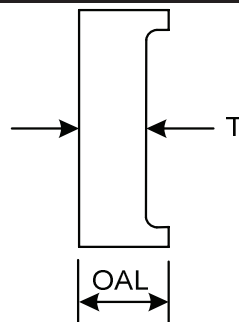
Other sizes and SDR's are available please contact your sales rep for details

Field fusion of machined end caps may require the use of a stub end holder

Sufficient length of pipe may be fused to end cap to eliminate the use of a stub end holder

* -Caps made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

DIPS MACHINED END CAPS



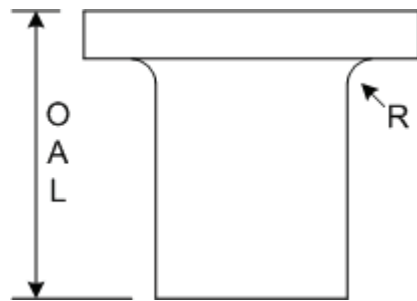
DIPS MACHINED END CAPS

DIPS SIZE	TRUE OD	T	OAL	SDR	WPR PE3608	WPR PE4710*
4"	4.800	1.25	2.00	11	160	200
6"	6.900	2.25	3.00	11	160	200
8"	9.050	2.25	3.00	11	160	200
10"	11.100	2.25	3.00	11	160	200
12"	13.200	2.75	3.50	11	160	200
14"	15.300	3.25	4.00	11	160	200
16"	17.400	4.25	5.00	11	160	200
18"	19.500	4.25	5.00	11	160	200
20"	21.600	5.25	6.00	11	160	200
24"	25.800	5.25	6.00	11	160	200

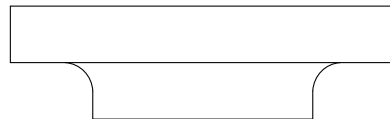
Technical Notes

* -Caps made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.
 Sizes 24" and smaller meet AWWA C906 Fitting requirements,
 Field fusion of machined end caps may require the use of a stub end holder
 Sufficient length of pipe may be fused to end cap to eliminate the use of a stub end holder
 Other Sizes and SDR's are available please contact your sales rep for details.

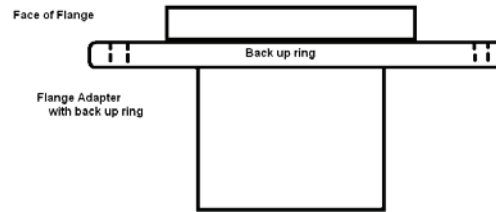
Flange Adapter & Stub End Design and Information



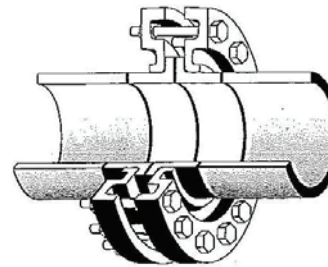
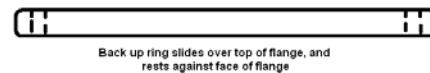
Flange Adapter



Stub End

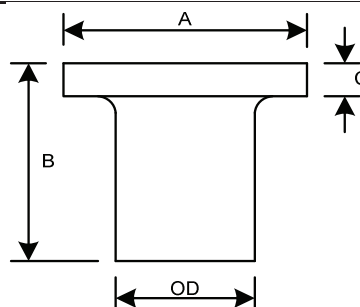


For back up ring details see D-8



- The face thickness should be at least 1.25 times pipe wall thickness for full pressure rating.
- The face diameter fits inside the bolt-circle to promote alignment and concentricity with sealing.
- Flange adapter overall thickness must be long enough to allow butt-fusion in all applicable fusion machines.
- “R” must be matched to the radius of the metal back up ring.
- Corrosion protected convoluted Ductile Iron back up rings are recommended.
- OD Dimensions and tolerances machined in compliance with specifications of ASTM F714.
- Fusion machine stub-end holders are required for fusion of stub ends.
- Stub End overall thickness must be long enough to allow butt-fusion in all applicable fusion machines, size on size or larger, with the use of a stub-end holder.
- Stub-end wall thickness is 10% thicker than pipe to accommodate pipe end toe-in and out of roundness, while assuring virtually 100% butt fusion.

MOLDED / MACHINED IPS FLANGE ADAPTERS



MOLDED / MACHINED IPS FLANGE ADAPTERS

IPS SIZE	TRUE OD	A	B	C	SDR	WPR PE3608	WPR PE4710 ⁷
3/4"	1.050	1.85	4.02	0.39	11	160	200
1"	1.315	2.36	4.02	0.39	11	160	200
1 1/4"	1.660	2.80	4.02	0.39	11	160	200
1 1/2"	1.900	3.15	4.02	0.39	11	160	200
2"	2.375	3.94	6.00	0.39 ⁴	7,9,11,17	254,200,160,100	330,250,200,120
3"	3.500	5.00	6.00	0.63 ⁴	7,9,11,17	254,200,160,100	330,250,200,120
4"	4.500	6.60	6.00	0.54 ⁴	7,9,11,17	254,200,160,100	330,250,200,120
5"	5.563	7.63	7.75	0.75 ⁴	7,9,11,17	254,200,160,100	330,250,200,120
6"	6.625	8.50	8.00	0.78 ⁴	7,9,11,17	254,200,160,100	330,250,200,120
8"	8.625	10.63	11.00	1 ⁴	7,9,11,17	254,200,160,100	330,250,200,120
10"	10.750	12.75	12.00	1.28 ⁴	7,9,11,17	254,200,160,100	330,250,200,120
12"	12.750	15.00	12.00	1.54 ⁴	7,9,11,17	254,200,160,100	330,250,200,120
14"	14.000	17.50	12.00	1.5 ⁴	7,9,11,17	254,200,160,100	330,250,200,120
16"	16.000	20.00	12.00	1.75 ⁴	7,9,11,17	254,200,160,100	330,250,200,120
18"	18.000	21.38	12.00	1.88 ⁴	7,9,11,17	254,200,160,100	330,250,200,120
20"	20.000	23.47	12.00	2.27 ⁴	7,9,11,17	254,200,160,100	330,250,200,120
22"	22.000	25.60	12.00	2.5 ⁴	7,9,11,17	254,200,160,100	330,250,200,120
24"	24.000	27.85	12.00	2.82 ⁴	7,9,11,17	254,200,160,100	330,250,200,120
26"	26.000	30.00	14.00	2.95 ⁶	11,17,21	160,100,80	200,120,100
28"	28.000	32.30	14.00	3.18 ⁶	11,17,21	160,100,80	200,120,100
30"	30.000	34.30	14.00	3.40 ⁶	11,17,21	160,100,80	200,120,100
32"	32.000	36.50	14.00	3.63 ⁶	11,17,21	160,100,80	200,120,100
34"	34.000	38.50	14.00	3.86 ⁶	11,17,21	160,100,80	200,120,100
36"	36.000	40.80	14.00	4.10 ⁶	11,17,21	160,100,80	200,120,100
42"	42.000	47.50	14.00	3.10 ⁹	17,21,26	100,80,65	120,100,80
48"	48.000	54.00	14.00	2.85 ⁹	17,21,26	100,80,65	120,100,80
54"	54.000	60.00	14.00	3.21 ⁹	17,21,26	100,80,65	120,100,80

Technical Notes

Dimensions are in Inches

Back up rings sold separately, for dimensions see Back Up Ring Design & Information pg. D-7

For example of how Flange Adapters work with Back up rings see next page

⁴=Face thickness is for SDR 11, call for specifics on other SDR's

⁶=Face thickness is for SDR 11, 1.25 x wall thickness

⁹=Face thickness is for SDR 17, 1.25 x wall thickness.

⁷=Pressure ratings apply when using in conjunction with PE4710 pipe.

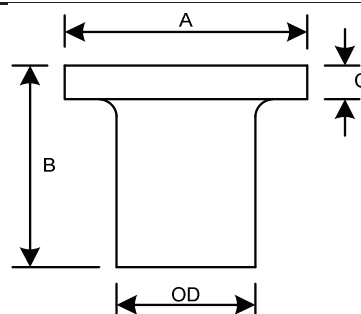
Other sizes, styles and SDR's not listed are available. Contact your HCFC representative for a quote

Sizes 24" and smaller meet AWWA C906 fitting requirements

MOLDED / MACHINED DIPS FLANGE ADAPTERS



**HIGH COUNTRY
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COMPANY INC



MOLDED / MACHINED DIPS FLANGE ADAPTERS

DIPS SIZE	TRUE OD	A	B	C	SDR	WPR PE3608	WPR PE4710 ⁴
4"	4.800	6.625	6.00	FACE	7,9,11,17	250,200,160,100	330,250,200,160
6"	6.900	8.625	6.00	THICKNESS	7,9,11,17	250,200,160,100	330,250,200,160
8"	9.050	10.750	9.00	IS APPROX	7,9,11,17	250,200,160,100	330,250,200,160
10"	11.100	12.750	9.00	1.25 X WALL	7,9,11,17	250,200,160,100	330,250,200,160
12"	13.200	15.000	11.00	THICKNESS ⁹	7,9,11,17	250,200,160,100	330,250,200,160
14"	15.300	17.500	11.00	BASED ON	7,9,11,17	250,200,160,100	330,250,200,160
16"	17.400	20.000	12.00	SDR.	7,9,11,17	250,200,160,100	330,250,200,160
18"	19.500	21.850	12.00	PLEASE	7,9,11,17	250,200,160,100	330,250,200,160
20"	21.600	23.600	12.00	CONTACT	9,11,17	200,160,100	250,200,160
24"	25.800	27.800	14.00	FOR EXACT	9,11,17	200,160,100	250,200,160
30"	32.000	34.300	14.00	THICKNESS	9,11,17	200,160,100	250,200,160

Technical Notes

Dimensions are in Inches

Back up rings sold separately, for dimensions see Back Up Ring Design & Information Section. D-7

⁴ = Pressure ratings apply only when used in conjunction with PE4710 pipe.

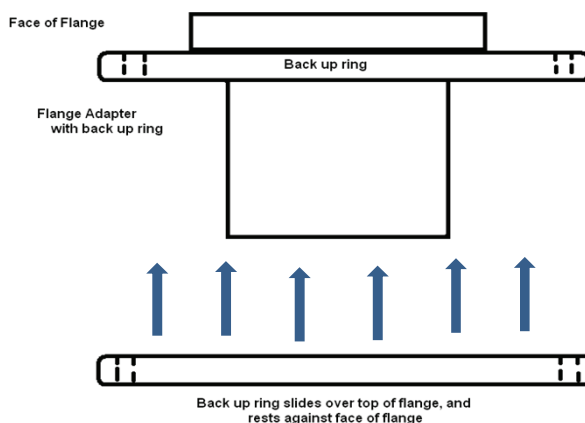
⁹ = Wall Thickness is a calculation of PIPE OD ÷ SDR = wall thickness, i.e. 18" ÷ 11 = 1.64 wall

Other sizes, styles and SDR's not listed are available. Contact your HCFC representative for a quote

Gaskets and Bolt kits available upon request

Sizes 24" and smaller meet AWWA C906 fitting requirements

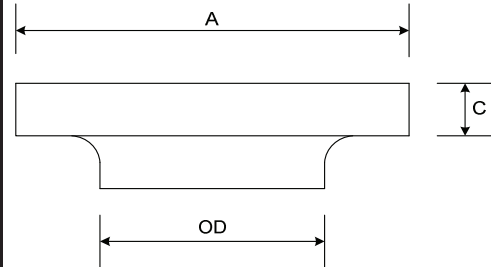
How Flange Adapters work with Back Up Rings



MOLDED / MACHINED IPS STUB ENDS



**HIGH COUNTRY
FUSION**
COMPANY INC



MOLDED / MACHINED IPS STUB ENDS

IPS SIZE	TRUE OD	FACE DIAMETER A	FACE THICKNESS C	SDR	WPR PE3608	WPR PE4710*
14"	14.000	17.50	FACE THICKNESS IS APPROX. 1.25 X WALL THICKNESS ⁴ BASED ON SDR. PLEASE CALL FOR EXACT THICKNESS	7,9,11,17	254,200,160,100	330,250,200,120
16"	16.000	20.00		7,9,11,17	254,200,160,100	330,250,200,120
18"	18.000	21.12		7,9,11,17	254,200,160,100	330,250,200,120
20"	20.000	23.50		7,9,11,17	254,200,160,100	330,250,200,120
22"	22.000	25.60		7,9,11,17	254,200,160,100	330,250,200,120
24"	24.000	28.00		7,9,11,17	254,200,160,100	330,250,200,120
26"	26.000	30.00		9,11,17	200,160,100	250,200,120
28"	28.000	32.30		9,11,17	200,160,100	250,200,120
30"	30.000	34.30		11,17,21,26	160,100,80,65	200,120,100,80
32"	32.000	36.50		11,17,21,26	160,100,80,65	200,120,100,80
34"	34.000	38.50		11,17,21,26	160,100,80,65	200,120,100,80
36"	36.000	40.80		11,17,21,26	160,100,80,65	200,120,100,80
42"	42.000	47.50		17,21,26,32.5	100,80,65,50	120,100,80,64
48"	48.000	54.00		17,21,26,32.5	100,80,65,50	120,100,80,64
54"	54.000	60.00		17,21,26,32.5	100,80,65,50	120,100,80,64

Technical Notes

*=Pressure ratings apply when using in conjunction with PE4710 pipe.

Dimensions are in Inches

Back up rings sold separately, for dimensions see Back Up Ring Design & Information Section. D-7

For example of how Stub Ends work with Back up rings see previous page

Other sizes, styles and SDR's not listed are available. Contact your HCFC representative for a quote

⁴ Wall Thickness is a calculation of PIPE OD ÷ SDR = wall thickness, i.e. 18" ÷ 11 = 1.64 wall

Gaskets and Bolt kits available upon request

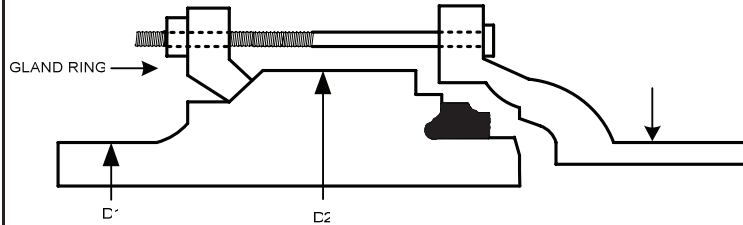
Sizes 24" and smaller meet AWWA C906 fitting requirements

MJ ADAPTER WITH KIT

DIMJA-KIT FOR IPS AND DIPS PIPE / Connects HDPE to Ductile Iron Pipe



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IPS and DIPS MJ ADAPTERS WITH KIT

SIZE	D1	D1	D2	OAL	WPR PE3608	WPR PE4710
IPS and DIPS	IPS	DIPS				
2" IPS	2.38	-	3.50	8.00	MJ ADAPTERS ARE FULLY PRESSURE RATED FOR SDR RATED AND ARE AWWA COMPLIANT	
3"	3.50	3.96	5.37	8.00		
4"	4.50	4.80	6.63	8.00		
6"	6.63	6.90	8.63	9.00		
8"	8.63	9.05	10.75	11.50		
10"	10.75	11.10	12.75	11.50		
12"	12.75	13.20	15.38	11.50		
14"	14.00	15.30	17.50	12.50		
16"	16.00	17.40	20.00	12.50		
18"	18.00	19.50	22.00	12.50		
20"	20.00	21.60	24.00	14.00		
24"	24.00	25.80	28.00	16.00		

Technical Notes

Dimensions are in Inches

MJ adapters are fully pressure rated for SDR ordered and are AWWA compliant

MJ Bell Adapters for use with Plain End Ductile Iron and PVC are also available, call for quote

MJ adapter hydrant swivels are also available, please call for spec sheet or quote

This kit includes the HDPE anchor fittings, longer T-bolts, standard rubber gasket, C110 full body gland ring, and OPTIONAL stainless steel stiffener.

DUCTILE IRON MECHANICAL JOINT GLAND

and ACCESSORY PACK



Size	ID	Bolt Hole Circle	# of holes x dia. of bolts	T-BOLT LENGTH	BODY THICKNESS
2"	2.61	4.75	2 X 5/8	5.00*	1.37
3"	4.06	6.19	4 X 5/8	4.50*	1.37
4"	4.90	7.50	4 X 3/4	4.50	1.50
6"	7.00	9.50	6 X 3/4	5.00	1.63
8"	9.15	11.75	6 X 3/4	6.00	1.75
10"	11.20	14.00	8 X 3/4	6.00	1.75
12"	13.30	16.25	8 X 3/4	6.00	1.75

Technical Notes

This gland ring is used in combination with both IPS and DIPS MJ Polyethylene adapters

* indicates hex head bolts

Kit includes extra long T-bolts, standard rubber gaskets, and full body gland ring
Joint Glands are also available for Ductile Iron and PVC call for details & quote.

DUCTILE IRON MECHANICAL JOINT GLAND

and ACCESSORY PACK (HEAVY DUTY)



MJ Accessory Kits - does not include Cast iron Gland Ring - Black Carbon Steel Ring ordered separately below

Size	# of bolts x dia. of bolts	T-BOLT LENGTH
14"	10 X 3/4	7.00
16"	12 X 3/4	7.00
18"	12 X 3/4	7.00
20"	14 X 3/4	7.00
24"	16 X 3/4	7.00

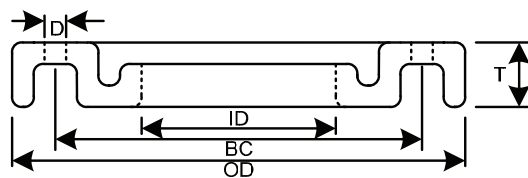
Carbon Steel Gland Rings

Size	Bolt Hole Circle	# of holes x dia. of bolts	ID	BODY THICKNESS
14"	18.75	10 X 3/4	15.44	2.00
16"	21.00	12 X 3/4	17.54	2.06
18"	23.25	12 X 3/4	19.64	2.13
20"	25.50	14 X 3/4	21.74	2.19
24"	30.00	16 X 3/4	25.94	2.31

Technical Notes

This gland ring is used in combination with both IPS and DIPS MJ Polyethylene adapters
 Kit includes extra long T-bolts, standard rubber gaskets, and full body gland ring
 Kit does not include Gland Ring - Black carbon Steel ring must be ordered separately
 Joint Glands are also available for Ductile Iron and PVC call for details & quote.

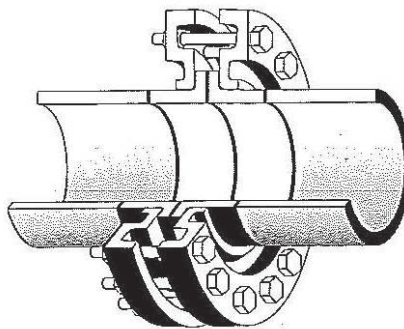
Back up Ring Design and Information



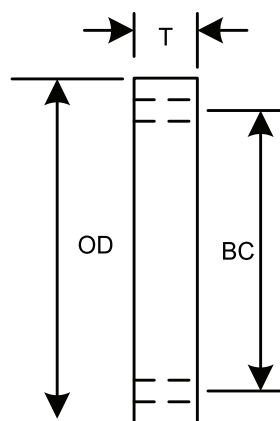
Side View



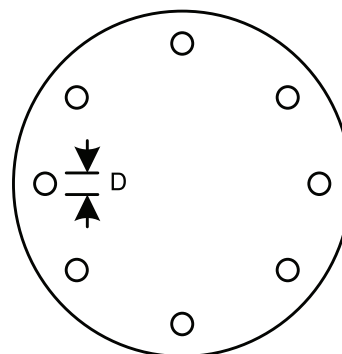
Top View



Back Up Rings



Side View



Top View

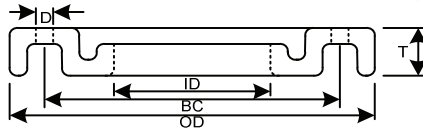
Blind Flanges

BACK UP RINGS

IPS DUCTILE IRON PRIMER COATED 1" - 20"



**HIGH COUNTRY
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COMPANY INC



IPS BACK UP RINGS 1" - 20"

IPS SIZE	SDR RATING	OUTSIDE DIAMETER "OD"	BOLT CIRCLE "BC"	INSIDE DIAMETER "ID"	THICKNESS "T"	# OF BOLTS "N"	BOLT HOLE DIAMETER "D"	WPR 2:1 SAFETY PSI
1"	7	4.25	3.13	1.38	0.56	4	0.63	267
1 1/4"	7	4.63	3.50	1.72	0.63	4	0.63	267
1 1/2"	7	5.00	3.88	1.97	0.69	4	0.63	267
2"	7	6.00	4.75	2.46	0.75	4	0.75	267
	11			2.63	0.50			160
3"	7	7.50	6.00	3.60	0.94	4	0.75	267
	11			3.75	0.53			160
4"	11	9.00	7.50	4.75	0.55	8	0.75	267
5"	7	10.00	8.50	5.69	0.94	8	0.88	267
6"	7	11.00	9.50	6.75	1.00	8	0.88	267
	11			6.88	0.63			160
8"	7	13.50	11.75	8.75	1.12	8	0.88	267
	11			8.88	0.85			160
10"	7	16.00	14.25	10.92	1.19	12	1.00	267
	11			11.00	0.98			160
12"	7	19.00	17.00	12.92	1.50	12	1.00	267
	11			13.13	1.25			160
14"	7	21.00	18.75	14.18	1.63	12	1.13	267
	11			14.38	1.38			160
16"	7	23.50	21.25	16.19	1.88	16	1.13	267
	11			16.38	1.44		1.16	160
18"	9	25.00	22.75	18.20	1.75	16	1.25	200
	11			18.38	1.67			160
20"	9	27.50	25.00	20.38	1.81	20	1.25	200
	11				2.13		1.38	160

Technical Notes

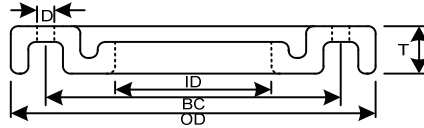
For sizes 22" - 63" please see next page
Dimensions are in Inches

BACK UP RINGS

IPS DUCTILE IRON PRIMER COATED 22" - 63"



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FUSION**
C O M P A N Y I N C



IPS BACK UP RINGS 22" - 63"

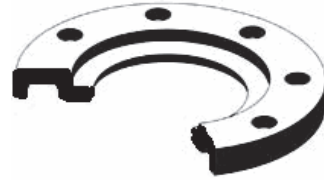
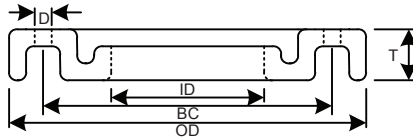
IPS SIZE	SDR RATING	OUTSIDE DIAMETER "OD"	BOLT CIRCLE "BC"	INSIDE DIAMETER "ID"	THICKNESS "T"	# OF BOLTS "N"	BOLT HOLE DIAMETER "D"	WPR 2:1 SAFETY PSI
22"	9	29.50	27.25	22.38	2.13	20	1.38	200
	11				2.00			160
24"	9	32.00	29.50	24.38	2.13	20	1.38	200
	11				2.17			160
26"	11	34.25	31.75	26.38	2.38	24	1.38	160
	17				2.00			100
28"	11	36.50	34.00	28.38	2.50	28	1.38	160
	17				2.06			100
30"	11	38.75	36.00	30.38	2.60	28	1.38	160
	26				2.06			65
32"	11	41.75	38.50	32.38	2.75	28	1.63	160
	26				2.06			65
34"	17	43.75	40.50	34.38	2.69	32	1.63	100
	26				2.14			64
36"	17	46.00	42.75	36.38	2.75	32	1.63	100
	32.5				2.06			50
42"	21	53.00	49.50	42.38	3.00	36	1.63	80
	39				2.26			40
48"	26	59.50	56.00	48.50	3.50	44	1.63	64
	51				2.40			30
54"	26	66.25	62.75	54.62	3.75	44	1.88	64
	51				2.57			30
63"	51	73.00	69.25	64.00	2.80	52	1.88	32

Technical Notes

For sizes 1" - 20" please see previous page
Dimensions are in Inches

BACK UP RINGS

DIPS DUCTILE IRON PRIMER COATED



DIPS BACK UP RINGS

DIPS SIZE	SDR RATING	OUTSIDE DIAMETER "OD"	BOLT CIRCLE "BC"	INSIDE DIAMETER "ID"	THICKNESS "T"	# OF BOLTS "N"	BOLT HOLE DIAMETER "D"	WPR 2:1 SAFETY PSI
4"	11	9.000	7.50	4.90	0.94	8	3/4"	275
6"	7	11.000	9.50	7.00	1.00	8	7/8"	275
8"	7	13.500	11.75	9.13	1.12	8	7/8"	275
10"	7	16.000	14.25	11.25	1.19	12	1"	275
12"	7	19.000	17.00	13.37	1.50	12	1"	275
14"	7	21.000	18.75	15.48	1.63	12	1-1/8"	200
16"	7	23.500	21.25	17.59	1.88	16	1-1/8"	200
18"	9	25.000	22.75	19.70	1.75	16	1-1/4"	200
20"	9	27.500	25.00	21.85	2.06	20	1-1/4"	200
24"	9	32.000	29.50	26.05	2.13	20	1-3/8"	200
30"	13.5	38.750	36.00	32.25	2.65	28	1-3/8"	128

Technical Notes

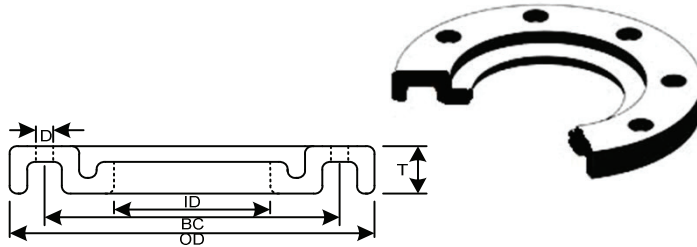
Dimensions are in Inches

BACK UP RINGS

IPS STAINLESS STEEL 1" - 18"



**HIGH COUNTRY
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COMPANY INC



IPS BACK UP RINGS 1" - 18"

IPS SIZE	SDR RATING	OUTSIDE DIAMETER "OD"	BOLT CIRCLE "BC"	INSIDE DIAMETER "ID"	THICKNESS "T"	# OF BOLTS "N"	BOLT HOLE DIAMETER "D"	WPR 2:1 SAFETY PSI
1"	7	4.25	3.13	1.38	0.56	4	0.63	267
1 1/2"	7	5.00	3.88	1.97	0.69	4	0.63	267
2"	7	6.00	4.75	2.46	0.75	4	0.75	267
	11				0.40			160
3"	7	7.50	6.00	3.60	0.94	4	0.75	267
	13.5				0.40			128
4"	7	9.00	7.50	4.60	0.94	8	0.75	267
	13.5				0.50			128
6"	7	11.00	9.50	6.75	1.00	8	0.88	267
	13.5				0.60			128
8"	7	13.50	11.75	8.75	1.12	8	0.88	267
	13.5				0.70			128
10"	7	16.00	14.25	10.92	1.27	12	1.00	267
	13.5				0.90			128
12"	7	19.00	17.00	12.92	1.77	12	1.00	267
	11				1.25			160
	13.5				1.05			128
14"	7	21.00	18.75	14.18	1.78	12	1.13	267
	9				1.38			183
	17				1.13			100
16"	7	23.50	21.25	16.19	2.17	16	1.13	267
	13.5				1.44			128
	17				1.25			100
18"	7	25.00	22.75	18.20	2.06	16	1.25	267
	11				1.56			160
	21				1.34			80

Technical Notes

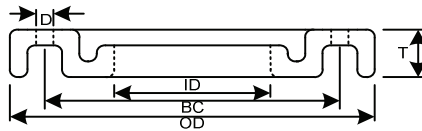
For sizes 20" - 54" please see next page
Dimensions are in Inches

BACK UP RINGS

IPS STAINLESS STEEL 20" - 54"



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C O M P A N Y I N C


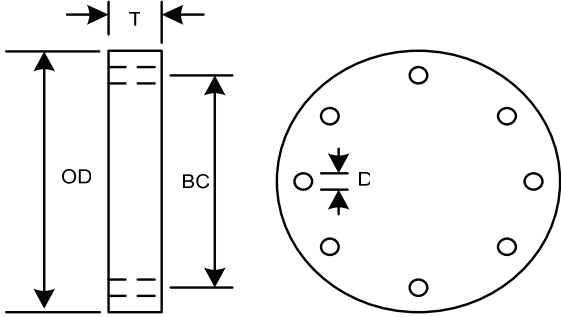


IPS BACK UP RINGS 20" - 54"

IPS SIZE	SDR RATING	OUTSIDE DIAMETER "OD"	BOLT CIRCLE "BC"	INSIDE DIAMETER "ID"	THICKNESS "T"	# OF BOLTS "N"	BOLT HOLE DIAMETER "D"	WPR 2:1 SAFETY PSI
20"	7	27.50	25.00	20.25	2.27	20	1.25	267
	11	27.50	25.00	20.25	2.15	20	1.25	160
	21	27.50	25.00	20.25	1.47	20	1.25	80
22"	7	29.50	27.25	22.25	2.43	20	1.38	267
	11	29.50	27.25	22.25	2.25	20	1.38	160
	21	29.50	27.25	22.25	1.54	20	1.38	80
24"	7	32.00	29.50	24.25	2.60	20	1.38	267
	11	32.00	29.50	24.25	2.50	20	1.38	160
	26	32.00	29.50	24.25	1.60	20	1.38	64
26"	11	34.25	31.75	26.38	2.50	24	1.38	160
	21	34.25	31.75	26.38	2.20	24	1.38	80
28"	11	36.50	34.00	28.38	2.68	28	1.38	160
	21	36.50	34.00	28.38	2.30	28	1.38	80
30"	13.5	38.75	36.00	30.38	2.75	28	1.38	128
	26	38.75	36.00	30.38	2.18	28	1.38	64
32"	11	41.75	38.50	32.38	3.40	28	1.63	160
	26	41.75	38.50	32.38	2.36	28	1.63	64
34"	11	43.75	40.50	34.38	3.25	32	1.63	160
	17	43.75	40.50	34.38	2.95	32	1.63	100
36"	17	46.00	42.75	36.38	3.00	32	1.63	100
	32.5	46.00	42.75	36.38	2.35	32	1.63	50
40"	21	50.75	47.25	39.75	3.45	36	1.63	89
42"	21	53.00	49.50	42.38	3.25	36	1.63	80
48"	26	59.50	56.00	48.50	3.50	44	1.63	64
54"	26	66.25	62.75	54.62	3.86	44	1.88	64

Technical Notes

For sizes 1" - 18" please see previous page
Dimensions are in Inches

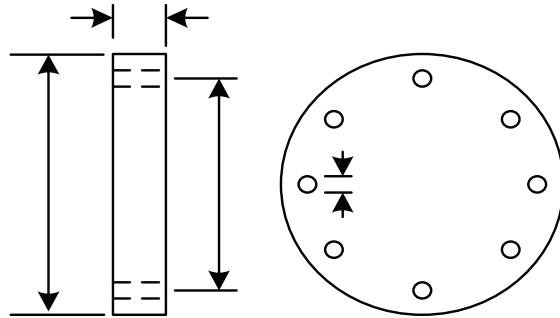
<h2 style="margin: 0;">STEEL BLIND FLANGES</h2> <h3 style="margin: 0;">FOR BOTH IPS AND DIPS PIPE SIZES</h3>	
	
<h2 style="margin: 0;">STEEL BLIND FLANGES</h2>	

SIZE	OUTSIDE DIAMETER "OD"	BOLT CIRCLE "BC"	THICKNESS "T"	# OF BOLTS "N"	BOLT HOLE DIAMETER "D"	WPR 2:1 SAFETY PSI
1-1/2"	5.00	3.88	0.625	4	0.63	275
2"	6.00	4.75	0.625	4	0.75	275
2-1/2"	7.00	5.50	0.625	4	0.75	275
3"	7.50	6.00	0.625	4	0.75	275
4"	9.00	7.50	0.625	8	0.75	239
5"	10.00	8.50	0.625	8	0.88	247
6"	11.00	9.50	0.688	8	0.88	227
8"	13.50	11.75	0.688	8	0.88	117
10"	16.00	14.25	0.688	12	1.00	68
12"	19.00	17.00	0.812	12	1.00	60
14"	21.00	18.75	0.938	12	1.13	77
16"	23.50	21.25	1.000	16	1.13	63
18"	25.00	22.75	1.062	16	1.25	60
20"	27.50	25.00	1.125	20	1.25	56
22"	29.50	27.25	1.188	20	1.38	50
24"	32.00	29.50	1.250	20	1.38	49
28"	36.50	34.00	1.312	28	1.38	38
30"	38.75	36.00	1.375	28	1.38	39
32"	41.75	38.50	1.500	28	1.63	41
36"	46.00	42.75	1.625	32	1.63	39
40"	50.75	47.25	1.625	36	1.63	31
42"	53.00	49.50	1.750	36	1.63	33
48"	59.50	56.00	1.750	44	1.63	24
54"	66.25	62.75	2.125	44	1.88	27

Technical Notes
Description - An AWWA C207 cross section.
Material - ASTM A36 plate steel, ASTM A240, SS316
Dimensions - Bolt circle is ANSINB16.5, lass 106. Mates with ANSIB 16.1, B16.47
AWWA C207 2-D and 4-E MSS SP44
Finish - Red oxide primer, hot dipped galvanized
Other sizes and pressure ratings are available please call for details

HDPE BLIND FLANGES

FOR BOTH IPS AND DIPS PIPE SIZES



HDPE BLIND FLANGES

SIZE	OUTSIDE DIAMETER "OD"	BOLT CIRCLE "BC"	THICKNESS "T"	# OF BOLTS "N"	BOLT HOLE DIAMETER "D"
2"	6.00	4.75	1" / 2"	4	0.75
3"	7.50	6.00	1" / 2"	4	0.75
4"	9.00	7.50	1" / 2"	4	0.75
6"	11.00	9.50	1" / 2"	8	0.88
8"	13.50	11.75	1" / 2"	8	0.88
10"	16.00	14.25	1" / 2"	12	1.00
12"	19.00	17.00	1" / 2"	12	1.00
14"	21.00	18.75	1" / 2"	12	1.13
16"	23.50	21.25	1" / 2"	16	1.13
18"	25.00	22.75	1" / 2"	16	1.25
20"	27.50	25.00	1" / 2"	20	1.25
22"	29.50	27.26	1" / 2"	20	1.38
24"	32.00	29.50	1" / 2"	20	1.38

Technical Notes

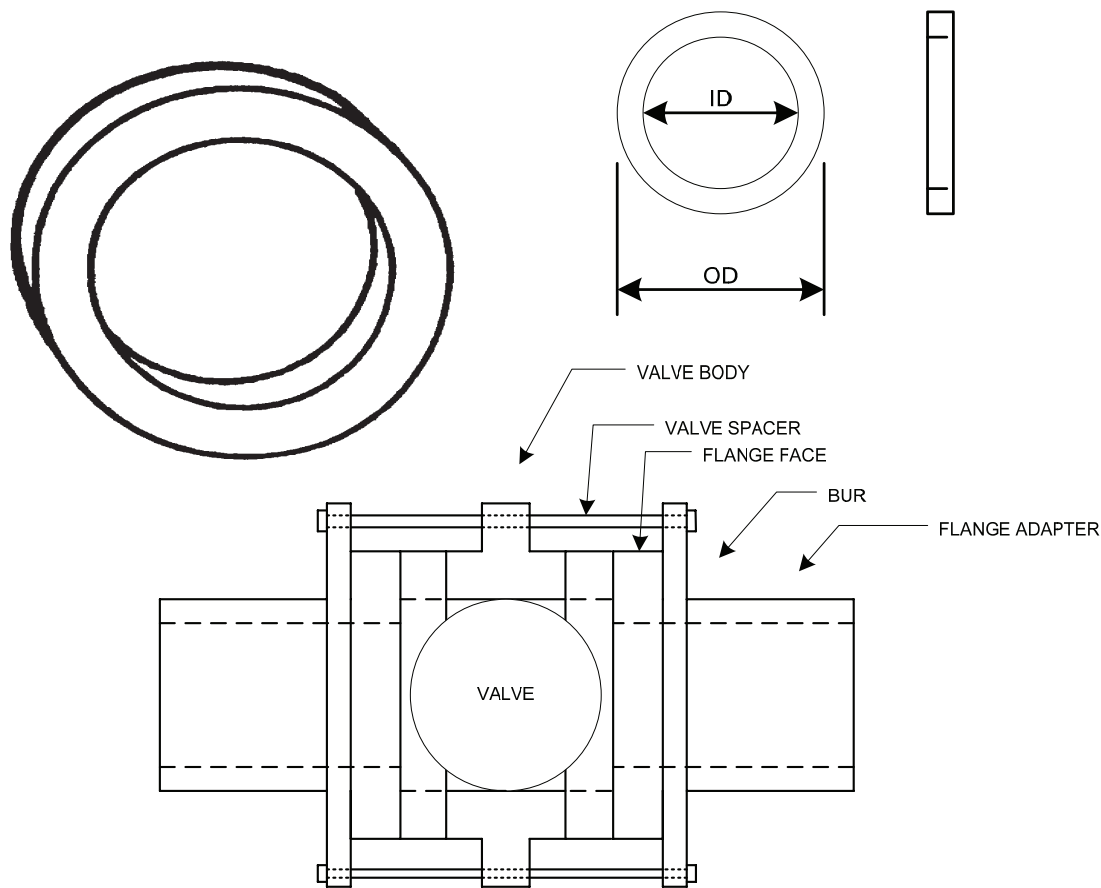
These blind flanges are ordinarily used for closure or nitecapping of flanged pipes.

They are NOT fully pressure rated

Without the use of a metal back-up blind flange, the HDPE flange may leak between bolt holes at moderate pressures

Dimensions are in Inches

Butterfly Valve Spacer Design and Information



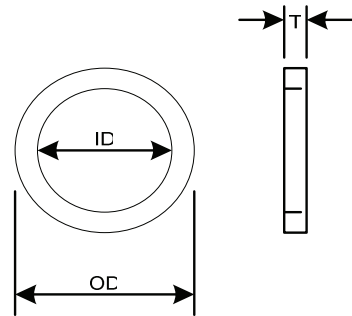
Butterfly valve spacers are used when the BFFV disk is larger than the ID of the pipe and will not open because of clearance. A cut sheet may be needed to assure standard spacers will work properly.

BUTTERFLY VALVE SPACERS

IPS AND DIPS



**HIGH COUNTRY
FUSION**
COMPANY INC



BUTTERFLY VALVE SPACERS

SIZE	OD	ID	THICKNESS	WPR PE3408	WPR PE4710*
2"	3.90	2.40	1"	160	200
3"	5.00	3.50	1"	160	200
4"	6.63	4.50	1 1/2"	160	200
6"	8.63	6.63	2"	160	200
8"	10.75	8.63	2"	160	200
10"	12.70	10.50	2"	160	200
12"	15.00	12.70	2"	160	200
14"	17.50	14.00	2"	160	200
16"	20.00	16.00	2"	160	200
18"	21.12	18.00	2 1/2"	150	190
20"	23.50	20.00	2 1/2"	150	190
22"	25.60	21.91	2 1/2"	150	190
24"	28.00	24.00	2 1/2"	145	180

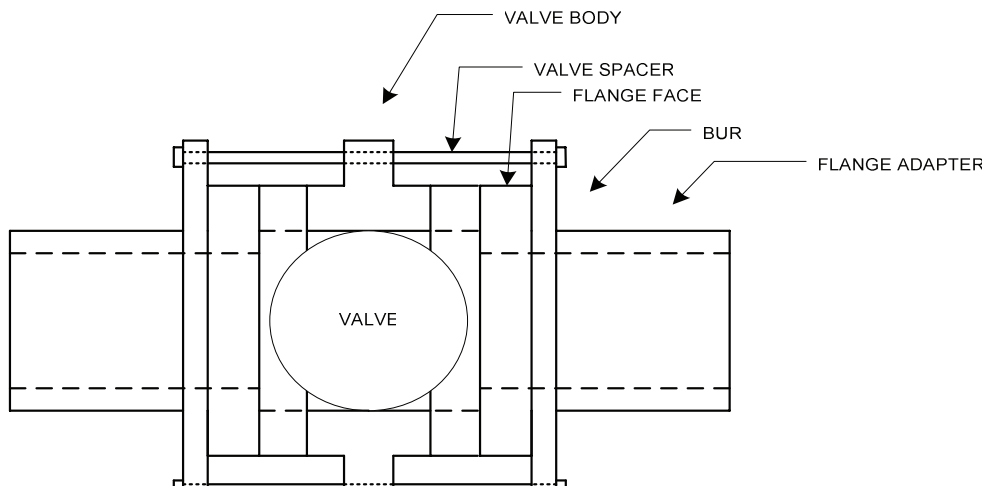
Technical Notes

Design Data Needed: Disc diameter, valve width face to face, and stem location

Dimensions are in inches

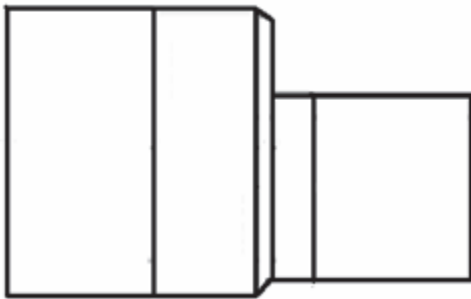
*=Pressure ratings apply when using in conjunction with PE4710 pipe.

-Valve spacers are standard dimensions that HCFC Stocks, Please confirm your actual needs. The following information is needed: Width of Valve face to face, diameter of wafer, and location of center stem.

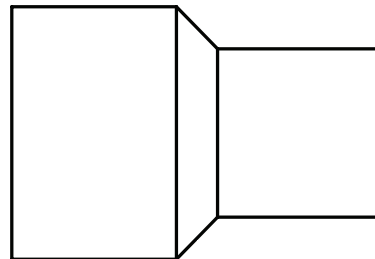


Concentric and Eccentric Reducer Design and Information

Eccentric Reducer



Concentric Reducer



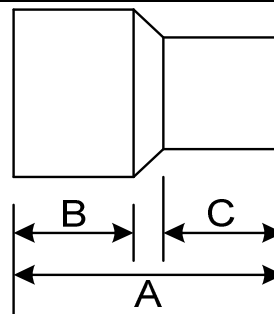
Concentric reducers are single or multi-stage pipe reducers which connect pipes of measurable different diameters. They provide an in-line conical transition between pressurized pipes of differing diameters. A reducer maybe a single standard diameter change (i.e.: 6" x 4") or a multiple diameter change (i.e.: 8"x 2"). The flow is only affected by the inside diameter conical transition configuration.

Eccentric reducers are popular for gravity flow sewers with multiple lateral sewer inlets or outlets. Many gravity flow and drainage pipelines require a uniform line and grade. Eccentric reducers assist in achieving this. They keep the pipe invert at the same level or slope along the pipeline length. These are not a standard item and are not detailed out in our catalog. Please call for a quote and details

IPS CONCENTRIC REDUCERS



HIGH COUNTRY
FUSION
C O M P A N Y I N C



IPS CONCENTRIC REDUCER

IPS SIZE	A	B	C	SDR	WPR PE3608	WPR PE4710*
1" X 1/2"	4.00	1.50	1.25	9	200	252
1" X 3/4"	4.50	1.50	1.85	9	200	252
1 1/4" X 1"	4.25	1.86	1.92	11	160	200
1 1/2" X 3/4"	5.69	2.50	2.50	9	200	252
1 1/2" X 1"	5.75	2.50	2.28	9	200	252
2" X 1"	6.31	2.49	2.88	11	160	200
2" X 1 1/4"	6.44	3.25	2.56	11	160	200
2" X 1 1/2"	6.50	2.95	2.64	11-17	160, 100	200, 126
3" X 2"	7.87	3.94	2.95	7-17	254, 200, 160, 100	336, 252, 200, 126
4" X 2"	9.06	4.33	2.95	7-17	254, 200, 160, 100	336, 252, 200, 126
4" X 3"	9.06	4.33	3.94	7-17	254, 200, 160, 100	336, 252, 200, 126
6" X 3"	11.42	5.12	3.94	7-17	254, 200, 160, 100	336, 252, 200, 126
6" X 4"	11.42	5.12	4.33	7-11	254, 200, 160, 100	336, 252, 200, 126
8" X 6"	12.80	6.10	5.12	7-11	254, 200, 160, 100	336, 252, 200, 126
10" X 6"	14.50	6.50	6.00	9-17	200, 160, 100	252, 200, 126
10" X 8"	16.00	6.00	6.00	7-17	254, 200, 160, 100	336, 252, 200, 126
12" X 8"	16.54	7.09	6.69	11-17	160, 100	200, 126
12" X 8"	14.50	6.50	6.00	9	200	252
12" X 10"	16.54	7.09	6.69	7-17	254, 200, 160, 100	336, 252, 200, 126
14" X 10"	14.50	6.50	6.00	11-17	160, 100	200, 126
14" X 12"	14.50	6.50	6.00	7-17	254, 200, 160, 100	336, 252, 200, 126
16" X 12"	14.50	6.50	6.00	11-17	160, 100	200, 126
16" X 14"	14.50	6.50	6.00	7-17	254, 200, 160, 100	336, 252, 200, 126
18" X 16"	14.50	6.50	6.00	7-17	254, 200, 160, 100	336, 252, 200, 126
20" X 18"	14.50	6.50	6.00	9-17	200, 160, 100	252, 200, 126
22" X 20"	14.50	6.50	6.00	9-17	200, 160, 100	200, 160, 100
24" X 20"	14.50	6.50	6.00	11-17	160, 100	200, 126

Technical Notes

*=Pressure ratings apply when used in conjunction with PE4710 pipe.

Dimensions are in Inches

Other sizes, SDR's not listed are available

Contact your HCFC representative for a quote

Sizes 24" and smaller meet AWWA C906 fitting requirements

PHONE: 800-780-6330

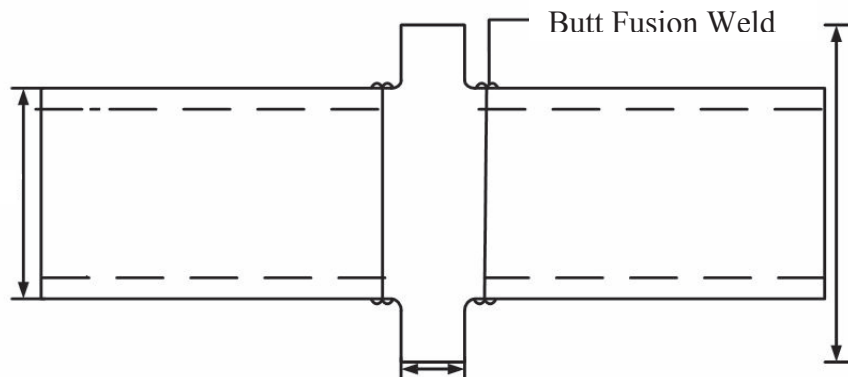
FAX: 208-764-2094

PHONE :

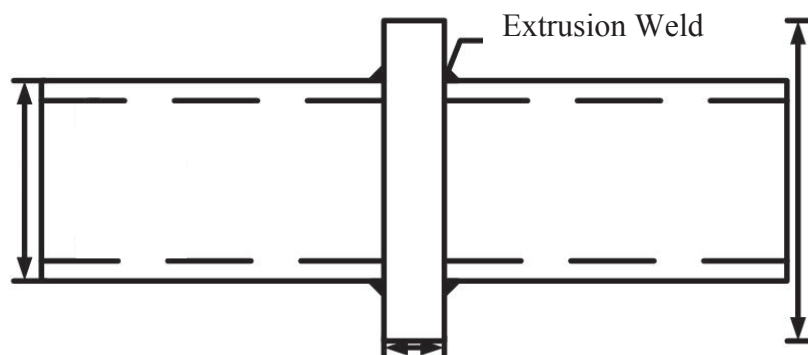
www.hcfusion.com

Water Stops & Wall Anchor

Design and Information



Wall Anchors manufactured using only butt fusion techniques are designed to prevent pipe pullout from where they are anchored. They may also act as a water stop.



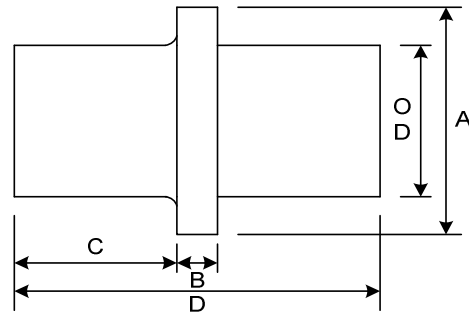
Not for use as a thrust restraint.

Water Stops are manufactured using sheet stock attached to the outside of a pipe by extrusion welding. They are designed solely as a water stop and not to anchor pipe.

IPS WALL ANCHORS



**HIGH COUNTRY
FUSION**
COMPANY INC



IPS WALL ANCHORS

IPS SIZE	TRUE OD	A	B	C	D	SDR	WPR PE3408	WPR PE4710*
2"	2.375	3.94	0.39	5.11	11.00	11,17	128,80	160,100
3"	3.500	5.00	0.63	5.37	11.50	11,17	128,80	160,100
4"	4.500	6.50	0.54	5.25	11.00	11,17	128,80	160,100
6"	6.625	8.50	0.78	7.22	15.00	11,17,21	128,80,65	160,100,80
8"	8.625	10.63	1.00	10.00	21.00	11,17,21	128,80,65	160,100,80
10"	10.750	12.75	1.25	10.75	22.00	11,17,21	128,80,65	160,100,80
12"	12.750	15.00	1.50	10.50	22.00	11,17,21,26	128,80,65,50	160,100,80,65
14"	14.000	17.50	1.50	10.50	22.00	11,17,21,26	128,80,65,50	160,100,80,65
16"	16.000	20.00	1.75	10.25	22.00	11,17,21,26	128,80,65,50	160,100,80,65
18"	18.000	21.38	1.88	10.12	22.00	11,17,21,26,32.5	128,80,65,50	160,100,80,65
20"	20.000	23.50	2.27	9.73	21.00	11,17,21,26,32.5	128,80,65,50	160,100,80,65
22"	22.000	25.60	2.50	9.50	21.00	11,17,21,26,32.5	128,80,65,50	160,100,80,65
24"	24.000	28.00	2.82	9.18	21.00	11,17,21,26,32.5	128,80,65,50	160,100,80,65
26"	26.000	30.00	2.95	11.05	25.00	11,17,21,26,32.5	128,80,65,50	160,100,80,65
28"	28.000	32.30	3.18	10.72	25.00	11,17,21,26,32.5	128,80,65,50	160,100,80,65
30"	30.000	34.30	3.41	10.59	25.00	11,17,21,26,32.5	128,80,65,50	160,100,80,65
32"	32.000	36.50	2.35	11.65	25.00	17,21,26,32.5	128,80,65,50	160,100,80,65
34"	34.000	38.50	2.50	11.50	25.00	17,21,26,32.5	128,80,65,50	160,100,80,65
36"	36.000	40.80	2.65	11.35	25.00	17,21,26,32.5	128,80,65,50	160,100,80,65
42"	42.000	47.50	2.60	18.40	37.00	17,21,26,32.5	128,80,65,50	160,100,80,65
48"	48.000	53.00	2.60	18.40	37.00	21,26,32.5	80,65,50	100,80,65
54"	54.000	60.00	2.60	18.40	37.00	26,32.5	65,50	80,65
63"	63.000	70.00	2.60	18.40	37.00	26,32.5	65,50	80,65

Technical Notes

*=Pressure ratings apply when used in conjunction with PE4710 pipe.

Dimensions are in Inches

DIPS Wall Anchors are available.

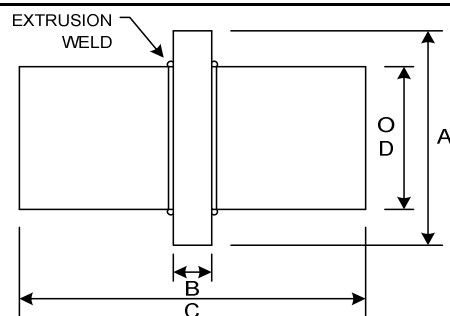
Contact your HCFC representative for a quote

Sizes 24" and smaller meet AWWA C906 fitting requirements

IPS WATER STOPS



**HIGH COUNTRY
FUSION**
COMPANY INC



IPS WATER STOPS

IPS SIZE	TRUE OD	A	B	C	SDR	WPR PE3608	WPR PE4710*
2"	2.375	CUSTOMER DESIGNATED	CUSTOMER DESIGNATED	12.00	AVAILABLE IN ANY SDR NEEDED	WPR BASED ON SDR AND MATERIAL TYPE (see pipe charts in the HDPE Pipe Section under pressure rating)	
3"	3.500			12.00			
4"	4.500			18.00			
6"	6.625			18.00			
8"	8.625			18.00			
10"	10.750			18.00			
12"	12.750			18.00			
14"	14.000			24.00			
16"	16.000			24.00			
18"	18.000			24.00			
20"	20.000			36.00			
22"	22.000			36.00			
24"	24.000			36.00			
26"	26.000			36.00			
28"	28.000			36.00			
30"	30.000			36.00			
32"	32.000			36.00			
34"	34.000			36.00			
36"	36.000			36.00			
42"	42.000			42.00			
48"	48.000			42.00			
54"	54.000			42.00			
63"	63.000			42.00			

Technical Notes

*=Pressure ratings apply when used in conjunction with PE4710 pipe.

Dimensions are in Inches

DIPS Water Stops are available.

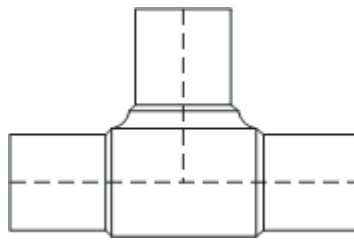
Contact your HCFC representative for a quote

Sizes 24" and smaller meet AWWA C906 fitting requirements

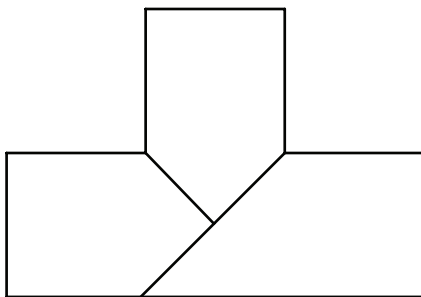
Fabricated & Molded Tees

Design and Information

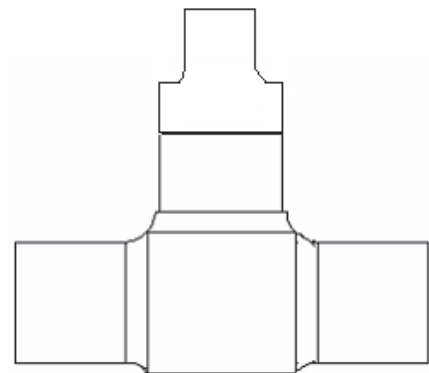
Molded Tee



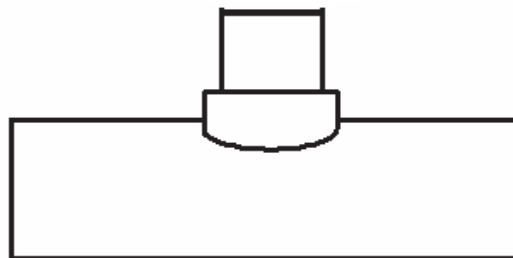
Fabricated Tees



Standard Tee



Concentric Reducing Tee

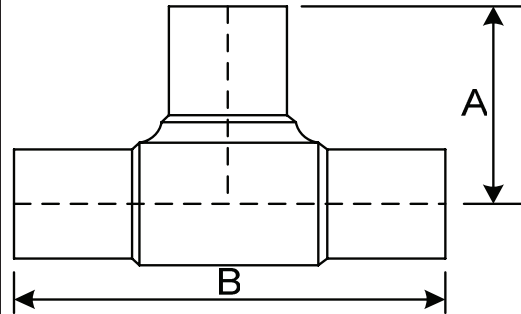


Reducing branch saddle tee

IPS MOLDED TEES



**HIGH COUNTRY
FUSION**
COMPANY INC



IPS MOLDED TEES

IPS SIZE	TRUE OD	A	B	SDR	WPR PE3608	WPR PE4710*
3/4"	1.050	2.50	5.00	11	160	200
1"	1.315	2.73	5.67	11	160	200
1 1/4"	1.660	3.31	6.61	11	160	200
1 1/2"	1.900	4.00	7.99	11	160	200
2"	2.375	4.33	8.66	7,9,11,17	254,200,160,100	336, 250, 200, 160
3"	3.500	5.91	11.81	7,9,11,17	254,200,160,100	336, 250, 200, 160
4"	4.500	6.89	13.78	7,9,11,17	254,200,160,100	336, 250, 200, 160
6"	6.625	9.06	18.11	7,9,11,17	254,200,160,100	336, 250, 200, 160
8"	8.625	11.81	23.62	7,9,11,17	254,200,160,100	336, 250, 200, 160
10"	10.750	13.78	27.56	11,17	160,100	200, 160
12"	12.750	15.79	31.57	11,17	160,100	200, 160

Technical Notes

*=Pressure ratings apply when used in conjunction with PE4710 pipe.

Note: Dimension will vary slightly depending on the manufacturing source.

Dimensions are in Inches

Other sizes and SDR's not listed are available.

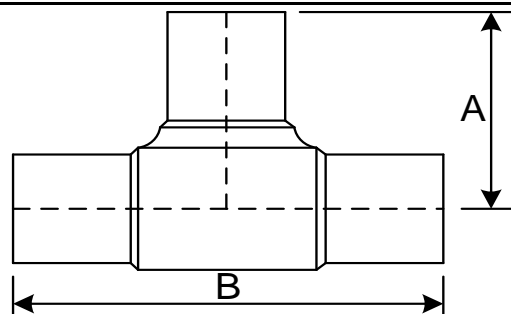
Contact your HCFC representative for a quote

All fittings meet AWWA C906 fitting requirements

DIPS MOLDED TEES



HIGH COUNTRY
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DIPS MOLDED TEES

DIPS SIZE	TRUE OD	A	B	SDR	WPR PE3608	WPR PE4710*
4"	4.800	5.42	15.63	11	160	202
6"	6.900	6.22	19.34	11	160	202
8"	9.050	7.06	23.15	11	160	202
10"	11.100	13.25	26.50	11	160	202
12"	13.200	15.88	31.75	11	160	202

Technical Notes

*Pressure ratings apply when used in conjunction with PE4710 pipe.

Note: Dimension will vary slightly depending on the manufacturing source.

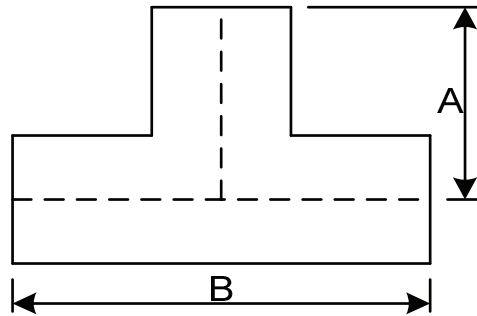
Dimensions are in Inches

Other sizes and SDR's not listed are available.

Contact your HCFC representative for a quote

All fittings meet AWWA C906 fitting requirements

IPS FABRICATED TEES



IPS FABRICATED TEES

IPS SIZE	TRUE OD	A	B	SDR	WPR PE3608	WPR PE4710*
6"	6.625	12.00	24.00	7,9,11	200,160,128	254,200,160
8"	8.625	14.00	28.00	7,9,11,17	200,160,128,80	254,200,160,100
10"	10.750	14.00	28.00	7,9,11,17	200,160,128,80	254,200,160,100
12"	12.750	15.00	30.00	7,9,11,17	200,160,128,80	254,200,160,100
14"	14.000	15.00	30.00	7,9,11,17	200,160,128,80	254,200,160,100
16"	16.000	18.00	36.00	7,9,11,17	200,160,128,80	254,200,160,100
18"	18.000	20.00	40.00	7,9,11,17	200,160,128,80	254,200,160,100
20"	20.000	22.00	44.00	7,9,11,17	200,160,128,80	254,200,160,100
22"	22.000	24.00	48.00	9,11,17	160,128,80	200,160,100
24"	24.000	26.00	52.00	9,11,17	160,128,80	200,160,100
28"	28.000	28.00	56.00	11,17	128,80	160,100
30"	30.000	29.00	58.00	11,17	128,80	160,100
32"	32.000	30.00	60.00	17,21	80,65	100,80
36"	36.000	50.00	74.00	17,21	80,65	100,80
42"	42.000	54.00	82.00	17,21	80,65	100,80
48"	48.000	57.00	88.00	17,21	80,65	100,80
54"	54.000	60.00	94.00	17,21	80,65	100,80

Technical Notes

For Derating factors please refer to derating chart in HDPE Pipe Section.

* Fittings made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

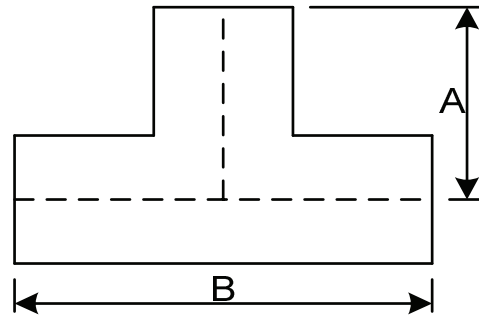
Dimensions are in Inches

Other sizes and SDR's not listed are available.

Contact your HCFC representative for a quote

Sizes 24" and smaller meet AWWA C906 fittings requirements.

DIPS FABRICATED TEES



DIPS FABRICATED TEES

DIPS SIZE	TRUE OD	A	B	SDR	WPR PE3608	WPR PE4710 *
4"	4.800	8.50	17.00	9,11,17	160,128,80	200,160,100
6"	6.900	9.50	19.00	9,11,17	160,128,80	200,160,100
8"	9.050	12.50	25.00	9,11,17	160,128,80	200,160,100
10"	11.100	13.50	27.00	9,11,17	160,128,80	200,160,100
12"	13.200	14.50	29.00	9,11,17	160,128,80	200,160,100
14"	15.300	16.50	33.00	9,11,17	160,128,80	200,160,100
16"	17.400	18.00	36.00	9,11,17	160,128,80	200,160,100
18"	19.500	20.00	40.00	9,11,17	160,128,80	200,160,100
20"	21.600	21.00	41.00	9,11,17	160,128,80	200,160,100
24"	25.800	25.00	50.00	9,11,17	160,128,80	200,160,100
30"	32.000	30.00	60.00	11,17	128, 80	160, 100

Technical Notes

For Derating factors please refer to derating chart in HDPE Pipe Section.

Dimensions are in Inches

Other sizes and SDR's not listed are available.

Contact your HCFC representative for a quote

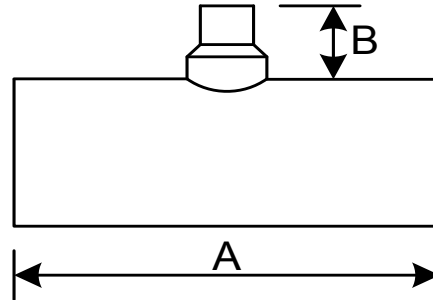
* - Fittings made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

Sizes 24" and smaller meet AWWA C906 fittings requirements.

IPS FABRICATED REDUCING TEES



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IPS FABRICATED REDUCING TEES

IPS SIZE	A	B	SDR		IPS SIZE	A	B	SDR
4" X 2"	18.00	3.50	9-17		12" X 6"	28.00	6.00	9-17
6" X 2"	18.00	3.50	9-17		14" X 6"	28.00	6.00	9-17
8" X 2"	18.00	3.50	9-17		16" X 6"	28.00	6.00	9-17
10" X 2"	18.00	3.50	9-17		18" X 6"	28.00	6.00	9-17
12" X 2"	18.00	3.50	9-17		20" X 6"	28.00	6.00	9-17
14" X 2"	18.00	3.50	9-17		24" X 6"	28.00	6.00	9-17
16" X 2"	18.00	3.50	9-17		10" X 8"	30.00	8.00	9-17
18" X 2"	18.00	3.50	9-17		12" X 8"	30.00	8.00	9-17
20" X 2"	18.00	3.50	9-17		14" X 8"	30.00	8.00	9-17
24" X 2"	18.00	3.50	9-17		16" X 8"	30.00	8.00	9-17
4" X 3"	20.00	3.50	9-17		18" X 8"	30.00	8.00	9-17
6" X 3"	20.00	3.50	9-17		20" X 8"	30.00	8.00	9-17
8" X 3"	20.00	3.50	9-17		24" X 8"	30.00	8.00	9-17
10" X 3"	20.00	3.50	9-17		12" X 10"	36.00	12.00	9-17
12" X 3"	20.00	3.50	9-17		14" X 10"	36.00	12.00	9-17
14" X 3"	20.00	3.50	9-17		16" X 10"	36.00	12.00	9-17
16" X 3"	20.00	3.50	9-17		18" X 10"	36.00	12.00	9-17
18" X 3"	20.00	3.50	9-17		20" X 10"	36.00	12.00	9-17
20" X 3"	20.00	3.50	9-17		24" X 10"	36.00	12.00	9-17
24" X 3"	20.00	3.50	9-17		14" X 12"	38.00	12.00	9-17
6" X 4"	24.00	3.50	9-17		16" X 12"	38.00	12.00	9-17
8" X 4"	24.00	3.50	9-17		18" X 12"	38.00	12.00	9-17
10" X 4"	24.00	3.50	9-17		20" X 12"	38.00	12.00	9-17
12" X 4"	24.00	3.50	9-17		24" X 12"	38.00	12.00	9-17
14" X 4"	24.00	3.50	9-17		18" X 14"	40.00	12.00	9-17
16" X 4"	24.00	3.50	9-17		20" X 14"	40.00	12.00	9-17
18" X 4"	24.00	3.50	9-17		24" X 14"	40.00	12.00	9-17
20" X 4"	24.00	3.50	9-17		20" X 16"	42.00	12.00	9-17
24" X 4"	24.00	3.50	9-17		24" X 16"	42.00	12.00	9-17
8" X 6"	28.00	6.00	9-17		24" X 18"	44.00	12.00	9-17
10" X 6"	28.00	6.00	9-17					

Technical Notes

For Derating factors please refer to derating chart in HDPE Pipe Section. Outlet size and SDR determines if derating occurs

Fittings available in PE 3408 and PE4710.

Fully pressure rated reducing tees are available with outlet sizes 3/4" to 24" IPS.

Other sizes and SDR's not listed are available.

Contact your HCFC representative for a quote

Sizes 24" and smaller meet AWWA C906 fitting requirements.

Dimensions are in Inches

PHONE: 800-780-6330

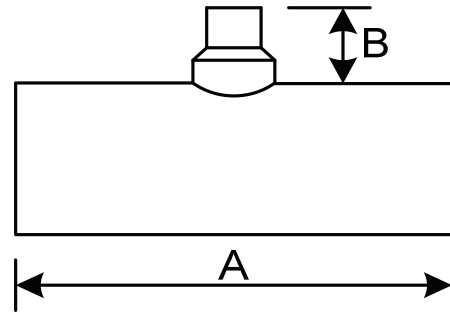
FAX: 208-764-2094

www.hcfusion.com

DIPS FABRICATED REDUCING TEES



**HIGH COUNTRY
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COMPANY INC



DIPS FABRICATED REDUCING TEES

DIPS SIZE	A	B	SDR	WPR PE3608	WPR PE4710 *
6" X 4"	24.00	6.00	11	128	160
8" X 4"	24.00	6.00	11	160	200
10" X 4"	24.00	6.00	11	160	200
12" X 4"	24.00	6.00	11	160	200
8" X 6"	28.00	10.00	11	128	160
10" X 6"	28.00	10.00	11	160	200
12" X 6"	28.00	10.00	11	160	200
14" X 6"	28.00	10.00	11	160	200
16" X 6"	28.00	10.00	11	160	200
10" X 8"	30.00	12.00	11	128	160
12" X 8"	30.00	12.00	11	160	200
12" X 10"	36.00	12.00	11	128	160
14" X 10"	36.00	12.00	11	160	200
16" X 10"	36.00	12.00	11	160	200
14" X 12"	38.00	12.00	11	128	160
16" X 12"	38.00	12.00	11	160	200

Technical Notes

For Derating factors please refer to derating chart in HDPE Pipe Section. Outlet size and SDR determines if derating occurs

Fully pressure rated reducing tees are available with outlet sizes 4" to 12" dips.

Other sizes and SDR's not listed are available.

Contact your HCFC representative for a quote

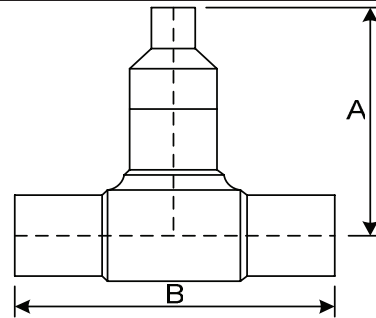
* - Fittings made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

Dimensions are in Inches

IPS CONCENTRIC REDUCING TEES



**HIGH COUNTRY
FUSION**
COMPANY INC



IPS CONCENTRIC REDUCING TEES

IPS SIZE	A	B	SDR	WPR P3608	WPR P4710 *
1" X 1/2"	6.5	6.38	11	160	200
1 1/2" X 1"	9.0	8.50	11	160	200
2" X 3/4"	13.0	9.28	11	160	200
2" X 1"	10.0	9.28	11	160	200
2" X 1 1/4"	10.0	9.28	11	160	200
2" X 1 1/2"	10.0	9.28	11	160	200
3" X 1"	15.0	10.26	11	160	200
3" X 1 1/4"	15.0	10.26	11	160	200
3" X 1 1/2"	15.0	10.26	11	160	200
3" X 2"	10.0	10.26	11	160	200
4" X 1"	15.0	11.20	11	160	200
4" X 1 1/2"	15.0	11.20	11	160	200
4" X 2"	11.0	11.20	11	160	200
4" X 3"	11.0	11.20	11	160	200
6" X 3"	18.0	18.00	11	160	200
6" X 4"	16.0	18.00	11	160	200
8" X 3"	30.0	24.00	11	160	200
8" X 4"	29.0	24.00	11	160	200
8" X 6"	21.0	24.00	11	160	200
10" X 6"	27.0	26.50	11	160	200
10" X 8"	27.0	26.50	11	160	200
12" X 8"	27.0	31.75	11	160	200
12" X 10"	27.0	31.75	11	160	200

Technical Notes

Other sizes and SDR's not listed are available.

Note: Dimension will vary slightly depending on the manufacturing source.

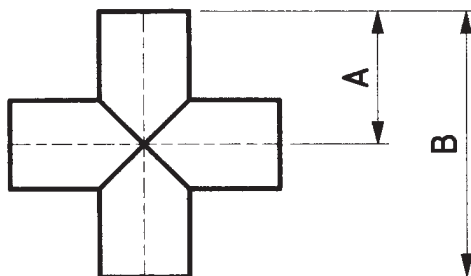
Contact your HCFC representative for a quote

The overall "A" dimension can be cut down shorter for your specification if needed

* - Fittings made with PE4710 Material carry these ratings when used in conjunction with PE 4710 pipe.

Dimensions are in Inches

Fabricated Cross Design and Information

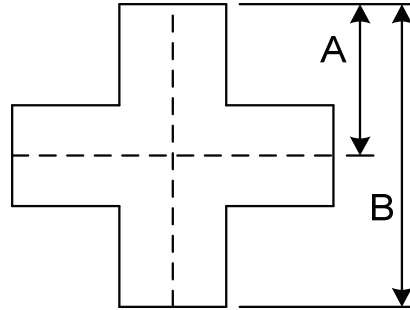


Fabricated Crosses and Reducing Crosses are available in the same sizes and ranges as standard tees and reducing tees. Call for pricing on your specific reducing cross needs.

IPS Crosses



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IPS CROSSES

IPS SIZE	TRUE OD	A	B	SDR	WPR PE3608	WPR PE4710*
4"	4.500	10.00	20.00	7,9,11	160, 128, 80	200, 160, 100
6"	6.625	12.00	24.00	7,9,11	160, 128, 80	200, 160, 100
8"	8.625	14.00	28.00	7,9,11,17	200,160,128,80	200,160,100,80
10"	10.750	14.00	28.00	7,9,11,17	200,160,128,80	200,160,100,80
12"	12.750	15.00	30.00	7,9,11,17	200,160,128,80	200,160,100,80
14"	14.000	15.00	30.00	7,9,11,17	200,160,128,80	200,160,100,80
16"	16.000	16.00	32.00	7,9,11,17	200,160,128,80	200,160,100,80
18"	18.000	18.00	36.00	7,9,11,17	200,160,128,80	200,160,100,80
20"	20.000	21.00	42.00	7,9,11,17	200,160,128,80	200,160,100,80
22"	22.000	24.00	48.00	9,11,17	160,128,80	200,160,100
24"	24.000	24.00	48.00	9,11,17	160,128,80	200,160,100
28"	28.000	50.00	100.00	11,17	128,80	160,100
30"	30.000	50.00	100.00	11,17	128,80	160,100
32"	32.000	50.00	100.00	17,21	80,65	100,80
36"	36.000	54.00	108.00	17,21	80,65	100,80
42"	42.000	54.00	108.00	21	65	80
48"	48.000	54.00	108.00	21	65	80
54"	54.000	54.00	108.00	21	65	80

Technical Notes

*=Pressure ratings apply when used in conjunction with PE4710 pipe.

Dimensions are in Inches

Other sizes, SDR's not listed are available

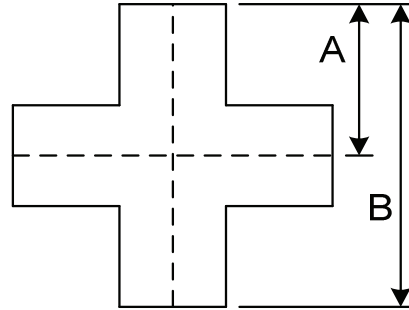
Contact your HCFC representative for a quote

For Derating factors please refer to derating chart.

DIPS Crosses



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DIPS CROSSES

DIPS SIZE	TRUE OD	A	B	SDR	WPR PE3608	WPR PE4710*
4"	4.800	7.50	15.00	9,11	160,128	200,160
6"	6.900	10.00	20.00	9,11	160,128	160,128
8"	9.050	13.00	26.00	9,11,17	160,128,80	200,160,100
10"	11.100	14.00	28.00	9,11,17	160,128,80	200,160,100
12"	13.200	15.00	30.00	9,11,17	160,128,80	200,160,100
14"	15.300	17.00	34.00	9,11,17	160,128,80	200,160,100
16"	17.400	18.00	36.00	9,11,17	160,128,80	200,160,100
18"	19.500	20.00	40.00	9,11,17	160,128,80	200,160,100
20"	21.600	21.00	42.00	9,11,17	160,128,80	200,160,100
24"	25.800	24.00	48.00	9,11,17	160,128,80	200,160,100
30"	32.000	30.00	60.00	11,17	128,80	160,100

Technical Notes

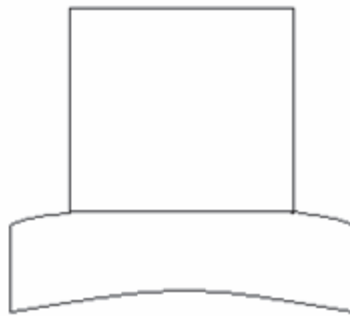
*=Pressure ratings apply when used in conjunction with PE4710 pipe.

Dimensions are in Inches

Other sizes, SDR's not listed are available

Contact your HCFC representative for a quote

For Derating factors please refer to derating chart.

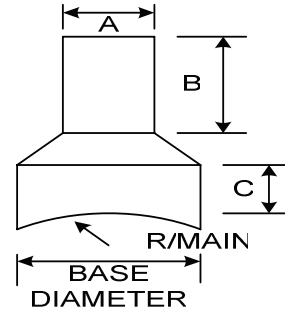


For onsite fusions, please check that you have Branch Saddle heaters available for sidewall fusion onto the main. A fusion unit capable of sidewall fusion in the branch saddle OD is required as well.

See our Fusion Machine section for Sale and Rental information.

The Branch can be taper bored to match like SDR's

IPS BRANCH SADDLES



IPS BRANCH SADDLES

OUTLET IPS SIZE	MAIN RANGE SIZE	SDR	BASE DIAMETER	MINIMUM DIMENSION A	MINIMUM DIMENSION B	MINIMUM DIMENSION C	MASSIVE BRANCH BASE DIAMETER
2" IPS BUTT	3 - 12 14 - 34 36 - 54	11,9	2.6"	2.375	3"	0.2"	3.25"
3" IPS BUTT	4 - 12 14 - 34 36 - 54	11,9	3.9"	3.5	3"	0.5"	4.50"
4" IPS BUTT	6 - 12 14 - 34 36 - 54	11,9	4.8"	4.5	3"	0.5"	5.95"
6" IPS BUTT	8 - 12 14 - 34 36 - 54	11,9	7.3"	6.625	5"	0.8"	8.625"
8" IPS BUTT	10 - 12 14 - 34 36 - 54	11,9	9.4"	8.625	8"	0.8"	10.75"
10" IPS BUTT	12 14 - 34 36 - 54	11,9	11.5"	10.75	8"	1"	12.75"
12" IPS BUTT	14 - 34 36 - 54	11,9	13.8"	12.75	8"	1"	14"

Technical Notes

Dimensions are in Inches

Order information needed: IPS & SDR x Exact Main Diameter

Contact your HCFC representative for a quote

IPS Branch Saddles meet AWWA C906 fitting requirements

Purchaser must determine that concave/convex heater plate adapters are available to complete the saddle fusion.

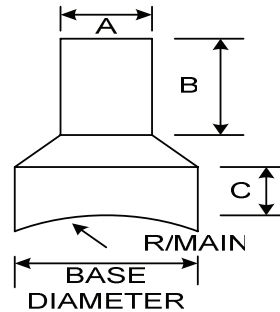
"Blank" branch saddles stocked in DR 9 and 11. Blanks are machined per order to radius of pipe Main size.

C Dimension is determined by base diameter and pipe main radius.

DIPS BRANCH SADDLES



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DIPS BRANCH SADDLES

OUTLET DIPS SIZE	MAIN RANGE SIZE	SDR	OUTLET DIMENSION A	BASE DIAMETER	DIMENSION MINIMUM B	BASE DIMENSION C
4" BUTT	6 - 12 14 - 34 36 - 54	11	4.80	5.95	6.60	1.00
6" BUTT	8 - 12 14 - 34 36 - 54	11	6.90	8.63	8.60	1.50
8" BUTT	10 - 12 14 - 34 36 - 54	11	9.05	10.75	11.50	1.50
10" BUTT	12 14 - 34 36 - 54	11	11.10	12.75	13.80	2.00
12" BUTT	14 - 34 36 - 54	11	13.20	16.00	16.00	2.00

Technical Notes

Dimensions are in Inches

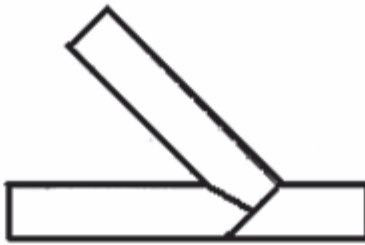
Order information needed: DIPS & SDR x Exact Main Diameter

Contact your HCFC representative for a quote

Purchaser must determine that concave/convex heater plate adapters are available to complete the saddle fusion.

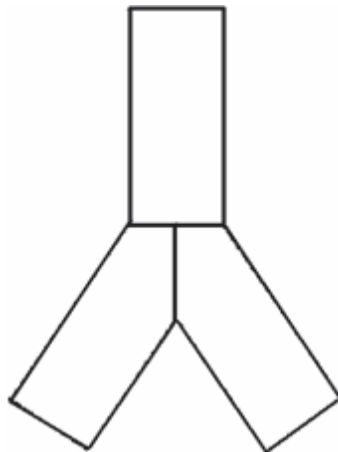
Branch Saddles meet AWWA C906 fitting requirements

Fabricated 45 Degree & True Wye's Design and Information



45 Degree Wye

The intersection of the branch into the main produces an elliptical hole (oval). The hoop of the pipe main is more severely breached than a line tee with its circular hole. The de-rating of the wye is based on geometry and the stress intensification at the intersection joint. As the angle goes from a 90 degree tee to a 60 degree to a 45 degree to 30 degree wye, the de-rating factor becomes more severe as the loss in "hoop" increases accordingly. The pressure capacity of an un-reinforced 45 degree lateral wye using a 2:1 safety factor is about 50% of the pressure rating of the straight pipe used for its fabrication.



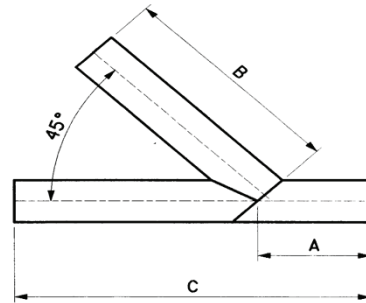
45 Degree True Wye

Call your HCFC representative for a True Wye quote

FABRICATED IPS 45 DEGREE WYE



HIGH COUNTRY
FUSION
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FABRICATED IPS 45 DEGREE WYES

IPS SIZE	TRUE OD	A	B	C	SDR	WPR PE3608	WPR PE4710*
2"	2.370	6.00	14.00	20.00	7,9,11	200,160,128	254,200,160
3"	3.500	7.00	14.00	21.00	7,9,11	200,160,128	254,200,160
4"	4.500	7.00	22.00	29.00	7,9,11	200,160,128	254,200,160
6"	6.625	7.00	28.00	35.00	7,9,11,17	200,160,128,80	254,200,160,100
8"	8.625	8.00	30.00	38.00	7,9,11,17	200,160,128,80	254,200,160,100
10"	10.750	8.00	31.00	39.00	7,9,11,17	200,160,128,80	254,200,160,100
12"	12.750	11.00	36.00	47.00	7,9,11,17	200,160,128,80	254,200,160,100
14"	14.000	11.00	42.00	53.00	7,9,11,17	200,160,128,80	254,200,160,100
16"	16.000	13.00	45.00	58.00	7,9,11,17	200,160,128,80	254,200,160,100
18"	18.000	14.00	57.00	71.00	7,9,11,17	200,160,128,80	254,200,160,100
20"	20.000	14.00	65.00	79.00	7,9,11,17	200,160,128,80	254,200,160,100
22"	22.000	14.00	67.00	81.00	7,9,11,17	200,160,128,80	254,200,160,100
24"	24.000	15.00	69.00	84.00	7,9,11,17	200,160,128,80	254,200,160,100

Technical Notes

*=Pressure ratings apply when used in conjunction with PE4710 pipe.

Dimensions are in Inches

For Derating factors please refer to derating chart in HDPE Pipe section.

Other sizes, SDR's not listed are available

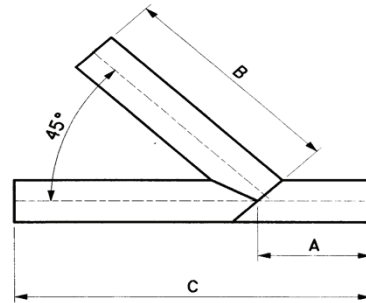
Contact your HCFC representative for a quote

Sizes 24" and smaller meet AWWA C906 fitting requirements

FABRICATED DIPS 45 DEGREE WYE



HIGH COUNTRY
FUSION
COMPANY INC



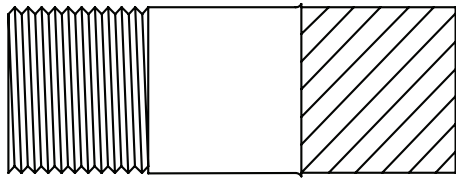
FABRICATED DIPS 45 DEGREE WYES

DIPS SIZE	TRUE OD	A	B	C	SDR	WPR PE3608	WPR PE4710*
4"	4.800	7.00	22.00	29.00	9,11,17	160,128,80	200,160,100
6"	6.900	7.00	28.00	35.00	9,11,17	160,128,80	200,160,100
8"	9.050	8.00	30.00	38.00	9,11,17	160,128,80	200,160,100
10"	11.100	8.00	31.00	39.00	9,11,17	160,128,80	200,160,100
12"	13.200	11.00	33.00	44.00	9,11,17	160,128,80	200,160,100
14"	15.300	11.00	42.00	53.00	9,11,17	160,128,80	200,160,100
16"	17.400	13.00	44.00	57.00	9,11,17	160,128,80	200,160,100
18"	19.500	14.00	57.00	71.00	9,11,17	160,128,80	200,160,100
20"	21.600	14.00	65.00	79.00	9,11,17	160,128,80	200,160,100
24"	25.800	15.00	69.00	84.00	9,11,17	160,128,80	200,160,100

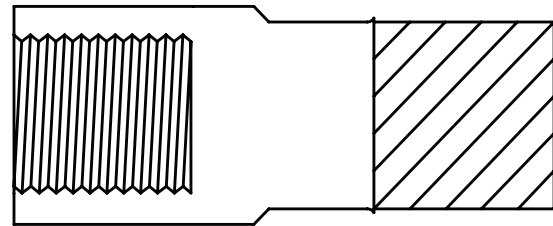
Technical Notes

*=Pressure ratings apply when used in conjunction with PE4710 pipe.
 Dimensions are in Inches
 For Derating factors please refer to derating chart in HDPE Pipe section.
 Other sizes, SDR's not listed are available
 Contact your HCFC representative for a quote
 Sizes 24" and smaller meet AWWA C906 fitting requirements

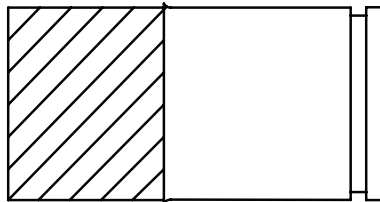
Transition Fittings Design and Information



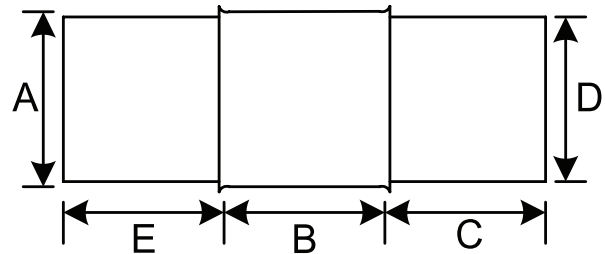
MPT/Poly



FPT/Poly



Groove Adapter



PVC/Poly

Transition fittings are manufactured to meet or exceed the following standards:

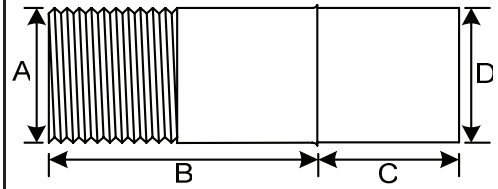
- ANSI / AWWA C901 and C906
- NSF
- ASTM-D-2513-96A
- DOT PART 196.287 and 192.283
- ASTM D1599, D1598, F714

Couplings are available in Carbon Steel, Epoxy, Coater Steel, Stainless Steel 304, Stainless Steel 316 and Aluminum Bronze.

STANDARD MPT AND FPT ADAPTERS

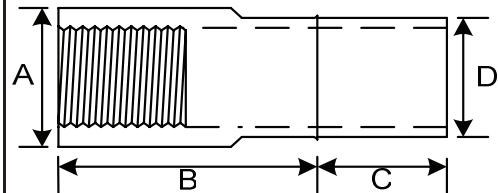


**HIGH COUNTRY
FUSION**
C O M P A N Y I N C



STANDARD MPT ADAPTER

IPS SIZE	COUPLING DIAMETER A	COUPLING LENGTH B	HDPE LENGTH C	HDPE DIAMETER D	WPR P3608	WPR P4710
1/2"	1.000	1.400	2.600	0.840	WPR RATING BASED ON SDR AND MATERIAL TYPE	
3/4"	1.250	1.600	2.400	1.050		
1"	1.315	2.000	3.000	1.315		
1 1/4"	1.600	2.600	3.400	1.660		
1 1/2"	1.900	2.600	3.400	1.900		
2"	2.375	3.500	4.500	2.375		
3"	3.500	4.000	4.000	3.500		
4"	4.500	4.000	4.000	4.500		
5"	5.563	5.000	7.000	5.563		
6"	6.625	4.500	7.500	6.625		
8"	8.625	7.000	6.000	8.625		
10"	10.750	8.000	7.000	10.750		
12"	12.750	9.000	7.000	12.750		



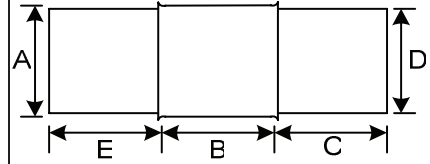
STANDARD FPT ADAPTER

IPS SIZE	COUPLING DIAMETER A	COUPLING LENGTH B	HDPE LENGTH C	HDPE DIAMETER D	WPR P3608	WPR P4710
1/2"	1.000	1.400	2.600	0.840	WPR RATING BASED ON SDR AND MATERIAL TYPE	
3/4"	1.250	1.600	2.400	1.050		
1"	1.485	2.000	2.600	1.315		
1 1/4"	2.000	2.600	3.400	1.660		
1 1/2"	2.250	3.000	3.400	1.900		
2"	2.750	4.000	3.400	2.375		
3"	4.000	5.250	4.000	3.500		
4"	5.000	5.500	4.000	4.500		
6"	7.390	6.000	7.000	6.625		
8"	9.625	10.000	7.000	8.625		

Technical Notes

Available in Carbon, Epoxy and Stainless Steel 34 / 316, & Aluminum Bronze

HDPE TO PVC TRANSITION FITTING



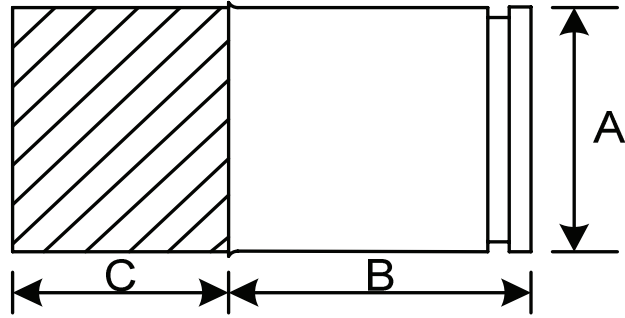
HDPE TO PVC TRANSITION FITTINGS

IPS SIZE	COUPLING DIAMETER A	COUPLING LENGTH B	PVC LENGTH C	HDPE / PVC DIAMETER D	HDPE LENGTH E	WPR P3608	WPR P4710
1/2"	1.000	2.0	3.0	0.840	3.00	WPR RATING BASED ON SDR AND MATERIAL TYPE	
3/4"	1.250	2.0	3.0	1.050	3.00		
1"	1.315	2.5	3.0	1.315	3.00		
1 1/4"	1.660	3.5	4.0	4.660	3.00		
1 1/2"	1.900	4.0	4.0	1.900	4.00		
2"	2.375	4.5	4.0	2.375	4.00		
3"	3.500	5.0	4.5	3.500	4.50		
4"	4.500	6.0	4.5	4.500	4.50		
6"	6.625	8.0	6.0	6.625	8.00		
8"	8.625	9.0	6.0	8.625	9.00		

Technical Notes

HDPE / PVC transition material is either Carbon Steel, Galvanized Steel or Stainless Steel 304

STANDARD CUT GROOVE COUPLING



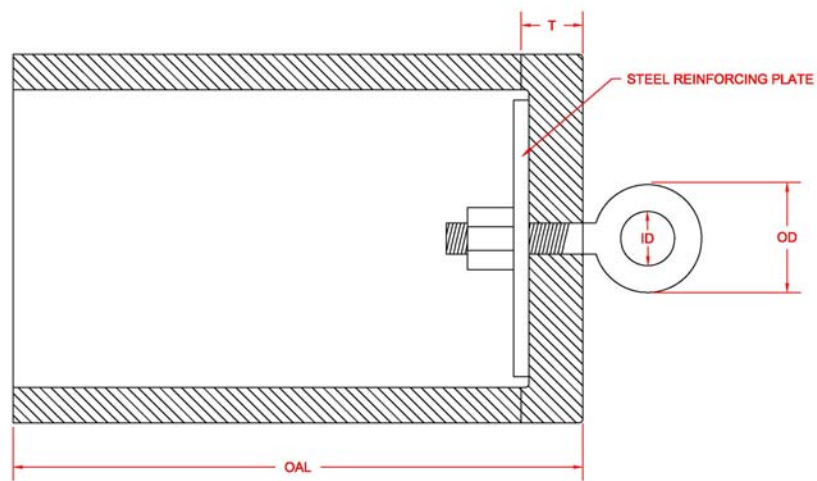
STANDARD CUT GROOVE COUPLING

IPS SIZE	COUPLING DIAMETER A	COUPLING LENGTH B	HDPE LENGTH C	HDPE DIAMETER	WPR P3608	WPR P4710
3/4"	1.200	1.6	2.4	1.200	WPR RATING BASED ON SDR AND MATERIAL TYPE	
1"	1.315	2.0	3.0	1.315		
1 1/4"	1.660	2.6	3.4	1.660		
1 1/2"	1.600	2.6	3.4	1.900		
2"	2.375	3.5	4.5	2.375		
3"	3.500	4.0	4.0	3.500		
4"	4.500	4.0	4.0	4.500		
5"	5.600	5.0	7.0	5.600		
6"	6.625	4.5	7.5	6.625		
8"	8.625	7.0	8.0	8.625		
10"	10.750	8.0	8.0	10.750		
12"	12.750	9.0	7.0	12.750		
14"	14.000	9.0	7.0	14.000		
16"	16.000	12.0	12.0	16.000		
18"	18.000	14.0	10.0	18.000		

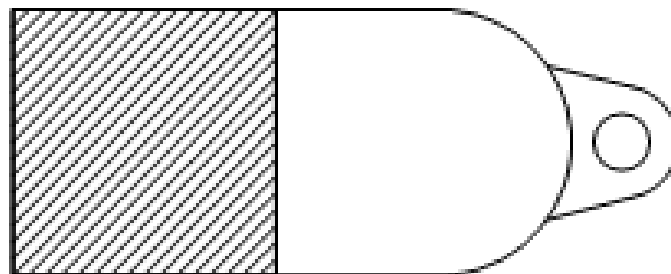
Technical Notes

Available in Carbon, Epoxy and Stainless Steel 304 / 316

Reinforced Pulling Heads IPS & DIPS Design and Information



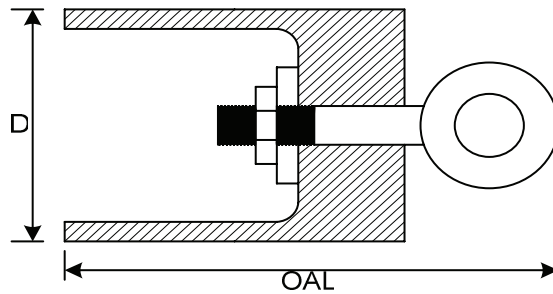
Reinforced Steel Pulling head



Carbon Steel Pulling Head

STEEL REINFORCE PULLING HEAD

IPS Sizes



STEEL REINFORCE PULLING HEAD

IPS SIZE	D	OAL	# OF EYEBOLTS	PULL STRENGTH
2"	2.375	8.000	1	1,800 lbs
3"	3.500	8.000	1	4,000 lbs
4"	4.500	8.000	1	7,000 lbs
6"	6.625	8.000	1	15,000 lbs
8"	8.625	8.000	1	25,000 lbs
10"	10.750	10.000	1	38,000 lbs
12"	12.750	10.000	1	50,000 lbs
14"	14.000	10.000	1	50,000 lbs
16"	16.000	10.000	1	50,000 lbs
18"	18.000	10.000	1	50,000 lbs
20"	20.000	14.000	1	50,000 lbs
22"	22.000	14.000	1	50,000 lbs
24"	24.000	14.000	1	50,000 lbs

Technical Notes

Multiple eyebolts will be used when heads are built for loads over 50,000 lbs.

Material for Steel reinforcing plate to be ASTM #836 Carbon Steel

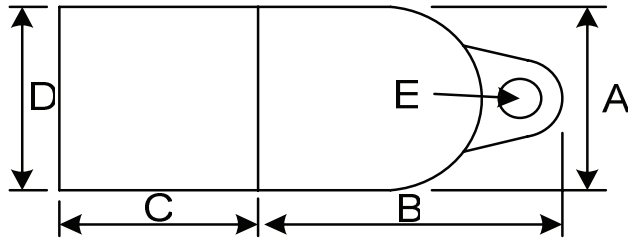
Material for eyebolt(s) to be #1030 Forged Steel

Pressure rating is based on materials used and application. Call for information

Other sizes not listed are available. Contact your HCFC representative for more information and quote

CARBON STEEL PULLING HEAD

IPS & DIPS Sizes



CARBON STEEL PULLING HEAD

SIZE	PULLING HEAD DIAMETER A	PULLING HEAD LENGTH B	HDPE LENGTH C	IPS DIAMETER D	DIPS DIAMETER D2	EYEBOLT HOLE DIAMETER E
2"	2.375	4.000	5.000	2.375	-	1.187*
3"	3.500	6.000	5.000	3.500	-	1.500*
4"	4.500	7.000	5.000	4.500	4.800	1.812*
5"	5.563	8.500	7.000	5.563	-	2.187*
6"	6.625	10.000	8.000	6.625	6.900	2.500*
8"	8.625	11.000	8.000	8.625	9.050	3.250*
10"	10.750	13.000	8.000	10.750	11.100	4.000*
12"	12.750	15.000	8.000	12.750	13.200	4.000*
14"	14.000	20.500	16.500	14.000	15.300	2.000
16"	16.000	21.000	16.500	16.000	17.400	2.000
18"	18.000	27.000	18.500	18.000	19.500	3.000
20"	20.000	30.000	20.500	20.000	21.600	3.000
24"	24.000	34.500	26.000	24.000	25.800	3.250
30"	30.000	38.500	32.000	30.000	32.000	4.000

Technical Notes

Dimensions in inches

* Forged Eyebolt

Other sizes not listed are available. Contact your HCFC representative for more information and quote

Electrofusion Design and Information



BROCHURES AND
OTHER INFORMATION



Connecting the
Water System
of the
21st Century



GEORG FISCHER
PIPING SYSTEMS

The Leading Provider of Ready-Made Solutions for your Polyethylene System

Successfully Addressing Your Needs and Concerns Related to

Transitions

To and from Existing Non-Polyethylene Systems

An important key to maintaining total system integrity is making successful transitions to HDPE from Ductile Iron or PVC. We have successfully met that challenge with two of our products, the MJ Adapter for Ductile Iron systems and the Electrofusion Flexible Restraint Saddle for PVC systems. Both solutions ensure a successful pipe transition point while simultaneously maintaining a fully restrained and positively sealed connection.

Branching

From a Polyethylene Main

Achieve 100% leak free compatibility with your HDPE water system when using our high-quality Branch Saddles. Our Electrofusion Branch Saddles are designed to make your fitting installations more efficient, more effective, and ultimately less expensive. Conventional Branch Saddles are also available and can be installed with most fusion equipment available in the field today.

Tapping

Polyethylene Mains for Service Connections and Monitoring

Don't compromise the leak-free integrity of your HDPE water system by using bolt-on taps. Our Electrofusion Self-Tapping Tees provide you with the ideal fitting for installing domestic and industrial services while our Electrofusion Corporation Saddle not only allows you to install services, it also makes the installation of purge points and flow monitoring locations faster and more efficient.

Restraining

Polyethylene Where Movement Must Be Controlled

Total System integrity is our goal. Therefore, in order to maximize on the self-restrained characteristics of HDPE in your water system, it is important to restrict the movement of piping materials at the non-HDPE transition points. Having researched the issue of pipe restraint thoroughly, Central Plastics makes available two fitting options specifically designed to address the pipe restraint issue. The Electrofusion Half-Coupling provides efficient size-on-size restraints for pipe. Our Electrofusion Flexible Restraint Saddle provides a broader range of superior pipe restraint in a variety of sizes — all with one fitting.

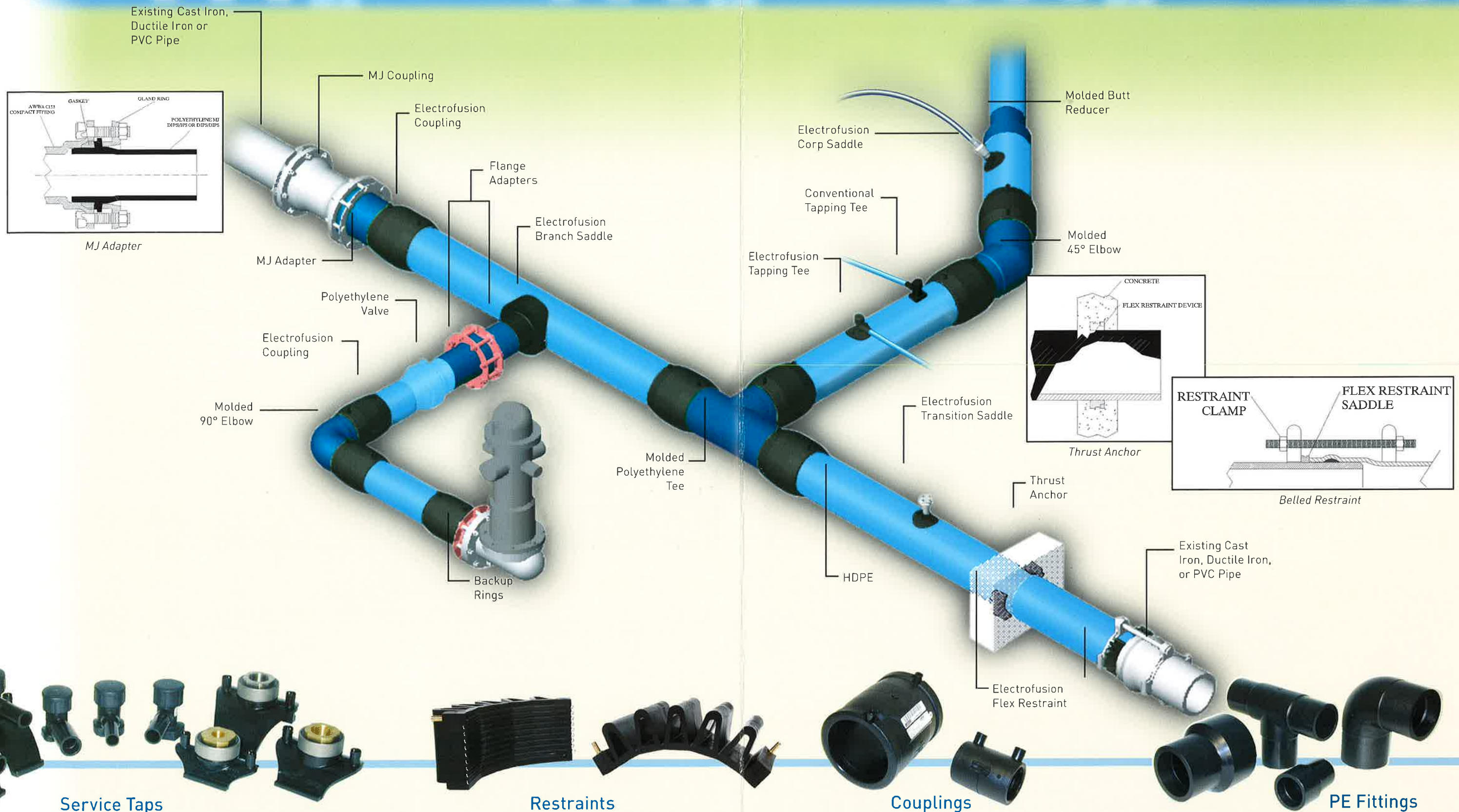


Transitions



Branches

The Water System of the 21st Century



Your Source for the Least Cost of Ownership

Increase the Integrity of Your System

Improve Water Quality

- Preempt SWDA concerns
- Eliminate potential back-siphonage sources
- Eliminate leaking joints
- Eliminate deteriorated or fatigued pipes
- Eliminate faulty service connections
- Minimize accumulation of sediments and turbidity particles

Reduce Water Loss

- Zero Joints = Zero Leaks
- Zero Gaskets = Zero leaks
- Fused Pipe = Zero Leaks
- Fused Fittings = Zero Leaks

Avoid Liability

Consideration of HDPE today minimizes negligence related liabilities tomorrow.

- Minimize construction related liabilities
- Minimize turbidity related liabilities
- Minimize treatment related liabilities
- Minimize water damage related liabilities

Minimize Water Hammer

- HDPE is the most fatigue resistant piping material available in the water market today.
The unique characteristics of HDPE will reduce the destructive forces of water hammer even in non-HDPE systems by flexing with each pressure wave and thus dampening its fatiguing effect.

Reduce Construction and Maintenance Costs

Our System Helps Control Your Costs By Reducing...

- | | | |
|----------------------|---------------------------|-------------------|
| • Construction Times | • Street Repairs | • Warehouse Costs |
| • Excavation Costs | • Traffic Congestion | • Handling Costs |
| • Shoring Costs | • Eliminate Thrust Blocks | • Repair Costs |
| • Open Trench Times | • Fitting Needs | |
| • Property Damage | • Excessive Inventory | |

Innovating Water System Solutions Through Diversified Technologies

Georg Fischer Central Plastics, the international leader of manufactured polyethylene fittings and accessories, with manufacturing facilities located around the world, offers high quality products and services by meeting or exceeding the standards of our day.

ISO 9001 - 2000 CERTIFIED

ASTM	American Society of Testing Material	NSF	National Sanitation Foundation
ISO	International Standards Organization	PPI	Plastic Pipe Institute
BS	British Standard	SGC	State Gas Company of Argentina
JIS	Japanese Industrial Standard	CEN	Committee of European Normalization
ASME	American Society of Mechanical Engineers	DIN	German Institute for Normalization
AWWA	American Water Works Association	KS	Korean Standard
DOT/TSI	Department of Transportation Transportation Safety Institute	CSA	Canadian Standard Association
IAPMO	International Association of Plumbing and Mechanical Officials	AGA	American Gas Association
NACE	National Association of Corrosion Engineers	API	American Petroleum Institute
NFPA	National Fire Protection Agency	ANSI	American National Standards Institute
		FM	Factory Mutual



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GEORG FISCHER
PIPING SYSTEMS

PE Electrofusion Systems for Gas and Water Catalog



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IPEX

IPEX PE ELECTROFUSION SYSTEMS FOR GAS & WATER

The smarter, more reliable way of fusing HDPE pipe

The strongest, most reliable leak-proof seal in the industry

IPEX electrofusion products are engineered smarter than traditional fusion systems. Manufactured in North America, our couplings feature a unique, exposed coil design that provides a seal stronger than any other electrofusion system on the market. This is achieved for two reasons:

- the heat, created by the electrical current passing through the exposed coil of the IPEX coupling, is transferred directly to the PE pipe, and
- the coil protrudes from the interior surface of the coupling. When the pipe is heated, the coil sinks into it creating a much stronger bond.

As a result of this process, every joint will be sealed precisely to specification, automatically, every time, minimizing the risk of human error. This unparalleled sealing technology has earned our couplings the highest pressure rating in the industry. What's more, because every joint is as strong as the pipe itself, the IPEX Electrofusion system is ideal for horizontal direct drilling and other trenchless applications.

Industry-leading trackability

With the industry's most advanced barcode monitoring, recording and tracking technology, IPEX makes managing your infrastructure easier than ever before.

Imagine, no more hidden costs or surprises on future dig ups. Instead, you'll know when, where and how every coupling in your system was installed, and by whom.

All these benefits add up to deliver substantial time and cost savings on every project.

IPEX Electrofusion Systems.
Smarter engineering for
your gas and water HDPE
infrastructure.



TABLE OF CONTENTS

FRIAMAT® II	1
Couplings	4
Reducer	8
Tapping Tees	9
Scraper Tools	16
Re-Round Clamps	17
Saddles	19
Repair Patches and Clamps	22



FRIAMAT® II



Universal Electrofusion Processor

The FRIAMAT® II is the industry's leading electrofusion processor. With a simple scan the FRIAMAT® II instantly reads every type of universal fitting. The precision continues throughout the fusion process. All details of the fusion are recorded, including the operator, temperatures and duration. It stores all fusion information and the data can be easily transferred to a computer. You can even input the GPS location of the joint into the electrofusion processor.

Description

Product Code

Includes reader wand, manual input, documentation feature, hand scraper with 5 spare blades, user manual and carrying case.

328005



FRIAMAT® II CONT'D

FRIAMAT® II Fusion Units



The fusion units of the FRIAMAT® family are constructed using state of the art technology. And in accordance with recognized safety rules are fitted with the appropriate protective equipment.

The units have 6 function buttons:

Start This is used to start a fusion process

Stop Is used to cancel a fusion process

Info It is used to call up current information (voltage/frequency, date/time, ambient temperature, fusion operator and language)

Set To save settings

Menu This button is used to call up the main menu and to scroll through individual menus e.g. date/time, signal volume, language

Res For cancelling an input process

The electronics in your fusion unit are housed in a splash-proof casing. The carrying frame is used to hold the cables. The FRIAMAT® fusion units are designed for a maximum fusion voltage of 48 V. The supply and fusion voltage are isolated from each other by a safety transformer.

The computerized command system:

- is completely automatic in regulating and checking the metering of the electrical power
- determines the fusion time depending on the ambient temperature. The temperature probe in the fusion cable continuously determines the ambient temperature.

Technical Data

Input Voltage Range	AC 95 V - 135 V
Frequency Range	45 Hz. . . 66 Hz
Current Consumption	AC 30 A max
Power	3.5 kW
Generator rated output, 1/2" CTS - 2" IPS, 3" IPS - 28" IPS	AC 2.0 kW, AC 4.0 kW
Equipment Fuse	30 A slow acting
Casing	Enclosure class IP54 DIN 40 050, Protection class II DIN 57 700
Power Cable	16' with 30 AMP twist lock plug
Fusion Cable	13' with 4mm fittings plug
Bar Code	Made to ANSI HM 10.8M-1983, ISO CD 13950/08.94
Working Temperature Range	-4°F. . . + 122°F*
Fusion Current Monitoring	Short circuit 110 A, Open circuit 0.25 x IN
Printer Interface	Parallel (D-Sub 25)
Fusion Voltage	Max AC 48 V
Dimensions W x D x H	14 1/2" x 11" x 19"
Weight	47 lbs
Weight w Transport Box	57 lbs

* When fusing fittings from other manufacturers always take note of the details given on the working temperature range.



Accessories for Universal Electrofusion Processor

Description	Product Code
Marinco Adapter, Plug 30A to 15A	328000
Frialen® Silver Pipe Markers	328002
FRIATool Complete Software Kit Includes: 328208, 328012 & 328013	328206
CD-ROM Software (only)	328208
Memory Box (only)	328012
Connection Cable: PC to Memory Box	328013
Connection Cable: PC to Friamat	328173
UPONOR / New Style Central Connectors (pair) 4.7mm	328015
Central Connectors (pair) 2.3mm	328016
Reader Wand Replacement	328063
FriaFit® Adapter (pair)	328014
Aluminum Fusion Processor Carrying Case	328143
Fusion Lead End (pair)	328119



COUPLINGS

1/2" CTS through 28" IPS



Our Couplings and Fittings deliver flexibility and reliability. No one offers a wider range of coupling sizes and every FRIATEC fitting is ASTM approved.

Short Designation MBI/UBI... OD

Field of Application Connections of PE Pipes 2406 and 3408/4710

Range of Application Gas up to 100 psi and water up to 160 psi

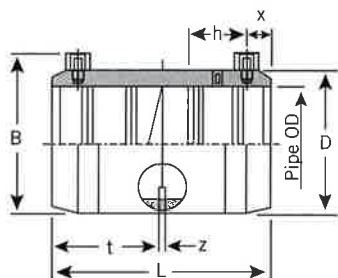
For higher pressure ranges, contact IPEX at 800-463-9572



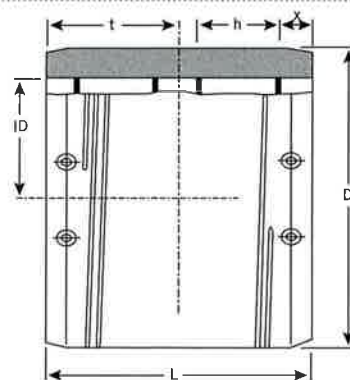


1/2" CTS through 28" IPS cont'd

1/2" - 6"



8" - 28"



Nominal Pipe OD-CTS	Product SDR	Code	ID min	ID max	D	B	L	t	z	h	x	Fusion Time/Sec @ 73°F	Cooling Time/Min **/**/**
1/2"	11	128031	0.622	0.634	1.102	1.732	2.283	1.142	0.079	0.591	0.23	27	05/08/10
1"	11	128027	1.122	1.134	1.654	2.244	3.071	1.535	0.079	0.787	0.31	28	05/08/10

Nominal Pipe OD IPS	Product SDR	Code	ID min	ID max	D	B	L	t	z	h	x	Fusion Time/Sec @ 73°F	Cooling Time/Min **/**/**
3/4"	11	128026	1.047	1.059	1.575	2.165	2.598	1.260	0.079	0.728	0.27	28	05/08/10
1"	11	128024	1.311	1.323	1.850	2.460	3.071	1.496	0.079	0.787	0.31	28	05/08/10
1-1/4"	11	128025	1.654	1.679	2.244	2.835	3.346	1.634	0.079	0.945	0.39	34	10/15/25
1-1/2"	11	128033	1.902	1.917	2.480	3.130	3.858	1.870	0.079	1.060	0.46	34	10/15/25
2"	11	128028	2.374	2.390	3.142	3.657	4.449	2.205	0.079	1.205	0.51	54	10/15/25
3"	11	128029	3.496	3.516	4.606	4.980	5.472	2.717	0.079	1.417	0.59	100	10/30/40
† 4"	11	128030	4.492	4.516	5.827	6.173	6.260	3.110	0.079	1.689	0.67	151	10/30/40
† 6"	11	128032	6.610	6.634	8.543	8.740	7.992	3.976	0.079	2.295	0.79	440	20/60/75
† 8" monofilar	11	128060	8.626	8.665	11.029	-	9.448	4.724	-	2.953	1.063	540	20/60/75
† 8" bifilar	11	128023	8.626	8.665	11.022	-	9.448	4.724	-	2.953	1.063	554 ea side	20/60/75
† 10"	11	128061	10.748	10.787	13.975	-	11.811	5.275	-	3.149	1.063	500 ea side	30/75/100
† 12"	11	128062	12.748	12.787	15.746	-	11.219	5.610	-	2.679	1.142	550 ea side	30/75/100
† 14"	11	128064	13.976	14.016	17.716	-	11.811	5.905	-	3.500	1.260	580 ea side	30/75/100
† 16"	11	128063	15.969	16.008	19.685	-	12.598	6.299	-	3.748	1.260	870/730 ea side	45/95/120
† 18"	11	128065	17.969	18.008	22.047	-	13.386	6.693	-	3.346	1.260	870/870 ea side	45/95/120
† 20"	11	128176	19.961	20.016	24.803	-	14.173	7.086	-	3.622	1.260	870/720 ea side	45/95/120
22"	17	128066	21.961	22.016	24.803	-	14.566	7.283	-	3.291	1.260	870/720 ea side	45/95/120
24"	13.5	128067	24.000	24.039	27.952	-	15.748	7.874	-	4.095	1.420	870/850 ea side	45/95/120
28"	17	128068	27.992	28.031	31.496	-	15.748	7.874	-	6.062	1.614	850/850 ea side	60/80/120

FRIATEC Safety Fittings can be fused to all PE pipes within melt index groups 003-050 and pipe SDR range 9.33 through 17.6.

* Pipe can be moved after indicated cooling time (handling)

** Pipe can be pressurized after indicated cooling time (pressure <90 psi)

*** Pipe can be pressurized after indicated cooling time (pressure >90 psi)

† FM 200 psi, Short Designation: MBI...OD

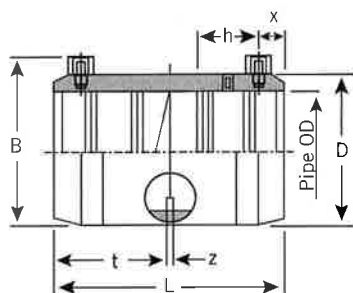


COUPLINGS CONT'D

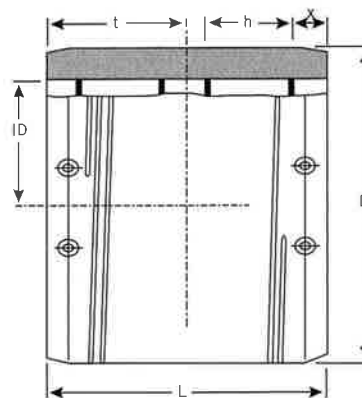
4" through 24" DIPS



Short Designation UBI...OD
Field of Application Connections of PE Pipes 2406 and 3408/4710
Range of Application Water up to 160 psi
For higher pressure ranges, contact IPEX at 800-463-9572



4"



6" - 20"

Nominal Pipe OD DIPS	Product SDR	Product Code	ID min	ID max	D	L	t	h	x	Fusion Time/Sec @ 73°F	Cooling Time/Min */**/**
4"	13.5	128183	4.799	4.819	5.669	6.354	3.177	1.765	0.827	100	15/20/30
6"	11	128134	6.889	6.929	8.825	8.268	4.134	2.535	0.827	486	20/60/75
8"	11	128131	9.039	9.078	11.022	9.448	4.724	2.953	0.827	540	30/75/100
10"	11	128136	11.082	11.122	13.976	11.023	5.511	3.291	0.827	550 ea side	30/75/100
12"	11	128132	13.182	13.224	15.746	11.023	5.511	2.582	0.827	550 ea side	30/75/100
14"	11	128158	15.272	15.311	18.000	11.417	5.708	3.500	0.827	730 ea side	40/95/120
16"	11	128135	17.385	17.444	22.047	11.417	5.708	3.392	0.827	870/720 ea side	40/95/120
18"	13.5	128138	19.472	19.531	22.047	11.417	5.708	3.392	0.827	870/720 ea side	40/95/120
20"	13.5	128133	21.582	21.641	24.803	11.417	5.708	2.460	0.827	870/720 ea side	40/95/120
24"	11	128207	25.732	25.791	32.000	16.535	8.268	4.764	0.827	870/1080 ea side	45/95/120

FRIATEC Safety Fittings can be fused to all PE pipes within melt index groups 003-050 and pipe SDR range 9.33 through 17.6.

* Pipe can be moved after indicated cooling time (handling)

** Pipe can be pressurized after indicated cooling time (pressure <90 psi)

*** Pipe can be pressurized after indicated cooling time (pressure >90 psi)

Please note 4", 18" or 20" DIP are rated SDR 13.5 and can be pressurized up to 150 psi (water)



Low Pressure Safety Electrofusion

(formally called FriaFit)

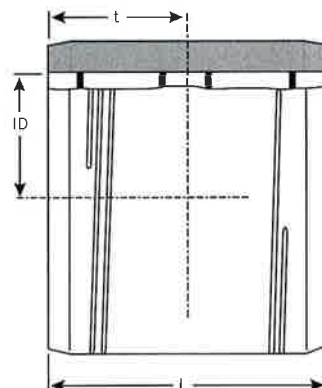
The low pressure coupling can be fused to pipes of SDR stages 11 - 32 in accordance with ASTM F1055.

Pipes made of raw material types PE2406 and PE3408/4710, PE63, PE80 and P100 in melt index groups 005 - 050 can be fused.

It is possible to work with these couplings at ambient temperatures of between -4°F up to 122°F. It is always necessary to use a FriaFit adapter for the fusion.

The thinwall safety coupling (AM) is made of PE3408 and can be pressurized up to a maximum of 80 psi if the pipe is of suitable design.

With exposed heating coils for optimal heat transfer, large insertion depth, extra wide fusion zones plus cold zones at the end and in the middle to prevent the flow of molten material for use without a holding device.



Size OD IPS	Product Code	Order No.	VE	PE	ID (in)	L (in)	t (in)	Weight lb/ea
8"	128139	190008-A	48	PE - HD	8.626	7.874	3.937	9
10"	128140	190010-A	32	PE - HD	10.748	8.268	4.134	11
12"	128141	190012-A	32	PE - HD	12.748	8.661	4.330	8
16"	128142	190016-A	16	PE - HD	16.008	8.661	4.330	16



REDUCER

Reducer CTS x CTS & IPS x CTS

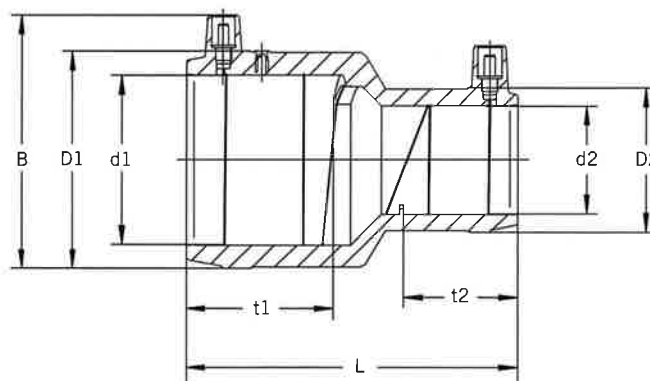


Field of Application Connections of PE Pipes 2406 and 3408/4710

Range of Application Gas up to 100 psi and water up to 160 psi

For higher pressure ranges, contact IPEX at 800-463-9572

- Increased coupler depth (no holding clamps required)
- Extra wide fusion zones
- Increased wall thickness providing maximum stability
- Front and middle cold zones
- Exposed heating coil with direct contact to pipe
- Contacts are safe to touch
- Visual fusion indicator
- Batch marking
- Individually wrapped



Nominal Pipe d1 (in)	Main Size d2 (in)	Product Code	D1 (in)	D2 (in)	B (in)	L (in)	t1 (in)	t2 (in)	Weight lbs/ea
1 CTS	1/2 CTS	128203	1.661	1.110	2.289	3.465	1.516	1.181	0.112
1 IPS	1/2 CTS	128204	1.858	1.110	2.482	3.465	1.516	1.181	0.122
1-1/4 IPS	1 CTS	128202	2.213	1.661	2.835	3.858	1.673	1.535	0.178
2 IPS	1 CTS	128205	3.118	1.661	3.652	4.921	2.165	1.535	0.382

TAPPING TEES

EFS Tapping Tees

IPEX EFS Tapping Tees make for fast and safe installation of service and branch pipe.

Material Class PE4710

Field of Application Installation of service and branch pipes to PE pipes 2406 and 3408/4710

Range of Application Gas up to 100 psi

For higher pressure ranges, contact IPEX at 800-463-9572

- Corrosion-proof construction for long service life
- Leak-proof seals based on hot tapping tee construction
- Easy installation using conventional tooling (no special saddling tools required)
- Best after-market service in the industry with an established North American manufacturer
- Compatible with all Universal Electrofusion Processors



Host Pipe	Branch	Part No.
1-1/4 IPS	1/2 CTS	528000
1-1/4 IPS	3/4 IPS	528001
1-1/4 IPS	1 CTS	528002
1-1/4 IPS	1 IPS	528003
2 IPS	1/2 CTS	528004
2 IPS	3/4 IPS	528005
2 IPS	1 CTS	528006
2 IPS	1 IPS	528007
2 IPS	1-1/4 CTS	528008
2 IPS	1-1/4 IPS	528009
2 IPS	2 IPS	528010
3 IPS	1/2 CTS	528011
3 IPS	3/4 IPS	528012
3 IPS	1 CTS	528013
3 IPS	1 IPS	528014
3 IPS	1-1/4 CTS	528015
3 IPS	1-1/4 IPS	528016
3 IPS	2 IPS	528017
4 IPS	1/2 CTS	528018

Host Pipe	Branch	Part #
4 IPS	3/4 IPS	528019
4 IPS	1 CTS	528020
4 IPS	1 IPS	528021
4 IPS	1-1/4 CTS	528022
4 IPS	1-1/4 IPS	528023
4 IPS	2 IPS	528024
6 IPS	1/2 CTS	528025
6 IPS	3/4 IPS	528026
6 IPS	1 CTS	528027
6 IPS	1 IPS	528028
6 IPS	1-1/4 CTS	528029
6 IPS	1-1/4 IPS	528030
6 IPS	2 IPS	528031
8 IPS	1/2 CTS	528032
8 IPS	3/4 IPS	528033
8 IPS	1 CTS	528034
8 IPS	1 IPS	528035
8 IPS	1-1/4 CTS	528036
8 IPS	1-1/4 IPS	528037

Requires EFS Tapping Tool - see page 13

For Pipe SDR Range 21+, contact IPEX for reduced fusion times.

Allow electrofusion joints to cool prior to handling, pressurizing or tapping.

TAPPING TEES CON'T

DAA High Pressure Tapping Tees - IPS

The industry-leading design of FRIATEC Tapping Tees makes for fast and safe installation of service and branch pipes.

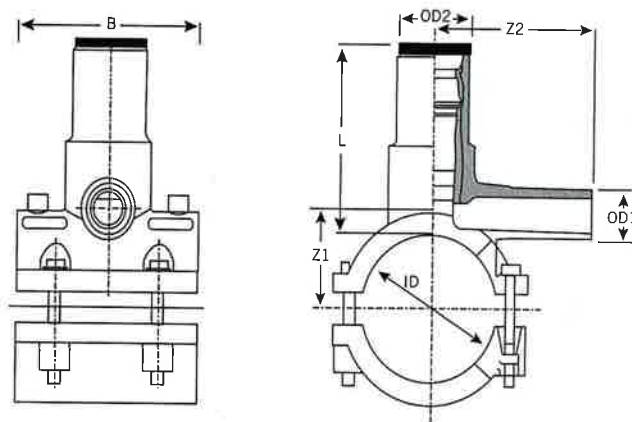
Short Designation DAA d1./d2...

Field of Application Installation of service and branch pipes

Range of Application Gas up to 100 psi and water up to 160 psi

For higher pressure ranges, contact IPEX at 800-463-9572

- Hot tapping tee designed for leakproof installation under pressure up to 160 psi for water and 100 psi for gas
- Ease of assembly—no rounding clamps or special tools
- Cutter and sleeve made of brass
- Brass guide allows easy cutting of thick wall pipe
- Lower and upper "cutter stops" prevent overcutting as well as accidental removal of cutter
- Threaded plug with o-ring seal
- Corrosion-proof construction



FRIATEC Safety Fittings can be fused to all PE pipes within melt index groups 003-050 and Pipe SDR Range 9.33 through 17.6. For Pipe SDR Range 21+, contact IPEX for reduced fusion times.
Allow electrofusion joints to cool prior to handling, pressurizing or tapping.



DAA High Pressure Tapping Tees - IPS

Nominal Pipe OD IPS	Nominal Outlet	Product Code	ID	OD 1	OD 2	Cutter	L	Z1	Z2	B
1-1/4"	1/2" CTS	228020	1.575	0.626	1.259	0.630	2.913	1.102	9.624	2.756
1-1/4"	3/4" IPS	228021	1.575	1.051	1.259	0.630	2.913	1.102	9.624	2.756
1-1/4"	1" CTS	228022	1.575	1.126	1.259	0.630	2.913	1.102	9.624	2.756
1-1/4"	1" IPS	228023	1.575	1.315	1.259	0.630	2.913	1.102	9.624	2.756
2"	1/2" CTS	228042	2.378	0.626	1.575	0.846	3.878	1.780	3.937	4.094
2"	3/4" IPS	228029	2.378	1.051	1.575	0.846	3.878	1.780	3.701	4.094
2"	1" CTS	228033	2.378	1.126	1.575	0.846	3.860	1.780	3.701	4.094
2"	1" IPS	228032	2.378	1.315	1.575	0.846	3.860	1.780	3.701	4.094
2"	2" IPS	228274	2.378	2.378	1.575	1.180	5.000	2.170	5.952	6.060
3"	1/2" CTS	228043	3.504	0.626	1.969	1.180	4.764	2.343	4.410	4.803
3"	3/4" IPS	228030	3.504	1.051	1.969	1.180	4.764	2.343	3.937	4.803
3"	1" CTS	228031	3.504	1.126	1.969	1.180	4.764	2.343	4.255	4.803
3"	1" IPS	228044	3.504	1.315	1.969	1.180	4.764	2.343	4.255	4.803
3"	2" IPS	228028	3.504	2.378	1.969	1.180	4.780	2.350	6.890	5.905
4"	1/2" CTS	228045	4.512	0.626	1.969	1.180	4.764	2.905	4.016	4.785
4"	3/4" IPS	228034	4.512	1.051	1.969	1.180	4.764	2.846	4.409	4.764
4"	1" CTS	228035	4.512	1.126	1.969	1.180	4.764	2.846	4.527	4.785
4"	1" IPS	228046	4.512	1.315	1.969	1.180	4.764	2.913	4.527	4.785
4"	2" IPS	228025	4.512	2.378	1.969	1.180	4.780	2.913	7.086	4.905
6"	1/2" CTS	228047	6.638	0.626	1.969	1.180	6.575	4.500	4.586	7.677
6"	3/4" IPS	228036	6.638	1.051	1.969	1.180	6.575	4.528	4.331	7.677
6"	1" CTS	228038	6.638	1.126	1.969	1.180	6.575	4.528	4.331	7.677
6"	1" IPS	228049	6.638	1.315	1.969	1.180	6.575	4.528	4.331	7.677
6"	2" IPS	228027	6.638	2.378	1.969	1.180	6.575	4.803	6.811	7.677
8"	1/2" CTS	228048	8.605	0.626	1.969	1.180	6.575	5.483	4.586	7.677
8"	3/4" IPS	228037	8.605	1.051	1.969	1.180	6.575	5.315	4.331	7.677
8"	1" CTS	228041	8.605	1.126	1.969	1.180	6.575	5.315	4.331	7.677
8"	1" IPS	228040	8.605	1.315	1.969	1.180	6.575	5.315	4.331	7.677
8"	2" IPS	228039	8.605	2.378	1.969	1.180	6.575	5.827	6.811	7.677
10" - 16" *	2" IPS	228056	10.75 - 16.00	--	1.969	1.180	6.575	--	7.087	7.677

* Friatop pneumatic top-loading tool required

FRIATEC Safety Fittings can be fused to all PE pipes within melt index groups 003-050 and Pipe SDR Range 9.33 through 17.6. For Pipe SDR Range 21+, contact IPEX for reduced fusion times.

Allow electrofusion joints to cool prior to handling, pressurizing or tapping.

For 12" and 14" IPS applications, maximum SDR for full coupon cut is SDR 11.

For 16" IPS applications, maximum SDR for full coupon cut is SDR 13.5.

For 12" DIP applications, maximum SDR for full coupon cut is SDR 11.

For 14" and 16" DIP applications, maximum SDR for full coupon cut is SDR 17.

TAPPING TEES CON'T

DAA High Pressure Tapping Tees - DIP



The DAA is easy to assemble and delivers a high quality design for the gas and water industry.

Short Designation DAA d1./d2...

Field of Application Installation of service and branch pipes

Range of Application Gas up to 100 psi and water up to 160 psi

For higher pressure ranges, contact IPEX at 800-463-9572

- Hot tapping tee designed for leakproof installation under pressure up to 160 psi for water and 100 psi for gas
- Ease of assembly—no rounding clamps or special tools
- Cutter and sleeve made of brass
- Brass guide allows easy cutting of thick wall pipe
- Lower and upper "cutter stops" prevent overcutting as well as accidental removal of cutter
- Threaded plug with o-ring seal
- Corrosion-proof construction



Nominal Pipe OD DIP	Nominal Outlet (in)	Product Code	ID	OD 1	OD 2	Cutter	L	Z1	Z2	B
4"	1/2" CTS	228251	4.512	0.626	1.969	1.201	4.764	2.905	4.016	4.785
4"	3/4" IPS	228252	4.512	1.051	1.969	1.201	4.764	2.846	4.409	4.764
4"	1" CTS	228250	4.512	1.126	1.969	1.201	4.764	2.846	4.527	4.785
4"	2" IPS	228253	4.512	2.378	1.969	1.201	4.780	2.913	7.086	4.905
6"	1/2" CTS	228254	6.638	0.626	1.969	1.201	6.575	4.500	4.586	7.677
6"	3/4" IPS	228255	6.638	1.051	1.969	1.201	6.575	4.528	4.331	7.677
6"	1" CTS	228256	6.638	1.126	1.969	1.201	6.575	4.528	4.331	7.677
6"	2" IPS	228257	6.638	2.378	1.969	1.201	6.575	4.803	6.811	7.677
8"	1/2" CTS	228258	8.605	0.626	1.969	1.201	6.575	5.483	4.586	7.677
8"	3/4" IPS	228259	8.605	1.051	1.969	1.201	6.575	5.315	4.331	7.677
8"	1" CTS	228260	8.605	1.126	1.969	1.201	6.575	5.315	4.331	7.677
8"	2" IPS	228261	8.605	2.378	1.969	1.201	6.575	5.827	6.811	7.677

FRIATEC Safety Fittings can be fused to all PE pipes within melt index groups 003-050 and Pipe SDR Range 9.33 through 17.6. For Pipe SDR Range 21+, contact IPEX for reduced fusion times.

Allow electrofusion joints to cool prior to handling, pressurizing or tapping.

DAA Tapping Tee Accessories

Description	Product Code
10mm Hex Wrench for 1-1/4" Main DAA Tees	228050
17 mm Hex Wrench for 2" Main DAA Tees	228051
19mm Hex Wrench for 3" - 16" Main DAA Tees	228052
Friatop Pneumatic Top Loading Tool for 10" - 16" DAA-TL and all TL fittings	228053
Pressure Test Cap Adapter (optional) for DAA style 1-1/4" Tees	228024
Pressure Test Cap Adapter (optional) for DAA style 2" - 16" Tees	228055



Tapping Tee Accessories

Description	Part No.
Low Volume Pressure Test Cap (stem sizes 1/2" to 1")	528039
Medium Volume Pressure Test Cap (stem size 1-1/4")	528040
2" IPS x 1/2" CTS Training Test Tee	528042
2" IPS x 1" CTS Training Test Tee	528043
Tapping Tool	528038

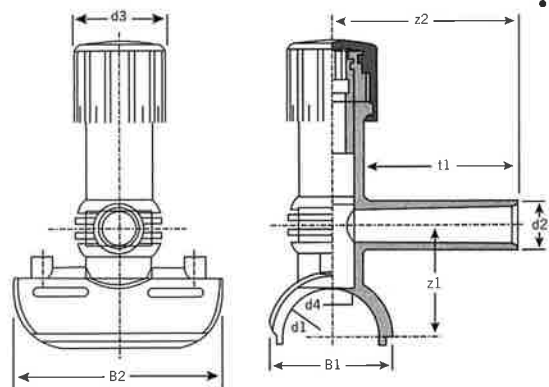
TAPPING TEES CON'T



DAS II Top Loading Tapping Tees

Short Designation DAS II d1./d2...
 Field of Application Installation of service and branch pipes
 Range of Application Gas up to 100 psi and water up to 160 psi
 For higher pressure ranges, contact IPEX at 800-463-9572

- Top loading • High volume • Self-tapping tee
- Internal cutter blade that is the largest on the market



Nominal Pipe Main Outlet	Product Code	d3	L	z1	z2	t1	B1	B2	d4
2" IPS x 1/2" CTS	228110	2.165	5.748	2.559	3.449	2.717	2.795	4.724	1.016
2" IPS x 3/4" IPS	228111	2.165	5.748	2.559	3.843	3.110	2.795	4.724	1.016
2" IPS x 1" CTS	228112	2.165	5.748	2.559	4.236	3.504	2.795	4.724	1.016
2" IPS x 1-1/4" IPS	228123	2.402	5.000	2.157	4.677	3.740	2.795	4.724	1.214
2" IPS x 2" IPS	228124	2.402	5.000	2.319	6.496	5.559	2.795	4.724	1.214
4" IPS x 1/2" CTS	228113	2.165	5.827	3.524	3.449	2.717	4.528	5.906	1.016
4" IPS x 3/4" IPS	228114	2.165	5.827	3.524	3.843	3.110	4.528	5.906	1.016
4" IPS x 1" CTS	228115	2.165	5.827	3.524	4.236	3.504	4.528	5.906	1.016
4" IPS x 1-1/4" IPS	228126	3.268	8.386	4.114	5.512	4.114	4.528	5.906	1.798
4" IPS x 2" IPS	228127	3.268	8.386	4.449	5.512	4.114	5.039	5.906	1.798
6" IPS x 1/2" CTS	228116	2.165	5.827	4.449	3.449	2.717	5.039	5.906	1.016
6" IPS x 3/4" IPS	228117	2.165	5.827	4.449	3.843	3.110	5.039	5.906	1.016
6" IPS x 1" CTS	228118	2.165	5.827	4.449	4.236	3.110	5.039	5.906	1.016
6" IPS x 1-1/4" IPS	228128	3.268	8.386	4.449	5.512	4.114	5.039	5.906	1.798
6" IPS x 2" IPS	228129	3.268	8.386	4.449	6.299	4.902	5.039	5.906	1.798
8" IPS x 1/2" CTS	228120	2.165	6.457	4.921	3.449	2.717	5.827	5.906	1.016
8" IPS x 3/4" IPS	228121	2.165	6.457	4.921	3.843	3.110	5.827	5.906	1.016
8" IPS x 1" CTS	228122	2.165	6.457	4.921	4.236	3.504	5.827	5.906	1.016
8" IPS x 1-1/4" IPS	228130	3.268	8.976	4.921	5.512	4.114	5.827	5.906	1.798
8" IPS x 2" IPS	228131	3.268	8.976	4.921	6.299	4.902	5.827	5.906	1.798

FRIATEC Safety Fittings can be fused to all PE pipes within melt index groups 003-050 and Pipe SDR Range 9.33 through 17.6.
 For Pipe SDR Range 21+, contact IPEX for reduced fusion times.

Allow electrofusion joints to cool prior to handling, pressurizing or tapping.



DAS II Top Loading Tapping Tee Accessories

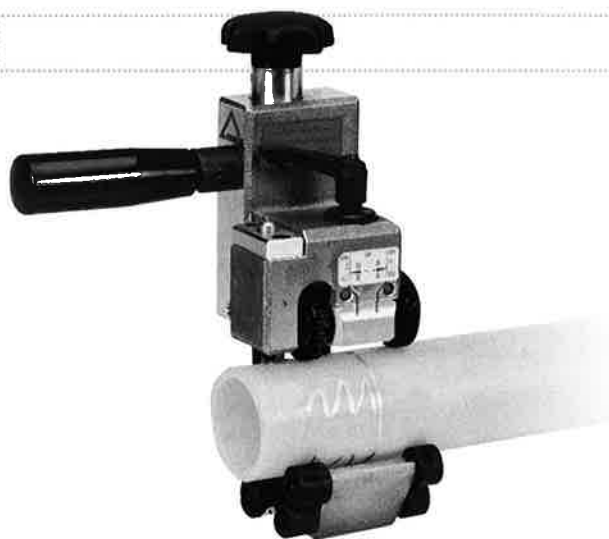
Description	Product Code
Top Loading Tool and Tapping Tools (complete set) Includes: 228065, 228066, 228072, 228073, 228074, 228075, 228077, 228078, 228079 and 228080	228067
Top Loading Tool (only) Includes: Top Bar and Ratchet	228075
25mm Top Loading Cap (adapter only)	228072
33mm Top Loading Cap (adapter only)	228073
50mm Top Loading Cap (adapter only)	228074
15mm DAS II Tap Tool (only)	228065
24mm DAS II Tap Tool (only)	228066
DAS Lock Pin	228077
DAS Short Strap	228078
DAS Long Strap	228079
DAS Standard Case	228080
25mm Aluminum Test Cap	228057
33mm Aluminum Test Cap	228058
50mm Aluminum Test Cap	228059



SCRAPER TOOLS

Scraper Tools with Accessories

FRIATEC scraper tools are designed to assist the installer in producing a quality electrofusion joint every time.



Scraper Tools	Product Code	Pipe Size Compatibility	Accessories	Product Code
FWZ Hand Scraper	328018	all	Spare Blades for FWZ Hand Scraper (set of 5 blades)	328017
GBZ Pocket Scraper	128020	1/2" CTS - 1-1/4" CTS	Spare Blade Kit for FWSG 63 3 blades, 2 screws, 1 driver	128041
FWSG 63 Scraper Tool w/ Case	128034	1/2" IPS - 2" IPS	Spare Blade Kit for FWSG 315 3 blades, 2 screws, 1 driver	128040
FWSG 315 Scraper Tool w/ Case	128036	3" IPS - 8" IPS 4" DIP - 6" DIP	Spare Blade Kit for FWSG 630/710 3 blades, 2 screws, 1 driver	128042
Scraper Tools w/ Case (complete set) Includes: FWSG 63 & FWSG 315	128039	1/2" IPS - 2" IPS 3" IPS - 10" IPS 4" DIP - 6" DIP	Aluminum Carrying Case for FWSG 630-710 Scraper Tool	128198
FWSG 710 Scraper Tool w/ Case	128190	6" IPS - 28" IPS 6" DIP - 20" DIP	Aluminum Carrying Case for FWSG 63-315 Scraper Tool	128035

RE-ROUND CLAMPS



Hydraulic Re-Round Clamps

If the end of a PE pipe is not perfectly round, the coupling will not fit over the end of the pipe. Our Re-Round Clamps solve this problem.

The clamping unit is comprised of:

- 1 – Hydraulic clamping unit
- 2 – Component inserts



Description - IPS	Product Code
14" IPS Master Re-Round Clamp	228152
16" IPS Re-Round Insert	228158
18" IPS Master Re-Round Clamp	228154
20" IPS Master Re-Round Clamp	228161
d 630mm Large Master Re-Round Clamp 22" - 24"	228156
22" IPS Re-Round Insert	228159
24" IPS Re-Round Insert	228160
28" IPS Master Re-Round Clamp	228217

Description - DIP	Product Code
8" DIP Re-Round Insert	228162
10" DIP Master Re-Round Insert	228151
12" DIP Master Re-Round Clamp	228153
12" DIP Re-Round Insert	228163
16" DIP Master Re-Round Clamp	228155
16" DIP Re-Round Insert	228164
18" DIP Master Re-Round Clamp (20" IPS master)	228161
20" DIP Re-Round Insert (requires 228156 d 630mm Master Re-Round Clamp)	228165

RE-ROUND CLAMPS CON'T

Alignment Clamps - IPS / DIP

Each alignment clamp listed in the table aligns only one size pipe. Select tool according to pipe size to be aligned.

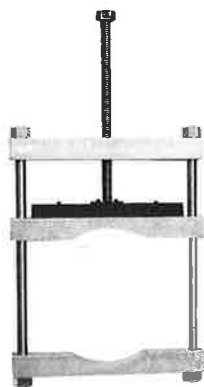


Description - Single	Product Code
1-1/4" IPS	228244
2" IPS	228137
3" IPS	228248
4" IPS	228138
4" DIP	228263
6" IPS	228139
6" DIP	228264
8" IPS	228246

Description - Double	Product Code
1-1/4" IPS	228245
2" IPS	228140
3" IPS	228249
4" IPS	228141
6" IPS	228142
8" IPS	228247

Manual Re-Rounding Tools

Our industrial-quality re-rounding tools for the gas and water industries has a reputation of being the best-quality tools on the market.



Description	Product Code
6" IPS/DIP - 12" IPS/DIP Re-Round Tool	228271
12" IPS/DIP - 20" IPS/DIP Re-Round Tool	228278
20" IPS - 28" IPS & 20" - 24" DIP Re-Round Tool	228275

SADDLES



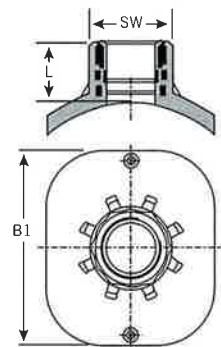
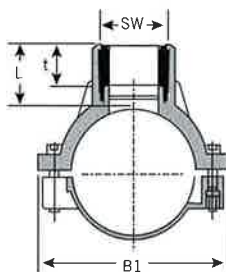
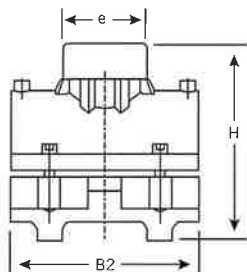
VA Electrofusion Service Saddles

Short Designation VA, VA-TL d1./d2...
 Field of Application Installation of service and branch pipes
 Range of Application Gas up to 100 psi and water up to 160 psi
 For higher pressure ranges, contact IPEX at 800-463-9572

FRIATEC Molded Saddle Fittings may be clamped onto pipes up to SDR 9 and sealed using electrofusion. In addition to house connection fittings, FRIATEC Molded Saddle Fittings can also be used as branch saddles for polyethylene relining pipes (U-liners, C-liners, Roll-down)

Benefits include:

- universal compatibility with various diameters of polyethylene pipe from 3" up to 28"
- quick, easy and safe assembly



Nominal Pipe d1 (in)	Main Size d2	Nominal Outlet	Product Code	B1	B2	H	L	t	e
3"	IPS	2" SSPT	228262	6.102	5.906	7.835	3.740	1.063	3.189
4"	IPS	2" SSPT	228170	6.890	7.087	8.228	3.740	1.063	3.189
4"	DIP	2" SSPT	228298	6.890	7.087	8.228	3.740	1.063	3.189
6"	IPS	2" SSPT	228171	8.858	7.677	10.197	3.740	1.063	3.189
6"	DIP	2" SSPT	228302	8.858	7.677	10.197	3.740	1.063	3.189
8" - TL*	IPS	2" SSPT	228218	9.843	7.677	11.693	3.740	1.063	3.189
8" - TL*	DIP	2" SSPT	228173	10.039	7.677	12.283	3.740	1.063	3.189
10" - 22" TL*	IPS	2" SSPT	228174	7.874	--	--	3.543	--	--
10" - 20" TL*	DIP	2" SSPT							

* FRIATEC Pneumatic Top-loading tool required

FRIATEC Safety fittings can be fused to all PE pipes within melt index groups 003-050 and SDR range 9.33 through 17.6.
 Assemble nipple, bushing or corporation stop into saddle using red LOCTITE #262
 (SSPT) = Straight Standard Pipe Thread. The use of tapered fittings for the outlet is not permitted

SADDLES CON'T

SA Branch Saddles



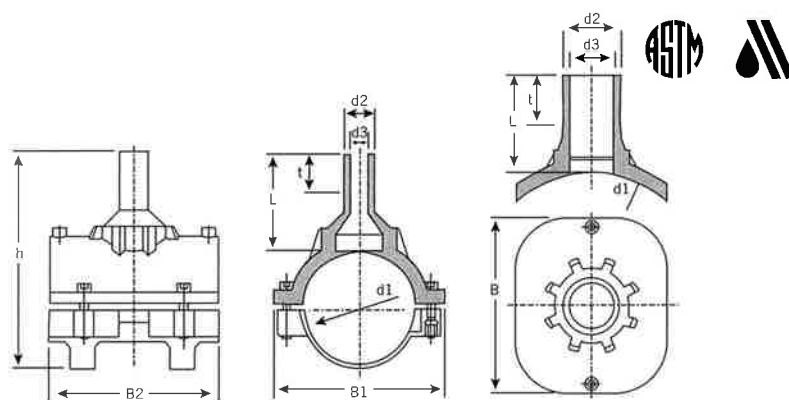
Short Designation SA, SA-TL d1./d2...

Field of Application Installation of service and branch pipes

Range of Application Gas up to 100 psi and water up to 160 psi

SA Branch Saddles are available with either a 2" or 3" outlet

For higher pressure ranges, contact IPEX at 800-463-9572



Nominal Pipe d1 (in)	Main Size d2	Nominal Outlet	Product Code	d3	L	h	t	B1	B2
3"	IPS	2 IPS	228184	1.969	4.055	8.150	2.756	6.102	5.906
4"	IPS	2 IPS	228185	1.929	4.291	9.173	2.205	6.890	7.087
4"	DIP	2 IPS	228296	1.929	4.291	9.173	2.205	6.890	7.087
4"	IPS	3 IPS	228186	2.756	4.528	8.976	3.543	6.496	7.480
4"	DIP	3 IPS	228297	2.756	4.528	8.976	3.543	6.496	7.480
6"	IPS	2 IPS	228144	1.850	4.291	11.142	2.205	8.858	7.677
6"	DIP	2 IPS	228305	1.850	4.291	11.142	2.205	8.858	7.677
6"	IPS	3 IPS	228180	2.717	5.079	11.496	3.937	8.543	9.646
6"	DIP	3 IPS	228306	2.717	5.079	11.496	3.937	8.543	9.646
6"	IPS	4 IPS	228277	3.543	5.512	12.256	4.291	9.055	10.433
8" - TL *	IPS	2 IPS	228146	1.850	4.291	12.244	2.205	9.843	7.677
8" - TL *	DIP	2 IPS	228311	1.850	4.291	13.228	2.205	10.039	7.677
8" - TL *	IPS	3 IPS	288181	2.402	4.567	13.780	3.150	10.039	7.677
8" - TL *	DIP	3 IPS	228312	2.402	4.567	13.780	3.150	10.039	7.677
8"	IPS	4 IPS	228276	3.543	5.512	14.256	4.370	11.220	11.024
10" - 22" - TL *	IPS	2 IPS	228182	1.850	4.291	--	2.205	--	7.874
10" - 20" - TL *	DIP	2 IPS	228182	1.850	4.291	--	2.205	--	7.874
10" - 22" - TL *	IPS	3 IPS	228187	2.402	4.567	--	3.150	--	7.874
10" - 20" - TL *	DIP	3 IPS	228187	2.402	4.567	--	3.150	--	7.874

* FRIATEC Pneumatic Top-loading tool required

FRIATEC Safety Fittings can be fused to all PE pipes within melt index groups 003-050 and Pipe SDR Range 9.33 through 17.6.
For Pipe SDR Range 21+, contact IPEX for reduced fusion times.
PE pipes of different melt index groups can be joined.



SPA Ballon Saddles

Short Designation VA, VA-TL d1./d2...
 Field of Application Installation of service and branch pipes
 Range of Application Gas up to 100 psi and water up to 160 psi
 For higher pressure ranges, contact IPEX at 800-463-9572

FRIATEC Molded Saddle Fittings may be clamped onto pipes up to SDR 9 and sealed using electrofusion. In addition to house connection fittings, FRIATEC Molded Saddle Fittings can also be used as branch saddles for polyethylene relining pipes (U-liners, C-liners, Roll-down)

Benefits include:

- universal compatibility with various diameters of polyethylene pipe from 3" up to 28"
- quick, easy and safe assembly



Nominal Pipe d1 (in)	Main Size d2	Product Code
3"	IPS	228236
4"	IPS	228237
4"	DIP	228301
6"	IPS	228238
6"	DIP	228308
8" - TL *	IPS	228239
10" - 12" TL *	IPS	228241

* FRIATEC Pneumatic Top-loading tool required



SPA Dust Cap

SPA Dust Cap protects against dirt and debris from entering the top portion of the SPA saddle.

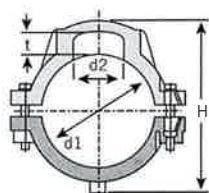
Description	Product Code
Electrofusion Cap for SPA Saddles	228242



FRIATEC Safety fittings can be fused to all PE pipes within melt index groups 003-050 and SDR range 9.33 through 17.6. Assemble nipple, bushing or corporation stop into saddle using red LOCTITE #262 (SSPT) = Straight Standard Pipe Thread. The use of tapered fittings for the outlet is not permitted

REPAIR PATCHES AND CLAMPS

For Pipe Repairs up to 28"



Short Designation VVS / VSC-TL d...

Field of Application Repair of small damage leakage
Reinforcement of "squeeze off" areas and areas with surface damage

Range of Application Gas up to 100 psi and water up to 160 psi
For higher pressure ranges, contact IPEX at 800-463-9572

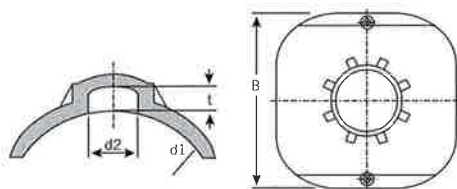
If a pipe is damaged, FRIATEC Repair Patches and Clamps are the quick reliable way to make the repair.

FRIATEC pipe repair systems are both simple to use and effective for pipe repair up to 28". Our repair systems make use of existing FRIATEC technology to seal a pipe puncture.



Repair Clamps - Under saddle

Nominal Pipe	Main Size	Product Code	d1	d2	H	t	Cold Zone Width (Center)
3"	IPS	228175	3.500	1.969	5.827	0.827	2.953"/75mm
4"	IPS	228176	4.500	1.969	6.614	0.827	3.071"/78mm
4"	DIP	228295	4.500	1.969	6.614	0.827	3.071"/78mm
6"	IPS	228177	6.625	1.969	8.583	0.827	3.346"/85mm
6"	DIP	228307	6.625	1.969	8.583	0.827	3.346"/85mm



Repair Patches - Top Loading

Nominal Pipe (in)	Main Size	Product Code	d1	d2	t	B	Cold Zone Width (Center)
8"	IPS *	228178	8.625	1.969	0.827	10.157	3.268"/85mm
8"	DIP *	228310	9.050	1.969	0.827	11.142	3.268"/85mm
10" - 22"	IPS *	228179	10.750 - 28.000	1.969	0.787	7.874	3.307"/83mm
10" - 20"	DIP *		11.100 - 21.600				

* FRIATEC Pneumatic Top-loading tool required (restriction on 28")

FRIATEC Safety Fittings can be fused to all PE pipes within melt index groups 003-050 and Pipe SDR Range 9.33 through 17.6. For Pipe SDR Range 21+, contact IPEX for reduced fusion times.

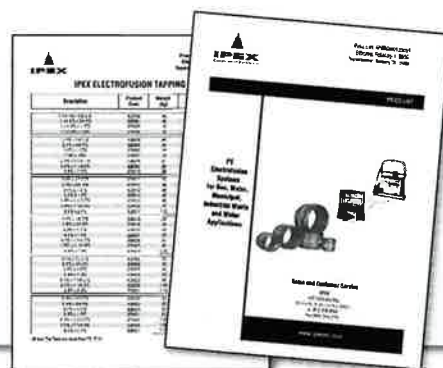
REFERENCE MATERIALS FROM IPEX

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www.ipexamerica.com

About IPEX

IPEX is a leading supplier of thermoplastic piping systems. We provide our customers with one of the 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, 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:

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

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.

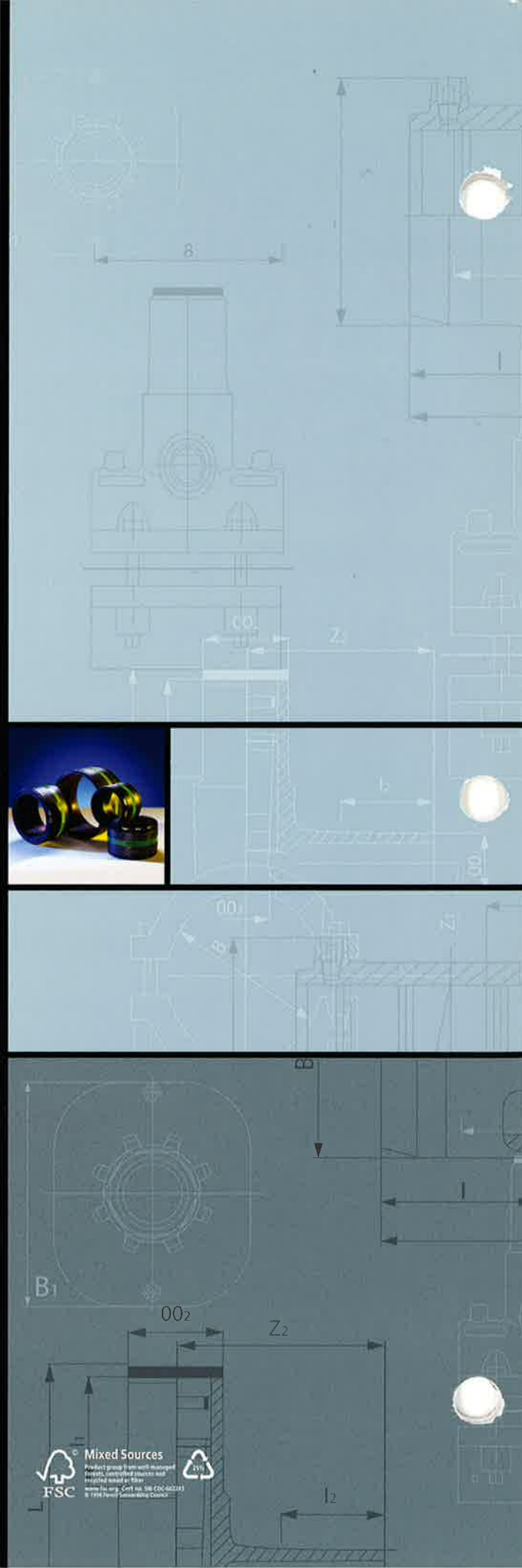
It is agreed and understood that the Company's liability in respect to the sale is strictly limited to the replacement of Products as hereinbefore specified and that the Company shall not, in any event, be liable for any damages whether for the loss of use or business interruption or any other claim 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.



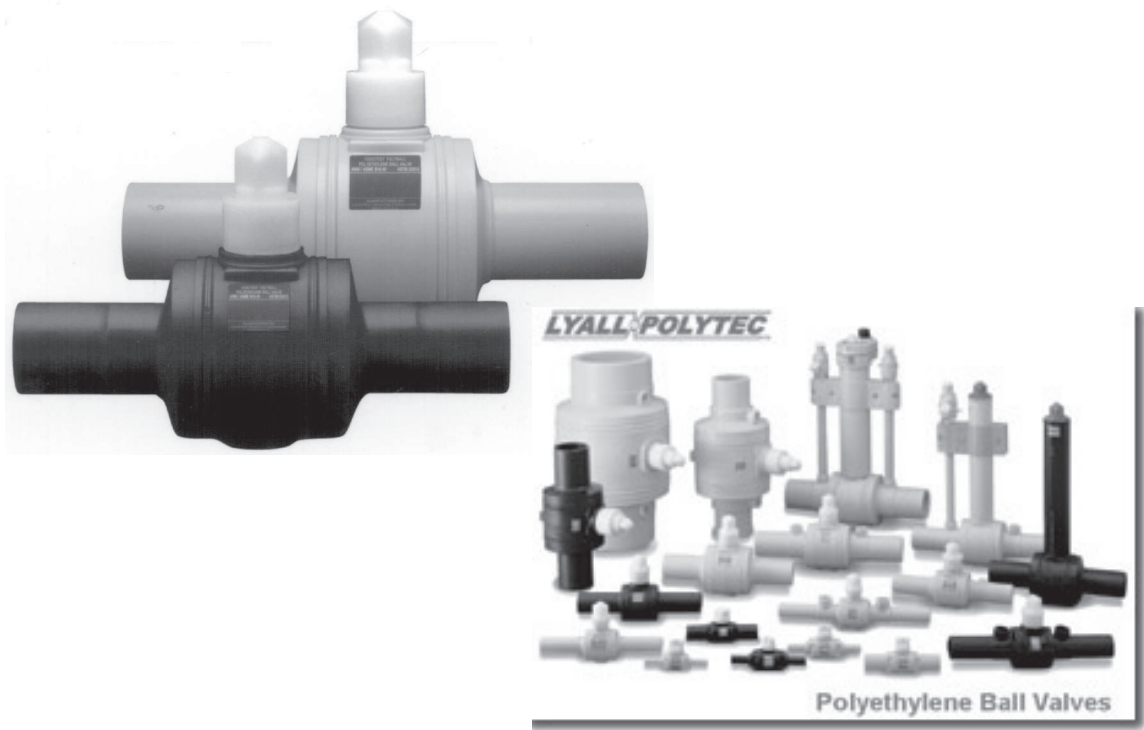
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recycled material in fiber
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Poly Ball Valves & Compression Fittings Design and Information



Full Port Ball Valves

Compression Fittings

P3408 and P2406

COMPRESSION BOLT ON SADDLES



COMPRESSION BOLT ON SADDLES

SIZE	OUTLET SIZE	PSI RAITING	ID DIM	FLANGE DIM	LENGTH DIM	HEIGHT DIM	# OF BOLTS
3/4"	1/2"	160	0.98	3.10	1.93	2.40	2
1"	1/2" - 3/4"	160	1.26	3.10	1.93	2.40	2
1-1/4"	1/2" - 1"	160	1.58	3.40	2.44	2.80	2
1-1/2"	1/2" - 1-1/4"	160	1.85	3.40	2.44	3.23	2
2"	1/2" - 1-1/2"	160	2.27	3.90	2.44	3.78	4
3"	1/2" - 2"	160	3.35	5.40	3.42	4.60	4
4"	1/2" - 2"	160	4.33	5.90	3.89	5.90	4
6"	3/4" - 2"	160	6.35	8.90	4.48	8.46	4
6"	3" - 4"	80	6.35	8.90	5.59	8.74	6
8"	1" - 2"	160	8.46	11.30	5.71	11.29	6
8"	3" - 4"	80	8.46	11.30	6.84	11.61	6
10"	2"	160	CALL	CALL	CALL	CALL	6
10"	3" - 4"	80	CALL	CALL	CALL	CALL	6
12"	2"	160	CALL	CALL	CALL	CALL	6
12"	3" - 4"	80	CALL	CALL	CALL	CALL	6

Technical Notes

Polypropylene Body, UV Stabilized

3/4" to 1/2" Mains, 1/2" to 4" Outlets

Stainless Fasteners

Other sizes not listed are available. Contact your HCFC representative for more information and quote

PerformanceTM Series Compression Fittings and Valves



Reliable Products for:

- IPS (OD) Poly Pipe
- CTS (OD) Poly Pipe
- Metric/NPT Poly Pipe
- Composite Pipe

Approved by leading internationally
recognized testing institutes

The Lateral Connection Corp.

PP Compression Fittings

Performance™ Series

Description

- PP Compression Fittings for PE pressure piping applications.

Range

- IPS (OD) in 1/2" - 4" • Blue body
- CTS (OD) in 3/4" - 2" • Copper body
- METRIC/NPT in 16mm - 110mm • Gray body
- COMPOSITE PIPE in 12/16 - 25/32 • Gray body

Tube

- Connect to certified PE pipe.
- IPS (OD) • For use on SDR 7.3 thru SDR 17.
- CTS (OD) • For use on SDR 9 & SDR 11.

Working pressure

- Pressure rating: 200 PSI @ 73° F (23° C)

Features

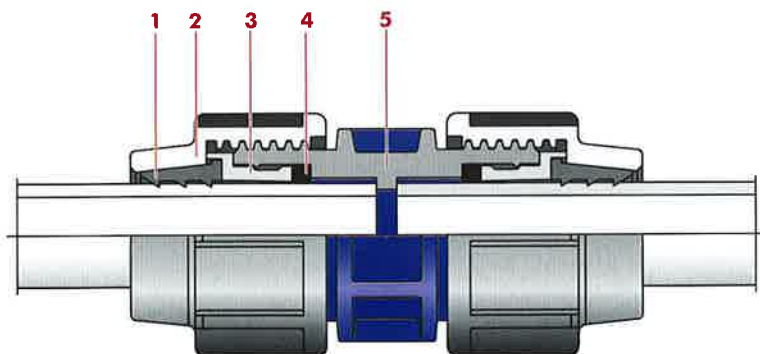
- Ease of installation.
- One source for all your IPS, CTS and Metric needs.
- UV stabilized.
- Extensively used worldwide.
- ISO 9002 certified.

Applications

- Water distribution
- Industrial
- Leachate Collection
- Irrigation
- Many other uses

Specifications

- IPS (OD) • ASTM-F714 / ASTM-D3035 / ASTM-D-1599-99
- CTS (OD) • ASTM-D2737 / ASTM-D1248 / ASTM-D-1599-99
- METRIC/NPT • DIN EN 714/911 / ANSI-B-1.20.1-92
- COMPOSITE PIPE • ASTM-F1282



Parts

N°	Description	Material
1	Split Ring	Acetalic resin POM
2	Nut	Polypropylene PP
3	Pipe Guide	Polypropylene PP
4	O-Ring	Drinking water rubber NBR
5	Body	Polypropylene PP

PP Ball Valves

Performance™ Series

Description

- Polypropylene Ball Valves for PE pressure piping applications.

Range

- IPS (OD) in 1/2" - 2"
- CTS (OD) in 3/4" - 2"
- METRIC/NPT in 16mm - 63mm
- COMPOSITE PIPE in 12/16 - 25/32

Tube

- Connect to certified PE pipe.
- IPS (OD) • For use on SDR 7.3 thru SDR 17.
- CTS (OD) • For use on SDR 9 & SDR 11.

Working pressure

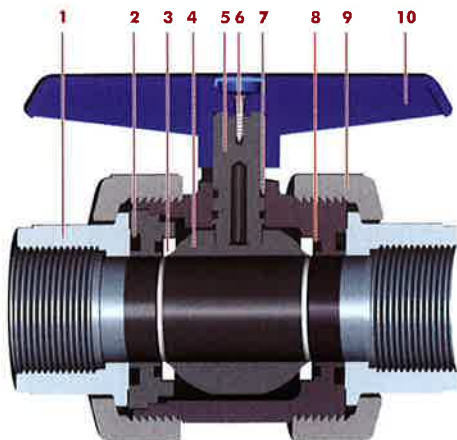
- Pressure rating: 200 PSI @ 73° F (23° C)

Features

- Compression (IPS, CTS & Metric) & Threaded (NPT Male & Female) end connectors available.
- Fully serviceable.
- EPDM O-Rings.
- 100% hydro tested prior to leaving the factory.
- Extremely smooth handle operation.
- UV stabilized.
- Extensively used worldwide.
- ISO 9002 certified.
- Handles available in purple for Reclaim applications.

Applications

- Water distribution
- Reclaim water
- Industrial
- Leachate Collection
- Irrigation
- Many other uses



Parts

N°	Description	Material	N° Req.
1	End Connector	PP	2
2	End Connector O-Ring	EPDM	2
3	Seat	PE	2
4	Ball	PVC	1
5	Stem	PVC	1
6	Fastening Screw	Stainless Steel	1
7	Stem O-Ring	EPDM	2
8	Body O-Ring	EPDM	2
9	Nut	PP	2
10	Handle	PP	1

Curb Stop Valves

Performance™ Series

Description

- Polypropylene Curb Stops for PE pressure piping applications.

Range

- IPS (OD) in 1 1/4", 1 1/2" & 2"
- CTS (OD) in 1 1/4", 1 1/2" & 2"
- METRIC/NPT in 40mm, 50mm & 63mm

Tube

- Connect to certified PE pipe.
- IPS (OD) • For use on SDR 7.3 thru SDR 17.
- CTS (OD) • For use on SDR 9 & SDR 11.

Working pressure

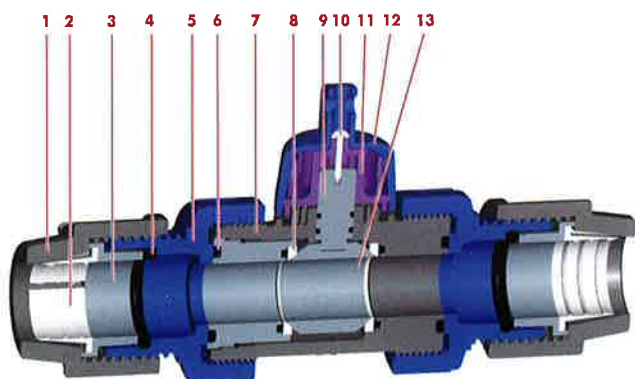
- Pressure rating: 200 PSI @ 73° F (23° C)

Features

- Compression (IPS, CTS & Metric) & Threaded (NPT Male & Female) end connectors available.
- Fast and easy operation in small spaces.
- Inbuilt torque overload protection.
- Fully serviceable.
- EPDM O-Rings.
- 100% hydro tested prior to leaving the factory.
- Extremely smooth handle operation.
- UV stabilized.
- Extensively used worldwide.
- ISO 9002 certified.

Applications

- Water distribution
- Reclaim water
- Industrial
- Leachate Collection
- Irrigation
- Many other uses



Parts

N°	Description	Material	N° Req.
1	Nut	PP	2
2	Split Ring	POM	2
3	Pipe Guide	PP	2
4	O-Ring	EPDM	2
5	Valve Nut	PP	2
6	End Connector O-Ring	EPDM	2
7	Body	PP	1
8	Seat	PE	2
9	Stem	PVC	1
10	Fastening Screw	Stainless Steel	1
11	Handle Inner	POM	1
12	Handle Outer	POM	1
13	Ball	PVC	1

Range

Comp x Comp



90° Tee



Coupling & Adapter



End cap



Comp x Female thread



Comp x Male thread



Comp x Reducing comp.



Installation Instructions

Standard Installation #1



Cut pipe square with pipe cutters.
Chamfer the pipe with the beveler tool.
Apply neutral lubricant on the pipe.



Slacken the ring nut without removing from the body. Check that O-ring and clip ring are in proper position.



Insert the pipe end without tightening the ring nut.
Push the fitting until the pipe oversteps the O-ring and reaches the stop.



Hand tighten the ring nut then tighten further with a strap / chain wrench.

Standard Installation #2



Cut pipe square with pipe cutters.
After preparing pipe ends, unscrew the fitting. Then, remove all internal components: the ring nut, the clip ring, the packing presser bush and the O-ring.



Push the pipe into the fittings until it reaches the stop. Insert the O-ring and position the same by inserting the packing-presser bush.



Displace the clip ring onto the pipe as shown in picture C.



Slide the ring nut over the clip ring and tighten with a strap/chain wrench in order to complete the assembly.

Tools

We recommend these tools for proper installation:



Beveler



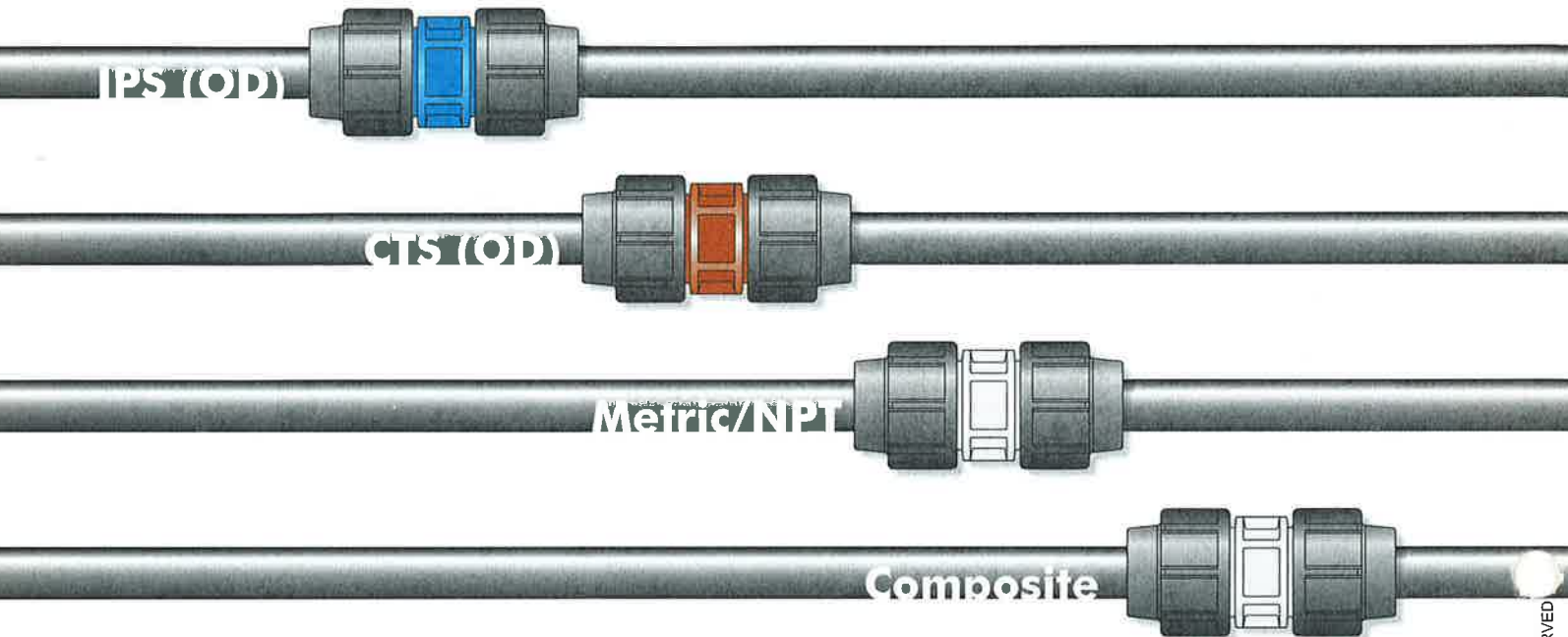
Strap wrench



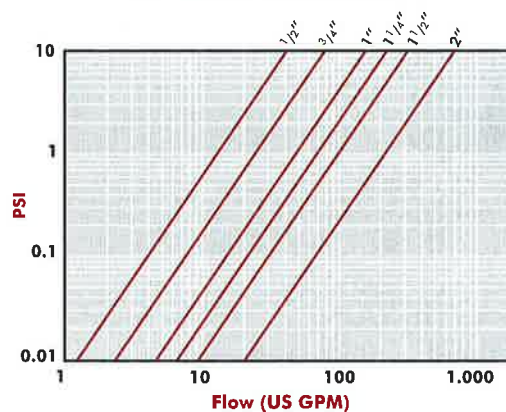
PP-PE Pipe cutters

The Lateral Connection Corp.

Tap into the source...



Ball Valves Pressure Loss



Local distributor:

Cepex Fittings & Valves are manufactured by Cepex Holding, S.A. and Internationally Distributed by THE LATERAL CONNECTION CORP.

The Lateral Connection Corp
www.lateralconnection.com

Canada:
27576 - 51A Ave • Langley, BC • V4W 4A9
Phone: 604-856-7253 / 1-800-993-2599
Fax: 604-856-7260 / 1-888-302-7199

U.S.:
PO Box 67 • Tallmadge, OH 44278
Toll Free Phone: 1-866-926-0187
Toll Free Fax: 1-866-926-0472



ISO 9001:2000

NSF



PP COMPRESSION FITTINGS AND VALVES FOR PE PIPES
ACCESORIOS DE PP A COMPRESIÓN Y VÁLVULAS PARA TUBERÍAS DE PE

IPS PIPING

CTS TUBING

UNIVERSAL

NSF International

RECOGNIZES

SOCIEDAD DE TRANSFORMACIÓN DE
PLÁSTICOS S. A. (S.T.P)
SPAIN

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



This certificate is the property of NSF International and must be retained upon request. For the most current and complete information, please access NSF's website (www.nsf.org).

May 28, 2004
Certificate# 11260 - 01

David Perkos, General Manager
Water Distribution Systems

U.S.A. NSF approved N° 11260 01



**FloPlast
Compression
Fittings LP**

 American Water Works Association
The Authoritative Resource on Safe Water™

 American Water Works Association
The Authoritative Resource on Safe Water™

**We are pleased to announce
FloPlast Compression Fittings
meet all requirement for
mechanical fittings as outlined in
AWWA C-901 for sizes 1/2" up to 3"
AWWA C906-90 for sizes 4" and larger**

FloPlast meets all requirements for mechanical fittings C-901 and C906-90

FloPlast rating is 232PSI for all fittings offered

FloPlast maximum temperature is 176°F at 232PSI

FloPlast tests show fitting assembly cannot be pulled apart in accordance with ISO 3501

FloPlast fittings install in minutes resulting in labor and equipment cost savings.

FloPlast fittings can be used in new installation or in most repair/maintenance situations.

FloPlast products have a 50 year life expectancy

FloPlast application fields are Oil & Gas, Drinkable Water, Waste Water, Salt Water, and Commercial Irrigation, Industrial applications including acid bases, swimming pools, ship installations, and fiber duct pipe.



Other Certifications include



NSF No. 11260 01

ISO 9080 and ISO 12162: Testing of material / MRS (Minimum required strength)

The Polypropylene Copolymer (PP-B) specified for the fitting body is tested in accordance with ISO 9080 and ISO 12162 to determine the MRS value. Verification of long-term behavior.

ISO 12090: Testing of Fittings

When a FloPlast injection-molded fitting body is tested in accordance with ISO 12090 using test Temperature of 68°, 1 hour duration, test pressure of 580PSI up to 2" & 326.6 from 2 1/2"- 4"- and 203° 1000 hrs, test pressure 92.8 psi up to 2" and 58psi from 2 1/2"- 4" No failures (leakage, cracking) in joint area of fitting or pipe during test period.

Meet all requirements for; ISO 3503—Leaktightness when subjected to bending; **ISO 3501** Resistance to Pullout; **ISO3459** Leaktightness under internal vacuum; **ISO1167** Long-term pressure test for leaktightness of assembled joints

901 E Hwy 82

Nocona, TX 76255

Phone: 940-825-3300, 877-356-7527

Fax: 940-825-4075

www.floplastfits.com

FloPlast products are NSF approved.



FloPlast Compression Fittings have every ISO certification applicable to our fittings.

FloPlast products have a 50 year life expectancy

FloPlast rating is 232PSI for all fittings offered

FloPlast tests show fitting assembly cannot be pulled apart in accordance with ISO 3501

FloPlast maximum temperature is 176°F at 232PSI.

FloPlast fittings install in minutes resulting in labor and equipment cost savings.

FloPlast fittings provide simple to understand installation procedures.

FloPlast fittings can be used in new installation or in most repair/maintenance situations.

March 2007

To Whom It May Concern;

We have listed corrections and changes made to the 2006 FloPlast Catalog since it has been printed. Please make note in your catalog of the changes.

Thank You.

FloPlast Compression Fittings Marketing Department

Page 8

000120PVI	1/2" PVC Grip Ring	Added to catalog
000125PVI	3/4" PVC Grip Ring	Added to catalog
000132PVI	1" PVC Grip Ring	Added to catalog
000140PVI	1 1/4" PVC Grip Ring	Added to catalog
000150PVI	1 1/2" PVC Grip Ring	Added to catalog
000163PVI	2" PVC Grip Ring	Added to catalog
000190PVI	3" PVC Grip Ring	Added to catalog
000110PVI	4" PVC Grip Ring	Added to catalog

000163GLV	2" Galvanized Grip Ring	Added to catalog
-----------	-------------------------	------------------

Page 9

702049CTS	1 1/2" – 1" Reducing Coupling	New carton Qty = 18
704050CTS	1 1/2" Male Adapter	New Carton Qty = 22

Page 10

705050CTS	1 1/2" End Cap	New Carton Qty = 24
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Page 11

709050CTS	1 1/2" 90° Tee	New Carton Qty = 6
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Page 12

000514CTS	1/2" EPDM O'Ring	Correct #000520CTS
000529CTS	3/4" EPDM O'Ring	Correct #000525CTS
000534CTS	1" EPDM O'Ring	Correct #000532CTS
000116CTS	1/2" Grip Ring	Correct #000120CTS
000416CTS	1/2" Compression Ring	Correct #000420CTS

Page 13

Rated Pressure: 232 psi at 68° to 4"
 Minimum Temperature Rating: -4°

Page 14

716025IPS	3/8" – 1/2" Universal Transition Coupling	New Carton Qty = 40
-----------	---	---------------------

Page 20

PP compression fittings for repairing or joining any kind of pipes between 15mm or 1/2" to 50mm or 1 1/2".
 (not 2")

Page 21

730109	Universal Repairing Coupling	Correct Sizing is: Universal 1 1/4" – 1 1/2" Universal 1 1/4" – 1 1/2" Carton Qty - 10
--------	------------------------------	---

Page 22

715035

Universal Fitting Kit

Correct size:

Universal 1 1/4"

Universal 1 1/2"

Page 27

140025U

3/8" -1/2" Universal x Universal Compression

New Carton Qty = 28

140032U

1/2" - 1/2 " Universal x Universal Compression

New Carton Qty = 20

140040U

3/4" – 1" Universal x Universal Compression

New Carton Qty = 12

Page 39ASTM Standard D-2513 compliance – **still in testing**



901 E. Hwy 82
Nocona, Texas 76255
Phone: 940-825-3300
Toll Free: 877-FLOPLAST(356-7527)
Fax: 940-825-4075
www.floplastfits.com

FloPlast Compression Fittings: 2007 Unavailable Items
(As items become available FloThru customers will be notified)

Page 4

702090IPS

Page 6

707063IPS
708021IPS
710021IPS

Page 7

711024IPS
714050IPS
714063IPS
714090IPS
714110IPS

Page 9

703022CTS
703027CTS
703033CTS
704021CTS
704024CTS
704026CTS
704033CTS
704049CTS

Page 10

707021CTS
707031CTS
708021CTS
708026CTS

Page 11

710021CTS
710026CTS
711024CTS
713040CTS

Page 14

719032IPS
719040IPS
724220IPS
724221IPS
724226IPS
724233IPS

Page 15

724001IPS
724002IPS
724003IPS
724004IPS
724005IPS
724006IPS
724007IPS
724008IPS
724009IPS
724010IPS
724011IPS
724012IPS
724013IPS
724014IPS
724015IPS
724016IPS
724120IPS
724121IPS
724125IPS
724126IPS
724132IPS
724133IPS

Page 16

720027
721034
721040
721042

Page 17

723132
723133

Page 18

724233CTS

Page 19

724003CTS
724007CTS
724010CTS
724014CTS

Page 21

730201
730202
730203
730204
730304
730305
730405

Page 22

730501
730502
730503
730504

INDEX - ÍNDICE

PP COMPRESSION FITTINGS FOR PE IPS TUBING ACCESORIOS DE PP A COMPRESIÓN PARA TUBERÍAS DE IPS	4
PP COMPRESSION FITTINGS FOR PE CTS TUBING ACCESORIOS DE PP A COMPRESIÓN PARA TUBERÍAS DE CTS	9
COMPRESSION FITTINGS FOR UNIVERSAL TRANSITIONS ACCESORIOS DE COMPRESIÓN PARA TRANSICIONES UNIVERSALES	13
PP COMPRESSION FITTINGS FOR UNIVERSAL REPAIRS ACCESORIOS DE PP ACOMPRESIÓN PARA REPARACIONESS UNIVERSALES	20
TOOLS AND ACCESSORIES LLAVES Y ACCESORIOS	23
COMPRESSION VALVES VÁLVULAS A COMPRESIÓN	24
PP THREADED FITTINGS ACCESORIOS PARA ROSCADO	29
HISTORY OF STP HISTORIA DE STP	30
ISO 1426:2000	31
INSTALLATION INSTRUCTION INSTRUCCIONES DE MONTAJE	34
CERTIFICATIONS CERTIFICACIONES	39

PVC Conversion Rings!!

A FloPlast Exclusive



Convert IPS Fittings
for use with PVC on One End or Both Ends!



Use any IPS Fitting

+



Insert
PVC Grip

Multiple applications with
the same fitting!!!!



Stainless Steel
Teeth!

- Applications for pipe and tubing sizes 3/4" through 4" IPS sizes
- Fittings rated at 232 PSI
- A longitudinal stress of 2200 lbs applied for 1 hr and 5 min.
- Reusable can be used in new installation or in most repair/maintenance situations.
- Application fields are Oil & Gas Distribution, Drinkable Water, Waste Water, and Salt Water, Waterworks. Commercial Irrigation, Industrial Applications including Mining, Plumbing, Acid Bases, Swimming Pools, Ship Installations, and Fiber Duct Pipe.

All Sizes Now In Stock

Item #	Description
000120PVI	.50 (3/4)" Grip Ring PVC Transition-IPS
000125PVI	.75 (3/4)" Grip Ring PVC Transition- IPS
000132PVI	1" Grip Ring PVC Transition-IPS
000140PVI	1.25 (1 1/4)" Grip ring PVC transition-IPS
000150PVI	1.50 (1 1/2)" Grip Ring PVC Transition- IPS
000163PVI	2" Grip Ring PVC Transition-IPS
000190PVI	3" Grip Ring PVC Transition-IPS
000110PVI	4" Grip Ring PVC Transition-IPS



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Nocona, TX 76255
Phone: 877-FLOPLAST
www.floplastfits.com

PVC Grip ring with
inner "stainless
steel" teeth used to
hold PVC pipe!



Proof of strength!
350# Fire Hydrant Suspended
from 2" PVC pipe utilizing
PVC Grip ring connected to
2" PE Pipe In IPS fitting

Multi Application Conversion Ring!!



A FloPlast Exclusive

Convert IPS Fittings

for use with Galvanized, Stainless Steel, Iron or other IPS Pipe
on One End or Both Ends!

The superior 2200 lbs of pullout resistance of the grip ring with a fitting rating of 232 PSI translates into more reliable and longer lasting connections.



Proof of strength!
750# of steel
suspended
from
2" Galvanized
to
2" PVC pipe
to
2" Poly pipe!
utilizing
Galvanized, PVC
and Poly Grip
rings in the same
style fittings!!



Galvanized Grip ring
with inner "steel" teeth used to
hold pipe!

Multiple applications
with the same fitting!!!



Use any IPS Fitting



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+



Insert
Galvanized
Grip Ring

=



Galvanized

Steel

Iron Pipe

Web: www.FloPlastfits.com

PP COMPRESSION FITTINGS FOR PE IPS PIPING

ACCESORIOS DE PP A COMPRESIÓN PARA TUBERÍAS DE PE IPS



SLIP COUPLING MANGUITO DE REPARACIÓN



CODE	PIPE IPS		WEIGHT x BOX LBS	VOLUME x BOX m ³
725063IPS	2"	17	26.08	A 0.074
725090IPS	3"	8	26.20	A 0.074
725110IPS	4"	4	25.36	A 0.074

COUPLING MANGUITO



CODE	PIPE IPS		WEIGHT x BOX LBS	VOLUME x BOX m ³
701020IPS	1/2"	50	7.81	C 0.019
701025IPS	3/4"	40	8.14	C 0.019
701032IPS	1"	25	8.05	C 0.019
701040IPS	1 1/4"	13	7.17	C 0.019
701050IPS	1 1/2"	15	13.40	B 0.037
701063IPS	2"	17	28.69	A 0.074
701090IPS	3"	8	28.82	A 0.074
701110IPS	4"	4	25.37	A 0.074

REDUCING COUPLING MANGUITO REDUCIDO



CODE	PIPE IPS		WEIGHT x BOX LBS	VOLUME x BOX m ³
702025IPS	3/4"-1/2"	45	8.10	C 0.019
702031IPS	1"-1/2"	30	7.19	C 0.019
702032IPS	1"-3/4"	30	7.90	C 0.019
702039IPS	1 1/4"-3/4"	18	7.00	C 0.019
702040IPS	1 1/4"-1"	18	7.88	C 0.019
702049IPS	1 1/2"-1"	22	14.01	B 0.037
702050IPS	1 1/2"-1 1/4"	20	14.43	B 0.037
702062IPS	2"-1 1/4"	20	23.30	A 0.074
702063IPS	2"-1 1/2"	20	26.20	A 0.074
702090IPS	3" - 2"	8	24.50	A 0.074
702110IPS	4" - 3"	5	25.81	A 0.074

FEMALE ADAPTER ENLACE ROSCA HEMBRA



CODE	PIPE IPS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
703020IPS	1/2"	1/2"	90	11.00	C 0.019
703022IPS	1/2"	3/4"	90	12.10	C 0.019
703024IPS	3/4"	1/2"	60	8.45	C 0.019
703025IPS	3/4"	3/4"	60	8.45	C 0.019
703027IPS	3/4"	1"	60	10.56	C 0.019
703031IPS	1"	3/4"	35	7.48	C 0.019
703032IPS	1"	1"	35	7.48	C 0.019
703040IPS	1 1/4"	1 1/4"	22	7.92	C 0.019
703050IPS	1 1/2"	1 1/2"	27	15.27	B 0.037
703063IPS	2"	2"	30	31.77	A 0.074
703090IPS	3"	3"	12	27.48	A 0.074
703110IPS	4"	4"	6	21.91	A 0.074

PP COMPRESSION FITTINGS FOR PE IPS PIPING

ACCESORIOS DE PP A COMPRESIÓN PARA TUBERÍAS DE PE IPS



MALE ADAPTER ENLACE ROSCA MACHO



CODE	PIPE IPS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
704020IPS	1/2"	1/2"	90	7.88	C 0.019
704021IPS	1/2"	3/4"	90	7.85	C 0.019
704024IPS	3/4"	1/2"	60	6.73	C 0.019
704025IPS	3/4"	3/4"	60	6.95	C 0.019
704026IPS	3/4"	1"	60	7.13	C 0.019
704031IPS	1"	3/4"	45	7.83	C 0.019
704032IPS	1"	1"	45	8.18	C 0.019
704040IPS	1 1/4"	1 1/4"	23	7.30	C 0.019
704050IPS	1 1/2"	1 1/2"	30	14.98	B 0.037
704063IPS	2"	2"	34	31.88	A 0.074
704090IPS	3"	3"	12	25.30	A 0.074
704110IPS	4"	4"	6	22.00	A 0.074

END CAP TAPÓN



CODE	PIPE IPS		WEIGHT x BOX LBS	VOLUME x BOX m ³
705020IPS	1/2"	125	10.36	C 0.019
705025IPS	3/4"	75	8.14	C 0.019
705032IPS	1"	50	8.71	C 0.019
705040IPS	1 1/4"	24	7.13	C 0.019
705050IPS	1 1/2"	30	14.43	B 0.037
705063IPS	2"	34	31.31	A 0.074
705090IPS	3"	16	34.12	A 0.074
705110IPS	4"	8	29.33	A 0.074

90° ELBOW CODO 90° IGUAL



CODE	PIPE IPS		WEIGHT x BOX LBS	VOLUME x BOX m ³
706020IPS	1/2"	45	7.88	C 0.019
706025IPS	3/4"	35	7.81	C 0.019
706032IPS	1"	20	7.17	C 0.019
706040IPS	1 1/4"	12	7.48	C 0.019
706050IPS	1 1/2"	12	11.99	B 0.037
706063IPS	2"	14	27.83	A 0.074
706090IPS	3"	6	25.70	A 0.074
706110IPS	4"	3	22.09	A 0.074

90° REDUCING ELBOW CODO 90° REDUCIDO



CODE	PIPE IPS		WEIGHT x BOX LBS	VOLUME x BOX m ³
726025IPS	3/4"-1/2"	35	7.81	C 0.019
726032IPS	1"-3/4"	20	7.17	C 0.019

PP COMPRESSION FITTINGS FOR PE IPS PIPING

ACCESORIOS DE PP A COMPRESIÓN PARA TUBERÍAS DE PE IPS



90° ELBOW WITH THREADED MALE OFFTAKE CODO 90° ROSCA MACHO



CODE	PIPE IPS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
707020IPS	1/2"	1/2"	70	8.23	C 0.019
707021IPS	1/2"	3/4"	70	8.23	C 0.019
707024IPS	3/4"	1/2"	40	6.80	C 0.019
707025IPS	3/4"	3/4"	40	6.25	C 0.019
707031IPS	1"	3/4"	30	8.58	C 0.019
707032IPS	1"	1"	30	8.38	C 0.019
707040IPS	1 1/4"	1 1/4"	15	6.62	C 0.019
707050IPS	1 1/2"	1 1/2"	18	13.73	B 0.037
707063IPS	2"	2"	20	27.90	A 0.074

90° ELBOW WITH THREADED FEMALE OFFTAKE CODO 90° HEMBRA



CODE	PIPE IPS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
708020IPS	1/2"	1/2"	70	8.89	C 0.019
708021IPS	1/2"	3/4"	70	8.89	C 0.019
708024IPS	3/4"	1/2"	40	7.44	C 0.019
708025IPS	3/4"	3/4"	40	6.67	C 0.019
708026IPS	3/4"	1"	30	6.67	C 0.019
708031IPS	1"	3/4"	30	9.33	C 0.019
708032IPS	1"	1"	30	8.18	C 0.019
708040IPS	1 1/4"	1 1/4"	15	6.84	C 0.019
708050IPS	1 1/2"	1 1/2"	18	14.19	B 0.037
708063IPS	2"	2"	20	29.50	A 0.074
708090IPS	3"	3"	8	24.75	A 0.074
708110IPS	4"	4"	4	20.24	A 0.074

90° TEE TE IGUAL



CODE	PIPE IPS		WEIGHT x BOX LBS	VOLUME x BOX m ³
709020IPS	1/2"	30	7.61	C 0.019
709025IPS	3/4"	20	6.49	C 0.019
709032IPS	1"	12	6.34	C 0.019
709040IPS	1 1/4"	6	5.41	C 0.019
709050IPS	1 1/2"	8	11.57	B 0.037
709063IPS	2"	10	28.27	A 0.074
709090IPS	3"	4	25.54	A 0.074
709110IPS	4"	1	10.56	A 0.074

90° TEE WITH THREADED FEMALE OFFTAKE TE 90° DERIVACIÓN HEMBRA



CODE	PIPE IPS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
710020IPS	1/2"	1/2"	40	8.18	C 0.019
710021IPS	1/2"	3/4"	40	8.18	C 0.019
710024IPS	3/4"	1/2"	25	7.17	C 0.019
710025IPS	3/4"	3/4"	25	6.86	C 0.019
710031IPS	1"	3/4"	15	6.97	C 0.019
710032IPS	1"	1"	15	6.53	C 0.019
710040IPS	1 1/4"	1 1/4"	9	6.56	C 0.019
710050IPS	1 1/2"	1 1/2"	10	12.67	B 0.037
710063IPS	2"	2"	11	25.50	A 0.074
710090IPS	3"	3"	4	21.14	A 0.074
710110IPS	4"	4"	2	16.46	A 0.074

PP COMPRESSION FITTINGS FOR PE IPS PIPING

ACCESORIOS DE PP A COMPRESIÓN PARA TUBERÍAS DE PE IPS



PLAST
IPS
PIPING

90° TEE WITH THREADED MALE OFFTAKE TE 90° DERIVACIÓN MACHO



CODE	PIPE IPS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m³
711020IPS	1/2"	1/2"	40	7.99	C 0.019
711024IPS	3/4"	1/2"	30	7.57	C 0.019
711025IPS	3/4"	3/4"	30	7.57	C 0.019
711032IPS	1"	1"	15	6.45	C 0.019
711040IPS	1 1/4"	1 1/4"	9	6.56	C 0.019
711050IPS	1 1/2"	1 1/2"	10	11.99	B 0.037
711063IPS	2"	2"	12	26.71	A 0.074

WALL SUPPORT CODO GRIFO



CODE	PIPE IPS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m³
712020IPS	1/2"	1/2"	50	7.26	C 0.019
712025IPS	3/4"	3/4"	40	7.59	C 0.019

90° REDUCING TEE TE REDUCIDA



CODE	PIPE IPS		WEIGHT x BOX LBS	VOLUME x BOX m³
713025IPS	3/4"-1/2"	20	6.42	C 0.019
713032IPS	1"-3/4"	12	6.05	C 0.019
713040IPS	1 1/4"-1"	8	6.86	C 0.019
713049IPS	1 1/2"-1"	8	11.51	B 0.037
713050IPS	1 1/2"-1 1/4"	8	11.51	B 0.037
713063IPS	2"-1 1/2"	8	20.50	A 0.074

COMPRESSION FLANGE ENLACE BRIDA



CODE	PIPE IPS		WEIGHT x BOX LBS	VOLUME x BOX m³
714050IPS	1 1/2"	10	25.52	B 0.037
714063IPS	2"	18	60.41	A 0.074
714090IPS	3"	8	41.51	A 0.074
714110IPS	4"	6	40.48	A 0.074



IPS

EPDM O'RING JUNTA EPDM



★ NBR Ring Standard

CODE	IPS		WEIGHT x BOX LBS	VOLUME x BOX m ³
000520IPS	1/2"	-	-	-
000525IPS	3/4"	-	-	-
000532IPS	1"	-	-	-
000540IPS	1 1/4"	-	-	-
000550IPS	1 1/2"	-	-	-
000563IPS	2"	-	-	-
* 000590IPS	3"	-	-	-
* 000511IPS	4"	-	-	-

GRIP RING CASQUILLO DE AGARRE



CODE	IPS		WEIGHT x BOX LBS	VOLUME x BOX m ³
000120IPS	1/2"	-	-	-
000125IPS	3/4"	-	-	-
000132IPS	1"	-	-	-
000140IPS	1 1/4"	-	-	-
000150IPS	1 1/2"	-	-	-
000163IPS	2"	-	-	-
000190IPS	3"	-	-	-
000111IPS	4"	-	-	-

COMPRESSION RING ANILLO DE COMPRESIÓN



CODE	IPS		WEIGHT x BOX LBS	VOLUME x BOX m ³
000420IPS	1/2"	-	-	-
000425IPS	3/4"	-	-	-
000432IPS	1"	-	-	-
000440IPS	1 1/4"	-	-	-
000450IPS	1 1/2"	-	-	-
000463IPS	2"	-	-	-
000490IPS	3"	-	-	-
000411IPS	4"	-	-	-

COMPRESSION NUT TUERCA DE COMPRESIÓN



CODE	IPS		WEIGHT x BOX LBS	VOLUME x BOX m ³
000220IPS	1/2"	-	-	-
000225IPS	3/4"	-	-	-
000232IPS	1"	-	-	-
000240IPS	1 1/4"	-	-	-
000250IPS	1 1/2"	-	-	-
000263IPS	2"	-	-	-
000290IPS	3"	-	-	-
000211IPS	4"	-	-	-

They are spare parts. Only available under request. Delivered in bags of 10 units


PP COMPRESSION FITTINGS FOR PE CTS TUBING

ACCESORIOS DE PP A COMPRESIÓN PARA TUBERÍAS DE PE CTS




COUPLING MANGUITO



CODE	PIPE CTS		WEIGHT x BOX LBS	VOLUME x BOX m ³
701020CTS	1/2"	50	7.81	0.019
701025CTS	3/4"	40	8.14	0.019
701032CTS	1"	25	8.05	0.019
701040CTS	1 1/4"	13	7.17	0.019
701050CTS	1 1/2"	13	13.40	0.037
701063CTS	2"	17	28.69	0.074


REDUCING COUPLING MANGUITO REDUCIDO



CODE	PIPE CTS		WEIGHT x BOX LBS	VOLUME x BOX m ³
702025CTS	3/4"-1/2"	45	8.10	0.019
702031CTS	1"-1/2"	30	7.19	0.019
702032CTS	1"-3/4"	30	7.90	0.019
702039CTS	1 1/4"-3/4"	18	7.00	0.019
702040CTS	1 1/4"-1"	18	7.88	0.019
702049CTS	1 1/2"-1"	22	14.01	0.037
702050CTS	1 1/2"-1 1/4"	20	14.43	0.037
702062CTS	2"-1 1/4"	20	23.30	0.074
702063CTS	2"-1 1/2"	20	26.20	0.074


FEMALE ADAPTER ENLACE ROSCA HEMBRA



CODE	PIPE CTS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
703020CTS	1/2"	1/2"	90	11.00	0.019
703022CTS Pending	1/2"	3/4"	90	12.10	0.019
703024CTS	3/4"	1/2"	60	8.45	0.019
703025CTS	3/4"	3/4"	60	8.45	0.019
703027CTS Pending	3/4"	1"	60	10.56	0.019
703031CTS	1"	3/4"	35	7.48	0.019
703032CTS	1"	1"	35	7.48	0.019
703033CTS Pending	1"	1 1/4"	35	7.48	0.019
703040CTS	1 1/4"	1 1/4"	22	7.92	0.019
703050CTS	1 1/2"	1 1/2"	22	15.27	0.037
703063CTS	2"	2"	30	31.77	0.074

MALE ADAPTER ENLACE ROSCA MACHO



CODE	PIPE CTS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
704020CTS	1/2"	1/2"	90	7.88	0.019
704021CTS Pending	1/2"	3/4"	90	7.85	0.019
704024CTS Pending	3/4"	1/2"	60	6.73	0.019
704025CTS	3/4"	3/4"	60	6.95	0.019
704026CTS Pending	3/4"	1"	60	7.13	0.019
704031CTS	1"	3/4"	45	7.83	0.019
704032CTS	1"	1"	45	8.18	0.019
704033CTS Pending	1"	1 1/4"	45	8.56	0.019
704040CTS	1 1/4"	1 1/4"	22	7.30	0.019
704049CTS	1 1/2"	1 1/4"	23	7.63	0.019
704050CTS	1 1/2"	1 1/2"	30	14.98	0.037
704063CTS	2"	2"	34	31.88	0.074

PP COMPRESSION FITTINGS FOR PE CTS TUBING

ACCESORIOS DE PP A COMPRESIÓN PARA TUBERÍAS DE PE CTS



END CAP TAPÓN



CODE	PIPE CTS		WEIGHT x BOX LBS	VOLUME x BOX m ³
705020CTS	1/2"	125	10.36	0.019
705025CTS	3/4"	75	8.14	0.019
705032CTS	1"	50	8.71	0.019
705040CTS	1 1/4"	24	7.13	0.019
705050CTS	1 1/2"	30	14.43	0.037
705063CTS	2"	34	31.31	0.074

90° ELBOW CODO 90° IGUAL



CODE	PIPE CTS		WEIGHT x BOX LBS	VOLUME x BOX m ³
706020CTS	1/2"	45	7.88	0.019
706025CTS	3/4"	35	7.81	0.019
706032CTS	1"	20	7.17	0.019
706040CTS	1 1/4"	12	7.48	0.019
706050CTS	1 1/2"	12	11.99	0.037
706063CTS	2"	14	27.83	0.074

90° REDUCING ELBOW CODO 90° REDUCIDO



CODE	PIPE CTS		WEIGHT x BOX LBS	VOLUME x BOX m ³
726025CTS	3/4"-1/2"	35	7.81	0.019
726032CTS	1"-3/4"	20	7.17	0.019

90° ELBOW WITH THREADED MALE OFFTAKE CODO 90° ROSCA MACHO



CODE	PIPE CTS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
707020CTS	1/2"	1/2"	70	8.23	0.019
707021CTS Pending	1/2"	3/4"	70	8.23	0.019
707024CTS	3/4"	1/2"	40	6.80	0.019
707025CTS	3/4"	3/4"	40	6.25	0.019
707031CTS Pending	1"	3/4"	30	8.58	0.019
707032CTS	1"	1"	30	8.38	0.019
707040CTS	1 1/4"	1 1/4"	15	6.62	0.019
707050CTS	1 1/2"	1 1/2"	18	13.73	0.037
707063CTS	2"	2"	20	27.90	0.074

90° ELBOW WITH THREADED FEMALE OFFTAKE CODO 90° HEMBRA



CODE	PIPE CTS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
708020CTS	1/2"	1/2"	70	8.89	0.019
708021CTS Pending	1/2"	3/4"	70	8.89	0.019
708024CTS	3/4"	1/2"	40	7.44	0.019
708025CTS	3/4"	3/4"	40	6.67	0.019
708026CTS Pending	3/4"	1"	30	6.67	0.019
708031CTS	1"	3/4"	30	9.33	0.019
708032CTS	1"	1"	30	8.18	0.019
708040CTS	1 1/4"	1 1/4"	15	6.84	0.019
708050CTS	1 1/2"	1 1/2"	18	14.19	0.037
708063CTS	2"	2"	20	29.50	0.074

PP COMPRESSION FITTINGS FOR PE CTS TUBING

ACCESORIOS DE PP A COMPRESIÓN PARA TUBERÍAS DE PE CTS



90° TEE TE IGUAL



CODE	PIPE CTS		WEIGHT x BOX LBS	VOLUME x BOX m ³
709020CTS	1/2"	30	7.61	0.019
709025CTS	3/4"	20	6.49	0.019
709032CTS	1"	12	6.34	0.019
709040CTS	1 1/4"	6	5.41	0.019
709050CTS	1 1/2"	8	11.57	0.037
709063CTS	2"	10	28.27	0.074

90° TEE WITH THREADED FEMALE OFFTAKE TE 90° DERIVACIÓN HEMBRA



CODE	PIPE CTS	THREAD NPT	WEIGHT x BOX LBS	VOLUME x BOX m ³
710020CTS	1/2"	1/2"	40	8.18
710021CTS Pending	1/2"	3/4"	40	8.18
710024CTS	3/4"	1/2"	25	7.17
710025CTS	3/4"	3/4"	25	6.86
710026CTS Pending	3/4"	1"	25	6.86
710031CTS	1"	3/4"	15	6.97
710032CTS	1"	1"	15	6.53
710040CTS	1 1/4"	1 1/4"	9	6.56
710050CTS	1 1/2"	1 1/2"	10	12.67
710063CTS	2"	2"	11	25.50

90° TEE WITH THREADED MALE OFFTAKE TE 90° DERIVACIÓN MACHO



CODE	PIPE CTS	THREAD NPT	WEIGHT x BOX LBS	VOLUME x BOX m ³
711020CTS	1/2"	1/2"	40	7.99
711024CTS Pending	3/4"	1/2"	30	7.57
711025CTS	3/4"	3/4"	30	7.57
711032CTS	1"	1"	15	6.45
711040CTS	1 1/4"	1 1/4"	9	6.56
711050CTS	1 1/2"	1 1/2"	10	11.99
711063CTS	2"	2"	12	26.71

WALL SUPPORT CODO GRIFO



CODE	PIPE CTS	THREAD NPT	WEIGHT x BOX LBS	VOLUME x BOX m ³
712020CTS	1/2"	1/2"	50	7.26
712025CTS	3/4"	3/4"	40	7.59

90° REDUCING TEE TE 90° REDUCIDA



CODE	PIPE CTS	WEIGHT x BOX LBS	VOLUME x BOX m ³
713025CTS	3/4"-1/2"	20	6.42
713032CTS	1"-3/4"	12	6.05
713040CTS Pending	1 1/4"-1"	8	6.86
713049CTS	1 1/2"-1"	8	11.51
713050CTS	1 1/2"-1 1/4"	8	11.51
713063CTS	2"-1 1/2"	8	20.50

SPARE PARTS

RECAMBIOS



CTS

EPDM O-RING JUNTA EPDM



CODE	CTS		WEIGHT x BOX LBS	VOLUME x BOX m ³
000514CTS	1/2"	-	-	-
000529CTS	3/4"	-	-	-
000534CTS	1"	-	-	-
000540CTS	1 1/4"	-	-	-
000550CTS	1 1/2"	-	-	-
000563CTS	2"	-	-	-

GRIP RING CASQUILLO DE AGARRE



CODE	CTS		WEIGHT x BOX LBS	VOLUME x BOX m ³
000116CTS	1/2"	-	-	-
000125CTS	3/4"	-	-	-
000132CTS	1"	-	-	-
000140CTS	1 1/4"	-	-	-
000150CTS	1 1/2"	-	-	-
000163CTS	2"	-	-	-

COMPRESSION RING ANILLO DE COMPRESIÓN



CODE	CTS		WEIGHT x BOX LBS	VOLUME x BOX m ³
000416CTS	1/2"	-	-	-
000425CTS	3/4"	-	-	-
000432CTS	1"	-	-	-
000440CTS	1 1/4"	-	-	-
000450CTS	1 1/2"	-	-	-
000463CTS	2"	-	-	-

COMPRESSION NUT TUERCA DE COMPRESIÓN



CODE	CTS		WEIGHT x BOX LBS	VOLUME x BOX m ³
000220CTS	1/2"	-	-	-
000225CTS	3/4"	-	-	-
000232CTS	1"	-	-	-
000240CTS	1 1/4"	-	-	-
000250CTS	1 1/2"	-	-	-
000263CTS	2"	-	-	-

They are spare parts. Only available under request. Delivered in bags of 10 units

PP COMPRESSION FITTINGS FOR UNIVERSAL TRANSITIONS

ACCESORIOS DE PP A COMPRESIÓN PARA TRANSICIONES UNIVERSALES



PP COMPRESSION FITTINGS FOR TRANSITIONS.

Transition from polyethylene pipes in IPS/ CTS sizes

PE

Ø 1/2"

Ø 3/4"

Ø 1"

Ø 1 1/4"

Ø 1 1/2"

Ø 2"

a / to

ACCESORIOS DE PP A COMPRESIÓN PARA TRANSICIONES.

Transición de tuberías de polietileno en medidas IPS/CTS

uPVC
mPVC

Imperial PE

LDPE

MDPE

HDPE

Galvanized
Steel

LEAD

CU

15 mm. 1/2"
to
50mm. 1 1/2"



any metallic or plastic pipe between (15mm(1/2")- 50mm(1 1/2"))

cualquier tubería metálica o de plástico entre (15mm(1/2")- 50mm(1 1/2"))

CHARACTERISTICS • CARACTERÍSTICAS

APPLICATION FIELDS • APLICACIONES

Drinkable water and sewer-systems, any kind of irrigation systems ; fertilizing irrigation included; canalizations for wine, beer, beverages and other alimentary fluids; industrial equipment for acid base, salts; swimming pools with fresh or sea water, ship installations mining. oil & gas piping and fiber duct pipe.

Cometidas de agua potable, tomas de abonado, instalaciones de riego, jardinería, agricultura, depuración de aguas, minería, piscinas. industria, telecomunicaciones. Instalaciones para petróleo, gas y fibra óptica.

MATERIALS • MATERIALES

Body and nut: Polypropylene.
O-Ring: EPDM.
Clenching ring: Polyacetal Resin.
Metal reinforcements: Stainless steel.

Cuerpo y tuercas: Polipropileno.
Bicono de agarre: Resina acetálica.
Juntas tóricas: EPDM.
Refuerzos metálicos: Acero inoxidable.

WORKING CONDITIONS • CONDICIONES DE TRABAJO

Maximum temperature: 176°F
Rated Pressure: 232 psi at 68°F up to Ø2"
145 psi at 68°F from Ø2 1/2" to Ø4"

Temperatura máxima: 80 °C
Presión nominal: 232 psi a 68°F hasta Ø2"
145 psi a 68°F a partir de Ø2 1/2" hasta Ø4"

PP COMPRESSION FITTINGS FOR UNIVERSAL TRANSITIONS

ACCESORIOS DE PP A COMPRESIÓN PARA TRANSICIONES UNIVERSALES



UNIVERSAL TRANSITION COUPLING MANGUITO TRANSICIÓN UNIVERSAL



CODE	UNIVERSAL	PIPE IPS		WEIGHT x BOX LBS	VOLUME x BOX m ³
716020IPS	3/8" - 1/2"	1/2"	45	10.23	C 0.019
716025IPS	3/8" - 1/2"	3/4"	45	10.03	C 0.019
716032IPS	3/8" - 1/2"	1"	40	9.88	C 0.019
716040IPS	3/8" - 1/2"	1 1/4"	30	9.20	C 0.019
717020IPS	1/2" - 3/4"	1/2"	30	8.69	C 0.019
717025IPS	1/2" - 3/4"	3/4"	30	9.37	C 0.019
717032IPS	1/2" - 3/4"	1"	25	9.28	C 0.019
717040IPS	1/2" - 3/4"	1 1/4"	18	8.76	C 0.019
717050IPS	1/2" - 3/4"	1 1/2"	18	-	C 0.019
718025IPS	3/4" - 1"	3/4"	18	8.71	C 0.019
718032IPS	3/4" - 1"	1"	18	9.59	C 0.019
718040IPS	3/4" - 1"	1 1/4"	15	9.72	C 0.019
718050IPS	3/4" - 1"	1 1/2"	10	8.16	C 0.019
718063IPS	3/4" - 1"	2"	10	12.01	B 0.019
719032IPS	1" - 1 1/2"	1"	18	11.46	B 0.037
719040IPS	1" - 1 1/2"	1 1/4"	16	11.55	B 0.037
719050IPS	1" - 1 1/2"	1 1/2"	12	10.71	B 0.037
719063IPS	1" - 1 1/2"	2"	18	23.58	A 0.074

UNIVERSAL TRANSITION 90° ELBOW CODO 90° TRANSICIÓN UNIVERSAL



CODE	UNIVERSAL	PIPE IPS		WEIGHT x BOX LBS	VOLUME x BOX m ³
723020IPS	3/8" - 1/2"	1/2"	35	6.49	C 0.019
723021IPS	3/8" - 1/2"	3/4"	35	7.81	C 0.019
723025IPS	1/2" - 3/4"	3/4"	20	6.42	C 0.019
723026IPS	1/2" - 3/4"	1"	20	7.17	C 0.019
723033IPS	3/4" - 1"	1 1/4"	12	7.48	C 0.019
723041IPS	1" - 1 1/2"	1 1/2"	6	7.48	C 0.019

UNIVERSAL TRANSITION MALE TEE TE MACHO DE TRANSICIÓN UNIVERSAL



CODE	UNIVERSAL	PIPE IPS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
724220IPS	3/8" - 1/2"	3/4"	1/2"	40	8.18	C 0.019
724221IPS	3/8" - 1/2"	3/4"	3/4"	40	8.18	C 0.019
724226IPS	1/2" - 3/4"	1"	1"	15	6.91	C 0.019
724233IPS	3/4" - 1"	1 1/4"	1 1/4"	15	6.91	C 0.019

UNIVERSAL TRANSITION FEMALE TEE
TE HEMBRA DE TRANSICIÓN UNIVERSAL



CODE	UNIVERSAL	PIPE IPS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
724120IPS	3/8" - 1/2"	3/4"	1/2"	40	8.18	C 0.019
724121IPS	3/8" - 1/2"	3/4"	3/4"	25	6.86	C 0.019
724125IPS	1/2" - 3/4"	1"	3/4"	25	6.86	C 0.019
724126IPS	1/2" - 3/4"	1"	1"	15	6.53	C 0.019
724132IPS	3/4" - 1"	1 1/4"	1"	15	6.53	C 0.019
724133IPS	3/4" - 1"	1 1/4"	1 1/4"	15	6.53	C 0.019


UNIVERSAL TRANSITION 90° TEE
TE 90° TRANSICIÓN UNIVERSAL



CODE	UNIVERSAL	UNIVERSAL	PIPE IPS	PIPE IPS		WEIGHT x BOX LBS	VOLUME x BOX m ³
724001IPS	3/8" - 1/2"		3/4"	3/4"	30	7.61	C 0.019
724002IPS	3/8" - 1/2"	3/8" - 1/2"	3/4"		30	7.61	C 0.019
724003IPS	3/8" - 1/2"		1/2"	3/4"	30	7.61	C 0.019
724004IPS	3/8" - 1/2"	3/8" - 1/2"	1/2"		30	7.61	C 0.019
724005IPS	1/2" - 3/4"		1"	1"	12	6.34	C 0.019
724006IPS	1/2" - 3/4"	1/2" - 3/4"	1"		12	6.34	C 0.019
724007IPS	1/2" - 3/4"		3/4"	1"	12	6.34	C 0.019
724008IPS	1/2" - 3/4"	1/2" - 3/4"	3/4"		12	6.34	C 0.019
724009IPS	1/2" - 3/4"	3/8" - 1/2"	1"		12	6.34	C 0.019
724010IPS	3/8" - 1/2"		1"	1"	6	5.41	C 0.019
724011IPS	3/4" - 1"		1 1/4"	1 1/4"	6	5.41	C 0.019
724012IPS	3/4" - 1"		1 1/4"	1 1/4"	6	5.41	C 0.019
724013IPS	3/4" - 1"		1"	1 1/4"	6	5.41	C 0.019
724014IPS	3/4" - 1"	3/4" - 1"	1"		6	5.41	C 0.019
724015IPS	3/4" - 1"	1/2" - 3/4"	1 1/4"		6	5.41	C 0.019
724016IPS	1/2" - 3/4"		1 1/4"	1 1/4"	6	5.41	C 0.019


UNIVERSAL TRANSITION FEMALE ADAPTER
ENLACE ROSCA HEMBRA
TRANSICIÓN UNIVERSAL



CODE	UNIVERSAL	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
720020	3/8"-1/2"	1/2"	60	8.80	C 0.019
720021	3/8"-1/2"	3/4"	60	10.51	C 0.019
720022	3/8"-1/2"	1"	60	11.48	C 0.019
720025	1/2"-3/4"	3/4"	35	9.65	C 0.019
720026	1/2"-3/4"	1"	35	10.09	C 0.019
720027	1/2"-3/4"	1 1/4"	35	10.62	C 0.019
720032	3/4"-1"	1"	25	12.16	C 0.019
720033	3/4"-1"	1 1/4"	22	10.84	C 0.019
720041	1 1/2"-1"	1 1/2"	25	12.54	B 0.037


UNIVERSAL TRANSITION MALE ADAPTER
ENLACE ROSCA MACHO
TRANSICIÓN UNIVERSAL



CODE	UNIVERSAL	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
721020	3/8"-1/2"	1/2"	60	9.90	C 0.019
721021	3/8"-1/2"	3/4"	60	9.52	C 0.019
721022	3/8"-1/2"	1"	60	10.16	C 0.019
721025	1/2"-3/4"	3/4"	35	7.83	C 0.019
721026	1/2"-3/4"	1"	45	10.80	C 0.019
721027	1/2"-3/4"	1 1/4"	45	11.00	C 0.019
721032	3/4"-1"	1"	25	10.40	C 0.019
721033	3/4"-1"	1 1/4"	23	9.65	C 0.019
721034	3/4"-1"	1 1/2"	22	9.35	C 0.019
721040	1"-1 1/2"	1 1/4"	25	12.10	B 0.037
721041	1"-1 1/2"	1 1/2"	25	12.49	B 0.037
721042	1"-1 1/2"	2"	25	12.49	B 0.037


90° ELBOW FEMALE THREADED
UNIVERSAL TRANSITION
CODO 90° HEMBRA
TRANSICIÓN UNIVERSAL



CODE	UNIVERSAL	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
723220	3/8"-1/2"	1/2"	40	7.43	C 0.019
723221	3/8"-1/2"	3/4"	40	8.40	C 0.019
723225	1/2"-3/4"	3/4"	30	10.80	C 0.019
723226	1/2"-3/4"	1"	30	10.89	C 0.019
723232	3/4"-1"	1"	15	7.67	C 0.019
723233	3/4"-1"	1 1/4"	15	6.84	C 0.019
723241	1"-1 1/2"	1 1/2"	18	31.21	C 0.019


**90° ELBOW MALE THREADED
UNIVERSAL TRANSITION
CODO 90° MACHO
TRANSICIÓN UNIVERSAL**



CODE	UNIVERSAL	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m³
723120	3/8"-1/2"	1/2"	40	7.74	C 0.019
723121	3/8"-1/2"	3/4"	40	7.96	C 0.019
723125	1/2"-3/4"	3/4"	30	8.58	C 0.019
723126	1/2"-3/4"	1"	30	8.38	C 0.019
723132	3/4"-1"	1"	15	6.53	C 0.019
723133	3/4"-1"	1 1/4"	15	6.62	C 0.019


**UNIVERSAL END CAP
TAPÓN UNIVERSAL**



CODE	UNIVERSAL	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m³
722020	3/8"-1/2"	1/2"	75	8.14	C 0.019
722025	1/2"-3/4"	3/4"	50	8.71	C 0.019
722032	3/4"-1"	1"	24	7.12	C 0.019
722040	1"-1 1/2"	1 1/2"	24	11.55	B 0.037

**UNIVERSAL WALL SUPPORT
CODO GRIFO UNIVERSAL**



CODE	UNIVERSAL	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m³
722121	3/8"-1/2"	3/4"	50	7.26	C 0.019

**TRANSITION CU.FE.PVC
(TRANSITION RUBBER)
TRANSICIÓN CU.FE.PVC
(GOMA TRANSICION)**



CODE	UNIVERSAL		WEIGHT x BOX LBS	VOLUME x BOX m³
000715	3/8"	100	10.00	C 0.007
000721	1/2"	75	8.25	C 0.007



PLAST
CTS
TUBING

UNIVERSAL TRANSITION COUPLING
MANGUITO TRANSICIÓN UNIVERSAL



CODE	UNIVERSAL	PIPE CTS		WEIGHT x BOX LBS	VOLUME x BOX m³
716020CTS	3/8" - 1/2"	1/2"	45	10.23	C 0,019
716025CTS	3/8" - 1/2"	3/4"	45	10.03	C 0,019
716032CTS	3/8" - 1/2"	1"	40	9.88	C 0,019
717020CTS	1/2" - 3/4"	1/2"	30	8.69	C 0,019
717025CTS	1/2" - 3/4"	3/4"	30	9.37	C 0,019
717032CTS	1/2" - 3/4"	1"	25	9.28	C 0,019
718025CTS	3/4" - 1"	3/4"	18	8.71	C 0,019
718032CTS	3/4" - 1"	1"	18	9.59	C 0,019
719032CTS	1" - 1 1/2"	1"	18	5.21	B 0,036

UNIVERSAL TRANSITION 90° ELBOW
CODO 90° TRANSICIÓN UNIVERSAL



CODE	UNIVERSAL	PIPE CTS		WEIGHT x BOX LBS	VOLUME x BOX m³
723020CTS	3/8" - 1/2"	1/2"	35	6.49	C 0.019
723021CTS	3/8" - 1/2"	3/4"	35	7.81	C 0.019
723025CTS	1/2" - 3/4"	3/4"	20	6.42	C 0.019
723026CTS	1/2" - 3/4"	1"	20	7.17	C 0.019


UNIVERSAL TRANSITION MALE TEE
TE MACHO DE TRANSICIÓN UNIVERSAL



CODE	UNIVERSAL	PIPE CTS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m³
724220CTS	3/8" - 1/2"	3/4"	1/2"	40	8.18	C 0.019
724221CTS	3/8" - 1/2"	3/4"	3/4"	40	8.18	C 0.019
724226CTS	1/2" - 3/4"	1"	1"	15	6.91	C 0.019
724233CTS	3/4" - 1"	1 1/4"	1 1/4"	15	6.91	C 0.019


UNIVERSAL TRANSITION FEMALE TEE
TE HEMBRA DE TRANSICIÓN UNIVERSAL



CODE	UNIVERSAL	PIPE CTS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
724120CTS	3/8" - 1/2"	3/4"	1/2"	40	8.18	C 0.019
724121CTS	3/8" - 1/2"	3/4"	3/4"	25	6.86	C 0.019
724125CTS	1/2" - 3/4"	1"	3/4"	25	6.86	C 0.019
724126CTS	1/2" - 3/4"	1"	1"	15	6.53	C 0.019

UNIVERSAL TRANSITION 90° TEE
TE 90° TRANSICIÓN UNIVERSAL



CODE	UNIVERSAL	UNIVERSAL	PIPE CTS	PIPE CTS		WEIGHT x BOX LBS	VOLUME x BOX m ³
724001CTS	3/8" - 1/2"		3/4"-3/4"	3/4"	30	6.34	C 0.019
724002CTS	3/8" - 1/2"	3/8" - 1/2"	3/4"		30	6.34	C 0.019
724003CTS	3/8" - 1/2"		1/2"-3/4"	3/4"	30	6.34	C 0.019
724004CTS	3/8" - 1/2"	3/8" - 1/2"	1/2"		30	6.34	C 0.019
724005CTS	1/2" - 3/4"		1"-1"	1"	12	6.34	C 0.019
724006CTS	1/2" - 3/4"	1/2" - 3/4"	1"		12	6.34	C 0.019
724007CTS	1/2" - 3/4"		3/4"-1"	1"	12	6.34	C 0.019
724008CTS	1/2" - 3/4"	1/2" - 3/4"	3/4"		12	6.34	C 0.019
724009CTS	1/2" - 3/4"	1/2" - 3/4"	1"		12	6.34	C 0.019
724010CTS	3/8" - 1/2"		1"-1"		6	5.41	C 0.019
724014CTS	1" - 1 1/2"	1" - 1 1/2"	1"	1"	6	5.41	C 0.019

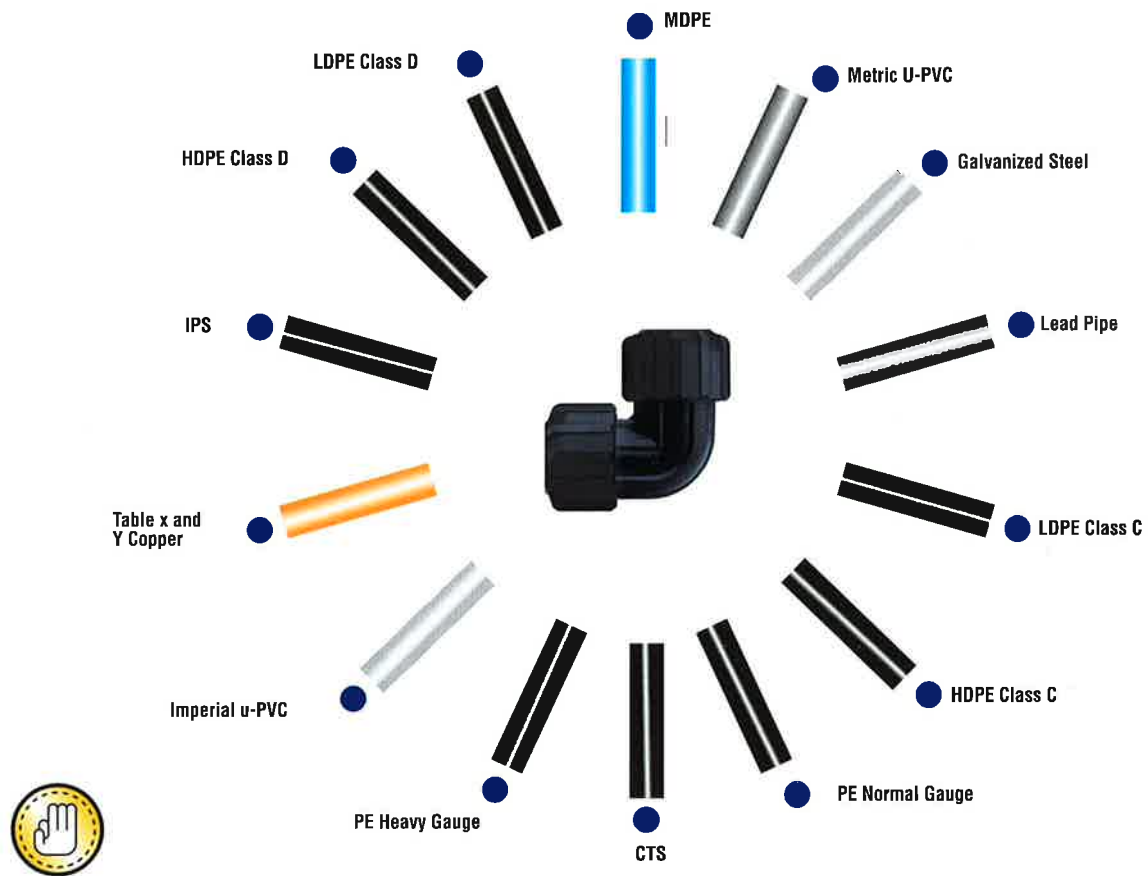
PP COMPRESSION FITTINGS FOR UNIVERSAL REPAIRS

ACCESORIOS DE PP A COMPRESIÓN PARA REPARACIONES UNIVERSALES



PP compression fittings for repairing or joining any kind of pipes between 15mm or 1/2" and 50mm or 2"

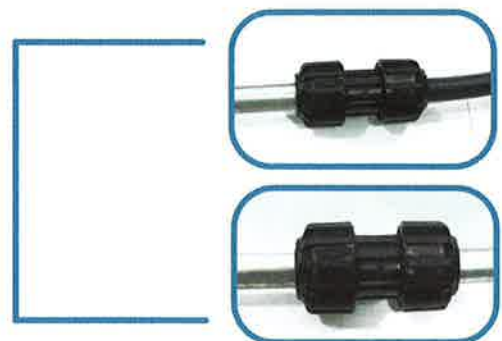
Accesorios de PP a compresión para reparaciones mediante unión de cualquier tubería entre 15mm o 1/2" y 50mm o 1 1/2" sea del material que sea.



Perfect for solving problems with imagination.

Ideal para solucionar problemas con ingenio.

Leak repair with R-Plast fittings



End pipe adjustment with a R-Plast valve



PP COMPRESSION FITTINGS FOR UNIVERSAL REPAIRS

ACCESORIOS DE PP A COMPRESIÓN PARA REPARACIONES UNIVERSALES



UNIVERSAL REPAIRING COUPLING MANGUITO REPARACIÓN UNIVERSAL



CODE	UNIVERSAL	UNIVERSAL		WEIGHT x BOX LBS	VOLUME x BOX m ³
730101	3/8" - 1/2"	3/8" - 1/2"	34	10.25	C 0.019
730102	3/8" - 1/2"	1/2" - 3/4"	25	7.26	C 0.019
730103	3/8" - 1/2"	3/4" - 1"	16	8.69	C 0.019
730104	1/2" - 3/4"	1/2" - 3/4"	24	10.09	C 0.019
730105	1/2" - 3/4"	3/4" - 1"	15	9.15	C 0.019
730106	1/2" - 3/4"	1" - 1 1/2"	10	6.38	C 0.019
730107	3/4" - 1"	3/4" - 1"	12	9.13	C 0.019
730108	3/4" - 1"	1 - 1 1/2"	9	7.54	C 0.019
730109	1 - 1 1/2"	1" - 1 1/2"	8	7.54	C 0.019

90° UNIVERSAL REPAIRING ELBOW CODO 90° REPARACIÓN UNIVERSAL



CODE	UNIVERSAL	UNIVERSAL		WEIGHT x BOX LBS	VOLUME x BOX m ³
730201	3/8" - 1/2"	3/8" - 1/2"	30	9.28	C 0.019
730202	3/8" - 1/2"	1/2" - 3/4"	20	8.84	C 0.019
730203	1/2" - 3/4"	1/2" - 3/4"	20	9.15	C 0.019
730204	3/4" - 1"	3/4" - 1"	10	8.31	C 0.019

90° UNIVERSAL REPAIRING TEE TE 90° REPARACIÓN UNIVERSAL



CODE	UNIVERSAL	UNIVERSAL	UNIVERSAL		WEIGHT x BOX LBS	VOLUME x BOX m ³
730301	3/8" - 1/2"	3/8" - 1/2"	3/8" - 1/2"	20	9.37	C 0.019
730302	1/2" - 3/4"	3/8" - 1/2"	1/2" - 3/4"	12	8.07	C 0.019
730303	1/2" - 3/4"	1/2" - 3/4"	1/2" - 3/4"	12	8.42	C 0.019
730304	3/4" - 1"	1/2" - 3/4"	3/4" - 1"	6	6.82	C 0.019
730305	3/4" - 1"	3/4" - 1"	3/4" - 1"	6	7.26	C 0.019


UNIVERSAL REPAIRING FEMALE TEE TE HEMBRA REPARACIÓN UNIVERSAL



CODE	UNIVERSAL	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
730401	3/8" - 1/2"	1/2"	25	9.68	C 0.019
730402	3/8" - 1/2"	3/4"	25	9.30	C 0.019
730403	1/2" - 3/4"	3/4"	15	8.84	C 0.019
730404	1/2" - 3/4"	1"	15	8.42	C 0.019
730405	3/4" - 1"	1"	9	8.49	C 0.019
730406	3/4" - 1"	1 1/4"	9	8.44	C 0.019

UNIVERSAL REPAIRING MALE TEE
TE MACHO REPARACIÓN UNIVERSAL




CODE	UNIVERSAL	UNIVERSAL	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m³
730501	3/8"	1/2"	1/2"	25	8.80	C 0.019
730502	3/8"	1/2"	3/4"	25	8.75	C 0.019
730503	1/2"	3/4"	1"	15	8.25	C 0.019
730504	3/4"	1"	1 1/4"	9	8.36	C 0.019

SPARE PARTS

RECAMBIOS

UNIVERSAL FITTING KIT
KIT ACCESORIO UNIVERSAL



CODE	UNIVERSAL	UNIVERSAL	UNIVERSAL		WEIGHT x BOX LBS	VOLUME x BOX m³
715015	3/8"	1/2"	1/2"	1	0.11	C 0.019
715021	1/2"	3/4"		1	0.17	C 0.019
715027	3/4"	1"		1	0.28	C 0.019
715035	1"	1 1/2"		10	2.60	C 0.019



SMALL WRENCH
LLAVE PEQUEÑA



CODE	DIAMETER		WEIGHT x BOX LBS	VOLUME x BOX m ³
776001	1/2" - 1"	50	11.79	C 0.019

LARGE WRENCH
LLAVE GRANDE



CODE	DIAMETER		WEIGHT x BOX LBS	VOLUME x BOX m ³
776002	1 1/4" - 2"	50	20.53	B 0.037

DOUBLE WRENCH
LLAVE DOBLE



CODE	DIAMETER		WEIGHT x BOX LBS	VOLUME x BOX m ³
776003	1/2" - 2"	50	20.04	B 0.037

METALLIC WRENCH
LLAVE METÁLICA



CODE	DIAMETER		WEIGHT x BOX LBS	VOLUME x BOX m ³
776004	1 1/4" - 4"	10	20.04	B 0.037

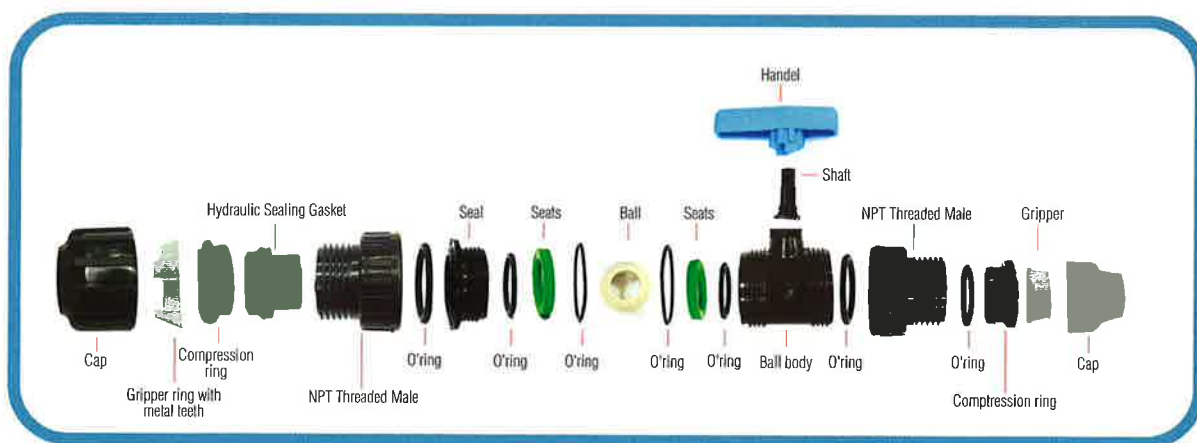
PP COMPRESSION VALVES

VÁLVULAS DE PP A COMPRESIÓN



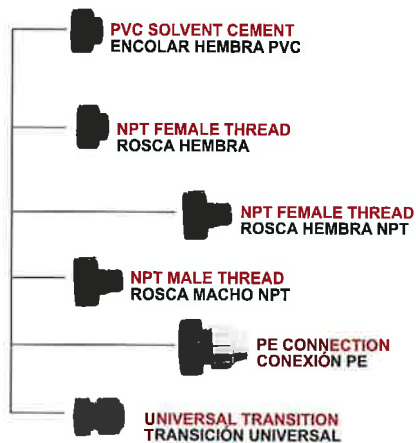
VALVES COMPONENTS

DESPIECE VÁLVULA



PPB VALVE COMPONENTS

DESPIECE VÁLVULA PPB



**PE-PE COMPRESSION
COMPRESIÓN PE-PE**



CODE	PIPE IPS		WEIGHT x BOX LBS	VOLUME x BOX m³
141020CI	1/2"	75	0.66	0.036
141025CI	3/4"	32	0.73	0.036
141032CI	1"	28	0.79	0.036
141040CI	1 1/4"	12	1.58	0.036
141050CI	1 1/2"	12	1.71	0.036
141063CI	2"	5	2.64	0.036

**PE COMPRESSION x FEMALE NPT THREAD
COMPRESIÓN PE x ROSCA HEMBRA NPT**



CODE	PIPE IPS	THREAD NPT	WEIGHT x BOX LBS	VOLUME x BOX m³
140020CXI	1/2"	1/2"	75	0.60
140025CXI	3/4"	3/4"	35	0.68
140032CXI	1"	1"	30	0.72
140040CXI	1 1/4"	1 1/4"	15	1.45
140050CXI	1 1/2"	1 1/2"	15	1.57
140063CXI	2"	2"	5	2.42

**PE COMPRESSION x MALE NPT THREAD
COMPRESIÓN PE x ROSCA MACHO NPT**



CODE	PIPE IPS	THREAD NPT	WEIGHT x BOX LBS	VOLUME x BOX m³
142020CI	1/2"	1/2"	75	0.60
142025CI	3/4"	3/4"	35	0.68
142032CI	1"	1"	30	0.72
142040CI	1 1/4"	1 1/4"	15	1.45
142050CI	1 1/2"	1 1/2"	15	1.57
142063CI	2"	2"	15	2.42

**PE COMPRESSION x FEMALE NPT THREAD
COMPRESIÓN PE x ROSCA HEMBRA NPT**



CODE	PIPE IPS	THREAD NPT	WEIGHT x BOX LBS	VOLUME x BOX m³
146020CFI	1/2"	1/2"	120	0.60
146025CFI	3/4"	3/4"	45	0.68
146032CFI	1"	1"	40	0.72
146040CFI	1 1/4"	1 1/4"	18	1.45
146050CFI	1 1/2"	1 1/2"	16	1.57
146063CFI	2"	2"	9	2.42

**PE COMPRESSION x MALE NPT THREAD
COMPRESIÓN PE x ROSCA MACHO NPT**



CODE	PIPE IPS	THREAD NPT	WEIGHT x BOX LBS	VOLUME x BOX m³
147020CMI	1/2"	1/2"	120	0.60
147025CMI	3/4"	3/4"	45	0.68
147032CMI	1"	1"	40	0.72
147040CMI	1 1/4"	1 1/4"	18	1.45
147050CMI	1 1/2"	1 1/2"	16	1.57
147063CMI	2"	2"	9	2.42



CTS

**PE-PE COMPRESSION
COMPRESIÓN PE-PE**



CODE	PIPE CTS		WEIGHT x BOX LBS	VOLUME x BOX m ³
141020CC	1/2"	75	-	0.036
141025CC	3/4"	28	9.24	0.034
141032CC	1"	32	10.88	0.041
141040CC	1 1/4"	12	7.20	0.036
141050CC	1 1/2"	12	1.32	0.036
141063CC	2"	5	4.75	0.036

**PE COMPRESSION x FEMALE NPT THREAD
COMPRESIÓN PE x ROSCA HEMBRA NPT**



CODE	PIPE CTS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
140020CXC	1/2"	1/2"	50	28.50	0.036
140025CXC	3/4"	3/4"	40	8.40	0.036
140032CXC	1"	1"	40	12.80	0.028
140040CXC	1 1/4"	1 1/4"	20	9.60	0.038
140050CXC	1 1/2"	1 1/2"	20	17.60	0.038
140063CXC	2"	2"	12	14.52	0.037

**PE COMPRESSION x MALE NPT THREAD
COMPRESIÓN PE x ROSCA MACHO NPT**



CODE	PIPE CTS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
142020CC	1/2"	1/2"	48	8.16	0.019
142025CC	3/4"	3/4"	24	6.72	0.019
142032CC	1"	1"	16	6.88	0.020
142040CC	1 1/4"	1 1/4"	12	7.68	0.020
142050CC	1 1/2"	1 1/2"	12	12.00	0.039
142063CC	2"	2"	12	18.72	0.052

**PE COMPRESSION x FEMALE NPT THREAD
COMPRESIÓN PE x ROSCA HEMBRA NPT**



CODE	PIPE CTS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
146020CFC	1/2"	1/2"	48	6.24	0.019
146025CFC	3/4"	3/4"	32	6.77	0.192
146032CFC	1"	1"	24	6.72	0.192
146040CFC	1 1/4"	1 1/4"	12	5.76	0.020
146050CFC	1 1/2"	1 1/2"	12	6.24	0.020
146063CFC	2"	2"	12	11.88	0.036

**PE COMPRESSION x MALE NPT THREAD
COMPRESIÓN PE x ROSCA MACHO NPT**



CODE	PIPE CTS	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
147020CMC	3/4"	3/4"	48	6,24	0.019
147025CMC	1/2"	1/2"	60	12,00	0,360
147032CMC	1"	1"	24	6,96	0,019
147040CMC	1 1/4"	1 1/4"	12	6,00	0,020
147050CMC	1 1/2"	1 1/2"	12	6,72	0,020
147063CMC	2"	2"	12	12,84	0,039

COMPRESSION VALVES (PP body .TPE seats. EPDM O'ring)**VÁLVULAS A COMPRESIÓN (cuerpo PP. asiento TPE. junta EPDM)****PP BODY TPE SEATS EPDM O'RING****CUERPO PP ASIENTO TPE JUNTA EPDM**
PE-UNIVERSAL COMPRESSION
COMPRESIÓN PE x UNIVERSAL
CTS
**PATENTED**

CODE	UNIVERSAL		PIPE CTS
141024CUC	3/8" - 1/2"	25	3/4"
141025CUC	1/2" - 3/4"	25	3/4"
141031CUC	1/2" - 3/4"	25	1"
141032CUC	3/4" - 1"	25	1"
141040CUC	3/4" - 1"	10	1 1/4"
141049CUC	1" - 1 1/2"	10	1 1/4"
141050CUC	1" - 1 1/2"	5	1 1/2"

PE-UNIVERSAL COMPRESSION
COMPRESIÓN PE x UNIVERSAL
IPS
**PATENTED**

CODE	UNIVERSAL		PIPE IPS
141024CUI	3/8" - 1/2"	25	3/4"
141025CUI	1/2" - 3/4"	25	3/4"
141031CUI	1/2" - 3/4"	25	1"
141032CUI	3/4" - 1"	25	1"
141040CUI	3/4" - 1"	10	1 1/4"
141049CUI	1" - 1 1/2"	8	1 1/4"
141050CUI	1" - 1 1/2"	5	1 1/2"

UNIVERSAL x UNIVERSAL COMPRESSION
COMPRESIÓN UNIVERSAL x UNIVERSAL
**PATENTED**

CODE	UNIVERSAL	UNIVERSAL		WEIGHT x BOX LBS	VOLUME x BOX m ³
140025U	3/8" - 1/2"	3/8" - 1/2"	70	8.40	0.036
140031U	1/2" - 3/4"	3/8" - 1/2"	30	-	-
140032U	1/2" - 3/4"	1/2" - 3/4"	25	12.80	0.028
140040U	3/4" - 1"	3/4" - 1"	10	9.60	0.038
140049U	1" - 1 1/2"	3/4" - 1"	10	-	-
140050U	1" - 1 1/2"	1" - 1 1/2"	5	17.60	0.036

UNIVERSAL COMPRESSION x
FEMALE NPT THREAD
COMPRESIÓN UNIVERSAL x
ROSCA HEMBRA NPT
**PATENTED**

CODE	UNIVERSAL	THREAD NPT	
141025UM	3/8" - 1/2"	3/4"	25
141030UM	3/8" - 1/2"	1"	25
141031UM	1/2" - 3/4"	3/4"	25
141032UM	1/2" - 3/4"	1"	25
141040UM	3/4" - 1"	1 1/4"	10
141041UM	3/4" - 1"	1 1/2"	10
141049UM	1" - 1 1/2"	1 1/4"	8
141050UM	1" - 1 1/2"	1 1/2"	5

UNIVERSAL COMPRESSION VALVES
VÁLVULAS A COMPRESIÓN UNIVERSAL



PP BODY TPE SEATS EPDM O`RING

CUERPO PP ASIENTO TPE JUNTA EPDM

**UNIVERSAL COMPRESSION x
MALE NPT THREAD**
**COMPRESIÓN UNIVERSAL x
ROSCA MACHO NPT**



PATENTED

CODE	UNIVERSAL	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
142024UM	3/8" - 1/2"	1/2"	30	-	-
142025UM	3/8" - 1/2"	3/4"	24	6.72	0.019
142030UM	3/8" - 1/2"	1"	30	-	-
142031UM	1/2" - 3/4"	3/4"	30	-	-
142032UM	1/2" - 3/4"	1"	16	6.88	0.020
142040UM	3/4" - 1"	1 1/4"	12	7.68	0.020
142041UM	3/4" - 1"	1 1/2"	10	-	-
142049UM	1" - 1 1/2"	1 1/4"	8	-	-
142050UM	1" - 1 1/2"	1 1/2"	12	12.0	0.039

**UNIVERSAL COMPRESSION x
FEMALE NPT THREAD**
**COMPRESIÓN UNIVERSAL x
ROSCA HEMBRA NPT**



PATENTED

CODE	UNIVERSAL	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
146025UF	3/8" - 1/2"	3/4"	32	6.08	0.192
146032UF	1/2" - 3/4"	1"	24	6.70	0.192
146040UF	3/4" - 1"	1 1/4"	12	5.76	0.020
146050UF	1" - 1 1/2"	1 1/2"	12	6.24	0.020



**UNIVERSAL COMPRESSION x
MALE NPT THREAD**
**COMPRESIÓN UNIVERSAL x
ROSCA MACHO NPT**



PATENTED

CODE	UNIVERSAL	THREAD NPT		WEIGHT x BOX LBS	VOLUME x BOX m ³
147025UM	3/8" - 1/2"	3/4"	60	12.00	0.360
147032UM	1/2" - 3/4"	1"	24	6.96	0.019
147040UM	3/4" - 1"	1 1/4"	12	6.00	0.020
147050UM	1" - 1 1/2"	1 1/2"	12	6.72	0.020



PP THREADED FITTINGS

ACCESORIOS ROSCADOS DE PP



NIPPLE MACHÓN



CODE	DIAMETER NPT		WEIGHT x BOX LBS	VOLUME x BAG m³
750001	1/2"x1/2"	100	1.89	0.003
750002	3/4"x3/4"	100	2.62	0.005

REDUCING NIPPLE MACHÓN REDUCIDO



CODE	DIAMETER NPT		WEIGHT x BOX LBS	VOLUME x BAG m³
751001	3/4"x1/2"	100	2.2	0.005

THREADED CAP TAPÓN HEMBRA



CODE	DIAMETER NPT		WEIGHT x BOX LBS	VOLUME x BAG m³
753001	1/2"	100	1.06	0.002

REDUCING SOCKET MANGUITO REDUCIDO



CODE	DIAMETER NPT		WEIGHT x BOX LBS	VOLUME x BAG m³
755001	3/4"x1/2"	100	4.42	0.009
755002	1"x3/4"	100	3.47	0.007

REDUCING BUSH TUERCA REDUCIDA



CODE	DIAMETER NPT		WEIGHT x BOX LBS	VOLUME x BAG m³
757001	3/4" x 1/2"	100	1.54	0.004
757002	1"x1/2"	50	1.58	0.003
757003	1"x3/4"	50	1.41	0.003
757006	1 1/4"x1"	50	2.46	0.006



HISTORY

Since 1983 STP has been manufacturing compression fittings and valves. We have been growing, not only in number, but also in the capacity to provide you with the best and most extensive service including a wide variety of supplementary products that we have been incorporating to our catalog. STP Holding is a leading marketing and distribution company with worldwide commercial presence in over 80 countries. As a specialist manufacturer of polyethylene pipe accessories, we have been implementing our experience in mould injection to more fields such as swimming pool products, construction accessories, irrigation products and water distribution. In order to accomplish this, there is an organization of professionals who make it possible. STP Holding group is fully aware of the evolution and development of the markets, and through the acquisition of an Italian brass fittings factory, we have become the only world group producing plastic and metal fittings for polyethylene piping.

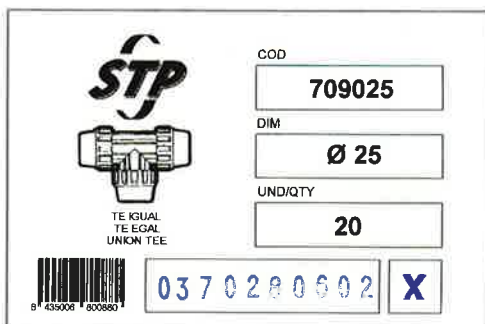


CERTIFICATIONS & STANDARDS

STP Holding currently complies with the Quality Assurance Standard ISO 9001:2000 registered with number ER-0989/2000 for "The design and production of: mechanical fittings, of plastic materials among polyolefin's pressure pipes and its accessories, suitable for water distribution, water service connections, construction, industry, gardening, turf irrigation, telecommunications", certified and issued by IQNet and AENOR.

Regarding performance, all products produced in STP Holding comply with today's most demanding standard for compression fittings for polyethylene pipes: ISO 14236:2000.

For more than 8 years, STP Holding has been complying with the ISO 9001:2000 Quality Assurance Standard and thus guarantees that all our production meet the performance test requirements from ISO 14236. Therefore PLAST fittings & valves remain watertight for the whole service life of 50 years.



PLASTIC COMPRESSION FITTINGS FOR POLYETHYLENE PIPES

Test methods and requirements for the Plast fittings

Testing of material / MRS value (Minimum required strenght)

The Polypropylene Copolymer (PP-B) specified for the fitting body is tested in accordance with ISO 9080 and ISO 12162 to determine the MRS value. Verification of long-term behavior.

The long-term behavior of the material of the Plast fitting body shall be verified in a type test on an injection-moulded pipe specimen with an outside diameter of not less than 1 1/2 inch produced in accordance with ISO 15853 from the same material as that of the fitting body. The wall thickness of the specimen is not less than that of a NP 87 PSI pipe and not more than that of a NP 232 PSI pipe of the corresponding size and of the same material.

When the specimen is pressure-tested in accordance with the procedure described in ISO 1167, it conforms to the applicable requirement :

Performance requirements for Plast fittings / Testing of material

Fitting material	Test temperature °F	Test duration h	Introduced stress Mpa	Requirement
PP-B	176°	8760	3.2	No failures during test
	203°	1000	2.6	
	230°	8760	1.1	

(*) 1 BAR= 0.1 MPa = 14.5PSI



TESTING OF FITTINGS

Resistance to internal pressure

When a Plast injection-moulded fitting body is tested in accordance with ISO 12092 using the test parameters given in the following table, it conforms to the applicable requirements given in such table.

NOTE : The test requirements are related to the NP of the fitting.

Performance requirements for Plast compression fittings / Testing of fitting

Fitting material	Test temperature °F	Test duration h	Test press. PSI	Requirement
PP-B	68°	1h	580 up to Ø 2" 362.6 from Ø 2 1/2"	No failures (leakage, fractures, cracking) in joint area of fitting or pipe during either test period
	203°	1000h	92.8 up to Ø 2" 58 from Ø 2 1/2"	



Assembly test

Test specimens

Each test specimen comprises a Plast fitting assembled with a PE NP 232 psi if diameters are from 1/2" to 4.

Leaktightness under internal pressure when subjected to bending

When a straight Plast fitting (coupling) assembly is tested in accordance with ISO 3503, the assembly conforms to the following requirement

Performance requirements for Plast compression fitting assemblies / Leaktightness when subjected to bending

Pipe material	Test temperature °F	Test duration h	Test press. MPa	Test press. PSI	Requirement
PE 63 PE 80 PE 100	68° ±41°	1h 1h 1h	9.0 11.4 14.4	1.8xNP 1.8xNP 1.8xNP	No failures (leakage, fractures, cracking) in joint area of fitting or pipe during either test period



The test pressure p_T shall be calculated, in bars, from the equation

$$p_T = \frac{\sigma_T}{\sigma_S} \times NP$$

where

σ_T is the applicable test stress given in the table (MPa);

σ_S is the design stress in accordance with ISO 4427

NP is the nominal pressure (232 psi from Ø 1/2" to Ø 2")

NOTE 1 : 14.5 psi = 1 MPa

NOTE 2 : For diameters larger than 2", the use of special equipment might be necessary to create the bending radius required for the pipe under test.

Resistance to pull-out

When a Plast fitting assembly is tested in accordance with ISO 3501, the assembly conforms to the requirements given in the next table, the test force F_T being calculated, in newtons.

($F_T = 1.5 \text{ sTTen (dn-en)}$)

Performance requirements for Plast compressions fittings assemblies / Pull-out test

Pipe material	Test temperature °F	Test duration h	Test press. MPa	Requirement
PE 63 PE 80 PE 100	68° ±41°	1h 1h 1h	4.5 5.7 7.2	Displacement of pipe during test does not affect leaktightness of joint



These are longitudinal stresses, and their values are therefore half those of the circumferential stresses given as test stresses in previous table.

Leaktightness under internal vacuum

When a Plast fitting assembly is tested at two pressures in accordance with ISO 3459, the assembly conforms to the performance requirement

Performance requirements for Plast compressions fittings assemblies— Leaktightness under vacuum

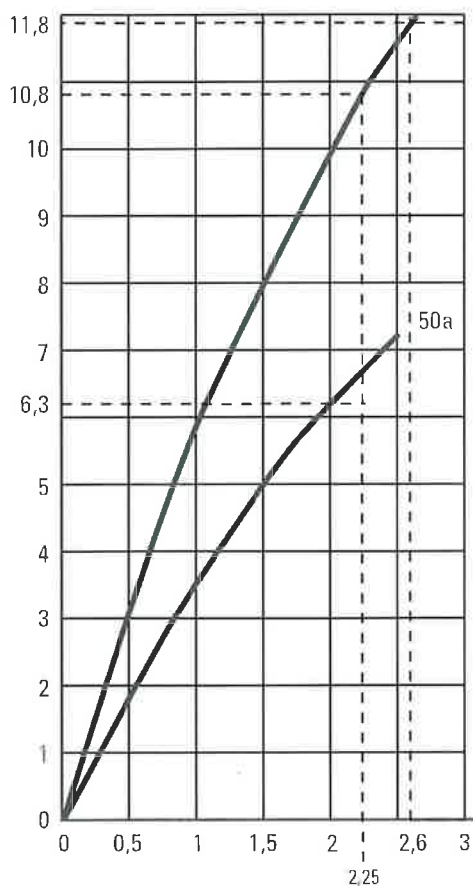


Long-term pressure test for leaktightness of assembled joints

When an assembly comprising of at least one Plast fitting with one or more pipe(s) jointed to it is tested in accordance with ISO 1167, the joint conforms to the needed requirement as it is shown.

Performance requirements for Plast compressions fitting assemblies leaktightness of assembled joints

Fitting material	Pipe material	Test duration (two periods)	Test temp.	Test press. bar	Requirement
PP-B	PE 63	1000h	68°F	1.2 x NP	No leakage from joint or cracking of pipe during either test period
	PE 80	followed by 1000h	140°F	0.8 x NP	
	PE 100				



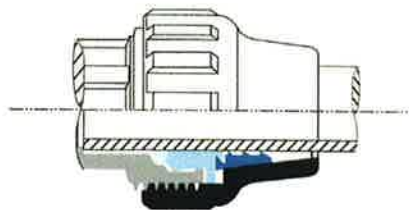
Calculation of pressure to be used for long-term leaktightness testing. Estimated life: 50 years

The long-term leaktightness test for mechanical joints with fittings made of plastics materials is based on the principle that these joints will have to remain watertight for the whole service life of the assembly, i.e. 50 years. This requires that any deformation occurring in the joint area due to creep does not cause any leakage.

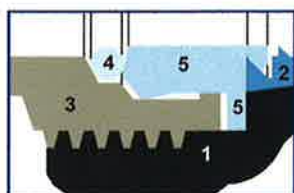
The test is therefore carried out under conditions such that the expected creep deformation after 50 years is reached in 1000 h. The strain in the fitting material corresponding to the nominal stress in the system over 50 years can be determined from isochronous stress/strain diagrams for the material at the service temperature.



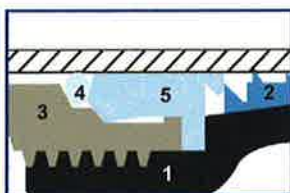
THE MECHANICAL PRINCIPLES OF FLOPLAST COMPRESSION FITTINGS



HYDRAULIC SEAL



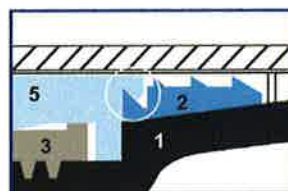
Due to the compression-ring, the nut always keeps the O-ring under pressure



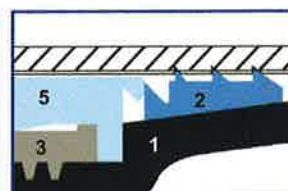
The conical design of the pressing-ring and the nut allows the pressure of the ring against the pipe, independent of its initial pressure.

1. Nut
2. Clenching Ring
3. Body
4. O-ring
5. Compression

MECHANICAL WORK



The clenching ring increases the resistance and holds the pipe firmly.



The special design of the fittings allows the clenching ring to go with the pipe in its natural movement due to the pull out.

FLOPLAST COMPRESSION FITTINGS—VALUE AND QUALITY

FloPlast products are NSF approved.

FloPlast Compression Fittings have every ISO certification applicable to our fittings.

FloPlast products have a 50 year life expectancy

FloPlast rating is 232PSI for all fittings offered

FloPlast tests show fitting assembly cannot be pulled apart in accordance with ISO 3501

FloPlast maximum temperature is 176°F at 232PSI.

FloPlast fittings install in minutes resulting in labor and equipment cost savings.

FloPlast fittings provide simple to understand installation procedures.

FloPlast fittings can be used in new installation or in most repair/maintenance situations.

FloPlast Fittings come in IPS, CTS and universal sizes and can be used to connect most all types of pipe

FloPlast application fields are Oil & Gas, drinkable water, waste water, and salt water, and commercial irrigation, industrial applications including acid bases, swimming pools, ship installations, and fiber duct pipe

www.floplastfits.com



*FloPlast
Compression
Fittings LP*

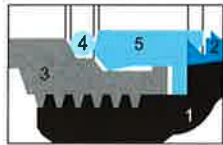
901 E. Hwy 82
Nocona, TX 76255
Phone: 940-825-3300
800-FLOPLAST
Fax: 940-825-4075

INSTALLATION INSTRUCTION

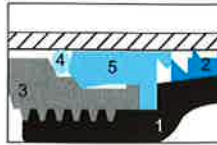
INSTRUCCIONES DE MONTAJE



HYDRAULIC SEAL

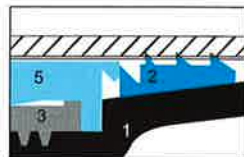
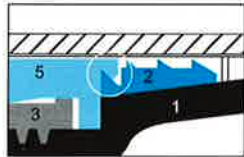


- 1- Nut
- 2- Clenching Ring
- 3- Body
- 4- O-ring
- 5- Compression ring



Due to the compression-ring, the nut always keeps the O-ring under pressure. The conical design of the pressing-ring and the nut allows the pressure of the ring against the pipe, independently of its internal pressure.

MECHANICAL WORK



The special design of the fitting allows the clenching ring to go with the pipe in its natural movement due to the pull out while the clenching ring increases the resistance and holds the pipe firmly.

- Application fields are Oil & Gas, drinkable water, waste water, and salt water, and commercial irrigation, industrial applications including acid bases, swimming pools, ship installations, and fiber duct pipe.
- Fittings can be used in new installation or in most repair/maintenance situations.
- Fittings come in IPS, CTS and universal sizes and can be used to connect most all types of pipe
- Fittings install in minutes resulting in labor and equipment cost savings.
- Fittings provide simple to understand installation procedures.
- Have every ISO certification applicable to our fittings.
- Maximum temperature is 176°F at 232PSI.
- Products have a 50 year life expectancy
- Rating is 232PSI for all fittings offered
- Tests show fitting assembly cannot be pulled apart in accordance with ISO 3501
- Suitable for above ground use
- UV stabilized
- ASTM and ISO information found on page 39

INSTALLATION INSTRUCTIONS FOR 1/2" TO 2" FLOPLAST FITTINGS ON POLYETHYLENE PIPE—CTS AND IPS

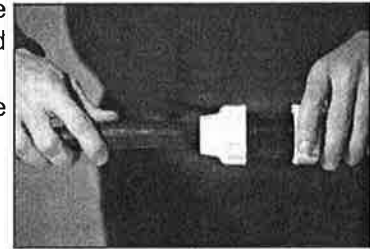


Step 1

- **Cut** pipe square, (an uneven cut will result in leakage).
- **Make** sure the pipe end is clear of sharp edges and debris before connecting. It is not required, however it does assist in an easier installation if you utilize a chamfer tool, rasp or file on pipe edges 1/2" - 2".
- **Clean** pipe ends with soap water and cloth insuring it is cleaned from debris such as dirt, oil, sand, etc.. to ensure a leak-free connection.
- **Apply** teflon tape on male threads for the purpose of easing the friction between the cap and the threads. You may also use soapy water, if available, on the pipe, which will make it easier to slide pipe past the O-ring. Before using any lubricant on pipe directly (if being installed in a potable water system), ensure it meets NSF approval.

Step 2

- **Loosen Compression Nut**— It is not necessary to remove the nut prior to installation. Check that the o'ring, compression ring and grip ring are in proper position
- **Insert** pipe past 1st) the grip ring; and 2nd) past the o'ring into the body of the fitting until it meets the interior step of the fitting body.
- **Ensure** the pipe always goes through the o'ring.
- **After** inserting pipe into fitting.



Step 3

- **Tighten the Compression Nut** towards the body of the fitting using a suitable pipe wrench. **DO NOT USE CHAIN WRENCHES OR STRAP WRENCHES.** This is because the chain wrench applies pressure around the entire cap and causes pressure on the threads, which makes it much harder to tighten. Using a chain or strap wrench will cause you to experience extreme tightness before all threads are actually covered.
- **Tightening of Caps** – This is the number one cause of any leaks. The distance between the bottom of the compression ring and the base of the fitting is 1/4". Once this distance is closed and the compression ring sits flush on the body, the O-Ring has compressed. **THIS DOES NOT HAPPEN UNTIL THE LAST THREAD IS COVERED.**
- **IPS Fittings require compression nut be completely turned to the end of the threads (no thread showing) to insure a leak proof connection.**

Optional **Floplast** Wrench:



Metal Wrench
(for 2" to 4")

1. **Care must be taken** not to cut pipe too short as it is essential to draw the pipe onto the fitting when making a joint. Avoid excess wrench pressure on central body when tightening nuts.
2. **End User's Responsibility**
 - Ensure pipe is correct specification and that valves, fittings and pipe met local authority requirements.
 - Designed for applications up to 232psi at 68°F up to 4"
 - Chemical resistance— for special applications check suitability of materials with manufacturer.



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6/14/2007

INSTALLATION INSTRUCTIONS FOR 3" AND 4" **FLOPLAST** FITTINGS ON POLYETHYLENE PIPE—CTS AND IPS



Fig. 1



Fig. 1



Fig. 2



Fig. 3

Step 1

- **Cut** pipe square, an uneven cut will result in leakage
- **Clean** pipe ends with soap water and cloth insuring it is cleaned from debris such as dirt, oil, sand, etc.. to ensure a leak-free connection.
- **You** may also use soapy water, if available, on the pipe, which will make it easier to seat the O-ring. Before using any lubricant on pipe directly (if being installed in a potable water system), ensure it meets NSF approval.
- **Remove** fitting components from central fitting body.
- **Important: Slide parts on pipe in this order: (Fig. 1)**
 - Compression Nut (threads facing fitting body)
 - Grip-ring (**ensure the taper on ring faces away from fitting body**)
 - Compression ring (flat side away from fitting body)
 - O-ring on the end of the pipe

Step 2

- **Insert** the pipe into the body of the fitting until it meets the interior step of the fitting body. (**Fig. 2**)
- **Ensure** O-ring is correctly positioned on the pipe and draw close to the body.
- **Slide** Compression ring against O-ring using hand force (**Fig.3**), this is to seat the o'ring onto the body.
- **Slide** Grip-ring against Compression ring
- **Slide** Compression Nut onto threads.

Step 3

- **Apply** Teflon tape on male threads for the purpose of easing the friction between the cap and the threads. You may also use soapy water, if available, on the pipe, which will make it easier to slide the O-ring into the fitting. Before using any lubricant on pipe directly (if being installed in a potable water system), ensure it meets NSF approval.
- **Tighten the Compression Nut** towards the body of the fitting using a suitable pipe wrench. **DO NOT USE CHAIN WRENCHES OR STRAP WRENCHES.** This is because the wrenches apply pressure around the entire cap and causes pressure on the threads, which makes it much harder to tighten. Using a chain or strap wrench will cause you to experience extreme tightness before all threads are actually covered.



Optional FloPlast Wrench:

Metallic Wrench

1. End User's Responsibility

- Ensure pipe is correct specification and that valves, fittings and pipe met local authority requirements.
- Designed for applications up to 232psi at 68°F up to 4"
- Chemical resistance— for special applications check suitability of materials with manufacturer.



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June 12, 2007



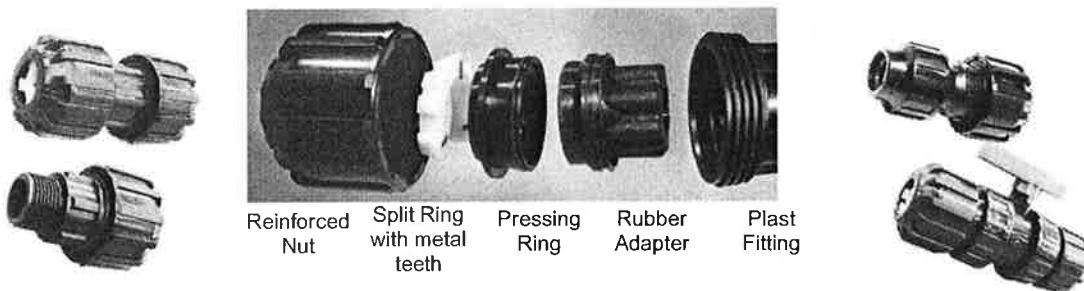
INSTALLATION INSTRUCTIONS FOR *FLOPLAST* UNIVERSAL FITTINGS ON ASSORTED PIPES



Universal Sizes Fitting Size Chart*	3/8" - 1/2"	1/2" - 3/4"	3/4" - 1	1 1/4" - 1 1/2"
Standard Pipe Sizes O.D.	0.59" - 0.82"	0.82" - 1.06"	1.06" - 1.34"	1.41" - 1.69"
Pipe Material				
PE CTS	1/2"	3/4"	1"	1 1/2"
PE IPS—SDR 9, 11	3/8", 1/2"	1/2", 3/4"	3/4", 1"	1 1/4", 1 1/2"
Copper	1/2"	3/4"	1"	1 1/2"
PVC	3/8", 1/2"	1/2", 3/4"	3/4", 1"	1 1/4", 1 1/2"
Galvanized Iron	3/8", 1/2"	1/2", 3/4"	3/4", 1"	1 1/4", 1 1/2"
PE IPS—SIDR 9		3/4"	1"	1 1/4"
PE IPS—SIDR 15		3/4"	1"	1 1/4"

* This chart is meant for reference only. If you have any doubt regarding the pipe size, then select the correct Universal Fitting size by measuring the ACTUAL O.D. of the pipe.

General Sizing Note: IPS sizes fit both sizes of Universal Fitting (ex: fits 1/2" - 3/4")
CTS sizes fit the larger of the sizes listed on Universal Fitting (ex: fits 3/4" on 1/2—3/4" size)



Step 1

- Cut pipe square, an uneven cut will result in leakage
- Clean pipe ends with soap water and cloth insuring it is cleaned from debris such as dirt, oil, sand, etc.. to ensure a leak-free connection. When threaded **FLOPLAST** Fittings attach to steel or metal, **deburr metal threads for a leak-proof connection.**

Step 2

- The **Universal Transition** Coupling does not require removal of the nut prior to installation
- Ensure the nut is at least 3 threads back from the flange of the body for smaller size pipe allowing 4-5 threads
- Insert the pipe into the body of the fitting being cautious not to push pipe past the rubber seal joint (**Fig 1**)

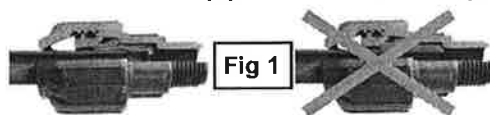
Step 3

- Screw the Compression Nut tightly towards the body of the fitting using the FLOPLAST wrench or suitable tool.
- In confined spaces the FloPlast nut assembly can be removed from the fitting and slid onto the pipe, prior to inserting the pipe into the central body.

CORRECT

Just place the pipe into the rubber adapter

How to insert the pipe into universal adapter



INCORRECT

CAUTION: Do not push the pipe through the rubber adapter.

1. **Caution:** When inserting plastic pipes and/or FloPlast valves and/or fittings into existing metal pipe work, ensure electrical earth continuity is maintained at all times.
2. **Care must be taken** not to cut pipe too short as it is essential to draw the pipe onto the fitting when making a joint. For sealing threads PTFE tape should be applied to the male threads. Avoid excess wrench pressure on central body when tightening nuts.
3. **End User's Responsibility**
 - Ensure pipe is correct specification and that valves, fittings and pipe met local authority requirements.
 - Designed for applications up to 232psi at 68°F up to 1 1/2"
- Chemical resistance— for special applications check suitability of materials with manufacturer.



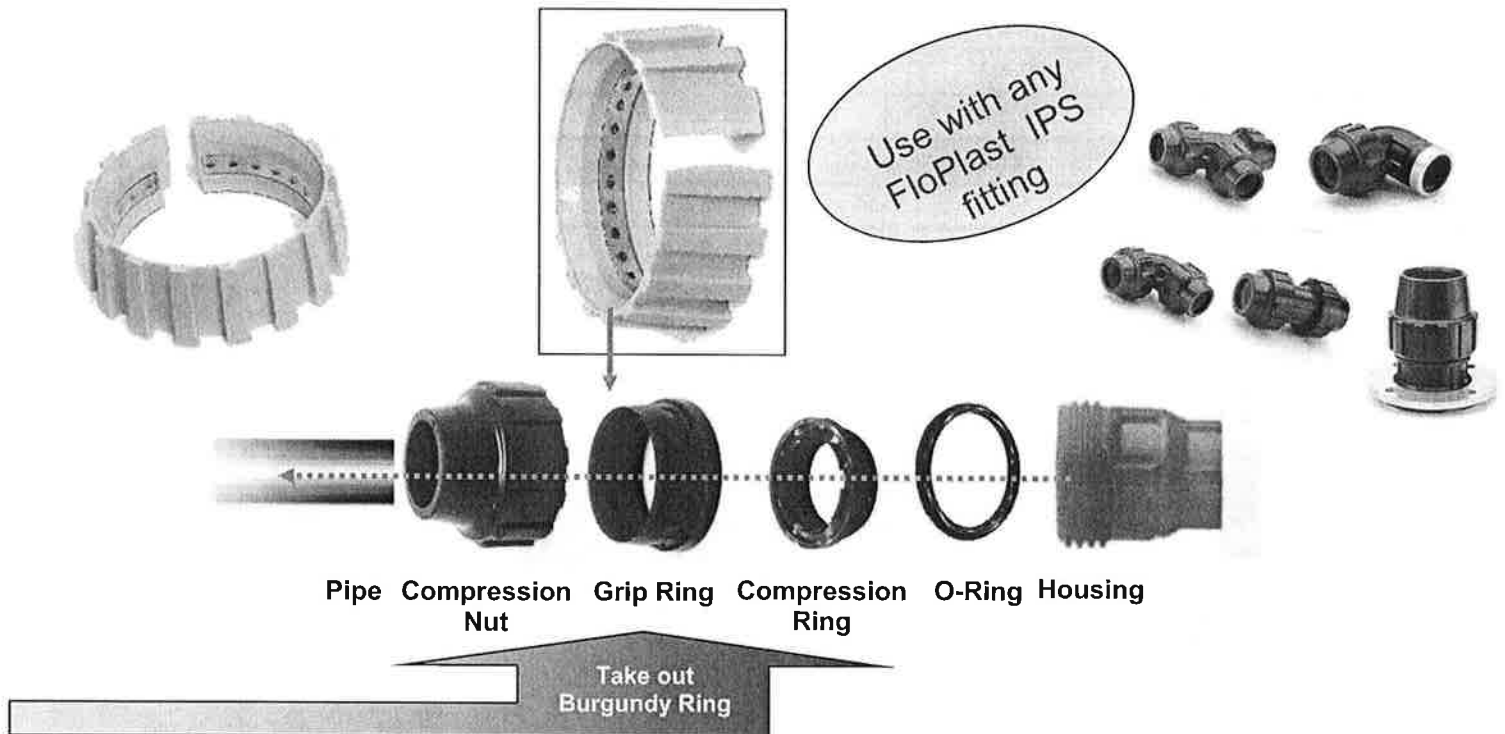
901 E Hwy 82
Nocona, TX 76255
Phone: 877-FLOPLAST (356-7527)
Fax: 940-825-4075

Web: www.FloPlastfits.com

3/26/08

Installation Instructions PVC Conversion Grip Rings For IPS Applications !

The revolutionary FloPlast "PVC Conversion Grip Ring" converts PE pipe fittings into convertible fittings for **PVC** applications. The superior 2200 lbs of pullout resistance of the grip ring with a fitting rating of 232 PSI translates into more reliable and longer lasting connections for PVC applications.



Step
1

- **Cut** pipe square, an uneven cut will result in leakage
- **Clean** pipe ends with soap water and cloth insuring it is cleaned from debris such as dirt, oil, sand, etc.. to ensure a leak-free connection.
- Remove nut from central body.
- Important: Slide parts on in this order:
- Compression Nut
- **Grip-ring (remove BURGUNDY Grip Ring; REPLACE WITH WHITE PVC GRIP RING)**
- Compression ring (**ensure the taper on ring faces toward the insert point**)
- O-ring on the end of the pipe

Step
2

- Insert the pipe into the body of the fitting until it meets the interior step of the fitting body.
- Ensure O-ring is correctly positioned on the pipe and draw close to the body.
- Slide Compression ring against O-ring
- Slide Grip-ring against Compression ring
- Slide Compression Nut onto threads.

Step
3

- Screw the Compression Nut tightly towards the body of the fitting using the FLOPLAST wrench or suitable tool.
- **IPS Fittings require compression nut be completely turned to the end of the threads (no thread showing) to insure a leak proof connection.**



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Systems



Cool Water Agua fría



Telecommunications Telecomunicaciones



PE Transitions to other materials

Transiciones de PE a otros materiales



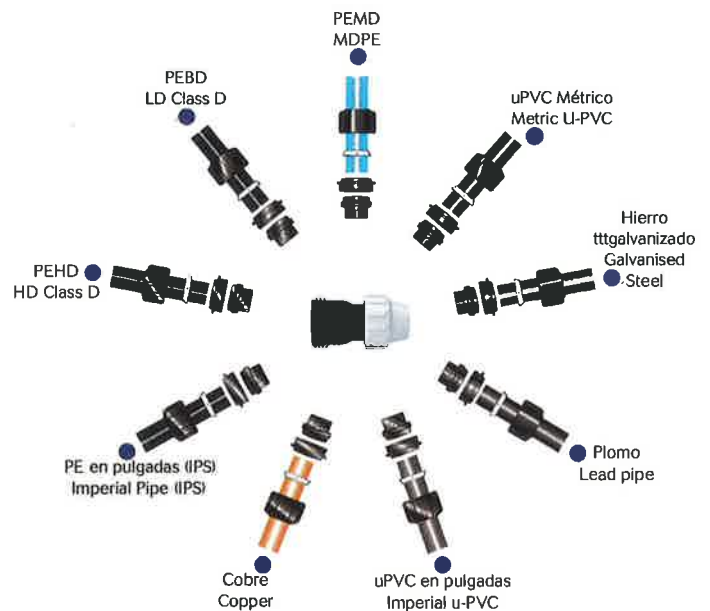
Universal Fitting Accesorio universal



Universal Fitting Accesorio universal



PVC		PE Ø16
		PE Ø20
Imperial PE		PE Ø25
LDPE		PE Ø32
MDPE		PE Ø40
HDPE		PE Ø50
Galvanised Steel		PE Ø63
LEAD		
Cu		



CERTIFICATIONS
CERTIFICACIONES



Australia
No. AS/NZS 4129
No. AS/NZS 4129

Bulgaria
No. 050300A

Czech Republic
No. ICIM 028AV/0
No. 04 0158 V/AO

England
No. 0405060
No. 0405086

France
No. 03 ACC NY 067

Germany
No. DW-8616B00360

Hungary
No. A-2388/2003

Mexico
No. CP-0234-CAN/03

Poland
No.. AT/97-01-0211-01

Romania
No. 016-05/1800-2001

Russia
No. 0360670

South Africa
No. SABS 1808-41

Spain
No. 301-081
No. 97006597
No. 31263
UPC Approved

Sweden
No. 0256/095

Ukraine
No. 05.03.03-03/8062

For a copy of the certificates please contact Foplast Compression Fittings office.

ISO Certified and test with these ISO standards:

ISO 9001:2000
ISO 14236:2000
ISO 9080
ISO 12162

ISO 15853
ISO 1167
ISO 12092
ISO 3503

ISO 4427
ISO 3501
ISO 3459
ISO 1167



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Toll Free: 1 (877)FLOPLAST (1-877-356-7527)
Web Site: www.floplastfits.com

FRIALEN® AKHP Hot Tapping Ball Valve



IPEX
426 Fairforest Way, Greenville, SC 29607
Tel: 864-286-8600 • Fax: 864-234-2060
www.friatecusa.com





Valve Extension and Aluminum Nut



FWAB Driller Kit

Part Number	Main size X Valve Size
615427	4"IPS X 2"IPS
615428	4"IPS X 3"IPS
615433	6"IPS X 2"IPS
615434	6"IPS X 3"IPS
615437	8"IPS X 3"IPS *REQUIRES FRIATOP
615525	10"IPS-12"IPS X 2"IPS *REQUIRES FRIATOP
615526	10"IPS - 12"IPS X 3"IPS *REQUIRES FRIATOP
613360	FWAB Driller Kit Complete
340001	Valve Extension 12" Prefab (black)
340005	Valve Extension Tube 39" (gray)
340007	Valve Extension Tube 78" (gray)
340009	Aluminum Operator Nut Adapter
* 613350	FRIATOP Pneumatic Top Loading Tool

FRIALEN SAFETY FITTINGS CAN BE FUSED TO ALL PE PIPES WITHIN MELT INDEX GROUPS 003-050 AND SDR RANGE 9-17.6, FOR SDR 21 AND UP PLEASE CONTACT FRIATEC. MAXIMUM HOT TAP PRESSURE IS 60 PSI

FRIALEN® Polyethylene Ball Valve



IPEX
426 Fairforest Way, Greenville, SC 29607
Tel: 864-286-8800 • Fax: 864-234-2060
www.friatecusa.com

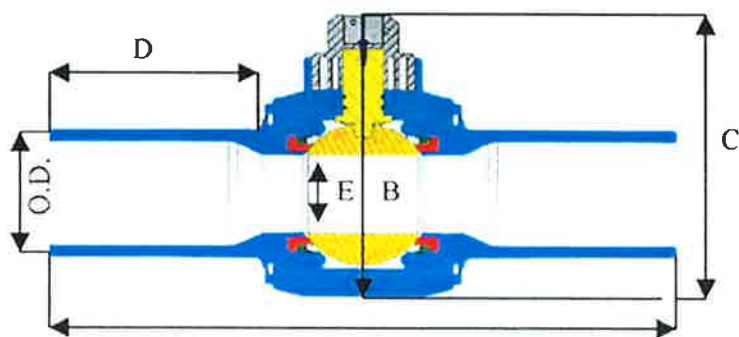


FRIALEN® polyethylene ball valves are available in 2406 medium or 3408 high density resins for gas distribution service. As a material, polyethylene is completely inert – chemically and electrically. Therefore, it is not subject to corrosion, whatever the environment. It's plasto-elastic, so it will not crack, leak or break due to the normal compression, expansion, vibration or volume changes caused by terrain, traffic or temperature.

FRIALEN® polyethylene valves have proven their superior characteristics, particularly for endurance and the reliability of the valve seals. The unique "ball-to-seat" seal design uses line pressure and an extra "angle of protection" to assure leak-proof operation. When the ball is in the closed position, the pressure helps maximize seating by forcing the ball against the downstream seal for a tight, leak-proof seal. The design provides "13 degrees" of seal area for dependable, leak-proof closure. This is the largest sealing area available on any polyethylene ball valve.

FRIALEN® valves operate smoothly with just a ¼ turn for gas, water and industrial applications. Valve pipe ends are extra long for socket, butt and electrofusion installations.

Nominal Valve Size (in.)	Actual O.D. (in./mm.)	CV Value	Weight (lbs./kg.)	Dimensions					End Configuration	Resin Designations		
				A (end-to-end)	B (c/l to top)	C (overall ht.)	D (end length)	E (bore)		SDR	Med. Density (PE-2406)	High Density (PE-3408)
1 ¼ IPS	1.66"	23.9	1.65	11.18	5.08	4.72	3.75	0.94	IPS	11.0	F1252411	F125341
	42.16		75	284	129	120	95	24				
2	2 3/8"	198	43.0	15.16	4.72	7.09	4.92	1.69	IPS	11.0	F22411	F2341
	60.33		1.95	385	120	180	125	43				
3	3 ½"	406	6.18	14.4	5.80	93.50	3.54	2.60	IPS	11.0	F32411	F3341
	88.90		4.70	365	148	240	90	67				
4	4 ½"	398	11.02	15.55	5.83	9.45	4.72	2.64	IPS	11.0	F42411	F43411
	114.30		5.00	395	148	240	120	67				
6	6 5/8"	660	29.73	18.11	7.24	12.60	5.12	3.86	IPS	11.0	F62411	F6341
	168.30		13.50	460	184	320	130	98				
8	8 5/8"	435	36.00	28.03	10.31	18.78	5.90	3.86	IPS	11.0	F82411	F8341
	215.10		16.33	712	262	477	150	98				



*Key to Resin Code

F	2	24	11
FRIALEN®	Value diameter (2 = 2")	Resin density 24 = medium 34 = high	SDR

Code Compliance

FRIALEN Polyethylene shutoff valves meet or exceed all ANSI B 16.40, ASTM D2513 and all DOT (part 192) requirements and are manufactured in accordance with ISO 9002, a total quality management system.

LYALL·POLYTECTM

G A S A P P L I C A T I O N S



P O L Y E T H Y L E N E B A L L V A L V E S

LYALL-POLYTEC ALLIANCE & COMMITMENT STATEMENT

ALLIANCE

R.W. Lyall & Company, Inc. and **Polytec Co., LTD** have teamed up to provide you with a full line of medium and high density PE Ball Valves. With Polytec's extensive knowledge in the development of polyethylene products, and Lyall's expertise in the gas piping & distribution industry, Lyall can now provide you with a full range of high quality residential and industrial PE Ball Valves, sized 1/2 CTS through 16 IPS.

COMPANY BACKGROUND

R. W. Lyall & Company, Inc. is a leading manufacturer of quality service line piping systems for the distribution of Natural Gas and Liquid Propane Gas to residential and commercial gas consumers. Founded in 1970, R. W. Lyall & Company has developed and maintained strong brand recognition for its many innovative products including, LYCO® Anodeless Meter Risers, LYCOFIT® Mechanical Fittings and Tapping Tees, LYCO® Meter Set Assemblies, and LYCOFAST® the Industry's first patented pre-assembled, pre-packaged service line kit for extended cost savings to the customer's bottom line.

Established in 1988, **Polytec Co. LTD** has been designing and manufacturing polyethylene ball valves to the highest quality standard since 1993. Because of Polytec's strict adherence to QC processes which are in complete compliance with ISO 9001, Polytec has become a leading manufacturer of high quality, cost effective polyethylene ball valves worldwide.

OUR COMMITMENT TO YOU

Lyall has built a strong reputation of supplying quality products and services at the best possible value to the utility industry. We are continuing this tradition with our commitment to Lyall-Polytec products.

Leveraging the technical and operational expertise of Lyall and Polytec, ensures the highest level of quality is consistently achieved. Working collaboratively to refine process controls for both manufacturing and logistics, our customers can rest assured that the Lyall-Polytec offering will meet or exceed the high performance standards they have become accustomed to, on other Lyall products.

Our exclusive agreement to distribute Lyall-Polytec valves in North America includes our proven distribution network, guaranteeing you an extensive product offering of polyethylene ball valves engineered to meet your rigorous requirements.



CONTENTS

ALLIANCE & COMMITMENT STATEMENT.....	IFC
SMALL BODY PE VALVES.....	2
LARGE BODY PE VALVES.....	3
STEM EXTENSIONS & PURGE/BYPASS.....	4
GEAR ACTUATION.....	5
SUMMARY OF VALIDATION TESTING.....	6
SUPPLEMENTAL TESTING.....	7
PE VALVE APPLICATIONS.....	8
MATERIALS OF CONSTRUCTION.....	IBC
LYALL-POLYTEC PE VALVE FEATURES/BENEFITS.....	BC
DISTRIBUTOR CONTACT INFORMATION.....	BC

POLYETHYLENE BALL VALVES

SMALL BODY PE VALVES

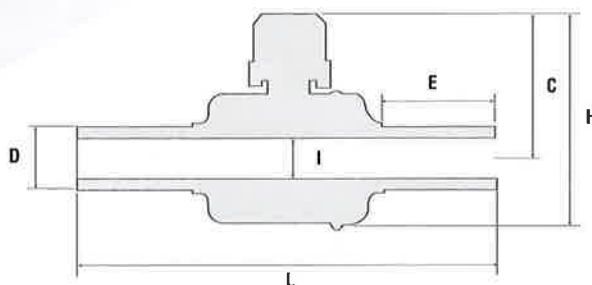
AVAILABLE IN BOTH MDPE & HDPE MATERIALS



SMALL BODY PE BALL VALVES IN MDPE



SMALL BODY PE BALL VALVES IN HDPE



CTS VALVE SIZES AND DIMENSIONS (APPROX.)

NOMINAL VALVE SIZE	D	L	H	C	I	Port	CV	E	Weight lbs kg
1/2 CTS	0.625	11.50	5.12	3.70	1.06	Full	9	3.62	0.97
	15.9mm	292mm	130mm	94mm	27mm			92mm	0.44 kg
1 CTS	1.125	11.50	5.12	3.70	1.06	Full	36	3.62	1.01
	28.6mm	292mm	130mm	94mm	27mm			92mm	0.46 kg
1 1/4 CTS	1.375	11.50	5.12	3.70	1.06	Full	55	3.62	1.0
	34.9mm	292mm	130mm	94mm	27mm			92mm	0.46 kg

All CTS valve sizes are available in a full range of wall thicknesses. Contact your Lyall-Polytec representative for available ISO and other metric sizes.

IPS VALVE SIZES AND DIMENSIONS (APPROX.)

NOMINAL VALVE SIZE	D	L	H	C	I	Port	CV	E	Weight lbs kg
1/2 IPS SDR 9.3	0.840	11.50	5.12	3.70	1.06	Full	20	3.62	0.97
	21.3mm	292mm	130mm	94mm	27mm			92mm	0.44 kg
3/4 IPS SDR 11	1.050	11.50	5.12	3.70	1.06	Full	32	3.62	0.99
	26.7mm	292mm	130mm	94mm	27mm			92mm	0.45 kg
1 IPS SDR 11	1.315	11.50	5.12	3.70	1.06	Full	50	3.62	1.01
	33.4mm	292mm	130mm	94mm	27mm			92mm	0.46 kg
1 1/4 IPS SDR 11	1.660	11.50	5.12	3.70	1.06	Std	79	3.62	1.01
	42.1mm	292mm	130mm	94mm	27mm			92mm	0.46 kg
1 1/2 IPS SDR 11	1.900	11.81	5.51	3.78	1.26	Std	104	2.80	1.8
	48.3mm	300mm	140mm	96mm	32mm			71mm	0.8 kg
2 IPS SDR 11	2.375	11.81	5.51	3.78	1.38	Std	118	3.31	1.9
	60.3mm	300mm	140mm	96mm	35mm			84mm	0.86 kg

Where applicable, other SDR's are available upon request. Contact your Lyall-Polytec representative for available ISO and other metric sizes.

LARGE BODY PE VALVES

AVAILABLE IN BOTH MDPE & HDPE MATERIALS

INNOVATIVE DESIGNS

- **INTEGRATED PURGE-READY PORTS:** Lyall-Polytec large size valves can be furnished with standard pup-ends (NPC Type) or with Purge-Ready ports (PC Type) that can easily be configured for attaching purge port valves.
- **PERMANENT ACTUATOR PROTECTION COLLARS** (Factory fused)



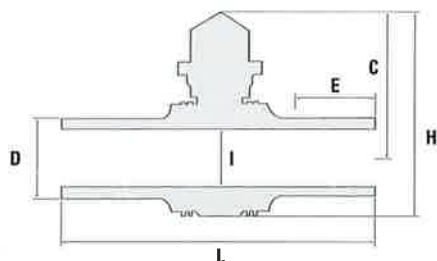
NPC TYPE VALVES



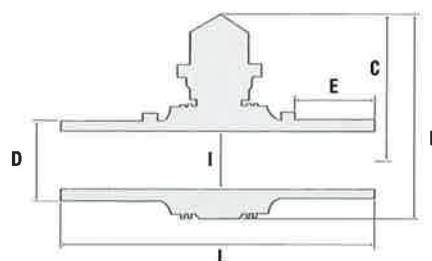
PC TYPE VALVES



VALVE WITH COLLAR OPTION



NO PURGE CONNECTOR (NPC) TYPE VALVE



PURGE READY (PC) TYPE VALVE

IPS VALVE SIZES AND DIMENSIONS (APPROX.)

NOMINAL VALVE SIZE	D	L		H	C	I	Port	CV	E		Weight lbs kg	
		NPC	PC						NPC	PC	NPC	PC
2 IPS	2.37	19.53	25.98	9.65	7.01	1.77	Full	164	6.69	6.69	4.19	5.29
SDR 11	60.3mm	496mm	660mm	245mm	178mm	45mm			170mm	170mm	1.9 kg	2.4 kg
3 IPS	3.50	21.18	25.98	11.81	8.50	2.52	Full	375	6.69	6.69	8.60	10.36
SDR 11	88.9mm	538 mm	660mm	300mm	216mm	64mm			170mm	170mm	3.90 kg	4.7 kg
4 IPS	4.50	21.18	25.98	11.81	8.50	2.52	Std	407	6.69	6.69	9.70	11.24
SDR 11	114.3mm	538mm	660mm	300mm	216mm	64mm			170mm	170mm	4.4 kg	5.1 kg
4 IPS	4.50	24.02	28.74	14.92	10.39	3.58	Full	591	6.69	6.69	18.52	19.40
SDR 11	114.3mm	610mm	730mm	379mm	264mm	91mm			170mm	170mm	8.4 kg	8.8 kg
6 IPS	6.62	24.02	28.74	14.92	10.39	3.58	Std	854	6.69	6.69	22.27	23.59
SDR 11	168.3mm	610mm	730mm	379mm	264mm	91mm			170mm	170mm	10.1 kg	10.7 kg
6 IPS	6.62	26.18	31.89	18.94	13.03	4.80	Full	1280	6.69	6.69	38.36	40.79
SDR 11	168.3mm	665mm	810mm	481mm	331mm	122mm			170mm	170mm	17.40 kg	18.5kg
8 IPS	8.62	30.12	33.46	24.80	16.57	6.69	Full	2146	6.69	6.02	91.49	94.80
SDR 11	219.1mm	765mm	850mm	630mm	421mm	170mm			170mm	153mm	41.50 kg	43 kg
10 IPS	10.75	30.12	31.89	24.80	16.57	7.95	Full	3074	7.09	5.55	97.22	99.87
SDR 11	273.0mm	765mm	810mm	630mm	421mm	202mm			180mm	141mm	44.10 kg	45.3 kg
12 IPS	12.75	30.12	32.28	24.80	16.57	7.95	Std	3646	7.48	5.55	100.75	103.62
SDR 11	323.8mm	765mm	820mm	630mm	421mm	202mm			190mm	141mm	45.70 kg	47 kg
14 IPS	14.00	35.83	38.58	31.18	19.33	11.38	Full	5736	6.69	5.91	248.02	252.65
SDR 11	355.6mm	910mm	980mm	792mm	491mm	289mm			170mm	150mm	112.50 kg	114.6 kg
16 IPS	16.00	35.83	38.58	31.18	19.33	11.38	Full	6559	6.69	5.91	256.40	261.47
SDR 11	406.4mm	910mm	980mm	792mm	491mm	289mm			170mm	150mm	116.30 kg	118.6 kg

Where applicable, other SDR's are available upon request. Contact your Lyall-Polytec representative for available ISO and other metric sizes.

STEM EXTENSION & PURGE / BYPASS

AVAILABLE IN BOTH MDPE & HDPE MATERIALS

INNOVATIVE OPTIONS PROVIDE ADDITIONAL VALUE AND COST SAVING OPPORTUNITIES

- PERMANENT HEAD EXTENSIONS (Factory fused)
- INTEGRATED PURGE-PORT/VALVES: Ideal for purge and bypass applications



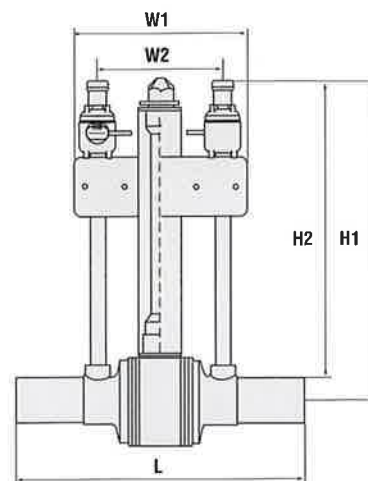
STEM EXTENSION
TYPE VALVES



1PS TYPE
VALVES



2PS TYPE
VALVES



DIMENSIONS OF
2PS VALVE

IPS VALVE SIZES AND DIMENSIONS (APPROX.)

NOMINAL VALVE SIZE	L	H1	H2	W1	W2	Port	CV	Weight lbs kg		
								NPS	1PS	2PS
2 IPS	25.98	28.74	27.56	14.80	9.84	Full	164	11.68	19.00	21.91
	660mm	730mm	700mm	376mm	250mm			5.3 kg	8.62 kg	9.94 kg
3 IPS	25.98	30.28	28.50	14.80	9.84	Full	375	16.76	21.65	24.56
	660mm	769mm	724mm	376mm	250mm			7.6 kg	9.82 kg	11.14 kg
4 IPS	25.98	30.28	27.95	14.80	9.84	Std	407	17.86	22.71	25.57
	660mm	769mm	710mm	376mm	250mm			8.1 kg	10.3 kg	11.6 kg
4 IPS	28.74	31.85	29.53	17.56	12.60	Full	591	26.01	30.91	33.82
	730mm	809mm	750mm	446mm	320mm			11.8 kg	14.02 kg	15.34 kg
6 IPS	28.74	31.85	28.70	17.56	12.60	Std	854	30.64	35.49	38.47
	730mm	809mm	729mm	446mm	320mm			13.9 kg	16.1 kg	17.45 kg
6 IPS	31.89	33.74	30.51	20.24	15.35	Full	1280	51.37	56.53	59.66
	810mm	857mm	775mm	514mm	390mm			23.3 kg	25.64 kg	27.06 kg
8 IPS	33.46	38.07	33.70	22.76	17.72	Full	2146	105.38	110.54	113.67
	850mm	967mm	856mm	578mm	450mm			47.8 kg	50.14 kg	51.56 kg
10 IPS	31.89	38.07	32.56	22.76	17.72	Full	3074	110.45	77.69	120.50
	810mm	967mm	827mm	578mm	450mm			50.1 kg	35.24 kg	54.66 kg
12 IPS	32.28	38.07	31.85	22.76	17.72	Std	3646	114.20	121.12	124.25
	820mm	967mm	809mm	578mm	450mm			51.8 kg	54.94 kg	56.36 kg
14 IPS	38.58	40.98	33.70	28.90	23.62	Full	5736	259.93	263.03	271.06
	980mm	1041mm	856mm	734mm	600mm			117.9 kg	119.31 kg	122.95 kg
16 IPS	38.58	40.98	32.72	28.90	23.62	Full	6559	268.74	271.85	279.88
	980mm	1041mm	831mm	734mm	600mm			121.9 kg	123.31 kg	126.95 kg

GEAR ACTUATION

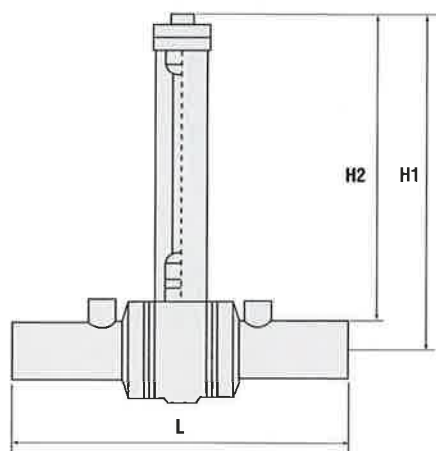
AVAILABLE IN BOTH MDPE & HDPE MATERIALS



2PS GEAR VALVES



NPS GEAR VALVES



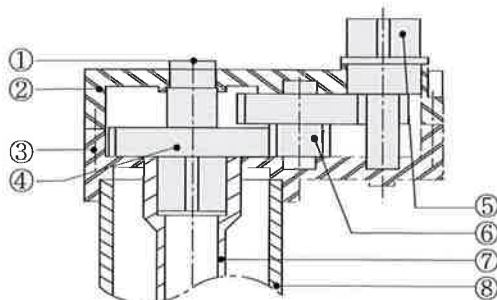
DIMENSIONS OF GEAR VALVE



SIDE VIEW OF GEAR

IPS VALVE SIZES AND DIMENSIONS (APPROX.)

NOMINAL VALVE SIZE	L	H1	H2	Port	CV	Weight lbs kg		
						NPS	1PS	2PS
6 IPS	30.31	34.72	31.18	Full	1280	62.61	67.77	70.90
	770mm	882mm	792mm			28.4 kg	30.74 kg	32.16 kg
8 IPS	22.83	40.59	36.34	Full	2146	113.98	119.14	122.27
	580mm	1031mm	923mm			51.7 kg	54.04 kg	55.46 kg
10 IPS	31.89	40.59	35.35	Full	3074	119.05	125.97	129.10
	810mm	1031mm	898mm			54 kg	57.14 kg	58.56 kg
12 IPS	38.58	41.97	35.47	Std	3646	265.88	273.90	276.99
	980mm	1066mm	901mm			120.6 kg	124.24 kg	125.64 kg
14 IPS	38.58	41.97	34.68	Full	5736	268.08	276.55	279.63
	980mm	1066mm	881mm			121.6 kg	125.44 kg	126.84 kg
16 IPS	38.58	41.97	33.70	Full	6559	277.34	285.37	288.45
	980mm	1066mm	856mm			125.8 kg	129.44 kg	130.84 kg



STRUCTURE & MATERIAL		
No	Component	Material
1	Sub Stem Gear Cap	Acetal
2	Housing Top	PE
3	Housing Bottom	PE
4	Sub Stem Gear	6/6 Nylon+Brass
5	Handle Gear	6/6 Nylon+Brass
6	Middle Gear	6/6 Nylon+Brass
7	Sub Stem	Acetal
8	Protection Tube	PE

GEAR INFORMATION	
Item	Description
Gear Ratio	9:1
Operator (Nut)	2" Square

SUMMARY OF VALIDATION TESTING

Each valve is designed in accordance with ASME B16.40, the Code of Federal Regulations, Part 192 and other international standards. Lyall, Polytec, and third party labs conducted testing under these specifications as well as other supplemental tests, as follows:

SHELL TEST:

Each valve is tested at both 4 and 150 psi to verify the pressure boundary integrity of the valve shell.

All valves passed this test.

SEAT TEST:

Each valve seat (since the Lyall-Polytec valve is a bi-directional valve, both seats are tested) is tested at 4 and 150 psi to verify the pressure containing ability of the valve closure element and seat seals.

All valves passed this test.

PRESSURE BOUNDARY VERIFICATION:

This test is designed to verify the basic pressure boundary integrity of the valve shell. ASME B16.40 requires this test be performed at 74° F and also at 100° F for 1,000 hours. See supplemental testing for additional testing completed that exceeds the minimum requirements.

All valves passed this test.

CLOSURE VERIFICATION:

This test is designed to verify the structural integrity and pressure retention capability of the valve closure element (ball). The valve is closed and the inlet pressurized for a minimum of 1000 hours at 100° F. The outlet is open to atmosphere.

All valves passed this test.

TEMPERATURE RESISTANCE:

This test is designed to verify the valve will perform properly over the temperature range from -20° F to 100° F. The valve is first cooled to -20° F, operated against a differential pressure equal to the design pressure, and subjected to shell and seat leakage tests while at -20° F. The valve temperature is then raised to 100° F and the above process repeated. In addition to operating properly and not leaking, the valve operating torque must not exceed specified limits at both temperature extremes.

All valves passed this test.

OPERATING TEST:

This test is designed to verify the valve will not be damaged or leak after being operated ten times with a differential pressure equal to the design pressure applied across the valve as it is opened. After the ten cycles of operation, each valve is shell and seat tested.

All valves passed this test.

FLOW TEST:

This test is performed to verify each valve design has at least the specified minimum flow capacity (Cv) in accordance with ASME B16.40.

All valves passed this test.

Note: Cv values presented within this document are the typical values of Lyall-Polytec valves and are based on the mathematical equation set forth by ASME B16.40. All Lyall-Polytec valves far exceed the minimum requirement set forth by ASME B16.40. Please contact your Lyall-Polytec representative for more data on the physical testing that was performed.

SUPPLEMENTAL TESTING

In addition to ASME B16.40 qualification requirements, the following tests were conducted to ensure that the product performance exceeds our customers' requirements.

SUSTAINED PRESSURE VERIFICATION

Testing was conducted at 670 psi Hoop and at a temperature of 176° F for a minimum of 1000 hours.

All valves passed this test.

Note: The normal time for this test under these conditions is 170 hours.

IMPACT TEST:

Each valve was subjected to impact testing at temperatures of 0° and 100° F. A twenty pound weight with a special TUP was dropped from a height of three feet on the valve actuator, a total of five times. This test was performed at both temperatures. The valve must continue to operate properly and pass the basic valve shell and seat tests after the impacts.

All valves passed this test.

TENSILE TEST:

Each valve was subjected to a tensile test at loads which would create in the attached pipe either 25% elongation or elongation equal to that caused by the thermal expansion due to 100° F temperature change. The valve must remain operable and not leak during or after this test.

All valves passed this test.

CYCLE TEST:

Each valve was tested for 1000 cycles. The valves were opened each cycle against a 100 psig differential pressure. At the conclusion, each valve must pass the basic shell and seat tests.

All valves passed this test.

BLOWDOWN TEST:

Each valve was subjected to a blowdown test. The intent is to verify the valve will operate properly and the seats will not be damaged during this high-energy release. The valve was installed in a pipeline with a significant reservoir of pressurized air stored upstream. The downstream was open to atmosphere. The upstream reservoir of air was pressurized to 100 psi and the valve opened against this full differential. The reservoir of air blew through the valve. At the conclusion, each valve must pass the basic shell and seat tests.

All valves passed this test.

Please contact your Lyall-Polytec representative for additional technical specifications.

POLYETHYLENE BALL VALVES

APPLICATIONS

- UTILITIES
- MUNICIPALITIES
- RESIDENTIAL SERVICES
- SERVICE MAINS

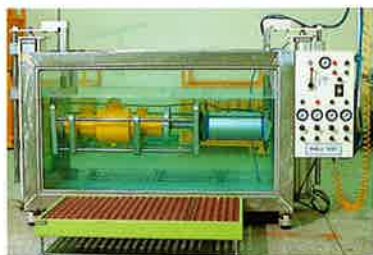
WHEREVER POLYETHYLENE SERVICES ARE INSTALLED

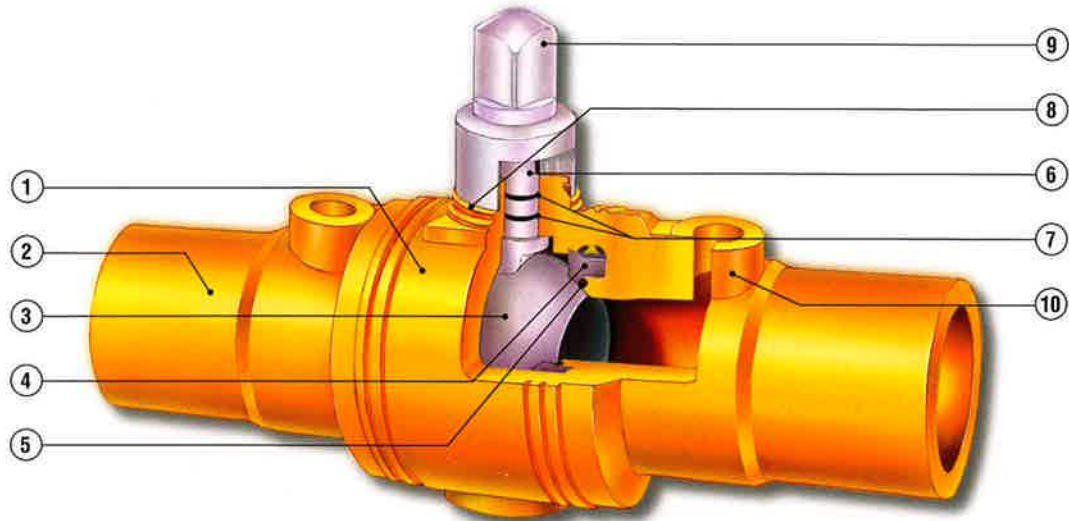
- NATURAL GAS
- PROPANE (LPG)
- WATER
- AGRICULTURE
- IRRIGATION
- SEWER



ISO CERTIFICATION

ISO 9001 Certified manufacturing facility ensures 100% inspection and adherence to rigid quality standards.





MATERIALS OF CONSTRUCTION

No	Component	Material	Operating Feature
1	Body	Polyethylene	PE 2406 (PE 80), PE 3408 (PE 100)
2	End	Polyethylene	PE 2406 (PE 80), PE 3408 (PE 100)
3	Ball	Acetal / Polypropylene*	Excellent Strength & Thermal Resistance
4	Retainer	Polypropylene	Positive Seal under any Condition, Retains Seat under High Differential Pressure
5	Ball Seat	Nitrile (HNBR)	Reliable Sealing from -20° F to 140° F
6	Stem	Acetal	Excellent Durability & Strength
7	Stem Seal	Nitrile (HNBR)	Redundant Sealing with Dual O-rings
8	Weather Seal	Nitrile (HNBR)	Protects from Ground Water and Dirt
9	Operator Nut	Polypropylene	2 inch (50mm) Square or Hexagon
10	Purge Connector	Polyethylene	Integral Easy Purge Connection

Note: The Lyall-Polytec valve utilizes specially compounded Nitrile (HNBR) seals, unique in the industry. HNBR = Hydrogenated Nitrile Rubber, known for its excellent high temperature performance, high tensile strength, as well as high resistance to fuels, oils, solvents, and ozone.

* 2 IPS (RP) valves and smaller = Acetal 2 IPS (FP) valves and larger = Polypropylene

GENERAL INFORMATION

Item	Operating Feature	
Sizes	All standard 1/2 through 1-1/4 CTS and 1/2 through 16 IPS sizes All standard 20mm through 400mm Metric sizes	
Designed/Tested	ASTM D 2513, ASME B16.40, CFR 49, Part 192, CSA B137.4	
Materials	Medium Density PE 2406	High Density PE 3408
Operating Pressure (SDR 11)	PE 2406: 80 psi	PE 3408: 100 psi
Temperature	From -20° F to 140° F	From -20° F to 140° F
Bore	Standard (Reduced) Port & Full Port	
Pipe Connection	Butt Fusion, Socket Fusion, Electrofusion or LYCOFIT® Mechanical Fittings (up to 2 IPS)	
Operation	90 Degree Operating Standard (360° Optional)	
Valve Boxes	Lyall-Polytec Valves are supported by all the leading Valve Box Manufacturers	

LYALL-POLYTEC

POLYETHYLENE BALL VALVES FOR GAS APPLICATIONS

- Meets or exceeds **ASTM D 2513, ASME B16.40, CFR 49, PART 192, and CSA B137.4**
- ISO 9001 certified manufacturing facility
- Serialized for complete material and process traceability
- Unrestricted flow and maximum capacity for optimal performance
- Service rated to maximum allowable pressures
- Operating temperature range of -20° F to 140° F
- Precision manufacturing processes ensure lower operating torque
- Bubble-tight seal throughout entire pressure and temperature range
- Specially compounded nitrile seals (HNBR) exceed industry standards
- Valve body design provides resistance to mechanical and thermal loads making it the strongest part of a PE Piping System
- **10-Year Warranty**

Your Authorized Lyall-Polytec Distributor:

R.W. LYALL & COMPANY, INC.

2665 Research Drive • Corona, CA 92882-1618 • Ph: (800) 535-9255 • Fax: (951) 270-1600 • www.rwlyall.com

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Pigs

Unlimited

International, Inc.



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23802 FM 2978, Suite C1
Tomball, Texas 77375

Tel: 281-351-2749
Fax: 281-351-4658
Toll Free: 800-578-7436
E-mail: sales@pigsunlimited.com

www.pigsunlimited.com

Foam Pigs



Pigs Unlimited International, Inc. manufactures foam pigs in many styles and sizes ranging from 2" to 48" nominal pipe diameters for wiping, drying, batching, separating, scraping, and cleaning of pipelines.

Standard densities include two pound, five pound, and eight pound per cubic foot as well as special densities for unique applications. The following illustrate the most common styles available, however any conceivable configuration can be manufactured.

Swabs & Bare Pigs

These pigs are constructed of light, medium, and heavy density foam. They are used for drying and sweeping loose debris and gauging internal pipe conditions before extensive pigging.



Criss-cross

This design is typically bullet shaped and constructed of medium or high density foam with a polyurethane elastomer coating applied in a single-spiral or criss-cross pattern.



Silicon Carbide

By adding silicon carbide, in loose grit or strap, moderate scraping action can be achieved.



Wire Brush or Plastic Bristle

Equipping the pig with wire brushes or plastic bristles provides maximum scraping and cleaning of pipelines in a variety of applications. Standard configurations include barber pole or total coverage.



Configuration Options

Pigs Unlimited International, Inc. manufactures many optional foam pig configurations, such as double-dish, double-nose, double-length, totally coated, and pulling rope or cable. A transmitter cavity can be incorporated for pig tracking applications.



Solid Cast Pigs

Solid-cast pigs, which have the flexibility and easy handling of foam pigs, coupled with the ruggedness and excellent sealing capabilities of steel pigs, prove very efficient as general purpose pigs for batching, displacement and routine pigging applications. With the addition of brushes, they can also be used for cleaning operations. Various configurations are available, including spherical, cup-type, and disc-type.



Pigging Related Products

Also available are pigging related products including:



Launchers and Receivers

Launchers and receivers are used to properly launch and receive pigs in the pipeline. The basic design consists of an oversized barrel, a reducer to mate to existing pipe, and a closure door for access, as well as other connections for components. Units are available for purchase or rental.

Closures allow access to a launcher, receiver or main pipeline. They are used in lieu of a flange to blind-flange arrangement. The two basic types are threaded and quick-opening and are available in a wide range of sizes and pressure ratings.

Closures



Pig Detectors

Pig Detectors are used to detect the passage of a pig. The two basic categories are intrusive and non-intrusive. An intrusive detector is permanently attached to the pipe and is equipped with a probe that intrudes into the pipeline. The non-intrusive type does not intrude into the pipeline and is either magnetic, transmitter/receiver, or ultrasonic. Detectors can be equipped with electric signals to control the functioning of valves, pumps, and compressors.



Pig Trackers and Pingers

Pig Trackers and Pingers are used to track pigs during pigging operations. Operators are able to physically walk the line and pickup the signal emitted by the transmitter. The difference between trackers and pingers is that transmitters are equipped with an on/off switch and pingers are activated once they come in contact with a liquid.

Units can be purchased or rented.



Process Pigging System

The process pigging system utilizes a specially designed process displacement pig, as well as other customized components, to recover normally wasted product thereby reducing processing costs, improving efficiency, and increasing profits.

With a series of strategically placed pigging stations, three-way valves, pigging tees, ells, pressure gauges, and flow regulators, lines are pigged between product changeovers and transfers, virtually eliminating cross-contamination and recovering product that would otherwise be lost. Because the process pig is so effective in removing product residue, dedicated lines for individual products can be eliminated.



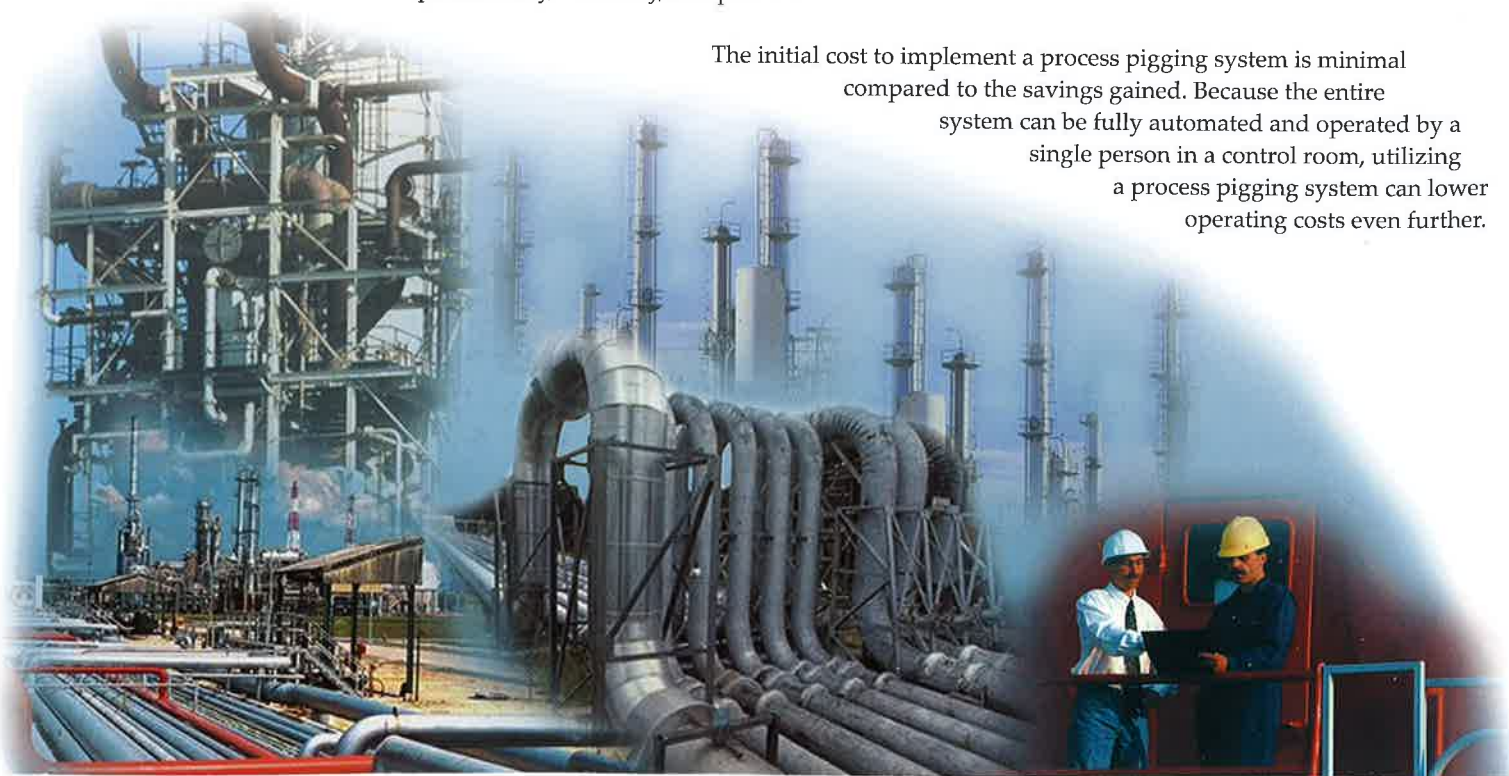
Product Displacement Pig

The key to the system is in the design of the process displacement pig, which with its multiple discs, virtually eliminates bypass. The pig is capable of spanning full-branch tees, negotiating full-port valves, and 1.5 diameter bends. The PDP can be manufactured to any diameter, length, and configuration as well as from various compounds to be compatible with different products or applications.

Pigging System Benefits

Numerous companies in a variety of processing industries have utilized the process pigging system and saved millions of dollars. By design, the system eliminates cross-contamination, decreases downtime for product changeovers, recovers normally wasted product, and minimizes the need for dedicated lines. These benefits equate to increased productivity, efficiency, and profits.

The initial cost to implement a process pigging system is minimal compared to the savings gained. Because the entire system can be fully automated and operated by a single person in a control room, utilizing a process pigging system can lower operating costs even further.



Launching and Receiving Pigging Valve

Pigs Unlimited International, Inc. pig valve offers an economical alternative to conventional launchers and receivers. Available in sizes from 2" and above, it is capable of launching and receiving foam, steel, and solid-cast pigs in both cylindrical and spherical shapes. They are designed for use as end-of-line units or within closed-loop systems.

Other features include: shut-off style design with upstream sealing seat or bypass design, automatic body cavity venting downstream, wide range of fluid compatibility, double block-and-bleed, body drain and vent, and lockable stop plate in "open" or "closed" position. The valve is a cost-effective, safe, and easy-to-use launcher and receiver for any pigging operation.



Design Advantages

The valve's simple design offers easy installation and immediate sealing during launching, thereby eliminating "false" launches. Manpower and downtime are saved due to the ease of loading and unloading pigs. With its compact design, which is important in processing plants and offshore platforms, it offers superior accessibility and user-friendliness. A smooth valve bore eliminates trapping of foreign particles and buildup and is also equipped for corrosion inhibitor injections.



Rugged Construction

The design incorporates a one-piece body and flange assembly. This ensures complete integrity throughout the entire valve. The trunnion-mounted ball and stem are constructed of 300 series stainless steel, making them resistant to most corrosive fluids. The catcher plate is secured to the ball via a designed shoulder. And with the valve stem installed through the body, it is blowout proof. Self-lubricating Delrin seats minimize torque and provide for applications in high-pressure services.

Easy to Use

The valve requires no special tools, therefore use and servicing is made easy. Also, all repairs can be made in the field without having to remove them from the line. The units are bidirectional and able to serve as both launcher and receiver, depending on their installation. The bonnet's o-ring design and position eliminates the need for special torque requirements or sequence of tightening studs as with blind-flanges found on conventional launchers and receivers.

Safe Operation

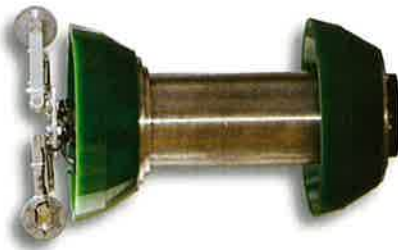
The valve is equipped with two bleed connections for venting pressure before accessing the pig chamber. Over-pressurization of a line is eliminated during pigging operations with the bypass design, thereby making launching and receiving pigs a quick and safe operation.

Pigging Services



Pipeline Cleaning services can be performed in all types of applications, including new construction, online, progressive, and chemical for the oil and gas, municipalities and mining, chemical and petrochemical, food and beverage, cosmetic, and pharmaceutical industries. Cleaning operations are utilized for pipelines with product impurities, excessive buildup, sand and other heavy sediment buildup, and fine debris accumulation.

Pig Tracking can be performed on any pigging application, from 2" to 48" pipelines, with no limit to length or terrain. Detailed reports are supplied after the job, with information such as pig speed and pressure charts that are key in pointing out possible problem areas in the pipeline.



Caliper Pig Services utilize our high-resolution, multi-channel caliper pigs for new-construction approval and acceptance, or for inspection of existing operating systems. Automatic defect sizing allows for fast, accurate reporting of geometric defects including ovality, wrinkles, buckles, dents or other types of geometric anomalies, which allow for quick onsite integrity decisions backed by hard data.

Intelligent Pig Services use high-resolution MFL (Magnetic Flux Leakage) technology for the inspection of operating pipelines for the detection of anomalies due to body-wall corrosion. Anomalies are reported using Pipeline Operator Forum guidelines or as specified by client requirements to insure pipeline integrity. All reporting is analyzed with B31G remaining-strength formulas, as well as, customized calculations for special applications. Our powerful software allows client interaction directly with the data management programs.



Layout, Design, and Pigging Consultation assistance is offered for plant design, launcher and receiver design, and other applications, as well as ensuring proper pig selection and pigging procedure application. Experience is derived from numerous fields, and expertise is geared toward ensuring that pigging achieves optimum efficiency.

Field Supervision, On-site Inspection, and Trouble-Shooting is offered for those having the equipment and personnel to pig their own pipeline but are unsure of pigging procedures. Inspection services verify that desired pigging results have been achieved. Troubleshooting is provided with all pigs and pigging procedures.

Time & Material Quotes and Cost & Savings Analysis can be performed for all services provided, with cost and savings analysis demonstrating savings verses other methods of cleaning and rehabilitation.

Contract Manufacturing and Custom Designs

is available for the manufacture of any pigging-related product, including "private labeling." We will also manufacture products not related to pigging but that utilize the same raw materials.



Steel Pigs

Pigs Unlimited International, Inc. also manufactures steel-mandrel pigs in sizes ranging from 2" to 48" nominal pipe diameter with configurations including standard cup, disc, conical, multi-disc, and articulated pigs. All of which can be fitted with wire brushes or paraffin-removal blades.



Cup and Disc Pigs

Equipped with cups and/or discs, these pigs are primarily used for evacuating air and liquid during hydrostatic testing, routine batching, displacement, and product removal. Gauging plates can also be added to prove pipe roundness and minimum bend radius.



Cleaning Pigs

These rugged pigs are equipped with circular brushes or block-type brushes or blades mounted on wear-compensating springs. They are used for cleaning rust, millscale, sand, wax, organic growth, mud, oxides, and other foreign debris.



Conical Cup Pigs

Suitable for the entire range of pigging applications, this versatile design allows for the same pig body to be equipped with 2, 3 or 4 cups or discs, and with or without spring-loaded brushes or blades for cleaning operations.



Spares and Accessories

In addition to complete pigs, spare components including cups, discs, blades, springs, and other accessories can be manufactured to fit all styles and makes of pigs.



NEW

***Pigs Unlimited International, Inc.
introduces their newly
revised website at:***

www.pigsunlimited.com

***In addition to each and every product having its
own dedicated page with:***

- Individual Picture
- Technical Description
- Downloadable Specification Sheet
- Pricing

We also have helpful resources like:

- Frequently Asked "Pigging" Questions
- Informative Troubleshooting Guide
- Downloadable Pigging Papers
- Interactive Pigging Formulas



With all of the above, it is easy to see how our website has become the most comprehensive information available for all of our products and services. And coupled with our high quality, low pricing, and unparalleled service, also assist us in accomplishing our mission of:

**Making the world a cleaner place...
One pipeline at a time.**

23802 FM 2978, Suite C1
Tomball, TX 77375

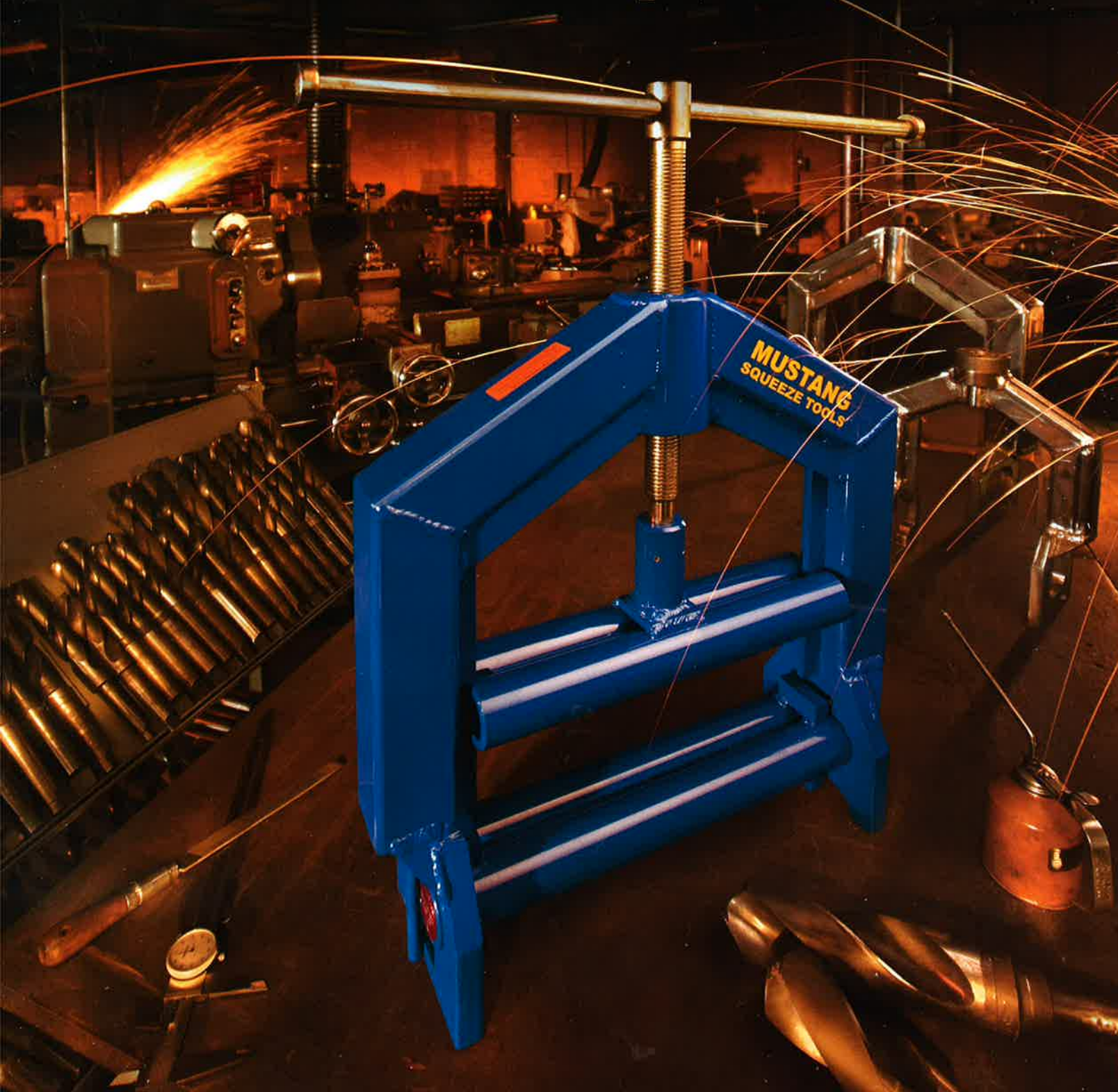
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MUSTANG

Squeeze Tools



About Mustang

Mustang story begins in 1967 when founder Ted Melsheimer began work with DuPont to develop a tool that could control the flow of gas through a pipe made of a revolutionary new material called polyethylene. Many different designs were tested before the double bar configuration finally proved to provide the best squeeze off with the least effort. This new double bar design was patented and production began to produce tools for use by DuPont and later many other users.

Almost 40 years later, Mustang still leads the industry as the only company that designs and manufactures only squeeze tools. By not being distracted by other products, Mustang is able to focus all it's resources on squeezing pipe in the most efficient and safest manner possible.

Mustang designs each of it's tools to an uncompromising design factor of 3 to 1 utilizing lighter weight aluminum where appropriate but high strength steel for the critical stressed components. This philosophy results in a tool that is in some cases heavier than the competition, but unequaled in strength. Mustang has not, and will never compromise safety for the allure of a lighter sleeker tool.

The complete Mustang lineup is presented in this catalog along with information that may prove helpful in making the correct choice of squeeze tool. If you have further questions or concerns, Mustang's technical staff stands ready to offer any assistance to help make your job of squeezing polyethylene pipe easier and safer.



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Contents

Mustang Squeeze Tool Operation & Features

A Word on Gap Stops	2
Tool Safety Features	2
Manual & Hydraulic Tools	3

Static Electricity Prevention & Discharge

Electrostatic Discharge	4
SEG-30 Static Electric Grounding Device	5
Frequently Asked Questions	6

Manual Operation Squeeze Tools

Manual Tool Lineup and Anatomy	7-8
GLS-26 Ground Level Squeeze Tool	9
DBS-10A 1" IPS Service Size Squeeze Tool	10
DBS-11A 3/4" IPS Service Size Squeeze Tool	11
DBS-20C 2" IPS Double-Bar Mid-Range Squeeze Tool	12
DBS-24C 2" IPS Quad-Bar Mid-Range Squeeze Tool	13
DBS-40F 4" IPS Double-Bar Mid-Range Squeeze Tool	14
DBS-44F 4" IPS Quad-Bar Mid-Range Squeeze Tool	15
DBG-60 6" IPS Double-Bar Heavy-Duty Squeeze Tool	16
DBG-80 8" IPS Double-Bar Heavy-Duty Squeeze Tool	17
Mechanical Tool Saddle Clamps	18

Hydraulic Operation Squeeze Tools & Pumps

Hydraulic Tool Lineup and Anatomy	19-20
DBM-60 6" IPS Hydraulic Mid-Duty Squeeze Tool	21
DBML-80 8" IPS Hydraulic Mid-Duty Squeeze Tool	22
DBH-68-E 8" IPS Hydraulic Heavy-Duty Squeeze Tool	23
DBH-1200 12" IPS Hydraulic Heavy-Duty Squeeze Tool	24

Steel Pipe Squeeze Tools

Huskie™ SPS-50 Emergency Remote Steel Pipe Squeeze Tool	25
Huskie™ PS-62B Emergency Steel Pipe Squeeze Tool	25
Huskie™ PS-75 Emergency Steel Pipe Squeeze Tool	25

Hydraulic Accessories

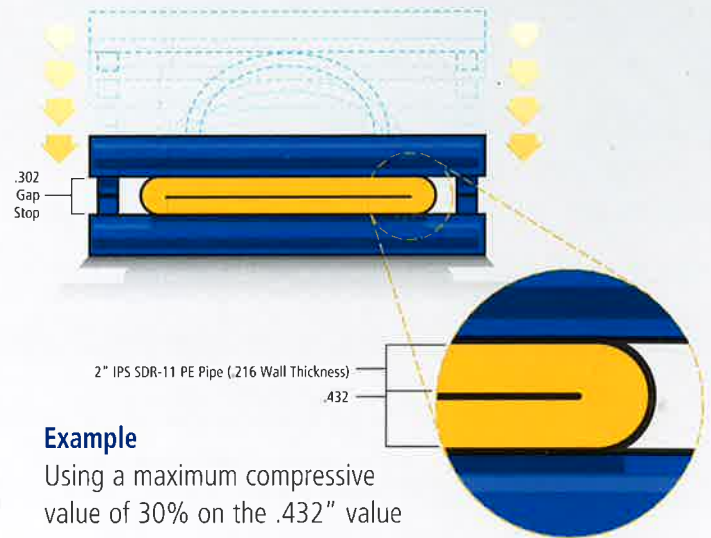
Model HP50 Single Acting High-Pressure Hand Pump	26
Model AP201L Air-Over-Hydraulic Portable Hydraulic Pump	26
Model 20A 2-Stage Hydraulic Hand Pump	26
Model 25 2-Stage Hydraulic Hand Pump	26

A Word on Gap Stops

Pressure control of Polyethylene Plastic Pipe using the squeeze-off principle has been practiced for many years. A very important part of the squeeze-off concept is to protect the pipe using gap stops to prevent over squeezing. Gap stop sizes are determined by doubling the pipe wall thickness and subtracting a compressive value up to 30% of the doubled wall thickness amount.

All Mustang Squeeze Tools are equipped with gap stops. When ordering tools, specify the pipe size and SDR (Standard Dimensional Ratio) of the PE pipe used. Gap stops on Mustang Squeeze Tools have a tolerance of $\pm .005"$. The unique patented double-bar jaw design allows gap stops to be conservative in size (ranging from 10-22% compressive value). The double-bar jaw produces a shut off with less compressive force than other jaw shapes, which often enables a complete shut off with considerable "daylight" between the upper jaw and gap stops on the lower jaw. Complete shut off is usually achieved after the PE pipe has relaxed for several minutes. If necessary, an additional application of compressive force will result in complete shut off.

It is very important to visually center the pipe under the upper jaw. Failure to do so will result in an unsuccessful squeeze-off and possible damage to the squeeze tool.



Example

Using a maximum compressive value of 30% on the .432" value results in a gap stop of .302". This should be the minimum gap stop used on a squeeze tool to protect 2" IPS SDR-11 PE Pipe.

Tool Safety Features

Mustang Squeeze Tools are used in an environment that requires the utmost in operational safety and Mustang Manufacturing believes that safety should not be compromised due to cost or competitive reasons. Mustang builds each squeeze tool to a strict 3:1 safety factor. See example below:

- A.** Mustang "H" and "ML" Series Hydraulic Squeeze Tools use a pilot operated cylinder locking valve. This specially designed valve assures the permanent locking of the hydraulic cylinder in the compressive squeeze-off mode. It automatically locks the cylinder and does not require the operator to remember to close a conventional valve. Upon completion of the squeeze-off, the double acting cylinder is retracted after unlocking the valve hydraulically.
- B.** Mustang designs and manufactures Hydraulic Hand Pumps with non-conductive high-pressure hose assemblies to power hydraulic tools. Hi-Flo Quick Disconnect couplings permit positive connection using a threaded sleeve.
- C.** Mustang's static electric discharge grounding device is manufactured from solid copper and bronze for maximum conductivity. Attachment to the upper jaw's grounding lug provides the optimum path to ground if a static charge builds and discharges through the pipe/tool.

Squeeze Tool Operation

Polyethylene Pipe Squeeze-off Procedure

Polyethylene plastic used in gas distribution piping systems has a unique feature that allows it to be squeezed-off for flow control and returned to near original shape without a reduction in pressure rating. Any squeeze-off method must be addressed with properly designed tools and operating procedures. A suggested procedure for using Mustang Double-Bar Squeeze Tools is as follows:

- 1. Before using any squeeze tool, familiarize yourself with its construction, operation and design features.** Operation instructions for mechanical and hydraulic operated tools vary. Training in the correct use of these tools is essential if safe and efficient results are to be achieved.
- 2. The PE pipe size should be identified and the proper gap stop on the jaw positioned.** Inspect the pipe for surface damage and remove any dirt from the squeeze zone. If possible, inspect the inside surface of the pipe. A smooth finish will permit better squeeze-off than a rippled or rough texture.
- 3. The squeeze tool should be grounded to prevent static electric discharge before positioning it on the pipe.** A thorough understanding of the phenomenon of external and internal static electric discharge should be included in the training session on the use of squeeze tools. Mustang Manufacturing offers a Static Electric Grounding device that adapts to all Mustang tools.
- 4. Visually center and square the squeeze tool on the pipe then partially squeeze 10-15%.** Determine that the upper jaw is parallel, or level, with the lower jaw and that equal space exists between the tool frame and the sides of the pipe. If the upper jaw is sloped or tilted to one side, the tool is not properly centered and should be adjusted.
- 5. After the tool is properly centered, squeeze the pipe until the hand torque on mechanical tools is "tight".** Allow one minute per diameter inch of pipe size for cold flow relaxation. Double this time for temperatures below freezing. After relaxation, re-torque the screw approximately one-quarter turn. Hydraulic tools will achieve a "tight" level at a prescribed gauge pressure. After relaxation the pressure gauge will show a drop of 150-200psi and must be re-pumped to the original pressure. Complete squeeze-off should be achieved at this point.
- 6. Hydraulic and large mechanical tools use a pair of saddle clamps as mechanical locking devices, locking the jaws in place in the event of hydraulic failure.** Saddle clamps should be installed immediately as explained in the operation instructions for each tool. Saddle clamps can be used on mechanical tools to achieve a more precise squeeze-off by asserting additional clamping force adjacent to the squeezed pipe folds.
- 7. Purge the pipe.** Purging the pipe can be accompanied by controlled opening of the squeeze tool or squeeze tool and saddle clamp combination.
- 8. Mark the pipe with a clamp or tape to indicate the squeeze-off area.** Repeated squeezing on the same area should be avoided.

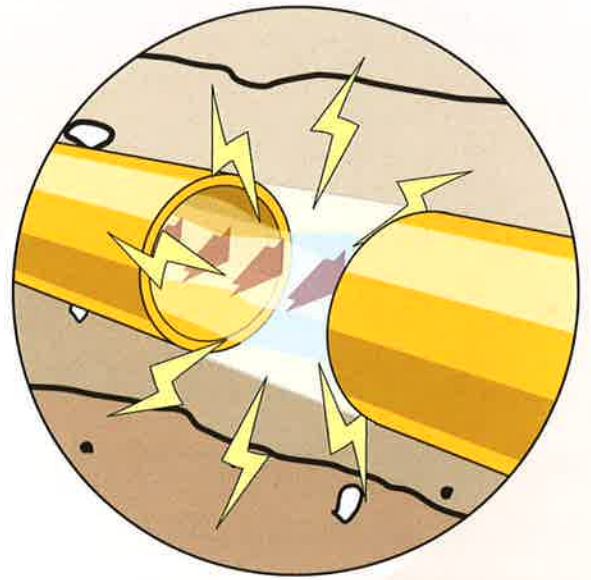
Helpful Hints

- 1.** When using Mustang tools in a trench or bell hole, positioning the tool 45° to the pipe permits the lower jaw to be inserted or removed with minimal side excavation of the trench wall.
- 2.** Re-rounding of the pipe can often be assisted by rotating the tool 90° and pushing the pipe to a near round shape. The use of a re-rounding tool or two-piece clamp will also aid in this operation.



This phenomenon is aggravated by:

1. Sufficient gas flow to cause extensive turbulence, such as the reduced area of pipe during squeeze-off.
2. Rust or foreign particles present in the gas.



Electrostatic Discharge

Polyethylene plastic used in manufacturing gas pipe has many advantages over steel and other materials. However, one disadvantage is the potentially dangerous electrostatic buildup caused by gas flowing through this non-conductive material.

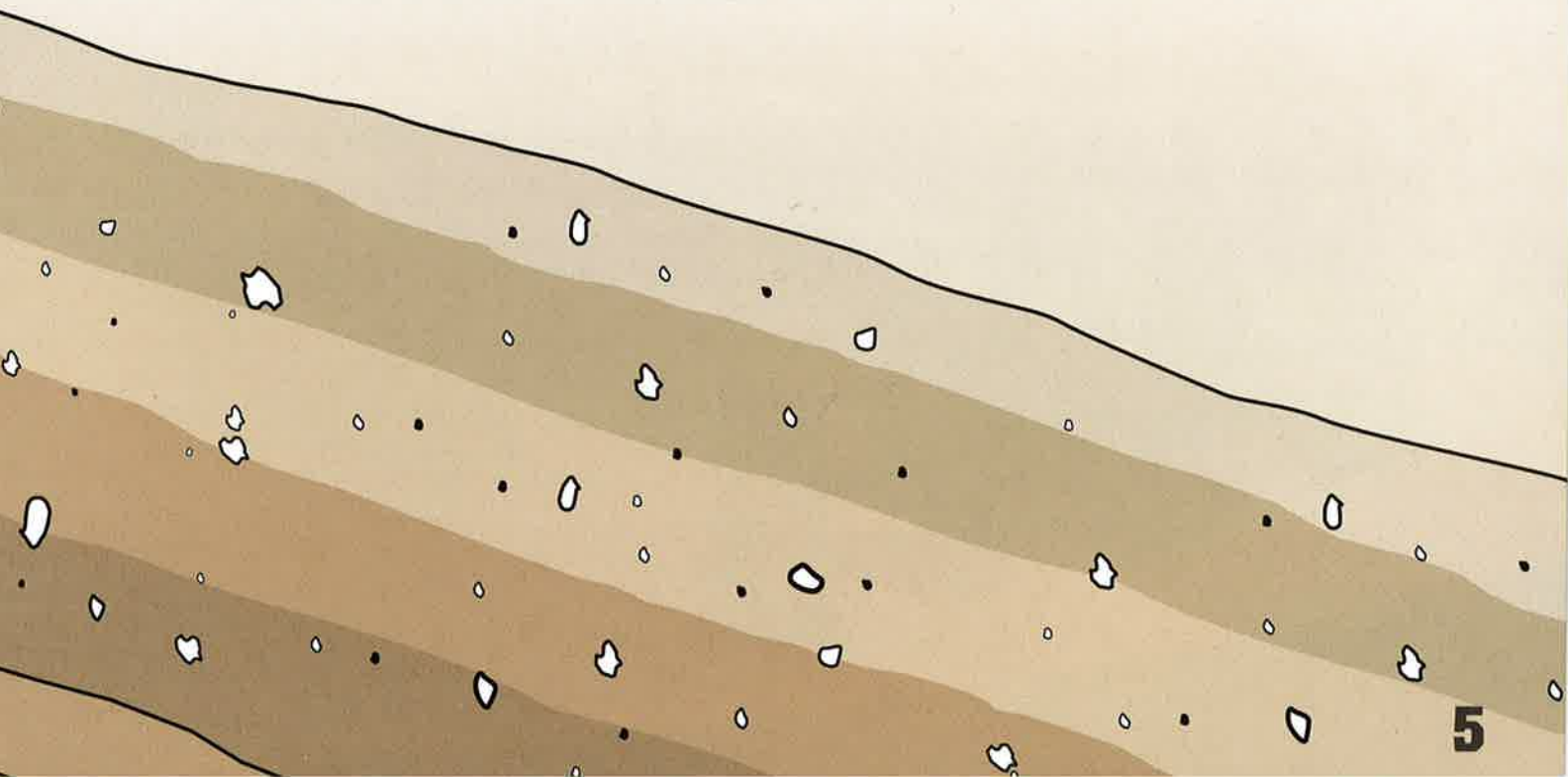
The possibility of static electric discharge during squeeze-off of PE gas pipe is now recognized and addressed by gas utilities and pipe manufacturers. During the normal flow of natural gas in PE pipe, electric charges move in the direction of the gas. When squeeze-off occurs, turbulence and gas velocity increase at the squeeze point, which causes the charges to become heavily concentrated at that same point. As the charge increases in density on the inside wall surface, the force between the charges inside the pipe and the opposing charges outside the pipe increase. When the force exceeds the dielectric strength of the pipe, the charges move through the pipe and create a pin hole opening in the pipe wall. If the squeeze tool is properly grounded, the discharge will move through the squeeze tool to the earth.

SEG-30 Static Electric Grounding Device

The SEG-30 static electric Grounding Device adapts to all Mustang Squeeze Tools manufactured since 1972. An adapter is screwed into the upper jaw grease fitting tapped hole which provides a grounding strap terminal and a passageway for lubrication grease.

A 5-foot insulated braided copper cable connects the squeeze tool to a 12" copper cast spike which is inserted into the earth adjacent to the work area. Bronze casted handle and terminal lug completes the device. Frayed cable ends can be trimmed away and re-inserted into the machined bronze castings.

The SEG-30 terminal lug provides a large area path to ground and should be permanently attached to the tool. Use of alligator clamp attachment is not recommended due to minimal contact area of the clamped teeth.



Frequently Asked Questions

Q: Can a Mustang tool handle ALL pipe sizes within its range?

A: NO – Due to the large number of pipe sizes and SDRs for a given size, it is not possible to accommodate ALL pipe sizes on one or two stops. Many sizes/SDRs that are close can be combined (i.e. 3" SDR 11 and SDR 11.5) but sizes such as 3" SDR 13.5 or SDR 17 must stand alone. Therefore, the DBS-20C for example can accommodate two sizes up to 2" IPS but not ALL sizes up to 2" IPS. Please see the gap stop chart for the particular model you are interested in to select the correct stop combination.

Q: Can a hex nut or adapter be welded to the screw of a mechanical tool so that we may use an impact wrench or other power tool?

A: NO – We do not recommend that anything be welded to the screw. The material that the screw is made of is a high strength alloy that is not considered weldable. You may be able to get something to stick to the screw but there will be little if any strength and it could break off suddenly and cause injury. The handle that is provided with each mechanical tool is of the correct length to provide the most torque while staying within the tool's design limits. Using an extension or "cheater bar" can over stress the tool and cause permanent damage.

Q: How far away from a fusion joint or fitting can I squeeze?

A: A minimum of three pipe diameters (i.e. 12" on 4" pipe) is the accepted rule.

Q: We can not get a 100% shut off. What's wrong with the tool?

A: Squeezing pipe has never been able to offer a 100% leak free shut off. 100% means, to us, that there will never be a bubble of gas escape ever. That is not possible. A 95%-98% shut off should be attainable in most cases. Some pipe produced in the last several years has proven to be more difficult to squeeze than some of the older material. If after squeezing all the way to the gap stops, the flow is still not controlled, it may be necessary to install a second tool on the line.

Q: We have a hydraulic tool that will pump down but won't come back up.

A: It is important to make sure that the quick disconnects are completely engaged on the tool. The threaded collars need to be completely screwed down so that there is no gap. If not fully engaged the return oil or the oil necessary to raise the ram cannot reach the cylinder and the tool will remain down.

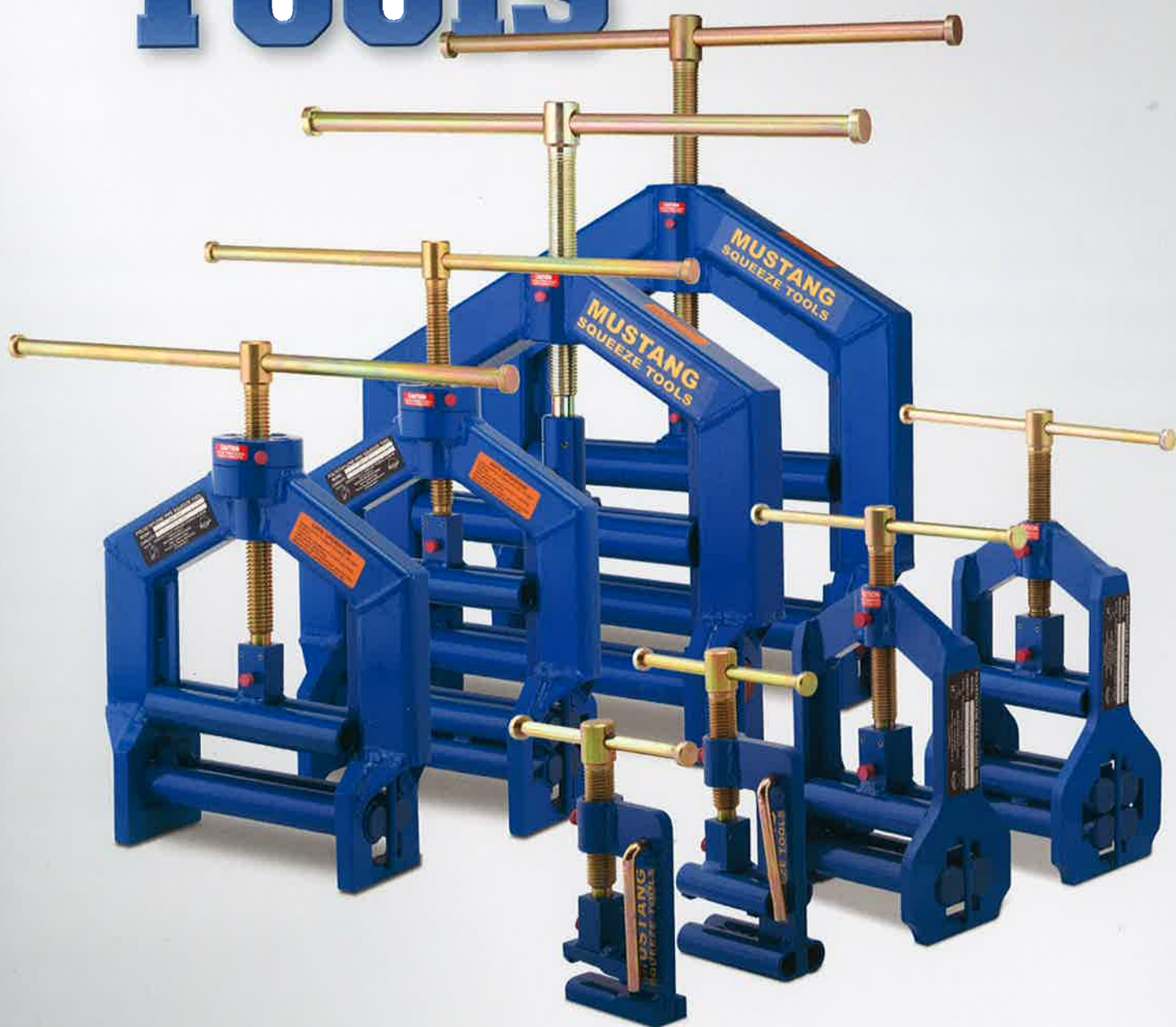
Q: What type of oil should I use in the hydraulic tool?

A: The tools are factory filled with AW32 (anti-wear). Any brand hydraulic oil meeting this spec can be used (this is a very common spec). DO NOT use brake fluid or automatic transmission fluid (ATF) as this will damage the seals in both the pump and the cylinder.

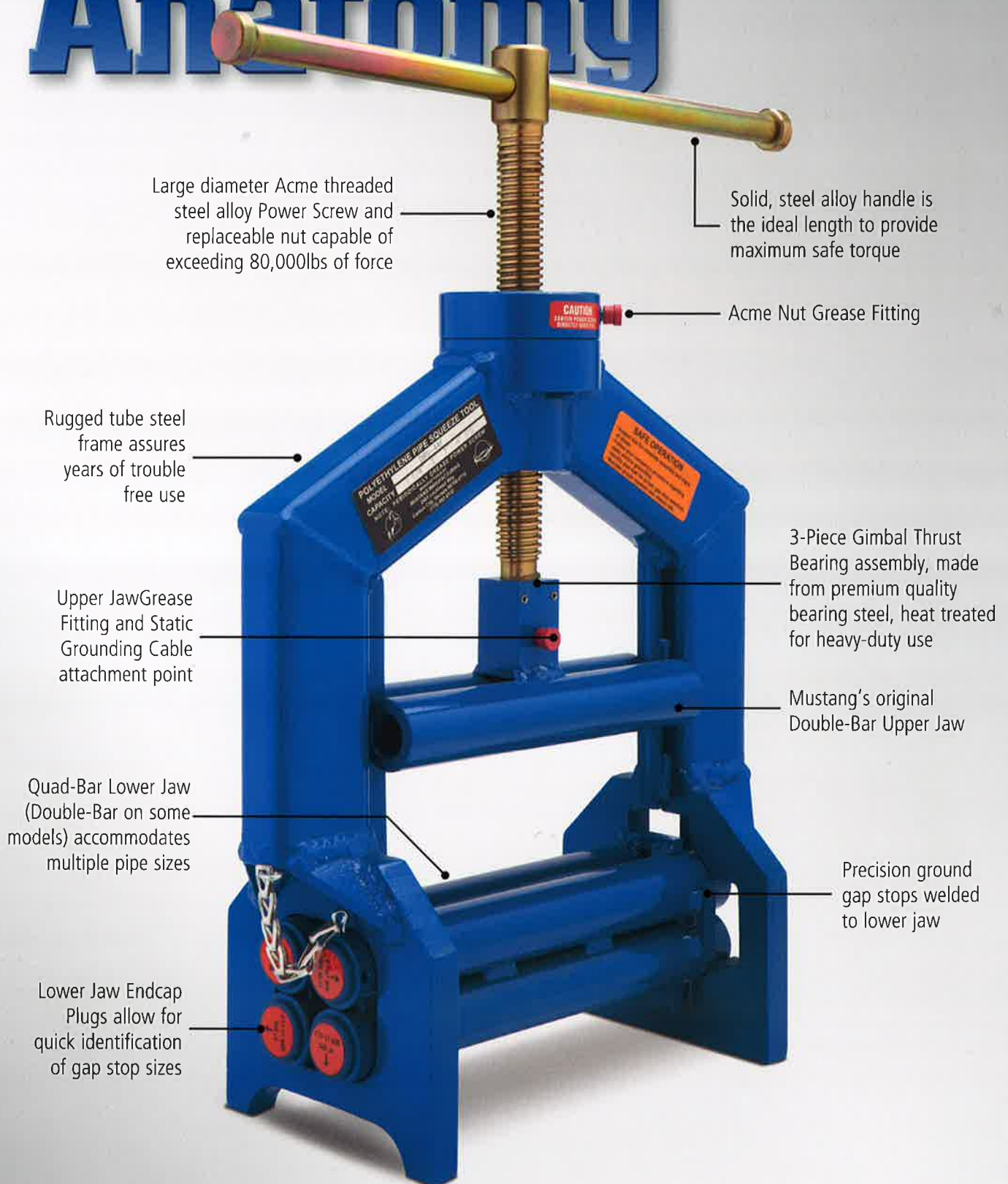
Q: Should we ground our tools? Are jumper cables OK?

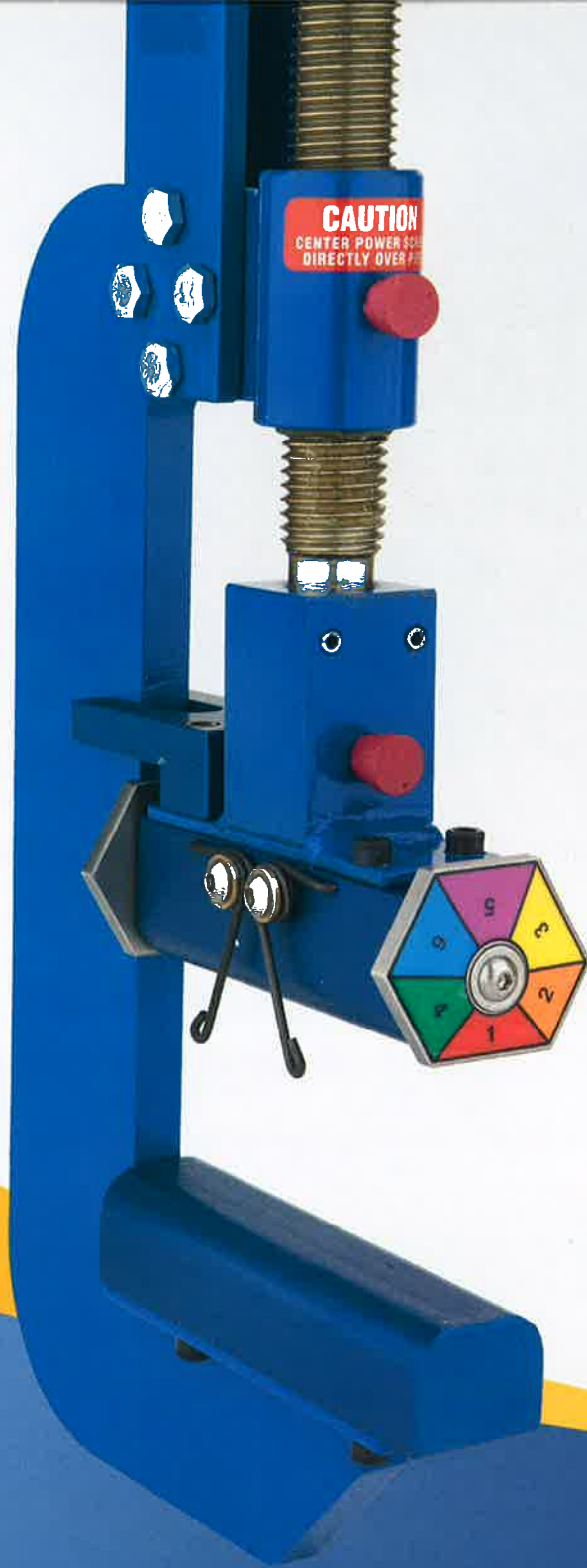
A: YES & NO – We recommend that all squeeze tools (and other tools as well) be grounded. Jumper cables typically attach with an alligator type clamp which does not provide a good grounding contact. The attachment is also easily knocked off during use. Jumpers are better than nothing, but a proper fixed grounding attachment is preferred.

Manual Squeeze Tools



Squeeze Tool Anatomy





GLS-26

Ground Level Squeeze Tool

The GLS-26 is an upgrade to our field proven GLS-20 Emergency Tool by providing direct dial squeeze control. The new color coded gap stops, along with an emergency setting, enables you to safely squeeze off every PE pipe size from 1/2" CTS through 2" IPS — with all settings and pipe sizes cross-referenced on a frame-mounted color chart. Simply dial in the prescribed gap stop by rotating the stainless steel, color coded disc. A dual set of spring-action "whiskers" guide you in centering the jaws squarely on the pipe. Turning the tool's 12" handle generates up to 10,000lbs of squeeze force, while its upper-frame torque handle provides added leverage. Light and durable, the trim GLS-26 is designed with the same unparalleled 3:1 strength factor bred into the entire Mustang family. For further safety, we've attached a solid copper grounding device, with 5' strap and 3/8"x12" spike, as standard equipment.



Weight: 19lbs
Dimensions: 59"x 6.5"

Emergency Gap .000
Any Size
1/2" CTS – 2" IPS

1/2" IPS, DR-9.3
1/2" CTS, DR-7
1" CTS, DR-12.5
3/4" CTS, DR-9.7
.090-.095 Wall

3/4" IPS, DR-11
1" CTS, DR-11/11.5
1-1/4" CTS, DR-15
.095-.101 Wall

1" IPS, DR-11
1" CTS, DR-9
.119-.121 Wall

1-1/4" IPS, DR-10/11
1-1/2" IPS, DR-11
.151-.173 Wall

2" IPS, DR-11
.216 Wall



DBS-10A

Service Size Squeeze Tool

1" IPS Integrated Single-Bar

The smallest tool in Mustang's lineup, the DBS-10A employs an open frame design, which permits easy application on service PE pipe. Gap stops are welded to the upper jaw and grease fittings are provided for power screw and thrust bearing lubrication.

Static electric grounding is accomplished using a SEG-30 Grounding Rod attached to the upper jaw.

Weight: 6lbs
 Dimensions: 8.75" Height
 Capacity: Specify (1) Size (see table below)

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
CTS 1/2"	.090	7	.147	22
	.104	6	.172	21
CTS 3/4"	.077	11	.125	24
	.090	9.7	.155	18
CTS 1"	.090-.101	11-12.5	.155	29
			—	—
CTS 1-1/4"	.090	15	.155	21
	.121	11	.210	19

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 1/2"	.090	9.3	.155	18
	—	—	—	—
IPS 3/4"	.095	11	.155	25
	—	—	—	—
IPS 1"	.119	11	.210	22
	—	—	—	—

Gap stops are welded to the upper jaw on DBS-10A Service Tools. A gap stop can protect more than one pipe size if a similar wall thickness exists. (Example: 1/2" CTS SDR-7 and 1" CTS SDR-11.5 can be squeezed using a common .155 size gap stop. Custom gap stops are available upon request.)



DBS-11A

Service Size Squeeze Tool

1" CTS Integrated Flat-Bar

Similar in size and design to the DBS-10A, the DBS-11A employs a Flat-Bar design to service size PE pipe with a less than smooth interior surface finish.

The flat-bar design applies more contact area on the pipe and produces a larger sealing surface. Higher hand torque is required and limits the tool range to 3/4" IPS maximum. Gap stops are welded to the upper jaw and grease fittings are provided for power screw and thrust bearing lubrication.

Static electric grounding is accomplished using a SEG-30 Grounding Rod attached to the upper jaw.

Weight: 5lbs
 Dimensions: 8" Height
 Capacity: Specify (1) Size (see table below)

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
CTS 1/2"	.090	7	.147	22
	.104	6	.172	21
CTS 3/4"	.077	11	.125	23
	.090	9.7	.155	18
CTS 1"	.090-.101	11-12.5	.155	29

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 1/2"	.090	9.3	.155	18
	—	—	—	—
IPS 3/4"	.095	11	.155	25
	—	—	—	—

NOTE: Gap stops are welded to the upper jaw on DBS-11A Service Tools. A gap stop can protect more than one pipe size if a similar wall thickness exists. (Example: 1/2" CTS SDR-7 and 1" CTS SDR-11.5 can be squeezed using a common .155 size gap stop. Other combinations are available using custom gap stop sizes.)



DBS-20C

Mid-Range Squeeze Tool

2" IPS Double-Bar

The redesigned Mustang Model DBS-20C Mid-Range Squeeze Tool accommodates pipe sizes from 1/2" CTS to 2" IPS maximum. The DBS-20C can be used on service size pipe up to medium size distribution pipe with ease and safety. The lower jaw has two sets of gap stops to accommodate two pipe sizes of your choice.

Features include a larger, heavy-duty frame designed to withstand the greater force needed to squeeze today's PE pipe, while retaining the double-bar jaw design for greater contact area.

A high-strength power screw and thrust bearing with grease fittings for lubrication, as well as a provision for using a SEG-30 Grounding Rod for static electric grounding, completes the package.

Weight: 15lbs
 Dimensions: 13.5" Height
 Capacity: Specify (2) Sizes (see table below)

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
CTS 1/2"	.090	7	.147	22
	.104	6	.172	21
CTS 3/4"	.090	9.7	.155	18
	—	—	—	—
CTS 1"	.090-.101	11-12.5	.155	29
	—	—	—	—
CTS 1-1/4"	.090	15	.155	17
	.121	11	.210	19

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 1/2"	.090	9.3	.155	14
	—	—	—	—
IPS 3/4"	.095	11	.155	25
	—	—	—	—
IPS 1"	.119	11	.210	22
	.140	9.3	.234	27
IPS 1-1/4"	.151-.166	10-11	.270	27
	.178	9.3	.288	25
IPS 1-1/2"	.173	11	.288	22
	—	—	—	—
IPS 2"	.216	11	.347	25
	—	—	—	—



DBS-24C

Mid-Range Squeeze Tool

2" IPS Quad-Bar

The DBS-24C is similar to the DBS-20C but uses a quad-bar design that accommodates pipe sizes from 1/2" CTS to 2" IPS maximum. The DBS-24C can be used on service size pipe up to medium size distribution pipe with ease and safety. The lower jaw has four sets of gap stops to accommodate four pipe sizes of your choice.

Features include a larger, heavy-duty frame designed to withstand the greater force needed to squeeze today's PE pipe, while retaining the quad-bar jaw design for greater contact area.

A high-strength power screw and thrust bearing with grease fittings for lubrication, as well as a provision for using a SEG-30 Grounding Rod for static electric grounding, completes the package.

Weight: 19lbs

Dimensions: 14.75" Height

Capacity: Specify (4) Sizes (see table below)

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
CTS 1/2"	.090	7	.147	22
	.104	6	.172	21
CTS 3/4"	.090	9.7	.155	18
	—	—	—	—
CTS 1"	.090-.101	11-12.5	.155	29
	—	—	—	—
CTS 1-1/4"	.090	15	.155	17
	.121	11	.210	19

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 1/2"	.090	9.3	.155	14
	—	—	—	—
IPS 3/4"	.095	11	.155	25
	—	—	—	—
IPS 1"	.119	11	.210	22
	.140	9.3	.234	27
IPS 1-1/4"	.151-.166	10-11	.270	27
	.178	9.3	.288	25
IPS 1-1/2"	.173	11	.288	22
	—	—	—	—
IPS 2"	.216	11	.347	25
	—	—	—	—



DBS-40F

Mid-Range Squeeze Tool

4" IPS Double-Bar

One of our most robust and flexible tools the DBS-40F accommodates wide range of large PE pipe sizes from 1" IPS to 4" IPS. The double-bar lower jaw has two sets of gap stops for the two pipe sizes of your choice.

Features include a larger, heavy-duty frame designed to withstand the greater force needed to squeeze today's PE pipe, while retaining the double-bar jaw design for greater contact area.

A high-strength Acme power screw and replaceable nut is powered with a 24" alloy steel handle. The unique Mustang designed thrust bearing and grease fitting, for lubrication, provides friction free force to the upper jaw.

Static electric grounding is accomplished by using an upper jaw grease fitting adapter.

Weight: 41lbs
 Dimensions: 18.5" Height
 Capacity: Specify (2) Sizes (see table below)

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 1"	.119	11	.210	22
	.140	9.3	.234	27
IPS 1-1/4"	.151-.166	10-11	.270	27
	.178	9.3	.288	25
IPS 1-1/2"	.173	11	.288	22
	—	—	—	—

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 2"	.216	11	.347	25
	.255	9.3	.410	28
IPS 3"	.307-.318	11.5-11	.500	29
	.259	13.5	.435	26
IPS 4"	.395-.409	11.5-11	.675	26
	.333	13.5	.560	25



DBS-44F

Mid-Range Squeeze Tool

4" IPS Quad-Bar

The DBS-44F is similar to the DBS-40F but uses a quad-bar design that accommodates wide range of large PE pipe sizes from 1" IPS to 4" IPS. The quad-bar lower jaw has four sets of gap stops for the four pipe sizes of your choice.

Features include a larger, heavy-duty frame designed to withstand the greater force needed to squeeze today's PE pipe, while retaining the quad-bar jaw design for greater contact area.

A high-strength Acme power screw and replaceable nut is powered with a 24" alloy steel handle. The unique Mustang designed thrust bearing and grease fitting, for lubrication, provides friction free force to the upper jaw.

Static electric grounding is accomplished by using an upper jaw grease fitting adapter.

Weight: 45lbs
 Dimensions: 20" Height
 Capacity: Specify (4) Sizes (see table below)

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 1"	.119	11	.210	22
	.140	9.3	.234	27
IPS 1-1/4"	.151-.166	10-11	.270	27
	.178	9.3	.288	25
IPS 1-1/2"	.173	11	.288	22
	—	—	—	—

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 2"	.216	11	.347	25
	.255	9.3	.410	28
IPS 3"	.307-.318	11.5-11	.500	29
	.259	13.5	.435	26
IPS 4"	.395-.409	11.5-11	.675	26
	.333	13.5	.560	25



DBG-60

Mid-Range Squeeze Tool

6" IPS Double-Bar

The Mustang Model DBG-60 has been reintroduced to provide an economical tool with which to squeeze up to 6" diameter SDR 11 pipe. The double-bar lower jaw has two sets of gap stops for the two pipe sizes of your choice.

The same rugged design as used in all Mustang tools is utilized to provide maximum strength, lighter weight, and superior performance.

Nearly identical to it's "big brother" the DBGA-80, the DBG-60 features the same proven tubular frame, powerful Acme Power Screw and Upper Jaw Thrust Bearing with grease fittings for lubricating the screw and thrust bearing.

Includes a pair of SC-60 Saddle Clamps.

Weight: 80lbs
 Dimensions: 26" Height
 Capacity: Specify (2) Sizes (see table below)

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 3"	.259	13.5	.435	26
	.307-.318	11.5-11	.500	29
IPS 4"	.389	9	.625	26
	.333	13.5	.560	25
	.395-.409	11.5-11	.675	26
	.500-.548	9	.800	24

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 6"	.427	15.5	.725	22
	.491	13.5	.813	26
	.568-.602	11.5-11	1.00	26
	—	—	—	—



DBGA-80

Heavy-Duty Squeeze Tool

8" IPS Double-Bar

The DBGA-80 Double-Bar Squeeze Tool is the largest manual tool in Mustang's lineup and is an economical means of squeezing-off large diameter PE pipe. The double-bar lower jaw has two sets of gap stops for the two pipe sizes of your choice.

The same rugged design as used in all Mustang tools is utilized to provide maximum strength, lighter weight, and superior performance.

Nearly identical to its "little brother" the DBG-60, the DBGA-80 features the same proven tubular frame, powerful Acme Power Screw and Upper Jaw Thrust Bearing with grease fittings for lubricating the screw and thrust bearing. Includes a pair of SC-80 Saddle Clamps.

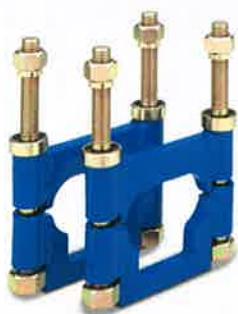
Weight: 92lbs
 Dimensions: 30" Height
 Capacity: Specify (2) Sizes (see table below)

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 3"	.259	13.5	.435	26
	.307-.318	11.5-11	.500	29
	.389	9	.625	26
IPS 4"	—	—	—	—
	.333	13.5	.560	25
	.395-.409	11.5-11	.675	26
	.500-.548	9	.800	24
	—	—	—	—

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 6"	.427	15.5	.725	22
	.491	13.5	.813	26
	.568-.602	11.5-11	1.000	26
IPS 8"	.736	9	1.125	24
	.557	15.5	.935	26
	.639	13.5	1.125	21
	.750-.785	11.5-11	1.250	28
	—	—	—	—

Saddle Clamps

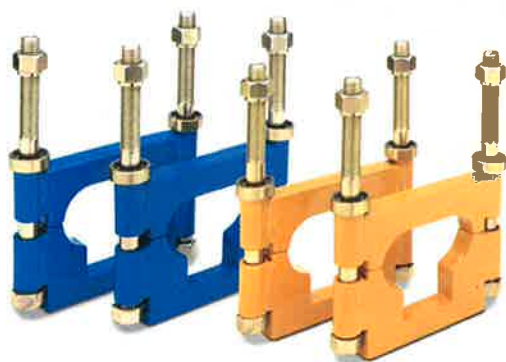
Mustang Saddle Clamps are available for large pipe squeeze tools when additional compressive force is needed for difficult to squeeze PE pipe. Because some pipe interior surface finishes are rippled or rough textured, making bubble tight squeeze-off unobtainable, even torquing of the squeeze tool power screw and saddle clamps will enable the user to lesson this problem and help achieve a controlled flow.



SC-40/44 **Fits 40/44-Series Tools**

The smallest and lightest in Mustang's Saddle Clamp Lineup, the SC-40/44 Saddle Clamps are designed to work in tandem with Mustang 40/44-Series Squeeze Tools.

Weight: 8lbs/pair



SC-60 **Fits 60-Series Tools**

Nearly identical in design to the SC-80, only smaller, the SC-60 Saddle Clamps are designed to work in tandem with Mustang 60-Series Squeeze Tools. Available in yellow for hydraulic tools.

Weight: 8lbs/pair



SC-80 **Fits 80-Series Tools**

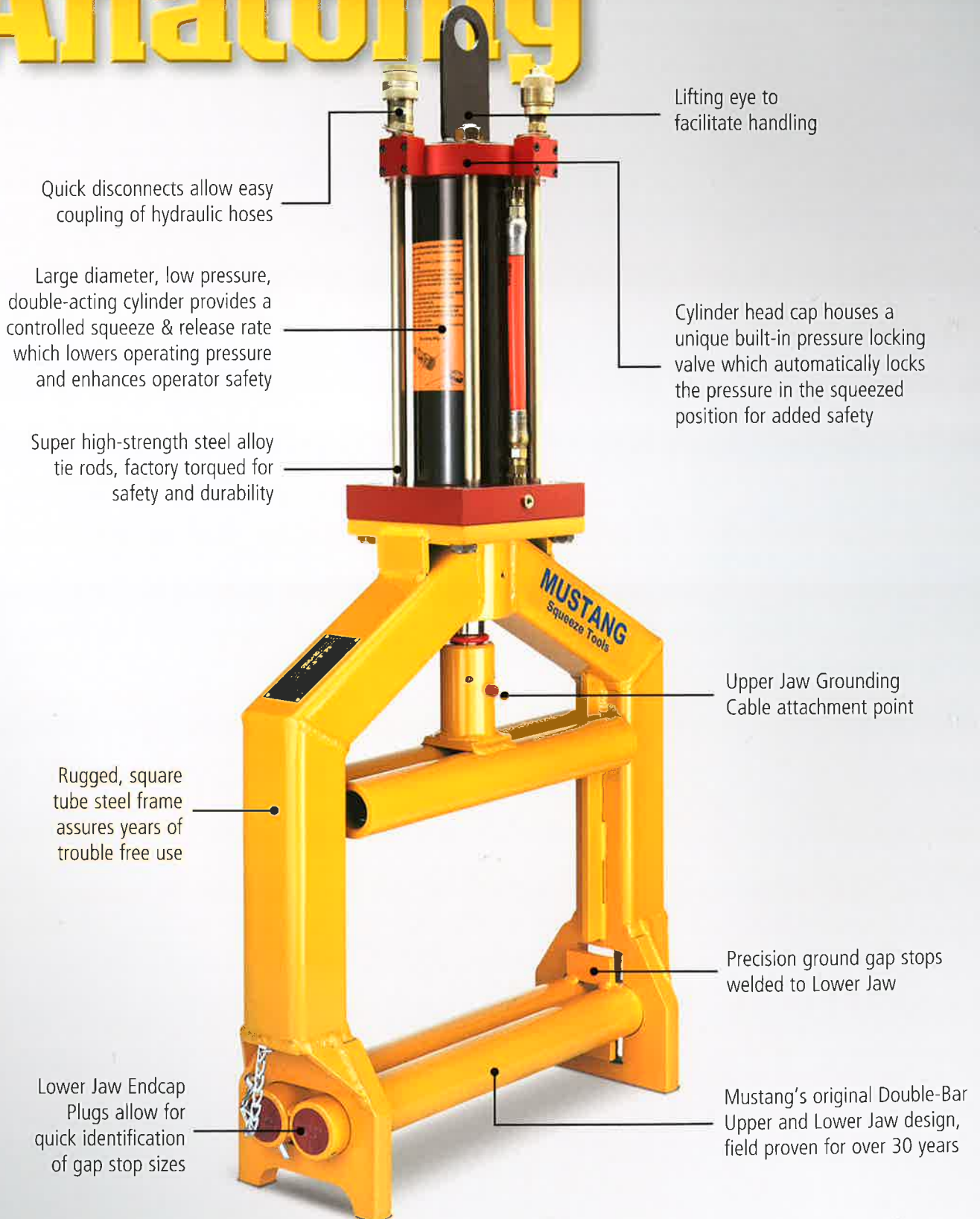
The largest in Mustang's Saddle Clamp Lineup, the SC-80 is designed to work in tandem with Mustang 80-Series Squeeze Tools. Available in yellow for hydraulic tools.

Weight: 8lbs/pair

Hydraulic Squeeze Tools



Squeeze Tool Anatomy



DBM-60

Mid-Duty Squeeze Tool

6" IPS Hydraulic ML Series

The Model DBM-60 Mid-Duty Squeeze Tool is similar to the DBG-60 manual tool with the exception that it is hydraulically operated.

A reduced-stroke version of Mustang's proven hydraulic cylinder provides 41,000lbs of force directly over the pipe. The cylinder incorporates a built in locking valve to assure that pressure is maintained on the pipe in the event of a hydraulic failure.

Saddle clamps are provided to mechanically lock the upper and lower jaws and to assist in accomplishing a good squeeze off.

Includes Model 20A Hydraulic Pump & Hose and a pair of SC-60 Saddle Clamps. An optional squeeze release control valve is also available that permits slow, controlled release of the upper jaw.

Weight: 117lbs
 Dimensions: 42" Height
 Capacity: Specify (2) Sizes (see table below)

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 3"	.259	13.5	.450	26
	.307-.318	11.5-11	.500	29
IPS 4"	.389	9	.675	26
	.333	13.5	.560	25
	.395-.409	11.5-11	.675	26
	.500-.548	9	.800	24

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 6"	.427	15.5	.725	22
	.491	13.5	.813	26
	.568-.602	11.5-11	1.00	26
	—	—	—	—



DBML-80

Mid-Duty Squeeze Tool

8" IPS Hydraulic ML Series

The Mustang DBML-80 Mid-Duty Hydraulic Squeeze Tool is similar to the DBGA-80 Mechanical Tool with the exception that it is hydraulically operated.

A Mustang manufactured, double-acting, large-bore hydraulic cylinder mounts to the tubular frame, providing 41,000lbs of centralized force to PE pipe up to 8" IPS. A pair of SC-80 Saddle Clamps mechanically lock the upper and lower jaws and assist in completing the squeeze-off procedure. The cylinder is hydraulically locked with a Mustang pilot operated locking valve for complete safety.

Use of the DBML-80 on PE pipe that has a rough or rippled interior finish may result in less than bubble-tight squeeze-off. Refer to the "H" Series Hydraulic Tools for ultimate squeeze-off of pipe sizes shown.

Includes Model 20A Hydraulic Pump & Hose and a pair of SC-80 Saddle Clamps. An optional squeeze release control valve is also available that permits slow, controlled release of the upper jaw.

Weight: 134lbs
 Dimensions: 45" Height
 Capacity: Specify (2) Sizes (see table below)

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 3"	.259	13.5	.435	26
	.307-.318	11.5-11	.500	29
IPS 4"	.389	9	.625	26
	.333	13.5	.560	25
	.395-.409	11.5-11	.675	26
	.500-.548	9	.800	24

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 6"	.427	15.5	.725	22
	.491	13.5	.813	26
	.568-.602	11.5-11	1.00	26
IPS 8"	.736	9	1.125	24
	.557	15.5	.935	26
	.639	13.5	1.125	21
	.750-.784	11.5-11	1.250	28
	—	—	—	—



DBH-68-E

Heavy-Duty Squeeze Tool

8" IPS Hydraulic H Series

The DBH-68-E Hydraulic Heavy-Duty Squeeze Tool utilizes two large-bore hydraulic cylinders which provide a massive 82,000lbs of force adjacent to the folds of the flattened pipe. The Model 25 2-Stage Pump provides the correct volume and pressure for safe, reliable compressive force in a controlled manner. Both cylinders are hydraulically locked with a Mustang pilot operated locking valve incorporated in the manifold block. A pair of SC-80 Saddle Clamps mechanically lock the upper and lower jaws and assist in completing the squeeze-off procedure.

Includes Model 25, 2-Stage Hydraulic Pump & Hose and a pair of SC-80 Saddle Clamps. An optional squeeze release control valve is also available that permits slow, controlled release of the upper jaw.

Weight: 296lbs
 Dimensions: 53" Height
 Capacity: Specify (2) Sizes (see table below)

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 3"	.259	13.5	.435	26
	.307-.318	11.5-11	.500	29
IPS 4"	.389	9	.625	26
	.333	13.5	.560	25
	.395-.409	11.5-11	.675	26
	.500-.548	9	.800	24

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 6"	.427	15.5	.725	22
	.491	13.5	.813	26
	.568-.602	11.5-11	1.00	26
IPS 8"	.736	9	1.125	24
	.557	15.5	.935	26
	.639	13.5	1.125	21
	.750-.784	11.5-11	1.250	28



DBH-1200B

Heavy-Duty Squeeze Tool

12" IPS Hydraulic H Series

The DBH-1200-B Quad-Bar Large Diameter Squeeze Tool utilizes three large-bore hydraulic cylinders to assert a massive 123,000lbs of force adjacent to the folds of the flattened pipe. The Model 25 2-Stage Pump or an optional air over hydraulic pump provides the correct volume and pressure for safe, reliable compressive force in a controlled manner. A quad-bar lower jaw offers four surfaces for gap stops of your choice and beam strength required for a high load force.

Upon completion of the squeeze-off, the tool is automatically locked hydraulically and mechanically using special SC-1200 Saddle Clamps.

Includes Model 25, 2-Stage Hydraulic Pump & Hose and a pair of SC-1200 Saddle Clamps. An optional squeeze release control valve is also available that permits slow, controlled release of the upper jaw.

Weight: 460lbs
 Dimensions: 65" Height
 Capacity: Specify (4) Sizes (see table below)

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 6"	.427	15.5	.725	22
	.491	13.5	.813	26
	.568-.602	11.5-11	1.00	26
	.736	9	1.125	24
IPS 8"	.557	15.5	.935	26
	.639	13.5	1.125	21

Pipe Size	Nominal Wall Thickness	SDR	Gap Stop	%Max Squeeze
IPS 8"	.750-.784	11.5-11	1.250	28
	.958-1.048	9	1.500	28
IPS 10"	.977	11	1.625	21
	All Lesser Sizes			
IPS 12"	1.159	11	1.800	24
	All Lesser Sizes			



Huskie SPS-50

Emergency Remote 2" IPS Steel Pipe Squeeze Tool

Compact and lightweight, the SPS-50 has a remote controlled head, which generates up to 16-tons of force, and features spring centering whiskers and a latched lower jaw for ease of operation — enabling you to squeeze up to 2" IPS Schedule 40 pipe without having to skive off your pipe's coating. To release, simply turn the release knob. The Huskie's remote head is connected to the hydraulic hand pump with 10-feet of rugged, non-conductive 10,000psi hose, designed to an exacting 4:1 safety factor so you can shut down dangerous gas leaks from a safe distance.

Weight: 22lbs **Size:** 17"x 6.8"
Force: 16-Tons **Jaw:** 4.68"x 2.63"

NOTE: The SPS-50 has adopted the rounded radius jaw incorporated into the PS-62B. Because of this, the tool may not have sufficient force to properly squeeze some types of 2" pipe.



Huskie PS-62B

Emergency 2" IPS Steel Pipe Squeeze Tool

Control hazardous gas leaks quickly with our compact, hand-operated, emergency squeeze tool. With the lightweight, self-contained, hydraulic PS-62B it's a cinch to shut down up to 2" IPS Schedule 40 coated pipe, whether or not the pipe jacket is removed. Rapid closure is achieved with short pump strokes that deliver 18-tons of controlled force in a matter of seconds. To release, simply turn the release knob. The PS-62B features a redesigned rounded jaw which lessen the chances of severing brittle pipe or pipe of unknown chemistry.

For increased safety, any over-pumping activates a unique Pressure Relief Bypass System without reducing pressure on the pipe itself. The Huskie's latched lower jaw and 90° swivel head are able to navigate the tightest areas while the steel-wire centering whiskers and non-conductive fiberglass insulated handles ensure a swifter, safer squeeze-off every time.

Weight: 29lbs **Size:** 28.6"x 6.9"
Force: 18-Tons **Jaw:** 4.68"x 2.63"

775 Squeeze Force Gauge Assembly

Optional gauge which offers a reference for approximate range of force necessary to obtain flow control on pipe sizes from 3/4" to 2" IPS.



Huskie PS-75

Emergency 2" IPS Steel Pipe Squeeze Tool

In natural gas distribution systems steel pipe can produce difficult to squeeze properties that require a **super tool**. The PS-75, with its massive 34-ton force, is a new design which meets the need for a 2" IPS super tool.

Rapid closure is achieved with short pump strokes that deliver 34-tons of controlled force in a matter of seconds. To release, simply turn the release knob. The PS-75 incorporates newly redesigned rounded jaws which lessen the chances of severing brittle pipe or pipe of unknown chemistry.

For increased safety, any over-pumping activates a unique Pressure Relief Bypass System without reducing pressure on the pipe itself. The Huskie's latched lower jaw and 90° swivel head are able to navigate the tightest areas while the steel-wire centering whiskers and non-conductive fiberglass insulated handles ensure a swifter, safer squeeze-off every time.

A unique feature of the PS-75 is the pipe size color coded 775 Squeeze Force Gauge Assembly. This gauge offers a reference for approximate range of force necessary to obtain flow control on pipe sizes from 3/4" to 2" IPS.

Weight: 49lbs **Size:** 34"x 9"
Force: 34-Tons **Jaw:** 4.68"x 2.63"

Hydraulic Pumps

Mustang hydraulic tools are all provided complete with a hand pump. The models 20A and 25 are designed and manufactured by Mustang and incorporate several features not found on the "off-the-shelf" type units. Mustang hand pumps feature accessible check valves making them easy to maintain and are precision machined from aluminum alloy for strength and light weight.



Model HP50

Single-Acting High-Pressure Hydraulic Hand Pump

The Model HP50 hand pump and hose assembly is offered with the Huskie Model SPS-50 remote steel pipe squeeze tool. Because this pump is pressure regulated at 10,000psi, it requires the specially manufactured high-pressure hose that is provided.



Model 20A

2-Stage Hydraulic Hand Pump

The Mustang Model 20A 2-Stage Hand Pump is provided as standard equipment with the DBM-60 and DBML-80 squeeze tools. The 2-stage design allows for a rapid advancement of the squeeze tool upper jaw by using the color coded large piston. Once the pipe is contacted and pumping pressure builds, a simple switch to the smaller piston completes the squeeze-off with reasonable effort. A high capacity oil reservoir and built-in pressure relief valve complete the unit.



Model 25

2-Stage Hydraulic Hand Pump

Newly redesigned with an extra-large oil reservoir, the Mustang Model 25 2-Stage Hand Pump is ideal for use with "H" Series multiple cylinder squeeze tools. The 2-stage design allows for a rapid advancement of the squeeze tool upper jaw by using the color coded large piston. Once the pipe is contacted and pumping resistance builds, a simple switch to the smaller piston completes the squeeze-off with reasonable effort. An extra-high capacity oil reservoir and built-in pressure relief valve complete the unit.



Model AP201L

Portable Hydraulic Pump

The Model AP201L pump is available as an option for all hydraulic tools up to 18" capacity and is standard with the larger 18" capacity tools. This is an air operated hydraulic pump that requires no physical pumping effort. Simply select the "Up" or "Down" valve position and operate the air ball valve. The unit comes complete with an air-line oiler, pressure gauge, 20' non-conductive hose set, and is factory adjusted to provide the correct operating pressure for Mustang tools. Air requirements are 50cfm at 80psi.

McElroy Fusion Machines Sales, Repairs & Rental Information

McELROY PROVEN PERFORMANCE, SUPERIOR DESIGN

With ¼" thru 63" pipe size capacities anything can be created, or modified. The line tamer will straighten pipe purchased in coils and the Datalogger can record and track all fusions which take place on your project with handheld printouts or linkage to your PC for full graphics. For extra support of the straight lengths of pipe we also carry a range of pipe stands as well as the Polyhorse. For those concerned with the fusion bead please inquire into our de-beaders.





MCELROY FUSION EQUIPMENT

Why Purchase or Use the McElroy Fusion Machine vs. other equipment?

McElroy is a company with over 30 years of fusion machine manufacturing experience. They were the first company to patent the centerline guidance systems, and the first to manufacture a self-contained fusion machine. Their machines give the highest quality design and manufacture consistent fusion with reliable results, field durability, safe, easy and efficient operation, and minimal maintenance.

PATENTED CENTERLINE GUIDANCE

The patented centerline guidance system is where the centerline of the guide rods is located in a plane, which passes through the centerline of the pipe or fittings being fused. The result is an equal distribution of force around the interfaces, resulting in a uniform bead formation and consistent joint quality.

HIGHLY EFFICIENT CLAMPING MECHANISM

Multiple deep serrations in the jaws and inserts combined with the thrust bearings in the clamp knobs minimize the force required to clamp and round pipe. This improves operator efficiency and prolongs the life of the machine.

SELF CONTAINED

Unites with ranges covering 2" to 8" all the way up to 12" – 36" are available as self contained machines. These are powered by gasoline or diesel engines and are available in many options. No external power source is needed.

HYDRAULICALLY POWERED PIPE LIFT

The hydraulically powered pipe lift raises and lowers with the pull of a lever. This assists the operator with pipe handling and removal. This heavy duty "V" roller ensures safe tracking through the machine loading and unloading. This also allows for the highest level of efficiency and productivity in the field.

SEMI-AUTOMATIC HYDRAULIC CONTROL SYSTEM

The semi-automatic hydraulic manifold block design allows for presetting of facing, heating and fusion pressures. The constant, continuous pressure provided by the self-contained hydraulic system provides adequate pressure to ensure consistently good fusion joints. This semi-automatic operation also simplifies operator training and ensures consistent repeatable performance.

HYDRAULICALLY OPERATED FACER

The hydraulically powered facer has sufficient power to face even the heaviest wall pipe with ease. The cutter block rotates on maintenance free sealed ball bearings and the facer stops ensure a square face off. The locking mechanism safely locks the facer in the open or closed position. There are three carbide tipped blades on each side of the facer to provide quick facing and these blades are very easily replaced and require no adjustment during facing, one again saving you valuable time. It is possible that the facer may stall during pipe facing from too much pressure being applied. If a hydraulic facer stalls, there is no damage to it. If an electric facer stalls, the brushed must be replaced every time! Another McElroy Advantage.

"The Perfect Fit"



MCELROY FUSION EQUIPMENT

COMPACT REMOVABLE CARRIAGE

The three jaw carriage assembly can be easily removed from the chassis for remote operation.

LIGHTWEIGHT HEATERS

The McElroy lightweight heaters are revolutionary in the industry. They have easy to read, precise temperature controls and heat up to 500°F (260°C) in less than 20 minutes. They have replaceable bolt on butt fusion heater adapter plates and come with an insulated heater stand for protection and convenience. Unlike other heaters with a flexible teflon coated sheet, our McElroy heaters are designed with a solid aluminum surface teflon coated plate which ensures proper and equal heat distribution.

DATALOGGER COMPATIBILITY

The McElroy fusion machines are all fully compatible with the portable McElroy datalogger technology. The datalogger prompts the operator with pressure and temperature parameters before joining. The datalogger allows recording of:

- *Date and Time of Fusion
- *Pipe Data and Manufacturer
- *Operator ID
- *Job and Joint Numbers
- *Heating Time and Temperature
- *Fusion Pressure
- *Cooling Time and Pressure

MCELROY FUSION MACHINE ADVANTAGE

Durability: Hard anodized aluminum gives the durability of steel but is corrosion resistant and lightweight.

Ease of Operation: Semi-automatic hydraulic controls simplifies operator training.

Centerline Guidance: McElroy patented centerline guidance provides equal distribution of force around the pipe ends resulting in a uniform melt bead.

Consistent Fusion Quality: Accurate resetting of facing, heating, and fusion pressures provides repeatable performance.

Versatility: Quick change inserts allow efficient butt fusion of pipe and fittings.

Value: Quality engineering, premium components, long tool life, and a 3-year warranty.

“The Perfect Fit”

Additional Accessories

All accessories provide very useful in the management and fusion of HDPE pipe and supporting McElroy fusion machines. See the McElroy Brochure located at the back of this section, or contact one of HCFC's Fusion Specialists for all other available accessories.



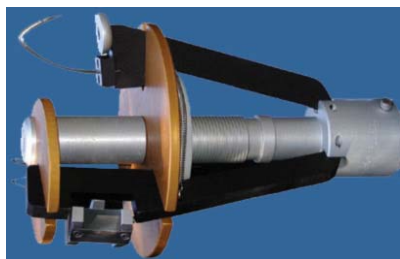
Line Tamer

Each Size **Linetamer** cost effectively straightens and rerounds 2, 3, 4 or 6" IPS coiled pipe to meet or exceed ASTM D2513 ovality requirements. It safely removes coil set for speedy installations on the job site. This manually operated LineTamer allows you to install PE pipe, conduit, and duct quickly, safely and with minimal training. Ball thrust bearings make for easy roller adjustment.



Coil Trailer

Pipe Coil transport **trailers** make moving small coils simple and easy with a "Lazy Susan" action swivel the coils can rotate on.



The use of a **Debeader** is becoming more common in thermoplastic piping systems, engineers recognize the efficiency and advantages of having the internal weld bead removed from a system compared to a system that is not. Whether the issue is flow Reduction, or flow Restriction, or Stimulated Bblockage, or Biofilm/Bacteria entrapment or Turbulence Wear. The concept of bead removal is an advancement in the thermoplastic piping industry that needs to be utilized. If for no other reason than higher efficiency. Sizes range for pipe 3" through 24".

A WAY OF HOLDING PIPE THAT STANDS ALONE



SOLDIER pipe stands for all your needs:



Advantages

- Helps prevent machine damage by containing the pipe and not collapsing or tipping.
- Sturdy, durable, long lasting construction
- Hydraulic controlled option on some models
- 'Quick hooks' for easy lifting & movement of stand
- Increases fusion production time
- Built for smooth pipe rolling

The HCFC SOLDIER's unique construction is designed to provide engineered strength, stability, and ease of operation. Both rollers on each stand are bearing mounted for ease of pipe roll through, preventing gouging and pipe stand instability. With 5 different sizes to choose from, you will find it easy to match them to any brand of fusion machine.

Most importantly, they will increase your fusion production and overall speed and success. For more information contact High Country Fusion at:

1-800-780-6330

and visit our website at:

www.hcfc.com



HIGH COUNTRY FUSION CO. Inc.
Innovative Solutions for Plastic Pipe Fusion

Fusion Equipment Repairs



Unfortunately “it” happens.

High Country Fusion has the people, tools, parts, and knowledge to repair, rebuild, and completely recondition your used and damaged fusion equipment. Please call us with any questions and let us know how we can help you.



High Country Fusion Rental Equipment And Services

McElroy Fusion Machines

#14 Pibull Fusion Machine: Fuses 1" through 4" pipe & fittings; machine requires a min of 2500 watts

Weight: 60 lbs*

Dimensions: 27" L X 20" H X 24" W*

#28 Rolling Unit: Fuses 2" through 8" pipe & fittings; machine requires a minimum of 3500 watts

Weight: 650 lbs*

Dimensions: 65" L X 51" H X 37" W*

#28 TracStar: Fuses 2" through 8" pipe & fittings; machine is self-contained & self-propelled

Weight: 1400 lbs*

Dimensions: 95" L X 50" H X 43" W*

#412 Rolling Unit: Fuses 4" through 12" Pipe & fittings; machine is self-contained

Weight: 1325 lbs*

Dimensions: 85" L X 46" H X 49" W*

#412 TracStar: Fuses 4" through 12" pipe & fittings; machine is self-contained & self-propelled

Weight: 2100 lbs*

Dimensions: 97" L X 53" H X 53" W*

#618 Rolling Unit: Fuses 6" through 18" pipe & fittings; machine is self-contained

Weight: 1400 lbs*

Dimensions: 85" L X 52" H X 50" W*

#618 TracStar: Fuses 6" through 18" pipe and fittings; machine is self-contained & self-propelled

Weight: 2100 lbs*

Dimensions: 97" L X 53" H X 57" W*

#500 TracStar: Fuses 6" through 20" pipe & fittings; machine is self-contained & self-propelled

Weight: 2800 lbs*

Dimensions: 95" L X 53" H X 63" W*

#824 Rolling Unit: Fuses 8" through 24" pipe and fittings; generator is supplied for machine

Weight: 6350 lbs*

Dimensions: 131" L X 69" H X 83" W*

TracStar #630: Fuses 8" through 24" pipe & fittings; machine is self-contained & self-propelled

Weight: 9250 lbs*

Dimensions: 142" L X 79" H X 102" W*

#1236 Rolling Unit: Fuses 12" through 36 " pipe & fittings; generator is supplied for machine

Weight: 6350 lbs*

Dimensions: 131" L X 69" H X 83" W*

TracStar #900: Fuses 12" through 36" pipe & fittings; machine is self-contained & self-propelled

Weight: 9250 lbs*

Dimensions: 142" L X 79" H X 102" W*

#1648 Rolling Unit: Fuses 16" through 48" pipe & fittings; generator is supplied for machine

Weight: 10,200 lbs*

Dimensions: 153" L X 87" H X 95" W*

#2065 Rolling Unit: Fuses 20" through 65" pipe & fittings; generator is supplied with machine

Weight: 15,500 lbs*

Dimensions: 187" L X 106" H X 108" W

Other Machines and Accessories

Electrofusion Processor: Fuses electrofusion fittings; requires a minimum of 5000watts

Weight: 60 lbs*

Dimensions: 17" L X 12" H X 20" W*

Datalogger: Records and documents the key parameters of each fusion process. Attaches directly to the McElroy Fusion machine.

Dimensions: 24" L X 12" H X 20" W*

Inserts Only: Rentals of inserts only to supplement your personal machine versus purchasing a set for a small project is always an option. Contact a sales rep for details on each size needed. We carry all sizes from 1/2" through 63"

Debeading Tools: Contact a sales rep for details on each size desired. Debeading tool consists of a debeading

head and Handle, extension handles can be added if needed.

Extrusion Welding: A Technician can fill in damage made by earth movers on gravity fed or no pressure lines using an extrusion welder. Contact your sales rep for additional details and questions.

Polyhorse Pipe Handling System: Pipe handling capability for up through 20" pipe

Weight: 1275 lbs*

* Weights and dimensions are approximate.

Equipment rentals include inserts.

Equipment rentals of #28 machines and larger, pipe stands are included.

The customer is responsible for all freight charges to and from the jobsite.

The customer is responsible for any damages incurred to the machine during the rental period.

The rental period starts when the machine leaves a HCFC facility and ends when the machine returns to a HCFC facility. One portal to portal day may be given in each direction for LTL Shipments. #1236 machines and larger require a dedicated truck.

Trained technicians are available for Electrofusion jobs and 1" through 65" jobs. A technician is required for rentals of #1236 machines and above unless prior arrangements have been made. Techs are also available for training purposes at a HCFC facility or at your location.

**Please call for rental rates and technician rates
or with any other questions.
1-800-780-6330**

HIGH COUNTRY FUSION RENTALS INFORMATION 800-780-6330

BUTT FUSION EQUIPMENT									
MACHINE SIZE	TECH REQUIRED	SIZE RANGE	POWER REQUIREMENT	POWER SOURCE SUPPLIED	PIPE STANDS SUPPLIED	WEIGHT W/O SHIPPING BOX	FREIGHT OPTIONS	FREIGHT CHARGES	ONE WORKING DAY OF PORTAL TO PORTAL TRAVEL ARE ALLOWED EACH DIRECTION WITHOUT RENTAL CHARGES APPLYING ALL EQUIPMENT IS BASED ON A MAXIMUM OF 12 HOURS PER DAY
McElroy #14	NO	1" IPS - 4" DIPS	3500 Watt	NO	NO	65 LBS.	UPS, FEDEX, WILL CALL	AT COST BOTH WAYS	
McElroy # 28	NO	2" IPS to 8" IPS	5000 Watt	NO	YES	750 LBS.	COMMON CARRIER, WILL CALL	AT COST BOTH WAYS	
McElroy #T28 Self Propelled Track Driven	NO	2" IPS to 8" DIPS	Self Contained Gas	NA	YES	1320 LBS.	COMMON CARRIER, WILL CALL	AT COST BOTH WAYS	
McElroy #412	NO	4" IPS to 12" DIPS	Self Contained Gas	NA	YES	1200 LBS.	COMMON CARRIER, WILL CALL	AT COST BOTH WAYS	
McElroy #412 Tracstar, self propelled track driven	NO	4" IPS to 12" DIPS	Self Contained Diesel	NA	YES	1500 LBS.	COMMON CARRIER, WILL CALL	AT COST BOTH WAYS	OUR STANDARD CONTRACT MUST BE SIGNED PRIOR TO RENTAL OF ALL EQUIPMENT.
McElroy #618	NO	6" IPS to 18" IPS	Self Contained Gas	NA	YES	1800 LBS.	COMMON CARRIER, WILL CALL	AT COST BOTH WAYS	
McElroyTracstar #618, Self propelled track driven	NO	6"IPS TO 18" IPS	Self Contained Diesel	NA	YES	2000 LBS.	COMMON CARRIER, WILL CALL	AT COST BOTH WAYS	
McElroyTracstar 500II, Self propelled track driven	NO	6"IPS TO 20" IPS	Self Contained Diesel	NA	YES	2700 LBS.	COMMON CARRIER, WILL CALL	AT COST BOTH WAYS	
McElroy #824	NO	8" IPS TO 24" OD	40 KW, 3 P, 240V	YES	YES	5710 LBS	DEDICATED TRUCK, WILL CALL	AT COST BOTH WAYS	
McElroy T630	NO	8" IPS TO 24" OD	Self Contained Deisel	NA	YES	8600 LBS	DEDICATED TRUCK, WILL CALL	AT COST BOTH WAYS	
McElroy # 1236	YES	12" IPS to 36" OD	40 KW, 3 P, 240V	YES	YES	5900 LBS. GENERATOR, 3000 LBS.	DEDICATED TRUCK, WILL CALL	AT COST BOTH WAYS	
McElroy T900	YES	12" IPS to 36" OD	Self Contained Deisel	NA	YES	9300 LBS	DEDICATED TRUCK, WILL CALL	AT COST BOTH WAYS	
McElroy # 1648	YES	16" to 48" IPS	50 KW, 3 P, 240V	YES	YES	9000 LBS. GENERATOR, 3600 LBS.	DEDICATED TRUCK, WILL CALL	AT COST BOTH WAYS	
McElroy # 2065	YES	20" IPS to 1600MM (63")	60KW, 3 P, 240V	YES	YES	15,000 LBS. GENERATOR, 4000 LBS.	DEDICATED TRUCK, WILL CALL	AT COST BOTH WAYS	
BUTT FUSION EQUIPMENT									

HIGH COUNTRY FUSION RENTALS INFORMATION 800-780-6330

ELECTROFUSION AND SIDEWALL FUSION EQUIPMENT									
Electrofusion Processor	NO	ALL SIZES	110 VOLT 5000 KW OF CLEAN POWER, NO	NO	NA	70 LBS.	UPS, FEDEX, WILL CALL	AT COST BOTH WAYS	SIDEWALL HEATERS ARE AVAILABLE FOR RENT IN SIZES STOCKED AT HCFC. IF AN UNSTOCKED SIZE IS NEEDED, THEY MAY BE PURCHASED BY THE CUSTOMER. ANY DAMAGE DONE TO THE COATING OF THE HEATERS WILL BE BILLED TO THE CUSTOMER AT \$150 PER SET.
Electrofusion Pipe Scraper, size 3" to 28"	NO	3" to 28"	NA	NA	NA	32 LBS.	UPS, FEDEX, WILL CALL	AT COST BOTH WAYS	
Electrofusion Top Load Pneumatic Clamping System	NO	FRIATEC TOP LOAD SIDEWALL EF UNITS	NA	NA	NA	30 LBS.	UPS, FEDEX, WILL CALL	AT COST BOTH WAYS	
Sidewinder: Machine and heater only, no adapters	NO	UP TO 4" IPS BRANCH SIDEWALL FUSION, ANY MAIN SIZE	3500 Watt	NO	NO	30 LBS.	UPS, FEDEX, WILL CALL	AT COST BOTH WAYS	
Sidewinder Heater Adapters	NO	BRANCH X MAIN SIZE AS AVAILABLE**	HEATER SUPPLIED WITH SIDEWINDER	NA	NO	3-12 LBS.	UPS, FEDEX, WILL CALL	AT COST BOTH WAYS	
Debeader Heads	NO	4" TO 24"	Handles upon request	NO	NO	DEPENDANT ON SIZE	UPS, FEDEX, WILL CALL	AT COST BOTH WAYS	
Technician Rate	NA	AVAILABLE FOR ALL SIZES OF MACHINES	NA	NA	NA		DRIVE OR FLY BASED ON LOCATION	AT COST BOTH WAYS, CALL FOR QUOTE	
ELECTROFUSION AND SIDEWALL FUSION EQUIPMENT									

POLYETHYLENE BUTT FUSION TECHNIQUE

The following is a recommended procedure* for the joining of HDPE pipe.

Step 1: is to determine the fusion pressure using the manufacturers recommended interface Pressure (MIP) and the formula:

$$\text{Fusion Pressure} = (((\text{OD} - \text{wall thickness}) \times \text{wall thickness} \times 3.14 \times \text{MIP}) / \text{machine piston area}) + 30$$

At this time, the maximum allowable tolerance of High - Low mismatch of the two joints should be determined from the manufacturers and engineering specifications, generally 10% of the wall thickness.

Step 2: is simply cleaning the pipe ends of any rock, dirt, water, dust, etc.

Step 3: is the loading of the pipe into the machine and on the pipe stands. An additional cleaning of the pipe ends may be necessary.

Step 4: involves the lining up of the pipe to check for High - Low tolerances. This may include a pre-facing to allow for greater visual inspection. It may also require removal of the pipe to cut off beveled ends when mismatch exceeds tolerances.

Step 5: begins the fusion process with facing the ends square with each other. After complete facing, the pipe will be brought together for final inspection of High - Low tolerance. If deemed to lie within the recommended specifications, the pipe and fusion machine will be wiped clean of all shavings, dirt, etc., that could possibly interfere with a successful fusion. The pipe will also be tested at fusion pressure for slippage in the jaws, and any need drag compensation, by applying pressure as if the pipe was being joined.

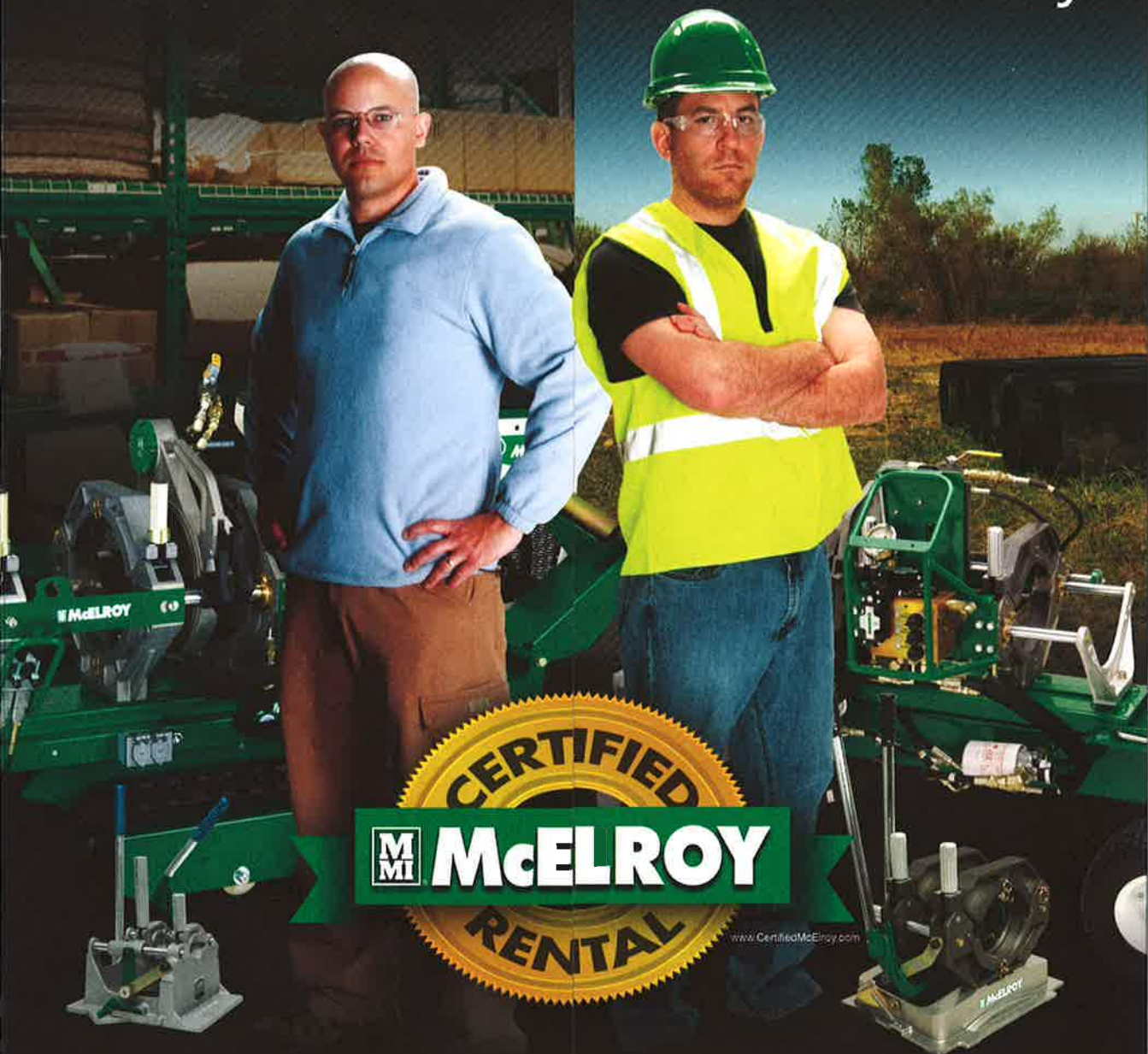
Step 6: starts the heating process. First, the heater will be pyrometer tested for correct temperature. This temperature is determined by the manufacturer. When the heater has reached proper temperature the pipe is brought to the face of the heater and is held under constant pressure until melted material is visible on the complete circumference of both pieces of pipe. All pressure is then removed and the pipe is allowed a heat soak that is variable with outside temperature, wind, and pipe temperature. The general rule of complete heat is when the melt at the pipe surface begins and inward angle toward the heater.

Step 7: begins with the removal of the heater from the fusion area and proceeds immediately with the joining of the pipe using the recommended fusion pressure and compensating drag pressure. Things to watch for are, first the roll. Both pieces of pipe's ends must "roll over" creating the critical bonding. Second, the pipe must not slip in the jaws. Third, No Water or any other liquid may be allowed to enter the "Fusion Zone" (6-8" on either side of the fusion).

Step 8: CRITICAL - The fusion must be cooled, under pressure, for the specified time before the joint of pipe may be removed from the machine.

*Note: this procedure may be adjusted in any way by the technician to meet existing conditions to ensure proper fusion. Any manufacturers specifications will always supersede any of these guidelines.

The most reliable fusion machine rentals in the industry.



A man in a light blue polo shirt and safety glasses stands with his hand on his hip next to a man in a green hard hat, safety glasses, and a high-visibility vest. They are standing in front of a large green McElroy fusion welding machine. The background is split: the left side shows a warehouse interior with shelves of equipment, and the right side shows an outdoor construction site with trees and a clear sky. In the foreground, there are smaller pieces of equipment, including a small green machine on the left and a larger one on the right.

CERTIFIED

McELROY

RENTAL

www.CertifiedMcElroy.com

Inspected **By Us...** So It Works **For You**

Choose a Better Fusion Rental Experience.

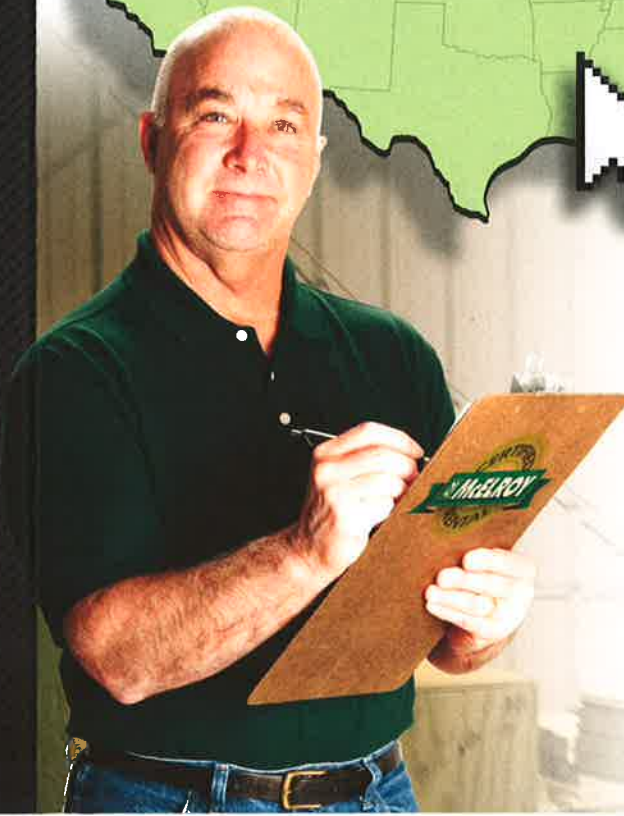
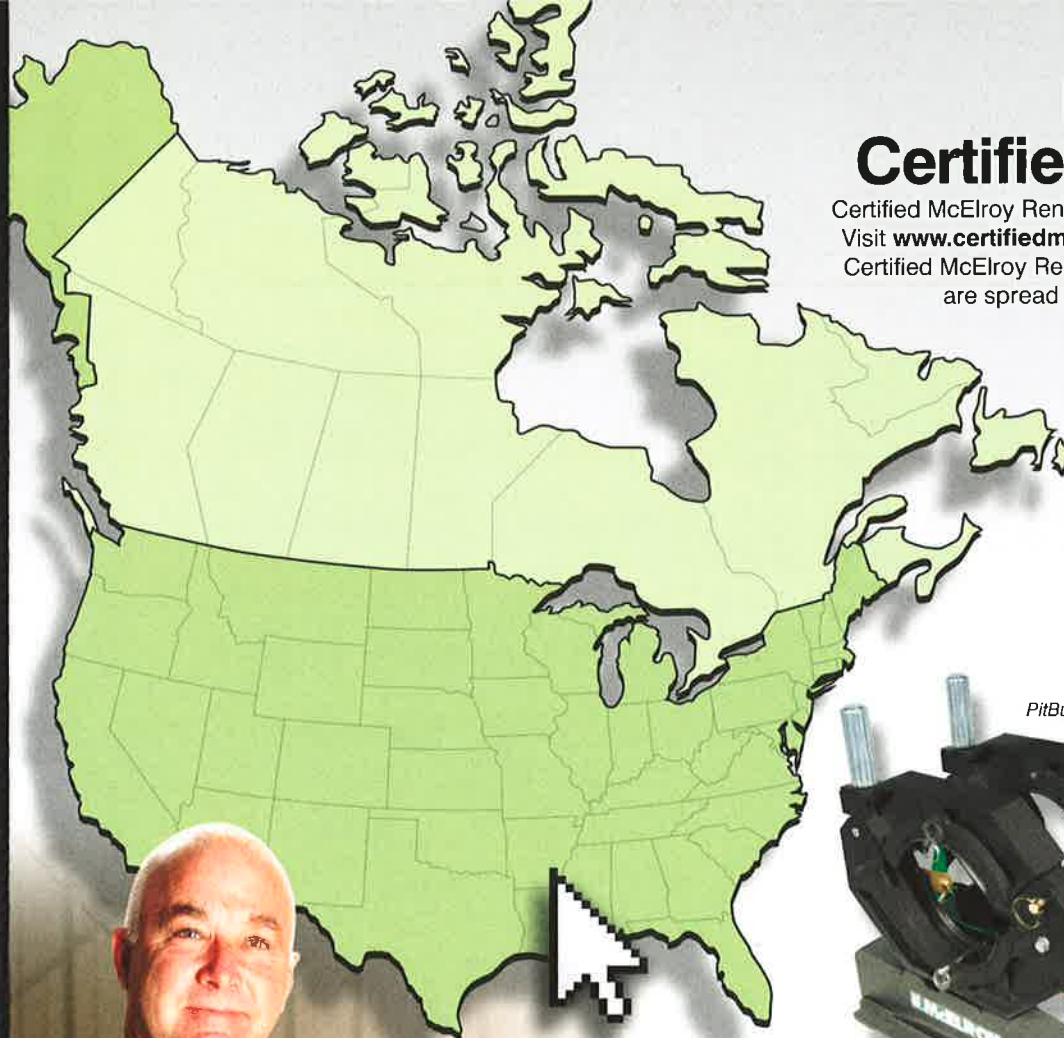


There are plenty of rental fusion machines in the marketplace, but how do you know if your next rental machine is properly maintained and ready to perform?

To secure a premium rental machine, make sure your next rental is from a Certified McElroy Rental equipment fleet.

There's a reason why Certified McElroy Rental equipment fleets are a step above other rental options:

- Certified McElroy Rental equipment gets better overall care than other rental machines. Your McElroy distributor adheres to a **comprehensive checklist** for every rental machine in their fleet.
- Machines in the rental program are constantly maintained to be in the best condition possible – **all parts of the machine, from top to bottom, are checked.** These checks include electrical, hydraulic, facer, heater and much more. When a repair is needed, **only Genuine McElroy Parts are used.**
- **Factory-trained inspectors look over the machine after each rental.** If repairs are needed on a machine, McElroy factory-trained mechanics are on-hand to perform repairs.
- Certified McElroy Rental **distributors are audited** to ensure that each fleet meets the high expectations of the program.
- **Certified McElroy Rental offers more security and reliability,** giving you the ability to get the job done.



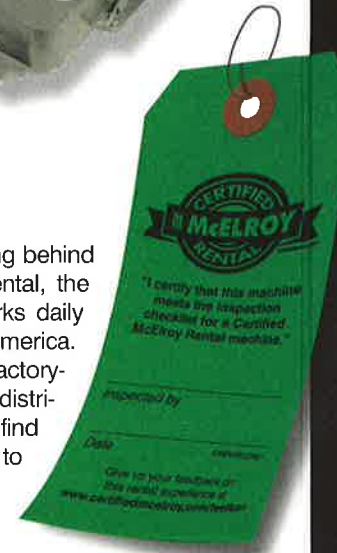
Find Your Certified Rental

Certified McElroy Rentals are easy to locate. Visit www.certifiedmcelroy.com to use the Certified McElroy Rental Locator. Locations are spread across North America.



Enjoy Peace of Mind

McElroy has a long tradition of standing behind products. To protect your McElroy rental, the Certified McElroy Rental program works daily to maintain rental fleets across North America. The combination of genuine parts, a factory-trained team and an industry-leading distribution network ensures that you can find a local rental machine that performs to McElroy's expectations...and yours.



Choose The Right Machine For Your Job

* Check with your local distributor to verify availability of machines and accessories.

1/2" CTS - 1" IPS
(16mm - 34mm) MiniMc™, 1LC

1/2" CTS - 2" IPS
(16mm - 60mm) 2LC, 2CU

1" IPS - 4" DIPS
(32mm - 110mm) PitBull® 14

4" IPS and smaller branch saddles onto 1 1/4" IPS and larger mains Sidewinder™

2" IPS - 6" DIPS (63mm - 180mm)
PitBull® 26

2" IPS - 8" DIPS (63mm - 225mm)
Rolling 28, TracStar® 28, DynaMc™ 28 2- and 4-Jaw HP, DynaMc™ 28 2- and 4-Jaw EP, DynaMc™ 28 Sidewinder™ EP, DynaMc™ 28 Vertical EP

4" IPS - 12" DIPS (110mm - 340mm)
Rolling 412, TracStar® 412, DynaMc™ 412 2- and 4-Jaw HP, DynaMc™ 412 2- and 4-Jaw EP

6" IPS - 18" OD
(180mm - 450mm)
Rolling 618, TracStar® 618

6" IPS - 20" OD
(180mm - 500mm)
TracStar® 500, Automated TracStar® 500

8" IPS - 24" OD (225mm - 630mm)
TracStar® 630, MegaMc® 824

12" IPS - 36" OD (340mm - 900mm)
TracStar® 900, MegaMc® 1236

16" OD - 48" OD
(450mm - 1200mm)
MegaMc® 1648

20" OD - 65" OD
(500mm - 1600mm)
MegaMc® 2065, MegaMc® 1600



Small Diameter

Medium Diameter

Large Diameter

Keep your fusion
operations
running smoothly
with the security
of a **Certified
McElroy Rental.**



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McELROY



The Journey

Founded in 1954, McElroy Manufacturing, Inc. has grown from a two-person start-up in an Oklahoma garage, to the industry expert in the science of joining polyethylene pipe. The name McElroy is recognized worldwide as the most reliable, rugged and technically advanced fusion equipment in the world. We back this statement with equipment that sets the benchmark for the industry and has the longest warranty on the market. We hold dozens of U.S. and foreign patents on fusion related equipment and credit our leadership to an unyielding focus toward excellence.

Our People

The people, who make up the team that is McElroy, are the key to our success. McElroy employees have a sense of accountability to be the best and pride themselves in the craftsmanship and service that delivers the highest standard.

Relationships

Our customer satisfaction is the highest in the industry due to a skilled technical service team, worldwide distributor locations and a specialized training university all designed to serve the customer.

Ingenuity

Our engineering design capabilities have been our stronghold since the beginning. Our abilities to research, invent and produce, are what set us apart.

Here To Stay

McElroy has placed its stamp on the world as the leader in engineering and manufacturing of fusion equipment. Throughout our history we have balanced our principals on the shoulders of the brightest and best people. The result speaks for itself. That is why McElroy is... The leader by design.

The McElroy Advantage

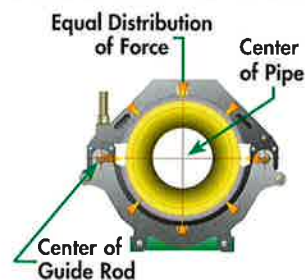
In 35 years of manufacturing fusion equipment we've learned a few things. From the beginning we made the decision to strive for excellence in customer satisfaction and have settled for nothing less. Through the years we've improved upon our designs based on the needs and input from our customers. Those developments and innovations set us apart from the competition. We were the first to:

- Patent the Centerline Guidance System
- Manufacture self-contained fusion machines
- Design a manifold block semi-automatic pressure control system
- Develop the highly productive tracked fusion machines

And all our equipment complies with ISO Standard 12176-1 "Equipment for Fusion Jointing Polyethylene Systems".

Quality fusion, joint after joint

Even Fusion Force around the joint



Centerline Guidance – Centerline Guidance is a balanced force system. This patented feature is incorporated in all of our fusion machines. The centerline of the pipe clamping jaws is on the same plane as the pipe's centerline. The force applied during fusion passes through the center of the pipe,

giving an equal distribution of force around the diameter of the pipe. This results in perfect fusion around the entire pipe interface.

Precision Alignment For Precise Face Off

Facer Stops – Each machine has machined stops on the clamping jaws and facer. This feature provides precise face-off with both pipe ends being perpendicular to the centerline of the pipe. It also provides controlled minimum standoff, which means the machine is clamping the pipe close to the fusion joint providing precision re-rounding and alignment of the pipe in the fusion area.

Joint Quality Assurance



Data Logging – McElroy hydraulic butt fusion machines are DataLogger® ready. The DataLogger is used to record and document the profile of each fusion joint including the time, temperature and pressure. Datalogging is also a feature of the Automated machines.

Productivity – Fuse more pipe

Faster Joining

Mobility – Mobility means productivity. McElroy's wheeled and track machines allow mobility on the jobsite for faster setup, thus shortening the fusion cycle times. By raising the pipe lifts, on wheeled machines, pipe can be pulled through the machine to the next fusion joint or if desired the entire machine can be pulled to the next fusion joint.

The TracStar® machines can be easily unloaded from the transport vehicle and then maneuvered into the tightest locations. The TracStar can pull pipe into position reducing manpower and equipment and can drive to the next joint



without removing the pipe from the machine. Many of the McElroy machines are "self-contained" so that a generator set and separate hydraulic power unit (HPU) with controls are not required. This feature eliminates the need to move a generator and HPU along with the machine.

Clamping Jaws – The clamping jaws are clamped from only one side and pivot open. Each clamping jaw is independent of the others so proper alignment of the pipes can be attained. Serrations in the clamping jaws and inserts combined with the thrust bearings in the clamp knobs minimize the force required to clamp and round pipe. This improves operator efficiency and prolongs the life of the machine.

Facer/Heater – The facers on all of McElroy's hydraulic fusion machines are mounted on the fusion machines and pivoted into place for operation. Heaters on MegaMc® machines are also mounted on the fusion machines and pivoted into place for operation, thereby eliminating the need for lifting equipment or hoists for the heater and facer. Time, equipment, and manpower savings are realized because of the machine mounted pivoting facers and heaters.



One Man Operation – Only one man is needed to operate any McElroy fusion machine.

Durability – Performance, less maintenance

Robust Design

McElroy prides itself on building the toughest and longest lasting fusion machines in the world. With proper maintenance, some McElroy machines built in the 1970's are still operating today. They are designed to be used anywhere in the world and at interfacial pressures from 15 psi (0.1 MPa) to 150 psi (1.03 MPa). For ease of use, McElroy has incorporated many lightweight aluminum components. Critical components such as facer cutter blocks, jaw and inserts are surface hardened so they last for years. Facer blocks are mounted on sealed ball bearings for long life and no maintenance. These features combine to provide quality products that have the McElroy Advantage.



Customer Service

Delivering customer focused service has been our goal for the last 35 years. We pride ourselves on being easily accessible to our customers through an extensive distributor network. Our machines, service and training are available through our distributors in all areas of the U.S. and around the world. To contact our distributors go to our website www.mcelroy.com or call us at 918-836-8611.

Advantage

McElroy Quality & Safety

QUALITY IS THE STANDARD

McElroy is dedicated to Total Quality Management throughout the organization.

Processes and procedures are documented utilizing our McElroy "SP" (Standard Practice) and "ES" (Engineering Standard) system. Building on our doctrine of empowerment, each process/procedure is the specific responsibility of the team member that performs the task.

Procedures and records specific to performance within the McElroy system are independently audited in an ongoing basis through a priority based, random system that ensures record and task accuracy. All deviations, whether discovered through execution of a process or through the Process Integrity Audit, are remedied immediately.

Conformance to our Standards is the minimum requirement for any member of McElroy; and it is what allows us as a Company to consistently deliver products that are of higher performance and higher quality than the competition.

Our fusion machines comply with ISO Standard 12176-1 "Equipment for fusion jointing polyethylene systems"

LIMITED WARRANTY

McElroy warrants all products manufactured, sold and repaired by it to be free from defects

in materials and workmanship, its obligation under this warranty being limited to repairing or replacing at its factory and new products, within **3 years** after shipment, with the exception of purchased items (such as electronic devices, pumps, switches, etc.), in which case that manufacturer's warranty applies. For complete information on our warranty, terms, and conditions please refer to:

www.mcelroy.com/fusion/support/warranty.htm

McElroy Puts Your Safety First

McElroy considers safety as our number one priority. All of our equipment, literature and training classes are strictly designed with the operators safety in mind. Never operate machinery until you have read the manual completely, and understand the safety and operation sections of your manual. Your safety and the safety of others depends upon care and judgment in the operation of the equipment.



All product manuals and assembly drawings are available for downloading from our website at

www.mcelroy.com

The principle of heat fusion is to heat two surfaces to a designated temperature, and then fuse them together by application of force. This pressure causes flow of the melted materials, which causes mixing and thus fusion. When the

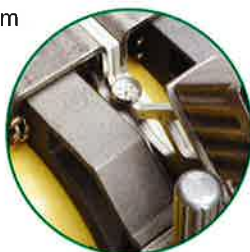


polyethylene pipe is heated, the molecular structure is transformed from a crystalline state into an amorphous condition. When fusion pressure is applied, the molecules from

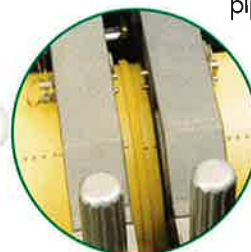


each pipe end mix. As the

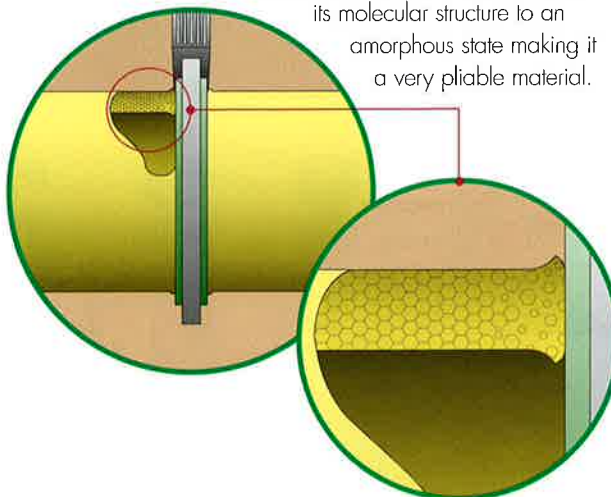
joint cools, the molecules return to their crystalline form, the original interfaces are gone, and the two pipes have become one homogeneous



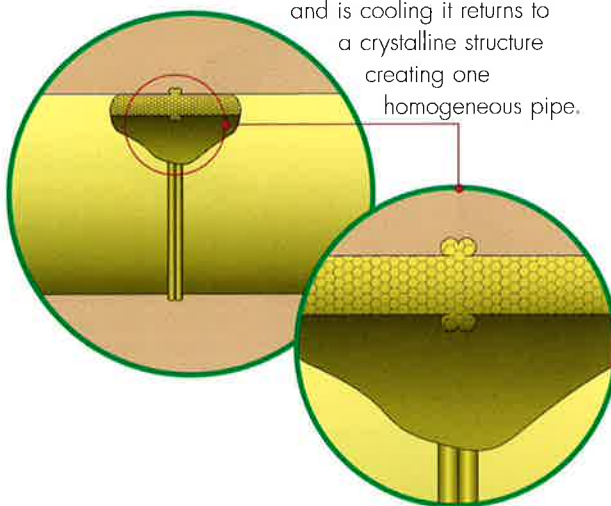
pipe. There are slightly different methods or techniques for fulfilling the heating, joining, and holding phases, but the end result is the same – a fusion joint that is as strong or stronger than the pipe itself.

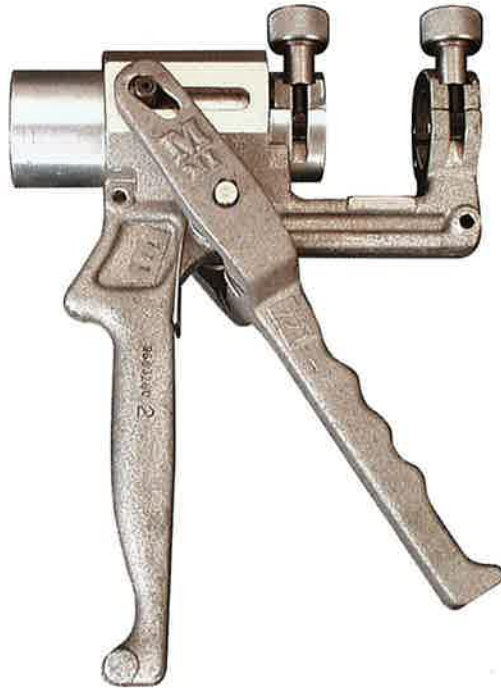


The pipe is being heated changing its molecular structure to an amorphous state making it a very pliable material.



After the pipe has been fused and is cooling it returns to a crystalline structure creating one homogeneous pipe.





McElroy MiniMc™ Machines are compact, lightweight, highly reliable, accurate and rugged. Perfect for joining **½" CTS – 1" IPS (16 mm – 34 mm)** service sizes. The MiniMc™ requires only one operator and works in the most difficult conditions. McElroy's patented features and precision engineering provide joint integrity and minimal maintenance. The narrow clamp design provides for butt fusion with precise pipe alignment at the fusion joint. The MiniMc heater is thermostatically controlled and has a durable anti-stick coating. Our insulated heater sling protects the heater and allows carrying while hot.

- Compact, lightweight
- Hand operated
- Thermostatically controlled heater

MiniMc Fusion Machines

Package includes: fusion machine, screw/driver kit. Heater, facer and inserts are sold separately.

Description	Part No.
1" MiniMc	CTS07901
32mm MiniMc	CTS08001

For Inserts and Accessories
visit: www.mcelroy.com



Patent No. 4,484,975



No. 2LC Pictured

The McElroy No. 2LC (Locking Cam) and No. 2CU (Combination Unit) butt fusion machines fuse $\frac{1}{2}$ " CTS – 2" IPS pipe (20mm – 60mm). Both machines incorporate McElroy's patented Centerline Guidance System, and are designed to butt fuse tees, ells, and other fittings with consistent high quality results. Additional sidewall clamps with chain vise allow the No. 2CU to be attached on the centerline of a pipe main for saddle fusion of $\frac{1}{2}$ " to 2" saddles and tapping tees.

Both machines incorporate surface hardened aluminum and stainless steel for light weight and durability. Jaws and inserts have multiple serrations for maximum grip on the pipe.



No. 2LC



No. 2CU

For Inserts and Accessories
visit: www.mcelroy.com



No. 2LC Fusion Machines

Package includes: fusion machine, facer, Multi-Mc heater, insulated heater/facer stand and screw/driver kit.

Description	Part No.
100-120V, 50/60Hz, 1Ph	A217201
200-240V, 50/60Hz, 1Ph	A217202

No. 2CU Fusion Machines

Package includes: fusion machine, facer, Multi-Mc heater, insulated heater/facer stand and screw/driver kit.

Description	Part No.
100-120V, 50/60Hz, 1Ph	A200101
200-240V, 50/60Hz, 1Ph	A200102

Patent No. 4,352,708



McElroy PitBull® No.14 Machines

fuse **1" IPS – 4" DIPS pipe** (32mm – 110mm). The machine incorporates McElroy's patented Centerline Guidance System, and is designed to butt fuse tees, ells, and other fittings with consistent high quality results. The machine's semi-automatic locking cam system maintains force during the cooling cycle. The machine is primarily made of surface hardened aluminum for light weight and durability. Features include reversible jaws, clamp knobs and facer.

- Semi-Automatic locking cam
- Designed to fuse a variety of fittings

PitBull No.14 Fusion Machines

Package includes: fusion machine, facer, Multi-Mc heater, insulated heater/facer stand and screw/driver kit.

Description	Part No.
100-120V, 50/60Hz, 1Ph	A430101
200-240V, 50/60Hz, 1Ph	A430102

For Inserts and Accessories
visit: www.mcelroy.com





No. 2LC Pictured

McElroy Sidewinder™ Fusion Machines

are manually operated for fusing 4" IPS and smaller branch saddles, tapping tees and service saddle fittings onto 1 1/4" IPS and larger main sizes. The chains shipped with the machine will fit up to 8" IPS pipe. Longer chains are available for larger pipe sizes.

The Jaw Clamp Sidewinder is a manually operated saddle fusion machine for fusing 3" IPS and smaller branch saddles, tapping tees and service saddle fittings onto 1 1/4" IPS to 4" IPS main sizes. An optional chain clamp kit is available for 6" and larger mains.

Both Sidewinders incorporate McElroy's patented Centerline Guidance and Quick Release Systems. They are both DataLogger® compatible.



Jaw Clamp

Chain Clamp

Patent No. 4,533,424

Sidewinder Fusion Machines

All Sidewinder packages include: a calibration capable pressure gauge, 3" pivot master, heater guide and screw/driver kit. Heaters and adapters are sold separately.

Sidewinder packages	Package Number			
Gauge Options ➤	300 PSI	600 PSI	1000 PSI	1500 PSI
Chain Clamp	ASW00113	ASW00112	ASW00111	ASW00110
Compact Chain Clamp	ASW00123	ASW00122	ASW00121	ASW00120
Jaw Clamp	ASW00133	ASW00132	ASW00131	ASW00130
Compact Jaw Clamp	ASW00143	ASW00142	ASW00141	ASW00140

For Inserts and Accessories
visit: www.mcelroy.com



DataLogger Compatible
A handheld computer used to document the profile of each fusion joint. See page 26.

Sidewinder



HPU Sold Separately

Patent No's 5,814,182 6,212,748 6,212,747 6,021,832 4,352,708
(other patents pending)

McElroy No.28 Machines will butt fuse pipe sizes from 2" IPS – 8" DIPS (63mm – 225mm). The **Rolling No.28** has staked its claim as the industry standard for 20 years. Its ease of use and rugged quality construction opened the door for the most extensive line of 8 inch fusion machines on the market. All models incorporate the interchangeable **PitBull No.28** carriage and feature McElroy's patented Centerline Guidance System. The **CU (Combination Unit)** adds saddle fusion capability of branch saddles on almost all main sizes. Two fixed and movable clamping jaws result in precision pipe alignment for higher quality fusion joints. The **TracStar No.28** offers a self-contained, self-propelled track mounted chassis that can handle hills up to 30 degrees. The machines are **DataLogger®** compatible and can fabricate segmented ells with optional mitered inserts.

The latest option available to the **No.28** line of machines is an **Automated Tracstar No.28**. This option allows automated control and monitoring of the heat, soak, fuse, and cool cycles. This automated system gives the operator a step by step procedure for fusing pipe which helps remove operator error. It has a built-in datalogging feature that keeps a record of each fusion joint, which is required by some municipalities to verify joint integrity.



DataLogger Compatible
A handheld computer used to document the profile of each fusion joint. See page 26.

For Inserts and Accessories
visit: www.mcelroy.com

Rolling No.28

- Wheeled chassis for easy maneuvering on the jobs
- Interchangeable Carriage can be easily removed for in-ditch use

TracStar® No.28



- Track mounted, self-contained, self-propelled, all-terrain
- Interchangeable Carriage can be easily removed for in-ditch use
- On-board generator for powering heater & other devices
- Fits in a standard long box truck bed for easy transport
- Automated Unit Available

PitBull® No.28



- Compact for fusion above or in the trench
- Simple jawset/carriage for greater portability

PitBull HPU

Package includes: Hydraulic Power Unit, hydraulic and extension hoses.

Description	Part No.	
240V, 60Hz, 1Ph	T1810901	
220-240V, 50/60Hz, 3Ph	T1810902	
380V, 50Hz, 3Ph	T1810903	

No.28 Fusion Machines

Package includes: fusion machine, facer, heater, butt fusion heater adapter set, insulated heater stand, and 8" IPS butt fusion inserts.

High Force Cyl. Packages	Part No.
120V, 60Hz, 1Ph	A860805
208-240V, 60Hz, 1Ph	A860806
Low Force Cyl. Packages	Part No.
120V, 60Hz, 1Ph	A860810

TracStar No.28 Fusion Machines

Package includes: fusion machine, facer, heater, insulated heater stand, and 8" IPS butt fusion inserts.

Standard Hydraulic	Part No.
High Force Cylinders	AT800105
Low Force Cylinders	AT800107
Automated Machines	Part No.
High Force Cylinders	AT806101
Low Force Cylinders	AT806103

PitBull No.28 Fusion Machine

Package includes: fusion carriage, facer, 240VAC heater, insulated heater stand and 8" IPS butt fusion inserts. HPU sold separately.

Description	Part No.
High Force Cylinders	AT805501
Low Force Cylinders	AT805503



HPU Sold Separately

Patent No's 5,814,182 6,212,748 6,212,747 6,021,832 4,352,708
(other patents pending)

McElroy 250 Machines will butt fuse pipe sizes from 63mm – 250mm (2" IPS – 8" DIPS). All models incorporate the interchangeable **PitBull 250** carriage and feature McElroy's patented Centerline Guidance System. The **CU (Combination Unit)** adds saddle fusion capability of branch saddles on almost all main sizes. Two fixed and movable clamping jaws result in precision pipe alignment for higher quality fusion joints. The **TracStar 250** offers a self-contained, self-propelled track mounted chassis that can handle hills up to 30 degrees. The machines are **DataLogger®** compatible and can fabricate segmented ells with optional mitered inserts.

The latest option available to the **250** line of machines is an **Automated Tracstar 250**. This option allows automated control and monitoring of the heat, soak, fuse, and cool cycles. This automated system gives the operator a step by step procedure for fusing pipe which helps remove operator error. It has a built-in datalogging feature that keeps a record of each fusion joint, which is required by some municipalities to verify joint integrity.



DataLogger Compatible
A handheld computer used to document the profile of each fusion joint. See page 26.

For Inserts and Accessories
visit: www.mcelroy.com

Rolling 250

- Wheeled chassis for easy maneuvering on the jobs
- Interchangeable Carriage can be easily removed for in-ditch use

TracStar® 250



- Track mounted, self-contained, self-propelled, all-terrain
- Interchangeable Carriage can be easily removed for in-ditch use
- On-board generator for powering heater & other devices
- Fits in a standard long box truck bed for easy transport
- Automated Unit Available

PitBull® 250



- Compact for fusion above or in the trench
- Simple jawset/carriage for greater portability

250 Fusion Machines

Package includes: fusion machine, facer, heater, insulated heater stand, and 8" IPS butt fusion inserts.

220V, 50 HZ, 1Ph	Part No.
High Force Cylinders	A866001
Low Force Cylinders	A866003

TracStar 250 Fusion Machines

Package includes: fusion machine, facer, heater, insulated heater stand, 8" IPS butt fusion inserts.

Standard Hydraulic	Part No.
High Force Cylinders	AT2500103
Low Force Cylinders	AT2500102
Automated Machines	Part No.
High Force Cylinders	AT2506101
Low Force Cylinders	AT2506103

PitBull 250 Fusion Machine

Package includes: fusion carriage, facer, 240VAC heater, insulated heater stand and 8" IPS butt fusion inserts. HPU sold separately.

Description	Part No.
High Force Cylinders	AT2505501
Low Force Cylinders	AT2505503

PitBull HPU

Package includes: Hydraulic Power Unit, hydraulic and extension hoses

Description	Part No.
240V, 60Hz, 1Ph	T1810901
220-240V, 50/60Hz, 3Ph	T1810902
380V, 50Hz, 3Ph	T1810903





McElroy No.412 Machines will butt fuse pipe sizes from 4" IPS – 12" DIPS (110mm – 340mm). All models incorporate the interchangeable **PitBull No.412** carriage with McElroy's patented Centerline Guidance System. Two fixed and movable clamping jaws result in precision pipe alignment for higher quality fusion joints. The machines are **DataLogger®** compatible and can fabricate segmented ells with optional mitered inserts.

The latest option available to the **No.412** line of machines is an **Automated Tracstar No.412**. This option allows automated control and monitoring of the heat, soak, fuse, and cool cycles. This automated system gives the operator a step by step procedure for fusing pipe which helps remove operator error. It has a built-in datalogging feature that keeps a record of each fusion joint, which is required by some municipalities to verify joint integrity.



HPU Sold Separately

Patent No's: 5,814,182 6,212,748 6,212,747 6,021,832
(other patents pending)

Rolling No.412

- Wheeled chassis for easy maneuvering on the jobsite
- Interchangeable Carriage can be easily removed for in-ditch use
- Hydraulic pipe lifts



DataLogger Compatible
A handheld computer used to document the profile of each fusion joint. See page 26.

For Inserts and Accessories
visit: www.mcelroy.com



TracStar® No.412



- Track mounted, self-contained, self-propelled, all-terrain
- Interchangeable Carriage can be easily removed for in-ditch use
- On-board generator and hydraulic pipe lifts
- Fits in a standard long box truck bed for easy transport
- Automated Unit Available

PitBull® No.412



- Compact for fusion above or in the trench
- Simple jawset/carriage for greater portability

PitBull No.412 Fusion Machines

Package includes: fusion carriage, facer, 240VAC heater, insulated heater stand and 12" IPS butt fusion inserts. **HPU sold separately.** (See page 19)

Description	Part No.
High Force Cylinders	AT1213002
Medium Force Cylinders	AT1213001
Low Force Cylinders	AT1213003

No.412 Fusion Machines

Powered by a low vibration V-twin gasoline engine, CARB compliant or a TEFC electric motor. Package includes: fusion machine, facer, heater, insulated heater stand, 12" IPS butt fusion inserts and lifting sling.

Gasoline Power	Part No.
High Force Cylinders	A1248101
Medium Force Cylinders	A1248102
Low Force Cylinders	A1248103
Electric 220-240V, 50/60Hz, 3 Ph	Part No.
High Force Cylinders	A1248104
Medium Force Cylinders	A1248105
Low Force Cylinders	A1248106

TracStar No.412 Fusion Machines

Powered by a low vibration, CARB compliant diesel engine. Package includes: fusion machine, facer, heater, butt fusion heater adapter set, insulated heater stand, 12" IPS butt fusion inserts and lifting sling.

Standard Hydraulic	Part No.
High Force Cylinders	AT1212902
Medium Force Cylinders	AT1212901
Low Force Cylinders	AT1212903
Automated Machine	Part No.
High Force Cylinders	AT1213202
Medium Force Cylinders	AT1213201
Low Force Cylinders	AT1213203



HPU Sold Separately

Patent No's. 5,814,182 6,212,748 6,212,747 6,021,832
(other patents pending)

McElroy No.618 Machines will butt fuse pipe sizes from 6" IPS – 18" OD (180mm – 450mm). All models incorporate the interchangeable **PitBull No.618** carriage with McElroy's patented Centerline Guidance System. Two fixed and movable clamping jaws result in precision pipe alignment for higher quality fusion joints. The machines are **DataLogger®** compatible and can fabricate segmented ells with optional mitered inserts.

The latest option available to the **No.618** line of machines is an **Automated Tracstar No.618**. This option allows automated control and monitoring of the heat, soak, fuse, and cool cycles. This automated system gives the operator a step by step procedure for fusing pipe which helps remove operator error. It has a built-in datalogging feature that keeps a record of each fusion joint, which is required by some municipalities to verify joint integrity.

Rolling No.618

- Wheeled chassis for easy maneuvering on the jobsite
- Interchangeable Carriage can be easily removed for in-ditch use
- Hydraulic pipe lifts



DataLogger Compatible
A handheld computer used to document the profile of each fusion joint. See page 26.

For Inserts and Accessories
visit: www.mcelroy.com



TracStar® No.618

- Track mounted, self-contained, self-propelled, all-terrain
- Interchangeable Carriage can be easily removed for in-ditch use
- On-board generator and hydraulic pipe lifts
- Fits in a standard long box truck bed for easy transport
- Automated Unit Available



PitBull® No.618

- Compact for fusion above or in the trench
- Simple jawset/carriage for greater portability

PitBull No.618 Fusion Machines

Package includes: fusion carriage, facer, 240VAC 12" IPS - 18" OD heater and insulated heater stand. **HPU sold separately. (See Page 19)**

Description	Part No.
High Force Cylinders	AT1807502
Medium Force Cylinders	AT1807501
Low Force Cylinders	AT1807503

No.618 Fusion Machines

Powered by a low vibration V-twin gasoline engine, CARB compliant or a TEFC electric motor. Package includes: fusion machine, facer, heater, insulated heater stand and lifting sling.

Gasoline Power	Part No.
High Force Cylinders	A1869101
Medium Force Cylinders	A1869102
Low Force Cylinders	A1869103
Electric 220-240V, 50/60Hz, 3 Ph	Part No.
High Force Cylinders	A1869104
Medium Force Cylinders	A1869105
Low Force Cylinders	A1869106

TracStar No.618 Fusion Machines

Powered by a liquid cooled, CARB compliant diesel engine. Package includes: fusion machine, facer, heater, insulated heater stand and lifting sling.

Standard Hydraulic	Part No.
High Force Cylinders	AT1807402
Medium Force Cylinders	AT1807401
Low Force Cylinders	AT1807403
Automated Machine	Part No.
High Force Cylinders	AT1813202
Medium Force Cylinders	AT1813201
Low Force Cylinders	AT1813203

No.618



HPU Sold Separately

Patent No's 5,814,162 6,212,748 6,212,747 6,021,832
(other patents pending)

McElroy 500 Machines will butt fuse pipe sizes from 6" IPS – 20" OD (180mm – 500mm). All models incorporate the interchangeable **PitBull 500** carriage with McElroy's patented Centerline Guidance System. Two fixed and movable clamping jaws result in precision pipe alignment for higher quality fusion joints. The standard manifold machines are **DataLogger®** compatible and can fabricate segmented ells with optional mitered inserts.

The latest option available to the **500** line of machines is an **Automated Tracstar 500**. This option allows automated control and monitoring of the heat, soak, fuse, and cool cycles. This automated system gives the operator a step by step procedure for fusing pipe which helps remove operator error. It has a built-in datalogging feature that keeps a record of each fusion joint, which is required by some municipalities to verify joint integrity.



DataLogger Compatible
A handheld computer used to document the profile of each fusion joint. See page 26.

For Inserts and Accessories
visit: www.mcelroy.com



TracStar® 500



- Track mounted, self-contained, self-propelled, all-terrain
- Interchangeable Carriage can be easily removed for in-ditch use
- On-board generator for powering heater & other devices
- Fits in a standard long box truck bed for easy transport
- Automated Unit Available
- Dual speed tracks

PitBull® 500



- Compact for fusion above or in the trench
- Simple jawset/carriage for greater portability

TracStar® 500 Fusion Machines

Package includes: fusion machine, facer, heater, insulated heater stand, 12" IPS - 20" OD heater and lifting assembly, Download cable included with Automated machine.

Standard Hydraulic	Part No.
Standard Manifold 20" OD Jawset	AT5000106
Standard Manifold 500mm Jawset	AT5000108
Automated Machine	Part No.
Standard Manifold 20" OD Jawset	AT5036104
Standard Manifold 500mm Jawset	AT5036103

PitBull® 500 Fusion Machines

Package includes: fusion carriage, facer, facer stand, 240VAC 12" IPS - 20" OD heater and insulated heater stand. HPU sold separately.

Description	Part No.
Medium Force Cylinders (20" Jawset)	AT5034001
Medium Force Cylinders (500mm Jawset)	AT5034002

PitBull HPU

Package includes: Hydraulic Power Unit, hydraulic and extension hoses.

Description	Part No.	
240V, 60Hz, 1Ph	T1810901	
220-240V, 50/60Hz, 3Ph	T1810902	
380V, 50Hz, 3Ph	T1810903	



MegaMc® No. 824 & TracStar® 630

Machines will butt fuse pipe sizes from 8" IPS – 24" OD (225mm – 630mm). The machine allows for butt fusion of most fittings without special holders or removal of outer jaw. Mitered inserts are available for fabricating ells. McElroy's unique semi-automatic control system requires only one operator. Hydraulic power assists all fusion functions including the complete operation of the jaws, pipe lifts, heater, and facer. Both machines have 4 jaws with a removable 3 jaw carriage and top loading heater and facer to maximize functionality within a limited space. It also incorporates McElroy's patented Centerline Guidance System and is **DataLogger®** compatible.



The latest option available to the **TracStar 630** line of machines is an **Automatic Tracstar 630**. This option allows automated control and monitoring of the heat, soak, fuse, and cool cycles. This automatic system gives the operator a step by step procedure for fusing pipe which helps remove operator error. It has a built-in datalogging feature that keeps a record of each fusion joint, which is required by some municipalities to verify joint integrity.



Featuring a wireless remote control for precision placement, and optimum visibility on the job site with the TracStar 630 machines.



DataLogger Compatible
 A handheld computer used to document the profile of each fusion joint. See page 26.

For Inserts and Accessories
 visit: www.mcelroy.com

Patent No's. 5,814,182 6,212,748 6,212,747 6,021,832
 (other patents pending)



MegaMc No.824



- Four or three jaw capability
- Jawset/Carraige can be easily removed for in-ditch use
- For confined spaces machine can be converted to top-loading heater & facer
- Improved In-Ditch capabilities

TracStar 630



- Track mounted, self-contained, self-propelled, all-terrain
- On-board generator for powering heater & other devices
- Jawset/Carraige can be easily removed for in-ditch use
- Automatic Unit Available
- Four or three jaw capability
- Improved In-Ditch capabilities
- Can be converted to top-loading heater & facer
- Dual Speed Tracks

No.824 Fusion Machines

Package includes: fusion machine, facer, heater, 24" OD butt fusion inserts and lifting assembly.

Description	Part No.
High Force Cylinders	A2435501
Medium Force Cylinders	A2435502
Low Force Cylinders	A2435503

TracStar 630 Fusion Machines

Package includes: fusion machine, facer, heater, 24" OD butt fusion inserts, remote control with batteries and 12V charger. Download cable included with Automatic machine. Optional heater/facer stand sold separately.

Standard Hydraulic	Part No.
High Force Cylinders	AT2400101
Medium Force Cylinders	AT2400102
Low Force Cylinders	AT2400103
Automatic Machine	Part No.
High Force Cylinders	AT2408101
Medium Force Cylinders	AT2408102
Low Force Cylinders	AT2408103



MegaMc® No.1236 & TracStar® 900

machines will butt fuse pipe sizes from 12" IPS – 36" OD (340mm – 900mm). The machine allows for butt fusion of most fittings without special holders or removal of the outer jaw. Mitered inserts are available for fabricating ells. McElroy's unique semi-automatic control system requires only one operator. Hydraulic power assists all fusion functions including the complete operation of the jaws, pipe lifts, heater, and facer. Both machines have 4 jaws with a removable 3 jaw carriage and top loading heater and facer to maximize functionality within a limited space. The standard manifold **No.1236** is **DataLogger®** compatible.

The latest upgrade to the **TracStar 900** line of machines is an **Automatic Tracstar 900**. This option allows automated control and monitoring of the heat, soak, fuse, and cool cycles. This automatic system gives the operator a step by step procedure for fusing pipe which helps remove operator error. It has a built-in datalogging feature that keeps a record of each fusion joint, which is required by some municipalities to verify joint integrity.



Featuring a wireless remote control for precision placement, and optimum visibility on the job site with the TracStar 900 machines.



DataLogger Compatible
A handheld computer used to document the profile of each fusion joint. See page 26.

For Inserts and Accessories
visit: www.mcelroy.com

Patent No's. 5,814,182 6,212,748 6,212,747 6,021,832
[other patents pending]



MegaMc No.1236



- Four or three jaw capability
- Jawset/Carraige can be easily remove for in-ditch use
- Can be converted to top-loading heater & facer
- Improved In-Ditch capabilities

TracStar 900



- Track mounted, self-contained, self-propelled, all-terrain
- On-board generator for powering heater & other devices
- Jawset/Carraige can be easily removed for in-ditch use
- Automatic Unit Available
- Four or three jaw capability
- Improved In-Ditch capabilities
- Can be converted to top-loading heater & facer
- Dual Speed Tracks

No.1236 Fusion Machines

Package includes: fusion machine, facer, heater, butt fusion heater adapter set and lifting assembly.

220-240V, 50/60Hz, 3 Ph	Part No.
High Force Cylinders	A3639501
Medium Force Cylinders	A3639502
Low Force Cylinders	A3639503

TracStar 900 Fusion Machines

Package includes: fusion machine, facer, heater, remote control with batteries & 12V charger and lifting assembly. Download cable included with Automatic machine. Optional heater/facer stand sold seperately.

Standard Hydraulic	Part No.
High Force Cylinders	AT9028001
Medium Force Cylinders	AT9028002
Low Force Cylinders	AT9028003
Automatic Machine	Part No.
High Force Cylinders	AT9028101
Medium Force Cylinders	AT9028102
Low Force Cylinders	AT9028103



MegaMc® No.1648 Machines will butt fuse pipe sizes from 16" OD – 48" OD (450mm – 1200mm). The machine allows for butt fusion of most fittings without special holders or removal of the outer jaw. Mitered inserts are available for fabricating ells. McElroy's unique semi-automatic control system requires only one operator. Hydraulic power assists all fusion functions including the complete operation of the jaws, pipe lifts, heater, and facer. It also incorporates McElroy's patented Centerline Guidance System and is **DataLogger®** compatible.

MegaMc® No.1648

- Four Jaw Construction
- DataLogger® Compatible
- Hydraulic Clamping
- Hydraulic Pivoting Heater and Facer



For Inserts and Accessories
visit: www.mcelroy.com



DataLogger Compatible
A handheld computer used to document the profile of each fusion joint. See page 26.

No.1648 Fusion Machines

Package includes: fusion machine, facer, heater and lifting assembly.

220-240V, 50/60Hz, 3 Ph	Part No.
High Force Cylinders	A4800806
Medium Force Cylinders	A4800807



MegaMc® No.2065 machines will butt fuse pipe sizes from 20" OD – 65" OD (500mm – 1600mm). The machine allows for butt fusion of most fittings without special holders. Mitered inserts are available for fabricating ells. McElroy's unique semi-automatic control system requires only one operator. Hydraulic power assists all fusion functions including the complete operation of the jaws, pipe lifts, heater, and facer. It also incorporates McElroy's patented Centerline Guidance System and is **DataLogger®** compatible.



MegaMc® No.2065



- Two Jaw Construction
- DataLogger® Compatible
- Hydraulic Clamping
- Hydraulic Pivoting Heater and Facer

No.2065 Fusion Machine

Package includes: fusion machine, facer, 48" and 65" heaters, butt fusion heater adapter set and lifting assembly.

220-240V, 50/60Hz, 3 Ph	Part No.
High Force Cylinder	A6300102

For Inserts and Accessories
visit: www.mcelroy.com



DataLogger Compatible
A handheld computer used to document the profile of each fusion joint. See page 26.

No.2065



DataLogger Package

Package includes: DataLogger, Rugged Pocket PC with DataLogger software pre-installed, Rugged Pocket PC wrist strap, carrying case, SD card reader, operator's manual, one year free software support.

The McElroy DataLogger® is used to record and document key parameters of the fusion process. This cost effective device can be used to verify that proper procedures have been followed prior to installation. The DataLogger consists of a rugged handheld computer as the recording device wirelessly connected to a data collection device. The data collection device records the heater temperature and fusion pressure profile over time. All data is recorded and transmitted to the handheld computer where the joint report can be stored, viewed, printed out directly and transferred to a desktop computer for archiving.

Features of the handheld computer

- Meets MIL-STD-810F standards for drops, vibration and temperature extremes
- IP67 rating: impervious to dust and water immersion
- Wireless connection to the data collection device via Bluetooth®
- Provides familiar Microsoft Windows user interface
- Program and joint reports store in persistent (nonvolatile) memory
- Transfers joint reports to PC via standard USB port and Microsoft ActiveSync
- Generates reports in imperial or metric units

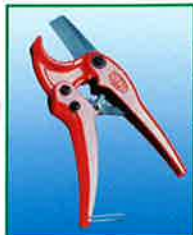
Collection Device

- Laser-guided pyrometer for accurate temperature readings
- New quick disconnect allows connection under pressure
- Joint report recorded in nonvolatile Flash memory
- Battery operated for portability

Description	Part No.
100-240V, 50/60Hz	DL6303



Shears for Plastic Pipe



Description	Part No.
1.7" OD Capacity	MMD00009
2.4" OD Capacity	MMD00008

Tube Cutter for Plastic Pipe



Description	Part No.
For 1/4" to 2 3/8" OD Capacity	MMD00001
For 1 7/8" to 4 1/2" OD Capacity	MMD00002
For 4" to 6 5/8" OD Capacity	MMD00040

Pyrometers



Description	Part No.
Digital Meter, Surface Probe with Case	A218803

PolyHorse™



Description	Part No.
Pipe handling system that consists of a series of adjustable racks to store and help install the pipe on the job site.	1875501

Shears for Plastic Pipe



Description	Part No.
For 2" to 4" IPS (63mm - 125mm)	MMD00051
For 3" to 8" IPS (90mm - 225mm)	MMD00036

External Bead Remover Patent No. 4,033,106



Description	Part No.
For 1 1/4" to 6" IPS Pipe	1221101
For 4" IPS to 18" OD Pipe	1810102

Note: McElroy also fabricates internal bead removers upon request.

McElroy Spreader Bars



Description	Part No.
3,000 lbs Maximum	8261000-0101
6,000 lbs Maximum	8261000-0201

Ideal for handling 40' bundles or a single joint of pipe. Nylon lifting straps fasten securely to spreader bar to prevent bundle breakage and damage to the pipe.

PolyPorter™



Description	Part No.
Designed to aid in lifting of HDPE pipe into the fusion machine as well as perform as a pipe stand.	864201



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McElroy Fusion Products listed in this catalog are covered by one or more of the following U.S. patents: 3,846,208 - 4,083,106 - 4,071,395 - 4,352,708 - 4,484,975 - 4,227,067 - 4,533,424 - 4,085,505 - 3,729,360 - 5,013,376 - 5,078,827 - 5,814,182 - 5,676,009 - 5,098,225 - 6,212,748 - 6,212,747 - 6,021,832 - 6,239,412.

Canadian patents: 1182967, 1244212, 1019513.

Other U.S. and foreign patents pending.

McElroy Manufacturing, Inc. is a member of: AGA, ASTM, AWWA, AEM, DCA, NUCA, PPI, WEF.

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Technical Note 814-TN

Engineering Considerations for Temperature Change

Like most materials, polyethylene is affected by temperature change. However, polyethylene's response to temperature change is significant and unique when compared to other "traditional" piping materials. Polyethylene pipe design for thermal change may be significantly different compared to other piping materials.

Polyethylene pipe can be installed and operated in sub-freezing conditions. Ice in the pipe will restrict or stop flow, but not cause pipe breakage. Care must be taken during installation to avoid impact and suddenly applied high stress. In response to changing temperature, unrestrained polyethylene pipe will undergo a length change. Anchored or end restrained pipe will develop longitudinal stresses instead of undergoing a change in length. This stress will be tensile during temperature decrease, or compressive during temperature increase. If the compressive stress level exceeds the column buckling resistance of the restrained length, then lateral buckling (or snaking) will occur. While thermal stresses are well tolerated by polyethylene pipe, anchored or restrained pipe may apply stress to restraining structures. The resulting stress or thrust loads can be significant and the restraining structures must be designed to resist the anticipated loads.

The PlexCalc® II program is available from Performance Pipe to aid in performing many of the calculations in this technical note. PlexCalc® II is located on the Performance Pipe CD-Rom.

Unrestrained Thermal Effects

The theoretical change in length for an unrestrained pipe placed on a frictionless surface can be determined from Equation 1.

$$\Delta L = L \alpha \Delta T \quad (1)$$

where:

ΔL	=	length change, in
L	=	pipe length, in
α	=	thermal expansion coefficient, in/in/°F
ΔT	=	temperature change, °F

The coefficient of thermal expansion for DriscoPlex® high density polyethylene pipe material is about 9.0×10^{-5} in/in/°F. This coefficient results in an approximate expansion for pipe of 1/10/100, that is, 1 in for each 10° F change for each 100 ft of pipe. This is a significant length change compared to other piping materials and should be taken into account in piping system design. A temperature rise results in a length increase while a temperature drop results in a length decrease.

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End Restrained Thermal Effects

A length of pipe that is restrained or anchored on both ends and placed on a frictionless surface will exhibit a substantially different reaction to temperature change than an unrestrained pipe. If the pipe is restrained in a straight line between two points and the temperature decreases, the pipe will attempt to decrease in length. Because of the end restraints, a length change is not possible, so a tensile stress is created in the longitudinal direction along the pipe. This stress can be determined using Equation 2.

$$\sigma = E \alpha \Delta T \quad (2)$$

where terms are as defined above, and

σ = longitudinal stress in pipe, psi
 E = elastic modulus, psi

The selection of the modulus can have a large impact on the calculated stress. As with all thermoplastic materials, polyethylene's modulus and therefore its stiffness, is a function of temperature and the duration of the applied load. To select the appropriate elastic modulus, these two variables must be known. When determining the appropriate time interval, it is important to consider that heat transfer occurs at relatively slow rates through the wall of polyethylene pipe, therefore temperature changes do not occur rapidly. Because the temperature change does not happen rapidly, the average temperature between the initial and final temperature is often chosen for the modulus selection.

Modulus values for PE 3608 (formerly PE3408) are given in Table 1

As longitudinal stress builds in the pipe wall, a thrust load is created on the end structures. This load can be significant and is determined by Equation 3.

$$F = \sigma A \quad (3)$$

where terms are as defined above, and

F = end thrust, lb
 A = cross section area of pipe, in²

Equations 2 and 3 can also be used to determine the compressive stress and thrust (respectively) that is created when a temperature increase occurs. However, if the compressive thrust exceeds the critical longitudinal buckling force for the pipe segment, the pipe will deflect laterally. The critical force for a slender column can be determined using Euler's equation, assuming ends are free to rotate (which is conservative for restrained ends).

Euler's Equation

$$F' = \frac{\pi^2 E I}{(L')^2} \quad (4)$$

where terms are as defined above, and

F' = critical thrust force, lb
 I = cross section moment of inertia, in⁴

$$I = \frac{\pi (OD^4 - ID^4)}{64} \quad (5)$$

L' = distance between end restraints, in

The modulus is selected using the same criteria used for determining the stress in the pipe wall due to the thermal change. The applicability of Euler's equation for any specific pipeline calculation must be evaluated. For pipe installed on top of a surface (i.e. the ground, a pipe rack) pipe and fluid weight in the pipe and frictional forces increase the critical thrust force whereas in aerial applications weight and initial curvature due to deflection reduce the critical thrust force.

While the amount of length change experienced by polyethylene pipe during thermal changes is greater than many other materials, the amount of force required to restrain the movement is less because of its lower modulus of elasticity.

Table 1 Typical Elastic Modulus for DriscoPlex® PE 3608

Load Duration	Elastic Modulus†, 1000 psi (MPa), at Temperature, °F (°C)							
	-20 (-29)	0 (-18)	40 (4)	60 (16)	73 (23)	100 (38)	120 (49)	140 (60)
Short-Term	300.0 (2069)	260.0 (1793)	170.0 (1172)	130.0 (896)	110.0 (758)	100.0 (690)	65.0 (448)	50.0 (345)
10 h	140.8 (971)	122.0 (841)	79.8 (550)	61.0 (421)	57.5 (396)	46.9 (323)	30.5 (210)	23.5 (162)
100 h	125.4 (865)	108.7 (749)	71.0 (490)	54.3 (374)	51.2 (353)	41.8 (288)	27.2 (188)	20.9 (144)
1000 h	107.0 (738)	92.8 (640)	60.7 (419)	46.4 (320)	43.7 (301)	35.7 (246)	23.2 (160)	17.8 (123)
1 y	93.0 (641)	80.6 (556)	52.7 (363)	40.3 (278)	38.0 (262)	31.0 (214)	20.2 (139)	15.5 (107)
10 y	77.4 (534)	67.1 (463)	43.9 (303)	33.5 (231)	31.6 (218)	25.8 (178)	16.8 (116)	12.9 (89)
50 y	69.1 (476)	59.9 (413)	39.1 (270)	29.9 (206)	28.2 (194)	23.0 (159)	15.0 (103)	11.5 (79)

† Typical values based on ASTM D 638 testing of molded plaque material specimens.
Modulus values for PE4710 are under development.

Controlling Expansion and Contraction

Black polyethylene pipe on the surface or above grade and exposed to the sun can absorb solar energy. The resulting pipe temperatures can be greater than the air temperature. To help reduce temperature changes resulting solar heating of a piping system, the pipe may be shaded or placed in a location that receives less direct sunlight.

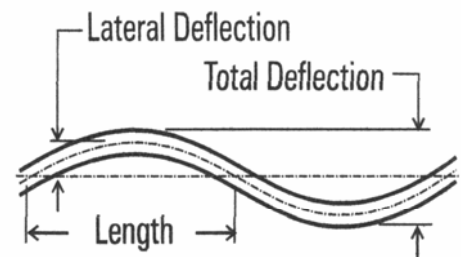
The effects of thermal expansion and contraction on a piping system can be controlled in several ways, including

- ❑ Lateral deflection expansion loops (snaking the pipe)
- ❑ Anchor and guide the pipe
- ❑ Conventional Expansion loops
- ❑ Expansion joints (non-pressures systems only)
- ❑ Burying pipes

Lateral Deflection Expansion Loops

The simplest installation involves stringing pipe between end point anchor structures. If the pipe is simply laid in a straight line between the end anchors the pipeline anchoring structures must be capable of handling potentially high thermal contraction thrust loads during temperature decrease. During temperature increase, the thrust force on the anchoring structure is limited by the pipe's critical thrust force. As the temperature increases, the pipe exerts an increasing force on the anchor structures. In reaction, the anchor structures apply an increasing compressive thrust on the pipe. When the critical thrust force is reached the pipe undergoes elastic buckling and deflects laterally. The force on the anchoring structures decreases. To minimize these loads, pipe may be pre-snaked during installation rather than placed in a straight line.

Figure 1 Lateral Deflection



The critical thrust force may be calculated using Equation 4. Equation 4 is based on a column with no lateral support. Where frictional resistance acts to restrain lateral movement of the pipe such as pipe on the ground or in a rack, Equation 4 may under predict the thrust force.

Snaked piping installations are also referred to as lateral deflection expansion loops. These loops can be used for DriscoPlex® piping systems that are laid on the surface, supported or suspended above grade on hangers or in racks, or installed underwater.

An effective flexible pipe expansion loop system employs the pipe's natural tendency to deflect laterally, and its high strain tolerance. Lateral deflection expansion loops are recurrent "S-curves" (snaking) along the piping runs that provide an initial lateral deflection, and allow pipe temperature changes to result in greater or lesser lateral deflection. The required number of "S-curves" (or equivalently the number of nodal points between curves) depends on how much lateral deflection is permitted.

Surface and rack supported pipe systems designed with lateral deflection expansion loops must provide sufficient width allowance for lateral pipe deflection. The amount of lateral deflection is related to the anchor or guide spacing.

Lateral deflection may be approximated by

$$y = L \sqrt{\frac{\alpha \Delta T}{2}} \quad (6)$$

Where

y	=	lateral deflection, in
L	=	distance between endpoints, in
α	=	thermal expansion coefficient, in/in/°F
ΔT	=	temperature change, °F

A long, semi-restrained pipe run can snake to either side of the run centerline. Total deflection is

$$Y_T = 2(\Delta y) + D \quad (7)$$

where terms are as defined above and

Y_T	=	total deflection, in
D	=	pipe diameter, in

To minimize thrust loads on restraints or to control which side of the centerline the pipe snakes, an initial deflection can be provided so the pipe does not contract to a straight line at minimum expected temperature. Likewise, during thermal expansion, pipe that is pre-snaked requires less force than predicted using Equation 4 to continue snaking. At the time of installation, the anticipated temperature change from installation temperature to minimum temperature should be determined. Using this temperature change and the distance between points, determine lateral deflection, and install the pipe with this lateral deflection plus the minimum lateral deflection specified by the designer.

The minimum allowable distance between restraining points is dependent upon pipe lateral deflection or bending strain and may be determined from

$$L = \frac{D \sqrt{96 \alpha (\Delta T)}}{\epsilon_{allow}} \quad (8)$$

where terms are as defined above and

ϵ_{allow} = allowable bending strain, in/in

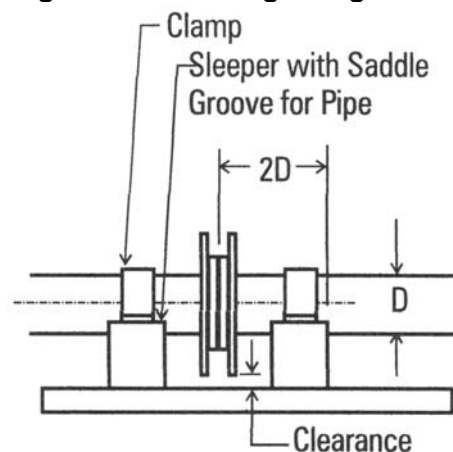
Published values for allowable field cold bend radii of pressure pipe can be used to determine the allowable bending strain.

Table 2 Allowable Bending Strain

Pipe Dimension Ratio, DR	Allowable Bending strain, ϵ_{allow} , in/in
≤ 13.5	0.025
$> 13.5 - 21$	0.020
$> 21 - 32.5$	0.017
Pipe with Fittings	0.005

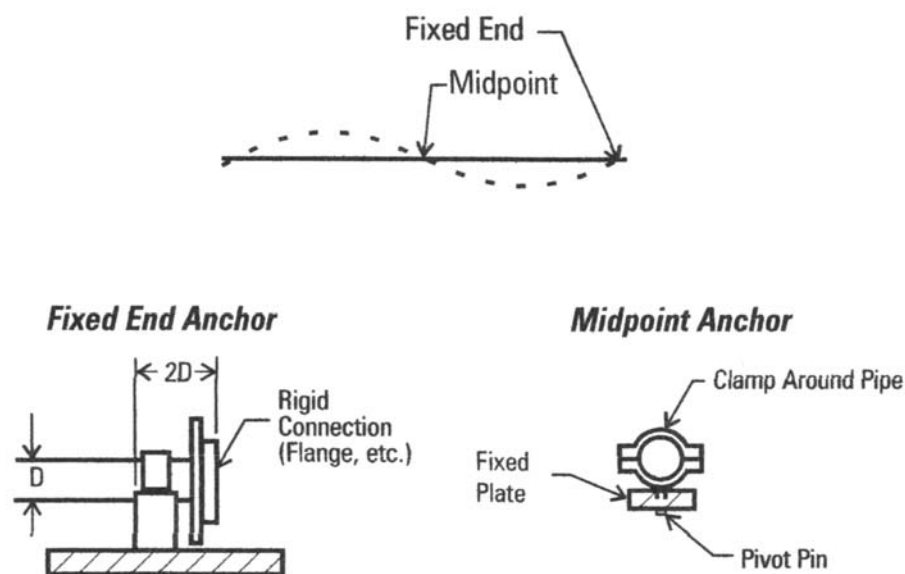
Where pipe is connected to rigid devices, fabricated directional fittings or where flanges or other rigid connections are employed, the pipe and fittings including flanges must be protected from shear, flexing and bending. Flanges laid on the surface can become anchored in the soil, and should be supported on sleepers. Figure 2 illustrates a method for protecting connections to directional fittings and flanged connections to other appurtenances. Wrap elastomer or rubber sheet material around the pipe under the clamps.

Figure 2 Anchoring Flange Connections



End points and mid points of pipe run lengths will require anchoring or guiding. Endpoint anchors must transfer loads and deflections to the pipe, away from rigid joints, or fittings. Midpoint anchors or guides must remain in location, but allow the pipe to move or pivot with the lateral deflection of the expansion loop. Figure 3 shows possible anchoring methods. Wrap elastomer or rubber sheeting around the pipe under clamps to protect the pipe from chafing.

Figure 3 Midpoint and End Anchoring



Above grade piping may also be hung from support rods. Hangers must allow for lateral deflection with sufficient support rod length, and with a clevis or ball type joint at the suspension point. See PP 815-TN *Above Grade Pipe Support* for additional information on above grade piping.

Example 1

24" SDR 11 pipe is conveying a liquid and lying on the ground with an installation temperature of 60° F and operating conditions between 20° F and 120° F. The line is to be installed in a straight line between guides. Installing a line straight between guides results in maximum end thrust loads (tension and compression) on the anchors. Pre-snaking the line will reduce the anchor thrust loads. (a) What is the minimum distance between guides? (b) How much lateral deflection occurs? (c) How much thrust load is generated at the end structures/anchors?

All examples in this Technical Note are for PE 3608 pipes unless otherwise noted.

Solution: (a) During thermal expansion, the minimum distance between guides can be determined using Equation 8.

$$L = \frac{24 \sqrt{96 (9 \times 10^{-5})(60)}}{0.025}$$

$$L = 691.2 \text{ in}$$

(b) The resultant lateral deflection between points is found using Equation 6.

$$y = 691.2 \sqrt{\frac{(9 \times 10^{-5})(60)}{2}}$$

$$y = 35.9 \text{ in}$$

The total deflection can now be determined using Equation 7.

$$Y_T = 2(35.9) + (24)$$

$$Y_T = 95.8 \text{ in}$$

Equation 8 provides the minimum distance between guides based on the strain from lateral deflection. Using the Equation 6 minimum distance (spacing) between pipeline guide points provides the smallest theoretical lateral deflection. Increasing the spacing will increase the lateral deflection (offset) and require a wider pipeline right-of-way, but will decrease the compressive thrust load on end or guide points from thermal expansion.

(c) An estimate of the maximum longitudinal compressive thrust force based on the minimum guide spacing of 691.2 inches, can be determined from Equation 4.

$$F = \frac{(3.14)^2 (50800)(9369)}{(691.2)^2}$$

$$F = 9833 \text{ lb}$$

This is a theoretical value assuming the pipeline has no lateral resistance. The actual force may be higher as frictional force with the ground must be overcome before lateral deflection occurs. Lateral frictional resistance is not considered in Euler's equation.

Thermal contraction of the pipe results in a tensile stress in the pipe wall that can be determined from Equation 2.

$$\sigma = (79800)(9 \times 10^{-5})(40)$$

$$\sigma = 287 \text{ psi}$$

The tensile stress should be kept below the allowable long-term tensile stress for the material which can be found using Equation 9.

$$\sigma_{allow} = (1600)(0.50)(1.2)$$

$$\sigma_{allow} = 960 \text{ psi}$$

The tensile load on the end anchors can be determined from Equation 3.

$$F = (287)(157.57)$$

$$F = 4527 \text{ lb}$$

This example assumes a straight installation. If the line is pre-snaked, additional right-of-way may be required; however the loads on the end anchors would be decreased because of the pre-snaked condition.

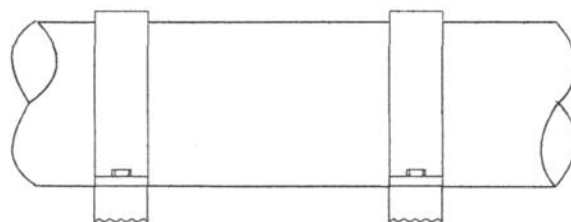
Anchored and Guided Pipe

If the space required for lateral deflection expansion loops is not available, the pipe may be anchored at the end points and guided frequently enough so that snaking (column buckling) does not occur. **This method results in longitudinal thrust and may require significant end anchoring structures.**

For this discussion, anchoring restrains the pipe such that movement is not allowed in any direction, that is, longitudinal, lateral or vertical. Guides between the end anchors should allow the pipe to slide freely through the guide. Fabricated fittings and rigid connections such as flanges and transition fittings must be protected from bending, therefore if anchors are used to protect a fitting from bending stresses, all of the fitting outlets must be anchored.

Anchored and guided piping systems require analysis of both the temperature increase and decrease.

Figure 4 Typical Guides



As pipeline temperature decreases from weather or processing conditions, tensile stress develops along the length of the pipe. The stress can be calculated using Equation 2. Tensile stress causes an end thrust at the anchors that can be calculated using Equation 3. **Anchors or end structures should be designed to withstand this thrust without allowing movement of the pipe in any direction.**

The tensile stress in the pipe should not exceed the allowable tensile stress determined from Equation 9.

$$\sigma_{allow} = HDB f_e f_t \quad (9)$$

where

σ_{allow}	=	allowable tensile stress, lb/in ²
HDB	=	Hydrostatic Design Basis, lb/in ² (Table 1-1, Chp. 6, Handbook of PE Pipe)
f_e	=	environmental design factor (Table 1-2, Chp. 6, Handbook of PE Pipe)
f_t	=	service temperature design factor (Table 1-3, Chp. 6, Handbook of PE Pipe)

A link to the Plastics Pipe Institute [Handbook of Polyethylene Pipe](#) is available on the Technical Library page of the Performance Pipe website.

During temperature increase, the pipeline attempts to increase its length. The anchors prevent length increase, creating longitudinal compressive stress in the pipe and a thrust load against the anchors. Compressive stress can be determined using Equation 2 and should not exceed the allowable stress per Equation 9. (For convenience, the HDB value is used as a conservative value for allowable long-term compressive strength.) Guides must be placed at intervals not exceeding the column buckling length of the pipe per Equation 4. Combining Equations 3 and 4 yields Equation 10 for guide spacing.

$$L_{guide} = \sqrt{\frac{\pi^2 I}{N \alpha \Delta T A}} \quad (10)$$

where terms are as previously defined and

L_{guide}	=	distance between guides, in
I	=	cross section moment of inertia, in ⁴ (Equation 5)
N	=	safety factor
A	=	pipe cross section area, in ²

$$A = \frac{\pi}{4} (OD^2 - d^2) \quad (11)$$

where

OD	=	pipe outside diameter, in
d	=	pipe inside diameter, in (Formula 4-1)

Equation 11 may also be written as:

$$A = \pi OD^2 \left(\frac{1}{DR} - \frac{1}{DR^2} \right) \quad (12)$$

An appropriate safety factor should be used when determining guide spacing. While the guides allow for longitudinal movement of the pipe, they must resist lateral and vertical movement. The following rule of thumb for steel columns may be considered. When designing steel columns, a reaction load of 10% of the force that induces a longitudinal buckle of the column is used to resist lateral movement of the column and therefore resist buckling.

Example 2

Determine the guide spacing and anchor loads for 8" SDR 11 installed at 70° F with a maximum operating temperature of 130° F and a minimum operating temperature of 10° F. The minimum time for a processing condition temperature is 10 hours.

Solution: For thermal expansion as the temperature increases from 70°F to 130°F, the average temperature is 100°F. Equation 2 gives the longitudinal compressive stress. As the minimum process time is 10 hours use the 10-hour modulus at 100° F (Table 1).

$$\sigma = (46900) (9 \times 10^{-5}) (60)$$

$$\sigma = 253 \text{ psi}$$

$$\sigma_{allow} = (1600) (0.50) (0.63)$$

$$\sigma_{allow} = 504 \text{ psi}$$

The force generated on the end structures can be determined using Equation 3.

$$F = (253) (20.35)$$

$$F = 5149 \text{ lb}$$

Use Equation 10 to determine spacing between guides.

$$L_{guide} = \sqrt{\frac{(314)^2 (156.28)}{(2) (9 \times 10^{-5}) (60) (20.35)}}$$

$$L_{guide} = 83.7 \text{ in}$$

For thermal contraction, use Equation 2 to determine the longitudinal tensile stress using a 10-hour modulus at 40° F.

$$\alpha = (79800) (9 \times 10^{-5}) (60)$$

$$\alpha = 431 \text{ psi}$$

$$\sigma_{allow} = (1600) (0.50) (1.2)$$

$$\sigma_{allow} = 960 \text{ psi}$$

The force generated on the end structures can be determined using Equation 3.

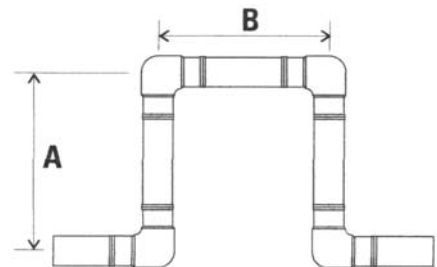
$$F = (431) (20.35)$$

$$F = 8771 \text{ lb}$$

Conventional Expansion Loops

Conventional expansion loops reduce end point anchor structural requirements, but may require more space. Typical expansion loop designs use fittings to create an offset and return to the original piping run. However, long runs of flexible polyethylene pipe would rather deflect laterally than push, so expansion loop designs should utilize guides that permit longitudinal slippage, but not lateral deflection to direct length change to the expansion loop. Conventional fitting-style expansion loops are generally limited to piping systems where molded fittings are available.

Figure 5 Conventional Expansion Loop



Large diameter fabricated fittings must be protected against bending and flexure stresses with cross bracing or other suitable means. The following protocol is for suspended expansion loops only. When designing conventional expansion loops, first determine the maximum length change from temperature change for the pipe run. The maximum run length change run may occur during expansion or contraction and can be determined using Equation 1.

Next, determine the required leg length “A” for the loop. The “A-leg” length is determined from Equation 13 for a cantilever beam with a concentrated load.

$$L_A = \sqrt{\frac{\frac{3}{2} D \Delta L}{\epsilon_{allow}}} \quad (13)$$

where

L_A	=	expansion loop leg “A” length, in
OD	=	pipe outside diameter, in
ΔL	=	length change in pipe run, in
ϵ_{allow}	=	allowable bending strain for pipe with fittings, in/in (Table 2)

The length of the “B-leg” is typically one half the “A-leg” length.

$$L_B = \frac{L_A}{2} \quad (14)$$

Once the dimensions of the loop have been determined, the next step is to determine the frequency at which the runs must be guided so that the activation force required for the loop is not greater than the column buckling resistance strength of the run. Combining Euler’s equation (Equation 4) with Equation 13 yields

$$L_{guide} = \sqrt{\frac{\pi^2 (L_A)^3}{3 \Delta L}} \quad (15)$$

where

L_{guide}	=	pipe run guide spacing, in
OD	=	pipe outside diameter, in
ΔL	=	length change in pipe run, in
ϵ_{allow}	=	allowable bending strain for pipe with fittings, in/in (Table 2)

Guides should allow for longitudinal pipe slippage. For above grade piping, the guide spacing is the smaller of the result from Equation 14 or from Performance Pipe's PP 815-TN *Above Grade Pipe Support*, Equation 1. Where the pipe is to be anchored or terminated, the end or anchor structure must be designed to withstand the force necessary to activate the expansion loop. This force can be theoretically determined by from Equation 16.

$$F_L = \frac{\Delta L 3 E I}{L_A^3} \quad (16)$$

where

F_L = force required to active expansion loop, lb

Two guides may be required on each side of the expansion loop to restrict bending of the pipeline run. The guide closest to the loop should be placed far enough back from the 90° elbow so that the fitting does not contact the guide. The second guide should be placed about ten (10) pipe diameters back from the first guide.

Expansion loops that are on the surface must take the frictional resistance between the pipe and surface into account in determining guide spacing. Also, see Performance Pipe's PP 815-TN *Above Grade Pipe Support*, for more information.

Example 3

Determine the A and B leg lengths, and the activation force for a suspended 4" SDR 17 pipeline installed with conventional expansion loops every 200 feet (2400 in). The minimum operating temperature is 40° F with an installation temperature of 80° F and a maximum temperature of 100° F.

Solution: First determine the maximum length change, using Equation 1. In this case, the maximum length change results from the greater temperature difference during contraction (80°F - 40°F = 40°F) rather than during expansion (100°F - 80°F = 20°F).

$$\Delta L = (2400)(9 \times 10^{-5})(60)$$
$$\Delta L = 12.96 \text{ in}$$

Next, determine leg length "A" of the expansion loop using equation (13).

$$L_A = \sqrt{\frac{\frac{3}{2}(4.5)(12.96)}{0.005}}$$
$$L_A = 132.3 \text{ in}$$

From Equation 14, leg length "B" is half of length "A".

$$L_B = \frac{132.3}{2} = 66.2 \text{ in}$$

Now determine the guide spacing from Equation 15.

$$L_{guide} = \sqrt{\frac{(3.14)^2 (132.3)^3}{(3)(12.96)}}$$

$$L_{guide} = 766 \text{ in}$$

While the guides allow for longitudinal movement, end structures/anchors are designed to withstand the activation force determined from Equation 16. A short-term modulus provides conservative results.

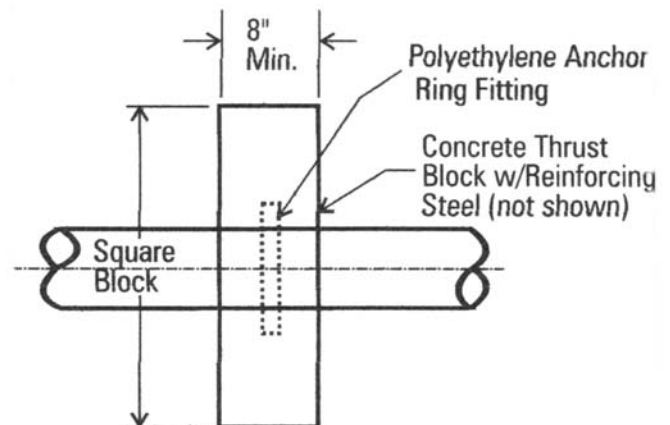
$$F_L = \frac{(12.96)(3)(110000)(8.31)}{(132.3)^3}$$

$$F_L = 15.3 \text{ lb}$$

Expansion Joints

If used, expansion joints must be specifically intended for use with HDPE pipe. These joints activate at very low longitudinal forces and permit large movements. Expansion joints intended for use with other piping materials are not recommended for several reasons. (1) Expansion allowance is frequently insufficient for polyethylene. (2) The force required to activate the joint may exceed the column buckling strength or tensile strength of the polyethylene pipe. (3) Expansion joints for pressure service may include internal components that when exposed to internal pressure, result in a longitudinal thrust which may exceed the column buckling resistance of polyethylene pipe. Contact the expansion joint manufacturer prior to use.

Figure 6 Longitudinal Force Thrust Block



Buried Piping Systems

A buried pipe is generally well restrained by soil friction along its length, and with moderate or low temperature change, soil friction alone is usually sufficient to prevent dimensional change and expansion movement. Therefore, a buried polyethylene pipe will usually experience a change in internal stress rather than dimensional change and movement. A very significant temperature decrease may exceed soil friction restraint, and apply contraction thrust loads to pipeline appurtenances. Thrust blocks for underground pipelines are usually not required unless great temperature change is anticipated.

When transitioning from DriscoPlex® pipe to bell and spigot style pipes such as ductile iron or PVC, the combination of thermal change and thrust load from internal pressure may cause sufficient contraction to pull apart the transition joint or other bell and spigot joints in the pipeline. The connection between the PE pipe and the other style pipe needs to be restrained from longitudinal pullout. Additionally, either the

PE pipe needs to be restrained from longitudinal movement (in-line anchor) or a sufficient number of upstream (or downstream) bell and spigot joints need to be restrained against pull out. The manufacturers of ductile iron and PVC pipe typically provide methods for calculating the number of joints that need to be restrained for a given axial force.

If temperature change is extreme, low thrust capacity (unrestrained) connections to manholes may require longitudinal force thrust block (in-line anchor) protection. See Figure 6.

The longitudinal stress from temperature change may be estimated using Equation 2. Soil load bearing capacity will require appropriate soils testing. Temperature changes below grade usually are not instantaneous, so an appropriate long-term elastic modulus from Table 1 should be selected. Figure 6 illustrates a typical thrust block design.

Heat Transfer

Polyethylene pipe may be heat traced, insulated, or both. Temperature limited (120°F maximum) heat tracing tape should be used, and the tape should be installed over a pressure-sensitive metallic tape installed on the pipe. The metallic tape helps distribute heat over the pipe surface.

Thermal conductivity terms:

- k = thermal conductivity, Btu/(h-ft²-°F-in)
C = thermal conductance, BTU/(hr-ft²-°F)

$$C = \frac{k}{t} \quad (17)$$

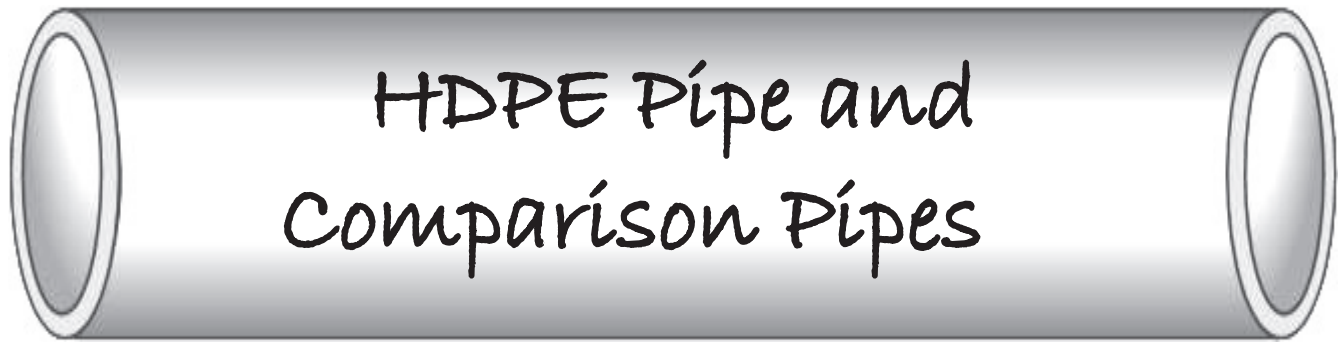
- t = thickness, in
R = thermal resistance, (hr-ft²-°F)/Btu

$$R = \frac{1}{C} \quad (18)$$

$$R = \frac{t}{k} \quad (19)$$

Table 3 Thermal Properties

<i>Property</i>	<i>ASTM Reference</i>	<i>Nominal Value</i>
Thermal Conductivity, k	C 177	3.5
Thermal Resistance, R (1" thickness)	—	0.3



**PVC Explodes
Concrete Erodes
Ductile Corrodes
HDPE Flows**

August 17, 2009

Dear Pipe Distributors, Water/Wastewater Utilities and Engineers:

Communities invest heavily in water and wastewater pipe infrastructure improvements. With these projects planned years in advance, the material selection and installation are vital to the long-term viability of a community's water and wastewater supply. As a provider of high density polyethylene (HDPE) piping products for over 50 years, we have a vested interest in our customers, and the communities that they serve.

The recent introduction of fused polyvinylchloride (fused PVC) piping has resulted in a number of myths regarding the use of fused PVC compared to HDPE in water and wastewater applications. We'd like to take this opportunity to set the record straight.

MYTH: Fused PVC gives you the best of both worlds – the same PVC you have used before with a fused joint just like HDPE.

FUSED PVC FACT: Fusion joined PVC pipes are susceptible to catastrophic long running cracks. During installation and operation, PVC pipes can suffer crack damage due to handling, damage, and other failure points. In conventional bell and spigot PVC pipes, the crack is typically limited to a single joint of the pipe due to the bell and spigot joint. With a fused PVC pipeline, a crack in pipe can run unabated for the entire length of the pipeline – in some cases over 1000 ft. At least 14 water utilities have reports of major fused PVC pipe failures since the introduction of fused PVC in 2004. Several of these failures resulted in the use of HDPE to replace the fused PVC pipeline. See attached information for details.

HDPE FACT: Performance Pipe's HDPE pipes have high ductility, toughness, and impact strength compared to PVC. In fact, AWWA M23 and M55 report values that show HDPE has 15 times greater impact strength than PVC. Long running cracks are not a concern with Performance Pipe's HDPE pipes.

MYTH: Long running cracks are only a concern during installation.

FUSED PVC FACT: Long running cracks do not have to be due to poor or inferior pipe quality or installation. They are an inherent material characteristic for a fused PVC pipeline. In-service damage such as rock impingement, third party impact, wet taps, or fatigue can also act to initiate a crack in service. When such a crack occurs, it can propagate along the entire length of pipe through the PVC fusion joints.

HDPE FACT: Performance Pipe's HDPE pipes are tough enough to resist both cracking and crack propagation. This provides long term security to your trenchless applications.

The decision to replace a community's water and wastewater piping infrastructure is significant. Options must be carefully weighed to ensure the best value for the community. We hope this information helps clarify myths about material selection. For more information, please contact me, or visit www.performancepipe.com.

Regards,

A handwritten signature in black ink, appearing to read 'Wes Long', with a stylized flourish extending to the right.

Wes Long

HDPE and PVC:

Working Pressure Rating and Fatigue Life

Design Fatigue Life (Years) at Velocity of 4 fps at 1 cycle every 15 minutes

● PVC ● PE4710 HDPE

	DR14 PC305	DR18 PC235	DR21 PC200	DR25 PC165	DR9 PC250	DR11 PC200	DR13.5 PC160	DR17 PC125	DR21 PC100
25	>100	71	64	36	>100	>100	>100	>100	>100
50	86	43	26	17	>100	>100	>100	>100	>100
75	59	31	21	14	>100	>100	>100	>100	>100
100	56	29	17		>100	>100	>100	>100	
125	54	27			>100	>100	>100		
150	50	26			>100	>100			
175	46				>100				
200	43				>100				
225	40				>100				
250					>100				

■ Pumping Pressure exceeds Working Pressure Rating, not suited for use.

■ Design Fatigue Life less than 50 years.

- Most municipal applications have recurring surges that must be accounted for by calculating the pipe's Working Pressure Rating (WPR).
- The Working Pressure Rating for HDPE pipe equals its Pressure Class (see AWWA C906 and M55). For PVC, the Working Pressure Rating is always less than the Pressure Class since the anticipated surge magnitude is subtracted from PVC's Pressure Class.
- BUT Working Pressure Rating is not the only factor that needs to be considered. The Fatigue Life must be evaluated.
- Frequent repetitive surges (common to all Distribution and Force Main pipes) can cause fatigue failure in PVC pipes over time. Studies have shown that HDPE pipes are not susceptible to fatigue under typical municipal field conditions.
- Because of its low fatigue resistance, an important part of design for PVC pipe is an evaluation of fatigue life as given in AWWA C900-07.
- Flow velocity is the most significant factor in fatigue life. Most systems operate at velocities of 2 fps to 4 fps. Normally, velocity will vary throughout a piping system. Prudent engineering suggests using the highest velocity that may occur.
- The chart gives the estimated design fatigue life for PVC and HDPE pipe based on a two-to-one safety factor.
- Light blue indicates an acceptable Working Pressure Rating and more than 50 year fatigue life for PVC.
- All of the HDPE pipe sizes significantly exceed 100 years fatigue service life.

When Performance Matters Rely on
Performance Pipe

HDPE and PVC:

Working Pressure Rating and Fatigue Life

Design Fatigue Life (Years) at Velocity of 4 fps at 1 cycle every 15 minutes

● PVC ● PE3608 HDPE

	DR14 PC305	DR18 PC235	DR21 PC200	DR25 PC165	DR9 PC200	DR11 PC160	DR13.5 PC128	DR17 PC100	DR21 PC80
25	>100	71	64	36	>100	>100	>100	>100	>100
50	86	43	26	17	>100	>100	>100	>100	>100
75	59	31	21	14	>100	>100	>100	>100	>100
100	56	29	17		>100	>100	>100	>100	
125	54	27			>100	>100	>100		
150	50	26			>100	>100			
175	46				>100				
200	43				>100				

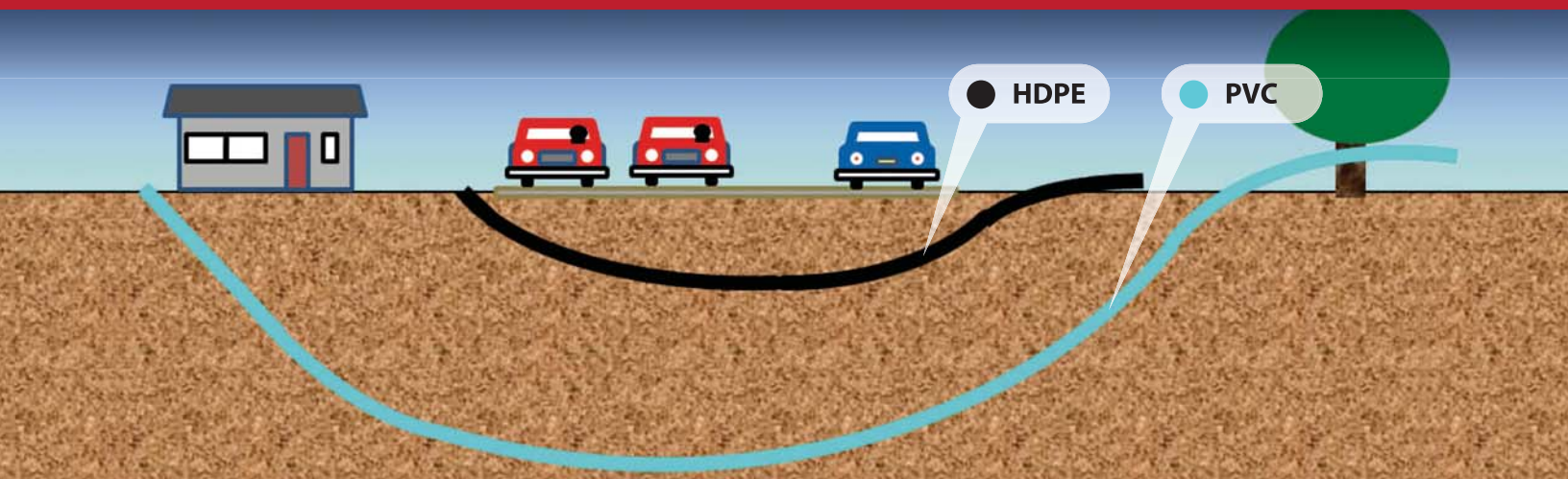
■ Pumping Pressure exceeds Working Pressure Rating, not suited for use. ■ Design Fatigue Life less than 50 years.

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When Performance Matters Rely on
Performance Pipe

HDPE PIPE — Small Bend Radius Big Installation Advantage



Minimum Bend Radius (ft)			Length of pipe required to make a 90° bend (ft)		
	HDPE ¹	Fused PVC ²		HDPE	Fused PVC
4"	10'	100'	4"	16'	157'
6"	14'	144'	6"	23'	226'
8"	19'	189'	8"	30'	297'
10"	23'	231'	10"	36'	363'
12"	28'	275'	12"	43'	432'
14"	32'	319'	14"	50'	501'
16"	36'	363'	16"	57'	570'
18"	41'	406'	18"	64'	638'
20"	45'	450'	20"	71'	707'
24"	54'	538'	24"	84'	845'
30"	67'	667'	30"	105'	1048'
36"	80'	798'	36"	125'	1253'

1: Performance Pipe technical note PP819 | 2: Underground Solutions Fusible C-900®, Bulletin AE-3-001 Rev. 21 02/06/2009

Which pipe will you choose to handle your next trenchless application?

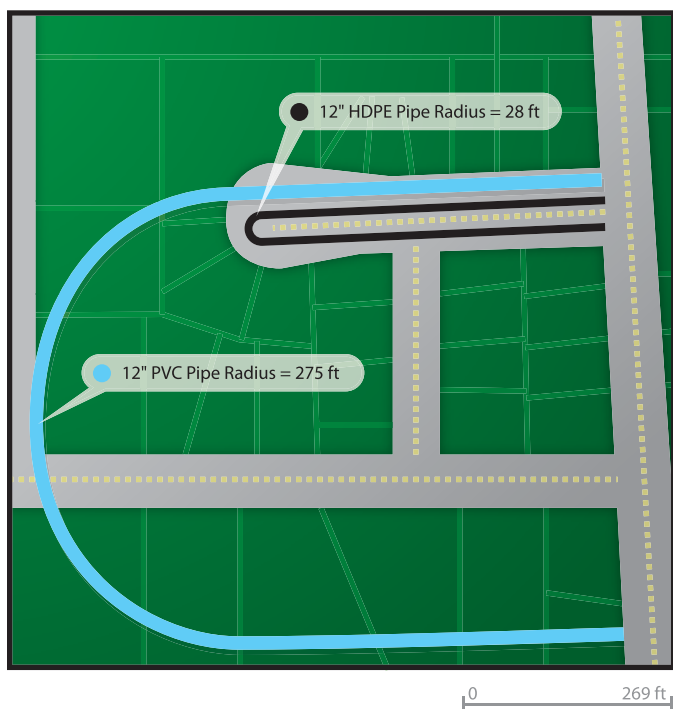
HDPE PIPE — Small Bend Radius Big Installation Advantage

CHOOSE THE BEST PROVEN PIPING MATERIAL FOR YOUR APPLICATION — HDPE PIPE

- No joints, no leaks, no corrosion.
- Minimize pipe laydown space.
- Flexibility reduces need for fittings.
- Reduce breakover curvature.
- Bore to a tighter radius.
- Sizes up to 6" available in coils.
- Tighter bend radius than drill rod.
- Impact resistant and tough.

CONTROL YOUR RISK

- Don't void your pipe warranty.
- Design your HDD radius of curvature within the capabilities of your pipe.
- Avoid contractor claims and constructability problems.
- Don't risk a joint break during bending. Built-in safety factor with HDPE as the drill rod can't bend as tight as the pipe.
- Use HDPE. Don't risk a lateral split or other long running crack that travels through fused joints.



Which material do you think is **most effective** for
Horizontal Directional Drilling?

When Performance Matters Rely on
Performance Pipe



How to Design Against Long Running Cracks in Plastic Pipe for Water Applications

By

Dr. Gene Palermo, Palermo Plastics Pipe Consulting

www.plasticspipe.com

Table 1 – Selected Rapid Crack Propagation (RCP) Field Failures
in PVC Pipe US Installations

US RCP Field Failure	Occurrence	Pipe Size and DR	Length of RCP crack	Joining method
California 2006	During Pressurized Tap	20"	400 ft	Butt Fusion
Florida 2007	During Leak Test	30" DR 25	1100 ft	Butt Fusion
Florida 2008	During Leak Test	20" DR 18	1600 ft	Butt Fusion
Florida 2009	Not identified	8" DR 25	200 ft	Butt Fusion
Florida 2010	Rock impingement	30" DR 25	750 ft	Butt Fusion

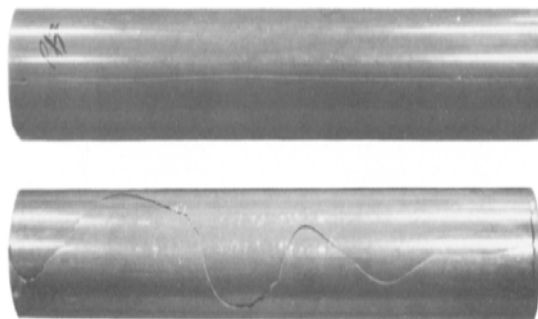
Figure 1 – RCP Field Failure - 30" DR 25 PVC Pipe



Figure 2 - RCP Field Failure - 20" DR 18 PVC Pipe



Figure 6 – PVC Pipe - Straight RCP crack path in water (top) vs. sinusoidal RCP
crack path in air/water. (Laboratory test results)



CONCLUSIONS

To prevent long running cracks due to RCP in PVC pipe, the design engineer should

- 1) use thick wall pipe – at least DR 13 or thicker wall, and
- 2) avoid the butt fusion joining method.

To prevent long running cracks due to RCP in PE pipe, the design engineer should

- 1) use at least DR 29 or thicker wall, and
- 2) use a high performance PE 4710 material.



Palermo Plastics Pipe (P³)
Consulting
Dr. Gene Palermo
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How to Design Against Long Running Cracks in Plastic Pipe for Water Applications

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October 1, 2010

How to Design Against Long Running Cracks in Plastic Pipe for Water Applications

**Dr. Gene Palermo
Palermo Plastics Pipe Consulting**

I. Abstract

It is well known that Rapid Crack Propagation (RCP) occurs in metal pipe. Rapid Crack Propagation is a failure of a pipe (metal or plastic) in which a crack propagates very rapidly for several feet or even hundreds of feet – hence the term RCP. Many years of research have been devoted to studying this phenomenon of RCP in metal pipe.

Using similar research techniques that had been developed for metal pipe, RCP testing has been conducted on various plastic piping materials used for water distribution and other applications. These plastic piping materials include polyethylene (PE), poly vinyl chloride (PVC), polyamide (PA), and cross-linked PE (PEX). Because of its flexibility, ease of joining and long-term durability, along with lower installed cost and lack of corrosion, water companies are installing plastic pipes instead of metallic pipe, especially in larger diameters.

This paper will review the history of Rapid Crack Propagation testing for plastic pipe and the key test methods that have been developed. I will also discuss the variables that affect a plastic pipeline's performance including the pipe material, impact energy, pipe diameter, temperature and the effect of entrapped air on Rapid Crack Propagation. Finally, I will discuss the effect of joining techniques, such as bell-and-spigot joints and butt fusion joints, on the RCP performance of plastic pipe. Rapid Crack Propagation has occurred in isolated cases in some plastic and metal pipes used for water distribution and the results have been very long cracks, with rapid cracks propagating hundreds of feet. Based on the research and testing that has been conducted on plastic pipe; the industry now knows how to design a plastic pipe system to prevent Rapid Crack Propagation. The key focal point of this paper will be to provide guidance for the water design engineer on how to prevent the occurrence of a Rapid Crack event in their plastic pipe system. Although Rapid Crack Propagation also occurs in metal pipe, such as ductile iron, this paper will not address metal pipe.

II. Background

Although the phenomenon of Rapid Crack Propagation has been known and researched for several years (1), the number of RCP incidents in plastic pipe has been very low. With water engineers in Europe and the US desiring to use plastic pipe at higher operating pressures and larger diameters, a key property of a

plastic piping material - resistance to rapid crack propagation (RCP) – also known as brittle fracture- becomes more important.

Most of the original research work conducted on Rapid Cracking was for metal pipes in Europe. There were several incidents of long running cracks that occurred in metal pipe, and as a result test methods were developed to measure the Rapid Crack Resistance of the metal pipes. Brittle fractures in European water pipes occurred primarily in cast iron pipes and also in PVC pipes (it should be noted that the PVC material used in Europe may not be the same as PVC used in the US). PE pipes, on the other hand, have shown excellent resistance to brittle fracture. Greenshields, Leever and Morris reported the following (2).

“The first survey revealed an apparently high number of failures in PVC pipe manufactured before 1973. With hindsight, it is now known that with better standard test procedures this material would not have been installed. In the second survey, a large proportion of brittle failures in cast iron and PVC pipes were observed, more usually in large diameter pipe, in areas air pockets were likely to form.”

As plastic pipe became more prominent for water applications, researchers applied similar methodologies used for metal pipe on plastic pipe materials, and particularly on polyethylene (PE) pipe (3). Most of this research was done in Europe and through the International Standards Organization (ISO) community.

PE is a ductile, semi-crystalline, plastic material, and is not very susceptible to Rapid Crack Propagation. There have only been a few Rapid Crack failures in PE pipe used in water applications in Europe and in the US throughout the 50 year service of the pipes.

PVC is a more brittle, amorphous, plastic material and there have been Rapid Crack Failures in Europe of PVC pipe. This occurs because PVC pipe is susceptible to crack initiation and to brittle crack failure. When mishandled during constructions, PVC pipe can easily crack (4). There have been Rapid Crack failures that have been reported in bell-and-spigot joined PVC pipe in the US. For bell and spigot pipes, these Rapid Cracks only traveled a short distance because the cracks terminate when they reach the bell-and-spigot joint. Recently, however, there have been Rapid Crack incidents in PVC pipes that have been joined by the butt fusion method. With the butt fusion joining method, once initiated, the crack continues to travel through the joint and can travel for hundreds of feet as seen in the table below.

Table 1 – Selected Rapid Crack Propagation Field Failures in PVC Pipe
US Installations

US RCP Field Failure	Occurrence	Pipe Size and DR	Length of RCP crack	Joining method
2006	During Pressurized Tap	20"	400 ft	Butt Fusion
2007	During Leak Test	30" DR 25	1100 ft	Butt Fusion
2008	During Leak Test	20" DR 18	1600 ft	Butt Fusion
2009	Not identified	8" DR 25	200 ft	Butt Fusion
2010	Rock impingement	30" DR 25	750 ft	Butt Fusion

Because PVC is a brittle material, the pipe can shatter during an RCP event as shown in Figure 1, or travel as a single long running crack, such as the 1600 ft long crack shown in Figure 2.

Figure 1 – RCP Field Failure in 30" DR 25 PVC



Figure 2 - RCP Field Failure in 20" DR 18 PVC Pipe



III. What is Rapid Crack Propagation?

Rapid Crack Propagation, as its name implies, is a very fast fracture. It is also referred to as “fast brittle fracture” and a “linear split”. Crack speeds up to 1800 ft/sec (600 m/sec) have been measured. These fast cracks can also travel very long distances, even hundreds of feet. RCP cracks can initiate at internal defects or points of damage during an impact or impulse event, during a leak test, or during the tapping operation. They generally occur in pressurized systems with enough stored energy to drive the crack faster than the energy is released. Based on several years of research, the probability of an RCP failure in plastic pipe is dependent on these factors:

1. pipe size
2. internal pressure or stress
3. temperature
4. resistance to Rapid Crack of the plastic material

RCP is an engineering performance property of the plastic material. Various plastic piping materials will behave differently when an RCP event occurs. For some ductile plastics, the rapid crack travels for a few feet and arrests; whereas, for other plastics that are more brittle, the plastic pipe shatters during an RCP event or runs for several hundred feet. Whatever the type of plastic, RCP is a performance property and the water engineer can design his pipe system to prevent the occurrence of an RCP failure.

It is also important to remember that RCP occurs in various pipe materials. RCP has occurred both in metal pipe and also in plastic pipe. The original research

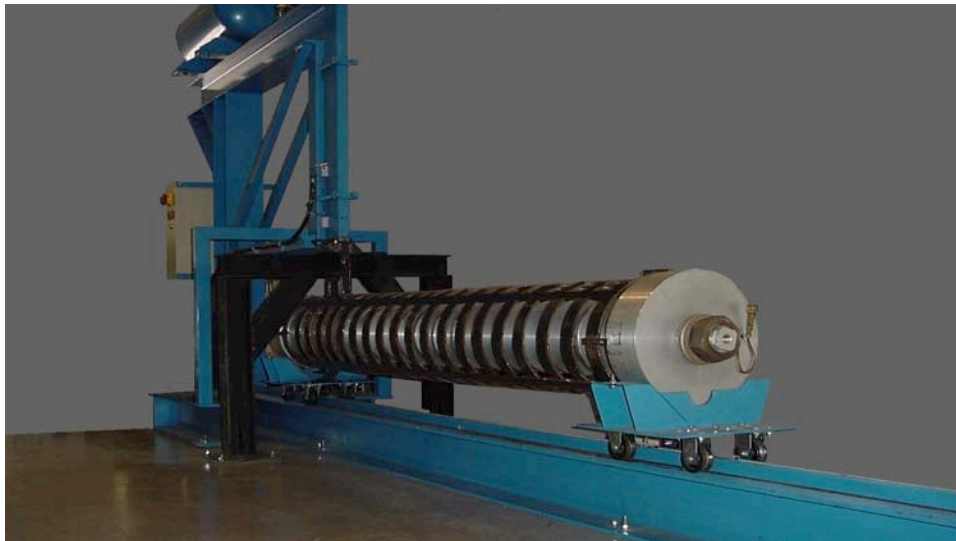
for RCP was all for metal pipe, and test methods were developed to design against RCP occurring in metal pipe. More recently, these same test methods for metal pipe have been modified so that they can be used for plastic pipe. There have been many papers published discussing RCP failures in metal pipe and the RCP test methods for metal pipe. This paper will focus on RCP in plastic pipe materials.

IV. Resistance to Rapid Crack Propagation – Test Methods for Plastic Pipe

The Rapid Crack Propagation test method that is considered to be the most reliable for plastic pipe is the full-scale (FS) test method, as described in ISO 13478. This method requires at least 50 feet of plastic pipe for each test and another 100 feet of supply pipe for the pressure reservoir. This test is very expensive and time consuming.

Due to this high cost for the Full Scale test, Dr. Pat Leever of Imperial College developed the Small-Scale Steady State (S4) test method to correlate with the Full-Scale test (5). This accelerated RCP test uses much smaller pipe samples (a few feet) and a series of baffles, and it is described in ISO 13477. Due to these baffles, pressure data from the S4 test need to be converted to full-scale pressures using a conversion factor. The cost of conducting this S4 testing is still expensive, but less than Full Scale testing. Figure 3 is a photo of a typical S4 test rig.

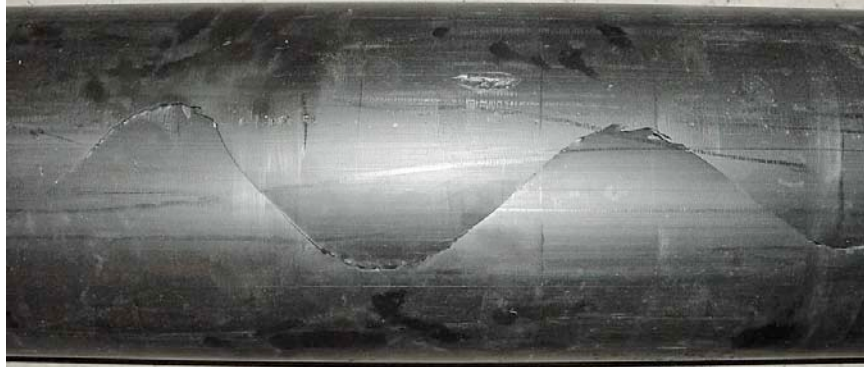
Figure 3. S4 laboratory test rig.



Full scale and S4 RCP testing have been conducted on several plastic piping materials, including HDPE, MDPE, PEX, PVC, PA 11 and PA 12.

Figure 4 is a test failure on 10" SDR 11 PE pipe obtained during S4 testing. Note the sinusoidal nature of the RCP crack path in this laboratory-induced RCP failure in PE pipe, which is indicative of entrapped air inside the pipe.

Figure 4 – S4 Laboratory RCP Crack in 10" SDR 11 PE Pipe



Greenshields and Leevers reported similar results when comparing a PVC pipe RCP field failure with a laboratory-induced PVC pipe S4 RCP failure (4).

"The fracture surface from an S4 test is compared with a fracture surface from a 160 mm diameter SDR 19 PVC pipe which failed during under-pressure tapping. The surfaces are similar in appearance".

Note that the PVC pipe RCP field failure in this case in Europe was due to the tapping operation.

V. Variables that Affect RCP in Plastic Pipe

A. Plastic Pipe Material

Impact strength, which is a measure of toughness, is an important property of the plastic material. It measures how ductile or brittle a pipe material is and the material's ability to absorb impact without fracturing. In general the more brittle a plastic pipe material is, the more susceptible it is to an RCP failure.

In general, PE pipe grade materials have higher ductility, and higher impact strength than PVC pipe materials. This is a key reason why PE is used in the application of gas distribution instead of PVC. PVC pipe is used for some gas distribution applications in Europe, but its maximum operating pressure is limited to 1 bar (15 psig) in the ISO PVC gas pipe standard in part because of PVC's low RCP resistance, as measured by S4 testing. Table 2 below compares the impact strength for PVC and PE materials (8), (9).

Table 2 – PVC and PE Impact Strength

Material	Test Method	Impact Strength (ft-lbs/in)
PVC	ASTM D256 Method A	0.65
PE	ASTM D256 Method A	>4.0

Based on these values, PE has over six times more impact strength than PVC, and thus is more resistant to forming a crack, such as an RCP crack.

B. Pipe Diameter and Dimension Ratio (DR)

For all pipe materials, Rapid Crack Propagation is more likely to occur in larger diameter pipe sizes. Rapid cracking generally does not occur in pipe sizes less than 4" IPS. The larger the pipe diameter, the more likely Rapid Crack Propagation will occur. This does not mean that a water utility should not use large diameter pipes. It simply means that the water design engineer needs to be more aware of the possibility of Rapid Crack Propagation in larger pipe sizes, and design against its occurrence.

The dependence of RCP resistance on pipe diameter was determined in Europe after several years of research. These data formed the basis for the RCP requirement being dependent on pipe diameter in the ISO Water Pipe standards. Greenshields and Leevers report that for PVC pipe the minimum DR for a sustaining RCP crack in pipe with 100% water is DR 13. For PE pipe, the minimum DR for a sustaining crack is DR 29.

"Although it is difficult to estimate the maximum crack speed for a particular material, experimental data from transducer measurements give 600 ms⁻¹ for PVC-U and 300 ms⁻¹ for PE-80 at 3°C just above the critical pressure. Substituting dynamic modulus data into (5) for a full-scale test ($\sqrt{3} = 1$), these wave speed values correspond to a minimum DR 13 for PVC-U and DR 29 for PE-80. Although such high DR's are rarely seen in PE-80, almost all PVC-U pipe is 'thin-walled' (at least higher than DR 13) and as such is capable of sustaining RCP in 100 percent water pressurized pipe."

With this information, the water design engineer should select a minimum DR 13 (or thicker wall) for PVC pipe to prevent a running crack. With a higher DR (thinner wall), it is possible for a crack to initiate and run (propagate) the length of the PVC pipeline. Typical DR's such as DR 25 and DR 18 may result in long running cracks in PVC pipe – as shown in the field failures in Figures 1 and 2. For PE pipe, the water design engineer should select a minimum DR 29 to prevent a running crack. Typical DR's such as DR 21, DR 17 and DR 13.5 may be selected to design against a running crack in PE pipe.

C. Internal Pressure

For all plastic pipe materials, RCP is more likely to occur at higher pressures.

These higher pressures provide the energy to drive the rapidly propagating crack – sometimes for several hundred feet. The higher the internal pressure, the more likely RCP will occur. This does not mean that a water utility should not use plastic pipe at high pressures (determined by the HDB). It simply means that the water design engineer needs to be more aware of the possibility of RCP at higher pressures, and design against its occurrence.

Table 3 summarizes the minimum pressures at which RCP could occur for various plastic piping materials with only 2% air volume, as reported by Greenshields, Leever and Morris (2) in 1997.

Table 3 – Minimum Pressure at Which Rapid Crack Propagation Can Occur
(1990's vintage Water Pipe with 2% contained air)

Material	Diameter	SDR	Minimum Pressure bar (psig)
PVC	114 mm (4.5")	18.5	4.95 (72)
MDPE (PE 80)	125 mm (5")	10.5	12.77 (185)
HDPE (PE 100)	125 mm (5")	10.5	17.72 (257)

From these data, we can see that Rapid Crack Propagation can occur in PVC pipe at a pressure as low as 72 psig, with 2% air volume for the tested pipes. For the HDPE pipe tested in the referenced paper, RCP will not occur until the pressure is over 257 psig.

Testing of the more recent HDPE PE 4710 pipe materials show that for some of these materials, Rapid Crack Propagation will not occur until the pressure is over 600 psig. For these PE 4710 materials, RCP will simply not occur in a water distribution pipeline.

In their paper, Greenshields and Leever reported that, *"PVC could fail by RCP at pressures below the rated pressure; whereas, for PE critical pressures are significantly higher than the rated pressure"* (4). As a result, in some ISO standards the maximum operating pressure for plastic water pipe is the lower of the pressure determined by the rating method or the pressure determined from RCP testing. For PVC, the maximum pressure is limited by RCP; whereas, for PE the maximum pressure is the full pressure determined by the rating method or the applications.

In addition to de-rating PVC pipe due to its resistance to RCP, Marshall and Shepherd reported that PVC water pipe should be de-rated because of surge and fatigue effects on the pipe (6).

D. Ground Temperature

For all plastic pipe materials, Rapid Crack Propagation is more likely to occur at lower temperatures. At these lower temperatures, plastic pipe becomes more brittle. The lower the temperature, the more likely Rapid Crack Propagation will

occur. This does not mean that a water utility should not use plastic pipe in cold environments. It simply means that the water design engineer needs to be more aware of the possibility of Rapid Crack Propagation at colder temperatures, and design against its occurrence.

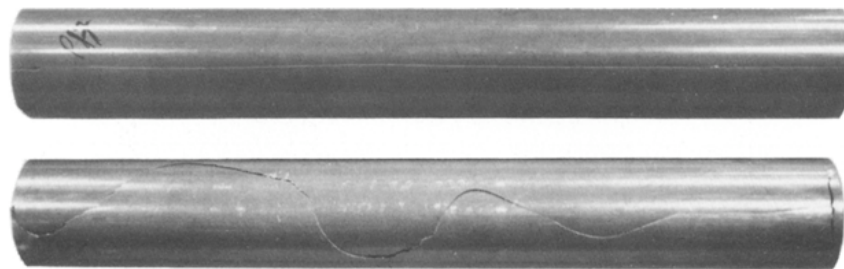
E. Entrapped Air in Water Pipe

Because of HDPE's ductility, Rapid Crack Propagation failures do not occur in PE pipe when completely filled with water. For Rapid Crack Propagation to occur in PE water distribution pipe, some air generally needs to be trapped in the pipeline, and this air helps to drive the crack down the pipeline. When this air is present with the water, the RCP crack path is sinusoidal, as seen in Figure 4. In their 1997 paper, Greenshields, Leevers and Morris concluded about HDPE pipe (2):

"The work concluded that fast brittle fracture could not occur in [HDPE] pipes at their rated pressure when they were completely filled with water. However, the inclusion of modest amounts of air, 5 to 10% by volume, enabled cracks to propagate."

Research, testing, and field experience has shown that when there is only water inside PVC pipe, RCP can occur and the RCP crack path is a straight line. When air is present in the PVC pipe, the RCP crack path changes from a straight line path to a sinusoidal path. This is shown in Figure 5 taken from Greenshields and Leevers (7).

Figure 5 – PVC Pipe - Straight RCP crack path in water (top) vs. sinusoidal RCP crack path in air/water. (Laboratory test results)



Note that the straight RCP crack path in the top of Figure 6 with only water in the PVC pipe is similar to the RCP field failure for PVC pipe in Figure 2. In both cases, the crack path is straight indicating that only water is present in the PVC pipe.

F. Joining Techniques

For the RCP crack to travel (propagate) long distances, it needs to be unimpeded. A bell-and-spigot joint used on PVC pipe will usually arrest (stop) a running crack. A butt fusion joint, whether on PE pipe or PVC pipe, will not arrest the crack.

Greenshields and Leever concluded the following in their paper on RCP (4).

“Although PVC pipe has improved considerably over the last 20 years, its resistance to RCP still appears to be a cause for concern. Cracks were able to propagate in 125 mm (5”) diameter S4 pipe test specimens at 2.3 bar (33 psig) with 10% air volume. Even using the generous S4 to full scale conversion factor of 3.6, this suggests a full scale critical pressure of 8.3 bar (120 psig) for 10% air. The problems are compounded by the apparently poor resistance of PVC to crack initiation. PE appears to be more than adequate to resist RCP. Its 10% air S4 critical pressure was 7.5 bar (108 psig), equivalent to a full-scale critical pressure of 27.0 bar (390 psig [pressure]).”

VI. How to Design Plastic Pipe to Prevent RCP

As we have seen, RCP failures can occur and have occurred in plastic pipe used for water distribution. This does not mean that the water company should not use plastic pipe. RCP also occurs in metal pipe. Whether the water company uses plastic pipe or metal pipe, the water design engineer needs to be aware of RCP and design their pipeline to prevent its occurrence.

In the case of PE pipe, because it is a more ductile material, RCP is very rare. If the design engineer has specified a water pipeline that is operating at very high pressures, or large diameters in a cold environment, he or she needs to be more aware of RCP. The best way to design against an RCP occurrence in PE pipe is to select a PE material that has high resistance to RCP. The new PE 4710 “high performance” materials have very high resistance to RCP. While the improved properties of the PE 4710 materials have not yet been recognized in AWWA C906, they may still be specified by requiring the pipe material be listed as a PE 4710 in the PPI’s TR4. With these high performance PE 4710 materials, RCP will never occur even at high pressures or large diameters and cold environments.

In the case of PVC pipe, because it is a more brittle material, RCP is more likely to occur. Since the water design engineer cannot specify a specific grade of PVC to prevent RCP, the water design engineer needs to plan for the potential for RCP field failures if using PVC pipe.

For bell and spigot joined PVC pipes, the potential damage is limited to a single joint, and the design engineer may have replacement pipes available in case they are needed. Additionally, PVC pipe manufacturers have specific guidance on tapping procedures and other field handling to minimize the risk of damage to the pipeline.

For butt fusion joined PVC pipes, the potential for damage is not limited to a single joint and can affect hundreds of feet of pipe in a less than a minute.

Therefore the water design engineer must ensure that extra caution is taken to reduce additional stress on the line and that bend radii and surge pressure limitations are known. Additionally the same cautions apply regarding potential damage during installation and tapping.

VII. Conclusions

RCP can and has occurred in plastic pipe. Based on metal pipe RCP research, we now have established test methods that can determine the resistance to RCP for plastic pipe materials. The test methods can also specify a maximum pressure for thermoplastic pipes that are prone to RCP failures.

By knowing about RCP and the factors that can cause RCP, the water design engineer can design his pipeline so that RCP will not occur. As noted above, HDPE pipes are very resistant to RCP, and many of the current generation PE 4710 pipe materials will not fail by RCP.

The water design engineer should select a minimum DR 13 for PVC pipe to prevent a running crack. With a higher DR (thinner wall), it is possible for a crack to initiate and run (propagate) the length of the PVC pipeline. Typical DR's such as DR 25 and DR 18 may result in long running cracks in PVC pipe – as shown in the field failures in Figures 1 and 2. For PE pipe, the water design engineer should select a minimum DR 29 to prevent a running crack. Typical DR's such as DR 21, DR 17 and DR 13.5 may be selected to design against a running crack in PE pipe.

For PVC pipes, we now know that the joining technique can affect the length of a running crack in an RCP field failure. PVC pipe that is joined by bell and spigot joints offers limited exposure to RCP cracks due to the presence of the bell. Standard design and construction practices have minimized this concern as evidenced by the many thousands of miles of PVC water pipe in service with traditional bell and spigot joints.

PVC pipes that are joined by the butt fusion technique have experienced some RCP field failures with cracks hundreds of feet – up to 1600 feet long (10,11). While these only represent a percentage of the many installations of fused PVC, due to the potential of a complete pipeline failure, the engineer may want to establish additional safeguards to protect the pipe – particularly during installation and tapping. These would include pressure limitations, changes in design practices, or use of bell and spigot joints.

To prevent long running cracks due to RCP in PVC pipe, the design engineer should 1) use thick wall pipe – at least DR 13 or thicker wall, and 2) avoid the butt fusion joining method.

To prevent long running cracks due to RCP in PE pipe, the design engineer should 1) use at least DR 29 or thicker wall, and 2) use a high performance PE 4710 material.

VIII. References

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9. AWWA M55 PE Pipe – Design and Installation.
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11. Jacksonville, Clay County, Florida, May 2008.

XI. ACKNOWLEDGEMENT

Many thanks to Pat Leever, Phil Marshall and Gordon Williams for their assistance, photographs and memories of PE and PVC RCP field failures and RCP testing conducted in Europe.

Avoid Long-Running Cracks of Fused PVC Pipe

Control your risk. Choose HDPE—the best proven piping material to resist Rapid Crack Propagation (RCP)

- RCP is a rapidly traveling longitudinal crack that can pass through fused joints and explosively destroy a pipeline in seconds.
- RCP can be initiated by impact, improper tapping, faulty fusion, fatigue or other forms of failure.
- Gas industry studies show that HDPE is highly resistant to RCP. Over 97% of all new gas distribution piping installed each year is PE pipe.
- Laboratory testing shows that water-filled HDPE will not undergo RCP. See Performance Pipe Technical Note PP-838 on RCP.
- Use HDPE pipe. Don't risk a long running crack.

Fused PVC is Risky for Communities

- Fused PVC is prone to RCP because the potential for RCP is inherent in PVC pipelines. RCP can occur in fused PVC pipe without a manufacturing defect.
- Tapping fused PVC pipe under pressure must be done with great caution to avoid RCP.
- Impacting fused PVC pipe can result in a long running crack. Cracks longer than 1000 ft have been reported, running through fused joints.



Is it worth the risk?

This photo is one of many RCP failures of Fused PVC pipe. Water-filled HDPE pipe will not undergo this type of failure.

Known Failures in Fused PVC Pipe

RCP Long-Running Cracks in Fused PVC Pipe

- Winter Park, FL (2004)
8" — During pressure test pipe reportedly cracked and ran through the entire line (approx. 250 ft).
- Danville, CA (EBMUD) (August, 2006)
20" — Extended (approx. 400 ft) long running crack through joints during wet tapping.
- Collier County, FL (Naples) (January, 2007)
30" DR25 — 1,100 ft long running crack through joints with catastrophic failure.
- Greencastle, IN (Installed 2007)
10" — Reported long running crack during tapping, traveled through "many, many joints."
- Clay County, FL (Jacksonville) (March, 2008)
20" DR18 Green pipe — Extended (approx. 600 ft) longitudinal crack after pressure testing.
- Clay County, FL (Jacksonville) (May, 2008)
20" DR18 Purple pipe — Extended (approx. 1,600 ft) longitudinal crack during pressure testing.
- Xenia, IA (2008)
20" — 1,100 ft directional bore under river cracked entire length.
- Tampa, FL (2009)
8" — Reported 200 ft Cracked entire length.

Bending, Fusion, & Other Issues in Fused PVC Pipe

- Young's Bay, OR (2007)
8" — Broke during pullback. Reports of additional failures.
- San Francisco, CA (Dec/Jan 2008)
12" — Fusion failure under tarmac at SF Airport.
- Collier County, FL (Naples) (May, 2008)
36" — Failed in service and replaced with 550' of HDPE.
- Guttenberg, IA (2008)
12" — Replaced 2000 ft with HDPE after fusion and bending issues.
- Troy, NY (2009)
24" — Reported fused PVC in directional drill under Hudson River broke during pullback due to bending. Replaced with 1,200 ft HDPE.
- Bremerton, WA (2009)
16" — Reported pipe shattered during pressure testing.
- London, ON (2009)
20" — Reported fusion failure during pullback and cracking pipe.

Reported FPVC Field Failures

First Failure at Naples, Collier County , FL (January, 2007)

1,100ft 30" DR 25 Fused PVC

Longitudinal crack with catastrophic failure

Replaced with HDPE pipe



Reported FPVC Field Failures

Second Failure at Naples, Collier County, Florida (May, 2008)

36" Fused PVC Broke twice during construction

Fusion failure while in service. Replaced approximate 600ft section with HDPE.

Water rerouted in East Naples because of water main break

By ERIC STAATS

3:58 p.m., Tuesday, May 6, 2008

Collier County utilities is rerouting drinking water to thousands of customers in East Naples until crews can repair a break in a new water main along Collier Boulevard.

The county had been using the 36-inch water main for about a month when a joint between two pipes south of The Lord's Way failed last Monday, spilling 3.5 million gallons of treated drinking water into the canal along Collier Boulevard, county spokeswoman Margie Hapke said today....

The same section of pipe broke twice before during construction, but last week's break has been the only failure since the county began using the pipe, she said....

Excerpted from the Naples Daily News

Reported FPVC Field Failures

Danville, CA East Bay MUD (August, 2006)

20" Longitudinal crack occurred in Fused PVC during a wet tap

While making a 4" tap on a pressurized water line, the fused PVC pipe ruptured

The crack ran up hill approximately 400ft

When the pipe was being excavated from the trench, fusion joints broke



Reported FPVC Field Failures

First Failure in Jacksonville, Clay County, FL (March, 2008)

20" DR 18 a longitudinal pressure crack (~600ft) occurred in fused PVC after a pressure test

The contractor cut the pipe to empty the water and lower the ends to the ground.

The fused PVC split longitudinally running beneath the wetlands as far as the contractor could see



Reported FPVC Field Failures

Second Failure in Jacksonville, Clay County, FL (May, 2008)

20" DR 18 Fused PVC
cracked ~1600 ft during
pressure test



Reported FPVC Field Failures

First Failure Young's Bay, OR (2007)

8" DR18 Fused PVC broke when being pulled around a weld



Reported FPVC Field Failures

Second Failure Young's Bay, OR (2008)

8" DR 18 Fused PVC broke at a weld



Reported FPVC Field Failures

Xenia, IA (2008)

20" DR 18 – Longitudinal crack 1,100' long.

Additional failure reported as "Other pipe was being cut and shattered like glass into 3' pieces of shrapnel".



Reported FPVC Field Failures

Guttenberg, IA (October, 2008)

12" Fused PVC DR 18

Joints are breaking while pipe is being pulled on ground

Replaced with HDPE.



Reported FPVC Field Failures

Tampa, FL (March 2009)

200 ft of 8" DR 25 Fused PVC

Cracked and ran the full length of the line.



Reported FPVC Field Failures

Bremerton, WA (June 2009)

16" Fused PVC. Reports of pipe and fusions breaking

Troy, NY (2009)

24" Fused PVC in directional drill under Hudson River reportedly broke during pullback due to bending. Replaced with 1,200 ft HDPE

London, ON (July 2009)

20" Fused PVC. Reported fusion failure and cracking pipe

Greencastle, IN (December 2007)

10" Fused PVC with a longitudinal crack through "many, many joints" during a tap.

San Francisco, CA (December 2007)

12" Fused PVC Fusion failure under the tarmac at San Francisco Airport

Winter Park, FL (2004)

8" Fused PVC. During pressure test pipe reportedly cracked and ran through the entire line (approx. 250 ft).



How to Design Against Long Running Cracks in Plastic Pipe for Water Applications

By

Dr. Gene Palermo, Palermo Plastics Pipe Consulting

www.plasticspipe.com

Table 1 – Selected Rapid Crack Propagation (RCP) Field Failures
in PVC Pipe US Installations

US RCP Field Failure	Occurrence	Pipe Size and DR	Length of RCP crack	Joining method
California 2006	During Pressurized Tap	20"	400 ft	Butt Fusion
Florida 2007	During Leak Test	30" DR 25	1100 ft	Butt Fusion
Florida 2008	During Leak Test	20" DR 18	1600 ft	Butt Fusion
Florida 2009	Not identified	8" DR 25	200 ft	Butt Fusion
Florida 2010	Rock impingement	30" DR 25	750 ft	Butt Fusion

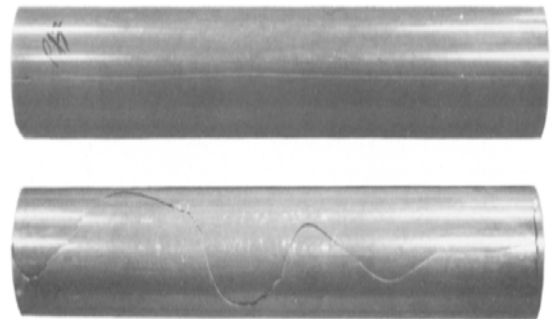
Figure 1 – RCP Field Failure - 30" DR 25 PVC Pipe



Figure 2 - RCP Field Failure - 20" DR 18 PVC Pipe



Figure 6 – PVC Pipe - Straight RCP crack path in water (top) vs. sinusoidal RCP
crack path in air/water. (Laboratory test results)



CONCLUSIONS

To prevent long running cracks due to RCP in PVC pipe, the design engineer should

- 1) use thick wall pipe – at least DR 13 or thicker wall, and
- 2) avoid the butt fusion joining method.

To prevent long running cracks due to RCP in PE pipe, the design engineer should

- 1) use at least DR 29 or thicker wall, and
- 2) use a high performance PE 4710 material.



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| • Manufacturer's Name Or Trademark | | • Pressure Class |



This pipe meets all AWWA C900 print requirements.



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This pipe does **NOT** meet AWWA C900 print requirements. If a pipe is not Pressure Tested it must be marked '**NOT HYDROSTATICALLY PROOF TESTED**'



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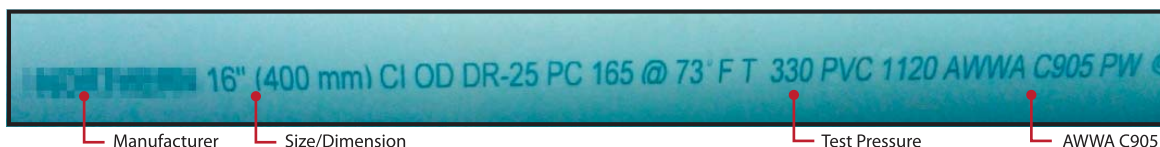
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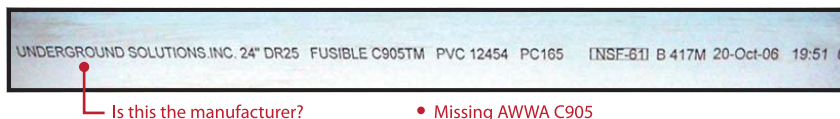
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| • Manufacturer's Name Or Trademark | • Pressure Class |
-



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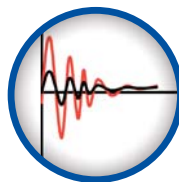
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- Operating temperatures from -50°F to 140°F



VIBRATION

- PE has excellent, proven resistance to fatigue
- PE4710 pipe's fatigue resistance to recurring surges far exceeds that of comparable PVC pipe. (See Performance Pipe's Technical Note 402)

When Performance Matters Rely on
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- *PE2046 – Sizes ½"- 8" IPS MDPE
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