DuPont™ Spallshield® Composite

TECHNICAL DATA SHEET

SPALLSHIELD® COMPOSITES PASS THE FOLLOWING ANSI Z26.1 TESTS

Test	Name	Description	Measures	Requirement	Spallshield® Results
16	Luminous Transmittance and Weathering	Tvis is measured after exposing samples to type D twin enclosed (violet arc) chamber under standard operation for 1667 hours.	Tvis Change %	Less than 5%	–4.91%
1	Light Stability and Luminous Transmittance	Samples exposed to a UV Arc test radiation for 100 hours	Tvis retention %	70%	99.70%
26	Ball Drop	5 lb ball drop from 12 feet at room temperature	Penetration	No penetration	No penetration
12	Ball Drop	1/2 lb ball dropped 30 feet at room temperature	Penetration	No penetration	No penetration
9	Dart Test	7 oz steel dart dropped from 30 feet at room temperature	Penetration	No penetration	No penetration
19	Chemical Resistance	Laminated specimens are exposed on the plastic sides both in non-stressed and stressed conditions to five different specified chemicals for 10 min each using separate specimens in each case. The laminates must show no signs of tackiness, crazing, or	Haze %	4%	< 4%
24	Flammability	Three laminated specimens measuring 0.5 X 6 in are inclined at a 45 degree angle and are subjected to a flame on the plastic side at the lower end. Once the flame is removed, the burn rate must not exceed 3.5 in/min.	In/min burn rate	Max 3.5	< 3.5 in/min

HARD COAT PERFORMANCE

Spallshield® is a three layer composite structure of Butacite®, PET, and hard coat. The hard coat is a proprietary formulation developed by DuPont with the following features:

- Highly scratch resistant
- Chemically resistant
- Very durable
- Superior optical quality, indistinguishable from glass

Tvis %	91.3
Haze (ASTM D1003)	0.7
YID 1925 (2/c)	1.35

Iridescence

Iridescence is caused by light being refracted off of thin coatings. The hard coat applied to Spallshield® is a very thin coating with micro variations in coating thickness. This will cause the hard coat to iridesce under certain types of indoor fluorescent lighting and is only visible under reflective lighting. If the composite is viewed at a 90-degree angle no iridescence can be seen. Iridescence is not seen under normal fluorescent lighting or outdoor lighting.

This iridescence is not a defect but a phenomenon seen under specific lighting conditions.

Boil Test

Conducting 6-hour boil testing per ANSI Z26.1 test method tests durability of hard coat. Tests are conducted on laminates autoclaved at 135°C for 30 minutes. The hard coat is evaluated for adhesion and appearance.

Spallshield® composites have 100% hard coat adhesion after the six hour boil. Hard coat appearance remains excellent.

Coffin Tests

Spallshield® laminates are exposed to 50°C at 95% RH for a period of 2 weeks. After the test, the hard coat adhesion remained at 100%. Optical appearance remained unchanged.

	Adhesion
Unscribed	100%
6 Line Scribed	100%
X-Scribed	100%

Cycling Tests

Cycling tests are conducted to predict the effects of exposing the Spallshield® composite to extreme temperatures and humidity.

Spallshield® composites were tested by the PV1200 protocol. Spallshield® composite is placed in a chamber and exposed to the following cycle 10 times:

60 minutes heat up to 80°C from 23°C
240 minutes at 80°C and 80% RH
120 minutes to cool down to –40°C
240 minutes at –40°C
60 minutes to 23°C

Peel tests were measured after equilibrium of 21 hours at 69°F.

Used Permalel 40 oz. tape for peels.

Hardcoat Adhesion Performance (ASTM 3359)				
Autoclave Temps	**Crosshatch -Scribed**	**Unscribed**	**X Scribed**	**Adhesion Rating**
125°C	100/5B	100	5/5	100
135°C	100/5B	100	5/5	100
150°C	100/5B	100	5/5	100

WEATHERING DATA

Spallshield® composites have excellent weathering durability. Sidelites made from Spallshield® composites were installed in a test vehicle 20 years ago and they still look outstanding!

Spallshield® composites have undergone extensive weathering testing. The following weathering tests have been conducted on Spallshield® composites:

- EMMA
- Natural Florida
- XENON-ARC SAE-J1960

EMMA

2,000 mega-joules is equivalent to nine years Arizona. Laminates autoclaved at 135°C for 30 minutes.

	b color	Tvis %	Haze %	ISO9050 UV Transmission %
0 mega-joules of UV radiation per m²	1.42	91.7	0.97	0.46
2000 mega-joules of UV radiation per m²	1.62	91.4	0.78	0.68

Natural Florida

Samples were exposed two years in Florida.

	YID	b Color	Haze %	Tvis %
Initial	2.8	2.35	0.62	91.7
2 years exposure	1.76	1.67	0.63	91.7

XENON–ARC SAE J1960

All samples were coated in the lab. Commercially produced Spallshield®.

Composite has haze value of < 1.

	Laminate Haze %	Laminate Tvis %	Laminate b Color	PET/PVB Adhesion, lb/in
Initial	1.91	91.7	1.12	24.8
2,500 MJ	2.1	91.6	1.42	22

DuPont Offices Worldwide

Americas
DuPont Company, BMP26-2363
Lancaster Pike & Route 141
Wilmington, DE 19805 U.S.A.
Telephone +1 302 774 1161
Toll-free (USA) 800 448 9835
Fax +1 302 999 4399

DuPont do Brasil, S.A.
Alameda Itapecuru, 506
06454-080 Barueri, SP Brasil
Telephone +55 11 4166 8122
Fax +55 11 4166 8720

Asia Pacific
DuPont China Holding Co, Ltd.
5th Floor, Shui on Plaza
333 Huai Hai Road (Central)
Shanghai 200021, China
Telephone +86 21 6386 6366
Fax +86-21-6386-6333

Europe/Middle East/Africa
DuPont de Nemours Int'l. S.A.
2, Chemin du Pavillon Box 50
CH-1218 Le Grand Saconnex
Geneva, Switzerland
Telephone +41 22 717 51 11
Fax +41 22 717 55 00

www.dupont.com/safetyglass

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