COMPACTSHIELD

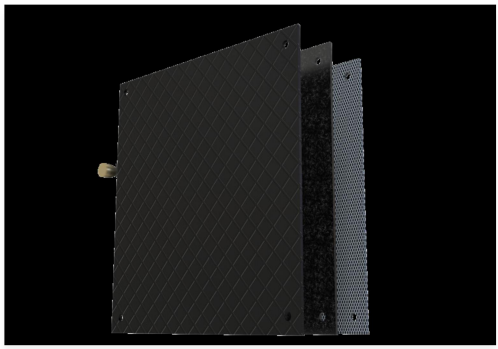
BALLISTIC DECORATIVE COMPACT

DECORATIVE SOLUTIONS FOR
PRESERVING LIFE

INTRODUCTION

A ballistic decorative compact using composite materials based on nanotechnology, advanced fibrous materials and high energy absorption structures, resulting in a lightweight and thin compact for ballistic protection.

CompactShield materials were tested under the U.S. National Institute of Justice's Standard for Ballistic Resistant Protective Materials, NIJ 0108.01 (1985), for different levels (IIIA, III, and IV), stopping different caliber shots without piercing the material, and keeping the ammunition blocked inside it. The validation tests were conducted in a certified independent ballistic laboratory. For military applications, the standard used is NATO STANAG 4569. CompactShield is available in several configurations, considering its weight, thickness and level of protection.



COMPANY APPROACH

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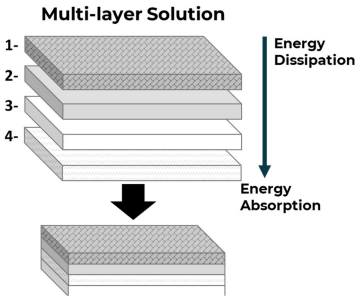
CompactShield is a solution suited for the armored transportation industries, including land vehicles, aviation, and naval applications. It is designed to be a customized solution, evaluated, and tailored to meet the client's specific needs in terms of protection level, weight, thickness and other characteristics. It can be used alone or in combination with other materials such as armored steel or ceramics. CompactShield's lightweight and durable spall liners are specifically designed to protect vehicle crews against projectiles and secondary fragments (spall).



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CompactShield is designed using a selection of different materials depending on the characteristics required by the client. These materials are combined in a carefully studied manner to enhance the intrinsic properties of each raw material. The raw materials are then pressed at high pressure and temperature to create a compact material tailored for specific applications and capable of withstanding defined environments.

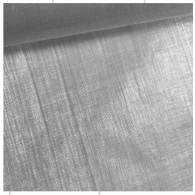
The composite material used in ballistic plates exhibits thermal, chemical and mechanical resistance, enabling it to withstand extreme conditions while maintaining its structural integrity, providing reliable protection even in demanding environments.

MATERIALS

Depending on the specific application, materials like carbon fiber, aramid, UHMWPE (Ultra-High-Molecular-Weight Polyethylene) and glass can be utilized in combination to offer multi-scale solutions for various protective needs.

Carbon Fiber

Aramid



UHMWPE

Glass Fiber

Ultra-high-molecular-weight polyethylene (UHMWPE), a remarkable high-performance fiber, has emerged as a groundbreaking innovation in the materials industry. Discovered in the 1960s, this UHMWPE offers exceptional strength while maintaining an incredibly lightweight profile.

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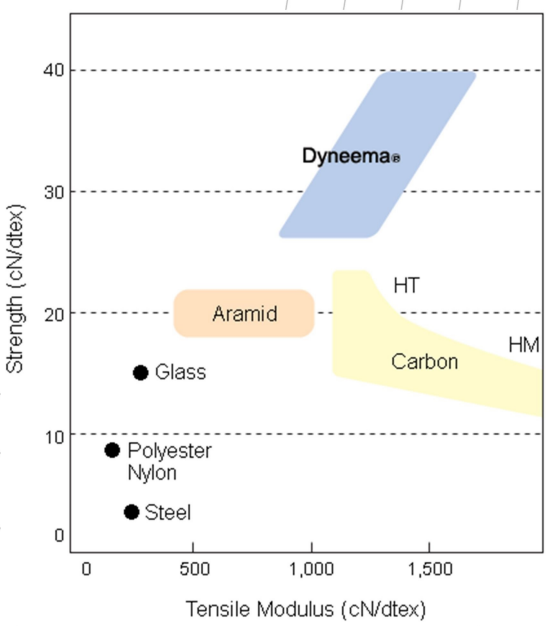
Strength and stiffness

UHMWPE is a high-strength polyethylene known for its excellent stiffness and tensile strength. Compared to aramid, such as kevlar fiber, UHMWPE is up to 15 times stronger. Even when compared to carbon, UHMWPE can offer comparable strength, making it a popular choice in applications where robustness is essential.



Lightweight

One of the primary advantages of UHMWPE is its lightweight nature. While aramid and carbon are notoriously light in their own right, UHMWPE is even lighter, allowing for the manufacture of thin and lightweight products without compromising strength and durability.

Flexibility and durability

UHMWPE is known for its exceptional flexibility and durability. Unlike carbon, which is rigid and can break under extreme stresses, UHMWPE has a unique ability to absorb impacts and bend without losing its mechanical properties.

Moisture and UV resistance

While Aramid can lose its strength when exposed to damp environments, and Carbon composites may degrade with prolonged UV exposure, UHMWPE is resistant to both conditions.

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FINISH

CompactShield presents a cutting-edge solution that goes beyond conventional expectations.

CompactShield is melamine-coated providing UV and scratch resistance. These panels are phenolic which means they are a type of composite material that consists of multiple layers of cellulose fibers impregnated with phenolic resin. These panels are widely used in various industries due to their exceptional properties, including high strength, durability and resistance to moisture and chemicals. One of the key features that enhance the performance of phenolic panels is the melamine coating. Melamine is a synthetic resin that is known for its excellent protective qualities. When applied to the phenolic panel's surface, it forms a strong and resilient layer that provides several benefits:


Low-volume production is possible


Long life


Fire resistance


Easy cleaning


UV protection


Waterproofing

UV resistance: Melamine-coated phenolic panels are highly resistant to damage caused by exposure to UV rays from the sun. This resistance ensures that the panels retain their color and structural integrity over extended periods of outdoor use.

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Scratch resistance: The melamine coating enhances the surface hardness of the phenolic panels making them more resistant to scratches and abrasions.

Chemical resistance: Phenolic panels with melamine coating exhibit excellent resistance to a wide range of chemicals, including solvents, acids and alkalis.

Easy maintenance: The protective melamine coating simplifies maintenance and cleaning procedures. The panels can be easily wiped clean and they resist stains, reducing the need for extensive upkeep.

Aesthetic appeal: Melamine-coated phenolic panels are available in a variety of finishes and colors offering architects and designers the freedom to create visually appealing and versatile spaces. The finishes can mimic natural materials like wood or stone, allowing for aesthetically pleasing applications.

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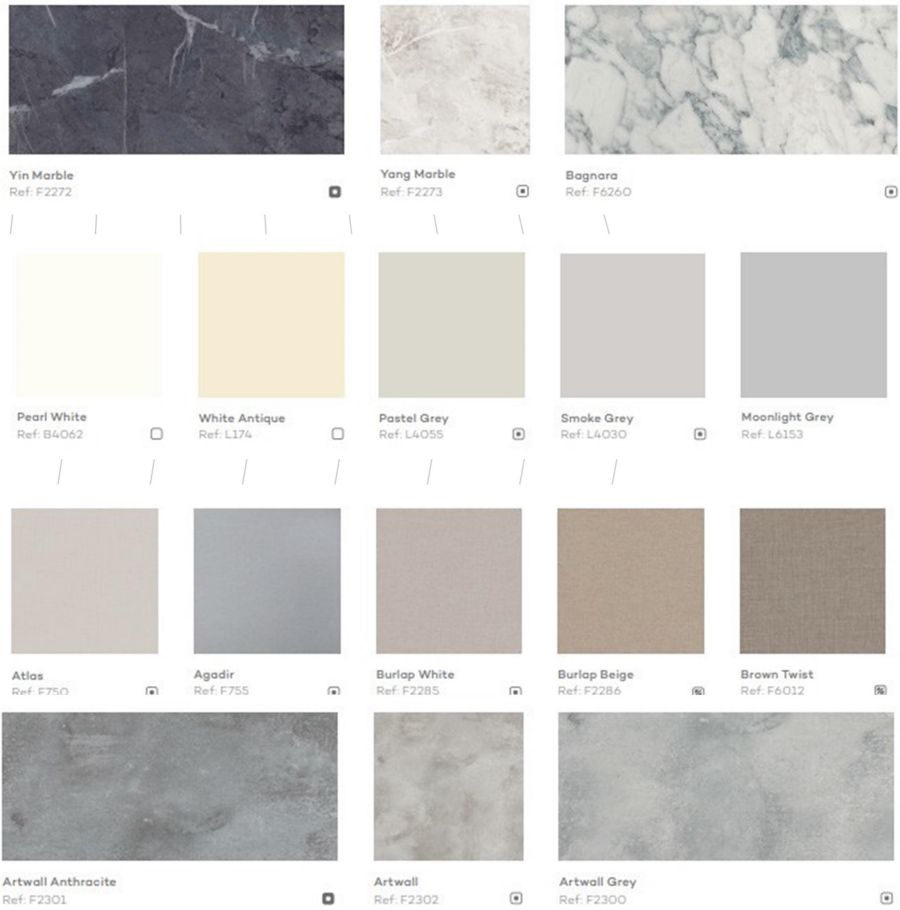
AESTHETIC APPEAL

Its unique personalized finish opens up a realm of possibilities for showcasing finishes on both sides. **CompactShield** offers unparalleled flexibility allowing optimization tailored to specific needs. The innovation behind **CompactShield** ensures a versatile and customizable experience, revolutionizing the way we approach finish and design.



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CompactShield is suitable for use in buildings and interior design, including modular and lightweight walls, front desks, screens, divisions, and partitions. It can also be used in furniture such as tables, desks or whiteboards that can serve as protection in case of immediate need in schools, banks, government and military buildings, hospitals and healthcare facilities, hotels and restaurants, offices, shops and other public or residential spaces.

Surforma offers a wide range of decorative variations of **CompactShield** with the ultimate goal of satisfying the requirements of interior designers and architects. It can also be provided without any decorative surface for inclusion inside a wall structure.

NIJ SOLUTIONS

NIJ 0108.01 is a ballistic standard developed by the National Institute of Justice (NIJ) in the United States. The NIJ is a research, development and evaluation agency of the U.S. Department of Justice and is responsible for setting standards for body armor and ballistic protection.

The protection levels in NIJ 0108.01 are designated as **Level I**, **Level II**, **Level III**, and **Level IV**. These levels represent increasing levels of ballistic protection, with Level I providing the least protection and Level IV offering the highest protection against more powerful ammunition.

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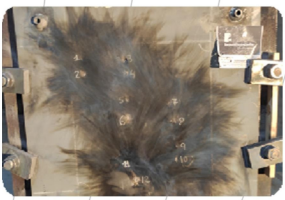
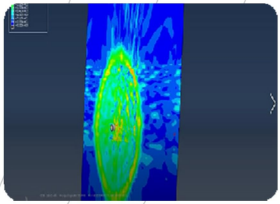
CompactShield STANDARD			
NIJ 0108.01	**Ammo**	**Mass (m^2/ kg)**	**Thickness (mm)**
CompactShield Soft IIIA	44 Magnum Lead SWC (426 m/s) 9mm FMJ (426 m/s)	26	13 mm
CompactShield IIIA	44 Magnum Lead SWC (426 m/s) 9mm FMJ (426 m/s)	21	11 mm
CompactShield III	7.62 mm (838 m/s) 308 Winchester FMJ (838 m/s)	59	28 mm

Premium solutions are recognized for providing a level of protection equivalent to the standard but with lower density, achieved through an intensive study and selection of materials.

CompactShield PLUS			
NIJ 0108.01	**Ammo**	**Mass (m^2/ kg)**	**Thickness (mm)**
CompactShield Soft Plus	44 Magnum Lead SWC (426 m/s) 9mm FMJ (426 m/s)	7.5	8 mm
CompactShield III Plus	7.62 mm (838 m/s) 308 Winchester FMJ (838 m/s)	19	20 mm
CompactShield IV Plus	30-96 AP (838 m/s)	59	20 mm + 9 mm (alumina)



Steel after shot
Impact face



Prediction of ballistic behaviour through FEM method

Composite panel after shot
Back face

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STANAG SOLUTIONS

STANAG 4569 is a **NATO** standard that establishes protection levels for occupants of logistic and light armored vehicles. This standard is crucial in ensuring the safety and survivability of military personnel operating in various combat scenarios.

STANAG 4569 also defines specific ballistic and blast protection levels based on threat classifications, such as small arms fire, artillery fragments and mine explosions. These protection levels are categorized into different classes with each class representing a specific level of protection. The higher the class number, the greater the protection provided.

Protection levels for occupants of logistic and light armored vehicles			
STANAG 4569 Level	**Ammo**	**Mass (m^2/kg)**	**Thickness (mm)**
1	7.62 mm x 51 NATO ball (833 m/s)	48	9 mm **CompactShield** + 5 mm Steel A500
	5.56 mm x 45 NATO SS109 (900 m/s)	19	20 mm **Compact-Shield** (III Plus)
2	7.62 mm x 39 API BZ (695 m/s)	58	20 mm **Compact-Shield** + 5mm Steel
3	7.62 mm x 54R B32 API (854 m/s)	76	21 mm **CompactShield** + 7 mm Steel
	7.62 mm x 51 AP (WC core) (930 m/s)		
4	14.5 mm x 114 API/B32 (911 m/s)	84	21 mm **CompactShield** + 7 mm Steel + Ceram-ics

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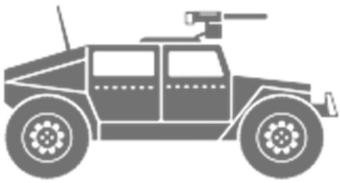
APPLICATIONS

Spall Liner



CompactShield can be utilized as a spall liner when installed in the crew compartment of a vehicle. Its purpose is to prevent fragments (spall) generated during an impact from being propelled towards the occupants of the vehicle. The spall liner can serve both as an additional safety measure alongside the armor system and as an integral component of the protection system, capitalizing on the exceptional energy-absorbing properties of the fibers.

When provided as panels, the spall liner appears as a solid composite plate, consolidated through a customized resin system to meet operational and environmental requirements. This imparts notable rigidity and durability to the plates. The panels integrate cutouts for mounting and packaging interfaces to better conform to the vehicle.

Add-on Armor

Add-on armor can effectively enhance the level of protection for existing and new vehicles. Through composite technology, the added weight to the vehicle can be reduced enabling the implementation of high-level protection solutions even for lightweight vehicles without compromising mobility.

Add-on armor systems are customized to address specific

threat requirements, incorporating different types of materials into the armor solution and considering any existing base armor such as the steel or aluminum structure of the vehicle hull. This makes all armor solutions provided unique to the specific application and scenario. **CompactShield** is dedicated to developing lightweight and durable armor solutions to counter ballistic threats and improvised explosive devices (IEDs) encountered in the current battlefield.

Structural Armor

Structural armor solutions are meticulously designed to counter threats beyond the scope of mobility. This dual flexibility empowers designers to seamlessly incorporate armor panels as fundamental construction elements in shelters, buildings and even individual components like doors. Furthermore, this innovative approach not only enhances security but also offers the advantage of seamless integration, ensuring a perfect harmony between protective functionality and architectural design.

With the capability to adapt and customize structural armor solutions to meet the specific needs of each application, **CompactShield** is at the forefront of creating secure and resilient environments where protection and aesthetics effectively and innovatively intertwine.