SPECIFICATION FOR GABIONS, STONE PITCHING AND RIP-RAP

1.0 GENERAL

1.1 Scope

This section covers the requirements for:

(i) wire mesh gabions filled with stone and for the filter cloth on which they may be laid;

(ii) stone and precast concrete block pitching for surface protection;

(iii) rip-rap for slope protection.

1.2 Reference Standards

The following standards are referred to in this section:

BS 443	Testing zinc coatings on steel wire and for quality requirements.
BS1052	Mild steel wire for general engineering purposes.
ASTM D1682	Test methods for breaking load and elongation of textile fabrics.

1.3 Preparation of Formations

The Contractor shall prepare the formation for pitching and gabions by trimming the excavation accurately to the specified dimensions. When over-excavation occurs it shall be backfilled with compacted gravel backing to the approval of the Engineer at the expense of the Contractor.

Where filter cloth is to be laid on the formation, all sharp projections caused by rocks, roots, etc. shall be removed and the voids so formed shall be filled with compacted sand. The surface of the formation shall be smooth and even.

1.4 Gravel Backing and Filter

Gravel backing and filter shall consist of approved clean, hard natural gravel or broken stone well graded from 50mm to 10mm and shall be laid to the thickness specified to give an even surface parallel to the face of the bank protection. Gravel backing shall be laid under gabions, pitching, rip-rap and other bank protection as specified.

2.0 GABIONS

2.1 Stone for Gabions

Stone used for gabions and gabion mattresses shall be clean, natural, hard and durable with a minimum density of 2 650 kg/m^3. Stone shall be well graded within the following limits:

	Minimum dimension	Maximum dimension
Box gabions	150mm	300mm
170mm mattress	75mm	120mm
230mm mattress	75mm	150mm
300mm mattress	75mm	200mm

2.2 Wire Fabric for Gabions

The fabric shall be triple-twisted hexagonal woven steel wire mesh complying with BS 1052. The wire shall be galvanised before weaving as specified in BS 443. Galvanised steel wire shall further be coated with poly-viny chloride (PVC). The PVC coating shall not deteriorate on exposure to ultra-violet light and shall be resistance to abrasion which shall be at least 50% greater than that of vulcanised rubber compound according to DIN 53516. The minimum thickness of the PVC coating shall be 0.55mm.

Wire thickness and mesh size shall be as follows:

	Minimum wire diameter	Minimum overall diameter (after PVC coating)	Maximum mesh size
Box gabions	2.7mm	3.8mm	80x100mm
Gabion mattress	2.0mm	3.3mm	60x80mm

The wire mesh shall have elasticity sufficient to permit elongation of the mesh equivalent to a minimum of 10% of the length of a section of mesh under test without reducing the tensile strength of the individual wires.

All edges of the gabions, diaphragms and end panels shall be selvedged with a wire of diameter not less than 20% greater than that of the mesh wire.

The selvedging must be such that the mesh shall not unravel and such that the strength of the connection between the selvedge wire and the mesh shall be equal to or greater that the breaking strength of the mesh.

Alternative gabion systems may be substituted for the above specified system subject to prior approval of the Engineer.

2.3 Method of Construction

Gabions and gabion mattresses shall have internal diaphragms of the same mesh as the enclosing fabric. Diaphragms shall be positioned such that no internal dimension in a box gabion exceeds 1.0m, and such as to give compartments 2.0m x 0.6m in a gabion mattress. Adjoining gabions and gabion mattresses shall be firmly wired together to give a continuous joint along all adjacent edges. Where gabions are placed on filter cloth care shall be taken to avoid puncturing the cloth during erection. Stone shall be tipped or placed in the gabions in such a manner as to avoid damage to the fabric or filter cloth. The wire cages shall be slightly overfilled to allow for subsequent settlement. The compartments shall be filled and the lids shall be stretched tight over the filling with bars and wired down securely through each mesh along the whole length of the edges.

Where shown on the Drawings or otherwise directed, the gabion mesh shall be cut, folded and wired together to form mitre joints, angles, curves or slopes which are not possible to obtain in the structures with the standard rectangular gabions. The mesh must be cleanly cut and the

surplus mesh cut completely out, or folded back and neatly wired to an adjacent gabion face. The cut edges of the mesh shall be securely laced together with binding wire.

Sizes of gabions shall be as shown on the Drawings or ordered by the Engineer.

2.4 Filter Cloth

The filter cloth shall be a "welded" non-woven material to the approval of the Engineer. The filter cloth shall be resistant to chemical and biological degradation from all naturally occurring minerals and bacteria. The filter cloth shall be permeable and capable of passing 40 l/m^2/s at 100mm head of water with a uniform pore size distribution from 0.02 to 0.15mm. The filter cloth material shall have a minimum tensile strength of 1.7 kN/200mm and a minimum grab tensile strength of 0.85 kN when tested in accordance with ASTM Standard D1682 with a 200mm sample width.

The filter cloth shall be laid on a prepared formation or in a prepared trench and shall be overlapped at joints by not less than 0.5m and shall be laid strictly in accordance with the recommendations of the manufacturer.

3.0 STONE AND PRECAST CONCRETE BLOCK PITCHING

3.1 Stone for Stone Pitching

Stone for pitching shall be granite or other clean, hard dense and durable rocks free from cracks, kaolinised patches, organic or other impurities.

The dimension of each stone measured perpendicular to the face of the pitching shall not be less than 225mm. The exposed face of each stone shall not be less than 0.02m^2 in area.

Stone shall be hand placed with closed joints on a layer of gravel or crushed stone to a minimum finished thickness of 225mm or otherwise as shown on the Drawings.

The sides of stones shall be roughly trimmed with a spalling hammer to obtain a reasonably close fit and the interstices filled with clean coarse aggregate or gravel well rammed and wedged with spalls. The finished pitching shall show an even surface to the lines and levels shown on the Drawings.

The joints in pitching should be raked out to a depth of at least 50mm and sealed with 1:2 cement/sand mortar finished neatly flushed with the surrounding stones. The stones shall be left clean of all mortar and stains.

Measurement of pitching shall be made by the square metre of surface pitched on otherwise stated in the Bill of Quantities. The rates for pitching shall apply whether the surface to be pitched is level or inclined.

3.2 Precast Concrete Block Pitching

Concrete blocks for pitching shall be precast to the sizes shown on the Drawings using concrete grade C30. A lifting eye shall be incorporated in each block during precasting to facilitate handling.

The blocks shall be placed on a prepared gravel backing as shown on the Drawings to a true and even surface with a gap of 10mm between blocks.

4.0 RIP-RAP

4.1 Stone for Rip-Rap

Rip-rap shall be hard, sound, broken granite or equivalent hard rock obtained from an approved source, and shall be free from cracks, kaolinised patches, organic or other impurities. Sand and dust shall not exceed 1% by weight. Rock fragments used for rip-rap shall be angular and the greatest dimension of any piece shall not exceed twice the least dimension. Stones shall be graded as specified on the Drawings. The specific gravity of the rock shall not be less than 2.60.

4.2 Placing Rip-Rap

Rip-rap shall be tipped or otherwise placed in such a manner as to achieve the full thickness of the material, all large voids being filled with smaller rock fragments. It shall be finished finally by hand to the designed slope and thickness using crowbars.

The tender rates for rip-rap shall include the cost of supplying, handling and placing and any necessary adjustment after dumping to achieve the necessary uniformity of distribution.

4.3 Rubble Apron

Stone for rubble aprons shall be as specified for dumped rip-rap.

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