



FIXON

Corrugated Steel Pipe



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- ▶ **Fixon Inc.**
- ▶ **Chairman:** Sungman Jung, PhD
- ▶ **Established:** September 1, 1994
- ▶ **Products:** Corrugated steel pipe / Corrugated steel plates
Polymer laminated steel coil / Machinery

▶ **No. of employees:** 53

▶ **Locations:**

Corporate Office: Supsaemgil 129, Gwangyang, Jeonnam, Korea

Seoul Office: Ace Tower, Simindearo 36, Anyang Gyunggi

Factory #1: Singeum 1-gil, Industry Complex, Gwangyang

Factory #2: 56-56 Simyogil, Namwon, Jeonbuk

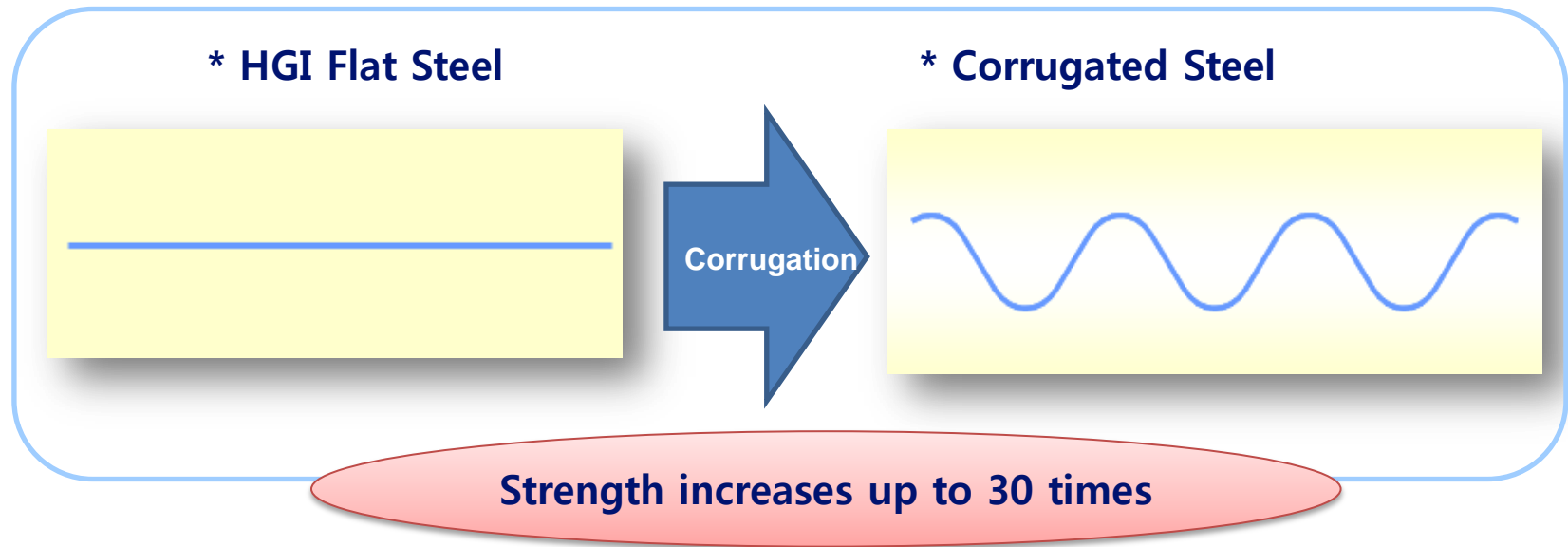
CS Pipe ▶ Corrugated Steel Pipe



What is **Corrugated Steel Pipe**?

- ▶ **The Best solution** for drainage using high corrosion resistant Hot Galvanized Steel with enhanced strength from corrugation
- ▶ One integrated production line for the whole process of manufacturing pipes of **300~3,600mm diameter**
- ▶ **The larger diameter, the more economical** cost of CS Pipe

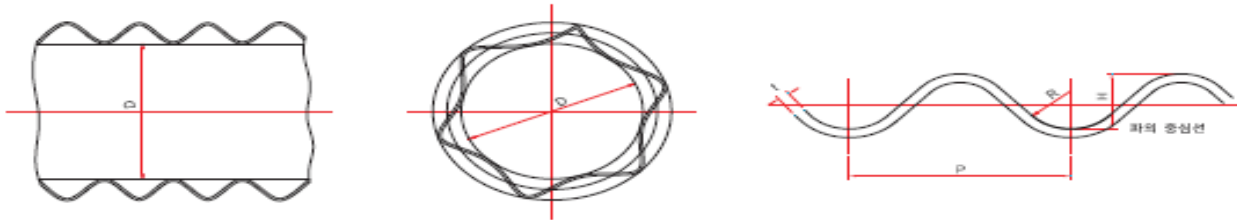
CS Pipe Basic Principle



- Up to 30 times strength increase by being corrugated
- 5 times thinner steel for the same strength of flat steel
- * Less consumption of steel material → Lower cost

CS Pipe Specifications

■ Specification



	Pitch	Depth	Remark
SCP 0RS	38	6.5	
SCP 1RS	68	13	
SCP 3RS	76.2	25.4	

■ Pipe size

	Diameter (mm)	Thickness (mm)	Remark
SCP 0RS	150~600	1.6	
SCP 1RS	300~2,000	1.6~3.2	
SCP 3RS	900~3,600	2.0~3.5	

CS Pipe Mechanical Properties

Raw Material

	Value	Unit	Remark
Yield Strength	270 <	MPa	
Tensile Strength	205 <	MPa	
Elongation	30 <	%	
Galvanizing	600 <	g/m ²	Both sides

Supplier: POSCO

Mill Test Certificate/검사증명서

Certificate No./증명서번호 : 171128-FL01KN-0010A4-0001
Date of Issue/발행일자 : Mar., 29, 2018
Post Treatment/후처리 : CL (Chromate)

Order No./계약번호 : 0152972182
Supplier/공급자 : HAN YANG STEEL IND.CO.,LTD.
Customer/고객사 : SEUNGWON STEEL

PO No./주문번호 : MSW0152972182
Commodity/품명 : HOT ROLLED GI COIL
Spec & Type/규격 : KS D 3506 SGHC

Size/치수	Product No. /제품번호	Quantity /수량	Weight 중량 (kg)	Heat No. /재질번호	Lot No.	Tensile Test 인장시험			Coating Metal Bend Test	Coating Weight (g/m ²)		Division	Chemical Composition/화학성분					
						Y _P	TS	EL (%)		Zn Upper	Zn Lower		C (%)	Si (%)	Mn (%)	P (%)	S (%)	
2.7x1360xC	CVY1432C	1	10,390	S052930	B	286	362	45	Good	339.0	343.0		L	0.0379	0.001	0.204	0.0089	0.0042
*** Sub Total (H10) ***						< Test Welded >				*** Last Item ***								
*** Grade Total ***																		
*** Grand Total ***																		

* Position : T : Top, M : Middle, B : Bottom
* Tensile Test Direction : Longitudinal, Gauge Length : 50mm(Rectangular),
YP Method : Upper Point
* Division - L : Ladle Analysis

We hereby certify that the material herein has been made in accordance with the order and above specification.

본 검사증명서 뒷면오시 사본서 위조/변조/합법 제231조로 불이익을 당할 수 있습니다.

Surveyor To :

Kim, Young-Ha

POSCO Gwangyang Works, 20-26, Pokposarang-gil, Gwangyang-si, Jeollanam-do, 57807, Korea

< PAGE : 1 > Chief of material testing section Kim, Young Ha

CS Pipe Mechanical Properties

■ CSP 68 x 13mm Profile

Diameter	1.6mm Thickness			2.0mm Thickness			2.7mm Thickness		
	Mound height (m)	Pipe weight (kg/m)	5% deformation external strength (kg/m2)	Mound height (m)	Pipe weight (kg/m)	5% deformation external strength (kg/m2)	Mound height (m)	Pipe weight (kg/m)	5% deformation external strength (kg/m2)
300	59.4	17	33,850	73	20	41,580			
400	29.5	21.4	22,380	35.2	26.3	26,740			
500	18.8	26.4	17,860	21.7	32.3	20,640			
600	14.1	30.8	16,050	15.8	38.5	17,990	18.9	50.5	21,520
700	11.7	34.5	15,540	12.8	43.2	16,970	14.7	56.9	19,560
800	10.3	39.5	15,720	11.1	49.3	16,810	12.4	65	18,790
900	9.5	44.7	16,290	10	55.5	17,150	10.9	72.8	18,720
1000	9	49.9	17,120	9.4	62.1	17,820	10	80.7	19,090
1100	8.7	54.9	18,110	8.9	67.8	18,680	9.4	88.8	19,730
1200	8.4	58.6	19,200	8.6	74	19,680	9	96.6	20,570
1350				8.3	83.2	21,370	8.6	108.5	22,070
1500							8.3	110.4	23,750

CS Pipe Mechanical Properties

CSP 76.2 x 25.4mm Profile

Diameter	2.0mm Thickness			2.7mm Thickness			3.2mm Thickness		
	Mound height (m)	Pipe weight (kg/m)	5% deformation external strength (kg/m2)	Mound height (m)	Pipe weight (kg/m)	5% deformation external strength (kg/m2)	Mound height (m)	Pipe weight (kg/m)	5% deformation external strength (kg/m2)
900	18.6	63.2	31,830	22.7	83.2	38,740			
1000	15.6	69	29,700	18.6	92	35,300			
1100	13.6	75.9	28,500	15.9	101.2	33,130	18.1	119.2	37,820
1200	12.3	83.2	27,940	14	109.4	31,830	15.2	130.2	34,680
1350	10.9	94	27,880	12.1	123.4	30,960	13	145.3	33,220
1500	10	103.3	28,470	10.9	136.8	30,960	11.5	161.7	32,790
1650	9.4	114.1	29,460	10.1	150.1	31,520	10.5	176.8	33,030
1800	9	124.9	30,740	9.5	163.5	32,470	9.9	191.9	33,790
2000	8.6	137.6	32,740	9	181.4	34,140	9.3	213.6	35,170
2200	8.4	151.8	34,970	8.6	199.3	36,130	8.8	235.4	36,980
2400	8.2	165	37,370	8.4	218.5	38,330	8.6	257.6	39,040

CS Pipe Manufacturing Process



Steel Coil



Forming (Corrugation)



Pipe Seaming



Cutting



Re-corrugating



Packing

CS Pipe Installation



Excavation



Sand Bedding



Installing CS Pipe



Coupling



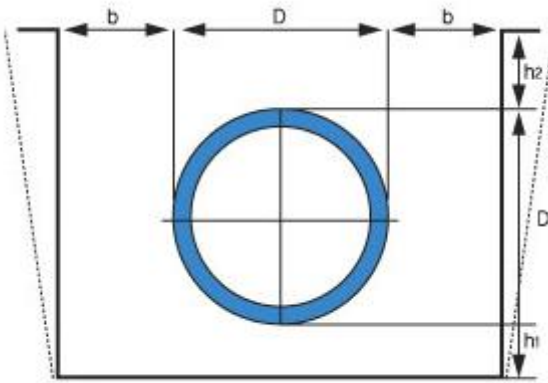
Backfilling



Soil Compaction

CS Pipe Installation Guideline

Excavation

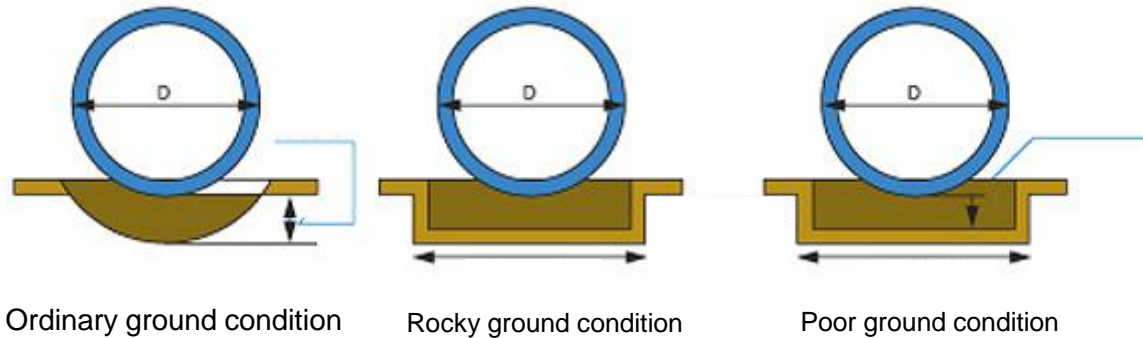


b: 25 ~ 30 cm for ordinary ground
 50 cm for poor ground
 h1: Defined with consideration of ground condition
 h2: 30 cm

D (mm) Diameter	300	350	400	450	500	600	700	800	900	1000	1100	1200	1300	1400	1500
Excavation Width (mm) $D+2b$	700	800	900	1000	1100	1200	1400	1600	1700	1800	2000	2100	2200	2400	2500

CS Pipe Installation Guideline

Foundation (Sand bedding)



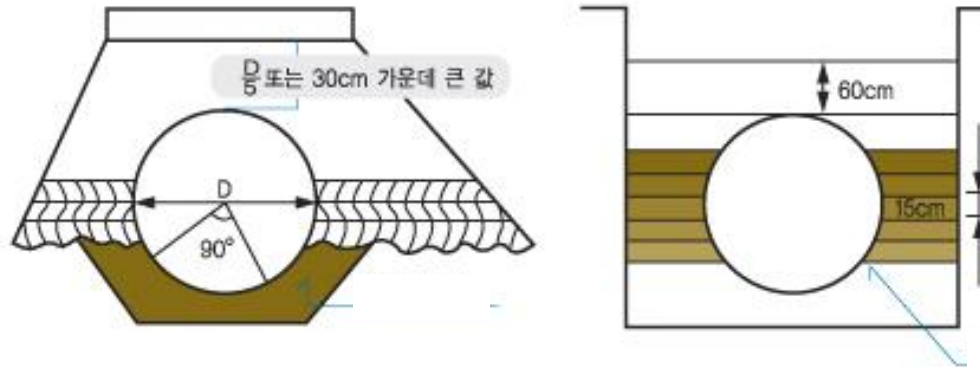
Ground Condition	Minimum thickness of soil layer of ground			Width of ground
	< 900mm	900 ~ 2,000mm	2,000mm <	
Ordinary ground condition	20cm	30cm	0.2D	D
Rocky ground condition	20cm If cover height is higher than 5m, 4cm added every 1m of cover height			D
Poor ground condition	50cm	0.4D or 50cm (Larger value applied)	0.3D (Maximum 1m)	2D~3D

* D: Diameter of CS Pipe

CS Pipe

▶ Installation Guideline

Backfilling



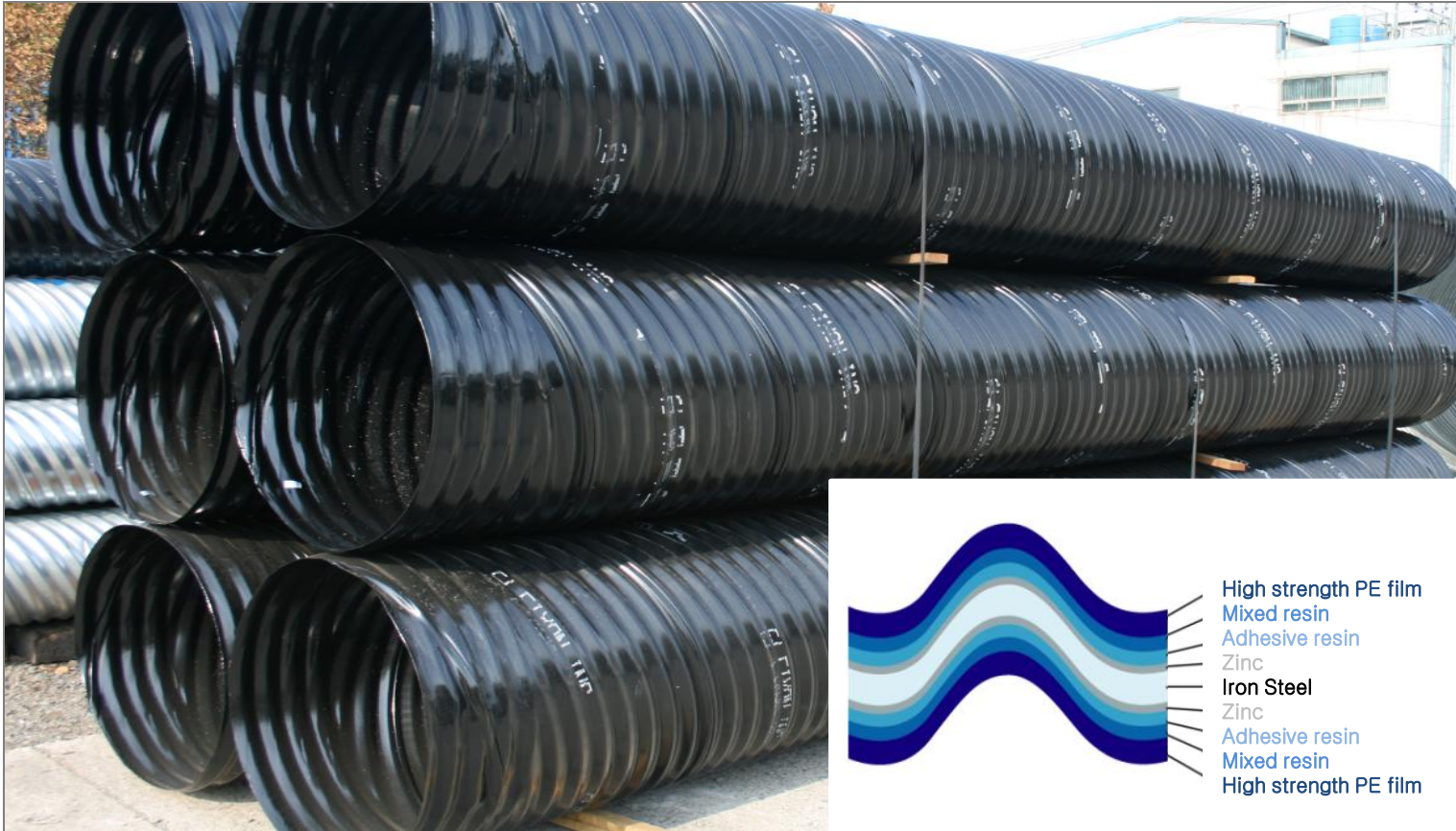
- ✓ Fine quality of soil should be used. Dry density: 95%
- ✓ Backfilling compaction: every 15 cm
- ✓ Backfilling cover height: 25cm or $D/5$ whichever greater

Galvanized CS Pipe



- ▶ With 600g/M² zinc coating the service life is up to **75year: high corrosion resistance**
- ▶ CS Pipe is the most popular solution for **storm water drainage**

Polyethylene Laminated (PL) CS Pipe



► Polyethylene film coated CS Pipe for salty or contaminated land

High-strength PL (HPL) CS Pipe

○ 물리적 충격 시험

충격에너지 (J)	JPL	FPL	HPL
50 J			
TEST 결과	파괴손상	이상없음	이상없음
60 J	NG		
TEST 결과		파괴손상	이상없음
65 J	NG	NG	
TEST 결과			이상없음





- 시험 방법 : ASTM D3763 - 시험기관 : 전남 신소재 기술산업화 지원센터
 - HPL 파형강관은 65J에도 물리적 파복 손상 없음

- ▶ HPL CS Pipe is more than 2 times stronger than PL CS Pipe in shock-resistance with high strength mesh in the polyethylene film

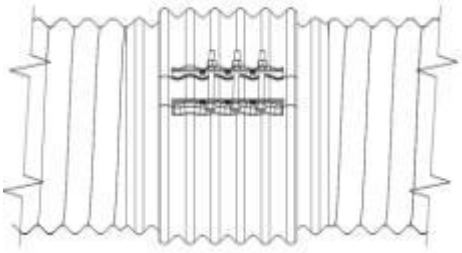
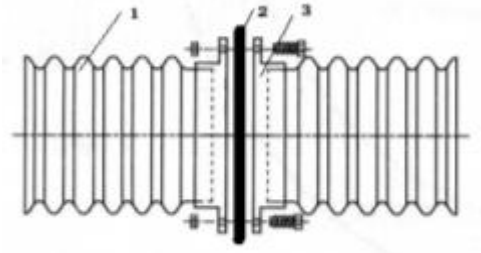
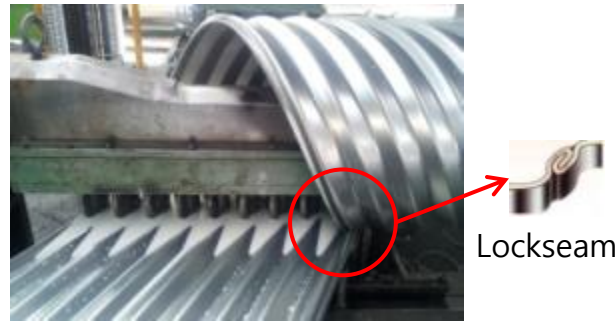
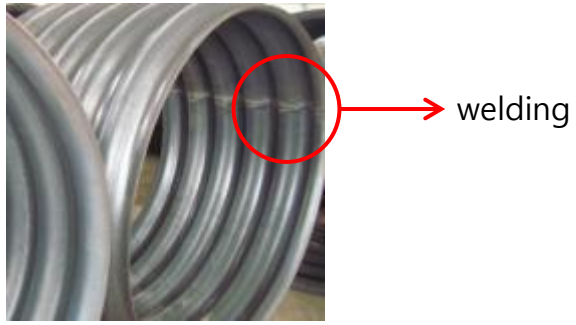
CS Pipe Pipe Comparison

Item	CS pipe	PL CS pipe	HDPE pipe	Concrete pipe
Pipe				
Material	Zinc(600g/m ²) coated steel with enhanced strength from being corrugated.	PE film laminated Zinc coated corrugated steel	Making in circular with High density PE material rectangle pipe enhanced by bar reinforcement.	Integrating wire in oblique line or in spiral to the concrete wall formed by centrifugal force.
Size (diameter)	D150~3,600MM	D150~3,600MM	D150 ~ D2,000MM	D250 ~ D1,800MM
Length	L = 1M~10M/ea	L = 1M~10M/ea	L = 6.0M/ea	L = 2.5M/ea
Purpose	Rainwater drainage	Rainwater, sewer, waste pipe	Rainwater, sewer, waste pipe	Rainwater drainage
Chemical resistance	Relatively good.	Superb against sodium and chemicals.	No reaction to acid and alkali	Easily corrosive at acid, alkali and sodium.
Corrosion	Excellent	Excellent	Excellent	Good
Flexibility	<ul style="list-style-type: none"> • Easy to install at any location • Well compatible at even differential settlement 	<ul style="list-style-type: none"> • Easy to install at any location • Well compatible at even differential settlement 	<ul style="list-style-type: none"> • Easy to install at any location • Well compatible at even differential settlement. 	<ul style="list-style-type: none"> • Weak joint at differential settlement.




CS Pipe ▶ Pipe Comparison

	CS pipe	PL CS pipe	HDPE pipe	Concrete pipe
Pipe				
Installation	<ul style="list-style-type: none"> • Easy to handle: Light weight and easy connection • High adaptability to soft ground and differential settlement • Buoyancy: Light weight • Caution required during backfill and compaction 	<ul style="list-style-type: none"> • Easy to handle due to its lightness of weight and simple connection • High adaptability at soft round and differential settlement. • Weak at buoyancy due to its lightness • Require caution during backfill and compaction 	<ul style="list-style-type: none"> • Applicable at differential settlement • Weak at buoyancy due to its lightness • Possibility of deformation due to the external pressure • Telescopic pipe required for temperature differential. 	<ul style="list-style-type: none"> • As rigid pipe, strong against external pressure & no deformation • Strong at buoyancy but adverse while handling at sites • Installation cost increased for footing concrete installation.
Joint	<ul style="list-style-type: none"> • Coupling band 	<ul style="list-style-type: none"> • Coupling band 	<ul style="list-style-type: none"> • Watertight socket connecting • Electrical melting connection & watertight sleeve connecting 	<ul style="list-style-type: none"> • Pipe(A type): watertight belt(band), Collar + Mortar connecting • Socket(B Type) : Rubber ring
Service Life	Over 70 years	Over 70 years	Over 50 years	20~30 years
Maintenance	<ul style="list-style-type: none"> • Light weight & and easy to repair due to the various joints 	<ul style="list-style-type: none"> • Light weight & and easy to repair due to the various joints 	<ul style="list-style-type: none"> • Light weight & and easy to repair due to the various joints 	<ul style="list-style-type: none"> • High installation cost due to pipe base work but favorable at small diameter pipe

CS Pipe ▶ Pipe Comparison

Item	Fixon Spiral CSP	Chinese Circle Type CSP
Shape		
Production process	Forming corrugation → Pipe seaming → Cutting	Forming corrugation → Curving → Welding
Piping process	 <p>Lockseam</p> <ul style="list-style-type: none"> • Continuous production by spiral piping applying "Lockseam process" 	 <p>welding</p> <ul style="list-style-type: none"> • Connecting two half circles of steel plate by welding

CS Pipe ▶ Pipe Comparison

Item	Fixon Spiral CSP	Chinese Circle Type CSP	Chinese Spiral CSP
Feature			
Productivity	<ul style="list-style-type: none"> • 40Mt/day • Continuous production 	<ul style="list-style-type: none"> • Less than 10 Mt/day • Inefficient production 	<ul style="list-style-type: none"> • Continuous production • Less than 25 Mt/day
Product line	<ul style="list-style-type: none"> • Galvanized CSP • Polyethylene Laminated CSP 	<ul style="list-style-type: none"> • Galvanized CSP only 	<ul style="list-style-type: none"> • Galvanized CSP only

CS Pipe



Project: Under-road Drainage



CS Pipe Manufacturing Line



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Thank you

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