Clients

"A company that creates the roots of structures that integrate the ground and the structure"

Major Clients

국토교통부
KORAIL
ex Korea Expressway Service
LH
K water 한국수자원공사
Incheon Airport 인천국제공항공사
SAMSUNG 삼성물산
현대건설
대우건설
GS건설
posco 포스코건설
HDC 현대산업개발
롯데건설
한화건설
SK E&C
DL E&C
HOBAN
DOOSAN 두산건설
GLOBAL SAE:A GROUP 쌍용건설
TAEYOUNG 태영건설
계룡건설
동부건설
중흥그룹
코오롱글로벌(주)



Company Introduction

CEO MESSAGE

To leap forward as a leading global enterprise, we will produce the best and highest quality products based on our extensive technological capabilities.



Samjin Steel Industry Co., Ltd. is a company specializing in the production and sale of ground anchors, PW heads, rock bolts, self-drilling equipment, epoxy-coated rebar, nailing, steel fibers, and various related auxiliary materials essential for the stability of structures and ground, as well as ground reinforcement. Through quality management dedicated to the customer, customer needs, and customer satisfaction, and based on product development through continuous research and accumulated technological expertise, all executives and employees are devoting their utmost efforts to providing the best and highest quality products solely for the stable reinforcement of the ground.

Sincerely,
CEO and All Executives and Staff of
Samjin Steel Industry Co., Ltd.



COMPANY HISTORY

2001~2004

2003
Conversion to Incorporation (Samjin Engineering → Samjin Steel Industry)
Expansion of Production Facilities

2002
Factory Expansion and Relocation

2001
Company Establishment - Samjin Engineering

2007~2011

2011
Relocation of Headquarters and Factory (Located in Daegot-myeon, Gimpo-si)

2009
Venture Company Certification No. 20090104637; Technology Innovation Small and Medium Enterprise INNO-BIZ Certification No. 906-1071

2007
Expansion of Anchor Chip Production Line; Factory Expansion and Relocation

2012~2014

2014
Selected as Winner of the Gimpo City SME Grand Prize (Productivity Improvement and Technological Innovation Sector)
Constructed Samjin Steel Industry's 2nd Factory
Selected as a "Good Jobs Company" by the Korea Credit Guarantee Fund
Factory Expansion

2013
Selected for the Seoul Economic Daily Management Grand Prize
Received Commendation from the Chairman of the Korea Chamber of Commerce and Industry
Received Commendation from the Mayor of Gimpo on Commerce and Industry Day

2012
Selected as a Promising SME (No. 2012-15): Kookmin Bank
Established a Corporate Research Institute (No. 2012110600): Korea Industrial Technology Association

"A company that creates the roots of structures that integrate the ground and structures." A specialized manufacturer of construction and civil engineering materials that prevents the collapse of ground and structures more conveniently and safely, protecting our living spaces."



ORGANIZATION



2015~2017

2017
Selected as a Promising SME in Gyeonggi Province
Selected as an Excellent Small Giant Enterprise designated by the Ministry of Employment and Labor

2016
Selected as an Outstanding Workplace for the Senior-Friendly Workplace Creation Support Project
Selected as the Best Workplace for the Foreign Employment Permit System
(KBS Documentary Production) Selected for the Senior-Friendly Workplace Creation Support Project
Industry-Academic Cooperation Agreement for the Industry-Academic Integrated Apprenticeship Program

2015
ROCK BOLT KS Certification Acquired (KS E 3132)

2018~2025

2021
New Business: Expansion of steel fiber production line
Expansion of epoxy-coated rebar production line

2020
Relocation of headquarters and production plant

2019
Selected as a Youth-Friendly Small Giant by the Ministry of Employment and Labor
Signed MOU with the Department of Environmental Engineering, Seoul National University

2018
Commendation for Meritorious Service to SMEs Prime Minister's Commendation (CEO)
Gyeonggi Provincial Governor's Commendation
Selected as a Youth-Friendly Small Giant by the Ministry of Employment and Labor

2025
Awarded the Grand Prize for Excellent Patents in Korea

2025
Commendation from the Minister of Land, Infrastructure and Transport on Road Day

2024
MOU with Vietnam Hoa Binh Construction Group

2024
MOU with the Korea Road Association

2022
Acquired KS Certification for Steel Fibers

Research Development

PATENTS



2001 Utility Model Registration No. 0235117: Reinforcement rebar fixing body

2002 Utility Model Registration No. 0292891: Liner screw for reinforcement rebar

2003 Utility Model Registration No. 0301035: Rebar fixing device for ground reinforcement

Utility Model Registration No. 0305688: Expansion of production facilities for rebar fixing device for ground reinforcement

2004 Patent Registration No. 0462129: Rebar fixing device for ground reinforcement: anchoring agent

2009 Design Registration No. 30-0528286: Waterproof cap for anchor body

Design Registration No. 30-0528291: Nut for anchor body

Design Registration No. 30-0536353: Body for anchor body

Patent Registration No. 10-0913320: Multifunctional composite anchor body

Patent Registration No. 10-0913201: Removable type Development of Ground Anchor System (SAMJ-ECD)

2010 Patent Registration No. 10-0944199: PC Anchor System Structure Using Multi-Reinforced Nails

Patent Registration No. 10-1003981: Removable Ground Anchor Body

2011 Patent Registration No. 10-1025915: Multi-compression Dispersed Pressure Type Permanent Anchor Body

Patent Registration No. 10-1038747: Construction Method of Multi-compression Dispersed Pressure Type Permanent Anchor Body

Design Registration No. 30-022583: Load-bearing Body

2012 Patent Registration No. 10-1167839: Multi-purpose Steel Wire Tension Jack

Patent Registration No. 10-1192931: Fixing Device for Intersection of Wire Rope for Rockfall Prevention Net

Patent Registration No. 10-1214527: Multi-purpose Steel Wire Tension Jack

2013 Patent Registration No. 10-1244746: Packer-Expandable Ground Anchor and Construction Method

Patent Registration No. 10-1283457: Supporter-type Compression-Expandable Ground Anchor

2014 Patent Registration No. 10-1394404 : Supporter-type Extended Ground Anchor

2015 Design Registration No. 30-0792466 : Rebar Protective Cap

Design Registration No. 30-0810388 : Nut for Lock Bolt

Design Registration No. 30-0810391 : Fixing Head for Anchor Body

Design Registration No. 30-0810401 : Fixing Head for Anchor Body

Design Registration No. 30-0810392 : Load-bearing Body for Anchor Body

Design Registration No. 30-0810398 : Load-bearing Body for Anchor Body

CERTIFICATION

"We are fully equipped with in-house facilities and capabilities to test a wide range of products, and conduct product inspections and testing through the thorough management and calibration of our testing equipment.

Furthermore, we are constantly striving to achieve a goal of 0% non-conforming items through rigorous quality audits."



Business Registration Certificate



Proof of Business Registration

"A company that creates the roots of structures that integrate the ground and structures." A specialized manufacturer of construction and civil engineering materials that prevents the collapse of ground and structures more conveniently and safely, protecting our living spaces."

2015
Design Registration No. 30-0810390: Cylinder guide for anchor body
Design Registration No. 30-0810396: Spring arrangement plate for earth anchor tension
Design Registration No. 30-0810394: Support wing for earth anchor
Design Registration No. 30-0810395: Support wing for earth anchor
Design Registration No. 30-0813703: Rebar fixing hook
Design Registration No. 30-0810389: Rebar connector
Design Registration No. 30-0827918: Angle support for anchor body

2016
Patent Registration No. 10-1587480: Support body for fixing earth anchor
Patent Registration No. 10-1646584: Removable ground anchor body using spring
Patent Registration No. 10-1646585: Packer expandable ground anchor body
Patent Registration No No. 10-1663571: Fixing device for the intersection of a wire rope for a rockfall prevention net

2017
Patent Registration No. 10-1744489: Removable ground anchor body using rotation
Patent Registration No. 10-1797443: Pressure-type grouting anchor body for ground reinforcement and method using the same

2018
Patent Registration No. 10-1825505: Steel wire tensioner
Patent US9,777,454 B1 : REMOVABLE GROUND ANCHOR BODY USING ROTATION

2019
Patent Registration No. 10-1949854: Ground anchor body using a guard packer and method thereof
Patent Registration No. 10-1983205: Removable rock bolt

2020
Patent Registration No. 10-1143375: Rock bolt unit for tunnel construction with installation depth adjustment function
Patent Registration No. 10-1559892: Hollow rock bolt equipped with a steel hook fixing device for easy initial tip fixing 10-2214141
Rebar connector 10-2317466
Pressure-type ground anchor body for ground reinforcement and method using the same 10-2378409 Supply and packing device for ground anchors 10-2382870

2021
Construction method for hollow rock bolts for tunnel construction 10-2253066

2022
Steel wire re-tensioning structure (FRN) 10-2482795

2024
Anchor and construction method using an X-mesh pocket with inserted perforated pipe 10-2806798

2025
Permanent anchor body having a fixing device in which a wedge anti-loosening socket and a head are firmly coupled 10-2872471
Slope stabilization support method with improved stability using a dual-compression dispersed permanent anchor body 10-0010632



Factory Registration Certificate



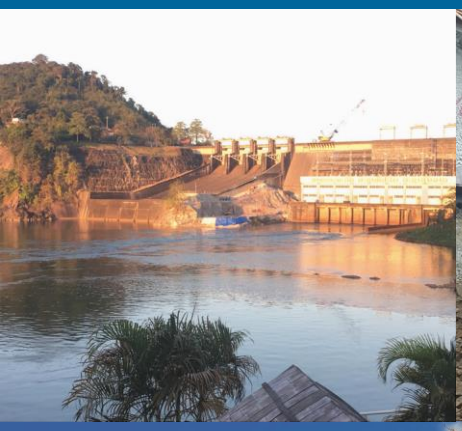
ISO Certificate

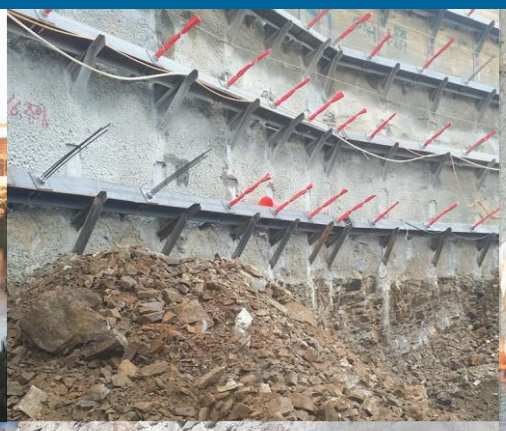


KS Certificate



Products



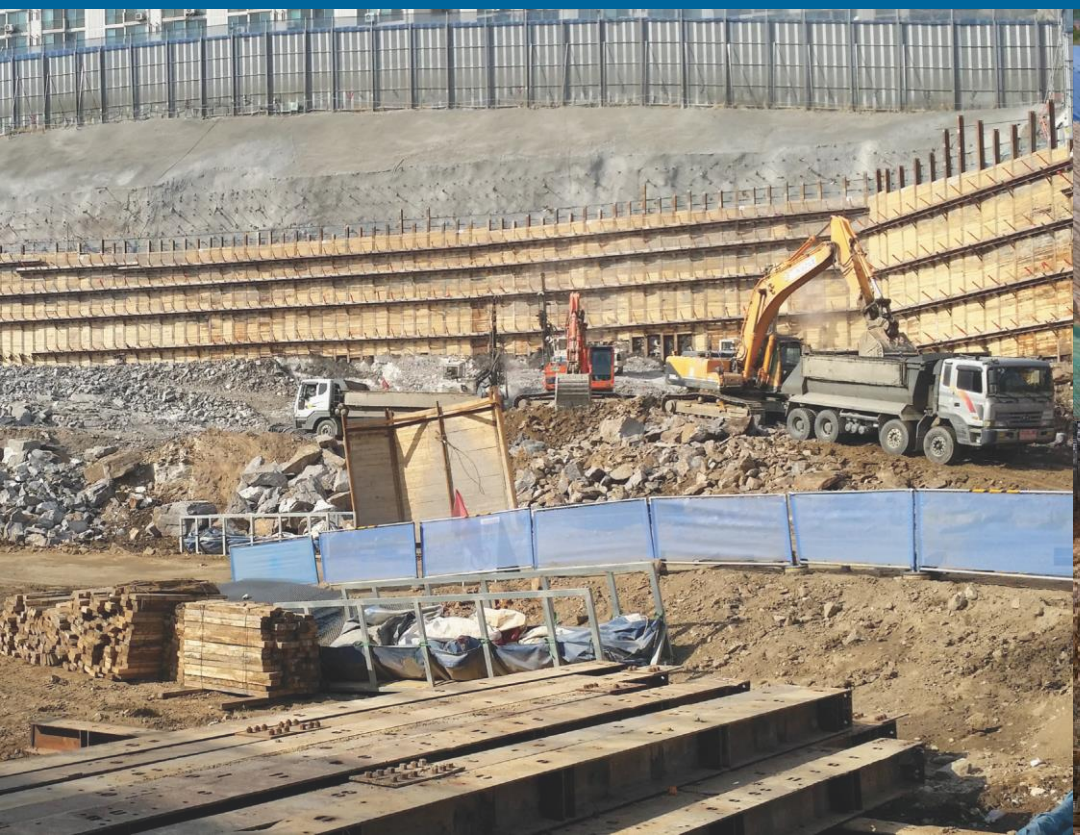




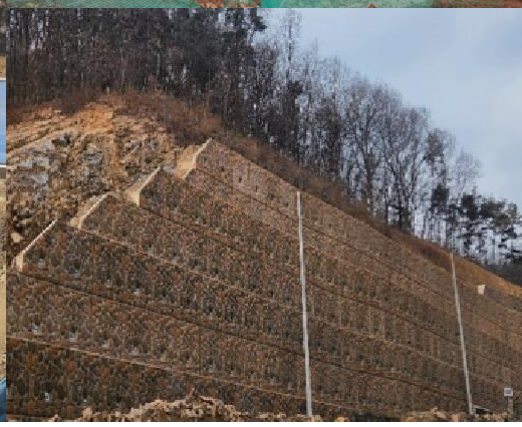




| Ground Anchor | PEA Anchor | PW Head | Head, Wedge |
| Anchor Accessories | Production Equipment | Anchor Delivery Track Record |







GROUND ANCHOR

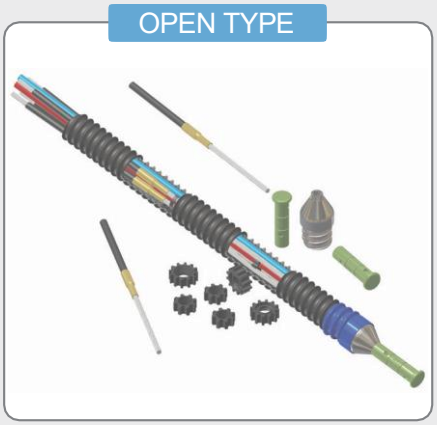
Lasting Tensile and Frictional Anchor (SAM-LTF)

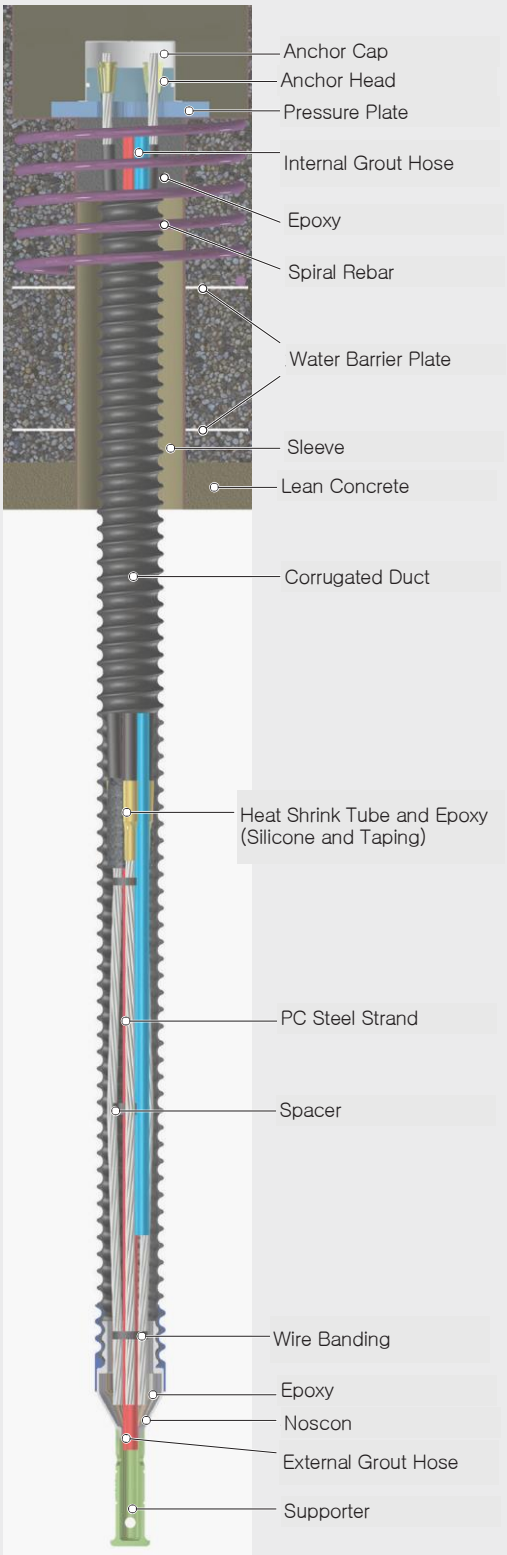
Double-corrosion-resistant permanent anchor that has been widely applied domestically and internationally, a tensile-friction embedded anchor installed and assembled within a corrugated duct. By utilizing unbonded PC strands, it ensures perfect waterproofing in conjunction with the duct, making it suitable for use as a permanent anchor for reinforcing slopes and retaining walls, as well as for preventing uplift.

CLOSE TYPE



OPEN TYPE





Buoyancy Anchor OPEN TYPE

■ Features

- Double waterproofing and corrosion protection treatment using unbonded PC strands and corrugated ducts.
- The most widely used anchor with the most domestic and international application track record
- Economical design is possible due to the flexible application of the number of strands
- Classified into Opened and Closed Types depending on the installation location of the injection hose inside or outside the duct
- Since it is delivered to the site as a factory-assembled finished product, it is easy to use and offers excellent quality control





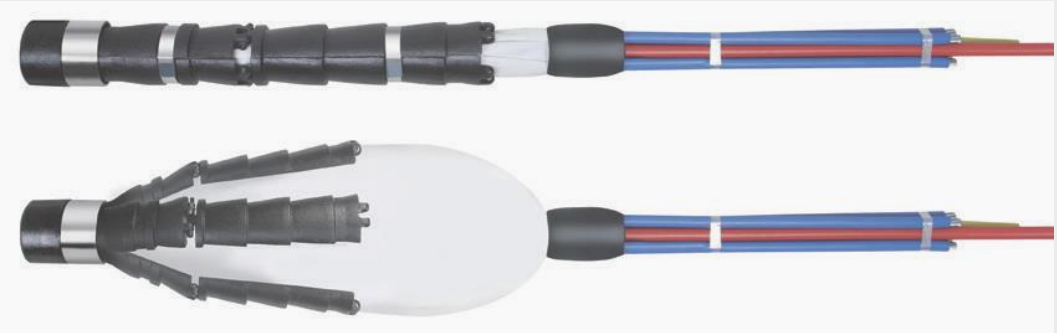
PEA Anchor (SAMJ-PEA) Packer Expansion Anchor

Patent No. : 10-1244746

Composite permanent anchor designed to simultaneously provide bearing pressure and compressive friction. It utilizes a sealed pack installed inside a wing-shaped load-bearing body (anchorage). When the inside of the pack is pressurized through grouting, the wings spread to compress (pressure) the borehole wall ground, thereby enhancing tensile strength.

Before PACKER expansion

After PACKER expansion



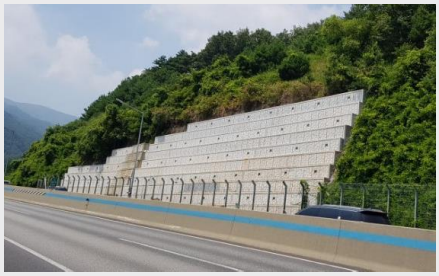
Features

- The spreading of the load-bearing body's wings disperses stress generated in the ground, resulting in minimal reduction in anchorage force and reduced impact from progressive failure.
- Increased anchorage force and reduced anchorage length due to increased compression cross-section and wing bearing pressure effect resulting from the spreading of the load-bearing body's wings.
- Since wing spreading and curing occur simultaneously with anchor installation, this method resolves construction inconveniences and the problem of anchor bulb damage during tensioning compared to other bearing-type anchors, which typically require
- As a permanent anchor primarily applied to slopes and retaining walls, it exhibits complex anchorage force through the simultaneous application of compression and bearing pressure.

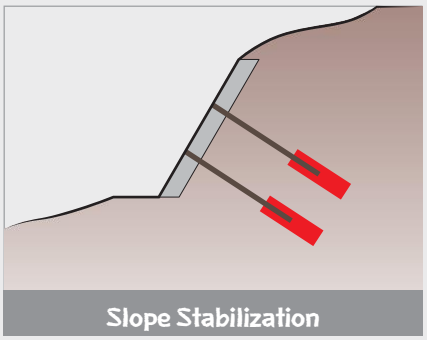


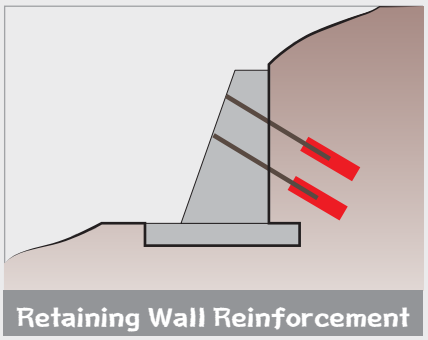


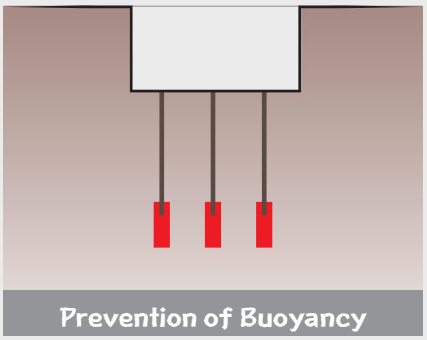




Application Areas







GROUND ANCHOR

Manual Removable Anchor Body (SAMJ-R3) Rotation, Release, Removal

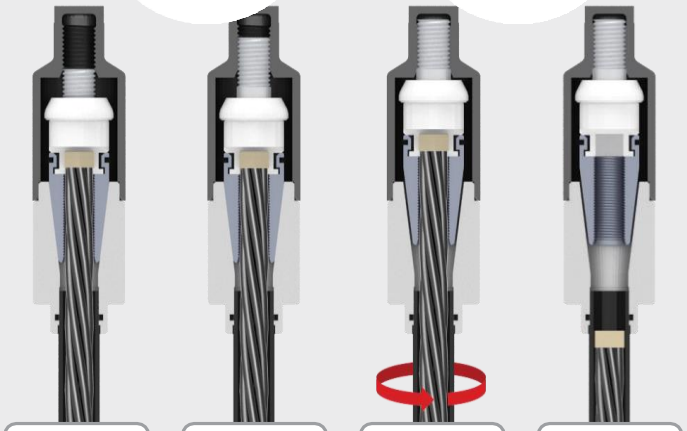
Removable anchors are products that prevent interference with adjacent sites in advance by removing the steel strands (tension members) remaining after the temporary anchor has finished its service life. They are mainly used in temporary earth retaining construction and have the effect of improving constructability on site by allowing the steel strands (tension members) to be easily and conveniently separated and reassembled.



Features

- Compression-dispersion type has excellent applicability to the ground.
- Steel strands can be removed manually.
- Removal work is possible even in confined spaces.
- Rebinding possible by rotating the steel strand counterclockwise

Removal Order



Load-bearing Body Material

GCD450 (SPS-KFCA-D4302-5016)	ALDC12.1 (KS D 2331)
	
Casting	Aluminum Diecasting
C, S, Mg	Al, Cu, Si, Mg, Zn, Fe, Mn, Ni, Sn, Pb, Ti
• High tensile strength. • Reliable anchoring force	

Removal Method

- Remove steel strands by rotating them clockwise

Reassembly Method

- Reassemble by rotating the steel strands counterclockwise

Precautions

Sling bars must be used to prevent damage to the product during loading and unloading. If the slack covering and taping are removed in advance, grout may enter. Damage to the covering pipe may reduce removal performance and cause quality issues during tensioning.

U-Turn Removable Anchor (SAMJ-U TURN)

Removal method using equipment where grease-filled steel strands (unbonded PC strands) are bent using a U-shaped load-bearing body, and when a single strand is pulled out, it rotates around the U-shaped load-bearing body to be removed.



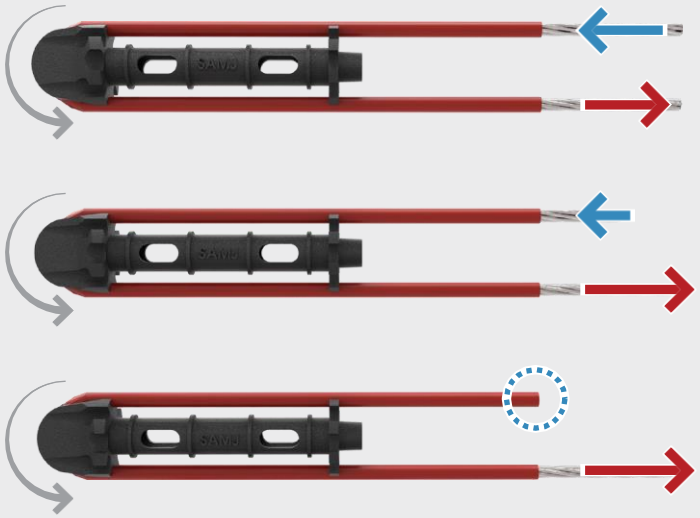
Features

- Load-distribution type anchor capable of load distribution through multiple load-bearing bodies
- Compression-type anchor with load-bearing bodies attached to grout to withstand tensile forces
- Prevention of interference with adjacent sites by removing residual steel strands from installed anchors
- Requires securing workspace as removal is performed using equipment (hydraulic cylinders, etc.)
- Relatively high steel strand removal rate due to minimal ground constraints
- Advantageous for quality control as it is factory-manufactured and delivered to the site

Load-bearing Body Material

GCD450 (SPS-KFCA-D4302-5016)	ALDC12.1 (KS D 2331)
	
Casting	Aluminum Diecasting
C, S, Mg	Al, Cu, Si, Mg, Zn, Fe, Mn, Ni, Sn, Pb, Ti
• High tensile strength. • Reliable anchoring force	• Large attachment surface area. • Reliable anchoring force

Removal Order



Step 01 Secure one end of the steel strand to the removal equipment.

Step 02 Apply a load of approximately 2 to 5 tons to pull it out.

Step 03 Pull the steel strand out until it is completely removed from the bore hole.

GROUND ANCHOR

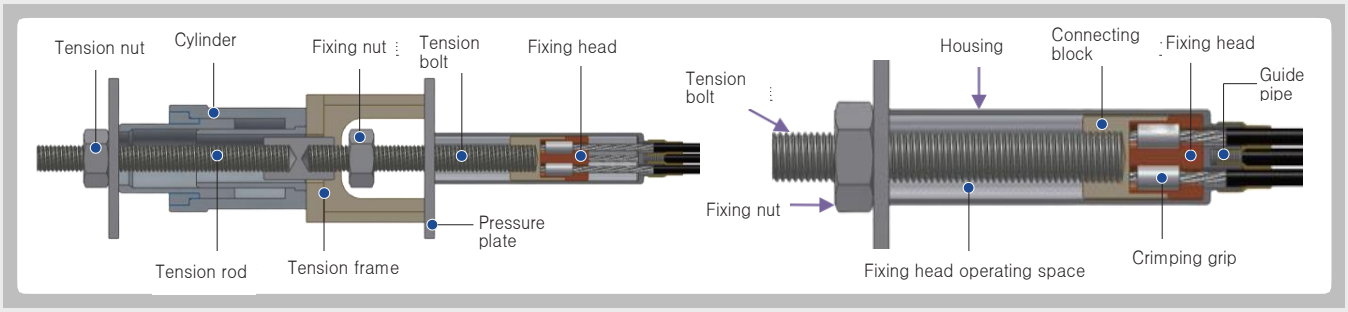
Patent No. 10-2482795

Overview of the Nut-Type Anchor Retensioning System (RFN : Strand Wire Retensioning Fastener using Nut)

- An assessment of the current status of anchors on highway reinforcement slopes has revealed various problems, including excessive reduction in tension, corrosion of steel strands and anchorages, and steel strand slippage during wedge anchorage. Furthermore, frequent instances require retension up to the design load because the initial tension zone cannot be maintained, such as deformation of hydraulic structures installed on cut surfaces (like grid blocks) or wedge detachment due to axial deformation during retension.

- RFN system is an anchor system designed to provide simpler and safer anchor head anchorage in terms of construction and maintenance by improving upon the issues associated with conventional wedge-type anchorage, maintenance, and retension. It is applicable to all ground anchors with identical steel strand lengths.

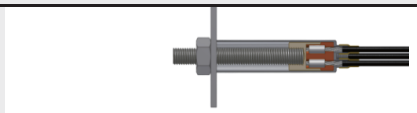
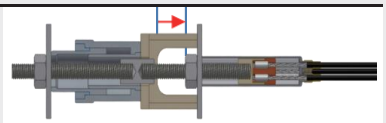
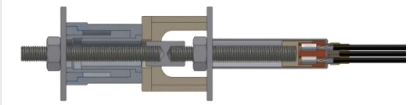
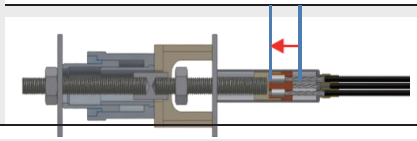
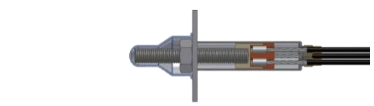
■ Structure and Role of RFN System



1. Steel strand	Transfers tensile load to the anchoring member; used with unbonded PC or the free member covered with a sheathing tube.
2. Fixing head	Its role is to secure the steel strand rigidly connected by a compression grip to transfer the tensile load to the strand.
3. Compression grip	The steel strand is inserted into the circular steel compression grip for compression and integration; this grip is then inserted into the fixing head for anchoring.
4. Guide pipe	The steel strand inlet pipe at the bottom of the housing serves to install a heat shrink tube for waterproofing between the sheathing tube and the housing.
5. Tension bolt, Fixing nut	Screw connection to the fixing head; during tensioning, the fixing head connected to the steel wire is pulled out to secure the load with a fixing nut.
6. Housing	Recovers space to facilitate smooth movement of the fixing head, connecting block, and tension bolt during tensioning, and serves as an internal waterproofing function.
7. Tension frame	Supports the tensile load by being supported by the pressure plate; features a structure that allows the supporting nut to be tightened from the side of the central space of the frame.
8. Tension rod, Tension nut	Tension accessories connected to the tension bolt via a coupler to connect the load to the tension bolt during tensioning.

- The core of this structural system is the application and installation of a Bolt & Nut type tension and anchoring system to each ground anchor. This allows for simultaneous improvements in terms of both tension and maintenance, addressing the issues associated with existing wedge and nut anchoring methods, as well as corrosion problems in the anchoring fixtures.
- The improved tensioning method moves away from the traditional approach of gripping the anchor body with a wedge. Instead, it utilizes a fixing head to grip the tension bolt and anchors it with a nut. This reduces the set quantity and improves issues caused by steel strand slippage from the wedge, as well as corrosion of the steel strands, heads, and wedges.

■ Tensioning method of the RFN system

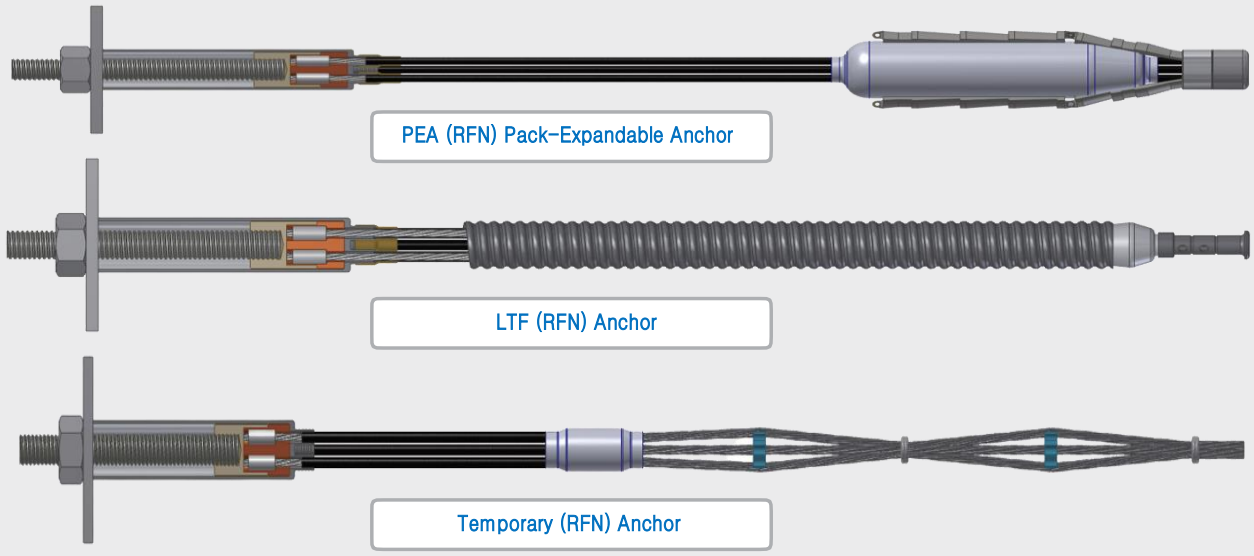
Step 1: Tighten the anchoring nuts on the pressure plate tension bolts.		Step 4: Tighten the anchoring nuts.	
Step 2: Install the tension cylinder and tension components.		Step 5: Disassemble the tension assembly.	
Step 3: Tension (Move the fixed head).		Step 6: Apply rust inhibitor, install protective caps, and complete the process.	

■ Advantages of RFN Anchor Re-tensioning System

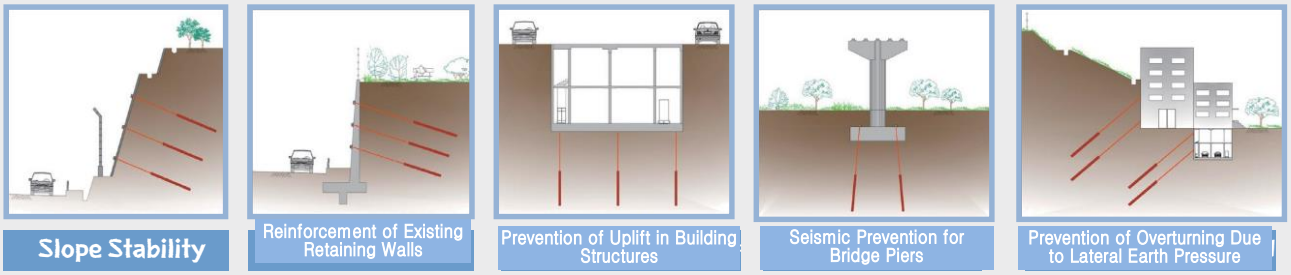
(RFN : Stand Wire Retensioning Fastener using Nut)

- Minimal loss of wedge-type set quantity during anchoring (reduced tensile load)
- No slippage caused by uneven loading or damage to the head or wedge tension during tensioning
- Tensioning is possible by adjusting the length of the anchoring bolt even if the anchor body end anchoring position (nut tightening position) is displaced (better field adaptability compared to conventional nut anchoring methods)
- Sufficient operating space (20~30cm) for the fixed head allows for adequate tolerance to re-tension elongation during re-tensioning
- Excellent waterproofing of key anchoring components due to the main housing and connecting sleeve enclosing the tension wire compression grip, fixed head, connecting block, and tension bolt
- Anchoring is expanded by simply tightening the nut during tensioning and re-tensioning, and installation is also simple
- RFN anchor tensioning system can be applied to all anchor bodies with the same free length

■ Application combinations of each anchor body in RFN system



■ Structures to which RFN System Ground Anchor applies



※ RFN Anchor Re-tensioning System is a new concept civil engineering material applicable to all anchors, a head anchoring system utilizing a nut that addresses the various issues of existing wedge-type anchors by eliminating all risk factors that may occur in the anchorage during tensioning, maintenance, and re-tensioning.

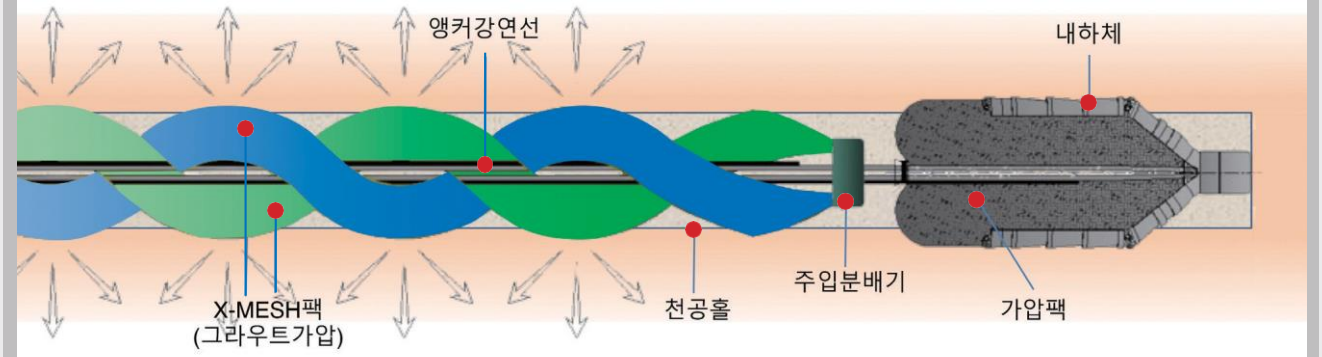
GROUND ANCHOR

X-mesh Pocket Anchor

▶ The X-mesh Pocket Anchor system is an anchor designed for soft ground that maximizes anchoring force through the shape of the bulb and the centralization of the anchor body, applicable to all types of anchors and can be used for both temporary and permanent anchor bodies.

▶ By winding a sealed small-diameter packer in an X-shape and pressurizing grout into the packer using an injection hose connected to a distribution pipe, an increase in anchoring force can be expected due to the friction between the ground and the grout bulb and the effect of packer expansion.

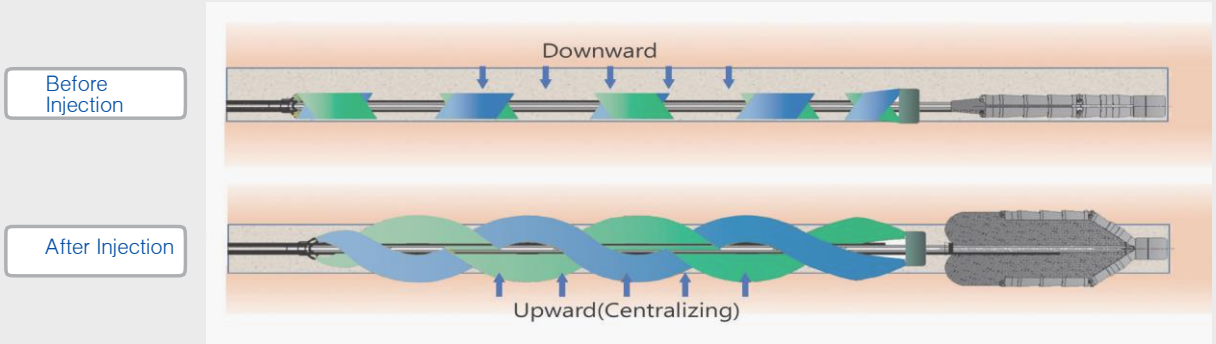
■ Structure and Role of X-mesh Pocket Anchor Body



- The X-Mesh Pocket Anchor is a system in which an injection distributor (steel) is attached to the load-bearing body, and a packer (geotextile) connected to the injection distributor wraps around the anchor body in an X-shape over the anchoring section to pressurize the packer. Through the centralizing effect of the anchor body and the pressurization of the packer, it penetrates the borehole wall to make the grout bulb uneven By creating an uneven shape, the frictional force between the entire bulb and the hole wall is maximized, and as the volume of the packer increases due to the injection of grout into the packer, the effect of pressurizing the grout (primary) inside the hole is generated, thereby maximizing the anchoring force.

- The X-Mesh Pocket Anchor can be applied to grounds where increased anchoring force is required, such as soft clay soil, hole collapse ground, and loose soil ground.

■ Centralizing Effect



■ Effects of X-Mesh Pocket Anchors

- When 1 to 2 rows of small packers are wrapped around the anchor body in an X-shape within the anchor section and injected under pressure, the packers, with their small cross-sectional areas, swell and expand, easily penetrating the borehole walls. This forms an uneven cross-section of the bulb, increasing the frictional and bearing pressure around the anchor section during tensioning.
- As the packers swell, the spaces between the packers wrapping the anchor body in an X-shape create sealed areas, which is expected to provide a pressure grouting effect within the borehole.
- The expansion of the packs surrounding the anchor body ensures the centralization of the load-bearing body and the anchor body itself. This resolves the most difficult issue to address—eccentricity within the bulb—and results in an increase in the anchoring strength of the anchor bulb.

■ Effects of X-Mesh Pocket Anchors

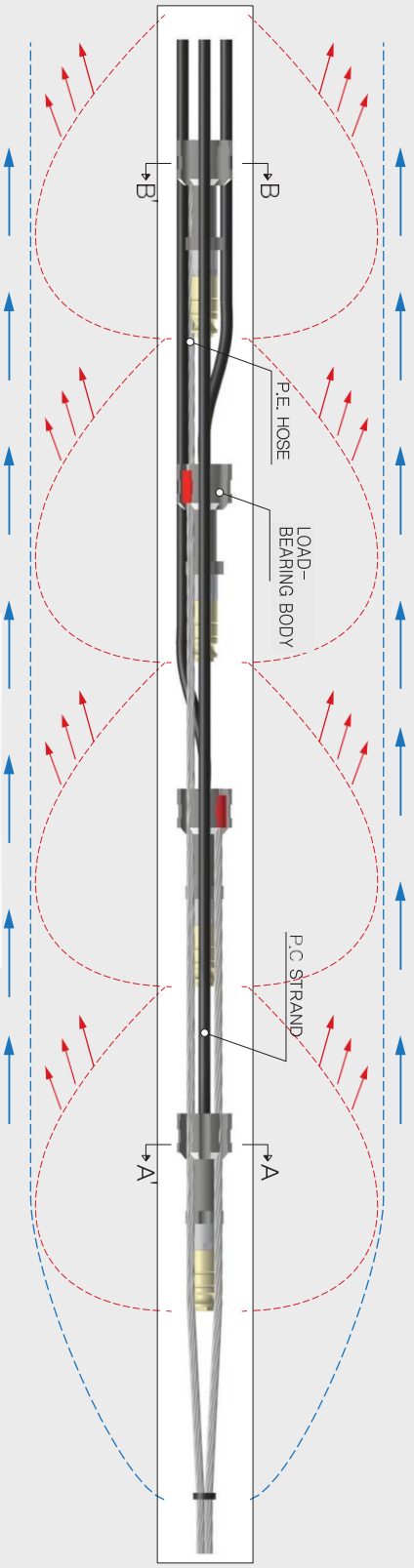
Div.	X-MESH POCKET Anchor	Standard Pack Anchor	Standard Anchor
Conceptual Diagram			
Method Overview	By winding a sealed small-diameter pack into an X shape and pressurizing the inside of the pack using an injection hose connected to a distribution pipe, an increase in anchorage force is expected due to the friction between the ground and the grout bulb and the effect of pack expansion.	The entire anchorage section of a standard anchor is wrapped with a pack and sealed by closing both ends; after inserting and installing the anchor body, the pack is pressure-injected to achieve the effect of pack expansion.	After drilling and inserting steel strands, grouting is performed in the drilled holes. Tensile force is then transmitted to the ground surrounding the drilled holes by the load-bearing body, embedded steel strands, and grouting bulbs, and is supported by the surrounding frictional resistance.
Anchorage	- Anchorage Force = Friction of G.B + Additional Friction of Pressurized Pack + Bearing Pressure during Tension of Pack Protrusion	- Anchoring Force = Friction of G.B + Additional Friction of Pressure Pack (Pressurization) (Here, G.B stands for Grout Bulb)	- Anchoring Force = Friction between the ground and the G.B
Features and Advantages/Disadvantages	- Pressurized injection of the pack provides sag prevention for the entire anchor anchorage section (unlike standard pack anchors, which only prevent sag at the tied ends). - When applied to soft ground (clay soil), the pack contact area is smaller compared to pack anchors, resulting in a greater penetration depth into the hole wall → The equivalent diameter of the grout bulb expands further, increasing friction. - The surface expanded beyond the bore hole acts as bearing stress during tension, maximizing anchor anchorage force. - Prevents loss of grouting in the anchorage section due to groundwater flow. - Applicable to all anchor bodies	- Increased frictional resistance when applied to clayey soil due to hole enlargement caused by PACK expansion resulting from pressurized injection - Prevents grout loss in the anchorage area caused by groundwater flow - Centralizing the anchor body borehole bottom is possible by limiting the binding locations at both ends of the pack - Exhibits high anchorage strength in soft ground and has a proven track record (numerous projects in Incheon Cheongna and Songdo) - Removal work is possible even in confined spaces	- Low construction costs in firm, anchorable ground - Widely used construction method with numerous examples and simple implementation - In soft ground, forming an anchor bulb is difficult due to borehole collapse and anchor settlement, and frictional resistance is difficult to expect - If groundwater flow is present, ensuring quality is difficult due to material loss
Field Applicability	○	△	
	1. Deflection of the anchor body has a significant effect on tensile strength, and in compression anchors with load-bearing bodies, tensile strength issues are often caused by the eccentricity of the grout bulb rather than failure due to insufficient friction, as is the case with piles. Furthermore, in cases where the strength of the borehole foundation is low and the confining pressure of the ground is low, it is common in field experience for the anchorage limit to appear early due to buckling failure of the grout bulb (G.B). 1. The X-Mesh Pocket Anchor resolves eccentricity issues by centralizing the anchor body through pressurized injection, which lifts the anchor body by wrapping a small-diameter pack around the standard anchor body in an X-shape. 2. The X-MP Anchor offers superior anchoring power as it adds bearing stress from the pack protrusion to the frictional force of the standard anchor and the additional frictional force resulting from the pressurization of the pack anchor. 3. Applicable structures include slope stabilization, retaining wall reinforcement, and support anchors for temporary earth retaining facilities; as the structure involves installing SP on a standard anchor body, it offers great applicability. 4. Suitable for various ground conditions where ground-related issues with standard anchors occur, as well as for all ground conditions where standard pack anchors are used. However, reconsideration is required for ground conditions with severe water or grout loss.		

※ X-mesh Pocket Anchor system can be attached to various types of anchors.-mesh Pocket Anchor

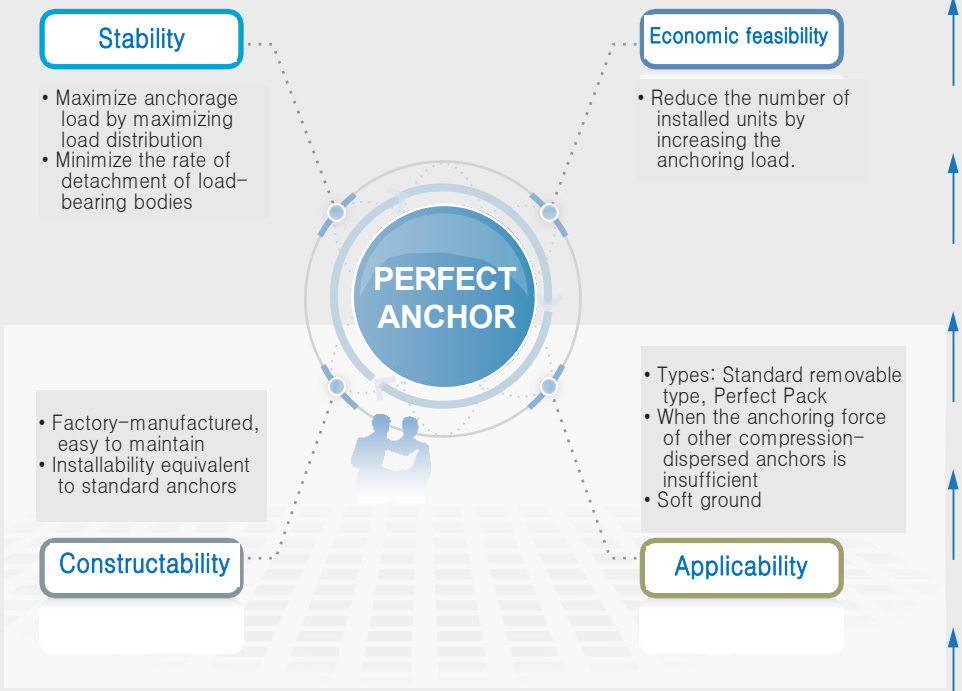
GROUND ANCHOR

Perfect Anchor (SAMJ-PF)

This anchor further subdivides and distributes tensile loads by arranging steel strands of varying lengths, which are coupled 1:1 with the anchoring head and load-bearing body in multiple stages. It is a compression-distributing type anchor that maximizes anchoring force by efficiently utilizing the load acting on the grout bulb and the frictional force induced with the ground when a tensile load is applied to the load-bearing body.



■ Features



■ Comparison of anchor bodies

Type	PERFECT Anchor	Standard Removable Anchor (R3 or U-TURN type)
Structure	• One load-bearing body installed per strand • Uses P.E. Coated Precast Concrete Strands	• 1 load-bearing body installed for every 2 strands of steel • P.E. Coated PC Strands are used
Safety	• Maximizes anchorage strength through grout stability and efficient utilization of ground friction due to the significant tensile load distribution effect	• Relatively low anchorage strength due to grout failure and insufficient ground friction caused by relative concentration of tensile load
Economic Efficiency	• Although somewhat expensive, the cost is comparable when considering anchorage load	• Relatively inexpensive, but the cost is similar when considering anchorage load
Application	• Removable and non-removable anchors (semi-permanent) • Applicable to normal and soft ground	• Removable anchor • Suitable for moderately hard or harder ground

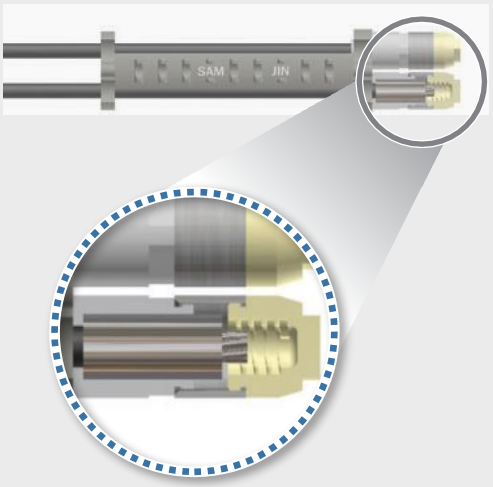
Lasting Compressive Distributive Anchor (SAMJ-LCD)

As a lasting compressive distributed anchor, the anchoring section secures the steel strands to the load-bearing body using a compression grip. Unbonded precast concrete strands are used to prevent corrosion, ensuring durability as a lasting anchor. It is primarily used for retaining wall reinforcement, slope stabilization, and buoyancy prevention.



Features

- Load-distributing compression anchor with no load reduction due to creep
- The tension member is an unbonded P.C. steel strand, which is advantageous for corrosion protection and rust prevention
- The connection between the load-bearing body and the steel strand is achieved through a grip, so there is no cross-sectional loss of the
- Since it is delivered to the site as a finished product after factory assembly, it is easy to use and offers excellent quality control



Non-removable anchor

This refers to an anchor used for the purpose of temporarily reinforcing temporary retaining walls or ground, and because it is used for a short period (generally less than 2 years), corrosion of the material progresses minimally during the service period, so corrosion protection and rust prevention are not required, or simple corrosion protection and rust prevention are sufficient. It is a product that is left in the ground as is even after the construction is completed.

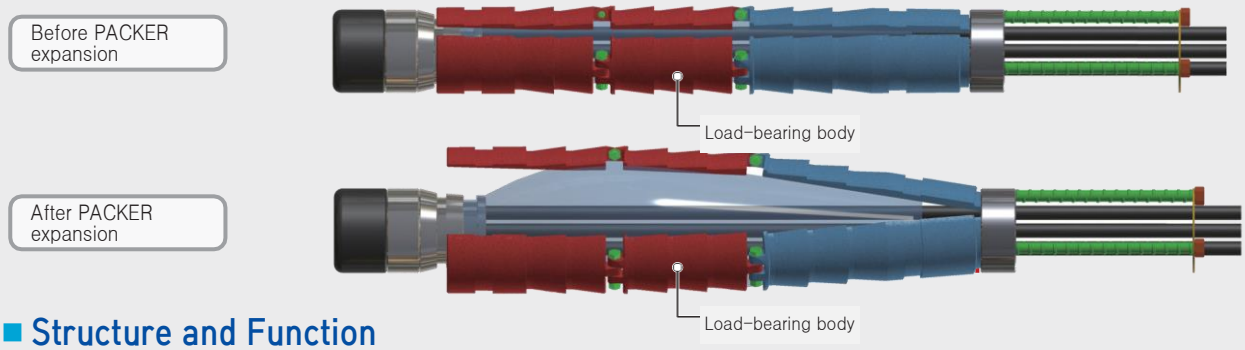




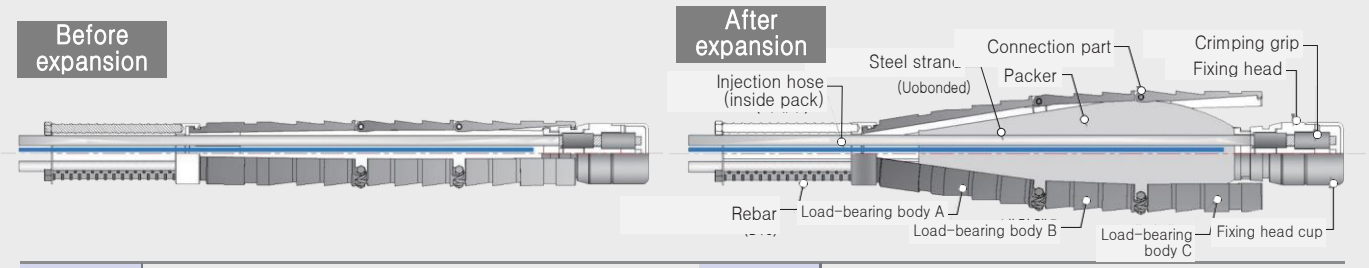
GROUND ANCHOR

Reverse Wing Anchor

This product utilizes the combined effect of bearing pressure acting on the borehole wall and the frictional force of the anchoring bulb, achieved by the wings expanding outward and spreading due to the expansion of the packer. The Reverse Wing Anchor (SAMJ-RWA) is a composite anchor that simultaneously exerts both skin friction with the ground and bearing pressure.



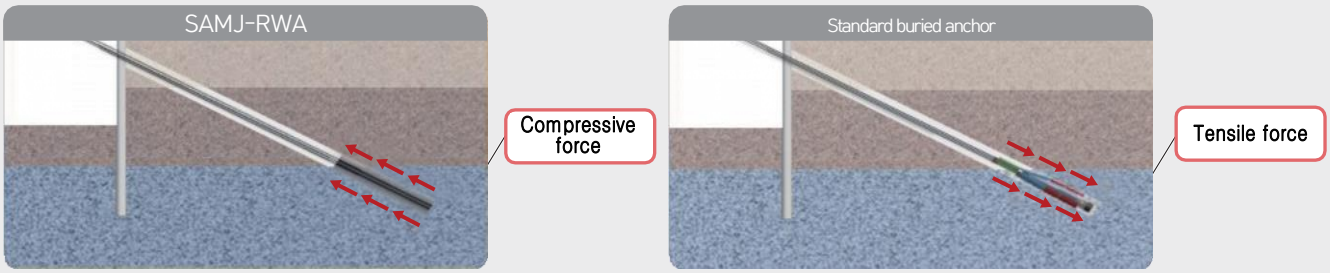
■ Structure and Function



Steel strand	Transfers tensile load to the anchorage and prevents corrosion and grout inflow with unbonded PC strands.	Pack	Unlike other anchors, it performs the role of expanding the load-bearing body solely, rather than increasing skin friction with the ground.
Load-bearing body	Connected to steel strands, it directly receives tensile load and simultaneously transfers the load to the borehole wall and bulb.	Compression Grip	Anchors steel strands to the head.
Pack injection hose	Serves to inject grout into the pack.	Fixing head	Transmits the load applied to the steel strands to the load-bearing body.

■ Features

- Anchoring force is exerted through a combination of compression and bearing pressure.
- Advantageous for securing tensile force even in soft ground areas such as fracture zones.
- Relatively reduced possibility of progressive failure compared to tension anchors.
- Minimal reduction in anchoring force as stress generated in the ground is dispersed due to the expansion of the anchor body.



PW HEAD

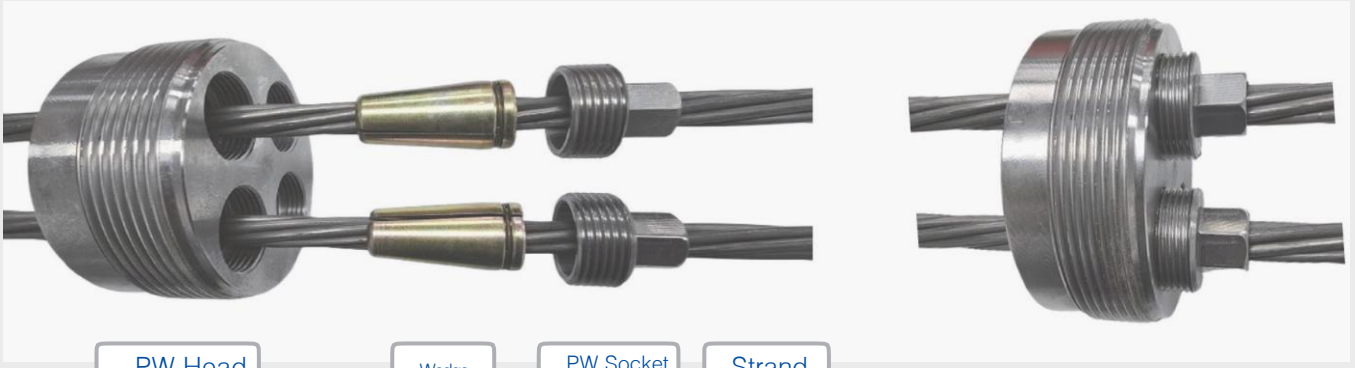
PW Head

Patent No. 10-2872471

: Permanent anchor body equipped with a fastener that firmly combines the wedge slip prevention socket and the head



PW Head (Permanent Wedge slip prevention Head) is a structure that tightly seals the wedge embedded after steel strand tensioning by forcefully pushing the PW Head and socket together via screw tightening. It resolves the structural problems of head and wedge anchoring systems where the wedge detaches or the steel strand slips due to external forces such as vibration.



PW Head | Wedge | PW Socket | Strand

Background of PW Head Development

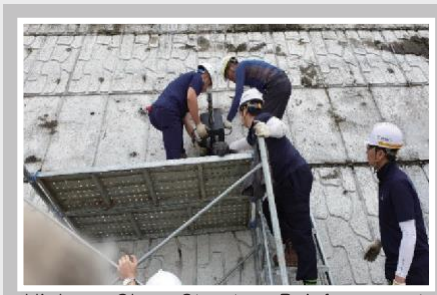
- The mounting device for ground anchors, where the tension member is a precast concrete (PC) steel strand, consists of a combination of a head and a wedge. Due to the nature of the wedge, it frequently occurs that the wedge slips or detaches over time after the steel strand is tensioned and anchored, due to construction and external forces (vibration, installation angle, corrosion, etc.), resulting in a loss of anchoring force.
- To prevent such wedge detachment, the PW Head (Permanent Wedge slip prevention Head) was developed for the first time in Korea. This method maintains a tight seal between the head, wedge, and steel strand by strongly pushing each embedded wedge through screw tightening with the PW socket, thereby preventing wedge detachment and permanently maintaining stable anchor tension.



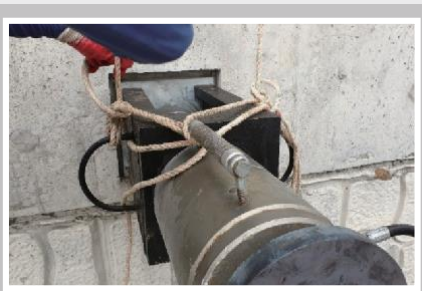
PW HEAD

◈ Case Study on Preventing Detachment of Anchor Body Anchoring Wedges

▶ Permanent Slope Reinforcement Anchor



Highway Slope Structure Reinforcement Anchor Lift-Off Test (Elapsed 3 Years)



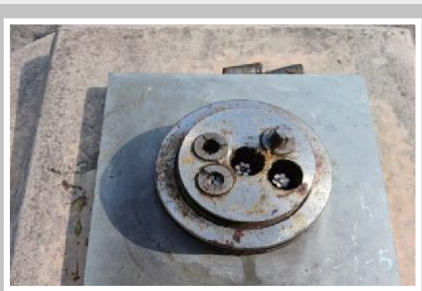
Placement of Re-tensioning Equipment for Lift-Off Test



Tensioning Equipment Dropped Due to Wedge Slip During Re-tensioning (Poor alignment of drilling angle and head → Cause of head movement)



Wedge slip due to head position shift during re-tensioning

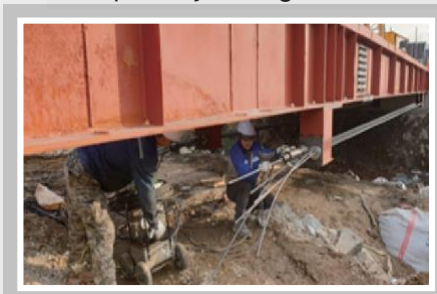


Wedge slip caused by external forces such as long-term vibration



Wedge detachment caused by external forces such as continuous vibration

▶ Temporary Bridge Post-tension Anchor



Temporary Bridge Post-tensioned Anchor Tensioning



Anchor steel strand slip due to wedge detachment caused by vehicle vibration (after 3 months)



Steel strand slip and wedge damage due to anchorage wedge detachment

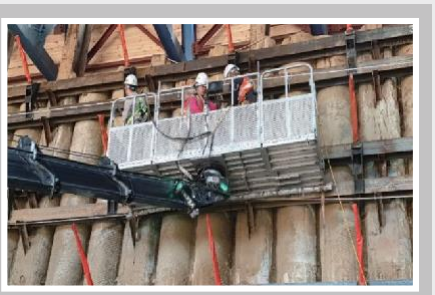
▶ Removable Earth Retaining Wall Anchor



Wedge detachment due to vibration, such as equipment contact after tensioning



Wedge detachment due to vibration, such as equipment contact after tensioning



Scene of re-tensioning work due to wedge detachment

◈ Comparison of Repair Methods for Anchor Heads of Steel Strands with Wedge Detachment

▶ Repair of Grid Block Reinforced Anchors (Current Repair Method)



The tension cable is sucked into the hole due to a tension cable slip.

Enlargement of the perimeter of the steel strand insertion hole (ø200~300mm)

Connection of the remaining steel strand and the new steel strand using a connecting coupler

Tensioning work using a pressure plate and steel pipe sleeve

Anti-rusting treatment of the head section and installation of a

- If a wedge detaches from the head wedge anchorage or steel strand slips, the steel strand is pulled into the anchorage upon release of tension, making re-tensioning impossible.
- To restore this, the damaged steel strand must be cut, extended using a steel strand coupler, and then tensioned. However, cutting the strand and installing the bidirectional coupler requires expanding the structure, and due to working conditions at high altitudes and in confined spaces, repair costs are substantial (over 1.5 million KRW per unit).
- When applying PW heads, they replace existing heads from the initial tensioning stage. This eliminates duplication of costs for existing anchorages (heads, wedges) and prevents steel strand slipping in advance. Therefore, this is a highly advantageous alternative method in terms of economic efficiency as well as ensuring long-term stability after construction.

◈ PW Head Field Application Case



- Structural Improvement Work for Reinforced Earth Retaining Wall in Sinhuk-dong, Boryeong-si
- SAMJ-LTF+Penel Retaining wall
- Construction Period: October 2025 - December 2025
- Ground Type: Weathered Soil
- Client: Boryeong City Hall
- Contractors: Hanto E&C Co., Ltd., UNI E&C Co., Ltd.



Installation of wedge anti-slip socket

Tightening of head and screw

Cutting of steel strand

Grease application

Installation of protective cap and

PW HEAD

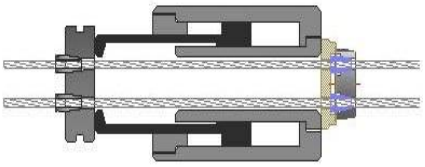
Features of PW head

Stability	Effectively compensates for the unstable structure of the head + wedge by suppressing the initial movement of the wedge through the pressure exerted by the rotation of the socket's threads on the top of the wedge.
Ease of Installatio	Since the PW head has a simple structure and uses a threaded tightening method, installation does not require skilled personnel and is simple as it utilizes a simple portable rotary tool.
Economy	The product itself is minimal compared to installation costs, and it is economical as it replaces existing heads. It is highly advantageous in terms of cost-effectiveness when considering the repair costs incurred due to wedge slip in permanent anchors where the remaining steel strands are trimmed short.
Applicabili tv	It can be used with all anchor bodies that utilize the head wedge anchoring method of lasting anchors.

PW Head Installation Sequence (Method)

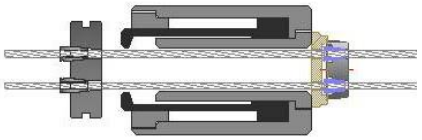
PW Head Installation Sequence

1



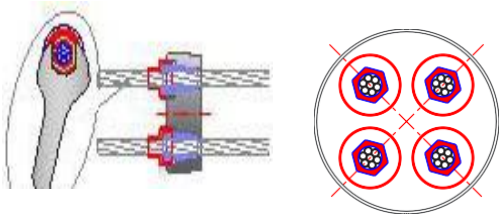
• Tensioning: Install the anchoring head and tension using the tension cylinder

2



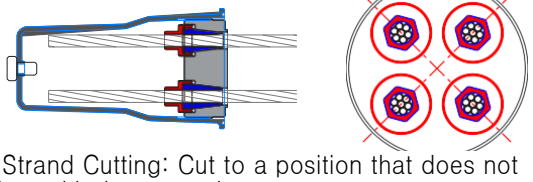
• Tension Complete: Secure the wedge to the anchoring head (maintain tension)

3



• PW Socket Fixing: Secure the socket to each wedge by screwing it in.
Tighten by pressing the inner surface of the socket against the wedge surface with high torque.

4



• Steel Strand Cutting: Cut to a position that does not interfere with the protective cap.
• Protective Cap Installation: Connect with the threads on the outer circumference of the head and fill with grease.

PW Socket Tightening Tool



Torque wrench



Ritchet wrench



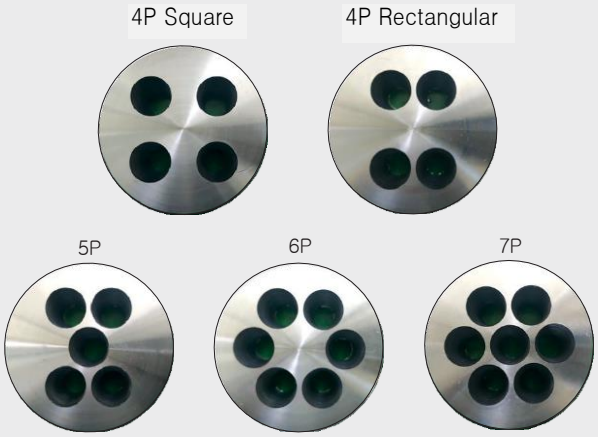
Monkey spanner



Electric impact wrench

Anchor Head

Anchor Head



■ Product Details

1. Classification: Standard Head, Square Head, Screw Head (for re-tensioning)
2. Application Areas : Earth retaining walls, slope stabilization, anti-buoyancy anchors, etc.
3. Standard: KS D 3752 SM45C (Carbon steel for mechanical structures)
4. Application by steel strand specifications: 7mm, 9.5/9.53mm, 11.1/11.11mm, 12.7mm, 15.2/15.24mm
5. Mechanical properties: (Korea Expressway Corporation Quality Standards for Construction Materials)

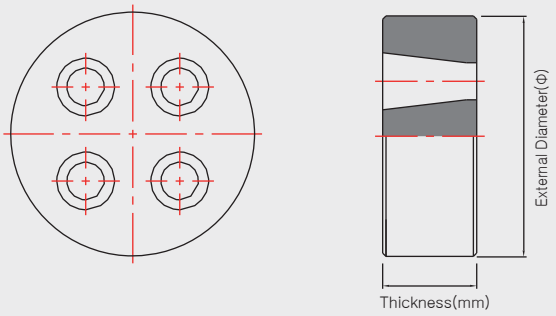
T.S.	Y,S,	Elongagtion	Hardness
Mpa	Mpa	%	HB(10/3000)
569or higher	343or higher	20or higher	167~229

※ Available for all head sizes, including 12.7Ø and 15.2

■ Product Specifications

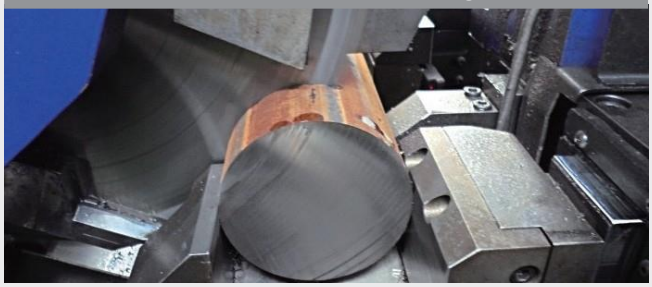
Number of Strand	External Diameter(Φ)		Thickness(T)	
	12.7	15.2	12.7	15.2
3~5	108	108	43	50
6~7	108	138	43	50
8~12	138	148	50	55
13~15	148	168	55	65

※ Re-tension head specifications require separate inquiry

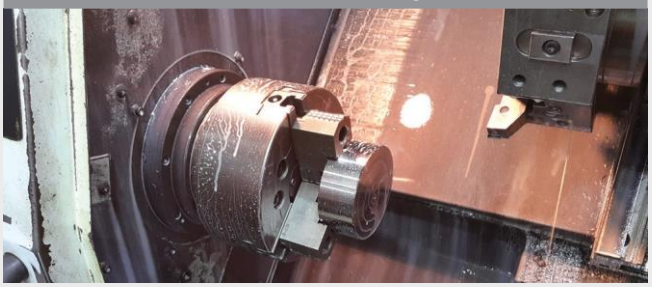


■ Production Process

1. Circular Saw Cutting



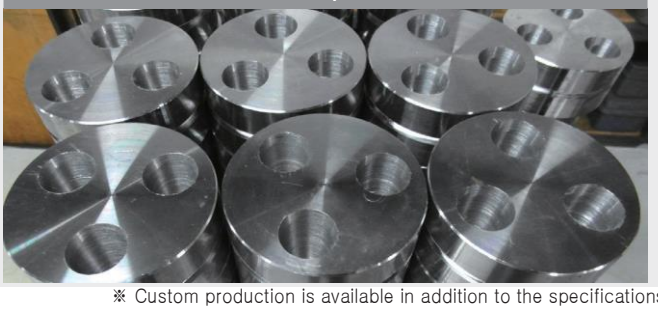
2. After Cutting



3. Drilling



4. Completion



※ Custom production is available in addition to the specifications above.

Anchor Wedge

Wedge

■ Product Details



1. Applications based on steel strand sizes: 7mm, 9.5/9.53mm, 11.1/11.11mm, 12.7mm, 15.2/15.24mm
2. Standards: KS D 3867 SNCM420, SCM415 (Alloy steel for mechanical structures)
3. Mechanical Properties: (Korea Expressway Corporation Construction Material Quality Standards)

T.S.	Y.S.	Elongation	Hardness	Surface Hardness	Core Hardness
Mpa	Mpa	%	HBW(10/3000)	HRC	HRC
430 or higher	330 or higher	12 or higher	126 or higher	58 or higher	46 or lower



4. Chemical Composition: (Korea Expressway Corporation Construction Material Quality Standards)

Div.	C	Si	Cr	Mn	Mo	P,S	Cu
SCM415	0.13~0.18	0.15~0.35	0.90~1.20	0.60~0.85	0.15~0.30	0.03 or less	0.3 or less

5. Test Method
   - The wedge test is performed by attaching wedges and anchors to both ends of the PC steel strand and applying tension.
   - The test is conducted according to the PC steel strand standard, and the presence or absence of wedge damage is checked upon steel strand fracture (SWPC7BL).

■ Production Process

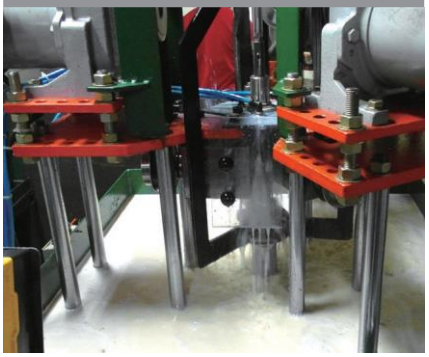
1. CNC Processing



2. Tapping



3. Cutting



4. After Cutting



5. Heat Treatment & Assembly



6. Application



※ Custom production is available in addition to the specifications above.

Anchor Steel Strand Specifications

■SAMJ-12.7mm

[KS D 7002]

Size	Quantity	UL (ton)	YL (ton)	AL (ton)	
				Temp	P
SAMJ-3	3	56.10	47.70		
SAMJ-4	4	74.80	63.60		
SAMJ-5	5	93.50	79.50		
SAMJ-6	6	112.20	95.40		
SAMJ-7	7	130.90	111.30		
SAMJ-8	8	149.60	127.20		
SAMJ-9	9	168.30	143.10		
SAMJ-10	10	187.00	159.00		
SAMJ-11	11	205.70	174.90		
SAMJ-12	12	224.40	190.80		
SAMJ-13	13	243.10	206.70		
SAMJ-14	14	261.80	222.60		



▪ AL(Design Allowable Load)
- Temp: 65% of UL (18.7 ton) = 12.16 ton
- P: 60% of UL (18.7 ton) = 11.22 ton

▪ UL (Ultimate Load): 15.9 ton
▪ Consult separately regarding matters not covered by the table.

■SAMJ-15.2mm

[KS D 7002]

Size	Quantity	UL (ton)	YL (ton)	AL (ton)	
				Temp	P
SAMJ-3	3	79.80	67.8	51.87	47.88
SAMJ-4	4	106.40	90.40	69.16	63.84
SAMJ-5	5	133.00	113.00	86.45	79.80
SAMJ-6	6	159.60	135.60	103.74	95.76
SAMJ-7	7	186.20	158.20	121.03	111.72
SAMJ-8	8	212.80	180.80	138.32	127.68
SAMJ-9	9	239.40	203.40	155.61	143.64
SAMJ-10	10	266.00	226.00	172.90	159.60
SAMJ-11	11	292.60	248.60	190.19	175.56
SAMJ-12	12	319.20	271.20	207.48	191.52
SAMJ-13	13	345.80	293.80	224.77	207.48
SAMJ-14	14	372.40	316.40	242.06	223.44



▪ AL(Design Allowable Load)
- Temp: 65% of UL (26.6 ton) = 17.29 ton
- P: 60% of UL (26.6 ton) = 15.96 ton

▪ UL (Ultimate Load): 22.6 ton
▪ Consult separately regarding matters not covered by the table.

Anchor Accessories

Anchor Accessories

■ Anchorage Head

Angle Head



Used on slopes for retaining wall reinforcement

Screw Head



Re-tension via side threads and mounting of protective cap

Buoyancy Head



Mounting of protective cap via side oiling

■ Protection Cap







■ P.C Strand Coupler



■ Single Cone



■ Packer

■ Spacer



Removable Type



12 X Large



12 X Medium



8 X Medium



8 X Small

QC Various Testing Equipment (In-house)

■ Hardness Tester



▪ Metal Specimen Hardness Testing

■ Hardness Tester (Rockwell)



Metal Specimen Hardness Testing

■ Tensile Test Pedestal (10m)



- PC Strand Elongation Test
- Wedge Slip Test
- PC Strand Relaxation Test

■ Universal Testing Machine (1000kN)



- Tensile Tests: Anchors, Nailing, Rock Bolts, etc.
- Compression Tests: Concrete & Grout Molds

Production Facilities and Capacity by Product

Production Facilities

Ground Anchor Production Line

* Anchor bodies and maximum production capacity: 8,000 ~ 10,000M

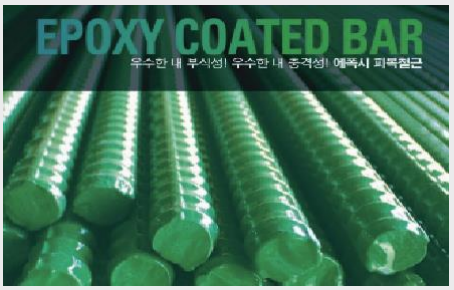




Epoxy Coated Rebar Production Lin

* Maximum monthly production capacity of epoxy coated rebar: 800 tons





Rock Bolt Production Line

* Maximum monthly production capacity of rock bolts: 400 tons





Steel Fiber Production Line

* Maximum monthly production capacity of steel fibers: 400 tons





Heads and Wedges Production Line

* Maximum monthly production capacity of heads (4P): 12,000 units / Maximum monthly production capacity of wedges: 60,000 units



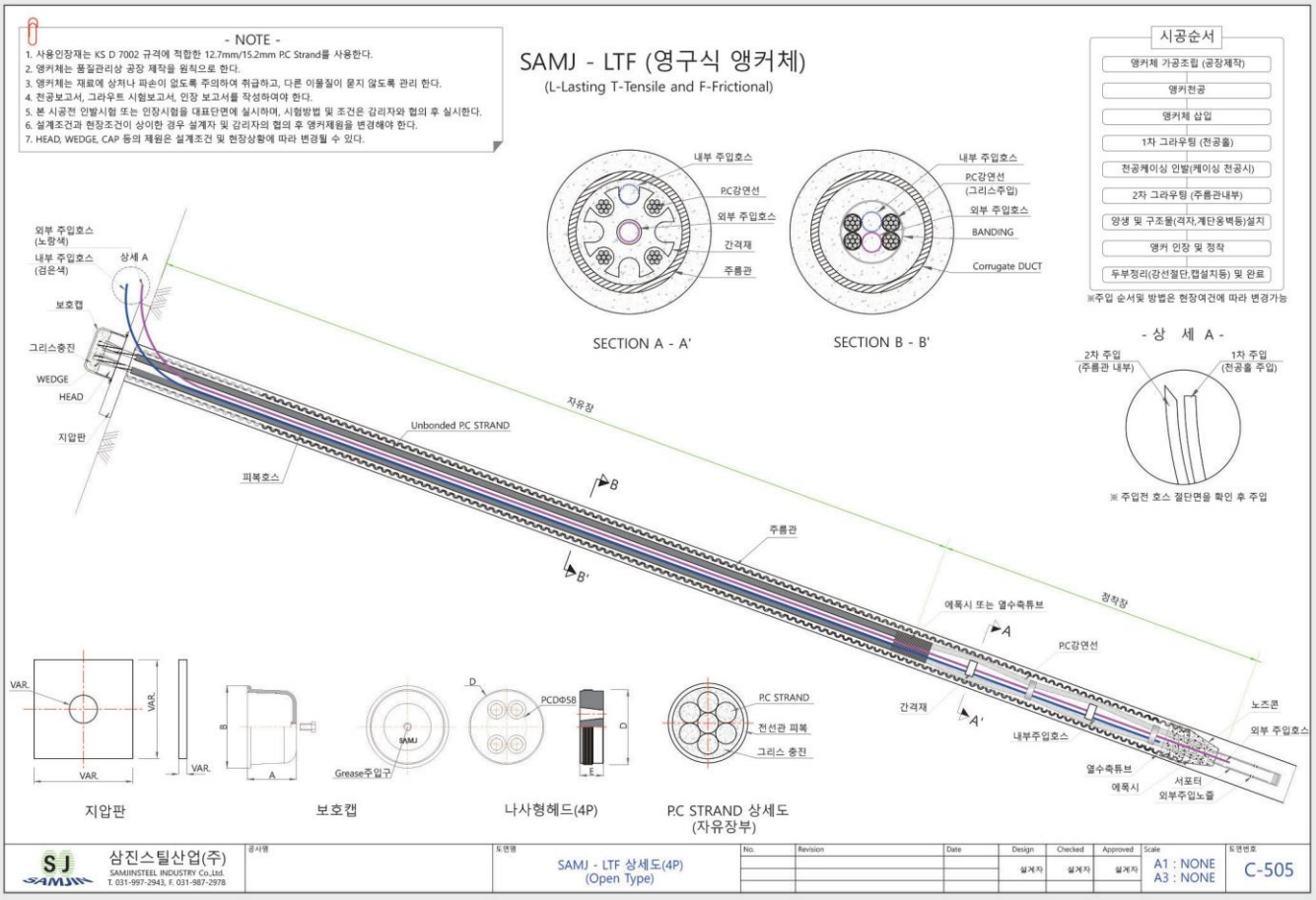


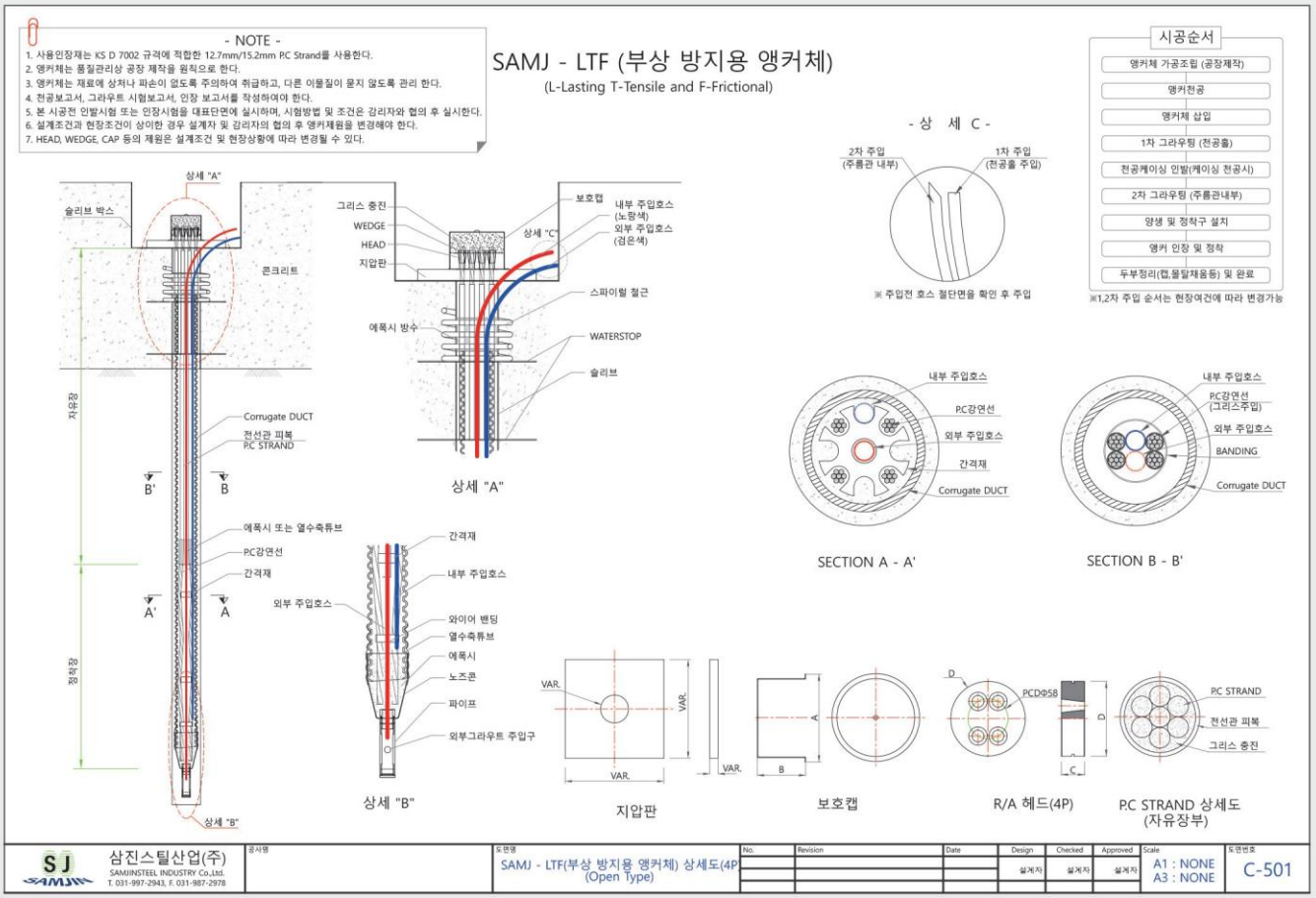
Anchor Delivery Track Record

Construction Company	Project Name	Product Name
Shinsegae E&C	Starfield Cheongna	R3 Anchor Body
DL E&C	Acro de Seocho New Construction	R3 Anchor Body
Samsung C&T	Songdo Station Area Development Project 2BL	R3 Anchor Body
Woomi E&C	Wonju Station Umi Rin The Sky Apartment New Construction	R3 Anchor Body
Daewoo E&C	Wonju Prugio The Central New Construction	R3 Anchor Body
Kyeryong Construction	Bucheon Daehyeon Cheongsil-oe Street Housing Redevelopment Project	R3 Anchor Body
Lotte E&C	Ansan Jungang Jugong Complex 5 Zone 2 Housing Reconstruction Redevelopment Project	R3, R3 Pack Anchor Body
HDC	Gwangmyeong Station Central IPARK New Construction	R3 Anchor Body
Doojin Construction	Cheongju Technopolis S4BL Heartrium New Construction	R3, R3 Pack Anchor Body
Hyundai E&C	Hillstate Jukrim The Proud New Construction	R3, R3 Pack Anchor Body
Hyundai E&C	Osong Station Hyundai Hillstate Multi-unit Housing Construction	R3, R3 Pack Anchor Body
Jungheung Construction	Seongnam Geumto District A-3BL Multi-unit Housing Construction	R3, R3 Pack Anchor Body
Hanwha E&C	Chungju Hoam Hanwha Forena Apartment Construction	R3, R3 Pack Anchor Body
SK E&C	Yongin Semiconductor Cluster	R3, R3 Pack Anchor Body
Daewoo E&C	Asan Tangjeong Prugio Center Park Construction	R3, R3 Pack Anchor Body
Daewoo E&C	Asan Tangjeong Prugio River Park Construction	R3, R3 Pack Anchor Body
POSCO/Hyundai E&C	Pohang Hillstate The Sharp Sangsaeng Park Construction	R3, R3 Pack Anchor Body
Kolon Global	Korean Air Unbok New Engine Maintenance Plant Construction	R3 Pack Anchor Body
DL E&C	Ilsan Pungdong Multi-unit Housing Construction	R3, R3 Pack Anchor Body
Lotte E&C	Gimhae Jinaeburam Area Housing Association Multi-unit Housing Construction	U-turn removable pack anchor body
Kyeryong Construction	Pangyo Water Quality Restoration Center Sewage Treatment Capacity Expansion Project	U-turn removable anchor body
DL E&C	Acro de Seocho Construction	U-turn removable anchor body
Daewoo E&C	Sanseong Station Heristone 3BL Multi-unit Housing Construction	U-turn removable anchor body
Seohae General Construction	Ulsan Taehwa Riverside A-2BL Apartment Construction	U-turn, R3 removable anchor body
HDC	Sangbong Zone 9-1 Mixed-use Building Construction	U-turn removable anchor body
HDC	Daegu Beomeo IPARK Construction	U-turn removable anchor body
POSCO이앤씨	Seoul-Gwangmyeong Expressway Section 1-2	R3, R3 Pack Anchor Body
Lotte E&C	Gangnam Circular Road Section 8	R3, R3 Pack Anchor Body
Hyundai E&C	Expressway Construction between Gimpo and Paju Section 2	R3, R3 Pack Anchor Body
Hyosung	Imsil-Jangsu Road Construction Section 2	U-turn removable anchor body
Hanwha E&C	Subgrade Facilities for Suwon-originating KTX Direct Connection Project Other Construction Works	Built-in type anchor body
Sejin E&C	Pipe Relocation Work on the Ungyo-Jinan (National Highway 30) Section	Built-in type anchor body
Daeyang Construction	Sindaesogyo Bridge Construction	Built-in type anchor body
Namkwang Construction	Road Construction between Saengnim and Sangdong	Built-in type anchor body
Samin Construction	Slope Reinforcement Work on Sinri Tunnel 1	Built-in type Anchor body
Korea Development Corporation	Disaster Recovery on National Highway 14 (Munmu Daewangneung Andong-ri - Hoam-ri)	Built-in type anchor body
Seowon Construction	Wastewater Treatment Facility at Seo-Ochang Techno Valley	Built-in type anchor body
Jinol Construction	Slope Collapse Section on National Highway 47	Built-in type anchor body
Samin Construction	Slope Reinforcement Work on Sinri Tunnel 1	Built-in type anchor body

Anchor Delivery Track Record

Construction Company/Client	Project Name	Product Name
HDC	Expressway No. 65 Pohang-Yeongdeok Construction Project Sections 1, 4, and 5	SAMJ-LTF Anchor Body
Daewoo E&C	Expressway No. 65 Pohang-Yeongdeok Construction Project Section 3	SAMJ-LTF Anchor Body
DL E&C	Namyangju Jinjeop 2B-1BL Apartment Construction Project	SAMJ-LTF Anchor Body
Dongbu E&C	Namyangju Jinjeop 2A-7BL Apartment Construction Project	SAMJ-LTF Anchor Body
Hanshin Engineering & Construction	Asan-Cheongju Line Inju-Yeomchi Construction Project Section 2	SAMJ-LTF Anchor Body
Doosan Energy	Expressway No. 29 Sejong-Anseong Construction Project Section 10	SAMJ-LTF Anchor Body
Kyeryong E&C	Expressway No. 29 Sejong-Anseong Construction Project Section 4	SAMJ-LTF Anchor Body
Daebo E&C	Pyeongtaek-Buyeo-Iksan Western Inland Expressway Private Investment Project Section 14	SAMJ-LTF Anchor Body
Doosan Heavy Industries	Hamyang-Changnyeong Expressway Section 7	SAMJ-LTF Anchor Body
Jinheung Enterprise	Daegu Dasa-Waegwan Metropolitan Road Construction Project	SAMJ-LTF Anchor Body
Kyungnam Enterprise / Samho Development	Expressway No. 14 Hamyang-Changnyeong Construction Project Sections 1 and 8	SAMJ-LTF Anchor Body
Daewoo E&C	Suwon Dayupyeong District Hwasan Underpass Construction Project	SAMJ-LTF Anchor Body
Kumho E&C	Daejeon Daedong 2 Residential Environment Improvement Project 1 and 2BL Multi-unit Housing Construction 24-F-Y Priority Facility Construction (Yecheon Air Force Airport)	SAMJ-LTF Anchor Body
Beomhan E&C	Expressway No. 65 Pohang-Yeongdeok Construction Project Sections 1, 4, and 5	SAMJ-LTF Anchor Body
Shinsegae E&C	Goyang Changneung A-4BL Apartment Construction Project	SAMJ-LTF Anchor Body
DL E&C	Chilbuk-Bukmyeon Road Construction Project	SAMJ-LTF Anchor Body
Dongyang Construction Industry	Pohang-Andong (1-2) Road Construction Project	SAMJ-LTF Anchor Body
Namhae General Development	Disaster Prevention Works at Wonchang-Beolgyo and 5 Other Locations	SAMJ-LTF Anchor Body
Gaon Construction Industry	Cheonan Wastewater Treatment Plant	SAMJ-LTF Anchor Body
Dongwon Development	Busan Sasang Park Specialization Project for Private Park Development	SAMJ-LTF Anchor Body
Orange Construction	Ogi-Jukpa Road Construction Project	SAMJ-LTF Anchor Body
Centum Enterprise	Yeosu Yulchon District Rockfall and Landslide Restoration Works at 4 Locations	SAMJ-LTF Anchor Body
Hangil General Construction	Hyeongsan River Hyoja 2 District River Environment Improvement Project	SAMJ-LTF Anchor Body
Hongcheon Regional Office of Land Management	Inje Kirin Rockfall and Landslide Restoration Works at 2 Locations	SAMJ-LTF Anchor Body
Hongcheon Regional Office of Land Management	Hongcheon National Land Survey Major Rockfall and Landslide Restoration Work	SAMJ-LTF Anchor Body
Gangneung Regional Office of Land Management	National Highway 31 Rockfall and Landslide Road Restoration Work	SAMJ-LTF Anchor Body
Gangneung Regional Office of Land Management	Hangye District 44 Rockfall and Landslide Restoration Work	SAMJ-LTF Anchor Body
Gangneung Regional Office of Land Management	National Highway 7 Gangneung Gangdong Rockfall and Landslide Restoration Work	SAMJ-LTF Anchor Body
Wonju Regional Office of Land Management	Chuncheon Hwacheon Section 3 Road Construction Project	SAMJ-LTF Anchor Body
Wonju Regional Office of Land Management	Yanggu Wontong Road Construction Project	PEA Pack Extended Anchor Body
Gangneung Regional Office of Land Management	Osaek E5 Site	PEA Pack Extended Anchor Body
Gangneung Regional Office of Land Management	Osaek 85 Site	PEA Pack Extended Anchor Body
Gyeongsangnam-do	Meri Yangsan Kkakgi Section 2 Site	PEA Pack Extended Anchor Body
Gangneung Regional Office of Land Management Yangyang Branch	Jinbu Bridge 2 Site	PEA Pack Extended Anchor Body
Gangneung Regional Office of Land Management	Samsan District 30 Site	PEA Pack Expandable Anchor Body
Pohang Regional Office of Land Management Uljin Branch	Uljin Giseong Manghyang Site	PEA Pack Expandable Anchor Body
Pohang Regional Office of Land Management	Songseon District 16 Site	PEA Pack Expandable Anchor Body
Busan Regional Office	Waryong Beopjeon National Road Slope Construction	PEA Pack Expandable Anchor Body
Daegu Regional Office of Land Management	Sangju Goseong Geochang District Site	PEA Pack Expandable Anchor Body
Sangju City Waterworks and Sewerage Office	Sangju Stormwater Pumping Station	PEA Pack Expandable Anchor Body
Hanwha E&C	Pyeongtaek Tongbok Sewage Treatment Plant	PEA Pack Expandable Anchor Body
Geumhang E&G	Ulsan Mipo National Industrial Complex Buffer Retention Basin Installation Construction	PEA Pack Expandable Anchor Body
Gyeongnam Road Management Office	Route G1014 Hadong Mukgye District Hazardous Slope Stabilization Construction	PEA Pack Expandable Anchor Body
DL E&C	Anseong-Guri Expressway Construction Section 4	PEA Pack Expandable Anchor Body
DL E&C	Sejong-Pocheon Expressway Anseong-Seongnam Expressway Section 12	PEA Pack Expandable Anchor Body
Kyeryong Construction	Sejong-Pocheon Expressway Anseong-Seongnam Expressway Section 8	PEA Pack Expandable Anchor Body
DL E&C	Sejong-Pocheon Expressway Anseong-Seongnam Expressway Section 9	PEA Pack Expandable Anchor Body





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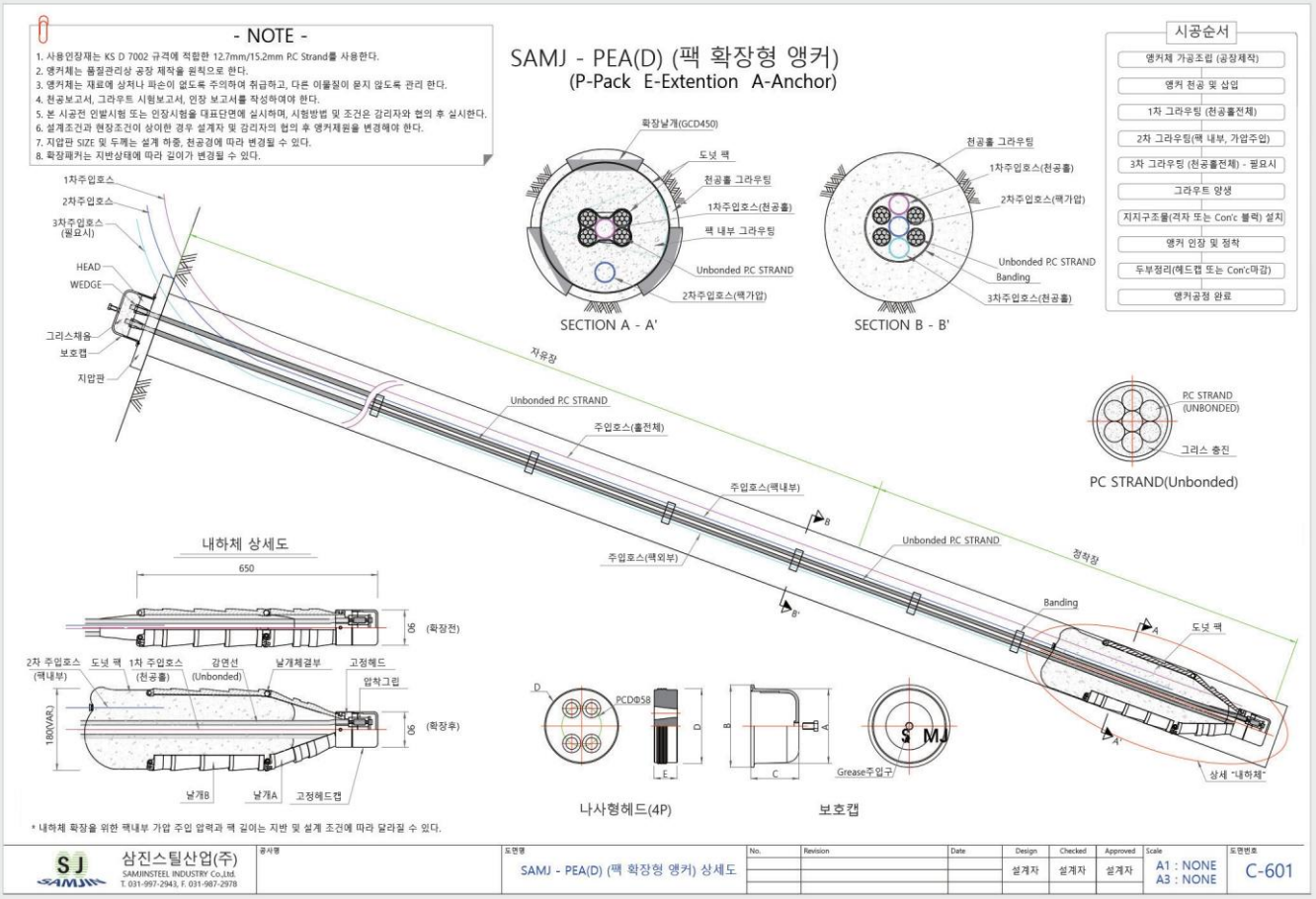
- NOTE -
1. 사용인장재는 KS D 7002 규격에 적합한 12.7mm/15.2mm P.C Strand를 사용한다.
2. 앵커체는 품질관리상 공장 제작을 원칙으로 한다.
3. 앵커체는 재료에 상처나 파손이 없도록 주의하여 취급하고, 다른 이물질이 묻지 않도록 관리 한다.
4. 천공보고서, 그라우트 시험보고서, 인장 보고서를 작성하여야 한다.
5. 본 시공전 인발시험 또는 인장시험을 대표단면에 실시하며, 시험방법 및 조건은 감리자와 협의 후 실시한다.
6. 설계조건과 현장조건이 상이한 경우 설계자 및 감리자의 협의 후 앵커체원을 변경해야 한다.
7. 지압판 SIZE 및 두께는 설계 하중, 천공경에 따라 변경될 수 있다.
8. 확장패커는 지반상태에 따라 길이가 변경될 수 있다.
SAMJ - PEA(D) (팩 확장형 앵커)
(P-Pack E-Extention A-Anchor)
시공순서
앵커체 가공조립 (공장제작)
앵커 현공 및 삽입
1차 그라우팅 (천공홀전체)
2차 그라우팅(팩 내부, 가압주입)
3차 그라우팅 (천공홀전체) - 필요시
그라우트 양생
지지구조물(격자 또는 Con'c 블럭) 설치
앵커 인장 및 정착
두부정리(헤드캡 또는 Con'c매입)
앵커공정 완료
확장날개(GCD450)
도넛 팩
천공홀 그라우팅
1차주입호스(천공홀)
팩 내부 그라우팅
Unbonded P.C STRAND
2차주입호스(팩가압)
SECTION A - A'
천공홀 그라우팅
1차주입호스(천공홀)
2차주입호스(팩가압)
Unbonded P.C STRAND
Banding
3차주입호스(천공홀)
SECTION B - B'
1차주입호스
2차주입호스
3차주입호스 (필요시)
HEAD
WEDGE
그리스채움
보호캡
지압판
자유장
Unbonded P.C STRAND
주입호스(홀전체)
주입호스(팩내부)
주입호스(팩외부)
정착장
Banding
도넛 팩
상세 "내하체"
PC STRAND (UNBONDED)
그리스 충진
PC STRAND(Unbonded)
내하체 상세도
650
90 (확장전)
90 (확장후)
180(VAR.)
2차 주입호스 (팩내부)
도넛 팩
1차 주입호스 (천공홀)
감면선 (Unbonded)
날개체결부
고정헤드
압착그리
날개B
날개A
고정헤드캡
* 내하체 확장을 위한 팩내부 가압 주입 압력과 팩 길이는 지반 및 설계 조건에 따라 달라질 수 있다.
PCD58
나사형헤드(4P)
Grease주입구
보호캡
삼진스틸산업(주)
SAMJINSTEEL INDUSTRY Co.,Ltd.
T. 031-997-2943, F. 031-987-2978
도면명
SAMJ - PEA(D) (팩 확장형 앵커) 상세도
No.
Revision
Date
Design
Checked
Approved
Scale
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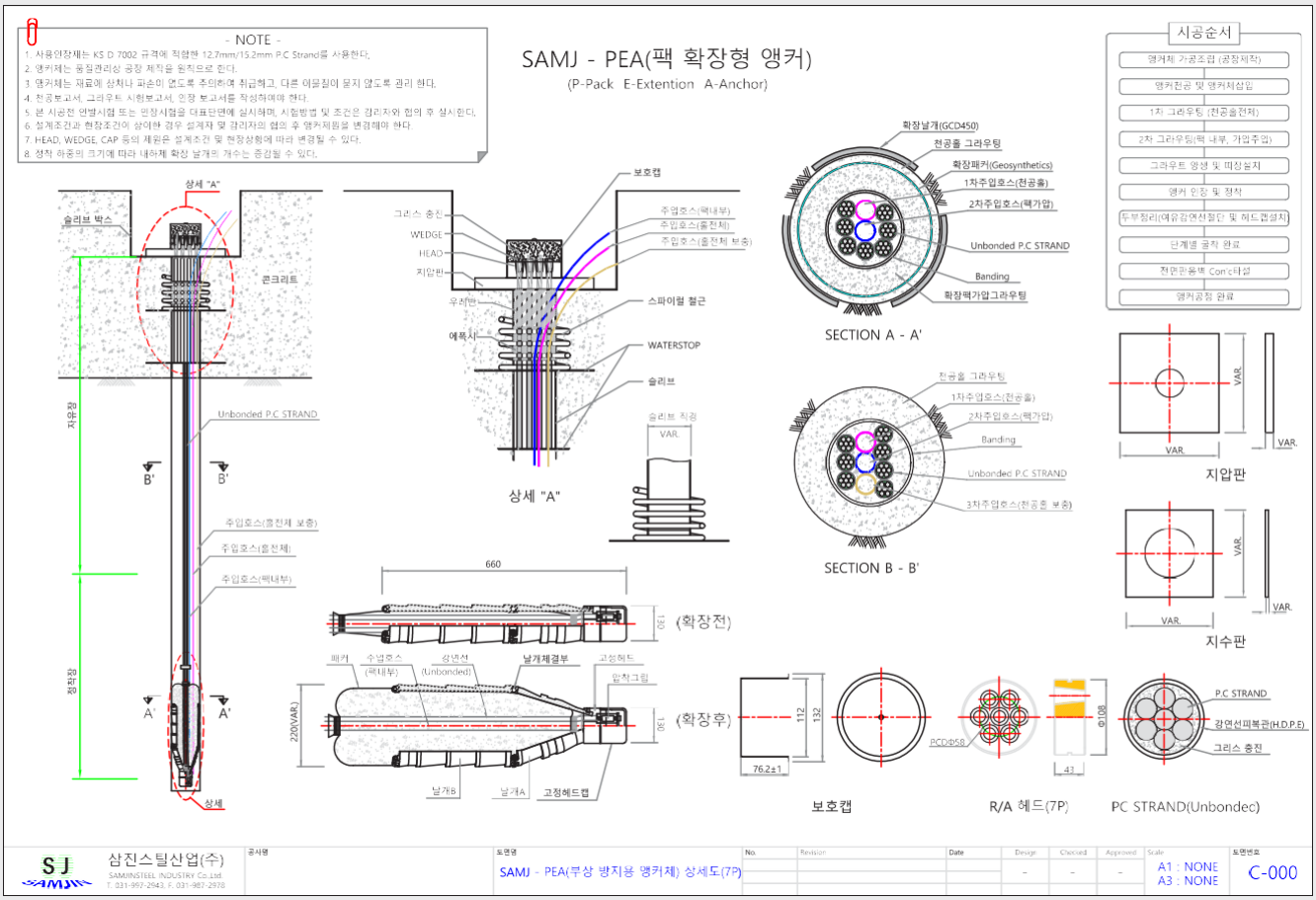
A3 : NONE
도면번호
C-601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6. 설계조건과 현장조건이 상이한 경우 설계자 및 감리자의 협의 후 앵커체원을 변경해야 한다.
7. HEAD, WEDGE, CAP 등의 제원은 설계조건 및 현장상황에 따라 변경될 수 있다.
8. 정착 하중의 크기에 따라 내하체 확장 날개의 개수는 증감될 수 있다.
SAMJ - PEA(팩 확장형 앵커)
(P-Pack E-Extention A-Anchor)
시공순서
앵커체 가공조립 (공장제작)
앵커현공 및 앵커체삽입
1차 그라우팅 (천공홀전체)
2차 그라우팅(팩 내부, 가압주입)
그라우트 양생 및 띠장설치
앵커 인장 및 정착
두부정리(예상검연선절단 및 헤드캡설치)
단계별 공직 완료
전면판옹벽 Con'c타설
앵커공정 완료
확장날개(GCD450)
천공홀 그라우팅
확장패커(Geosynthetics)
1차주입호스(천공홀)
2차주입호스(팩가압)
Unbonded P.C STRAND
Banding
확장팩가압그라우팅
SECTION A - A'
천공홀 그라우팅
1차주입호스(천공홀)
2차주입호스(팩가압)
Banding
Unbonded P.C STRAND
3차주입호스(천공홀 보충)
SECTION B - B'
상세 "A"
슬리브 박스
콘크리트
자유장
정착장
Unbonded P.C STRAND
주입호스(홀전체 보충)
주입호스(홀전체)
주입호스(팩내부)
보호캡
그리스 충진
WEDGE
HEAD
지압판
우레탄
에폭시
스파이럴 철근
WATERSTOP
슬리브
슬리브 직경
VAR.
660
130 (확장전)
130 (확장후)
220(VAR.)
패커
감면선 (Unbonded)
날개체결부
고정헤드
압착그리
날개B
날개A
고정헤드캡
보호캡
PCD58
R/A 헤드(7P)
P.C STRAND
강연선피복관(H.D.P.E)
그리스 충진
PC STRAND(Unbondec)
지압판
지수판
삼진스틸산업(주)
SAMJINSTEEL INDUSTRY Co.,Ltd.
T. 031-997-2943, F. 031-987-2978
도면명
SAMJ - PEA(부상 방지용 앵커체) 상세도(7P)
No.
Revision
Date
Design
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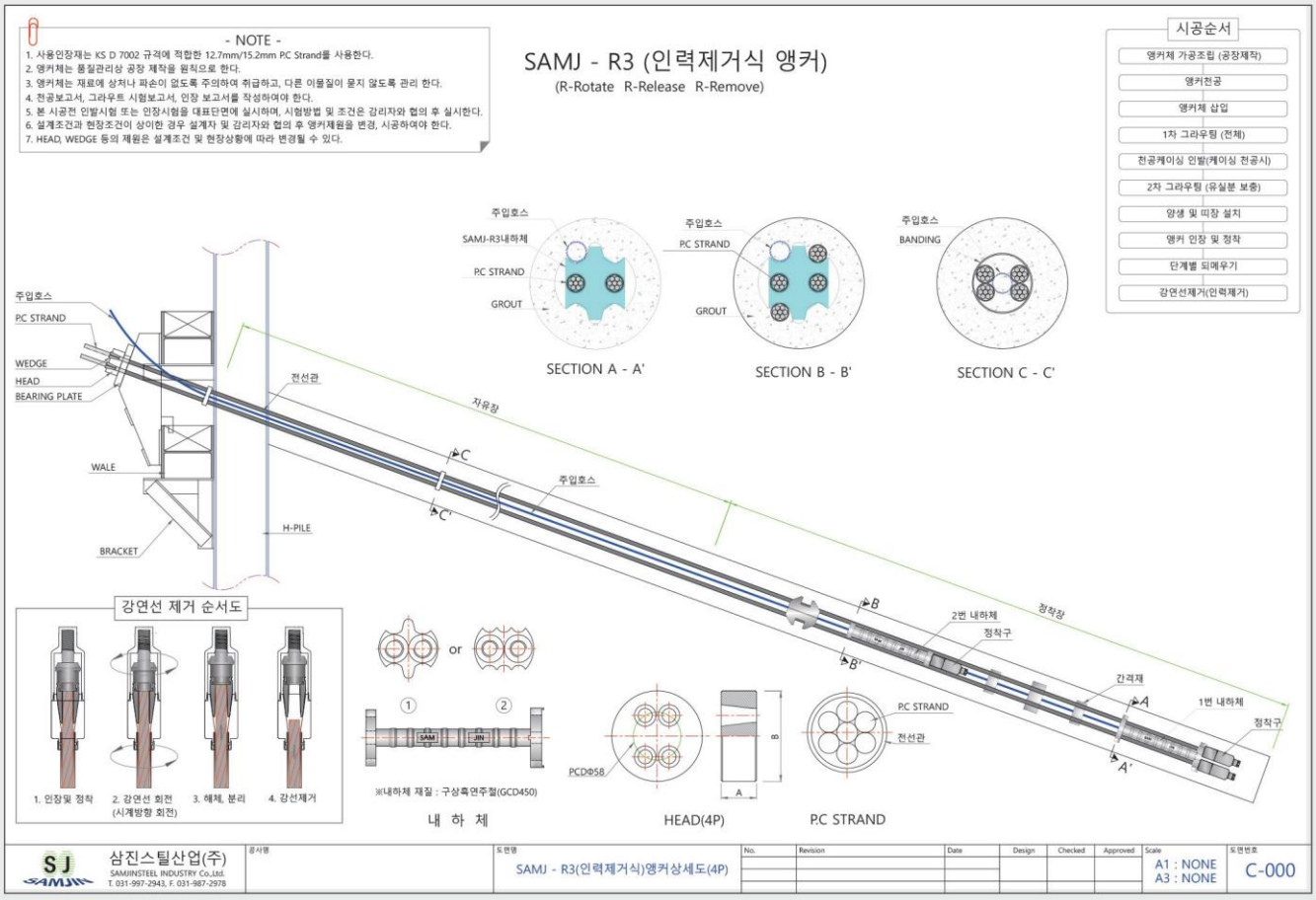
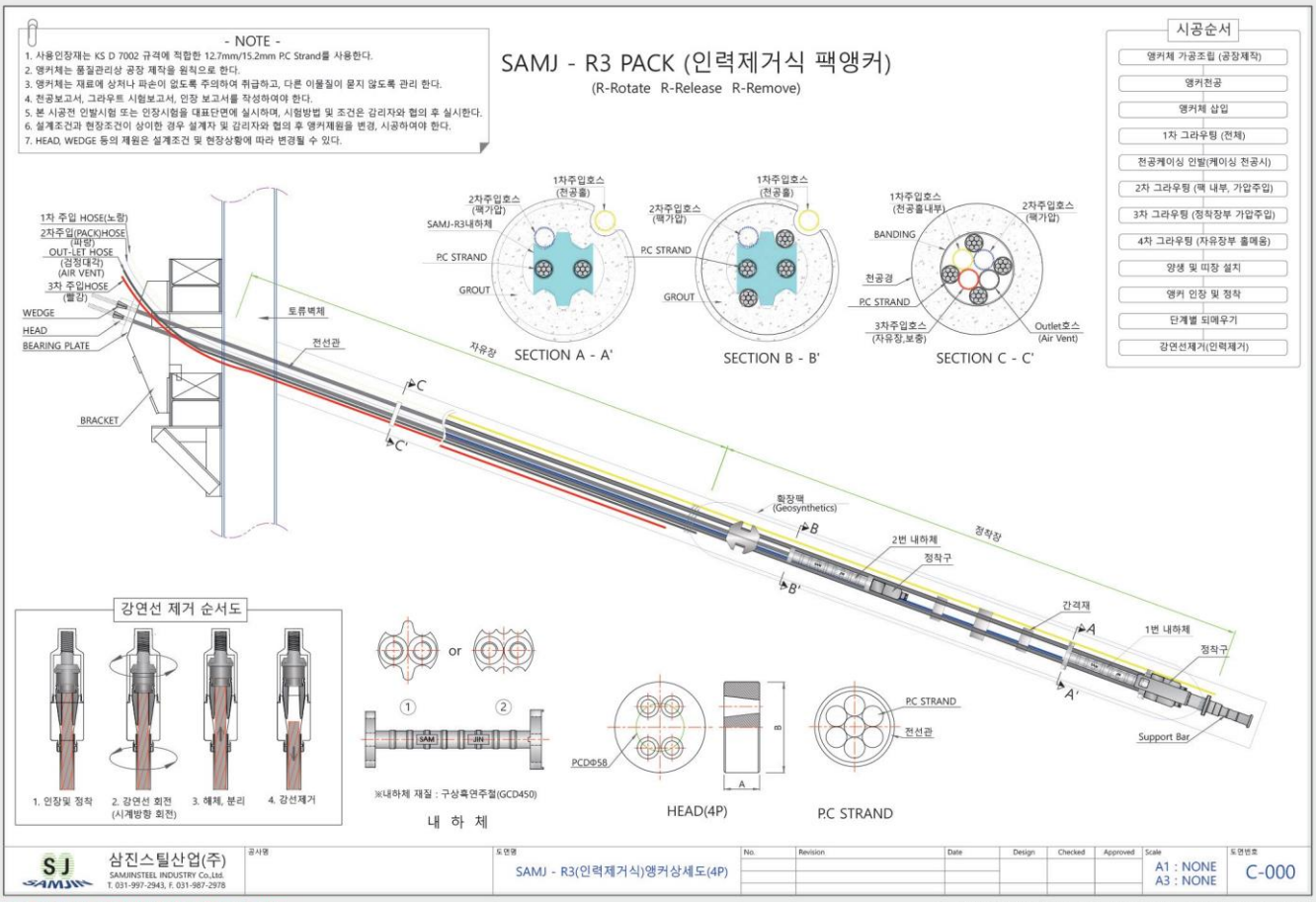
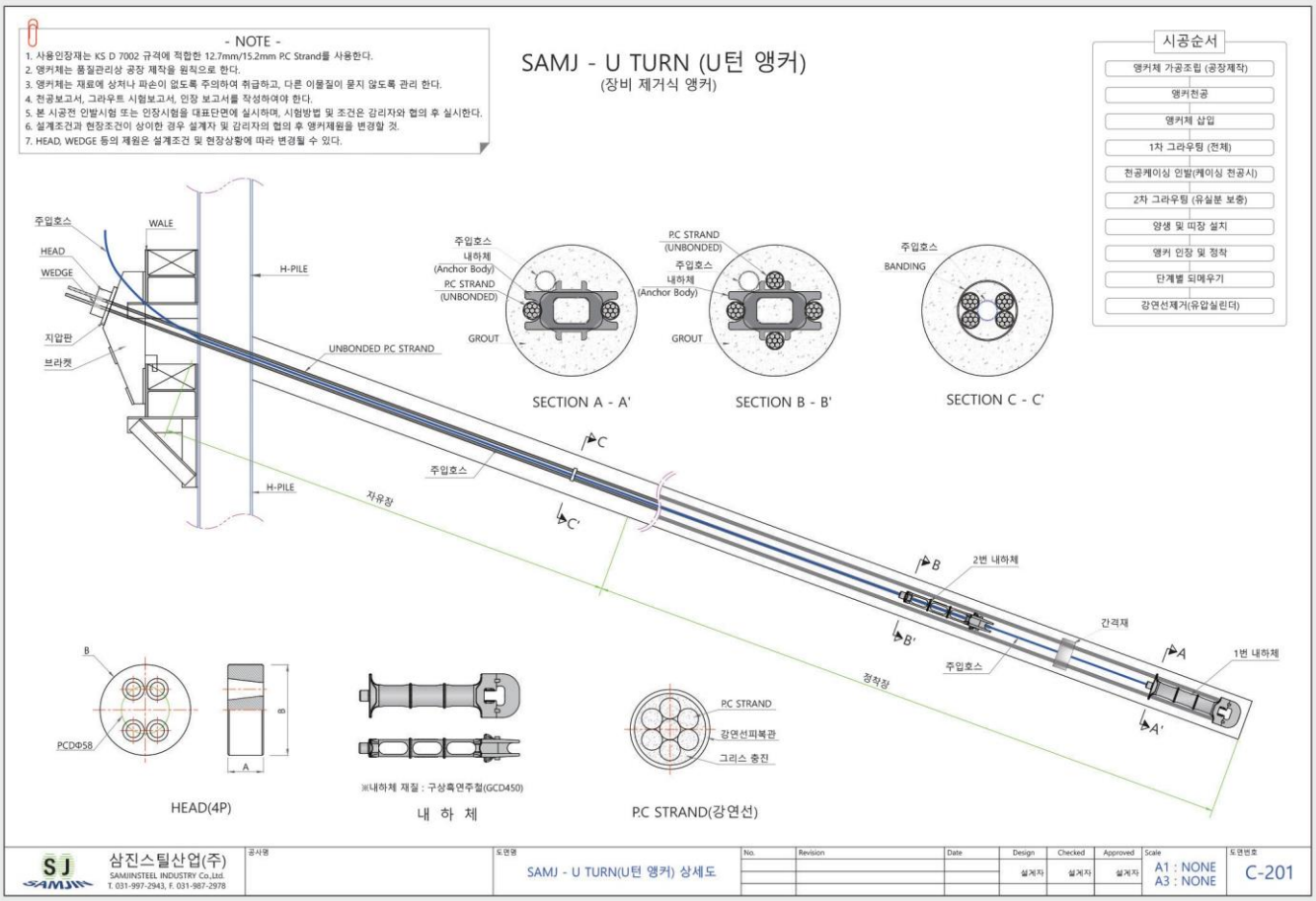
Scale
A1 : NONE
A3 : NONE
도면번호
C-000

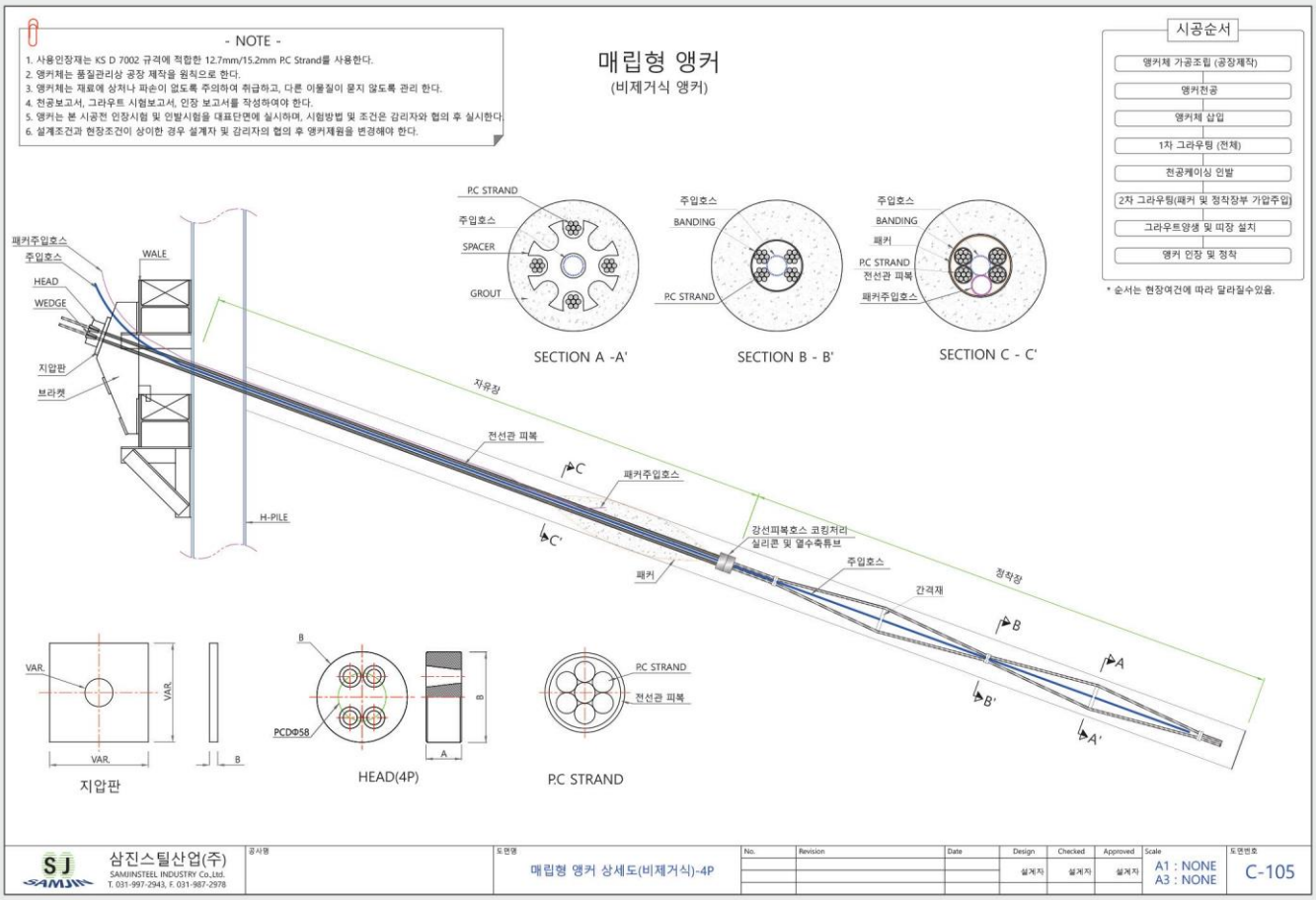




※ 홈페이지 자료실에서 다운 받으세요

※ 문의: 기술연구소 Tel. 031-997-2943 (내선. 401)





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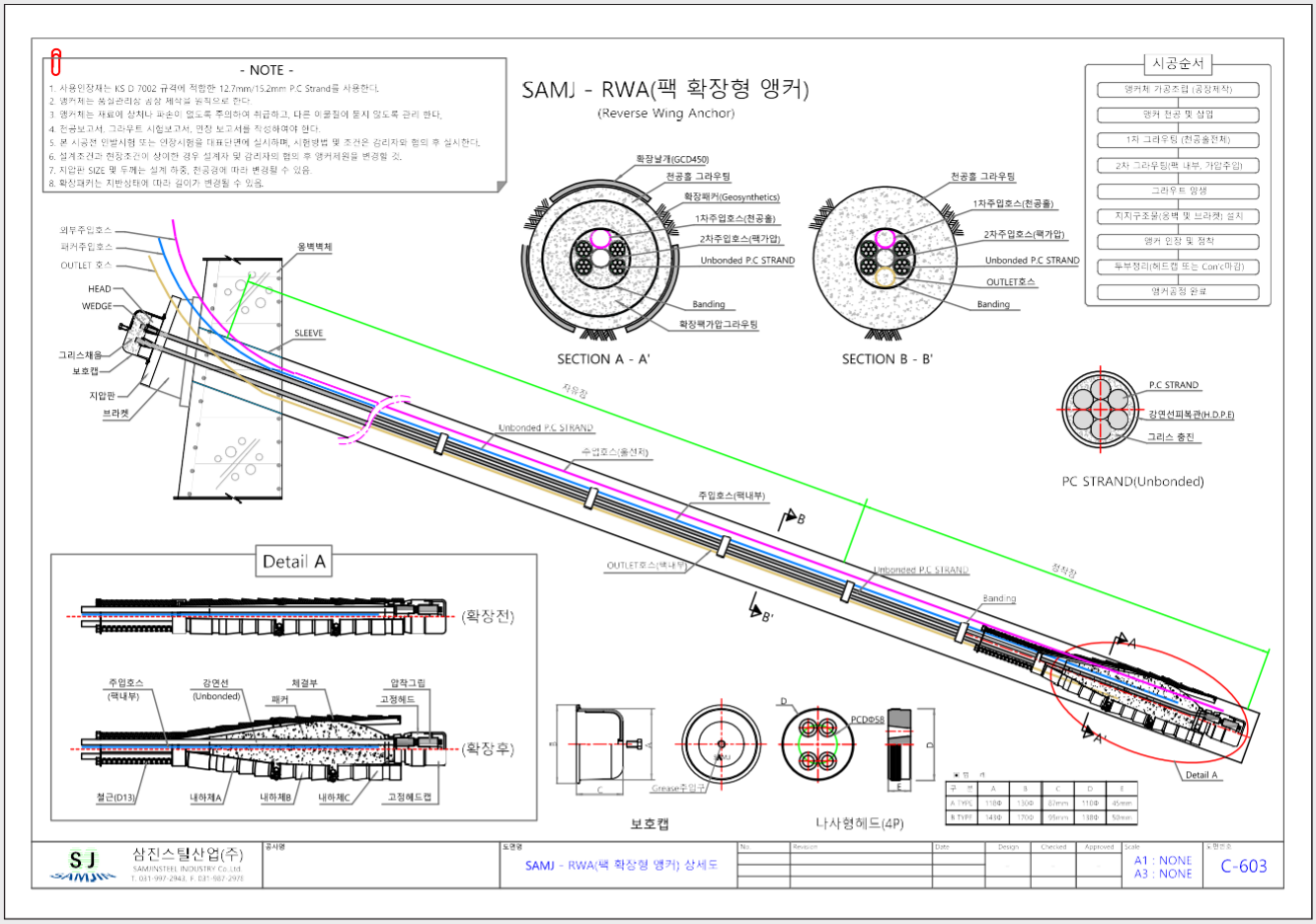

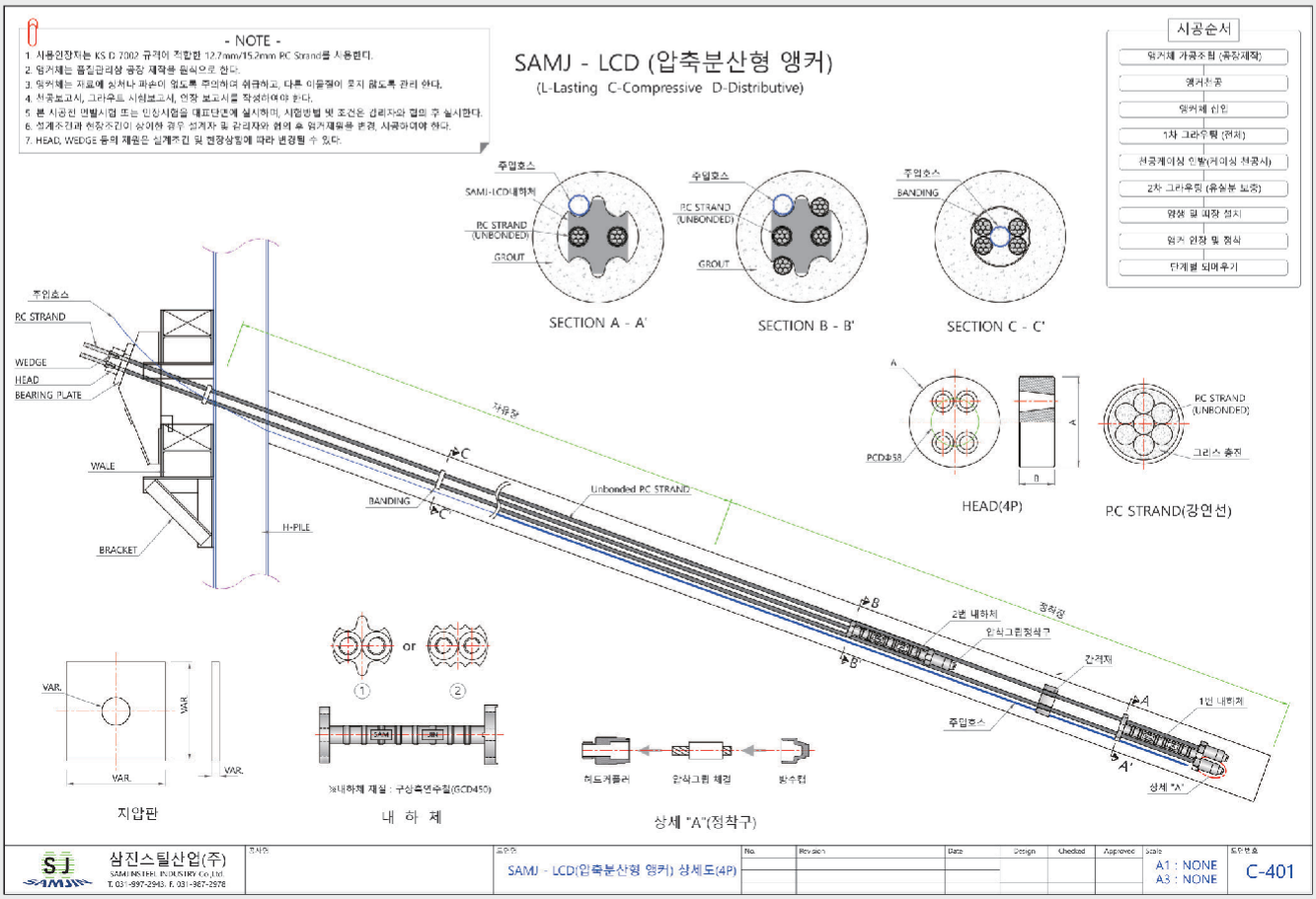

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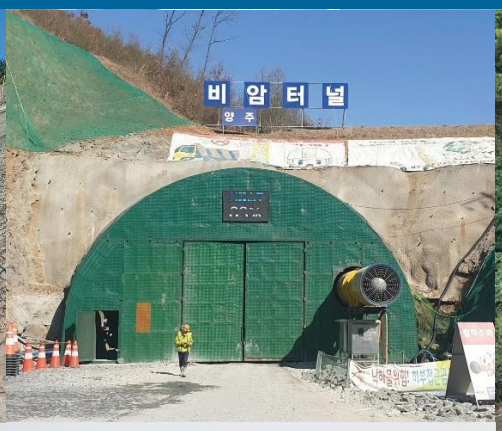
Products











| Rock Bolt | CT Rock Bolt | Self-Drilling | Tubular Steel Pipe Rock Bolt | Major Delivery Track List |
| Rock Bolt Accessories | Epoxy Coated Rebar | Soil Nailing | Removable Nailing | Steel Fiber |









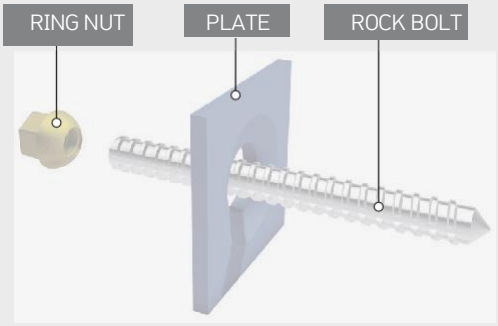
ROCK BOLT

KS E3132

Rock Bolt

■ Overview of Rock Bolt

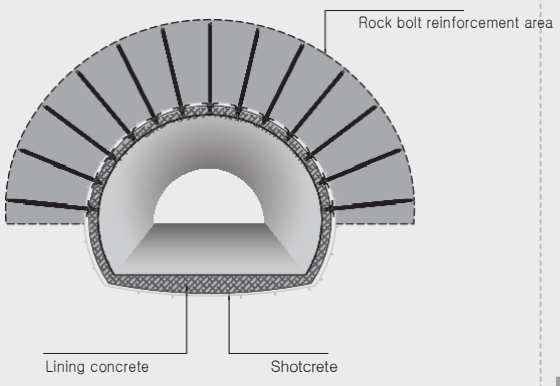
This is a construction method designed to prevent rock collapse caused by mechanical discontinuities, such as joints and cracks, in rock masses loosened by tunnels, cut slopes, or vertical excavation. It stabilizes the ground by reinforcing jointed or cracked rock masses with Rock Bolts, thereby inducing rock-to-rock bonding and a tunnel arching effect.



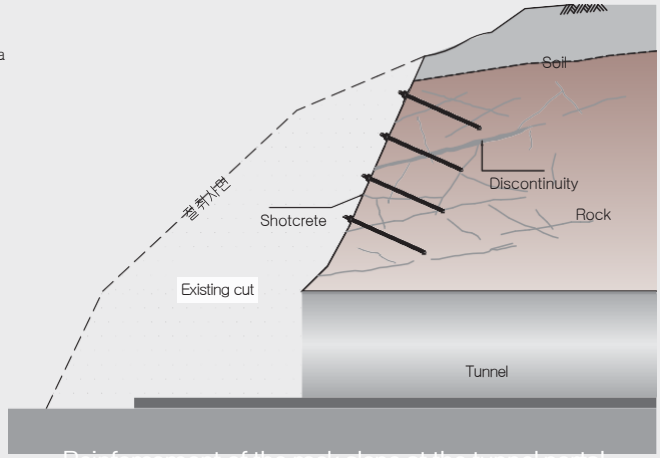
■ Bolt Specifications and Regulations

Steel Grade	Size	Mechanical Properties		Elongation(%)	Bending Angle	Chemical Composition (%)	
		Y.P. (N/㎟)	T.S. (N/㎟)			P	S
SD400	D25	400~520	1.15 times or more of yield strength	16 or higher	180°	0.045 or more	0.045 or less
	D29			18 or higher			

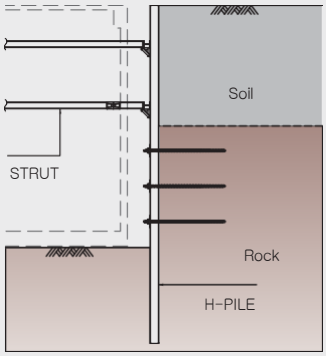
■ Application of Rock Bolt



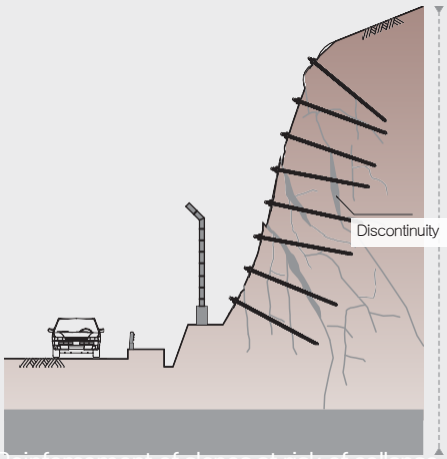
Tunnel excavation surface reinforcement



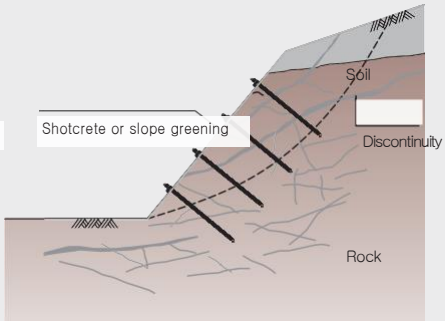
Reinforcement of the rock slope at the tunnel portal



Reinforcement of vertical excavation



Reinforcement of slopes at risk of collapse



Reinforcement of cut rock slopes

Role of Rock Bolt



Surturing Effect

Combines ground loosened by excavation with solid ground to prevent rockfalls

Reinforcing Effect

Protection against mechanical discontinuities such as joints and cracks, or failure surfaces occurring during excavation

Beam Action

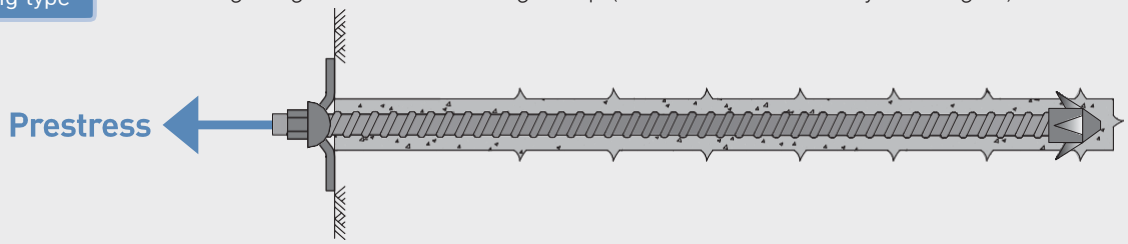
Comprehensive structural integrity achieved by joining multiple layers of layered jointed rock mass with ROCK BOLTs to form a single unit

Internal Pressure Effect

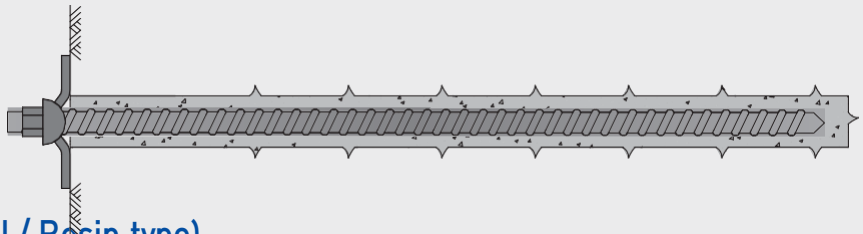
The tensile force acting on the ROCK BOLT acts as internal pressure on the ground, increasing the stability of the surrounding rock mass

Types of Rock Bolts

Tip anchoring type Prestressing the ground after anchoring the tip (medium to hard rock layers or higher)



Full adhesive type The entire length of the Rock Bolt is bonded to the ground by injecting adhesive materials such as cement mortar or resin.



Installation sequence (Tunnel / Resin type)

Drilling



Resin insertion



Rotation insertion of lock bolt



Pressure plate installation and resin foaming



Applied to tunnel reinforcement



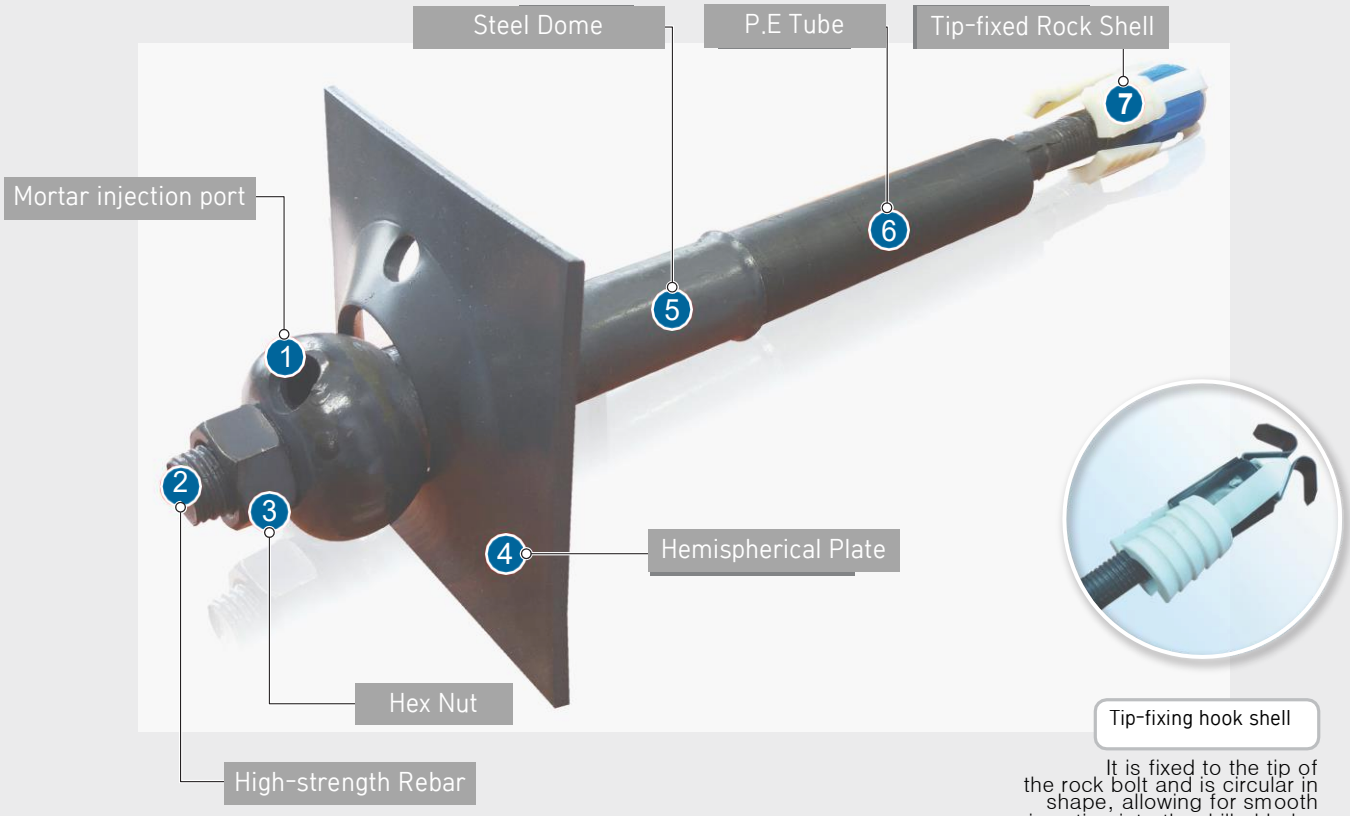


CT-ROCK BOLT

CT-Rock Bolt

■ Overview of CT-Rock Bolt

CT-Rock Bolt is a hybrid rock bolt that simultaneously employs a tip-fixing type and a full-surface bonding type, using a rock shell, which is a temporary tip-fixing device, to fix the deformed rebar rock bolt in the drilling hole until the strength of the injected mortar is developed, and using a combination tube (steel dome tube and P.E tube) to uniformly and densely fill the drilling hole with mortar.



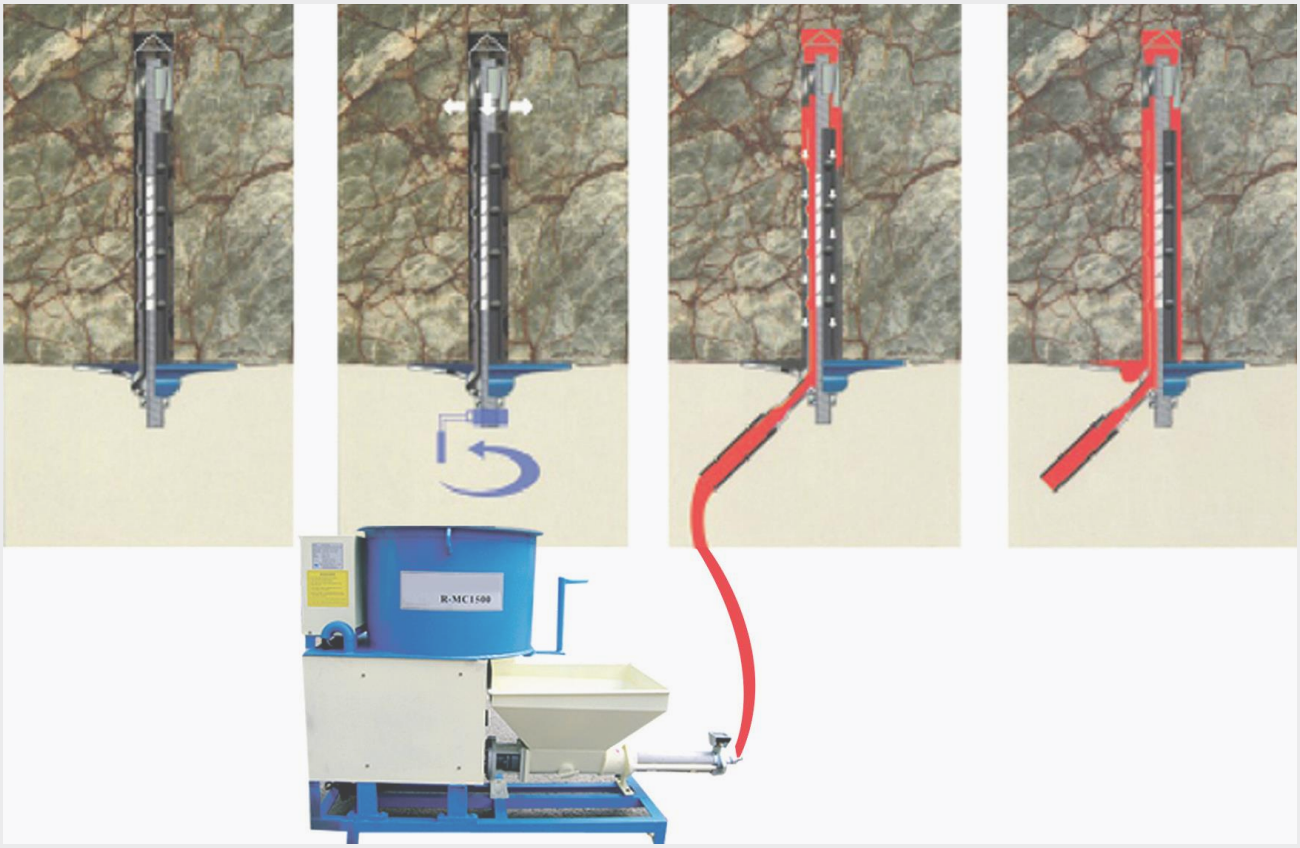
① Mortar injection port	Mortar injection	⑤ Steel Dome	Support for the mortar injection port plate
② High-strength Rebar	Deformed rebar rock fixation and support	⑥ P.E Tube	Air venting and mortar injection pathways, rock bolt corrosion prevention
③ Hex Nut	Fixing the plate and circular dome steel tube	⑦ Tip-fixed Rock Shell	Fixed tip of the rock bolt. Conical shape allows for smooth insertion into the drilled hole.
④ Hemispherical Plate	Enhanced support capacity due to increased contact surface, visual confirmation of mortar cushioning		

Features of CT-Rock Bolt

- Increased ease of installation through temporary fixation by the rock shell during rock bolt installation at the tunnel crown.
- During rock bolt installation at the tunnel sidewalls, the rock shell acts as a spare, preventing rock bolt eccentricity.
- Mortar injected at a pressure of approximately 20 Bar penetrates joints or cracks, effectively blocking ground water.
- The combi-tube surrounding the CT-Rock Bolt enhances corrosion resistance by blocking direct contact between the borehole, air, and the borehole wall.
- Mortar injected between the rock bolt and the PE tube flows back out through the PE tube and the borehole wall, allowing for visual confirmation of the mortar buffering.

CT-Rock Bolt Installation Sequence

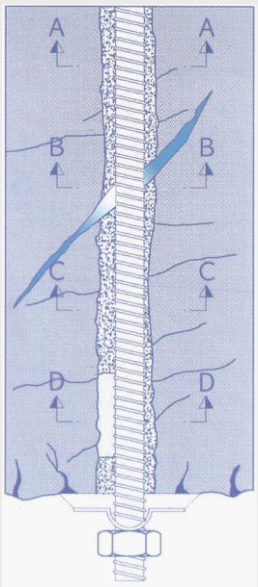
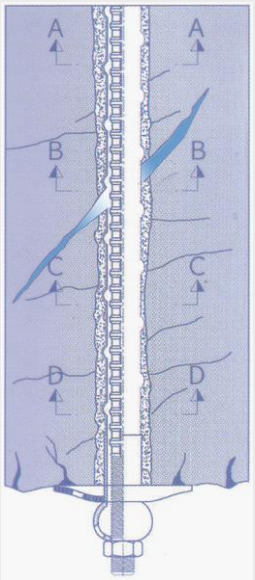
Step 1	Step 2	Step 3	Step 4
Insert CT-rock bolt	Tip fixation	Mortar injection	Mortar injection completed
Insert the lock bolt after installing the washer	Secure the CT-Lock bolt by expanding the rock shell through nut rotation.	Filling the combination tube from the inside out	Mortar flows out through the block washer hole



CT-ROCK BOLT

CT-Rock Bolt

■ Differentiation of CT-Rock Bolt

Existing construction methods			CT-Rock Bolt	
General	Cross-section	Div.	Cross-section	General
	Normal part	A – A	Normal part	
	When in contact with groundwater	B – B	When in contact with groundwater	
	When in contact with bedrock at the eccentric part	C – C	When in contact with bedrock at the eccentric part	
	When voids are present	D – D	When voids are present	

01 Grout loss occurs in ground with high groundwater flow during conventional rock bolt installation

⇨ Formation of densified grout inside the bore hole using the pressure grouting method

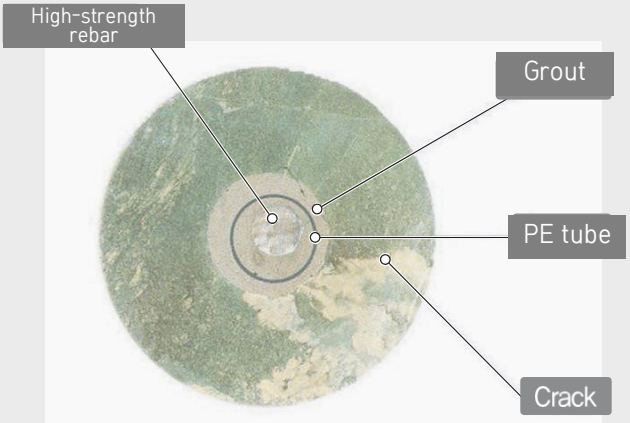
02 Concern over corrosion of rebar upon contact with groundwater

⇨ Blocking contact with groundwater due to PE tubes installed on the rock bolt surface

03 Angle deviation and reduced grout adhesion area due to rock bolt

⇨ Preventing sagging of the bottom of the borehole with PE tube (Centralizing)

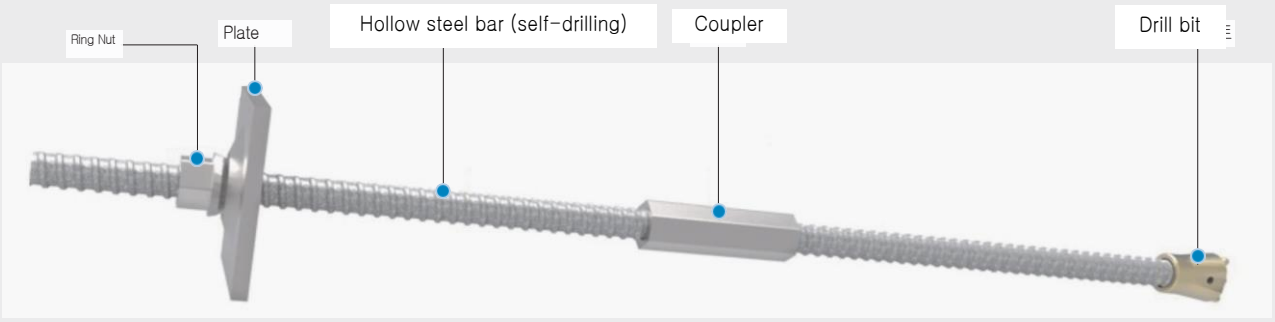
Cross-section after CT-Rock Bolt installation



Self-Drilling Rock Bolt

Overview of Self-Drilling Rock Bolt

In areas with poor quality fractured rock, such as fractured zones with many joints or weathered rock zones, there is a risk of borehole wall collapse and damage to the rods of expensive drilling equipment. The Self-Drilling Rock Bolt allows for self-drill



Features

- Since rock bolts are inserted simultaneously with drilling, it is effective for fractured zones and colluvial layers where there is a high risk of borehole collapse.
- Construction is simple and rapid as the bit is fastened directly to the rock bolt.
- Convenient and superior construction is achieved as grout milk can be injected after drilling without a separate injection hose.

Self-Drilling Rock Bolt Specifications and Regulations

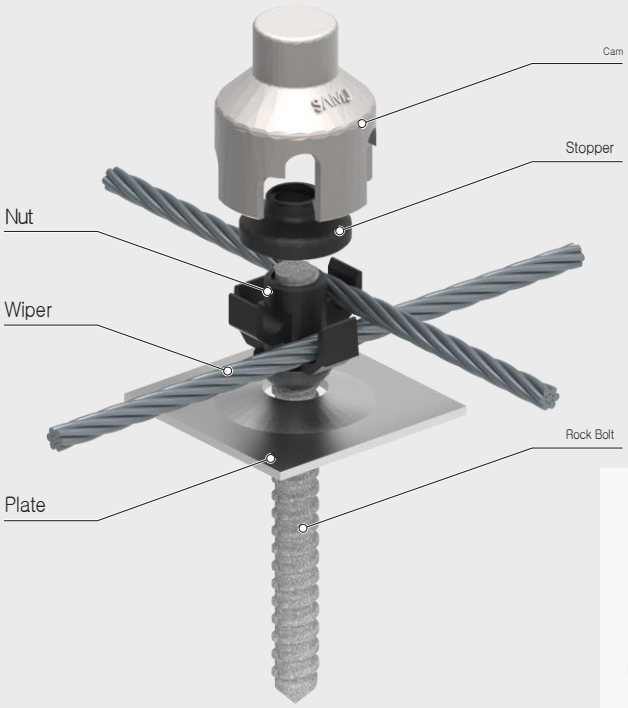
Bolt Name	Thread O.D.(m/m)	Length(m)	Screw Shape	Tensile Load(kg)	Disign Load(kg)
R28	28.3	3~4	Rope Screw	17,500	15,500
R32	31.4	3~4	Rope Screw	20,000	18,000

Product Composition

Self-drilling Rock Bolt R32 (Spiral Steel Pipe)	Button Bit R32*51	Cross Bit R32*51	Rock Bolt Coupler Ø42, L=160mm
			
Self-drilling rock bolt adapter (for connecting rock bolt drilling equipment) R38 - R32	**Ring Nut R32**	**Convex pressure plate 150*150*6, 9, 10, 12T**	**Mortar injection adapter**
			

Wire Rope Fixture / ROCK BOLT Accessories

Wire Rope Fixture









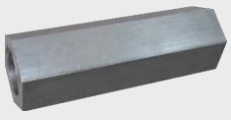
Rock Bolt Accessories

Rock Bolt Nut



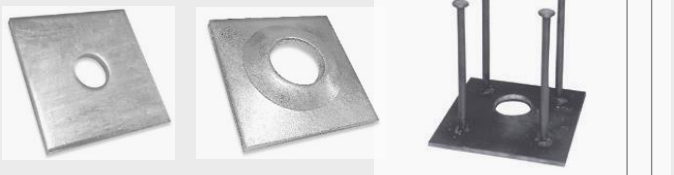
Ring Nut　　Hex Nut

Rock Bolt Sleeve



Connecting Coupler

PLATE



Flat Plate　　Block Plate　　STUD Plate

Resin and Adhesive



Resin　　Adhesive

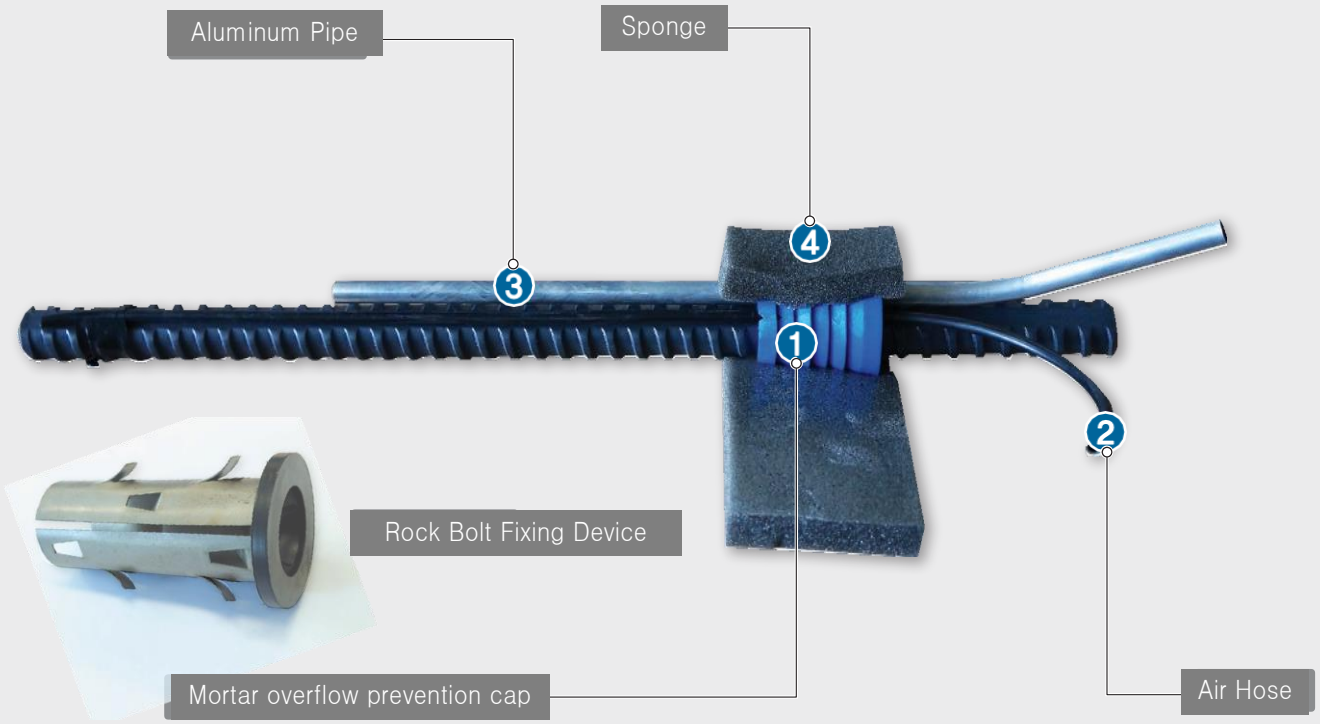
Lock Bolt Check Rod



Mortar Over Flow Prevention Components

■ Overview of Mortar Over Flow Prevention Caps / Rock Bolt Fixing Devices

The mortar overflow prevention caps and rock bolt fixing devices allow for the secure fixing of rock bolts without the use of temporary fixing resins for installing rock bolts on tunnel ceilings. Additionally, by preventing mortar overflow when injecting mortar into drilled holes, waste can be reduced, and by ensuring sufficient mortar injection, poor construction and construction inconveniences can be resolved.



Functions of Mortar Overflow Prevention Components

① Mortar Overflow Prevention Cap / Rock Bolt Fixing Device	Prevents mortar overflow during tip-mount injection and allows for grouting construction where the mortar is inserted in a tight seal at the borehole entrance, utilizing pump pressure to inject the mortar up to the joint surface.
②Air Hose	Allows for smooth mortar injection by discharging compressed air generated during tip-mount mortar injection to the outside of the borehole.
③ Aluminum Pipe	In-hole mortar injection function (can be bent to seal the entrance).
④ Sponge	Even if the borehole is enlarged, the sponge surrounding the mortar cap tightly fills the borehole, preventing the mortar from flowing down below the borehole.

ROCK BOLT Accessories

Features of Rock Shell

Tip-fixing function that firmly secures rock bolts to the center of boreholes in tunnel crowns and sidewalls to prevent falling and reduce construction risks.



- Rock Bolt Tip Anchorage (Temporary Fixing)
- Securely fixes the rock bolt in the drilled hole until mortar strength develops
- Satisfies both tip-fixed and full-surface adhesive types simultaneously
- Ensures construction stability by preventing rock bolt drop through fixation to the top section
- Exerts initial pull-out strength by expanding the rock shell
- When installed on side walls, functions as a spacer to position the rock bolt in the center of the

SJ-Dry Mortar

Overview of Dry Mortar

Dry mortar specifically designed for the ROCK BOLT system

- Excellent quality (compressive strength) achieved through precise quantitative mixing of cement, sand, and inorganic admixtures
- Excellent fluidity
- Can be used simply by adjusting the water-to-water ratio without any preparatory work
- Guarantees high early strength even at low temperatures
- Uniform quality is ensured due to precise quantitative mixing
- The fine sand particles allow for use with any type of mortar injection pump



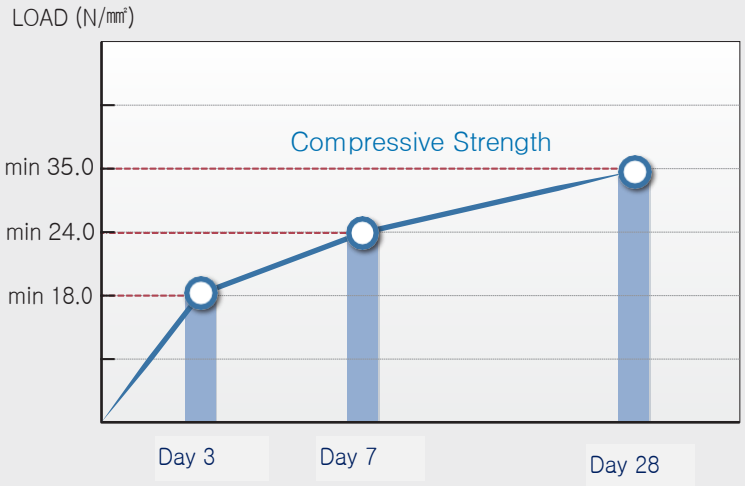
How to Use Dry Mortar

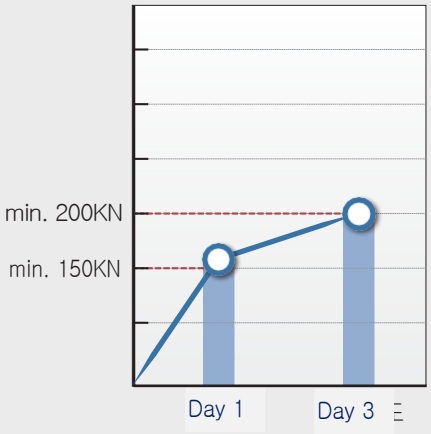
Since SJ-Dry Mortar consists of selected sand mixed with inorganic admixtures, it should be fed into a mortar injection pump in a dry state, mixed with a water ratio of 22%, and then used while adjusting the settings appropriately.

Dry Mortar Composition Ratio

Cement	Sand	Admixture
Standard Portland Cement	MAX / 0.3mm	Plasticizer, and many others
49.1%	49.1%	1.8%

Compressive Strength Quality Standard (KS F 4044)



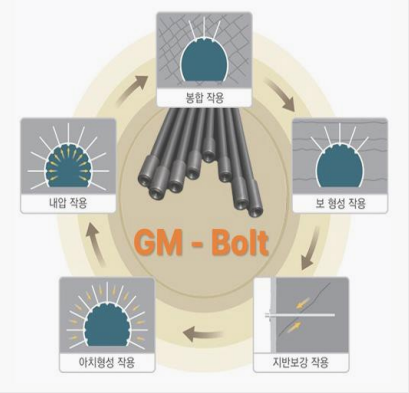


Tubular Steel Pipe Rock Bolt

Overview of Tubular Steel Pipe Rock Bolt GM-Bolt

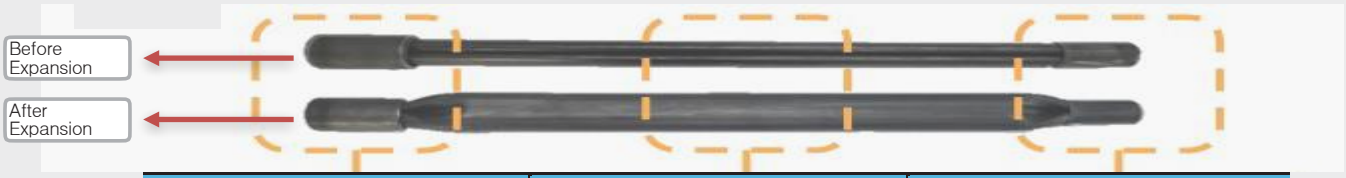
This product is manufactured without error by bending a proprietary steel pipe into a horseshoe shape using an automated production system and then welding the tip and fluid injection port using a robot. It provides support by injecting pressurized water into the pipe to expand it, generating friction and mechanical interlocking effects with the rock mass.





Features

- Perfect installation possible in water-prone areas without the use of anchoring agents (Applicability)
- Reinforced rock friction in fractured zones through radial expansion (Applicability) (Applicability)
- Convenient installation and improved work speed ensured by lightweight product (2.6 kg/m) (Constructability)
- Standardized installation is possible using a hydraulic device, and quality can be verified through pull-out testing simultaneously with installation (Constructability)
- Provides a harmless environment for the work site and the human body by eliminating the use of anchoring agents (Eco-friendly)
- Reduced construction costs compared to conventional rock bolts [No anchoring agents used], shortened construction period [No curing time required] (Economic feasibility)



Anchoring Section	Steel Pipe Expansion Section	Tip Section
Fluid Injection ※Fluid Pressure: Approx. 200 Br	Expansion Time: 15 seconds (4 m)	Sealed to prevent fluid leakage during high-pressure water injection

Div.	Steel Pipe O.D (mm)		Anchoring Section(mm)		Tip Section(mm)		Steel Pipe Thickness (mm)	Unit Weight (kg/m)
	Before Expansion	After Expansion	Length	O.D	Length	O.D		
Spec.	33±2	Max. 51	67±2	42±2	60±2	34±2	2.3	2.63

Accessories



Pressure Plate | Hydraulic Pressure Application Device | Insertable Fluid Injection Adapter | Pull-out Tester Fixing Band | Rock Bolt Fixing Band | One-touch Length Extension Device

※Extension possible up to 16m

ROCK BOLT Delivery Track Record

Rock Bolt Delivery Track Record

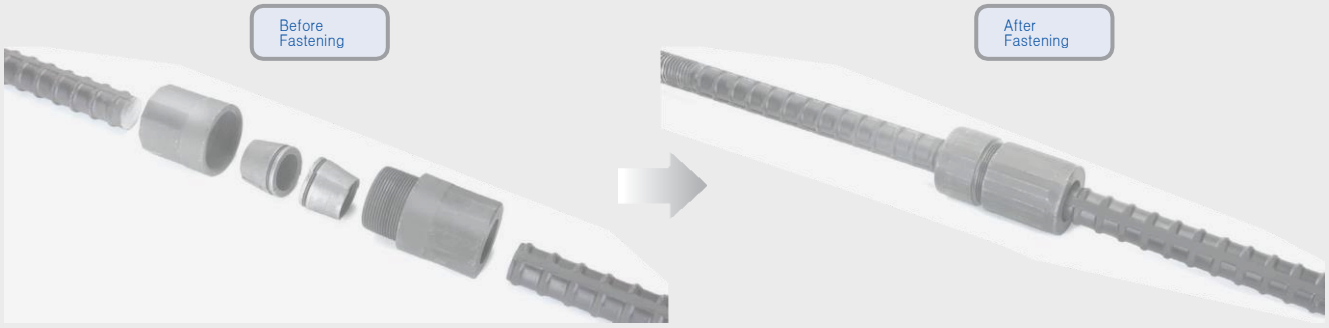
Client	Construction Company	Project Name	Project Name
Korea National Railway Corporation	KCC E&C	GTX-B Section 4	Rock Bolt
Gyeongsangnam-do and Gyeongsangbuk-do	KCC E&C	Mallyeongjae Tunnel	Rock Bolt
Korea National Railway Corporation	Kyeryong E&C	Gangneung-Jeongjin Railway Construction Section 7	Rock Bolt
Korea National Railway Corporation	SK E&C	Gangneung-Jeongjin Railway Construction Section 4	Rock Bolt
Korea National Railway Corporation	Seojin Industrial Development	Sinbundang Line Gwanggyo-Homaesil Section 1	Rock Bolt
Korea Hydro & Nuclear Power Co., Ltd.	DL E&C	Yeongdong Pumped Storage Power Plant	Rock Bolt
Korea National Railway Corporation	DL E&C	Indeokwon-Dongtan Double-Track Railway Section 5	Rock Bolt
Korea National Railway Corporation	Daebo Industrial	Yeoju-Wonju Double-Track Railway Section 2	Rock Bolt
Daejeon Metropolitan City	Dongbu Construction	Jeongnim Middle School - Sajeong Bridge Section	Rock Bolt
Korea National Railway Corporation	Kukdong Construction	Gangneung-Jeongjin Railway Construction Section 3	Rock Bolt
Korea National Railway Corporation	Daebo Construction	Chuncheon-Sokcho East-West High-Speed Railway Section 3	Rock Bolt
Korea National Railway Corporation	SK E&C	Chuncheon-Sokcho East-West High-Speed Railway Section 3	Rock Bolt
Korea National Railway Corporation	Hanshin Engineering & Construction	Chuncheon-Sokcho East-West High-Speed Railway Section 5	Rock Bolt
Korea National Railway Corporation	Kolon Construction	Chuncheon-Sokcho East-West High-Speed Railway Section 8	Rock Bolt
Korea National Railway Corporation	GS Construction	Indeokwon-Dongtan Double-Track Railway Section 2	Rock Bolt
Korea National Railway Corporation	Hanyang Construction	Indeokwon-Dongtan Double-Track Railway Sections 7-1, 7-2	Rock Bolt
Korea National Railway Corporation	HDC	Indeokwon-Dongtan Section 12	Rock Bolt
Seoul Northeast Road Co., Ltd.	Daewoo E&C	Eastern Expressway Undergrounding Sections 1, 2	Rock Bolt
Seoul Metropolitan City	Lotte E&C	Yeongdong-daero Undergrounding	Rock Bolt
Iksan Regional Office of Land and Transportation	Cheonji Development	Sinan Abhae-Hwawon Section 1	CT Rock Bolt
Korea National Railway Corporation	Hanjun Construction	Ulsan-Pohang Double-Track Railway	CT Rock Bolt
Korea National Railway Corporation	Hanwha E&C	Sosa-Wonsi Double-Track Railway	CT Rock Bolt
Gimpo City	Woowon Development	Gimpo Goldline Section 5	CT Rock Bolt
Daejeon Regional Office of Land and Transportation	Kwanghyeok Construction	Boryeong-Taean National Highway Construction Project	CT Rock Bolt
Incheon Gimpo Expressway Co., Ltd.	Daebo Industrial	Incheon-Gimpo Expressway	CT Rock Bolt
Korea Expressway Corporation	Hyundai E&C	Busan Outer Ring Road Section 2	CT Rock Bolt
Korea Expressway Corporation	Dong-A Geological Engineering	Dongsuncheon-Gwangyang Expressway Section 7	CT Rock Bolt
Korea National Railway Corporation	Kumho Construction	Gyeongbu High-Speed Railway Sections 10-1, 14-2	CT Rock Bolt
Korea National Railway Corporation	HL D&I Halla	Northeast Line Urban Railway Section 1	Self-drilling Rock Bolt
Korea Expressway Corporation	Kumho Construction	Pyeongtaek Eastern Expressway Section 1	Self-drilling Rock Bolt
Incheon Urban Railway	KCC E&C	Cheongna Extension Line Section 1	Self-drilling Rock Bolt

Rebar Coupler

Rebar Coupler

■ Field-connected type (D13, D16, D19, D22, D25, D29, D32, D35, D38, D41, D51)

This device is used in civil engineering and construction sites during general reinforcement processes to connect rebars by butting them together using a splicing device, without subjecting the rebars to any physical or chemical changes, but rather in their factory-produced state.
particular, by using a fixing bundle and wedge, the tightening process for connecting deformed rebars is simplified, allowing for a tighter connection and further reinforcing the strength of the deformed rebars.

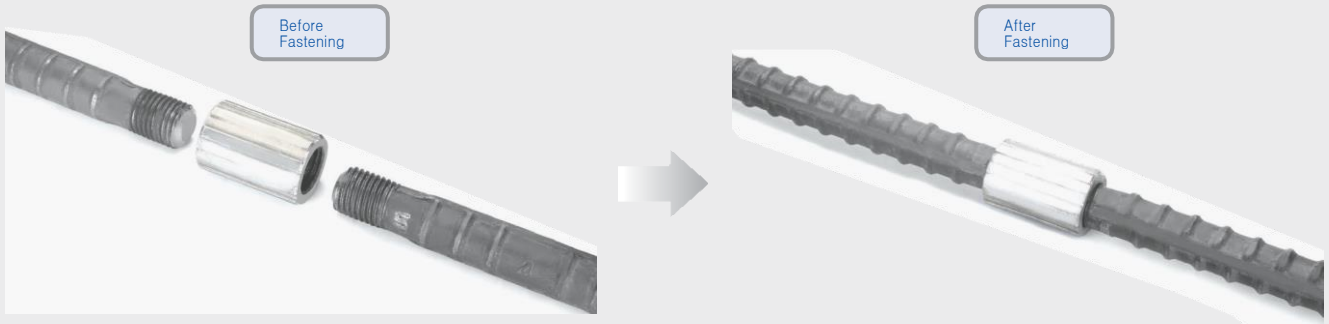


Div.	Unit	SD300	SD400	SD500	SD600
Unidirectional Tensile Test (Tensile Strength)	N/㎟	300~420	400~520	500~650	600~780
Unidirectional Tensile Test (Yield Point)	N/㎟	345~483	460~598	575~747.5	690~897

■ Mechanical Splicing

Secures the splicing strength of reinforcing bars most reliably. It involves rolling, chamfering, and rolling the splicing section of the reinforcing bar to create a thread, and then fastening the reinforcing bars using a coupler.

Although it has the disadvantage of requiring a separate reinforcing bar processing process, the mechanical properties of the splicing section are the best.

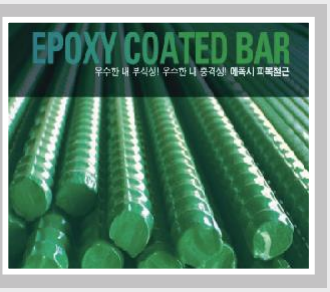


Div.	Unit	SD300	SD400	SD500	SD600
Unidirectional Tensile Test (Tensile Strength)	N/㎟	300~420	400~520	500~650	600~780
Unidirectional Tensile Test (Yield Point)	N/㎟	345~483	460~598	575~748	690~897
Static strength test (residual deformation)	㎜	Maximum residual deformation 0.3 mm or less			
Low-cycle repeated test (tensile strength)	N/㎟	125% or more of the yield stress of the base material reinforcing bar			

Epoxy Coated Rebar

Epoxy-coated rebar is widely used worldwide to prevent rebar corrosion in concrete structures, and is actively applied, particularly in coastal areas, hot and humid climates, and on roads and bridges exposed to de-icing salts (chloride).



■ Advantages of Applying Epoxy-Coated Rebar

1. Corrosion prevention	Significantly inhibits corrosion by preventing moisture, oxygen, and chlorides penetrating the concrete from coming into direct contact with the rebar.
2. Improved durability	A key reinforcing material that dramatically increases the lifespan of structures through corrosion prevention.
3. Ensured structural safety	Maintains stable structural performance by preventing the reduction of the corroded cross-section.
4. Eco-friendliness	Contributes to environmental benefits by reducing unnecessary repairs and resource waste through the extension of structural lifespan.
5. Ensured constructability	Can be cut, processed, and placed in the same way as standard rebar, eliminating the need for separate, complex processes on-site.
6. Reduced maintenance costs	Reduces repair and reinforcement work for cracks, spalling, and delamination caused by rebar corrosion.
7. Ensured structural performance	Maintains the inherent physical properties of rebar, such as tensile strength and yield strength.
8. Reduced maintenance costs	Effective for extending the long-term lifespan of structures.

※ Epoxy-coated rebar is produced in accordance with quality standards based on KS D3629, ASTMA-775 and A775M.

■ Countries Applying Epoxy-Coated Rebar

Korea	Used for coastal structures, ports, and bridges
USA	Applied to highways and bridges; strongly recommended by the U.S. Department of Transportation.
Canada	Bridge and tunnel applications: Addresses severe rebar corrosion issues caused by cold climates and the use of de-icing agents.
Japan	Primarily used for coastal structures, ports, and bridges.
Middle Eastern Countries	Used for buildings, ports, and structures in coastal areas and hot, humid environments such as Saudi Arabia and the UAE.
South Pacific	Applied to coastal structures, ports, and military facilities in areas such as Guam and Saipan.

Application Sites of Epoxy-Coated Rebar

Epoxy-Coated Rebar Application Sites	Reasons for Applying Epoxy-Coated Rebar to the Site
1. Applied to ports, docks, and offshore bridges	Preparation to prevent rebar corrosion caused by chlorides contained in seawater
2. Applied to ports, docks, and offshore bridges	Areas with high salt exposure due to de-icing agents
3. Underground parking lots, subway stations, foundation piles, etc.	Areas with a high potential for corrosion due to salt in groundwater or soil
4. Dams, water purification plants, sewage treatment plants	Humid areas exposed to chemicals

Epoxy-Coated Rebar Manufacturing Process

1. Rebar Surface Inspection	Removal of surface contaminants and inspection for defects
2. Surface Adjustment (Shot)	Surface roughness adjustment necessary to improve paint adhesion
3. Heating	Reinforcement heating (200°C~250°C) to obtain the heat required for easy curing of EPOXY resin powder coating
4. Painting	Removal of surface contaminants and inspection for defects
5. Cooling	Cooling by water spray (air cooling, water cooling, shower cooling)
6. Pinhole Inspection	Inspection using a pinhole tester at 67 ½ V
7. Coating Film Inspection	Final inspection of film thickness, appearance, corrosion resistance, impact resistance, etc.
8. Packaging	Packaging with binding cushioning material for film protection
9. Shipping	Affixing of trademarks and labels (handle with care during loading and unloading)



Rebar Surface Inspection



Shot Blast, Heating, Painting



Cooling



Product Completion



Pinhole and Coating Inspection



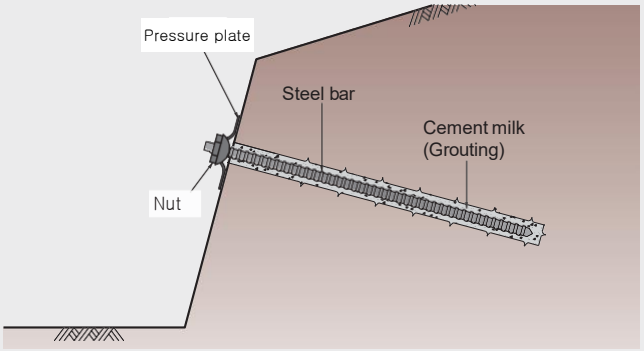
Packaging and Shipment

SOIL NAILING

Soil Nailing

■ Overview of Soil Nailing

The Soil Nailing method involves inserting reinforcing bars into the original ground at relatively close intervals without prestressing to increase the overall shear strength of the ground itself and to suppress ground deformation expected during or after construction as much as possible.



■ Construction Sequence

Drill



Nail Installation and Grouting



Wire Mesh Installation



Shotcrete Pouring and Finishing



Application to Earth Retaining





Application to Cut Slopes



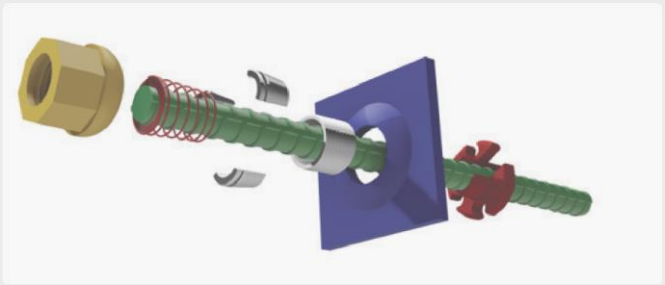


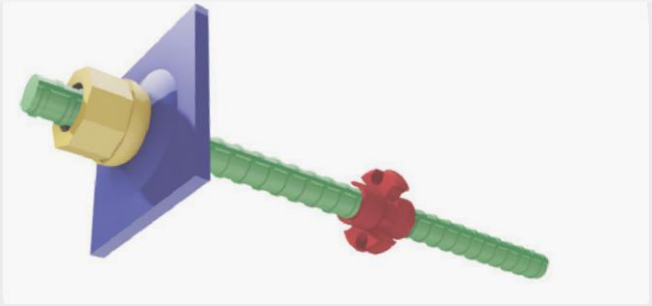
Pressure-type Nail Fixture (Anchorage) Wedge-Grip Nut

By attaching a pressure-type nail anchor consisting of a wedge and a fixing nut, the bonding strength with the nail is maximized, thereby reinforcing the slope, extending the lifespan of the retaining wall, and reinforcing the topsoil of the slope.

Features

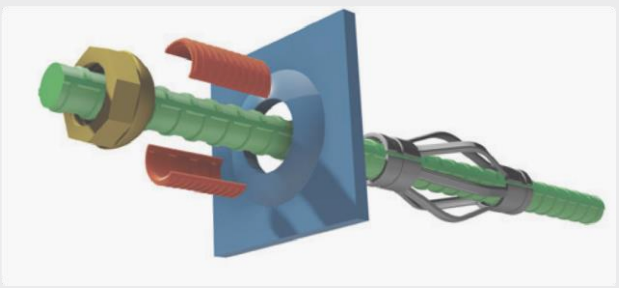
- Construction costs are low, construction is easy, and the construction period can be shortened.
- The use of a wedge and ring nut ensures close contact between the slope and the pressure plate, increasing adhesion strength.
- The strength and dimensions of the reinforcement can be selected according to the shape of the structure.
- Using Wedges and Ring Nuts ensures secure fastening between the slope and the bearing plate, facilitating the securing of passive resistance.
- The complete absence of play between the nail body and the bearing plate facilitates adhesion between the slope and embankment, resulting in superior application methods.

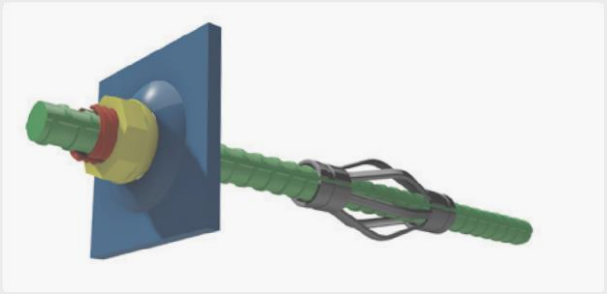




Liner-Screw Nut (Ring + L/S)

After drilling the ground, a reinforcing material capable of resisting external forces is inserted. The liner screw is then attached to the outer circumference of the reinforcing material to firmly secure the fixing nut and bearing plate, thereby extending the lifespan of the ground retaining wall.





Standard Specifications and Quality Control Criteria for Deformed Rebar (KS D 3504, SD400)

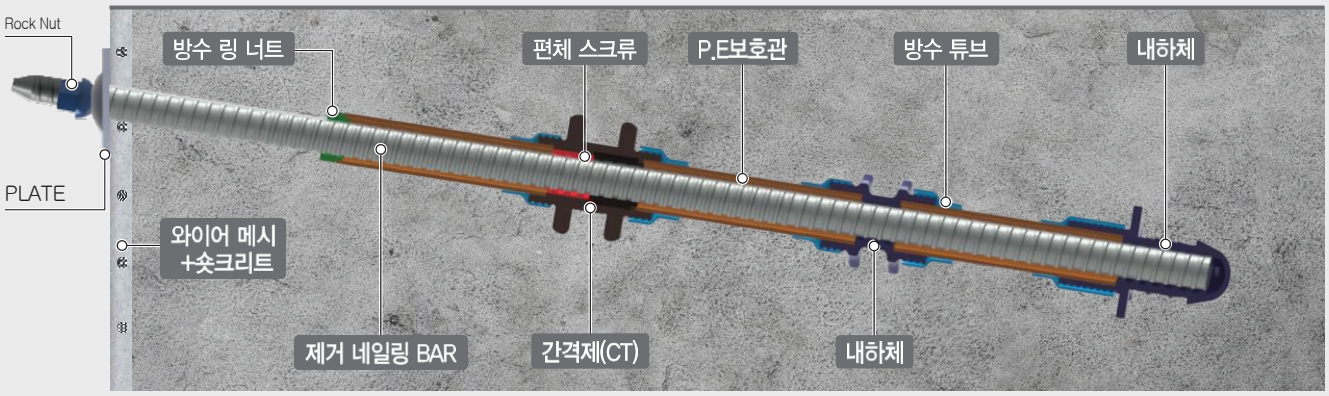
Div.	Cross-sectional Area	YS (N/㎟)	UTS (N/㎟)	Design Yield Load (ton)	Remarks (Internal Standard)
D25	5.067	400 or higher	560 or higher	9.120	Since there are no KS standards for connecting materials such as liner screws and anchors, the design allowable load of the reinforcing bar base material is managed as a reference value.
D29	6.424			11.563	
D32	7.942			14.295	

REMOVABLE NAILING

Removable Nailing

■ Overview of Removable Nailing

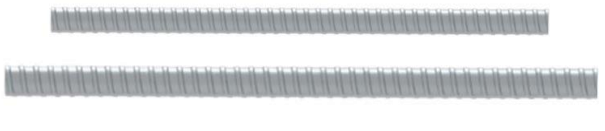
The removable soil nail method is applied to temporary construction projects where long-term retention of nails is impossible due to encroachment on the basements of adjacent buildings during deep excavation in urban areas with many basements. Once construction is completed, the nails can be removed using manual labor.



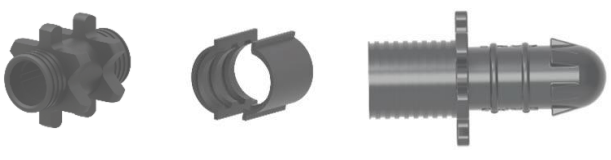
■ Product Features and Comparison

SAMJ-REMOVABLE NAILING	Removable Nailing (Wedge Type)	Removable Nailing (Rotation Type)
• Removable by manual labor - Delivered to the site after factory assembly, making it easy to use and ensuring excellent quality control • Constructed with a rigid load-bearing body, making it resistant to impact - Can be removed by pulling manually once it moves out of the rotating section (load-bearing bodies 1 and 2)	• Removable by manual labor - High risk of premature wedge detachment from load-bearing body due to impact during the drilling and insertion process - Since it is a wedge type, re-installation is impossible if detached prematurely	• Cannot be removed by manual labor • Requires equipment, incurring separate removal costs • Socket is made of PVC, making it vulnerable to impact - Removal speed is very slow due to multiple nut-type rotary sockets

■ Main Materials



Removal Nailing Bar D25/D29 (SD400)



Spacer (CT) | Flat Body (Screw) | Load-bearing Body



Specifications and Regulations for Removable Nailing Bars and Load-bearing Bodies

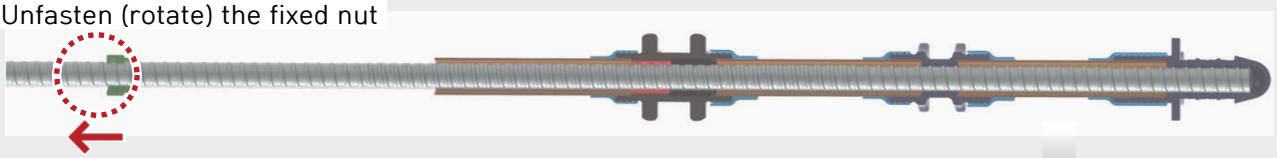
Steel Grade	Size	Mechanical Properties YP(N/㎟)	UTS(N/㎟)	Elongation(%)	Bending Angle	Chemical Composition(%) P	S
SD400	D25 D29	400~520	1.15 times or more of YS	16or higher 18or higher	180°	0.045 or less	0.045 or less

Steel Grade	Size	Mechanical Properties YP(N/㎟)	UTS(N/㎟)	Elongation(%)	Hardnes	Chemical Composition(%)		
Load-bearing Body	GDC 450	280or higher	450or higher	10or higher	140~210	2.5 or more	0.02 or less	0.09 or less

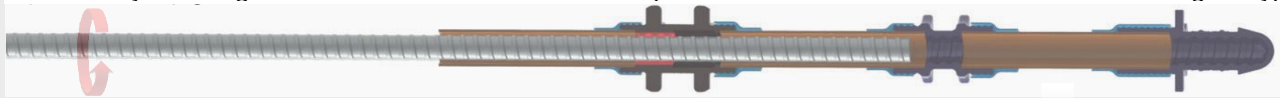
Removal Method

Removal is performed by rotating the excess length of the nail counterclockwise after the nail's lifespan has expired.

1. Unfasten (rotate) the fixed nut



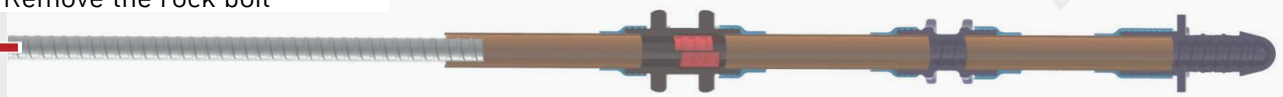
2. Remove by rotating the rock bolt counterclockwise (remove the rock bolt from the load-bearing body)



3. Push the rock bolt toward the load-bearing body to dislodge the slab installed separately by the spacer.



4. Remove the rock bolt



Construction Photos (Applied to Earth Retaining Sites)

On-site material delivery



Insert nailing after drilling



Install plate and nut after wire mesh installation



Shotcrete pouring and completion



Unlike the SOILNAIL method used for slope reinforcement, removable nails are generally applied as a substitute for ground anchors in earth retaining wall construction where bedrock appears early, and they are relatively advantageous in terms of construction time and cost as they do not require a separate tensioning process.

SOIL NAILING Accessories

Soil Nailing Accessories

Centralize (for 100Ø drilling)



R-5P (for 100Ø drilling)



Rebar P (for 70~75Ø drilling)



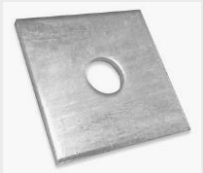
Rebar P Small (for 60~65Ø drilling)



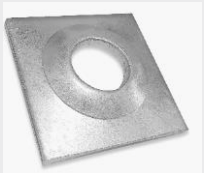
Protective Cap



Flat Plate



Convex Plate



STUD Plate



Micropile

As a pile capable of construction in confined spaces or restricted areas through small-diameter drilling, it can be used for various purposes such as under-pinning, foundation reinforcement, foundation piles for towers, chimneys, and transmission towers where compressive and tensile forces act simultaneously, and foundation pile construction for structures in noise-regulated areas.

■ THREAD BAR for PILE)

STEEL GRADE (kg/㎠)	DIA (mm)	Nominal Cross-sectional Area (㎠)	Ultimate Load (KN)	Yield Load (KN)
5000~5500/7700	50	1,963	1,511	1,079
	65	3,316	2,553	1,823
	75	4,415	3,399	2,428

* Micropiles are used in single or group form.
* Steel Grade is based on test reports.

■ Features

- It maintains uniform strength throughout its entire length.
- Construction is possible in confined spaces using small-diameter drilling equipment.
- Low noise and vibration minimize the risk of complaints.
- Highly applicable to structures subjected to both compressive and tensile forces simultaneously.



Epoxy-coated rebar/SOIL NAILING Delivery Track Record

Coated Rebar, Nailing Delivery Track Record

Client	Construction Company	Project Name	Product Name
Ulsan Port Authority	Bogang Tech	Ulsan SK G-HUB Northern Slope Reinforcement Work	Epoxy coated rebar
Korea Expressway Corporation	Taeyoung E&C	Daesan-Dangjin Construction Project Section 3	Epoxy coated rebar
Incheon Economic Zone Authority	DL E&C	Songdo Section 11-1 Infrastructure Construction Project (Zone 1-1)	Epoxy coated rebar
Incheon Economic Zone Authority	Ssangyong E&C	Songdo Section 11-1 Infrastructure Construction Project (Zone 1-2)	Epoxy coated rebar
Incheon Economic Zone Authority	Daewoo E&C	Songdo Section 11-1 Infrastructure Construction Project (Zone 1-4)	Epoxy coated rebar
Taebaek City	JH	Cheoram Gotersil General Industrial Complex Development Project	Epoxy coated rebar
Korea Hydro & Nuclear Power	Icontech E&C	Yeongdong Yangsu County Road No. 7	Epoxy coated rebar
Gangwon-do	Jeonggyo Construction	National Highway No. 42	Epoxy coated rebar
Ulleung-gun	Dongpyeong Construction Engineering	Jeongseon Imgye-Donghae Sinheung 2 Road Construction Project	Epoxy coated rebar
Korea Land & Housing Corporation	Seongwoo Construction	Ulleungdo LPG Storage Facility Slope Reinforcement Project	Epoxy coated rebar
GS E&C / Doosan E&C	GS E&C / Doosan E&C	Sejong Housing Complex Administrative City Zone 5-2 Development Project	Epoxy coated rebar
Korea Land & Housing Corporation	Sidae Construction	Changwon Megacity Xi & We've New Construction Project	Epoxy coated rebar
Jincheon-gun	JH	Jincheon Technopolis Industrial Complex Construction	Epoxy coated rebar
Korea National Railway Corporation	Hantoy E&C	Yeoju-Wonju Double-Track Railway Section 2 Roadbed Construction	Epoxy coated rebar
Korea Expressway Corporation	JH	National Expressway No. 400 Yangpyeong-Icheon Section 4 Construction	Epoxy coated rebar
Taebaek City	JH	Taebaek Wellness Anti-Aging Industry Specialized Complex Construction	Epoxy coated rebar
Korea National Railway Corporation	Geotech Engineering	Chuncheon-Sokcho Railway Construction Section 5	Epoxy coated rebar
Korea Hydro & Nuclear Power	Hoyeon Engineering	Gori 3-Bal Hinterland Slope Reinforcement	Epoxy coated rebar
Korea Expressway Corporation	Jinyang Construction	National Expressway No. 14 Hamyang-Changnyeong Section 8 Construction	Epoxy coated rebar
Korea National Railway Corporation	Geotech Engineering	Chuncheon-Sokcho Railway Construction Section 3	Epoxy coated rebar
Korea Expressway Corporation	Bogang Technology Engineering	Anseong-Guri Expressway Construction Section 4	Epoxy coated rebar
Busan Regional Office of Land and Transportation	Daeji Foundation	Pohang-Andong National Highway 1-1 Construction Section 2	Epoxy coated rebar
Cheongju City	Jeongil Construction Machinery	Chungbuk Ochang Technopolis Construction	Epoxy coated rebar
Korea Expressway Corporation	Jeongil Construction Machinery	Gangjin-Gwangju Section 7	Epoxy coated rebar
Korea Expressway Corporation	Hanyang Construction	Seoul-Gwangmyeong Section 2	Epoxy coated rebar
Busan Regional Office of Land and Transportation	Dae-A Construction	Goseong-Tongyeong Road Construction	Epoxy coated rebar
Wonju Regional Office of Land and Transportation	Gwanbo Construction	Anheung-Bangnim Section 2	Epoxy coated rebar
Jeollanam-do	Daewoo Shipbuilding & Marine Engineering Construction	Nampyeong-Hwasun Road Construction	Epoxy coated rebar
Busan Port Authority	Hyundai Engineering	Busan New Port Port Hinterland Complex Construction	Epoxy coated rebar

STEEL FIBER

Products Applied for Tunnel Construction (Steel Fibers)



As a material that reinforces concrete by bonding with it, it enhances the mechanical properties of concrete compared to ordinary concrete, including toughness, tensile strength, flexural strength, impact resistance, abrasion resistance, fatigue resistance, and reduced drying shrinkage time.

■ Reasons for Construction Using Steel Fibers

Prevention of cracks in tunnels and structures – Maintenance of strength – Ensuring durability – Formation of safe structures through improved construction efficiency.

■ Effects of Steel Fibers: Steel fibers are a high-efficiency material that compensates for the weaknesses of concrete, simultaneously increasing strength, toughness, and durability.

1. Crack control effect	Steel fibers randomly dispersed within the concrete inhibit the formation of microcracks and prevent crack propagation.
2. Improved toughness and ductility	Prevents brittle concrete from shattering suddenly upon failure and assists in load support after failure.
3. Enhanced impact resistance	Resistant to external impacts and repetitive loads, making it suitable for industrial floors, runways, and bridge decks.
4. Enhanced wear resistance	High abrasion resistance allows it to withstand vehicle traffic and mechanical loads.
5. Replacement and supplement for Rebar	Ensures economic efficiency by reducing rebar usage in structures; effective for sections where rebar placement is difficult and for complex structures.
6. Improved constructability	Allows the omission or reduction of rebar placement work, resulting in shorter construction periods and reduced labor costs.
7. Economic efficiency	Reduces initial construction costs and inhibits cracking, thereby lowering repair and reinforcement costs.
8. Reduced maintenance costs	Effective for extending the long-term lifespan of structures.
9. Special performance	Effective for enhancing fire resistance and seismic resistance; utilized in special structures such as tunnels and power plants.

■ Steel Fiber Product Standards (KS F 2564)

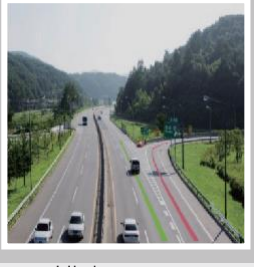
Diameter (Ø)	Length (mm)	Diameter Tolerance	Length Tolerance	Aspect Ratio Tolerance	Average Tensile Strength	Single Tensile Strength	Applicable
0.5	30	±5%	±5%	±10%	700Mpa or higher	650Mpa or higher	Tunnels, slopes, earth retaining walls, and shotcrete
0.75	60						Roads, runways, floor sleeves, and bridge decks

■ Applications of Steel Fibers

1. Shotcrete: Slope protection, tunnel lighting, earth retaining walls, structural restoration, repair, tunnel shotcrete
2. Paving, Overlays: Airport runways, roads, floors for heavy-duty factories, bridge decks
3. Metal decks for steel-framed buildings
4. Others: Precast concrete (PC) products, hydraulic structures, blast-resistant structures (military facilities), earthquake-resistant structures



Tunnels



Highways



Runways

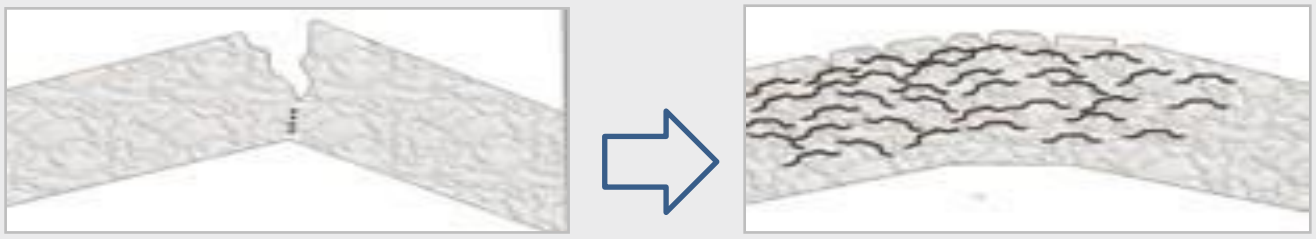


Dams



Bridge Decks

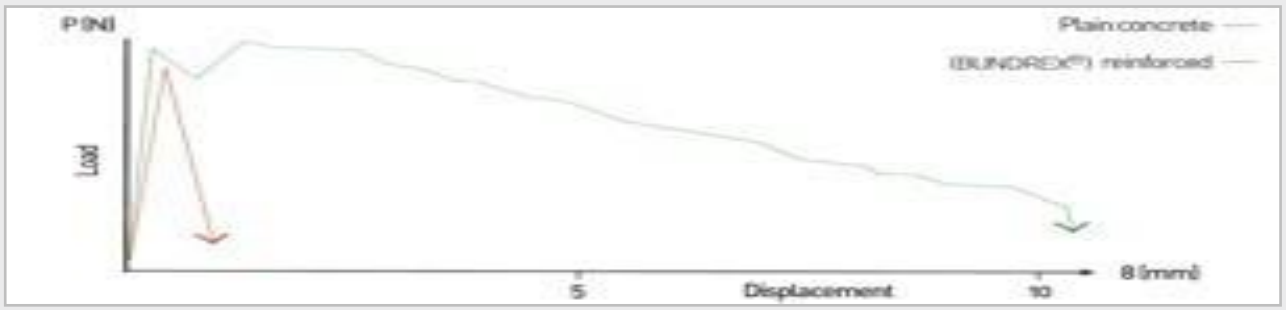
■ Changes in Concrete Properties When Reinforced with Steel Fiber



Brittle　　Ductile

※Reinforcement with steel fibers transforms the brittleness—a disadvantage of ordinary concrete—into ductility, thereby significantly increasing toughness and durability.

■ Graph of Equivalent Flexural Strength of SFRC Containing Steel Fiber

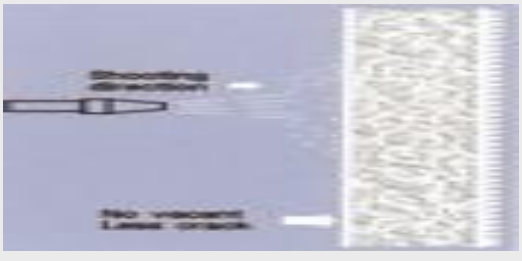


■ Features of Steel Fiber Reinforced Shot Concrete

Wire Mesh Reinforcement	Steel Fiber Reinforcement
If there is over-excavation, wire mesh installation is difficult and reinforcement effectiveness is reduced.	Enhanced reinforcement effect as it can be applied with uniform thickness to uneven excavation surfaces
Vibration applied to the wire mesh during shotcrete application leads to reduced adhesion, layer separation, and cavitation.	Increased tensile, flexural, and shear strength of concrete, resolution of cavity formation, and possibility of reduced application thickness
Cracks occur frequently in shotcrete, and reinforcement effectiveness decreases when cracks occur.	High resistance to cracking, and increased toughness (residual strength) even after cracking occurs
While immediate shotcrete reinforcement upon tunnel excavation is highly effective, delays in reinforcement timing due to wire mesh installation increase the risk of rockfalls and reduce reinforcement effectiveness.	Improved safety of permanent structures by reducing the risk of rockfall accidents and enhancing reinforcement effects, as shotcrete can be applied immediately after tunnel excavation
Wire mesh installation results in poor constructability and a complex work process.	Improved quality and increased safety due to simplified work processes
Increased construction costs due to longer working hours caused by wire mesh installation.	Cost reduction effect due to shortened working time



Wire Mesh Reinforcement



Steel Fiber Reinforcement

Steel Fiber Delivery Track Record

Steel Fiber Delivery Track Record

Client	Construction Company	Project Name	Product Name
Korea National Railway Corporation	Geumgwang Enterprise	Wolgot-Pangyo Line Section 4	Steel Fiber
Korea National Railway Corporation	Gwanghyeok Construction	Pyeongtaek-Osong Double-Track Railway Section 2	Steel Fiber
Korea National Railway Corporation	Daebo Industrial	Yeoju-Wonju Double-Track Railway Section 2	Steel Fiber
Seoul Northeast Road Co., Ltd.	Jangcha Construction	Eastern Seoul Expressway Undergrounding	Steel Fiber
Daejeon Metropolitan City	Dongbu Construction	Jeongnim Middle School-Sajeong Bridge Road Construction	Steel Fiber
Gyeongsangnam-do and Gyeongsangbuk-do	KCC Construction	Mallyeongjae Tunnel	Steel Fiber
Korea National Railway Corporation	Daeya Industry	Chuncheon-Sokcho Railway Section 5	Steel Fiber
Korea National Railway Corporation	Namkwang Construction	Sejong-Anseong Section 1	Steel Fiber
Seoul Metro	HCD Construction	Seoul Metropolitan Subway Line 9 Extension Phase 4 Section 2	Steel Fiber
Seoul Metro	Suseong Construction	Seoul Metropolitan Subway Line 9 Extension Section 1	Steel Fiber
Korea National Railway Corporation	Gwanghyeok Construction	GTX Section 3-3	Steel Fiber
Korea National Railway Corporation	DL E&C	GTX Section 5	Steel Fiber
Korea Expressway Corporation	Seocheon Construction	Gwangmyeong-Seoul Section 2	Steel Fiber
Korea National Railway Corporation	Woosang Construction	Dogye-Yeongwol Road Construction	Steel Fiber
Korea National Railway Corporation	Hanwha E&C	Dobongsan-Okjeong Metropolitan Railway Section 2	Steel Fiber
Korea Expressway Corporation	Samho Development	Northeast Line Section 4	Steel Fiber
Korea National Railway Corporation	Woowon Development	Sejong-Anseong Section 10	Steel Fiber
Korea National Railway Corporation	Jangcha Construction	Shinansan Line Section 4-1	Steel Fiber
Korea National Railway Corporation	Jangcha Construction	Shinansan Line Section 5-1	Steel Fiber
Korea National Railway Corporation	Gangneung Construction	Shinansan Line Section 3-1	Steel Fiber
Korea National Railway Corporation	Seocheon Construction	Wolgot-Pangyo Section 1	Steel Fiber
Korea National Railway Corporation	Jangcha Construction	Inju-Yeomchi Section 2	Steel Fiber
Korea Expressway Corporation	Seongbo C&I	GTX Section 4-3	Steel Fiber
Korea National Railway Corporation	Special Construction	GTX Section 4-4	Steel Fiber
Korea National Railway Corporation	Bugang T&C	Jinjeop Line Double-Track Railway Section 1	Steel Fiber
Korea National Railway Corporation	Woowon Development	Chuncheon-Sokcho Railway Section 7	Steel Fiber
Korea National Railway Corporation	Cheonji Development	Honam High-Speed Railway Section 1	Steel Fiber