Concrete Canvas

1.0 Description of Item:

Concrete canvas (CC), is a flexible, concrete impregnated fabric that hardens when hydrated to form a thin, durable, water proof and fire resistant concrete layer. Concrete canvas concrete does not require plant or mixing equipment as it is positioned on surface and added with water.

Concrete canvas consists of a 3-dimensional fibre matrix containing a specially formulated dry concrete mix. A PVC backing on one surface of the Canvas ensures the material is completely water proof. The material can be hydrated either by spraying or by being fully immersed in water. Once set, the fibres reinforce the concrete, preventing crack propagation and providing safe plastic failure mode.

2.0 Applications:

Concrete canvas is typically used to replace conventional concrete (in-situ, precast or sprayed) for erosion control, remediation and construction applications. Some examples are given below:
(i) **Ditch Lining:** Concrete canvas can be used to provide a hard wearing surface for lining of ditches for drainage and irrigation. Concrete canvas is typically used as an alternative to conventional drainages where vegetated or earth lined ditches are unsuitable due to high flow rates.

(ii) **Slope Protection:** Concrete canvas can be used to provide a hard, wearing and erosion control surface to protect slopes from environmental degradation. Concrete canvas can replace shotcrete and where vegetated slopes are unsuitable due to the high flow rates, arid climate or poor soil conditions.

(iii) **Outfalls / Spillways:** Concrete canvas can be used to protect surfaces located in high flow areas which are prone to erosion such as underneath culvert outlets, spillway surfaces and over-toppings. Concrete canvas can replace conventional concrete and is applied in the same manner as Concrete canvas in slope protection. Thickness selection is made based on the maximum expected flow rate.
(iv) **Concrete Remediation:** Concrete canvas can be used to reline concrete infrastructure which has become cracked and damaged and requires remediation. Concrete canvas is useful as an alternative to rebuilding as life of existing structures can be extended by reduced leakage or as lining where flexible membrane is unsuitable due to the flow conditions.

(v) **Weed Suppression:** Concrete canvas can be used to provide long-term weed growth prevention in areas where maintenance is difficult such as around sensitive infrastructure or in remote locations. Concrete canvas is used as a replacement for precast concrete slabs and conventional geotextiles.

(vi) **Culvert Lining:** Concrete canvas can be used to reline earthen, brick and concrete culverts which have degraded due to scour and corrosion. Concrete canvas is used to extend the life of culverts and provide a hard wearing erosion control layer with improved impermeability and flow characteristics. Concrete canvas can be used as an alternative to relining with bitumen, GRP or polyurethane.
(vii) **Bund Lining:** Concrete canvas is used as capping of containment bunds around land, roads, tanks etc. Concrete canvas protects the bund from environmental degradation, animal damage and improved impermeability.

3.0 **Physical Properties of Concrete Canvas:** Concrete Canvas of various thicknesses is available as under:

<table>
<thead>
<tr>
<th>Product Thickness (mm)</th>
<th>Batch Roll Size (sqm)</th>
<th>Bulk Roll Size (sqm)</th>
<th>Roll Width (m)</th>
<th>Mass (unset) (kg/m²)</th>
<th>Density (unset) (kg/m³)</th>
<th>Density (set) (kg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>10</td>
<td>200</td>
<td>1.0</td>
<td>7</td>
<td>1500</td>
<td>+30-35%</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>125</td>
<td>1.1</td>
<td>12</td>
<td>1500</td>
<td>+30-35%</td>
</tr>
<tr>
<td>13</td>
<td>N/A</td>
<td>80</td>
<td>1.1</td>
<td>19</td>
<td>1500</td>
<td>+30-35%</td>
</tr>
</tbody>
</table>

4.0 **Merits of Concrete Canvas:**

i. **Water Proof:** The PVC backing on one surface of the Canvas ensures the material has excellent impermeability.

ii. **Strong:** The fibre reinforcement prevents cracking, absorbs energy from impacts and provides a stable failure mode.

iii. **Durable:** Concrete canvas is chemical resistant, has good weathering performance and will not degradable in UV.

iv. **Flexible:** Concrete canvas has good drape (wrap) characteristics and will closely follow the profile of any ditch or embankment. The material can negotiate tight bends and fit around existing infrastructure. Unset Concrete canvas can be cut or tailored using basic hand tools.

v. **Eco-Friendly:** Concrete canvas is low mass, low carbon technology which uses up to 95% less material than conventional concrete for many applications.

vi. **Fire:** Concrete canvas has good performance against high temperature and can be used as a fire protection layer.

vii. **Chemical:** Concrete canvas has resistance to chemical attack and is generally much more resistant to aggressive compounds than conventional OPC based concretes.
5.0 Selection of Concrete Canvas:

(i) Ditch Lining: 8 mm thick Concrete canvas is generally recommended, unless either of the following conditions prevail:
   - 5 mm thick Concrete canvas may be used for relining existing concrete channels, hard substrates such as rock, or for temporary works.
   - 13 mm thick Concrete canvas may be used where flow speeds are in excess of 8.6 m/s, the ground is trafficked or is particularly unstable or steep.

(ii) Slope Protection: 5 mm thick Concrete canvas is recommended, unless ground is unstable or high flow conditions exist. In such cases, 8 mm thick Concrete canvas may be used.

(iii) Outfalls/Spillways: 8 mm thick Concrete canvas is recommended in general. However in case of outfalls with a high level of debris or with high flow conditions, 13 mm thick Concrete canvas may be used.

(iv) Concrete Remediation: 5 mm thick Concrete canvas is recommended in general conditions. However 8 mm thick Concrete canvas may be used where voids are large or end use involves high flow rates.

(v) Weed Suppression: 5 mm thick Concrete canvas can be used.

(vi) Culvert Lining: 8 mm thick Concrete canvas is recommended for normal conditions. 13 mm thick may be used for high flow conditions or with high levels of debris. 5 mm thick may be used for low flow conditions and low levels of debris.

(vii) Bund Lining: 5 mm thick Concrete canvas is recommended. 8mm or 13mm thick Concrete canvas may be used for heavy traffic areas.

6.0 Method of application:

6.1 Hydration:

Spray the fibre surface with adequate water until it feels wet to touch for several minutes after spraying. Re-spray the Concrete Canvas again after 1 hour if installing on a steep or vertical surface and in warm climates.

6.2 Setting: Once hydrated, CC remains workable for approximately 1-2 hours in cold climate. In warm climates, working time may be reduced. CC will harden to 80% of its 28 day strength in 24 hours and is ready for use.

Working Time
1-2 hours subject to ambient temperature.
Concrete canvas (CC) will achieve 80% strength at 24 hours after hydration.
6.3 Jointing and Fixing: Methods for jointing and fixing of Concrete canvas are illustrated below

A. Cutting Concrete Canvas:

- **Cutting Unset Concrete Canvas:** A ‘snap off’ type disposable blade can be used for cutting Concrete Canvas before it is hydrated or set. When cutting unset concrete canvas a 15-20mm allowance should be left from the cut edge due to potential loss of fill. Concrete canvas can also be cut using a powered disc-cutter, fabric cutter or hand saw.

  ![Concrete Canvas Cutting](image)

- **Cutting Set Concrete Canvas:** Set Concrete canvas can be cut using the same tools used for cutting conventional concrete, such as disc cutters, angle grinders or good quality tile cutters.

  ![Concrete Canvas Cutting](image)

B. Fixing Method: Concrete canvas should be securely fixed at the crest of the slope, with additional fixings used down the face for profiling or additional support as required.

  **Fixing to Soil:** Concrete canvas can be fixed to a soil substrate using pegs, an anchor trench, soil nails or ground anchors. The most common method of securing Concrete canvas at the crest is using a combination of pegs and an anchor trench. Peg length and spacing should be determined based on the pull-out force requirement (e.g. self weight, water flow etc.). It is particularly important to prevent water ingress between the Concrete canvas and the substrate at the crest as this can lead to undermining. An effective means of sealing this top edge is by burying the exposed Concrete canvas in an anchor trench as this method provides a neat aesthetic transition to the surrounding landscape.
Concrete canvas can be fixed down along the shoulder of the ditch using pegs of 250mm to 380mm length or an anchor trench or preferably both. Peg spacing will differ depending on loading and flow conditions. However, for a longitudinal layup pegs are typically spaced every 2m along the shoulders, while for a transverse layup, pegs are normally applied at every joint i.e. 1m spacing.

In addition to pegging, the edge of Concrete canvas can be buried along the shoulder to prevent undermining from surface water and this is particularly important for interceptor drains which collect water run-off along their edge. A properly designed anchor trench can be used as a substitute to pegging but would normally only be used on low flow-rate applications or where pegs are unsuitable due to the location of sensitive underground infrastructure such as power cables.
**Pegs:** Galvanised steel pegs are in lengths of 250mm and 380mm. Pegs may be must have a sufficiently sharp point to penetrate the Concrete Canvas and a head design that will capture the surface of Concrete Canvas. Peg length and spacing should be selected based on soil conditions and application. Pegs should be applied at joints where possible to secure adjacent layers together.

**Anchor Trench:** Burying Concrete Canvas is an effective means of securing the edge of the material when used in surfacing applications such as along the shoulder of a ditch or crest of a slope. An anchor trench may be used in addition to, or instead of, pegging, and will also help to prevent undermining from surface water and provide a neat aesthetic transition to the surrounding landscape.

**Soils Nails/Ground Anchors:** For high load applications or where ground conditions are poor, such as slope protection, slope stabilization or for high flow applications.
**Fixing to Rock:** Concrete Canvas can be secured onto rocky substrates using rock bolts. The number and type of fixings should be selected based on the pull-out force requirement. A suitable head design should be selected to prevent stress concentrations. A minimum head diameter of 15mm is normally recommended and plates up to 150mm are often used. Large anchor plates should be circular where possible or have radiused corners to avoid stress concentrations.

**Rock Bolts:** For use on hard or rocky substrates, the number and type of rock bolt should be selected based on the pull-out force requirement. A suitable head design should be selected to prevent stress concentrations. A minimum head diameter of 15mm is normally recommended and plates up to 150mm have been used.

![Fixing to Rock](image1)

![Fixing to Rock](image2)

**Fixing to Concrete:** CC can be fixed to a concrete substrate using conventional masonry fixings such as self tapping masonry bolts and wedge anchors. A minimum washer/head diameter of 15mm is recommended.

![Fixing to Concrete](image3)

**CC fixed at crest of slope with concrete anchor bolts**
Masonry fixings (bolts/ nails): A range of conventional masonry fixings, such as self tapping masonry bolts, wedge anchors can be used to fix Concrete Canvas to other concrete surfaces. A minimum washer/head diameter of 15mm for most fixings of this type to prevent pull-through.

Jointing method: Concrete Canvas can be jointed along the overlap by screws, sealants, or grout. The vast majority of ditches use a screwed joint which provides a good mechanical bond and sufficient impermeability for most drainage applications. A suitable jointing method should be selected based on the loading and water impermeability requirements of the project. The standard method of jointing for slope protection is to use a screwed joint which provides a good mechanical bond and sufficient impermeability for most slope protection applications. Use of stainless steel screws inserted at 200mm intervals along the overlap is normally recommended. The screws should be positioned between 30-50mm from the edge of the joint and applied prior to hydration or immediately afterward. The concrete within Concrete Canvas will then set around the thread of the screws. If a higher level of impermeability is required (for example on an outfall) then a bead of sealant can be applied in the overlap prior to screwing.

Sealant: A sealant can be applied between Concrete Canvas layers prior to screwing to improve joint impermeability. Sealants are typically applied using a caulkling gun. A bead diameter of 6-9mm is recommended with the screws inserted through the sealant bead where possible to minimize leakage. Suitable sealants from manufacturers such as Sika etc. are recommended.
7.0 Do’s & Don’ts:

- Concrete Canvas cannot be over hydrated and therefore an excess of water is always recommended. Minimum ratio of water: Concrete Canvas is 1:2 by weight.
- Do not jet high pressure water directly onto the matting as this may wash a channel in the material.
- Concrete Canvas has a working time of 1-2 hours after hydration. Do not move the material once it has begun to set.
- Concrete Canvas will set hard in 24 hours but will continue to gain strength for years.
- If Concrete Canvas is not fully saturated, the set may be delayed and strength reduced. If the set is delayed, re-wet with a large excess of water.

8.0 Cost: Cost per square meter including supply, providing and fixing for various grades of concrete canvas as provided by M/s Sanbros Spares Pvt. Ltd., Nagpur is as under:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Product</th>
<th>Prices in Rs.(per sqm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-</td>
<td>Concrete Canvas 5 mm, Batch roll size -10 sqm, Bulk roll size-200 sqm. Roll width- 1meter</td>
<td>3,400/-</td>
</tr>
<tr>
<td>2-</td>
<td>Concrete Canvas 8 mm, Batch roll size -05 sqm, Bulk roll size-125 sqm. Roll width- 1.1 meter</td>
<td>4,890/-</td>
</tr>
<tr>
<td>3-</td>
<td>Concrete Canvas 13 mm, Batch roll size –N/A, Bulk roll size-80 sqm. Roll width- 1.1 meter</td>
<td>6,990/-</td>
</tr>
</tbody>
</table>

Supplier:

1- SANBROS SPARES PVT. LTD.
202, 2ND FLOOR, HANSRAJ RESI - 1
PHASE, HABITATS, 27
GREAT NAG ROAD
NAGPUR 440009, MAHARASHTRA, INDIA
Tele-Fax: +91-0712-2741634
E-mail- sspl@sanbrosspares.com

2- STUTI EXPORTS PVT. LTD.
VIRAJ ROONGTA (DIRECTOR)
C-3, SHIV KRISHNADHAM SOCIETY, LBS MARG, MULUND WEST
MUMBAI - 400080, MAHARASHTRA, INDIA
Cell: 09654309792