

MAC.RO. SYSTEM - ROCKFALL PROTECTION EMBANKMENTS

Rockfall Protection Embankments

Rockfall protection embankments are reinforced soil structures used for the protection of roads, towns and other infrastructure situated at the foot of cliffs. Rockfall protection embankments are generally used in situations where revetments of the rock slopes are not possible, due to length or dimension of the rock slopes and/or the presence of vegetation.

The height and width of the embankment, as well as its deformation is defined in relation to the slope morphology, the characteristics of the area, and the kinematics of the falling rocks.

The reinforced soil structure is assembled with units made of double twist wire mesh that is metallic coated with a Galfan coating, (Zn - Al 5% - MM Mischmetal alloy), and a self extinguishing modified polyethylene (XPE) polymer coating over and above the Galfan.

Wire

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

- Tensile strength:** The wire used for the manufacture of Rockfall protection embankments shall have a tensile strength exceeding the range 350-550 kg/mm² as specified by EN 10223-3, in order to increase the tensile resistance of the finished products. Wire tolerances (Table 4) are in accordance with EN 10218 (Class T1).
- Elongation:** Elongation shall not be less than 10% in accordance with EN 10223-3. Tests shall be carried out on a sample at least 25 cm long.
- Galfan coating:** Minimum quantities of Galfan shown at Table 4 meet the requirements of EN 10244-2 (Table 2 and Class A).
- Adhesion of Galfan:** The adhesion of the Galfan coating to the wire shall be such that, when the wire is wrapped six turns around a mandrel having four times the diameter of the wire, it does not flake or crack when rubbing it with the bare fingers.

XPE coating

In addition to the Galfan coating, the steel wire is coated with a self extinguish modified polyethylene (XPE) sheet, according to EN-10245-3 with a nominal thickness of 0,50 mm. Properties of the XPE are shown in Table 1.

Technical characteristics of the polymer coating			
TENSILE STRENGTH			
- yield strength		MPa	18
- elongation at yield		%	40
	ASTM D638		
- strength at break		MPa	18
- elongation at break		%	480
- elongation at break		MPa	780
STRENGTH AT TEMPERATURE			
- Hot Set Test (H.S.T.)*	EIC 540	%	< 100 %
- Residual elongation	EIC 540	%	< 15 %
FIRE RESISTANCE			
	ASTM D479		
- flame application time	Sec.		30
- self extinguish time	Sec.		35
- dripping during flame exposure			No
- burned length	mm		30

Table 1

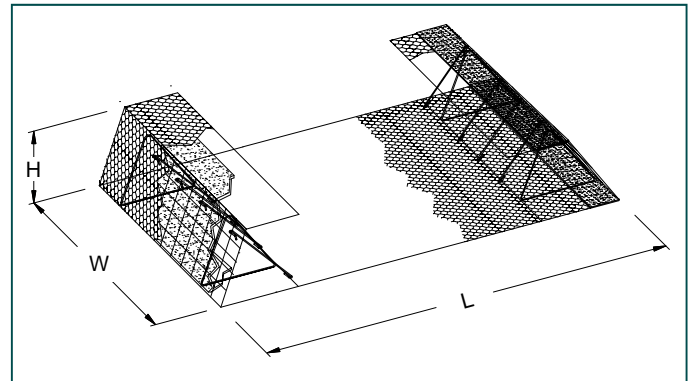


Figure 1 - Rockfall protection embankments scheme



Figure 2 -- Rockfall protection embankments application



Figure 3 - Rockfall protection embankments terminal

Table 2 - Standard mesh-wire

Type	D (mm)	Tolerance	Int. Wire Ø (mm)	Ext. Wire Ø (mm)
8x10	80	+16% / -4%	2,20	3,20

Table 4 - Table of wire tolerances and coating

Internal wire diameter	mm	2,20	2,70
Tolerance of wire	Ø (±) mm	0,06	0,06
Min. Quantity of Galfan	g/m ²	230	245

Table 3 - Standard wire diameters

Type	Mesh Wire Ø (mm)	Selvedge Wire (mm)
8x10	Int. 2,2 / Ext. 3,2	Int. 2,7 / Ext. 3,7

Table 5 - Table of embankments sizes

Length = L (m)	Width = W (m)	Height = H (m)
VARIABLE	3,00	0,75

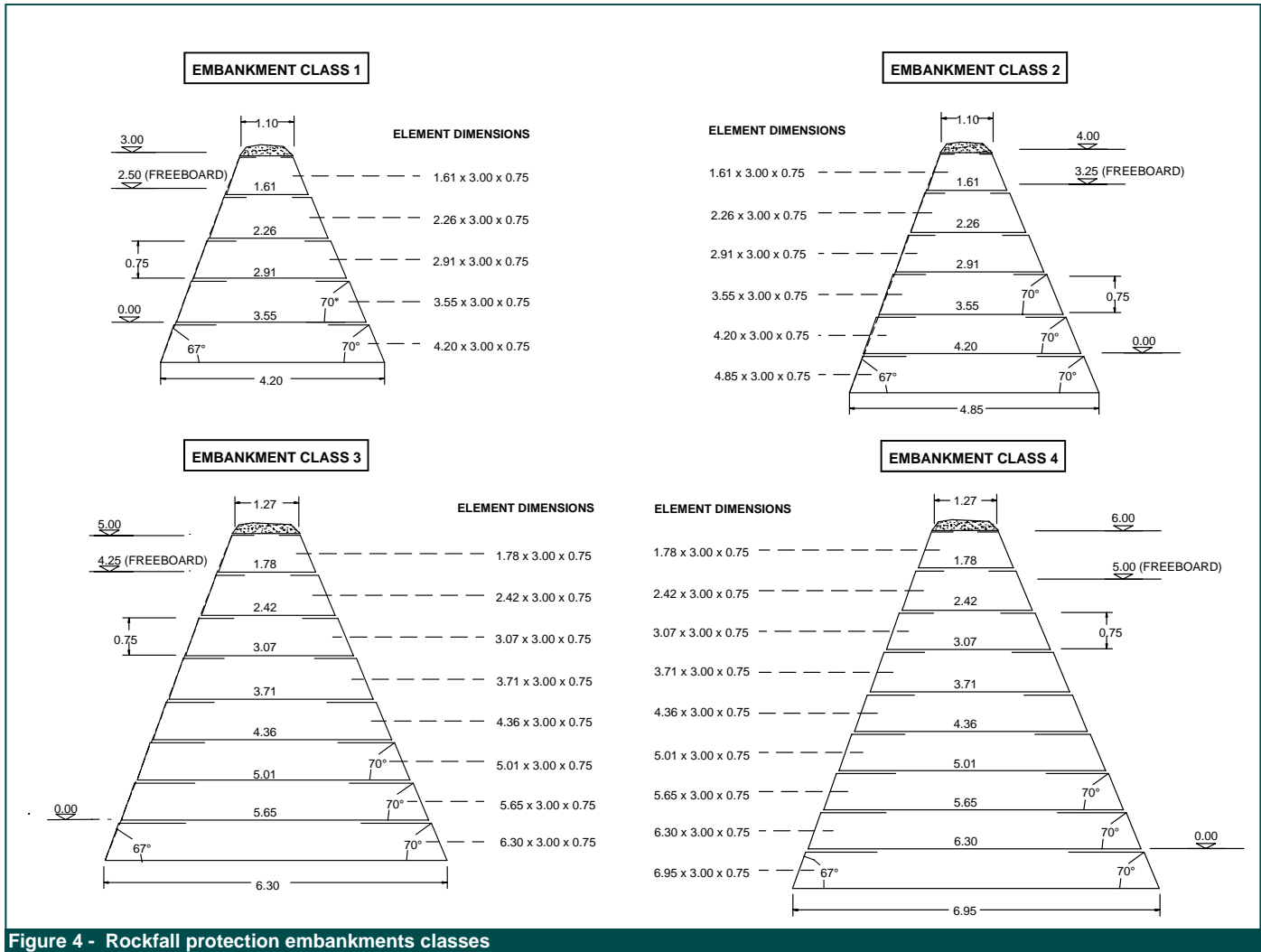


Figure 4 - Rockfall protection embankments classes