

*The Right Choice &  
The Best Solution In*

# **SUSPENSION BRIDGE**

BRIDGE ENGINEER



BRIDGE BUILDER



(void intentionally)

## Who we are

**KWANSOO** is a construction company with successful track records and has been a leader in the field of long span bridge construction with technical expertise and extensive experience in erection of cable and girder.

**KWANSOO**, since its foundation, has been involved in construction of every suspension bridges in domestic market and actively working in construction of overseas project, and, based on the technical know-how acquired through experiences, focuses on expanding in construction of suspension bridge in overseas markets.

**KWANSOO**, owns key equipments for Aerial Spinning and PPWS installation as well as various conventional equipments, and also has designed and manufactured a wide range of erection equipment for various types of suspension bridges.

**KWANSOO** has kept developing the erection technology including customizing special equipment and tools, site oriented detail engineering scheme, and so on.



Yi Sun-sin Bridge, Korea  
The world's fourth longest span

## What we do



Dandeung Bridge, Korea  
Girder erection by c-shape lifting gantry for 3D main cable



Paryeong Bridge, Korea  
Main cable wire erection by air spinning method

### Construction

- Hauling system (A/S, PPWS)
- Catwalk system
- Tramway system
- Cable & Girder erection

### Construction Engineering

- Planning of cable & girder erection
- Detailed design of temp. structure
- Site supervision

### Equipment Provision

- Special equipment for suspension bridge
- General equipment for onshore and offshore

### Cable/System Supply

### Maintenance

- Repair & Reinforcement of suspension bridge

**KWANSOO** prides itself in providing our customers the best service possible through a dedicated and experienced team of professionals.

since 2009	KWANSOO		since 2003		ENVICO	
<ul style="list-style-type: none"> <li>· Cable System Erection</li> <li>· Steel Deck Erection</li> </ul>	<ul style="list-style-type: none"> <li>· Supervision of Main Cable &amp; Deck Erection</li> </ul>	<ul style="list-style-type: none"> <li>· Cable System Erection</li> <li>· Steel Deck Erection</li> </ul>	<ul style="list-style-type: none"> <li>· Equipment Provision</li> </ul>	<ul style="list-style-type: none"> <li>· Cable System Erection</li> <li>· Steel Deck Erection</li> </ul>	<ul style="list-style-type: none"> <li>· Construction Engineering</li> </ul>	<ul style="list-style-type: none"> <li>· Independent Design Check</li> <li>· Construction Engineering</li> </ul>
<p><b>Project</b> [Completion / location]</p> <ul style="list-style-type: none"> <li>· Total Length (Main span)</li> <li>· Cable Weight (Strength)</li> </ul>	<p><b>Yi sun-sin bridge</b> [2013 / KOREA]</p> <ul style="list-style-type: none"> <li>· 2,260m (1,545m)</li> <li>· 12,773 ton (1,860MPa, Air Spinning)</li> </ul>	<p><b>Ulsan bridge</b> [2014 / KOREA]</p> <ul style="list-style-type: none"> <li>· 1,150m (1,150m)</li> <li>· 5,349 ton (1,960MPa, PPWS)</li> </ul>	<p><b>Dandeung bridge</b> [2015 / KOREA]</p> <ul style="list-style-type: none"> <li>· 400m (400m)</li> <li>· 1,079 ton (1,960MPa, Air Spinning)</li> </ul>	<p><b>3<sup>rd</sup> Bosphorus bridge</b> [2016 / TURKEY]</p> <ul style="list-style-type: none"> <li>· 2,164m (1,408m)</li> <li>· 13,000 ton (1,860MPa, PPWS)</li> </ul>	<p><b>Paryeong bridge</b> [2016 / KOREA]</p> <ul style="list-style-type: none"> <li>· 1,325m (850m)</li> <li>· 3,417 ton (1,960MPa, Air Spinning)</li> </ul>	<ul style="list-style-type: none"> <li>· Construction Engineering</li> </ul>
<ul style="list-style-type: none"> <li>· Design of Main Cable System</li> <li>· Construction Engineering</li> </ul>						

Special equipment for cable erection work

No.	Item	Specification	Q'ty
1	Driving winch	Input 1 tonf / Output 24 tonf	4
2	Driving winch	Input 15.5 tonf / Output 11.5 tonf	8
3	General winch	15 & 5 tonf	16
4	Wrapping machine	Wrapping speed max. 270mm/min	4
5	Wire reeling machine	Capacity 250 kgf, speed 500m/min	2
6	Lifting gantry	Lifting capacity 330 tonf	4
7	Compaction machine	Hydraulic cylinder 200 tonf x 6 nos.	8
8	Wire swift	Inside tension 600 & 300 kgf	6
9	Wire tensioner	Tension 250 kgf	4
10	Wire slacking machine		8
11	Rope unreeler for AS	5 & 3 tonf	10
12	Rope unreeler for PPWS	40 tonf	2
13	Tension control tower	4 Wire control system	8
14	Air spinning wheel	Wheel D=1,000mm (4-Wheel Type)	6
15	PPWS carrier	7 tonf	2
16	Guide roller	3 wheel type	200
17	Guide roller at tower		32
18	Turn sheave	D=1,000mm	36



**KWANSOO** not only has key equipment for cable erection on suspension bridge, but also has the facilities that can customize the equipment depending on the size and shape of bridge.

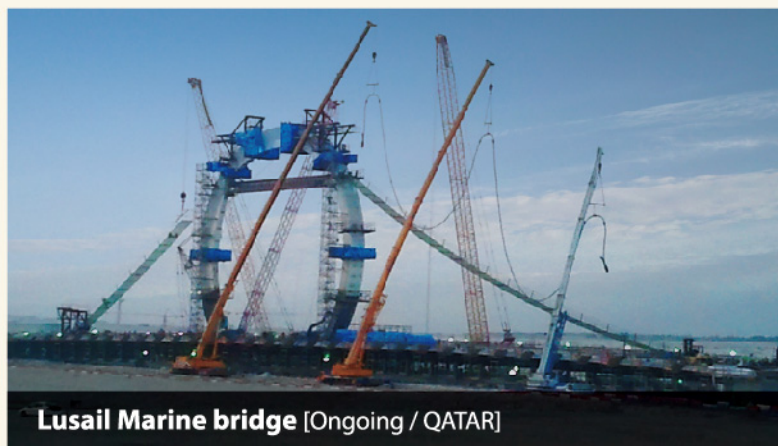
General equipment

Equipment for onshore			
No.	Item	Specification	Q'ty
1	Straddle carrier	900 TON	1
2	Gantry crane	80 TON	4
3	Overhead gantry crane	10, 7.5 & 5 TON	6
4	Crawler crane	100 & 80 TON	4
5	Mobile & Lorry crane	25 TON	5
6	Forklift	8, 7, & 5 TON	8
7	Tower crane	16 TON	5
8	Hoist	1 TON	3
9	Concrete pump truck	Boom 33m	3
10	Stationary pump		3
11	Hydraulic Jack & Pump	30 ~ 1,500 tonf	100
12	Generator and etc.		38

Equipment for offshore			
No.	Item	Specification	Q'ty
1	Tugboat	1200 & 1000 HP	5
2	Barge	1,000 ~ 4,000m³	5
3	Ferry boat	80 & 40 passengers	4
4	Speed boat	12 passengers	4



• Cable System Erection



**Lusail Marine bridge** [Ongoing / QATAR]

• 206/180 m (Two Bridges)  
• 200/160 ton (Locked Coil strand)

• Equipment Provision



**Sacheonnyeon bridge** [Ongoing / KOREA]

• 1,750m (2@650m)  
• 1,900 ton (1,960MPa, PPWS)

• Cable System Erection  
• Steel Deck Erection



**2nd Namhae bridge** [Ongoing / KOREA]

• 890m (890m)  
• 3,684 ton (1,960MPa, Air Spinning)

• Design & Independent Design Check  
• Construction Engineering



**Chacao bridge** [Ongoing / CHILE]

• 1,055 + 1,155 (Multispan)  
• 9,000 ton (1,860MPa, PPWS)

• Construction Engineering

• Design & Independent Design Check  
• Construction Engineering

• Design & Independent Design Check  
• Construction Engineering

• Design & Independent Design Check  
• Construction Engineering

## Who we are

ENVICO Consultants is a bridge engineering firm with successful track records and has been a leader in the field of long span cable supported bridge with technical expertise and extensive experience in Korea.

ENVICO has carried out various suspension bridge projects nationally and internationally based on the specific knowledge and technical know-how acquired through engineering activities at site as well as at office.

ENVICO's major experience of design includes Sae-Cheon-Nyeon Bridge, multi-span suspension. The major experience of construction engineering includes Yi Sun-sin Bridge, the world's fourth longest suspension and 3rd Bosphorus Bridge, hybrid of cable stayed & suspension.

ENVICO has actively participated in the "Super Long-Span Bridge R&D Project" (Government funded R&D project) and has provided a significant contribution to develop the key technologies of long span bridge, independently.

*The engineering solution you need, the engineering service we provide.*



## What we do



### Design

- Conceptual design
- Basic and detail design
- Independent design check



### Construction Engineering

- Erection planning of cable & girder erection
- Geometry control
- Erection design
- Planning & Design of temp. structure
- Site supervision



### Feasibility Studies

- Business feasibility
- Economic feasibility
- Structure feasibility



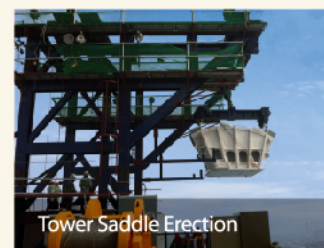
### Research & Development

- Research for erection system optimization
- Development of design software
- Internalization of erection technology
- Super long-span bridge R&D project

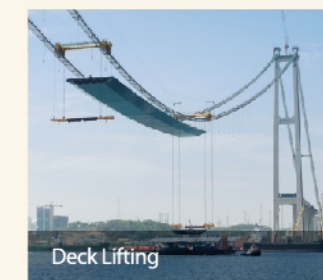
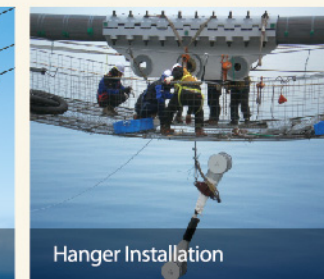
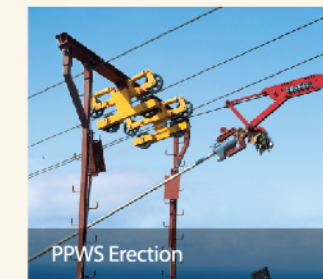
## Design



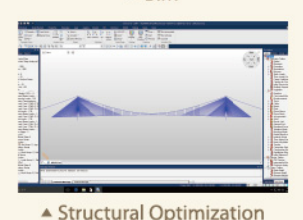
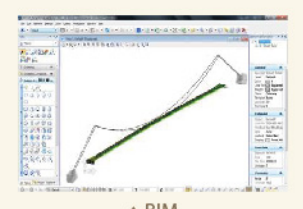
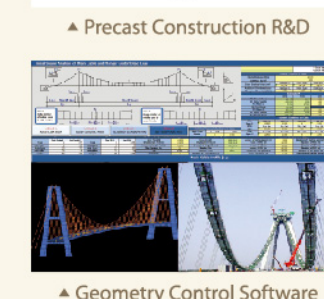
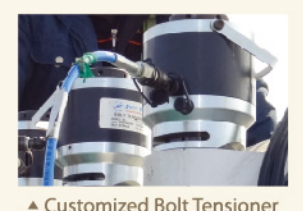
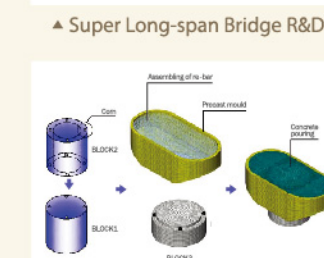
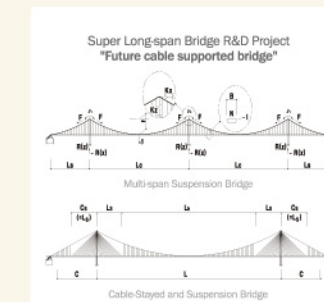
## Construction Engineering



## Construction Engineering



## Research & Development



**'ENVICO' & 'KWANSOO' in Suspension Bridge Projects**

NO.	Prj. Name (Cable type)	Main Span (Completion Yr.)	Contractor	Cable or Girder	Design and/or Construction Engineering (CE) <i>by ENVICO</i>						Construction <i>by KWANSOO</i>					
					Design or IDC	Erection Design		Geometry Control	Temp. Structure Design			Sub- Contractor	Equipment Provision	Supervisor		
						Basic	Detail		Basic	Detail	Shop					
1	Sorok Bridge (PPWS)	250m (2005)	DAELIM	Cable												
2	Yi Sun-sin Bridge (AS)	1,545m (2013)	DAELIM	Cable			●		●	●		●				
				Girder			●		●	●		●				
3	Paryeong Bridge (AS)	850m (2016)	DAELIM	Cable			●		●	●		●				
				Girder			●		●	●		●				
4	Ulsan Bridge (PPWS)	1,150m (2015)	HYUNDAI	Cable	●	●	●	●	●	●						●
				Girder	●	●		●								
5	Dandeung Bridge (AS)	400m (2016)	DAELIM	Cable			●		●	●	●	●				
				Girder			●		●	●		●		●		
6	2 <sup>nd</sup> Namhae Bridge (AS)	890m (2018)	GS	Cable		●	●	●	●	●	●	●	●	●		
				Girder		●	●	●	●	●	●	●	●	●	●	●
7	Lusail Bridge (LCR)	114m & 102m (2017)	SAMSUNG	Cable	●	●	●	●	●	●	●	●	●			
				Girder	●	●	●	●	●	●						
8	3 <sup>rd</sup> Bosphorus Bridge (PPWS)	1,408m (2016)	HYUNDAI SK	Cable	●	●	●	●	●	●	●					
				Girder			●	●	●	●						
9	Saecheonnyeon Bridge (PPWS)	650m+650m (2018)	DAELIM	Cable	●	●		●	●				●			
				Girder	●	●		●						●		
10	Chacao Bridge (PPWS)	1,055m+1,155m (2021)	HYUNDAI	Cable	●	●	TBD	●	●	TBD	TBD	TBD	TBD	TBD	TBD	TBD
				Girder	●	●	TBD	●	●	TBD	TBD	TBD	TBD	TBD	TBD	TBD



### ENVICO

ENVICO, established in 2003, is a bridge engineering company with outstanding performances in the field of design and construction engineering of long-span & cable-supported bridges. Team of 30 professional engineers are experts in design and construction engineering, and also have strong a competency to carry out all types of bridge structures.

### KWANSOO

KWANSOO is a subsidiary company of ENVICO established in 2009 as a bridge construction company, specialized in cable & girder erection of long span bridge including cable-stayed, arch as well as in general bridge. The business also covers cable/PT supply for bridge and supply of special equipment for erection.

This brochure is intended only for the suspension bridge among the company experience and capability.



(void intentionally)

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