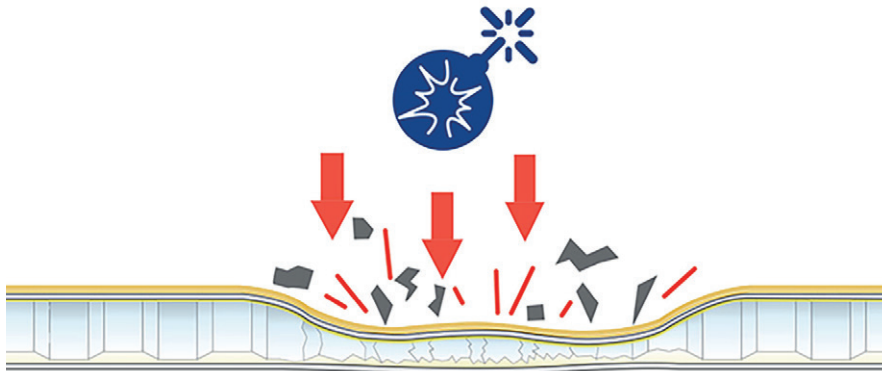


BALLISTIC & DEFENCE



BALLISTIC & DEFENCE

Honeycomb panels have an extraordinary potential for ballistic purposes as they can absorb strong shockwaves, contain material and are lightweight and transportable.



Multiple materials can be used depending by the needs of the costumer:

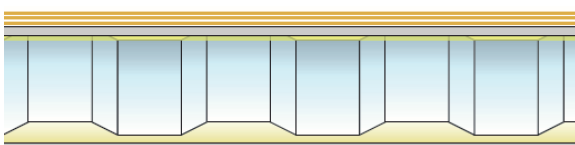
- polypropylene is a rigid material that provides thermal insulation and has a good behaviour to water and humidity;
- Various textiles can boost the properties of panels, para Aramidic textile, for example, prevents perforation of the panel;
- a dense aluminium structure absorbs the impact, thanks to a plastic deformation of the material.

APPLICATIONS

1-	Project:	Parking lot above Roma Termini railway station
	Year:	2019
	Location:	Italy
	mq:	15.000
	Explosive:	TNT
	Product:	Compocel Al + Para Aramidic Textile, ballistic certificate

The system was studied to be used only in the lowest floor and, together with the bearing structure, it should be able to withstand the weight of the collapsed upper levels.

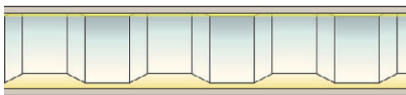
Below it's displayed the layering of the system.



- Para-Aramidic textile H: classified
- Compocel AL panel H: classified

2- Project: **Shelter for electronic equipment**
 Year: 2019- ongoing
 Location: Israel
 Product: Compocel ALP

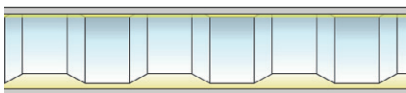
These panels are being produced as part of a system to be used in Israel as a military mobile shelter for electronic equipment. Polypropylene was chosen for its lightness and its characteristic as thermal insulator. Pared with aluminium sheets the product is able to carry at least the 500 Kg of equipment.



- Aluminium skin H: classified
- Polypropylene honeycomb H: classified
- Aluminium skin H: classified

3- Progetto **Armoured car underside**
 Anno 2018
 Luogo Egypt
 Prodotto Compocel AL

High density aluminium panels used as car floor I.E.D. shield (improvised explosive devices). Special alloys and densities, pared with the right dimensioning, are able to absorb the power of a close-up detonation.



- Aluminium skin alloy 5754 H: classified
- Aluminium honeycomb H: classified
- Aluminium skin alloy 5754 H: classified

4- Project: **Heat deflector for missile launching vehicles**
 Year: 2004-2005
 Location: Italy
 Product: Compocel AL+ Para Aramidic & Carbon textile

A combination of carbon and Aramidic fibres, together with the use of particular resins, help protecting the vehicle from the heat of missiles shot from the back. The propulsion is absorbed by a medium density honeycomb placed underneath the fabric.



- Para-Aramidic & Carbon textile**
- Aluminium skin H: classified
 - Aluminium honeycomb H: classified
 - Aluminium skin H: classified

SANDWICH PANEL COMPOCEL AL

Technical data sheet for standard panels (dimensions, materials and special finishes on request)							
panel size mm	standard 1250 x 2500 / 1250 x 3000 / 1500 x 3000; On request up to 2000 x 7000						
thickness' tolerance mm	± 0,3						
dimension's tolerance mm	± 30						
planarity *** mm/m	+/-1						
skins' thickness mm	from 0,5 to 5,0						
skin alluminium alloy	1000 series, 3000 series, 5000 series						
honeycomb alluminium alloy	3000 series, 5000 series						
thickness of honeycomb foil µm	50 and 70						
diameter of honeycomb Ø = mm	from 3 to 19						
honeycomb density Kg/m ³	from 20 to 163						
adhesive	two-components polyurethane adhesive/thermoplastic film/ epoxy film/ two-components epoxy adhesive						
skin characteristics	rough/primer/polyester/PVDF/ anodised						
type panel (some examples) - Panel Thickness mm	6	10	15	10	15	20	25
type panel (some examples) - Skin Thickness mm	0,5 + 0,5			1,0 + 1,0			
panel weight ‡ Kg/m ²	3,8	4,0	4,3	6,7	7,0	7,3	7,6
compressive stabilised strength MPa ** ‡ ASTM C 365-365 M Mpa	2,9						
maximum load ** ‡ ASTM C 393 † N	190	340	520	600	1.000	1.350	1.700
deflection at maximum load ‡ ASTM C 393 † mm	14	8	6	8	6	4	3
skins E Elastic Modulus Mpa	68.000 - 70.000						
moment of inertia I ** mm ⁴ /m	7.600	22.000	52.000	40.000	98.000	181.000	288.000
average resistance to peeling ** ‡ ASTM D1781-98 (2012)	> 280 N/76 mm or 40 Nmm/mm						
maximum service temperature ** °C	- 40 / + 60; on request + 80 / + 100 / + 150						
thermal expansion coefficient ** °C ⁻¹	2,3 x 10 ⁻⁵						

** Tested by Internal Laboratory

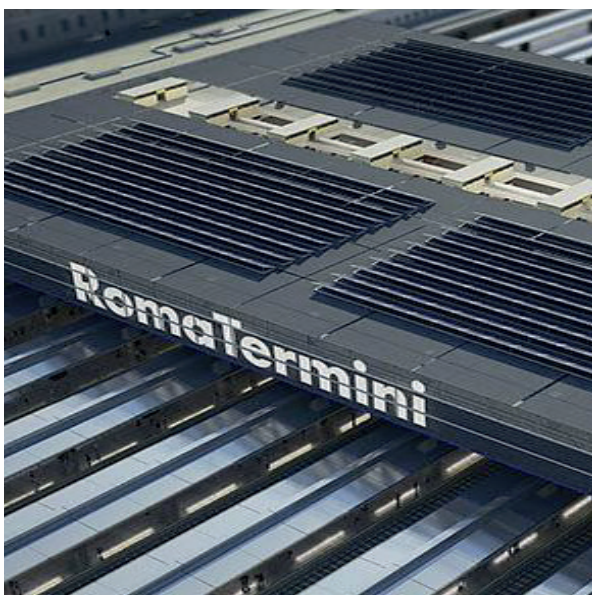
*** Approximate value

† Sample dimension with 4 support points (L, W) 540x50mm;
distance among the lower points 500mm, distance among the upper points 250mm

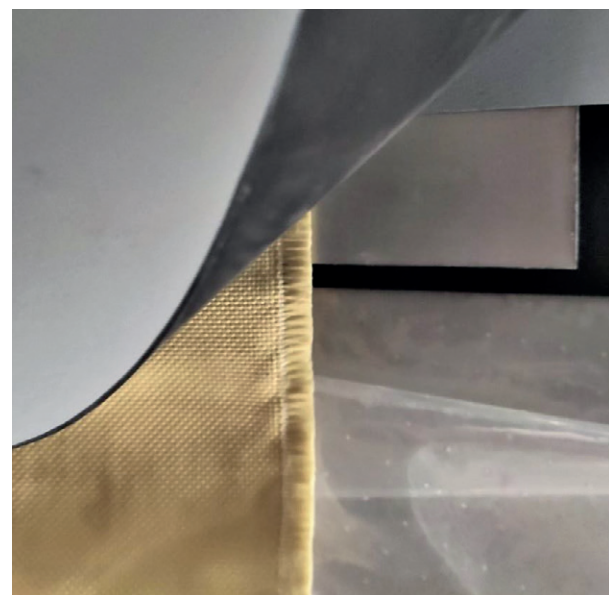
‡ Values for a panel with a honeycomb core of Ø6 56kg/m³ (Ø 1/4")



Roma Termini: exterior view



Rendering of Rome Termini from above



System stratigraphy

TYPE 101

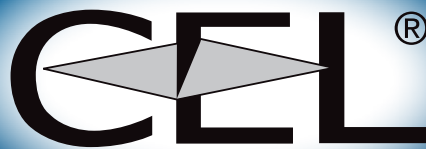
PROPERTIES	SPECIFICATION	STANDARD
Material	Kevlar® 29 3300 dtex	Uni 9275:1988
Fabric construction (ends/picks per cm)	6,7 X 6,7 ± 0,3	Uni en 1049-2:1966
Areal weight	460 G/m ² ± 4%	Uni en 12127:1999
Fabric thickness	630 µm ± 15%	Uni en iso 5084:1998
Weave	Plain	Uni 8099:1980
Tensile strength (warp/welf)	> 3200 N/cm	Uni en iso 13934-1:2000
Finishing	Loomstate	Uni en 24920:1993 Aatcc-118:1989
Safety information	See SDS en007 para-aramid fabric	
Storage	Keep the material in the original packaging in clean and dry place	
Notes	Mechanical fiber properties of kevlar® 29 3300 dtex Breacking tenacity: 2910 mpa (nominal) Modulus: 72,5 gpa (nominal)	
<i>This information is indicative of our present standard production: it might be changed and does't confirm contractual liabilities</i>		

T 750

PROPERTIES	SPECIFICATION	STANDARD
Material	Twaron® 29 3360 dtex - Type 1000	UNI 9275:1988
Fabric construction (ends/picks per cm)	6,7 x 6,7 ± 0,3	UNI EN 1049-2:1966
Areal weight	460 g/m ² ± 4%	UNI EN 12127:1999
Fabric thickness	650 µm ± 15%	UNI EN ISO 5084:1998
Weave	PLAIN	UNI 8099:1980
Tensile strength (warp/ welf)	Warp > 3200 N/cm - Welf > 3480 N/cm	UNI EN ISO 13934-1:2000
Finishing	Loomstate	UNI EN 24920:1993 AATCC-118:1989
Safety information	See SDS EN007 Para-Aramid fabric	
Storage	Keep the material in the original packaging in clean and dry place	
Notes	Mechanical Fiber Properties of Tawron® 3360 dtex Type 1000 Breacking Tenacity: 2870 MPa (nominal) Modulus: 67,0 GPa (nominal)	
<i>This information is indicative of our present standard production: it might be changed and does't confirm contractual liabilities</i>		

OTHER POSSIBLE APPLICATIONS

Below are two examples of a light weight safe module, easy and fast to assemble. The system was designed to be permanently installed in existing buildings in the event of an explosion to absorb shock waves and collapses caused by a nearby explosion.



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SISTEMA DI GESTIONE
CERTIFICATO
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9001:2015
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