



GTI HIGH TENSILE

ROCKFALL PROTECTION NETTINGS

RockNet & StrongNet

www.gabionindia.com

INTRODUCTION

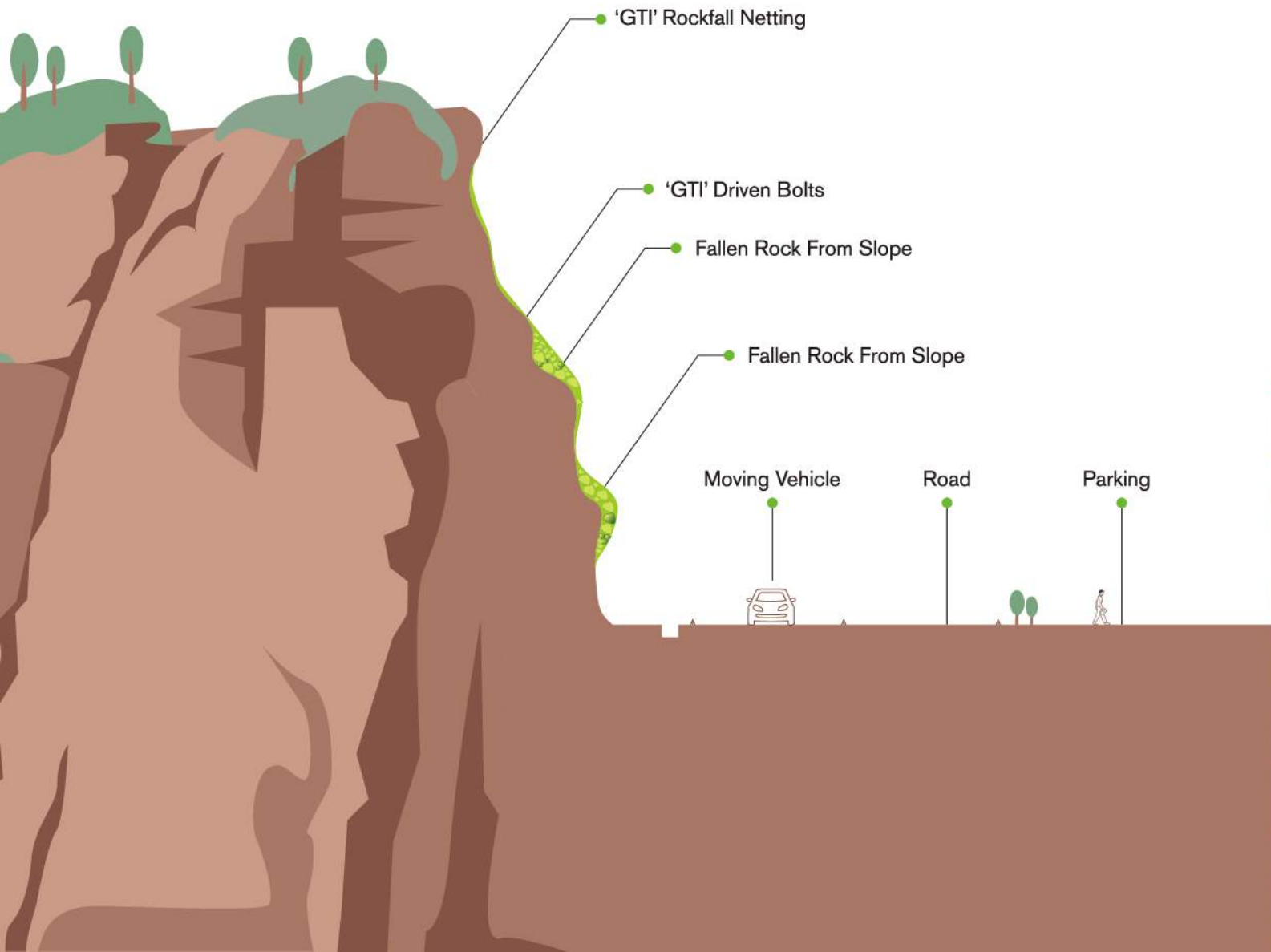
We at GTI, are a global service provider of geo-synthetics, geotechnical engineering and ground improvement techniques. We offer best-suited solutions for a variety of projects ranging from roads, railways, hydraulics, mining & geo-environment sector. Various certifications held by us are a testament to our quality assurance systems that are considered industry benchmarks. Our clientele involves all major Government institutions & industry majors like L&T, Tata Projects, Vedanta.

For over a decade, we have been devoting a great deal of time and effort to bring ease and innovation in the field of Geo-synthetics. We embrace the challenges along our way and are fascinated by them and that is what has enabled us to grow as market leaders in the field of Geo-technical Engineering. Seeking exceptional solutions to unconventional problems is what drives us everyday at GTI.

► ROCKFALL HAZARD

Rockfalls are a major hazard in rock cuts for highways and railways in mountainous terrain. A number of people are killed due to rocks falling on vehicles and causing accidents.

Rockfalls are generally initiated by some climatic or biological event that causes a change in the forces acting on a rock. These events may include pore pressure increases due to rainfall infiltration, erosion of surrounding material during heavy rain storms, freeze-thaw processes in cold climates, chemical degradation or weathering of the rock, root growth or leverage by roots moving in high winds.



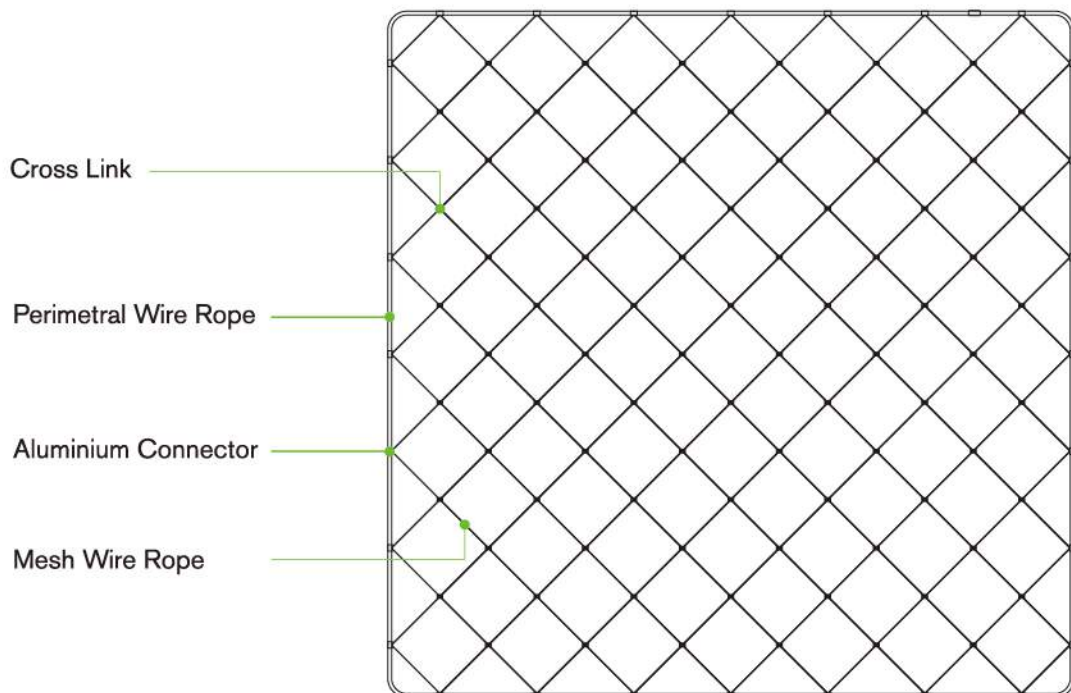
► GTI HIGH TENSILE ROCKFALL PROTECTION NETTINGS

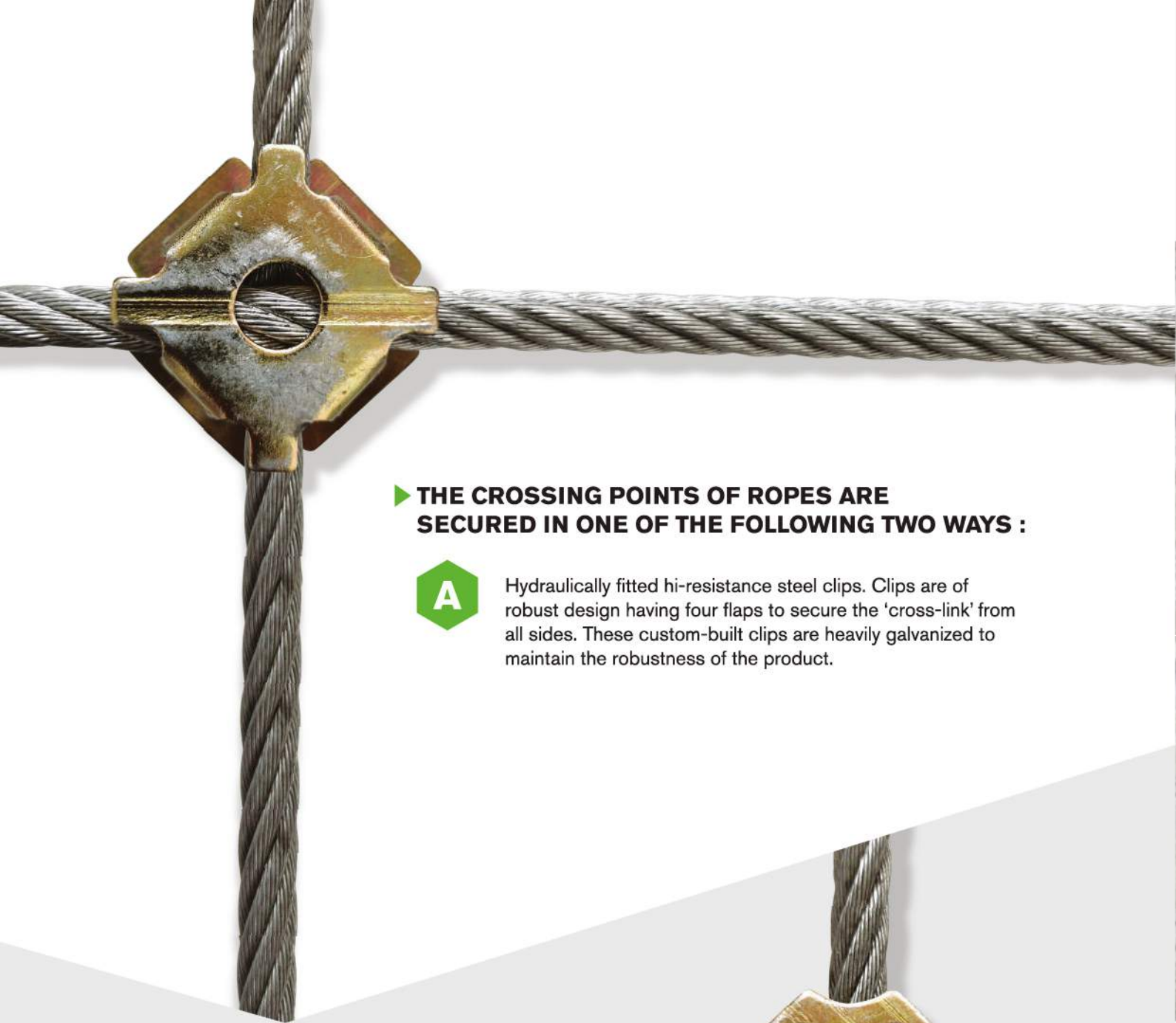
GTI High Tensile Rockfall Protection Nettings protect against rockfall by trapping dislocated rocks at the surface of the rocky slope. The loose rocks can slide between the anchors in a controlled way over time. Removal of sliding rock mass can be achieved in a systematic way. The nettings have very high energy absorption capacity and can hold back very large boulders. There are two types of GTI High Tensile Rockfall Protection Nettings:

1. Cross-Linked Rhomboidal / Square Mesh Steel Wire Rope Panels (Brand name: 'RockNet')
2. Double Twisted Hexagonal Mesh Wire Rope Tied Netting (Brand name: 'StrongNet')

► GTI ROCKNET

These are designed and manufactured to reach formidable tensile strengths up to 300 kN/m at very low strain. A single continuous length of steel wire rope of 8-10 mm diameter and 1770 N/mm² grade (tensile strength) is wound around a frame to form a netting panel of rhomboidal shaped openings. The openings are of typical size 300 mm by 300 mm. The rectangular netting panel is typically 4-6 m long on each side.

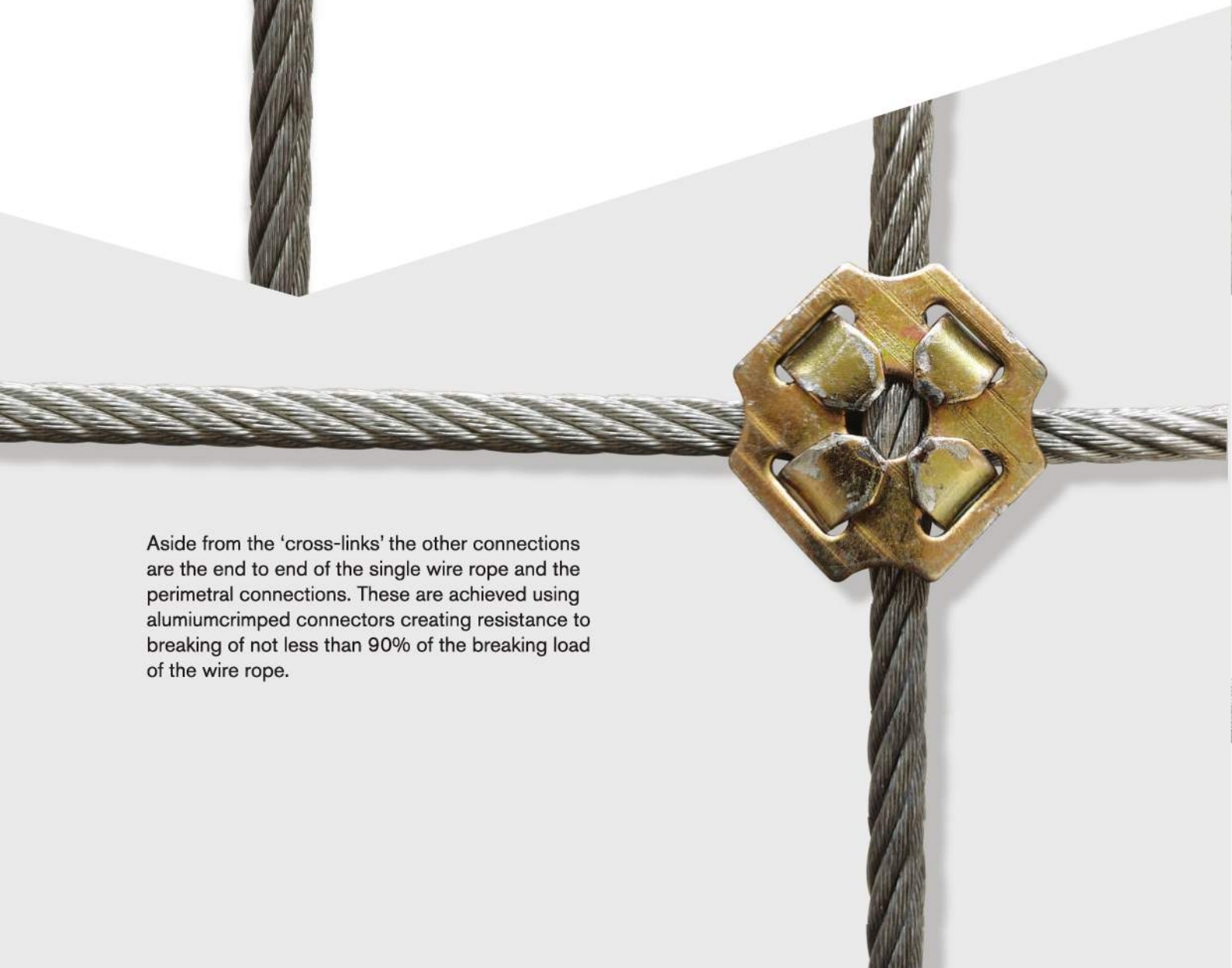




► **THE CROSSING POINTS OF ROPES ARE SECURED IN ONE OF THE FOLLOWING TWO WAYS :**



Hydraulically fitted hi-resistance steel clips. Clips are of robust design having four flaps to secure the 'cross-link' from all sides. These custom-built clips are heavily galvanized to maintain the robustness of the product.

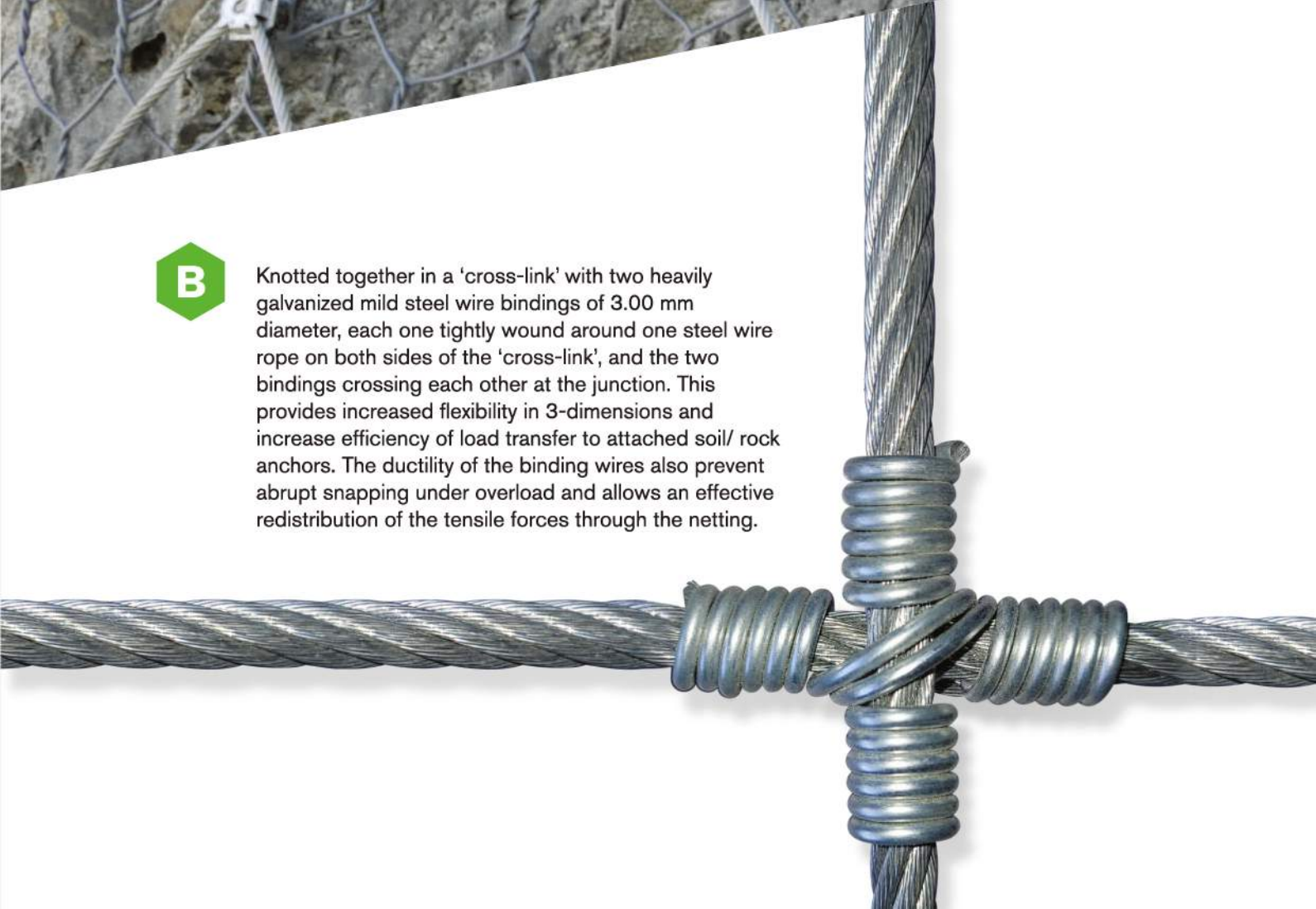


Aside from the 'cross-links' the other connections are the end to end of the single wire rope and the perimetral connections. These are achieved using aluminium crimped connectors creating resistance to breaking of not less than 90% of the breaking load of the wire rope.

GTI Cross-Linked Rhomboidal/Square Mesh Steel Wire Rope Panels are typically installed with small aperture secondary meshes to enable holding back of small sized debris.



Knotted together in a 'cross-link' with two heavily galvanized mild steel wire bindings of 3.00 mm diameter, each one tightly wound around one steel wire rope on both sides of the 'cross-link', and the two bindings crossing each other at the junction. This provides increased flexibility in 3-dimensions and increase efficiency of load transfer to attached soil/ rock anchors. The ductility of the binding wires also prevent abrupt snapping under overload and allows an effective redistribution of the tensile forces through the netting.



► STANDARD PANEL DIMENSION

Nominal mesh size (mm)	250x250 (mesh panel strength ~200 kN/m)
	300x300 (mesh panel strength ~175kN/m)
	400x400 (mesh panel strength ~130 kN/m)
Panel Width - W - (m)	*Upto 6
Panel length - L - (m)	*Upto 10

* External panel size is nominal (tolerance $\pm 5\%$);
~strength of mesh panel of 8 mm dia mesh wire rope

► 'CROSS LINK' BINDING WIRES

Galvanized G I Wire	IS 16014
Diameter, \varnothing (mm)	3.0 (IS 16014)
Tensile Strength (N / mm ²)	380-550

► STEEL WIRE ROPES

MESH WIRE ROPES		
	Diameter \varnothing (mm)	
Rope type (EN 12385- 4; IS 2266)	8	10/12
	6x7+WC	6x19+WC
Zinc Coating (EN 10264-2)	Class B; Class A	
Rope Grade - 1770 N/mm ²	Minimum Breaking Load - 45 kN	
PERIMETRAL ROPE (OPTIONAL)		
Diameter \varnothing (mm)	10 - 12- 14 -16	
Rope type (EN 12385-4; IS 2266)	6x19+WC	
Zinc Coating (EN 10264-2)	Class B; Class A	
Rope Grade - 1770 N/mm ²	Minimum Breaking Load - 45 kN	

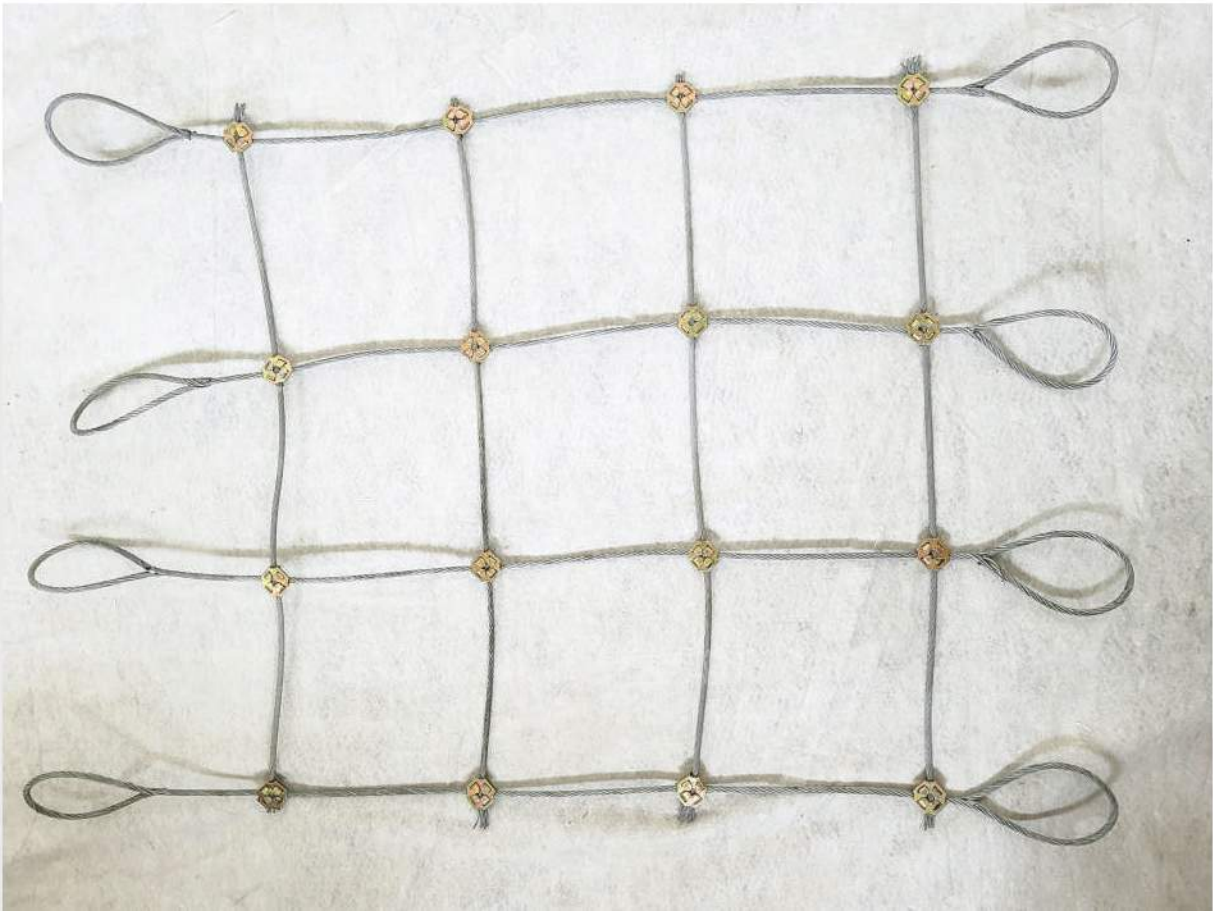
► 'CROSS-LINK' STRENGTH

Type of 'Cross-Link'	Resistance to Tear	Resistance to Pull Apart
A. Knotted with G I wire bindings	24.4 kN	11.9 kN
B. Hydraulically fitted hi-resistance steel clips	13.5 kN	8.0 kN



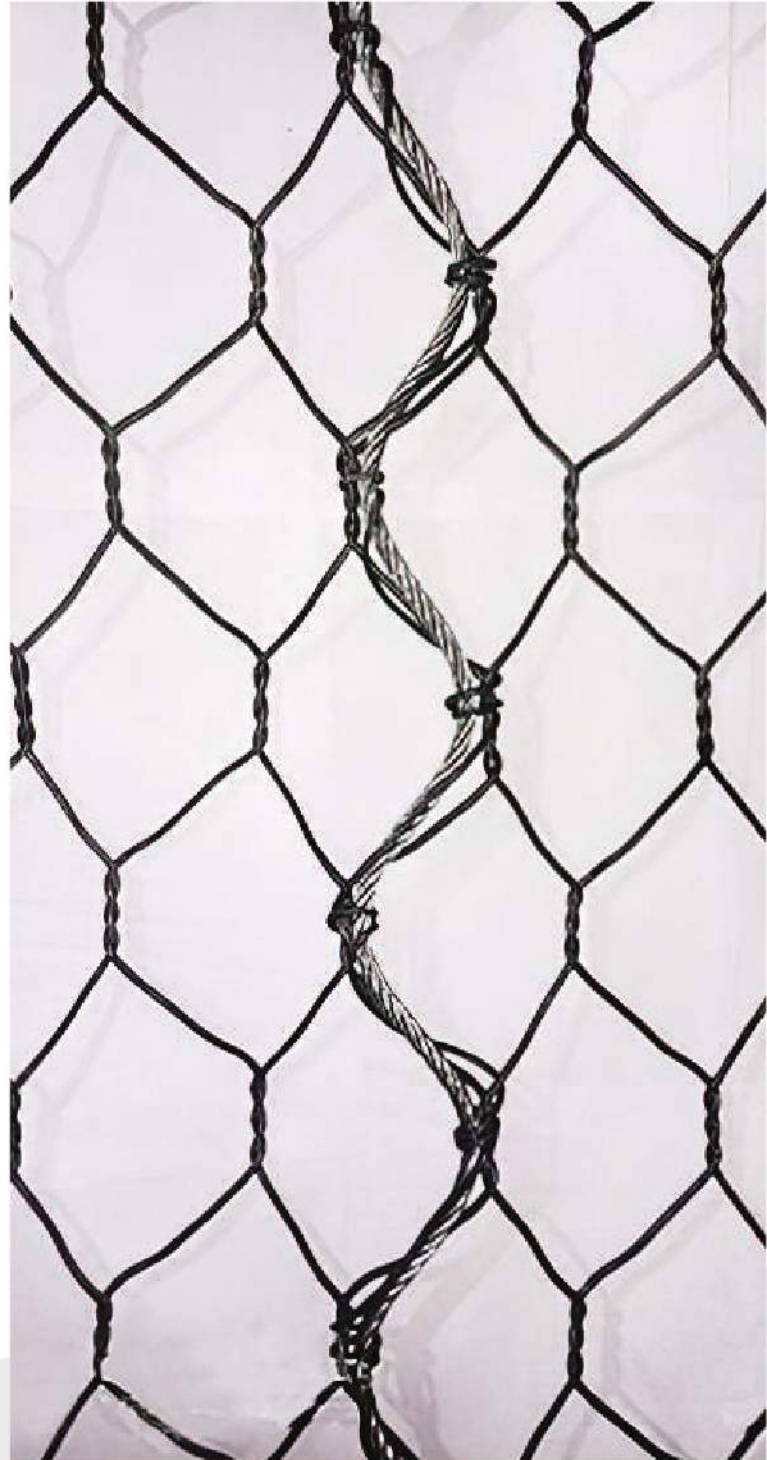
► ROCKNET

RockNet also comes in square shaped mesh instead of rhomboidal so that 'hangs' can be attached to the vertical ropes. And this option is made using Steel Wire Ropes with PP rope core instead of steel core. This type of RockNet has the advantage of connecting the longitudinal ropes to the top anchors.



▶ GTI STRONGNET

These are manufactured by combining Steel Wire Ropes of 8 mm-10 mm diameter with Mechanically Woven Double Twisted Hexagonal opening Steel Wire netting (IS 16014) to create a product with high tensile strength at low strain and high punch strength with low deformation. This is achieved by tying the Steel Wire Ropes longitudinally to the edge wires of the Double Twisted mesh using lacing wire. Steel Wire Ropes are also tied longitudinally to the mesh wires at intervals of 0.3 m to 1.5 m from the wire to which an adjacent Steel Wire Rope is tied.





The hexagonal IS 16014 mesh type and rope spacing is designed to provide various strengths reaching upto 200 kN/m. StrongNet has an excellent 'fall' during installation due to the vertical wire ropes and provides excellent function as a 'drapery' mesh system. The double twist of the hexagonal mesh prevents unravelling of the netting if a wire gets cut due to any reason.



► LONGITUDINAL STEEL WIRE ROPE

Rope type (IS 2266; ISO 2048)	Diameter 8-10 mm
Zinc Coating (IS 1835)	Class B
Rope Grade - 1770 N/mm ²	Minimum Breaking Load - 40 kN



StrongNet is designed to work efficiently with its anchorage system. The stress distribution is highly even and avoids grossly heterogeneous deformation in the mesh. The longitudinal wire ropes provide the strength to prevent shrinkage of the mesh under self-weight during installation and under weight of debris collected behind the mesh during its service life.

► RECENT CLIENTS / INSTALLATIONS



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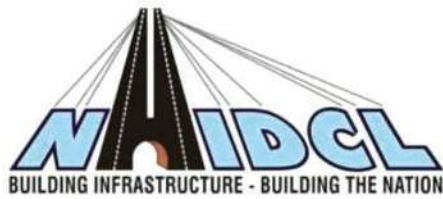
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