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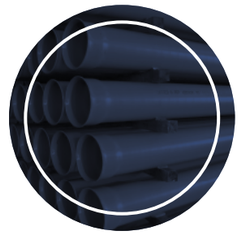
Polyethylene Powder Lining
Steel Pipe for Water Works



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CONTENTS

HISTORY

1994.12 Established Hyundai Fitting Industry

1995.04 Patent application for connector

1998.11 Started production of polyethylene coated pipe fittings

1999.10 Hwaseong plant completed and factory moved

2000.07 Changed the name of Coating Korea

2000.08 Acquired ISO 9001 mark approval

2000.11 Acquired KS D 3607 mark permission

2007.05 Certified as INNO-BIZ technology innovation

2007.08 Completed Gimje Plant

2008.06 Acquired KS D 3619 mark permission

2010.11 Acquired KS D 3589 mark permission

2012.03 Acquired NEP (New Product) Certification

2012.08 Designated as procurement excellent product

2016. 03 Acquired KS D 3565 labeling permission

2016. 04 Obtained ISO 14001 mark approval

2017. 06 Established an affiliated research institute

2017. 12 Acquired performance certification/green technology (product) certification

2018. 05 Designated as a root technology company

2018. 10 Designated as procurement excellent product

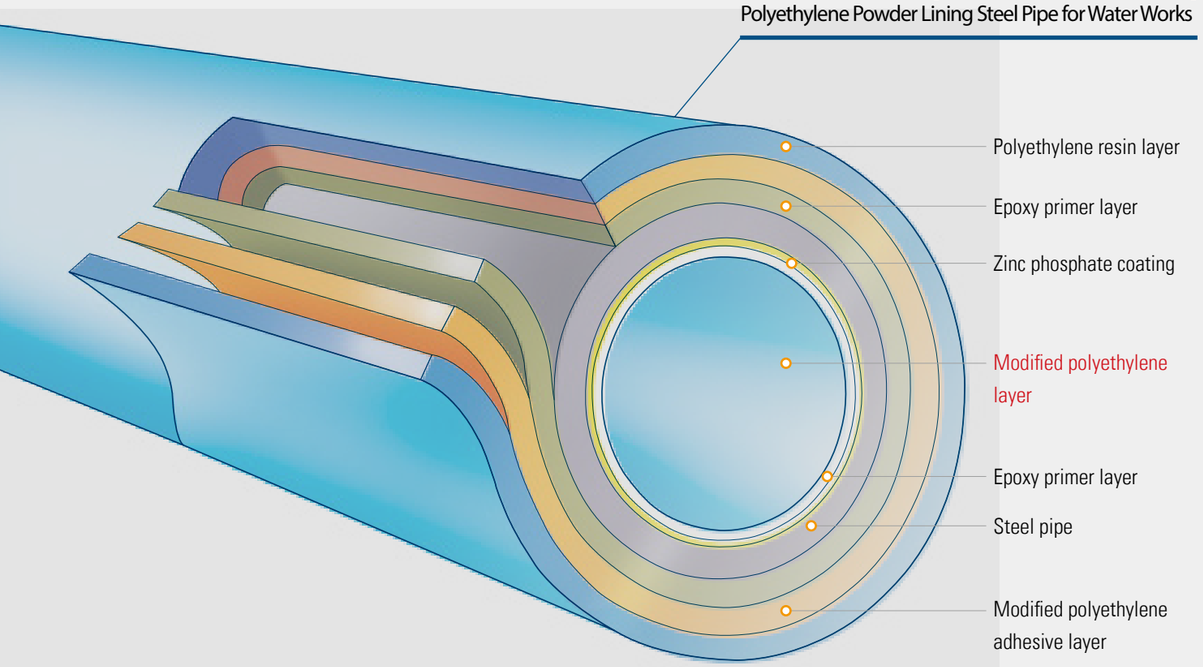
2019. 06 Designated as a leading company in Jeollabuk-do

2019. 11 Designated as a management-innovative SME (Main-Biz)

2020. 06 Acquisition of dbNP Coating Limited and inauguration of CEO Kyuho Choi

PFP(KS D 3619)

Polyethylene Powder Lining Steel Pipe for Water Works



Product Overview

A polyethylene powder lined steel pipe for water works (KS D 3619, PFP) is a product which has better product properties than any other pipe materials as it is made of steel, one of the highest quality materials in mechanical and physical properties, and its internal and external surface is specially coated and lined with hygiene and stable synthetic resins (polyethylene) to maximize its corrosion resistance.

Product features

- Strong and hygienic piping materials
- Stable properties and quality
- Strong adhesion
- Easy plumbing work
- Permanent lifespan

Applications

Water pipe / sewage pipe / industrial water / agricultural water / underground water and all sorts of underground pipes

Manufacturing Specification

O-DIE 15A - 100A

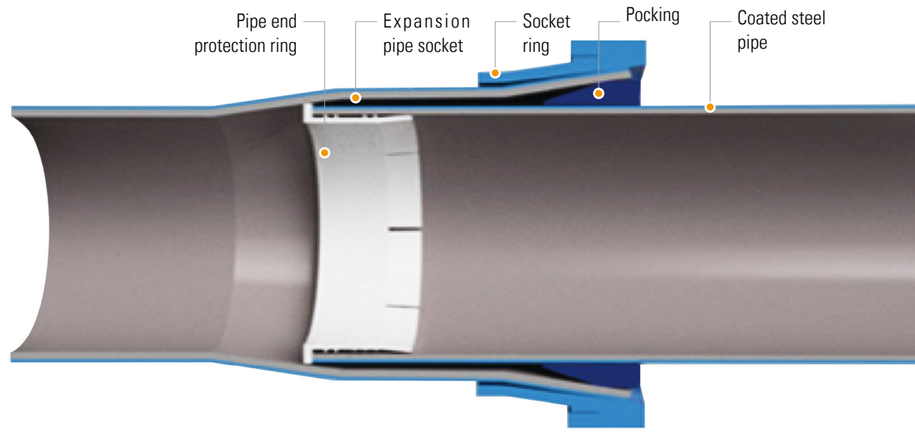
T-DIE 150A - 1,000A

Joining Methods

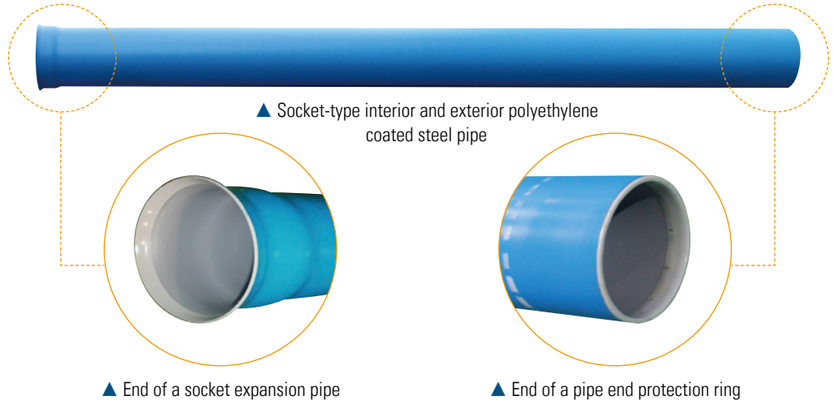
[PFP joint connection] Connection method for separable sockets of an expansion pipe [80A-1,000A]

- Fully coated with polyethylene from end to end on the interior and exterior of the steel pipe
- Secure air-tightness and earthquake resistance by applying expansion socket connection method to the coated steel pipe
- Completely seal the section of the pipe, which is the vulnerable part of coating, by applying pipe end protection rings
- Absorb and relieve the thermal expansion stress of a pipe with pipe end protection rings

PFP Section



PFP Part



▲ Socket-type interior and exterior polyethylene coated steel pipe

▲ End of a socket expansion pipe

▲ End of a pipe end protection ring

▲ Connection hole of a separation-type socket ring

▲ Socket ring inner race

▲ Socket ring outer race

PFP

Polyethylene Powder Lining
Steel Pipe for Water Works

KS D 3619

Polyethylene **P**owder Lining Steel **P**ipes for Water Works
→ 粉体(ふんたい: **F**undai)

Development Background

	Cast-iron Pipe	PE, PVC
Advantage	Excellent strength, Excellent connection	Excellent sanitation, Excellent usability
Disadvantage	Weak impact resistance, Declined sanitation, Declined durability	Lack of strength, Declined earthquake resistance, Vulnerable to soft ground, Declined durability, Weak connection

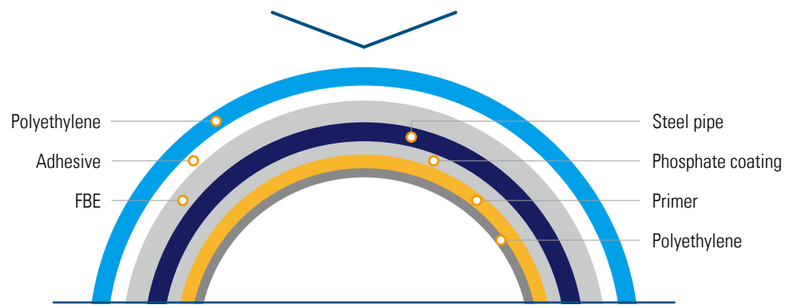
The need of new water pipes that can provide pure and clean water

Excellent sanitation, Excellent durability, Excellent earthquake resistance, Excellent connection, Excellent workability

Special advantages of PFP pipe

❶ The best water pipe with both mechanical properties of a steel pipe as well as the hygiene of a PE pipe

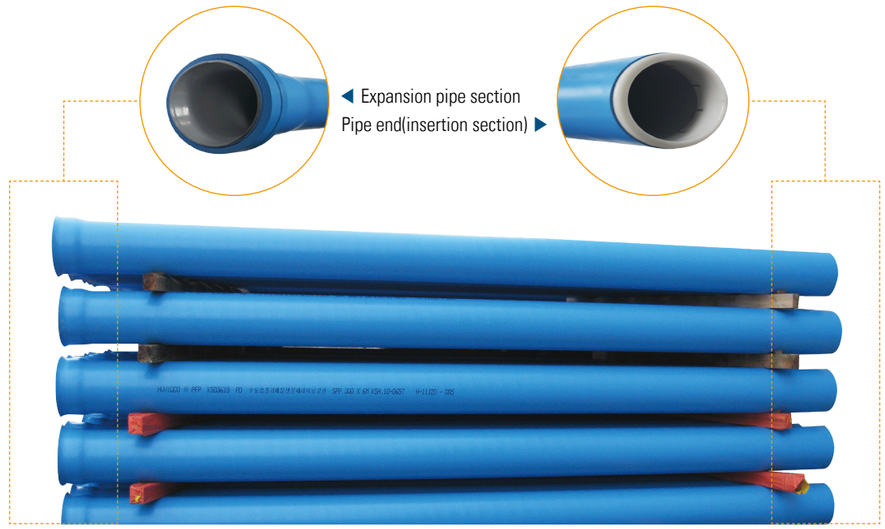
- The only one inner PE lining coated steel pipe in Korea
- Water pipe with verified durability and hygiene for more than 30 years since 1986



▲ PFP pipe(steel pipe + PE for interior and exterior)

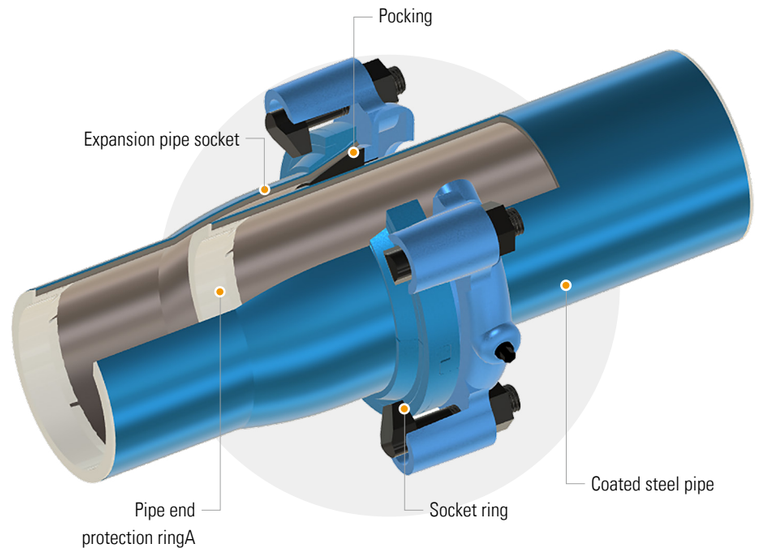
❷ Coated steel pipe with all sides including the section sealed

- Forms mechanical connection without removing the outer coating
- The section of the coated steel pipe is completely sealed with a protection ring



❸ Socket connection method implemented in coated steel pipe (First in the world)

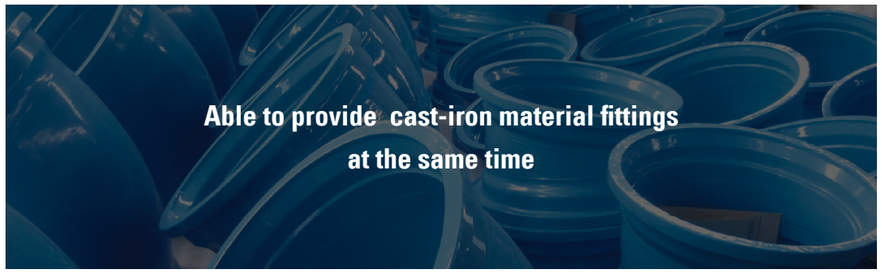
- The connection method that was most widely used for over 200 years
- The same plumbing method as the cast-iron pipe; excellent workability due to high compatibility
- Excellent leak resistance compared to other connection methods (Improved water tightness)



❹ Coated steel pipe which does not deform the entire pipeline by absorbing the thermal expansion of a pipe

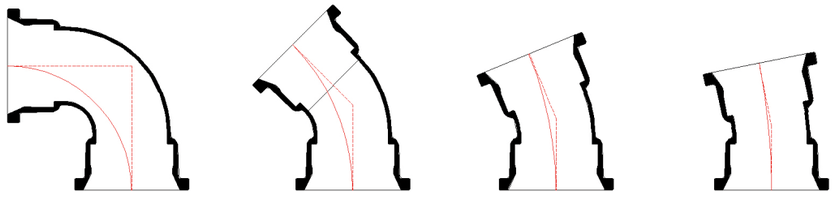
- Solved the chronic problem of welded type steel pipe connection (expansion joint pipe is unnecessary)
- Pipe end protection ring prevents corrosion of the section and absorbs and relieves thermal expansion stress

PEP fitting



- Provide the same corrosion resistance as the PFP pipe by powder-coating the inner and exterior of cast-iron fittings with polyethylene
- Compatible with cast-iron fittings; Able to provide all types of fittings

◀ Cast-iron fitting(90˚elbow)

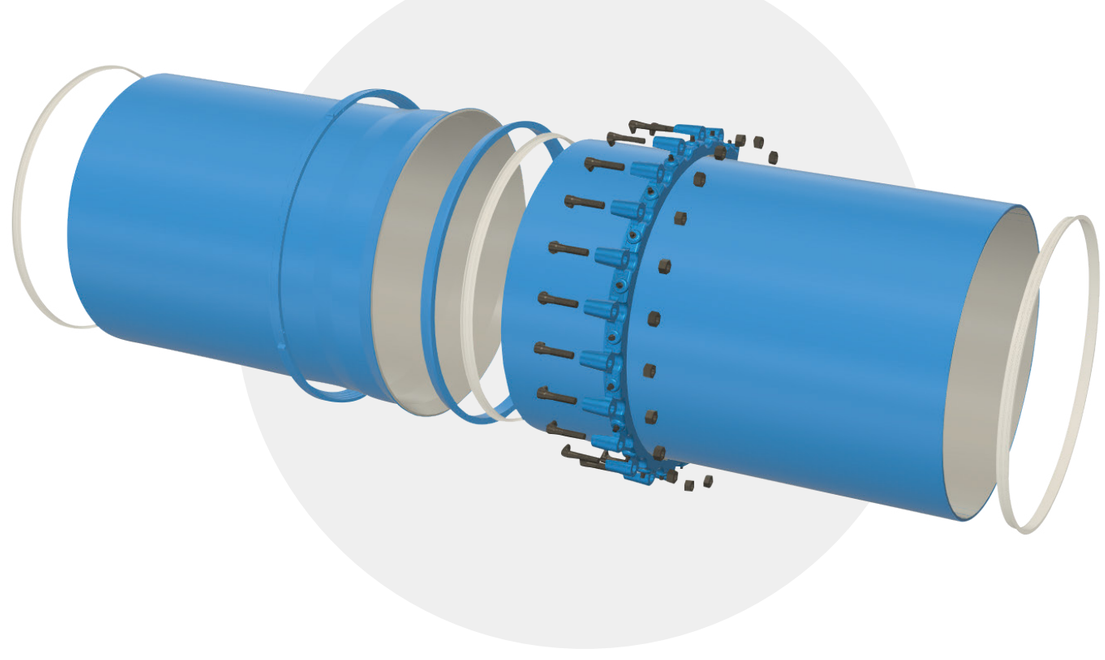


PFP
Polyethylene Powder Lining Steel Pipe for Water Works

Large-diameter [700A - 1,000A]

Large-diameter socket connection method

- **The best water pipe with both mechanical properties of steel pipes and hygiene of PE pipes**
- **Secured complete watertightness is secured by a socket-type connection and using a special pressure ring to prevent separation**
- **End-to-End, Perfect preservation of PE coating up to the end connection**



Product Specification [15A - 100A]

Nominal Diameter		Circular Pipe (Steel Pipe)			Inner Cover Thickness (mm)	Outer Cover Thickness (mm)
A(mm)	B(inch)	Exterior	Thickness	Weight (kg/Set)		
15	1/2	21.7	2.65	7.5	NLT 0.30	NLT 1.2
20	3/4	27.2	2.65	9.6		
25	1	34.0	3.25	14.76		
32	1 1/4	42.7	3.25	18.96	NLT 0.35	
40	1 1/2	48.6	3.25	21.78		
50	2	60.5	3.65	30.72		
65	2 1/2	76.3	3.65	38.04	NLT 0.40	
80	3	89.1	4.05	50.94		
100	4	114.3	4.50	73.2		NLT 1.6

Product Specification [80A - 1,000A]

Expansion pipe (socket method)

Nominal Diameter		Circular Pipe (Steel Pipe)			Inner Cover Thickness (mm)	Outer Cover Thickness (mm)	Straight Pipe			Expansion Pipe D		
							D	L	L1	D1		e
A (mm)	B (inch)	Exterior	Thickness	Weight (kg/Set)			Basic Dimension	Basic Dimension	Basic Dimension	Basic Dimension	Dimension Tolerance	Basic Dimension
80	3.2	89.1	4.05	50.94	NLT 0.4	NLT 1.2	92.9	5905	6000	132.1	±2	95
100	4	114.3	4.5	73.2		NLT 1.6	119.1	5905		163.3		95
150	6	165.2	4.85	115.2	NLT 0.5	NLT 1.8	170.2	5875		215.5		125
200	8	216.3	5.85	182.4			221.3	5875		264.5		125
250	10	267.4	6.4	247.2			272.4	5855		321.5		145
300	12	318.5	7	322.8		NLT 2.0	323.5	5850		377.5		150
350	14	355.6	6	310.2			360.6	5830		432		170
400	16	406.4	6	355.2			411.4	5825		489		175
500	20	508	6	445.8			513	5825		594		175
600	24	609.6	6	535.8		NLT 2.2	614.6	5835		686		165
700(6t)	28.0	711.2	6.0	636.5	NLT 0.5	NLT 2.2	719.2	5945.0	6100.0	792.8	±2.0	155.0
700(7t)			7.0	741.0						794.8		
800(7t)	32.0	812.8	7.0	848.5			820.8	5935.0		898.2		165.0
800(8t)			8.0	968.5						900.2		
900(7t)	36.0	914.4	7.0	955.5			922.4	5925.0		1001.8		175.0
900(8t)			8.0	1090.8						1003.8		
1,000(8t)	40.0	1016.0	8.0	1213.0			1024.0	5915.0		1107.3		185.0
1,000(9t)			9.0	1363.3						1109.3		

※ Outer cover thickness of not less than 150A nominal diameter can be manufactured according to the agreement between orderer and manufacturer.

Third party unit price contract product of the Public Procurement Service [Excellent Product]

• **Product Classification No:** 40142189 (polyethylene clad steel pipe), 40142384 (clad steel pipe fittings)

No	Product Identification No. of Korea Online E-Procurement System	Product Name and Specification	Unit
1	23297730	polyethylene coated steel pipe, Coating Korea, PFP-DH 80A, Φ80×t4.05mm, Internal/External: PE	Set
2	23297729	polyethylene coated steel pipe, Coating Korea, PFP-DH 100A, Φ100×t4.5mm, Internal/External: PE	
3	23297728	polyethylene coated steel pipe, Coating Korea, PFP-DH 150A, Φ150×t4.85mm, Internal/External: PE	
4	23297727	polyethylene coated steel pipe, Coating Korea, PFP-DH 200A, Φ200×t5.85mm, Internal/External: PE	
5	23297726	polyethylene coated steel pipe, Coating Korea, PFP-DH 250A, Φ250×t6.4mm, Internal/External: PE	
6	23297725	polyethylene coated steel pipe, Coating Korea, PFP-DH 300A, Φ300×t7.0mm, Internal/External: PE	
7	23297724	polyethylene coated steel pipe, Coating Korea, PFP-DH 350A, Φ350×t6.0mm, Internal/External: PE	
8	23297722	polyethylene coated steel pipe, Coating Korea, PFP-DH 400A, Φ400×t6.0mm, Internal/External: PE	
9	23297723	polyethylene coated steel pipe, Coating Korea, PFP-DH 500A, Φ500×t6.0mm, Internal/External: PE	
10	23297721	polyethylene coated steel pipe, Coating Korea, PFP-DH 600A, Φ600×t6.0mm, Internal/External: PE	
11	23872496	polyethylene coated steel pipe, Coating Korea, PFP-DH 700A, Φ600×t6.0mm, Internal/External: PE	
12	23872495	polyethylene coated steel pipe, Coating Korea, PFP-DH 700A, Φ600×t6.0mm, Internal/External: PE	
13	23872494	polyethylene coated steel pipe, Coating Korea, PFP-DH 800A, Φ600×t6.0mm, Internal/External: PE	
14	23872493	polyethylene coated steel pipe, Coating Korea, PFP-DH 800A, Φ600×t6.0mm, Internal/External: PE	
15	23872492	polyethylene coated steel pipe, Coating Korea, PFP-DH 900A, Φ600×t6.0mm, Internal/External: PE	
16	23872491	polyethylene coated steel pipe, Coating Korea, PFP-DH 900A, Φ600×t6.0mm, Internal/External: PE	
17	23872490	polyethylene coated steel pipe, Coating Korea, PFP-DH 1,000A, Φ600×t6.0mm, Internal/External: PE	
18	23872489	polyethylene coated steel pipe, Coating Korea, PFP-DH 1,000A, Φ600×t6.0mm, Internal/External: PE	

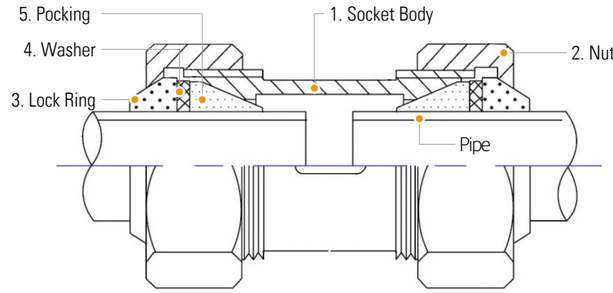
1	23295159	Coated steel pipe connection, Coating Korea, PFP-JOINT-DH 80A, Φ80mm	EA
2	23295160	Coated steel pipe connection, Coating Korea, PFP-JOINT-DH 100A, Φ100mm	
3	23295161	Coated steel pipe connection, Coating Korea, PFP-JOINT-DH 150A, Φ150mm	
4	23295162	Coated steel pipe connection, Coating Korea, PFP-JOINT-DH 200A, Φ200mm	
5	23295163	Coated steel pipe connection, Coating Korea, PFP-JOINT-DH 250A, Φ250mm	
6	23295164	Coated steel pipe connection, Coating Korea, PFP-JOINT-DH 250A, Φ250mm	
7	23295165	Coated steel pipe connection, Coating Korea, PFP-JOINT-DH 350A, Φ350mm	
8	23295166	Coated steel pipe connection, Coating Korea, PFP-JOINT-DH 400A, Φ400mm	
9	23295167	Coated steel pipe connection, Coating Korea, PFP-JOINT-DH 500A, Φ500mm	
10	23295168	Coated steel pipe connection, Coating Korea, PFP-JOINT-DH 600A, Φ600mm	
11	23878291	Coated steel pipe connection, Coating Korea, PFP-JOINT-DH 700A, Φ700mm	
12	23878292	Coated steel pipe connection, Coating Korea, PFP-JOINT-DH 800A, Φ800mm	
13	23878295	Coated steel pipe connection, Coating Korea, PFP-JOINT-DH 900A, Φ900mm	
14	23878296	Coated steel pipe connection, Coating Korea, PFP-JOINT-DH 1,000A, Φ1,000mm	

PM fitting

15A - 50A

Structure of Fitting

No	Part Name	Configuration Quantity	Material	Remark
1	Socket Body	1	GCMB 30-06	Epoxy powder coating after ED coating the interior and exterior
2	Nut	2	GCMB 30-06	Epoxy powder coating after ED coating the interior and exterior
3	Back-up (Lock Ring)	2	Acetal	Pipe separation preventing function
4	Washer	2	Acetal	Pocking pressurization function
5	Pocking	2	EPDM, SBR	Leakage preventing function



Product Features

- Small diameter PM fittings can be directly inserted into the pipe due to an airtight structure by special rubber gasket. In other words, there is no need for screw cutting, welding, etc. of the pipe; its working speed is fast because it is easy to measure and determine the dimension and angles of the pipe due to the special structure.
- The structure of the fitting has plasticity; it is designed so that it can withstand the vibration and small elongation of the pipe.
- It does not rust or corrode in joints due to its excellent corrosion resistance.
- PM fitting is developed to be dedicated to PFP; a backup ring is provided to prevent breakaway of pipes. As this backup ring is designed so that the thread of a backup ring may be ideally penetrated, it doesn't damage the strength of a PE cover, withstand the external force and internal pressure and prevent breakaway of pipes.
- It is used for gas, water, air, hot water pipes, etc. for a long period; its quality is guaranteed because it meets the specifications of KS B 1531(malleable cast iron fittings).

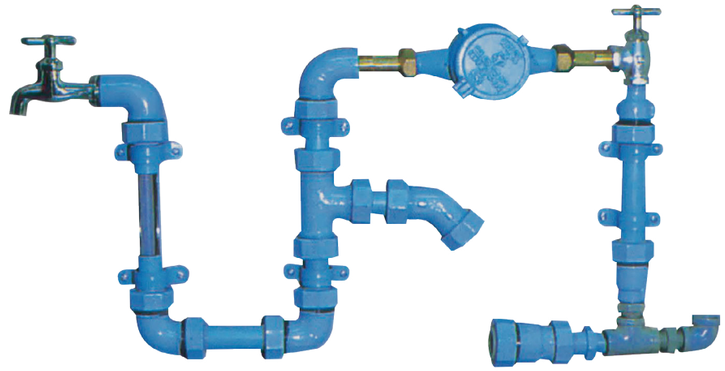
Usage of Product

- **It is piping that requires some flexibility as a water/ drainage pipe**
- **The water work pipe is NMT 2″(50A)**

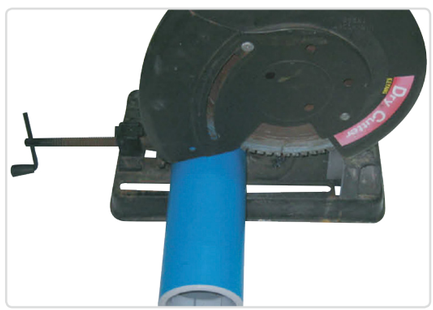
[Types of applicable pipes] The original type of pipe used was polyethylene powder lining steel pope (KS D 3619) PFP-D for tap water. It is perfectly compatible with other kinds of pipes including general steel pipe, stainless pipes, etc. when used with different kinds of rubber gaskets.

Piping Method

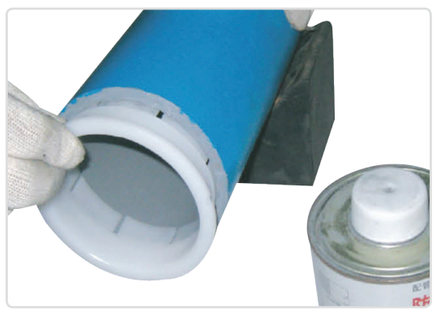
- Cut the necessary length of pipe without machining processes, such as thread cutting, welding, etc. and apply the anti-corrosion sealant to the pipe section and insert the pipe end protection ring (it is immediately effective after insertion). The construction is completed after injecting it into the PM fitting and tightening the outer nuts.
- Since the use of anti-corrosion sealant of the pipe section and insertion of pipe end protection ring is crucial for maintenance of product quality, it must be implemented at all costs.



▲ PM fittings pipe



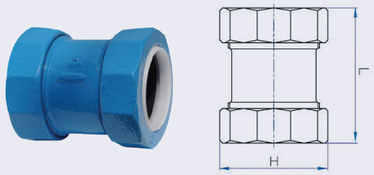
▲ PFP cutting
(uses Cutting M/C dedicated to PFP)



▲ Application of anti-corrosion sealant
and insertion of a pipe end protection ring

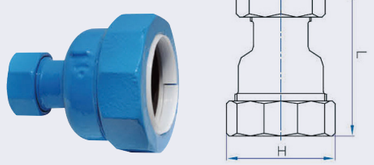
Specification of PM fittings [15A-50A]

Socket



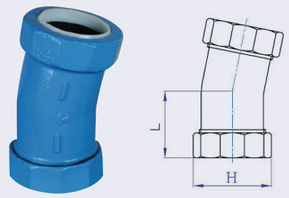
Specification	L	H
15A	67	48
20A	75	55
25A	83	66
32A	90	74
40A	97	81
50A	106	96

Reducer Socket



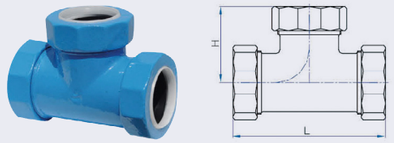
Specification	L	H
20 x 15A	75	55
25 x 15~20A	81	66
32 x 15~25A	88	74
40 x 15~32A	95	81
50 x 15~40A	102	96

11.25°Elbow



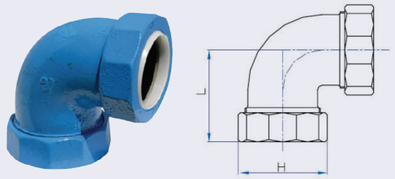
Specification	L	H
50A	80	96

Tee



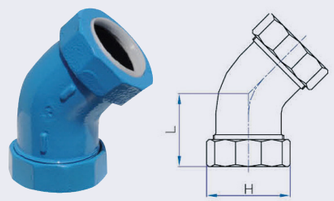
Specification	L	H
15A	94	45
20A	103	50
25A	118	57
32A	134	65
40A	148	78
50A	167	89

90°Elbow



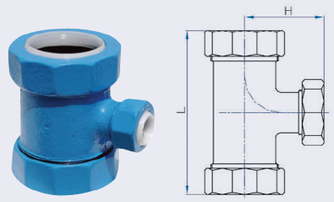
Specification	L	H
15A	49	48
20A	56	55
25A	63	66
32A	72	74
40A	80	81
50A	92	96

45°Elbow



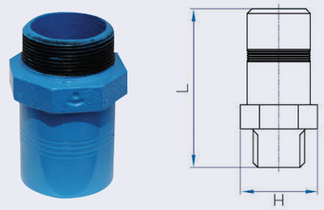
Specification	L	H
15A	49	48
20A	56	55
25A	63	66
32A	72	74
40A	80	81
50A	92	96

Reducer Tee



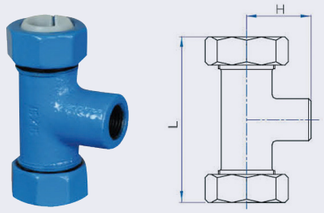
Specification	L	H
20 x 15A	97	35
25 x 15~20A	118	42
32 x 15~25A	134	49
40 x 15~32A	148	58
50 x 15~40A	167	66

Nipple-A



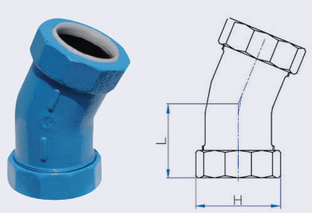
Specification	L	H
15A	69	34
20A	75	40
25A	83	46
32A	90	55
40A	97	61
50A	105	73

Socket Tee



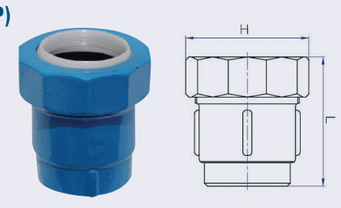
Specification	L	H
15 x 15A	98	43

22.5°Elbow



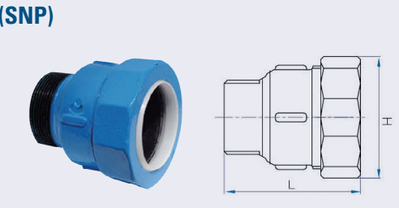
Specification	L	H
25A	55	66
30A	62	74
40A	68	81
50A	80	96

Nipple-B(FSNP)



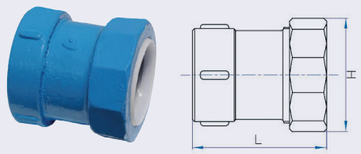
Specification	L	H
15A	57	48
20A	62	55
25A	67	66
32A	72	74
40A	77	81
50A	82	96

Nipple-C(SNP)



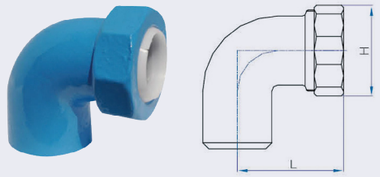
Specification	L	H
15A	67	48
20A	70	55
25A	72	66
32A	77	74
40A	82	81
50A	87	96

Water Socket (WFSNP)



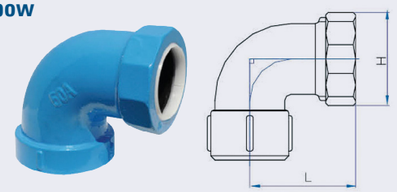
Specification	L	H
15A	59	48
20A	64	55
25A	69	66
32A	74	74
40A	81	81
50A	90	96

Socket Elbow



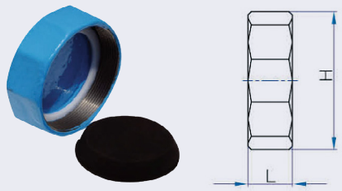
Specification	L	H
15A	49	48
20A	55	55
25A	63	66

Water Elbow (WSL)



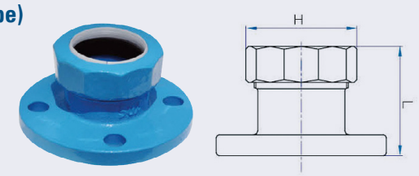
Specification	L	H
15A	49	48
20A	56	55
25A	63	66
32A	72	74
40A	80	81
50A	92	96

Cap



Specification	L	H
15A	20	48
20A	21	55
25A	22	66
32A	23	74
40A	26	81
50A	29	96

Flange Socket (Nut Type)



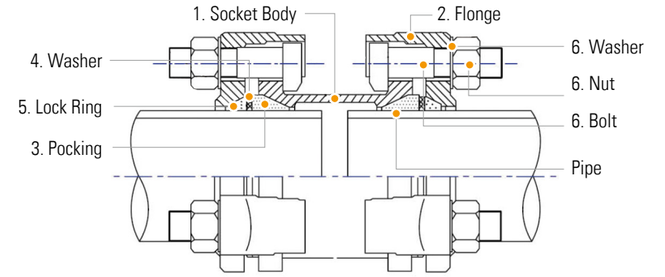
Specification	L	H
40A	71	81
50A	74	96

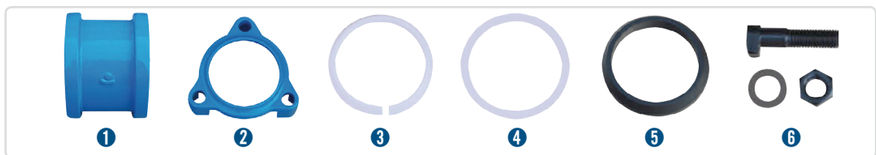
PM fitting

50A - 100A

Structure of Fittings

No	Parts	Configuration Quantity	Material	Remark
1	Socket Body	1	GCD 450-10	Interior and exterior epoxy powder coating
2	Flange	2	GCD 450-10	Interior and exterior epoxy powder coating
3	Back-up ring (Lock Ring)	2	Acetal 50~100A/ Al(Metal)/ 150~300A	Pipe separation preventing function
4	Washer	2	Acetal 50~100A/ Steel 150~300A	Pocking pressurization function
5	Lock Ring	2	EPDM, SBR	Leakage preventing function
6	Bolt	6	SS400	50A(M14), 65-100A(M18)
	Nut	8		150, 200A(M18)
	Washer	12		250, 300A(KP Bolt M24)



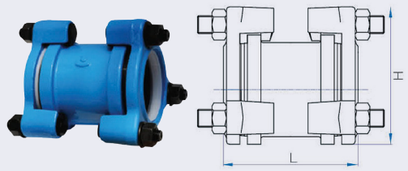


Product Features

- Large diameter PM fittings can be directly inserted into the pipe due to an airtight structure by special rubber gasket. In other words, there is no need for screw cutting, welding, etc. of the pipe; its working speed is fast because it is easy to measure and determine the dimension and angles of the pipe due to the special structure.
- The structure of the fitting has plasticity; it is designed so that it can withstand the vibration and small elongation of the pipe.
- It does not rust or corrode in joints due to its excellent corrosion resistance.
- It doesn't require thread cutting, welding, etc. as it is a three-point bolt tightening structure; it has outstanding constructability as it is connected with the spanner only.
- The water tightness of a rubber gasket with wide contact surface is excellent as it is a high-elasticity material. The back-up ring strongly locks the exterior of the pipe when tightening the bolt. Therefore, there are no problems such as breakaway, leakage, etc. of the connector even under high pressure load.

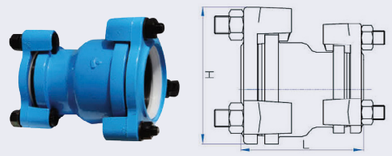
Specification of PM fittings [50A-100A]

Socket



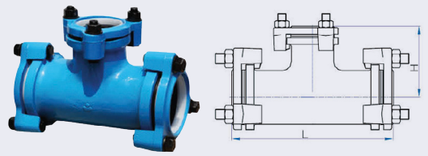
Specification	L	H
50A	144	110
65A	134	141
80A	156	156
100A	174	190

Reducer Socket



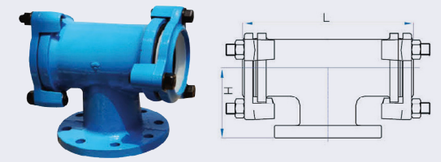
Specification	L	H
80 x 65A	155	156
100 x 65A	192	190
100 x 80A	201	190
65 x 15~50A	144	141
80 x 15~50A	155	156
100 x 15~50A	192	156

Reducer Tee



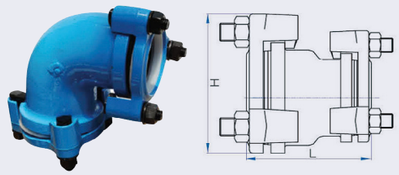
Specification	L	H
80 x 65A	279	140
100 x 65A	311	154
100 x 80A	324	155
65 x 15~50A	274	137
80 x 15~50A	279	140
100 x 15~50A	311	154

Flange Tee



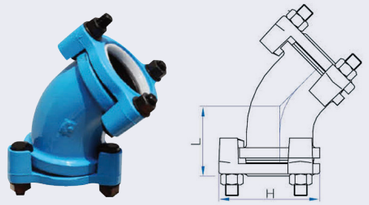
Specification	L	H
80A	230	106
100A	276	166
100 x 80A	272	138
80 x 50A	246	127
80 x 100A	266	152
100 x 50A	276	141

90°Elbow



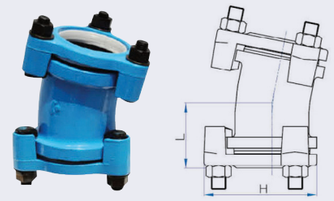
Specification	L	H
50A	119	110
65A	143	141
80A	141	156
100A	169	190

45°Elbow



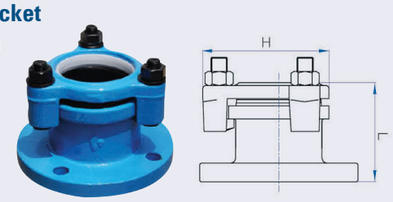
Specification	L	H
50A	89	110
65A	93	141
80A	102	156
100A	120	190

11.25°Elbow



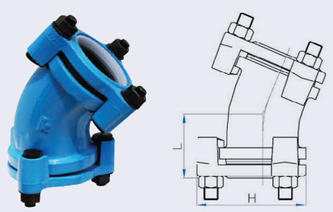
Specification	L	H
65A	79	141
80A	88	156
100A	90	190

Flange Socket (Nut Type)



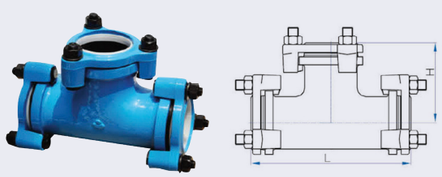
Specification	L	H
50A	107	110
65A	103	141
80A	118	156
100A	137	190

22.5°Elbow



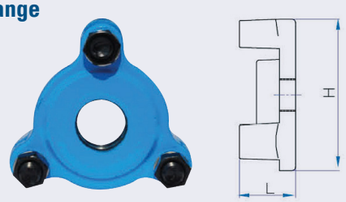
Specification	L	H
25A	77	110
30A	79	141
40A	88	156
50A	93	190

Tee



Specification	L	H
50A	238	119
65A	274	137
80A	282	141
100A	350	169

Reducer Flange



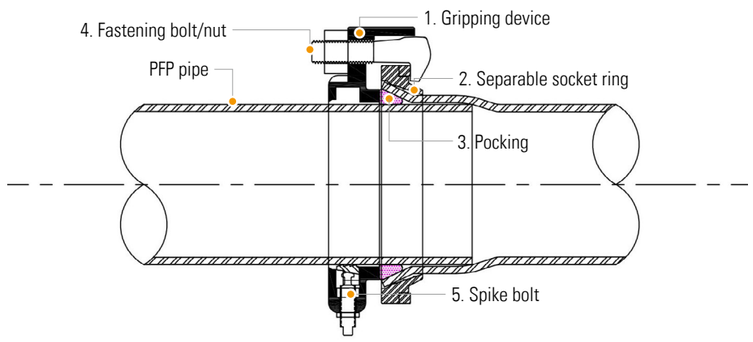
Specification	L	H
65 x 15~50A	52	141

PFP joint

80A - 600A

Socket structure (when an expansion pipe is connected)

No	Parts	Quality of Material	Remark
1	Gripping Device	Nodular Graphite Cast Iron (GCD450)	Internal/External : FBE
2	Socket Ring	AL(AC4D)	Internal/External : FBE
3	Pocking	SBR or NR	Hardness : 70
4	Fastening Bolt	SM45C or GCD	Corrosion Resistant Coating
5	Mounting Bolt	SM45C or GCD	
6	Spike	Steel Casting (SC46)	

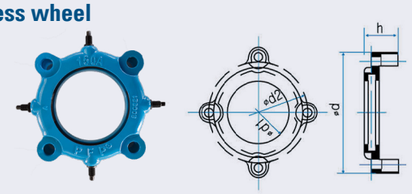


Product Features

- The socket connection expands one side of the PFP and connects one gripping device for a spigot with that of a connecting pipe to facilitate work and reduce connection cost.
- Bolt holes are not required in the body; it is sturdy as exterior jaw is formed.
- Since the head of the bolt is a hanger loop type, it is very big and strong. Therefore, there is no reason for any defects during the connection work or water flow.
- Since there is no bolt hole in the body, there is no need to match the bolt hole of the body with the gripping device and it can be quickly jointed in the bedrock section or during underwater work.
- Since mounting bolts and spikes specially designed for clad steel pipes are double jointed together in addition to the fastening bolt of the gripping device, it increases the coherence and withstands strong water hammering.
- When connecting the body (joint pipe), the angle of the pipe should be adjusted before fastening the bolt and when fastening the bolt, the use of some bent pipes can be reduced. It is easy to work in sections with many underground obstacles.
- It has the same durability as the pipe as the body and the gripping device are pre-treated and coated with FBE (Fusion Bonded Epoxy) or 3-layer polyethylene powder.

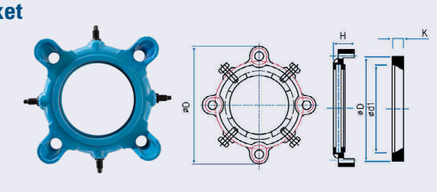
Specification of PFP joint [80A-600A]

PFP press wheel



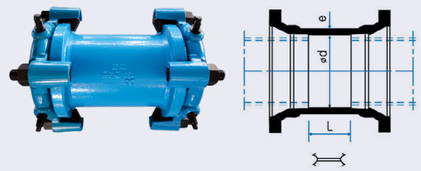
Nominal Diameter(DN)	Ød	Ød1	Ød2	h	Weight
80	258.0	95.7	204.0	92.5	4.1
100	279.0	121.0	225.0	97.5	4.7
150	336.0	175.4	282.0	97.5	6.4
200	384.0	226.3	330.0	101.5	8.1
250	445.0	276.4	391.0	102.5	11.4
300	501.0	329.0	447.0	111.0	13.8
350	551.0	368.2	497.0	119.0	20.0
400	605.0	419.0	551.0	130.0	24.4
500	717.0	520.6	663.0	135.0	33.6
600	809.0	622.8	755.0	135.0	36.0
700	929.0	727.2	872.2	147.6	54.4
800	1040.0	828.8	980.0	147.6	65.6
900	1144.0	930.4	1084.0	147.6	71.6
1,000	1250.0	1032.0	1190.0	152.6	77.8

Socket



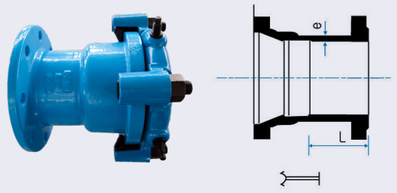
Nominal Diameter(DN)	D	D1	H	K	Weight
80	158.0	138.0	92.5	36.0	4.9
100	188.0	165.0	97.5	40.0	5.8
150	253.0	221.0	97.5	44.0	8.3
200	300.0	271.0	102.0	46.0	10.3
250	361.0	323.0	102.0	48.0	14.5
300	418.0	380.0	111.0	50.0	17.6
350	472.0	434.0	119.0	60.0	24.9
400	525.0	494.0	130.0	70.0	30.3
500	638.0	604.0	135.0	75.0	42.2
600	728.0	697.0	135.0	80.0	44.9
700	845.0	795.0	147.6	50.0	66.5
800	950.0	900.0	147.6	50.0	79.2
900	1054.0	1005.0	147.6	50.0	86.8
1,000	1160.0	1110.0	152.6	50.0	94.5

Joint Pipe



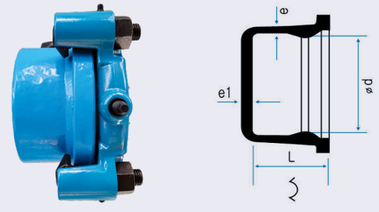
Nominal Diameter(DN)	e	R	L	Weight
150	7.8	180	165	17.4
200	8.4	232	170	23.5
250	9.0	285	175	32.0
300	9.6	337	180	40.0
350	10.2	390	185	51.0
400	10.8	441	190	62.0
500	12.0	545	200	90.0
600	13.2	649	210	126.0

Flange Socket



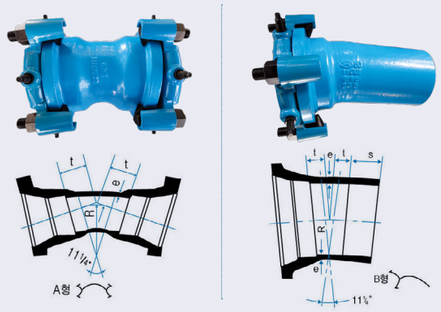
Nominal Diameter(DN)	e	L	Weight
150	7.8	135	16.1
200	8.4	140	22.5
250	9.0	145	30.5
300	9.6	150	39.5
350	10.2	155	48.5
400	10.8	160	58.5
500	12.0	170	83.5
600	13.2	180	118

Cap



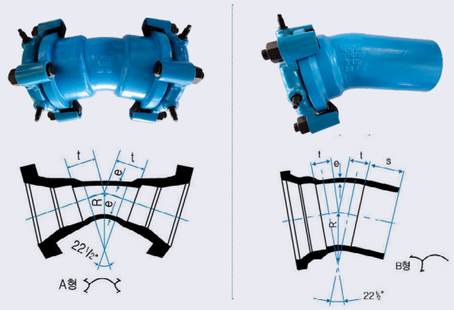
Nominal Diameter(DN)	e	e1	L	d	Weight
150	9.1	9.1	102	175.6	7
200	9.8	9.8	102	227.8	12
250	10.5	10.5	105	279.9	18
300	11.2	11.2	105	332.0	23
350	11.9	11.9	107	384.1	33
400	12.6	12.6	110	435.3	41
500	14.0	14.0	115	538.5	64
600	15.4	15.4	120	641.8	93

11 1/4°Elbow



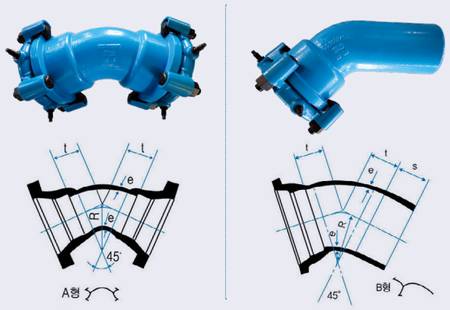
Nominal Diameter (DN)	e	R	t	Weight	
				A type	B type
150	7.8	150	60	18.2	16.4
200	8.4	185	65	25.0	23.0
250	9.0	230	75	34.5	32.0
300	9.6	310	80	44.0	41.0
350	10.2	345	85	57.5	52.5
400	10.8	380	90	70.5	64.0
500	12.0	495	100	104.0	93.5
600	13.2	570	110	149.0	131.0

22 1/2°Elbow



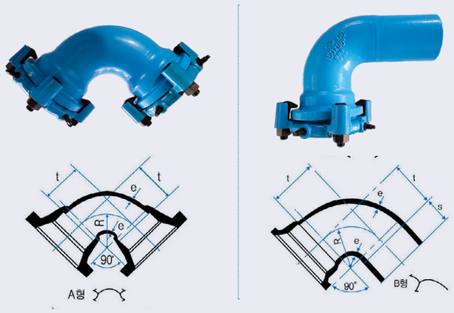
Nominal Diameter (DN)	e	R	t	Weight	
				A type	B type
150	7.8	155	80	19.3	17.5
200	8.4	195	90	27.0	25.0
250	9.0	240	100	37.5	34.5
300	9.6	300	110	48.0	45.0
350	10.2	345	120	63.0	58.0
400	10.8	390	135	79.0	73.0
500	12.0	495	155	119.0	108.0
600	13.2	590	175	172.0	154.0

45°Elbow(socket bent pipe)



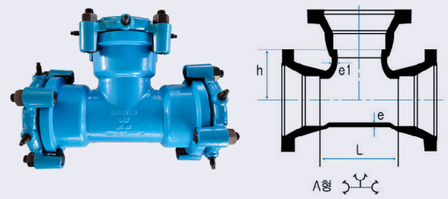
Nominal Diameter (DN)	e	R	t	Weight	
				A type	B type
150	7.8	145	100	21.0	19.0
200	8.4	200	135	30.0	28.0
250	9.0	245	155	42.5	40.0
300	9.6	300	175	56.0	53.0
350	10.2	350	200	75.0	70.0
400	10.8	400	220	94.5	88.5
500	12.0	495	265	147.0	136.0
600	13.2	595	310	217.0	199.0

90°Elbow(socket bent pipe)



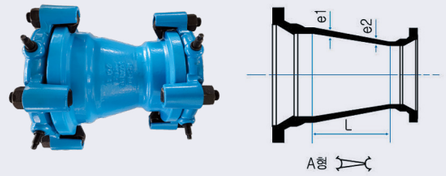
Nominal Diameter (DN)	e	R	t	Weight	
				A type	B type
150	7.8	145	220	25.5	23.5
200	8.4	195	270	38.0	36.0
250	9.0	240	320	55.0	52.5
300	9.6	290	370	75.0	71.5
350	10.2	340	420	101.0	96.0
400	10.8	390	470	130.0	123.0
500	12.0	485	570	206.0	195.0
600	13.2	580	670	307.0	289.0

Tee(socket T piece)



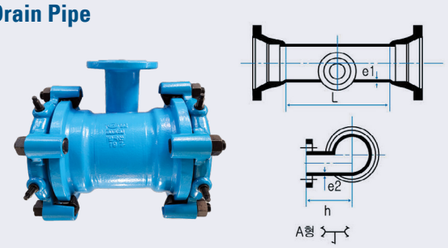
Main pipe			Sub pipe			Weight
Nominal Diameter (DN)	e	L	Nominal Diameter (DN)	e1	h	
150	9.1	220	80	8.1	145	26.5
	9.1	245	100	8.4	145	28.5
	9.1	305	150	9.1	150	33.0
200	9.8	225	80	8.1	170	35.0
	9.8	250	100	8.4	170	37.0
	9.8	305	150	9.1	175	42.5
	9.8	365	200	9.8	180	47.5
250	10.5	255	100	8.4	205	48.5
	10.5	370	200	9.8	210	60.5
	10.5	425	250	10.5	210	67.0
300	11.2	312	150	9.1	227	66.0
	11.2	370	200	9.8	232	73.0
	11.2	428	250	10.5	238	81.5
	11.2	486	300	11.2	243	89.0
350	11.9	257	100	8.4	246	73.5
	11.9	373	200	9.8	257	90.5
	11.9	489	300	11.2	268	108
	11.9	547	350	11.9	274	118
400	12.6	260	100	8.4	271	88.5
	12.6	376	200	9.8	282	107
	12.6	492	300	11.2	293	127
	12.6	608	400	12.6	304	149
500	14	382	200	9.8	332	149
	14	498	300	11.2	343	174
	14	614	400	12.6	354	201
	14	730	500	14.0	365	229
600	15.4	390	200	9.8	400	204
	15.4	500	300	11.2	405	233
	15.4	620	400	12.6	410	266
	15.4	730	500	14.0	415	298
	15.4	850	600	15.4	425	335

Reducer Socket(socket taper pipe)



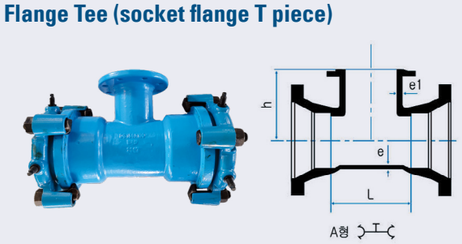
Main pipe		Sub pipe		L	Weight
Nominal Diameter (DN)	e1	Nominal Diameter (DN)	e2		
150	7.8	80	7.0	190	15.4
		100	7.2	150	15.6
200	8.4	100	7.2	250	22.0
		150	7.8	150	22.5
250	9.0	150	7.8	250	31.0
		200	8.4	150	30.0
300	9.6	150	7.8	350	40.5
		200	8.4	250	40.0
		250	9.0	150	39.0
350	10.2	200	8.4	360	53.0
		250	9.0	260	52.5
		300	9.6	160	50.5
400	10.8	250	9.0	360	67.0
		300	9.6	260	64.5
		350	10.2	160	62.5
500	12	350	10.2	360	99.5
		400	10.8	260	99.5
600	13.2	400	10.8	460	145.0
		500	12.0	260	134.0

Drain Pipe



Nominal Diameter (DN)		Measurement of each part				Weight
DN	dn	e1	e2	L	h	
200	80	9.8	8.1	190	250	32
	100	9.8	8.4	215	255	34
250	80	10.5	8.1	220	275	45
	100	10.5	8.4	220	285	46
300	80	11.2	8.1	220	305	56
	100	11.2	8.4	220	310	56
	150	11.2	9.1	335	325	68
350	80	11.9	8.1	225.1	330	98
	100	11.9	8.4	225	340	69
	150	11.9	9.1	340	355	83
400	100	12.6	8.4	225	365	81
	150	12.6	9.1	340	380	97
	200	12.6	9.8	345	395	101
500	100	14.0	8.4	230	420	118
	150	14.0	9.1	350	435	140
	200	14.0	9.8	400	450	152
600	100	15.4	8.4	355	475	189
	150	15.4	9.1	410	485	204
	200	15.4	9.8	470	495	220

Flange Tee (socket flange T piece)

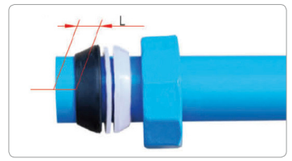


Main pipe			Sub pipe			Weight
Nominal Diameter (DN)	e	L	Nominal Diameter (DN)	e1	h	
150	9.1	220	80	8.1	205	26.5
		245	100	8.4	210	28.0
		305	150	9.1	220	33.0
200	9.8	225	80	8.1	235	35.0
		250	100	8.4	240	36.5
		304	150	9.1	250	42.0
		365	200	9.8	260	48.0
250	10.5	250	100	8.4	270	47.5
		365	200	9.1	290	60.5
		425	250	9.8	300	69.0
300	11.2	255	100	8.4	300	60.0
		370	200	9.8	320	74.0
		485	300	11.2	340	92.5
350	11.9	255	100	8.4	330	73.5
		375	200	9.8	350	91.0
		545	350	11.2	380	120.0
400	12.6	260	100	8.4	360	88.0
		375	200	9.8	380	108.0
		610	400	12.6	420	152.0
500	14.0	265	100	8.4	420	125.0
		380	200	9.8	440	150.0
		615	400	12.6	480	204.0
		730	500	14.0	500	234.0
600	15.4	390	200	9.8	500	203.0
		620	400	12.6	540	269.0
		850	600	15.4	580	344.0

Construction Method

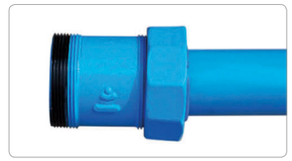
15A-50A **50A-100A**

PM Connection [15A-50A]



❶ It is inser ted into the pipe in the order of flange, lock ring, washer and pocking.

❷ Insert the body into the pipe where the parts are inserted and then attach the parts to the body.



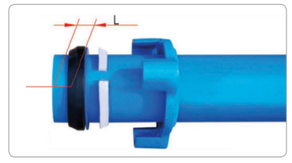
❸ Insert the bolt from the body to the flange so that the bolt can be caught on the jaw of the body and temporarily combine the washer and nut with the bolt.

❹ Assemble in the same way as ❶, ❷ and ❸ on the opposite side.

❺ Fasten the nuts and parts to the body with hands while maintaining them horizontal and then strongly fasten them by using a tool (ratchet handle, spanner, etc.).

❻ After completing construction, check the horizontality of the body, nut and par ts. Then, confirm whether the compression of the pocking is uniform or not.

PM Connection [50A-100A]



❶ It is inserted into the pipe in the order of nut, lock ring, washer and pocking.

❷ Insert the body into the pipe where the parts are inserted and then attach the parts to the body.

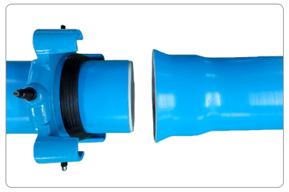
❸ Insert the bolt from the body to the flange so that the bolt can be caught on the jaw of the body and temporarily combine the washer and nut with the bolt.

❹ Assemble in the same way as ❶, ❷ and ❸ on the opposite side.

❺ Strongly fasten them by using a tool (ratchet handle, spanner, etc.) while maintaining them horizontal.

❻ After completing construction, check the horizontality of the body, nut and parts. Then confirm whether the compression of the pocking and connection of the lock ring are uniform or not.

PFP Joint (separable socket) [80A-600A]

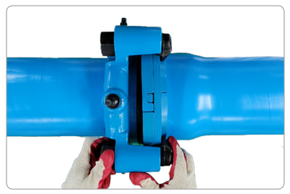


❶ After cleaning outer surface on the end of PFP pipe spigot and interior of the water outlet, insert the separation prevent ion gripping device and pocking from the end of the pipe to the opposite side by more than 150mm.

❷ Locate outer and inner separable socket ring in the water outlet of the PFP pipe.

❸ Fasten the inner separable socket ring in the water outlet of the PFP pipe.

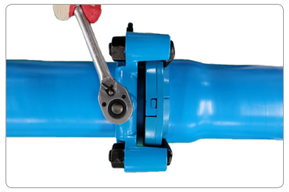
❹ Combine the separable socket ring (outer and inner) and locate it at the end of the water outlet.



❺ Be careful not to twist the pocking when inserting the spigot to the inner end of the water outlet and fasten the separation preventing press wheel and socket ring with the fastening bolt and nut.

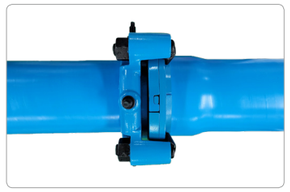
❻ The fastening bol t is gradual ly fastened by using a 41mm tool in vertical and diagonal directions and it is repeatedly fastened until separation prevention gripping device and socket ring completely come into contact with each other.

[Fastening torque] 14~18Kg·m



❼ Fasten the fastening bol t to the separat ion prevent ing gripping device of spigot using a 16mm tool in vertical and diagonal directions and sequential ly check whether the fastening bolt has been tightly fastened or not.

[Fastening torque] 8~10Kg·m

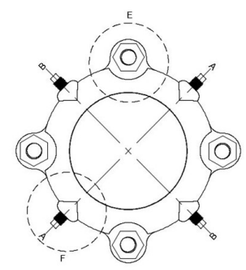


❽ Construction is complete.

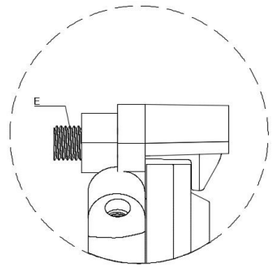
Bolt fastening method

Number of remaining threads for appropriate fastening of a gripping bolt

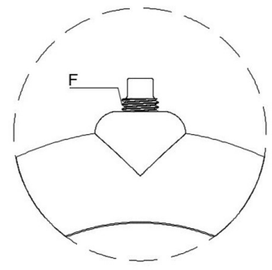
Size (A)	Number of bolts	Number of remaining threads		Specification of Bolt	
		Fastening bolt (E)	Clinching bolt (F)	Fastening bolt (E)	Clinching bolt (F)
80	3	2~3	2~3	M24 x 95	M16 x 52
100	3				
150	4				M16 x 57
200	5				
250	6	4~5			
300	6			M24 x 105	M20 x 60
350	8			M24 x 115	
400	10				
500	12				
600	14				
700	16			M24 x 135	M20 x 72
800	20			M27 x 135	
900	20				
1,000	22				



▲ Figure 1



▲ Fastening bolt (E)



▲ Clinching bolt (F)

Precautions for assembling the mounting bolt

- Fill the bolt/nut vertically and diagonally as shown in Figure 1 and gradually fasten it in an equally balanced manner several times. (Use 41mm fastening bolt and 16mm clinching bolt tools)
- When the final fastening of the bolt/nut is completed, it should be fastened to fit the number of remaining threads by nominal size as shown in Table 1
- Use a manual wrench for clinching bolts if possible and when unavoidably performing impact operation, apply appropriate torque. Otherwise, it may damage the circular pipe.

Construction of PFP/ PFP

KS D3619

Storage of Pipes

❶ The polyethylene powder lining steel pipes for water works (hereafter referred to as "PFP") shall be stored at a place where they can avoid direct sunlight, shall not be piled up on the ground and be covered with suitable material within a warehouse. When unavoidable kept outdoors, appropriate protection must be provided.

❷ When storing PFP, care should be taken not to give any damage, such as bending or deformation of pipe. When it is judged to have a problem, carefully inspect the interior/ exterior of the pipe and it should not be used if any defect is found. (the defective part should be cut off).

❸ It should not be put near fire or heat source. This is because the polyethylene may be defected at high temperature.

❹ Care should be taken not to damage the PE coating when the PFP is transferred at a place where there are sharp crushed stones.

❺ Care should be taken not to throw the pipe that is to be transported or to make direct contact with the stone piece of the underground pipe.

❻ When the water is frozen within the pipe, it should be thawed by steam thawing machine or hot water and not by direct fire using torch lamp, etc.

❼ During minor transport, it should not collide with the projection and it shall not be transferred with a stick rod within the pipe.

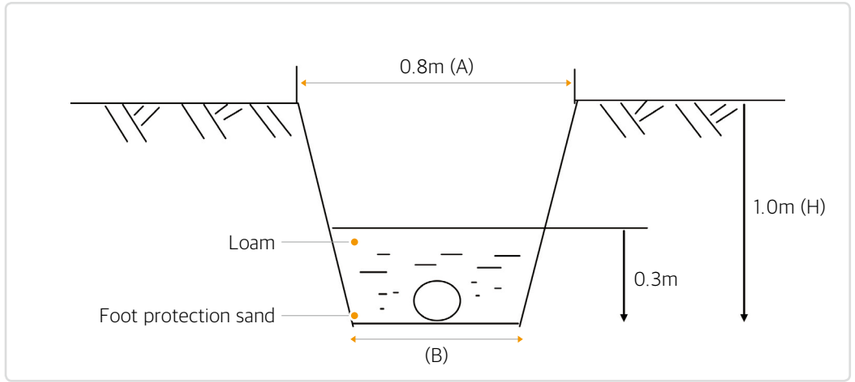
❽ When the PE covering is damaged during transport, it should be repaired with corrosion-resistant tape and thermal contraction sheet.

Earthwork and Bed Excavation

❶ In case of bed excavation for pipe construction, excavation shall be wide enough to use the tools when working with PM type fitting and PFP joints (KP type) according to the standard drawing shown in the floor plan.

❷ In case of the burial depth, pipes should be buried within the freezing depth (approximately 1m) of the concerned local area.

- When it is not more than 100A



- When the standard excavation measurement is not less than 150A

※ Unit : M

Nominal Diameter	Width	Soil cover 1. 2 M		Soil cover 1.5 M	
A(mm)	B	H	A	H	A
150	0.45	1.50	0.87	-	-
200	0.50	1.55	0.94	-	-
250	0.60	1.65	1.07	-	-
300	0.75	1.70	1.18	2.00	1.27
350	0.80	1.75	1.20	2.05	1.29
400	0.90	1.85	1.31	2.15	1.40
500	1.10	2.05	1.57	2.35	1.66
600	1.20	2.20	1.80	2.50	1.89
700	1.30	2.40	1.93	2.60	2.02
800	1.50	2.40	2.06	2.70	2.15
900	1.60	2.50	2.29	2.80	2.38
1,000	1.70	2.60	2.42	2.90	2.51

❸ Remove rock plate, wood pieces, gravel, etc. from the piping surface of the ground that has been bed-excavated. Then spread the foot protection sand to protect the laying pipe as well as take caution to evenly spread the weight that is transferred to the pipe.

❹ During bed excavation of pipeline, it is necessary to excavate more than 10 cm around the rock section, lay sand on the excavated part and make sure that direct load is not applied to the pipe by thoroughly laying sand around the pipe.

❺ When refilling the excavation area, remove stone pieces, pebbles, etc. around the pipe and fill it vertically and diagonally as thick as 20~30cm with loam and tamp it well so that it does not give bad effect to the pipe.

❻ The restoration procedure of the excavation ground should be in accordance with related specifications including General Standard Specification of the Ministry of Construction and Transportation, General Standard Specification of Concrete Construction, General Standard Specification of Road Pavement Construction and Waterworks, etc.

Construction Know-how

❶ Preparation of Construction

- Bring in PFP, bonding parts, small carrier, pipe wrench, PFP cutter, file, lining repair anti-corrosion tape, method sealer, pipe end protection ring, etc. to the construction site and also prepare portable worktable or working cloth.
- When transporting the PFP, care should be taken not to damage the outer surface covering and prevent foreign substances from entering the pipe.

❷ Separation of pipe, etc.

- Measure the PFP that is to be constructed at a prescribed size, temporarily arrange it by length and prepare necessary parts at the same time.
- Care should be taken not to let foreign substances from entering the connection pipes, fittings, etc., cover the pipe with a cloth and store it at the site by putting the parts in boxes, etc. Also, care should be taken so that dirt or dust, etc. do not go into the packing of the fittings.
- Care should be taken so that "air pocket" is not formed because it is common for construction of pipe to go from low land to high land.
- It should be re-checked whether there is damage or not on the covering surface of the PFP and other materials before starting construction.

Cutting of Pipes

❶ When cutting PFP, care should be taken to not damage the inner and outer lining surface.

❷ The PFP should be cut at right angle. For this purpose, it is recommended to mark it with a magic marker beforehand.

❸ When cutting with a cutting machine (dry cutting) dedicated to PFP, it doesn't give any damage to PFP coating films because it doesn't produce high heat just like cutting memorial stones. In particular, the use of gas cutting, arc cutting, etc. should be avoided when cutting on the site.

❹ The cut surfaces of the PFP and the inner and exterior surface of the pipe should be trimmed with a flat or round file.
- An anti-corrosion sealant should be applied evenly with a brush.
- The surface where an anti-corrosion sealant is applied should be thoroughly dried and be free of oil, acid, alkali, dust, etc.

❺ The cut surfaces of the PFP and the inner and exterior surface of the pipe should be trimmed with a flat or round file.
- The anti-corrosion sealant should have special properties to ensure the corrosion resistance of the cut iron surface when cutting the PFP and it is supplied under the brand name of SANI SEAL 88. The basic properties of the anti-corrosion sealant are as shown in (Table 3) and its rust resistance, pressure resistance, abrasion resistance, adhesion and hygiene are extremely excellent.

(Table 3) General Characteristics of the SANI-SEAL88

Inspection Items	Specification
Viscosity (CPS)	3,100~3,300
Specific Gravity (25℃)	1.30~1.40
Nonvolatile Ingredient (%)	60~66
Softening Degree (NS)	NLT 1.5
Adhesive Property Test (25~50℃ H20 x 60 days)	100/ 100
Salt Water Resistance Test (3% Nacl x 30 days)	Pass
Water Pressure Test (50 kg/㎠)	Pass

- The structure of the pipe end protection ring allows it to connect with PM fittings after it is inserted inside the PFP and integrated with the pipe; perfect pipe end corrosion resistant effect can be obtained due to the filling of corrosion resistant sealants between the CORE and the pipe end.

❻ In principle, the cut surface of the PFP should be coated with corrosion resistant sealants (SANI SEAL 88) and the pipe end protection ring should be used after being inserted inside the PFP.

Protection of PFP joint fittings

❶ The exterior of all 90˚ bends, 45˚ bends of not less than 150A, 22 ½˚ bends of not less than 300A, 11 ¼˚ bends of not less than 500A and T-tee of not less than 150A shall be protected with concrete support or piling.

❷ Protection works shall be installed for small diameter bends and T-tee in weak grounds or especially where water pressure is high, based on the preceding clause. However, in case of weak ground, caution should be taken during construction because problems such as subsidence may arise when installing the concrete protection.

Inspection and Tests

❶ Once the PFP is fastened, inspect whether there is any problem or not and conduct a water pressure test.

Laying of Pipes

❶ When laying PFPs underground, care should be taken to prevent harmful materials such as stones, irons, etc. from coming into contact with the pipes and protect the surroundings of the pipes with sand or soft sandy loam.

❷ The ground should be well maintained so that the body of the pipe is not bent or damaged due to live load and compaction pressure, etc. of the covering soil.

❸ For protection of PFP, it is best that it is preserved and laid in its original state.

❹ In case of the laying depth, pipes shall be buried and laid below the freezing depth of the area. (approximately 1m)

Final Test

❶ When the laying of pipes at the construction section is completed, the final water discharge and water pressure test should be implemented under the prescribed pressure to guarantee the constructability.

Precautions after Construction

❶ If reconnection is necessary due to incomplete connection after having completed connection, remove the fitting, remove foreign substances and replace the pocking, joint, etc., and connect pipes again.

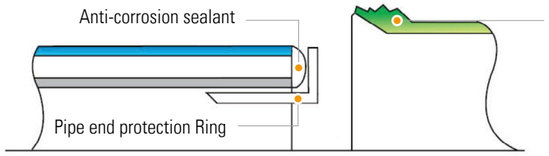
Anti-corrosion sealant

Pipe-end treatment

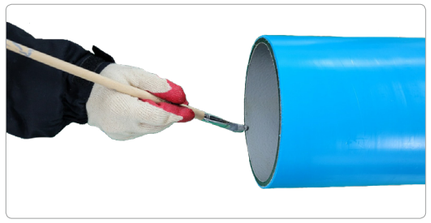
Physical Properties and Application Method

[Physical Properties] The anti-corrosion sealant is a product with physical properties specially designed to ensure corrosion resistance on the pipe section of the coated steel pipe.

[Application Method] Before mounting the fittings, the anti-corrosion sealant should be applied between exposed part and pipe-end protection ring so that there may be no exposed part between pipe end and pipe-end protection ring after the fittings are mounted.



❶ Cut the PFP with a dedicated cutting M/C as long as needed, treat the cut surface and the inner/exterior of the pipe with a round file or scraper, etc. and completely remove the chips, foreign substance, etc.



❷ Apply the anti-corrosion sealant on the cut pipe section.

❸ Insert the pipe end protection ring inside the pipe.

❹ It shall be assembled according to the PFP joint construction method.

Cases of Construction

Drilling

Precautions in drilling

An electric drill must be used when drilling

A hole saw type drill is used when drilling

Drilling Method

❶ Prepare an electric drilling machine.

❷ Prepare a hole saw drill.

❸ Place the snap taps with a saddle at the center of perforation site and tightly anchor both bolts by fastening them alternately.

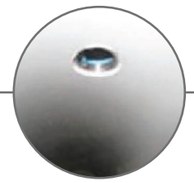
❹ Mount a hole saw drill bit to the drilling machine.

❺ When installing the drilling machine to the snap taps with a saddle, tightly fasten the locking nut

※ if it is not fixed properly, the drilling machine may turn suddenly.

※ Before drilling, turn the handle to see if it comes into contact with the water pipe, make one turn reversely and supply power to start drilling.

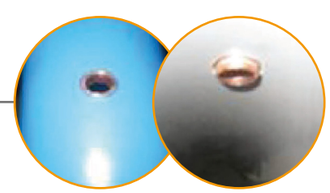
❻ If the handle turns naturally after drilling, turn off the power and slightly move the handle forward and then backward.



❼ Drilling is completed.

❽ After disassembling the drilling machine af ter drilling, install an anticorrosion ring to the clip installation rod.

❾ After tightly fastening a locking nut to the snap taps with a saddle, turn the bolt on top of the installation rod clockwise to receive the constant load, stop the rotation if it is softly rotated. When it is rotated reversely, the anti-corrosion ring is fixed to the drilling site.

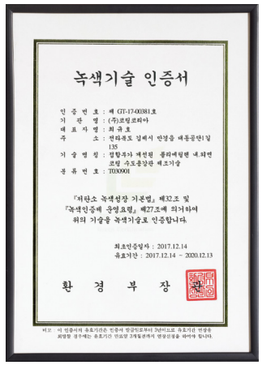


⑩ Instal lat ion of an ant i - corrosion ring is completed.

Main Certificates

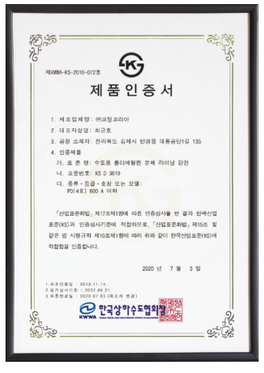
Certificates

▲ Excellent Product Certificate

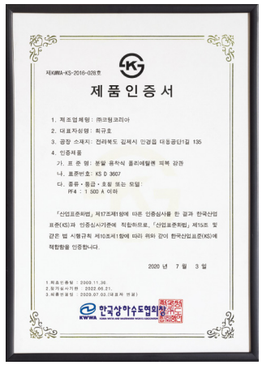


▲ Green Technology Certificate

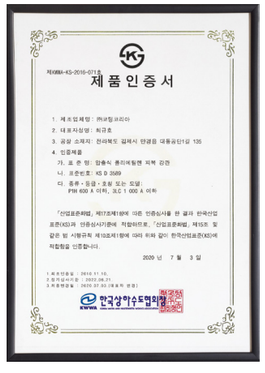
▲ Performance Certificate



▲ KS Product Certificate(KS D 3619)



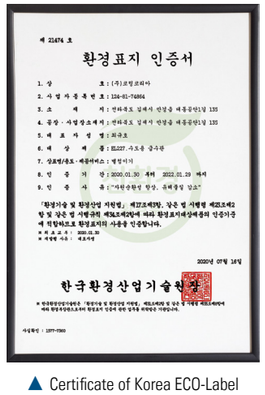
▲ KS Product Certificate(KS D 3607)



▲ KS Product Certificate(KS D 3589)

▲ Certificate of Research Center Attached to the Company

▲ Hygienic Safety Standard Certificate



▲ Certificate of Korea ECO-Label

Precautions in Handling

1. Storage

- It must be stored at a flat place and care should be taken not to be bent.
- In principle, it should be stored indoors. However, when it is unavoidably stored outdoors, it should be covered with a light shielding film, etc. to avoid direct sunlight.

2. Transport/ Handling

- Be careful that the covering doesn't come into direct contact with sharp parts during all sorts of loading work or transportation by crane and forklift. In addition, avoid using wire ropes and use nylon, etc. (magic sling, etc.)
- The inner covering of the PFP may be scratched if it is transported with a rod inserted within the PFP.

3. Fire

- When it is come into close contact with fire or heat source, precaution should be taken because phenomena such as surface softening or carbonization of polyethylene film may occur.

4. Fall/ Shock

- When bending or deformation occurs due to shock or fall, the inner surface should be checked before use.

5. Cutting

- Use a dedicated cutter blade when cutting the pipe.
- After cutting the pipe, apply the anti-corrosion sealant to the cut area, make sure to insert the pipe end core and assemble the fittings.