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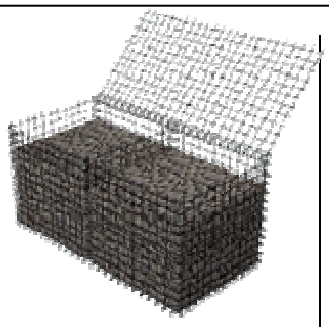
WELDED WIRE GABIONS / CRATES

The Sturdier alternative with the Welded Advantage



The most pressing challenge the rapidly developing world faces in the 21st century is the enormous effects of ***global warming***. The management of glacier melting with consequent river flooding calls for rising to the challenge with innovative deployment of river erosion control measures. **Welded Wire Gabions / Crates** present a more modern, sturdier and elegant alternative to the traditional twisted wire Gabions / Crates used in River Erosion control , Slope Retaining Structures, Embankment and Defence Bunker applications.

Welded Wire Gabions / Crates comprise of Welded wire mesh panels accurately cut to the size of the walls, lids and diaphragms with heavy section Wire Spirals used for interconnecting the edges. The Meshes and spirals are either Post Galvanized (after welding) or Pre Galvanized (using Pre-Galvanised Wire during Welding) depending on the design service exposure conditions. For River Erosion Control applications, Post Hot Dipped Galvanized Meshes with Zinc Coatings of more than 450 gsm are recommended. For severe Salt water exposure conditions a further Fusion bonded PVC / Epoxy Powder Coating may be added over the galvanized wires.

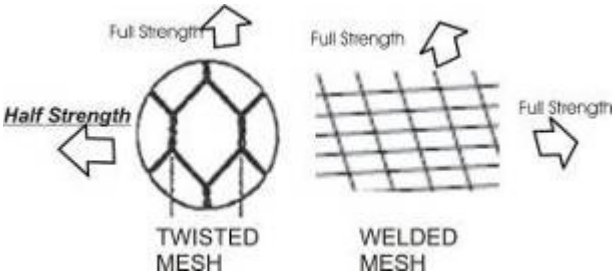
Welded Wire Mesh is a prefabricated reinforcement consisting of a series of parallel longitudinal wires with accurate spacing welded to cross wires at the required spacing. The welding of the wires is achieved by electric resistance welding with solid-state electronic control and all the spacings are controlled by an automatic mechanism of high reliability. There is no foreign metal added at the joint. The intersecting wires are actually fused into a homogeneous section thereby ensuring permanency of spacing and alignment in either direction. In India, Weded Wire Mesh manufacture conforms to **IS:4948/2002**.

Welded Wire Gabions are widely used all over the world. The Technical parameters are exhaustively covered by **ASTM-A974** (Standard Specification for Welded Wire Fabric Gabions and Gabion Mattresses). In most American state contracts for erosion control and slope retaining works, Welded Wire Gabions are adopted as an increasingly popular alternative to Twisted wire Gabions.

It is a misconception that vis-à-vis Twisted Wire Gabions , the relative rigid Welded Wire Construction is a drawback in Gabion applications. Actually the sturdier construction and accurately sized walls of Welded Wire Gabions are a major source of strength and many advantages such as:

1) **SYMMETRICALLY SUPERIOR TENSILE STRENGTH** : The Welded joints ensure a symmetrical mesh strength in wires in both directions. Unlike this the articulated nature of knots in twisted wire gabions results in weakness in a direction perpendicular to the twist of knots. A comparative study of the two relevant ASTM Specifications shows the following:

For Twisted Wire Gabions (**ASTM A975)** with Mesh of **83x114mm and 3.05mm** dia wire, the specified Mesh Strength is **51.1 kN/m in a direction parallel** to twist and only (half) **26.3 kN/m in a direction perpendicular to twist.**



On the other hand as per **ASTM A974** for Welded Wire Gabions with Mesh of 75x75mm pitch and 3.05mm dia wire of min. strength (as per ASTM A82) of 515 N/mm2 , the Mesh Strength shall be **50.2 kN/m** in **both directions**.

2) **SUPERIOR DIMENSIONAL ACCURACY**: Gabion baskets and mattresses assembled from welded wire mesh can have a dimensional accuracy of less than **0.5 percent** versus tolerances of **+/- 5.0 percent** for twisted mesh. This in turn results in structures of better aesthetics and as planned dimensions.

3) **VASTLY SUPERIOIR PROTECTION DUE TO POST - COATING POSSIBILITY:** In Twisted Wire Gabions due to the manufacturing process and the freedom required later ,all the coating / protection measures to the metal wire have to be compulsorily done before the manufacture. The Galvanised Wire Used is at best of **270 gsm zinc coating**. Unlike this the Welded Wire Meshes can be easily post Coated by Hot Dip Galvanizing with **Zinc coating exceeding 450 gsm**. Post Coating takes care of all cut ends or manufacturing abrasion marks. The corresponding life against corrosion effects is therefore 2 to three times with Post Hot Dip Galvanised Welded Wire Gabions.

The same advantage extends even with PVC coated Gabions. In twisted wire Gabions, the PVC Coating is a sleeve applied before the mesh / twist forming.This coating is stretched during manufacturing and may rupture in the twisting process. Wires at twisted joints rub against each other when the mesh moves; this friction at the twisted joint causes abrasion damage and accelerates deterioration of the coating.

As against this, in Welded Wire gabions, The PVC Coating is by Post Fusion Bonded powder coating. The Powder coating on mesh after welding is like a super skin. This prevents corrosive liquids from attacking the galvanized core wire - even in salt water. The UV Stability of Powder Coating is much superior to a PVC sleeve. Again strands of welded mesh cannot move at the joint so there is no question of internal wire abrasion to damage the coating.

Depending upon End usage Exposure conditions, **ASTM A974** provides for 5 different Gabion styles based on Coating types, namely :

Style 1, consists of welded wire fabric made from wire which is zinc-coated before being welded into fabric.

Style 2, consists of welded wire fabric which is made from uncoated wire and the fabric is subsequently zinc-coated after fabrication.

Style 3, consists of welded wire fabric made from wire which is coated with zinc-5 % aluminum-mischmetal alloy (Zn-5Al-MM) before being welded into fabric.

Style 4, consists of welded wire fabric made from wire which is aluminum-coated before being welded into fabric.

Style 5, consists of welded wire fabric, spiral binders, lacing wire, and stiffeners as Styles 1, 2, 3, or 4, and overcoated with PVC.

4) **4) EASIER HANDLING , ERECTION, INSTALLATION DUE TO REGULAR PRE-ASSEMBLED FEASIBILITY :**

A fully collapsed Pre-assembled 1m x 1m Welded Wire Gabion – needs 50 mm height of packing

The Pre-assembled Gabion opened out At first fold.

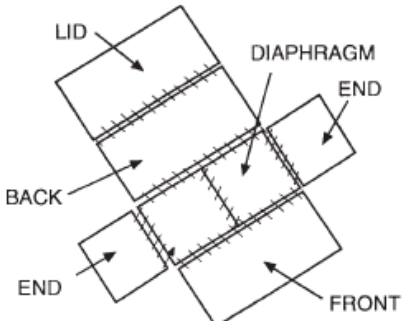
The Pre-assembled Welded Wire Gabion opened out with bottom and lid just before closing.

The Welded Wire Gabion ready for Stone filling.

Site Assembly completed in hardly 10 minutes for installation 6 Closing spirals of Bottom and Lid.

As seen in the images above, the combination of accurate sized meshes and sturdy wire spirals makes the scope of supplying pre-assembled gabions much more elegant than is ever possible with twisted / woven wire gabions.

The Twisted / Woven Wire crates require stretching to remove creases, kinks and to achieve full dimensional size. Twisted gabions are not self-supporting and are prone to significant slumping during the filling process.

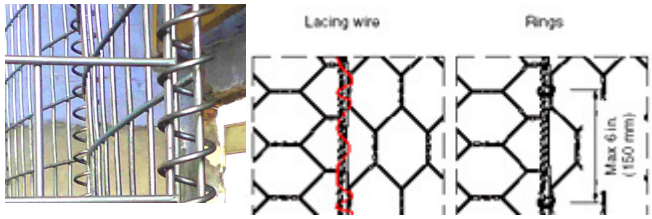


Scheme of Pre-assembled 2m x1m Welded Wire Gabion

Welded mesh gabions meet dimensional specifications and proper shape without stretching or straightening. They are self supporting for easy assembly, placement and filling. Welded mesh gabions are quickly assembled and joined with with quick-connecting, pre-formed spiral binders.

5) EFFICIENCY OF MATERIAL USAGE: For the same strength and performance, Welded Wire Gabions consume at least 15 to 25% less Steel per unit area of mesh or per unit volume of gabion fill compared to Twisted / Woven Wire Gabions with Double or Triple Twisted Knot Joints. This is simply because of the extra steel wire consumed in forming the double or triple twisted joint in each mesh.

6) BETTER JOINT STRENGTH / PULL-APART RESISTANCE : Studies in USA have conclusively established that **Preformed Spiral binders** which are the standard connection means in Welded Wire Gabions offer the greatest joint strength of 27 kN/m well above the ASTM A974 / A975 requirements of 20 kN/m .



Wire Spirals with Welded Wire Gabions

The ease of installation and strength of Spiral Binders is much better than the Spenax and Tiger Tite hog rings and lacing wire which are used with Woven / Twisted Wire Gabions. Spiral binders are preformed in manufacturing which allows the use of heavier gauge wire than is used for lacing wire. Spiral binders allow stress from opposing panels to be distributed evenly along the joint. Use of Spiral Binders with Twisted / Woven mesh is difficult due to the varying opening at the edge.

7) THE FLEXIBILITY DEBATE: The argument that Welded Wire Gabions are not flexible enough as Twisted / Woven Wire gabions is most ill-conceived without sound engineering logic. **Flexibility is a function of the gabion unit taken as a whole, rather than a function of the mesh alone.** Full scale tests conducted by two independent agencies, in USA concluded that both **welded and twisted gabions, when fully assembled and properly filled, offer similar or equal deflection and flexibility.**

In gabion applications, the design does not consider single meshes . Niether does the design consider single gabion units. The usage comprises of massive gravity structures with many layers and rows gabion units linked to each other. The filled Welded Wire Gabion with its sturdy cubical shape fits neatly into these structures and takes its design loads in combination with other units just as a rigid precast block performs its designed role in a masonry wall.

The argument of flexibility of twisted joints in the event of Sub-soil erosion or differential settlement assumes the failure conditions of the entire structure and and the small window of further loading and time which these twisted joints can supposedly take up. The assumption that Welded Wire Gabions cannot take up such conditions is yet to be conclusively established and the decisive relevance of such failure scenarios is debatable.