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FIXON

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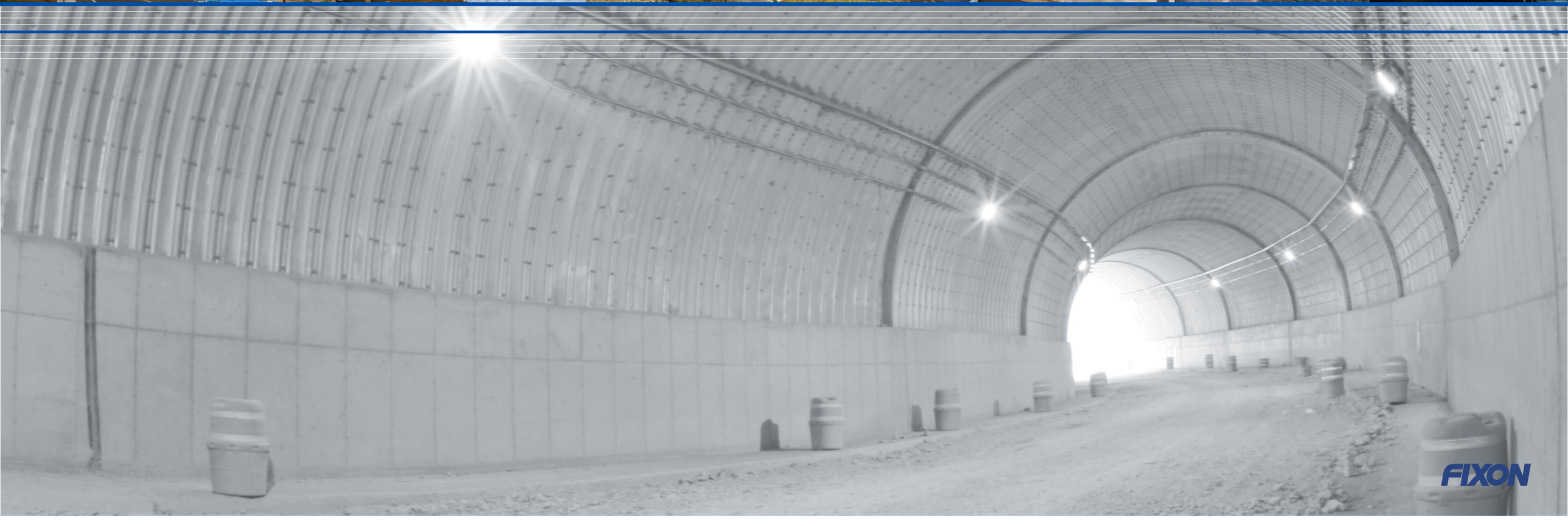
ECO PLATE

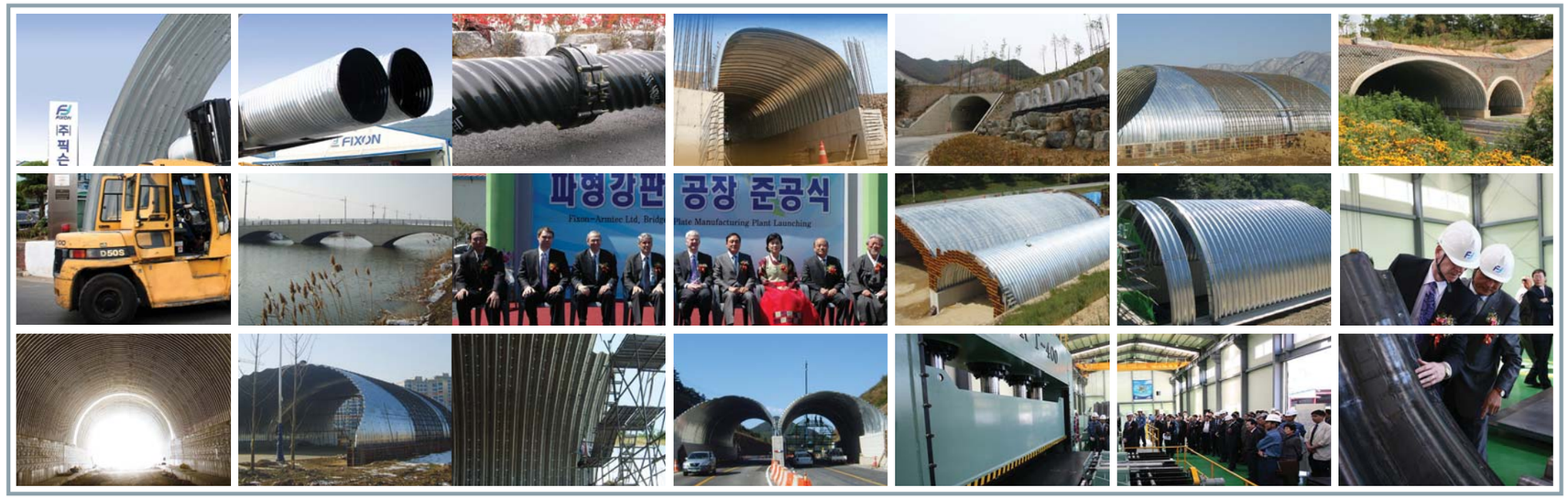


Welcome to the dynamic world FIXON is creating.

As a leading Corrugated Steel Pipe(CSP) and Corrugated Steel Plate company in Korea FIXON has paved a new road toward the future. Our ambitious efforts have resulted in a number of outstanding successes. Among them are new technologies in producing polyethylene laminated CSP and in reinforcing corrugated steel plate structures. These new technologies are believed to make great contributions to the industry by offering solutions for the decades old critical issues. In 2007 FIXON took a bold step to establish a joint-venture, FIXON-Armtec Ltd., in Gwangyang, Korea with Armtec, the world's best deep corrugated steel plate company in Canada. FIXON-Armtec manufactures BRIDGE PLATE, the best deep corrugated structural steel plate, exclusively for FIXON. With BRIDGE PLATE, FIXON became not only to substitute imported deep corrugated steel plates to Korea but also to export them to the world market. Currently FIXON is the only company in Korea producing both corrugated steel pipe and corrugated steel plate. FIXON has maintained its growth to carry out the missions as the industry leader. FIXON's Research Institute established in 2001 has played a leading role to address such missions, and made distinguished achievements in the development of new technology and quality improvement. We believe that the benefits of our success must be shared with our neighbors and society. The charity foundation, Charmsam Village, that FIXON has established in 2008 is a remarkable start to share the benefits with the society. We invite you to join the dynamic world of FIXON. Thank you.

FIXON INC.

History Of **FIXON** Securities

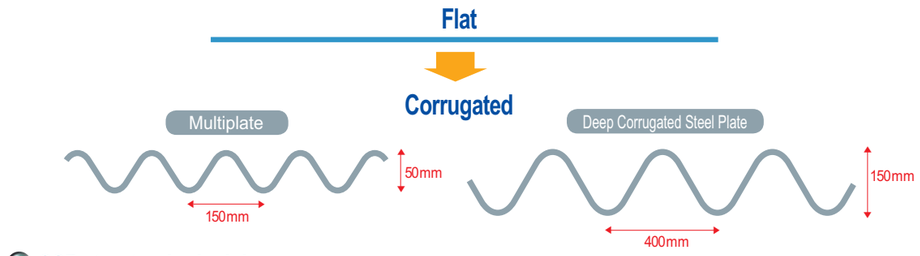


1994 Incorporated as Daesung Industries Inc.
1995 Certified with the Korea Standard on Corrugated Steel Pipe Certification
1997 Designated as promising small company
1998 Initiated the KCSPA(Korea corrugated Steel Pipe Association)
1999 Designated as superb venture company
2000 Designated as high technology competitive venture company
2001 Certified with the Ministry of Science and Technology on rare metal research institute
2001 Instituted research center on rare metal with Suncheon national Univ.
2002 Polyethylene Laminated Corrugated Steel Pipe(PLCSP) in selected as the Best Product by the Ministry of Public Procurement Service
2002 Designated as high technology company by KIBO
2002 Established Deasung America Inc. in Chicago, USA
2003 Designated as technical developer of rare metal manufacture techniques in national projects by the Ministry of Science and Technology
2004 Renamed to FIXON INC.
2004 Selected as innovative business
2005 Selected as clean business
2006 Chosen as promising export company
2006 Ministry of Commerce, Industry and Energy acknowledged PF Corrugated Steel Pipe as a excellent product.
2007 Launched the Bridge Plate Manufacturing
2007 Established Fixon-Armtec Ltd.
2008 Take over the Deasung new tech in China
2008 Open Charmsam Park for the mentally disabled
2009 Patent granted on "Composite Beam System" in Russia
2010 Patent granted on "Composite Beam system" in Canada

FIXON established joint-venture, Fixon-Armtec Ltd., with Armtec in Canada. And now they procude the best deep Corrugated Steel Plate "Eco(Bridge) Plate".

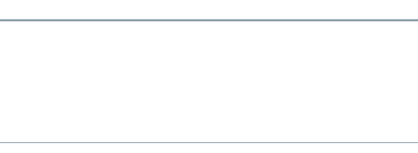
Corrugated Steel Plate

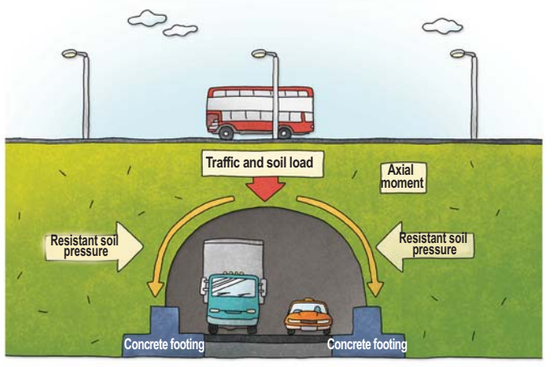
Steel plate with thickness from 2.7mm to 8mm being corrugated to increase stiffness and 900g/m2 galvanized to increase durability for lifespan up to 100 years(AISI)



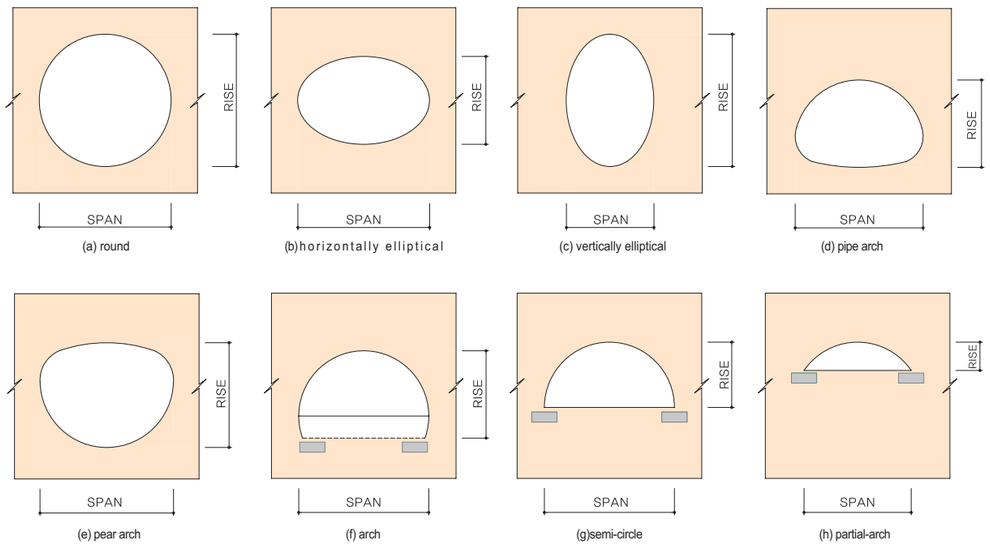
CSP structural principles

When vertical pressure is applied to corrugated steel structural plate, the vertical diameter contracts and the lateral diameter expands. Eventually the pressure surrounding structure become even by soil-steel interaction. Thanks to this soil-steel interaction, it inhibits bending moment and keep compressive strength throughout the structure.



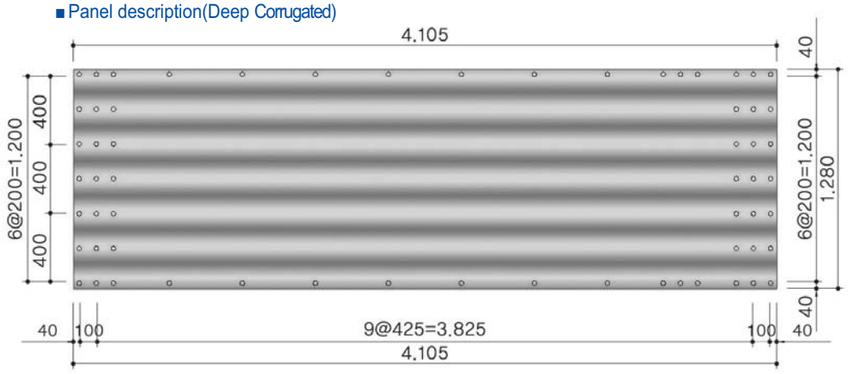


Profile available



CSP specification

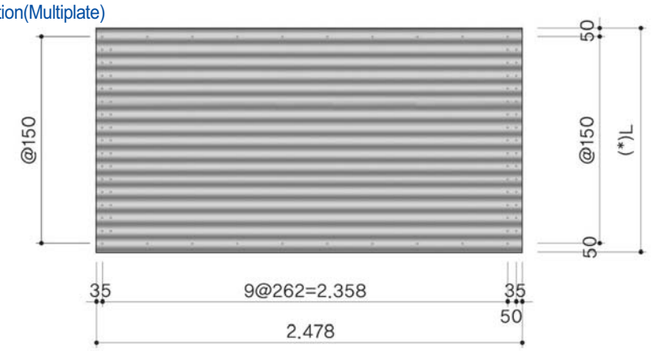
■ Panel description(Deep Corrugated)



■ Specification (Deep Corrugated)

Section unit H(425mm)	Length(mm)	Length including overlapping area(mm)
3	1275	1555
4	1700	1980
5	2125	2405
6	2550	2830
7	2975	3225
8	3400	3680
9	3825	4105

■ Panel description(Multiplate)



* Effective length “L” applies 450, 600, 750, 900, 1050, 1,200 according to in KS D 3590 7.3.2

■ Size of Panel

Height N(262mm)	Length(mm)	Length including overlapping part(mm)
3	786	906
6	1572	1692
9	2358	2478

■Corrogation profile

Type	Thickness(t)	Pitch(p)	Depth(d)	Radius(r)
Eco Plate	3.0~8.0mm	400mm	150mm	81mm
Multiplate	2.7~7.0mm	150mm	50mm	28mm

Note 1) Nominal thickness(calculated before galvanizing)

■ Material properties

Material code	Chemical Component		Mechanical properties				
	P(%)	S(%)	Amount of Zinc (g/m^2) 1)	Yield Strength (MPa) 2)	Tensile Strength (MPa)	Elongation(%)	
						t≤5	5<t ≤16
ASTM A 1018 Gr40	≤0.035	≤0.04	900≤	275≤	380≤	19≤	14≤
SS490	≤0.040	≤0.05	900≤	285≤	490≤	19≤	15≤
SS400	≤0.050	≤0.05	900≤	245≤	400≤	21≤	17≤

Note 1) For both side
2) Values for design (Different values from other test is applicable.)

■ Eco Plate properties by thickness

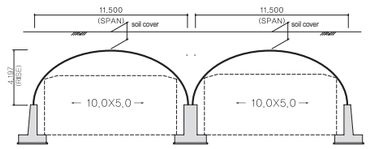
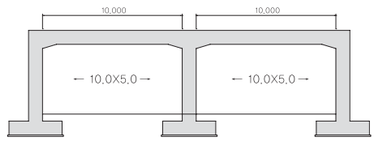
Nominal thickness t(mm)	Area of section As(mm^2/m)	Section modulus Ss(mm^3/m)	Plastic modulus Z(mm^3/m)	Moment of inertia I(mm^4/m)
8.00	109.35	372.48	518.88	3075.90
7.00	96.40	329.69	456.35	2707.10
6.00	82.60	283.71	390.57	2315.40
5.00	68.11	235.04	321.69	1906.00
4.30	57.92	200.52	273.69	1618.70
4.00	53.51	185.50	252.66	1494.40
3.00	39.05	136.01	184.16	1086.60

■ Multiplate properties by thickness

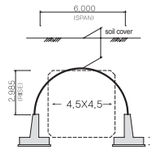
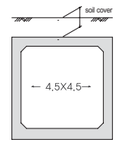
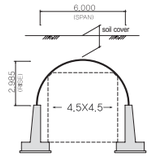
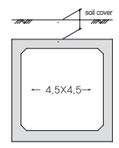
Nominal thickness t(mm)	Area of section As(mm^2/m)	Section modulus Ss(mm^3/m)	Plastic modulus Z(mm^3/m)	Moment of inertia I(mm^4/m)
7.00	87.10	92.26	135.70	262.93
6.00	74.60	79.64	115.78	223.01
5.30	65.86	70.75	101.95	195.62
4.50	55.88	60.49	86.25	164.84
4.00	49.65	50.42	76.50	145.87
3.20	39.69	43.57	60.99	115.90
2.70	33.48	36.96	51.35	97.40

Comparison of CSP structure by Eco Plate with concrete-rebar structure

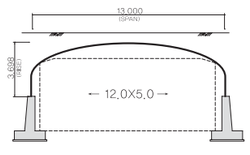
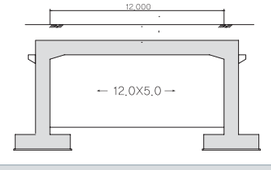
■ Open-cut tunnel

Clearance box	Corrugated Steel Plate structure	Concrete - rebar structure
10.0m × 5.0m		
Price	70%	100%

■ Culvert

Clearance box	Corrugated Steel Plate structure	Concrete - rebar structure
Waterway 4.5m × 4.5m		
Underpass 4.5m × 4.5m		
Price	70%	100%

■ Bridge

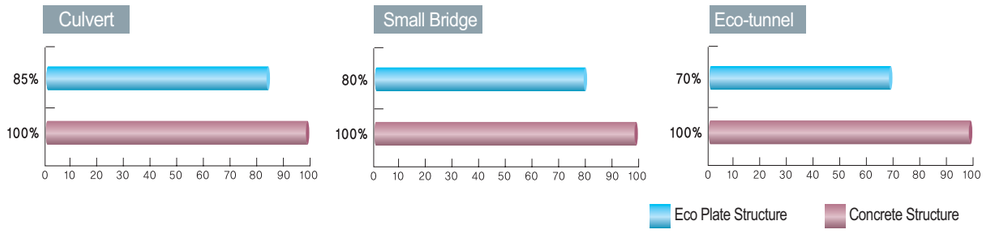
Clearance box	Corrugated Steel Plate structure	Concrete - rebar structure
12.0m × 5.0m		
Price	75%	100%

FIXON have successfully substituted Corrugated Steel Plate imported so far from overseas with Eco Plate. Moreover it is exported to worldwide. FIXON are the only manufacturer in Korea who produce both corrugated steel pipe and corrugated steel plate.

Advantages

Economic

Eco Plate structure is economical 15 to 30% than concrete one.



Fast construction

Production conforming to ASTM and KS standard guarantee qualities in consistence. Plates are assembled with only bolt and nuts, which saves construction time, especially during winter time that is bad for concrete curing

Eco-friendly

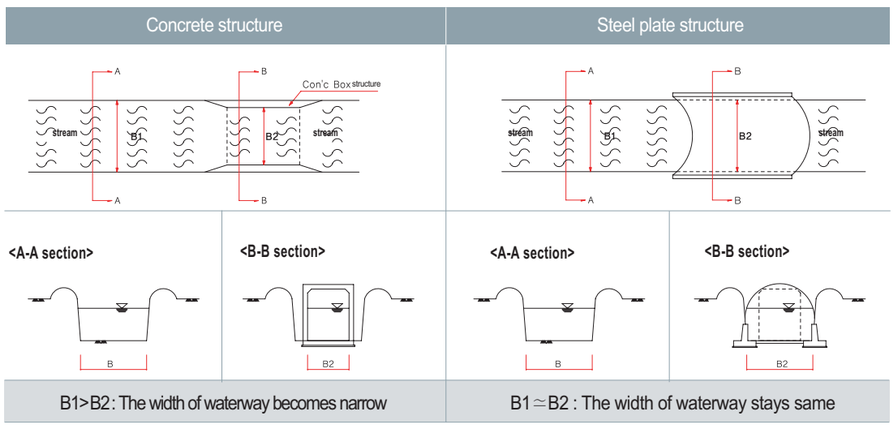
Unlike the concrete structure that leaves a lot of constructional wastes after dismantling, Eco Plate structure comprises mostly steel that is 100% recyclable. Also Eco Plate structure enables partial maintenance and affects the environment in vicinity very little.

Durability

900g/m2 hot dip galvanizing according to CSA G164 offers long durability. Eco plate coated with 900g/m2 of zinc. For longer durability, aluminized coating is also available.

Excellence in clearance

Eco Plate structure, especially the bridge provides free of bottlenecked water-flow thanks to well connectivity between upper and low stream



B1>B2: The width of waterway becomes narrow

Characteristic of galvanizing

01_ Highly densed zinc layer and its reactivity prevent corrosion of base metal underneath.
02_ Zinc and steel shape alloy strongly attachable to base metal.
03_ Reliable coating as even the part that cannot be reached by hand is provided.
04_ Ever-consistent mechanical properties.
05_ Wide application including additional painting of coating.
06_ No additional anti-corrosion coating needed in construction site.
07_ Very little maintenance in long term basis

Characteristic of Hot dip galvanization

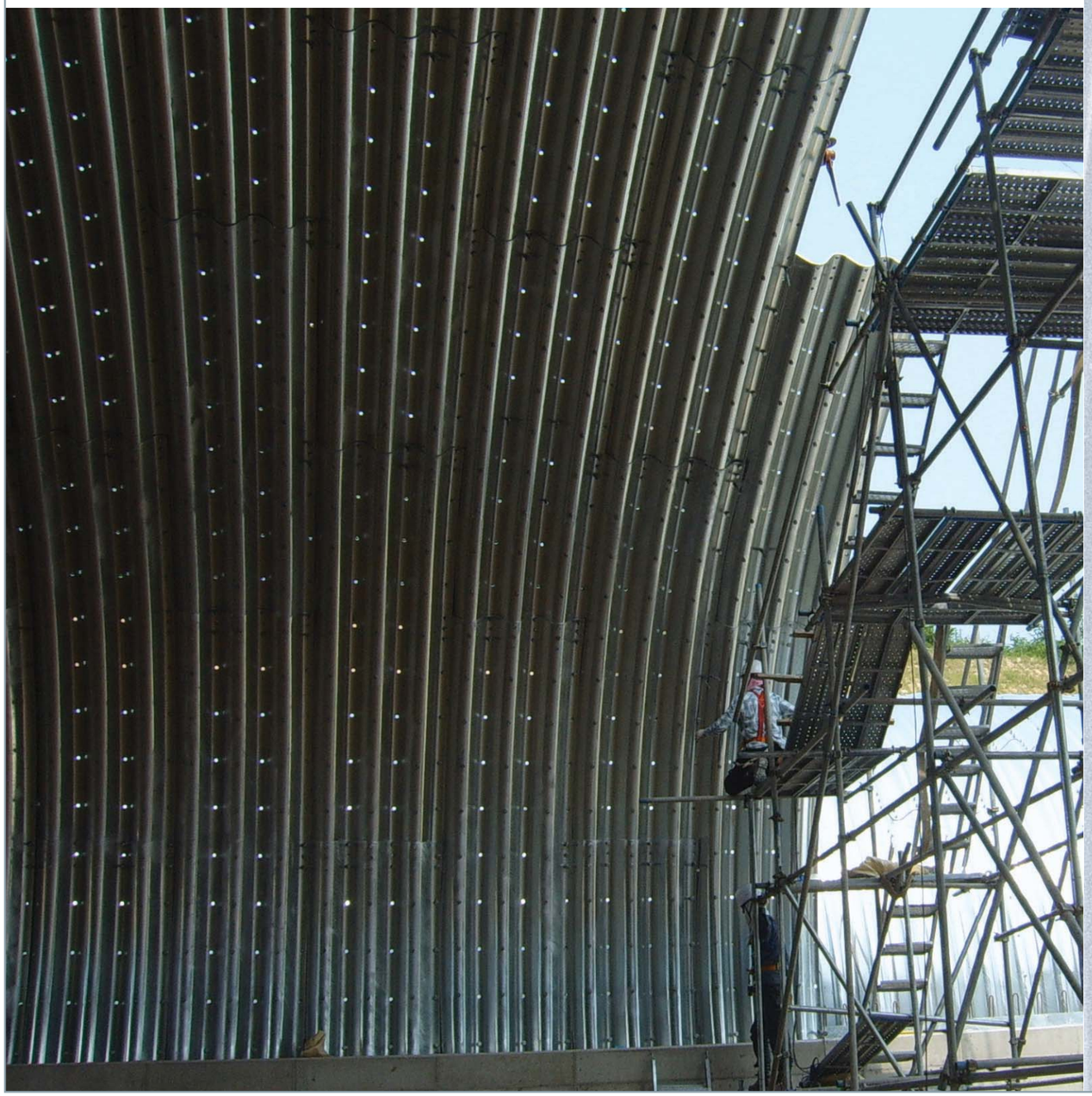
	Hot dip Galvanizing	General Plating
Process sequence	- Requires plate etching - Drying after galvanizing - Processed according to 3 classes.	- Plate cleaning(Blasting) before Process - Drying after Spraying materials on the plate
Durability	- 50yrs more under mild situation	- Re-coating needed every5 to 10yrs
Characteristic	- Cathodic protection if layer has scratches less than 2mm deep. - High adhesiveness to base metal because of the potential difference.	- Repair coating is needed for scratch - Regular maintenance is necessary - Weak adhesiveness compared with galvanizing
Economical view	- Readiness from the factory and no additional coating in end destination, which possibly bring contamination. - Cost-wise for its life cycle.	- Excessive maintenance expense - Initial cost for rust prevention can be low but entire cost for re-coating is high.

Lifespan by environments

Factor \ Amount of zinc	900g/m²		Formula for life expectancy
	Amount of corrosion (g/m²/yr)	Durable years (yr)	
Seaside	12.3	65.8	Life expectancy = $\frac{\text{amount of zinc}}{\text{amount of corrosion}} \times 90\%$
Rural	6.7	120.9	
Urban	15.9	50.9	

*Amount of galvanizing 900g/m² = 126㎛

FIXON aware that our business creates new space in nature for our economy and country. We try our best to be the number one CSP manufacturer through our strict design, construction and monitoring system.



Installation

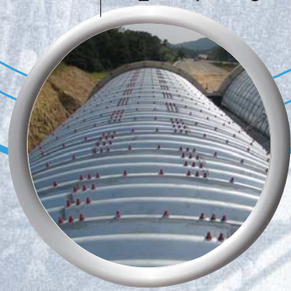
01_ Site Excavation

02_ Foundation by installing base channel

03_ Material transport and inspection

04_ Plate assembly and installation

05_ Waterproofing



06_ Backfilling

07_ Compaction

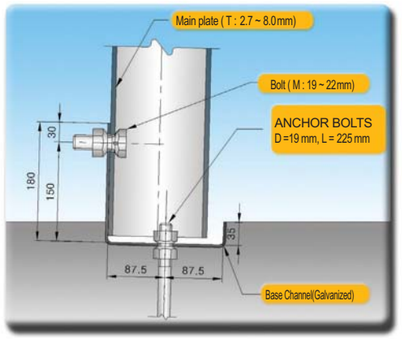
08_ Completion

Construction Sequence

Foundation

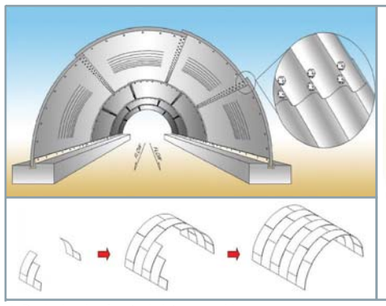
This stage is for installing base channels to achore the plate. Base-channeling is very critical to structural direction and footing. Accurate surveying of width of base channel is needed

1. Base channel connects concrete footing and main plate.
2. Base channel is installed with the anchor bolt for underground before concrete pouring.
3. According to purpose of structure, base channeling is not necessary.

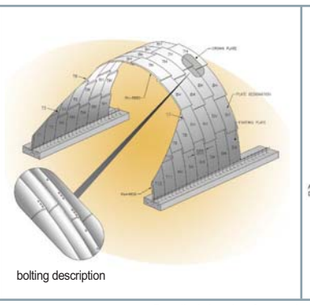


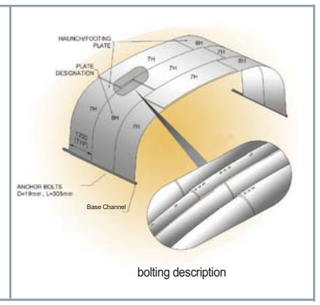
Assembly

Plate assembly sequence is marked in drawing for easy installation guide.



▲ Basic drawing for steel plate assembly





▲Detailed drawing for steel plate assembly

▲ Hunch assembly1

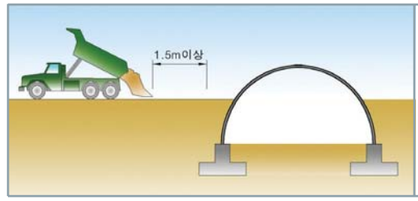
▲ Hunch assembly2

▲ Crown assembly1

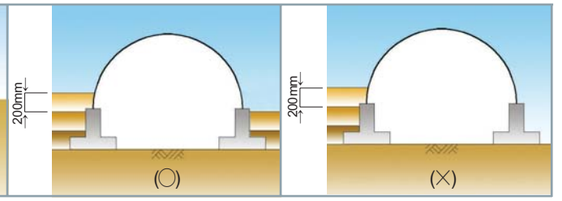
▲ Crown assembly2

Backfill

The backfill zone abides by the specification. Backfill material is Sb-1(Maximum granule size 75mm) or equivalent



Equipment cannot access within 1.5m from structure.



When a vibrating compactor is used for compaction, compacted thickness of each soil layer must not exceed 200mm. Any vehicles for compaction must keep away from the side of the structure to alleviate horizontal soil pressure. Each layer on both sides must be completed one by one in a returning manner.

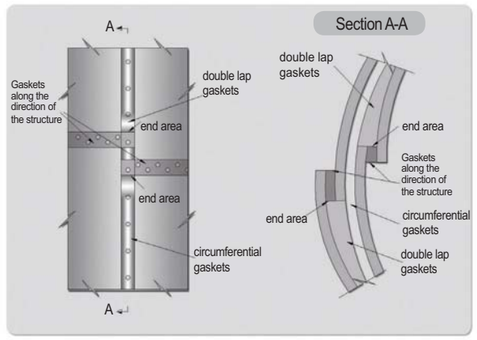
Compacting

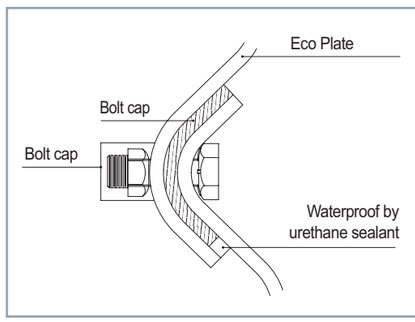
Backfilling material should obtain maximum moist contents, each soil layer should maintain minimum compaction density

Waterproof

Use rubber gaskets in gaps at overlapping area during assembly for waterproofing.

After gaskets installation, put rubber cap on bolted area by spreading urethane sealant.



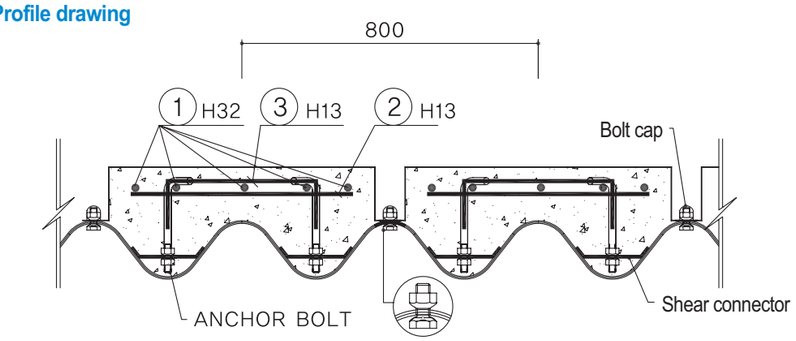


FIXON have built reputation for Corrugated Steel Plate in Korea with a lot of experiences in construction, completion and maintenance of CSP structures. We now offer remarkable solutions ever to overcome challenges and limitations that concrete structures have.

CBS(Composite Beam System) – Reinforcement Concrete Rib

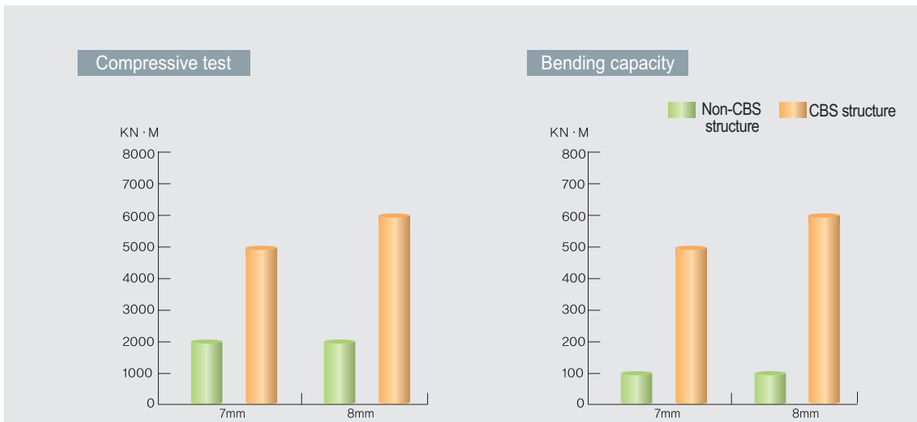
In case of structures with span over 18m span, which CSP structures have at the most, CBS is highly useful enduring uneven soil pressure or load from thick soil cover. Patented by FIXON in Russia and Canada, CBS provides increase in stiffness in connection area and rigidity of the whole structure. For example, it is recommended for construction of six lane highway or stockpile tunnels in mining area

CBS Profile drawing



CBS test result

Structures with CBS have more compressive strengths and bending capacity. According to the test result, the compressive strength and bending capacity increase by three times and six times respectively



CBS construction sequence

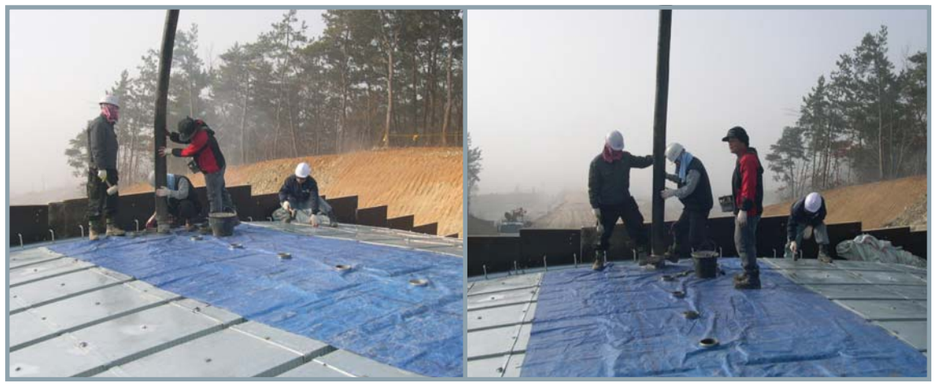
1. Rebar work

2. Ready for placing CBS steel form

3. Combining steel form with CSP shell starting from haunch part

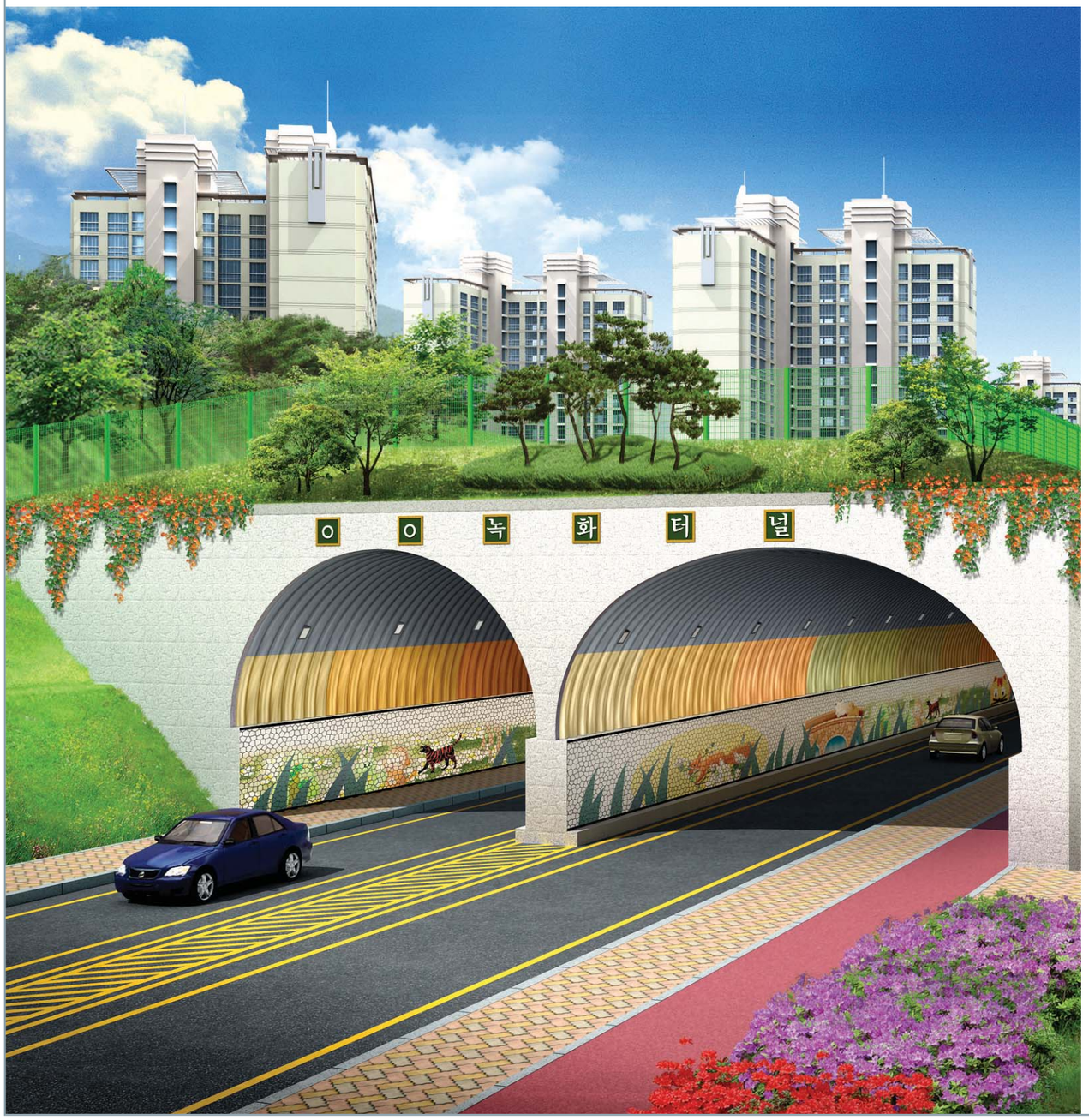
4. Concrete injection in combined area

5. Placing and cobining CBS steel form with CSP shell in crown part



6. Concrete injection in remaining combined area. Concrete is injected through Grout Fitting Hole.

We do our best for human and environment to bring harmony and prosperity with our human-environment oriented CSP design and construction experiences



▲Core-art panel completion

▲ Geolpo Eco Bridge in Gimpo

Finite Element Analysis

Specification in Korea

1. Korea Highway Corporation standard specification
2. Construction and Design Guideline for Corrugated steel plate structure
3. Korea Construction Corporation standard specification
4. KS D 3503/ KS D 3506 / KS D 3590
5. AASHTO(American Association of State Highway and Transportation Officials)
6. CHBDC(Canadian Highway Bridge Design Code)
7. ASTM A761/A796/A807
8. Complete design method and performance test for CSP structure(POSCO, RIST)

▶ Multiplate : AASHTO & CHBDC

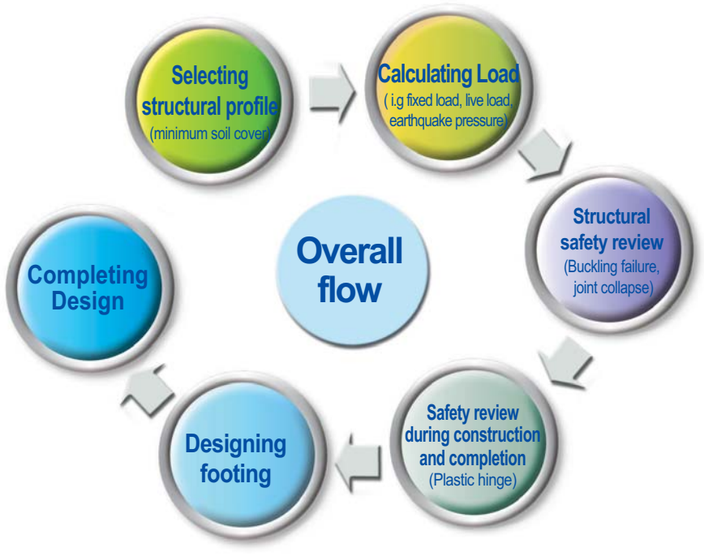
▶ Eco plate

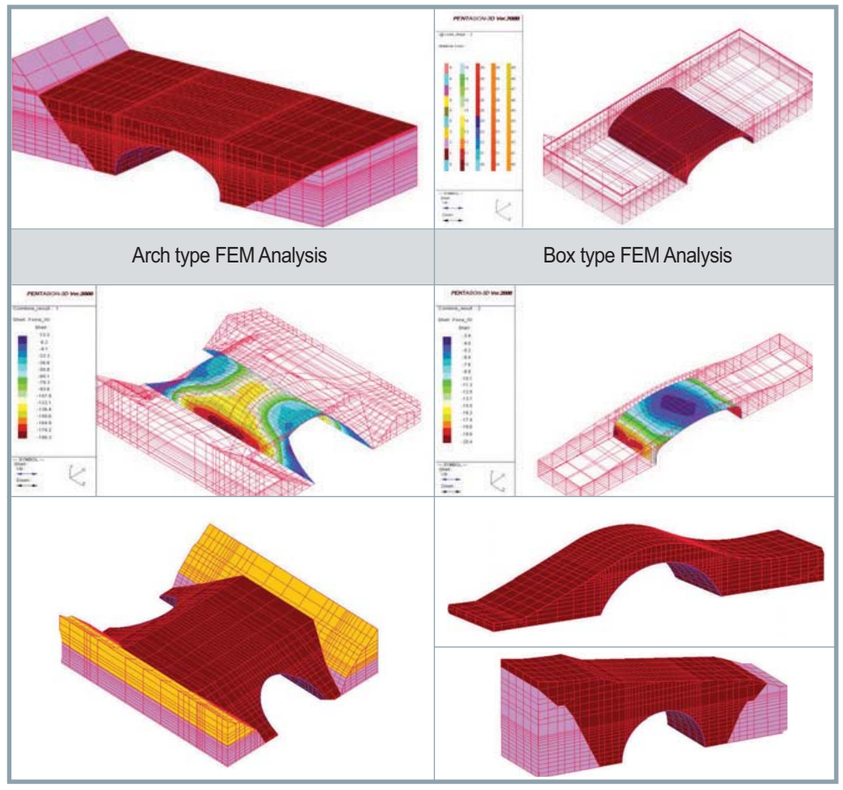
- For arch type : CHBDC - For Box type : ASSHTO

FE Analysis

CSP structure design needs 2D or 3D analysis to virtually monitor the structural changes according to factors. FIXON use Pentagon-3D software for soil modeling of interaction between the structure and adjacent covering soil and run analysis by Duncan-Chang Soil Model. Pentagon-3D simulates soil-steel interaction, bending moment and compressive moment during construction by changing backfill Es values according to compressive moments by height soil cover. On the basis of result from FE analysis, we can forecast effects of structure during constructions

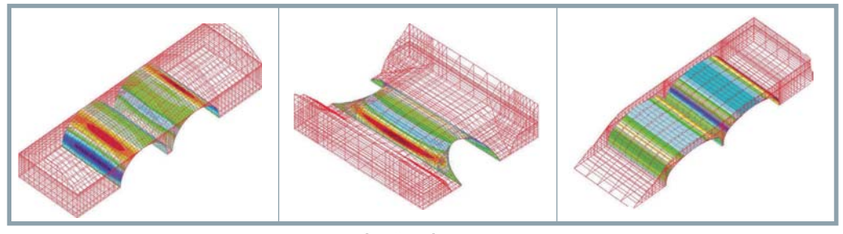
*** Structures with different soil pressure, skewness over 35 degree, high soil cover area, uneven soil cover pressure or box type structure with span over 8 meter or soil cover over. 1,5 meter might need otherwise additional analysis besides Pentagon-3D modeling.**





Arch type FEM Analysis | Box type FEM Analysis

Example of Finite Element Analysis



Section Segment

FIXON have established research center to develop new product and improve qualities. FIXON always seek to never-ending changes and renovation based on our project experiences supported by our best quality and new product development

Storm Water Retention Solution

Rain water retaining system

Fast installation

Saving construction time and minimizing traffic congestions and public complaints during construction

Durability

More than 100yrs life span thanks to galvanization

Constructability

In narrow or limited construction area, assemble plate first in nearby and bring it for anchoring. Plate manufacture is customized according to site condition or client's need.

Economical

40% cheaper than concrete method

Eco friendly

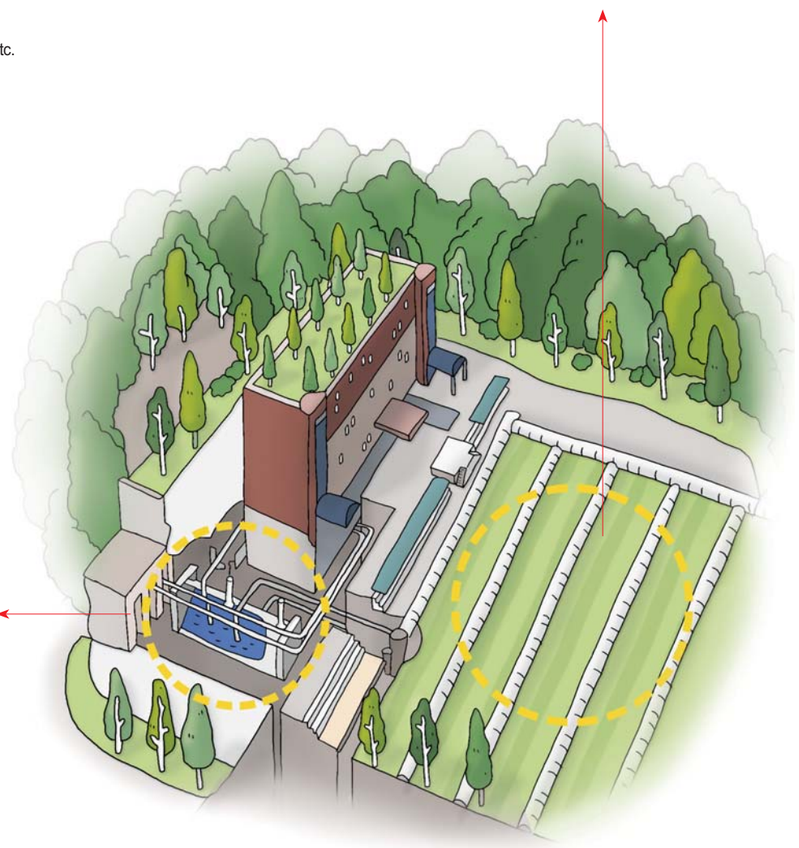
Steel plate is 100% recyclable after dismantlement

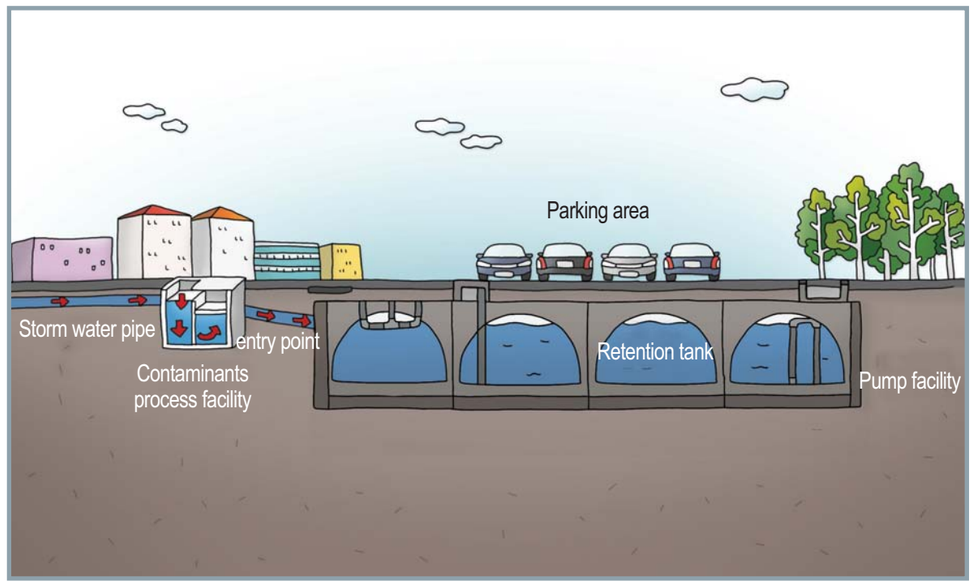
Using Upper space of structure

Upper space can be used as Park, Green zone or Parking lot etc.

Versatile

Recycling raindrop, preventing flood etc.





Construction cases

Giseong - Wonnam Road expansion construction

Shape : Low Arch, Span : 21.5m, Rise : 6.58m

Length : 30m, Plate Thickness : 8.0m, Design Load : DB-24

Wanju Shinchon Bridge

Shape : Box, Span: 10m, Rise : 2.87m

Length : 6.7m, Plate Thickness : 5.0m, Design Load : DB-24

Bridge at the Gwangyang Youth Camp Site

Shape : Multi-radius Arch, Span : 17m, Rise: 8.56m

Length : 6.08m, Plate Thickness : 8.0m, Design Load : DB-24

Gajimae Bridge for Farming road

Shape : Box, Span : 13.3m, Rise : 3.857m

Length : 7m, Plate Thickness : 8.0m, Design Load : DB-24

Construction cases

Godal - Sandong Eco Tunnel

Shape : Multi-radius Arch, Span: 17m, Rise : 5.95m
Length : 21.1m, Plate Thickness: 6.0m,
Design Load : DB-24

Gwangju Suwan district Tunnel Box

Shape: Box, Span: 6.68m, Rise: 3m
Length: 45.48m, Plate Thickness: 5.0m,
Design Load : DB-24

Damyang – Bukha Road Expansion and Pavement

Shape : Multi-radius Arch, Span: 10.5m,
Rise : 5.31m, Length : 40.18m,
Plate Thickness : 7.0m, Design Load : DB-24

Milyang leaders CC Tunnel

Shape : Multi-radius Arch(CBS),
Span : 10.5m, Rise: 5.31m,Length : 156.75m,
Plate Thickness : 5.0mm ~ 7.0m,
Design Load : DB-24

Water retension facilities in Ulju

Shape : Box(triple-arch), Span : 7.502m,
Rise : 2.001m, Length : 52.481mPlate
Thickness : 7.0mm, Design Load : DB-24

Hanam - Pungsan Eco Tunnel

Shape : Low Arch(CBS), Span : 21m,
Rise : 6.65m Length: 40m,
Plate Thickness : 7.0m, Design Load : DB-24

Certificate