ETFE

A new generation material, providing an architecturally innovative option, which goes beyond glass

Is durable, highly transparent and exceptionally lightweight in comparison to glass structures

An alternative to traditional skylight applications

Provides visual design impact

Has high resistance and elasticity, making it an ideal building solution

BENEFITS OF ETFE

LIGHT TRANSMISSION

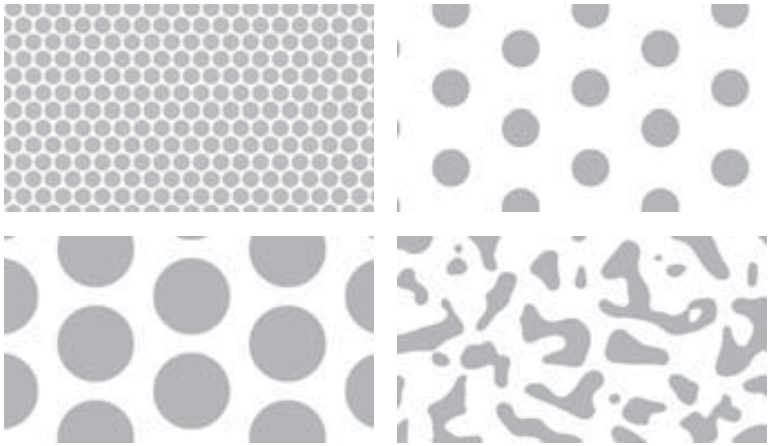
ETFE films can be highly transparent (from 90% to 95%) and allow for the passing of UV rays which help to promote of photsynthesis, thus facilitating growth. As a result of UV transparency, the film will not discolour or weaken structurally over time.

COST EFFECTIVE

Due to the lightweight nature of ETFE, substructure support systems and concrete foundations can be designed more efficiently. ETFE systems also provide ample natural daylighting, thus minimising energy costs by lowering the demand for indoor lighting.

SOLAR CONTROL/SHADING

ETFE film systems can incorporate a number of frit patterns on one or more multiple layers to alter thier solar performance. The film is printed with various standard or custom patterns. Some typical patterns are:



SUSTAINABLE

From extruding of the film to transportation to site, compared to other similar clading material, little energy will be consumed, thus reducing the overall carbon footprint. In addition, the nature of ETFE systems enhances the building physics through insulation and daylighting, contributing to the low energy aspect of the building.

LONGEVITY

Under exposure to environmental pollution, UV light, harsh chemicals, or extreme temperature variations, ETFE does not degrade.

PROPERTY	UNIT	ORIGINAL VALUE	VALUE AFTER WEATHERING					
			1 YEAR	2 YEAR	3 YEAR	5 YEAR	7 YEAR	10 YEAR
Tensile strength (md)	N/mm^2	46.7	45.6	46.2	44.9	46	48.4	52.4
Tensile strength (cd)	N/mm^2	42.3	43.8	45.5	42.6	44.8	42.4	44.6
Yield strength (md)	N/mm^2	22.6	22.5	25.0	22.3	23.2	22.8	22.5
Yield strength (cd)	N/mm^2	18.8	21.4	22.0	-	22.3	21.0	21.5
Elongation at break (md)	%	330	340	310	345	315	325	340
Elongation at break (cd)	%	390	405	390	390	410	390	405
Tear strength (md)	N/mm^2	420	430	415	445	440	523	-
Tear strength (cd)	N/mm^2	435	425	420	480	430	531	-
Light Transmission	%	95	96	94	95	96	96	96

md=machine direction | cd=cross direction
Test results/weathering test in Arizona, SA, on Hostaflon ET films (source Hoechst, Dyneon, 3M)

RECYCLABLE

Easily recyclable, waste from the manufacturing process or even old ETFE elements can be remoulded into new ETFE products such as tubing components and wires.

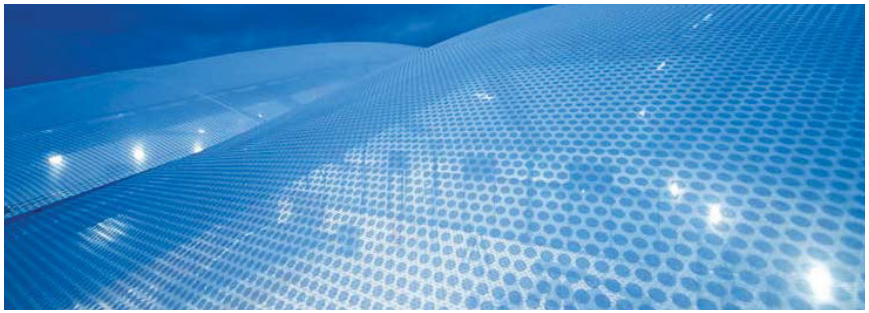
COLOURS

Colours can be introduced in a variety of ways. It can be applied during the film extrusion process provising a consistant tint in various tones from red to violet or by adding coloured lighting with chageable colour options.

WHAT IS ETFE FILM?

IT'S THE NEW GENERATION MATERIAL WHICH GOES BEYOND GLASS.

ETFE (Ethylene Tetra Fluoro Ethylene) is durable, highly transparent and very lightweight in comparison to glass structures. ETFE is being considered the material of choice for traditional skylight applications to long span structures and building facades. Few building materials can match ETFE for its impact or presence when you want a structure that stands out from the crowd.



HISTORY OF ETFE

- Originally developed by DuPont over 40 years ago as an inert coating material for the aerospace industry.
- First application in the building industry took place in the early 1980s in Europe
- Gained recognition with three major projects, the Eden Zoo Project in 1998, the Allianz Arena for the 2006 Soccer World Cup and the "Water Cube" at the 208 Bejing Olympics.

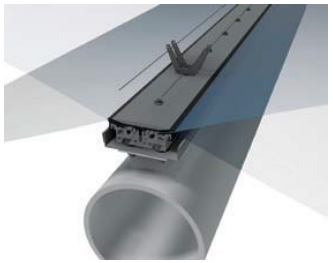
CONSTRUCTION TECHNOLOGY

SINGLE LAYERED APPLICATION

ETFE film can be applied in a single layer form and is reinforced with cables, lightweight steel or aluminum to maintain shape and stability.

DOUBLE OR TRIPLE LAYERED APPLICATION

For longer spans ETFE can incorporate a pneumatic system to maintain air between 2 or 3 layers of film restrained in aluminum extrusions and supported by a lightweight structure creating inflated cushions. These cushions are filled with low-pressure air, providing thermal insulation and structural stability against wind or snow loads. If needed, small cables can be used for reinforcement. Under typical loading conditions, ETFE cushions can range from 1.5m - 4.5m wide and reach up to 60m in length.

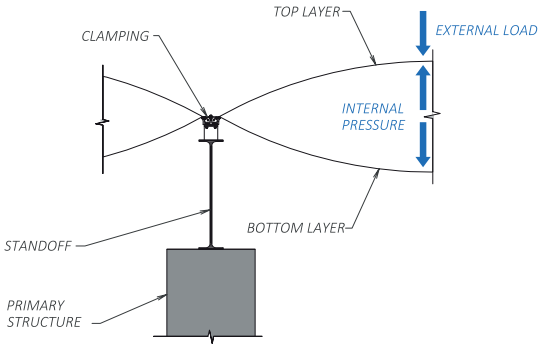


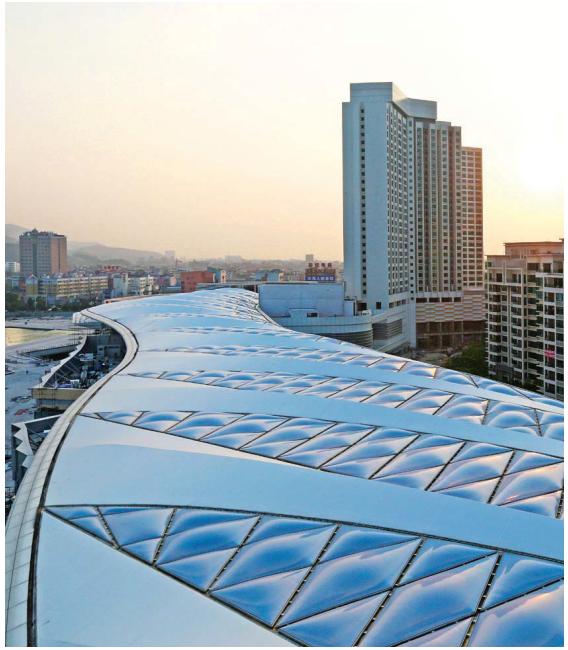
Empire City Casino at Yonkers Raceway
Yonkers, New York USA

AIR INFLATION SYSTEM/ENERGY CONSUMPTION

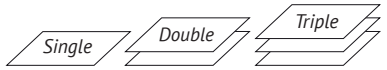
A pneumatic ETFE cushion system is generally supplied by one or more inflation units. Each unit consists of two redundant blowers forming a backup system for guaranteed structural stability. The air when entering the machine will be dried to avod condensation within the cushions. A series of pressure sensors continuously monitors the internal pressure of the ETFE cushions maintaining them between 250 to 300 Pa. In case of high wind or snow loads, sensors can automatically and continuously adapt the pressure to compensate external loading.

Depending on air temperature and humidity, one unit can supply a roof of up to 1500sqm. These units are UL certified and run on an 240V power with consumption less than 1KW/h.





THERMAL PERFORMANCE



ETFE Layers	U-Value (W/m2K)	R-Value (FT2hrF/BTU)
Single	5.7	1.0
Double	2.9	2.0
Triple	1.9	3.0

FIRE PERFORMANCE

ETFE films have been rated under different national and international standards as self-extinguishing with no burning drops. The film melts away at around 260°C.

*Values represent typical performance, not specification limits.

TYPICAL* PERFORMANCE OF ETFE FILM	
10 Mil (250 Micron)	Test Method
VTM - 0	UL 94VTM
Class A	ASTM E84
Class A	ASTM E108
B-s1, d0	DIN EN 13501-1
pass	CAN/ULC-S109-03 small & large flame tests
FSR = 5	CAN/ULC-S102-07
SDC = 100	CAN/ULC-S102-07

PHOTOVOLTAIC AND LED INTEGRATION

Flexible photovoltaic (PV) cells and/or LED lighting can be integrated with wither a single layer or cushioned system to meet performance and/or aestheric requirements.