STEEL CONFINED PRESTRESSED CONCRETE GIRDER
Introduction

We, SG ShinSung appreciate your everlasting concern and support on our company and SCP Girder System.

SG ShinSung is established in 1952 with 4th longest history in Korea construction business under the best credibility and sincerity and completed many projects in Korea, Middle East, Asia, China, Africa and various other countries.

SG ShinSung had invested in R&D continuously and developed “SCP Composite Girder” in 2003. Since then SG ShinSung also developed “MFD Composite Girder” and “Lattice Shell Construction method” and put its effort to extend the business opportunity.

We will continue our effort on investment in high-technology based on our experience in research and its practical development.

We, SG ShinSung expect your everlasting support and encouragement for our future success.

Thank you.

____________________________
CEO
MyongKeun, Lee.

VinaCon E&C, registered construction company in Vietnam under the sponsorship of Conclinic Co. Ltd in Korea which is established in 1997 and ever growing to the top class world known repair and retrofit construction business, will be the marketing representative of SG ShinSung for the territory of Vietnam, Myanmar, and other neighboring Asian countries.

____________________________
GENERAL MANAGER
HanWoong, Yoo.
Steel Confined Pre-stressed Concrete Girder

Bằng độc quyền sáng chế số: 7982
Patent No. 0370939 / Patent No. 0439470 / Patent No. 0554408
Factory Process of SCP System

Specifications

Detail Design

Material Purchase

Shop DWG

Approval

Checking

Treatment before Painting

Web Bending

templating

Plate Cutting

Sheath tube fabrication

Spacer manufacturing

Spacer fabrication

Sheath tube installation

Fabrication of main girder

Welding

Inspection

Pre-Assembly

Painting

Shipment
Construction site process

1. Carrying steel girders to construction site
2. Sheath tube Connection
3. Bearing Installation
4. Check material at construction site
5. Site welding
6. Upper Flange Bolting
7. Inspection
8. Tendon installation
9. Concreting
10. Site survey
11. Concrete curing
12. Tendon tensioning
13. Grouting
14. Transport of girder to site
15. Girder installation
16. Completion

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Structural concept of SCP girder

Characteristics of Steel Bridge
Roadway Bridge (Applicable span: Within 50m)
Railway Bridge (Applicable span: Within 30m)

Advantages
- Long span possible due to light weight
- Easy quality control by factory production

Disadvantages
- High Construction cost
- Disadvantage with deflection, vibration, and noise
- Long term maintenance

Advantages
- Relatively low cost compared to steel
- Tensile Stress reduction by prestress
- Low deflection and vibration

Disadvantages
- Difficulties in long span due to increasing in dead load
- Crack problem due to carbonation and chloride attack
- Rebar Assembly and steel formwork needed.

SCP Composite Girder
Roadway Bridge (Applicable span length: Within 45~75m)
Railway Bridge (Applicable span length: Within 40~55m)

- Long span possible due to steel and concrete composite
- Reduce construction cost due to low concrete cost
- Quality control enhancement due to simplification and rationalization of members
- Enhanced durability by protection from concrete carbonation and chloride attack
- Excellent construction ability by avoiding rebar and formwork
- Simplification of construction due to steel plate bending and reduced welding work

Construction work and economical characteristics

- Construction process is simple due to reduced welding and web steel bending process
- Production process by systemizing electronic automatic system for welding of upper and lower flange and web plate
- Exterior surface of girder is formed by steel plate, so no formwork necessary
- Minimized use of steel due to sharing of rigidity by internal concrete.
- Compare with other bridge system, long span construction reduce number of piers and foundations
- Extra rebar assembly work inside the girder is not necessary
- Composite of steel and concrete support compressive force
- Height of girder will be decided by adjustment of compressive strength of concrete and volume of steel work
- Composition of exterior steel and concrete (1st composition) will increase stiffness of girder and composition of tendon and inner concrete (2nd composition) will increase resistance of girder to tensile stress.
- Span length will be decided by adjusting dimensions of girder or adjusting thickness of lower steel plate and prestressing force of tendons.

- **Spacer member**
  - Function of spacer is to fix the inside of I-section of girder by welding

- **Stud Bolt**
  - Upper Stud Bolt size: Ø25X150
  - Inner Stud Bolt size: Ø19X60
  - Lower Stud Bolt size: Ø19X120

- **U-Bolt**
  - Used for correct positioning of sheath

- **Sheath**

- **Anchorage**

- **Upper Stiffener**
Standard cross-section of Composite Girder (Roadway bridge)

- Bridge cross section with 4 SCP girder (50m Single Span)

Cross Section

- Detail cross section of SCP Girder (50m) and applying span length by girder height

Mid-span Cross Section

<table>
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<tr>
<th>Girder Type</th>
<th>Span Length</th>
<th>Height/Span-Length Ratio</th>
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<td>FSC/BEAM</td>
<td>2.00</td>
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<td>12.077</td>
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End-span Cross Section
Standard cross-section of composite girder (railway bridge)

**Table:**

<table>
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<tr>
<th>Girder Type</th>
<th>Span Length</th>
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Structural test of SCP girder
Static load and fatigue test of 50m simple beam

Test condition and results

Static load test
Flexural test was conducted for the observation of failure behavior and failure mechanism of SCP girder. Under 300 tonf load at center of span, only some crack inside of slab concrete was detected without any sign of failure. Under the additional 260 tonf, no sign of failure were detected. 578 mm deflection was induced by the 560 tonf load. When the load was removed, displacement was recovered rapidly with the 99mm of residual displacement. This results mean that the sufficient safety margin of SCP girder under critical load is achieved.

Fatigue test
Fatigue test was conducted to observe fatigue crack behavior of welding details in SCP girder at around 2 million cyclic loading. Test result revealed fatigue cracking stress is higher than fatigue stress category B' in AASHTO code.

Real size static load test and fatigue test

Dismantling of SCP girder

- cross section
- left side
- right side
- bottom side
Continuous beam design and VE/LCC Analysis of SCP girder Bridge

Construction for continuous SCP Composite Girder

Construction sequence for continuous bridge

1. Install of precast SCP simple beam on the support
2. Connection at support for continuous beam and concreting at support
3. Construction of slab on the mid spans
4. Construction of slab concrete at the supports

Design Cross Section

Effective Width of slab

Positive Bending Moment

Negative Bending Moment

Bending Moment based on Load with Continuous

Sequential loading:
- self weight of girder + fixed dead load before composite
- Fixed dead load after composition + Live load

Status of research development of SCP girder

Research & Development Result
- Development of SCP composite girder (Dec. 2002, KICT)
- Development of SCP Girder to Continuous Bridges (Nov. 2003, KICT)
- VE/LCC Analysis of SCP Girder (Feb. 2004, Hangyang University)
- Research on Railway Bridge of SCP Girder (April. 2004, KICT)
- Development of continuous composite roadway bridge using SCP girder (July. 2005, KICT)
- Dynamic Performance Verification test of SCP girder (Jilang bridge) and research on dynamic behavior analysis (Dec. 2006, KRRI)
- Research on composite behavior and long term behavior of SCP girder (Sep. 2008, KICT)
- Research and study on dynamic characteristic of SCP girder (May. 2013, KICT)

Performance Verification & Test Result
- Short span static load and fatigue test of SCP girder (Mar. 2001, KICT)
- Static load test and fatigue test of SCP girder with continuous support (Aug. 2003, KICT)
- Static loading test of composite beam for roadway bridge (Feb. 2005, KICT)
- Verification test on grid steel anchor of SCP girder (Feb. 2005, KICT)
- Report on official evaluation of bearing capacity and engineering measurement and management of SCP girder (Okdong bridge) (Nov. 2007, KISTEC)
- Evaluation test on official bearing capacity (Seung Jeo bridge) of SCP girder (DEC. 2007, KISTRC)

※ KICT (Korea Institute of Civil Engineering and Building Technology), KRRI (Korea Railroad Research Institute), KISTEC (Korea Infrastructure safety corporation)
On 2013 Dec 9, SG ShinSung completed 70m SCP girder bridge, first longest single span bridge in Korea, and also the world first of this kind developed by genuine Korean Technology.

References of SCP girder bridge Construction

- **Bridges are constructed (as of 2014 March)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Name of bridge</th>
<th>Span length</th>
<th>Height</th>
<th>Owner</th>
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<tbody>
<tr>
<td>Highway roadway</td>
<td>Gunji-bridge &amp; other</td>
<td>1@70=70m</td>
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<td>National roadway</td>
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<td>Gangchang-bridge &amp; other</td>
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- **Bridges are currently designed (as of 2014 March)**

<table>
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<th>Description</th>
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<th>Span length</th>
<th>Height</th>
<th>Owner</th>
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<tbody>
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<td>Highway roadway</td>
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<tr>
<td>National roadway</td>
<td>Dangaecheon-bridge &amp; other</td>
<td>50+65+50=165m</td>
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<td>Provincial roadway</td>
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<td>Other roadway</td>
<td>Kangmae IC-bridge</td>
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<td>2.20m</td>
<td>LH Corporation</td>
</tr>
</tbody>
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Bridges with SPC girder

Korea Expressway Corporation
DongHae-SamCheok(Gunji-bridge) No.2 Section

Seungjeo-bridge(2@35=70m)
OkDong-bridge(6@50=300m)
JangSu-bridge(1@60=60m)
YuCheon-bridge(2@40=80m)
Sampo-bridge(5@40=200m)
SalKuMi-bridge(4@46.5+2@48=330m)
YeoMan-bridge(4@42=168m)
GangChang-bridge(6@50=300m)

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Bridges with SPC girder

- KangMae-bridge (1@55=55m)
- SeiCheon-bridge (7@50=350m)
- Kura-bridge (6@50=300m)
- SongSa-bridge (3@48=144m)
- Songam-bridge (4@50=200m)
- South Yeoju-bridge (1@45=45m)
- Changri-bridge (3@60=180m)
- Haguam-bridge (1@60=60m)
- BangChukCheon 12-bridge (1@44=44m)
- BangChukCheon 17-bridge (1@58=58m)
- BangChukCheon S-bridge (1@44=44m)
- JangSan-Camping Area Access bridge (1@42=42m)
SG Shinsung Chungju / R&D Center
SCP Composite Girder / MFD Composite Girder

- SCP composite girder Factory: 7,020m²
- MFD girder composite Factory: 1,440m²
- Painting Factory: 2,101m²
- miscellaneous steel factory and machine fabrication factory 729m²

- Factory Area: 97,226m²
- Office and R&D Center: 575m²
- Transformer house 178m²
- Multi-purpose warehouse 95m²

- Annual Production Capacity
  SCP Girder: 20,000 ton/year
  MDF Girder: 20,000 ton/year
  Steel Structure: 30,000 ton/year

## TOOLS AND EQUIPMENTS

- CNC GAS CUTTING M/C
- CNC DRILLING
- PLASMA GAS CUTTING M/C
- BAND SAW M/C
- BEVELING M/C
- RADIAL DRILLING
- DRILLING M/C
- SHEARING M/C
- ASSEMBLY STRAIGHTEN
- 25Ton, 15Ton, 7Ton FORKLIFT
- 50 CRAWLER CRANE
- SKID LOADER
- 20, 15TON OVERHEAD CRANE
- 20, 15TON GANTRY CRANE
■ Seoul Head Office
(SGTower) 47, Daewangpangyo-ro 606beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea
Tel : 82 2 3459 2151   Fax : 82 2 3459 2120

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