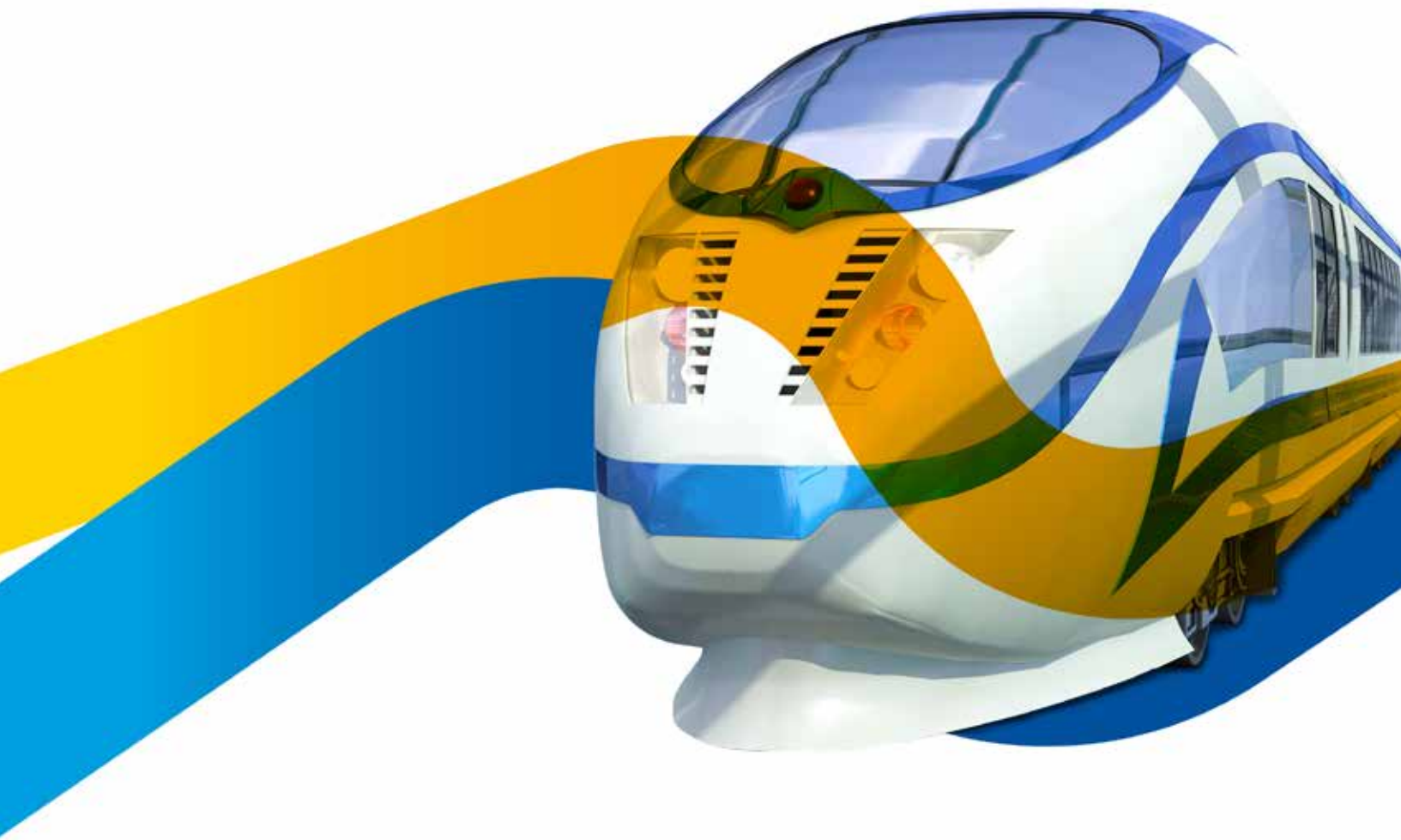
SAFETY+ AESTHETICS

LIGHTWEIGHT, FIRE SAFE THERMOPLASTIC MATERIALS FOR RAILWAY INTERIORS



CHEMISTRY THAT MATTERS™

COMBINING THERMOPLASTICS EXPERTISE WITH IN-DEPTH KNOWLEDGE OF THE INDUSTRY STANDARDS, REGULATIONS AND TRENDS, SABIC'S INNOVATIVE PLASTICS BUSINESS IS COMMITTED TO KEEPING ITS CUSTOMERS IN THE TRANSPORTATION INDUSTRY AT THE LEADING EDGE OF MATERIALS AND PROCESSING TECHNOLOGIES.

SABIC OFFERS HIGH PERFORMANCE, ENGINEERING THERMOPLASTICS PORTFOLIO INCLUDING RESINS, SHEETS, FILMS AND COMPOSITES, SPECIFICALLY DESIGNED FOR RAILWAY INTERIORS THAT CAN MEET INDUSTRY STANDARDS AND FIRE RESISTANCE REGULATIONS; MAY REDUCE OVERALL SYSTEM COSTS; AND ENHANCE THE AESTHETICS, SAFETY AND COMFORT OF THE TRAIN CABIN ENVIRONMENT.

SAFETY, AESTHETICS & PERFORMANCE

Today's public transportation industry is increasingly focused on safety. To create differentiated designs for new rail carriages or when refurbishing old ones, manufacturers are seeking the latest material solutions that not only meet current and upcoming safety regulations but also provide additional benefits ranging from durability and anti-vandalism protection to improved aesthetics, lower weight and system cost reduction.

Currently, fire safety regulations for rail interiors vary across the EU. Although there is a move towards standardization through the EN 45545-2:2013 standard regulation, manufacturers currently must contend with a range of requirements from one nation to another. SABIC has proactively developed and independently tested several materials designed specifically for compliance with the new standard.

SABIC offers a number of materials for railway interior applications that conform to leading European fire safety norms and supports increased material needs for

- Weight reduction
- Increased fire safety
- Graffiti resistance
- Vandalism resistance
- Lower system cost
- Design freedom
- Easy reparation
- Paint reduction

LIGHTWEIGHT MATERIALS COMPLYING WITH INDUSTRY STANDARDS

The broad portfolio of materials for the rail interiors sector manufactured by SABIC's Innovative Plastics strategic business unit can help manufacturers meet evolving fire safety requirements while delivering additional advantages. The company offers a one-stop shop comprising new plastics solutions, assistance with materials and process selection and technical support services worldwide.

SABIC offers a broad portfolio of engineering resins, sheet, film and composite materials for interior applications that conform to leading European fire safety norms and with EN 45545-2:2013 regulation.

SABIC'S SHEET PORTFOLIO

- ULTEM™ R16SG29 sheet R1 and R6 (2, 3, 4 mm) at HL3
- LEXAN™ F2000 sheet in clear & opal white R4 (2, 3, 4 mm)
- LEXAN™ H6500 sheet R1 and R6 (3, 4 mm) at HL2

SABIC'S RESIN PORTFOLIO

- ULTEM™ resin
- LEXAN™ resin
- LEXAN™ FST resin
- NORYL™ low smoke resins
- CYCOLOY™ resin

RAILWAY PASSENGER SAFETY & REGULATORY OVERVIEW

Operation Category (OC)	Design Category (DC)			
	N	A	D	S
1	HL1	HL1	HL1	HL2
2	HL2	HL2	HL2	HL2
3	HL2	HL2	HL2	HL3
4	HL3	HL3	HL3	HL3

OC = Operation Category related to passenger escape time
(OC 1 = shortest escape time, OC 4 = longest escape time)
DC = N, A, D, S = Design Category related to type of vehicle
A Automatic train **D** Double deck vehicle **S** Sleeping and couchette vehicle **N** Standard vehicles
HL = Hazard Level (HL1 = lowest, HL3 = highest hazard level)
HL3 = most stringent regulations regarding flame, smoke, toxicity and heat release.
R1 = Requirements for Interior components such as ceiling and sidewalls
R4 = Requirements for lighting applications
R6 = Requirements for back shell and base shell of passenger seats
R22 = Requirements for electro-technical applications and connectors

WEIGHT OUT & PART INTEGRATION

Engineering thermoplastics solutions from SABIC can help manufacturers address the growing demand for sustainability, lower system costs, improved durability and comfort and design innovation. Compared to metal, thermosets and glass, these materials can significantly lower system costs through consolidation of parts to streamline production, avoidance of secondary operations such as painting and coating, machining and polishing, and lower shipping costs by reducing weight.

ULTEM™ R16SG29 sheet is based on SABIC's polyetherimide (PEI) resin and features inherent flame retardancy and low smoke emission. It complies with the new EN45545-2 norm at the highest level (Hazard Level 3) for R1 & R6 applications (Requirements for interior components) across all four occupational categories at 1.2,3 and 4mm. ULTEM R16SG29 sheet delivers excellent impact resistance and chemical resistance for easy cleaning, anti-graffiti performance and long use of life.

ULTEM™ R16SG29 (PEI) sheet railway interior cladding

LEXAN H6500 sheet is an opaque, solid, low-gloss PC/ABS blend that delivers high stiffness for railway sidewalls, tables and seating. Its sustainable flame retardant performance meets the requirements of the Restriction of Hazardous Substances (RoHS) directive and it delivers non-chlorinated and non-brominated product technology. In addition to EN 45545-2 R6 (seating) and R1 (side wall panels), LEXAN H6500 sheet complies with current European standards including the French NF F16-101 M1/F1 norm (at 2-4 mm). The material can be thermoformed at a lower temperature than traditional PC materials. Its molded-in color capability can help avoid the cost and environmental hazards of secondary painting and provides excellent aesthetics.

LEXAN F2000 sheet, available in clear transparent and translucent opal white colors, is a flame retardant, lightweight product that can be an excellent choice for light diffusers and light covers. It offers ease of processing, excellent formability and can help achieve part integration in train ceilings with light diffusers. It complies with EN 45545-2 standard for R4 (Requirements for lighting components), German DIN 5510 S4 SR2 ST2 norms at 3 mm and French NF F16-101 M2 F2 rating at 2-8 mm.

Eurostar international train selected LEXAN sheet for its light diffusers.

Masterplex selected LEXAN™ sheets to create the Italian railway 's most challenging interior feature, a train ceiling complete with light diffusers.

Anticipating the implementation of the pan-European norm for fire safety in rail interiors, SABIC has introduced two new LEXAN™ sheet products to its materials portfolio. These new products include LEXAN H6500 sheet, a new PC/ABS sheet grade that complies with the upcoming EN 45545-2 harmonized standard, and LEXAN H6200 sheet, a new grade that complies with Germany's DIN norm including LEXAN H6206M sheet which meets NF F 16.101/102 M1/F2 (at 3-4mm). Both products have been engineered to help rail customers meet growing demand for enhanced sustainability and advanced thermoplastic technologies with non-chlorinated and non-brominated flame retardance that enhance the design and development of rail interior applications.

LEXAN H6006 sheet is a high-modulus PC/acrylonitrile-butadiene-styrene (PC/ABS) product that meets the Polish norms for side wall and ceiling applications (PN -K-02512, PN -L-02501, PN -K-02505) and UIC 564-2, Annex 7-11-15 at 3 and 4 mm. LEXAN H6006 sheet provides environmentally responsible flame retardance according the German DIN-VDE 0472 part 815 norm.

Potential applications include sidewalls, tables and seating.

Railway interior using LEXAN sheet

LEXAN H6200 sheet, which complies with the German DIN 5510 norm: S3 SR2 ST2 at 3 mm and S4 SR2 ST2 at 4 mm, offers an attractive cost-benefit balance with less-demanding requirements. It delivers excellent impact performance at low temperatures (ductility down to -20C), good colorability and excellent thermoforming at lower temperatures than standard PC materials.

Compared to metal, thermosets and glass, both new LEXAN sheet materials can significantly lower system costs through consolidation of parts to streamline production, avoidance of secondary operations such as painting and coating, machining and polishing, and lower shipping costs by reducing weight.

Compin chose LEXAN™ EXL resin to make various seating parts for the "Future Interior of the TGV" French railways high-speed train.

LEXAN™ FST3403 (flame-smoke-toxicity) polycarbonate (PC) copolymer is the first thermoplastic resin solution for rail seating applications to meet the strictest fire safety requirements under the EN 45545-2 standard. LEXAN FST3403 copolymer – developed specifically for seat back shells and side covers – achieved the highest possible hazard level rating (HL3) under EN 45545-2. In addition to its exceptional heat release, smoke density and toxicity performance, documented by independent laboratory testing, the LEXAN FST copolymer provides high flow capabilities that enable large parts, such as seat back shells, to be injection molded without marks, texture defaults, flow lines and other surface defects. Another aesthetic benefit of the copolymer is its ability to be custom colored, which avoids the need for secondary painting.

LEXAN™ EXL resin demonstrates durability in railway seating designed for Très Grande Vitesse (TGV) – the French railway high-speed trains. COMPIN chose this super-tough polycarbonate resin with added impact performance and low temperature ductility. LEXAN EXL resin maintains impact ductility after outdoor exposure, demonstrating good weatherability. It also has a low temperature ductility to -60°C. This resin's flame retardancy conforms to Blue Angel and TCO99 standards and resists a variety of industrial and consumer chemicals. LEXAN EXL resin also has a 20 - 40% reduction in cycle time processability. This resin exhibits good flow properties, extensive color capability, and I3-F2-M2 ratings that meet the French Railways standards (NF F16101 & NF F16102). It also matched the customer's specific requirement for a particular shade of grey (gris 150 sable). This, plus its light-weight, makes LEXAN EXL resin a great materials candidate for various railway seating parts.

NORYL™ NH6010B resin, offers low smoke density (ASTM E662 test) and toxicity (NF X 70-100 test) values compared to metal conduits, while remaining economically viable. This can be a critical advantage in transportation applications, as the first four minutes after the start of a fire are considered crucial in terms of occupant survival. Materials that generate low smoke in this short span can help facilitate passengers' exit to safety. With increasing awareness about environmental concerns, Fraenkische Rohrwerke (Germany), manufacturer of electrical conduit and drainage systems, introduced a range of halogen-free conduits based on NORYL™ NH6010B non-halogenated resin offering low smoke, toxicity, and flame performance to comply with IEC 61386, the European Union (EU) standard for electrical conduit and suitable for extrusion or injection molding.

For first-class railcars' tough, new seat back shells and side panels, Grammer Railway Interior GmbH has selected SABIC's new LEXAN™ FST copolymer – which meets requirements for the highest hazard level (HL3) for R5 under Europe's upcoming CEN/TS 45445-2 harmonized standard for fire safety.

CYCOLOY™ resins are amorphous PC/ABS blends that offer the superior mechanical properties and heat resistance of polycarbonate (PC) resins combined with the excellent processability of ABS materials. In addition, CYCOLOY resins offer non-brominated and non-chlorinated FR systems, odorless solutions and superior heat aging and color stability properties versus comparable ABS materials.

Generic property comparison

PROPERTY	ABS MATERIALS	PC/ABS
Halogen free FR	●	●
Low emission / odorless	●	●
Heat aging	●	●
Color stability	●	●
High Heat	●	●
Impact @ RT	●	●
Impact @ low T	●	●
Shrinkage	●	●
Flow	●	●

ULTEM™ resin fibers spun may address your need for inherent flame resistance; low smoke toxicity; aesthetic. For railway interior fabrics and panels, ULTEM polyetherimide (PEI) resin from SABIC has the high-temperature performance and inherent flame resistance manufacturers need to meet the increasing challenges of stringent flame resistance and low FST (Flame, Smoke and Toxicity) regulations. Plus, with great aesthetic qualities and good dye-ability, it's a smart way to achieve both compliance and appearance at the same time. This advanced amorphous polymer allows woven fabrics to be colored using conventional exhaust dying techniques, resulting in exceptional colorfastness and high tolerance to UV light. ULTEM resin also offers lightweight advantages along with outstanding mechanical integrity at elevated temperatures, and can be blended with other fibers for an optimal balance of performance and cost.

Fuji Electric using NORYL resins for switch gear isolator plates

Flame retardant ULTEM™ fibers.

ANTI-VANDALISM

For passenger comfort and overall usability, thermoplastics from SABIC provide ease of cleaning, protection against graffiti and high impact performance to resist vandalism.

SABIC's new, upcoming product series called LEXAN™ KF SHEET is an opaque products with outstanding anti-graffiti properties that meets the stringent requirements of the German rail standard, the French rail standard and the Italian rail standard. LEXAN KF sheet series can also provide very good chemical resistance properties by meeting the French norm NF F 31-112 (anti- graffiti), making them an excellent choice to replace polyvinyl chloride (PVC), polyester, vinyl ester or phenolic fiber-reinforced plastic (FRP) materials used in many interior train applications including interior panels, window frames, ceilings and other large interior parts.

LEXAN™ MARGARD™ MR5FR sheet is an excellent way to reduce railcar weight by replacing traditional glass, offering excellent abrasion resistance behavior combined with excellent chemical resistance. The product complies with the German rail standard, the French rail standard and the Italian rail standard. Additionally, Lexan Margard sheet can provide reduced weight, high impact strength and forced entry protection, graffiti resistance, excellent flame retardance, high impact strength and UV- and abrasion resistance. LEXAN MARGARD MR5FR sheet can be an excellent candidate for the compartment partitions.

Coated, transparent LEXAN MARGARD Sheet has been chosen by TOHO SHEET & FRAME CO., LTD, a leading Japanese converter, for the double glazing of side windows of The JAPAN RAILWAYS HOKKAIDO.

Italian railways compartment separators using LEXAN Margard sheet.

THERMOPLASTICS ADDRESS TRENDS

			OPAQUES								
			POLYCARBONATE & PC/ABS FR - Transportation								
			Flame retardant, high flow, mould release	Flame retardant, high flow, improved impact & processing	Flame retardent, UV Stabalized	Flame retardent, improved flow	Flame retardent + 10%GF, UV Stabalized	Flame retardent + 10%GF, improved impact & processing	Flame retardent + 20%GF	PC/ABS Flame retardent, Extrusion	PC/ABS Flame retardent, high flow, improved impact
			LEXAN™ 915R (LEXAN 916R)* resin	LEXAN EXL9330 resin	LEXAN 945U resin	LEXAN FST3403 resin	LEXAN 505RU resin	LEXAN EXL5689 resin	LEXAN 3412ECR resin	CYCOLOY™ C3650 resin	CYCOLOY CX7240 resin
Ceilings & Side Walls		CEILING	-	-	-	-	-	-	-	-	-
		WINDOW FRAME	-	-	-	-	-	-	-	-	-
		WALL CLADDING	-	-	-	-	-	-	-	-	-
		WALL DECORATION	-	-	-	-	-	-	-	-	-
		PARTITIONS	-	-	-	-	-	-	-	-	-
		DRAFT SCREENS	-	-	-	-	-	-	-	-	-
		OVERHEAD LUGGAGE RACKS	-	-	-	-	-	-	-	-	-
		DRIVERS DESK	-	-	-	-	-	-	-	-	-
		SUN BLIND	-	-	-	-	-	-	-	-	-
		AIR DUCTING	-	-	-	-	-	-	-	●	●
		CONTAINERS & COMPARTMENTS	-	-	-	-	-	-	-	-	-
		INTERIOR SURFACE GANGWAYS	-	-	-	-	-	-	-	-	-
		TABLES - including bottom surface	-	-	-	-	-	-	-	●	●
		ENCLOSURES FOR ELECTRICAL EQUIPTMENT	-	●	●	●	●	●	-	-	-
		PASSENGER INFO DEVICES	-	-	-	-	-	-	-	-	-
Seats & Arm Rests		SEAT BACKS - Back & Base Shell	-	-	-	●	-	-	-	-	●
		TRAY TABLES	-	-	-	●	-	-	-	-	●
		ARM RESTS	-	-	-	●	-	-	-	-	●
Lighting, Electrical & Signage		LIGHT DIFFUSERS	-	-	-	-	-	-	-	-	-
		VERTICAL COVER STRIPS - ON WALLS	-	-	-	-	-	-	-	●	-
		CONNECTORS & ELECTROTECHNICAL APPLICATIONS	●	●	●	-	●	●	-	-	-
		CABLE CHANNELS	-	-	-	-	-	-	-	●	-
		LIGHTING COVERING	-	-	-	-	-	-	-	-	-
SPECIFICATIONS & NORMS	Euro	EN 45545-2:2013 R1 Interior Surfaces	-	-	-	-	-	-	-	-	-
	Euro	EN 45545-2:2013 R4 Light Diffusers	-	-	-	-	-	-	-	-	-
	Euro	EN 45545-2:2013 R6 Passenger Seat Shells	-	-	-	HL3 @ 3mm	-	-	-	-	-
	Euro	EN 45545-2:2013 R22 Connectors & Electrotechnical applications	in progress	'HL2 @ 3mm	in progress	-	in progress	'HL3 @ 3mm	in progress	-	-
	DE	DIN 5510-2:2009	-	-	-	S4/SR2/ST2 @ 3mm	-	-	S4/SR2/ST2 @ 2mm	S3/SR2/ST2 @ 3mm	-
	FR	NF F 16-101 / -102	-	M2 / F2 @ 2-3mm	-	M2 / F2 @ 3mm	F1 / I2 @ 1.6mm	F2 / I3 @ 3mm	F1 / I2 @ 1.3mm	M2 / F2 / I3 @ 2mm	M1 / F2 / I3 @ 2mm
	FR	Anti- Graffiti NF F 31-112 SNCF	-	-	-	-	-	-	-	-	-
	IT	UNI CEI 11170-3	-	-	-	-	-	-	-	-	-
	POL	PN-K-02511 & UIC564-2, Annex 7-11-15	-	-	-	P1-D2-R2-A-T2 @ 3mm	-	-	-	-	-
	USA	ASTM E162 - Flame Spread Index Is	-	-	-	5	-	-	-	-	-
	USA	ASTM E662 - Optical Smoke Density	-	-	-	pass at 1.5 - 4mm	-	-	-	-	-
	USA	ASTM E1354 - Heat Release	-	-	-	in progress	-	-	-	-	-
	INT	Smoke Toxicity – BSS 7239, SMP800C	-	-	-	pass	-	-	-	-	-
	INT	UL-94 V0	@ 1.1mm (@ 0.8mm)	@ 1.49mm	@ 1.5mm	(@ 0.8mm)	@ 1.5mm	@ 1.5mm	@ 1.5mm	@ 1.5mm	@ 0.75mm
	INT	UIC 564-2 App 11 & 15	-	-	-	-	-	-	-	-	-
	RUS	GOST 12.1.044-89 (ISO4589-84)	-	-	-	-	-	-	-	-	-
	DE	ECO FR - Chlorine & Bromine Free	●	●	●	●	●	●	●	●	●

OPAQUES		OPAQUES			TRANSPARENTS			
PPE Blends FR - Transportation		POLYETHERIMIDE FR - Transportation			POLYCARBONATE FR - Transportation			
Flame retardent, extrusion & injection moulding	Flame retardent, extrusion	Flame retardent, Natural	Flame retardent + 30%GF	Flame retardent + 20%GF, improved chemical resistance, mould release	Flame retardent, extrusion, UV stabalized (available in Opal White)	Flame retardent, extrusion, UV stabalized (available in Opal White)	Flame retardent, injection moulding, UV stabalized	Flame retardent, extrusion & injection moulding
NORYL NH6010B resin	NORYL ENV131 resin	ULTEM™ 1000 (ULTEM 1010) resin	ULTEM 2300 resin	ULTEM CRS5201R resin	LEXAN EX9332T resin	LEXAN 2034 resin	LEXAN 945AU resin	LEXANT LUX7630C resin
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
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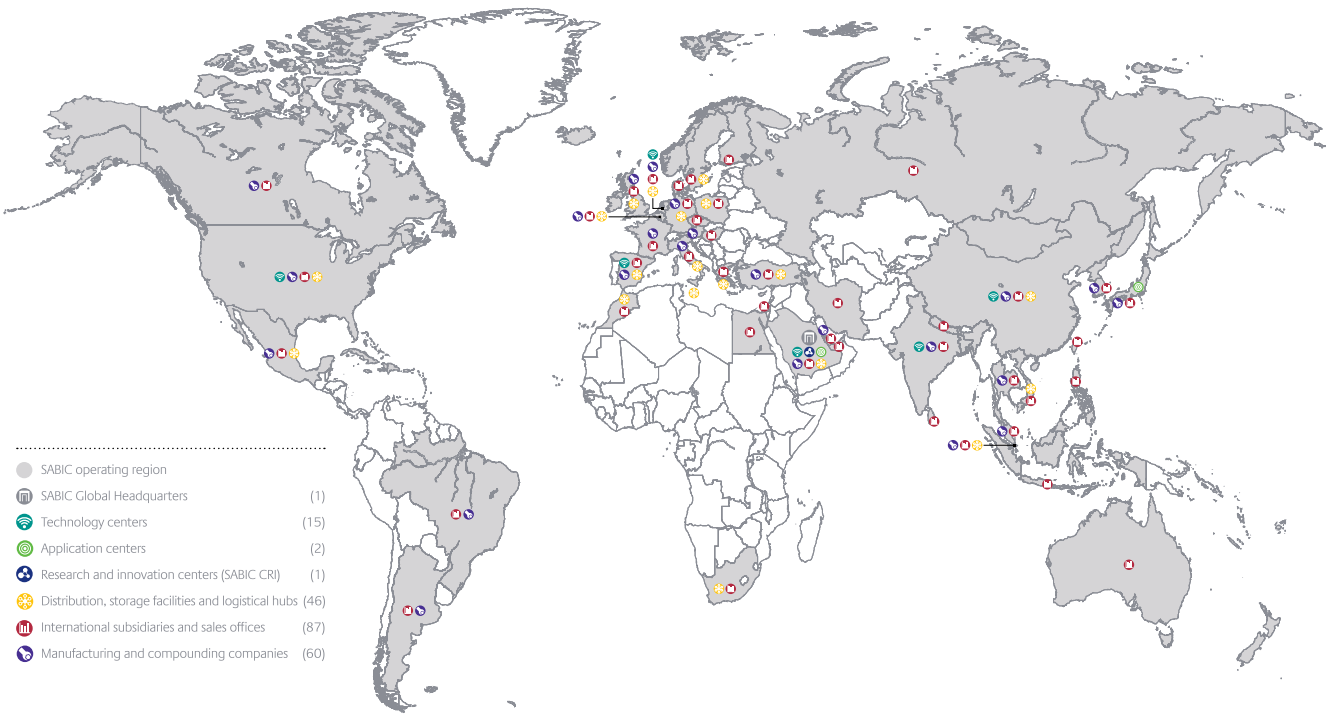
●	-	●	●	●	-	-	-	-
●	●	-	-	-	●	●	-	-
HL3 @ 2mm HL1 @ 3-4mm	-	-	-	-	-	-	-	-
-	-	-	-	-	HL3 @ 2-3mm	HL3 @ 2-3mm	-	in progress
HL3 @ 2mm	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	in progress	-
S4/SR2/ST2 @ 2-4mm	-	-	-	-	S4 / SR1 / ST2 @ 2-3mm	S4 / SR2 / ST2 @ 2-4mm		S4 / SR2 / ST2 @ 2&4mm
M2 / F1 / I3 @ 2-3mm	M2 / F3 @ 2mm	M1 / F2 @ 2-3mm	F1 / I2 @ 2-3mm	F1 / I3 @ 3mm	M1 / F2 @ 2mm M2 / F2 @ 3mm	M2 / F2 @ 2-4mm	F1 @ 2mm	M2/F2 @2-4mm (I2/F2 @2-3mm)
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
@ 1.5mm	-	-	-	-	-	-	-	-
-	-	(@3.2mm)	-	-	-	-	-	-
@ 1.5mm		(@3.2mm)	-	-	-	-	-	-
-	-	(@3.2mm)	-	-	-	-	-	-
-	-	(@3.2mm)	-	-	-	-	-	-
@ 1.5mm	@ 1.5mm	@ 0.75mm	@ 0.25mm	@ 1.5mm	@ 1.5mm	@ 2.5mm	@ 3mm	@ 1mm
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
●	●	●	●	●	-	-	●	●

			OPAQUES						TRANSPARENTS				
			ULTEM Sheet (PEI)	POLYCARBONATE & Blends FR - Transportation					POLYCARBONATE FR - Transportation				
			High Modulus meets EN45545 HL3 Ceilings & Side Walls	High Modulus Chlorine/Bromine Free	"Flame Retardent Polycarbonate Blend	High Impact FR PC Blend	High Impact FR PC Blend	High Modulus EN45545 HL2 Seats	Flame Retardant Clear Polycarbonate EN45545 Lighting	Coated Flame Retardant Polycarbonate	Optically Bright Coated Polycarbonate	Eco FR , VO, 2mm Polycarbonate	Flame retardent thin gauge film
			ULTEM™ R165G29 SHEET	LEXAN™ H6000 Sheet	LEXAN H6200M Sheet	LEXAN H6200 Sheet	LEXAN H6300 Sheet	LEXAN H6500 Sheet	LEXAN F2000 Sheet	MARGARD™ MR5FR Sheet	MARGARD™ MR5OBFR Sheet	LEXAN F2500 Sheet	LEXAN FR65 Film
Ceilings & Side Walls		CEILING	●	●	●	●	●	●	-	-	-	-	-
		WINDOW FRAME	●	●	●	●	●	●	-	-	-	-	-
		WALL CLADDING	●	●	●	●	●	●	-	-	-	-	-
		WALL DECORATION	-	-	-	-	-	-	-	-	-	-	●
		PARTITIONS	●	●	●	●	●	●	-	●	●	-	-
		DRAFT SCREENS	-	-	-	-	-	-		●	●	-	-
		OVERHEAD LUGGAGE RACKS	●	●	●	●	●	●	●	●	●	-	-
		DRIVERS DESK	●	●	●	●	●	●	-	-	-	-	-
		SUN BLIND	●	●	●	●	●	●	●	●	-	-	-
		AIR DUCTING	●	●	●	●	●	●	-	-	-	●	-
		CONTAINERS & COMPARTMENTS	●	-	-	-	-	-	-	-	-	-	-
		INTERIOR SURFACE GANGWAYS	●	●	●	●	●	●	-	-	-	-	-
		TABLES - including bottom surface	●	●	●	●	●	●	-	-	-	-	-
		ENCLOSURES FOR ELECTRICAL EQUIPTMENT	●	●	●	●	●	●	-	-	-	●	-
		PASSENGER INFO DEVICES	-	-	-	-	-	-	●	●	-	-	-
Seats & Arm Rests		SEAT BACKS - Back & Base Shell	●	●	●	●	●	●	-	-	-	-	-
		TRAY TABLES	●	●	●	●	●	●	-	-	-	-	-
		ARM RESTS	●	●	●	●	●	●	-	-	-	-	-
Lighting , Electrical & Signage		LIGHT DIFFUSERS	-	-	-	-	-	-	●	-	●	-	-
		VERTICAL COVER STRIPS - ON WALLS	-	-	-	-	-	-	●	-	●	-	-
		LAMP COVERINGS	-	-	-	-	-	-	●	-	●	-	-
		CONNECTORS & ELECTROTECHNICAL APPLICATIONS	-	-	-	-	-	-	-	-	-	-	-
		CABLE CHANNELS	-	-	-	-	-	-	-	-	-	-	-
		LIGHTING COVERING	●	●	●	●	●	●	●	-	●	-	-
SPECIFICATIONS & NORMS	Euro	EN 45545-2:2013 R1 Interior Surfaces	HL3 @ 2.6-4mm	-	-	-	-	HL2 @ 3-4mm	-	-	-	-	-
	Euro	EN 45545-2:2013 R4 Light Diffusers	-	-	-	-	-	-	HL3 @ 2-4mm	-	-	-	-
	Euro	EN 45545-2:2013 R6 Passenger Seat Shells	HL3 @ 2.6-4mm	-	-	-	-	HL2 @ 3-4mm	-	-	-	-	-
	Euro	EN 45545-2: 2013 R22 Connectors & Electrotechnical applications	-	-	-	-	-	-	-	-	-	-	-
	DE	DIN 5510-2:2009	-	-	-	S3/SR2/ST2 @3mm S4/SR2/ST2 @4mm	-	S4/SR2/ST2 @3-4mm	S4/SR2/ST2 @3-6mm	S4/SR2/ST2 @6-8mm	M2F2 @4-8mm	-	-
	FR	NF F 16-101 / -102	-	-	M1/F2 @ 3-4 mm	-	-	M1@2-4mm F1@ 3-4mm	-	●	-	-	-
	FR	Anti- Graffiti NF F 31-112 SNCF	-	-	-	-	-	-	-	-	-	-	-
	IT	UNI CEI 11170-3	-	-	-	-	-	-	Class 1A @ 2-4mm	Class 1A @ 9.5mm	-	-	-
	POL	PN-K-02511 & UIC564-2, Annex 7-11-15	-	P1(A)-R1-D2(B)-T2 @4mm	-	-	-	P1(A)-R1-A D2(B)- T2 @3mm	P1(B)-R1-A D2-B @3mm	-	-	-	-
	USA	ASTM E162 - Flame Spread Index Is	Pass	Pass	-	-	-	Pass	Pass**	Pass**	Pass**	Pass**	Pass**
	USA	ASTM E662 - Optical Smoke Density	Pass	Pass	-	-	-	Pass	Pass	Pass	Pass	Pass	Pass
	USA	ASTM E1354 - Heat Release @ 50 kW/ sq.m	Data on file	Data on file	-	-	-	Data on file	Data on file	Data on file	Data on file	Data on file	Data on file
	INT	Smoke Toxicity – BSS 7239, SMP800C	Pass	Pass	Pass	Pass	-	Pass	Pass	Pass	Pass	Pass	Pass
	INT	UL-94 V0	-	@1.5mm	-	-	-	@3mm (5VA)	@ 3mm	@ 3mm	-	@ 2mm	@ 0.23mm
	INT	UIC 564-2 App 11 & 15	-	-	-	-	Class B @ 3-4mm	-	-	-	-	-	-
	RUS	GOST 12.1.044-89 (ISO4589-84)	--	-	-	-	-	FR(TG) T2 SLOW D3	-	-	-	-	-
	DE	ECO FR - Chlorine & Bromine Free	●	●	-	●	-	●	-	-	-	●	-

** Meets ASTM E162 flamespread index of 100 or less

GLOBAL COMPANY WITH LOCAL SERVICES & SUPPLY



SABIC IS COMMITTED TO ITS CUSTOMERS AROUND THE WORLD WITH A PORTFOLIO OF SPECIALTY FILM & SHEET MATERIALS, APPLICATION SUPPORT AND WORLDWIDE SERVICES.

Specialty Film & Sheet business operates a worldwide network of sales, distribution, research, manufacturing and technical service facilities. With all twelve ISO certified manufacturing sites across the USA, Canada, the Netherlands, Italy, Austria, China, Malaysia, India and Brazil, the company serves customers around the world in a broad spectrum of industries and applications. As a business unit of SABIC, Specialty Film & Sheet benefits from global cross-business resources and expertise. From its network of technical centers in in the United States, the Netherlands, Saudi Arabia, China, Japan, Korea and India, the company provides a variety of services. These include hands-on engineering and technical support that extends from right material selection to characterization of mechanical, thermal, UV/heat aging data, advanced light measurements, optical modeling to part design and installation guidelines. The company also offers a local team, complete supply chain and distribution organization to ensure a reliable source of materials to its customers wherever their manufacturing site is located.

SABIC ranks among the world's top petrochemical companies, and is a global market leader in the production of polyethylene, polypropylene, advanced thermoplastics, glycols, methanol and fertilizers. SABIC operates in more than 40 countries across the world with 33,000 employees worldwide. It has significant research resources with 18 dedicated technology and innovation facilities in Saudi Arabia, the USA, the Netherlands, Spain, India and China.

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