Impact Tests on bi-oriented nets for deer fencing

Technical Report

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Man, Technology, Environment.

Table of content

1. Characteristic of TENAX nets: the raw material and production process.

1.1 Raw material

TENAX nets are produced by the processing of polyolefins. These materials have an exceptionally high level of resistance to other chemical substances, mould, bacteria and spores. Although derived from the same family, various classes of polymers exist which differentiate themselves from each other in a variety of ways. The choice of one polymer against another, combined with the production process employed, will result in a particular net suitable for a specific purpose.
It is possible to improve the basic performance characteristics of the polymer during the manufacturing process. Molecular orientation carried out following extrusion, for example, makes the finished product considerably more resistant to stretching. All net products from the TENAX Group are characterised by a high level of dimensional stability.

1.2 Production process

TENAX meshes and nets are produced through the process of polymer extrusion. The two principal components of polymer extruders are the extrusion "head" and the "die". The head has the function of directing the liquid polymers towards the die. The die - according to its shape and configuration - determines the principal characteristics of the net or the perforated membrane during extrusion. The result of the extrusion process can be the finished net or a semi-finished product ready for further stages of manufacturing.
The molecular orientation of the polymers provides a noticeable increase in the tensile strength of the net. For this reason some types of net undergo a process of longitudinal stretching during which orientation of the molecules takes place. The nets manufactured in this way (known as 'mono-oriented') have the benefit of improved mechanical characteristics in the direction of the stretching.
The transversal orientation is a successive process similar to the above, but which takes place in a transverse direction. In this way the net which has already been stretched in a longitudinal direction is now stretched in the transverse direction - resulting in a product which is both lightweight and extremely resistant in both directions. Nets produced in this way are known as 'bi-oriented' or "stretched nets".
The figure below shows the production process.

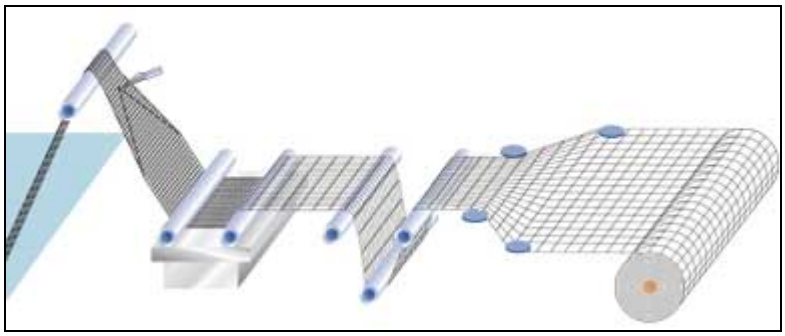


Figure 1: The typical production process for Tenax meshes and nets

2. Introduction: Tenax Testing Laboratory

The modern testing instrumentation and the highly specialized personnel which together form the TENAX Laboratory, make it one of the most advanced facilities of its kind in the world.
TENAX LAB is renowned not only for its excellence in product development, but also in design support testing, the development of new testing methods, and in basic and applied research. Laboratory tests are performed with the most advanced equipment, some of which having been specifically developed by TENAX.
The TENAX laboratory is capable of performing tests to measure mechanical and hydraulic properties as well as the durability of geosynthetic products in accordance with standard international methods.

The TENAX laboratory runs Performance testing, such as Pullout and Direct Shear tests carried out using the specific fill soil and the TENAX geosynthetics, thus to optimize the design parameters and the usage of the geosynthetic product. Research programs, such as the monitoring of reinforced slopes and walls or in-ground full scale testing of reinforced road bases and railroads, are continuously conducted in conjunction with main Universities worldwide.
TENAX Testing Laboratory pays considerable attention to research, since it is the key to development. Both basic research (like U.V. resistance of geogrids and geotextiles or large scale triaxial tests on geogrids) and applied research (like rain simulation testing of geosynthetics for erosion control) are performed through dedicated testing programs. Many of these programs are carried on in cooperation with some leading Universities.

3. Testing apparatus and Summary results

The impact trial tests have been conducted with wood empty box of dimension 0.95 x 1.10 meter. (Figure 2) The test specimens have been blocked on the border with screws and wood elements; the tests have been carried out with the trial load (Figure 3) of weight 150 lbs falled down from the following height: 0.20, 0.40 and 1.00 meter and the Table 1 shows the result for each test.

Figure 2: Testing Apparatus: the wood box

Figure 3: Testing Apparatus: the trial load

The product utilized for these impact tests have been:

- Tenax C-FLEX: 80 g/m² Aperture MD x TD: 44 x 49 mm
- Tenax C-FLEX P: 110 g/m² Aperture MD x TD: 44 x 49 mm
- Tenax RANCH: 140 g/m² Aperture MD x TD: 27 x 42 mm
- Tenax MILLENIUM: 200 g/m² Aperture MD x TD: 33 x 50 mm
- Greek Supplier: FENCE 1: 127 g/m² Aperture MD x TD: 35 x 35 mm
- Greek Supplier: FENCE 2: 60 gr/m² Aperture MD x TD: 45 x 45 mm

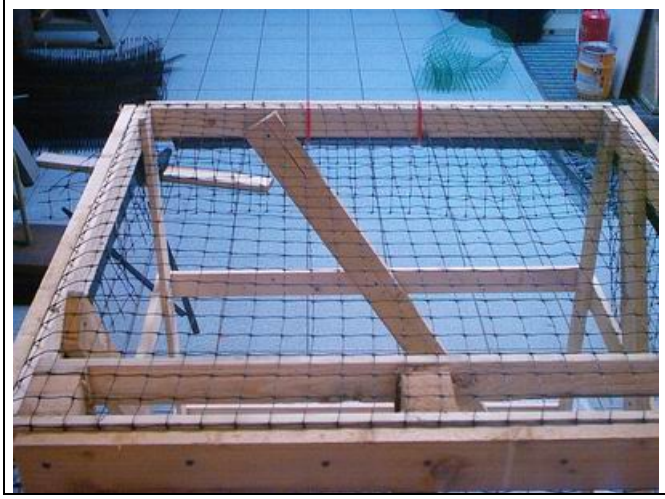
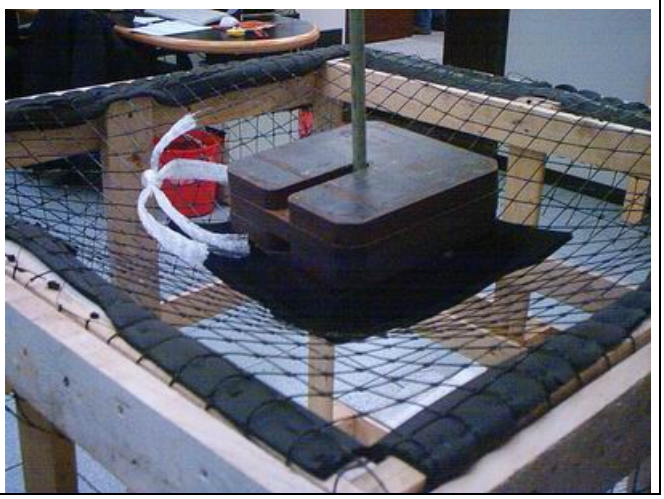
Laboratory TENAX	Impact Damage Tests with costant load simulating the impact of elk			
Products:	TENAX RANCH;CFLEX;CFLEXP;MILLENIUM; Greek Supplier FENCE 1;FENCE 2			
Weight:	68 Kg =>150 lbs			
Height of fall	0,20 m; 0,40 m ; 1,0 m			
Impact Area	Wood Empty Box of 0,95 x 1,10 m			
Velocity:	0,20m: 7,10 km/h 0,40m :10,10 km/h 1m: 16km/h			
Note:				
Product	Height (m)			Note:
	0,2	0,4	1,0	
Tenax CFlex	OK	OK	Breaking of the net	
Tenax CFlexP	OK	OK	Breaking of the net	
Tenax Ranch	OK	OK	Breaking of the net	
Tenax Millenium	OK	OK	Breaking of the net	
Greek Supplier-Fence 1	OK	Breaking of the net	Breaking of the net	
Greek Supplier - Fence 2	OK	Breaking of the net	Breaking of the net	

Table 1: The summary result for impact tests carried out with Tenax nets and other suppliers.

Below are reported several figure that shown each product after the impat test.

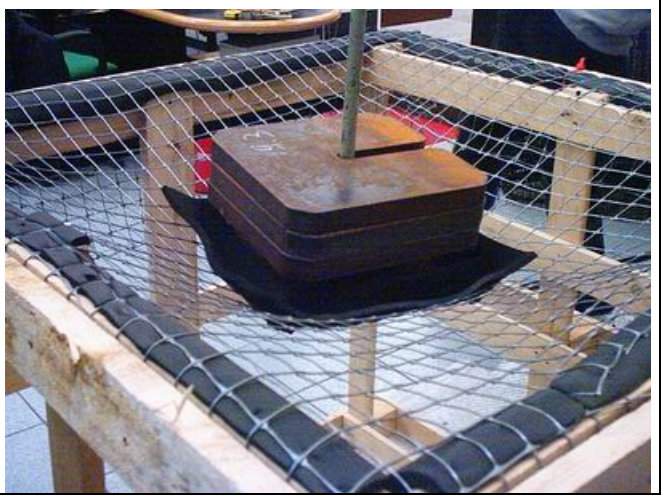
TENAX C-FLEX at 0.20 m	TENAX C-FLEX at 0.20 m
	

TENAX C-FLEX at 0.40 m	TENAX C-FLEX at 0.40 m
	

TENAX C-FLEX “P” at 0.20 m	TENAX C-FLEX “P” at 0.20 m
	

TENAX C-FLEX “P” at 0.40 m	TENAX C-FLEX “P” at 0.40 m
	

TENAX RANCH at 0.40 m	TENAX RANCH at 1.0 m
	

TENAX MILLENIUM at 0.40 m	TENAX MILLENIUM at 0.40 m
	

GREEK SUPPLIER FENCE 1 at 0.40 m	GREEK SUPPLIER FENCE 2 at 0.40 m