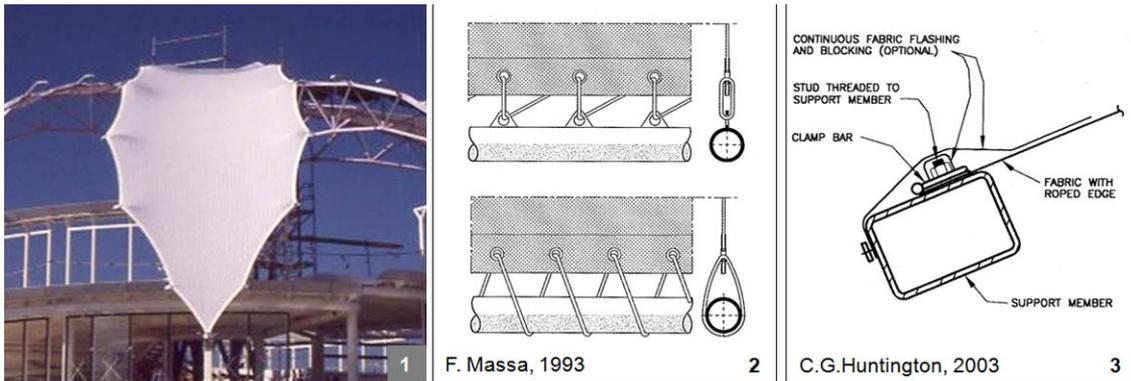


FLEXIBLE EDGES FOR STRUCTURAL MEMBRANES



Suitable materials for each type of edge			Polyester-PVC	PTFE/glass	Glass-silicone	Coated PTFE	PTFE
Edge	flexible	webbing belt	+	-	-	+	++
		rope in pocket	++	(+)	+	+	+
		separate edge cable	+	++	+	+	(+)
rigid	laced	+	(+)	(+)	+	+	
	clamping bar	++	+	+	+	+	
	keder rail	+	++	++	+	+	

++ typical + possible (+) rare - not possible

The task of a membrane edge is to accommodate and transfer the stresses from the surface of the membrane to the corners or directly to the edge support.

Typology of edges:

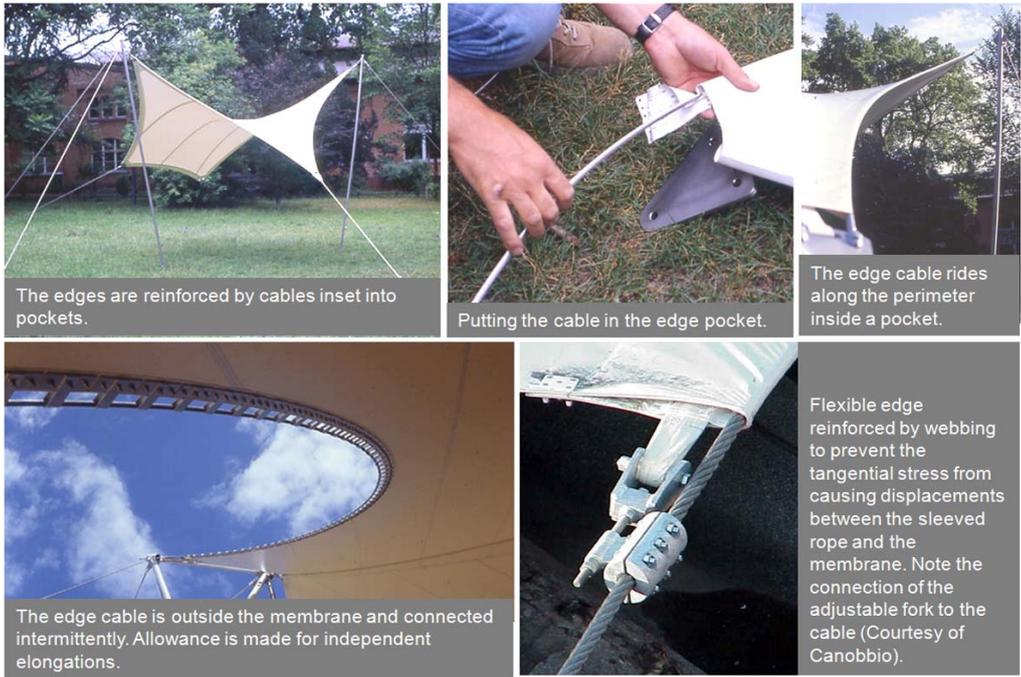
1 Flexible (deformable) edges are curved and carry the membrane stresses perpendicular to the edge and transfer these to the corners as tensile forces. They describe a circular arch (approximately) with $F = r \cdot P$ (F: force in the edge cable; r: radius; P: stress in the surface). It means that the force in the edge cable depends only on the stress in the surface and the radius, not the span. F increases considerably below a rise (s_c/ℓ) of 10%. Flexible edges may be plain or reinforced by a hem, belt or cable (in pocket or separate). They are more suited to the deformability of the membrane

2 Semi-flexible, laced with ropes joining the membrane to a rigid rod, bar, section or wall. The spacer components allow for certain adjustments of deformations and movements.

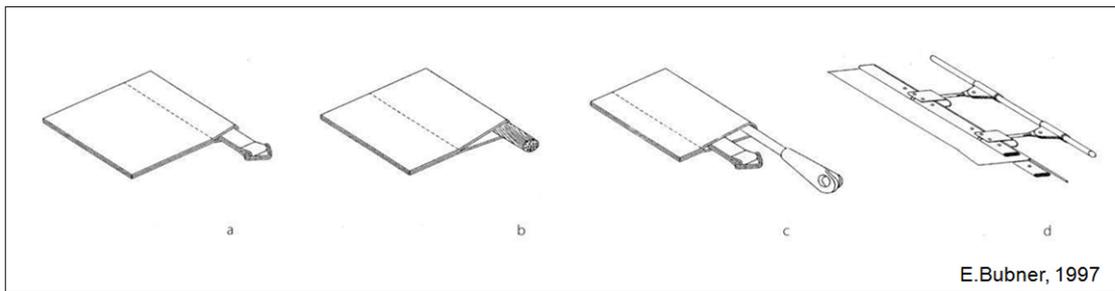
3 Rigid edges. The membrane is directly connected to a rigid linear component. Tensioning and adjusting may be possible bolting the rigid edge.

Flexible edges

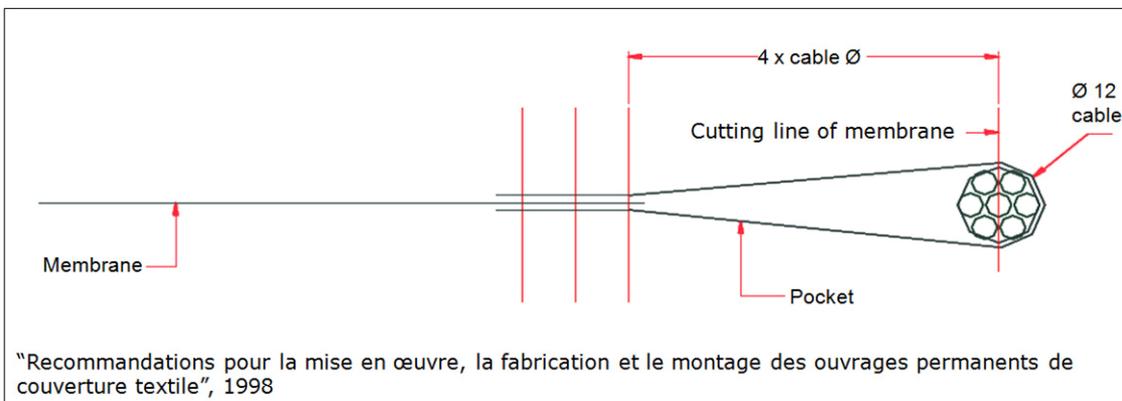
These are either non-reinforced or are reinforced by a hem, rope belt, or cable. To allow for varying elongations, the cable may be located outside the membrane. Flexible edges are loaded in tension. They do not bear bending stress and they follow funicular curves. Curvature is required for loads to be transmitted from the membrane to the end supports.



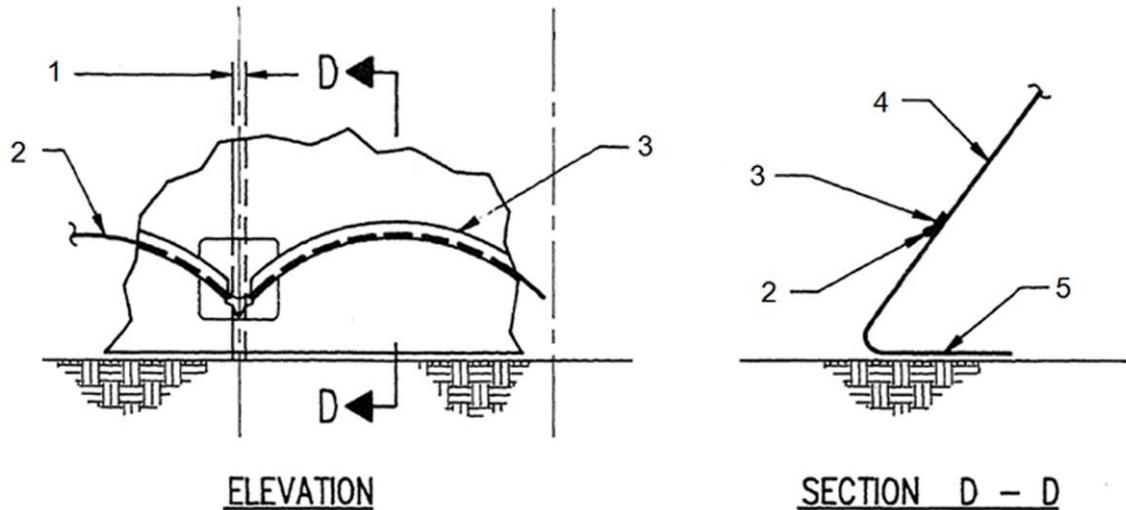
Typology of flexible edges:



- a) Webbing edge
- b) Rope edge
- c) Rope edge with webbing
- d) Clamping plate hung from cable



Cross section ("Recommandations pour la mise en œuvre, la fabrication et le montage des ouvrages permanents de couverture textile", 1998). The pocket, cut in bias, is welded (or double sewed) forming a band. Its width shall be at least equal to 4 times the diameter of the edge cable.



Catenary reinforcement in a pocketed flexible edge with cable (ASCE & Birdair)

- 1 Vertical seam.
 - 2 Catenary reinforcement cable.
 - 3 Catenary cable cuff.
 - 4 Membrane.
 - 5 Seal skirt (for airtightness)
- (ASCE 17-96, 1997: "Air-Supported Structures").



A membrane corner adjusted by two edge cables provided with threaded ends. They pass through two twin tubes welded to the corner plate. The metal plate is connected by another threaded rod that passes through a central tube integral with the plate. Also visible is a run-off pipe for rainwater so that the rainwater will run directly over the metal plate and the screw threads giving rise to durability concerns. Better solutions would be: extending the tube beyond the plate to where the run-off water will not cause damage or collecting the run-off water with a funnel. (R.Motro, 2013)