

**CASTORO MATTRESSES**

**Castoro Mattress**

Castoro mattresses are manufactured from hexagonal woven steel wire mesh Type 60, commonly referred to as double twist wire mesh as per SANS 1580:2005 (Figure 1 and Table 1). The Castoro mattresses are filled with rock at the project site to form flexible, permeable, monolithic structures for river bank and scour protection, channel linings for erosion control and underwater pipeline protection.

The steel wire used during the manufacture of the mattress is heavily zinc coated, Class A as per SANS 675:2009 and EN 10244-2:2001. If required, a PVC coating is extruded over the galvanised wire to provide added protection for use in aggressive environments such as, acidic soils and water, salt water and in water carrying a high abrasive sediment load. The PVC coating has a nominal thickness of 0,5 mm. The properties and tolerances of steel wire and mesh are shown in Tables 1 and 2.

The base, diaphragms, front, end and sides of the Castoro are manufactured from one continuous panel of mesh. The base is folded onto itself at 1,0m intervals to form double diaphragms that are automatically secured with spirals, prior to folding up the sides and securing to the diaphragms. To reinforce the unit, all mesh panel edges are selvedged with a wire having a greater diameter than the mesh wire. Dimensions and sizes of Castoro mattresses are shown in Table 3. When specifying Castoro mattresses in the tender documents or bill of quantities, please refer to Table 4.

**Filling and Lacing**

Castoro mattresses should be filled with rock ranging between 80 mm and 120 mm. The range in sizes may allow for a variation of 5% oversize and / or 5% undersize rock, provided it is not placed at the exposed surface. Rocks shall be hard, angular to round, durable and of such quality that they shall not disintegrate on exposure to water or weathering during the life of the structure. Care should be taken when placing the stone to ensure that the PVC coating of the Castoro mattress is not damaged. All visible faces should be carefully hand-packed for appearance purposes. For further information on the installation of mattresses, please refer to the [Installation Guidelines](#) for Castoro mattresses.

In place of lacing wire, lacing operations can be made by using a Spenax tool (Figure 4) available from our offices together with stainless steel rings (Figure 3A) having the following specifications:

- diameter: 3mm
- tensile strength: 156-178 kg/mm<sup>2</sup>

Spacing of the rings or loops when lacing must not exceed that shown in Figure 3B.

**Wire**

All tests on wire are performed prior to manufacturing the mesh.

1. **Tensile strength:** The wire used for the manufacture of the gabions has a tensile strength between 350-575 N/mm<sup>2</sup> according to SANS 675:2009.
2. **Elongation:** Elongation is not less than 10% in accordance with EN 10223-3. Tests are carried out on a sample at least 25 cm long.
3. **Adhesion of zinc:** To assess the adherence of the zinc coating on the underlying steel, the test wire must be coiled six times around a mandrel of the same diameter, the coating shall not crack or split to such an extent that slivers of coating can be removed by simply rubbing with the bare fingers, in accordance with EN 10218-1 and EN 10244-2: 2001.
4. **Ductility:** The ductility of the zinc-coated wire is such that when the wire is wrapped at least eight times around a wire having the same diameter of the test specimen at a rate not exceeding 15 turns per minute and then unwrapped at the same rate, it does not show any sign of fracture of the underlying steel wire in accordance with SANS 7802:2003.

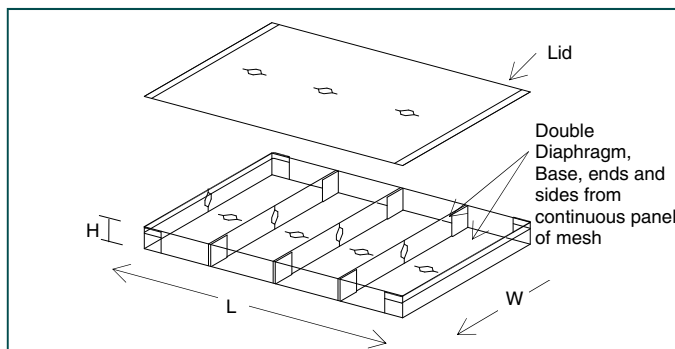
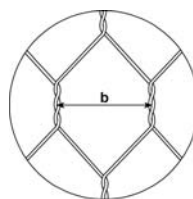


Figure 1

| STANDARD MESH-WIRE |    |                |                |
|--------------------|----|----------------|----------------|
| Mesh Type 60       | b  | Tolerance (mm) | OD Wire Ø (mm) |
| Galvanised         | 60 | -4 +10         | 2,2            |
| Galvanised + PVC   | 60 | -4 +10         | 2,2 / 3,2      |



**MESH TOLERANCE**

The tolerance on the opening of mesh "b" being the distance between the axis of two consecutive twists according to SANS 1580:2005.

Table 1

| PROPERTIES OF WIRE               |                   |                       |                  |                                    |
|----------------------------------|-------------------|-----------------------|------------------|------------------------------------|
| Use                              | Units             | Lacing                | Mesh             | Selvedge                           |
| Wire Galvanised Galvanised + PVC | Ø mm              | 2,2<br>2,2 / 3,2      | 2,2<br>2,2 / 3,2 | 2,7<br>2,7 / 3,7<br>SANS 1580:2005 |
| Wire Tolerance                   | Ø mm              | ±0,08                 | ±0,08            | ±0,08<br>SANS 675:2009             |
| Quantity of zinc                 | g/m <sup>2</sup>  | 240                   | 240              | 275<br>SANS 1580:2005              |
| Tensile strength                 | N/mm <sup>2</sup> | 350-575 SANS 675:2009 |                  |                                    |

Table 2



Figure 2

**PVC Coating Characteristics**

The properties of the PVC material adheres to the following:

- Colour:** Grey RAL 7037 according to ASTM D1482-57T;
- Specific gravity:** 1,30-1,38 kg/dm<sup>3</sup> in accordance with ASTM D792 Table 1;
- Hardness:** between 55 and 65 Shore D, according to ASTM D2240;
- Tensile strength:** not less than 20,6MPa, according to ASTM D412-92;
- Modulus of elasticity:** not less than 18,6 MPa, in accordance with ASTM D412-92;
- Abrasion resistance:** the percentage of the weight loss is less than 12%, according to ASTM D1242-92;
- Creeping corrosion:** max. penetration of corrosion of the wire from a square cut end is 25 mm when the specimen has been immersed for 2,000 hrs in a 5% solution HCl (hydrochloric acid 12 Be).

The accelerated aging tests are:

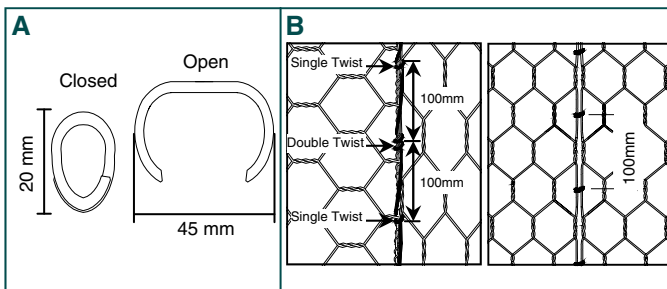
- Salt spray test:** test period 3,000 hours, test method ASTM B117-94;
- Exposure to UV rays:** test period 3,000 hours at 63°C, test method ASTM D1499-92a and ASTM G23-93 apparatus Type E;
- Brittleness temperature:** no higher than -9°C, or lower temperature when specified by the purchaser, when tested in accordance with ASTM D746.

The properties after aging tests are as follows:

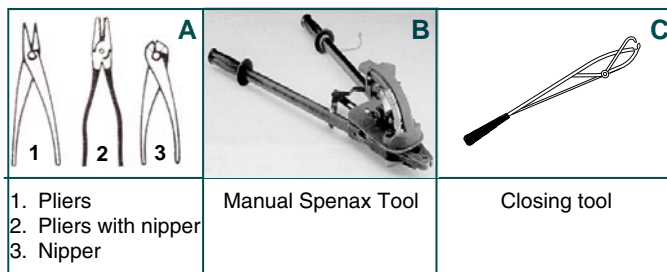
- Appearance of coated mesh:** no cracking, stripping or air bubbles, and no appreciable variation in color;
- Specific Gravity:** variations do not exceed 6%;
- Hardness:** variations do not exceed 10%;
- Tensile strength:** variations do not exceed 25%;
- Modulus of elasticity:** variations do not exceed 25%;
- Abrasion resistance:** variations do not exceed 10%;
- Brittleness temperature:** do not exceed +18°C.

| STANDARD CASTORO MATTRESS SIZES               |           |                    |
|---|-----------|--------------------|
| Length (m)                                    | Width (m) | Height (m)         |
| 6,0   | 2.0 / 3.0 | 0,17 / 0,23 / 0,30 |
| Tolerances : Height, Width: ±5%; Length: ±10% |           |                    |
| All sizes and dimensions are nominal.         |           |                    |

**Table 3**



**Figure 3**



**Figure 4**

| BILL OF QUANTITIES |   |                |          |      |            |
|--------------------|---|----------------|----------|------|------------|
| Item No.           | Description   | Unit           | Quantity | Rate | Amount (R) |
|                    | GABIONS - SANS 1200DK:1995 (Double twist hexagonal wire mesh to SANS 1580:2005).  |                |          |      |            |
| 1                  | CASTORO MATTRESSES with mattress base, sides, ends and double diaphragm made from continuous panel of mesh (Including material and delivery). |                |          |      |            |
| 1.1                | Mesh Type 60 with 2,2mm Class A Galvanised wire.<br>Length x Width x Height   | m <sup>3</sup> |          |      |            |
| 1.2                | Mesh Type 60 with 2,2 / 3,2mm Class A Galvanised and PVC coated wire.<br>Length x Width x Height  | m <sup>3</sup> |          |      |            |
| 2                  | Surface preparation for bedding of Castoro mattress   | m <sup>2</sup> |          |      |            |
| 3                  | Installation of Castoro mattress (Including unfolding, placing, filling and lacing).  | m <sup>3</sup> |          |      |            |
| 4                  | Rockfill  | m <sup>3</sup> |          |      |            |
| 5                  | AG GEOTEXTILE (Including material, delivery, unrolling, cutting and placing).<br>Continuous Polyester Filament Double Needle-Punched.         |                |          |      |            |
| 5.1                | AG150 - Minimum Energy Absorption of 4,0 kN/m   | m <sup>2</sup> |          |      |            |
| 5.2                | AG200 - Minimum Energy Absorption of 6,5 kN/m   | m <sup>2</sup> |          |      |            |
| 5.3                | AG300 - Minimum Energy Absorption of 10 kN/m  | m <sup>2</sup> |          |      |            |
| 5.4                | AG400 - Minimum Energy Absorption of 12 kN/m  | m <sup>2</sup> |          |      |            |

**Table 4**

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