Bằng độc quyền sáng chế số: 7982
Registration No. of New Technology of
KOREA RAIL NETWORK AUTHORITY : 2007-0006

STEEL CONFINED PRESTRESSED CONCRETE GIRDER

SHINSUNG E&C Co., Ltd.

VINACON E&C

Steel Confined Pre-stressed 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.

SG SHINSUNG E&C Co., Ltd.

VINACON E&C

Steel Confined Pre-stressed Concrete Girder

Bằng độc quyền sáng chế số: 7982

Patent No. 0370939 / Patent No. 0439470 / Patent No. 0554408

BỘ KHOA HỌC VÀ CÔNG NGHỆ
CỤC SỞ HỮU TRÍ TUỆ

CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự do - Hạnh phúc

BẰNG ĐỘC QUYỀN
SÁNG CHẾ
Số: 7982

Tên sáng chế: DẦM LIÊN HỢP DÙNG CHO CẦU VÀ PHƯƠNG PHÁP THI CÔNG CẦU SỬ DỤNG DẦM LIÊN HỢP NÀY

Chủ Bằng độc quyền: 1. KOREA INSTITUTE OF CONSTRUCTION TECHNOLOGY (KR)
2311, Taehwa-dong, Ilsan-gu, Koyang-si, Gyeonggi-do 411-712, Republic of Korea
2. (Danh sách kèm theo)

Tác giả: SIM Tae Young (KR), SIM Jun Gi (KR)

Số đơn: 1-2006-00771

Ngày nộp đơn: 27.11.2004

Số điểm yêu cầu bảo hộ: 13 **Số trang mô tả:** 19

Cấp theo **Quyết định số:** 20050/QĐ-SHTT, **ngày:** 28.09.2009

Có hiệu lực từ ngày cấp đến hết 20 năm tính từ ngày nộp đơn.

CỤC SỞ HỮU TRÍ TUỆ
NATIONAL OFFICE OF INTELLECTUAL PROPERTY OF VIETNAM

VN 1-0007982

KT. CỤC TRƯỞNG
PHÓ CỤC TRƯỞNG

Phạm Phi Anh


특 허 증


특 허 증


특 허 증

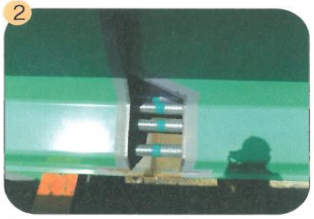
Factory Process of SCP System

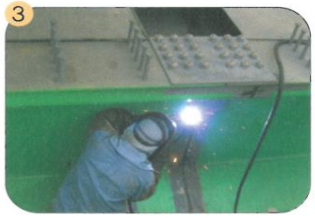
Specification
Detail design
Material purchase
Shop DWG
Approval
Checking
Treatment before Painting
Web Bending
Sheath tube fabrication
templating
PLate Cutting
Spacer manufacturing
Stud Bolt Welding
Spacer fabrication
Sheath tube installation
Fabrication of main girder
Welding
Inspection
Pre-Assembly
Painting
Shipment

SCP
Steel Confined Prestr

SCP

Construction site process





SCP

essed Concrete Girder

Carrying steel girders to construction Site

Sheath tube Connection

Check material at construction site

Bearing Installation

Site welding

Upper Flange Bolting

Inspection

Tendon installation

Concreting

Site survey

Concrete curing

Tendon tensioning

Grouting

Transport of girder to site

Girder installation

Completion

SCP

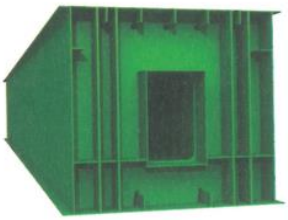
Structural concept of SCP girder

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

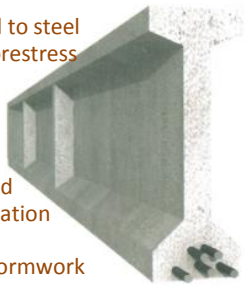
+

Characteristics of PSC Girder

Roadway Bridge(Applicable span:Within25~35m)
Railway Bridge (Applicable span: Within 35m)

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.

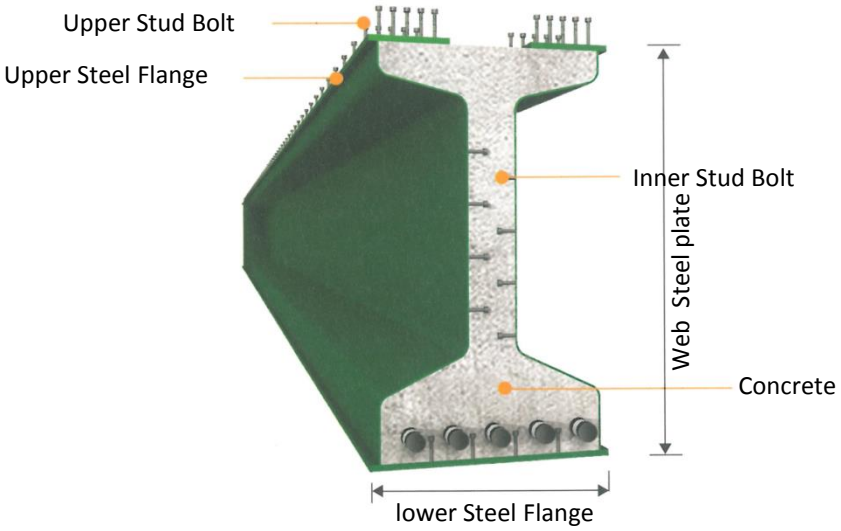
SCP Composite Girder

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

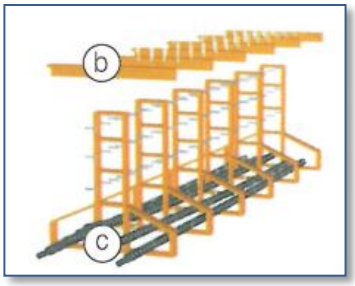
- Long span possible due to steel and concrete composite
- Reduce construction cost due to low concrete cost
- Quality control enhancement due to simplification and rationalization of members
- Enhanced durability by protection from concrete carbonation and chloride attack
- Excellent construction ability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

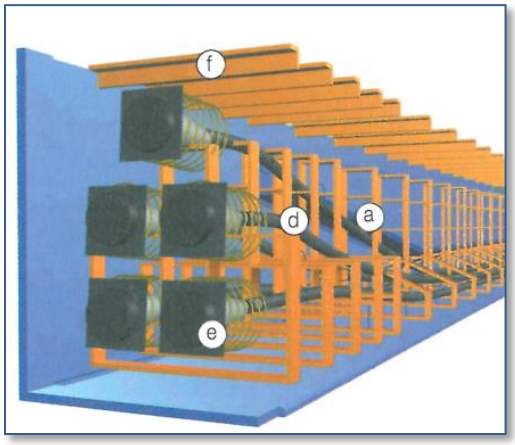
Construction work and economical characteristics

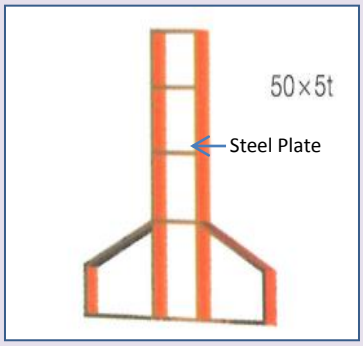
- Construction process is simple due to reduced welding and by web steel bending process
- Production process by systemizing electronic automatic system for welding of upper and lower flange and web plate
- Exterior surface of girder is formed by steel plate, so no formwork necessary
- Minimized use 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

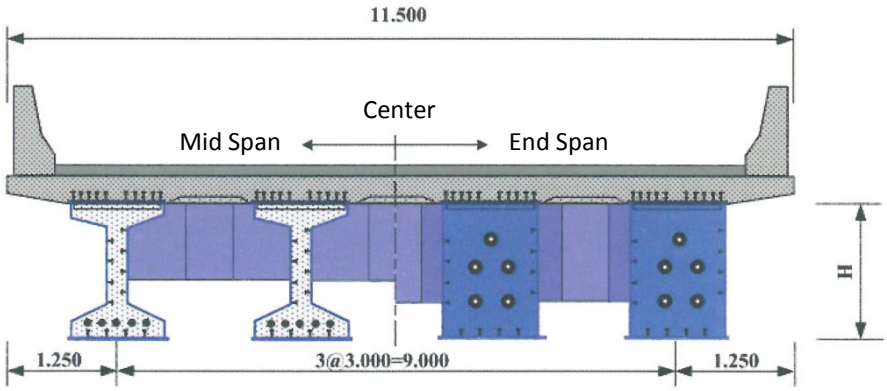
ⓔ Anchorage

ⓕ Upper Stiffener

Standard cross-section of Composite Girder (Roadway bridge)

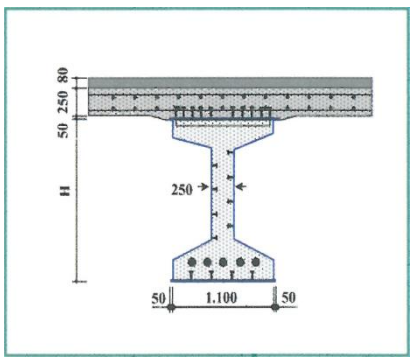
Bridge cross section with 4 SCP girder (50m Single Span)

Cross Section

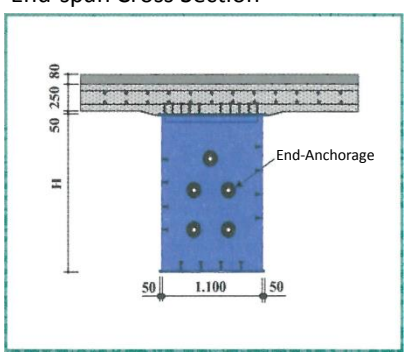


Detail cross section of SCP Girder (50m) and applying span length by girder height

Mid-span Cross Section



End-span Cross Section

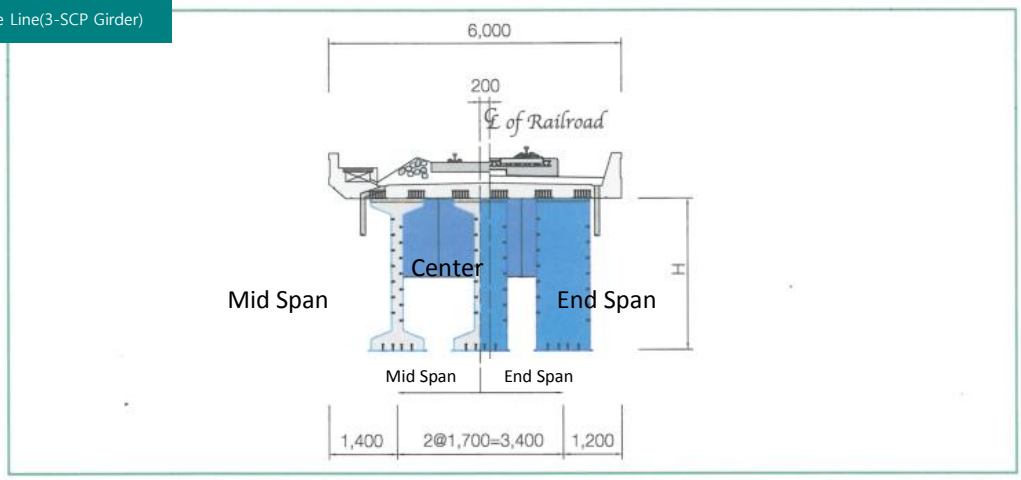


Girder Type \ Span Length	30	35	40	45	50	55	60	65	70	75	Height/Span-Length Ratio
PSCBEAM	2.00	2.20									1/14,286 ~ 1/15,909
Pre-Flexed BEAM	1.30	1.40	1.60	1.90	2.10						1/23,077 ~ 1/23,810
Re Pre-Flexed BEAM	1.30	1.40	1.60	1.90	2.10						1/23,077 ~ 1/23,810
Steel-Box Girder				2.20	2.50	2.70	2.70				1/20,455 ~ 1/20,000
I.P.C Girder	1.30	1.60	1.90	2.30	2.60						1/23,077 ~ 1/19,231
SCP Girder	0.90 - 1.10	1.10 - 1.30	1.30 - 1.50	1.48 - 1.65	1.60 - 1.95	1.80 - 2.20	1.90 - 2.40	2.30 - 2.65	2.60 - 2.90	3.00 - 3.20	1/32,432 ~ 1/22,581

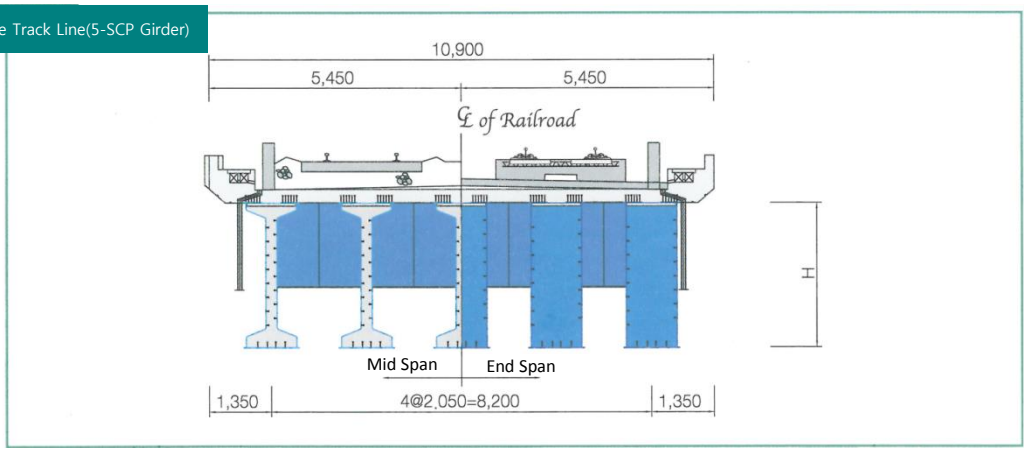
SCP

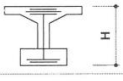
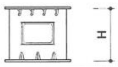
Standard cross-section of composite girder (railway bridge)

Single Line(3-SCP Girder)



Double Track Line(5-SCP Girder)



Girder Type \ Span Length	20	25	30	35	40	45	50	55	Height/Span-Length Ratio
PSCBEAM 		2.30							1/9,756 ~ 1/10,869
Pre-Flexed BEAM 	1.30	1.60	1.90	2.20					1/15,385 ~ 1/15,909
Steel-Box Girder 				2.30	3.00				1/15,217 ~ 1/13,333
SCP Girder 					2.50	2.80	3.10	3.20	1/18,188 ~ 1/17,777

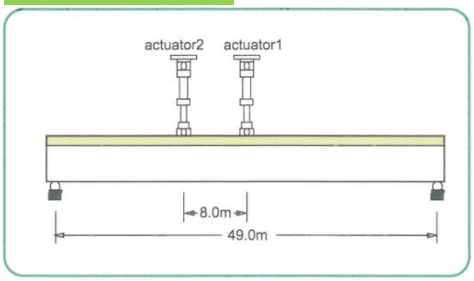
SCP

Structural test of SCP girder

Static load and fatigue test of 50m simple beam

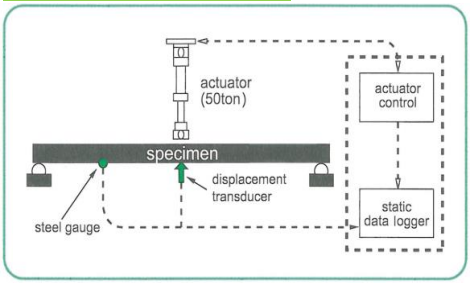
Test condition and results

Static load test



Flexural test was conducted for the observation of failure beha vior 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 t he load was removed, displacement was recovered rapidly wit h the 99mm of residual displacement . This results mean that t he sufficient safety margin of SCP girder under critical load is a chieved.

Fatigue Test



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

Real size static load test and fatigue test

Dismantling of SCP girder

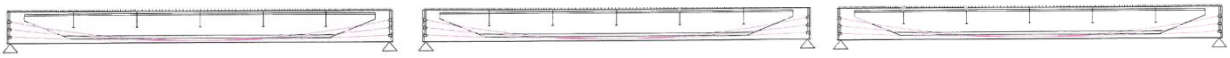
cross section | left side | right side | bottom side

SCP

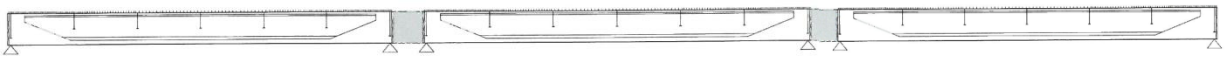
Continuous beam design and VE/LCC Analysis of SCP girder Bridge

Construction for continuous SCP Composite Girder

Construction sequence for continuous bridge

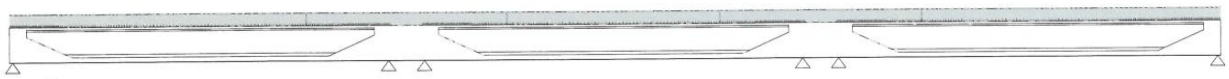


① Install of precast SCP simple beam on the support



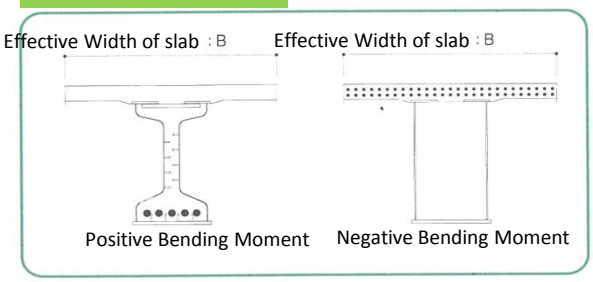
② Connection at support for continuous beam and concreting at support

③ Construction of slab on the mid spans

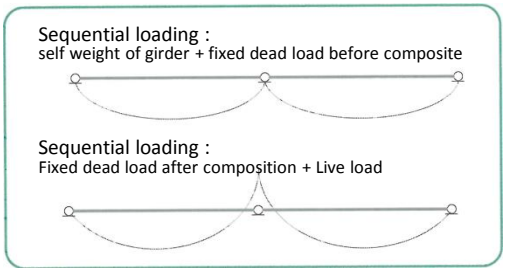


④ Construction of slab concrete at the supports

Design Cross Section



Bending Moment based on Load with Continuous



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)
- Analysis of VE/LCC of Railway Bridge of SCP Girder(Dec. 2005, Seoul National Univ. Science & Technology)
- Dynamic Performance Verification test of SCP girder(JiJang 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.

<Bridge Information>
- Owner : Korea Expressway Corporation
- Project Name : Highway local road #65 “DongHae - SamCheok” 2nd range(GunJi-Bridge)
- Bridge Specification : Length 70.0m, Width 25.2m

References of SCP girder bridge Construction

Bridges are constructed (as of 2014 March)

Description	Name of bridge	Span length	Height	Owner
Highway roadway	Gunji-bridge & other	1@70=70m	3.10m	Korea Express Corporation
National roadway	Changri-bridge & other	3@60=180m	2.40m	Wonju Regional Construction Management Administration
Provincial roadway	Gangchang-bridge & other	6@50=300m	1.80m	Daegu Metropolitan city
Other roadway	Bangchuk 17-bridge & other	1@58=58m	240m	LH Corporation

Bridges are currently designed (as of 2014 March)

Description	Name of bridge	Span length	Height	Owner
Railway bridge	Songsan-bridge & other	1@50=50m	3.10m	Korea Railway Network Authority
Highway roadway	Hapchcon IC-ramp & 2 bridges	1@55=50m	2.20m	Korea Express Corporation
National roadway	Dangaecheon-bridge & other	50+65+50=165m	2.30m	Pusan Regional Construction Management Administration
Provincial roadway	Bongseo-bridge & other	40+55+40=130m	1.90m	Jeollabuk-Do Province
Other roadway	Kangmae IC-bridge	1@55=55m	2.20m	LH Corporation

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

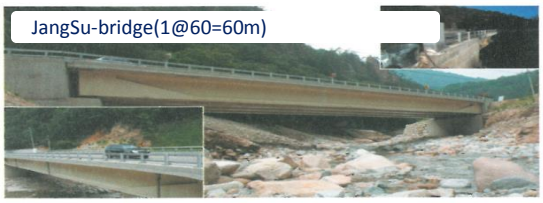
SCP

Bridges with SPC girder

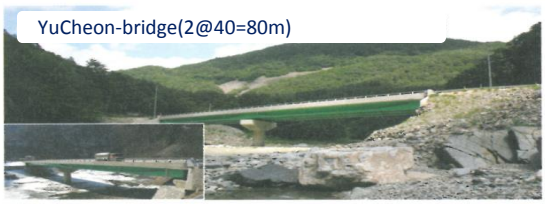
Seungjeo-bridge(2@35=70m)

OkDong-bridge(6@50=300m)

JangSu-bridge(1@60=60m)

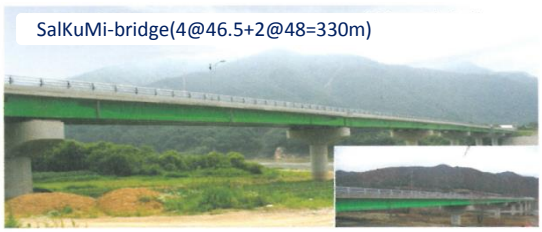


YuCheon-bridge(2@40=80m)



Sampo-bridge(5@40=200m)

SalKuMi-bridge(4@46.5+2@48=330m)



YeoMan-bridge(4@42=168m)

GangChang-bridge(6@50=300m)

Bridges with SPC girder

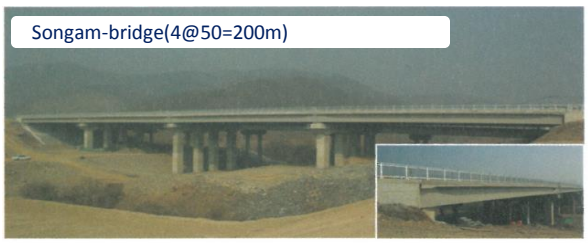
KangMae-bridge(1@55=55m)

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 5-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
- **miscellany 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

Painting Facility

Plasma Gas Cutter

CNC Gas Cutter

CNC Drill Machine

SG 신성건설

www.sscorp.co.kr

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Tel : 82 31 910 0130