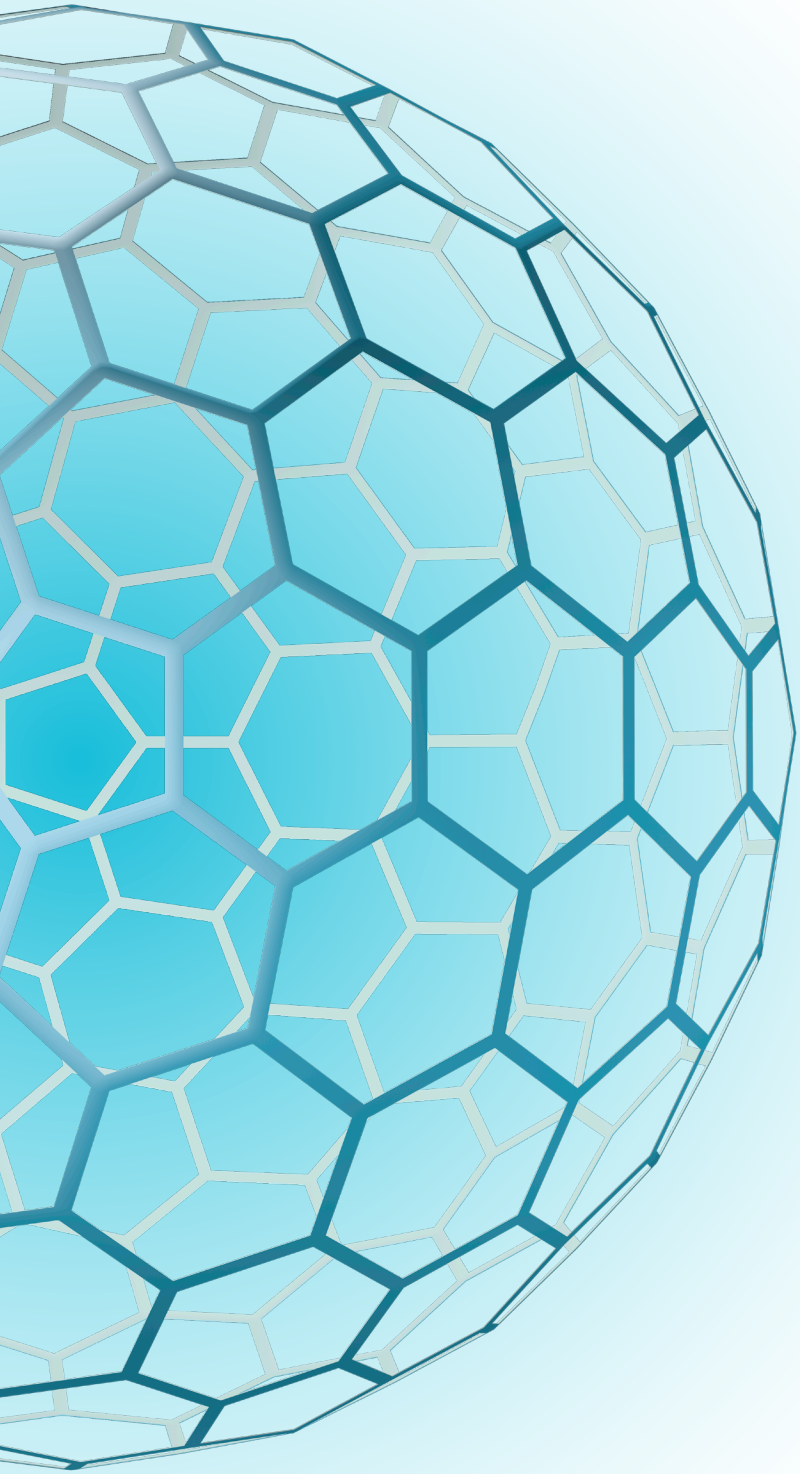


# A WORLD OF APPLICATIONS

COREX
HONEYCOMB

Corex Honeycomb provides high quality aluminium honeycomb to industries worldwide and offers a wealth of expertise together with a global distribution network.

## RAIL

Doors | Floors | Galley and Sanitary Modules | Energy Absorbers | Furniture | Walls | Dividing Panels

## MARINE

Interior Panels and Partitions | Furniture | Ceiling and Flooring Panels | Hulls and Bulkheads | Doors

## CONSTRUCTION

Building Facades | Ceiling and Flooring Panels | Clean Rooms | Furniture | Architecture

## INDUSTRIAL

Heating | Ventilation | Flow Straightening (Air & Liquid) | Light Diffusers | Electromagnetic Shielding | Sacrificial Beds (Laser and Water jet)

## AUTOMOTIVE

Motorsport | Commercial Vehicles | Military Vehicles | Impact Energy Absorbers

## WIND TURBINES

Rotor Blades | Turbine Cladding

The aluminium honeycomb structure is ideal when placed between two skins to form a lightweight floor built to withstand long-term use, as seen in the flooring of The London Eye, a project with TRB Lightweight Structures Ltd.

# A WORLD OF APPLICATIONS

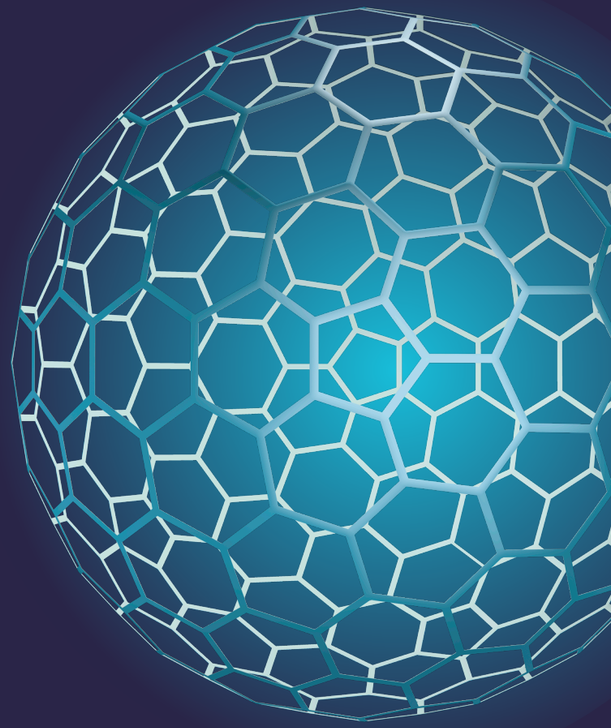
**We are led by a customer-focused and professional team, committed to finding the perfect solution to your project. Our dedicated Engineering and Product Development Team and onsite production and testing facilities can fulfil your project needs.**

The two principal characteristics of aluminium honeycomb – high strength coupled with lightweight mass – make it suitable for a world of applications.

Aluminium honeycomb is designed to sit between two skins to create a sandwich panel. In creating distance between these two skins and preventing them from moving a huge mechanical advantage is gained in the resulting rigidity of the panel, but with minimal increase in weight.

We pride ourselves in seeking solutions collaboratively with our customers, working with a wide range of businesses in the UK and globally.

Corex Honeycomb has been involved in many exciting projects including: The London Eye, Heathrow Personal Rapid Transit Pods and the Hitachi Class 800 train, all working with TRB Lightweight Structures; and the entrance of The Berkeley Hotel working with Bellapart. See our website for more details.



# RAIL

Doors | Floors | Galley and Sanitary Modules | Energy Absorbers | Furniture | Walls | Dividing Panels

Corex Honeycomb has been a trusted aluminium honeycomb provider to the composites industry for 30 years, with great experience in the European rail sector. When used in a bonded composite sandwich panel the high strength-to-weight ratio and corrosion resistance provide the perfect application for doors, floors, furniture, galley and sanitary modules (as shown) and interior panel partitions.

Corex Honeycomb collaborated with TRB Lightweight Structures, providing the core material used to develop the energy efficient Personal Rapid Transit Pod at London Heathrow Airport. The PRT (Personal Rapid Transit) Pod is an ultra-lightweight, electric, unmanned vehicle connecting Heathrow's business car park with Terminal 5 via a guideway. TRB Lightweight Structures produced the chassis and floor of the pod utilising Corex aluminium honeycomb to create a lightweight, high-strength composite panel.

Corex aluminium honeycomb is used by Satys, a French industrial group in their Rail Interiors division, as the core material for their train floors, doors and other rail-related products. Corex Honeycomb has been supplying this division with aluminium honeycomb for over 10 years.

# MARINE

Interior Panels and Partitions | Furniture | Ceiling and Flooring Panels | Hulls and Bulkheads | Doors

The high strength-to-weight ratio and corrosion resistance of Corex aluminium honeycomb makes it the ideal material to be used when developing Marine applications, including the construction of doors, floors, wall partitions and furniture.

Corex Honeycomb has been awarded the Wheelmark and United States Coastguard Certification. By complying with the International Convention for the Safety of Life at Sea 1974 and Smoke and Toxicity Test to IMO Resolution MSC 61(67), our aluminium honeycomb is suitable for use on board any European or American marine vessel. We are the ideal partner to collaborate on your marine project as we have invested in the relevant certification to support our long-standing customers.

# CONSTRUCTION

Building Facades | Ceiling and Flooring Panels | Clean Rooms | Furniture | Architecture

Corex Honeycomb is a renowned supplier of aluminium honeycomb within the construction industry. The characteristics of aluminium honeycomb make this the material of choice when manufacturing decorative or structural sandwich panels for building facades, ceilings, floors or clean rooms.

Our extensive core expertise within the construction industry has been utilised alongside various projects worldwide.

In a project with PSP UK, we provided the aluminium honeycomb used within the rainscreen system façade of Lancing College (see photo). This system is designed to offer good drainage and ventilation in the cavity while having rainscreen qualities.

When used in the entrance of The Berkeley Hotel in Knightsbridge, Corex aluminium honeycomb was placed between two sheets of glass to form a canopy, supported by sixteen 9m-long carbon fibre beams. The result is spectacular, as the sun can shine through the glass and is diffused by the honeycomb cell shaped structure. This project was a collaboration with the manufacturer Bellapart and the architects Rogers Stirk Harbour + Partners.

**Cleanrooms have a controlled level of contamination and are typically used in the manufacturing of pharmaceutical products or scientific research. Working with Gilcrest Manufacturing we provide our aluminium honeycomb for their cleanroom floor and wall panels (as shown), chosen for its excellent strength to weight ratio and its fire retardancy properties. Aluminium honeycomb does not shed fibres and has zero emissions, making it suitable for the cleanroom environment, which must maintain extremely low levels of airborne particles.**

# INDUSTRIAL

Heating | Ventilation | Flow Straightening (Air & Liquid) | Light Diffusers | Electromagnetic Shielding | Sacrificial Beds (Laser & Water jet)

Aluminium honeycomb is suited for use in a range of specialised applications including flow straightening, shielding and sacrificial beds. Corex Honeycomb offers a material that does not significantly alter the weight of applied product, whilst adding strength and rigidity.

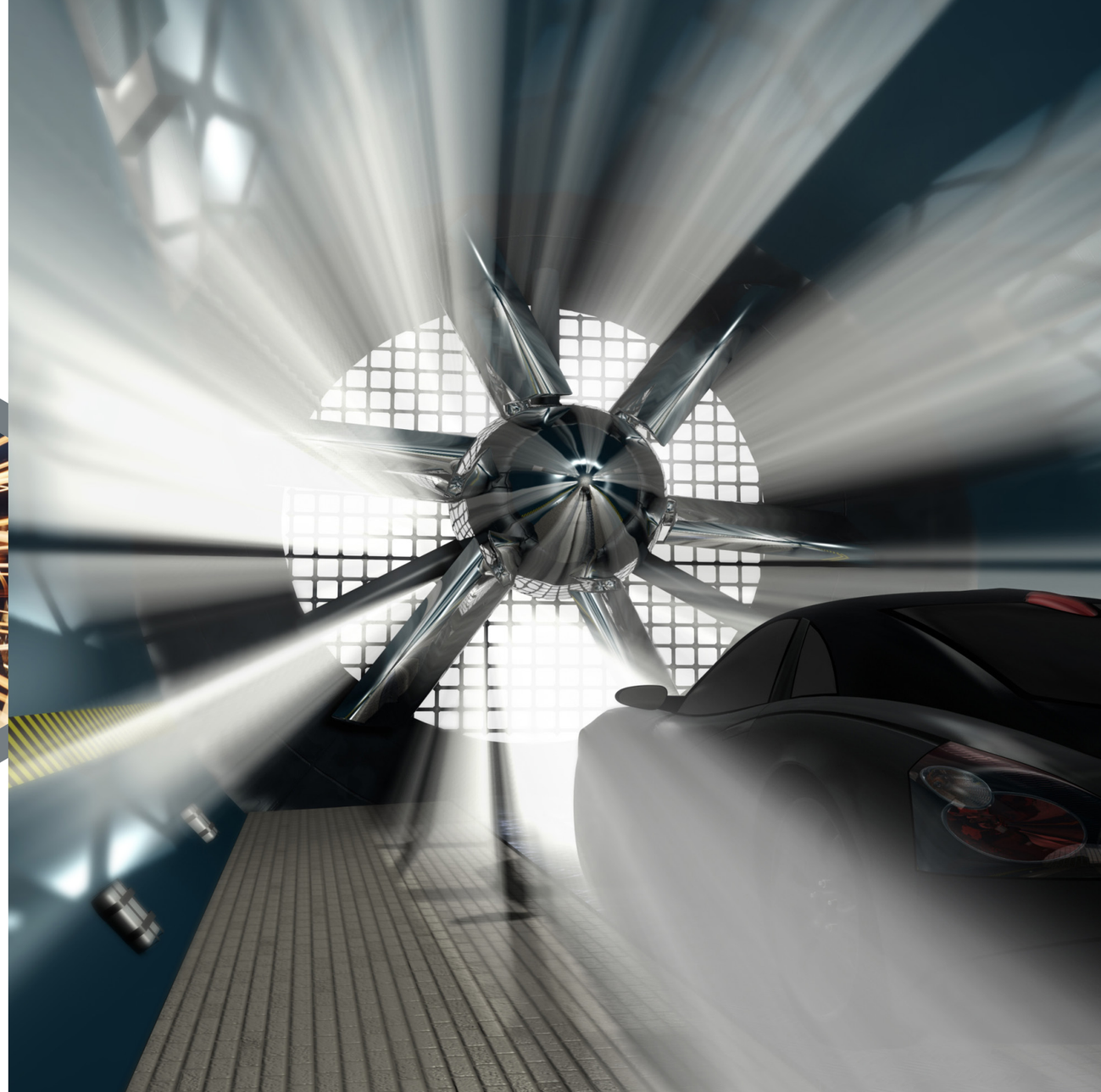
Corex aluminium honeycomb is used in applications for straightening, directing and filtering air, liquid and lightflow. The open cell structure allows maximum flow with minimal resistance.

Aluminium honeycomb is used as a flow straightener in ventilation panels and for wind tunnels. The ventilation panels can be used in electronic enclosures where good air flow is required. In wind tunnels, the air is made to move past a fixed object in a tubular passage, using a powerful fan with aluminium honeycomb directing its flow. The test object is instrumented with sensors to measure aerodynamic characteristics.

A light diffuser, when placed in the path of a source of light will soften the illumination effect, with the honeycomb structure directing and filtering the light. In photography this effect is used to eradicate harsh light and hard shadows.

When used as a bed for water jet and laser cutting (as shown), the material lies flat during the cutting process, supported by the aluminium honeycomb. Residue builds up on the bed over time, requiring it to be replaced regularly to prevent contamination.

Electromagnetic shielding is the practice of surrounding electronics and cables with conductive or magnetic materials to guard against incoming or outgoing emissions of electromagnetic frequencies.



# AUTOMOTIVE

Motorsports | Commercial Vehicles | Military Vehicles | Impact Energy Absorbers

Corex aluminium honeycomb is suitable for use in a variety of automotive applications including military vehicles, cars, buses, commercial vehicles, caravans and motorsports, including Formula 1and touring cars.

Within this sector our aluminium honeycomb is applied to interior and body panels, spoilers, floor, chassis components, wings, diffusers and energy absorbers. Its lightweight capabilities and high strength reduces the vehicle weight and fuel consumption, which enhances performance whilst enabling the chassis to retain its strength and rigidity.

As a sponsor of Formula Student Racing for many years we have supported various university racing teams, including Bath, Cambridge, Coventry and Wisconsin (USA). The team we currently sponsor is Oxford Brookes Racing, who use Corex aluminium honeycomb in the chassis of their electric and petrol racing car. The Formula Student competition challenges students to design and build a single seat racing car alongside a business concept and cost analysis. The teams compete annually at the Silverstone race track in the UK.

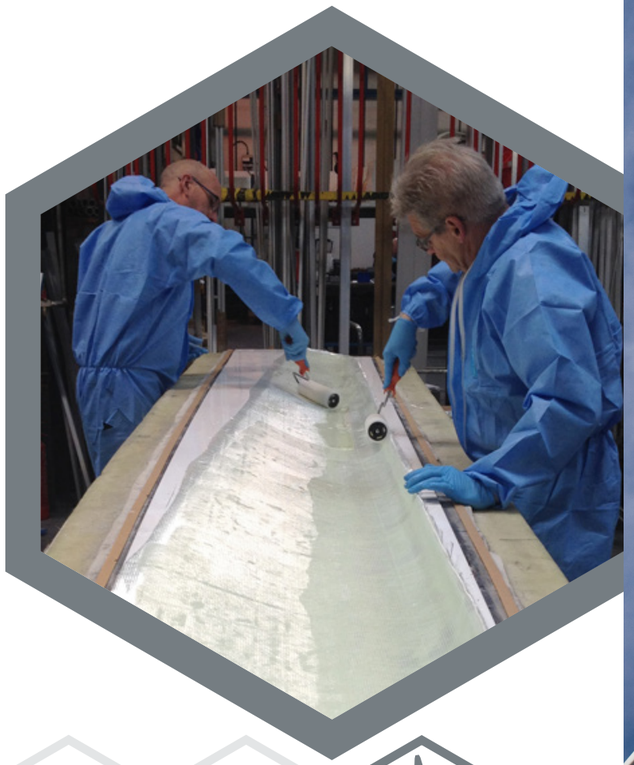
Aluminium honeycomb is also used in military vehicles, like the Panther Command Vehicle, and others which incorporate Active Mine Protection technologies. Its main use is in the flooring to improve the energy absorption, whilst adding minimal weight. We have worked with Advanced Blast and Ballistic Systems (ABBS) who have developed systems for protecting armoured vehicles from mines and Improvised Explosive Devises blasts.

# WIND TURBINES

Rotor Blades | Turbine Cladding

Clean and sustainable energy development is an area Corex Honeycomb passionately believes in. The composite technology employed in our aluminium honeycomb delivers a core material that combines high strength with low weight, highly desirable in the development of wind turbines, rotor blades and turbine core.

Corex Honeycomb and TWI LTD worked together on an EU funded project to develop an 'Embedded Early Failure Crack Detention Sensor'. Corex Honeycomb manufactured the rotor blade and TWI provided the sensor with the two sections being bonded together on site. Our aluminium honeycomb was used inside the turbine's shell due its high rigidity-to-weight ratio and its density being unaffected by changing environmental conditions.



# QUALITY

## STANDARDS

Achieving and maintaining the highest quality standards in all we do, is an objective of paramount importance to Corex Honeycomb. To consistently achieve excellence we adhere to strict regulations and client requirements regarding quality, achieving total customer satisfaction at every level of our service.

The company has also been granted the Wheelmark and United States Coastguard Certification. We are committed to continuously improving our quality management system and ensuring that it meets the requirements of ISO 9001:2015. This framework helps us to control our processes in order to achieve objectives including quality, schedule and cost performance.

bsi. ISO 9001 Quality Management | ISO 14001 Environmental Management | AS/EN 9100 Series Aerospace

FM 600774 EMS 593626 FM 78320

# CORPORATE RESPONSIBILITY

## HEALTH AND SAFETY

It is our duty to provide all our employees with a safe working environment. Through frequent training we ensure that our staff are constantly up-to-date with the latest health and safety regulations and all our machinery and equipment complies with the applicable guidelines.

## ENVIRONMENTAL COMMITMENT

As we move through the 21st century, we believe that every company has a responsibility to behave in a manner that is not detrimental to the environment. It is our policy to perform our operations with due regard to their effects on the environment. Corex Honeycomb is committed to maintaining a high standard of Environmental Management System, according to ISO 14001, in all areas of our business, with the purpose of preserving and improving the natural environment. As a company, we are certified to ISO 14001:2015.

The organisation aims for continual improvement in its environmental performance by the development, implementation, and maintenance of a documented Environmental Management System that reflects the following key environmental policy principles.

We commit ourselves to:

- Meeting or surpassing applicable environmental compliance obligations.
- Striving for continual improvement in environmental performance.
- Minimising the use of natural resource and the production of pollution and waste.
- Conserving and enhancing the natural environment.

Corex Honeycomb recognises that our operations can impact on the environment. We have always been sensitive to environmental issues and strictly adhere to all standards and regulations.

Our Environmental Management System aims to integrate best practice for sustainable and continual improvements in order to minimise any negative impact on the environment.

# MANUFACTURING

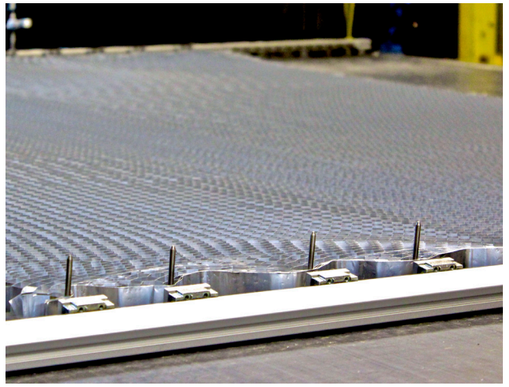
## The aluminium honeycomb manufacturing process

Corex aluminium honeycomb begins life as a roll of foil which is passed through a printer for adhesive lines to be printed on it. The foil is cut to size and stacked into piles using our stacking machine. These stacked sheets are pressed using a heated press to allow the adhesive to cure and bond the sheets of foil together to form a block of honeycomb which can be cut into slices. The thickness of the slices can be tailored to each customer's individual requirements. Finally, the honeycomb is expanded, which completes the manufacturing process.

The most popular manufacturing methods of sandwich panel construction are:

Heated Press- used for the production of flat board or simple panels

Vacuum Bag Processing - used for curved, large and complex panels



The Corex aluminium honeycomb range can be supplied in a variety of conditions, tailored to the individual needs of the customer:

| Aluminium Alloy Grade 3000 and 5000

| Full blocks or cut slices

The aluminium honeycomb block is the end result of the honeycomb manufacturing process. The blocks can be cut into individual unexpanded slices. The thickness depends on the customer requirement. The unexpanded slices can be expanded to form the finished expanded sheet. Corex Honeycomb sells honeycomb in all three formats: as blocks, unexpanded slices and expanded slices/sheets.

## Perforated or non-perforated

Non-volatile adhesive is used for bonding skins to the honeycomb core to prevent possible build-up of volatile substances during the curing process. This may be alleviated by using perforated honeycomb.

## Corrosion treated or untreated

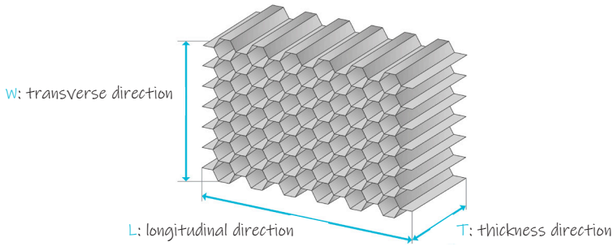
For most applications corrosion treated aluminium honeycomb is supplied. This means the aluminium foil has a surface coating applied to it before being made into a block. The treatment is carried out in-house and prevents the aluminium from corrosion. Furthermore, it improves the bonding properties of the aluminium and is therefore recommended for most panel manufacturing applications.

## Drilled

We have the capabilities to drill unexpanded core, allowing air to flow between the cells upon expansion. This can be carried out in a variety of diameters depending on customer requirements and the honeycomb cell size.

## Expanded or unexpanded

In its unexpanded form, aluminium honeycomb is very compact and easy to ship cost effectively and with minimal risk of damage. Unexpanded cut slices with a large cell size or thinner slice can be easily expanded into their full sheet form, without the need for sophisticated equipment. Corex Honeycomb can supply a Hand Expander for this purpose (as shown).




Corex Honeycomb's standard aluminium honeycomb can be expanded to the following sizes:

| W 2500mm x L 1250mm

| W 3000mm x L 1500mm

Non-standard block sizes are available on request. Depending on cell size, up to 18000mm can be achieved in the W direction.

T = thickness/ cell depth

L = ribbon direction/longitudinal direction

W= transverse direction

## Cutting Service

Honeycomb blocks can be cut to thicknesses to suit individual customer requirements. Using the latest cutting technology, Corex Honeycomb is able to supply slices up to a tolerance of +/- 0.125mm with a minimum slice thickness of 3mm.

## Engineering support

Corex Honeycomb is part of a group with more than 30 years' experience in manufacturing, engineering and design of composite materials.

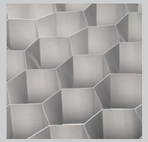
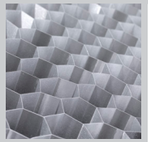
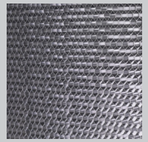
## Technical Support

Corex-Honeycomb offers engineering support services including:

| Consultancy

| Design Solutions

| Simulation (FE Analysis)

| | | |
|---|---|---|
|  |  |  |
| 25.4mm/1" | 12.7mm/1/2" | 4.8mm/3/16" |
| 19.1mm/3/4" | 9.5mm/3/8" | 3.2mm/1/8" |
| | 6.4mm/1/4" | 1.6mm/1/16" |
| These cell sizes are the largest which Corex Honeycomb manufactures, making this the lightest and the most cost-effective honeycomb. It is suitable for less demanding applications such as large panels used in architecture, interior design and building facades. | Medium cell sizes have very good strength, weight and cost ratio making this our most popular aluminium honeycomb. This size honeycomb can be used in a wide range of applications including marine, rail, construction and motorsport. | Small cell sizes result in higher density honeycomb, which makes this material heavier than larger cell sizes. This type of honeycomb achieves the highest strength available. It is mainly used in the most demanding applications to create extremely resilient sandwich panels. |

# SUPERFLEX
FLEXIBLE ALUMINIUM HONEYCOMB

By adjusting elements of our production process, the cell geometry has been adapted so that the aluminium honeycomb can be formed into 3D shapes. The resulting benefit of this cell configuration is that the flexible honeycomb retains its cell shape and therefore its strength, making it ideal for use in curved, spherical, cylindrical and organic shapes.

SuperFlex flexible honeycomb can be used for a wide range of applications, including train interiors, architectural structures, boat hulls, car and caravan body panels. Another application is in sports helmets where it is used as an energy absorber, providing protection to the wearer. As with our standard aluminium honeycomb, the product also adds strength whilst reducing the weight.

## MATERIAL SPECIFICATION

Corex Honeycomb manufacture pentagonal honeycomb with 3000 and 5000 alloy grades. SuperFlex can be supplied in a variety of conditions:

- Perforated or non-perforated
- Expanded or unexpanded
- In full blocks or cut slices

For further manufacturing information see the Technical Specification table.

TECHNICAL SPECIFICATIONS

## COREX ALUMINIUM HONEYCOMB RANGE

| CELL SIZE | | 1" 25.4mm | | 3/4" 19.1mm | | 1/2" 12.7mm | | 3/8" 9.5mm | | 1/4" 6.4mm | | 3/16" 4.8mm | | 1/8" 3.2mm | | 1/16" 1.6mm | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | lb/ft³ | kg/m³ | lb/ft³ | kg/m³ | lb/ft³ | kg/m³ | lb/ft³ | kg/m³ | lb/ft³ | kg/m³ | lb/ft³ | kg/m³ | lb/ft³ | kg/m³ | lb/ft³ | kg/m³ |
| 3000 Alloy Series | DENSITY | 0.9 | 14.4 | 1.3 | 20.8 | 1.8 | 28.8 | 2.4 | 38.4 | 3.4 | 54.5 | 4.4 | 70.5 | 8.1 | 129.7 | 12.4* | 198.6* |
| | | 1.3 | 20.8 | 1.8 | 28.8 | 2.6 | 41.6 | 3.7 | 59.3 | 5.2 | 83.3 | 6.9 | 110.5 | 10.0* | 160.0* | 16.4* | 262.7* |
| 5000 Alloy Series | | 0.6 | 9.6 | 0.8 | 12.8 | 1.1 | 17.6 | 1.6 | 25.3 | 2.3 | 36.8 | 3.1 | 49.7 | 4.5 | 72.1 | 9.2 | 147.7 |
| | | 1.3 | 20.8 | 1.8 | 28.8 | 2.6 | 41.6 | 3.7 | 59.3 | 5.2 | 83.3 | 6.9 | 110.5 | 10.0* | 160.2* | 16.4* | 262.7* |

## COREX 3000 ALLOY SERIES

| CELL SIZE | Nominal Density lb/ft³ | Compressive | | | Plate Shear | | | |
|---|---|---|---|---|---|---|---|---|
| | | Bare | Stabilised | | L Direction | | W Direction | |
| | | Strength psi | | Crush Strength psi | Strength psi | Modulus ksi | Strength psi | Modulus ksi |
| 1/4 (6.4mm) | 3.4 (54.5 kg/m³) | 305 | 330 | 115 | 205 | 35 | 105 | 17 |
| 1/4 (6.4mm) | 5.2 (83.3 kg/m³ | 625 | 655 | 235 | 360 | 65 | 210 | 35 |
| 3/8 (9.5mm) | 2.4 (38.4 kg/m³) | 180 | 195 | 55 | 115 | 24 | 65 | 12 |
| 3/8 (9.5mm) | 3.7 (59.3 kg/m³) | 335 | 365 | 120 | 225 | 40 | 125 | 20 |
| 1/2 (12.7mm) | 1.8 (28.8 kg/m³) | 100 | 115 | 35 | 90 | 20 | 55 | 8 |
| 1/2 (12.7mm) | 2.6 (41.6 kg/m³) | 195 | 210 | 60 | 135 | 27 | 75 | 13 |
| 3/4 (19.1mm) | 1.3 (20.8 kg/m³) | 55 | 65 | 25 | 50 | 13 | 35 | 6 |
| 3/4 (19.1mm) | 1.8 (28.8 kg/m³) | 115 | 125 | 40 | 95 | 22 | 60 | 10 |

## COREX 5000 ALLOY SERIES

| CELL SIZE | Nominal Density lb/ft³ | Compressive | | | Plate Shear | | | |
|---|---|---|---|---|---|---|---|---|
| | | Bare | Stabilised | | L Direction | | W Direction | |
| | | Strength psi | | Crush Strength psi | Strength psi | Modulus ksi | Strength psi | Modulus ksi |
| 1/16 (1.6mm) | 9.2 (147 kg/m³) | 1470 | 1519 | 735 | 850 | 150 | 520 | 53 |
| 1/16 (1.6mm) | 16.4 (262 kg/m³)* | n/a | n/a | n/a | n/a | n/a | n/a | n/a |
| 1/8 (3.2mm) | 4.5 (72.1 kg/m³) | 539 | 559 | 255 | 340 | 70 | 220 | 31 |
| 1/8 (3.2mm) | 10.0 (160.2 kg/m³)* | 2058 | 2205 | 1029 | 980 | 175 | 550 | 65 |
| 3/16 (4.8mm) | 3.1 (49.7 kg/m³) | 284 | 328 | 127 | 210 | 45 | 125 | 22 |
| 3/16 (4.8mm) | 6.9 (110.5 kg/m³) | 1097 | 1152 | 564 | 590 | 114 | 375 | 46 |
| 1/4 (6.4mm) | 2.3 (36.8 kg/m³) | 186 | 206 | 74 | 140 | 32 | 85 | 16 |
| 1/4 (6.4mm) | 5.2 (83.3 kg/m³) | 676 | 745 | 328 | 410 | 82 | 265 | 35 |
| 3/8 (9.5mm) | 1.6 (25.6 kg/m³) | 88 | 93 | 39 | 85 | 21 | 50 | 11 |
| 3/8 (9.5mm) | 3.7 (59.3kg/m³) | 362 | 402 | 176 | 250 | 55 | 160 | 26 |

## SUPERFLEX FLEXIBLE ALUMINIUM HONEYCOMB RANGE

| CELL SIZE | | 3/4" 19.1mm | | 1/2" 12.7mm | | 3/8" 9.5mm | | 1/4" 6.4mm | | 3/16" 4.8mm | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | lb/ft³ | kg/m³ | lb/ft³ | kg/m³ | lb/ft³ | kg/m³ | lb/ft³ | kg/m³ | lb/ft³ | kg/m³ |
| 3000 Alloy Series | DENSITY | 1.3 | 20.8 | 1.8 | 28.8 | 2.4 | 38.8 | 3.4 | 54.5 | 4.4 | 70.5 |
| | | 1.8 | 28.8 | 2.6 | 41.6 | 3.7 | 59.3 | 5.2 | 83.3 | 6.9 | 110.5 |
| 5000 Alloy Series | | 0.8 | 12.8 | 1.1 | 17.6 | 1.6 | 25.3 | 2.3 | 36.8 | 3.1 | 49.7 |
| | | 1.8 | 28.8 | 2.6 | 41.6 | 3.7 | 59.3 | 5.2 | 83.3 | 6.9 | 110.5 |

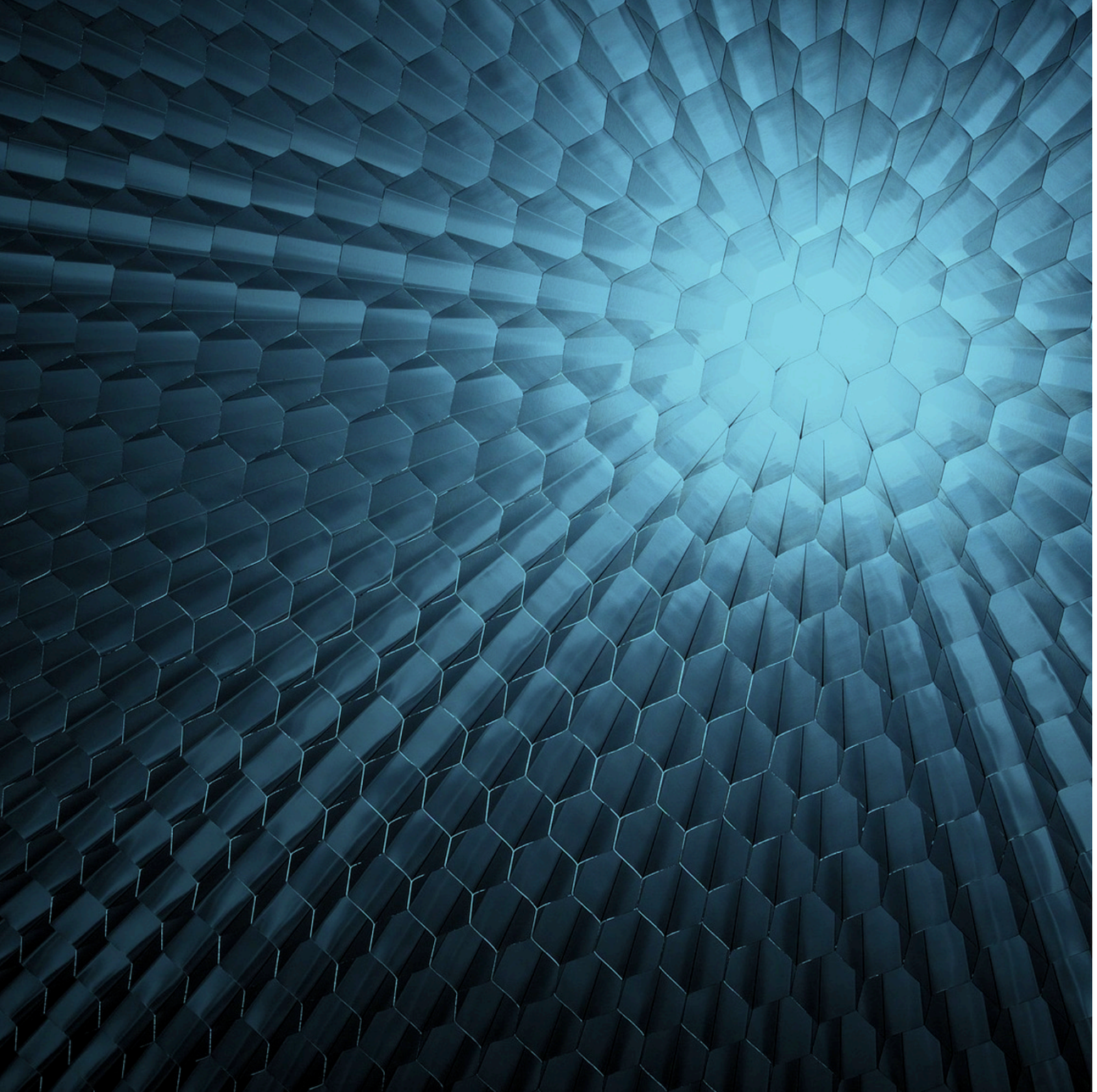
## SUPERFLEX 3000 ALLOY SERIES

| CELL SIZE | Nominal Density lb/ft³ | Compressive | | |
|---|---|---|---|---|
| | | Bare | Stabilised | |
| | | Strength psi | | Crush Strength psi |
| 1/4 (6.4mm) | 3.4 (54.5 kg/m³) | 305 | 330 | 115 |
| 1/4 (6.4mm) | 5.2 (83.3 kg/m³ | 625 | 655 | 235 |
| 3/8 (9.5mm) | 2.4 (38.4 kg/m³) | 180 | 195 | 55 |
| 3/8 (9.5mm) | 3.7 (59.3 kg/m³) | 335 | 365 | 120 |
| 1/2 (12.7mm) | 1.8 (28.8 kg/m³) | 100 | 115 | 35 |
| 1/2 (12.7mm) | 2.6 (41.6 kg/m³) | 195 | 210 | 60 |
| 3/4 (19.1mm) | 1.3 (20.8 kg/m³) | 55 | 65 | 25 |
| 3/4 (19.1mm) | 1.8 (28.8 kg/m³) | 115 | 125 | 40 |

## SUPERFLEX 5000 ALLOY SERIES

| CELL SIZE | Nominal Density lb/ft³ | Compressive | | |
|---|---|---|---|---|
| | | Bare | Stabilised | |
| | | Strength psi | | Crush Strength psi |
| 3/16 (4.8mm) | 3.1 (49.7 kg/m³) | 284 | 328 | 127 |
| 3/16 (4.8mm) | 6.9 (110.5 kg/m³) | 1097 | 1152 | 564 |
| 1/4 (6.4mm) | 2.3 (36.8 kg/m³) | 186 | 206 | 74 |
| 1/4 (6.4mm) | 5.2 (83.3 kg/m³) | 676 | 745 | 328 |
| 3/8 (9.5mm) | 1.6 (25.6 kg/m³) | 88 | 93 | 39 |
| 3/8 (9.5mm) | 3.7 (59.3kg/m³) | 362 | 402 | 176 |

*Sizes available on request. The above is an indication of the properties of Corex Honeycomb's aluminium honeycomb core. Please note that the above values are not guaranteed and should be used as an indication only. Variations in the above mentioned figures may occur without notice.



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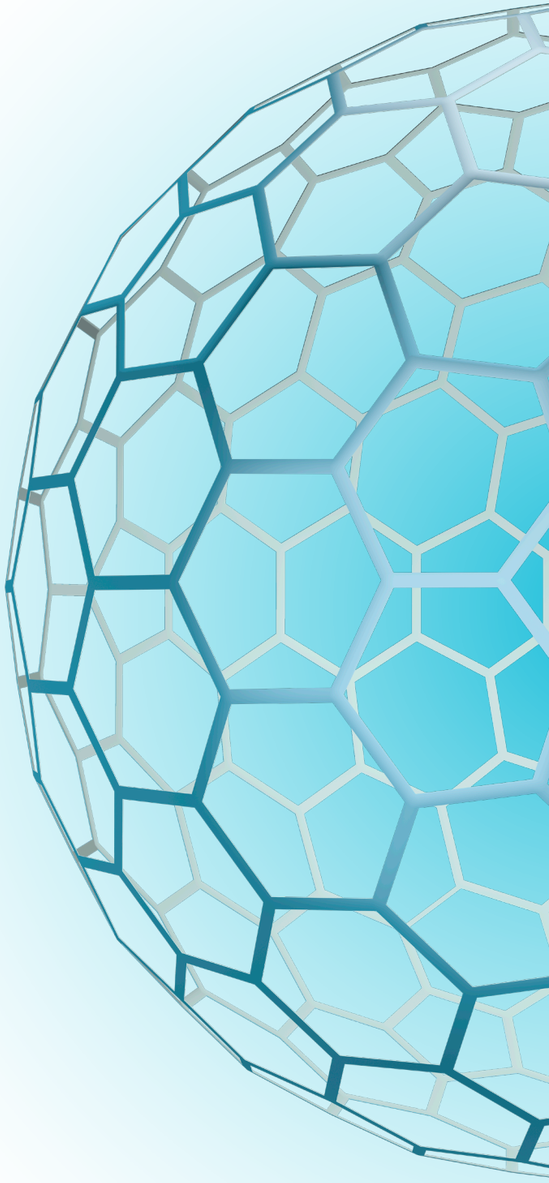
sales@corex-honeycomb.com
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