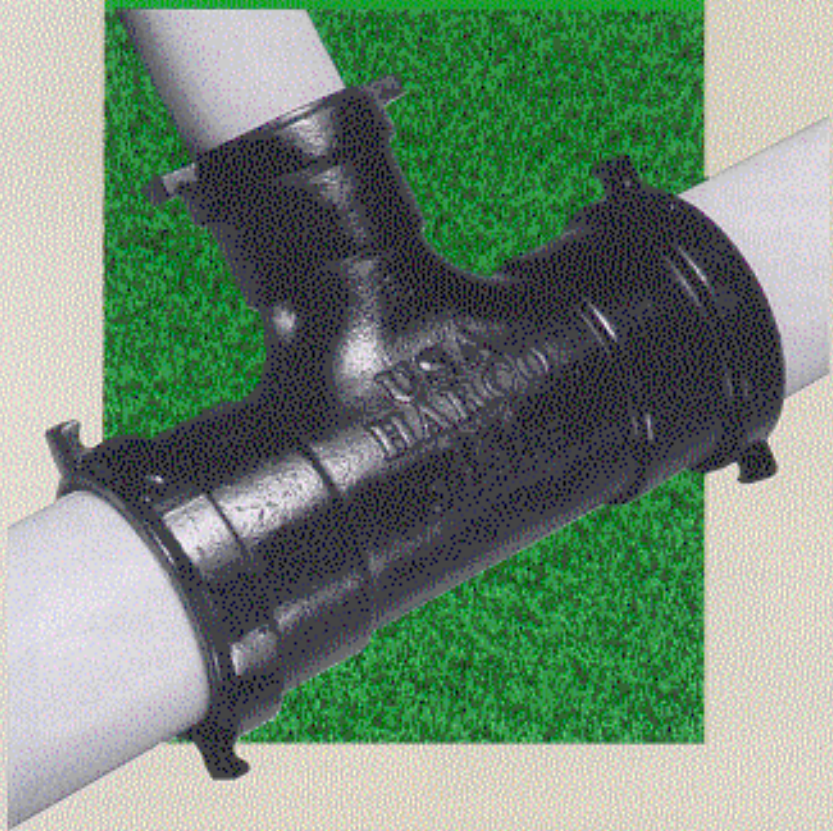


HARCO

Ductile Iron Fittings for IPS-Size PVC Pipe

For Golf Course
Irrigation Systems,
Commercial Turf Irrigation,
Rural Water Systems



Introducing Harco Push-On Joint Ductile Iron Fittings

Fittings Designed for Ductility and Reliability

Harco's DI push-on joint fittings are designed to offer the best possible balance of strength, ductility, impact, and corrosion resistance. Fittings are manufactured of ASTM A-536, Grade 65-45-12 ductile iron with a tensile strength of 65,000 psi. These fittings are designed for use on IPS PVC pipe and steel pipe in underground water mains, irrigation systems, and sewer force mains.

Harco Offers a Full Line of Top Quality Fittings

Ductile iron fittings provide greater strength for underground PVC piping systems than either PVC or epoxy-coated steel fittings. Harco's DI fittings come in 2" through 12" diameters, and are available in tees, bends, reducers, plugs, service tees, flange adapters, wyes, and male thread by bell adapters. Our 28 different SEB (Small End Bell) reducers combine with 77 basic patterns to create over 800 possible configurations. Deep bell push-on joints allow quick and easy installation. They also provide extra room in the bells to allow for pipe movement always present in underground systems.

All The Strength You Need... and Then Some

Ductile iron is produced by adding magnesium alloy to molten iron. The magnesium causes the flake-form graphite to assume a spheroidal shape. This change in the carbon structure results in a far stronger, tougher ductile material than cast iron while retaining superior corrosion properties.

Harco fittings are pressure rated at 350 psi. They are cast of ductile iron with 65,000 psi tensile strength and a wall thickness of 0.31". The following chart illustrates how these fittings stack up against steel and PVC fittings. A Harco 6 x 6 tee withstood a pressure test of 3,000 psi without failure. This high strength capacity is vital in withstanding the critical cyclical surges and high mechanical stresses present

STRENGTH COMPARISON TABLE FOR 6" FITTINGS

MATERIAL	TENSILE STRENGTH	WALL THICKNESS	RELATIVE STRENGTH
PVC	7,000 psi	.36"	1
Epoxy-Coated Steel	49,000 psi	.08"	7
Ductile Iron	65,000 psi	.31"	9

in golf course irrigation systems. This high strength is especially important on systems utilizing the new computer controllers which can create additional surge pressures.

Superior Corrosion Resistance Makes Ductile Cast Iron and Cast Iron Last and Last

Ductile cast iron is the standard underground material in the waterworks industry. In fact, one cast iron system has been in continuous use in a water supply line for over 325 years! Back in 1664, King Louis XIV of France ordered the construction of a cast iron pipe main extending fifteen miles from a pumping station at Marly-on-Seine to Versailles to supply water for the fountains and the town. That cast iron pipe is still functioning after more than 325 years of continuous service.

In ductile and cast iron, this corrosion resistance is created from a layer of insoluble graphite that is formed from initial corrosion that becomes a protective barrier against additional corrosion attack.

Unlike epoxy-coated fittings, rough handling will not reduce the strength or corrosion resistance of the fittings. Rusting caused by scratched or chipped epoxy coatings and interior pipe movement is completely eliminated.



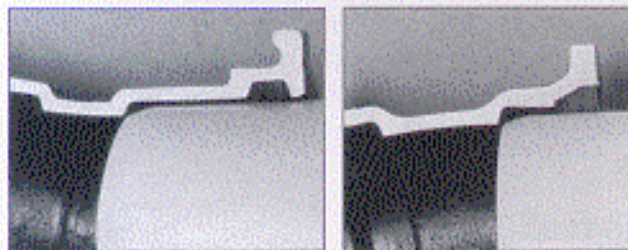
This cast iron water supply line was installed by Louis XIV of France in 1664. It's been in continuous service for over 325 years!

Deep Bells with Gasketed Joints Simplify Installation and Eliminate Problems

Harco's push-on joint design provides for a deep socket bell to accommodate the expansion and contraction of a PVC piping system. The design incorporates a massive gasket in a square groove to prevent roll out and fish mouths. All fittings are designed to work directly on IPS-size pipe — without the problems of using transition gaskets.

The push-on joint allows easy, all-weather installation for bottle-type joints every time. The joint assembles exactly like pipe joints, eliminating all the potential errors that solvent cement voids, incorrect procedures, and inclement weather can cause.

The Harco deep bell was designed in 1969 specifically for PVC pipe, with bell depths equal to pipe joint bell depths. The Harco joint is 2 to 4 times deeper behind the gasket than mechanical joints. The standard MJ joint was designed in 1930 specifically for iron pipe. It wasn't designed to handle the greater expansion and contraction of modern PVC pipe.



Harco Deep Bell vs Mechanical Joint

The Harco joint is 2-4 times deeper than conventional mechanical joints to accommodate expansion and contraction, and prevent roll out and fish mouths.

Gaskets Are Made by Us to Meet Our Own High Standards

Harco manufactures its own gaskets to assure the highest quality and compatible tolerances for gaskets and bells. The gaskets are molded from SBR rubber and are the Chemidur "Z" style of gasket. These gaskets have been used trouble free in hundreds of thousands of pipe and fitting joints since the mid 60's.

Harco's Patented Restraint Lug System Keeps Fittings Together (Patent No. 5,183,298)

Harco developed a special patented system of lugs and restraint rings. Restraint lugs designed to withstand over 10,000 pounds pull per lug are cast on the bells on the horizontal centerline of all fittings. The system provides positive restraint of Small End Bell (SEB) reducers, flange adapters and plugs to other fittings, and prevents separation of the assembled fittings.

The restraint rings are also designed to carry the extreme full load of a restrained plug at 350 psi pressure. Lugs allow fittings to be tied to valves and hydrants with the use of Harco restraint rods. Lugs on the bends provide pinch bar points for quick and easy push-on assembly.



These lugs are designed to withstand over 10,000 pounds pull per lug.

Modular Configurations Make Repairs Easier and Less Costly

Harco's patented system of 28 different SEB (Small End Bell) reducers combines with 77 basic patterns to create over 800 possible configurations for golf course irrigation systems. Restraint lugs on all fittings allow reducers to be positively attached to the basic fittings, so separation is never a concern. All configurations can either be assembled in the factory or in the field by contractors using standard fittings. This means your job won't be delayed waiting for special order fittings to be manufactured and shipped. *(continued on next page)*



Spigot end of reducers insert into the bells of all other Harco fittings. Restraint rings "lock" reducers to main fitting. Patent Pending.

Modular Configurations

(continued from previous page)

If a particular configuration doesn't get used, no problem. It can be disassembled into standard fittings for use elsewhere. This flexibility is a real plus for designers, contractors and suppliers because changes in the field become easier than ever. You also reduce the stock you need on hand as well as long lead times for special orders.

Shown is an assembled 4 x 2 x 4 tee. The 4 x 2 SEB reducer is installed and restraint rings have been latched over the lugs to create an assembled fitting.

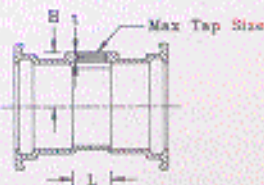


Install Services Easily with Harco Service Tees

Ductile iron service tees are the ideal solution for attaching services or irrigation swing joints onto the main. The gasketed joints of service tees provide added freedom for the

service and protect the main line from service line or sprinkler head shocks. Harco service tees eliminate the variety of problems associated with incorrectly installed saddles and incorrect drilling procedures. Iron threads also provide large safety factors for installation — no more cracked PVC threaded fittings from overtorquing and improper assembly. By using a service tee, the main line pipe wall structural integrity is maintained, eliminating the combined stresses formed when a hole is drilled into the pipe.

All Harco tapped tee outlets come furnished with female NPT threads in sizes you require.

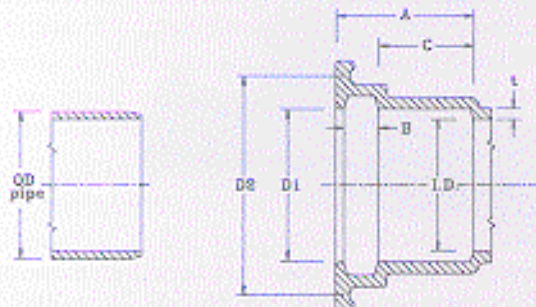


Service Tee.
Gasket Joints on each end provide added degrees of freedom.

Suggested Specification

Fittings shall be manufactured of ductile iron, Grade 65-45-12 in accordance with ASTM A-536. Fittings shall have deep bell push-on joints with gaskets meeting ASTM F-477. Fittings shall be HARCO DEEP BELL as manufactured by The Harrington Corporation of Lynchburg, VA. Transition gaskets are not allowed.

Weights and Dimensions

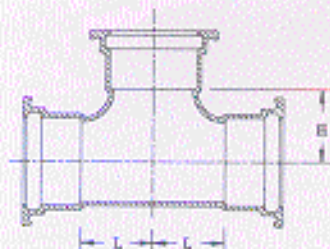


STANDARD JOINT DIMENSIONS

SIZE	A	B	C	D1	D2	ID	OD	T
2"	3.5	0.7	2.5	2.45	3.95	2.15	2.375	0.25
2½"	3.5	0.7	2.5	2.96	4.45	2.60	2.875	0.25
3"	3.8	0.9	2.5	3.59	5.49	3.23	3.500	0.25*
3"	3.0	0.9	2.0	3.59	5.49	3.10	3.500	0.25†
4"	4.1	0.8	2.8	4.59	6.49	4.10	4.500	0.31
6"	4.7	0.9	3.2	6.72	8.79	6.10	6.625	0.31
8"	5.2	1.0	3.6	8.72	10.95	8.10	8.625	0.31
10"	6.1	1.1	4.3	10.86	13.37	10.10	10.750	0.31
12"	6.4	1.4	4.4	12.86	15.50	12.10	12.750	0.31

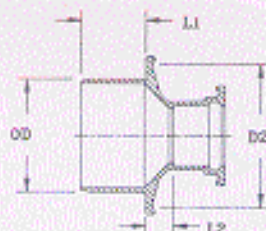
* SEB Reducers. † Tee, Bends, Tapt Tee

Weights and Dimension



TEE

CAT NO.	SIZE	L	H	WT.
80100	2" x 2"	1.3	1.3	9
80200	2½" x 2½"	1.6	1.6	11
80300	3" x 3"	4.2	4.2	18
80400	4" x 4"	4.0	4.0	24
80601	6" x 4"	4.5	5.6	44
80600	6" x 6"	5.6	5.6	53
80801	8" x 6"	5.6	6.6	69
80800	8" x 8"	6.6	6.6	73
81002	10" x 6"	6.0	7.2	93
81001	10" x 8"	7.0	7.9	106
81000	10" x 10"	7.6	7.6	115
81203	12" x 6"	5.6	8.6	94
81202	12" x 8"	6.6	8.6	116
81200	12" x 12"	8.6	8.6	132



SEB (SMALL END BELL) REDUCER

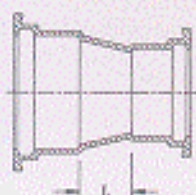
CAT NO.	SIZE	L1	L2	D2	OD*	WT.
80230	2½" x 2"	3.4	0.4	3.95	2.88	6
80330	3" x 2½"	3.0	0.5	4.45	3.50	6
80332	3" x 2"	3.0	0.6	3.95	3.50	5
80430	4" x 3"	3.9	0.5	5.49	4.50	11
80432	4" x 2½"	3.9	0.8	4.45	4.50	9
80434	4" x 2"	3.9	1.1	3.95	4.50	9
80632	6" x 4"	4.4	1.1	6.49	6.63	14
80634	6" x 3"	4.4	1.6	5.49	6.63	12
80832	8" x 6"	5.0	1.1	8.79	8.63	19
80834	8" x 4"	5.0	2.2	6.49	8.63	16
81030	10" x 8"	5.7	1.3	10.95	10.75	28
81032	10" x 6"	5.7	2.2	8.79	10.75	25
81230	12" x 10"	6.0	1.3	13.37	12.75	38
81232	12" x 8"	6.0	2.3	10.95	12.75	34
81234	12" x 6"	6.0	3.2	8.79	12.75	30

* Small End Bell reducers are designed and tested to work in Harco gasketed bells. Spigot ends of the reducers may not work in other gasketed joint systems.



BELL X MALE THREAD ADAPTER

CAT NO.	SIZE	L	WT.
80070	1½" X 1½"	1.5	3
80170	2" X 2"	1.5	4
80272	2½" X 2"	1.5	4
80270	2½" X 2½"	1.5	4
80372	3" X 2½"	1.5	5
80370	3" X 3"	1.5	5



CONCENTRIC REDUCER

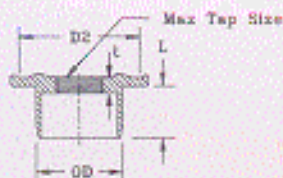
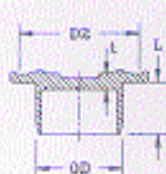
CAT NO.	SIZE	L	WT.
80630	6" x 4"	5.0	24
80830	8" x 6"	7.0	42



CONNECTING LINK

CAT NO.	SIZE	L	H	t	WT.
82000	2½"	1.5	1.5	⅜	.3

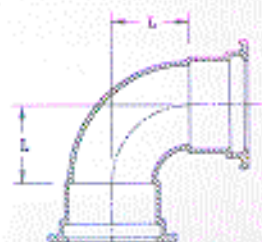
This link fits all sizes, 2½" through 12"



PLUGS & TAPT PLUGS

CAT NO.	SIZE	L	D2	OD	t	MAX TAP	WT.
80155	2"	3.0	3.95	2.375	0.50	1½	3
80255	2½"	3.0	4.45	2.875	0.50	2	4
80355	3"	3.0	5.49	3.500	0.50	2½	4
80455	4"	3.9	6.49	4.500	0.75	3	9
80655	6"	3.3	8.79	6.625	0.75	3	13
80855	8"	3.3	10.95	8.625	0.75	3	18
81055	10"	3.3	13.37	10.750	0.75	3	27
81255	12"	3.3	15.50	12.750	0.75	3	35

Weights and Dimensions



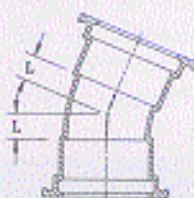
90° BEND

CAT NO.	SIZE	L	WT.
80120	2"	1.3	6
80220	2½"	1.6	8
80320	3"	3.0	13
80420	4"	4.0	17
80620	6"	6.0	38
80820	8"	7.0	60
81020	10"	9.0	88
81220	12"	10.0	100



45° BEND

CAT NO.	SIZE	L	WT.
80122	2"	0.7	6
80222	2½"	0.8	7
80322	3"	1.5	10
80422	4"	2.0	14
80622	6"	3.0	34
80822	8"	3.5	43
81022	10"	4.5	80
81222	12"	5.5	86



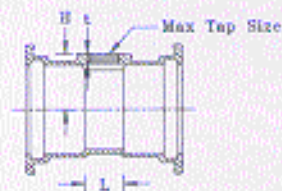
22½° BEND

CAT NO.	SIZE	L	WT.
80224	2½"	1.4	7
80324	3"	1.6	11
80424	4"	1.5	14
80624	6"	2.0	31
80824	8"	2.5	38



11½° BEND

CAT NO.	SIZE	L	WT.
80426	4"	13	14
80626	6"	15	28
80826	8"	18	42



SERVICE TEE

CAT NO.*	SIZE	L	H	t	MAX TAP	WT.
80150*	2"	1.5	2.1	0.75	1½"	7
80250*	2½"	2.0	2.4	0.75	2"	9
80350*	3"	3.5	2.3	0.75	2½"	13
80450*	4"	3.0	3.4	0.81	3"	18
80650*	6"	3.0	4.2	0.81	3"	31
80850*	8"	3.0	5.3	0.81	3"	41
81050*	10"	3.0	6.6	1.00	3"	53
81250*	12"	3.0	7.6	1.00	3"	63

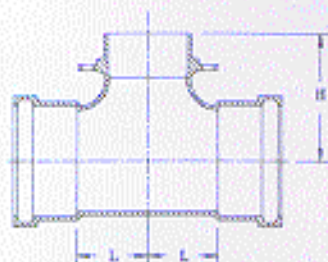
* See price sheet for tap sizes and product numbers



FLANGE X SPIGOT ADAPTER

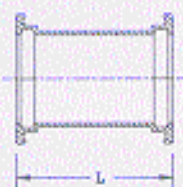
CAT NO.	SIZE	L1	L2	WT.
80360	3"	2.2	2.9	12
80460	4"	3.0	3.9	17
80660	6"	3.3	4.4	28
80860	8"	3.3	4.9	33
81060	10"	3.8	5.7	50
81260	12"	3.8	6.0	61

* See price sheet for tap sizes and product numbers



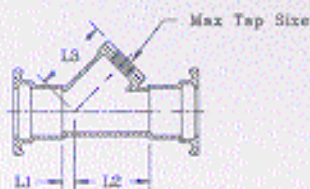
HYDRANT TEE

CAT NO.	SIZE	L	H	WT.
80619	6" x 6"	5.6	8.6	50
80819	8" x 6"	5.6	9.6	60



REPAIR COUPLING

CAT NO.	SIZE	L	WT.
80140	2"	8.0	6
80240	2½"	8.5	7
80340	3"	9.0	14
80440	4"	9.0	15
80640	6"	12.0	26
80840	8"	13.0	36
81040	10"	15.0	48
81240	12"	15.0	60



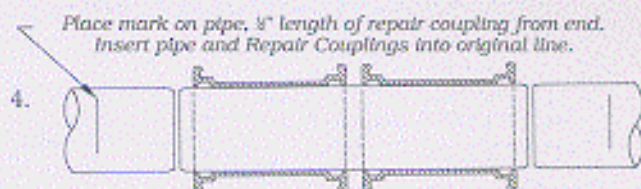
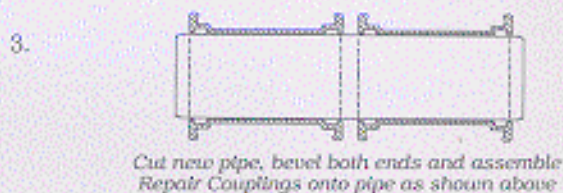
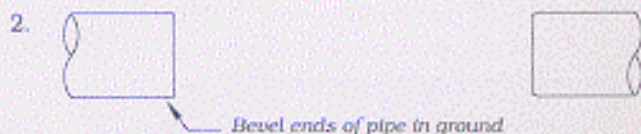
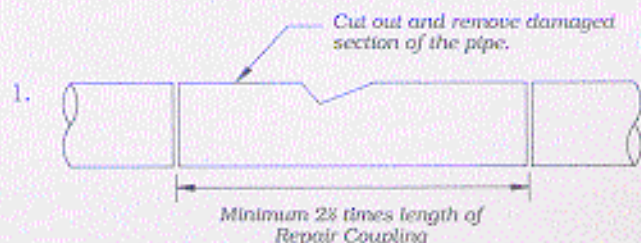
WYE-TAPPED OUTLET

CAT NO.	SIZE	L1	L2	L3	MAX TAP*	WT.
80010	1½"	0.6	3.0	3.7	1½"	7
80110	2"	0.7	3.1	4.1	2"	8
80210	2½"	0.8	4.2	4.6	2½"	12
80310	3"	0.9	5.8	5.7	3"	18

* See price sheet for tap sizes

Designed for use as cleanout in small diameter force sewer mains

Repair Coupling Installation Instructions



Slide Repair Coupling back over the original pipe 1/8 the length of the Repair Coupling. Repair is complete and may be backfilled and put back into immediate service.

Installation Instructions

1. Cut the pipe squarely and bevel the plain end of the pipe. Bevel should be approximately 15 degrees and $\frac{1}{8}$ " long. Remove any burrs and ridges on pipe. Measure the bell depth and mark the pipe for reference. In cold weather, allow $\frac{1}{8}$ " clearance between end of pipe and bell stop, to allow for later pipe expansion. (See illustration.)
2. Clean all debris from the bell areas of the fitting. Check the position of the gasket so it's completely seated in the groove with no raised areas.
3. Lubricate the gasket and the plain end of the pipe with the lubricant supplied by the pipe manufacturer.
4. Align the pipe with the fitting and push together by hand or with pry bars on the end of the fitting or with two pry bars using the lugs on the fitting. Insert until the reference line mark is even with the edge of the fitting bell.



Length from reference mark to end of pipe equal to "A" from Standard Bell Dimensions, less $\frac{1}{8}$ " to allow for expansion.



Thrust Blocking is needed at all changes in size or direction.

TABLE 1 THRUST/100 TABLE (POUNDS PER 100 PSI)

SIZE	TEES, PLUGS	90° BENDS	45° BENDS	22½° BENDS
2	363	513	259	141
2½	531	751	379	207
3	788	1,114	562	307
4	1,302	1,841	928	508
6	2,822	3,990	2,012	1,101
8	4,783	6,763	3,410	1,865
10	7,430	10,506	5,297	2,898
12	10,452	14,778	7,452	4,076

For Reducers, subtract small opening plug thrust from large opening plug thrust to calculate thrust/100.

TABLE 2 SOIL BEARING CAPACITY

SOIL TYPE	SAFE BEARING LOAD LBS PER SQ FT*
Soft Clay	1,000
Sand	2,000
Sand and Gravel	3,000
Sand and Gravel cemented w/Clay	4,000
Hard Pan	10,000

*Harco assumes no responsibility for the above bearing load data. The engineer is responsible for determining safe bearing loads and when doubt exists, soil bearing tests should be specified. The bearing loads given are for horizontal thrusts when depth of cover exceeds 2 ft.

Thrust Blocking

1. Provide thrust blocks at all changes in size or direction. Bends, reducers, plugs, and the opposite side of tee branches all require thrust blocks.
2. The size of the thrust block is determined by the working pressure, the size and type of fitting, and the soil conditions at the job site. To calculate the area of contact with the soil, follow these steps:
 - Calculate the total thrust by selecting thrust/100 by size and type of fitting from Table 1 and multiplying thrust/100 by system pressure divided by 100.
 - Divide the total thrust by the bearing capacity of the soil in excavation (from Table 2) to determine the area (in square feet) of thrust block required to be in contact with the undisturbed soil.

The Harrington Corporation

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