



TIRUPATI FENCE

TIRUPATI FENCE®

GABIONS & ENVIRONMENTAL SOLUTIONS



**BUILDING STABILITY
PROTECTING ENVIRONMENT**



“

For us customer's satisfaction is a passion.

”

In the present Global Market, with various quality of products and competitors in every field of business, our aim and target is to provide the best quality of materials and 100% satisfaction to the customers, not only to enhance business but create good and healthy relationship with our customers.

-Late Radheshyam Garodia

WELCOME TO TIRUPATI FENCE®

Today's ever-changing environment brings with it special challenges. Whether those challenges emanate from forces of nature or whether they come from the ever-increasing difficulties of people living within this environment with the need for infrastructure development and better utilization of available land, Tirupati Fence Environmental Solutions, a dedicated division of Tirupati Fence, is actively addressing these challenges head-on.

In recent years Tirupati Fence, one of the oldest manufacturers of border fencing, physical perimeter fencing systems, access control and detection systems, has been developing a range of Gabion Design Solutions for land reinforcement and erosion control needs.

Tirupati Engineering Co, situated in Siliguri, West Bengal, the gateway to North-East India, boasts state-of-the-art automatic production lines and a committed workforce. From retaining walls to erosion control, our gabions and geosynthetics are designed to provide durable and cost-effective solutions for various applications. Backed by our commitment to excellence and customer satisfaction, we strive to deliver products of the highest standard while maintaining environmental sustainability.

PRODUCTS & SYSTEMS :

- ◆ Tirupati Fence® Hexagonal Gabion Box / Wire Crates
- ◆ Tirupati Fence® Reno Mattresses
- ◆ Tirupati Fence® Sack Gabions
- ◆ Tirupati Fence® Rockfall Netting
- ◆ Tirupati Fence® Welded Gabions

- ◆ Tirupati Fence® Geobags
- ◆ Tirupati Fence® Woven & Non Woven Geotextiles
- ◆ Tirupati Fence® Geocomposites
- ◆ Tirupati Fence® Geocells



GEOTECHNICAL SERVICES :

- ◆ Retaining Wall
- ◆ Erosion Control & Coastal Protection
- ◆ River Bank Protection
- ◆ Slope Protection
- ◆ Soil Stabilization

- ◆ Ground Improvement
- ◆ Drainage Filtration & Paving
- ◆ Rockfall Protection
- ◆ Tunnelling
- ◆ Landscape & Architecture





TIRUPATI FENCE® HEXAGONAL GABIONS

Tirupati Fence Hexagonal Gabions are a trusted, well proven and technically sound way to retain earth and combat erosion. Gabions are rectangular woven wire mesh baskets filled with rocks to form flexible, permeable, monolithic structures, such as retaining walls or wires.

Their strength comes from a mechanically woven double twisted hexagonal mesh of steel wire. In the event of accidental breakage of one or more wires, the double twisted configuration ensures that minimal strength reduction occurs. The edges of the mesh are reinforced with a thicker wire called the selvedge/edge wire.

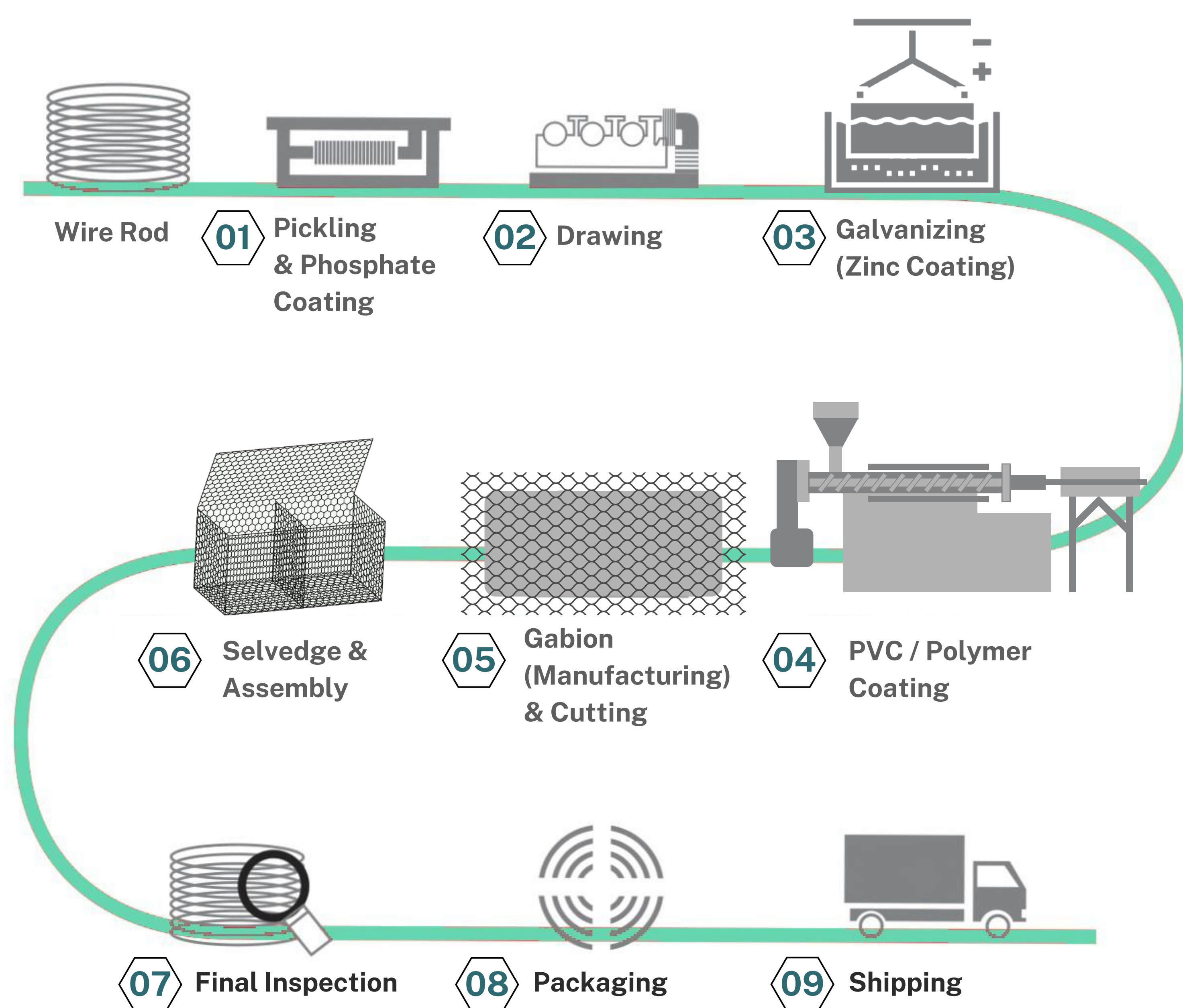
Tirupati Fence is committed to provide the best quality hexagonal gabion boxes / mattresses at the best price PAN India & internationally. Our factory has skilled We provide turnkey solutions for supply and installation of wire mesh.

Features of Double Twisted Hexagonal Steel Wire Mesh :

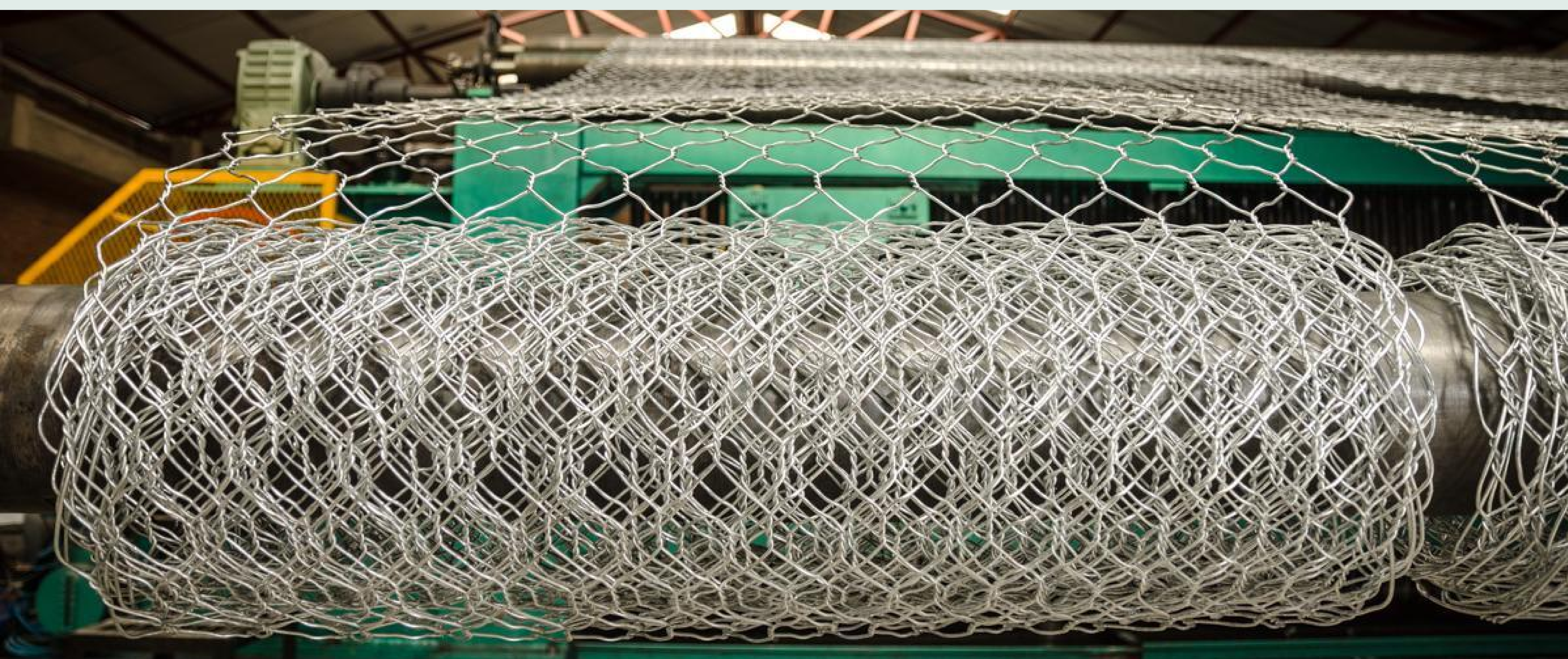
- ◆ Uniform mesh size (opening) and tight mesh
- ◆ Excellent distribution of stresses due to hexagonal shape of the wire mesh
- ◆ Easy assembly and stacking for quick installation
- ◆ Adaptability to uneven terrain for flexible deployment
- ◆ The mesh twists don't unravel even in case the wire gets cut accidentally, thereby maintaining the structural integrity
- ◆ Coating options such as heavy galvanized, PVC Coated, Galfan (90% Zn 10% Al) + PVC, and PA6, that increase the working life of the structure
- ◆ The mesh panels are provided with a thicker wire at the edges of the mesh by wrapping wire 2 and ½ times to provide greater rigidity and shape to the gabion box / mattresses / netting and sacks.



PROCESS OVERVIEW



Specialist in the Design, Manufacture, Supply and Erection of Double-Twisted Steel Wire, Hexagonal Mesh Gabion, Retaining Walls and Reinforced Earthwalls.

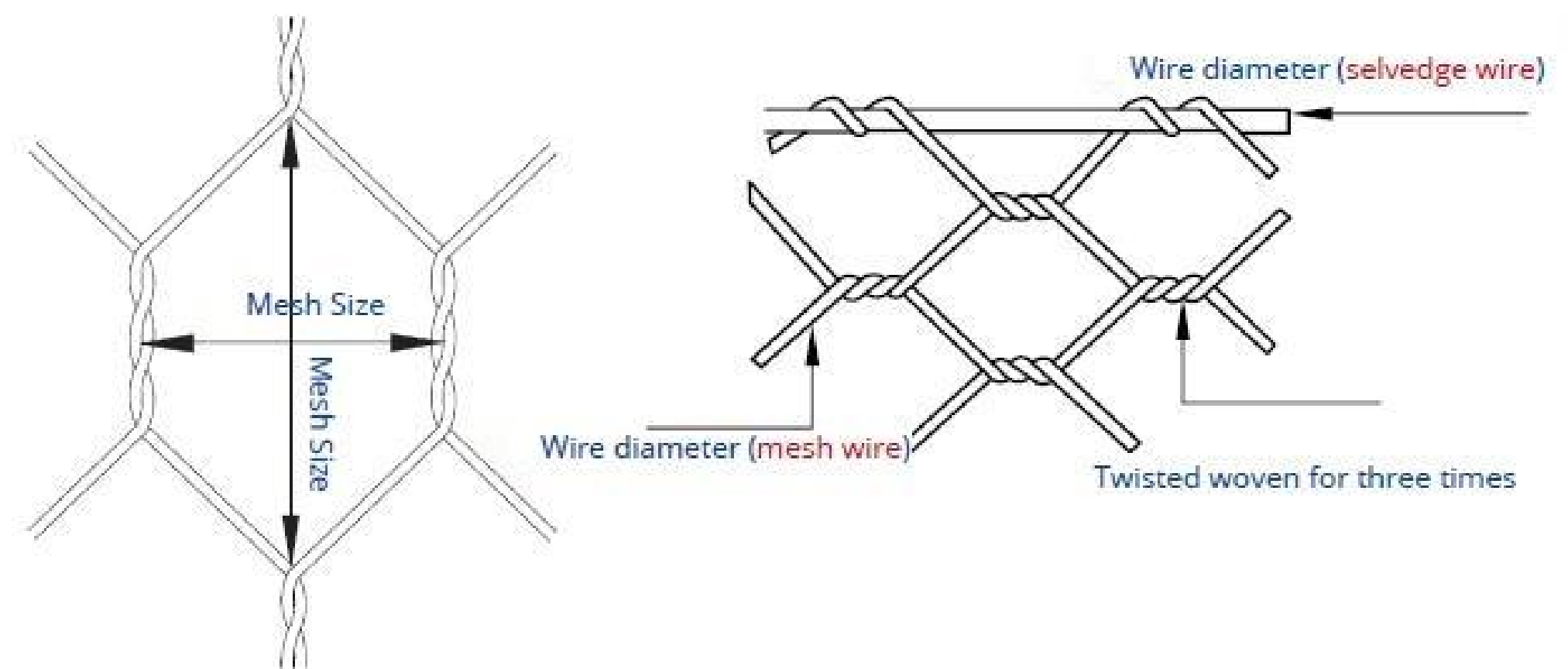


Hexagonal Gabion unit is factory fabricated from one main panel which forms the front, base, rear and lid of the unit with additional panels connected to the base section of the main panel to form the diaphragm and end panels.

MESH SIZES OF GABIONS AVAILABLE :

- 100 mm x 120 mm (D =100 mm)
- 80 mm x 100 mm (D = 80 mm)
- 60 mm x 80 mm (D = 60 mm)

**Tolerance in mesh size (+/- 2%)*



The wire used to manufacture the Double Twisted Hexagonal wire mesh is soft annealed, low carbon content mild steel wire provided with heavy coating galvanization as per EN 10244/ASTM A 641 or Galfan/Aluzinc wire (90% Zn 10% Al) to prevent corrosion. In case of use in aggressive environment, it is further extruded with 0.5 mm thick PVC Coating or PA6 coating. The PVC Coating is UV stabilized as per ASTM A975.

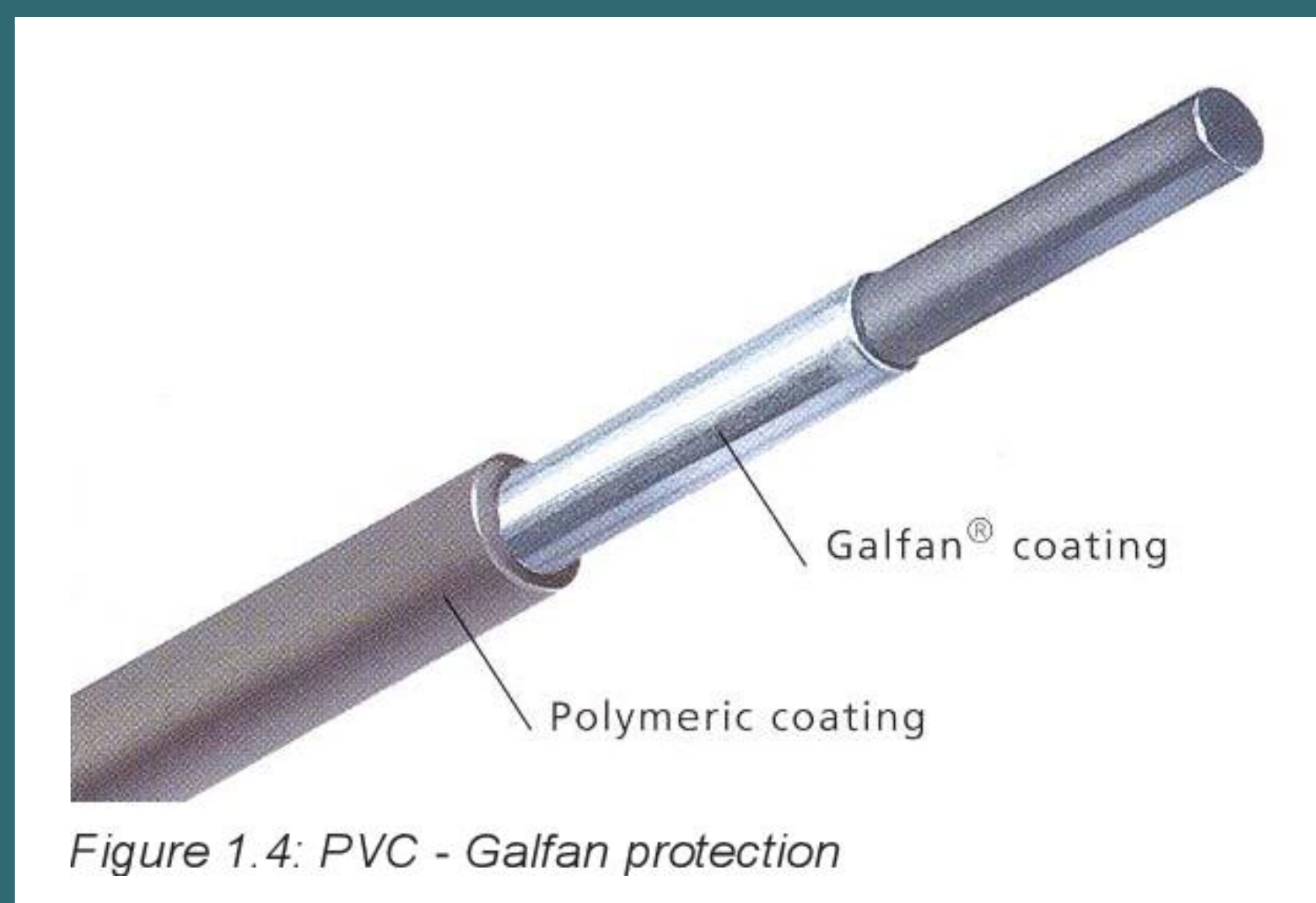


Figure 1.4: PVC - Galfan protection

WIRE USED FOR GABIONS

- Galvanized Steel (G.I) Wire with heavy Zinc coating
- PVC Coated Wire
- Galfan / Aluzinc Wire (90% Zn 10% Al)
- PA6 Coated Wire

**Tolerance in mesh size (+/- 2%)*

TENSILE STRENGTH OF WIRE :

Regularly the material for gabion is low-carbon steel wire (mild steel). Wire tensile strength is correspondingly 350-550 KN/n², in accordance with IS 280. Gabion netting tensile strength is 50 KN/M.

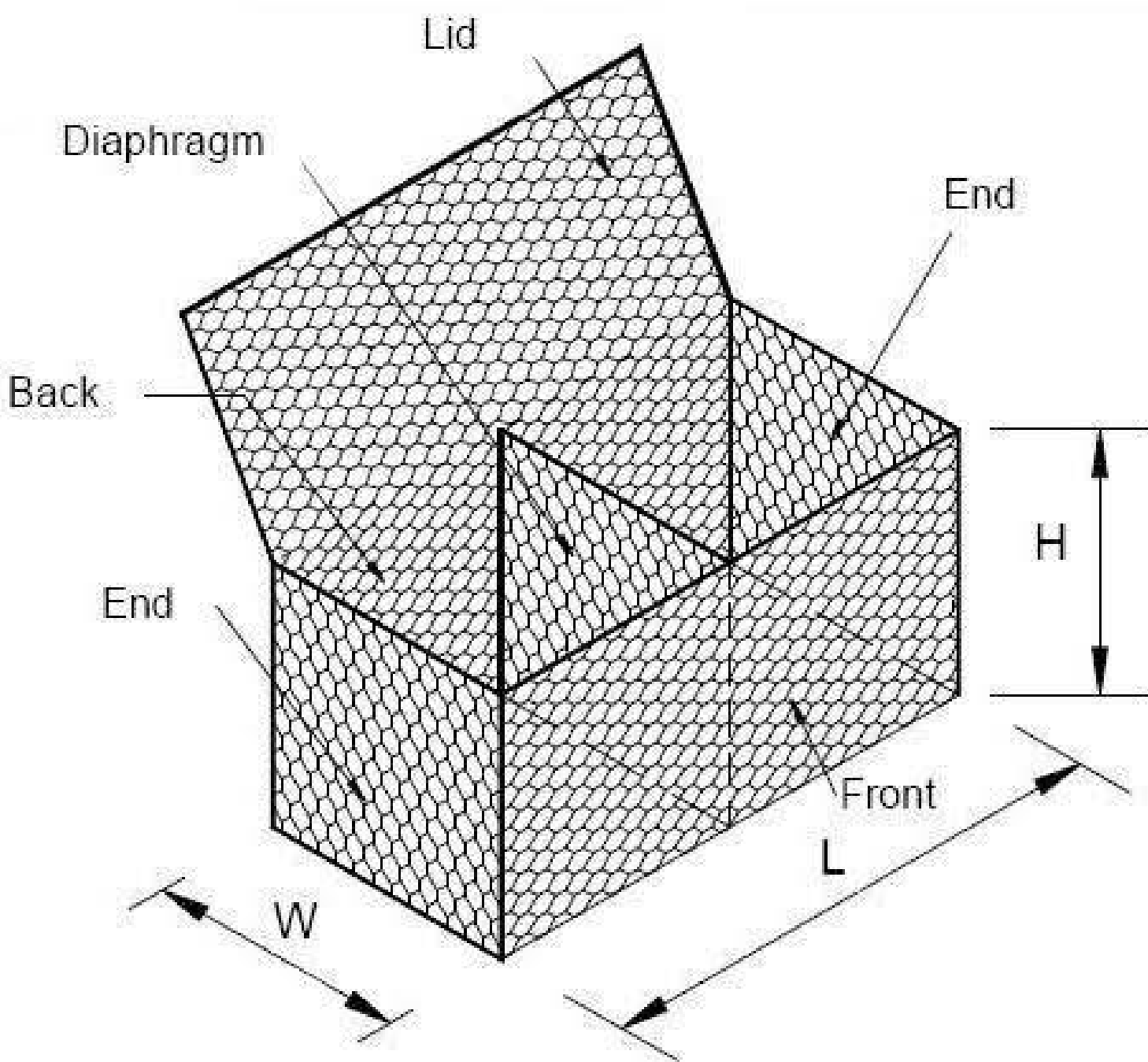
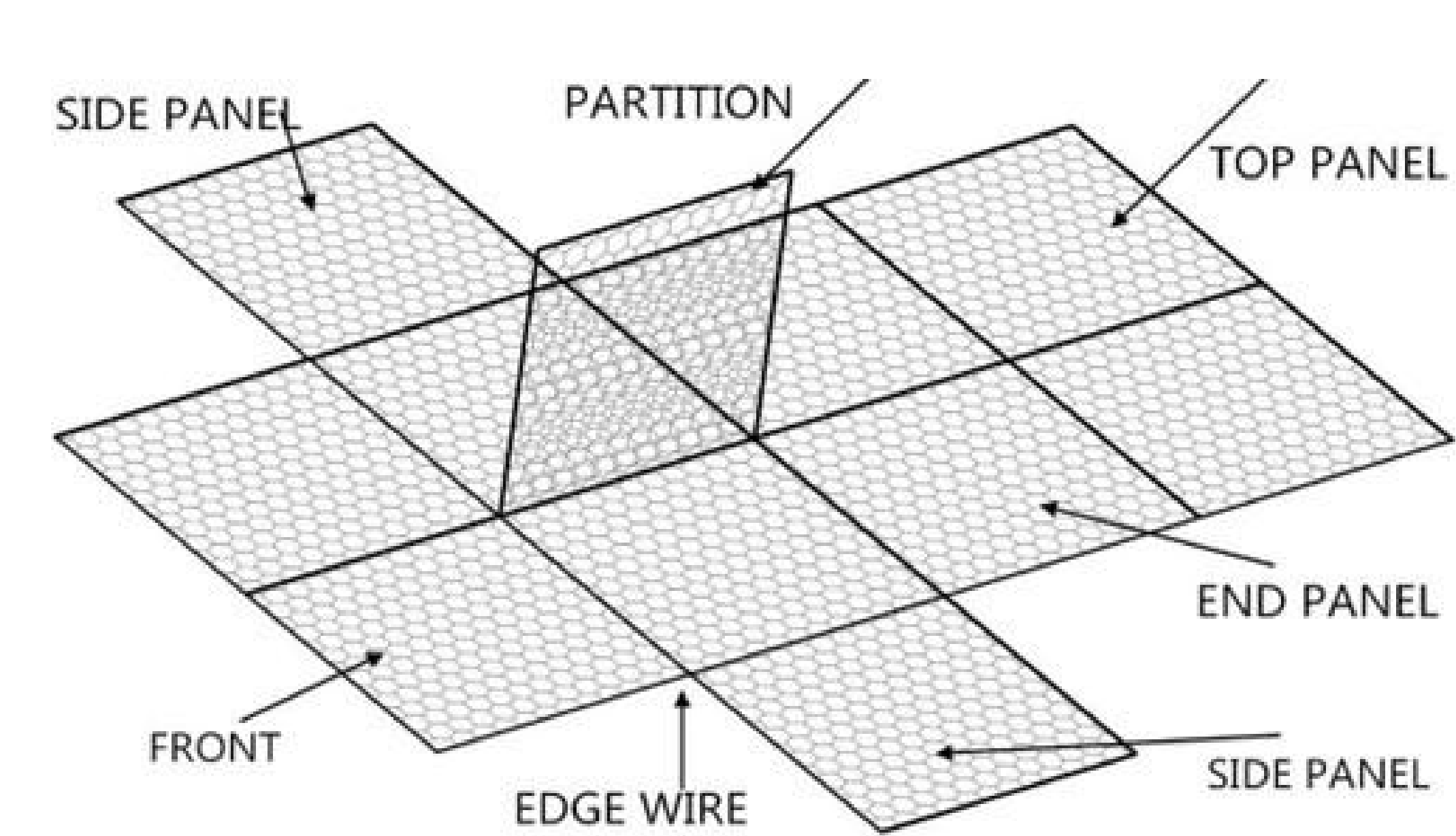
GALVANIZATION OF WIRE :

The zinc coating of wire confirms to IS 4826 heavily coated and soft type. The Zinc alloy consists of 90 percent zinc + 10 percent aluminium or 95 percent zinc + 5 percent aluminium. The wire is tested at the raw material manufacturer's lab and also in our laboratory for cross check.

Specification of Hexagonal Gabions :

S.NO	CHARACTERISTICS			
1	Mesh Type	100x120 mm / 80x100 mm / 60x80 mm		
		Only Zinc Coated (G.I) / Galfan		Zn + PVC Coated / Polymer Coated
		Type A	Type B	Type C (PVC Coated)
2	Mesh Wire Dia (mm)	2.70 mm	3.00 mm	2.7/3.7 mm
3	Edge / Selvedge Wire Dia (mm)	3.40 mm	3.90 mm	3.4/4.4 mm
4	Lacing Wire Dia (mm)	2.20 mm	2.20 mm	2.2/3.2 mm
5	PVC Coated Thickness	N.A	N.A	Nominal – 0.50 mm
6	Minimum Tensile Strength (Parellel to Twist) KN/m	32.00	40.00	32.00
7	Minimum Tensile Strength (Perpendicular to Twist) KN/m	15.50	20.50	15.50
8	Typical Box Sizes (Length x Width x Height) m (No.of Diaphragms)	4 x 1 x 1 (3 Nos) , 3 x 1 x 1 (2 Nos), 2 x 1 x 1 (1 Nos), 1.5 x 1 x 1 (0 Nos) 1 x 1 x 1 (0 Nos), 3 x 1 x 0.5 (2 Nos), 4 x 1 x 0.5 (3 Nos)		

*Tolerance in Length and Width +/- 5%
*Tolerance in Height > 0.3 m = +/- 5% & Height < 0.3 m = +/- 10%



1x1x1 m



2x1x1 m



3x1x1 m



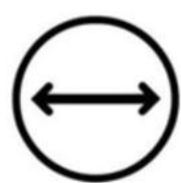
4x1x1 m

QUALITY ASSURANCE & TESTING FACILITY

Tirupati Fence® ensures 100% quality assured products by means of a well laid out Quality Assurance Plan (QAP) complying with ISO 9001:2015 norms and meeting the quality standards as per ASTM 975 and EN 10223 as well as IS 16014. Our factory has advanced equipment, skilled workers, complete quality management system and strong R&D capability. We have in-house lab testing facility for chemical, mechanical and physical testing of raw materials and finished goods.

A. Quality Check of Wire : All the wires are inspected so that they follow the required mechanical properties as per industry accepted standards – IS Specifications or ASTM Norms.

WIRE DIAMETER



Wire thickness is verified using a micrometer for cross verification 10 consecutive bundles

TENSILE STRENGTH & ELONGATION



We make sure that the tensile strength falls within the range as specified as per IS 280

GALVANIZATION



Mass of zinc is a measure of service life of the wire. More the mass of zinc coating, more will be the service life of wire. Testing method is as per EN 10224-2

PVC COATING & THICKNESS



We use the best quality of PVC granules with controlled thickness of coating

B. Quality Check During Manufacturing : Tirupati Fence team assures that every step in the manufacturing process is observed
Mechanical Tests on Finished Products:

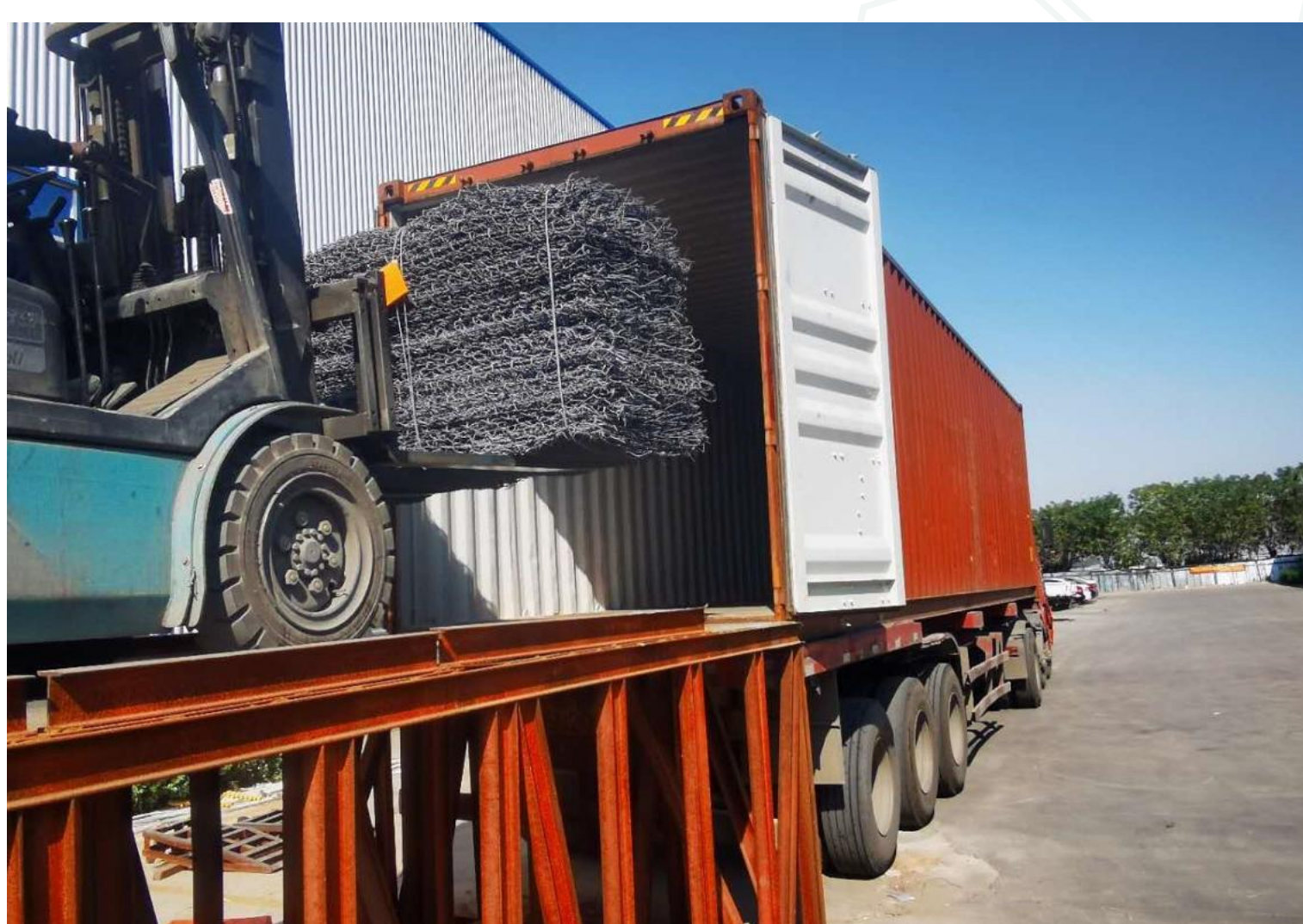
1. Tensile Strength of Wire Mesh Panel: Tensile strength of wire mesh panel parallel & perpendicular to twist direction is checked in every lot.

C. Physical Tests on Finished Products :

1. Mesh Size: Mesh Opening size horizontally and vertically is checked with tolerance of +/- 2% in mm
2. Dimensions of box or netting rolls

D. Quality Check During Dispatch : To ensure that the product satisfies the customer expectation and is ready to be used, final quality check is done before dispatching the product. We follow a strict packing standard to ensure that the product doesn't get damaged during logistics and the customer receives a high-quality product.

E. Third Party Inspection : Our materials are also third party inspected by agencies such as **Bureau Veritas, Rites LTD, Quality Council of India (QCI) etc.** Materials are also sent in outside laboratories such as **National Test House (NTH) or NABL Approved Lab.**



COMPARISON BETWEEN HAND MADE WIRE CRATES & TIRUPATI FENCE® GABIONS

HAND KNITTED WIRE CRATES	TIRUPATI FENCE® GABIONS	REMARKS
 Specification: Mesh Size: 100 x 100 ; Wire Dia: 4 mm	 Specification: Mesh Size: 100 x 120 mm; Wire: 2.70 mm or 3 mm or PVC Coated	Gabion boxes have better strength, durability than wire crates
Strength of Double Twist: For 10x10 mesh strength is 0.4 to 0.5 kN	Strength of Double Twist: For 10x12 mesh strength is 1.4kN	Double Twist adds strength to the wire mesh
Mesh Panel Strength: No available records, either of mesh tensile strength or long term tensile strength	Mesh Panel Strength: 100x120 mm mesh has the following tensile strength (a) Parallel to the twist: 43 kN/m. (b) Perpendicular to the twist: 19Kn/m. (c) Long term strength: 90% of the initial strength	This parameter affects: • The Shield’s co-efficient for designing with gabions, and hence the confining effect of the Gabion Boxes. • The durability and overall life of the gabion structure
Mesh Opening: Mesh Opening is not uniform throughout the mesh which results in enlargement of the mesh size and filled material escapes during load application. 	Mesh Opening: Mesh opening is uniform throughout the mesh to prevent bulging and escaping of fill material. 	Uniformity of mesh opening ensures safety of the retaining structure.

APPLICATIONS OF TIRUPATI FENCE® HEXAGONAL GABION BOXES:

Hexagonal mesh gabion box is widely used in the roads, railways, coastal embankment work and hydraulic structures, such as dams and culverts for the following geotechnical solutions:

- ◆ Retaining Walls
- ◆ River Bank Protection Walls
- ◆ Soil Erosion Control
- ◆ Flexible Apron
- ◆ Protect the engineering of seaside area.
- ◆ The control and guide of water



RIVER PROTECTION



SOIL EROSION CONTROL



PROTECT THE ENGINEERING OF SEA WATER AREA



PROTECT THE ROADWAY



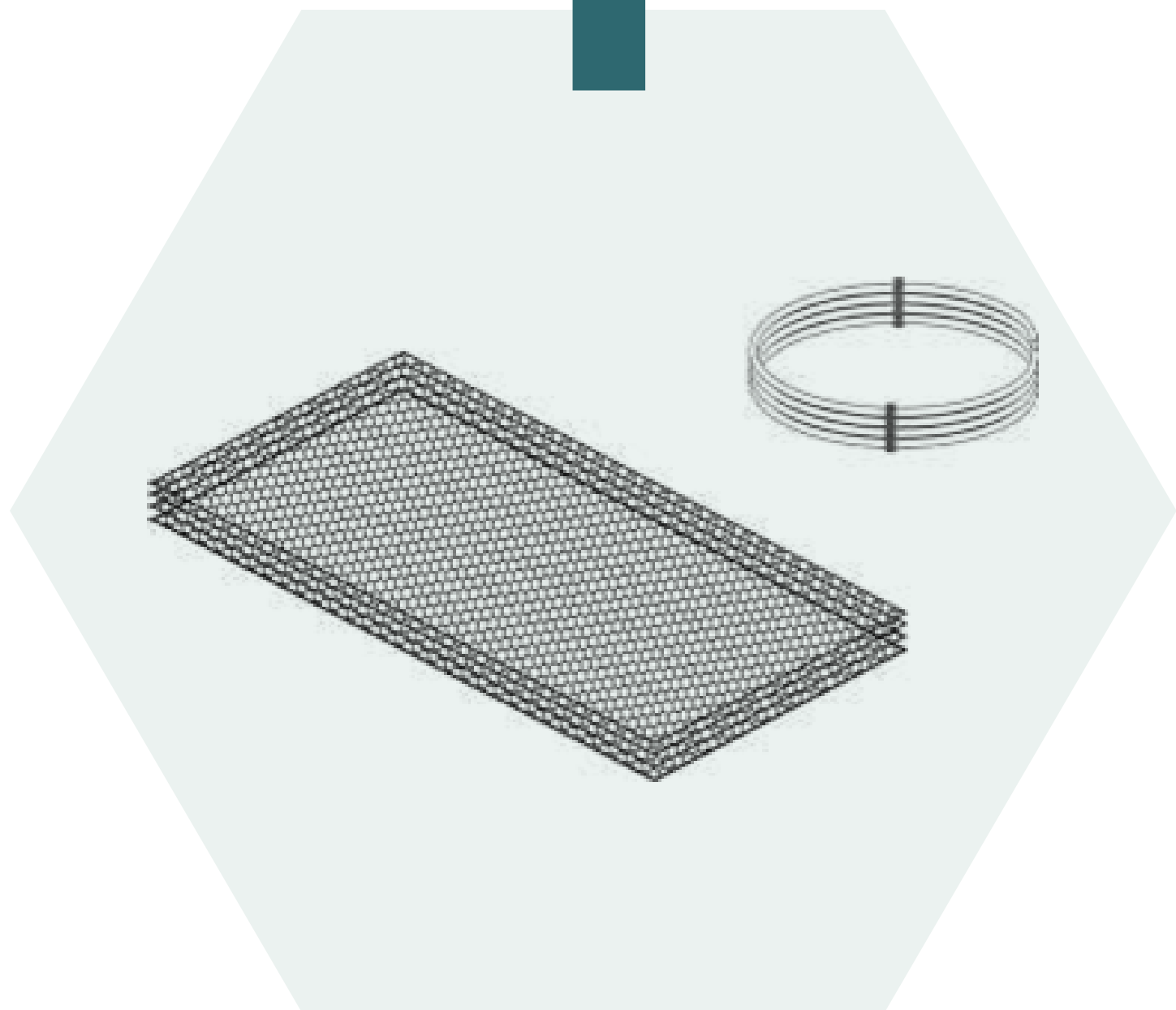
CONTROL AND GUIDE FOR WATER



RETAINING WALLS

INSTALLATION PROCESS OF GABION BOXES :

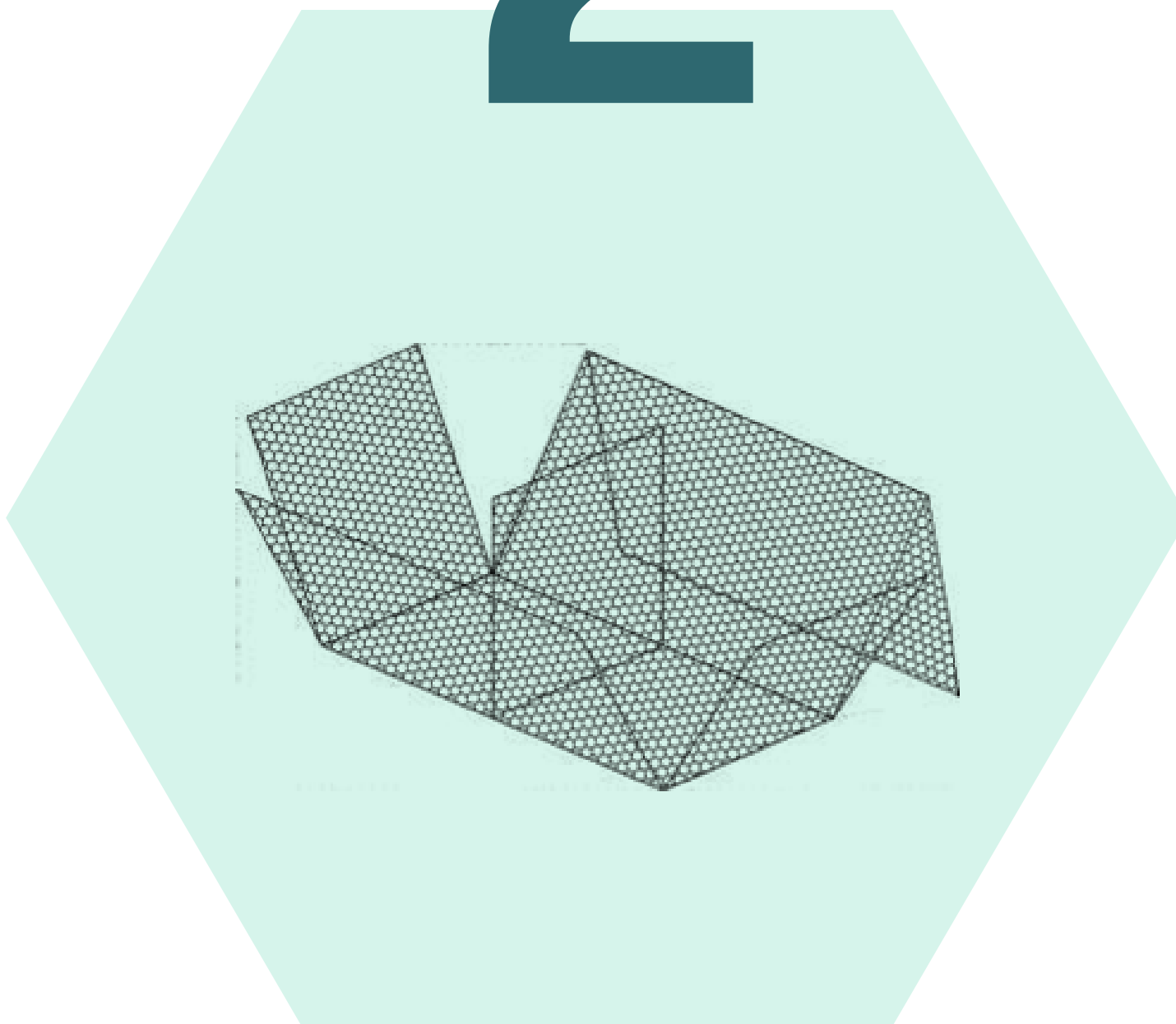
1



Prepare Materials

Prepare all needed gabion panels and lacing wires.

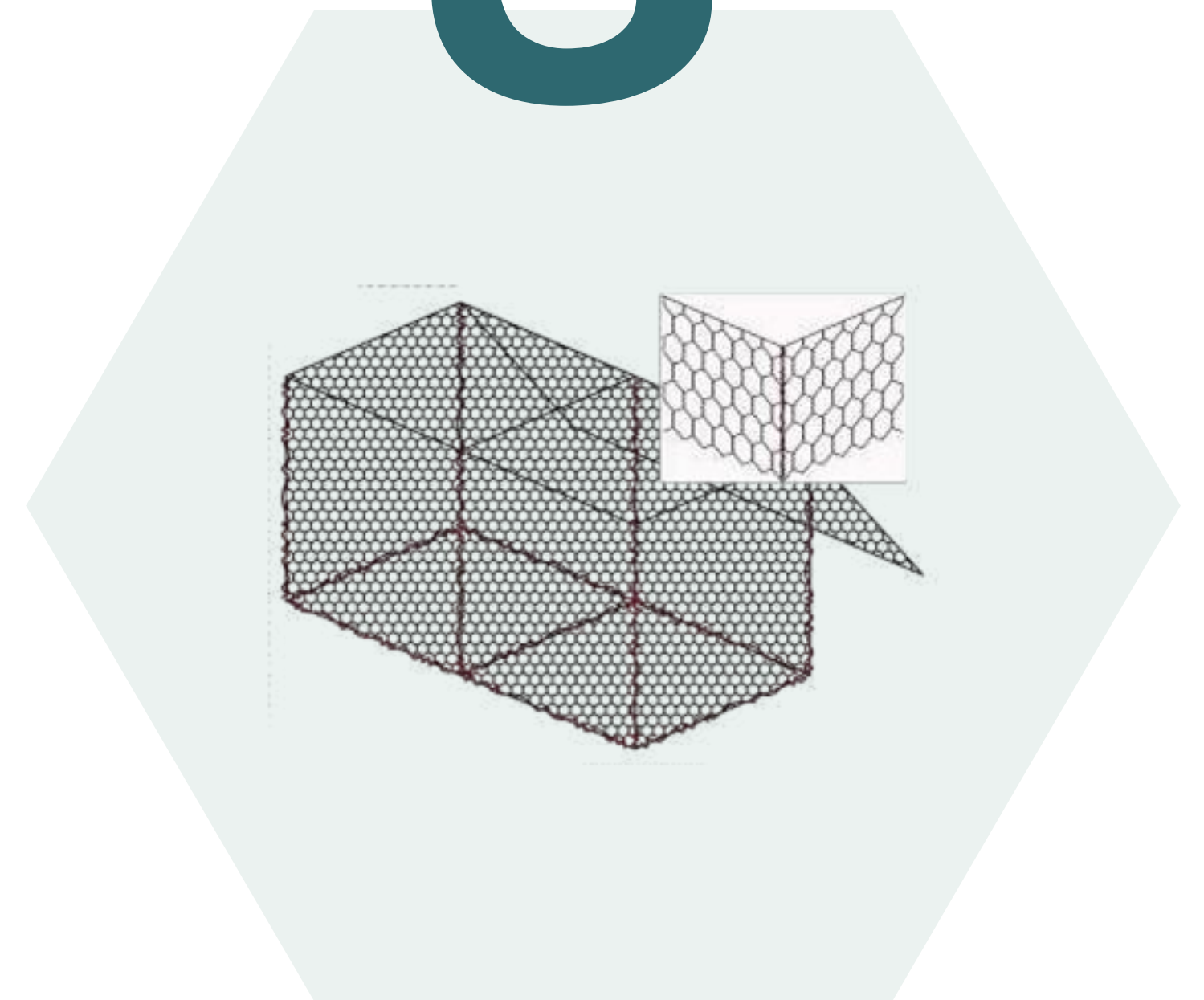
2



Erect Each Section Up

Erect front, back and all diaphragms vertically.

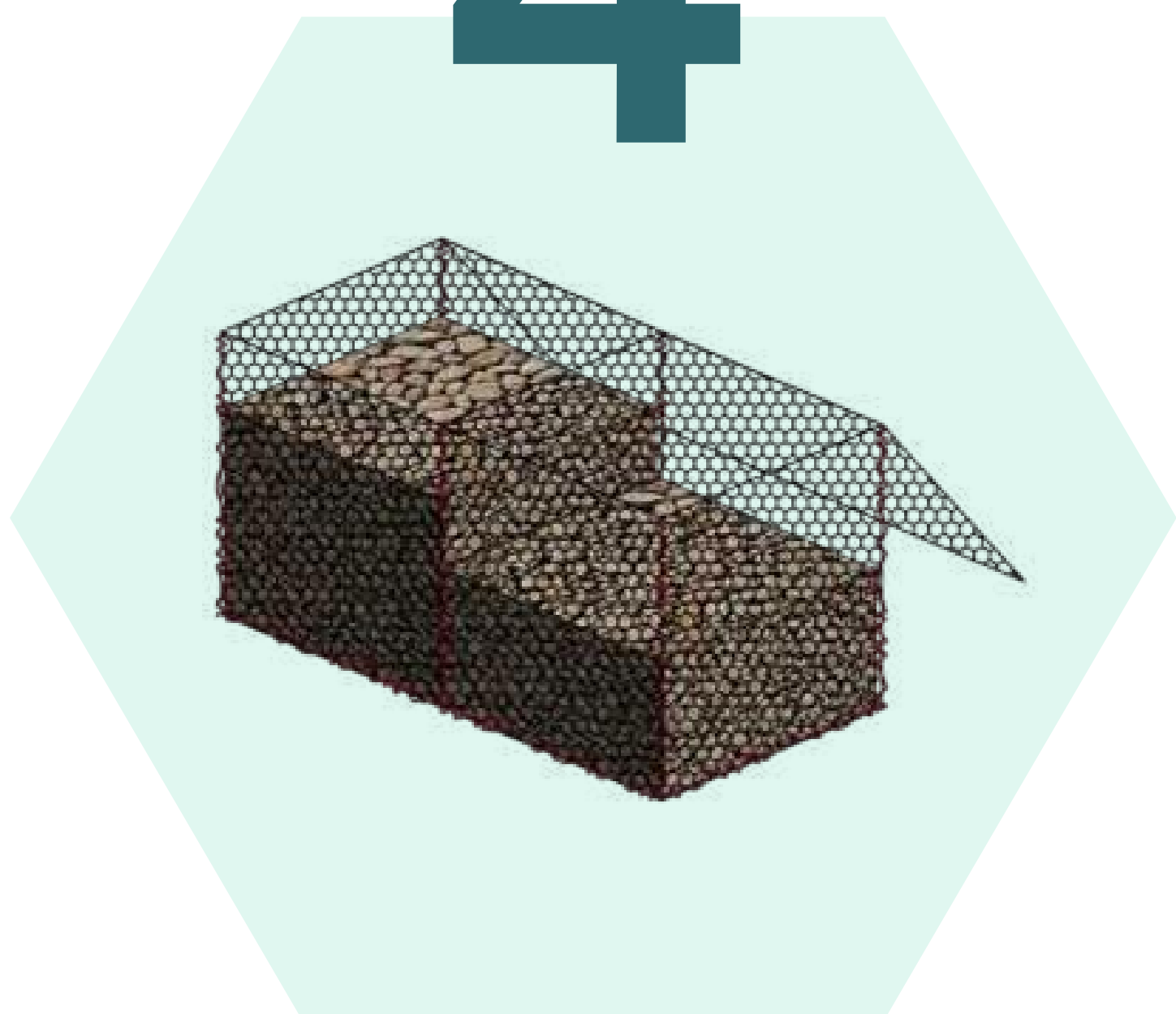
3



Fasten with lacing wire

Fasten and secure each panel together with lacing wires.

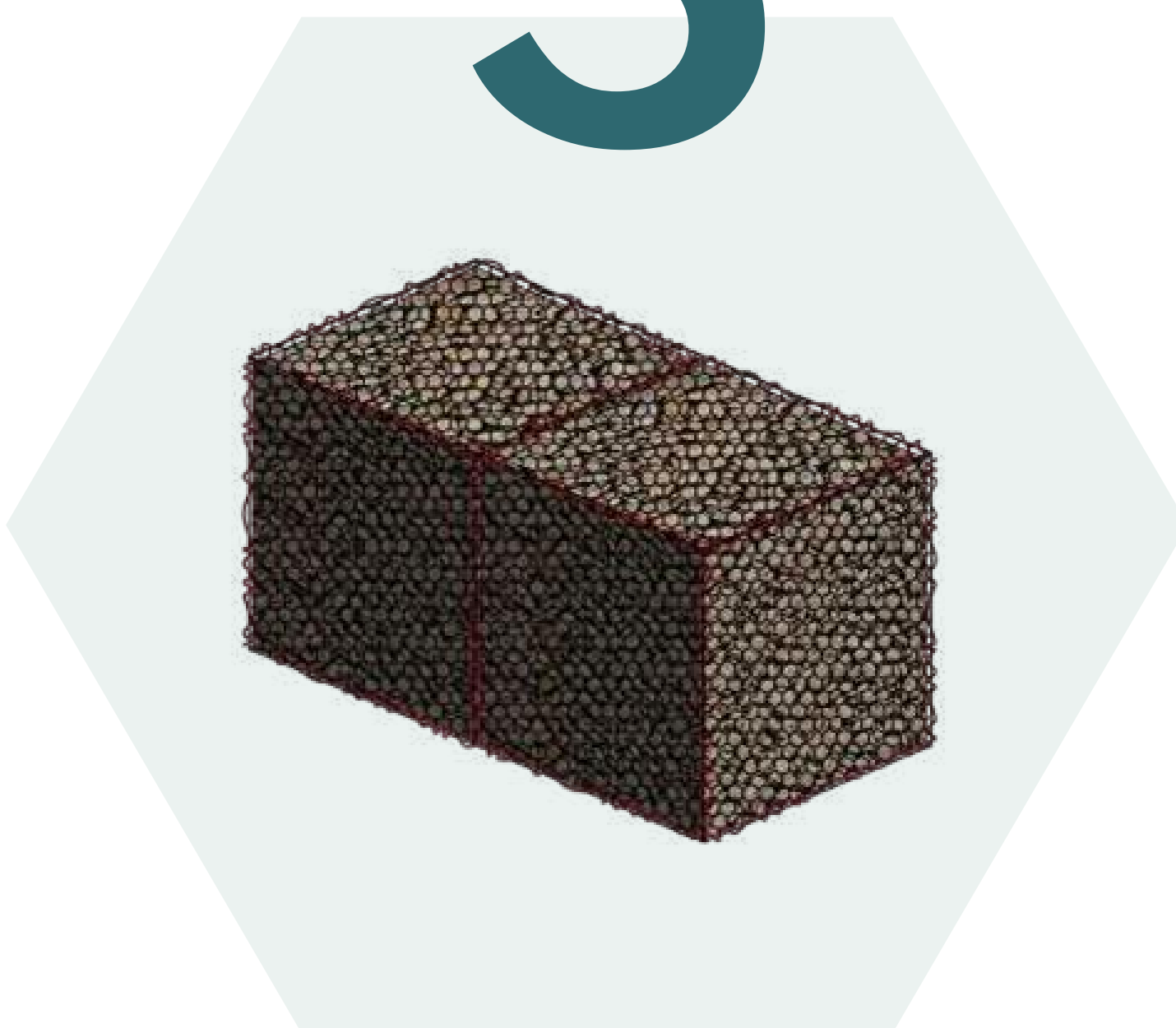
4



Fill Gabions with stones

Gabion box is filled with stones by hand or with as hovel.

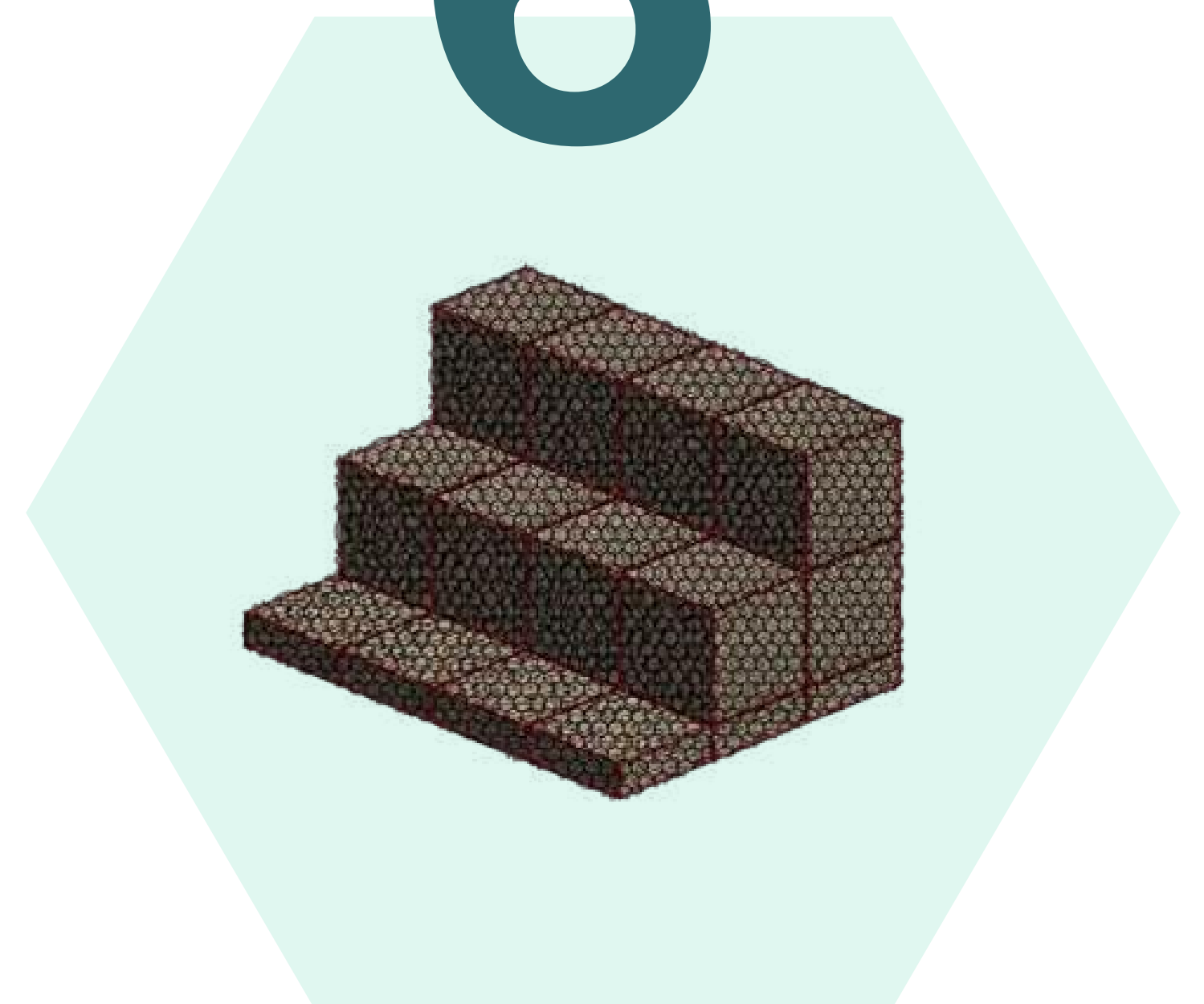
5



Cover lid with lacing wire

When gabions are filled with stones, cover the lids with lacing wire.

6



Continue construction

Combine gabion mattress and gabion boxes step by step to build your project.

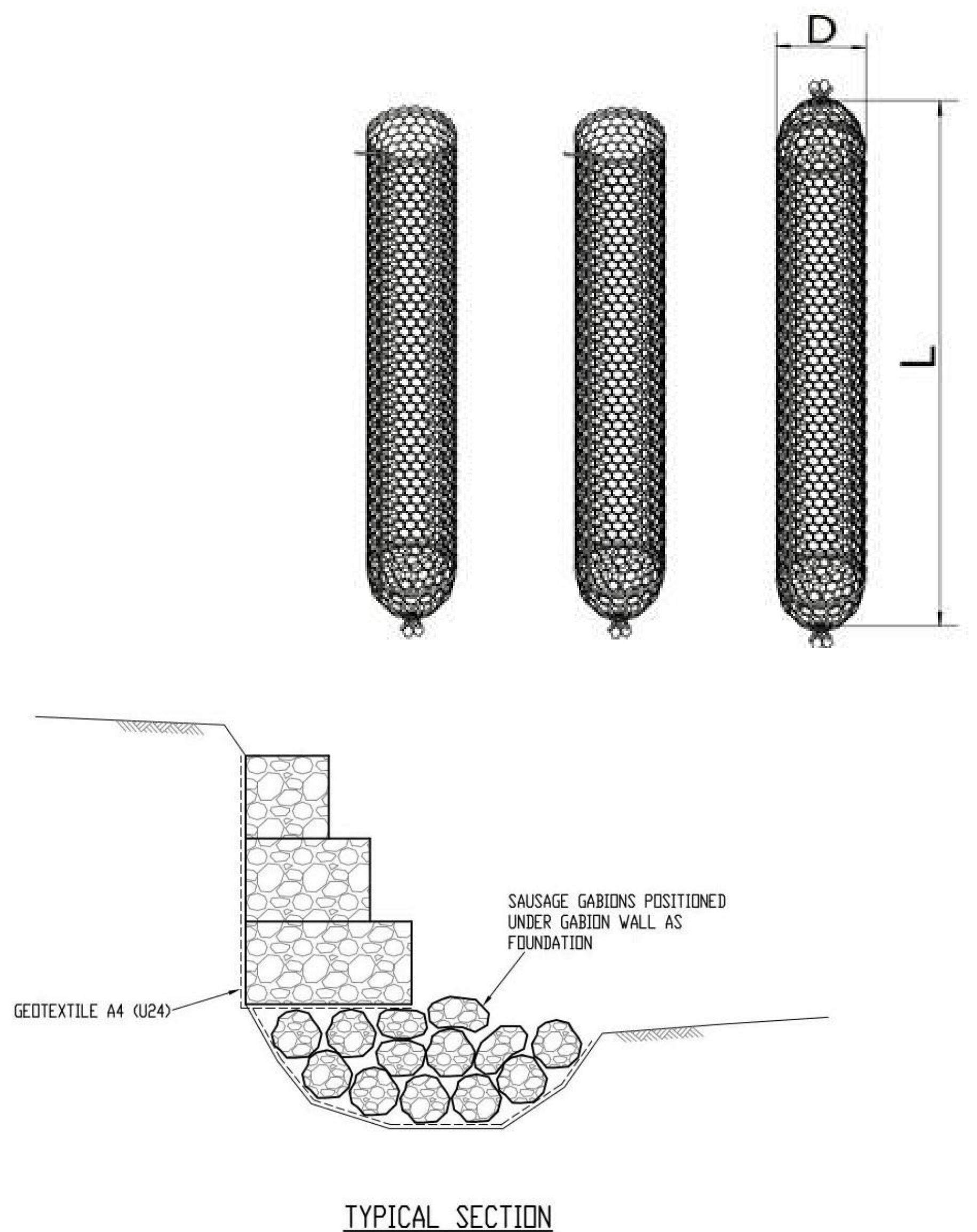


TIRUPATI FENCE® RENO MATTRESSES :

Tirupati Fence Reno Mattress is a low-profile gabion with internal partitions creating evenly spaced cells. Its purpose is to decrease water velocity in streams as depth increases, preventing displacement of soil particles at the bed interface. A geotextile separator membrane, typically nonwoven, with smaller pore size than soil particles, should be placed beneath the mattress for added precaution. Gabion mattresses are widely used in sea and river protection, erosion control, and road and railway construction. They're laid on slopes, usually extending one meter above the expected flood level.

TIRUPATI FENCE® SACK GABIONS :

Tirupati Fence Sack Gabions provide a stable platform in areas with poor founding conditions or wet ground. These cylindrical wire mesh baskets, made of galvanized steel or PVC-coated, are filled with stones for use in river control and emergencies. Steel wires are inserted for reinforcement, and mesh panel edges are selvaged with thicker wire for added strength. Gaps between stones allow water to seep through, reducing pressure and weakening soil shear strength, while also saving costs compared to traditional drainage equipment.





TIRUPATI FENCE® WELDED GABIONS:

Tirupati Engineering Co's welded gabion units consist of panels of quality welded wire mesh, secured together to form a gabion unit, which is filled on-site with gabion stone to form the appropriate structure. Our welded mesh gabion units have been successfully used within free-standing retaining walls, cladding, and other features within the built environment. Compared to woven hexagonal mesh, welded gabions are more rigid in shape which cannot easily bulge out when filled with stones.

FEATURES OF WELDED GABIONS :

- ◆ Durable structure with greater strength than ordinary gabion boxes.
- ◆ Better shape control.
- ◆ Utmost corrosion resistance.
- ◆ Easy to assemble.
- ◆ Aesthetically appearance.
- ◆ Quality high tensile wire.
- ◆ ASTM A974-97 Standard Specification.
- ◆ Application in slope protection, military defence, road protection, retaining walls, and fireplaces.



TIRUPATI FENCE® ROCKFALL NETTING:

Recent road expansions and new constructions to meet modern transportation needs have prompted the government to address roadside rock slide protection. High-Resistance Rock-Shield Netting, featuring double twisted hexagonal mesh, offers flexible, non-raveling, corrosion-resistant, and mechanically unique solutions. Tirupati Fence's netting provides the mechanical strength necessary to prevent rock shock loads and disperse rock fall energy. We offer both active and passive systems for stabilizing rock faces, soil slopes, and managing hydro-geological challenges. Our soil-nailing solutions, along with facing options, offer erosion protection and promote slope revegetation. Tirupati Engineering Co's Double Twist Mesh Rockfall netting serves as a drapery system, mitigating rockfall hazards on roads, highways, and railways.

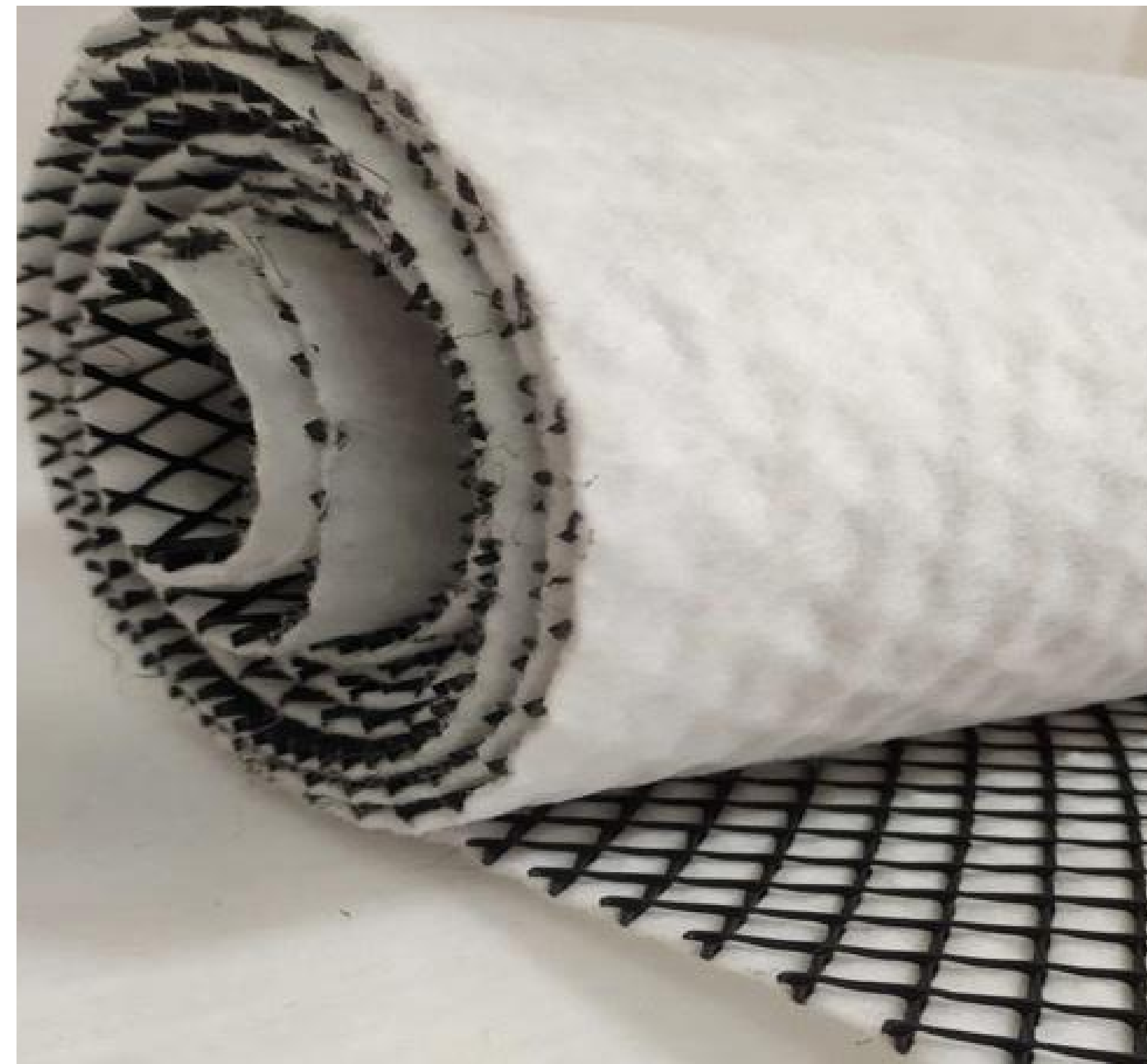


DRAINAGE COMPOSITES :

Tirupati Fence Drainage composites are prefabricated subsurface drainage products which directly replaces the granular drainage layer. It is formed by a combination of geotextile (woven or nonwoven) acting as a filter or separator on one or both sides with a core of Geonet. Drainage composites allows water to pass through into the polymer core but prevent the soil to washing through.

Applications :

- ◆ Reinforced Soil Wall & Retaining Wall
- ◆ Canal Lining
- ◆ Landfill
- ◆ Landscaping Projects
- ◆ Pavements & Track Beds



GEOBAGS :

Geo bag / Geotextiles sand container (GSC) are versatile and highly robust engineered containers made out of Needle punched woven & nonwoven Polypropylene or Recycled PET fabric, which is stitched from three sides and open from one side. Woven Geo bags are made up of high tenacity multifilament yarn. We can provide Geo bags of different sizes and various weights of geotextile as per customer requirements.

Applications :

- ◆ River Bank Revetments
- ◆ Shoreline Protection
- ◆ Dewatering of Sand & Silt
- ◆ Protection of embankment from erosion during floods

NON-WOVEN GEOTEXTILES:

Non - Woven geotextiles is manufacturer from PP Staple or polyester fibres which are mechanically bonded through needle - punching to form a strong, flexible and dimensionally stable fabric structure, with optimum pore sizes and high permeability. The geotextile is resistant to chemicals and biological organisms normally found in soils and are stabilized against degradation due to short-term exposure to ultraviolet radiation.

Application :

- ◆ Subgrade separator for roads, railways, airports
- ◆ Geotextile bags and containers
- ◆ Geomembrane protection, paving fabrics
- ◆ Filter for hard armour erosion control systems



POLYPROPYLENE BIAXIAL GEOGRIDS:

Tirupati Fence Biaxial geogrids are designed to have roughly the same tensile strength in both directions and to distribute loads over a wider area, increasing the load capacity of the soil. Base reinforcing geogrids interlock with the aggregate to confine the base and reinforce the subgrade. It is an integrally formed geogrid consisting of high-quality polypropylene and carbon black. The punched and drawn (stretched) manufacturing process are so designed that they provide the lateral confinement and helps in reinforcing the weak soil.

Applications :

- ◆ Base Reinforcement
- ◆ Reinforced soil walls and slopes
- ◆ Area stabilization, void spanning



EROSION CONTROL MATS:

Coir Non-Woven Geotextile manufactured from 100% coconut fiber. Top and bottom covered with UV stabilized black polypropylene net stitching together with a black thread to produce the blanket. The coconut fiber is evenly distributed with in the net in a roll form. Erosion Control Mats, also known as erosion control blankets, are manufactured from coir geotextiles and jute geotextiles. They provide stabilization and reinforcement, preventing soil erosion in various scenarios such as at rivers, trenches, hills and slopes, and lakes and ponds. They are durable and blend effortlessly into the environment being completely organic and biodegradable.

Applications :

- ◆ Being biodegradable, they add value to the soil, promoting vegetation
- ◆ Wetland construction and restoration
- ◆ Mining rehabilitation
- ◆ Slope stabilization and re-vegetation

GEOCELLS:

Geocell is a strong, 3D rhomboidal cellular confinement system, which offers unique, eco-friendly solutions for various civil engineering challenges. Engineered for diversity, Geocell can be utilised in various sectors such as roads, railways, ports and others. The cell is built of high-density polyethylene (HDPE), which is used to stabilize soil that is weak or unstable. This is due to their capacity to minimize soil particle lateral movement while vertically loading on the enclosed infill.

Application :

- ◆ Enhanced drainage owing to the perforations in the Geocells.
- ◆ Retaining walls with geocells help stabilize steep slopes
- ◆ Geocells are also resourceful in reservoirs and landfill areas.



HIGH TENSILE ROPE NET SYSTEM :

Tirupati Fence high tensile rope net systems is made out of high tensile steel wire ropes with tensile strength of more than 150 KN/M used for rockfall protection system. High Tensile rope net system works in combination with or without bearing plates and other elements like top & bottom support ropes, wire rope anchors and soil nails.

Applications :

- ◆ Rockfall Protection
- ◆ Slope Stabilization
- ◆ Landslide mitigation



SELF DRILLING ANCHORS :

Tirupati Fence Self Drilling Anchors are most commonly used items for slope stabilization projects as well as tunnelling and mining projects because of its flexibility to use in various type of soil and rock conditions. It reduces the cost of project to a significant amount with its lower stock of stocking as it can be kept with full length and can be cut as per project requirements. Smaller diameter bars can be used under same load due to extraordinary steel mechanical properties. Soil nailing should be planned in rhombus shaped grid to ensure efficient distribution of the reinforcement.

Applications :

- ◆ Soil Nailing
- ◆ Surface Protection

DRAINBOARD (DIMPLEBOARD) :

Tirupati Fence Drainboard is a modular sheet composed of high strength polyethalene (HDPE) of brown and black colour. Module height is 8 ± 0.2 mm. It is specially designed as drainage layer and for protection of underground walls. It acts as a barrier and provides protection to the waterproofing membrane from the backfill. The dimples create a vapour and thermal insulation barrier in both internal walls adjacent to waterproofing membranes. Drainboard offers protection against rising dam in ground slabs and without compromising the load bearing capacity of the sub base

Application :

- ◆ Ground slabs
- ◆ Basement walls





INNOVATIVE SOLUTIONS – TIRUPATI FENCE Q-FLOOD PROTECTION

Tirupati Fence Q-Flood protection is a quick flood protection solution with welded mesh geotextile lined units. The barriers ensure critical infrastructure remains functioning so emergency service routes can stay open. Q-Flood Units can be planted with suitable grasses and vegetation to form a natural landscape, as well as a protective structure. This makes it ideal for areas at risk of regular flooding, like a river or canal bank.

Save time and money in an emergency

Tirupati Fence Q-Flood protection is ideal for emergency flood response, offering significant advantages over traditional sandbags, in terms of cost, time and labour requirement for installation.

A wall using Q-Flood barrier can be filled by two people and a standard front-end loader in just 20 minutes. The equivalent sized wall of 1,500 sandbags can take 10 people up to 7 hours to fill and build.

The unique design, strength and versatility of the unit means that corners can be constructed easily, shaping the protective storm barrier to its surrounding landscape.



Specification : Geotextile-lined weldmesh units are made with Zinc+Al Coated wires of 4 mm diameter confirming to BS EN 10244-2:2009 and the geotextile is a heavy-duty, non-woven, permeable, polypropylene fabric with high strength springs & stiffeners at all corners.



MAJOR PROJECTS :



Rockfall Netting on NH-717A, West Bengal



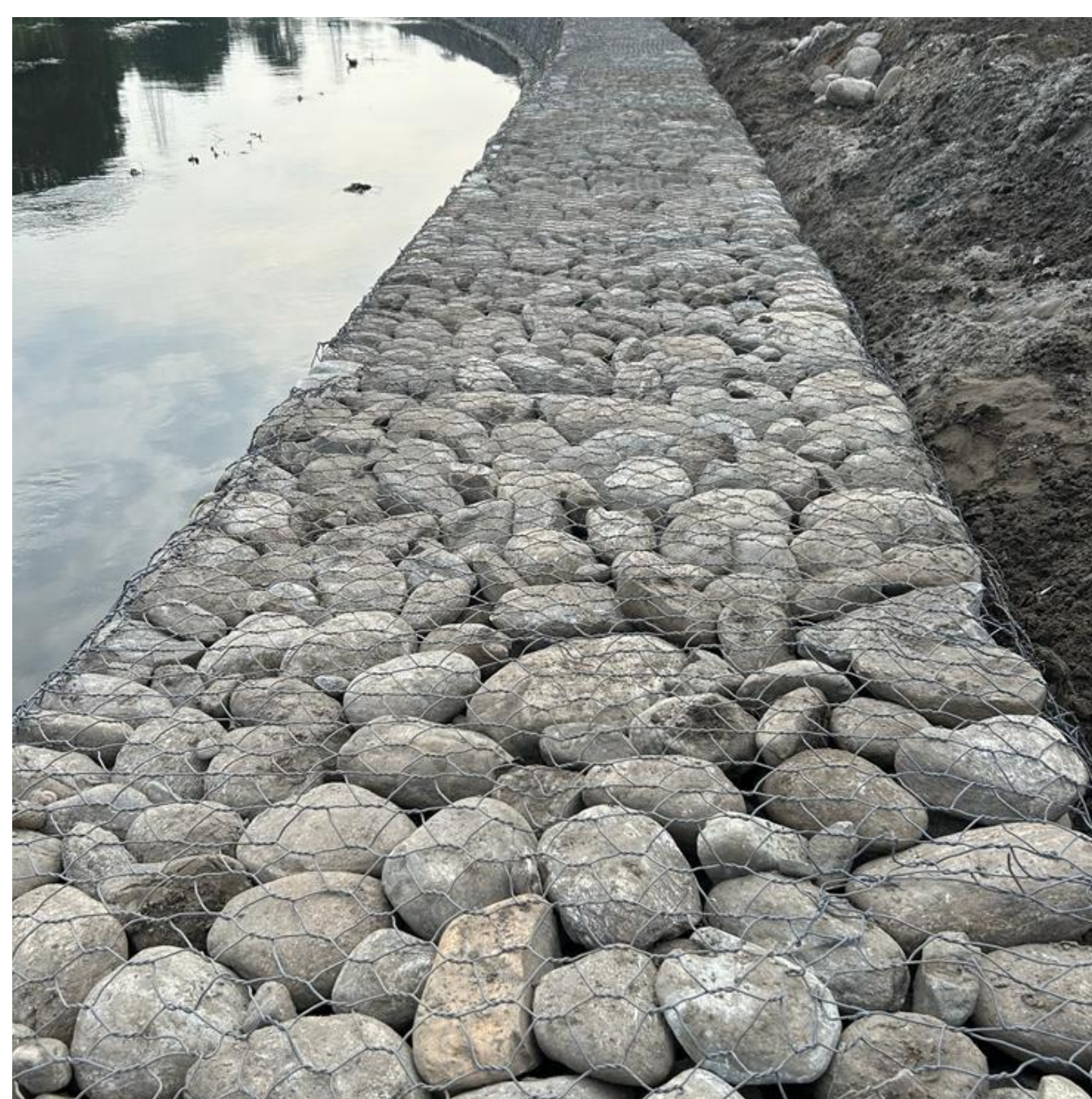
Retaining wall using PVC Gabions for Pharma Unit, Sikkim



Gabion Protection wall at Road Project, Bhutan



Gabion Wall for NHIDCL Road Project in Sikkim



River Protection work at Jorapani Industrial Park, Fulbari

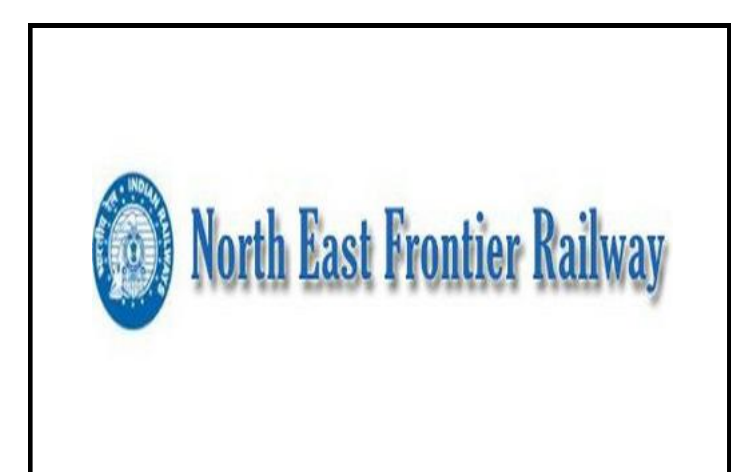
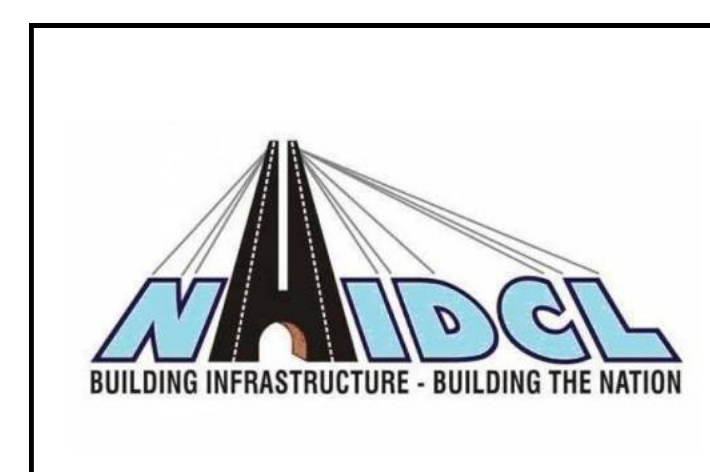
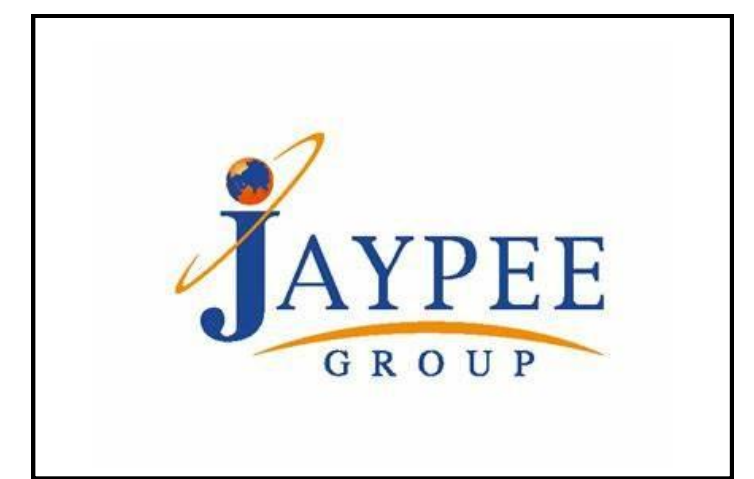
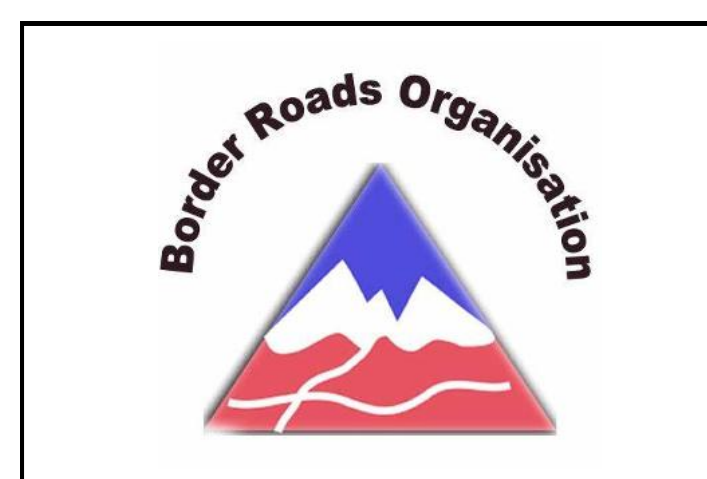
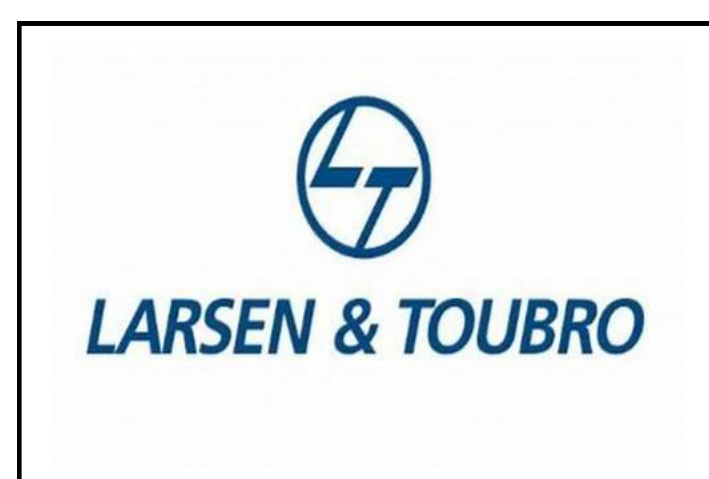


River bank protection using Tirupati Fence® Gabions, Gandak River, Uttar Pradesh

OUR CERTIFICATIONS



OUR VALUABLE CLIENTS



DISCLAIMER

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